# HYDROPEDOLOGY SCOPING REPORT FOR ELANDSFONTEIN COLLIERY COLLIERY

## Emalahleni, Mpumalanga

November 2019

**CLIENT**


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# 1 Introduction

The Biodiversity Company (TBC) was appointed to conduct a hydropedology scoping assessment comprising desktop information and also a high-level impact identification and assessment for the Environmental Impact Assessment (EIA) for Elandsfontein colliery. The applicant plans to consolidate two mining right areas into a single mining right.

# 2 Document Structure

This report has been compiled in accordance with the EIA Regulations, 2014 (Government Notice (GN) R982). A summary of the report structure, and the specific sections that correspond to the applicable regulations, is provided in Table 1 below.

*Table 1: Report Structure*

| ENVIRONMENTAL REGULATION | DESCRIPTION | SECTION IN REPORT |
|---|---|---|
| **NEMA EIA REGULATIONS 2014 (AS AMENDED)** | | |
| **Appendix 6 (1)(a):** | Details of –<br>(i) the specialist who prepared the report; and<br>(ii) the expertise of that specialist to compile a specialist report including a curriculum vitae; | Section 3 and Appendix B |
| **Appendix 6 (1)(b):** | a declaration that the specialist is independent in a form as may be specified by the competent authority; | Appendix A |
| **Appendix 6 (1)(c):** | an indication of the scope of, and the purpose for which, the report was prepared; | Section 4 |
| **Appendix 6 (1)(ca):** | an indication of the quality and age of base data used for the specialist report; | Section 8 |
| **Appendix 6 (1)(cb):** | a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change; | Section 9 |
| **Appendix 6 (1)(d):** | the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment; | N/A |
| **Appendix 6 (1)(e):** | a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used; | Section 8 |
| **Appendix 6(1)(f):** | details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives; | N/A |
| **Appendix 6(1)(g):** | an identification of any areas to be avoided, including buffers; | N/A |
| **Appendix 6(1)(h):** | a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers; | Section 0 |
| **Appendix 6(1)(i):** | a description of any assumptions made and any uncertainties or gaps in knowledge; | Section 0 |
| **Appendix 6(1)(j):** | a description of the findings and potential implications of such findings on the impact of the proposed activity or activities; | Section 9 |
| **Appendix 6(1)(k):** | any mitigation measures for inclusion in the EMPr; | Section 9 |
| **Appendix 6(1)(l):** | any conditions for inclusion in the environmental authorisation; | N/A |
| **Appendix 6(1)(m):** | any monitoring requirements for inclusion in the EMPr or environmental authorisation; | N/A |
| **Appendix 6(1)(n):** | a reasoned opinion-<br>(i) whether the proposed activity, activities or portions thereof should be authorised;<br>(iA) regarding the acceptability of the proposed activity or activities; and | N/A |

| | | |
|---|---|---|
| | (ii) if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan; | |
| **Appendix 6(1)(o):** | a description of any consultation process that was undertaken during the course of preparing the specialist report; | N/A |
| **Appendix 6(1)(p):** | a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and | N/A |
| **Appendix 6(1)(q):** | any other information requested by the competent authority. | N/A |

# 3 Specialist Details

| **REPORT NAME** | **HYDROPEDOLOGY SCOPING REPORT FOR ELANDSFONTEIN COLLIERY** |
|---|---|
| **SUBMITTED TO** | EIMS ENVIRONMENTAL IMPACT MANAGEMENT SERVICES |
| **THE CLIENT** | geo |
| **REPORT WRITER** | **Ivan Baker**<br><br>Ivan Baker is Cand. Sci Nat registered (119315) in environmental science and geological science. Ivan is a wetland and ecosystem service specialist, a hydropedologist and pedologist that has completed numerous specialist studies ranging from basic assessments to EIAs. Ivan has carried out various international studies following FC standards. Ivan completed training in Tools for Wetland Assessments with a certificate of competence and completed his MSc in environmental science and hydropedology at the North-West University of Potchefstroom.. |
| **REPORT REVIEWER** | **Andrew Husted**<br><br>Andrew Husted is Pr Sci Nat registered (400213/11) in the following fields of practice: Ecological Science, Environmental Science and Aquatic Science. Andrew is an Aquatic, Wetland and Biodiversity Specialist with more than 12 years' experience in the environmental consulting field. Andrew has completed numerous wetland training courses, and is an accredited wetland practitioner, recognised by the DWS, and also the Mondi Wetlands programme as a competent wetland consultant. |
| **DECLARATION** | The Biodiversity Company and its associates operate as independent consultants under the auspice of the South African Council for Natural Scientific Professions. We declare that we have no affiliation with or vested financial interests in the proponent, other than for work performed under the Environmental Impact Assessment Regulations, 2017. We have no conflicting interests in the undertaking of this activity and have no interests in secondary developments resulting from the authorisation of this project. We have no vested interest in the project, other than to provide a professional service within the constraints of the project (timing, time and budget) based on the principals of science. |

# 4 Terms of Reference

The aim of the assessment was to determine the current state of the associated water resources in the area of study. This was achieved through the following:

- Identification of soil profiles and morphology;
- Determining the Saturated Hydraulic Conductivity (*Ks*) of bedrock;
- Undisturbed sampling of all soil horizons for each land type;
- Conceptualising impacts towards hillslope hydrology;
- Using results from laboratory tests on undisturbed samples for the parameterisation of the relevant modelling software;
- Quantifying the loss of interflow towards watercourses; and
- The prescription of mitigation measures and recommendations for identified risks.

# 5 Project Description

The Elandsfontein Colliery is located in the Witbank Coal Field on the farm Elandsfontein 309 JS. The property is approximately 16 km west of the town of Witbank in the Mpumalanga Province, South Africa. The centre point of the site is 25°53'05.01"S and 29°05'36.57"E. The Elandsfontein Colliery comprises of 2 distinct mining rights (MR314 and MR63). The applicant plans to consolidate the two mining right areas into a single mining right with associated consolidated Environmental Management Programme (EMPr). In addition, the applicant wishes to expand their existing mining operations to include additional mineral resource areas (i.e. new opencast & underground areas within the consolidated mining right boundary) (GSW, 2019). The area surrounding the project area consists predominantly of mining activities, secondary roads and agricultural areas.

The various land-use activities within, and adjacent to the project area have impacted upon the associated ecosystems according to available desktop information. A locality map of the project area is shown in Figure 1.

