4a Old Main Road, Judges Walk, Kloof,
Kwazulu-Natal, South Africa, 3610
PO Box 819, Gillitts, 3603, South Africa
**Tel:** +27 (0) 31 764 7130 **Fax:** +27 (0) 31 764 7140 **Web:** www.gcs-sa.biz

# Somkhele Anthracite Mine Extension Environmental Impact Assessment and Environmental Management Programme

## Submitted for a Mining Right Application in terms of the Mineral and Petroleum Resources Development Act (Act No. 28 of 2002)

## Report

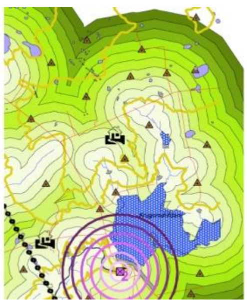
**Version - Final**

**19 March 2014**

**Tendele Coal Mining (Pty) Ltd**

**Project Number: 12-350**

**DMR Reference Number: KZN 30/5/1/2/2/10041 MR**



**Somkhele Anthracite Mine Extension**
**Environmental Impact Assessment and Environmental Management Programme**

**Report**
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12-350

## DOCUMENT ISSUE STATUS

| | | | |
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| **Report Issue** | Draft | | |
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| **Author** | Christopher Wright | | 19 March 2014 |
| **Title** | Somkhele Anthracite Mine Extension Environmental Impact Assessment and Environmental Management Programme | | |
| Document Reviewer | Russell Stow | | 19 March 2014 |
| Director | Ferdi Pieterse | | 19 March 2014 |

**LEGAL NOTICE**

# EXECUTIVE SUMMARY

**Project Background**

Somkhele is an operational anthracite mine, operated by Tendele Coal Mining (Pty) Ltd (hereafter referred to as Tendele), which started its opencast mining activities in 2007 after an old order mining right was granted in 2005 for Areas 2 and 3. The application for a mining right conversion was subsequently approved on 1 February 2011, and executed on 30 March 2011. This converted mining right (MR) is valid for 20 years.

Tendele is applying for an additional Mining Right to mine ten sites as part of a proposed extension project. As part of the Mining Right and environmental authorisation applications, an Environmental Impact Assessment (EIA) must be conducted to assess the potential impacts of the proposed expansion on the ecological, social and socio-economic aspects of the site and surrounding area.

The various mining areas being applied for are presented below:

**Table i Proposed Mining Areas**

| New Mine Sites | Size/Extent ($km^2$) |
|---|---|
| Machibini | 5.3755 |
| Kwaqubuka North | 2.8193 |
| Emalahleni (Area 10) | 2.5876 |
| Mahujini | 1.5168 |
| Ophondweni | 5.5585 |
| Tholokuhle | 3.2795 |
| Gwabalanda | 6.5907 |
| Mvutshini East | 2.038 |
| Mvutshini Central | 1.6311 |
| Mvutshini West | 1.1639 |

Each mining area has been investigated in this report. These mining areas will be reported on separately to ensure site specific management plans can be determined as well as enabling the existing EMP for mining operations to be incorporated into this document.

**Summary of Impacts**

There were no fatal flaws identified during the specialist studies. All potential impacts could be mitigated and impact significance ranged from low to high pre-mitigation through to low to medium significance post mitigation.

The main impacts identified and the mitigation measures which could be implemented are summarized below:

**Soil and Land Capability**

**Main Impacts assessed**

- Change in soil properties.
- Loss of Soil Integrity; Soil contamination.
- Loss of Soils through Erosion.
- Loss of Soil integrity; Soil and overburden stockpiling.
- Loss of soil integrity, mining area and roads rehabilitation.
- Usable material.

*Main Mitigation measures implemented*

- Effective soil stripping.
- Soil replacement and the preparation procedures.

**Aquatics**

**Main Impacts assessed**

- Altered stream morphology.
- Destruction/disturbance of riverine vegetation & habitat.
- Fragmentation of riverine habitat and reduction in natural connectivity.
- Introduction of invasive/alien species.
- Loss of biodiversity of in-stream habitat and biota.
- Modified hydrology.
- Reduced surface water quality and risk of eutrophication.
- Reduced surface water quantity.
- Sedimentation, erosion and increased turbidity.

*Main Mitigation measures implemented*

- Establish aquatic buffer zones.
- Demarcate/map all natural areas are that are off-limits to construction vehicles and personnel.
- No infringement into the mapped sensitive riparian areas must occur. This can be achieved by fencing footprint areas to contain all activities within designated mining impact areas.

- Where encroachment of mining into the areas of high sensitivity will be unavoidable, it must be ensured that impact footprints are minimised and that no activities encroach any further than indicated on the mining/infrastructural design masterplan.
- Developing and implementing a suitable monitoring programme for aquatic ecosystems.

**Visual**

**Main Impacts assessed**

- Visual impact by mining and mine infrastructure.
- Change in topography.
- Light Pollution.

*Main Mitigation measures implemented*

- Management in Site Preparation.
- Landscaping of sensitive areas.
- Site Revegetation and Rehabilitation.
- Managing lighting effectively.

**Hydrology**

**Main Impacts assessed**

- Surface compaction-increase in runoff.
- Roll-over mining coal from open pits.
- Treatment of coal - ROM and Product stockpiles - poor quality seepages and runoff at plant areas, wash bays and other infrastructure at Somkhele mine.
- Stockpiling of topsoil and overburden during mining.
- Pollution Control Dams - poor quality seepages and spill to the streams.

*Main Mitigation measures implemented*

- Diversion berms will be constructed upslope of the mining pits to divert clean water away from the active zone and separate clean/dirty water; and
- Settling ponds will be utilized for the clean surface water before discharge.

- Implement stormwater management plan.

**<u>Geohydrology</u>**

**<u>Main Impacts assessed</u>**

- Mining open cast on groundwater quantity.
- Mining open cast on groundwater quality.
- Coal transport via haulage roads to Area 2.
- Treatment of coal - ROM and Product stockpiles - poor quality seepages at plant areas.
- Waste disposal within Pits - poor quality seepages.
- Pollution Control Dams - poor quality seepages.
- Mining open cast and de-watering activities will impact on shallow aquifer by lowering of groundwater levels.
- Dewatering activity impact on shallow base-flow to the nearby stream.

*<u>Main Mitigation measures implemented</u>*

- Separate clean and dirty runoff and contain dirty water in adequately sized pollution control dams. Ensure that pollution control dams are adequately sized according to the specifications in DWAF's GN704 or other applicable regulations.
- Keep dirty areas as small as possible.
- Compact the base of dirty areas, like the ROM coal stockpile, workshops and oil and diesel storage areas to minimise infiltration of poor quality water to the underlying aquifers.
- Re-use groundwater seepage collected in the open pits to adequately sized pollution control facilities in the mining process.
- Keep dirty areas like the pollution control dam and coal stockpiles, workshops and oil and diesel storage areas as small as possible.
- Contain poor quality runoff from dirty areas and divert this water to pollution control dam for re-use.

**Biodiversity**

**Main Impacts assessed**

- Destruction of Natural Vegetation.
- Fragmentation of Habitat and reduced connectivity.
- Increased fire Risk.
- Increased pressure on natural resources.
- Introduction of invasive alien species.
- Loss of Fauna.
- Loss of Red Data and Protected Species.
- Pollution of Habitats.
- Soil erosion & Sedimentation.

*Main Mitigation measures implemented*

- A zero development, 50 m buffer zone on either side of the riverine forest community must be maintained. These should be clearly demarcated with beacons.
- Stream crossings are to be sensitively planned to target areas where:
  - The riverine forest is naturally 'open' and there are no gaps in the continuity.
  - There are no large trees present.
- All areas of high ecological sensitivity near to mining operations should be clearly marked as "out of bounds" or "no-go areas" for all construction vehicles and mining personnel. This can be achieved by appropriately demarcating/mapping all natural areas are that are off-limits to and by fencing mining footprint areas to contain all activities within designated areas.
- Where encroachment of mining into the areas of high sensitivity will be unavoidable, it must be ensured that impact footprints are minimised and that no activities encroach any further than indicated on the infrastructural design master plan.
- Use/upgrade existing roads to access the site only and do not construct any new access routes where possible.
- Reduce the fragmentation of faunal habitat by confining the area of disturbance. This particularly applies to the riverine forest and the related

stream crossings.

- Where encroachment of mining into the areas of high sensitivity will be unavoidable, it must be ensured that impact footprints are minimised and that no activities encroach any further than indicated on the infrastructural design master plan.
- Where haul roads and other services infrastructure will need to traverse habitat mapped as ecologically sensitive (medium-high EIS rating), these should be located along existing routes/tracks or degraded areas of veld/habitat before seeking alternative routes. The shortest/most convenient route is often not the most ecologically sensitive one. Additional infrastructure such as roads, power lines, etc. should be located in transformed areas wherever practically possible.
- Ensure that migratory connectivity is maintained between open natural areas where possible by limiting the removal of vegetation and restricting the fragmentation of habitat, particularly for sensitive areas.
- Fences and other obstruction to wildlife movement should not be constructed through natural areas.
- Retain indigenous trees as far as possible and do not damage/remove any indigenous species outside of the mining impact zone.
- Monitor rehabilitation in the long-term to ensure that the desired habitat is created for the re-colonisation of fauna.
- Revegetate the disturbed areas as quickly as possible.
- Ensure vegetation corridors are maintained. A 50meter buffer from riverine areas will be maintained.

**Heritage**

**Main Impacts assessed**

- Places Associated With Oral Traditions or Living Heritage.
- Traditional Burial Places.
- Archaeological Sites.

*Main Mitigation measures implemented*

- make information about the project available to local communities as this will reduce the potential development of unnecessary fears and resentment towards the mine;

- Actively and publicly support the important ritual activities relating ancestors and graves at the level of the community (both logistically and financially);
- Facilitate important ritual activities that need to take place in and around the project site wherever possible; and
- Involve affected individuals, families, traditional leaders and elected leaders in the process.

A summary of the potential impacts and specialist studies are presented in Table ii below. These impacts outline impacts significance both pre and post mitigation. All potential impacts can be mitigated into a low or medium range. There are double ratings for various impacts. This is due to some study areas being more environmentally sensitive than others.

**Table ii Impact ranking summary**

| Specialist Study | Impact range without mitigation | | Impact Range with mitigation | |
|---|---|---|---|---|
| Soil and Land Capability | Low - | High | Low - | Medium |
| Aquatics | Medium | | Medium | |
| Visual | Medium | | Medium | |
| Hydrology | Medium - | High | Low - | Medium |
| Geohydrology | Low - | High | Low - | Medium |
| Biodiversity | Medium - | High | Low - | Medium |
| Heritage | No fatal flaws identified | | | |

## Management measures

Management measures have been drafted to manage the impacts identified. These measures included actions that have already been implemented for current and previous operations. The mining areas are all similar in nature and environmental impacts for all the areas are almost identical. The management measures that will be implemented can be generically applied to all mining areas, but will have specific measures for certain areas.

## Conclusion and recommendations

No environmental fatal flaws have been identified for the project. All management measures outlined in this report adequately assess the impacts identified.

The EMP is a working document and it is recommended that this EMP be constantly reviewed and updated to ensure management measures are pertinent to activities on the mine.

## CHECKLIST IN TERMS OF REGULATION 50 AND 51 OF GOVERNMENT NOTICE 26275 OF MPRDA

This document has been compiled in terms of Section 39 and of Regulations 50 and 51 of the Mineral and Petroleum Resources Development Act (Act No. 28 of 2002) (MPRDA). The Department of Mineral Resources (DMR) Environmental Impact Assessment (EIA) and Environmental Management Programme (EMP) template states the following:

*"All applicants for mining rights are herewith, in terms of the provisions of Section 29 (a) and in terms of Section 39 (5) of the Mineral and Petroleum Resources Development Act, directed to submit an environmental Impact Assessment, and an Environmental Management Programme strictly in accordance with the subject headings herein, and to compile the content according to all the sub items to the said subject headings referred to in the guideline published on the Departments website, within 30 days of notification by the Regional Manager of the acceptance of such application."*

For ease of reference the checklist below has been provided. All subject headings are furthermore included under each chapter of the document.

**Regulations and links to requirements**

| REGULATION 50 (a). | REPORT REFERENCE |
|---|---|
| 1. Description of the baseline environment | |
| 1.1. Concise description of the environment on site relative to the environment in the surrounding area. | Chapter 2 |
| 1.2. Concise description of each of the existing environmental aspects both on the site applied for and in the surrounding area which may require protection or remediation. | Chapter 2 |
| 1.3. Concise description of the specific land uses, cultural and heritage aspects and infrastructure on the site and neighbouring properties/farms in respect of which the potential exists for the socio-economic conditions of other parties to be affected by the proposed mining operation. | Chapter 2 |
| 1.4. Annotated map showing the spatial locality and aerial extent of all environmental, cultural/heritage, infrastructure and land use features identified on site and on the neighbouring properties and farms. | Figure 1-3 |

| | |
|---|---|
| 1.5. Confirmation that supporting documents in the form of specialist studies are attached as appendices. | Chapter 14 |
| 2. The proposed mining operation. | |
| 2.1. The mineral to be mined | Chapter 3 |
| 2.2. The mining method to be employed at the level of opencast, underground, stoping, stooping, total extraction, bord and pillar, block caving, shrinking, dredging, pumping, monitoring, etc. and provide a concise description of the intended magnitude thereof, in terms of volumes, depth and aerial extent. | Section 3.3.1 |
| 2.3. List of the main mining actions, activities, or processes, such as, but not limited to, access roads, shafts, pits, workshops and stores, processing plant, residue deposition sites, topsoil storage sites, stockpiles, waste dumps, access roads dams, and any other basic mine design features. | Chapter 3 |
| 2.4. Plan showing the location and aerial extent of the aforesaid main mining actions, activities, or processes as required to calculate the financial provision in accordance with the Department's published guideline. (Reg. 51 (b) (v)). | Figure 1-3 |
| 2.5. Listed activities (in terms of the NEMA EIA regulations) which will be occurring within the proposed project. | Table 1-5 and Table 1-6 |
| 2.6. Indication of the phases (construction, operational, decommissioning) and estimated time frames in relation to the implementation of these actions, activities or processes and infrastructure. | Section 6.1 |
| 2.7. Confirmation if any other relevant information is attached as appendices. | List of Appendices and Chapter 14 |
| 3. The potential impacts | |
| 3.1. List of the potential impacts, on environmental aspects separately in respect of each of the aforesaid main mining actions, activities, processes, and activities listed in the NEMA EIA regulations. (Include all the items to be included in the list referred to in the concomitant section of the guideline posted on the official website of the Department). | Chapter 7 |
| 3.2. List of all potential cumulative environmental impacts. | Chapter 7 |
| 3.3. State specifically whether or not there is a risk of acid mine drainage or potential groundwater contamination associated with the mineral to be mined. (If such a risk is associated with the mineral to be mined provide a summary of the findings and recommendations of a specialist geo-hydrological report in that regard). | Section 7.3.3 |
| **REGULATION 50 (b)** | |
| 4. The alternative land use or developments that may be affected | |
| 4.1. Concise description of the alternative land use of the area in which the mine is proposed to operate. | Chapter 2 |
| 4.2. List and description of all the main features and infrastructure related to the alternative land uses or developments. | Chapter 3 |

| | |
|---|---|
| 4.3. Plan showing the location and aerial extent of the aforesaid main features of the alternative land use and infrastructure related to alternative land developments identified during scoping. | Figure 1-3 |
| 5.The potential impacts of the alternative land use or development | |
| 5.1. List of the potential impacts of each of the aforesaid main features and infrastructure related to the alternative land use or development and related listed activities. | N/A |
| 5.2. Description of all potential cumulative impacts of the main features and infrastructure related to the identified alternative land uses or developments. | N/A |
| **REGULATION 50 (c)** | |
| 6. Identification of potential social and cultural impacts. | |
| 6.1. List of potential impacts of the proposed mining operation on the socio- economic conditions of other parties' land use activities. (Include all the items to be included in the list referred to in the concomitant section of the guideline posted on the official website of the Department). | Chapter 7 |
| 6.2. Description of the cultural aspect that will potentially be affected, and describe the potential impact on such cultural aspect. (In cases where such features are not applicable the applicant must still include the item in the list and describe it as not applicable). | Chapter 7 |
| 6.3. Description of heritage features and the potential impact on such heritage feature. (In cases where such features are not applicable the applicant must still include the item in the list and describe it as not applicable). | Chapter 7 |
| 6.4. Quantification of the impact on the socio-economic conditions of directly affected persons, as determined by the findings and recommendations of a specialist report in that regard. | Chapter 7 |
| 6.4.1. The amount of the quantified potential impact on property or infrastructural assets. | Chapter 7 |
| 6.4.2. State the amount of the quantified potential impact on commercial, economic or business activity which will be impacted upon as a result of the mining activity. | Chapter 7 |
| 6.4.3. The sum of the amounts, referred to in paragraphs 6.6.1 and 6.6.2 above. | Chapter 7 |
| 7. Assessment and evaluation of potential impacts. | |
| 7.1. List of each potential impact identified in paragraphs 3 and 6 above. (Include all the items to be included in the list referred to in the concomitant Chapter of the guideline posted on the official website of the Department). | Chapter 7 |
| 7.2.Concomitant impact rating for each potential impact listed in paragraph 7.1 above in terms of its nature, extent, duration, probability and significance.(Provide a definition of the criteria used for each of the variables used for rating potential impacts and ensure that the potential impacts are rated specifically with the assumption that no mitigation measures are applied). | Chapter 7 |
| 7.3. Indication of the phases (construction, operational, decommissioning) and estimated time frames in relation to the potential impacts rated. | Chapter 7 |
| **REGULATION 50 (d)** | |

| | |
|---|---|
| 8. Identification of the alternative land uses which will be impacted upon. (Include all the items to be included in the list referred to in the concomitant section of the guideline posted on the official website of the Department). | Chapter 4 |
| 9. Listed results of a specialist comparative land use assessment. (Refer to the concomitant section of the guideline posted on the official website of the Department and attach the specialist study as an appendix). | Chapter 4 |
| **REGULATION 50 (e)** | |
| 10.List of all the significant impacts as identified in the assessment conducted in terms of Regulation 50 (c) (Include all the items to be included in the list referred to in the concomitant section of the guideline posted on the official website of the Department). | Chapter 7 |
| **REGULATION 50 (f)** | |
| 11. Identification of interested and affected parties. (Including the community, and list as identified according to the scoping report guideline and identified in the scoping report). | Chapter 5 |
| 12. The details of the engagement process. (Including the community, and list as identified according to the scoping report guideline and identified in the scoping report and any further consultation since the compilation of the scoping report). | Chapter 5 |
| 13. Details regarding the manner in which the issues raised were addressed. (Include all the items to be included in the list referred to in the concomitant section of the guideline posted on the official website of the Department) | Chapter 5 |
| **REGULATION 50 (g)** | |
| 14. The appropriate mitigatory measures for each significant impact of the proposed mining operation. | |
| 14.1. Adequacy of predictive methods utilised. | Section 12.1 |
| 14.2. Adequacy of underlying assumptions. | Section 12.2 |
| 14.3. Uncertainties in the information provided. | Section 12.3 |
| **REGULATION 50 (h)** | |
| 15. Arrangements for monitoring and management of environmental impacts. | |
| 15.1. List of identified impacts which will require monitoring programmes. | Chapter 7 |
| 15.2. Functional requirements for the said monitoring programmes. | Chapter 8 |
| 15.3. Roles and responsibilities for the execution of the monitoring programmes. | Chapter 8 |
| 15.4. Time frames for monitoring and reporting. | Section 8.6 |
| **REGULATION 50 (i)** | |
| 16. Technical and supporting information.<br>(Include all the items to be included in the list referred to in the concomitant section of the guideline posted on the official website of the Department). | List of Appendices and Chapter 14 |

| **ENVIRONMENTAL MANAGEMENT PROGRAMME** | |
|---|---|
| **REGULATION 51 (a)** | |
| 1. Description of environmental objectives and specific goals for mine closure. | |
| 1.1. Environmental aspects that describe the pre-mining environment. | Chapter 2 |
| 1.2. Measures required to contain or remedy any causes of pollution or degradation or the migration of pollutants, both for closure of the mine and post-closure. | Chapter 7 |
| 2. Description of environmental objectives and specific goals for the management of identified environmental impacts emanating from the proposed mining operation. (As informed by the information provided in the EIA in terms of Regulation 50 (h)). | |
| 2.1. List of identified impacts which will require monitoring programmes. | Chapter 7 |
| 2.2. List of the source activities that are the cause of the impacts which require to be managed. | Chapter 3 |
| 2.3. Management activities which, where applicable, will be conducted daily, weekly, monthly, quarterly, annually or periodically as the case may be in order to control any action, activity or process which causes pollution or environmental degradation. | Chapter 7 |
| 2.4. The roles and responsibilities for the execution of the monitoring and management programmes. | Section 8.6 |
| 3. Description of environmental objectives and specific goals for the socio-economic conditions as identified in the social and labour plan. (Include all the items to be included in the list referred to in the concomitant section of the guideline posted on the official website of the Department). | Section 6.2 |
| 4. Description of environmental objectives and specific goals for historical and cultural aspects. | |
| 4.1. Environmental objectives and goals in respect of historical and cultural aspects identified in specialist studies conducted during the EIA phase. | Section 6.2 |
| **REGULATION 51 (b) – Outline of the implementation programme** | |
| 5.The appropriate technical and management options chosen for each environmental impact, socio-economic condition and historical and cultural aspect in each phase of the mining operation, as follow | |
| 5.1. Actions, activities or processes, including any NEMA EIA Regulation listed activities, which cause pollution or environmental degradation. (Include all the items to be included in the list referred to in the concomitant section of the guideline posted on the official website of the Department). | Chapter 7 |
| 5.2. Concomitant list of appropriate technical or management options chosen to modify, remedy, control or stop any action, activity, or process which will cause significant impacts on the environment, socio-economic conditions and historical and cultural aspects as identified. (Attach detail of each technical or management option as appendices). | Chapter 7 |
| 6. Action plans to achieve the objectives and specific goals contemplated in Regulation 50 (a). | Chapter 7 |
| 17. Time schedules of deadlines for each action to be undertaken to implement each technical or management option chosen. (Include all the items to be included in the list referred to in the concomitant section of the guideline posted on the official website of the Department). | Chapter 7 |

| | |
|---|---|
| 7. Procedures for environmentally related emergencies and remediation<br>(An environmental emergency plan that includes all the items referred to in the concomitant section of the guideline posted on the official website of the Department). | Chapter 9 & Appendix D |
| 8. Planned monitoring and environmental management programme performance assessment. | |
| 8.1. Description of planned monitoring of the aspects of the environment which may be impacted upon. (Include all the items referred to in the concomitant section of the guideline posted on the official website of the Department). | Chapter 8 |
| 8.2. Provide a description as to how the implementation of the action plans contemplated in Regulation 51 (b) (ii) as described will be monitored as described in paragraph 6 of the EMP will be monitored. | Chapter 8 |
| 8.3. Frequency of proposed reporting for assessment purposes. | Chapter 8 |
| 9.Financial provision in relation to the execution of the environmental management programme:- | |
| 9.1. Plan showing the location and aerial extent of the aforesaid main mining actions, activities, or processes anticipated. (Include all the items referred to in the concomitant section of the guideline posted on the official website of the Department) | Figure 3.1 |
| 9.2. Annual forecasted financial provision calculation (Refer to the concomitant section of the EIA and EMP guideline). | Chapter 10 and Appendix E |
| 9.3. Confirmation of the amount that will be provided should the right be granted. | Chapter 10 and Appendix E |
| 9.4. The method of providing financial provision contemplated in Regulation 53. | Chapter 10 and Appendix E |
| 10. Environmental Awareness Plan (Section 39 (3) (c))<br>(Include all the items referred to in the concomitant section of the guideline posted on the official website of the Department). | Chapter 9 and Appendix D |
| 11. Attachment of specialist reports, technical and supporting information.<br>(Provide a List) | List of Appendices and Chapter 14 |
| 12. SECTION 39 (4) (a) (iii), Capacity to manage and rehabilitate the environment (Include all the items referred to in the concomitant section of the guideline posted on the official website of the Department. | Chapter 10 and Appendix E |
| 13. UNDERTAKING | |
| 13.1. The Environmental Management Programme will, should it comply with the provisions of section 39 (4) (a) of the Act and the right be granted, be approved and become an obligation in terms of the right issued. As part of the proposed Environmental Management Programme, the applicant is required to provide an undertaking that it will be executed as approved and that the provisions of the Act and regulations thereto will be complied with. | Chapter 15 |

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## LIST OF FIGURES

## LIST OF TABLES

## LIST OF PHOTOS

## LIST OF APPENDICES

## REPORT STRUCTURE

This EIA Report has been compiled in compliance with the requirements of regulation 50 and 51 of the MPRDA Regulations, Government Notice R527, dated 23 April 2004. The outline of the report is outlined below.

This report outline includes information on how the existing EMP's correlate to this document. One of the objectives of this document is to ensure that existing commitments are effectively integrated into this document. To comply with the above-mentioned legislation as well as to enable the integration of existing EMPs, the Report structure is outlined as follows:

Chapter 1:

- This chapter provides a background to the project and the applicant.
- Overview of existing approvals.
- Objectives of this document.
- Integration and description of previous EMP's for Somkhele mine.
- Description of the surface rights with regards to the MRA.
- A list of the applicable legislation reviewed during the compilation of this report.
- Description of all the applicable environmental authorization application processes being undertaken with respect to the proposed extension.

Chapter 2:

- A description of the baseline biophysical and socio-economic conditions of the project areas.
    - The baseline data will outline the entire mining area. Specific biophysical conditions pertinent to specific mining areas will be outlined. The layout will be separated according to various specialist disciplines. The information in this chapter has been obtained from the specialist studies undertaken as well as previous reports and various desktop sources.

Chapter 3:

- A description of the proposed pit layouts.
- Description of mining method.
- Outline of required services, access routes, transport routes and surface infrastructure.

Chapter 4:

- A description of the project alternatives considered.
- Motivation for why the preferred alternative was selected.

Chapter 5:

- A description of the stakeholder consultation process undertaken.
- Outline of the issues which were identified during the process.
- The proof of public consultation is attached under Appendix C of this report.

Chapter 6:

- This chapter outlines the environmental management objectives and goals for the proposed mine extension.

Chapter 7:

- The construction, operational and decommissioning activities that will impact on the biophysical and socio-economic environment (These aspects will be assessed for each mining area).
- A description of the environmental impact assessment methodology, impact assessment criteria and rankings.
- The rating of the significance of the impacts posed by the proposed activities (These rating tables will be assessed for each mining area).
- The management and mitigation measures, action plans, timeframes and costs with respect to avoiding and managing environmental and socio-economic impacts, as well as the associated costs (The management and mitigation measures will be outlined for each separate area). The costs for managing and actioning the environmental plans will be looked at for the whole mine operations.

Chapter 8:

- Summarises existing monitoring Programs
- Outlines the monitoring and auditing programmes which will be implemented. It includes objectives of each monitoring programme, the location of monitoring points, the procedures to be followed when undertaking monitoring; the frequency of monitoring required; criteria to assess environmental performance, as well as the internal and external (independent) auditing to be undertaken.

Chapter 9:

- This chapter sets out procedures to be followed during and after various types of incidents and accidents. It also sets out the procedure for inducting employees and informing all mine employees and contractors of the various risks which may results from the various activities on site and all required management and mitigation measures which are in place and that must be complied with in order to avoid environmental pollution and degradation. The environmental awareness and emergency response plan is attached under Appendix D of this report.

Chapter 10:

- The chapter provides the financial provision required for the project. The contents of this chapter are attached under Appendix E of this report.

Chapter 11:

- This chapter outlines the environmental rehabilitation to be undertaken following environmental disturbances caused by the proposed activities associated with the proposed mine.

Chapter 12:

- This chapter outlines the assumptions made during the specialist studies and environmental impact assessment, the adequacy of underlying assumptions, the uncertainties in the information provided, as well as recommendations to improve the accuracy of the information used to compile this report and the relevant appendices.

Chapter 13:

- This chapter is the conclusion to the report which summarises the results of the studies and contains the recommendations of the EAP.

Chapter 14:

- List of specialist reports which are appended to this document.

Chapter 15:

- This chapter is the undertaking that the EMP will be executed as approved and that the provisions of the Act and regulations thereto will be complied with.

Chapter 16:

- List of references used to compile this report.

## DOCUMENT OBJECTIVES

The following objectives were considered when writing this report:

- Document must be easy to understand.
- Document must be practical in its management objectives.
- Document must be easy to audit, this is in relation to management objectives and environmental management plans.
- All unnecessary repetition must be avoided.
- Document must be flexible and any alterations or additional management plans can be easily integrated into the document.

# 1 BACKGROUND AND INTRODUCTION

## 1.1 Background

Somkhele is an operational anthracite mine, operated by Tendele Coal Mining (Pty) Ltd (hereafter referred to as Tendele), which started its opencast mining activities in 2007 after an old order mining right was granted in 2005 for Areas 2 and 3. The application for a mining right conversion was subsequently approved on 1 February 2011, and executed on 30 March 2011. This converted mining right is valid for 20 years.

The Mining Rights (MRs) and corresponding Environmental Management Programmes (EMPs) which have been approved, or are yet to be approved in respect of the Somkhele operations, are listed in Table 1-1.

**Table 1-1 Mining Rights and Corresponding EMPs**

| EMP Approval | Type | DMR Reference | Approval Date |
|---|---|---|---|
| Area 2/3 | Old Order Mining Right | KZN 30/5/1/2/2/216 MR | 2005 |
| Area 1 | New Order Mining Right Addendum 1 | KZN 30/5/1/2/2/135 MR | 2007 |
| Area 2 Conversion | Conversion of Old Order to New Order Mining Right | KZN 30/5/1/2/2/216 MR | 1 February 2011 |
| Luhlanga & Kwaqubuka | Section 102 application to include in Area 2 MR | KZN 30/5/1/2/2/216 MR | Approved |
| Amendment to Area 2 EMP | Amendment to include 2'nd washing plant and calcining plant and fuel storage | KZN 30/5/1/2/2/216 MR | Approved |
| Addendum to Area 2 EMP | Addendum to EMP to include 3$^{rd}$ washing plant. | KZN 30/5/1/2/2/216 MR | Approved |
| Area 4/5 | MR Application for Areas 4/5 | KZN 30/5/1/2/2/10041 MR | Pending (This application) |

Tendele is applying for an additional MR to mine ten sites as part of a proposed extension project.

The various mining areas being applied for are presented in Table 1-2. Each mining area will be discussed independently to ensure impacts identified in the specialist studies can incorporate specific management and mitigation measures for the specific mining area. This format will enable Somkhele to integrate existing EMP's of its current operations with this EMP.

**Table 1-2 Mining sites included in MR Application**

| New Mine Sites | Size/Extent ($km^2$) |
|---|---|
| Machibini | 5.3755 |
| Kwaqubuka North | 2.8193 |
| Emalahleni (Area 10) | 2.5876 |
| Mahujini | 1.5168 |
| Ophondweni | 5.5585 |
| Tholokuhle | 3.2795 |
| Gwabalanda | 6.5907 |
| Mvutshini East | 2.038 |
| Mvutshini Central | 1.6311 |
| Mvutshini West | 1.1639 |

The current process involves obtaining environmental approval In terms of Section 39 (1) of the Mineral and Petroleum Resources Development Act (Act 28 of 2002) (MPRDA). The application for authorisation under the MPRDA will include a Scoping and Environmental Impact Assessment (EIA) process in respect of the proposed extension and alteration to mining operations.

## 1.2 Consolidation of EMPs

Currently Somkhele has two mining rights with approved EMPs. The existing EMPs are very similar in content, with the EMP for Area 1 being submitted as an addendum to the initial EMP for Area 2. This was done to ensure uniformity in management measures but was also the result of similar environmental issues.

The EMP for Area 2, which was the first approved EMP, outlines all the management measures for the processing plants, workshops as well as waste management. This application to extend mining operations will utilize all the existing infrastructure within Area 2 and subsequently this EMP as well as the approved EMP for Area 2 will need to reflect the changes and extension in mining operations. Taking cognizance of this aspect, operational alterations will be outlined in this document.

A Section 102 application was approved by the Department of Mineral Resources (DMR) which extended Somkhele MR to include Luhlanga and Kwaqubuka mining areas which are contiguous to Area 2. The EMPs in operation were consolidated to ensure that a single document could be utilized. This EMP will subsequently encompass all existing management measures along with any additional new measures identified in the various impact assessments (specialist studies) commissioned for the current MR application.

This purpose of this document is not to amend the existing management plans but will consolidate management plans into a singular document. A visual representation of the EMPs and how they correlate to each other is outlined in Figure 1-1.

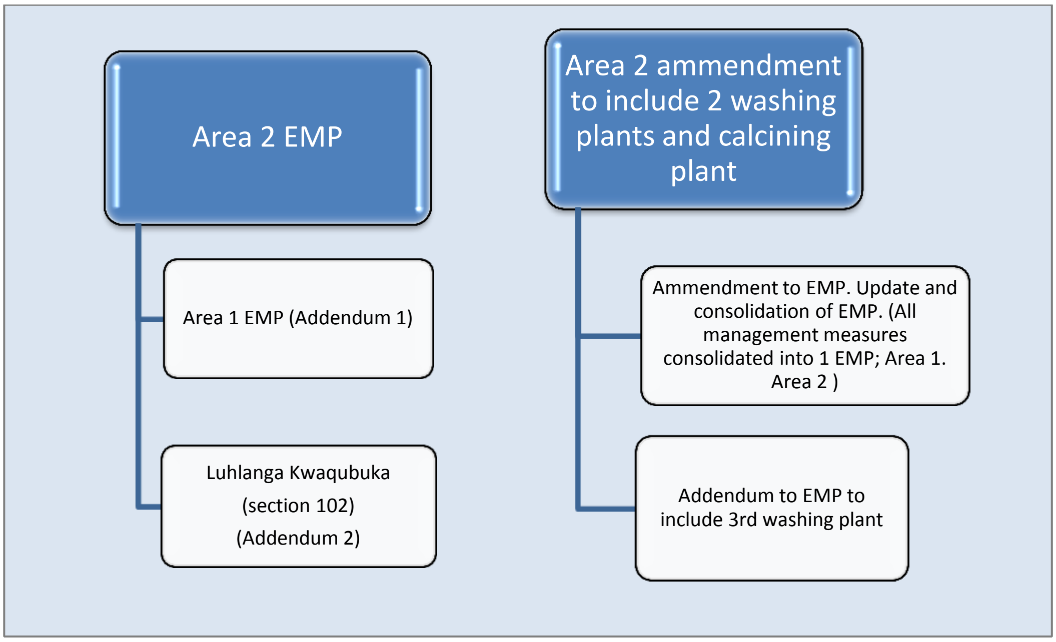
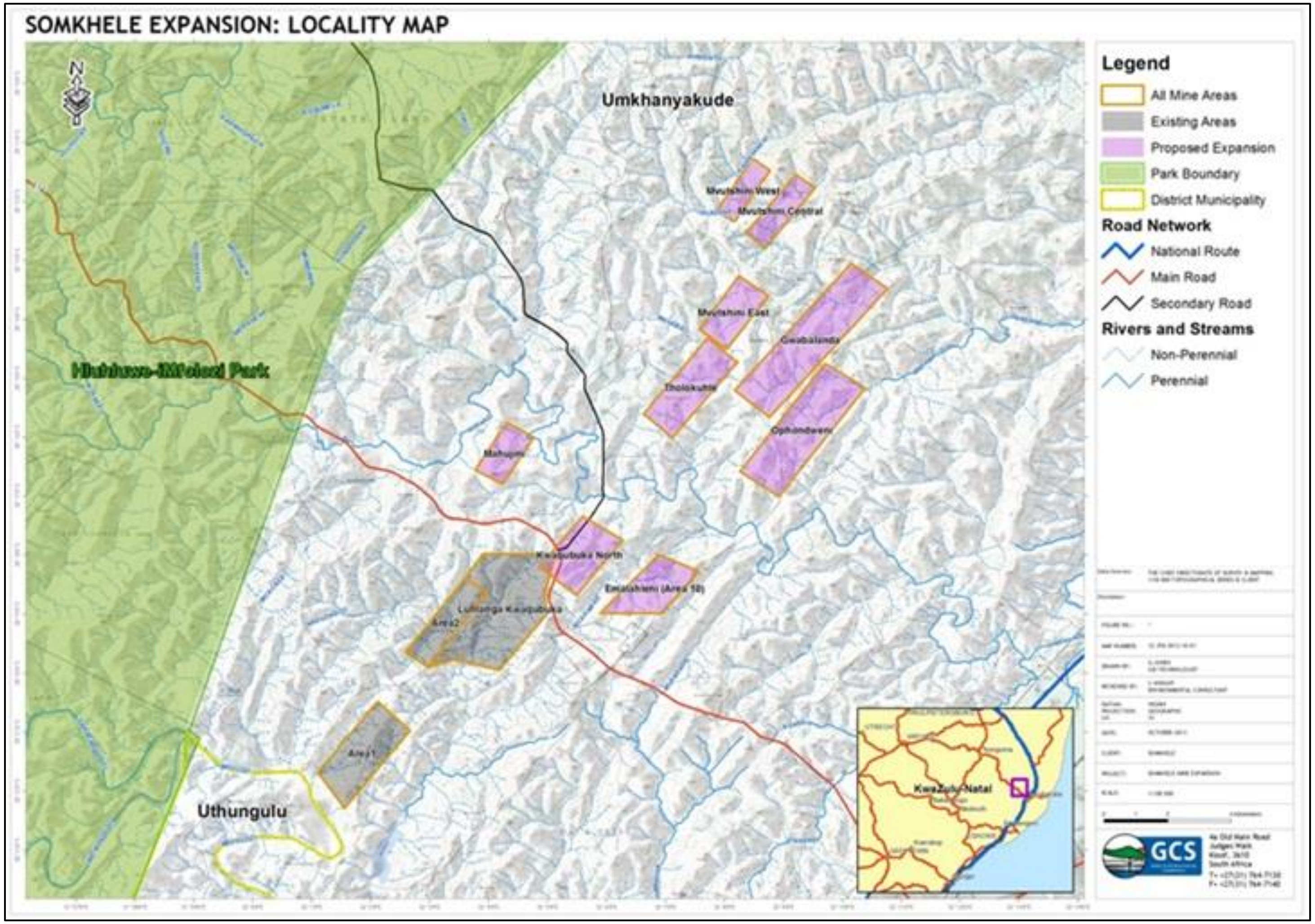
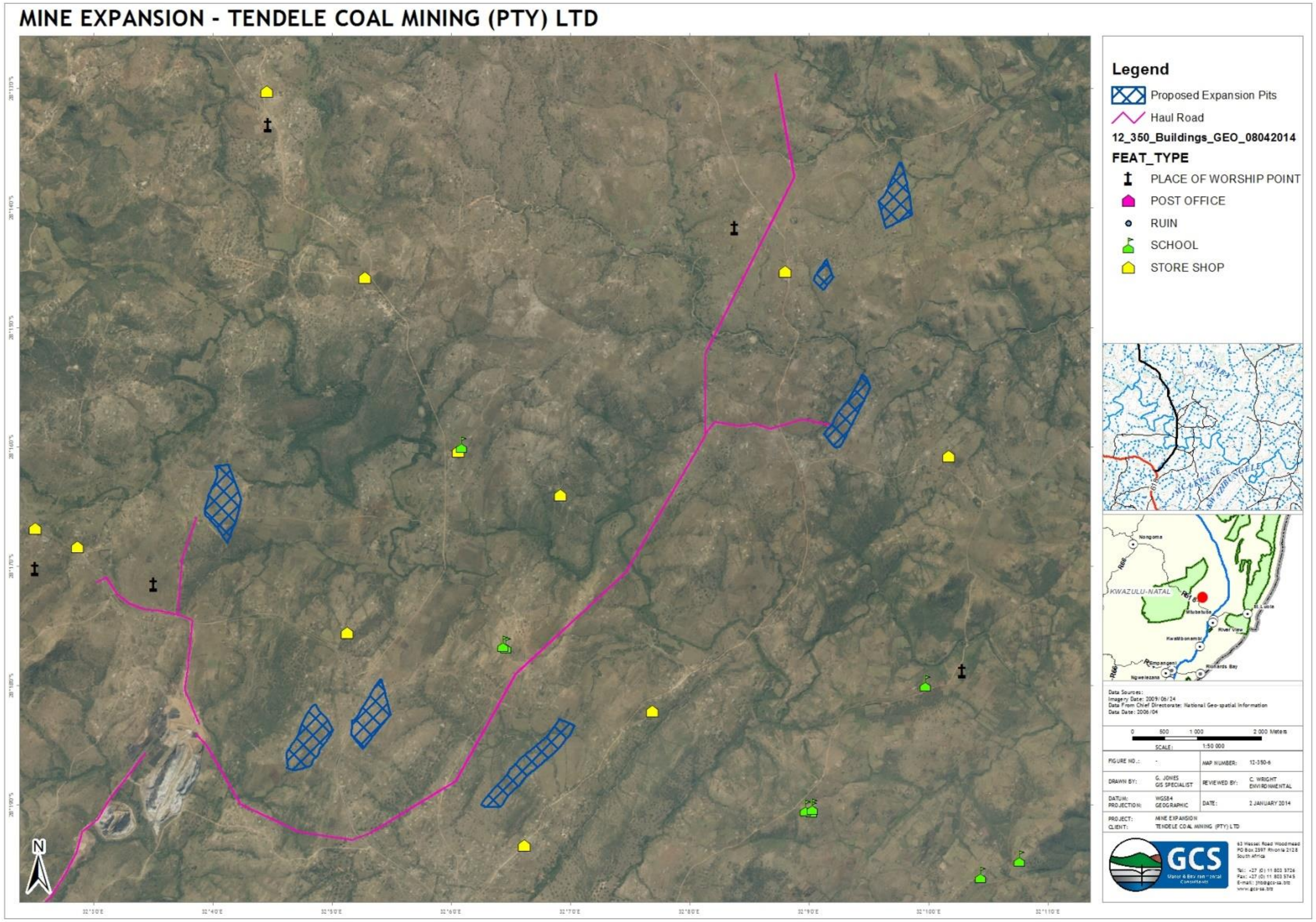



**Figure 1-1: Visual representation of existing EMPs**




**[FIGURE NOT TO SCALE- REFER TO A3 MAP ATTACHED]**

**Figure 1-2: Somkhele Extension Locality Map**




**[FIGURE NOT TO SCALE- REFER TO A3 MAP ATTACHED]**

**Figure 1-3: Spatial locality and aerial extent of planned mining operations**

## 1.3 Brief Project Description

Somkhele intend on extending mining operations to prolong the life of mine (LoM). Extensive prospecting has resulted in the identification of viable mining reserves. These reserves will be mined systematically and concurrently by means of opencast mining. The mining works programme outlines proposed timeframes for mining different areas. These time frames are summarised in Table 1-3 below.

**Table 1-3 Planned mining schedule of areas**

| Mining Area | Commencement of mining | Completion of mining | Existing/New |
|---|---|---|---|
| Area 2 | 2006 | 2013 | Existing |
| Area 1 | 2013 | 2018 | Existing |
| Luhlanga | 2013 | 2017 | Existing |
| Kwaqubuka | 2015 | 2020 | Existing |
| Kwaqubuka North | 2018 | 2020 | New |
| Emalahleni | 2018 | 2015 | New |
| Opondweni | 2021 | 2025 | New |
| Mahujini | 2021 | 2026 | New |
| Gwabalanda | 2024 | 2031 | New |
| Tholokhule | 2025 | 2031 | New |
| Mvutshini | 2026 | 2035 | New |

The project will involve establishing the following infrastructure in each area:

- Dedicated haul roads to the various opencast pits;
- Pollution and stormwater infrastructure;
- Fencing and security structures;
- Remote contractor offices; and
- Temporary ablution facilities.

All Run of Mine (RoM) material will be transported via dedicated haul roads to existing processing infrastructure within Area 2 (Refer to Figure 1-2). No processing activities will take place within the proposed extension areas.

## 1.4 Contact Details

The relevant contact details of the applicant are presented in Table 1-4.

**Table 1-4 Applicant Contact Details**

| **Name of Applicant** | **Tendele Coal Mining (Pty) Ltd<br>A wholly owned subsidiary of Petmin Ltd** |
|---|---|
| Company Registration Number | 1997/021507/07 |
| Contact Person | Johan Gloy |
| Physical Address | Along R618 Mtubatuba |
| Postal Address | c/o Petmin Ltd, P.O. Box 6070 Rivonia 2128 |
| Telephone | +27 82 895 1378 |
| Fax | +27 86 525 9245 |
| Email | jjgloy@somkhele.co.za |

## 1.5 Description of Land

The mining right area (MRA) is located within the Mtubabtuba District Municipality and is located approximately 15km west of the town of Mtubatuba.

The MRA, which is referred to as Area 4 and Areas 5 (refer to Figure 1-4) in the MR application, is completely encompassed within the tribal trust land which is administered by the Ingonyama Trust. The current land use is predominately grazing and subsistence farming. The open land between the homesteads is used for livestock grazing (predominantly cattle and goats) and some (subsistence?) crop production (mainly maize). Cropping tends to occur on the lower portion of the slopes or on the flat, open floodplain area adjacent to the streams.

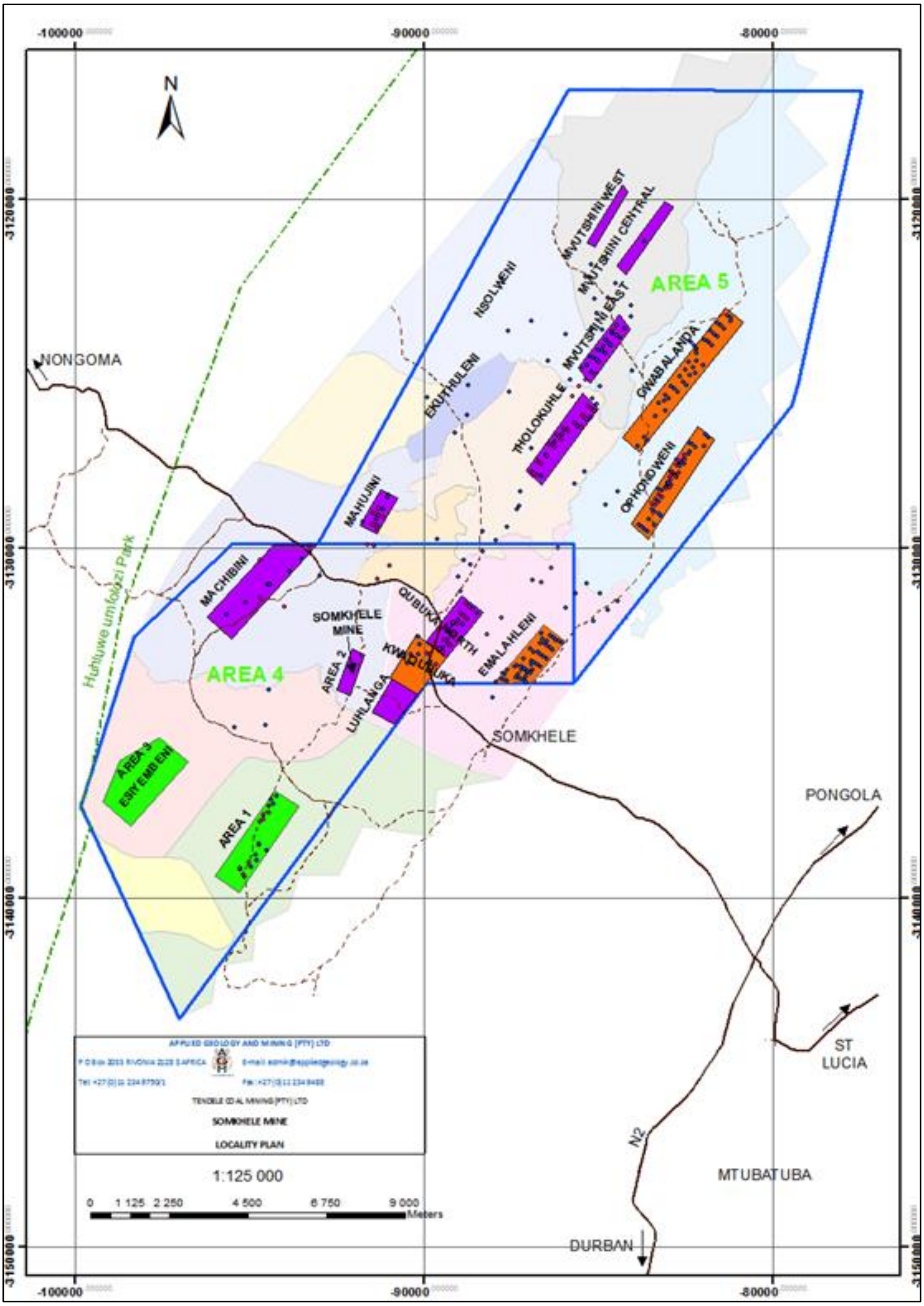



**Figure 1-4: Outline of Mining Areas**

## 1.6 Environmental Processes

The environmental processes are being undertaken with the aim to ensure that the proposed development complies with the relevant legislation. The following authorizations are being applied for:

- Mining Right in terms of Section 23 of the MPRDA.

In addition, the following pieces of legislation will be complied with prior to mining commencing:

- Environmental authorisation for various activities listed in terms of Section 24 (2) of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA); and
- Integrated Water Use License (IWUL) for water uses listed in terms of Section 21 of the National Water Act, 1998 (Act No. 36 of 1998) (NWA).

### 1.6.1 Environmental Legislation

The Environmental Impact Assessment (EIA) and Environmental Management Programme (EMP) preparation process must take cognizance of various sets of legislation in order to be comprehensive and thorough. The following legislation is applicable to the proposed extension of operations at Somkhele and, as such, the proposed extension will need to comply with the provisions, of inter alia the following:

- The Constitution of South Africa, 1996 (Act No. 108 of 1996);
- The Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA);
- The National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA);
- The National Water Act, 1998 (Act No. 36 for 1998) (NWA); and

Other legislation which has been reviewed during the compilation of this document includes:

- Hazardous Substance Act, 1973 (Act No.15 of 1973)(HSA);
- The National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEM:BA);
- The National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) (NEM:WA);

- The National Environmental Management Air Quality Act, 2004 (Act No 39 of 2004) (NEMAQA);
- The National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA);
- The Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983) (CARA);
- The Mine Health and Safety Act, 1996 (Act No. 29 of 1996) (MHSA); and
- The Occupational Health and Safety Act, 1993 (Act No. 85 of 1993) (OHSA).

### 1.6.2 MPRDA process

A Mining Right Application was accepted by the DMR on the 9th September 2013. The acceptance letter is presented in Appendix A.

### 1.6.3 NEMA Process

This section fulfils the requirement as per heading number 2.5 under Regulation 50 (a) (2) of the EMP template:

*"Listed activities (in terms of the NEMA EIA regulations) which will be occurring within the proposed project"*

Section 24 of the NEMA makes provision for the identification of activities which may not commence without authorization granted in writing by the competent authority.

These activities were promulgated under Government Notice Regulations (GNR) 544, and 545 in Government Gazette No. 33306 on 18 June 2010 (R544 and R545 repealed R386 and R387, respectively which were published on 21 April 2006).

Various environmental activities as outlined in GNR 544 and GNR 545 will be triggered. Table 1-5 and Table 1-6 outline activities which will require NEMA authorization prior to the commencement of mining related activities.

**Table 1-5 Notice R544 NEMA Identified Triggers**

| GOVERNMENT NOTICE R544 (18 JUNE 2010): REQUIRES A BASIC ASSESSMENT | | |
|---|---|---|
| **ACTIVITY NUMBER** | **DESCRIPTION OF LISTED ACTIVITY** | **APPLICABILTY TO THE PROJECT** |
| 9 | The construction of facilities or infrastructure exceeding 1000 metres in length for the bulk transportation of water, sewage or storm water –<br>(i) with an internal diameter of 0.36 metres or more; or<br>(ii) with a peak throughput of 120 litres per second or more, | Infrastructure may be required to transport storm water away from mining area or to pollution control dams. |

| GOVERNMENT NOTICE R544 (18 JUNE 2010): REQUIRES A BASIC ASSESSMENT | | |
|---|---|---|
| **ACTIVITY NUMBER** | **DESCRIPTION OF LISTED ACTIVITY** | **APPLICABILTY TO THE PROJECT** |
| | Excluding where:<br>a. such facilities or infrastructure are for bulk transportation of water, sewage or storm water or storm water drainage inside a road reserve; or<br>b. where such construction will occur within urban areas but further than 32 metres from a watercourse, measured from the edge of the watercourse. | |
| 11 | The construction of: (i) canals; (ii) channels; (iii) bridges; (iv) dams; (v) weirs; (vi) bulk storm water outlet structures; (vii) marinas; (viii) jetties exceeding 50 square metres in size; (ix) slipways exceeding 50 square metres in size; (x) buildings exceeding 50 square metres in size; or (xi) infrastructure or structures covering 50 square metres or more Where such construction occurs within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line. | The proposed community road will require a river crossing. Haul roads will also intercept drainage lines. |
| 20 | Any activity requiring a mining permit in terms of section 27 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) or renewal thereof. | The mine has applied for a Mining right. No mining permits are required. |
| 22 | The construction of a road, outside an urban areas, (i) with a reserve wider than 13.5 metres or, (ii) where no reserve exists where the road is wider that 8 metres, or (iii) for which an environmental authorisation was obtained for the route determination in terms of activity 5 in Government Notice 387 of 2006 or activity 18 in Notice 545 of 2010. | Internal haul roads and the re-alignment or construction of community roads may have a road reserve greater than 8 metres. |
| 24 | The transformation of land bigger than 1000 square metres in size, to residential, retail, commercial, industrial or institutional use, where, at the time of the coming into effect of this Schedule or thereafter such land was zoned open space, conservation or had an equivalent zoning. (Corrected by 'Correction Notice 2' of 10 December 2010, GN No. R. 1159) | Land is all zoned as tribal. Mining operations will convert land use from subsistence/agriculture to mining. |
| 47 | The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre – (1) where the existing reserve is wider than 13.5 meters, or (ii) where no reserve exists, where the existing road is wider than 8 metres – excluding widening or lengthening occurring inside urban areas. | Community roads will be upgraded, or new roads will be constructed which may be longer than 1 kilometre. |

**Table 1-6 Notice R545 NEMA Identified Triggers**

| GOVERNMENT NOTICE R545 (18 JUNE 2010): REQUIRES A SCOPING AND EIA | | |
|---|---|---|
| **ACTIVITY NUMBER** | **DESCRIPTION OF LISTED ACTIVITY** | **APPLICABILTY TO THE PROJECT** |
| 15 | Physical alteration of undeveloped, vacant or derelict land for residential, retail, commercial, recreational, industrial or institutional use where the total area to be transformed is 20 hectares or more; except where such physical alteration takes place for: (i) linear development activities; or (ii) agriculture or afforestation where activity 16 in this Schedule will apply. | The opencast pits are greater than 20 hectares. |

### 1.6.4 Integrated Water Use Licence Application

Section 21 of the NWA identifies 11 consumptive and non-consumptive water uses which must be authorized by the Department of Water Affairs (DWA), in terms of Section 40 of the NWA:

- 21 (a): Taking water from a water resource;
- 21 (b): Storing water;
- 21 (c): Impeding or diverting the flow of water in a watercourse;
- 21 (d): Engaging in stream flow reduction activity contemplated in Section 36;
- 21 (e): Engaging in a controlled activity identified as such in Section 37 (1) or declared under Section 38 (1);
- 21 (f): Discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduit;
- 21 (g): Disposing of waste in a manner which may detrimentally impact on a water resource;
- 21 (h): Disposing in any manner of water which contains waste from, or which has been heated in, any industrial or power generation process;
- 21 (i): Altering the beds, banks, course or characteristics of a watercourse;
- 21 (j): Removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people; and
- 21 (k): Using water for recreational purposes.

An Integrated Waste and Water Management Plan (IWWMP) has been submitted to the DWA for approval. This IWWMP serves as a management tool for the mine to manage storm water and wastewater. This document will be amended to include any additional water uses that may be required and resubmitted to the DWA.

Since the inception of the mine, three (3) integrated water use license applications (IWULAs) have been submitted to the DWA which are all still pending approval. Once a license is awarded, it will be audited on an annual basis and amended to include new operations and additional applications for licenses.

### 1.6.5 Environmental Process Objectives

Under the MPRDA, The environmental process aims to:

- Facilitate the participation of any parties who may be directly or indirectly affected by the proposed project;
- Identify any potential fatal flaws which may detrimentally impact the proposed development;
- Identify all potential environmental, socio-economic and cultural/historical impacts;
- Develop management and mitigation measures (included in this EMP) in line with best practices to manage or avoid potential negative impacts; as well as measures to enhance potential positive impacts;
- Compiling an EIA Report that will be a truthful representation of foreseen impacts; and
- Compile an EMP that will assist in mitigating, managing and monitoring impacts.

### 1.6.6 Environmental Assessment Practitioner

**Table 1-7 EAPs undertaking Somkhele Extension Environmental Processes**

| Name | Qualification | Experience in environmental processes | Role in the Environmental Process |
|---|---|---|---|
| Christopher Wright | BSocSc Geography | 7 | Project Manager |
| Ryan Edwards | MSc Environmental Science | 8 | Wetland Ecologist |
| Pieter Labuschagne | MSc Hydrogeology | 14 | Geohydrologist |
| Russell Stow | BSc Hons Environmental Biology | 13 | Project review |
| Gareth Jones | BSoc Sci Geography | 2 | GIS and Visual |
| Karen King | Msc Hydrology | 10 | Hydrology |
| Adam Teixeira-Leite | BSc Hons Environmental Sciences | 7 | Wetland Ecologist |

## 1.7 Other Requirements

### 1.7.1 Waste Management License

The NEMWA came into effect on 1 July 2009 and repealed Section 20 (1) of the Environmental Conservation Act, 1989 (Act No. 73 of 1989) (ECA), which governed waste management activities

Section 20 of NEM: WA provides that no person may commence, undertake or conduct a waste management activity except in accordance with the requirements or standards determined in terms of Section 19 (3) for the activity.

The waste management activities were listed in Government Notice 718, in Government Gazette No. 32368, dated 3 July 2009. In terms of GNR718, a Basic Assessment process in terms of Section 24 (5) of NEMA must be undertaken to seek authorization for activities under Category A, while an Environmental Impact Assessment (EIA) process must be undertaken for all activities listed under Category B. No listed wastes have currently been identified at Somkhele[1].

Maybe NB to note that this application process is usually integrated with NEMA process as the procedural requirements are the same.

[1] It must be noted that certain mine related activities such as slurry and discard disposal are deemed to be exempt from the NEM: WA.

# 2 ENVIRONMENTAL DESCRIPTION

The chapter describes the existing status of the receiving environment which will be impacted on by the proposed mining activities and associated infrastructure development. As required by the EIA and EMP Template, the following information is included under this chapter:

***REGULATION 50 (a):***

- *(Section 1): Description of the baseline environment:*
    - *(Section 1.1): Concise description of the environment on site relative to the environment in the surrounding area;*
    - *(Section 1.2): Concise description of each of the existing environmental aspects both on the site applied for and in the surrounding area which may require protection or remediation;*
    - *(Section 1.3): Concise description of the specific land uses, cultural and heritage aspects and infrastructure on the site and neighbouring properties/farms in respect of which the potential exists for the socio-economic conditions of other parties to be affected by the proposed mining operation;*
    - *(Section 1.4): Annotated map showing the spatial locality and aerial extent of all environmental, cultural/heritage, infrastructure and land use features identified on site and on the neighbouring properties and farms; and*
    - *(Section 1.5): Confirmation that supporting documents in the form of specialist studies are attached as appendices.*

***REGULATION 50 (d):***

- *(Section 1 – 8): Identification of the alternative land uses which will be impacted upon. (Include all the items to be included in the list referred to in the concomitant section of the guideline posted on the official website of the Department)*
- *(Section 1 – 9): Listed results of a specialist comparative land use assessment. (Refer to the concomitant section of the guideline posted on the official website of the Department and attach the specialist study as an appendix).*

## 2.1 Geology

The Somkhele coalfield is one of many coal deposits hosted by the Karoo Supergroup in South Africa. The Supergroup is thick sedimentary pile deposited in a foreland basin between 320 and 150 million years ago. Deposition commenced with the Dwyka tillite Formation and concluded with basalt extrusions of the Drakensberg and Lebombo Volcanic Groups. Rifting associated with the division of Gondwanaland some 160-140 million years ago started the extensive flood magma extrusions resulting in the extrusion of flood basalts that, in north-eastern KwaZulu-Natal make up the Lebombo Group of the Karoo Igneous Province. The sills and dykes that intrude the Emakwezini Formation and locally affect the coal quality preserve the intricate magma feeder systems to the Lebombo and Drakensberg. The stratigraphic column for the Emakwezini formation is presented in Figure 2-1.

Volcanic Groups, later listric normal faulting associated with rifting introduced or extension on a geocline introduced the moderate easterly dip to the strata and created a succession of fault bounded blocks in which the coal bearing strata is repeated. The repetitions create multiple exploration and open pit mining opportunities.

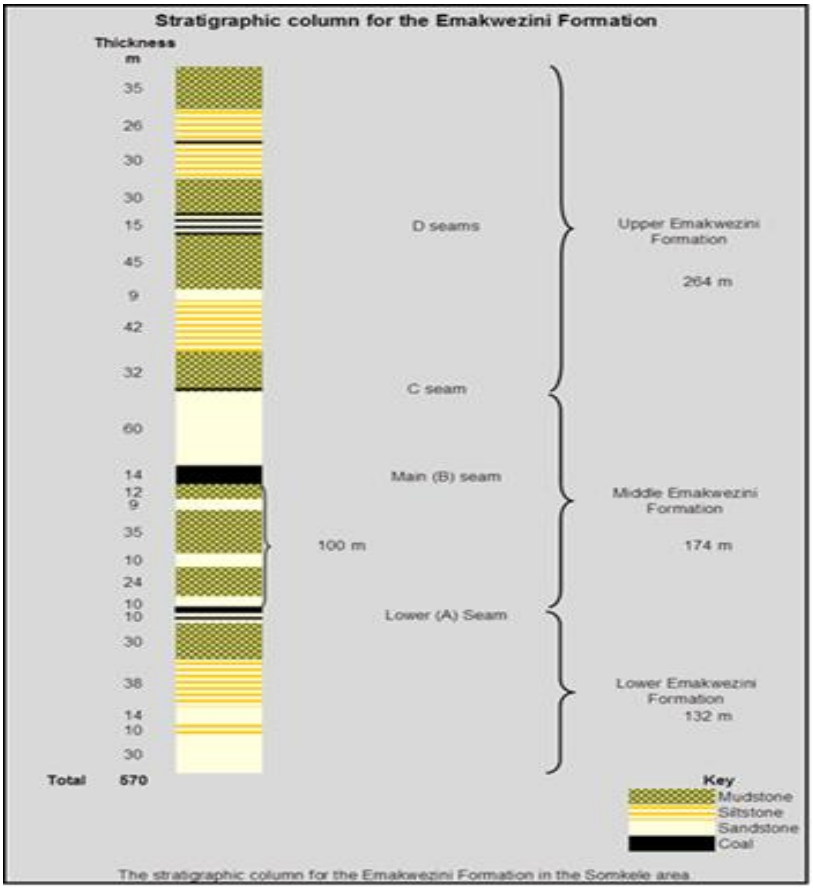
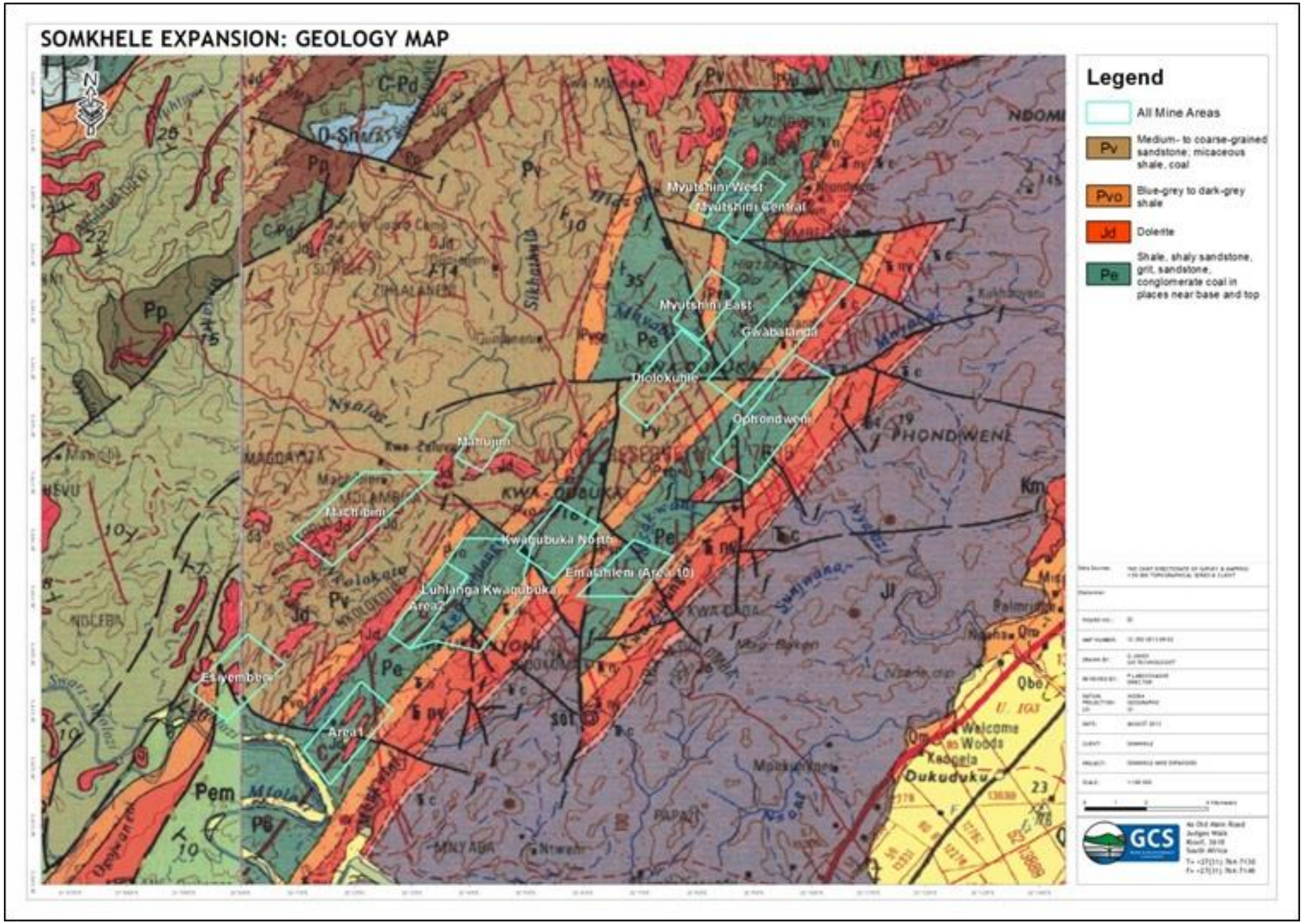
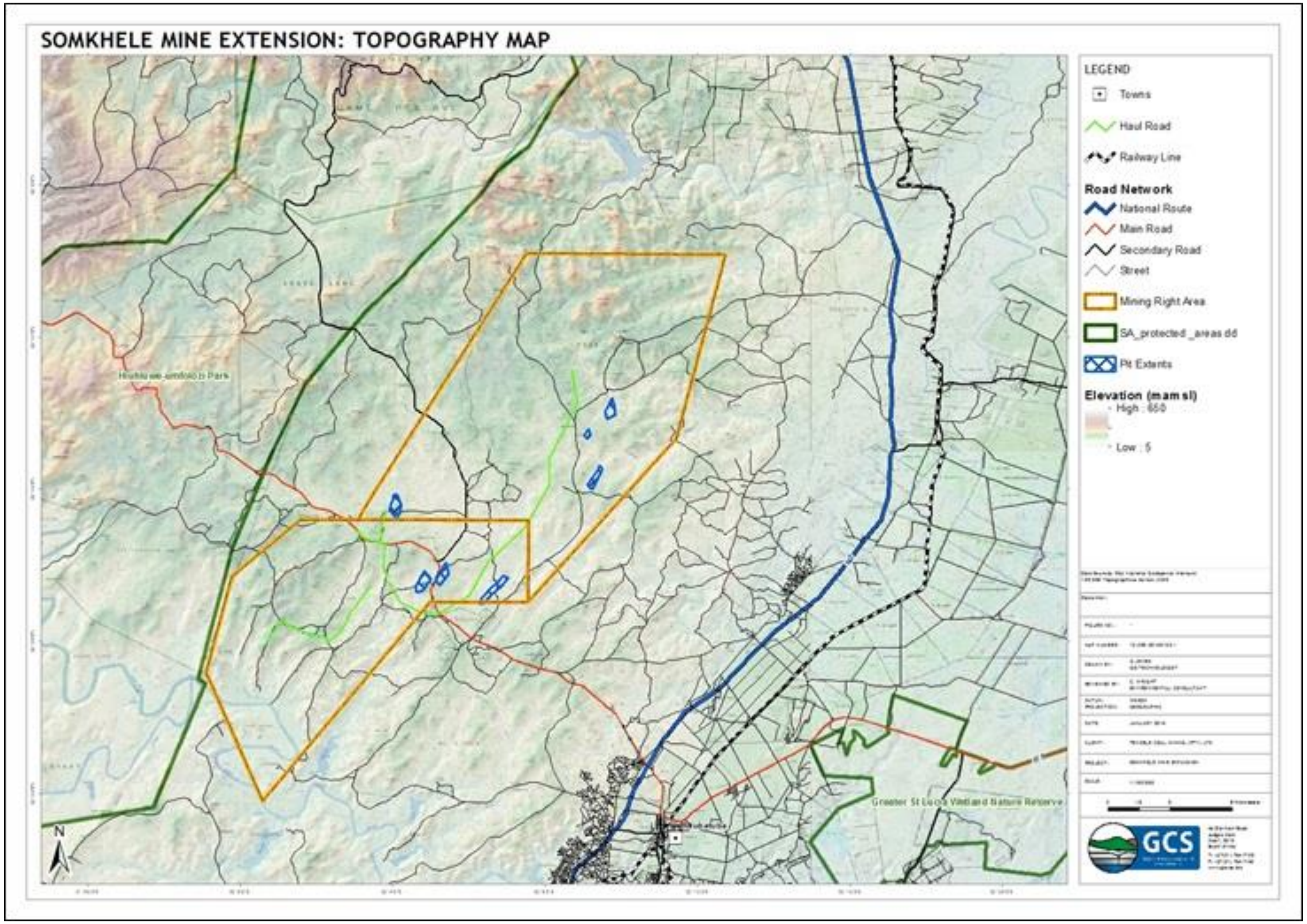



**Figure 2-1: Generalised stratigraphic column for the middle Emakwezini Formation in the Somkhele Area**




[FIGURE NOT TO SCALE- REFER TO A3 MAP ATTACHED]

**Figure 2-2: Geological Map of Somkhele**




**[FIGURE NOT TO SCALE- REFER TO A3 MAP ATTACHED]**

**Figure 2-3: Somkhele Extension Topography**

## 2.2 Topography

The study area is characterised by elevations ranging between 50 m and 250 m above mean sea level (mamsl), with the highest hills reaching just over 350 mamsl. A map outlining the topography of the region is presented in Figure 2-3.

## 2.3 Climate

The section below is an overview of the climate experienced at Somkhele.

### 2.3.1 Mean Annual Precipitation

The Water Resources of South Africa 2005 (WR2005) quaternary catchment spreadsheet (Middleton and Bailey, 2009) indicates a Mean Annual Precipitation (MAP) of 846 mm; the Rainfall Extraction Utility Programme (Kunz, 2004) indicate an MAP of 793 mm; the Design Rainfall Estimation Programme (Smithers and Schulze, 2002) indicates an MAP of 792 mm and the TR102 dataset indicates an MAP of 893 mm.

The rainfall used to describe rainfall conditions on site was that of the Design Rainfall Estimation of South Africa programme (792 mm) as the MAP agreed generally with the majority of the other sources, the programme is used with a high level of confidence within the hydrology and engineering fields and the dataset also contains design rainfall depths, used within this study. All calculations are based on these data.

This software calculates the MAP and design rainfall depths at a point (28°16'00.04"S; 32°05'20.15"E). The total annual rainfall distribution over the record period that characterises this MAP is shown in Figure 2-4.

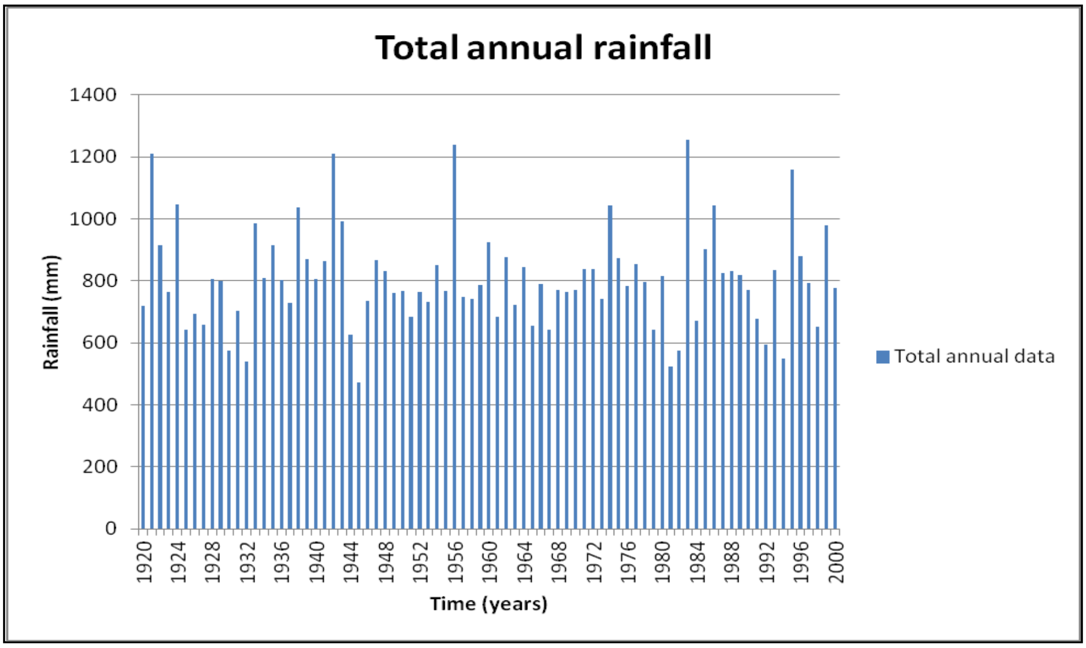



**Figure 2-4: Total annual rainfall distribution**

### 2.3.2 Average normal, Average dry, and Average wet rainfall

The data series of this quaternary catchment area was further analysed in order to obtain estimations of normal average, average dry, and average wet rainfall conditions (monthly). A statistical distribution of the data set (time series of 85 years) was analysed and is shown in Figure 2-5.

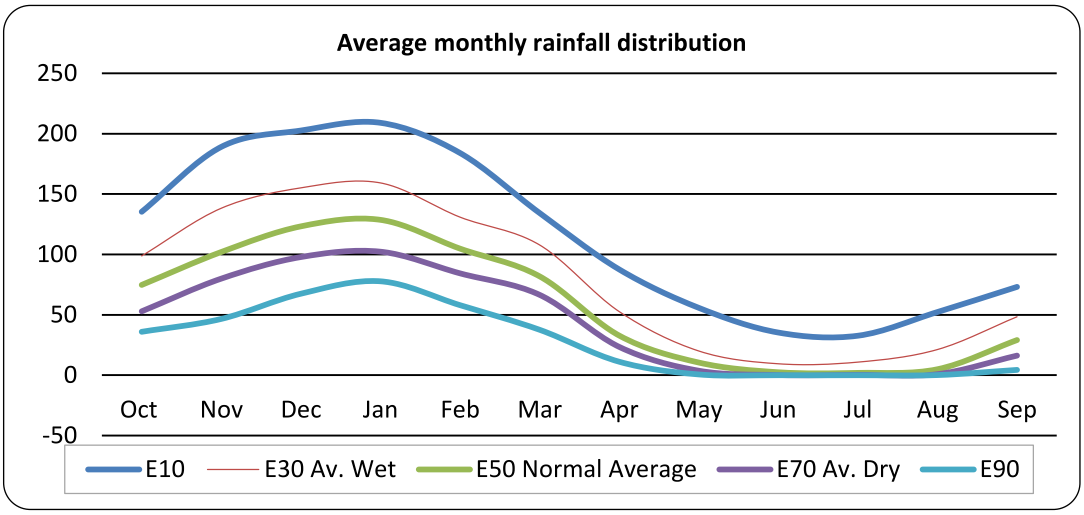



**Figure 2-5: Average monthly rainfall distribution**

### 2.3.3 Mean Annual Evaporation

Mean Annual Evaporation (MAE) for the site area according to the WR2005 database is 1 400 mm. The average monthly distribution of this evaporation is shown in Figure 2-6.

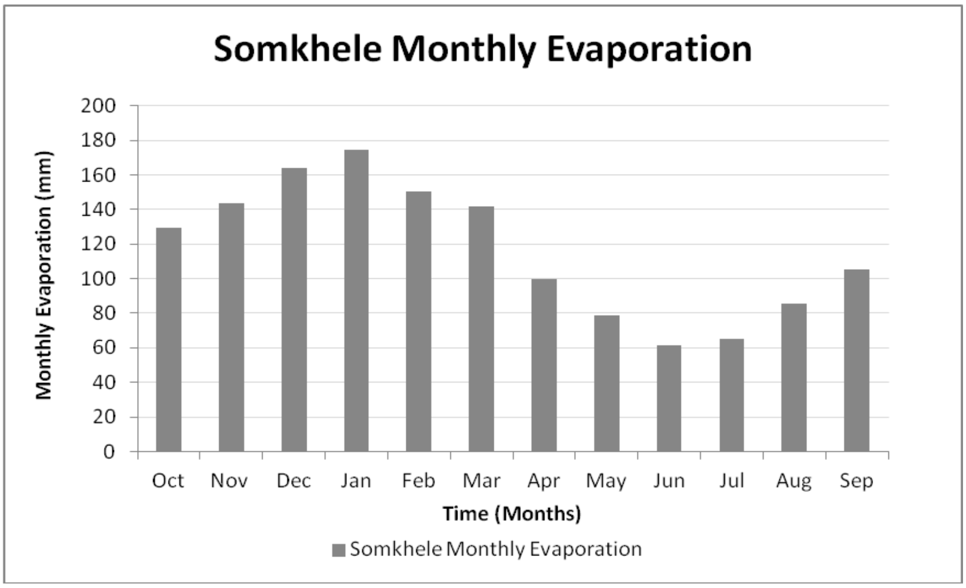



**Figure 2-6: Average Annual Evaporation**

### 2.3.4 Storm Rainfall

The 24-hour storm rainfall depths (point rainfall) for the 1:50- and 1:100-year recurrence intervals were extracted using the Design Rainfall Estimation package (Smithers and Schulze, 2003) and are shown in Table 2-1.

**Table 2-1 Point Rainfall (24 hours)**

| Return Period (Years) | 1:50 | 1:100 |
|---|---|---|
| Point Rainfall (mm) | 273 | 339.2 |

### 2.3.5 Temperature

The region experiences hot, humid summers and mild winters. The mean monthly temperatures for Mtubatuba show limited variation and range from 25°C (January) to 17°C (June/July).

During the summer months, from October to March, the mean daily maximum temperatures range between 26°C and 30°C, while the mean daily minimum temperatures for the period range between 17°C and 21°C. During the winter months, from April to September, mean daily maximum temperatures range between 23°C and 25°C while the mean daily minimum temperatures range between 12°C and 17°C (refer to Table 2-2).

The extreme maximum temperature range is from 33°C to 43°C. The highest maximum temperature of 43ºC was recorded in September; however, maxima for the period September to February all exceed 40°C. Very cold temperatures are never experienced; however, extreme minima of 4.3°C to 5°C may occur during the coldest months (July and August).

**Table 2-2 Summary of Temperature Data for Mtubatuba**

| Month | Mean Daily Maximum (°C) | Mean Daily Minimum (°C) | Mean (°C) | Extreme Maximum (°C) | Extreme Minimum (°C) |
|---|---|---|---|---|---|
| January | 30.2 | 21.0 | 25.6 | 40.8 | 14.3 |
| February | 30.0 | 21.0 | 25.5 | 40.0 | 11.5 |
| March | 29.3 | 20.2 | 24.7 | 39.1 | 12.5 |
| April | 27.3 | 17.7 | 22.5 | 38.2 | 9.0 |
| May | 25.5 | 15.0 | 20.2 | 36.2 | 7.0 |
| June | 23.5 | 12.1 | 17.8 | 34.1 | 4.8 |
| July | 23.6 | 12.1 | 17.8 | 33.6 | 4.3 |
| August | 24.8 | 13.8 | 19.3 | 38.2 | 5.0 |
| September | 25.6 | 15.9 | 20.8 | 40.0 | 7.4 |
| October | 26.3 | 17.1 | 21.7 | 43.0 | 8.9 |
| November | 27.4 | 18.6 | 23.0 | 40.0 | 11.4 |
| December | 29.3 | 20.2 | 24.7 | 40.6 | 10.8 |
| Ave/Total | 26.9 | 17.0 | 22.0 | 43.0 | 4.3 |

Dust emissions are a function of the make-up of the exposed material (particularly silt and small particle content), wind and moisture. Conditions of fine, dry, exposed material in windy weather will result in the greatest emissions. Therefore, in analysing potential dust from a source such as the proposed extension of the Somkhele mine, it is these factors on which the focus lies.

Even the addition of a small amount of moisture can have a dramatic effect on the reduction of potential dust emissions. Similarly, a long spell without rain will necessitate intervention in the form of dust control measures in order to manage impacts on the surrounding environment.

### 2.3.6 Wind

The region is considered to be windy with relatively few calms experienced during the year (in summer 3.3 % calms and in winter 5.3 %).

Based on percentage frequency, the prevailing surface winds in the area are the north-easterlies. This is followed closely by the northerly, north-north-easterly and west-south-westerly winds.

Analysis of the wind frequency data revealed the following seasonal variation in prevailing winds:

- Summer: North-easterly, north-north-easterly, west-south-westerly.
- Winter: Northerly, westerly, north-easterly.

Generally winds in the area blow at speeds between 1.6 to 3.5 m/s (33%) and 3.6 to 5.5 m/s (29%). Stronger winds, in excess of 8m/s, are less common (6.2%) and are mostly likely to blow during September and October.

The strongest winds typically blow from the south-west at an average speed of 5.8m/s (refer to Table 2-3). Other strong winds (4.9 m/s to 5.2 m/s) that blow in the area are also the prevailing winds i.e. north-easterly, north-north-easterly, west-south-westerly. The strongest winds tend to blow during October.

The windiest period of the year is October/November when average wind speeds exceed 5 m/s. The summer months are windier than the winter months when average monthly wind speeds decrease to less than 4 m/s. Overall, however, average monthly wind speeds in the region do not drop below 3 m/s throughout the year.

**Table 2-3 Wind speed per direction for Richards Bay (m/s)**

| MONTH | N | NNE | NE | ENE | E | SE | SSE | S | SSW | SW | WSW | W | WNW | NW | NNW | AVE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Jan | 3 | 5 | 5 | 4 | 6 | 5 | 3 | 4 | 5 | 6 | 5 | 4 | 2 | 2 | 2 | 4.1 |
| Feb | 3 | 4 | 5 | 5 | 5 | 4 | 3 | 4 | 4 | 5 | 5 | 3 | 2 | 2 | 2 | 3.7 |
| Mar | 3 | 4 | 5 | 4 | 5 | 4 | 3 | 4 | 5 | 5 | 5 | 3 | 2 | 2 | 2 | 3.7 |
| Apr | 3 | 4 | 5 | 4 | 4 | 4 | 3 | 4 | 4 | 6 | 5 | 4 | 2 | 2 | 2 | 3.7 |
| May | 3 | 4 | 4 | 4 | 3 | 3 | 3 | 3 | 4 | 5 | 5 | 4 | 2 | 2 | 2 | 3.4 |
| June | 3 | 4 | 4 | 3 | 3 | 3 | 2 | 3 | 5 | 6 | 5 | 4 | 2 | 2 | 2 | 3.4 |
| July | 3 | 5 | 5 | 4 | 4 | 3 | 3 | 3 | 5 | 6 | 5 | 4 | 3 | 2 | 2 | 3.8 |
| Aug | 3 | 5 | 5 | 4 | 4 | 4 | 3 | 4 | 5 | 6 | 5 | 4 | 2 | 2 | 2 | 3.9 |
| Sept | 3 | 6 | 6 | 5 | 5 | 4 | 3 | 4 | 5 | 6 | 6 | 4 | 3 | 2 | 2 | 4.3 |
| Oct | 4 | 6 | 6 | 5 | 5 | 4 | 4 | 4 | 5 | 7 | 6 | 3 | 2 | 2 | 3 | 4.4 |
| Nov | 4 | 6 | 5 | 5 | 5 | 4 | 3 | 4 | 5 | 6 | 5 | 3 | 2 | 2 | 3 | 4.1 |
| Dec | 4 | 6 | 5 | 5 | 5 | 4 | 4 | 5 | 5 | 6 | 5 | 3 | 3 | 2 | 2 | 4.3 |
| Ave | 3.3 | 4.9 | 5.0 | 4.3 | 4.5 | 3.8 | 3.1 | 3.8 | 4.8 | 5.8 | 5.2 | 3.6 | 2.3 | 2.0 | 2.2 | 3.9 |

Source: South African Weather Bureau, 2002

## 2.4 Landuse

The greater Somkhele area is characterized predominately by grazing and subsistence farming. Soil characteristics outlined in chapter 2.5 outline the general unsuitable quality of soil for agricultural purposes. General soil properties are acidic with low nutrient and agricultural potential. Agricultural activities are isolated. Figure 2-7 outlines current landuse at Somkhele. This map outlines that the majority of land is currently being utilized as subsistence farming with little or none being under cultivation.

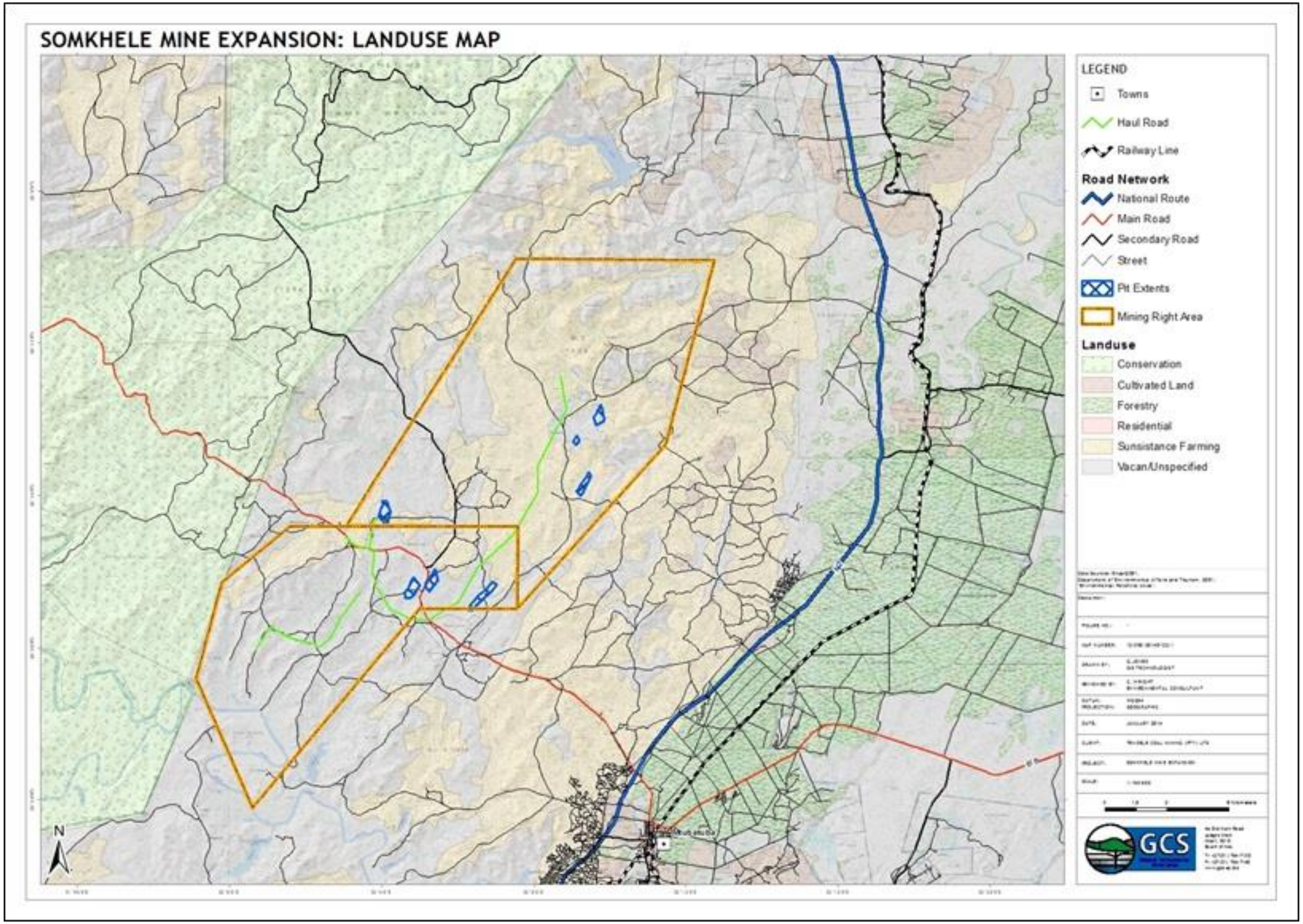



**Figure 2-7: Somkhele Extension Land Use**

## 2.5 Soils and Land Capability

The information presented under this chapter was received from the Soils and land capability report that was written by Lyn Fitchen from Worley Parsons and Mzikayise Nkwane from GCS. The full report can be viewed in chapter 14 of this report.

### 2.5.1 Soils

Soil samples were collected from all the proposed mining sites. The soils of the area were mapped using standard procedures. A base map derived from aerial photography, with contours superimposed together with the boundaries of the study area and the boundaries of the proposed pit area (where available) were used to provide an overview of the area as well as form the base maps for the soil

The identification and classification of soils was carried out in terms of “Soil Classification, A Taxonomic System for South Africa”, (MacVicar et al, 1991 edition). This is a relatively simple system that has two (2) levels of classification - an upper, fairly general level comprising Soil Forms, and, a lower, more specific level comprising Soil Families. Each of the Soil Forms in the classification is defined by a specific, unique vertical sequence of diagnostic horizons. All forms are further divided into two (2) or more Families that have the same vertical sequence of diagnostic horizons, but are differentiated within the Form on the basis of certain physical and/or chemical properties.

Sampling of representative areas of each of the Soil Forms was carried out and the samples submitted to the Department of Agriculture laboratory at Cedara for analysis. Factors that were considered in the laboratory include clay fraction grading, pH and fertility analysis.

### 2.5.2 Geology and Soil land types

Understanding of the geology of the area can give clues on the type of soil to be expected in the area during field work.

The regional geology in the Somkhele area is characterized by late-Permian sedimentary rocks of the Emakwezini Formation of the Beaufort group (Karoo Supergroup) that conformably overlies the Volkrust Formation and has been correlated with the lower Beaufort Group (Bordy and Prevec, 2008). The strata in the Emakwezini Formation(Somkhele area) has been intruded by numerous dolerite dykes and sills producing fractures and tilt of the strata eastwards to south-eastwards at an angle ranging from 15 to 30 degrees (GCS, 2009).

The onsite geology at Somkhele comprise mainly of white to pinkish, felspatic, quartzitic sandstones, mudstones and shale’s of the Emakwezini Formation. The sandstones at the Somkhele area are characterized by fine to coarse grain size (Bordy and Prevec, 2008).

The Environmental Protection Atlas (ENPAT) soils dataset indicates that the soils overlying lithology’s at the Somkhele area comprise the Glenrosa and Mispah soil formations.

The Glenrosa soil form is characterised by an orthic A horizon overlying a lithocutanic B horizon. An orthic A horizon is a surface horizon that does not qualify as an organic, humic (contains humified organic matter and is free draining), vertic (well-structured and fine grained) or melanic (well-structured and dark coloured) topsoil. These topsoil's cover the majority of South Africa and are regarded as "normal" soils. A lithocutanic B horizon is a subsoil horizon that is largely the product of in-situ bedrock weathering. As a result the horizon's organisation in respect to colour, structure and consistency has distinct affinities with the underlying parent rock.

The Mispah soil form is characterised by an orthic A horizon overlying hard rock. The orthic A horizon of this soil form comprises red or yellow-brown apedal (soils with a poor structure) soils with low organic matter content. These soils are generally thin and can be considered rocky. The identification of the soil forms indicates that the soil cover within the project area is generally thin and strongly associated with shallow bedrock.

**Table 2-4 ENPAT Geology and Soil land types for extension areas**

| New Mine Sites | ENPAT Geology | ENPAT Soils and Land Types |
|---|---|---|
| Esiyembeni | Sandstone, mudstone and sand/alluvium with some dolerite | Glenrosa and/or Mispah forms (Fb337) and undifferentiated deep deposits (Ia72) |
| Machibini | Sandstone with some dolerite | Glenrosa and/or Mispah forms (Fb337), and prismacutanic and/or pedocutanic diagnostic horizons (Dc25) |
| Kwaqubuka North | Shale and mudstone with some dolerite | Vertic, melanic and red structured diagnostic horizons (Ea137) |
| Emalahleni (Area 10) | Shale, mudstone and sandstone with some dolerite | Vertic, melanic and red structured diagnostic horizons (Ea137), and prismacutanic and/or pedocutanic diagnostic horizons (Db155) |
| Mahujini | Sandstone and dolerite | Prismacutanic and/or pedocutanic diagnostic horizons (Dc45) |
| Ophondweni | Shale, mudstone and sandstone with some dolerite | Vertic, melanic and red structured diagnostic horizons (Ea137), and prismacutanic and/or pedocutanic diagnostic horizons (Db155) |
| Tholokuhle | Shale, mudstone and sandstone with some dolerite | Vertic, melanic and red structured diagnostic horizons (Ea137) |
| Gwabalanda | Shale, mudstone and sandstone with some dolerite | Vertic, melanic and red structured diagnostic horizons (Ea137), and Glenrosa and/or Mispah forms (Fb336) |
| Mvutshini East | Shale, mudstone and sandstone with some dolerite | Vertic, melanic and red structured diagnostic horizons (Ea137) |
| Mvutshini Central | Shale, mudstone and sandstone with some dolerite | Vertic, melanic and red structured diagnostic horizons (Ea137), and Glenrosa and/or Mispah forms (Fb336) |
| Mvutshini West | Shale, mudstone and sandstone with some dolerite | Vertic, melanic and red structured diagnostic horizons (Ea137) |

### 2.5.3 Land Capability

Land capability was determined using data obtained from the soil survey and was classified using the Chamber of Mines Classification System (1991) as shown in Table 2-5.

