Proposed upgrading of the 66 kV network to a 132 kV network in the Hotazel, Kuruman and Kathu area

Ga-Segonyana -, Joe Morolong - and Gamagara Local Municipalities, John Taolo Gaetsewe District Municipality, Northern Cape Province

Farm: Existing servitude

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Palaeontological Impact Assessment: Addendum CaseID 11967

Facilitated by: Zitholele Consulting

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Tel: 011 207 2060

2018/08/16

Ref: DEA 14/12/16/3/3/1/1367

B. Executive summary

Outline of the development project: Zitholele Consulting has facilitated the appointment of Dr H. Fourie, a palaeontologist, to undertake a Paleontological Impact Assessment (PIA), Phase 1: Field Study of the suitability of the Proposed upgrading of the 66 kV network to a 132 kV network in the Hotazel, Kuruman and Kathu area, Ga-Segonyana -, Joe Morolong – and Gamagara Local Municipalities, in the John Taolo Gaetsewe District Municipality, Northern Cape Province.

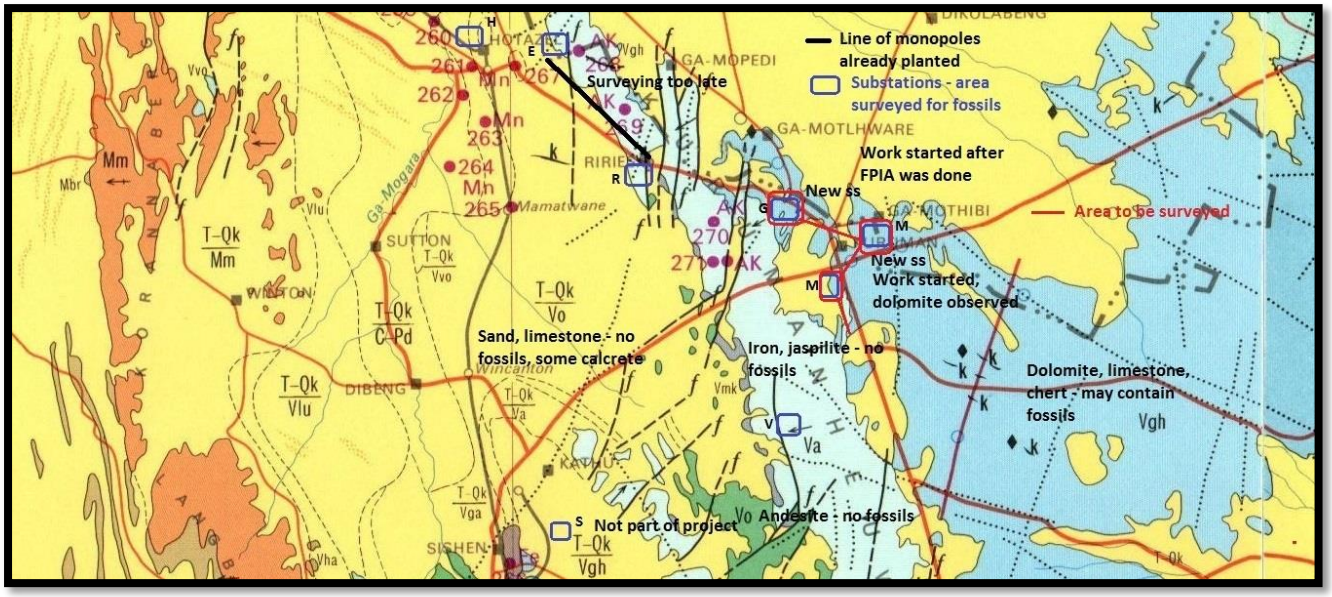
The applicant, Eskom Holdings SOC Limited proposes to upgrade the 66 kV line to a 132 kV power line in the existing servitude.

The Project includes several Alternatives (see Figure 1):
Up to four Alternatives were considered for each section and the Preferred Alternatives between substations are:
Alternative 1: Pink line.
Alternative 3: Orange line.
Alternative 4: Blue line.
Alternatives have already been granted authorisation. There are six Substations planned of which two will be new and four will be extended adjacent to its present locality or upgraded.

This report serves as an addendum to the Field Assessment report it aims to give more information on the site visit.

Outline of the geology and the palaeontology:
The geology was obtained from map 1:100 000, Geology of the Republic of South Africa (Visser 1984).

Figure 1: The geology of the development area.