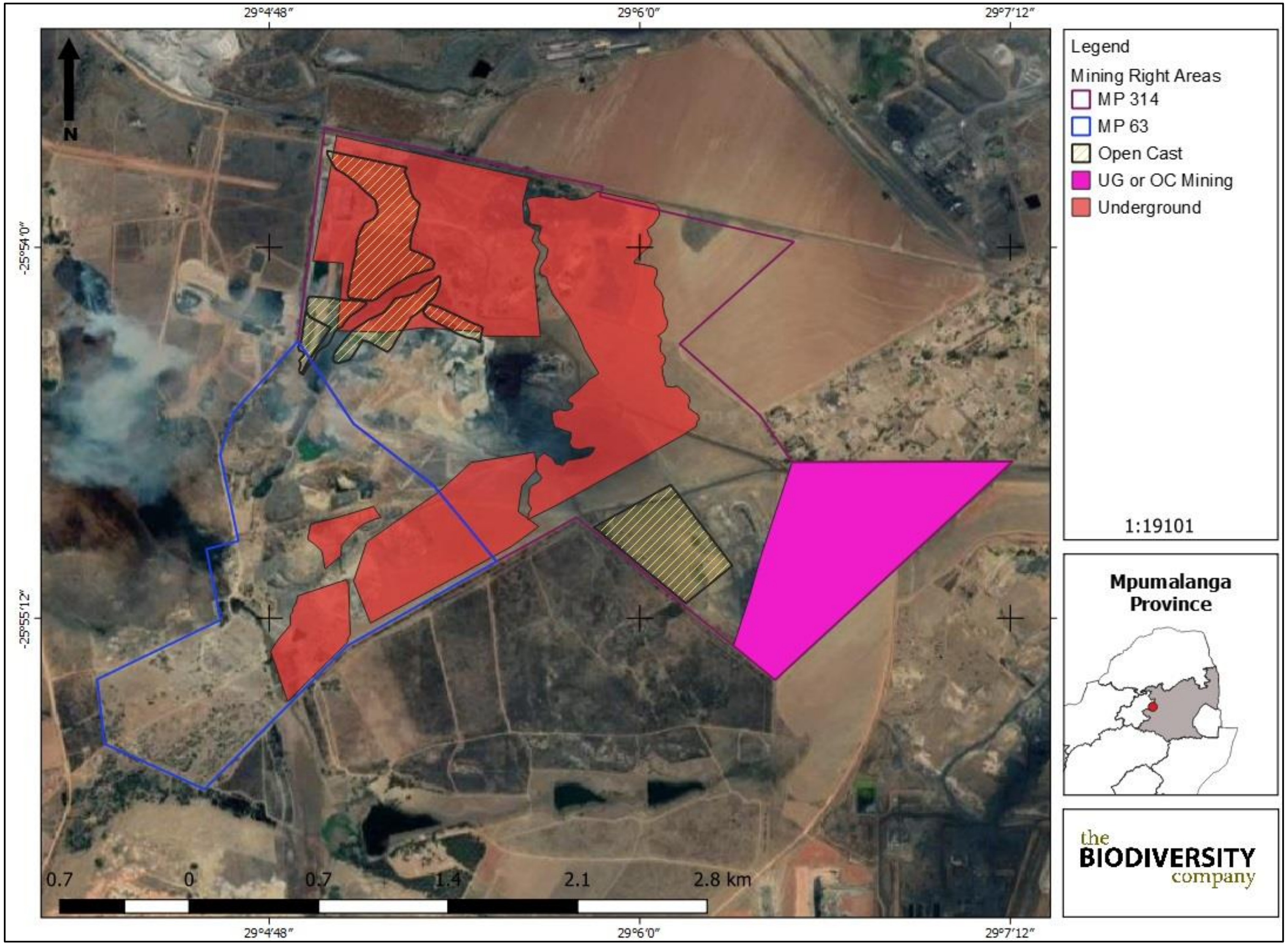


*Figure 1: The proposed Elandsfontein project area*

# 6 Key Legislative Requirements

Currently, various pieces of legislation and related policies exist that guide and direct the land user in terms of land use planning both on a national and provincial level. This legislation includes, but is not limited to:

- The Constitution of the Republic of South Africa (Act 108 of 1996);
- Sub-division of Agricultural Land Act (Act 70 of 1970);
- Municipal Structures Act (Act 117 of 1998);
- Municipal Systems Act (Act 32 of 2000); and
- Spatial Planning and Land Use Management Act, 16 of 2013 (not yet implemented).

The above mentioned are supported by additional legislation that aims to manage the impact of development on the environment and the natural resource base of the country. Related legislation to this effect includes:

- Conservation of Agricultural Resources Act (Act 43 of 1983);
- Environment Conservation Act (Act 73 of 1989);
- National Environmental Management Act (Act 107 of 1998); and
- National Water Act (Act 36 of 1998).

# 7 Limitations

- This assessment represents the Scoping Phase of the project only;
- A detailed hydropedology baseline and impact assessment report will be submitted for the Environmental Impact Assessment (EIA) phase of the project;
- The impact assessment has only been conducted for the proposed opencast and underground mining areas; and
- A field survey still needs to be conducted to advise on the viability of the alternatives.

# 8 Receiving Environment

## 8.1 Vegetation Types

The MRA is located within two vegetation types, including the Rand Highveld Grassland (Gm 11) Eastern Highveld Grassland (Gm 12). The distribution of the Rand Highveld Grassland ranges between the North-West, Gauteng, Free State and Mpumalanga provinces. This vegetation type can be found between rocky ridges specifically between Witbank and Pretoria. The Rand Highveld Grassland extends into these ridges in the Stoffberg area as well as west of Krugersdorp stretching all the way to Potchefstroom. The preferred altitude for this vegetation type is between 1300m and 1635m above sea level (Mucina & Rutherford, 2006).

Grass species commonly found in these regions include the genera *Themeda. Eragrostis, Elionurus* and *Heteropogon*. The diversity of herbs is high in these regions with rocky ridges and hills being colonized by sparse woodlands accompanied by a rich suite of shrubs with the genus *Rhus* making up the bulk thereof (Mucina & Rutherford, 2006). The sparse woodlands in this vegetation type includes species like *Protea caffra* subsp., *Caffra, Acacia caffra, P. Welwitschii* etc.

The project area falls within the Eastern Highveld Grassland (Gm 12) vegetation type. This vegetation type is located in the Gauteng and Mpumalanga province within the plains between Belfast and Johannesburg. This vegetation type also extends to Bethal, the western areas of Piet Retief and Ermelo. The altitude in which this vegetation type occurs ranges between 1 520 meters above sea level to 1 780 meters above sea level (Mucina & Rutherford, 2006).

