



TITLE: PALAEOLOGICALIMPACT ASSESSMENT FOR THE PROPOSED KRONOS-ARIES 765KV TRANSMISSION POWER LINE AND SUBSTATIONS UPGRADE, NORTHERN CAPE PROVINCE

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DECLARATION OF INDEPENDENCE

This report has been compiled by Professor Marion Bamford, lead Palaeontologist for NGT Consulting. The views expressed in this report are entirely those of the author and NGT Consulting no other interest was displayed during the decision making process for the project.

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EXECUTIVE SUMMARY

There is an extremely low chance of finding fossils in the sediments of the Dwyka group because these are deep water marine deposits and there are reports of isolated finds from elsewhere in this stratum. There is a slightly greater chance of fossils occurring in the Prince Albert Formation but again reports are rare. Along watercourses or around pans there is a slight chance of finding Quaternary aged fossils of wood and bones.

Based on the low chance of fossils occurring in the area; it is recommended that once the route has been selected and the sites for road access and excavation of foundations of towers have been determined; a geologist or environmentalist should be engaged to monitor the work. When fossils are found a palaeontologist, should be engaged to check the potential fossils and decide what should be removed and preserved (with the relevant permit from SAHRA or HWC). The rescued fossils would then be housed and catalogued in a recognized institution such as the McGregor Museum in Kimberley or Iziko Museum in Cape Town.

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1. BACKGROUND

Eskom Holding SOC Limited proposes to construct a 765kV transmission power line for the “Proposed Northern Alignment 2 765kV Power Line Project”. A section of this line is to run from the existing Aries Substation southwest of Kenhardt to the Kronos Substation south of the town of Copperton in the Northern Cape Province. The total length of the power line would be approximately 160km. For this purpose; three alternative alignments have been identified, one of which will be selected as the most viable proposition.

The access roads and foundations for the towers are likely to impact on the palaeontological heritage in certain sections of the proposed route but it is anticipated that overall the impact will be minimal.

A broad area between Aries substation (29°29′21.86″S and 20°47′01.49″E) near Kenhardt and Kronos substation (30°01′23.13″S and 22°20′03.82″E) near Copperton (Fig 1) has been assessed for the potential impact of this project.

2. METHODS

Published geological and palaeontological literature, unpublished records and databases were consulted to determine if there are any records of fossils from the sites and the likelihood of any fossils occurring there. The National Heritage Resources Act (Act 25 of 1999) and the National Environmental Management Act (Act 107 of 1998) requires that proposed developments must be preceded by the relevant impact assessment, in this case for palaeontology.

2.2 Stages

1. In order to determine the likelihood of fossils occurring in the affected area geological maps, literature, palaeontological databases and published and unpublished records must be consulted.
2. If fossils are likely to occur then a site visit must be conducted by a qualified palaeontologist to locate and assess the fossils and their importance.
3. Unique or rare fossils should either be collected (with the relevant SAHRA permit) and removed to a suitable storage and curation facility, for example a Museum, University palaeontology department or protected on site.
4. Common fossils can be sacrificed only if they are of minimal or no scientific importance but a representative collection could be made if deemed necessary.

3. A GEOLOGICAL AND PALAEOLOGICAL CONTEXT OF THE SITE

The oldest rocks occurring in the region are near Copperton and Kenhardt and there is a large granite suite covering much of the area of interest. These rocks are either too old to contain body fossils, or are volcanic extrusive rocks that do not contain fossils at all. Algae were present at this time but was rarely preserved in any recognisable form. Furthermore, these rocks of the Brulpan and Areachap Groups are highly altered gneisses and schists and could not preserve fossils even if they were present.

