ENVIRONMENTAL & ENGINEERING

# REPORT

# OPSIREX (PTY) LTD - WILDEBEESTFONTEIN COLLIERY

## DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT

**REPORT REF: 19-724 AUTH DRAFT EIA EMP**

**DMR REF: MP 30/5/1/2/3/2/1 (10235) EM**

**15/9/2019**

VERSION CC

## DOCUMENT AND QUALITY CONTROL

| **Document No:** | **19-724 AUTH DRAFT EIA EMP** | | | |
|---|---|---|---|---|
| AA – draft | 11/09/209 | Riana Panaino |  | First draft for review / comments |
| BB – draft | 11/09/209 | Henno Engelbrecht | | Technical Review |
| CC– draft | 12/09/2019 | Leoni le Roux |  | Quality review |
| DD– draft | | | | Final Review |
| **Approved for Distribution:** | | | | |
| 0.0 | 13/09/2019 | Vernon Siemelink | | Final report |

## QUALITY CONTROL BY:

| **Nature of Signoff:** | **Responsible Person:** | **Role / Responsibility** | **Qualification** |
|---|---|---|---|
| Author | Riana Panaino | Senior Environmental Consultant | BSc Honns Biodiversity and Conservation |
| Quality Reviewer | Leoni le Roux | Administrator | Professional Secretary and Personal Assistant |
| Reviewer | Vernon Siemelink | Director | BSc Honn Environmental Analysis and Management<br>MSc Project Management |
| Client | Ferdie Nieman | Esimeme (Pty) Ltd | BSc Honns Environmental Sciences |

## DISCLAIMER

**This is a legally binding document and many of the actions and recommendations remain the responsibility of the client (as the owner/lessee of the property).**

**Eco Elementum (Pty) Ltd and the authors of this report are protected from any legal action, possible loss, damage or liability resulting from the content of this report. This document is considered confidential and remains so unless requested by a court of law. Please consider the environment and only print this document if necessary.**

**The findings, results, observations, conclusions and recommendations given in this report are based on the author's best scientific and professional knowledge, as well as available information. Information utilised and contained in this report is based on data/information supplied to Eco Elementum (Pty) Ltd by the client and other external sources (including previous site investigation data and external specialist studies).**

**Eco Elementum (Pty) Ltd exercises due care and diligence in rendering services and preparing documents, however it has been assumed that the information provided to Eco Elementum (Pty) Ltd is correct and as such the accuracy of the conclusions made are reliant on the accuracy and completeness of the data supplied.**

**No responsibility is accepted by Eco Elementum (Pty) Ltd for incomplete or inaccurate data supplied by the client and/or other external sources. Opinions expressed in this report apply to the site conditions and features that existed at the time of the start of the investigations and the production of this document. For this reason, Eco Elementum (Pty) Ltd accepts no liability, and the client by receiving and therefore accepting this document, indemnifies Eco Elementum (Pty) Ltd and its directors against all actions, claims, demands, losses, liabilities, costs, damages and expenses arising from or in connection with the services rendered, directly or indirectly.**

## DECLARATION OF INDEPENDANCE

I, Henno Engelbrecht, declare that;

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing:
    - any decision to be taken with respect to the application by the competent authority; and
    - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of section 24F of the Act.

13/09/2019

_____ _____

**Signature** **Date**

**Mr. Henno Engelbrecht**
**BSc Honn Environmental Management & Analysis (UP)**
**MSc Project Management**
**IAIA Memeber**

# EXECUTIVE SUMMARY

## BACKGROUND

Opsirex (Pty) Ltd as a legal entity applied for a Prospecting Right on portions 5 and 6 of the farm Wildebeestfontein 327 JS covering a total of 157.11 ha and this right was awarded on the 8th of May 2013 subsequently lapsing on the 7th of May 2013. A renewal for this right was applied for and ultimately awarded on the 30th of September 2016 for a 3-year period, lapsing on the 29th of September 2019. On the 14th of November 2017 Portions 19 and RE/2 was included in the existing right and now covers a total of 411.64 ha.

## PROJECT DESCRIPTION

The project involves the development of a new mining operation within eMalahleni (near Phola) in the Mpumalanga Province (

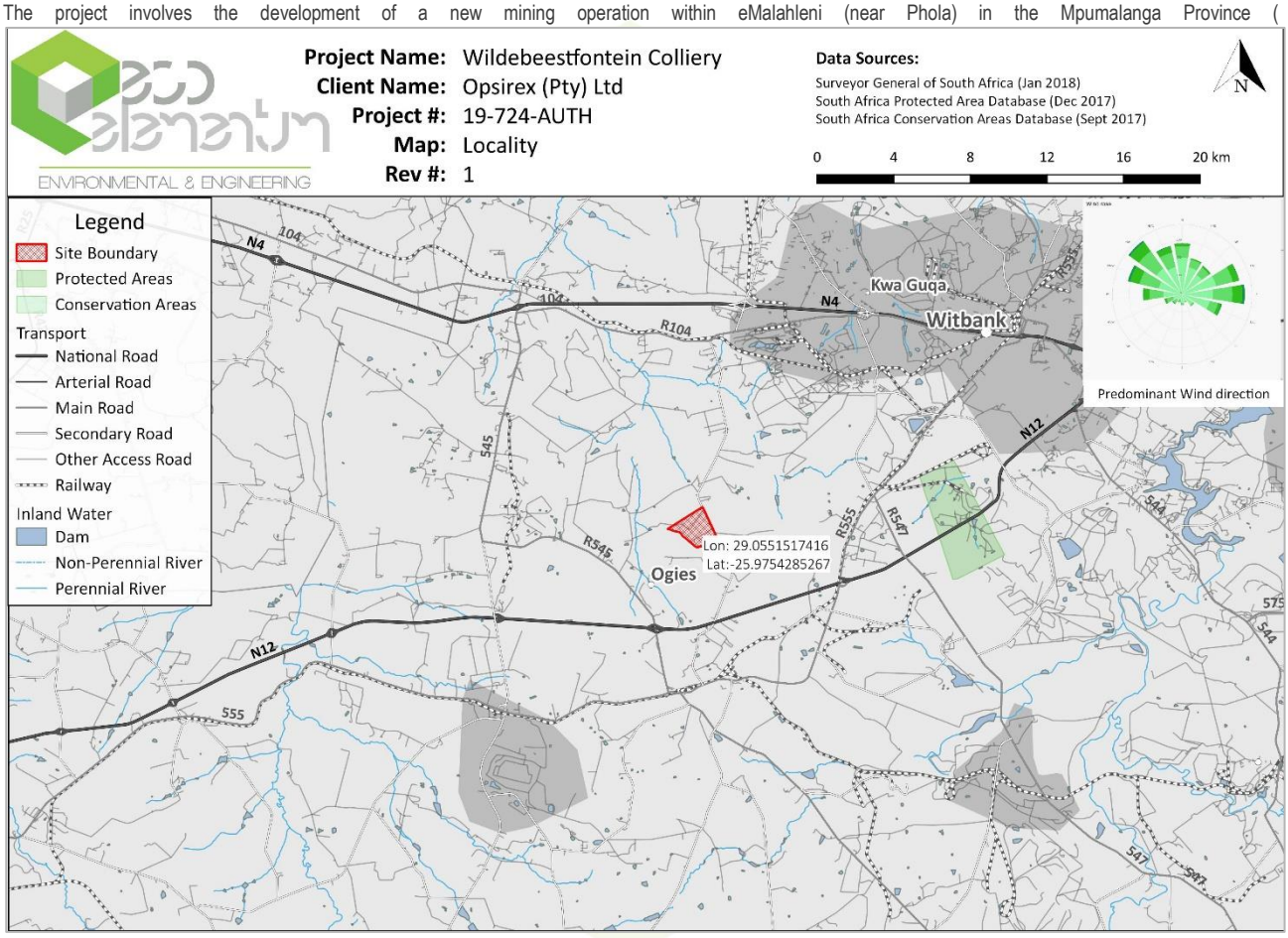


Figure 1.1). The mine will be located on Portions RE/2 and 19 of the Farm Wildebeestfontein 327 JS and will occupy approximately 250 ha in total of which approximately 15 ha is required for infrastructure. The coal resource will be mined using open pit methods.

## LEGAL REQUIREMENTS

The intention to undertake mining activities requires an application for a Mining Right (MR) in terms of the Minerals and Petroleum Resources Development Act, Act No. 28 of 2002 (MPRDA). An application for Environmental Authorisation (EA) was submitted simultaneously, as per the requirements of the National Environmental Management Act, Act No. 107 of 1998 (NEMA) and the NEM: Waste Act, Act No. 59 of 2008 (NEM:WA); read with the requirements of the MPRDA.

In terms of the NEMA and other applicable laws, it is required that the environmental and social impacts associated with mining activities be assessed to identify any potential negative and / or positive consequences as result thereof. Following which measures must be proposed to avoid or minimise these impacts.

## MINING PROCESS

| ITEM | DETAIL |
|---|---|
| **Type of mineral** | Coal |
| **Mining method** | Strip and Rollover Mining Techniques. |
| **Depth of the mineral below surface** | Average depth 33 m |
| **Geological formation** | Located on the central part of the Witbank Coalfield. In the Witbank Coalfield, primary economic seams are the 5, 4, 2 and 1 Seams. Numerous dolerite intrusions (dykes and sills) intrude the Vryheid Formation at various stratigraphic levels. These intrusions tend to influence the stratigraphy and coal qualities. |
| **Life of mine** | 7 Years. |
| **Production rate** | 14 Million Tonnes<br>Rates are set at 180,000 tpm |
| **Saleable Product** | No.1 and 4 seams will be presented to the export market as a RB1 quality, or separated as Nuts Peas and Duff. With an A-grade coal quality.<br>The No. 2 seam will primarily be crushed and screened to a 0-50 mm product, targeting the local domestic demand towards Eskom. |
| **Target Market** | International (Export) and local market. |
| **Saleable Product** | • Washed Coal<br>• Grade/Quality: 27 CV<br>• Quantity: 96,372,385 tons<br>• Sizing: 0 – 50 mm.<br>• Quantity: 96,372,385 tons |
| **Target Market** | International (Export) |

## IMPACT ASSESSMENT SUMMARY

| Impact description | | | Significance before mitigation | Significance after mitigation | Risk after prioritisation |
|---|---|---|---|---|---|
| **No** | **Phases** | **Impact** | | | |
| **Groundwater impacts** | | | | | |
| 1 | Decommissioning | Adequate backfilling and rehabilitation will decrease aquifer recharge. The period to decant will therefore be prolonged. | M | M | M |
| 2 | Construction | Increase in surface run-off and therefore decrease in aquifer recharge | L | L | L |
| 3 | Construction | Decrease in water level should the pit floor be lower than the water level | M | M | M |
| 4 | Operation | Acid generation in the case of carbonaceous material placement. | M | M | M |
| 5 | Operation | Acid generation as a result of carbonaceous material. | M | M | M |
| 6 | Operation | Spills from mining vehicles can infiltrate to the aquifer and cause a down gradient plume migration. | M | L | L |
| 7 | Operation | The water infiltrating the pit will be removed for safe mining, causing a decrease in the water level of up to 55 m. | H | H | H |
| 8 | Closure and decommissioning | Carbonaceous material, if any in the overburden, will be placed at the bottom of the pit as to prevent or minimise the exposure to oxygen and potential acid generation. | M | L | L |
| 9 | Rehabilitation | Increase surface runoff over the rehabilitated opencast, therefore decreasing aquifer recharge. | M | L | L |
| 10 | Residual | Recovery of the water level in the pit as dewatering ceases. In the case of acid generation, the plume will start to move away from the pit as the water level recovered. Decanting may occur once the water level has recovered to the decanting elevation. | H | H | H |
| Wetland Impacts | | | | | |

| Impact description | | | Significance before mitigation | Significance after mitigation | Risk after prioritisation |
|---|---|---|---|---|---|
| No | Phases | Impact | | | |
| 11 | Construction | Flow alterations due to erosion and sedimentation | M | M | H |
| 12 | Construction | Pollution of watercourse | M | M | H |
| 13 | Construction | Spread of alien vegetation | H | M | H |
| 14 | Operation | Flow alterations due to erosion and sedimentation | H | M | M |
| 15 | Operation | Flow alterations due to erosion and sedimentation | H | M | M |
| 16 | Operation | Flow alterations | H | M | M |
| 17 | Operation | Pollution of watercourse | H | M | M |
| 18 | Operation | Pollution of watercourse | H | M | M |
| 19 | Operation | Pollution of watercourse | H | M | M |
| 20 | Operation | Pollution of watercourse | H | M | M |
| 21 | Operation | Pollution of watercourse | H | M | M |
| 22 | Operation | Pollution of watercourse | H | M | M |
| 23 | Operation | Spread of alien vegetation | H | M | M |
| Noise | | | | | |
| 24 | Construction | Noise disturbance | M | L | M |
| 25 | Construction | Noise disturbance | M | L | M |
| 26 | Construction | Noise disturbance | M | L | M |
| 27 | Operation | Noise disturbance | M | M | M |
| 28 | Operation | Noise disturbance | M | M | M |
| 29 | Operation | Noise disturbance | M | M | M |
| 30 | Operation | Noise disturbance | M | M | M |
| 31 | Operation | Noise disturbance | M | M | M |
| 32 | Closure and decommissioning | Noise disturbance | L | L | L |
| 33 | Rehabilitation | Noise disturbance | L | L | L |
| 34 | Rehabilitation | Noise disturbance | L | L | L |
| Soils | | | | | |
| 35 | Construction | Exposure of soil surface to erosion | H | M | H |
| 36 | Construction | Soil compaction and reduced water infiltration capacity | M | M | H |
| 37 | Construction | Destruction of in situ soil profiles | M | M | H |
| 38 | Construction | Destruction of soil nutrient cycles and hydropedological functioning | M | M | H |
| 39 | Construction | Soil chemical pollution | M | M | M |
| 40 | Construction | Destruction of arable and grazing land capability | H | H | H |
| 41 | Operation | Soil compaction and reduced water infiltration capacity | M | M | H |
| 42 | Operation | Soil chemical pollution | M | M | M |
| 43 | Closure and decommissioning | Soil chemical pollution | M | M | M |
| 44 | Rehabilitation | Soil compaction and reduced water infiltration capacity | M | M | M |
| Air Quality | | | | | |
| 45 | Construction | Fugitive dust (containing TSP (total suspended particulate, will give rise to nuisance impacts as fallout dust), as well as PM10 and PM2.5 (dust with a size less than 10 microns, and dust with a size less than 2.5 microns giving rise to health impacts | M | M | M |
| 46 | Construction | fugitive dust emissions containing TSP (total suspended particulate, giving rise to nuisance impacts as fallout dust) | M | M | M |
| 47 | Construction | fugitive dust emissions containing TSP (total suspended particulate, giving rise to nuisance impacts as fallout dust) | M | M | M |
| 48 | Closure and decommissioning | fugitive dust emissions | M | M | M |
| 49 | Rehabilitation | fugitive dust emissions | M | M | M |
| Visual Assessment | | | | | |
| 50 | Construction | Change in sense of place | M | L | M |
| 51 | Cumulative | Change in sense of place | M | M | M |
| Heritage | | | | | |
| 52 | Cumulative | Destruction of structures | M | M | M |
| 53 | Cumulative | Destruction of structure and graveyard | H | M | M |
| 54 | Cumulative | Destruction of structures | M | M | M |
| 55 | Operation | Impacting on settlements | M | M | M |
| Blasting | | | | | |
| 56 | Construction | Ground Vibrations | M | M | M |
| 57 | Construction | Air blasts | M | M | M |
| Aquatics | | | | | |

| Impact description | | | Significance before mitigation | Significance after mitigation | Risk after prioritisation |
|---|---|---|---|---|---|
| No | Phases | Impact | | | |
| 58 | Construction | Water Quantity and Loss Of Water/Flow | M | L | M |
| 58 | Construction | Habitat Loss/Fragmentation | M | L | M |
| 58 | Construction | Sedimentation and Erosion | H | M | M |
| 58 | Construction | Water quality deterioration | H | M | M |
| 58 | Operation | Sedimentation and Erosion. Water quality deterioration | H | M | M |
| 0 | Operation | Loss of Indigenous Vegetation and Habitat | H | M | M |

## SUMMARY OF COMMENTS RECEIVED BY COMMENTING AUTHORITIES

| Organisation | Name Surname | Method of comment | Comment | EAP Response |
|---|---|---|---|---|
| Transnet | Thami Hadebe | email: official letter 15 May 2019 | Transnet is not affected by the proposed development. | Comment is noted. |
| eMalahleni Local Municipality | H S Mayisela | email: official letter 31 May 2019 | The proposed mine triggers activities of great magnitude and therefore is a serious threat to the environment in terms of general environmental degradation and elevated carbon footprint. | This comment is noted and therefore an application for an environmental authorisation has been submitted and an Environmental Management Plan will be compiled. |
| | | | The portion of land specified is no longer natural, and other mining activities in close proximity will add to the cumulative impact on the environment and human health in terms of noise, air pollution and soil pollution. | This will be addressed as part of the cumulative impact assessment of the EIA. |
| | | | The proposed application is supported subject to the following:<br>a. the applicant must submit a copy of a rezoning certificate;<br>b. the municipality is informed about blasting periods every time blasting should be undertaken;<br>c. the mine waste plan is in line with the municipality's waste management bylaws, especially in terms of waste transportation and disposal permits.<br>d. Alien invasive species be controlled and managed by the applicant.<br>e. Replant / replace / relocate indigenous vegetation that may be of importance or that is protected in the province if such vegetation cannot be avoided. | a. The rezoning application will be dealt with separately to this application.<br>b. The mine will inform all relevant parties of blasting.<br>c. Waste contractors will be contracted.<br>d. An alien invasive species management plan will be compiled once the mine is operational.<br>e. A vegetation management plan will be compiled once the mine is operational, as part of the rehabilitation plan. |

## SUMMARY OF ISSUES RAISED BY I&APS

| Name Surname | Involvement | Method of comment | Comment | EAP Response |
|---|---|---|---|---|
| J. Meyer, Gert F. Meyer | Nearby Landowner | Open Day 31 May 2019 | The Meyer's are located on the catchment divide and therefore on the highest point in the immediate area. They are experiencing drawdown from the surrounding mines as the groundwater levels in their boreholes are lower than usual. Another mine will add to the drawdown effect and how will they be compensated for their loss in groundwater. | A detailed groundwater investigation is being undertaken and the impacts will be represented in the EIA. This will concur whether the drawdown from this mine will impact on the Meyer's boreholes. |
| | | | The Road that runs between Ogies and the Mine runs directly past their house. The traffic on this road will increase as more people are now going to travel from Ogies in the mines direction. The road is not made to carry so much traffic and the dust will increase. Will the road be upgraded to handle the traffic and minimise the dust? Does the mine know that South 23 wants to close and divert this road, they will be mining through it? | A detailed Traffic impact assessment will be undertaken for the EIA which will propose the correct mitigation measures to address the impacts. |
| | | | The wind blows in the direction of their farm and all the mine dust blows onto their farm. This mine will just add to the dust. | An Air Quality study is being undertaken to recommend mitigation measures to address these impacts. |
| Mr Nkkosinathi Mtsweni | Greater eMalahleni Youth Forum | Open Day 31 May 2019 | GEYF is a non-profit organisation that would like to join and participate in the SLP as they do community outreach programmes. The Mine needs to give the GEYF an opportunity and align the SLP/CSI projects to achieve goals and social objectives | Once the Mine starts with construction the SLP will be implemented and the communities will be approached regarding job opportunities. |
| | | | They face a high rate of youth unemployment in the country they think this is one of the positive ways to reduce the unemployment rate in eMalahleni. They want to create job opportunities and skills development and empower the young people and build their capacity. | Once the Mine starts with construction the SLP will be implemented and the communities will be approached regarding job opportunities. |

## REASONED OPINION

Although not all the specialist studies were available at the time of the report being circulated for comment, the project can be recommended for approval with conditions contained in this report (subject to additional conditions received from specialists once their reports are finalised).

## CONTENTS

## List of Figures

## List of Tables

## Definition of Terms

| | |
|---|---|
| **Audit** | a systematic, independent and documented review of operations and practises to ensure that relevant requirements are met. Qualified professionals with relevant auditing experience should conduct audits and, where possible, independent external auditors should also be used. |
| **Borehole** | is a narrow shaft bored in the ground, either vertically or horizontally. A borehole may be constructed for many different purposes, including the extraction of water or other liquid (such as petroleum) or gases (such as natural gas), as part of a geotechnical investigation, environmental site assessment, mineral exploration, temperature measurement, as a pilot hole for installing piers or underground utilities, for geothermal installations, or for underground storage of unwanted substances, e.g. in Carbon capture and storage. |
| **Clean Water** | clean water is any water that has maintained the chemical, physical, and biological integrity of the waters by preventing point and nonpoint pollution sources. |
| **Compliant** | a full achievement of the performance requirement of a particular condition of the license or programme. |
| **Conservation** | in relation to a water resource means the efficient use and saving of water, achieved through measures such as water saving devices, water-efficient processes, water demand management and water rationing; |
| **Construction** | the time period that corresponds to any event, process, or activity that occurs during the Construction phase (e.g., building of site, buildings, and processing units) of the proposed project. This phase terminates when the project goes into full operation or use. |
| **Corrective Action Plan** | an action plan developed by the proponent, contractor, or facility owner and approved by the external auditor that describes how the contractor or facility owner intends to resolve the non-conforming item. The Corrective Action Plan should be specific, measurable, achievable, realistic, and timely. |
| **Director-General** | means the Director-General of the Department; |
| **Effluent** | is defined by the United States Environmental Protection Agency as "wastewater - treated or untreated - that flows out of a treatment plant, sewer, or industrial outfall. Generally refers to wastes discharged into surface waters". The Compact Oxford English Dictionary defines effluent as "liquid waste or sewage discharged into a river or the sea".<br><br>Effluent in the artificial sense is in general considered to be water pollution. |
| **Environmental Audit Report** | a summary report prepared after an environmental audit that describes the attributes of the audit and the audit findings and conclusions. |
| **Environmental Authorisation** | is an environmental authorisation issued by a state department. |
| **Environmental Component** | an attribute or constituent of the environment (i.e., air quality; marine water; waste management; geology, seismicity, soil, and groundwater; marine ecology; terrestrial ecology, noise, traffic, socio-economic) that may be impacted by the proposed project. |
| **Environmental Impact** | a positive or negative condition that occurs to an environmental component as a result of the activity of a project or facility. This impact can be directly or indirectly caused by the project's different phases (i.e., Construction, Operation, and Decommissioning). |
| **Environmental Management Plan** | An Environmental Management Plan (EMP) can be defined as "an environmental management tool used to ensure that undue or reasonably avoidable adverse impacts of the construction, operation and decommissioning of a project are prevented; and that the positive benefits of the projects are enhanced". |
| **Groundwater** | is the water located beneath the earth's surface in soil pore spaces and in the fractures of rock formations. A unit of rock or an unconsolidated deposit is called an aquifer when it can yield a usable quantity of water. The depth at which soil pore spaces or fractures and voids in rock become completely saturated with water is called the water table. Groundwater is recharged from, and eventually flows to, the surface naturally; natural discharge often occurs at springs and seeps, and can form oases or wetlands. |
| **Non-conformance** | constitutes a non-compliance or an action plan or initial actions taken without tangible deliverables. Non-conformance may also be associated with activities breaching legislation. Non-Conformance findings therefore have a high priority and mitigation measures are mandatory. |
| **Operation** | the time period that corresponds to any event, process, or activity that occurs during the Operation (i.e., fully functioning) phase of the proposed project or development. (The Operation phase follows the Construction phase, and then terminates when the project or development goes into the Decommissioning phase.) |

| | |
|---|---|
| **Partially Compliant** | achievement with shortcomings (such as documented proof and or work in progress) and achievement where there is an obvious shortcoming in the delivery of the performance requirement. |
| **Pollution** | is the introduction of contaminants into the natural environment that cause adverse change. Pollution can take the form of chemical substances or energy, such as noise, heat or light. Pollutants, the components of pollution, can be either foreign substances/energies or naturally occurring contaminants. Pollution is often classed as point source or nonpoint source pollution. |
| **Protection** | in relation to a water resource, means -<br>(a) Maintenance of the quality of the water resource to the extent that the water resource may be used in an ecologically sustainable way;<br>(b) Prevention of the degradation of the water resource; and<br>(c) the rehabilitation of the water resource; |
| **Proponent** | the person, company, or agency that is the primary responsible party for a development project and that is the permit applicant/holder for the project. |
| **Rehabilitation** | is the act of restoring something to its original state; |
| **Responsible Authority** | in relation to a specific power or duty in respect of water uses, means -<br>(a) if that power or duty has been assigned by the Minister to a catchment management agency, that catchment management agency; or<br>(b) if that power or duty has not been so assigned, the Minister; |
| **Water Resource** | includes a watercourse, surface water, estuary, or aquifer; |
| **Wetland** | means land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil. |

## Abbreviations

| | |
|---|---|
| **AEL** | Atmospheric Emissions License in terms of NEM:AQA |
| **AMD** | Acid Mine Drainage |
| **ASTM** | American Standard for Testing and Materials (followed by protocol number) |
| **BA** | Basic Assessment (process or report) |
| **BID** | Background Information Documents |
| **CARA** | Conservation of Agricultural Resources Act (Act 43 of 1983) as amended |
| **CBD** | Central Business District |
| **COP** | Codes of Practice |
| **C-Plan** | Conservation Plan (specifically Mpumalanga Conservation Plan) |
| **DMC** | Dense Medium Circuit (associated with processing plant) |
| **DMR** | Department of Mineral Resources |
| **DO** | Dissolved Oxygen |
| **DWS** | Department of Water Affairs and Sanitation |
| **EA** | Environmental Authorisation in terms of NEMA |
| **EAP** | Environmental Assessment Practitioner |
| **ECA** | Environmental Conservation Act (Act 73 of 1989) as amended |
| **EIA** | Environmental Impact Assessment (process or report) |
| **EIA Regulation** | Environmental Impact Assessment Regulation published under NEMA |
| **EIS** | Ecological Importance and Sensitivity |
| **EMPr** | Environmental Management Programme Report |
| **GDP** | Gross Domestic Product |
| **GIS** | Geographical Information Systems |
| **GN** | General Notice (issued under an Act, providing notice or information) |
| **GNR** | General Notice Regulation (issued under an Act, providing instruction) |
| **HSTP** | Human Settlement Plan |
| **I&AP** | Interested and Affected Parties |
| **IAIA SA** | International Association of Impact Assessment South Africa |
| **IDP** | Integrated Development Plan |
| **IWUL** | Integrated Water Use License |
| **IWULA** | Integrated Water Use License Application |
| **IWWMP** | Integrated Water and Waste Management Plan |
| **LED** | Local Economic Development |
| **LoM** | Life of Mine |
| **MHSA** | Mine Health and Safety Act (Act 29 of 1996) as amended |
| **MPRDA** | Mineral and Petroleum Resources Development Act (Act 28 of 2002) as amended |
| **MR** | Mining Right in terms of the MPRDA |
| **MRA** | Mining Right Application in terms of the MPRDA |
| **NAEIS** | National Atmospheric Emissions Inventory System |
| **NEA** | National Energy Act, Act 34 of 2008 |
| **NEM:AQA** | National Environmental Management: Air Quality Act (act 59 of 2008) as amended |

| | |
|---|---|
| **NEM:BA** | National Environmental Management: Biodiversity Act (Act 10 of 2004) as amended |
| **NEM:PAA** | National Environmental Management: Protected Areas Act (Act 57 of 2003) as amended |
| **NEM:WA** | National Environmental Management: Waste Act (Act 39 of 2004) as amended |
| **NEMA** | National Environmental Management Act (Act 107 of 1998) as amended |
| **NFEPA** | National Freshwater Ecological Priority Areas |
| **NHRA** | National Heritage Resources Act (Act No. 25 of 1999) as amended |
| **NPAES** | National Protected Area Expansion Strategy |
| **NWA** | National Water Act (Act 35 of 1998) as amended |
| **PCD** | Pollution Control Dam |
| **PDA** | Potential Development Area (in terms of the SDF) |
| **PES** | Present Ecological State (usually followed by category A-F) |
| **PM10/5/2.5** | Particulate Matter up to 10/5/2.5 micrometers |
| **POI** | Points of Interest |
| **PPP** | Public Participation Process |
| **RoD** | Record of Decision (for specific application) |
| **RWD** | Return Water Dam |
| **RWQO** | Resource Water Quality Objectives |
| **SCC** | Species of Conservation Concern |
| **S&EIR** | Scoping and Environmental Impact Reporting process |
| **S&LP** | Social and Labour Plan |
| **SACNASP** | South African Council for Natural Scientific Professions |
| **SAHRA** | South African Heritage Resource Agency |
| **SAMRAD** | South African Mineral Resources Administration System |
| **SANBI** | South African National Biodiversity Institute |
| **SANS** | South African National Standard (followed by standard number) |
| **SASS5** | South African Scoring System version 5 (in terms of aquatic invertebrate assessments) |
| **SAWIS** | South African Waste Information System |
| **SDF** | Spatial Development Framework (specifically LLM) |
| **SEMA** | Specific Environmental Management Acts |
| **SMME** | Small and Medium and Micro Enterprise |
| **SOP** | Standard Operating Procedure |
| **SPLUMA** | Spatial Planning and Land Use Management Act (Act No.16 of 2013) |
| **Stats SA** | Statistics South Africa |
| **Tph** | Tons per hour |
| **WMA** | Water Management Area |
| **WML** | Waste Management License in terms of NEM:WA |

# ENVIRONMENTAL IMPACT ASSESSMENT REPORT AND ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

Submitted for Environmental Authorisations in terms of the National Environmental Management Act, 1998 and the National Environmental Management Waste Act, 2008 in respect of listed activities that have been triggered by applications in terms of the Mineral and Petroleum Resources Development Act, 2002 (MPRDA) (as amended).

## DETAILS OF APPLICANT

**Table 1.1: Applicant Details**

| Applicant Name: | Opsirex (Pty) Ltd |
|---|---|
| **Registration No.:** | 2010/002524/07 |
| **Contact Person:** | Eddie Johnston |
| **Telephone:** | +27 (11) 783-9810 |
| **Fax:** | +27 (86) 625-4121 |
| **E-mail:** | Balele.eddie@gmail.com |
| **Postal Address:** | P.O. Box 1216, Isando, 1600 |
| **Physical Address:** | Farm Wildebeestfontein 327 JS, Phola |

## IMPORTANT NOTICE

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

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

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

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

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

## OBJECTIVE OF THE ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

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

a. determine the policy and legislative context within which the activity is located and document how the proposed activity complies with and responds to the policy and legislative context;

b. describe the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the preferred location;

c. identify the location of the development footprint within the preferred site based on an impact and risk assessment process inclusive of cumulative impacts and a ranking process of all the identified development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects of the environment;

d. determine the—-

   i. nature, significance, consequence, extent, duration and probability of the impacts occurring to inform identified preferred alternatives; and

   ii. degree to which these impacts—

      (aa) can be reversed;
      (bb) may cause irreplaceable loss of resources, and
      (cc) can be avoided, managed or mitigated;

e. identify the most ideal location for the activity within the preferred site based on the lowest level of environmental sensitivity identified during the assessment;

f. identify, assess, and rank the impacts the activity will impose on the preferred location through the life of the activity;

g. identify suitable measures to manage, avoid or mitigate identified impacts; and

h. identify residual risks that need to be managed and monitored.

# PART A: SCOPE OF ASSESSMENT AND ENVIRONMENTAL IMPACT ASSESSMENT REPORT

# 1. INTRODUCTION

Opsirex (Pty) Ltd as a legal entity applied for a Prospecting Right on portions 5 and 6 of the farm Wildebeestfontein 327 JS covering a total of 157.11 ha and this right was awarded on the 8th of May 2013 subsequently lapsing on the 7th of May 2013. A renewal for this right was applied for and ultimately awarded on the 30th of September 2016 for a 3-year period, lapsing on the 29th of September 2019. On the 14th of November 2017 Portions 19 and RE/2 was included in the existing right and now covers a total of 411.64 ha.

## 1.1 PROJECT DESCRIPTION

The project involves the development of a new mining operation within eMalahleni (near Phola) in the Mpumalanga Province (Figure 1.1). The mine will be located on Portions RE/2 and 19 of the Farm Wildebeestfontein 327 JS and will occupy approximately 250 ha in total of which approximately 15 ha is required for infrastructure. The area proposed to be mined is indicated in **Error! Reference source not found.**. It is anticipated that mining will involve removing around 9 Mt of coal for a life of 7 years.

The coal resource will be mined using open pit methods due to the seemly depth of the coal reserve below surface. Strip and Rollover Mining Techniques will be utilised considering the site layout and resources. Rollover Mining involves the development of an open pit through a series of benches at varying depths. Strip mining involves the movement of overburden laterally to an adjacent empty pit where the mineral has already been extracted. This further assist with the concurrent rehabilitation and is also proven to be the most effective way of handling materials. The proposed project will include one open pit.

Topsoil and subsoil will be stripped using an excavator and will be stored in separate stockpile areas on the mining area. Drilling and blasting will be employed for the hard overburden or bedrock to expose the coal seams. Once blasted, the hard overburden will be excavated and stockpiled separately for rehabilitation. The mined coal from the open pit will be transported via the haul roads and stored on the Run of Mine (RoM) stockpile area on the nearby Elandsfontein Colliery. Elandsfontein Colliery have an approved authorisation to accommodate this additional coal at its processing facilities. The coal will be processed either through only Crushing and Screening or through the washing plant to develop sellable products that will be sold to either the local or export markets.

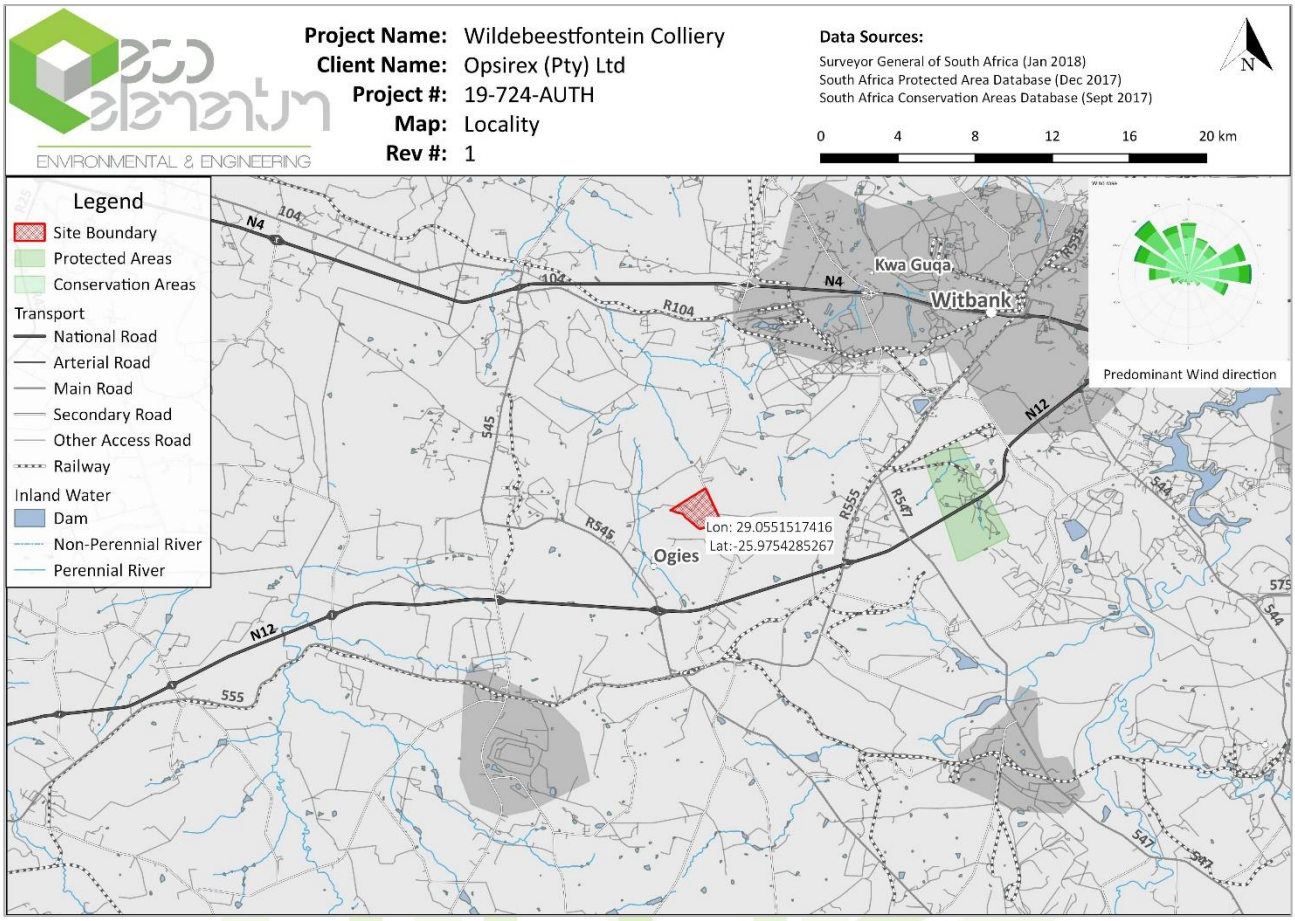


**Figure 1.1: Project Locality**

## 1.2 MINING PROCESS

**Table 1.1: Mining Activities**

| ITEM | DETAIL |
|---|---|
| **Type of mineral** | Coal |
| **Mining method** | Strip and Rollover Mining Techniques |
| **Depth of the mineral below surface** | Average depth 33 m |
| **Geological formation** | Located on the central part of the Witbank Coalfield, the Witbank Coalfield, primary economic seams are the 5, 4, 2 and 1 Seams. Numerous dolerite intrusions (dykes and sills) intrude the Vryheid Formation at various stratigraphic level that tend to influence stratigraphy and coal qualities. |
| **Life of mine** | 7 Years. |
| **Production rate** | 14 Million Tonnes<br>Rates are set at 180,000 tpm |
| **Saleable Product** | No.1 and 4 seams will be presented to the export market as a RB1 quality, or separated as Nuts Peas and Duff. With an A-grade coal quality.<br>The No. 2 seam will primarily be crushed and screened to a 0-50mm product, targeting the local domestic demand towards Eskom |
| **Target Market** | International (Export) and local market |

# 2. CONTACT DETAILS

## 2.1 APPLICANT

**Table 2.1: Applicant Details**

| | |
|---|---|
| **Applicant Name:** | Opsirex (Pty) Ltd |
| **Registration No.:** | 2010/002524/07 |
| **Contact Person:** | Eddie Johnston |
| **Telephone:** | +27 (11) 783-9810 |
| **Fax:** | +27 (86) 625-4121 |
| **E-mail:** | Balele.eddie@gmail.com |
| **Postal Address:** | P.O. Box 1216, Isando, 1600 |
| **Physical Address:** | Farm Wildebeestfontein 327 JS, Phola |

## 2.2 ITEM 3(A)(I): ENVIRONMENTAL ASSESSMENT PRACTITIONER

**Table 2.2: EAP Details**

| | |
|---|---|
| **EAP:** | Eco Elementum (Pty) Ltd - Environmental and Engineering |
| **Contact Person:** | Riana Panaino |
| **Telephone:** | 012 807 0383 |
| **Fax:** | N/A |
| **E-mail:** | riana@ecoe.co.za |
| **Postal Address:** | 26 Greenwood Crescent, Lynnwood Ridge, 0040 |
| **Physical Address:** | 442 Rodericks Road, Lynnwood, Pretoria 0081 |

## 2.3 ITEM 3(A)(II): EXPERTISE OF THE EAP

### 2.3.1 The Qualifications of the EAP

**Table 2.3: EAP Qualifications**

| | |
|---|---|
| **Name** | Riana |
| **Surname** | Panaino |
| **Company** | Eco Elementum (Pty) Ltd |
| **Position** | Senior Environmental Consultant |
| **Location** | 442 Rodericks Road, Lynnwood, Pretoria 0081 |
| **Email** | riana@ecoe.co.za |
| **Telephone Number** | 012 807 0383 |
| **Qualifications** | BSc - Honours in Biodiversity and Conservation at University of Johannesburg, South Africa (Mpumalanga) |
| **Professional skills** | - Riana Panaino is Pr.Sci.Nat registered in the field of Environmental Sciences<br>- Riana Panaino has been an environmental consultant and professional since 2008, specialising in the fields of:<br>• Environmental Impact Assessments and Authorisations;<br>• Water use license application;<br>• Waste use license application;<br>• Environmental Monitoring and Control;<br>• Mine Closure and Rehabilitation;<br>• Environmental Compliance and Audits;<br>• Environmental Management Systems; and Specialist Impact Studies<br>- During this time, she has provided quality, environmental consulting and auditing services in the mining and power industry sector. |

### 2.3.2 Summary of the EAP's Past Experience

**Table 2.4: EAP Experience**

| | |
|---|---|
| **Skills** | - Environmental Impact Assessments<br>- Basic assessments,<br>- Water use license application<br>- Waste use license application<br>- Prospecting and Mining Right Authorizations<br>- Environmental Management Plans<br>- Public Participation<br>- Environmental Authorizations |
| **EAP Experience** | Riana is a Senior Environmental Consultant and has worked in the Environmental field since 2008. Riana has 7 years' experience in the environmental management field and 4 years' experience as a wetland ecologist. She has worked with the National Environmental Management Act, 1998 (Act No. 107 of 1998) and the associated regulations, the National Water Act, 1998 (Act No. 36 of 1998), as well as DWA Wetland Guidelines. Her key roles include Environmental Impact Assessment Reports, Basic Assessment Reports, Environmental Management Programmes, Integrated Water Use Licenses and Wetland Assessments. All of the above functions require in depth communication with government departments and well as the public. |

# 3. ITEM 3(B): DESCRIPTION OF THE PROPERTY

**Table 3.1: Location of the property**

| | |
|---|---|
| **Farm Name:** | WILDEBEESTFONTEIN 327 JS PTN 19 & RE OF PTN 2. |
| **Application area (Ha)** | 254.53 ha |
| **Magisterial district:** | Emalahleni Local Municipality, Nkangala District Municipality, Mpumalanga. |
| **Distance and direction from nearest town:** | Farm Wildebeestfontein 327 JS, Located approximately 17 km West of Emalahleni, 1.5 km east of the town of Phola, and approximately 3.5 km north of Ogies town in the Mpumalanga Province. |
| **21-digit Surveyor General Code for each farm portion:** | WILDEBEESTFONTEIN 327 JS PTN - 19T0JS00000000032700019<br>WILDEBEESTFONTEIN 327 JS RE OF PTN 2 - T0JS00000000032700002 |

**Table 3.2: Summary of Surface Right Owners**

| Farm | Portion | Surface Right owner | Title Deed | Extent of farm (ha) |
|---|---|---|---|---|
| Wildebeestfontein 327 JS | RE/2 | Quickstep 412 (Pty) Ltd | T10817/1904 | 168.87 |
| Wildebeestfontein 327 JS | 19 | eMalahleni Local Municipality | T23795/1949 | 85.66 |
| Total Area: | | | | 254.53 |

## 3.1 LOCALITY MAP

(Nearest town, scale not smaller than 1:250000 attached as Annexure 3)

