HERITAGE IMPACT ASSESSMENT:
PROPOSED 132 KV POWER LINE OVER FARMS 432/REM, 464/1 & 465/REM FOR THE HYPERION HYBRID FACILITY, NORTH OF KATHU, KURUMAN MAGISTERIAL DISTRICT, NORTHERN CAPE

Report for:

Savannah Environmental (Pty) Ltd
P.O. Box 148, Sunninghill, 2157
Tel: 011 656 3237
Email: joanne@savannahsa.com

On behalf of:

Hyperion Solar Hybrid (Pty) Ltd

Dr Jayson Orton
ASHA Consulting (Pty) Ltd
40 Brassie Street, Lakeside, 7945
Tel: (021) 788 1025 | 083 272 3225
Email: jayson@asha-consulting.co.za

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SUMMARY

ASHA Consulting (Pty) Ltd was appointed by Savannah Environmental (Pty) Ltd to conduct an assessment of the potential impacts to heritage resources that might occur through the proposed development of a 132 kV powerline linking the proposed Hyperion Hybrid Facility to the existing Eskom Kalbas Substation located to the north of Kathu. The end points of the proposed powerline are S27° 33′ 08.93″ E23° 03′ 49.68″ and S27° 36′ 05″ E23° 01′ 37″. The line would start on Lyndoch 432/Rem., cross Farm Selsden 464/1, and end on Kathu 465/Rem.

The study area is generally sandy with some calcrete exposed at the surface in the south. Vegetation includes grass, bushes and thorn trees. The site was not subjected to a field survey because good data for the area are already on record and, due to the known sandy surface, it was not expected that a survey would prove useful.

The desktop study revealed that, although fossil localities are unknown in the area aside from Kathu Pan, there is a small chance of finding fossils in the Kalahari Group sediments (calcrete and red aeolian sand). Studies at the northern and southern ends of the proposed corridor have shown that in sandy and calcrete-covered areas archaeological materials are virtually absent from the surface. However, the surface exposure of an area of ironstone gravel with associated artefacts near the northern end of the corridor shows that such material extends beneath the sand cover. It is thus likely that excavations for pylon foundations could intersect the gravel and reveal archaeological materials. Graves are an ever-present but very unlikely type of heritage resource that could be present.

With mitigation, highly significant impacts are not expected. Management of heritage impacts should be easy to effect and, because this will result in low significance impacts – and possibly even some scientific benefits, the project may – from a heritage point of view, be authorised in full.

It is recommended that the proposed development be allowed to proceed but subject to the following recommendations which should be incorporated into the conditions of approval and/or EMPr as required:

- An archaeologist must be appointed to conduct inspections of the pylon foundations;
- The ECO must examine the final alignment prior to the start of construction to determine whether any obvious graves might be present;
- The ECO must monitor the construction phase work for the presence of heritage materials (fossils, stone artefacts, graves); and
- If any palaeontological material, archaeological material or human burials are uncovered during the course of development then work in the immediate area should be halted. The find would need to be reported to the heritage authorities and may require inspection by a palaeontologist or archaeologist. Such heritage is the property of the state and may require excavation and curation in an approved institution.

Glossary

Acheulean: An archaeological name for the period comprising the later part of the Early Stone Age. This period started about 1.7-1.5 million years ago and ended about 250-200 thousand years ago.

Background scatter: Artefacts whose spatial position is conditioned more by natural forces than by human agency.

Doline: a sinkhole caused by collapse of surface sediments into an underground solution cavity.

Early Stone Age: Period of the Stone Age extending approximately between 2 million and 200 000 years ago.

Fauresmith: A period right at the end of the Early Stone Age when very small handaxes were made.

Handaxe: A bifacially flaked, pointed stone tool type typical of the Early Stone Age Acheulian Industry. It is also referred to as a large cutting tool.

Holocene: The geological period spanning the last approximately 10-12 000 years.

Hominid: a group consisting of all modern and extinct great apes (i.e. gorillas, chimpanzees, orangutans and humans) and their ancestors.

Later Stone Age: Period of the Stone Age extending over the last approximately 20 000 years.

Middle Stone Age: Period of the Stone Age extending approximately between 200 000 and 20 000 years ago.

Pleistocene: The geological period beginning approximately 2.5 million years ago and preceding the Holocene.

Abbreviations

APHP: Association of Professional Heritage Practitioners

ASAPA: Association of Southern African Professional Archaeologists

BA: Basic Assessment

BIF: Banded Iron Formation

CRM: Cultural Resources Management

DMR: Department of Mineral Resources

ECO: Environmental Control Officer

ESA: Early Stone Age

GP: General Protection

GPS: global positioning system

HIA: Heritage Impact Assessment

LSA: Later Stone Age

MSA: Middle Stone Age

NBKB: Ngwao-Boswa Ya Kapa Bokoni

NEMA: National Environmental Management Act (No. 107 of 1998)

NHRA: National Heritage Resources Act (No. 25) of 1999

PPP: Public Participation Process

SAHRA: South African Heritage Resources Agency

SAHRIS: South African Heritage Resources Information System

Contents

1. INTRODUCTION

ASHA Consulting (Pty) Ltd was appointed by Savannah Environmental (Pty) Ltd to conduct an assessment of the potential impacts to heritage resources that might occur through the proposed development of a 132 kV powerline linking the proposed Hyperion Hybrid Facility to the existing Eskom Kalbas Substation located to the north of Kathu (Figures 1 & 2). The end points of the proposed powerline are S27° 33' 08.93" E23° 03' 49.68" and S27° 36' 05" E23° 01' 37" and the line would start on Lyndoch 432/Rem., cross Farm Selsden 464/1, and end on Kathu 465/Rem.