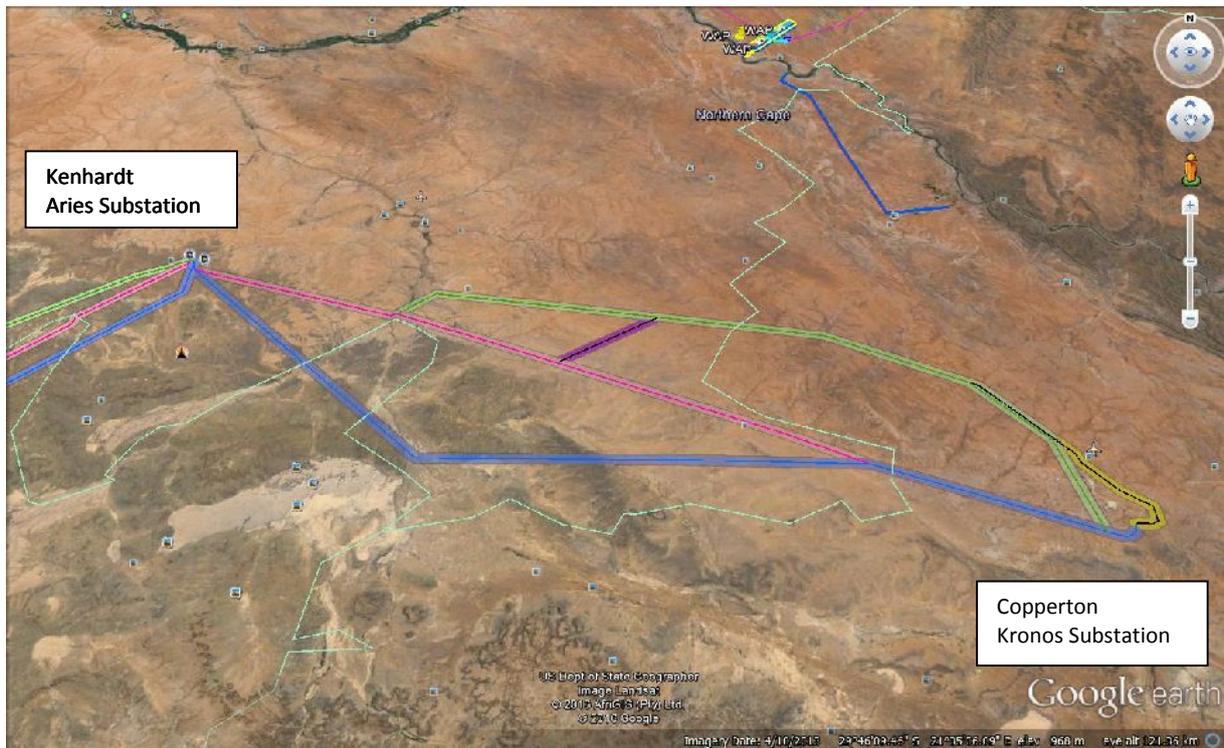


Figure 1 – Google map of the proposed routes and corridor from the existing Aries Substation southwest of Kenhardt to the Kronos Substation south of the town of Copperton in the Northern Cape Province. The total length of the power line would be approximately 160km. For this purpose three alternative alignments have been identified, one of which will be selected as the most viable proposition.

In the central region are sediments of the Karoo Supergroup which are part of the northern section of the main Karoo Basin. However they are from the oldest deposits and from glacial or deep water facies so fossils are very rare.

The Dwyka Group is Late Carboniferous to Early Permian in age and in the northwestern part of the Karoo basin overlies the glaciated Precambrian bedrock (Visser, 1989). It is considered to have been deposited in a marine basin and comprises a number of different lithofacies types, including massive diamictites, stratified diamictites, massive carbonate-rich diamictite facies, conglomerate facies, sandstone, mudrock with stones and mudrock facies. The latter contains rare examples of fossil pollen, spores, plant remains, arthropod and fish trackways (Anderson and McLachlan, 1976; Anderson, 1981). These fossils have been recovered from sites in the southwest of the Karoo basin and northwest near the South African-Namibian border.