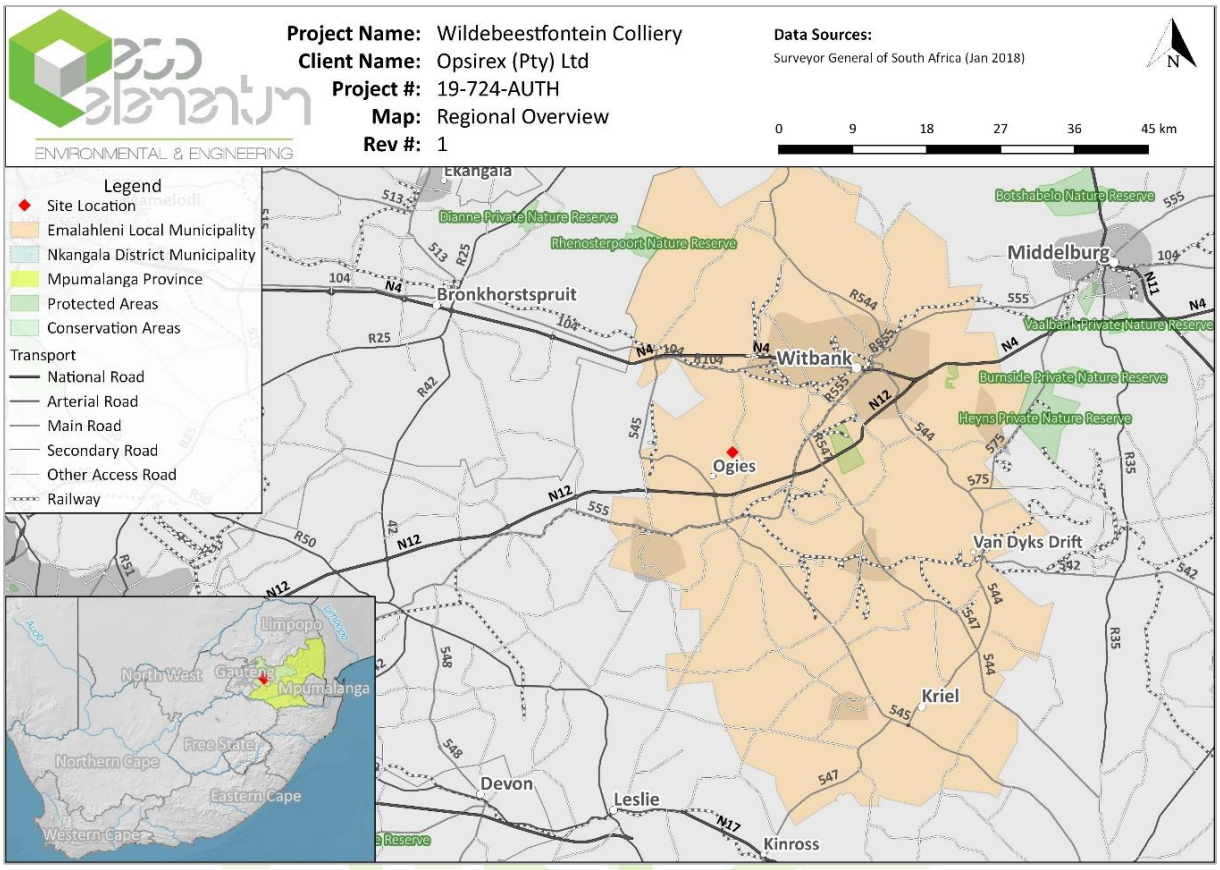


**Figure 3.1: Regional Overview**

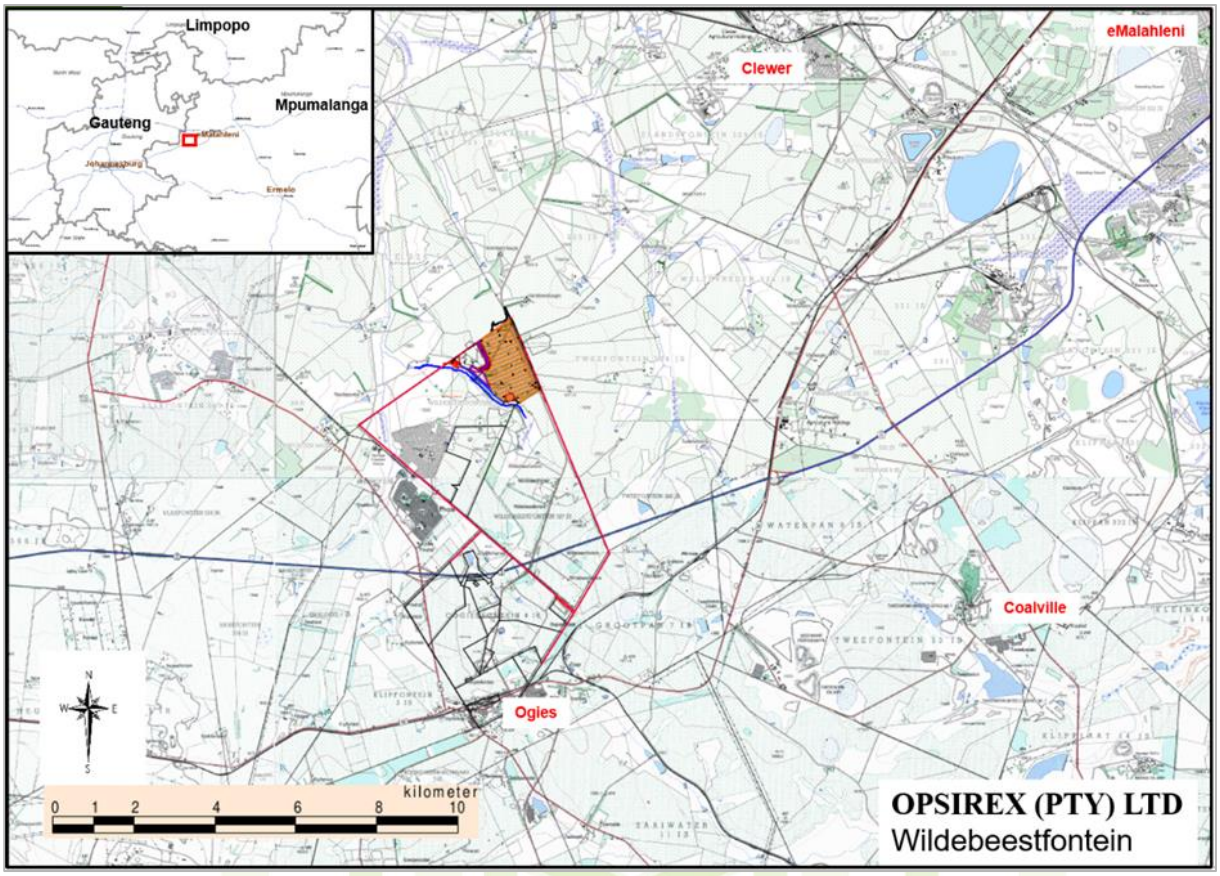


**Figure 3.2: Local setting**

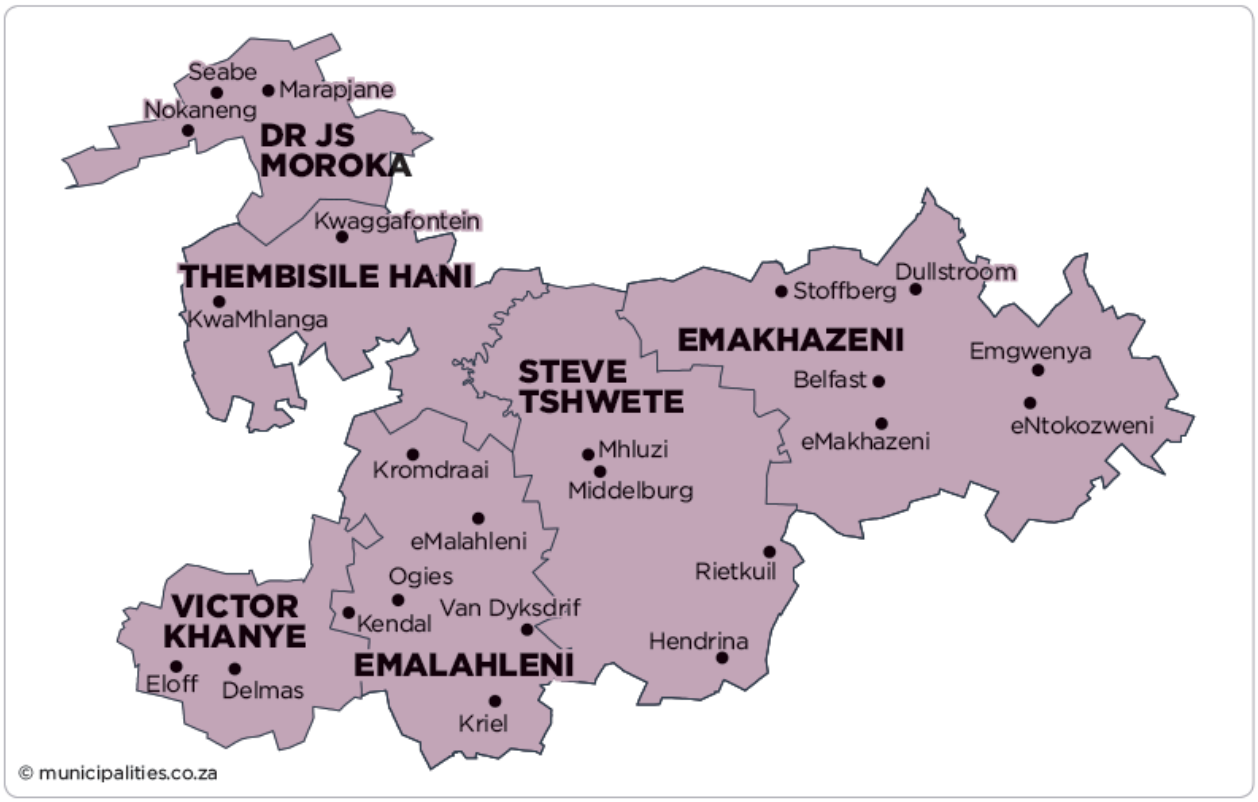


**Figure 3.3: Nkangala District Municipality**

# 4. ITEM 3(D) (II): DESCRIPTION OF THE OVERALL ACTIVITY

## 4.1 Description Of The Scope Of The Proposed Overall Activity

Provide a plan drawn to a scale acceptable to the competent authority but not less than 1: 10 000 that shows the location, and area (hectares) of all the aforesaid main and listed activities, and infrastructure to be placed on site – please refer to Annexure 4.

**Table 4.1: Description of the Overall Activity**

| ITEM | DETAIL |
|---|---|
| **Type of mineral** | Coal |
| **Mining method** | Strip and Rollover Mining Techniques |
| **Depth of the mineral below surface** | Average depth 33 m |
| **Geological formation** | Located on the central part of the Witbank Coalfield. In the Witbank Coalfield, primary economic seams are the 5, 4, 2 and 1 Seams. Numerous dolerite intrusions (dykes and sills) intrude the Vryheid Formation at various stratigraphic levels. These intrusions tend to influence the stratigraphy and coal qualities. |
| **Life of mine** | 7 Years. |
| **Production rate** | 14 Million Tonnes<br>Rates are set at 180,000 tpm |
| **Saleable Product** | No.1 and 4 seams will be presented to the export market as a RB1 quality, or separated as Nuts Peas and Duff. With an A-grade coal quality.<br>The No. 2 seam will primarily be crushed and screened to a 0-50mm product, targeting the local domestic demand towards Eskom. |
| **Target Market** | International (Export) and local market |

## 4.2 Listed Activities To Be Undertaken

Section 16 of the Mineral and Petroleum Resources Development Act, 200 2 (Act No. 28 of 2002) requires, upon request by the Minister that an Environmental Management Plan be submitted and that the applicant must notify and consult with Interested and Affected Parties (I&APs).

Section 37 of the MPRDA confirms that the principles set out in the NEMA apply to all prospecting and mining operations and must be carried out in accordance with the generally accepted principles of sustainable development Section 24 of the NEMA requires that activities, which may impact on the environment must obtain an environmental authorisation from a relevant authority before commencing with the activities.

Such activities are listed under Regulations Listing Notice 1 Government Notice (GN) 983, Listing Notice 2 GN 984 and Listing Notice GN 985 (dated 4 December 2014 as amended in 2017) of NEMA. The proposed mining activity triggers are listed in Table 4.2.

**Table 4.2: Listed and Specified Activities**

| NAME OF ACTIVITY | Aerial extent of the Activity Ha or m² | LISTED ACTIVITY | APPLICABLE LISTING NOTICE (GNR 544, GNR 545 or GNR 546) | WASTE MANAGEMENT AUTHORISATION |
|---|---|---|---|---|
| Mining Right Application | 254.53 ha | X | GNR 983 – Listing Notice 1: Activity 11, 12, 13, 22, 24, 27, 30.<br>GNR 984 – Listing Notice 2: Activity 6, 15, 17 & 21<br>GNR 985 – Listing Notice 3: 2, 4, 10, 12 & 14 | Norms & Standards<br>Category B: Activity 10, 11 |
| All infrastructure areas, development footprints and associated activities. | Mineral Boundary 254.53 ha<br>Approximate are of surface disturbance 200 ha | X | GNR 983 – Listing Notice 1: Activity 11, 12, 13, 22, 24, 27, 30.<br>GNR 984 – Listing Notice 2: Activity 6, 15, 17 & 21<br>GNR 985 – Listing Notice 3: 2, 4, 10, 12 & 14 | Norms & Standards<br>Category B: Activity 10, 11 |
| Box cut excavation | 3 ha | X | GNR 984, listed activity 17 | |
| Topsoil & subsoil stripping & stockpiling into berms | Maximum 50 ha area | X | GNR 983, listed activity 27 & 30<br>GNR 984, listed activity 15 | |
| Overburden stockpiles (non-carbonaceous) | 1.5 ha | X | | Category B: Activity 10, 11 |
| Access and hauling along roads | 2000 m x 13 m | X | GNR 983, listed activity 24<br>GNR 985, Listed activity 4 | |
| Water supply and storage (potable & process) | Process water: 2 ha for PCD<br>Potable water: <1 ha for 40 m³/day | X | GNR 983, listed activity 13<br>GNR 985, listed activity 2 | |
| Storm water runoff management features | Dirty water trenches:<br>3000 m | X | | |
| Water pipelines | <1000 m | X | GNR 983, listed activity 9 & 10 | |
| Waste generation & storage | 0.1 ha | | | Norms and Standards |

| NAME OF ACTIVITY | Aerial extent of the Activity Ha or $m^2$ | LISTED ACTIVITY | APPLICABLE LISTING NOTICE (GNR 544, GNR 545 or GNR 546) | WASTE MANAGEMENT AUTHORISATION |
|---|---|---|---|---|
| Ablutions & change house with sewage treatment plants. | 0.5 ha | X | GNR.983, listed activity 25 | |
| Fuel storage | 0.1 ha | X | GNR.985, listed activity 10 | |
| Administration area | 2 ha | X | | |
| Substation and power transmission | 0.5 ha and <1 ha cumulative for pylons | X | GNR.983, listed activity 11 | |
| Rehabilitation, including backfilling of box cut. | 200 ha | X | GNR.983, listed activity 22 | Category A: Activity 14 |
| Run Off Mine – in pit stockpiling and hauling directly to Elandsfontein Colliery for beneficiation. | 0.5 ha | X | | Category B: Activity 10, 11 |

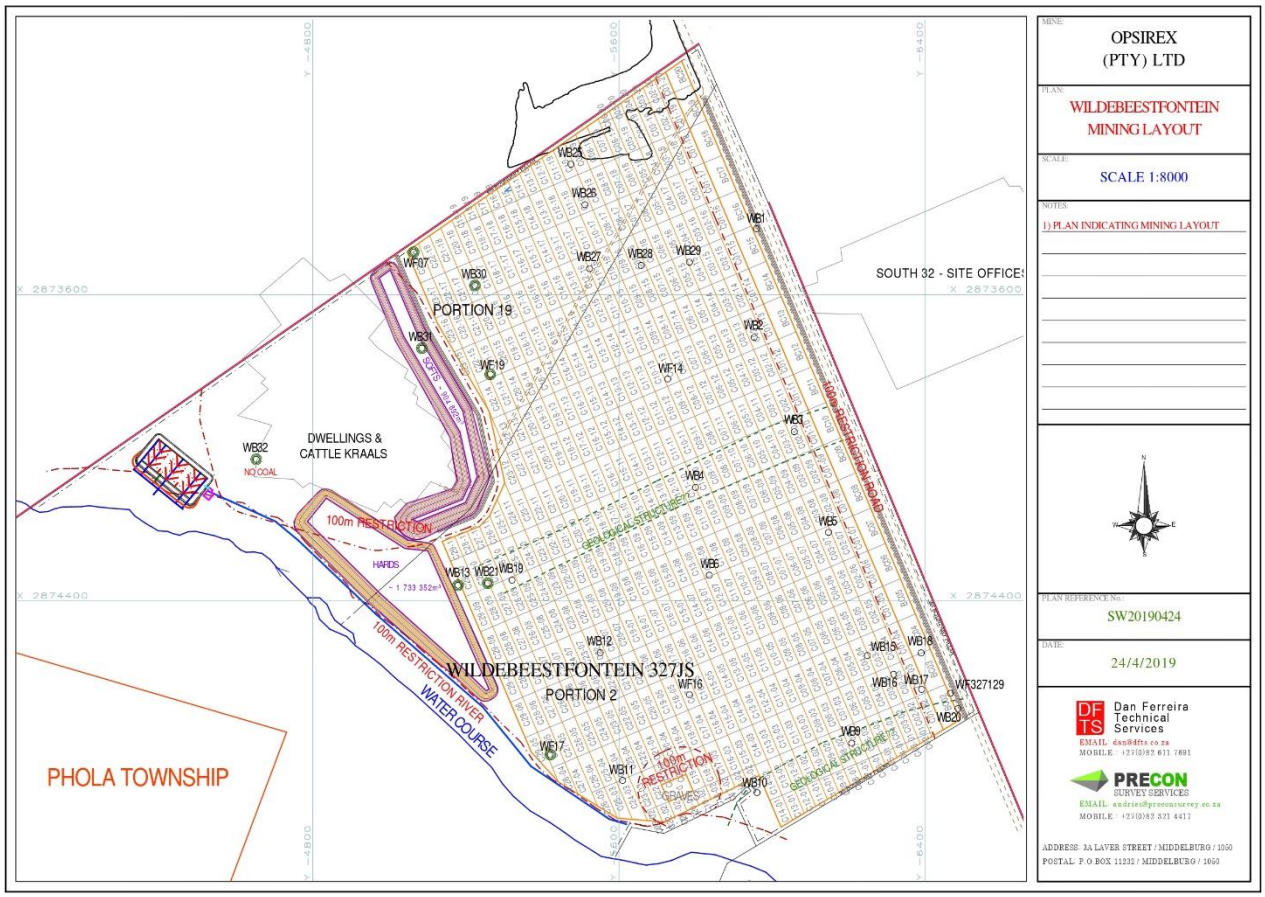


**Figure 4.1: Site Layout**

## 4.3 Item 3 (d) (ii) Description Of The Activities To Be Undertaken

### 4.3.1 Mining Method

The mining method that will be used to exploit the different coal seams will be Roll-over Strip mining concurrently with rehabilitation. The roll over mining will make use of dozer and truck and shovel teams to remove the waste material to expose either the No. 4 or 2 seam. Once the coal seam is exposed, it will be mined by truck and shovel operation and placed on the ROM stockpiles for transport to Elandsfontein Colliery where beneficiation will be done.

The initial box cut waste mining material will be placed on dumps to create space for the next cut material to be rolled into. This will form a continuous roll over method where the waste material will be placed in the previous mined out cut. The placement of material on the low wall side as part of the rehabilitation strategy will be in the same sequence as the material mined from bottom to top, i.e. hards at the bottom, then subsoil on top of the hards and finally topsoil on top of the soft subsoils.

Drilling and blasting operations will occur on the hard overburden and inter-burdens during the critical part of mining the hards as well as the coal seams. It is currently foreseen that the No. 1 seam might not require blasting, although planning has been made to blast the No. 1 seam if it should be necessary. All hard material horizons will be drilled at specific patterns and blasted with the use of emulsion and pyrotechnics (shock tube).

### 4.3.2 ROM Production

The plant feed will be from the Wildebeestfontein Operation. The discard will be discarded in the current Elandsfontein discard handling facility (off site). This will have the effect that the Wildebeestfontein Opencast facility will not be used for any discard from the plant, and therefore the rehabilitation can commence immediately when the operation reaches a steady state scenario.

A truck and shovel mining method will be used to transport the ROM coal to a ROM pad on Wildebeestfontein from where it will be loaded on roadworthy road- hauler trucks, which will transport the coal to the Elandsfontein Facility (off site).

### 4.3.3 Basic Crushing & Screening Plant design

ROM coal from the Wildebeestfontein project will be processed and beneficiated on site via a crushing and screening process, mainly for the local & regional Eskom market.

This plant will consist of a Primary breaker in the form of a Jaw Crusher, which will crush the ROM coal to a -150mm product feed. This feed will be fed onto a single deck screen that will remove the already 0-50mm product before the oversize (+50mm) will be fed to a secondary crusher in the form of an Impact crusher.

The secondary crusher will re-circulate its product back to the screen to ensure that coal within the 0-50mm spectrum does not get crushed for a third time.

The coal gets circulated through the Impact crusher until it is removed through the screen and produced as a 0-50mm Eskom product.

The plant yield will be 100% as no coal is discarded.

The impact crusher creates more fines than some other conventional crushers although its throughput is substantially higher.

It is therefore envisaged that the split will be 30% +30 mm, and 70% -30 mm.

### 4.3.4 Coal Processing

Opsirex (Pty) Ltd has an agreement that all coal mined from the Wildebeestfontein coal reserve, will be transported to Elandsfontein Colliery for beneficiation. The coal will be transported by trucks via a public road that runs past both the two Mine properties.

The agreement entails that all coal will be run from the Wildebeestfontein Colliery as ROM to Elandsfontein where the No. 4 and No. 1 coal seams will be washed and screened into Nuts, Peas and Duff products. The No. 2 coal seam will be crushed and screened to a 0-50 mm product.

For this reason, no beneficiation infrastructure need to be build.

### 4.3.5 Potable Water

Potable water is for the use in the mine offices, workshops and change house facilities.

### 4.3.6 Diesel Storage

Storage facility consist of 2 x 23 000 ℓ storage tanks. Total storage capacity is 46 000 litres.

### 4.3.7 General Waste Storage

For general waste, no authorisation is required as the waste site is kept to less than 100 $m^3$. The removal of waste will be managed on a daily basis to ensure that the limit is not exceeded.

### 4.3.8 Hazardous Industrial Waste

The site is maintained to less than 35$m^3$. This is a relatively small waste site and the mine will have a waste removal contract with a reputable company to remove this waste on a regular basis.

### 4.3.9 Sewerage

Sewerage is removed on a need basis.

### 4.3.10 Dirty Water

Dirty water on site will be diverted to the PCD. Dust suppression for the operations will be done my means of a water cart. Water from the dirty water storage facility will be used for dust allying at a rate of 50 000-80 000 ℓ/day dependant on distance of haulage.

### 4.3.11 Ancillary infrastructure

- Haul roads from pit to Dumps and Hard Parks;
- Haul roads inside mining area to mine access point;
- Site Offices;
- Security Offices.

# 5. POLICY AND LEGISLATIVE CONTEXT

Table 5.1 outlines the legislation and guidelines that are considered to be applicable to the proposed project; and which were considered at the time of compiling this report.

**Table 5.1: Applicable legislation and guidelines**

| APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT (a description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process); | | REFERENCE WHERE APPLIED |
|---|---|---|
| **National Environmental Management Act (107 of 1998)**<br>The NEMA provides the overarching legislation for environmental governance in South Africa, giving effect to Section 24 of the Constitution of the Republic of South Africa. NEMA sets out the fundamental principles of Integrated Environmental Management that must be adhered to in order to ensure sustainable development. | Section 28 of the NEMA includes a far-reaching general "Duty of Care" which stipulates the need to protect the environment from degradation and pollution,<br>In terms of the listed activities, a S&EIR process is required. | An Application for Environmental Authorisation and Mining Right has been made to the DMR. |
| **Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002)**<br>To make provision for equitable access to and sustainable development of the nation's mineral and petroleum resources; and to provide for matters connected therewith. | Section 22- The project requires a mining right authorisation from the DMR. | A section 22 Mining Right Application was lodged with the DMR. |
| **NEMA Environmental Impact Assessment (EIA) Regulations, 2014 (as amended)** | In terms of the listed activities, a S&EIR process is required. The process will be followed in terms of the "one environmental system. | An Application for Environmental Authorisation and Mining Right has been made to the DMR. |
| **The South African Constitution**<br>In terms of Section 24, of the Constitution of the Republic of South Africa (108 of 1996), everyone has the right to an environment that is not harmful to their health or well-being and to have the environment protected, for the benefit of present and future generations, through reasonable legislation and other measures that prevent pollution and ecological degradation, promote conservation and secure ecologically sustainable development and use of natural resources while prompting justifiable economic and social development. | Applied at potential impacts identification as well as mitigation measures and public participation. | An open and participatory public participation process will be followed. An EMP and awareness plan will be designed according to the issues raised during this process. |
| **National Environmental Management: Biodiversity Act, 2004**<br>The National Environmental Management: Biodiversity Act (Act 10 of 2004) (NEM:BA) provides for listing of threatened or protected species. | The fauna and flora prevailing in the proposed project site will be handled in terms of this Act and relevant ecological studies have already been initiated. | The mining footprint will be guided by the results of the ecological studies where possible. Permits will be applied for where and when necessary should any red data species be relocated. |
| **National Environmental Management: Waste Act**<br>The objectives of NEM:WA involve the protection of health, wellbeing and the environment by providing reasonable measures for the minimization of natural resource consumption, avoiding and minimizing the generation of | In terms of the list of Section 19 waste management activities, a S&EIR process is required. The | In terms of GN718 of 2009, under NEMWA, various Category A and B waste management activities are applicable to the proposed |

| APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT (a description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process); | | REFERENCE WHERE APPLIED |
|---|---|---|
| waste, reducing, recycling and recovering waste, and treating and safely disposal of waste as a last resort. In terms of the NEMWA, all waste management activities must be licensed.<br><br>A distinction is made between Category A waste management activities, which require a basic assessment, and Category B activities, which require a full EIA, and Category C waste management activities which do not require a waste management license but compliance with relevant requirements or standards.<br><br>According to Section 44 of the Act, the licensing procedure must be integrated with an EIA process in accordance with the Regulations GNR 982. | process is part of the "one environmental system".<br><br>GNR 633 includes the establishment or reclamation of a residue stockpile or residue deposit resulting from prospecting or mining activities as a listed activity. | mining operation. The impacts and associated management and/or mitigation measures will be included in the EIA phase of the project. |
| **National Heritage Resources Act (Act No. 25 of 1999)**<br><br>The protection and management of South Africa's heritage resources are controlled by the National Heritage Resources Act (Act No. 25 of 1999) (NHRA). The enforcing authority for this act is the South African National Heritage Resources Agency (SAHRA). | A Heritage and Paleontological study has been initiated to identify and assess the project in terms of heritage and paleontological resources. This is mandatory in terms of Section 38 of the NHRA. | The Heritage Report will be uploaded on the SAHRIS website for comment and the development guided by any findings of the Report. |
| **National Water Act (Act No. 36 of 1998)**<br><br>The NWA is the primary regulatory legislation, controlling and managing the use of water resources as well as the pollution thereof. This act provides for fundamental reformation of legislation relating to water resource use.<br><br>GN 704- Regulations on use of water for mining and related activities aimed at the protection of water resources. | An IWULA will be submitted to DWS for consideration for the following Section 21 water uses including:<br><br>(a) abstraction from a borehole<br><br>(c) and (i) mining activities within 500m from a wetland.<br><br>(g) dust suppression, coal stockpiling, mine residue stockpiling and dirty water dams. | The DWS will provide comment and an application will be lodged for their review prior to the undertaking of any water use activities on site.<br><br>Management Principles will be applied to the mining operations as per GN704. |
| **National Environmental Management: Air Quality Act, 2004 (Act no.39 of 2004); and applicable Regulations, Standards and Notices published in terms of NEMAQA**<br><br>The promulgation of this Act marked a turning point in the approach to air pollution control and governance in South Africa, introducing the philosophy of Air Quality Management, in line with international policy developments and the environmental right, i.e. Section 24 of the Constitution (Act No. 108 of 1996). | Dust monitoring on site during operations. | As part of the EMP dust suppression methods will be used. |
| **Mine Health and Safety Act, 1996 (Act No. 29 of 1996);**<br><br>The Mine Health and Safety Act (Act No. 29 of 1996) (MHSA) aims to provide for protection of the health and safety of all employees and other personnel at the mines of South Africa. | Health and Safety Policy of mine to be guided by this Act. | Risk Impact Assessment to be conducted. |
| **Mpumalanga Spatial Development Framework (SDF)** | Used to identify the municipality's long term spatial development plans. SDF to be considered in terms of the need and desirability | The SDF should be consulted as part of the Socio-Economic Study's Scope of Work. |

| APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT (a description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process); | | REFERENCE WHERE APPLIED |
|---|---|---|
| **National Development Plan (2012)**<br>The National Development Plan outlines what we should do to eradicate poverty, increase employment and reduce inequality by 2030. The Plan has the target of developing people's capabilities to be to improve their lives through education and skills development, health care, better access to public transport, jobs, social protection, rising income, housing and basic services, and safety. | Used to identify project Need and Desirability and alignment with National Policy. | To form part of the project background and socio-economic evaluation. |
| **Promotion of Access to Information Act, 2000**<br>**(Act No. 2 of 2000) (PAIA)**<br>PAIA recognises that everyone has a right of access to any information held by the state and by another person when that information is required to exercise or protect any right. | The S&EIR process is aligned with the PAIA and therefore fair and open public participation is undertaken. | NEMA Public Participation Process will be followed as per the 2014 EIA Guidelines. |
| **Conservation of Agricultural Resources Act (act no. 43 of 1983) (CARA)**<br>CARA provides for control over the utilization of the natural agricultural resources in order to promote the conservation of the soil, the water sources and the vegetation and the combating of weeds and invader plants. | Principles of the Act to be included in the relevant specialist's Scope of Work. | Mine Closure and Rehabilitation strategy to be informed by CARA and stakeholder engagement process. |

## 5.1 LEGAL REQUIREMENTS

The intent to mine requires the various applications and subsequent approvals prior to commencement. Refer to **Table 4.2 and** Error! Reference source not found. in the previous sections. To this effect, an integrated environmental application process was followed by means of S&EIR. A S&EIR process typically has three phases as illustrated by Figure 5.1 below. The report is the final step in the environmental assessment phase, before authorisation can take place.

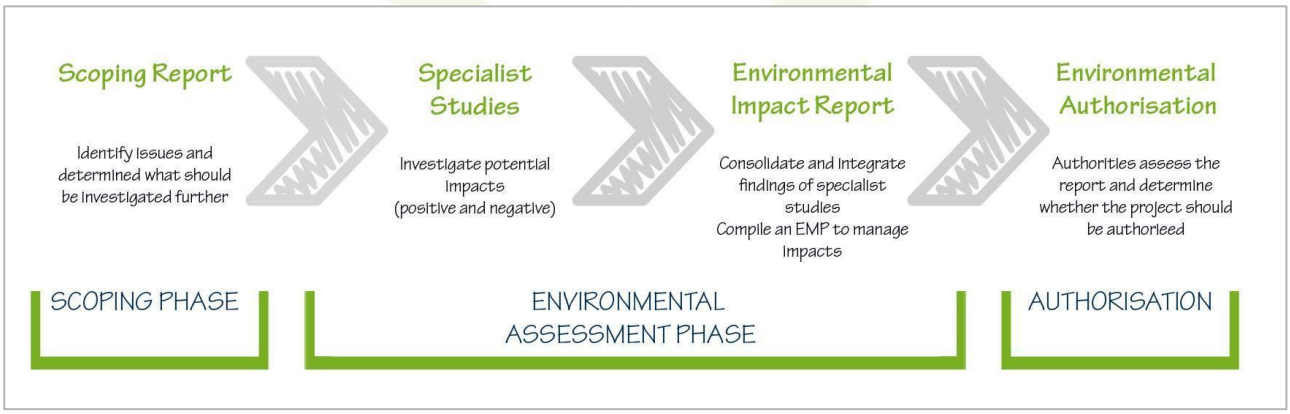


**Figure 5.1: S&EIR flow diagram**

## 6. NEED AND DESIRABILITY OF THE PROPOSED PROJECT

- The project is in line with the 2012 National Development Plans' Nine Point Plan which is aimed at reigniting the economy to be able to create much-needed jobs include industrialisation, mining and beneficiation, agriculture and agro-processing, energy, small, medium and micro enterprises (SMMEs), managing workplace conflict, attracting investments, growing the oceans economy and tourism. Cross-cutting areas such as science and technology, water and sanitation infrastructure, transport infrastructure and broadband roll-out have also been added.
- The mining sector generates mass employment opportunities which are mainly situated within the rural areas of the municipality. Although some key sectors of the municipality are slowly declining (due to international and national factors), the mining sector continues to grow.
- The activity of mining has numerous social and economic benefits in local, regional and national context. These include: 1. Job creation 2. Skills development 3. SMME development 4. Local economic development 5. Contribution to local and national tax income (royalties, companies' tax etc.) 6. Contribution to the national gross domestic product, and 7. Future business opportunities.
- Through the Wildebeestfontein Project, Wildebeestfontein Colliery is committed to delivering improvements in the social and human capacities of the people who will surround this operation, not only to maintain their social licence to operate, but to create real opportunities for socio-economic advancement.
- Decades distorted development in the area has manifested in highly skewed distribution of income and wealth. The unemployment rate is approximately 27.3 % in 2011 (Stats SA). The leading industry in terms of employment is trade with 21.1%, followed by mining 20.6% and manufacturing 14.2%. Since 2001 there has been an increasing role/share of mining, construction, community services & finance as employer and a decrease in the role/share of trade, manufacturing, transport, agriculture, private households and utility. To aid in combatting unemployment the local community will be consulted with regards to recruitment, bursaries, learnerships, etc. The local community will also form part of the Future Forum.
- A preliminary socio-economic survey and investigation will continue to be conducted in order to enable and empower the Mine Committee to develop a much needed programme of action with measurable activities and timeframes to implement its social responsibility plan once the mining right has been awarded. This programme will contribute to skills development, job creation and education opportunities, with a knock on effect of local economic development, and SMME development.

# 7. ALTERNATIVES ASSESSMENT

Refer to Annexure 4 where the final layout plan is provided in terms of the motivation provided below.

## 7.1 THE PROPERTY OR LOCATION

The site location is limited to the Prospecting Right Area, which is constrained by the location of other mining houses and residential areas. The resource location and the presence of a watercourse on the site boundary further restrict the infrastructure layout. Therefore, no alternative properties or locations were considered.

## 7.2 THE TYPE OF ACTIVITY TO BE UNDERTAKEN

Opencast or underground mining are the alternatives for the activity to be undertaken. Due to the shallow nature of the Coal seam the preferred alternative is Opencast Rollover mining. Opencast mining is a more economically viable method for the extraction of the largest amount of resource at such a shallow depth. This will also ensure a longer period of job creation and input into the local economic development.

| Description | Advantages | Disadvantages |
|---|---|---|
| **Mining Method Alternatives** | | |
| Underground board-and-pillar. | • Smaller footprint associated with surface disturbance.<br>• Alternative/current land uses can continue on areas not directly impacted by surface activities.<br>• Reduced impact on dust, noise and air quality.<br>• No blasting during operational phase.<br>• Reduced rehabilitation costs. | • Not economically viable as large pillars will remain.<br>• Risk of subsidence during operation.<br>• Risk of subsidence post-closure.<br>• Potential decrease in groundwater quantity and quality.<br>• Potential decrease in groundwater interaction with wetland.<br>• De-watering of the surrounding aquifer.<br>• Potential AMD post mining and closure phase.<br>• Potential undermining of aquifer.<br>• Drawdown of water levels of privately owned boreholes.<br>• Potential decrease in base flow to the streams and wetlands running through the MRA. |
| Opencast mining<br>(preferred method) | • Additional employment opportunities.<br>• Economically viable as more coal will be efficiently extracted.<br>• Increased LOM – extended employment opportunities.<br>• No subsidence risk during operation.<br>• No subsidence risk post-closure. | • Greater surface area disturbance.<br>• Change in land use required for all farm portions in the MRA.<br>• Decrease in agricultural area/cultivated land.<br>• Decrease in surface water runoff to catchment.<br>• Potential decrease in surface and ground water quantity and quality.<br>• Potential decrease in groundwater interaction with wetland.<br>• Increased dust generation.<br>• Increased blast and vibration impacts.<br>• Increased noise from the use of construction and mining machinery on surface during operations.<br>• Higher rehabilitation costs. |

## 7.3 THE DESIGN OR LAYOUT OF THE ACTIVITY

Refer to Section 7.1 above.

## 7.4 Operational aspects of the activity

Opencast Rollover mining is the preferred alternative for mining.

The other alternatives would be beneficiation on site or off site. Due to the limited space available on site, the preferred alternative will be to transport crushed and screened ROM to the Elandsfontein Colliery for further beneficiation. Therefore, no beneficiation plant will be required on site.

## 7.5 The Technology To Be Used In The Activity

Refer to section 7.4

## 7.6 The Option Of Not Implementing The Activity

The no-go option will result in the protection of the environment in situ and the continued use of the land for agricultural purposes. Not mining the area for coal will result in the sterilisation of the coal resource. The no-go option would also prevent the socioeconomic benefits, including the need for job creation, increased socio-economic activity and social upliftment. If Opsirex (Pty) Ltd does not proceed with the Mining Right Application, another company is almost certain to apply for the rights.

The following negative impacts will however be avoided should the project not go-ahead:

- Potential surface and groundwater pollution associated with the Olifants River Catchment;
- Loss of natural habitat and faunal disturbance;
- Loss of sensitive riparian habitats associated with identified wetland areas on site;
- Additional traffic loads and on the local road network;
- Increased noise and dust levels (PM10 and PM2.5);
- Potential decant of acid mine drainage during post closure (as a result of the sulphides) which may result in significant water quality modification;
- Lowering of the water table in the coal seam aquifer as a result of mine dewatering; and
- Loss of agricultural land/grazing land (current land use).

# 8. PUBLIC PARTICIPATION PROCESS (PPP)

## 8.1 Details Of The Public Participation Process Followed

Section 41 of NEMA Regulation 982 (specifically Chapter 6) set out the Legal and Regulatory Requirement for Public Participation. The Public Participation Process (PPP) aims to involve the authorities and I&APs in the project process, and determines their needs, expectations and perceptions which in turn ensures a complete and comprehensive environmental study. An open and transparent process will/has been followed at all times and is based on reciprocal dissemination of information. The following was/will be undertaken during the PPP:

- Identification of Interested and Affected Parties (IAPs);
- Consultation with selected landowners;
- Notification of IAPs regarding the proposed project via newspaper advert (in the Witbank News); the placing of 4 x site notices at conspicuous places, the sending of notices to affected parties via email (in the form of Background Information Documents) and sms'.
- A public information meeting (open day) with IAPs was held on 31 May 2019 at the eMalahleni Main Library and another will be held on 11 September 2019;
- Gathering comments, issues and concerns from IAPs;
- Responding to IAP comments, issues and concerns;
- Compilation and submission of results of consultation report to the DMR; and
- Providing IAPs with the opportunity to review and comment on the Draft Scoping and EIA Reports

Refer to the PPP report in Appendix 2for the full details of the PPP carried out to date.

## 8.2 Summary Of Landowner Consultation And Public Participation

### 8.2.1 Adjacent Landowners

Adjacent landowners were identified through windeed and other projects in the surrounding areas. These landowners were then notified of the project via email and sms notification. Adjacent landowners were further invited to comment on the project / reports, and to attend the Public Open Days where questions can be asked and answered and concerns raised.

### 8.2.2 Interested and Affected Parties

All other interested and affected parties (I&APs) were notified through the placement of site notices around the Project Area, and Advertisements placed in the Witbank News. I&APs were invited to comment on the Draft Reports and also to attend the Public open days.

### 8.2.3 Commenting Authority Consultation

Commenting Authorities were provided with a hard copy of the Draft Reports and urged to give comments on the project. The following Commenting Authorities were provided with reports:

| Department | Attention to |
|---|---|
| Department: Water Affairs - Bronkhorstspruit | Musa Lubambo |
| Mpumalanga Provincial Government DARDLEA | Ms. S.P. Xulu (HOD) |
| Nkangala District Municipality | Pierre Rossouw |
| eMalahleni LM | Erald Nkabinde |
| Mpumalanga Tourism and Park Agency | Komilla Narasoo |
| Department of Roads and Transport | Mr Mxolisi Cyril Dlamini |

| | |
|---|---|
| Department of Agriculture forestry and fisheries | Doreen Sithole |
| Mpumalanga Economic Development & Tourism | Mr PS Mohlala |
| Department of Mineral Resources (Competent Authority) | Registry |

## 8.3 Comment And Response Report

**Table 8.1: Summary of the issues raised by the various I&APs and the EAP's response/feedback thereto**

| Name Surname | Involvement | Method of comment | Comment | EAP Response |
|---|---|---|---|---|
| J. Meyer, Gert F. Meyer | Nearby Landowner | Open Day 31 May 2019 | The Meyer's are located on the catchment divide and therefore on the highest point in the immediate area. They are experiencing drawdown from the surrounding mines as the groundwater levels in their boreholes are lower than usual. Another mine will add to the drawdown effect and how will they be compensated for their loss in groundwater. | A detailed groundwater investigation is being undertaken and the impacts will be represented in the EIA. This will concur whether the drawdown from this mine will impact on the Meyer's boreholes. |
| | | | The Road that runs between Ogies and the Mine runs directly past their house. The traffic on this road will increase as more people are now going to travel from Ogies in the mines direction. The road is not made to carry so much traffic and the dust will increase. Will the road be upgraded to handle the traffic and minimise the dust? Does the mine know that South 23 wants to close and divert this road, they will be mining through it? | A detailed Traffic impact assessment will be undertaken for the EIA which will propose the correct mitigation measures to address the impacts. |
| | | | The wind blows in the direction of their farm and all the mine dust blows onto their farm. This mine will just add to the dust. | An Air Quality study is being undertaken to recommend mitigation measures to address these impacts. |
| Mr Nkkosinathi Mtsweni | Greater eMalahleni Youth Forum | Open Day 31 May 2019 | GEYF is a non-profit organisation that would like to join and participate in the SLP as they do community outreach programmes. The Mine needs to give the GEYF an opportunity and align the SLP/CSI projects to achieve goals and social objectives. | Once the Mine starts with construction the SLP will be implemented and the communities will be approached regarding job opportunities. |
| | | | They face a high rate of youth unemployment in the country they think this is one of the positive ways to reduce the unemployment rate in eMalahleni. They want to create job opportunities and skills development and empower the young people and build their capacity. | Once the Mine starts with construction the SLP will be implemented and the communities will be approached regarding job opportunities. |

**Table 8.2: Summary of the issues raised by the Commenting Authorities and the EAP's response/feedback thereto**

| Organisation | Name | Method of | Comment | EAP Response |
|---|---|---|---|---|

| | Surname | comment | | |
|---|---|---|---|---|
| Transnet | Thami Hadebe | email: official letter 15 May 2019 | Transnet is not affected by the proposed development. | Comment is noted. |
| eMalahleni Local Municipality | H S Mayisela | email: official letter 31 May 2019 | The proposed mine triggers activities of great magnitude and therefore is a serious threat to the environment in terms of general environmental degradation and elevated carbon footprint. | This comment is noted and therefore an application for an environmental authorisation has been submitted and an Environmental Management Plan will be compiled. |
| | | | The portion of land specified is no longer natural, and other mining activities in close proximity will add to the cumulative impact on the environment and human health in terms of noise, air pollution and soil pollution. | This will be addressed as part of the cumulative impact assessment of the EIA. |
| | | | The proposed application is supported subject to the following:<br>a. the applicant must submit a copy of a rezoning certificate;<br>b. the municipality is informed about blasting periods every time blasting should be undertaken;<br>c. the mine waste plan is in line with the municipality's waste management bylaws, especially in terms of waste transportation and disposal permits.<br>d. Alien invasive species be controlled and managed by the applicant.<br>e. Replant / replace / relocate indigenous vegetation that may be of importance or that is protected in the province if such vegetation cannot be avoided. | a. The rezoning application will be dealt with separately to this application.<br>b. The mine will inform all relevant parties of blasting.<br>c. Waste contractors will be contracted.<br>d. An alien invasive species management plan will be compiled once the mine is operational.<br>e. A vegetation management plan will be compiled once the mine is operational, as part of the rehabilitation plan. |

# 9. THE ENVIRONMENTAL ATTRIBUTES ASSOCIATED WITH THE SITES

## 9.1 SPECIALIST INVESTIGATIONS

The following specialist studies have been undertaken as part of the EIA process.

**Table 9.1: List of Specialists**

| Specialist Study | Appointed Specialist | Company |
|---|---|---|
| **Socio-Economic Impact Study** | Vumile Ribeiro | Niara Environmental Consultants (Pty) Ltd |
| **Air quality** | Neel Breitenbach | Eco Elementum (Pty) Ltd |
| **Aquatic Ecology** | Joppie Schrijvershof | Oasis Environmental Specialists (Pty) Ltd |
| **Visual Impact Assessment** | Neel Breitenbach | Eco Elementum (Pty) Ltd |
| **Noise Assessment** | Barend van der Merwe | dB Acoustic (Pty) Ltd |
| **Blasting and Vibration** | Marica Pretorius | Big C Rock Engineering |
| **Ecological** | Ferdie Nieman | Esimeme (Pty) Ltd |
| **Geo-hydrological** | Elida Naude | Eco Elementum (Pty) Ltd |
| **Surface water** | Jaco Badenhorst | J B Umwelttecknick |
| **Wetland** | Joppie Schrijvershof | Oasis Environmental Specialists (Pty) Ltd |
| **Heritage, Archaeological, and Paleo** | Tobias Coetzee | Mr. Tobias Coetzee |
| **Soils, land use and land capability** | Mariné Pienaar | Terra Africa |

## 9.2 Description Of The Current Land Uses

The current land use for the project area is agriculture (crop production) and grazing with Mining activities directly adjacent to the North, East and South of the Project and urbanisation and informal settlement to the West of the project area.

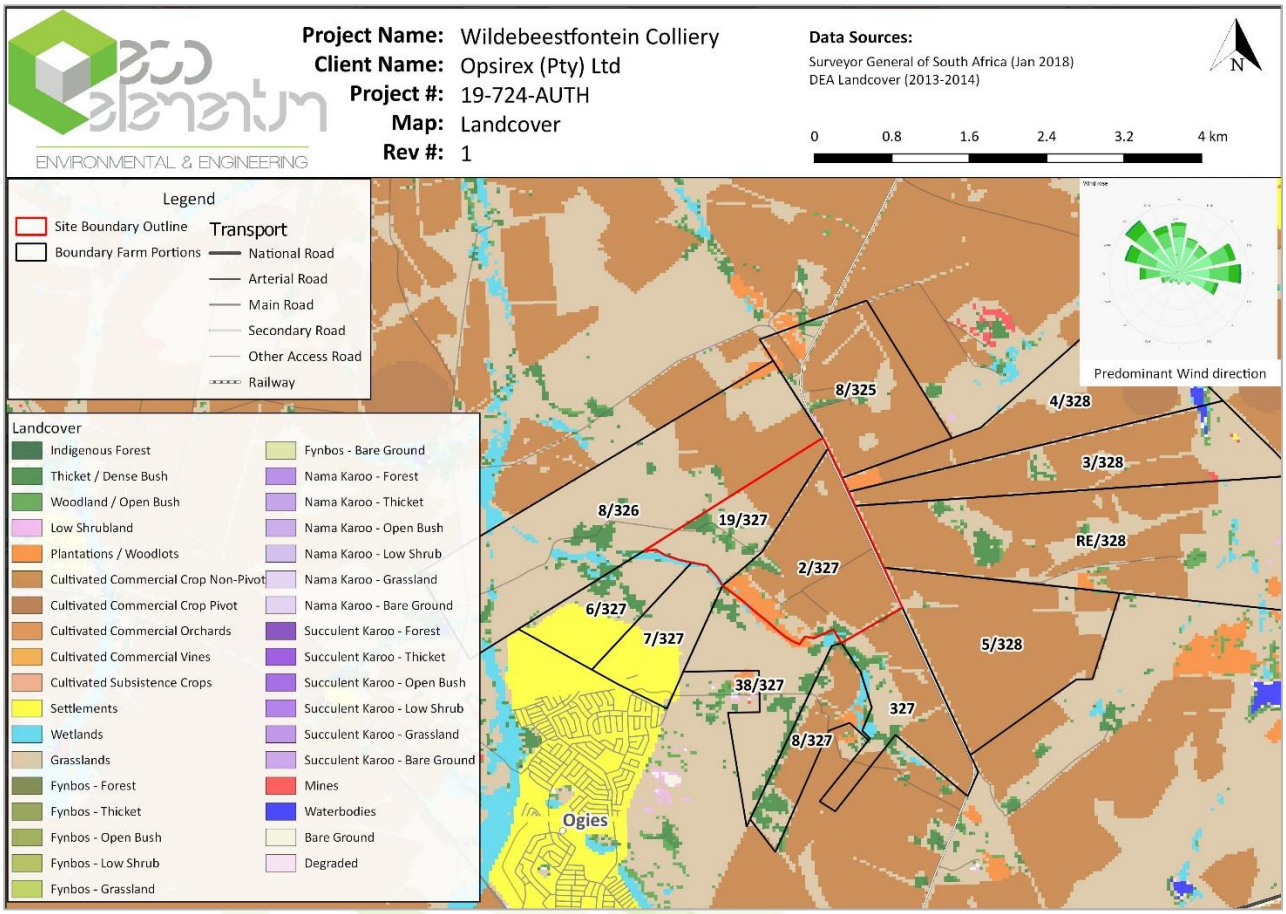


**Figure 9.1: Landcover of the project area**

### 9.2.1 Land Conversion

The land use patterns of the surrounding area are defined as a mixture between agriculture, mining with intermittent residential and business use. Since the proposed new mining operations will consist of opencast mining, the land use in these areas will change from agriculture to mining. The areas where the pit, site infrastructure and stock piles will be located will be sterilized from agriculture. High production areas should be avoided as far as possible.

