SOUTH32 SA COAL HOLDINGS (PTY) LTD

RELOCATION OF 132KV KROMFONTEIN POWERLINE AT VANDYKSDRIFT CENTRAL OF THE WOLVEKRANS COLLIERY
VISUAL ASSESSMENT
IMPACT ASSESSMENT REPORT

Report No.: JW124/19/H759-07 - Rev 2

May 2019

Jones & Wagener
Engineering & Environmental Consultants

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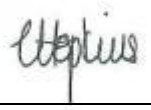
Prepared	Environmental Scientist	Konrad Kruger	15 May 2019	
Reviewed and Approved	Environmental Scientist	Tolmay Hopkins	17 May 2019	

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15 May 2019	Rev 0	Draft Report for internal review	Tolmay Hopkins	Electronic	1
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SYNOPSIS

Wolvekrans Colliery is an operational division of South32 SA Coal Holdings (Pty) Limited. The mine is located between the towns of eMalahleni and Kriel, approximately 30 km south-east of the town of eMalahleni, in close proximity to the Duvha Power Station.

The Vandyksdrift Central (VDDC) section of Wolvekrans Colliery is located to the south of the Steenkoolspruit and Vandyksdrift North sections, and north of the Vandyksdrift South and Albion sections (mining has ceased at these two sections). The Olifants River determines the southern boundary of the VDDC mining section. The R544 and R575 provincial roads are located to the east and west of the Wolvekrans Colliery, respectively.

The VDDC section area falls within the footprint of historic underground mining operations at the old Douglas Colliery. In 2007, an amendment of the Environmental Management Programme Report (EMPR) for the Douglas Colliery operations was approved, to allow the opencast mining of the remaining coal seams. This is now referred to as the VDDC section to be opencast mine using dragline, and truck and shovel operations. Mining will commence in 2020.

Electricity for the VDDC section is supplied from Eskom's Klein Olifants 132 kV Substation, which feeds the Klein 132 kV Substation. The existing Kromfontein 132 kV powerline which connects the Klein Substation and the Kromfontein Substation, traverse the area to be opencast mined and therefore has to be relocated before opencast mining can commence

Jones & Wagener Engineering and Environmental Consultants (J&W) has been appointed as an independent Environmental Assessment Practitioner (EAP) to undertake the application for Environmental Authorisation (EA) for the re-alignment of the Kromfontein 132 kV powerline. This application is undertaken by South32, in terms of a self-build agreement with Eskom. This document provides the visual impact assessment to be include in the Basic Assessment process to be undertaken in support of the EA application

The topography associated with the study area is gently undulating mine and farmlands at an elevation of between 1520 mamsl and 1590 mamsl. The Olifants River drains the southern and western part of the site, where the topography is frequently steeper due to the presence of sandstone outcrops and depicts scenic cliffs and bends in the river.

The study area is situated within the Eastern Highveld Grassland (GM12) vegetation type. The grassland found within the study area is very short with intermittent alien trees close to farmsteads and settlements. In the eastern parts of the site maize is planted and harvested annually, resulting in open fields without cover during the winter months. The vegetation therefore provides little visual cover for structures.

Most of the infrastructure present in the greater study area stems from mining activities (South32 Wolvekrans, Middelburg, Glencore Impunzi and Anglo Goedehoop). Some other industrial development is concentrated around the towns of eMalahleni and Middelburg. The main road in the area is the N12/N4 Highway and the R544, connecting Gauteng with Mpumalanga. In addition, the Duvha and Komati power stations provide further industrial impact. These activities have an industrial visual character and result in a more pronounced impact on the natural character of the landscape. Additionally, prominent Eskom powerlines cross the landscape to and from the two power stations.

Visually there are no sensitive features or no-go areas on the site itself. In the surrounding area the following are considered to be visually sensitive:

- Topographic Features - None
- Surrounding homesteads - The area around the site has several settlements overlooking the proposed study area as well as along the infrastructure routes.
- Towns/urban areas
    - The towns of eMalahleni and Middelburg are located to the north of the project area.
    - The proposed infrastructure should not affect any towns/urban areas.
- Roads - The proposed project will be located west of the R544 from eMalahleni.

The viewshed from the proposed infrastructures extends some 10-12km in all directions. The elevated views from the Ogies dyke in the north is offset by the flat terrain around the Olifants River floodplain, where the site is located. Views to the east are somewhat blocked due to topography, with a few isolated exceptions.

The results from the impact assessment are summarised below.

Table 1: Impact Summary

Activity	Impact	Project Rating	Cumulative rating	Rating post mitigation
Construction: **Site preparation and construction**	**NEGATIVE IMPACT:** Erection of infrastructure Dust generated from construction activities as well as views of the activities themselves. Clearing of vegetation and soil	LOW	HIGH	LOW
Operations **Operation of powerlines – Alternative A**	**NEGATIVE IMPACT:** Powerlines and pylons to remain in place	MODERATE	HIGH	MODERATE
Operations **Operation of powerlines – Alternative B**	**NEGATIVE IMPACT:** Powerlines and pylons to remain in place	HIGH	HIGH	HIGH
Closure **Rehabilitation of powerline**	**POSITIVE IMPACT** Rehabilitation of infrastructure by removing pylons and returning land to surrounding land use	MODERATE POSITIVE	HIGH	MODERATE POSITIVE

The re-alignment of the Kromfontein 132kV powerline will have a moderate impact on the visual environment. The main local road will be partially screened by topography when compared to route alternative B and the resultant impact is deemed an acceptable impact for a project of this nature. It is the opinion of this specialist that the development should be allowed to proceed, as there is no visual impact that would prohibit the development.

The project provided two route alternatives, alternative A (preferred) and alternative B. In terms of the visual impacts, alternative A is a shorter route, and is located as far as possible from the R544, the main road in the study area. Alternative B is longer and is located adjacent to the road, maximising the visual impact.

If Route A is utilised, then the visual impact will be Moderate. If Route B is utilised, then the impact will be High.

NEMA Appendix 6 requirements

Regulation: GNR 982, December 2014, as amended		
Specialist Report		**Section in the Report**
Appendix 6 (a)	A specialist report prepared in terms of these Regulations must contain— details of— the specialist who prepared the report; and the expertise of that specialist to compile a specialist report including a curriculum vitae;	Section 1.8 & App A
Appendix 6 (b)	A declaration that the specialist is independent in a form as may be specified by the competent authority;	App B
Appendix 6 (c)	An indication of the scope of, and the purpose for which, the report was prepared;	Section 1.1
Appendix 6 (cA)	An indication of the quality and age of base data used for the specialist report;	Section 2.1
Appendix 6 (cB)	A description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 4
Appendix 6 (d)	The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 2.2
Appendix 6 (e)	A description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Section 2.1
Appendix 6 (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;	Section 4
Appendix 6 (g)	An identification of any areas to be avoided, including buffers;	Section 4
Appendix 6 (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 4
Appendix 6 (i)	A description of any assumptions made and any uncertainties or gaps in knowledge;	Section 2
Appendix 6 (j)	A description of the findings and potential implications of such findings on the impact of the proposed activity or activities;	Section 4
Appendix 6 (k)	Any mitigation measures for inclusion in the EMPr;	Section 4.4
Appendix 6 (l)	Any conditions for inclusion in the environmental authorisation;	Section 6.2
Appendix 6 (m)	Any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Section 5
Appendix 6 (n)	A reasoned opinion— i.whether the proposed activity, activities or portions thereof should be authorised; (iA) regarding the acceptability of the proposed activity or activities; and 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;	Section 6
Appendix 6 (o)	A description of any consultation process that was undertaken during the course of preparing the specialist report;	Refer main EIA
Appendix 6 (p)	A summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	Refer main EIA
Appendix 6 (q)	Any other information requested by the competent authority.	Refer main EIA

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APPENDIXES

Appendix A	Curriculum Vitae
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Acronyms and Abbreviations

DEA ..... Department of Environmental Affairs
DMR ..... Department of Mineral Resources
DWS ..... Department of Water and Sanitation
EA ..... Environmental Authorisation
EAP ..... Environmental Assessment Practitioner
EE ..... Employment Equity
EIA ..... Environmental Impact Assessment
EIS ..... Ecological Importance and Sensitivity
ELM ..... Emalahleni Local Municipality
GDP ..... Gross Domestic Product
IDP ..... Integrated Development Plan
J&W ..... Jones & Wagener (Pty) Ltd Engineering & Environmental Consultants
km ..... kilometres
km^2 ..... square kilometres
LED ..... Local Economic Development
m ..... metres
m^2 ..... square metres
m^3 ..... cubic metres
LOM ..... Life-of-Mine
MPRDA ..... Mineral and Petroleum Resources Development Act
NEMA ..... National Environmental Management Act
NEM: WA ..... National Environmental Management Waste Act
NWA ..... National Water Act
S32 ..... South32
SKS ..... Steenkoolspruit
VDDC ..... Vandyksdrift Central
WML ..... Waste Management Licence
WUL ..... Water Use Licence

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1. INTRODUCTION

1.1 Background Information

Wolvekrans Colliery is an operational division of South32 SA Coal Holdings (Pty) Limited. The mine is located between the towns of eMalahleni and Kriel, approximately 30 km south-east of the town of eMalahleni, in close proximity to the Duvha Power Station (refer to **Figure 1-1**).

The Vandyksdrift Central (VDDC) section of Wolvekrans Colliery is located to the south of the Steenkoolspruit and Vandyksdrift North sections, and north of the Vandyksdrift South and Albion sections (mining has ceased at these two sections). The Olifants River determines the southern boundary of the VDDC mining section. The R544 and R575 provincial roads are located to the east and west of the Wolvekrans Colliery, respectively

The VDDC section area falls within the footprint of historic underground mining operations at the old Douglas Colliery. In 2007, an amendment of the Environmental Management Programme Report (EMPR) for the Douglas Colliery operations was approved, to allow the opencast mining of the remaining coal seams. This is now referred to as the VDDC section to be opencast mine using dragline, and truck and shovel operations. Mining will commence in 2020.

Electricity for the VDDC section is supplied from Eskom's Klein Olifants 132 kV Substation, which feeds the Klein 132 kV Substation. The existing Kromfontein 132 kV powerline which connects the Klein Substation and the Kromfontein Substation, traverse the area to be opencast mined (refer to **Figure 1-2**) and therefore has to be relocated before opencast mining can commence.

Figure 1-1: Locality Plan

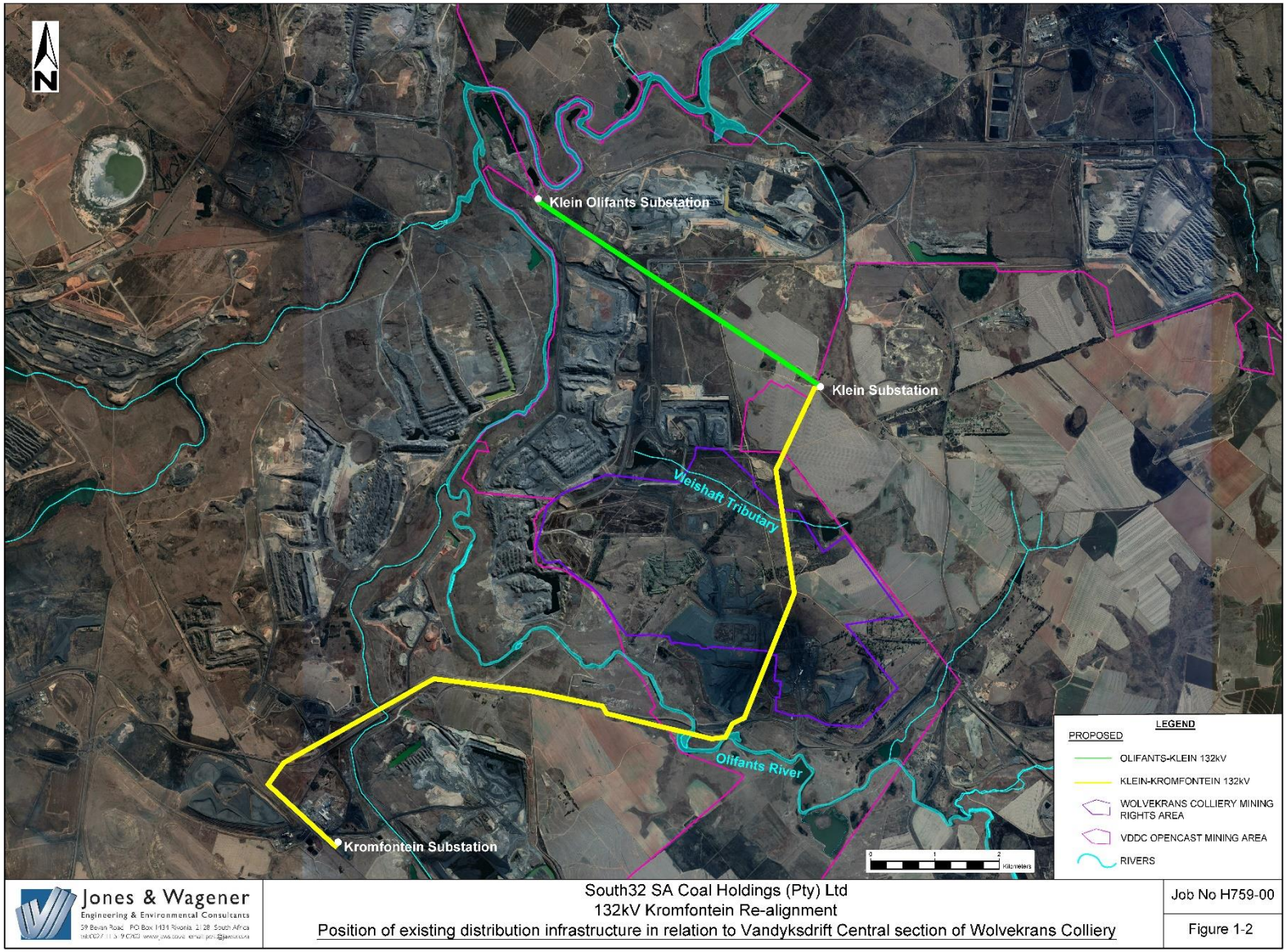

Figure 1-2: Position of existing distribution infrastructure in relation to Vandyksdrift Central section of Wolvekrans Colliery

1.2 Purpose

Jones & Wagener Engineering and Environmental Consultants (J&W) has been appointed as an independent Environmental Assessment Practitioner (EAP) to undertake the application for Environmental Authorisation (EA) for the re-alignment of the Kromfontein 132 kV powerline. This application is undertaken by South32. This document provides the visual impact assessment to be include in the Basic Assessment process to be undertaken in support of the EA application.

1.3 Project Description

The infrastructure development forms part of the VDDC mining project. The construction phase will commence after authorisation for the infrastructure components has been obtained and is expected to commence in January 2020. The construction period is expected to be 3 - 6 months. The operational phase is expected to commence January 2022.

As part of the VDDC opencast mining project, South32's Wolvekrans Colliery intends to relocate the 132 kV electricity distribution powerline between the Eskom Kromfontein Substation and the Eskom Klein Substation. The proposed activities will be undertaken at the VDDC Section of the mine, where opencast mining has already been approved in 2007 with the amendment of the EMPR for the Douglas Colliery operations. The relocation of the powerline is necessary in order for the opencast mining to commence.

A 132 kV electricity distribution powerline which is approximately 7.5 km in length, will be constructed from a point (Coordinates: 26°5'42.36"S, 29°17'45.88"E) on the existing Eskom Kromfontein / Klein substation feeder, to a point (Coordinates 26° 3'29.31"S, 29°18'7.69"E) of the same overhead line tying the Eskom Kromfontein and Klein substations, within a 36 m corridor.

This represents listed activities as per the Environmental Impact Assessment (EIA) Regulations, 2014, which require an Environmental Authorisation in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998; NEMA).

1.3.1 Current Power Supply and Reticulation

VDDC is supplied from Eskom's Klein Olifant 132 kV Substation, which feeds the Klein Olifant 132 kV Substation. The voltage is stepped down to 22 kV via 2 x 20 MVA power transformers feeding the 22 kV switchgear located in the Klein Olifant Substation. The 22 kV switchgear consists of single bus bar, 2 x 1250 A Incomers, 2 x Feeders and Power Factor Correction. No bus section is available, which means that the power transformers are paralleled with a combined fault current rating of approximately 10.5 kA (South32, 2017).

1.3.2 Re-alignment of Kromfontein 132kV distribution line

Two routes were selected, i.e. the Proposed 132 kV Powerline Route (as preferred route) and the Alternative 132 kV Powerline Route as the alternative route.

The preferred route was selected for the project based on the fact that it will have insignificant impact to environment and that it is located a distance away from the existing R544 provincial road. Part of this powerline will be constructed on previous mined out rehabilitated areas, that is the area has already been disturbed.

Proposed 132 kV Powerline Route

The proposed powerline will be constructed within the VDDC section of the Wolvekrans Colliery and within the Mining Rights Boundary. The electricity distribution powerline will be constructed and relocated to a proposed route outside an area planned to be mined by South32 and a preferred site for the proposed project was selected looking at terrain and

current mining activities. The proposed powerline will be approximately 7.5 km with a corridor of about 36 m (refer to **Table 1-1**). The foundation depths will range between 2 m to 3 m. The proposed powerline will be constructed using intermediate steel pole towers that will be erected a few metres apart depending on the terrain, ground clearance requirements, geology etc. The proposed steel towers may consist of the following:

- Mono-pole guyed intermediate suspension structures;
- Mono-pole self-supporting intermediate suspension structures;
- Mono-pole angle suspension structures; and/or
- Mono-pole strain structures.

The height of the towers is expected to range between 22 m and 26 m, depending on the terrain and ground clearance requirements.

Table 1-1: Co-ordinates of corridor for preferred route (Enercon, 2019)

	Latitude	Longitude
A1	26° 3' 29.15"S	29° 18' 07.73"E
A2	26° 5' 08.51"S	29° 19' 32.65"E
A3	26° 5' 47.88"S	29° 18' 54.11"E
A4	26° 5' 47.66"S	29° 18' 48.21"E
A5	26° 6' 00.29"S	29° 18' 13.31"E
A6	26° 5' 53.68"S	29° 17' 49.53"E

Alternative 132 kV Powerline Route

The Alternative Route will run in proximity of the R544 Witbank to Kriel Provincial Road. This route indicates significant impacts in term of the fact that some of the poles will have to be excavated closer to the R544 road. This route was not considered as the preferred option due to the foreseen extent of impact it might have to the R544 Provincial Road, the impact on agricultural activities, as well as local communities currently residing within the corridor area required for the relocation of the line. The coordinates for the alternative powerline route corridor are indicated in **Table 1-2**.

Table 1-2: Co-ordinates of corridor for alternative route (Enercon, 2019)

	Latitude	Longitude
B1	26° 4' 58.23"S	29° 19' 43.91"E
B2	26° 4' 54.52"S	29° 19' 43.20"E
B3	26° 4' 30.49"S	29° 19' 35.61"E
B4	26° 4' 18.51"S	29° 19' 34.75"E
B5	26° 3' 44.38"S	29° 19' 37.69"E
B6	26° 3' 21.10"S	29° 19' 10.70"E

	Latitude	Longitude
B7	26° 3' 24.15"S	29° 18' 56.88"E
B8	26° 3' 0.11"S	29° 18' 22.96"E

1.4 Project Phases

1.4.1 Planning and design phase

The planning and design phase will evaluate the necessary documentation that is required for the construction phase. This will include activities such as a route survey, line design, and ordering of poles.

1.4.2 Construction phase

Construction activities related to relocating and constructing the proposed powerline and associated infrastructure will be undertaken and will include the construction of foundations, planting the poles, stringing, hand-over and commissioning.

A laydown area may be developed within the existing mining area for the storage of material during the construction phase. This is not expected to be larger than 50m^2.

The portion of the existing 132 kV powerline which traverses the VDDC opencast mining area will be decommissioned once the new alignment has been constructed. This will involve:

- Removal of the conductor and dispatch back to the Eskom stores;
- Removal of the existing poles and sale as scrap metal;
- The existing foundations will remain in place, since these will be mined through as opencast mining at VDDC progresses.

1.4.3 Operational phase

The operational phase will include the maintenance and management on the proposed relocated powerline. Once completed, this powerline will be operated by Eskom as part of its distribution network to sustain the 132 kV network and surrounding areas with the required electricity. This will ensure that surrounding mines, such as Goedehoop Colliery's infrastructure and mining sections that are dependent on this power supply, will continue with conducting its mining activities as planned.

1.4.4 Decommissioning

The decommissioning phase will consider regulatory requirements in terms of demolishment and rehabilitation activities associated with the proposed relocated powerline, as well as managing and mitigating impacts associated with this phase.

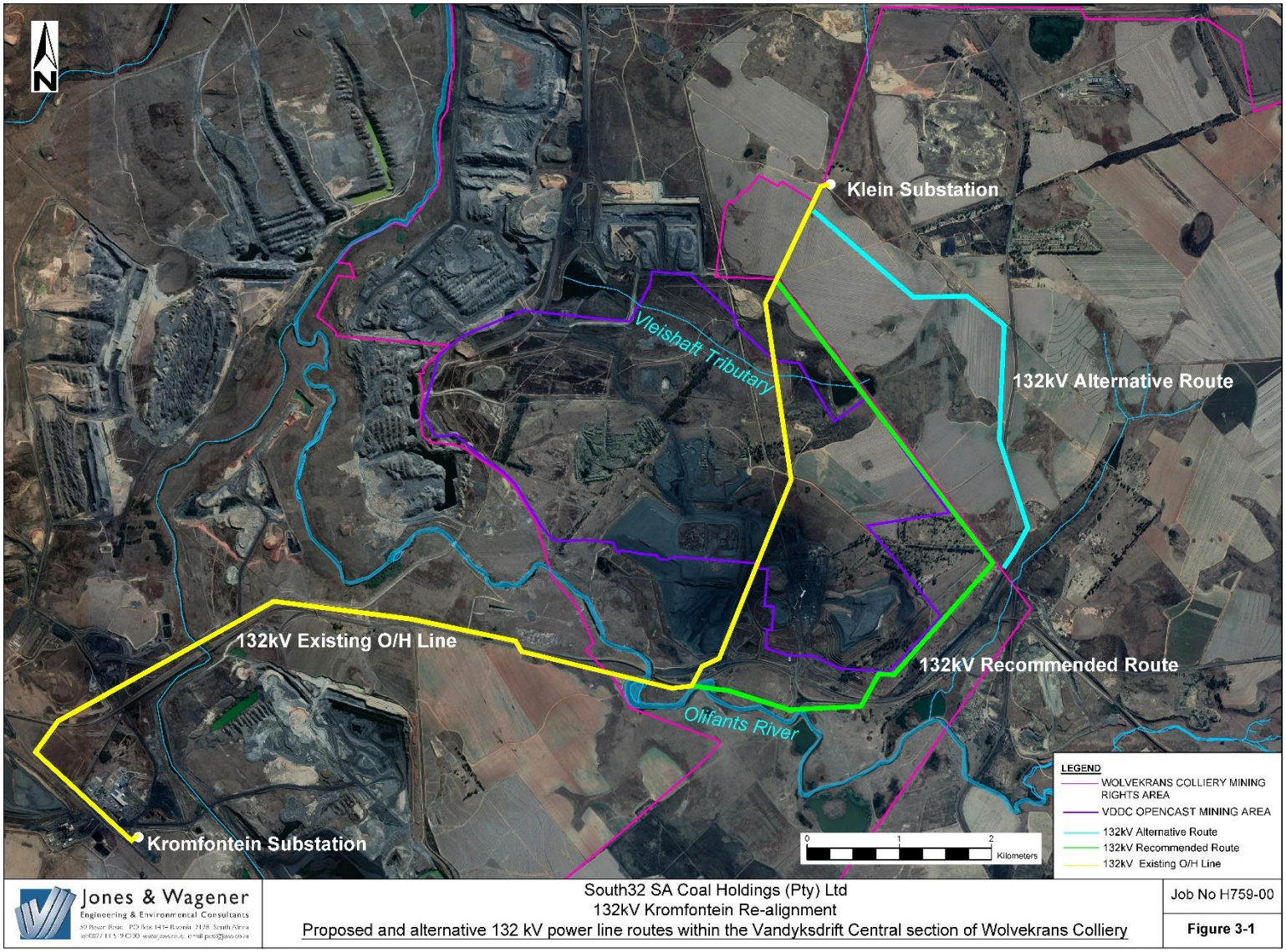

Figure 1-3: Proposed and alternative 132 kV powerline routes

1.5 Specialist Project Team

The following personnel were involved in the compilation of this report. Refer to **Appendix A** for copies of the curricula vitae (CV's).

Table 1-3: Specialist Team Members.

Name	Organisation	Highest Qualifications	Experience	Role
Konrad Kruger	Jones & Wagener	BSc Honours Geography	14 Years	Specialist
Tolmay Hopkins	Jones & Wagener	MSc (Agric) Microbiology	20 Year	Pr. Sci Nat Reviewer

1.6 Assumptions and Limitations

The following assumptions/limitations were relevant during the assessment:

- The location of the infrastructures was supplied by South32. Any variation in the locations will render the assessment inaccurate.
- The terrain model was based on 4m contours from the client on the Wolvekrans footprint, supplemented with 20m contours from the Surveyor General's office.
- The height of structures has not been made available at the time of assessing the baseline, hence the viewshed assumed a 26m height for all pylons.

2. BASELINE ASSESSMENT

2.1 Approach and Methodology

In order to adequately assess the visual impact, the following methodology was applied:

- All the required data were collected, which included data on topography, existing visual character and quality, plans of the proposed development and other background information;
- Fieldwork (a site visit) was conducted on the 2nd of May 2019. The objectives of the fieldwork were to:
    - familiarise the author with the site and its surroundings;
    - to identify key viewpoints/ corridors and visual receptors;
    - groundtruth the sensitivity of the landscape; and
    - determine the distance from which visual impacts are likely to become discernible.
- Landscape characterisation was done by mapping the site location and context and describing the landscape character and sense of place. This considered geological and topographical features, vegetation and land-use.
- Visual sampling was undertaken using photography from a number of viewpoints within approximately 5km of the site. The location of the viewpoints was recorded with a GPS and photographs were taken at a depth of field between 45-55mm. A selection of these are used in the assessment phase of the VIA to illustrate the likely zone of influence and visibility.
- ArcGIS 3D Analyst extension was used to calculate the viewshed making use of a 20m contour interval Digital Elevation Model (DEM) as the input raster with a more detailed raster (2m) made available for the Wolwekrans property.

- The sensitivity of the landscape was analysed, taking the following factors into consideration:
    - Slope and elevation;
    - Proximity of visual receptors (farmsteads and towns);
    - Proximity of major roads and scenic routes;
    - Nature reserves and National Parks; and
    - Other relevant features and buffer guidelines.
- Visual concerns and potential impacts were identified;
- The potential magnitude of visual impacts was evaluated using standard VIA criteria and rating methodologies; and
- Potential visual impacts for each project phase as well as cumulative impacts was assessed using an impact assessment methodology developed by J&W to adhere to the NEMA, Environmental Impact Assessment Regulations, 2014 (GN No. 326, as amended). This methodology is explained in detail in Section 3.

2.2 Visual Baseline

2.2.1 Topography

The topography associated with the proposed site is gently undulating mine and farmlands at an elevation of between 1 520 mamsl and 1 590 mamsl (**Figure 2-1**). The Olifants River runs to the south and west of the proposed study area, where the topography is frequently steeper due to the presence of sandstone outcrops.

Wetlands are associated with open water and stream margins along drainage lines in the study area. Rocky outcrops are often located to one side of the drainage lines and probably developed as streams incised into the landscape.

The drainage pattern is dendritic towards the south and west, with various small tributaries flowing into the Olifants River. The study area falls within the Olifants River Catchment.

2.2.2 Vegetation

The project area is situated within the grassland biome. This biome is centrally located in southern Africa, and adjoins all except the desert, fynbos and succulent Karoo biomes (Mucina & Rutherford, 2006). The project area is situated predominantly within one vegetation type; namely the Eastern Highveld Grassland (GM12) vegetation type.

This vegetation type occurs on slightly to moderately undulating planes, including some low hills and pan depressions. The vegetation is a short dense grass land dominated by the usual highveld grass composition (*Aristida, Digitaria, Eragrostis, Themeda, Tristachya* etc.) with small scattered rocky outcrops with, wiry sour grasses and some woody species. Some 44% transformed primarily by cultivation, plantations, mines, urbanisation and by building of dams (Mucina & Rutherford, 2006).

As seen in the photos of **Figure 2-2** below, the grassland found within the study area is very short with intermittent trees close to farmsteads and settlements. In the eastern parts of the site maize is planted and harvested annually, resulting in open fields without cover during the winter months. The vegetation therefore provides little visual cover for structures.

2.2.3 Land Use

The land use of the study area is dominated by cultivated fields (39%) and grassland (38%), with some 21% of the area comprising development and mining activities.

Most of the infrastructure present in the greater study area stems from mining activities (S32 Wolwekrans, Middelburg, Glencore Impunzi and Anglo Goedehoop). Some other industrial development is concentrated around the towns of eMalahleni and Middelburg. The main road in the area is the N12/N4 Highway, connecting Gauteng with Mpumalanga. In addition, the Duvha and Komati power stations provide further industrial impact. These activities have an industrial visual character and result in a more pronounced impact on the natural character of the landscape. Additionally, prominent high voltage Eskom powerlines cross the landscape to and from the two power stations. Refer to **Figure 2-2** for some examples.

2.2.4 Sensitivities

Visually there are no sensitive features or no-go areas on the site itself. In the surrounding area the following are considered to be visually sensitive:

- Topographic Features
  - None
- Surrounding homesteads
  - The area around the site has several settlements overlooking the proposed infrastructure routes.
- Towns/urban areas
  - The towns of eMalahleni and Middelburg are located to the far north of the project area.
  - The proposed infrastructure should not affect any towns/urban areas.
- Roads
  - The proposed project will be located west of the R544 from eMalahleni.

2.2.5 Viewshed

In order to determine the potential baseline for the proposed new infrastructures, this assessment had to determine the viewshed within the study area.

A viewshed is the geographical area that is visible from a location. It includes all surrounding points that are in line-of-sight with that location and excludes points that are beyond the horizon or obstructed by terrain and other features.

The viewshed from the proposed infrastructures is shown in **Figure 2-3** and extends some 10-12 km in all directions with some local screening due to ridges. Please note that local visual obstructions from buildings, infrastructure and vegetation are not reflected in the viewshed. The elevated views from the Ogies dyke in the north is offset by the flat terrain around the Olifants River floodplain, where the site is located. Views to the east are somewhat blocked due to topography, with a few isolated exceptions.

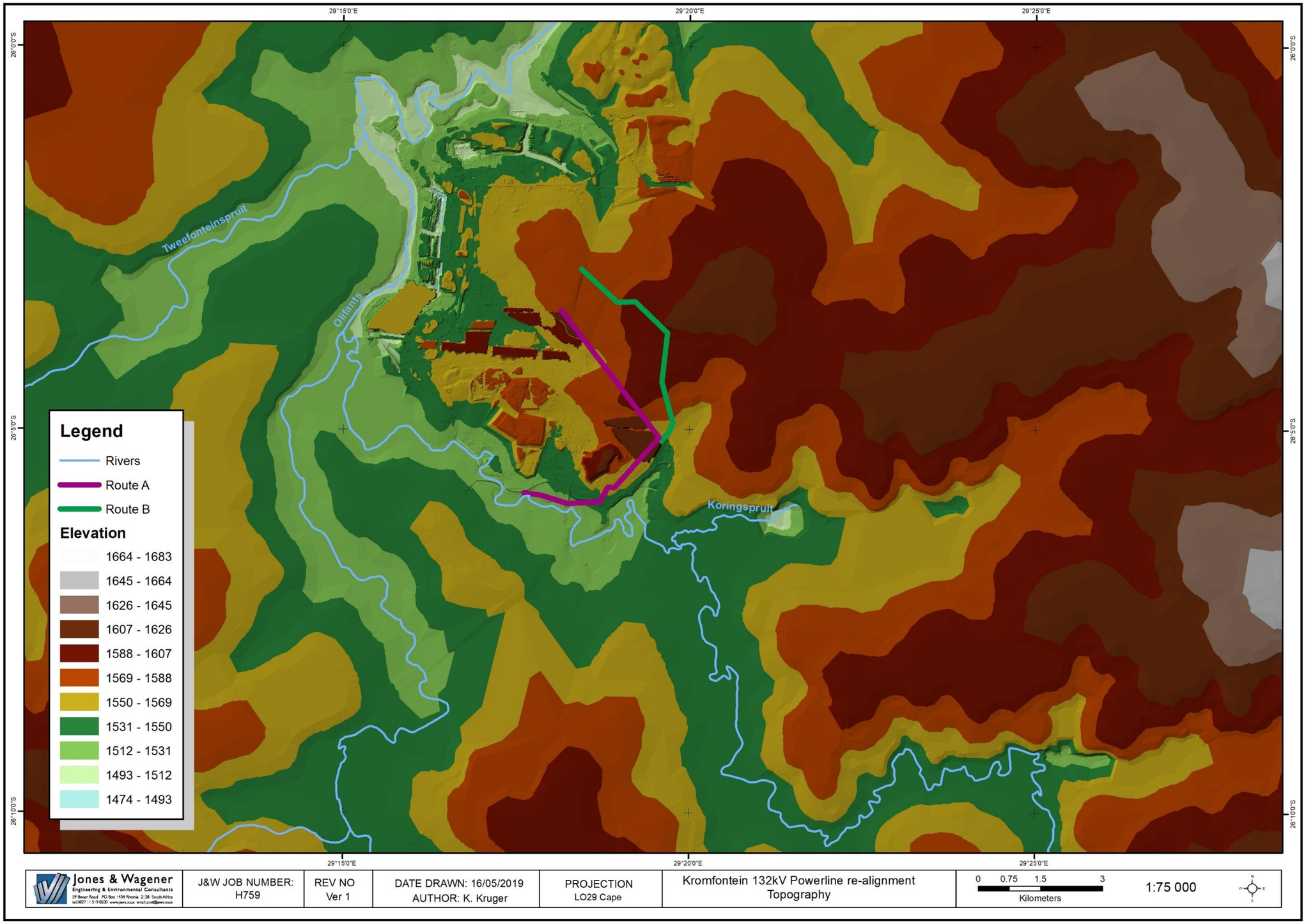

Figure 2-1: Topography of the study area

Panorama of the agricultural land from the R544 looking southwest. Note the recently harvested cultivated fields in the foreground and the limited vegetation screening. The pylons from Route B will be placed at the location where the picture was taken from, and the pylons from Route A will be placed lower down the valley as indicated by the arrow.

Views of existing powerlines along the R544

Examples of visual observers on site - vehicles from the R544 dominate – proposed powerline locations shown in yellow

Figure 2-2: Photographs of the visual cover/impact on site

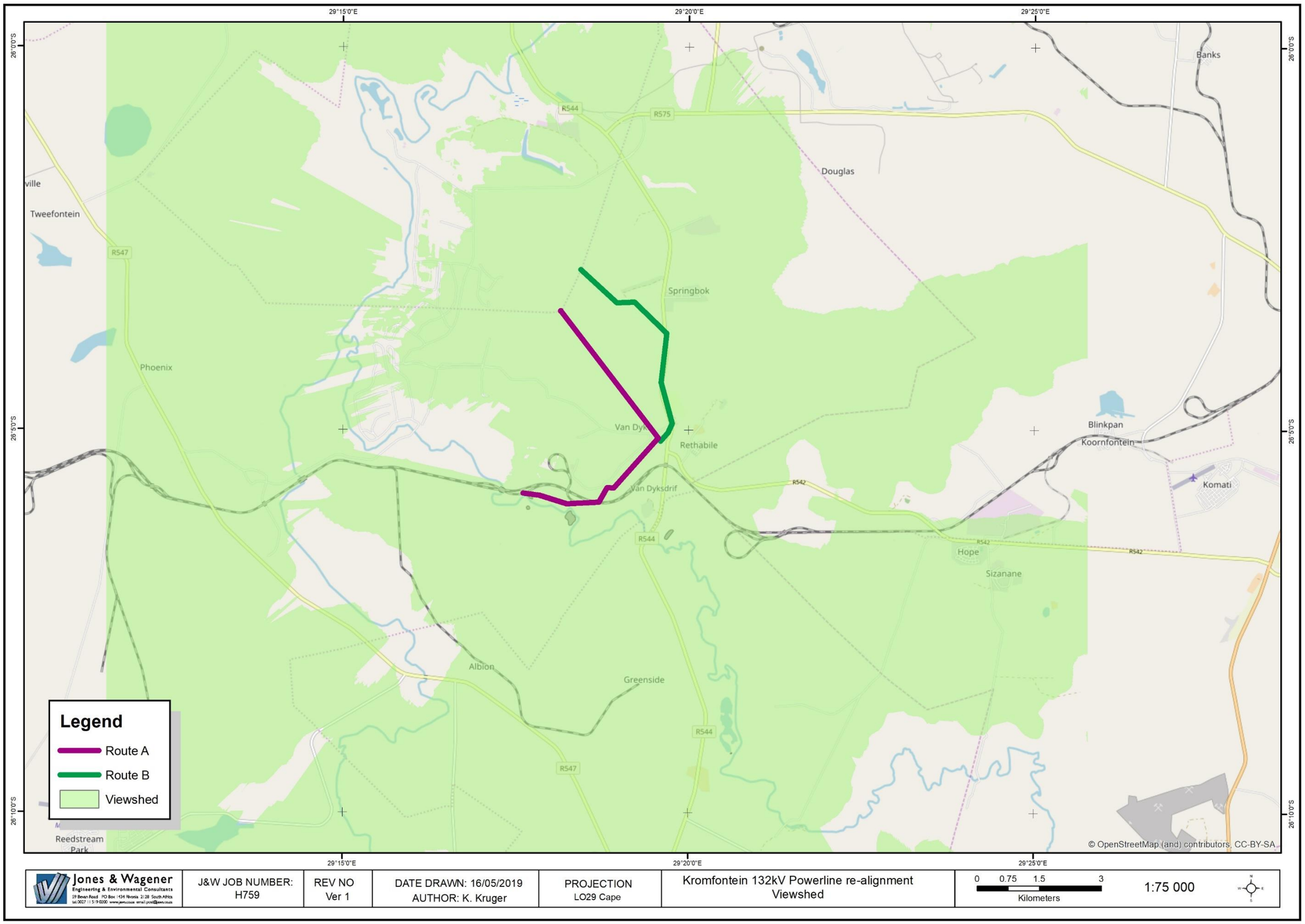

Figure 2-3: Viewshed of the proposed powerline routes

3. IMPACT ASSESSMENT METHODOLOGY

In order to ensure uniformity, a standard impact assessment methodology will be utilised so that a wide range of impacts can be compared. The impact assessment methodology makes provision for the assessment of impacts against the following criteria:

- Significance;
- Spatial scale;
- Temporal scale;
- Probability; and
- Degree of certainty.

A combined quantitative and qualitative methodology will be used to describe the impacts for each of the aforementioned assessment criteria. A summary of each of the qualitative descriptors along with the equivalent quantitative rating scale for each of the aforementioned criteria is given in **Table 3-1**.

Table 3-1: Quantitative rating and equivalent descriptors for the impact assessment criteria

RATING	SIGNIFICANCE	EXTENT SCALE	TEMPORAL SCALE
1	VERY LOW	*Isolated corridor / proposed corridor*	Incidental
2	LOW	*Study area*	Short-term
3	MODERATE	*Local*	Medium-term
4	HIGH	*Regional / Provincial*	Long-term
5	VERY HIGH	*Global / National*	Permanent

A more detailed description of each of the assessment criteria is given in the following sections.

3.1 Significance Assessment

Significance rating (importance) of the associated impacts embraces the notion of extent and magnitude but does not always clearly define these since their importance in the rating scale is very relative. For example, the magnitude (i.e. the size) of area affected by atmospheric pollution may be extremely large (1000km^2) but the significance of this effect is dependent on the concentration or level of pollution. If the concentration is great, the significance of the impact would be HIGH or VERY HIGH, but if it is diluted it would be VERY LOW or LOW. Similarly, if 60 ha of a grassland type are destroyed the impact would be VERY HIGH if only 100 ha of that grassland type were known. The impact would be VERY LOW if the grassland type was common. A more detailed description of the impact significance rating scale is given in **Table 3-2** below.

Table 3-2: Description of the significance rating scale

RATING		DESCRIPTION
5	VERY HIGH	Of the highest order possible within the bounds of impacts which could occur. In the case of adverse impacts: there is no possible mitigation and/or remedial activity which could offset the impact. In the case of beneficial impacts, there is no real alternative to achieving this benefit.
4	HIGH	Impact is of substantial order within the bounds of impacts, which could occur. In the case of adverse impacts: mitigation and/or remedial activity is feasible but difficult, expensive, time-consuming or some combination of these. In the case of beneficial impacts, other means of achieving this benefit are feasible but they are more difficult, expensive, time-consuming or some combination of these.
3	MODERATE	Impact is real but not substantial in relation to other impacts, which might take effect within the bounds of those which could occur. In the case of adverse impacts: mitigation and/or remedial activity are both feasible and fairly easily possible. In the case of beneficial impacts: other means of achieving this benefit are about equal in time, cost, effort, etc.
2	LOW	Impact is of a low order and therefore likely to have little real effect. In the case of adverse impacts: mitigation and/or remedial activity is either easily achieved or little will be required, or both. In the case of beneficial impacts, alternative means for achieving this benefit are likely to be easier, cheaper, more effective, less time consuming, or some combination of these.
1	VERY LOW	Impact is negligible within the bounds of impacts which could occur. In the case of adverse impacts, almost no mitigation and/or remedial activity is needed, and any minor steps which might be needed are easy, cheap, and simple. In the case of beneficial impacts, alternative means are almost all likely to be better, in one or a number of ways, than this means of achieving the benefit. Three additional categories must also be used where relevant. They are in addition to the category represented on the scale, and if used, will replace the scale.
0	NO IMPACT	There is no impact at all - not even a very low impact on a party or system.

3.2 Spatial Scale

The spatial scale refers to the extent of the impact i.e. will the impact be felt at the local, regional, or global scale. The spatial assessment scale is described in more detail in **Table 3-3**.

Table 3-3: Description of the significance rating scale

RATING		DESCRIPTION
5	Global/National	The maximum extent of any impact.
4	Regional/Provincial	The spatial scale is moderate within the bounds of impacts possible and will be felt at a regional scale (District Municipality to Provincial Level). The impact will affect an area up to 50km from the proposed site / corridor.
3	Local	The impact will affect an area up to 5km from the proposed route corridor / site.
2	Study Area	The impact will affect a route corridor not exceeding the boundary of the corridor / site.
1	Isolated Sites / proposed site	The impact will affect an area no bigger than the corridor / site.

3.3 Duration Scale

In order to accurately describe the impact, it is necessary to understand the duration and persistence of an impact in the environment. The temporal scale is rated according to criteria set out in **Table 3-4**.

Table 3-4: Description of the temporal rating scale

RATING		DESCRIPTION
1	Incidental	The impact will be limited to isolated incidences that are expected to occur very sporadically.
2	Short-term	The environmental impact identified will operate for the duration of the construction phase or a period of less than 5 years, whichever is the greater.
3	Medium term	The environmental impact identified will operate for the duration of life of the project.
4	Long term	The environmental impact identified will operate beyond the life of operation.
5	Permanent	The environmental impact will be permanent.

3.4 Degree of Probability

The probability or likelihood of an impact occurring will be described, as shown in **Table 3-5** below.

Table 3-5: Description of the degree of probability of an impact occurring

RATING	DESCRIPTION
1	Practically impossible
2	Unlikely
3	Could happen
4	Very Likely
5	It's going to happen / has occurred

3.5 Degree of Certainty

As with all studies it is not possible to be 100% certain of all facts, and for this reason a standard "degree of certainty" scale is used as discussed in **Table 3-6**. The level of detail for specialist studies is determined according to the degree of certainty required for decision-making. The impacts are discussed in terms of affected parties or environmental components.

Table 3-6: Description of the degree of certainty rating scale

RATING	DESCRIPTION
Definite	More than 90% sure of a particular fact.
Probable	Between 70 and 90% sure of a particular fact, or of the likelihood of that impact occurring.
Possible	Between 40 and 70% sure of a particular fact, or of the likelihood of an impact occurring.
Unsure	Less than 40% sure of a particular fact or the likelihood of an impact occurring.
Can't know	The consultant believes an assessment is not possible even with additional research.

3.6 Quantitative Description of Impacts

To allow for impacts to be described in a quantitative manner in addition to the qualitative description given above, a rating scale of between 1 and 5 was used for each of the assessment criteria. Thus, the total value of the impact is described as the function of significance, spatial and temporal scale as described below.

$$\textit{Impact Risk} = \frac{(\text{SIGNIFICANCE} + \textit{Spatial} + \text{Temporal})}{3} \times \frac{\text{Probability}}{5}$$

An example of how this rating scale is applied is shown in **Table 3-7**.

Table 3-7: Example of Rating Scale

IMPACT	SIGNIFICANCE	SPATIAL SCALE	TEMPORAL SCALE	PROBABILITY	RATING
	LOW	*Local*	Medium Term	*Could Happen*	
Impact to air	**2**	***3***	**3**	**3**	**1.6**

Note: The significance, spatial and temporal scales are added to give a total of 8, that is divided by 3 to give a criteria rating of 2,67. The probability (3) is divided by 5 to give a probability rating of 0,6. The criteria rating of 2,67 is then multiplied by the probability rating (0,6) to give the final rating of 1,6.

The impact risk is classified according to 5 classes as described in **Table 3-8**.

Table 3-8: Impact Risk Classes

RATING	IMPACT CLASS	DESCRIPTION
0.1 – 1.0	1	Very Low
1.1 – 2.0	2	Low
2.1 – 3.0	3	Moderate
3.1 – 4.0	4	High
4.1 – 5.0	5	Very High

4. IMPACT ASSESSMENT

The impact assessment was undertaken for the project components described in Section 1 above. The sections below described the various visual impacts per project phase, prior to assessing the impacts. The impact assessment is summarised in **Table 4-1** at the end of this section.

4.1 Initial Impact

The area of assessment includes the study area shown in **Figure 3-1** above. The powerline routes travers between the existing mining areas, and commercial farming operations to the east. There are several existing powerlines in the area, especially adjacent to the R544 and the railway line to the south of the site. The visual environment has been impacted to the point where the sense of place is mixed between farming and coal mining.

4.2 Additional Impact

4.2.1 Construction Phase

During the construction phase the work carried out will mainly be the excavation of the pylon foundations, erection of the steel structures and finally the stringing of the conductors. The visual impacts will be the views of the structures, dust, and the vehicle movements.

The initial impact during the construction phase is rated as probable, LOW, short term impact on the *proposed infrastructure sites*. This impact is going to happen and is rated as a Low impact (1.67).

4.2.2 Operational Phase

During operations the pylons and conductors erected during construction will remain in place while the electricity is distributed along the powerline. The project description noted that the powerline pylons will be maximum 26m in height, and this was the height used to model the potential visual impact for each of the route alternatives.

The visual impact was modelled each of the route alternatives, with the impact from the proposed alternative (Route A) illustrated in **Figure 4-1** below, and the impact from Route B in **Figure 4-2**. The model assumed that all structures have reached the 26m height and is therefore a worst-case representation.

From the models it can be seen that Route A has a smaller visual footprint than Route B. Route B is a longer route, and traverses right next to the R544, increasing the visual exposure of the powerline. In addition, topography reduces the potential views to Route A from the east.

The additional impact during the operational phase of Route A is rated as definite, MODERATE, medium term impact on the *local area*. This impact is going to happen and is rated as a Moderate impact (3).

Route B is rates as a definite HIGH, medium term impact on the *local area*. This impact is going to happen and is rated as a High impact (3.3).

4.2.3 Rehabilitation and Closure

During the rehabilitation and closure phase, the conductors will be removed along with the pylons. The pylon foundations will be rehabilitated, and the land returned to the surrounding land use.

The initial impact during the rehabilitation and closure phase is rated as probable, LOW POSITIVE, short term impact on the *local area*. This impact will happen and is rated as a Moderate positive impact (2.3).

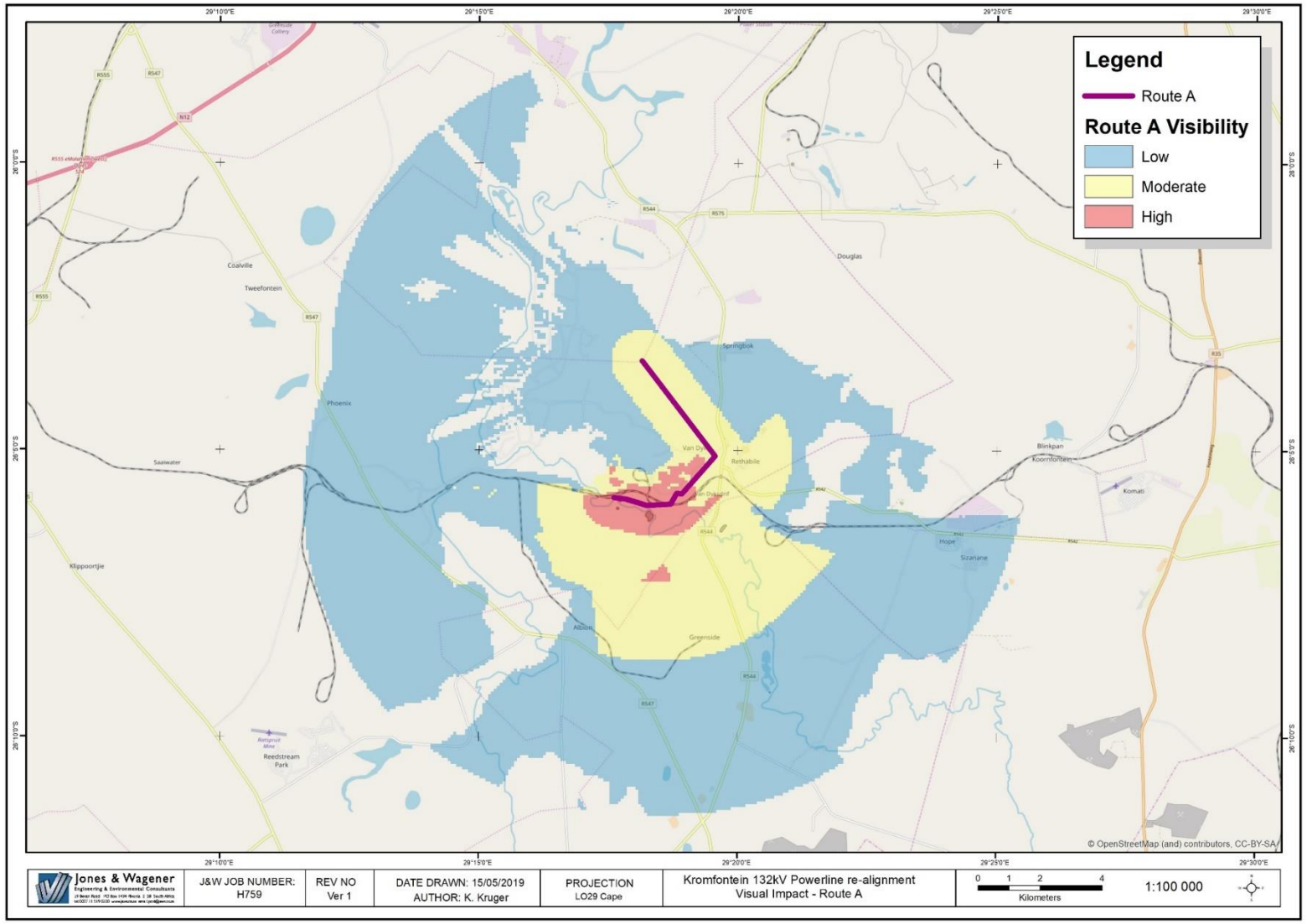

Figure 4-1: Modelled impacts of Route A

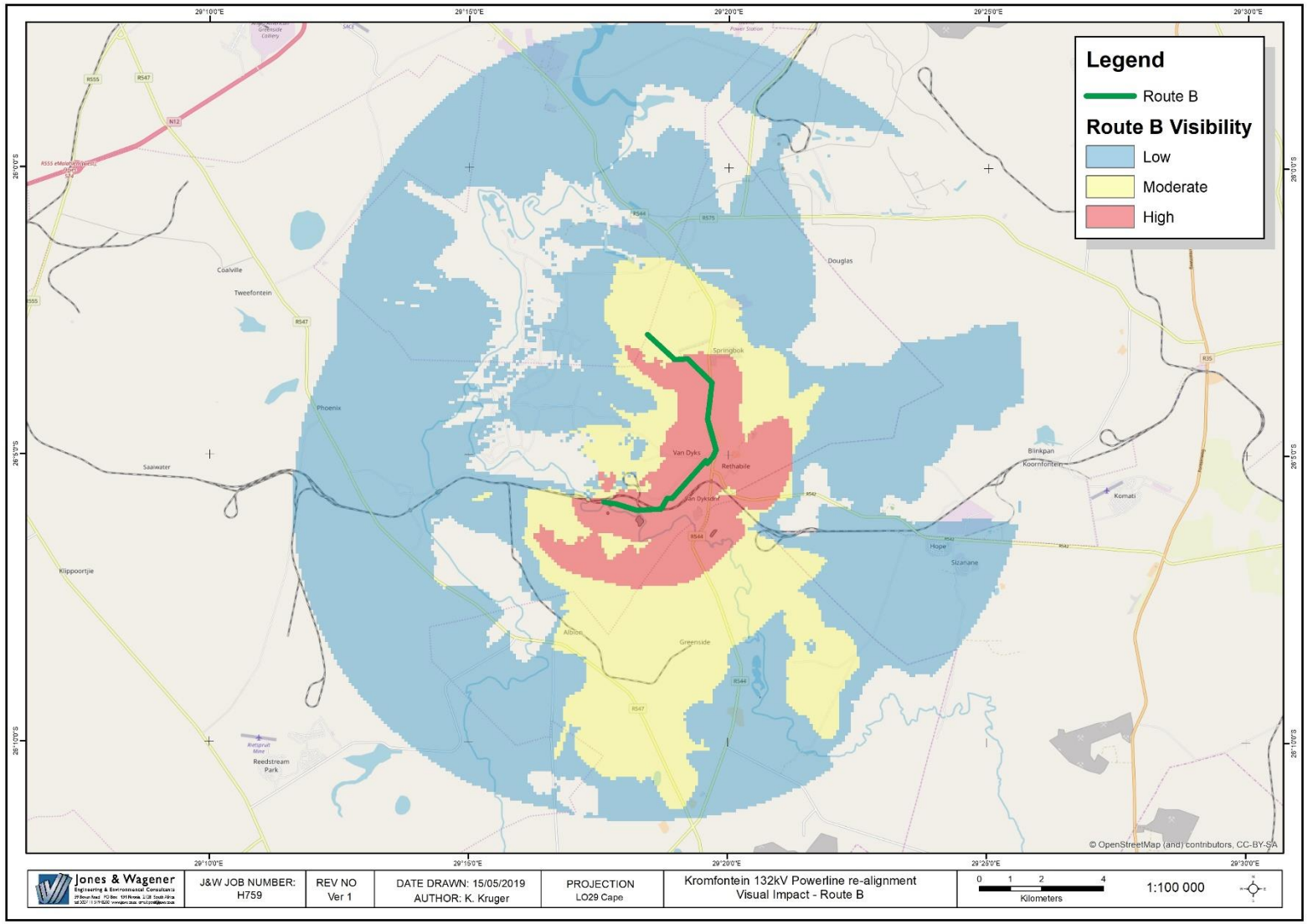

Figure 4-2: Modelled impact of Route B

4.3 Cumulative Impact

The visual model shown in the figures above takes the existing visual landscape, adds the contours from the proposed development and models the visual impact of the combined landscape. Therefore, the impact shown in **Figure 4-1** can be regarded as the cumulative impact of the site.

However, when considering the larger landscape where the project is located in, then the numerous mining operations (Wolvekrans, Kleinkopje, iMpunzi, Steenkoolspruit, North Shaft etc) also have to be considered.

The combined cumulative impact is definitely rated as a VERY HIGH, *local,* long-term impact. This impact will occur and is rated as a High impact (rating 4.0).

4.4 Mitigation Measures

4.4.1 *Construction and Operations

- Locate the powerline along the Route A alignment (preferred);
- Only clear vegetation when and where necessary;
- Only remove topsoil when and where necessary for pylon foundations;
- Monitor and fix any erosion around the pylon foundations;

4.4.2 Rehabilitation and Closure

- Ensure that all infrastructure/foundations demolished/removed; and
- Rehabilitate all areas where infrastructure have been removed.

4.5 Residual Impact

The residual impact assesses the impact considering that the mitigation measures mentioned above have been successfully implemented and the recommended Route A has been selected.

4.5.1 Construction Phase

With the successful implementation of the proposed mitigation measures the residual impact during the construction phase is rated as probable, MODERATE, short term impact on the *proposed infrastructure sites*. This impact is going to happen and is rated as a Low impact (2).

4.5.2 Operational Phase

The residual impact during the operational phase is rated as definite, MODERATE, medium term impact on the *local area*. This impact is going to happen and is rated as a Moderate impact (3). The rating above assumed Route 1 would be utilised. If not the residual impact for Route 2 would be rated as a definite HIGH, medium term impact on the *local area*. This impact is going to happen and is rated as a High impact (3.3).

4.5.3 Rehabilitation and Closure

The residual impact during the rehabilitation and closure phase is rated as probable, LOW POSITIVE, short term impact on the *local area*. This impact will happen and is rated as a Moderate positive impact (2.3).

Table 4-1: Impact Assessment Table:

Activity	Aspect	Impact	Mitigation	Criteria	Rating prior to mitigation (Additional Impact)		Cumulative rating		Rating post mitigation (Residual Impact)	
Construction Phase										
Site preparation and construction	Visual	**NEGATIVE IMPACT:** Erection of infrastructure Dust generated from construction activities as well as views of the activities themselves. Clearing of vegetation and soil.	• Utilise Route A alignment • Only clear vegetation when and where necessary; • Monitor and fix any erosion around pylons; • Only remove topsoil when and where necessary for pylon foundations.	Significance	3	**LOW**	5	**HIGH**	3	**LOW**
				Spatial	2		3		2	
				Temporal	1		4		1	
				Probability	5		5		5	
Operational /Maintenance Phase Route A										
Operation of the powerline	Visual	**NEGATIVE IMPACT:** Powerlines and pylons to remain in place	• Same as measures for construction • Utilise Route A alignment	Significance	3	**MODERATE**	5	**HIGH**	3	**MODERATE**
				Spatial	3		3		3	
				Temporal	3		4		3	
				Probability	5		5		5	
Operational /Maintenance Phase Route B										
Operation of the powerline	Visual	**NEGATIVE IMPACT:** Powerlines and pylons to remain in place	• Same as measures for construction	Significance	4	**HIGH**	5	**HIGH**	4	**HIGH**
				Spatial	3		3		3	
				Temporal	3		4		3	

Activity	Aspect	Impact	Mitigation	Criteria	Rating prior to mitigation (Additional Impact)		Cumulative rating		Rating post mitigation (Residual Impact)	
				Probability	5		5		5	
Rehabilitation / Closure Phase										
Rehabilitation of powerline.	Visual	**POSITIVE IMPACT** Rehabilitation of infrastructure by removing pylons and returning land to surrounding land use	• Ensure that all infrastructure is demolished/removed; and • Rehabilitate all areas where infrastructure have been removed.	Significance	2	**MODERATE POSITIVE**	5	**HIGH**	2	**MODERATE POSITIVE**
				Spatial	3		3		3	
				Temporal	2		4		2	
				Probability	5		5		5	

5. MONITORING REQUIREMENTS

There are no direct visual monitoring requirements, however often secondary impacts could raise visual concerns, such as erosion scars. The monitoring requirements for erosion are included in the soil report.

6. CONCLUSIONS AND RECOMMENDATIONS

6.1 Preferred alternative

The project provided two route alternatives, alternative A (preferred) and alternative B. In terms of the visual impacts, alternative A is a shorter route, and is located as far as possible from the R544, the main road in the study area. Alternative B is longer and is located adjacent to the road, maximising the visual impact.

If Route A is utilised, then the visual impact will be Moderate. If Route B is utilised, then the impact will be High.

6.2 Opinion on Proceeding with Project

The re-alignment of the Kromfontein 132kV powerline will have a moderate impact on the visual environment. The R544, the main local road will be partially screened by topography when compared to Alternative B, and the resultant impact is deemed an acceptable impact for a project of this nature.

It is the opinion of this specialist that the development should be allowed to proceed, as there is no visual impact that would prohibit the development.

6.3 Conditions for approval

It is recommended that the mitigation measures proposed in this report, be seen as the minimum conditions for approval.

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APPENDIX A

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CURRICULUM VITAE

01 January 2019
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KONRAD KRÜGER

Profession	Environmental Scientist
Date of Birth	20 November 1981
Position in firm	Senior Environmental Scientist
Years with the firm	6 years 2 months
Nationality	South African
Education / Qualifications	BSc Honours (Geography) University of Pretoria 2003 (cum laude) BSc Environmental Sciences, University of Pretoria 2002
Languages	Afrikaans, English
Employers	
2005 – 2009	Cymbian Enviro-Social Consulting Services (Randburg) - Environmental Consultant
2009 – 2012	Zitholele Consulting (Pty) Ltd (Midrand) - Environmental Consultant
2012 – Current	Jones & Wagener (Pty) Ltd - Senior Environmental Scientist

About Konrad Krüger

Konrad graduated from the University of Pretoria with a BSc in Environmental Science in 2002 and BSc Honours in Geography in 2003. He has been involved in a variety of environmental projects in the last twelve years and has undertaken a variety of specialist studies, mapping and environmental consulting. The specialist studies included vegetation assessments, soil mapping and agricultural assessments, wetland delineations, visual assessments and terrestrial ecological assessments.

Areas of Expertise

<u>Specialist Assessments:</u>

- Soils and Land Capability / Agricultural Potential;
- Wetland Delineation;
- Flora Assessments;
- Terrestrial Ecological Assessment;

- Visual Impact Assessment; and
- GIS (ArcGIS 10)

Professional Affiliations

- International Association of Impact Assessors (South Africa)
- Land and Rehabilitation Society of South Africa (LARSSA)

Relevant Experience

Wetland Delineation

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1. Visual Assessment for the proposed 400kv KIPower powerlines – Delmas, South Africa – KIPower - 2016
2. Visual Assessment for the proposed Middelburg Colliery extension – Middelburg, South Africa, South32 – 2016
3. Visual Assessment for the proposed Wolwekrans Evaporator Project – Emalahleni, South Africa, South32 - 2015
4. Visual Assessment for the proposed Klipfontein Colliery extension – Middelburg, South Africa, South32 - 2015
5. Visual Assessment for the proposed Pongola-Candover 132 kV powerline – Pongola, South Africa – Eskom Eastern Regions - 2014
6. Visual Assessment for the proposed Ndumo - Gezisa 132 kV powerline – Pongola, South Africa – Eskom Eastern Regions - 2014
7. Visual Assessment for the extension of the Camden Power Station Ash Dump - Ermelo, South Africa - Eskom Generation – 2012
8. Visual Assessment for the proposed day visitor's facility at the Olifants Camp, Kruger National Park - Limpopo & Mpumalanga, South Africa - Kruger National Park – Olifants - 2007
9. Conducted the Visual Specialist Studies for the integration of the Bravo (Kusile) power station into the Eskom grid. Five EIAs for the proposed construction of overhead power lines and associated infrastructure for the Bravo Integration Project. - Gauteng and Mpumalanga, South Africa - Eskom – Bravo Integration Project – 20009
10. Conducted the Visual Specialist Studies for the proposed railway line to the Kusile power station. - Gauteng and Mpumalanga, South Africa - Eskom – Kusile Railway Line - 2010
11. Visual Assessment for the proposed Ingula burial grounds near Van Reenen. - KwaZulu Natal, South Africa - Eskom – Ingula burial ground - 2011
12. Visual Assessment for the proposed substation and connecting power lines - Limpopo, South Africa - Eskom – Tabor - 2011
13. Visual Assessment for the proposed Teak Place Estate Development in the Cradle of Humankind. - Cradle of Humankind, South Africa - Teak Place Estate Development – 2007

Summary of other Training/Courses attended

Centre for Environmental Studies	March 2007	NEMA EIA Regulations and their application
Cameron Cross	May 2008	National Environmental Management Waste Act Seminar
Africa Land-Use Training	April 2010	Tree Identification
Africa Land-Use Training	June 2010	Soil Classification and Mapping

Declaration

I confirm that the above CV is an accurate description of my experience and qualifications.

Signature of Staff Member

2 January 2019

Date

APPENDIX B

DECLARATION OF INDEPENDANCE

I, Konrad Krüger, hereby 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 not, 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.
- I realise that a false declaration is an offence in terms of Regulation 48 and is punishable in terms of section 24F of the Act.

Konrad Krüger

A detailed CV of the authors are included in **Appendix A**.

SOUTH32 SA COAL HOLDINGS (PTY) LTD

RELOCATION OF 132KV KROMFONTEIN POWERLINE AT VANDYKSDRIFT CENTRAL OF THE WOLWEKRANS COLLIERY SOIL, LAND CAPABILITY AND LAND USE ASSESSMENT IMPACT ASSESSMENT REPORT

Report No.: JW123/19/H759-08 – Rev 3

May 2019

Jones & Wagener
Engineering & Environmental Consultants

Internet presence: www.jaws.co.za

DOCUMENT APPROVAL RECORD

Report No.: JW123/19/H759-08 – Rev 3

ACTION	FUNCTION	NAME	DATE	SIGNATURE
Prepared	Environmental Scientist	Konrad Kruger	13 May 2019	
Reviewed and Approved	Environmental Manager	Tolmay Hopkins	17 May 2019	

RECORD OF REVISIONS AND ISSUES REGISTER

Date	Revision	Description	Issued to	Issue Format	No. Copies
13 May 2019	Rev 0	Draft Report for internal review	Tolmay Hopkins	Electronic	1
27 May 2019	Rev 1	Draft for client review	Jacana Environmental	Electronic	N/A
11 June 2019	Rev 2	Final report	Tolmay Hopkins	Electronic	1
21 June 2019	Rev 3	Final report	Tolmay Hopkins	Electronic	1

SYNOPSIS

Wolvekrans Colliery is an operational division of South32 SA Coal Holdings (Pty) Limited (South32). The mine is located between the towns of eMalahleni and Kriel, approximately 30 km south-east of the town of eMalahleni, in close proximity to the Duvha Power Station.

The Vandyksdrift Central (VDDC) section of Wolvekrans Colliery is located to the south of the Steenkoolspruit and Vandyksdrift North sections, and north of the Vandyksdrift South and Albion sections (mining has ceased at these two sections). The Olifants River determines the southern boundary of the VDDC mining section. The R544 and R575 provincial roads are located to the east and west of the Wolvekrans Colliery, respectively.

The VDDC section area falls within the footprint of historic underground mining operations at the old Douglas Colliery. In 2007, an amendment of the Environmental Management Programme Report (EMPR) for the Douglas Colliery operations was approved, to allow the opencast mining of the remaining coal seams. This is now referred to as the VDDC section to be opencast mine using dragline, and truck and shovel operations. Mining will commence in 2020.

Electricity for the VDDC section is supplied from Eskom's Klein Olifants 132 kV Substation, which feeds the Klein 132 kV Substation. The existing Kromfontein 132 kV powerline which connects the Klein Substation and the Kromfontein Substation, traverse the area to be opencast mined and therefore has to be relocated before opencast mining can commence.

Jones & Wagener Engineering and Environmental Consultants (J&W) has been appointed as an independent Environmental Assessment Practitioner (EAP) to undertake the application for Environmental Authorisation (EA) for the re-alignment of the Kromfontein 132 kV powerline. This application is undertaken by South32. This document provides the soils, land capability and land use impact assessment to be include in the Basic Assessment process to be undertaken in support of the EA application

The baseline assessment combined existing baseline reports in the study area with field verified data. The site was visited on the 2nd of May 2019 and soils mapped using a 1.2m bucket hand auger.