Legend to Map and short explanation.
T-Qk/Vo – Sand, limestone (yellow). Kalahari Group with a sub outcrop of Vo below.
Vmk – Diamictite, jaspilite, sandstone (dark purple). Makganyeni Formation, Griqualand West Basin, Transvaal Supergroup.
Va – Jaspilite (light blue). Asbestos Hills (Iron Formation), Griquatown Group, Griqualand West Basin, Transvaal Supergroup.

Vgh – Dolomite, limestone, chert (blue). Ghaap Plateau Formation, Campbell Group, Griqualand West Basin, Transvaal Supergroup.
Vo – Andesite (green). Ongeluk Formation, Cox Group, Griqualand West Basin, Transvaal Supergroup.
---f--- – (black) Fault.
……. – Lineament.
□ – Approximate position of Substations with letters indicating which one.

Mining Activities
AK – Crocodolite Fe – Iron Mn – Manganese.

Summary of findings: The Palaeontological Impact Assessment: Phase 1: Field Study was undertaken in March 2018 in the summer in wet and hot conditions (Appendix 6 of Act, 1(d)), and the following is reported:

The development is taking place on the Kalahari Group (T-Qk) with underlying Griqualand West Basin rocks, Transvaal Supergroup of Vaalian age.

The Kalahari deposits extend in age down to at least the Late and probably the Early Tertiary (65 million years ago). Fossils are scarce, and are of terrestrial plants and animals with close affinity to living forms. Included in the Kalahari Group are the Quaternary alluvium, terrace gravels, surface limestone, silcrete, and aeolian sand. Four major types of sands have been delineated (Kent 1980).

The alluvium sands were deposited by a river system and reworked by wind action (Snyman 1996). A thick cover of Kalahari reddish sand blankets most outcrops and is dominated by the typical Kalahari thornveld (Norman and Whitfield 2006). The Kalahari Group is underlain by the Uitenhage and Zululand Groups (McCarthy and Rubidge 2005).

The Griqualand West Basin, Transvaal Supergroup consists mainly of sediments of chemical origin together with lavas and subordinate clastic sediments. The basal unit, the Vryburg Formation lies unconformably on the granite and rocks of the Ventersdorp Supergroup. It is followed by the Campbell Group which consists of the Schmidtsdrif Formation and the upper Ghaap Plateau Formation. There are also two formations in the Griquatown Group, namely, the Asbestos Hills and Koegas Formations. The Gamagara Formation follows and is located on the Maremane Anticline, it is overlain by the Makganyene Formation. The Cox Group consists of the lower Ongeluk Formation and the upper Voëlwater Formation. It attains a maximum thickness of 4500 m (Kent 1980, Snyman 1996).

Fossils in South Africa mainly occur in rocks of sedimentary nature and not in rocks from igneous or metamorphic nature. Therefore, the palaeontological sensitivity can generally be LOW to VERY HIGH, and here locally **HIGH** for the Kalahari Group and **MODERATE** for the Griqualand West rocks (SG 2.2 SAHRA APMHOB, 2012) (Groenewald and Groenewald 2014).

Recommendation:
The impact of the development on fossil heritage is **HIGH and MODERATE** and therefore a field survey or further mitigation or conservation measures were necessary for this development (according to SAHRA protocol). A Phase 1 Palaeontological Impact Assessment was done. Fossils were not found during the walk through.

Table 1: Criteria used (Fossil Heritage Layer Browser/SAHRA):

Rock Unit	Significance/vulnerability	Recommended Action
Kalahari Group	High	Desktop study is required and based on the outcome of the desktop study, a field assessment is likely
Griqualand West Basin	Moderate	Desktop study is required

The Kalahari Group is present here in the development area. Groenewald & Groenewald (2014) rates this Group as having a high palaeontological significance due to the significant fossil remains of Cenozoic aged terrestrial organisms that have been recorded from the sedimentary rocks. These fossils are important indicators of palaeo-environmental conditions. Therefore a **HIGH** status is allocated, however, this area was found not to be palaeontologically sensitive.