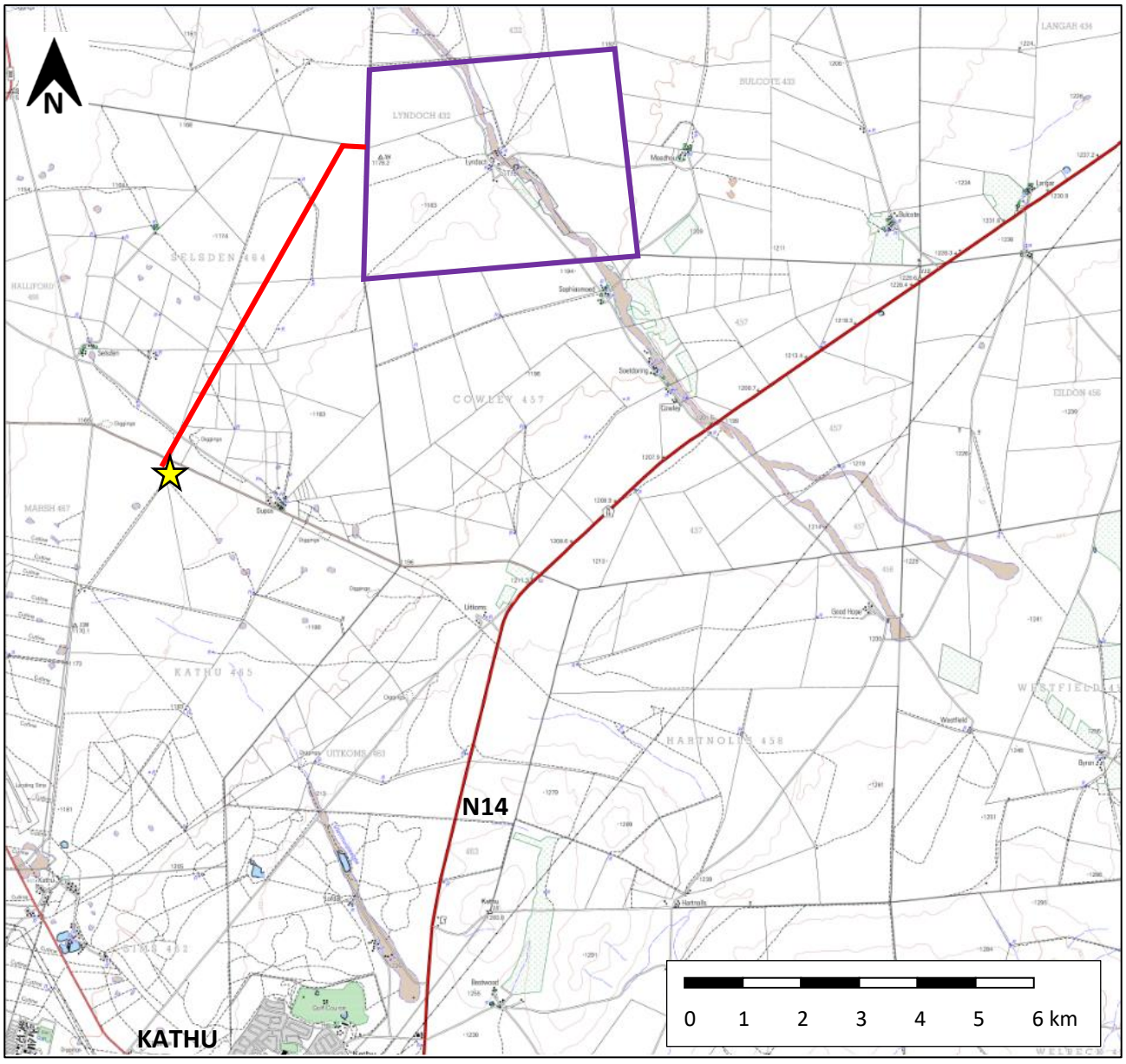

Figure 1: *Extract from 1:50 000 topographic map 2723CA showing the location of the proposed Hyperion Hybrid Facility(purple polygon), the existing Kalbas Substation (yellow star) and the currently proposed 132 kV power line (red line) relative to the town of Kathu in the south. Source of basemap: Chief Directorate: National Geo-Spatial Information. Website: www.ngi.gov.za.*

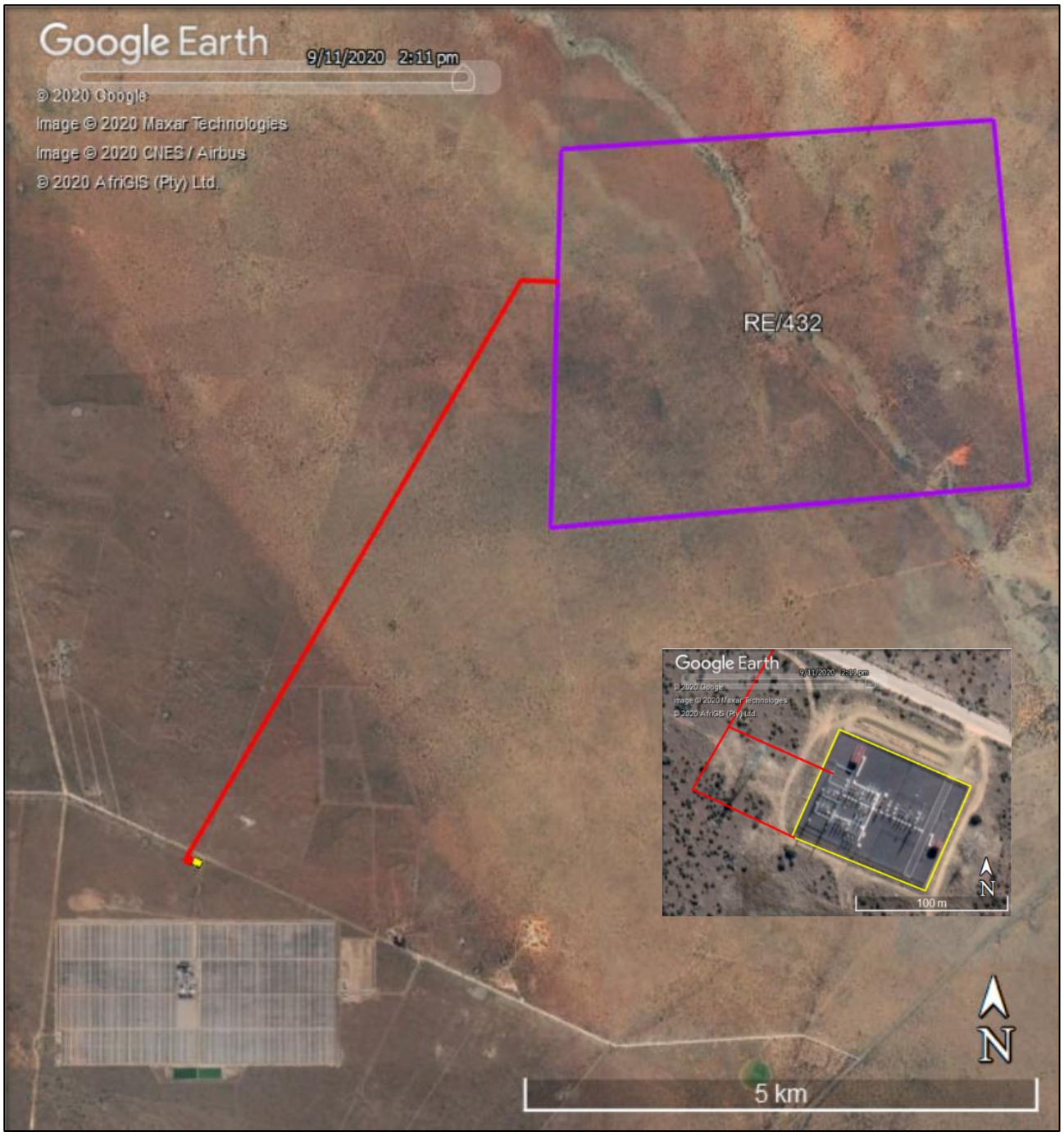

Figure 2: *Aerial view of the study area showing the location of the authorised Hyperion Hybrid Facility (purple polygon), the existing Kalbas Substation (yellow polygon) and the currently proposed 132 kV power line (red line). The inset shows the Kalbas Substation connection.*

1.1. The proposed project

1.1.1. Project description

Hyperion Solar Hybrid (Pty) Ltd is proposing to construct a 132 kV overhead powerline between the on-site substation at the proposed Hyperion Hybrid Facility and the existing Eskom Kalbas Substation. The powerline would be approximately 7.75 km long and would be placed on steel monopoles of up to 24 m height. A 300 m wide corridor centred on the line shown in Figures 1 and 2 is under consideration.

1.1.2. Identification of alternatives

There are no alternatives for the project. Although two entry points to the substation are under consideration, authorisation is being sought for both of these so that the most technically feasible option can be implemented one this has been confirmed.

1.1.3. Aspects of the project relevant to the heritage study

All aspects of the proposed development are relevant since excavations for foundations and/or services may impact on archaeological and/or palaeontological remains, while all above-ground aspects create potential visual (contextual) impacts to the cultural landscape and any significant heritage sites that might be visually sensitive.

1.2. Terms of reference

ASHA Consulting was asked to compile a Heritage Impact Assessment (HIA) that would meet the requirements of the South African Heritage Resources Agency (SAHRA), the Department of Forestry and Fisheries (DEFF) specialist assessment protocols and the International Finance Corporation (IFC) standards (IFC 2012). Due to the heritage consultant's knowledge of the area, it was agreed that the study should be a desktop assessment. The HIA was to consider all aspects of heritage including archaeology, palaeontology and the cultural landscape.

1.3. Scope and purpose of the report

An HIA is a means of identifying any significant heritage resources before development begins so that these can be managed in such a way as to allow the development to proceed (if appropriate) without undue impacts to the fragile heritage of South Africa. This HIA report aims to fulfil the requirements of the heritage authorities such that a comment can be issued by them for consideration by DEFF who will review the Environmental Impact Assessment (EIA) and grant or refuse authorisation. The HIA report will outline any management and/or mitigation requirements that will need to be complied with from a heritage point of view and that should be included in the conditions of authorisation should this be granted.