## 9.3 Type Of Environment Affected By The Proposed Activity

### 9.3.1 Climate and Air Quality

*Information for this field were taken from the Air Quality Impact Assessment for Wildebeestfontein Colliery done by Eco Elementum (Pty) Ltd*

#### *9.3.1.1 Climate*

Strongly seasonal summer rainfall, with very dry winters. MAP 650–900 mm (overall average: 726 mm), MAP relatively uniform across most of this unit, but increases significantly in the extreme southeast. The coefficient of variation in MAP is 25% across most of the unit, but drops to 21% in the east and southeast. Incidence of frost from 13–42 days, but higher at higher elevations.

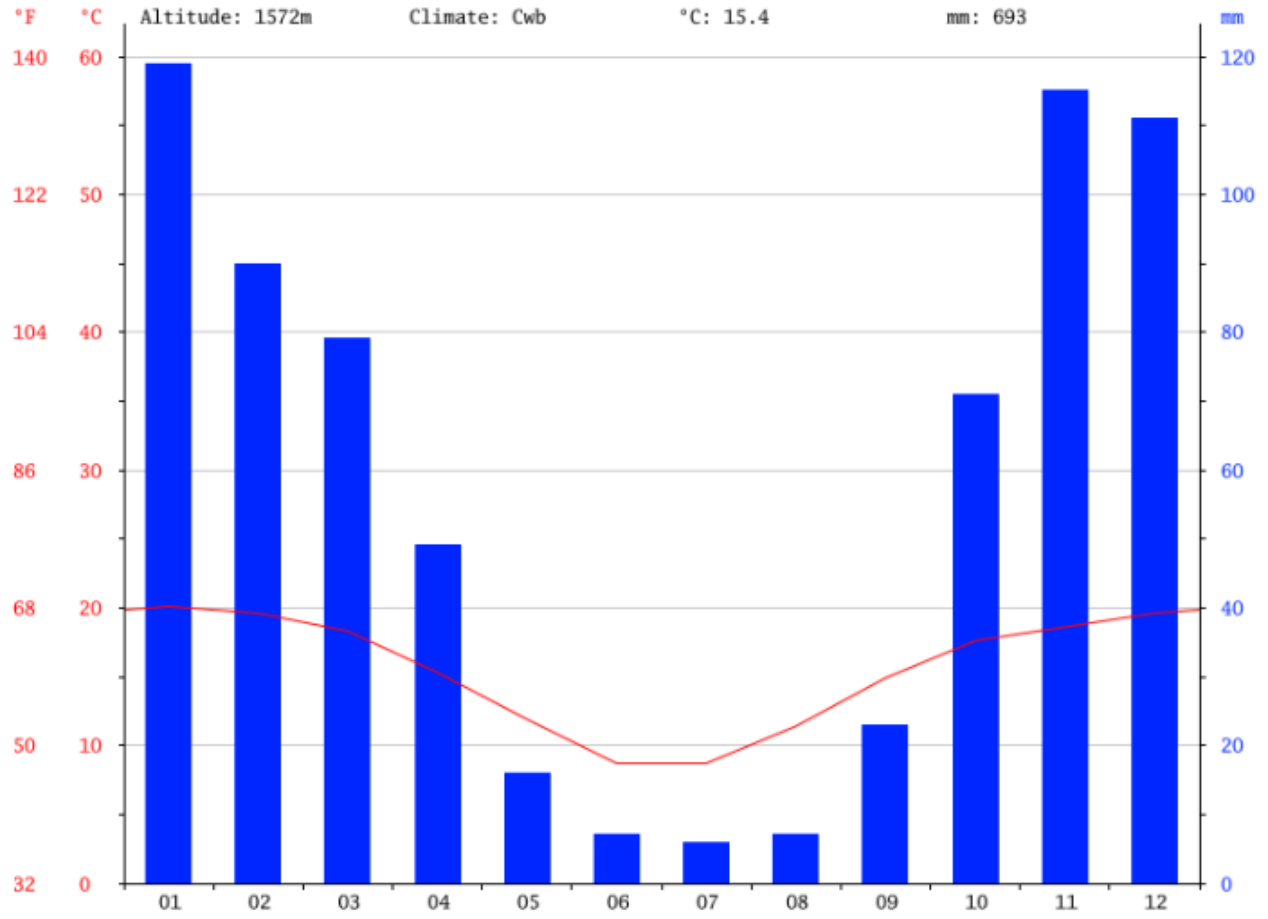


**Figure 9.2: Average Climate Graph by month for eMalahleni**

| | January | February | March | April | May | June | July | August | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Avg. Temperature (°C) | 20.1 | 19.6 | 18.3 | 15.3 | 11.9 | 8.7 | 8.7 | 11.4 | 14.9 | 17.6 | 18.6 | 19.6 |
| Min. Temperature (°C) | 13.6 | 13.2 | 11.5 | 7.8 | 3.4 | -0.3 | -0.4 | 2.1 | 6.2 | 10 | 11.8 | 13.1 |
| Max. Temperature (°C) | 26.6 | 26.1 | 25.2 | 22.9 | 20.4 | 17.8 | 17.8 | 20.7 | 23.7 | 25.3 | 25.4 | 26.2 |
| Avg. Temperature (°F) | 68.2 | 67.3 | 64.9 | 59.5 | 53.4 | 47.7 | 47.7 | 52.5 | 58.8 | 63.7 | 65.5 | 67.3 |
| Min. Temperature (°F) | 56.5 | 55.8 | 52.7 | 46.0 | 38.1 | 31.5 | 31.3 | 35.8 | 43.2 | 50.0 | 53.2 | 55.6 |
| Max. Temperature (°F) | 79.9 | 79.0 | 77.4 | 73.2 | 68.7 | 64.0 | 64.0 | 69.3 | 74.7 | 77.5 | 77.7 | 79.2 |
| Precipitation / Rainfall (mm) | 119 | 90 | 79 | 49 | 16 | 7 | 6 | 7 | 23 | 71 | 115 | 111 |

**Figure 9.3: eMalahleni weather by month**

### *9.3.1.2 Baseline Air Quality*

*The following baseline information was sourced from the* ***Baseline Assessment, Problem Analysis and the Air Quality Management Plan for the Highveld Priority Area (2011).***

The Highveld area in South Africa is associated with poor air quality, and elevated concentrations of criteria pollutants occur due to the concentration of industrial and nonindustrial sources (Held et al, 1996; DEAT, 2006). The Minister of Environmental Affairs and Tourism, Martinus van Schalkwyk, therefore, declared the Highveld Priority Area (HPA) on 23 November 2007. The priority area covers 31 106 km$^2$, including parts of Gauteng and Mpumalanga Provinces, with a single metropolitan municipality, three district municipalities, and nine local municipalities (Figure 9.4).

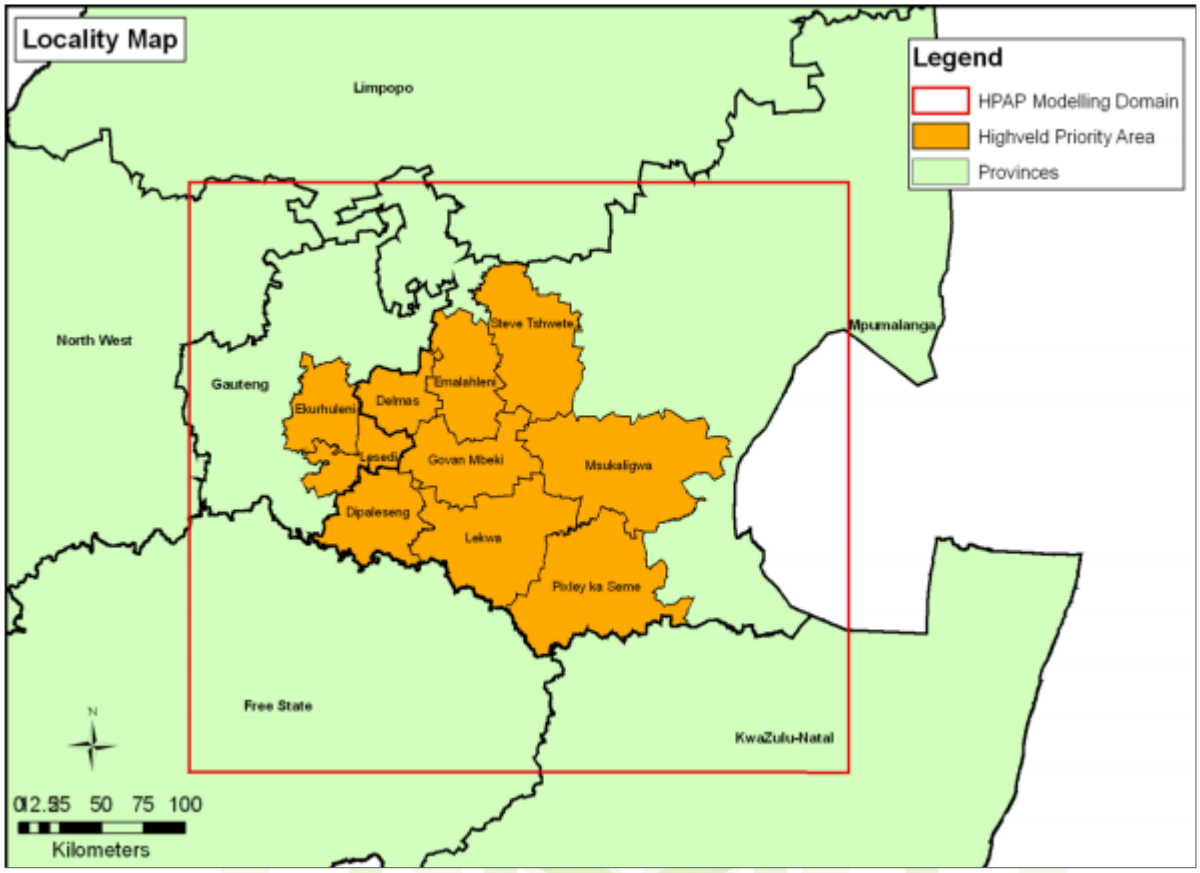


**Figure 9.4: Highveld Priority Areas (HPA)**

The total estimated annual emissions of fine particulate matter ($PM_{10}$) on the HPA is 279 630 tons, of which approximately half is attributed to particulate entrainment on opencast mine haul roads. The emission of $PM_{10}$ from the primary metallurgical industry accounts for 17% of the total emission, with 12% of the total from power generation. By contrast, power generation contributes 73% of the total estimated oxides of nitrogen ($NO_x$) emission of 978 781 tons per annum and 82% of the total estimated sulphur dioxide ($SO_2$) emission of 1 633 655 tons per annum. The emission inventory for industrial sources was relatively complete and included all industries on the HPA with scheduled processes in terms of the APPA. Industrial sources in total are by far the largest contributor of emissions in the HPA, accounting for 89% of $PM_{10}$, 90% of $NO_x$ and 99% of $SO_2$. Major industrial source contributors were grouped into the following categories:

- Power Generation
- Coal Mining
- Primary Metallurgical Operations
- Secondary Metallurgical Operations
- Brick Manufacturers
- Petrochemical Industry
- Ekurhuleni Industrial Sources
- Mpumalanga Industrial Sources

**Table 9.2: Total emission of $PM_{10}$, $NO_x$ and $SO_2$ from the different source types on the HPA (in tons per annum), and the percentage contribution for each source category**

| Source Category | $PM_{10}$ t/a | % | $NO_x$ t/a | % | $SO_2$ t/a | % |
|---|---|---|---|---|---|---|
| Ekurhuleni MM Industrial (incl. Kelvin) | 8909 | 3,00 | 15 636 | 2 | 25 772 | 2 |
| Mpumalanga Industrial | 684 | 0,00 | 590 | 0 | 5 941 | 0 |
| Clay Brick Manufacturing | 9708 | 3,00 | - | | 9 963 | 1 |
| Power Generation | 34373 | 12,00 | 716 719 | 73 | 1 337 521 | 82 |
| Primary Metallurgical | 46805 | 17,00 | 4 416 | 0 | 39 582 | 2 |
| Secondary Metallurgical | 3060 | 1,00 | 229 | 0 | 3 223 | 0 |
| Petrochemical | 8246 | 3,00 | 148 434 | 15 | 190 172 | 12 |
| Mine Haul Roads | 135766 | 49,00 | - | | - | - |
| Motor vehicles | 5402 | 2,00 | 83 607 | 9 | 10 059 | 1 |
| Household Fuel Burning | 17239 | 6,00 | 5 600 | 1 | 11 422 | 1 |
| Biomass Burning | 9438 | 3,00 | 3 550 | 0 | - | - |
| **TOTAL HPA** | **279630** | **99*** | **978781** | **100** | **1633655** | **101*** |

* *Total Percentage does not count to 100% due to rounding of figures.*

### *9.3.1.3 Ambient air quality*

Most of the HPA experiences relatively good air quality, but ambient air quality standards for $SO_2$, $PM_{10}$ and ozone ($O_3$) concentrations are exceeded in nine extensive areas. These "hot spots" are illustrated in Figure 9.4 by the number of modelled exceedances of the 24-hour $SO_2$ and $PM_{10}$ standards, and are confirmed by ambient monitoring data (Table 9.3). The air quality hot spots result mostly from a combination of emissions from the different industrial sectors and residential fuel burning, with motor vehicle emissions, **mining** and cross boundary transport of pollutants into the HPA adding to the base loading.

Available monitoring confirms that the areas of concern are in the vicinity of **Witbank 2**, Middelburg, Secunda, Ermelo, Standerton, Balfour, and Komati where exceedances of ambient $SO_2$ and $PM_{10}$ air quality standards occur (Table 9.3).

**Table 9.3: Exceedances at HPA sites based on historic and new monitoring data**

| Municipality | Area | $NO_2$ *1-hr (88)* | $O_3$ *8-hr (11)* | $PM_{10}$ *24-hr (4)* | $SO_2$ *24-hr (4); 1-hr (88)* |
|---|---|---|---|---|---|
| **Emalahleni LM** | Kendal 2 | 1 | **58** | | **34; 343** |
| | Phola | 0 | | 3 | 7; 27 |
| | **Witbank** | 37 | 9 | **9** | **4**; 51 |

| Municipality | Area | $NO_2$ *1-hr (88)* | $O_3$ *8-hr (11)* | $PM_{10}$ *24-hr (4)* | $SO_2$ *24-hr (4); 1-hr (88)* |
|---|---|---|---|---|---|
| | **Witbank 2** | | **17** | **25** | 1; 11 |
| Steve Tshwete LM | Columbus | | | | |
| | Komati 2 | | | **26** | 1; 14 |
| | Hendrina | 1 | **22** | 3 | 1; 2 |
| | Middelburg | 71 | **60** | **7** | 1; 4 |
| | Middelburg 2 | | 1 | **7** | 0; 1 |
| Govan Mbeki LM | Sasol Club | 1 | | 0 | 0; 25 |
| | Langverwacht | 1 | | 0 | 2; 78 |
| | Bosjesspruit | | | | 2; 27 |
| | Elandsfontein | 0 | **73** | 3 | 4; 33 |
| | Leandra | | | | 6; 114 |
| | eMbalenhle | 2 | 4 | **39** | 0; 1 |
| Msukaligwa LM | Camden | 0 | **24** | 1 | 0; 4 |
| | Ermelo | 1 | **73** | **22** | **21**; 10 |

| Municipality | Area | $NO_2$ *1-hr (88)* | $O_3$ *8-hr (11)* | $PM_{10}$ *24-hr (4)* | $SO_2$ *24-hr (4); 1-hr (88)* |
|---|---|---|---|---|---|
| Pixley Ka Seme LM | Amersfoort | | | | |
| | Majuba 1 | | | | 4; 87 |
| | Majuba 2 | | | | |
| | Verkykkop | 0 | **46** | 0 | 1; 7 |
| Lekwa | Standerton | 4 | 10 | **29** | 1; 6 |
| Dipaleseng | Balfour | | **29** | **8** | 0; 4 |

***NB. - Row 1: The averaging period for the relevant pollutant's standard is represented below the pollutant and following the allowed frequency of exceedance in brackets - Exceedances in bold are greater than the permitted frequency in the standard for the monitoring period. The permitted frequency of exceedance varies according to period for which data is presented at each monitoring site, and for Eskom and Sasol stations must be assessed against a cumulative permitted frequency of exceedance for 3 years of data.***

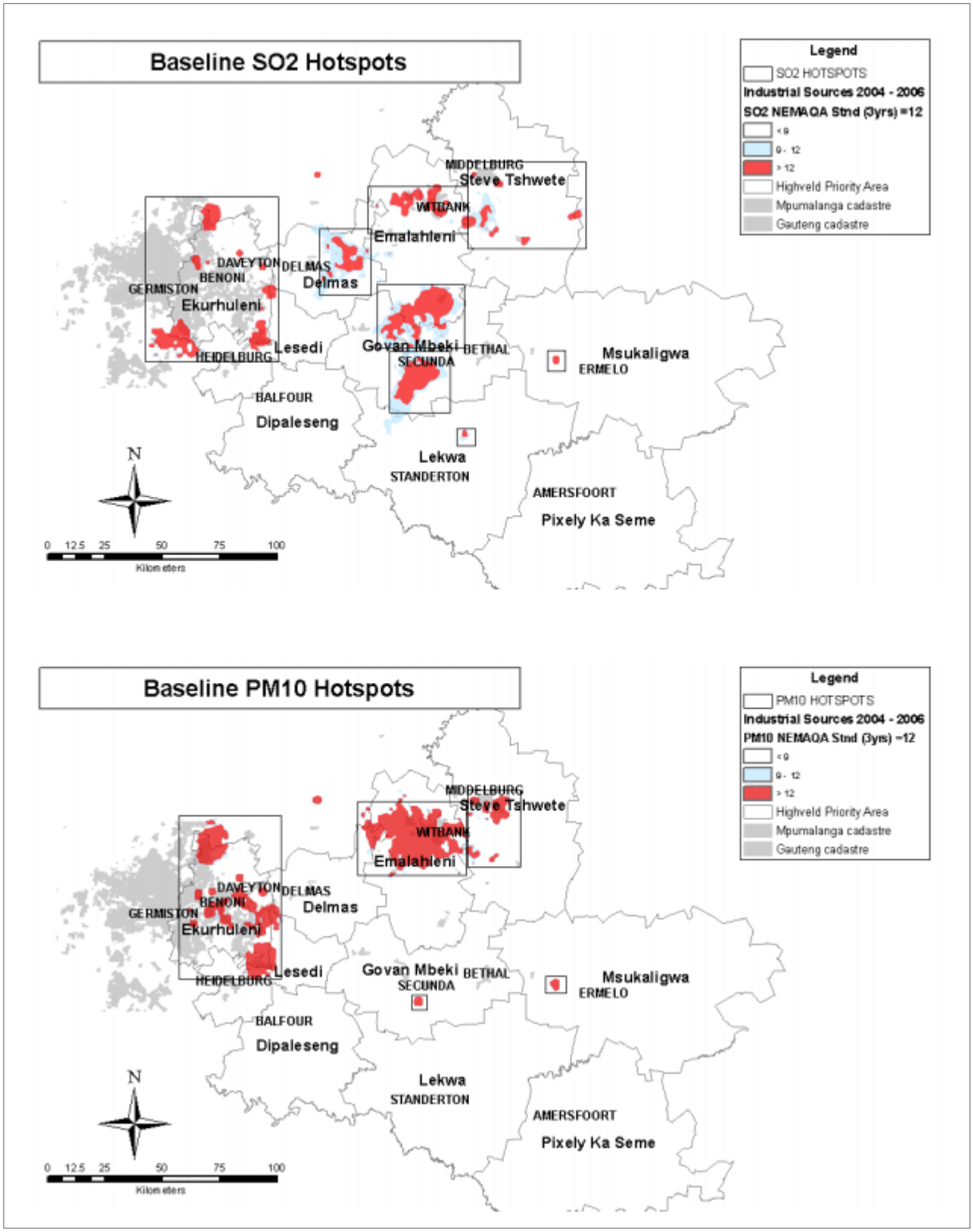


**Figure 9.5: Modelled frequency of exceedance of 24-hour ambient $SO_2$ and $PM_{10}$ standards in the HPA, indicating the modelled air quality Hot Spot areas**

### 9.3.1 Topography

Eastern Highveld Grassland is characterised by slightly to moderately undulating plains, including some low hills and pan depressions with an altitude 1 520–1 780 m.

Rand Highveld Grassland is characterised by areas between rocky ridges from Pretoria to Witbank, extending onto ridges in the Stoffberg and Roossenekal regions as well as west of Krugersdorp centred in the vicinity of Derby and Potchefstroom, extending southwards and north-eastwards from there. The altitude ranges from 1 300–1 635 m.

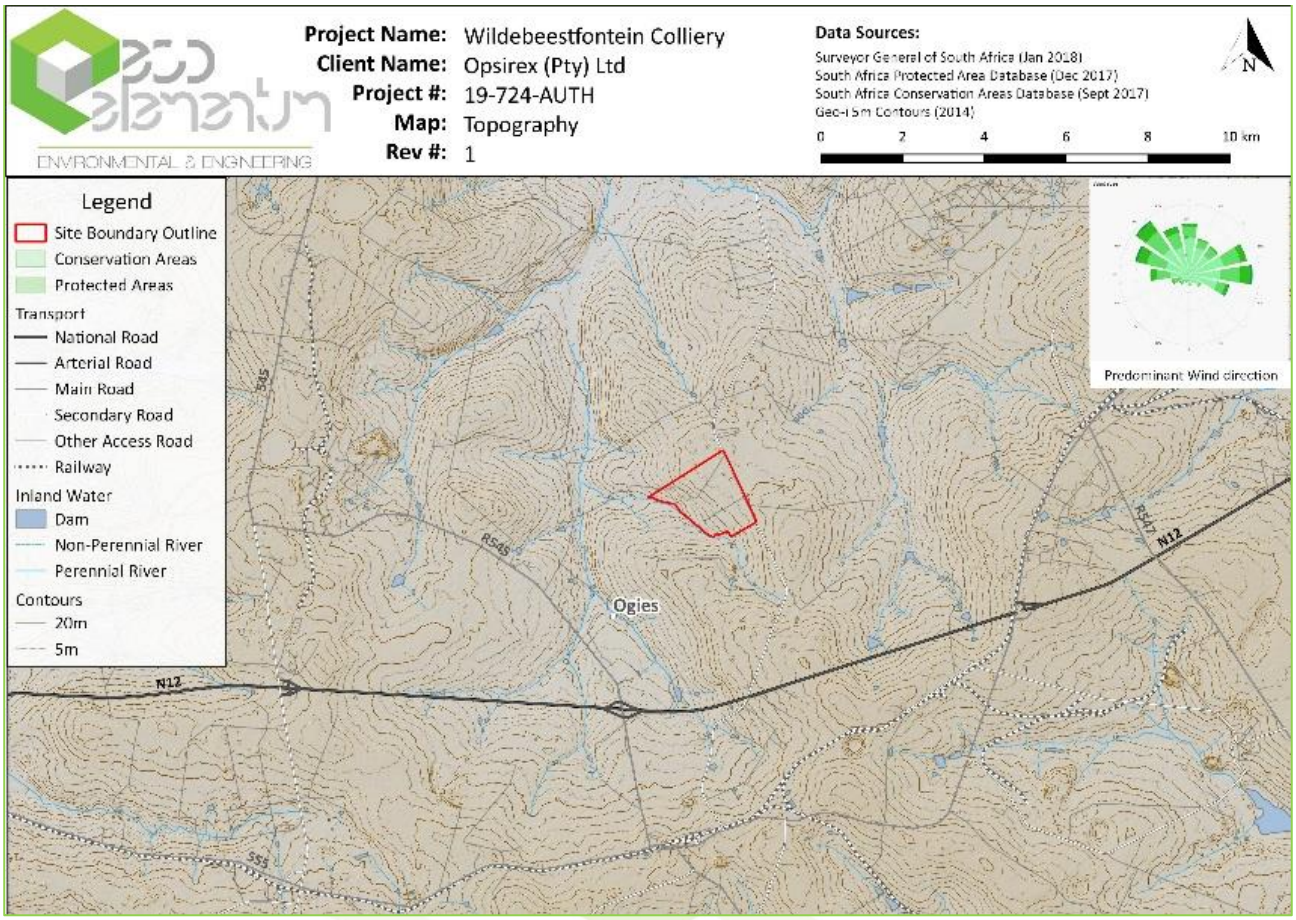


**Figure 9.6: Site topography**

### 9.3.2 Soil Forms and Land Capability

*Soil, land use, land capability and agricultural potential study for the Wildebeestfontein colliery project, Mpumalanga (Terra Africa, 2019).*

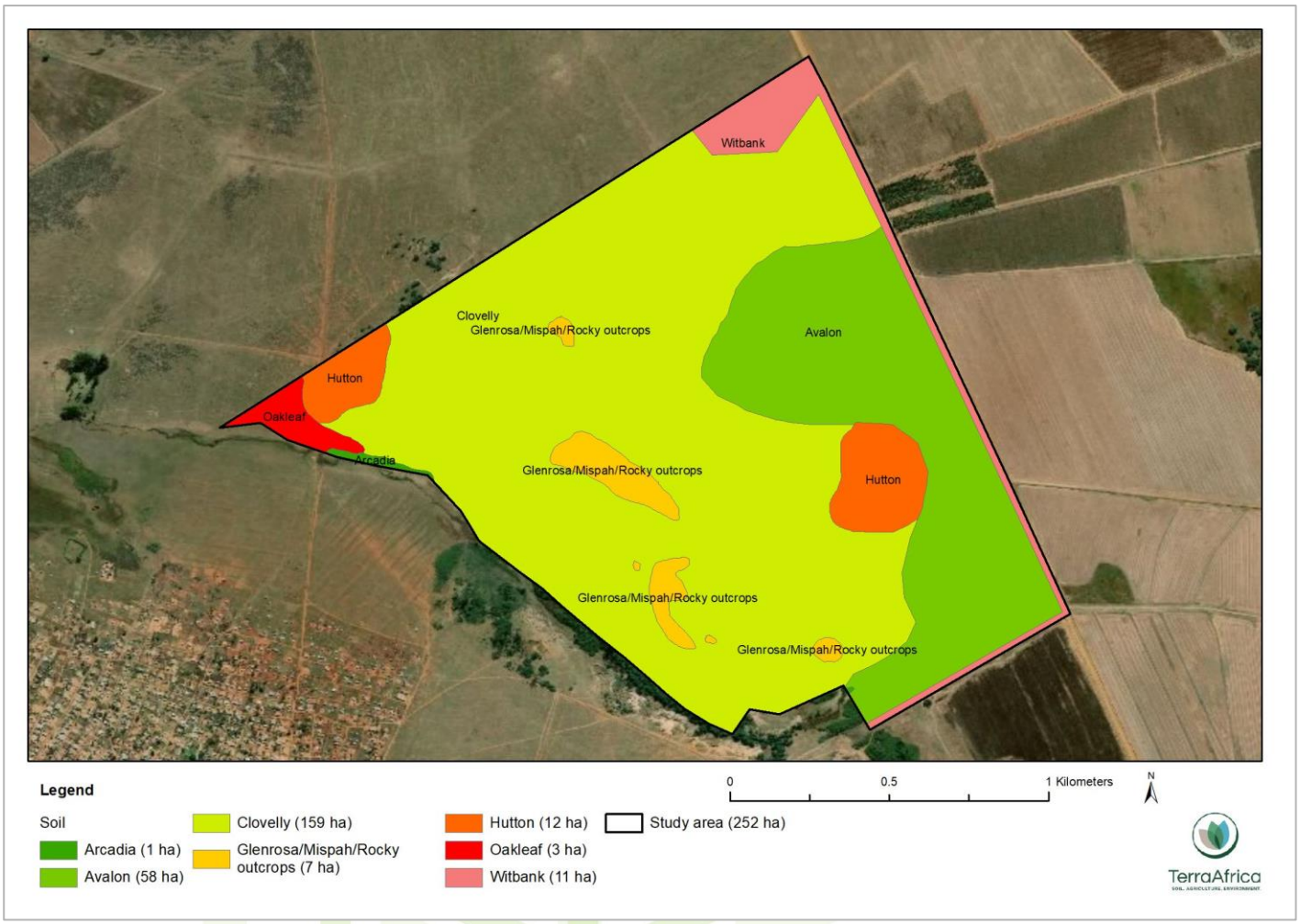


**Figure 9.7: Soil Classification for the project area**

### *9.3.2.1 Land capability and agricultural potential:*

A large portion of the site has high arable land capability with a smaller section that has good grazing land capability. The largest portion of the site has high agricultural potential and is suitable for a variety of dryland crops such as maize, soy beans and groundnuts. The area currently begin grazed showed signs of overgrazing but this can be restored when good veld management is implemented.

### *9.3.2.2 Land Types*

The most prevalent soil form on site is the Clovelly profiles that consist of yellow-brown, sandy loam to sandy clay-loam soil overlying unspecified material at varying depths. Clovelly profiles in the south-western and western parts are shallower (between 0,3 and 0,8 m deep) while the deepest profiles are found in the crop field where are profiles are up to 1,8 m deep. The Avalon soil form that is also present in the crop field area, consists of yellow-brown apedal soil underlain by soft plinthic material. The soft plinthite is an indication of wetter soil profiles where water accumulate and can still be available for crop roots during the following growing season. The soft plinthic material on site occurs deeper than 0,5m and do not indicate wetlands on site.

Other soil forms present include Oakleaf, Hutton and Arcadia forms. A few smaller patches of lithic, shallow rocky soils have also been identified and grouped together (soil of the Glenrosa and Mispah forms interspersed with rock outcrops on the surface). The area where the road is present as well as the area where soil is currently stockpiled, has been classified as the Witbank form which indicates the changes to the in situ profiles as a result of anthropogenic activities.

#### *9.3.2.3 Land Use*

The crops that were cultivated during the growing season was already harvested when the site visit was conducted. Evidence was found on site that the last crop was soy beans. The western part of the site has a community cattle feedlot which consist of several small units used by individual owners.

### 9.3.3 Surface Water

The Wildebeestfontein colliery is located at the headwaters of the B20G quaternary catchment which is in the Wilge River catchment of the Olifants Water Management Area (WMA).

The project is located in the Upper Olifants River catchment and there are a large number of defunct mines scattered over the Wilge, Middelburg Dam and Witbank Dam catchments. The DWS report (DWAF, 2009) has reiterated on the deteriorating water quality, where Total Dissolved Solids (TDS) and sulphate concentrations in the Witbank, Middelburg and Loskop Dams have been increasing since 1970. Owing to the impacts, it is imperative that the DWS developed water management strategies. Hence the development of the Integrated Water Resource Management Plan for the Upper and Middle Olifants Catchment in 2009 (DWAF, 2009) which was responsible for setting up the Resource Water Quality Objectives (RWQO) used in this assessment. The project area lies in the greater Wilge River Catchment, which is upstream of the Loskop Dam Catchment. The confluences of the Klein Olifants, Spookspruit, Klipspruit and Wilge Rivers with the Olifants River are between Witbank and Loskop Dams.

#### *9.3.3.1 Water Use*

According to the Department of Water and Sanitation (DWS) water use database (WARMS), the main use of water in the catchment area is for agricultural irrigation and mining. Other uses identified in the area include:

- Domestic use, mainly limited to informal communities that use water for bathing and laundry, but the potential exist that the water could be used for drinking;
- Livestock watering for cattle and game.; and
- Irrigation of land. There are 36 registered users of which 98% is for irrigation use and the remaining 2% is used for mining purposes.

### 9.3.4 Groundwater

#### *9.3.4.1 Unsaturated Zone*

The unsaturated zone is the zone between the ground surface and the static water table. In the unsaturated zone the pores between the ground particles are filled with air and water- thus below saturation. No water levels could be measured in the hydrocensus boreholes since they were both equipped with a pump. Static water levels in the region of the Wildebeestfontein Colliery as obtained from the studies conducted in the nearby region, range between 4 to 25 mbs, therefore also the thickness of the unsaturated zone. The unsaturated zone may consist of soil, weathered bedrock and even solid bedrock from the sandstone and shale of the Ecca Group.

#### *9.3.4.2 Saturated Zone*

The saturated zone is that part of the aquifer below the regional static water level where all pores and fractures are filled with water at a pressure greater than atmospheric pressure. The depth of the saturated zone in the Wildebeestfontein Colliery area, is therefore more than 4 to 25 mbs. Geohydrological studies compiled for mining areas in the close vicinity of Wildebeestfontein indicated that the saturated zone consists of two main aquifer systems.

- Firstly, the weathered, unconfined aquifer that typically occurs on the transition between soil and weathered bedrock (typically sandstone and shale). The groundwater flow closely mimics the surface topography. Groundwater levels are usually shallow in the low lying topographical regions and may even daylight on surface which is referred to as springs. The weathered aquifer is more prominent in the wet season because it is located on top of solid bedrock or clayey layers. This aquifer normally has a low yield.

- The second aquifer is known as the deeper, confined aquifer. Flow in this aquifer mainly occurs along fractures, bedding planes and other groundwater flow paths. The presence of fractures generally decreases with depth in this aquifer. The secondary aquifer, due to its heterogeneous nature, may be higher yielding than the weathered aquifer.

A third very deep aquifer system may also be present: the pre-Karoo aquifer in the basement geology. This aquifer is not frequently intersected during drilling and will not have an influence on the much shallower proposed opencast activities.

### *9.3.4.3 Hydraulic Conductivity*

Hydraulic conductivity refers to the ease with which water passes through a porous medium in a certain time under a hydraulic gradient (m/d). Hydraulic Conductivity (K) can be determined as:

$$K = \frac{\text{Transmissivity (T)}}{\text{Aquifer thickness (d)}}$$

Aquifer testing were conducted on nine boreholes at Elandsfontein Colliery during the 2018 study by Digby Wells. As mentioned previously, the aquifer characteristics at Wildebeestfontein Colliery is expected to be very similar than at Elandsfontein Colliery due to its close proximity. The hydraulic conductivity was estimated with these tests to be an average of 0.05 m/d.

### *9.3.4.4 Groundwater vulnerability*

Groundwater vulnerability refers to the likelihood for contamination to reach a certain area/receptor after it has been introduced to the surface. For the Wildebeestfontein Colliery area the vulnerability was estimated from the Aquifer Vulnerability map of South Africa (DWA, 2013) and by the Groundwater Vulnerability Classification System. According to the Aquifer Vulnerability map the Wildebeestfontein Colliery is located in a moderate vulnerability rating area. Therefore, an area that if continuously exposed to contamination may be vulnerable to some pollutants.

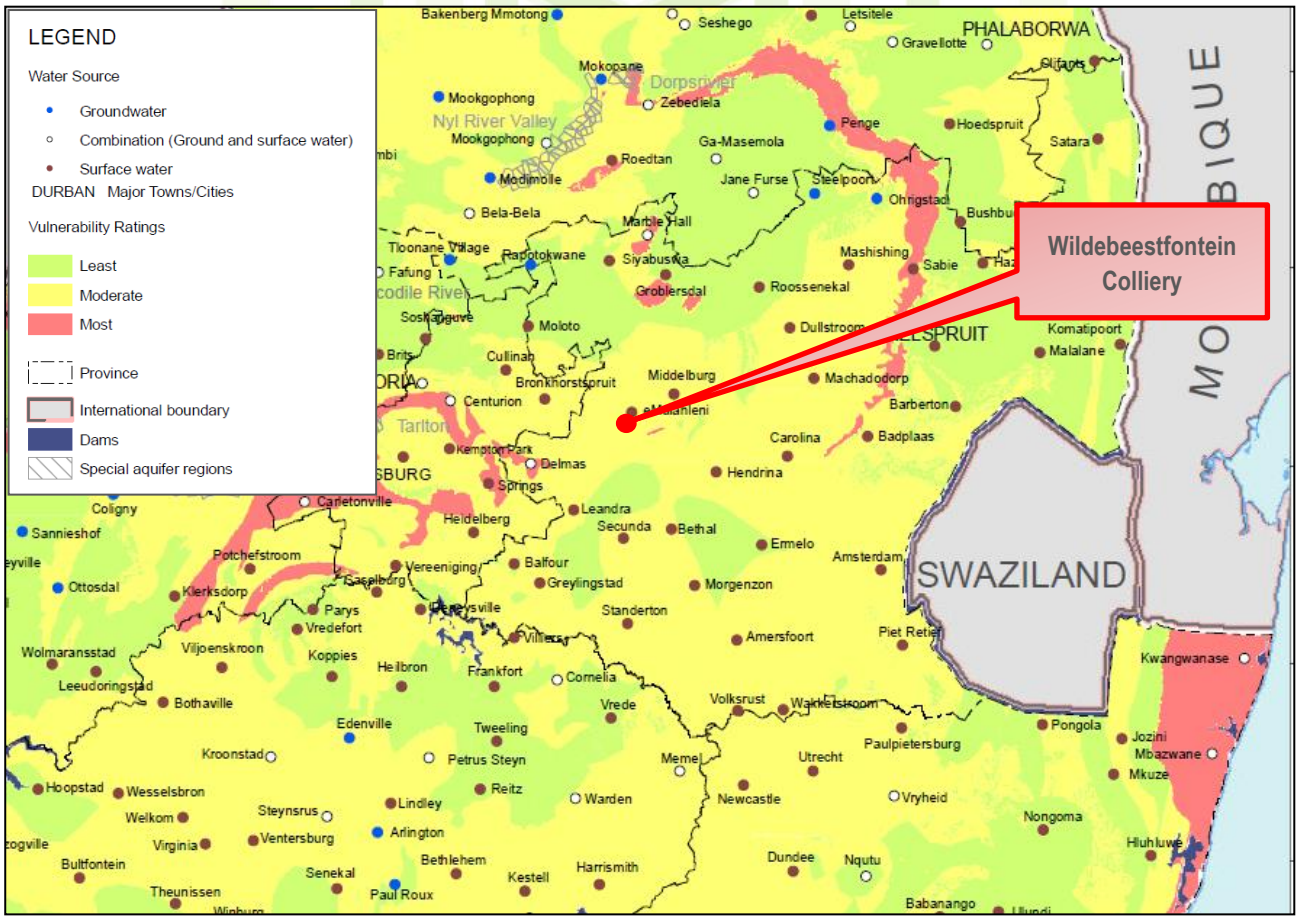

**Figure 9.8: Aquifer vulnerability rating of the proposed Wildebeestfontein Colliery (DWA, 2013)**

The Groundwater Vulnerability Classification System incorporates the Parsons Aquifer Classification System and the drinking water guidelines from the Department of Water Affairs and Forestry.

**Table 9.4: Groundwater Vulnerability Classification System**

| Rating | Depth to Water Level | Groundwater Quality | Aquifer Type- Parsons |
|---|---|---|---|
| 1 | > 10 m | Poor (TDS > 2 400 mg/l) | Non-Aquifer System |
| 2 | 6 – 10 m | Marginal (TDS > 1 000 < 2 400 mg/l) | Minor Aquifer System |
| 3 | 3 – 6 m | Good (TDS > 450 < 1 000 mg/l) | Major Aquifer System |
| 4 | 0 – 3 m | Excellent (TDS < 450 mg/l) | Sole Aquifer System |

**Table 9.5: Groundwater Vulnerability Rating**

| Rating | Vulnerability |
|---|---|
| ≤ 4 | Low |
| > 4 ≤ 8 | Medium |
| ≥ 9 | High |

**Table 9.6: Groundwater Vulnerability for Wildebeestfontein Colliery.**

| Rating | |
|---|---|
| Depth to water level | 2 |
| Groundwater quality | 4 |
| Aquifer Type | 2 |
| **Total Score** | **8** |

According to the Groundwater Vulnerability Classification System, the Wildebeestfontein Colliery aquifer scored a rating of 8 which is indicative of a medium vulnerability. Due to many of the groundwater qualities in terms of TDS concentrations being excellent, the aquifer in some areas may even be highly vulnerable.

#### *9.3.4.5 Aquifer Classification*

According to the Aquifer Classification map (DWA, 2012), the Wildebeestfontein Colliery is situated in a **minor** aquifer classification area. Aquifer classification is based on the Parsons System (1995). Qualities in these aquifers can vary and is typically moderately yielding aquifers.

**Table 9.7: Aquifer System Management Classes.**

| | |
|---|---|
| **Sole Aquifer System** | An aquifer that is used to supply 50% or more of domestic water for a given area, and for which there is no reasonably available alternative sources should the aquifer be impacted upon or depleted. Aquifer yields and natural water quality are immaterial. |
| **Major Aquifer System** | Highly permeable formation, usually with a known or probable presence of significant fracturing. They may be highly productive and able to support large abstractions for public supply and other purposes. Water quality is generally very good (less than 150 mS/m). |
| **Minor Aquifer System** | These can be fractured or potentially fractured rocks that do not have a primary permeability, or other formations of variable permeability. Aquifer extent may be limited and water quality variable. Although these aquifers seldom produce large volumes of water, they are important both for local suppliers and in supplying base flow for rivers. |
| **Non-Aquifer System** | These are formations with negligible permeability that are generally regarded as not containing groundwater in exploitable quantities. Water quality may also be such that it renders the aquifer |

| | |
|---|---|
| | unusable. However, groundwater flow through such rocks, although impermeable, does take place, and needs to be considered when assessing the risk associated with persistent pollutants. |
| **Special Aquifer System** | An aquifer designated as such by the Minister of Water Affairs, after due process. |

Two aquifer systems are expected to exist in the Wildebeestfontein Colliery area. Firstly, is a swallow, weathered aquifer which is found in the transitional soil and weathered bedrock zone. Due to direct recharge and dynamic groundwater flow through the weathered sediments, the natural groundwater qualities are often good. The direct recharge and dynamic groundwater flow are also the reason why this aquifer is vulnerable to pollution. Water levels in this aquifer are often shallow (few meters below ground level) and follow the surface topography.

Secondly is a deeper semi-confined to confined fractured aquifer where groundwater flow is predominantly fracture flow. The fractured Karoo aquifer consists of sedimentary successions of siltstone, shale, sandstone and the coal seams. Groundwater flow is dominated by secondary porosities like faults, fractures, joints, bedding planes or other geological contacts. Yields can be higher in this aquifer along these geological structures. The rock matrix is characterised by a low permeability. Borehole yields in the in the Ecca aquifers are generally low and can be expected to be less than 2 l/s.

#### *9.3.4.6 Aquifer Protection Classification*

As part of policy and regulation development and implementation, the aquifer classification used in Table 9.7 alone is not sufficient. To minimise misinterpretation, the decision support tool in Table 9.8 also needs to be incorporated as part of aquifer classification (Parsons, 1995). The combination of the Aquifer System Management Classification and the Aquifer Vulnerability Classification rating is referred to as the Groundwater Quality Management (GQM) classification, which provide a level of aquifer protection.

**GQM = Aquifer System Management x Aquifer Vulnerability**

**Table 9.8: GQM Classification for the Wildebeestfontein Colliery.**

| Aquifer System Management Classification | | Aquifer Vulnerability Classification | | GQM | | GQM |
|---|---|---|---|---|---|---|
| **Class** | **Points** | **Class** | **Points** | **Index** | **Level of protection** | **Wildebeestfontein Colliery** |
| Sole Source Aquifer System | 6 | High | 3 | <1 | Limited | 6 |
| Major Aquifer System | 4 | | | 1 - 3 | Low | |
| Minor Aquifer System | 2 | Medium | 2 | 3 - 6 | Medium | |
| Non-aquifer System | 0 | Low | 1 | 6 - 10 | High | |
| Special Aquifer System | 0-6 | | | >10 | Strictly non-degradation | |

The level protection for the Wildebeestfontein Colliery according to the GQM Index is 6. This indicates a medium level of protection. Based on the findings of the geohydrological study it is highly recommended that a proposed monitoring protocol should be in place for the proposed project area.

The DWA has also compiled a susceptibility map for South Africa (2013). This map indicates the qualitative measure of the relative ease with which an aquifer can potentially be contaminated. According to the aquifer susceptibility map, the Wildebeestfontein Colliery is also classified as medium susceptible to contamination.

#### *9.3.4.7 Groundwater Elevation Gradient*

Groundwater within the Wildebeestfontein Colliery model area decrease from approximately 1 597 mamsl (southern boundary of the Wildebeestfontein Colliery model) to 1 458 mamsl north of the model area (Figure 9.10). Groundwater gradients over the area is approximately 1%.