The vegetation of this vegetation type is characterised by short and dense grasslands that occur in moderately undulating plains which include low hills and pan depressions (Mucina & Rutherford, 2006). Small scattered rocky outcrops are common in this area with wiry, sour grasses accompanied by some woody species which include *Celtis africana, Parinari capensis, Protea caffra* etc.

The conservation status of the Gm 12 vegetation type is endangered with a target percentage of 24. Half of the area is already transformed into agriculture, mining, urban etc. with a handful of conservation areas still up and running. These include Holkranse, Nooitgedacht Dam and Morgenstond (just to name a few) (Mucina & Rutherford, 2006).

## 8.2 Soils and Geology

According to the land type database (Land Type Survey Staff, 1972 - 2006), the project area is characterised by the Bb 13 and the Ba 5 land types. Figure 2 illustrates the respective terrain units relevant to the Bb 13 land type with the expected soils illustrated in Table 2. Figure 3 illustrates the respective terrain units relevant to the Ba 5 land type with the expected soils illustrated in Table 3.

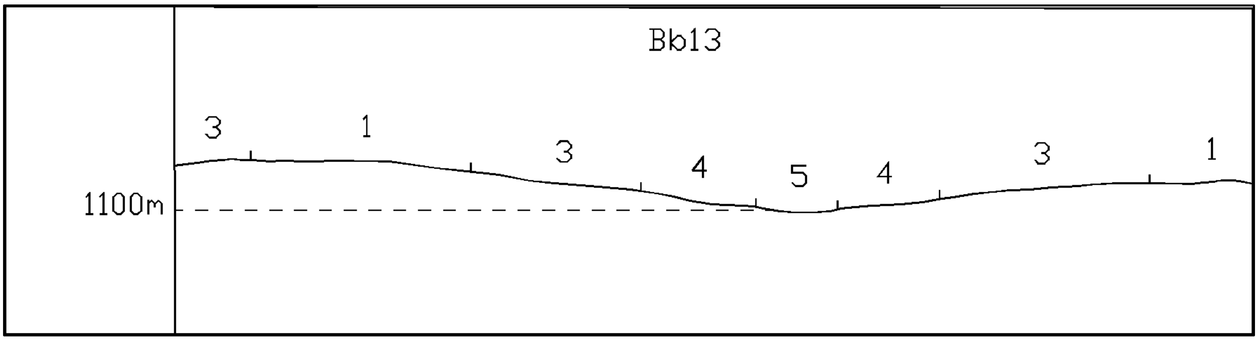


*Figure 2: Illustration of land type Bb 13 terrain units (Land Type Survey Staff, 1972 - 2006)*

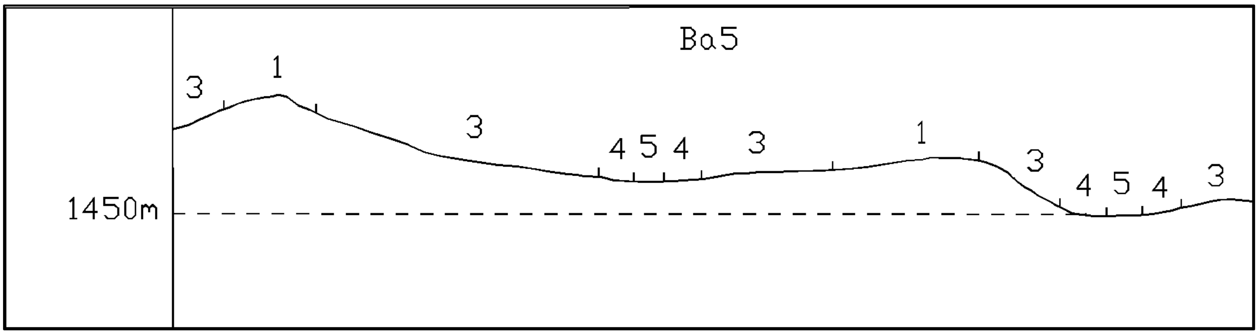


*Figure 3: Illustration of land type Ba 5 terrain units (Land Type Survey Staff, 1972 - 2006)*

*Table 2: Soils expected at the respective terrain units within the Bb 13 land type (Land Type Survey Staff, 1972 - 2006)*

| Terrain units | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 (40%) | | **3 (45%)** | | **4 (10%)** | | **5 (5%)** | |
| Clovelly | 45 | Avalon | 35 | Avalon | 30 | Katspruit | 40 |
| Glencoe | 25 | Clovelly | 35 | Longlands | 25 | Kroonstad | 30 |
| Hutton | 15 | Hutton | 10 | Kroonstad | 15 | Fernwood | 20 |
| Avalon | 15 | Glencoe | 10 | Glencoe | 10 | Longlands | 10 |
| | | Longlands | 5 | Wasbank | 10 | | |
| | | Kroonstad | 5 | Fernwood | 10 | | |

*Table 3: Soils expected at the respective terrain units within the Ba 5 land type (Land Type Survey Staff, 1972 - 2006)*

| Terrain units | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 (20%) | | **3 (60%)** | | **4 (15%)** | | **5 (5%)** | |
| Hutton | 60 | Hutton | 40 | Hutton | 25 | Rensburg | 50 |
| Glenrosa | 20 | Avalon | 15 | Avalon | 15 | Katspruit | 30 |
| Clovelly | 10 | Glencoe | 10 | Longlands | 15 | Swartland | 20 |
| | | Glenrosa | 10 | Kroonstad | 10 | | |
| | | Clovelly | 5 | Bonheim | 10 | | |
| | | Longlands | 5 | Clovelly | 10 | | |
| | | Swartland | 5 | Swartland | 5 | | |
| | | Wasbank | 5 | Glencoe | 5 | | |
| | | Mispah | 5 | Wasbank | 5 | | |

The geology of this vegetation type is characterised by the Pretoria group and the Witwatersrand Subgroup's quartzite ridges as well as the Rooiberg Group's Selons River Formation which is from the Transvaal Supergroup. The parent geology from this vegetation type supports shallow soils like Glenrosa and Mispah which typically forms on slopes and ridges where topsoil is likely to wash off (Mucina & Rutherford, 2006).

## 8.3 Climate

The climate for the Rand Highveld Grassland is characterised by a summer rainfall with a mean annual precipitation of 654mm which is slightly lower in the western parts of this vegetation type see (Figure 4). These areas are known to have warm-temperate conditions with dry winters. The likelihood of frost however is greater in the western parts with the incidence of frost ranging from 30 to 40 days compared to the east which has a frost incidence of 10 to 35 days (Mucina & Rutherford, 2006). This vegetation type is also classified as endangered even though very little conservation has been done for this vegetation type.