A total of eight (8) soil forms were identified (**Table 6-1**) in the study area. The distribution of the soils on site (**Figure 6-1**) is closely linked to the topography and parent materials from which they are derived, as well as the groundwater flow regime of the area. Soils found on site included:

- Red apedal soils (37.4%);
- Yellow-brown apedal soils (2.4%);
- Shallow rocky soils (43%);
- Wetland soils (2.4%);
- Man-made/disturbed soils (12.4%);
- Dams/streams (2.3%).

The red apedal soils are considered high agricultural potential, while the wetlands soils are considered sensitive to impact. The land capability of the study area comprises of:

- Arable land (37.4%)
- Grazing land (2.4%)
- Wilderness land (43%)
- Wetland (2.4%)
- Disturbed land (12.4%)
- Water (2.3%).

The dominant land uses on site are cultivated commercial fields and open grasslands (wilderness). In terms of land use the study area comprises of:

- Cultivated fields (38.8%)
- Grasslands (37.5%)
- Mining (9.1%)
- Development (5.9%)
- Bush (5.2%)
- Wetlands (2.2%)
- Bare ground, water, shrubland (1.2%).

The results from the impact assessment for both options are summarised below.

Table 1: Impact Summary

Activity	Impact	Project Rating	Cumulative rating	Rating post mitigation
Construction: **Site preparation and construction**	**NEGATIVE IMPACT:** Clearing and excavation of pylon foundation soil will result in loss of soil/ land capability. Vehicle movement will result in compaction of soils. Soil contamination by hydrocarbons.	**MODERATE**	**MODERATE**	**LOW**
Operations **Operations of powerline**	**NEGATIVE IMPACT:** Pylon foundations remain as does soil impact.	**MODERATE**	**MODERATE**	**LOW**
Closure **Rehabilitation of powerline pylon foundations**	**POSITIVE IMPACT** Rehabilitation of soil, land capability and land use by removing pylons, foundations and replacing soil	**LOW POSITIVE**	**MODERATE**	**LOW POSITIVE**

The re-alignment of the Kromfontein 132kV powerline will have a low impact on the soil resources found on site. The impact will be very localised, as the soil at each pylon foundation will be removed, and the area sterilised for other land uses. The impact is estimated at 250 – 300m^2 of soils to be disturbed which is deemed an acceptable impact for a project of this nature.

It is the opinion of this specialist that the development should be allowed to proceed, as there is no soil, land capability or land uses that would prohibit the development.

The project provided two route alternatives, alternative A (Corridor 1 preferred) and alternative B (Corridor 2). In terms of the soil, land capability and land use impacts, Corridor 1 is a shorter route, and is located on the maximum amount of mine-owned property. Corridor 2 is longer and spans more agricultural land.

Both alternatives start within the Olifants River floodplain, and pylon placement is of key importance, but it does not distinguish between the alternatives. Corridor 1 does, however, include a second stream/dam crossing.

NEMA Appendix 6 requirements

Regulation: GNR 982, December 2014, as amended	Description	Section in the Report
Appendix 6 (a)	A specialist report prepared in terms of these Regulations must contain— details of— the specialist who prepared the report; and the expertise of that specialist to compile a specialist report including a curriculum vitae;	Section 1 & App A
Appendix 6 (b)	A declaration that the specialist is independent in a form as may be specified by the competent authority;	App B
Appendix 6 (c)	An indication of the scope of, and the purpose for which, the report was prepared;	Section 1.2
Appendix 6 (cA)	An indication of the quality and age of base data used for the specialist report;	Section 3.2.1
Appendix 6 (cB)	A description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 4
Appendix 6 (d)	The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 1
Appendix 6 (e)	A description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Section 6
Appendix 6 (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;	Section 6
Appendix 6 (g)	An identification of any areas to be avoided, including buffers;	Section 6
Appendix 6 (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 6.2
Appendix 6 (i)	A description of any assumptions made and any uncertainties or gaps in knowledge;	Section 1.4
Appendix 6 (j)	A description of the findings and potential implications of such findings on the impact of the proposed activity or activities;	Section 6 and 8
Appendix 6 (k)	Any mitigation measures for inclusion in the EMPr;	Section 8.4
Appendix 6 (l)	Any conditions for inclusion in the environmental authorisation;	Section 10.2
Appendix 6 (m)	Any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Section 9
Appendix 6 (n)	A reasoned opinion— i.whether the proposed activity, activities or portions thereof should be authorised; (iA) regarding the acceptability of the proposed activity or activities; and 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;	Section 10
Appendix 6 (o)	A description of any consultation process that was undertaken during the course of preparing the specialist report;	Refer main BA/EIA report
Appendix 6 (p)	A summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	Refer main BA/EIA report
Appendix 6 (q)	Any other information requested by the competent authority.	None

SOUTH32 SA COAL HOLDINGS (PTY) LTD

RELOCATION OF 132KV KROMFONTEIN POWERLINE AT VANDYKSDRIFT CENTRAL OF THE WOLWEKRANS COLLIERY
SOIL, LAND CAPABILITY AND LAND USE ASSESSMENT
IMPACT ASSESSMENT REPORT REPORT NO: JW123/19/H759-08 – Rev 3

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Acronyms and Abbreviations

DEA ..... Department of Environmental Affairs
DMR ..... Department of Mineral Resources
DWS ..... Department of Water and Sanitation
EA ..... Environmental Authorisation
EAP ..... Environmental Assessment Practitioner
EE ..... Employment Equity
EIA ..... Environmental Impact Assessment
EIS ..... Ecological Importance and Sensitivity
ELM ..... Emalahleni Local Municipality
GDP ..... Gross Domestic Product
IDP ..... Integrated Development Plan
J&W ..... Jones & Wagener (Pty) Ltd Engineering & Environmental Consultants
km ..... kilometres
km^2 ..... square kilometres
kPa ..... kilopascals
LED ..... Local Economic Development
m ..... metres
m^2 ..... square metres
m^3 ..... cubic metres
LOM ..... Life-of-Mine
MPRDA ..... Mineral and Petroleum Resources Development Act
NEMA ..... National Environmental Management Act
NEM: WA ..... National Environmental Management Waste Act
NDM ..... Nkangala District Municipality
NWA ..... National Water Act
S32 ..... South32
SKS ..... Steenkoolspruit
VDDC ..... Vandyksdrift Central
WML ..... Waste Management Licence
WUL ..... Water Use Licence

Glossary of Terms

Term	Explanation
Alluvium	Refers to detrital deposits resulting from the operation of modern streams and rivers
Base status	A qualitative expression of base saturation
Black turf	Soils included by this lay-term are the more structured and darker soils such as the Bonheim, Rensburg, Arcadia, Milkwood, Mayo, Sterkspruit, and Swartland soil forms.
Buffer capacity	The ability of soil to resist an induced change in pH
Calcareous	Containing calcium carbonate
Catena	A sequence of soils of similar age, derived from similar parent material, and occurring under similar macroclimatic conditions, but having different characteristics due to variation in relief and drainage
Clast	An individual constituent, grain or fragment of a sediment or sedimentary rock produced by the physical disintegration of a larger rock mass
Cohesion	The molecular force of attraction between similar substances. The capacity of sticking together. The cohesion of soil is that part of its shear strength which does not depend upon interparticle friction. Attraction within a soil structural unit or through the whole soil in apedel soils
Concretion	A nodule made up of concentric accretions
Crumb	A soft, porous more or less rounded ped from one to five millimetres in diameter. See structure, soil
Cutan	Cutans occur on the surfaces of peds or individual particles (sand grains, stones). They consist of material which is usually finer than, and that has an organisation different to the material that makes up the surface on which they occur. They originate through deposition, diffusion or stress. Synonymous with clay skin, clay film, argillan
Denitrification	The biochemical reduction of nitrate or nitrite to gaseous nitrogen, either as molecular nitrogen or as an oxide of nitrogen
Erosion	The group of processes whereby soil or rock material is loosened or dissolved and removed from any part of the earth's surface
Fertilizer	An organic or inorganic material, natural or synthetic, which can supply one or more of the nutrient elements essential for the growth and reproduction of plants.
Fine sand	1) A soil separate consisting of particles 0,25-0,1mm in diameter 2) A soil texture class (see texture) with fine sand plus very fine sand (i.e. 0,25-0,05mm in diameter) more than 60% of the sand fraction
Fine textured soils	Soils with a texture of sandy clay, silty clay or clay
Hardpan	A massive material enriched with and strongly cemented by sesquioxides, chiefly iron oxides (known as ferricrete, diagnostic hard plinthite, ironpan, ngubane, ouklip, laterite hardpan), silica (silcrete, dorbank) or lime (diagnostic hardpan carbonate-horizon, calcrete). Ortstein hardpans are cemented by iron oxides and organic matter.
Land capability	The ability of land to meet the needs of one or more uses under defined conditions of management
Land type	1) A class of land with specified characteristics. 2) In South Africa it has been used as a map unit denoting land, mapable at 1:250,000 scale, over which there is a marked uniformity of climate, terrain form and soil pattern.
Land use	The use to which land is put
Mottling	A mottled or variegated pattern of colours is common in many soil horizons. It may be the result of various processes inter alia hydromorphy, illuviation, biological activity, and rock

Term	Explanation
	weathering in freely drained conditions (i.e. saprolite). It is described by noting (i) the colour of the matrix and colour or colours of the principal mottles, and (ii) the pattern of the mottling. The latter is given in terms of abundance (few, common 2 to 20% of the exposed surface, or many), size (fine, medium 5 to 15mm in diameter along the greatest dimension, or coarse), contrast (faint, distinct or prominent), form (circular, elongated-vesicular, or streaky) and the nature of the boundaries of the mottles (sharp, clear or diffuse); of these, abundance, size and contrast are the most important
Nodule	Bodies of various shapes, sizes and colour that have been hardened to a greater or lesser extent by chemical compounds such as lime, sesquioxides, animal excreta and silica. These may be described in terms of kind (durinodes, gypsum, insect casts, ortstein, iron-manganese, lime, lime-silica, plinthite, salts), abundance (few, less than 20% by volume percentage; common, 20 – 50%; many, more than 50%), hardness (soft, hard meaning barely crushable between thumb and forefinger, indurated) and size (threadlike, fine, medium 2 – 5mm in diameter, coarse).
Overburden	A material which overlies another material difference in a specified respect, but mainly referred to in this document as materials overlying weathered rock
Ped	Individual natural soil aggregate (e.g. block, prism) as contrasted with a clod produced by artificial disturbance
Pedocutanic diagnostic B-horizon	The concept embraces B-horizons that have become enriched in clay, presumably by illuviation (an important pedogenic process which involves downward movement of fine materials by, and deposition from, water to give rise to cutanic character) and that have developed moderate or strong blocky structure. In the case of a red pedocutanic B horizon, the transition to the overlying A-horizon is clear or abrupt
Pedology	The branch of soil science that treats soils as natural phenomena, including their morphological, physical, chemical, mineralogical and biological properties, their genesis, their classification and their geographical distribution
Slickenslides	In soils, these are polished or grooved surfaces within the soil resulting from part of the soil mass sliding against adjacent material along a plane which defines the extent of the slickenslides. They occur in clayey materials with a high smectite content
Sodic soil	Soil with a low soluble salt content and a high exchangeable sodium percentage (usually EST > 15)
Swelling clay	Clay minerals such as the smectites that exhibit interlayer swelling when wetted, or clayey soils which, on account of the presence of swelling clay minerals, swell when wetted and shrink with cracking when dried. The latter are also known as heaving soils
Texture, soil	The relative proportions of the various size separates in the soil as described by the classes of soil texture. The pure sand, sand, loamy sand, sandy loam and sandy clay loam classes are further subdivided (see diagram) according to the relative percentages of the coarse, medium and fine sand subseparates
Vertic, diagnostic A-horizon	A-horizons that have both, a high clay content and a predominance of smectitic clay minerals possess the capacity to shrink and swell markedly in response to moisture changes. Such expansive materials have a characteristic appearance: structure is strongly developed, ped faces are shiny, and consistence is highly plastic when moist and sticky when wet

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SOUTH32 SA COAL HOLDINGS (PTY) LTD

RELOCATION OF 132KV KROMFONTEIN POWERLINE AT VANDYKSDRIFT CENTRAL OF THE WOLWEKRANS COLLIERY
SOIL, LAND CAPABILITY AND LAND USE ASSESSMENT
IMPACT ASSESSMENT REPORT REPORT NO: JW123/19/H759-08 – Rev 3

1. INTRODUCTION

1.1 Background Information

Wolvekrans Colliery is an operational division of South32 SA Coal Holdings (Pty) Limited (South32). The mine is located between the towns of eMalahleni and Kriel, approximately 30 km south-east of the town of eMalahleni, in close proximity to the Duvha Power Station (refer to **Figure 1-1**).

The Vandyksdrift Central (VDDC) section of Wolvekrans Colliery is located to the south of the Steenkoolspruit and Vandyksdrift North sections, and north of the Vandyksdrift South and Albion sections (mining has ceased at these two sections). The Olifants River determines the southern boundary of the VDDC mining section. The R544 and R575 provincial roads are located to the east and west of the Wolvekrans Colliery, respectively

The VDDC section area falls within the footprint of historic underground mining operations at the old Douglas Colliery. In 2007, an amendment of the Environmental Management Programme Report (EMPR) for the Douglas Colliery operations was approved, to allow the opencast mining of the remaining coal seams. This is now referred to as the VDDC section to be opencast mine using dragline, and truck and shovel operations. Mining will commence in 2020.

Electricity for the VDDC section is supplied from Eskom's Klein Olifants 132 kV Substation, which feeds the Klein 132 kV Substation. The existing Kromfontein 132 kV powerline which connects the Klein Substation and the Kromfontein Substation, traverse the area to be opencast mined (refer to **Figure 1-2**) and therefore has to be relocated before opencast mining can commence.

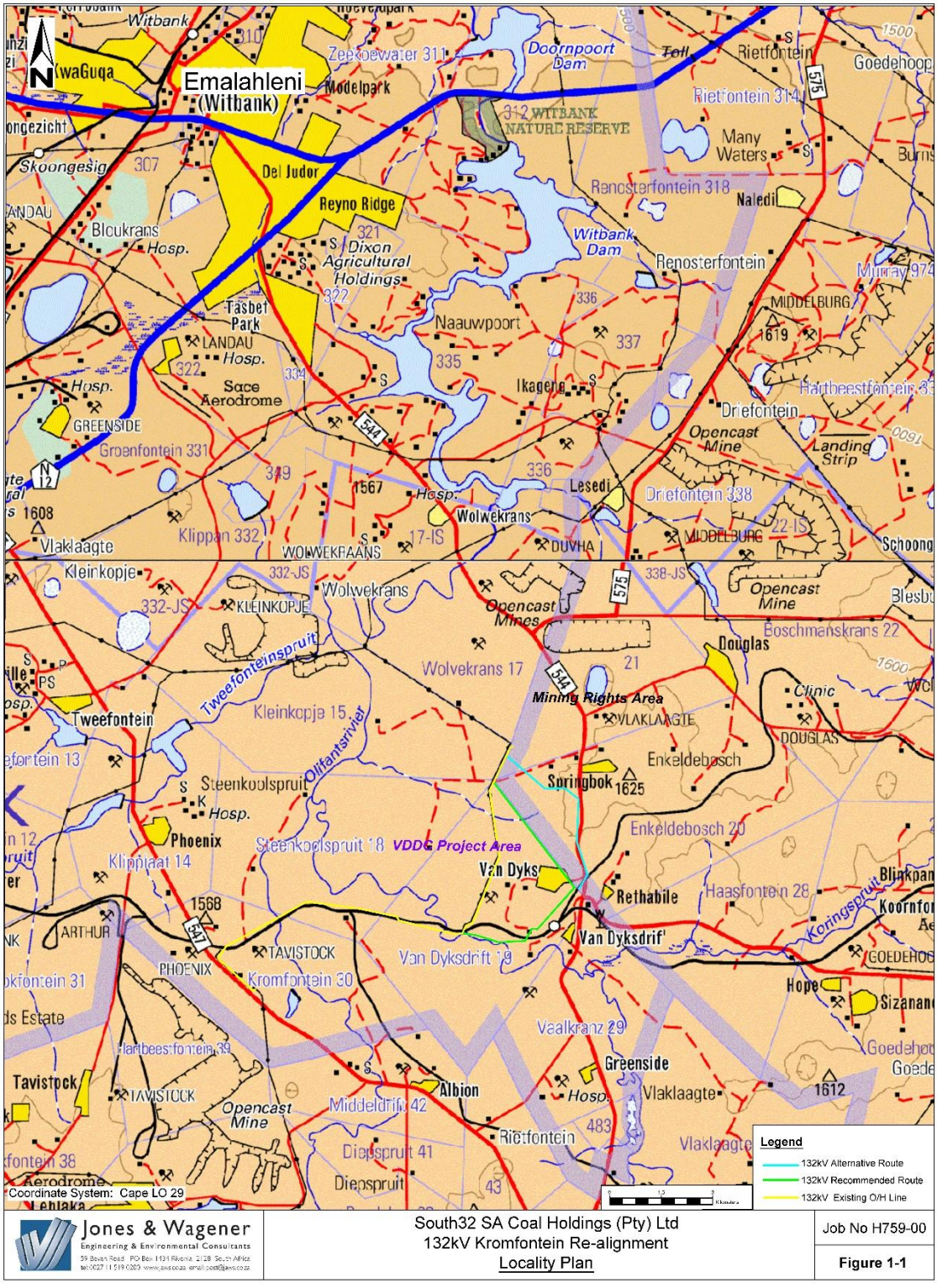

Figure 1-1:Locality Plan

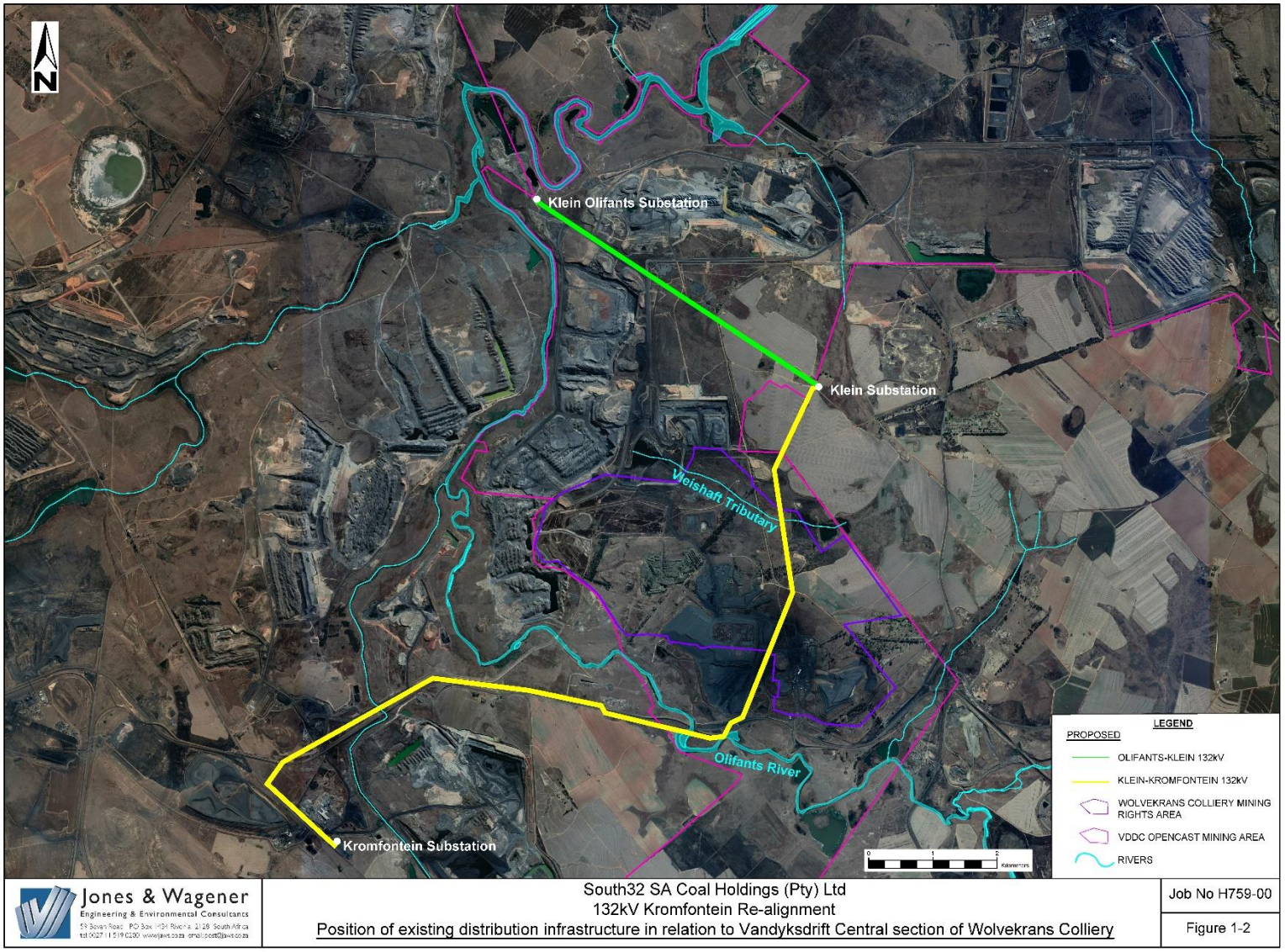

Figure 1-2:Position of existing distribution infrastructure in relation to Vandyksdrift Central section of Wolvekrans Colliery

1.2 Purpose

Jones & Wagener Engineering and Environmental Consultants (J&W) has been appointed as an independent Environmental Assessment Practitioner (EAP) to undertake the application for Environmental Authorisation (EA) for the re-alignment of the Kromfontein 132 kV powerline. This application is undertaken by South32. This document provides the soils, land capability and land use impact assessment to be include in the Basic Assessment process to be undertaken in support of the EA application.

1.3 Specialist Project Team

The following personnel were involved in the compilation of this report. Refer to **Appendix A** for copies of the curricula vitae (CV's).

Table 1-1: Specialist Team Members.

Name	Organisation	Highest Qualifications	Experience	Role
Konrad Kruger	Jones & Wagener	BSc Honours Geography	14 Years	Specialist
Tolmay Hopkins	Jones & Wagener	MSc (Agric) Microbiology	20 Year	Pr. Sci Nat Reviewer

1.4 Assumptions and Limitations

The following assumptions/limitations were relevant during the assessment:

- The information collected in the previous soil reports for VDDC are correct and do not require verification. Thus, the information was used as published previously.

2. PROJECT BACKGROUND

As part of the VDDC opencast mining project, South32's Wolvekrans Colliery intends to relocate the 132 kV electricity distribution powerline between the Eskom Kromfontein Substation and the Eskom Klein Substation. This application is undertaken by South32 in terms of a self-build agreement with Eskom. The EA will be transferred to Eskom on completion of the construction phase. The proposed activities will be undertaken at the VDDC Section of the mine, where opencast mining has already been approved in 2007 with the amendment of the EMPR for the Douglas Colliery operations. The relocation of the powerline is necessary in order for the opencast mining to commence.

A 132 kV electricity distribution powerline which is approximately 7.5 km in length, will be constructed from a point (Coordinates: 26°5'42.36"S, 29°17'45.88"E) on the existing Eskom Kromfontein / Klein substation feeder, to a point (Coordinates 26° 3'29.31"S, 29°18'7.69"E) of the same overhead line tying the Eskom Kromfontein and Klein substations, within a 36 m corridor.

This represents listed activities as per the Environmental Impact Assessment (EIA) Regulations, 2014 (as amended), which require an Environmental Authorisation in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998; NEMA).

2.1 Current Power Supply and Reticulation

VDDC is supplied from Eskom's Klein Olifant 132 kV Substation, which feeds the Klein Olifant 132 kV Substation. The voltage is stepped down to 22 kV via 2 x 20 MVA power transformers feeding the 22 kV switchgear located in the Klein Olifant Substation. The 22 kV switchgear consists of single bus bar, 2 x 1250 A Incomers, 2 x Feeders and Power Factor Correction. No bus section is available, which means that the power transformers are paralleled with a combined fault current rating of approximately 10.5 kA (South32, 2017).

2.2 Re-alignment of Kromfontein 132kV distribution line

Two routes were selected, i.e. the Proposed 132 kV Powerline Route (Corridor 1) and the Alternative 132 kV Powerline Route (Corridor 2) as the alternative route. In order to assess the soils, a 100m wide corridor was assessed along each of the routes.

The preferred route was selected for the project based on the fact that it is expected to have a lesser impact and that it is located a distance away from the existing R544 provincial road. Part of this powerline will be constructed on previous mined out rehabilitated areas, that is the area has already been disturbed.

2.2.1 Proposed 132 kV Powerline Route

The proposed powerline will be constructed within the VDDC section of the Wolvekrans Colliery and within the Mining Rights Boundary. The electricity distribution powerline will be constructed and relocated to a proposed route outside an area planned to be mined by South32 and a preferred site for the proposed project was selected looking at terrain and current mining activities. The proposed powerline will be approximately 7.5 km with a corridor of about 36 m (refer to **Table 2-1**). The foundation depths will range between 2 m to 3 m. The proposed powerline will be constructed using intermediate steel pole towers that will be erected a few metres apart depending on the terrain, ground clearance requirements, geology etc. The proposed steel towers may consist of the following:

- Mono-pole guyed intermediate suspension structures;
- Mono-pole self-supporting intermediate suspension structures;
- Mono-pole angle suspension structures; and/or
- Mono-pole strain structures.

The height of the towers is expected to range between 22 m and 26 m, depending on the terrain and ground clearance requirements.

Table 2-1: Co-ordinates of corridor for preferred route (Enercon, 2019)

	Latitude	Longitude
A1	26° 3’ 29.15”S	29° 18’ 07.73”E
A2	26° 5’ 08.51”S	29° 19’ 32.65”E
A3	26° 5’ 47.88”S	29° 18’ 54.11”E
A4	26° 5’ 47.66”S	29° 18’ 48.21”E
A5	26° 6’ 00.29”S	29° 18’ 13.31”E
A6	26° 5’ 53.68”S	29° 17’ 49.53”E

2.2.2 Alternative 132 kV Powerline Route (Corridor 1)

The Alternative Route will run in proximity of the R544 Witbank to Kriel Provincial Road. This route indicates significant impacts in term of the fact that some of the poles will have to be excavated closer to the R544 road. This route is expected to have potential impacts on the R544 Provincial Road, agricultural activities, as well as local communities currently residing within the corridor area required for the relocation of the line. The coordinates for the alternative powerline route corridor are indicated in **Table 2-2**.

Table 2-2: Co-ordinates of corridor for alternative route (Enercon, 2019)

	Latitude	Longitude
B1	26° 4' 58.23"S	29° 19' 43.91"E
B2	26° 4' 54.52"S	29° 19' 43.20"E
B3	26° 4' 30.49"S	29° 19' 35.61"E
B4	26° 4' 18.51"S	29° 19' 34.75"E
B5	26° 3' 44.38"S	29° 19' 37.69"E
B6	26° 3' 21.10"S	29° 19' 10.70"E
B7	26° 3' 24.15"S	29° 18' 56.88"E
B8	26° 3' 0.11"S	29° 18' 22.96"E

2.3 Project Phases

2.3.1 Planning and design phase

The planning and design phase will evaluate the necessary documentation that is required for the construction phase. This will include activities such as a route survey, line design, and ordering of poles.

2.3.2 Construction phase

Construction activities related to relocating and constructing the proposed powerline and associated infrastructure will be undertaken and will include the construction of foundations, planting the poles, stringing, hand-over and commissioning.

A laydown area may be developed within the existing mining area for the storage of material during the construction phase. This is not expected to be larger than 50m^2.

The portion of the existing 132 kV powerline which traverses the VDDC opencast mining area will be decommissioned once the new alignment has been constructed. This will involve:

- Removal of the conductor and dispatch back to the Eskom stores;
- Removal of the existing poles and sale as scrap metal;
- The existing foundations will remain in place, since these will be mined through as opencast mining at VDDC progresses

2.3.3 Operational phase

The operational phase will include the maintenance and management on the proposed relocated powerline. Once completed, this powerline will be operated by Eskom as part of its distribution network to sustain the 132kV network and surrounding areas with the required electricity. This will ensure that surrounding mines, such as Goedehoop Colliery's infrastructure and mining sections that are dependent on this power supply, will continue with conducting its mining activities as planned.

2.3.4 Decommissioning

The decommissioning phase will consider regulatory requirements in terms of demolishment and rehabilitation activities associated with the proposed relocated powerline, as well as managing and mitigating impacts associated with this phase.

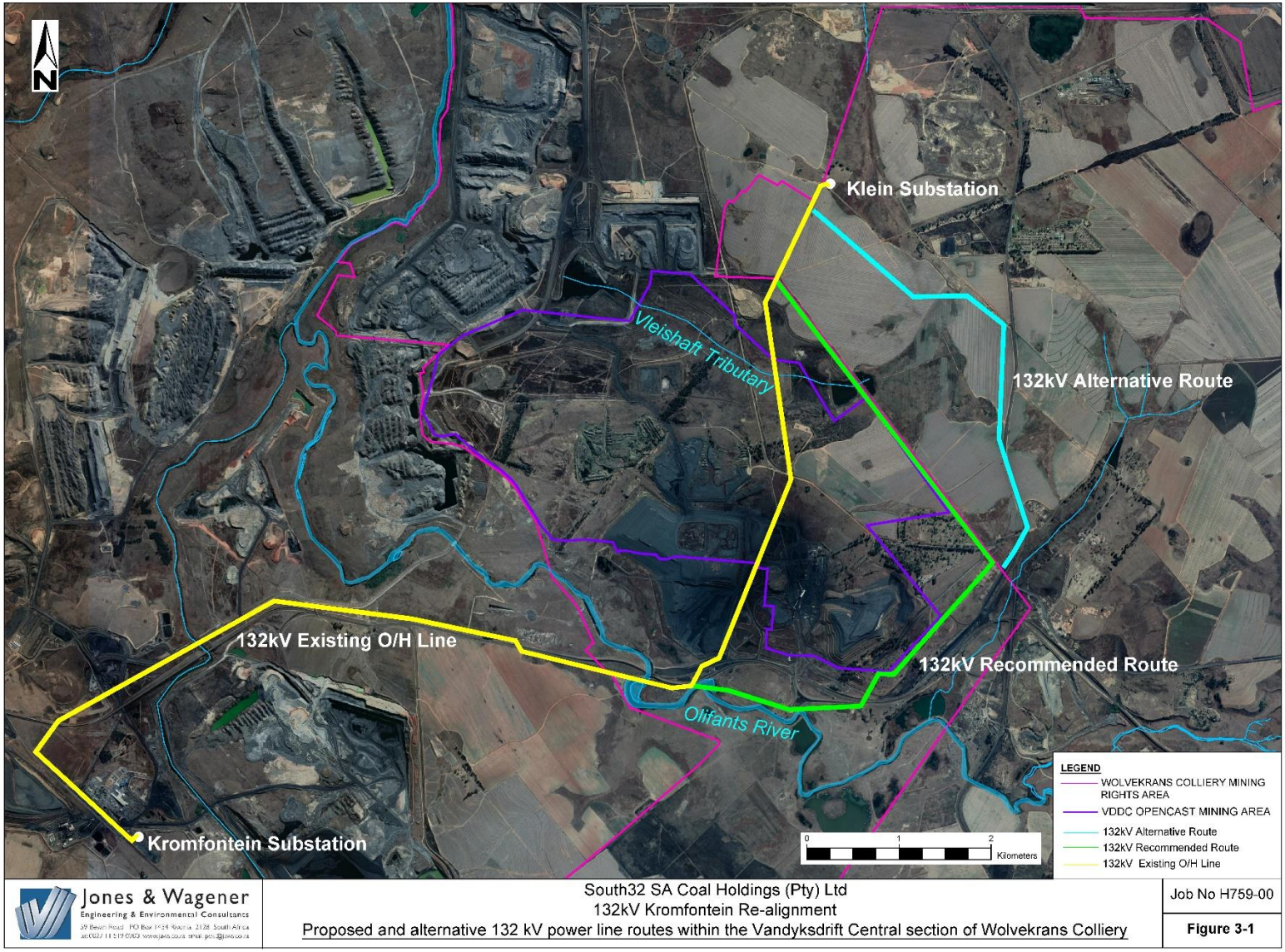

Figure 2-1:Proposed and alternative 132 kV powerline routes

3. BASELINE ASSESSMENT

3.1 Approach and Methodology

3.1.1 Soil Baseline Determination

Review of Existing Data/Reports

The first step of the baseline determination was to undertake a desktop review of all the available soil, land capability and land use reports for the nearby mining areas. These reports were supplemented by a site visit.

Soil Mapping

In the existing baseline report, soils were classified according to Taxonomic Soil Classification, a System for South Africa (Mac Vicar et al, 2nd edition 1991). In order to allow consistency, the same system was used in this report. The following soil characteristics were documented:

- Soil form and family;
- Soil horizons;
- Soil colour;
- Soil depth;
- Soil texture (Field determination);
- Wetness;
- Occurrence of concretions or rocks;
- Land Use; and
- Underlying material (if possible).

As the position of the pylons have not yet been fixed, the assessment was undertaken within a 100m wide corridor along each of the route alternatives. The above information was gathered by augering the soil at 100m intervals along the proposed corridors, where no baseline information was available.

3.1.2 Land Capability Baseline

The above information was used to determine the land capability units as prescribed by the Chamber of Mines. The main land capability classes are agriculture, wilderness, wetland and grazing land. The criteria for this classification are set out below:

- Criteria for Wetland
    - Land with organic soils or supporting hygrophilous vegetation where soil and vegetation processes are water determined.
- Criteria for Arable land
    - Land, which does not qualify as a wetland.
    - The soil is readily permeable to a depth of 750 mm.
    - The soil has a pH value of between 4.0 and 8.4.
    - The soil has a low salinity and Sodium Absorption Ratio (SAR).

- The soil has less than 10% (by volume) rocks or pedocrete fragments larger than 100 mm in the upper 750 mm.
- Has a slope (in %) and erodibility factor (K) such that their product is <2.0.
- Occurs under a climate of crop yields that are at least equal to the current national average for these crops.

- Criteria for Grazing land
  - Land, which does not qualify as wetland or arable land.
  - Has soil, or soil-like material, permeable to roots of native plants, that is more than 250 mm thick and contains less than 50 % by volume of rocks or pedocrete fragments larger than 100 mm.
  - Supports, or is capable of supporting, a stand of native or introduced grass species, or other forage plants utilisable by domesticated livestock or game animals on a commercial basis.
- Criteria for Wilderness land
  - Land, which does not qualify as wetland, arable land or grazing land.

3.1.3 Baseline Reporting

The abovementioned data were included in the baseline report. Using the results from the above the soil form, land capability and land use maps were generated and described in this report.

3.1.4 Impact Assessment Reporting

Once the infrastructure was located and designed, an impact assessment was undertaken using the methodology prescribed in the EIA. This assessment is included in this Impact Assessment Report and will cover the construction, operational, closure and post closure phases.

3.2 Soil Baseline

3.2.1 Data Collection

Review of previous studies undertaken

The assessments listed below have been reviewed and extracts have been included in this assessment:

- 2006 Douglas EMP Amendment by Pulles Howard & De Lange Incorporated;
- 2013 Baseline Specialist Soils, Land Use and Land Capability Studies Impact Assessment and Management Plan by Earth Science Solutions;
- 2013 Vandyksdrift Central (VDDC) Project Preliminary Mine Closure Plan by SRK; and
- 2019 VDDC Central Infrastructure Project Soils and Land Capability Assessment by Jones & Wagener.

It was found that the preferred alternative is located on the edge of the VDDC mining area and the soils information for this section was readily available in the above reports. The second alternative was located outside of the available studies and was assessed in this assessment.

Additional fieldwork

In order to obtain the missing information, the site was visited on the 2nd of May 2019, and the soils augered with a hand bucket auger and assessed as per the methodology described in Section 6.1.

3.2.2 Soil Distribution

The major soil forms are closely associated with the lithologies from which the soils are derived (in-situ formation) as well as the topography and general geomorphology of the site. The site is mostly underlain by sandstone with several outcrops in both high- and low-lying areas on site.

The site drains southwestward towards the Olifants River, the main drainage feature in the region. Soil distribution follows a typical highveld plinthic catena, with the intermittent sandstone outcrops as described above.

As with any natural system, the transition from one system to another is often complex with multiple facets and variations over relatively small/short distances. However, in simplifying the trends mapped, the following major soil groupings pertain (refer to **Table 3-1**):

- The deeper and more sandy loam soils are considered High Potential soils and are distinguished by the better than average depth of relatively free draining soil to a greater depth (> 1,200mm). This group are recognisable by the subtleness of the mottling (water within the profile for less than 30% of the season), the greater depth of mottling within the profile (>500mm), while the resultant land capability is rated as moderate intensity grazing and/or arable depending on their production potential. These soils are generally much lower in clay than the associated wet based soils and more structured colluvial derived materials, have a distinctly weaker structure and are deeper and better drained (better permeability). The ability for water to move through these profiles is significantly better. The sandier texture of this soil group renders them more easily worked and renders then of a lower sensitivity (Deep >750mm).
- In contrast, the shallower and more structured materials are considered to be more sensitive and will require greater management if disturbed. This group of shallower and more sensitive soils (< 500mm) are associated almost exclusively with the sub outcropping of the sandstone parent materials (Karoo Sediments) (geology) at surface or with a ferricrete (ouklip) layer, and they constitute a relatively large percentage of the overall area of study.
- The third group of soils comprise those that are associated with perched soil water. These soils are characterised by relatively much higher clay contents (often of a swelling nature), poor intake rates, poor drainage, generally poor liberation of soil water and a restricted depth – often due to the inhibiting barrier within the top 700mm of the soil profile. These soils are generally associated with wetness within the top 500mm. These soils are easily recognised by the mottled red and yellow colours on low chroma background to the soil wet base. These soils are regarded as sensitive zones that will require authorisation/permission if they are to be impacted.

All areas included in the study have been captured in a GIS format and mapped according to their soil classification nomenclature.

Soil Forms Identified

A total of eight (8) soil forms were identified (**Table 3-1 and 3-2**) in the study area and the soil mapping is shown below in **Figure 3-1.**

Table 3-1: Soil Forms Identified

Soil	Soil Form	Area (ha)	% of Area
Red apedal	Hutton	51.81	37.4
	Bainsvlei		
Yellow-brown apedal	Avalon	3.29	2.4
Shallow	Mispah	59.6	43.0
	Dresden		
Wetland	Westleigh	3.3	2.4
	Katspruit		
Man-made	Witbank	17.1	12.4
Dam/Stream	Water	3.25	2.3
Total		**138.4**	**100**

It should be noted that the wetland soils should be regarded as sensitive.

Table 3-2: Soil Forms Identified per Corridor[1]

Soil	Soil Form	Corridor 1 (ha)	Corridor 2 (ha)
Red apedal	Hutton	22.56	29.23
	Bainsvlei		
Yellow-brown apedal	Avalon	3.3	0
Shallow	Mispah	33.83	51.34
	Dresden		
Wetland	Westleigh	3.3	2.23
	Katspruit		
Man-made	Witbank	15.73	17.11
Dam/Stream	Water	3.2	0
Total		**81.92**	**99.91**

[1] Note that the southern section of the two alternative corridors are the same and therefore this area is reflected in the statistics for both options

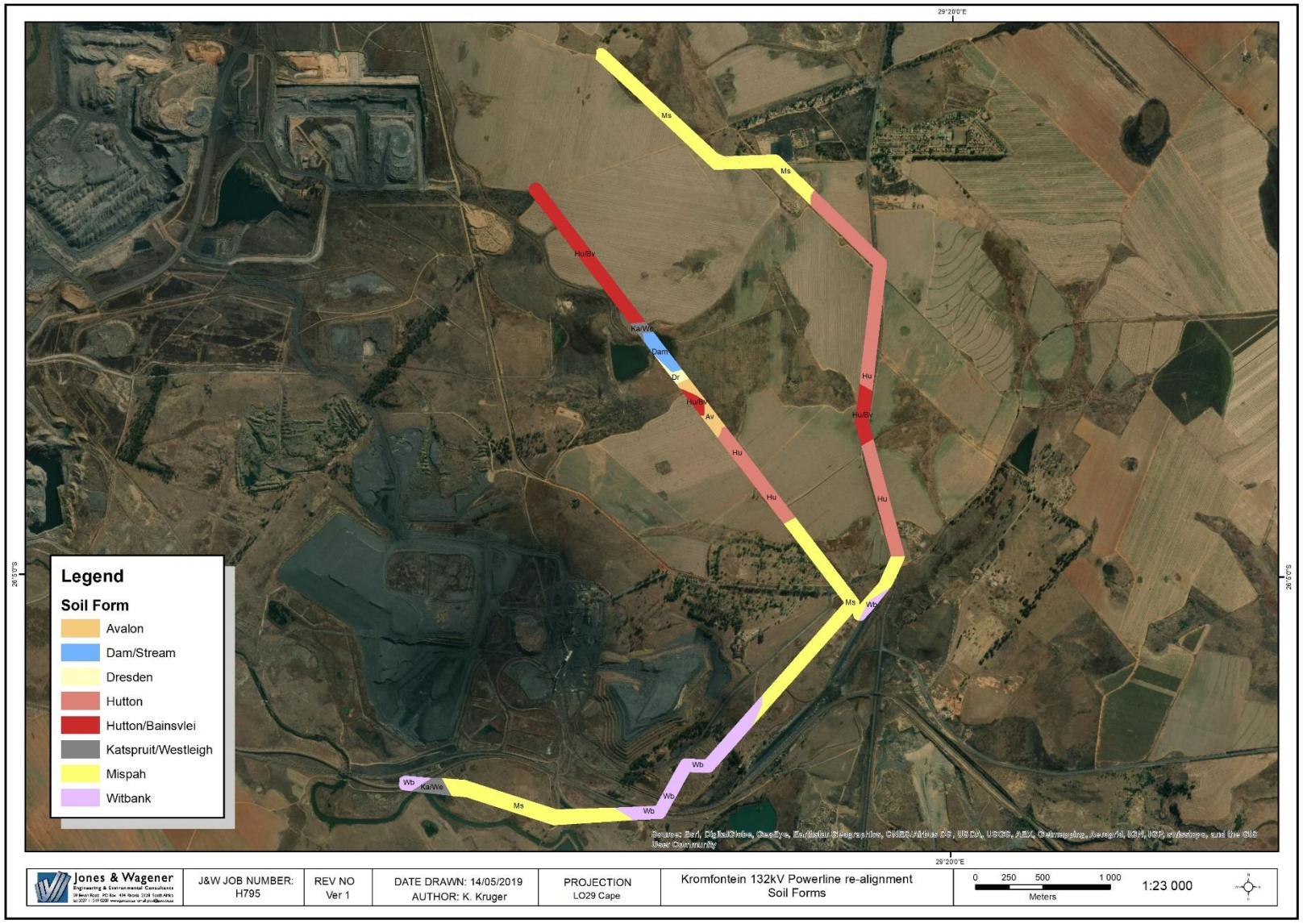

Figure 3-1:Soil forms identified within the power line corridors

3.2.3 Soil Chemical Properties

Soil chemical analysis was performed as part of the 2013 ESS assessment on the VDDC soils. This assessment did not include soils analysis, hence the results below are extracted and extrapolated from the 2013 ESS assessment.

The soils range from very well sorted sandy loams with lower than average nutrient stores and moderate clay percentages (<20% - B2/1) to soils with a moderately stratified to weak blocky structure, sandy loam to clay loam texture and varying degrees of utilizable nutrients, generally associated with the colluvial derived materials, while soil with high clays and extremes of structure were sampled from the bottomlands and lower slope positions where the soils are generally wet based and wetland derived.

In general, the pH ranges from acid at 5.8 to neutral and slightly alkaline at 7.5 (extremes of highly acid at 4 and relatively alkaline at 8), a base status ranging from 2.3me% to 22me% (Eutrophic (slight leaching status) to Dystrophic (high leaching status)), and nutrient levels reflecting generally moderate to good reserves of calcium and magnesium but deficiencies in the levels of sodium, potassium, phosphorous and zinc, with low stores of organic carbon matter.

The more structured (moderate crumby to blocky) and associated sandy and silty clay loams returned values that are indicative of the more iron rich materials and more basic lithologies that have contributed to the soils mapped. They are inherently low in potassium reserves and returned variable but generally lower levels of phosphorous.

The growth potential on soils with these nutrient characteristics is at best moderate to poor and additions of nutrient and compost are necessary if commercial returns are to be achieved from these soils. They are at best moderate grazing lands. The chemistry of the dominant soil forms is given in ***Table 3-3****.*

The results are from the report by ESS in 2013 and did not include a map of the location of the sampling points.

Table 3-3: Soil Chemistry of the Main Soil Forms (ESS, 2013)

Sample No.	VD1	VD2	VD3	VD4	VD5	VD6	VD7	VD8	VD9	VD10	VD11	VD12	VD13	VD14	VD15	VD16	VD17	VD18	VD19
Soil Form	Hu	Cv	Av	Sd/Hu	Gc	Gc	Ms	Pn	Av	Ka	Hu	Ka/Kd	Cv/Gf	Kd	Dr	We	Lo	Lo/Ka	Rg
Constituents																			
pH	6.2	6.25	8	6	6.1	5.5	4.5	6.5	6	5.2	6.4	7.1	5	6.4	6.1	6.4	5	6.4	5.5
"S" Value	2.3	11.2	3.1	22.8	1.2	22.1	0.6	14.8	8.9	31	11	22.4	3.8	22	5.2	5.8	1.17	7.34	33
Ca Ratio	102	59	132	68	126	66	52	65	70	62	65	54	66	49	70	65	89	201	62
Mg Ratio	51	16	49	34	36	30	26	32	24	34	22	33	22	28	28	10	37	92	34
K Ratio	6	18	4	4	0.3	1	6	1	4	7	4	10	5	8	1	12	10	1	9
Na Ratio	0.3	0.2	0.3	0.4	0.3	0.2	1.3	1.6	0.3	1.1	0.5	0.4	0.3	0.3	1.4	0.2	0.5	1	0.8
P	31	111	9	12	14	8	32	6	22	17	10	18	11	15	5	82	22.4	20.9	20
Zn	4.5	7.2	2.4	2	1.5	1	1.3	1.1	2	1.4	1.5	1.7	1.4	1.4	1	1.6	1.4	1.8	1.1
Organic Carbon	0.25	0.28	0.29	0.20	0.14	0.20	0.25	0.40	0.49	0.35	0.60	0.26	0.18	0.25	0.30	0.55	0.30	0.45	0.40
Sand	72	45	74	42	78	34	80	46	42	18	52	21	45	21	58	44	86	18	16
Silt	9	39	9	26	6	38	9	46	36	22	30	24	43	27	34	35	9	13	26
Clay	19	16	17	32	16	28	11	8	22	60	18	55	12	52	8	21	5	69	58

3.3 Land Capability Baseline

3.3.1 Data Collection

The following data was obtained and studied for the desktop study and literature review in addition to the reports listed in Section 6.2:

- Land type data for the site was obtained from the Institute for Soil Climate and Water (ISCW) of the Agricultural Research Council (ARC);
- Broad geological, soil depth and soil description classes were obtained from the Department of Environmental Affairs and studied;

3.3.2 Baseline Land Capability Description

The "land capability classification" (Chamber of Mines and Canadian Land Inventory) as described above was used to characterise and classify the soil polygons or units of land identified during the pedological survey.

These variables (depth, structure, texture etc.) combined with the geomorphological aspects (ground roughness, topography, climate etc.) of the site were then employed to rate the capability of the land in question.

The area to be disturbed by the power line re-alignment infrastructure comprises a range of soils with a resultant range of land capability classes. **Figure 3-2** illustrates the distribution of land capability classes across the study areas and the area of each is summarised in **Table 3-4 and 3-5**.

Table 3-4: Combined land capability

Land Capability	Area (ha)	% of total area
Arable	51.8	37.4
Grazing	3.3	2.4
Wetlands	3.3	2.4
Wilderness	59.6	43.0
Water	3.2	2.3
Disturbed Land	17.1	12.4
Total	**138.4**	**100**

Table 3-5: Land capability per corridor

Land Capability	Corridor 1 (ha)	Corridor 2 (ha)
Arable	22.56	29.23
Grazing	3.3	0
Wetlands	3.3	2.23
Wilderness	33.83	51.34
Water	3.2	0
Disturbed Land	15.73	17.11
Total	**81.92**	**99.91**

Arable Land

There are several areas of arable land potential soils found on site. Soil depths are reflective of an arable status (>750mm), the growth potential (nutrient status and soil water capabilities) and ability of these soils to return a cropping yield equal to or better than the national average is moderate with the ambient nutrient status measured. This is due mainly to the fluctuating soil depths and the highveld climate. These variables reflect the natural conditions, and do not include any man induced additives such as fertilizers or water.

Grazing Land

The classification of grazing land is generally confined to the shallower and transitional zones that are well drained. These soils are generally darker in colour and are not always free draining to a depth of 750mm but are capable of sustaining palatable plant species on a sustainable basis. In addition, there should be no rocks or pedocrete fragments in the upper horizons of this soil group. If rocks are present it will limit the land capability to wilderness land. A small portion of the study area comprises soils with a grazing land potential.

Wilderness Land

The shallow rocky areas are characteristically poorly rooted and support at best very low intensity grazing, or more realistically are of a Wilderness character and rating. This land capability type covers the bulk of the study area, mostly due to shallow sandstone layers found on site.

Disturbed Land

The areas that are currently disturbed by mining, railway lines and coal export facilities have been grouped into this category, covering a small portion of the study area.

Wetland

Wetland areas in this document (soils and land capability) are limited to only the soil aspects described in the wetland delineation guidelines, which use both soil characteristics, the topography as well as flora and fauna criteria to define the domain limits (a separate wetland assessment has been undertaken).

These zones (wetlands) are dominated by hydromorphic soils (wet based) that often show signs of moderately strong to strong structure and have plant life (vegetation) that is associated with seasonal wetting or permanent wetting of the soil profile (separate study). All of these aspects are significant and render the majority of the wet based soils sensitive to being disturbed.

The wetland soils are generally characterised by dark grey to black (organic carbon) in the topsoil horizons and are often high in transported clays and show variegated signs of mottling on gleyed backgrounds (pale grey colours) in the subsoils. Wetland soils occur within the zone of soil water influence.

These zones are considered very important, highly sensitive and vulnerable due to their ability to contain and hold water for periods through the summers and into the dry winter seasons. Only a small portion of the site, within the Olifants River floodplain and along an unnamed tributary fall within this class.

3.4 Land Use Baseline

3.4.1 Data Collection

Desktop land cover data was visually assessed and during the site visit as part of the ground truthing, and general land use for the area. In terms of land use planning, the site falls within the eMalahleni Local Municipality. Additional information was obtained from the SANBI/CSIR National Land Cover Dataset 2014.

3.4.2 Land Use Baseline Description

The land use of the VDDC area is shown in **Figure 3-3** and listed in **Table 3-6 and 3-7** below. The dominant land uses on site are cultivation and open grasslands. These are followed by mining, developed land, bush and wetlands. The minor land uses include water, shrubland and bare ground.

Table 3-6: Combined Corridor Land Use

Land Use	Ha	%
Water seasonal	0.54	0.39
Water permanent	0.63	0.46
Wetlands	3.06	2.21
Bush	7.11	5.15
Grassland	51.84	37.52
Shrubland	0.45	0.33
Cultivation	53.64	38.83
Mining	12.6	9.12
Bare Ground	0.09	0.07
Developed	8.19	5.93
Total	**138.15**	**100%**

Table 3-7: Land Use per Corridor

Land Use	Corridor 1 (ha)	Corridor 2 (ha)
Water seasonal	0.54	0.36
Water permanent	0.63	0.18
Wetlands	2.52	0.9
Bush	3.6	6.75
Grassland	35.37	42.39
Shrubland	0.09	0.45
Cultivation	20.97	32.67
Mining	11.7	12.6
Bare Ground	0.09	0.09
Developed	6.74	4.4
Total	**83.25**[2]	**101.79**

[2] The land use assessment was based on a 10x10m raster grid that is slightly larger in area than the corridors assessed for the soil and land capability tables, hence the slightly larger footprint reflected in the table.

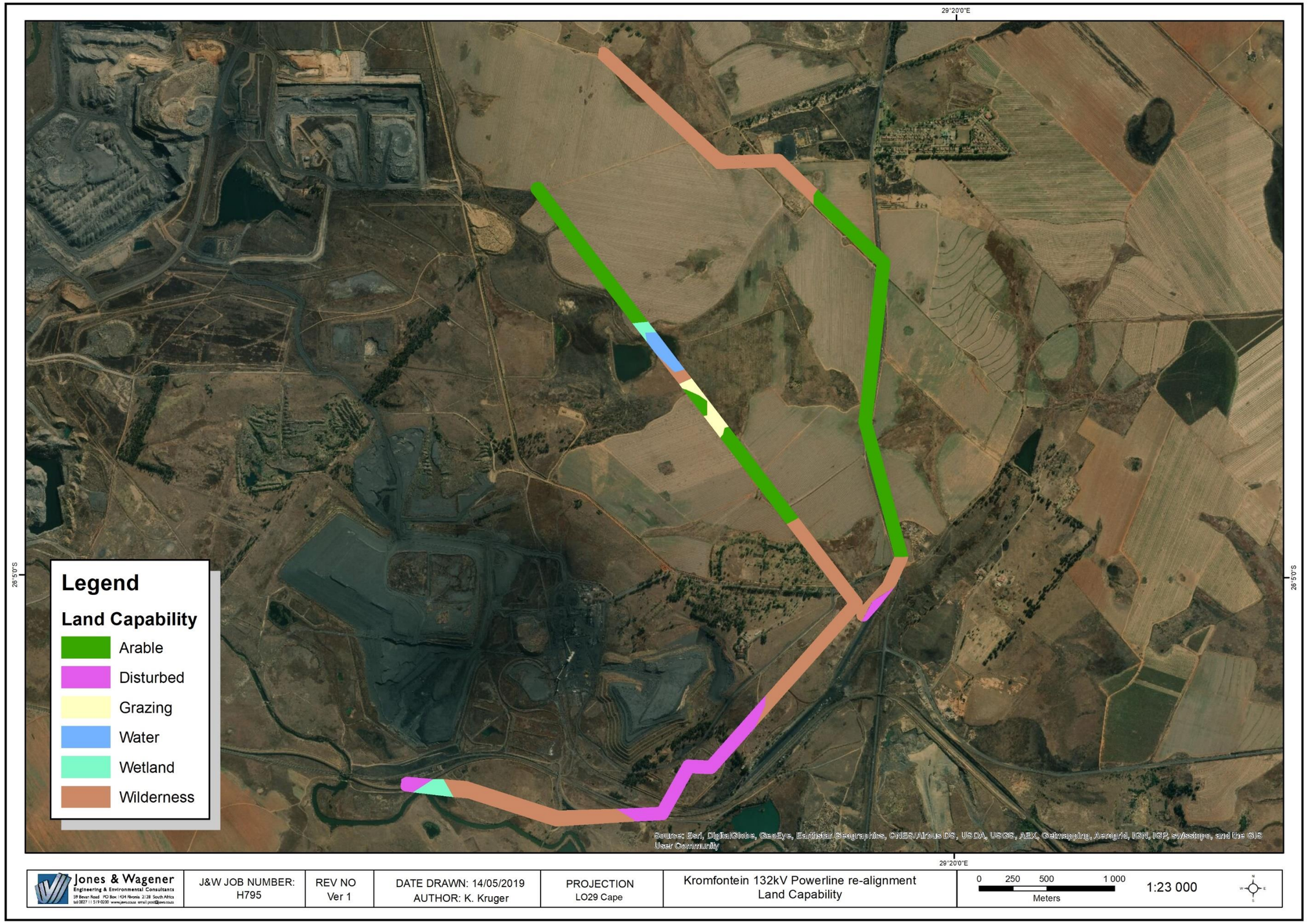

Figure 3-2:Land Capability for the power line corridors

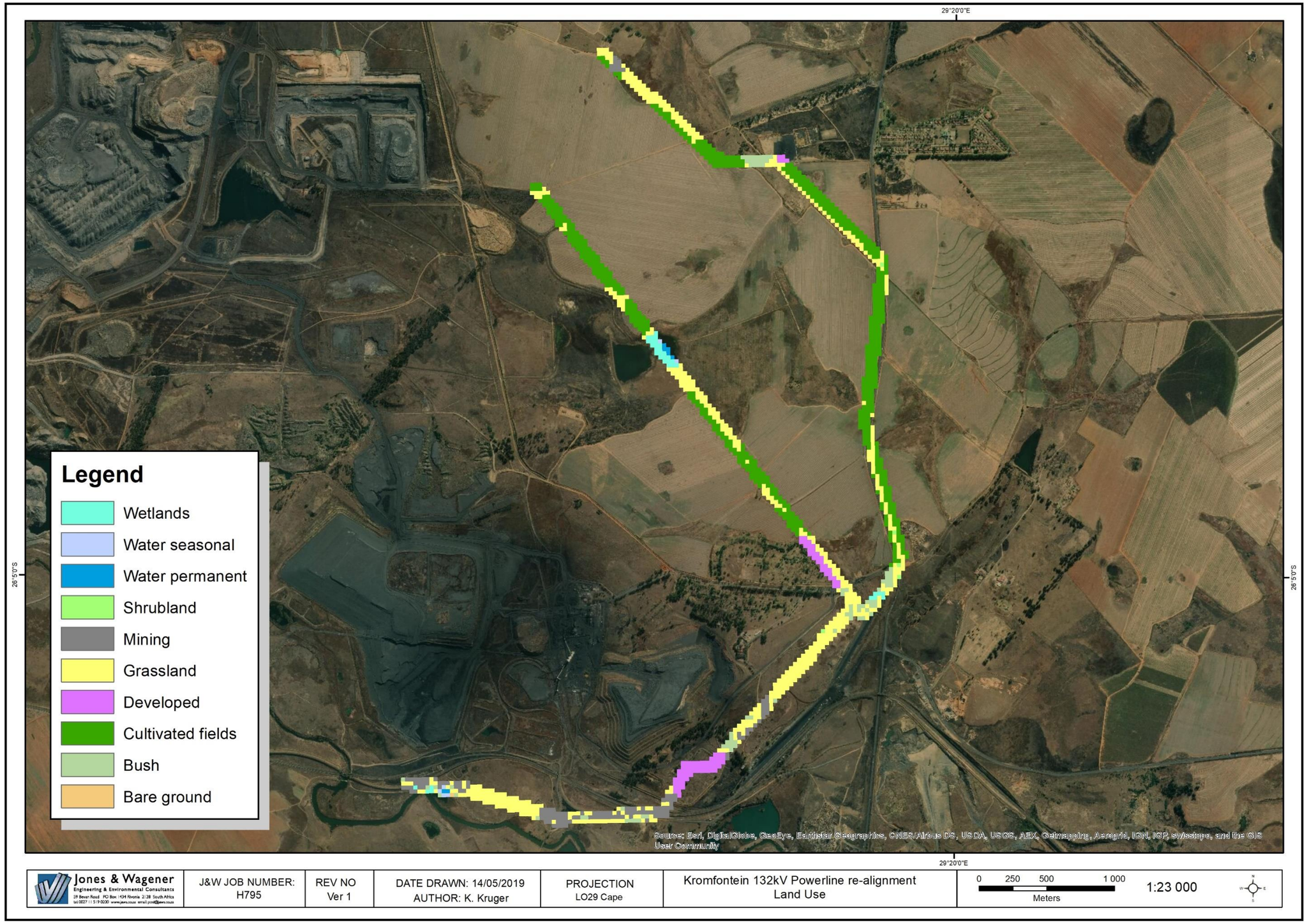

Figure 3-3:Land use for the power line corridors (CSIR/SANBI 2014)

4. IMPACT ASSESSMENT METHODOLOGY

In order to ensure uniformity, a standard impact assessment methodology will be utilised so that a wide range of impacts can be compared. The impact assessment methodology makes provision for the assessment of impacts against the following criteria:

- Significance;
- Spatial scale;
- Temporal scale;
- Probability; and
- Degree of certainty.

A combined quantitative and qualitative methodology will be used to describe the impacts for each of the aforementioned assessment criteria. A summary of each of the qualitative descriptors along with the equivalent quantitative rating scale for each of the aforementioned criteria is given in **Table 4-1**.

Table 4-1: Quantitative rating and equivalent descriptors for the impact assessment criteria

RATING	SIGNIFICANCE	EXTENT SCALE	TEMPORAL SCALE
1	VERY LOW	*Isolated corridor / proposed corridor*	Incidental
2	LOW	*Study area*	Short-term
3	MODERATE	*Local*	Medium-term
4	HIGH	*Regional / Provincial*	Long-term
5	VERY HIGH	*Global / National*	Permanent

A more detailed description of each of the assessment criteria is given in the following sections.

4.1 Significance Assessment

Significance rating (importance) of the associated impacts embraces the notion of extent and magnitude but does not always clearly define these since their importance in the rating scale is very relative. For example, the magnitude (i.e. the size) of area affected by atmospheric pollution may be extremely large (1000km^2) but the significance of this effect is dependent on the concentration or level of pollution. If the concentration is great, the significance of the impact would be HIGH or VERY HIGH, but if it is diluted it would be VERY LOW or LOW. Similarly, if 60 ha of a grassland type are destroyed the impact would be VERY HIGH if only 100 ha of that grassland type were known. The impact would be VERY LOW if the grassland type was common. A more detailed description of the impact significance rating scale is given in **Table 4-2** below.

Table 4-2: Description of the significance rating scale

RATING		DESCRIPTION
5	VERY HIGH	Of the highest order possible within the bounds of impacts which could occur. In the case of adverse impacts: there is no possible mitigation and/or remedial activity which could offset the impact. In the case of beneficial impacts, there is no real alternative to achieving this benefit.
4	HIGH	Impact is of substantial order within the bounds of impacts, which could occur. In the case of adverse impacts: mitigation and/or remedial activity is feasible but difficult, expensive, time-consuming or some combination of these. In the case of beneficial impacts, other means of achieving this benefit are feasible but they are more difficult, expensive, time-consuming or some combination of these.
3	MODERATE	Impact is real but not substantial in relation to other impacts, which might take effect within the bounds of those which could occur. In the case of adverse impacts: mitigation and/or remedial activity are both feasible and fairly easily possible. In the case of beneficial impacts: other means of achieving this benefit are about equal in time, cost, effort, etc.
2	LOW	Impact is of a low order and therefore likely to have little real effect. In the case of adverse impacts: mitigation and/or remedial activity is either easily achieved or little will be required, or both. In the case of beneficial impacts, alternative means for achieving this benefit are likely to be easier, cheaper, more effective, less time consuming, or some combination of these.
1	VERY LOW	Impact is negligible within the bounds of impacts which could occur. In the case of adverse impacts, almost no mitigation and/or remedial activity is needed, and any minor steps which might be needed are easy, cheap, and simple. In the case of beneficial impacts, alternative means are almost all likely to be better, in one or a number of ways, than this means of achieving the benefit. Three additional categories must also be used where relevant. They are in addition to the category represented on the scale, and if used, will replace the scale.
0	NO IMPACT	There is no impact at all - not even a very low impact on a party or system.

4.2 Spatial Scale

The spatial scale refers to the extent of the impact i.e. will the impact be felt at the local, regional, or global scale. The spatial assessment scale is described in more detail in **Table 4-3**.

Table 4-3: Description of the spatial rating scale

RATING		DESCRIPTION
5	Global/National	The maximum extent of any impact.
4	Regional/Provincial	The spatial scale is moderate within the bounds of impacts possible and will be felt at a regional scale (District Municipality to Provincial Level). The impact will affect an area up to 50km from the proposed site / corridor.
3	Local	The impact will affect an area up to 5km from the proposed route corridor / site.
2	Study Area	The impact will affect a route corridor not exceeding the boundary of the corridor / site.
1	Isolated Sites / proposed site	The impact will affect an area no bigger than the corridor / site.

4.3 Duration Scale

In order to accurately describe the impact, it is necessary to understand the duration and persistence of an impact in the environment. The temporal scale is rated according to criteria set out in **Table 4-4**.

Table 4-4: Description of the temporal rating scale

RATING		DESCRIPTION
1	Incidental	The impact will be limited to isolated incidences that are expected to occur very sporadically.
2	Short-term	The environmental impact identified will operate for the duration of the construction phase or a period of less than 5 years, whichever is the greater.
3	Medium term	The environmental impact identified will operate for the duration of life of the project.
4	Long term	The environmental impact identified will operate beyond the life of operation.
5	Permanent	The environmental impact will be permanent.

4.4 Degree of Probability

The probability or likelihood of an impact occurring will be described, as shown in **Table 4-5** below.

Table 4-5: Description of the degree of probability of an impact occurring

RATING	DESCRIPTION
1	Practically impossible
2	Unlikely
3	Could happen
4	Very Likely
5	It's going to happen / has occurred

4.5 Degree of Certainty

As with all studies it is not possible to be 100% certain of all facts, and for this reason a standard "degree of certainty" scale is used as discussed in **Table 4-6**. The level of detail for specialist studies is determined according to the degree of certainty required for decision-making. The impacts are discussed in terms of affected parties or environmental components.

Table 4-6: Description of the degree of certainty rating scale

RATING	DESCRIPTION
Definite	More than 90% sure of a particular fact.
Probable	Between 70 and 90% sure of a particular fact, or of the likelihood of that impact occurring.
Possible	Between 40 and 70% sure of a particular fact, or of the likelihood of an impact occurring.
Unsure	Less than 40% sure of a particular fact or the likelihood of an impact occurring.
Can't know	The consultant believes an assessment is not possible even with additional research.

4.6 Quantitative Description of Impacts

To allow for impacts to be described in a quantitative manner in addition to the qualitative description given above, a rating scale of between 1 and 5 was used for each of the assessment criteria. Thus, the total value of the impact is described as the function of significance, spatial and temporal scale as described below.

$$\textit{Impact Risk} = \frac{(\text{SIGNIFICANCE} + \textit{Spatial} + \text{Temporal})}{3} \times \frac{\text{Probability}}{5}$$

An example of how this rating scale is applied is shown in **Table 4-7**.

Table 4-7: Example of Rating Scale

IMPACT	SIGNIFICANCE	SPATIAL SCALE	TEMPORAL SCALE	PROBABILITY	RATING
	LOW	*Local*	Medium Term	*Could Happen*	
Impact to air	**2**	***3***	**3**	**3**	**1.6**

Note: The significance, spatial and temporal scales are added to give a total of 8, that is divided by 3 to give a criteria rating of 2,67. The probability (3) is divided by 5 to give a probability rating of 0,6. The criteria rating of 2,67 is then multiplied by the probability rating (0,6) to give the final rating of 1,6.

The impact risk is classified according to 5 classes as described in **Table 4-8**.

Table 4-8: Impact Risk Classes

RATING	IMPACT CLASS	DESCRIPTION
0.1 – 1.0	1	Very Low
1.1 – 2.0	2	Low
2.1 – 3.0	3	Moderate
3.1 – 4.0	4	High
4.1 – 5.0	5	Very High

5. IMPACT ASSESSMENT

The impact assessment was undertaken for the project components described in Section 4 above. The sections below described the various soil impacts per project phase, prior to assessing the impacts. The impact assessment is summarised in **Table 5-3** at the end of this section.

5.1 Initial Impact (Baseline)

The area of assessment includes the corridors shown in **Figure 3-3** above. Each corridor investigated is 100m wide, and the areas reported below are calculated per corridor. As noted in **Table 3-4 to 3-7**, the dominant land uses and capabilities are cultivation and grazing/wilderness. Mining and development only make up 15% of the area investigated and have impacted the soils in isolated areas.

5.2 Additional Impact (Project only)

5.2.1 Construction Phase

During the construction phase the work carried out will mainly be the construction of the power line pylon footings and the stringing of the conductors. This will entail the clearing and excavation of the pylon foundations, the casting of concrete, the erections of the towers and then lastly the stringing of the conductors.