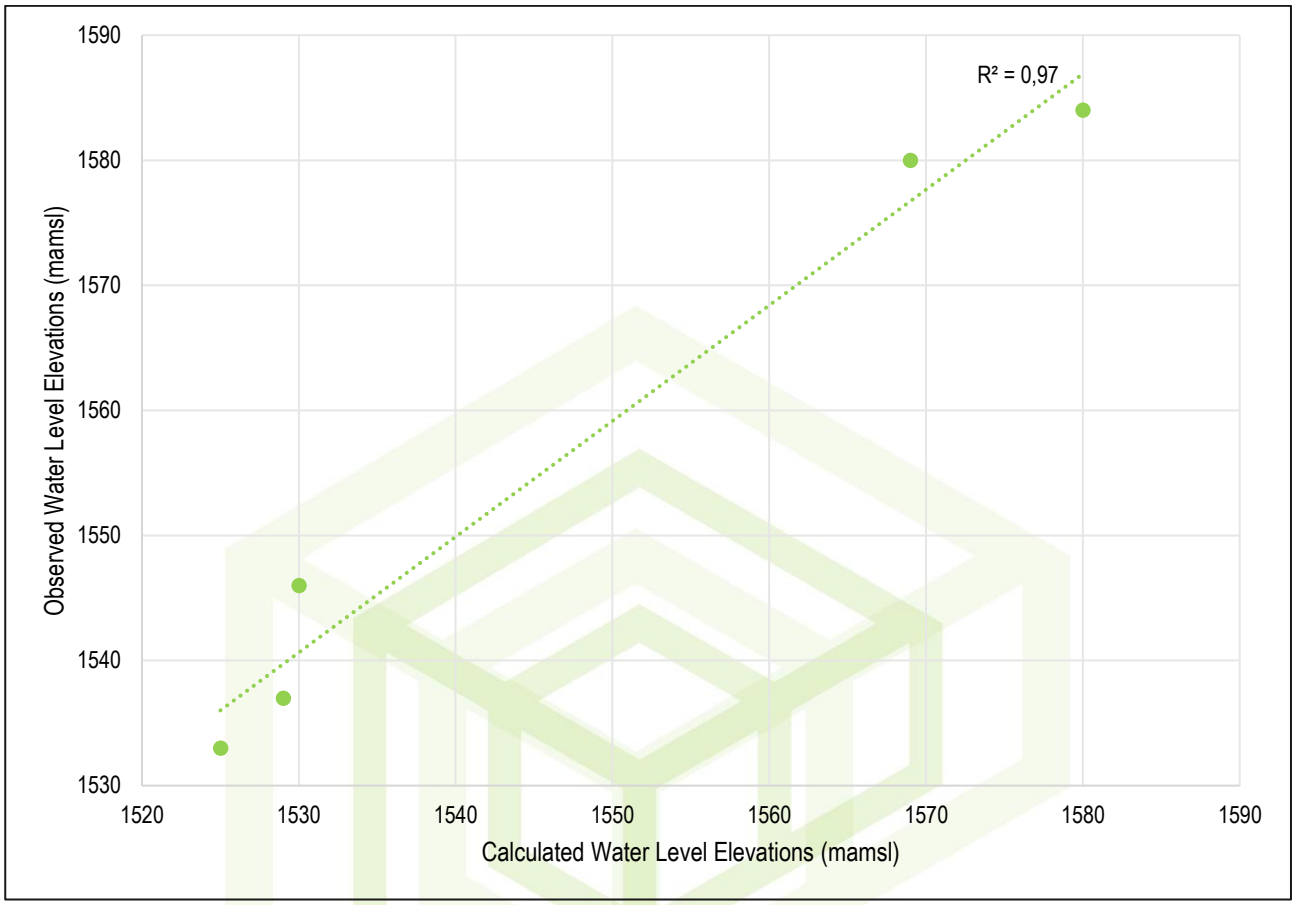


**Figure 9.9: Model calculated water level elevations vs observed water level elevations correlation.**

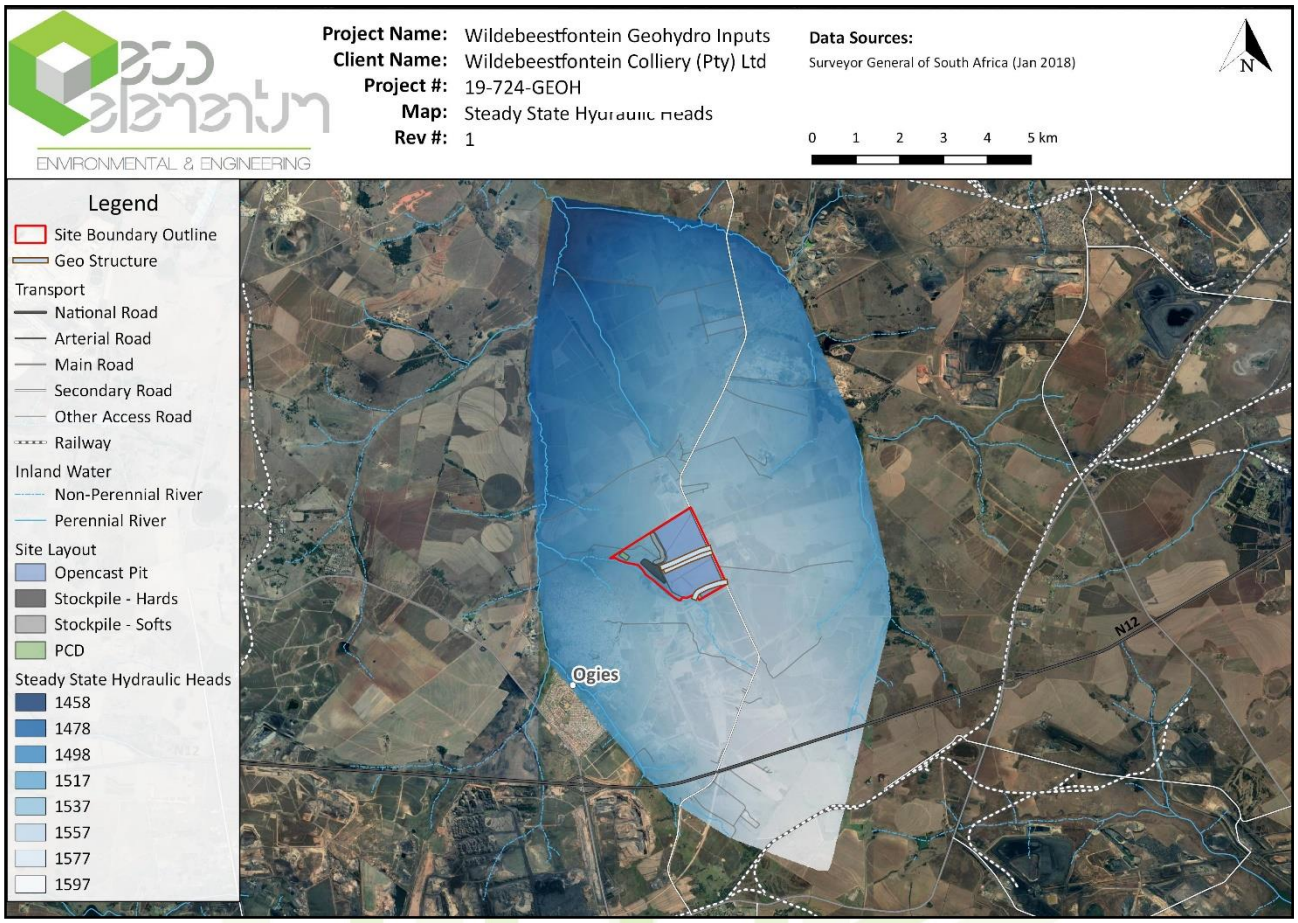


**Figure 9.10: Steady state water level elevation contours.**

### 9.3.5 Geology

#### *9.3.5.1 Regional Geology*

The Wildebeestfontein Colliery is underlain by rocks from the Karoo Supergroup. The site is also situated in the Witbank Coalfields which is the most important coal producing coalfields in South Africa (Figure 9.11). Five coal seams exist in the coal field, but not all are economically viable. These coal seams are hosted in Vryheid Formation the middle Ecca Group sediments.

The Karoo Supergroup mainly consist of sedimentary successions of sandstone, shale and coal. The Ecca group is underlain by the Dwyka Formation which consist of tillites and diamictites.

Geological features such as dykes (dolerite intrusions) and faults are commonly found in the coal field. The dolerite intrusions typically act as groundwater flow barriers due to its low permeability, while the contact zone of the intrusions act as flow pathways due to cracks and faults leading to higher flow rates along these contact zones.

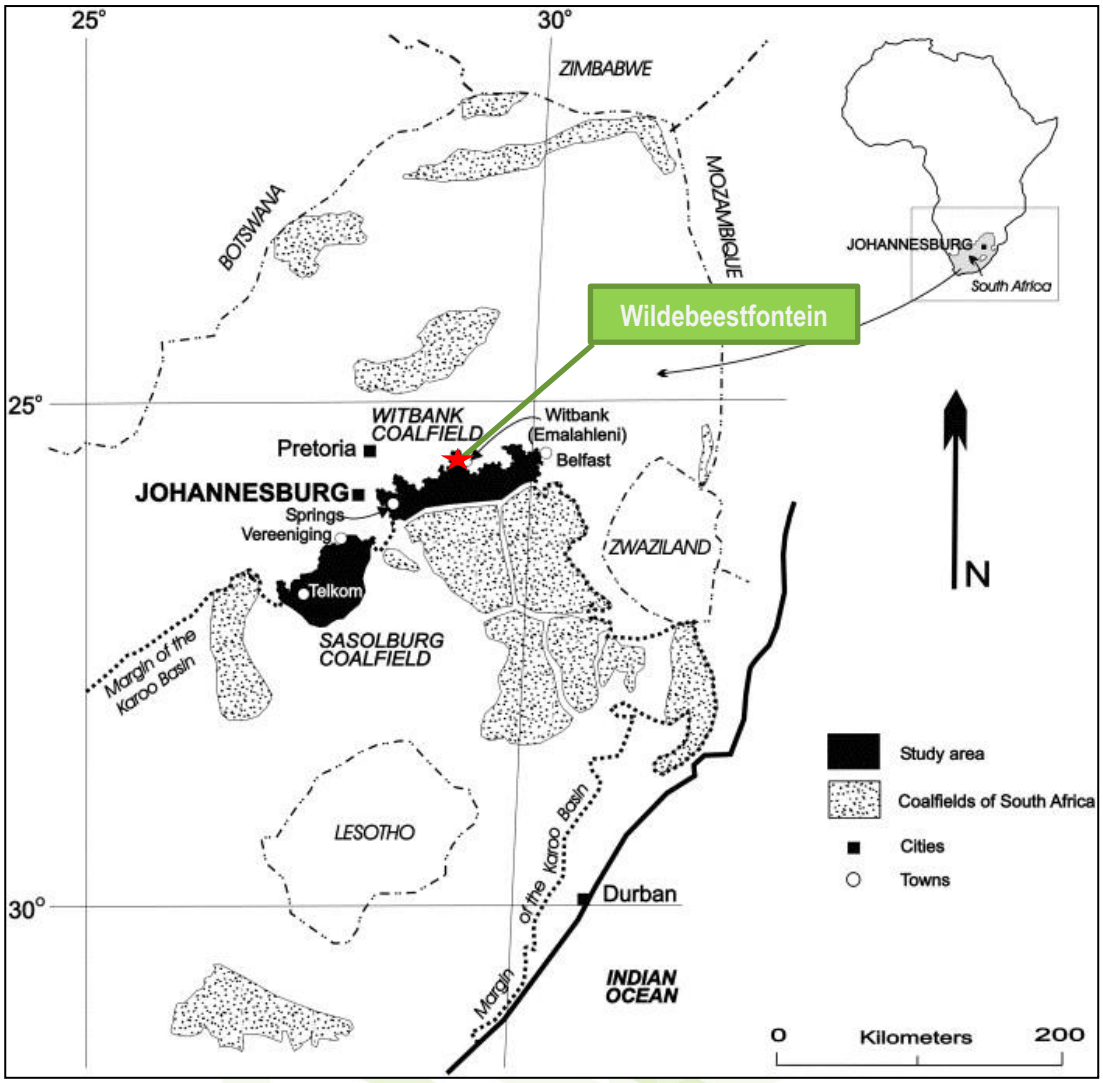


**Figure 9.11: Witbank Coalfields and the position of Wildebeestfontein Colliery in relation to it (Denis et.al., 2007).**

### *9.3.5.2 Local Geology*

Site specific geology information is scarce, since no new monitoring boreholes have been drilled. Information on two geological structures in the proposed pit area have been provided by the client (Figure 9.12). Typical of the geology in the area, sandstones, shales and coal measures are expected to dominate the lithology.

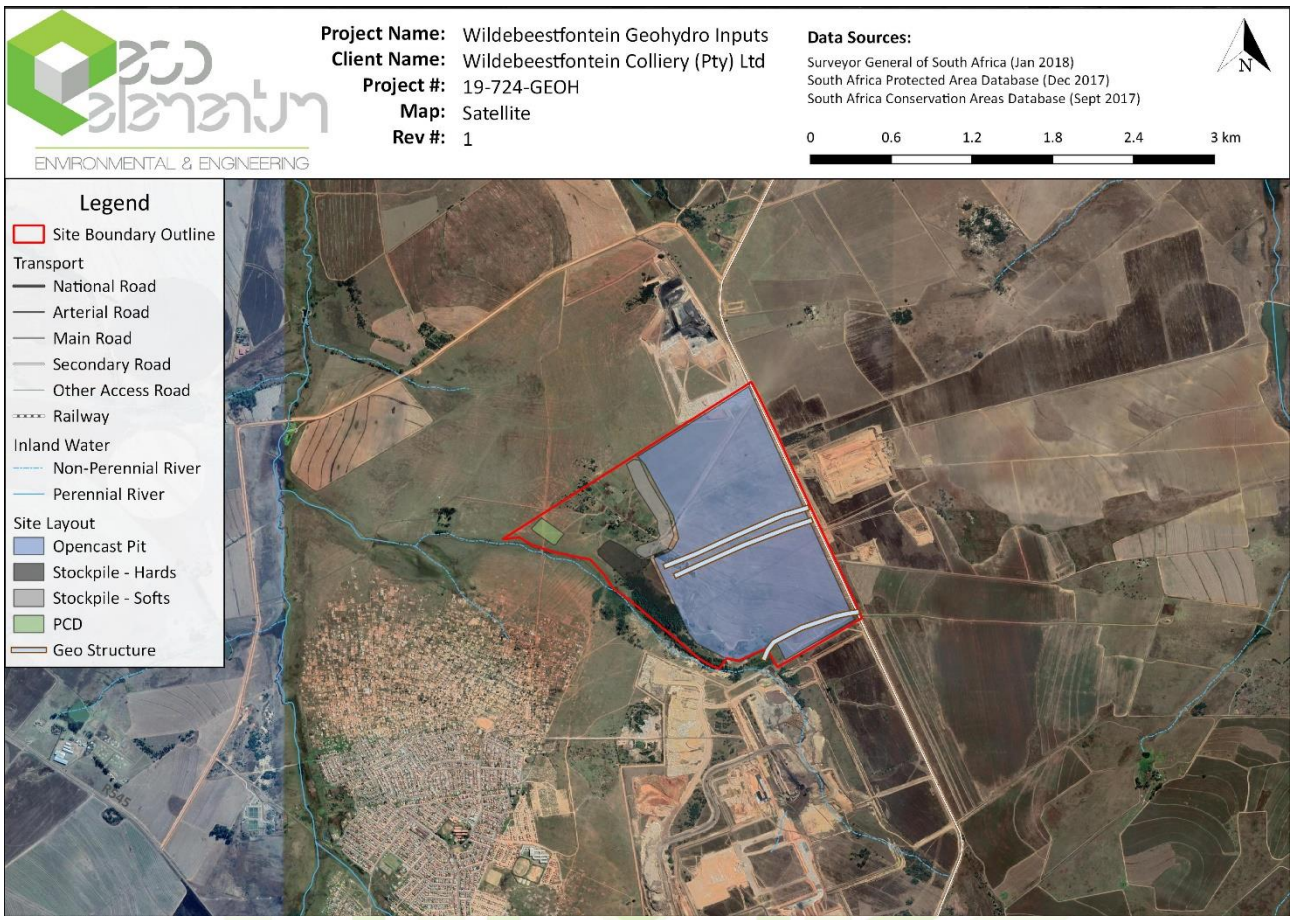


**Figure 9.12: Geological structures in the proposed Wildebeestfontein pit area.**

### 9.3.6 Wetland Assessment

Wetland areas were overlapping within the Wildebeestfontein project boundary. These wetland areas were identified and mainly delineated according to the presence of hydric (wetland) soil types. Hydric soils are defined as those which show characteristics (redoximorphic features) resulting from prolonged and repeated saturation. Characteristics include the presence of mottling (i.e. bright insoluble manganese and iron compounds) a gleyed matrix and/or Mn/Fe concretions.

The presence of redoximorphic features are the most important indicator of wetland occurrence, as these soil wetness indicators remain in wetland soils, even if they are degraded or desiccated (DWAF, 2005). Redoximorphic features are soil characteristics which develop as a result of prolonged and repeated saturation. It is important to note that the presence or absence of redoximorphic features within the upper 500 mm of the soil profile alone is sufficient to identify the soil as being hydric, or non-hydric (Collins, 2005).

Hydric soils identified within the site were classified as a Sandy Clay Loam (Figure 9.13) and the Katspruit soil form (Figure 9.14); in some areas with a high organic content (Figure 9.15) soil forms. Katspruit is a widely encountered wetland soil in South Africa (Fey, 2010). Mottling was identified within the temporary zones of the wetland areas (Figure 9.16). Alluvial soils were identified within the heavily eroded channel areas (Figure 9.17).

Terrestrial soils sampled were dominated by Clovelly (Figure 9.18) and Hutton soils (Figure 9.19).

**Figure 9.13: Hydric soils included a Sandy Clay Loam soil form associated with the wetland areas**

**Figure 9.14: Hydric soils included Katspruit soil form associated in the wetland areas.**

**Figure 9.15: Organic matter found and associated with hydric characteristics and wetland conditions**

**Figure 9.16: Soils affiliated with the seasonal and temporary (outer edge) zones, note the mottling present in the upper section**

**Figure 9.17: Alluvial soils associated with the channel areas**

**Figure 9.18: Clovelly soils were identified and dominant outside of the wetland system within the grasslands.**

**Figure 9.19: Hutton soils were identified and dominant outside of the wetland system within the grasslands.**

According to DWAF (2005), vegetation is regarded as a key component to be used in the delineation procedure for wetlands. Vegetation also forms a central part of the wetland definition in the National Water Act, Act 36 of 1998. However, using vegetation as a primary wetland indicator requires an undisturbed condition (DWAF, 2005). Minor disturbances were however noted in the wetland systems making it difficult to rely solely on vegetation as a wetland indicator. Disturbances included the presence of alien invasive species, mining, erosion and grazing within the area.

Despite this a number of wetland species were identified within the wetland system including grasses and sedges. Hydrophytic wetland vegetation consisted of *Typha capensis*, *Cyperus spp*. and *Juncus spp. (*Figure 9.20).

Alien invasive plants observed onsite included Poplar tree (*Populus alba*), Common Thorn Apple (*Datura stramonium*), Khaki Weed (*Tagetes minuta*), Tall Verbena (*Verbena bonariensis*), Black Wattle (*Acacia mearnsii*), Spreading century plant (*Agave Americana*) and Weeping willow (*Salix babylonica*).

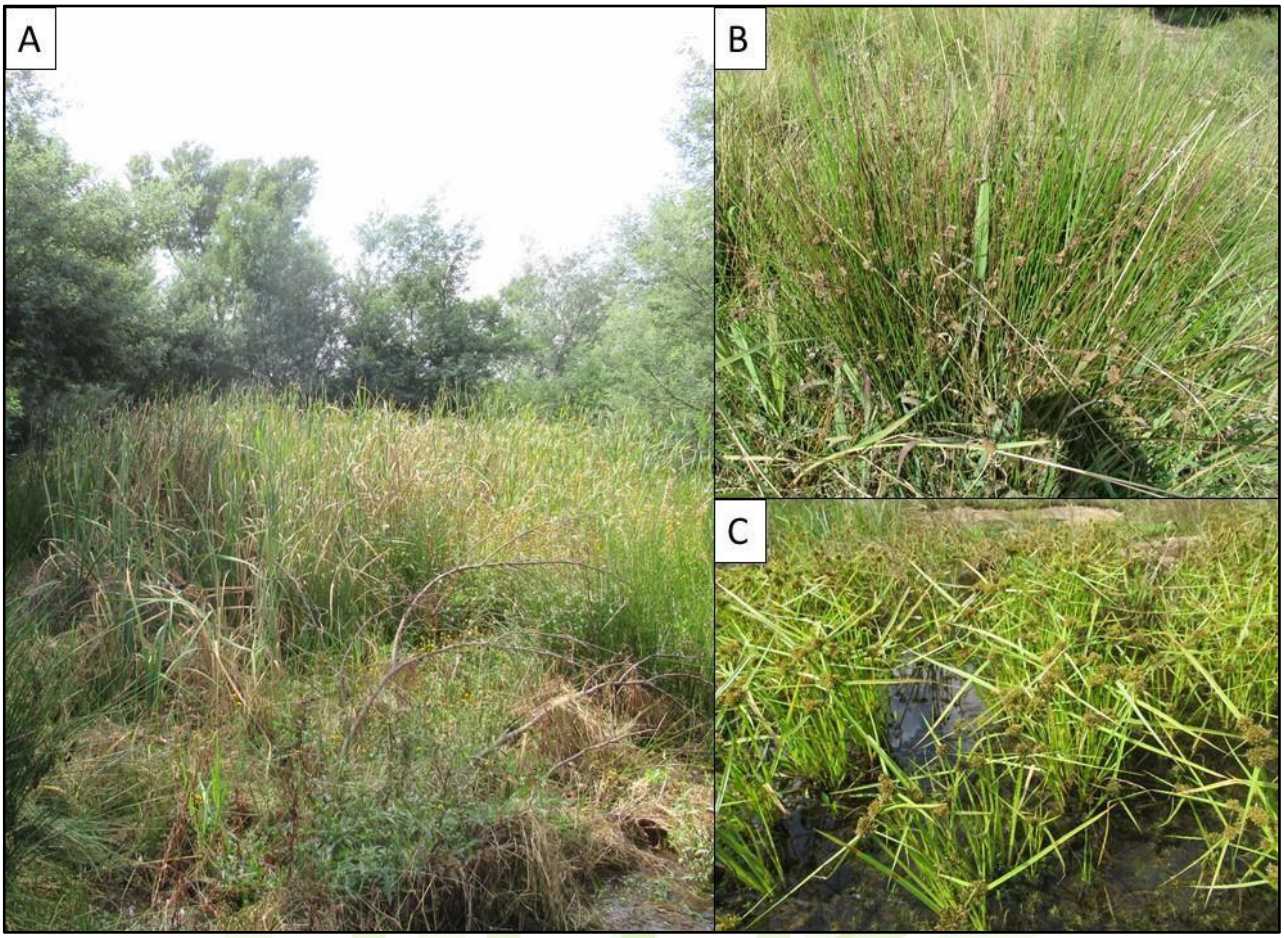


**Figure 9.20: *Typha capensis, Juncus spp.* and *Cyperus spp.* were identified in wetland systems**

Any wetlands identified on the site were categorised according to the National Wetland Classification System for South Africa (Ollis *et al*., 2013). The wetland area was classified as a hydro-geomorphic (HGM) unit. An HGM unit is a recognisable physiographic wetland-unit based on the geomorphic setting, water source of the wetland and the water flow patterns (MacFarlane *et al*., 2009).

One channelled valley bottom wetland system (HGM 1) was identified within the study boundary (Figure 9.21). Channelled valley bottom wetlands are characterised by their location on valley floors and the presence of a channel flowing through the wetland. Dominant water inputs to these wetlands are from/into a channel, in this instance an upstream source, flowing through the wetland either as surface flows resulting from flooding or as subsurface flow. Water generally moves through the wetland as diffuse surface flow although occasionally as short-lived concentrated flows during flood events (Kotze *et al*., 2008; Ollis *et al*., 2013).

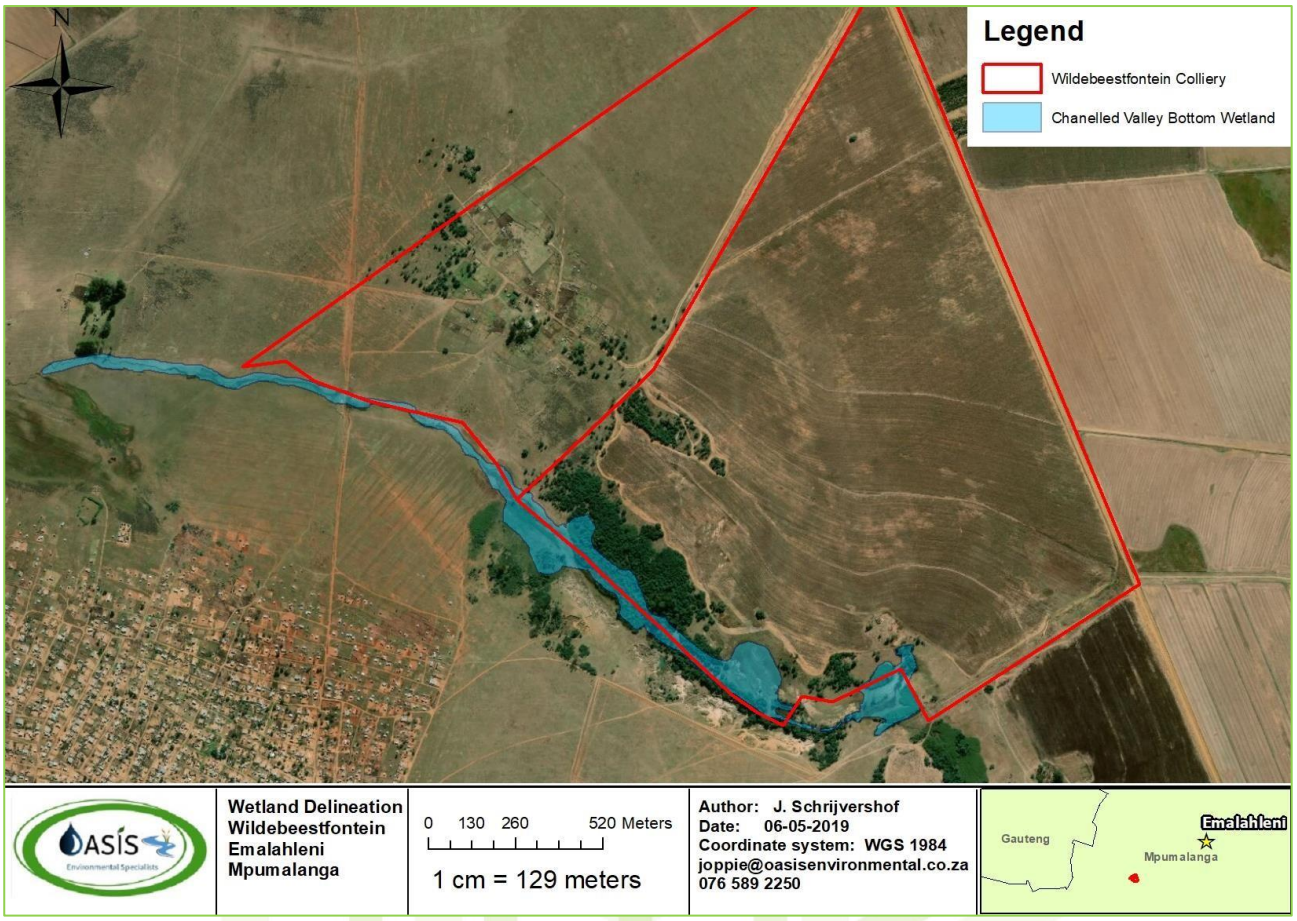


**Figure 9.21: Wildebeestfontein - Wetland delineation map**

The Ecological Services of the wetland has been recorded as **intermediate** and the EIS as **moderate**. Although no red-data species were identified during the site investigation, the majority of channelled valley bottom systems provide habitat for a number of floral and faunal species. The presence of open water and vegetation provides a suitable area for breeding, feeding, and protection for some faunal and floral species.

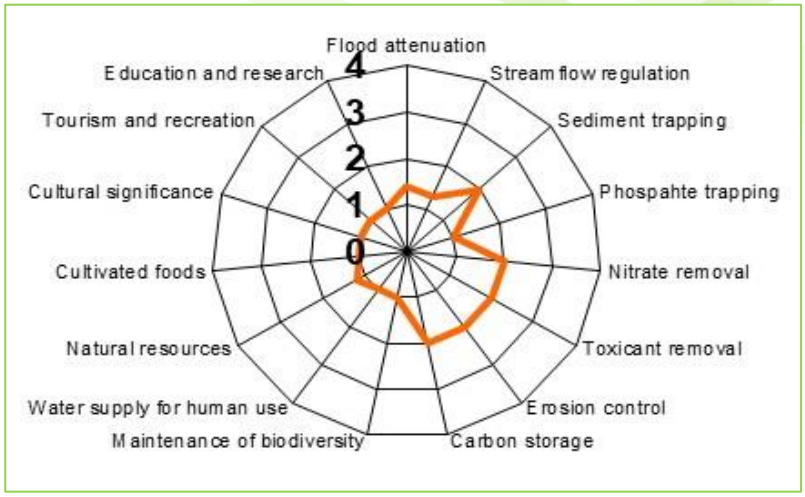


**Figure 9.22: WET-Eco services Results**

According to the functional assessment flood attenuation; sediment trapping; erosion control; the maintenance of biodiversity; and the provision of natural resources are the predominant attributes provided by these wetlands to the surrounding landscapes.

The channelled valley bottom wetland system was assessed in terms of health and was found to be categorised as **largely modified (Category D)**. Modifications to the systems and the resultant effect on the health of the wetlands is predominantly related to the surrounding mining, informal settlements, pollution, extensive, alien invasive vegetation, crop cultivation, erosion and grazing

Overgrazing, extensive *Acacia mearnsii* infestation and erosion have had a negative impact on the basal cover of vegetation within the catchments associated with the channelled valley bottom wetland, leading to an increase in velocity entering the wetlands and the formation of erosion gullies in the majority of these systems. This results in a negative impact on the wetlands ability to maintain biodiversity.

### 9.3.7 Aquatics

A site assessment was conducted on the 14th August 2019. The sampled sites are illustrated in the Figure 9.23 and Figure 9.24 and the coordinates for each site assessed are provided in Table 9.9. During the site visit it was evident that alien invasive plant infestation, bank trampling and extensive mining activities were present within certain sections of the study boundary and that water quality were impacted by the pollution from the Phola community. It must be noted that the study sites had stagnant water in certain sections of the streams at the time at the assessment.

**Table 9.9: Sample site coordinates**

| Site | Coor linates | |
|---|---|---|
| **Sample point 1** | 25°58'58.94"S | 29° 3'13.32"E |
| **Sample point 2** | 25°58'35.05"S | 29° 2'39.82"E |

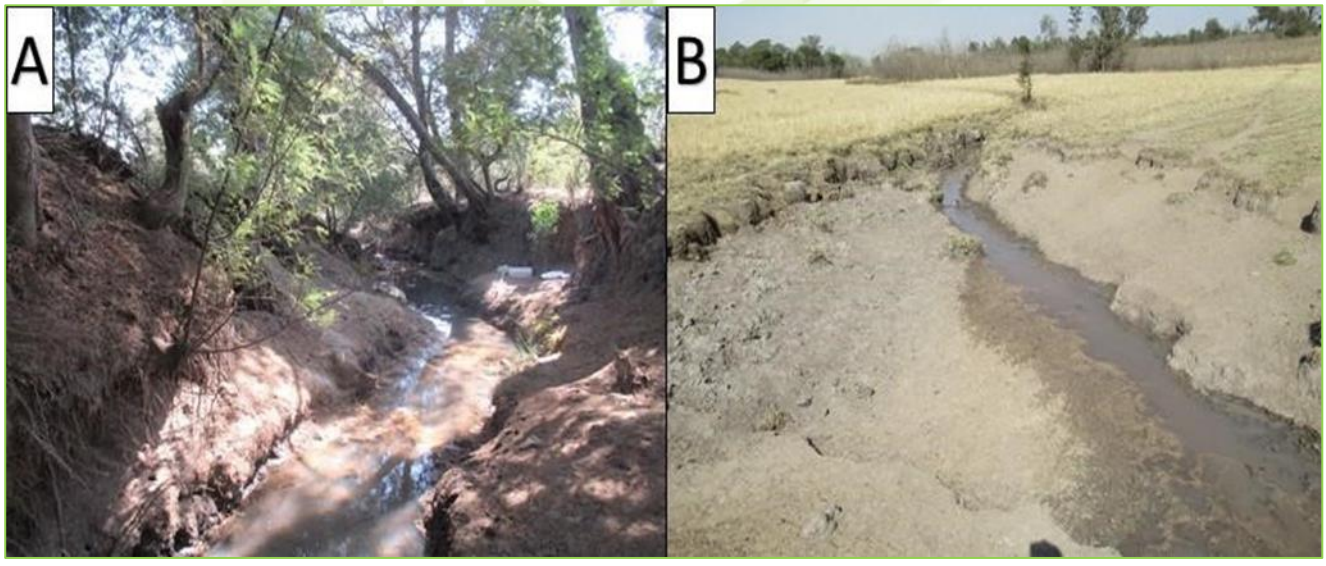


**Figure 9.23: Sample Localities for the Wildebeestfontein study area where (A) upstream site (Sample point 1), (B) Downstream site (Sample point 2)**

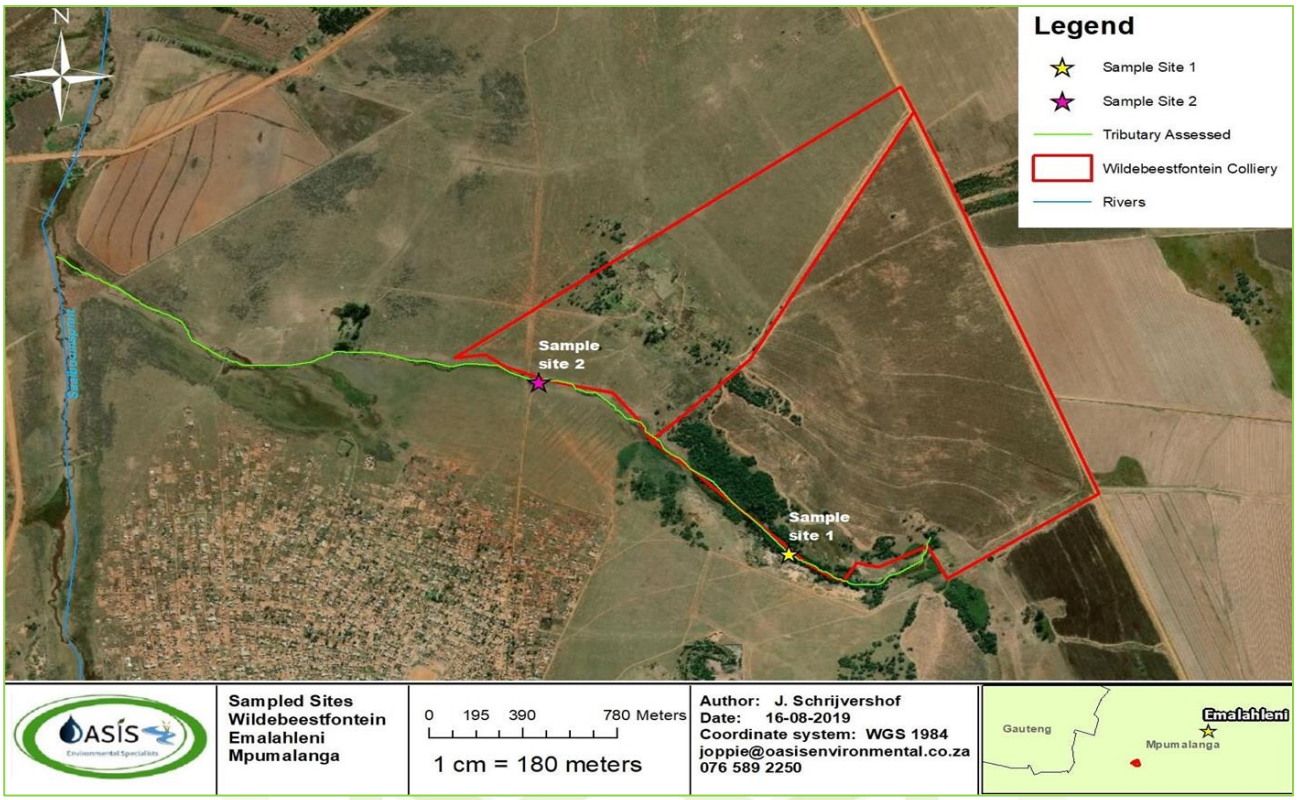


**Figure 9.24: Wildebeestfontein – Sample localities map**

*In situ* water quality variables was within unacceptable limits compared to the Target Water Quality Ranges (TWQRs) for aquatic ecosystems of South Africa.

**Table 9.10: *In situ* water quality results**

| Constituents | Guideline values (TWQRs) | Sample point 1 | Sample point 2 |
|---|---|---|---|
| pH | 6.5-9,5 | 8,55 | 7,87 |
| Temp (°C) | 5-30 | 13,9 | 20,2 |
| Conductivity (µS/cm) | <700 | 147 | 143 |
| Dissolved Oxygen (%) | >80% | 39,7 | 42,9 |
| Dissolved Oxygen (mg/L) | >6 | 3,49 | 3,29 |

The IHIA results recorded, place all sites assessed within a **seriously modified state (Category E)**. A category of E indicates that the loss of natural habitat, biota and basic ecosystem functions is extensively transformed from reference conditions. The predominant cause for concern was erosion, alien invasive plants, mining and water pollution.

The IHIA assesses the number and severity of anthropogenic impacts and the damage they potentially inflict on the habitat integrity of aquatic ecosystems. The results of the IHIA are presented below in Table 9.11**.**

**Table 9.11: Overall IHIA instream and riparian results**

| INSTREAM CRITERIA | WEIGHT | Site 1 | Site 2 | Average | Score |
|---|---|---|---|---|---|
| Water abstraction | 14 | 15 | 15 | 15,00 | 8,40 |
| Flow modification | 13 | 19 | 22 | 20,50 | 10,66 |
| | | 18 | 22 | 20,00 | 10,40 |
| Bed modification | 13 | | | | |
| Channel modification | 13 | 19 | 22 | 20,50 | 10,66 |
| Water quality | 14 | 20 | 21 | 20,50 | 11,48 |
| Inundation | 10 | 17 | 16 | 16,50 | 6,60 |
| | | 22 | 12 | 17,00 | 6,12 |
| Exotic macrophytes | 9 | | | | |
| Exotic fauna | 8 | 8 | 8 | 8,00 | 2,56 |
| Solid waste disposal | 6 | 18 | 15 | 16,50 | 3,96 |
| TOTAL | 100 | | | | **29,16** |
| **RIPARIAN ZONE CRITERIA** | **WEIGHT** | **Site 1** | **Site 2** | **Average** | **Score** |
| Indigenous vegetation removal | 13 | 22 | 14 | 18,00 | 9,36 |
| Exotic vegetation encroachment | 12 | 22 | 14 | 18,00 | 8,64 |
| Bank erosion | 14 | 15 | 21 | 18,00 | 10,08 |
| Channel modification | 12 | 16 | 15 | 15,50 | 7,44 |
| Water abstraction | 13 | 15 | 14 | 14,50 | 7,54 |
| Inundation | 11 | 15 | 13 | 14,00 | 6,16 |
| Flow modification | 12 | 20 | 21 | 20,50 | 9,84 |
| Water quality | 13 | 20 | 21 | 20,50 | 10,66 |
| TOTAL | 100 | | | | **30,28** |

During this survey; no sensitive organisms were sampled at any of the study sites. These results should be approached with caution as it is not a true representation of the site, due to a lack of suitable flow conditions. Only sampled invertebrates included the Gerridae and Gyrinidae, families at both sites. This SASS5 scores for both sites indicate that the stream is **seriously modified (Category E/F)**. The presence of only two highly pollution tolerant organisms indicates the pressure from extensive pollution and lack of suitable habitat.

**Table 9.12: IHAS results for the macro-invertebrate habitat**

| | Site 1 | Site 2 |
|---|---|---|
| IHAS Score | 32 | 26 |
| EC Rating | **Ina lequate** | |

The habitat reaches which were assessed and found to be inadequate, where biotopes with limited habitat structures were present. The dominant feature of the invertebrate habitat is the sandy-clay substrate which dominates the streams under study. Generally, no stones in or out of current biotope were found to be available throughout the stream with extensive erosion present.

### 9.3.8 Flora

#### *9.3.8.1 Eastern Highveld Grassland*

This vegetation type corresponds partially with Bankenveld and North-eastern Sandy Highveld according to the Acocks (1975) and also Moist Sandy Highveld Grassland as described by Low and Rebelo (1996).

This vegetation type occurs within the Gauteng and Mpumalanga Provinces on the plains in the areas between Belfast in the East and the eastern side of Johannesburg in the West and southwards to Bethal, Ermelo and West of Piet Retief.

The conservation status of this vegetation type is Endangered and the conservation target is 24%. By 2006 some 44% was already transformed primarily by cultivation, plantations, mining, urbanisation and building of dams. No serious invasions are reported, although *Acacia mearnsii* can become dominant in disturbed sites. Erosion is generally low. Only a small part of this vegetation type is conserved in the statutory nature reserves Nooitgedacht dam - and Jericho dam Nature Reserve of the Mpumalanga Tourism and Parks Agency and in Private Nature Reserves such as Holkranse, Kransbank and Morgenstond (Mucina and Rutherford, 2006).

Important plant species of this vegetation type are given in Table 9.13.

**Table 9.13: Important plant species of the Eastern Highveld Grassland**

| FAMILY | SPECIES | STATUS |
|---|---|---|
| POACEA | *Aristida aequiglumis* | D |
| POACEA | *A. congesta* | D |
| POACEA | *A. junciformis* subsp. *galpinii* | D |
| POACEA | *Brachiaria serrata* | D |
| POACEA | *Cynodon dactylon* | D |
| POACEA | *Digitaria monodactyla* | D |
| POACEA | *D. tricholaenoides* | D |
| POACEA | *Elionurus muticus* | D |
| POACEA | *Eragrostis chloromelas* | D |
| POACEA | *E. curvula* | D |
| POACEA | *E. racemosa* | D |
| POACEA | *E. sclerantha* | D |
| POACEA | *Heteropogon contortus* | D |
| POACEA | *Loudetia simplex* | D |
| POACEA | *Microchloa caffra* | D |
| POACEA | *Monocymbium ceresiiforme* | D |
| POACEA | *Setaria sphacelata* | D |
| POACEA | *Sporobolus africanus* | D |
| POACEA | *S. pectinatus* | D |
| POACEA | *Themeda triandra* | D |
| POACEA | *Trachypogon spicatus* | D |
| POACEA | *Tristachya leucothrix* | D |
| POACEA | *T. rehmannii* | D |
| POACEA | *Alloteropsis semialata* subsp. *eckloniana* | |
| POACEA | *Andropogon appendiculatus* | |
| POACEA | *A. schirensis* | |
| POACEA | *Bewsia biflora* | |
| POACEA | *Ctenium concinnum* | |
| POACEA | *Diheteropogon amplectens* | |
| POACEA | *Eragrostis capensis* | |
| POACEA | *E. gummiflua* | |
| POACEA | *E. patentissima* | |
| POACEA | *Harpochloa falx* | |
| POACEA | *Panicum natalense* | |
| POACEA | *Rendlia altera* | |
| POACEA | *Schizachyrium sanguineum* | |
| POACEA | *Setaria nigrirostris* | |
| POACEA | *Urelytrum agropyroides* | |
| ASTERACEAE | *Berkheya setifera* | D |
| ASTERACEAE | *Haplocarpha scaposa* | D |
| ACANTHACEAE | *Justicia anagalloides* | D |
| GERANIACEAE | *Pelargonium luridum* | D |
| EUPHORBIACEAE | *Acalypha angustata* | |
| FABACEAE | *Chamaecrista mimosoides* | |
| ASTERACEAE | *Euryops gilfillanii* | |
| ASTERACEAE | *E. transvaalensis* subsp. *setilobus* | |
| ASTERACEAE | *Helichrysum aureonitens* | |
| ASTERACEAE | *H. caespititium* | |
| ASTERACEAE | *H. callicomum* | |
| ASTERACEAE | *H. oreophilum* | |
| ASTERACEAE | *H. rugulosum* | |
| CONVOLVULACEAE | *Ipomoea crassipes* | |
| RUBIACEAE | *Pentanisia prunelloides* subsp. *latifolia* | |
| SCROPHULARIACEAE | *Selago densiflora* | |
| ASTERACEAE | *Senecio coronatus* | |
| ASTERACEAE | *Vernonia oligocephala* | |
| CAMPANULACEAE | *Wahlenbergia undulata* | |
| IRIDACEAE | *Gladiolus crassifolius* | |
| AMARYLLIDACEAE | *Haemanthus humilis* subsp. *hirsutus* | |
| HYPOXIDACEAE | *Hypoxis rigidula* var. *pilosissima* | |
| HYACINTHACEAE | *Ledebouria ovatifolia* | |
| ASPHODELACEAE | *Aloe ecklonis* | |
| RUBIACEAE | *Anthospermum rigidum* subsp. *pumilum* | |
| ASTERACEAE | *Stoebe plumosa* | |

*9.3.8.2 Rand Highveld Grassland*

This vegetation type corresponds partially with the Bankenveld (64%) of Acocks (1953) and with the Rocky Highveld Grassland (45%) and Moist Sandy Highveld Grassland (21%) of Low & Rebelo (1996).

Rand Highveld Grassland is distributed in parts of Gauteng, North-West, Free State and Mpumalanga Provinces in areas between rocky ridges from Pretoria to Witbank (eMalahleni), extending onto ridges in the Stoffberg and Roossenekal regions as well as west of Krugersdorp centred in the vicinity of Derby and Potchefstroom, extending southwards and northeast wards from there. Altitude 1 300-1 635 m, but reaches 1 760 m in places.