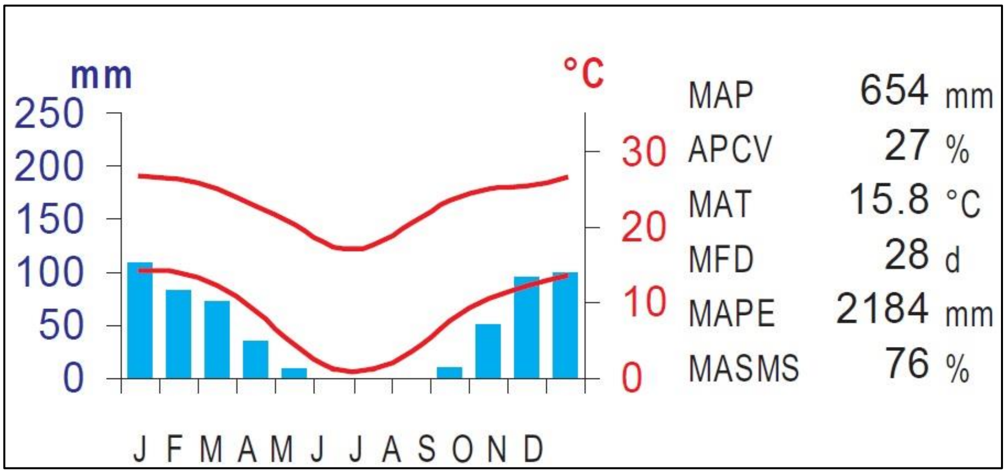


*Figure 4: Climate for the Rand Highveld Grassland (Mucina & Rutherford, 2006)*

## 8.4 Digital Elevation Model

The elevation of the project area (in Meters Above Sea Level (MASL)) is illustrated in Figure 5. The elevation of the MRAs range between 1 471 MASL to 1 571 MASL, ultimately indicating a difference of 100 m (vertically) between the valley bottom and the crest.

## 8.5 Slope Percentage

The slope percentage of the project area is illustrated in Figure 6. The slope percentage ranges between 0 and 3 with the majority of the MRA characterised by a slope percentage between 0 and 1, which indicates a gentle slope.