**Table 2-5 Criteria for pre-mining land capability**

| | |
|---|---|
| **CRITERIA FOR WETLAND** | Land with organic soils.<br>Land supporting hygrophilous vegetation where soil and vegetation processes are water determined. |
| **CRITERIA FOR ARABLE LAND** | Land, which does not qualify as a wetland.<br>The soil is readily permeable to a depth of 750 mm.<br>The soil has a pH value of between 4.0 and 8.4.<br>The soil has a low salinity and SAR.<br>The soil has less than 10% (by volume) rocks or pedocrete fragments larger than 100 mm in the upper 750 mm.<br>Has a slope (in %) and erodibility factor (K) such that their product is <2.0<br>Occurs under a climate of crop yields that are at least equal to the current national average for these crops. |
| **CRITERIA FOR GRAZING LAND** | Land which does not qualify as wetland or arable land.<br>Has soil, or soil-like material, permeable to roots of native plants, that is more than 250 mm thick and contains less than 50 % by volume of rocks or pedocrete fragments larger than 100 mm.<br>Supports, or is capable of supporting, a stand of native or introduced grass species, or other forage plants utilisable by domesticated livestock or game animals on a commercial basis. |
| **CRITERIA FOR WILDERNESS LAND** | Land which does not qualify as wetland, arable land or grazing land. |

*Source: Chamber of Mines (1991)*

### 2.5.4 Soil Forms, Distribution and Diagnostic Characteristics - Kwaqubuka North

Three terrain units can be identified within the Kwaqubuka North area, namely crests, hill slopes and bottomland zones. The soils occurring on crests of hills are Milkwood / Mispah Form and Mayo / Glenrosa Form together with the Westleigh and Dresden Forms. These soils also occur most commonly on the hill slopes, together with Clovelly Form soils. The soils that were identified in the bottomland zones are predominantly of the Willowbrook, Katspruit and Dundee Form.

The distribution of the soils is indicated on Figure 2-8. The corresponding Soil Families and diagnostic horizons are summarised in Table 2-6, whilst the estimated area and percentage covered by the various soils is given in Table 2-7. The Glenrosa / Mayo Form soils are dominant over the project area (45%), followed by the Mispah / Milkwood Form soils (24%). Westleigh and Clovelly Form soils are less common with isolated occurrences of Dresden, Willowbrook, Katspruit and Dundee Form soils.

The soils of the area generally comprise an Orthic or Melanic topsoil overlying a Lithocutanic or Hard Rock B horizon.

The Glenrosa and Mayo Form soils generally have a hard B horizon, which is generally calcareous. The Mispah Form soils are generally non-calcareous whilst the Milkwood Form soils are calcareous. The Clovelly Form soils are mesotrophic and luvic and the Westleigh Form soils are luvic. The Willowbrook and Katspruit Form soils are calcareous.

**Table 2-6 Soil forms and families found within the Kwaqubuka North Mine area**

| Soil Form | Soil Family | Code | Diagnostic Horizons |
|---|---|---|---|
| Mispah | Myhill | Ms – 1100 | Orthic A<br>Hard rock |
| Milkwood | Mpetu | Mw – 2000 | Melanic A<br>Hard rock |
| Mayo | Boyela | My – 2200 | Melanic A<br>Lithocutanic B |
| Glenrosa | Bergsig | Gs – 1212 | Orthic A<br>Lithocutanic B |
| Westleigh | Mareetsane | We – 2000 | Orthic A<br>Soft plinthic B |
| Dresden | Tevreden | Dr – 1000 | Orthic A<br>Hard plinthic B |
| Clovelly | Leiden | Cv – 2200 | Orthic A<br>Yellow brown apedal B |
| Willowbrook | Kromdal | Wo – 2000 | Melanic A<br>G |
| Katspruit | Slangspruit | Ka – 2000 | Orthic A<br>G |
| Dundee | Nonoti | Du - 1110 | Orthic A<br>Stratified alluvium |

**Table 2-7 Soil form coverage percentage within the Kwaqubuka North Mine area**

| Soil Form | Area (ha) | Percentage Cover |
|---|---|---|
| Mispah / Milkwood | 66 | 24 |
| Mayo / Glenrosa | 128 | 45 |
| Westleigh | 32 | 11 |
| Dresden | 3 | 1 |
| Clovelly | 38 | 13 |
| Willowbrook / Katspruit | 15 | 5 |
| Dundee | 1 | <1 |
| Total | 283 | 100 |

#### *2.5.4.1 Soil Chemical Characteristics*

(i) Soil pH

The soil pH influences plant growth through the direct effect of the hydrogen ion concentration on nutrient uptake, and, through the mobilization of toxic ions such as aluminium and manganese (which restrict plant growth). In addition, pH indirectly affects plant growth through its effect on the availability of major trace nutrients. A pH range of between 6 and 7 most readily promotes the availability of plant nutrients. pH values below 3 or above 9, will seriously affect the nutrient uptake by a plant.

The pH of the soils tested ranged from 4.69 to 7.42 indicating that the soils generally have an acidic to neutral pH. No particular soil form emerged as more, or less, acidic than the others.

(ii) Soil Salinity/Sodicity

Highly saline soils will result in the reduction of plant growth caused by the diversion of plant energy from normal physiological processes to that involved in the acquisition of water under highly stressed conditions. The following guidelines are given regarding electrical conductivity (EC) values and salinity effects in soils:

- 60 mS/m: No effect on plant growth
- 60 –120 mS/m: Salt sensitive plants are affected
- > 120 mS/m: Growth of all plants severely affected

In addition, soil salinity may directly influence the effects of particular ions on soil properties. The sodium adsorption ratio (SAR) is an indication of the effect of sodium on soils. At high levels of exchangeable sodium, certain clay minerals, when saturated with sodium, swell markedly. With the swelling and dispersion of a sodic soil, pore spaces become blocked and infiltration rates and permeability are greatly reduced. The critical SAR for the various soils types are as follows:

- poorly drained grey soils: 6 – Westleigh, Dresden, Katspruit
- slowly draining black swelling clays: 10 – Milkwood, Mayo, Willowbrook
- well drained soils: 15 – Mispah, Glenrosa, Clovelly, Dundee

In the Kwabuquka North area the soils are likely to have electrical conductivity values of less than 60 mS/m which is below the threshold level for no effect on plant growth. Soils that may have a moderate salinity / sodicity hazard are the Mayo, Milkwood, Mispah, Westleigh, Dresden, Willowbrook and Katspruit Form soils.

(iii) Soil Fertility

The levels of calcium and magnesium are generally high. The available phosphorus is very low and the potassium levels are generally low to very low. It is considered that the arable soils are suitable for cultivation, provided that adequate levels of the required fertilisers are applied. The laboratory test results are included in Appendix 2.4 of the Soils, Land Use and Land Capability Report.

(iv) Nutrient Storage and Cation Exchange Capacity (CEC)

The potential of a soil to retain and supply nutrients can be assessed by measuring the cation exchange capacity (CEC). A lack of organic matter and clay minerals, which provide exchange sites that serve as nutrient stores, results in a low ability to retain and supply nutrients for plant growth. Low CEC values are an indication of soils lacking organic matter and clay minerals. Typically a soil rich in humus can have a CEC of 300 meq/100g (>30 meq/%), while a soil low in organic matter and clay may have a CEC of 1-5 meq/100g (<5 meq/%).

The CEC values of the soils in the area are typically moderate.

(v) Soil Erosion Hazard

The erodibility of the soils occurring on the site is given in Table 2-8. The erodibility index was calculated based on visual inspection of the site, as well as the physical properties of the soils, particularly the sodium adsorption ratio (SAR). To quantify erodibility, the following index was used:

- ESP < 3 = Low;
- ESP 3 to 8 = Medium; and
- ESP > 8 = High.

**Table 2-8 Soil erosion hazard for soils found within the Kwaqubuka North Mine area**

| Soil Form | Erosion Hazard |
|---|---|
| Mayo, Milkwood, Willowbrook, Katspruit and Dundee | Moderate to low |
| Mispah, Glenrosa, Westleigh, Dresden and Clovelly | High |

#### *2.5.4.2 Soil Physical Characteristics*

(i) Soil Depth

The thickness of the topsoil ranges between 200 mm and 700 mm, averaging in the order of 300 mm to 500 mm. The effective soil depth or rooting depth (depth to refusal of auger on gravels or rock) is variable. The Mispah and Milkwood soils are seldom deeper than 200 mm; the Dresden, Westleigh, Glenrosa and Mayo soils are up to 0.50 metres deep and the Willowbrook, Katspruit, Clovelly and Dundee soils are up to 1.5 m deep. The deepest soils are those found in the lower and gentlest mid slopes. The shallowest soils are generally concentrated on the crests of hills and steeper slopes where soil depth is generally between 150 mm and 400 mm.

(ii) Available Moisture and Drainage

The available moisture content of the Willowbrook, Mayo, Milkwood and Katspruit Form soils is moderate to high whilst that of the remaining soils is low to moderate, except for the Mispah Form soils, in which it is very low. The intake rate in the Willowbrook, Mayo, Milkwood, Katspruit, Westleigh and Dresden form soils is moderate to poor and in the Clovelly, Glenrosa, Mispah and Dundee form soils is moderate to good.

The drainage in most of the soils is moderate to good, but is poor in the Willowbrook, Katspruit, Westleigh and Dresden Form soils.

(iii) Tillage Constraints

Various tillage constraints exist in the different soil types. Cloddy consistency such that soils tend to be slippery when wet and hard and cloddy when dry, is characteristic of the Mayo, Milkwood and Willowbrook Form soils. A crusting and capping hazard is common in the Mispah and Glenrosa Form soils. These soils tend to be soft and slightly plastic when wet and cement when dry. The Glenrosa, Form soils are susceptible to compaction hazard and are thus prone to physical damage such as puddling and smearing by traffic under wet conditions. Sub-surface hindrance occurs in the shallower Milkwood, Mayo, Mispah, Glenrosa, Westleigh and Dresden Form soils.

### 2.5.5 Land Capability of Kwaqubuka North

#### *2.5.5.1 Dryland Potential*

The shallower Milkwood, Mayo, Mispah, Glenrosa, Westleigh, Dresden, Willowbrook, Katspruit and Dundee Form soils are generally considered to have poor cultivation potential. The Clovelly Form soils generally have fair to good cultivation potential. The nutrient status is fair, but supplements of nitrogen and phosphorus would probably be required.

#### *2.5.5.2 Irrigation Potential*

The irrigation potential of the area is generally poor. There are only limited areas with cultivation potential, and these areas comprise Clovelly Form soils. In addition, there is insufficient surface water for irrigation purposes. Currently, no boreholes exist in the area for irrigation purposes.

#### *2.5.5.1 Arable Land Capability*

In general, the land with arable potential comprises those areas where soils have a fair to moderate dryland production potential. These are relatively deep soils located on gentle to moderate slopes. The soils should typically be well drained with a low to moderate erosion hazard and few to slight tillage constraints. The only soils in the Kwaqubuka North Anthracite Mine area that can be classified as having arable potential are the Clovelly Form soils. As a result about 38 ha (or 13% of the survey area) is considered to have arable potential.

#### *2.5.5.2 Grazing Land Capability*

Generally, areas of grazing land capability are covered by relatively shallow soils. They occur in bottomland areas and drainage ways that are not permanently wet or on steeper slopes. These soils may be susceptible to erosion, have a low moisture capacity and possible salinity hazards. In the Kwaqubuka North Anthracite Mine area the land with grazing potential coincides with the distribution of Glenrosa, Mayo, Westleigh and Dresden Form soils, covering 58% of the study area.

#### *2.5.5.3 Wilderness Land Capability*

In general, wilderness land comprises very steep, rugged slopes and areas underlain by very shallow soils or rock outcrop. As outlined in Table 2-9; the wilderness land occurs in the areas underlain by Milkwood and Mispah Form soils and represents 24% of the total survey area.

#### *2.5.5.4 Wetland Capability*

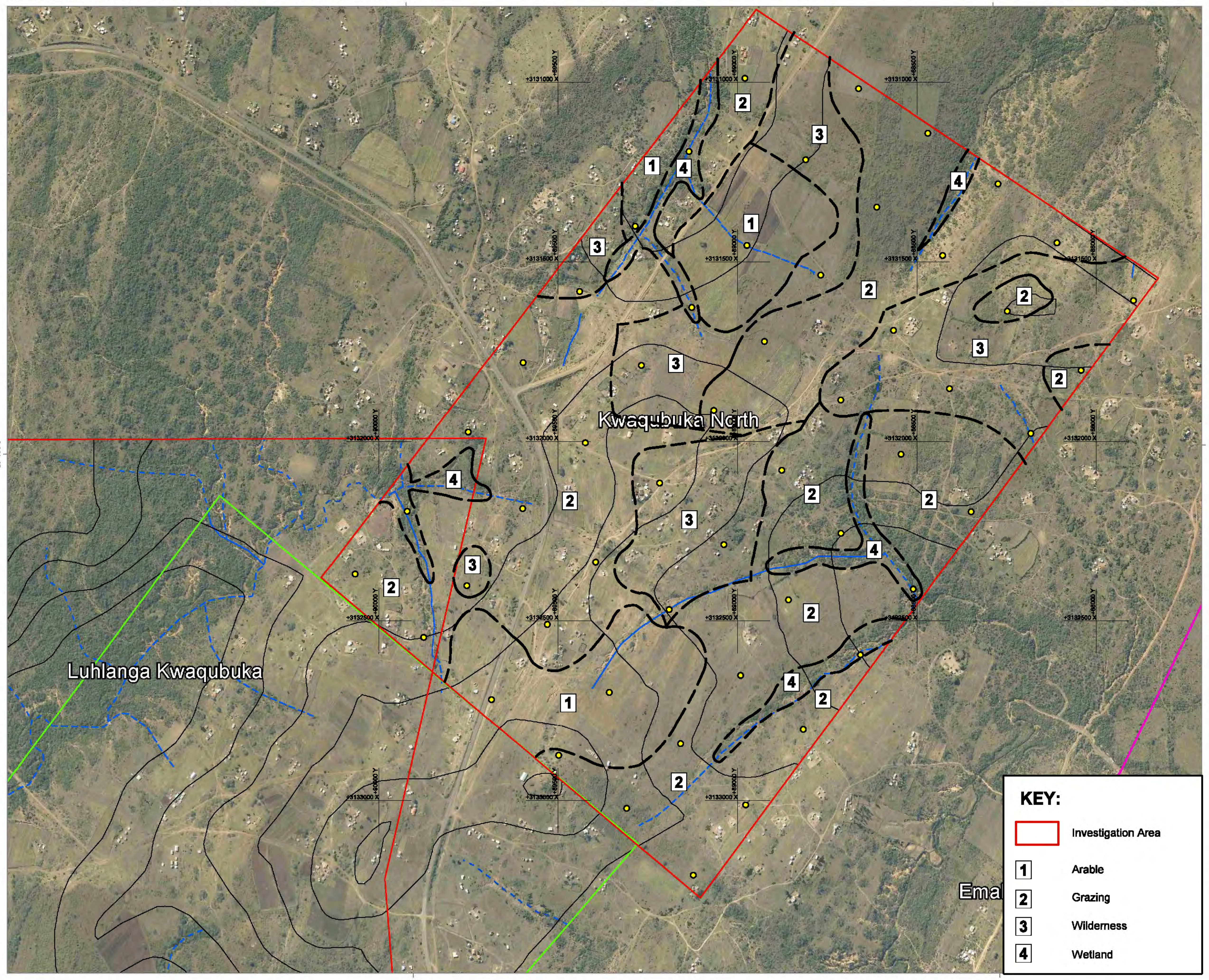
The wetland soils in the Kwaqubuka North Anthracite Mine area are those located immediately adjacent to perennial and non-perennial streams and other drainage lines. Areas of wetland capability are generally seasonally or permanently wet and occur where the water table is perched. They generally comprise the Katspruit, Willowbrook and Dundee Form soils.

There are only small non-perennial streams and drainage lines that traverse the site, with narrow wetland areas associated with them. A separate wetland assessment has been carried out by wetland specialists.

**Table 2-9 Coverage per land capability class within survey area**

| Land Capability Class | Area (ha) | Percentage Cover |
|---|---|---|
| Arable | 38 ha | 13 % |
| Grazing | 163 ha | 58 % |
| Wilderness | 66 ha | 24 % |
| Wetland | 16 ha | 5 % |
| Total | 283 ha | 100 % |

# SOMKHELE NORTHERN EXPANSION




## Legend

- Line_HAUL_ROADS
- Pits
- Contours 10m

### Rivers

### Rivers & Streams

- NON-PERENNIAL
- PERENNIAL

| | |
|---|---|
| Data Sources: | THE CHIEF DIRECTORATE OF SURVEY & MAPPING 1:50 000 TOPOGRAPHICAL SERIES & CLIENT |
| Disclaimer: | |
| FIGURE NO.: | 01 |
| MAP NUMBER: | 13-027-11-04-2013-01 |
| DRAWN BY: | G. JONES GIS TECHNOLOGIST |
| REVIEWED BY: | C.WRIGHT ENVIRONMENTAL CONSULTANT |
| DATUM: PROJECTION: | WGS84 GEOGRAPHIC |
| DATE: | 18 APRIL 2012 |
| CLIENT: | SOMKHELE |
| PROJECT: | * |
| SCALE: | 1:10 000 |

0 75 150 300 450 Meters


4a Old Main Road
Judges Walk
Kloof, 3610
South Africa
T• +27(31) 764-7130
F• +27(31) 764-7140

### 2.5.6 Soil Forms, Distribution and Diagnostic Characteristics: Emalahleni North

Three (3) terrain units can be identified within the area, namely crests, hill slopes and bottomland zones. The soils occurring on crests of hills are Mispah Form and Mayo / Glenrosa Form together with the Westleigh Form. These soils also occur most commonly on the hill slopes, together with Clovelly and minor Hutton Form soils. The soils that were identified in the bottomland zones are predominantly of the Willowbrook, Katspruit and Dundee Form.

#### *2.5.6.1 Soil Characteristics*

The distribution of the soils is indicated on Figure 2-10. The corresponding Soil Families and diagnostic horizons are summarised in Table 2-10, whilst the estimated area and percentage covered by the various soils is given in Table 2-11.

The Clovelly Form soils are dominant in the area (45%) followed by Mispah, Glenrosa / Mayo Form soils (28%). Willowbrook and Katspruit Form soils are less common, with isolated occurrences of Hutton, Westleigh and Dundee Form soils.

The soils of the area generally comprise an Orthic and to a lesser extent, Melanic topsoil overlying a Yellow brown apedal, Lithocutanic or Hard Rock B horizon.

The Clovelly and Hutton Form soils are mesotrophic and luvic and the Westleigh Form soils are also luvic. The Mispah Form soils are calcareous whilst the Willowbrook, Katspruit, Mayo and Glenrosa Form soils are non-calcareous.

**Table 2-10 Soil forms and families found within the Emalahleni North Mine area**

| Soil Form | Soil Family | Code | Diagnostic Horizons |
|---|---|---|---|
| Mispah | Carnarvon | Ms – 1200 | Orthic A<br>Hard rock |
| Mayo | Grassmere | My – 2100 | Melanic A<br>Lithocutanic B |
| Glenrosa | Tsende | Gs – 1211 | Orthic A<br>Lithocutanic B |
| Westleigh | Mareetsane | We - 2000 | Orthic A<br>Soft plinthic B |
| Clovelly | Leiden | Cv - 2200 | Orthic A<br>Yellow-brown apedal B |
| Hutton | Suurbekom | Hu - 2200 | Orthic A<br>Red apedal B |
| Willowbrook | Ottawa | Wo - 1000 | Melanic A<br>G |
| Katspruit | Lammermoor | Ka - 1000 | Orthic A<br>G |
| Dundee | Mtamvana | Du - 1210 | Orthic A<br>Stratified alluvium |

**Table 2-11 Soil form coverage percentage within the Emalahleni North Mine area**

| Soil Form | Area (ha) | Percentage Cover |
|---|---|---|
| Mispah | 43 | 17 |
| Mayo / Glenrosa | 29 | 11 |
| Westleigh | 2 | 1 |
| Clovelly | 117 | 45 |
| Hutton | 15 | 6 |
| Willowbrook / Katspruit | 50 | 19 |
| Dundee | 2 | 1 |
| Total | 258 | 100 |

#### *2.5.6.2 Soil Chemical Characteristics*

(i) Soil pH

The soil pH influences plant growth through the direct effect of the hydrogen ion concentration on nutrient uptake, and, through the mobilization of toxic ions such as aluminium and manganese (which restrict plant growth). In addition, pH indirectly affects plant growth through its effect on the availability of major trace nutrients. A pH range of between 6 and 7 most readily promotes the availability of plant nutrients. pH values below 3 or above 9, will seriously affect the nutrient uptake by a plant.

Soil pH ranges from 4.50 to 5.53 indicating that the soils generally have an acidic pH. No particular soil form emerged as more or less acidic than the others.

*(ii) Soil Salinity/Sodicity*

Highly saline soils will result in the reduction of plant growth caused by the diversion of plant energy from normal physiological processes to that involved in the acquisition of water under highly stressed conditions. The following guideline values are given regarding electrical conductivity (EC) values and salinity effects in soils:

60 mS/m: No effect on plant growth

60 –120 mS/m: Salt sensitive plants are affected

> 120 mS/m: Growth of all plants severely affected

In addition, soil salinity may directly influence the effects of particular ions on soil properties. The sodium adsorption ratio (SAR) is an indication of the effect of sodium on soils. At high levels of exchangeable sodium, certain clay minerals, when saturated with sodium, swell markedly. With the swelling and dispersion of a sodic soil, pore spaces become blocked and infiltration rates and permeability are greatly reduced. The critical SAR for the various soils types are as follows:

| | |
|---|---|
| poorly drained grey soils: | 6 – Willowbrook, Katspruit, Westleigh. |
| slowly draining black swelling clays: | 10 – Mayo. |
| well drained soils and recent sands: | 15– Mispah, Glenrosa, Clovelly, Hutton, Dundee. |

Most of the soils are expected to have electrical conductivity values of less than 60 mS/m which is below the threshold level for no effect on plant growth. The soils likely to show higher conductivity values are the Willowbrook Form soils.

The soils are mostly non-saline with low salinity hazard, and generally low sodicity ratings. The Willowbrook Form soils may have a moderate to severe sodicity rating.

*(iii) Soil Fertility*

The levels of calcium and magnesium are generally high. The available phosphorus and potassium are, however, low to very low. It is considered that the arable soils are suitable for cultivation, provided that adequate levels of the required fertilisers are applied. The laboratory test results are included in Appendix G-5.

*(iv) Nutrient Storage and Cation Exchange Capacity (CEC)*

The potential of a soil to retain and supply nutrients, can be assessed by measuring the cation exchange capacity (CEC). A lack of organic matter and clay minerals, which provide exchange sites that serve as nutrient stores, results in a low ability to retain and supply nutrients for plant growth. Low CEC values are an indication of soils lacking organic matter and clay minerals. Typically a soil rich in humus can have a CEC of 300 meq/100g (>30 meq/%), while a soil low in organic matter and clay may have a CEC of 1-5 meq/100g (<5 meq/%).

The CEC values of the soils in the area are typically moderate.

*(v) Soil Erosion Hazard*

The erodibility of the soils occurring on the site is given in Table 2-12. The erodibility index was calculated based on visual inspection of the site, as well as the physical properties of the soils, particularly the sodium adsorption ratio (SAR). To quantify erodibility, the following index was used: ESP < 3 = Low, ESP 3 to 8 = Medium and ESP > 8 = High.

**Table 2-12 Soil erosion hazard for soils found within the Emalahleni North Mine area**

| Soil Form | Erosion Hazard |
|---|---|
| Willowbrook, Mayo and Hutton | Moderate to low |
| Katspruit, Dundee, Westleigh, Clovelly, Mispah and Glenrosa | Moderate to high |

#### *2.5.6.3 Soil Physical Characteristics*

*(i) Soil Depth*

The thickness of the topsoil ranges between 150 mm and 750 mm, averaging in the order of 300 mm to 450 mm. The effective soil depth, or rooting depth (depth to refusal of auger on gravels or rock) is variable. The Mispah soils are seldom deeper than 200 mm; the Westleigh, Glenrosa and Mayo soils are up to 0.50 m deep and the Willowbrook, Katspruit, Dundee, Clovelly and Hutton soils are up to 1.5 m deep. The deepest soils are those found in the lower and gentlest mid slopes. The shallowest soils are generally concentrated on the crests of hills and steeper slopes where soil depth is generally between 150mm and 400mm.

*(ii) Available Moisture and Drainage*

The available moisture content of the Mayo, Willowbrook, Katspruit, Hutton and Dundee Form soils is moderate to high whilst that of the remaining soils is low. The intake rate in most of the soils is moderate to good, but is poor in the Willowbrook, Katspruit and Westleigh Form soils.

The drainage in most of the soils is moderate to good, but is poor in the Willowbrook, Katspruit and Westleigh Form soils.

*(iii) Tillage Constraints*

Various tillage constraints exist in the different soil types. Cloddy consistency such that soils tend to be slippery when wet and hard and cloddy when dry, is characteristic of the Mayo, Milkwood and Willowbrook Form soils. A crusting and capping hazard is common in the Mispah and Glenrosa Form soils. These soils tend to be soft and slightly plastic when wet and cement when dry. The Glenrosa, Form soils are susceptible to compaction hazard and are thus prone to physical damage such as puddling and smearing by traffic under wet conditions. Sub-surface hindrance occurs in the shallower Mayo, Mispah and Glenrosa Form soils.

### 2.5.7 Land Capability of Emalahleni

#### *2.5.7.1 Dryland Potential*

The shallower Mayo, Mispah and Glenrosa Form soils and the poorly drained Willowbrook, Katspruit and Westleigh Form soils are generally considered to have poor cultivation potential. The Clovelly and Hutton Form soils generally have fair to good cultivation potential. The nutrient status is fair, but supplements of nitrogen and phosphorus would probably be required.

#### *2.5.7.2 Irrigation Potential*

The irrigation potential of the area is generally poor. There are only limited areas with cultivation potential, and these areas comprise Clovelly and Hutton Form soils. In addition, there is insufficient surface water for irrigation purposes. Currently, no boreholes exist in the area for irrigation purposes.

#### *2.5.7.3 Arable Land Capability*

In general, the land with arable potential comprises those areas where soils have a fair to moderate dryland production potential. These are relatively deep soils located on gentle to moderate slopes. The soils should typically be well drained with a low to moderate erosion hazard and few to slight tillage constraints. The soils in the Emalahleni North Anthracite Mine area that can be classified as having arable potential are the Clovelly and Hutton Form soils. As a result about 132 ha (or 51% of the survey area) is considered to have arable potential (Table 2-13).

#### *2.5.7.4 Grazing Land Capability*

Generally, areas of grazing land capability are covered by relatively shallow soils. They occur in bottomland areas and drainage ways that are not permanently wet or on steeper slopes. These soils may be susceptible to erosion, have a low moisture capacity and possible salinity hazards. In the Kwaqubuka North Anthracite Mine area the land with grazing potential coincides with the distribution of Glenrosa, Mayo and Westleigh Form soils, covering 12% of the study area (Table 2-13).

#### *2.5.7.5 Wilderness Land Capability*

In general, wilderness land comprises very steep, rugged slopes and areas underlain by very shallow soils or rock outcrop. The wilderness land occurs in the areas underlain by Mispah Form soils and represents 17% of the total survey area (Table 2-13).

#### *2.5.7.6 Wetland Capability*

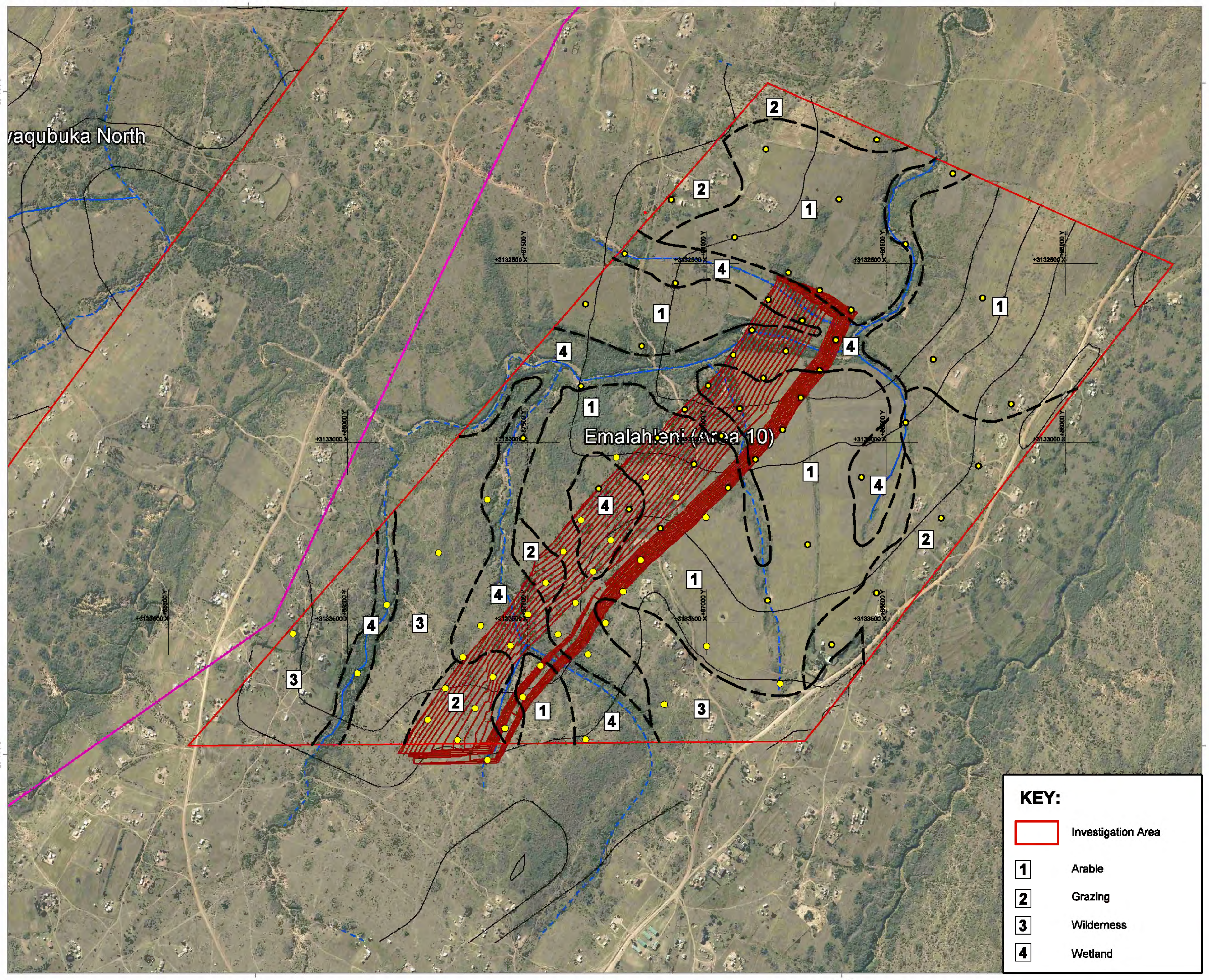
The wetland soils in the Emalahleni North Anthracite Mine area are those located immediately adjacent to perennial and non-perennial streams and other drainage lines. Areas of wetland capability are generally seasonally or permanently wet and occur where the water table is perched. They generally comprise the Katspruit, Willowbrook and Dundee Form soils.

There are only small non-perennial streams and drainage lines that traverse the site, with narrow wetland areas associated with them. A separate wetland assessment has been carried out by wetland specialists.

**Table 2-13 Coverage per land capability class within survey area**

| Land Capability Class | Area (ha) | Percentage Cover |
|---|---|---|
| Arable | 132 ha | 51 % |
| Grazing | 31 ha | 12 % |
| Wilderness | 43 ha | 17 % |
| Wetland | 52 ha | 20% |
| Total | 258 ha | 100 % |

# SOMKHELE NORTHERN EXPANSION




**Legend**

Line_HAUL_ROADS

Pits

Contours 10m

**Rivers**

**Rivers & Streams**

NON-PERENNIAL

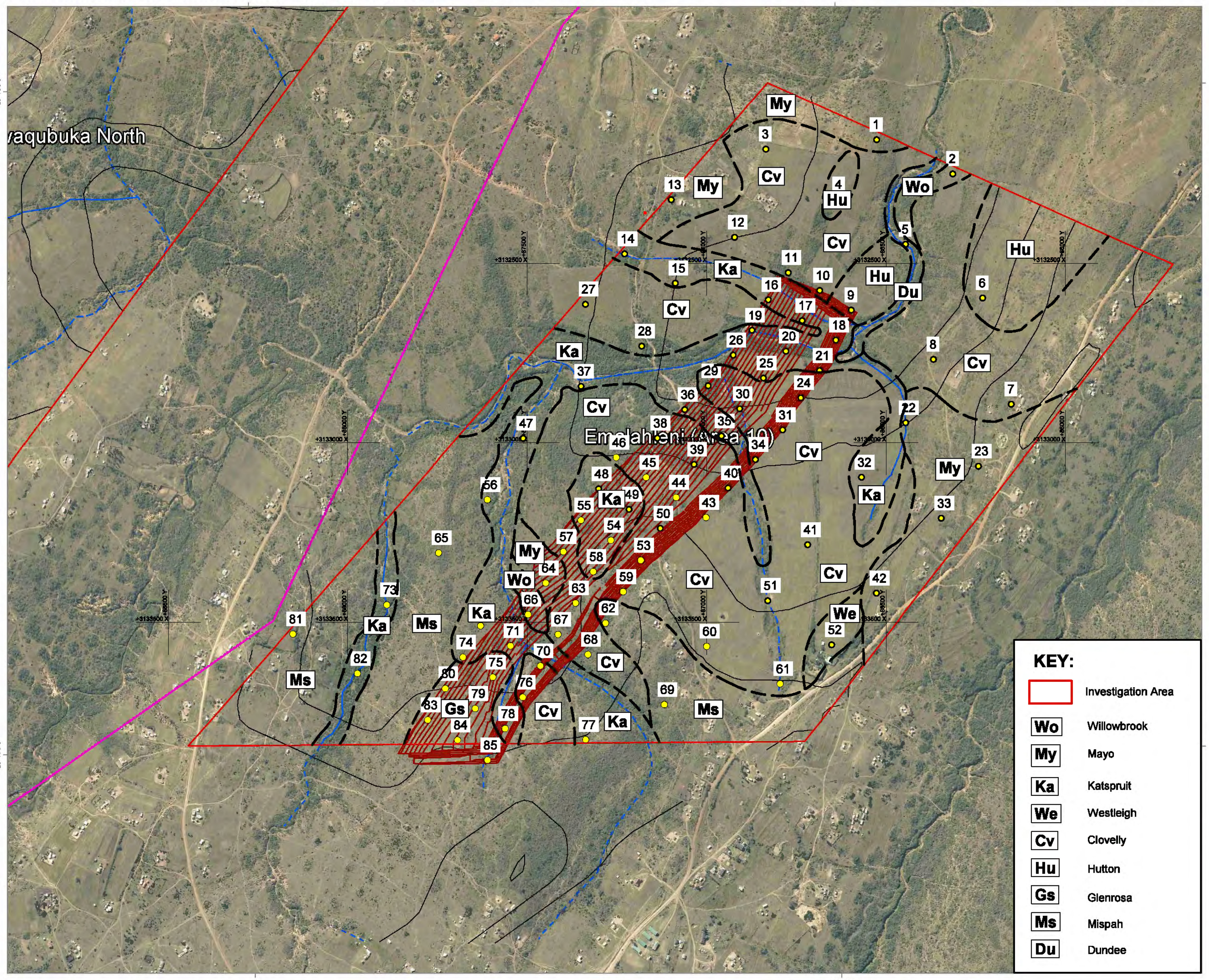
PERENNIAL

| | |
|---|---|
| Data Sources: | THE CHIEF DIRECTORATE OF SURVEY & MAPPING 1:50 000 TOPOGRAPHICAL SERIES & CLIENT |
| Disclaimer: | |
| FIGURE NO.: | 01 |
| MAP NUMBER: | 13-027-11-04-2013-01 |
| DRAWN BY: | G. JONES<br>GIS TECHNOLOGIST |
| REVIEWED BY: | C. WRIGHT<br>ENVIRONMENTAL CONSULTANT |
| DATUM:<br>PROJECTION: | WGS84<br>GEOGRAPHIC |
| DATE: | 18 APRIL 2012 |
| CLIENT: | SOMKHELE |
| PROJECT: | * |
| SCALE: | 1:10 000 |

0 75 150 300 450 Meters


4a Old Main Road
Judges Walk
Kloof, 3610
South Africa
T• +27(31) 764-7130
F• +27(31) 764-7140

# SOMKHELE NORTHERN EXPANSION




**Legend**

Line_HAUL_ROADS

Pits

Contours 10m

**Rivers**

**Rivers & Streams**

NON-PERENNIAL

PERENNIAL

| | |
|---|---|
| Data Sources: | THE CHIEF DIRECTORATE OF SURVEY & MAPPING 1:50 000 TOPOGRAPHICAL SERIES & CLIENT |
| Disclaimer: | |
| FIGURE NO.: | 01 |
| MAP NUMBER: | 13-027-11-04-2013-01 |
| DRAWN BY: | G. JONES GIS TECHNOLOGIST |
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| DATE: | 18 APRIL 2012 |
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| PROJECT: | * |
| SCALE: | 1:10 000 |

0 75 150 300 450 Meters

GCS Water & Environmental Consultants


4a Old Main Road
Judges Walk
Kloof, 3610
South Africa
T• +27(31) 764-7130
F• +27(31) 764-7140

### 2.5.8 Soil Forms, Distribution and Diagnostic Characteristics Mahujini

Three terrain units can be identified within the area, namely crests, hill slopes and bottomland zones. The soils occurring on crests of hills are Mispah / Milkwood Form and Mayo / Glenrosa Form together with the Westleigh Forms. These soils also occur most commonly on the hill slopes, together with Cartref and Clovelly Forms. The soils commonly occurring in the lowland areas and adjacent to streams are those of the Willowbrook and Katspruit Forms.

The distribution of the soils is indicated on Figure 2-12. The corresponding Soil Families and diagnostic horizons are summarised in Table 2-14 whilst the estimated area and percentage covered by the various soils is given in Table 2-15.

The Mispah / Milkwood Form soils are dominant over the project area (49%), followed by the Clovelly Form soils (17%), Mayo / Glenrosa Form soils (16%), and Willowbrook and Katspruit Form soils (16%). There are isolated occurrences of Cartref and Westleigh Form soils.

The soils of the area generally comprise an Orthic or to a lesser extent, Melanic topsoil overlying a Lithocutanic or Hard Rock B horizon.

The Glenrosa and Mayo Form soils generally have a hard B horizon, which is generally calcareous. The Mispah Form soils are generally non-calcareous whilst the Milkwood Form soils are calcareous. The Clovelly Form soils are mesotrophic and luvic and the Westleigh Form soils are luvic. The Willowbrook and Katspruit Form soils are non-calcareous.

**Table 2-14 Soil forms and families found within the Mahujini Mine area**

| Soil Form | Soil Family | Code | Diagnostic Horizons |
|---|---|---|---|
| Mispah | Myhill | Ms – 1100 | Orthic A<br>Hard rock |
| Milkwood | Mpetu | Mw - 2000 | Melanic A<br>Hard rock |
| Mayo | Boyela | My – 2200 | Melanic A<br>Lithocutanic B |
| Glenrosa | Bergsig | Gs – 1212 | Orthic A<br>Lithocutanic B |
| Cartref | Steenbras | Cf – 2100 | Orthic A<br><br>Lithocutanic B |
| Westleigh | Mareetsane | We – 2000 | Orthic A<br>Soft plinthic B |
| Clovelly | Leiden | Cv – 2200 | Orthic A<br>Yellow-brown apedal B |
| Willowbrook | Ottawa | Wo - 1000 | Melanic A<br>G |
| Katspruit | Lammermoor | Ka - 1000 | Orthic A<br>G |

**Table 2-15 Soil form coverage percentage within the Mahujini Mine area**

| Soil Form | Area (ha) | Percentage Cover |
|---|---|---|
| Mispah / Milkwood | 102 | 49 |
| Mayo / Glenrosa | 34 | 16 |
| Cartref | 3 | 1 |
| Westleigh | 3 | 1 |
| Clovelly | 35 | 17 |
| Willowbrook / Katspruit | 34 | 16 |
| Total | 211 | 100 |

#### *2.5.8.1 Soil Chemical Characteristics*

(i) Soil pH

The soil pH influences plant growth through the direct effect of the hydrogen ion concentration on nutrient uptake, and, through the mobilization of toxic ions such as aluminium and manganese (which restrict plant growth). In addition, pH indirectly affects plant growth through its effect on the availability of major trace nutrients. A pH range of between 6 and 7 most readily promotes the availability of plant nutrients. pH values below 3 or above 9, will seriously affect the nutrient uptake by a plant.

Soil pH ranges from 4.62 to 6.38 indicating that the soils generally have an acidic to slightly acidic pH. No particular soil form emerged as more or less acidic than the others.

(ii) Soil Salinity/Sodicity

Highly saline soils will result in the reduction of plant growth caused by the diversion of plant energy from normal physiological processes to that involved in the acquisition of water under highly stressed conditions. The following guideline are given regarding electrical conductivity (EC) values and salinity effects in soils:

60 mS/m: No effect on plant growth

60 –120 mS/m : Salt sensitive plants are affected

> 120 mS/m: Growth of all plants severely affected

In addition, soil salinity may directly influence the effects of particular ions on soil properties. The sodium adsorption ratio (SAR) is an indication of the effect of sodium on soils. At high levels of exchangeable sodium, certain clay minerals, when saturated with sodium, swell markedly. With the swelling and dispersion of a sodic soil, pore spaces become blocked and infiltration rates and permeability are greatly reduced. The critical SAR for the various soils types are as follows:

| | |
|---|---|
| poorly drained grey soils: | 6 – Westleigh, Katspruit |
| slowly draining black swelling clays: | 10 – Mayo, Milkwood, Willowbrook |
| well drained soils and recent sands: | 15 – Mispah, Glenrosa, Clovelly, Cartref |

Most of the soils are likely to have electrical conductivity values of less than 60 mS/m, which is below the threshold level for no effect on plant growth. However, the Willowbrook Form soils may have elevated electrical conductivity values.

The results soils are mostly non-saline with low salinity hazard, and generally low sodicity ratings. The Willowbrook subsoils generally have a moderate to severe sodicity rating.

(iii) Soil Fertility

The levels of calcium and magnesium are generally medium to high. The available phosphorus and potassium are, however, low to very low. It is considered that the arable soils are suitable for cultivation, provided that adequate levels of the required fertilisers are applied. The laboratory test results are included in Appendix 2.4 of the Soils, Land Us and Land Capability Report (Appendix G-5).

(iv) Nutrient Storage and Cation Exchange Capacity (CEC)

The potential of a soil to retain and supply nutrients, can be assessed by measuring the cation exchange capacity (CEC). A lack of organic matter and clay minerals, which provide exchange sites that serve as nutrient stores, results in a low ability to retain and supply nutrients for plant growth. Low CEC values are an indication of soils lacking organic matter and clay minerals. Typically a soil rich in humus can have a CEC of 300 meq/100g (>30 meq/%), while a soil low in organic matter and clay may have a CEC of 1-5 meq/100g (<5 meq/%).

The CEC values of the soils in the area are typically moderate.

(v) Soil Erosion Hazard

The erodibility of the soils occurring on the site is given in Table 2-16 The erodibility index was calculated based on visual inspection of the site, as well as the physical properties of the soils, particularly the sodium adsorption ratio (SAR).

**Table 2-16 Soil erosion hazard for soils found within the Mahujini Mine area**

| Soil Form | Erosion Hazard |
|---|---|
| Willowbrook, Mayo, Milkwood and Katspruit | Moderate to low |
| Cartref, Westleigh, Clovelly, Mispah and Glenrosa | Moderate to high |

#### *2.5.8.2 Soil Physical Characteristics*

(i) Soil Depth

The thickness of the topsoil ranges between 150 mm and 700 mm, averaging in the order of 300 mm to 400 mm. The effective soil depth, or rooting depth (depth to refusal of auger on gravels or rock) is variable. The Mispah and Milkwood soils are seldom deeper than 200 mm; the Westleigh, Cartref, Glenrosa and Mayo soils are up to 0.50 m deep and the Katspruit, Willowbrook and Clovelly soils are up to 1.5 m deep. The deepest soils are those found in the lower and gentlest mid slopes. The shallowest soils are generally concentrated on the crests of hills and steeper slopes where soil depth is generally between 150 mm and 400 mm.

(ii) Available Moisture and Drainage

The available moisture content of the Willowbrook, Mayo, Milkwood, Katspruit, Glenrosa and Mispah Form soils is moderate to high whilst that of the remaining soils is low. The intake rate in most of the soils is moderate, but is poor in the Willowbrook, Katspruit and Westleigh Forms.

The drainage in most of the soils is good, but is moderate to poor in the Willowbrook, Katspruit and Westleigh soils.

(iii) Tillage Constraints

Various tillage constraints exist in the different soil types. Cloddy consistency such that soils tend to be slippery when wet and hard and cloddy when dry, is characteristic of the

Mayo, Willowbrook and Milkwood Form soils. A crusting and capping hazard is common in the Mispah and Glenrosa Form soils. These soils tend to be soft and slightly plastic when wet and cement when dry. The Glenrosa, Form soils are susceptible to compaction hazard and are thus prone to physical damage such as puddling and smearing by traffic under wet conditions. Sub-surface hindrance occurs in the shallower Mayo, Mispah and Glenrosa Form soils.

### 2.5.9 Land Capability of Mahujini

#### *2.5.9.1 Dryland Potential*

The shallower Mayo, Milkwood, Westleigh, Mispah and Glenrosa Form soils are generally considered to have poor cultivation potential. The Cartref and Clovelly Form soils generally have fair to good cultivation potential. The nutrient status is fair, but supplements of nitrogen and phosphorus would probably be required.

#### *2.5.9.2 Irrigation Potential*

The irrigation potential of the area is generally poor. There are only limited areas with cultivation potential, and these areas comprise Clovelly Form soils. In addition, there is insufficient surface water for irrigation purposes. Currently, no boreholes exist in the area for irrigation purposes.

#### *2.5.9.3 Arable Land Capability*

In general, the land with arable potential comprises those areas where soils have a fair to moderate dryland production potential. These are relatively deep soils located on gentle to moderate slopes. The soils should typically be well drained with a low to moderate erosion hazard and few to slight tillage constraints. The only soils in the Mahujini Mine area that can be classified as having arable potential are the Clovelly and Cartref Form soils. As a result about 38 ha (or 18% of the survey area) is considered to have arable potential.

#### *2.5.9.4 Grazing Land Capability*

Generally, areas of grazing land capability are covered by relatively shallow soils. They occur in bottomland areas and drainage ways that are not permanently wet or on steeper slopes. These soils may be susceptible to erosion, have a low moisture capacity and possible salinity hazards. In the Mahujini Mine area the land with grazing potential coincides with the distribution of Glenrosa, Mayo and Westleigh Form soils, covering 17% of the study area (Table 2-17).

#### *2.5.9.5 Wilderness Land Capability*

In general, wilderness land comprises very steep, rugged slopes and areas underlain by very shallow soils or rock outcrop. The wilderness land occurs in the areas underlain by Mispah and Milkwood Form soils and represents 49% of the total survey area (Table 2-17).

#### *2.5.9.6 Wetland Capability*

The wetland soils in the Mahujini Mine area are those located immediately adjacent to perennial and non-perennial streams and other drainage lines. Areas of wetland capability are generally seasonally or permanently wet and occur where the water table is perched. They generally comprise the Katspruit and Willowbrook Form soils (Table 2-17).

There are only small non-perennial streams and drainage lines that traverse the site, with narrow wetland areas associated with them. A separate wetland assessment has been carried out by wetland specialists.

**Table 2-17 Coverage per land capability class within survey area**

| Land Capability Class | Area (ha) | Percentage Cover |
|---|---|---|
| Arable | 38 ha | 18 % |
| Grazing | 37 ha | 17 % |
| Wilderness | 102 ha | 49 % |
| Wetland | 34 ha | 16 % |
| Total | 211 ha | 100 % |

**Figure 2-11: Mahujini Land Capability Map**

**Figure 2-12: Soil Distribution Map of Mahujini Area**

Insert Soil Distribution Map

### 2.5.10 Soil Forms, Distribution and Diagnostic Characteristics Gwabalanda

Three terrain units can be identified within the area, namely crests, hill slopes and bottomland zones. The soils occurring on crests of hills are Mispah Form and Mayo / Glenrosa Form together with the Westleigh Forms. These soils also occur most commonly on the hill slopes, together with Bonheim, Cartref, Clovelly and Hutton Form soils. The soils that were identified in the bottomland zones are predominantly of the Willowbrook and Katspruit Forms.

The distribution of the soils is indicated on Figure 2-14. The corresponding Soil Families and diagnostic horizons are summarised in Table 2-18 whilst the estimated area and percentage covered by the various soils is given in Table 2-19.

The Glenrosa / Mayo Form soils are dominant over the project area (32%), followed by the Mispah Form soils (27%). Westleigh, Bonheim, Willowbrook and Katspruit Form soils are less common with isolated occurrences of Cartref, Clovelly and Hutton Form soils.

The soils of the area generally comprise an Orthic or to a lesser extent, Melanic topsoil overlying a Lithocutanic or Hard Rock B horizon.

The Glenrosa and Mayo Form soils generally have a hard B horizon, and are generally non-calcareous. The Clovelly and Hutton Form soils are luvic and dystrophic whilst the Westleigh Form soils are also luvic. The Cartref form soils have a yellow E horizion and a hard B horizon. The Bonheim and Willowbrook Form soils are non-calcareous.

**Table 2-18 Soil forms and families found within the Gwabalanda Mine are**

| Soil Form | Soil Family | Code | Diagnostic Horizons |
|---|---|---|---|
| Mispah | Myhill | Ms – 1100 | Orthic A<br>Hard rock |
| Mayo | Grassmere | My – 2100 | Melanic A<br>Lithocutanic B |
| Glenrosa | Tsende | Gs – 1211 | Orthic A<br>Lithocutanic B |
| Cartref | Witzenberg | Cf – 2200 | Orthic A<br>E<br>Lithocutanic B |
| Westleigh | Mareetsane | We – 2000 | Orthic A<br>Soft plinthic B |
| Bonheim | Eureka | Bo – 1110 | Melanic A<br>Pedocutanic B |
| Clovelly | Brereton | Cv – 1200 | Orthic A<br>Yellow-brown apedal B |
| Hutton | Kelvin | Hu – 1200 | Orthic A<br>Red apedal B |
| Willowbrook | Ottawa | Wo - 1000 | Melanic A<br>G |
| Katspruit | Slangspruit | Ka - 2000 | Orthic A<br>G |

**Table 2-19 Soil form coverage percentage within the Gwabalanda Mine area**

| Soil Form | Area (ha) | Percentage Cover |
|---|---|---|
| Mispah | 95 | 27 |
| Mayo / Glenrosa | 111 | 32 |
| Cartref | 3 | 1 |
| Westleigh | 36 | 10 |
| Bonheim | 42 | 12 |
| Clovelly | 7 | 2 |
| Hutton | 5 | 1 |
| Willowbrook / Katspruit | 52 | 15 |
| Total | 351 | 100 |

#### *2.5.10.1 Soil Chemical Characteristics*

(i) Soil pH

The soil pH influences plant growth through the direct effect of the hydrogen ion concentration on nutrient uptake, and, through the mobilization of toxic ions such as aluminium and manganese (which restrict plant growth). In addition, pH indirectly affects plant growth through its effect on the availability of major trace nutrients. A pH range of between 6 and 7 most readily promotes the availability of plant nutrients. pH values below 3 or above 9, will seriously affect the nutrient uptake by a plant.

Soil pH ranges from 4.04 to 7.59 indicating that the soils generally have an acidic to neutral pH. No particular soil form emerged as more or less acidic than the others.

(ii) Soil Salinity/Sodicity

Highly saline soils will result in the reduction of plant growth caused by the diversion of plant energy from normal physiological processes to that involved in the acquisition of water under highly stressed conditions. The following guidelines are given regarding electrical conductivity (EC) values and salinity effects in soils:

60 mS/m: No effect on plant growth

60 –120 mS/m: Salt sensitive plants are affected

> 120 mS/m: Growth of all plants severely affected

In addition, soil salinity may directly influence the effects of particular ions on soil properties. The sodium adsorption ratio (SAR) is an indication of the effect of sodium on soils. At high levels of exchangeable sodium, certain clay minerals, when saturated with sodium, swell markedly. With the swelling and dispersion of a sodic soil, pore spaces become blocked and infiltration rates and permeability are greatly reduced. The critical SAR for the various soils types are as follows:

| | |
|---|---|
| poorly drained grey soils: | 6 – Westleigh, Katspruit |
| slowly draining black swelling clays: | 10 – Mayo, Bonheim, Willowbrook |
| well drained soils and recent sands: | 15 – Mispah, Glenrosa, Clovelly, Hutton, Cartref |

Most of the soils are likely to have electrical conductivity values of less than 60 mS/m which is below the threshold level for no effect on plant growth. However, the Bonheim and Willowbrook Form soils may have elevated electrical conductivity values.

The results indicate that the soils are mostly non-saline with low salinity hazard, and generally low sodicity ratings. The Bonheim and Willowbrook subsoils generally have a moderate to severe sodicity rating.

(iii) Soil Fertility

The levels of calcium and magnesium are generally medium to high. The available phosphorus and potassium are, however, low to very low. It is considered that the arable soils are suitable for cultivation, provided that adequate levels of the required fertilisers are applied. The laboratory test results are included in Appendix G-5.

(iv) Nutrient Storage and Cation Exchange Capacity (CEC)

The potential of a soil to retain and supply nutrients, can be assessed by measuring the cation exchange capacity (CEC). A lack of organic matter and clay minerals, which provide exchange sites that serve as nutrient stores, results in a low ability to retain and supply nutrients for plant growth. Low CEC values are an indication of soils lacking organic matter and clay minerals. Typically a soil rich in humus can have a CEC of 300 meq/100g (>30 meq/%), while a soil low in organic matter and clay may have a CEC of 1-5 meq/100g (<5 meq/%).

The CEC values of the soils in the area are typically moderate.

(v) Soil Erosion Hazard

The erodibility of the soils occurring on the site is given in Table 2-20. The erodibility index was calculated based on visual inspection of the site, as well as the physical properties of the soils, particularly the sodium adsorption ratio (SAR).

**Table 2-20 Soil erosion hazard for soils found within the Gwabalanda Mine area**

| Soil Form | Erosion Hazard |
|---|---|
| Willowbrook, Mayo, Bonheim, Katspruit and Hutton | Moderate to low |
| Cartref, Westleigh, Clovelly, Mispah and Glenrosa | Moderate to high |

#### *2.5.10.2 Soil Physical Characteristics*

(i) Soil Depth

The thickness of the topsoil ranges between 150 mm and 700 mm, averaging in the order of 300 mm to 400 mm. The effective soil depth, or rooting depth (depth to refusal of auger on gravels or rock) is variable. The Mispah soils are seldom deeper than 200 mm; the Westleigh, Cartref, Glenrosa and Mayo soils are up to 0.50 m deep and the Katspruit, Bonheim, Clovelly and Hutton soils are up to 1.5m deep. The deepest soils are those found in the lower and gentlest mid slopes. The shallowest soils are generally concentrated on the crests of hills and steeper slopes where soil depth is generally between 150 mm and 400 mm.

(ii) Available Moisture and Drainage

The available moisture content of the Willowbrook, Mayo, Milkwood, Bonheim, Katspruit, Hutton, Glenrosa and Mispah Form soils is moderate to high whilst that of the remaining soils is low. The intake rate in most of the soils is moderate, but is poor in the Willowbrook, Katspruit and Westleigh Forms.

The drainage in most of the soils is good, but is moderate to poor in the Willowbrook, Bonheim, Katspruit and Westleigh soils.

(iii) Tillage Constraints

Various tillage constraints exist in the different soil types. Cloddy consistency such that soils tend to be slippery when wet and hard and cloddy when dry, is characteristic of the Mayo, Willowbrook and Bonheim Form soils. A crusting and capping hazard is common in the Mispah and Glenrosa Form soils. These soils tend to be soft and slightly plastic when wet and cement when dry. The Glenrosa, Form soils are susceptible to compaction hazard and are thus prone to physical damage such as puddling and smearing by traffic under wet conditions. Sub-surface hindrance occurs in the shallower Mayo, Mispah and Glenrosa Form soils.

### 2.5.11 Land Capability Gwabalanda

#### *2.5.11.1 Dryland Potential*

The shallower Mayo, Westleigh, Cartref, Mispah and Glenrosa Form soils are generally considered to have poor cultivation potential. The Bonheim, Clovelly and Hutton Form soils generally have fair to good cultivation potential, although the Bonheim Form soils have a cloddy consistency. The nutrient status is fair, but supplements of nitrogen and phosphorus would probably be required.

#### *2.5.11.2 Irrigation Potential*

The irrigation potential of the area is generally poor. There are only limited areas with cultivation potential, and these areas comprise Clovelly and Hutton Form soils. In addition, there is insufficient surface water for irrigation purposes. Currently, no boreholes exist in the area for irrigation purposes.

#### *2.5.11.1 Arable Land Capability*

In general, the land with arable potential comprises those areas where soils have a fair to moderate dryland production potential. These are relatively deep soils located on gentle to moderate slopes. The soils should typically be well drained with a low to moderate erosion hazard and few to slight tillage constraints. The only soils in the Gwabalanda Mine area that can be classified as having arable potential are the Clovelly, Hutton, Cartref and Bonheim Form soils. As a result about 57 ha (or 16% of the survey area) is considered to have arable potential.

#### *2.5.11.2 Grazing Land Capability*

Generally, areas of grazing land capability are covered by relatively shallow soils. They occur in bottomland areas and drainage ways that are not permanently wet or on steeper slopes. These soils may be susceptible to erosion, have a low moisture capacity and possible salinity hazards. In the Gwabalanda Mine area the land with grazing potential coincides with the distribution of Glenrosa, Mayo and Westleigh Form soils, covering 32% of the study area.

#### *2.5.11.3 Wilderness Land Capability*

In general, wilderness land comprises very steep, rugged slopes and areas underlain by very shallow soils or rock outcrop. The wilderness land occurs in the areas underlain by Mispah Form soils and represents 27% of the total survey area.

#### *2.5.11.4 Wetland Capability*

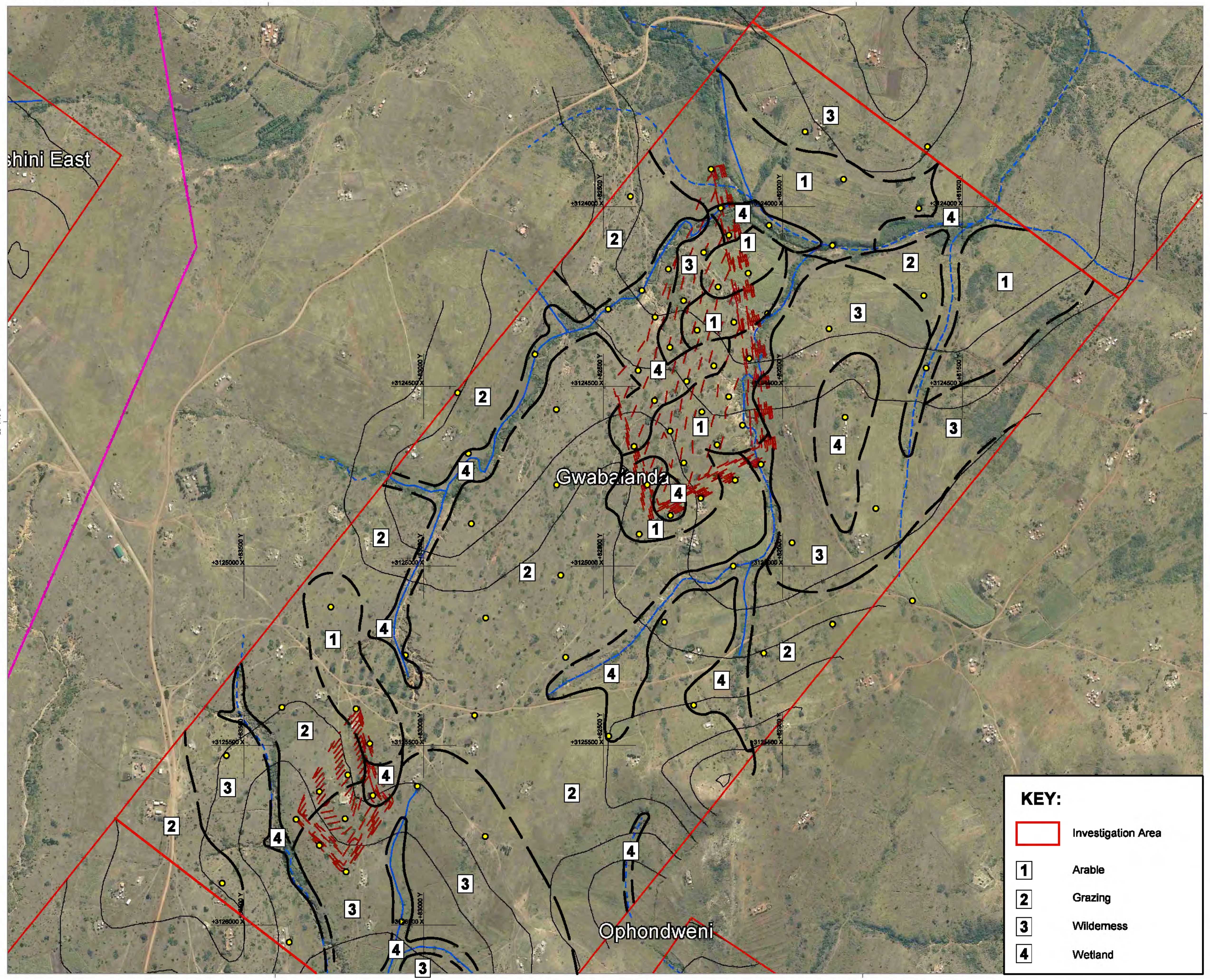
The wetland soils in the Gwabalanda Mine area are those located immediately adjacent to perennial and non-perennial streams and other drainage lines. Areas of wetland capability are generally seasonally or permanently wet and occur where the water table is perched. They generally comprise the Katspruit and Willowbrook Form soils.

There are only small non-perennial streams and drainage lines that traverse the site, with narrow wetland areas associated with them. A separate wetland assessment has been carried out by wetland specialists (refer to section 2.8 of this report).

**Table 2-21 Coverage per land capability class within survey area**

| Land Capability Class | Area (ha) | Percentage Cover |
|---|---|---|
| Arable | 57 ha | 16 % |
| Grazing | 147 ha | 42 % |
| Wilderness | 95 ha | 27 % |
| Wetland | 52 ha | 15 % |
| Total | 351 ha | 100 % |

# SOMKHELE NORTHERN EXPANSION




## Legend

- Line_HAUL_ROADS
- Pits
- Contours 10m

**Rivers**

**Rivers & Streams**

- NON-PERENNIAL
- PERENNIAL

| | |
|---|---|
| Data Sources: | THE CHIEF DIRECTORATE OF SURVEY & MAPPING<br>1:50 000 TOPOGRAPHICAL SERIES & CLIENT |
| Disclaimer: | |
| FIGURE NO.: | 01 |
| MAP NUMBER: | 13-027-11-04-2013-01 |
| DRAWN BY: | G. JONES<br>GIS TECHNOLOGIST |
| REVIEWED BY: | C.WRIGHT<br>ENVIRONMENTAL CONSULTANT |
| DATUM:<br>PROJECTION: | WGS84<br>GEOGRAPHIC |
| DATE: | 18 APRIL 2012 |
| CLIENT: | SOMKHELE |
| PROJECT: | ' |
| SCALE: | 1:10 000 |

0 75 150 300 450 Meters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4a Old Main Road
Judges Walk
Kloof, 3610
South Africa
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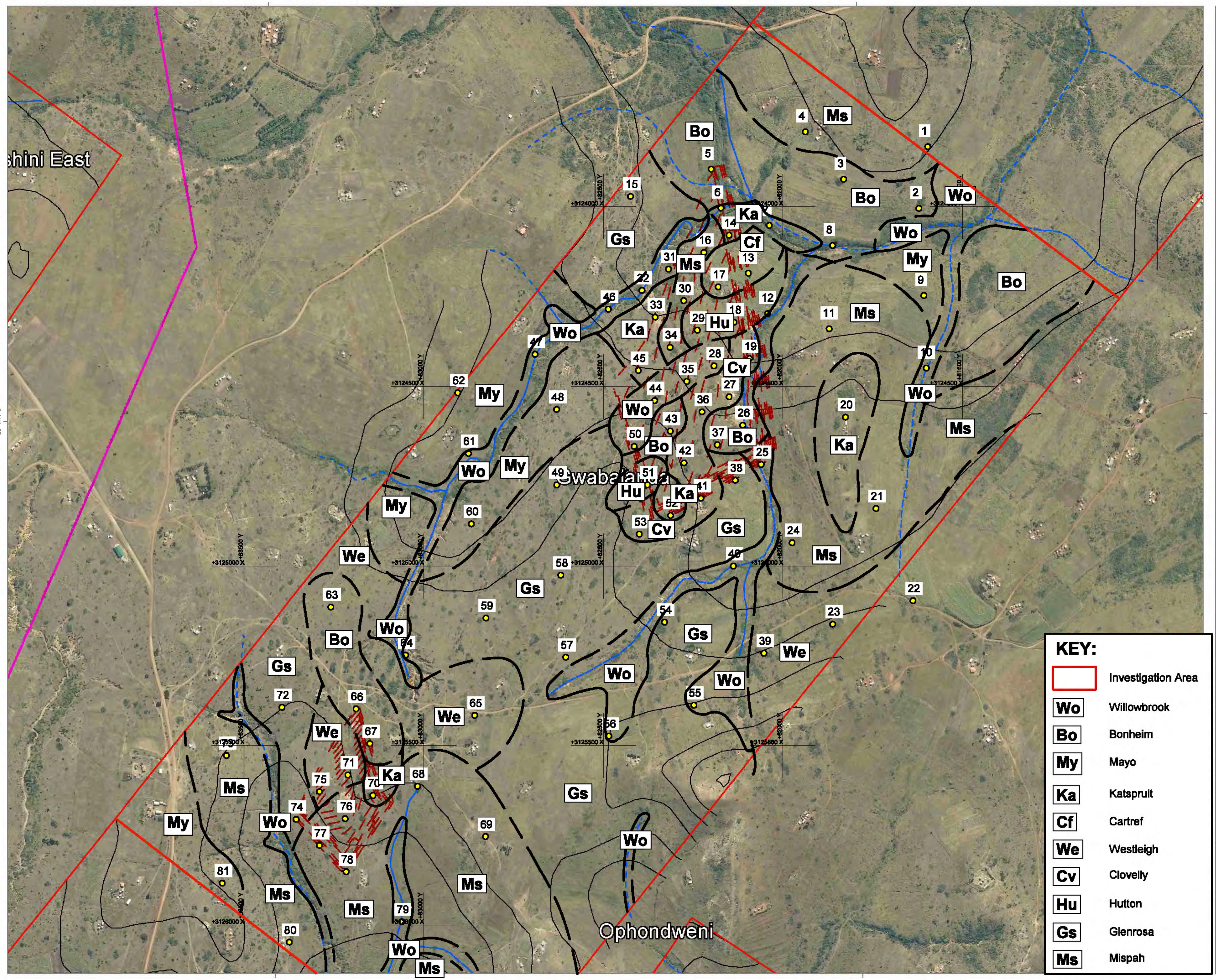
# SOMKHELE NORTHERN EXPANSION




## Legend

- Line_HAUL_ROADS
- Pits
- Contours 10m

**Rivers**

**Rivers & Streams**

- NON-PERENNIAL
- PERENNIAL

| | |
|---|---|
| Data Sources: | THE CHIEF DIRECTORATE OF SURVEY & MAPPING 1:50 000 TOPOGRAPHICAL SERIES & CLIENT |
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4a Old Main Road
Judges Walk
Kloof, 3610
South Africa
T• +27(31) 764-7130
F• +27(31) 764-7140

### 2.5.12 Soil Forms, Distribution and Diagnostic Characteristics Mvutshini East

Three terrain units can be identified within the area, namely crests, hill slopes and bottomland zones. The soils occurring on crests of hills are Milkwood / Mispah Form and Mayo / Glenrosa Form together with the Westleigh and Dresden Forms. These soils also occur most commonly on the hill slopes, together with Clovelly and Hutton Form soils. The soils that were identified in the bottomland zones are predominantly of the Willowbrook and Katspruit Forms.

The distribution of the soils is indicated on Figure 2-15. The corresponding Soil Families and diagnostic horizons are summarised in Table 2-22 whilst the estimated area and percentage covered by the various soils is given in Table 2-23.

The Glenrosa / Mayo Form soils are dominant over the project area (34%), followed by the Mispah / Milkwood Form soils (17%) and Westleigh (15%) and Hutton (14%) Form soils. There are isolated occurrences of Dresden, Clovelly, Willowbrook and Katspruit Form soils.

The soils of the area generally comprise an Orthic or Melanic topsoil overlying a Lithocutanic or Hard Rock B horizon.

The Glenrosa and Mayo Form soils generally have a hard B horizon, and the soils are all generally non-calcareous except for the Milkwood, Mayo and Willowbrook Form soils. The Clovelly and Hutton Form soils are luvic and mesotrophic and the Westleigh Form soils are also luvic. The Glenrosa Form soils have a hard B-horizon that does not show signs of wetness and the Mispah and Glenrosa Form soils do not have bleached A horizons.

**Table 2-22 Soil forms and families found within the Mvutshini East Mine area**

| Soil Form | Soil Family | Code | Diagnostic Horizons |
|---|---|---|---|
| Mispah | Myhill | Ms – 1100 | Orthic A<br>Hard rock |
| Milkwood | Mpetu | Mw – 2000 | Melanic A<br>Hard rock |
| Mayo | Boyela | My – 2200 | Melanic A<br>Lithocutanic B |
| Glenrosa | Tsende | Gs – 1211 | Orthic A<br>Lithocutanic B |
| Westleigh | Mareetsane | We - 2000 | Orthic A<br>Soft plinthic B |
| Dresden | Tevreden | Dr - 1000 | Orthic A<br>Hard plinthic B |
| Clovelly | Leiden | Cv – 2200 | Orthic A<br>Yellow brown apedal B |
| Hutton | Suurbekom | Hu - 2200 | Orthic A<br>Red apedal B |

| Soil Form | Soil Family | Code | Diagnostic Horizons |
|---|---|---|---|
| Willowbrook | Kromdal | Wo - 2000 | Melanic A<br>G |
| Katspruit | Lammermoor | Ka - 1000 | Orthic A<br>G |

**Table 2-23 Soil form coverage percentage within the Mvutshini East Mine area**

| Soil Form | Area (ha) | Percentage Cover |
|---|---|---|
| Mispah / Milkwood | 35 | 17 |
| Mayo / Glenrosa | 70 | 34 |
| Westleigh | 30 | 15 |
| Dresden | 6 | 3 |
| Clovelly | 9 | 5 |
| Hutton | 29 | 14 |
| Willowbrook / Katspruit | 24 | 12 |
| Total | 203 | 100 |

##### *2.5.12.1 Soil Chemical Characteristics*

*(i) Soil pH*

The soil pH influences plant growth through the direct effect of the hydrogen ion concentration on nutrient uptake, and, through the mobilization of toxic ions such as aluminium and manganese (which restrict plant growth). In addition, pH indirectly affects plant growth through its effect on the availability of major trace nutrients. A pH range of between 6 and 7 most readily promotes the availability of plant nutrients. pH values below 3 or above 9, will seriously affect the nutrient uptake by a plant.

Soil pH ranges from 2.81 to 6.23 indicating that the soils generally have an acidic pH. No particular soil form emerged as more or less acidic than the others.

*(ii) Soil Salinity/Sodicity*

Highly saline soils will result in the reduction of plant growth caused by the diversion of plant energy from normal physiological processes to that involved in the acquisition of water under highly stressed conditions. The following guideline are given regarding electrical conductivity (EC) values and salinity effects in soils:

60 mS/m: No effect on plant growth

60 –120 mS/m: Salt sensitive plants are affected

> 120 mS/m: Growth of all plants severely affected

In addition, soil salinity may directly influence the effects of particular ions on soil properties. The sodium adsorption ratio (SAR) is an indication of the effect of sodium on soils. At high levels of exchangeable sodium, certain clay minerals, when saturated with sodium, swell markedly. With the swelling and dispersion of a sodic soil, pore spaces become blocked and infiltration rates and permeability are greatly reduced. The critical SAR for the various soils types are as follows:

| | |
|---|---|
| poorly drained grey soils: | 6 – Westleigh, Dresden, Katspruit |
| slowly draining black swelling clays: | 10 – Milkwood, Mayo, Willowbrook |
| well drained soils and recent sands: | 15 – Mispah, Glenrosa, Clovelly, Hutton |

Most of the soils sampled are likely to have electrical conductivity values of less than 60 mS/m which is below the threshold level for no effect on plant growth. However, some soils may show elevated electrical conductivity values. The soils likely to have higher conductivity values are the Willowbrook Form soils.

The results indicate that the soils are mostly non-saline with low salinity hazard and generally low sodicity ratings. The soils likely to have a medium to high salinity hazard, and moderate to severe sodicity rating are the Mayo, Milkwood, and particularly the Willowbrook Form soils.

*(iii) Soil Fertility*

The levels of calcium and magnesium are generally high. The available phosphorus and potassium are, however, low to very low. It is considered that the arable soils are suitable for cultivation, provided that adequate levels of the required fertilisers are applied. The laboratory test results are included in Appendix G-5.

*(iv) Nutrient Storage and Cation Exchange Capacity (CEC)*

The potential of a soil to retain and supply nutrients, can be assessed by measuring the cation exchange capacity (CEC). A lack of organic matter and clay minerals, which provide exchange sites that serve as nutrient stores, results in a low ability to retain and supply nutrients for plant growth. Low CEC values are an indication of soils lacking organic matter and clay minerals. Typically a soil rich in humus can have a CEC of 300 meq/100g (>30 meq/%), while a soil low in organic matter and clay may have a CEC of 1-5 meq/100g (<5 meq/%).

The CEC values of the soils in the area typically moderate.

*(v) Soil Erosion Hazard*

The erodibility of the soils occurring on the site is given in Table 2-24. The erodibility index was calculated based on visual inspection of the site, as well as the physical properties of the soils, particularly the sodium adsorption ratio (SAR).

**Table 2-24 Soil erosion hazard for soils found within the Mvutshini East Mine area**

| Soil Form | Erosion Hazard |
|---|---|
| Mayo, Willowbrook, Milkwood, Katspruit and Hutton | Moderate to low |
| Clovelly, Westleigh, Dresden, Mispah and Glenrosa | Moderate to high |

#### *2.5.12.2 Soil Physical Characteristics*

*(i) Soil Depth*

The thickness of the topsoil ranges between 100 mm and 800 mm, averaging in the order of 300 mm to 600 mm. The effective soil depth, or rooting depth (depth to refusal of auger on gravels or rock) is variable. The Dresden, Mispah and Milkwood soils are seldom deeper than 200 mm; the Westleigh, Glenrosa and Mayo soils are up to 0.50 m deep and the Willowbrook, Katspruit, Clovelly and Hutton soils are up to 1.5m deep. The deepest soils are those found in the lower and gentlest mid slopes. The shallowest soils are generally concentrated on the crests of hills and steeper slopes where soil depth is generally between 150 mm and 400 mm.

*(ii) Available Moisture and Drainage*

The available moisture content of the Mayo, Milkwood, Willowbrook, Hutton and Katspruit Form soils is moderate to high whilst that of the remaining soils is low. The intake rate in most of the soils is moderate to poor, but is good in the Clovelly, Hutton, Glenrosa and Mispah Forms.

The drainage in most of the soils is moderate to good, but is poor to very poor in the Willowbrook, Katspruit, Westleigh and Dresden Form soils.

*(iii) Tillage Constraints*

Various tillage constraints exist in the different soil types. Cloddy consistency such that soils tend to be slippery when wet and hard and cloddy when dry, is characteristic of the Mayo, Milkwood and Willowbrook Form soils. A crusting and capping hazard is common in the Mispah and Glenrosa Form soils. These soils tend to be soft and slightly plastic when wet and cement when dry. The Glenrosa, Form soils are susceptible to compaction hazard and are thus prone to physical damage such as puddling and smearing by traffic under wet conditions. Sub-surface hindrance occurs in the shallower Milkwood, Mayo, Mispah and Glenrosa Form soils.

## 2.5.13 Land Capability Mvutshini

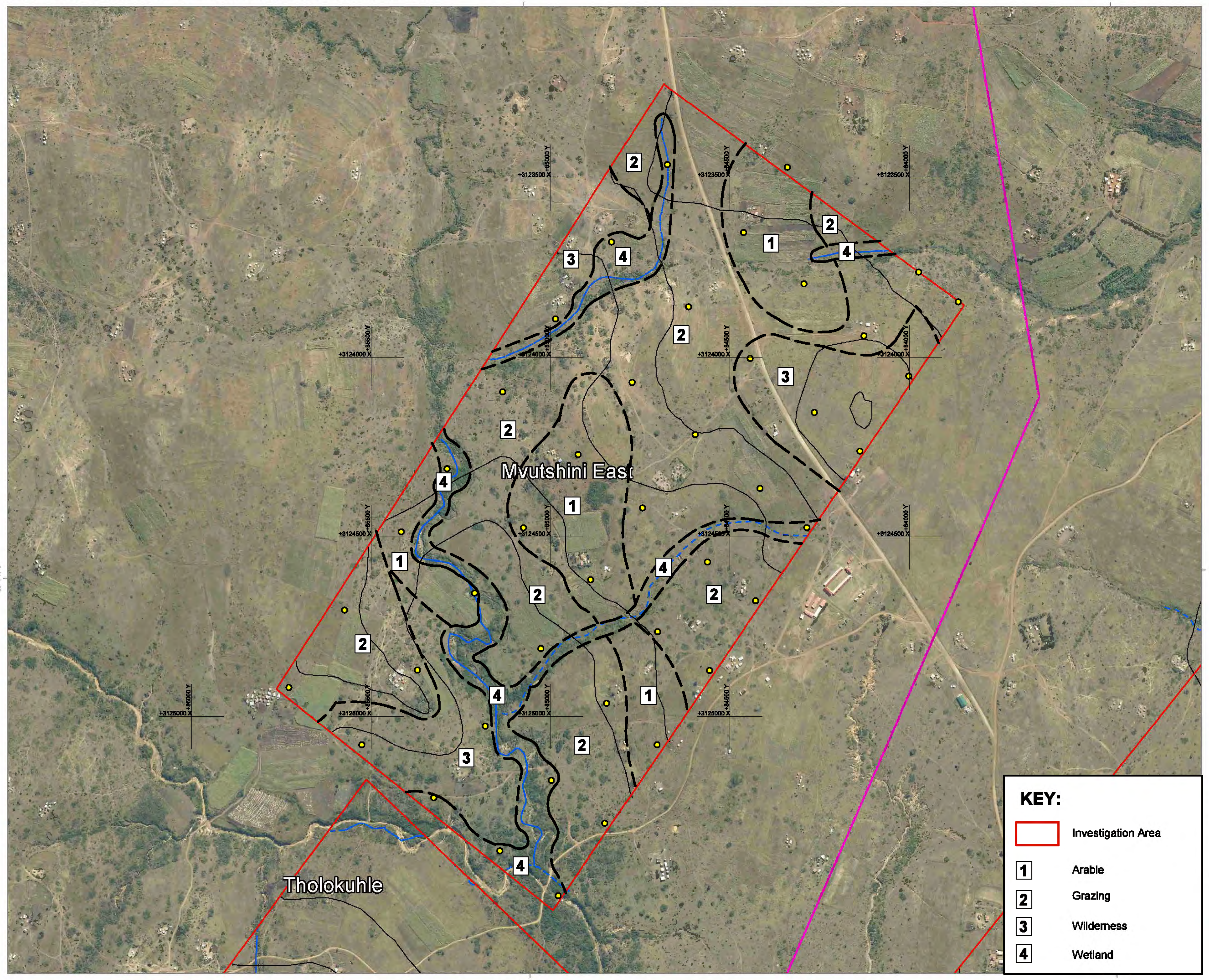
### *2.5.13.1 Dryland Potential*

The shallower Milkwood, Mayo, Dresden, Westleigh, Mispah and Glenrosa Form soils are generally considered to have poor cultivation potential. The Clovelly and Hutton Form soils generally have fair to good cultivation potential. The nutrient status is fair, but supplements of nitrogen and phosphorus would probably be required.

### *2.5.13.2 Irrigation Potential*

The irrigation potential of the area is generally poor. There are only limited areas with cultivation potential, and these areas comprise Clovelly and Hutton Form soils. In addition, there is insufficient surface water for irrigation purposes. Currently, no boreholes exist in the area for irrigation purposes.

# SOMKHELE NORTHERN EXPANSION




## Legend

- Line_HAUL_ROADS
- Pits
- Contours 10m

**Rivers**

**Rivers & Streams**

- NON-PERENNIAL
- PERENNIAL

| | |
|---|---|
| Data Sources: | THE CHIEF DIRECTORATE OF SURVEY & MAPPING 1:50 000 TOPOGRAPHICAL SERIES & CLIENT |
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| FIGURE NO.: | 01 |
| MAP NUMBER: | 13-027-11-04-2013-01 |
| DRAWN BY: | G.JONES GIS TECHNOLOGIST |
| REVIEWED BY: | C.WRIGHT ENVIRONMENTAL CONSULTANT |
| DATUM: PROJECTION: | WGS84 GEOGRAPHIC |
| DATE: | 18 APRIL 2012 |
| CLIENT: | SOMKHELE |
| PROJECT: | ' |
| SCALE: | 1:10 000 |

0 75 150 300 450 Meters


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Judges Walk
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South Africa
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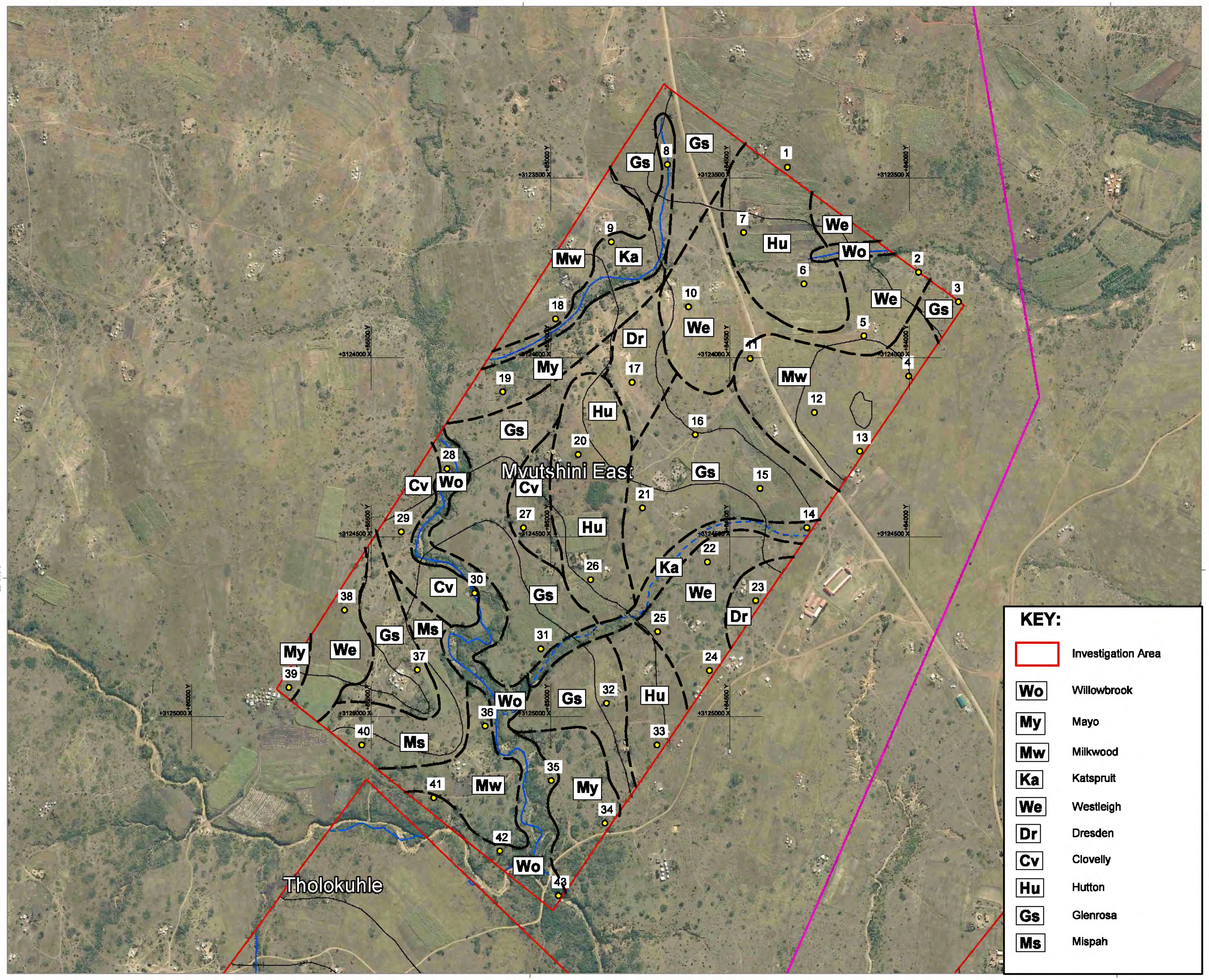
# SOMKHELE NORTHERN EXPANSION




**Legend**

- Line_HAUL_ROADS
- Pits
- Contours 10m

**Rivers**

**Rivers & Streams**

- NON-PERENNIAL
- PERENNIAL

| | |
|---|---|
| Data Sources: | THE CHIEF DIRECTORATE OF SURVEY & MAPPING 1:50 000 TOPOGRAPHICAL SERIES & CLIENT |
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4a Old Main Road
Judges Walk
Kloof, 3610
South Africa
T• +27(31) 764-7130
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### 2.5.14 Soil Forms, Distribution and Diagnostic Characteristics Ophondweni

Three terrain units can be identified within the area, namely crests, hill slopes and bottomland zones. The soils occurring on crests of hills are Milkwood / Mispah Form and Mayo / Glenrosa Form together with the Westleigh and Dresden Forms. These soils also occur most commonly on the hill slopes, together with Clovelly Form soils. The soils that were identified in the bottomland zones are predominantly of the Willowbrook, Katspruit and Dundee Form.

The distribution of the soils is indicated on Figure 2-17. The corresponding Soil Families and diagnostic horizons are summarised in Table 2-25, whilst the estimated area and percentage covered by the various soils is given in Table 2-26

The Mispah / Milkwood Form soils are dominant over the project area (58%), followed by the Glenrosa / Mayo Form soils (28%). There are isolated occurrences of Hutton and Katspruit Form soils.

The soils of the area generally comprise an Orthic or to a lesser degree, Melanic topsoil overlying a Lithocutanic or Hard Rock B horizon.

The soils are all generally non-calcareous except for the Katspruit Form soils. The Hutton Form soils are luvic and mesotrophic. The Glenrosa Form soils have a hard B-horizon that does not show signs of wetness and the Mispah and Glenrosa Form soils do not have bleached A horizons.

**Table 2-25 Soil forms and families found within the Ophondweni Mine area**

| Soil Form | Soil Family | Code | Diagnostic Horizons |
|---|---|---|---|
| Mispah | Myhill | Ms – 1100 | Orthic A<br>Hard rock |
| Milkwood | Effingham | Mw – 1000 | Melanic A<br>Hard rock |
| Mayo | Grassmere | My – 2100 | Melanic A<br>Lithocutanic B |
| Glenrosa | Tsende | Gs – 1211 | Orthic A<br>Lithocutanic B |
| Hutton | Suurbekom | Hu - 2200 | Orthic A<br>Red apedal B |
| Katspruit | Slangspruit | Ka - 2000 | Orthic A<br>G |

**Table 2-26 Soil form coverage percentage within the Ophondweni Mine area**

| Soil Form | Area (ha) | Percentage Cover |
|---|---|---|
| Mispah / Milkwood | 87 | 58 |
| Mayo / Glenrosa | 42 | 28 |
| Hutton | 10 | 7 |
| Katspruit | 10 | 7 |
| Total | 149 | 100 |

#### *2.5.14.1 Soil Chemical Characteristics*

(i) Soil pH

The soil pH influences plant growth through the direct effect of the hydrogen ion concentration on nutrient uptake, and, through the mobilization of toxic ions such as aluminium and manganese (which restrict plant growth). In addition, pH indirectly affects plant growth through its effect on the availability of major trace nutrients. A pH range of between 6 and 7 most readily promotes the availability of plant nutrients. pH values below 3 or above 9, will seriously affect the nutrient uptake by a plant.

Soil pH ranges from 4.00 to 6.92 indicating that the soils generally have an acidic pH. No particular soil form emerged as more or less acidic than the others.

(ii) Soil Salinity/Sodicity

Highly saline soils will result in the reduction of plant growth caused by the diversion of plant energy from normal physiological processes to that involved in the acquisition of water under highly stressed conditions. The following guidelines are given regarding electrical conductivity (EC) values and salinity effects in soils:

| | |
|---|---|
| 60 mS/m: | No effect on plant growth |
| 60 –120 mS/m: | Salt sensitive plants are affected |
| > 120 mS/m: | Growth of all plants severely affected |

In addition, soil salinity may directly influence the effects of particular ions on soil properties. The sodium adsorption ratio (SAR) is an indication of the effect of sodium on soils. At high levels of exchangeable sodium, certain clay minerals, when saturated with sodium, swell markedly. With the swelling and dispersion of a sodic soil, pore spaces become blocked and infiltration rates and permeability are greatly reduced. The critical SAR for the various soils types are as follows:

| | |
|---|---|
| poorly drained grey soils: | 6 - Katspruit |
| slowly draining black swelling clays: | 10 – Milkwood, Mayo |
| well drained soils and recent sands: | 15 – Mispah, Glenrosa, Hutton |

Most of the soils are likely to have electrical conductivity values of less than 60 mS/m which is below the threshold level for no effect on plant growth.

The results indicate that the soils are non-saline with low salinity hazard, and have generally low sodicity ratings.

(iii) Soil Fertility

The levels of calcium and magnesium are generally high. The available phosphorus and potassium are, however, low to very low. It is considered that the arable soils are suitable for cultivation, provided that adequate levels of the required fertilisers are applied. The laboratory test results are included in Appendix G-5.

(iv) Nutrient Storage and Cation Exchange Capacity (CEC)

The potential of a soil to retain and supply nutrients, can be assessed by measuring the cation exchange capacity (CEC). A lack of organic matter and clay minerals which provide exchange sites that serve as nutrient stores, results in a low ability to retain and supply nutrients for plant growth. Low CEC values are an indication of soils lacking organic matter and clay minerals. Typically a soil rich in humus can have a CEC of 300 meq/100g (>30 meq/%), while a soil low in organic matter and clay may have a CEC of 1-5 meq/100g (<5 meq/%).

The CEC values of the soils in the area are typically moderate.

(v) Soil Erosion Hazard

The erodibility of the soils occurring on the site is given in Table 2-27. The erodibility index was calculated based on visual inspection of the site, as well as the physical properties of the soils, particularly the sodium adsorption ratio (SAR).

**Table 2-27 Soil erosion hazard for soils found within the Ophondweni Mine area**

| Soil Form | Erosion Hazard |
|---|---|
| Mayo, Milkwood, Glenrosa, Hutton and Katspruit | Moderate to low |
| Mispah | Moderate to high |

#### *2.5.14.2 Soil Physical Characteristics*

*(i) Soil Depth*

The thickness of the topsoil ranges between 100 mm and 600 mm, averaging in the order of 100 mm to 300 mm. The effective soil depth, or rooting depth (depth to refusal of auger on gravels or rock) is variable. The Mispah and Milkwood soils are seldom deeper than 200 mm; the Glenrosa and Mayo soils are up to 0.50 m deep and the Katspruit and Hutton soils are up to 1.5 m deep. The deepest soils are those found in the lower and gentlest mid slopes. The shallowest soils are generally concentrated on the crests of hills and steeper slopes where soil depth is generally between 150 mm and 400 mm.

*(ii) Available Moisture and Drainage*

The available moisture content of the Mayo, Milkwood, Katspruit and Hutton Form soils is moderate to high whilst that of the Glenrosa and Mispah Form soils is low. The intake rate in the Hutton, Mispah and Glenrosa Form soils is moderate to good, but is poor in the Mayo, Milkwood and Katspruit Forms.

The drainage in most of the soils is moderate to good but is very poor in the Katspruit Form soils.

*(iii) Tillage Constraints*

Various tillage constraints exist in the different soil types. Cloddy consistency such that soils tend to be slippery when wet and hard and cloddy when dry, is characteristic of the Mayo and Milkwood Form soils. A crusting and capping hazard is common in the Mispah and Glenrosa Form soils. These soils tend to be soft and slightly plastic when wet and cement when dry. The Glenrosa, Form soils are susceptible to compaction hazard and are thus prone to physical damage such as puddling and smearing by traffic under wet conditions. Sub-surface hindrance occurs in the shallower Milkwood, Mayo, Mispah and Glenrosa Form soils.

### 2.5.15 Land Capability Opondweni

#### *2.5.15.1 Dryland Potential*

The shallower Milkwood, Mayo, Mispah and Glenrosa Form soils are generally considered to have poor cultivation potential. The Hutton Form soils generally have fair to good cultivation potential. The nutrient status is fair, but supplements of nitrogen and phosphorus would probably be required.

#### *2.5.15.2 Irrigation Potential*

The irrigation potential of the area is generally poor. There are only limited areas with cultivation potential, and these areas comprise Hutton Form soils. In addition, there is insufficient surface water for irrigation purposes. Currently, no boreholes exist in the area for irrigation purposes.

#### *2.5.15.1 Arable Land Capability*

In general, the land with arable potential comprises those areas where soils have a fair to moderate dryland production potential. These are relatively deep soils located on gentle to moderate slopes. The soils should typically be well drained with a low to moderate erosion hazard and few to slight tillage constraints. The only soils in the Ophondweni Mine area that can be classified as having arable potential are the Hutton Form soils. As a result about 10 ha (or 7% of the survey area) is considered to have arable potential.

#### *2.5.15.2 Grazing Land Capability*

Generally, areas of grazing land capability are covered by relatively shallow soils. They occur in bottomland areas and drainage ways that are not permanently wet or on steeper slopes. These soils may be susceptible to erosion, have a low moisture capacity and possible salinity hazards. In the Ophondweni Mine area the land with grazing potential coincides with the distribution of Glenrosa and Mayo Form soils, covering 28% of the study area.