Vegetation & landscape features display a highly variable landscape with extensive sloping plains and a series of ridges slightly elevated over undulating surrounding plains. The vegetation is species-rich, wiry, sour grassland alternating with low, sour shrub land on rocky outcrops and steeper slopes. Most common grasses on the plains belong to the genera *Themeda, Eragrostis, Heteropogon* and *Elionurus.* High diversity of herbs, many of which belong to the Asteraceae, is also a typical feature. Rocky hills and ridges carry sparse (savannoid) woodlands with *Protea caffra* subsp. *caffra, P. welwitschii, Acacia caffra* and *Celtis africana,* accompanied by a rich suite of shrubs among which the genus *Rhus* (especially *R. magalismontana)* is most prominent.

Biogeographically Important Taxa (all Northern sourveld endemics) Geophytic Herbs: *Agapanthus inapertus* subsp. *pendulus, Eucomis vandermerwei.* Succulent Herb: *Huernia insigniflora.* Low Shrub: *Melhania randii.* Endemic Taxa Herbs: *Melanospermum rudolfii, Polygala spicata*. Succulent Herbs: *Anacampseros subnuda* subsp. *lubbersii, Frithia humilis.* Succulent Shrubs: *Crassula arborescens* subsp. *undulatifolia, Delosperma purpureum.* Small Trees: *Encephalartos lanatus, E. middelburgensis.*

The Conservation status is Endangered and the conservation target is 24%. It is currently poorly conserved (only 1%). Small patches are protected in statutory reserves such as Kwaggavoetpad, Van Riebeeck Park, Bronkhorstspruit and Boskop Dam Nature Reserves as well as in private conservation areas such as Doornkop, Ezemvelo, Rhenosterpoort and Mpopomeni. Almost half of the vegetation type has been transformed mostly by cultivation, plantations, urbanisation or dam-building. Cultivation may also have had an impact on an additional portion of the surface area of the unit where old lands are currently classified as grasslands in land cover classifications and poor land management has led to degradation of significant portions of the remainder of this unit. Scattered aliens (most prominently *Acacia mearnsii)* occur in about 7% of this unit. Only about 7% has been subjected to moderate to high erosion levels.

Important plant species of this vegetation type are given in Table 9.14.

**Table 9.14: Important plant species of the Rand Highveld Grassland**

| FAMILY | SPECIES | STATUS |
|---|---|---|
| POACEAE | *Ctenium concinnum* | D |
| POACEAE | *Cynodon dactylon* | D |
| POACEAE | *Digitaria monodactyla* | D |
| POACEAE | *Diheteropogon amplectens* | D |
| POACEAE | *Eragrostis chloromelas* | D |
| POACEAE | *Heteropogon contortus* | D |
| POACEAE | *Loudetia simplex* | D |
| POACEAE | *Monocymbium ceresiiforme* | D |
| POACEAE | *Panicum natalense* | D |
| POACEAE | *Schizachyrium sanguineum* | D |
| POACEAE | *Setaria sphacelata* | D |
| POACEAE | *Themeda triandra* | D |
| POACEAE | *Trachypogon spicatus* | D |
| POACEAE | *Tristachya biseriata* | D |
| POACEAE | *T. rehmannii* | D |
| POACEAE | *Andropogon schirensis* | |
| POACEAE | *Aristida aequiglumis* | |
| POACEAE | *A. congesta* | |
| POACEAE | *A. junciformis* subsp. *galpinii* | |
| POACEAE | *Bewsia biflora* | |
| POACEAE | *Brachiaria nigropedata* | |
| POACEAE | *B. serrata* | |
| POACEAE | *Cymbopogon caesius* | |
| POACEAE | *Digitaria tricholaenoides* | |
| POACEAE | *Elionurus muticus* | |
| POACEAE | *Eragrostis capensis* | |
| POACEAE | *E. curvula* | |
| POACEAE | *E. gummiflua* | |
| POACEAE | *E. plana* | |
| POACEAE | *E. racemosa* | |
| POACEAE | *Hyparrhenia hirta* | |
| POACEAE | *Melinis nerviglumis* | |
| POACEAE | *M. repens* subsp. *repens* | |
| POACEAE | *Microchloa caffra* | |
| POACEAE | *Setaria nigrirostris* | |
| POACEAE | *Sporobolus pectinatus* | |
| POACEAE | *Trichoneura grandiglumis* | |
| POACEAE | *Urelytrum agropyroides* | |
| CYPERACEAE | *Bulbostylis burchellii* | |
| ASTERACEAE | *Acanthospermum australe* | D |
| ACANTHACEAE | *Justicia anagalloides* | D |
| ILLECEBRACEAE | *Pollichia campestris* | D |
| EUPHORBIACEAE | *Acalypha angustata* | |
| FABACEAE | *Chamaecrista mimosoides* | |
| ASTERACEAE | *Dicoma anomala* | |
| ASTERACEAE | *Helichrysum caespititium* | |
| ASTERACEAE | *H. nudifolium* var. *nudifolium* | |
| ASTERACEAE | *H. rugulosum* | |
| CONVOLVULACEAE | *Ipomoea crassipes* | |
| RUBIACEAE | *Kohautia amatymbica* | |
| ASTERACEAE | *Lactuca inermis* | |
| ASTERACEAE | *Macledium zeyheri* subsp. *argyrophyllum* | |
| ASTERACEAE | *Nidorella hottentotica* | |
| RUBIACEAE | *Oldenlandia herbacea* | |
| LAMIACEAE | *Rotheca hirsuta* | |
| SELAGINACEAE | *Selago densiflora* | |
| ASTERACEAE | *Senecio coronatus* | |

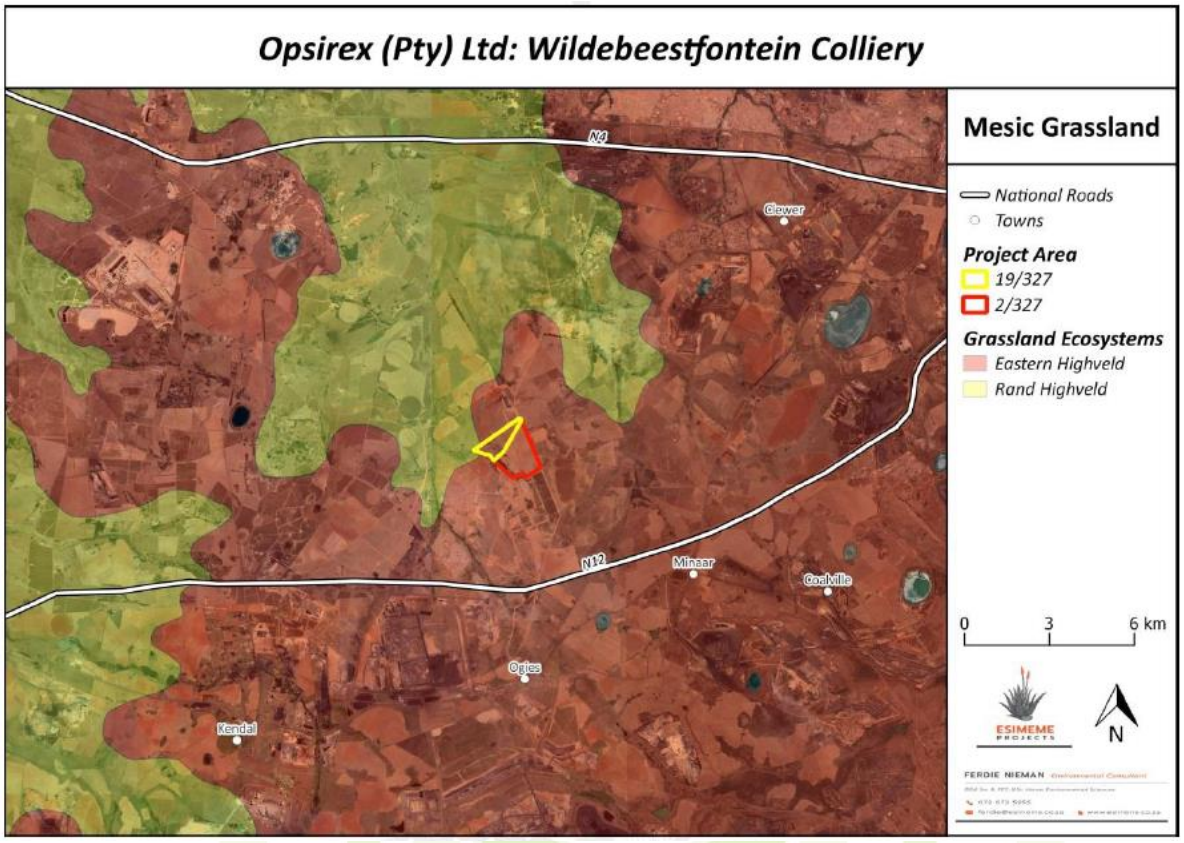


**Figure 9.25: Vegetation type of the area**

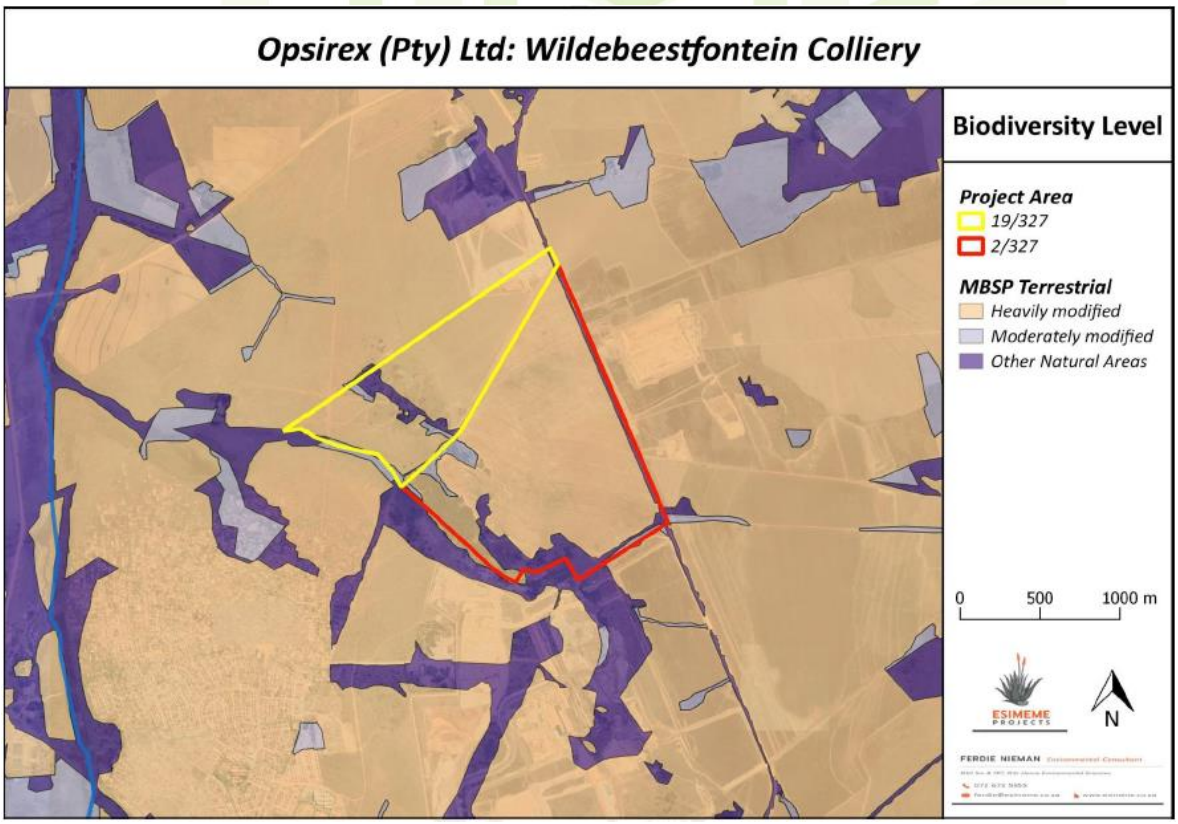


**Figure 9.26: Mpumalanga Biodiversity Sector Plan**

From the imaging available for the project area (Google Earth 13/05/2019), it is evident that approximately 140 ha has very recently been used for soybean agriculture, while an additional 18 ha is currently fenced off for low concentration cattle grazing. Apart from these, bush encroachment by Black wattle has rendered approximately 19 ha impenetrable and unusable by the local community. This encroachment seems to have followed an elevational gradient, with lower lying areas being severely overgrown. The elevation profile of the project area can be described as generally shallow sloping towards the west, with the highest (1560 amsl) and lowest (1512 amsl) points respectively being found in the east and west of the project area.

A list of 304 plant species that have been recorded in the quarter degree square 2529CC (POSA, http://newposa.sanbi.org/) is presented in the Fauna and Flora Report. Of these only two species, *Frithia humilis* (EN) and *Gladiolus paludosus* (VU), are of conservation concern. Even though *F. humilis* grows predominantly in shallow soil surrounding larger flat rocky outcrops (Bugoyne et al., 2000) as was found within the project area, none of the 9 known identified subpopulations occur near the project area. In the case of *G. paludosus*, this species is also not expected to occur within the project area as this species requires year-round moist conditions to flourish (von Staden and Lötter, 2013).

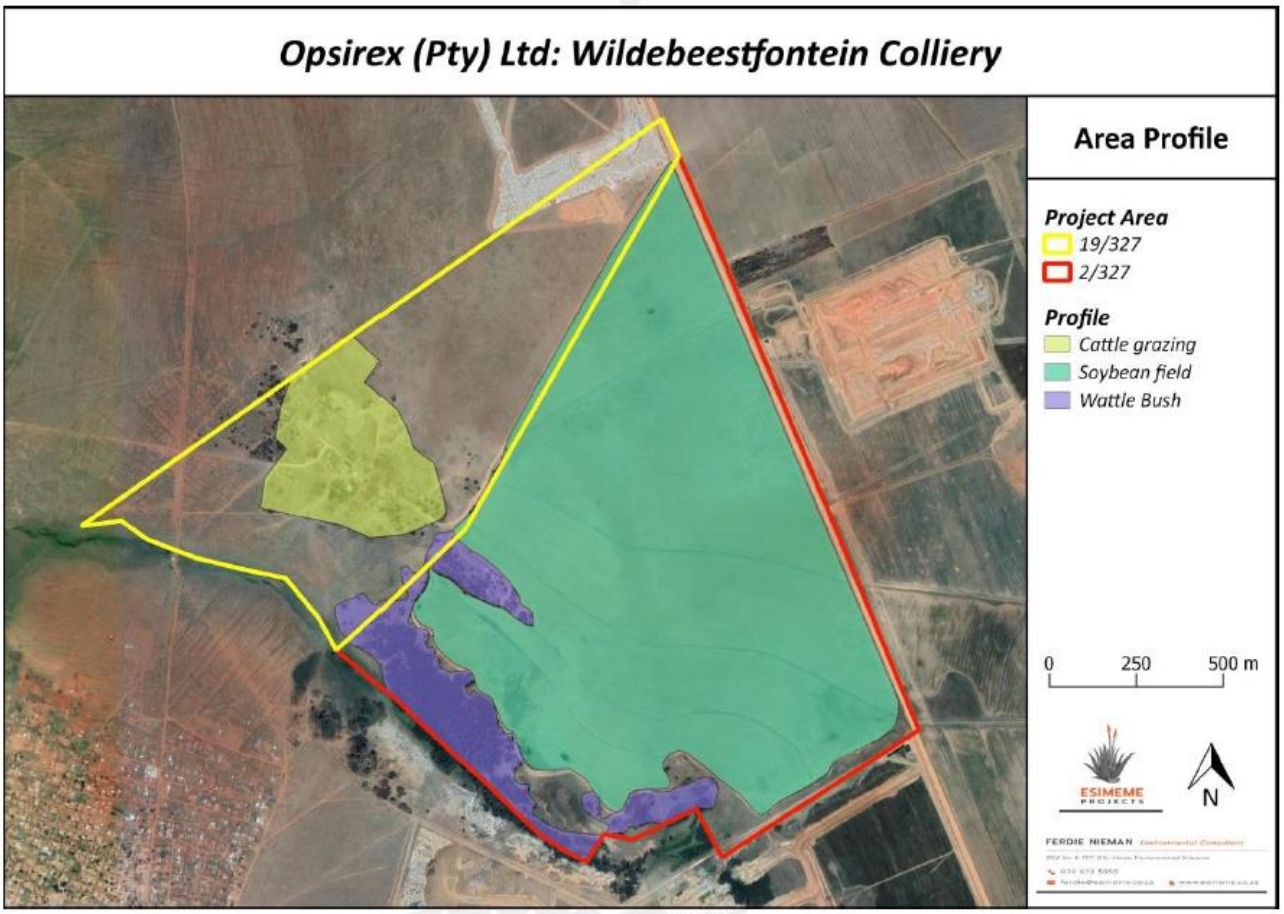


**Figure 9.27: Current Terrestrial Profile**

### *9.3.8.3 Site assessment*

The proposed mining site was found to be in a degraded state due to the presence of invasive species, current land-use practices and low concentration informal housing. Floral species diversity seemed to be homogenous in the northern veld area where apart from generally dominant grassland species, no other species were found to be present. This homogenous pattern becomes broken and scattered heterogeneity towards the south with small patches of grassland remaining interspersed between invaded, bush encroached areas. The soybean veld dominating the project area has lost all native vegetation apart from a restricted rocky outcrop area which still has some grass and shrub species present. Taking the above into consideration, native species diversity decreased along a north-south as well as a west-east gradient.

The northern veld area seems to have been disturbed by past agricultural land use, with early stages of invasion by *Seriphium plumosum* (previously *Stoebe vulgaris* [Bankrupt-bush]) present. At the time of the survey, cattle and goats were also found to be grazing within the property boundaries, however, *S. plumosum* is inedible in its adult form, commonly leading to severe decreases in the carrying capacity of the veld over time. The presence of *S. plumosum* can therefore indicate poor ecological functioning of a grassland ecosystem of the northern veld, and be indicative of poor land use management.

It was evident during the site visit that the impacts of past mining activities within the project area still remain. Within the northern most wattle bush (i.e. central area of the property), the remains of a surface void was found. This area has become severely invaded and it is evident that this sight in particular has been used for dumping purposes in the past. In addition to this area, a defunct underground mine shaft was found within the wattle bush along the south-western boundary of the property. This area, even though dominated by invasive species had some native fern species present along the edges of the shaft opening. However, as this area falls outside of the proposed mining footprint, species found here are excluded from this report and are not discussed further.

Apart from the agricultural land which was severely disturbed, the remaining pockets of grassland was dominated by Argemone ochroleuca, P. plumosum, Eragrostis sp, Cynodon dactylon, Chloris gayana, Datura ferox and D. stramonium (Psammotropha myriantha were found in close association with the rocky outcrop area). However, as can been seen in the field survey images below, the dominant species present on site in terms of biomass and surface coverage is the invasive A. mearnsii which has invaded approximately 11% of the surface area of the property. Considering that 137 ha of the project area consists of homogenous agricultural land, the A. mearnsii invasion has in reality covered 23% of the invadable, non-agricultural land.

In general, the less abundant species present within the project area were larger species that were found to be scattered and clumped. Among these were Agave sp, Opuntia ficus indica, Searsia lancea, Acacia galpinii, Quercus robus, Schinus molle and Melia azedarach. The majority of these tree species were found in the cattle grazing area and are associated with the informal rural development.

**Figure 9.28: Soy bean plantation**

**Figure 9.29: Central Black wattle bush**

**Figure 9.30: Rocky outcrop**

### *9.3.8.4 Rare and Endangered species*

Even though suitable habitat was found for *F. humilis*, this area has been trampled through cattle grazing and was also found to have large numbers of *P. plumosum*, corroborating the observation that the area has been degraded by over grazing. Also, no wetlands are found on site and thus no suitable habitat is present for *G. paludosus*.

### *9.3.8.5 Alien Invasive Species*

In terms of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) Alien and Invasive Species Lists, 2016. NEM:BA defines a Category 1(b) as "Invasive species requiring on-going control as part of a management plan. The spread of alien species in this category must be contained, and in cases where effective control by individuals is generally not possible, an integrated programme (typically managed by a local, regional or national authority) would be necessary to bring them under control." Category 2

invasive species are regulated by area. A demarcation permit is required to import, possess, grow, breed, move, sell, buy or accept as a gift any plants listed as Category 2 plants. No permits will be issued for Category 2 plants to exist in riparian zones. It is therefore recommended that due to the large number of Alien Invasive Plants (AIPs) found within the project are, the Guidelines for Monitoring, Control and Eradication Plans as Required by Section 76 of The National Environmental Management: Biodiversity Act, 2004 (Act No. 10 Of 2004) (NEM:BA) for species listed as invasive in terms of Section 70 of the Act, be considered when a management plan is to be compiled. It is recommended that such a management plan be drafted prior to commencement of the mining activity and that the success of the management plan be monitored in order to update the plan on an annual basis.

As mentioned above, numerous AIPs were found to have become established within the boundaries of the project area. It should be noted that informal clearance of AIP species was observed on site with *Acacia mearnsii* and *Populas alba* being cleared and harvested by the local community.

**Table 9.15: Alien Invasive Species identified on site**

| Common name | Scientific name | NEMBA Status |
|---|---|---|
| Barbary fig | *Opuntia ficus indica* | 1b; (Spineless cactus pear cultivars and selections are not listed) |
| Black wattle | *Acacia mearnsii* | 2 |
| Bugweed | *Solanum mauritianum* | 1b |
| Cholla cactus | *Cylindropuntia sp.* | 1b |
| Eucalyptus | *Eucalyptus sp.* | 1b within riparian areas |
| Jimsonweed | *Datura stramonium* | 1b |
| Large thorn apple | *Datura ferox* | 1b |
| Red fruit spiny bush | *Solanum sisymbriifolium* | 1b |
| Rough cocklebur | *Xanthium strumarium* | 1b |
| Syringa | *Melia azedarach* | 1b |
| White poplar | *Populus alba* | 2 |
| White-flowered Mexican poppy | *Argemone ochroleuca* | 1b |

### 9.3.9 Fauna

#### *9.3.9.1 Desktop assessment*

##### *9.3.9.1.1 Mammal Species*

In total, 34 mammal species have been recorded in the quarter degree grid cell encompassing the project site (2529CC). Of these, three species have conservation statuses other than Least Concern.

**Table 9.16: Mammal species of conservation concern found in QDS 2529CC**

| Family | Scientific name | Common name | Red list category |
|---|---|---|---|
| Felidae | *Felis nigripes* | Black-footed Cat | Vulnerable |
| Felidae | *Panthera pardus* | Leopard | Vulnerable |
| Hyaenidae | *Hyaena brunnea* | Brown Hyena | Near threatened |

Felis nigripes, the Black-footed cat has the most restricted distribution of any of the African felid species (Nowell & Jackson 1996), and inhabits dry, open savannah, grasslands and Karoo semi-desert with sparse shrub and tree cover and a mean annual rainfall of between 100 and 500 mm at altitudes up to 2,000 m asl (Sliwa 2013). This species is very secretive by nature and is not expected to occur in areas with evidence of human activity as is found within the project area. The similar cryptic nature of leopard and brown hyena suggests

that these are also not expected to occur on site. The project area is severely disturbed by the current land-use activity (i.e. agricultural) and it is therefore not expected that the species listed in Table 9.16 above make use of the area.

#### *9.3.9.1.2 Avifaunal Species*

According to data collected during 2017 of SABAP2 (http://udp.adu.org.za/), a total of 269 bird species have been recorded in the 2555_2900 pentad encompassing the site. These data also indicate that 5 of the listed species are of conservational concern in terms of their IUCN Conservation Status (excluding Data Deficient, Least Concern and Near Threatened species).

#### *9.3.9.1.3 Reptiles and Amphibians*

A list of 27 reptile and 11 amphibian species are found in the quarter degree square 2529CC. None of these species have conservation statuses other than Least Concern. Therefore, the proposed mining activity is not expected to influence any species of conservation concern.

### *9.3.9.2 Site Assessment*

Based on scat and spoor found on site, Canis mesomelas (Black-backed jackal), make use of the wattle bush in the south of the site while also frequenting the open soy bean veld (presumably at night to hunt). The abundant and widely spread Lepus saxatilis (Scrub hare) is also expected to frequent similar areas, with Figure 9.31 presenting remains of this species found within the tree line to the south. Even though the scrub hare remains were found near the jackal scat, predation could also have been by domestic dogs which were also found to be present on site. Other domestic animals found within the project area were cattle and coats. The strong presence of domestic dogs in conjunction with the severely degraded veld reduces the possibility that more sensitive species are still found within the project area. Markedly, no evidence was found of small game species such as Duiker, Oribi and Steenbok, corroborating the previous statement that domestic dogs and possibly locals in the area are imposing a hunting pressure on these species

Burrowing mounds, indicating the presence of mole-rat species were found throughout the site, excluding areas with rocky outcrops, bush encroachment or agricultural activity. Other species such as Yellow Mongoose, Serval, Small-spotted Genet and the South African Hedgehog, although not found during the survey, are expected to be present on site, possibly preferring the invaded tree-line and riparian area to the south outside of the proposed mining footprint.

No reptile or amphibian species were found during the survey nor were any proxies of presence found (i.e. shed skin, drag trails, etc.). Nevertheless, due to the Limitations of the study, a cautious approach was taken and it is thus assumed that the common occur within, or make use of, the project area.

**Table 9.17: Mamma Species found on site**

| Common name | Scientific name |
|---|---|
| Black-backed jackal | *Canis mesomelas (scat)* |
| Cattle | *Bos taurus* |
| Domestic dogs | *Canis lupus familiaris* |
| Goats | *Capra aegagrus hircus* |
| Mole-rat spp | *Unknown (mounds)* |
| Scrub hare | *Lepus saxatilis (remains)* |

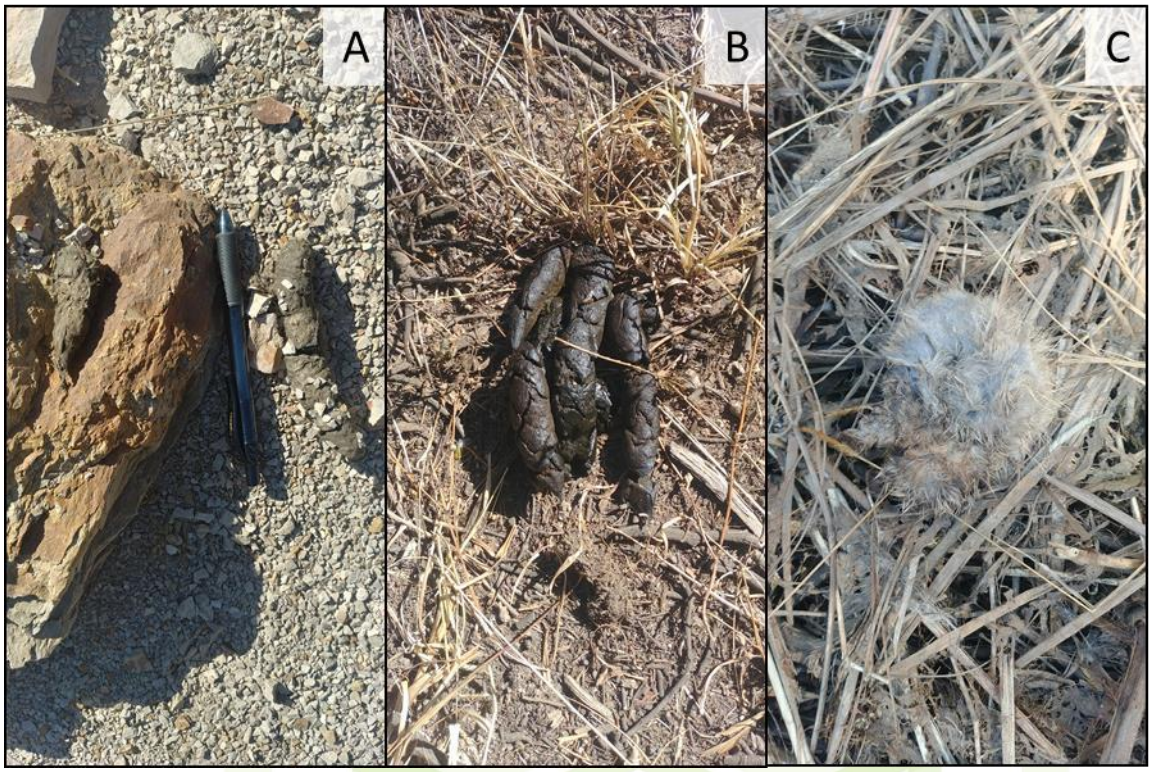


**Figure 9.31: Signs of presence of Black backed Jackal (A & B) and Scrub Hare (C)**

Bird species observed on site are presented in the following table.

**Table 9.18: Bird Species found on site**

| Common name | Scientific name |
|---|---|
| African stonechat | *Saxicola torquatus* |
| Blacksmith lapwing | *Vanellus armatus* |
| Black-winged kite | *Elanus caeruleus* |
| Cape longclaw | *Macronyx capensis* |
| Cape turtle-dove | *Streptopelia capicola* |
| Common Fiscal | *Lanius collaris* |
| Common myna | *Acridotheres tristis* |
| Crested barbet | *Trachyphonus vaillantii* |
| Crowned lapwing | *Vanellus coronatus* |
| Grey-headed gull | *Chroicocephalus cirrocephalus* |
| Helmeted guineafowl | *Numida meleagris* |
| House sparrow | *Passer domesticus* |
| Laughing dove | *Spilopelia senegalensis* |
| Namaqua dove | *Oena capensis* |
| Red-headed finch | *Amadina erythrocephala* |
| Scarlet-chested sunbird | *Chalcomitra senegalensis* |
| Southern masked weaver | *Ploceus velatus* |
| Speckled pigeon | *Columba guinea* |

| | |
|---|---|
| White-browed sparrow-weaver | *Plocepasser mahali* |
| White-fronted bee-eater | *Merops bullockoides* |

No fauna species of conservational concern were found to be present within the project area. Nevertheless, as avifauna are highly mobile and seasonal in nature, a cautious approach is taken and the five avifauna species of conservational concern are presented here.

**Table 9.19 : Avifauna of conservation concern**

| Common Name | Scientific Name | Red List Category |
|---|---|---|
| Crane, Blue | *Anthropoides paradiseus* | Vulnerable |
| Crane, Grey Crowned | *Balearica regulorum* | Endangered |
| Duck, Maccoa | *Oxyura maccoa* | Vulnerable |
| Ibis, Southern Bald | *Geronticus calvus* | Vulnerable |
| Secretarybird, Secretarybird | *Sagittarius serpentarius* | Vulnerable |

### 9.3.10 Heritage and Archaeological Resources

#### *9.3.10.1 Emalahleni general history*

Emalahleni, previously known as Witbank, has a rich history in terms of development and mineral exploitation. Mpumalanga, especially the area between Emalahleni, Middelburg, Bethal, Hendrina, Ermelo and Carolina, is associated with vast coal fields. These coal fields formed between 200 and 300 million years ago from rotten forests in swamps. During this period, Africa was still attached to South America, India and Antarctica as part of the Gondwana supercontinent. By 250 million years ago the climate changed to dry warm conditions and the swamps in Mpumalanga were replaced by desert-like conditions around 200 million years ago. By 180 million years ago, when the Gondwana supercontinent started to split up, volcanic lava fields covered areas in Mpumalanga (De Wit 2007: 37).

With the rich coal deposits in Mpumalanga, it was only a matter of time before its value was realised and the coal extracted. Coal mining is Mpumalanga's most important industrial activity and produces about 80% of South Africa's coal. The earliest coal mining in the area dates to 1868 when farmers extracted coal for personal use in the Middelburg district. Large-scale coal mining around Emalahleni, however, only started after the discovery of gold on the Witwatersrand in 1886. Due to the discovery of coal in the Brakpan and Springs surroundings in 1887 and no railway linking Emalahleni with the Rand, these early Emalahleni coal mines closed down. It was more cost effective to exploit the closer Brakpan and Springs coal deposits than the coal found at Emalahleni (Schirmer 2007: 316).

After the construction of the railway line between the Rand and Emalahleni the deposits were exploited on large scale again. The coal fields, which are about 40 km wide, are concentrated around Emalahleni and run towards Belfast in the east. The first collieries around Emalahleni were Douglas, Transvaal, Delagoa Bay, Witbank and Landau and are of a higher quality compared to the coal found at Brakpan and Springs. During the 1890s some of the coal was exported via Delagoa Bay. In addition, the coal was readily accessible as the deposits occurred at a depth of 100 m or less (Schirmer 2007: 316-317). It should also be noted that the railway line between Pretoria and Lorenço Marques (Maputo) was completed on 2 November 1894 and the connection between Emalahleni and Johannesburg during the 1910s (Heydenrych 1999).

Between 1900 and 1920 many new collieries were established and the coal price dropped. This led to the establishment of the Transvaal Coal Owners' Association with the main aim to regulate output coal prices. This also acted to counter possible competition. It should also be noted that not all collieries joined this association. The establishment of the Transvaal Coal Owners' Association had positive as well as negative influences. On the one hand eliminating the competition might have impacted negatively on efficiency and the workers. On the other hand, it is possible that the capacity of coal mines was enhanced and facilitated further development in the industry. One positive point was that the association eased interaction with international buyers. During the 1930s, however, the coal price continued to drop and resulted in mechanisation. This introduced electric coal cutters and eliminated the need for high number of unskilled workers. By 1946 Emalahleni and Middelburg saw the emergence of a modern coal industry. The Transvaal had 34 large collieries that were responsible for 99.7% of the province's coal (Schirmer 2007: 317-319).

Between 1940 and 1960 coal output in the Eastern Transvaal increased from 13 million to 25 million tons. Although industrialisation expanded throughout this time in South Africa and a demand existed for coal both locally and internationally, a steady shift to oil as the dominant form of energy was noted. In light of these developments Anglo American Corporation launched three research programmes in the 1960s. As a result of these programmes the region's coal mines became export orientated. This trend continued throughout the 1980s. During these times a series of coal-burning power stations around the eastern Highveld coal deposits were constructed (Schirmer 2007: 321).

The town of Witbank was founded in 1903 by Neumann's Witbank Colliery as a result of the mining activity. In 1906 Witbank became a health board, a village council in 1910 and a municipality in 1914 (Schirmer 2007: 338).

On 3 March 2006 Witbank was renamed Emalahleni.

### *9.3.10.2 Site Assessment*

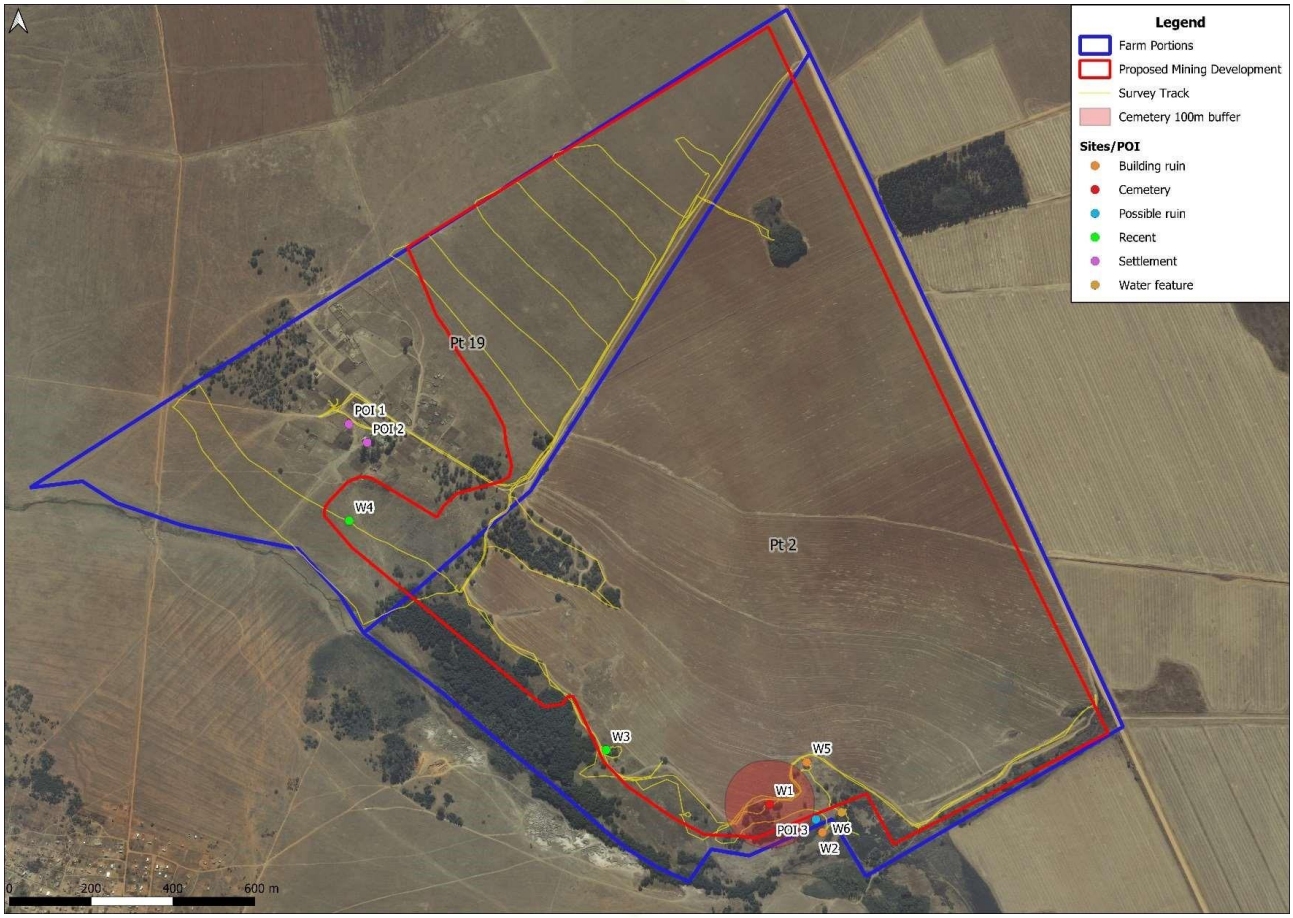


**Figure 9.32: Study area with survey track on a 2012 aerial backdrop**

**Table 9.20: Site coordinates & dimensions**

| Site / Survey Point Name | Longitude | Latitude | +- Site Dimensions (m) |
|---|---|---|---|
| POI1 | 29.048256 | -25.974062 | N/A |
| POI2 | 29.048660 | -25.974467 | N/A |
| POI3 | 29.058521 | -25.982742 | N/A |
| W1 | 29.057506 | -25.982410 | 16 X 12 |
| W2 | 29.058663 | -25.983027 | 3 X 2 |
| W3 | 29.053912 | -25.981222 | 10 X 5 |

| | | | |
|---|---|---|---|
| W4 | 29.048266 | -25.976188 | 3 X 13 |
| W5 | 29.058322 | -25.981489 | 14 X 15 |
| W6 | 29.059082 | -25.982590 | 3 X 2 |

Sites POI 1 & POI 2 (Figure 9.33 and Figure 9.34) were identified on a 1960 topographical map. These structures were marked as huts to the northwest of the demarcated study area. Structures are shown on all subsequent topographical maps, although there is a strong possibility that some of these structures were replaced in later years. On the 1943 aerial image no structures are visible, but a possible structure might be located to the southeast of POI 1 & POI 2 (Figure 9.39). The 1961 aerial image, however, shows the presence of structures in the vicinity of the two POI sites, but the structure to the southeast is not visible as agricultural land was made in the same locality. The same general area is still occupied today and consists of several homesteads and kraals. It is, however, unclear if structures dating to between 1943 and 1961 still exist. The area associates with POI 1 & POI 2 fall outside of the demarcated study area and should not be affected by die proposed mining activities.

Sites W2, W5, W6 and POI 3 (Figure 9.35 to Figure 9.38) are located on the southern border of Portion 19 and are likely to date to the same time period. POI 3 and W6, however, are not visible on historical aerial photographs as these sites are locate within a forest. Sites W2 & W5 are visible on the 1943, as well as the 1961 aerial images. Additionally, structures are shown at W6 and POI 3 on the 1960 topographical map (Figure 9.43). The 1974 topographical map (Figure 9.44) shows only W5 and a structure just north of POI 3, while the 1996 topographical map only shows W5 (Figure 9.45). It should be noted that Sites W2, W6 and POI 3 fall outside of the area demarcated for mining development, while Site W5 falls inside the demarcated boundary. Also, no surface material, except for building material remains, was observed at any of the sites.

Site W2 (Figure 9.35) is a slightly rectangular, white-plastered dilapidated building measuring roughly 3 X 2m and was built using bricks and cement. The building consists of one room and no roof exists.

W6 depicts a water channel or small dam constructed from cement, bricks and stone (Figure 9.36).

POI 3 was not visible as the site is located within an extremely dense forest.

W5 consists of a 14 X 15m dilapidated building with 8 rooms. Cement, soil and bricks appear to have been used as building material and no roof is present (Figure 9.37 and Figure 9.38).

The study done by Van Vollenhoven (2015) also recorded the remains of a building likely to exceed 60 years of age.