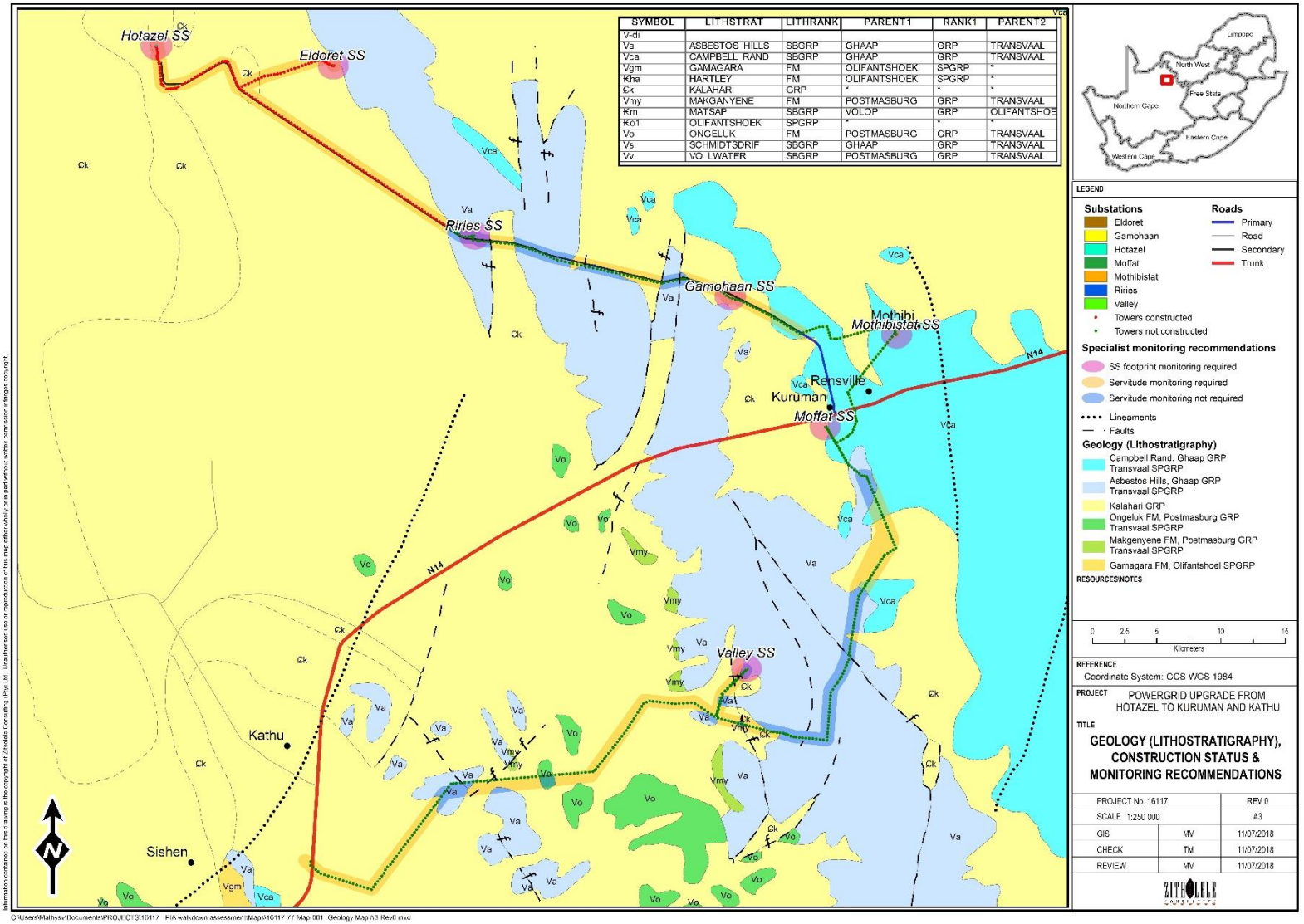
Concerns/threats to be added to the EMPr (1g,1ni,1nii,1o,1p):

1. The overburden and inter-burden must always be surveyed for fossils. Special care must be taken during the digging, drilling, blasting and excavating of foundations, trenches, channels and footings and removal of overburden not to intrude fossiliferous layers.
2. Threats are earth moving equipment/machinery (front end loaders, excavators, graders, dozers) during construction, the sealing-in, disturbance, damage or destruction of the fossils by development, vehicle traffic and human disturbance.