#### *2.5.15.3 Wilderness Land Capability*

In general, wilderness land comprises very steep, rugged slopes and areas underlain by very shallow soils or rock outcrop. The wilderness land occurs in the areas underlain by Milkwood and Mispah Form soils and represents 58% of the total survey area.

#### *2.5.15.4 Wetland Capability*

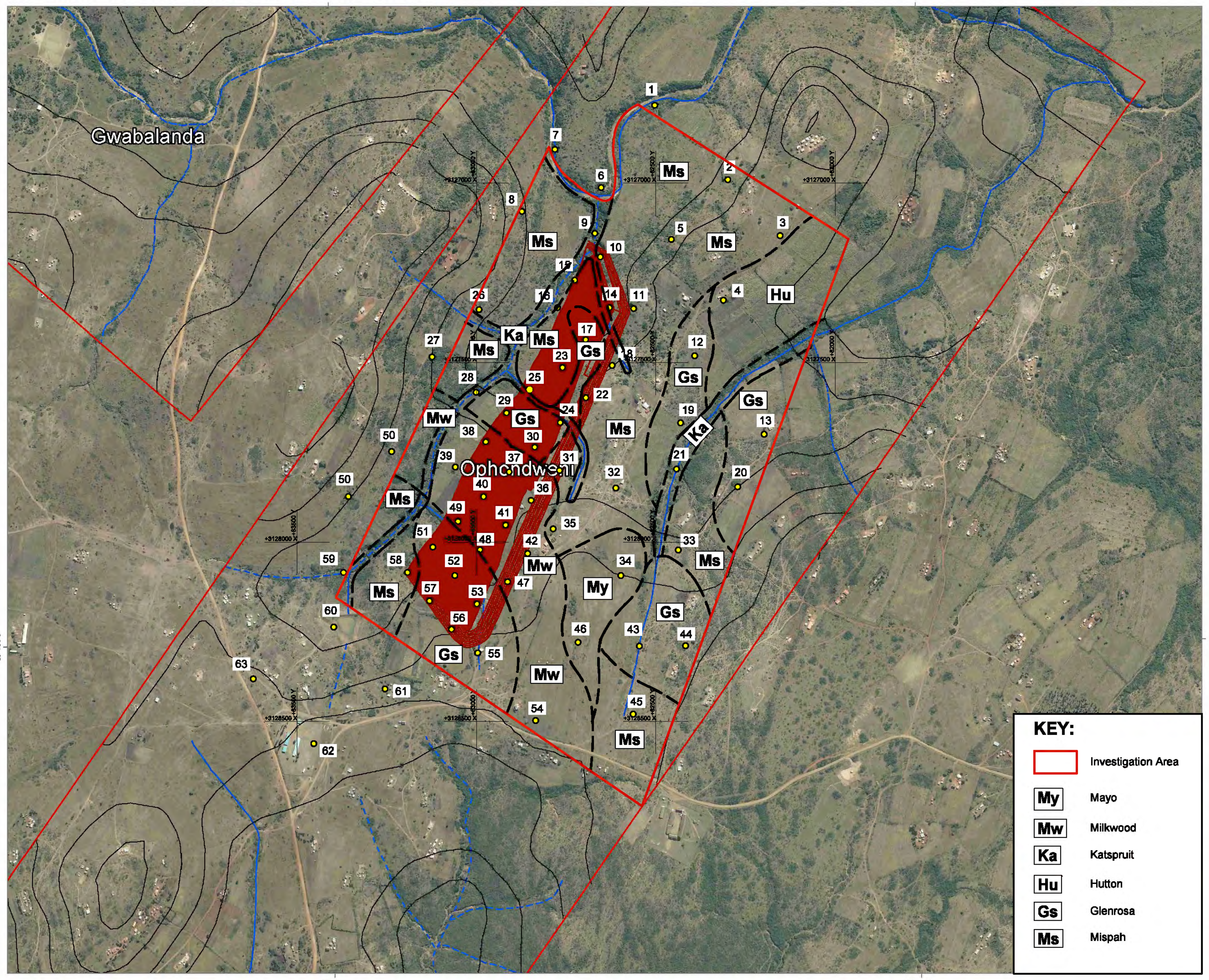
The wetland soils in the Ophondweni Mine area are those located immediately adjacent to perennial and non-perennial streams and other drainage lines. Areas of wetland capability are generally seasonally or permanently wet and occur where the water table is perched. They generally comprise the Katspruit Form soils.

There are only small non-perennial streams and drainage lines that traverse the site, with narrow wetland areas associated with them. A separate wetland assessment has been carried out by wetland specialists.

**Table 2-28 Coverage per land capability class within survey area**

| Land Capability Class | Area (ha) | Percentage Cover |
|---|---|---|
| Arable | 10 ha | 7 % |
| Grazing | 42 ha | 28 % |
| Wilderness | 87 ha | 58 % |
| Wetland | 10 ha | 7 % |
| Total | 149 ha | 100 % |

# SOMKHELE NORTHERN EXPANSION




## Legend

Line_HAUL_ROADS

Pits

Contours 10m

## Rivers

### Rivers & Streams

NON-PERENNIAL

PERENNIAL

| | |
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| Data Sources: | THE CHIEF DIRECTORATE OF SURVEY & MAPPING 1:50 000 TOPOGRAPHICAL SERIES & CLIENT |
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| FIGURE NO.: | 01 |
| MAP NUMBER: | 13-027-11-04-2013-01 |
| DRAWN BY: | G. JONES GIS TECHNOLOGIST |
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GCS Water & Environmental Consultants
4a Old Main Road
Judges Walk
Kloof, 3610
South Africa
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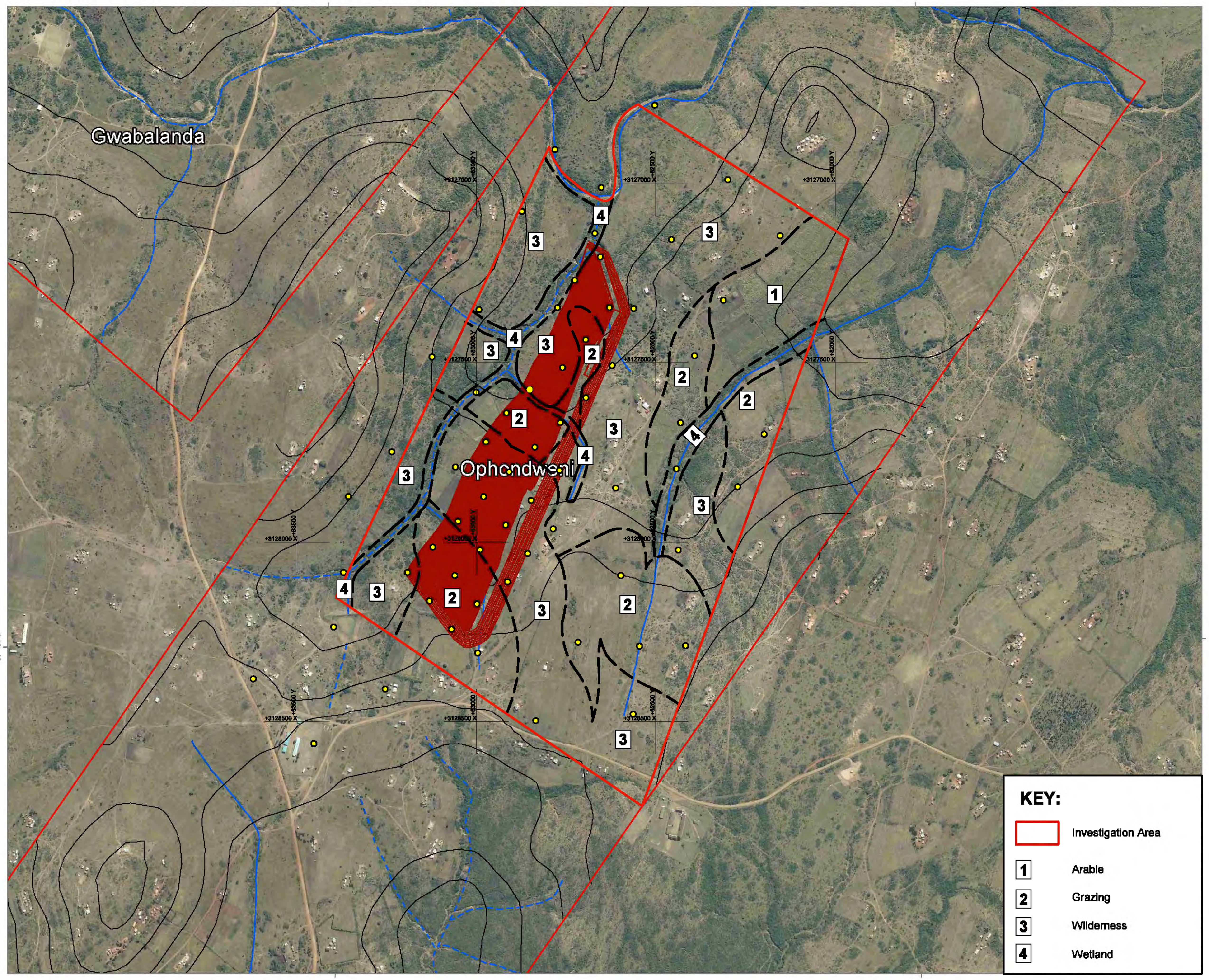


**Legend**

Line_HAUL_ROADS

Pits

Contours 10m

**Rivers**

**Rivers & Streams**

NON-PERENNIAL

PERENNIAL

| | |
|---|---|
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## 2.6 Flora and Fauna

### 2.6.1 Mucina & Rutherford Vegetation Units (2006)

According to Mucina and Rutherford (2006), the vegetation type naturally occurring within the project sites are classified as Northern Zululand Sourveld and Zululand Lowveld, both vegetation types of the Savannah biome. The vegetation type occurring within each mining block is shown in Table 2-29.

The northern Zululand Sourveld comprises wooded grassland interspersed with areas of pure sour grassland and dense bushveld thickets. This vegetation type occurs in the KwaZulu-Natal (KZN) Province and Zululand. The conservation status of the vegetation unit is classified as vulnerable and only 4% is statutorily conserved, mainly within the Hluhluwe-Mfolozi Game Reserve and the Ithala Game Reserve. Some 22% is already transformed, mainly by cultivation and plantations.

The Zululand Lowveld comprises a complex of various bushveld units ranging from dense thickets of *Dichrostachys cinerea* and Acacia species, through park-like savannah dominated by *A. tortilis,* to tree-dominated woodland with broad-leaved open bushveld with *Sclerocarya birrea* subsp. *caffra* and *A. nigrescens*. Tall grassveld types with sparsely scattered solitary trees and shrubs form a mosaic with the typical savannah thornveld, bushveld and thicket patches. This vegetation type occurs in the KZN Province, Swaziland and Mpumalanga Province. The conservation status of the vegetation unit is classified as vulnerable and only 11% is statutorily conserved, mainly within the Hluhluwe-Mfolozi Game Reserve and the Pongolapoort Nature Reserve. About 26% is already transformed, mainly by cultivation.

**Table 2-29 Vegetation Types and Conservation Status of Proposed Project Sites**

| New Mine Sites | Mucina & Rutherford Vegetation Units | Muncina & Rutherford Conservation Status |
|---|---|---|
| Esiyembeni | Northern Zululand Sourveld (SVl22) and Zululand Lowveld (SVl23) | Vulnerable |
| Machibini | Northern Zululand Sourveld (SVl22) and Zululand Lowveld (SVl23) | Vulnerable |
| Kwaqubuka North | Zululand Lowveld (SVl23) | Vulnerable |
| Emalahleni (Area 10) | Zululand Lowveld (SVl23) | Vulnerable |
| Mahujini | Zululand Lowveld (SVl23) | Vulnerable |
| Ophondweni | Zululand Lowveld (SVl23) | Vulnerable |
| Tholokuhle | Zululand Lowveld (SVl23) | Vulnerable |
| Gwabalanda | Zululand Lowveld (SVl23) | Vulnerable |
| Mvutshini East | Zululand Lowveld (SVl23) | Vulnerable |
| Mvutshini Central | Zululand Lowveld (SVl23) | Vulnerable |
| Mvutshini West | Zululand Lowveld (SVl23) | Vulnerable |

### 2.6.2 NEMBA Threatened Ecosystems

No listed threatened ecosystems occur within the ten sites.

### 2.6.3 KZN Wildlife C-Plan

In terms of KZN conservation plan (C-Plan), no site has been flagged as being a Biodiversity Priority Area of high conservation importance and low irreplaceability (Table 2-30). None of the sites are included in the C-Plan and as such are not considered as being of high biodiversity conservation importance.

**Table 2-30 Systematic Conservation Details of the Proposed Project Sites**

| New Mine Sites | KZN Wildlife Biodiversity Priority Areas | Threatened Flora | Threatened Fauna |
|---|---|---|---|
| Machibini | Not prioritised | - | - |
| Kwaqubuka North | Not prioritised | - | - |
| Emalahleni (Area 10) | Not prioritised | - | - |
| Mahujini | Not prioritised | - | - |
| Ophondweni | Not prioritised | - | - |
| Tholokuhle | Not prioritised | - | - |
| Gwabalanda | Not prioritised | - | - |
| Mvutshini East | Not prioritised | - | - |
| Mvutshini Central | Not prioritised | - | - |
| Mvutshini West | Not prioritised | - | - |

## 2.7 Wetlands

The information below is an extract from the Specialist wetland study. The full specialist report is presented in **Appendix B.**

### 2.7.1 Ecoregions

When assessing the ecology of any area it is important to know within which ecoregion the area of study is located. This knowledge allows for improved interpretation of data to be made, since reference information and representative species lists are often available at this level of assessment. The study area being assessed falls within the North Eastern Uplands and Lowveld ecoregions (Kleynhans *et al.*, 2005a), which can be characterised by lowlands, plains and hills with a low to moderate relief and with vegetation consisting mostly of grassland, valley thicket and bushveld types. Although several large perennial streams traverse this region (e.g. White and Black Umfolozi Rivers), few perennial streams originate here. Stream frequency is generally low to medium.

### 2.7.2 Topography and drainage

The study area is characterised by topography of relatively low elevation variation and described as low rolling hills and relatively broad valleys, with local elevations ranging from 100 – 250 mamsl. The study area falls mainly within the W32G quaternary catchment, with a small section of the southern mining blocks (Kwaqubuka and Machibini) located in the W23A quaternary catchment. The major rivers of the area include the Hlazane River, Mnyaba River, Mbukwini and Nyalazi River. These are largely seasonal river systems that do not experience flow during the dry season. A large perennial river, the Mfolozi River, is located downstream to the south, beyond the proposed mining areas. A portion of flows from the southern mining blocks drain into this river system via the Mbukwini River and minor tributaries. Other drainage in the region comprises a network of smaller tributary stream channels that are largely ephemeral in nature in that they only experience flow after considerable rainfall events. The mining areas and their relevant river sub-quaternary catchments are indicated in Table 2-31.

**Table 2-31 Summary details of drainage relevant to each of the proposed mining areas.**

| Proposed Mining Areas | Sub-quaternary Catchment |
|---|---|
| Machibini | Nyalazi River and Mbukwini River |
| Kwaqubuka North | Nyalazi River and Mbukwini River |
| Emalahleni (Area 10) | Nyalazi River |
| Mahujini | Nyalazi River |
| Ophondweni | Mnyaba River and Nyalazi River |
| Tholokuhle | Mnyaba River and Nyalazi River |
| Gwabalanda | Mnyaba River and Hlazane River |
| Mvutshini East | Mnyaba River and Hlazane River |
| Mvutshini Central | Hlazane River |
| Mvutshini West | Hlazane River |

### 2.7.3 Conservation Context of Aquatic Resources

#### *2.7.3.1 National Freshwater Ecosystem Priority Areas (NFEPA)*

At a National level, Freshwater Ecosystem Priority Areas (FEPAs) have been identified. FEPAs are strategic spatial priorities for conserving freshwater ecosystems and supporting sustainable use of water resources (Driver et al., 2011). FEPAs are often tributaries and wetlands that support large, hard-working rivers and are an essential part of an equitable and sustainable water resource strategy. These systems need to stay in a good condition in order to contribute to national biodiversity goals, to manage and conserve freshwater ecosystems and to protect water resources for human use; and should therefore be supported by good planning, decision-making and management to ensure that human use does not impact on the condition of the ecosystem. FEPA status applies to the actual river reach within such a sub-quaternary catchment, however, it is nevertheless still critical that the surrounding land and smaller stream network be managed in a way that maintains the good condition of the river reach. Although the FEPAs themselves have no formal legal status, several of the processes they inform do, with the primary means of securing FEPAs and giving effects to FEPA maps being through the classification of water resources in terms of the NWA (Driver et al., 2011).

FEPAs should be regarded as ecologically important and generally sensitive to changes in water quality and quantity, owing to their role in protecting freshwater ecosystems and supporting sustainable use of water resources.

Rivers in the study area and region that are classified by the NFEPA project as being important FEPAs include the Hlazane, Mnyaba, Mbukwini and Nyalazi Rivers (shown in Figure 2-18). The mining areas are all located within an Upstream Management Area, according to the NFEPA coverage (CSIR, 2011). Upstream Management Areas are sub-quaternary catchments in which human activities need to be managed to prevent degradation of downstream FEPAs and Fish Support Areas (Driver et al., 2011). Important FEPA resources located outside of the mining area and downstream of mining blocks, include the Mfolozi River in the south and the St Lucia and Mkhuze Rivers in the north-east. A number of important FEPA wetland ecosystems are situated a considerable distance downstream of the study area, most notably the Mkuze swamp and St Lucia estuary.

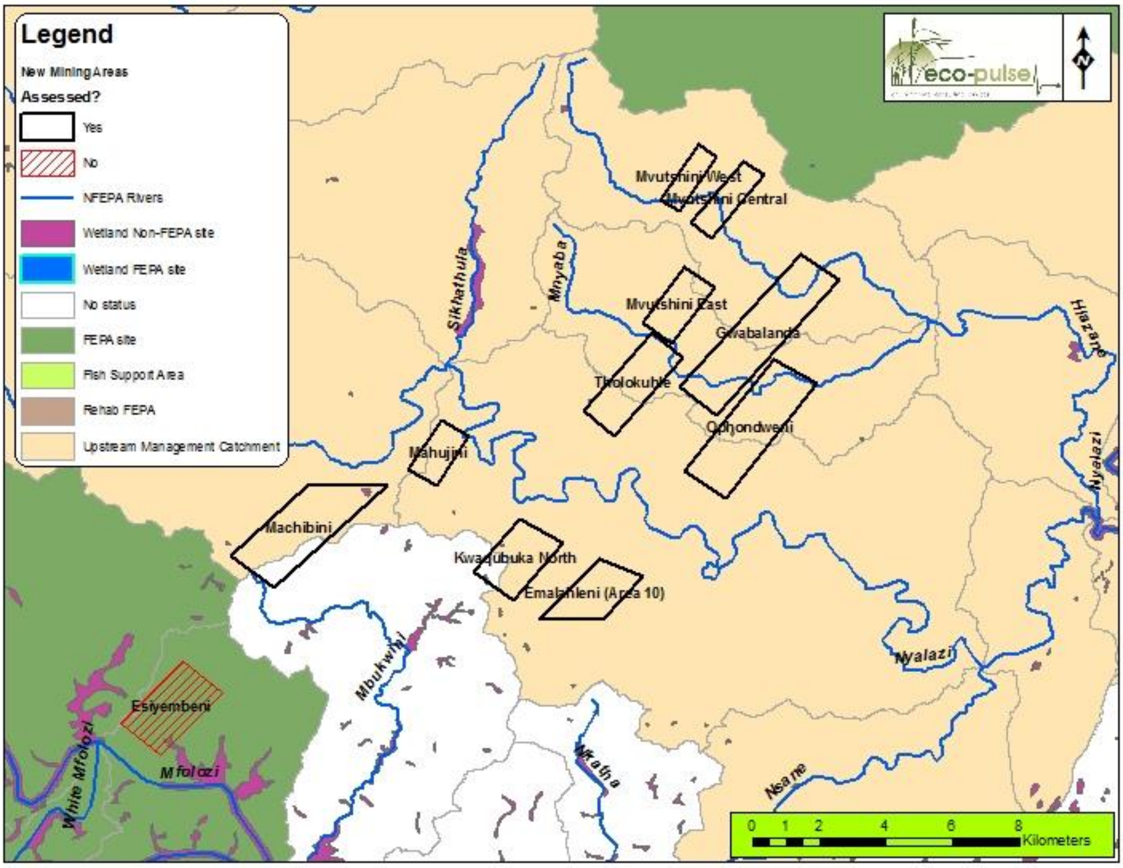



**Figure 2-18: Map showing the location of the proposed mining expansion areas in relation to NFEPAs highlighted in the NFEPA rivers and wetland coverage (CSIR, 2011).**

### 2.7.4 Provincial Aquatic Conservation Priorities

At the Provincial Level, the Freshwater Systematic Conservation Plan for the Province (EKZNW, 2007) identifies conservation priorities for inland aquatic systems. The broader study area is regarded as "Available", suggesting that the area is not regarded as a Provincial Conservation Priority Area in terms of aquatic resource conservation (see Figure 2-19).

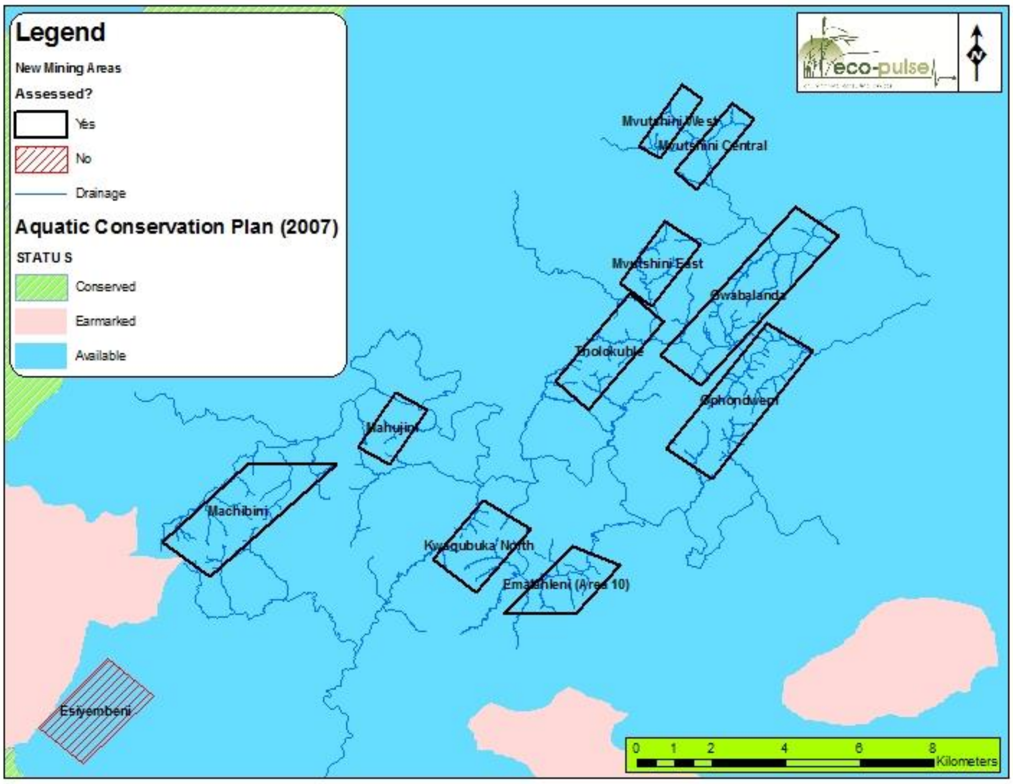



**Figure 2-19: Map showing the location of the proposed mining expansion areas in relation to aquatic conservation priorities highlighted in the KZN Freshwater Systematic Conservation Plan (EKZNW, 2007)**

### 2.7.5 Aquatic Assessment

The results of the desktop and in-field freshwater aquatic assessment undertaken for the proposed Somkhele Mine Expansion project are provided in this section of the report. Note that this assessment report focuses on the assessment of channelled watercourses only (e.g. rivers, streams and drainage lines).

#### *2.7.5.1 Types of freshwater aquatic ecosystems occurring in the project area*

Channelled watercourses occurring in the study area include the Nyalazi River, a major river system of the region, as well as a number of smaller river systems that are tributaries of the Nyalazi, namely the Hlazane and Mnyamba rivers (seasonal systems). These three river systems traverse the northern mining blocks. A fourth river system, the Mbukwini River, is a smaller ephemeral river that drains the southern section of the study area (near the Machibini mining area) and is a tributary of the much larger perennial Mfolozi River located further south outside of the project area. In addition to these primary river systems, a variety of smaller ephemeral streams and drainage lines make up the broader drainage network of the study area. These smaller drainage lines and streams are small in extent, drain small catchment areas, typically only experience flow under heavy rainfall/storm events and are generally limited to less than 1.5 km in length, with most being only a few hundred metres long. The location and extent of the various watercourses, classified according to channel size, are shown in Figure 2-20.

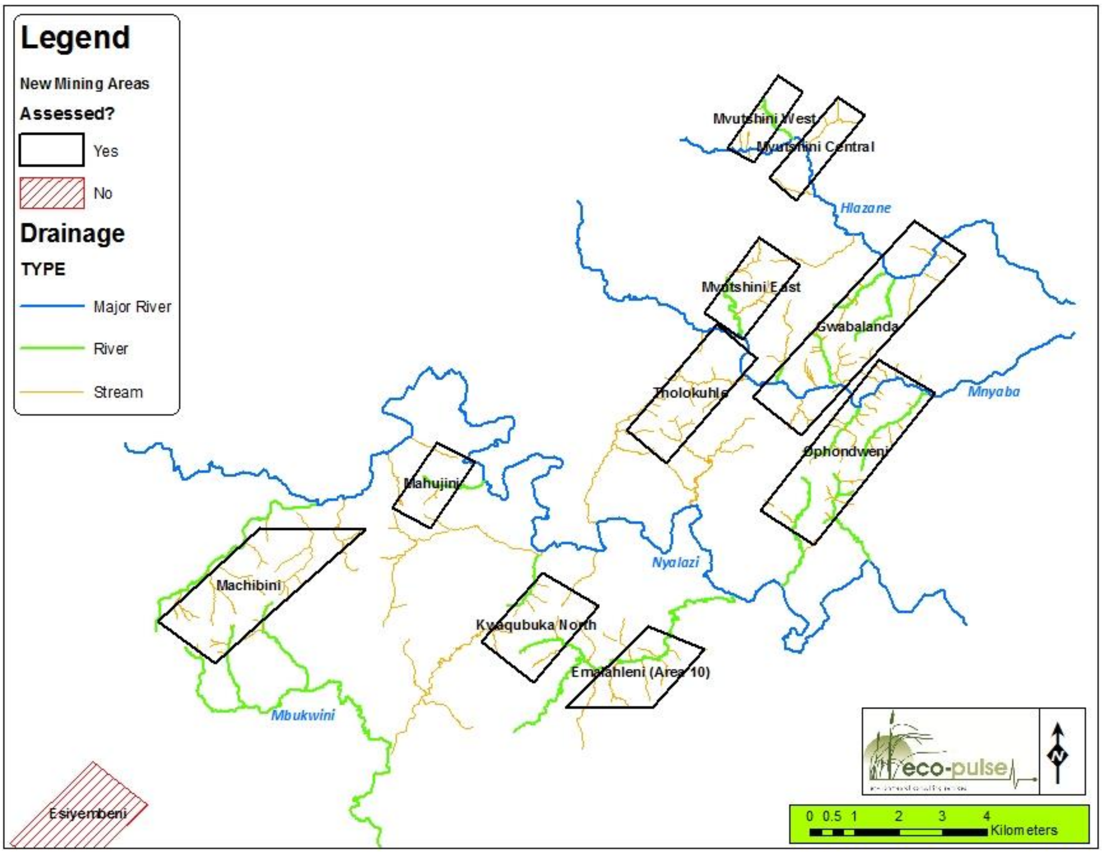



**Figure 2-20: Map showing the different types of channelled systems based on channel size, including major river, rivers and streams.**

### *2.7.5.2 General characteristics of the watercourses assessed*

The river systems all comprise single-thread, sandy bed channels overlying shale-sandstone bedrock, with outcrops of shallow underlying bedrock apparent in many of the systems assessed. Channel width varies from around 2 to 3 m for the smaller stream channels (Photo 2.2) to in excess of 10 m for the larger river systems, such as the Mnyaba River (Photo 2.1).

Rivers are largely confined within steep, sandy vegetated banks that show signs of bank erosion, undercutting and bank collapse in many instances. The smaller ephemeral systems are generally associated with poor bank structure, with many drainage lines having low sandy banks less than 1m in height. Soil erosion and incision is evident in most of the smaller channelled systems, which in many instances can be likened to bare, eroded gullies lacking significant riparian vegetation.

#### 2.7.5.3 In-stream riverine habitat and water quality

At the time of the field assessment, all of the rivers/streams assessed experienced zero flow, revealing dry, exposed sandy river beds comprising medium-coarse grained sandy alluvial deposits amongst small outcrops of shallow sandstone/shale bedrock (Photo 2.1 & Photo 2.2). A few of the larger systems had large outcrops of sandstone and shale bedrock as well as dolerite in a few places.

At the time of the field survey, most of the in-stream habitats were almost completely devoid of vegetation and had been extensively trampled by local livestock. The Hlazane River (assessed at Gwabalanda) and Mnyaba River (assessed at Ophondweni) had some stagnant water remaining within shallow pools along the reach of river assessed (Photo 2.4). *Phragmites australis* (Common reed), *Cyperus textilis* (Mat sedge) and Blue Water Lily (Nymphae) were observed occurring in the few remaining wet areas and would probably be the dominant form of emergent in-stream vegetation during the wet season (Photo 2.3). Most channel banks showed signs of exacerbated erosion and bank undercutting (Photo 2.5) probably linked to adjacent land use and on-site impacts caused by harvesting of species and disturbance by humans and livestock traversing the area via footpaths along the river banks.

Livestock utilize the dry river beds as movement corridors, with signs of excessive trampling of the sandy river beds at all sites visited in the field. The local community has also installed informal wells which have been sunk to considerable depths in order to abstract sub-surface water from the dry river beds (Photo 2.7). Water quality was not analysed due to the absence of any flowing water at the time of the field assessment (sampling within stagnant pools of water would give a skewed result and unrealistic representation of conditions at each site). Visually, signs of faecal contamination were evident where pools of water were found, and floating algal growth was also observed (Photo 2.6).

| | | | |
|---|---|---|---|
|  **Photo 2.1 Dry sandy river bed and riparian zone associated with the Mnyaba River, looking upstream at Ophondweni.** |  **Photo 2.2 Smaller ephemeral tributary stream adjacent to the Hlazane River (looking upstream).** |  **Photo 2.3 In-stream vegetation (*Phgragmites australis* reeds), Hlazane River at Gwabalanda.** | |
|  **Photo 2.4 Stagnant pool in the Mnyaba River channel at Ophondweni.** |  **Photo 2.5 Outer bank eroded (undercutting) looking upstream (tributary river to the main Nyalazi River at Emalahleni).** |  **Photo 2.6 Surface algal growth in a stagant pool, Hlazane River at Gwabalanda.** |  **Photo 2.7 Informal water abstraction well in river bed (Hlazane River at Gwabalanda).** |

#### *2.7.5.4 Characteristics of the riparian zone*

The 'riparian zone' of a watercourse refers to the physical structure and associated vegetation within a zone or area adjacent to and affected by surface and subsurface hydrologic features such as rivers, streams or drainage ways and are commonly associated with alluvial soils. The larger river network comprises a riparian zone that ranges in width from 30 m to more than 100 m in places. The smaller ephemeral drainage network comprises a much narrower zone of riparian vegetation usually only several metres wide but up to 30-50 m wide for some systems. The condition of the riparian zone appears predominantly intact for most systems identified, with some loss of structural integrity in places due to removal of woody species following disturbance and replacement of some species by exotics and invasive species, the most common being *Chromolaena odorata* (Triffid weed) and woody invaders such as *Psidium guajava* (Guava). There are also numerous tracks and dirt roads that traverse the riparian zone of rivers and streams; and trampling by humans and livestock is evident adjacent to the river systems and through the riparian zone along the upper river banks at almost all of the sites assessed.

Riparian vegetation occurring in the riparian zone links the in-stream aquatic ecosystem to the surrounding terrestrial ecosystem, which in turn influences river process and patterns. Riparian or riverine species commonly have a composition and structure that is distinct from those of adjacent terrestrial lands. Two principle types of riparian vegetation occur in the project area, namely *Riverine Thicket/dense bush* which is the dominant type and *Lowveld Riverine Forest* which occurs only in a few patches, essentially restricted to the larger perennial-seasonal rivers within the Mahujini and Mvutshini West mining areas. These two distinct riparian vegetation communities are described in more detail below and are shown mapped in Figure 2-21. For the complete list of riparian vegetation species identified, refer to the Wetland report in **Appendix B**.

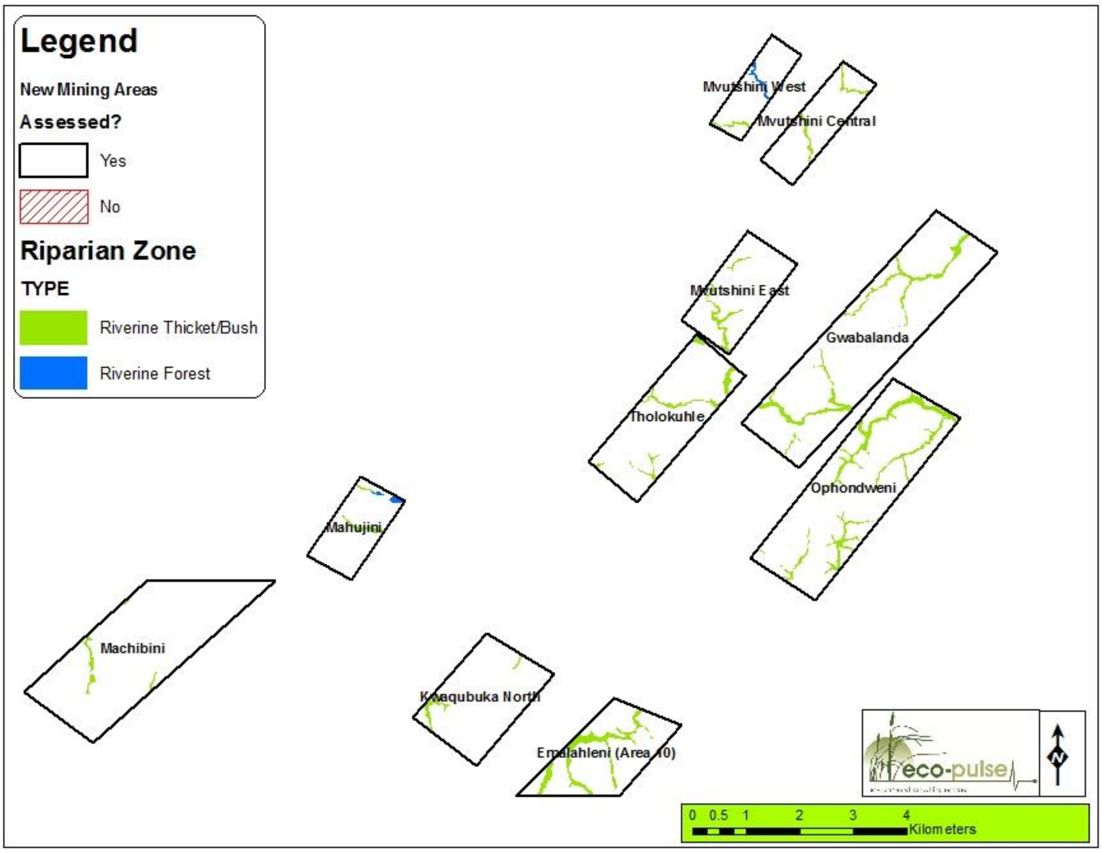



**Figure 2-21: Map showing the extent and types of riparian habitat occurring in the riparian zone of rivers & streams for each mining area**

### 2.7.6 Riverine Thicket/Dense bush community

Overall, vegetative cover is good with very few exposed areas and comprises a mix of woody shrubs and trees common to riverine areas, with a surface layer comprising indigenous grasses, forbs and aloes. Species diversity is quite high, with the dominant species including: *Apodytes dimidiate, Bridelia micrantha, Canthium inerme, Dichrostachys cinerea, Erythrina caffra, Euphorbia tirucalli, Gymnosporia senegalensis, Lippia javanica, Phoenix reclinata, Phragmites australis, Phragmites mauritianus* and *Vigna spp.*

Other indigenous species that are less dominant in the riverine thicket type include: *Acacia gerrardii, Acacia karoo, Acacia nilotica, Acacia schweinfurthii, Acacia tortilis, Acokanthera oppositifolia, Aloe marlothii, Aloe parvibracteata, Argyrolobium tomentosum, Asparagus macowanii, Asplenium sp,* ***Berkheya carlinopsis subsp. magalismontana****, Bersama lucens, Boscia albitrunca, Celtis Africana, Centella spp, Cheilanthes spp, Coddia rudis,* ***Crotalaria capense****, Cussonia spicata,* ***Cyperus textilis****, Dalbergia armata, Dalbergia obovata, Diospyros dichrophylla,* ***Diospyros glandulifera****, Diospyros lycioides, Ehretia obtusifolia, Ehretia rigida, Erythrina lysistemon, Euclea crispa, Euclea divinorum, Euphorbia ingens, Ficus sur, Ficus sycomorus, Hedera spp, Hippobromus pauciflorus, Juncus kraussii, Kraussia* *floribunda, Microsorum scalopendria, Momordica repens, Nymphaea nouchali,* ***Pavetta capensis****, Pavetta lanceolata, Pavetta spp, Pellaea spp, Plectranthus verticillatus, Rhus rehmanniana, Sansevieria hyacinthoides, Schotia brachypetala, Sclerocarya birrea, Searsia dentata (=Rhus dentata), Searsia gueinzii (=Rhus dgueinszii), Searsia rehmanniana, Senna italic, Sideroxylon inerme, Spirostachys Africana, Stenotaphrum secundatum, Strychnos spinosa, Tarchonanthus camphoratus, Themeda triandra, Typha capensis, Vangueria infausta, Vigna vexillata and Ziziphus mucronata. [Note SA endemic species in* ***bold****].*

The level of infestation by invasive alien/exotic species is generally low-moderate (20-30% abundance of exotics) with the principal alien plants being: *Agave sisalana, Chromolaena odorata (dominant), Conyza albida, camara, Opuntia ficus-indica, Psidium guajava (sub-dominant), Ricinus communis, Senna didymobotrya and Senna hirsute.*

### 2.7.7 Riverine Forest

This vegetation community is likened to the Lowveld Riverine Forest vegetation type (EKZNW, 2012) and is restricted to the larger, perennial/seasonal river systems associated largely with the Nyalazi River (sampled at Mahujini mining area). Overall, vegetative cover is generally quite good within the remaining patches; however, the forest canopy has been impacted, with gaps in canopy cover evident in places. Species diversity is relatively high, comprising a range of indigenous forest species common to riverine areas, the dominant ones being *Ficus sycomorus* and *Phoenix reclinata.*

Other indigenous species that are less dominant include: *Acacia robusta, Adenia gummifera* (declining), *Apodytes dimidiate, Argyrolobium tomentosum, Asparagus densiflorus, Asparagus macowanii, Asplenium spp, Centella spp, Ceratotheca triloba, Cheilanthes spp, Dalbergia armata, Diospyros dichrophylla, Ehretia rigida, Euclea crispa, Euclea divinorum, Flagellaria guineensis, Gymnosporia senegalensis, Panicum deustum, Pellaea spp, Phragmites australis, Phragmites mauritianus, Rauvolfia caffra, Sansevieria hyacinthoides, Searsia dentate, Searsia rehmanniana, Spirostachys Africana and Vigna spp.*

The level of invasion by invasive alien/exotic species is generally low-moderate (<30% abundance) with the principle alien plants being: *Achyranthes aspera, Chromolaena odorata (dominant), Conyza albida, Gomphrena celosioides, Lantana camara and Psidium guajava.*

### 2.7.8 Present Ecological State (PES) of watercourses

Present Ecological State (PES) refers to the current state or condition of an environmental resource in terms of its characteristics and reflecting change from its reference condition. The condition or PES of rivers and their associated riparian areas in the project area was assessed largely at a desktop level, with field verification occurring at selected sites. Based on the assessment undertaken, the watercourses in the study area have all been modified to varying degrees by the following local land-uses and impacts:

- Colonisation by invasive alien plants and weeds, with the density of alien species being generally low to moderate (10 – 30%) for most areas, the dominant species being *Chromolaena odorata*, *Psidium guajava* and *Ricinus communis*;
- Erosion/undercutting of steep, sandy river banks as a result of adjacent/upstream land uses and human/animal trampling;
- Trampling of the sandy river bed and banks by humans and cattle/livestock which utilise these corridors;
- Harvesting/removal of woody tree species for firewood/building purposes;
- Slight reduction in the structure and extent of riverine vegetation and loss of longitudinal and lateral connectivity as a result of numerous tracks and dirt roads crossing the channels and traversing across riparian vegetation;
- Limited abstraction of water for domestic purposes (informal wells placed in the channel, even in the dry season when the bed is dry); and
- Impacts on water quality from upstream catchment activities (identified by visually poor water quality, high turbidity and algal growth in pools usually associated with nutrient enrichment of water as a result of faecal contamination amongst other potential sources of nutrients/toxicants).

These impacts have resulted in the modification of river condition from the estimated natural or ‘reference’ state of rivers in the region. The PES was informed largely by the DWA Desktop PES assessment database for rivers (DWA, in prep.) and refined based on field visits to selected sites, where possible. Based on this assessment, the three main rivers of the study area (Mnyaba, Hlazane and Nyalazi rivers) all attain a PES rating of **Moderately Modified (Class C)** as a result of modifications to habitat, connectivity, flows and water quality. This is summarised below in Table 2-32 and shown visually in Figure 2-22

For the smaller drainage network comprising the numerous ephemeral streams/drainage lines, the desktop PES assessment undertaken by Eco-Pulse reported PES results that ranged from Largely Natural systems (B class) to Largely Modified (D class), depending on the perceived level of modification to these systems from adjacent and in-stream activities identified from digital imagery and in field surveys.

**Table 2-32 Summary of desktop river PES ratings, after DWA (2013, in prep).**

| | Mnyaba | Hlazane | Nyalazi |
|---|---|---|---|
| DWA Code | W32G-02980 | W32G-02943 | W32G-03006 |
| Type | | | |
| Length (km) | 15.99 | 17.61 | 38.04 |
| Stream Order | 1 | 1 | 2 |
| PES | C: Moderately modified | C: Moderately modified | C: Moderately modified |
| *Instream habitat continuity* | Moderately modified | Slightly modified | Slightly modified |
| *Riparian zone continuity* | Largely modified | Moderately modified | Moderately modified |
| *Instream habitat* | Moderately modified | Moderately modified | Moderately modified |
| *Riparian zone composition/structure* | Largely modified | Moderately modified | Largely modified |
| *Potential flow* | Slightly modified | Slightly modified | Slightly modified |
| *Potential physico-chemical activities* | Slightly modified | Slightly modified | Moderately modified |

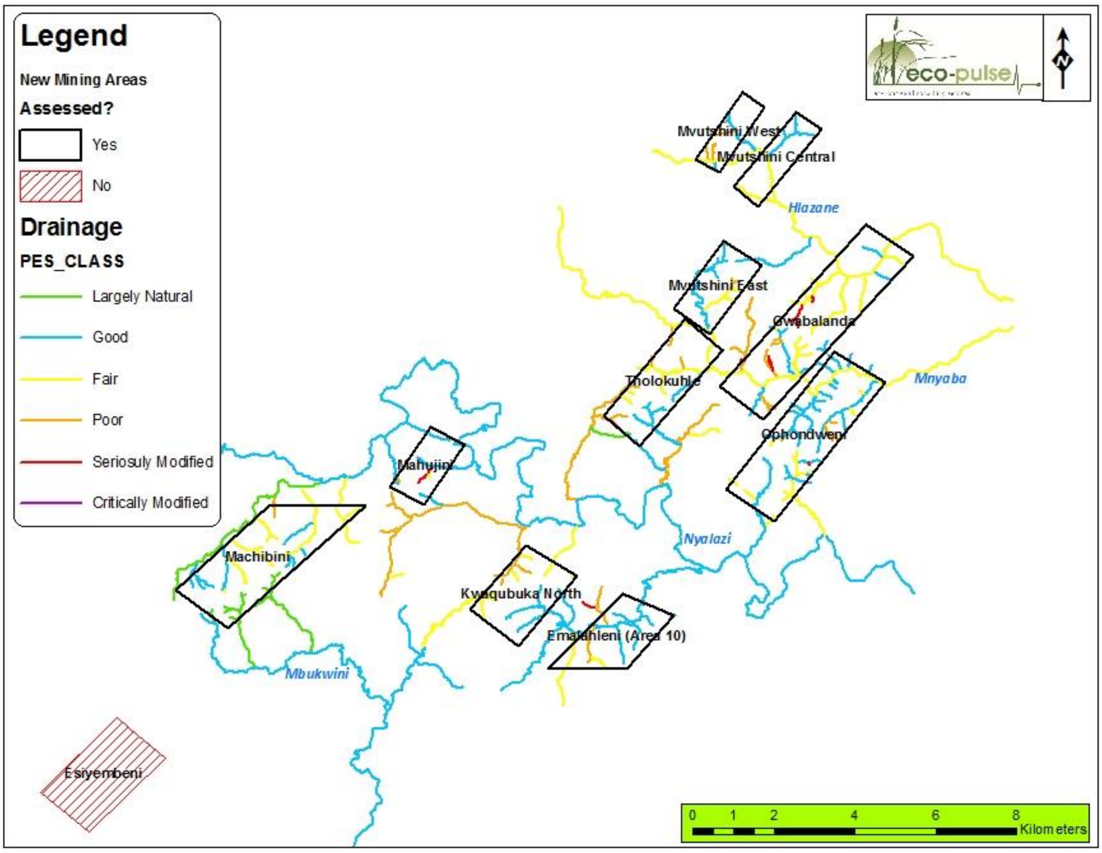



**Figure 2-22: Map showing the Present Ecological State (PES) of channelled rivers & streams in the project area.**

#### 2.7.8.1 *Ecological Importance & Sensitivity of watercourses*

One of the primary focuses of this study was to assess the Ecological Importance and Sensitivity (EIS) of aquatic resources potentially affected by the project in order to inform the assessment of potential impacts to the receiving environment. Ecological Importance is an expression of the importance of an environmental resource for the maintenance of biological diversity and ecological functioning on local and wider scales, whilst Ecological Sensitivity (or fragility) refers to a system's ability to resist disturbance and its capability to recover from disturbance once it has occurred (Kleynhans & Louw, 2007).

The EIS assessment was informed largely by the DWA Desktop River EIS assessment database (DWA, in prep.) and refined based on the field visit where possible. Based on this assessment, the three main rivers of the study area (Mnyaba, Hlazane and Nyalazi rivers) attain an EIS rating of **Medium-High**, with the Nyalazi River considered to have a **High** EIS rating (see Table 2-33). Smaller systems assessed by Eco-Pulse at a desktop level and refined in the field for selected sites where possible, yielded varying results, with the more intact and functional river systems attaining a **Medium** EIS rating, and the smaller ephemeral tributary systems and eroded/degraded drainage lines attaining Very Low to Low EIS ratings.

**Table 2-33 Summary of desktop river EIS ratings, after DWA (2013, in prep).**

| | **Mnyaba** | **Hlazane** | **Nyalazi** |
|---|---|---|---|
| DWA Code | W32G-02980 | W32G-02943 | W32G-03006 |
| Length (km) | 15.99 | 17.61 | 38.04 |
| Stream Order | 1 | 1 | 2 |
| **EIS** | Medium-High | Medium-High | High |
| *Fish representivity* | High | High | High |
| *Fish rarity* | High | High | High |
| *Instream vertebrates representivity* | High | High | High |
| *Riparian vegetation (% natural)* | High | High | High |
| *Habitat diversity* | Low | Moderate | Very Low |
| *Riparian habitat integrity* | Moderate | High | Moderate |
| *Instream habitat integrity* | High | High | High |
| *Fish sensitivity to flow modification* | Very High | Very High | Very High |
| *Invertebrates sensitivity to flow modification* | High | High | High |
| *Vegetation sensitivity to flow modification* | Very High | Very High | Very High |

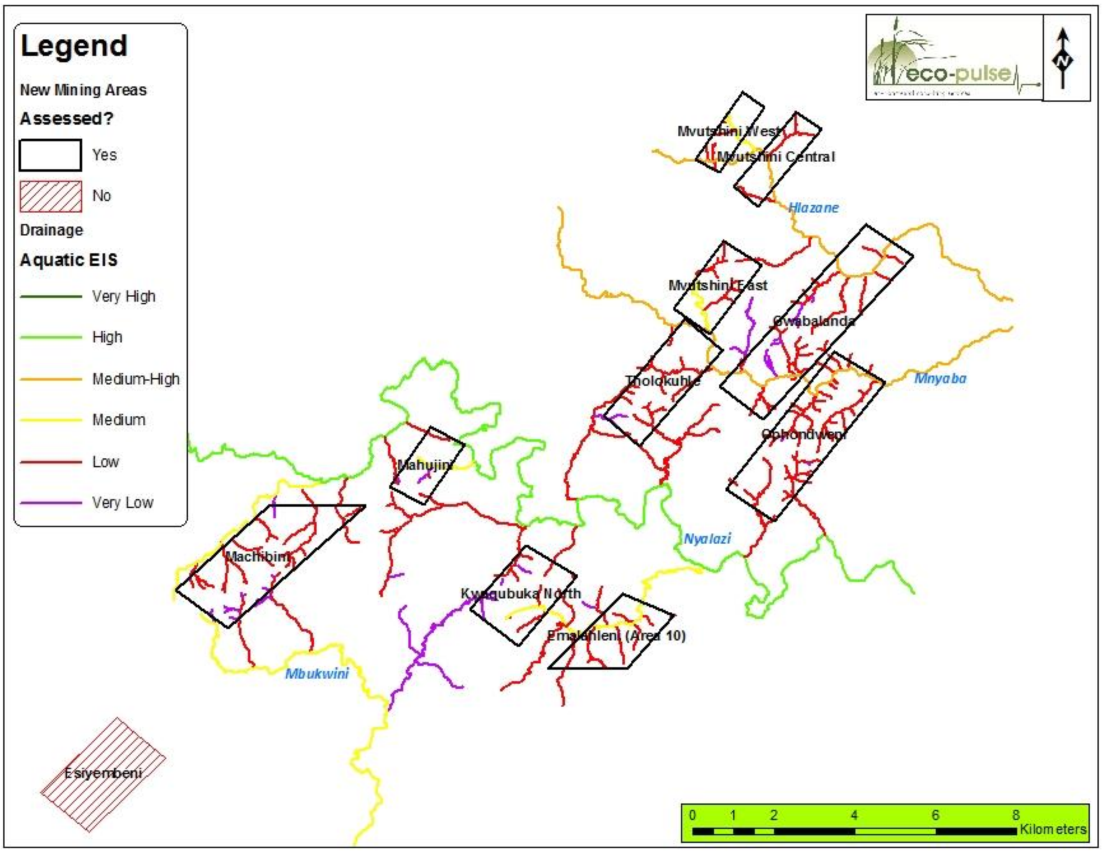



**Figure 2-23: Map showing the Ecological Importance & Sensitivity (EIS) of channelled rivers & streams in the project area.**

## 2.8 Sensitive landscapes

Sensitive Landscapes were assessed in previous impact assessments.(Impact Assessments for Area 1 and for Luhlanga & Kqaqubuka mining rights). The sensitive landscapes assessed during these assessments remain pertinent to the extension of Somkhele. Areas identified as being sensitive include:

- Hluhluwe-Mfolozi Game Reserve.
- Mbukwini Pan.
- Isimangaliso Wetland Park.

### 2.8.1 Hluhluwe-Mfolozi Game Park

Hluhluwe-Mfolozi Park is the oldest proclaimed natural park in Africa and lies 10 km west of the project area. It consists of 960 km$^2$ (96 000 ha) of hilly topography. The wilderness area within the park is extremely susceptive to any audible or visual intrusions from mining operations, however, current extension plans are moving away from the wilderness area.

### 2.8.2 Mbukwini Pan

Mining activities are progressing further away from the Mbukwini pan and all the extension areas fall out of the catchment of the Mbukwini Pan. The Mbukwini Pan is a wetland that is diverse in fauna and avi-fauna. Siting of Nile Crocodiles which are a red data species have been identified in the past. The pan is also popular with birders and rare species of birds have been identified at the Pan such as the Lesser Moorhen *Gallinula angulata* (SA Rare Bird News Report). The current mining area, including Area 2 where the washing plants, are located within the catchment of the pan and are upstream of the pan. The distance is some 8 kilometres and the river systems are predominantly non-perennial in nature. To date there have been no impacts on the pan from mining operations.

### 2.8.3 Isimangaliso Wetland Park

All drainage lines and river systems flow towards the Isimangaliso Wetland Park. The Isimangaliso has been named as a World Heritage Site and incorporates a variety of habitats including grasslands, forests, wetlands, mangroves and dunes. Four wetland sites within the park are Ramsar sites (wetlands of international importance). Isimangaliso Wetlands Park protects rare swamp forests, Africa's largest estuary and some of the world's highest coastal vegetated dunes.

## 2.9 Surface water

### 2.9.1 Catchment Delineation, Characterization, Properties and Land Use

Surface water features on site include both perennial and non-perennial streams. Pans occur on site and a few small dams are present within the proposed site boundary.

The 1:50 000 topographic contour data and identified perennial and non-perennial streams were used to delineate sub-catchments that represent natural drainage on site. Seven sub-catchments were identified within this area, relevant to flood line calculations on six non-perennial rivers and one perennial river – the Nyalazi River (refer to Figure 2-24). Table 2-34 gives the sizes of these catchments and of the catchments within which they are situated.

**Table 2-34 Catchment Area Sizes**

| Sub-Catchment | Total Surface Area (km2) |
|---|---|
| Water Management Area (WMA) 6 | 62035.00 |
| Quaternary Catchment (W23A) | 414.00 |
| Quaternary Catchment (W32G) | 658.00 |
| Catchment 1 | 31.12 |
| Catchment 2 | 10.50 |
| Catchment 3 | 4.11 |
| Catchment 4 | 32.10 |
| Catchment 5 | 5.55 |
| Catchment 6 | 67.39 |
| Catchment 7 | 192.06 |

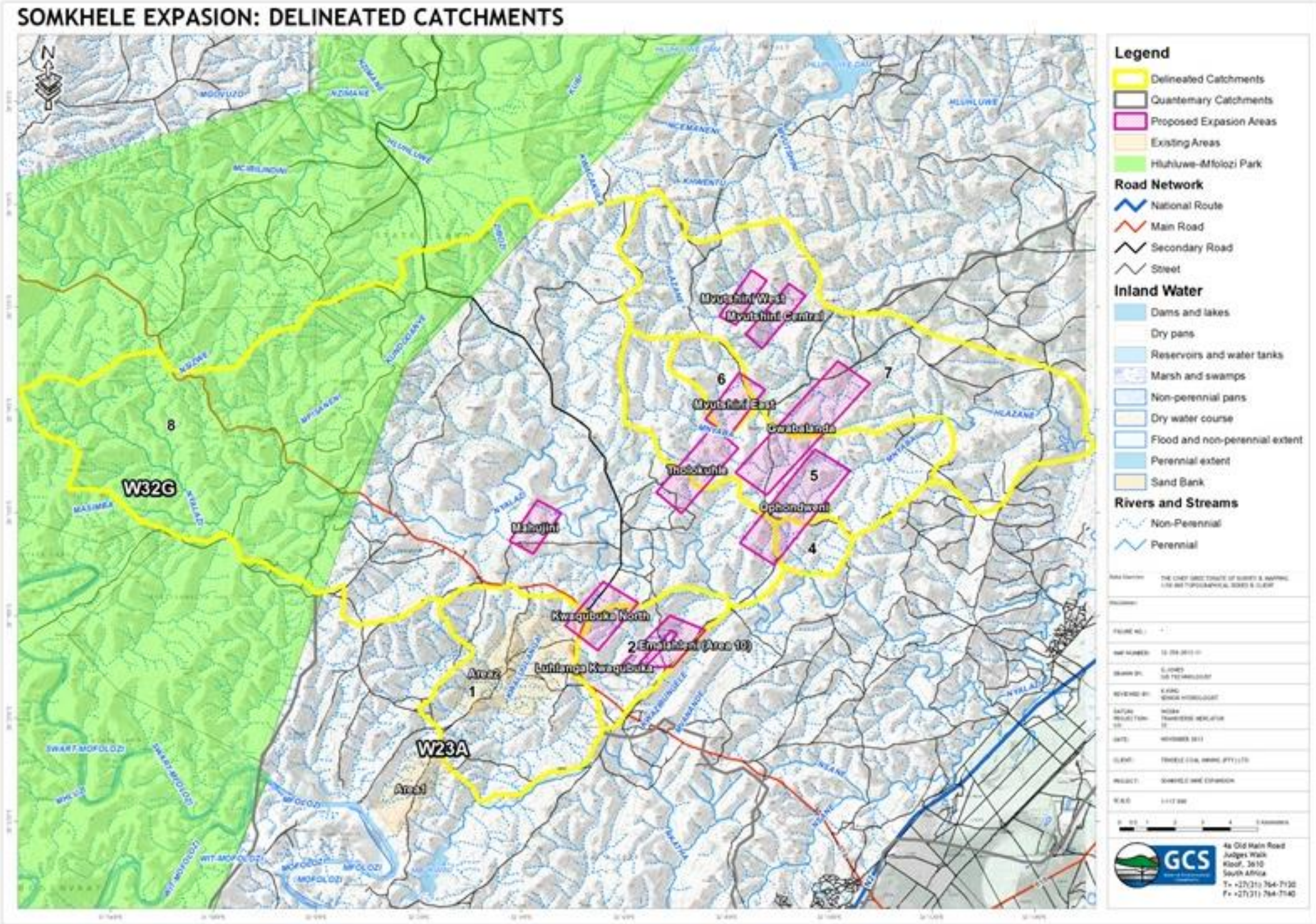



Figure 2-24: Somkhele Expansion Area Catchments

### 2.9.2 Mean Annual Runoff (MAR)

WR2005 runoff data indicates a MAR of 54.458 $Mm^3$ for the W32G quaternary catchment. The total annual runoff that characterizes this MAR over an 85 year record period (1920 - 2004) is shown in the graph in Figure 2-25.

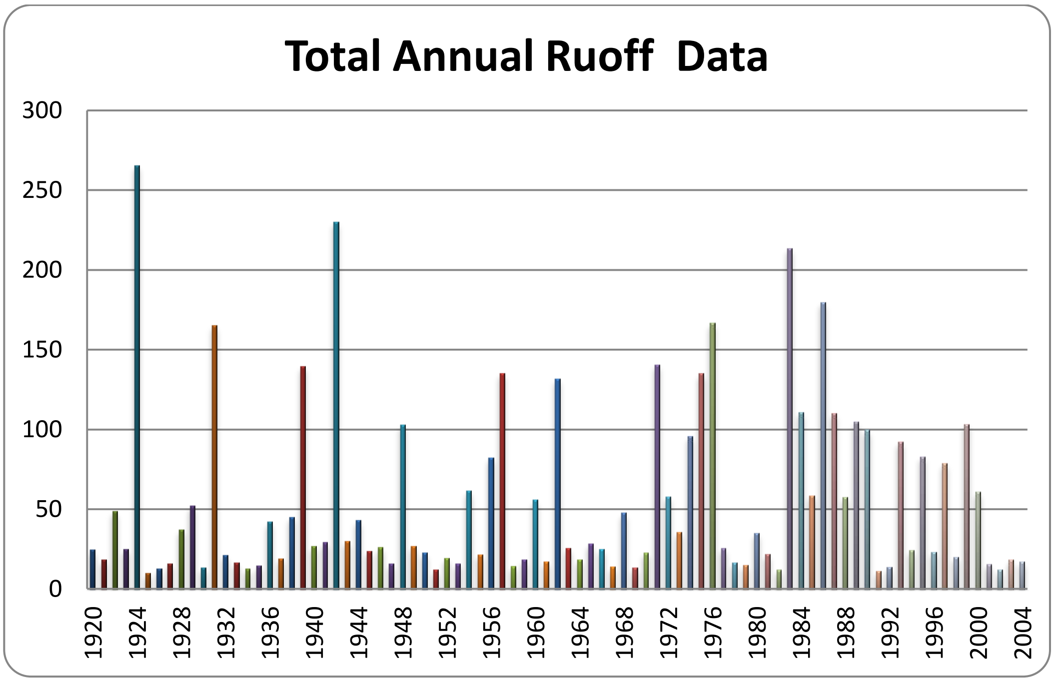



**Figure 2-25: Total Annual Runoff**

Quaternary Catchment runoff data (Middleton and Bailey, 2009) were downscaled in order to obtain representative site-specific runoff. MAR for the catchment and the sub-catchments was calculated in two manners. Initially this was calculated using the simple equation; site runoff = (site area x quaternary catchment runoff) / quaternary catchment area. MAR was also calculated by multiplying monthly runoff values obtained from the WR2005 database (Middleton & Bailey, 2009) by a correction factor. This factor was calculated by multiplying the quotient of the site area and the quaternary catchment area, raised to the power of 2.6, by the quotient of the site rainfall and the quaternary catchment rainfall. The results of these calculations agree well with each other. The MAR results calculated using the correction factor method was chosen, as this method is more accurate. The resulting MAR values are presented in Table 2.35. Table 2-35 also shows the relevant Water Management Area (WMA) and Quaternary Catchment MARs. Table 2-36 shows the baseline percentages of MAR from the site and sub-catchment boundaries that make up the relevant quaternary catchment, and Table 2-37 shows the Post-Development MAR per proposed mining area.

**Table 2-35 Mean Annual Runoff of Catchments**

| WMA 6 ($km^2$) | Quaternary Catchment | Quaternary Catchment Area ($km^2$) | Quaternary Catchment MAR ($x10^6$ $m^3$) |
|---|---|---|---|
| *623 035* | W32G | 658 | 54.45823529 |

**BASELINE MAR:**

**Table 2-36 Baseline MAR in Relation to the Catchment**

| **Basic MAR V2= (A2*V1)/A1** | **Correction factor MAR** | |
|---|---|---|
| **Sub-Catchment** | **Site Area** ***(km²)*** | **Sub-Catchment MAR (x10⁶ m³)** |
| Catchment 1 | 31.116 | 2.575262081 |
| Catchment 2 | 12.87 | 1.065163356 |
| Catchment 3 | 4.108 | 0.339991536 |
| Catchment 4 | 32.1 | 2.656701144 |
| Catchment 5 | 5.55 | 0.459336179 |
| Catchment 6 | 67.3927 | 5.577640598 |
| Catchment 7 | 192.0552 | 15.89511743 |

| **Compared with WMA 6** | | | | | | |
|---|---|---|---|---|---|---|
| Sub-Catchment MAR (m³) | **Sub-Catchment MAR (x10⁶ m³)** | **Sub-Catchment Contribution to MAR %** | **MAR** ***(Mm³)*** | **% Sub-catchment Area** ***(%)*** | **Actual MAR** ***(Mm³)*** | **% MAR** ***(%)*** |
| 2202900.336 | 2.202900336 | 4.045118841 | 6421 | 0.0050 | 0.3207 | 0.0050 |
| 911149.4834 | 0.911149483 | 1.673116065 | 6421 | 0.0021 | 0.1326 | 0.0021 |
| 290831.5523 | 0.290831552 | 0.534045128 | 6421 | 0.0007 | 0.0423 | 0.0007 |
| 2272563.98 | 2.27256398 | 4.173040069 | 6421 | 0.0052 | 0.3308 | 0.0052 |
| 392919.9404 | 0.39291994 | 0.721506928 | 6421 | 0.0009 | 0.0572 | 0.0009 |
| 4771159.58 | 4.77115958 | 8.761135123 | 6421 | 0.0108 | 0.6945 | 0.0108 |
| 13596814.01 | 13.59681401 | 24.96741573 | 6421 | 0.0308 | 1.9793 | 0.0308 |

**POST-DEVELOPMENT MAR:**

**Table 2-37 Post-Development MAR in Relation to the Catchment**

| Proposed Sites | Site Area ($km^2$) | Basic MAR V2= (A2*V1)/A1 | Correction factor MAR | | |
|---|---|---|---|---|---|
| | | Proposed site MAR ($x10^6$ $m^3$) | Proposed site MAR ($m^3$) | Proposed site MAR ($x10^6$ $m^3$) | Proposed site Contribution to MAR % |
| Kwaqubuka North | 2.8193 | 0.233334503 | 199596.2501 | 0.19959625 | 0.366512519 |
| Emalahleni | 2.5876 | 0.214158252 | 183192.7275 | 0.183192728 | 0.33639123 |
| Mahujini | 1.5168 | 0.125535336 | 107383.96 | 0.107383958 | 0.197185893 |
| Tholokuhle | 3.2795 | 0.271422162 | 232176.7468 | 0.232176747 | 0.426339094 |
| Gwabalanda | 6.5907 | 0.54546792 | 466597.739 | 0.466597739 | 0.856799227 |
| Mvutshini East | 2.038 | 0.168671556 | 144283.034 | 0.144283034 | 0.264942544 |
| Mvutshini Central | 1.6311 | 0.134995179 | 115475.9846 | 0.115475985 | 0.212045036 |
| Mvutshini West | 1.1639 | 0.096328176 | 82399.91327 | 0.082399913 | 0.151308453 |
| Ophondweni | 5.5585 | 0.460039667 | 393521.7097 | 0.39352171 | 0.722611938 |

| MAR | % Sub-catchment Area | Actual MAR | % MAR |
|---|---|---|---|
| ***($Mm^3$)*** | ***(%)*** | ***($Mm^3$)*** | ***(%)*** |
| 6421 | 0.0005 | 0.0291 | 0.0005 |
| 6421 | 0.0004 | 0.0267 | 0.0004 |
| 6421 | 0.0002 | 0.0156 | 0.0002 |
| 6421 | 0.0005 | 0.0338 | 0.0005 |
| 6421 | 0.0011 | 0.0679 | 0.0011 |
| 6421 | 0.0003 | 0.0210 | 0.0003 |
| 6421 | 0.0003 | 0.0168 | 0.0003 |

### 2.9.3 Peak Flows

Peak flows for the 1:50- and 1:100-year rainfall events were calculated in order to determine 1:50- and 1:100-year flood lines. Daily design rainfall depths were obtained from TR102 data (Adamson, 1981) and The Design Rainfall estimation for SA programme (Smithers & Schulze, 2000) (refer to Table 2-38).

The design depths are representative of a 24-hour rainfall event over the catchments. The results of the TR102 data were used as these data are widely used throughout the professional hydrological and engineering industries and are associated with a high confidence level. They also agree with the Design Rainfall Estimation for SA values. These data were used within the Rational and Standard Design Flood (SDF) methodology (Alexander, 2002) used to calculate peak flows for the catchment.

**Table 2-38 Design rainfall depths for the Somkhele area**

| Return Period (years) | Rain Depth (TR102) (mm) | Design rainfall estimation for South Africa (mm) |
|---|---|---|
| 1:50 | 273 | 273 |
| 1:100 | 339.2 | 339.3 |

Three methodologies were utilized (please see the information box below) to calculate and compare the peak flows for the catchments for the 1:50- and 1:100-year return periods. The results of these calculations are presented in Table 2.39, with the chosen results highlighted.

Of the methodologies used here, the results using the SDF method was chosen for catchments 1, 4, 6 and 8 as it is a widely-accepted method within the hydrology profession and it is specific to South African conditions. It is also a conservative approach. The Rational Method was chosen for catchments 2, 3 and 5 because these catchments are smaller than 15 $km^2$ and the Rational Method is known to work well for catchments of such small areas. Please see Table 2-39.

**Rational Method**

The rational method was developed in the mid-19th century and is one of the most widely used methods for the calculation of peak flows for small catchments (< 15 $km^2$). The formula indicates that Q = CIA, where I is the rainfall intensity, A is the upstream runoff area and C is the runoff coefficient. Q is the peak flow.

**Alternative Rational Method**

The alternative rational method is based on the rational method with the point precipitation being adjusted to take into account local South African conditions.

**Standard Design Flood Method**

The standard design flood (SDF) method was developed specifically to address the uncertainty in flood prediction under South African conditions (Alexander, 2002). The runoff coefficient (C) is replaced by a calibrated value based on the subdivision of the country into 26 regions or Water Management Areas (WMAs). The design methodology is slightly different and looks at the probability of a peak flood event occurring at any one of a series of similarly sized catchments in a wider region, while other methods focus on point probabilities.

**Table 2-39 Peak Flows as Calculated Using Three Methods**

| Catchment (Size in km$^2$) | Method | | | | | |
|---|---|---|---|---|---|---|
| | Rational | | Alternative Rational | | SDF | |
| | 1:50 | 1:100 | 1:50 | 1:100 | 1:50 | 1:100 |
| | *(m$^3$/s)* | | | | | |
| Catchment 1 (31.12) | 116.34 | 177.68 | 109.30 | 132.46 | 313.88 | 391.04 |
| Catchment 2 (12.87) | 83.50 | 121.26 | 73.85 | 88.64 | 162.35 | 202.26 |
| Catchment 3 (10.50) | 54.25 | 78.31 | 36.26 | 43.98 | 133.34 | 166.12 |
| Catchment 4 (4.11) | 138.11 | 187.90 | 124.15 | 149.71 | 244.72 | 304.87 |
| Catchment 5 (32.10) | 47.65 | 63.25 | 38.72 | 46.70 | 113.60 | 141.52 |
| Catchment 6 (67.39) | 245.39 | 285.17 | 216.91 | 261.57 | 370.95 | 462.14 |
| Catchment 7 (192.06) | 346.10 | 431.51 | 438.34 | 528.73 | 537.19 | 669.25 |

### 2.9.4 Peak Volumes

Peak volumes were calculated for the 1:50 and 1:100 year return periods (refer to Table 2-40), based on the peak flow figures calculated above, using the calculation from the South African National Roads Agency Drainage Manual (SANRAL, 2007):

**Volume (m$^3$) = 0.5*(3*Tc (sec))* Qp,**

Where Tc is Time of Concentration and Qp is Peak Flow.

**Table 2-40 Somkhele Peak Volumes**

| Catchment | Peak Volume | | | | | |
|---|---|---|---|---|---|---|
| | Rational | | Alternative Rational | | SDF | |
| | 1:50 | 1:100 | 1:50 | 1:100 | 1:50 | 1:100 |
| | *($Mm^3$)* | | | | | |
| Catchment 1 | 1.69 | 2.59 | 1.59 | 1.93 | 4.57 | 5.70 |
| Catchment 2 | 0.96 | 1.39 | 0.85 | 1.01 | 1.86 | 2.32 |
| Catchment 3 | 0.17 | 0.25 | 0.12 | 0.14 | 0.43 | 0.53 |
| Catchment 4 | 2.91 | 3.96 | 2.62 | 3.16 | 5.16 | 6.42 |
| Catchment 5 | 0.29 | 0.39 | 0.24 | 0.29 | 0.70 | 0.88 |
| Catchment 6 | 7.51 | 8.72 | 6.64 | 8.00 | 11.35 | 14.14 |
| Catchment 7 | 23.27 | 29.02 | 29.48 | 35.55 | 36.12 | 45.00 |

The highlighted volumes are those calculated based on the peak volumes chosen in Table 2-40.

### 2.9.5 Flood Lines

A flood line is a flood height for a given return period. Flood lines are usually determined for areas where existing and proposed infrastructure could be influenced by in stream flood volumes and their respective levels. These values are not fixed and may change over time due to the change in the hydrological and hydraulic characteristics of the catchments.

Flood lines on river sections are analysed to evaluate risks associated with potential flooding of infrastructure and protection of natural resources. Legislation guides the planning team of any project with regards to minimum requirements of placement of infrastructure in relation to a natural watercourse. General Notice 704 of the NWA stipulates that no mining infrastructure is allowed to be placed and constructed closer than 100 m from a river or from the 1:50 year flood line or whichever of the two is farthest. Regulation 4(b) of GN704 reads; *''No person in control of a mine or activity may - except in relation to a matter contemplated in regulation 10, carry on any underground or opencast mining, prospecting or any other operation or activity under or within the 1:50 year flood-line or within a horizontal distance of 100 meters from any watercourse or estuary, whichever is the greatest"*.

The river sections were modelled in HEC-RAS (US Army Corps of Engineers, 1995) by creating cross sections at various intervals or at positions in the river where the flow regime is anticipated to change, such as at bends in the river. The cross-sections were created in ArcView10.1 (ESRI, 2012). The South Africa Surveys and Mapping 1:50 000 Scale Topographic

Maps were used to create cross-sections, specifically blocks 2832AC and 2832AA. HEC-RAS models total energy of water by applying basic principles of mass, continuity and momentum as well as applying Manning's equation for roughness between all cross sections. Flows at the most downstream position in the river section are modelled first, moving upstream. Manning's roughness coefficients (n-coefficients) of 0.04 and 0.03 were selected for the channel and flood plain, respectively. The area is generally flat with varying flood plains. A height is calculated at each cross section, which represents the level to which water will rise at that section, given the potential peak flows. This was calculated for the 1:50-year and 1:100-year peak flows on all river sections. The geographic positions of all cross-sections can be seen in Figure 2-26 to Figure 2-32.

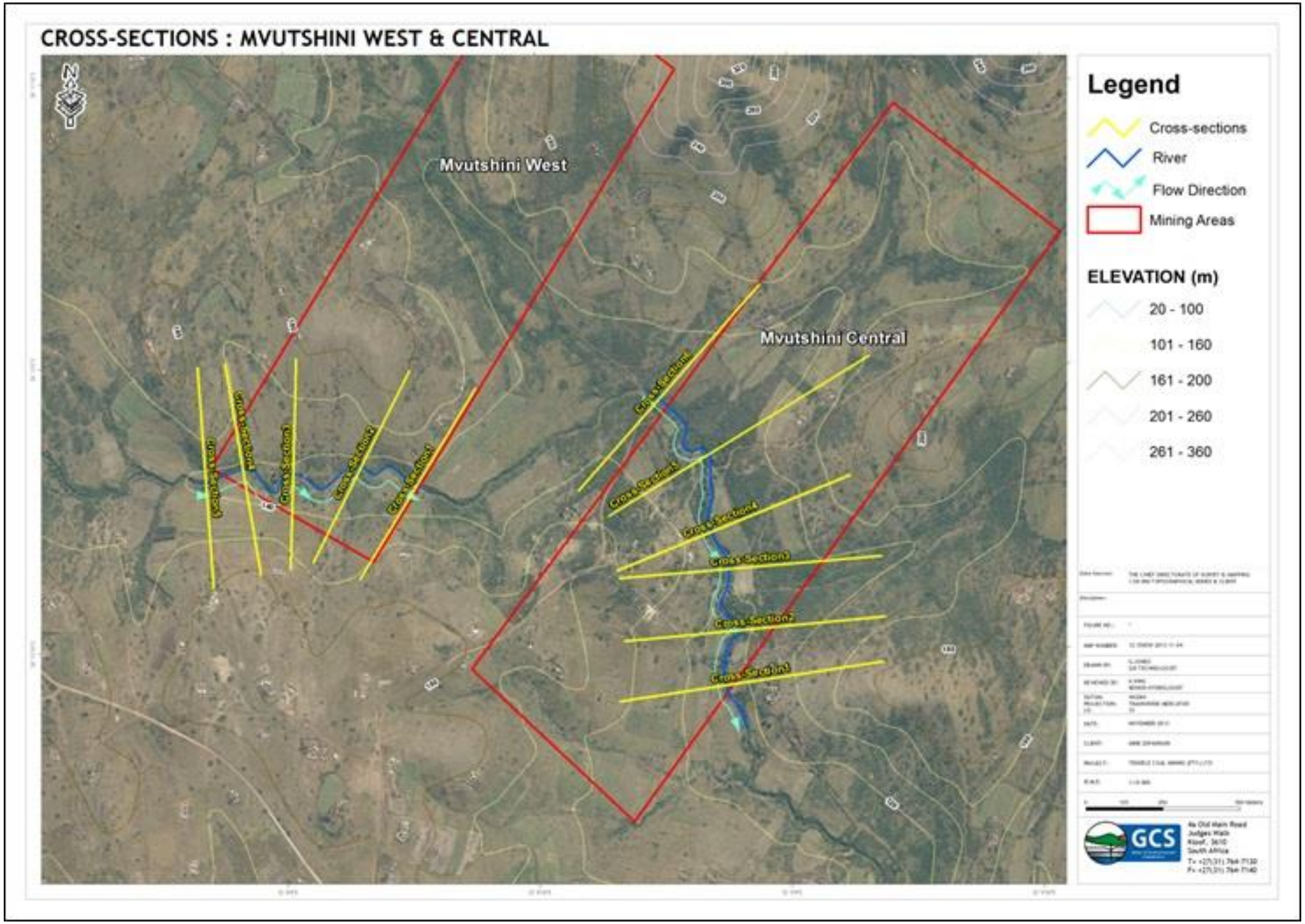



**Figure 2-26: Mvutshini West and Central Area River Cross Sections**

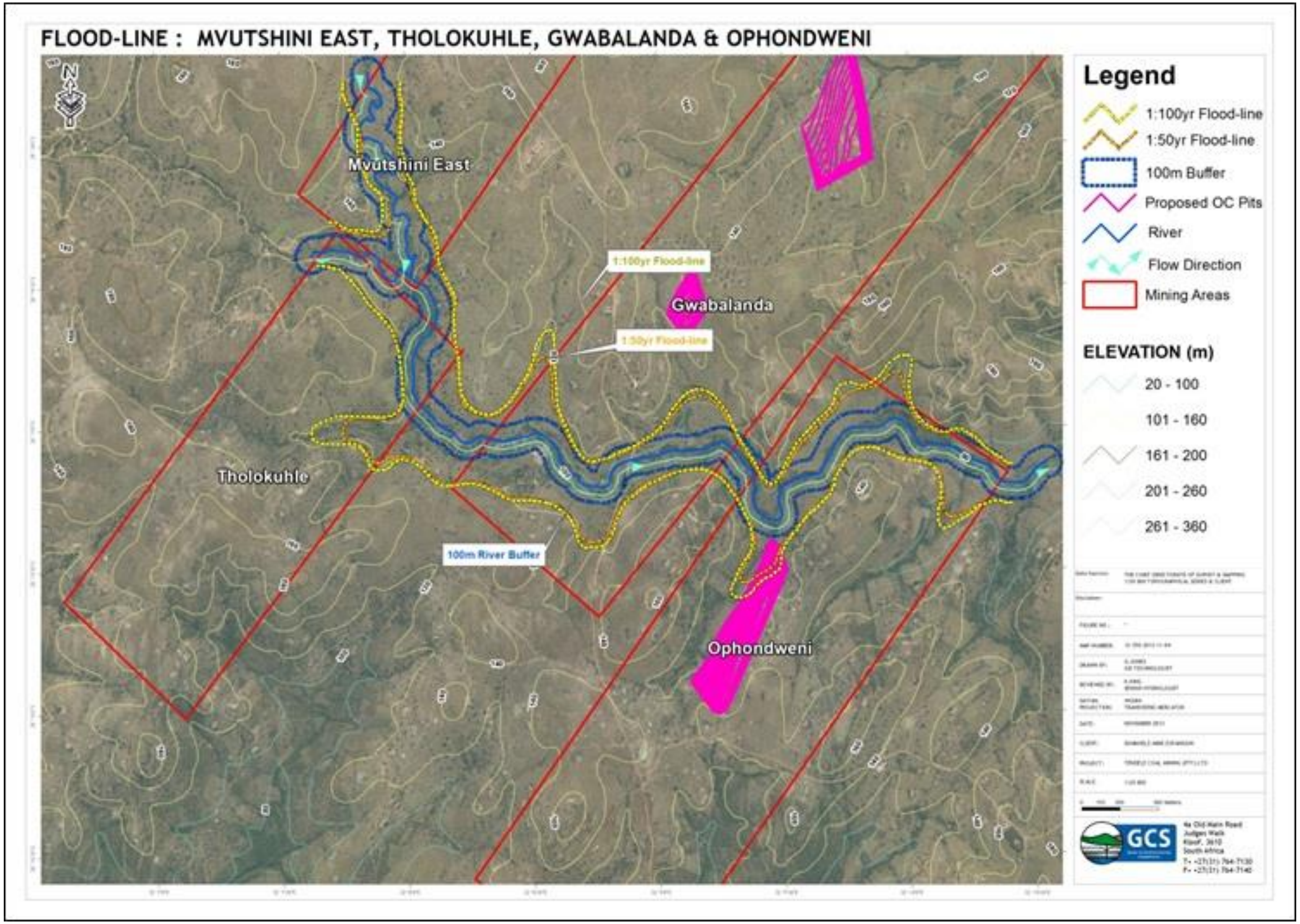



**Figure 2-27: Mvutshini East Area River Cross Sections**

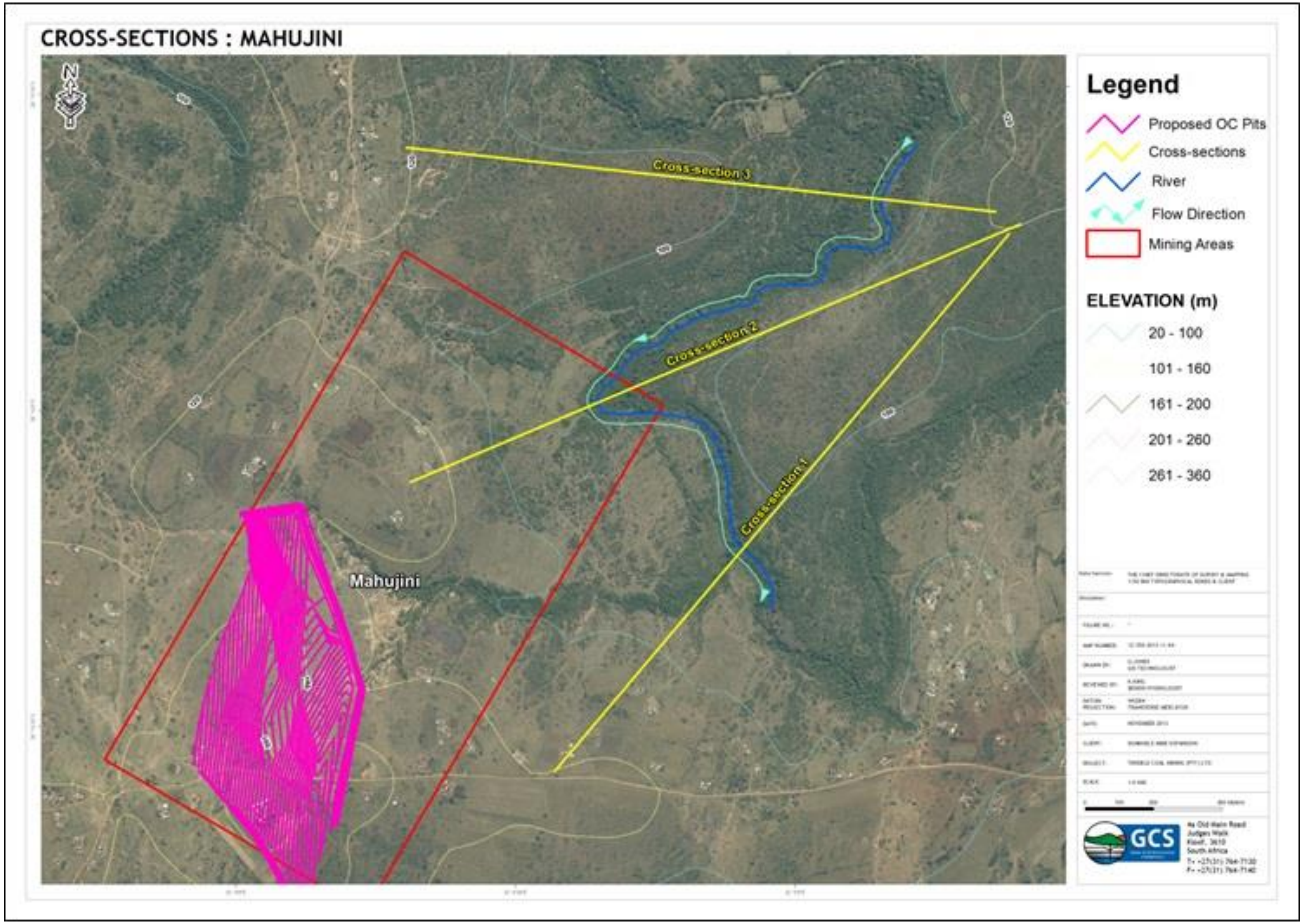



**Figure 2-28: Mahujini Area River Cross Sections**

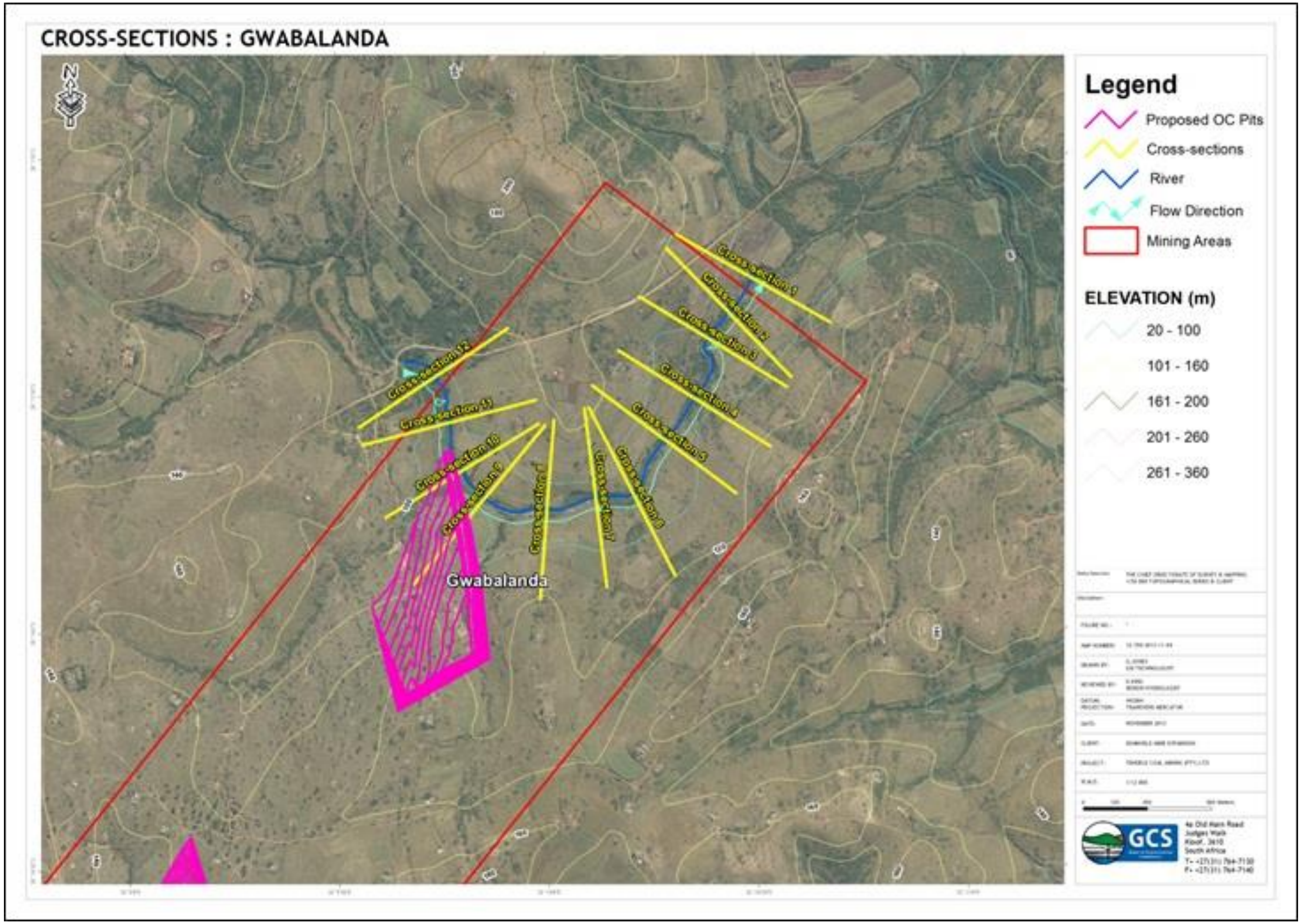



**Figure 2-29: Gwabalanda Area River Cross Sections**

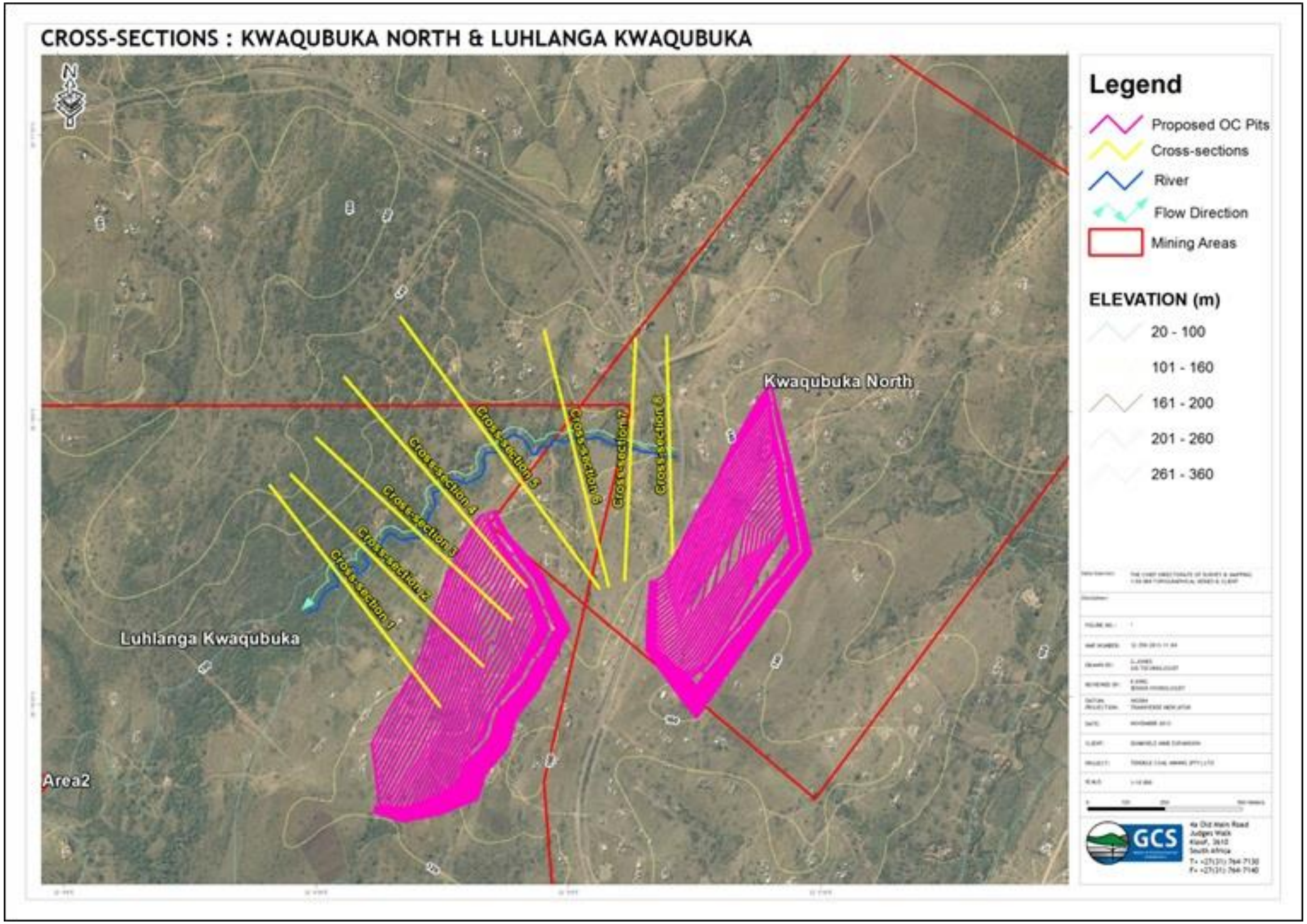



**Figure 2-30: Kwaqubuka Area River Cross Sections**

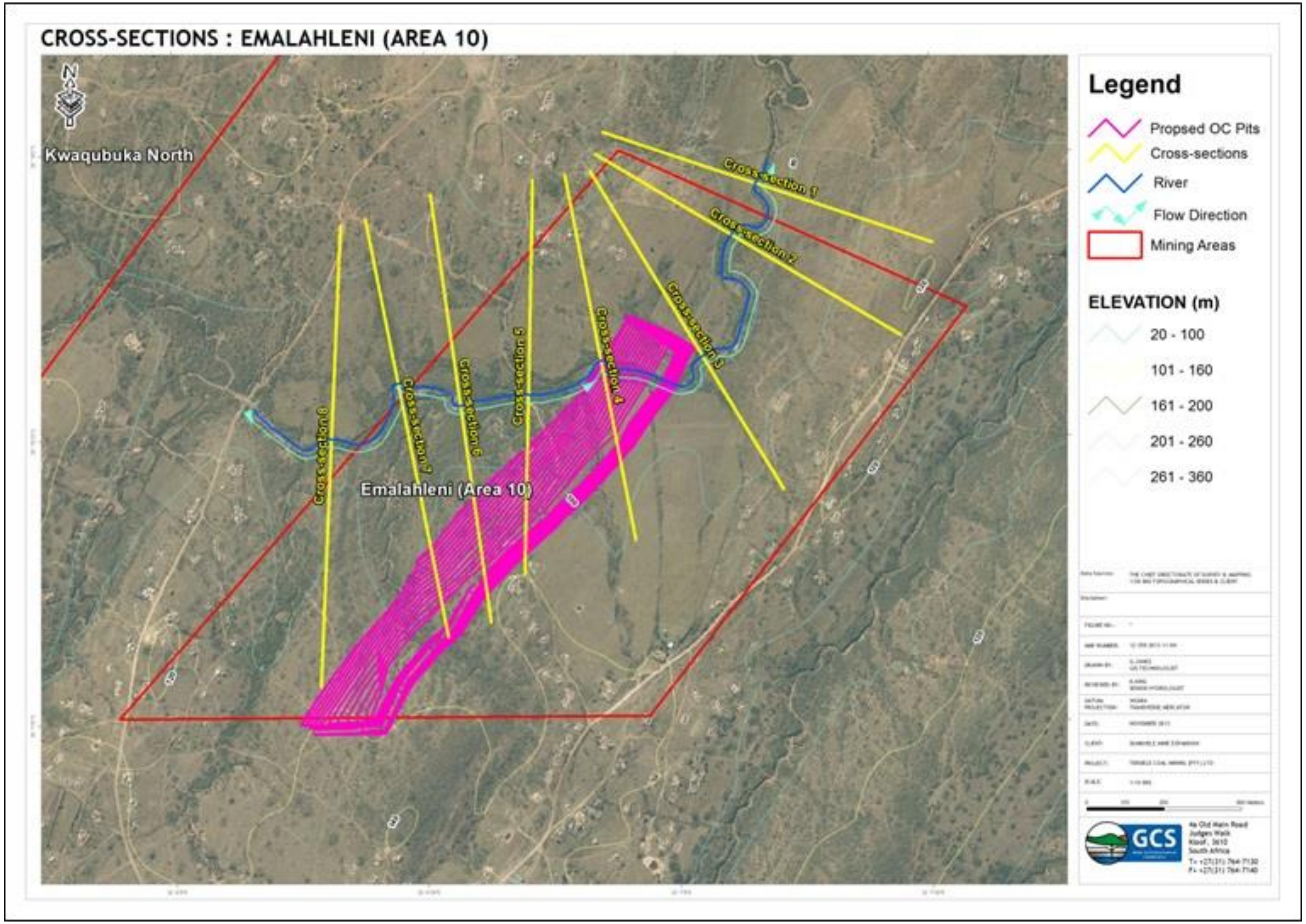



**Figure 2-31: Emalahleni Area River Cross Sections**

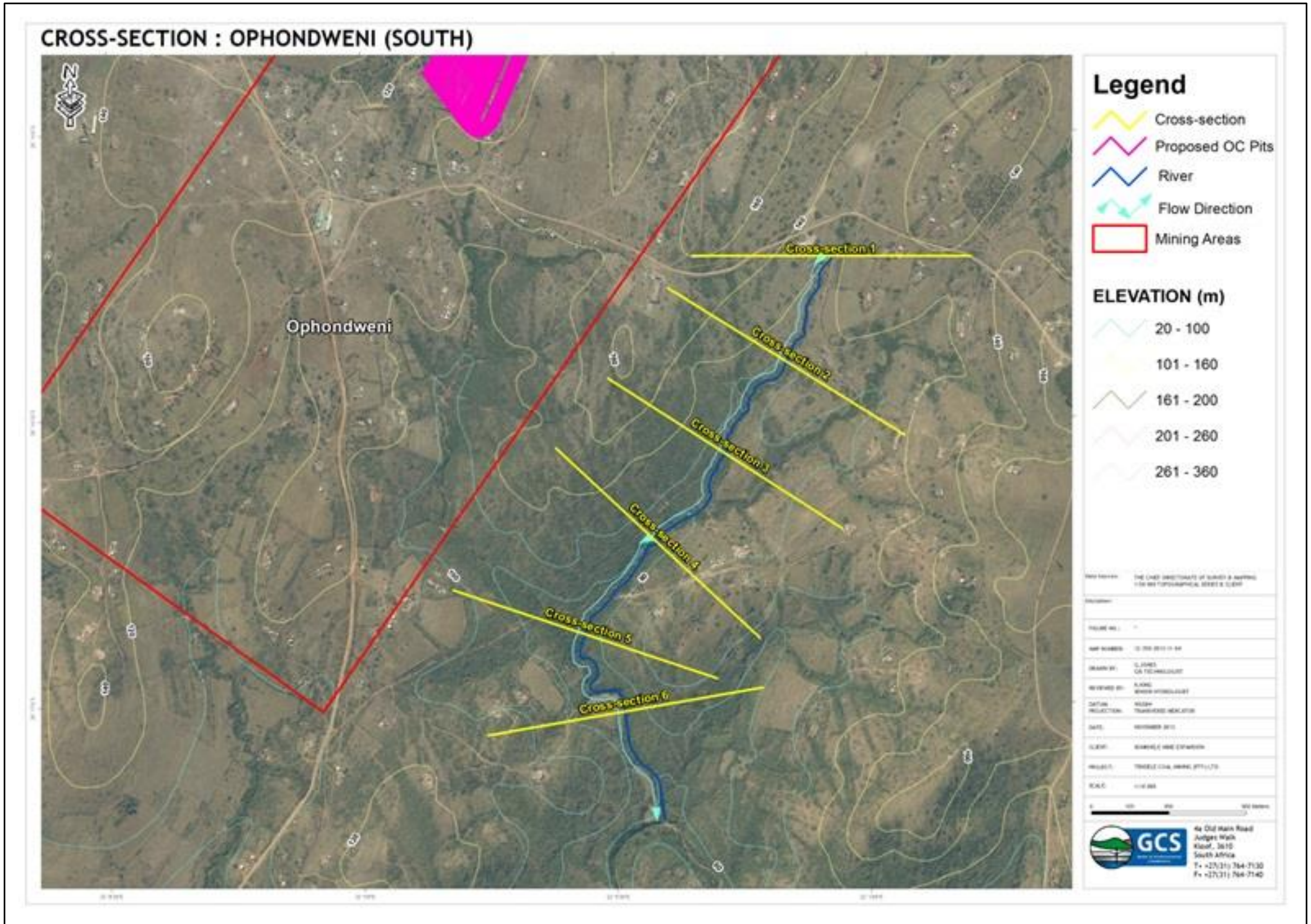



**Figure 2-32: Ophondweni Area River Cross Sections**

### 2.9.6 Results

The flood line heights along the relevant rivers, calculated for the 1:50 and 1:100-year peak flows, are shown in Appendix D (Water Surface Elevations are the flood heights). The corresponding flood lines are shown in Figure 2-33 to Figure 2-39.