1.4. The author

Dr Jayson Orton has an MA (UCT, 2004) and a D.Phil (Oxford, UK, 2013), both in archaeology, and has been conducting Heritage Impact Assessments and archaeological specialist studies in South Africa (primarily in the Western Cape and Northern Cape provinces) since 2004 (please see curriculum vitae included as Appendix 1). He has also conducted research on aspects of the Later Stone Age in these provinces and published widely on the topic. He is an accredited heritage practitioner with the Association of Professional Heritage Practitioners (APHP; Member #43) and also holds archaeological accreditation with the Association of Southern African Professional Archaeologists (ASAPA) CRM section (Member #233) as follows:

- Principal Investigator: Stone Age, Shell Middens & Grave Relocation; and
- Field Director: Colonial Period & Rock Art.

1.5. Declaration of independence

ASHA Consulting (Pty) Ltd and its consultants have no financial or other interest in the proposed development and will derive no benefits other than fair remuneration for consulting services provided.

2. HERITAGE LEGISLATION

The National Heritage Resources Act (NHRA) No. 25 of 1999 protects a variety of heritage resources as follows:

- » Section 34: structures older than 60 years;
- » Section 35: prehistoric and historical material (including ruins) more than 100 years old as well as military remains more than 75 years old, palaeontological material and meteorites;
- » Section 36: graves and human remains older than 60 years and located outside of a formal cemetery administered by a local authority; and
- » Section 37: public monuments and memorials.

Following Section 2, the definitions applicable to the above protections are as follows:

- » Structures: "any building, works, device or other facility made by people and which is fixed to land, and includes any fixtures, fittings and equipment associated therewith";
- » Palaeontological material: "any fossilised remains or fossil trace of animals or plants which lived in the geological past, other than fossil fuels or fossiliferous rock intended for industrial use, and any site which contains such fossilised remains or trace";
- » Archaeological material: a) "material remains resulting from human activity which are in a state of disuse and are in or on land and which are older than 100 years, including artefacts, human and hominid remains and artificial features and structures"; b) "rock art, being any form of painting, engraving or other graphic representation on a fixed rock surface or loose rock or stone, which was executed by human agency and which is older than 100 years, including any area within 10m of such representation"; c) "wrecks, being any vessel or aircraft, or any part thereof, which was wrecked in South Africa, whether on land, in the internal waters, the territorial waters or in the maritime culture zone of the Republic, as defined respectively in sections 3, 4 and 6 of the Maritime Zones Act, 1994 (Act No. 15 of 1994), and any cargo, debris or artefacts found or associated therewith, which is older than 60 years or which SAHRA considers to be worthy of conservation"; and d) "features, structures and artefacts associated with military history which are older than 75 years and the sites on which they are found";
- » Grave: "means a place of interment and includes the contents, headstone or other marker of such a place and any other structure on or associated with such place"; and
- » Public monuments and memorials: "all monuments and memorials a) "erected on land belonging to any branch of central, provincial or local government, or on land belonging to any organisation funded by or established in terms of the legislation of such a branch of government"; or b) "which were paid for by public subscription, government funds, or a public-spirited or military organisation, and are on land belonging to any private individual."

Section 3(3) describes the types of cultural significance that a place or object might have in order to be considered part of the national estate. These are as follows:

a) its importance in the community, or pattern of South Africa's history;
b) its possession of uncommon, rare or endangered aspects of South Africa's natural or cultural heritage;
c) its potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage;
d) its importance in demonstrating the principal characteristics of a particular class of South Africa's natural or cultural places or objects;
e) its importance in exhibiting particular aesthetic characteristics valued by a community or cultural group;
f) its importance in demonstrating a high degree of creative or technical achievement at a particular period;
g) its strong or special association with a particular community or cultural group for social, cultural or spiritual reasons;
h) its strong or special association with the life or work of a person, group or organisation of importance in the history of South Africa; and
i) sites of significance relating to the history of slavery in South Africa.

While landscapes with cultural significance do not have a dedicated Section in the NHRA, they are protected under the definition of the National Estate (Section 3). Section 3(2)(c) and (d) list

"historical settlements and townscapes" and "landscapes and natural features of cultural significance" as part of the National Estate. Furthermore, some of the points in Section 3(3) speak directly to cultural landscapes.

Section 38(8) of the NHRA states that if an impact assessment is required under any legislation other than the NHRA then it must include a heritage component that satisfies the requirements of S.38(3). Furthermore, the comments of the relevant heritage authority must be sought and considered by the consenting authority prior to the issuing of a decision. Under the National Environmental Management Act (No. 107 of 1998; NEMA), as amended, the project is subject to an EIA. The present report provides the heritage component. Ngwao-Boswa Ya Kapa Bokoni (Heritage Northern Cape; for built environment and cultural landscapes) and the South African Heritage Resources Agency (SAHRA for archaeology and palaeontology) are required to provide comment on the proposed project in order to facilitate final decision making by the DEFF.

3. METHODS

3.1. Literature survey and information sources

A survey of available literature was carried out to assess the general heritage context into which the development would be set. This literature included published material, unpublished commercial reports and online material, including reports sourced from the South African Heritage Resources Information System (SAHRIS). The 1:50 000 map was sourced from the Chief Directorate: National Geo-Spatial Information.

3.2. Field survey

Although the IFC Performance Standard 8 requires fieldwork, motivation for carrying out the heritage assessment as a desktop study is provided here:

- The heritage consultant is well-familiar with the broader study area having worked on the Hyperion PV Cluster (Orton 2019a, 2019b, 2019c, 2019d) and the Kalahari Solar development (Orton & Walker 2015). These projects occur at either end of the present study area and were all conducted with fieldwork;
- The distribution of archaeological resources is very well understood in relation to the local geology. Archaeological materials are seldom seen on the surface of the aeolioan sand with the exception of locations in close proximity to water sources (e.g. ephemeral stream beds or pans). Artefacts are also absent from areas coated in calcrete. Stone artefacts are very strongly associated with the underlying iron-rich gravels but, when the surface is sandy, the presence of gravels and/or artefacts below ground cannot be predicted. A precautionary approach is thus indicated; and
- The nature of much of the surface in the study area (red Kalahari sand) is evident from aerial photography and is such that archaeological materials are extremely unlikely to be seen. This is because, if present, they are buried by the aeolian sands.

It should be noted that amount of time between the dates of the field inspections for the above-mentioned projects and the present report do not materially affect the outcome of the present report.

3.3. Specialist studies

No specialist studies were commissioned as part of the HIA. The heritage specialist made use of existing palaeontological reports in order to predict the impacts that would result from the present project.

3.4. Impact assessment

For consistency among specialist studies, the impact assessment was conducted through application of a scale supplied by Savannah Environmental.

3.5. Grading

S.7(1) of the NHRA provides for the grading of heritage resources into those of National (Grade I), Provincial (Grade II) and Local (Grade III) significance. Grading is intended to allow for the identification of the appropriate level of management for any given heritage resource. Grade I and II resources are intended to be managed by the national and provincial heritage resources authorities respectively, while Grade III resources would be managed by the relevant local planning authority. These bodies are responsible for grading, but anyone may make recommendations for grading.

It is intended under S.7(2) that the various provincial authorities formulate a system for the further detailed grading of heritage resources of local significance but this is generally yet to happen. SAHRA (2007) has formulated its own system[1] for use in provinces where it has commenting authority. In this system sites of high local significance are given Grade IIIA (with the implication that the site should be preserved in its entirety) and Grade IIIB (with the implication that part of the site could be mitigated and part preserved as appropriate) while sites of lesser significance are referred to as having 'General Protection' (GP) and rated as GP A (high/medium significance, requires mitigation), GP B (medium significance, requires recording) or GP C (low significance, requires no further action).

3.6. Consultation

The NHRA and IFC standards[2] require consultation as part of an HIA but, since the present study falls within the context of an EIA which includes a public participation process (PPP), no dedicated consultation was undertaken as part of the HIA. Interested and affected parties would have the opportunity to provide comment on the heritage aspects of the project during the PPP.

3.7. Assumptions and limitations

No fieldwork was carried out for the reasons outlined above. It is highly unlikely that informative field data could have been collected and, therefore, the lack of fieldwork is not considered a limitation of this assessment.