The overall impact will be loss of topsoil as a result of soil removal, erosion and possible contamination of the soil by fuel and oils from machinery. Soil compaction caused by heavy vehicles and machinery surrounding the pit areas could also be a problem.

The impact to soils will be limited to the pylon footings. These excavations will be 2-3m deep and depending on the tower type and topography, 300 – 500m apart. The exact area of the pylon footing was not available at the time of assessment, and it was therefore assumed to be 3 x 3m. The equates to an impact of $9m^2$ per pylon, every 3ha of corridor (assuming a pylon every 300m along a 100m wide corridor).

Tables 5-1 and 5-2 below summarises the impact of each corridor on the soils and land capability. From the tables it is clear that Corridor 2 has a larger impact as the route is significantly longer. In terms of potential sensitivities, Corridor 1 has an additional wetland area to cross.

Table 5-1: Impacts to Soil Forms

Impact Area	Av	Hu	Hu/ Bv	Ka/ We	Ms/ Dr	Wb	Dam	Total
Corridor 1 (m^2)	9.9	25	42.8	10	104.7	47.3	9.7	**249.4**
Corridor 2 (m^2)		49	12.5	6.7	154	51.4		**299.8**

Table 5-2: Impacts to Land Capability

Impact Area	Arable	Disturbed	Grazing	Wilderness	Wetland	Grand Total
Corridor 1 (m^2)	67.7	47.3	9.9	104.7	19.7	**249.4**
Corridor 2 (m^2)	87.7	51.4		154	6.7	**299.8**

The impact of both route options is similar, hence the rating given below applies to both alternatives.

The initial impact during the construction phase is rated as probable, LOW, long term impact on the *proposed infrastructure sites*. This impact is going to happen and is rated as a Moderate impact (2.3).

5.2.2 Operational Phase

During the operation phase the impacts created by construction of the foundations will persist, as those areas of soil will be sterile for other land uses. It is not anticipated that any other impacts will occur during this phase.

The initial impact during the operational phase is rated as probable, LOW, long term impact on the *proposed infrastructure sites*. This impact is going to happen and is rated as a Moderate impact (2.3).

5.2.3 Rehabilitation and Closure Phase

During rehabilitation and closure the pylons will be removed and the foundations broken up. It is assumed that the land use will be returned to agriculture or grazing depending on the surrounding land use/capability.

The initial impact during the rehabilitation and closure phase is rated as probable, VERY LOW POSITIVE, long term impact on the *proposed infrastructure sites*. This impact could happen and is rated as a Low positive impact (1.2).

5.3 Cumulative Impact (Project with Baseline)

The cumulative impact assessment combines the project only impact (additional impact) with the baseline (initial impact) per project phase.

5.3.1 Construction phase

The baseline impact rated as a Moderate Impact. With the additional Moderate Impact of the construction phase, the overall cumulative impact to soils will remain a Moderate Impact.

5.3.2 Operational Phase and Closure Phase

During operation and closure the impact to soils will be minimal, other than those already impacted by construction. These impacts will persist during operations and be removed during closure. Viewed in combination with the background impacts, the cumulative impact will remain a Moderate Impact.

5.4 Mitigation Measures

The aim of mitigation measures is twofold, they either prevent an impact from occurring, or they reduce the significance/duration/extent of the impact once it occurs. The following mitigation measures are proposed for the project to assist in mitigating the impacts on soils, land capability and land use.

5.4.1 Construction and Operational Phase

- Pylon positions should avoid wetland soils as far as possible;
- Foundation excavated soil should be utilised to mitigate construction impacts along the proposed route;
- Foundations are to be clearly demarcated on site layout plans. Indicate the soil to be excavated as well as those to be avoided to ensure that impacts to wetland soils are avoided as far as possible;

- Impacts to be limited to the pylon foundations, no other excavations to be allowed along the route;
- Traffic to be limited to existing roads as far as possible, and the creation of new roads to be kept to the absolute minimum;
- If erosion occurs, corrective actions must be taken to minimise any further erosion from taking place. Erosion to be monitored monthly during the rainy season while construction is taking place;
- Prevent any spills from occurring. If a spill occurs, it is to be cleaned up immediately and reported to the appropriate authorities;
- All vehicles are to be serviced in a correctly bunded area or at an off-site location; and
- Leaking vehicles should have drip trays place under them where the leak is occurring.

5.4.2 Rehabilitation and Closure Phase

- Ensure that the rehabilitation integrates the cleared pylon areas with the surrounding land use as far as possible;
- All steel structures and foundations to be removed, the soil landscaped and the vegetation to establish naturally.

5.5 Residual Impact (Implemented Mitigation Measures)

The residual impact assesses the impact considering that the mitigation measures mentioned above have been successfully implemented.

5.5.1 Construction phase

The construction phase residual impact will probably remain a LOW, medium term impact on the *proposed infrastructure sites*. This impact is going to happen and is rated as a Low impact (2).

5.5.2 Operational Phase

The operational phase residual impact will probably remain a LOW, medium-term impact on the *isolated sites*. This impact will occur and cannot be avoided hence the rating remains a Low Impact (rating 2).

5.5.3 Rehabilitation and Closure Phase

The effects of rehabilitating the pylon foundations and re-establishing the soil will probably have a LOW POSITIVE impact, in the long term on the *proposed infrastructure sites.* This impact could happen and is rated as a Low positive impact (1.4)

Table 5-3: Impact Assessment Table:

Activity	Aspect	Impact	Mitigation	Criteria	Rating prior to mitigation		Cumulative rating		Rating post mitigation	
Construction Phase										
Site preparation and construction	Soils, Land Capability and Land Use	**NEGATIVE IMPACT:** Clearing and excavation of pylon foundation soil will result in loss of soil/ land capability. Vehicle movement will result in compaction of soils. Soil contamination by hydrocarbons.	• Foundation excavated soil should be utilised to mitigate construction impacts along the proposed route; • Foundations are to be clearly demarcated on site layout plans. Indicate the soil to be excavated as well as those to be avoided to ensure that impacts to wetland soils are avoided as far as possible; • Ensure proper storm water control measures are put in place along any drainage line/wetland or stream; • Impacts to be limited to the pylon foundations, no other excavations to be allowed along the route; • Traffic to be limited to existing roads as far as possible, and the creation of new roads to be kept to the absolute minimum; • If erosion occurs, corrective actions must be taken to minimise any further erosion from taking place. Erosion to be monitored monthly during the rainy season while construction is taking place; • Prevent any spills from occurring. If a spill occurs, it is to be cleaned up immediately and reported to the appropriate authorities; • All vehicles are to be serviced in a correctly bunded area or at an off-site location; and • Leaking vehicles should have drip trays place under them where the leak is occurring.	Significance	2	**MODERATE**	4	**MODERATE**	2	**LOW**
				Spatial	1		1		1	
				Temporal	4		4		3	
				Probability	5		5		5	
Operational / Maintenance Phase										
Operations of powerline	Soils, Land Capability and Land Use	**NEGATIVE IMPACT:** Pylon foundations remain as does soil impact.	• Same as measures for construction	Significance	2	**MODERATE**	4	**MODERATE**	2	**LOW**
				Spatial	1		1		1	

Activity	Aspect	Impact	Mitigation	Criteria	Rating prior to mitigation		Cumulative rating		Rating post mitigation	
				Temporal	4		4		3	
				Probability	5		5		5	
Rehabilitation / Closure Phase										
Rehabilitation of powerline pylon sites	Soils and land capability	**POSITIVE IMPACT** Rehabilitation of soil, land capability and land use by removing pylons and replacing soil.	• Ensure that the rehabilitation integrates the cleared pylon areas with the surrounding land use as far as possible; • All steel structures to be removed, foundations to be removed and soil landscaped with vegetation to establish naturally.	Significance	1	**LOW POSITIVE**	4	**MODERATE**	2	**LOW POSITIVE**
				Spatial	1		1		1	
				Temporal	4		4		4	
				Probability	3		5		3	

6. MONITORING REQUIREMENTS

The critical phase of the development will be construction phase and the first following rainy season. It is therefore recommended that all the pylon footings and construction areas be inspected for signs of erosion at least monthly during construction, and throughout the first rainy season following the construction.

It is also recommended that the general construction aspects such as hydrocarbon spills, maintenance of vehicles and the placing of drip trays form part of the EMP and the performance auditing during construction. It is recommended that these aspects be monitored at least monthly during construction.

7. CONCLUSIONS AND RECOMMENDATIONS

7.1 Opinion on Proceeding with Project

The re-alignment of the Kromfontein 132kV powerline will have a low impact on the soil resources found on site. The impact will be very localised, as the soil at each pylon foundation will be removed, and the area sterilised for other land uses. The impact is estimated at 250 – 300m^2 of soils to be disturbed which is deemed an acceptable impact for a project of this nature.

It is the opinion of this specialist that the development should be allowed to proceed, as there is no soil, land capability or land uses that would prohibit the development.

7.2 Preferred alternative

The project provided two route alternatives, alternative A (preferred) and alternative B. In terms of the soil, land capability and land use impacts, alternative A is a shorter route, and is located on the maximum amount of mine-impacted property. Alternative B is longer and spans more agricultural land.

Both alternatives start within the Olifants River floodplain, and pylon placement is of key importance, but it does not distinguish between the alternatives. Alternative A does, however, include a second stream/dam crossing. Alternative A is preferred (corridor 1).

7.3 Conditions for approval

It is recommended that the mitigation measures proposed in this report, be included in the conditions for approval.

8. REFERENCES

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Konrad Kruger
Specialist

Tolmay Hopkins
Project Manager

for Jones & Wagener

21 June 2019
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APPENDIX A

CURRICULUM VITAE

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CURRICULUM VITAE

01 January 2019
kruger_specialistcv_jan2018

KONRAD KRÜGER

Profession	Environmental Scientist
Date of Birth	20 November 1981
Position in firm	Senior Environmental Scientist
Years with the firm	6 years 2 months
Nationality	South African
Education / Qualifications	BSc Honours (Geography) University of Pretoria 2003 (cum laude) BSc Environmental Sciences, University of Pretoria 2002
Languages	Afrikaans, English
Employers	
2005 – 2009	Cymbian Enviro-Social Consulting Services (Randburg) - Environmental Consultant
2009 – 2012	Zitholele Consulting (Pty) Ltd (Midrand) - Environmental Consultant
2012 – Current	Jones & Wagener (Pty) Ltd - Senior Environmental Scientist

About Konrad Krüger

Konrad graduated from the University of Pretoria with a BSc in Environmental Science in 2002 and BSc Honours in Geography in 2003. He has been involved in a variety of environmental projects in the last twelve years and has undertaken a variety of specialist studies, mapping and environmental consulting. The specialist studies included vegetation assessments, soil mapping and agricultural assessments, wetland delineations, visual assessments and terrestrial ecological assessments.

Areas of Expertise

<u>Specialist Assessments:</u>

- Soils and Land Capability / Agricultural Potential;
- Wetland Delineation;
- Flora Assessments;
- Terrestrial Ecological Assessment;

- Visual Impact Assessment; and
- GIS (ArcGIS 10)

Professional Affiliations

- International Association of Impact Assessors (South Africa)
- Land and Rehabilitation Society of South Africa (LARSSA)

Relevant Experience

Wetland Delineation

1. Wetland Assessment for the proposed Era Stene expansion – Delmas, South Africa – Era Stene - 2016
2. Wetland delineation for the proposed Pongola-Candover 132 kV powerline – Pongola, South Africa – Eskom Eastern Regions - 2014
3. Wetland delineation for the proposed Ndumo-Gezisa 132 kV powerline – Pongola, South Africa – Eskom Eastern Regions - 2014
4. Wetland delineation for EnviroServ Holfontein – Holfontein, South Africa – EnviroServ - 2012
5. Wetland delineation for the extension of the Camden Power Station Ash Dump - Ermelo, South Africa - Eskom Generation – 2012
6. Wetland delineation for the proposed Solar Integration Project and the CSP amendment - Upington, South Africa - Eskom Transmission - 2012
7. Dragline Relocation Wetland Assessments and GIS mapping - Kriel, South Africa - Xstrata Coal South Africa – Rietspruit - 2007
8. Conducted the wetland assessment and associated GIS for the integration of the Bravo (Kusile) power station into the Eskom grid. Five EIAs for the proposed construction of overhead power lines and associated infrastructure for the Bravo Integration Project. - Gauteng and Mpumalanga, South Africa - Eskom – Bravo Integration Project – 20009
9. Conducted the wetland assessment and associated GIS for the proposed railway line to the Kusile power station. - Gauteng and Mpumalanga, South Africa - Eskom – Kusile Railway Line - 2010
10. Wetland delineation for the proposed Braamhoekspruit Bridge upgrade WUL. - KwaZulu Natal, South Africa - Eskom – Ingula bridge - 2010
11. Wetland Delineation for the proposed Ingula burial grounds near Van Reenen. - KwaZulu Natal, South Africa - Eskom – Ingula burial ground - 2011
12. Wetland risk assessment for the proposed substation alternatives and connecting power lines. - Gauteng, South Africa - Eskom – Bapsfontein - 2010
13. Wetland risk assessment for the proposed substation and connecting power lines. - Limpopo, South Africa - Eskom – Tabor - 2011
14. Route selection report and associated wetlands assessment for 2 power line route alternatives in Wilgeheuwel. - Gauteng, South Africa - Johannesburg City Power - 2007
15. Wetland delineation for the proposed storm water system upgrade in Soweto - Gauteng, South Africa - Johannesburg Road Agency - 2010
16. Wetland delineation for the proposed Teak Place Estate Development in the Cradle of Humankind. - Cradle of Humankind, South Africa - Teak Place Estate Development – 2007
17. Wetland delineation for the Pala Meetse Eco Estate, Modimolle. - Limpopo Province, South Africa - Pala Meetse Eco Estate - 2008
18. Wetland delineation for the N17 borrow pit application, SANRAL - Mpumalanga, South Africa – SANRAL - 2008

19. Wetland delineation for the proposed development on Farm Nooitgedacht Portions 8 and 32 - Gauteng, South Africa - Viva Construction – Portion 8 and 36 - 2008
20. Wetland assessment for the proposed lodge development in the Vredefort Dome - North West, South Africa - Wesplan Town and Regional Planners - 2006
21. Wetland delineation for the proposed Randfontein Golf Estate. - Gauteng, South Africa - Randfontein Golf Estate – 2008

Soil and Land Capability Assessment

1. Soil, Land Capability and Land Use Assessment for the Vandyksdrift Central extension – South32, Middelburg – 2019
2. Soil, Land Capability and Land Use Assessment for the Chloorkop Landfill Expansion Project – EnviroServ, Johannesburg - 2019
3. Soil, Land Capability and Land Use Assessment for the Syferfontein Alexander Project – Sasol Mining, Secunda – 2018-2019
4. Rehabilitation Assessment for the Schoonoordt Mine – Exxaro Coal, Arnot - 2018
5. Soil, Land Capability and Land Use Quantitative Risk Assessment for the closure of Sasol Sigma – Sasolburg, South Africa – 2017 - 2018
6. Soil, Land Capability and Land Use Quantitative Risk Assessment for the closure of Sasol Twistdraai, Middelbult and Brandspruit Mines – Secunda, South Africa – 2016 and 2019
7. Soil and Land Capability Assessment for the proposed Era Stene expansion – Delmas, South Africa – Era Stene - 2016
8. Long term soil impact monitoring and assessment for the Wolwekrans Evaporator Project – Emalahleni, South Africa – South32 – 2015-16
9. Soil and Land Capability Assessment for the proposed 400kv KIPower powerlines – Delmas, South Africa – KIPower - 2016
10. Soil and Land Capability Assessment for the Boschmanspoort EMPR – Hendrina, South Africa – Xstrata Coal - 2013
11. Soil and Land Capability Assessment for the extension of the Camden Power Station Ash Dump - Ermelo, South Africa - Eskom Generation – 2012
12. Soil and Land Capability Assessment for the proposed Solar Integration Project and the CSP amendment - Upington, South Africa - Eskom Transmission - 2012
13. Dragline Relocation Soil Assessments - Kriel, South Africa - Xstrata Coal South Africa – Rietspruit - 2007
14. Compilation of the Soil Assessments for the EMPR update project - Cullinan, South Africa - De Beers Consolidated Mines – Cullinan - 2005
15. Soil specialist assessments for the proposed Metal Recovery and Slag Processing Plant at Metalloys - Meyerton, South Africa - Samancor Manganese, Metalloys – MRSPP - 2007
16. Soil and Land Capability Assessment for the proposed Sinter Plant at the Mamatwan Mine. - Hotazel, South Africa - Samancor Manganese – Sinter - 2009
17. Conducted the soil and land capability assessment for the integration of the Bravo (Kusile) power station into the Eskom grid. Five EIAs for the proposed construction of overhead power lines and associated infrastructure for the Bravo Integration Project. - Gauteng and Mpumalanga, South Africa - Eskom – Bravo Integration Project – 2009
18. Conducted the soil and land capability assessment for the proposed railway line to the Kusile power station. - Gauteng and Mpumalanga, South Africa - Eskom – Kusile Railway Line - 2010
19. Soil assessment for the proposed Tutuka Power Station general waste disposal site, Standerton. - Mpumalanga, South Africa - Eskom – Tutuka Domestic Waste Site - 2011
20. Soil and Land Capability Assessment for the proposed Ingula burial grounds near Van Reenen. - KwaZulu Natal, South Africa - Eskom – Ingula burial ground - 2011
21. Soil and Land Capability risk assessment for the proposed substation alternatives and connecting power lines. - Gauteng, South Africa - Eskom – Bapsfontein - 2010

22. Soil and Land Capability risk assessment for the proposed substation and connecting power lines. - Limpopo, South Africa - Eskom – Tabor - 2011
23. Route selection report Soil Assessment for 2 power line route alternatives in Wilgeheuwel. - Gauteng, South Africa - Johannesburg City Power - 2007
24. Agricultural feasibility study for the Ramasega development project. - Gauteng, South Africa - Ramasega Agricultural Development Project - 2006
25. Soil and Land Capability Assessment for the proposed Teak Place Estate Development in the Cradle of Humankind. - Cradle of Humankind, South Africa - Teak Place Estate Development – 2007
26. Soil assessment for the Pala Meetse Eco Estate, Modimolle. - Limpopo Province, South Africa - Pala Meetse Eco Estate - 2008
27. Soil and Land Capability assessment for a residential development in Noordheuwel, Krugersdorp. - Gauteng, South Africa - Noordheuwel Ext 17 and 19 - 2008
28. Soil Assessment for Holding 68 and 67 Morningside. - Gauteng, South Africa - Bernard Glazer Trust - 2007
29. Soil mapping for the proposed Harmony Mega Tailings Facility, Welkom. - Free State, South Africa - Harmony Gold – Welkom - 2009
30. Soil assessment for the proposed 3rd bypass line, Richards Bay Coal Terminal. - KwaZulu Natal, South Africa - Transnet, RBCT - 2008
31. Soil assessment for the proposed industrial development of the Farm Nooitgedacht Portion 215. - Gauteng, South Africa - Viva Construction – Portion 215 - 2008
32. Soil assessment for the proposed development of Portions 16, 17 and 18 of the Mostyn Park Smallholdings. - Gauteng, South Africa - Viva Construction – Mostyn Park - 2008
33. Soil assessment for the proposed lodge development in the Vredefort Dome - North West, South Africa - Wesplan Town and Regional Planners - 2006

Terrestrial Ecology Assessment

1. Terrestrial Ecological Assessment for the proposed 400kv KIPower powerlines – Delmas, South Africa – KIPower - 2016
2. Biodiversity Assessment for the extension of the Camden Power Station Ash Dump - Ermelo, South Africa - Eskom Generation – 2012
3. Biodiversity Assessment for the proposed Solar Integration Project and the CSP amendment - Upington, South Africa - Eskom Transmission - 2012
4. Dragline Relocation Vegetation Assessments - Kriel, South Africa - Xstrata Coal South Africa – Rietspruit - 2007
5. Vegetation Assessments for the CDM EMPR update project - Cullinan, South Africa - De Beers Consolidated Mines – Cullinan - 2005
6. Vegetation Assessment for the proposed Metal Recovery and Slag Processing Plant at Metalloys - Meyerton, South Africa - Samancor Manganese, Metalloys – MRSPP - 2007
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17. Vegetation, Tree Identification and Fauna survey for Holding 68 and 67 Morningside. - Gauteng, South Africa - Bernard Glazer Trust - 2007
18. Vegetation Assessment for the proposed development on Portion 105, 106 and 331 of the Farm Knoppjeslaagte. - Gauteng, South Africa - Vibro Brics - 2008
19. Vegetation assessment for the proposed 3rd bypass line, Richards Bay Coal Terminal. - KwaZulu Natal, South Africa - Transnet, RBCT - 2008
20. Ecological site assessment for the proposed development of Portions 16, 17 and 18 of the Mostyn Park Smallholdings. - Gauteng, South Africa - Viva Construction – Mostyn Park - 2008
21. Vegetation and fauna assessment for the proposed lodge development in the Vredefort Dome - North West, South Africa - Wesplan Town and Regional Planners – 2006

Visual Impact Assessment

1. Visual Assessment for the proposed 400kv KIPower powerlines – Delmas, South Africa – KIPower - 2016
2. Visual Assessment for the proposed Middelburg Colliery extension – Middelburg, South Africa, South32 – 2016
3. Visual Assessment for the proposed Wolwekrans Evaporator Project – Emalahleni, South Africa, South32 - 2015
4. Visual Assessment for the proposed Klipfontein Colliery extension – Middelburg, South Africa, South32 - 2015
5. Visual Assessment for the proposed Pongola-Candover 132 kV powerline – Pongola, South Africa – Eskom Eastern Regions - 2014
6. Visual Assessment for the proposed Ndumo - Gezisa 132 kV powerline – Pongola, South Africa – Eskom Eastern Regions - 2014
7. Visual Assessment for the extension of the Camden Power Station Ash Dump - Ermelo, South Africa - Eskom Generation – 2012
8. Visual Assessment for the proposed day visitor's facility at the Olifants Camp, Kruger National Park - Limpopo & Mpumalanga, South Africa - Kruger National Park – Olifants - 2007
9. Conducted the Visual Specialist Studies for the integration of the Bravo (Kusile) power station into the Eskom grid. Five EIAs for the proposed construction of overhead power lines and associated infrastructure for the Bravo Integration Project. - Gauteng and Mpumalanga, South Africa - Eskom – Bravo Integration Project – 20009
10. Conducted the Visual Specialist Studies for the proposed railway line to the Kusile power station. - Gauteng and Mpumalanga, South Africa - Eskom – Kusile Railway Line - 2010
11. Visual Assessment for the proposed Ingula burial grounds near Van Reenen. - KwaZulu Natal, South Africa - Eskom – Ingula burial ground - 2011
12. Visual Assessment for the proposed substation and connecting power lines - Limpopo, South Africa - Eskom – Tabor - 2011
13. Visual Assessment for the proposed Teak Place Estate Development in the Cradle of Humankind. - Cradle of Humankind, South Africa - Teak Place Estate Development – 2007

Summary of other Training/Courses attended

Centre for Environmental Studies	March 2007	NEMA EIA Regulations and their application
Cameron Cross	May 2008	National Environmental Management Waste Act Seminar
Africa Land-Use Training	April 2010	Tree Identification
Africa Land-Use Training	June 2010	Soil Classification and Mapping

Declaration

I confirm that the above CV is an accurate description of my experience and qualifications.

Signature of Staff Member

2 January 2019

Date

APPENDIX B

DECLARATION OF INDEPENDANCE

I, Konrad Krüger, hereby 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 not, 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.
- I realise that a false declaration is an offence in terms of Regulation 48 and is punishable in terms of section 24F of the Act.

Konrad Krüger

A detailed CV of the author is included in **Appendix A**.

Biodiversity & Wetland Assessment: Basic Assessment re-alignment of the 132 kV powerline at Vandyksdrift Central Section

eMalahleni, Mpumalanga

DATE

April 2019

CLIENT

Prepared by:

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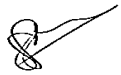
Report Name	**Biodiversity & Wetland Assessment: Basic Assessment re-alignment of the 132 kV powerline at Vandyksdrift Central Section**
Submitted to	
Report Writer (GIS, Botany)	**Martinus Erasmus**  Martinus Erasmus (Cand Sci Nat) obtained his B-Tech degree in Nature Conservation in 2016 at the Tshwane University of Technology. Martinus has been conducting EIAs, basic assessments and assisting specialists in the field during his studies since 2015.
Report Writer	**Lindi Steyn**  Lindi Steyn has a Ph.D. in Biodiversity and Conservation from the University of Johannesburg. She specializes in avifauna and has worked in this specialization since 2013.
Report Writer / Reviewer	**Andrew Husted**  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, recognized 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, 2014 (as amended). We have no conflicting interests in the undertaking of this activity and have no interests in secondary developments resulting from the authorization 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 principles of science.

DOCUMENT GUIDE

The table below provides the NEMA (2014) Requirements for Biodiversity Assessments, and also the relevant sections in the reports where these requirements are addressed:

GNR 326 April 2017	Description	Section in the Report
Specialist Report		
Appendix 6 (a)	A specialist report prepared in terms of these Regulations must contain— details of— i. the specialist who prepared the report; and ii. the expertise of that specialist to compile a specialist report including a curriculum vitae;	Page i.
Appendix 6 (b)	A declaration that the specialist is independent in a form as may be specified by the competent authority;	Page iii - iv
Appendix 6 (c)	An indication of the scope of, and the purpose for which, the report was prepared;	Section 2
Appendix 6 (cA)	An indication of the quality and age of base data used for the specialist report;	Section 6
Appendix 6 (cB)	A description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 10.2
Appendix 6 (d)	The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 1
Appendix 6 (e)	A description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Section 3
Appendix 6 (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;	Section 9
Appendix 6 (g)	An identification of any areas to be avoided, including buffers;	Section 8.6.5 & 9
Appendix 6 (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 8.6.5 & 9
Appendix 6 (i)	A description of any assumptions made and any uncertainties or gaps in knowledge;	Section 4
Appendix 6 (j)	A description of the findings and potential implications of such findings on the impact of the proposed activity **[including identified alternatives on the environment]** or activities;	Section 8
Appendix 6 (k)	Any mitigation measures for inclusion in the EMPr;	Section 10.5
Appendix 6 (l)	Any conditions for inclusion in the environmental authorisation;	Section 11.4
Appendix 6 (m)	Any monitoring requirements for inclusion in the EMPr or environmental authorisation;	None
Appendix 6 (n)	A reasoned opinion— i. **[as to]** whether the proposed activity, activities or portions thereof should be authorised; (iA) regarding the acceptability of the proposed activity or activities; and 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;	Section 13
Appendix 6 (o)	A description of any consultation process that was undertaken during the course of preparing the specialist report;	N/A
Appendix 6 (p)	A summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	N/A
Appendix 6 (q)	Any other information requested by the competent authority.	None

DECLARATION

I, Martinus Erasmus, 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 favorable 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 realize that a false declaration is an offense in terms of Regulation 71 and is punishable in terms of Section 24F of the Act.

Martinus Erasmus

Terrestrial Ecologist

The Biodiversity Company

April 2019

DECLARATION

I, Andrew Husted, 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 favorable 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 realize that a false declaration is an offense in terms of Regulation 71 and is punishable in terms of Section 24F of the Act.

Andrew Husted

Wetland Ecologist

The Biodiversity Company

April 2019

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Figures

1 Introduction

1.1 Background

Wolvekrans Colliery is an operational division of South32 SA Coal Holdings (Pty) Limited (South32). The mine is located between the towns of eMalahleni and Kriel, approximately 30 km south-east of the town of eMalahleni, in close proximity to the Duvha Power Station (Figure 1).

The Vandyksdrift Central (VDDC) section of Wolvekrans Colliery is located to the south of the Steenkoolspruit and Vandyksdrift North sections, and north of the Vandyksdrift South and Albion sections (mining has ceased at these two sections). The Olifants River determines the southern boundary of the VDDC mining section. The R544 and R575 provincial roads are located to the east and west of the Wolvekrans Colliery, respectively.

The VDDC section area falls within the footprint of historic underground mining operations at the old Douglas Colliery. In 2007, an amendment of the Environmental Management Programme Report (EMPR) for the Douglas Colliery operations was approved, to allow the opencast mining of the remaining coal seams. This is now referred to as the VDDC section to be opencast mine using dragline, and truck and shovel operations. Mining will commence in 2020.

Electricity for the VDDC section is supplied from Eskom's Klein Olifants 132 kV Substation, which feeds the Klein 132 kV Substation. The existing Kromfontein 132 kV powerline which connects the Klein Substation and the Kromfontein Substation, traverses the area to be opencast mined and therefore has to be relocated before opencast mining can commence (J&W, 2019).

1.2 Project Requirements

The Biodiversity Company (TBC) was appointed by Jones & Wagener Engineering and Environmental Consultants (J&W) to conduct the terrestrial (biodiversity) and wetland assessment for the proposed realignment of the 132 kV Kromfontein Eskom powerline.

TBC (2018) was appointed by J&W to conduct an assessment of the biodiversity and wetlands for the proposed infrastructure development project, which has been considered to supplement the requirements of this project.

A wet season survey was conducted on the 4th of April 2019 for this project. The survey focused primarily on those areas which were most likely to be impacted upon by the proposed development. Furthermore, the identification and description of any sensitive receptors were recorded across the project area, and the manner in which these sensitive receptors may be affected by the activity was also investigated.

This report, after taking into consideration the findings provided by the specialist herein, should inform and guide the Environmental Assessment Practitioner (EAP) and regulatory authorities, enabling informed decision-making, as to the ecological viability of the proposed development.

1.3 Project Information

As part of the VDDC opencast mining project, South32's Wolvekrans Colliery intends to re-align the 132 kV electricity distribution powerline between the Eskom Kromfontein Substation and the Eskom Klein Substation. The application is undertaken by South32 in terms of a self-build agreement with Eskom. The EA will be transferred to Eskom on completion of the construction

phase. The proposed activities will be undertaken at the VDDC Section of the mine, where opencast mining has already been approved in 2007 with the amendment of the EMPR for the Douglas Colliery operations. The realignment of the powerline is necessary in order for the opencast mining to commence.

A 132 kV electricity distribution powerline which is approximately 7.5 km in length, will be constructed from a point (Coordinates: 26°5'42.36"S, 29°17'45.88"E) on the existing Eskom Kromfontein / Klein substation feeder, to a point (Coordinates 26° 3'29.31"S, 29°18'7.69"E) of the same overhead line tying the Eskom Kromfontein and Klein substations, within a 36 m corridor (J&W, 2019).

This represents listed activities as per the Environmental Impact Assessment (EIA) Regulations, 2014 (as amended), which require an Environmental Authorisation in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998; NEMA).

1.3.1 Current Power Supply and Reticulation

VDDC is supplied from Eskom's Klein Olifant 132 kV Substation, which feeds the Klein Olifant 132 kV Substation. The voltage is stepped down to 22 kV via 2 x 20 MVA power transformers feeding the 22 kV switchgear located in the Klein Olifant Substation. The 22 kV switchgear consists of single bus bar, 2 x 1250 A Incomers, 2 x Feeders and Power Factor Correction. No bus section is available, which means that the power transformers are paralleled with a combined fault current rating of approximately 10.5 kA (South32, 2017).

1.3.2 Re-alignment of Kromfontein 132 kV distribution line

Two routes were selected, i.e. the Proposed 132 kV Powerline Route (as recommended route) and the Alternative 132 kV Powerline Route.

The recommended route was selected for the project based on the fact that it is located a distance away from the existing R544 provincial road. Part of this powerline will be constructed on previously mined out rehabilitated areas, that is the area has already been disturbed (J&W, 2019).

The portion of the existing 132 kV powerline which traverses the VDDC opencast mining area will be decommissioned once the new alignment has been constructed. This will involve:

- Removal of the conductor and dispatch back to the Eskom stores;
- Removal of the existing poles and sale as scrap metal;
- The existing foundations will remain in place, since these will be mined through as opencast mining at VDDC progresses.

1.3.3 Proposed 132 kV Powerline Route

The Proposed powerline will be constructed within the VDDC Section of the Wolvekrans Colliery and within the Mining Rights Boundary. The electricity distribution powerline will be constructed and relocated to a proposed route outside an area planned to be mined by South32 and a preferred site for the proposed project was selected looking at the terrain and current mining activities. The proposed powerline will be approximately 7.5 km with a corridor of about 36 m wide. The foundation depths will range between 2 m to 3 m. The proposed powerline will be constructed using intermediate steel pole towers that will be erected a few metres apart

depending on the terrain, ground clearance requirements, geology, etc. The proposed steel towers may consist of the following:

- Mono-pole guyed intermediate suspension structures;
- Mono-pole self-supporting intermediate suspension structures;
- Mono-pole angle suspension structures; and/or
- Mono-pole strain structures.

The height of the towers is expected to range between 22 m and 26 m, depending on the terrain and ground clearance requirements.

Table 1: Co-ordinates of corridor for recommended route (Enercon, 2019)

	Latitude	Longitude
A1	26° 5’ 42.36’’S	29° 17’ 45.88’’E
A2	26° 5’ 55.42’’S	29° 18’ 23.90’’E
A3	26° 5’ 53.53’’S	29° 18’ 36.85’’E
A4	26° 5’ 49.94’’S	29° 18’ 51.40’’E
A5	26° 5’ 8.32’’S	29° 19’ 33.26’’E
A6	26° 5’ 29.31’’S	29° 18’ 07.69’’E

1.3.4 Alternative 132 kV Powerline Route

The Alternative Route will run in proximity of the R544 Witbank to Kriel provincial road. This route indicates potentially significant impacts as some of the poles will have to be excavated closer to the R544 road. This route was not considered as the recommended option due to the foreseen extent of impact it might have to the R544 provincial road, the impact on agricultural activities, as well as local communities currently residing within the corridor area required for the realignment of the line. The coordinates for the Alternative 2 powerline route corridor are indicated in Table 2

Table 2: Co-ordinates of corridor for Alternative route (Enercon, 2019)

	Latitude	Longitude
B1	26° 4’ 58.23’’S	29° 19’ 43.91’’E
B2	26° 4’ 54.52’’S	29° 19’ 43.20’’E
B3	26° 4’ 30.49’’S	29° 19’ 35.61’’E
B4	26° 4’ 18.51’’S	29° 19’ 34.75’’E
B5	26° 3’ 44.38’’S	29° 19’ 37.69’’E
B6	26° 3’ 21.10’’S	29° 19’ 10.70’’E
B7	26° 3’ 24.15’’S	29° 18’ 56.88’’E
B8	26° 3’ 0.11’’S	29° 18’ 22.96’’E

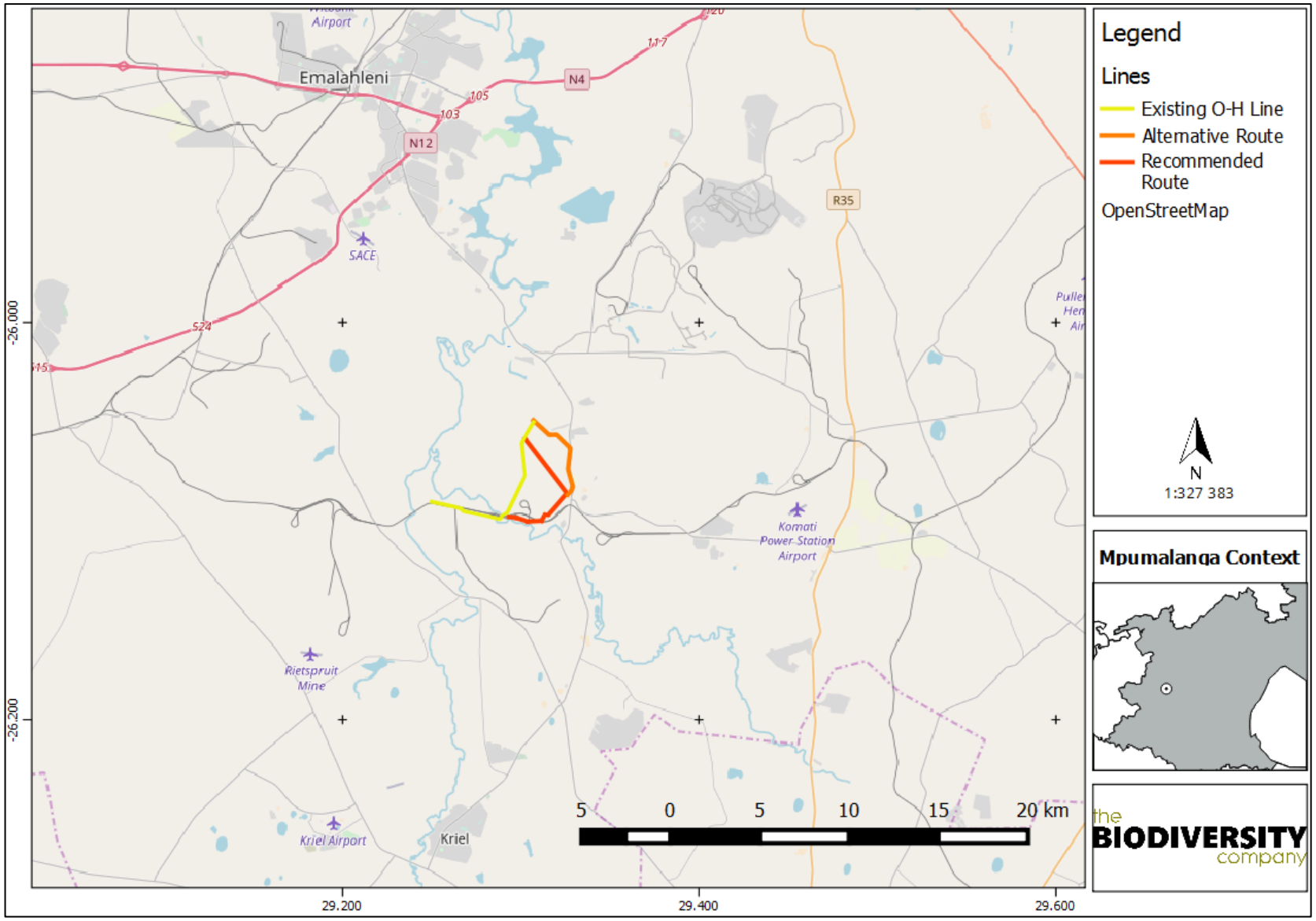

Figure 1: The general location of the project area and the relevant routes

2 Scope of Work

TBC was commissioned by J&W to conduct a biodiversity and wetland assessment for the proposed realignment of the 132 kV Kromfontein Eskom powerline. The Terms of Reference (ToR) included the following:

- Desktop description of the baseline receiving environment specific to the field of expertise (general surrounding as well as site-specific environment);
- Identification and description of any systems in terms of relevant specialist disciplines (biodiversity & wetlands) that occur in the project area, and the manner in which these systems may be affected by the activity;
- Identify 'significant' ecological, botanical and zoological features within the proposed development areas;
- Delineate and assess wetland systems within the 500 m regulated area;
- Provide a map identifying systems in the project area, based on available maps, database information & site visit verification;
- Site visit to verify desktop information; and
- Screening to identify any critical issues (potential fatal flaws) that may result in project delays or rejection of the application.

3 Methodologies

3.1 Botanical Assessment

The botanical assessment encompassed an assessment of all the vegetation units and habitat types within the project area. The focus was on an ecological habitat assessment of habitat types as well as the identification of any red-data species within the known distribution of the project area. The methodology included the following survey techniques:

- Timed meanders;
- Sensitivity analysis based on structural and species diversity; and
- Identification of floral red-data species.

3.1.1 Literature Study

A literature review was conducted as part of the desktop study to identify the potential habitats present within the project area. The SANBI provides an electronic database system, namely the Botanical Database of Southern Africa (BODATSA), to access distribution records on southern African plants. This is a new database which replaces the old Plants of Southern Africa (POSA) database. The POSA database provided distribution data of flora at the quarter degree square (QDS) resolution.

The Red List of South African Plants website (SANBI, 2018) was utilized to provide the most current account of the national status of flora. Relevant field guides and texts consulted for identification purposes in the field during the surveys included the following:

- A Field Guide to Wild flowers (Pooley, 1998);
- Guide to Grasses of Southern Africa (Van Oudtshoorn, 1999);
- Orchids of South Africa (Johnson & Bytebier, 2015);
- Guide to the Aloes of South Africa (Van Wyk & Smith, 2014);
- Medicinal Plants of South Africa (Van Wyk *et al*., 2013);
- Freshwater Life: A field guide to the plants and animals of southern Africa (Griffiths & Day, 2016); and
- Identification Guide to Southern African Grasses. An identification manual with keys, descriptions and distributions. (Fish *et al*., 2015).

Additional information regarding ecosystems, vegetation types, and species of conservation concern (SCC) included the following sources:

- The Vegetation of South Africa, Lesotho and Swaziland (SANBI, 2018);
- Grassland Ecosystem Guidelines: landscape interpretation for planners and managers (SANBI, 2013); and
- Red List of South African Plants (Raimondo *et al*., 2009; SANBI, 2019).

3.2 Faunal Assessment (Mammals & Avifauna)

The faunal desktop assessment included the following:

- Compilation of identified species lists;
- Compilation of expected species lists;
- Identification of any Red Data or SCC present or potentially occurring in the area; and
- Emphasis was placed on the probability of occurrence of species of provincial, national and international conservation importance.

The field survey component of the study utilised a variety of sampling techniques including, but not limited to, the following:

- Visual observations;
- Identification of tracks and signs; and
- Utilisation of local knowledge.

3.3 Herpetology (Reptiles & Amphibians)

A herpetofauna assessment of the project area was also conducted. The herpetological field survey comprised the following techniques:

- Diurnal hand searches – Used for reptile species that shelter in or under specific microhabitats (typically rocks, exfoliating rock outcrops, fallen timber, leaf litter, bark etc.);

- Visual searches – Typically undertaken for species whose behaviour involves surface activity or for species that are difficult to detect by hand-searches or pitfall trapping. May include walking transects or using binoculars to view species from a distance without them being disturbed;
- Amphibians – Many of the survey techniques listed above will be able to detect species of amphibians. Over and above these techniques, vocalisation sampling techniques are often the best to detect the presence of amphibians as each species has a distinct call; and
- Opportunistic sampling – Reptiles, especially snakes, are incredibly elusive and difficult to observe. Consequently, all possible opportunities to observe reptiles are taken, in order to augment the standard sampling procedures described above. This will include talking to local people and staff at the site and reviewing photographs of reptiles and amphibians that the other biodiversity specialists may come across while on site.

3.4 Wetland Assessment

The wetland assessment of the project area included the following:

- A desktop assessment of all available datasets and specialist findings;
- The wetland areas are delineated in accordance with the DWAF (2005) guidelines, whereby the outer edges of the wetland areas were identified;
- The Present Ecological State (PES) or health for the wetland as a whole was calculated, whereby the hydrology, geomorphology and vegetation scores are aggregated to obtain an overall PES health score (Macfarlane *et al*., 2009);
- The assessment of the ecosystem services supplied by the identified wetlands was conducted as per the guidelines described in WET-EcoServices (Kotze *et al*., 2009);
- The Ecological Importance and Sensitivity (EIS) tool was derived to assess the system's ability to resist disturbance and its capability to recover from disturbance once it has occurred (Rountree & Kotze, 2013);
- The "Preliminary Guideline for the Determination of Buffer Zones for Rivers, Wetlands and Estuaries" (Macfarlane, *et al*., 2014) was used to determine the appropriate buffer zone for the proposed activity; and
- The risk assessment was completed in accordance with the requirements of the Department of Water and Sanitation (DWS) General Authorisation (GA) in terms of Section 39 of the National Water Act (No. 36 of 1998) for water uses as defined in Section 21(c) or Section 21(i) (GN 509 of 2016).

4 Limitations

The following limitations should be noted for the study:

- The spatial data might not be accurate or based on outdated features; ground-truthing has been performed in an attempt to increase the accuracy;

- The GPS used for delineations is accurate to within 5 m. Therefore, the wetland delineation plotted digitally may be offset by at least 5 m to either side; and
- Despite these limitations, a comprehensive desktop study was conducted, in conjunction with the detailed results from the surveys, and as such, there is a high confidence in the information provided.

5 Key Legislative Requirements

The legislation, policies, and guidelines listed below are applicable to the current project in terms of biodiversity and wetlands. The list below, although extensive, may not be complete and other legislation, policies, and guidelines may apply in addition to those listed below.

Explanation of certain documents or organisations is provided (Table 3) where these have a high degree of relevance to the project and/or are referred to in this assessment.

Table 3: A list of key legislative requirements relevant to biodiversity and conservation in Mpumalanga

INTERNATIONAL	Convention on Biological Diversity (CBD, 1993)
	The United Nations Framework Convention on Climate Change (UNFCCC,1994)
	The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES 1973)
	The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention, 1979)
NATIONAL	Constitution of the Republic of South Africa (Act No. 108 of 2006)
	The National Environmental Management Act (NEMA) (Act No. 107 of 1998)
	The National Environmental Management Protected Areas Act (Act No. 57 of 2003)
	The National Environmental Management Biodiversity Act (Act No. 10 of 2004)
	The National Environmental Management: Waste Act, 2008 (Act 59 of 2008);
	The Environment Conservation Act (Act No. 73 of 1989)
	National Environmental Management Air Quality Act (No. 39 of 2004)
	National Protected Areas Expansion Strategy (NPAES)
	Natural Scientific Professions Act (Act No. 27 of 2003)
	National Biodiversity Framework (NBF, 2009)
	National Forest Act (Act No. 84 of 1998)
	National Veld and Forest Fire Act (101 of 1998)
	National Water Act, 1998 (Act 36 of 1998)
	National Freshwater Ecosystem Priority Areas (NFEPAs)
	National Spatial Biodiversity Assessment (NSBA)
	World Heritage Convention Act (Act No. 49 of 1999)
	National Heritage Resources Act, 1999 (Act 25 of 1999)

	Municipal Systems Act (Act No. 32 of 2000)
	Alien and Invasive Species Regulations, 2014
	South Africa's National Biodiversity Strategy and Action Plan (NBSAP)
	Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983)
	Sustainable Utilisation of Agricultural Resources (Draft Legislation).
	White Paper on Biodiversity
PROVINCIAL	Mpumalanga Parks Board Act 6 of 1995
	Mpumalanga Conservation Act, 1998 (Act 10 of 1998)
	Mpumalanga Tourism and Parks Agency Act, No 5 of 2005
	Mpumalanga Conservation Plan (C-plan 2)
	Mpumalanga Biodiversity Sector Plan

6 Desktop Spatial Assessment

The following features describe the general area, this assessment is based on spatial data that are provided by various sources such as the provincial environmental authority and the South African National Biodiversity Institute (SANBI). The desktop analysis and their relevance to this project are listed in Table 4.

Table 4: Desktop spatial features examined.

Desktop Information Considered	Relevant/Not relevant	Section
Land Use	Relevant: description included	7.1
Conservation Plan	The project area overlaps with Other Natural Areas (ONA); and Moderately or Heavily Modified Areas (MMAs or HMAs)	7.2
Rocky Ridges	No regulation for Mpumalanga	-
Ecosystem Threat Status	Falls within a VU ecosystem	7.3.1
Ecosystem Protection Level	Falls in a poorly protected ecosystem	7.3.2
Protected Areas	Irrelevant:18 km to the closest protected area.	-
NFEPA Rivers and Wetlands	No NFEPA wetlands or NFEPA rivers close to the project area.	-
Mpumalanga Highveld Grasslands	Wetland systems are present within the project area	7.1.5
Mining and Biodiversity Guidelines	Relocation of the powerline is directly related to the proposed opencast mining at VDDC. Although not relevant to the powerline project per se, these guidelines should be taken into account in the application for the opencast mining and supporting infrastructure	-
Important Bird and Biodiversity Areas	Irrelevant: 37 km to the closes IBA	-

6.1 General Land Use

The land uses surrounding the project area consists of opencast coal mines, agricultural fields (Soya and Maize) and informal settlements. The following infrastructure exists in the project area and surrounds:

- Various roads, both tar and gravel;
- Powerlines; and
- Coal mines.

6.2 Relation to the Mpumalanga Biodiversity Sector Plan

The key output of the Mpumalanga Biodiversity Sector Plan (MBSP) is a map of biodiversity priority areas (MTPA, 2014). The plan delineates Critical Biodiversity Areas, Ecological Support Areas, Other Natural Areas, Protected Areas, and areas that have been irreversibly modified from their natural state (MTPA, 2014). The MBSP uses the following terms to categorise the various land use types according to their biodiversity and environmental importance:

- Critical Biodiversity Area (CBA);
- Ecological Support Area (ESA);
- Other Natural Area (ONA);
- Protected Area (PA); and
- Moderately or Heavily Modified Areas (MMAs or HMAs).

CBAs are terrestrial and aquatic areas of the landscape that need to be maintained in a natural or near-natural state to ensure the continued existence and functioning of species and ecosystems and the delivery of ecosystem services. CBAs are areas of high biodiversity value and need to be kept in a natural state, with no further loss of habitat or species (MTPA, 2014). Thus, if these areas are not maintained in a natural or near-natural state then biodiversity targets cannot be met. Maintaining an area in a natural state can include a variety of biodiversity compatible land uses and resource uses (SANBI-BGIS, 2017).

The MBSP specifies two different CBAs, **Irreplaceable CBAs and Optimal CBAs**. Irreplaceable CBAs include: (1) areas required to meet targets and with irreplaceability biodiversity values of more than 80%; (2) critical linkages or pinch-points in the landscape that must remain natural; or (3) critically Endangered ecosystems (MTPA, 2014).

ESAs are not essential for meeting biodiversity targets but play an important role in supporting the ecological functioning of Critical Biodiversity Areas and/or in delivering ecosystem services. Critical Biodiversity Areas and Ecological Support Areas may be terrestrial or aquatic (SANBI-BGIS, 2017).

ONAs consist of all those areas in a good or fair ecological condition that fall outside the protected area network and have not been identified as CBAs or ESAs. A biodiversity sector plan or bioregional plan must not specify the desired state/management objectives for ONAs or provide land-use guidelines for ONAs (SANBI-BGIS, 2017).

Moderately or Heavily Modified Areas (sometimes called 'transformed' areas) are areas that have been heavily modified by human activity so that they are by-and-large no longer natural, and do not contribute to biodiversity targets (MTPA, 2014). Some of these areas may still provide limited biodiversity and ecological infrastructural functions but their biodiversity value has been significantly, and in many cases irreversibly, compromised.

Figure 2 shows the project area superimposed on the MBSP Terrestrial CBA map. Based on this, the proposed powerlines will potentially overlap with:

- Other Natural Areas (ONAs); and
- Moderately or Heavily Modified Areas (MMAs or HMAs).

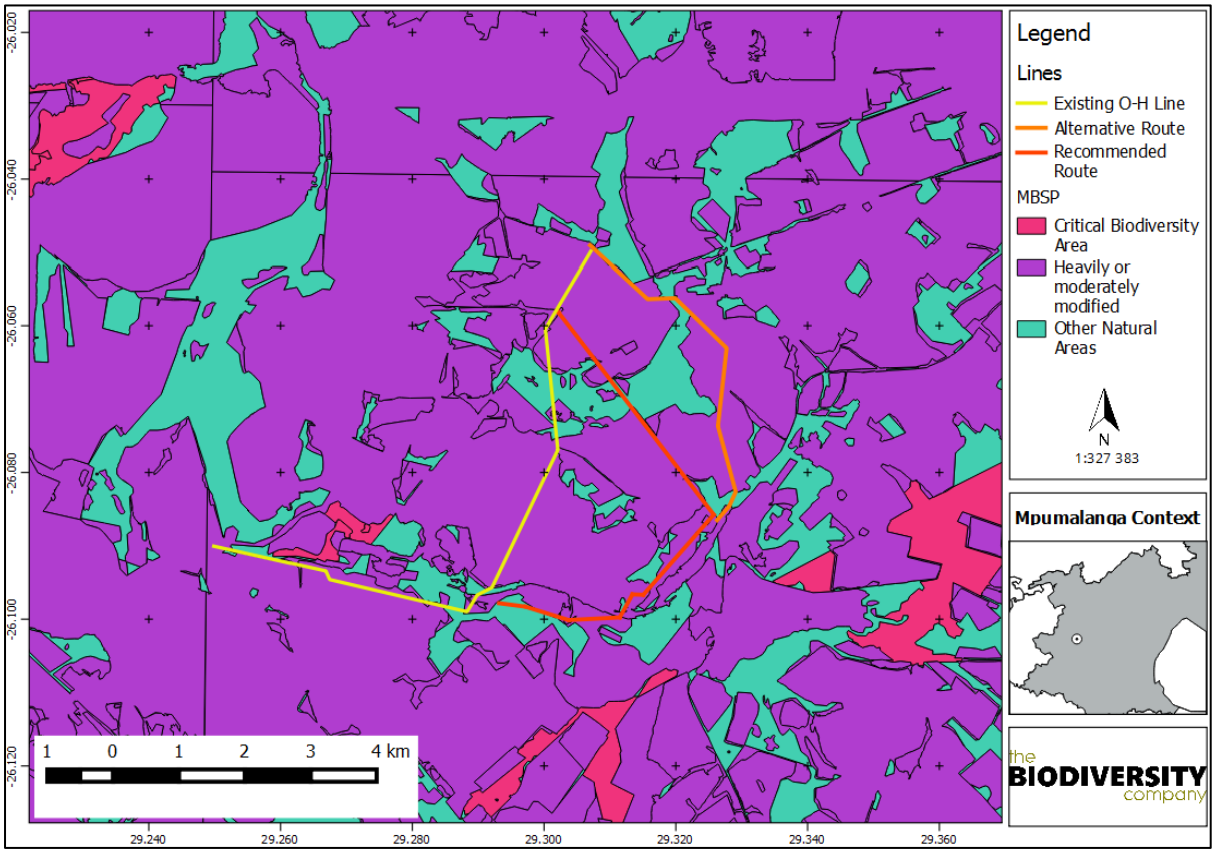

Figure 2: The relevant routes superimposed on the MBSP

6.3 National Biodiversity Assessment

The National Biodiversity Assessment (NBA) was completed as a collaboration between the SANBI, the Department of Environmental Affairs (DEA) and other stakeholders, including scientists and biodiversity management experts throughout the country over a three-year period (Driver *et al*., 2011).

The purpose of the NBA is to assess the state of South Africa's biodiversity with a view to understanding trends over time and informing policy and decision-making across a range of sectors (Driver *et al*., 2011).

The two headline indicators assessed in the NBA are *ecosystem threat status* and *ecosystem protection level* (Driver *et al*., 2011).

6.3.1 Ecosystem Threat Status

Ecosystem threat status outlines the degree to which ecosystems are still intact or alternatively losing vital aspects of their structure, function, and composition, on which their ability to provide ecosystem services ultimately depends (Driver *et al*., 2011).

Ecosystem types are categorised as Critically Endangered (CR), Endangered (EN), Vulnerable (VU) or Least Threatened (LT), based on the proportion of each ecosystem type that remains in good ecological condition (Driver *et al*., 2011).

The powerline routes were superimposed on the terrestrial ecosystem threat status (Figure 3). As seen on Figure 3, the routes fall entirely within an ecosystem which is listed as VU. Due to the various impacts this ecosystem has been exposed to, the habitat has been altered and were given a listing of VU by the NBA (2012).

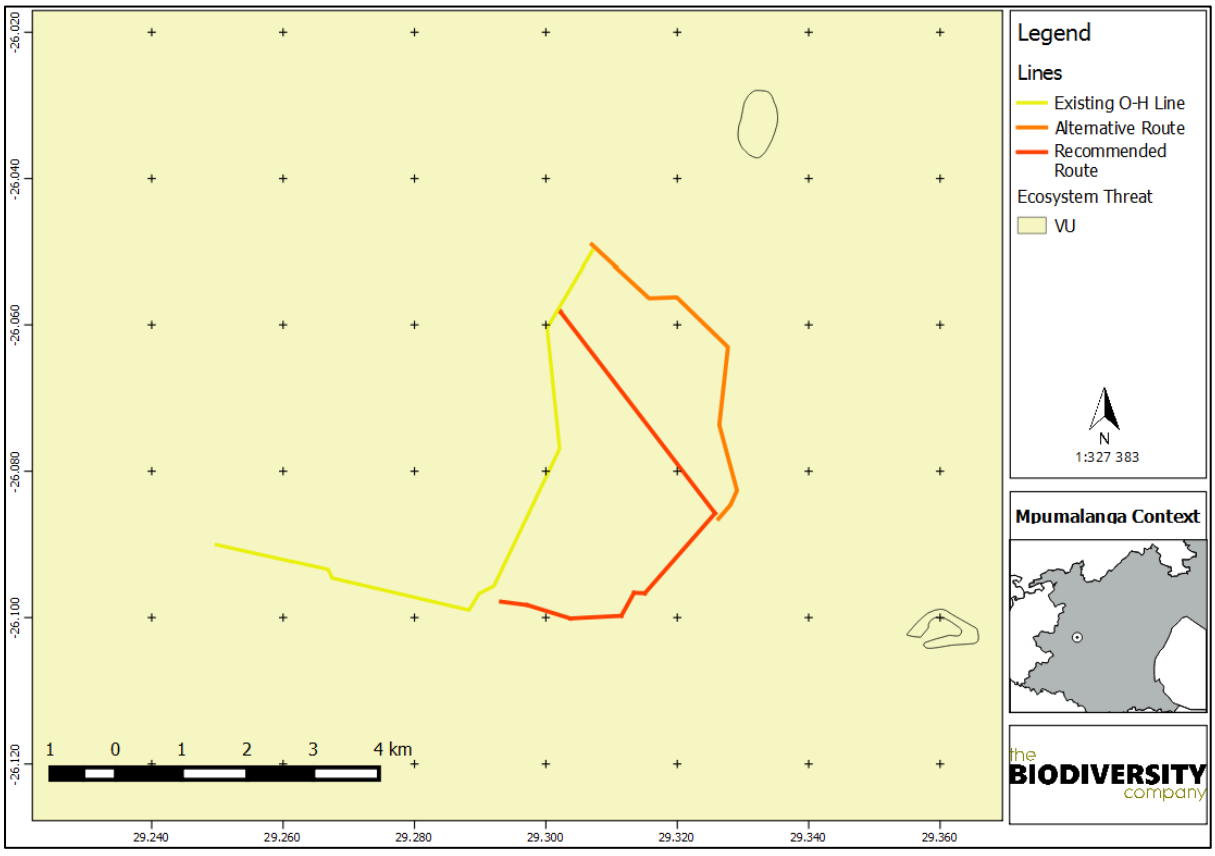

Figure 3: The relevant routes showing the ecosystem threat status of the associated terrestrial ecosystems (NBA, 2012)

6.3.2 Ecosystem Protection Level

Ecosystem protection level tells us whether ecosystems are adequately protected or under-protected. Ecosystem types are categorised as not protected, poorly protected, moderately

protected or well protected, based on the proportion of each ecosystem type that occurs within a protected area recognised in the Protected Areas Act (Driver *et al*., 2011).

The routes were superimposed on the ecosystem protection level map to assess the protection status of terrestrial ecosystems associated with the development (Figure 4). Based on Figure 4, all the terrestrial ecosystems associated with the development (entire project area and surrounds) are rated as *not protected*. This means that this ecosystem is not protected in any formally protected areas or nature reserves.

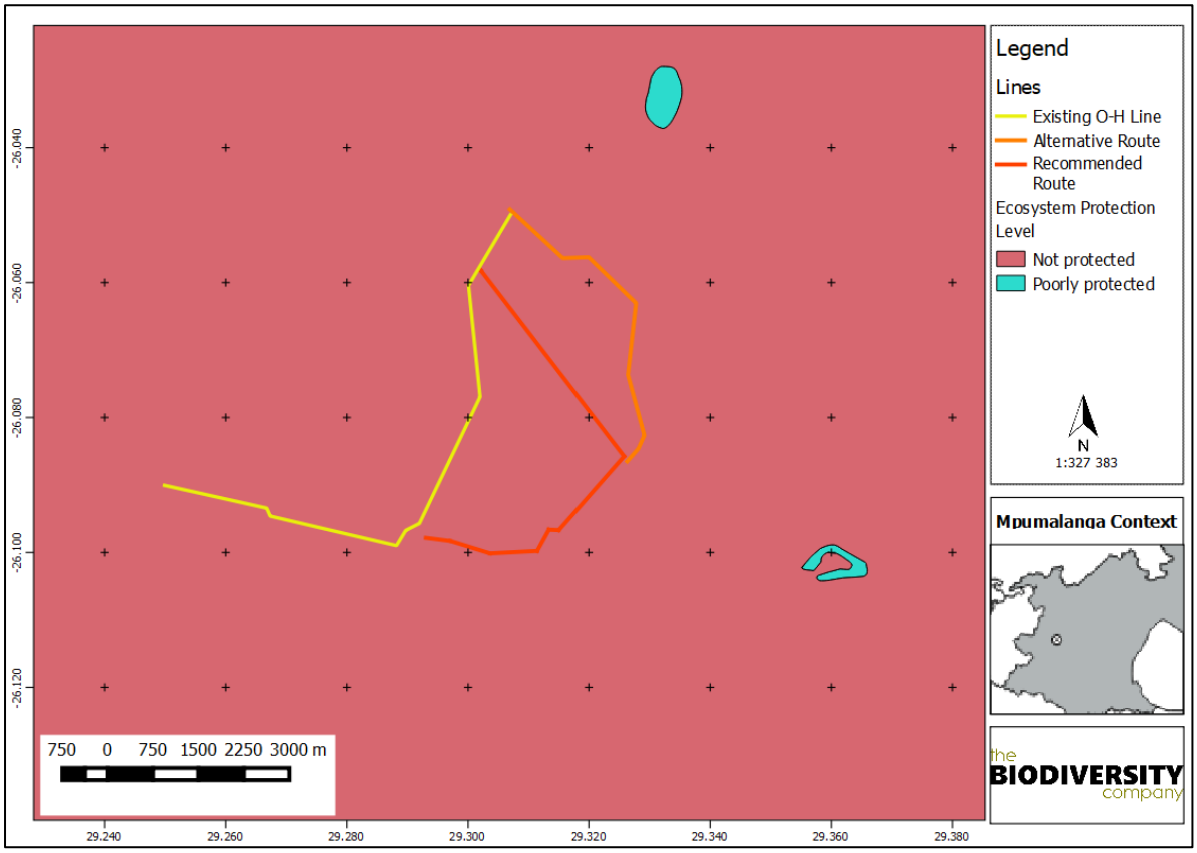

Figure 4: The relevant routes showing the level of protection of terrestrial ecosystems (NBA, 2012)

7 Desktop Results

7.1 Desktop Assessment

7.1.1 Vegetation Assessment

The project area is situated within the grassland biome, specifically the Eastern Highveld Grassland. This biome is centrally located in southern Africa and adjoins all except the desert, fynbos and succulent Karoo biomes (Mucina & Rutherford, 2006). Major macroclimatic traits that characterise the grassland biome include:

a) Seasonal precipitation; and
b) The minimum temperatures in winter (Mucina & Rutherford, 2006).

The grassland biome is found chiefly on the high central plateau of South Africa, and the inland areas of KwaZulu-Natal and the Eastern Cape. The topography is mainly flat and rolling but includes the escarpment itself. Altitude varies from near sea level to 2 850 m above sea level.

Grasslands are dominated by a single layer of grasses. The amount of cover depends on rainfall and the degree of grazing. The grassland biome experiences summer rainfall and dry winters with frost (and fire), which are unfavourable for tree growth. Thus, trees are typically absent, except in a few localised habitats. Geophytes (bulbs) are often abundant. Frosts, fire, and grazing maintain the grass dominance and prevent the establishment of trees.

7.1.2 Vegetation Types

The grassland biome comprises many different vegetation types. The project area is situated entirely in one vegetation type; the Eastern Highveld Grassland, according to SANBI (2018) (Figure 5).

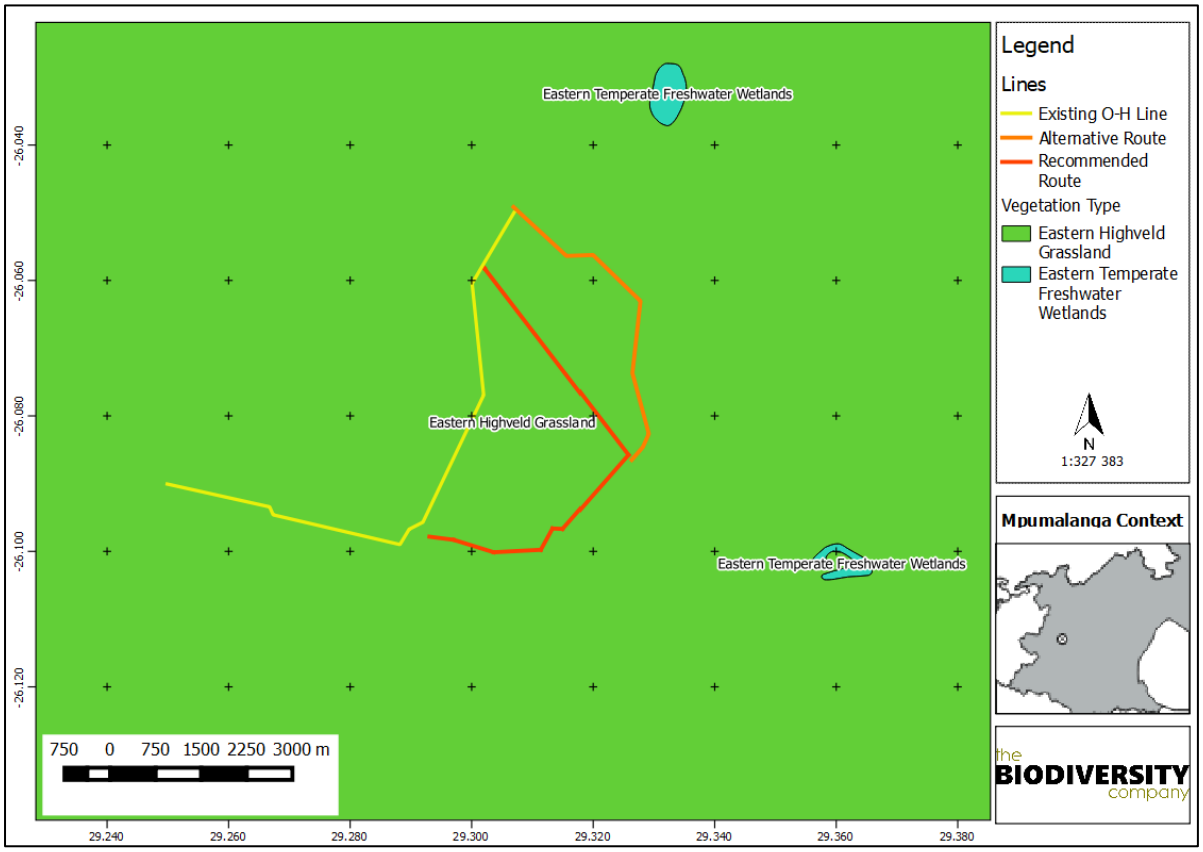

Figure 5: Project area showing the vegetation type based on the Vegetation Map of South Africa, Lesotho & Swaziland (BGIS, 2017)

7.1.3 Eastern Highveld Grassland

This vegetation type occurs on slightly to moderately undulating planes, including some low hills and pan depressions. The vegetation is a short dense grassland dominated by the usual highveld grass composition (*Aristida, Digitaria, Eragrostis, Themeda, Tristachya,* etc.) with small scattered rocky outcrops with, wiry sour grasses and some woody species. Some 44%

of this vegetation type is transformed primarily by cultivation, plantations, mines, urbanisation and by the building of dams (Mucina & Rutherford, 2006).

7.1.3.1 Important Plant Taxa

Important plant taxa are those species that have a high abundance, a frequent occurrence or are prominent in the landscape within a particular vegetation type (Mucina & Rutherford, 2006).