**Figure 9.33: Homestead in the vicinity of POI 1 & POI 2**

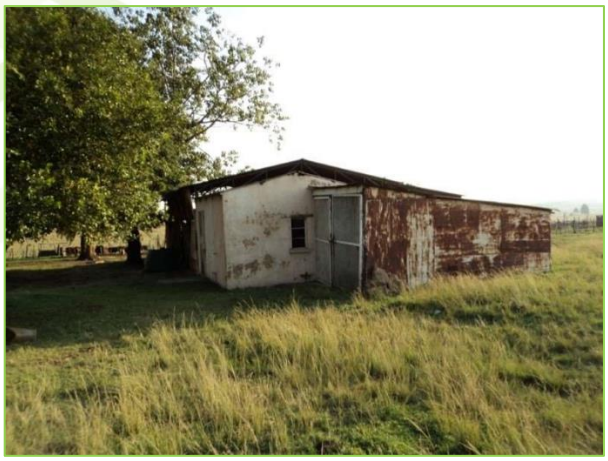

**Figure 9.34: Structure in the vicinity of POI 1 & POI 2**

Figure 9.35: Angular Ruin W2

Figure 9.36: Water feature W6

Figure 9.37: Western perspective of dilapidated building W5

Figure 9.38: Structure W5 seen from the east

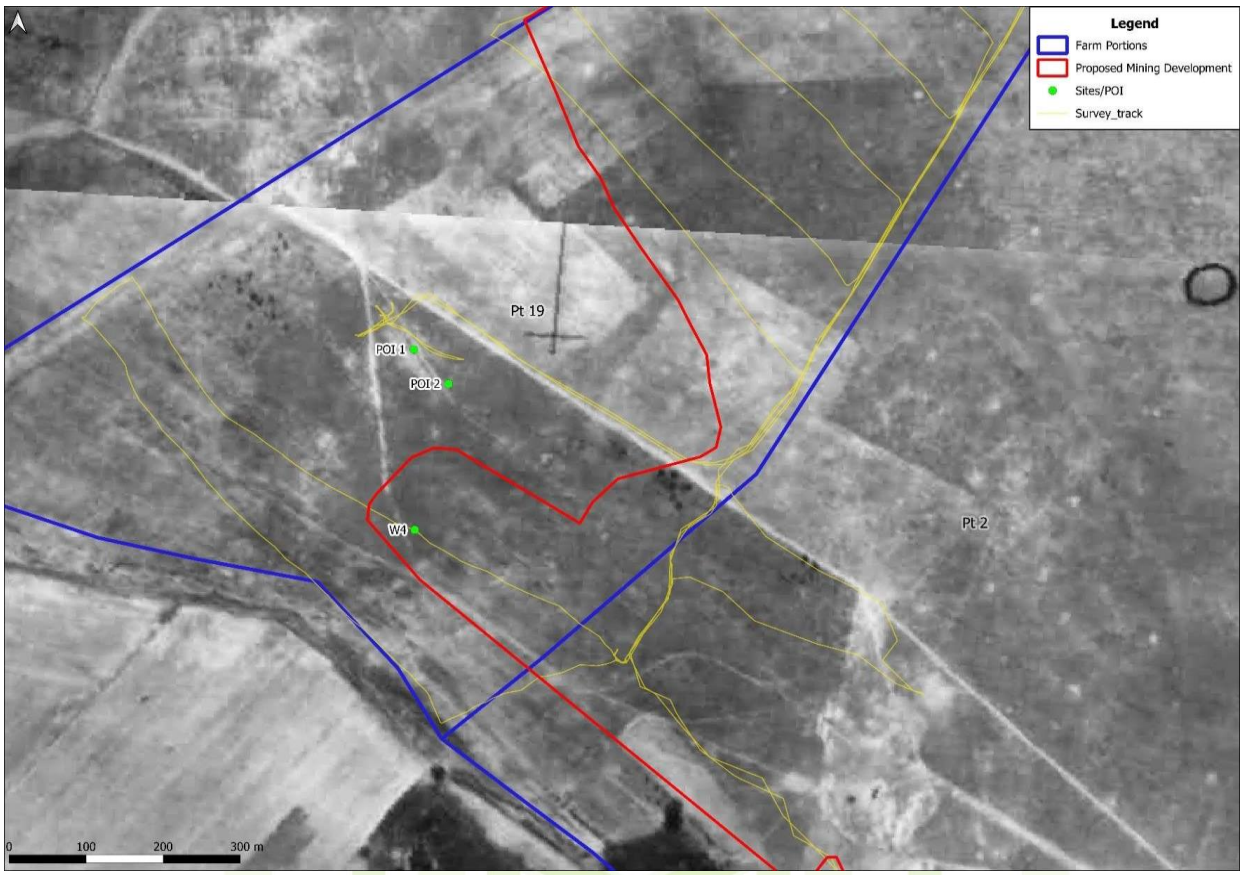


**Figure 9.39: A portion of Portion 2 superimposed on a 1943 aerial photograph**

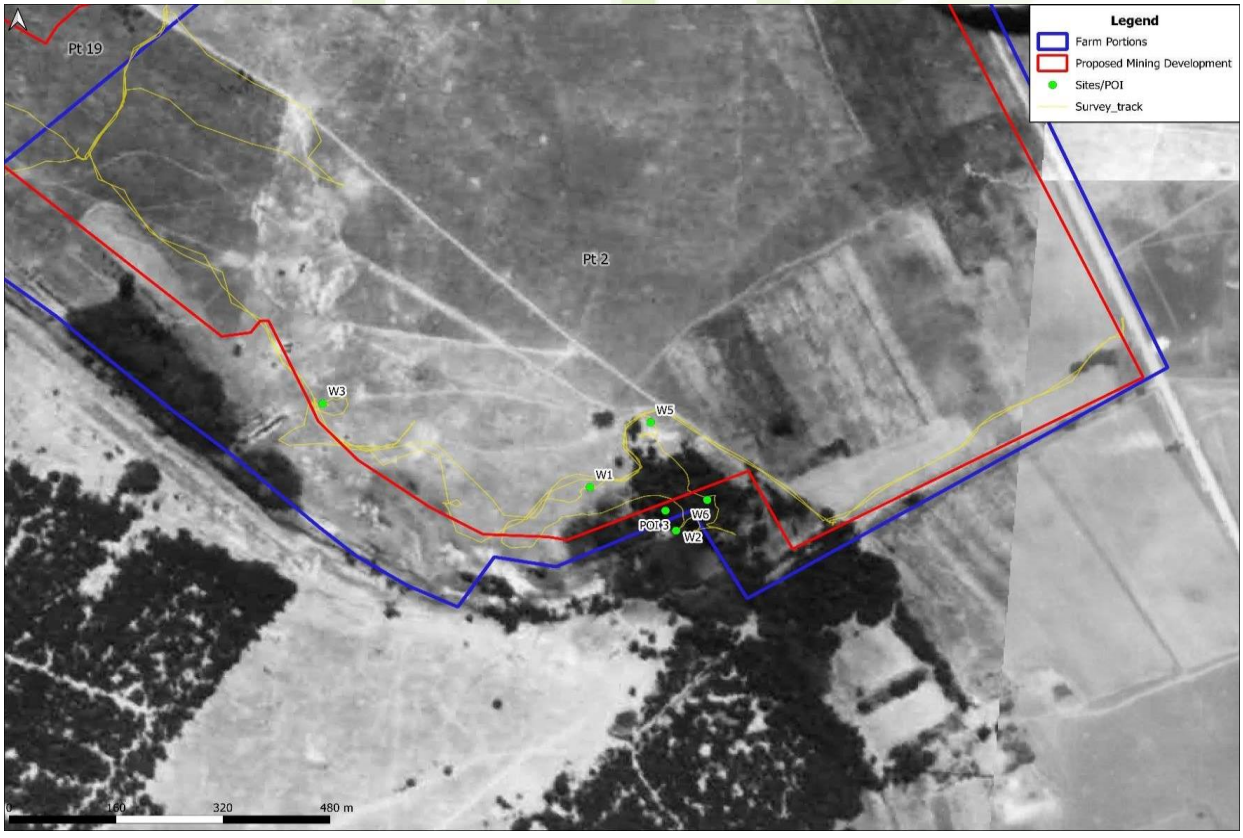


**Figure 9.40: A portion of Portion 2 superimposed on a 1943 aerial photograph**

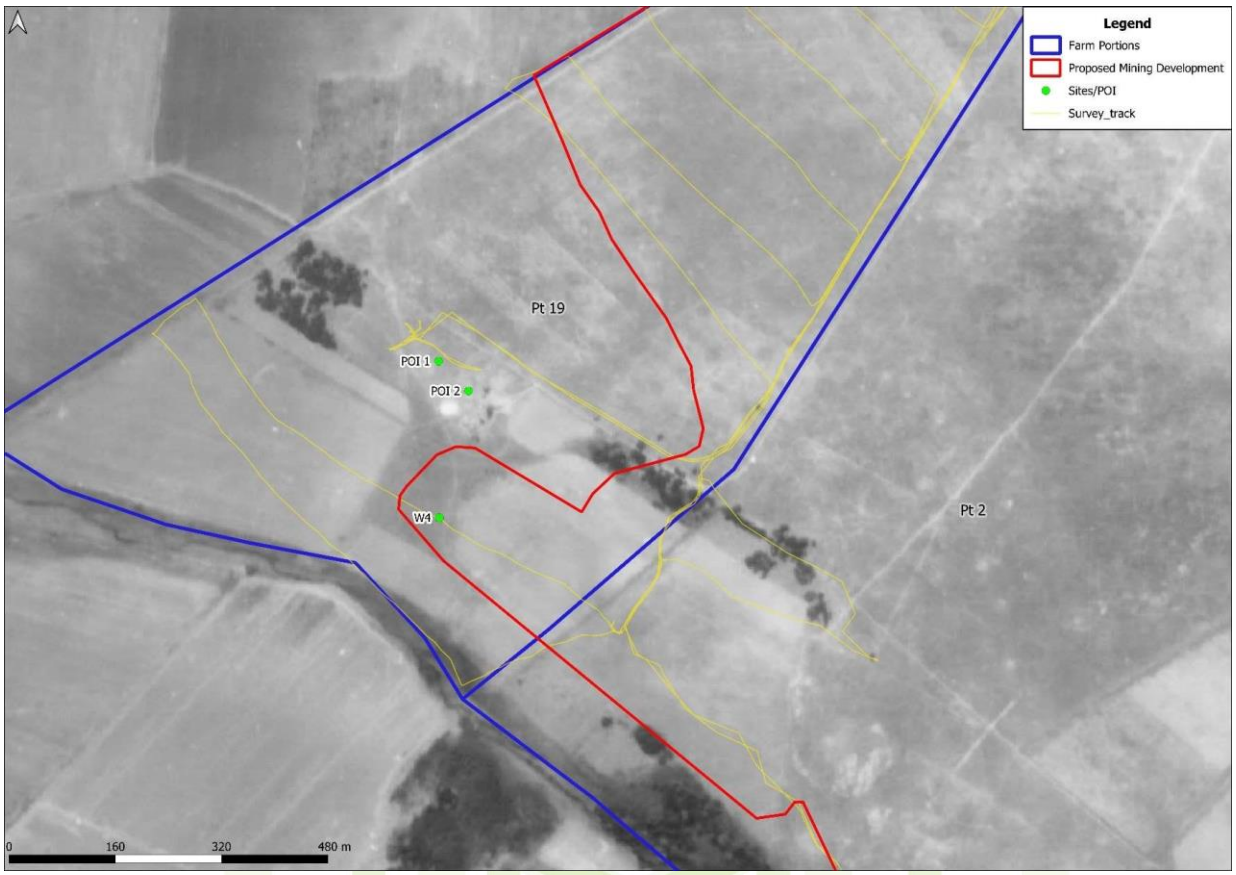


**Figure 9.41: A portion of Portion 2 superimposed on a 1961 aerial photograph**


**Figure 9.42: A portion of Portion 2 superimposed on a 1961 aerial photograph**

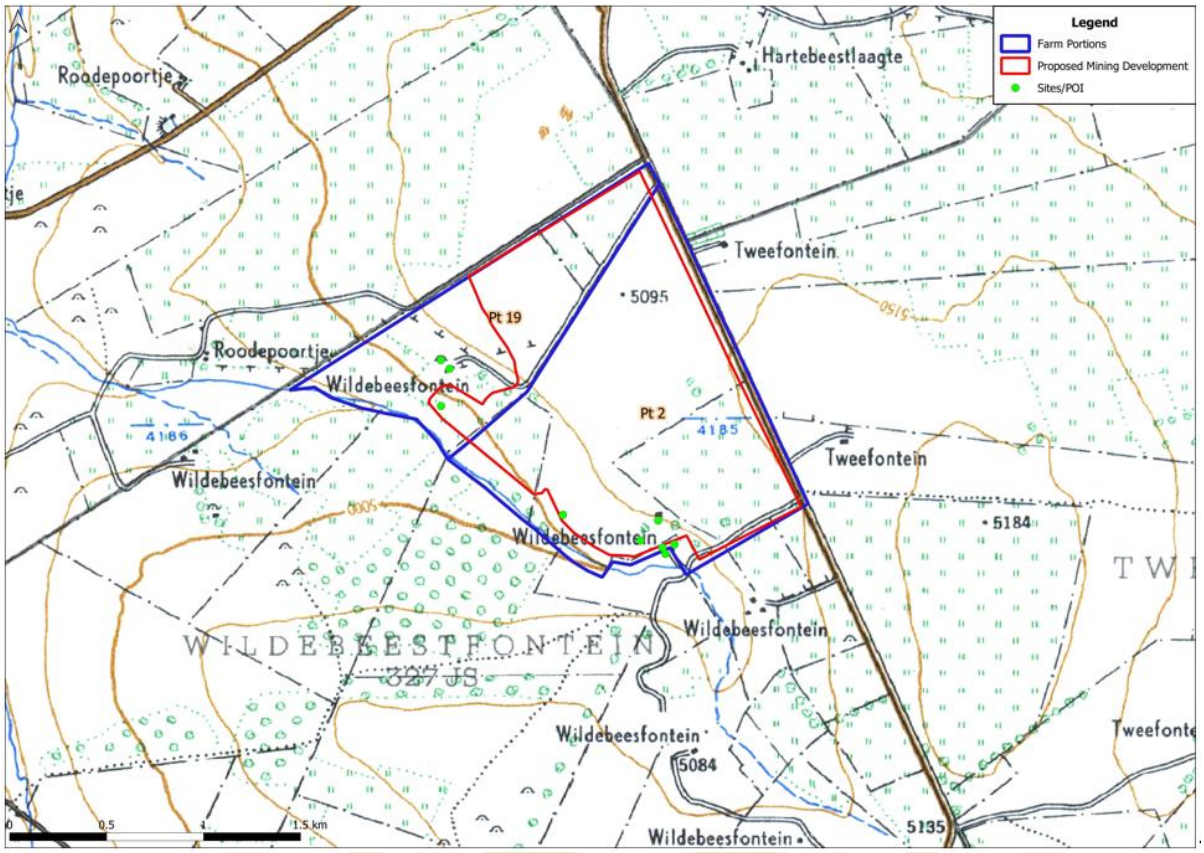


**Figure 9.43: Study area superimposed on a 1960 topographical map**

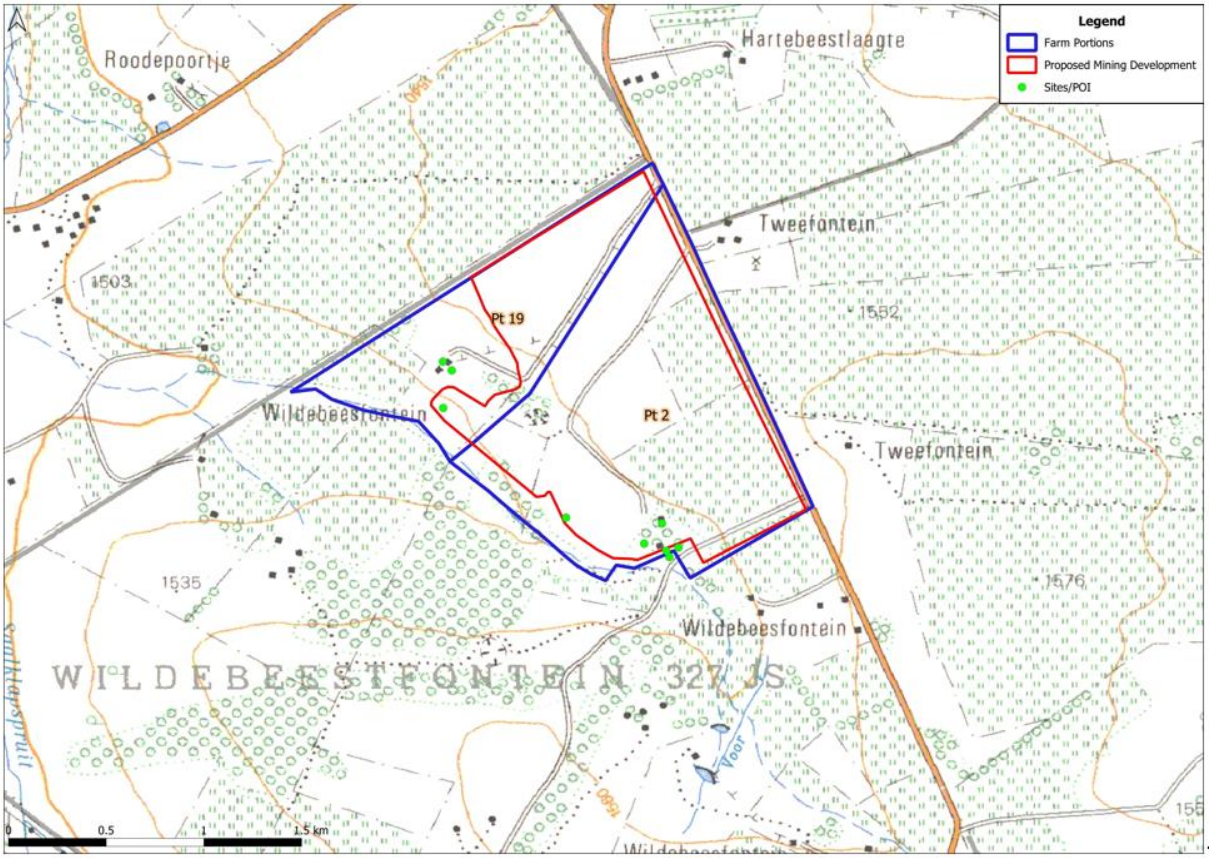


**Figure 9.44: Study area superimposed on a 1974 topographical map**

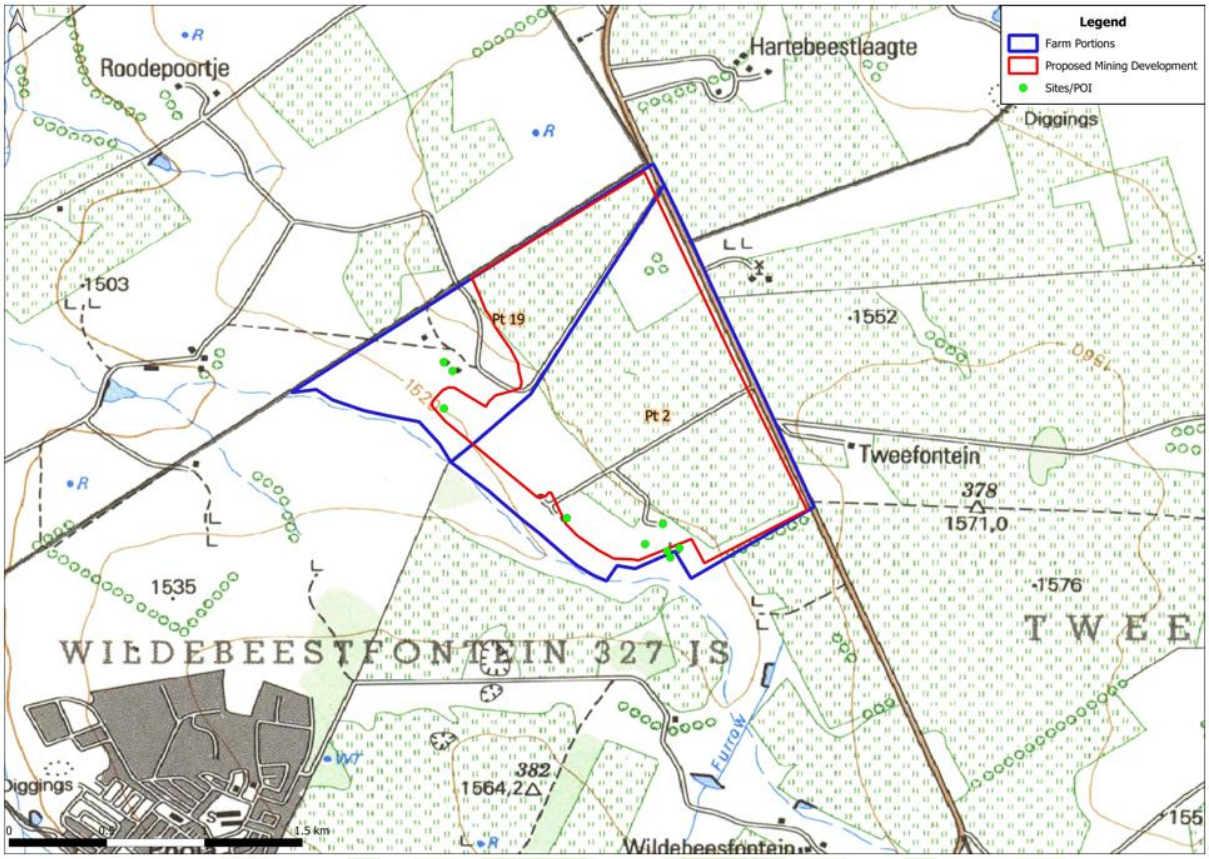


**Figure 9.45: Study area superimposed on a 1996 topographical map**

The recent remains located in the vicinity of the study area include an angular feature (POI 3) likely to be associated with agricultural activities, recent structures near Sites POI 1 & POI 2 (Figure 9.46), and building ruins under a small patch of trees (W3).

Site W4 (Figure 9.47) is located to the south of the settlements on Portion 19 and consists of an angular structure standing two bricks high. The site measures 3 X 13 m. The use of the feature is unknown, but it is possible that it relates to agricultural activities as the general area on Portion 19 is used for cattle grazing. The modern building material suggests that the structure is of recent origin.

Site W3 (Figure 9.48 and Figure 9.49) is located along the southern boundary of the area demarcated for development on Portion 2 and consists of what appears to be the remains of building foundations. Remains include angular foundations constructed using bricks, as well as small piles of broken bricks. The site is not visible on aerial images, but is first indicated on the 1996 topographical map.

**Figure 9.46: Modern features near POI 1 & POI 2**

**Figure 9.47: W4 indicating the modern angular structure.**

Figure 9.48: Pile of broken bricks at W3

Figure 9.49: Structure W5 seen from the east

Site W1 (Figures 48 – 47) indicates an unfenced cemetery in a poor state of preservation. Apart from the poor preservation, site visibility and identification were hampered by dense vegetation and tree growth (Figure 9.50). Eleven graves could be identified, but a strong possibility exists that additional graves are associated with the immediate vicinity. All the graves are indicated by stone cairns placed in an east-west orientation, known as the Christian Western style. Although headstones are absent from the majority of graves, an upright stone is found on the western side of the grave in some cases (Figures 49 & 50). In one case, an inscription was observed on a broken headstone (Figure 9.53). Although badly damaged, it could be determined that the person was born Opperman in 1854 and died in 1882. Because Cemetery W1 is located roughly 100 m west of the historical structures on Portion 2, there is a high probability that the graves are linked to these ruins.

Figure 9.50: Cemetery W1 seen from the east.

Figure 9.51: Grave with an upright stone as headstone..

Figure 9.52: Stone cairns indicating burial location

Figure 9.53: Inscribed headstone at graveyard W1

All sites should include a field rating in order to comply with section 38 of the National Heritage Resources Act (Act No. 25 of 1999). The field rating and classification in this report are prescribed by SAHRA.

Table 9.21: Field Ratings

| Rating | Field Rating/Grade | Significance | Recommendation |
|---|---|---|---|
| National | Grade 1 | | National site |
| Provincial | Grade 2 | | Provincial site |
| Local | Grade 3 A | High | Mitigation not advised |
| Local | Grade 3 B | High | Part of site should be retained |
| General protection A | 4 A | High/Medium | Mitigate site |
| General Protection B | 4 B | Medium | Record site |
| General Protection C | 4 C | Low | No recording necessary |

Table 9.22: Individual site ratings

| Site / Survey Point Name | Type | Rating | Field Rating / Grade | Significance | Recommendation |
|---|---|---|---|---|---|
| POI 1 | Settlement | Local | Grade 3 A | High | Mitigation not advised |
| POI 2 | Settlement | Local | Grade 3 A | High | Mitigation not advised |
| POI 3 | Possible ruin | Local | Grade 3 A | High | Mitigation not advised |
| W1 | Cemetery | Local | Grade 3 A | High | Mitigation not advised |
| W2 | Building ruin | Local | Grade 3 A | High | Mitigation not advised |
| W3 | Building foundation | General Protection C | 4 C | Low | No recording necessary |
| W4 | Angular structure | General Protection C | 4 C | Low | No recording necessary |
| W5 | Building ruin | Local | Grade 3 A | High | Mitigation not advised |
| W6 | Water feature | Local | Grade 3 A | High | Mitigation not advised |

Sites W3 and W4 are located within the area demarcated for development, but are not significant from a heritage perspective. The general area in the vicinity of POI 1 and POI 2 is associated with historical settlements, but have since seen significant expansion and development. Although it is unclear whether some of these structures date to historical times, the possibility that exists they might exceed 60 years of age, and would therefore be protected under the NHRA act 25 of 1999. Because past human activity can be traced

back to at least 1943, the area is considered significant from a heritage perspective. This area falls outside of the area demarcated for development, but could be impacted by the proposed mining activity, especially if blasting will occur at the site.

The sites located towards the south of Portion 2 (POI 3, W1, W2, W5, W6) most likely date to the same time period when construction material and location are considered and might therefore be associated with each other. These sites exceed 60 years of age, are significant from a heritage perspective and would therefore be protected under the NHRA act 25 of 1999. Although only W1 and W5 fall within the demarcated study area, the remaining sites might be affected by the proposed mining development due to their close proximity to the study area.

### 9.3.11 Paleontological Resources

#### *9.3.11.1 Regional Setting*

The Karoo Supergroup is renowned for its fossil wealth. The Vryheid Formation (Pe, Pv), Ecca Group is rich in plant fossils such as the *Glossopteris* flora represented by stumps, leaves, pollen and fructifications (Appendix 1). This formation is early to mid-Permian (Palaeozoic) in age and consists of sandstone, shaly sandstone, grit, conglomerate, coal and shale. Coal seams are present in the Vryheid Formation within the sandstone and shale layers. Fossils are mainly present in the grey shale which is interlayered between the coal seams (Kent 1980, Visser 1989). Borehole logs in the coalfields show the following layers; soil, shale and sandstone, shale and sandstone interbedded, sandstone, coal, conglomerate reworked diamictite, Dwyka Tillite, and the Pre-Karoo Basement.

Fossils in South Africa mainly occur in rocks of sedimentary nature and not in rocks from igneous or metamorphic nature. Therefore, if there is the presence of Karoo Supergroup strata the palaeontological sensitivity can generally be LOW to VERY HIGH, and here locally **VERY HIGH** for the Vryheid Formation (SG 2.2 SAHRA APMHOB, 2012).

### 9.3.12 Noise

Table 9.23 depicts acceptable noise levels within districts according to the SANS 10103 guideline.

**Table 9.23: Acceptable rating levels for noise in districts (SANS 10103, 2008)**

| Type of District | Equivalent continuous rating level ($L_{Reg.T}$) for noise (dBA) | | | | | |
|---|---|---|---|---|---|---|
| | Outdoors | | | Indoors, with open windows | | |
| | Day-night | Day-time | Night-time | Day-night | Day-time | Night-time |
| | $L_{R,dn}$a | $L_{Req,d}$b | $L_{Req,n}$b | $L_{R,dn}$a | $L_{Req,d}$b | $L_{Req,n}$b |
| RESIDENTIAL DISTRICTS | | | | | | |
| a) Rural districts | 45 | 45 | 35 | 35 | 35 | 25 |
| b) Suburban districts with little road traffic | 50 | 50 | 40 | 40 | 40 | 30 |
| c) Urban districts | 55 | 55 | 45 | 45 | 45 | 35 |
| NON-RESIDENTIAL DISTRICTS | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| d) Urban districts with | | | | | | |
| some workshops, with business premises, and with main roads | 60 | 60 | 50 | 50 | 50 | 40 |
| e) Central business districts | 65 | 65 | 55 | 55 | 55 | 45 |
| f) Industrial districts | 70 | 70 | 60 | 60 | 60 | 50 |

NOTE 1 If the measurement or calculation time interval is considerably shorter than the reference time intervals, significant deviations from the values given in the table might result.

NOTE 2 If the spectrum of the sound contains significant low frequency components, or when an unbalanced spectrum towards the low frequencies is suspected, special precautions should be taken and specialist advice should be obtained. In this case the indoor sound levels might significantly differ from the values given in columns 5 to 7.

NOTE 3 In districts where outdoor $L_{R,dn}$ exceeds 55 dBA, residential buildings (e.g. dormitories, hotel accommodation and residences) should preferably be treated acoustically to obtain indoor $L_{Req,T}$ values in line with those given in table 1.

NOTE 4 For industrial districts, the $L_{R,dn}$ concept does not necessarily hold. For industries legitimately operating in an industrial district during the entire 24 h day/night cycle, LReq,d = LReq,n =70 dBA can be considered as typical and normal.

NOTE 5 The values given in columns 2 and 5 in this table are equivalent continuous rating levels and include corrections for tonal character, impulsiveness of the noise and the time of day.

NOTE 6 The noise from individual noise sources produced, or caused to be produced, by humans within natural quiet spaces such as national parks, wilderness areas and bird sanctuaries, should not exceed a maximum Weighted sound pressure level of 50 dBA at a distance of 15 m from each individual source.

a The values given in columns 2 and 5 are equivalent continuous rating levels and include corrections for tonal character and impulsiveness of the noise and the time of day.

b The values given in columns 3, 4, 6 and 7 are equivalent continuous rating levels and include corrections for tonal character and impulsiveness.

The probable community/group response to levels in excess of the acceptable rating levels are presented in Table 9.24, where LReq,T is the equivalent continuous A-weighted sound pressure level, in decibels (dBA), determined over a specific time period. 'A-weighted' is a standard weighting of the audible frequencies designed to reflect the response of the human ear to noise.

**Table 9.24: Categories of community/group response (SANS 10103, 2008)**

| Excess ($\Delta L_{Req,T}$)[a]dBA | Estimated community/group response | |
|---|---|---|
| | Category | Description |
| 0 – 10 | Little | Sporadic complaints |
| 5 – 15 | Medium | Widespread complaints |
| 10 - 20 | Strong | Threats of action |
| >15 | Very strong | Vigorous action |
| NOTE Overlapping ranges for the excess values are given because a spread in the community reaction might be anticipated. | | |
| a $\Delta L_{Req,T}$ should be calculated from the appropriate of the following: | | |
| 1) $\Delta L_{Req,T}$ = $L_{Req,T}$ of ambient noise under investigation MINUS LReq,T of the residual noise (determined in the absence of the specific noise under investigation); | | |
| 2) $\Delta L_{Req,T}$ = $L_{Req,T}$ of ambient noise under investigation MINUS the maximum rating level for the ambient noise given in table 1; | | |
| 3) $\Delta L_{Req,T}$ = $L_{Req,T}$ of ambient noise under investigation MINUS the typical rating level for the applicable district as determined from table 2; or | | |
| 4) $\Delta L_{Req,T}$ = Expected increase in $L_{Req,T}$ of ambient noise in an area because of a proposed development under investigation. | | |

The measuring points for the study area were selected to be representative of the prevailing ambient noise levels for the study area and include all the noise sources such as distant traffic noise, agricultural activities but exclude traffic noise which was intermittent in the vicinity of the measuring points. The measuring points are illustrated in Figure 9.54.

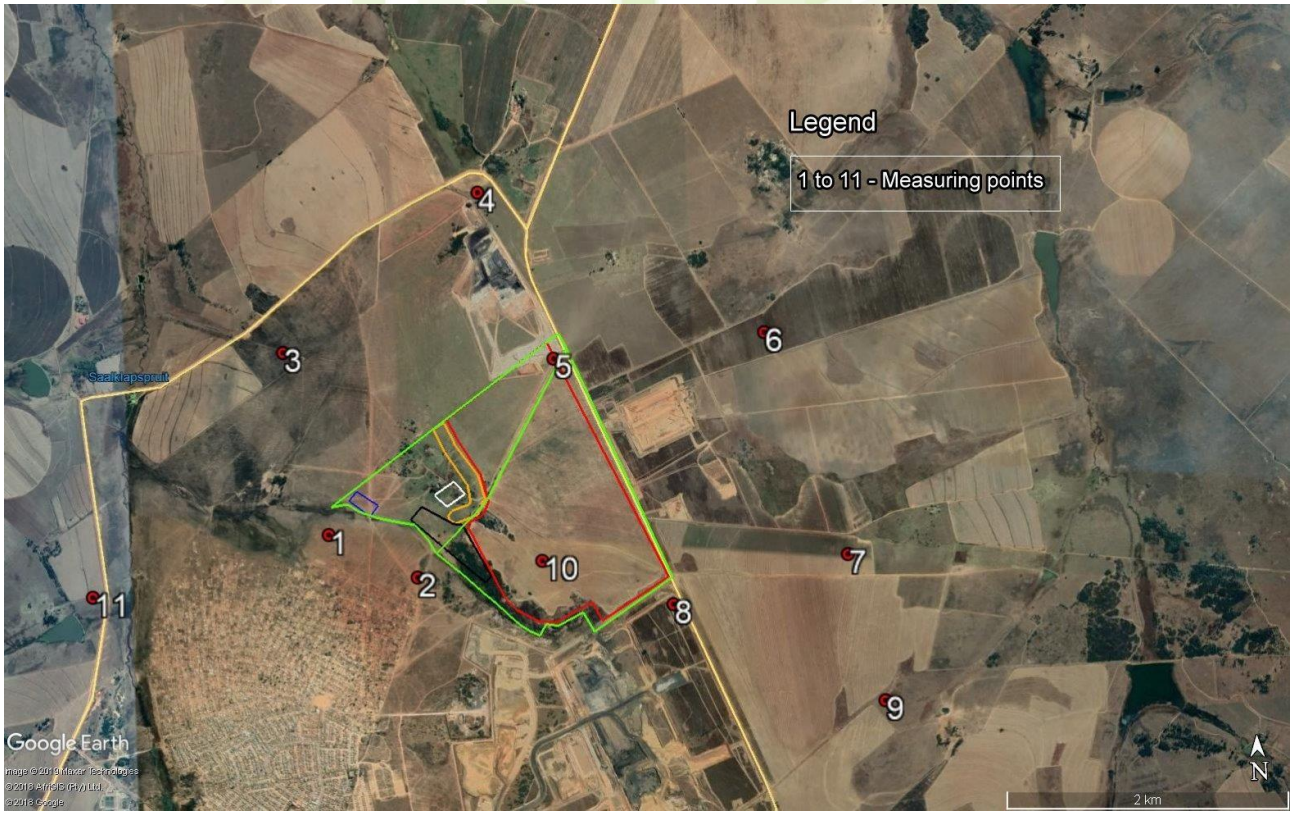

**Figure 9.54: Noise measuring points within the study area**

### *9.3.12.1 Current Noise Source*

The following are noise sources in the vicinity of and the boundaries of the study area:

- Mining related noise;
- Seasonal agricultural activities;
- Traffic noise along the feeder roads;
- Distant traffic noise from the abutting feeder roads;
- Insects;
- Birds; and
- Wind noise.

### *9.3.12.2 Noise Survey Results*

In Table 9.25 are the different prevailing ambient noise levels for the specific areas, which include all the noise sources currently in the area such as domestic, traffic noise, distant mine noise and natural noise sources. Leq is the average noise level for the specific measuring point over a period of time, the Lmax is the maximum noise level and the Lmin is the minimum noise level registered during the noise survey for the specific area in dBA.

**Table 9.25: Noise levels for the day and night in the study area.**

| Position | | Day time | | | | | Night time | |
|---|---|---|---|---|---|---|---|---|
| | Leq dBA | Lmax (Fast) - dBA | Lmin (Fast) - dBA | Remarks | Leq - dBA | Lmax (Fast) - dBA | Lmin (Fast) - dBA | Remarks |
| 1 | 39.0 | 58.2 | 30.7 | Distant mine, wind & domestic. | 29.8 | 46.9 | 25.2 | Domestic noise. |
| 2 | 40.5 | 62.4 | 34.0 | Distant mine, wind & domestic. | 33.0 | 61.9 | 25.0 | Domestic noise. |
| 3 | 45.7 | 61.5 | 33.0 | Distant hauling vehicles. | 32.8 | 59.4 | 28.2 | Distant mining activities. |
| 4 | 40.5 | 64.1 | 36.9 | Distant hauling vehicles & wind. | 31.9 | 54.1 | 22.8 | Distant mining activities. |
| 5 | 41.2 | 61.9 | 33.1 | Distant hauling vehicles & wind. | 45.3 | 58.8 | 35.6 | Distant mining activities. |
| 6 | 40.1 | 63.8 | 39.2 | Distant mining activities from South 32. | 38.9 | 52.4 | 33.1 | Distant mining activities. |
| 7 | 36.5 | 62.6 | 34.2 | Distant mining activities from South 32. | 40.6 | 61.2 | 36.1 | Distant mining activities. |
| 8 | 39.8 | 63.9 | 34.7 | Distant mining activities and hauling. | 44.8 | 62.2 | 39.6 | Distant mining activities from South 32. |
| 9 | 43.8 | 65.0 | 37.2 | Distant mining activities from South 32. | 30.3 | 44.1 | 26.3 | Distant mining activities. |
| 10 | 53.9 | 69.6 | 36.0 | Traffic noise | 46.2 | 71.1 | 29.7 | Traffic noise. |
| 11 | 35.8 | 59.4 | 31.3 | Distant mining activities. | 39.9 | 63.2 | 33.1 | Distant mining activities. |

### 9.3.13 Socio-Economics

The proposed Project is located in eMalahleni Local Municipality (ELM), within the Nkangala District Municipality (NDM) in Mpumalanga Province. The socio-economic characteristics of the population within each of the aforementioned areas are listed below.

#### *9.3.13.1 Population and Demographics*

According to the ELM 2013-2014 IDP, this municipality is the largest economic contributor to the NDM of the six local municipalities, contributing 45% to the districts economy. Dominant economic contributors include utilities (74.1%), mining (52.8%) and construction (52.5%). eMalahleni' s population size, as recorded by Stats SA 2011, was 395 466 people which makes up 30% Nkangala District's population. The population lives in 119 874 households with an average household size of 3.3 people. This is a relatively low family size, which may reflect the young age of the urban centres in the district, in which large family structures have not had time to develop. More established towns generally have average family sizes in excess of 4.5 people, while rural areas often average 5.5 people or more per household. The ELM's population grew by 43.1% between 2001 and 2011 while annualised population growth rate was measured at 3.6%.

#### *9.3.13.2 Educational Status*

Educational achievement is a key development indicator of a population. The majority of the population (ages over twenty) in the local study area as well as district municipality have not completed matric, however, there is a large percentage of learners who complete primary level education.

#### *9.3.13.3 Employment and Labour*

According to Statistics South Africa, (2011) the employment rate for Mpumalanga Province and Nkangala District Municipality was 24% and 27% respectively (Stats SA, 2011). There has been a drop in unemployment rate in the ELM from 38.4% to 27% between 2001 and 2011. A large portion of those employed are absorbed into the mining, construction, power generation and agricultural sectors.

#### *9.3.13.4 Annual Household Income*

Over 40% of people in Mpumalanga Province have no annual income at all. Average income figures for the local study area, the ELM and the NDM are all very much in line with the provincial average; however, the income earning figures are slightly higher for the local study area, with more people earning between R3 201 and R12 800 (Stats SA, 2011). It can be gathered that the ELM has a higher income production than the provincial figures. This is attributed to the concentration of mining and power generation activities, and construction industry in this area (Stats SA, 2011).

#### *9.3.13.5 Social Infrastructure and Services*

All the urban areas within ELM (with the exception of informal settlements and townships) are fully reticulated in terms of potable water supply. A large percentage of households in the local study area have access to piped water either inside their house or within a communal yard, with an average of 77% having access to municipal water, whilst 8% have access to water through a borehole. In terms of sanitation, data from the 2011 census, show that an estimated 57% of households in the local study area have access to waterborne sewer services (flush toilets, with or without septic tanks); the majority (33%) of the remaining households use pit latrines (Stats SA, 2011). An estimated 69% of waste generated within the ELM is collected weekly by the local municipality. In contrast to the ELM, the most common means of waste disposal for populations in Ward 30 is through utilisation of their own refuse dumps (39%), 36% make use of municipal services and a significant amount of the population has no means of waste disposal at all. Of the households in local study area, 53% use electricity for cooking, heating and lighting. In contrast 69% of the households in the ELM use electricity. The bulk electricity provider throughout the municipality is Eskom (ELM IDP, 2012 - 2013). The ELM is strategically located in terms of the provincial context and transport network. It is situated in close proximity to the City of Johannesburg, City of Tshwane and Ekurhuleni Metropolitan Municipalities in Gauteng, and is connected to these areas by the N4 and N12 freeways. Although roads in the ELM are sufficiently connected with district, provincial and national roads, many secondary road systems are in a state of disrepair, being insufficient to handle the increased traffic created by mining and other industrial developments. Crime and community safety is generally

a cause of concern for communities in the local study area. There has been a history of substance abuse and widespread criminal activity in the area, with several instances of community conflict, industrial action and opposition towards the local municipality and surrounding mining companies.

#### *9.3.13.6 Health Services*

It was found in an interview with the head nurses at the Phola Community Health Centre and the Ogies Clinic that prostitution has become an increased problem within the region as a result of the mining operations; this then in turn leads to an increase in HIV/AIDS rates. The mining operations also have resulted in an influx of inhabitants into the area which has put tremendous strain on health facilities.

#### *9.3.13.7 Agriculture Sector in Mpumalanga*

Between 1996 to 2012, the agricultural sector for Gert Sibande has remained fairly constant with only a 0.3% decline, while Nkangala has witnessed a slight decline in agricultural sector from 23.9% in 1996 to 22.9% in 2012 (Gert Sibande District Municipality, 2017). The agricultural sector contributes the least towards the GVA of the Nkangala (1.91%), however, the agricultural sector is an important sector as it has the potential for the development of rural areas and the country as a whole (Nkangala District Municipality, 2017).

Agricultural activity within Gert Sibande is a large sector producing products such as maize, grain, wheat, mutton, dairy, wool and sorghum and are grown mainly through dryland agriculture. The lack of training, capacity and support has resulted in Gert Sibande collaborating with various stakeholders to coordinate programmes in the development of the agricultural sector. According to the Gert Sibande District Municipality (2017), agricultural land within Gert Sibande is constantly under threat by mining activities.

Food security is an issue faced by both District municipalities. Due to the competition of land between mining and agricultural sectors, the prevalence of food security as a challenge has increased (Gert Sibande District Municipality, 2017; Nkangala District Municipality, 2017).

#### *9.3.13.8 Mpumalanga's Tourism Sector*

The Mpumalanga Tourism and Parks Agency had divided the Province into seven different tourism regions that are geographically diverse and offer tourists very different experiences. Significantly, the District hosts three of the seven regions, namely "Cosmos Country," "Grass and Wetlands," and the "Wild Frontier". Unfortunately, though, with the exception of the Wild Frontier towards Barberton which is currently rated as the second most popular area in the Province, the other two regions are currently ranked very low.

Tourism contribution in Mpumalanga is of strategic importance especially because it boosts provincial employment and GDP. In 2015, tourism's direct contribution towards GDP is estimated at R17.6 billion and the total contribution is estimated at R35.1 billion compared to national at R 357 billion. The contribution is estimated at a percentage of 3.4 and 9.4 respectively during the same year. The sector also contributes significantly to employment in the province as well as the country.

The site under investigation is however not linked to any major tourism attraction and not located on any of the main roads associated with tourism routes.

## 9.4 Description Of Specific Environmental Features And Infrastructure On The Site

The proposed infrastructure has been discussed under Heading **Error! Reference source not found.**. The following is a summary of the identified sensitive environmental features and other structures on the proposed site:

### 9.4.1 Specific Sensitive Environmental Features

**Table 9.26: Specific Environmental Features associated with the site**

| Sensitive Environmental Features | Details |
|---|---|
| **Wetlands and Surface Water** | The study area is associated with a tributary of the Olifants River.<br>A channeled valley bottom wetland is situated within the 500 m buffer zone of the proposed mining infrastructure.<br>A 100 m buffer from these surface water features are proposed. |
| **Ecological** | Sensitive ecological habitats are associated with the riparian area of the wetland area. |

### 9.4.2 Specific Infrastructure on site

**Table 9.27: Specific Infrastructure Features associated with the site**

| Aspect | Infrastructure |
|---|---|
| **Heritage** | The area associated with the historical buildings (W2, W5, W6 and POI 3) are significant form a heritage perspective. This is due to the fact that some of the buildings are visible on areal imagery dating to 1943, as well as a topographical map dating to 1960. It is recommended that this area be avoided by the proposed project and monitored during construction and development phases.<br>The cemetery (W1), located in close proximity of the abovementioned buildings, should be fenced-off, maintained and monitored by an ECO during construction and operational phases. Access to the graveyard should also not be restricted |

## 9.5 Environmental Sensitivity And Current Land Use Map

Figure 9.55 below depicts the environmentally sensitive areas, in relation to, the proposed project infrastructure. The riparian area and valley bottom wetland associated with the site are the main factors determining the overall site sensitivity map.

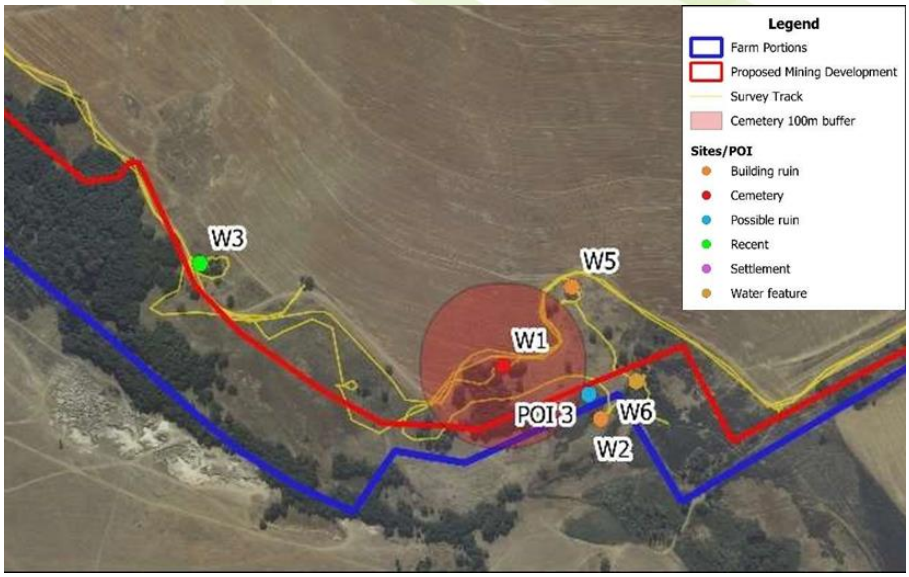


**Figure 9.55: Areas of cultural sensitivity**

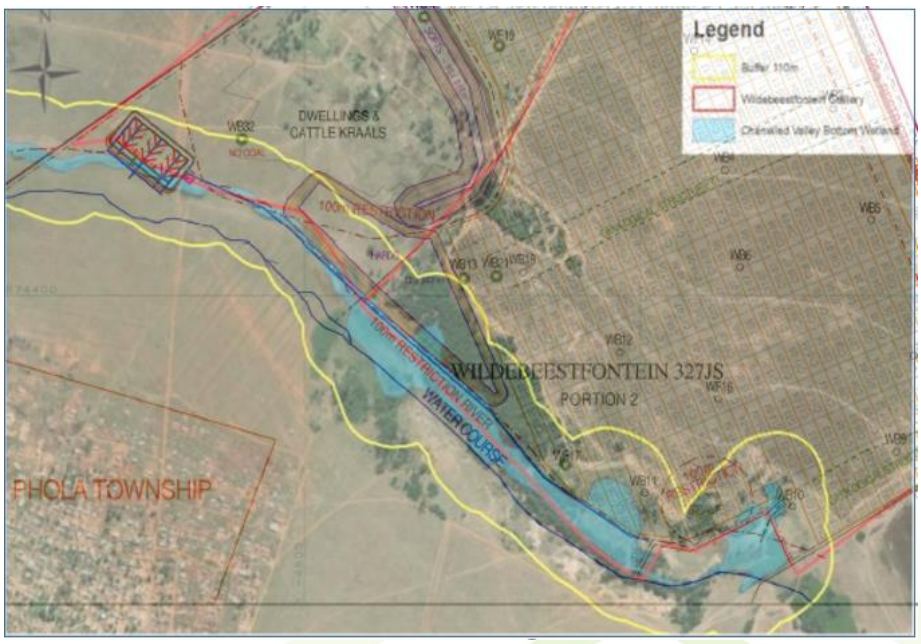


**Figure 9.56: Wetlands and infrastructure**

# 10. ITEM 3(G)(V): IMPACT ASSESSMENT PROCESS AND FINDINGS

## 10.1 Summary Of Impacts And Risks Identified By Specialists

This section summarises the main findings of various specialists' impact assessments with respect to the proposed project.

### 10.1.1 Air Quality Impacts

During site clearance and site establishment a number of operations take place such as land clearing, topsoil removal, loading of material, hauling, grading, stockpiling, bulldozing and compaction. Initially, topsoil and subsoil will be removed with large scrapers. The topsoil will be stockpiled for rehabilitation in the infrastructure area. It is anticipated that each of the above mentioned operations will have its own duration and potential for dust generation. Fugitive dust (containing TSP (total suspended particulate, will give rise to nuisance impacts as fallout dust), as well as PM10 and PM2.5 (dust with a size less than 10 microns, and dust with a size less than 2.5 microns giving rise to health impacts)). It is anticipated that the extent of dust emissions would vary substantially from day to day depending on the level of activity, the specific operations, and the prevailing meteorological conditions. This activity will be short-term and localised, seizing after construction activities. Material will be removed by using a bulldozer and then storing this material separately for use during rehabilitation at end of life of mine when the operation cease. These construction sites are ideal for dust suppression measures as land disturbance from clearing and excavation generates a large amount of soil disturbance and open space for wind to pick up dust particles and deposit it elsewhere (wind erosion). Issues with dust can also arise during the transportation of the extracted material, usually by truck and shovel methods, to the stock piles. The dust can further be created by the entrainment from the vehicle itself or due to dust blown from the back of the bin of the trucks during transportation of material to and from stockpiles

### 10.1.2 Soils, Land Use and Land Capability

Impacts anticipated include:

- Exposure of soil surface to erosion
- Soil compaction and reduced water infiltration capacity
- Destruction of in situ soil profiles
- Destruction of soil nutrient cycles and hydropedological functioning
- Soil chemical pollution
- Destruction of arable and grazing land capability

### 10.1.3 Surface Water

*This information was not available at the time of submission*

### 10.1.4 Groundwater

#### *10.1.4.1 Construction Phase*

##### *10.1.4.1.1 Impacts on Groundwater Quantity*

No significant impacts are expected during the construction phase in terms of groundwater quantity. The removal of vegetation in preparation of the mining area and haul road construction may cause an increase in surface runoff and therefore a small decrease in aquifer recharge.