4. PHYSICAL ENVIRONMENTAL CONTEXT

4.1. Site context

The study area lies to the north of Kathu which is a modern town focused on the mining of iron ore. A large open mine pit and associated infrastructure occur to the southwest of the town. In recent years, several solar energy facilities have been constructed in the area to the north of the town, including one at the southern end of the present study area. The land use on the surrounding farms is largely livestock grazing. The well-known Kathu Forest lies in the area between Kathu and the study area but is focused closer to Kathu.

4.2. Site description

The study area is coated in red Kalahari sand which supports grass, bushes and thorn trees. Because no site visit was conducted for this assessment a detailed description is not provided. However, Figures 3 and 4 show typical examples of the landscape in close proximity to the study area. From an examination of aerial photography, there is no reason to believe that the power line corridor will be any different. The only feature worth noting is a small excavation to the east

[1] The system is intended for use on archaeological and palaeontological sites only.

[2] IFC Performance Standard 8 lists consultation with Indigenous communities where such people use, or have within living memory used, cultural heritage for long-standing cultural purposes. Such people were not identified in or close to the study area. Consultation with regulatory agencies is also required and will happen as part of the approval process.

of the southern end of the corridor. This may well be an old sand mine. Although it may offer some subsurface observations, it is outside of the corridor and is unlikely to reveal anything not already known from this quite well documented area.

Figure 3: *View towards the north in an area 3 km southeast of the powerline alignment currently under assessment (taken on 21 July 2018).*

Figure 4: *View towards the south from a survey beacon close to the northern end of the proposed powerline (taken on 21 July 2018). The powerline would pass through the right hand side of this view in the distance.*

5. FINDINGS OF THE HERITAGE STUDY

This section describes the heritage resources recorded in the study area during the course of the project.

5.1. Palaeontology

Although not studied by a specialist specifically for this project, the palaeontological sensitivity can be gleaned from other work done in the immediately surrounding area. The SAHRIS

Palaeosensitivity Map indicates that the northern two-thirds of the proposed corridor is of moderate palaeontological sensitivity and the southern third is of high sensitivity (Figure 5). The ratings provided on SAHRIS are largely theoretical ratings based on the geological horizons present in the area.

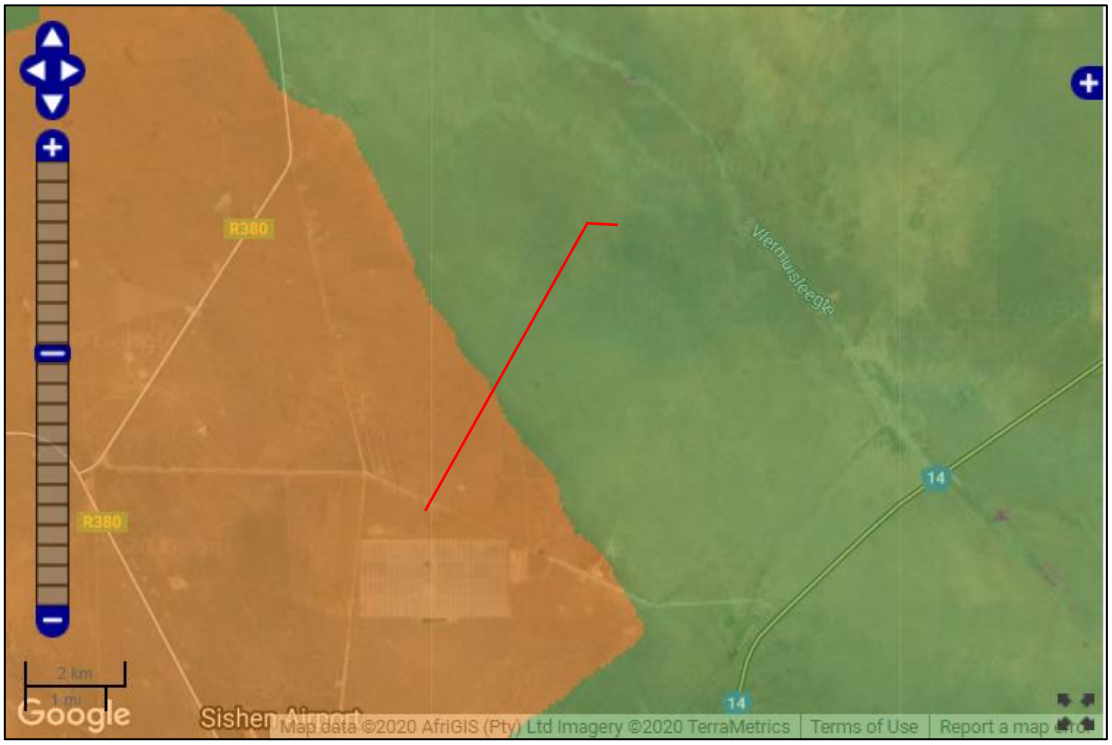

Figure 5: *Extract from the SAHRIS Palaeosensitivity map showing the study area to be of moderate (green shading) to high (orange shading) sensitivity.*

Almond (2018) studied the potential palaeontological impacts for the authorised Hyperion PV Cluster at the northern end of the proposed powerline. He noted the Kathu region to be largely underlain by Late Cenozoic continental sediments of the Kalahari Group (Partridge *et al.* 2006). From other work in the area he considers these sediments to be of generally low sensitivity. Some areas have a thick layer of calcrete of the Mokolanen Formation (up to 5 million years old), while younger calcrete of the Kalahari Group occurs at the surface in places. Gravels of the Obobogorop Formation and red Kalahari aeolian sands of the Gordonia Formation overlie these older rocks. Figure 6 shows an extract from the relevant geological map. It is evident that the study area overlies Kalahari Group aeolian sand and, in the southwest, calcrete.

Almond (2018) considers the Kalahari Group aeolian sediments to be of low sensitivity except that there is a small possibility of encountering quaternary-aged mammalian remains (bones, teeth and horncores), trace fossils and plant fossils in buried pans or solution cavities (dolines) as occurs at the famous Kathu Pan located 7 km south of the Kalbas Substation. Rossouw (n.d.) sees the same concern with the sands and notes that the calcretes may contain fossils. Given how little is known about the area's fossil potential, he considers excavations into the calcrete as a benefit to palaeontology if appropriate mitigation measures are carried out[3].

[3] No measures are proposed, however, and it is assumed here that inspection of excavations would be appropriate.

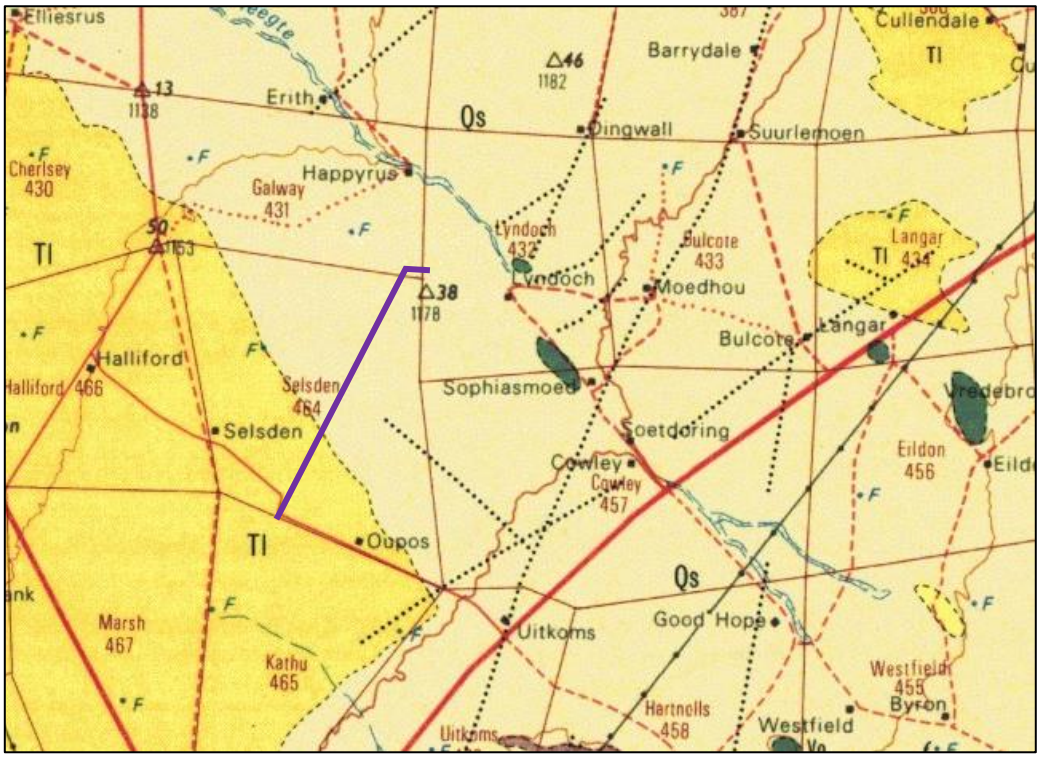

Figure 6: *Extract from the 1:250 000 geological map 2722 showing the location of the proposed powerline (purple line). Tl (yellow) indicates calcretes (surface limestone) of the Kalahari Group, while Qs (pale orange) denotes aeolian sands of the Gordonia Formation, Kalahari Group (Source Almond 2018: figure 2).*