The following species are important in the **Eastern Highveld Grassland** vegetation type:

Graminoids: *Aristida aequiglumis, A. congesta, A. junciformis subsp. Galpinii, Brachiaria serrata, Cynodon dactylon, Digitaria monodactyla, D. tricholaenoides, Elionurus muticus, Eragrostis chloromelas, E. curvula, E. plana, E. racemosa E. sclerantha Heteropogon contortus, Loudetia simplex, Microchloa caffra, Monocymbium ceresiiforme, Setaria sphacelata, Sporobolus africanus, S. pectinatus, Themeda triandra, Trachypogon spicatus, Tristachya leucothrix, T. rehmanni, Alloteropsis semialata subsp. eckloniana, Andropogon appendiculatus, A. schirensis, Bewsia biflora, Ctenium concinnum, Diheteropogon amplectens, Eragrostis capensis, E. gummiflua, E. patentissima, Harpochloa falx, Panicum natalense, Rendlia altera, Schizachyrium sanguineum, Setaria nigrirostris, Urelytrum agropyroides;*

Herbs: *Berkheya setifera, Haplocarpha scaposa, Justicia anagalloides, Acalypha angusta, Chamaecrista mimosoides, Dicoma anomala, Euryops gilfillanii, E. transvalensis subsp. setilobus, Helichrysum aureonitens, H caespititium, H. callicomum, H. oreophilum, H. caespititium, H. oreophilum, H. rugulosum, ipomoea crassipes, Pentanisia prunelloides subsp. latifolia, Selago densiflora, Senecio coronatus, Vernonia oligocephala, Wahlenbergia undulata;*

Geophytic herbs: *Gladiolus crassifolius, Haemanthus humilis subsp. hirsutus, Hypoxis rigidula var. pilosissima, Ledebouria ovatifolia;*

Succulent herb: *Aloe ecklonis*; and

Low shrubs: *Anthospermum rigidum subsp. pumilum, Stoebe plumosa.*

7.1.3.2 Conservation Status of the Vegetation Type

According to Mucina & Rutherford (2006), this vegetation type is classified as Endangered (EN). The national target for conservation protection for both these vegetation types is 24%, but only a few patches are statutorily conserved in Nooitgedacht Dam and Jericho Dam Nature Reserves and in private reserves (Holkranse, Kransbank, Morgenstond).

Some 44% of this vegetation type has already been transformed primarily by cultivation, plantations, mines, urbanisation and by the building of dams. Cultivation may have had a more extensive impact, indicated by land-cover data.

7.1.3.3 Plant Species of Conservation Concern

Based on the Plants of Southern Africa (BODATSA-POSA, 2016) database, 233 plant species are expected to occur in the area (Figure 5). The list of expected plant species is provided in Appendix A. Of the 233 plant species, three (3) species are listed as being SCC (Table 5).

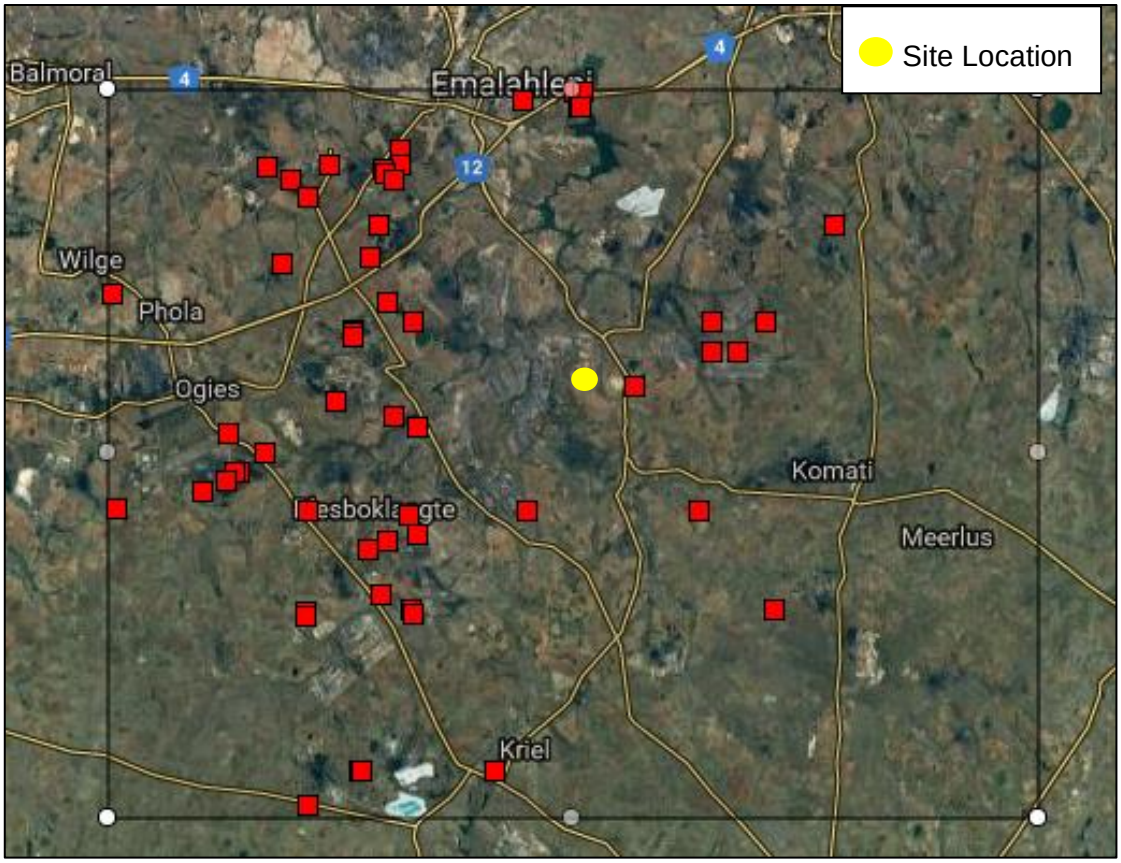

Figure 6: Map showing the grid drawn in order to compile an expected species list (BODATSA-POSA, 2016)

Table 5: Plant SCC expected to occur in the project area (BODATSA-POSA, 2016).

Family	Taxon	Common Name	Author	IUCN status	Habitat preference	Likelihood of occurrence
Fabaceae	*Argyrolobium longifolium*	Silver Pod	(Meisn.) Walp.	VU	Ngongoni and sandstone grassland. Small populations only exist.	Moderate
Iridaceae	*Gladiolus paludosus*	Sword lily	Baker	VU	Moist highveld grasslands, found in wet, rocky sites, mostly dolerite outcrops, wedged in rock crevices.	Moderate
Aizoaceae	*Khadia carolinensis*	Khadiwortel	(L.Bolus) L.Bolus	VU	Well-drained, sandy loam soils among rocky outcrops, or at the edges of sandstone sheets, Highveld Grassland, 1700 m.	Moderate

7.1.4 Faunal Assessment

7.1.4.1 Avifauna

Based on the South African Bird Atlas Project, Version 2 (SABAP2) database, 326 bird species are expected to occur in the vicinity of the project area (pentads 2555_2910, 2555_2915, 2555_2920, 2600_2910, 2600_2915, 2600_2920, 2605_2910, 2605_2915, 2605_2920, 2610_2910, 2610_2915, 2610_2920). The full list of potential bird species is provided in Appendix B.

Of the expected bird species, twenty-five (25) species (7.7%) are listed as SCC either on a regional (23) or global scale (12) (Table 6) (SANBI, 2016). The SCC include the following:

- One (1) species that is listed as Critically Endangered (CR) on a regional basis;
- Four (4) species that are listed as Endangered (EN) on a regional basis;
- Ten (10) species that are listed as Vulnerable (VU) on a regional basis; and
- Eight (8) species that are listed as Near Threatened (NT) on a regional basis;

On a global scale, two (2) species are listed as EN, four (4) species are listed as VU and six (6) species as NT (IUCN, 2017).

Table 6: List of bird species of regional or global conservation importance that are expected to occur in pentads 2555_2910, 2555_2915, 2555_2920, 2600_2910, 2600_2915, 2600_2920, 2605_2910, 2605_2915, 2605_2920, 2610_2910, 2610_2915, 2610_2920 (SABAP2, 2017, ESKOM, 2014; IUCN, 2019)

Species	Common Name	Conservation Status		Likelihood of occurrence
		Regional (SANBI, 2016)	IUCN (2017)	
Alcedo semitorquata	Kingfisher, Half-collared	NT	LC	Moderate
Anthropoides paradiseus	Crane, Blue	NT	VU	Low
Aquila verreauxii	Eagle, Verreaux's	VU	LC	Low
Balearica regulorum	Crane, Grey Crowned	EN	EN	Low
Bugeranus carunculatus	Crane, Wattled	CR	VU	Low
Calidris ferruginea	Sandpiper, Curlew	LC	NT	High
Ciconia abdimii	Stork, Abdim's	NT	LC	High
Ciconia nigra	Stork, Black	VU	LC	Moderate
Circus ranivorus	Marsh-harrier, African	EN	LC	Moderate
Coracias garrulus	Roller, European	NT	LC	Moderate
Eupodotis caerulescens	Korhaan, Blue	LC	NT	Moderate
Eupodotis senegalensis	Korhaan, White-bellied	VU	LC	Low
Falco biarmicus	Falcon, Lanner	VU	LC	High
Geronticus calvus	Ibis, Southern Bald	VU	VU	High
Glareola nordmanni	Pratincole, Black-winged	NT	NT	Moderate

Mycteria ibis	Stork, Yellow-billed	EN	LC	Low
Neotis denhami	Bustard, Denham's	VU	NT	Moderate
Oxyura maccoa	Duck, Maccoa	NT	NT	High
Phoeniconaias minor	Flamingo, Lesser	NT	NT	Moderate
Phoenicopterus ruber	Flamingo, Greater	NT	LC	Moderate
Podica senegalensis	Finfoot, African	VU	LC	Low
Sagittarius serpentarius	Secretarybird	VU	VU	Moderate
Spizocorys fringillaris	Lark, Botha's	EN	EN	Moderate
Sterna caspia	Tern, Caspian	VU	LC	Low
Tyto capensis	Grass-owl, African	VU	LC	High

Alcedo semitorquata (Half-collared Kingfisher) is listed as NT on a regional scale and occurs across a large range. This species generally prefers narrow rivers, streams, and estuaries with dense vegetation onshore, but it may also move into coastal lagoons and lakes. It mainly feeds on fish (IUCN, 2017). The possibility of occurrence is rated as moderate due to the fact that there are some natural wetlands in the project area, and there are various river systems throughout, both of which could provide suitable habitat for this species.

Anthropoides paradiseus (Blue Crane) is listed as NT on a regional scale and as VU on a global scale. This species has declined, largely owing to direct poisoning, power-line collisions and loss of its grassland breeding habitat owing to afforestation, mining, agriculture and development (IUCN, 2017). This species breeds in natural grass- and sedge-dominated habitats, preferring secluded grasslands at high elevations where the vegetation is thick and short. Due to the lack of extensive open grassland areas and the lack of crane records from this area, the likelihood of occurrence is rated as low.

Aquila verreauxii (Verreaux's Eagle) is listed as VU on a regional scale and LC on a global scale. This species is locally persecuted in southern Africa where it coincides with livestock farms, but because the species does not take carrion, is little threatened by poisoned carcasses. Where hyraxes are hunted for food and skins, eagle populations have declined (IUCN, 2017). Based on the expected habitat and the availability of prey items, the likelihood of occurrence of this species at the project site is rated as low.

Balearica regulorum (Grey Crowned Crane) is listed as EN on a regional scale as well as global scale. The species inhabits wetlands such as marshes, pans, and dams with tall emergent vegetation, open riverine woodland, shallowly flooded plains and temporary pools with adjacent grasslands, open savannas, croplands and breeds within or at the edges of wetlands. Due to the lack of extensive open grassland areas and the lack of crane records from this area, the likelihood of occurrence is rated as low.

Bugeranus carunculatus (Wattled Crane) is listed as CR on a regional scale (SANBI, 2016) and VU on a global scale (IUCN, 2017). This species is generally not migratory but those that inhabit seasonal wetlands are irregularly nomadic in response to water availability (del Hoyo *et al*., 1996). In South Africa, this species was found to occupy large home ranges of approximately 16 km^2, which consist largely (75%) of grassland with a small core of essential

wetland breeding habitat (McCann & Benn, 2006). The primary threat is loss and degradation of wetlands as a result of upstream river regulation, intensified agriculture, mining, drainage, invasive species such as Mimosa pigra. Other threats include nest disturbance, grass-burning regimes, poisoning, collision with utility lines, direct consumption of chicks and traditional medicine. Due to the lack of extensive open grassland areas, undisturbed wetlands and the lack of crane records from this area, the likelihood of occurrence is rated as low.

Calidris ferruginea (Curlew Sandpiper) is migratory species which breeds on slightly elevated areas in the lowlands of the high Arctic and may be seen in parts of South Africa during winter. During winter, the species occurs at the coast, but also inland on the muddy edges of marshes, large rivers and lakes (both saline and freshwater), irrigated land, flooded areas, dams and saltpans (IUCN, 2017). Due to the presence of many of these habitat types within the project area the likelihood of occurrence of this species was rated as high.

Ciconia abdimii (Abdim's Stork) is listed as NT on a local scale and the species is known to be found in open grassland and savanna woodland often near water but also in semi-arid areas, gathering beside pools and water-holes. They tend to roost in trees or cliffs (IUCN, 2017). The existence of multiple wet areas and grasslands creates the potential for this species to occur in the area and the likelihood of occurrence was rated as high.

Ciconia nigra (Black Stork) is native to South Africa and inhabits old, undisturbed, open forests. They are known to forage in shallow streams, pools, marshes swampy patches, damp meadows, flood-plains, pools in dry riverbeds and occasionally grasslands, especially where there are stands of reeds or long grass (IUCN, 2017). It is unlikely that this species would breed in the project area due to the lack of forested areas, however, some suitable foraging habitat remains in the form of the open grasslands and wetland areas, and as such the likelihood of occurrence is rated as moderate.

Circus ranivorus (African Marsh Harrier) is listed as EN in South Africa (ESKOM, 2015). This species has an extremely large distributional range in sub-equatorial Africa. South African populations of this species are declining due to the degradation of wetland habitats, loss of habitat through over-grazing and human disturbance and possibly, poisoning owing to over-use of pesticides (IUCN, 2017). This species breeds in wetlands and forages primarily over reeds and lake margins. Due to the presence of some suitable habitat, especially along the Olifants river adjacent to the project area the likelihood of occurrence is considered as moderate.

Coracias garrulous (European Roller) is a winter migrant from most of South-central Europe and Asia occurring throughout sub-Saharan Africa (IUCN, 2017). The European Roller has a preference for bushy plains and dry savannah areas (IUCN, 2017). There is a moderate chance of this species occurring in the project area as they prefer to forage in bushy savanna areas.

Eupodotis caerulescens (Blue Korhaan) is listed as NT according to the IUCN (2017). Their moderately rapid decline is accredited to habitat loss that is a result of intensive agriculture. They are found in high grassveld in close proximity to water, usually above an altitude of 1 500m (del Hoyo *et al*., 1996). The species nests in bare open ground, situated in thick grass or cropland. Based on the required habitat the likelihood of occurrence of this species is rated as moderate.

Eupodotis senegalensis (White-bellied Korhaan) is Near-endemic to South Africa, occurring from the Limpopo Province and adjacent provinces, south through Swaziland to KwaZulu-Natal and the Eastern Cape (Hockey *et al*, 2005). It generally prefers tall, dense sour or mixed grassland, either open or lightly wooded, occasionally moving into cultivated or burnt land. This species may forage in the project area but is unlikely to be resident and as such the likelihood of occurrence was rated as low.

Falco biarmicus (Lanner Falcon) is native to South Africa and inhabits a wide variety of habitats, from lowland deserts to forested mountains (IUCN, 2017). They may occur in groups up to 20 individuals but have also been observed solitary. Their diet is mainly composed of small birds such as pigeons and francolins. The likelihood of occurrence for this species in the project area is rated as high due to the presence of good habitat for this species and the presence of many bird species on which Lanner Falcons may predate.

Geronticus calvus (Southern Bald Ibis) is listed as VU on a regional basis and prefers high rainfall (>700 mm p.a.), sour and alpine grasslands, with an absence of trees and a short, dense grass sward and also occurs in lightly wooded and relatively arid country. It forages on recently burned ground, also using unburnt natural grassland, cultivated pastures, reaped maize fields and ploughed areas. It has a varied diet, mainly consisting of insects and other terrestrial invertebrates (IUCN, 2017). It has high nesting success on safe, undisturbed cliffs. The likelihood of the species foraging within the project area is high due to plentiful suitable habitat, although it is unlikely to roost in this area. .

Glareola nordmanni (Black-winged Pratincole) is a migratory species which is listed as NT both globally and regionally. This species has a very large range, breeding mostly in Europe and Russia, before migrating to southern Africa. Overall population declines of approximately 20% for this species are suspected (IUCN, 2017). This species generally occurs near water and damp meadows, or marshes overgrown with dense grass. Due to its migratory nature, this species will only be present in South Africa for a few months during the year and will not breed locally. There is a small amount of suitable habitat within the project area and adjacent to it and as such the likelihood of occurrence is rated as moderate.

Mycteria ibis (Yellow-billed Stork) is listed as EN on a regional scale and Least Concern (LC) on a global scale. This species is migratory and has a large distributional range which includes much of sub-Saharan Africa. It is typically associated with freshwater ecosystems, especially wetlands and the margins of lakes and dams (IUCN, 2017). The presence of large water bodies within and adjacent to the project area creates a moderate possibility that this species may occur.

Neotis denhami (Denham's Bustard) is listed as VU on a regional scale and NT on a global scale. It occurs in flat, arid, mostly open country such as grassland, Karoo, bushveld, thornveld, scrubland, and savanna but also including modified habitats such as wheat fields and firebreaks Collisions with power lines may be a significant threat in parts of the range, particularly South Africa (IUCN, 2007). The habitat at the project area does provide suitable habitat for this species and therefore its likelihood of occurrence is rated as moderate.

Oxyura maccoa (Maccoa Duck) has a large northern and southern range, South Africa is part of its southern distribution. During the species' breeding season, it inhabits small temporary and permanent inland freshwater lakes, preferring those that are shallow and nutrient-rich with

extensive emergent vegetation such as reeds (*Phragmites* spp.) and cattails (*Typha* spp.) on which it relies for nesting (IUCN, 2017). The likelihood of occurrence of this species in the project area was rated as high due to the presence of dams and rivers within and adjacent to the project area.

Phoeniconaias minor (Lesser Flamingo) is listed as NT on a global and regional scale whereas Phoenicopterus roseus (Greater Flamingo) is listed as NT on a regional scale only. Both species have similar habitat requirements and the species breed on large undisturbed alkaline and saline lakes, salt pans or coastal lagoons, usually far out from the shore after seasonal rains have provided the flooding necessary to isolate remote breeding sites from terrestrial predators and the soft muddy material for nest building (IUCN, 2017). Due to the presence of some preferred habitat within the project area, the likelihood of occurrence is moderate for both species.

Podica senegalensis (African Finfoot) occurs in forest and wooded savanna along permanent streams with thick growths of *Syzygium guineense,* along secluded reaches of thickly wooded rivers and on the edges of pools, lakes, and dams with well-vegetated banks on the edges of dense papyrus beds far from the shore. It is rarely found away from shoreline vegetation and generally avoids stagnant or fast-flowing water (IUCN, 2017). There is some habitat for this species in the project area in the forms of dams and rivers and as such the likelihood of occurrence is rated as moderate.

Sagittarius serpentarius (Secretarybird) occurs in sub-Saharan Africa and inhabits grasslands, open plains, and lightly wooded savanna. It is also found in agricultural areas and sub-desert (IUCN, 2017). The likelihood of occurrence is rated as moderate due to the presence of some open grasslands present in the project area.

Spizocorys fringillaris (Botha's Lark) is listed as EN both globally and nationally (IUCN, 2017; SANBI, 2016). This species is endemic to South Africa, with a restricted distribution to southern Mpumalanga and eastern Free State. Their habitat is limited to well-grazed grasslands, mostly coinciding with black clay soils known as Moist Clay Highveld Grassland. The likelihood of occurrence is rated as moderate to low.

Sterna caspia (Caspian Tern) is native to South Africa and are known to occur in inland freshwater systems such as large rivers, creeks, floodlands, reservoirs and sewage ponds. Habitat suitability was found to be moderate and thus the likelihood of occurrence is moderate.

Tyto capensis (African Grass-owl) is rated as VU on a regional basis. The distribution of the species includes the eastern parts of South Africa. The species is generally solitary, but it does also occur in pairs, in moist grasslands where it roosts (IUCN, 2017). The species prefers thick grasses around wetlands and rivers which are present in the project area. Furthermore, this species specifically has a preference for nesting in dense stands of the grass species *Imperata cylindrica*. Extensive areas of this grass species are evident within the project area and as such the likelihood of occurrence is rated as high.

7.1.4.2 Mammals

The IUCN Red List Spatial Data (IUCN, 2017) lists 84 mammal species that could be expected to occur within the project area (Appendix C). Of these species, 12 are medium to large conservation dependent species, such as *Ceratotherium simum* (Southern White Rhinoceros)

and *Tragelaphus oryx* (Common Eland) that are generally restricted to protected areas such as game reserves in South Africa. These species are not expected to occur in the project area and are removed from the expected SCC list. They are however still included in Appendix C.

Of the remaining 72 small to medium sized mammal species, sixteen (16) (22.2%) are listed as being of conservation concern on a regional or global basis (Table 7) (SANBI, 2016).

The list of potential species includes:

- Two (2) that are listed as EN on a regional basis;
- Four (4) that are listed as VU on a regional basis; and
- Five (5) that are listed as NT on a regional scale.

On a global scale, one (1) species is listed as EN, two (2) are listed as VU and three (3) as NT (IUCN, 2019).

Table 7: List of mammal species of conservation concern that may occur in the project area as well as their global and regional conservation statuses (IUCN, 2019; SANBI, 2016)

Species	Common Name	Conservation Status		Likelihood of occurrence
		Regional (SANBI, 2016)	IUCN (2019)	
Aonyx capensis	Cape Clawless Otter	NT	NT	High
Atelerix frontalis	Southern African Hedgehog	NT	LC	Moderate
Cloeotis percivali	Short-eared Trident Bat	EN	LC	Moderate
Crocidura maquassiensis	Swamp Musk Shrew	NT	LC	Moderate
Dasymys incomtus	African Marsh Rat	NT	LC	Low
Eidolon helvum	African Straw-colored Fruit Bat	LC	NT	Moderate
Felis nigripes	Black-footed Cat	VU	VU	Moderate
Hydrictis maculicollis	Spotted-necked Otter	VU	NT	Moderate
Leptailurus serval	Serval	NT	LC	High
Mystromys albicaudatus	White-tailed Rat	VU	EN	Moderate
Ourebia ourebi	Oribi	EN	LC	Low
Panthera pardus	Leopard	VU	VU	Low

Aonyx capensis (Cape Clawless Otter) is the most widely distributed otter species in Africa (IUCN, 2017). This species is predominantly aquatic, and it is seldom found far from water. Based on the presence of various rivers and dams within, or adjacent to, the project area and therefore the likelihood of occurrence of this species occurring in the project area is considered to be high.

Atelerix frontalis (South African Hedgehog) has a tolerance of a degree of habitat modification and occurs in a wide variety of semi-arid and sub-temperate habitats (IUCN, 2017). Based on the Red List of Mammals of South Africa, Lesotho and Swaziland (2016), A. frontalis

populations are decreasing due to the threats of electrocution, veld fires, road collisions, predation from domestic pets and illegal harvesting. Although the species is cryptic and therefore not often seen, there is suitable habitat in the project area the likelihood of occurrence is rated as moderate.

Cloeotis percivali (Short-eared Trident Bat) occurs in savanna areas where there is sufficient cover in the form of caves and mine tunnels for day roosting (IUCN, 2017). It feeds exclusively on moths and appears to be very sensitive to disturbance. Suitable habitat can be found around the project area and therefore the likelihood of finding this species is rated as moderate.

Crocidura maquassiensis (Maquassie Musk Shrew) is listed as VU on a regional basis and is known to be found in rocky, mountain habitats. It may tolerate a wider range of habitats and individuals have been collected in Kwa-Zulu Natal from a garden, and in mixed bracken and grassland alongside a river at 1,500 m (IUCN, 2017). There is a lack of suitable habitat for this species in the project area and therefore the likelihood of occurrence is rated as moderate.

Dasymys incomtus (African Marsh Rat) is listed as NT on a regional scale and LC on a global scale. This species has a wide distributional range that includes Central Africa, East Africa and parts of Southern Africa. This species has been recorded from a wide variety of habitats, including forest and savanna habitats, wetlands and grasslands (IUCN, 2017). Based on the presence of a river in the project area the likelihood of occurrence of this species may be present in the project area, the proximity of the mining area and degree of disturbance may cause the species to be absent, thus rated as low.

Eidolon helvum (African Straw-coloured Fruit Bat) is listed as LC on a regional scale and NT on a global scale. This species has been recorded from a very wide range of habitats across the lowland rainforest and savanna zones of Africa (IUCN, 2017). Although considered to be widespread and abundant across its range, certain populations are decreasing due to severe deforestation, hunting for food and medicinal use (IUCN, 2017). This species is known to form large roosts and colonies numbering in the thousands to even millions of individuals (IUCN, 2017). No colonies of this species are known to occur in the project area or in the immediate vicinity and, although individuals may occasionally be recorded, it is not expected to be resident within the project area and therefore its likelihood of occurrence is rated as moderate.

Felis nigripes (Black-footed cat) is endemic to the arid regions of southern Africa. This species is naturally rare, has cryptic colouring is small in size and is nocturnal. These factors have contributed to a lack of information on this species. Given that the highest densities of this species have been recorded in the more arid Karoo region of South Africa, the habitat in the project area can be considered to be sub-optimal for the species and the likelihood of occurrence is rated as moderate.

Hydrictis maculicollis (Spotted-necked Otter) inhabits freshwater habitats where water is un-silted, unpolluted, and rich in small to medium sized fishes (IUCN, 2017). Suitable habitat may be available in the Olifants River adjacent to the project area and therefore the likelihood of occurrence is moderate.

Leptailurus serval (Serval) occurs widely through sub-Saharan Africa and is commonly recorded from most major national parks and reserves (IUCN, 2017). The Serval's status

outside reserves is not certain, but they are inconspicuous and may be common in suitable habitat as they are tolerant of farming practices provided there is cover and food available. In sub-Saharan Africa, they are found in habitat with well-watered savanna long-grass environments and are particularly associated with reedbeds and other riparian vegetation types. Due to the presence of grassland areas in the project area the likelihood of occurrence is rated as high.

Mystromys albicaudatus (White-tailed Rat) is listed as VU on a regional basis and EN on a global scale. It is relatively widespread across South Africa and Lesotho; the species is known to occur in shrubland and grassland areas. A major requirement of the species is black loam soils with good vegetation cover. Although the vegetation type is suitable, no black loam seems to be present on site, therefore the likelihood of occurrence of this species is rated as moderate.

Ourebia ourebi (Oribi) has a patchy distribution throughout Africa and is known to occur in South Africa. Populations are becoming more fragmented as it is gradually eliminated from moderately to densely settled areas (IUCN, 2017). The likelihood of occurrence is rated as moderate due to the relatively small size of the patches of natural vegetation that remain within the project area, occurrence for this species is rated as low.

Panthera pardus (Leopard) has a wide distributional range across Africa and Asia, but populations have become reduced and isolated, and they are now extirpated from large portions of their historic range (IUCN, 2017). Impacts that have contributed to the decline in populations of this species include continued persecution by farmers, habitat fragmentation, increased illegal wildlife trade, excessive harvesting for the ceremonial use of skins, prey base declines and poorly managed trophy hunting (IUCN, 2017). Although known to occur and persist outside of formally protected areas, the densities in these areas are considered to be low and the likelihood of occurrence in an area in close proximity to various mining activities in the area, and where they are likely to be persecuted, is regarded as low.

7.1.4.3 Herpetofauna (Reptiles & Amphibians)

Based on the IUCN Red List Spatial Data (IUCN, 2017) and the ReptileMap database provided by the Animal Demography Unit (ADU, 2018) 22 reptile species are expected to occur in the project area (Appendix D). Of the expected reptile species, only one (1) is regarded as an SCC (Table 8).

Based on the IUCN Red List Spatial Data (IUCN, 2017) and the AmphibianMap database provided by the Animal Demography Unit (ADU, 2018) 21 amphibian species are expected to occur in the project area (Appendix E). One amphibian SCC should be present in the project area (Table 8).

Table 8: Herpetofauna SCC that may occur in the project area

Species	Common Name	Conservation Status		Likelihood of Occurrence
		Regional (SANBI, 2016)	IUCN (2017)	
REPTILES				
Crocodylus niloticus	Nile Crocodile	VU	LC	Low
AMPHIBIANS				

Pyxicephalus adspersus	Giant Bull Frog	**NT**	LC	Low

The Nile Crocodile (*Crocodylus niloticus)* is listed as VU regionally. Although this species is listed as expected to occur in the project area, the extensive human presence, as well as the lack of recent records for the surrounding area, suggest that the likelihood of occurrence is low.

The Giant Bull Frog (*Pyxicephalus adspersus*) is a species of conservation concern that will possibly occur in the project area. The Giant Bull Frog is listed as NT on a regional scale. It is a species of drier savannahs. It is fossorial for most of the year, remaining buried in cocoons. They emerge at the start of the rains, and breed in shallow, temporary waters in pools, pans, and ditches (IUCN, 2017). The likelihood of occurrence is rated as low due to previous disturbances and on-going anthropogenic disturbances which increase the chance of persecution.

7.1.5 Mpumalanga Highveld Grasslands

According to the Mpumalanga Highveld Grasslands (MPHG) dataset (Figure 7), the two Proposed and Alternative routes both transect a channelled valley bottom wetland, classified as moderately modified (class C). Other wetland systems considered to be of relevance include seepage areas and dams.

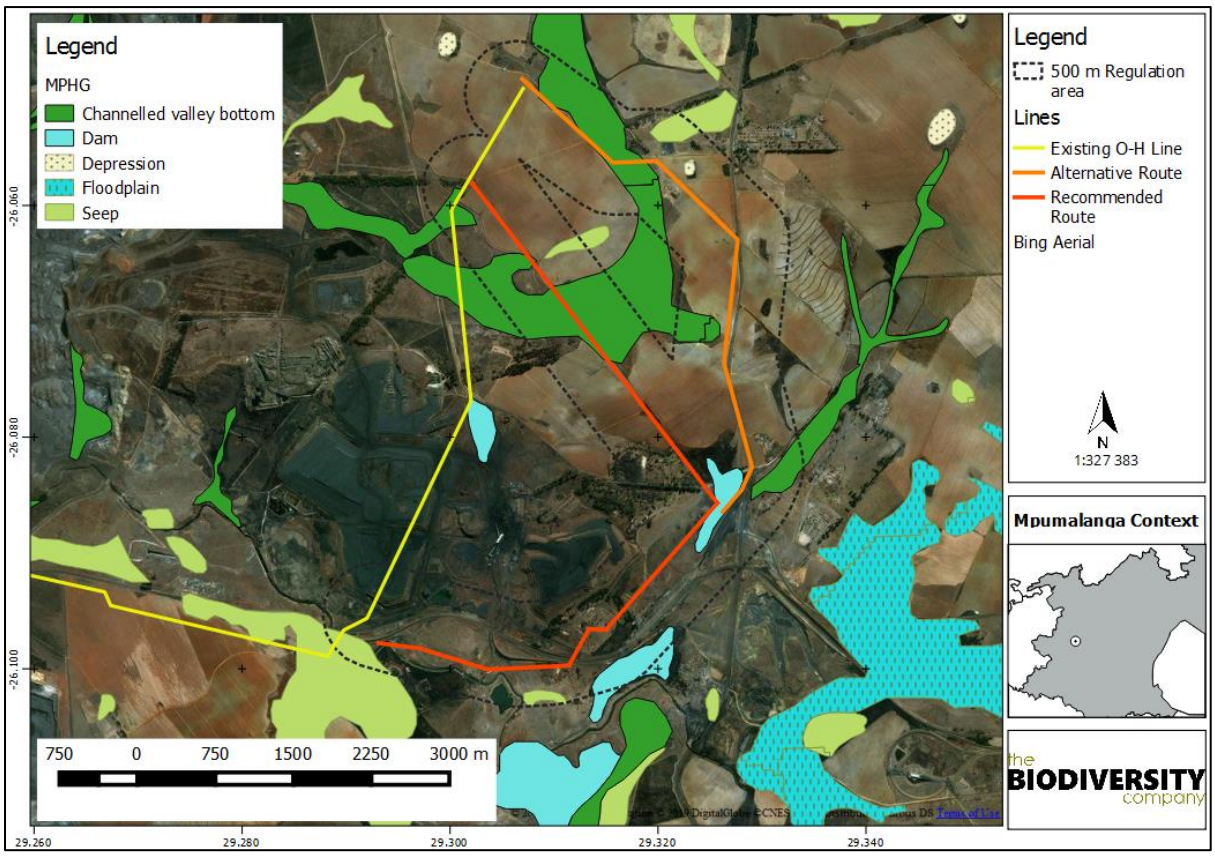

Figure 7: The wetlands in the area according to the MPHG dataset

8 Field Results

The field survey for the project (flora and fauna (mammals, avifauna, amphibians, and reptiles)) and wetlands was conducted on the 4th April 2019. A dry season survey was conducted in the first week of August 2018 and a wet season survey was conducted from the 26th to 28th of November 2018[1] for the adjacent mining area (TBC, 2018). The results herein have prioritised the findings from April 2019 assessment, but have been supplemented by the previous surveys.

8.1 Vegetation Assessment

The vegetation assessment was conducted throughout the entire project area (Figure 8). The following habitats were identified in the project area, namely Disturbed Grassland habitat, Riparian habitat, Transformed habitat, and Wetland habitat.

The Disturbed grassland habitat is an area where the vegetation is either in a semi-natural or degraded state, depending on the area and its disturbance. This habitat is connected, or in close proximity to, many of the wetland and riparian habitats and functions as a buffer for these areas. These fragments of grasslands do function as a part of the ecosystem.

The Riparian habitat refers to the Olifants River as well as areas in close proximity to the river which are still in a natural to semi-natural state. This habitat is fundamental in the water resource scheme on the local and even regional scale.

Transformed habitat refers to several different types of land uses which has resulted in the overall transformation of habitat. Land uses includes agriculture, which covers the largest area within the habitat, followed by mining areas and the associated infrastructure. These areas have been degraded to such an extent that rehabilitation and time (several years) will be needed to recover. These areas have a high amount of alien invasive plant species.

The Wetland habitats identified include a dam as well as wetlands. These areas host a number of wetland plants and due to the nature of this habitat on a local scale, it is considered the most sensitive within the project area. The wetlands, especially the areas with standing water, are in a natural or semi-natural state. These habitats host a large number of the bird species observed in the project area. This area has been impacted upon but forms a crucial part of the ecosystem as a source of food, refugia and a movement corridor for the fauna present within this habitat.

The majority of the vegetation associated with the Proposed and Alternative routes, can be regarded as not sensitive as the routes either go along roads or previously disturbed areas.

[1] Surveys conducted for the proposed infrastructure development project

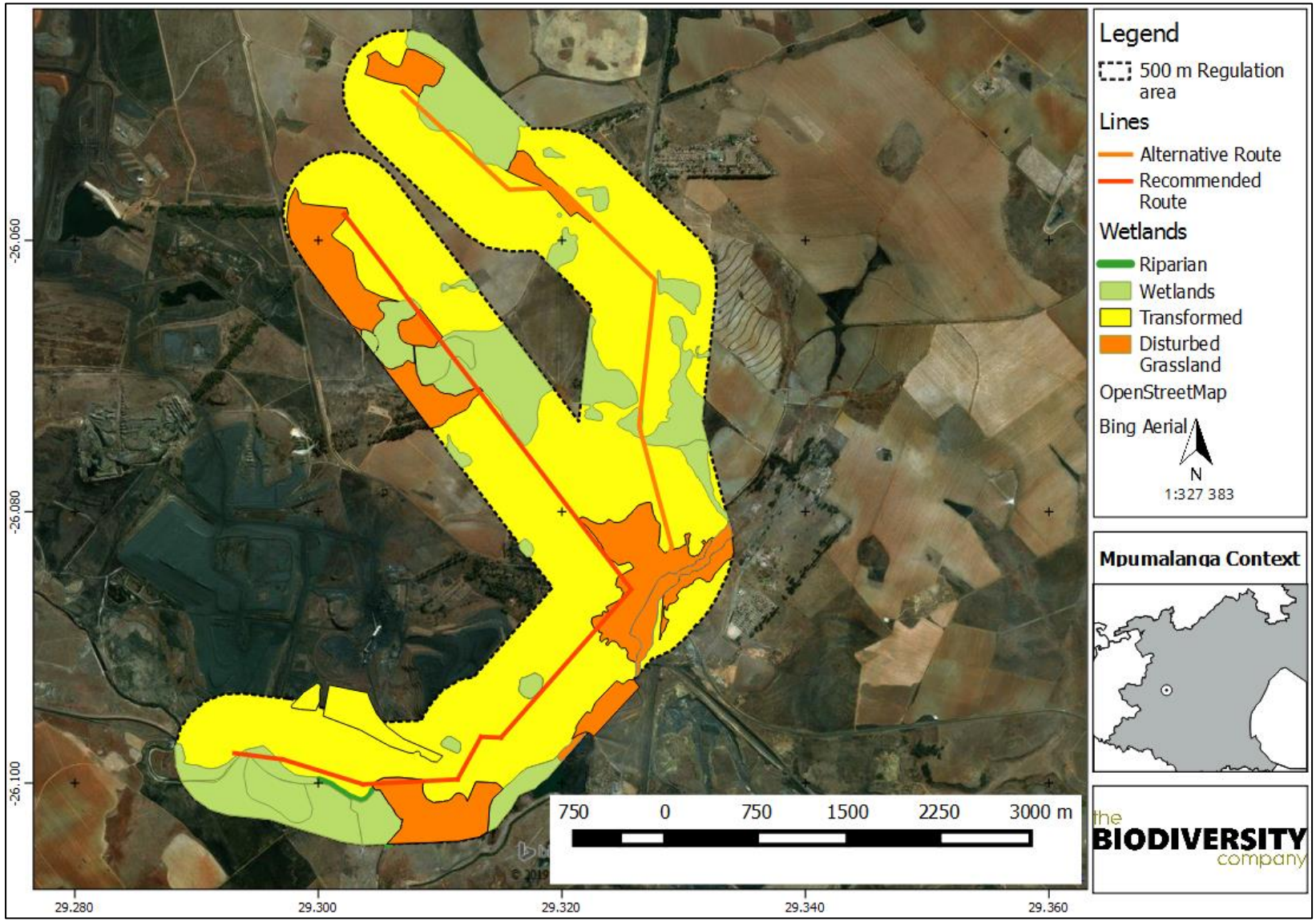

Figure 8: The habitats delineated within the project area

A total of 78 tree, shrub, and herbaceous plant species were recorded in the project area during the April 2019 field assessment (Table 9 and Figure 9). Alien/Exotic/Invader plant species appear in blue text, and NEMBA Category 1 Plants are in green.

Table 9: Trees, shrubs, and weeds recorded at the proposed project area

Scientific Name	Common Name	Threat Status (SANBI, 2017)	SA Endemic	NEMBA Category
Acacia mearnsii	**Black Wattle**			**Category 2**
Andropogon eucomus	Snowflake Grass	LC	No	
Argemone ochroleuca	Mexican Poppy			**NEMBA Category 1b**
Aristida junciformis	Gongoni Three-awn	LC	No	
Berkheya setifera	Buffalo-tongue Thistle	LC	No	
Bidens pilosa	**Blackjack**			**Naturalized exotic weed**
Campuloclinium macrocephalum	Pom Pom Weed			**NEMBA Category 1b**
Celtis africana	White Stinkwood	LC	No	
Chamaecrista comosa	Trailing Dwarf Cassia	LC	No	
Chironia palustris	Cerise Stars	LC	No	
Cirsium vulgare	**Spear Thistle**			**NEMBA Category 1b.**
Cleome maculata	Spotted Cleome	LC	No	
Commelina africana var. krebsiana	Common commelina	LC	No	
Commelina erecta	Whitemouth dayflower	LC	No	
Conyza bonariensis	Hairy Fleabane			**Naturalized exotic weed**
Cortaderia selloana	Pampas grass			**NEMBA Category 1b**
Cosmos bipinnatus	Cosmos			**Naturalized exotic weed**
Cotula anthemoides	Umhlonyane	LC	No	
Cynodon dactylon	**Couch Grass**			**Category 2**
Cynodon nlemfuensis	Star Grass	LC	No	**Naturalized exotic weed**
Cyperus obtusiflorus var. flavissimus	Yellow Sedge	LC	No	
Datura ferox	Large Thorn Apple			**NEMBA Category 1b**
Datura stramonium	Common Thorn Apple			**NEMBA Category 1b**
Digitaria eriantha	Digitgrass	LC	No	
Diospyros lycioides	Bluebush	LC	No	

*Disa woodii**	Disa	LC	No	
Eleusine coracana	Finger millet	LC	No	
Eragrostis chloromelas	Blue Love Grass	LC	No	
Eragrostis curvula	Weeping Love Grass	LC	No	
Eragrostis gummiflua	Gum Grass	LC	No	
Eragrostis lehmanniana	Lehman Love Grass	LC	No	
Eragrostis superba	Flat-Seed Love Grass	LC	No	
Eucalyptus camaldulensis	Red River Gum			**NEMBA Category 1b**
Eucalyptus cinerea	Argyle apple			**NEMBA Category 1b**
Felicia muricata	Wild Aster	LC	No	
Gomphocarpus fruticosus	Narrow-leaved cotton bush	LC	No	
Haplocarpha scaposa	False Gerbera	LC	No	
Helichrysum cephaloideum	Ibhade	LC	No	
Helichrysum nudifolium	Hottentot's Tea	LC	No	
Helichrysum rugulosum	Marotole	LC	No	
Hermannia transvaalensis	Desert rose	LC	Yes	
Hibiscus trionum	Bladder Hibiscus			**Naturalized exotic**
Hyparrhenia hirta	Common Thatching Grass	LC	No	
*Hypoxis hemerocallidea**	Star Flower	LC	No	
Hypoxis rigidula	Silver-leaved Star-flower	LC	No	
Imperata cylindrica	Cotton-Wool Grass	LC	No	
Ipomoea indica	**Ocean blue morning glory**	**LC**	**No**	**NEMBA Category 1b**
Kyllinga alba	Witbiesie	LC	No	
Leersia hexandra	Southern Cutgrass	LC	No	
Melinis repens	Natal Red Top	LC	No	
Monocymbium ceresiiforme	Boat Grass	LC	No	
Monopsis decipiens	Butterfly Monopsis	LC	No	
Nemesia fruticans	Cape Snapdragon	LC	No	

Ocimum obovatum	Cat's Whiskers	LC	No	
Oenothera rosea	Pink Evening Primrose			**NEMBA Category 2**
Panicum maximum	Guinea Grass	LC	No	
Paspalum dilatatum	Dallis Grass	LC	No	
Paspalum urvillei	Vasey Grass			**Not Indigenous**
Pelargonium luridum	Wild Geranium	LC	No	
Pennisetum clandestinum	Kikuyu Grass			**NEMBA Category 1b**
Perotis patens	Bottlebrush Grass	LC	No	
Phragmites australis	Common Reed	LC	No	
Richardia brasiliensis	**Mexican clover**			**Not Indigenous**
Schkuhria pinnata	**Dwarf Marigold**			**Naturalized exotic weed**
Senecio affinis	-	LC	No	
Setaria sphacelata var sericea	Golden Bristle Grass	LC	No	
Solanum sisymbriifolium	**Thorned Bitter Apple**			**NEMBA Category 1b.**
Sporobolus africanus	Rush Grass	LC	No	
Stoebe plumosa	Slangbossie	LC	No	
Tagetes minuta	**Khaki Bush**			**Naturalized exotic weed**
Themeda triandra	Angle Grass	LC	No	
Tristachya leucothrix	Hairy Trident Grass	LC	No	
Typha capensis	Bulrush	LC	No	
Vachellia karroo	Sweet Thorn	LC	No	
Verbena bonariensis	**Wild Verbena**			**NEMBA Category 1b.**
Wahlenbergia undulata	African Bluebell	LC	No	
Xanthium strumarium	**Large Cocklebur**			**NEMBA Category 1b.**

Figure 9: Some of the plant species observed in the project area: A) Cosmos bipinnatus, B) Commelina erecta, C) Chironia palustris, D) Hibiscus trionum, E) Helichrysum cephaloideum, F) Pelargonium luridum, and G) Monopsis decipiens

8.2 Alien and Invasive Plants

Declared weeds and invader plant species have the tendency to dominate or replace the canopy or herbaceous layer of natural ecosystems, thereby transforming the structure, composition, and function of these systems. Therefore, it is important that these plants are

controlled and eradicated by means of an eradication and monitoring programme. Some invader plants may also degrade ecosystems through superior competitive capabilities to exclude native plant species.

The NEMBA is the most recent legislation pertaining to alien invasive plant species. In August 2014, the list of Alien Invasive Species was published in terms of the National Environmental Management: Biodiversity Act (Act 10 of 2004) (Government Gazette No 78 of 2014). The Alien and Invasive Species Regulations were published in the Government Gazette No. 37886, 1 August 2014. The legislation calls for the removal and/or control of alien invasive plant species (Category 1 species). In addition, unless authorised thereto in terms of the National Water Act, 1998 (Act No. 36 of 1998), no land user shall allow Category 2 plants to occur within 30 meters of the 1:50 year flood line of a river, stream, spring, natural channel in which water flows regularly or intermittently, lake, dam or wetland. Category 3 plants are also prohibited from occurring within proximity to a watercourse.

Below is a brief explanation of the three categories in terms of the National Environmental Management: Biodiversity Act (Act 10 of 2004) (NEMBA):

- Category 1a: Invasive species requiring compulsory control. Remove and destroy. Any specimens of Category 1a listed species need, by law, to be eradicated from the environment. No permits will be issued.
- Category 1b: Invasive species requiring compulsory control as part of an invasive species control programme. Remove and destroy. These plants are deemed to have such a high invasive potential that infestations can qualify to be placed under a government-sponsored invasive species management programme. No permits will be issued.
- Category 2: Invasive species 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.
- Category 3: Invasive species regulated by activity. An individual plant permit is required to undertake any of the following restricted activities (import, possess, grow, breed, move, sell, buy or accept as a gift) involving a Category 3 species. No permits will be issued for Category 3 plants to exist in riparian zones.

Note that according to the regulations, a person who has under his or her control a Category 1b listed invasive species must immediately:

- Notify the competent authority in writing;
- Take steps to manage the listed invasive species in compliance with:
    - Section 75 of the Act;
    - The relevant invasive species management programme developed in terms of regulation 4; and
    - Any directive issued in terms of section 73(3) of the Act.

Thirteen (13) Category 1b invasive species were recorded within the project area and must therefore be removed by implementing an alien invasive plant management programme in compliance of section 75 of the Act as stated above. The NEMBA category 1-listed species identified within the project area are marked in green (Table 9), while the blue indicate the alien/ exotic/invader plants as well as the NEMBA category 2 species.

8.3 Avifauna

During the April 2019 survey fifty-five species of birds were recorded (Table 10 and Figure 10). No SCCs were recorded in the survey; however, this does not exclude the likelihood of them occurring in the area.

Table 10: A list of the avifaunal species recorded in the project area

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2017)
Acridotheres tristis	Myna, Common	Unlisted	LC
Alopochen aegyptiacus	Goose, Egyptian	Unlisted	LC
Anas undulata	Duck, Yellow-billed	Unlisted	LC
Anhinga rufa	Darter, African	Unlisted	LC
Ardea cinerea	Heron, Grey	Unlisted	LC
Ardea goliath	Heron, Goliath	Unlisted	LC
Ardea melanocephala	Heron, Black-headed	Unlisted	LC
Ardea purpurea	Heron, Purple	Unlisted	LC
Bostrychia hagedash	Ibis, Hadeda	Unlisted	LC
Bubulcus ibis	Egret, Cattle	Unlisted	LC
Buteo rufofuscus	Buzzard, Jackal	Unlisted	LC
Cercomela familiaris	Chat, Familiar	Unlisted	LC
Cisticola tinniens	Cisticola, Levaillant's	Unlisted	LC
Columba livia	Dove, Rock	Unlisted	LC
Corvus albus	Crow, Pied	Unlisted	LC
Crithagra atrogularis	Canary, Black-throated	Unlisted	LC
Dicrurus adsimilis	Drongo, Fork-tailed	Unlisted	LC
Egretta intermedia	Egret, Yellow-billed	Unlisted	LC
Elanus caeruleus	Kite, Black-shouldered	Unlisted	LC
Estrilda astrild	Waxbill, Common	Unlisted	LC
Euplectes afer	Bishop, Yellow-crowned	Unlisted	LC
Euplectes orix	Bishop, Southern Red	Unlisted	LC
Euplectes progne	Widowbird, Long-tailed	Unlisted	LC
Fulica cristata	Coot, Red-knobbed	Unlisted	LC
Hirundo cucullata	Swallow, Greater Striped	Unlisted	LC
Lamprotornis bicolor	Starling, Pied	Unlisted	LC
Lamprotornis nitens	Starling, Cape Glossy	Unlisted	LC

Lanius collaris	Fiscal, Common (Southern)	Unlisted	LC
Larus cirrocephalus	Gull, Grey-headed	Unlisted	LC
Macronyx capensis	Longclaw, Cape	Unlisted	LC
Motacilla capensis	Wagtail, Cape	Unlisted	LC
Numida meleagris	Guineafowl, Helmeted	Unlisted	LC
Oenanthe monticola	Wheatear, Mountain	Unlisted	LC
Onychognathus morio	Starling, Red-winged	Unlisted	LC
Passer domesticus	Sparrow, House	Unlisted	LC
Phalacrocorax africanus	Cormorant, Reed	Unlisted	Unlisted
Phalacrocorax carbo	Cormorant, White-breasted	Unlisted	LC
Ploceus cucullatus	Weaver, Village	Unlisted	LC
Ploceus velatus	Masked-weaver, Southern	Unlisted	LC
Prinia subflava	Prinia, Tawny-flanked	Unlisted	LC
Quelea quelea	Quelea, Red-billed	Unlisted	LC
Riparia paludicola	Martin, Brown-throated	Unlisted	LC
Saxicola torquatus	Stonechat, African	Unlisted	LC
Spizocorys conirostris	Lark, Pink-billed	Unlisted	LC
Streptopelia capicola	Turtle-dove, Cape	Unlisted	LC
Streptopelia semitorquata	Dove, Red-eyed	Unlisted	LC
Streptopelia senegalensis	Dove, Laughing	Unlisted	LC
Tachybaptus ruficollis	Grebe, Little	Unlisted	LC
Uraeginthus angolensis	Waxbill, Blue	Unlisted	LC
Urocolius indicus	Mousebird, Red-faced	Unlisted	LC
Vanellus armatus	Lapwing, Blacksmith	Unlisted	LC
Vanellus coronatus	Lapwing, Crowned	Unlisted	LC
Vanellus senegallus	Lapwing, African Wattled	Unlisted	LC
Vidua macroura	Whydah, Pin-tailed	Unlisted	LC

Figure 10: Avifaunal species recorded during the survey: A) Red-knobbed Coot (Fulica cristata), B) Black Headed Heron (Ardea melanocephala), C) Southern Red-Bishop (Euplectes orix), D) Pied Starling (Lamprotornis bicolor), E) Helmeted Guineafowl (Numida meleagris) and F) Laughing Dove (Streptopelia senegalensis)

8.4 Mammals

Overall, mammal diversity in the project area was considered low, with five mammal species recorded during this April 2019 survey based on either direct observation or the presence of visual tracks & signs. Two SCCs were observed: the Serval (*Leptailurus serval*) and the Cape Clawless Otter (*Aonyx capensis*).

Table 11: A list of the mammal species observed in the project area

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2017)
Aonyx capensis	Cape Clawless Otter	NT	NT
Atilax paludinosus	Water Mongoose	LC	LC
Canis mesomelas	Black-backed Jackal	LC	LC
Cynictis penicillata	Yellow Mongoose	LC	LC
Leptailurus serval	Serval	NT	LC

Figure 11: Some of the mammal species observed in the project area, A) Serval (Leptailurus serval), B) Water Mongoose track (Atilax paludinosus) and C) Cape Clawless Otter (Aonyx capensis) tracks.

8.5 Herpetofauna (Reptiles & Amphibians)

The herpetofauna diversity was considered low, with two (2) reptiles and one (1) amphibian recorded during the April 2019 survey (Table 12).

Table 12: A list of herpetofauna recorded in the project area during the April 2019 survey

Species	Common Name	Conservation Status	
		Regional	Global
Reptiles			
Crotaphopeltis hotamboeia	Red-lipped Snake	LC	Unlisted
Trachylepis varia	Variable Skink	LC	LC
Amphibians			
Sclerophrys gutturalis	Guttural Toad	LC	LC

Figure 12: Some of the reptiles observed in the project area: A & C) Red-lipped Snake (Crotaphopeltis hotamboeia) and B) Variable Skink (Trachylepis varia)

8.6 Wetland Assessment

8.6.1 Wetland Delineation

According to the DWAF (2005) wetland delineation guidelines, there are four main characteristics which are used to delineate wetlands, which includes the following:

- Hydromorphic/wetland soils;
- Terrain unit indicators (topography);
- The presence of hydrophytes; and
- A high-water table leading to hydromorphic soils.

However, only one of the above-mentioned characteristics needs to be present for an area to be classified as being a wetland, (DWAF, 2005).

Previous study findings have been considered for the delineation and assessment of wetland systems. This included a wetland dataset created by Wetland Consulting Services (2004), and also the wetland assessment completed for SRK Consulting (Pty) Ltd (2013). It is evident from this dataset that a number of the wetlands were authorised to be mined out, and the general topography of the area altered considerably.

A total of five (5) hydro-geomorphic (HGM) wetland types were identified and delineated for this assessment, these include a river (with riparian zone), both channelled and unchannelled wetland systems, seepage areas and depressions (refer to Figure 16). A total of nine (9) HGM units were delineated for this assessment (refer to Figure 17). HGM 9 was determined to comprise of dams, canals and previously mined areas, thus constituting artificial systems, and as a result, HGM 9 was only delineated and not further assessed. The wetland classification as per the Ollis *et al*. (2013) guidelines is shown in Table 13.

Conceptual illustrations of the wetlands, showing the typical landscape setting and the dominant inputs, throughputs and outputs of water are presented in Figure 15 (Ollis *et al*., 2013). Photographs of some of the soil forms and vegetation identified for the project are presented in Figure 13 and Figure 14 respectively.

Table 13: Wetland classification as per SANBI guideline (Ollis et al., 2013)

Level 2		Level 3	Level 4		
Ecoregion/s	**NFEPA Wet Veg Group/s**	**Landscape Unit**	**4A (HGM)**	**4B**	**4C**
Highveld	Eastern Highveld Grassland	Valley Floor	River	Lower foothills	Riparian zone
Highveld	Eastern Highveld Grassland	Valley Floor	Channelled Valley Bottom	N/A	N/A
Highveld	Eastern Highveld Grassland	Valley Floor	Unchannelled Valley Bottom	N/A	N/A
Highveld	Eastern Highveld Grassland	Slope	Seep	-	-
Highveld	Eastern Highveld Grassland	Valley Floor	Depression	-	-

Figure 13: Photographs of soil forms identified for the assessment (April 2019). Left: Rensburg. Centre: Dundee. Right: Longlands

Figure 14: Photographs of vegetation identified for the assessment (April 2019). Left: Leersia hexandra. Centre: Imperta cylindrica. Right: Andropogon appendulatus (facultative)

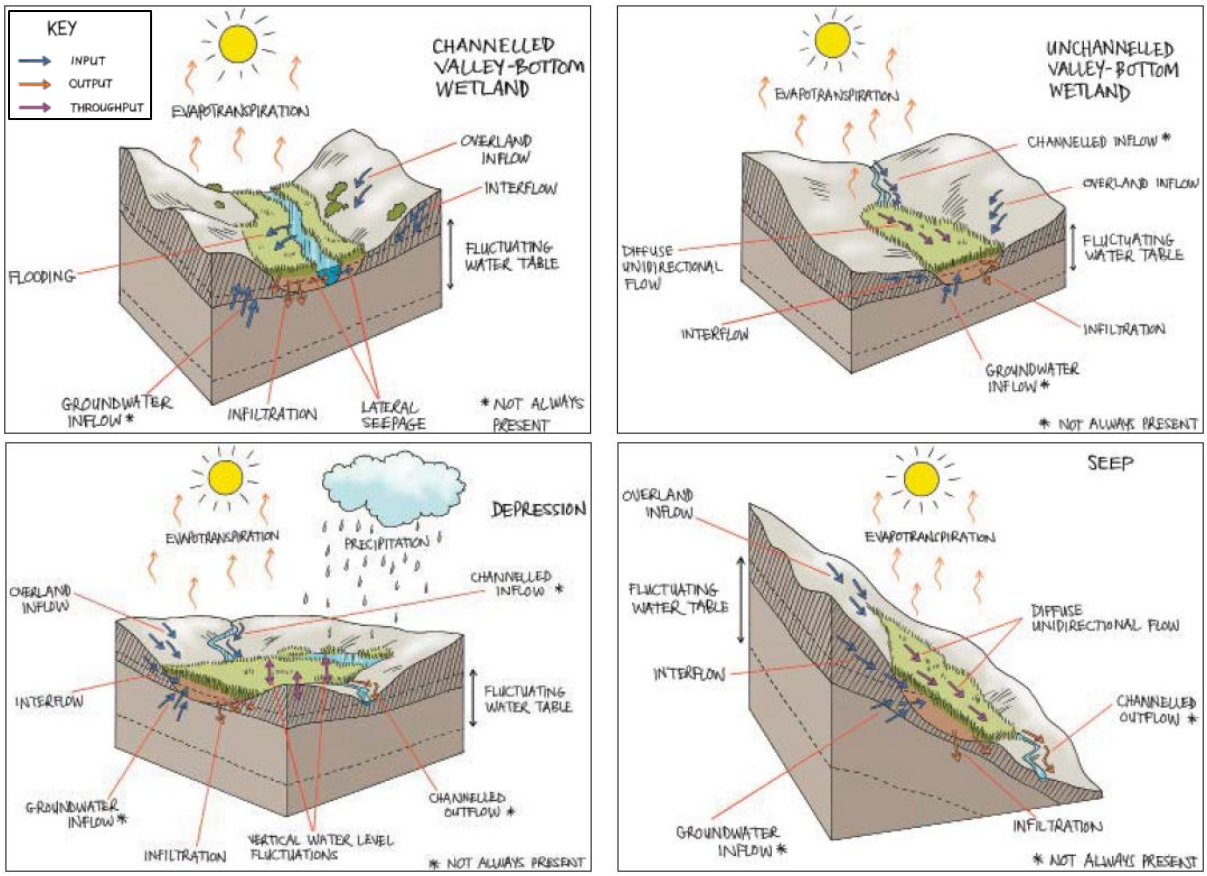

Figure 15: Conceptual illustrations of the wetlands, showing the typical landscape setting and the dominant inputs, throughputs and outputs of water (Ollis et al. 2013)

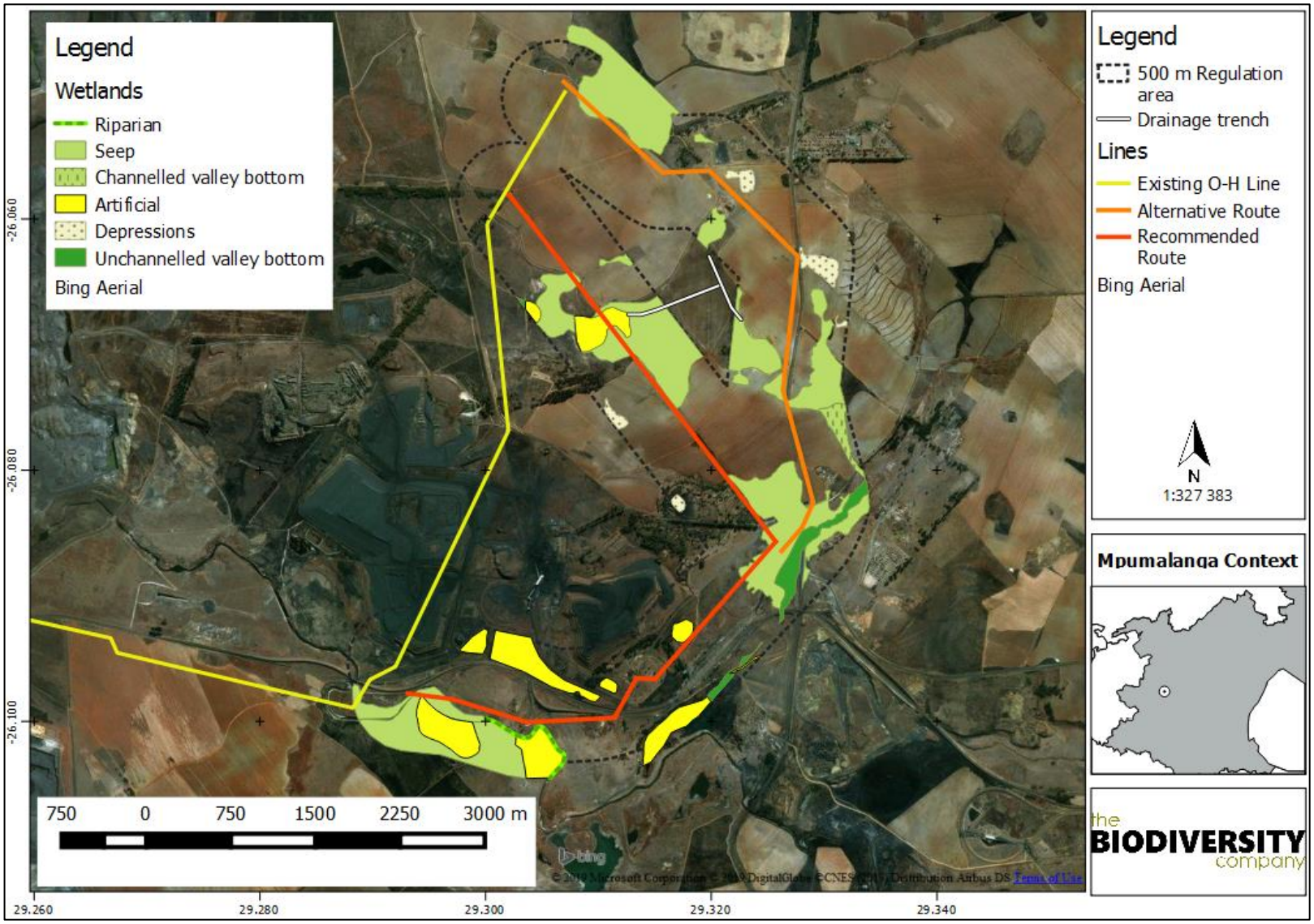

Figure 16: The wetland areas delineated for the project area

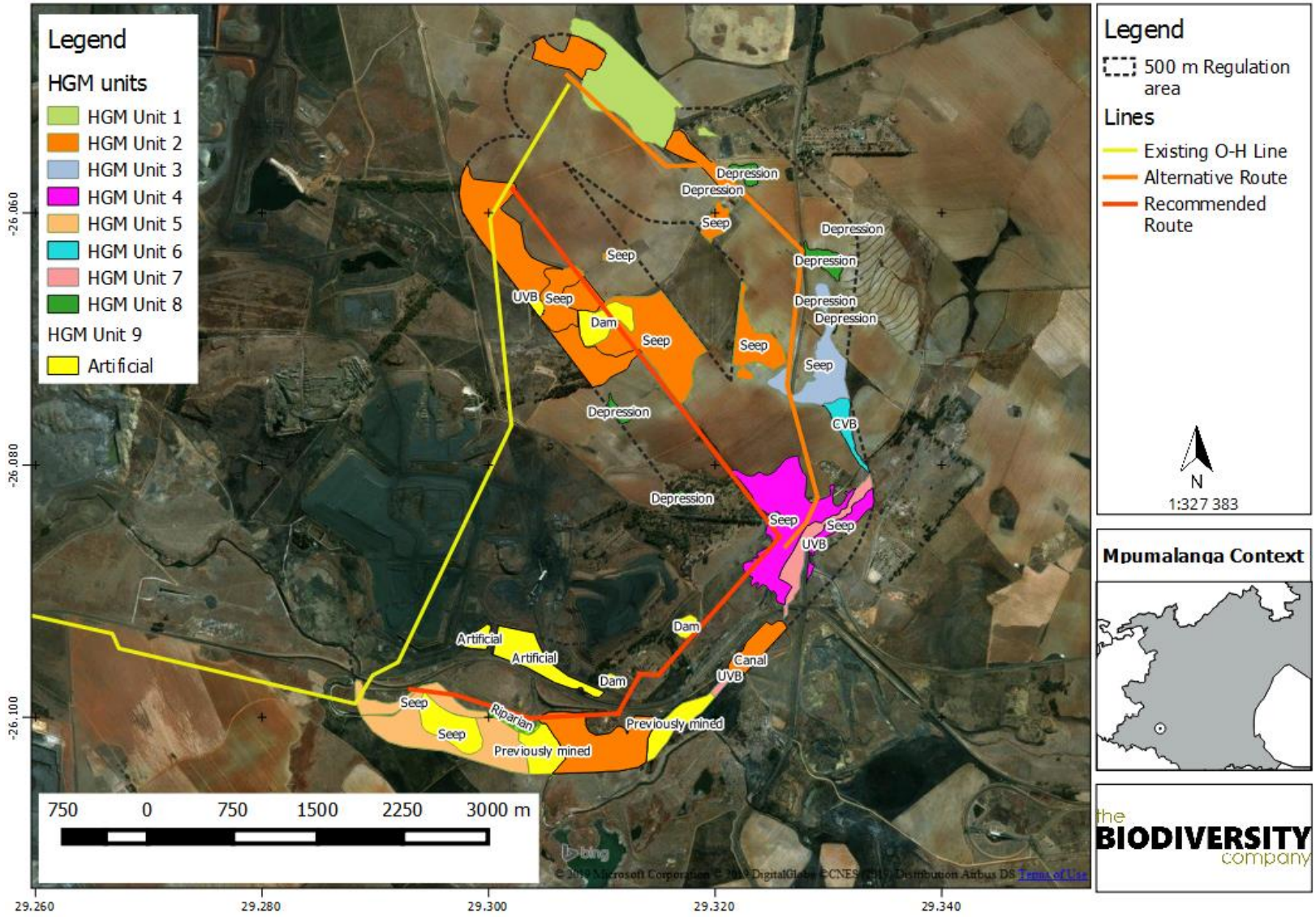

Figure 17: The HGM units delineated for the project area

8.6.2 Present Ecological Status

The PES for the assessed HGM units is shown in Table 14. A summary of key aspects that have contributed to the impacted state of the wetlands includes the following:

- The mining of areas in close proximity to the project area;
- Agricultural cultivation within the project area;
- Development of the catchment area, including roads; and
- The establishment of alien vegetation.

HGM unit 2 and 5 were both assigned a rating of C (moderately modified) and the remaining HGM units were assigned a rating of D (largely modified) (Figure 18). All of the HGM units have large proportions of their catchments under cultivation, predominantly Maize and Soya. No signs of abstraction for irrigation were immediately apparent. Scattered stands of woody alien vegetation (mostly *Eucalyptus camaldulensis* and *Acacia mearnsii*) occur in the catchments. Tillage practices have considerably increased the prevalence of exposed ground in the catchments of these systems, contributing to increased floodpeaks. Roads and other mining-related infrastructure compound this issue but to a lesser extent (mostly croplands in catchment). Overall, all systems appear to have experienced decreased inputs from their catchments, with the exception of HGM unit 8 which very likely receives additional inputs. The distribution and retention of water within all HGM units has been decreased by increased drainage facilitated by tillage practices and in some cases by the construction of canals. HGM units 1, 4 and 8 are particularly impacted in this regard by the presence of large drains, although their efficacy in draining the systems is somewhat limited. All these systems have experienced a decrease in vegetative cover as a result of these impacts which has undoubtedly affected their retention capacity.