The recommendations are:

1. Mitigation is needed if fossils are found, permission needed from SAHRA.
2. No consultation with parties was necessary.
3. The development may go ahead with caution, but the ECO must survey for fossils before or after blasting or excavating in line with the legally binding Environmental Management Programme (EMPr) this must be updated to include the involvement of a palaeontologist/ archaeozoologist when necessary.
4. The EMPr already covers the conservation of heritage and palaeontological artefacts that may be exposed during construction activities. The protocol is to immediately cease all construction activities if a fossil is unearthed, a buffer of 30 m must be established, and contact SAHRA for further investigation. It is recommended that the EMPr be updated to include the involvement of a palaeontologist / archaeozoologist (pre-construction training of ECO) and **during the digging and excavation phase of the development the ECO must visit the site bi-weekly for monitoring and to keep a photographic record. A palaeontologist / archaeozoologist does not need to monitor the excavations.**
5. Care must be taken during the Dolomite Risk Assessment according to SANS 1936-1 (2012) as stromatolites may be present.
6. Authorisation has already been granted in 2015 and construction has begun.

Figure 2: Geology of the area

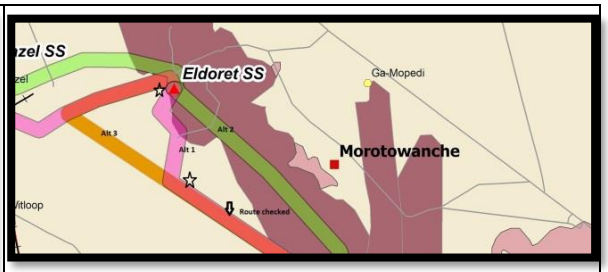


Legend on Map. Please note that a high resolution A3 map of Figure 2 and zoomed maps is included as an appendix to this report.

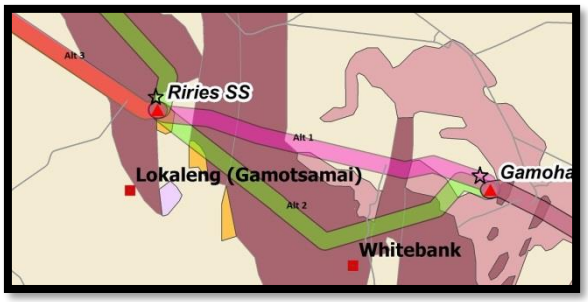
Field Observations:
I apologise for the lack of photographs and information in the Field Assessment report, herewith.

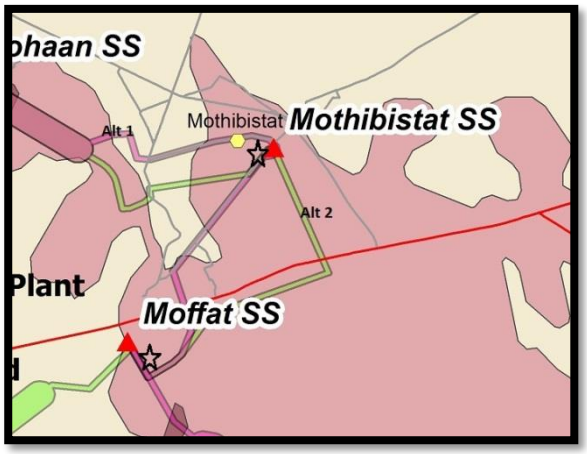
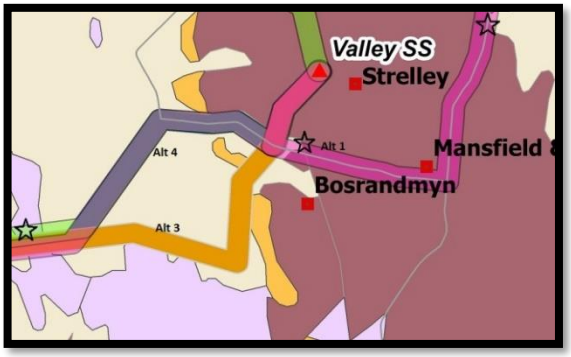
The building or moving of the substations will have a greater impact on the Palaeontological Heritage than the planting of the monopoles. Only Mothibistat substation was being built and one monopole was being planted at the time of the site visit. The site visit was done pre-construction. Workers were not present on-site. There is a small section that still needs monitoring (area to be surveyed) by the ECO as indicated on Figure 1 in red as these have a **MODERATE** impact. The Kalahari Group in this project area did not yield any outcrops or fossils, it is mostly sand and small pieces of scattered calcrete. Site visits to Morokweng and Hotazel, also T-Qk, have also yielded no fossils. Document SAHRA 7/6/9/2/1 only requires track records/logs from archaeologists not palaeontologists. Palaeontologists concentrate on outcrops, if none then it is not recorded on a GPS. Isolated occurrences of rocks do not constitute an outcrop.