An Exclusion Zone has been drawn which traces the 1:50-year flood line level or the 100 m river buffer line, at each point, depending on which of the two is furthest from the river at that point, in accordance with GN704 legislation. Please see Figure 2-40 to Figure 2-46.

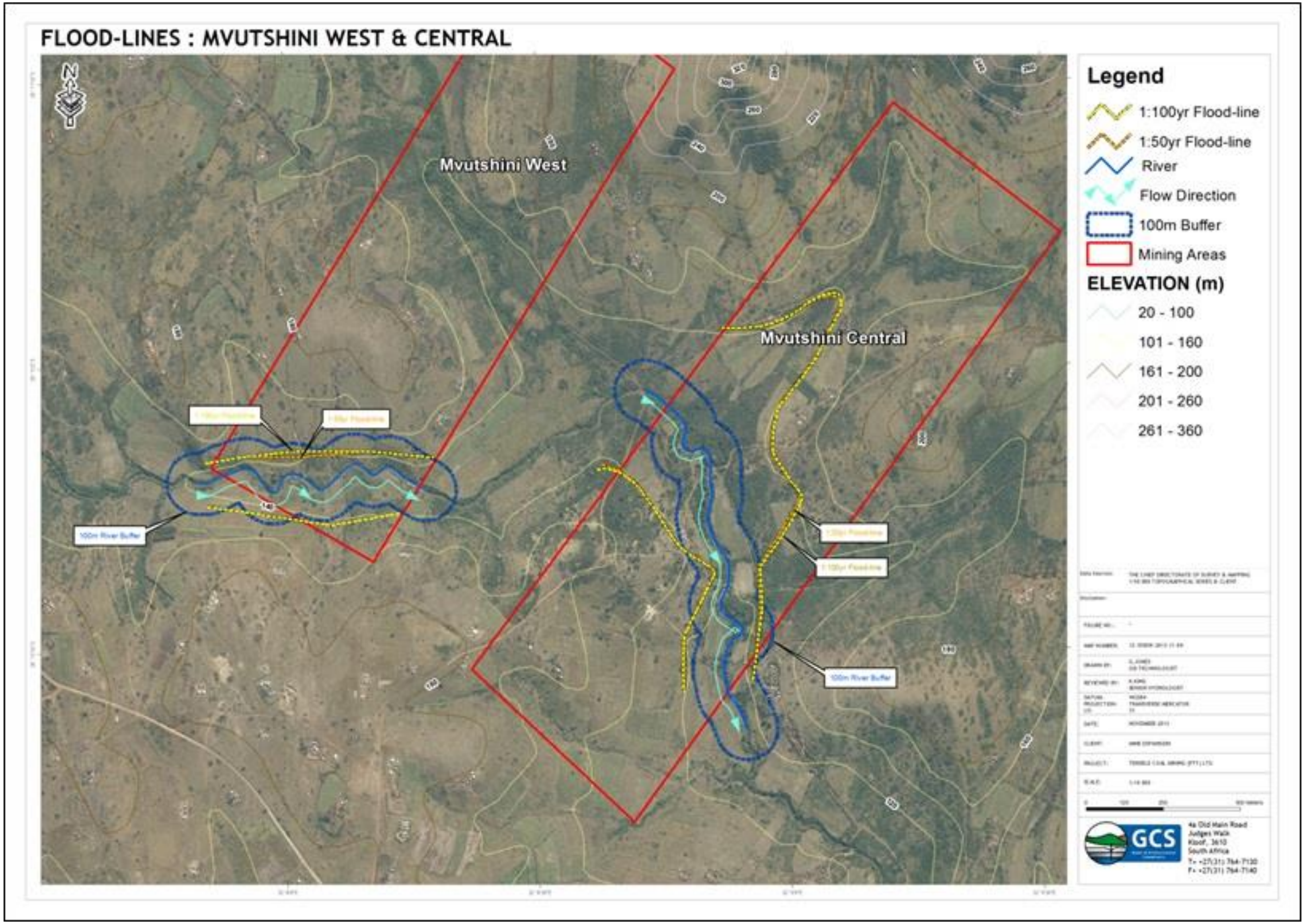



**Figure 2-33: Mvutshini West and Central Area 1:50- and 1:100-year Flood Lines**

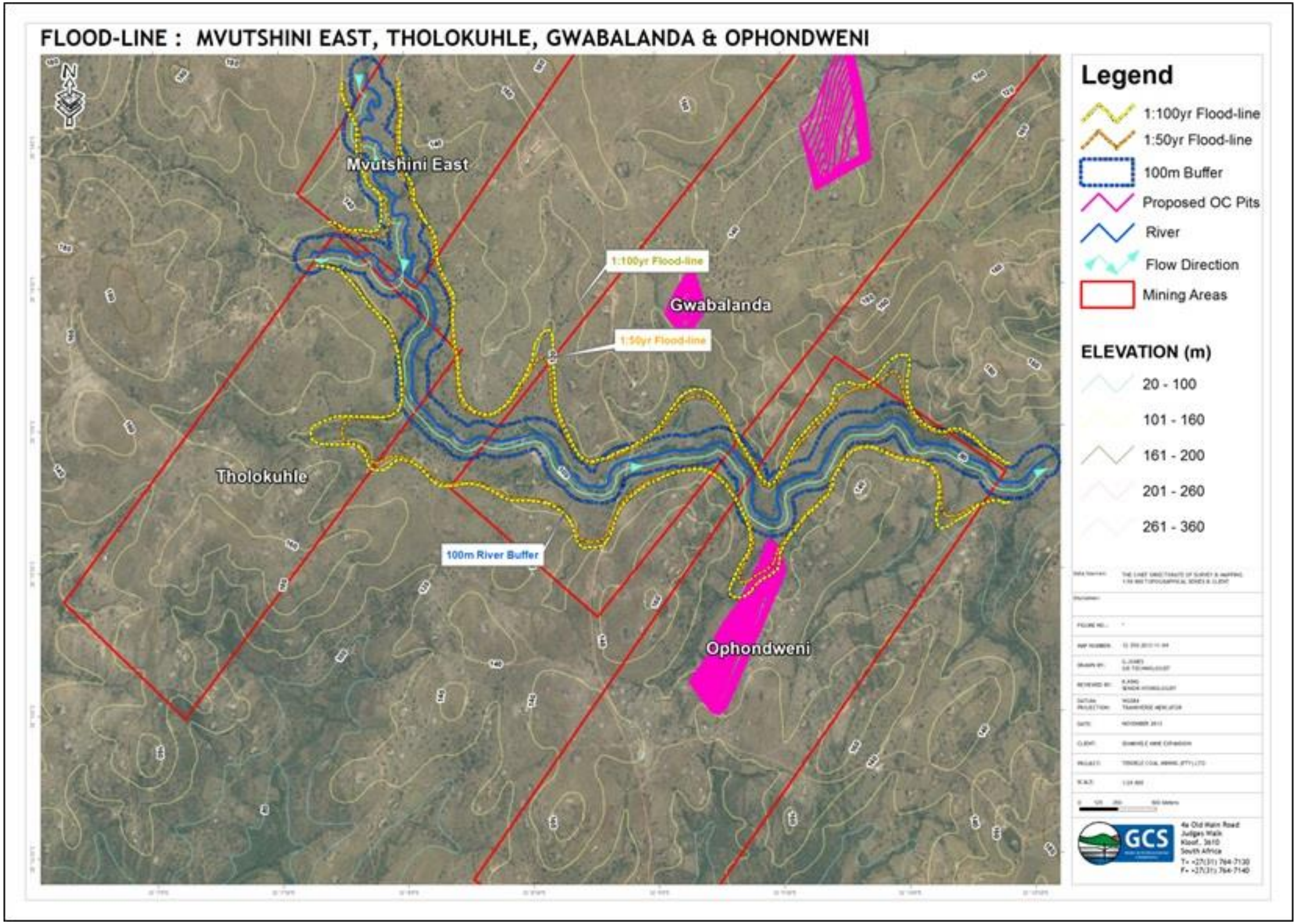



**Figure 2-34: Mvutshini East Area 1:50- and 1:100-year Flood Lines**

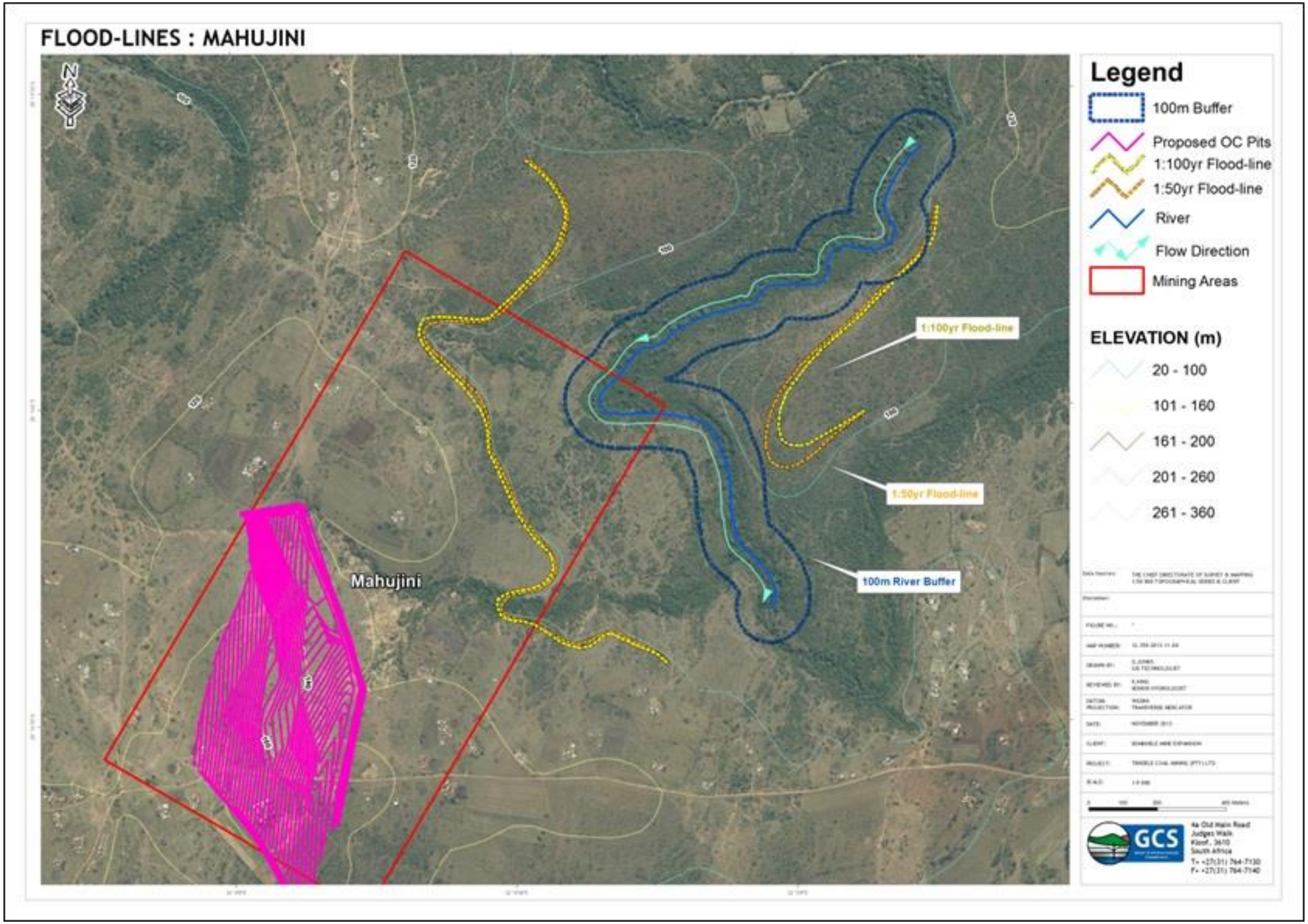



**Figure 2-35: Mahujini Area 1:50- and 1:100-year Flood Lines**

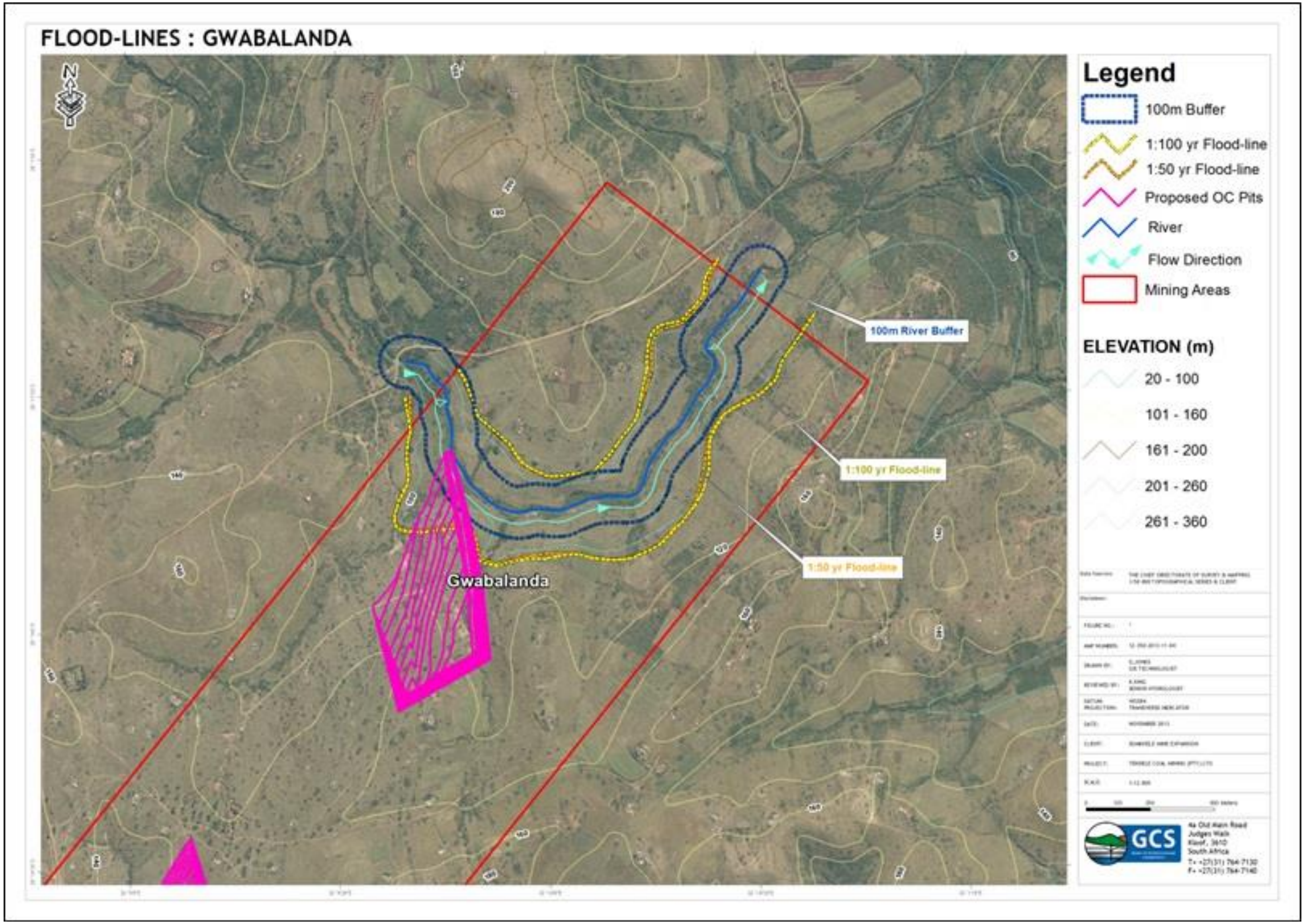



**Figure 2-36: Gwabalanda Area 1:50- and 1:100-year Flood Lines**

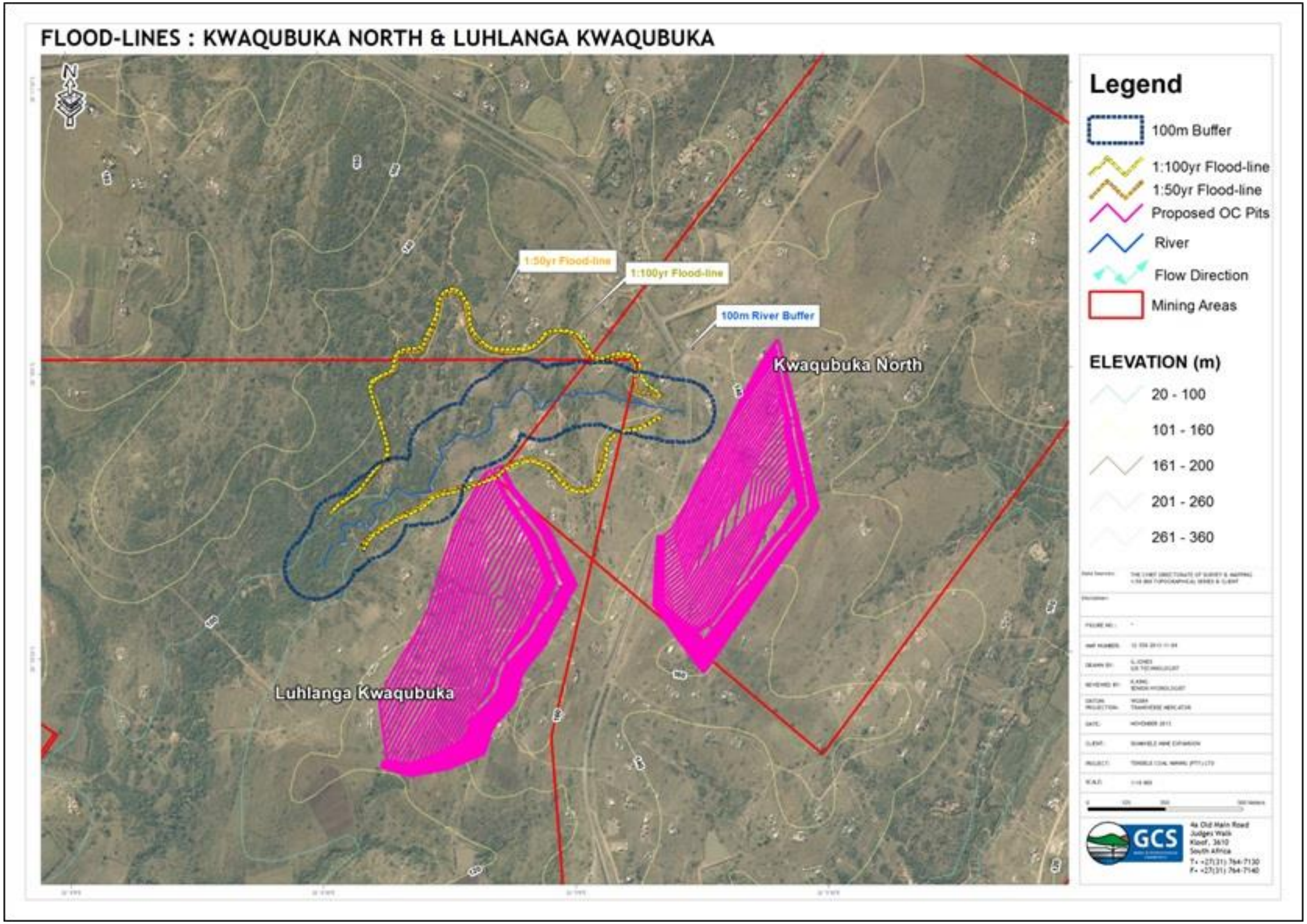



Figure 2-37: Kwaqubuka Area 1:50- and 1:100-year Flood Lines

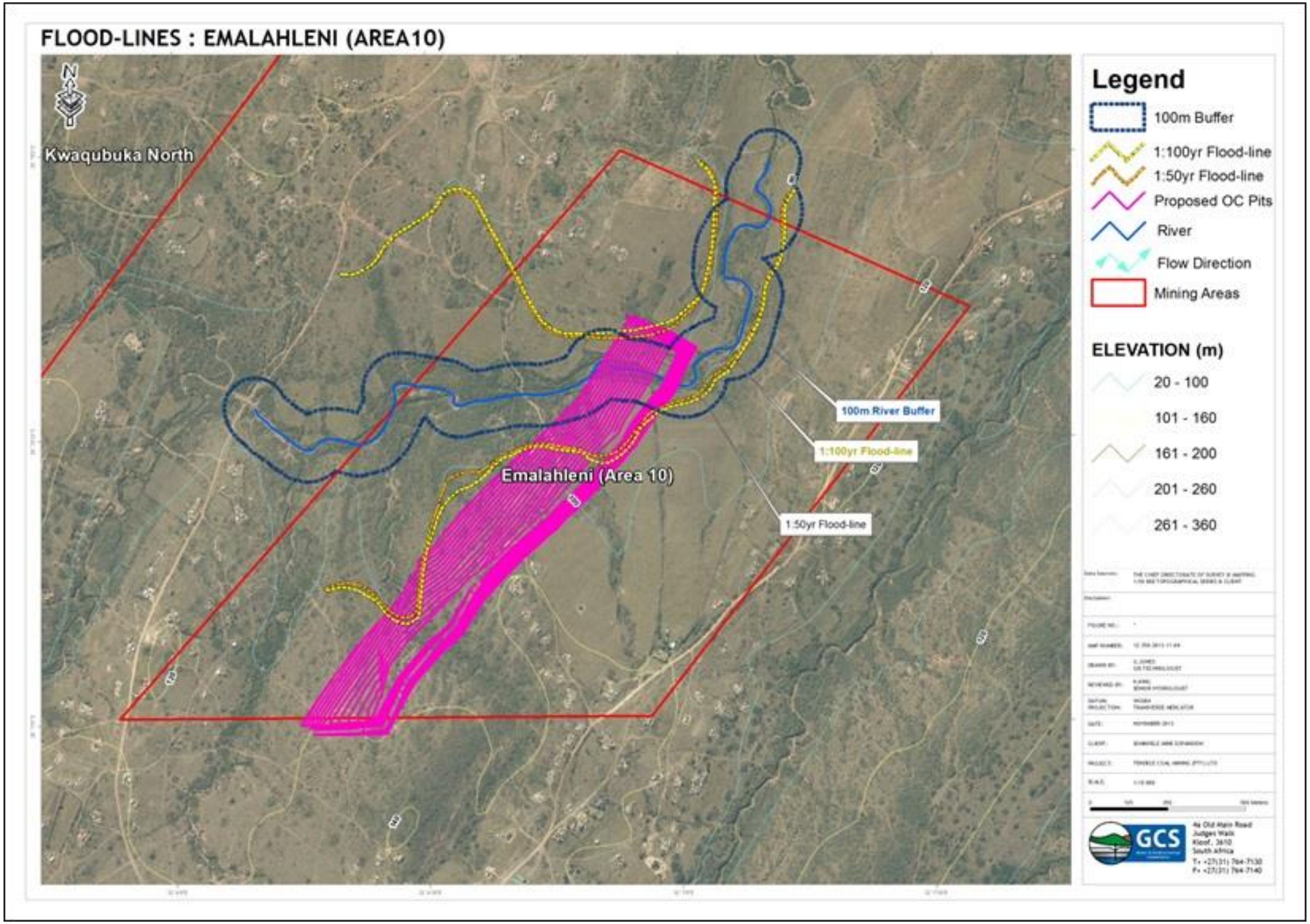



**Figure 2-38: Emalahleni Area 1:50- and 1:100-year Flood Lines**

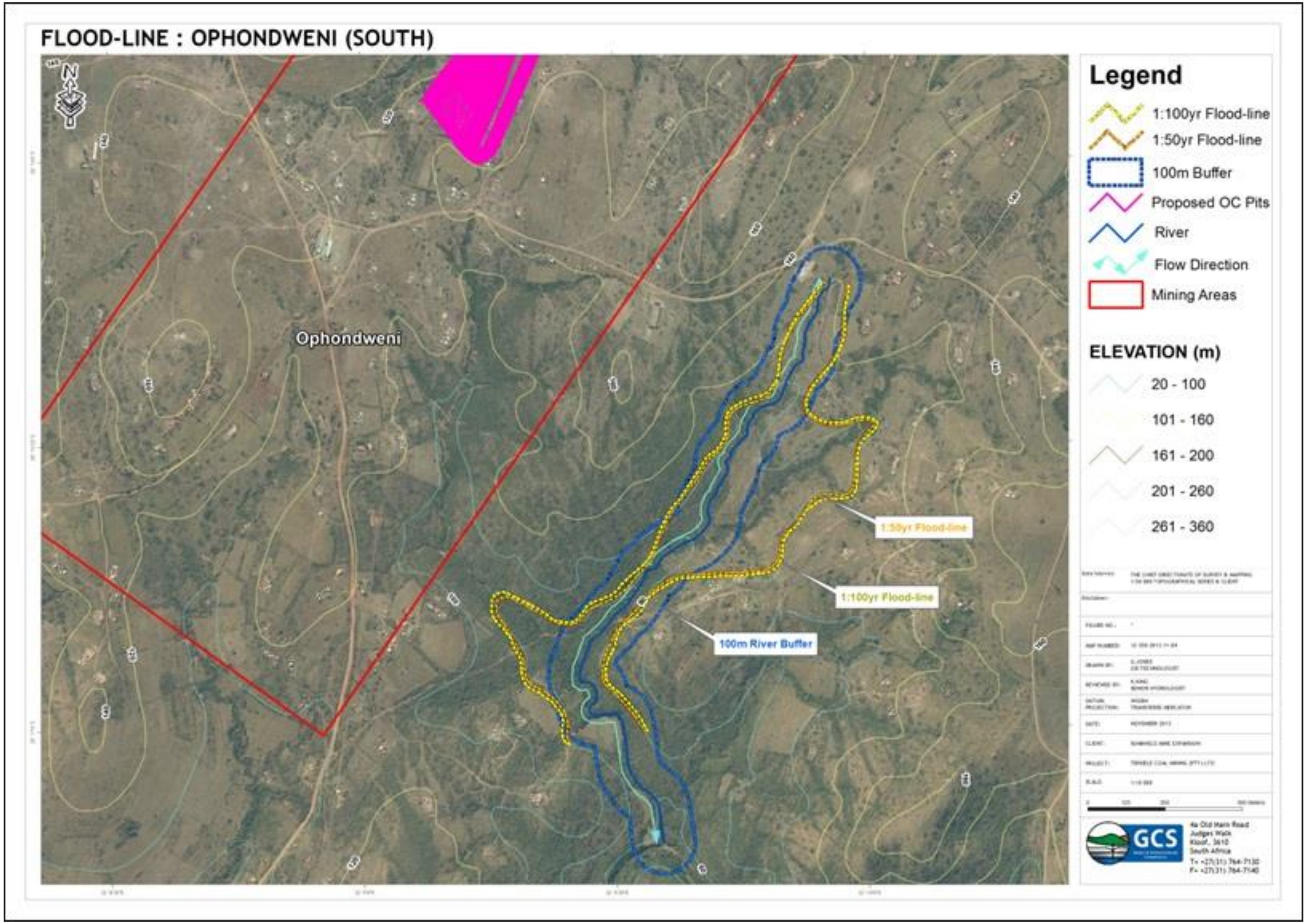



**Figure 2-39: Ophondweni Area 1:50- and 1:100-year Flood Lines**

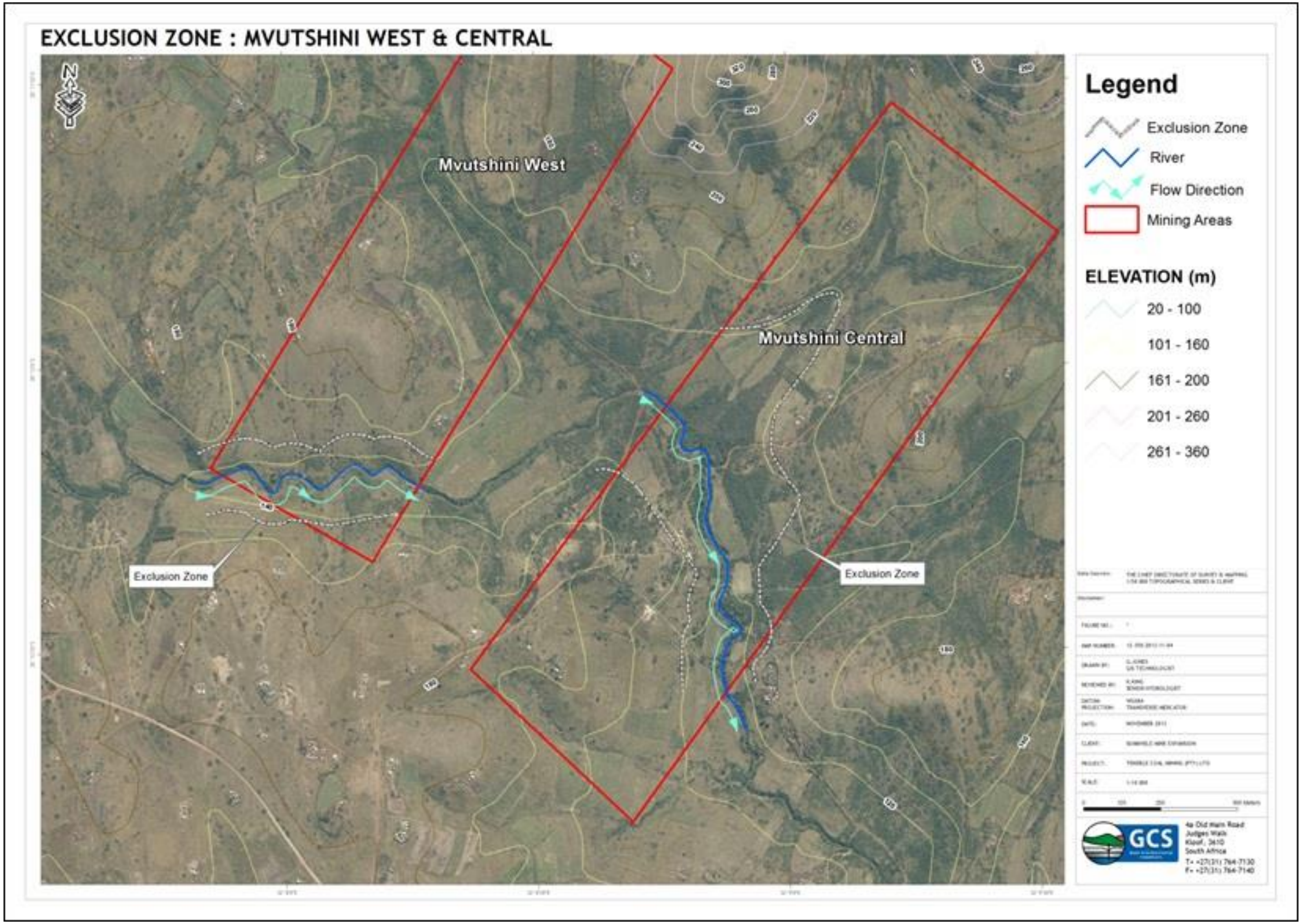



Figure 2-40: Mvutshini West and Central Area Exclusion Zones

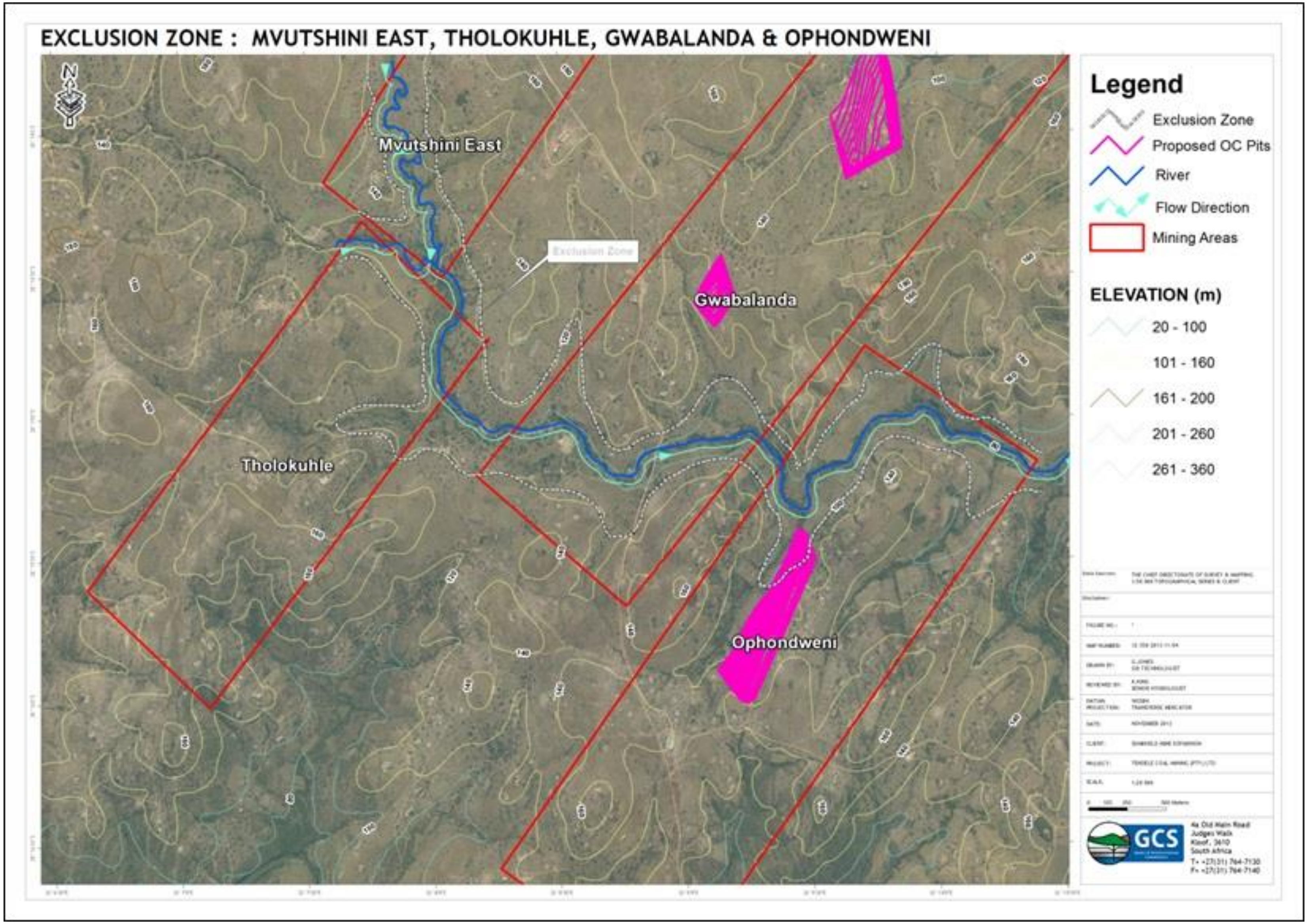



**Figure 2-41: Mvutshini East Area Exclusion Zones**

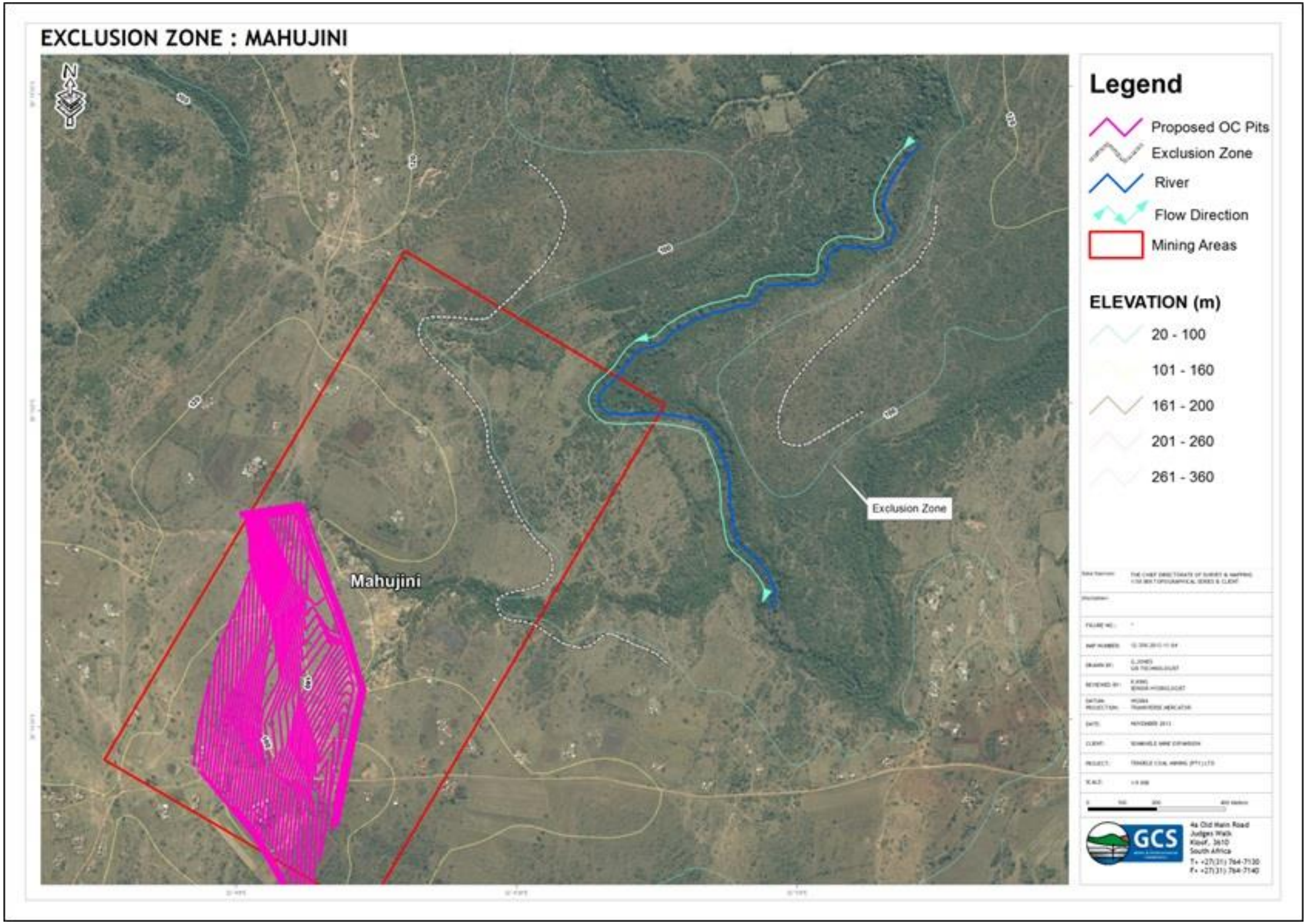



Figure 2-42: Mahujini Area Exclusion Zone

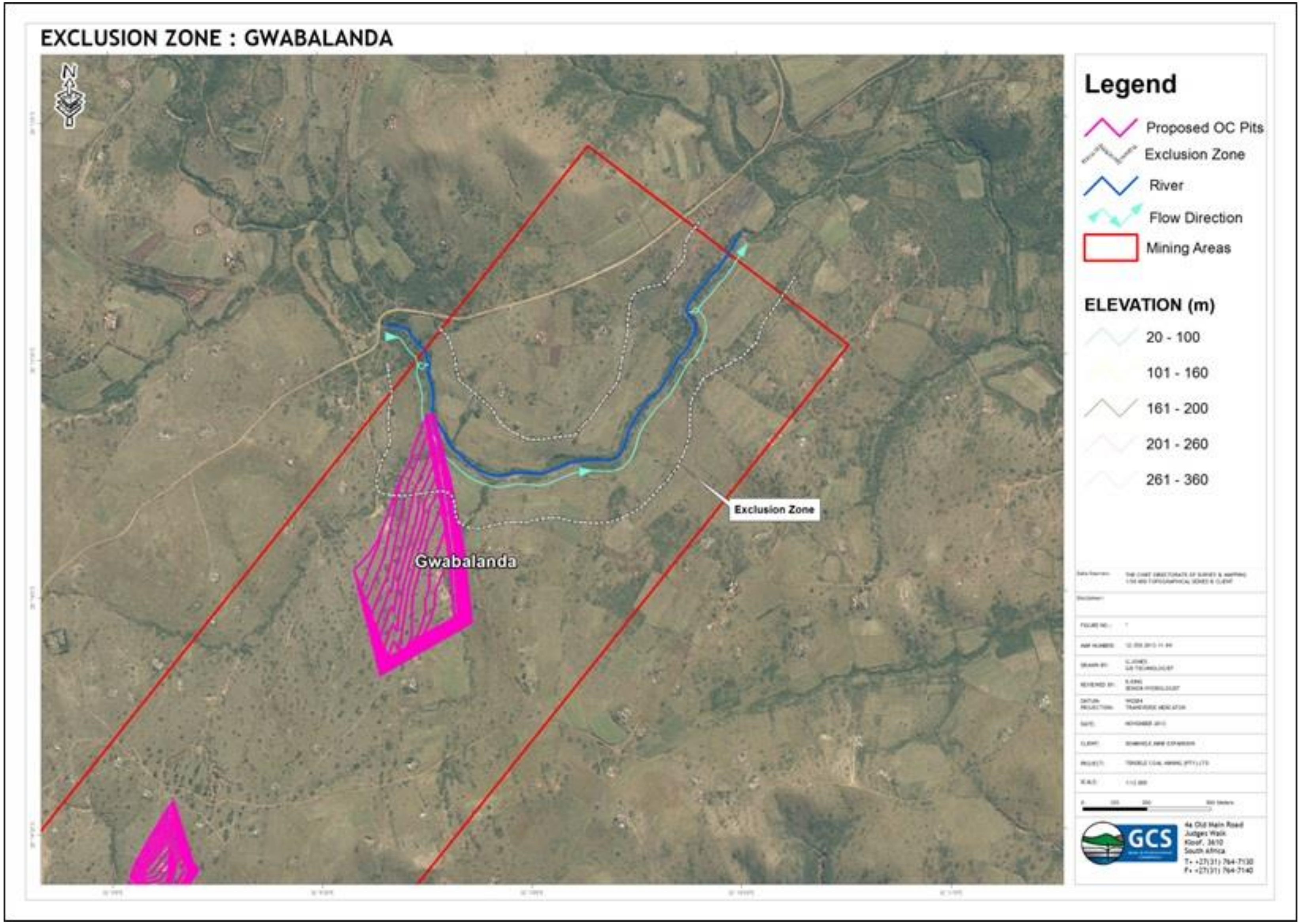



**Figure 2-43: Gwabalanda Area Exclusion Zone**

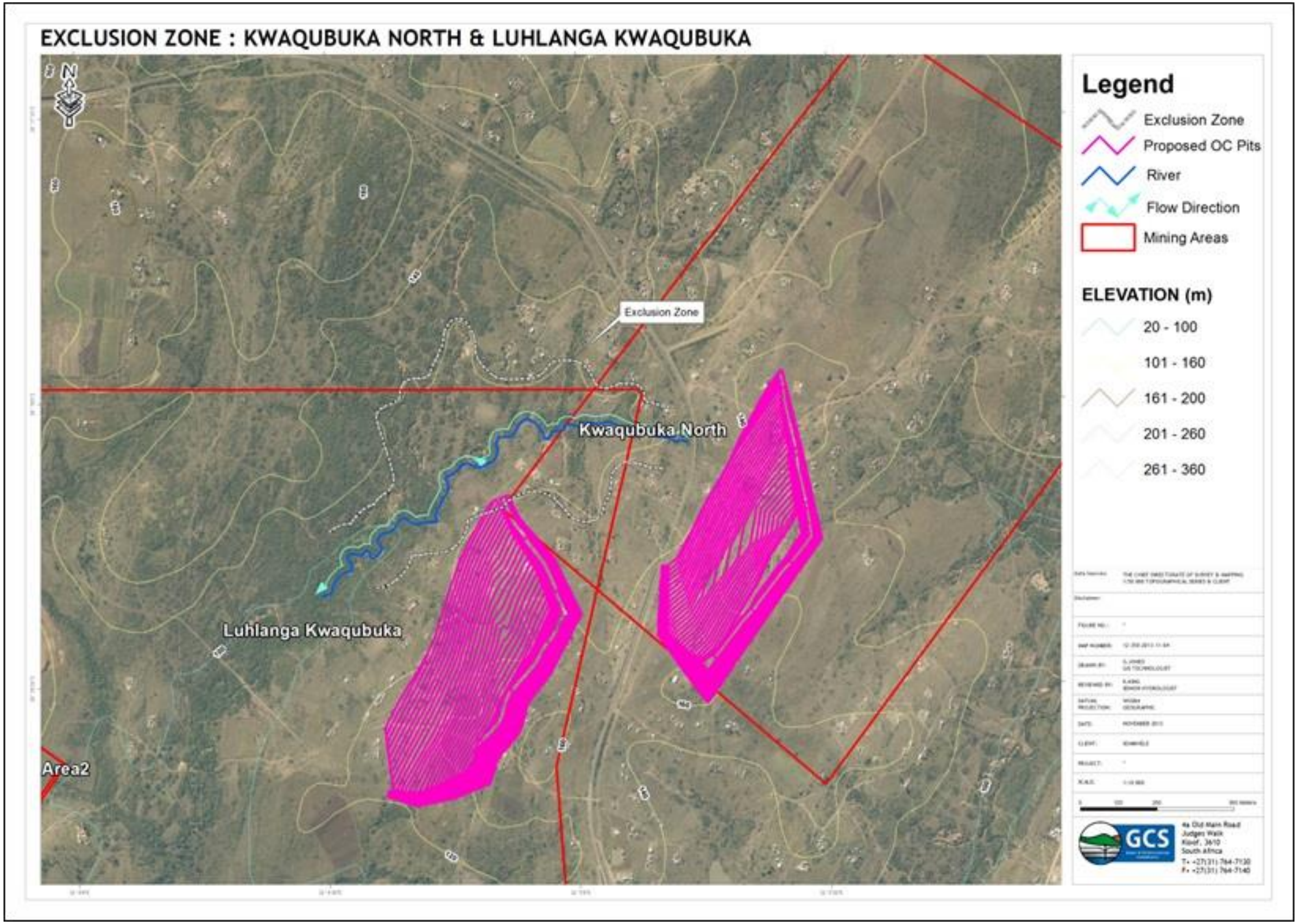



Figure 2-44: Kwaqubuka Area Exclusion Zone

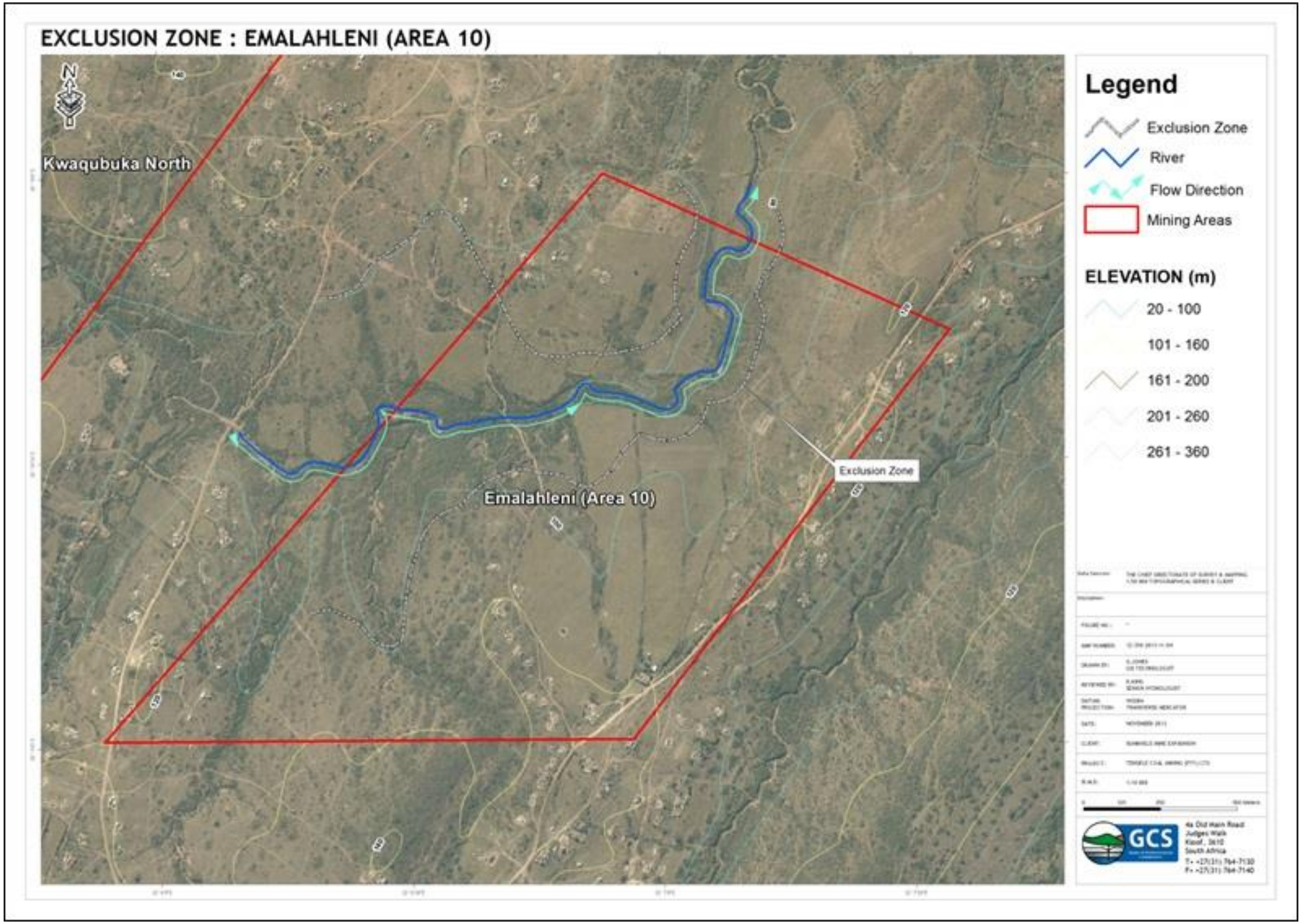



**Figure 2-45: Emalahleni Area Exclusion Zone**

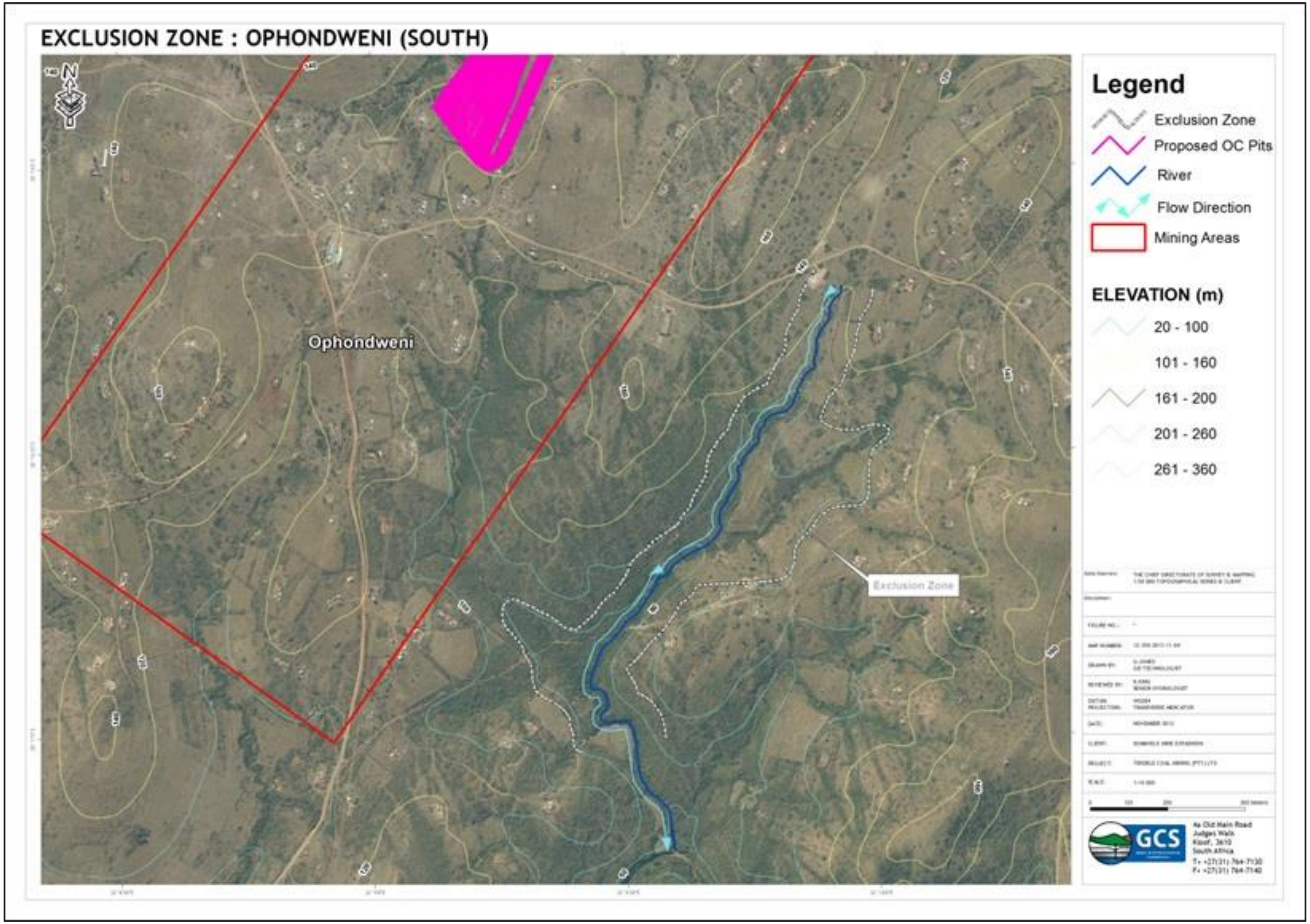



**Figure 2-46: Ophondweni Area Exclusion Zone**

## 2.10 Ground water

The information presented in this section is sourced from the Hydrological Assessment Report. This report is presented in APPENDIX B in its entirety.

### 2.10.1 Hydrocensus and Exploration borehole Survey

The hydrogeological baseline assessment for the proposed Somkhele mine expansion project was initiated by looking at available exploration borehole data. It can be seen from Table 2-41 that 150 percussion boreholes were drilled for mineral exploration purposes. It was decided to identify suitable boreholes at each proposed mining block that can be applied for further hydrogeological observations and not necessarily from newly drilled boreholes.

Table 2-42 supplies an overview of the borehole data per mining block and the localities of these can be viewed from Figure 2-47 to Figure 2-49.

**Table 2-41 Summary of the target generation percussion drilling program**

| DESCRIPTION | STATISTIC |
|---|---|
| Number of percussion holes (SPX) | 150 boreholes (SPX 066 – SPX216) |
| Meters drilled / Average hole depth | 17,812 m |
| Average SPX borehole depth | 118 m |
| Meters drilled per new strike | 2,226 m |

#### *2.10.1.1 Groundwater Use*

It can be seen from Table 2-42 that most of the boreholes that have been visited are exploration boreholes; only four community supply boreholes were visited:

- Two boreholes within the Mvutshini Area (CBH and CBH-Pump),
- One borehole within the Gwabalanda Area (GW3-GW), and
- One borehole within the Ophondweni Area (OP1-GW).

Refer to Appendix A of the Groundwater Report for the photo log of the community boreholes.

Limited groundwater supply boreholes exist due to the poor natural quality of groundwater within the area. Water for human consumption and agricultural purposes within the mining areas are either obtained from streams or newly installed governmental water reticulation system.

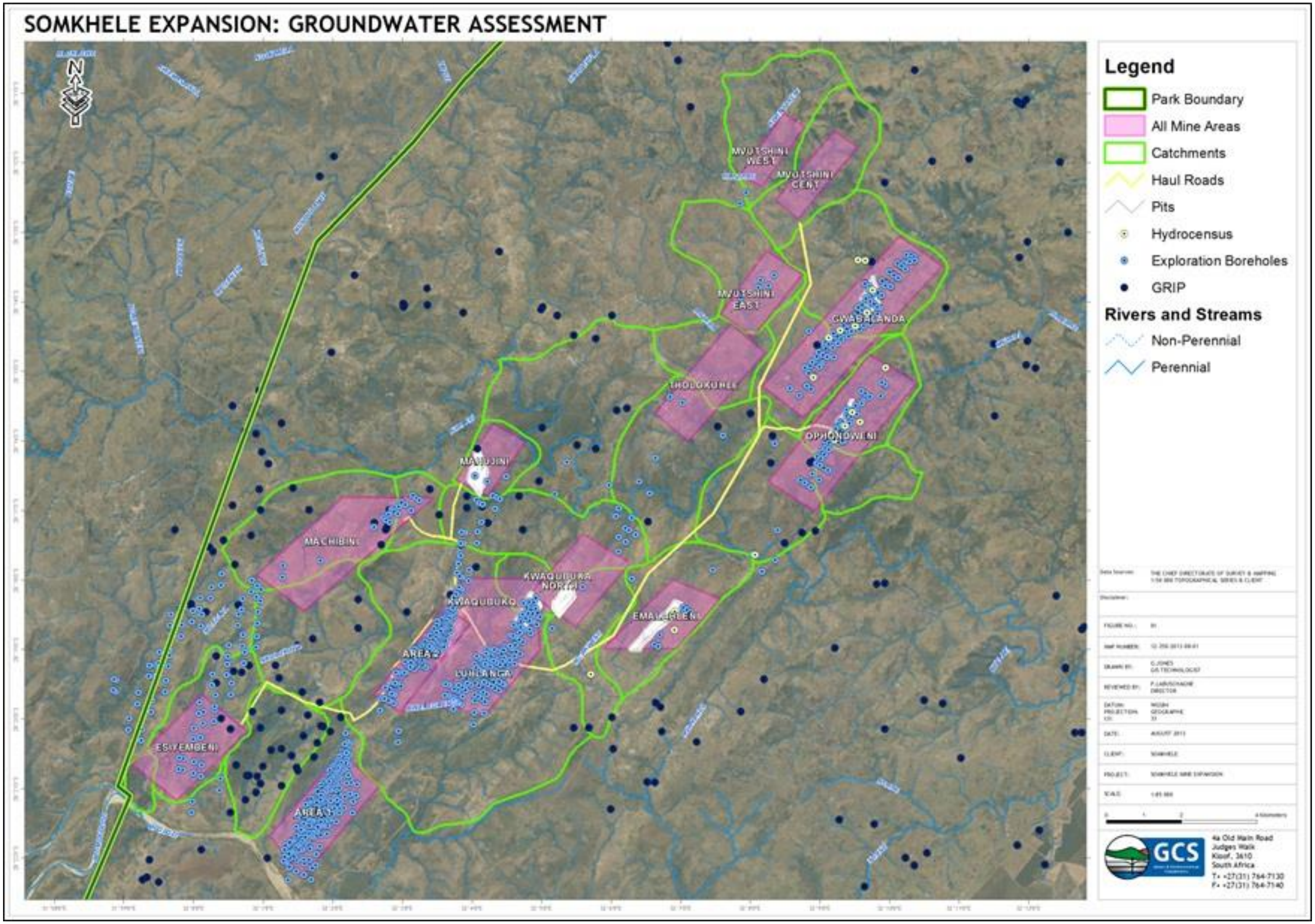



**Figure 2-47: Locality map of the identified boreholes within the Somkhele Area**

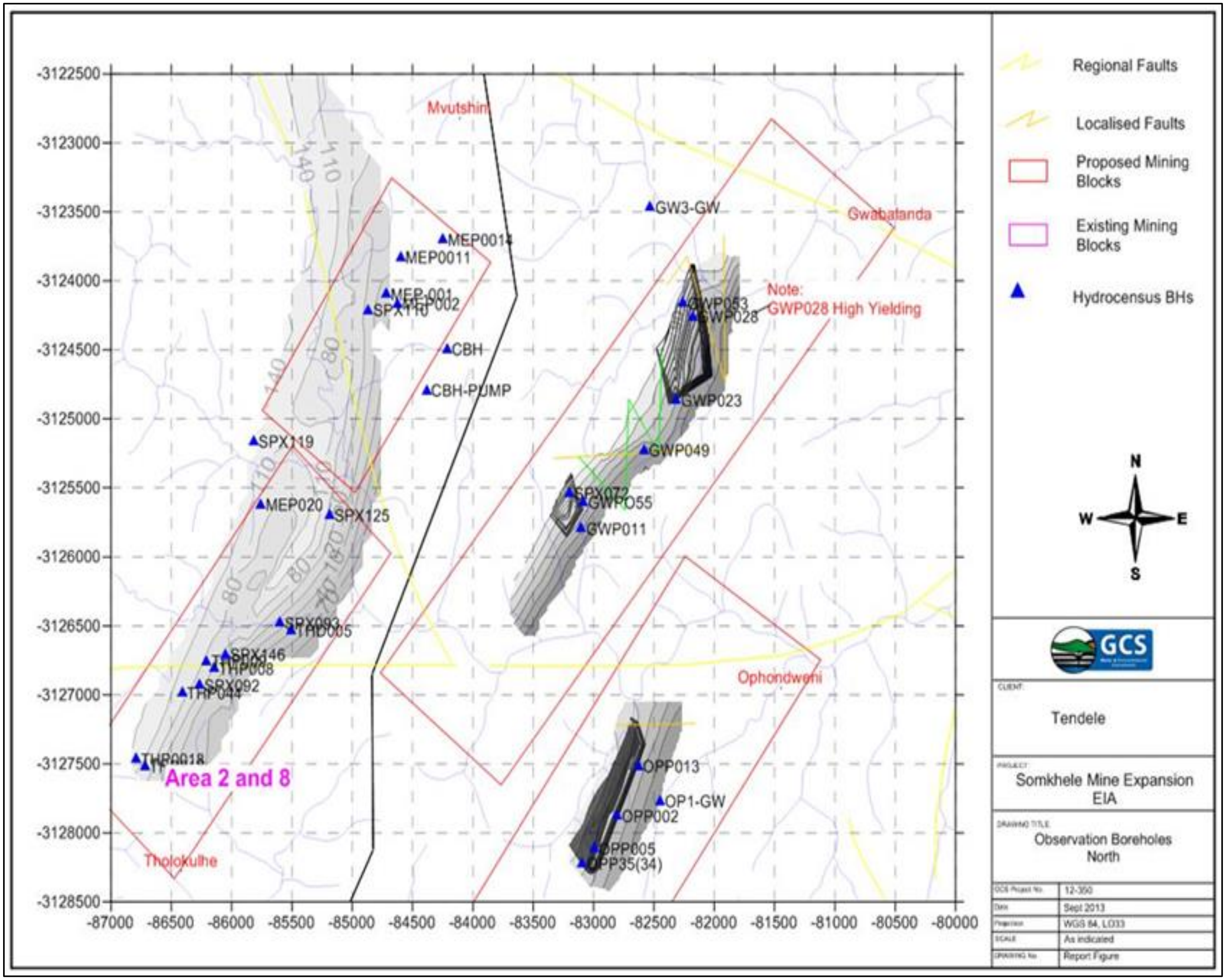



**Figure 2-48: Observation and test boreholes for the northern part of the project area**

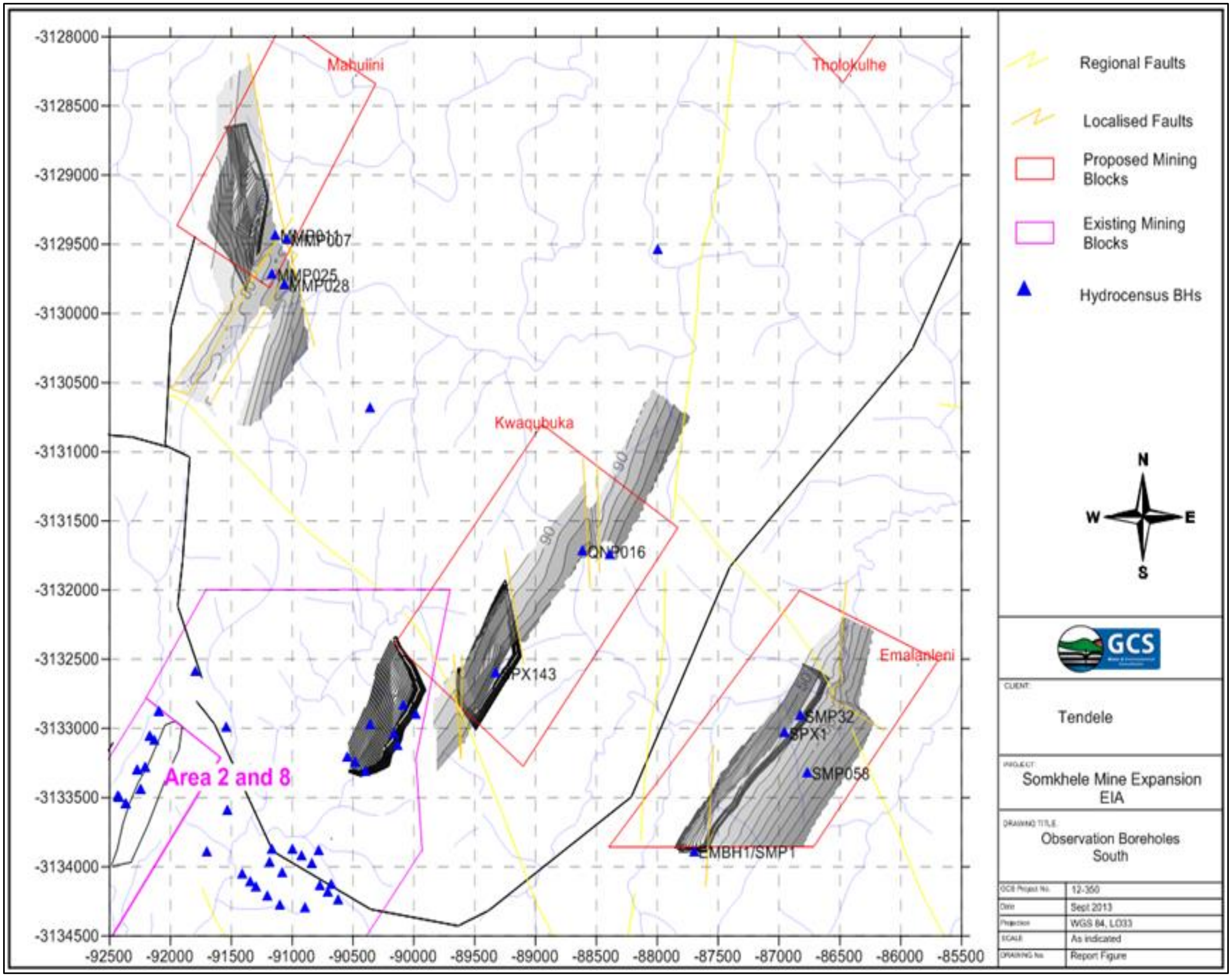



**Figure 2-49: Observation and test boreholes for the southern part of the project area**

**Table 2-42 Description of the Hydrocensus boreholes visited during the 2013 assessment**

| Borehole ID | X co-ord | Y co-ord | Elevation (mamsl) | WL (mbgl) | WL (mamsl) | Depth (m) | EC (mS/cm) | pH | Temp (˚C) | TDS (mg/l) | collar height (m) | Equipment | Use |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| OPHONDWENI AREA | | | | | | | | | | | | | |
| OP1-GW | -82450.34 | -3127774.37 | | | | | 161 | 7.23 | 24.8 | 800 | | | Community water supply |
| OPP35(34) | -83096.15 | -3128227.57 | 136.99 | 14.23 | 122.76 | 90 | 232 | 7.15 | 25.3 | 1160 | 0.3 | none | Exploration BH |
| OPP005 | -82997.92 | -3128119.23 | 162.04 | 6.75 | 155.29 | 149 | 273 | 6.91 | 24.4 | 1360 | 0.2 | none | Exploration BH |
| OPP002 | -82806.24 | -3127884.42 | 162.21 | 12.74 | 149.47 | 105 | 211 | 6.74 | 24.6 | 1050 | 0.3 | none | Exploration BH |
| OPP013 | -82631.98 | -3127521.73 | 155.73 | 8.7 | 147.03 | 101 | 550 | 6.78 | 24.9 | 2740 | 0.26 | none | Exploration BH |
| GWABALANDA AREA | | | | | | | | | | | | | |
| SPX072 | - 83202.044 | - 3125543.341 | 146.64 | 27.58 | 119.06 | 59 | 164 | 6.58 | 22.7 | 810 | 0.4 | none | Exploration BH |
| GWP053 | - 82262.577 | -3124169.21 | 102.78 | 20.31 | 82.47 | 65 | 220 | 7.04 | 23.5 | 1110 | 0.32 | none | Exploration BH |
| GWP011 | - 83102.016 | -3125801.5 | 125.32 | 15.08 | 110.24 | 150 | | | | | | none | Exploration BH |
| GWP049 | -82583.15 | - 3125232.928 | 141.89 | 17.4 | 124.49 | 162 | 155 | 7.04 | 23.3 | 770 | 0.32 | none | Exploration BH |
| GWPO55 | -83085.68 | -3125610.8 | 140.92 | 22.79 | 118.13 | 110 | | 0.75 | | | | none | Exploration BH |
| GWP023 | -82314.84 | - 3124871.636 | 131.86 | 16 | 115.86 | 122 | 170 | 7.06 | 23.6 | 780 | 0.3 | none | Exploration BH |
| GWP028 | - 82177.518 | - 3124264.331 | 111.07 | 17.9 | 93.17 | 86 | 274 | 6.88 | 23.7 | 1370 | 0.22 | none | Exploration BH |
| GW3-GW | - 82530.258 | -3123473.5 | 109.63 | N/A | N/A | N/A | 248 | 7.22 | 24.3 | 1240 | 0.9 | Pressure pump | community water supply |
| EMALAHLENI AREA | | | | | | | | | | | | | |
| SMP32 | - 86827.923 | - 3132918.872 | 91.37 | 9.6 | 81.77 | 81 | 992 | 6.67 | 24.9 | 5010 | 0.39 | none | Exploration BH |
| EMBH1/SMP1 | - 87700.694 | - 3133899.392 | 123.40 | 7.24 | 116.16 | N/A | 915 | 6.7 | 25.1 | 4570 | 0.4 | none | Exploration BH |
| SPX1 | - 86956.232 | - 3133043.767 | 95.52 | 13.61 | 81.91 | 85 | 654 | 6.9 | 25.1 | 3260 | 0.4 | none | Exploration BH |
| SMP058 | - 86771.263 | - 3133329.916 | 106.08 | 11.53 | 94.55 | 106 | 477 | 7.28 | 26.1 | 2390 | 0.41 | none | Exploration BH |
| MVUTSHINI EAST | | | | | | | | | | | | | |
| MEP0014 | - 84247.539 | -3123708.3 | 156.71 | 7.2 | 149.51 | 160 | 179 | 8.58 | 23.09 | 890 | 0.3 | none | Exploration BH |
| MEP0011 | - 84600.039 | -3123834.8 | 159.96 | 13.44 | 146.52 | 80 | 315 | 7.84 | 25 | 1580 | 0.3 | none | Exploration BH |
| MEP-001 | - 84721.813 | -3124104 | 160.02 | 19.22 | 140.80 | 110 | 295 | 7.78 | 24.6 | 1470 | 0.44 | none | Exploration BH |
| SPX110 | - 84865.313 | -3124217 | 149.38 | 35.66 | 113.72 | 143 | 217 | 7.78 | 24.6 | 1080 | 0.33 | none | Exploration BH |

| Borehole ID | X co-ord | Y co-ord | Elevation (mamsl) | WL (mbgl) | WL (mamsl) | Depth (m) | EC (mS/cm) | pH | Temp (˚C) | TDS (mg/l) | collar height (m) | Equipment | Use |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MEP002 | -84626.102 | -3124173 | 161.47 | 18.78 | 142.69 | 195 | 121 | 7.34 | 24.7 | 600 | 0.19 | none | Exploration BH |
| CBH | -84216.398 | -3124501.5 | 160.47 | N/A | N/A | N/A | 440 | 7.37 | 26 | 2200 | 0.9 | pressure pump | Community water supply |
| CBH-PUMP | -84386.07 | -3124798.8 | 153.83 | N/A | N/A | N/A | 426 | 7.9 | 25.1 | 2130 | 0.23 | engine pump | Community water supply |
| SPX119 | -85816.516 | -3125169.3 | 122.84 | 7 | 115.84 | 90 | 190 | 8.29 | 24.4 | 950 | 0.15 | none | Exploration BH |
| THOLOKUHLE AREA | | | | | | | | | | | | | |
| MEP020 | -85759.234 | -3125625.5 | 135.89 | 13.29 | 122.60 | 60 | 540 | 7.26 | 26.4 | 2740 | 0.32 | none | Exploration BH |
| SPX125 | -85187.43 | -3125703.3 | 119.53 | 6.38 | 113.15 | 130 | 152 | 8.78 | 28.04 | 750 | 0.36 | none | Exploration BH |
| THD005 | -85506.297 | -3126539 | 121.59 | 13 | 108.59 | 160 | 128 | 6.84 | 28.4 | 640 | 0.25 | none | Exploration BH |
| SPX093 | -85598.922 | -3126487.8 | 118.20 | 6.81 | 111.39 | 134 | 130 | 6.53 | 25.5 | 640 | 0.58 | none | Exploration BH |
| THP008 | -86146.156 | -3126815.3 | 145.55 | 20.7 | 124.85 | 110 | 379 | 7.44 | 26.7 | 1900 | 0.47 | none | Exploration BH |
| THP009 | -86206.422 | -3126760.3 | 146.70 | 22.21 | 124.49 | 90 | 271 | 7.26 | 30.5 | 1360 | 0.3 | none | Exploration BH |
| SPX146 | -86050.719 | -3126713.8 | 138.81 | 10.25 | 128.56 | 113 | 451 | 7.06 | 26.2 | 2250 | 0.24 | none | Exploration BH |
| SPX092 | -86264.023 | -3126938 | 159.84 | 9.82 | 150.02 | 127 | 146 | 7.53 | 26.5 | 730 | | none | Exploration BH |
| THP044 | -86408.883 | -3126991.3 | 160.77 | 15.5 | 145.27 | 157 | 144 | 7.8 | 27.5 | 720 | 0.28 | none | Exploration BH |
| THP016 | -86719.047 | -3127523.3 | 150.13 | 12.58 | 137.55 | 69 | 283 | 7.57 | 25.7 | 1420 | 0.26 | none | Exploration BH |
| THP0018 | -86791.055 | -3127472.8 | 146.46 | 14 | 132.46 | 40 | 112 | 7.89 | 25.5 | 550 | 0.27 | none | Exploration BH |
| MAHUJINI AREA | | | | | | | | | | | | | |
| MMP011 | -91139.141 | -3129444 | 141.23 | 13.82 | 127.41 | 165 | 380 | 7.54 | 23.7 | 1890 | 0.24 | none | exploration BH |
| MMP025 | -91165.422 | -3129726.8 | 131.41 | 26 | 105.41 | 86 | 296 | 7.34 | 24 | 1450 | 0.32 | none | exploration BH |
| MMP007 | -91048.617 | -3129476.5 | 135.67 | 23.72 | 111.95 | 78 | | | | | | none | exploration BH |
| MMP028 | -91066.711 | -3129803.5 | 120.77 | 17 | 103.77 | 124 | | | | | | none | exploration BH |
| KWAQUBUKA NORTH | | | | | | | | | | | | | |
| QNP016 | -88613.13 | -3131729.09 | 141.26 | 12.82 | 128.44 | 170 | 1088 | 7.01 | 25.7 | 5310 | 0.25 | none | Exploration BH |
| SPX143 | -89325.32 | -3132609.7 | 126.34 | 8.07 | 118.27 | 110 | | | | | 0.3 | none | Exploration BH |

### 2.10.2 DWA National Groundwater Database

The DWA National Groundwater Database (NGDB) was searched for available boreholes in the Somkhele areas. It can be seen from Figure 2-47 that a fair amount of data points exist for the project area. 349 Boreholes were located in the two relevant catchments, W23A and W32G; the following statistical data can be derived from the data set:

- 92 groundwater level readings were available; the average groundwater level is around 24 metres below ground level (mbgl) (refer to Figure 2-50);
- An 86% correlation between the topographical setting and the groundwater elevation or piezometric head occurs. This is an indication that groundwater mimics the topographical setting (refer to Figure);
- The average borehole yield is around 0.98 L/sec (refer to Figure 2-52).

It can be seen from Figure 2-53 that the average TDS is around 1888 mg/l and that the Na and Cl concentrations are fairly high.

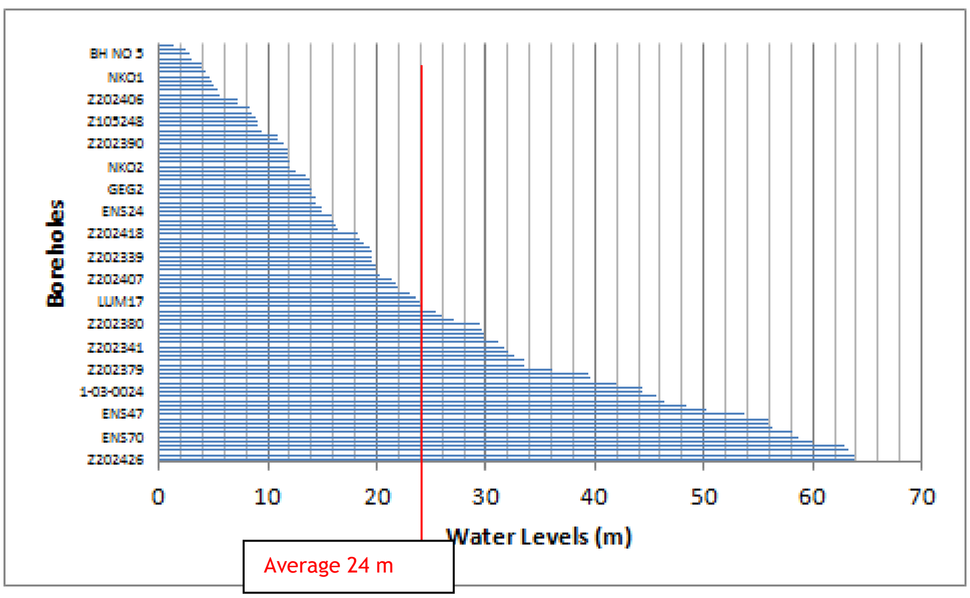



**Figure 2-50: Grip data groundwater level distribution graph**

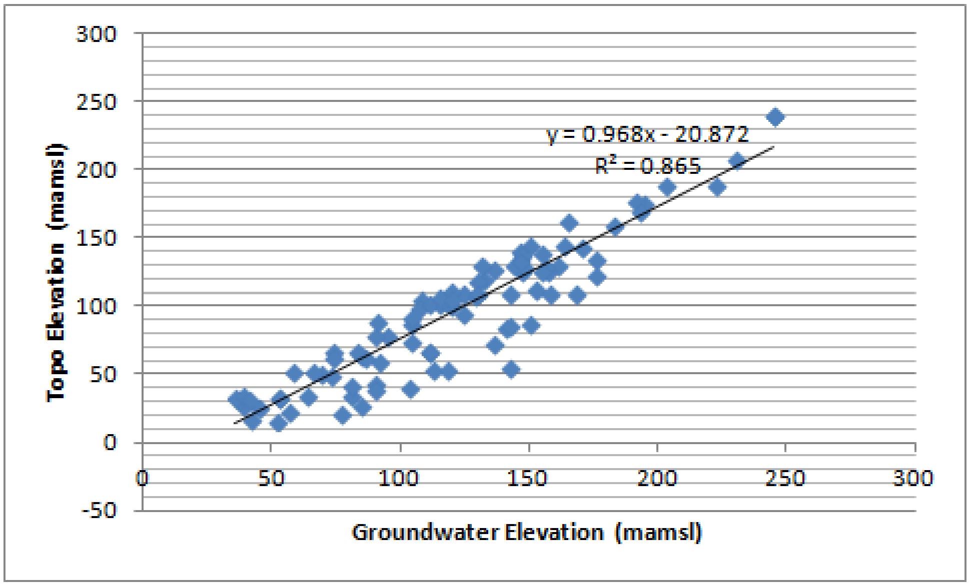



**Figure 2-51: Grip data groundwater elevation and topographical correlation graph**

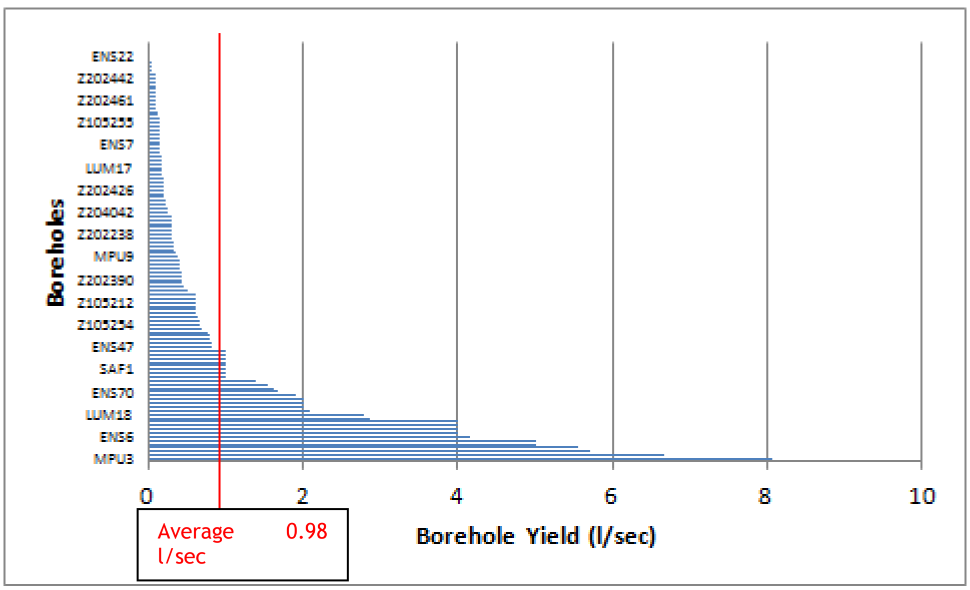



**Figure 2-52: Grip data borehole yield distribution graph**

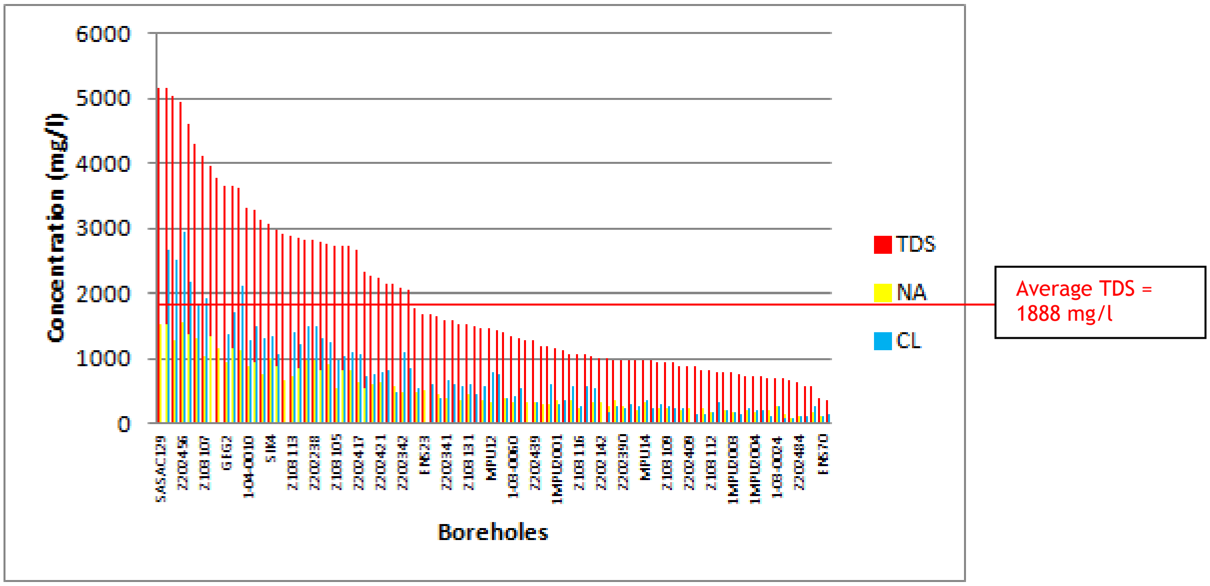



**Figure 2-53: Grip data groundwater quality distribution graph**

### 2.10.3 Aquifer Description

Recorded water strikes for the Karoo aquifers (intersection of aquifers) vary between 12 to 102 mbgl. Distinction was made between two aquifers in the area; the one overlying the other, with some interaction between the two. However, the interaction was limited and it was still possible to distinguish individual groundwater depth trends:

- The average depth of weathering in the Karoo rocks is ±11 m, with recorded weathering up to 25 m deep. Most water strikes were encountered below the weathered zone. It can be assumed that weathered aquifers are of minor importance (from an aquifer supply point of view), especially in the higher ridges. **Perched weathered aquifers** are likely to form during wet periods and shallow wells have been reported in the lower lying areas, close to streams (outside the mining area).
- The groundwater within the **deeper fractured rock aquifer** occurs within discrete zones, due to secondary processes such as fracturing, faulting and contact metamorphism along intrusive rock contacts. These aquifers, with the exception of regional faults, normally have a limited extent and interconnectivity. Borehole blow yields from fractured aquifers in this area were highly variable, ranging from dry to 2.5 l/s.

Most groundwater occurrences were associated with semi-weathered fracturing. Along the Mfolozi, a well-developed floodplain exists that is used for small-scale subsistence crops by the local residents. The thickness of the alluvium at the floodplain is 20 to 30 meters (m), and it can be a good primary aquifer due to the connection with the river.

### 2.10.4 Aquifer Parameters

The recharge from rainfall ranges between 0.5% and 2.5% of the MAP (808 mm/a) for Karoo rock aquifers.

Transmissivity values were calculated from aquifer tests performed on monitoring boreholes in the existing Areas 1, 2 and 8 and ranged from 9 to 0.06 $m^2$/day. The geometric mean transmissivity, for the tested boreholes in Karoo rock, is 0.6 $m^2$/day and was representative of the fractured aquifers. It was assumed that the transmissivity values of the weathered aquifers would be in the same order. If a 10 m aquifer zone is considered, hydraulic conductivity values can be assumed to be between 0.9 and 0.006 m/day. If an aquifer thickness of 40 m is considered, the hydraulic conductivity is 0.0015 m/day.

Typical hydraulic conductivity values for the sediments are highly variable and values range from 1 – 20 m/day.

Storativity values were between $5x10^{-3}$ to $5x10^{-4}$ for Karoo rock aquifers.

### 2.10.5 2013 Pump Testing

The results of the tests are shown in Table 2-43 and the test graphs in Appendix B of the Groundwater Report.

It can be seen from the available data that the hydraulic permeability corresponds with normal Karoo Aquifer type hydraulic parameters but also with the tests previously completed within the Somkhele area. The hydraulic conductivity (K) values range between 0.5 to 0.0017 m/day if a 20 m aquifer thickness is used.

It can be seen from Table 2-43 that borehole GWP028, within the proposed Gwabalanda Pit, was pumped for approximately four hours at a rate of 1.5 l/sec and that only 1 m drawdown was achieved. It is fair to assume that a high yielding zone exists along the identified geological structure in this area, which is a north south striking localised fault zone. These higher yielding zones are not the norm but may occur along geological structures and usually along deeper zones. These higher yielding zones may have an out of the norm effect on groundwater inflows and pit stabilities.

**Table 2-43 Overview of the Somkhele Aquifer tests data**

| BH. ID | STUDY AREA | DATE | STATIC WL (MBGL) | TIME PUMPED (MIN) | PUMP TO LEVEL (M) | REC TO (M) | TIME REC (MIN) | % REC | T ($M^2$/DAY) | K (M/DAY) (20M ZONE) | S-VALUE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| GWP011 | Gwabalanda | 24/09/2013 | 15.08 | 35 | 56.73 | 17.59 | 660 | 94 | 0.3511 | 0.0176 | 0.0001 |
| GWP055 | Gwabalanda | 24/09/2013 | 22.79 | 50 | 52.44 | 24 | 300 | 97 | 0.5536 | 0.0277 | 0.0036 |
| GWP028 | Gwabalanda | 25/09/2013 | 18.11 | 35 | 19.21 | 18.40 | 230 | 74 | 9.173 | 0.4587 | 1.1920 |
| GWP023 | Gwabalanda | 25/09/2013 | 15.69 | 40 | 44.65 | 19.35 | 150 | 87 | 0.4858 | 0.0243 | 0.0001 |
| OPP013 | Ophondweni | 01/10/2013 | 9.10 | 20 | 32.00 | 13.40 | 120 | 81 | 0.455 | 0.0228 | 0.0003 |
| OPP005 | Ophondweni | 01/10/2013 | 6.85 | 30 | 42.53 | 8.50 | 1080 | 95 | 0.05274 | 0.0026 | 0.0020 |
| QNP016 | Kwaqubuka N | 05/10/2013 | 12.82 | 70 | 23.47 | 15.68 | 160 | 73 | 1.508 | 0.0754 | 0.0007 |
| SPX143 | Kwaqubuka N | 05/10/2013 | 8.07 | 25 | 22.22 | none | | | 0.8125 | 0.0813 | 0.0222 |

Table 2-44Table 2-44 Aquifer Test data for the 2001 Area 2 boreholes and EIA supplies the data as obtained during the 2001 aquifer testing for the Area 2 hydrogeological assessment. It can be seen that the data correlates with the recently completed tests. Boreholes SM6 and SM9 have relatively higher transmissivity values compared to the other boreholes. SM6 is associated with a northeast- southwest trending fault zone and SM9 is associated with a northwest-southeast trending lineament (fault).