The box-cut may cause a decrease in the water level due to dewatering if the base of the box-cut is lower than the groundwater level at that position.

##### *10.1.4.1.2 Impacts on Groundwater Quality*

The proposed Wildebeestfontein Colliery is not expected to impact on the groundwater quality during the construction phase. The only possible impacts may be from example fuel spillages from the construction vehicles.

#### *10.1.4.2 Operational Phase*

##### *10.1.4.2.1 Impacts on Groundwater Quantity*

The operational phase impacts on the groundwater quantity will mainly be as a result of the dewatering of the surrounding aquifer during the opencast mining. The groundwater level in close proximity of the pit is expected to decrease since groundwater seepage to the void will be abstracted. Groundwater levels may rise below facilities such as the pollution control dam should leakage from the dam occur.

As simulated with the numerical model the extent of the dewatering cone is not expected to extent more than 600 m from the pit area in the shallow aquifer. Any groundwater users within this dewatering cone extent may experience a decrease in water levels. No known users are located within this area.

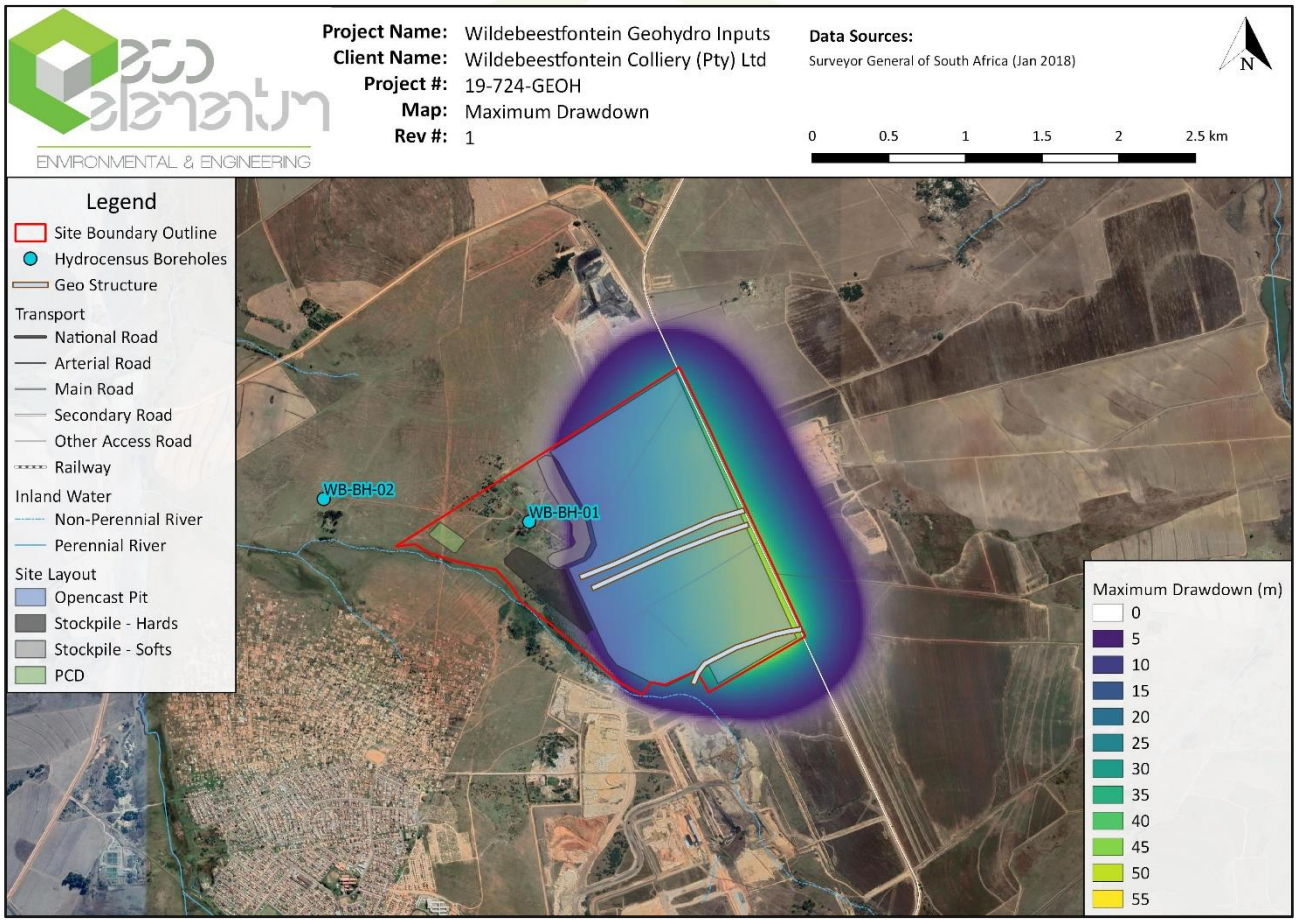


**Figure 10.1: The simulated maximum drawdown cone in the shallow aquifer for the Wildebeestfontein Colliery.**

##### *10.1.4.2.2 Impacts on Groundwater Quality*

During the operational phase and for the period after mining when the groundwater level has not yet recovered, the mine void will act as a groundwater sink area. Groundwater gradients and therefore groundwater flow will be towards the pit area. For this reason, groundwater contamination will not be able to flow down gradient from the pit area during the operational phase.

A potential for acid generation is very likely as results from nearby studies indicated. The dewatering of the pit will result in any contaminated water in the pit to be removed. For this reason, no impacts in terms of contamination is expected to influence any surrounding groundwater users.

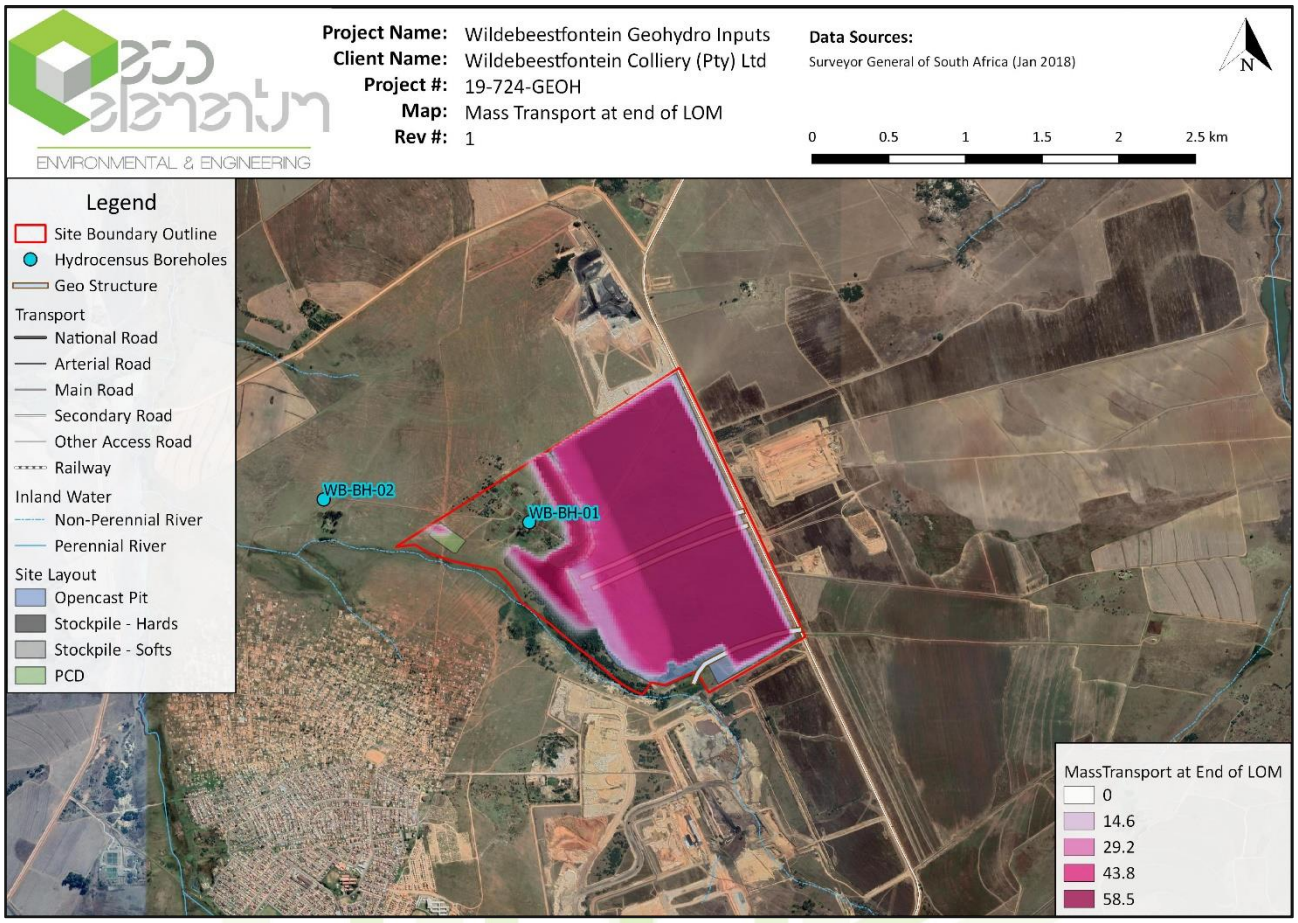


**Figure 10.2: The simulated mass transport at the end of the operational phase at Wildebeestfontein Colliery.**

### *10.1.4.2.3 Impacts on Surface Water*

The closest NFEPA wetland is situated approximately 2 km west of the proposed mining area. No impact on any NFEPA wetlands are therefore expected as a result of the Wildebeestfontein mining operation.

Groundwater can contribute to surface drainage, base flow to streams and wetlands only if the static water level is higher or at the same elevation as the base of the surface water feature. No water levels are available in the areas of the stream adjacent to the proposed opencast mining area. The numerical model simulation indicated that the dewatering cone does indeed reach the adjacent watercourse. The model simulations indicated that the opencast mining may cause a decrease of up to 30 m in the water levels of the aquifer within the area adjacent to the stream. The stream adjacent to the proposed mining area is perennial of sort, and therefore only expected to be water bearing in the rainfall season and in the event of sufficient precipitation. It is also during this season that the groundwater may contribute base flow to the stream.

Post-closure, the sulphate contamination plume is expected to reach the watercourse once the water level has reached equilibrium and the plume starts to migrate away from the pit area. The maximum and worst-case sulphate concentrations expected at the surface watercourses is estimated to increase to 2 400 mg/l. These concentrations are expected at 50 years post-closure with no mitigation measures.

### *10.1.4.3 Decommissioning Phase*

During the decommissioning phase all the potential contamination sources will be removed. These include the overburden and ROM stockpiles, the pollution control dam and all carbonaceous or contaminated material. This will decrease the surface sources for further groundwater contamination.

The opencast pit area will be rehabilitated which will have a positive impact on the groundwater regime in some areas since the poor-quality seepage to the groundwater will decrease.

#### *10.1.4.4 Post Closure*

##### *10.1.4.4.1 Groundwater Quantity*

Since dewatering has ceased at the end of the operational phase, the groundwater level will start to recover to a state of equilibrium. Decant from the lowest elevation on the pit boundary may occur once the groundwater levels have recovered.

With sufficient and adequate rehabilitation, the recharge to the opencast pits will decrease to approximately 12,5%.

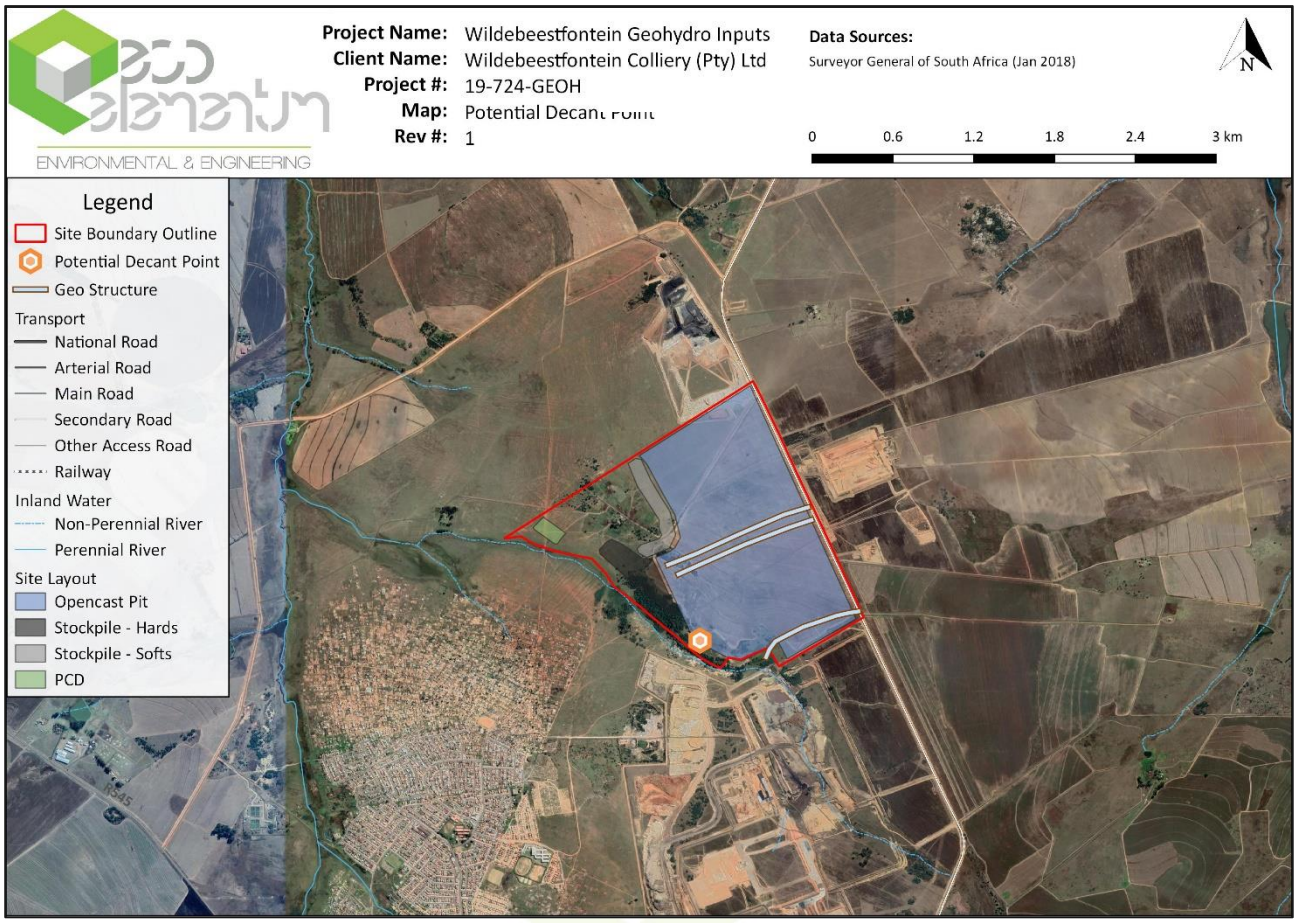


**Figure 10.3: The potential decant point position.**

##### *10.1.4.4.2 Groundwater Quality*

Geochemical analysis conducted in studies for mining activities surrounding the Wildebeestfontein Colliery area indicated a probability for acid generating. Therefore, the groundwater quality in the pit region will decrease as a result of the acidification. It is highly recommended that all carbonaceous material be placed on the pit floor and covered with overburden material. This will result in coverage of the carbonaceous material with water first, which will eliminate oxygen from the system to decrease the process of acid generation. Some areas at the opencast pit will not be covered by water once the decant elevation is reached. It is therefore suggested that carbonaceous material not be placed in these areas exposed to oxygen.

A groundwater pollution plume will start to migrate down gradient once the groundwater level has reached a point of equilibrium.

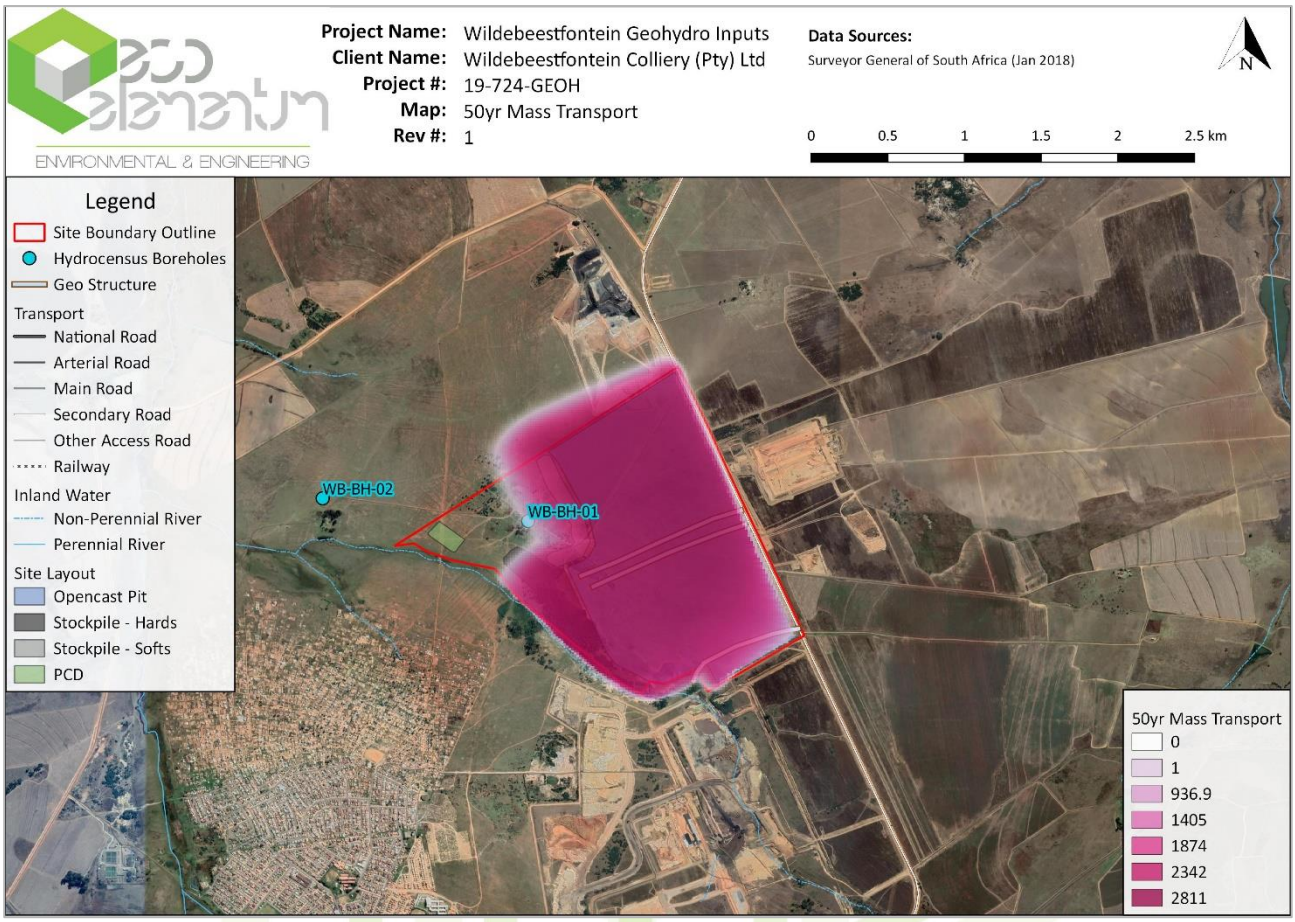


**Figure 10.4: Model Simulated groundwater contamination plume 50 years post facility.**

#### *10.1.4.5 Cumulative Impact*

The Wildebeestfontein Colliery is situated in an area with several mining and agricultural activities at or near its boundaries. These include:

- Elandsfontein Colliery ±5 km north of Wildebeestfontein,
- Coal mining operation on the northern boundary of the Wildebeestfontein pit;
- South 32 coal mining activities just to the southern boundary of the Wildebeestfontein pit.
- Several coal mining operations to the south-west of Wildebeestfontein,
- Agricultural activities to the east, north and north-western sections.

The South32 operations to the south are of special interest as it is bounding Wildebeestfontein, both within the B20G quaternary catchment. The impacts from South 32 as well as several other mining operations as well as agricultural activities could superimpose to have a cumulative impact on the catchment.

### 10.1.5 Wetlands and Aquatics

#### *10.1.5.1 Construction phase*

During the construction phase, areas that are targeted for the expanded opencast mining and new access roads, will be cleared of vegetation and the topsoil will be stripped. This will lead to sediments being washed downslope into wetland areas impacting on the biota and hydrodynamics of the wetlands. The increased runoff will increase the erosion potential and sediment carrying capacity of surface waters, especially during a storm event.

Construction/establishment activities associated with bulk earthworks (such as excavations, reshaping, back-filling and compaction) can alter natural patterns of surface runoff reaching water resources downslope/downstream. Excavations may impound and redirect/restrict

water, starving downstream water resources. Infilling, compaction and rutting of soils caused by construction/establishment alter the patterns of diffuse surface and sub-surface flows by altering micro-topography and the permeability of soil profiles. Changes in flow patterns will affect hydrological functionality and ecosystem integrity. Increased runoff velocities linked to concentrated flow paths created during construction/establishment will lead to erosion and sedimentation. Should temporary damming and abstraction of water take place, a short-term reduction of flows to downstream habitat will also result in alterations of the sediment balance (Macfarlane et al., 2014).

Upgrading and construction/establishment of infrastructure will result in increased sediment runoff and sedimentation. Site preparation and all associated infrastructure will entail blasting, drilling, dewatering, clearing, grubbing, grading and ground preparation as well as the creation of containment facilities that will eliminate some stream reaches and intercept all surface run-off within the proposed area. Impacts associated with this activity include increased erosion and sediment deposition in the receiving aquatic environment far downstream.

#### *10.1.5.2 Operational Phase*

Increased sedimentation may occur as a result from the runoff from the waste rock dump. This has the potential to change habitat structure within the receiving environment and this will in turn result in changes in ecosystem function. Changes in habitat structure due to sedimentation would result in changes in the species composition. Water quality impairment has the potential to change ecosystem function, change community structure as species sensitive to water quality impairment are eliminated and tolerant species increase in number, this results in a loss of biodiversity of sensitive species.

Infrastructure construction/establishment/maintenance will introduce unnatural disturbance, enhancing the "edge effect" promoting establishment of disturbance-tolerant species, including further colonisation by alien invasive species in areas adjacent to the work servitude. While this impact is initiated during the construction/establishment phase the impacts will persist into the operational phase. Invasive alien plants have far reaching detrimental effects on native biota and has been widely accepted as being a leading cause of biodiversity loss. They typically have rapid reproductive turnover and are able to outcompete native species for environmental resources, alter soil stability, and promote erosion, change litter accumulation and soil properties. In addition, certain alien plants exacerbate soil erosion whilst others contribute to a reduction in stream flow thereby potentially increasing sediment inputs and altering natural hydrology of receiving watercourses. These impacts negatively affect areas that are largely natural (with low existing weed levels) greater than for areas already characterised by dense infestations of alien plants with low indigenous plant diversity (Macfarlane et al., 2014).

### 10.1.6 Flora & Fauna

#### *10.1.6.1 Potential Construction Phase Impacts*

The clearance of vegetation will result in the loss of Eastern Highveld Grassland vegetation. Impacts related to this loss can be minimised by restricting vegetation clearance and road construction to the designated areas, thereby minimising the footprint area and reducing the required rehabilitation effort. As disturbed areas are more susceptible to alien species encroachment, a pre-emptive Invasive Species Management Plan will reduce impacts related to AIP species spread. It should be noted that due to the degraded state of the environment, natural vegetation losses due to mining is expected to be minimal.

#### *10.1.6.2 Potential Operational Phase Impacts*

Topsoils and overburden will be stripped and stockpiled. Primarily the actual soil stripping footprint will temporarily loose its entire species assemblage, while secondarily, the stockpile area will undergo the same loss. Increased vehicle movement and associated human activities on the site can result in increased roadkill's and vegetation disturbance, particularly if the rules of the road are not followed. In addition, AIP species may also spread due to the level of expected soil disturbance. The increased vehicle movement can be seen as an additional vector for AIP species spread to and from the project area. Provision must also be made for unplanned impact events such as hydrocarbon spills and illegal poaching of fauna and flora species.

#### *10.1.6.3 Potential Rehabilitation Phase Impacts*

As rehabilitation will focus on alien invasive species eradication, this will temporarily lead to a reduction in habitat heterogeneity. Care must be taken to correctly apply topsoil to disturbed areas, without disturbing additional vegetation and ultimately increasing areas of potential invasion.

### 10.1.7 Heritage Sites

The following impacts are anticipated:

- Destruction of structure and graveyard
- Impacting on settlements

### 10.1.8 Noise, Blasting and Vibration

The following Noise intrusion level criteria are applicable:

| Increase Δ -dBA | Assessment of impact magnitude | Color code |
|---|---|---|
| 0 < Δ ≤ 1 | Not audible | |
| 1 < Δ ≤ 3 | Very Low | |
| 3 < Δ ≤ 5 | Low | |
| 5 < Δ ≤ 10 | Medium | |
| 10 < Δ ≤ 15 | High | |
| 15 < Δ | Very High | |

#### *10.1.8.1 Construction phase*

The noise intrusion levels during the construction phase at opencast pit and infra-structure are illustrated in Table 10.1. The noise intrusion during the construction phase will be insignificant.

**Table 10.1: Noise intrusion levels (in dBA) during construction phase**

| Position | Clearing and grubbing of the plant footprint | Construction activities at plant | Construction of the infra-structure | Civil construction activities | Construction of the overland conveyor | Construction of hauling roads | Cumulative Levels | Cumulative noise level - Daytime | Cumulative noise level - Night time | Intrusion noise level - daytime | Intrusion noise level - night time |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **A** | 3.0 | 3.0 | 3.0 | 5.0 | 4.5 | 4.4 | 21.2 | 39.1 | 36.8 | 0.1 | 0.1 |
| **B** | 8.1 | 8.1 | 8.1 | 10.1 | 8.7 | 9.1 | 22.6 | 40.4 | 36.9 | 0.1 | 0.2 |
| **C** | 8.0 | 8.0 | 8.0 | 10.0 | 9.0 | 8.8 | 27.8 | 40.5 | 37.2 | 0.2 | 0.5 |
| **D** | 3.4 | 3.4 | 3.4 | 5.4 | 5.6 | 5.6 | 18.1 | 40.3 | 36.8 | 0.0 | 0.1 |
| **E** | -0.7 | -0.7 | -0.7 | 1.3 | 1.5 | 1.5 | 13.1 | 40.3 | 36.7 | 0.0 | 0.0 |
| **F** | -3.4 | -3.4 | -3.4 | -1.4 | -1.0 | -1.1 | 13.7 | 40.3 | 36.7 | 0.0 | 0.0 |

#### *10.1.8.2 Operational phase*

The calculated noise levels and subsequent noise intrusion levels at the abutting noise receptors during mining activities at the mine footprint (plant and open cast) will be illustrated in Table 10.2.

The mine activities will not be audible during the day and night after the implementation of the noise mitigatory measures. The threshold value of 7.0dBA will not be exceeded at any of the noise receptors.

**Table 10.2: Noise intrusion levels (dBA) at the residential areas during pit activities**

| Position | Crushing activities | Screening activities | Pit activities | ROM | Hauling of material to the plant | Hauling of waste rock to the waste rock dump | Traffic | Emergency generator | Cumulative Levels | Cumulative noise level - Daytime | Cumulative noise level - Night time | Intrusion noise level - daytime | Intrusion noise level - night time |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A | 16.0 | 11.0 | 16.0 | 15.5 | 10.5 | 7.1 | 2.1 | 15.4 | 28.5 | 39.4 | 37.3 | 0.4 | 0.6 |
| B | 21.1 | 16.1 | 21.1 | 20.2 | 14.7 | 13.3 | 4.7 | 16.7 | 28.1 | 40.6 | 37.3 | 0.3 | 0.6 |
| C | 21.0 | 16.0 | 21.0 | 20.5 | 15.0 | 13.9 | 2.7 | 17.0 | 39.2 | 42.8 | 41.2 | 2.5 | 4.5 |
| D | 16.4 | 11.4 | 16.4 | 16.8 | 11.6 | 9.6 | -0.6 | 13.6 | 26.8 | 40.5 | 37.1 | 0.2 | 0.4 |
| E | 12.3 | 7.3 | 12.3 | 12.5 | 7.5 | 4.8 | -3.9 | 9.5 | 18.8 | 40.3 | 36.8 | 0.0 | 0.1 |
| F | 9.6 | 4.6 | 9.6 | 9.9 | 5.0 | 1.7 | -5.8 | 7.0 | 18.4 | 40.3 | 36.8 | 0.0 | 0.1 |

### 10.1.9 Visual

Information not available at time of submission

### 10.1.10 Broad level Socio-Economic Environment

Information not available at time of submission

### 10.1.11 Specific Issues raised by Interested and Affected Parties

Refer to Table 8.1 in section 8.3

## 10.2 Impact Assessment And Ranking Methodology

The assessment and evaluation of environmental impacts is often complicated by the subjective nature of these impacts. Ideally, the degree of severity or significance of a particular impact should be expressed in quantitative terms, against a quantitative assessment of the conditions that pertained before a particular activity started. There must also be some expression as to whether a particular impact is desirable or not, as the desirability of an impact will depend largely on the attitude and experience of the assessment team, subjectivity is unavoidable. In order to address these issues and to provide a basis for comparison of the different impacts associated with the activities, a number of standard definitions and approaches will be used.

For the purpose of assessing impacts of the proposed project has been divided into the following phases:

**Table 10.3: Impact Phases**

| | |
|---|---|
| **Construction Phase:** | All the construction related activities on site, until the contractor leaves the site |
| **Operational Phase:** | All activities, including the operation and maintenance of the proposed development. Life of Mine is planned for 7 years. |
| **Decommissioning & Mine Closure** | Mine closure is the period of time when the ore-extracting activities of a mine have ceased and final decommissioning and mine reclamation is being completed. |

### 10.2.1 Impact Rating Assessment Approach

The following methodology was used to rank these impacts. Clearly defined rating and rankings scales (Table 10.4 to Table 10.11) were used to assess the impacts associated with the proposed activities. The impacts identified by each specialist study and through public participation were combined into a single impact rating table for ease of assessment.

Each impact identified was rated according the expected magnitude, duration, scale and probability of the impact (Table 10.11).

To ensure uniformity, the assessment of potential impacts will be addressed in a standard manner so that a wide range of impacts is comparable. For this reason a clearly defined rating scale will be provided to the specialist to assess the impacts associated with their investigation.

Each impact identified will be assessed in terms of scale (spatial scale), magnitude (severity) and duration (temporal scale). Consequence is then determined as follows:

**Consequence = Severity + Spatial Scale + Duration**

The Risk of the activity is then calculated based on frequency of the activity and impact, how easily it can be detected and whether the activity is governed by legislation. Thus:

**Likelihood = Frequency of activity + frequency of impact + legal issues + detection**

The risk is then based on the consequence and likelihood.

**Risk = Consequence x likelihood**

In order to assess each of these factors for each impact, the ranking scales in Table 10.4 – Table 10.11 were used.

**Table 10.4: Severity.**

| | |
|---|---|
| Insignificant / non-harmful | 1 |
| Small / potentially harmful | 2 |
| Significant / slightly harmful | 3 |
| Great / harmful | 4 |
| Disastrous / extremely harmful / within a regulated sensitive area | 5 |

**Table 10.5: Spatial Scale - How big is the area that the aspect is impacting on?**

| | |
|---|---|
| Area specific (at impact site) | 1 |
| Whole site (entire surface right) | 2 |
| Local (within 5km) | 3 |
| Regional / neighboring areas (5km to 50km) | 4 |
| National | 5 |

**Table 10.6: Duration.**

| | |
|---|---|
| One day to one month (immediate) | 1 |
| One month to one year (Short term) | 2 |
| One year to 10 years (medium term) | 3 |
| Life of the activity (long term) | 4 |
| Beyond life of the activity (permanent) | 5 |

**Table 10.7: Frequency of the activity - How often do you do the specific activity?**

| | |
|---|---|
| Annually or less | 1 |
| 6 monthly | 2 |
| Monthly | 3 |

| | |
|---|---|
| Weekly | 4 |
| Daily | 5 |

**Table 10.8: Frequency of the incident/impact - How often does the activity impact on the environment?**

| | |
|---|---|
| Almost never / almost impossible / >20% | 1 |
| Very seldom / highly unlikely / >40% | 2 |
| Infrequent / unlikely / seldom / >60% | 3 |
| Often / regularly / likely / possible / >80% | 4 |
| Daily / highly likely / definitely / >100% | 5 |

**Table 10.9: Legal Issues - How is the activity governed by legislation?**

| | |
|---|---|
| No legislation | 1 |
| Fully covered by legislation | 5 |

**Table 10.10: Detection - How quickly/easily can the impacts/risks of the activity be detected on the environment, people and property?**

| | |
|---|---|
| Immediately | 1 |
| Without much effort | 2 |
| Need some effort | 3 |
| Remote and difficult to observe | 4 |
| Covered | 5 |

Environmental effects will be rated as either of high, moderate or low significance on the basis provided in Table 10.11.

**Table 10.11: Impact Ratings.**

| RATING | CLASS |
|---|---|
| 1 – 55 | (L) Low Risk |
| 56 – 169 | M) Moderate Risk |
| 170 – 600 | (H) High Risk |

## 10.3 Advantages And Disadvantages Of Proposed Activity

**Table 10.12: Advantages and Disadvantages regarding Mining Methods Alternatives**

| Description | Advantages | Disadvantages |
|---|---|---|
| **Mining Method Alternatives** | | |
| Underground board-and-pillar. | • Smaller footprint associated with surface disturbance.<br>• Alternative/current land uses can continue on areas not directly impacted by surface activities. | • Not economically viable as large pillars will remain.<br>• Risk of subsidence during operation.<br>• Risk of subsidence post-closure. |

| Description | Advantages | Disadvantages |
|---|---|---|
| **Mining Method Alternatives** | | |
| | • Reduced impact on dust, noise and air quality.<br>• No blasting during operational phase.<br>• Reduced rehabilitation costs. | • Potential decrease in groundwater quantity and quality.<br>• Potential decrease in groundwater interaction with wetland.<br>• De-watering of the surrounding aquifer.<br>• Potential AMD post mining and closure phase.<br>• Potential undermining of aquifer.<br>• Drawdown of water levels of privately owned boreholes.<br>• Potential decrease in base flow to the streams and wetlands running through the MRA. |
| Opencast mining<br>(preferred method) | • Additional employment opportunities.<br>• Economically viable as more coal will be efficiently extracted.<br>• Increased LOM – extended employment opportunities.<br>• No subsidence risk during operation.<br>• No subsidence risk post-closure. | • Greater surface area disturbance.<br>• Change in land use required for all farm portions in the MRA.<br>• Decrease in agricultural area/cultivated land.<br>• Decrease in surface water runoff to catchment.<br>• Potential decrease in surface and ground water quantity and quality.<br>• Potential decrease in groundwater interaction with wetland.<br>• Increased dust generation.<br>• Increased blast and vibration impacts.<br>• Increased noise from the use of construction and mining machinery on surface during operations.<br>• Higher rehabilitation costs. |

## 10.4 Possible Mitigation Measures For I&AP-Identified Impacts

The proposed mitigation measures or alterations that could be implemented specifically to address issues and concerns raised by I&APs are summarised below and discussed in terms of overall risks if these mitigation measures are implemented on site.

All mitigation measures included in the EMP have taken cognizance of any I&AP issues during the process.

## 10.5 Motivation Where No Alternative Sites Were Considered

The site location is limited to the Prospecting Right Area, which is constrained by the location of other mining houses and residential areas. The resource location and the presence of a watercourse on the site boundary further restrict the infrastructure layout. Therefore, no alternative sites were considered.

## 10.6 Statement Motivating The Alternative Development Location Within The Overall Site

The site location is limited to the Prospecting Right Area, which is constrained by the location of other mining houses and residential areas. The resource location and the presence of a watercourse on the site boundary further restrict the infrastructure layout.

The most suitable layout presented in the EIA is based on specialist investigations.

## 10.7 Detailed Assessment Of Each Identified Potentially Significant Impact And Risk

| Impact description | | | | Significance before mitigation | Significance after mitigation | Risk after prioritisation | Mitigation measures | Action plan | Responsible person |
|---|---|---|---|---|---|---|---|---|---|
| **Phases** | **Activity** | **Aspect** | **Impact** | | | | | | |
| **Groundwater impacts** | | | | | | | | | |
| Decommissioning | Backfilling | Reshaping of area | Adequate backfilling and rehabilitation will decrease aquifer recharge. The period to decant will therefore be prolonged. | M | M | M | Carbonaceous material at deeper base of pit. Rehabilitation to direct surface runoff away from pit and recharge to pit minimized. Flow paths including fracture zones sealed. | Refer to rehabilitation plan | Site manager |
| Construction | Surface clearing and preparation | Removal of vegetation | Increase in surface run-off and therefore decrease in aquifer recharge | L | L | L | Re-vegetate | Rehabilitation plan | Site manager |
| Construction | Box cut opening | Dewatering | Decrease in water level should the pit floor be lower than the water level | M | M | M | No management can be incorporated to limit the impacts of dewatering should the box-cut floor be lower than the groundwater level. | Quarterly monitoring of monitoring boreholes. Compensate users should water levels decreases cause losses of groundwater availability. | Environmental Manager |
| Operation | Topsoil and overburden stockpiling | Leaching from stockpiles | Acid generation in the case of carbonaceous material placement. | M | M | M | Should a contamination plume be detected, groundwater abstraction to contain plume. | Quarterly monitoring of monitoring boreholes | Environmental Manager |
| Operation | ROM stockpiling | Leaching from stockpiles | Acid generation as a result of carbonaceous material. | M | M | M | Should a contamination plume be detected, groundwater abstraction to contain plume. | Quarterly monitoring of monitoring boreholes | Environmental Manager |
| Operation | Hydrocarbon spills | Plume migration | Spills from mining vehicles can infiltrate to the aquifer and cause a down gradient plume migration. | M | L | L | Clean any hydrocarbon spills in the appropriate manner. | Report any hydrocarbon spillage. | Site manager |
| Operation | Pit dewatering | Dewatering | The water infiltrating the pit will be removed for safe mining, causing a decrease in the water level of up to 55 m. | H | H | H | No management can be incorporated to limit the impacts of dewatering. | Quarterly monitoring of monitoring boreholes. Compensate users should water levels decreases cause losses of groundwater availability. | Environmental Manager |
| Closure and decommissioning | Topsoil and overburden removal | Placement of topsoil and overburden into pit | Carbonaceous material, if any in the overburden, will be placed at the bottom of the pit as to prevent or minimise the exposure to oxygen and potential acid generation. | M | L | L | Remove the top soil and overburden dumps during rehabilitation. Placement of carbonaceous material at bottom of pit. | Rehabilitation Plan- placement of topsoil and overburden in pit. | Site manager |
| Rehabilitation | Revegetation | Reshaping of area and revegetating the area | Increase surface runoff over the rehabilitated opencast, therefore decreasing aquifer recharge. | M | L | L | Remove the ROM stockpile. This will eliminate the ROM stockpile as a potential source. | Rehabilitation Plan | Site manager |
| Residual | Pit dewatering | Backfilling of the pit and no more dewatering. | Recovery of the water level in the pit as dewatering ceases. In the case of acid generation, the plume will start to move away from the pit as the water level recovered. Decanting may occur once the water level has recovered to the decanting elevation. | H | H | H | Keep water level in pit lower than level in nearby streams. Maintain water level below decant level (abstraction). | Abstracted/decant water to be treated or handled in appropriate manner and within legislation. Continue quarterly monitoring post-closure. | Site manager & Environmental Manager |

| Impact description | | | | Significance before mitigation | Significance after mitigation | Risk after prioritisation | Mitigation measures | Action plan | Responsible person |
|---|---|---|---|---|---|---|---|---|---|
| **Phases** | **Activity** | **Aspect** | **Impact** | | | | | | |
| Wetland Impacts | | | | | | | | | |
| Construction | Surface clearing and preparation | Sediment Runoff | Flow alterations due to erosion and sedimentation | M | M | H | Topsoil should be placed to avoid erosion and runoff.<br>Attenuation of storm water to control the velocity | Avoid wetland areas and their associated buffer zones.<br>Follow a soil management plan for topsoil placement.<br>Implement SWMP | Site manager & Environmental Manager |
| Construction | Surface clearing and preparation | Removal of interflow | Pollution of watercourse | M | M | H | Prevent water quality deterioration | No washing of any construction equipment in close proximity to the channel or any wetlands<br>No releases of any substances that could be toxic to fauna or faunal habitats<br>Spillages of fuels, oils and other potentially harmful chemicals must 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 must be removed and the affected area rehabilitated immediately.<br>Portable toilets must be placed on impervious level surfaces that are lipped to prevent spillage.<br>Hazardous substances must be stored in bunded areas;<br>Surface water management plan.<br>Biomonitoring plan | Site manager & Environmental Manager |
| Construction | Infrastructure construction | alteration to terrain | Spread of alien vegetation | H | M | H | Remove Alien and invasive vegetation and prevent the spread of alien and invasive vegetation | An alien invasive management programme must be implemented | Site manager & Environmental Manager |
| Operation | Topsoil and overburden stockpiling | Sediment Runoff | Flow alterations due to erosion and sedimentation | H | M | M | Topsoil should be placed to avoid erosion and runoff.<br>Attenuation of storm water to control the velocity.<br>Prevent erosion of stockpiles and bare soil areas | Avoid wetland areas and their associated buffer zones.<br>Follow a soil management plan for topsoil placement.<br>Implement SWMP<br>Do not allow surface water or storm water to be concentrated, or to flow down cut or fill slopes without erosion protection<br>Exposed soils must be rehabilitated as soon as practically possible | Site manager & Environmental Manager |
| Operation | ROM stockpiling | Sediment Runoff | Flow alterations due to erosion and sedimentation | H | M | M | Prevent sedimentation of watercourses | Install sediment barriers (silt catchers and Reno mattresses) along any drainage construction areas<br>Monitor Bank erosion on a regular basis | Site manager & Environmental Manager |
| Operation | Roll Over Mining | Removal of interflow | Flow alterations | H | M | M | Topsoil should be placed to avoid erosion and runoff.<br>Attenuation of storm water to control the velocity | Avoid wetland areas and their associated buffer zones.<br>Follow a soil management plan for topsoil | Site manager & Environmental Manager |

| Impact description | | | | Significance before mitigation | Significance after mitigation | Risk after prioritisation | Mitigation measures | Action plan | Responsible person |
|---|---|---|---|---|---|---|---|---|---|
| Phases | Activity | Aspect | Impact | | | | | | |
| | | | | | | | | placement.<br>Implement SWMP | |
| Operation | Crushing and Screening of Coal | Sediment runoff to watercourse | Pollution of watercourse | H | M | M | Topsoil should be placed to avoid erosion and runoff.<br>Attenuation of storm water to control the velocity.<br>Prevent erosion of stockpiles and bare soil areas | Avoid wetland areas and their associated buffer zones.<br>Follow a soil management plan for topsoil placement.<br>Implement SWMP<br>Do not allow surface water or storm water to be concentrated, or to flow down cut or fill slopes without erosion protection<br>Exposed soils must be rehabilitated as soon as practically possible | Site manager & Environmental Manager |
| Operation | Topsoil and overburden stockpiling | Sediment runoff to watercourse | Pollution of watercourse | H | M | M | Topsoil should be placed to avoid erosion and runoff.<br>Attenuation of storm water to control the velocity.<br>Prevent erosion of stockpiles and bare soil areas | Avoid wetland areas and their associated buffer zones.<br>Follow a soil management plan for topsoil placement.<br>Implement SWMP<br>Do not allow surface water or storm water to be concentrated, or to flow down cut or fill slopes without erosion protection<br>Exposed soils must be rehabilitated as soon as practically possible | Site manager & Environmental Manager |
| Operation | ROM stockpiling | Leachate to watercourse | Pollution of watercourse | H | M | M | Prevent water quality deterioration | No washing of any construction equipment in close proximity to the channel or any wetlands<br>No releases of any substances that could be toxic to fauna or faunal habitats<br>Spillages of fuels, oils and other potentially harmful chemicals must 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 must be removed and the affected area rehabilitated immediately.<br>Portable toilets must be placed on impervious level surfaces that are lipped to prevent spillage.<br>Hazardous substances must be stored in bunded areas;<br>Surface water management plan.<br>Biomonitoring plan | Site manager & Environmental Manager |
| Operation | PCD operation | Leaks and spills | Pollution of watercourse | H | M | M | Prevent water quality deterioration | No washing of any construction equipment in close proximity to the channel or any wetlands<br>No releases of any substances that could be toxic to fauna or faunal habitats<br>Spillages of fuels, oils and other potentially harmful chemicals must be cleaned up | Site manager & Environmental Manager |