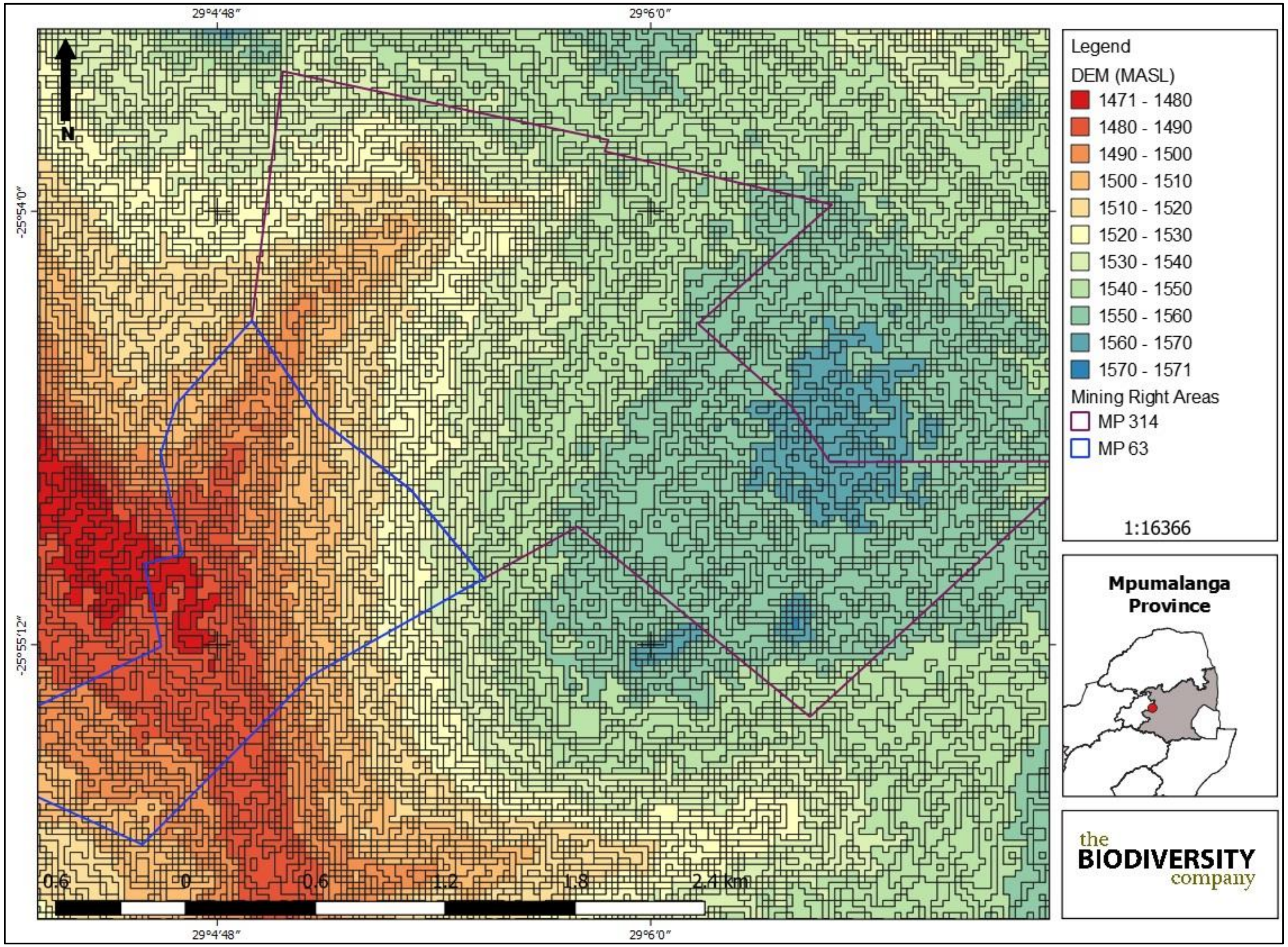


*Figure 5: Digital elevation model for the relevant Mining Right Areas*

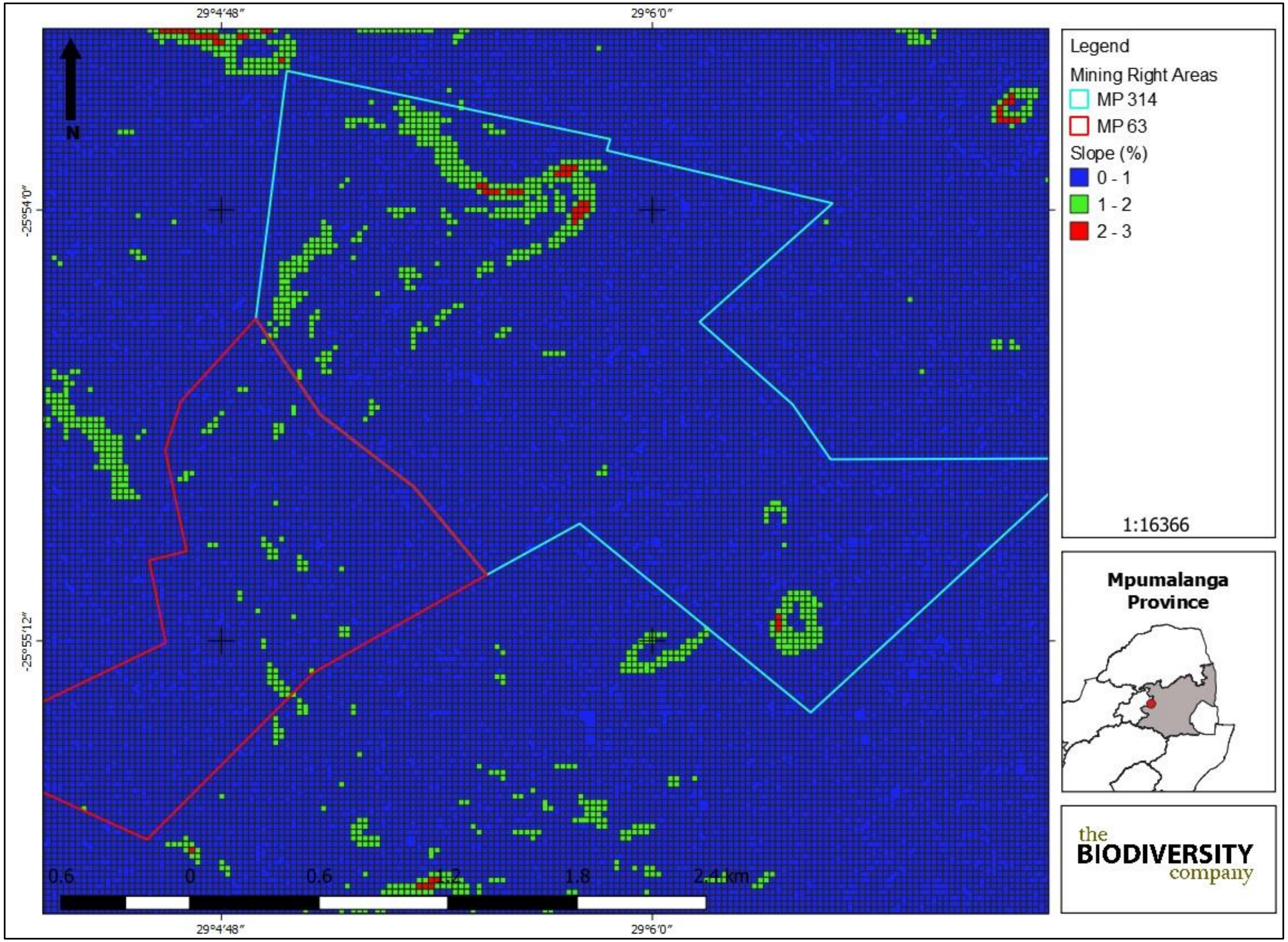


*Figure 6: Slope percentage of the project area*

# 9 Impact Assessment

The summarised impact assessment is a prediction of the risks/impacts that will be associated with the mining phases associated with the proposed opencast and underground mining areas. A full impact assessment will be completed once the final fieldwork assessment has been conducted. The risk assessment ranges from high to low for the anticipated risks and activities associated with the project. One main impact has been taken into consideration for the proposed activities, namely "Loss of hydropedological flow paths".

It is worth noting that the subsidence investigation report (Geomech Consulting, 2019) indicated various areas characterised by a "High" risk of subsidence, with various other areas characterised by "Moderate" risks (see Figure 7).