5.2. Archaeology

5.2.1. Desktop study

The vicinity of Kathu has long been known to have highly significant archaeological resources and much literature related to the archaeology of the area exists. The region is perhaps best-known for the extensive deposits of Early Stone Age (ESA) material that have been described. Most research has been centred on the site of Kathu Pan (which also hosts younger archaeology), but Kathu Townlands (at the north-eastern edge of Kathu) has also seen considerable attention. Due to the amount of literature associated with the Kathu area, only certain relevant papers and reports were consulted in compiling the summary below. Several Kathu sites, together known as the Kathu Complex, have been formally graded as a Grade 1 heritage resource indicating that the collection of sites has been accorded national significance. The archaeological resources within and beyond the proposed declaration area are under continued threat from development in the vicinity (see for example the Kalahari Solar and Kathu Extension 6-10 developments which, to the present author's knowledge, commenced without archaeological mitigation).

Several archaeological localities are reviewed, whereafter some general comments are provided. Figure 7 locates the sites relative to Kathu and the powerline corridor under study. Archaeology tends to be physically associated with gravel deposits but these are mostly obscured by surface sands. The lack of known archaeological sites near the current project site does not indicate a lack of archaeological deposits north of Kathu. This paucity is more of a reflection of this area being largely unexamined by archaeologists.

5.2.2. Kathu Pan

Kathu Pan (KP1) is the most studied and best-known site in the area and has the longest history of research. It was discovered in 1974 (Beaumont 1990) and reported in popular literature the following year (Anonymous 1975; see also Hocking 1983). The site is a natural sinkhole located

within a large pan that, under natural conditions, would have filled with water in summer (owing to the rising water table during the summer rainy season) and become a valuable water supply for prehistoric populations (Van Zinderen Bakker 1995). It has produced a sequence of ESA deposits including some Fauresmith material and evidence for the onset of the Middle Stone Age (MSA) some 500 000 years ago (Wilkins 2013). Wilkins *et al.* (2012) have studied fracture patterns on points from the site and determined that they were used in a hafted manner as spear tips. The site has also yielded very early evidence for blade production (Wilkins & Chazan 2012). A special feature of KP1 is the fact that faunal remains have been preserved. Such preservation is unusual for Kathu. These remains include species such as hippopotamus that point to a far wetter environment than exists in the region today (Klein 1988).

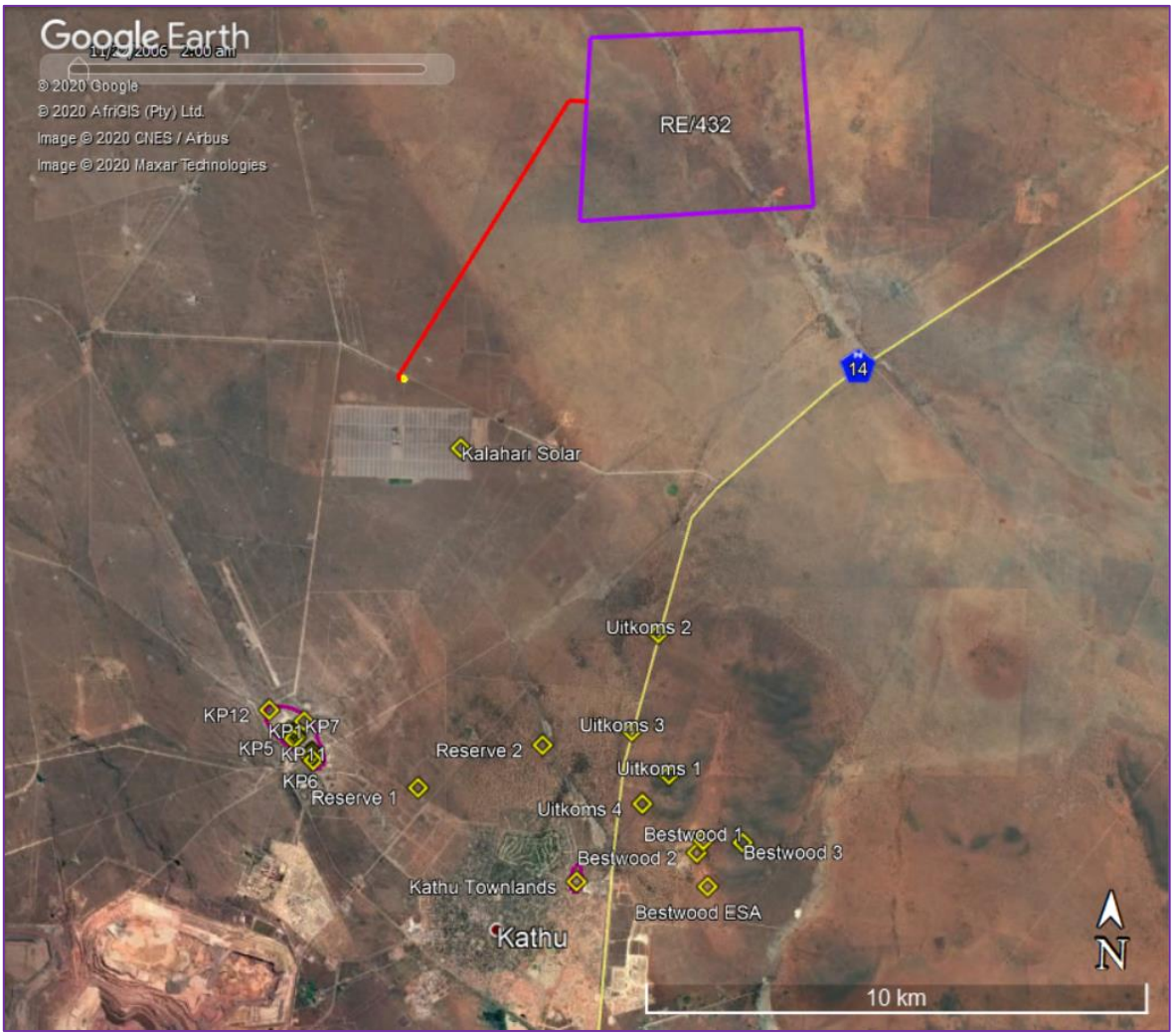

Figure 7: *Aerial view of the Kathu area showing the locations of previously recorded archaeological occurrences (labelled yellow symbols). Key as per Figures 1 and 2.*

The sequence described by Klein (1988:11), from top to bottom, is as follows:

» Approximately 1.5 m of organic silty sands containing Holocene-aged Iron Age and Later Stone Age (LSA) material;
» Between 0.9 m and 1.7 m of less organic silty sand containing rare LSA artefacts;
» Approximately 0.8 m of poorly sorted gravelly sand with many Pleistocene-aged MSA artefacts and associated faunal remains; and
» About 3.5 m to 4 m of medium to fine-grained sand containing fossil spring deposits that in turn contain abundant, Pleistocene-aged ESA artefacts and associated fauna.