**Table 2-44 Aquifer Test data for the 2001 Area 2 boreholes and EIA**

| Borehole No | Borehole depth | Water strike depth | Test pump duration | Pumping rate | Final drawdown | Transmissivity | |
|---|---|---|---|---|---|---|---|
| | | | | | | Constant rate | Recovery |
| | *m* | *mbgl* | *minutes* | *l/s* | *m* | *$m^2$/day* | |
| SM1 | 60 | 31, 38 | 110 | 0.6 | 42.6 | 0.25 | 0.4 |
| SM2 | 60 | 25, 56 | 210 | 0.6 | 44.35 | 0.35 | 0.5 |
| SM3 | 60 | 30, 56 | 70 | 0.6 | 53.19 | 0.2 | 0.7 |
| SM4 | 60 | 30, 52 | 360 | 0.6 | 24.35 | 0.7 | 0.6 |
| SM6 | 60 | 25, 50 | 360 | 0.6 | 6.2 | 4 | 3 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| SM7 | 60 | 30 | 180 | 0.6 | 55.9 | 0.1 | 0.5 |
| SM8 | 40 | 12, 25 | 35 | 0.6 | 35.26 | 0.25 | 0.5 |
| SM9 | 40 | 31, 38 | 300 | 0.6 | 7.8 | 2.7 | 2 |

### 2.10.6 Groundwater Levels

The average groundwater level, measured from the 38 boreholes visited during the field work phase, is around 15 mbgl (refer to Figure 2-54). Plotting groundwater level versus the topographical elevation at each observation point yields an 88 % correlation (Refer to Figure 2-55). This correlation suggests that groundwater follows topography in the area.

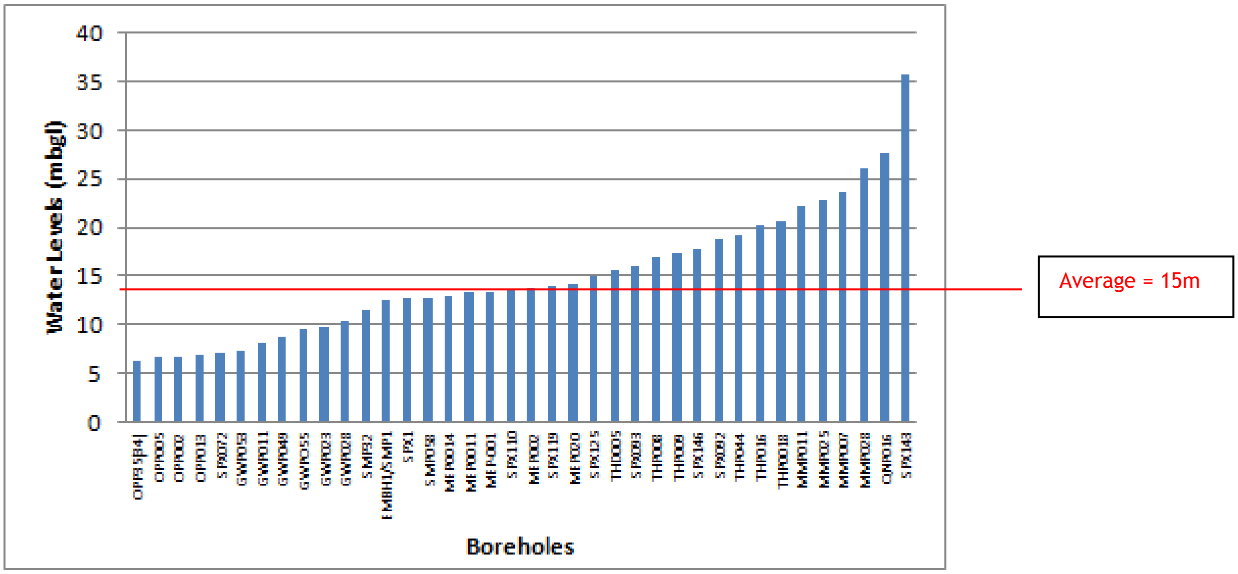



**Figure 2-54: Groundwater level distribution graph for the Somkhele boreholes**

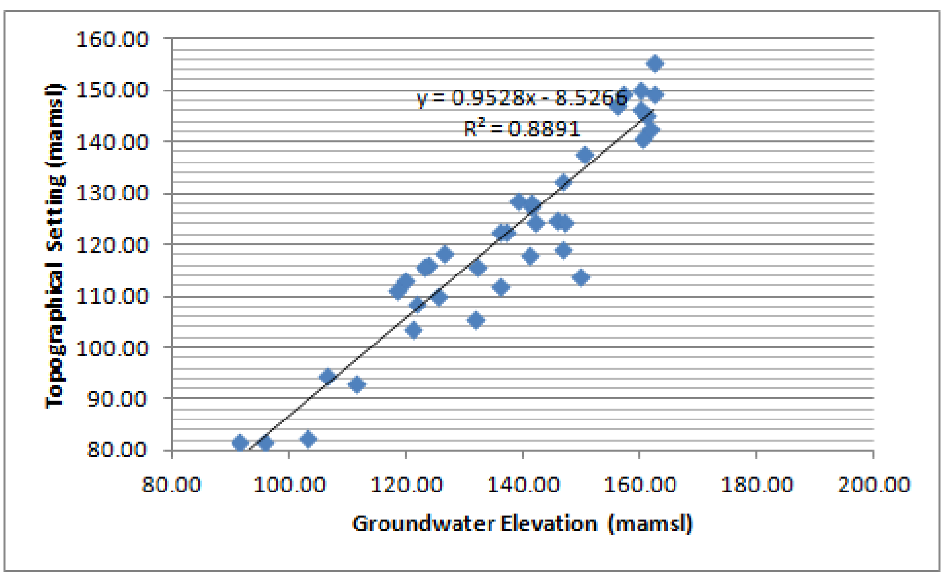



**Figure 2-55: Correlation between surface elevation and groundwater elevation for the Somkhele Area**

The groundwater gradient for the site was calculated by using randomly selected boreholes. Moderate groundwater gradients occur across the proposed mining site; gradient factors range from 1:10 to 1:50 (0.02), depending on the topographical setting of a given area.

### 2.10.7 Groundwater Flow

The following highlights important aspects related to groundwater flow for the existing Area 1, Area 2 and Area 8 pit areas:

- A linear correlation exists between the surface elevations and groundwater elevations. This relationship suggests that the groundwater levels more or less mimic the topographic surface. Groundwater flow directions also tend to be from topographically higher areas towards lower lying areas;
- The depth to groundwater level in the boreholes in Area 1 was between 9 to 37 mbgl with an average value of 20 mbgl;
- The depth to groundwater level varied between 2 to 20 mbgl for Area 2; and
- The depth to groundwater level varied between 6 to 26 mbgl for Area 8.

### 2.10.8 Aquifer Classification

The site is situated on low to medium yielding aquifers. These aquifers have no to low potential in terms of development due to the low yield. The aquifers are of minor regional importance in terms of community water supply and can therefore be classified as a **Minor Aquifer System** according to the Parsons Classification methods (WRC, 1995). However, for certain farms and smaller communities it is the sole source of water.

### 2.10.9 Water Quality

Groundwater quality was assessed in order to obtain an idea of the pre-mining and ambient groundwater quality and current status.

A total of 20 water samples were collected during the field investigations, of these five samples represent surface water bodies and 15 from groundwater. The results of the chemical analyses are summarised in Table 2-45 and compared to the 1996 DWA standards for Domestic Use; the following can be observed from the table:

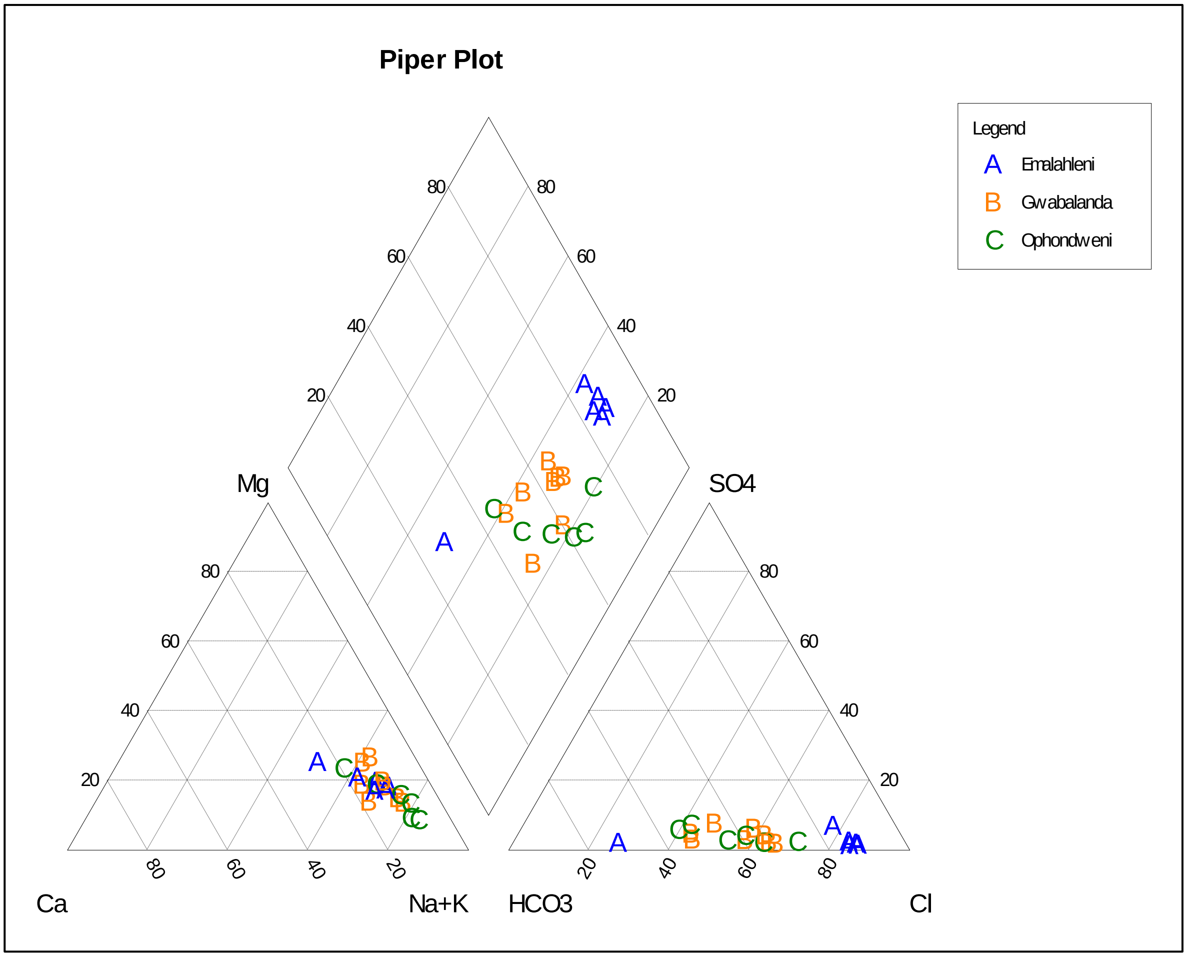
- Sodium and chloride are high in almost all the samples which results in high EC and TDS;

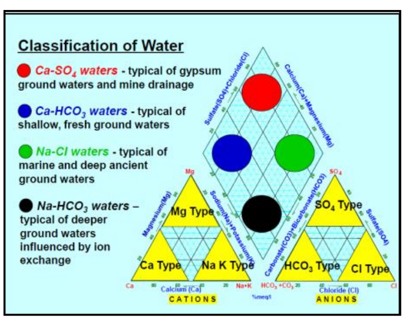
- Neutral pH with very low sulphate and iron occur; and
- The table supplies an average, low and high range statistical data; these can be applied as a pre-mining reference or ambient condition for future comparison purposes.

Table 2-46 supplies the original pre-mining water qualities prior to mining in Area 2, as per 2001 initial field work.

It is critical that these sites be visited again approximately 2 to 3 months prior to any construction. Other regional boreholes must be added to the list as per the updated infrastructure plans to ensure that a proper and sound database is developed for the regional groundwater environment.

The groundwater quality character is shown graphically in the form of a Piper diagram in Figure 2-56, see insert to the right for an explanation of typical water types. The groundwater quality is generally poor with dominant sodium and chloride facies which is typical of the area.


Piper Plot
Legend
A Emalahleni
B Gwabalanda
C Ophondweni
Mg
SO4
Ca
Na+K
HCO3
Cl
80
60
40
20


Classification of Water
Ca-SO4 waters - typical of gypsum ground waters and mine drainage
Ca-HCO3 waters - typical of shallow, fresh ground waters
Na-Cl waters - typical of marine and deep ancient ground waters
Na-HCO3 waters – typical of deeper ground waters influenced by ion exchange
Mg Type
Ca Type
Na K Type
SO4 Type
HCO3 Type
Cl Type
CATIONS
ANIONS

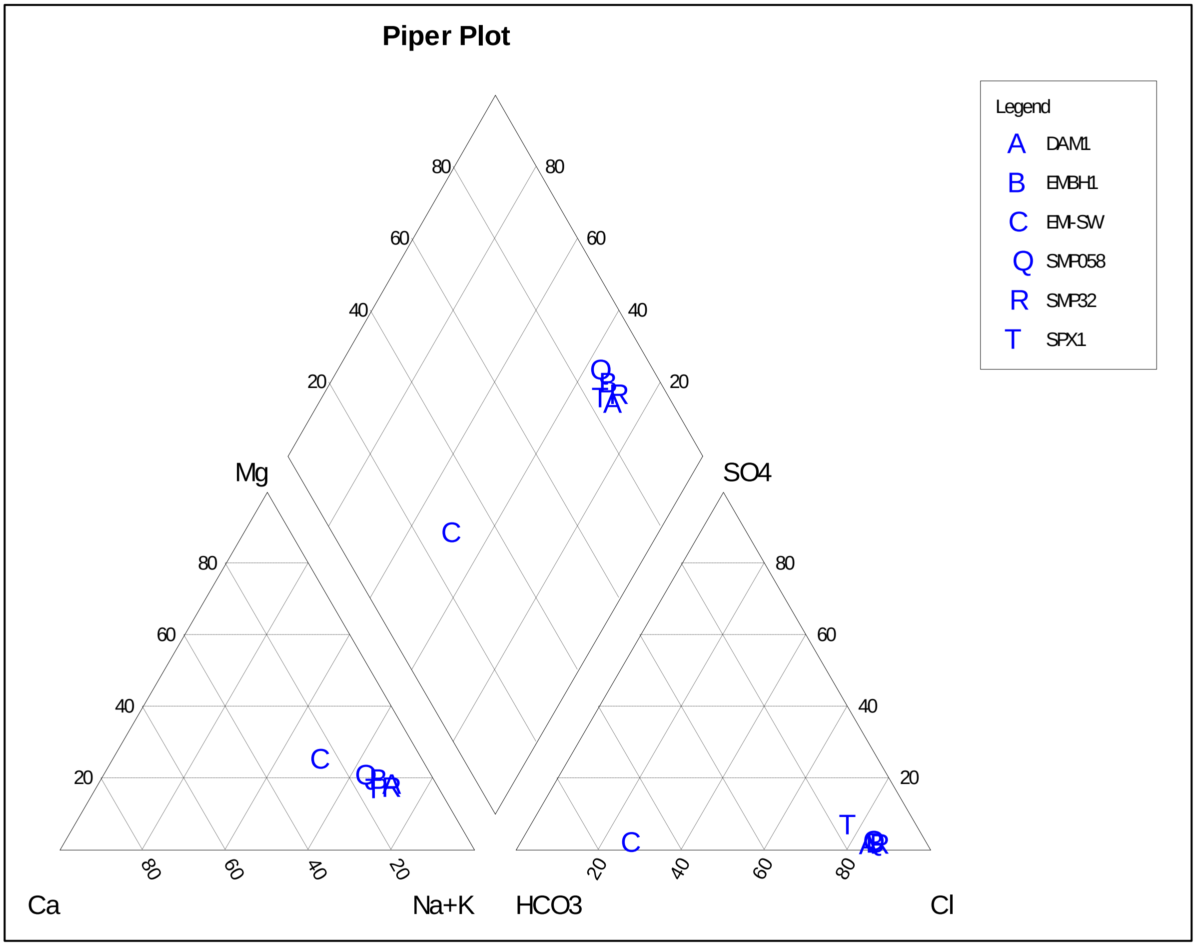



**Figure 2-56: Piper diagram for the Somkhele data**

**<u>Factors that have resulted in the hydrochemical character of the area</u>**

The high-mineralised chloride groundwater of the area is the result of various causes, including the following:

- Cyclic salts have been carried from the Indian Ocean inland by prevailing winds, resulting in saline groundwater recharge. Salt spray is seen as the major reason for high salinities by Van Wyk (1963);
- Paleo seawater ingresses: – Groundwater of the area was influenced by seawater intrusions during the Neogene and Quaternary periods. Dilution of groundwater has since taken place; and
- Hydrogeology: - Solubility tests indicate that not all of the salinity is resultant from weathered aquifer rocks. Potential soluble chloride concentrations from rock samples are low (less than 100 mg/l). Sodium is the dominant soluble constituent from powdered rock samples. Primary and/or secondary minor salt (gypsum, halite) containing layers within the area can, however,

not be excluded.

The fact that the average Cl/Na ratios are between 3 to 4, suggests relatively older water. Cl/Na ratios of seawater are normally around 1. Sodium removal and/or chloride enrichment thus took place with time.

Chloride, with no dominant major cation type water, discussed above, probably resulted where sodium-chloride water has undergone reverse ion exchange due to the concentration charge effect. Sodium is exchanged for calcium and magnesium, resulting in sodium not being the dominant cation.

**Water compliance to different uses**

Groundwater is mainly used for small-scale domestic purposes (washing, etc.). The chemical constituents in Table 2-45, which exceeds target values of the South African Water Quality Guidelines (SAWQG) for domestic use (DWA, 1996) are highlighted. Those constituents that are unsuitable for human consumption are also highlighted, since domestic use target values are not necessarily drinking standards. Most of the water samples are not suitable for human consumption.

The water has some potential for stock watering (normally obtained from surface water sources), and target values for stock watering (SAWQG, DWA) are also included.

**Table 2-45 Groundwater quality data for the Somkhele Area**

| Station ID | Date Sampled | pH | EC | Ca | Mg | Na | K | Cl | SO4 | NO3-N | Fe | Mn | HCO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | mS/cm | mg/l | | | | | | | | | |
| OP2-SW | Jul-13 | 8.2 | 120.0 | 47.0 | 35.0 | 161.0 | 3.8 | 186.0 | 36.0 | <0.1 | 0.04 | <0.001 | 436.0 |
| GW1-SW | Jul-13 | 8.6 | 155.0 | 27.0 | 41.0 | 182.0 | 2.8 | 266.0 | 56.0 | <0.1 | 0.06 | <0.001 | 421.0 |
| EMI-SW | Jul-13 | 8.0 | 69.7 | 43.0 | 27.0 | 99.0 | 5.7 | 79.0 | 7.7 | <0.1 | 0.04 | <0.001 | 357.0 |
| GW2-SW | Jul-13 | 8.6 | 127.0 | 41.0 | 47.0 | 216.0 | 5.6 | 211.0 | 30.0 | <0.1 | 0.07 | 0.00 | 428.0 |
| DAM1 | Jul-13 | 9.0 | 161.0 | 35.0 | 38.0 | 281.0 | 4.8 | 461.0 | 9.4 | 0.1 | 0.04 | 0.01 | 127.0 |
| OP1 | Jul-13 | 8.1 | 150.0 | 49.0 | 42.0 | 287.0 | 1.5 | 240.0 | 55.0 | 5.2 | 0.009 | 0.03 | 494.0 |
| GW3 | Jul-13 | 8.2 | 233.0 | 59.0 | 58.0 | 425.0 | 1.8 | 564.0 | 19.9 | 0.1 | 0.007 | 0.02 | 468.0 |
| SMP32 | Jul-13 | 7.5 | 1027.0 | 239.0 | 222.0 | 1726.0 | 10.3 | 2889.0 | 65.0 | | 0.003 | | 656.0 |
| EMBH1 | Jul-13 | 7.5 | 933.0 | 241.0 | 226.0 | 1479.0 | 6.9 | 2485.0 | 67.0 | | <0.001 | | 585.0 |
| SPX1 | Jul-13 | 7.9 | 667.0 | 183.0 | 132.0 | 1009.0 | 10.3 | 1674.0 | 199.0 | | <0.001 | | 552.0 |
| SMP058 | Jul-13 | 8.0 | 490.0 | 153.0 | 116.0 | 660.0 | 3.4 | 1268.0 | 47.0 | | 0.350 | | 345.0 |
| SPX072 | Jul-13 | 7.3 | 161.0 | 33.0 | 36.0 | 239.0 | 3.4 | 314.0 | 28.0 | | 0.001 | | 290.0 |
| GWP053 | Jul-13 | 7.9 | 220.0 | 70.0 | 48.0 | 311.0 | 5.6 | 446.0 | 20.0 | | 0.003 | | 399.0 |
| GWP049 | Jul-13 | 8.1 | 152.0 | 25.0 | 23.0 | 249.0 | 2.1 | 259.0 | 16.6 | | 0.020 | | 299.0 |
| GWP023 | Jul-13 | 8.4 | 154.0 | 29.0 | 27.0 | 260.0 | 2.2 | 212.0 | 18.5 | | <0.001 | | 422.0 |
| GWP028 | Jul-13 | 7.9 | 276.0 | 95.0 | 46.0 | 433.0 | 2.9 | 532.0 | 74.0 | | 0.010 | | 549.0 |
| OPP35 | Jul-13 | 8.0 | 230.0 | 41.0 | 24.0 | 406.0 | 3.5 | 427.0 | 40.0 | | 0.010 | | 493.0 |
| OPP005 | Jul-13 | 7.7 | 273.0 | 39.0 | 26.0 | 483.0 | 2.6 | 561.0 | 24.0 | | 0.006 | | 538.0 |
| OPP002 | Jul-13 | 8.2 | 210.0 | 35.0 | 38.0 | 346.0 | 0.9 | 376.0 | 25.0 | | 0.003 | | 527.0 |
| OPP013 | Jul-13 | 8.3 | 558.0 | 80.0 | 87.0 | 980.0 | 3.5 | 1283.0 | 55.0 | | <0.001 | | 816.0 |
| *Average* | | *8.1* | *318.3* | *78.2* | *67.0* | *511.6* | *4.2* | *736.7* | *44.7* | *1.8* | *0.042* | *0.016* | *460.1* |
| *High Range* | | *9.0* | *1027.0* | *241.0* | *226.0* | *1726.0* | *10.3* | *2889.0* | *199.0* | *5.2* | *0.4* | *0.0* | *816.0* |
| *Low Range* | | *7.3* | *69.7* | *25.0* | *23.0* | *99.0* | *0.9* | *79.0* | *7.7* | *0.1* | *0.0* | *0.0* | *127.0* |
| | | pH | EC | Ca | Mg | Na | K | Cl | SO4 | NO3 as N | Fe | Mn | |
| Class 0 Limits | | 5 - 9.5 | 70 | 80 | 70 | 100 | 25 | 100 | 200 | 6 | 0.5 | 0.05 | |
| Class 1 Limits | | 4.5 - 10 | 150 | 150 | 100 | 200 | 50 | 200 | 400 | 10 | 1 | 1 | |
| Class 2 Limits | | 4 - 10.5 | 370 | 300 | 200 | 400 | 100 | 600 | 600 | 20 | 5 | 5 | |
| Class 3 Limits | | 3 -- 11 | 520 | >300 | 400 | 1000 | 500 | 1200 | 1000 | 40 | 10 | 20 | |
| Class 4 Limits | | 3 -- 11 | >520 | | >400 | >1000 | >500 | >1200 | >1000 | >40 | >10.0 | >20 | |

**Table 2-46 Hydrochemical data from mine monitoring boreholes -June 2001**

| | Units | SAWQG: Domestic use | | SAWQG: Stock watering | SM1 | SM2 | SM3 | SM4 | SM6 | SM7 | SM8 | SM9 | *Average* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Target value | Limit: human consumption | Target value | | | | | | | | | |
| Total Dissolved Solids | mg/l | *<450* | *<2400* | *<3000* | 2612 | 1078 | 3666 | 1362 | 2442 | 2076 | 3140 | 3088 | *2433* |
| Conductivity | mS/cm | *<70* | *<375* | *NA* | 467 | 176.8 | 630 | 241 | 463 | 380 | 589 | 561 | *438* |
| pH value | pH units | *6 - 9* | *<3.5, >10.5* | *NA* | 7.86 | 8.02 | 7.57 | 7.76 | 7.78 | 7.68 | 8.09 | 8.06 | *8* |
| Sodium as Na | mg/l | <100 | <400 | <2000 | 357 | 129 | 392 | 376 | 335 | 241 | 436 | 390 | 332 |
| Potassium as K | mg/l | <50 | <100 | NA | 3.96 | 1.34 | 12.3 | 2.17 | 3.56 | 4.41 | 11.4 | 7.45 | 6 |
| Calcium as Ca | mg/l | <32 | <300 | <1000 | 78 | 89.6 | 212 | 64.8 | 77.1 | 75.7 | 97.2 | 105 | 100 |
| Magnesium as Mg | mg/l | <30 | <200 | <500 | 91.9 | 77.2 | 155 | 52.1 | 87.8 | 92.9 | 141 | 147 | 106 |
| Total Alkalinity as CaCO3 | mg/l | NA | NA | NA | 844 | 448 | 510 | 456 | 705 | 634 | 668 | 572 | 605 |
| Chloride as Cl | mg/l | <100 | <600 | <3000 | 1110 | 217 | 1825 | 351 | 1225 | 830 | 1425 | 1595 | 1072 |
| Sulphate as SO4 | mg/l | <200 | <600 | <1000 | 14.7 | 40 | 24 | 32 | 37.3 | 48 | 40 | 45.3 | 35 |
| Fluoride as F | mg/l | <1 | <1.5 | <6 | 0.44 | 0.23 | 0.1 | 0.36 | 0.31 | 0.28 | 0.07 | 0.03 | 0.23 |
| Nitrate + Nitrite as N | mg/l | <6 | <20 | <100 | 0.14 | 23.5 | 0.5 | 1.3 | 0.17 | 0.34 | 0.3 | 0.24 | 3.31 |
| Iron as Fe | mg/l | <0.1 | <5 | <10 | <0.01 | <0.01 | 0.61 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Manganese as Mn | mg/l | <0.05 | <4 | <10 | 0.13 | <0.01 | 0.61 | <0.01 | 0.19 | <0.01 | 0.37 | 0.26 | 0.31 |
| Aluminium as Al | mg/l | <0.15 | NA | <5 | <0.01 | <0.01 | 0.03 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Copper as Cu | mg/l | <0.5 | <2 | <1 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Zinc as Zn | mg/l | <3 | <50 | <20 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |

| | |
|---|---|
| (grey) | Exceeding the Target Values set for the SAWQG for Domestic Use (DWAF, 1996) |
| (pink) | Not suitable for human consumption |
| TEXT | Exceeding the Target Values set for the SAWQG for Live Stock Watering (DWAF, 1996) |

## 2.11 Visual Assessment

### 2.11.1 Topography

The topography of both the proposed Eastern and Western pit areas are characterized as being hilly with continuously undulating hills. The elevation range of the Eastern pit areas is between 200 metres above mean sea level (mamsl) to 80 mamsl. The elevation range of the Western pit areas is between 220 mamsl to 60 mamsl. The land comprises a complex assemblage of moderately steep to steep-sided valleys interspersed with higher lying ridges and koppies (Refer to Photo 2.8 and Photo 2.9).

Photo 2.8 Topography, looking in an easterly direction

Photo 2.9 Topography, looking in a westerly direction.

### 2.11.2 Vegetation

The footprint areas fall within the Savannah biome, with two bioregions, namely the Northern Zululand Sourveld and Zululand Lowveld falling with the immediate project area. The presence of bushveld, dense thickets within this biome can act as a natural screen, however the open grasslands do mean that visual intrusions are more visible due to the lack of high screening vegetation (Refer to Photo 2.9).

The surrounding area falls within the Savannah Biome (Northern Zululand Sourveld and Zululand Lowveld) which is predominantly low to moderate screening vegetation types, with low level savannah grasslands, bushveld, thickets and small trees (Refer to

Photo 2.10 &

Photo 2.11)

**Photo 2.10 Vegetation of the Eastern Pits and surrounding areas**

**Photo 2.11 Vegetation (large trees) and agricultural clearings**

## 2.12 Sense of Place

Central to the concept of sense of place is that the landscape requires uniqueness and distinctiveness. 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 footprint areas are located within rural tribal land that is comprised of small houses varying in colour, shape and building material, adding to the uniqueness of the area. The rural ruggedness of the study area characterized by gently undulating landscape of grasslands, with sparsely scattered trees give the area a strong medium of place (refer to photo **Photo 2.12**).

Photo 2.12 Sense of Place: Rural homestead and subsistence farming

### 2.12.1 Visual Quality and Character

#### *2.12.1.1 Tourism Value and Scenic Value*

The footprint areas are not major tourism areas, however the surrounding area contributes to tourism. Well-known tourist destinations in the vicinity are the Hluhluwe/Umfolozi Game Parks and the Isimangaliso Wetland Park (Lake St Lucia).

The R618, linking the Hluhluwe/Mfolozi Game Park to Mtubatuba, falls within 0 – 2km of the proposed opencast pit areas, which is used by tourists to access Hluhluwe/Mfolozi Game Park. This is the main access to the Hluhluwe/Umfolozi Game Park from the N2 north of Durban.

### 2.12.2 The Visual Analysis

This section describes the aspects which have been considered in order to determine the intensity of the visual impact on the area. The criteria includes the area from which the footprint areas can be seen (the viewshed), the viewing distance, the capacity of the landscape to visually absorb structures and forms placed upon it (the visual absorption capacity), and the appearance of the project from important or critical viewpoints (sensitivity).

#### *2.12.2.1 The Viewshed*

A viewshed analysis is carried out to define areas, which contain all possible observation sites from which the proposed infrastructure would be visible. The visibility analysis considers the worst-case scenario, using line-of-sight i.e. ignoring trees and other structures and is based on topography alone. This assists the process of identifying possible affected viewers and the extent of the affected environment.

Two 'single-analysis' viewshed were conducted for each of the footprint areas:

Figure 2-57: Eastern Opencast Pits Viewshed Map spatially depicts the viewshed area and the areas which have direct visibility of the proposed Eastern pits. A single analysis viewshed of the Eastern opencast pit footprint area was used, meaning that the figure shows all the points from which the proposed opencast pit can be seen (incorporating an offset height of 0m [as the pit will not extrude from the surface terrain] for the opencast pit, and an offset height of 2m for observation points).

The viewshed indicates that the opencast pit is visible to areas that have higher elevations than the site of the opencast pit within all three ranges of 0 - 2km, 2 - 5km and 5 - 10km. Terrain screening acts throughout the zone of influence to limit the visual exposure to the north east of the pit, throughout the valleys of the zone of influence, and in areas where the elevation is below that of the pits.

The viewshed also indicates that the proposed Eastern pits will be visible from residents within all three ranges of 0 -2km, 2 – 5km and 5 – 10km of the potential zone of influence.

Figure 2-58: Western Opencast Pit Viewshed Map spatially depicts the viewshed area and the areas which have direct visibility of the proposed Western pits. A single analysis viewshed of the pits footprint area was used, meaning that the figure shows all the points from which the proposed opencast pit can be seen (incorporating an offset height of 0m [as the pit will not extrude from the surface terrain] for the opencast pit, and an offset height of 2m for observation points).

The viewshed indicates that opencast pit is visible to areas for at least 5km in all directions with some form of topographic screening to the south of the footprint areas. From 5km- 10km the viewshed diminishes slightly, with some topographic screening to the south and south east of the opencast pits.

The viewshed also indicates that the proposed Western pits will be visible to residents, tourists and motorists (along the R618) within the potential zone of influence.

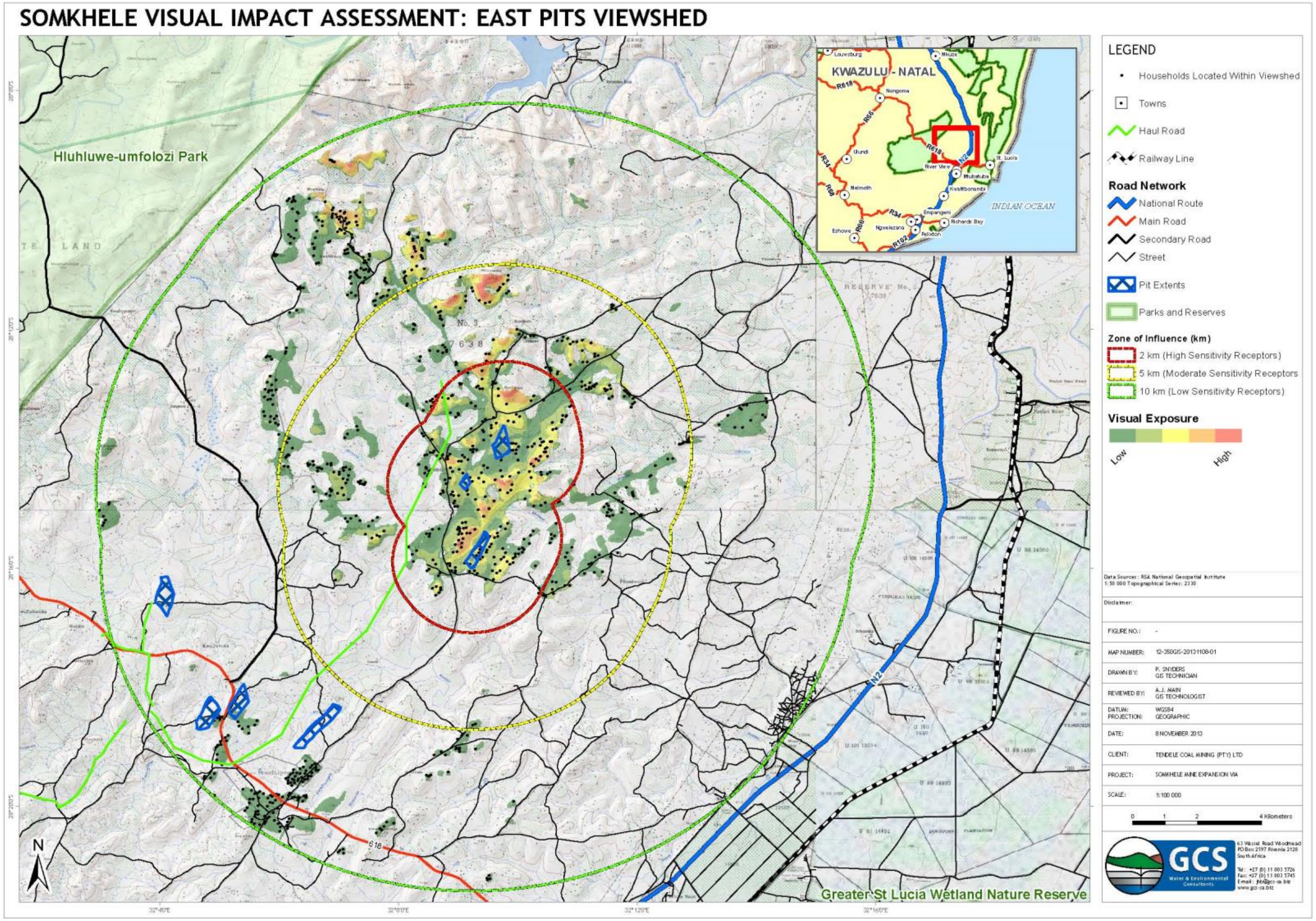



**Figure 2-57: Eastern Opencast Pits Viewshed Map**

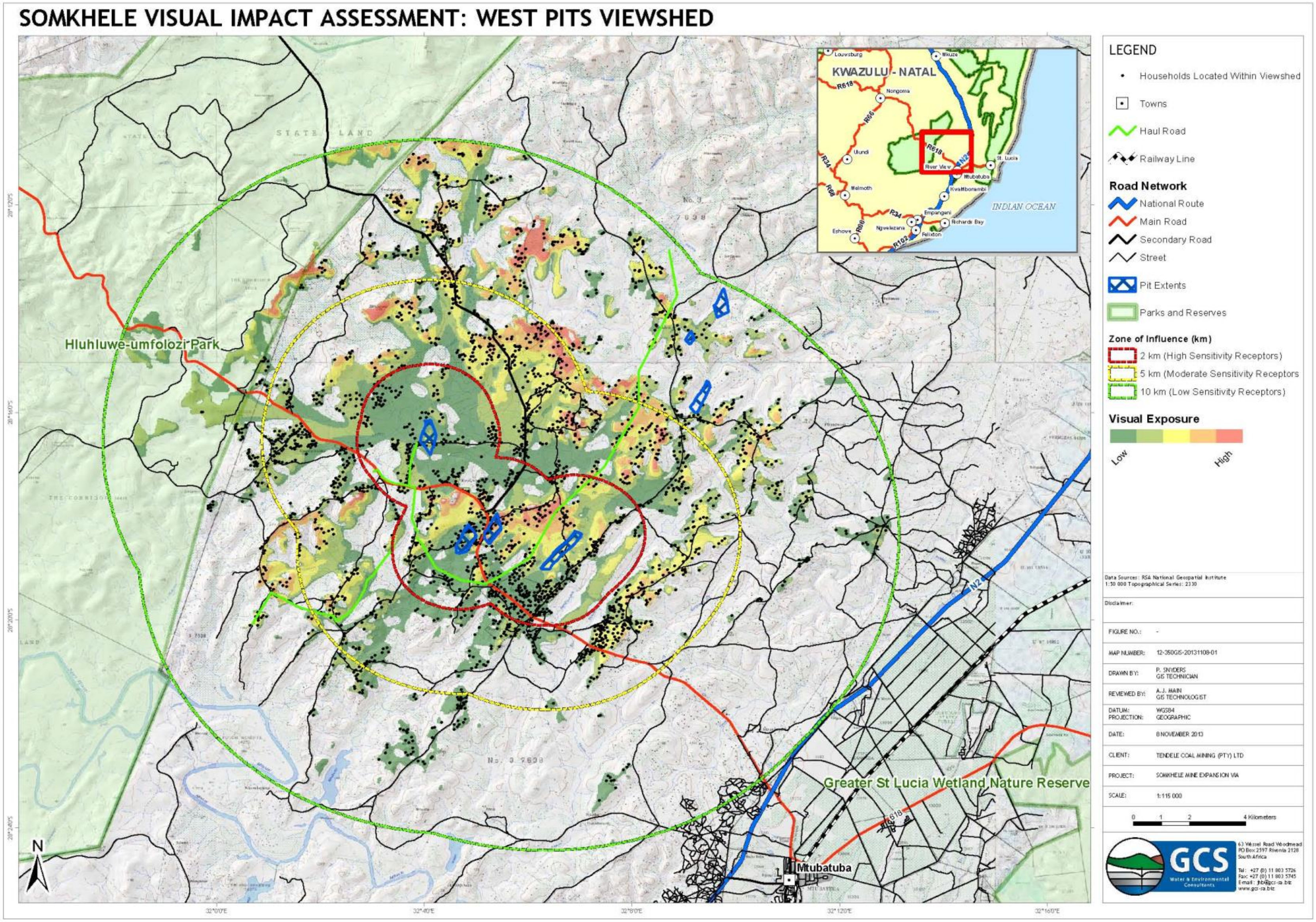



**Figure 2-58: Western Opencast Pit Viewshed Map**

## 2.13 Air quality

A Dust monitoring network has been established around Somkhele. This monitoring network measures ambient dust fallout. The methodology follows the ASTM D1739 standard and South African National Standards (SANS) for ambient dust fallout. The dust monitoring network will be extended to include new areas. The dust monitoring network is outlined under Section 8.4 of this document.

## 2.14 Sites of Historical and Cultural Importance

### 2.14.1 Places Associated With Oral Traditions or Living Heritage

Communal areas in southern Africa typically include places (such as mountains, river pools and forests) that are associated with cultural tradition; oral history; performance; ritual; popular memory; traditional skills and techniques; indigenous knowledge systems; and the holistic approach to nature, society and social relationships.

Such places may be known to and utilised by entire communities, or only certain individuals, such as traditional healers. They may be visited regularly or only periodically, and their heritage significance could vary from low to high along a local to a national scale.

Extensive developments such as mining activities potentially damage or destroy such places, with little or no opportunities for restitution and concomitant community disruption. Accordingly, it is imperative that alteration to such places is avoided by changing the development footprint if necessary, or negotiating appropriate offsets with affected communities.

### 2.14.2 Landscapes and Natural Features

The project area is largely undeveloped and rural with low-density dispersed settlements and associated subsistence agriculture. Dwellings are grouped as small family-sized homesteads. The project area borders the R618 as well as an auxiliary road, located in undulating terrain. The opencast mine lies on the west-facing slopes of a small valley and the plant and discard dump on the east-facing slopes. The R618 road curves around the site to the east and north, on a similar altitude, in an arc with a non-continuous visual radius of between 2 km and 3 km.

A Visual Impact Assessment (VIA) of the area was conducted in September 2009 and additional

Assessment conducted in 2013 (section 2.11) and the potential visual impact of the proposed Mine Expansion Project has been evaluated against internationally accepted criteria to determine the impact it will have on the landscape character and the viewers that have been identified in the study area. Heritage Scoping Assessment of Somkhele Anthracite Mine Northern Expansion, KwaZulu-Natal

Visual impacts would result from the construction, operation and closure phase of the proposed project. Specifically, impacts would result from the discard dump, open cast pits and ancillary surface infrastructure being seen from sensitive viewpoints (especially tourists) and the negative effects (relating primarily to visibility and visual absorption capability) on the scenic quality and sense of place of the landscape of the proposed site.

### 2.14.3 Hluhluwe-Mfolozi Park

Hluhluwe–Mfolozi Park is the oldest proclaimed natural park in Africa and lies 10 km west of the project area. It consists of 960 $km^2$ (96 000 ha) of hilly topography, located 280 km north of Durban in central Zululand, KwaZulu-Natal. It is known for its rich wildlife and conservation efforts. The park is the only state-run park in KwaZulu-Natal where all the big five game animals occur. Due to conservation efforts, the park now has the largest population of white rhino in the world. Hluhluwe–Mfolozi was originally three separate reserves that joined under its current title in 1989.

Throughout the park there are many signs of Stone Age archaeological sites. The area was originally a royal hunting ground for the Zulu kingdom, but was established as a park in 1895. The Umfolozi and Hluhluwe reserves were established primarily to protect the white rhinoceros, then on the endangered species list. The area has always been a haven for animals as tsetse flies carrying the nagana disease are common. This protected the area from hunters in the colonial era. However, as the Zululand areas was settled by European farmers the game was blamed for the prevalence of the tsetse fly and the reserves became experimental areas in the efforts to eradicate the fly. Farmers called for the slaughter of game and about 100 000 animals were killed in the reserve before the introduction of DDT spraying in 1945 solved the problem. However, white rhinoceros were not targeted and today a population of about 1000 is maintained.

### 2.14.4 Isimangaliso Wetland Park World Heritage Site

This park is located approximately 40 km from the mine and will not be considered further in this report or the HIA since the mine is unlikely to have any direct or indirect heritage impact on the park. However, due to the significance of the park it has been included in Management

Plans for the mine.

### 2.14.5 Traditional Burial Places

Numerous traditional burial places are known to occur within and adjacent to the project area. Such burials comprise one or more ancestral graves, typically located within or close to homestead precincts, rather than in formal cemeteries managed by a local authority. Graves usually comprise stone-packed mounds, with or without a headstone, although older graves may be less readily identifiable due to the deflation of the mound and scattering of the stone covering.

All human remains have high heritage significance at all levels due to their spiritual, social and cultural values and may not be altered in any way without the permission of the next-of-kin and a permit from Amafa.

### 2.14.6 Archaeological Sites

Numerous archaeological sites are known to occur close to the project area (Anderson 1998, 1999; Hall 1981). Iron Age and historical sites are common in valley bottoms, on hill slopes and the tops of hills, ridges and spurs.

If undisturbed, archaeological may have medium to high heritage significance for their historical and scientific values at various levels.

Appropriate mitigation for sites with low heritage significance may be limited to basic recording and application for a destruction permit from Amafa; whereas more significant sites may require extensive recording, artefact sampling and/or excavation, all of which actions would require a permit from Amafa.

## 2.15 Noise

As Somkhele is an operational mine with noise monitoring programs already in place, therefore no additional noise studies were conducted for the extension of mining operations.
The noise generated from mining activities within the extended areas are expected to be similar to those already experienced. Most noise generating activities will occur within the existing area where the processing of coal will take place.

Noise generating activities are typically those of an operational coal mine, these include:

- Noise generated by dumper trucks transporting ROM to the washing plant;
- Noise generated by the operation of the washing plant. These noise levels are not

considered to be excessive;

- Noise generated from the hoppers, conveyors and crushers; and
- Noise created by blasting. Community complaints have been received in respect of the noise created by blasting. All blasts are monitored.

## 2.16 Traffic

The volume of traffic will remain unchanged. Somkhele mine is not increasing production but extended the life of mine through additional resources. The mine currently places between 40-50 trucks on the road daily. These trucks are typically 30 ton multi-axel vehicles. Most of the anthracite coal is transported to the Richards Bay Coal Terminal where it is exported. About a quarter of the anthracite is trucked inland to be used primarily in the metallurgical industry.

## 2.17 Social Conditions

### 2.17.1 Local context

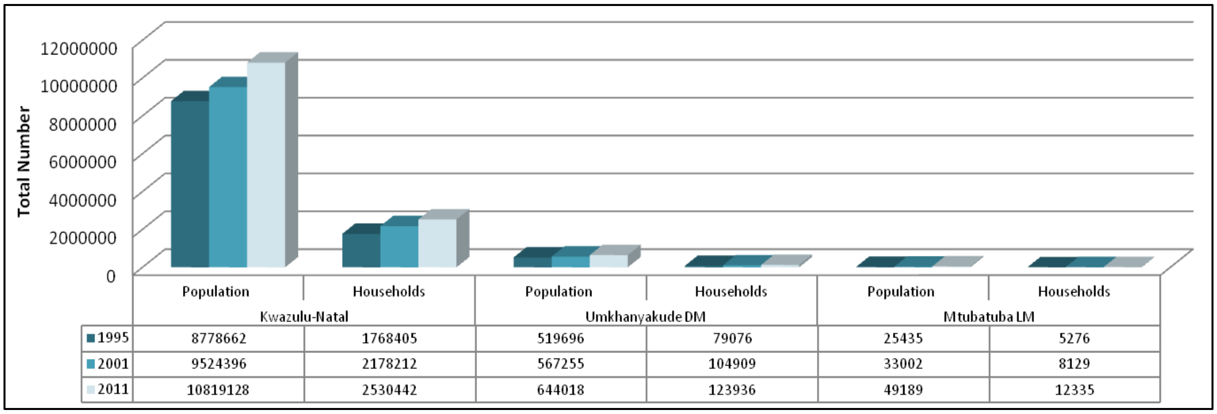
Information obtained from Statistics South Africa, and statistical analysis tools from Quantec Research (Pty) Ltd were used to provide an overview of the baseline socio-economic conditions within the study area. In addition to census data, data collected as part of an independent survey of the mine community by Umsizi Sustainable Social Solutions was also used to provide a view on the status quo of the local communities.

Somkhele initiated a research survey of the local communities within which it operates, and the findings of this survey are summarised in a report called “Somkhele Anthracite Mine Community Baseline Socio-Economic Study Survey” (or BSESS). The survey was conducted during 2011 and a total of 125 households were interviewed in the Esiyembeni community, 125 in the Machibini community, 170 in the Dubelekonzi community and 192 in the KwaMyeki community. The findings of this survey are included in the baseline assessment, where applicable, to provide a better perspective on the socio-economic status of the local communities.

### 2.17.2 Demographic profile

<u>Population and household profile</u>

According to Figure 2-59, the population size (persons) for the Mtubatuba Local Municipality (LM) increased by 48.29% over the 1995 to 2011 time period, whereas the Umkhanyakude District Municipality (DM) grew by 19.30% over the same period.



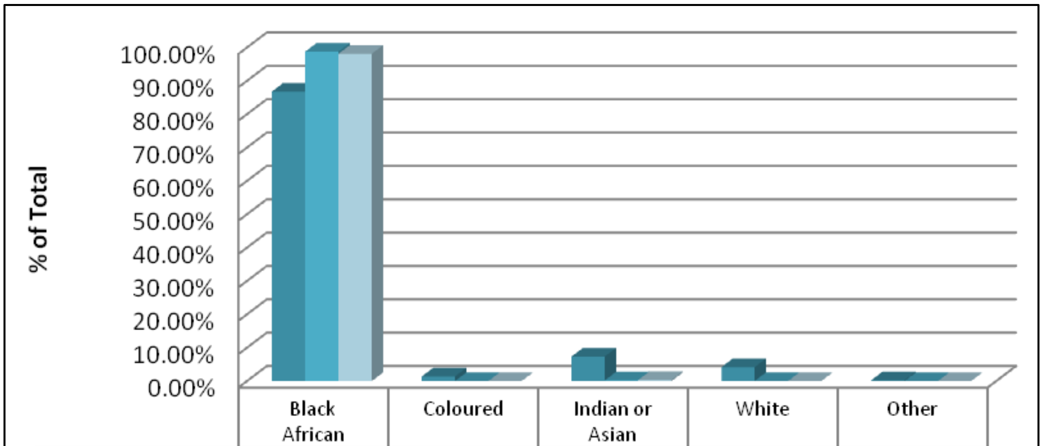

Source: Quantec Research (Pty) Ltd

**Figure 2-59: Population and household size (1995 – 2011)**

Households have grown at a faster pace over the 1995 to 2011 time period, with the Mtubatuba LM showing a 57.23% increase and the Umkhanyakude DM a 36.20% increase. This is in line with the growth in population of the KZN Province (18.86%) as well as households (30.11%). The Mtubatuba LM showed the highest growth from 1996 – 2011.

<u>Population group</u>

Figure 2-60 indicates that the Mtubatuba LM population are composed of mostly Black African persons (98.13%) followed by 0.32% Indian or Asian persons. The Umkhanyakude DM has a similar population group compilation of 98.77% Black African persons with a slightly larger percentage of Indian or Asian persons (7.37%). According to the BSESS a total of 98.7% of all respondents was Black African, with 0.9% being White persons. A total of 99.8% of the respondents were South African with 0.2% originating from countries within the Southern African Development Community Countries.



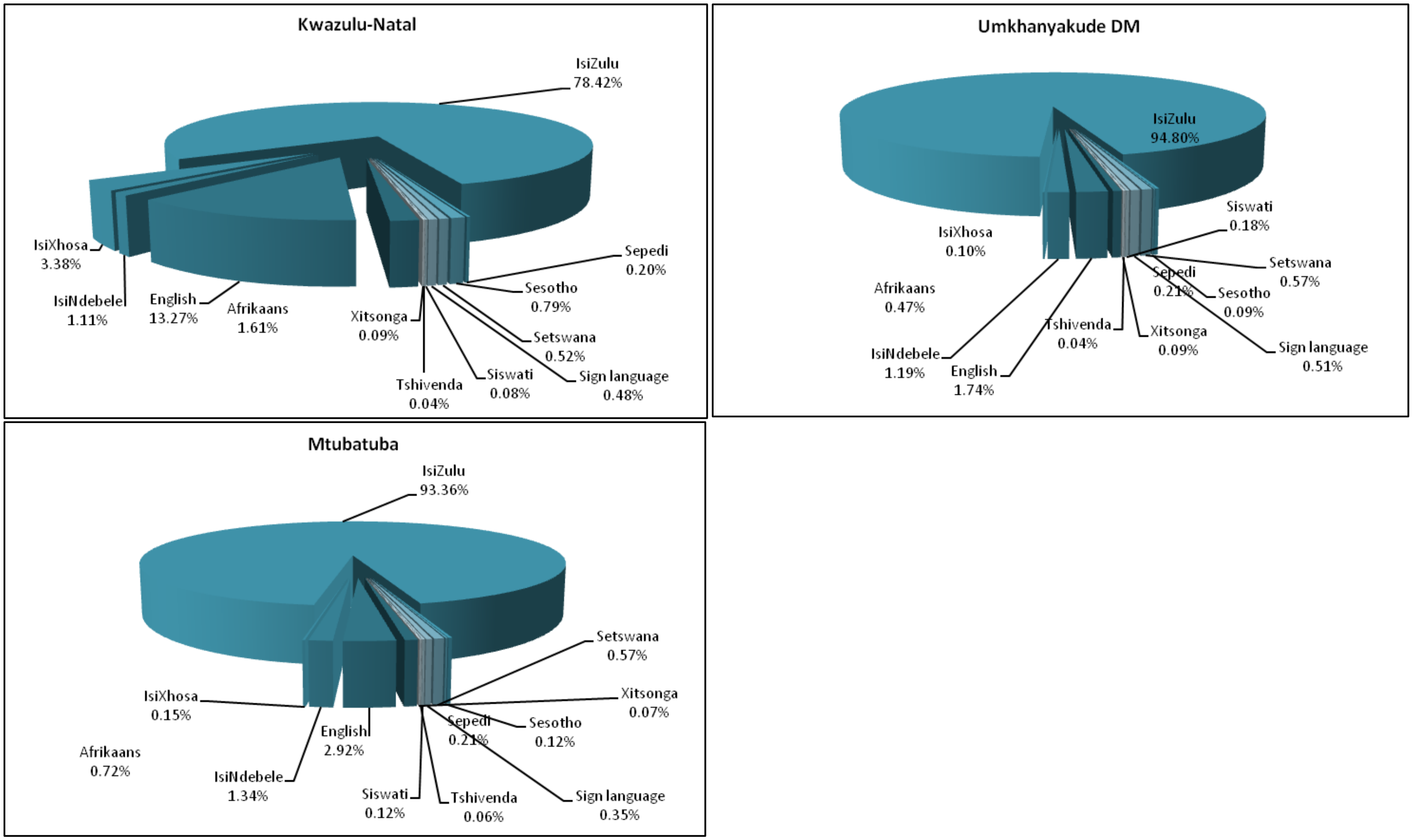

| | Black African | Coloured | Indian or Asian | White | Other |
|---|---|---|---|---|---|
| Kwazulu-Natal | 86.81% | 1.38% | 7.37% | 4.18% | 0.26% |
| Umkhanyakude DM | 98.77% | 0.01% | 0.22% | 0.04% | 0.01% |
| Mtubatuba LM | 98.13% | 0.01% | 0.32% | 0.02% | 0.00% |

Source: Statistics SA 2011

**Figure 2-60: Population group (2011)**

<u>Language</u>

Language is often very closely linked to population groups and it's a good indicator of what the preferred language of communication will be during consultations with the community. Figure 2-62 (2011) indicates that the Umkhanyakude DM consists of mostly IsiZulu (94.80%) and English (1.74%) speaking persons. The Mtubatuba LM follows a similar trend with 93.36% IsiZulu and 1.34% English speakers. According to the BSESS report, the majority of respondents (97.8%) spoke IsiZulu, with 0.9% speaking English.



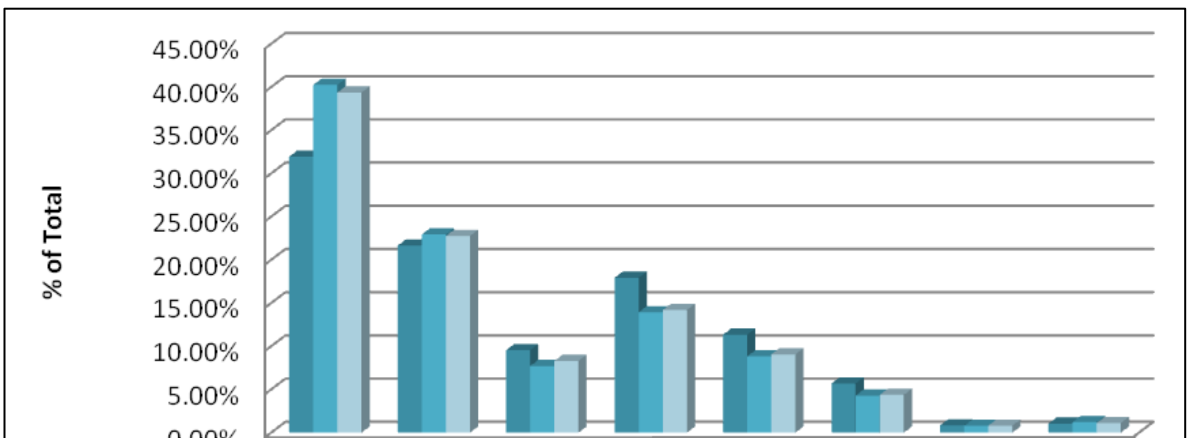

Source: Statistics SA 2011

**Figure 2-61: Language (2011)**

Age

It is important to assess the age distribution of persons in order to determine both the current and future needs of an area. Age is an important indicator as it relates to education, skills and dependency. A young population may require an improved educational system, whereas an older society may need an accented focus on healthcare. The region has a relatively large youth population (0-14 years), with the Umkhanyakude DM showing a youth population of 40.26%. The Mtubatuba LM population has a similar youth population (39.37%), both being much larger than the provincial average of 31.94%. According to the BSESS 42.2% of the respondents were younger than 14 years of age, which is slightly higher than the municipal average. This youthful population steadily levels off from 15 years of age (Figure 2-62). Persons younger than 15 years of age do not form part of the Economically Active Population (EAP) of the area.

A relatively large portion (14.21%) of the Mtubatuba LM population falls among the 30 to 44 year age band. These persons normally form part of the economically active group, and since they have more work experience, usually fall within the higher skilled and higher salary bracket. The BSESS also reported that 14% of all respondents fell within the 30 to 44 age category. One can clearly note that the population starts decreasing from the age of 59 years, leaving fewer economically active individuals.



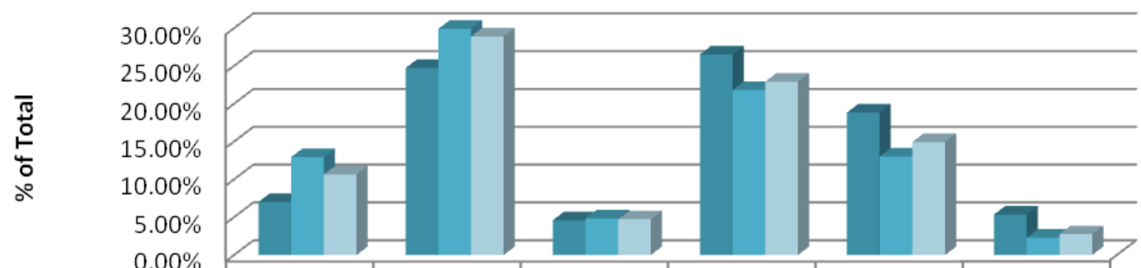

| | 0-14 | 15-24 | 25-29 | 30-44 | 45-59 | 60-74 | 75-79 | 80+ |
|---|---|---|---|---|---|---|---|---|
| Kwazulu-Natal | 31.94% | 21.64% | 9.55% | 17.93% | 11.34% | 5.70% | 0.84% | 1.05% |
| Umkhanyakude DM | 40.26% | 22.94% | 7.72% | 13.94% | 8.83% | 4.29% | 0.80% | 1.22% |
| Mtubatuba LM | 39.37% | 22.76% | 8.30% | 14.21% | 9.06% | 4.37% | 0.81% | 1.12% |

Source: Statistics SA 2011

**Figure 2-62: Age (2011)**

Education

The largest percentage (28.90%) of the Mtubatuba LM population has obtained some form of secondary schooling (Figure 2-63). The Mtubatuba LM has slightly higher levels of education than the Umkhanyakude DM as far as secondary education and higher is concerned. The BESS report indicated that 23.6% of respondents did not receive any form of education, which is double the municipal average.



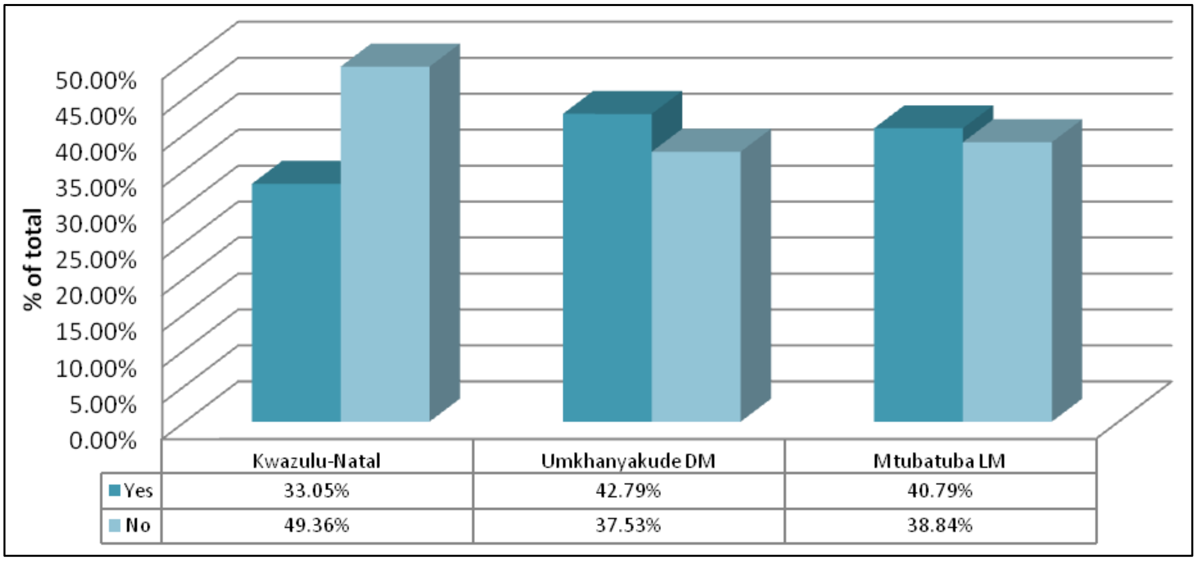

| | No schooling | Some primary | Complete primary | Some secondary | Grade 12 / Std 10 / Form 5 | Higher |
|---|---|---|---|---|---|---|
| Kwazulu-Natal | 7.02% | 24.74% | 4.59% | 26.53% | 18.84% | 5.37% |
| Umkhanyakude DM | 12.95% | 29.92% | 4.85% | 21.82% | 13.03% | 2.30% |
| Mtubatuba LM | 10.66% | 28.90% | 4.74% | 22.93% | 14.95% | 2.76% |

Source: Statistics SA 2011

**Figure 2-63: Education level (2011)**

When considering the population that is of school going age (except for children younger than five years institutional population and transients), the LM and DM have a greater percentage of children attending school than not. The KZN Province has the lowest levels of school attendance, as measured during the 2011 Statistics SA Census (Figure 2-64).

According to the BSESS survey, the majority (85.9%) of respondents had access to a primary school, followed by 69.6% who had access to a secondary school. Crèches also appear to be fairly accessible (49.3%), however, colleges, Further Education and Training Centres and universities were not accessible to the residents (0.7%, 1.3% and 0.2% respectively).




Source: Statistics SA 2011

**Figure 2-64: School attendance (2011)**

### 2.17.3 Economic profile

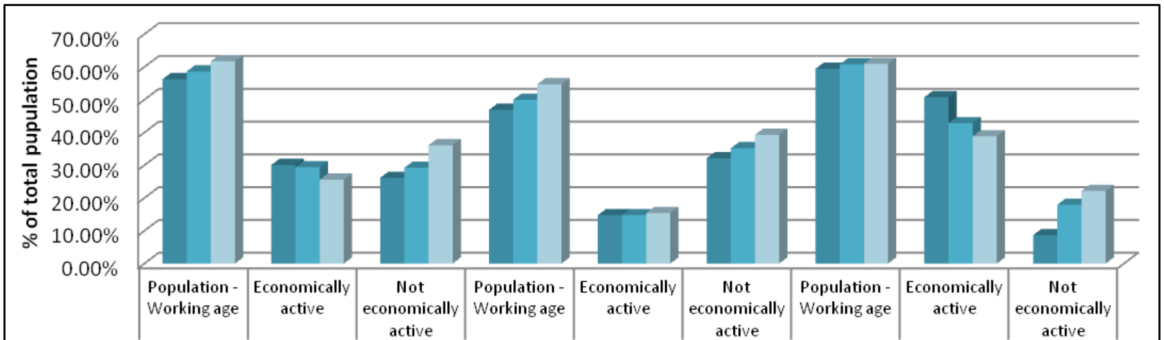
This section provides a delineation of the study area and a brief economic status quo pertaining to employment and labour profile.

<u>Employment and labour profile</u>

The employment status of the population has a variety of important implications. Economically active and employed persons can contribute to the overall welfare of a specific community by paying their taxes, looking after the youth and aged and by stimulating the economy. However, should a community have a large number of economically inactive and / or unemployed persons, the burden on the economically active persons (EAP) of that community are amplified.

Statistics SA data indicates that the EAP of the Mtubatuba LM has declined from 50.75% in 1995 to 38.81% in 2011 (Figure 2-65). The EAP for the Umkhanyakude DM has, however, stayed constant at around 15%. The number of persons not economically active within the Mtubatuba LM has increased at a much faster rate than the other regions, rising from 8.68% in 1995 to 22.15% in 2011.

According to the BSESS, 26.1% of the respondents were unemployed and a further 15.2% employed, followed by 58.7% of those who were not economically active. The unemployment rate was calculated at 63.3%, which is considerably higher than the 8% for the LM (Figure 2-65).




| | Kwazulu-Natal | | | Umkhanyakude DM | | | Mtubatuba LM | | |
|---|---|---|---|---|---|---|---|---|---|
| | Population - Working age | Economically active | Not economically active | Population - Working age | Economically active | Not economically active | Population - Working age | Economically active | Not economically active |
| 1995 | 56.25% | 30.10% | 26.15% | 46.90% | 14.76% | 32.14% | 59.43% | 50.75% | 8.68% |
| 2001 | 58.62% | 29.39% | 29.23% | 49.97% | 14.77% | 35.20% | 60.77% | 42.82% | 17.94% |
| 2011 | 61.73% | 25.62% | 36.11% | 54.71% | 15.42% | 39.29% | 60.96% | 38.81% | 22.15% |

Source: Statistics SA 2011

**Figure 2-65: Employment status (2011)**

When considering the primary sectors of the economy, the agriculture forestry and fishing industry for the KZN Province has declined substantially (208.01%) between 2001 and 2011 (**Figure 2-68**), it is now only the 7th largest sector within the provincial economy. The mining and quarrying industry has increased by 50.80% over the same period, bur remains small (8th largest). Similarly, the Umkhanyakude DM's agriculture forestry and fishing industry has declined, however, here less significantly, with a 95.31% contraction and still remains the 5th largest sector. Mining and quarrying is currently the 2nd smallest industry for the DM even after having grown by 61.07% since 2001. Mtubatuba LM's agriculture forestry and fishing industry has declined by 131.78% since 2001 with mining and quarrying growing by 46.46%.

The BSESS report indicates that the largest sector within the mining area was business services (8.5%), followed by mining and quarrying (7.1%), transport services and communication (5.4%) and security (5.2%).

The survey further found that 52.3% of respondents were employed in KZN Province, of which the majority were working near Somkhele Mine in areas such as Somkhele, Mtubatuba, Hlabisa or surrounding villages. Several household members are working in Durban (8.7%) and Richards Bay (3.9%).

According to the Statistics SA census data (2011), the largest percentage of households within the Mtubatuba LM earn between R19 201 and R38 400 per month, the largest percentage of households within the KZN Province and the Umkhanyakude DM earn between R9 601and R19 200 per month, indicating that the households within the LM are, on average, earning more than the DM or Province (**Figure 2-71**). The BSESS survey found that 22.8% of respondents (persons, not households) did not earn any income, and 45.9% households did not report any income, which is considerably higher than the municipal average of 13.51%.

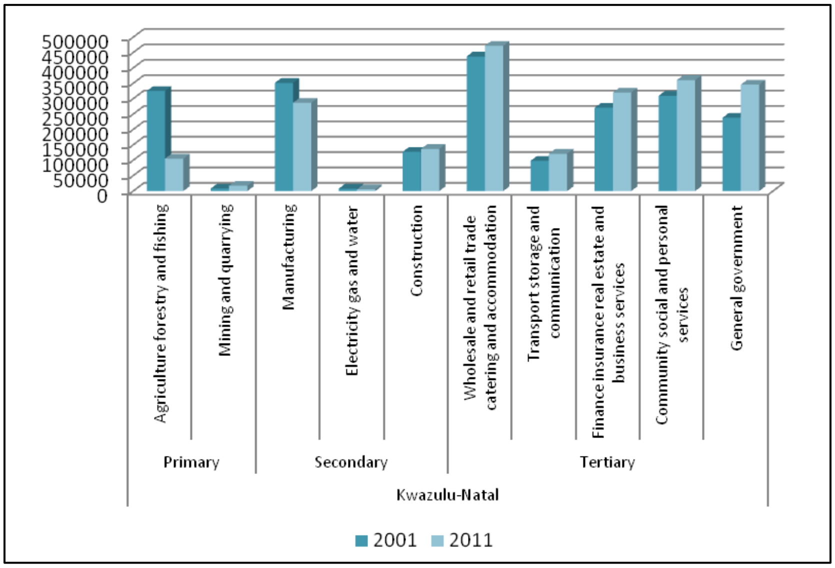



**Figure 2-66: Industry KZN (2001 vs 2011)**

Source: Quantec Research (Pty) Ltd

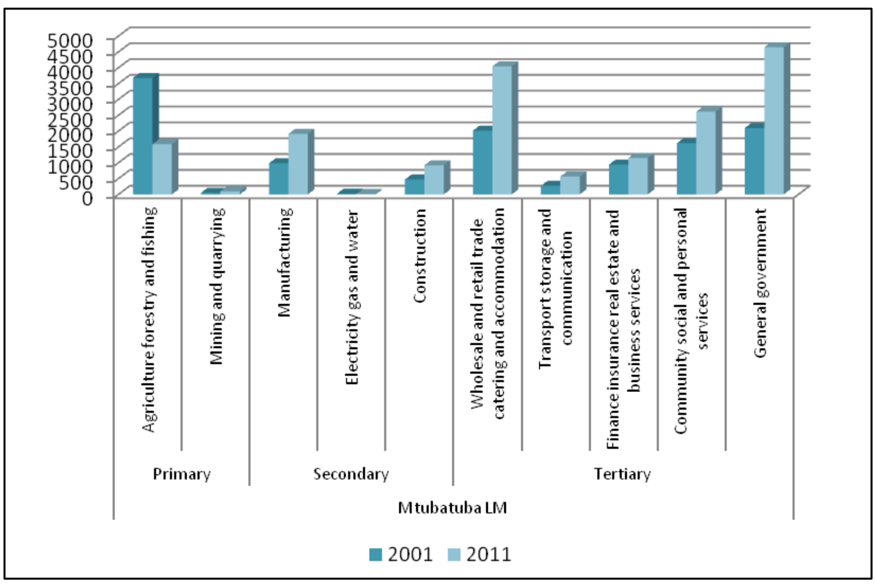



**Figure 2-68: Industry Mtubatuba LM (2001 vs. 2011)**

Source: Quantec Research (Pty) Ltd

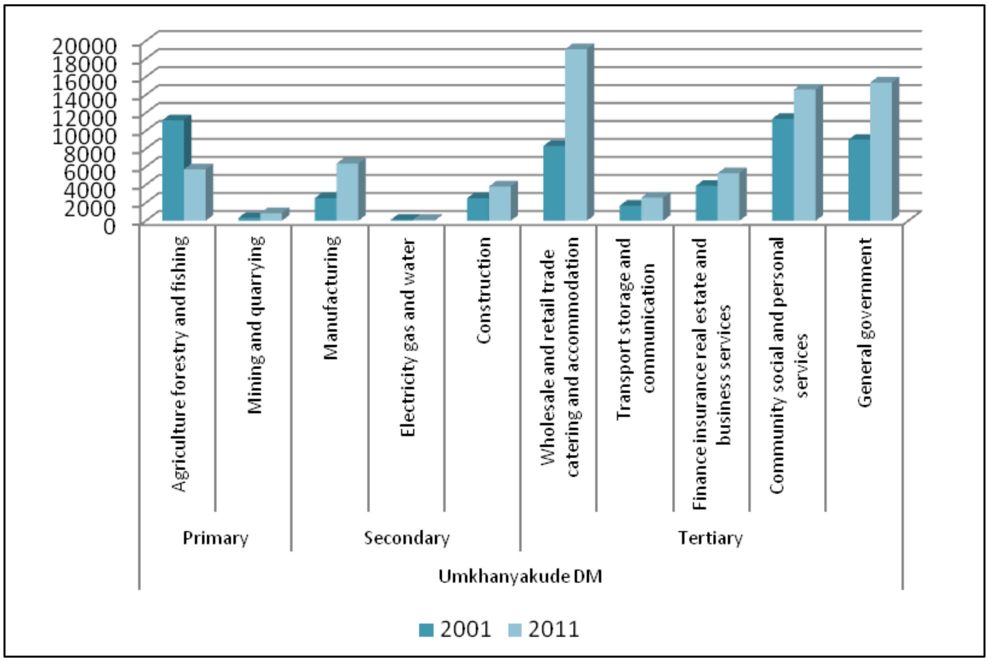
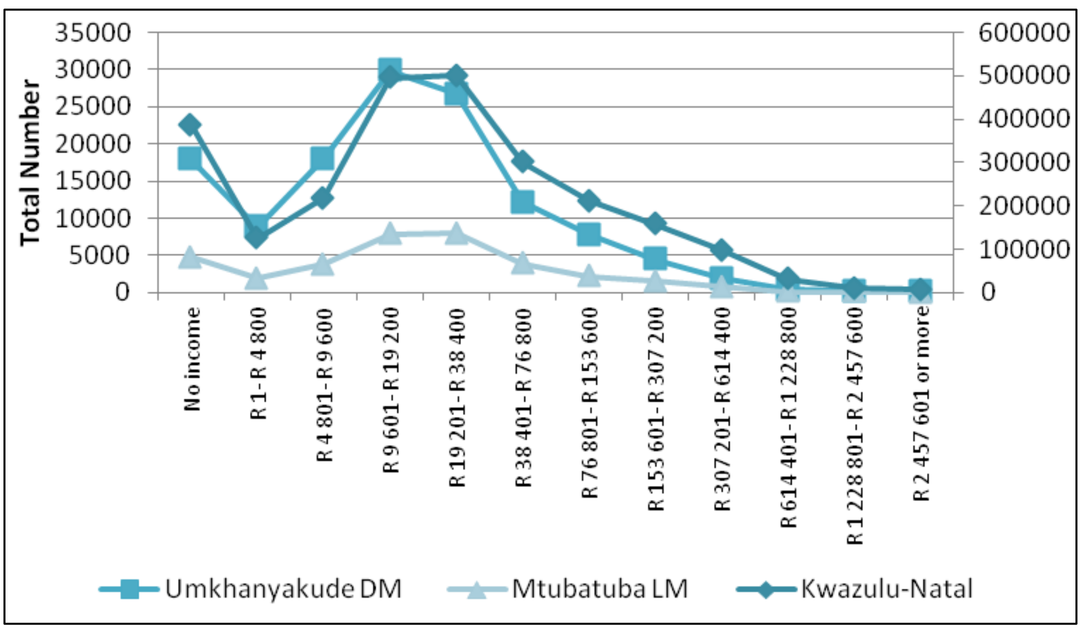


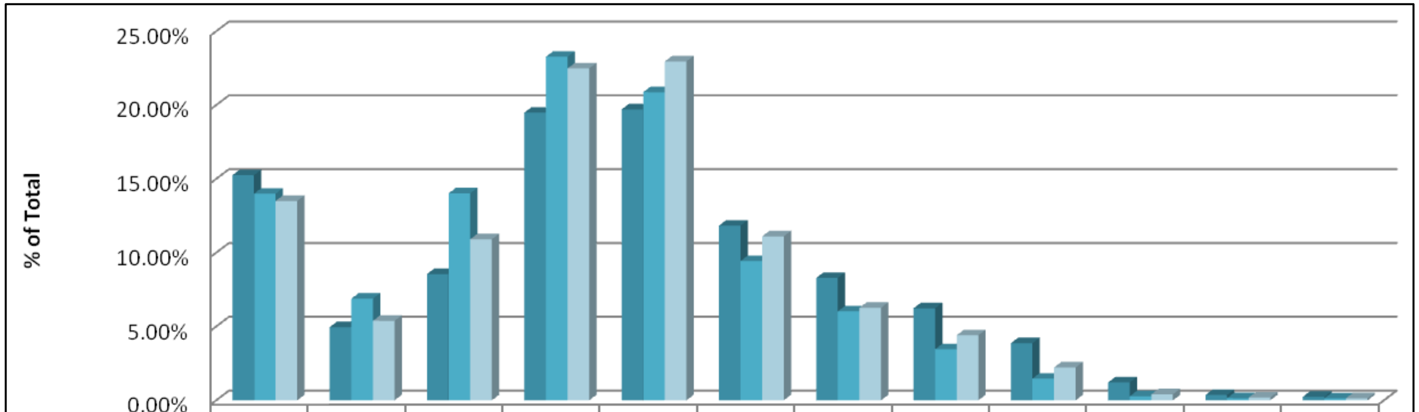

**Figure 2-69: Industry Umkhanyakude**

Source: Quantec Research (Pty) Ltd




Source: Statistics SA 2011

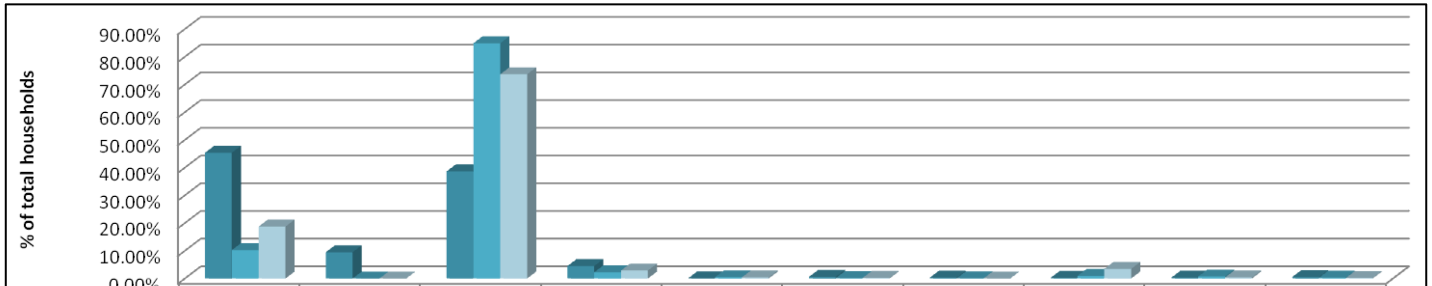
**Figure 2-70: Household Income (Total)**




| | No income | R 1 - R 4 800 | R 4 801 - R 9 600 | R 9 601 - R 19 200 | R 19 201 - R 38 400 | R 38 401 - R 76 800 | R 76 801 - R 153 600 | R 153 601 - R 307 200 | R 307 201 - R 614 400 | R 614 401 - R 1 228 800 | R 1 228 801 - R 2 457 600 | R 2 457 601 or more |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Kwazulu-Natal | 15.25% | 4.96% | 8.55% | 19.49% | 19.71% | 11.83% | 8.29% | 6.24% | 3.87% | 1.21% | 0.36% | 0.24% |
| Umkhanyakude DM | 14.00% | 6.88% | 14.02% | 23.28% | 20.87% | 9.44% | 6.03% | 3.46% | 1.47% | 0.27% | 0.15% | 0.13% |
| Mtubatuba LM | 13.51% | 5.39% | 10.91% | 22.48% | 22.96% | 11.11% | 6.27% | 4.41% | 2.23% | 0.41% | 0.19% | 0.14% |

Source: Statistics SA 2011

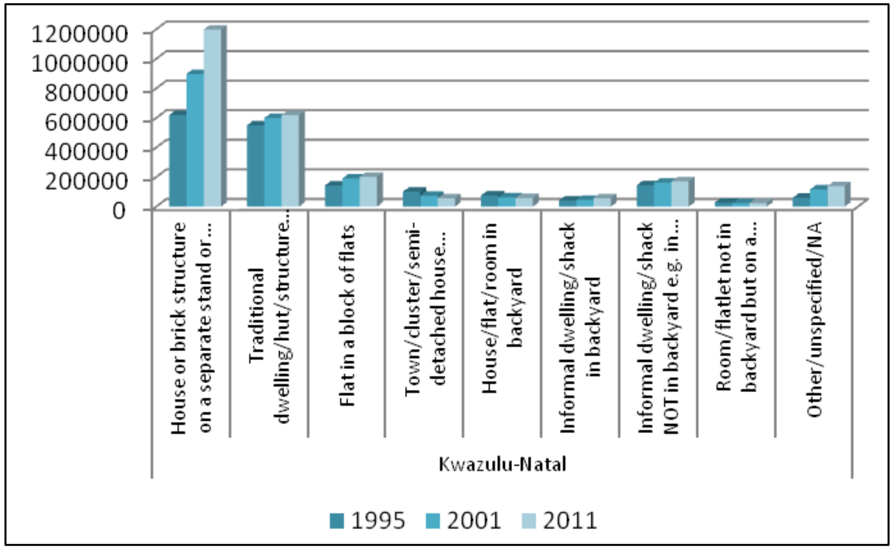
**Figure 2-71: Household Income (%)**

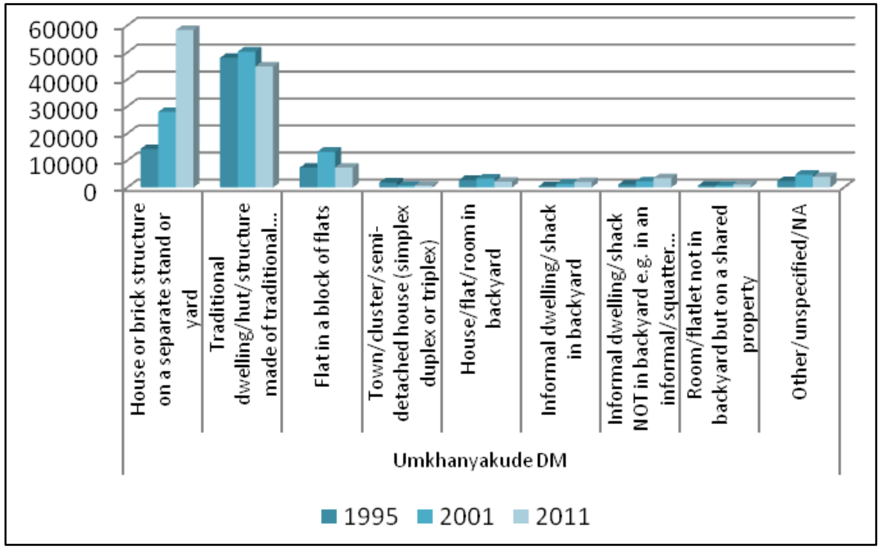


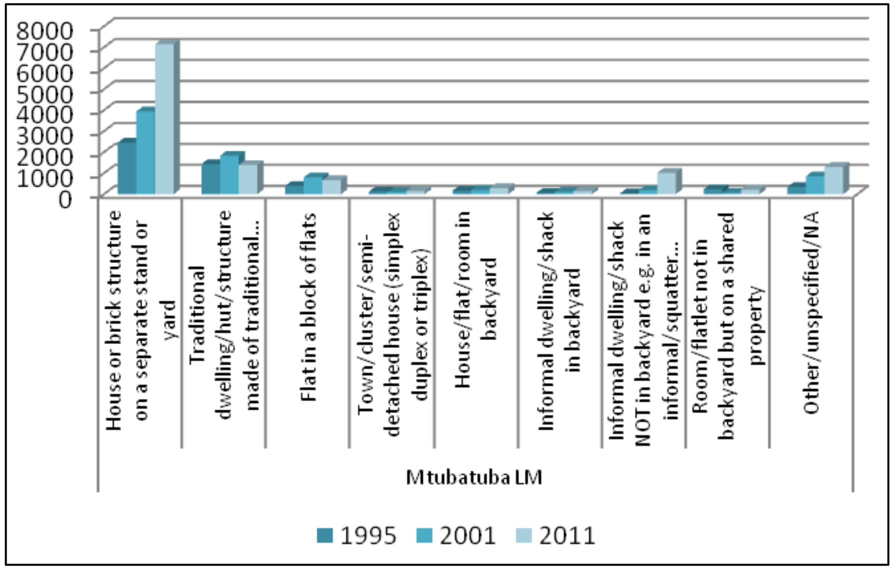

| | Formal residential | Informal residential | Traditional residential | Farms | Parks and recreation | Collective living quarters | Industrial | Small holdings | Vacant | Commercial |
|---|---|---|---|---|---|---|---|---|---|---|
| Kwazulu-Natal | 45.36% | 9.47% | 38.66% | 4.48% | 0.08% | 0.59% | 0.29% | 0.23% | 0.32% | 0.52% |
| Umkhanyakude DM | 10.25% | 0.00% | 84.89% | 2.24% | 0.46% | 0.16% | 0.04% | 0.94% | 0.72% | 0.30% |
| Mtubatuba LM | 18.76% | 0.00% | 73.70% | 2.89% | 0.41% | 0.20% | 0.00% | 3.45% | 0.39% | 0.20% |

Source: Statistics SA 2011

**Figure 2-72: Enumeration Area (2011)**

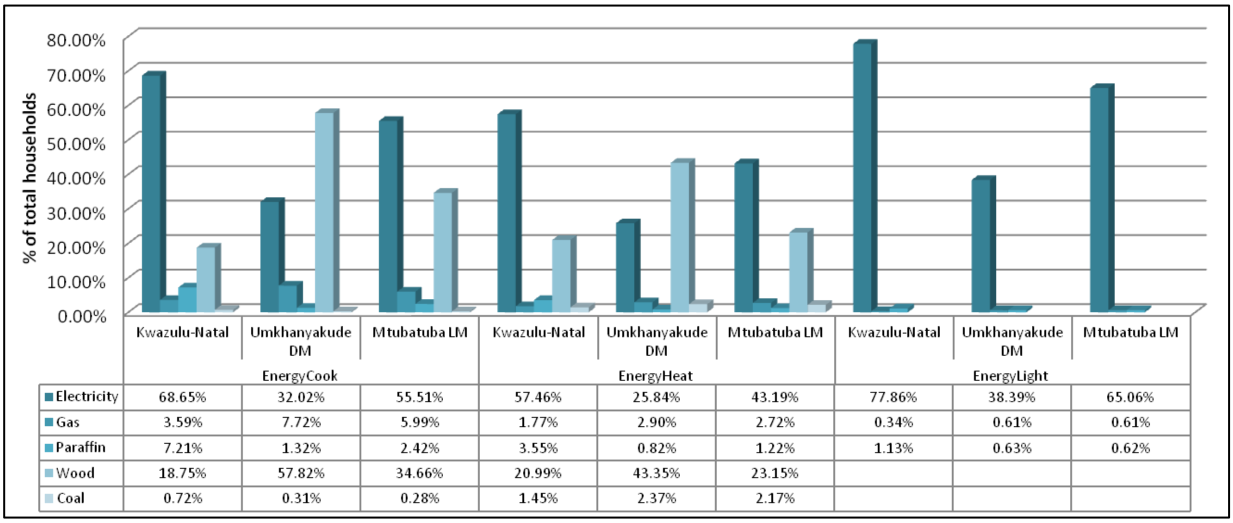



Source: Statistics SA 2011

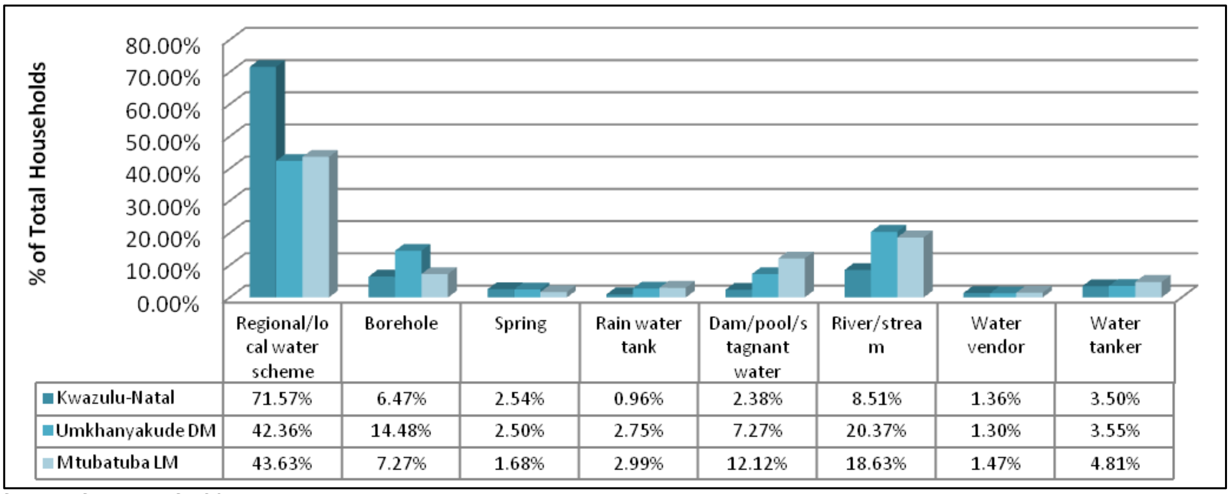
**Figure 2-73: Type of dwelling (2011)**




| | EnergyCook: Kwazulu-Natal | EnergyCook: Umkhanyakude DM | EnergyCook: Mtubatuba LM | EnergyHeat: Kwazulu-Natal | EnergyHeat: Umkhanyakude DM | EnergyHeat: Mtubatuba LM | EnergyLight: Kwazulu-Natal | EnergyLight: Umkhanyakude DM | EnergyLight: Mtubatuba LM |
|---|---|---|---|---|---|---|---|---|---|
| Electricity | 68.65% | 32.02% | 55.51% | 57.46% | 25.84% | 43.19% | 77.86% | 38.39% | 65.06% |
| Gas | 3.59% | 7.72% | 5.99% | 1.77% | 2.90% | 2.72% | 0.34% | 0.61% | 0.61% |
| Paraffin | 7.21% | 1.32% | 2.42% | 3.55% | 0.82% | 1.22% | 1.13% | 0.63% | 0.62% |
| Wood | 18.75% | 57.82% | 34.66% | 20.99% | 43.35% | 23.15% | | | |
| Coal | 0.72% | 0.31% | 0.28% | 1.45% | 2.37% | 2.17% | | | |

Source: Statistics SA 2011

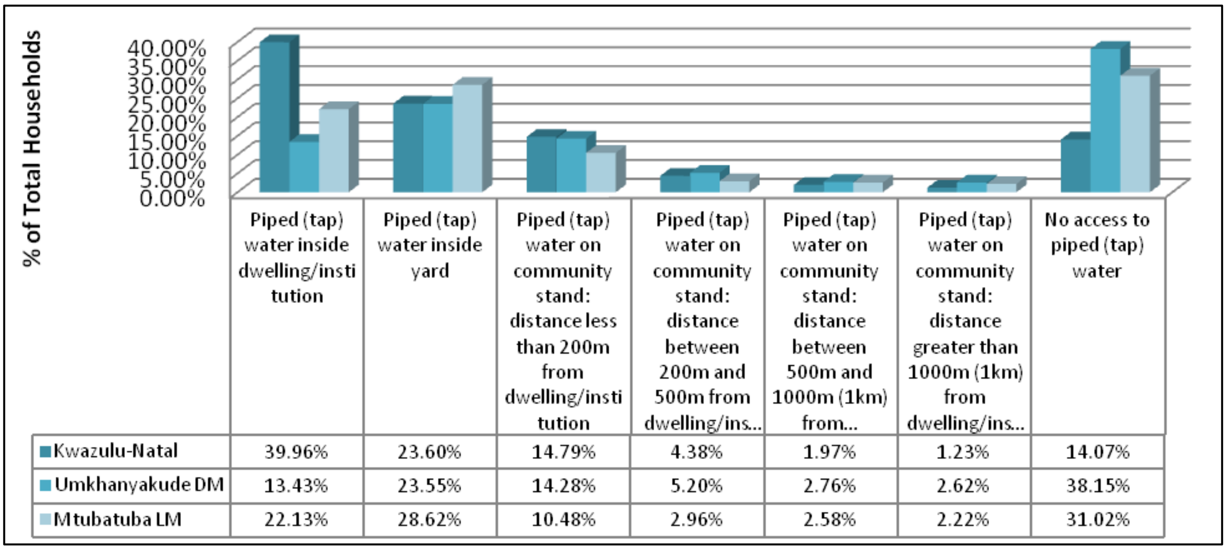
**Figure 2-74: Type of energy (2011)**




| | Regional/local water scheme | Borehole | Spring | Rain water tank | Dam/pool/stagnant water | River/stream | Water vendor | Water tanker |
|---|---|---|---|---|---|---|---|---|
| Kwazulu-Natal | 71.57% | 6.47% | 2.54% | 0.96% | 2.38% | 8.51% | 1.36% | 3.50% |
| Umkhanyakude DM | 42.36% | 14.48% | 2.50% | 2.75% | 7.27% | 20.37% | 1.30% | 3.55% |
| Mtubatuba LM | 43.63% | 7.27% | 1.68% | 2.99% | 12.12% | 18.63% | 1.47% | 4.81% |

Source: Statistics SA 2011

**Figure 2-75: Access to water (2011)**




| | Piped (tap) water inside dwelling/institution | Piped (tap) water inside yard | Piped (tap) water on community stand: distance less than 200m from dwelling/institution | Piped (tap) water on community stand: distance between 200m and 500m from dwelling/ins... | Piped (tap) water on community stand: distance between 500m and 1000m (1km) from... | Piped (tap) water on community stand: distance greater than 1000m (1km) from dwelling/ins... | No access to piped (tap) water |
|---|---|---|---|---|---|---|---|
| Kwazulu-Natal | 39.96% | 23.60% | 14.79% | 4.38% | 1.97% | 1.23% | 14.07% |
| Umkhanyakude DM | 13.43% | 23.55% | 14.28% | 5.20% | 2.76% | 2.62% | 38.15% |
| Mtubatuba LM | 22.13% | 28.62% | 10.48% | 2.96% | 2.58% | 2.22% | 31.02% |

Source: Statistics SA 2011 **Figure 2-76: Access to piped water (2011)**

# 3 PROJECT DESCRIPTION

This chapter describes the proposed surface infrastructure, mining infrastructure, mining method, etc., thereby fulfilling the requirements as per Regulation 50 (a) of the MPRDA Regulation R527 and the EMP Template.

***<u>REGULATION 50 (a):</u>***

- *(Section 1 – 2): The proposed mining operation*
  - *(Section 1 – 2.1): The mineral to be mined;*
  - *(Section 1 – 2.2): The mining method to be employed at the level of opencast, underground, stoping, stooping, total extraction, bord and pillar, block caving, shrinking, dredging, pumping, monitoring, etc. and provide a concise description of the intended magnitude thereof, in terms of volumes, depth and aerial extent;*
  - *(Section 1 – 2.3): List of the main mining actions, activities, or processes, such as, but not limited to, access roads, shafts, pits, workshops and stores, processing plant, residue deposition sites, topsoil storage sites, stockpiles, waste dumps, access roads dams, and any other basic mine design features;*
  - *(Section 1 – 2.4): Plan showing the location and aerial extent of the aforesaid main mining actions, activities, or processes as required to calculate the financial provision in accordance with the Department's published guideline. (Reg. 51 (b) (v));*
  - *(Section 1 – 2.5): Listed activities (in terms of the NEMA EIA regulations) which will be occurring within the proposed project (Refer to section 1.6.3);*
  - *(Section 1 – 2.6): Indication of the phases (construction, operational, decommissioning) and estimated time frames in relation to the implementation of these actions, activities or processes and infrastructure; and*
  - *(Section 1 – 2.7): Confirmation if any other relevant information is attached as appendices.*

The information contained in this chapter has been obtained from the Mining Works Programme (MWP) submitted to DMR in November 2011, the Integrated Development Plan for the District Municipality, as well as relevant publications regarding the available services in the area.