All HGM units were assigned a geomorphology rating of C (moderately modified). Although the prevailing substrate (Longlands, Katspruit and Rensburg) is prone to erosion, the systems appear to be depositional in nature with little evidence of erosion in most. This is likely due to their relatively gentle slope and the high delivery of sediment to these systems from their catchments. With the exception HGM unit 8, none of these systems are deprived of sediment from upstream dams. The numerous earthen depressions, dams within HGM unit 8, although artificial, have undoubtedly helped to attenuate stormflows and trap sediment preventing the systems from becoming channelled and erosive in nature.

Vegetation integrity has been compromised within all the HGM units. Crop cultivation (present and historic) has been the primary modifier, yet, alien species encroachment, infrastructure and flooding upstream of impeding features have also played a role. Of all the systems, vegetation within HGM unit 2 is the most intact (class C, moderately modified), supporting a relatively high diversity of species and low level of alien infestation. In contrast the vegetation within HGM units 3-4 is considerably more transformed (class E, seriously modified) due to extensive soil transformation from tillage and mining practices.

Table 14: The wetland PES for the assessed systems

Wetland	Area (ha)	Hydrology		Geomorphology		Vegetation	
		Rating	Score	Rating	Score	Rating	Score
HGM 1	81.5	E: Seriously Modified	6.5	C: Moderately Modified	2.3	D: Largely Modified	5.6
Overall PES Score		5.0		Overall PES Class		D: Largely Modified	
HGM 2	37.35	C: Moderately Modified	3.5	C: Moderately Modified	2.2	C: Moderately Modified	2.6
Overall PES Score		2.9		Overall PES Class		C: Moderately Modified	
HGM 3	27.2	E: Seriously Modified	6.0	C: Moderately Modified	2.3	E: Seriously Modified	6.1
Overall PES Score		5.0		Overall PES Class		D: Largely Modified	
HGM 4	24.2	E: Seriously Modified	6.5	C: Moderately Modified	2.8	E: Seriously Modified	7.2
Overall PES Score		5.6		Overall PES Class		D: Largely Modified	
HGM 5	38.8	C: Moderately Modified	3.5	C: Moderately Modified	3.0	C: Moderately Modified	3.8
Overall PES Score		3.4		Overall PES Class		C: Moderately Modified	
HGM 6	12.82	E: Seriously Modified	6.0	C: Moderately Modified	2.4	D: Largely Modified	5.6
Overall PES Score		4.9		Overall PES Class		D: Largely Modified	
HGM 7	25.40	E: Seriously Modified	6.5	C: Moderately Modified	2.3	D: Largely Modified	5.9
Overall PES Score		5.1		Overall PES Class		D: Largely Modified	
HGM 8	21.1	D: Largely Modified	4.0	C: Moderately Modified	3.1	D: Largely Modified	4.8
Overall PES Score		4.0		Overall PES Class		D: Largely Modified	

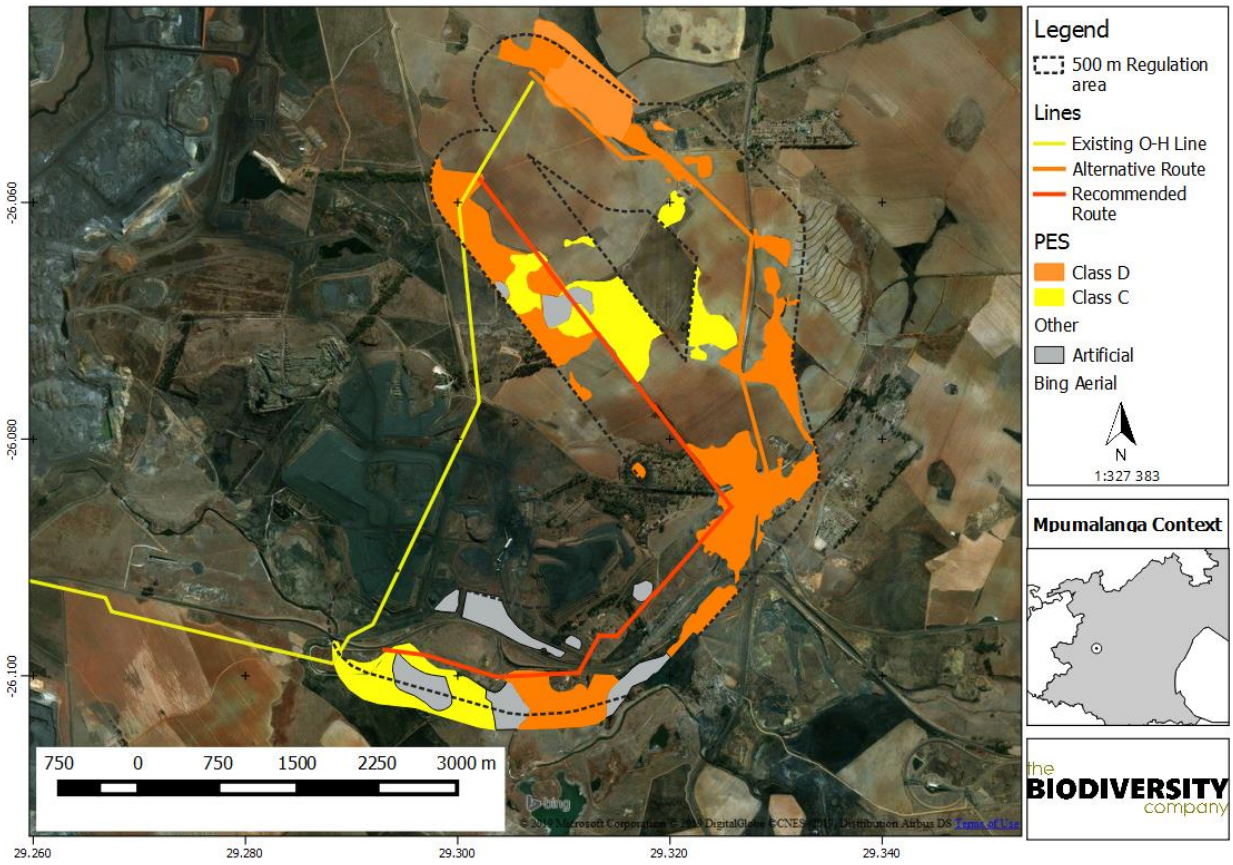

Figure 18: The PES of the delineated wetlands within the regulation area

8.6.3 Wetland Ecosystem Services

Wetland functionality refers to the ability of wetlands to provide healthy conditions for the wide variety of organisms found in wetlands as well as humans. Ecoservices serve as the main factor contributing to wetland functionality.

The assessment of the ecosystem services supplied by the identified wetlands was conducted per the guidelines as described in WET-EcoServices (Kotze *et al*. 2009). An assessment was undertaken that examines and rates the following services according to their degree of importance and the degree to which the services are provided (Table 15).

Table 15: Classes for determining the likely extent to which a benefit is being supplied

Score	Rating of likely extent to which a benefit is being supplied
< 0.5	Low
0.6 - 1.2	Moderately Low
1.3 - 2.0	Intermediate
2.1 - 3.0	Moderately High
> 3.0	High

All the HGM units with the exception of HGM unit 7 had an overall intermediate service rating, with HGM unit 7 receiving a moderate high rating. The highest ratings (predominantly moderately high) for all the HGM units is associated with the indirect benefits, specifically for the enhancement of water quality, streamflow regulation and the enhancement of biodiversity.

The only service provided by the wetlands to provide a high level of benefit was nitrate assimilation associated with HGM 7. Table 16 presents the level of benefit provided for each of the evaluated ecosystem services.

Table 16: The level of ecosystem benefits provided by the assessed wetland units

Wetland Unit					HGM 1	HGM 2	HGM 3	HGM 4	HGM 5	HGM 6	HGM 7	HGM 8
Ecosystem Services Supplied by Wetlands	Indirect Benefits	Regulating and supporting benefits	Flood attenuation		1.4	1.3	1.1	1.3	1.2	1.6	1.6	1.5
			Streamflow regulation		2.7	2.8	2.8	2.7	2.7	2.8	3.0	1.8
			Water Quality enhancement benefits	Sediment trapping	2.2	2.5	2.4	2.5	2.4	2.5	2.7	2.6
				Phosphate assimilation	2.4	2.5	2.5	2.4	2.4	2.3	2.7	2.4
				Nitrate assimilation	2.4	2.8	2.8	2.7	2.6	2.6	3.2	2.3
				Toxicant assimilation	2.4	2.6	2.6	2.6	2.4	2.4	3.0	2.4
				Erosion control	2.3	2.5	2.2	1.5	2.2	2.4	2.7	2.6
			Carbon storage		1.0	1.7	1.7	0.7	1.3	1.7	2.0	1.0
	Direct Benefits	Biodiversity maintenance			3.0	3.0	3.0	1.8	3.0	3.0	3.0	3.0
		Provisioning benefits	Provisioning of water for human use		1.6	1.8	1.8	1.6	1.6	1.8	2.0	1.3
			Provisioning of harvestable resources		0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
			Provisioning of cultivated foods		1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
		Cultural benefits	Cultural heritage		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			Tourism and recreation		1.3	1.3	0.9	1.0	1.0	1.0	1.9	1.1
			Education and research		0.8	1.0	0.8	0.8	0.8	0.8	0.8	0.8
Overall					26.1	28.4	27.1	23.9	26.2	27.1	23.9	26.2
Average					1.7	1.9	1.8	1.6	1.7	1.8	1.6	1.7

8.6.4 Ecological Importance & Sensitivity

The method used for the EIS determination was adapted from the method as provided by DWS (1999) for floodplains. The method takes into consideration PES scores obtained for WET-Health as well as function and service provision to enable the assessor to determine the most representative EIS category for the wetland feature or group being assessed. A series of determinants for EIS are assessed on a scale of 0 to 4, where 0 indicates no importance and 4 indicates very high importance. The mean of the determinants is used to assign the EIS category as listed in Table 17 (Rountree and Kotze, 2013).

Table 17: Description of Ecological Importance and Sensitivity categories

EIS Category	Range of Mean	Recommended Ecological Management Class
Very High:	3.1 to 4.0	Wetlands that are considered ecologically important and sensitive on a national or even international level. The biodiversity of these systems is usually very sensitive to flow and habitat modifications. They play a major role in moderating the quantity and quality of water of major rivers
High	2.1 to 3.0	**Wetlands that are considered to be ecologically important and sensitive. The biodiversity of these systems may be sensitive to flow and habitat modifications. They play a role in moderating the quantity and quality of water of major rivers.**
Moderate	1.1 to 2.0	**Wetlands that are considered to be ecologically important and sensitive on a provincial or local scale. The biodiversity of these systems is not usually sensitive to flow and habitat modifications. They play a small role in moderating the quantity and quality of water of major rivers.**
Low Marginal	< 1.0	**Wetlands that are not ecologically important and sensitive at any scale. The biodiversity of these systems is ubiquitous and not sensitive to flow and habitat modifications. They play an insignificant role in moderating the quantity and quality of water of major rivers.**

The EIS assessment was applied to the wetland units in order to assess the levels of sensitivity and ecological importance of the systems. The results of the assessment are shown in Table 16. The EIS for all the wetland units has considered similar aspects from the infrastructure project (TBC, 2018). The EIS of HGM units 1, 2, 5 and 7 were rated as high, with the remaining units rated as moderate. This “high” rating is partially attributed to the location of the project area within the Olifants River catchment (TBC, 2018). The catchment is under stress due to mining, power stations, urbanization and agriculture, and the ability of these systems to contribute towards water quality enhancement and regulation, a high importance and conservation value is placed on these systems.

For HGM unit 1, the temporary to seasonal hydroperiod and low vegetation cover would likely preclude the presence of Red Data species if it weren’t for the presence of the artificial dams. These artificial dams may be visited by the region’s Harrier species (although unlikely to breed on site). Additionally, their margins may support conservation significant small mammals (e.g. *Otomys auratus* and *Crocidura mariquensis*). In spite of historic cultivation, HGM unit 2 maintains hydromorphic grasslands that are still in a relatively good state. This system provides suitable habitat for African Grass-owl, *Otomys auratus* and *Crocidura mariquensis*. Saturation levels may be limiting for Marsh Sylph. Upstream of the point where HGM unit 7

becomes canalised (R554 road) the system provides suitable foraging habitat for Harriers and African Grass-owl. Although suitable breeding habitat exists for these species it is likely that disturbance levels are too high. In terms of unique species only HGM unit 2 and 7 stand out in their potential to support orchids and other unique plant species. The open waterbodies within HGM units 1 and 7 may support congregations of local and migratory waterfowl whereas a general lack of open water and other significant natural features (e.g. rocky outcrops) in the other HGM units suggest a low importance in supporting unique or migratory species. These systems and their vegetation type are poorly protected.

Findings from the biodiversity assessment were also considered for the EIS component of the project.

The hydrological / functional importance rated as moderate too high for the respective units. The direct human benefits were rated as low for all of the units, with the exception of HGM units 2 , 5 and 7 which were both rated as moderate.

Table 18: The EIS for the assessed wetland units

Wetland Importance and Sensitivity	HGM 1	HGM 2	HGM 3	HGM 4	HGM 5	HGM 6	HGM 7	HGM 8
Ecological Importance & Sensitivity	2.7	2.3	1.7	1.7	2.2	2.0	3.0	1.3
Hydrological / Functional Importance	2.1	2.3	2.3	2.0	1.5	2.3	2.6	2.1
Direct Human Benefits	0.5	1.1	1.0	1.0	1.4	0.5	1.2	1.0

8.6.5 Buffer Assessment

The wetland buffer zone tool was used to calculate the appropriate buffer required for the project aspects above. According to the buffer guideline (Macfarlane, *et al*. 2014) a high-risk activity, such as mining, would require a buffer that is 95% effective to reduce the risk of the impact to a low level threat. In this case, the proposed powerline is not regarded as a high-risk activity. The recommended minimum buffer according to the guidelines is 10 m for the proposed powerline (Table 19).

Table 19: Post-mitigation buffer requirement

Required Buffer after mitigation measures have been applied	
Powerline	10 m

A conservative buffer zone of 10 m was suggested for the powerline, calculated assuming mitigation measures are applied. This would typically include a commitment to rehabilitate and manage buffer zones to ensure that these areas function optimally.

The powerline will traverse wetland areas with the placement of only five (5) poles within the systems, with the remaining 32 poles avoiding the wetlands. The buffer zone would also be applicable to supporting activities which are not required for the construction of foundations, planting the poles and stringing of powerlines within the wetland areas.

9 Habitat Sensitivity Mapping

As per the terms of reference for the project, a GIS sensitivity map is required in order to identify sensitive features in terms of the relevant specialist discipline/s within the project area. The sensitivity scores identified during the field survey for each habitat were then visually mapped (Figure 19).

Areas that were classified as having low sensitivities are those habitats which were deemed by the specialists to have been most impacted upon and/or were modified from their original condition due to factors such as previous and current human activity and/or presence of alien invasive species.

A low-moderate classification was given to the habitats that play a crucial role within the local ecosystem but are degraded/disturbed. These areas still host a healthy diversity of faunal and floral species.

A moderate-high sensitivity was given predominantly to the wetland and riparian areas in close proximity to the Olifants River. These areas function as an important part of the ecosystem within the project area but also the immediate local area, as areas that have the capacity to serve as habitat or important corridors for various species. Freshwater ecosystems such as rivers and wetlands are generally the lowest point in a landscape, and therefore particularly vulnerable to pollution from waste, sedimentation and pollutants present in runoff.

From a habitat sensitivity perspective, there is no preferred option between the Proposed and Alternative routes, both of which transect delineated wetland systems (low-moderate sensitivity) with no placement of poles within these systems.

It is important to note that this map does not replace any local, provincial or government legislation relating to these areas or the land use capabilities or sensitivities of these environments.

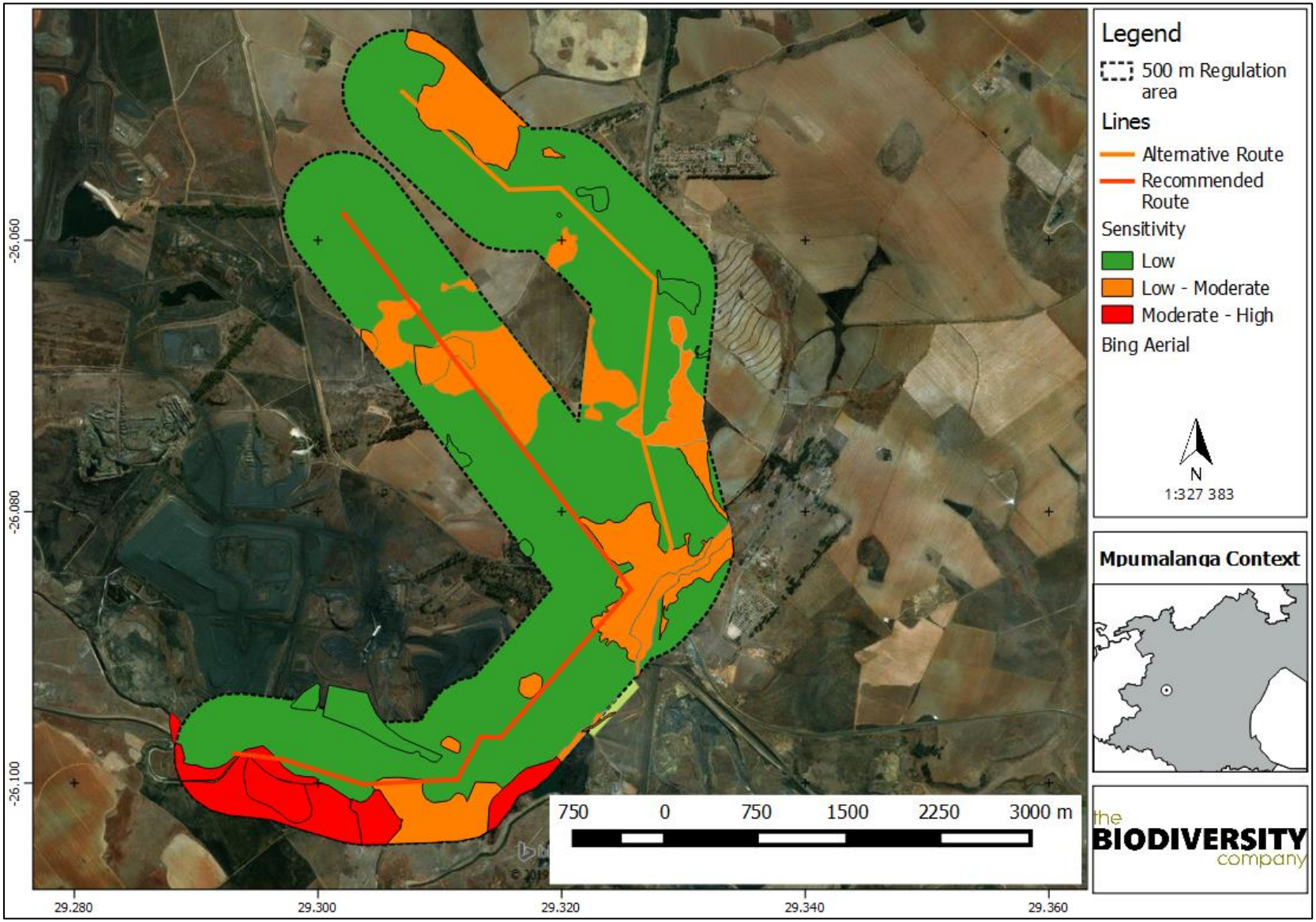

Figure 19: Habitat sensitivity within the project area

10 Impact Assessment: Biodiversity

10.1 Impact Assessment Methodology

Potential impacts were evaluated against the data captured during the desktop and field assessments to identify relevance to the project area. The relevant impacts associated with the proposed development were then subjected to a prescribed impact assessment methodology, presented below.

Likelihood descriptors

Probability of impact	Rating
Highly unlikely	1
Possible	2
Likely	3
Highly likely	4
Definite	5
Sensitivity of receiving environment	**Rating**
Ecology not sensitive/important	1
Ecology with limited sensitivity/importance	2
Ecology moderately sensitive/ /important	3
Ecology highly sensitive /important	4
Ecology critically sensitive /important	5

Consequence Descriptors

Severity of impact	Rating
Insignificant / ecosystem structure and function unchanged	1
Small / ecosystem structure and function largely unchanged	2
Significant / ecosystem structure and function moderately altered	3
Great / harmful/ ecosystem structure and function largely altered	4
Disastrous / ecosystem structure and function seriously to critically altered	5
Spatial scope of impact	**Rating**
Activity specific/ < 5 ha impacted / Linear features affected < 100m	1
Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	2
Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	3
Regional within 5 km of the site boundary / < 2000ha impacted / Linear features affected < 3000m	4
Entire habitat unit / Entire system/ > 2000ha impacted / Linear features affected > 3000m	5
Duration of impact	**Rating**
One day to one month: Temporary	1
One month to one year: Short Term	2
One year to five years: Medium Term	3
Life of operation or less than 20 years: Long Term	4
Permanent	5

Significance Rating Matrix

	CONSEQUENCE (Severity + Spatial Scope + Duration)															
LIKELIHOOD (Frequency of activity + Frequency of impact)	0	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Very Low
	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	Low
	3	6	9	12	15	18	21	24	27	301	33	36	39	42	45	
	4	8	12	16	20	24	28	32	36	40	44	48	52	56	60	Moderate
	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	
	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	Moderately High
	7	14	21	28	35	42	49	56	63	70	77	84	91	98	105	High
	8	16	24	32	40	48	56	64	72	80	88	96	104	112	120	
	9	18	27	36	45	54	63	72	81	90	99	108	117	126	135	Critical
	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	

10.2 Current Impacts

During the field surveys, the current impacts that are having a negative impact on the area were identified, and are listed below and some are shown in Figure 20;

- Presence of alien invasive plant species;
- Mining;
- Roads;
- Agriculture; and
- Existing powerlines.

Figure 20: Some of the impacts observed: A) Dragline from adjacent mine, B) Maize fields, C) Large Trucks, D) Cattle, E) Existing powerlines and F) Gravel roads

10.3 Potential Impacts

The proposed development will result in further loss and disturbance of habitat and displacement of fauna and flora. The potential impacts associated with the various project stages are discussed below. It should be noted that the impacts for the alternatives will be the same and as such the impact rating were combined.

10.3.1 Planning Phase

The planning and design phase will evaluate the necessary documentation that is required for the construction phase. This will include activities such as a route survey, line design and ordering of poles (J&W, 2019).

The following potential impacts were considered:

- Disturbance of vegetation and fauna during field surveys and site inspections.

10.3.2 Construction Phase

Construction activities related to constructing the re-aligned proposed powerline and associated infrastructure will be undertaken and will include the construction of foundations, planting the poles, stringing, hand-over and commissioning. A laydown area may be developed within the existing mining area for the storage of material during the construction phase. This is not expected to be larger than 50m^2 (J&W, 2019).

The decommissioning of the portion of the existing 132 kV powerline which traverses the VDDC opencast mining area, will also take place during the construction phase.

The following potential impacts were considered for the construction phase.

Potential impacts were considered on terrestrial vegetation communities:

- Destruction, further loss and fragmentation of the vegetation community.

Potential impacts on faunal communities include:

- Displacement of faunal community due to habitat loss, direct mortalities and disturbance (noise, dust and vibration);
- Bird strikes with the powerlines; and
- Road killings due to the access roads.

10.3.3 Operational Phase

The operational phase will include the maintenance and management of the proposed relocated powerline. Once completed, this powerline will be operated by Eskom as part of its distribution network to sustain the 132 kV network and surrounding areas with the required electricity. This will ensure that surrounding mines, such as Goedehoop Colliery's infrastructure and mining sections that are dependent on this power supply, will continue with conducting its mining activities as planned (J&W, 2019). The following potential impacts were considered for the operational phase.

Potential impacts were considered on terrestrial vegetation communities:

- Continued encroachment and displacement of the vegetation community due to alien invasive plant species, particularly in previously disturbed areas.

Potential impacts on faunal communities include:

- Continued displacement and fragmentation of the faunal community due to ongoing anthropogenic disturbances (noise, human presence and dust);
- Loss of faunal species (road mortalities); and
- Bird strikes with the power lines.

10.3.4 Decommissioning

The decommissioning phase will consider regulatory requirements in terms of demolishment and rehabilitation activities associated with the proposed relocated powerline, as well as managing and mitigating impacts associated with this phase.

The following impacts were considered for the decommissioning phase

- Disturbance of vegetation during removal of the poles; and
- Displacement of faunal community (including possible threatened or protected species) due to habitat loss, disturbance (noise, dust and vibration) and/or direct mortalities.

10.4 Assessment of Significance

10.4.1 Planning Phase

As the area has already been disturbed and existing infrastructure can be found in the area the impacts during the planning phase was rated as absent pre and post mitigations (Table 20).

10.4.2 Construction Phase

Table 21 shows the significance of potential impacts associated with the development of vegetation communities before and after implementation of mitigation measures. Prior to implementation of mitigation measures the significance of impacts were rated as *Moderate*. Implementation of avoidance measures as mitigation reduced the significance of potential impact on the vegetation community to *Low* (Table 21).

The significance of potential impacts associated with the development of faunal communities before and after mitigation is presented in Table 21. Prior to implementation of mitigation measures the significance of impacts were rated as *Moderate*. Implementation of avoidance measures as mitigation reduced the significance of potential impact on the faunal communities to *Low* (Table 21).

10.4.3 Operational Phase

Table 20 shows the significance of potential operational phase impacts on vegetation communities before and after implementation of mitigation measures. The significance of encroachment of alien invasive plant species on the vegetation community was rated as Moderately high significance prior to mitigation (Table 20). Implementation of mitigation measures in the form of an alien invasive plant management plan and rehabilitation of project footprint after completion of construction reduced the significance of the impact to Low (Table 20).

The significance of operational phase impacts on terrestrial fauna communities was rated as *Moderately-high* or *Moderate* prior to mitigation and low post mitigation). High risks to the faunal species in the environment are seen as powerline strikes and road mortalities.

10.4.4 Decommissioning Phase

Table 23 shows the impacts that are associated with the decommissioning phase. The vegetation will be disturbed because of the removal of the poles and the vehicles that will be moving into the area, pre mitigations it was rated as moderate and post mitigations it is rated as low. The impact on the fauna is based on the displacement of the organisms which was rated as moderate prior to mitigations and low post mitigations. The chance of bird strikes is removed and as such the impact is rated as absent after the powerlines are removed.

*Table 20: Assessment of significance of potential **planning and design impacts** on the biodiversity associated with the proposed development pre- and post- mitigation*

Impact	Prior to mitigation						Post mitigation					
	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
Disturbance of vegetation and fauna during field surveys and site inspections.	1	1	2	3	2		1	1	1	2	1	
	Temporary	Activity Specific	Small	Ecology moderately sensitive	Possible	**Absent**	Temporary	Activity Specific	Insignificant	Limited sensitivity	Highly unlikely	**Absent**

*Table 21: Assessment of significance of potential **construction impacts** on the biodiversity associated with the proposed development pre- and post- mitigation*

Impact	Prior to mitigation						Post mitigation					
	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
Destruction, further loss and fragmentation of the vegetation community (including an EN vegetation type)	3	3	4	3	4		2	2	2	2	3	
	Medium Term	Local	Great	Ecology moderately sensitive	Highly likely	**Moderate**	Short Term	Development specific	Small	Limited sensitivity	Possible	**Low**
	3	3	3	3	4		2	2	2	2	3	

Displacement of faunal community (including possible threatened or protected species) due to habitat loss, disturbance (noise, dust and vibration) and/or direct mortalities	Medium Term	Local	Significant	Ecology moderately sensitive	Highly likely	**Moderate**	Short Term	Development specific	Small	Limited sensitivity	Possible	**Low**
	3	3	4	3	4		2	2	2	2	3	
Bird strikes with the powerlines	Medium Term	Local	Great	Ecology moderately sensitive	Highly likely	**Moderate**	Short Term	Development specific	Small	Limited sensitivity	Possible	**Low**
	3	3	3	3	4		2	2	2	2	3	
Road killings due to the access roads	Medium Term	Local	Significant	Ecology moderately sensitive	Highly likely	**Moderate**	Short Term	Development specific	Small	Limited sensitivity	Possible	**Low**

*Table 22: Assessment of significance of potential **operational impacts** on biodiversity associated with the proposed development pre- and post- mitigation*

Impact	Prior to mitigation						Post mitigation					
	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance	Duration of Impact	Spatial Scope	Severity of impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
Continued encroachment and displacement of indigenous vegetation community by alien invasive plant species	5	3	3	3	4		2	2	2	2	3	
	Permanent	Local	Significant	Ecology Moderately sensitive	Highly likely	**Moderately High**	Short term	Development Specific	Small	Ecology with limited sensitivity	Likely	**Low**
Continued displacement and fragmentation of the faunal community due to ongoing anthropogenic disturbances (noise, human presence and dust)	5	3	3	3	3		2	2	2	2	2	
	Permanent	Local	Significant	Ecology Moderately sensitive	Likely	**Moderate**	Short term	Activity specific	Small	Ecology with limited sensitivity	Possible	**Low**
Loss of faunal species (road mortalities)	5	3	4	3	4		2	2	2	2	3	
	Permanent	Local	Great	Ecology Moderately sensitive	Highly likely	**Moderately High**	Short term	Development Specific	Small	Ecology with limited sensitivity	Likely	**Low**
Bird strikes due to the power lines	5	3	4	3	4		2	2	2	2	3	
	Permanent	Local	Great	Ecology Moderately sensitive	Highly likely	**Moderately High**	Short term	Development Specific	Small	Ecology with limited sensitivity	Likely	**Low**

*Table 23:Assessment of significance of potential **decommissioning impacts** on biodiversity associated with the proposed development pre- and post- mitigation*

Impact	Prior to mitigation						Post mitigation					
	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
Disturbance of vegetation during removal of the poles	3	2	3	3	4		2	2	2	2	3	
	Medium Term	Development Specific	Significant	Ecology moderately sensitive	Highly likely	**Moderate**	Short Term	Development specific	Small	Limited sensitivity	Possible	**Low**
Displacement of faunal community (including possible threatened or protected species) due to habitat loss, disturbance (noise, dust and vibration) and/or direct mortalities	3	2	3	3	4		2	2	2	2	3	
	Medium Term	Development Specific	Significant	Ecology moderately sensitive	Highly likely	**Moderate**	Short Term	Development specific	Small	Limited sensitivity	Possible	**Low**
Bird strikes with the powerlines	3	2	3	3	1		2	2	2	2	1	
	Medium Term	Development Specific	Significant	Ecology moderately sensitive	Highly unlikely	**Low**	Short Term	Development specific	Small	Limited sensitivity	Highly unlikely	**Absent**

10.5 Mitigation Measure Objectives

The focus of mitigation measures should be to reduce the significance of potential impacts associated with the development and thereby to:

- Minimise the further loss and fragmentation of this EN vegetation community and in the vicinity of the project area; and
- Prevent the loss of the faunal community associated with this vegetation type.

10.5.1 Mitigation Measures for Impacts on Vegetation Communities

Recommended mitigation measures include the following:

- Demarcate the construction materials storage area, ensure that adjacent areas are not impacted;
- The road leading to the construction site must be demarcated to prevent more than one road from being formed;
- Compilation and implementation of an alien vegetation management plan for the area that is being disturbed by the building of the powerline; and
- Revegetate the disturbed areas with indigenous vegetation after the decommissioning of the powerline.

10.5.2 Mitigation Measures for Impacts on Faunal Communities

Recommended mitigation measures for faunal community's hinge largely on protecting their habitat. In addition to this, the following measures are recommended:

- If any SCC faunal species are recorded during construction, activities should temporarily cease and allow for the species to move away. In the event a species does not move away, an appropriate specialist should be consulted to identify the correct course of action;
- No trapping, killing or poisoning of any wildlife should be allowed on site during the construction phase;
- Install bird flappers on the Eskom powerlines; and
- Environmental awareness programmes should include topics about possible fauna in the area (e.g. birds) and their conservation status, as well as actions to be taken should these be encountered.
- Speed limitations on existing roads should be adhered to.

11 Risk Assessment: Wetlands

A number of wetlands have been delineated in the project area as outlined in section 8.6. The DWS regulates all activities within the regulated area, which is defined as an area located within 500m of the delineated watercourses. Both the route options traverse a wetland system.

11.1 Risk Assessment Methodology

The risk assessment was completed in accordance with the requirements of the DWS General Authorisation (GA) in terms of Section 39 of the NWA for water uses as defined in Section 21(c) or Section 21(i) (GN 509 of 2016). The methodology is presented below.

SEVERITY

Insignificant / non-harmful	1
Small / potentially harmful	2
Significant / slightly harmful	3
Great / harmful	4
Disastrous / extremely harmful	5

SPATIAL SCALE

Area specific (at impact site)	1
Whole site (entire surface right)	2
Regional / neighbouring areas (downstream within quaternary catchment)	3
National (impacting beyond secondary catchment or provinces)	4
Global (impacting beyond SA boundary)	5

DURATION

One day to one month, PES, EIS and/or REC not impacted	1
One month to one year, PES, EIS and/or REC impacted but no change in status	2
One year to 10 years, PES, EIS and/or REC impacted to a lower status but can be improved over this period through mitigation	3
Life of the activity, PES, EIS and/or REC permanently lowered	4
More than life of the organisation/facility, PES and EIS scores, a E or F	5

FREQUENCY OF THE ACTIVITY

Annually or less	1
6 monthly	2
Monthly	3
Weekly	4
Daily	5

FREQUENCY OF THE INCIDENT/IMPACT

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

LEGAL ISSUES

No legislation	1
Fully covered by legislation (wetlands are legally governed)	5

DETECTION

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

RATING CLASSES

RATING	CLASS	MANAGEMENT DESCRIPTION
1 – 55	(L) Low Risk	Acceptable as is or consider requirement for mitigation. Impact to watercourses and resource quality small and easily mitigated.
56 – 169	(M) Moderate Risk	Risk and impact on watercourses are notably and require mitigation measures on a higher level, which costs more and require specialist input. Licence required.
170 – 300	(H) High Risk	Watercourse(s) impacts by the activity are such that they impose a long-term threat on a large scale and lowering of the Reserve. Licence required.

11.2 Potential Risks

A risk assessment has been conducted to present the potential level of risk posed by the proposed project to all wetlands (cumulatively), specifically for the placement of mono-poles within the wetland systems. The risk assessment has considered both alternatives, and due to similar levels of risk posed by the project a single risk assessment has been undertaken for the assessment. The risk assessment has been completed for the revised and final layout. The placement of poles will impact directly on the wetland systems, but with a very limited (cumulative) disturbance footprint area. The associated activities are likely to pose an indirect risk to the system, which could result in degradation of these systems. Key considerations for the risk assessment include the following:

- A total of five (5) poles will be placed within the delineated wetland systems, with 32 poles avoiding the wetlands (Figure 21);
- The two wetlands to be directly impacted on by the placement of poles within the system is HGM 1 (2 poles) and HGM 4 (3 poles), with a PES Class C and Class D rating respectively; and
- The placement of 3 of 5 poles is located on the periphery of the wetland areas, with only 2 poles located further into the wetland.

A number of moderate risks (without mitigation) were identified for the construction phase of the project, these are largely attributed to the direct impact of these aspects on the wetland systems. Implementation of the prescribed mitigation measures will reduce the level of risk posed by these aspects to low. The placement of poles within wetlands could not be avoided. The duration of these aspects is also expected to be short. Moderate risks without mitigation were identified for the operational phase of the project, but this is attributed to the longevity of this phase. However, based on the assumption that the prescribed mitigation measures will

be implemented, the level of risk is reduced to low for this phase of the project. Only low risks were identified for the decommissioning phase of the project, which is also expected to have a short duration. This phase will also allow for the recovery of the system.

Aspects associated with the respective phases of the project are presented in the subsequent sections. Findings from the DWS aspect and impact register/risk assessment as outlined in GN 509 (of 2016) are provided in Table 22, Table 23, and Table 24.

Table 24: The DWS risk assessment for the proposed powerline

Activity	Aspect	Impact
Andrew Husted (Pr Sci Nat 400213/11)		
Construction phase	Clearing of vegetation	The clearing of vegetation and stripping of topsoil will increase runoff and increase the potential of erosion and sedimentation of the wetland systems. The operation of equipment, vehicles and machinery brings the risk of contaminants polluting the wetland systems. Access routes could change drainage.
	Stripping and stockpiling of topsoil	
	Establish working area	
	Digging of hole	
	Vehicle access	
	Leaks and spillages from machinery, equipment & vehicles	
	Solid waste disposal	
	Human sanitation & ablutions	
	Re-fuelling of machinery and vehicles	
	Laydown & storage areas	
Operation phase	Standing mono-poles	The placement of poles within the system may impact the hydrodynamics of the wetland. The access route will alter drainage, and also be a potential source of sedimentation.
	Service route	
Decommissioning phase	Removal of poles	The removal of the poles and access route will restore the hydrodynamics to some extent. The operation of equipment, vehicles and machinery brings the risk of contaminants polluting the wetland systems.
	Vehicle access	
	Leaks and spillages from machinery, equipment & vehicles	
	Solid waste disposal	
	Human sanitation & ablutions	
	Re-fuelling of machinery and vehicles	
	Laydown & storage areas	

Table 25: DWS Risk Impact Matrix for the proposed powerline

Aspect	Flow Regime	Water Quality	Habitat	Biota	Severity	Spatial scale	Duration	Consequence
Construction Phase								
Clearing of vegetation	3	3	3	3	3	2	1	6
Stripping and stockpiling of topsoil	3	3	2	2	2.5	1	1	4.5
Establish working area	2	3	3	3	2.75	1	1	4.75
Digging of hole	2	2	2	2	2	1	1	4
Vehicle access	2	3	2	3	2.5	1	1	4.5
Leaks and spillages from machinery, equipment & vehicles	1	3	2	2	2	1	1	4
Solid waste disposal	1	3	1	2	1.75	1	1	3.75
Human sanitation & ablutions	1	2	1	2	1.5	1	1	3.5
Re-fuelling of machinery and vehicles	1	3	2	2	2	1	1	4
Laydown & storage areas	2	3	2	2	2.25	1	1	4.25
Operational Phase								
Standing mono-poles	2	1	1	2	1.5	1	4	6.5
Service route	2	3	2	2	2.25	2	4	8.25
Decommissioning Phase								
Removal of poles	2	2	2	2	2	1	1	4
Vehicle access	2	3	2	3	2.5	2	1	5.5
Leaks and spillages from machinery, equipment & vehicles	1	3	2	2	2	1	1	4
Solid waste disposal	1	3	1	2	1.75	1	1	3.75
Human sanitation & ablutions	1	2	1	2	1.5	1	1	3.5
Re-fuelling of machinery and vehicles	1	3	2	2	2	1	1	4
Laydown & storage areas	2	3	2	2	2.25	1	1	4.25

Table 26: DWS Risk Impact Matrix for the proposed powerline (continued)

Aspect	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Sig.	Without Mitigation	Confidence Level	Control Measures	With Mitigation
Construction Phase										
Clearing of vegetation	3	3	5	2	13	78	**Moderate***	80%	Section 11.3	Low
Stripping and stockpiling of topsoil	3	3	5	2	13	58.5	**Moderate***	80%	Section 11.3	Low
Establish working area	1	2	5	2	10	47.5	**Moderate***	80%	Section 11.3	Low
Digging of hole	2	2	5	2	11	44	**Moderate***	80%	Section 11.3	Low
Vehicle access	2	2	5	2	11	49.5	**Moderate***	80%	Section 11.3	Low
Leaks and spillages from machinery, equipment & vehicles	2	2	1	3	8	32	**Low**	80%	Section 11.3	Low
Solid waste disposal	2	2	1	2	7	26.25	**Low**	80%	Section 11.3	Low
Human sanitation & ablutions	2	2	1	2	7	24.5	**Low**	80%	Section 11.3	Low
Re-fuelling of machinery and vehicles	2	2	1	2	7	28	**Low**	80%	Section 11.3	Low
Laydown & storage areas	2	2	1	2	7	29.75	**Low**	80%	Section 11.3	Low
Operational Phase										
Standing mono-poles	3	2	1	2	8	52	**Moderate***	80%	Section 11.3	Low
Service route	3	2	1	2	8	66	**Moderate***	80%	Section 11.3	Low
Decommissioning Phase										
Removal of poles	2	2	1	2	7	28	**Low**	80%	Section 11.3	Low
Vehicle access	2	2	5	2	11	60.5	**Low**	80%	Section 11.3	Low
Leaks and spillages from machinery, equipment & vehicles	2	2	1	3	8	34	**Low**	80%	Section 11.3	Low
Solid waste disposal	2	2	1	2	7	28	**Low**	80%	Section 11.3	Low
Human sanitation & ablutions	2	2	1	2	7	26.25	**Low**	80%	Section 11.3	Low
Re-fuelling of machinery and vehicles	2	2	1	2	7	28	**Low**	80%	Section 11.3	Low
Laydown & storage areas	2	2	1	2	7	26.25	**Low**	80%	Section 11.3	Low

(*) denotes-In accordance with General Notice 509 “Risk is determined after considering all listed control / mitigation measures. Borderline moderate risk scores can be manually adapted downwards up to a maximum of 25 points (from a score of 80).

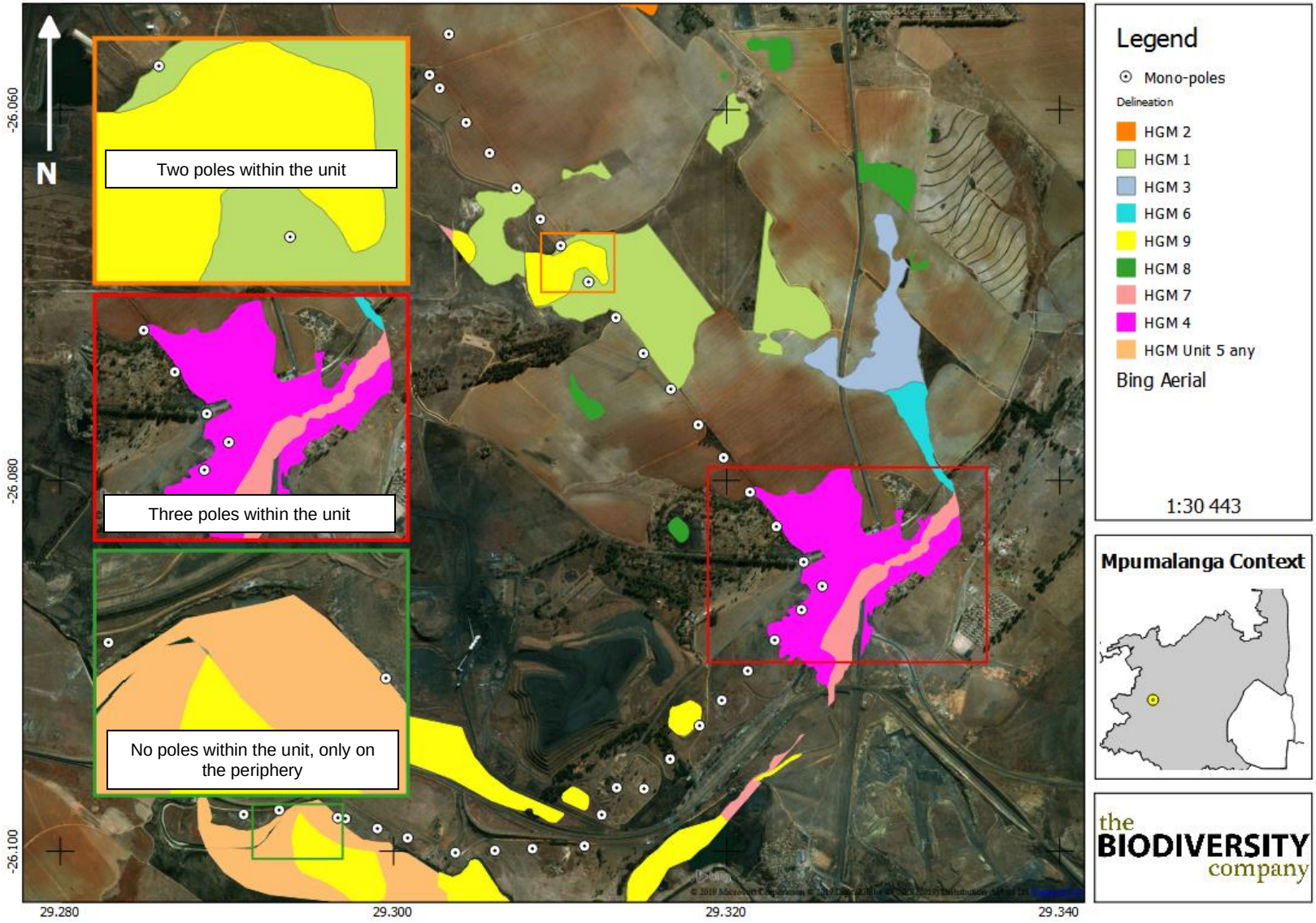

Figure 21: The location of mono-poles within the delineated wetland units

11.3 Mitigation Measures

The following mitigation measures are prescribed:

- Construction activities should be scheduled for the least sensitive periods, in order to avoid the migration, nesting and breeding seasons of SCC as far as practical;
- Demarcate the delineated wetland and a buffer zone of 10m to prevent any unauthorised activities within this area;
- Entry into the wetlands (HGM 2 and HGM 4) for the placement of poles must make use of the shortest route possible, and avoiding unnecessary access (or traversing) within the wetland;
- All non-essential services and activities must adhere to a demarcated 10m buffer zone;
- Final site selection should be based on the inputs from this assessment and approved or signed-off by a managing authority to ensure that the best-suited area and/or correct area has been demarcated;
- Selected pole sites must be clearly demarcated to avoid unnecessary disturbances or impacts to adjacent areas;
- Make use of existing access routes as much as possible, before new routes are considered;
- Clearing of vegetation should be minimised and avoided where possible. Maintain small patches of natural vegetation within the site to accelerate restoration and succession of cleared patches;
- A fire management plan must be implemented, to restrict the impact of fire on the vegetation especially in the winter;
- All contractors and labour must undergo environmental awareness training, and be encouraged to maintain a “clean” working area, and report any (potential) risks to the environment as a result of the project;
- A method statement is required from the Contractor(s) that includes the layout of the pole site, amenities and waste management;
- Laydown areas, storage areas and ablution facilities must be located within the existing VDDC mining area, with no new areas created for this project;
- The Contractor should supply sealable and properly marked domestic waste collection bins and all solid waste collected must be disposed of at a licensed disposal facility;
- The Contractor must be in possession of an emergency spill kit that must be complete and available at all times on site;
- Any possible contamination of topsoil by hydrocarbons must be avoided. Any contaminated soil must be treated *in situ* or be placed in containers and removed from the site for disposal in a licensed facility;
- No vehicles may remain within the project area, when not in use;

- No servicing of equipment on site unless absolutely necessary. Leaking equipment must be repaired immediately or be removed from the site to facilitate repair;
- All vehicles and equipment must be well maintained to ensure that there are no oil or fuel leakages;
- When vegetation is cleared, hand cutting techniques should be used as far possible in order to avoid the use of heavy machinery (i.e. bulldozers); and
- All disturbed and compacted footprint areas must be rehabilitated and landscaped after construction is complete. These areas must either be rehabilitated to the original land use or an agreed upon land use.

12 Conclusion

The completion of a comprehensive desktop study, in conjunction with the detailed results from the surveys, means that there is high confidence in the information that was provided. The survey, which was completed, and the corresponding studies resulted in good site coverage.

It is clear from the regional ecological overview, as well as the baseline data collected to date that the project area has been altered (historically and currently). The area was mainly transformed by the adjacent mine and large agricultural fields.

The following further conclusions were reached based on the results of this assessment:

- The project area does not fall within a CBA or an ESA classified area;
- The project area falls entirely within an ecosystem which is listed as VU;
- All of the terrestrial ecosystems associated with the development (entire project area and surrounds) are rated as not protected;
- The project area does not overlap with any formally or informally protected area;
- The project area is situated in one vegetation type; the Eastern Highveld Grassland, according to Mucina & Rutherford (2006). This vegetation type is classified as EN;
- Based on the Plants of Southern Africa database, 233 plant species are expected in the project and surrounding areas and three (3) of these species are listed as being SCC;
- A total of 78 tree, shrub and herbaceous plant species were recorded in the project area during the April 2019 field assessment. No plant SCC were recorded during the survey.
- Thirteen (13) Category 1b invasive species were recorded within the project area and must therefore be removed by implementing an alien invasive plant management programme in compliance of section 75 of the Act as stated above; and
- Two faunal SCC were recorded during the survey, the Serval (*Leptailurus serval*) and Cape Clawless Otter (*Aonyx capensis*).

A total of four (4) HGM wetland types were identified and delineated for this assessment, these include both channelled wetland systems, seepage areas and depressions. A total of nine (9) HGM units were delineated for this assessment. All were assessed, with the exception of HGM 9, which was determined to comprise of dams, canals and previously mined areas, thus constituting artificial systems.

HGM unit 2 and 5 were both assigned a rating of C (moderately modified) and the remaining HGM units were assigned a rating of D (largely modified).

All of the HGM units with the exception of HGM unit 7 had an overall intermediate service rating, with HGM unit 7 receiving a moderate high rating. The highest ratings (predominantly moderately high) for all the HGM units is associated with indirect benefits. The EIS of HGM units 1, 2, 5 and 7 were rated as high, with the remaining units rated as moderate.

A conservative buffer zone was suggested of 10 m for the associated powerline; this buffer is calculated assuming mitigation measures are applied.

The placement of poles will impact directly on the wetland systems and will have a very limited (cumulative) disturbance footprint area. The level of risk posed by the various aspects for three (3) phases of the project was determined to be low, based on the assumption that mitigation measures will be implemented.

13 Impact Statement

An impact statement is required as per the NEMA EIA regulations (as amended) with regards to the proposed development.

Based on the results and conclusions presented in this report, no fatal flaws were identified for the project. Both proposed routes are permissible for this project, but all mitigation measures must be implemented for the project.

In accordance with the requirements of GN 509 process, the applicant is permitted to apply for a WUL for Section 21(c) & (i) under a GA as the post mitigation risks were all determined to be low.

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APPENDIX A: *Flora species expected to occur in the project area*

Family	Taxon	IUCN	Ecology
Lamiaceae	*Aeollanthus buchnerianus*	LC	Indigenous
Apiaceae	*Afrosciadium magalismontanum*	LC	Indigenous
Cyperaceae	*Afroscirpoides dioeca*		Indigenous; Endemic
Poaceae	*Agrostis eriantha var. eriantha*	LC	Indigenous
Hyacinthaceae	*Albuca virens subsp. virens*		Indigenous
Amaranthaceae	*Amaranthus hybridus subsp. cruentus*		notIndigenous; Naturalised
Poaceae	*Andropogon schirensis*	LC	Indigenous
Bryaceae	*Anomobryum julaceum*		Indigenous
Fabaceae	*Argyrolobium longifolium*	VU	Indigenous; Endemic
Fabaceae	*Argyrolobium speciosum*	LC	Indigenous
Poaceae	*Aristida junciformis subsp. junciformis*	LC	Indigenous
Apocynaceae	*Asclepias albens*	LC	Indigenous
Apocynaceae	*Asclepias aurea*	LC	Indigenous
Apocynaceae	*Aspidoglossum araneiferum*	LC	Indigenous
Apocynaceae	*Aspidoglossum biflorum*	LC	Indigenous
Apocynaceae	*Aspidoglossum interruptum*	LC	Indigenous
Asteraceae	*Berkheya radula*	LC	Indigenous
Asteraceae	*Berkheya setifera*	LC	Indigenous
Asteraceae	*Berkheya speciosa subsp. lanceolata*	LC	Indigenous
Blechnaceae	*Blechnum australe subsp. australe*		Indigenous
Acanthaceae	*Blepharis innocua*		Indigenous; Endemic
Acanthaceae	*Blepharis stainbankiae*		Indigenous; Endemic
Poaceae	*Brachiaria eruciformis*	LC	Indigenous
Poaceae	*Brachiaria serrata*	LC	Indigenous
Apocynaceae	*Brachystelma foetidum*	LC	Indigenous
Bryaceae	*Bryum argenteum*		Indigenous
Cyperaceae	*Bulbostylis densa subsp. afromontana*	LC	Indigenous
Cyperaceae	*Bulbostylis hispidula subsp. pyriformis*	LC	Indigenous
Cyperaceae	*Bulbostylis humilis*	LC	Indigenous
Poaceae	*Calamagrostis epigejos var. capensis*	LC	Indigenous
Cyperaceae	*Carex glomerabilis*	LC	Indigenous
Fabaceae	*Chamaecrista capensis var. flavescens*	LC	Indigenous
Pteridaceae	*Cheilanthes viridis var. glauca*	LC	Indigenous
Amaranthaceae	*Chenopodium glaucum*		notIndigenous; Naturalised
Agavaceae	*Chlorophytum fasciculatum*		Indigenous
Asteraceae	*Cineraria parvifolia*	LC	Indigenous; Endemic
Asteraceae	*Cirsium vulgare*		notIndigenous; Naturalised; Invasive
Cucurbitaceae	*Citrullus lanatus*	LC	Indigenous
Bruchiaceae	*Cladophascum gymnomitrioides*		Indigenous
Cleomaceae	*Cleome monophylla*	LC	Indigenous
Commelinaceae	*Commelina benghalensis*	LC	Indigenous
Commelinaceae	*Commelina subulata*	LC	Indigenous
Asteraceae	*Conyza canadensis*		notIndigenous; Naturalised
Asteraceae	*Conyza sumatrensis var. sumatrensis*		notIndigenous; Naturalised

Apocynaceae	*Cordylogyne globosa*	LC	Indigenous
Asteraceae	*Cosmos bipinnatus*		notIndigenous; Naturalised
Asteraceae	*Cotula anthemoides*	LC	Indigenous
Crassulaceae	*Crassula capitella subsp. nodulosa*		Indigenous
Orobanchaceae	*Cycnium tubulosum subsp. tubulosum*	LC	Indigenous
Poaceae	*Cynodon dactylon*	LC	Indigenous
Cyperaceae	*Cyperus congestus*	LC	Indigenous
Cyperaceae	*Cyperus denudatus*	LC	Indigenous
Cyperaceae	*Cyperus difformis*	LC	Indigenous
Cyperaceae	*Cyperus esculentus var. esculentus*	LC	Indigenous
Cyperaceae	*Cyperus fastigiatus*	LC	Indigenous
Cyperaceae	*Cyperus laevigatus*	LC	Indigenous
Cyperaceae	*Cyperus longus var. longus*	NE	Indigenous
Cyperaceae	*Cyperus margaritaceus var. margaritaceus*	LC	Indigenous
Cyperaceae	*Cyperus marginatus*	LC	Indigenous
Cyperaceae	*Cyperus obtusiflorus var. flavissimus*	LC	Indigenous
Cyperaceae	*Cyperus rigidifolius*	LC	Indigenous
Cyperaceae	*Cyperus rupestris var. rupestris*	LC	Indigenous
Cyperaceae	*Cyperus sp.*		
Cyperaceae	*Cyperus sphaerospermus*	LC	Indigenous
Cyperaceae	*Cyperus squarrosus*	LC	Indigenous
Aizoaceae	*Delosperma sp.*		
Caryophyllaceae	*Dianthus transvaalensis*		Indigenous
Poaceae	*Digitaria eriantha*	LC	Indigenous
Poaceae	*Digitaria sanguinalis*	NE	notIndigenous; Naturalised
Poaceae	*Digitaria tricholaenoides*	LC	Indigenous
Hyacinthaceae	*Dipcadi viride*		Indigenous
Orchidaceae	*Disa woodii*	LC	Indigenous
Poaceae	*Echinochloa holubii*	LC	Indigenous
Poaceae	*Echinochloa jubata*	LC	Indigenous
Cyperaceae	*Eleocharis dregeana*	LC	Indigenous
Cyperaceae	*Eleocharis limosa*	LC	Indigenous
Poaceae	*Eragrostis curvula*	LC	Indigenous
Poaceae	*Eragrostis lappula*	LC	Indigenous
Poaceae	*Eragrostis lehmanniana var. lehmanniana*	LC	Indigenous
Poaceae	*Eragrostis mexicana subsp. virescens*	NE	notIndigenous; Naturalised
Ericaceae	*Erica drakensbergensis*	LC	Indigenous
Fabaceae	*Eriosema salignum*	LC	Indigenous
Fabaceae	*Eriosema simulans*	LC	Indigenous
Ruscaceae	*Eriospermum porphyrium*	LC	Indigenous
Ruscaceae	*Eriospermum porphyrovalve*	LC	Indigenous
Asteraceae	*Euryops transvaalensis subsp. transvaalensis*	LC	Indigenous
Exormothecacea e	*Exormotheca holstii*		Indigenous
Convolvulaceae	*Falkia oblonga*		Indigenous
Poaceae	*Festuca arundinacea*	NE	notIndigenous; Naturalised

Cyperaceae	*Fimbristylis complanata*	LC	Indigenous
Cyperaceae	*Fuirena pachyrrhiza*	LC	Indigenous
Cyperaceae	*Fuirena pubescens var. pubescens*	LC	Indigenous
Asteraceae	*Geigeria burkei subsp. burkei*	NE	Indigenous; Endemic
Iridaceae	*Gladiolus crassifolius*	LC	Indigenous
Iridaceae	*Gladiolus elliotii*	LC	Indigenous
Iridaceae	*Gladiolus paludosus*	VU	Indigenous
Iridaceae	*Gladiolus papilio*	LC	Indigenous
Apocynaceae	*Gomphocarpus fruticosus subsp. fruticosus*	LC	Indigenous
Apocynaceae	*Gomphocarpus physocarpus*	LC	Indigenous
Apocynaceae	*Gomphocarpus rivularis*	LC	Indigenous
Amaranthaceae	*Guilleminea densa*		notIndigenous; Naturalised
Orchidaceae	*Habenaria epipactidea*	LC	Indigenous
Orchidaceae	*Habenaria filicornis*	LC	Indigenous
Orchidaceae	*Habenaria nyikana subsp. nyikana*	LC	Indigenous
Poaceae	*Harpochloa falx*	LC	Indigenous
Scrophulariaceae	*Hebenstretia angolensis*	LC	Indigenous
Asteraceae	*Helichrysum difficile*	LC	Indigenous
Asteraceae	*Helichrysum mixtum var. mixtum*	NE	Indigenous
Asteraceae	*Helichrysum nudifolium var. nudifolium*	LC	Indigenous
Asteraceae	*Helichrysum rugulosum*	LC	Indigenous
Asteraceae	*Helichrysum stenopterum*	LC	Indigenous
Poaceae	*Heteropogon contortus*	LC	Indigenous
Malvaceae	*Hibiscus aethiopicus var. aethiopicus*	LC	Indigenous
Malvaceae	*Hibiscus trionum*		notIndigenous; Naturalised
Poaceae	*Hyparrhenia anamesa*	LC	Indigenous
Poaceae	*Hyparrhenia dregeana*	LC	Indigenous
Asteraceae	*Hypochaeris radicata*		notIndigenous; Naturalised
Fabaceae	*Indigofera frondosa*	LC	Indigenous
Convolvulaceae	*Ipomoea crassipes var. crassipes*	LC	Indigenous
Convolvulaceae	*Ipomoea ommanneyi*	LC	Indigenous
Cyperaceae	*Isolepis costata*	LC	Indigenous
Cyperaceae	*Isolepis setacea*	LC	Indigenous
Scrophulariaceae	*Jamesbrittenia aurantiaca*	LC	Indigenous
Juncaceae	*Juncus dregeanus subsp. dregeanus*	LC	Indigenous
Juncaceae	*Juncus exsertus*	LC	Indigenous
Juncaceae	*Juncus lomatophyllus*	LC	Indigenous
Juncaceae	*Juncus oxycarpus*	LC	Indigenous
Aizoaceae	*Khadia carolinensis*	VU	Indigenous; Endemic
Poaceae	*Koeleria capensis*	LC	Indigenous
Cyperaceae	*Kyllinga alba*	LC	Indigenous
Cyperaceae	*Kyllinga erecta var. erecta*	LC	Indigenous
Asteraceae	*Lactuca inermis*	LC	Indigenous
Hydrocharitaceae	*Lagarosiphon muscoides*	LC	Indigenous
Verbenaceae	*Lantana camara*		notIndigenous; Cultivated; Naturalised; Invasive
Thymelaeaceae	*Lasiosiphon microcephalus*		Indigenous

Hyacinthaceae	*Ledebouria cooperi*		Indigenous
Poaceae	*Leersia hexandra*	LC	Indigenous
Poaceae	*Leptochloa fusca*	LC	Indigenous
Fabaceae	*Lessertia phillipsiana*	DD	Indigenous; Endemic
Scrophulariaceae	*Limosella inflata*	LC	Indigenous
Linderniaceae	*Linderniella nana*		Indigenous
Cyperaceae	*Lipocarpha nana*	LC	Indigenous
Cyperaceae	*Lipocarpha rehmannii*	LC	Indigenous
Fabaceae	*Listia solitudinis*	LC	Indigenous; Endemic
Lobeliaceae	*Lobelia erinus*	LC	Indigenous
Lobeliaceae	*Lobelia sonderiana*	LC	Indigenous
Fabaceae	*Lotus discolor subsp. discolor*	LC	Indigenous
Poaceae	*Melinis nerviglumis*	LC	Indigenous
Fabaceae	*Melolobium wilmsii*	LC	Indigenous; Endemic
Convolvulaceae	*Merremia verecunda*	LC	Indigenous
Hyacinthaceae	*Merwilla plumbea*		Indigenous
Geraniaceae	*Monsonia angustifolia*	LC	Indigenous
Aizoaceae	*Mossia intervallaris*	LC	Indigenous
Fabaceae	*Mucuna coriacea*		Indigenous
Amaryllidaceae	*Nerine angustifolia*	LC	Indigenous
Amaryllidaceae	*Nerine rehmannii*	LC	Indigenous
Lythraceae	*Nesaea schinzii*		Indigenous
Ophioglossaceae	*Ophioglossum polyphyllum var. polyphyllum*	LC	Indigenous
Hyacinthaceae	*Ornithogalum flexuosum*		Indigenous
Poaceae	*Oropetium capense*	LC	Indigenous
Orchidaceae	*Orthochilus leontoglossus*		Indigenous
Asteraceae	*Osteospermum muricatum subsp. muricatum*	LC	Indigenous
Polygonaceae	*Oxygonum dregeanum subsp. canescens*	NE	Indigenous
Poaceae	*Panicum hygrocharis*	LC	Indigenous
Poaceae	*Paspalum dilatatum*	NE	notIndigenous; Naturalised
Poaceae	*Paspalum scrobiculatum*	LC	Indigenous
Poaceae	*Paspalum urvillei*	NE	notIndigenous; Naturalised
Fabaceae	*Pearsonia grandifolia subsp. latibracteolata*	LC	Indigenous
Geraniaceae	*Pelargonium luridum*	LC	Indigenous
Geraniaceae	*Pelargonium pseudofumarioides*	LC	Indigenous
Pteridaceae	*Pellaea calomelanos var. calomelanos*	LC	Indigenous
Apocynaceae	*Periglossum angustifolium*	LC	Indigenous
Polygonaceae	*Persicaria amphibia*	LC	notIndigenous; Naturalised
Plantaginaceae	*Plantago lanceolata*	LC	Indigenous
Polygalaceae	*Polygala africana*	LC	Indigenous
Polygalaceae	*Polygala hottentotta*	LC	Indigenous
Polygalaceae	*Polygala krumanina*	LC	Indigenous; Endemic
Portulacaceae	*Portulaca hereroensis*		Indigenous
Portulacaceae	*Portulaca oleracea*		notIndigenous; Naturalised
Potamogetonaceae	*Potamogeton octandrus*	LC	Indigenous

Potamogetonaceae	*Potamogeton pectinatus*	LC	Indigenous
Rosaceae	*Potentilla supina*		Indigenous
Asteraceae	*Pseudognaphalium oligandrum*	LC	Indigenous
Asteraceae	*Pulicaria scabra*	LC	Indigenous
Cyperaceae	*Pycreus macranthus*	LC	Indigenous
Cyperaceae	*Pycreus pumilus*	LC	Indigenous
Apocynaceae	*Raphionacme hirsuta*	LC	Indigenous
Apocynaceae	*Raphionacme velutina*	LC	Indigenous
Ricciaceae	*Riccia albovestita*		Indigenous
Ricciaceae	*Riccia atropurpurea*		Indigenous
Ricciaceae	*Riccia elongata*		Indigenous; Endemic
Ricciaceae	*Riccia okahandjana*		Indigenous
Ricciaceae	*Riccia rosea*		Indigenous
Ricciaceae	*Riccia stricta*		Indigenous
Brassicaceae	*Rorippa fluviatilis var. fluviatilis*	LC	Indigenous
Lamiaceae	*Salvia tiliifolia*		notIndigenous; Naturalised; Invasive
Asteraceae	*Schistostephium crataegifolium*	LC	Indigenous
Hyacinthaceae	*Schizocarphus nervosus*		Indigenous
Cyperaceae	*Schoenoplectus corymbosus*	LC	Indigenous
Cyperaceae	*Schoenoplectus decipiens*	LC	Indigenous
Cyperaceae	*Schoenoplectus muriculatus*	LC	Indigenous
Cyperaceae	*Schoenoplectus scirpoides*	LC	Indigenous
Cyperaceae	*Schoenoplectus tabernaemontani*		notIndigenous; Naturalised
Cyperaceae	*Scirpoides burkei*	LC	Indigenous
Anacardiaceae	*Searsia dentata*		Indigenous
Anacardiaceae	*Searsia magalismontana subsp. magalismontana*		Indigenous
Scrophulariaceae	*Selago densiflora*	LC	Indigenous
Asteraceae	*Senecio harveianus*	LC	Indigenous
Asteraceae	*Seriphium plumosum*		Indigenous
Poaceae	*Setaria sphacelata var. torta*	LC	Indigenous
Malvaceae	*Sida chrysantha*	LC	Indigenous
Apocynaceae	*Sisyranthus randii*	LC	Indigenous
Asteraceae	*Sonchus asper subsp. asper*		notIndigenous; Naturalised; Invasive
Orobanchaceae	*Sopubia cana var. cana*	LC	Indigenous
Poaceae	*Sporobolus albicans*	LC	Indigenous
Orobanchaceae	*Striga asiatica*	LC	Indigenous
Orobanchaceae	*Striga elegans*	LC	Indigenous
Lamiaceae	*Syncolostemon pretoriae*	LC	Indigenous
Asteraceae	*Tagetes minuta*		notIndigenous; Naturalised; Invasive
Santalaceae	*Thesium costatum var. juniperinum*	LC	Indigenous; Endemic
Santalaceae	*Thesium pallidum*	LC	Indigenous
Asphodelaceae	*Trachyandra reflexipilosa*	LC	Indigenous
Poaceae	*Triraphis andropogonoides*	LC	Indigenous
Poaceae	*Tristachya leucothrix*	LC	Indigenous
Asteraceae	*Ursinia cakilefolia*	LC	Indigenous; Endemic

Lentibulariaceae	*Utricularia stellaris*	LC	Indigenous
Verbenaceae	*Verbena brasiliensis*		notIndigenous; Naturalised; Invasive
Fabaceae	*Vigna unguiculata subsp. unguiculata*	NE	Indigenous
Campanulaceae	*Wahlenbergia banksiana*	LC	Indigenous
Campanulaceae	*Wahlenbergia sp.*		
Campanulaceae	*Wahlenbergia undulata*	LC	Indigenous
Fabaceae	*Zornia linearis*	LC	Indigenous