This sequence makes the site one of only a handful in the country to preserve deposits pertaining to all three Stone Ages. Dreyer (2013) notes a circle of standing stones whose function he could not determine. However, his description and illustrations are clearly of a *trapvloer* (threshing floor) which serves to add a historical layer to the site. Porat *et al.* (2010: table 4) obtained optically stimulated luminescence and electron spin resonance/U-series dates on the deposits. The Fauresmith ESA was dated to about half a million years ago, while an age of 330 000 to 250 000 years was obtained for the MSA. Ages of 17 500 to 15 500 years and 10 500 to 9500 years were obtained for the LSA levels. Artefactual material supports quite recent occupation near the surface (Porat *et al.* 2010). On the basis of the presence of the teeth of the extinct elephant *Elephas recki*, Klein (2000) reports that the lowest archaeological layer, containing Acheulean artefacts, is likely to be between 1 million and 500 000 years old. Importantly, the ESA stone artefacts are reported to be fresh and unabraded (Porat *et al.* 2010).

5.2.3. Kathu Townlands

The Kathu Townlands site lies across the surface of a low rise within the bounds of the town of Kathu. It was first reported in 1980 and had initial excavations carried out by Beaumont in 1982 and 1990 (Beaumont 1990). Due to proposed development on the site, mitigation work was carried out to enable a better understanding of the deposits (Walker *et al.* 2013). The archaeological material was found to occur within a dense accumulation of banded iron formation (BIF) rubble with a sandy matrix directly over bedrock. The artefacts from both the Beaumont and Walker excavations lack evidence of water transport, but damage to the artefacts does indicate mechanical damage through redeposition subsequent to the ESA occupation (Walker *et al.* 2014).

5.2.4. Bestwood

Archaeological sites were first reported at Bestwood by Dreyer (2008). Further research has been undertaken there by Chazan *et al.* (2012). They described two sites, designated Bestwood 1 and Bestwood 2. These are both windows into a larger landscape of artefacts that have been exposed by sand quarrying activity within a sandy valley. A third site, Bestwood 3, is located on the hilltop along the east side of this valley (not to be confused with Uitkoms 1 which is located on the hilltop to the west of the valley). Their initial investigation at Bestwood 1 revealed a lithic industry characterized by well-made hand-axes, well-retouched scrapers, occasional blades and a great diversity of core types (Chazan *et al.* 2012:331). They conclude that the site represents an ESA living surface. Again, the artefacts are fresh which militates against extensive transport and long-term exposure.

Walker *et al.* (2013) note that excavations at Bestwood 1 demonstrated that this material is present *in situ* in a single horizon beneath the covering sands. This horizon is artefactually similar to the surface exposures at Bestwood 3 and Uitkoms 1. Given these observations (as well as other currently unpublished work done at Bestwood), it seems that the archaeological deposit extends beyond the limits of the quarries, across the landscape and connects the two hilltop exposures as a continuous horizon. They also note the presence of ESA material in another quarry to the south (indicated in Figure 18 above as Bestwood ESA).

5.2.5. Uitkoms

The farm Uitkoms to the northeast of Kathu has also yielded various archaeological occurrences. Beaumont has named these occurrences as Uitkoms 1, 2, 3 and 4. Uitkoms 1 appears to be similar to Kathu Townlands 1 in terms of artefact density and debitage frequency, but occurs on a hilltop. Indeed, in his first published description of Uitkoms 1, he considered these sites to be connected as one continuous landscape of artefacts (Beaumont 2004). Uitkoms 4 is largely buried beneath surface sands in a manner similar to Bestwood 1 and 2, "where bifaces are very similar to those from the quarries, but with a formal tool incidence about a thousand times higher, and like that at a typical occupation site" (Beaumont 2008b:3). The Uitkoms 2 & 3 localities appear to be first described by Beaumont (2007). He describes these sites as follows: "In mid-2006, two road cuttings along the N14 further towards Kuruman were also seen to

contain ESA artefacts in a thin rubble of jaspilite and below red sand. One of these, Uitkoms 3, suggests that the Uitkoms 1 site also extends over the north-western side of the Kathu hill (Fig. 1). The other, Uitkoms 2, could represent the extreme western limit of a site that may range over two upslope hills on Hartnolls" (Beaumont 2007: 1-2).

5.2.6. General comments

The above sites show that archaeological materials are fairly widespread around Kathu and the area is best regarded as an archaeological landscape rather than a collection of individual sites. Indeed, in his discussion of precolonial cultural landscapes, Orton (2016:124) cited the Kathu area as an example of a Type 4 landscape which was described as a large area "containing multitudes of artefacts or occurrences not separable into individual sites".

A large number of impact assessments have been carried out in the Kathu area. Although some have discovered significant archaeological heritage sites, others reported little or nothing. It is currently unclear if these differences are due to varying methodologies employed by different observers (for example the methods employed in distinguishing between a 'site' and 'background scatter'), variations in surface geomorphology, or actual differences in the nature of the archaeological deposits as manifested on the surface. Several observations are directly relevant to the present assessment. In the Hyperion PV Cluster area Orton (2019a, b, c, d) noted stone artefacts to be present beneath the cover sands and visible along the margins of the Vlermuisleegte. A small hill some 1.4 km southeast of the northern end of the present corridor was found to be an outcropping area of ironstone gravel with many associated artefacts. Closer to the corridor a very small gravel patch hosts a trigonometric beacon; it is likely that at least some of the gravel was brought to the surface during construction of the tower on which the beacon stands. Several artefacts were seen in this gravel as well. These observations prove that archaeological materials do occur beneath the aeolian sand. Near the Kalbas Substation Orton (2015) noted MSA artefacts scattered around two small pans. To the southwest of the Kalbas Substation Orton and Walker (2015) found calcrete exposed at the surface with artefacts virtually absent. Moving eastwards, the calcrete gave way to BIF gravel and the number of artefacts increased dramatically. In a survey further south again, Dreyer (2010) found nothing.

Further afield, to the east of Kathu, Morris (2014) examined already disturbed areas finding nothing except some artefacts and banded ironstone fragments that were in obvious secondary context related to the on-going construction activities in the area. Gaigher (2013) examined an area about 8 km west of the present study area and reported very little archaeological material. By contrast, surveys on Hartnolls to the northeast of Kathu have revealed extensive archaeological deposits said to be similar to those of Kathu Townlands and those found at Bestwood (Beaumont 2007; Dreyer 2006). To the northwest of Kathu, Pelser (2018) located light scatters of Stone Age materials in a number of places.

De Jong (2008) reports that rock engravings are also known from the Kathu area. He does not provide locations for these engravings, nor citations for their publication. The present literature review has revealed no primary archaeological sources to substantiate this statement.

Humphreys (1976) has considered the evidence for the southern limit of Late Iron Age occupation in the area and concluded that there was likely some occupation of the Kathu area from at least about AD 1700 onwards. However, reliable documentary evidence from the 19th century points to Iron Age people not being present much further southwest than Kuruman (Figure 8). Nevertheless, that they did live in the present study area at some point is testified to by the reporting of an Iron Age site close to Kathu (Reserve 1). This site is reported by Beaumont (2006: 3) who describes it as: "an Iron Age (Tswana?) ceramic surface scatter" and states that it was excavated in 1989. Unfortunately, he provides no description or further reference. Enquiries at McGregor Museum have not been able to produce any further documentation on this site. Dreyer (2012) surveyed the same property again and, although he marks the site on a map, he provides no commentary at all – as such no further description of this site can be provided here.