## 3.1 Overview of the Activity

### 3.1.1 Construction Phase

The following activities are envisaged during the construction phase:

- Construction of access roads where necessary;
- Construction of haul roads where necessary;
- Construction of water pollution control structures;
- Construction of storm water management structures;
- Construction of clean and dirty water infrastructure; and
- Construction of ancillary infrastructure.

### 3.1.2 Operational Phase

The following activities are envisaged during the operational phase:

- Opencast mining operation;
- Generation of discard; and
- Dust suppression.

### 3.1.3 Decommissioning and Closure Phase

During the closure phase the disturbed areas will have to be rehabilitated and re-vegetated. The overall objectives of closure will be to rehabilitate the disturbed areas to a state similar to pre-project conditions and to re-vegetate the footprint areas to blend into the surrounding environment. The planned life of mine for all activities from operational phase to closure and rehabilitation is thirty years.

The closure phase would have to consider the following:

- Demolition of redundant structures;
- Ripping of all compacted areas, which will be followed with amelioration and vegetation;
- Amelioration and vegetation of all disturbed areas;
- Shaping of all remaining dumps, piles and slopes to blend in with the surrounding environment;
- Maintenance of all re-vegetated areas up until such areas initiate succession and create a sustainable cover;
- Monitoring of rehabilitated areas; and
- Monitoring for a specific period after closure or up until such time that a

sustainable cover and ecosystem has been established (in accordance with the legislative requirements).

## 3.2 Existing Infrastructure

As Somkhele is an operational mine, all infrastructure required to process the raw anthracite or Run of Mine (RoM) is already in place. The existing infrastructure which is located in Area 2 includes:

- Three Washing Plants;
- Series of Workshops;
- Water storage dams;
- Pollution and stormwater control dams;
- Offices;
- Change Houses;
- Stockpile Facilities;
- Fuel Storage Facilities;
- Weighbridges;
- Backup Generators; and
- Discard Dump.

Current slurry and discard disposal takes place within the discard dump area. These methods of discarding slurry and discard will continue until capacity is reached. The disposal plan for the life of operations is outlined in Table 3-2. This disposal plan is currently being revised in conjunction with comments received from DWA.

## 3.3 Roads

An aerial survey was carried out and supplied by Tendele Coal Mining (Tendele) in the form of a strip survey that covers Tendele's proposed road horizontal alignment.

The proposed route was traversed by helicopter on 12 November 2013. This led to amendments to the horizontal alignment and the positioning of the proposed underpass. Another survey was subsequently supplied by Tendele covering the new alignment. The survey was developed into a digital terrain model (DTM) which was utilized for the preliminary geometric design of the roads and for the provision of drainage. A report on the preliminary design road designs is presented in **APPENDIX C.**

### 3.3.1 Geotechnical

No detailed geotechnical investigations have been carried out to date as these are only required at detail design stage. These would then allow for economising the vertical alignment by optimising materials usage, and minimising cut and fill as appropriate where there is very hard or unsuitable material..

### 3.3.2 Design Vehicle (Anthracite Haulage)

Eighteen-wheeler horse and trailer vehicles will be utilised to haul anthracite from the outlying mine pits to the main processing plant. These horse and trailer vehicles may be modified in future to a horse pulling three number trailers.

### 3.3.3 Intersecting Roads

Tendele vehicles will have exclusive use of the haul roads - i.e. these roads would not be open to the general public. STOP/GO facilities would be required at intersections with existing roads, which need to be accommodated at 'at-grade' intersections.

### 3.3.4 Estimated Time per Haul Truck

It is estimated that 100 000 tons per month of unprocessed anthracite would be transported to the mine processing plant from the new pits. This equates to approximately 5000 loads per month utilizing 20ton trucks or 1 truck passing every 3 to 3.5 minutes on the basis of both full trucks and empty return trucks.

### 3.3.5 Design Life

It is anticipated that the haul roads would be constructed in 2017 with a 20 year lifespan required for the mining operations.

### 3.3.6 Fencing and Expropriation

Areas where the roadway passes within the new mine pits will be fenced in (mainly for blasting purposes). The roadway may require re-routing outside of the fenced area.

## 3.4 Mining Process

### 3.4.1 Mining Method

Mining will be conducted by opencast method by means of the roll-over method, which implies that the overburden stripped from the initial cut will need to be stockpiled. This stockpile will create the screening berm.

However, with each successive cut taken, the overburden/soils stripped will be used to backfill and top dress the previous cut. In this way, the soils can be replaced in a position very close to that from which they were taken and thus result in minimal impact.

The overburden/soils that are stripped and stockpiled for use in the final void will need to be protected so as to minimise wind and water erosion (drainage), as well as any compaction. This will be done by the re-vegetation of the stockpiles by hand seeding or hydro seeding.

### 3.4.2 Mineral Resource Blocks

Resources have been identified in 10 different mining blocks. The volumes are outlined in the Mining Works Programme. A summary of the quantities is presented in Table 3-1.

**Table 3-1 Mining Resource Volumes**

| New strike discovered | Extent | Comment |
|---|---|---|
| 1. Mvutshini West | 1,000 m | Coal (burnt and replaced by dolerite dykes) |
| 2. Mvutshini Central | 2 500 m | Coal destroyed by dolerite |
| 3. Mvutshini East | 1,500 m | Some good coal but otherwise burnt by dolerite |
| 4. Tholokuhle | 2,500 m | Good coal in small areas. Burnt by dolerite |
| 5. Qubuka North | + 3,000 m | Good coal in areas (burnt and diced in north by dolerite) |
| 6. Mahujini East | +- 1,000 m | Good coal (burnt by dolerite in east) |
| 7. Mahujini West | +- 1,000 m | Good coal generally, shallow dip like Luhlanga |
| 8a. Machibini South | Uncertain | Coal entirely replaced and displaced by dolerite sills |
| 8b. Machibini North | +- 600 m | Coal burnt by dolerite |
| Total | + 11.5 Kms | |

### 3.4.3 Access to workings

Ramps into the open pit will be constructed on the upslope side of the box cut, and will move progressively with the roll over method of mining that is proposed. The mine will maintain the haul roads and appropriate storm water control measures will be implemented in order to minimize erosion. The roads will be cleared of coal debris on a regular basis to prevent potential contamination.

### 3.4.4 Production rate

The run of mine or raw ore material (ROM) is currently at 230 000/ month (2 760 000 ROM per annum and 10 500 tons per day). Currently ROM is processed by a series of three processing plants. The by-product of the anthracite screening and washing activities are:

- A fine slurry material that is approximately 10% of the ROM; and

- Course discard that consist of roof and floor sandstone and shale's and makes up approximately 42% of the ROM.

## 3.5 Mineral Processing

Beneficiation will be undertaken at the existing facilities in Area 2. Coal washing is required as the raw coal requires to be upgraded to at least a B-grade specification. The Somkhele plant has a drum, cyclone and spiral washing facilities. Plant 3 also located within Area 2 has the ability to process a much smaller product.

## 3.6 Storage and Transport of Ore

It is estimated that 100 000 month of unprocessed anthracite would be transported to the mine processing plant from the new pits. The current area has capacity to store Both RoM material and product. Tendele also has storage facilities at Richards Bay Coal Terminal (RBCT).

## 3.7 Waste Management

### 3.7.1 Domestic and Industrial Waste

Very little industrial and/or domestic waste will be produced on the site. Industrial waste will be limited to oil, diesel and grease. All maintenance and repairs will be undertaken at the workshop located in Area 2. This workshop is fitted with oil traps and has receptacles for contaminated materials.

A minor amount of industrial waste will be generated during the operational period. Industrial waste that is generated will be stored in skips and collected by waste contractors on a regular basis. All oils and greases will be collected and stored in approved containers for collection by recycling agents. Domestic waste generated will be collected in bins and skips and collected by a waste contractor.

### 3.7.2 Mine waste

Mining waste comes in the form of slurry and discard. These materials have elements that can oxidise which could have negative impacts on the receiving environment. Related impacts can be managed if waste is correctly disposed of as described in Table 3-2. The disposal plan has been submitted to the Department of Water Affairs (DWA) as part of an Integrated Water Use Licence Application (IWULA).

**Table 3-2 Slurry and Discard Disposal Plan**

| Years | Date | Slurry | Discard |
|---|---|---|---|
| 1 | 2009 | Pit A | Pit B |
| 2 | 2010 | Pit A | Pit B |
| 3 | 2011 | Pit A | Pit D |
| 4 | 2012 | Pit A | Pit D |
| 5 | 2013 | Pit A | Pit D |
| 6 | 2014 | Pit A | Pit D |
| 7 | 2015 | Pit A | Pit D |
| 8 | 2016 | Pit E | Pit D |
| 9 | 2017 | Pit E | Pit D |
| 10 | 2018 | Pit E | Pit D |
| 11 | 2019 | Pit E | Pit B |
| 12 | 2020 | Pit E | Pit B |
| 13 | 2021 | Pit E | Pit B |
| 14 | 2022 | Luhlanga | Pit B |
| 15 | 2023 | Luhlanga | Luhlanga |
| 16 | 2024 | Luhlanga | Luhlanga |
| 17 | 2025 | Luhlanga | Luhlanga |
| 18 | 2026 | Luhlanga | Luhlanga |
| 19 | 2027 | Luhlanga | Luhlanga |
| 20 | 2028 | Luhlanga | Luhlanga |
| 21 | 2029 | Luhlanga | Luhlanga |
| 22 | 2030 | Luhlanga | Luhlanga |
| 23 | 2031 | Luhlanga | Luhlanga |
| 24 | 2032 | Luhlanga | Luhlanga |
| 25 | 2033 | Luhlanga | Luhlanga |
| 26 | 2034 | Luhlanga | Luhlanga |
| 27 | 2035 | Luhlanga | Luhlanga |
| 28 | 2036 | Luhlanga | Luhlanga |
| 29 | 2037 | Luhlanga | Luhlanga |
| 30 | 2038 | Luhlanga | Luhlanga |

### 3.7.3 Hazardous waste

No hazardous material will be stored or created within the extension areas. All servicing of vehicles and machinery will be done within the workshop in Area 2. All hydrocarbons will be stored within Area 2. All hazardous waste is taken offsite by a licenced waste contractor to be disposed of in a licenced waste facility.

### 3.7.4 Sewage Facilities

No sewage facilities are required. Somkhele makes use of four (4) conservancy tanks which are emptied by waste contractors on a bi-weekly basis.

## 3.8 Water Storage and Management

### 3.8.1 Water Balance

A water balance has been developed in line with DWA best practice. The water balance outlined volumes of water used within the mining proses including dust suppression, dewatering of opencast pits and recycling of process water. The most recent water balance is presented below[2].

[2] The water balance is updated when operation methodologies or volumes change. Water balance updated August 2013.

**Table 3-3 Water Balance for Somkhele Mine**

Insert water balance pg. 2/3

Insert water balance pg. 3/3

### 3.8.2 Clean Water Storage Facilities

The mine currently stores water in two storage dams. These are referred to as Mnyenge1 and Mnyenge2. A report outlining water and how water use is optimized at Somkhele (**Appendix B**) has been submitted to the DWA.. All water storage facilities are already in place and no additional facilities will be needed for the expansion.

### 3.8.3 Dirty Water Storage Facilities

Storm water management systems are already in place. Storm water management around the mining pit will comply with the GN 704 requirements stipulated under the National Water Act (NWA) Act no 36 of 1998. A series of return water ponds and, if necessary pollution control dams, will be constructed. Should any ponds be required, the Integrated Water Use Licence (IWUL) will be amended accordingly.

### 3.8.4 Storm Water Management Plan (SWMP)

A Storm water management plan has been developed in accordance to GN 704 of the National Water Act (Act 36 of 1998). A stormwater management plan was submitted to the DWA as part of the (Integrated Water Use Licence Application) IWULA.

## 3.9 Water Supply

### 3.9.1 Potable Water

A water reticulation system has been installed along the R618. The mine’s potable supply will be sourced from this system.

The municipal supply has been unreliable and as a result, when potable water cannot not be supplied by the municipality, the mine pumps water from the Mfolozi River, which is treated in a $12m^3/h$ filtration/chlorine plant to make it suitable for potable use.

### 3.9.2 Process Water

Water for mining operations is sourced from the various sources including in pit seepage, rainwater and most notably from the Mfolozi River which Somkhele has a license to abstract 750 $000m^3$ per annum. This volume is sufficient for all planned future operations.

## 3.10 Power Supply

The extension project will not require significant quantities of additional electricity. While the wash plants are powered by Eskom power, most of the mining is conducted primarily through diesel powered machinery.

A back up power supply has been established and is currently available using a series of Genset generators which are capable of powering the entire mining operation.

## 3.11 Workshops, Administration and other buildings

All workshop and administrative facilities are located in the original mining area. These facilities will continue to service the requirements for the expanded mining operation.

## 3.12 Hydrocarbon Storage

Fuel is stored in selfbunded tanks located at the workshops. Environmental authorization (National Environmental Management Act; act 107 of 1998) has been granted to store in excess of 500 000l of fuel at this facility. The management measures outlined in the Record of Decision (RoD) for the storage of fuel has been incorporated into this EMP.

## 3.13 Linear Infrastructure

### 3.13.1 Roads

The development of haul roads is outlined in section 3.3 of this report. Haul road will link the mining pits to the wash plants.

### 3.13.2 Power lines

No powerlines are required for the extension of mining operations at Somkhele. Generators will be used on site when power is required primarily for lighting. All generators will need to adhere to the requirements outlined in section 7.8 of this report, which outlines management objectives and procedures.

# 4 PROJECT ALTERNATIVES

This section describes the project alternatives which have been considered, including alternative land uses, thereby fulfilling the requirements as per Regulation Section 50 (b) of the MPRDA Regulation R527 and the DMR EMP Template.

***REGULATION 50 (b)***

- *(Section 1 - 4): The alternative land use or developments that may be affected.*
  - *(Section 1- 4.1): Concise description of the alternative land use of the area in which the mine is proposed to operate.*
  - *(Section 1 - 4.2): List and description of all the main features and infrastructure related to the alternative land uses or developments.*
  - *(Section 1 - 4.3): Plan showing the location and aerial extent of the aforesaid main features of the alternative land use and infrastructure related to alternative land developments identified during scoping.*

## 4.1 Transport Alternatives

### 4.1.1 Rail Transport

Being an operational mine, the transportation mode has already been established. Alternate transport routes were fully explored during the commissioning of the mine in 2002 which included investigating sidings in the area.

### 4.1.2 Road Transport

Road transport is the preferred option due to the relative close proximity of Richards Bay Coal Terminal as well as the lack of any sidings within close proximity of the mine.

## 4.2 Infrastructure Alternatives

As the mine is operational, investigating infrastructure alternatives is not practical. The mine has advised that optimizing recovery of resources has been successful using current processing practices.

Developments of new mining technologies such as dry mining have not been considered as this technology is not suitable for the beneficiation of higher quality grades of anthracite such as those found at Somkhele.

## 4.3 Mining Method Alternatives

Opencast mining is the preferred option for the following reasons.

- The resource lies close to the surface; and
- Geology is complex making underground mining difficult in most areas.

## 4.4 Land Use Alternatives

### 4.4.1 Tourism

The potential for tourism within the proposed mining area is very limited due to the lack of infrastructure and a viable tourism market, as well as the proximity to the existing mining areas. Tourism potential lies within the Hluhluwe-Mfolozi Park.

### 4.4.2 Commercial Farming

Most of the soils identified during the land capability study (Chapter 2.5) were found to have little agricultural potential. A few pockets of fertile land occur within the MRA. These areas are currently planted with maize or sugar cane.

### 4.4.3 Forestry

Commercial forestry is not viable for a number of reasons, which include:

- The area is water scarce and water is not available to sustain any commercial forestry; and
- The soil is not conducive to forestry. The soils are generally highly acidic and very shallow.

Forestry could be conducted on a small scale to supply local communities with timber for building material or alternatively as fuel for cooking and heating.

## 4.5 No-Go Option

If the no-go option were applied, the following circumstances would prevail:

- The existing land uses within the proposed Somkhele expansion area, namely grazing and subsistence farming, would continue.
- The life span of the mine would be limited to existing resources
- A rejection of this application will result in the decrease in longevity in providing employment opportunities.
- All potential job opportunities for local businesses to provide services to the mine and community would not be realised.
- All current and planned infrastructural development such as homesteads,

hospitals, community centres reliant on the mine for financial support would collapse.

- Environmental impacts related to the extension of the mining operations would not take place.

## 4.6 Product Alternatives

The product generated at Somkhele is a quality anthracite product which is used primarily in the metallurgical industry. Various grades are blended to create different products which the market and customer needs dictate. A study into improving the quality of the anthracite through calcining the product has been explored and authorization to construct a calcining plant has been approved. This has been delayed to the lack of demand for a higher quality product.

# 5 PUBLIC PARTICIPATION PROCESS

This chapter describes the stakeholder engagement process undertaken as per Regulation 50 (f) of the MPRDA Regulation R527 and headings 11 to 13.

***REGULATION 50 (f):***

- *(Section 11): Identification of interested and affected parties. (Including the community, and list as identified according to the scoping report guideline and identified in the scoping report).*
- *(Section 12): The details of the engagement process. (Including the community, and list as identified according to the scoping report guideline and identified in the scoping report and any further consultation since the compilation of the scoping report).*
- *(Section 13): Details regarding the manner in which the issues raised were addressed. (Include all the items to be included in the list referred to in the concomitant section of the guideline posted on the official website of the Department).*

The proof of public consultation is attached under Appendix D of this report.

## 5.1 Purpose of Public Participation

### 5.1.1 Rationale for Consultation

According the DMR "Guideline for Consultation with Communities and Interested and Affected Parties":

*'The purpose of consultation with the landowner, affected parties and communities is to provide them with the necessary information about the proposed prospecting or mining project so that they can make informed decisions, and to see whether some accommodation with them is possible insofar as the interference with their rights to use the affected properties is concerned. Consultation under the Act's provisions requires engaging in good faith to attempt to reach such accommodation.'*

### 5.1.2 Legal Requirements

The public participation process (PPP) forms an integral part of the environmental authorization application in terms of the following legislative processes:

- MPRDA: Section 48 (f) and 49(f) respectively of the MPRDA regulation R527, published in terms of Section 107(1) of the MPRDA Government Gazette No. 26275, dated 23 April 2004;

## 5.2 Identification of Interested and Affected Parties (I&APs)

### 5.2.1 Landowner Consultation

The mining application falls completely within land administered by the Ingonyama Trust. The land owner is the Zulu Nation and subsequently representatives of the Zulu Nation were involved during the consultation process. Individuals involved in the consultation process include the Indunas from the affected Isigodis. The community meetings were chaired by MQ Mkhwanazi who was sent by the Inkosi to oversee the process. The presence of the Indunas can be confirmed in the minutes of the community meetings as well as in the attendance registers. The attendance registers for the meetings are presented in **Appendix D**. All meetings were recorded on video and audio. These can be provided should they be required.

Community meetings were held within the various Isigodis. These included:

- Thulukhule on 17 November 2013.
- Mahujini on 17 November 2013.
- Kwamyeki on 23 November 2013.
- Isolesiwe School in Mvutshini on 24 November.
- Ophondweni on 24 November.

The community meetings were well attended. At each, the proposed project was presented and explained that the consultation process is ongoing and that negotiations with individuals will commence at least 24 months before any mining commences in the various areas. The development of a new structure which will enable continued communication is outlined in chapter 5.2.2 below.

### 5.2.2 Ongoing stakeholder engagement through development of new body (STAC)

The new structure that has been proposed includes a new body called the Somkhele Tribal Authority Working Committee (STAC) to manage all communication and interaction between Tendele, the Council and the Community. This structure is also recognised by the KZN Traditional Leadership and Governance Act, 2005 and all signatories to the STAC acknowledge that all interactions between them should be open to public scrutiny and be transparent.

The STAC will presented by the following members:

- Three members appointed by council which should include the Portfolio Head of Mining, a representative from the Royal House, and one other representative appointed by the council;
- The Induna plus the Head of Warriors plus one member that is elected by the community (non-mine employee) of each of the areas where mining is actively taking place (i.e. Dubelenkuzi, Machibini, Esiyembeni and Myeki), thus 12 in total;
- Tendele senior managers, one member from the Tendele Community Forum, chairpersons of the National Union of Mineworkers (NUM) and shop stewards from the Association of Mineworkers and Construction Union (AMCU) from the Tendele Combined Union Forum Committee; and
- Other invitees in Tendele's sole discretion to add special expertise from time to time as may be required.

The STAC will meet as often as required to address community concerns, but will have a minimum of 1 monthly meeting. Quarterly meetings with the Inkosi will be held to ensure that the Inkosi is fully briefed. The Inkosi and STAC sets out to support Tendele in respect of all its dealings with government institutions, including the DMR, the South African Police Service (SAPS), service providers such as Eskom and Transnet, and in dealings with the Union Structures.

### 5.2.3 List of Authorities consulted

The following authorities were informed, in writing, of the project application processes being undertaken:

| | |
|---|---|
| Siboniso Mbense | DAEA Mtubatuba |
| Colleen Moonsamy | DWA |

| | |
|---|---|
| Thembi Buthelezi | Isimangaliso |
| Patrick Sibeko | KZN Wildlife |
| Dave Druce | KZN Wildlife |
| Dave Robertson | KZN Wildlife |
| Jabulani Ngubane | KZN WIldlife |
| Jenny Longmore | KZN Wildlife |
| Jabulani Hlophe | KZN Wildlife |
| E M Ntombela | Mtubatuba Municipality |
| Jinhle Thwala | Mtubatuba Municipality – Planning Department |
| Boxer Lungelo Mpontshane | Umkhanyekude Planning Department |

All the above listed authorities were automatically registered as I&APs on the stakeholder database developed for the project.

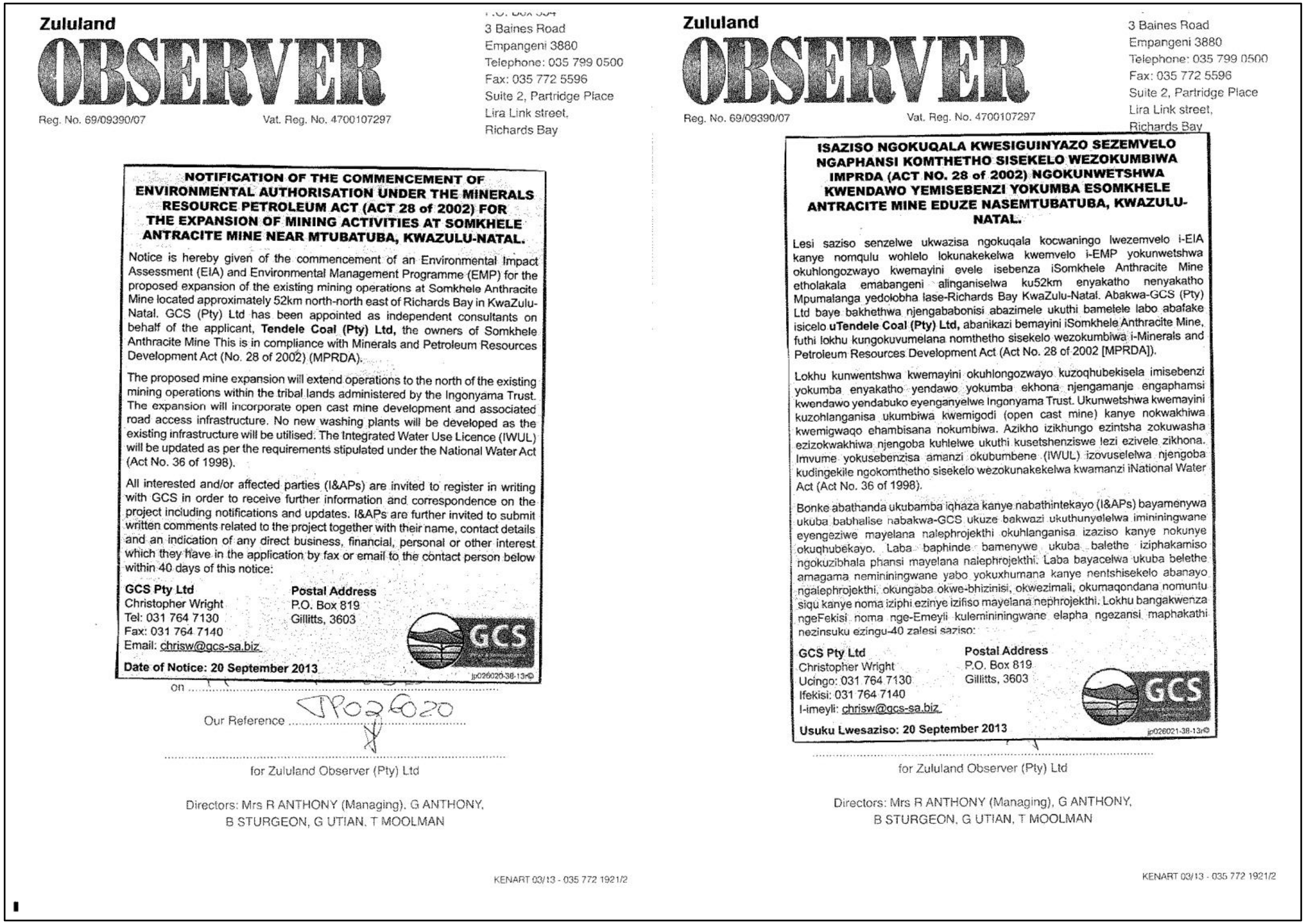
## 5.3 Notification of Stakeholders

Various methods of written notification were utilized to inform the I&APs. The process undertaken thus far is described in this section of the report.

Newspaper adverts for placed in Zulu and English regional papers (Figure 5-1). Background Information Documents (BIDs) were used to notify stakeholders and the public of the project. The public notices contained the following information:

- The geographic location of the project;
- The name of the applicant;
- An invitation to register as an I&AP;
- The contact details and deadline for registration; and
- Notification that a public meeting will be held to present the project informing the public that all registered I&APs will be informed of the date, time and venue for the public meeting.

### 5.3.1 Media advertisement



Zululand OBSERVER

3 Baines Road
Empangeni 3880
Telephone: 035 799 0500
Fax: 035 772 5596
Suite 2, Partridge Place
Lira Link street,
Richards Bay

Reg. No. 69/09390/07 Vat. Reg. No. 4700107297

**NOTIFICATION OF THE COMMENCEMENT OF ENVIRONMENTAL AUTHORISATION UNDER THE MINERALS RESOURCE PETROLEUM ACT (ACT 28 of 2002) FOR THE EXPANSION OF MINING ACTIVITIES AT SOMKHELE ANTRACITE MINE NEAR MTUBATUBA, KWAZULU-NATAL.**

Notice is hereby given of the commencement of an Environmental Impact Assessment (EIA) and Environmental Management Programme (EMP) for the proposed expansion of the existing mining operations at Somkhele Anthracite Mine located approximately 52km north-north east of Richards Bay in KwaZulu-Natal. GCS (Pty) Ltd has been appointed as independent consultants on behalf of the applicant, **Tendele Coal (Pty) Ltd,** the owners of Somkhele Anthracite Mine This is in compliance with Minerals and Petroleum Resources Development Act (No. 28 of 2002) (MPRDA).

The proposed mine expansion will extend operations to the north of the existing mining operations within the tribal lands administered by the Ingonyama Trust. The expansion will incorporate open cast mine development and associated road access infrastructure. No new washing plants will be developed as the existing infrastructure will be utilised. The Integrated Water Use Licence (IWUL) will be updated as per the requirements stipulated under the National Water Act (Act No. 36 of 1998).

All interested and/or affected parties (I&APs) are invited to register in writing with GCS in order to receive further information and correspondence on the project including notifications and updates. I&APs are further invited to submit written comments related to the project together with their name, contact details and an indication of any direct business, financial, personal or other interest which they have in the application by fax or email to the contact person below within 40 days of this notice:

**GCS Pty Ltd**
Christopher Wright
Tel: 031 764 7130
Fax: 031 764 7140
Email: chrisw@gcs-sa.biz

**Postal Address**
P.O. Box 819
Gillitts, 3603

**Date of Notice: 20 September 2013**

jp026020-38-13r©

on ........

Our Reference ........ JP026020

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for Zululand Observer (Pty) Ltd

Directors: Mrs R ANTHONY (Managing), G ANTHONY,
B STURGEON, G UTIAN, T MOOLMAN

KENART 03/13 - 035 772 1921/2

Zululand OBSERVER

3 Baines Road
Empangeni 3880
Telephone: 035 799 0500
Fax: 035 772 5596
Suite 2, Partridge Place
Lira Link street,
Richards Bay

Reg. No. 69/09390/07 Vat. Reg. No. 4700107297

**ISAZISO NGOKUQALA KWESIGUINYAZO SEZEMVELO NGAPHANSI KOMTHETHO SISEKELO WEZOKUMBIWA IMPRDA (ACT NO. 28 of 2002) NGOKUNWETSHWA KWENDAWO YEMISEBENZI YOKUMBA ESOMKHELE ANTRACITE MINE EDUZE NASEMTUBATUBA, KWAZULU-NATAL.**

Lesi saziso senzelwe ukwazisa ngokuqala kocwaningo lwezemvelo i-EIA kanye nomqulu wohlelo lokunakekelwa kwemvelo i-EMP yokunwetshwa okuhlongozwayo kwemayini evele isebenza iSomkhele Anthracite Mine etholakala emabangeni alinganiselwa ku52km enyakatho nenyakatho Mpumalanga yedolobha lase-Richards Bay KwaZulu-Natal. Abakwa-GCS (Pty) Ltd baye bakhethwa njengababonisi abazimele ukuthi bamelele labo abafake isicelo **uTendele Coal (Pty) Ltd,** abanikazi bemayini iSomkhele Anthracite Mine, futhi lokhu kungokuvumelana nomthetho sisekelo wezokumbiwa i-Minerals and Petroleum Resources Development Act (Act No. 28 of 2002 [MPRDA]).

Lokhu kunwentshwa kwemayini okuhlongozwayo kuzoqhubekisela imisebenzi yokumba enyakatho yendawo yokumba ekhona njengamanje engaphamsi kwendawo yendabuko eyenganyelwe Ingonyama Trust. Ukunwetshwa kwemayini kuzohlanganisa ukumbiwa kwemigodi (open cast mine) kanye nokwakhiwa kwemigwaqo ehambisana nokumbiwa. Azikho izikhungo ezintsha zokuwasha ezizokwakhiwa njengoba kuhlelwe ukuthi kusetshenziswe lezi ezivele zikhona. Imvume yokusebenzisa amanzi okubumbene (IWUL) izovuselelwa njengoba kudingekile ngokomthetho sisekelo wezokunakekelwa kwamanzi iNational Water Act (Act No. 36 of 1998).

Bonke abathanda ukubamba iqhaza kanye nabathintekayo (I&APs) bayamenywa ukuba babhalise nabakwa-GCS ukuze bakwazi ukuthunyelelwa imininingwane eyengeziwe mayelana nalephrojekthi okuhlanganisa izaziso kanye nokunye okuqhubekayo. Laba baphinde bamenywe ukuba balethe iziphakamiso ngokuzibhala phansi mayelana nalephrojekthi. Laba bayacelwa ukuba belethe amagama nemininingwane yabo yokuxhumana kanye nentshisekelo abanayo ngalephrojekthi, okungaba okwe-bhizinisi, okwezimali, okumaqondana nomuntu siqu kanye noma iziphi ezinye izifiso mayelana nephrojekthi. Lokhu bangakwenza ngeFekisi noma nge-Emeyli kulemininingwane elapha ngezansi maphakathi nezinsuku ezingu-40 zalesi saziso:

**GCS Pty Ltd**
Christopher Wright
Ucingo: 031 764 7130
Ifekisi: 031 764 7140
I-imeyli: chrisw@gcs-sa.biz

**Postal Address**
P.O. Box 819
Gillitts, 3603

**Usuku Lwesaziso: 20 September 2013**

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for Zululand Observer (Pty) Ltd

Directors: Mrs R ANTHONY (Managing), G ANTHONY,
B STURGEON, G UTIAN, T MOOLMAN

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**Figure 5-1: Adverts placed in regional newspapers**

### 5.3.2 Background Information Documents (BIDs)

Background Information documents (BID) were sent to all registered I&Ps. The BID documents outlined the required process in terms of the MPRDA. The mine has been through various authorization processes in the past years including MR Applications and authorization through NEMA. The database created during these processes has been constantly updated and expanded and was utilized for distribution of the BID documents.

## 5.4 Public Meetings

Two (2) public meetings were held in Durban and St Lucia. All I&APs were invited to attend the meetings. The meetings were held at the Assagay Hotel in Assgay, Durban on 14 November 2013 and in St Lucia on 15 November 2013. Meetings with various isigodis around the mining areas were held in the community surrounding Somkhele mine.

### 5.4.1 Introductory Public Meeting

An initial meeting introducing the project was held with I&APs in St Lucia on 28 March 2013. A follow up meeting was held at the GCS offices in Kloof on 11 April 2013 with representatives of various NGOs, including the Wilderness Action Group.

### 5.4.2 Specialist Feedback

Specialists were invited to attend the meeting held in Durban on the 14 November 2013. In this meeting specialists responded to questions posed by the public.

## 5.5 Stakeholder Database

A database has been kept and updated since the mine first application in 2005. The stakeholder database is presented in Table 5-1.

**Table 5-1 Stakeholder Database**

| First Name | Last Name | Company | Business Fax | Business Phone | Mobile Phone | Other Phone | Email Address |
|---|---|---|---|---|---|---|---|
| Rosanne | Clark | | | 033 702 1061 | | | rosanne@dbnmail.co.za |
| Jonathan | | Zululand Observer | | 035 799 0500 | | | Sub@zululandobserver.co.za |
| Boxer Lungelo | Mpontshane | Umkhanyekude Planning | | 035 573 8600 | | | |
| Tim | Bradley | UCOSP | | 035 550 0331 | 083 627 6187 | | tim@ucosp.co.za |
| Peter | Hill | St Lucia Ratepayers | | 035 590 1545 | 071 423 2968 | | shillfilly@hotmail.co.uk |
| Paul | Cryer | WIlderness trails | | 031 462 8642 | 072 223 2053 | | paulcryer@telkomsa.net |
| Michael | Parsons | Whalesong Guest House | | 035 590 1561 | | | info@whalesongstlucia.co.za |
| Derrick | Holman | Wetland Guesthouse | | 035 590 1098 | | | wetlands@iafrica.com |
| David | Lawson | St Lucia Ratepayers | | 035 5901644 | 083 267 0969 | | dk_lawson2000@telkomsa.net |
| Bianca | McKelvey | WESSA | | 031 201 3126 | | | conservation@wessakzn.org.za |
| Andrew | Bester | St Lucia Ratepayers | 0355901173 | | 082 970 1602 | | andrew@jacanaproperties.com |
| Alex | Searle | SASA | | 083 320 9099 | | | alex.searle@sugar.org.za |
| Wally | Menne | Plantnet | | | 082 444 2083 | | plantnet@iafrica.com |
| Hans | van de Wijgert | Rate Payers Association St Lucia. Water committee | 0866026114 | 035 590 1016 | 072 703 6193 | | info@serene-estate.com |
| Wendy | Forse | Mtunzini Concervancy | | 035 340 2586 | 082 722 3333 | | wendytwiga@iafrica.com |
| Jinhle | Thwala | Mtubatuba Planning | | 035 550 0069 | | | planning.mtubatuba@lantic.net |
| Will | Voster | Mtubatuba Ratepayers | | 035 550 1718 | | | ratepayers.mtubatuba@gmail.com |
| Sheila | Berry | MNF GET | | | 082 295 7328 | | sheila.bee@gmail.com |
| Ross | Crouch | MNF GET | | 084 466 3187 | | | elrossco@gmail.com |
| Patrick | Sibeko | KZN Wildlife | | 035 550 8200 | | | sibekop@kznwildlife.com |
| Lyzette | Kotze | Lindiko Lodge | | 035 590 1581 | 082 940 7184 | | lyzette@lidikolodge.co.za |
| Esther | Hollman | Mtubatuba Ratepayers | | 035 550 1718 | | | ratepayers.mtubatuba@gmail.com |
| E M | Ntombela | Mtubatuba Municipality | | 035 550 0069 | | | |
| Thembi | Buthelezi | Isimangaliso | 035 590 1602 | 035 590 1633 | 072 289 8602 | 0826119174 | thembi@isimangaliso.com |
| Dave | Druce | KZN Wildlife | | 035 562 0605 | 084 447 7407 | | druced@kznwildlife.com |
| Dave | Robertson | KZN Wildlife | | 035 550 8200 | | | Robertsd@kznwildlife.com |
| Sally | Jackson | GET | | 031 765 5937 | 083 495 2617 | | sallyjackson.conservation@gmail.com |
| Michelle | Brown | Ewing Trust Company | | 031 765 5737 | 084 518 2997 | | michelle.brown@ewing.co.za |
| Jonathan | Erasmus | Fever Local News | | 035 901 9415 | | | zulunews2@feveronline.co.za |

| First Name | Last Name | Company | Business Fax | Business Phone | Mobile Phone | Other Phone | Email Address |
|---|---|---|---|---|---|---|---|
| Elfie | Camps | Enduduzweni | 0355901627 | | 082 703 8080 | | enduduzweni@stlucia-southafrica.com |
| Coleen | Moonsamy | DWA | 0313059915 | 031 336 2846 | 082 808 0208 | | moonsamyc@dwaf.gov.za |
| Ron | Wood | | | (0026) 876021574 | | | rwood@smi.co.sz |
| Rhana | Naicker | | | 035 5507 509 | | | rnaicker@africacentre.ac.za |
| Mrs S | Stefanini | | | 035 590 1150 | | | alfredos@wpd.co.za |
| Louw | Kloppers | | | | 072 245 1037 | | |
| John | Field | | | 034 413 8142 | | | fieldj@tsb.co.za |
| I P | Facer | | | 035 590 1988 | | | annas@annasbnb.com |
| Graham | Hulett | | | | 082 894 9446 | | hulettgraham@telkomsa.net |
| Debbie | Smith | | | 035 580 1105 | | | debbie@familycaresa.co.za |
| Cherise | Acker-Pritchard | | | 035 340 2511 | | | Cherise.ap@mweb.co.za |
| Alfredo | Stefanini | Alfredos St Lucia | | | | | alfredos@wpd.co.za |
| Ashley | McKenzie | Acer Africa / Isimangaliso | | | | | ashleigh.mckenzie@acerafrica.co.za |
| Jabulani | Ngubane | KZN WIldlife | | | | | Jabulani.Ngubane@kznwildlife.com |
| Andrew | Ewing | Ewing Trust Company | | | | | andrew@ewing.co.za |
| Vusi | Mthalane | Fever Local News | | 035 901 9400 | 079 389 5205 | | zulunews4@feveronline.co.za |
| Con | Vermaak | Seasands Lodge | | 035 590 1082 | | | con@seasands.co.za |
| Giles | Churchill | Acer Africa / Isimangaliso | | 035 340 2715 | | | giles.churchill@acerafrica.co.za |
| Francois | van der Merwe | St Lucia B&B | 0355901966 | 035 5901151 | | | vika@santalucia.co.za |
| Kian | Barker | Horn Bill B&B | | 035 590 1162 | | | info@shakabarker.co.za |
| Dirk | Kotze | Lidiko Lodge | | 035 590 1581 | | | lidiko@wetlands.co.za |
| Jenny | Longmore | KZN Wildlife | (033) 8451499 | 033 845 1349 | | | Jenny.Longmore@kznwildlife.com |
| Sandy | Camminga | Richards Bay Clean Air Association | | 035 786 0076 | 083 515 2384 | | camminga@iafrica.com |
| Allan | Moore | | | | | | |
| Eddy | Malese | | | 073 802 8724 | | | eddy@glaengineering.co.za |
| Zaloumis | Andrew | | | | | | apz@worldonline.co.za |
| Todhani | Moyo | | | | | | moyo@yokoyo.co.za |
| Tim | Condon | | | | | | tim.condon@shaw.ca |
| Sonja | Kruger | KZN Wildlife | | | | | SKruger@kznwildlife.com |

| First Name | Last Name | Company | Business Fax | Business Phone | Mobile Phone | Other Phone | Email Address |
|---|---|---|---|---|---|---|---|
| Michelle | Fisher | | | | | | fishy@chillibyte.com |
| Mark | Doherty | | | | | | hamdoherty@mweb.co.za |
| Magda | Botha | | | 035 590 1623 | | | magdabotha.stlucia@gmail.com |
| Malese | Eddy | | | 073 802 8724 | | | eddy@glaengineering.co.za |
| Lylie | Musgrave | | | | | | kibao@iafrica.com |
| Ken | Dunbar | | | 035 590 1576 | | | parkertravel@gmail.com |
| Ilan | Lax | | | | | | hallax@sai.co.za |
| Glynis | Mitchell | | | | | | |
| Geoffrey | Botts | | | 035 5901575 | | | lynandgeoffbotts@gmail.com |
| Gary | Lang | | | 035 590 1427 | | | stlucia@zulani.co.za |
| Felicity | Elliot | KZN Wildlife | | 033 845 1437 | | | elliottf@kznwildlife.com |
| Drummond | Densham | | | | | | densham@sai.co.za |
| Dr Ian | Player | | | | | | icplayer@eastcoast.co.za |
| Dr Bill | Bainbridge | | | | | | wrbainbr@iafrica.com |
| Conrad | Geldenhuys | | | | | | conrad@iafrica.com |
| Carolyn | Schwegman | WESSA | | | | | afromatz@telkomsa.net |
| Bruce | Tait | St Lucia Ratepayers | | 035 5901069 | | | igwala@mweb.co.za |
| Andrew David | Savides | Zululand Observer | | | | | dave@zululandobserver.co.za |
| Jabulani | Hlophe | KZN Wildlife | | | | | hlophej@kznwildlife.com |
| Siboniso | Mbense | DAEA | | 035 550 0210 | 082 719 9771 | | siboniso.mbense@kzndae.gov.za |

## 5.6 Issues and Responses

A Issues and response report was drafted up which included all comments from I&Aps received through E:Mails, telephone conversations as well as from public meetings. The Issues and response report is outlined in Table 5-2below.

**Table 5-2 Issues and Response Report**

| ISSUE/COMMENT RAISED | COMMENTATOR/S | REFERENCE | DATE | RESPONSE |
|---|---|---|---|---|
| Comments and issues received from community meetings | | | | |
| | | | | |
| Concerned that people are being forced to relocate. | | Thulukhule Meeting | 17-Nov-13 | JG informed. We are taking down concerns. We need to take down names and closer to the time of mining will know what individuals will be affected and will engage with those individuals. If a person needs to be relocated there are procedures in place that will look at all aspects including a persons fields and buildings. |
| How will the mine rehabilitate the mine areas. What will happen to the land. The mine mentions opportunities, can the mine be more specific on what these opportunities are. | Ndlovu | Thulukhule Meeting | 17-Nov-13 | JG Responded. Not Everyone may get employment on the mine. The mine will add benefit to the area. Small business opportunities will be available. Priority will be given in Areas where they mine to local enterprise. For people who will relocate, they can nominate a person from their household who will be put on a list to apply for a job. With regards to rehabilitation. A plan is submitted to the DMR on how to close and rehabilitate the mine. In Machibini will fill area completely. In some areas will shape into a dam and make it suitable for livestock. |
| When we grow up, What will be the benefit to the new generation | Bekhomisi | Thulukhule Meeting | 17-Nov-13 | JG Responded. The Area will benefit. Negotiations will take place with the head of the household. That person can always change. |
| Before the mine comes in 2025, Can the community send in a request for a new dam. | | Thulukhule Meeting | 17-Nov-13 | JG Responded. A baseline needs analysis is done every 5 years. Joyce Makema elaborated that they allow requests from all areas. |
| Concerned about grave relocation. We have a culture of ancestors which is important. How does the mine compensate for graves and how does the mine relocate people. | Superman Mkhize | Thulukhule Meeting | 17-Nov-13 | JG Responded. There is a standard procedure which has already been conducted in 3 areas. The procedure is signed off the traditional council. These procedures may change periodically. There will be an agreed pay-out for graves and the cost to rebury. On Business, if a person has lost fields mine will look at the loss of income and offer compensation. |
| If people move from where they are, where will the people move the church services. Concerned that the community will be split up | Themba Mkwanazi | Thulukhule Meeting | 17-Nov-13 | JG Responded. There will be meetings closer to the time to look at relocation and engage with the community. We will have to look at churches, schools and determine an area before people relocate. All relocations done have been in close proximity to where they moved from. There will be no relocation until everyone is happy. |

| ISSUE/COMMENT RAISED | COMMENTATOR/S | REFERENCE | DATE | RESPONSE |
|---|---|---|---|---|
| Understands the stakeholder Manger Joyce is liaising with the community. Wants to engage with Joyce regarding relocation | Phiri Mkwanazi | Thulukhule Meeting | 17-Nov-13 | JG Responded. To soon to engage about relocation. Mine will engage closer to the time. |
| Concerned that when mine come, the people will not be ready. They must be informed before the mine comes. | Mr Khanyile | Thulukhule Meeting | 17-Nov-13 | JG Informed. Mine will communicate through tribal structures called stac. There will be feedback on a monthly basis to the Induna and a community representative. Community is already part of the mine. People can enrol in ABET and go to training centre. |
| Concerned about employment. Community is lucky as can see what is happening at the mine. There have been lots of disasters. Contractors fill their pockets with money. Mine must sort out labour issues before they come to Machibini. | Johannes Mkwanazi | Thulukhule Meeting | 17-Nov-13 | JG Responded. Mine has been operating for 6 years. Even now people do not understand how mine operates. Must be careful not to listen to all. They must either speak to JG or the Nkosi. Mine is a business. If employees do the wrong thing, they may be disciplined or fired. Government has police to look after law and order. Encourages people to read the newspapers and listen to the news. Many mines have closed down due to global economics. From time to time a business may need to optimise and people may be retrenched. Mine continues to talk to people through structures. You will find that the majority of people who are unhappy were fired from the mine. The mine is a business and has to report to government. People must speak to the right person as many people who are unhappy are spreading rumours. |
| The process of submitting CVs does not work. The issues of relocating graves is difficult. If the mine comes, only people who are relocated must mine. There must be no outsiders. | VE Simulani | Thulukhule Meeting | 17-Nov-13 | JG Informed. All concerns are being recorded. |
| Concerned that the poor can be manipulated as they are starving. DMR must come and show them their rights. | | Thulukhule Meeting | 17-Nov-13 | JG Responded. DMR will be invited to sessions closer to the time of mining. There are procedures in place. If people are not happy they will not be relocated. |
| How does the mine make sure that those who are relocated get jobs. | P Sithole | Thulukhule Meeting | 17-Nov-13 | JG Responded. The mine signs an agreement with the household. The household will nominate a person who will be shortlisted until they get a job. |
| When the mine comes, how will the mine give jobs to small enterprise and co-operatives | Siboniso Mkwanyane | Thulukhule Meeting | 17-Nov-13 | JG Responded. Business must come forward so that the mine knows what is available. All relocation and the infrastructure required for the mine development will be prioritised for local people. Things like Roads, fencing, dip tanks. |
| Which area in Mahujini will be mined. | Bongi Mkwanazi | Mahujini Meeting | 17-Nov-13 | JG Responded. We are busy finalising the fence line. Once this is determined we will come back and engage further with the community. |

| ISSUE/COMMENT RAISED | COMMENTATOR/S | REFERENCE | DATE | RESPONSE |
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| Difficult to engage and wants specific details and layouts. | Bongi Mkwanazi | Mahujini Meeting | 17-Nov-13 | JG Responded. We are here to listen to your concerns. |
| Concerned about the youth and concerned about the livestock. Disappointed about not knowing exactly where pit layout is | Zamine Mbatha | Mahujini Meeting | 17-Nov-13 | JG Responded. We are here to listen. The mine has existing procedures in place. The mine will give an value on your buildings and fields. Until everyone is happy about relocation, the area will not be mined. |
| What programs are in place that will benefit the Mpukonyoni Are. Land is a very sensitive issue and wants to ensure that the community will benefit. Is there a health and safety officer on the mine that looks after the wellbeing of the surrounding community. Dust is an issue in winter. We don't have dams and are relying on rainwater. The mine doesn't care about our fields and livestock. Till today the area does not have water. | Bongi Mkwanazi | Mahujini Meeting | 17-Nov-13 | JG Responded. We will make note of all concerns and submit a report. Mahujini has not been part of the mine yet. Mine has performed a needs analysis. Future plans are to include all areas. The previous tribal system wanted us to include specific areas affected by mining. Nkosi wants us now to concentrate on all areas. Mine has a health and safety officer. Dust and noise is measured. These reports are submitted to the DMR. As far as development is concerned; there is a plan that outlines that when the mine comes into the area, infrastructure opportunities such as roads/fencing will be prioritised for the Mahujini. As far as people affected by relocation we will engage with these individuals to reach an agreement. |
| Concerned that no one has come into the area to check for environmental pollutants and conduct studies. | Bongi Mkwanazi | Mahujini Meeting | 17-Nov-13 | JG Responded. The mine health and safety officer is Richard Ngwenya. The mine will conduct studies before mining. The mine has a social and Labour plan. A baseline needs analysis of the greater Mpukonyoni area was conducted. |
| Aware of the ABET, Aware of the training centre and aware of the agricultural hub. Feels that these programs are trivial. We want to see how much money the mine makes. | Bongi Mkwanazi | Mahujini Meeting | 17-Nov-13 | JG Responded that point had been noted. |
| Where will the people be relocated to. They have been moved from the mine to here, where will the mine put them. | Baba Khumalo | Mahujini Meeting | 17-Nov-13 | |
| The mine is conniving with the royal house. Mine is dealing with an elite group. We don't want the mine to rob us of our land a second time. | Bongi Mkwanazi | Mahujini Meeting | 17-Nov-13 | Absolon Mkwanazi (Representing MQ). The passing of the previous Nkosi left a gap. Nkosi is around now and is looking at how gaps can be closed. The health of the people is very important. He mine will not be allowed to do as it wishes. The purpose is to get concerns. The concern about where you will be relocated to has been recorded. Before the mine comes to this area in conjunction with the Induna will decide where to move. |

| ISSUE/COMMENT RAISED | COMMENTATOR/S | REFERENCE | DATE | RESPONSE |
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| Worried about health and safety. What is the mine doing about this. We have small kids and are worried about the vehicles. | Sibusiso Nyembe | Mahujini Meeting | 17-Nov-13 | Point noted |
| Worried about the progress of training initiatives. Enquired about how many people have been trained. | Siyabonga Dlamini | Mahujini Meeting | 17-Nov-13 | JG The mine employs 954 people. 480 trained to use excavators and trucks. |
| Enquired why is HR from Somkhele Mine not present at meeting. | Themba Mkwanazi | Kwamyeki Meeting | 23-Nov-13 | Johan Gloy (CEO) (JG)responded stating that he represents the company and would be able to answer any HR related questions. |
| Outlined concern that the mine will develop a relationship with the Traditional Council, and that this would bias the Councils decisions. Wanted to know how will this would be avoided. | Themba Mkwanazi | Kwamyeki Meeting | 23-Nov-13 | MQ Mkwanazi (MQ) responded. Explained that the traditional council has a relationship with the community and with the mine. The council will not allow strangers to come into the area and separate the community. |
| Wanted to know where exactly KwaQubuka North mining area is and where Emalahleni is located. He wanted specific information in relation to the isigodi. | CL Msweli | Kwamyeki Meeting | 23-Nov-13 | MQ responded. Tribal council will provide another map to make this clear. MQ suggested the Induna can assist. Induna identified the boundary as the Nyalazi river and said the best way is to identify by household. |
| Enquired about what benefits will the mine bring to the community of Kwamyeki? When people are relocated how will the people benefit. They already have houses, this should not be viewed as a benefit. | Mdu Mayise | Kwamyeki Meeting | 23-Nov-13 | JG responded. Directly affected people will get shortlisted for employment. Procedure is to allow 1 person from each homestead to be nominated for employment. Mine has an agreement with Traditional council and the DMR to invest in community. In the last 5 years the mine has spent 40 Million in projects. Mine has a 5 year plan for projects in the Area. Nkosi wants the all communities to benefit. Maternity ward at Somkhele Clinic, Agricultural Hub and Training centre are examples of this. |
| Appreciates the Mine being in Area. Would like opportunity to meet without the mine present to discuss the benefits the mine will bring. Wants to question the number of Myeki people employed on the mine. Has been told 500, but believes this to be false. Ubukhosi is happy to see a white person he is concerned that they are blinded by the mine. | Muzi Gumede | Kwamyeki Meeting | 23-Nov-13 | MQ will respond by means of Traditional council. No one will be forced by the traditional council. Not forcing the community to accept mine. They are not blinded by the mine but see an opportunity for local employment. |
| If Myeki people want to sit and discuss, there is a committee chosen to link and discuss issues with the mine. Induna must call them to discuss further with the mine | Phith Mhlongo | Kwamyeki Meeting | 23-Nov-13 | MQ noted suggestion. Other people concerns still need to be registered. Confirmed that more meetings will take place closer to the time of mining entering the Area. |

| ISSUE/COMMENT RAISED | COMMENTATOR/S | REFERENCE | DATE | RESPONSE |
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| People may have many wives. When mine relocates, they must relocate entire community to another area. How is the mine identifying relocation? | Phith Mhlongo | Kwamyeki Meeting | 23-Nov-13 | JG responded. If people have 2-3 wives will have to look at relocation until the person is happy. Can't do anything until the person is happy. Mine cannot relocate entire community as this is not financially viable |
| His sugar cane fields have holes in from drilling. The water is being contaminated and his livestock are getting sick. People will get poisoned. | Nkomozitsheni Mkhwanazi | Kwamyeki Meeting | 23-Nov-13 | JG responds. Damage to fields will be taken out of this meeting. Any person who loses fields will be compensated. This will include compensation for loss of income and loss of access to fields. With regard to water problem shale and coal came out with water during prospecting. Mine has drilled over 200 boreholes and tested water to check quality. Mine wanted to see if could provide this water to the community. Water is brackish due to proximity to the ocean. Where water is good, have equipped are to use the water for the community. |
| What is the DMR requirement for the distance required between the community and the mine. Does the mine consider planting trees to beautify relocated areas. Rainwater is contaminated. We rely on rainwater. | Mtuli | Kwamyeki Meeting | 23-Nov-13 | JG Responded. Mine cannot blast within 100meters. Mine will relocate everyone within 300meters of mine pit. The mine measures dust and blasts and sends report to the DMR. In relation to rainwater harvesting will investigate filtration systems. |
| Those who are in the representative committee are not present. Don't seem to be representing the people. | Muzi Gumede | Kwamyeki Meeting | 23-Nov-13 | Baba Muse (Induna) commented on committee in Myeki. Muse and MQ represent the entire Mpukonyoni area. Committee mentioned was not properly established. |
| Previously is was mentioned the Myeki community needs Taxis only to find that they pushed their own interests. Suggest that things be approved by TA. The tender for the taxis was awarded to committee members. | Muzi Gumede | Kwamyeki Meeting | 23-Nov-13 | Point noted |
| Worried about the loss of livestock and fields. Concerned that water will become polluted and dust has caused infection in his chest. Community is hurting, people have died due to the mine. | Jabulani Mbogezi | Kwamyeki Meeting | 23-Nov-13 | JG noted concern. Fields where mining will take place is small. After mining the areas will be rehabilitated and returned to the community. |

| ISSUE/COMMENT RAISED | COMMENTATOR/S | REFERENCE | DATE | RESPONSE |
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| Happy the mine is here. Mine came to an area where people are not educated. CV is a concern as people who are knowledgeable are able to apply. Those without knowledge cannot apply. Chances are for those with knowledge. It is not people from around here working for the mine. The mine promised a school to teach people. School has been turned into a university. What will happen to those who are not educated. | Ndlovu Xulu | Kwamyeki Meeting | 23-Nov-13 | JG commented that one must be careful in stating "the mine promised" Issue of communication. These things are happening but community may not be aware of these. Mine submits to the DMR and department of labour employment numbers. Currently here are 954 people employed. 80% come from Mpukonyoni area. 264 come from Myeki area. There is lots of information community has not seen. If mine was not here jobs would not be available. There are different levels of jobs requiring different levels of skills. You do not have to have a CV. You can fill out an application form. There are many training programmes at education centre. Not all are technical. When mine moves into area, opportunities for construction and development of infrastructure will be given to local contractors or co-operatives |
| Outlined that agreement does not need to be achieved. This is an information gathering session and information must be spread throughout community. He heard that when they drilled they found little coal and that they would not mine that area. He has now heard that they found coal and would like to know how long the mine will be in the area. What opportunities will mining in this area bring. | Busesweni Mkhwanazi (Indunas representative) | Isolesizwe School | 24-Nov-13 | JG Responded. The mine will return to finalise drilling. When mine comes back it will give priority for opportunities to local people. MQ emphasised about projects and jobs. |
| Would like clarity on agreements between the mine and community. Is this the same for all areas. | Busesweni Mkhwanazi (Indunas representative) | Isolesiwe School Meeting | 24-Nov-13 | The procedures are agreed by the tribal council. |
| Would like to know how compensation will be calculated | Busesweni Mkhwanazi (Indunas representative) | Isolesiwe School Meeting | 24-Nov-13 | JG Responded. Values of property differ depending on what people have. Procedure agreed by Tribal council. Negotiations are based on fields , costs. |
| What will happen after mining is complete. Can he move back to where it was previously mined. | Mancobo Shezi | Isolesiwe School Meeting | 24-Nov-13 | JG Stated. Mine reports to the government. The area will be top soiled and rehabilitated. After closure in one area there will be a dam. |

| ISSUE/COMMENT RAISED | COMMENTATOR/S | REFERENCE | DATE | RESPONSE |
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| Is it possible to build a road to Hluhluwe. Is it possible to give subcontracting opportunities | JV Zondo | Isolesiwe School Meeting | 24-Nov-13 | JG replies. Every five years mine puts the communities priorities on a list and will do the most important projects in consultation with the TA. Any person can apply for a job at the mine. MQ elaborates. The mine issues tenders/adverts. Induna should collect and distribute to the people. Need to look for opportunities and check with Induna. |
| Worried about living close to mine. What does mine do to people living close to the mine. | JV Zondo | Isolesiwe School Meeting | 24-Nov-13 | JG Responded. The mine assesses/monitors before and during mining operations. The mine continues to measure. Closer to when mining commences, mine will invite community to see what blasting looks like and how monitoring is done. |
| Sent to relay information to the Nkosi. Here to ensure there is a good working relationship with the community. Nkosi will appreciate that things are done harmoniously in the area. | Shamas Muse Mkhwanazi | Isolesiwe School Meeting | 24-Nov-13 | |
| Wants to know why mine has different blocks identified as Gwabalanda and Opondweni. These should be classed together. | LX Mkwanazi | Ophondweni Meeting | 24-Nov-13 | MQ responds. These names refer to a location and not the entire area. |
| It is important that minutes from this meeting be taken by someone in the community. Is this consultation or a final decision. He wants to know in detail the advantages and disadvantages | Robert Zulu | Ophondweni Meeting | 24-Nov-13 | MQ Responds. They are here to confirm mining. Are here to allow people to question info advantages and disadvantages. It was confirmed that a local person was taking minutes. |
| Has livestock and fields. Needs to be informed about future of mining. | PM Mthete | Ophondweni Meeting | 24-Nov-13 | JG responds 2-3 years before the mine comes, it will engage with the community further. Discussions with people who need to be relocated will commence. The mine has a procedure in place and these procedures have been approved by the tribal authorities. |
| Will the mine change the timeframe it will likely come to the area. | Thokozani Msweli | Ophondweni Meeting | 24-Nov-13 | Coal in areas is different. Need to blend coal to get it right and thus have to mine different areas at different times. |
| Where will the people be relocated to. Needs clarity | RT Nkabinde | Ophondweni Meeting | 24-Nov-13 | JG Responded. 2021 is a long way away. Mine has a relocation procedure. Negotiation according to fields. When Induna decides where he wants to move, then the preparation of area where they want to move to will commence. Only until everyone is happy will relocation take place. No one will be forced to move. MQ indicated that relocation is a sensitive matter and Ubukhosi will be presented to oversee. A committee will be established representing the Ubukhosi, the mine and Induna. Relocation will only happen until all are satisfied. No one will be forced to move. |

| ISSUE/COMMENT RAISED | COMMENTATOR/S | REFERENCE | DATE | RESPONSE |
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| Need to look at the good and bad so that there are no regrets. We need to equip the youth with skills. We need schools with computers. Would like to see lives changed through development. We need crèches and roads. | Q Ntshangase | Ophondweni Meeting | 24-Nov-13 | JG Responded. we are here to listen and to take minutes. Points are all valid. All comments and concerns will be put into a report and given to the DMR |
| 8 years is too long to not have work. Wants mining schedule to change and bought forward. Advised there is space for people to be relocated so people must not worry. | LX Mkwanazi | Ophondweni Meeting | 24-Nov-13 | JG responds. You do not have to wait to get a job at the mine. Each household will nominate a person to be shortlisted. These people will go for interviews until they gain employment. mine cannot change timeframes. Coal is not great in area and have to mine better coal first. |
| There has been fighting and unrest. Will appreciate employment. Glad that there is time before mine arrives as kids can go to university. Local people must be employed and not people from Mpumalanga and other areas. There must also be no nepotism. | Baba Shezi | Ophondweni Meeting | 24-Nov-13 | MQ Regarding conflict, Mpukunyoni doesn't want this. MQ has been restoring peace. The killings have affected them greatly. The old Tribal authority was accountable. Enyeza was burnt. Ancestors are questioning this. Those who burnt Enyeza will have their children and great grandchildren burning. Employment is between the individual and the mine. The Tribal authority cannot get involved. |
| He has learned from the mines previous relocations that a lot of people are not employed. To avoid conflict we must ensure that this does not happen. People are coming from Mpumalanga to get employment. | Baba Shezi | Ophondweni Meeting | 24-Nov-13 | JG The mine has a 5 year plan that looks at community needs. There is a training centre amongst others. The mine has invested 40 million into the community over the last 5 years. Every 5 years a baseline needs analysis is done. The projects identified are put into the social and labour plan which is submitted to the DMR. The Nkosi wanted all the people to benefit so the latest plan looks at whole Mpukonyoni area. When mine moves into specific areas.; priority for projects will be given to locals. These can include fencing, roads, dip tanks. Mine employs 954 people. The Mine committed to the DMR that 80% will come from the local community. The mine is training people on operating skills and programs. Mine needs people from the outside with skills. The mine has supported students in Geology and Engineering. We will get concerns before any mining commences. MQ explains misconceptions about nepotism and outlines the current projects. |
| Relocation must consider multiple wives. | TP Zulu | Ophondweni Meeting | 24-Nov-13 | Noted |
| Relocation concerns | G Dube | Ophondweni Meeting | 24-Nov-13 | MQ outlined relocation procedures. |

| ISSUE/COMMENT RAISED | COMMENTATOR/S | REFERENCE | DATE | RESPONSE |
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| Worried about blasting | Sandile Shanga | Ophondweni Meeting | 24-Nov-13 | JG Responded. Every time the mine blasts, the blast is measured and a report is sent to the DMR. The mine measures vibration, noise and dust. The DMR visits the mine monthly. All complaints are investigated. Closer to the time the mine will take community members on a tour to show blasting and how blasts are measured. |
| People need feedback. | | Ophondweni Meeting | 24-Nov-13 | JG Responded. Not in a position to explain committee. As mine progresses Induna will form part of committee. Tribal council will explain to the communities about the new committee. |
| I&AP Comments | | | | |
| Return of exhausted mine to previous state - what guarantees if company is insolvent? | John Field | E-Mail: Fieldj@tsb.co.za | 04-Nov-13 | A closure assessment is conducted annually. Financial guarantees to fully close and rehab mine are in place and updated. The closure plan involves removing all infrastructure, filling voids. Top soiling and re-vegetating. It also has a aftercare component |
| Rumours exist that the product being found underground does not match the prospectus - is this why the expansion is being contemplated? | John Field | E-Mail: Fieldj@tsb.co.za | 04-Nov-13 | The expansion is due to expand the life of mine. All coal resources are independently verified and quality testing is done continuously. The quality of coal at Somkhele is very good. |
| vehicle weights compliant? | | E-Mail: Fieldj@tsb.co.za | 04-Nov-13 | All vehicles pass over a weighbridge before leaving the mine. All these weights are recorded. |
| water affairs compliance | John Field | E-Mail: Fieldj@tsb.co.za | 04-Nov-13 | A water licence to abstract water from Mfolozi has been granted. A application for storage, using water for dust suppression and dewatering of the pits is currently being processed by Water Affairs. AN annual assessment of the licence is requires. GCS conducts quarterly monitoring and submits a annual report to Water Affairs. |
| waste compliance? | John Field | E-Mail: Fieldj@tsb.co.za | 04-Nov-13 | All waste is removed by certified waste contractors. The only hazardous materials produced on the mine are rags contaminated with hydrocarbons. The quantity produced don't require any licencing. |
| Community involvement? | John Field | E-Mail: Fieldj@tsb.co.za | 04-Nov-13 | The mine employs almost 1000 people of which over 80% come from the surrounding community. There are monthly meetings with the tribal authorities and Indunas. The Indunas meet regularly with the mine to discuss issues. All grievances are sent to the Indunas who raises them with the mine. |
| Concerns from 2000 have been over looked | Rosanne Clark | E-mail: Rosanne@dbnmail.co.za | 05-Nov-13 | E-mail Response requesting specific concerns E:Mail 5 November 2013. |

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| The establishment of a mine & Pits themselves so close to a world renowned game reserve & the consequences of opening up such pits for the local inhabitants. | Andrew Ewing | E-mail: andrew@ewing.co.za | 12-Nov-13 | Comments noted E-mail acknowledging receipt. E:Mail 13 November 2013. |
| Was interested in how the demographics of the area have chanced since to inception of the mine. | Sheila Berry | Assagay Meeting | 14-Nov-13 | E-mail response with a document comparing demographic data. E-Mail: Tue 2013/11/19 02:04 PM Sheila.bee@gmail.com |
| Has the impacts of light / Lighting being considered in the visual study (big impacts associated with lighting even in the open pits). | Sheila Berry | Assagay Meeting | 14-Nov-13 | Gareth Jones GIS Specialist: Not really but we will take that into consideration. For now we can only simulate from the available conditions. Gareth will incorporate light pollution into his VIA report. |
| Information from previous meeting was not received | Wally Mene | Assagay Meeting | 14-Nov-13 | Point noted. Previous minutes will be forwarded |
| What Mine is doing to curb climate change, what is the mines contribution to climate change. What measures is the mine taking to reduce the impacts on it's anthracite. | Wally Mene | Assagay Meeting | 14-Nov-13 | Point has been noted. Difficult for incorporate these impacts into this current project. |
| Interested in the size of the pumps used at Somkhele | Alex Searle | ST Lucia Meeting | 15-Nov-13 | CW to forward pump data to Alex. E:mail sent to mine 28 November requesting information. |
| Enquired about the agricultural potential of the land for the community to get involved in Sugar Farming. | Alex Searle | ST Lucia Meeting | 15-Nov-13 | CW outlined the initial findings from the soil and land capability studies for the area. Area is not conducive to commercial agriculture. |
| Ezemvelo KZN Wildlife, the authority mandated to conserve biodiversity in the Province of KwaZulu-Natal and the designated Management Authority for Hlhuluwe-iMfolozi Park (HiP), requests that Ezemvelo be registered as an interested and affected party. It is noted that public meetings were held last week on 14 and 15 November 2013. Ezemvelo, being an organ of state, does not as a rule attend public meetings. Please advise whether GCS intends calling an authorities meeting. Please may I request that you forward me an electronic copy of the BID so that I can forward onto our reserve management and scientific services staff at HiP. We look forward to engaging closely in the EIA process | Jenny Longmore | Jenny.Longmore@kznwildlife.com | 18-Nov-13 | Reply From Chris Wright 18 November 2013.<br>Dear Jenny<br><br>Many thanks for your reply. Please find attached electronic copy of the BID. I have also attached a copy of the presentation.<br><br>It is difficult to get authorities together to attend meetings. It is easier to engage with authorities on a one on one basis. I did attempt to get someone from KZN planning to attend the public meeting with specialists unfortunately I believe there was a meeting the previous day which made this difficult.<br><br>Can I suggest a meeting with KZN wildlife take place in early December. I will be able to make draft specialist studies available for review.<br><br>Best Regards |

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| note that you attached the scoping report instead of the BID. It is of concern that the report issue status is recorded as “final” (p ii of the scoping report). Please could you advise what “phase” the process is at. It was my understanding that the project was still at the information phase.<br>Can I suggest a meeting with KZN wildlife take place in early December. I will be able to make draft specialist studies available for review.<br><br>Ezemvelo would like to meet with GCS and the appointed specialists. Please could you proposed a few dates so I can try and secure a date with my colleagues. If you could forwarded us copies of the specialist work undertaken to date it would be appreciated. Please could you also send us copies of the TOR’s supplied to specialists. | Jenny Longmore | Jenny.Longmore@kznwildlife.com | 18-Nov-13 | Reply from Chris Wright 18 November 2013<br>Process being followed is the MPRDA. The clients prospecting licence was about to expire and he wished to convert into a mining right.<br>Authorisation under NEMA as well as updating water use licence will be done in the next year or so. No mining will occur in the proposed areas for at least 3/4 years.<br><br>It would be difficult to apply for NEMA listings currently as the time some activities will commence is 20 years +.<br>I’ll Liaise with specialists regarding dates for a meeting and revert |
| It is clear that the social issues require more attention especially after hearing from Johan Gloy that he is raising funds for proposed developments in the area.<br>We would value an opportunity to receive input from the person who is over-seeing the community work. | Sheila Berry | Sheila.bee@gmail.com | 19-Nov-13 | E:Mail response: 19 November 2013.<br>We are currently having meetings with various affected community members. The issues raised will be looked at. Initial comments have ranged from relocation of graves to re-settlement concerns. I will put everything into a comments and response report which I will forward to you once the current phase of public engagement is complete.<br>I am also scheduling a meeting with KZN Wildlife and the specialist team. This meeting is likely to take place in the 2nd week of December. Minutes to the public meetings are currently being drafted and will be forwarded to the I&Aps as soon as they are complete. Minutes taken of the community meetings will also be forwarded once complete. Attendance in the first community meeting exceeded 120 people and the numbers were similar for the second meeting. There are 3 more meetings next weekend.<br><br>The community officer or stakeholder manager is Joyce Makhema. Her contact details are joyce@somkhele.co.za cellphone: 0798858286. |

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| interested in the input relating to impacts on the heritage of the area as a result of the mine | Andrew Ewing | Sheila.bee@gmail.com | 20-Nov-13 | Email Reply: 28 November 2013. Thank you for your comments. They have been captured and will put them to the mine for a response |
| concerned to hear plans to bring industries into the area. I understood it to be a source of job creation and a possible back-stop when Somkhele closes. | Andrew Ewing, Dr Player Sheila Berry. | Sheila.bee@gmail.com | 20-Nov-13 | |
| Given the close proximity of HIP and its historic value as the first conservation area and first wilderness area on the African continent, as well as the place where the first wilderness trail in the world was conducted, plus the foremost haven of the white rhino, surely tourism developments should top the list of preferred land use options. | Andrew Ewing, Dr Player Sheila Berry. | Sheila.bee@gmail.com | 20-Nov-13 | |
| Andrew also reiterated his concern about the increasing local population. He said he counted 100 new houses close to the road the last time he visited HIP. | Andrew Ewing, Dr Player Sheila Berry. | Sheila.bee@gmail.com | 20-Nov-13 | |
| Andrew raised the issue as to what would happen if the price of anthracite dropped or pressure on fossil fuels resulted in carbon taxes being imposed that decreased the viability of Somkhele. | Andrew Ewing, Dr Player Sheila Berry. | Sheila.bee@gmail.com | 20-Nov-13 | |

# 6 ENVIRONMENTAL MANAGEMENT GOALS AND OBJECTIVES

This chapter of the EIA/EMP report relates to Section 51 (a) (ii) of the MPRDA Regulation 527 and Section 2- 2 of the EMP Template:

- *(Section 2 – 2): Description of environmental objectives and specific goals for the management of identified environmental impacts emanating from the proposed mining operation. (As informed by the information provided in the EIA in terms of Regulation 50 (h)).*

The environmental consequences/impacts associated with the Somkhele operations on the surrounding area are addressed within this report according to the prerequisites of the MPRDA and all relevant legislation as listed previously. To ensure that the impacts associated with the mine as a whole are properly mitigated, managed and or avoided (where possible), a number of specific environmental objectives have been defined. The environmental objectives need to be attained and/or maintained to ensure optimal environmental (social, economic, biophysical) management of the mining area and minimisation of the potential cumulative impacts on the surrounding environment.

The overall objectives of closure will be to:

- Rehabilitate the disturbed areas to grazing land,
- Ensure that the site is made safe and
- Control erosion and pollution emanating from the former mine area.

As the mine is operational with environmental objectives having already been defined, these objectives have been refined to include any additional objectives identified and are defined in Table 6-1.

**Table 6-1 Management Objectives and Goals**

| Aspect | Management Goal and Objective |
|---|---|
| Topography | To mitigate topographic impacts created during the operational phase – to restore the topography to as close to its original state as possible<br>To ensure the most effective water management of the mining site<br>To prevent surface subsidence by using appropriate mitigation measures and to rehabilitate areas where subsidence may occur |
| Geology | To limit the impact on the mining area<br>To limit the size of the area disturbed by mining<br>To ensure proper stockpiling of the overburden for use during rehabilitation. |
| Soils | To mitigate long-term soil contamination impacts<br>To maintain the viability of the soils for future rehabilitation purposes<br>To ameliorate altered physical and chemical properties of soils caused by stripping, handling and stockpiling<br>To ensure proper and effective dust control and monitoring measures are put in place during the operation of the mine<br>To prevent the possible contamination of soils along the roads, and around the mining operational area<br>To install and maintain long-term erosion control structures, using natural vegetation and stand-alone methods |
| Land capability | To restore the affected surfaces to grazing land capability<br>To create indigenous grassland that will stabilise the soils in the short term, and recreate the natural grassland and/or agricultural lands in the long term, so that the area can be returned to its natural state as far as possible and used for grazing purposes |
| Land use | To identify and find alternative routes and footpaths for the movement of persons and livestock<br>To enable the continued utilisation of grazing land surrounding the mine-affected area<br>To ensure safe access to grazing land through construction of underpasses and crossing points at the haul roads<br>To restore the affected surface area to pre-mining status so that pre-mining land use activities can be resumed within time<br>To reduce the area that is to be disturbed, and contain the impacts on the natural habitat caused by the mechanised equipment |
| Vegetation | To reduce the impact on the natural biodiversity in the area<br>To control weed/alien plant invasion<br>To avoid the loss of ethno-botanical plants which could potentially be useful to the local community<br>To minimise risk of germination failure during site rehabilitation as a result of very high surface temperatures<br>To provide guidelines for the controlled removal of vegetation<br>To implement controls that will limit the impact on valuable vegetation communities, namely the riverine forest and the wetland area<br>To ensure that the quality and diversity of the pre-mining vegetation communities is represented in the post-mining rehabilitated land<br>To conserve the protected plant species present within the affected area<br>To establish a cover of vegetation that will control erosion until such time that the area can be used for the grazing of cattle and goats<br>To create indigenous grassland that will stabilise the soils in the short term, and recreate the natural grassland and/or agricultural lands in the long term<br>To minimise the occurrence and extent of erosion caused by vegetation stripping and clearing<br>To limit the mining activities to the designated areas and thereby minimise loss of vegetation.<br>To reintroduce pioneer grass species for the effective rehabilitation that will ensure natural succession will occur |

| Aspect | Management Goal and Objective |
|---|---|
| Animal life | To reduce the impact on the natural biodiversity in the area<br>To preserve a Red Data listed reptile species<br>To provide for the protection of local fauna (including livestock) against mine-related hazards<br>To control the presence of pest animals within the mining area<br>To ensure the prevention of animal hunting and poaching throughout the life of mine<br>To ensure proper rehabilitation and natural succession occurs so that the natural habitats can be restored<br>To make the area safe for animal habitation |
| Surface water & Groundwater | Surface water<br>To manage surface water so as to separate clean and dirty water, intercept all contaminated water and control the impact of mine-contaminated water on local water resources.<br>To prevent the flooding of mine pits and the plant/discard dump complex during high intensity or long duration rainfall events<br>To manage the positive water balance during the wet season to ensure minimum risk of contamination of surface water resources<br>To compensate affected persons whose surface water usage will be interrupted as a result of the mining operation<br>To avoid indirect impacts on the local wetland community and Mbukwini Pan through the contamination of the water supply<br>To design mine structures in such a way as to limit development within the critical floodline areas and construct structures that will control the contamination from the mining and plant area<br>To provide guidelines to ensure that stream crossings are sensitively planned and constructed with care<br><br>Groundwater<br><br>To manage and contain groundwater inflows into the mining pits so as to minimise the potential for contamination of the groundwater and surface water resources within the catchment during the life of mine and beyond<br>To obtain approval from DMR and DWA for the groundwater closure objectives during the Decommissioning Phase of the project, based on the results of the monitoring information obtained during the Construction and Operational Phases of the project.<br>To continue the groundwater quality and groundwater level monitoring for a period of two years after mining ceases in order to establish post-closure groundwater level and quality trends. If required, the monitoring information will be used to update, verify and recalibrate the predictive tools used during the study.<br>To present the results of the monitoring program to DWA and the DMR on an annual basis. The post-closure monitoring program will be re-evaluated on an annual basis in consultation with Government.<br>To negotiate mine closure with Government based on the results of the groundwater monitoring undertaken, after the two-year post-closure monitoring period. |
| Noise & Vibration | To minimise the noise impact on surrounding land users<br>To minimise the element of surprise associated with blast events<br>To monitor the noise impact and make ongoing recommendations for the improvement of noise control strategies<br>To ensure blasting events are guided by the MHSA<br>To ensure that the blasting events are controlled and monitored<br>To reduce the impact of mining noise on the overall environment and within the proposed mining area in particular. |
| Visual | To minimise the visual impact of the mining activities on surrounding land users/passers-by |

| Aspect | Management Goal and Objective |
|---|---|
| Sites of Archaeological and Cultural Value | To actively involve the affected community in the grave relocation process in order to minimise the social disorientation and potential feelings of resentment surrounding the activity<br>To ensure compliance with legal requirements pertaining to the relocation of graves<br>To define the costs associated with grave exhumation and re-interment<br>To develop a guideline procedure for the relocation of graves |
| Safety | To minimise safety risks on public roads during construction or upgrade activities undertaken by the mine<br>To provide for the protection of workers against danger from animals<br>To ensure the safety of local residents and avoid injury or death due to mine-related accidents |
| Socio-Economic | To guarantee that women have direct access to the cash economy created by the mine thereby reducing their reliance on agricultural production and natural resources<br>To ensure that resettled communities can re-establish their ties to the land in a way that will not jeopardise their future security<br>To reduce unsustainable pressures on surrounding land and resources<br>To ensure that anyone losing access to land and resources, either as a direct or indirect result of mining, is adequately compensated<br>To prevent conflict from arising over the matter of access to land<br>To minimise conflict between 'outsiders' and the local community with respect to employment opportunities<br>To improve understanding of STDs and HIV/AIDS through educational programs and expanding awareness<br>To ensure the inclusion of local and Traditional Authorities in a widely acceptable and participative resettlement and compensation process<br>To identify and implement programs for skills training within the local community thus improving their skills (beyond subsistence agricultural) and increasing their marketability in the broader labour market<br>To avoid damage to properties and structures outside of the mine area, and to repair such damage should it inadvertently occur<br>To establish and maintain an ongoing, transparent line of communication between the mine and the community<br>To develop a Resettlement and Compensation Plan that is widely accepted and ensures that no resettled persons are left 'worse off'<br>To limit the socio-economic impacts as a result of cessation of the mining activities |
| Maintenance | To monitor and manage post-closure impacts until closure is obtained |
| Infrastructure | To find alternative uses for mine infrastructure, or if not possible, to ensure that the components are properly disposed of |
| Waste | To collect and dispose of all waste at a permitted disposal site<br>To reduce waste, by initiating recycling projects.<br>Ensure that operations are compliant with the National Waste Act |

# 7 IDENTIFICATION OF IMPACTS AND ISSUES WITH MANAGEMENT MAEASURES AND ACTION PLANS (EMP)

This chapter of the report fulfils the requirements of regulations 50 (a) to (e) and 51 (a) and (b) of the MPRDA Regulations, R527.

***<u>REGULATION 50 (a):</u>***

- *(Section 1- 3): The potential impacts*
  - *(Section 1-3.1): List of the potential impacts, on environmental aspects separately in respect of each of the aforesaid main mining actions, activities and processes;*
  - *(Section 1 - 3.2): List of all potential cumulative environmental impacts;*
  - *(Section 1 - 3.3): State specifically whether or not there is a risk of acid mine drainage or potential groundwater contamination associated with the mineral to be mined. (If such a risk is associated with the mineral to be mined provide a summary of the findings and recommendations of a specialist geo-hydrological report in that regard).*

***<u>REGULATION 50 (b)</u>***

- *(Section 1 - 5)The potential impacts of the alternative land use or development*
  - *(Section 1 - 5.1): List of the potential impacts of each of the aforesaid main features and infrastructure related to the alternative land use or development and related listed activities;*
  - *(Section 1 - 5.2): Description of all potential cumulative impacts of the main features and infrastructure related to the identified alternative land uses or developments.*

***<u>REGULATION 50 (c)</u>***

- *(Section 1 - 6): Identification of potential social and cultural impacts.*
  - *(Section 1 - 6.1): List of potential impacts of the proposed mining operation on the socio- economic conditions of other parties' land use activities (include all the items to be included in the list referred to in the concomitant section of the guideline posted on the official website of the*

*Department);*

- *(Section 1 - 6.2): Description of the cultural aspect that will potentially be affected, and describe the potential impact on such cultural aspect (In cases where such features are not applicable the applicant must still include the item in the list and describe it as not applicable);*
- *(Section 1 - 6.3): Description of heritage features and the potential impact on such heritage feature. (In cases where such features are not applicable the applicant must still include the item in the list and describe it as not applicable);*
- *(Section 1 - 6.4): Quantification of the impact on the socio-economic conditions of directly affected persons, as determined by the findings and recommendations of a specialist report in that regard*
  - *(Section 1 - 6.4.1): The amount of the quantified potential impact on property or infrastructural assets;*
  - *(Section 1 - 6.4.2): State the amount of the quantified potential impact on commercial, economic or business activity which will be impacted upon as a result of the mining activity*
  - *(Section 1 - 6.4.3): The sum of the amounts, referred to in paragraphs 6.6.1 and 6.6.2 above.*

- *(Section 1-7): Assessment and evaluation of potential impacts.*
  - *(Section 1- 7.1.): List of each potential impact identified in paragraphs 3 and 6 above. (Include all the items to be included in the list referred to in the concomitant section of the guideline posted on the official website of the Department)*
  - *(Section 1 - 7.2.): Concomitant impact rating for each potential impact listed in paragraph 7.1 above in terms of its nature, extent, duration, probability and significance.(Provide a definition of the criteria used for each of the variables used for rating potential impacts and ensure that the potential impacts are rated specifically with the assumption that no mitigation measures are applied).*
  - *(Section 1 - 7.3.): Indication of the phases (construction, operational, decommissioning) and estimated time frames in relation to the potential impacts rated.*

***REGULATION 50 (e)***

- *(Section 1 - 10): List of all the significant impacts as identified in the assessment conducted in terms of Regulation 50 (c) (Include all the items to be included in the list referred to in the concomitant section of the guideline posted on the official website of the Department).*

***Regulation 51 (a)***

- *(Section 2 -1): Description of environmental objectives and specific goals for mine closure.*
    - *(Section 2 - 1.1): Environmental aspects that describe the pre-mining environment.*
    - *(Section 2 - 1.2): Measures required to contain or remedy any causes of pollution or degradation or the migration of pollutants, both for closure of the mine and post-closure.*
- *(Section 2 – 2): Description of environmental objectives and specific goals for the management of identified environmental impacts emanating from the proposed mining operation. (As informed by the information provided in the EIA in terms of Regulation 50 (h)).*
    - *(Section 2 - 2.1): List of identified impacts which will require monitoring programs.*
    - *(Section 2 - 2.2): List of the source activities that are the cause of the impacts which require to be managed.*
    - *(Section 2 - 2.3): Management activities which, where applicable, will be conducted daily, weekly, monthly, quarterly, annually or periodically as the case may be in order to control any action, activity or process which causes pollution or environmental degradation.*
    - *(Section 2 - 2.4): The roles and responsibilities for the execution of the monitoring and management programs.*
- *(Section 2 – 3) Description of environmental objectives and specific goals for the socio-economic conditions as identified in the social and labour plan. (Include all the items to be included in the list referred to in the concomitant section of the guideline posted on the official website of the Department).*

- (Section 2 – 4): Description of environmental objectives and specific goals for historical and cultural aspects.
    - *(Section 2 - 4.1): Environmental objectives and goals in respect of historical and cultural aspects identified in specialist studies conducted during the EIA phase.*

***<u>Regulation 51 (b) – Outline of the implementation program</u>***

- *(Section 2 – 5): The appropriate technical and management options chosen for each environmental impact, socio-economic condition and historical and cultural aspect in each phase of the mining operation, as follows;*
    - *(Section 2 - 5.1): Actions, activities or processes, including any NEMA EIA Regulation listed activities, which cause pollution or environmental degradation. (Include all the items to be included in the list referred to in the concomitant section of the guideline posted on the official website of the Department).*
    - *(Section 2 - 5.2): Concomitant list of appropriate technical or management options chosen to modify, remedy, control or stop any action, activity, or process which will cause significant impacts on the environment, socio-economic conditions and historical and cultural aspects as identified. (Attach detail of each technical or management option as appendices).*

- (Section 2 – 6): Action plans to achieve the objectives and specific goals contemplated in ***<u>Regulation 50 (a)</u>***
- *(Section 1 – 17): Time schedules of deadlines for each action to be undertaken to implement each technical or management option chosen. (Include all the items to be included in the list referred to in the concomitant section of the guideline posted on the official website of the Department).*

## 7.1 Impacts and Mining Phases

This section comprises of the description of potential impacts associated with the proposed operation of the mine on the biophysical, socio-economic and heritage and cultural environment. These descriptions are followed by the impact tables which contain the assessment of the significance of each identified impact without, then with mitigation measures. Each mitigation measure proposed is assigned a proposed action plan, frequency, associated management cost, as well as person responsible for implementation of the mitigation measures proposed to mitigate and/or manage each impact. Different impacts occur during different phases of the mining operations. In order to avoid unnecessary repetition, all the potential impacts phases have been grouped together including the areas and phases that the impacts may occur are below. It must be noted that the management measures already being implemented at Somkhele have been included. A summary of impact significance is presented under this chapter. The full impact rating tables can be viewed in **APPENDIX E**.

### 7.1.1 Impact rating methodology

The potential impacts significance was calculated by looking at various aspects of the impact. These included the probability, frequency, special extent, intensity and duration.
Table 7-1 below outlines the rating system used to calculate impact significance.

## Table 7-1 Impact rating methodology

| Rating | Description | Quantitative Rating |
|---|---|---|
| ***Status (S)*** | | |
| Positive | A benefit to the holistic environment | 1 |
| Negative | A detriment to the holistic environment | -1 |
| ***Probability (P)*** | | |
| Improbable | In all likelihood the impact will not occur | 1 |
| Low Probability | Possibility of the impacts to materialise is very low | 2 |
| Probable | A distinct possibility that the impact will occur | 3 |
| Highly Probable | Most likely that the impact will occur | 4 |
| Definite | The impact will occur regardless of any prevention measures | 5 |
| ***Frequency (F)*** | | |
| Continuous | Daily | 1 |
| Frequent | Less than daily (hours) | 0,8 |
| Infrequent | Moderate frequency (weekly) | 0,5 |
| Occasional | Lees than weekly (once or twice per month) | 0,2 |
| ***Spatial Extent (SE)*** | | |
| Site Specific | Effects occur within the site/servitude boundary | 1 |
| Local | Effects extend beyond the site boundary | |
| | Affects immediate surrounding areas | 2 |
| Regional | Widespread | |
| | Extends far beyond the site boundary | |
| | Effects felt within a 50km radius of the surface lease area | 3 |
| National | Effects felt beyond the 50km radius | 4 |
| ***Intensity (I)*** | | |
| Very Severe | Substantial deterioration/improvement | |
| | Irreversible or permanent | |
| | Cannot be mitigated | 4 |
| Very Beneficial | Permanent improvement and benefit | 4 |
| Severe | Marked deterioration | |
| | Long term duration | |
| | Serious and severe impacts | |
| | Mitigation is very expensive, difficult or time consuming | 3 |
| Beneficial | Large improvement | |
| | Long term duration | 3 |
| Moderately Severe | Moderate deterioration | |
| | Medium term to long term duration | |
| | Fairly easily mitigated | 2 |
| Moderately Beneficial | Moderate improvement | |
| | Medium to long term duration | 2 |
| Slight | Minor deterioration | |
| | Short to medium term duration | |
| | Mitigation is easy, cheap or quick | 1 |
| Beneficial | Minor improvement | |
| | Short to medium term duration | 1 |
| ***Duration (D)*** | | |
| Short Term | 0 - 5 years | |
| | Less than the project life span | 1 |
| Medium Term | 5 - 10 years | 2 |
| Long Term | 15 - 40 years | |
| | Life of project | 3 |
| Permanent | Where the impact will be irreversible and will remain | 4 |
| | | |
| ***Significance*** | | (Negative) |
| High | Negative long term/permanent change to the natural and social en | 13 - 18 |
| Medium | Medium or long term effects to natural and social environment | 7 - 12.9 |
| | These effects are real and mitigation is possible, difficult and ofte | |
| Low | Short term effects on the natural environment | |
| | Effects are not substantial and are often viewed as unimportant | 0 - 6.9 |
| | Mitigation is cheap, easy, quick or seldom required | |
| | | (Positive) |
| High | To the greater benefit of the social and/or natural environment | 13 - 18 |
| | No mitigation or monitoring needed | |
| Medium | A benefit to the holistic environment | |
| | Monitoring is needed | 7 - 12.9 |
| | Some mitigation is needed | |
| Low | No real benefit to the holistic environment | 0 - 6.9 |
| | Mitigation and monitoring is needed | |

### 7.1.2 Outline of mining phases

*Construction phase*

The construction phase will be undertaken over a relatively short. The activities listed below will be undertaken to prepare the area for the mining operations. These include the construction of:

- Access and haul roads
- The initial box cut for the opencast pit
- Temporary overburden stockpiles
- The temporary topsoil and overburden stockpiles
- Construction of pollution control ponds.

***Operational Phase:***

There will be an increase in the potential for environmental impacts with the commencement of mining of the Luhlanga and Kwaqubuka pits. The operational phase will comprise of the following activities:

- Mining.
- Blasting.
- Increased movement of heavy trucks on transport route.
- Contribution to the various stockpiles.
- Dust suppression.
- Maintenance of machinery.
- Waste generation.

***Decommissioning and Closure Phase:***

The decommissioning and closure phases will comprise of the following activities that could lead to potential impacts:

- Demolition of all infrastructure in meeting the closure objectives,
- Decontamination of areas as part of the rehabilitation process,
- Overall rehabilitation of the affected area,
- Retrench and/or retraining of employees.

## 7.2 Topography

Alterations to the topography will be most prevalent during the initial boxcut and from stockpiling of overburden. The impacts, applicable mining areas and mining phase along with associated management measures are outlined below.

### 7.2.1 Alteration to topography due to surface subsidence – Opencast Operations

Surface subsidence may take place in the form of landslides and / or land slumps of soil or rock into the opencast pits.

| Phase of the mining operation | | |
|---|---|---|
| Construction | Operational | Decommissioning & Closure |
| ☑ | ☑ | |

| Applicable Areas | | | | | |
|---|---|---|---|---|---|
| Area1 | ☑ | Luhlanga | ☑ | Kwaqubuka North | ☑ |
| Area 2 | | Kwaqubuka | ☑ | Opondweni | ☑ |
| Gwabalanda | ☑ | Emalahleni | ☑ | Mahujini | ☑ |
| Tholokhule | ☑ | Mvutshini | ☑ | | |

***Management and mitigation measures***

Surface subsidence may take place in the form of landslides and / or land slumps of soil or rock into the opencast pits. Appropriate management such as terracing will prevent or limit this movement of earth material throughout the operation, and until the rehabilitation is complete and closure is achieved.

The opencast areas will be back-filled using correct and recognised mining procedures to minimise and where possible, prevent surface subsidence from occurring..

The bulking factor associated with backfilling will cater for the coal that will have been removed, and the topography will be slightly altered after mining. However, the levels will be surveyed and checked to ensure that free flow of surface water occurs, and no ponding takes place.

### 7.2.2 Altered Drainage

Mining activities may impact on the drainage of areas. The altered drainage could result in changes in surface water runoff and an increase in erosion potential. These impacts are discussed in section 7.8.

| Phase of the mining operation | | |
|---|---|---|
| Construction | Operational | Decommissioning & Closure |
| ✓ | ✓ | |

| Applicable Areas | | | | | |
|---|---|---|---|---|---|
| Area1 | ✓ | Luhlanga | ✓ | Kwaqubuka North | ✓ |
| Area 2 | | Kwaqubuka | ✓ | Opondweni | ✓ |
| Gwabalanda | ✓ | Emalahleni | ✓ | Mahujini | ✓ |
| Tholokhule | ✓ | Mvutshini | ✓ | | |

***Management and mitigation measures***

Diversion systems (berms and drains) will need to be installed during the construction phase in preparation for diverting runoff away from the opencast mining. The installation of the diversion berms will alter the existing drainage patterns across the site, however:

- The catchment areas are small so limited drainage will be impacted upon;
- Diversion structures will be located near the crests of hills (and thus sub-catchment limits) thereby reducing the affected area. The benefit of the diversion systems is that they will reduce the volume of surface water that may be contaminated.

Altered drainage patterns can also be expected along the mine access roads where V-drains and mitre drains are installed. Table 7-2 below is a summary of predicted impacts for the Topography.

**Table 7-2 Impact summary Topography**

| POTENTIAL ENVIRONMENTAL IMPACT | Significance<br>Pre-Mitigation | Significance<br>Post Mitigation |
|---|---|---|
| **Topography** | | |
| Alteration of the topography due to the opencast mining and the associated stockpiling of overburden | Medium(-) | Low(-) |
| Alteration to topography due to surface subsidence - Opencast Operations | Low(-) | Low(-) |
| Altered Drainage | Medium(-) | Medium(-) |

## 7.3 Geology

The geology of the area will be impacted on due to mining. Although this impact is expected to be of medium significance, no mitigation is possible as mining permanently impacts on the geological strata. The mining activities will, however, remain within the MR area.