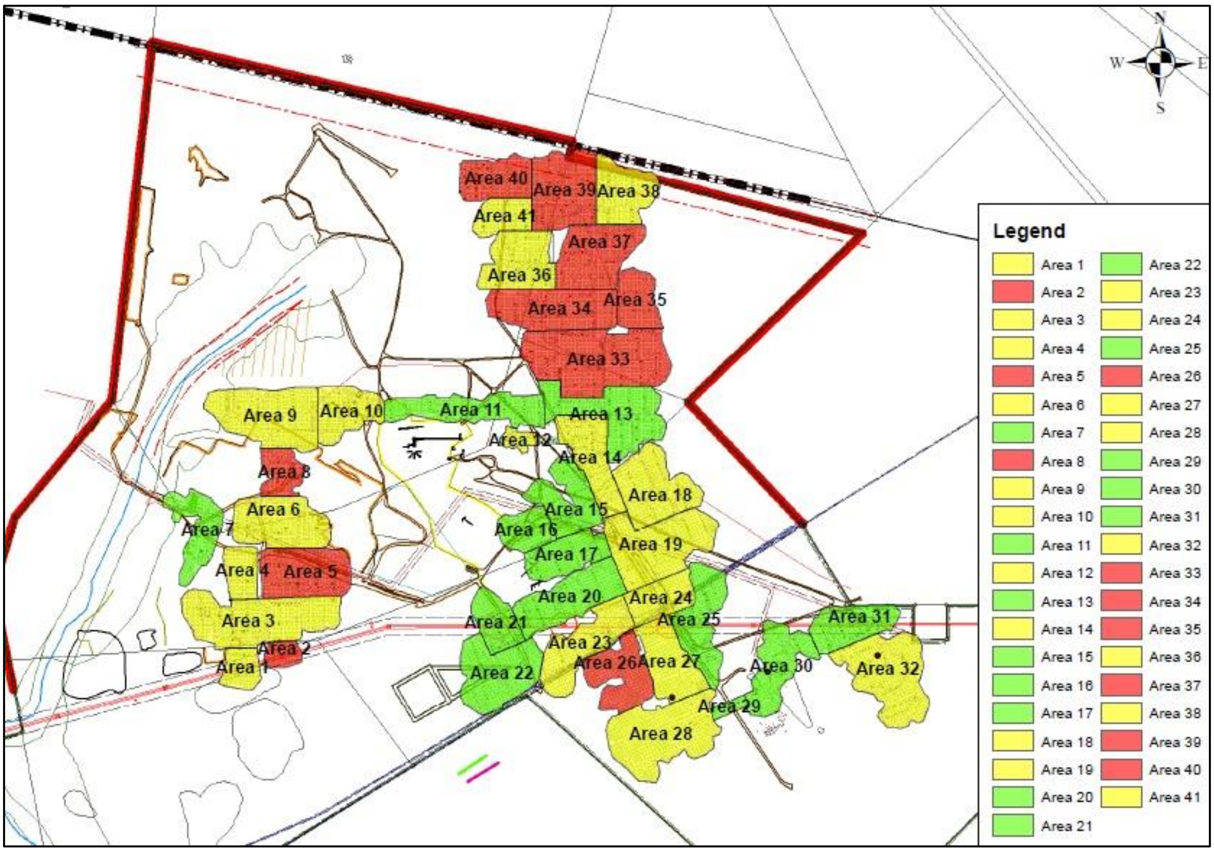


*Figure 7: Subsidence risk level*

## 9.1 Planning Phase

The planning phase will not affect the hydropedological flow paths in any way.

## 9.2 Construction Phase

### Opencast Mining

The final significance rating for the construction of the opencast mine and associated infrastructure has been determined to be associated with a "High" final significance score. This includes blasting activities, construction of associated infrastructure and stripping of topsoil.

### Underground Mining

The final significance rating for the construction of the underground mine and associated infrastructure has been determined to be associated with a “Low” final significance score. This includes blasting activities, construction of associated infrastructure and stripping of topsoil.

### 9.2.1 Mitigation

No mitigation measures can rectify the loss of hydropedological flow paths.

### 9.2.2 Cumulative Impact

The cumulative impact rating has been scored “High” given the extent of degraded soil resources as a result of mining activities.

### 9.2.3 Irreplaceable Loss

The construction phase of the relevant activities may result in irreplaceable loss of soil resources.

## 9.3 Operational Phase

**Opencast Mining**

The final significance rating for the operations of the opencast mine and associated infrastructure has been determined to be associated with a “High” final significance score. This includes blasting activities, traffic of heavy machinery, erosion etc, degradation of stockpiles etc.

**Underground Mining**

The final significance rating for the operations of the underground mine and associated infrastructure has been determined to be associated with a “Moderate” final significance score. This includes blasting activities, traffic of heavy machinery, erosion etc, degradation of stockpiles etc.

### 9.3.1 Mitigation

The EIA report will quantify expected loss of interflow, which can be rectified by means of irrigating water from opencast pits and underground mines back into wetland areas.

### 9.3.2 Cumulative Impact

The cumulative impact rating has been scored “High” given the extent of degraded soil resources as a result of mining activities.

### 9.3.3 Irreplaceable Loss

The operational phase of the relevant activities may result in irreplaceable loss of soil resources.

## 9.4 Decommissioning Phase

**Opencast and Underground Mining**

The final significance rating has been determined to be “Low” given the duration of decommissioning activities and the low magnitude expected for the proposed activities.

#### 9.4.1 Mitigation

No mitigation measures are required for this phase, given the fact that the pre- and post-mitigation environmental risks are expected to be the same ("Low"). All degraded areas must be investigated during the rehabilitation phase and tended to accordingly.

#### 9.4.2 Cumulative Impact

The cumulative impact rating has been scored "High" given the extent of degraded soil resources as a result of mining activities.

#### 9.4.3 Irreplaceable Loss

The decommissioning phase of the relevant activities are not expected to result in irreplaceable loss of soil resources.

### 9.5 Rehabilitation and Closure Phase

**Opencast and Underground Mining**

The final significance rating has been determined to be "Low" given fact that the rehabilitation phase will be focussed on rehabilitating degraded areas, which could result in an improvement of environmental conditions.

#### 9.5.1 Mitigation

No mitigation measures are required for this phase, given the fact that the pre- and post-mitigation environmental risks are expected to be the same ("Low").

#### 9.5.2 Cumulative Impact

The cumulative impact rating has been scored "High" given the extent of degraded soil resources as a result of mining activities.

#### 9.5.3 Irreplaceable Loss

The rehabilitation and closure phase of the relevant activities are not expected to result in irreplaceable loss of soil resources.

# 10 Conclusion

It is apparent from the scoping phase that the project area is characterised by freely drained soils, predominantly Clovelly, Glencoe and Hutton soils. The project area also is characterised by a gentle slope (between 0 and 1%) with a large portion already disturbed by means of mining activities. Various areas within the MRAs have been determined to have “Moderate” and “High” subsidence risks, which indicates the potential for the loss of interflow.

The only aspects and phases determined to have higher final significance ratings than “Low”, is that of the construction and operational phases of the opencast mining activities.

# 11 Terms of Reference for Final Study

## 11.1 Field Procedure

The slopes within the project area were assessed during the desktop assessment to identify possible transects that will represent typical terrain and soil distribution patterns. These locations where then altered slightly during the survey depending on the extent of vegetation, slopes, access and any features that will improve the accuracy of data acquired.

## 11.2 Identification of Soil Types and Hydrological Soil Types

Soil types have been identified according to the South African soil classification (Soil Classification Working Group, 1991) after which the link between soil forms and hydropedological response were established (van Tol & Le Roux, 2019), and the soils regrouped into various hydropedological soil types as shown in **Error! Reference source not found.**.

*Table 4: Hydrological soil types of the studied hillslopes (van Tol et al., 2019)*

| Hydrological Soil Type | Description | Subgroup | Symbol |
|---|---|---|---|
| Recharge | Soils without any morphological indication of saturation. Vertical flow through and out the profile into the underlying bedrock is the dominant flow direction. These soils can either be shallow on fractured rock with limited contribution to evapotranspiration or deep freely drained soils with significant contribution to evapotranspiration. | Shallow | |
| | | Deep | |
| Interflow (A/B) | Duplex soils where the textural discontinuity facilitates build-up of water in the topsoil. Duration of drainable water depends on rate of ET, position in the hillslope (lateral addition/release) and slope (discharge in a predominantly lateral direction). | A/B | |
| Interflow (Soil/Bedrock) | Soils overlying relatively impermeable bedrock. Hydromorphic properties signify temporal build of water on the soil/bedrock interface and slow discharge in a predominantly lateral direction. | Soil/Bedrock | |
| Responsive (Shallow) | Shallow soils overlying relatively impermeable bedrock. Limited storage capacity results in the generation of overland flow after rain events. | Shallow | |
| Responsive (Saturated) | Soils with morphological evidence of long periods of saturation. These soils are close to saturation during rainy seasons and promote the generation of overland flow due to saturation excess. | Saturated | |

| | | | |
|---|---|---|---|
| Stagnating | In these soils outflow of water is limited or restricted. The A and/or B horizons are permeable but morphological indicators suggest that recharge and interflow are not dominant. These includes soils with carbonate accumulations in the subsoil, accumulation and cementation by silica, and precipitation of iron as concretions and layers. These soils are frequently observed in climate regions with a very high evapotranspiration demand. Although infiltration occurs readily, the dominant hydrological flow path in the soil is upward, driven by evapotranspiration. | | |