APPENDIX B*: Avifaunal species expected to occur in the project area*

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2017)
Accipiter melanoleucus	Sparrowhawk, Black	Unlisted	LC
Accipiter ovampensis	Sparrowhawk, Ovambo	Unlisted	LC
Acridotheres tristis	Myna, Common	Unlisted	LC
Acrocephalus arundinaceus	Reed-warbler, Great	Unlisted	LC
Acrocephalus baeticatus	Reed-warbler, African	Unlisted	Unlisted
Acrocephalus gracilirostris	Swamp-warbler, Lesser	Unlisted	LC
Acrocephalus palustris	Warbler, Marsh	Unlisted	LC
Acrocephalus schoenobaenus	Warbler, Sedge	Unlisted	LC
Actitis hypoleucos	Sandpiper, Common	Unlisted	LC
Actophilornis africanus	Jacana, African	Unlisted	LC
Afrotis afraoides	Korhaan, Northern Black	Unlisted	LC
Alcedo cristata	Kingfisher, Malachite	Unlisted	Unlisted
Alcedo semitorquata	**Kingfisher, Half-collared**	**NT**	**LC**
Alopochen aegyptiacus	Goose, Egyptian	Unlisted	LC
Amadina erythrocephala	Finch, Red-headed	Unlisted	LC
Amandava subflava	Waxbill, Orange-breasted	Unlisted	Unlisted
Amaurornis flavirostris	Crake, Black	Unlisted	LC
Amblyospiza albifrons	Weaver, Thick-billed	Unlisted	LC
Anas capensis	Teal, Cape	Unlisted	LC
Anas erythrorhyncha	Teal, Red-billed	Unlisted	LC
Anas hottentota	Teal, Hottentot	Unlisted	LC
Anas platyrhynchos	Duck, Mallard	Unlisted	LC
Anas smithii	Shoveler, Cape	Unlisted	LC
Anas sparsa	Duck, African Black	Unlisted	LC
Anas undulata	Duck, Yellow-billed	Unlisted	LC
Anhinga rufa	Darter, African	Unlisted	LC
Anomalospiza imberbis	Finch, Cuckoo	Unlisted	LC
Anthropoides paradiseus	**Crane, Blue**	**NT**	**VU**
Anthus caffer	Pipit, Bushveld	Unlisted	LC
Anthus cinnamomeus	Pipit, African	Unlisted	LC
Anthus leucophrys	Pipit, Plain-backed	Unlisted	LC
Anthus lineiventris	Pipit, Striped	Unlisted	LC
Anthus similis	Pipit, Long-billed	Unlisted	LC
Anthus vaalensis	Pipit, Buffy	Unlisted	LC
Apalis thoracica	Apalis, Bar-throated	Unlisted	LC
Apus affinis	Swift, Little	Unlisted	LC
Apus apus	Swift, Common	Unlisted	LC
Apus barbatus	Swift, African Black	Unlisted	LC
Apus caffer	Swift, White-rumped	Unlisted	LC
Apus horus	Swift, Horus	Unlisted	LC
Aquila verreauxii	**Eagle, Verreaux's**	**VU**	**LC**

Ardea cinerea	Heron, Grey	Unlisted	LC
Ardea goliath	Heron, Goliath	Unlisted	LC
Ardea melanocephala	Heron, Black-headed	Unlisted	LC
Ardea purpurea	Heron, Purple	Unlisted	LC
Ardeola ralloides	Heron, Squacco	Unlisted	LC
Asio capensis	Owl, Marsh	Unlisted	LC
Balearica regulorum	**Crane, Grey Crowned**	**EN**	**EN**
Batis molitor	Batis, Chinspot	Unlisted	LC
Bostrychia hagedash	Ibis, Hadeda	Unlisted	LC
Bradornis mariquensis	Flycatcher, Marico	Unlisted	LC
Bradypterus baboecala	Rush-warbler, Little	Unlisted	LC
Bubo africanus	Eagle-owl, Spotted	Unlisted	LC
Bubo capensis	Eagle-owl, Cape	Unlisted	LC
Bubulcus ibis	Egret, Cattle	Unlisted	LC
Bugeranus carunculatus	**Crane, Wattled**	**CR**	**VU**
Buphagus erythrorhynchus	Oxpecker, Red-billed	Unlisted	Unlisted
Burhinus capensis	Thick-knee, Spotted	Unlisted	LC
Buteo rufofuscus	Buzzard, Jackal	Unlisted	LC
Buteo vulpinus	Buzzard, Steppe	Unlisted	Unlisted
Butorides striata	Heron, Green-backed	Unlisted	LC
Calandrella cinerea	Lark, Red-capped	Unlisted	LC
Calendulauda sabota	Lark, Sabota	Unlisted	LC
Calidris ferruginea	**Sandpiper, Curlew**	**LC**	**NT**
Calidris minuta	Stint, Little	LC	LC
Caprimulgus pectoralis	Nightjar, Fiery-necked	Unlisted	LC
Caprimulgus tristigma	Nightjar, Freckled	Unlisted	LC
Centropus burchellii	Coucal, Burchell's	Unlisted	Unlisted
Centropus superciliosus	Coucal, White-browed	Unlisted	LC
Cercomela familiaris	Chat, Familiar	Unlisted	LC
Certhilauda semitorquata	Lark, Eastern Long-billed	Unlisted	LC
Ceryle rudis	Kingfisher, Pied	Unlisted	LC
Chalcomitra amethystina	Sunbird, Amethyst	Unlisted	LC
Chalcomitra senegalensis	Sunbird, Scarlet-chested	Unlisted	LC
Charadrius pecuarius	Plover, Kittlitz's	Unlisted	LC
Charadrius tricollaris	Plover, Three-banded	Unlisted	LC
Chersomanes albofasciata	Lark, Spike-heeled	Unlisted	LC
Chlidonias hybrida	Tern, Whiskered	Unlisted	LC
Chlidonias leucopterus	Tern, White-winged	Unlisted	LC
Chrysococcyx caprius	Cuckoo, Diderick	Unlisted	LC
Chrysococcyx klaas	Cuckoo, Klaas's	Unlisted	LC
Ciconia abdimii	**Stork, Abdim's**	**NT**	**LC**
Ciconia ciconia	Stork, White	Unlisted	LC
Ciconia nigra	**Stork, Black**	**VU**	**LC**
Cinnyricinclus leucogaster	Starling, Violet-backed	Unlisted	LC
Cinnyris afer	Sunbird, Greater Double-collared	Unlisted	LC
Cinnyris mariquensis	Sunbird, Marico	Unlisted	LC

Cinnyris talatala	Sunbird, White-bellied	Unlisted	LC
Circaetus cinereus	Snake-eagle, Brown	Unlisted	LC
Circaetus pectoralis	Snake-eagle, Black-chested	Unlisted	LC
Circus pygargus	Montagu's Harrier	Unlisted	LC
Circus ranivorus	**Marsh-harrier, African**	**EN**	**LC**
Cisticola aberrans	Cisticola, Lazy	Unlisted	LC
Cisticola aridulus	Cisticola, Desert	Unlisted	LC
Cisticola ayresii	Cisticola, Wing-snapping	Unlisted	LC
Cisticola cinnamomeus	Cisticola, Pale-crowned	Unlisted	LC
Cisticola fulvicapilla	Neddicky, Neddicky	Unlisted	LC
Cisticola juncidis	Cisticola, Zitting	Unlisted	LC
Cisticola lais	Cisticola, Wailing	Unlisted	LC
Cisticola textrix	Cisticola, Cloud	Unlisted	LC
Cisticola tinniens	Cisticola, Levaillant's	Unlisted	LC
Colius striatus	Mousebird, Speckled	Unlisted	LC
Columba arquatrix	Olive-pigeon, African	Unlisted	LC
Columba guinea	Pigeon, Speckled	Unlisted	LC
Columba livia	Dove, Rock	Unlisted	LC
Coracias garrulus	**Roller, European**	**NT**	**LC**
Corvus albus	Crow, Pied	Unlisted	LC
Corvus capensis	Crow, Cape	Unlisted	LC
Corythaixoides concolor	Go-away-bird, Grey	Unlisted	LC
Cossypha caffra	Robin-chat, Cape	Unlisted	LC
Cossypha humeralis	Robin-chat, White-throated	Unlisted	LC
Coturnix coturnix	Quail, Common	Unlisted	LC
Coturnix delegorguei	Quail, Harlequin	Unlisted	LC
Creatophora cinerea	Starling, Wattled	Unlisted	LC
Crex crex	Crake, Corn	Unlisted	LC
Crithagra atrogularis	Canary, Black-throated	Unlisted	LC
Crithagra flaviventris	Canary, Yellow	Unlisted	LC
Crithagra gularis	Seedeater, Streaky-headed	Unlisted	LC
Crithagra mozambicus	Canary, Yellow-fronted	Unlisted	LC
Cuculus clamosus	Cuckoo, Black	Unlisted	LC
Cuculus solitarius	Cuckoo, Red-chested	Unlisted	LC
Cursorius temminckii	Courser, Temminck's	Unlisted	LC
Cypsiurus parvus	Palm-swift, African	Unlisted	LC
Delichon urbicum	House-martin, Common	Unlisted	LC
Dendrocygna bicolor	Duck, Fulvous	Unlisted	LC
Dendrocygna viduata	Duck, White-faced	Unlisted	LC
Dendropicos fuscescens	Woodpecker, Cardinal	Unlisted	LC
Dicrurus adsimilis	Drongo, Fork-tailed	Unlisted	LC
Dryoscopus cubla	Puffback, Black-backed	Unlisted	LC
Egretta alba	Egret, Great	Unlisted	LC
Egretta ardesiaca	Heron, Black	Unlisted	LC
Egretta garzetta	Egret, Little	Unlisted	LC
Egretta intermedia	Egret, Yellow-billed	Unlisted	LC

Elanus caeruleus	Kite, Black-shouldered	Unlisted	LC
Emberiza capensis	Bunting, Cape	Unlisted	LC
Emberiza tahapisi	Bunting, Cinnamon-breasted	Unlisted	LC
Eremomela icteropygialis	Eremomela, Yellow-bellied	Unlisted	LC
Eremopterix leucotis	Sparrowlark, Chestnut-backed	Unlisted	LC
Estrilda astrild	Waxbill, Common	Unlisted	LC
Estrilda erythronotos	Waxbill, Black-faced	Unlisted	LC
Euplectes afer	Bishop, Yellow-crowned	Unlisted	LC
Euplectes albonotatus	Widowbird, White-winged	Unlisted	LC
Euplectes ardens	Widowbird, Red-collared	Unlisted	LC
Euplectes axillaris	Widowbird, Fan-tailed	Unlisted	LC
Euplectes capensis	Bishop, Yellow	Unlisted	LC
Euplectes orix	Bishop, Southern Red	Unlisted	LC
Euplectes progne	Widowbird, Long-tailed	Unlisted	LC
Eupodotis caerulescens	**Korhaan, Blue**	**LC**	**NT**
Eupodotis senegalensis	**Korhaan, White-bellied**	**VU**	**LC**
Falco amurensis	Falcon, Amur	Unlisted	LC
Falco biarmicus	**Falcon, Lanner**	**VU**	**LC**
Falco naumanni	Kestrel, Lesser	Unlisted	LC
Falco rupicoloides	Kestrel, Greater	Unlisted	LC
Falco rupicolus	Kestrel, Rock	Unlisted	Unlisted
Fulica cristata	Coot, Red-knobbed	Unlisted	LC
Gallinago nigripennis	Snipe, African	Unlisted	LC
Gallinula chloropus	Moorhen, Common	Unlisted	LC
Geronticus calvus	**Ibis, Southern Bald**	**VU**	**VU**
Glareola nordmanni	**Pratincole, Black-winged**	**NT**	**NT**
Glaucidium perlatum	Owlet, Pearl-spotted	Unlisted	LC
Halcyon albiventris	Kingfisher, Brown-hooded	Unlisted	LC
Halcyon chelicuti	Kingfisher, Striped	Unlisted	LC
Halcyon senegalensis	Kingfisher, Woodland	Unlisted	LC
Haliaeetus vocifer	Fish-eagle, African	Unlisted	LC
Himantopus himantopus	Stilt, Black-winged	Unlisted	LC
Hirundo abyssinica	Swallow, Lesser Striped	Unlisted	LC
Hirundo albigularis	Swallow, White-throated	Unlisted	LC
Hirundo cucullata	Swallow, Greater Striped	Unlisted	LC
Hirundo dimidiata	Swallow, Pearl-breasted	Unlisted	LC
Hirundo fuligula	Martin, Rock	Unlisted	Unlisted
Hirundo rustica	Swallow, Barn	Unlisted	LC
Hirundo semirufa	Swallow, Red-breasted	Unlisted	LC
Hirundo spilodera	Cliff-swallow, South African	Unlisted	LC
Indicator indicator	Honeyguide, Greater	Unlisted	LC
Indicator minor	Honeyguide, Lesser	Unlisted	LC
Ixobrychus minutus	Bittern, Little	Unlisted	LC
Jynx ruficollis	Wryneck, Red-throated	Unlisted	LC
Kaupifalco monogrammicus	Buzzard, Lizard	Unlisted	LC
Lagonosticta rubricata	Firefinch, African	Unlisted	LC

Lagonosticta senegala	Firefinch, Red-billed	Unlisted	LC
Lamprotornis nitens	Starling, Cape Glossy	Unlisted	LC
Laniarius ferrugineus	Boubou, Southern	Unlisted	LC
Lanius collaris	Fiscal, Common (Southern)	Unlisted	LC
Lanius collurio	Shrike, Red-backed	Unlisted	LC
Lanius minor	Shrike, Lesser Grey	Unlisted	LC
Larus cirrocephalus	Gull, Grey-headed	Unlisted	LC
Lophaetus occipitalis	Eagle, Long-crested	Unlisted	LC
Lybius torquatus	Barbet, Black-collared	Unlisted	LC
Macronyx capensis	Longclaw, Cape	Unlisted	LC
Malaconotus blanchoti	Bush-shrike, Grey-headed	Unlisted	LC
Megaceryle maximus	Kingfisher, Giant	Unlisted	Unlisted
Melaenornis pammelaina	Flycatcher, Southern Black	Unlisted	LC
Merops apiaster	Bee-eater, European	Unlisted	LC
Merops bullockoides	Bee-eater, White-fronted	Unlisted	LC
Merops pusillus	Bee-eater, Little	Unlisted	LC
Milvus aegyptius	Kite, Yellow-billed	Unlisted	Unlisted
Milvus migrans	Kite, Black	Unlisted	LC
Mirafra africana	Lark, Rufous-naped	Unlisted	LC
Mirafra apiata	Lark, Cape Clapper	Unlisted	LC
Mirafra fasciolata	Lark, Eastern Clapper	Unlisted	LC
Mirafra marjoriae	Lark, Agulhas Clapper	Unlisted	Unlisted
Mirafra rufocinnamomea	Lark, Flappet	Unlisted	LC
Monticola rupestris	Rock-thrush, Cape	Unlisted	LC
Motacilla aguimp	Wagtail, African Pied	Unlisted	LC
Motacilla capensis	Wagtail, Cape	Unlisted	LC
Motacilla clara	Wagtail, Mountain	Unlisted	LC
Muscicapa striata	Flycatcher, Spotted	Unlisted	LC
Mycteria ibis	**Stork, Yellow-billed**	**EN**	**LC**
Myrmecocichla formicivora	Chat, Anteating	Unlisted	LC
Nectarinia famosa	Sunbird, Malachite	Unlisted	LC
Neotis denhami	**Bustard, Denham's**	**VU**	**NT**
Netta erythrophthalma	Pochard, Southern	Unlisted	LC
Netta rufina	Pochard, Red-crested	Unlisted	LC
Nilaus afer	Brubru, Brubru	Unlisted	LC
Numida meleagris	Guineafowl, Helmeted	Unlisted	LC
Nycticorax nycticorax	Night-Heron, Black-crowned	Unlisted	LC
Oena capensis	Dove, Namaqua	Unlisted	LC
Oenanthe monticola	Wheatear, Mountain	Unlisted	LC
Oenanthe pileata	Wheatear, Capped	Unlisted	LC
Onychognathus morio	Starling, Red-winged	Unlisted	LC
Oriolus larvatus	Oriole, Black-headed	Unlisted	LC
Ortygospiza atricollis	Quailfinch, African	Unlisted	LC
Otus senegalensis	Scops-owl, African	Unlisted	LC
Oxyura maccoa	**Duck, Maccoa**	**NT**	**NT**
Pandion haliaetus	Osprey, Osprey	Unlisted	LC

Parus niger	Tit, Southern Black	Unlisted	Unlisted
Passer diffusus	Sparrow, Southern Grey-headed	Unlisted	LC
Passer domesticus	Sparrow, House	Unlisted	LC
Passer griseus	Sparrow, Northern Grey-headed	Unlisted	LC
Passer melanurus	Sparrow, Cape	Unlisted	LC
Peliperdix coqui	Francolin, Coqui	Unlisted	LC
Petronia superciliaris	Petronia, Yellow-throated	Unlisted	LC
Phalacrocorax africanus	Cormorant, Reed	Unlisted	Unlisted
Phalacrocorax carbo	Cormorant, White-breasted	Unlisted	LC
Philomachus pugnax	Ruff, Ruff	Unlisted	LC
Phoeniconaias minor	**Flamingo, Lesser**	**NT**	**NT**
Phoenicopterus ruber	**Flamingo, Greater**	**NT**	**LC**
Phoeniculus purpureus	Wood-hoopoe, Green	Unlisted	LC
Phylloscopus trochilus	Warbler, Willow	Unlisted	LC
Platalea alba	Spoonbill, African	Unlisted	LC
Plectropterus gambensis	Goose, Spur-winged	Unlisted	LC
Plegadis falcinellus	Ibis, Glossy	Unlisted	LC
Plocepasser mahali	Sparrow-weaver, White-browed	Unlisted	LC
Ploceus capensis	Weaver, Cape	Unlisted	LC
Ploceus cucullatus	Weaver, Village	Unlisted	LC
Ploceus velatus	Southern Masked-weaver, Southern	Unlisted	LC
Podica senegalensis	**Finfoot, African**	**VU**	**LC**
Podiceps cristatus	Grebe, Great Crested	Unlisted	LC
Podiceps nigricollis	Grebe, Black-necked	Unlisted	LC
Pogoniulus chrysoconus	Tinkerbird, Yellow-fronted	Unlisted	LC
Polyboroides typus	Harrier-Hawk, African	Unlisted	LC
Porphyrio madagascariensis	Swamphen, African Purple	Unlisted	Unlisted
Prinia flavicans	Prinia, Black-chested	Unlisted	LC
Prinia subflava	Prinia, Tawny-flanked	Unlisted	LC
Prionops plumatus	Helmet-shrike, White-crested	Unlisted	LC
Prodotiscus regulus	Honeybird, Brown-backed	Unlisted	LC
Psophocichla litsipsirupa	Thrush, Groundscraper	Unlisted	Unlisted
Pternistis natalensis	Spurfowl, Natal	Unlisted	LC
Pternistis swainsonii	Spurfowl, Swainson's	Unlisted	LC
Pycnonotus tricolor	Bulbul, Dark-capped	Unlisted	Unlisted
Pytilia melba	Pytilia, Green-winged	Unlisted	LC
Quelea quelea	Quelea, Red-billed	Unlisted	LC
Rallus caerulescens	Rail, African	Unlisted	LC
Recurvirostra avosetta	Avocet, Pied	Unlisted	LC
Rhinopomastus cyanomelas	Scimitarbill, Common	Unlisted	LC
Riparia cincta	Martin, Banded	Unlisted	LC
Riparia paludicola	Martin, Brown-throated	Unlisted	LC
Riparia riparia	Martin, Sand	Unlisted	LC
Sagittarius serpentarius	**Secretarybird, Secretarybird**	**VU**	**VU**
Sarkidiornis melanotos	Duck, Comb	Unlisted	LC
Sarothrura rufa	Flufftail, Red-chested	Unlisted	LC

Saxicola torquatus	Stonechat, African	Unlisted	LC
Scleroptila levaillantii	Francolin, Red-winged	Unlisted	LC
Scleroptila levaillantoides	Francolin, Orange River	Unlisted	Unlisted
Scleroptila shelleyi	Francolin, Shelley's	Unlisted	LC
Scopus umbretta	Hamerkop, Hamerkop	Unlisted	LC
Serinus canicollis	Canary, Cape	Unlisted	LC
Sigelus silens	Flycatcher, Fiscal	Unlisted	LC
Spermestes cucullatus	Mannikin, Bronze	Unlisted	Unlisted
Sphenoeacus afer	Grassbird, Cape	Unlisted	LC
Spizocorys conirostris	Lark, Pink-billed	Unlisted	LC
Spizocorys fringillaris	**Lark, Botha's**	**EN**	**EN**
Spreo bicolor	Starling, Pied	Unlisted	Unlisted
Stenostira scita	Flycatcher, Fairy	Unlisted	LC
Sterna caspia	**Tern, Caspian**	**VU**	**LC**
Streptopelia capicola	Turtle-dove, Cape	Unlisted	LC
Streptopelia semitorquata	Dove, Red-eyed	Unlisted	LC
Streptopelia senegalensis	Dove, Laughing	Unlisted	LC
Struthio camelus	Ostrich, Common	Unlisted	LC
Sylvia borin	Warbler, Garden	Unlisted	LC
Sylvietta rufescens	Crombec, Long-billed	Unlisted	LC
Tachybaptus ruficollis	Grebe, Little	Unlisted	LC
Tachymarptis melba	Swift, Alpine	Unlisted	LC
Tadorna cana	Shelduck, South African	Unlisted	LC
Tchagra senegalus	Tchagra, Black-crowned	Unlisted	LC
Telophorus zeylonus	Bokmakierie, Bokmakierie	Unlisted	LC
Terpsiphone viridis	Paradise-flycatcher, African	Unlisted	LC
Thalassornis leuconotus	Duck, White-backed	Unlisted	LC
Thamnolaea cinnamomeiventris	Cliff-chat, Mocking	Unlisted	LC
Threskiornis aethiopicus	Ibis, African Sacred	Unlisted	LC
Trachyphonus vaillantii	Barbet, Crested	Unlisted	LC
Treron calvus	Green-pigeon, African	Unlisted	LC
Tricholaema leucomelas	Barbet, Acacia Pied	Unlisted	LC
Tringa glareola	Sandpiper, Wood	Unlisted	LC
Tringa nebularia	Greenshank, Common	Unlisted	LC
Tringa stagnatilis	Sandpiper, Marsh	Unlisted	LC
Turdoides jardineii	Babbler, Arrow-marked	Unlisted	LC
Turdus libonyanus	Thrush, Kurrichane	Unlisted	Unlisted
Turdus olivaceus	Thrush, Olive	Unlisted	LC
Turdus smithi	Thrush, Karoo	Unlisted	LC
Turnix sylvaticus	Buttonquail, Kurrichane	Unlisted	LC
Turtur chalcospilos	Wood-dove, Emerald-spotted	Unlisted	LC
Tyto alba	Owl, Barn	Unlisted	LC
Tyto capensis	**Grass-owl, African**	**VU**	**LC**
Upupa africana	Hoopoe, African	Unlisted	Unlisted
Uraeginthus angolensis	Waxbill, Blue	Unlisted	LC
Urocolius indicus	Mousebird, Red-faced	Unlisted	LC

Vanellus armatus	Lapwing, Blacksmith	Unlisted	LC
Vanellus coronatus	Lapwing, Crowned	Unlisted	LC
Vanellus senegallus	Lapwing, African Wattled	Unlisted	LC
Vidua chalybeata	Indigobird, Village	Unlisted	LC
Vidua funerea	Indigobird, Dusky	Unlisted	LC
Vidua macroura	Whydah, Pin-tailed	Unlisted	LC
Vidua paradisaea	Paradise-whydah, Long-tailed	Unlisted	LC
Zosterops pallidus	White-eye, Orange River	Unlisted	LC
Zosterops virens	White-eye, Cape	Unlisted	LC

APPENDIX C: *Mammals species expected to occur in the project area*

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2017)
Aethomys ineptus	Tete Veld Rat	LC	LC
Alcelaphus buselaphus	Red Hartebeest	LC	LC
Antidorcas marsupialis	Springbok	LC	LC
Aonyx capensis	Cape Clawless Otter	NT	NT
Atelerix frontalis	Southern African Hedgehog	NT	LC
Atilax paludinosus	Water Mongoose	LC	LC
Canis mesomelas	Black-backed Jackal	LC	LC
Caracal caracal	Caracal	LC	LC
Ceratotherium simum	White Rhinoceros	NT	NT
Cloeotis percivali	Short-eared Trident Bat	EN	LC
Connochaetes gnou	Black Wildebeest	LC	LC
Connochaetes taurinus	Blue Wildebeest	LC	LC
Crocidura cyanea	Reddish-grey Musk Shrew	LC	LC
Crocidura maquassiensis	Swamp Musk Shrew	NT	LC
Crocidura silacea	Lesser Grey-brown Musk Shrew	LC	LC
Cryptomys hottentotus	Common Mole-rat	LC	LC
Cynictis penicillata	Yellow Mongoose	LC	LC
Damaliscus pygargus	Blesbok	LC	LC
Dasymys incomtus	African Marsh Rat	NT	LC
Dendromus melanotis	Grey Climbing Mouse	LC	LC
Diceros bicornis	Black Rhinoceros	EN	CR
Eidolon helvum	African Straw-colored Fruit Bat	LC	NT
Elephantulus brachyrhynchus	Short-snouted Sengi	LC	LC
Elephantulus myurus	Eastern Rock Sengi	LC	LC
Eptesicus hottentotus	Long-tailed Serotine Bat	LC	LC
Equus quagga	Plains Zebra	LC	NT
Felis nigripes	Black-footed Cat	VU	VU
Felis silvestris	Wildcat	LC	LC
Galago moholi	Southern Lesser Galago	LC	LC
Genetta genetta	Small-spotted Genet	LC	LC
Gerbilliscus brantsii	Highveld Gerbil	LC	LC
Gerbilliscus leucogaster	Bushveld Gerbil	LC	LC
Herpestes sanguineus	Slender Mongoose	LC	LC
Hydrictis maculicollis	Spotted-necked Otter	VU	NT
Hystrix africaeaustralis	Cape Porcupine	LC	LC
Ichneumia albicauda	White-tailed Mongoose	LC	LC
Ictonyx striatus	Striped Polecat	LC	LC
Kerivoula lanosa	Lesser Woolly Bat	LC	LC
Leptailurus serval	Serval	NT	LC
Lepus saxatilis	Scrub Hare	LC	LC
Lepus victoriae	African Savanna Hare	LC	LC
Mastomys coucha	Multimammate Mouse	LC	LC

Mastomys natalensis	Natal Multimammate Mouse	LC	LC
Mellivora capensis	Honey Badger	LC	LC
Mungos mungo	Banded Mongoose	LC	LC
Mus musculus	House Mouse	Unlisted	LC
Myotis welwitschii	Welwitsch's Hairy Bat	LC	LC
Mystromys albicaudatus	White-tailed Rat	VU	EN
Neoromicia capensis	Cape Serotine Bat	LC	LC
Neoromicia zuluensis	Aloe Bat	LC	LC
Nycteris thebaica	Egyptian Slit-faced Bat	LC	LC
Orycteropus afer	Aardvark	LC	LC
Otomys angoniensis	Angoni Vlei Rat	LC	LC
Otomys irroratus	Vlei Rat (Fynbos type)	LC	LC
Ourebia ourebi	Oribi	EN	LC
Panthera pardus	Leopard	VU	VU
Papio ursinus	Chacma Baboon	LC	LC
Parahyaena brunnea	Brown Hyaena	NT	NT
Pedetes capensis	Springhare	LC	LC
Pelea capreolus	Grey Rhebok	NT	LC
Poecilogale albinucha	African Striped Weasel	NT	LC
Procavia capensis	Rock Hyrax	LC	LC
Pronolagus randensis	Jameson's Red Rock Hare	LC	LC
Pronolagus saundersiae	Hewitt's Red Rock Rabbit	LC	LC
Proteles cristata	Aardwolf	LC	LC
Raphicerus campestris	Steenbok	LC	LC
Rattus rattus	House Rat	Exotic (Not listed)	LC
Redunca fulvorufula	Mountain Reedbuck	EN	LC
Rhabdomys pumilio	Xeric Four-striped Mouse	LC	LC
Rhinolophus clivosus	Geoffroy's Horseshoe Bat	LC	LC
Rhinolophus darlingi	Darling's Horseshoe Bat	LC	LC
Saccostomus campestris	Pouched Mouse	LC	LC
Scotophilus dinganii	Yellow House Bat	LC	LC
Steatomys pratensis	Fat Mouse	LC	LC
Suncus varilla	Lesser Dwarf Shrew	LC	LC
Suricata suricatta	Meerkat	LC	LC
Sylvicapra grimmia	Common Duiker	LC	LC
Syncerus caffer	African Buffalo	LC	LC
Tadarida aegyptiaca	Egyptian Free-tailed Bat	LC	LC
Taphozous mauritianus	Mauritian Tomb Bat	LC	LC
Thryonomys swinderianus	Greater Cane Rat	LC	LC
Tragelaphus oryx	Common Eland	LC	LC
Tragelaphus strepsiceros	Greater Kudu	LC	LC
Vulpes chama	Cape Fox	LC	LC

APPENDIX D: *Reptile species expected to occur within the project area*

Species	Common name	Conservation Status	
		Regional	Global
Acontias gracilicauda	Thin-tailed Legless Skink	LC	LC
Afroedura nivaria	Drankensberg Flat Gecko	LC	LC
Afrotyphlops bibronii	Bibron's Blind Snake	LC	LC
Agama aculeata distanti	Eastern Ground Agama	LC	LC
Aparallactus capensis	Black-headed Centipede-eater	LC	LC
Atractaspis bibronii	Bibron's Stiletto Snake	LC	Unlisted
Boaedon capensis	Brown House Snake	LC	Unlisted
Causus rhombeatus	Rhombic Night Adder	LC	Unlisted
Chamaeleo dilepis	Common Flap-neck Chameleon	LC	LC
Crocodylus niloticus	Nile Crocodile	VU	LC
Crotaphopeltis hotamboeia	Red-lipped Snake	LC	Unlisted
Dasypeltis scabra	Rhombic Egg-eater	LC	LC
Duberria lutrix	South African Slug-eater	LC	LC
Gerrhosaurus flavigularis	Yellow-throated Plated Lizard	LC	Unlisted
Hemachatus haemachatus	Rinkhals	LC	LC
Hemidactylus mabouia	Common Tropical House Gecko	LC	Unlisted
Lamprophis aurora	Aurora House Snake	LC	LC
Lycodonomorphus inornatus	Olive House Snake	LC	LC
Lycodonomorphus rufulus	Brown Water Snake	LC	Unlisted
Lygodactylus capensis capensis	Common Dwarf Gecko	LC	Unlisted
Naja mossambica	Mozambique Spitting Cobra	LC	Unlisted
Pachydactylus affinis	Transvaal Gecko	LC	LC
Pachydactylus vansoni	Van Son's Gecko	LC	LC
Prosymna ambigua	East African Shovel-Snout	LC	LC
Psammophis brevirostris	Short-snouted Grass Snake	LC	Unlisted
Psammophis subtaeniatus	Stripe-bellied Sand Snake	LC	LC
Psammophylax rhombeatus rhombeatus	Spotted Grass Snake	LC	Unlisted
Psammophylax tritaeniatus	Striped Skaapsteker	LC	LC
Pseudocordylus melanotus melanotus	Common Crag Lizard	LC	LC
Stigmochelys pardalis	Leopard Tortoise	LC	LC
Telescopus semiannulatus semiannulatus	Eastern Tiger Snake	LC	Unlisted
Trachylepis capensis	Cape Skink	LC	Unlisted
Trachylepis punctatissima	Speckled Rock Skink	LC	LC
Trachylepis varia	Variable Skink	LC	LC

APPENDIX E: *Amphibian species expected to occur within the project area*

Species	Common name	Conservation Status	
		Regional	Global
Amietia angolensis	Angola river frog	LC	LC
Amietia delalandii	Delalande's River Frog	LC	Unlisted
Amietia fuscigula	Cape River Frog	LC	LC
Cacosternum boettgeri	Common Caco	LC	LC
Kassina senegalensis	Bubbling Kassina	LC	LC
Phrynobatrachus natalensis	Snoring Puddle Frog	LC	LC
Ptychadena porosissima	Striped Grass Frog	LC	LC
Pyxicephalus adspersus	Giant Bull Frog	NT	LC
Schismaderma carens	Red Toad	LC	LC
Sclerophrys capensis	Raucous Toad	LC	LC
Sclerophrys garmani	Olive Toad	LC	LC
Sclerophrys gutturalis	Guttural Toad	LC	LC
Semnodactylus wealii	Rattling Frog	LC	LC
Strongylopus fasciatus	Striped Stream Frog	LC	LC
Strongylopus grayii	Clicking Stream Frog	LC	LC
Tomopterna cryptotis	Tremelo Sand Frog	LC	LC
Tomopterna natalensis	Natal Sand Frog	LC	LC
Tomopterna tandyi	Tandy's Sand Frog	LC	LC
Xenopus laevis	Common Platanna	LC	LC

SOUTH32 SA COAL HOLDINGS (PTY) LTD

KROMFONTEIN 132kV POWERLINE RELOCATION
SPECIALIST SURFACE WATER STUDY
FINAL

Report No.: JW126/19/H759-00 – Rev 4

May 2019

Jones & Wagener
Engineering & Environmental Consultants

Internet presence: www.jaws.co.za

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ACTION	FUNCTION	NAME	DATE	SIGNATURE
Prepared	Scientist	Tolmay Hopkins	6 May 2019	
Reviewed	Engineer	Malini Veeragaloo	20 May 2019	
Approved	Scientist	Tolmay Hopkins	21 May 2019	

RECORD OF REVISIONS AND ISSUES REGISTER

Date	Revision	Description	Issued to	Issue Format	No. Copies
2019-05-20	A-B	Internal Review	Tolmay Hopkins	Word	1
2019-05-21	0	Draft for client review	Jacana Environmentals	Electronic (pdf and MS Word)	N/A
2019-06-18	1	Final for client review	Jacana Environmentals	Electronic (pdf and MS Word)	N/A
2019-06-25	2	Final for client review	Jacana Environmentals	Electronic	N/A
2019-06-27	3	Final for client review	Jacana Environmentals	Electronic	N/A
2019-07-08	4	Revised Final Report	Jacana Environmentals	Electronic	N/A

NEMA Appendix 6 requirements

GNR 326	Description	Section in the Report
Appendix 6 (a)	A specialist report prepared in terms of these Regulations must contain— details of— the specialist who prepared the report; and the expertise of that specialist to compile a specialist report including a curriculum vitae;	Section 3.3 Appendix B
Appendix 6 (b)	A declaration that the specialist is independent in a form as may be specified by the competent authority;	Appendix A
Appendix 6 (c)	An indication of the scope of, and the purpose for which, the report was prepared;	Section 1.2
Appendix 6 (cA)	An indication of the quality and age of base data used for the specialist report;	Section 1.4
Appendix 6 (cB)	A description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 5.6 Section 7.4
Appendix 6 (d)	The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 1.4
Appendix 6 (e)	A description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Section 1.4
Appendix 6 (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;	Section 6 Section 7
Appendix 6 (g)	An identification of any areas to be avoided, including buffers;	Section 5.5.5
Appendix 6 (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 5.5.5
Appendix 6 (i)	A description of any assumptions made and any uncertainties or gaps in knowledge;	Section 1.5
Appendix 6 (j)	A description of the findings and potential implications of such findings on the impact of the proposed activity or activities;	Section 7
Appendix 6 (k)	Any mitigation measures for inclusion in the EMPr;	Section 7
Appendix 6 (l)	Any conditions for inclusion in the environmental authorisation;	Section 9
Appendix 6 (m)	Any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Section 8
Appendix 6 (n)	A reasoned opinion – • whether the proposed activity, activities or portions thereof should be authorised; • regarding the acceptability of the proposed activity or activities; and • 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;	Section 9
Appendix 6 (o)	A description of any consultation process that was undertaken during the course of preparing the specialist report;	No consultation undertaken
Appendix 6 (p)	A summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	No consultation undertaken
Appendix 6 (q)	Any other information requested by the competent authority.	Not applicable

SPECIALIST DECLARATION

I, Malini Veeragaloo, hereby 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 not, 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.
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

A detailed CV of the author is included in Error! Reference source not found..

Malini Veeragaloo Pr Eng

SYNOPSIS

Wolvekrans Colliery is an operational division of South32 SA Coal Holdings (Pty) Limited (South32). The mine is located between the towns of eMalahleni and Kriel, approximately 30 km south-east of the town of eMalahleni, in close proximity to the Duvha Power Station.

Wolvekrans Colliery is made up of several mining section, namely Vandyksdrift Central (VDDC), Vandyksdrift North (VDDN), Vandyksdrift South (VDDS), Steenkoolspruit (SKS) and Albion sections. The VDDC section of Wolvekrans Colliery is located to the south of the Steenkoolspruit and VDDN sections, and north of the VDDS and Albion sections (mining has ceased at these two sections). The Olifants River forms the southern boundary of the VDDC mining section. The R544 and R575 provincial roads are located to the east and west of the Wolvekrans Colliery, respectively.

The VDDC section area falls within the footprint of historic underground mining operations at the old Douglas Colliery. In 2007, an amendment of the Environmental Management Programme Report (EMPR) for the Douglas Colliery operations was approved, to allow the opencast mining of the remaining coal seams. This is now referred to as the VDDC section, which is earmarked to be an opencast mine using dragline, and truck and shovel operations. Mining will commence in 2020.

Electricity for the VDDC section is supplied from Eskom's Klein Olifants 132 kV Substation, which feeds the Klein 132 kV Substation. The existing Kromfontein 132 kV powerline which connects the Klein Substation and the Kromfontein Substation, traverse the area to be opencast mined and therefore has to be relocated before opencast mining can commence.

Study Approach

The objective of the baseline surface water assessment is to characterise the surface water regime at the site in terms of catchment areas and surface water quality and quantity.

This surface water study does not include the delineation of sensitive areas such as wetlands, or the assessment of aquatic ecology.

Thereafter an assessment of the impacts of the project on surface water was conducted.

This involves an assessment of the impacts of the project and its components on surface water, in terms of impact on water quality and quantity, for the proposed powerline project.

In addition, this includes the formulation of proposed mitigation measures for significant impacts, as well as the monitoring required to measure the success of the mitigation measures, once implemented. The residual impact after implementation of the mitigation measures is also quantified.

Project Description

The proposed powerline will be constructed within the VDDC section of the Wolvekrans Colliery and within the approved Mining Rights Boundary. The electricity distribution powerline will be constructed and relocated to a proposed route, which runs outside an area planned to be mined by South32. The preferred site for the proposed powerline route was selected looking at the terrain and the current mining activities. The proposed powerline will be approximately 7.5 km with a corridor of about 36 m. The foundation depths will range between 2 m to 3 m. The proposed powerline will be constructed using intermediate steel pole towers that will be erected a few metres apart depending on the terrain, ground clearance requirements, geology etc. The proposed steel towers may consist of the following:

- Mono-pole guyed intermediate suspension structures;
- Mono-pole self-supporting intermediate suspension structures;
- Mono-pole angle suspension structures; and/or
- Mono-pole strain structures.

None of the structures will be located within delineated watercourses or the 1:100 year floodline.

The height of the towers is expected to range between 22 m and 26 m, depending on the terrain and ground clearance requirements

Impact assessment

The potential impacts associated with the construction and decommissioning phases of the powerline on surface water quality are as follows:

- Erosion of topsoil on areas cleared or disturbed around the pylon sites, including any new access routes, with resultant increased suspended solids, as well as siltation in watercourses.
- Impact on quality of storm water runoff from the pylon sites during the construction phase as a result of:
    - Spillage of oil, grease and diesel from plant (increased hydrocarbon concentrations in surface water);
    - Concrete spillages;
    - Spillage of construction/demolition waste into watercourses;
    - Inadequate management of sewage waste.

These impacts can, however, be limited through the implementation of mitigation measures provided in this report and the residual impact is therefore rated as very low.

No water will be retained on site during the construction phase. All storm water will be allowed to run off the pylon construction sites, with only temporary retention for silt management, if required.

All storm water will be allowed to drain freely under the powerline and no surface water quantity impacts are expected during the operational phase. The potential impact on water quantity is limited and rated as very low or unlikely.

On the assumption that adequate rehabilitation will be implemented during the decommissioning phase, no impacts are expected during the post closure phase.

Therefore, the main concerns with regard to the powerline project's surface water impacts revolve around the effective water management during the construction phase and maintenance during the operational phase.

Effective management through the minimisation of disturbed areas and designation of "no-go" zones for construction and maintenance vehicles in close proximity to watercourses is essential in order to keep the impact on the clean catchment minimal.

Due to the close proximity of the powerline to watercourses and the fact that pylons will be located within the regulated area (i.e. within 500 m of delineated watercourses, but outside of the delineated watercourses), the development of the powerline will be a section 21(c) and (i) water use. The water uses should be authorised in terms of the National Water Act, 1998 (Act 36 of 1998) before construction commences. It is anticipated that the water use activities could be authorised in terms of the General Authorisation (GA) for 21(c) and (i) water use as promulgated in GNR 509 of 2016. This should be confirmed through a risk assessment process by a suitably qualified wetland specialist as required in terms of the GA.

CONTENTS PAGE

APPENDICES

Appendix A

CVS OF SPECIALIST

LIST OF TABLES

LIST OF FIGURES

Abbreviations used

°C	degrees **C**elsius
BEEH	**B**io-resources **E**ngineering and **E**nvironmental **H**ydrology
BPG	**B**est **P**ractise **G**uidelines
DWAF	**D**epartment of **W**ater **A**ffairs and **F**orestry
DWS	**D**epartment of **W**ater and **S**anitation
DWF	**D**ry **W**eather **F**low
EAP	**E**nvironmental **A**ssessment **P**ractitioner
EC	**E**lectrical **C**onductivity
ECO	**E**nvironmental **C**ontrol **O**fficer
EIA	**E**nvironmental **I**mpact **A**ssessment
EMPr	**E**nvironmental **M**anagement **P**rogramme
EMPR	**E**nvironmental **M**anagement **P**rogramme **R**eport
GA	**G**eneral **A**uthorisation
GN	**G**overnment **N**otice
GNR	**G**overnment **N**otice **R**egulation
ICFR	**I**nstitute for **C**ommercial **F**orestry **R**esearch
IUA	**I**ntegrated **U**nit of **A**nalysis
J&W	**J**ones **& W**agener
km	**k**ilo**m**etre
kV	**k**ilo**V**olt
LDV	**L**ight **d**elivery vehicle
m	metre
m^2	square metre
mg/ℓ	milligram per litre
mm	millimetre
MAE	**M**ean **A**nnual **E**vaporation
MAP	**M**ean **A**nnual **P**recipitation
MAR	**M**ean **A**nnual **R**unoff
NEMA	**N**ational **E**nvironmental **M**anagement **A**ct
NEM:WA	**N**ational **E**nvironmental **M**anagement: **W**aste **A**ct
NWA	**N**ational **W**ater **A**ct, 1998 (Act 36 of 1998)
RMF	**R**egional **M**aximum **F**lood
RQO	**R**esource **Q**uality **O**bjectives
SANS	**S**outh **A**frican **N**ational **S**tandards
SAWS	**S**outh **A**frican **W**eather **S**ervice
SDF	**S**tandard **D**esign **F**lood
SO_4	Sulphate
South32	**South32 SA** Coal Holdings (Pty) Ltd

SS	**S**uspended **S**olids
SKS	**S**teen**k**ool**s**pruit
TDS	**T**otal **D**issolved **S**olids
TWQG	**T**arget **W**ater **Q**uality **G**uidelines
VDDC	**V**an**d**yks**d**rift **C**entral
VDDN	**V**an**d**yks**d**rift **N**orth
VDDS	**V**an**d**yks**d**rift **S**outh
WR90	**S**urface **W**ater **R**esources of South Africa 19**90**
WRC	**W**ater **R**esource **C**ommission

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SOUTH32 SA COAL HOLDINGS (PTY) LTD

KROMFONTEIN 132KV POWERLINE RELOCATION
SPECIALIST SURFACE WATER STUDY
FINAL REPORT NO: JW126/19/H759-00 – Rev 4

1. INTRODUCTION

1.1 Background

Wolvekrans Colliery is an operational division of South32 SA Coal Holdings (Pty) Limited (South32). The mine is located between the towns of eMalahleni and Kriel, approximately 30 km south-east of the town of eMalahleni, in close proximity to the Duvha Power Station (refer to **Figure 1-1**).

Wolvekrans Colliery is made up of several mining section, namely Vandyksdrift Central (VDDC), Vandyksdrift North (VDDN), Vandyksdrift South (VDDS), Steenkoolspruit (SKS) and Albion sections. The Vandyksdrift Central (VDDC) section of Wolvekrans Colliery is located to the south of the Steenkoolspruit and VDDN sections, and north of the VDDS and Albion sections (mining has ceased at these two sections). The Olifants River forms the southern boundary of the VDDC mining section. The R544 and R575 provincial roads are located to the east and west of the Wolvekrans Colliery, respectively.

The VDDC section area falls within the footprint of historic underground mining operations at the old Douglas Colliery. In 2007, an amendment of the Environmental Management Programme Report (EMPR) for the Douglas Colliery operations was approved, to allow the opencast mining of the remaining coal seams. This is now referred to as the VDDC section to be opencast mine using dragline, and truck and shovel operations. Mining will commence in 2020.

Electricity for the VDDC section is supplied from Eskom's Klein Olifants 132 kV Substation, which feeds the Klein 132 kV Substation. The existing Kromfontein 132 kV powerline which connects the Klein Substation and the Kromfontein Substation, traverse the area to be opencast mined (refer to **Figure 1-2**) and therefore has to be relocated before opencast mining can commence.

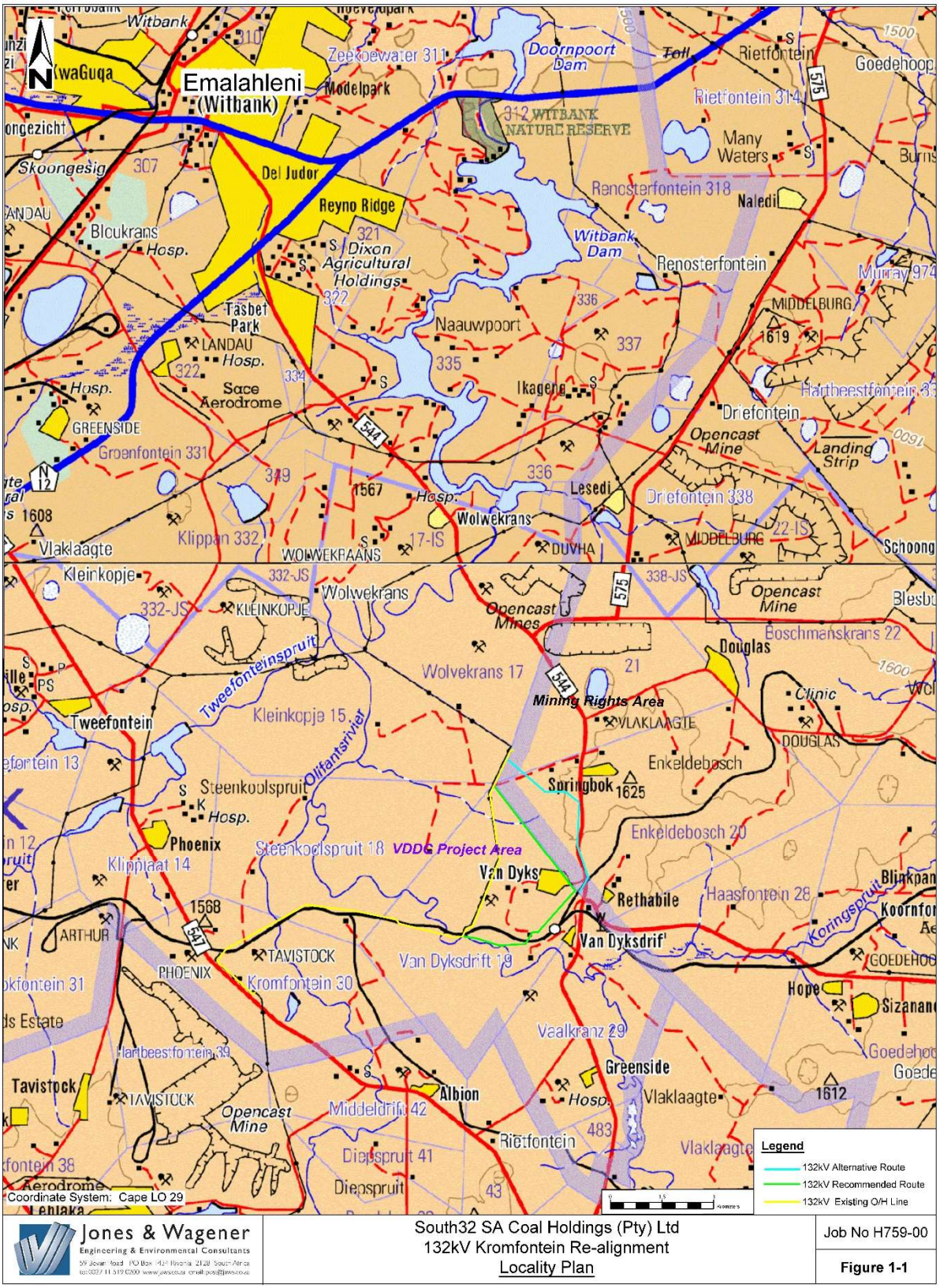

Figure 1-1: Locality Plan

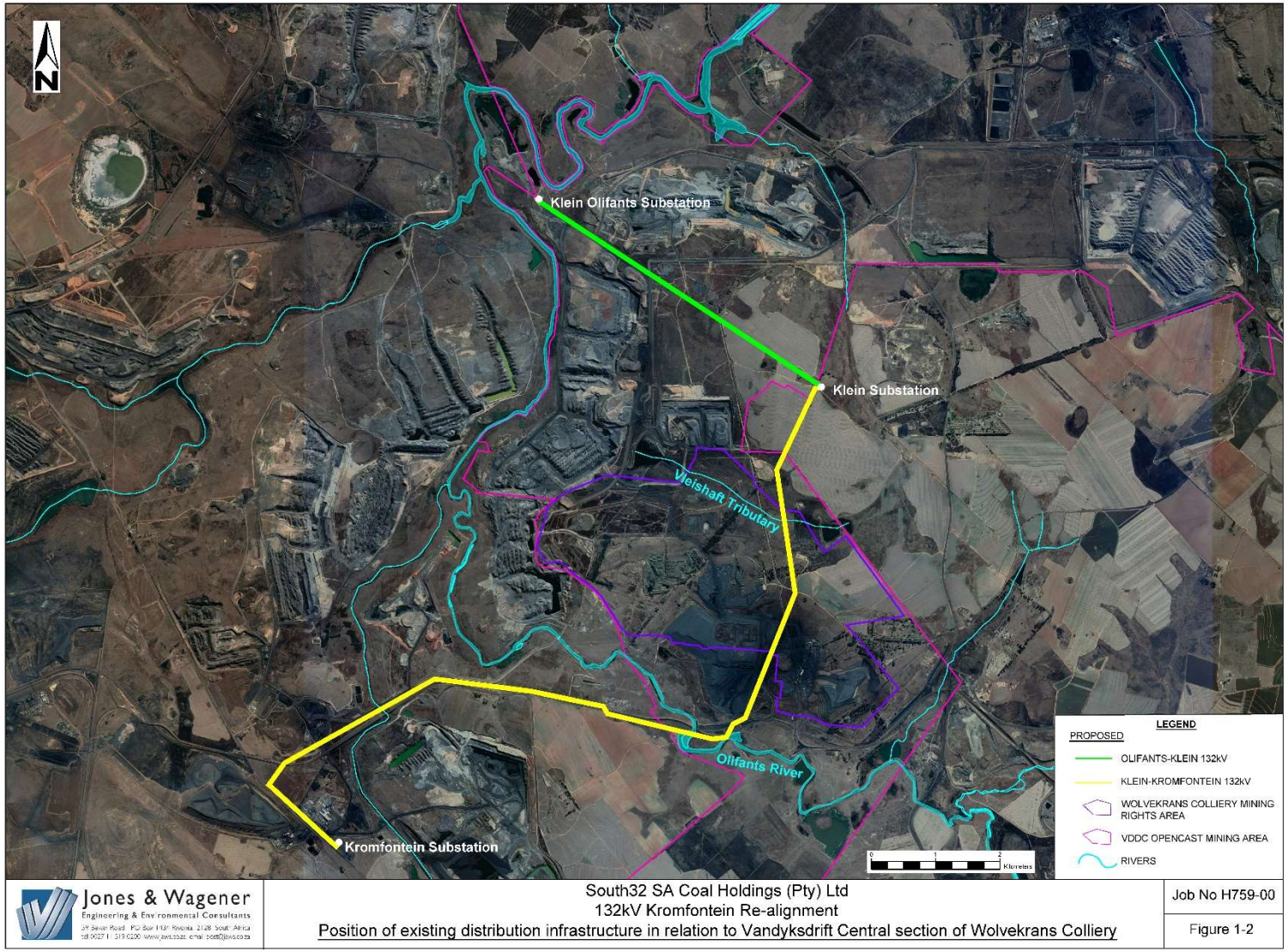

Figure 1-2: Position of existing electricity distribution infrastructure in relation to Vandyksdrift Central section of Wolvekrans Colliery

1.2 Terms of reference

The terms of reference for the specialist surface water study are summarised below. Specific components to be addressed include the following:

1.2.1 Baseline assessment

The objective of the baseline study is to characterise the surface water regime at the project area and the catchments in which it resides, in terms of surface water quantity and quality.

Information for the baseline assessment was abstracted from the following studies:

- 2004 Surface Water Study carried out by J&W for the Douglas Pillar Project EMPR (Report Number JW188/04/9347);
- November 2013 Surface Water Impact Study compiled by SRK Consulting for the Vandyksdrift Central (VDDC) Dewatering Project (Report Number 449019);
- 2018 Surface water baseline assessment conducted by J&W for the VDDC infrastructure project (Report number JW188/18/G535).

The information contained in these reports remains valid and is regarded as sufficient for the purposes of the baseline assessment for the proposed project. No additional sampling or analyses were conducted as part of this investigation.

It should be noted that the surface water study does not include the delineation of sensitive areas such as pans and wetlands, or the assessment of aquatic ecology. Information regarding the aquatic ecology, pans and wetlands is included in separate specialist studies.

1.2.2 Site water management

The objective is to ensure compliance with legislation in terms of the management of both storm water and water affected by planned activities.

1.2.3 Impact assessment

This includes an assessment of the impact of the project and its components on surface water in the study area, in terms of both water quality and water quantity.

In addition, this includes the formulation of proposed mitigation measures for significant impacts, as well as monitoring required to measure the success of the mitigation measures, once implemented. The residual impact after implementation of the mitigation measures was also quantified.

1.3 Study area

The proposed relocation of the 132 kV Kromfontein powerline will largely be in a brownfields project within the greater Wolvekrans Colliery mining rights area. Wolvekrans Colliery is located between the towns of eMalahleni and Kriel, within the jurisdictional area of the eMalahleni Local Municipality and the Nkangala District Municipality of the Mpumalanga Province. The mine is situated approximately 30 km south-east of the town of eMalahleni, in close proximity to the Duvha Power Station.

VDDC is located on the western boundary of Wolvekrans Colliery, with the Olifants River located on the southern and western boundaries of the VDDC section.

1.4 Approach and methodology

The following actions were taken as part of the surface water specialist study for this project:

- Information received from South32, was reviewed and relevant issues were noted.
- Rainfall data was obtained from the Institute for Commercial Forestry Research (ICFR) database and the South African Weather Service (SAWS);
- Topographical maps and satellite imagery (Google Earth) were reviewed to assess the study area;
- Peak flood flows at relevant locations within the study area were extracted from previous studies undertaken in the area;
- Water quality data within the study area were extracted from previous studies undertaken in the area;
- The potential impacts associated with the proposed relocation of the powerline was assessed for the construction, operational, decommissioning and post closure phases. Potential impacts have been detailed and mitigation measures described, with residual impacts then being rated.

1.5 Assumptions, study limitations and knowledge gaps

This study is undertaken based on the assumption that the structures along the re-aligned powerline route will be located outside of delineated watercourses and the 1:100 year floodline.

No additional surface water sampling was done to augment the monitoring data used in previous baseline assessments. The available information is, however, regarded as sufficient to provide an accurate description of the current status of water quality in the receiving catchment and to assess potential impact associated with the proposed development.

2. LEGISLATIVE ASPECTS

2.1 Regulatory Requirements

The Acts and Regulations that pertain to the surface water for infrastructure projects include:

- The Constitution of the Republic of South Africa (Act 108 of 1996).
- The National Water Act, Act 36 of 1998 (hereafter referred to as NWA).
- The National Environmental Management Act, Act 107 of 1998 (hereafter referred to as NEMA).
- National Environmental Management: Waste Act, 2008 (Act 59 of 2008) (NEM:WA).
- Government Notice (GN) R704 of 4 June 1999: Regulation on use of water for mining and related activities aimed at the protection of water resources (although these

regulations were specifically developed for the mining industry, the water management principles contained there-in are relevant to other developments).

- GN 399 dated 26 March 2004: General Authorisations in terms of Section 39 of the NWA: S21(a) and (b) water uses, as extended in GN 970 dated 30 November 2012: Extension of time period for General Authorisations in terms of Section 39 of the NWA: S21(a) and (b) water uses – until withdrawn by Notice in the Government Gazette.
- GN 509 dated 26 August 2016: General Authorisation in terms of Section 39 of the NWA for water uses as defined in Section 21(c) or Section 21(i).
- GN R324 to R327 of April 2017: NEMA Environmental Impact Assessment (EIA) Regulations 2014.
- GN 466 of April 2016: Classes and Resource Quality Objectives for water resources in the catchment of the Olifants River, in terms of S13(4) of the NWA.
- GN 932 dated 7 September 2018: Reserve Determination of Water Resources for the Olifants and Letaba Catchments.

2.2 Applicable policies and/or guidelines

The principles contained in the following Best Practice Guideline (BPG) documents as published by the (then) Department of Water Affairs and Forestry (DWAF) have been considered in this project:

- Best Practice Guidelines for Water Resource Protection in the SA Mining Industry, Series G: Best Practice Guideline G1: Storm Water Management, August 2006
- Best Practice Guidelines for Water Resource Protection in the SA Mining Industry, Series G: Best Practice Guideline G3: Water Monitoring Systems, July 2007
- Best Practice Guidelines for Water Resource Protection in the SA Mining Industry, Series G: Best Practice Guideline G4: Impact Prediction, December 2008
- Best Practice Guidelines for Water Resource Protection in the SA Mining Industry, Series H: Best Practice Guideline H2: Pollution Prevention and Minimization of Impacts, July 2008.

3. DETAILS OF THE APPLICANT AND ENVIRONMENTAL ASSESSMENT PRACTITIONER

3.1 Details of the Applicant

The details for the applicant for the Environmental Authorisation for the proposed project are summarised in **Table 3-1**.

Table 3-1: Applicant details

Project applicant:	South32 SA Coal Holdings Proprietary Limited: Wolvekrans Colliery				
Contact person:	Mr Thembani Mashamba				
Postal address:	PO Box 61820, Marshalltown, 2107				
Email:	thembani.mashamba@south32.net	Tel:	011 376 2705	Fax:	011 376 2160

3.2 Details of the Environmental Assessment Practitioner

The details of the Environmental Assessment Practitioner (EAP) responsible for the application are provided in **Table 3-2**.

Table 3-2: Environmental Assessment Practitioner details

EAP	Jones & Wagener (Pty) Ltd				
Contact person:	Tolmay Hopkins				
Postal address:	PO Box 1434, Rivonia, 2128				
Email:	tolmay@jaws.co.za	Tel:	011 519 0200	Fax:	011 519 0201

3.3 Details of the surface water specialists

The details of the Surface Water Specialist responsible for the Specialist Surface Water Study in respect of this project are provided in **Table 3-3** below. Details of the J&W project team members and their relevant experience are provided in **Table 3-4**.

Table 3-3: Specialist consultant contact details

Specialist consultant	Jones & Wagener (Pty) Ltd				
Contact person:	Malini Veeragaloo				
Postal address:	PO Box 1434, Rivonia, 2128				
Email:	moodley@jaws.co.za	Tel:	011 519 0200	Fax:	011 519 0201

Table 3-4: J&W team members and relevant experience

Name	Email address	Experience	Responsibility
Malini Veeragaloo	moodley@jaws.co.za	BSc (Eng) 11 years experience	Surface Water Specialist Report
Michael Palmer	palmer@jaws.co.za	Pr Eng, MSc Eng Civil 21 years experience	Project Director Review of: Surface Water Specialist Report

4. DESCRIPTION OF THE PROJECT

4.1 General description

As part of the VDDC opencast mining project, South32's Wolvekrans Colliery intends to relocate the existing 132 kV electricity distribution powerline between the Eskom Kromfontein Substation and the Eskom Klein Substation. The application is undertaken by South32 in terms of self-build agreement between South32 and Eskom. The Environmental Authorisation will be transferred to Eskom on completion of the construction phase. The proposed activities will be undertaken at the VDDC Section of the mine, where opencast mining has already been approved in 2007 with the amendment of the EMPR for the Douglas Colliery operations. The relocation of the powerline is necessary in order for the opencast mining to commence.

A 132 kV electricity distribution powerline which is approximately 7.5 km in length, will be constructed from a point (Coordinates: 26°5'42.36"S, 29°17'45.88"E) on the existing Eskom Kromfontein / Klein substation feeder, to a point (Coordinates 26° 3'29.31"S, 29°18'7.69"E) of the same overhead line tying the Eskom Kromfontein and Klein substations, within a 36 m corridor.

4.2 Surface infrastructure

4.2.1 Proposed re-alignment

The proposed powerline will be constructed within the VDDC section of the Wolvekrans Colliery and within the Mining Rights Boundary (refer to **Figure 4-1**). The electricity distribution powerline will be constructed and relocated to a proposed route outside an area planned to be mined by South32. Consideration was given to the terrain and current mining activities. The proposed powerline will be approximately 7.5 km with a corridor of about 36 m (refer to **Table 4-1**). The foundation depths will range between 2 m to 3 m. The proposed powerline will be constructed using intermediate steel pole towers that will be erected a few metres apart depending on the terrain, ground clearance requirements, geology etc. The proposed steel towers may consist of the following:

- Mono-pole guyed intermediate suspension structures;
- Mono-pole self-supporting intermediate suspension structures;
- Mono-pole angle suspension structures; and/or
- Mono-pole strain structures.

The height of the towers is expected to range between 22 m and 26 m, depending on the terrain and ground clearance requirements.

Table 4-1: Co-ordinates for proposed route (Enercon, 2019)

	Latitude	Longitude
A1	26° 3' 29.15''S	29° 18' 07.73''E
A2	26° 5' 08.51''S	29° 19' 32.65''E
A3	26° 5' 47.88''S	29° 18' 54.11''E
A4	26° 5' 47.66''S	29° 18' 48.21''E
A5	26° 6' 00.29''S	29° 18' 13.31''E
A6	26° 5' 53.68''S	29° 17' 49.53''E

4.2.2 Alternative re-alignment

The Alternative Route will run in the same position as the proposed route for the southern section, but once the line turns in a northerly direction, it will be further to the east in proximity of the R544 Witbank to Kriel Provincial Road. The coordinates for the alternative powerline route corridor are indicated in **Table 4-2**.

Table 4-2: Co-ordinates of corridor for alternative route (Enercon, 2019)

	Latitude	Longitude
B1	26° 4' 58.23''S	29° 19' 43.91''E
B2	26° 4' 54.52''S	29° 19' 43.20''E
B3	26° 4' 30.49''S	29° 19' 35.61''E
B4	26° 4' 18.51''S	29° 19' 34.75''E
B5	26° 3' 44.38''S	29° 19' 37.69''E
B6	26° 3' 21.10''S	29° 19' 10.70''E
B7	26° 3' 24.15''S	29° 18' 56.88''E
B8	26° 3' 0.11''S	29° 18' 22.96''E

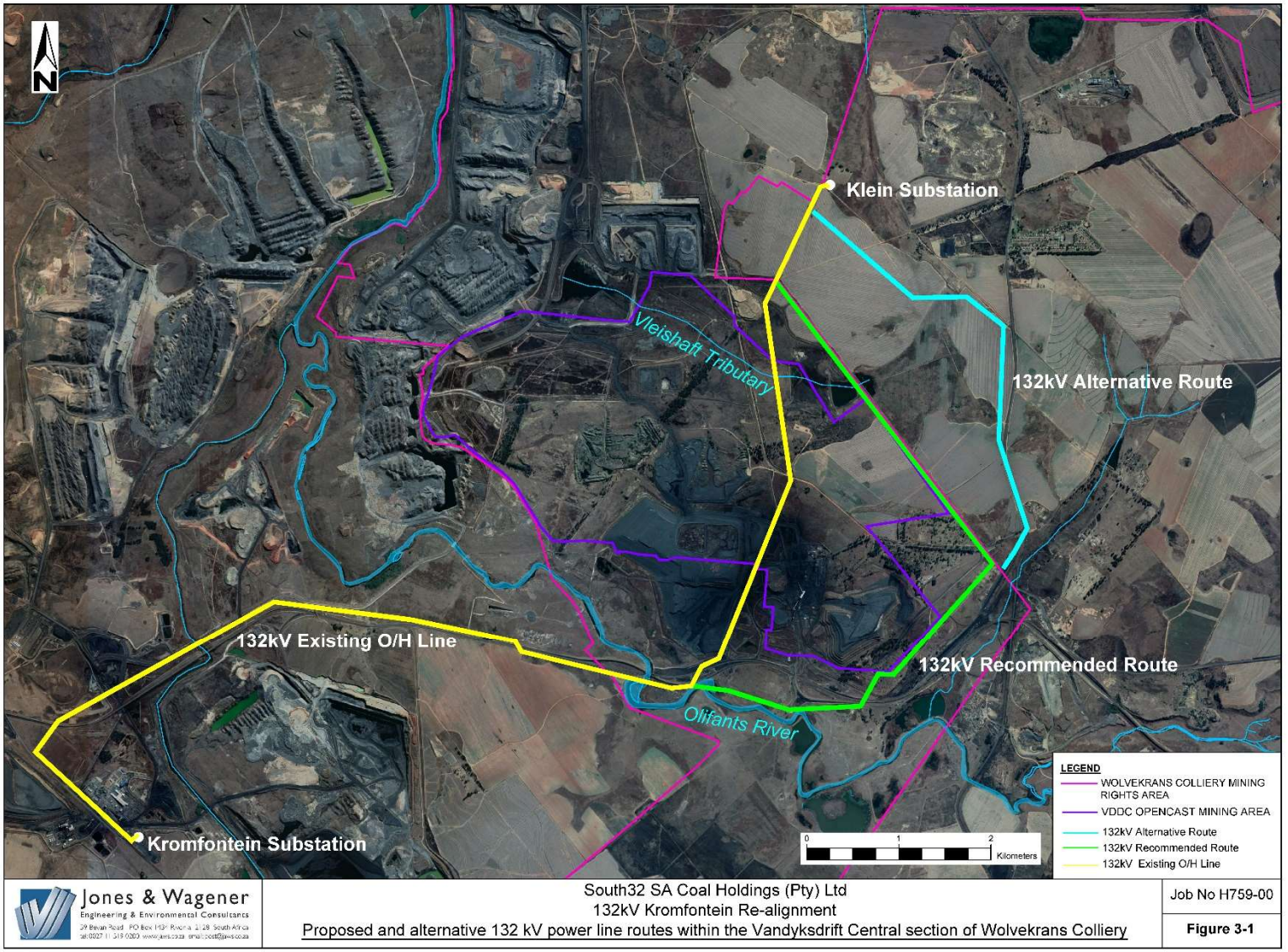

Figure 4-1: Proposed routing options for re-alignment of 132kV Kromfontein powerline

4.2.3 Project phases

4.2.3.1. Planning and design phase

The planning and design phase will evaluate the necessary documentation that is required for the construction phase. This will include activities such as a route survey, line design, and ordering of poles.

4.2.3.2. Construction phase

Construction activities related to relocating and constructing the proposed powerline and associated infrastructure will be undertaken and will include the construction of foundations, planting the poles, stringing, hand-over and commissioning.

A laydown area may be developed within the existing mining area for the storage of material during the construction phase. This is not expected to be larger than 50 m^2.