## 7.4 Soils

Impacts on Soils pertain to the loss of soils primarily through erosion and changes in soil properties from mining activities. The tables under this section outline the impacts and management measures. A summary of the impacts anticipated is presented in Table 7-3.

### 7.4.1 Change in soil properties

Opencast mining and the stripping and handling of soils could result in alterations of soil properties. Changes in soil properties could influence the suitability of soils for rehabilitation purposes.

| Phase of the mining operation | | |
|---|---|---|
| Construction | Operational | Decommissioning & Closure |
| ☑ | ☑ | |

| Applicable Areas | | | | | |
|---|---|---|---|---|---|
| Area1 | ☑ | Luhlanga | ☑ | Kwaqubuka North | ☑ |
| Area 2 | ☑ | Kwaqubuka | ☑ | Opondweni | ☑ |
| Gwabalanda | ☑ | Emalahleni | ☑ | Mahujini | ☑ |
| Tholokhule | ☑ | Mvutshini | ☑ | | |

***Management and mitigation measures:***

**Soil Stripping:**

- Soils will be stripped and stockpiled for use in rehabilitation of the site;
- As a general rule, a minimum of 200 mm topsoil will be stripped from all areas;
- Separate stripping principles will apply i.e.: separation of the topsoil (topsoil layer contains a seedbank of natural seed which will accelerate the rehabilitation process) from the subsoil;
- Separation of the topsoil, subsoil and overburden layers owing to differing physical and chemical properties;
- Separation of blocky black clay soils from grey sands/sandy loams;
- Machine operators are to be advised of the different soil types and the requirements for stripping, handling and stockpiling.
- All soils should be stripped in a dry or near-dry state where possible.
- Repeated handling of soils should be avoided (through immediate replacement of soils as part of a roll-over mining process or forward planning);
- Soil should not be handled during high wind conditions to minimise soil loss through wind erosion;
- No soil stripping is to be undertaken after rainfall events. This must be monitored by the Environmental Control Officer (ECO) or Mine manager. Staff will be trained in order to ensure that they are aware of the problems associated with stripping wet soils.

**Soil Replacement and Stockpiling**

- Soil replacement should emulate the pre-stripping location i.e. soils should be replaced in a position very close to that from which they were taken (bottomland in a bottomland position; midslope in a midslope position);
- Soils should be replaced as soon as possible after stripping. Soils which cannot be replaced immediately must be stockpiled properly. The stockpiling requirements are as follows:
    - Separate stockpiling of different soil types and layers;
    - Away from watercourses or areas where they will be prone to erosion;

  - Upslope of the workings (for topsoils and subsoils);
  - Soils should be replaced in sequence (subsoil below topsoil);
  - Stockpiles are to be protected from wind and water erosion;
- For short-term stockpiling (less than 1 to 3 months) erosion control measures will not need to be implemented;
- For long-term stockpiling (more than 3 months) the stockpiles must be grassed; and
- The colonisation of stockpiles by invasive plants must be controlled by removing the plants when they germinate. The purpose of this is to reduce the risk of developing a weedy seedbank within the stockpiled soil.

### 7.4.2 Loss of soil integrity, Topsoil and Subsoil Handling

Poor handling of topsoils could reduce the viability of the soils. Topsoils and subsoils are required for rehabilitation of mining areas.

| Phase of the mining operation | | |
|---|---|---|
| Construction | Operational | Decommissioning & Closure |
| ☑ | ☑ | |

| Applicable Areas | | | | | |
|---|---|---|---|---|---|
| Area1 | ☑ | Luhlanga | ☑ | Kwaqubuka North | ☑ |
| Area 2 | ☑ | Kwaqubuka | ☑ | Opondweni | ☑ |
| Gwabalanda | ☑ | Emalahleni | ☑ | Mahujini | ☑ |
| Tholokhule | ☑ | Mvutshini | ☑ | | |

***Management and mitigation measures:***

The impacts on the soils may be mitigated with the following management procedures:

- Effective soil stripping during the dry winter months. This will help to maintain the structural integrity of the structured soils;
- Soil replacement and the preparation of a seed bed to facilitate the re-vegetation program and to limit potential erosion;
- Soil amelioration to enhance the capability of the soils and sustain the soils ability to retain oxygen and thus sustain vegetative material during the storage stage; and

- Topsoil and subsoil should be stockpiled separately and managed accordingly.

### 7.4.3 Loss of soil integrity - mining area and roads rehabilitation

During the rehabilitation phase, poor utilization and management of soils can result in a loss of soil integrity. This may impact on the suitability and effectiveness of rehabilitation.

| Phase of the mining operation | | |
|---|---|---|
| Construction | Operational | Decommissioning & Closure |
| | | ☑ |

| Applicable Areas | | | | | |
|---|---|---|---|---|---|
| Area1 | ☑ | Luhlanga | ☑ | Kwaqubuka North | ☑ |
| Area 2 | | Kwaqubuka | ☑ | Opondweni | ☑ |
| Gwabalanda | ☑ | Emalahleni | ☑ | Mahujini | ☑ |
| Tholokhule | ☑ | Mvutshini | ☑ | | |

***Management and mitigation measures:***

The impacts on the soils may be mitigated with the following management procedures:

- Soil replacement depths are controlled by the pre-mining land capability as mapped, and all soils will be replaced to as similar a depth as originally encountered;
- Stones and boulders encountered on the site during the stripping operation will be stockpiled with the overburden and will be buried as deep in the soft overburden as possible, so that they do not interfere with the preparation of the seed bed during either the stockpiling stage or the rehabilitation stage;
- Limiting the access of vehicles onto the rehabilitated land will reduce induced compaction. Tracked vehicles or those with high flotation tyres will be used in preference to normal wheeled vehicles in the levelling operations. Ripping prior to planting will alleviate the effects of over-compaction;
- The area will be smoothed so as to emulate the pre-mining contours. Soils will not be placed on slopes with a gradient greater than 6% to limit the potential for erosion; and

- In order to further limit erosion, prior to the establishment of vegetation, erosion controls will be placed at intervals over the rehabilitated land, using either Vetiver Grass or contour ridges. This will limit the effect of uncontrolled run-off onto the unconsolidated soils.

### 7.4.4 Loss of Soils though Erosion - vegetation removal

During site clearing and during mining; areas where vegetation has been removed are susceptible to erosion.

| Phase of the mining operation | | |
|---|---|---|
| Construction | Operational | Decommissioning & Closure |
| ☑ | ☑ | |

| Applicable Areas | | | | | |
|---|---|---|---|---|---|
| Area1 | ☑ | Luhlanga | ☑ | Kwaqubuka North | ☑ |
| Area 2 | ☑ | Kwaqubuka | ☑ | Opondweni | ☑ |
| Gwabalanda | ☑ | Emalahleni | ☑ | Mahujini | ☑ |
| Tholokhule | ☑ | Mvutshini | ☑ | | |

***Management and mitigation measures***

The following management measures are proposed:

- Ensure that disturbed areas are rehabilitated as soon as possible by rehabilitating each pit on completion of mining and/or implementing a roll-over method of mining where possible;

  Monitor for actual or potential erosion sites and repair the erosion sites immediately;

- One, or a combination of, the following methodologies may be used for repair of erosion sites. The choice will depend on the severity of the erosion:
  - Place loose sack gabions (biodegradable sacks filled with soil and Cynodon dactylon seed) within and/or around the eroded area. The sack gabions will be used to reduce flow velocity and protect the surface until the seeds germinate and establish a cover of vegetation;

- Backfill the erosion zone and seed as follows:

| | | |
|---|---|---|
| Cynodon dactylon | Kweek | 5kg/ha |
| Digitaria eriantha | Finger grass | 5kg/ha |
| Eragrostis tef | Tef | 10kg/ha |

- Apply fertiliser (2:3:2 (25) NPK + Zn at 30 g/m²) and water; and
- Backfill the eroded zone with rocks or rock gabions (rock-filled wire baskets) as well as a soil fill material. Seed the area as above.

### 7.4.5 Usable Material

During the construction and operational phase, material will be available to construct stormwater management systems such as upslope diversion systems and cut-off trenches.

| Phase of the mining operation | | |
|---|---|---|
| Construction | Operational | Decommissioning & Closure |
| ✓ | ✓ | |

| Applicable Areas | | | | | |
|---|---|---|---|---|---|
| Area1 | ✓ | Luhlanga | ✓ | Kwaqubuka North | ✓ |
| Area 2 | ✓ | Kwaqubuka | ✓ | Opondweni | ✓ |
| Gwabalanda | ✓ | Emalahleni | ✓ | Mahujini | ✓ |
| Tholokhule | ✓ | Mvutshini | ✓ | | |

***Management and mitigation measures***

This is a positive impact resulting from mining operations. Any material utilised must follow the management measures outlined in 7.4.2 and 7.4.3 above to ensure the integrity of material used in not compromised.

### 7.4.6 Summary of impacts relating to soils

Impacts from soils range from low to medium. Table 7-3 summarised the impacts identified during the soil assessments.

**Table 7-3 Summary of impacts relating to Soils**

| POTENTIAL ENVIRONMENTAL IMPACT | Significance Pre-Mitigation | Significance Post Mitigation |
|---|---|---|
| **Soils** | | |
| Change in soil properties | Medium(-) | Medium(-) |
| Loss of Soil Integrity; Soil contamination | Medium(-) | Medium(-) |
| Loss of Soils through Erosion. | Medium(-) | Medium(-) |
| Loss of Soil integrity; Soil and overburden stockpiling. | Medium(-) | Low (-) |
| Loss of soil integrity, Mining area and roads rehabilitation | Medium(-) | Medium(-) |
| Usable material | Medium(+) | Medium(+) |

## 7.5 Land Use and Land Capability

### 7.5.1 The destruction of footpaths and access routes through mining activities

Mining activities may create barriers and inhibit the movement of people and livestock. Haul roads may bisect grazing areas.

| Phase of the mining operation | | |
|---|---|---|
| Construction | Operational | Decommissioning & Closure |
| ✓ | ✓ | |

| Applicable Areas | | | | | |
|---|---|---|---|---|---|
| Area1 | ✓ | Luhlanga | ✓ | Kwaqubuka North | ✓ |
| Area 2 | | Kwaqubuka | ✓ | Opondweni | ✓ |
| Gwabalanda | ✓ | Emalahleni | ✓ | Mahujini | ✓ |
| Tholokhule | ✓ | Mvutshini | ✓ | | |

***Management and mitigation measures:***

The Tribal Authority, in consultation with the affected persons, is to identify the route requirements of the local community.

The mine should assist in creating alternative routes that are safe and are located an adequate distance from the active mining areas and the intra-mine haul roads.

Where necessary, assistance should be provided in making formal stream crossings for livestock and humans (e.g. rock causeways or similar).

Pre-cast gabions will be placed under the haul roads to ensure grazing lands can be safely accessed by livestock.

### 7.5.2 Loss of arable land potential

Mining activities will require the acquisition of land that could have the potential to be used as arable land. Only small areas of land are suitable for agriculture and the loss of this land is therefore significant.

| Phase of the mining operation | | |
|---|---|---|
| Construction | Operational | Decommissioning & Closure |
| ✓ | ✓ | |

| Applicable Areas | | | | | |
|---|---|---|---|---|---|
| Area1 | | Luhlanga | ✓ | Kwaqubuka North | ✓ |
| Area 2 | | Kwaqubuka | ✓ | Opondweni | ✓ |
| Gwabalanda | ✓ | Emalahleni | ✓ | Mahujini | ✓ |
| Tholokhule | ✓ | Mvutshini | ✓ | | |

***<u>Management and mitigation measures:</u>***

- The mining area must be kept as small as possible. All soils will be stockpiled in accordance to the soil stockpiling and utilisation guidelines outlined in section 7.1

### 7.5.3 Loss of grazing land potential

Mining will require the acquisition of areas of land that are currently being utilized for grazing.

| Phase of the mining operation | | |
|---|---|---|
| Construction | Operational | Decommissioning & Closure |
| ✓ | ✓ | |

| Applicable Areas | | | | | |
|---|---|---|---|---|---|
| Area1 | | Luhlanga | ✓ | Kwaqubuka North | ✓ |

| | | | | | |
|---|---|---|---|---|---|
| Area 2 | | Kwaqubuka | ☑ | Opondweni | ☑ |
| Gwabalanda | ☑ | Emalahleni | ☑ | Mahujini | ☑ |
| Tholokhule | ☑ | Mvutshini | ☑ | | |

***Management and mitigation measures:***

- The mining area will be kept as small as possible.
- All soils will be stockpiled in accordance to the soil stockpiling and utilisation guidelines outlined in section 7.4.
- Grazing land lost during mining operations will be rehabilitated back to grazing upon closure.
- Ongoing rehabilitation of mined out areas during operation to ensure land is rehabilitated during the mining process. This can be done as the mine has adopted the rollover method of mining.

### 7.5.4 Loss of Wetland potential

Areas which have a wetland potential may be impacted upon during mining operations.

| Phase of the mining operation | | |
|---|---|---|
| Construction | Operational | Decommissioning & Closure |
| ☑ | ☑ | |

| Applicable Areas | | | | | |
|---|---|---|---|---|---|
| Area1 | | Luhlanga | ☑ | Kwaqubuka North | ☑ |
| Area 2 | | Kwaqubuka | ☑ | Opondweni | ☑ |
| Gwabalanda | ☑ | Emalahleni | ☑ | Mahujini | ☑ |
| Tholokhule | ☑ | Mvutshini | ☑ | | |

***Management and mitigation measures:***

- The mining area will avoid wetlands. Buffer and exclusion zones have been developed and form part of the aquatic and surface water studies. These exclusion zones must be adhered to. A no development zone of 50 meters surrounding all riparian zones has already been implemented at Somkhele.

### 7.5.5 Summary of impacts for land capability and land use.

Impacts for the land capability and land use range from medium to high. A summary is outlined in Table 7-4.

**Table 7-4 Impact summary for Land Capability and Land Use**

| POTENTIAL ENVIRONMENTAL IMPACT | Significance | Significance |
|---|---|---|
| | Pre-Mitigation | Post Mitigation |
| **Land Capability and Land Use** | | |
| The destruction of footpaths and access routes through mining activities | Medium (-) | Medium (-) |
| Loss of arable land potential | High (-) | Medium (-) |
| Loss of grazing land potential | Medium (-) | Medium (-) |
| Loss of wetland | Medium (-) | Medium (-) |

## 7.6 Biodiversity

### 7.6.1 Destruction of natural vegetation

This impact is associated with the complete removal or partial destruction/disturbance of existing indigenous vegetation by mining activities. An approximate 30-50 % loss of landscape structure is generally associated with open- cast coal mining which transforms not only the natural asset but any land cover that is in the path of the coal seam (O'Connor & Kuyler, 2006). This impact may be caused by the following activities:

- Clearing of land for mining and associated activities;
- Placement of spoil/material in natural areas;
- Creation of access/haul roads in natural areas; and
- Increased fire frequency and intensity due to increased human activity, particularly if these take place under unfavourable weather conditions.

| Phase of the mining operation | | |
|---|---|---|
| Construction | Operational | Decommissioning & Closure |
| ☑ | ☑ | |

| Applicable Areas | | | | | |
|---|---|---|---|---|---|
| Area1 | ☑ | Luhlanga | ☑ | Kwaqubuka North | ☑ |
| Area 2 | ☑ | Kwaqubuka | ☑ | Opondweni | ☑ |
| Gwabalanda | ☑ | Emalahleni | ☑ | Mahujini | ☑ |
| Tholokhule | ☑ | Mvutshini | ☑ | | |

***Management and mitigation measures:***

- A zero development, 50 m buffer zone on either side of the riverine forest community must be maintained. These should be clearly demarcated with beacons;
- Stream crossings are to be sensitively planned to target areas where:
    - the riverine forest is naturally 'open' and there are no gaps in the continuity;
    - there are no large trees present.
- All areas of high ecological sensitivity near to mining operations should be clearly marked as "out of bounds" or "no-go areas" for all construction vehicles and mining personnel. This can be achieved by appropriately demarcating/mapping all natural areas are that are off-limits to and by fencing mining footprint areas to contain all activities within designated areas.
- Where encroachment of mining into the areas of high sensitivity will be unavoidable, it must be ensured that impact footprints are minimised and that no activities encroach any further than indicated on the infrastructural design master plan.
- Use/upgrade existing roads to access the site only and do not construct any new access routes where possible.

### 7.6.2 Fragmentation of Habitat and reduced connectivity

Vegetation clearing and disturbance of local habitat types generally reduces the availability of habitat for local wildlife. Mining may not only destroy large portions of these habitats, but may also temporarily, or even permanently, restrict corridor movement between areas through associated fragmentation of natural habitat. This will be of particular significance where mining will affect relatively un-impacted areas, especially across local wildlife corridors. The effect of fragmentation will be greater for fauna than for flora and lower for grasslands when compared with bushveld and thornveld communities, generally speaking.

Uncontrolled fires caused either accidentally or intentionally, can also exacerbate these impacts, particularly if these take place under unfavourable weather conditions.

| Phase of the mining operation | | |
|---|---|---|
| Construction | Operational | Decommissioning & Closure |
| ☑ | ☑ | |

| Applicable Areas | | | | | |
|---|---|---|---|---|---|
| Area1 | ☑ | Luhlanga | ☑ | Kwaqubuka North | ☑ |
| Area 2 | ☑ | Kwaqubuka | ☑ | Opondweni | ☑ |
| Gwabalanda | ☑ | Emalahleni | ☑ | Mahujini | ☑ |
| Tholokhule | ☑ | Mvutshini | ☑ | | |

***Management and mitigation measures:***

- Reduce the fragmentation of faunal habitat by confining the area of disturbance. This particularly applies to the riverine forest and the related stream crossings.
- Where encroachment of mining into the areas of high sensitivity will be unavoidable, it must be ensured that impact footprints are minimised and that no activities encroach any further than indicated on the infrastructural design master plan.
- Haul roads and other services infrastructure that need to traverse habitat mapped as 'ecologically sensitive' (medium-high EIS rating) should be located along existing routes/tracks or degraded areas of veld/habitat before seeking alternative routes. The shortest/most convenient route is often not the most ecologically sensitive one. Additional infrastructure such as roads, powerlines, etc. should be located in transformed areas wherever practically possible.
- Ensure that migratory connectivity is maintained between open natural areas where possible by limiting the removal of vegetation and restricting the fragmentation of habitat, particularly for sensitive areas.
- Fences and other obstruction to wildlife movement should not be constructed through natural areas.
- Retain indigenous trees as far as possible and do not damage/remove any

indigenous species outside of the mining impact zone.

- Monitor rehabilitation in the long-term to ensure that the desired habitat is created for the re-colonisation of fauna.
- Rehabilitation of disturbed areas as quickly as possible.
- Ensure vegetation corridors are maintained. A 50meter buffer from rivnerine areas will be maintained.

### 7.6.3 Establishment of Alien Vegetation

The disturbance of natural areas by mining-related activities can lead to optimal conditions for alien invasive plants to invade these areas, including agricultural and commercial exotic species.

The establishment of alien and invasive plant species in natural areas may be caused by the following mining-related activities:

- Vegetation clearing and disturbance;
- Establishment of access/haul roads;
- Tipper trucks are implicated in the dispersal of propagates to newly mined areas;
- Incorrect rehabilitation and remediation methods.
- Soil erosion linked with mining disturbance;
- Dumping/litter; and
- Increased fire frequency and intensity due to increased human activity in the area.

| Phase of the mining operation | | |
|---|---|---|
| Construction | Operational | Decommissioning & Closure |
| ☑ | ☑ | ☑ |

| Applicable Areas | | | | | |
|---|---|---|---|---|---|
| Area1 | ☑ | Luhlanga | ☑ | Kwaqubuka North | ☑ |
| Area 2 | ☑ | Kwaqubuka | ☑ | Opondweni | ☑ |
| Gwabalanda | ☑ | Emalahleni | ☑ | Mahujini | ☑ |
| Tholokhule | ☑ | Mvutshini | ☑ | | |

***Management and mitigation measures:***

- The Mine must implement an alien plant eradication program by removing all alien plants found within the mine-affected areas.
- Persons involved in alien plant removal will need to be trained in the identification of the target plants as well as the appropriate methods for removal of each species.
- All herbicides used must be registered as agricultural remedies in terms of the Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies Act, No. 36 of 1947
- Species-specific herbicides/methods should be favoured, provided they will not compromise the naturally occurring plants. The species-specific methods for eradication and management of the most commonly occurring problem aliens on the site are listed in Table 7-5.
- Alien plants that have been removed are not to be haphazardly disposed of but are to be collected and transferred to a site where they can be burned in a container (e.g. a skip).
- Alien plants should preferably not be removed when they are seeding as this may encourage the spread of the plant. However, if this is unavoidable, extra care must be taken not to spill the seeds.

**Table 7-5 Commonly occurring alien plant invaders at the Somkhele with eradication guidelines**

| Invasive Plant | Treatment |
|---|---|
| *Lantana camara*<br>(Lantana) | Hand pull or hoe seedlings<br>OR<br>Apply Mamba (300 ml/10l water) as a foliar spray on seedlings |
| *Chromolaena odorata*<br>(Triffid weed) | Slash and spray regrowth using Mamba (100 ml/10l water) or Garlon 4 (37.4 ml/10 l water) for established plants<br>OR<br>Cut stump and apply Chopper (300 ml/10 l water) for established plants |
| *Ricinis communis*<br>(Castor-oil bush) | Cut stem below the ground and apply Chopper (300 ml/10l water) |
| *Melia azedarach*<br>(Syringa) | Cut stump and apply Chopper (300 ml/10 l water) for established plants<br>Remove seedlings by hand |

Source: Working for Water Programme

### 7.6.4 Disturbance or loss of Fauna.

Disturbance created by site clearing and general visual and noise-pollution associated with workers and mining activities will affect local wildlife utilising natural habitats. Fauna generally respond to disturbances caused by human activities according to the magnitude, timing, and duration of the particular disturbance. Human activities can affect an animal's ability to feed, rest, and breed if it is unable to habituate to the disturbance caused.

| Phase of the mining operation | | |
|---|---|---|
| Construction | Operational | Decommissioning & Closure |
| ✓ | ✓ | |

| Applicable Areas | | | | | |
|---|---|---|---|---|---|
| Area1 | ✓ | Luhlanga | ✓ | Kwaqubuka North | ✓ |
| Area 2 | ✓ | Kwaqubuka | ✓ | Opondweni | ✓ |
| Gwabalanda | ✓ | Emalahleni | ✓ | Mahujini | ✓ |
| Tholokhule | ✓ | Mvutshini | ✓ | | |

***Management and mitigation measures:***

- Rehabilitation of disturbed areas as quickly as possible.
- Use plant species endemic to the site for rehabilitation purposes in order to recreate the pre-mining animal habitats - using other species may alter the habitat, especially for birds, and render it unsuitable.
- Control the invasion of alien plants which will outcompete the indigenous vegetation that is favoured as a faunal habitat.
- Reduce the fragmentation of faunal habitat by confining the area of disturbance. This particularly applies to the riverine forest and the related stream crossings.
- Monitor rehabilitation in the long-term to ensure that the desired habitat is created for the re-colonisation of fauna.

- Steps must be taken to ensure that workers do not poach animals and birds. No member of the mining team will be permitted to:
  - Hunt, kill, set devices to trap, tamper with or harass wild animals and livestock or destroy any form of animal shelter;
  - Feed indigenous animals; or

  - Bring his/her own pets to the site.
- Incorporate fauna protection into the Mine's environmental awareness program to ensure that all Mine personnel are aware of the requirements.
- Livestock must be protected from potential harm by fencing off / cordoning off the active mining area or any dangerous excavations that could result in the death of or injury to local livestock.

### 7.6.5 Loss of Red Data and Protected Species

Mining and related activities in natural areas could result in the destruction or loss of plants and animal species of conservation concern, including protected and threatened/Red data listed species. This, of course, depends on whether these species are present at a site or not and on the threat status of individual species. If a subpopulation of a species of conservation concern is found to occur on a proposed development site, it would be one indicator that human activities are likely to result in the loss of biodiversity, bearing in mind that loss of subpopulations of these species will either increase their extinction risk or may in fact contribute to their extinction risk (SANBI, 2009). This impact may be incurred as long as humans are operating in the vicinity of natural areas. Related activities that could result in the loss of protected/threatened species may include:

- Clearing of land for mining and associated activities;
- Placement of spoil/material in natural areas;
- Creation of access/haul roads in natural areas;
- Increased fire frequency and intensity due to increased human activity; and
- Increased harvesting pressure on flora/fauna species as a result of increased human activity.

| Phase of the mining operation | | |
|---|---|---|
| Construction | Operational | Decommissioning & Closure |
| ☑ | ☑ | |

| Applicable Areas | | | | | |
|---|---|---|---|---|---|
| Area1 | ☑ | Luhlanga | ☑ | Kwaqubuka North | ☑ |

| | | | | | |
|---|---|---|---|---|---|
| Area 2 | ☑ | Kwaqubuka | ☑ | Opondweni | ☑ |
| Gwabalanda | ☑ | Emalahleni | ☑ | Mahujini | ☑ |
| Tholokhule | ☑ | Mvutshini | ☑ | | |

***Management and mitigation measures:***

- The loss of sensitive habitat availability and/or condition must be avoided.
- All attempts should be made to locate mining and related activities outside of sensitive natural areas (untransformed habitats). All mining and related activities should be situated only within the low-medium sensitivity areas.
- Demarcate/map all natural areas are that are off-limits to construction vehicles and personnel.
- Where encroachment of mining into the areas of high sensitivity will be unavoidable, it must be ensured that impact footprints are minimised and that no activities encroach any further than indicated on the infrastructural design master plan.
- Where haul roads and other services infrastructure will need to traverse habitat mapped as 'ecologically sensitive' (medium-high EIS rating), these should be located along existing routes/tracks or degraded areas of veld/habitat before seeking alternative routes. The shortest/most convenient route is often not the most ecologically sensitive one. Additional infrastructure such as roads, powerlines, etc. should be located in transformed areas wherever practically possible.
- Ensure that migratory connectivity is maintained between open natural areas where possible by limiting the removal of vegetation and restricting the fragmentation of habitat, particularly for sensitive areas.
- Fences and other obstruction to wildlife movement should not be constructed through natural areas.
- Retain indigenous trees as far as possible and do not damage/remove any indigenous species outside of the mining impact zone.
- Where mining will impact on areas identified as being highly sensitive, a Red Data plant species survey and rescue exercise should be undertaken. If any Red Data plant species are to be disturbed, ensure effective relocation of individuals to suitable natural habitat outside of the mining impact zone. Prior to mining activities taking place in natural areas, it is advised that the 'flushing out' of local wildlife from habitats to be disturbed be undertaken to allow species to move and

relocate naturally before mining commences.

- Provide environmental awareness training for all mining personnel about the importance of the natural plant/animal species and biodiversity of the natural surroundings.
- No animals are to be killed on the site or surrounding areas, including species considered as dangerous/vermin such as snakes and rats. Where these are encountered on the site, these should be removed and transferred to the nearest natural habitat. A specialist may need to be used for dangerous/venomous species such as snakes.
- No trapping of any animal must be allowed on the site and nearby/adjacent areas.
- Inform site staff that under no circumstance may firewood or medicinal plants be harvested from any nearby natural areas.
- The Mine will adopt a policy of live capture and translocation to the game reserve for any python specimens found. KZN Wildlife will be contacted in this regard. No rewards or incentives will be offered if the snake is killed or injured. Mine contractors and employees will be made aware of the seriousness around killing Pythons.

### 7.6.6 Impact on protected plant species present within the affected region.

Previous flora studies identified protected plant species within rivernerine forests. These specimens must be protected. The management and mitigation measures already being implemented for previous mining areas have been included in the management plans for the extension of mining areas.

| Phase of the mining operation | | |
|---|---|---|
| Construction | Operational | Decommissioning & Closure |
| ✓ | ✓ | |

| Applicable Areas | | | | | |
|---|---|---|---|---|---|
| Area1 | ✓ | Luhlanga | ✓ | Kwaqubuka North | |
| Area 2 | ✓ | Kwaqubuka | | Opondweni | |
| Gwabalanda | | Emalahleni | | Mahujini | |
| Tholokhule | | Mvutshini | | | |

***Management and mitigation measures:***

Specimens of *Sideroxylon inerme* need to be protected from damage; however flora studies conducted revealed that no specimens are present within the planned mining areas. This tree occurs within the riverine forest so stream crossings or any future development must be planned to avoid damage to/disturbance of specimens of this species.

Should a specimen of Sideroxylon inerme need to be removed or damaged in order to facilitate a stream crossing, the necessary permits must be obtained from KZN Wildlife beforehand.

Generally, large trees are concentrated along the streams and so stream crossings should be sensitively planned. All river crossings will be carefully planned in order to prevent damage to important plant specimens. The process is governed under the NWA and needs to be licensed. Detailed planning and engineering design is required before a license for the activity will be issued.

### 7.6.7 Increased pressure on natural resources

Mining activities occurring within a close proximity to natural habitat containing fauna and plants that may have medicinal-use, use in crafts or can be used for construction/building purposes can lead to an increase in the demand placed natural resources. Mining will not only bring additional people to the area and place an increase demand on natural resources, but may also improve access to certain more intact natural areas, where medicinal plants may occur for example. This can result in increased hunting/poaching pressure on plants, animals, reptiles or insects from these locations for these types of use. This is particularly relevant to areas where protected/Red data species may occur and those remote areas that have not been impacted to a high degree by local communities in the area.

| Phase of the mining operation | | |
|---|---|---|
| Construction | Operational | Decommissioning & Closure |
| ☑ | ☑ | |

| Applicable Areas | | | | | |
|---|---|---|---|---|---|
| Area1 | ☑ | Luhlanga | ☑ | Kwaqubuka North | ☑ |
| Area 2 | ☑ | Kwaqubuka | ☑ | Opondweni | ☑ |
| Gwabalanda | ☑ | Emalahleni | ☑ | Mahujini | ☑ |
| Tholokhule | ☑ | Mvutshini | ☑ | | |

***Management and mitigation measures:***

- Only the minimum area of vegetation is to be cleared to enable construction or mining to take place – excessive vegetation clearing leads to erosion problems.
- In grassland areas, the vegetation should be stripped together with the topsoil as this incorporates both seeds and mulch into the topsoil, which can be used for rehabilitation.
- Larger trees and shrubs should not be wasted. Prior to commencement, the community should be allowed to enter the area to clear the trees and shrubs for firewood or building material.
- A number of the plant species present within the affected area have ethnobotanical uses/functions. Thus, to maximise the occurrence of such plants, the local community, through the Tribal Authority, should be given the opportunity for collection of the site prior to the site clearing. It is suggested that the offer also be extended to the nursery officials at the Hluhluwe Nursery within the Hluhluwe-Umfolozi Park.
- The translocation of vegetation to surrounding areas should also be carried out.

### 7.6.8 Pollution of Habitats

The pollution of natural habitats by mining activities includes noise, light and the potential migration of pollutants via air, soil, surface water and groundwater contamination. Waste products and pollutants may include fuels and hazardous chemicals as well as solid waste in the form of building material and litter generated by labourers. These can potentially enter sensitive natural environment and alter the quality of natural habitat, affecting vegetation and species ecology, with a potentially large impact to sensitive/intolerant species. Solid waste pollution (including litter) can also have a negative effect on vegetation, displacing certain species of plants in some instances and encouraging the invasion of early successional and alien invasive species that capitalise on disturbed conditions at sites. Windblown dust caused by mining activities can also settle on natural vegetation, interrupting regular ecological functioning and affecting vegetation health negatively (e.g. reductions in photosynthetic activity and primary production caused by sediments impeding light penetration. This may be caused by the following activities related to mining:

- Clearing of vegetated land and exposure of soils to wind;
- Mining associated disturbance within exposed areas;
- Ineffective dust suppression techniques;
- Creation of unpaved haul/access roads; and
- Incorrect rehabilitation and remediation methods.

| Phase of the mining operation | | |
|---|---|---|
| Construction | Operational | Decommissioning & Closure |
| ☑ | ☑ | |

| Applicable Areas | | | | | |
|---|---|---|---|---|---|
| Area1 | ☑ | Luhlanga | ☑ | Kwaqubuka North | ☑ |
| Area 2 | ☑ | Kwaqubuka | ☑ | Opondweni | ☑ |
| Gwabalanda | ☑ | Emalahleni | ☑ | Mahujini | ☑ |
| Tholokhule | ☑ | Mvutshini | ☑ | | |

***Management and mitigation measures:***

- Dust management measures outlined in section 7.10 must be adhered to.
- Identified storm water management measures must be put in place as outlined in section 7.8.
- Soil management measures must be followed as outlined in section 7.4.1

### 7.6.9 Increase in fire potential

Mining in general has a moderate impact on the fire regime, mainly on account of its impact on frequency rather than on season, intensity or extent. Increased fire risk is associated with increased vehicular and human activities near and within natural habitats and can be accidental or intentional. Grasslands and dry wooded habitats are particularly at risk of runaway veld/bush fires, as well as species of fauna that are not easily mobile.

| Phase of the mining operation | | |
|---|---|---|
| Construction | Operational | Decommissioning & Closure |
| ☑ | ☑ | |

| Applicable Areas | | | | | |
|---|---|---|---|---|---|
| Area1 | ☑ | Luhlanga | ☑ | Kwaqubuka North | ☑ |
| Area 2 | ☑ | Kwaqubuka | ☑ | Opondweni | ☑ |
| Gwabalanda | ☑ | Emalahleni | ☑ | Mahujini | ☑ |
| Tholokhule | ☑ | Mvutshini | ☑ | | |

***Management and mitigation measures:***

- Adequate firebreaks around the mining areas must be maintained at all times.
- Illicit or informal fires must be prohibited on site and within natural areas.
- No open fires to be permitted on the site.
- Smoking must not be permitted in areas considered to be a fire hazard (i.e. in close proximity to forested areas/grasslands, etc.).
- Ensure adequate fire-fighting equipment is available at the site and train workers on how to use equipment.
- Ensure that all workers on site know the proper procedure in case of a fire occurring.
- Ensure that no refuse wastes are burnt on the site or surrounding areas.

### 7.6.10 Soil erosion & Sedimentation

Storm water runoff (rainwater) from the site can cause local erosion of soils and transportation of eroded sediments downstream impacting on natural habitat by removing vegetation/smothering vegetation with silt as well as having an impact on water quality. Water flowing down trenches and access roads, as well as construction site de-watering, could also cause additional erosion & sedimentation. Mining operations generally produce large quantities of dust and finely powdered rock. Plants often fail to establish on these infertile dumps which can be subject to invasion of early successional and alien invasive species that capitalise on disturbed conditions at these sites.

| Phase of the mining operation | | |
|---|---|---|
| Construction | Operational | Decommissioning & Closure |
| ☑ | ☑ | |

| Applicable Areas | | | | | |
|---|---|---|---|---|---|
| Area1 | ☑ | Luhlanga | ☑ | Kwaqubuka North | ☑ |
| Area 2 | ☑ | Kwaqubuka | ☑ | Opondweni | ☑ |
| Gwabalanda | ☑ | Emalahleni | ☑ | Mahujini | ☑ |
| Tholokhule | ☑ | Mvutshini | ☑ | | |

***Management and mitigation measures:***

- Adequate storm water management must be incorporated into the design of the proposed project in order to prevent erosion and the associated sedimentation of riverine areas.
- All storm water containment facilities must remain outside of sensitive areas.
- Storm water that may be contaminated with industrial-type wastes should drain to sump collection points where this water will need to be filtered and/or treated for fuel/oil/chemical contaminants before being released into the environment. Any release must then comply with the relevant DWA standards.
- Adequate stormwater management must be incorporated into the design of the proposed development in order to prevent incision, erosion and the associated sedimentation of areas adjacent or downstream of mining areas and access roads. In this regard specific mention is made of the need to ensure that sufficient attenuation of stormwater takes place and to ensure that any stormwater released is released in such a way that the energy of releases is minimised and to prevent soil erosion.
- During the construction and operational phases of the proposed mining project, erosion berms should be installed on all unpaved surfaces and roadways and around stockpile areas to prevent gully formation and siltation of adjacent or downstream areas.

  - Where the track has a slope <2%, berms every 50m should be installed.
  - Where the track slopes between 2% - 10%, berms should be installed every 25m.
  - Where the track slopes between 10% - 15%, berms should be installed every 20m.
  - Where the track has a slope > 15%, berms should be installed every 10m.
- Dewatering of any areas within the mining site needs to be done so in a manner that does not cause erosion and does not result in heavily silt-laden water flowing into any adjacent sensitive area. Water must be pumped out into a well vegetated and preferably already disturbed area to facilitate sediment trapping.
- Excavated or imported material/sediments/spoil should not be placed or stockpiled within sensitive natural areas.
- Soil/sand required for construction purposes must not be derived from adjacent sensitive natural areas.

### 7.6.11 Biodiversity impact ratings

Impact ratings differ as the impacts in certain areas is more significant dur to the sensitivity of the receiving environment. As outlined in Table 7-6 impacts range from high (pre-mitigation) to Low (Post mitigation).

**Table 7-6 Impacts associated with Biodiversity**

| POTENTIAL ENVIRONMENTAL IMPACT | Significance | | Significance | |
| --- | --- | --- | --- | --- |
| | Pre-Mitigation | | Post Mitigation | |
| **Biodiversity** | | | | |
| Destruction of Natural Vegetation | Medium (-) | High (-) | Medium (-) | |
| Fragmentation of Habitat and reduced connectivity | Medium (-) | | Medium (-) | Low (-) |
| Increased fire Risk | Medium (-) | | Medium (-) | |
| Increased pressure on natural resources | Medium (-) | | Medium (-) | |
| Introduction of invasive alien species | Medium (-) | | Medium (-) | Low (-) |

| | | | |
|---|---|---|---|
| Loss of Fauna | Medium (-) | Medium (-) | Low (-) |
| Loss of Red Data and Protected Species | Medium (-) | Medium (-) | Low (-) |
| Pollution of Habitats | Medium (-) | Medium (-) | |
| Soil erosion & Sedimentation | Medium (-) | Medium (-) | |

## 7.7 Aquatics

Aquatic studies were conducted by Eco-Pulse Consulting. . The impacts outlined below are taken from the impacts assessment which is available in **Appendix B**. A summary of the impacts is presented in Table 7-7.

### 7.7.1 Modified hydrology

Areas of hardened surfaces, erosion or poor groundcover reduce infiltration rates leading to increased runoff and more flashy flows in receiving drainage lines. Mining pits can also affect groundwater movement and may reduce base flows if they intercept groundwater resources. Seepage from overburden or stockpiles can also affect natural hydrological dynamics. Where mining activities and associated infrastructure traverse water courses, the temporary damming/obstruction/ redirection and/or canalisation of a watercourse can also lead to the alteration of flows and natural channel processes within the watercourse itself.

| **Phase of the mining operation** | | |
|---|---|---|
| Construction | Operational | Decommissioning & Closure |
| ☑ | ☑ | |

| **Applicable Areas** | | | | | |
|---|---|---|---|---|---|
| Area1 | ☑ | Luhlanga | ☑ | Kwaqubuka North | ☑ |
| Area 2 | ☑ | Kwaqubuka | ☑ | Opondweni | ☑ |
| Gwabalanda | ☑ | Emalahleni | ☑ | Mahujini | ☑ |
| Tholokhule | ☑ | Mvutshini | ☑ | | |

***Management and mitigation measures:***

- Adequate storm water management must be incorporated into the design of the proposed project in order to prevent erosion and the associated sedimentation of riverine areas.

- All storm water containment facilities such as retention dams/berms must remain outside of the riparian zones and associated aquatic buffer zones.

### 7.7.2 Altered stream morphology

Where mining infrastructure/activities such as the construction of bridges, stream crossings and weirs for water abstraction encroach on channelled aquatic systems, the associated disturbance and excavation can significantly alter channel bed and banks and in so doing, diminish the condition and natural functioning of affected watercourses. The input of additional concentrated storm water flows from mining areas/roads can also lead to channel scouring and erosion of stream banks. Vegetation removal can also destabilize banks, leaving them more prone to erosion and potential collapse. The presence of erodible sandy soils and steep channel banks associated with the majority of channelled watercourses, makes water resources in the study area particularly prone to such impacts. The potential for localized erosion and increased lateral sediment delivery to channels and/or wetlands downstream could also be anticipated. In addition, sediment fluxes from eroded soils can alter habitat quality within the channel, even for a short period of time since deposited sediment is likely to be exported downstream during heavy flows.

| **Phase of the mining operation** | | |
|---|---|---|
| Construction | Operational | Decommissioning & Closure |
| ✓ | | |

| **Applicable Areas** | | | | | |
|---|---|---|---|---|---|
| Area1 | ✓ | Luhlanga | ✓ | Kwaqubuka North | ✓ |
| Area 2 | ✓ | Kwaqubuka | ✓ | Opondweni | ✓ |
| Gwabalanda | ✓ | Emalahleni | ✓ | Mahujini | ✓ |
| Tholokhule | ✓ | Mvutshini | ✓ | | |

***<u>Management and mitigation measures:</u>***

- No dirty water runoff from mining areas must be discharged into the environment or permitted to reach riverine resources during the entire life-span mining operations.

- Clean and dirty water management systems must be put in place to prevent contaminated runoff (containing sediments, salts, pollutants/toxicants such as hydrocarbons/oils and water with low pH) from entering the receiving aquatic environment.
- All dirty water containment facilities must remain outside of the riparian zones and associated aquatic buffer zones.
- The location of residue stockpiles, residue dumps and retention dams should be carefully evaluated with regard to the likelihood of pollution of water resources as a result of drainage and/or seepage into downstream areas. Site-specific mitigation measures must then be put in place to reduce risks.

### 7.7.3 Destruction/disturbance of riverine vegetation & habitat

Where mining activities traverse riverine/riparian areas, there is likely to be a loss or degradation of riparian vegetation. Injudicious movement of vehicles and people across the site may also cause disturbance unless water resources are appropriately safeguarded. Loss of vegetation generally affects nutrient cycles, removes the organic litter layer, accelerates the rate of soil loss through erosion, leads to habitat fragmentation and destruction of wildlife corridors, and generally reduces the availability of habitat for local wildlife. Uncontrolled fires caused either accidentally or intentionally, can also exacerbate impacts to natural vegetation, particularly if these take place under unfavourable weather conditions. In the case of any hardened infrastructure being located within riparian areas (such as road bridges), the transformation of natural habitat is often complete and permanent.

| **Phase of the mining operation** | | |
|---|---|---|
| Construction | Operational | Decommissioning & Closure |
| ☑ | ☑ | |

| **Applicable Areas** | | | | | |
|---|---|---|---|---|---|
| Area1 | ☑ | Luhlanga | ☑ | Kwaqubuka North | ☑ |
| Area 2 | ☑ | Kwaqubuka | ☑ | Opondweni | ☑ |
| Gwabalanda | ☑ | Emalahleni | ☑ | Mahujini | ☑ |
| Tholokhule | ☑ | Mvutshini | ☑ | | |

***Management and mitigation measures:***

- Adequate storm water management must be incorporated into the design of the proposed project in order to prevent erosion and the associated sedimentation of riverine areas.
- All storm water containment facilities such as retention dams/berms must remain outside of the riparian zones and associated aquatic buffer zones
- A zero development 50 m buffer zone on either side of the riverine forest community must be maintained. These should be clearly demarcated with beacons;
- Stream crossings are to be sensitively planned to target areas where:
    - the riverine forest is naturally 'open' and there are no gaps in the continuity; and
    - there are no large trees present.

### 7.7.4 Fragmentation of riverine habitat and reduction in natural connectivity

Fragmentation of riparian habitat can be expected in areas affected by mining activities. Such activities reduce the longitudinal connectivity along rivers and may impact negatively on the potential for movement of flora/fauna along riparian corridors.

| **Phase of the mining operation** | | |
|---|---|---|
| Construction | Operational | Decommissioning & Closure |
| ☑ | ☑ | |

| **Applicable Areas** | | | | | |
|---|---|---|---|---|---|
| Area1 | ☑ | Luhlanga | ☑ | Kwaqubuka North | ☑ |
| Area 2 | ☑ | Kwaqubuka | ☑ | Opondweni | ☑ |
| Gwabalanda | ☑ | Emalahleni | ☑ | Mahujini | ☑ |
| Tholokhule | ☑ | Mvutshini | ☑ | | |

***Management and mitigation measures:***

- A zero development 50 m buffer zone on either side of the riverine forest community must be maintained. These should be clearly demarcated with beacons;

- Stream crossings are to be sensitively planned to target areas where:
    - the riverine forest is naturally ‘open’ and there are no gaps in the continuity; and
    - there are no large trees present.

### 7.7.5 Introduction of invasive/alien species

The disturbance of riparian areas as a result of mining-related activities can lead to optimal conditions for invasion by alien invasive plants and weeds. Invasive species displace indigenous flora and fauna, often increasing fire risk and disrupting natural processes such as nutrient cycling and water purification.

| **Phase of the mining operation** | | |
|---|---|---|
| Construction | Operational | Decommissioning & Closure |
| | ☑ | ☑ |

| **Applicable Areas** | | | | | |
|---|---|---|---|---|---|
| Area1 | ☑ | Luhlanga | ☑ | Kwaqubuka North | ☑ |
| Area 2 | ☑ | Kwaqubuka | ☑ | Opondweni | ☑ |
| Gwabalanda | ☑ | Emalahleni | ☑ | Mahujini | ☑ |
| Tholokhule | ☑ | Mvutshini | ☑ | | |

***Management and mitigation measures:***

- Remove alien plants occurring on the site in accordance with the legislative requirements specified under the CARA (Conservation of Agricultural Resources Act).
- Alien plant management should target specifically the edges of natural habitat adjacent to the mining impact zone (i.e. riparian vegetation).
- The accepted method for alien plant removal/control is generally cut-stump treatment followed immediately by the application of relevant herbicides to the cut surface. For larger species, these may be frilled first and then herbicide added. The use of a bright coloured dye mixed with the applied herbicide in order to indicate treated species is also recommended.

- Do not damage/remove indigenous tree species during alien plant clearing.
- Undertake regular inspections to inform adequate follow-up treatment of alien plants.

### 7.7.6 Sedimentation, erosion and increased turbidity

Erosion poses a great risk to the geomorphological/functional integrity of rivers and streams and can also affect system hydrology depending on the position of erosional/depositional features. The deposition of sediment within riparian areas can also result in the alteration of flow paths and gradients, which can leave areas more susceptible to water erosion. Sedimentation of water resources can also impact negatively on water quality and lead to the siltation of in-stream habitats which further act to reduce the systems functionality and ability to provide ecosystem services. Some of the key biological effects related to erosion and the deposition of sediment and suspension of fine sediment within the water column of rivers/streams include:

- Habitat alteration downstream of crossing points due to increased sediment deposition (degradation of coarse streambed habitats by the infilling of interstitial spaces and the reduction of inter-gravular flow for example).
- The smothering of in-stream and riparian vegetation and soils, often resulting in the formation of a dry, disturbed layer of sediment that will be susceptible to invasion by invasive and pioneer plants species.
- Reductions in photosynthetic activity and primary production in rivers/streams caused by sediments impeding light penetration of the water column.
- Reduced density and diversity in benthic invertebrate communities as a result of habitat degradation, interference in embryogenesis and larval
- development of amphibians and mortality of filter-feeding macro- invertebrates, blanketing of breeding sites and the establishment of more tolerant taxa or exotic species.

| **Phase of the mining operation** | | |
|---|---|---|
| Construction | Operational | Decommissioning & Closure |
| ☑ | ☑ | |

| Applicable Areas | | | | | |
|---|---|---|---|---|---|
| Area1 | ☑ | Luhlanga | ☑ | Kwaqubuka North | ☑ |
| Area 2 | ☑ | Kwaqubuka | ☑ | Opondweni | ☑ |
| Gwabalanda | ☑ | Emalahleni | ☑ | Mahujini | ☑ |
| Tholokhule | ☑ | Mvutshini | ☑ | | |

***Management and mitigation measures:***

- Establish and maintain aquatic buffer zones as follows:
    - A 30 metre buffer for smaller ephemeral streams with Low sensitivity rating
    - A 50 meter buffer zone must be maintained for rivers and streams with medium-high sensitivity rating from the edge of active drainage channels and rivnerine areas.
    - A generic 100m buffer should be established around NFEPA Rivers.

### 7.7.7 Reduced surface water quality and risk of eutrophication

Most mining operations share similar sets of activities or materials that generate contaminants which can potentially enter sensitive aquatic environments either directly through surface runoff during rainfall events, subsurface water movement or via the natural drainage network. Potential sources of pollutants which can alter surface water quality include:

- Spillage of hydrocarbons and other chemicals used and from haulage vehicles;
- Surface runoff from overburden stockpiles and/or waste rock dumps and areas of disturbed soil;
- Runoff from topsoil stockpiles if not managed correctly;
- Solid waste pollution (including litter);
- Coal dust either from vehicles passing across water courses or from wind pollution;
- Altered flow regimes and sedimentation which alter the proportion of different forms of metals which have varying levels of toxicity to both humans and biota utilising watercourses such as rivers & streams;
- Discharge of underground water during dewatering processes which is usually high in nitrates from blasting seepage and seepage from sewage disposal systems employed for the local workforce which can lead to the eutrophication of surface

water resources.

| Phase of the mining operation | | |
|---|---|---|
| Construction | Operational | Decommissioning & Closure |
| ✓ | ✓ | |

| Applicable Areas | | | | | |
|---|---|---|---|---|---|
| Area1 | ✓ | Luhlanga | ✓ | Kwaqubuka North | ✓ |
| Area 2 | ✓ | Kwaqubuka | ✓ | Opondweni | ✓ |
| Gwabalanda | ✓ | Emalahleni | ✓ | Mahujini | ✓ |
| Tholokhule | ✓ | Mvutshini | ✓ | | |

***Management and mitigation measures:***

- No dirty water runoff from mining areas must be discharged into the environment or permitted to reach riverine resources during the entire life-span mining operations.
- Clean and dirty water management systems must be put in place to prevent contaminated runoff (containing sediments, salts, pollutants/toxicants such as hydrocarbons/oils and water with low pH) from entering the receiving aquatic environment.
- All dirty water containment facilities should remain outside of the riparian zones and associated aquatic buffer zones.
- The location of residue stockpiles, residue dumps and retention dams should be carefully evaluated with regard to the likelihood of pollution of water resources as a result of drainage and/or seepage into downstream areas. Site-specific mitigation measures must then be put in place to reduce risks.
- Care should be taken to reduce the risks of aquifer penetration when drilling/blasting, wherever this occurs.
- Any cement batching activities should occur outside of the recommended aquatic buffer zones. Cement batching boards should be used and cement-based products/wash not to be disposed of into the natural environment.

- No dumping of waste (liquid & solid waste) should take place within the riparian zone or recommended aquatic buffers.
- The proper storage and handling of hazardous substances (hydrocarbons and chemicals) needs to be administered for all mining activities.
- Potentially hazardous materials (chemicals, fuel, oils) liable to spillage need to be stored in appropriate containment structures (e.g. within concrete bunded areas or using suitable industry-standard drip-trays).
- Washing and cleaning of any construction and/or mining equipment should not be undertaken in rivers or their respective aquatic buffer zones.
- Provide drip-trays beneath any standing machinery/plant where left standing for an extended period.
- Mechanical plant not to be refuelled or serviced within rivers or their recommended buffers.
- Spillages of fuels, oils and other potentially harmful chemicals should be cleaned up immediately and contaminants properly drained and disposed of using proper solid/hazardous waste facilities (not to be disposed of within the natural environment). Any contaminated soil from the site must be removed and rehabilitated timeously and appropriately.
- Provide adequate solid waste disposal facilities (bins) and encourage workers not to litter or dispose of solid waste in the natural environment but to use available facilities for waste disposal.
- Ensure that any rubbish generated is regularly cleared from the site.
- No stockpiling of any materials should take place within any watercourse or the associated buffer zones.
- Sanitation – portable toilets (1 toilet per 30 users is the norm) must be provided where mining is occurring. Workers need to be encouraged to use these facilities and not the natural environment. Toilets should be located outside of the 1:100 yr flood line of a watercourse or outside of the recommended aquatic buffer zones for any natural watercourse. Waste from chemical toilets should be disposed of regularly and in a responsible manner by a registered waste contractor.

### 7.7.8 Reduced surface water quantity

Whilst water quality changes are widely considered to be the most significant consequence of mining activities, mining impacts on water quantity can also be a cause for concern, particularly in catchments where water demand is high relative to the availability of water.

In South Africa, the quantity of water used by a mining operation places it in direct competition with other water users, especially domestic, agriculture and the needs of the aquatic environment itself. This becomes heightened when the mining operation is also responsible for any deterioration in water quality, which can effectively reduce the availability of 'clean' water suitable for domestic use or consumption.

| **Phase of the mining operation** | | |
|---|---|---|
| Construction | Operational | Decommissioning & Closure |
| ☑ | ☑ | |

| **Applicable Areas** | | | | | |
|---|---|---|---|---|---|
| Area1 | ☑ | Luhlanga | ☑ | Kwaqubuka North | ☑ |
| Area 2 | ☑ | Kwaqubuka | ☑ | Opondweni | ☑ |
| Gwabalanda | ☑ | Emalahleni | ☑ | Mahujini | ☑ |
| Tholokhule | ☑ | Mvutshini | ☑ | | |

***Management and mitigation measures:***

- Adequate storm water management must be incorporated into the design of the proposed project in order to prevent erosion and the associated sedimentation of riverine areas.
- All storm water containment facilities such as retention dams/berms must remain outside of the riparian zones and associated aquatic buffer zones.
- Storm water that may be contaminated with industrial-type wastes should drain to sump collection points where this water will need to be filtered and/or treated for fuel/oil/chemical contaminants before being released into the environment. Any release must then comply with the relevant standards stipulated by the DWA (Department of Water Affairs).
- Adequate stormwater management must be incorporated into the design of the proposed development in order to prevent incision, erosion and the associated sedimentation of riverine and riparian areas that may be impacted. In this regard specific mention is made of the need to ensure that sufficient attenuation of stormwater takes place outside of riparian areas and their respective buffer zones and to ensure that any stormwater released is released in such a way that the energy in the system is minimised in order to prevent erosion and incision of the

receiving environment.

- During the construction and operational phases of the proposed mining project, erosion berms should be installed on all unpaved surfaces and roadways and around stockpile areas to prevent gully formation and siltation of adjacent or downstream aquatic resources as follows:
    - Where the track has a slope <2%, berms every 50m should be installed.
    - Where the track slopes between 2% - 10%, berms should be installed every 25m.
    - Where the track slopes between 10% - 15%, berms should be installed every 20m.
    - Where the track has a slope > 15%, berms should be installed every 10m.
- Dewatering of any areas within the mining site needs to be done so in a manner that does not cause erosion and does not result in heavily silt-laden water flowing into any watercourse. Water must be pumped out into a well vegetated and preferably already disturbed area a fair distance from any watercourse to facilitate sediment trapping and reduce the chance of sediment entering rivers/streams.
- Excavated or imported material/sediments/spoil should not be placed or stockpiled within any watercourse.
- Soil/sand required for construction purposes must not be derived from nearby rivers/streams.

### 7.7.9 Loss of diversity of in- stream habitat and biota

Despite the aquatic resources of the area having a fairly limited level of in-stream biodiversity (based on in-field investigations), impacts of mining on the aquatic environment will still have the potential to affect the aquatic ecology of the system detrimentally. This could potentially include a reduction in spawning sites for fish and invertebrates as well as the loss of refuge areas for aquatic biota during low flows. Loss of in-stream biodiversity and a reduction in community sensitivity may be caused by the following activities:

- Physical disturbance of stream morphology and continuity;
- Sedimentation caused by runoff from the mining area as well as other areas of disturbed soils;
- Impacts on water quality caused by pollution; and

- Impacts on aquatic community structure and function

| Phase of the mining operation | | |
|---|---|---|
| Construction | Operational | Decommissioning & Closure |
| ☑ | ☑ | |

| Applicable Areas | | | | | |
|---|---|---|---|---|---|
| Area1 | ☑ | Luhlanga | ☑ | Kwaqubuka North | ☑ |
| Area 2 | ☑ | Kwaqubuka | ☑ | Opondweni | ☑ |
| Gwabalanda | ☑ | Emalahleni | ☑ | Mahujini | ☑ |
| Tholokhule | ☑ | Mvutshini | ☑ | | |

***Management and mitigation measures:***

- Establish and maintain aquatic buffer zone as follows:
  - A 30 metre buffer for smaller ephemeral streams with Low sensitivity rating
  - A 50 meter buffer zone must be maintained for rivers and streams with medium-high sensitivity rating from the edge of active drainage channels and riverine areas.
  - A generic 100m buffer should be established around NFEPA Rivers.

**Table 7-7 Impacts Summary Aquatics**

| POTENTIAL ENVIRONMENTAL IMPACT | Significance Pre-Mitigation | Significance Post Mitigation | |
|---|---|---|---|
| **Aquatics** | | | |
| Altered stream morphology | Medium (-) | Medium (-) | |
| Destruction/disturbance of riverine vegetation & habitat | Medium (-) | Medium (-) | Low (-) |
| Fragmentation of riverine habitat and reduction in natural connectivity | Medium (-) | Medium (-) | Low (-) |
| Introduction of invasive/alien species | Medium (-) | Medium (-) | |
| Loss of biodiversity of in-stream habitat and biota | Medium (-) | Medium (-) | Low (-) |
| Modified hydrology | Medium (-) | Medium (-) | Low (-) |
| Reduced surface water quality and risk of eutrophication | Medium (-) | Medium (-) | Low (-) |
| Reduced surface water quantity | Medium (-) | Medium (-) | |
| Sedimentation, erosion and increased turbidity | Medium (-) | Medium (-) | |

## 7.8 Surface Water

Surface water quality in the Nyalaza and Mnyaba Rivers may be impacted upon. This could occur as a result of:

- Mobilisation of sediments from areas cleared ahead of mining;
- Mobilisation of sediments from inter-burden, over-burden and residue deposits;
- Release of contact water from the over-burden and inter-burden, which have variable potential to generate Acid Rock Drainage and Metal Leaching (ARDML) and mobilise salts;
- Release of chemicals associated with mining; and
- The construction of haul roads and transport of product material could increase the quantity of airborne coal sediments. This dust would settle on the ground surface where it would present and additional sediments during rainfall events.

### 7.8.1 Surface Water Contamination

Surface water contamination refers to the decrease in surface water quality through various mining and construction operations. Each potential contamination process is outlined below. These include Handling and Storage of Hazardous Chemicals, Operation of Fuel Tanks

**i. Contamination of Surface water due to opencast mining**

| **Phase of the mining operation** | | |
|---|---|---|
| Construction | Operational | Decommissioning & Closure |
| ☑ | ☑ | ☑ |

| **Applicable Areas** | | | | | |
|---|---|---|---|---|---|
| Area1 | ☑ | Luhlanga | ☑ | Kwaqubuka North | ☑ |
| Area 2 | ☑ | Kwaqubuka | ☑ | Opondweni | ☑ |
| Gwabalanda | ☑ | Emalahleni | ☑ | Mahujini | ☑ |
| Tholokhule | ☑ | Mvutshini | ☑ | | |

***<u>Management and mitigation measures:</u>***

**Mining Pits**

- Diversion berms will be constructed upslope of the mining pits to divert clean water away from the active zone and separate clean/dirty water; and
- Settling ponds will be utilized for the clean surface water before discharge.

### ii. Handling and Storage of Hazardous Chemicals

Contamination of water resources may result from the improper handling and storage of chemicals. This potential impact is most prevalent to the existing workshops.

| **Phase of the mining operation** | | |
|---|---|---|
| Construction | Operational | Decommissioning & Closure |
| ☑ | ☑ | |

| **Applicable Areas** | | | | | |
|---|---|---|---|---|---|
| Area1 | | Luhlanga | | Kwaqubuka North | |
| Area 2 | ☑ | Kwaqubuka | | Opondweni | |
| Gwabalanda | | Emalahleni | | Mahujini | |
| Tholokhule | | Mvutshini | | | |

***Management and mitigation measures:***

The following management measures are proposed:

- The Site Manager / Mining Contractor must ensure that the quantities of fuels and chemicals stored on site are appropriate to the requirements;
- All chemicals must be confined to specific and secured areas to minimise the risk of spillage or leakage and the related contamination;
- Chemicals must be stored in an area with an impermeable base (e.g. concrete or plastic lining);
- Any generators used on site are to be underlain by an impermeable surface (e.g. concrete bund) or placed within a drip tray to intercept leaks;
- Oil/grease traps are to be fitted at all workshops and wash-down sites;
- All chemicals will be stored in close proximity to the workshop areas. These chemicals must be kept under lock and key and only authorized personnel will be

allowed to access and remove the material;

- A management plan for spillage of hazardous material has been developed in conjunction with a recognized and experienced service provider in the industry. This must include the management of oil spills, lubricants and hydrocarbons. This will form part of the occupational health and safety programme.

### iii. Operation of Fuel Tanks

Effective operation and management of fuel storage must be adhered to to prevent any spills. Fuel tanks have an approve RoD from the department of Environemntal Affairs, the EMP from this authorisation is incorporated into the management outlined below.

| **Phase of the mining operation** | | |
|---|---|---|
| Construction | Operational | Decommissioning & Closure |
| ☑ | ☑ | |

| **Applicable Areas** | | | | | |
|---|---|---|---|---|---|
| Area1 | | Luhlanga | | Kwaqubuka North | |
| Area 2 | ☑ | Kwaqubuka | | Opondweni | |
| Gwabalanda | | Emalahleni | | Mahujini | |
| Tholokhule | | Mvutshini | | | |

***<u>Management and mitigation measures:</u>***

The following management measures should be implemented:

- All liquid fuels (e.g. diesel and petrol) which are stored in tanks or drums must have a bund wall around the tanks to prevent liquids from escaping in the event of a spill or leak. The volume of the bund must be 110% of the volume of the storage tanks;
- Gas and fuel must not be stored in the same storage area as chemicals;
- The re-fuelling of vehicles must only take place at designated sites underlain by a concrete bund;
- The fuels dispenser must be hung within the bunded area while not in use; and
- Any party delivering fuels or other chemicals to the site are to be made aware of the appropriate storage/drop-off locations.

### iv. Equipment/Machinery

Improper use of machinery and poorly maintained machinery may pollute surface water resources.

| **Phase of the mining operation** | | |
|---|---|---|
| Construction | Operational | Decommissioning & Closure |
| ✓ | ✓ | |

| **Applicable Areas** | | | | | |
|---|---|---|---|---|---|
| Area1 | ✓ | Luhlanga | ✓ | Kwaqubuka North | ✓ |
| Area 2 | ✓ | Kwaqubuka | ✓ | Opondweni | ✓ |
| Gwabalanda | ✓ | Emalahleni | ✓ | Mahujini | ✓ |
| Tholokhule | ✓ | Mvutshini | ✓ | | ✓ |

***Management and mitigation measures:***

The following management measures should be implemented:

- Any equipment / machinery that may leak oil or fuel on must be placed on an impermeable surface (e.g. concrete bund);
- If the use of a bund is not possible (e.g. in active mining area, or during construction phase), the equipment / machinery must be underlain by watertight drip trays to catch any pollutants;
- Drip trays must be sized to allow the equipment to be placed inside it, must be cleaned regularly, and must not be allowed to overflow. If the item is too large to fit within the tray, the tray must placed below the item and must be sized to cover all potential leakage areas; and
- Chemicals collected in the drip trays must be decanted into appropriate collection drums and disposed of at a permitted disposal site.

**Spills of Hazardous Substances**

- The accidental or negligent spillage of fuels or potentially hazardous substances must be cleaned up immediately using the most appropriate methodologies, equipment and materials;

- The Site Manager / Mining Contractor must ensure that the necessary materials, equipment and chemicals are available on the site to deal with spills of any of the hazardous materials present (e.g. Drizit or Peat Sorb); and
- Any contaminated soil or water must be removed and stored in a skip until it can be disposed of at a permitted disposal site.

**Wash-down Sites**

- Designated wash-down areas (for the cleaning and rinsing of equipment and machinery) must be created;
- The wash-down area must be underlain by an impermeable surface;
- The contaminated runoff from the wash-down areas must be channelled to cut-off drains and enter the water recycling system. During construction, wash-down water must be channelled to a sunken PVC tank or similar; and
- There must be no wash-down sites at the active mining area – equipment must be transferred to the plant site for cleaning.

### 7.8.2 Floodlines and Flood Control; Increase in surface runoff.

Hard surfaces and alterations in drainage lines may result in localised flooding. The construction of opencast pits close to rivers and drainage lines may also be susceptible to flooding during storm events. Dirty water runoff from storm events may pollute the surrounding environment.

| **Phase of the mining operation** | | |
|---|---|---|
| Construction | Operational | Decommissioning & Closure |
| ✓ | ✓ | |

| **Applicable Areas** | | | | | |
|---|---|---|---|---|---|
| Area1 | ✓ | Luhlanga | ✓ | Kwaqubuka North | ✓ |
| Area 2 | | Kwaqubuka | ✓ | Opondweni | ✓ |
| Gwabalanda | ✓ | Emalahleni | ✓ | Mahujini | ✓ |
| Tholokhule | ✓ | Mvutshini | ✓ | | |

***Management and mitigation plan:***

The following have been incorporated into the mine design to meet the aforementioned objective:

- Diversion berms will be constructed upslope of the mining area to separate clean/dirty water by diverting all clean water away from the contaminated zones; and
- All surface water management ponds will be designed to have a capacity to cope with a 1:100 year rainfall event.

### 7.8.3 Stream and Drainage Line Crossings

Developing river crossing may impact on the water quality as well as impacting on the flow of the stream or drainage line.

| **Phase of the mining operation** | | |
|---|---|---|
| Construction | Operational | Decommissioning & Closure |
| ☑ | ☑ | |

| **Applicable Areas** | | | | | |
|---|---|---|---|---|---|
| Area1 | ☑ | Luhlanga | ☑ | Kwaqubuka North | ☑ |
| Area 2 | | Kwaqubuka | ☑ | Opondweni | ☑ |
| Gwabalanda | ☑ | Emalahleni | ☑ | Mahujini | ☑ |
| Tholokhule | ☑ | Mvutshini | ☑ | | |

***Management and mitigation measures:***

The following recommendations are made with regard to stream crossing points:

- The vegetation at the crossing point must be removed and preserved so that it may be used for the rehabilitation of the site on completion of the activity;
- Stream crossings are to be built rapidly so as to limit the time period that the area remains exposed;
- Wherever possible, manual construction methods should be utilised for construction of stream crossings;

- Ensure that the stream crossings do not completely obstruct flow within the stream;
- The areas surrounding the crossing (including the banks) and the stream bed in the vicinity of the crossing will need to be reinforced with rock gabions (or similar) to protect against scour and erosion of the channel;
- Any destabilised stream banks and erosion caused by the construction process are to be repaired immediately;
- Preferably replant the original vegetation along the disturbed section of the crossing. Vegetation from the adjacent drier areas should not to be used as it is not adapted to the wet conditions along the watercourse; and
- The rehabilitation of the affected sites will include the installation of suitable long-term erosion control measures such as gabions and sand bags.

### 7.8.4 Impacts on Stream Health

Mining may impact on the water quality of surrounding streams. The reduction in water quality may impact on the biological ecosystems within the river systems.

| **Phase of the mining operation** | | |
|---|---|---|
| Construction | Operational | Decommissioning & Closure |
| ☑ | ☑ | |

| **Applicable Areas** | | | | | |
|---|---|---|---|---|---|
| Area1 | ☑ | Luhlanga | ☑ | Kwaqubuka North | ☑ |
| Area 2 | | Kwaqubuka | ☑ | Opondweni | ☑ |
| Gwabalanda | ☑ | Emalahleni | ☑ | Mahujini | ☑ |
| Tholokhule | ☑ | Mvutshini | ☑ | | |

***<u>Management and mitigation measures:</u>***

The surface water monitoring programme should include a South African Scoring System (SASS) component for monitoring. SASS monitoring involves studying the stream invertebrate populations as an indication of the stream health. These studies will be conducted annually for the life of the mine. A revised SASS monitoring program will be conducted for the extension area.

**Table 7-8 Impact summary Surface Water**

| POTENTIAL ENVIRONMENTAL IMPACT | Significance | Significance |
|---|---|---|
| | Pre-Mitigation | Post Mitigation |
| **Surface Water** | | |
| Surface compaction-increase in runoff | Medium (-) | Medium (-) |
| Roll-over mining coal from open pits | Medium (-) | Medium (-) |
| Treatment of coal - ROM and Product stockpiles - poor quality seepages and runoff at plant areas, wash bays and other infrastructure at Somkhele mine | High (-) | Medium (-) |
| Stockpiling of topsoil and overburden during mining | Medium (-) | Medium (-) |
| Pollution Control Dams - poor quality seepages and spill to the streams | High (+) | Low (-) |

## 7.9 Groundwater

Groundwater impacts relate to changes in groundwater quality and/or groundwater quantity primarily from opencast mining.

### 7.9.1 De-watering of the local aquifer system

Mining open cast and de-watering activities will impact on shallow aquifer by lowering of groundwater levels. A mathematical model was developed to simulate the effects of dewatering during the mining operations, particularly to simulate the drawdown cone that will be generated by the dewatering. This will assist in identifying the zone of influence.

| Phase of the mining operation | | |
|---|---|---|
| Construction | Operational | Decommissioning & Closure |
| | ✓ | |

| Applicable Areas | | | | | |
|---|---|---|---|---|---|
| Area1 | ✓ | Luhlanga | ✓ | Kwaqubuka North | ✓ |
| Area 2 | ✓ | Kwaqubuka | ✓ | Opondweni | ✓ |
| Gwabalanda | ✓ | Emalahleni | ✓ | Mahujini | ✓ |
| Tholokhule | ✓ | Mvutshini | ✓ | | |

***Management and mitigation measures:***

- The groundwater level in the study area will be lowered during the operational phase due to mine dewatering. The water pumped from the pit area where it will be utilised for dust suppression along the haul roads.
- It is not expected that any private groundwater users will be impacted due to the lowering of the groundwater level.
- Re-bound of water levels will start after mining activities cease, groundwater levels will start recovering towards the pre-mining levels.
- Groundwater levels and quality in the monitoring boreholes be monitored on a quarterly basis in order to verify the findings of the groundwater study. Additional monitoring boreholes should be installed where necessary to effectively monitor the impact on groundwater quality and quantity.
- Backfill of overburden and under burden in correct way - geology with highest acid leach potential must be backfilled at bottom of pit and compacted.

### 7.9.2 Decrease of groundwater quality; handling of waste and transport of construction material.

Poor handling of waste and construction material may impact on groundwater quality.

| Phase of the mining operation | | |
|---|---|---|
| Construction | Operational | Decommissioning & Closure |
| ☑ | | |

| Applicable Areas | | | | | |
|---|---|---|---|---|---|
| Area1 | ☑ | Luhlanga | ☑ | Kwaqubuka North | ☑ |
| Area 2 | ☑ | Kwaqubuka | ☑ | Opondweni | ☑ |
| Gwabalanda | ☑ | Emalahleni | ☑ | Mahujini | ☑ |
| Tholokhule | ☑ | Mvutshini | ☑ | | |

***Management and mitigation measures:***

- Waste should to be discarded in the allocated waste area.
- The waste area should be bunded.

- Spills should be cleaned up immediately according to the WULA conditions. The DWA should be notified in the event of a significant spill.
- Solid waste must similarly either be stored at site on an approved waste disposal area, or removed by accredited contractors.

### 7.9.3 Dewatering activity impact on shallow base-flow to any nearby stream

Opencast mining which occurs near streams may impact on the stream flow through the creation of a cone of depression.

| **Phase of the mining operation** | | |
|---|---|---|
| Construction | Operational | Decommissioning & Closure |
| ☑ | ☑ | |

| **Applicable Areas** | | | | | |
|---|---|---|---|---|---|
| Area1 | ☑ | Luhlanga | ☑ | Kwaqubuka North | ☑ |
| Area 2 | ☑ | Kwaqubuka | ☑ | Opondweni | ☑ |
| Gwabalanda | ☑ | Emalahleni | ☑ | Mahujini | ☑ |
| Tholokhule | ☑ | Mvutshini | ☑ | | |

***Management and mitigation measures:***

Maintain buffer from stream as per GN704 requirements.

Implement water management according to surface water management plan.

### 7.9.4 Treatment of coal - ROM and Product stockpiles - poor quality seepages at plant areas

Poor management of runoff from stockpiles

| **Phase of the mining operation** | | |
|---|---|---|
| Construction | Operational | Decommissioning & Closure |
| | ☑ | |

| Applicable Areas | | | | | |
|---|---|---|---|---|---|
| Area1 | | Luhlanga | | Kwaqubuka North | |
| Area 2 | ☑ | Kwaqubuka | | Opondweni | |
| Gwabalanda | | Emalahleni | | Mahujini | |
| Tholokhule | | Mvutshini | | | |

***Management and mitigation measures:***

Housekeeping in terms of storm water management - prevent ponds and seepages. Compact areas and keep stockpile areas as small as possible.

### 7.9.5 Waste disposal within pits; poor quality seepages

Current disposal methods for slurry and discard are for the disposal of material into opencast pits. This could result in poor quality seepage from within the pits.

| Phase of the mining operation | | |
|---|---|---|
| Construction | Operational | Decommissioning & Closure |
| | ☑ | |

| Applicable Areas | | | | | |
|---|---|---|---|---|---|
| Area1 | | Luhlanga | ☑ | Kwaqubuka North | |
| Area 2 | ☑ | Kwaqubuka | | Opondweni | |
| Gwabalanda | | Emalahleni | | Mahujini | |
| Tholokhule | | Mvutshini | | | |

***Management and mitigation measures:***

Waste backfilling must be prevented but if backfilled it must be stopped at least 5m below the static groundwater level, well compacted and lime added.

### 7.9.6 Poor quality seepage from pollution control dams

Pollution control dams have already been constructed around the plant area. The potential for poor quality seepage exists.

| Phase of the mining operation | | |
|---|---|---|
| Construction | Operational | Decommissioning & Closure |

| | | |
|---|---|---|
| | ✓ | |

| Applicable Areas | | | | | |
|---|---|---|---|---|---|
| Area1 | | Luhlanga | | Kwaqubuka North | |
| Area 2 | ✓ | Kwaqubuka | | Opondweni | |
| Gwabalanda | | Emalahleni | | Mahujini | |
| Tholokhule | | Mvutshini | | | |

***<u>Management and mitigation measures:</u>***

Areas susceptible to poor quality seepage should be lined.

The IWUL conditions for pollution control ponds must be adhered to.

### 7.9.7 Acid Mine Drainage Leaching

Certain elements within the rocks have the potential to oxidise resulting in acid mine drainage.

| Phase of the mining operation | | |
|---|---|---|
| Construction | Operational | Decommissioning & Closure |
| ✓ | ✓ | |

| Applicable Areas | | | | | |
|---|---|---|---|---|---|
| Area1 | ✓ | Luhlanga | ✓ | Kwaqubuka North | ✓ |
| Area 2 | | Kwaqubuka | ✓ | Opondweni | ✓ |
| Gwabalanda | ✓ | Emalahleni | ✓ | Mahujini | ✓ |
| Tholokhule | ✓ | Mvutshini | ✓ | | |

***<u>Management and mitigation measures:</u>***

- The extent to which AMD will be generated from the pits will be controlled by careful handling of the spoils, and specifically any pyritic material, like the shale, during the operational phase; and by flooding the exposed coal seam at the bottom section of the pits as quickly as possible.
- The shale that will be stripped above the coal seam will be backfilled to the

lowest possible elevation during the roll-over method of mining. This will ensure that the shale is flooded as quickly as possible after mining is completed and so reduce the risk of oxidation and acidification.

- On final rehabilitation the pit will be shaped and re-vegetated according to acceptable DMR standards. This will ensure a free draining area and limit the risk of decant from the pit.

| POTENTIAL ENVIRONMENTAL IMPACT | Significance | Significance |
|---|---|---|
| | Pre-Mitigation | Post Mitigation |
| **Groundwater** | | |
| Mining open cast on groundwater quantity | Medium (-) | Medium (-) |
| Mining open cast on groundwater quality | Medium (-) | Medium (-) |
| Coal transport via haulage roads to Area 2 | Low (-) | Low (-) |
| Treatment of coal - ROM and Product stockpiles - poor quality seepages at plant areas | High (-) | Medium (-) |
| Waste disposal within Pits - poor quality seepages | High (-) | Medium |
| Pollution Control Dams - poor quality seepages | High (-) | Medium |
| Mining open cast and de-watering activities will impact on shallow aquifer by lowering of groundwater levels | Medium (-) | Medium (-) |
| Dewatering activity impact on shallow base-flow to the nearby stream. | Medium (-) | Medium (-) |

## 7.10 Air Quality

Air quality was assessed in 2012 by SSR Bolweki consultants who are also responsible for running and maintaining the Somkhele dust monitoring network. The management measures outlined below have been taken from existing air quality management measures in place at Somkhele.

### 7.10.1 Dust Emissions

Dust emissions from mining activities can generate fugitive dust or nuisance dust. The nuisance dust can impact on the surrounding communities.

| Phase of the mining operation | | |
|---|---|---|
| Construction | Operational | Decommissioning & Closure |
| ☑ | ☑ | |

| Applicable Areas | | | | | |
|---|---|---|---|---|---|
| Area1 | ☑ | Luhlanga | ☑ | Kwaqubuka North | ☑ |
| Area 2 | ☑ | Kwaqubuka | ☑ | Opondweni | ☑ |
| Gwabalanda | ☑ | Emalahleni | ☑ | Mahujini | ☑ |
| Tholokhule | ☑ | Mvutshini | ☑ | | |

***Management and mitigation measures:***

Somkhele has a dust monitoring network in place. This network will be extended to include new mining areas:

- With respect to haul road dust levels, limit vehicle speeds to 30km/hour.
- Water bowsers must be utilized to wet roads to reduce fugitive dust.
- A dust monitoring network has been set up, this network will follow the ASTM D 1739-98 methods for monitoring.

| POTENTIAL ENVIRONMENTAL IMPACT | Significance Pre-Mitigation | Significance Post Mitigation |
|---|---|---|
| **Dust emissions** | | |
| Fugitive dust emissions (2011 studies). | Medium (-) | Medium (-) |

## 7.11 Noise and Vibration

Noise was not assessed during this application. Noise levels have previously been assessed and various management measures implemented. The management measures from previous studies at Somkhele are summarised below and form part of the management plans for the extension of operations at Somkhele.

### 7.11.1 Disturbing noise

Noise can be deemed a nuisance by the surrounding communities. Noise can be defined as an unwanted sound. The major noise generating activities are those generated from blasting and from mine equipment such as front end loaders.

| Phase of the mining operation | | |
|---|---|---|
| Construction | Operational | Decommissioning & Closure |

| | | |
|---|---|---|
| ☑ | ☑ | |

| Applicable Areas | | | | | |
|---|---|---|---|---|---|
| Area1 | ☑ | Luhlanga | ☑ | Kwaqubuka North | ☑ |
| Area 2 | ☑ | Kwaqubuka | ☑ | Opondweni | ☑ |
| Gwabalanda | ☑ | Emalahleni | ☑ | Mahujini | ☑ |
| Tholokhule | ☑ | Mvutshini | ☑ | | |

***Management and mitigation measures:***

**Resettlement**

For a range of reasons, all persons living within the 300 m radius of the active mining zone will be relocated to a new site. This will also enable noise impacts on the affected persons to be avoided.

**General**

All equipment to be used during the construction and operational phases is to be kept in a good working condition. This is particularly important for the exhaust systems of the diesel earthmoving equipment.

Regular checks on the noise emissions of equipment in operation should be performed. Equipment should be adequately maintained and serviced. Equipment that has an increased level of noise emissions should not be used until its noise levels are normalized.

**Operational Hours**

The mine operates 24 hours a day and seven days a week. The mine policy is to employ those who are directly affected by the Mine. Those who will most likely be affected by noise will likely be involved in the mining operations. A monitoring and complaints programme is being implemented.

**Blasting**

Blasting must be restricted to times which will have the least impact on residents.

The surrounding communities must be made fully aware of blasting procedures and schedules, in order to reduce any startle effect caused by blasting. The CLO will be responsible for notifying residents of blasting times and procedures.

Monitor blasts to ensure compliance with the requirements stipulated in the Mines and Works Act (Act 27 of 1956).

**Monitoring and Complaints**

Monitoring is to include the monitoring of blasting and drilling (if applicable) impacts and the implementation and proper management of acoustic treatment recommendations.

Periodic monitoring of ambient sound (according to SABS Code 0103) must be undertaken at the closest receiver points when active mining is underway and during blasting events in order to verify the noise generated. The data obtained will be used to determine the potential annoyance level of mining activities on surrounding land users and decide if/what mitigation should be implemented.

Complaints regarding noise should be reported to the Tribal Authority and the mine. The community must be informed of the complaints procedure. Should complaints about the noise be received from the community, the Tribal Authority will assess the situation and make appropriate recommendations to reduce the noise impacts on nearby residents in consultation with the Site Manager, Mining Contractor and, where necessary, a noise specialist. Blasting will be monitored using a vibro-graph.

| POTENTIAL ENVIRONMENTAL IMPACT | Significance | Significance |
|---|---|---|
| | **Pre-Mitigation** | **Post Mitigation** |
| **Noise** | | |
| Assessed in previous assessments | Medium (-) | Medium (-) |

## 7.12 Sites of Archaeological and Cultural Interest

### 7.12.1 Sites of archaeological and cultural value

The mine has established protocols and frameworks for the relocation of graves. A community cemetery was built during Phase 1 of Somkhele, and has proved to be an approved, successful and accepted cemetery by the local community and the Tribal Authority. Plans to construct a second cemetery have been sent to the local municipality. The size of the cemetery is such that no environmental authorisation is required.

#### *7.12.1.1 Grave relocation*

Relocation of graves is a sensitive issue, especialliy when considering the importance of ancestors within the Zulu culture. A grave relocation plan and protocols has been established. They are outlined in the management plans below.

| **Phase of the mining operation** | | |
|---|---|---|
| Construction | Operational | Decommissioning & Closure |
| ☑ | | |

| **Applicable Areas** | | | | | |
|---|---|---|---|---|---|
| Area1 | ☑ | Luhlanga | ☑ | Kwaqubuka North | ☑ |
| Area 2 | ☑ | Kwaqubuka | ☑ | Opondweni | ☑ |
| Gwabalanda | ☑ | Emalahleni | ☑ | Mahujini | ☑ |
| Tholokhule | ☑ | Mvutshini | ☑ | | |

***Management and mitigation measures:***

From the work that has been undertaken in Area 2 and Area 1, a generic procedure for the exhumation and re-interment process agreement has been drawn up.

The procedure includes the exhumation of the cadavers, a plain deal coffin, transport to and from site, digging up of old grave, digging of new grave, grave marker, consumables, storage and allowance for a minister.

The procedure must be discussed with each affected individual/family to confirm their support/agreement and establish specific requirements (where applicable).

It is important that the affected individuals, families and communities should endorse the following:

- The timing for relocating graves;
- The new location of graves;
- An acceptable procedure for physically transporting the remains; and
- Ritual activities to take place in relation to the relocation of graves.

For the success of the grave relocation process, it will be important for the mine to:

- Actively make information about the project available to local communities as this will reduce the potential development of unnecessary fears and resentment towards the mine;
- Actively and publicly support the important ritual activities relating ancestors and graves at the level of the community (both logistically and financially);
- Facilitate important ritual activities that need to take place in and around the project site wherever possible; and
- Involve affected individuals, families, traditional leaders and elected leaders in the process.

The known grave sites within the general area must be mapped. The mine will need to finalise, map and detail the number of graves to be relocated. Participation of the affected persons may be necessary. Details to be recorded must include:

- Grave number (each grave must be allocated a number);
- Locality of the grave (GPS reading);
- Affected family and contact person;
- Name of deceased (if known);
- The existing local tribal committee will discuss and negotiate, inter alia, the requirements relating to the grave exhumation and re-interment;
- The decisions to be taken will include:
  - Logistical requirements;
  - Social requirements and costs;
  - Spiritual requirements;
  - Grave relocation site(s);
  - Timing of the grave removal;

All the costs associated with the relocation will be borne by the mine, including both logistical costs as well as social costs.

Social costs of relocating graves will include the following items (note this is a general list and requirements may differ from family to family):

- A box or coffin to contain the remains of the deceased;
- The services of traditional healer to preside over the process;

- The services of a Christian priest to preside over the process;
- Food for participants in the ceremony;
- Traditional alcohol to be consumed for ritual purposes;
- Appropriate animals for slaughter; and
- Allowance is made for 1 cow, 1 goat, as well as compensation per family to place the stone and attend the re-interment.

Sanction / permission will need to be obtained from the following by the mine:

- Department of Health;
- AMAFA; and
- KwaZulu-Natal Heritage.

On the agreed date(s), the exhumation and re-interment of graves will take place. The physical act of exhumation and re-interment will be conducted by an approved registered undertaker.

Spiritual requirements will be met by ensuring that a traditional healer and / or Christian priest attend the ceremony. The costs will be borne by the mine.

Ceremonial needs will be met at cost to the Mine. This will include the provision of an animal for slaughter, food and traditional alcohol.

Each step of the procedure must be documented thoroughly providing supporting reasoning where possible. Records of the following are required:

- Minutes of meeting of the local tribal committee;
- Individual agreements with affected families;
- Relocation site(s) with GPS readings;
- Date and times for relocation;
- Names of spiritual leaders presiding at the ceremony;
- Names of undertakers used;
- Volume / number of ceremonial requirements;
- Details of coffins;
- Procedure followed; and

- Photographic records of sites and procedures.

| POTENTIAL ENVIRONMENTAL IMPACT | Significance | Significance |
|---|---|---|
| | Pre-Mitigation | Post Mitigation |
| **Heritage** | | |
| Grave relocation | High | Medium |

## 7.13 Visual Aspects

### 7.13.1 Visual impact by mining and mine infrastructure

Visual impact is defined as the significance and/or magnitude of changes to visual quality of the area resulting from a development or change in land use that may occur in the landscape. The potential visual impact of the proposed activity will primarily result from changes to the visual character of the area.

| Phase of the mining operation | | |
|---|---|---|
| Construction | Operational | Decommissioning & Closure |
| ☑ | ☑ | |

| Applicable Areas | | | | | |
|---|---|---|---|---|---|
| Area1 | ☑ | Luhlanga | ☑ | Kwaqubuka North | ☑ |
| Area 2 | ☑ | Kwaqubuka | ☑ | Opondweni | ☑ |
| Gwabalanda | ☑ | Emalahleni | ☑ | Mahujini | ☑ |
| Tholokhule | ☑ | Mvutshini | ☑ | | |

***Management and mitigation measures:***

**Site Preparation**

The minimum amount of existing vegetation and soil material must be removed from mine-affected areas.

Wherever possible, all existing natural vegetation will be retained and incorporated into the site design to act as a buffer/screen.

**Landscaping**

An ecological approach to rehabilitation and screening measures, as opposed to a horticultural approach to landscaping, should be adopted. Communities of indigenous plants enhance biodiversity and blend well with existing vegetation. This ecological approach to landscaping costs significantly less to maintain than conventional landscaping methods and is more sustainable.

Plant rows/clumps of fast-growing, indigenous trees along the northern and southern borders of the plant area as visual screens. The species listed below can be used, particularly the *Acacia* species as they are fast-growing.

**Table 7-9 List of plant species for use in tree screen planting**

| Taller Species | Smaller Species |
|---|---|
| *Vepris lanceolata* (White Ironwood); | *Nuxia congesta* (Common Wild Elder); |
| *Celtis africana* (White Stinkwood); | *Nuxia floribunda* (Forest Elder); |
| *Trichilia emetica* (Natal Mahogany); | *Bauhinia tomentosa* (Yellow Tree Bauhina); |
| *Millettia grandis* (Umzimbeet); | *Euclea Natalensis* (Bush Guarri); |
| *Protorhus longifolia* (Red Beech); | *Brachylaena discolor* (Wild Silver Oak). |
| *Acacia caffra* (Common Hook Thorn); | |
| *Acacia karroo* (Sweet Thorn); | |
| *Acacia sieberiana var. woodii* (Paperbark Thorn). | |

Due to the close proximity to the road, screening berms will need to be constructed to block views of the mining pits from passing traffic. Berms should be approximately 5 m in height and should be grassed. The berms can be created from overburden and topsoil removed from the clearing of the pit area. Various indigenous shrubs or smaller plant species should be planted to increase the aesthetic value of the berms.

**Access and Haul Roads**

Haul roads will require an effective dust suppression management programme, such as regular wetting and/or the use of non-polluting chemicals that will retain moisture in the road surface.

Where a paved surface is required, i.e. mine access road, dark paving materials will be used that complement the natural brown colours and textures of the soil and rock in the area rather than light coloured materials i.e. concrete colours should be avoided.

**Site Revegetation and Rehabilitation**

- Ensure that all berms and long-term stockpiles are revegetated, i.e. flood control berm, diversion berms, pond berm walls.

- Continuously cap (with topsoil) and revegetate the surface of the discard dump;
- Revegetate the terraces after construction;
- Ensure that continuous rehabilitation of the mining pits is undertaken as mining is completed; and
- Ensure that the topography of backfilled, rehabilitated areas is consistent with the pre-mining landscape.

**Lighting**

- Lighting should be carefully planned and kept to a minimum to enable work to continue since light at night is visible at great distances.
- Security flood lighting and operational lighting should only be used where absolutely necessary and carefully directed, preferably away from sensitive viewing areas (away from the game reserve and nearby homesteads).
- Wherever possible lights should be directed downwards so as to avoid illuminating the sky.
- Use should be made of lighting equipment that minimises the spread of light near to or above the horizontal.
- Lights should be positioned and aimed to ensure minimum light spill.
- The aim is to limit the visual impact of the mining activities to the road-users and local residence of the area.

| POTENTIAL ENVIRONMENTAL IMPACT | Significance Pre-Mitigation | Significance Post Mitigation |
|---|---|---|
| **Visual** | | |
| Visual impact by mining and mine infrastructure | Medium(-) | Medium(-) |
| Change in topography | Medium(-) | Medium(-) |
| Light Pollution | Medium(-) | Medium(-) |

## 7.14 Socio-Economic Impacts

A social economic study was conducted during previous mining applications at Somkhele. Somkhele has developed a comprehensive Social and Labour plan which was based on a needs analysis conducted. A Gap analysis on social information available for this assessment was conducted to ensure that social impacts experienced during the current mining operations and the management of these impacts can be maintained or improved.

The new structure that has been proposed includes a new body called the Somkhele Tribal Authority Working Committee (STAC) to manage all communication and interaction between Tendele, the Council and the Community. This structure is also recognised by the KZN Traditional Leadership and Governance Act, 2005 and all signatories to the STAC acknowledge that all interactions between them should be open to public scrutiny and be transparent.

The STAC will presented by the following members:

- Three members appointed by council which should include the Portfolio Head of Mining, a representative from the Royal House, and one other representative appointed by the council;
- The Induna plus the Head of Warriors plus one member that is elected by the community (non-mine employee) of each of the areas where mining is actively taking place (i.e. Dubelenkuzi, Machibini, Esiyembeni and Myeki), thus 12 in total;
- Representatives from Tendele;
- Tendele senior managers, one member from the Tendele Community Forum, chairpersons of the National Union of Mineworkers (NUM) and shop stewards from the Association of Mineworkers and Construction Union (AMCU) from the Tendele Combined Union Forum Committee; and
- Other invitees in Tendele’s sole discretion to add special expertise from time to time as may be required.

The STAC will meet as often as required to address community concerns, but will have a minimum of 1 monthly meeting. Quarterly meetings with the Inkosi will be held to ensure that the Inkosi is fully briefed. The Inkosi and STAC sets out to support Tendele in respect of all its dealings with government institutions, including the DMR, the South African Police Service (SAPS), service providers such as Eskom and Transnet and in dealings with the Union Structures.

Furthermore, through the work of STAC, it will be ensured that the community is constantly updated with progress relating to the SLP that Tendele is required to submit as part of the requirements of the Mineral and Petroleum Resources Development Act (MPRDA), 2002. The purpose of the SLP is to address the objectives of the MPRDA, which are to:

- Promote employment and advance the social and economic welfare of the people of South Africa, especially within the community where the mining activities and operations are being conducted;
- Contribute to the transformation of the Mining Industry; and
- Contribute towards the socio-economic development of the area within which the mining operation is taking place.

Tendele further acknowledges the Royal House nominates, from time to time, an Inkosi and such nominated Inkosi is then appointed in accordance with the Traditional Leaders and Governance Frame Amendment Act, 2003 in addition to the abovementioned KZN Traditional Leadership and Governance Act, 2005. In terms of this legislation, Tendele acknowledges the current appointed Inkosi, Inkosi Mzokhulayo Myson Mkhwanazi (hereafter referred to as Inkosi). The Inkosi has the responsibility to ensure that STAC operates efficiently and performs duties in ensuring good communication between Tendele and the broader community. The impacts outlined below formed part of the social assessment conducted for mining operations in Area 2. They have been included in this section as the management measures identified will be included in this EMP.

| Phase of the mining operation | | |
|---|---|---|
| Construction | Operational | Decommissioning & Closure |
| ☑ | ☑ | |

| Applicable Areas | | | | | |
|---|---|---|---|---|---|
| Area1 | ☑ | Luhlanga | ☑ | Kwaqubuka North | ☑ |
| Area 2 | ☑ | Kwaqubuka | ☑ | Opondweni | ☑ |
| Gwabalanda | ☑ | Emalahleni | ☑ | Mahujini | ☑ |
| Tholokhule | ☑ | Mvutshini | ☑ | | |

***Management and mitigation measures:***

The following management measures are proposed:

- Ensure that potential benefits of mining are available to women in a manner that they can access;
- Enable direct involvement of women in the development of appropriate resettlement and compensation plans;
- Establish employment policies that ensure women's access to appropriate types and numbers of job opportunities. The Social and Labour Plan (SLP) provides numbers of women that must be employed within the mine. These levels must be adhered to and contractors used by the mine must follow the guidelines as stipulated in the mine's SLP.

### 7.14.1 Traditional claims to land

| Phase of the mining operation | | |
|---|---|---|
| Construction | Operational | Decommissioning & Closure |
| ☑ | | |

| Applicable Areas | | | | | |
|---|---|---|---|---|---|
| Area1 | ☑ | Luhlanga | ☑ | Kwaqubuka North | ☑ |
| Area 2 | ☑ | Kwaqubuka | ☑ | Opondweni | ☑ |
| Gwabalanda | ☑ | Emalahleni | ☑ | Mahujini | ☑ |
| Tholokhule | ☑ | Mvutshini | ☑ | | |

***Management and mitigation measures:***

Resettlement planning and implementation should be participative and should include potential host communities and traditional leaders and elders.

This has been ongoing and the Somkhele Mining Community Committee, which includes representatives from various stakeholder groups, has been involved from the onset of Somkhele Mine. Current consultation has involved liaison with tribal authorities, community leaders and municipal representatives. Extensive meetings have been held with the surrounding community to reach agreement on planning protocols. Minutes of community meetings are in available in **Appendix C** of this report.