### 11.2.1 Undisturbed Sampling

Undisturbed samples were collected for each of the diagnostic horizons. These samples were sent to *Van's lab* (Pty) Ltd. in Bloemfontein to determine the particle size distribution, saturated hydraulic conductivity (*Ks*), bulk density, and water retention characteristics. A cylindric Poly Vinyl Chloride (PVC) is gently inserted laterally into a diagnostic soil type to extract an undisturbed sample of the relevant soil type. Wooden lids are then taped to the pipe to ensure that the sample stays intact.

### 11.2.2 *In-Situ* Testing of Hydraulic Conductivity

*In-situ Ks* was tested by means of a single ring infiltrometer within the excavated pits. These tests are vital for the sections of the profile undisturbed sampling is not possible due to the physical properties of such a layer, i.e. bedrock.

A single ring infiltrometer consists of a metal sheet driven into a soil profile which is used as a constant head test. Water is poured into the sheet up to a specific mark in the inside of the sheet that resembles the upper part of a line set to measure the drop of water in a one-centimetre interval. The time the water takes to infiltrate a centimetre (from the upper mark to the bottom mark) is taken several times, until the infiltration rate remains close to constant (differing no more than 10% of the previous infiltration time). For soil profiles too deep to excavate up to the refusal layer, *Ks* was tested by means of a 55 mm diameter PVC pipe which were inserted into the auger hole. The conductivity was then calculated using:

$$K = \frac{r^2 \ln\left(\frac{L}{R}\right)}{2LT_0}$$

Where *K* = hydraulic conductivity; *r* = radius of pipe; *L* = length of saturated portion of the perforated area; *R* = radius of perforated area (the same as *r* in this experiment and $T_0$ = basic time lag.

## 11.3 Modelling

The aim of the modelling exercise is to quantify hydrologic processes and how they will be impacted upon by the proposed development. The conceptual models of hillslope hydrological responses developed from soil morphological properties guided the modelling approach. For assessment of the impact of open cast pit on hydropedological processes the Catchment Model Framework (CMF) model will be used (Kraft *et al*., 2011). CMF is essentially a toolbox to configure a wide range of different model structures based on the finite volume approach (Figure 8). Water fluxes through the landscape are presented as a network of storages and boundary conditions in CMF. Flux governing equations can be assigned to link the storage units with the next one. These equations can be fairly simple e.g. linear storage or tipping bucket approaches or more complex e.g. solving of Kinematic Wave or Richards equation. The compounds of the model are assembled using the scripting language Python.

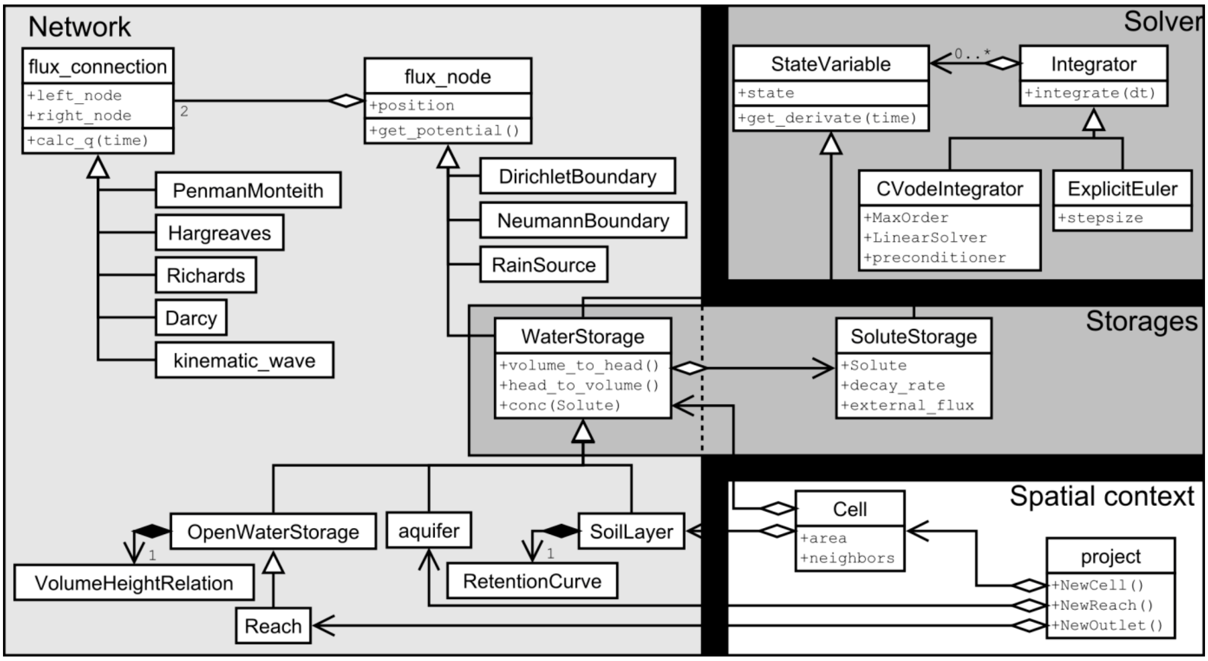


*Figure 8: Simplified class representation of the Catchment Modelling Framework and its components (Kraft et al., 2011).*

# 12 References

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Van Tol, J., Le Roux, P. & Lorentz, S. 2017. The science of hydropedology- Linking soil morphology with hydrological processes. *Water Wheel* 16(3).

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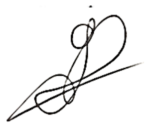
# 13 Appendices

***Appendix A: Specialist declarations***

**DECLARATION**

I, Ivan Baker, 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.



Ivan Baker

Wetland Ecologist

The Biodiversity Company

November 2019

***Appendix B: Specialist CV***

# Ivan John Baker

## Masters in Environmental Science and Hydropedology

*Cell: +27 79 898 4056*

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*Date of birth: 10 January 1994*

**Profile Summary**

Working experience throughout Southern Africa

Working experience in West-Africa

Specialist experience with mining, construction and agriculture.