Figure 3: Table with walk down photographs and maps (Also refer to Figure 1). Stars represent areas that were surveyed (*).

	
The walk down was started at the Hotazel end. The first stop was at the already planted monopoles on route to Eldoret SS from Riries SS.	Kalahari Group. Arrow points to monopole that was not planted yet. This area does not need monitoring.

	The calcrete is only present from 0 – 1.7 m. This calcrete can be put aside for the ECO. Foundation 3m x 3m x 3m. It may be too late to check the spoil heap. The soil around all the other monopoles as on photograph above have been evened out or removed.
It does not make sense to walk the route as Eskom has not yet plotted the route on ground so the general area was assessed, the pit results are in Section E.	Kalahari Group. The general area geology confirms the geology on the geological map.
	The National Working Database for palaeontological collections lists no fossil localities close by or in the vicinity. The Kalahari Group areas do not need monitoring. It lacks outcrops.
Calcrete found on site.	Kalahari Group.
	
Already dug hole for monopole, still on route to Eldoret SS. Work is complete till about 2km from Riries SS.	Line of monopoles inspected.

	This area was surveyed and no outcrops or fossils were located. The area is strewn with small rocks.
Eldoret SS – expansion will be on the area in the foreground. Work has not started here.	Asbestos Hills and Kalahari Group.
	
Riries SS – no further action required. Work has not started yet.	Asbestos Hills Formation. No further action required.
	Work has commenced here since the FPIA and this needs to be monitored as dolomites may be present. The ECO is responsible for this.
Gamohaan SS – general area, no dolomite observed, chert is present. Work has not started yet at time of FPIA.	Ghaap Plateau.
Photographs were not taken everywhere as no fossils were found. Alternative 2 is not preferred by ESKOM, but it will have less of an impact.	No construction work has commenced on the other monopole lines.

	(Courtesy F. Ludeke). Dolomites are present here, the ECO must monitor the excavations and check for stromatolites in the dolomites.
Mothibistat SS – Dolomite was observed in this area, but no fossils. Work has commenced.	Ghaap Plateau.
	
Moffat SS – general area. Construction has not started yet.	Kalahari Group and Ghaap Plateau. The line from Gamohaan ss to Mothibistat ss and then to Moffat ss must be monitored during excavation. As well as the construction of the substations, whether new or being moved.
	
Valley SS – no further action required. From here the existing corridor will be used and the farmer did not grant permission for a site visit. Construction has not started yet.	Asbestos Hills Formation. No need for a survey.

	The existing power line will remain.
Last stop. Kuruman to Kathu section, densily vegetated. Power line and corridor in back ground.	

Hotazel Substation: Present on the sands of the Kalahari Group. This substation will not expand beyond its perimeter and therefore the construction will have zero impact on the Heritage.

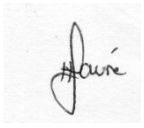
Declaration (Disclaimer) (1b)

I, Heidi Fourie, declare that I am an independent consultant and have no business, financial, personal or other interest in the proposed development project for which I was appointed to do a palaeontological assessment. There are no circumstances that compromise the objectivity of me performing such work.

I accept no liability, and the client, by receiving this document, indemnifies me against all actions, claims, demands, losses, liabilities, costs, damages and expenses arising from or in connection with services rendered, directly or indirectly by the use of the information contained in this document.

It may be possible that the Addendum study may have missed palaeontological resources in the Project Area as the presence of outcrops are not known and may only be found once development commences.

This report may not be altered in any way and any parts drawn from this report must make reference to this report.



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Heidi Fourie
2018/08/16

Appendix A: A3 geological map (Full extent), including 3 x A3 maps of zoomed in sections

SYMBOL	LITHSTRAT	LITHRANK	PARENT1	RANK1	PARENT2
V-di					
Va	ASBESTOS HILLS	SBGRP	GHAAP	GRP	TRANSVAAL
Vca	CAMPBELL RAND	SBGRP	GHAAP	GRP	TRANSVAAL
Vgm	GAMAGARA	FM	OLIFANTSHOEK	SPGRP	*
Kha	HARTLEY	FM	OLIFANTSHOEK	SPGRP	*
Ck	KALAHARI	GRP	*	*	*
Vmy	MAKGANYENE	FM	POSTMASBURG	GRP	TRANSVAAL
Km	MATSAP	SBGRP	VOLOP	GRP	OLIFANTSHOE
Ko1	OLIFANTSHOEK	SPGRP	*	*	*
Vo	ONGELUK	FM	POSTMASBURG	GRP	TRANSVAAL
Vs	SCHMIDTSDRIF	SBGRP	GHAAP	GRP	TRANSVAAL
Vv	VO LWATER	SBGRP	POSTMASBURG	GRP	TRANSVAAL