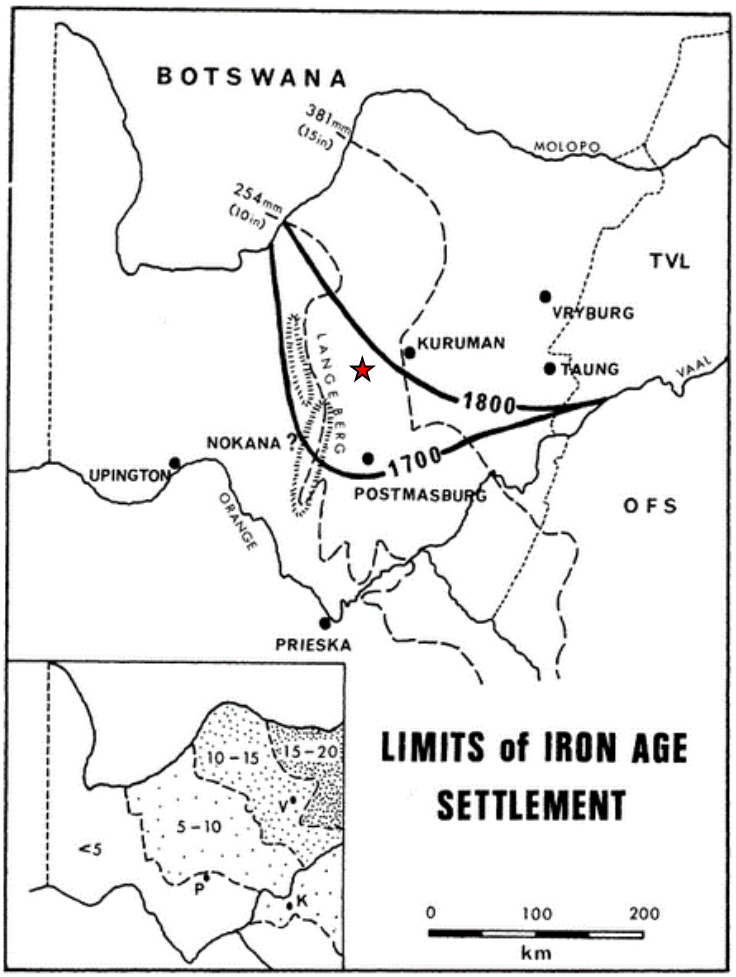

Figure 8: *Map showing the approximate south-western limits of Iron Age settlement in the Northern Cape. Source: Humphreys (1976: fig. 1). The red star indicates the position of Kathu.*

5.3. Site visit

No site visit was conducted. It is envisaged that with a ground survey very little or no archaeology would have been seen on the sandy surface as was the case at the northern end of the study area (Orton 2019a, b, c, d). The survey by Orton and Walker (2015) to the south has shown that stone artefacts are virtually non-existent on the calcrete-covered areas.

5.4. Graves

It is unlikely that historical graves will occur in remote locations (i.e. away from farmsteads) such as the present study area. Pelser (2018) reported a set of 12-15 graves from close to Kathu Pan. One of the three dated graves is now older than 60 years making it a heritage resource. Five farm workers' graves were found 1.9 km east of the north end of the present study area close to the Farm 432/rem farmhouse but the only dated one was from 1973. Not far away, a single grave is dated 1928 but, according to the farm owner, the grave is somewhat of a mystery. Some years ago some family of the deceased came to remove the remains to another location but, despite excavating the grave and some of the surrounding area no remains were located. The grave was then rebuilt in the same location and left as is (Orton 2019a, b, c, d). There is a chance that Stone Age or even Iron Age graves could be found in the area. These would be isolated features and may or may not be marked at the surface. Orton (2019a, b, c, d) located a collection of stones in an otherwise sandy area on the northeast bank of the Vlermuisleegte. With no other stones naturally occurring in the immediate vicinity, there is a chance that this feature represents a grave.

5.5. Historical aspects and the Built environment

5.5.1. Desktop study

Although a town named Kathu (or variations thereof) can be found on maps going back to the 1890s, the modern town of Kathu only dates back to the 1970s when iron ore mining commenced. Aerial photographs from 1957 show no mining and no development of any sort in the current town area.

The Langeberg Rebellion was an important historical event to have occurred in the area. The following description is based on Saker and Aldridge (1971). The former Crown Colony of British Bechuanaland was annexed by the Cape Colony on 16th November 1895. Just over a year later, in December 1896 and January 1897, revolts – collectively known as the Langeberg Rebellion – broke out in the area. Over the following months they took root in the Langeberg Mountains, west of modern-day Kathu, and were only suppressed by the Government in August 1897. The discontent among the Tlhaping and Tlharo people had arisen some years earlier when, in 1884, about 75% of their land was taken away from them. Two years later the Land Commission met to settle land claims after the demise of the Boer Republics of Stellaland and Goshen, but little was done to help the Tlhaping and Tlharo. Although ten Native Reserves were proclaimed, 1400 square miles of crown land was made available for white settlement – this created further friction and unhappiness. In addition to the loss of their land, the Tswana chiefs were losing their authority. Eventually, on 27 November 1896, seventeen head of cattle strayed out of the Taungs Reserve and were shot. This appears to have been the critical moment when the rebellion began.

5.5.2. Site visit

No site visit was conducted, but it is clear from aerial photography that no historical or built heritage features occur along the proposed alignment.

5.6. Cultural landscapes and scenic routes

Two aspects of the cultural landscape require discussion. The first is the precolonial cultural landscape of archaeological materials that occurs widely in the area, while the second is the 20th century surface landscape related to farming. The archaeological landscape is comprised of all the sites discussed in Section 5.2 above and is not repeated here.

The more recent agricultural landscape on site is very poorly developed in terms of human interventions. It is focused on livestock farming but this leaves a negligible cultural imprint on the landscape (essentially just fences, sand tracks and the occasional wind pump). Electrical developments and mining dominate the broader landscape around Kathu, including a large photo-voltaic (PV) solar development just south of the Kalbas Substation. Two other PV plants have been constructed some 9-10 km west of the Kalbas Substation. Overall, the cultural landscape is strongly dominated by these modern landscape uses which are of no heritage concern. Because of this, none of the roads in the area can be considered significant scenic routes.

5.7. Statement of significance and provisional grading

Section 38(3)(b) of the NHRA requires an assessment of the significance of all heritage resources. In terms of Section 2(vi), ''cultural significance'' means aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance. The reasons that a place may have cultural significance are outlined in Section 3(3) of the NHRA (see Section 2 above).

Palaeontological resources are expected to be very rare. In general, fossils of less cultural significance for their scientific value are usually more common. Such finds would be of medium local significance and might be worthy of Grades GPB to GPA. However, in the highly unlikely

event that an old doline preserving fossils was intersected during excavation for the pylons then such a find could have provincial to national significance and be considered Grade II or Grade I.

Although no archaeological resources are expected to occur on the surface, there is a good chance that such materials can be located below the surface, especially if ironstone gravels are encountered. Although the Kathu Complex is of very high significance for its scientific value and is a Grade I archaeological cultural landscape, the study to the south of the present study area suggested that artefact densities were likely to be far lower than within the Kathu Complex area (Orton & Walker 2015). Any materials likely to be encountered during excavation of powerline footings in the present corridor would more likely be of medium to high local significance and can be considered as Grade GPA to IIIB resources.

Graves are deemed to have high cultural significance for their social value and if any are found they would be rated as Grade IIIA.

The archaeological cultural landscape in the study area can be considered in the same light as the potential archaeological resources just mentioned, while the general historical/recent cultural landscape is of low local significance and of no further concern.

5.8. Summary of heritage indicators

Any fossils uncovered during the course of the project must be preserved *in situ* if possible and examined by a palaeontologist because otherwise important contextual information that assists with interpreting the find could be lost. Fossils are likely to be rare and, if found, could have considerable cultural significance.

» Indicator: Fossils should not be disturbed, destroyed or removed from their context without study by a palaeontologist.

Any archaeological materials uncovered during the course of development must be preserved *in situ* if possible and examined by an archaeologist because otherwise important contextual information that assists with interpreting the find could be lost. There is the potential, albeit small, for artefacts or even deposits of high significance to be found.

» Indicator: Archaeological materials should not be disturbed, destroyed or removed from their context without study by an archaeologist.

Graves are culturally significant heritage sites and should not be disturbed by the proposed development.

» Indicator: Graves should not be disturbed, destroyed or moved without study by an archaeologist.

6. ASSESSMENT OF IMPACTS

The cultural landscape has been shown to be of little to no significance and therefore does not require further assessment. The heritage issues that have been identified as potential concerns for the proposed powerline development are palaeontology, archaeology and graves. As such, only these three aspects of heritage are formally assessed in this section.