The portion of the existing 132 kV powerline which traverses the VDDC opencast mining area will be decommissioned once the new alignment has been constructed. This will involve:

- Removal of the conductor and dispatch back to the Eskom stores;
- Removal of the existing poles and sale as scrap metal;
- The existing foundations will remain in place, since these will be mined through as opencast mining at VDDC progresses.

4.2.3.3. Operational phase

The operational phase will include the maintenance and management on the proposed re-located powerline. Once completed, this powerline will be maintained by Eskom as part of its distribution network to sustain the 132 kV network and surrounding areas with the required electricity. This will ensure that surrounding mines, such as Goedehoop Colliery's infrastructure and mining sections that are dependent on this power supply, will continue with conducting its mining activities as planned.

4.2.3.4. Decommissioning phase

The decommissioning phase will consider regulatory requirements in terms of demolishment and rehabilitation activities associated with the proposed relocated powerline, as well as managing and mitigating impacts associated with this phase.

4.3 Sources of water

4.3.1 Water consumption requirements

Water for construction purposes will be sourced from the VDDC section of the Wolvekrans Colliery.

There will be no water requirements during the operational phase.

4.3.2 Water management related to waste

Solid waste will be generated during the construction phase of the powerline. General and hazardous waste generated during the construction phase of the powerline will be stored in dedicated waste containers at the laydown area and will be transported from each pylon site to the laydown area from where it will be removed from the site at regular intervals.

There will be no waste generated during the operational phase, except when maintenance will be conducted. Waste generated during maintenance will be removed by the maintenance contractor and disposed in accordance with their contractual agreement with Eskom.

4.3.3 Domestic wastewater management

Chemical toilets will be provided during the construction phase of the powerline at various sections along the route as required. The appointed contractor will be responsible for the management of these facilities.

4.3.4 Storm water management

It is not common practise to provide formal storm water management infrastructure along powerline routes, given the small footprint of the pylons on surface. However, impacts can arise during the construction phase, due the disturbance of the ground and natural vegetation within the construction footprint, as well as the movement and operation of construction equipment.

Effective surface water management at the active construction areas will be essential to protect the natural water resource during the construction of the powerline. It is recommended that the soil excavated for the foundations of a pylon should be placed on the upstream side of the construction activities in order to act as a storm water diversion berm. Where such diversion berms create concentrated flows, the use of swales is recommended to attenuate runoff.

Although some pylons will be in close proximity to watercourses, i.e. the Olifants River and unnamed wetland (refer to **Figure 1-2)**, the design is such that no pylons will be within the footprint of the delineated watercourses (including wetlands), or the 1:100 year floodline.

Water management and mitigation measures at these locations are detailed in Section 7 below.

4.4 Watercourse alterations

No physical watercourse alterations are planned and the design of the powerline is such that the pylons will be located outside the watercourses, although the overhead lines will span the watercourses.

5. BASELINE ENVIRONMENTAL DESCRIPTION

The baseline environmental information is important for several reasons. This data forms the basis of the assessment of possible impacts, and the setting of objectives for closure. For surface water it is important that the mine is able to identify point sources that may be impacting on surface water so that the origin of any future impacts can be identified.

5.1 Regional Climate

The project is located in the Mpumalanga Highveld region where the climate is characterised as generally dry. Summers are warm to hot with an average daily high temperature of approximately 27°C (with occasional extremes up to 35°C). Winters range from mild to cold with an average daily high of approximately 15°C (with occasional extreme minima as low as -10°C). Frost and mist are frequently experienced during the winter months on the Mpumalanga Highveld.

5.2 Catchment description

The proposed powerline relocation is situated within quaternary sub-catchment B11B and B11F of the Limpopo-Olifants primary drainage region, as indicted in **Figure 5-1**.

The Olifants River is the southern boundary of the VDDC mining area of the Wolvekrans Colliery and located on the western boundary of the Steenkoolspruit section.

The Vleishaft tributary of the Olifants River is located on the northern boundary of the VDDC section. This tributary is used as a dirty water management system at the mine and the area has been approved for opencast mining in the future.

Downstream of the Wolvekrans Colliery, the Olifants River flows to the Witbank Dam, then to the Loskop Dam and through the central part of the Kruger National Park to Mozambique. It joins the Limpopo River and discharges to the Indian Ocean on the east African coastline.

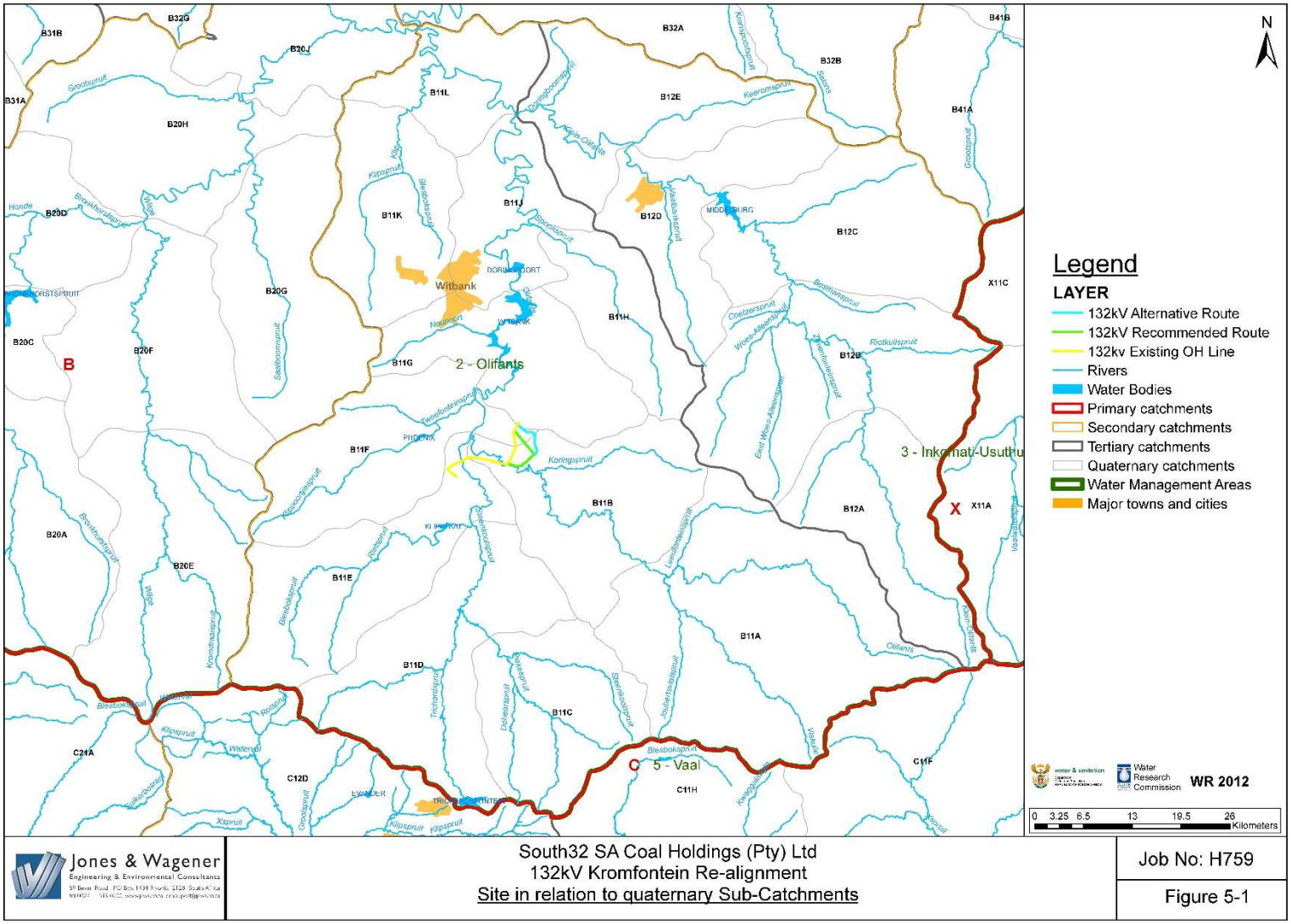

Figure 5-1: Site in relation to quaternary sub-catchments

5.3 Receiving water body

In terms of the catchment description, the receiving water body is an important concept. The receiving water body is the point below which the proposed development's impact on the catchment is considered to be negligible. This implies that aspects such as surface water users need only be defined down to the receiving water body.

The receiving water body for the assessment of potential surface water quality impacts of the proposed powerline development is taken as the Witbank Dam with the next largest water body downstream being the Loskop Dam.

The use of these dams is motivated on the basis that:

- The Witbank Dam and Loskop Dam have been selected as they are both located downstream of the proposed development within the Olifants River catchment area.
- Beyond the Witbank Dam, the potential impacts become extremely small due to the water volumes in the catchment and dilution effects.
- Further, by the time the water reaches the Witbank Dam, it is required to be suitable for use for all of the expected uses (drinking water, agricultural, industrial and aquatic ecosystems). Thus, by achieving compliance in terms of these, no additional impacts are expected downstream of the Witbank Dam. The receiving water body is relevant only in so far as it defines the aerial extent of the catchment to be considered in the impact assessment and described in the baseline study.
- The use of the Witbank Dam is based on the relatively small size of the disturbed areas compared to the catchment for the dam.
- The total disturbance footprint for the powerline is small compared to the Witbank Dam and Loskop Dam catchments. However, the powerline will not reduce the mean annual runoff (MAR) of the catchment. The catchment for the Witbank Dam is reported as 579 km^2 and the catchment for the Loskop Dam is reported as 12 285 km^2.
- The MAR for the Witbank Dam and the Loskop Dam is 124.9 x 10^6 m^3 and 384 x 10^6 m^3, respectively (Midgley *et al*., 2005).

5.4 Rainfall and evaporation

5.4.1 Rainfall data

The Daily Rainfall Extraction Utility, developed by the Institute for Commercial Forestry Research (ICFR) in conjunction with the School of Bio-resources Engineering and Environmental Hydrology (BEEH) at the University of KwaZulu-Natal, Pietermaritzburg, was used to obtain summary data for all rainfall stations within the vicinity of the site. This data was assessed in terms of length of record, completeness of the data set, mean annual precipitation (MAP) and location of the rainfall station with respect to the site and the catchment. Key data extracted from the database for the five most reliable stations is shown in **Table 5-1**. The ICFR database contains daily patched rainfall data for all official South African Weather Service (SAWS) stations and includes data up to August 2000.

After an assessment of the length of the record, MAP and the reliability of the data for the five rainfall stations, the Witbank, EDE and Blinkpan rainfall stations were disregarded. This was due to the limited length of the records and low reliability of the data sets. To further assess the two remaining rainfall stations and select an appropriate and representative

station for the site, each of the records were assessed to determine whether the records contained events exceeding the 1:50 year event.

Table 5-1: Key data for selected rainfall stations (ICFR database)

Station number	Station name	Reliable (%)	MAP (mm)	Length of record (years)
0515826_W	Middelburg (TNK)	51.9	643	96 (1903 – 1999)
0516201_W	EDE	42.2	643	90 (1903 – 1993)
0515412_W	Witbank (MUN)	37.1	641	44 (1956 – 2000)
0478546_W	Vandyksdrift	59.8	686	82 (1928 – 2010)
0478786	Blinkpan	25	643	13 (1987 – 2000)

The top 100 ranked peaks from the two rainfall records were plotted along with the rainfall depths relating to various recurrence intervals, extracted from the SAWS design rainfall depths manual. For both rainfall stations it was found that only one event exceeded the 1:50 year event. Therefore, the Vandyksdrift rainfall station was selected as being the representative rainfall data set for the site. The Vandyksdrift rainfall station was found to have the most reliable data set with a high MAP.

It was found that, although data was available for the Vandyksdrift station after 1998, this data was not completely intact, with data missing and inconsistencies. Therefore, only data up until 1998 was considered for the station. A mass plot was produced for the record and is shown in **Figure 5-2.** A mass plot is a graph showing the cumulative rainfall depth with time for the full rainfall record. It is good indication of the reliability of the data set. A good mass plot will produce a straight line, with slight oscillations for seasonality. Any changes in the slope indicate a potential problem in the data set.

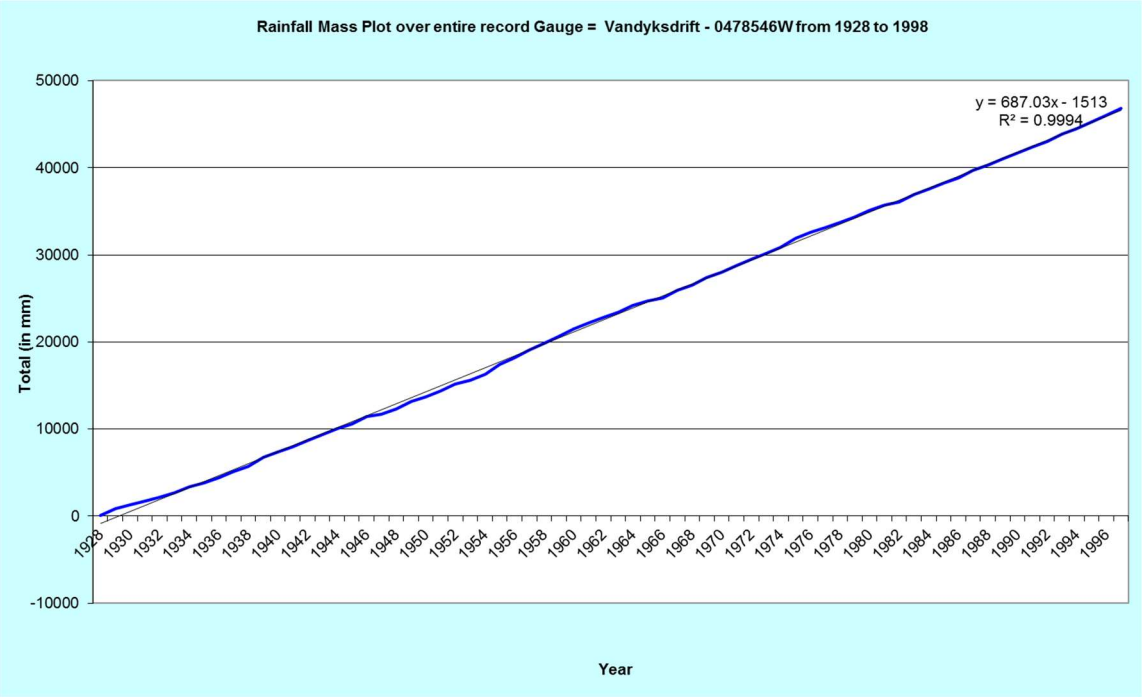

Figure 5-2: Rainfall mass plot for the rainfall record

The mass plot for the rainfall record is considered to be acceptable. The record has therefore been selected as being a representative rainfall data set for the site for the hydrological assessment.

The average monthly rainfall depths are presented in **Table 5-1.** The rainfall record is presented graphically in **Figure 5-2**. The entire rainfall record is presented graphically in **Figure 5-2.** Mean monthly rainfall is shown graphically, together with mean monthly evaporation, in **Figure 5-4**.

The site in relation to the regional MAP for the area, taken from WR2012 as shown in **Figure 5-3**.

5.4.2 Evaporation data

Evaporation data was taken from the evaporation station for Witbank Dam (B1E001). Monthly data for this station was only available for the period 1964 to 2009. Over the periods for which there was no monthly evaporation data, average evaporation depth, taken directly from the *WR90 report* for the Evaporation Zone into which the site falls. The Evaporation Zone is 4A. The Mean Annual Evaporation (MAE) for this zone is 1600 mm. The average monthly evaporation depths are presented in **Table 5-2** and **Figure 5-6**. The site in relation to the regional MAE for the area, taken from WR2012 can be seen in **Figure 5-4**.

Table 5-2: Average monthly rainfall depth for the Vandyksdrift rainfall record (0478546_W) and evaporation depths (from *WR90)*

Month	Average rainfall (mm)	Average evaporation (mm)
October	70	176
November	108	147

December	109	145
January	109	111
February	94	94
March	72	76
April	42	83
May	17	110
June	8	143
July	7	172
August	7	163
September	24	179
Annual Total	**669**	**1600**

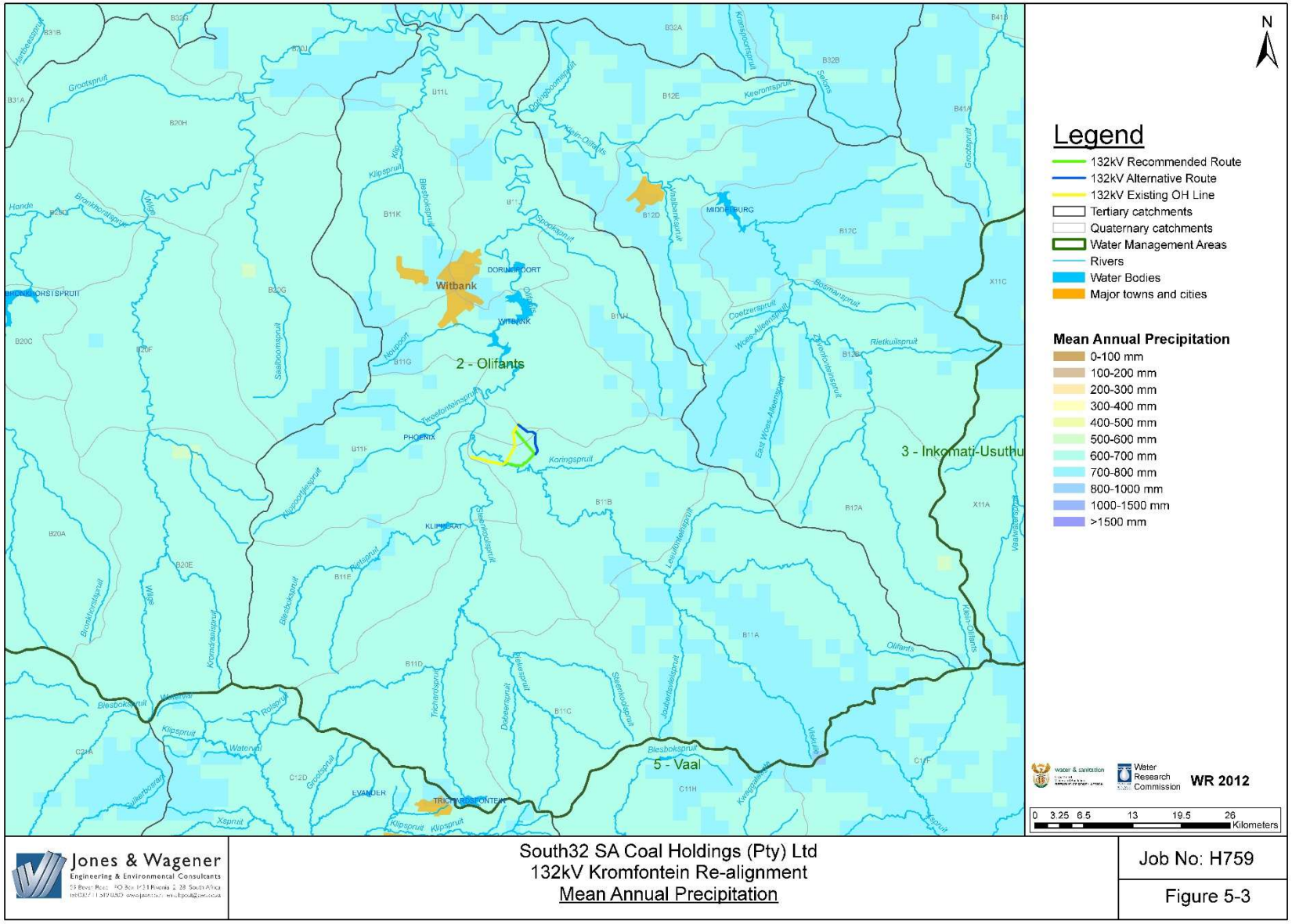

Figure 5-3: Mean Annual Precipitation

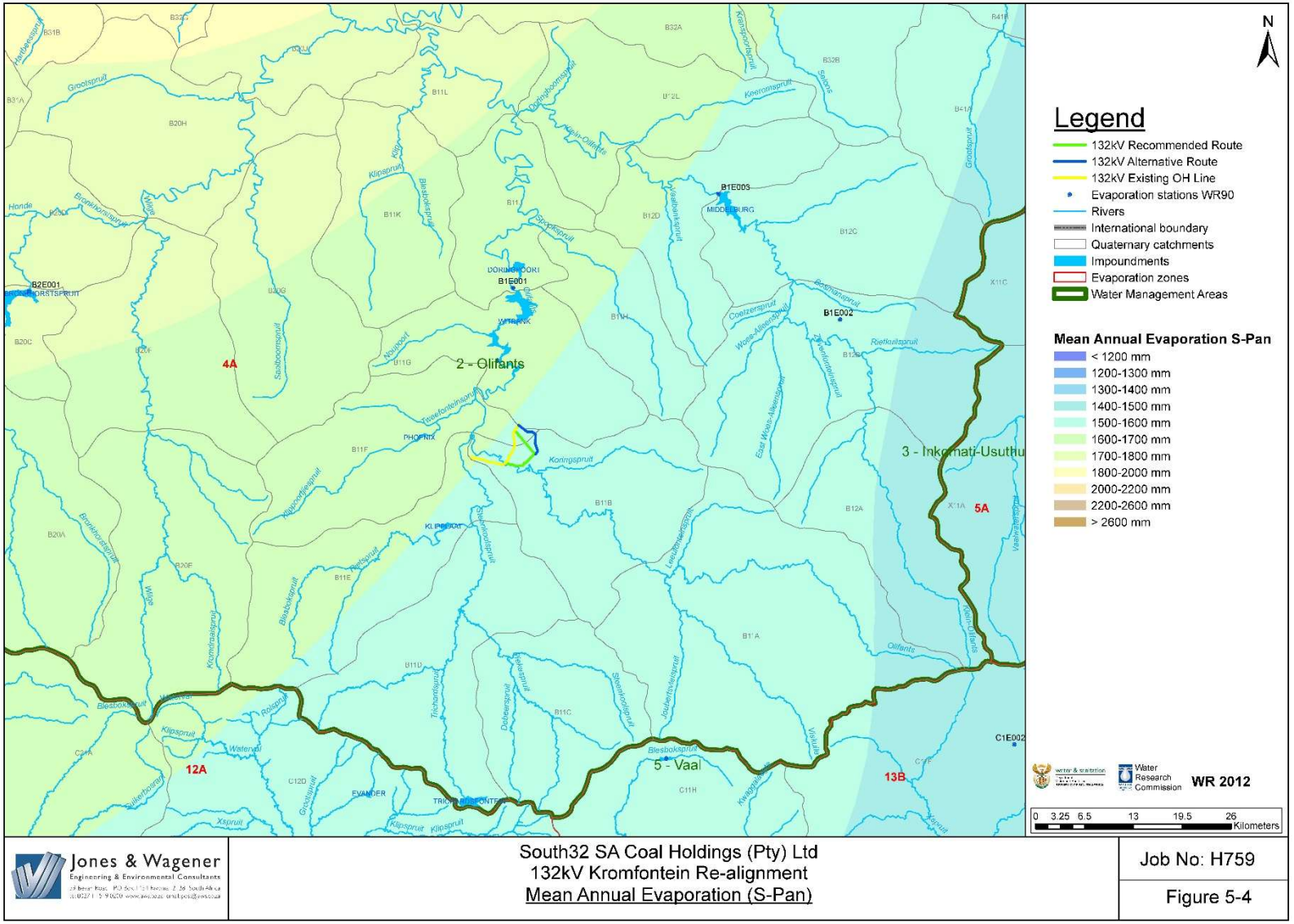

Figure 5-4: Mean Annual Evaporation

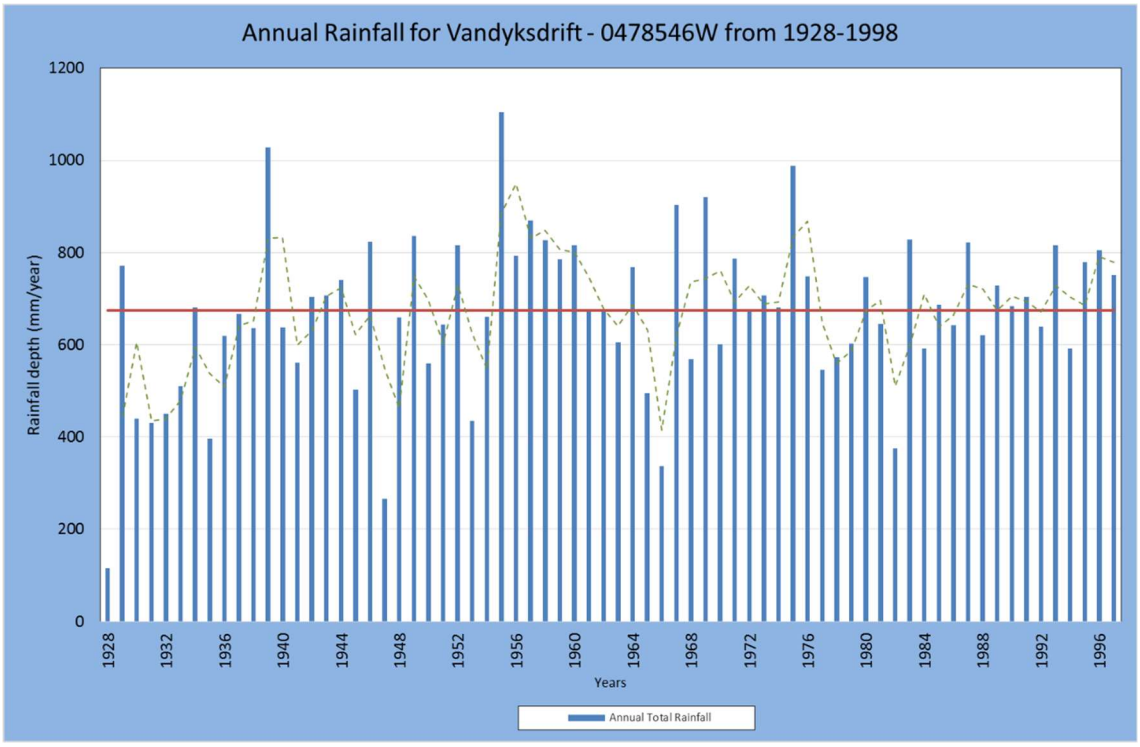

Figure 5-5: Rainfall record for Vandyksdrift

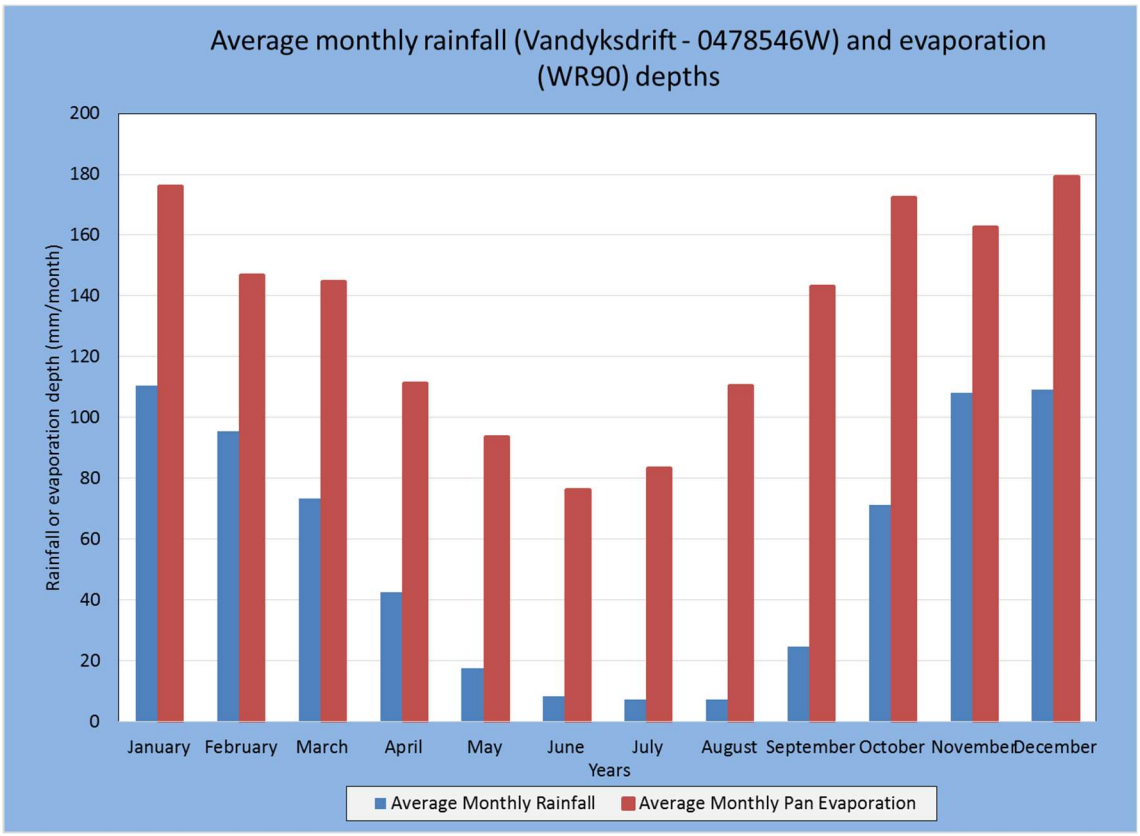

Figure 5-6: Mean monthly rainfall and evaporation for Vandyksdrift

5.4.3 Maximum rainfall intensities

5.4.3.1. Rainfall extremes

Apart from the normal criteria of being statistically consistent, normally measured by considering the mass plot and ensuring that it is linear, it is also important that the rain gauge have a long record, and within that record that it contain rainfall events that correspond to at least the 1:50 year event, since the legal requirement is that a mine should not spill dirty water to the environment more than once in 50 years (a 2% risk of spilling in any one year). The duration of the event can vary, and in most of the larger mines, the critical event is not the 24 hour event, but rather above average rainfall over a period of several months, typically with several extreme rainfall events occurring during a wetter than average period.

Statistical rainfall extremes corresponding to various recurrence intervals where extracted from the Design Rainfall Depths of SAWS Rainfall Stations (Smithers and Schulze, WRC Project No K5/1060). These are shown in **Table 5-3**.

Table 5-3: Statistical rainfall extremes for Vandyksdrift rainfall station (from WRC K5/1060)

Event	Rainfall depth (mm)						
	1:2	1:5	1:10	120	1:50	1:100	1:200
1 day	54	72	85	99	117	132	148

Figure 5-7 illustrates the top 100 one day ranked rainfall peaks, along with the statistical rainfall extremes for Vandyksdrift, from the WRC. It is evident that, for the Vandyksdrift station, there are no events that has been recorded at the station, which are in excess of the 1:50 year event. The rainfall record is still suitable for the hydrological assessment.

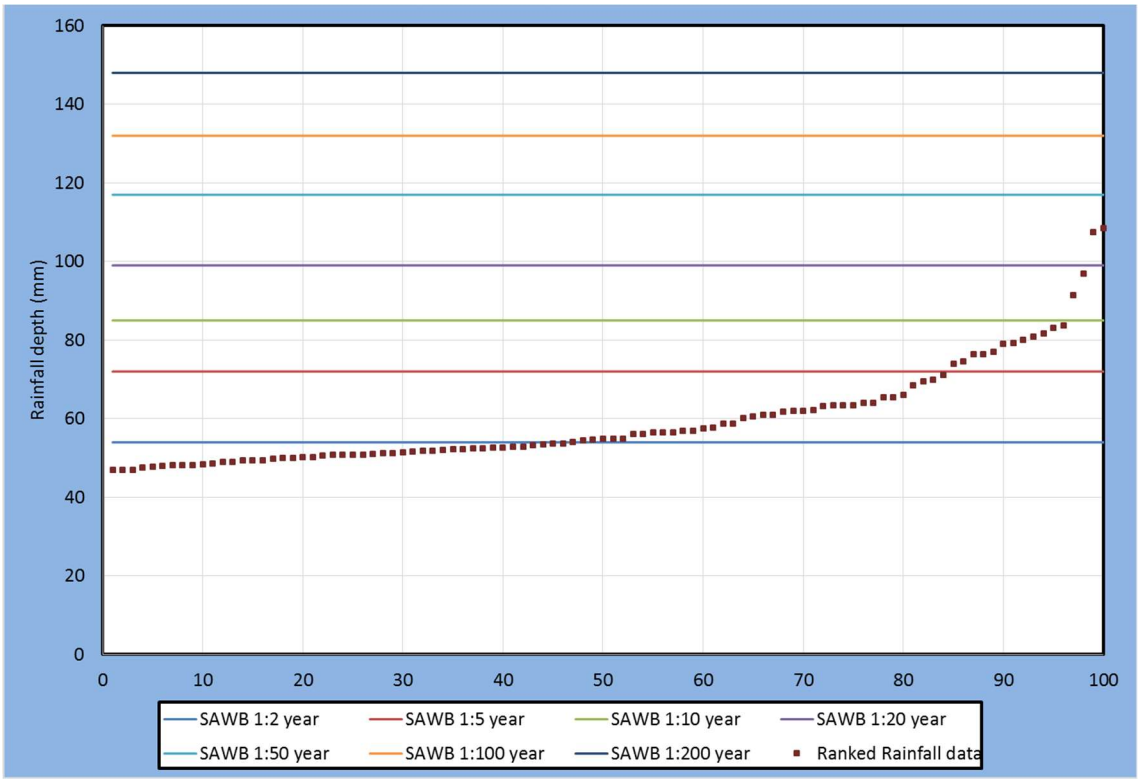

Figure 5-7: Top 100 one day ranked rainfall peaks

5.5 Surface water quantity

This section details the baseline surface water information related to water quantity, such as flood events and stream flow (in essence the hydrology).

5.5.1 Map of the catchment

The project in relation to the catchment areas is shown in **Figure 5-1**. Catchment areas upstream, downstream and within the project area are given in **Table 5-4** below.

Table 5-4: Catchment areas

River	Measured at	Catchment (km^2)
Olifants River	Upstream of Vandyksdrift (Entrance of mine property)	1 350
Olifants River	Downstream of mine property	3 309

5.5.2 Mean Annual Runoff (MAR)

The WRSM2012 synthetic generation model was used to obtain simulated monthly flow records at various points within the mine property. The rainfall input to the model was an averaged historical record of several rain gauges in the vicinity. The MAR is given in **Table 5-5**. The site in relation to the regional MAR for the area, taken from WR2012 can be seen in **Figure 5-8**.

Table 5-5: Computed Mean Annual Runoff

River	Measured at	MAR ($x106m^3$)	Percentage of MAR at Witbank Dam
Olifants River	Entrance to mine	59.5	46
Steenkoolspruit	Immediately before confluence with Olifants River	52.0	40
Olifants River	Exit from mine property	188.1	99
Witbank Dam	At dam	190	100

Note: *Varying values on the MAR for Witbank Dam were found in the literature. This value of 190 x 10^6 m^3 is derived from the runoff values given for various measuring points in the Surface Water Resources of South Africa – 1990*

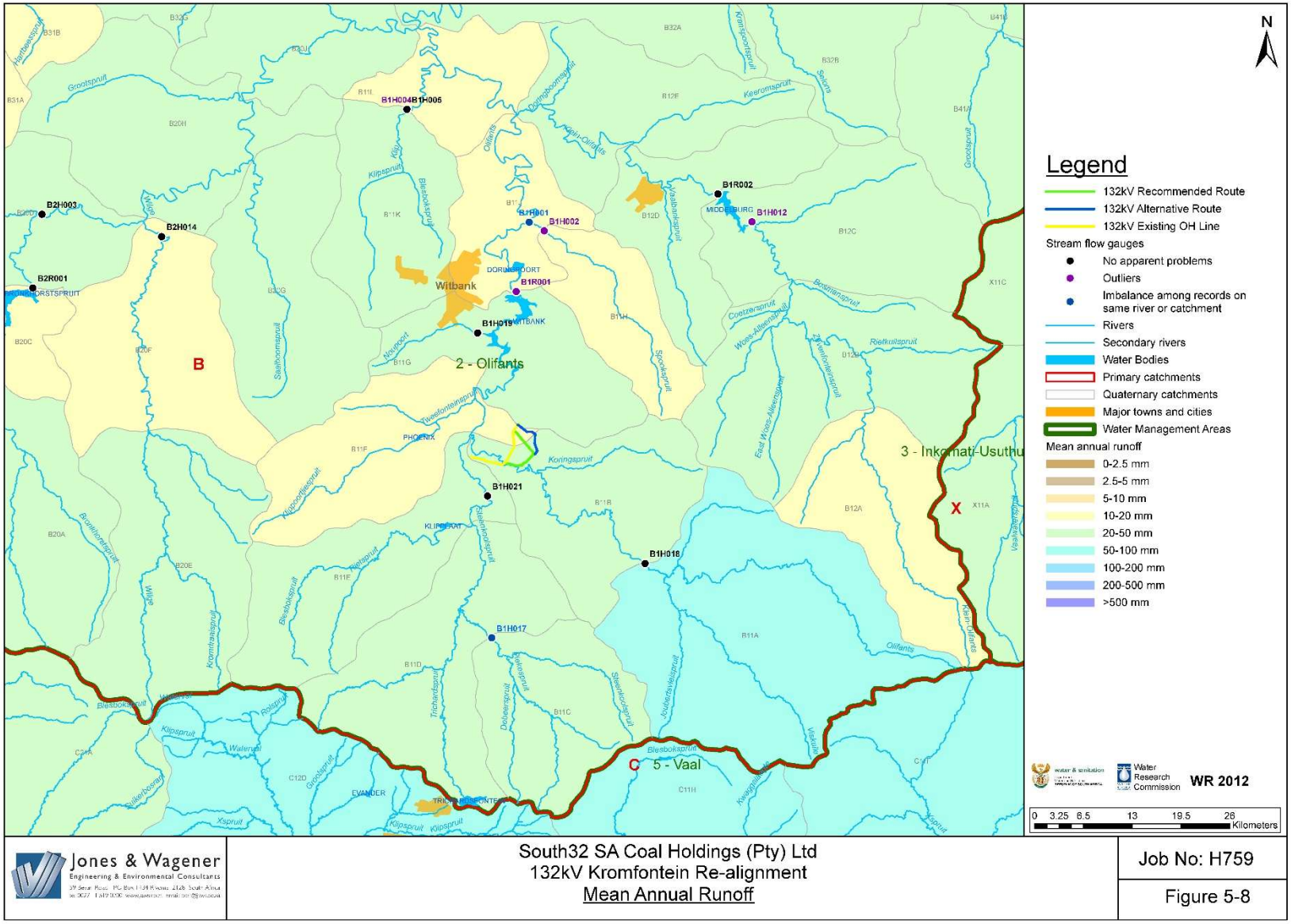

Figure 5-8: Mean Annual Runoff

5.5.3 Dry Weather Flow

A simulated stream flow record was generated (as described in **Section 5.5.2** above) at the downstream boundary of the mine. A flow-duration curve was then constructed for the simulated stream flow record. Based on the criterion that the dry weather flow is the flow in the stream that is equalled or exceeded 70% of the time, this flow was computed and corresponds to the flow during the winter months, shown for key points in **Table 5-6**.

Table 5-6: Dry weather flows

River	Measured at	Dry weather flow (m^3/s)	Nature of stream flow
Olifants River	Entrance to mine property	0.3	Perennial
Steenkoolspruit	Immediately before confluence with Olifants River	0.34	Perennial
Olifants River	Exit from mine property	0.71	Perennial

5.5.4 Flood Peaks and Volumes

The flood peaks for the 1:20, 1:50 and 1:100 year recurrence intervals were computed using the Rational Method (DWA implementation and Alternative implementation) and Unit Hydrograph techniques. Use was also made of the Regional Maximum Flood.

The volumes of the floods were based on the simplified hydrograph proposed by Kovacs, and the relationship between the Regional Maximum Flood and Mean Annual Runoff as derived from the measurement of various extreme flood events across South Africa documented in various DWAF publications.

Table 5-7 lists these flood peaks and the Regional Maximum Flood together with the corresponding flood volumes on the Olifants River and Steenkoolspruit.

Table 5-7: Computed flood peaks and volumes in the Olifants River, Steenkoolspruit and their tributaries affected by the powerline relocation

River	Measured at	Recurrence Interval	Flood Peak (m^3/s)	Flood Volume ($x10^6m^3$)
Olifants River	Upstream of Vandyksdrift	20 year	480	26
		50 year	760	41
		100 year	1150	58
		RMF	350	196
Olifants River	Immediately before confluence with Steenkoolspruit	20 year	490	27
		50 year	780	3
		100 year	1200	60
		RMF	240	203
Steenkoolspruit	Immediately before confluence with Olifants River	20 year	515	26
		50 year	810	42
		100 year	1250	58
		RMF	2402	199
Olifants River	Downstream of mine property	20 year	823	51
		50 year	1292	80
		100 year	1837	112
		RMF	3810	380

5.5.5 Floodlines

The 1:100 year recurrence interval pre-mining floodlines are shown on in **Figure 5-9,** taken from J&W 2004 report – "Surface Water Inputs to Douglas Pillar Project EMPR"-Report Number JW188/04/9347).

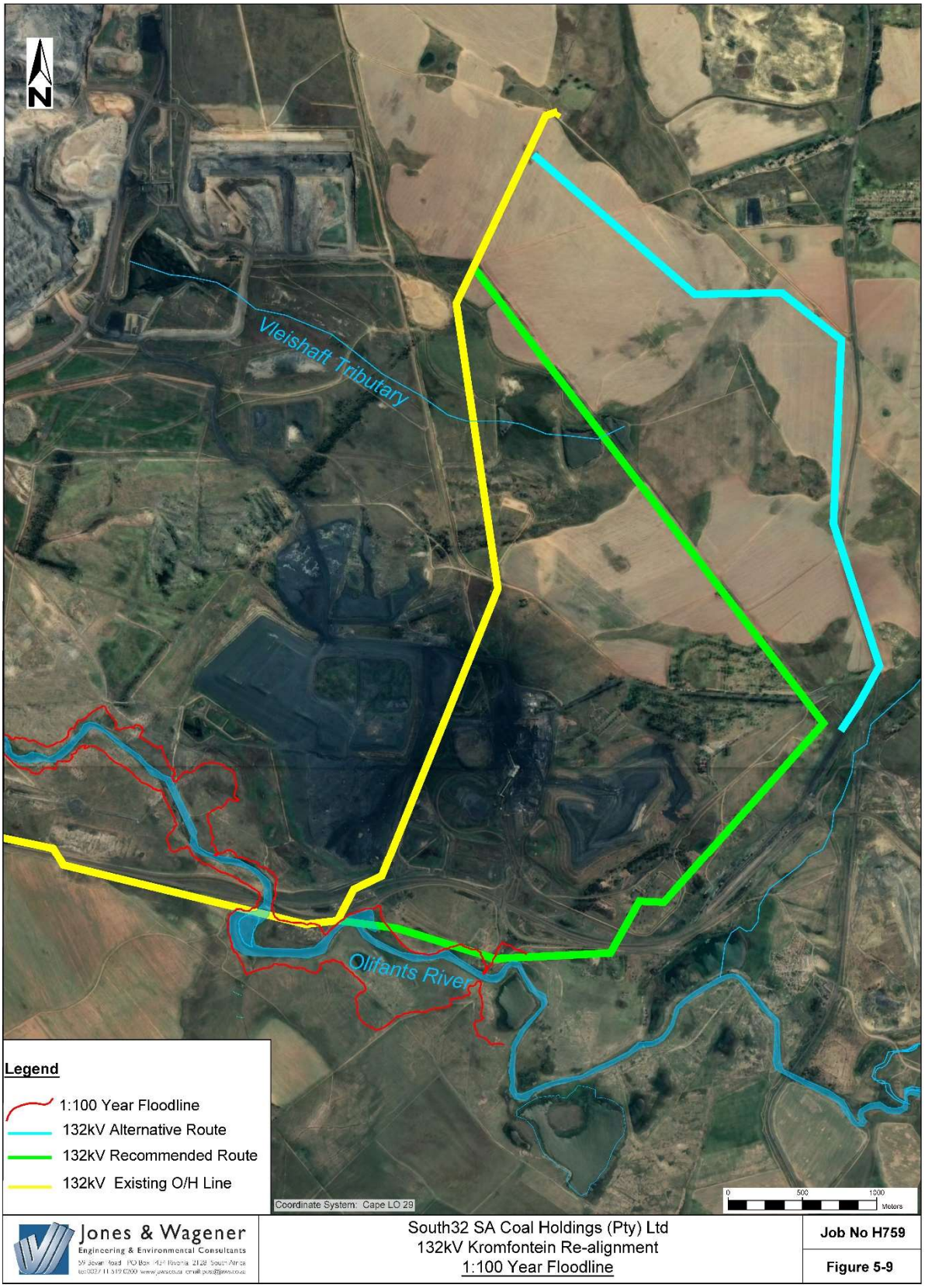

Figure 5-9: Floodlines

5.6 Surface water quality

This section details existing surface water sampling locations and water quality data in the area. It provides an assessment of the surface water quality and the impact of existing land uses on the surrounding watercourses and catchments.

Water quality data, for several locations around the site, extending from September to October 2012, July 2015 to November 2017 and January to February 2018, was used in the description of the baseline (as extracted from report number JW188/18/G535). This is regarded as sufficient to provide a description of the surface water quality in the area and the impact of existing land uses on the water quality of the watercourses.

5.6.1 Surface water quality monitoring locations

The surface water monitoring locations are illustrated in **Figure 5-10** and a description and coordinates of these points are given in **Table 5-8.**

Table 5-8: List of surface water monitoring locations

Sampling Location	Description (as per South32 monitoring programme)	Coordinates
VDD 1	2538 V01 Springbokspruit @ entrance to mine property	S26°06.043' E29°19.148'
VDD 5	2545 V09 Oxbow 9 ponded water	S26°06.146' E29°18.214'
VDD 6	2551 V16 Olifants D/S of PSS discard dump	S26°05.135' E29°16.416'
VDD 7	V 22 Douglas Upstream Betal Bridge	S26°06.383' E29°19.371'
VDD 8	2555 V30 Olifants D/S of confluence with Steenkoolspruit	S26°03.407 E29°15.038'
VDD 9	2556 V31 Olifants U/S Steenkoolspruit confluence D/S pit	S26°03.791' E29°15.177'
VDD 10	2557 V32 Olifants D/S tributary near defunct pit U/S pit	S26°05.108' E29°16.116'
VDD 11	2558 V40 Plant water u/g railway boreholes @ small bridge	S26°05.844' E29°17.308'
VDD 12	2547 V11 Olifants @ DWAF Weir U/S PSS discard dump	S26°05.502" E29°16.967'
VDD 18	2569 VW Olifants tributary from PSS dump pollution control dam	S26°05.838 E29°17.544

Sampling Location	Description (as per South32 monitoring programme)	Coordinates
Douglas 1	Douglas 1-2571 W02 Olifants River at Wolwekrans Weir.	S26°00.413' E29°15.240'

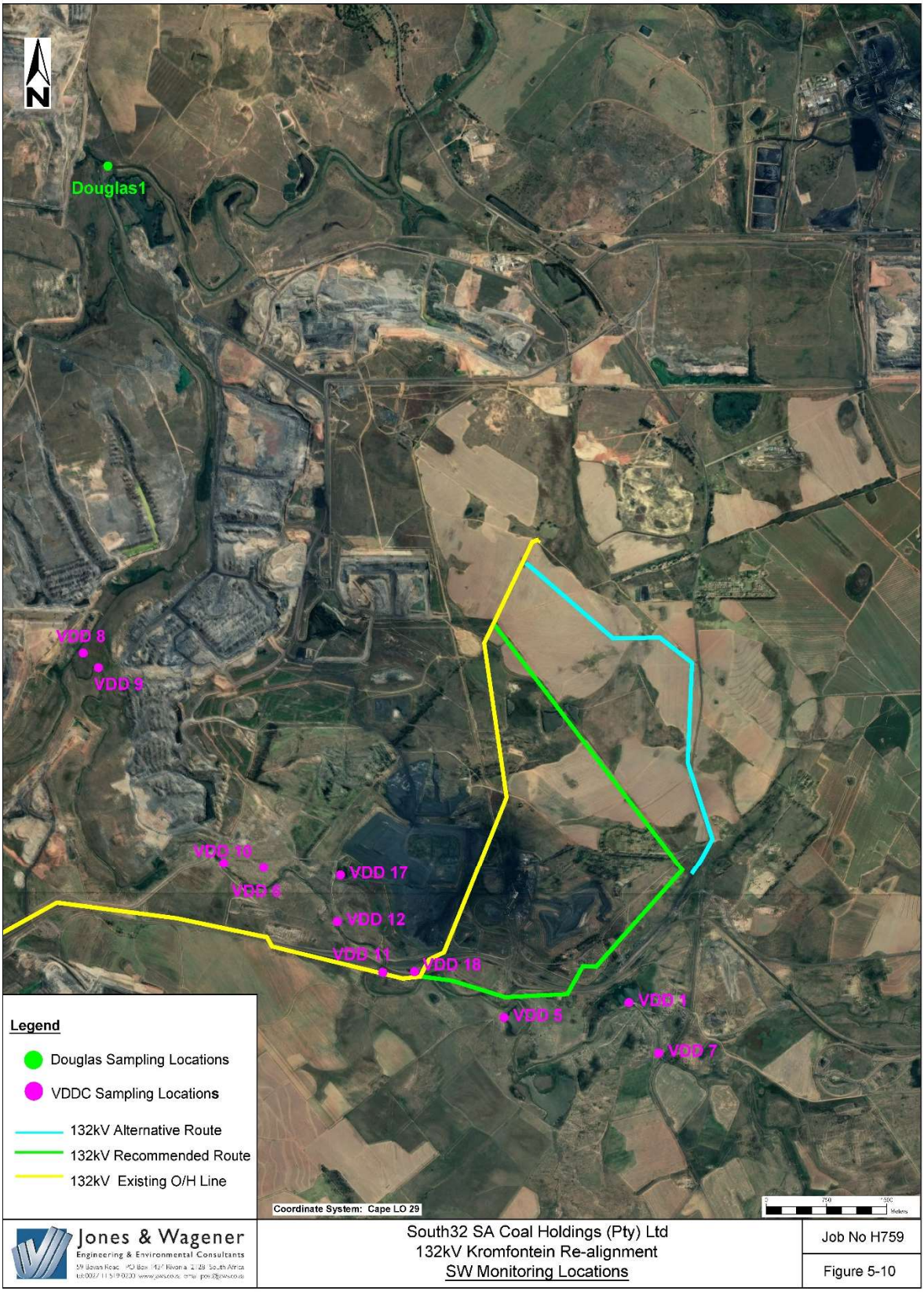

Figure 5-10: Existing surface water monitoring locations at VDDC

5.6.2 Surface water quality objectives

There are various standards and objectives in terms of surface water quality, depending on what the end use is to be. Some of these include the DWS South African Target Water Quality Guidelines (TWQG) for different uses (e.g. Aquatic Ecosystems and Agricultural use) that were published in 1996 and the SANS 241 Drinking Water Quality Standard (2015).

In some cases, however, there are more specific standards in terms of the catchment itself, as determined by the Catchment Management Agency. The DWS published in 2016 Classes and Resource Quality Objectives of water resources for the Olifants River catchment. One of the key elements of this document is Resource Quality Objectives (RQO) in the Olifants River catchment. In this document the catchment is divided into various Integrated Unit of Analysis (IUA) areas and Resource Units. Each IUA has a set of water quality constituents for which limits have been set. The proposed powerline relocation project is located within IUA 1, which is referred to as the Upper Olifants River catchment and within Resource Unit 11.

A summary of the different standards, guidelines and objectives is provided in **Table 5-9**.

For the purpose of this assessment, the 2016 RQO was used to describe the current status of the water resources in the catchment, since this is the most recent objectives set specifically for the catchment. Where no limits are provided for a specific constituent, the SANS 241 standards were used as a guideline to indicate the level of impact.

Although the TWQO were also considered, these were not used in the assessment of the current water quality status in the catchment. The guidelines provide target water quality objectives for the specific water use and is more stringent in most cases than the SANS 241 Drinking Water Quality Standard. The aquatic ecosystem is always present as a potential water user. In the case of VDDC, although some agriculture is practiced in the larger catchment area, the area immediately downstream of the VDDC section, is mining.

Table 5-9: Standards, objectives and guidelines considered for the baseline assessment

Constituent	Unit	TWQG Agricultural Use: Irrigation (DWS, 1996)	TWQG Aquatic Ecosystems (DWS, 1996)	SANS 241: 2015 Drinking Water Standard	RQO for Olifants River IUA 1, Resource Unit 11 (2016)
Physical					
Electrical conductivity (EC) @ 25°C	mS/m			170	111
Chemical Oxygen Demand (COD)	mg/ℓ				-
pH	-	6.5-8.4	Background +/-0.50 pH units	5 to 9.7	-
Chemical, Inorganic					
Alkalinity	mg $CaCO_3$ /ℓ				-
Boron (B)	mg/ℓ	≤ 0.5		2.4	-
Calcium (Ca)	mg/ℓ				-
Chloride (Cl)	mg/ℓ	≤ 100		300	-
Fluoride (F)	mg/ℓ	≤ 2	≤ 0.75	1.5	-
Magnesium (Mg)	mg/ℓ				-
Potassium (K)	mg/ℓ				-
Sodium (Na)	mg/ℓ	≤ 70		200	-
Sulphate (SO_4)	mg/ℓ			500	500
Total Dissolved Solids (TDS)	mg/ℓ	≤ 40	Background +/-10%	1 200	-
Metals, Dissolved					
Iron (Fe)	mg/ℓ	<= 5	Background +/-10%	2	-
Aluminium (Al)	mg/ℓ	≤ 5	≤ 0.005 for pH<6.5 and ≤ 0.01 for pH>6.5		-
Manganese (Mn)	mg/ℓ	≤ 0.02	≤ 0.18	0.40	-
Chromium VI (Cr VI)	mg/ℓ	≤ 0.1	≤ 0.007		-
Plant Nutrients					
Nitrate (NO_3)	mg/ℓ as N			11	4
Ammonium (NH_4)	mg/ℓ as N		≤ 0.007	1.5	0.1

Constituent	Unit	TWQG Agricultural Use: Irrigation (DWS, 1996)	TWQG Aquatic Ecosystems (DWS, 1996)	SANS 241: 2015 Drinking Water Standard	RQO for Olifants River IUA 1, Resource Unit 11 (2016)
Phosphate (PO_4)	mg/ℓ as P				0.125
Nickel (Ni)	mg/ℓ	≤ 0.2		0.07	-
Arsenic (As)	mg/ℓ	≤ 0.1	≤ 0.01	0.010	-
Antimony (Sb)	mg/ℓ			0.020	-
Barium (Ba)	mg/ℓ			0.70	-
Beryllium (Be)	mg/ℓ	≤ 0.1			-
Cadmium (Cd)	mg/ℓ	≤ 0.01		0.0030	-
Total Chrome (Total Cr)	mg/ℓ			0.050	-
Cobalt (Co)	mg/ℓ	≤ 0.05		0.50	-
Copper (Cu)	mg/ℓ	≤ 0.2		2.0	-
Lead (Pb)	mg/ℓ	≤ 0.2		0.010	-
Mercury (Hg)	mg/ℓ		≤ $4x10^{-5}$	0.006	-
Molybdenum (Mo)	mg/ℓ				-
Selenium (Se)	mg/ℓ	≤ 0.02	≤ 0.002	0.010	-
Tin (Sn)	mg/ℓ				-
Vanadium (V)	mg/ℓ	≤ 0.1		0.20	-
Zinc (Zn)	mg/ℓ	≤ 1	≤ 0.002	5.0	-

5.6.3 Baseline water quality analysis

The summarised baseline water quality results for the available data for the periods indicated in section 5.6 is shown in **Table 5-10**, where the average, maximum and minimum concentrations are presented, together with the coefficient of variation.

The values in highlighted in red indicate where the RQO for the Olifants River catchments **OR** the SANS 241 guidelines are exceeded.

Table 5-10: Water quality monitoring results

Mine	Sample Location	RQO and SANS Guidelines	pH	EC mS/m	TDS mg/ℓ	SS mg/ℓ	Fe mg/ℓ	TALK	Ca mg/ℓ	Cl mg/ℓ	Mg mg/ℓ	NO_3 mg/ℓ	PO_4 mg/ℓ	K mg/ℓ	Na mg/ℓ	SO_4 mg/ℓ	Al mg/ℓ	F mg/ℓ	Mn mg/ℓ
		SANS 241 2015	5-9.7	170	1200	-	2	-	-	300	-	11	-	-	200	500	-	1.5	0.4
		Olifants IUA 1		111	-	-	-	-	-	-	-	4	0.125	-	-	500			
VDDC	VDD1	Average	7.71	121.59	999.33	24.61	0.08	87.50	108.02	23.11	85.78	0.16	0.00	9.43	49.27	581.80	0.08	0.91	0.25
		Maximum	8.80	268.00	2444.00	252.00	0.37	142.00	269.00	61.00	210.00	0.42	0.00	14.40	176.00	1481.00	0.20	1.37	1.43
		Minimum	6.05	42.40	326.00	3.60	0.01	17.00	39.00	8.13	25.50	0.00	0.00	6.15	15.90	187.00	0.02	0.60	0.01
		Coeff of Variation %	8.66	34.96	39.74	188.37	102.87	47.86	38.61	41.59	42.05	64.26		17.00	57.94	40.12	63.94	27.60	160.89
	VDD5	Average	8.05	90.21	674.87	26.84	0.08	115.53	72.38	24.51	50.39	0.15	0.10	9.12	54.92	342.48	0.13	0.69	0.04
		Maximum	8.74	175.00	1524.00	91.20	0.21	155.00	149.00	50.50	139.00	0.24	0.10	13.00	110.00	863.00	0.50	1.10	0.20
		Minimum	6.99	39.60	280.00	0.40	0.01	60.00	28.90	12.50	16.80	0.10	0.10	6.11	24.50	95.90	0.01	0.49	0.01
		Coeff of Variation%	4.61	39.71	46.26	74.25	71.79	22.35	44.61	37.26	59.82	40.77		18.88	39.15	57.17	96.43	22.63	112.14
	VDD6	Average	7.47	132.66	1097.11	754.44	0.31	137.33	122.56	42.48	82.91	0.25	0.32	23.29	65.15	581.52	0.19	0.63	1.84
		Maximum	8.31	295.00	2506.00	10450.00	1.31	297.00	266.00	136.00	221.00	0.88	0.38	186.00	147.00	1439.00	1.13	1.36	11.80
		Minimum	6.48	26.60	182.00	1.60	0.01	32.00	18.20	9.66	9.30	0.10	0.23	4.88	10.60	63.80	0.01	0.47	0.01
		Coeff of Variation%	6.45	59.85	65.54	330.16	107.64	49.81	57.81	79.31	74.48	94.59	25.19	187.13	65.47	70.80	141.59	30.74	161.30
	VDD7	Average	7.90	209.01	2070.13	22.67	0.23	120.07	215.58	25.53	177.13	1.93		14.47	97.61	1288.03	0.52	0.66	2.63
		Maximum	8.44	478.00	5406.00	64.40	1.04	163.00	569.00	38.80	504.00	5.24	0.00	43.70	241.00	3480.00	9.08	0.96	14.10
		Minimum	7.43	32.60	230.00	2.80	0.01	69.00	23.40	11.80	13.40	0.17	0.00	5.35	21.40	60.00	0.01	0.43	0.01
		Coeff of Variation%	3.31	80.55	93.56	76.77	104.45	23.41	89.12	32.85	100.94	78.60		67.06	68.30	100.98	319.32	25.45	154.23
	VDD8	Average	7.85	51.76	373.10	43.78	0.29	99.00	39.27	20.07	25.63	0.93	0.14	6.88	33.97	152.21	0.41	0.41	0.10
		Maximum	8.90	113.40	842.00	82.00	1.42	149.00	99.20	37.60	64.50	3.18	0.21	10.30	62.10	436.00	2.32	0.63	0.51
		Minimum	7.32	31.10	208.00	14.40	0.02	68.00	20.40	14.10	13.10	0.10	0.10	5.06	22.80	59.10	0.02	0.25	0.01
		Coeff of Variation%	3.85	41.54	46.72	45.78	101.19	19.80	51.00	28.04	59.79	85.19	43.45	21.61	32.44	70.37	118.22	24.37	131.86
	VDD9	Average	7.96	74.41	565.20	24.97	0.25	110.90	60.62	22.75	40.87	0.46		8.06	45.95	269.03	0.29	0.51	0.05
		Maximum	8.53	158.00	1410.00	54.40	0.93	158.00	150.00	46.20	115.00	1.06	0.00	13.60	98.70	780.00	1.63	0.74	0.26
		Minimum	7.35	30.30	240.00	1.60	0.02	61.00	25.30	12.40	14.50	0.20	0.00	5.74	21.60	90.00	0.01	0.32	0.01
		Coeff of Variation%	3.49	41.88	49.35	67.18	100.47	21.24	51.81	32.04	59.89	48.01		21.80	39.03	62.06	121.21	17.12	140.19
	VDD10	Average	7.87	96.47	761.40	33.74	0.23	115.20	81.99	24.31	59.98	0.25		9.80	52.21	400.72	0.21	0.67	0.14
		Maximum	8.58	248.00	2232.00	537.00	0.73	179.00	217.00	72.00	206.00	0.41	0.00	17.00	165.00	1284.00	0.77	1.12	0.98
		Minimum	6.53	31.30	248.00	0.80	0.01	60.00	25.40	9.76	14.80	0.10	0.00	5.71	12.00	80.10	0.01	0.39	0.01
		Coeff of Variation%	6.53	56.70	65.31	285.22	100.97	31.65	59.11	50.76	77.87	49.49		28.55	61.04	75.02	117.26	29.94	180.85
	VDD11	Average	7.87	107.67	873.72	13.30	0.23	121.69	92.54	26.92	64.28	1.05		9.63	66.07	457.89	0.24	0.59	0.33
		Maximum	8.50	231.00	2058.00	41.20	0.92	175.00	223.00	61.70	167.00	8.50	0.00	15.90	146.00	1210.00	1.31	0.83	3.88
		Minimum	6.78	31.20	244.00	0.80	0.01	63.00	24.50	12.80	14.20	0.00	0.00	5.68	22.40	76.10	0.01	0.42	0.01
		Coeff of Variation%	4.78	51.73	59.03	86.29	110.38	25.88	57.87	46.23	64.31	250.95		26.62	54.28	67.34	135.13	18.36	266.42
	VDD12	Average	8.14	101.19	797.33	25.55	0.33	112.04	78.44	26.67	60.93	0.24	8.96	10.85	71.85	412.65	0.18	0.65	0.10
		Maximum	9.04	195.40	1590.00	246.00	3.00	182.00	132.00	44.50	143.00	0.57	8.96	34.30	246.00	939.00	0.64	0.92	0.36
		Minimum	7.12	31.10	248.00	1.20	0.01	63.00	25.10	13.20	14.40	0.10	8.96	5.76	21.60	0.05	0.01	0.41	0.01
		Coeff of Variation%	5.97	47.80	52.78	186.92	186.54	25.13	46.74	39.02	61.42	68.01		50.28	65.81	65.37	107.70	23.34	109.48
	VDD18	Average	6.51	29.78	217.43	69.78	1.23	35.44	22.25	7.44	12.10	1.48		6.10	17.55	110.98	0.15	0.44	0.66
		Maximum	7.72	74.50	614.00	320.00	4.90	187.00	70.80	28.10	31.90	4.28	0.00	20.60	41.70	347.00	1.16	0.65	3.83
		Minimum	4.69	5.57	36.00	1.60	0.02	5.00	2.57	1.90	1.17	0.10	0.00	1.17	1.11	14.50	0.02	0.23	0.01
		Coeff of Variation%	13.26	62.85	67.07	144.92	131.63	157.31	79.54	79.58	74.08	128.16		74.87	54.46	81.19	166.20	28.45	171.58
	Douglas 1	Average	7.80	47.01	340.13	42.19	0.36	85.63	34.04	18.13	21.77	0.64	0.00	6.62	31.74	140.74	0.31	0.45	0.06
		Maximum	8.23	69.80	526.00	178.00	1.35	113.00	45.60	23.80	32.70	1.22	0.00	8.83	61.90	229.00	1.65	0.60	0.43
		Minimum	7.49	28.30	224.00	4.80	0.02	65.00	22.90	13.20	13.70	0.21	0.00	5.24	22.10	75.90	0.03	0.29	0.01
		Coeff of Variation%	2.70	22.01	23.55	107.37	131.92	13.72	21.72	14.71	26.72	45.93		14.93	30.33	32.94	137.12	18.52	223.21

5.6.4 Baseline water quality interpretation

The outcome of the water quality assessment for a number of indicator constituents are discussed below.

5.6.4.1. pH

The pH of natural waters is a measurement of the acidity/alkalinity and is the result of complex acid-base equilibrium of various dissolved compounds. The pH of most raw water sources is within the range of 6.5 to 8.5 (DWAF, 1996). A decrease in the pH of water in a mining area will be an indication of the generation of hydronium ions (H_30^+ ions) and acid mine drainage.

The results in **Table 5-10** indicate the following:

- On average, all of the monitoring points are within the required pH range of 5.9 to 9.7.
- Maximum recorded levels of pH which fell out of the required pH range, and higher than the required 9.7 was at monitoring point VDD 12.

The average and maximum concentrations for pH measured at each monitoring location in terms of compliance with the RQO or SANS 241 standard, are visually depicted in **Figure 5-11**.

5.6.4.2. Sulphate (SO_4)

The concentration of sulphates in natural surface water is typically low (~5mg/ℓ), although concentrations of several hundred mg/ℓ may occur where dissolution of sulphate minerals or discharge of sulphate-rich effluents takes place (DWAF, 1996). Mine water decanting or seeping from mining areas can increase the sulphate in surface water significantly. Chemical fall-out during rain events in areas where coal burning takes place can also increase the sulphate content of surface water bodies.

The results in **Table 5-10** indicate that on average, the SO_4 guideline concentration a number of monitoring points exceed the required SO_4 concentration limit, with the exception of VDD 5, VDD 8, VDD 9, VDD 10, VDD 11, VDD 12, VDD 18 and Douglas1.

It should be noted that the upstream concentration is outside of the acceptable limits and this is attributed to mining activities in the area.

The average and maximum concentrations for pH measured at each monitoring location in terms of compliance with the RQO or SANS 241 standard, are visually depicted in **Figure 5-12**.

5.6.4.3. Electrical Conductivity (EC)

Electrical conductivity (EC) is a measure of the ability of water to conduct an electrical current, which is as a result of the presence of charged ions such as carbonate, bicarbonate, chloride, sulphate, nitrate, potassium, calcium and magnesium (DWAF, 1996). It is therefore an indicator of the salinity, or total salt content, of water. Accumulation of salts can influence the potential to use the water downstream by water users, such as irrigation for agriculture, as well as livestock watering.

The results in **Table 5-10** indicate that on average, elevated EC levels were noted at monitoring locations VDD 1, VDD 5, VDD 6, and VDD 7.

The average and maximum concentrations for EC measured at each monitoring location in terms of compliance with the RQO or SANS 241 standard, are visually depicted in **Figure 5-13**.

5.6.4.4. Manganese

The results are indicated in **Table 5-10**. On average, elevated manganese concentrations were noted at VDD 6 and VDD 7.

Once again it is observed that water quality upstream of the VDDC section show elevated Mn concentration, indicating an impact as a result of mining activities in the surrounding area.