LEGEND

Substations
- Eldoret
- Gamohaan
- Hotazel
- Moffat
- Mothibistat
- Riries
- Valley
- Towers constructed
- Towers not constructed

Roads
- Primary
- Road
- Secondary
- Trunk

Specialist monitoring recommendations
- SS footprint monitoring required
- Servitude monitoring required
- Servitude monitoring not required
- Lineaments
- Faults

Geology (Lithostratigraphy)
- Campbell Rand, Ghaap GRP Transvaal SPGRP
- Asbestos Hills, Ghaap GRP Transvaal SPGRP
- Kalahari GRP
- Ongeluk FM, Postmasburg GRP Transvaal SPGRP
- Makgenyene FM, Postmasburg GRP Transvaal SPGRP
- Gamagara FM, Olifantshoel SPGRP

RESOURCES\NOTES

0 2.5 5 10 15
Kilometers

REFERENCE
Coordinate System: GCS WGS 1984

PROJECT
POWERGRID UPGRADE FROM HOTAZEL TO KURUMAN AND KATHU

TITLE
GEOLOGY (LITHOSTRATIGRAPHY), CONSTRUCTION STATUS & MONITORING RECOMMENDATIONS

PROJECT No. 16117		REV 0
SCALE 1:250 000		A3
GIS	MV	11/07/2018
CHECK	TM	11/07/2018
REVIEW	MV	11/07/2018

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SYMBOL	LITHSTRAT	LITHRANK	PARENT1	RANK1	PARENT2
V-di					
Va	ASBESTOS HILLS	SBGRP	GHAAP	GRP	TRANSVAAL
Vca	CAMPBELL RAND	SBGRP	GHAAP	GRP	TRANSVAAL
Vgm	GAMAGARA	FM	OLIFANTSHOEK	SPGRP	*
Kha	HARTLEY	FM	OLIFANTSHOEK	SPGRP	*
Ck	KALAHARI	GRP	*	*	*
Vmy	MAKGANYENE	FM	POSTMASBURG	GRP	TRANSVAAL
Km	MATSAP	SBGRP	VOLOP	GRP	OLIFANTSHOE
Ko1	OLIFANTSHOEK	SPGRP	*	*	*
Vo	ONGELUK	FM	POSTMASBURG	GRP	TRANSVAAL
Vs	SCHMIDTSDRIF	SBGRP	GHAAP	GRP	TRANSVAAL
Vv	VO LWATER	SBGRP	POSTMASBURG	GRP	TRANSVAAL

Hotazel SS

Eldoret SS

Riries SS

Ck

Va

Vca

LEGEND

Substations
- Eldoret
- Hotazel
- Riries
- Towers constructed
- Towers not constructed

Roads
- Secondary

Specialist monitoring recommendations
- SS footprint monitoring required
- Servitude monitoring required
- Servitude monitoring not required

- Lineaments
- Faults

Geology (Lithostratigraphy)
- Campbell Rand, Ghaap GRP Transvaal SPGRP
- Asbestos Hills, Ghaap GRP Transvaal SPGRP
- Kalahari GRP

RESOURCES\NOTES

PART 1 OF 3:
HOTAZEL-ELDORET-RIRIES SS

0 1 2 4 6 8
Kilometers

REFERENCE
Coordinate System: GCS WGS 1984

PROJECT
POWERGRID UPGRADE FROM HOTAZEL TO KURUMAN AND KATHU

TITLE
GEOLOGY (LITHOSTRATIGRAPHY), CONSTRUCTION STATUS & MONITORING RECOMMENDATIONS

PROJECT No. 16117		REV 0
SCALE 1:125 000		A3
GIS	MV	11/07/2018
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REVIEW	MV	11/07/2018