### 7.14.2 Impacts on Surrounding Land and Resources

| Phase of the mining operation | | |
|---|---|---|
| Construction | Operational | Decommissioning & Closure |
| ☑ | ☑ | |

| Applicable Areas | | | | | |
|---|---|---|---|---|---|
| Area1 | ☑ | Luhlanga | ☑ | Kwaqubuka North | ☑ |
| Area 2 | | Kwaqubuka | ☑ | Opondweni | ☑ |
| Gwabalanda | ☑ | Emalahleni | ☑ | Mahujini | ☑ |
| Tholokhule | ☑ | Mvutshini | ☑ | | |

***Management and mitigation measures:***

The following management measures are proposed:

- Identify alternative land near to the existing settlement for the purposes of resettlement of homesteads and subsistence activities;
- Assess its future agricultural potential of the 'new' land, both with and without technological intervention (it is suggested that the Department of Agriculture extension officer for the area be contacted in this regard);
- Identify and reach agreement on suitable alternatives when compensating for lost land and productivity, with active participation of affected parties; and
- Identify the needs for the 'new' land in terms of carrying capacity / requirements for grazing (number of head of livestock), area of arable land, water, etc. This will largely be based on the existing requirements of the various families. It is important that families do not relocate to areas that will be impacted on by mining operations or areas where potential mining could occur within the near future. In this regard it is important that communication between the mine and the Induna and community representatives is ongoing. Where possible homesteads should relocate to areas where potable water supplies and electricity can be installed. Remote areas will be difficult to provide remote areas with electricity and piped water.

### 7.14.3 Loss of Access to Land and Resources

| Phase of the mining operation | | |
|---|---|---|
| Construction | Operational | Decommissioning & Closure |
| ☑ | | |

| Applicable Areas | | | | | |
|---|---|---|---|---|---|
| Area1 | ☑ | Luhlanga | ☑ | Kwaqubuka North | ☑ |
| Area 2 | ☑ | Kwaqubuka | ☑ | Opondweni | ☑ |
| Gwabalanda | ☑ | Emalahleni | ☑ | Mahujini | ☑ |
| Tholokhule | ☑ | Mvutshini | ☑ | | |

***<u>Management and mitigation measures:</u>***

The Somkhele stakeholder manager, in conjunction with the Somkhele Mining Community Committee, will need to:

- Identify compensation alternatives for those resettled off their land and fields;
- Identify compensation alternative for those losing fields;
- Include discussion with other land users outside of the study area who may be impacted on as a result of the mining;
- Actively involve host communities in integrating people resettled off the study area;
- Identify and map when parcels of land will be absorbed into the mining area; and
- Communicate this information to the affected families so that they may plan accordingly.

### 7.14.4 Conflict with outsiders

| Phase of the mining operation | | |
|---|---|---|
| Construction | Operational | Decommissioning & Closure |

| | | |
|---|---|---|
| ☑ | ☑ | |

| Applicable Areas | | | | | |
|---|---|---|---|---|---|
| Area1 | ☑ | Luhlanga | ☑ | Kwaqubuka North | ☑ |
| Area 2 | ☑ | Kwaqubuka | ☑ | Opondweni | ☑ |
| Gwabalanda | ☑ | Emalahleni | ☑ | Mahujini | ☑ |
| Tholokhule | ☑ | Mvutshini | ☑ | | |

***Management and mitigation measures:***

- The use of local labour would mitigate possible social conflict between outsiders and existing residents. Maximise the usage of local service providers, maintenance, etc. No foreign workforce should be housed in the mining area or surrounding community.
- It may not be possible to avoid using "outside" skills and services where necessary, but locals will be the first option.

### 7.14.5 STDs and AIDS

| Phase of the mining operation | | |
|---|---|---|
| Construction | Operational | Decommissioning & Closure |
| ☑ | ☑ | |

| Applicable Areas | | | | | |
|---|---|---|---|---|---|
| Area1 | ☑ | Luhlanga | ☑ | Kwaqubuka North | ☑ |
| Area 2 | | Kwaqubuka | ☑ | Opondweni | ☑ |
| Gwabalanda | ☑ | Emalahleni | ☑ | Mahujini | ☑ |
| Tholokhule | ☑ | Mvutshini | ☑ | | |

***Management and mitigation measures:***

- Develop and present accessible and culturally appropriate awareness programmes around the dangers of STDs for mine employees at least twice a year.

- Present accessible and culturally appropriate awareness programmes around the dangers of STDs to the community members at least once a year. This can be done through forging links between the mine and the Africa Centre. The Africa Centre has conducted extensive research within the Somkhele area.
- Ensure that employees have ongoing access to information as well as condoms.

### 7.14.6 Develop a skills base within the community.

| Phase of the mining operation | | |
|---|---|---|
| Construction | Operational | Decommissioning & Closure |
| ✓ | ✓ | |

| Applicable Areas | | | | | |
|---|---|---|---|---|---|
| Area1 | ✓ | Luhlanga | ✓ | Kwaqubuka North | ✓ |
| Area 2 | | Kwaqubuka | ✓ | Opondweni | ✓ |
| Gwabalanda | ✓ | Emalahleni | ✓ | Mahujini | ✓ |
| Tholokhule | ✓ | Mvutshini | ✓ | | |

***Management and mitigation measures:***

- Wherever possible, throughout the Life of Mine (LoM), a concerted effort must be made to impart skills to local people, either through a local employment policy and/or skills based adult education programme.
- The mine will therefore seek to invest in forming partnerships for the skills training of the local community with skills.
- Partnership organisations could include existing community-based concerns that have existing direct links to the community (e.g. Africa Centre) or those furthering the development and business skills of communities and SMMEs (e.g. the Mpukonyoni Business Association (MBA).
- Possible skills development opportunities include: fence making, sewing, cooking and catering, block making, poultry farming, gardening, welding, brick laying,

computer literacy, tender training, emerging contractors training. There are also those relating to the mine's needs during rehabilitation. Refer to the Somkhele Anthracite Mine SLP for details with regards to all socio-economic factors.

### 7.14.7 Damage to Property and Structures

| Phase of the mining operation | | |
|---|---|---|
| Construction | Operational | Decommissioning & Closure |
| ☑ | ☑ | |

| Applicable Areas | | | | | |
|---|---|---|---|---|---|
| Area1 | ☑ | Luhlanga | ☑ | Kwaqubuka North | ☑ |
| Area 2 | ☑ | Kwaqubuka | ☑ | Opondweni | ☑ |
| Gwabalanda | ☑ | Emalahleni | ☑ | Mahujini | ☑ |
| Tholokhule | ☑ | Mvutshini | ☑ | | |

***<u>Management and mitigation measures:</u>***

- As far as possible, the mine will restrict operations to the defined mining area.
- Damage to structures, fences, crop lands and grazing land outside of the defined mining area, will be avoided as far as possible.
- Should damage to the aforementioned occur, the Site Manager/Mining Contractor will be responsible for repairing the damage caused or compensating the property owner accordingly. The property owner must be consulted with regards to the repair and compensation.
- Any fencing that is removed to enable construction to proceed must be replaced on completion of work in that area.
- The Site Manager/Mining Contractor will be responsible for providing a temporary fenced off area (e.g. for keeping of livestock) if required by the property owner.

### 7.14.8 Community Liaison

| Phase of the mining operation | | |
|---|---|---|
| Construction | Operational | Decommissioning & Closure |
| ☑ | ☑ | |

| Applicable Areas | | | | | |
|---|---|---|---|---|---|
| Area1 | ☑ | Luhlanga | ☑ | Kwaqubuka North | ☑ |
| Area 2 | | Kwaqubuka | ☑ | Opondweni | ☑ |
| Gwabalanda | ☑ | Emalahleni | ☑ | Mahujini | ☑ |
| Tholokhule | ☑ | Mvutshini | ☑ | | |

***Management and mitigation measures:***

- A Community Liaison Officer (CLO) has be appointed to manage the ongoing liaison with the community. This person is referred to as the stakeholder manager.
- A system will be developed whereby the community can express their complaints, fears, comments, problems, and questions. The system will be communicated to the community through the stakeholder manager.
- Any complaints or comments received from the community will be directed to the CLO who will in turn report to Site Manager.
- Residents are to be informed, ahead of time, about the duration and nature of the mining related activities that will take place in their neighbourhood. This will ensure that the community do not develop feelings of fear or resentment due to (the perception of) information being withheld.
- Regular community meetings will be held between the community, the CLO and the Somkhele Mine management.
- The newly formed STAC committee will form a valuable vehicle for the dissemination of information to the broader community.

### 7.14.9 Resettlement and Compensation Plan

The persons/families that reside within the 300 m radius of the active mining zone and associated will be resettled during the project.

The bulk of the socio-economic impacts can be mitigated through the implementation of a widely accepted Resettlement and Compensation Plan (RCP) that is well conceptualised and properly managed. However, structures are fluid and dynamic and, not all of those directly affected will respond in the same way. In all likelihood some people will be much better off after the implementation of the project, some slightly better off, some slightly worse off, and some much worse off. The challenge for Tendele is to ensure that the resettlement and compensation process particularly caters for the last two categories.

| Phase of the mining operation | | |
|---|---|---|
| Construction | Operational | Decommissioning & Closure |
| ☑ | ☑ | |

| Applicable Areas | | | | | |
|---|---|---|---|---|---|
| Area1 | ☑ | Luhlanga | ☑ | Kwaqubuka North | ☑ |
| Area 2 | | Kwaqubuka | ☑ | Opondweni | ☑ |
| Gwabalanda | ☑ | Emalahleni | ☑ | Mahujini | ☑ |
| Tholokhule | ☑ | Mvutshini | ☑ | | |

***Management and mitigation measures:***

- With the experience gained during the resettlement and compensation of homesteads and graves in Area 2 and Area 1, a comprehensive and workable platform has been obtained. The knowledge gained and the systems put in place, along with the continued involvement of the community on a decision making level has resulted in a successful example to the relocation process. All of the action plans as stipulated in the original Somkhele EMPR, will be adopted in the mine extension with the additional lessons learnt.

### 7.14.10 Decrease in employment opportunities – decommissioning and closure phase

| Phase of the mining operation | | |
|---|---|---|
| Construction | Operational | Decommissioning & Closure |

| | | |
|---|---|---|
| | | ☑ |

| Applicable Areas | | | | | |
|---|---|---|---|---|---|
| Area1 | ☑ | Luhlanga | ☑ | Kwaqubuka North | ☑ |
| Area 2 | ☑ | Kwaqubuka | ☑ | Opondweni | ☑ |
| Gwabalanda | ☑ | Emalahleni | ☑ | Mahujini | ☑ |
| Tholokhule | ☑ | Mvutshini | ☑ | | |

***Management and mitigation measure:***

- The negative socio-economic impacts related to mine closure will be alleviated by long term skills development, learnership programs and educational training during the mining operation, and with job saving and the management of downscaling at closure. This will entail a focused approach throughout the production stage, and continued planning of the decommissioning process in advance of closure. In addition, the supporting of development initiatives will be sustainable long after the mine has closed, and will aid in the alleviation of job losses on closure of the mining venture.
- The mine will furthermore endeavour to empower people by providing them with the skills and business know-how that will allow them to build their own future after the mining venture has ended.

- Projects are being investigated by the mine which could create prolonged economic benefits to the community. A study was commissioned to identify projects within the greater mining community. All projects both current and proposed are outlined in the mines Social and Labour Plan.

### 7.14.11 Submission of Information

Ground and surface water, as well as dust, air emissions and noise will be monitored and the results submitted to the DWA and DMR on an annual basis or as otherwise requested.

All concerns and reports of mining related occurrences; either social, economic and/or environmental, will be channelled to the affected public through the mine environmental committee or their representatives.

## 7.15 Cumulative Impacts

As there are no mining operations within the receiving environment, the cumulative impacts from mining are based on impacts already being experienced at Somkhele. The cumulative impacts have been identified through experience from other mining operations in South Africa.

#### *7.15.1.1 Geology*

The available geology resources of the area will be reduced due to the additional mining operation. Although this impact is expected to be of medium significance, no mitigation is possible as mining permanently impacts on the geological strata. The mining activities will, however, remain within the MRA. It should also be noted that the geological resources are owned by the state and the objective of the applicant is to optimally mine these resources should the mining right be awarded.

#### *7.15.1.2 Air Quality*

Dust emissions and an increase in the deterioration of ambient dust levels may result from increased mining operations. Dust is mitigated by various methods. Additional monitoring and the continued use of mitigation measures are expected to ensure dust does not exceed prescribed levels.

#### *7.15.1.3 Groundwater*

As more opencast pits are established, the impacts on the surrounding aquifer systems may increase. The cumulative Impacts of opencast mining could dewater the aqifers. Due to the distance between opencast pits and data received from groundwater monitoring, the cumulative impact is considered to be low.

#### *7.15.1.4 Social*

With the mine expanding into new areas, more people will come into contact with the mine and could possibly be affected by the mine expansion programme as detailed in the above section. The social and labour plan has been adapted to ensure the greater community benefits from mining operations in the region in addition to the mine having a well established method for interacting with the surrounding communities.

## 7.16 Management and Action Plans

Based on the information received from the various specialist impacts reports, various specific management plans have been drafted as outlined in Table 7-10 overleaf. The management plans and associated required action also include management and actions from the existing EMPs at Somkhele.

**Table 7-10 Management and action plans**

| Objective | Phase | Areas | Action Plan | Responsible Party | Frequency | Cost |
|---|---|---|---|---|---|---|
| **Topography** | | | **Topography** | | | |
| Prevention of surface subsidence | Construction, Operation | All Areas | Terracing will prevent or limit this movement of earth material throughout the operation | Mine Manager/Contractors | Ongoing | Included in mine operational costs |
| Free flow of surface water to prevent ponding | Operation, Closure | All Areas | The levels will be surveyed and checked upon rehabilitation | Mine surveyor. | Upon completion of rehabilitation | Included in mine operational costs |
| **Soils** | | | **Soils** | | | |
| To maintain the viability of the soils for rehabilitation purposes: **Soil Stripping** | Construction, Operation | All Areas | All soils should be stripped in a dry or near-dry state as possible, no soil stripping after rainfall events. | Mine Manager/Contractors | continuous | |
| | Construction, Operation | All Areas | All soils will be stripped and stockpiled for use in rehabilitation of the site. | Mine Manager/Contractors | Annual EMP Audit | |
| | Construction, Operation | All Areas | Soils should be stockpiled as close to harvested area as possible | Mine Manager/Contractors | Annual EMP Audit | |
| | Construction, Operation | All Areas | Soil should not be handled during high wind conditions | Mine Manager | continuous | |
| To maintain the viability of the soils for rehabilitation purposes: **Soil Stockpiling** | Construction, Operation | All Areas | Stockpiles should be kept away from watercourses or areas where they will be prone to erosion | Mine Manager | Annual EMP Audit | |
| | Construction, Operation | All Areas | Stockpiles are to be protected from wind and water erosion and should not to exceed 5 metres in height | Mine Manager | Annual EMP Audit | |
| | Construction, Operation | All Areas | for long-term stockpiling (more than 3 months) the stockpiles must be revegetated by sowing with a suitable grass/legume mix | Mine Manager | Annual EMP Audit | |
| To maintain the viability of the soils for rehabilitation purposes To create indigenous grassland that will stabilize the soils : **Mine and Road rehabilitation** | Construction, Operation | All Areas | Prevent the development of hollows where water may collect and result in the water-logging of materials. | Mine Manager , Mine surveyor | Annual EMP Audit | |
| | Construction, Operation, Closure | All Areas | Ensure the free drainage of water. | Mine Manager , Mine surveyor | Annual EMP Audit | |
| | Construction, Operation | All Areas | Limiting the access of vehicles onto the rehabilitated land | Mine Manager/Contractors | continuous | |

| Objective | Phase | Areas | Action Plan | Responsible Party | Frequency | Cost |
|---|---|---|---|---|---|---|
| | Construction, Operation | All Areas | Soils will not be placed on slopes with a gradient greater than 6% | Mine Manager | Annual EMP Audit | |
| Fertilizer management: To ensure effective use of fertilizer. | Construction, Operation, Closure | All Areas | Prior to rehabilitation preliminary soil sampling will be carried out to determine fertilizer requirements. Soil samples will be analysed for the following parameters: pH (H2O); Electrical Conductivity; Calcium mg/kg; Magnesium mg/kg; Potassium mg/kg; Sodium mg/kg; Cat-ion exchange capacity; Phosphorus (Bray I); Zinc mg/kg; Clay%; Organic matter content (C%). | Consultant | Prior to rehabilitation or when required. | Included in OPEX |
| **Land Use** | | | **Land Use** | | | |
| The destruction of footpaths and access routes through mining activities | Construction | All Areas | The Mine should assist in creating alternative routes that are safe and are located an adequate distance from the active mining areas and the intra-Mine haul roads. | Mine Manager/Contractors | Annual EMP Audit | Included in mine Capex |
| | Construction. Operation | Haul Road | The mine will construct safe crossings underneath haul roads in places where access to grazing land is compromised. | Infrastructure Manager | Annual EMP Audit | Included in mine Capex |
| | Construction, Operation | All Areas | Assistance should be provided in making formal stream crossings for livestock and humans (e.g. rock causeways or similar). | Mine Manager/Contractors | when required | |
| **Flora** | | | **Flora** | | | |
| Controlled removal of vegetation to minimize the extent of vegetation clearance | Construction, Operation | All Areas | Only the minimum area of vegetation is to be cleared to enable construction or mining to take place – excessive vegetation clearing leads to erosion problems | Mine Manager/Contractors | During construction phase | |
| | Construction, Operation | All Areas | In grassland areas, the vegetation should be stripped together with the topsoil – this incorporates both seeds and mulch into the topsoil, which can be used for rehabilitation. | Mine Manager/Contractors | During construction phase | |
| | Construction | All Areas | Larger trees and shrubs should not be wasted.- Prior to commencement, allow the community to enter the area to clear the trees and shrubs for firewood or building material. Where possible plant species should be relocated to areas undergoing rehabilitation. | Stakeholder Manager | During construction phase | |

| Objective | Phase | Areas | Action Plan | Responsible Party | Frequency | Cost |
|---|---|---|---|---|---|---|
| Limit the impact on valuable vegetation communities, namely the riverine forest and the wetland area | Construction, Operation | All Areas | A zero development, 50 m buffer zone on either side of the riverine forest community must be maintained. These should be clearly demarcated with beacons. | Mine Manager/Contractors | Annual EMP Audit | |
| | Construction, Operation | All Areas | Stream crossings are to be sensitively planned to target areas where: | Mine Manager/Contractors | Annual EMP Audit | |
| | | | i) the riverine forest is naturally 'open' and there are gaps in the continuity; | | | |
| | | | ii). there are no large trees present. | | | |
| To limit the loss of ethnobotical plants utilised by the community | Construction | All Areas | The local community, through the Tribal Authority, should be given the opportunity for collection of the site prior to the site clearing. | Community development officer. | Annual EMP Audit | |
| To conserve the protected plant species present within the affected region. | Construction Operation | Area 2 | Specimens of Sideroxylon inerme need to be protected from damage. This tree occurs within the riverine forest so stream crossings or any future development must be planned to avoid damage to/disturbance of specimens of this species. | Mine Manager/Contractors | Ongoing | |
| To prevent the colonisation and spread of alien vegetation | Construction, Operation, Closure | All Areas | The Mine has implemented an alien plant eradication programme. A full time team is tasked with removing all alien plants found within the Mine-affected areas. | Mine Manager | continuous | |
| | Operation | Workshops | All herbicides used must be registered as agricultural remedies in terms of the Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies Act, No. 36 of 1947 | Health and safety officer | when required, Annual assessment | |
| | Operation, Closure | All Areas | Species-specific herbicides/methods should be favoured, provided they will not compromise the naturally occurring plants. | Mine Manager | when required, Annual assessment | |
| | | | Invasive plants are to be collected and transferred to a site where they can be burned in a container (e.g. a skip). | Mine Manager | When required | |
| | | | Alien plants should preferably not be removed when they are seeding as this may encourage the spread of the plant | Mine Manager | Continuous | |
| Establish a nursery to | Construction, | | Develop a community nursery, initiate seed | Stakeholder Manager | Continuous | |

| Objective | Phase | Areas | Action Plan | Responsible Party | Frequency | Cost |
|---|---|---|---|---|---|---|
| harvest indigenous plant species | Operational and Closure | | harvesting. | | | |
| **Aquatic** | | | **Aquatic** | | | |
| Prevent loss of important aquatic areas | Construction | All Areas | Ensure that mining activities avoid the moderately sensitive and sensitive aquatic areas. (Outlined in Aquatic specialist report.) | Infrastructure Manager | During construction phase | |
| Establish appropriate Bio monitoring programme | Construction, Operation | All Areas | Develop and initiate a water quality and aquatic bio-monitoring programme for the site to include sites on rivers/streams immediately downstream of mining operations. | Consultants | Annually | R 40 000,00 |
| Limit the impact on ecological sensitive watercourses | Pre-Construction, Operation | All Areas | Where haul roads need to cross watercourses ecologically sensitive water resources (medium-high EIS rating), these should ideally be located at existing crossings. If this is not feasible, the crossings should be located in degraded areas of riverine habitat to limit potential impacts. · Limit the removal of riparian vegetation to restrict the fragmentation of habitat, Fences and other obstruction to wildlife movement should not be constructed across rivers and should remain outside of the vegetated riparian areas. · Rivers should not be canalised or channelized. · Restriction of surface flows through culverts or pipes should be designed to minimise interruption to flows and connectivity for aquatic organisms. Modifications to the bed and banks of a watercourse should be limited as far as possible. · Rehabilitate disturbed areas once road construction has been completed. | Contractors | During construction phase | |
| **Animal Life (Fauna)** | | | **Animal Life (Fauna)** | | | |
| To limit the impact on the animals including | Construction, Operation | All Areas | Steps must be taken to ensure that workers do not poach animals and birds. These must | Mine Manager | Continuous | |

| Objective | Phase | Areas | Action Plan | Responsible Party | Frequency | Cost |
|---|---|---|---|---|---|---|
| cattle and bird life in the area, | | | include educating the workforce in toolbox talks as well as during the induction process. | | | |
| | Construction, Operation | All Areas | No member of the mining team will be permitted to: I. hunt, kill, set devices to trap, tamper with or harass wild animals and II. feed indigenous animals; livestock or destroy any form of animal shelter; III. bring his/her own pets to the site. | Shift foreman, Mine Manager | Continuous | |
| To implement measures that will minimise the direct and indirect effect on the local fauna population and encourage the re-introduction of species on decommissioning | Closure | All Areas | Use plant species endemic to the site for rehabilitation purposes in order to recreate the pre-mining animal habitats - using other species may alter the habitat, especially for birds, and render it unsuitable | Mine Manager, Consultant | Annual EMP Audit | |
| | Operational, Closure | All Areas | Control the invasion of alien plants which will outcompete the indigenous vegetation that is favoured as a faunal habitat | Mine Manager | continuous | |
| | Construction, Operation | All Areas | Reduce the fragmentation of faunal habitat by confining the area of disturbance. This particularly applies to the riverine forest and the related stream crossings | Mine Manager/Contractors | During construction | |
| | Operational, Closure | All Areas | Monitor rehabilitation in the long-term to ensure that the desired habitat is created for the re-colonisation of fauna. | Consultant | When required | |
| Protection of the African Rock Python. The African Rock Python is located in the area and is listed as an endangered species. | Construction, Operation, Closure | All Areas, Greater community | The Mine will adopt a policy of live capture and translocation to the game reserve for any python specimens found. KZN Wildlife will be contacted in this regard. Offering rewards for the identification of Pythons has proved ineffective but will be continued. No rewards or incentives will be offered if the snake is killed or injured | Staff, contractors, community. | continuous | |
| **Surface Water** | | | **Surface Water** | | | |
| To ensure that community members have access to surface water. | Construction, Operation | Greater Community | Community dams have been constructed on the periphery of the existing mining area. The mine will investigate possibilities to assist in water provision. | Stakeholder Manager | Monitor monthly | |

| Objective | Phase | Areas | Action Plan | Responsible Party | Frequency | Cost |
|---|---|---|---|---|---|---|
| To reduce the potential for contamination of surface water resources and control the impacts of Mine-contaminated water: **Mining Pits** | Construction, Operation | All Areas | Diversion berms will be constructed upslope of the mining pits to divert clean water away from the active zone and separate clean/dirty water. | Mine Manager, Contractor | Annual EMP Audit, GN704 Audit | |
| To reduce the potential for contamination of surface water resources: **Handling and Storage of Hazardous Chemicals** | Construction, Operation | Workshops | Ensure that quantities of fuels and chemicals stored on site are appropriate to the requirements. | Stores Manager | Ongoing | |
| | Construction, Operation | Workshops | All chemicals must be confined to specific and secured areas | Mine Manager/Contractors | Ongoing | |
| | Construction, Operation | Workshops | All chemicals will be stored in close proximity to the workshop areas. These chemicals will be kept under lock and key and only authorized personnel will be allowed to access and remove the material. | Mine Manager/Contractors/Stores Manager | continuous | |
| | Construction, Operation | Workshops | Chemicals must be stored in an area with an impermeable base (e.g. concrete or plastic lining). | Mine Manager/Contractors | continuous | |
| | Construction, Operation | Workshops | Any generators used on site are to be underlain by an impermeable surface (e.g. concrete bund) or placed within a drip tray to intercept leaks. | Mine Manager/Contractors | continuous | |
| | Construction, Operation | Workshops | Oil/grease traps are to be fitted at all workshops and wash-down sites | Contractors | continuous | |
| To reduce the potential for contamination of surface water resources: **Fuel Tanks** | Construction, Operation | Workshops | All liquid fuels (e.g. diesel and petrol) which are stored in tanks or drums must have a bund wall around the tanks to prevent liquids from escaping in the event of a spill or leak. The volume of the bund must be 100% of the volume of the storage tanks. | Mine Manager/Contractors | Annual EMP Audit | |
| | Construction, Operation | Workshops | Gas and fuel must not be stored in the same storage area as chemicals | Mine Manager/Contractors | continuous | |
| | Construction, Operation | Workshops | The re-fuelling of vehicles must only take place at designated sites underlain by a concrete bund. | Mine Manager/Contractors | continuous | |
| | Construction, | Workshops | The fuels dispenser must be hung within the | Mine Manager/Contractors | continuous | |

| Objective | Phase | Areas | Action Plan | Responsible Party | Frequency | Cost |
|---|---|---|---|---|---|---|
| | Operation | | bunded area while not in use. | | | |
| | Construction, Operation | Workshops | Any party delivering fuels or other chemicals to the site are to be made aware of the appropriate storage/drop-off locations. | Mine Manager/Contractors | continuous | |
| To reduce the potential for contamination of surface water resources: **Equipment/Machinery** | Construction, Operation | Workshops | Any equipment / machinery that may leak oil or fuel on must be placed on an impermeable surface (e.g. concrete bund). | Mine Manager/Contractors | continuous | |
| | Construction, Operation | All Areas | If the use of a bund is not possible (e.g. in active mining area, or during construction phase), the equipment / machinery must be underlain by watertight drip trays to catch any pollutants. | Mine Manager/Contractors | continuous | |
| | Construction, Operation | All Areas | Drip trays must be sized to allow the equipment to be placed inside it, must be cleaned regularly, and must not be allowed to overflow. If the item is too large to fit within the tray, the tray must placed below the item and must be sized to cover all potential leakage areas. | Mine Manager/Contractors | continuous | |
| | Construction, Operation | Workshops | Chemicals collected in the drip trays must be collected and disposed of at permitted disposal sites. | Mine Manager/Contractors | continuous | |
| To reduce the potential for contamination of surface water resources: Spills of Hazardous Substances | Construction, Operation | Workshops | The accidental or negligent spillage of fuels or potentially hazardous substances must be cleaned up immediately using the most appropriate methodologies, equipment and materials. | Mine Manager/Contractors | continuous | |
| | Construction, Operation | Workshops | The Site Manager / Mining Contractor must ensure that the necessary materials, equipment and chemicals are available on the site to deal with spills of any of the hazardous materials present (e.g. Drizit or Peat Sorb). | Mine Manager/Contractors | continuous | |
| | Construction, Operation | Workshops | Any contaminated soil or water must be removed and stored in a skip until it can be disposed of at a permitted disposal site. | Mine Manager/Contractors | continuous | |
| To reduce the potential for contamination of | Construction, Operation | Workshops | Designated wash-down areas (for the cleaning and rinsing of equipment and machinery) must be created. | Mine Manager/Contractors | continuous | |

| Objective | Phase | Areas | Action Plan | Responsible Party | Frequency | Cost |
|---|---|---|---|---|---|---|
| surface water resources: **Wash-down Sites** | Construction, Operation | Workshops | The wash-down area must be underlain by an impermeable surface. | Contractor | continuous | |
| | Construction, Operation | Workshops | The contaminated runoff from the wash-down areas must be channelled to cut-off drains and enter the water recycle system. During construction, wash-down water must be channelled to a sunken PVC tank or similar. | Contractor | Annual EMP Audit | |
| | Construction, Operation | Workshops | There must be no wash-down sites at the active mining area – equipment must be transferred to the plant site for cleaning. | Mine Manager/Contractors | continuous | |
| To design Mine structures in such a way as to limit development within the critical floodline areas and construct structures that will control the contamination from the mining and plant area. | Construction, Operation | All Areas | Diversion berms will be constructed upslope of the mining area to divert all clean water away from the contaminated zones and to separate clean/dirty water. | Mine Manager/Contractors | Annual EMP Audit | |
| | Construction, Operation | All Areas | All surface water management ponds will be designed to have a capacity to cope with a 1 in 100 year rainfall event. | Engineer | | |
| To ensure that stream crossings are sensitively planned and constructed with care | Construction | All Areas | Stream crossings are to be built rapidly so as to limit the time period that the area remains exposed. | Contractor | | |
| | Construction | All Areas | Wherever possible, manual construction methods should be utilised for construction of stream crossings. | Contractor | | |
| | Construction | All Areas | Ensure that the stream crossings do not obstruct flow within the stream. | Mine Manager/Contractors | Post construction of stream crossing | |
| | Construction, Operation | All Areas | The areas surrounding the crossing (including the banks) and the stream bed in the vicinity of the crossing will need to be reinforced with rock gabions (or similar) to protect against scour and erosion of the channel. | Mine Manager/Contractors | Annual EMP Audit / Post construction of stream crossing | |
| | Construction, Operation | All Areas | Any destabilised stream banks and erosion caused by the construction process are to be | Mine Manager/Contractors | Ongoing | |

| Objective | Phase | Areas | Action Plan | Responsible Party | Frequency | Cost |
|---|---|---|---|---|---|---|
| | | | repaired immediately. | | | |
| | Construction, Operation | All Areas | Replant the original vegetation along the disturbed section of the crossing. Vegetation from the adjacent drier areas should not to be used as it is not adapted to the wet conditions along the watercourse | Mine Manager/Contractors | When required | |
| | Operation, Closure | All Areas | The rehabilitation of the affected sites will include the installation of suitable long-term erosion control measures such as gabions and sand bags. | Mine Manager/Contractors | Upon completion of rehabilitation | |
| The surface water monitoring programme should include a South African Scoring System (SASS) component for monitoring | Construction, Operation, Closure | All Areas | SASS monitoring locations have been determined and will be monitored during summer months when the rivers have flow. | Consultant | Annual | |
| **Groundwater** | | | **Groundwater** | | | |
| To monitor the extent of dewatering and to verify and update predicted results. | Construction, Operation, Closure | All Areas | Groundwater levels and quality in the monitoring boreholes must be monitored on a quarterly basis. | Consultant | Quarterly | R 80 000,00 |
| | Construction, Operation | All Areas | Additional monitoring boreholes should be installed where necessary to effectively monitor the impact on groundwater quality and quantity. | Consultant | when required | R 200 000,00 |
| | Operation | All Areas | Calibration of numerical transport and de-watering models at least once every two years. | Consultant | Every 2 Years | |
| | Operation | All Areas | Continuous assessment of source term. This will require rock samples twice a year from pits, plant slurry and discard. Samples to be tested for ABA and leach potential. | Consultant | Ongoing | |
| | Operation | All Areas | At least 3 kinetic leach cell tests must be completed once a year. | Consultant | Annually | |
| | Operation | All Areas | Geochemical model to refine source terms must be updated once every two years and the data must be applied in the numerical groundwater model. | Consultant | Every 2 Years | |

| Objective | Phase | Areas | Action Plan | Responsible Party | Frequency | Cost |
|---|---|---|---|---|---|---|
| To control the acid Mine drainage and long-term sulphate concentrations. | Construction, Operation | All Areas | Spoils, and specifically any pyritic material, like the shale must not be placed with overburden. All acid generating material must be disposed of with the discard from the mine. All slurry and discard must be placed at least 5 meters below the water table when disposing into voids. Material must be well compacted and lime added. | Shift foreman, Mine Manager | Ongoing | |
| | Construction, Operation | All Areas | The shale that will be stripped above the coal seam will be backfilled to the lowest possible elevation during the roll-over method of mining. This will ensure that the shale is flooded as quickly as possible after mining is completed and so reduce the risk of oxidation and acidification. | Shift Foreman, Mine Manager | Ongoing | |
| | Closure | All Areas | On final rehabilitation the pits will be shaped and re-vegetated according approved closure plans approved by the DMR. | Contractor, Mine Manager | upon closure | |
| | Construction, Operation, Closure | All Areas | Based on the groundwater model, sites with a potential for decant must be included in the monitoring programme. | Consultant | Annual | |
| **Air Quality** | | | **Air Quality** | | | |
| To reduce the impact of dust emissions relating to mining activities | Construction, Operation | Haul Road | With respect to haul road dust levels, limit vehicle speeds to 30km/hour. | Safety Officer | Continuous | |
| | Construction, Operation | Haul Road | Water bowsers must be utilized to wet roads to reduce fugitive dust. | Shift Foreman, Mine Manager | Continuous | |
| To ensure compliance with SANS 1929:2005 levels of permissible dust. | Operation | All Areas | A dust monitoring network has been set up, this network will follow the ASTM D 1739-98 methods for monitoring. | Consultant | Monthly | R 90 000,00 |
| To ensure the calcine plant compliance with the National Air Quality Act emission requirements. | Operation | Area 2 | Emissions from the calcine plant will be measured monthly. The calcine plant will be decommissioned until: | Consultant | Monthly | |
| | Operation | | 1. The required emission licenses have been applied for or | | | |
| | Operation | | 2. The emission levels fall within an acceptable level by maintain calcine plant or by the reduction in emissions through | | | |

| Objective | Phase | Areas | Action Plan | Responsible Party | Frequency | Cost |
|---|---|---|---|---|---|---|
| | | | improved control of off gasses.. | | | |
| **Noise And Vibration** | | | **Noise And Vibration** | | | |
| To reduce the impact of mining noise on the overall environment and to minimise the noise impact on surrounding land users. To minimise the element of surprise associated with blast events. | Construction, Operation | All Areas | all persons living within the 300 m radius of the active mining zone will be relocated to a new site. | Mine Manager | continuous | |
| To monitor the noise impact and make ongoing recommendations for the improvement of noise control strategies | Construction, Operation | Workshops | All equipment to be used during the construction and operational phases is to be kept in a good working condition. This is particularly important for the exhaust systems of the diesel earthmoving equipment. | Contractors | continuous | |
| | Construction, Operation | Workshops | Regular checks on the noise emissions of equipment in operation should be performed. Equipment should be adequately maintained and serviced. Equipment that has an increased level of noise emissions should not be used until its noise levels are normalized. | Contractors | continuous | |
| | Construction, Operation | All Areas | Blasting must be restricted to times which will have the least impact on residents ). | Blast Manager, Mine Manager | Blast Monitoring. | |
| | Construction, Operation | Surrounding communities | The surrounding communities must be made fully aware of blasting procedures and schedules | Stakeholder Manager | | |
| | Construction, Operation | All Areas | All blasts are to be monitored. | Consultant | During blasting events | |
| | Construction, Operation | All Areas | The Hluhluwe Mfolozi game reserve is to be made aware of blasting times prior to any blasting events. | Mine Manager | When required | |
| **Sites Of Archaeological And Cultural Interest** | | | **Sites Of Archaeological And Cultural Interest** | | | |

| Objective | Phase | Areas | Action Plan | Responsible Party | Frequency | Cost |
|---|---|---|---|---|---|---|
| To actively involve the affected community in the grave relocation process, in order to minimise social disorientation | Construction, Operation, Closure | Affected community | Actively make information about the project available to local communities as this will reduce the potential development of unnecessary fears and resentment towards the Mine; | Stakeholder Manager, Mine Manager | N/A | |
| | Construction, Operation | All Areas | Actively and publicly support the important ritual activities relating ancestors and graves at the level of the community (both logistically and financially); | Stakeholder Manager, Mine Manager | N/A | |
| | Construction, Operation | All Areas | Facilitate important ritual activities that need to take place in and around the project site wherever possible; | Stakeholder Manager, Mine Manager | N/A | |
| | Construction, Operation | All Areas | Involve affected individuals, families, traditional leaders and elected leaders in the process. | Stakeholder Manager, Mine Manager | N/A | |
| To ensure compliance with legal requirements pertaining to the relocation of graves. | Construction | All Areas | The mitigation, exhumation and re-interment of graves located outside of formal cemeteries (namely ancestral graves) may only proceed with the sanction of the bodies associated with the South African Heritage Resources Act, the KwaZulu-Natal Heritage Act, and the Graves and Crematoria's Act. | Stakeholder Manager, Mine Manager | N/A | |
| | Construction | All Areas | The Department of Health requires proof that all reasonable means have been pursued to engage with the relatives and families of the deceased. | Stakeholder Manager, Mine Manager | when required | |
| | Construction | All Areas | The Department of Health also requires that a registered undertaker perform the exhumation and re-interment. | Mine Manager | when required | |
| | Construction | All Areas | The necessary permission from the relevant organisations (as above) will need to be obtained by the Mine. | Mine Manager | N/A | |
| To define the costs associated with grave exhumation and re-interment. | Construction | All Areas | All the costs associated with the relocation will be covered by the Mine, including both logistical costs as well as social costs. | Mine Manager | N/A | |
| | Pre-Construction | All Areas | A box or coffin to contain the remains of the deceased; The services of traditional healer to preside over the process; Food for participants in the ceremony; The services of a religious | Stakeholder Manager | N/A | |

| Objective | Phase | Areas | Action Plan | Responsible Party | Frequency | Cost |
|---|---|---|---|---|---|---|
| | | | representative to preside over the process; Traditional alcohol to be consumed for ritual purposes; | | | |
| Outline a procedure for the relocation of graves | Pre-Construction | All Areas | The known grave sites within the general area must be mapped and details of the grave recorded. Details to be recorded include: | | | |
| | | All Areas | Grave number (each grave must be allocated a number); | Relocation Consultant | | |
| | | All Areas | Locality of the grave (GPS reading); | | | |
| | | All Areas | Affected family and contact person; | | | |
| | | All Areas | Name of deceased (if known). | | | |
| | | All Areas | The existing local tribal committee will discuss and negotiate, inter alia, the requirements relating to the grave exhumation and re-interment. | Mine Manager | When required | |
| | Pre-Construction | All Areas | The decisions to be taken will include: | Relocation Consultant | Procedure will be reviewed annually | |
| | | All Areas | i. Logistical requirements; | | | |
| | | All Areas | ii. Social requirements and costs; | | | |
| | | All Areas | iii. Spiritual requirements; | | | |
| | | All Areas | iv. Grave relocation site(s); | | | |
| | | All Areas | v. Timing of the grave removal; | | | |
| | | All Areas | Refer to procedure for grave exhumation | | | |
| | | All Areas | Sanction / permission will need to be obtained from the following by the Mine: Department of Health; AMAFA, KwaZulu-Natal Heritage. | Mine Manager | | |
| **Visual Aspects** | | | **Visual Aspects** | | | |
| To minimise the visual impact of the mining activities on | Construction, Operation | All Areas | The minimum amount of existing vegetation and soil material must be removed from Mine-affected areas. | Contractors | Continuous | |

| Objective | Phase | Areas | Action Plan | Responsible Party | Frequency | Cost |
|---|---|---|---|---|---|---|
| surrounding land users/passers-by. | Construction, Operation, Closure | All Areas | An ecological approach to rehabilitation and screening measures, as opposed to a horticultural approach to landscaping, should be adopted. Communities of indigenous plants enhance biodiversity and blend well with existing vegetation. | Consultant | N/A | |
| | Construction, Operation | All Areas | Plant rows/clumps of fast-growing, indigenous trees along the northern and southern borders of the plant area as visual screens. | Contractors | Annual | |
| | Construction, Operation | All Areas | screening berms will need to be constructed to block views of the mining pits from passing traffic. Visual Berms should be approximately 3 meters in height and should be grassed. Various indigenous shrubs or smaller plant species should be planted to increase the aesthetic value of the berms. | Contractors | Annual | |
| Site Revegetation and Rehabilitation | operation, Closure | All Areas | Ensure that all berms and long-term stockpiles are revegetated i.e. flood control berm, diversion berms, pond berm walls. | Contractor/ Mine Manager | Ongoing | |
| | operation, Closure | All Areas | Continuously cap (with topsoil) and revegetate the surface of the discard dump. | Contractor/ Mine Manager | Ongoing | |
| | operation, Closure | All Areas | Revegetate the terraces after construction. | Contractor/ Mine Manager | Ongoing | |
| | operation, Closure | All Areas | Ensure that continuous rehabilitation of the mining pits is undertaken as mining is completed. | Contractor/ Mine Manager | Ongoing | |
| | operation, Closure | All Areas | Ensure that the topography of backfilled, rehabilitated areas is consistent with the pre-mining landscape. | Contractor/ Mine Manager | Ongoing | |
| To minimise the visual impact of Lighting | Construction, Operation | All Areas | Lighting should be carefully planned and kept to a minimum to enable work to continue since light at night is visible at great distances. | Contractor/ Mine Manager | Ongoing | |
| | Construction, Operation | All Areas | Security flood lighting and operational lighting should only be used where absolutely necessary and carefully directed, preferably away from sensitive viewing areas (away from the game reserve and nearby homesteads). | Safety Officer | Annual | |
| | Construction, | All Areas | Wherever possible lights should be directed | Safety Officer | Annual | |

| Objective | Phase | Areas | Action Plan | Responsible Party | Frequency | Cost |
|---|---|---|---|---|---|---|
| | Operation | | downwards so as to avoid illuminating the sky. | | | |
| | Construction, Operation | All Areas | Use should be made of lighting equipment that minimises the spread of light near to or above the horizontal. | Contractors | Annual | |
| | Construction, Operation | All Areas | Lights should be positioned and aimed to ensure minimum light spill. | Contractors | Annual | |
| **Safety And Security** | | | **Safety And Security** | | | |
| To minimise the safety impact on public roads during construction or upgrade activities undertaken by the Mine | Construction, Operation | Haul Road | During any construction or upgrade along a public road or at an intersection with a public road, the required traffic safety procedures must be followed. | Safety Officer | as required | |
| | Construction, Operation | Haul Road | Traffic control and safety must be done in accordance with the South African Safety Manual with the relevant signs, flagmen and barriers being provided and erected at the critical points | Safety Officer | as required | |
| | Construction, Operation | | | | | |
| | Construction, Operation | | Traffic control will be done in co-operation with local traffic officials and will meet the requirements of the Provincial Roads Department. | Safety Officer | as required | |
| To ensure the safety of local residents and Mine workers and avoid injury or death due to Mine-related accidents. | Construction, Operation | All Areas | Adhere to Fire emergency procedures | Safety Officer / Contractors | Ongoing | |
| Adhere to the requirements outlined in NOSA accreditation body | Construction, Operation | All Areas | Adhere to first aid and emergency advisory procedure | Safety Officer / Contractors | Ongoing | |
| | Construction, Operation | All Areas | The Site Manager / Mining Contractor will ensure that the necessary safety equipment is issued to all workers. | Safety Officer / Contractors | Ongoing | |
| | Construction, Operation | All Areas | Safety officer / Mining Contractor will ensure that the wearing of safety equipment is policed. | Safety Officer / Contractors | Ongoing | |
| | Construction, Operation | All Areas | All persons on site will be required to wear a hard hat when entering dangerous areas. | Safety Officer / Contractors | Ongoing | |

| Objective | Phase | Areas | Action Plan | Responsible Party | Frequency | Cost |
|---|---|---|---|---|---|---|
| | Construction, Operation | All Areas | Protective gloves are to be worn by all persons engaging in the handling of heavy or sharp edged materials or persons engaged in welding or gas cutting activities. | Safety Officer / Contractors | Ongoing | |
| | Construction, Operation | All Areas | All persons entering the plant, workshops and active working area will be required to wear approved safety shoes or safety boots. | Safety Officer / Contractors | Ongoing | |
| **Social Economic Impacts** | | | **Social Economic Impacts** | | | |
| To guarantee that women have direct access to the cash economy created by the Mine thereby reducing their reliance on agricultural production and natural resources | Construction, Operation | All Areas | Ensure that potential benefits of mining are available to women in a manner that they can access. | Stakeholder Manager | N/A | |
| | Construction, Operation | All Areas | Enable direct involvement of women in the development of appropriate resettlement and compensation plans. | Stakeholder Manager | N/A | |
| | Construction, Operation | All Areas | Establish employment policies that ensure women's access to appropriate types and numbers of job opportunities. The Social and Labour Plan (SLP) provides numbers of women that must be employed within the Mine. These levels must be adhered to and contractors used by the Mine must follow the guidelines as stipulated in the Mines SLP. | Stakeholder Manager | N/A | |
| To ensure that resettled communities can re-establish their ties to the land in a way that will not jeopardise their future security | Construction, Operation | All Areas | Resettlement planning and implementation should be participative and should include potential host communities and traditional leaders and elders along with tribal authorities, community leaders and municipal representatives | Mine Manager | N/A | |
| To reduce unsustainable pressures on surrounding land and resources | Construction, Operation | All Areas | Identify alternative land near to the existing settlement for the purposes of resettlement of homesteads and subsistence activities. | Tribal Authority | N/A | |
| | Construction, Operation | All Areas | Assess its future agricultural potential of the 'new' land, both with and without technological intervention | Stakeholder Manager | N/A | |
| | Construction, Operation | All Areas | Identify and reach agreement on suitable alternatives when compensating for lost land | Stakeholder Manager, Mine Manager | N/A | |

| Objective | Phase | Areas | Action Plan | Responsible Party | Frequency | Cost |
|---|---|---|---|---|---|---|
| To ensure that anyone losing access to land and resources, either as a direct or indirect result of mining, is adequately compensated and to prevent conflict from arising over the matter of access to land. | | | and productivity, with active participation of affected parties. | | | |
| | Construction, Operation | All Areas | Identify the needs for the 'new' land in terms of capacity to handle / requirements for grazing (number of head of livestock), area of arable land, water, etc. This will largely be based on the existing requirements of the various families. | Stakeholder Manager, Consultant | N/A | |
| | Construction, Operation | All Areas | Communication between the Mine and the Induna and community representatives is ongoing. Where possible homesteads should relocate to areas where potable water supplies and electricity can be installed. Remote areas will be difficult to provide remote areas with electricity and piped water. | Stakeholder Manager, Mine Manager | When required | |
| | | All Areas | Stakeholder manager in conjunction with the Somkhele Mining Community Committee, will need to: | | | |
| | Construction | All Areas | Identify compensation alternatives for those resettled off their land and fields; | Stakeholder Manager. Somkhele Community Committee | N/A | |
| | Construction | All Areas | Identify compensation alternative for those losing fields; | Stakeholder Manager. Somkhele Community Committee | N/A | |
| | Construction | All Areas | Include discussion with other land users outside of the study area who may be impacted on as a result of the mining; | Stakeholder Manager. Somkhele Community Committee | N/A | |
| | Construction | All Areas | Actively involve host communities in integrating people resettled off the study area; | Consultant, Mine Manager | N/A | |
| | Construction | All Areas | Identify and map when parcels of land will be absorbed into the mining area; | Induna | N/A | |
| | Construction / Operation | All Areas | Communicate this information to the affected families so that they may plan accordingly. | Stakeholder Manager | N/A | |
| To minimise conflict between 'outsiders' and the local community with | Construction / Operation | All Areas | The use of local labour would mitigate possible social conflict between outsiders and existing residents. Maximise the usage of local service providers, maintenance, etc. No foreign | SLP | N/A | |

| Objective | Phase | Areas | Action Plan | Responsible Party | Frequency | Cost |
|---|---|---|---|---|---|---|
| respect to employment opportunities. | | | workforce should be housed in the mining area or surrounding community | | | |
| To improve understanding of STDs and HIV/AIDS through educational programmes and expanding awareness. | Construction / Operation | Greater Community | Develop and present accessible and culturally appropriate awareness programmes around the dangers of STDs for Mine employees at least twice a year. | Stakeholder Manager | twice a year | |
| | | | Present accessible and culturally appropriate awareness programmes around the dangers of STDs to the community members at least once a year. This can be done through forging links between the Mine and the Africa Centre. The Africa Centre has conducted extensive research within the Somkhele area. | Stakeholder Manager | annually | |
| To identify and implement programmes for skills training within the local community thus improving their skills (beyond subsistence agricultural) and increasing their marketability in the broader labour market. | Construction / Operation | Greater Community | Wherever possible, throughout the life of the Mine, a concerted effort must be made to impart skills to local people, either through a local employment policy and/or skills based adult education programme. | SLP | AS per SLP | |
| | | Greater Community | The Mine will therefore seek to invest in forming partnerships for the skills training of the local community with skills. | SLP | AS per SLP | |
| | | Greater Community | Partnership organisations could include existing community-based concerns that have existing direct links to the community (e.g. Africa Centre) or those furthering the development and business skills of communities and SMMEs (e.g. the Mpukonyoni Business Association (MBA). | MBA, Stakeholder Manager | N/A | |
| | | Greater Community | Possible skills development opportunities include fence making, sewing, cooking and catering, block making, poultry farming, gardening, welding, brick laying, computer literacy, tender training, emerging contractors training. There are also those relating to the Mine's needs during rehabilitation. Refer to the Somkhele Anthracite Mine SLP for details with regards to all socio-economic factors. | SLP | N/A | |

| Objective | Phase | Areas | Action Plan | Responsible Party | Frequency | Cost |
|---|---|---|---|---|---|---|
| To avoid damage to properties and structures outside of the Mine area, and to repair such damage should it inadvertently occur. | Construction, Operation | All Areas | As far as possible, the Mine will restrict operations to the defined Mine-affected Area. | Contractor | | |
| | | All Areas | Damage to structures, fences, crop lands and grazing land outside of the defined Mine-affected Area, will be avoided as far as possible. | Contractor | as required | |
| | | All Areas | Should damage to the aforementioned occur, the Site Manager/Mining Contractor will be responsible for repairing the damage caused or compensating the property owner accordingly. The property owner must be consulted with regards to the repair and compensation. | Contractor | as required | |
| | | All Areas | Any fencing that is removed to enable construction to proceed must be replaced on completion of work in that area. | Contractor | as required | |
| | | All Areas | The Site Manager/Mining Contractor will be responsible for providing a temporary fenced off area (e.g. for keeping of livestock) if required by the property owner. | Contractor | as required | |
| To establish and maintain an ongoing, transparent line of communication between the Mine and the community. | | All Areas | A Stakeholder manager has been appointed to manage the ongoing liaison with the community. | Stakeholder Manager, Mine Management | | |
| | | All Areas | Any complaints or comments received from the community will be directed to the STAKEHOLDER MANAGER who will in turn report to Somkhele | Stakeholder Manager | as required | |
| | | All Areas | Residents are to be informed, ahead of time, about the duration and nature of the mining related activities that will take place in their neighbourhood. This will ensure that the community do not develop feelings of fear or resentment due to (the perception of) information being withheld. | Stakeholder Manager | Prior to any blasting event | |
| | | All Areas | Regular community meetings will be held between the community, the STAKEHOLDER MANAGER and the Somkhele Mine management. | Mine Management , Stakeholder Manager | During meetings | |

| Objective | Phase | Areas | Action Plan | Responsible Party | Frequency | Cost |
|---|---|---|---|---|---|---|
| To relocate all families resident within the 300 m radius of the active mining zone and ensure that no person should land up "worse off" as a result of relocation. | | All Areas | Negotiations with families will be done on an individual basis for compensation. | Mine Manager | when required | |
| | | All Areas | No persons will be forced to relocate. | Mine Manager | N/A | |
| | | All Areas | All negotiations will be documented and signed by all parties. | Mine Manager | N/A | |
| The aim is to limit the negative socio-economic impacts as a result of cessation of the mining activities. | | All Areas | TO be investigated fully nearer to mine closure | Consultants, Mine Manager | N/A | |

# 8 MONITORING AND AUDITING

This chapter of the reports fulfils the requirements of section 50 (h) and 51 (b) of the MPRDA Regulation R527, as listed under the EMP template:

***<u>REGULATION 50 (h):</u>***

- *(Section 1- 15): Arrangements for monitoring and management of environmental impacts:*
  - *(Section 1 - 15.1): List of identified impacts which will require monitoring programmes;*
  - *(Section 1 - 15.2): Functional requirements for the said monitoring programmes; and*
  - *(Section 1 - 15.3): Roles and responsibilities for the execution of the monitoring programmes;*
  - (Section 1 - 15.4): Time frames for monitoring and reporting.

***<u>REGULATION 51 (b):</u>***

- *(Section 2 – 8): Planned monitoring and environmental management programme performance assessment:*
  - *(Section 2 - 8.1): Description of planned monitoring of the aspects of the environment which may be impacted upon. (Include all the items referred to in the concomitant section of the guideline posted on the official website of the Department);*
  - *(Section 2 - 8.2): Provide a description as to how the implementation of the action plans contemplated in regulation 51 (b) (ii) as described will be monitored as described in paragraph 6 of the EMP will be monitored;*
  - *(Section 2 - 8.3): Frequency of proposed reporting for assessment purposes.*

Furthermore, Regulation 55 (1) (2) of the MPRDA Regulations, R527 require that the holder of a mining right conduct monitoring on a continuous basis.

## 8.1 Surface Water Monitoring Programme

Due to the fact that all dirty water contained in pollution ponds will be utilized in the mine process it is recommended that all dirty water systems be monitored monthly. The water quality parameters for which the samples should be tested should include the following, as well as any other parameters required by DWA in the WUL:

- Electric Conductivity;
- pH;
- Total Dissolved Solids;
- Suspended Solids;
- Total Hardness;
- Total Alkalinity;
- Calcium;
- Magnesium;
- Sodium;
- Potassium;
- Chloride;
- Sulphate;
- Fluoride;
- Nitrate;
- Iron;
- Manganese.

## 8.2 Groundwater Monitoring Programme

### 8.2.1 Purpose and Objectives of Groundwater Monitoring

The objective of a groundwater monitoring program is to detect any changes that the mining activities may have on water quality and levels in the area over time from pre-construction through to closure. Accurate record keeping of monitoring data will assist with the updating of the groundwater model of the mine over time.

The monitoring programme will also aid the mine management team to identify where noncompliances have occurred and where mitigation and management measures need to be improved.

Groundwater monitoring assessment should include the following:

- The impact of mine dewatering on the surrounding aquifers. This will be achieved through monitoring of groundwater levels in the open exploration boreholes; and
- Groundwater quality trends: This will be achieved through sampling of the groundwater in the boreholes at the prescribed frequency.

### 8.2.2 Groundwater Monitoring Points

The groundwater monitoring points are outlined in Figure 8-1 below which will need to be extended with various monitoring points selected from suitable exploration boreholes to gather pre-mining water quality information. A full outline on boreholes identified during the hydrocensus study is presented in Figure 8-2.

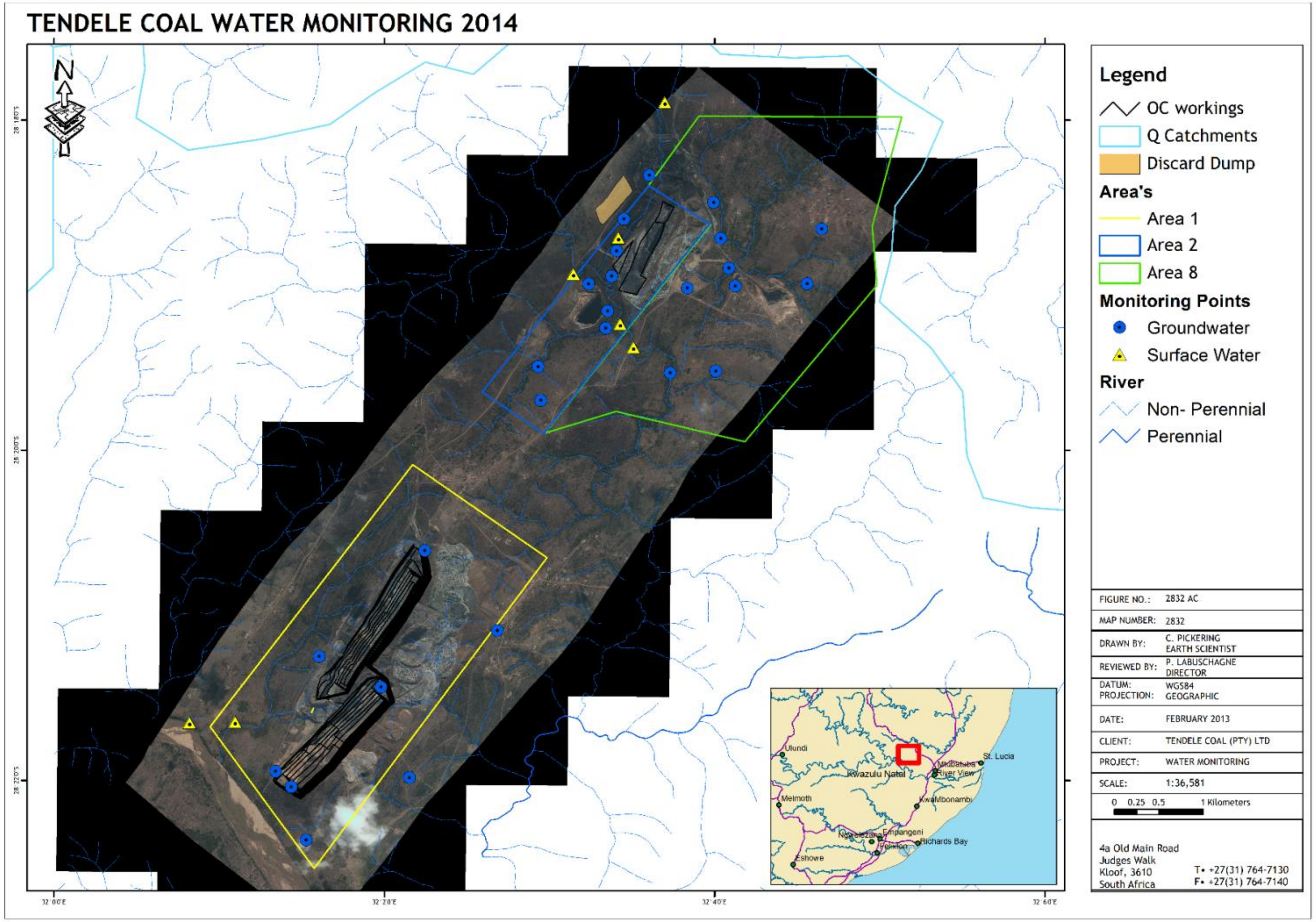


**Figure 8-1: Existing Somkhele monitoring network**

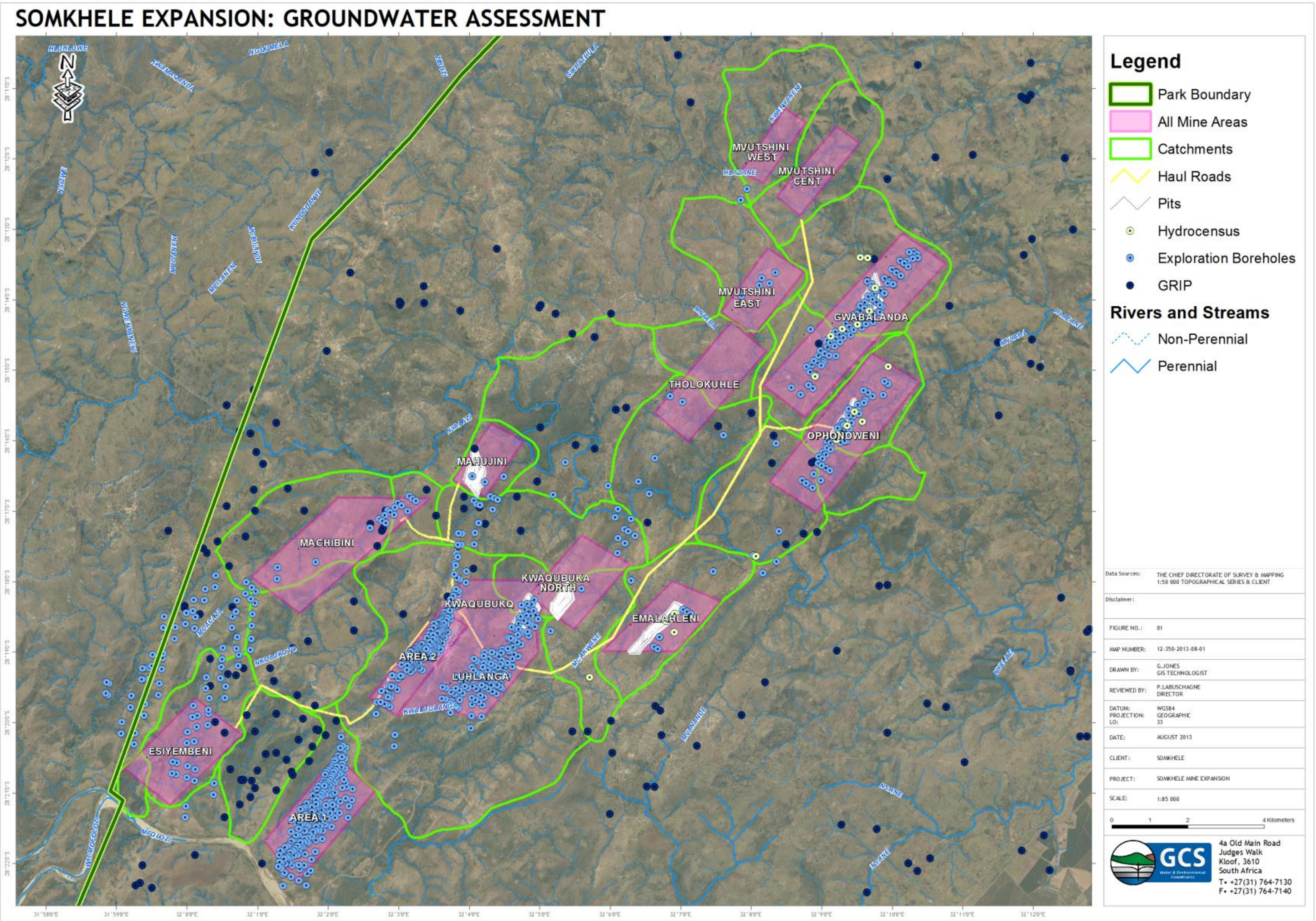


Figure 8-2: Identified boreholes to be selected in groundwater monitoring programme.

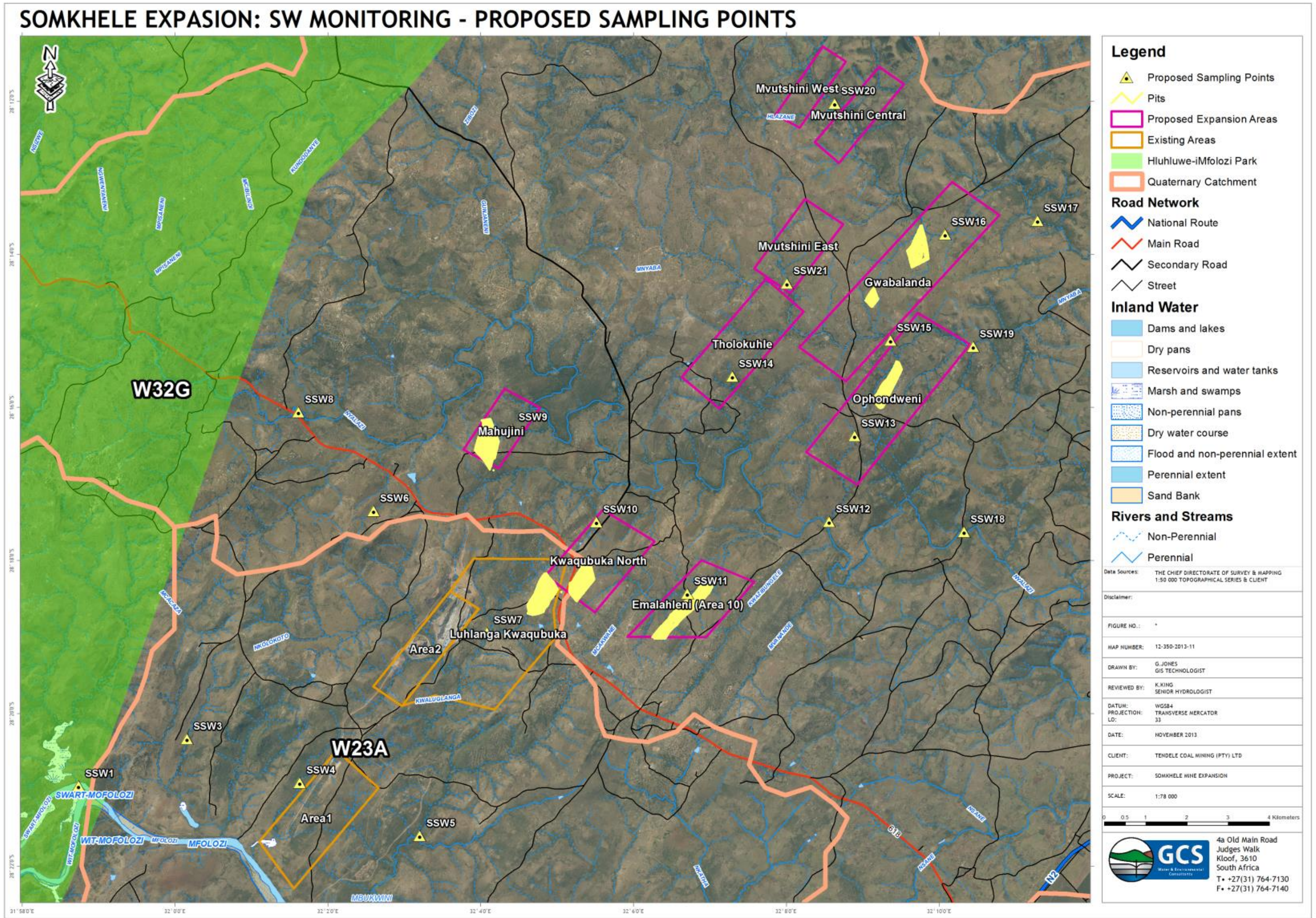


**Figure 8-3: Proposed surface water monitoring points**

### 8.2.3 Monitoring Parameters

**Table 8-1 Somkhele Groundwater Monitoring Schedule**

| MONITORING POSITION | SAMPLING INTERVAL | ANALYSIS | WATER QUALITY STANDARDS |
|---|---|---|---|
| **Construction, Operational, Decommissioning and Post Closure Phases** | | | |
| All monitoring boreholes | Monthly: measuring the depth of groundwater levels | N/a | N/a |
| All monitoring boreholes | Quarterly: sampling for water quality analysis | Full analysis in January, April, July and October | South African Water Quality Guidelines: Domestic Use, Livestock Watering |
| Rainfall | Daily at the mine | N/a | N/a |

The identification of the monitoring parameters is crucial and depends on the chemistry of possible pollution sources. They comprise a set of physical and/or chemical parameters (e.g. groundwater levels and predetermined organic and inorganic chemical constituents).

Physical Parameters:

- Groundwater levels.

Chemical Parameters:

- Field measurements: pH, EC;
- Laboratory analyses: Anions and cations (Ca, Mg, Na, K, NO3, Cl, SO4, F, Fe, Mn, Al, As, V, Sr, Pb, Zn, NH4 & Alkalinity); Other parameters (pH, EC, TDS).

Laboratory analysis techniques should comply with SABS guidelines. The groundwater monitoring database will be updated on a monthly basis as information becomes available. The database should be used to analyse the information and evaluate trends noted. An annual compliance report will be compiled and submitted to the authorities for evaluation and comment.

This report will be submitted annually for the construction, operational and decommissioning phases as well as for two years after mining ceases. The mine will develop a monitoring response protocol after the completion of the Construction Phase of the project. This protocol will describe procedures in the event that groundwater monitoring information indicates that action is required.

#### 8.2.4 Soils monitoring

Soil monitoring will involve the inspection of soil which has been disturbed, compacted, contaminated or eroded. Soil monitoring will assist in determining where soils have not been sufficiently rehabilitated.

Where soils have been contaminated by the spillage of hydrocarbon, monitoring must take place on a weekly basis for at least four (4) weeks or until the soil is considered sufficiently rehabilitated. Soils samples should be taken and submitted to a laboratory to test for contaminant content if it is considered necessary.

Soil monitoring should be undertaken during the following periods:

- After rehabilitation of areas post construction;
- After remediation soils which have been contaminated by spillages during the operational phase; and
- After the Closure and Decommissioning Phase.

### 8.3 Aquatic Ecology (Biomonitoring)

Aquatic biomonitoring is currently being conducted at Somkhele although monitoring runs have been problematic as the majority of streams are non-perennial. Biomonitoring will continue has this has been a requirement stipulated by the DWA in terms of the existing IWULA.

### 8.4 Air Quality

A dust monitoring network has been set up around Somkhele. This network will be expanded to include the proposed mining areas. The monitoring network consists of a series of buckets which measures ambient dust fallout. Currently the network covers operational mining areas and will need to be extended to include the additional areas. Dust buckets should be erected at least 12 months prior to mining in an area to obtain baseline data.

### 8.5 Monitoring Reports

Monitoring reports must be produced on a quarterly basis and submitted to the mine management team. The report will also be submitted to the DWA, as required by the IWUL.

(IWULA will be submitted to DWA for the proposed new water uses). The proposed monitoring points are outlined in Figure 8-3.

## 8.6 Data Management

Water quality monitoring results must be stored on a database which will be utilized to update the groundwater model and to determine the groundwater and surface water quality trends over time. Trend analysis will also assist to determine if additional management measures are required.

It is important that the database is kept updated and that access to the database is properly controlled to maintain the integrity of the data.

## 8.7 Performance Assessment /Audit

Performance assessment audits are required in terms of Regulation 55 (1) of the MPRDA Regulations, R527. In order to comply with this regulation, the following will be undertaken:

- Monitoring which will be conducted on an ongoing basis;
- Annual performance assessments of the environmental management programme, with an external performance assessment audit every two years or as agreed by the Minister in writing. The annual performance assessment will be undertaken by a suitably qualified person, while the audit will be undertaken by an external, independent third party; and
- Submission of a performance assessment report to the Director: Minerals.

# 9 ENVIRONMENTAL AWARENESS AND EMERGENCY RESPONSE PLAN

This chapter fulfils the requirements as per Regulation 51 (b) (iii) of the MPRDA Regulation R527 and headings 7 and 10 of the EMP Template.

***REGULATION 51 (B)*** *– Outline of the implementation programme.*

- (*Section 7): Procedures for environmentally related emergencies and remediation (An environmental emergency plan that includes all the items referred to in the concomitant section of the guideline posted on the official website of the Department).*
- *(Section 10): Environmental Awareness Plan (Section 39 (3) (c)) (Include all the items referred to in the concomitant section of the guideline posted on the official website of the Department).*

The environmental awareness plan is required in terms of Section 39 (3) (c) of the MPRDA:
*"An applicant who prepares an environmental management programme or an environmental management plan must –*

*(a) develop an environmental awareness plan describing the manner in which the applicant intends to inform his or her employees of any environmental risks which may result from their work and the manner in which the risks must be dealt with in order to avoid pollution or the degradation of the environment".*

The purpose of this chapter of the EMP is to set out procedures to be followed during and after various types of incidents and accidents. It also sets out the procedure for inducting employees and informing all mine employees and contractors of the various risks which may results from the various activities on site and all required management and mitigation measures which are in place and that must be complied with in order to avoid environmental pollution and degradation.

The Environmental Awareness and Emergency Response Plan is attached under **APPENDIX F**.

# 10 FINANCIAL PROVISION FOR CLOSURE

This chapter of the report fulfils the requirements as per section 41 and 45 of the MPRDA and Regulation 53 and 54 of the MPRDA Regulation R527 and heading 9 of the EMP Template.

**EMP Template:**

- *(Section 2 – 9): Financial provision in relation to the execution of the environmental management programme:-*
  - *(Section 2 - 9.1): Plan showing the location and aerial extent of the aforesaid main mining actions, activities, or processes anticipated. (Include all the items referred to in the concomitant section of the guideline posted on the official website of the Department)(Refer to* Figure 1-3*).*
  - *(Section 2 - 9.2): Annual forecasted financial provision calculation (Refer to the concomitant section of the EIA and EMP guideline);*
  - *(Section 2 - 9.3): Confirmation of the amount that will be provided should the right be granted;*
  - *(Section (2 - 9.4): The method of providing financial provision contemplated in Regulation 53.*

The closure cost estimate is undertaken in accordance with the Guideline Document for the Evaluation of the Quantum of Closure Related Financial Provision Provided by a Mine, by the DMR (January, 2005).

## 10.1 Overview of Legal Requirements

**Section 41 and 45 of MPRDA:**

- Section 41(1): Requires that an applicant must before the Minister approves the EMP in terms of section 39(4) make the prescribed “financial provision” for the rehabilitation or management of negative environmental impacts.
- Section 41(2): If a holder of a mining right fails to rehabilitate / manage, is unable to undertake such rehabilitation or to manage any negative impact on the environment, the Minister may upon written notice to such holder, use all or part of the financial provision to rehabilitate or manage the negative environmental impact in question.

- Section 41(3): Require the holder to undertake an annual assessment of his or her environmental liability and increase his or her financial provision to the satisfaction of the Minister.
- Section 45: Allows the Minister to recover cost in the event of urgent remedial measures.

**<u>Regulation 53 and 54 of the MPRDA Regulation R527:</u>**

- Regulation 53 sets out the methods for providing the financial provision required, i.e. trust fund, financial guarantee by a bank or other financial institution, or direct deposit into a bank account stipulated by the DMR Director General;
- Regulation 54: Requires that the quantum of financial provision to be approved by the Minister must be based on the requirements of the approved EMP and shall include detailed itemization of all actual costs required for premature closure regarding:
    - The rehabilitation of the surface of the area;
    - The prevention and management of pollution of the atmosphere;
    - The prevention and management of pollution of water and the soil; and
    - The prevention of leakage of water and minerals between subsurface formations and the surface.
    - Decommissioning and final closure of the operation; and
    - Post closure management or residual latent environmental impacts.

## 10.2 Closure Goal

The overall closure goal for the proposed Somkhele Mine area is to return the disturbed areas to a state that is as close as possible to the natural conditions. Tendele aims to progressively re-instate an area that is safe, stable, and non-polluting to be integrated into the current land uses (grazing). The proposed plan to achieve these objectives is provided in the Environmental Rehabilitation Plan, under Chapter 11 of this report.

## 10.3 Summary of Closure Cost

The closure cost methodology and the detailed financial provision is provided in the Closure Cost Assessment report attached under Appendix E.

It must be noted that Somkhele is an exisitng mine with exisitng financial guarentees in place. Considering that the entire infrastructure required for operating Somkhele has already been constructed. (Washing plants etc.) And that the rollover method of mining will be adapted for opencast operation. It can be anticipated that the quantum for closure will not differ substantially from that already in place at Somkhele.

Current closure calculations outline the cost from rehabilitating and removing of the washing plants as well as the closure of opencast pits from two (2) different mining areas. Considering that at the end of mine life, the mine will have to close the last mining area and rehabilitate the washing plants and infrastructure within Area 2.

The costs calculated for the Somkhele, based on the closure of Area 2 where the washing plants and all mine infrastructure is located. An additional opencast Area has been included as this will be the last mining void open that will need to be rehabilitated. The costs are summarised in Table 10.1.

**Table 10-1 Somkhele Closure Cost Summary**

| | Area 2 | Opencast Mining Area |
|---|---|---|
| Sub-total for INFRASTRUCTURAL AREAS | R 8 112 452,27 | R 131 651,30 |
| Sub-total for MINING AREAS | R 3 928 608,89 | R 27 406 216,35 |
| Sub-total for GENERAL SURFACE RECLAMATION | R 1 334 703,46 | R 550 374,72 |
| Sub-total for WATER MANAGEMENT | R 159 883,75 | R 255 814,00 |
| SUB-TOTAL 1 | R 13 535 648,37 | R 28 344 056,37 |
| (Infrastructure and related aspects) | | |
| SUB-TOTAL 2 | R 3 857 110,08 | R 2 501 047,04 |
| (Post-closure aspects) | | |
| SUB-TOTAL 3 | R 1 353 564,84 | R 2 834 405,64 |
| (Additional allowances) | | |
| Total (Excl) VAT | R 18 746 323,29 | R 33 679 509,04 |
| **Total Incl VAT** | **R 21 370 808,55** | **R 38 394 640,31** |

# 11 ENVIRONMENTAL REHABILITATION PLAN

This chapter fulfils the requirement of Regulation 39 (4) (a) (iii) of the MPRDA Regulations R527 and Chapter 13 of the EMP Template:

- *Section (2- 13): SECTION 39 (4) (a) (iii), Capacity to manage and rehabilitate the environment (Include all the items referred to in the concomitant section of the guideline posted on the official website of the Department)*

A rehabilitation plan has been formulated for each the areas which will be disturbed by the proposed surface infrastructure for the proposed Somkhele Extension. The actual cost for rehabilitation action required is also allocated. This rehabilitation plan should thus be read in conjunction with the financial provision (refer to chapter 10 of this report and Appendix E).

## 11.1 Land Capability and Future Land Use

The closure objective is to return the land to grazing capability. Pre-mining land use capability has indicated that the soils are poor in quality with a low ph and potential high erodibility. The most suitable landuse is subsequently grazing.

## 11.2 Aim of Rehabilitation Plan

The aim of the rehabilitation plan is to:

- Return the disturbed areas to an acceptable post mining state;
- Ensure all areas are stable, and there is no risk of erosion;
- Ensure that the mining activities are closed to protect the area against subsidence;
- Monitor and manage alien plant invasion on the site until the site is in a stable state; and
- Ensure that all areas are free-draining and non-polluting.

## 11.3 Rehabilitation Objectives

The overall rehabilitation objectives for the proposed Somkhele extension are as follows:

- Remove all infrastructure, however where possible and the need is identified infrastructure could be provided as a social investment;

- All demolition waste or hazardous waste will be removed off site to a licensed facility;
- Visual impacts of rehabilitated areas should be minimised by recreating natural landforms and ensuring that reshaped areas are visually suited to surrounding landscapes;
- Maintaining soil integrity. Soil forms the base from which rehabilitation proceeds. If soils are not correctly prepared, suitable conditions for re-vegetation will not be achieved; and
- Avoid the establishment of alien floral invasion.

## 11.4 Management Objective for Rehabilitated land

The rehabilitation of all areas disturbed by the Somkhele Extension and associated infrastructure must ultimately achieve the objective of returning the land as close to the pre-mining land use as possible.

## 11.5 Management Criteria for Rehabilitated Land

To meet the management objectives it will be necessary to implement the following management measures, which are applicable to all rehabilitated areas:

- Access to ripped and ameliorated areas will be restricted to avoid compaction and erosion;
- Where self-succession does not succeed, a revegetation programme will be investigated and implemented;
- Traffic onto rehabilitated areas will be limited to allow for the re-establishment of vegetation;
- Alien vegetation establishment will be monitored and controlled, i.e. a weed/alien eradication programme will be implemented to remove undesirable plants;
- Ongoing monitoring for pests and diseases will be undertaken at least once in six months and vegetation will be treated in accordance with identified accepted procedures if necessary;
- Ongoing monitoring of the rehabilitation process will take place to establish if it is necessary to intervene;

- The clean and dirty water systems will be removed as the last phase of rehabilitation;
- No dirty water will be allowed to be discharged into the environment. The land must be rehabilitated until the area can be made free draining, i.e. the runoff from the area must be considered clean;
- Any damage caused by erosion will be rehabilitated and erosion control measures retained and maintained; and
- Annual inspections of rehabilitated areas will be undertaken for the first three years after rehabilitation or until such time that the areas are self-sustaining.

### 11.5.1 Infrastructure removal and rehabilitation

Rehabilitation of all disturbed land surfaces will include the following and will be completed within a period as specified in the appropriate closure document:

- Photographs of the infrastructure, before, during and after rehabilitation will be taken at selected fixed points and kept on record for the Environmental Coordinator and the DMR's purposes;
- All vehicles, conveyors and workshop equipment will be removed for salvage or resale;
- All fixed assets that can be profitably removed will be removed for salvage or resale, however should it be determined that infrastructure has a social or economic benefit for the area, the infrastructure will remain;
- Any item that has no salvage value to the mine but could be of value to individuals will be treated as waste;
- All structures will be demolished, terracing removed and foundations demolished to 400 – 500 mm below the original ground level;
- Dismantle and remove redundant fencing for salvage;
- Demolish all concrete fence foundations to 500mm below the original ground level;
- All services like the water supply line and the power line will be demolished only for the section on the mine's property; and
- The contractor laydown area will be demolished and rehabilitated.

### 11.5.2 Rehabilitation for surfaces

Rehabilitation of all disturbed surfaces will include the following and will be completed within a period as specified in the appropriate closure document:

- Where sites have been denuded of vegetation or where soils have been compacted or covered with concretes, these sites will be ripped and ploughed. The topsoil shall be appropriately fertilized to allow vegetation to grow rapidly should self-succession not take place;
- All disturbed and exposed surfaces will be covered with at least 0.15 m of topsoil (or as found during ongoing soils monitoring during the life of mine) and re-vegetation must be allowed to take place naturally;
- If a reasonable assessment indicates that the re-establishment of vegetation is unacceptably slow, the soil will need to be analysed and any deleterious effects must be corrected and the area be seeded with a seed mix to specification;
- All rehabilitated areas will be fenced off and access will be controlled;
- Appropriate erosion control measures (i.e. contour banks) must be taken when required; and
- All illegal invader plants and weeds shall be dealt with through a weed eradication programme as required in terms of the relevant legislation.

### 11.5.3 Disposal of Material

The disposal of material will include the following and will be completed within a period as specified in the appropriate closure document (to be compiled towards the end of the operational phase):

- No building rubble or any other types of waste shall be dumped in the surrounding environment. In cases where it has already happened the sites shall be cleaned up and the waste and/or rubble removed to appropriate sites in consultation with the Environmental Coordinator;
- All types of waste shall be removed entirely from the area and appropriately dealt with in respect of the general waste handling procedure;
- All foreign matter shall be removed from the site;
- Inert ceramics such as bricks, concrete, gravel etc. will be used as backfill or disposed of in a licensed waste disposal site;
- Inert waste, which is more than 500 mm underground, such as pipes will be left in

place; and

- Inert ceramic and buried waste with a salvage value to individuals such as scrap metal, building materials, etc. will be removed and disposed of at a licensed facility.

### 11.5.4 Decommissioning of product stockpile and load out facility area

The objectives of the closure and rehabilitation measures will be:

- To ensure that all stockpiles area removed;
- To remove all concreted areas; and
- To ensure that all compacted soils are ripped and re-vegetated.

### 11.5.5 Water pollution control structures

The continuous rehabilitation program and the demolishing and/or maintenance of water pollution control structures will attempt to restore the area to an acceptable free draining standard:

- No dirty water will be allowed to be discharged into the environment. The land must be rehabilitated until the area can be made free draining, i.e. the runoff from the area must be considered clean; and
- The clean and dirty water systems will be removed as the last phase of rehabilitation.

## 11.6 Maintenance

The aim of the maintenance measures are to ensure that the area affected by the mining operations is rehabilitated according to the closure plan and to apply for closure. The objective is for the area to be rehabilitated sustainability, ensuring self-succession of plants and the associated return of natural wildlife; as well as the improvement of the groundwater systems.

The following maintenance measures will be implemented as part of the post-closure process:

- All natural physical, chemical and biological processes for which a closure condition has been specified must be monitored for three years after closure or as long as deemed necessary at the time. Such processes include erosion of the rehabilitated surfaces, surface water drainage, surface water quality, groundwater quality, vegetative re-growth, weed encroachment and colonization by animals;

- Measures must be implemented to curb environmental impacts and to ensure that they do not worsen/cumulate over time;
- The closure plan will be reviewed every five years; and
- All rehabilitated areas will be monitored and maintained until such time as required to enable the mine to apply for closure of these different areas.

The following activities will be included during the maintenance phase:

- The closure costs (demolition, removal, re-shaping and rehabilitation quotes per key quantity) for each facility must be included in the database so that the total closure cost can be determined;
- All facilities that become redundant during the LoM must be rehabilitated concurrently to lighten the rehabilitation process at the end of the mine's life;
- Attention must be paid to the latest developments in mine rehabilitation sciences;
- Rehabilitation should be done as soon as possible, to ensure that the rehabilitation work required is kept to a minimum at the end of the life of the mine;
- Ensure that the area is free draining;
- Ensure that self-succession has been implemented;
- Ensure that all slopes are safe in the long term;
- Submission of closure report and application for closure to the authorities; and
- Environmental monitoring and maintenance for three years after closure.

## 11.7 Submission of Information

- All procedures (emergency, environmental awareness, rehabilitation strategies, etc.) must be included into the mine's Environmental Management System (EMS). The mine's EMS will monitor and assess the performance of the EMP on an ongoing basis. Formal audit of the performance assessment of the EMP will take place at the frequency required by the DMR in the approved EMP;
- All information as required by the various government departments should be

captured and be readily available for submission when required;

- An annual report will be submitted to the DMR;
- Groundwater monitoring will be undertaken on a quarterly basis by independent specialists. Annual groundwater reports will be submitted to the DWA;
- The groundwater levels will be monitored on a quarterly basis and will be presented in the form of piezometric maps, from which changes can be determined through time. Annual groundwater reports will be submitted to the DWA;
- An Environmental Management Programme Performance Assessment will be undertaken every two years as required by the MPRDA and will be submitted to the DMR;
- The financial provision for closure (quantum and method) will be updated every two years as part of the Environmental Programme Performance Assessment; and
- The Closure Plan must be reviewed every five years, and must always keep pace with the current best practices.

## 11.8 Rehabilitation – Phase 1

This phase will involve demolition work, blasting, loading and disposing of rubble material, selling of salvage, as well as the negation of the need of infrastructure for social investments. During this phase the following activities will be carried out:

- Erection of fencing around all areas where demolition is taking place;
- Removal of all mining infrastructure,
- Removal of plant and plant infrastructure including all buildings;
- Removal of buildings including workshops and offices;
- Removal of concrete; and
- Removal of powerlines.

## 11.9 Rehabilitation – Phase 2

The purpose of this phase is to shape the areas to form a free-draining landscape which flows into the surrounding environment, loosen the compacted areas to assist in vegetation establishment. During this phase, the following activities will be undertaken

- Ripping of soils;

- Amelioration of dumps;
- Removal of dirty water infrastructure (PCD's and RWD);
- Ensure that the slope of the remaining dumps (i.e. Waste Rock Dumps ), is to such a degree to allow self-succession and no erosion;
- Topsoil placement (where required) and re-vegetating (where required) disturbed areas; and
- Rehabilitation of berms, channels and PCDs to make the area free draining.

## 11.10 Rehabilitation – Phase 3

Phase 3 will involve the following activities

- Removal of fencing; and
- Aftercare monitoring:
  - Groundwater and Surface water monitoring;
  - Vegetation monitoring;
  - Weed Eradication on monitoring of progress;
  - Soils monitoring; and
  - Social Plan monitoring (skills development and retrenchments).

## 11.11 Rehabilitation responsibilities

The responsibilities of various parties during the rehabilitation phase are presented in Table 11-1.

**Table 11-1 Responsibilities and Responsible Parties for Rehabilitation Activities**

| RESPONSIBLE PARTY | RESPONSIBILITIES |
|---|---|
| Infrastructure Manager for Somkhele | - Planning of rehabilitation project;<br>- Initiating rehabilitation projects; and<br>- Compilation of closure plan with regards to rehabilitation area/sites. |
| Environmental Consultants for Somkhele | - General monitoring/surveillance and reporting and coordination; and<br>- Implementation/coordination with regard to particular environmental measures/action plans. |

| RESPONSIBLE PARTY | RESPONSIBILITIES |
|---|---|
| Environmental Consultants for Somkhele | Audits (Environmental, EMP Performance Assessment, etc.) and surveillance. |
| CEO of Somkhele Anthracite Mine | Authorisation of all rehabilitation projects. |

# 12 INFORMATION GAPS AND RECOMMENDATIONS

***REGULATION 50 (g):***

- *(Section 14): The appropriate mitigatory measures for each significant impact of the proposed mining operation.*
    - *(Section 14.1): Adequacy of predictive methods utilized:*
    - *(Section 14.2): Adequacy of underlying assumptions:*
    - *(Section 14.3): Uncertainties in the information provided.*

## 12.1 Adequacy of predictive methods utilized

The predictive methods looked at all the proposed mining areas. The most ecological sensitive areas were identified and those areas were studied in more detail. With ecology being dynamic and complex, some aspects (some of which may be important) may have been overlooked. Considering the most pertinent and potential significant impacts, in particular the ecologically sensitive riparian zones, have been assessed, the methods utilized in this report are considered adequate in assessing the potential risk.

The significance rating presented in this report are in line with the requirements of the DMR.

## 12.2 Adequacy of underlying assumptions

The ecological assessment was undertaken in winter (July/August 2013), which is not considered to be an optimal time for ecological assessments as it does not reflect the seasonal variation in ecological conditions at sites assessed. A more reliable ecological assessment would require seasonal sampling, including sampling of water quality attributes during the summer period. It has been assumed that the most that significant ecological areas have been identified.

In certain instance the exact pit layout is still being developed by the mine. In these instances the entire area was assessed for areas which were environmentally sensitive. In all areas, buffer zones and exclusion zones were developed based on the sensitivity of the environment. Provided any development in these areas remains out of the exclusion zones the mitigation measures identified are adequate in managing any potential environmental risk.

## 12.3 Uncertainties

Decant volumes can only be confirmed during mining as the inflow rates are confirmed, however, predicted decant volumes will not be higher than the inflow predictions. Why???

For proposed pit areas, Mvutshini East and Tholokuhle Area, more information will be required and the mine plans for these areas needs to be confirmed in order to predict the potential for decant. The groundwater model and decant prediction is updated on an Annual basis and this management plan to account for this has been written into this document.

# 13 CONCLUSION

Somkhele is an operational anthracite mine, operated by Tendele Coal Mining (Pty) Ltd (hereafter referred to as Tendele), which started its opencast mining activities in 2007 after an old order mining right was granted in 2005 for Areas 2 and 3. The application for a mining right conversion was subsequently approved on 1 February 2011, and executed on 30 March 2011. This converted mining right (MR) is valid for 20 years.

Tendele is applying for an additional Mining Right to mine ten sites as part of a proposed extension project. As part of the Mining Right and environmental authorisation applications, an Environmental Impact Assessment (EIA), this document, must be conducted to assess the potential impacts of the proposed expansion on the ecological, social and socio-economic aspects of the site and surrounding area. No environmental fatal flaws have been identified for the project although some aspects were recognised as having a potentially high impacts such as Biodiversity, Geohydrology and Landuse. All management measures outlined in this report adequately compensate for and reduce, where possible, the the impacts identified.

The EMP is a working document and it is recommended that this EMP be constantly reviewed and updated to ensure management measures are pertinent to activities on the mine.

# 14 LIST OF SPECIALIST REPORTS

This chapter provides a list of the specialist reports which are appended to this EIA/EMP as required by section 2 – 11 and 2 – 16 of the DMR EIA/EMP Template:

- *Section 2 -11): Attachment of specialist reports, technical and supporting information. (Provide a List)*

***REGULATION 50 (i):***

- *(Section 2 – 16): Technical and supporting information. (Include all the items to be included in the list referred to in the concomitant section of the guideline posted on the official website of the Department)*

The following Specialist studies were undertaken during 2013 and the reports attached as appendices to this EIA/EMP report:

- Hydrogeological (groundwater) Assessment- (GCS)- Appendix B-1;
- Hydrological (surface water) Impact Assessment- (GCS) – Appendix B-2;
- Terrestrial Biodiversity (fauna and flora) Assessment- ( Ecopulse )- Appendix B-3;
- Wetland and Riparian Areas Delineation and Assessment- (GCS)- Appendix B-4;
- Soils, Land Use and Land Capability- (GCS)- Appendix B-5;
- Heritage Impact Assessment – ( Ethembeni Cultural Heritage)- Appendix B-7; and
- Social Gap Analysis – (GCS) – Appendix B-8.

# 15 UNDERTAKING

This chapter of the report complies with Section 13 of the EMP Template:

- *(Section 1 - 13.1): The Environmental Management Programme will, should it comply with the provisions of section 39 (4) (a) of the Act and the right be granted, be approved and become an obligation in terms of the right issued. As part of the proposed Environmental Management Programme, the applicant is required to provide an undertaking that it will be executed as approved and that the provisions of the Act and regulations thereto will be complied with.*

The signed undertaking is provided on the next page.

**UNDERTAKING**

**(to be completed upon the final submission)**

I, ________________________________________________________. , the undersigned and duly authorised thereto by Tendele Coal Mining (Pty) Ltd, have studied and understand the contents of this Environmental Management Programme (EMP) and duly undertake to adhere to the conditions as set out therein, unless specifically or otherwise agreed to.

Signed at .____________________________________, on this .__________, day of

________________ 2014.

._________________________.

Signature of Applicant

I, .________________________________________________________, the undersigned and duly authorised thereto by the DEPARTMENT OF MINERAL RESOURCES, have studied and approved the contents of this Environmental Management Programme (EMP).

Signed at .____________________________________, on this .__________, day of

________________ 2014.

._________________________.

Signature of Director

# 16 REFERENCES

# APPENDICES

## APPENDIX A: DMR ACCEPTANCE LETTER

# APPENDIX B: SPECIALIST STUDIES

## APPENDIX B-1: HYDROGEOLOGICAL IMPACT ASSESSMENT

## APPENDIX B-2: HYDROLOGICAL IMPACT ASSESSMENT

## APPENDIX B-3: TERRESTRIAL BIODIVERSITY IMPACT ASSESSMENT

## APPENDIX B-4: WETLAND DELINEATION AND IMPACT ASSESSMENT

## APPENDIX B-5: SOILS, LAND USE AND LAND CAPABILITY ASSESSMENT

## APPENDIX B-6: HERITAGE IMPACT ASSESSMENT

## APPENDIX B-7: SOCIAL IMPACT ASSESSMENT

## APPENDIX C: PRELIMINARY DESIGN REPORT ROAD DESIGNS

## APPENDIX D: PROOF OF PUBLIC PARTICIPATION

## APPENDIX E: IMPACT ASSESSMENT TABLE

## APPENDIX F: ENVIRONMENTAL AWARENESS AND EMERGENCY RESPONSE PLAN

## APPENDIX G: FINANCIAL CLOSURE COST ASSESSMENT