Specialist expertise include hydropedology, pedology, land contamination, agricultural potential, land rehabilitation, rehabilitation management and wetlands resources.

Experience hydropedological modelling (HYDRUS model)

**Areas of Interest**

Mining, Oil & Gas, Renewable Energy & Bulk Services Infrastructure Development, Farming, Land contamination, Sustainability and Conservation.

**Key Experience**

- Environmental Impact Assessments (EIA)
- Environmental Management Programmes (EMP)
- Wetland delineations and ecological assessments
- Rehabilitation Plans and Monitoring
- Soil-and rock classification
- Level 1, 2 and 3 hydropedology assessments
- Agriculture potential assessments
- Land contamination assessments
- Modulation of surface- and subsurface flows (HYDRUS model)

**Countries worked in**

| | |
|---|---|
| South Africa | Mozambique |
| Swaziland | Zimbabwe |
| Guinea | |

**Nationality**

South African

**Languages**

English – Proficient

Afrikaans – Proficient

**Qualifications**

- MSc (North-West University of Potchefstroom) – Hydropedology
- BSc Honours (North-West University of Potchefstroom) – Environmental geology-Pedology and rehabilitation
- BSc Environmental sciences
- Pr Sci Nat candidateship

**SELECTED PROJECT EXPERIENCE**

**Project Name: Environmental impact assessment for the construction of Road DR08606 leading to Mlamli Hospital, Sterkspruit**

Client: EIMS

Personal position / role on project: Wetland ecologist

Location: Sterkspruit, Eastern Cape Province, South Africa

Main project features: To conduct a wetland assessment, as a component of the environmental authorisation process and Water Use Licence Application (WULA) for the construction of Road DR08606 leading to Mlamli Hospital

**Project Name: Biodiversity Baseline & Impact Assessment Report for the proposed Nondvo Dam Project**

Client: WSP

Personal position / role on project: Wetland ecologist

Location: Mbabane, Swaziland

Main project features: To conduct various assessments according to IFC standards in regard to delineation of wetlands and assessing ecosystem services.

**Project Name: Agricultural Potential Assessment - Proposed Kalabasfontein Coal Mining Project Extension**

Client: Nemai EIMS.

Personal position / role on project: Project Manager and Soil Specialist.

Location: Bethal, Mpumalanga, South Africa

Main project features: To conduct a soil assessment to identify any sensitive resources that might be affected by the proposed mining activities and associated infrastructure as part of an environmental impact assessment.

**Project Name: Soil assessment for the closure of the St Helena Shaft, Harmony**

Client: EIMS

Personal position / role on project: Soil specialist

Location: Welkom, Free State, South Africa

Main project features: To conduct a thorough soil and fertility assessment to recommend relevant mitigation and rehabilitation measures to finalise closure at the relevant mine

**Project Name: Wetland Functionality Assessment for the Environmental, Health and Socio-Economic Baseline Studies for Block 2 at Siguiri Gold Mine**

Client: SRK Consulting

Personal position / role on project: Wetland ecologist

Location: Siguiri, Guinea, West-Africa

Main project features: To conduct various assessments according to IUCN standards in regard to delineation of wetlands and assessing ecosystem services.

**Project Name: Level 3 Hydropedological Assessment for the Sara Buffels Mining Project**

Client: Alegna Environmental Consulting

Personal position / role on project: Hydropedologist

Location: Ermelo, Mpumalanga, South-Africa

Main project features: To conduct various assessments to determine the hillslope hydrology and to acquire information relevant to the vadose zone's hydraulic properties to quantify sub-surface flows by means of modelling.

**Project Name: Level 3 Hydropedological Assessment for the Buffalo Coal Mining Project**

Client: Agreenco

Personal position / role on project: Hydropedologist

Location: Dundee, KwaZulu-Natal, South-Africa

Main project features: To conduct various assessments to determine the hillslope hydrology and to acquire information relevant to the vadose zone's hydraulic properties to quantify sub-surface flows by means of modelling

**Project Name: Biodiversity Baseline & Impact Assessment for the proposed Tetereane 15MW Solar PV Plant**

Client: WSP

Personal position / role on project: Ecosystem Services Specialist

Location: Cuamba, Mozambique, Southern-Africa

Main project features: To conduct various assessments according to IUCN standards in regard to ecosystem services

**Project Name: Land contamination assessment for the proposed Fleurhof Development**

Client: Geo Soil and Water

Personal position / role on project: Soil Specialist

Location: Fleurhof, South Africa

Main project features: To conduct assessments relevant to the determination of land contamination, including recommendations, mitigations and risk assessments.

**OVERVIEW**

An overview of the specialist technical expertise include the following:

- Ecological wetland assessment studies, including the integrity (health) and functioning of the wetland systems.
- Wetland offset strategy designs.
- Wetland rehabilitation plans.
- Monitoring plans for wetland systems.
- Soil classification and agricultural assessments.
- Stripping and stockpiling guidelines.
- Soil rehabilitation plans.
- Soil and stockpile monitoring plans.
- Hydro pedological assessments.

**TRAINING**

Some of the more pertinent training undergone includes the following:

- Tools for a Wetland Assessment (Certificate of Competence) – Rhodes University 2018; and
- Workshop on digital soil mapping.

**EMPLOYMENT EXPERIENCE**

**Internship at SRK consulting (January 2017-August 2017)**

- **Field assistant** for SRK consulting during 2017 included the sampling of surface and groundwater as well as on site tests, the accumulation of various different data sets from field loggers, presenting and arranging the relevant data and ultimately using it for my own personal post-graduate studies.

**Internship at The Biodiversity Company (August 2017-December 2017)**

Employed as an intern (wetland and soil scientist) during the last few months of 2017. During this period, I was part of a variety of soil- and wetland projects, both as report writer and/or field assistant.

**CURRENT EMPLOYMENT: The Biodiversity Company (January 2018 – Present)**

- **Scientific report writing** to ensure that the relevant standards and requirements have been attained, namely local country legislation, as well as WB, EP and IFC requirements.

**ACADEMIC QUALIFICATIONS**

**North-West University of Potchefstroom (2018):** MAGISTER SCIENTIAE (MSc) - Hydropedology:

**Title:** *Characterisation of vadose zone processes in a tailings facility*

**North-West University of Potchefstroom (2016):** BACCALAUREUS SCIENTIAE HONORIBUS (Hons) – Environmental Geology- Pedology and rehabilitation

**North-West University of Potchefstroom (2015):** BACCALAUREUS SCIENTIAE IN NATURAL AND ENVIRONMENTAL SCIENCES. Majors: Geology and Geography