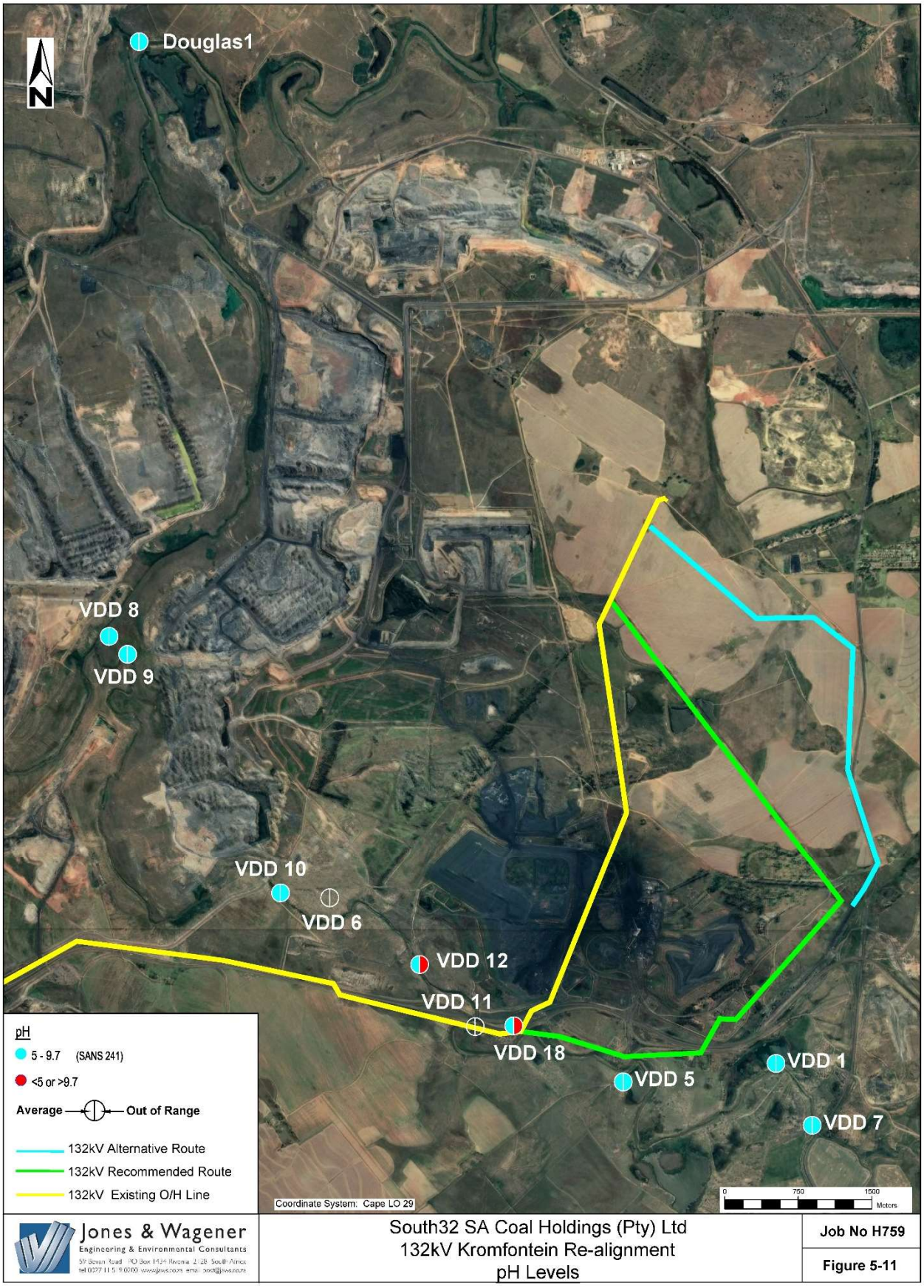

Figure 5-11: pH levels

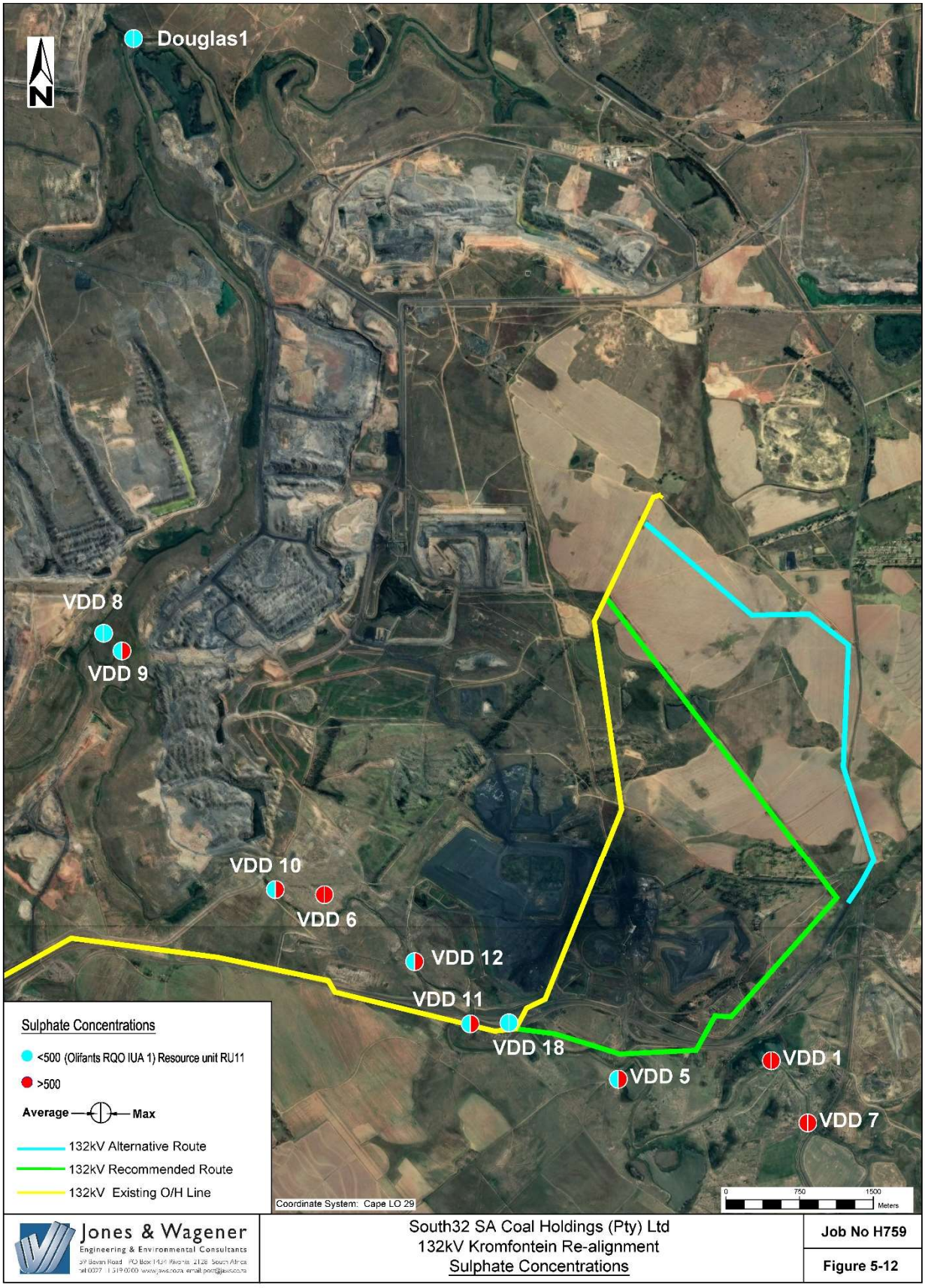

Figure 5-12: Sulphate (SO_4) concentrations

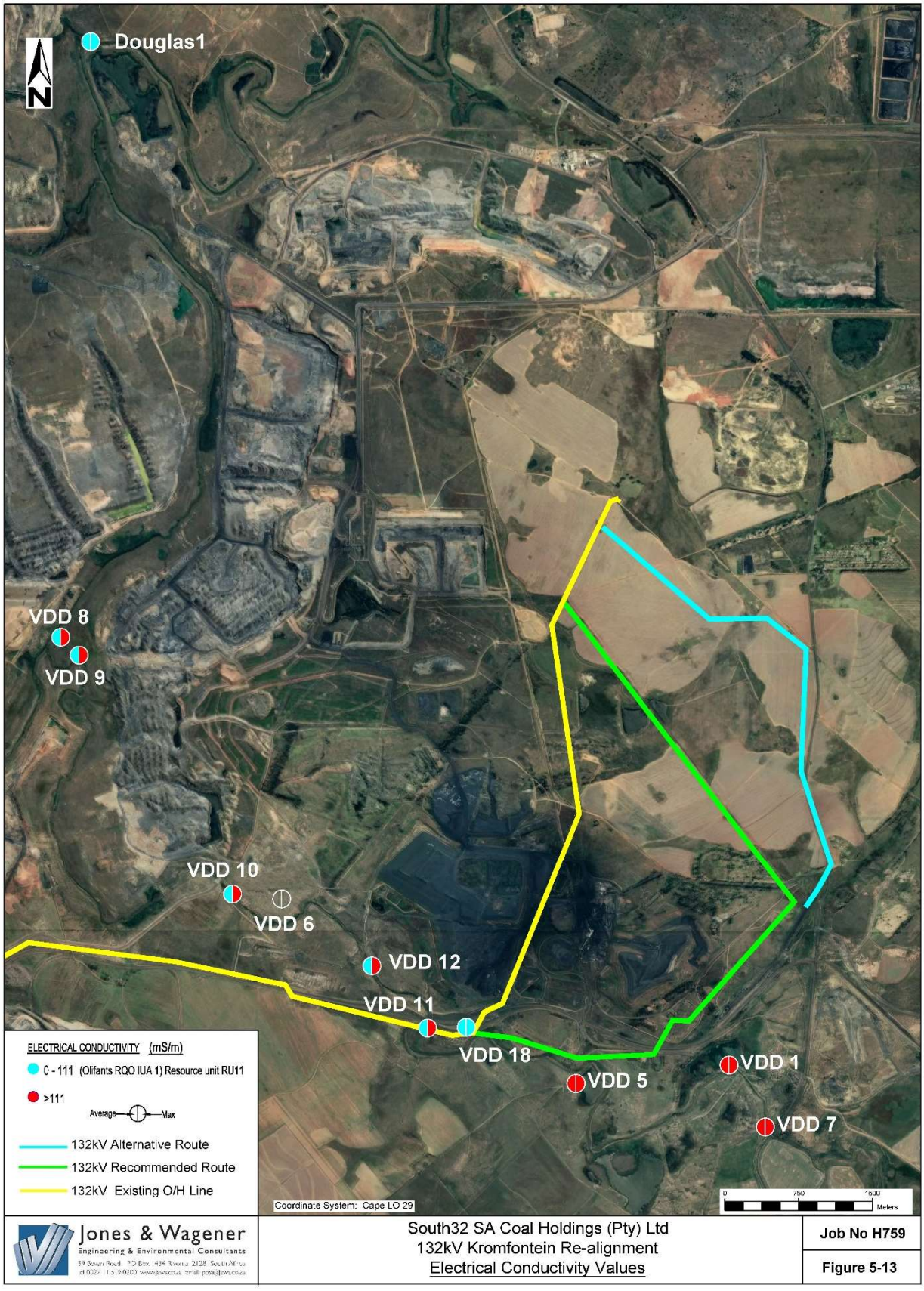

Figure 5-13: Electrical Conductivity (EC) levels

5.6.4.5. Other constituents

Analysis of the other constituents in **Table 5-10** indicates the following:

- Maximum recorded TDS levels at the majority of monitoring points was highly elevated when compared to the SANS241 guidelines, which can be attributed to mining in the area.
- On average, sodium (Na) concentrations at majority of locations was within range when compared to the SANS241 guidelines, with the exception of VDD 2, which can be attributed to mining in the area.
- The maximum recorded nitrate (NO_3) concentrations were elevated at monitoring points VDD 7 and VDD 11, when compared to the RQOs, which may be attributed to mining activities in the area.
- Phosphate (PO_4) concentrations on average as well as maximum recorded at monitoring points VDD 6, VDD 8 and VDD 12.
- Although there are no guideline limitations provided for suspended solids, several points show on average elevated suspended solids and highly elevated suspended solids for the maximum recorded at the monitoring point VDD 6. This is within the mining area and therefore may be attributed to mining in the area.

Therefore, in terms of surface water quality within the study area there are visible impacts associated with mining activities. This is also observed in the surface water quality upstream of the VDDC section indicating an existing impact as a result of land use activities. South32 has developed the Middelburg Water Treatment Plant at the Ifalethu Colliery to address impacts as a result of their mining activities.

5.7 Water authority

The water authority is the Department of Water and Sanitation, Mpumalanga Region (Olifants River Proto – Catchment Management Agency).

5.8 Surface water use

The project area is situated in an agricultural area, where water from the Olifants River and the Steenkoolspruit is used extensively for irrigation, formal and informal domestic usage, as well as livestock watering. The aquatic ecosystem is also present as a downstream user.

6. CONSIDERATION OF ALTERNATIVES

The alternative re-alignment considered is described in section 4.2.2. The southern section of this option is the same as for the proposed route, with a deviation further to the east once the powerline turns in a northerly direction. This option does not cross the Vleishaft tributary on the eastern boundary of the Wolvekrans Colliery Mining Rights Area boundary. However, the Vleishaft tributary is currently largely used as a dirty water management system.

The potential impact on surface water quality and quantity for the two options under consideration, is therefore similar.

7. ENVIRONMENTAL IMPACT ASSESSMENT AND MITIGATION MEASURES

In order to quantify the potential impacts, the general format of the assessment is to first assess the impact assuming no mitigation measures are applied. I. The residual impact after implementation of the mitigation measures is then assessed and indicated.

As required by the NEMA, cumulative impacts are also assessed as and where this is relevant and possible.

The format of the impact assessment is as follows:

- Section 7.1: The impact assessment methodology and rating system is described.
- Section 7.2: The nature of the various activities is described in terms of the phases of the project, from construction through to post-closure.
- Section 7.3: The activities are assessed, detailing the potential impacts, proposed mitigation measures and the residual impact over the full lifecycle of the project.
- Section 7.4: A qualitative note on cumulative impacts.

7.1 Impact assessment methodology and rating system

The impact assessment methodology makes provision for the assessment of impacts against the following criteria:

- Significance;
- Spatial scale;
- Temporal scale;
- Probability; and
- Degree of certainty.

A combined quantitative and qualitative methodology will be used to describe the impacts for each of the aforementioned assessment criteria. A summary of each of the qualitative descriptors along with the equivalent quantitative rating scale for each of the aforementioned criteria is given in **Table 7-1**.

Table 7-1: Quantitative rating and equivalent descriptors for the impact assessment criteria

RATING	SIGNIFICANCE	EXTENT SCALE	TEMPORAL SCALE
1	VERY LOW	Isolated corridor / proposed corridor	Incidental
2	LOW	Study area	Short-term
3	MODERATE	Local	Medium-term
4	HIGH	Regional / Provincial	Long-term
5	VERY HIGH	Global / National	Permanent

A more detailed description of each of the assessment criteria is given in the following sections.

7.1.1 Significance Assessment

Significance rating (importance) of the associated impacts embraces the notion of extent and magnitude but does not always clearly define these since their importance in the rating scale is very relative. For example, the magnitude (i.e. the size) of the area affected by atmospheric pollution may be extremely large (1 000 km^2) but the significance of this effect is dependent on the concentration or level of pollution. If the concentration is great, the significance of the impact would be HIGH or VERY HIGH, but if it is diluted it would be VERY LOW or LOW. Similarly, if 60 ha of a grassland type are destroyed the impact would be VERY HIGH if only 100 ha of that grassland type were known. The impact would be VERY LOW if the grassland type was common. A more detailed description of the impact significance rating scale is given in **Table 7-2**.

Table 7-2: Description of the significance rating scale

RATING		DESCRIPTION
5	VERY HIGH	Of the highest order possible within the bounds of impacts which could occur. In the case of adverse impacts: there is no possible mitigation and/or remedial activity which could offset the impact. In the case of beneficial impacts, there is no real alternative to achieving this benefit.
4	HIGH	Impact is of substantial order within the bounds of impacts, which could occur. In the case of adverse impacts: mitigation and/or remedial activity is feasible but difficult, expensive, time-consuming or some combination of these. In the case of beneficial impacts, other means of achieving this benefit are feasible but they are more difficult, expensive, time-consuming or some combination of these.
3	MODERATE	Impact is real but not substantial in relation to other impacts, which might take effect within the bounds of those which could occur. In the case of adverse impacts: mitigation and/or remedial activity are both feasible and fairly easily possible. In the case of beneficial impacts: other means of achieving this benefit are about equal in time, cost, effort, etc.
2	LOW	Impact is of a low order and therefore likely to have little real effect. In the case of adverse impacts: mitigation and/or remedial activity is either easily achieved or little will be required, or both. In the case of beneficial impacts, alternative means for achieving this benefit are likely to be easier, cheaper, more effective, less time consuming, or some combination of these.

RATING		DESCRIPTION
1	VERY LOW	Impact is negligible within the bounds of impacts which could occur. In the case of adverse impacts, almost no mitigation and/or remedial activity is needed, and any minor steps which might be needed are easy, cheap, and simple. In the case of beneficial impacts, alternative means are almost all likely to be better, in one or a number of ways, than this means of achieving the benefit. Three additional categories must also be used where relevant. They are in addition to the category represented on the scale, and if used, will replace the scale.
0	NO IMPACT	There is no impact at all - not even a very low impact on a party or system.

7.1.2 Spatial scale

The spatial scale refers to the extent of the impact i.e. will the impact be felt at the local, regional, or global scale. The spatial assessment scale is described in more detail in **Table 7-3**.

Table 7-3: Description of the spatial scale

RATING		DESCRIPTION
5	Global/National	The maximum extent of any impact.
4	Regional/Provincial	The spatial scale is moderate within the bounds of impacts possible and will be felt at a regional scale (District Municipality to Provincial Level). The impact will affect an area up to 50km from the proposed site / corridor.
3	Local	The impact will affect an area up to 5km from the proposed route corridor / site.
2	Study Area	The impact will affect a route corridor not exceeding the boundary of the corridor / site.
1	Isolated Sites / proposed site	The impact will affect an area no bigger than the corridor / site.

7.1.3 Temporal scale

In order to accurately describe the impact, it is necessary to understand the duration and persistence of an impact in the environment. The temporal scale is rated according to criteria set out in **Table 7-4**.

Table 7-4: Description of the temporal rating scale

RATING		DESCRIPTION
1	Incidental	The impact will be limited to isolated incidences that are expected to occur very sporadically.
2	Short-term	The environmental impact identified will operate for the duration of the construction phase or a period of less than 5 years, whichever is the greater.
3	Medium term	The environmental impact identified will operate for the duration of life of the project.
4	Long term	The environmental impact identified will operate beyond the life of operation.
5	Permanent	The environmental impact will be permanent.

7.1.4 Degree of Probability

The probability or likelihood of an impact occurring will be described, as shown in **Table 7-5**.

Table 7-5: Description of the degree of probability of an impact occurring

RATING	DESCRIPTION
1	Practically impossible
2	Unlikely
3	Could happen
4	Very Likely
5	It's going to happen / has occurred

7.1.5 Quantitative Description of Impacts

To allow for impacts to be described in a quantitative manner in addition to the qualitative description given above, a rating scale of between 1 and 5 was used for each of the assessment criteria. Thus, the total value of the impact is described as the function of significance, spatial and temporal scale as described below.

$$\textit{Impact Risk} = \frac{(\text{SIGNIFICANCE} + \textit{Spatial} + \text{Temporal})}{3} \times \frac{\text{Probability}}{5}$$

An example of how this rating scale is applied is shown in **Table 7-6**.

Table 7-6: Example of Rating Scale

IMPACT	SIGNIFICANCE	SPATIAL SCALE	TEMPORAL SCALE	PROBABILITY	RATING
	LOW	*Local*	Medium Term	Could Happen	
Impact	2	3	3	3	1.6

Note: The significance, spatial and temporal scales are added to give a total of 8, that is divided by 3 to give a criteria rating of 2.67. The probability (3) is divided by 5 to give a probability rating of 0.6. The criteria rating of 2.67 is then multiplied by the probability

rating (0.6) to give the final rating of 1.6. The impact risk is then classified according to 5 classes as described in **Table 7-7**.

Table 7-7: Impact Risk Classes

RATING	IMPACT CLASS	DESCRIPTION
0.1 – 1.0	1	Very Low
1.1 – 2.0	2	Low
2.1 – 3.0	3	Moderate
3.1 – 4.0	4	High
4.1 – 5.0	5	Very High

Therefore, with reference to the example used above, an impact rating of 1.6 will fall in the Impact Class 2, which will be considered to be a Low impact.

7.2 Activities to be undertaken for the Powerline Project that could potentially affect surface water

The following activities will be undertaken during the various phases of the proposed Powerline Project.

7.2.1 Construction phase

Once the authorisation is received the proposed project will commence. This phase will commence when the construction contractors establish on site and will end with the commissioning of the re-aligned powerline.

Typical construction activities to construct the section of the powerline that needs to be re-aligned that will potentially impact on surface water include the following:

- General construction activities:
  - Civil works.
  - Movement of materials and equipment.
  - Servicing of construction vehicles and equipment.
- Construction of powerline surface infrastructure:
  - Stockpiling of material excavated from foundation.
  - Transport and offloading of material to be used in construction.
  - Erection of pylons in excavated hole.
  - Backfilling of hole with appropriate backfill material for stabilisation.
  - Casting of a concrete cap around pole for corrosion protection.
  - Using cranes trucks, LDVs and string machines to assemble cables into position.

None of the activities associated with the decommissioning of the portion of the existing powerline are expected to have any impact on surface water. The removal of the conductor and existing poles will take place within the dirty water management area of the mine.

7.2.2 Operational Phase

This phase commences at the end of the construction period and will end when the powerline is decommissioned.

Maintenance of the powerline will take place during this phase. The activities that can impact on surface water include the repair and maintenance activities at the powerline.

7.2.3 Decommissioning and Post Closure Phase

As part of the decommissioning phase, the powerline infrastructure will be removed and the disturbed area will be rehabilitated.

Activities that can impact on surface water include:

- General demolition activities:
    - Civil works.
    - Movement of materials and equipment.
    - Servicing of construction vehicles and equipment.
- Rehabilitation of disturbed footprint:
    - Taking down and removal of powerline cables.
    - Demolition and removal of pylons.
    - Removal of pylon foundations and backfill of voids with suitable topsoil material.
    - Using cranes trucks, LDVs and string machines to remove cables and pylons.

7.3 Surface water impact assessment and mitigation measures

The impacts are described in terms of the nature of the activity that could potentially impact on surface water, the nature of the impact if not mitigated, possible mitigation measures and the long-term impact.

7.3.1 Construction Phase

7.3.1.1. Impact on surface water quality

The potential impacts of the construction of the powerline on surface water quality are as follows:

- Erosion of topsoil on areas cleared or disturbed around the pylon sites, including any new access routes, with resultant increased suspended solids, as well as siltation in watercourses.
- Impact on quality of storm water runoff from the construction sites, resulting from spillage of oil, grease and diesel from construction plant (increased hydrocarbon concentrations in surface water).
- Impact on quality of storm water runoff from the construction sites as a result of spillage of construction waste such as concrete.
- Impact on quality of storm water runoff as a result of poor management of waste material at construction sites, including poor sewage management.

The construction phase impacts on surface water quality are detailed in **Table 7-8.**

7.3.1.2. Impact on surface water quantity – catchment yield and flow rates

No water will be retained on site during the construction phase. All storm water will be allowed to run off the pylon construction sites, with only temporary retention for silt management, if required.

The construction phase impacts on surface water quantity are detailed in **Table 7-8**.

7.3.1.3. Mitigation measures

- No pylons must be located within an area that would be expected to become inundated during a 1:100 flood event, or in the riparian zone.
- No pylons must be located within the delineated extent of watercourses.
- The area of disturbance should be kept to a minimum.
- Remove vegetation only where essential for the construction activities. Do not allow any disturbance to the adjoining natural vegetation cover or soils.
- Vegetation and soil should be retained in position for as long as possible and should only be removed immediately ahead of construction / earthworks in any specific area.
- Existing roads must be used for access as far as possible.
- The duration of construction activities at each pylon site must be minimised as far as is practical.
- Construction should be immediately followed by rehabilitation.
- Storm water management and erosion control measures should be implemented. These should include the following:
    - The excavated soil should be placed on the upstream side of construction activities in order to act as a storm water diversion berm.
    - Where such diversion berms create concentrated flows, as well as in steep and/or sensitive areas (such as wetlands) the use of swales, silt fences or other effective erosion control measures is recommended to attenuate run-off.
- Drip trays must be placed under any activity requiring active lubrication or oiling at the pylon sites.
- Spill clean-up kits must be available on site for immediate remediation of any spills and removal of contaminated soils.
- No fuel must be stored at the pylon sites and no refuelling or servicing of construction plant must take place at the construction sites.
- No construction materials may be disposed of within the delineated wetlands or within the buffer zone recommended by the wetland specialist.
- No concrete batching may take place within the delineated wetlands or within the buffer zone recommended by the wetland specialist. Make use of ready mix concrete as far as possible.
- All surplus spoil material from the foundation excavations (i.e. not used as backfill) must be removed from the site as soon as is practically possible.

- Once construction at a pylon site is complete, the site must be rehabilitated immediately by removing any construction waste material.
- All waste material to be removed to a licensed waste disposal facility, if it cannot be re-used or recycled.
- Chemical toilets to be provided at various sections along the route, as required. The appointed contractor must ensure that these facilities are emptied on a regular basis and maintained as required. No chemical toilets to be placed in close proximity of watercourses.
- In areas where construction activities have been completed and no further disturbance is anticipated, should be landscaped and left to revegetate naturally.
- A construction method statement must be compiled and approved prior to the commencement of construction activities. The method statement should take cognisance of:
    - The mitigation measures outlined above, as well as mitigation measures specified by each of the environmental specialists.
    - The conditions of the Environmental Authorisation.
    - The Environmental Management Programme (EMPr) for the project submitted as part of the Basic Assessment Report.

  The Environmental Control Officer (ECO) must ensure that the contractor adheres to the above-mentioned documents.

Table 7-8: Rating of Construction Phase impacts

ACTIVITY	ASPECT AFFECTED	POTENTIAL IMPACT	PRE-MITIGATION	Score	Rating	MITIGATION	POST-MITIGATION	Score	Rating
Clearance of vegetation, stripping of topsoil and civil works (earthworks)	Surface water quality	Erosion of topsoil on areas cleared or disturbed around the pylon sites, including access routes, with resultant increased suspended solids, as well as siltation in watercourses.	Significance	2	1.20	See section 7.3.1.3	Significance	2	0.80
			Magnitude - Spatial	2			Magnitude - Spatial	2	
			Magnitude - Temporal	2			Magnitude - Temporal	2	
			Probability	3			Probability	2	
Movement and servicing of construction vehicles during construction	Surface water quality	Hydrocarbon spillages from fuel storage, servicing areas or construction equipment itself, with resultant elevated hydrocarbon concentrations in runoff water and watercourses.	Significance	2	1.20	See section 7.3.1.3	Significance	2	0.40
			Magnitude - Spatial	2			Magnitude - Spatial	2	
			Magnitude - Temporal	2			Magnitude - Temporal	2	
			Probability	3			Probability	1	
Casting of concrete at foundations	Surface water quality	Concrete spillage from casting of foundations resulting in water quality deterioration	Significance	1	0.80	See section 7.3.1.3	Significance	1	0.53
			Magnitude - Spatial	1			Magnitude - Spatial	1	
			Magnitude - Temporal	2			Magnitude - Temporal	2	
			Probability	3			Probability	2	
Waste management during all construction activities	Surface water quality	Contamination of water resources due to spillage of construction material and waste into watercourse and/or poor management of sewerage waste at construction sites	Significance	2	0.40	See section 7.3.1.3	Significance	2	0.40
			Magnitude - Spatial	2			Magnitude - Spatial	2	
			Magnitude - Temporal	2			Magnitude - Temporal	2	
			Probability	1			Probability	1	
Implementation of stormwater management measures at construction sites	Surface water quantity	Containment of contaminated runoff water emanating from the site, with no release to the catchment.	Significance	2	1.20	See section 7.3.1.3	Significance	2	0.80
			Magnitude - Spatial	2			Magnitude - Spatial	2	
			Magnitude - Temporal	2			Magnitude - Temporal	2	
			Probability	3			Probability	2	

7.3.2 Operational Phase

7.3.2.1. Impact on surface water quality

The potential impacts of the powerline on surface water quality during the operational phase relates to the following:

- Impact on quality of water in adjacent watercourses, resulting from scour and erosion at pylons with resultant increased suspended solids, as well as siltation in watercourses.
- During maintenance and repairs, impacts similar to the construction phase impacts could arise. (i.e. potential hydrocarbon spillage as a result of vehicle movement).

The operational phase impacts on surface water quality are detailed in **Table 7-9**.

7.3.2.2. Impact on surface water quantity – catchment yield

All storm water will be allowed to drain freely under the powerline and no surface water quantity impacts are expected during the operational phase.

7.3.2.3. Mitigation measures

- Existing roads must be used for access as far as possible.
- The powerline route must be regularly inspected during the operational phase.
- Any erosion channels developing during or after the construction period should be appropriately backfilled (and compacted where relevant) and the areas restored to a condition similar to the condition before the erosion occurred.
- No pylons must be located within an area that would be expected to become inundated during a 1:100 flood event

Table 7-9: Rating of Operational Phase impacts

ACTIVITY	ASPECT AFFECTED	POTENTIAL IMPACT	PRE-MITIGATION	Score	Rating	MITIGATION	POST-MITIGATION	Score	Rating
Maintenance activities resulting in poor quality runoff due to contact of the storm water with hydrocarbons and waste material.	Surface water quality	Hydrocarbon spills that discharge from the site, with resultant deterioration in water quality due to increase in suspended solids and hydrocarbons (oils and greases).	Significance	2	0.67	See section 7.3.2.3	Significance	2	0.33
			Magnitude - Spatial	2			Magnitude - Spatial	2	
			Magnitude - Temporal	1			Magnitude - Temporal	1	
			Probability	2			Probability	1	

7.3.3 Decommissioning Phase

7.3.3.1. Impact on surface water quality

The potential impacts of the powerline on surface water quality are as follows:

- Erosion of topsoil on areas cleared or disturbed around the pylon sites, including access routes, with resultant increased suspended solids, as well as siltation in watercourses.
- Poor rehabilitation resulting in poor ground cover and erosion, with resultant increased suspended solids, as well as siltation in watercourses.
- Impact on quality of storm water runoff from the pylon sites, resulting from spillage of oil, grease and diesel from construction plant (increased hydrocarbon concentrations in surface waters).Impact on quality of storm water runoff as a result of poor management on waste material at demolition sites in close proximity to watercourses, including poor sewage management from construction sites.

The decommissioning and phase impacts on surface water quality are detailed in **Table 7-10**.

7.3.3.2. Impact on surface water quantity – catchment yield and flow rates

No water will be retained on site during the decommissioning phase. All storm water will be allowed to run off the powerline footprint, with only temporary retention for silt management, if required.

The decommissioning phase impacts on surface water quantity are detailed in **Table 7-10**.

7.3.3.3. Mitigation measures

- The area of disturbance during decommissioning should be kept to a minimum.
- Remove vegetation only where essential for the demolition of the powerline. Do not allow any disturbance to the adjoining natural vegetation cover or soils.
- Vegetation and soil should be retained in position for as long as possible and should only be removed immediately ahead of demolition works in any specific area.
- Existing roads must be used for access as far as possible.
- The duration of decommissioning activities at each pylon site must be minimised as far as is practical.
- Soil surfaces should not be left open for lengthy periods to prevent erosion. The area should be landscaped and left to re-vegetate naturally as soon as possible.
- Storm water management and erosion control measures should be implemented. These should include the following:
    - The excavated soil should be placed on the upstream side of decommissioning activities in order to act as a storm water diversion berm.
    - Where such diversion berms create concentrated flows, as well as in steep and/or sensitive areas (such as wetlands) the use of swales, silt fences or other effective erosion control measures is recommended to attenuate run-off.

- All storm water management measures should be regularly maintained.

- Drip trays must be placed under any activity requiring active lubrication or oiling at the demolition sites.
- Spill clean-up kits must be available on site for immediate remediation of any spills and removal of contaminated soils.
- No fuel must be stored on site and no refuelling or servicing of plant must take place in close proximity to watercourses.
- No material generated during demolition may be disposed of within the delineated watercourses, or within buffer zone recommended by the wetland specialist.
- Once demolition at a pylon site is complete, the site must be rehabilitated immediately by removing all demolition material. The area should be landscaped and left to revegetate naturally.
- All waste material to be removed to a licensed waste disposal facility, if it cannot be re-used or recycled.
- Monthly inspections should be done of the rehabilitated area to monitor the status. Should any erosion be observed, appropriate corrective measures should be implemented.
- A demolition method statement must be compiled and approved prior to the commencement of demolition activities.
    - The method statement should take cognisance of:
        - The mitigation measures outlined above, as well as mitigation measures specified by each of the environmental specialists.
        - The conditions of the Environmental Authorisation should be adhered to.
        - The EMPr for the project submitted as part of the Basic Assessment Report.

The ECO must ensure that the contractor adheres to the abovementioned documents.

7.3.3.4. Post Closure Phases

On the assumption that adequate rehabilitation will be implemented during the decommissioning phase, no impacts are expected during the post closure phase.

Table 7-10: Rating of Decommissioning Phase impacts

ACTIVITY	ASPECT AFFECTED	POTENTIAL IMPACT	PRE-MITIGATION	Score	Rating	MITIGATION	POST-MITIGATION	Score	Rating
Removal of powerline and rehabilitation of the disturbed area	Surface water quality	Erosion of topsoil on areas cleared or disturbed around the pylon sites, including access routes, with resultant increased suspended solids, as well as siltation in watercourses. Erosion due to poor rehabilitation standard with resultant increased suspended solids, as well as siltation in watercourses.	Significance	2	1.20	See section 7.3.3.3	Significance	2	0.80
			Magnitude - Spatial	2			Magnitude - Spatial	2	
			Magnitude - Temporal	2			Magnitude - Temporal	2	
			Probability	3			Probability	2	
Movement and servicing of construction vehicles during the demolition of the pylons and associated support structures	Surface water quality	Hydrocarbon spillages from fuel storage, servicing areas or construction equipment, with resultant elevated hydrocarbon concentrations in runoff water and watercourses.	Significance	2	1.20	See section 7.3.3.3	Significance	2	0.40
			Magnitude - Spatial	2			Magnitude - Spatial	2	
			Magnitude - Temporal	2			Magnitude - Temporal	2	
			Probability	3			Probability	1	
Implementation of stormwater management measures at demolition sites	Surface water quantity	Containment of contaminated runoff water emanating from the site, with no release to the catchment.	Significance	2	1.20	See section 7.3.3.3	Significance	2	0.80
			Magnitude - Spatial	2			Magnitude - Spatial	2	
			Magnitude - Temporal	2			Magnitude - Temporal	2	
			Probability	3			Probability	2	

7.4 Cumulative impacts

7.4.1 Water quality

Land use in the area include mining and agriculture (crop production). The assessment of the existing water quality in section 5.6 indicates an existing impact on surface water quality as a result of these land use activities.

Given the small overall extent of the powerline, and the passive nature of the activity, its contribution to the cumulative impact is expected to be negligible in relation to the impact of existing land uses in the Olifants River system.

7.4.2 Water quantity

All storm water runoff will be allowed to flow unrestricted under the powerline into the watercourses and therefore the powerline is not expected to have any impact on catchment yield.

8. MONITORING AND AUDITING

No additional surface water quality monitoring is required during the construction phase. Visual inspections should be done weekly at the construction sites located close to watercourses to detect any erosion, which could result in increased suspended solids.

No additional or specific monitoring is required during the operational phase.

9. CONCLUSION AND RECOMMENDATIONS

9.1 Conclusion

The proposed re-location of the Kromfontein 132kV powerline to an alignment within the current Mining Rights Boundary of the Wolvekrans Colliery, is expected to have a low to very low impact after mitigation measures have been implemented. The main potential impact is during the construction phase, but these impacts can be minimised through the implementation of the proposed mitigation measures. This is based on the current proposed design which excludes any structures within the delineated watercourses and the 1:100 year floodline.

The assessment of the water quality indicates a current impact on surface water quality as a result of mining and agriculture activities against the guideline used, including the surface water resources upstream of the VDDC mining area.

Given the small overall extent of the powerline, and the passive nature of the activity, its contribution to the cumulative impact is expected to be negligible in relation to the impact of existing land uses in the Olifants River system.

Due to the close proximity of the powerline to watercourses and the fact that pylons will be located within the regulated area (i.e. within 500 m of delineated watercourses, but outside of the delineated watercourses), the development of the powerline will be a section 21(c) and (i) water use. The water uses should be authorised in terms of the

National Water Act, 1998 (Act 36 of 1998) before construction commences. It is anticipated that the water use activities could be authorised in terms of the General Authorisation (GA) for 21(c) and (i) water use as promulgated in GNR 509 of 2016. This should be confirmed through a risk assessment process by a suitably qualified wetland specialist as required in terms of the GA.

9.2 Recommendations

The following conditions are recommended for inclusion in the Environmental Authorisation:

- No structures may be constructed within the delineated watercourses or the 1:100 year floodline without the necessary authorisations;
- Authorisation in terms of the NWA should be obtained before construction commences.

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APPENDIX A

CVS OF SPECIALIST

Jones & Wagener
Engineering & Environmental Consultants
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CURRICULUM VITAE

22 February 2019
veeragaloo_generalcv_feb2019.docx

MALINI VEERAGALOO

Profession	Civil (Environmental) Engineer
Date of Birth	3 July 1984
Position in firm	Civil Engineer
Years of Experience	12
Nationality	South African
Education / Qualifications	BSc Eng (Civil) Environmental option (2006) University of the Witwatersrand
	GDE Water Engineering (2010) University of the Witwatersrand
Languages	English, Hindi

Employers

2007 - present	Jones & Wagener Engineering and Environmental Consultants

Areas of Expertise

Environmental Engineering, Hydrology calculations, Floodlines determination, Mine Water management a Canal Design, Surface water Impact Assessments, Mine water balance modelling

Professional Affiliations

ECSA	Professional Engineer (Registration number 20140490)
SAICE	Associate Member

Relevant Experience

Surface water inputs to the EMPR for Rooipoort underground mine – Mpumalanga – Oryx Environmental – 2007

EMPR Hydrology and Pipe Sizing for Holcim – Rooipoint - 2007

Canal Sizing – Newcastle – 2007

EMPR Hydrology, Floodline study for Shaft at Dominion Reefs Uranium Mine – North West Province – Prime Resources – 2007

EMPR Hydrology, Floodline determination and Canal sizing – Mpumalanga – Goedgevonden Xstrata Coal South Africa – 2007

Backwater Analysis and Floodline determination for Kriel Block 6 – Mpumalanga- Xstrata Coal South Africa – 2007

EMPR Hydrology For Veremo – Limpopo - Prime Resources - 2007

Storm water management – Johannesburg - Mittal Steel Dunswart - 2007

Surface water inputs and Floodline determination for Mbila mine-Natal-Synergistics - 2007

Dump Rehabilitation - Vereeniging - Arcelormittal South Africa Limited Vereeniging works - Vaal Dump – 2007

EMPR Hydrology, Floodline determination for Zondagsfontein West Mine-Mpumalanga-Oryx Environmental – 2007 – 2008

IWWMP for Tselentis Colliery-Mpumalanga-Xstrata Coal South Africa - 2008

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Floodline Analysis for Goedgevonden Colliery-Mpumalanga - Xstrata Coal South Africa - 2008

Design of Water Management structures for Goedgevonden Colliery – Mpumalanga-Xstrata Coal South Africa – 2008

Design of Water Management structures for Klipspruit Colliery – Mpumalanga-Bhp Billiton-2008

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WRSM Modelling - Langklip-Synergistics - 2009

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Surface Water Assessment – Ceres Kappa Sub-Station - Western Cape - Eskom Holdings - 2009

Detailed Design of water Management Structures for Tweefontein colliery- Witbank-Xstrata Coal South Africa-2009

Hydrology - Oogiesfontien - Witbank- Xstrata Coal South Africa - 2009

Strom Water Management- Afrisam- Roodepoort - 2010

Hydrology - Haasfontein- Mpumalanga - Exxaro New Clydesdale Colliery – 2009/2010

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Hydrology - Kanyika Niobium Project-Synergistics - 2010

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Surface water inputs to the EMP for Tweefontien Optimisation Project – Witbank – Xstrata Coal South Africa - 2010

Surface water inputs to the EMP for Ogiesfontien – Mpumalanga- Xstrata Coal South Africa – 2010

IWWMP Update for Spitzkop Colliery-Mpumalanga-Xstrata Coal South Africa - 2010

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Surface Water Baseline Study and Water Balance for Elders – Mpumalanga – SRK Consulting - 2012

Surface Water Specialist Study for the EMPR for Verkeerdepan Extension – Cleanstream Environmental - 2012

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Conceptual Storm Water Management Plan for Iduapriem Gold Mine-TSF-2017/2018

Dam Sizing and runoff assessment for Holfontein Waste Disposal Site -2018

Surface water specialist study Impact assessment for South32-Wolvekrans VDDC-2018

Integrated Water and Waste Management Plan Update for Glencore-iMpunzi Complex -2018

GN704 Audit for South32- Mamatwan Mine -2018

Declaration

I confirm that the above CV is an accurate description of my experience and qualifications.

_____ 22 February 2019

Signature of Staff Member Date

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TECHNICAL NOTE

To:	Tolmay Hopkins	**Date:**	20 August 2019
Company:	Jones & Wagener	**From:**	Malini Veeragaloo
Copies to:		**Reviewed:**	Tolmay Hopkins
		J&W ref:	TN227/19/H759-000
File ref:	H759-000-19-TN227_r1_mvth_PowerlineinRelationtoFloodlines		

SOUTH32 SA COAL HOLDINGS (PTY) LTD

KROMFONTEIN132KV POWERLINE RELOCATION

IMPACT ASSESSMENT OF POWERLINE LOCATION IN RELATION TO THE 1:100 YEAR FLOODLINES

1. INTRODUCTION

1.1 Background

Wolvekrans Colliery is an operational division of South32 SA Coal Holdings (Pty) Limited (South32). The mine is located between the towns of eMalahleni and Kriel, approximately 30 km south-east of the town of eMalahleni, in close proximity to the Duvha Power Station.

Wolvekrans Colliery is made up of several mining section, namely Vandyksdrift Central (VDDC), Vandyksdrift North (VDDN), Vandyksdrift South (VDDS), Steenkoolspruit (SKS) and Albion sections. The VDDC section of Wolvekrans Colliery is located to the south of the Steenkoolspruit and VDDN sections, and north of the VDDS and Albion sections (mining has ceased at these two sections). The Olifants River forms the southern boundary of the VDDC mining section. The R544 and R575 provincial roads are located to the east and west of the Wolvekrans Colliery, respectively.

The VDDC section area falls within the footprint of historic underground mining operations at the old Douglas Colliery. In 2007, an amendment of the Environmental Management Programme Report (EMPR) for the Douglas Colliery operations was approved, to allow the opencast mining of the remaining coal seams. This is now referred to as the VDDC section, which is earmarked to be an opencast mine using dragline, and truck and shovel operations. Mining will commence in 2020.

Electricity for the VDDC section is supplied from Eskom's Klein Olifants 132 kV Substation, which feeds the Klein 132 kV Substation. The existing Kromfontein 132 kV powerline which connects the Klein Substation and the Kromfontein Substation, traverse the area to be opencast mined (refer to **Figure 1.1**) and therefore has to be relocated before opencast mining can commence.

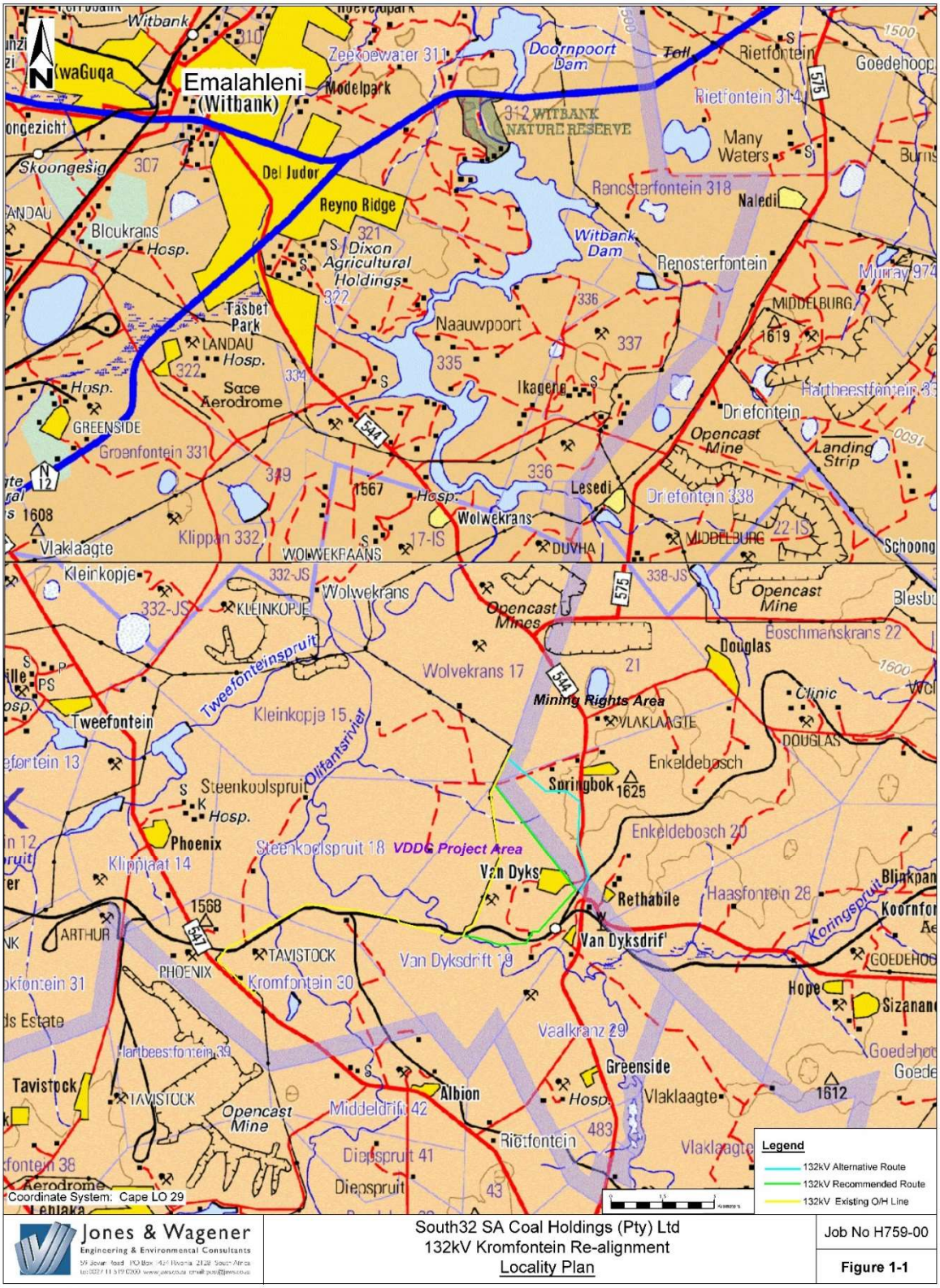

Figure 1.1: Locality Plan

The proposed relocation of the 132 kV Kromfontein powerline will largely be in a brownfields project within the greater Wolvekrans Colliery mining rights area. Wolvekrans Colliery is located between the towns of eMalahleni and Kriel, within the jurisdictional area of the eMalahleni Local Municipality and the Nkangala District Municipality of the Mpumalanga Province. The mine is situated approximately 30 km south-east of the town of eMalahleni, in close proximity to the Duvha Power Station.

VDDC is located on the western boundary of Wolvekrans Colliery, with the Olifants River located on the southern and western boundaries of the VDDC section.

Jones & Wagener (J&W) were appointed to undertake the environmental authorisations for the above activities which requires various specialist studies to be undertaken, one of which is surface water. Therefore, J&W were also appointed to undertake the specialist surface water study for the project and the final report was issued in July 2019.

The study was undertaken based on the assumption that the proposed associated powerline structures along the re-aligned powerline route will be located outside of delineated watercourses and the 1:100 year floodline.

Since then the final designs of the powerline structures have become available and some of the proposed associated powerline structures along the re-aligned powerline route lie within, and in some cases on, the 1:100 year floodline.

Therefore, this technical note serves as an assessment of these structures in relation to the watercourses and the 1:100 year floodline and should be read in conjunction with the Surface Water Specialist Report (Report Number: JW126/19/H759-00 – Rev 4).

1.2 Proposed surface infrastructure

The proposed powerline will be constructed within the VDDC section of the Wolvekrans Colliery and within the Mining Rights Boundary (refer to **Figure 1.2**). The electricity distribution powerline will be constructed and relocated to a proposed route outside an area planned to be mined by South32. Consideration was given to the terrain and current mining activities. The proposed powerline will be approximately 7.5 km with a corridor of about 36 m (refer to **Table 1.2**). The foundation depths will range between 2 m to 3 m. The proposed powerline will be constructed using intermediate steel pole towers that will be erected a few metres apart depending on the terrain, ground clearance requirements, geology etc. The proposed steel towers may consist of the following:

- Mono-pole guyed intermediate suspension structures;
- Mono-pole self-supporting intermediate suspension structures;
- Mono-pole angle suspension structures; and/or
- Mono-pole strain structures.

The height of the towers is expected to range between 22 m and 26 m, depending on the terrain and ground clearance requirements.

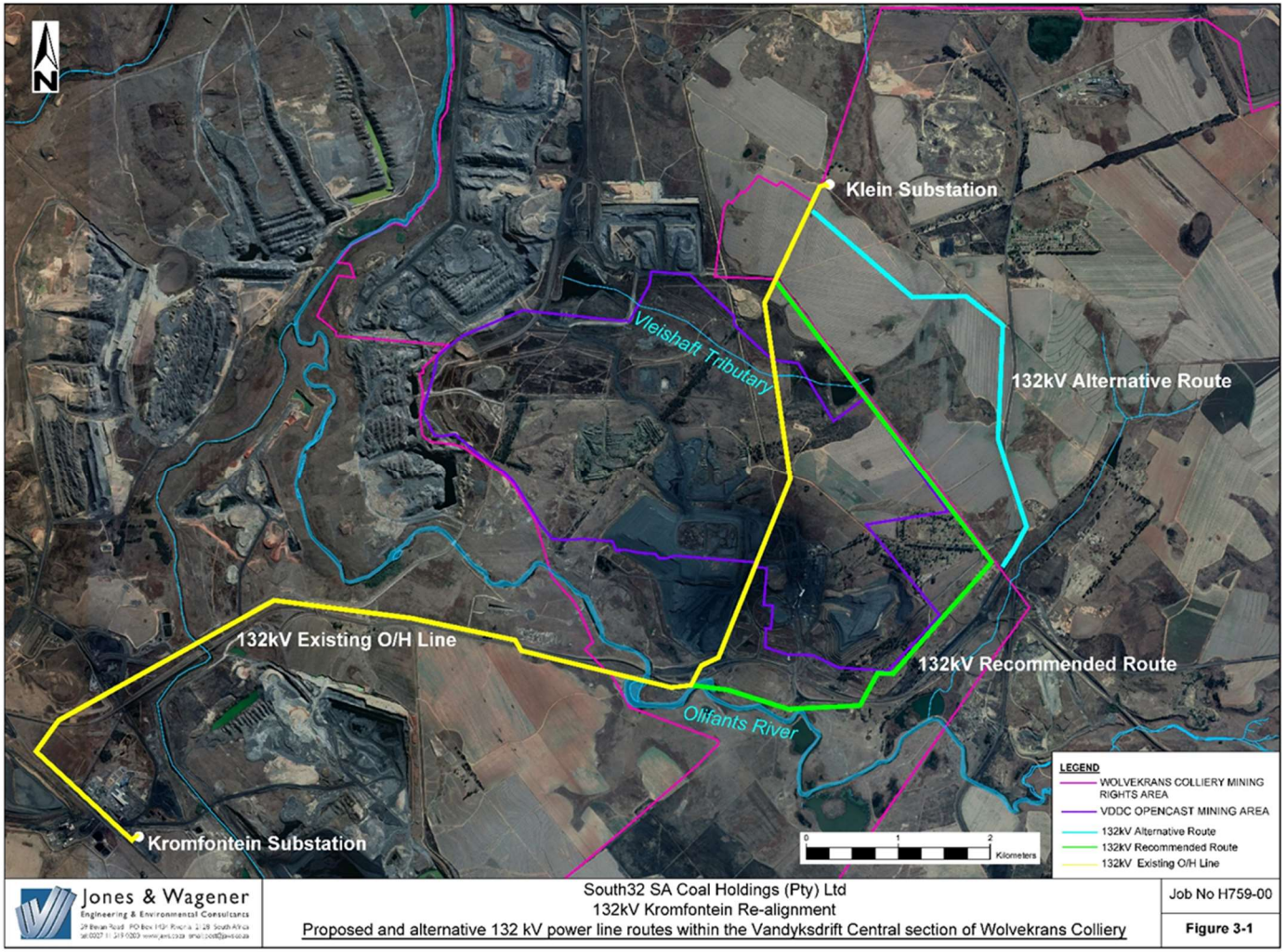

Figure 2.2: Proposed routing options for re-alignment of 132kV Kromfontein powerline

Table 1.2.a: Co-ordinates for proposed route (Enercon, 2019)

	Latitude	Longitude
A1	26° 3' 29.15''S	29° 18' 07.73''E
A2	26° 5' 08.51''S	29° 19' 32.65''E
A3	26° 5' 47.88''S	29° 18' 54.11''E
A4	26° 5' 47.66''S	29° 18' 48.21''E
A5	26° 6' 00.29''S	29° 18' 13.31''E
A6	26° 5' 53.68''S	29° 17' 49.53''E

The Alternative Route will run in the same position as the proposed route for the southern section, but once the line turns in a northerly direction, it will be further to the east in proximity of the R544 Witbank to Kriel Provincial Road. The coordinates for the alternative powerline route corridor are indicated in **Table 1.2.b**.

Table 2.2.b: Co-ordinates of corridor for alternative route (Enercon, 2019)

	Latitude	Longitude
B1	26° 4' 58.23''S	29° 19' 43.91''E
B2	26° 4' 54.52''S	29° 19' 43.20''E
B3	26° 4' 30.49''S	29° 19' 35.61''E
B4	26° 4' 18.51''S	29° 19' 34.75''E
B5	26° 3' 44.38''S	29° 19' 37.69''E
B6	26° 3' 21.10''S	29° 19' 10.70''E
B7	26° 3' 24.15''S	29° 18' 56.88''E
B8	26° 3' 0.11''S	29° 18' 22.96''E

1.3 Project Phases

Please refer to the Surface Water Specialist Report (Report Number: JW126/19/H759-00 – Rev 4) for description of the project phases.

1.4 Watercourse alterations

The powerline will cross the Olifants River (refer to **Figure 1.4**).There are approximately five (5) Mono-poles that will fall within the 1:100 year floodlines of the Olifants River, two (2) Mono-poles that will fall on the 1:100 year floodlines and one (1) Mono-pole that lies outside the 1:100 year floodlines.

No physical watercourse alterations have been planned. However, it is important to note that South32 is in the process of updating these floodlines as the available floodlines for the area is more than 5 years old.

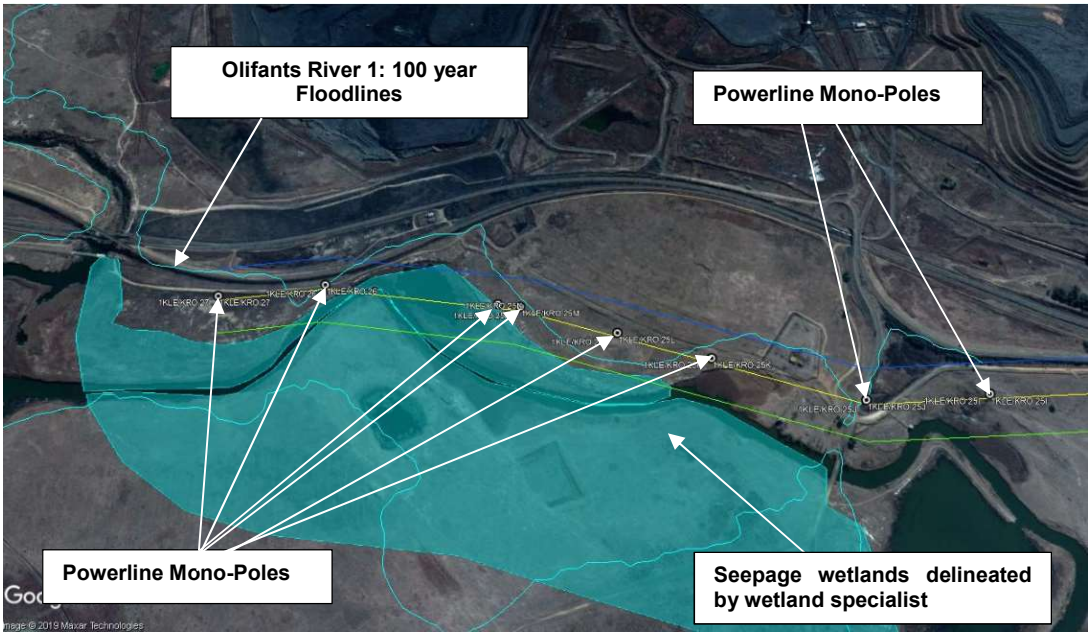

Figure 3.4: Position of mono-poles in relation to 1:100 year floodline

2. IMPACT ASSESSMENT

2.1 Impact assessment methodology and rating system

Please refer to the Surface Water Specialist Report (Report Number: JW126/19/H759-00 – Rev 4) for the methodology used.

2.2 Activities to be undertaken for the Powerline Project that could potentially affect surface water

Please refer to the Surface Water Specialist Report (Report Number: JW126/19/H759-00 – Rev 4) for the description of activities assessed.

2.3 Surface water impact assessment and mitigation measures

2.3.1 Construction Phase

2.3.1.1 Surface water quality

Please refer to the Surface Water Specialist Report (Report Number: JW126/19/H759-00 – Rev 4) for description of the impacts on surface water quality.

2.3.1.2 Surface water quantity– catchment yield and flow rates

No water will be retained on site during the construction phase. All storm water will be allowed to run off the Mono-pole construction sites, with only temporary retention for silt management, if required.

There are approximately five (5) Mono-poles that will fall within the 1:100 year floodlines of the Olifants River and two (2) Mono-poles that will fall on the 1:100 year floodlines, that will require management measures to be put in place to ensure minimal impact during construction.

2.3.1.3 Mitigation measures

The following mitigation measures are proposed in addition to those proposed in the Surface Water Specialist Report (Report Number: JW126/19/H759-00 – Rev 4):

- Mono-poles that are located within an area that would be expected to become inundated during a 1:100 flood event, or in the riparian zone, must be designed to accommodate at least the 1:100 year flood level and ensure:
    - The area of disturbance is kept to a minimum, especially where the powerline would stretch across the watercourse,
    - The flood level has been taken into account in the design parameters as well as materials of the Mono-poles to ensure sustainability,
    - Construction should be immediately followed by rehabilitation,
    - Storm water management and erosion control measures should be implemented,
    - A construction method statement must be compiled and approved prior to the commencement of construction activities in these areas.
- No Mono-poles must be located within the delineated extent of watercourses/ seepage areas as delineated by the wetland specialist, unless authorised.

2.3.1.4 Impact Rating

Please refer to the Surface Water Specialist Report (Report Number: JW126/19/H759-00 – Rev 4) for more detail. The impact rating is provided in **Table 2.3.a**.

Table 2.3.a: Rating of Construction Phase impacts

ACTIVITY	ASPECT AFFECTED	POTENTIAL IMPACT	PRE-MITIGATION	Score	Rating	MITIGATION	POST-MITIGATION	Score	Rating
Clearance of vegetation, stripping of topsoil and civil works (earthworks)	Surface water quality	Erosion of topsoil on areas cleared or disturbed around the pylon sites, including access routes, with resultant increased suspended solids, as well as siltation in watercourses.	Significance	2	1.20	See JW126/19/H759-00 – Rev 4	Significance	2	0.80
			Magnitude - Spatial	2			Magnitude - Spatial	2	
			Magnitude - Temporal	2			Magnitude - Temporal	2	
			Probability	3			Probability	2	
Movement and servicing of construction vehicles during construction	Surface water quality	Hydrocarbon spillages from fuel storage, servicing areas or construction equipment itself, with resultant elevated hydrocarbon concentrations in runoff water and watercourses.	Significance	2	1.20	See JW126/19/H759-00 – Rev 4	Significance	2	0.40
			Magnitude - Spatial	2			Magnitude - Spatial	2	
			Magnitude - Temporal	2			Magnitude - Temporal	2	
			Probability	3			Probability	1	
Casting of concrete at foundations	Surface water quality	Concrete spillage from casting of foundations resulting in water quality deterioration	Significance	1	0.80	See JW126/19/H759-00 – Rev 4	Significance	1	0.53
			Magnitude - Spatial	1			Magnitude - Spatial	1	
			Magnitude - Temporal	2			Magnitude - Temporal	2	
			Probability	3			Probability	2	
Waste management during all construction activities	Surface water quality	Contamination of water resources due to spillage of construction material and waste into watercourse and/or poor management of sewerage waste at construction sites	Significance	2	0.40	See JW126/19/H759-00 – Rev 4	Significance	2	0.40
			Magnitude - Spatial	2			Magnitude - Spatial	2	
			Magnitude - Temporal	2			Magnitude - Temporal	2	
			Probability	1			Probability	1	
Implementation of stormwater management measures at construction sites	Surface water quantity	Containment of contaminated runoff water emanating from the site, with no release to the catchment.	Significance	2	1.20	See JW126/19/H759-00 – Rev 4	Significance	2	0.80
			Magnitude - Spatial	2			Magnitude - Spatial	2	
			Magnitude - Temporal	2			Magnitude - Temporal	2	
			Probability	3			Probability	2	

ACTIVITY	ASPECT AFFECTED	POTENTIAL IMPACT	PRE-MITIGATION	Score	Rating	MITIGATION	POST-MITIGATION	Score	Rating
Location of mono poles	Surface water quantity	Damage to poles if inundated	Significance	2	1.20	Mono-poles must be designed to accommodate at least the 1:100 year flood level and ensure	Significance	2	0.80
			Magnitude - Spatial	2			Magnitude - Spatial	2	
			Magnitude - Temporal	2			Magnitude - Temporal	2	
			Probability	3			Probability	2	

2.3.2 Operational Phase

2.3.2.1 Surface water quality

Please refer to the Surface Water Specialist Report (Report Number: JW126/19/H759-00 – Rev 4) for description of the impacts on surface water quality.

2.3.2.2 Surface water quantity

All storm water will be allowed to drain freely under the powerline and no surface water quantity impacts are expected during the operational phase.

At the five (5) Mono-poles that will fall within the 1:100 year floodlines of the Olifants River and two (2) Mono-poles that will fall on the 1:100 year floodlines, management measures will need to be put in place to ensure minimal impact during operational phase.

2.3.2.3 Mitigation measures

The following mitigation measures are proposed in addition to those proposed in the Surface Water Specialist Report (Report Number: JW126/19/H759-00 – Rev 4):

- Mono-poles that are located within an area that would be expected to become inundated during a 1:100 flood event, or in the riparian zone, must be designed to accommodate at least the 1:100 year flood level.

2.3.2.4 Impact Rating

Please refer to the Surface Water Specialist Report (Report Number: JW126/19/H759-00 – Rev 4) for more detail. The impact rating is provided in **Table 2.3.b**.

2.3.3 Decommissioning Phase

Please refer to the Surface Water Specialist Report (Report Number: JW126/19/H759-00 – Rev 4) for more detail. The impact rating is provided in **Table 2.3.c**.

2.3.4 Post closure Phase

On the assumption that adequate rehabilitation will be implemented during the decommissioning phase, no impacts are expected during the post closure phase.

Table 2.3.b: Rating of Operational Phase impacts

ACTIVITY	ASPECT AFFECTED	POTENTIAL IMPACT	PRE-MITIGATION	Score	Rating	MITIGATION	POST-MITIGATION	Score	Rating
Maintenance activities resulting in poor quality runoff due to contact of the storm water with hydrocarbons and waste material.	Surface water quality	Hydrocarbon spills that discharge from the site, with resultant deterioration in water quality due to increase in suspended solids and hydrocarbons (oils and greases).	Significance	2	0.67	See JW126/19/H759-00 – Rev 4	Significance	2	0.33
			Magnitude - Spatial	2			Magnitude - Spatial	2	
			Magnitude - Temporal	1			Magnitude - Temporal	1	
			Probability	2			Probability	1	
Location of mono poles	Surface water quantity	Damage to poles if inundated	Significance	2	1.20	The mono poles should be designed to accommodate at least the 1:100 year flood level.	Significance	2	0.80
			Magnitude - Spatial	2			Magnitude - Spatial	2	
			Magnitude - Temporal	2			Magnitude - Temporal	2	
			Probability	3			Probability	2	

Table 2.3.c: Rating of Decommissioning Phase impacts

ACTIVITY	ASPECT AFFECTED	POTENTIAL IMPACT	PRE-MITIGATION	Score	Rating	MITIGATION	POST-MITIGATION	Score	Rating
Removal of powerline and rehabilitation of the disturbed area	Surface water quality	Erosion of topsoil on areas cleared or disturbed around the mono pole sites, including access routes, with resultant increased suspended solids, as well as siltation in watercourses. Erosion due to poor rehabilitation standard with resultant increased suspended solids, as well as siltation in watercourses.	Significance	2	1.20	See JW126/19/H759-00 – Rev 4	Significance	2	0.80
			Magnitude - Spatial	2			Magnitude - Spatial	2	
			Magnitude - Temporal	2			Magnitude - Temporal	2	
			Probability	3			Probability	2	
Movement and servicing of construction vehicles during the demolition of the pylons and associated support structures	Surface water quality	Hydrocarbon spillages from fuel storage, servicing areas or construction equipment, with resultant elevated hydrocarbon concentrations in runoff water and watercourses.	Significance	2	1.20	See JW126/19/H759-00 – Rev 4	Significance	2	0.40
			Magnitude - Spatial	2			Magnitude - Spatial	2	
			Magnitude - Temporal	2			Magnitude - Temporal	2	
			Probability	3			Probability	1	
Implementation of stormwater management measures at demolition sites	Surface water quantity	Containment of contaminated runoff water emanating from the site, with no release to the catchment.	Significance	2	1.20	See JW126/19/H759-00 – Rev 4	Significance	2	0.80
			Magnitude - Spatial	2			Magnitude - Spatial	2	
			Magnitude - Temporal	2			Magnitude - Temporal	2	
			Probability	3			Probability	2	

3. CONCLUSION AND RECOMMENDATION

The proposed re-location of the Kromfontein 132kV powerline to an alignment within the current Mining Rights Boundary of the Wolvekrans Colliery, is expected to have a low to very low impact after mitigation measures have been implemented. The main potential impact is during the construction phase, but these impacts can be minimised through the implementation of the proposed mitigation measures.

It is important to note that there are five (5) Mono-poles that will fall within the 1:100 year floodlines of the Olifants River and two (2) Mono-poles that will fall on the 1:100 year floodlines. Management measures as proposed in this technical report as well as Surface Water Specialist Report (Report Number: JW126/19/H759-00 – Rev 4) will need to be put in place to ensure minimal impact. These structures must be designed to accommodate at least the 1:100 year flood level.

On the assumption that adequate rehabilitation will be implemented during the decommissioning phase, no impacts are expected during the post closure phase.

Therefore, the main concerns with regard to the powerline project's surface water impacts revolve around the effective water management during the construction phase and maintenance during the operational phase.

Effective management through the minimisation of disturbed areas and designation of "no-go" zones for construction and maintenance vehicles in close proximity to watercourses is essential in order to keep the impact on the clean catchment minimal.

Due to the close proximity of the powerline to watercourses and the fact that some of the Mono-Poles will be located within the regulated area (i.e. within 500 m of delineated watercourses), the development of the powerline will be a section 21(c) and (i) water use. The water uses should be authorised in terms of the National Water Act, 1998 (Act 36 of 1998) before construction commences. It is anticipated that the water use activities could be authorised in terms of the General Authorisation (GA) for 21(c) and (i) water use as promulgated in GNR 509 of 2016. This should be confirmed through a risk assessment process by a suitably qualified wetland specialist as required in terms of the GA.

Yours faithfully

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