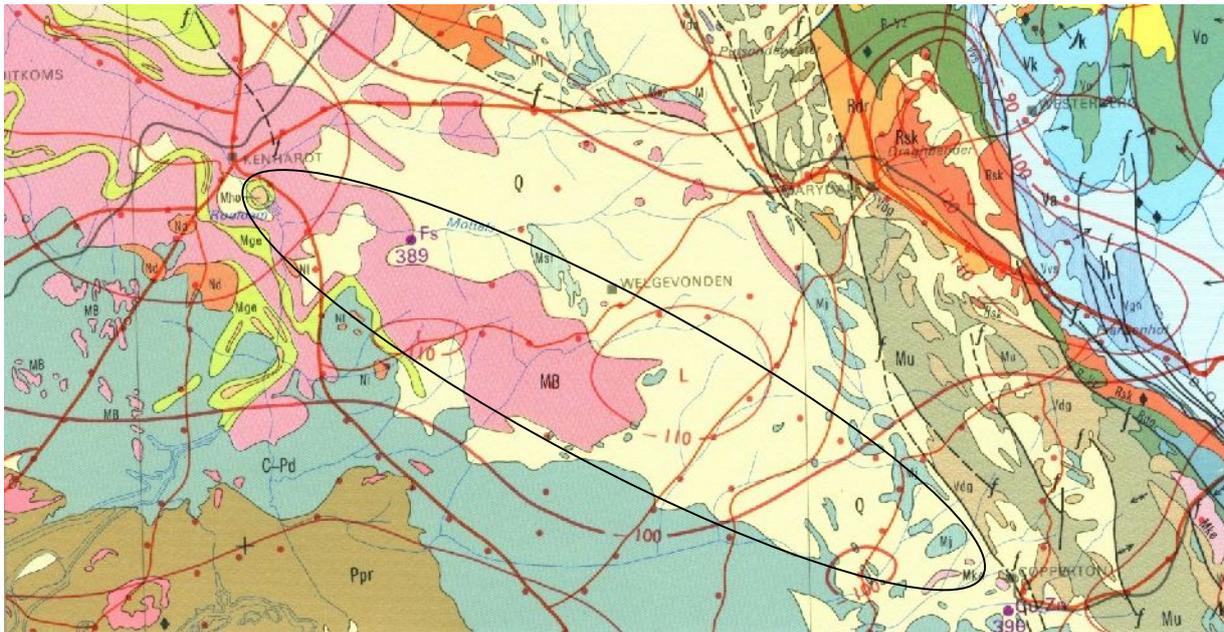


Figure 2 – Geological map of the area between Kenhardt and Copperton between which are the proposed routes for the powerlines indicated by the oval outline. Abbreviations of the rock types are explained in Table 1. Map enlarged from the Geological Survey 1: 1 000 000 map 1984.

Table 1 – Abbreviations for the geological formations, lithology and approximate ages taken from Cornell et al. (2006), Johnson et al. (2006).

Symbol	Group/Formation	Lithology	Approximate Age
Q	Quaternary	Alluvium, sand, silcrete	Quaternary (last 2.5 Ma)
Ppr	Prince Albert Fm, Ecca Group	Shales, mudstones, sandstones	Early Permian
C-Pd	Dwyka Group	Diamictites, tillites, shales	Late Carboniferous-Early Permian
NI	Lat River Granite	Biotite granite	
Nd	De Bakken Granites	Granite porphyry	
Mho	Hooghoor Suite	Pink gneiss	1900, 1600, 1200 Ma
MB	Unnamed granites	Gneiss, granite	
Mke	Granite undifferentiated	granite	1080-1090 Ma
Mj	Jannelsepan Fm, Areachap Group	Ampibolite, calc-silicate rocks	ca 1300 Ma
Msr	Sprigg Fm, Areachap Group	Schist, gneiss, kinzigite	ca 1300 Ma
Mge	Geelvloer Group	Quartzite, calc-silicate rocks	
Vdg	Dagbreek Fm	Schist, quartzite, amphibolite	>1300 Ma
Mu	Uitdraai Fm, Brulpan Group	quartzite	>1300 Ma

The Prince Albert Formation (base of the Ecca Group) is made up of grayish to olive-green micaceous shale and grey silty shale, sandstones and mudrocks. From near Douglas Anderson and McLachlan (1976) have reported marine fossils (cephalopods, lamellibranchs and brachiopods), plant remains, palaeoniscid fish fragments and coprolites. These occurrences are well north of the proposed routes for powerlines.

Quaternary alluvium, sands and silcretes overlie much of the rocks in this central part. While these sediments do not preserve fossils per se they are associated with river gravels, pans, ancient water courses and the like which may preserve isolated patches of fossils. These include silicified wood (for example Miocene woods from the Brandvlei and Sak Rivers to the southwest (Bamford and de Wit, 1993)), vertebrate bones (Kangnaas, Bosluispan) but these sites are well to the south.

4. CONCLUSIONS

There is an extremely low chance of finding fossils in the sediments of the Dwyka group because these are deep water marine deposits and there are reports of isolated finds from elsewhere in this stratum. There is a slightly greater chance of fossils occurring in the Prince Albert Formation but again reports are rare. Along watercourses or around pans there is a slight chance of finding Quaternary aged fossils of wood and bones.

5. RECOMMENDATIONS

Based on the low chance of fossils occurring in the area; it is recommended that once the route has been selected and the sites for road access and excavation of foundations of towers have been determined; a geologist or environmentalist is engaged to monitor the work. If fossil material is found, a palaeontologist should be engaged to check the potential fossils and decide what should be removed and preserved (with the relevant permit from SAHRA or HWC). The rescued fossils would then be housed and catalogued in a recognized institution such as the McGregor Museum in Kimberley or Iziko Museum in Cape Town.

6. REFERENCES

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