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SYMBOL	LITHSTRAT	LITHRANK	PARENT1	RANK1	PARENT2
V-di					
Va	ASBESTOS HILLS	SBGRP	GHAAP	GRP	TRANSVAAL
Vca	CAMPBELL RAND	SBGRP	GHAAP	GRP	TRANSVAAL
Vgm	GAMAGARA	FM	OLIFANTSHOEK	SPGRP	*
Kha	HARTLEY	FM	OLIFANTSHOEK	SPGRP	*
Ck	KALAHARI	GRP	*	*	*
Vmy	MAKGANYENE	FM	POSTMASBURG	GRP	TRANSVAAL
Km	MATSAP	SBGRP	VOLOP	GRP	OLIFANTSHOE
Ko1	OLIFANTSHOEK	SPGRP	*	*	*
Vo	ONGELUK	FM	POSTMASBURG	GRP	TRANSVAAL
Vs	SCHMIDTSDRIF	SBGRP	GHAAP	GRP	TRANSVAAL
Vv	VO LWATER	SBGRP	POSTMASBURG	GRP	TRANSVAAL

LEGEND

Substations
- Gamohaan
- Moffat
- Mothibistat
- Valley
- Towers not constructed

Roads
- Primary
- Secondary
- Trunk

Specialist monitoring recommendations
- SS footprint monitoring required
- Servitude monitoring required
- Servitude monitoring not required

- Lineaments
- Faults

Geology (Lithostratigraphy)
- Campbell Rand, Ghaap GRP Transvaal SPGRP
- Asbestos Hills, Ghaap GRP Transvaal SPGRP
- Kalahari GRP
- Ongeluk FM, Postmasburg GRP Transvaal SPGRP
- Makgenyene FM, Postmasburg GRP Transvaal SPGRP

RESOURCES\NOTES

PART 2 OF 3:
GAMOHAAN-MOTHIBISTAT-MOFFAT SS

0 1 2 4 6 8
Kilometers

REFERENCE
Coordinate System: GCS WGS 1984

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POWERGRID UPGRADE FROM HOTAZEL TO KURUMAN AND KATHU

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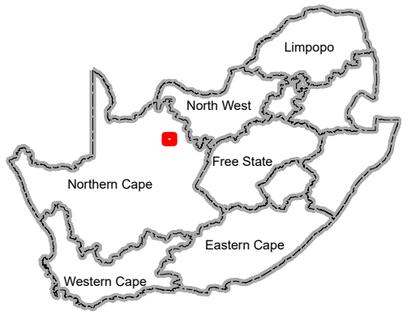
Vca	CAMPBELL RAND	SBGRP	GHAAP	GRP	TRANSVAAL
Vgm	GAMAGARA	FM	OLIFANTSHOEK	SPGRP	*
Ќha	HARTLEY	FM	OLIFANTSHOEK	SPGRP	*
Ċk	KALAHARI	GRP	*	*	*
Vmy	MAKGANYENE	FM	POSTMASBURG	GRP	TRANSVAAL
Ќm	MATSAP	SBGRP	VOLOP	GRP	OLIFANTSHOE
Ќo1	OLIFANTSHOEK	SPGRP	*	*	*
Vo	ONGELUK	FM	POSTMASBURG	GRP	TRANSVAAL
Vs	SCHMIDTSDRIF	SBGRP	GHAAP	GRP	TRANSVAAL
Vv	VO LWATER	SBGRP	POSTMASBURG	GRP	TRANSVAAL



LEGEND

Substations
- Valley
- Towers not constructed

Roads
- Road
- Trunk

Specialist monitoring recommendations
- SS footprint monitoring required
- Servitude monitoring required
- Servitude monitoring not required

- Lineaments
- Faults

Geology (Lithostratigraphy)
- Campbell Rand, Ghaap GRP Transvaal SPGRP
- Asbestos Hills, Ghaap GRP Transvaal SPGRP
- Kalahari GRP
- Ongeluk FM, Postmasburg GRP Transvaal SPGRP
- Makgenyene FM, Postmasburg GRP Transvaal SPGRP

RESOURCES\NOTES

PART 3 OF 3:
MOFFAT-VALLEY SS

0 1 2 4 6 8
Kilometers

REFERENCE
Coordinate System: GCS WGS 1984

PROJECT
POWERGRID UPGRADE FROM HOTAZEL TO KURUMAN AND KATHU

TITLE
GEOLOGY (LITHOSTRATIGRAPHY), CONSTRUCTION STATUS & MONITORING RECOMMENDATIONS

PROJECT No. 16117		REV 0
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CHECK	TM	11/07/2018
REVIEW	MV	11/07/2018

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