| Impact description | | | | Significance before mitigation | Significance after mitigation | Risk after prioritisation | Mitigation measures | Action plan | Responsible person |
|---|---|---|---|---|---|---|---|---|---|
| Phases | Activity | Aspect | Impact | | | | | | |
| | | | | | | | | 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 must be removed and the affected area rehabilitated immediately.<br>Portable toilets must be placed on impervious level surfaces that are lipped to prevent spillage.<br>Hazardous substances must be stored in bunded areas;<br>Surface water management plan.<br>Biomonitoring plan | |
| Operation | Hydrocarbon spills | Leaks and spills | Pollution of watercourse | H | M | M | Prevent water quality deterioration | No washing of any construction equipment in close proximity to the channel or any wetlands<br>No releases of any substances that could be toxic to fauna or faunal habitats<br>Spillages of fuels, oils and other potentially harmful chemicals must 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 must be removed and the affected area rehabilitated immediately.<br>Portable toilets must be placed on impervious level surfaces that are lipped to prevent spillage.<br>Hazardous substances must be stored in bunded areas;<br>Surface water management plan.<br>Biomonitoring plan | Site manager & Environmental Manager |
| Operation | Chemical spills | Leaks and spills | Pollution of watercourse | H | M | M | Prevent water quality deterioration | No washing of any construction equipment in close proximity to the channel or any wetlands<br>No releases of any substances that could be toxic to fauna or faunal habitats<br>Spillages of fuels, oils and other potentially harmful chemicals must 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 must be removed and the affected area rehabilitated immediately.<br>Portable toilets must be placed on impervious level surfaces that are lipped to prevent spillage.<br>Hazardous substances must be stored in bunded areas; | Site manager & Environmental Manager |

| Impact description | | | | Significance before mitigation | Significance after mitigation | Risk after prioritisation | Mitigation measures | Action plan | Responsible person |
|---|---|---|---|---|---|---|---|---|---|
| Phases | Activity | Aspect | Impact | | | | | | |
| | | | | | | | | Surface water management plan. Biomonitoring plan | |
| Operation | Heavy machinery and vehicle movement | transformation of the environment | Spread of alien vegetation | H | M | M | Remove Alien and invasive vegetation and prevent the spread of alien and invasive vegetation | An alien invasive management programme must be implemented | Site manager & Environmental Manager |
| Noise | | | | | | | | | |
| Construction | Surface clearing and preparation | Noise increase at the boundary of the mine footprint and at the abutting residential Noise increase at the boundary of the mine footprint and at the abutting residential | Noise disturbance | M | L | M | Cleaning and grubbing of the plant footprint and other areas to be done during daytime working hours unless there is no heavy duty machinery which may create a noise problem. | 0 | Site manager |
| Construction | Infrastructure construction | Noise increase at the boundary of the mine footprint and at the abutting residential | Noise disturbance | M | L | M | Construction of the infra-structure activities to be done during daytime working hours unless there is no heavy duty machinery which may create a noise problem. | 0 | Site manager |
| Construction | Topsoil and overburden stockpiling | Noise increase at the boundary of the mine footprint and at the abutting residential | Noise disturbance | M | L | M | Construction of the Dumps Hard/Softs to be done during daytime working hours unless there is no heavy duty machinery which may create a noise problem. | 0 | Site manager |
| Operation | Crushing and Screening of Coal | Noise increase at the boundary of the mine footprint and at the | Noise disturbance | M | M | M | All noise sources exceeding 85.0dBA to be identified and if practical to be acoustically screened off | Noise survey to be done on a quarterly basis and after one year to change to an annual basis if the prevailing ambient noise levels at the footprint boundaries are in line with the 70.0dBA threshold value. | Site manager & Environmental Manager |

| Impact description | | | | Significance before mitigation | Significance after mitigation | Risk after prioritisation | Mitigation measures | Action plan | Responsible person |
|---|---|---|---|---|---|---|---|---|---|
| Phases | Activity | Aspect | Impact | | | | | | |
| | | abutting residential | | | | | | | |
| Operation | Roll Over Mining | Noise increase at the boundary of the mine footprint and at the abutting residential | Noise disturbance | M | M | M | All noise sources exceeding 85.0dBA to be identified and if practical to be acoustically screened off. | Noise survey to be done on a quarterly basis and after one year to change to an annual basis if the prevailing ambient noise levels at the footprint boundaries are in line with the 70.0dBA threshold value. | Site manager & Environmental Manager |
| Operation | Hauling of material | Noise increase at the boundary of the mine footprint and at the abutting residential | Noise disturbance | M | M | M | All noise sources exceeding 85.0dBA to be identified and if practical to be acoustically screened off. | Noise survey to be done on a quarterly basis and after one year to change to an annual basis if the prevailing ambient noise levels at the footprint boundaries are in line with the 70.0dBA threshold value. | Site manager & Environmental Manager |
| Operation | Heavy machinery and vehicle movement | Noise increase at the boundary of the mine footprint and at the abutting residential | Noise disturbance | M | M | M | Road surfaces to be maintained in a good order without any pot holes | Speed limit of 40km/h to be adhered to at all times;<br>road maintenance plan | Site manager |
| Operation | Generators | Noise increase at the boundary of the mine footprint and at the abutting residential | Noise disturbance | M | M | M | Generator to be situated in an area away from any residential areas and the noise from the generator not to be audible at the residential areas. | Generator placement in a generator building with adequate mufflers. | Site manager |
| Closure and decommissioning | Infrastructure removal | Noise increase at the boundary of the mine footprint and at the abutting residential | Noise disturbance | L | L | L | Removal of infra-structure to be done during daytime only | 0 | Site manager |
| Rehabilitation | Area preparation, shaping and | Noise increase at the boundary | Noise disturbance | L | L | L | Removal of infra-structure to be done during daytime only | 0 | Site manager |

| Impact description | | | | Significance before mitigation | Significance after mitigation | Risk after prioritisation | Mitigation measures | Action plan | Responsible person |
|---|---|---|---|---|---|---|---|---|---|
| Phases | Activity | Aspect | Impact | | | | | | |
| | topsoil placement | of the mine footprint and at the abutting residential | | | | | | | |
| Rehabilitation | Revegetation | Noise increase at the boundary of the mine footprint and at the abutting residential | Noise disturbance | L | L | L | Planting of grass and vegetation to be done during daytime only. | 0 | Site manager |
| Soils | | | | | | | | | |
| Construction | Surface clearing and preparation | Removal of vegetation | Exposure of soil surface to erosion | H | M | H | Keep vegetation removal limited to footprint and use geo-textiles and other erosion control structures to limit soil erosion | Implement Soil Management Plan (SMP) and monitor site for signs of erosion | Environmental Officer<br>Site Manager |
| Construction | Heavy machinery and vehicle movement | Vehicles and equipment traversing over soil surface, especially when soil is wet | Soil compaction and reduced water infiltration capacity | M | M | H | Restrict vehicle and equipment movement to surface footprint | Use deep ripping before vegetation establishment (rehabilitation) to alleviate compaction. Avoid vehicle and equipment moving outside of the demarcated footprint areas | Environmental Officer<br>Site Manager |
| Construction | Topsoil and overburden removal | Stripping of topsoil and overburden to access coal resources | Destruction of in situ soil profiles | M | M | H | Only remove topsoil where necessary and don't mix topsoil layers with overburden | Follow SMP and keep footprint as small as possible | Environmental Officer<br>Site Manager |
| Construction | Topsoil and overburden stockpiling | Stockpiling of topsoil | Destruction of soil nutrient cycles and hydropedological functioning | M | M | H | Re-establish vegetation on topsoil stockpiles and maintain vegetation cover until soil is used for rehabilitation | Manage stockpiles according to SMP | Environmental Officer<br>Site Manager |
| Construction | Hydrocarbon spills | Movement of vehicles and equipment on site | Soil chemical pollution | M | M | M | Regularly check vehicles and equipment for possible oil and fuel leaks | Follow SMP and conduct regular soil quality audits | Environmental Officer<br>Site Manager |
| Construction | Infrastructure construction | Establishment of infrastructure required for mining | Destruction of arable and grazing land capability | H | H | H | No mitigation possible | Establish agricultural projects with in the larger mining right area | Environmental Officer<br>Site Manager |

| Impact description | | | | Significance before mitigation | Significance after mitigation | Risk after prioritisation | Mitigation measures | Action plan | Responsible person |
|---|---|---|---|---|---|---|---|---|---|
| **Phases** | **Activity** | **Aspect** | **Impact** | | | | | | |
| Operation | Heavy machinery and vehicle movement | Vehicles and equipment traversing over soil surface, especially when soil is wet | Soil compaction and reduced water infiltration capacity | M | M | H | Restrict vehicle and equipment movement to surface footprint | Use deep ripping before vegetation establishment (rehabilitation) to alleviate compaction. Avoid vehicle and equipment moving outside of the demarcated footprint areas | Environmental Officer<br>Site Manager |
| Operation | Hydrocarbon spills | Movement of vehicles and equipment on site | Soil chemical pollution | M | M | M | Regularly check vehicles and equipment for possible oil and fuel leaks | Follow SMP and conduct regular soil quality audits | Environmental Officer<br>Site Manager |
| Closure and decommissioning | Heavy machinery and vehicle movement | Movement of vehicles and equipment on site | Soil chemical pollution | M | M | M | Regularly check vehicles and equipment for possible oil and fuel leaks | Follow SMP and conduct regular soil quality audits | Environmental Officer<br>Site Manager |
| Rehabilitation | Area preparation, shaping and topsoil placement | Revegetation of mined areas | Soil compaction and reduced water infiltration capacity | M | M | M | Restrict vehicle and equipment movement to the areas that are revegetated | Use deep ripping before vegetation establishment (rehabilitation) to alleviate compaction. Avoid vehicle and equipment moving outside of the rehabilitation areas | Environmental Officer<br>Site Manager |
| Air Quality | | | | | | | | | |
| Construction | Surface clearing and preparation | Dust generation | Fugitive dust (containing TSP (total suspended particulate, will give rise to nuisance impacts as fallout dust), as well as PM10 and PM2.5 (dust with a size less than 10 microns, and dust with a size less than 2.5 microns giving rise to health impacts | M | M | M | Dampen soil being moved to reduce dust.<br>Avoid blasting during windy conditions.<br>Hauling to take place on roads with dust suppression<br>Cover load bins with tarpauling keep exposed soil surfaces to a minimum | Topsoil should not be removed during windy months (August to January).<br>Area of disturbance to be kept to a minimum and no unnecessary clearing of vegetation to occur.<br>Topsoil should be re-vegetated to reduce exposure areas.<br>During the loading of topsoil onto trucks or stockpiles, the dropping heights should be minimised.<br>Water or binding agents such as can be used for dust suppression<br>Minimise travel speed and distance and volume of traffic on the roads.<br>All stockpiles to be damped down,<br>- Successful trialing of broad acre temporary rehabilitation of unshaped overburden emplacement areas by aerial sowing of a cover crop<br>Constricting the areas and time of exposure of pre-strip clearing | Environmental Officer<br>Site Manager |
| Construction | Infrastructure construction | Dust generation | fugitive dust emissions containing TSP (total suspended particulate, | M | M | M | Dampen soil being moved to reduce dust.<br>Avoid blasting during windy | Topsoil should not be removed during windy months (August to January).<br>Area of disturbance to be kept to a minimum and | Environmental Officer<br>Site Manager |

| Impact description | | | | Significance before mitigation | Significance after mitigation | Risk after prioritisation | Mitigation measures | Action plan | Responsible person |
|---|---|---|---|---|---|---|---|---|---|
| Phases | Activity | Aspect | Impact | | | | | | |
| | | | giving rise to nuisance impacts as fallout dust) | | | | conditions.<br>Hauling to take place on roads with dust suppression<br>Cover load bins with tarpauling keep exposed soil surfaces to a minimum | no unnecessary clearing of vegetation to occur.<br>Topsoil should be re-vegetated to reduce exposure areas.<br>During the loading of topsoil onto trucks or stockpiles, the dropping heights should be minimised.<br>Water or binding agents such as can be used for dust suppression<br>Minimise travel speed and distance and volume of traffic on the roads.<br>All stockpiles to be damped down,<br>- Successful trialing of broad acre temporary rehabilitation of unshaped overburden emplacement areas by aerial sowing of a cover crop<br>Constricting the areas and time of exposure of pre-strip clearing | |
| Construction | Heavy machinery and vehicle movement | Dust generation | fugitive dust emissions containing TSP (total suspended particulate, giving rise to nuisance impacts as fallout dust) | M | M | M | Minimise dust entrainment on roads<br>Minimise dust blown from load bins<br>Prevent soil erosion on stockpiles | Dust suppression on roads.<br>Install speed bumps.<br>Cover load bins with tarpaulin.<br>Implement a speed limit. | Environmental Officer<br>Site Manager |
| Closure and decommissioning | Infrastructure removal | Transpiration of infrastructure and structures off site, and breaking | fugitive dust emissions | M | M | M | Minimise increased dust | Demolition should not be performed during windy periods<br>Speed restrictions should be imposed and enforced.<br>Cabs of machines should be swept or vacuumed regularly to remove accumulated dust.<br>Exhaust pipes of vehicles should be directed upwards.<br>Engine cooling fans of vehicles should be shrouded.<br>Hard surfaced haul roads or standing areas should be washed down and swept to remove accumulated dust.<br>Dust suppression of roads. | Environmental Officer<br>Site Manager |
| Rehabilitation | Area preparation, shaping and topsoil placement | Dust generation | fugitive dust emissions | M | M | M | Prevent long periods of bare soil.<br>Prevent dust emissions | Revegetation of exposed areas.<br>Plants with roots that bind the soil, and vegetation cover should be used.<br>Spreading of soil must be performed on less windy days.<br>Apply dust suppression.<br>Speed restrictions should be imposed and enforced. | Environmental Officer<br>Site Manager |
| Visual Assessment | | | | | | | | | |
| Construction | Infrastructure construction | visual exposure | Change in sense of place | M | L | M | Minimise the visual exposure and change in sense of place | Create visual barriers. | Site engineer |

| Impact description | | | | Significance before mitigation | Significance after mitigation | Risk after prioritisation | Mitigation measures | Action plan | Responsible person |
|---|---|---|---|---|---|---|---|---|---|
| **Phases** | **Activity** | **Aspect** | **Impact** | | | | | | |
| Cumulative | Roll Over Mining | increased amount of vehicles, and mining infrastructure . | Change in sense of place | M | M | M | Minimise the visual exposure and change in sense of place | Create visual barriers. | Site engineer |
| Heritage | | | | | | | | | |
| Cumulative | Surface clearing and preparation | Clearing of surface | Destruction of structures | M | M | M | none | None - sufficient recording | 0 |
| Cumulative | Surface clearing and preparation | Clearing of surface | Destruction of structure and graveyard | H | M | M | Prevent impact on cemetery and structure | Conservation buffer & monitoring | ECO |
| Cumulative | Blasting | Blasting | Destruction of structures | M | M | M | Prevent destruction of features | Monitoring of structures | ECO |
| Operation | Blasting | Blasting | Impacting on settlements | M | M | M | Prevent destruction of features | Monitoring of structures | ECO |
| Blasting | | | | | | | | | |
| Construction | Blasting | Opencast Mining | Ground Vibrations | M | M | M | Limit ground vibrations to an acceptable value with a proper blast design, measure and record, evaluate and improve. | Blast Designs and Codes of Practice | Blaster appointed by Mine Manager |
| Construction | Blasting | Opencast Mining | Air blasts | M | M | M | Limit the decibels to an acceptable value with a proper blast design, measure and record, evaluate and improve. | Blast Designs and Codes of Practice | Blaster appointed by Mine Manager |
| Aquatics | | | | | | | | | |
| Construction | Surface clearing and preparation | Removal of water sources | Water Quantity and Loss Of Water/Flow | M | L | M | Topsoil should be placed to avoid erosion and runoff.<br>Attenuation of storm water to control the velocity.<br>Prevent erosion of stockpiles and bare soil areas | Avoid wetland areas and their associated buffer zones.<br>Follow a soil management plan for topsoil placement.<br>Implement SWMP<br>Do not allow surface water or storm water to be concentrated, or to flow down cut or fill slopes without erosion protection<br>Exposed soils must be rehabilitated as soon as practically possible | Environmental Officer<br>Site Manager |
| Construction | Surface clearing and preparation | Less available water | Habitat Loss/Fragmentation | M | L | M | Avoid wetland areas and their associated buffer zones. | Implement a wetland sensitive mine layout.<br>Demarcate wetland areas and boundaries | Environmental Officer<br>Site Manager |
| Construction | Surface clearing and preparation | Wash-down of sediment and soil | Sedimentation and Erosion | H | M | M | Topsoil should be placed to avoid erosion and runoff.<br>Attenuation of storm water to control the velocity | Avoid wetland areas and their associated buffer zones.<br>Follow a soil management plan for topsoil placement.<br>Implement SWMP | Environmental Officer<br>Site Manager |

| Impact description | | | | Significance before mitigation | Significance after mitigation | Risk after prioritisation | Mitigation measures | Action plan | Responsible person |
|---|---|---|---|---|---|---|---|---|---|
| **Phases** | **Activity** | **Aspect** | **Impact** | | | | | | |
| Construction | Surface clearing and preparation | Spills and sedimentation | Water quality deterioration | H | M | M | Prevent water quality deterioration | No washing of any construction equipment in close proximity to the channel or any wetlands<br>No releases of any substances that could be toxic to fauna or faunal habitats<br>Spillages of fuels, oils and other potentially harmful chemicals must 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 must be removed and the affected area rehabilitated immediately.<br>Portable toilets must be placed on impervious level surfaces that are lipped to prevent spillage.<br>Hazardous substances must be stored in bunded areas;<br>Surface water management plan.<br>Biomonitoring plan | Environmental Officer<br>Site Manager |
| Operation | Topsoil and overburden stockpiling | Wash-down from stockpiles, spills and leaks | Sedimentation and Erosion.<br>Water quality deterioration | H | M | M | Topsoil should be placed to avoid erosion and runoff.<br>Attenuation of storm water to control the velocity.<br>Prevent erosion of stockpiles and bare soil areas | Avoid wetland areas and their associated buffer zones.<br>Follow a soil management plan for topsoil placement.<br>Implement SWMP<br>Do not allow surface water or storm water to be concentrated, or to flow down cut or fill slopes without erosion protection<br>Exposed soils must be rehabilitated as soon as practically possible | Environmental Officer<br>Site Manager |
| Operation | Roll Over Mining | Removal of surface growth | Loss of Indigenous Vegetation and Habitat | H | M | M | Avoid wetland areas and their associated buffer zones. | Implement a wetland sensitive mine layout.<br>Demarcate wetland areas and boundaries | Environmental Officer<br>Site Manager |

## 10.8 Summary Specific Specialist Recommendations

Following is a summary of recommendation specifically highlighted by certain specialists. Take note that not all specialists gave specific recommendations and recommendations for these studies are included in the mitigation measures.

### 10.8.1 Groundwater

- Operational phase:
  - Groundwater levels in the monitoring boreholes should be measured on at least a quarterly interval.
  - Monitor groundwater inflow rates on a monthly basis throughout the mining operation.
  - The groundwater quality in the monitoring boreholes should be analysed on a quarterly basis.
    The numerical model should be updated once more time-series monitoring data (water levels and qualities) are available.
- Post-closure phase:
  - Groundwater flow to the streams in close proximity to the pits will occur if the hydraulic head within the pits is higher than the stream bed elevation. It is proposed that the heads in the final pit void be kept lower than that of the river with the aid of dewatering.
  - Carbonaceous material should be placed at the base of the opencast pit to allow flooding with groundwater as soon as possible. This will reduce the redox reaction potential as oxygen is excluded from the system.
  - Rehabilitation should occur in such a manner that surface runoff is directed away from the rehabilitated pit and recharge to the pit minimized.
  - Flow paths which include fracture zones should be sealed to reduce inflow of fresh groundwater and outflow of contaminated groundwater.
  - Methods of handling the potential decant should be investigated and may include treatment of polluted water.
  - The groundwater quality in the monitoring boreholes should continue to be analysed on a quarterly interval basis.

### 10.8.2 Wetland and Aquatics

- Design and implementation of a suitable stormwater system;
- 110 m buffer was implemented for the wetland systems; and
- Ongoing water quality monitoring must take place every month during construction and operational phases.

### 10.8.3 Fauna and Flora

- Development of an AIP Management and Control Plan. This plan should incorporate the mining activity and the initial clearance of vegetation as part of AIP clearance. The progress of the plan should be monitored by the onsite ECO on a monthly basis and an annual audit should be conducted to support the updating of the management plan.
- Mining and vehicle activity should be limited to regular operating ours to minimise disturbances to nocturnal fauna.
- Concurrent rehabilitation of the mining area.
- The footprint area should be kept to a minimum and only existing access roads should be used.
- No off-road driving, hunting, poaching, or fires should be permitted on the property.
- Additional fauna and flora survey to be conducted on an annual basis or in the case that a species of concern is identified on site.

### 10.8.4 Heritage and Archaeology

The following recommendations are made in terms with the National Heritage Resources Act (25 of 1999) in order to avoid the destruction of heritage remains associated with the area demarcated for development:

- Sites W3 & W4 are of recent origin and therefore not significant from a heritage perspective. No further action is required.
- Although several modern structures occur in the vicinity, the area surrounding POI 1 & POI 2 dates to historical times. Therefore, it is recommended that the structures associated with this area be monitored by an ECO to determine the level of impact caused by the proposed mining activity. Should an impact be observed as a result of the proposed development, a qualified archaeologist must be contacted to provide further recommendations.

- The area associated with Sites W2, W5, W6 and POI 3 date to historical times. Therefore, it is recommended that these sites and the associated area not be impacted by the proposed mining activity. Monitoring should be done by an ECO to determine the level of impact caused by the proposed development. Should impact be observed as a result of the proposed development, or if the destructions of the sites are inevitable, a qualified archaeologist must be contacted to provide further recommendations.
- Because Graveyard W1 is no longer in use, it is recommended that a fenced-off conservation buffer of 100m be established around the graveyard and that the graveyard be kept tidy. Access to the graveyard must not be refused and the mine ECO should regularly inspect the fence, as well as the graves. Should any additional damage be observed as a result of mining activities, a qualified archaeologist must be contacted to assess the situation to provide further recommendations. Alternatively, the graves may be relocated by a qualified graves relocation unit to a premises earmarked by the local municipality, but will set in motion a substantial process as new legislation will be triggered. These processes, however, must be performed in accordance with the involvement of community leaders and the relatives of the deceased buried in the concerned cemetery.
- Because archaeological artefacts generally occur below surface, the possibility exists that culturally significant material may be exposed during the development and construction phases, in which case all activities must be suspended pending further archaeological investigations by a qualified archaeologist. Also, should skeletal remains be exposed during development and construction phases, all activities must be suspended and the relevant heritage resources authority contacted (See National Heritage Resources Act, 25 of 1999 section 36 (6)).
- Should the need arise to expand the proposed development beyond the surveyed area mentioned in this study, the following applies: A qualified archaeologist must conduct a full Phase 1 Archaeological Impact Assessment (AIA) on the sections beyond the demarcated area that will be affected by the development, in order to determine the occurrence and extent of any archaeological sites and the impact development might have on these sites.
- From a heritage point of view, development may proceed on the demarcated portion, subject to the abovementioned conditions, recommendations and approval by the South African Heritage Resources Agency.

### 10.8.5 Noise

| Activity | Recommendations |
|---|---|
| **Construction phase** | • Equipment and/or machinery which will be used must comply with the manufacturer's specifications on acceptable noise levels and any noise sources above 85.0dBA to be acoustically screened off.<br>• Construction activities to take place during daytime period only.<br>• Environmental noise monitoring on a quarterly basis. |
| **Operational phase** | • Equipment and/or machinery which radiate noise levels between 85.0dBA and 90.0dBA to be acoustically screened off.<br>• Emergency generators to be placed in such a manner that it is away from any residential area.<br>• Noise monitoring to be carried out along the footprint boundaries at the opencast pit, crushers and screening, along haul roads, pit activities and at the rim of the open cast pit;<br>• Noise monitoring at the residential areas and the mine boundaries to be done on a quarterly basis for a year after which the frequency can change to an annual basis;<br>• Actively manage the process and the noise management plan must be used to ensure compliance to the noise regulations and/or standards. The levels to be evaluated in terms of the baseline noise levels. |
| **Decommissioning phase** | • Machinery with low noise levels which complies with the manufacturer's specifications to be used; and<br>• Activities to take place during daytime period only. |

# 11. ENVIRONMENTAL IMPACT STATEMENT

## 11.1 The Key Findings Of The Environmental Impact Assessment And Positive And Negative Impacts Identified

The impacts that have been rated as medium or high risk after prioritisation must be carefully managed throughout the LOM in order to ensure the project is sustainable from an economic, social and environmental point of view. The project will stimulate the local economy and contribute to the national GDP, which in the current economic climate, is a positive impact. The negative impact on natural resources (groundwater, surface water, air quality and soils) can however not be avoided, but only managed and mitigated to a certain extent. It is therefore of utmost importance that monitoring is undertaken as stipulated within the EMP.

**Table 13: Impacts of Medium to High Risk**

| Impact description | | Risk after Prioritisation |
|---|---|---|
| **Phases** | **Impact** | **Rating** |
| Decommissioning | Adequate backfilling and rehabilitation will decrease aquifer recharge. The period to decant will therefore be prolonged. | M |
| Construction | Decrease in water level should the pit floor be lower than the water level | M |
| Operation | Acid generation in the case of carbonaceous material placement. | M |
| Operation | Acid generation as a result of carbonaceous material. | M |
| Operation | The water infiltrating the pit will be removed for safe mining, causing a decrease in the water level of up to 55 m. | H |
| Residual | Recovery of the water level in the pit as dewatering ceases. In the case of acid generation, the plume will start to move away from the pit as the water level recovered. Decanting may occur once the water level has recovered to the decanting elevation. | H |
| **Wetland Impacts** | | |
| Construction | Flow alterations due to erosion and sedimentation | H |
| Construction | Pollution of watercourse | H |
| Construction | Spread of alien vegetation | H |
| Operation | Flow alterations due to erosion and sedimentation | M |
| Operation | Flow alterations due to erosion and sedimentation | M |
| Operation | Flow alterations | M |
| Operation | Pollution of watercourse | M |
| Operation | Pollution of watercourse | M |
| Operation | Pollution of watercourse | M |
| Operation | Pollution of watercourse | M |
| Operation | Pollution of watercourse | M |
| Operation | Pollution of watercourse | M |
| Operation | Spread of alien vegetation | M |
| **Noise** | | |
| Construction | Noise disturbance | M |
| Construction | Noise disturbance | M |
| Construction | Noise disturbance | M |
| Operation | Noise disturbance | M |
| Operation | Noise disturbance | M |
| Operation | Noise disturbance | M |
| Operation | Noise disturbance | M |
| Operation | Noise disturbance | M |
| **Soils** | | |
| Construction | Exposure of soil surface to erosion | H |
| Construction | Soil compaction and reduced water infiltration capacity | H |
| Construction | Destruction of in situ soil profiles | H |
| Construction | Destruction of soil nutrient cycles and hydrogeological functioning | H |
| Construction | Soil chemical pollution | M |
| Construction | Destruction of arable and grazing land capability | H |
| Operation | Soil compaction and reduced water infiltration capacity | H |
| Operation | Soil chemical pollution | M |
| Closure and decommissioning | Soil chemical pollution | M |
| Rehabilitation | Soil compaction and reduced water infiltration capacity | M |
| **Air Quality** | | |
| Construction | Fugitive dust (containing TSP (total suspended particulate, will give rise to nuisance impacts as fallout dust), as well as PM10 and PM2.5 (dust with a size less than 10 microns, and dust with a size less than 2.5 microns giving rise to health impacts | M |

| Impact description | | Risk after Prioritisation |
|---|---|---|
| **Phases** | **Impact** | **Rating** |
| Construction | Fugitive dust emissions containing TSP (total suspended particulate, giving rise to nuisance impacts as fallout dust) | M |
| Construction | Fugitive dust emissions containing TSP (total suspended particulate, giving rise to nuisance impacts as fallout dust) | M |
| Closure and decommissioning | Fugitive dust emissions | M |
| Rehabilitation | Fugitive dust emissions | M |
| Visual Assessment | | |
| Construction | Change in sense of place | M |
| Cumulative | Change in sense of place | M |
| Heritage | | |
| Cumulative | Destruction of structures | M |
| Cumulative | Destruction of structure and graveyard | M |
| Cumulative | Destruction of structures | M |
| Operation | Impacting on settlements | M |
| Blasting | | |
| Construction | Ground Vibrations | M |
| Construction | Air blasts | M |
| Aquatics | | |
| Construction | Water Quantity and Loss Of Water/Flow | M |
| Construction | Habitat Loss/Fragmentation | M |
| Construction | Sedimentation and Erosion | M |
| Construction | Water quality deterioration | M |
| Operation | Sedimentation and Erosion.<br>Water quality deterioration | M |
| Operation | Loss of Indigenous Vegetation and Habitat | M |

## 11.2 Final Site Map

Refer to Appendix 4 for final site layouts (overlain with the sensitivity layer).

## 11.3 Summary Of Risks Of The Proposed Activity And Identified Alternatives

| Description | Advantages | Disadvantages |
|---|---|---|
| **Mining Method Alternatives** | | |
| Underground board-and-pillar. | • Smaller footprint associated with surface disturbance.<br>• Alternative/current land uses can continue on areas not directly impacted by surface activities.<br>• Reduced impact on dust, noise and air quality.<br>• No blasting during operational phase.<br>• Reduced rehabilitation costs. | • Not economically viable as large pillars will remain.<br>• Risk of subsidence during operation.<br>• Risk of subsidence post-closure.<br>• Potential decrease in groundwater quantity and quality.<br>• Potential decrease in groundwater interaction with wetland.<br>• De-watering of the surrounding aquifer.<br>• Potential AMD post mining and closure phase.<br>• Potential undermining of aquifer.<br>• Drawdown of water levels of privately owned boreholes.<br>• Potential decrease in base flow to the streams and wetlands running through the MRA. |

| Description | Advantages | Disadvantages |
|---|---|---|
| **Mining Method Alternatives** | | |
| Opencast mining<br>(preferred method) | • Additional employment opportunities.<br>• Economically viable as more coal will be efficiently extracted.<br>• Increased LOM – extended employment opportunities.<br>• No subsidence risk during operation.<br>• No subsidence risk post-closure. | • Greater surface area disturbance.<br>• Change in land use required for all farm portions in the MRA.<br>• Decrease in agricultural area/cultivated land.<br>• Decrease in surface water runoff to catchment.<br>• Potential decrease in surface and ground water quantity and quality.<br>• Potential decrease in groundwater interaction with wetland.<br>• Increased dust generation.<br>• Increased blast and vibration impacts.<br>• Increased noise from the use of construction and mining machinery on surface during operations.<br>• Higher rehabilitation costs. |

## 12. IMPACT MANAGEMENT OBJECTIVES AND IMPACT MANAGEMENT OUTCOMES

The objectives of impact mitigation and management are to:

- Primarily pre-empt impacts, assess their significance and implement appropriate mitigation and management measures to either avoid, minimise and/or remediate the associated impacts where they cannot completely be avoided.
- Implement an adequate monitoring programme to:
    - Ensure that mitigation and management measure are effective.
    - Allow quick detection of potential impacts, which in turn will allow for quick response to issue/impacts.
    - Reduce duration of any potential negative impacts.

# 13. ASPECTS FOR INCLUSION AS CONDITIONS OF THE AUTHORISATION

## 13.1 CONDITIONS TO BE INCLUDED IN THE AUTHORISATION

- Adhere to all recommendation and management measures contained in the EMP.
- All relevant permits and authorisation must be obtained prior to construction commencing.
- Adhere to all monitoring requirements.
- A water use license must be obtained prior to any water uses undertaken on site.
- The area associated with Heritage Sites W2, W5, W6 and POI 3 date to historical times. Therefore, it is recommended that these sites remain intact and be fenced off. Should they be removed the relevant NHRA permits need to be applied for.
- Graveyard W1 should be fenced off as per the Heritage Study recommendations. Should the site be in danger of incurring impacts, the graves will need to be relocated following an approved relocation Action Plan.
- Methods of handling the potential decant should be investigated, approved and set in place prior to mine closure.
- All acoustic screening measures must be in place before commissioning the mining activities.
- Any development must occur outside of the recommended 110 m wetland buffer zone.
- No off-road driving, hunting, poaching, or fires should be permitted on the property.
- An Alien Invasive eradication plan should be compiled, approved and implemented.

## 13.2 REHABILITATION REQUIREMENTS

Rehabilitation of the project will aim to:

- Create a safe, physically stable rehabilitated landscape that limits long-term erosion potential and environmental degradation;
- Sustain the long term catchment water yield and ensure suitable water quality;
- Rehabilitation of the surface infrastructure where necessary to minimize infiltration into the underground water regime (the philosophy of concentration and containment);
- Rehabilitation to minimise contamination of surface water resources (the philosophy of dilution and dispersion);
- Focus on establishing a functional post-mining landscape that would ensure self-sustaining agricultural practices post mine closure where possible;
- Ensure interconnectivity between the rehabilitated landscapes with surrounding regionally biologically diverse areas;
- Encourage, if and where required, the re-instatement of terrestrial and aquatic wetland biodiversity over time; and
- Create opportunities for alternative post-mining livelihoods by aligning to the regional planning;
- Meet with prevailing environmental legal requirements outlined in this report; and
- Prevent / Minimise negative impacts and risks as identified in this report.

# 14. DESCRIPTION OF ANY ASSUMPTIONS, UNCERTAINTIES AND GAPS IN KNOWLEDGE

## 14.1 General

Some specialist input was still outstanding at the time of submission of this report. These studies will be included in the final report. Studies outstanding include:

- Surface Hydrology Study and Impact Assessment
- Detailed Fauna and Flora Impact Assessments
- Social Economic Impact Assessment

## 14.2 Fauna and Flora

The narrow temporal scale of sampling (i.e. one full day) is the major limiting factor of the study. This study therefore cannot account for seasonal variation in presence of species. As the survey was conducted during the day, nocturnal species were not observed. Due to these constraints a cautious approach was taken and species of concern were identified in the QDS, and proxies of presence were actively searched for. Therefore, observed species list should be critically evaluated.

The desktop study was conducted with up to date resources and the site visit was conducted as thoroughly as possible. It might however be possible that additional information becomes available in time, as this type of study deals with dynamic natural ecosystems. It is therefore important that the report be viewed and acted upon with these limitations in mind. Esimeme Consulting cannot be held responsible for conclusions and pro-active mitigation measures that are made in good faith based on the available resources and information provided at the time of the study.

## 14.3 Aquatics and Wetland Assessment

It is difficult to apply pure scientific methods within a natural environment without limitations, and consequential assumptions need to be made. The following constraints may have affected this assessment:

- A hand-held Garmin eTrex 30 were used to delineate the channels had an accuracy of 3 m to 6 m
- The findings, results, observations, conclusions and recommendations provided in this report are based on the author's best scientific and professional knowledge as well as available information regarding the perceived impacts on the watercourses; and
- The assessment in determining the present ecological state (PES) of the identified system was based on a single site visit. Site visits should ideally be conducted over differing seasons in order to better understand the vegetation, hydrological and geomorphologic processes driving the characteristics of the watercourse.
- The watercourse management and rehabilitation plan will need to be updated as more information about the dynamics of the system and its response to the implemented management measures are observed over time.

## 14.4 Heritage features

The western section of the study area (Portion 19) is used for grazing, while the northern-most section of this portion is associated with mining activity. The areas to the south of the area demarcated for development on portion 19 is characterised by several settlements. These settlements and kraals, however, area located outside of the area demarcated for mining. The majority of Portion 2 is cultivated land, while a small strip along the southern edge is characterised by grassland and dense forest. The dense grass cover and forests severely hampered visibility and movement. The general visibility of the remaining areas, however, was fairly good.

## 14.5 Noise Assessment

The following limitations forms part of the environmental noise measurements:

- The number of hauling vehicles which will be required to transport coal from Wildebeestfontein mine to Elandsfontein mine was not available and a number of 20 hauling vehicles per hour was used to calculate the traffic noise levels;
- It was assumed that the mining operations will take place on a 24-hour basis.

- The prevailing ambient noise levels for the study area was created by far and near noise sources associated with traffic, mining activities, domestic activities and seasonal agricultural activities with the result that the prevailing ambient noise level may change at times;
- Noise measurements in the presence of winds in excess of 3.0m/s may impact the outcome of the environmental noise results;
- The identification of noise measuring points may create a problem in terms of the prevailing noise levels should it not be done with outmost care and in a scientific manner;
- The influx of traffic into an area will have an influence on the prevailing ambient noise levels and should be considered during the noise impact assessment process

There will be a difference between the summer and winter periods as the insect activities such as crickets raise the prevailing ambient noise levels during the summer period whereas the prevailing ambient noise levels will not be influenced by insects during the winter period.

# 15. REASONED OPINION AS TO WHETHER THE PROPOSED ACTIVITY SHOULD OR SHOULD NOT BE AUTHORISED

## 15.1 Reasons Why The Activity Should Be Authorized Or Not

Although not all the specialist studies were available at the time of the report being circulated for comment, the project can be recommended for approval with conditions contained in this report (subject to additional conditions received from specialists once their reports are finalised).

## 16. PERIOD FOR WHICH THE ENVIRONMENTAL AUTHORISATION IS REQUIRED

The life of Mine is estimated at 7 years. The EA and Waste Management License (WML) are being sought for a period of 10 years.

## 17. FINANCIAL PROVISION

As per NEMA financial provision regulations, itemised costs must be provided within the financial provision. As the DMR's closure cost assessment provides itemised costs, this process was used to determine the quantum for financial provision.

Financial Provision will be made by way of a guarantee acceptable to the DMR, as per the Regulations pertaining to the Financial Provision for Prospecting, Exploration, Mining or Production Operations.

The Financial Mine Closure Quantum is determined in accordance with the requirements of the 'Guideline Document for the Evaluation of the Quantum of Closure-Related Financial Provision Provided by a Mine (2005)' - Official guideline as contemplated in Regulation 54(1) to the Mineral and Petroleum Resources Development Act, 2002 (Act 28 of 2002).

The Mineral and Petroleum Resources Development (Act 28 of 2002) places the financial provision into context with respect to relevant constitutional considerations and the overall government policy currently prevailing in South Africa, as well as within a broader environmental legal framework. This guideline serves as a guide to the interpretation and application of the provision of the MPRDA, 2002 (Act 28 of 2002) and its Regulations, specifically as they relate to financial provision for the mining industry. This document is an official guideline in terms of regulation 54(1) promulgated in terms of the MPRDA, 2002 (Act 28 of 2002) and serves the specific objectives to;

- Improve the understanding of the financial and legal aspects pertaining to the costing of remediation measures as a result of prospecting and / or mining operations;
- Enable the DMR to adequately evaluate/review the quantum for financial provision submitted by the mining industry. This review will cover the financial provision for premature closure at any time (the current environmental liability); and
- Provide the DMR Regional Office personnel with a comprehensive and useful guideline on the generally accepted closure methods.

In terms of the new Financial Provision Regulations, a holder will have 39 months to assess, review and adjust the sum of the financial provision in accordance with Regulation 9 and 11. Failure to do so will mean that the existing approved financial provision will lapse after 45 calendar days after the lapsing of the 39 month period.

The Calculated Mine Closure Quantum is presented overleaf:

| CALCULATION OF THE MINE CLOSURE QUANTUM | | | | | | | | Version 1.0: Proposed Mine Closure Quantum Update for FY2019 |
|---|---|---|---|---|---|---|---|---|
| Mine: Opsirex (Pty) Ltd: Wildebeestfontein Colliery | | | | | Province: Mpumlanga | | | |
| Evaluators: Eco Elementum (Pty) Ltd | | | | | Date: Sept 2019 | | | |
| General Information | Risk Class | High (A) | OPSIREX (PTY) LTD WILDEBEESTFONTEIN COLLIERY | | | | | |
| | Environmental Sensitivity | Medium | | | | | | |
| | WF 1: Nature of Terrain Weighting Factor | Flat 1.00 | | | | | | |
| | WF 2: Proximity to Urban Area Weighting Factor | Peri-Urban 1.05 | | | | | | |

| Component No | Main Activities Itemized Descriptions | [B] CPI Adjusted Master Rate | [A] Quantity | Units | [C] Multiplication Factor | [D] Weighting Factor 1: Nature of Terrain | Sub Totals [E = A*B*C*D] | NOTES & SUPPORTING EXPLANATIONS |
|---|---|---|---|---|---|---|---|---|
| | | STEP 4.3 | STEP 4.5 | | STEP 4.3 | STEP 4.4 | | |
| 1 | Dismantling of processing plant and structures | R 14,53 | 0,00 | m3 | 1,00 | 1,00 | R 0,00 | |
| 2(A) | Demolition of steel buildings and structures | R 202,44 | 0,00 | m2 | 1,00 | 1,00 | R 0,00 | |
| 2(B) | Demolition of reinforced concrete buildings and structures | R 298,34 | 0,00 | m2 | 1,00 | 1,00 | R 0,00 | |
| 3 | Rehabilitation of access roads | R 36,23 | 6000,00 | m2 | 1,00 | 1,00 | R 217 358,65 | Gravel roads - 1000m lenght x 6m width |
| 4(A) | Demolition and rehabilitation of electrified railway lines | R 351,61 | 0,00 | m | 1,00 | 1,00 | R 0,00 | |
| 4(B) | Demolition and rehabilitation of non-electrified railway lines | R 191,79 | 0,00 | m | 1,00 | 1,00 | R 0,00 | |
| 5 | Demolition of housing and facilities | R 404,88 | 0,00 | m2 | 1,00 | 1,00 | R 0,00 | |
| 6 | Opencast rehabilitation including final voids and ramps | R 206 064,52 | 2,50 | ha | 0,52 | 1,00 | R 267 883,88 | 3x cuts open at once, rollover rehab |
| 7 | Sealing of shafts, adits and inclines | R 108,68 | 0,00 | m3 | 1,00 | 1,00 | R 0,00 | |
| 8(A) | Rehabilitation of overburden and spoils | R 141 496,22 | 17,50 | ha | 1,00 | 1,00 | R 2 476 183,82 | Hards 10ha + Softs 7.5 ha |
| 8(B) | Rehabilitation of processing waste deposits and evaporation ponds (basic, salt-producing waste) | R 176 230,98 | 0,00 | ha | 1,00 | 1,00 | R 0,00 | |
| 8(C) | Rehabilitation of processing waste deposits and evaporation ponds (acidic, metal-rich waste) | R 511 858,31 | 3,86 | ha | 0,80 | 1,00 | R 1 580 618,45 | Carbenaceous material footprints to be rehabilitated PCD 2 ha + ROM 1.86 ha |
| 9 | Rehabilitation of subsided areas | R 118 481,77 | 0,00 | ha | 1,00 | 1,00 | R 0,00 | |
| 10 | General surface rehabilitation, including grassing of denuded areas | R 15 626,20 | 173,00 | ha | 1,00 | 1,00 | R 2 703 332,60 | Entire disturbed footprint |
| 11 | River diversions | R 112 088,87 | 0,00 | ha | 1,00 | 1,00 | R 0,00 | |
| 12 | Fencing | R 127,86 | 0,00 | m | 1,00 | 1,00 | R 0,00 | |
| 13 | Water management (Separating clean and dirty water, managing polluted water and managing the impact on groundwater, including treatment, when required) | R 42 619,34 | 20,00 | ha | 0,67 | 1,00 | R 571 099,19 | Dirty footprint around stockpiling, carbenaceous and PCD area |
| 14 | 2 to 3 years of maintenance and after care | R 14 916,77 | 173,00 | ha | 1,00 | 1,00 | R 2 580 601,21 | Entire disturbed footprint |
| 15 | Specialist study | R 150 000,00 | 1,00 | report | 1,00 | 1,00 | R 150 000,00 | Final closure study: GNR1147 Format |
| | | | | | | Subtotal (1 to 15 above) | R 10 547 077,80 | |
| | Subtotal 1 | | Weighting Factor 2 | | | 1,05 | R 11 074 431,69 | |
| 1 | Preliminary and General | | 12% of Subtotal 1 if less than R100mil<br>6% of Sub Total 1 if more than R100mil | | | | R 1 328 931,80 | |
| 2 | Contingency | | 10% of Sub Total 1 | | | | R 1 107 443,17 | |
| | | | Subtotal 2 (Subtotal 1 plus sum of management and contingency) | | | | R 2 436 374,97 | |
| | | | Subtotal 3 | | | | R 13 510 806,66 | |
| | | | GRAND TOTAL (Subtotal 3 plus 15% VAT) | | | | R 15 537 427,66 | |

# 18. DEVIATIONS FROM THE APPROVED SCOPING REPORT

## 18.1 Deviations From The Methodology For Impact And Risk Assessment

No deviation has been made.

## 18.2 Motivation For The Deviation

Not applicable as no deviation has been made.

# 19. OTHER INFORMATION REQUIRED BY THE COMPETENT AUTHORITY

## 19.1 Compliance With The Provisions Of Sections 24(4) (A) And (B) Read With Section 24 (3) (A) And (7) Of NEMA, The EIA Report

### 19.1.1 Impact on the Socio-Economic Conditions of Any Directly Affected Person

Information not available at the time of submission

### 19.1.2 Impact on Any National Estate Referred To In Section 3(2) Of the National Heritage Resources Act

Refer to the Heritage Impact Assessment attached as Appendix 3 and Section 10.7

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

Section 24(4) (b) (i) of the Act specifies "investigation of the potential consequences or impacts of the alternatives to the activity on the environment and assessment of the significance of those potential consequences or impacts, including the option of not implementing the activity".

The alternatives assessed and the impacts associated with the alternatives assessed have been fully presented in Section 7 and Section 10.5

## 21. UNDERTAKING

The EAP herewith confirms

a. The correctness of the information provided in the reports ☒
b. The inclusion of comments and inputs from stakeholders and I&APs ; ☒
c. The inclusion of inputs and recommendations from the specialist reports where relevant; and ☒
d. The acceptability of the project in relation to the finding of the assessment and level of mitigation proposed; ☒

Signed: _____ 2019

## 22. LIST OF APPENDICES

- **Appendix 1 – EMP**
- **Appendix 2 – Proof of Public Participation**
- **Appendix 3 – Specialist Reports**
- **Appendix 4 – Maps**
- **Appendix 5 – Site Layout and infrastructure**
- **Appendix 6 – EAP CV**