6.1. Impacts to palaeontological resources

Direct impacts to fossils would only occur during the construction phase when foundations are excavated for the pylons. The magnitude of impacts relates largely to the cultural significance which is hard to predict. Nevertheless, because of the lack of known fossils in the area the overall impact significance is likely to be **low (20)**. It remains **low (8)** with mitigation (Table 1). Almond (2018) did not see any need for specialist mitigation at the northern end of the proposed corridor and only recommended that a Chance Finds Procedure be implemented (one has been provided in Appendix 2 of the present report). It should be noted that if fossils are found and successfully

rescued then this might result in a positive impact for science. No fatal flaws have been identified in terms of potential palaeontological impacts.

Table 1: Assessment of palaeontological impacts.

Nature: Direct destruction of fossils during excavation of pylon foundations		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (4)	Minor (2)
Probability	Improbable (2)	Very improbable (1)
Significance	**Low (20)**	**Low (8)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	
Mitigation: ECO, site foreman or other responsible person[4] to inspect pylon foundations for any sign of fossils and also explain to workers the need to protect and report any fossils that are uncovered during development. If fossils are found they must be protected in situ, the chance finds procedure must be implemented and the find must be reported to a palaeontologist or SAHRA for evaluation. If the chance finds procedure is implemented properly then this evaluation can often occur remotely.		
Residual Impacts: It is impossible to locate every fossil and, if present, some, especially smaller ones, will always be missed and lost during excavation.		

6.2. Impacts to archaeological resources

Direct impacts to archaeological resources would occur during the construction phase only when foundations are excavated for the pylons. The magnitude of impacts relates largely to the cultural significance which is hard to predict. The depth of sand cover will also affect the likelihood of uncovering archaeology The chances of finding highly significant materials as included in the Grade I Kathu Complex are fairly low, but nevertheless, as shown by Orton's (2019a, b, c, d) survey, it is highly probable that some archaeology will be uncovered, especially in the northern part of the alignment. A **medium (48)** significance impact can be expected (Table 2). With mitigation, which would be very easy to effect, the impact significance would reduce to **low (8)**. An archaeologist will need to be present to inspect the excavations[5] and determine whether some locations should be sampled. Creating a record of the subsurface archaeology is important towards creating a better understanding of the distribution of ESA deposits in the region. It should be noted that if significant archaeological materials are found and successfully sampled then this might result in a positive impact for science. It is recommended that the appointed archaeologist consider applying for a sampling permit prior to the monitoring so that, if SAHRA agrees, any required work could be carried out immediately with minimal delays. No fatal flaws have been identified in terms of potential archaeological impacts.

[4] Note that archaeological monitoring has been recommended and the project archaeologist would also be able to check for fossils.

[5] It is not necessarily required that every excavation be checked but a selection (at least one third of them) along the entire length of the line must be incorporated into the archaeological monitoring so as to provide a range of observations through space. For reasons of practicality, it may be possible for the developer to arrange that every third pylon foundation be excavated first in the presence of the archaeologist and then the rest can continue afterwards.

Table 2: Assessment of archaeological impacts.

Nature: Direct destruction of archaeological materials during excavation of pylon foundations		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Moderate (6)	Minor (2)
Probability	Highly probable (4)	Very improbable (1)
Significance	**Medium (48)**	**Low (8)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	
Mitigation: An archaeologist must inspect at least one third of the pylon foundation excavations and, if necessary, recommend judicious sampling (e.g. a $1m^2$ column) in a few locations in order to establish the stratigraphy, density and significance of the artefactual materials.		
Residual Impacts: Because there are likely to be millions of artefacts beneath the surface, it is impossible to rescue them all and, even with sampling, the vast majority of artefacts disturbed during development would go unsampled. However, because of the widespread nature of the archaeology, it is the understanding of distribution and content that is far more important than rescuing every artefact. If the above mitigation is applied, the potentially still extensive residual impacts will be of no concern.		

6.3. Impacts to graves

Direct impacts to graves would occur during the construction phase only when foundations are excavated for the pylons. Although impacts to graves are of high cultural significance, the probability of impacts occurring is very improbable and the resultant impact significance is **low (14)** (Table 3). Mitigation would entail stopping work and protecting and reporting any burial discovered during development. The post-mitigation significance would still be **low (8)**. There are no fatal flaws in terms of potential impacts to graves.

Table 3: Assessment of impacts to graves.

Nature: Direct destruction of graves during excavation of pylon foundations		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	High (8)	Minor (2)
Probability	Very improbable (1)	Very improbable (1)
Significance	**Low (14)**	**Low (8)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	
Mitigation: Workers should be instructed to watch for any graves that might be uncovered during excavation. If any are found work in the immediate vicinity (i.e that particular foundation) should cease and the find must be reported to an archaeologist		

and/or SAHRA immediately. It is likely that an archaeologist will need to be contracted to remove the remains to safety.
Residual Impacts: Because graves are easy to locate, even though they may be heavily disturbed during excavation, the chances of graves going completely unnoticed are very slim and residual impacts are thus highly unlikely.

6.4. Cumulative impacts to all heritage resources

The principle driver of cumulative impacts is archaeology. This is because of the many ESA sites on record and that have collectively been given Grade I status by SAHRA. Development in the Kathu region is proceeding rapidly and some developments are known to have commenced without the required archaeological mitigation. Not only is physical archaeological material damaged or destroyed, but the opportunity to understand distribution and content is lost. These impacts are of heightened significance because of the high cultural significance of the Grade I Kathu Complex archaeological cultural landscape. Although the Kathu Complex has national significance, known important sites are well-documented which means that impacts in the outlying area, where most electrical infrastructure is built, are more limited in extent. It should be noted that if significant archaeological materials are found in several areas and successfully sampled then this might result in a positive impact for science. Impacts to fossils and graves are rare and do not significantly drive cumulative impacts. Overall, the potential impacts to all heritage resources for the project area could be **medium (30)** but for all other developments in the surrounding area it would be of **medium (60)** significance (Table 4).

Table 4: Assessment of cumulative impacts.

Nature: Destruction and/or damage to heritage resources		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Regional (3)	Regional (4)
Duration	Permanent (5)	Permanent (5)
Magnitude	Minor (2)	Moderate (6)
Probability	Probable (3)	Highly probable (4)
Significance	**Medium (30)**	**Medium (60)**
Status (positive/negative)	Negative	Negative
Reversibility	Low	Low
Loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	
Confidence in findings: High.		
Mitigation: Monitoring of excavations with sampling of artefacts where necessary and also protection and reporting of chance finds for further actions as needed.		

6.5. The No-Go alternative

With implementation of the No-Go alternative the status quo would remain and no impacts to any heritage resources would be expected aside from those associated with natural erosion and weathering of surface materials. Such impacts are very slow and are of negligible significance.

6.6. Existing impacts to heritage resources

There are currently no obvious threats to heritage resources on the site aside from the natural degradation, weathering and erosion that will affect fossils and archaeological materials. Trampling from grazing animals and/or farm/other vehicles is not an issue because of the sand covering that exists.

6.7. Levels of acceptable change

Any impact to an archaeological or palaeontological resource or a grave is deemed unacceptable until such time as the resource has been inspected and studied further if necessary. Impacts to the landscape are difficult to quantify but in general a development that visually dominates the landscape from many vantage points is undesirable. Because of the height of the majority of the proposed development, such an impact is not envisaged.

7. INPUT TO THE ENVIRONMENTAL MANAGEMENT PROGRAM

OBJECTIVE: Protect heritage resources (fossils, archaeological materials & graves) from damage or destruction and ensure appropriate mitigation.	
Project component/s	Powerline foundations and associated service road.
Potential Impact	Loss of fossils/artefacts/graves by their being unnoticed and/or destroyed during excavation.
Activity/risk source	All bulk earthworks.
Mitigation: Target/Objective	To facilitate the likelihood of noticing fossils/artefacts/graves and ensure appropriate actions in terms of the relevant legislation.

Mitigation: Action/control	Responsibility	Timeframe
» Archaeologist to be appointed to conduct inspections of the pylon foundations.	Developer	Before construction starts.
» ECO to alert staff of the possibility of encountering fossils, stone artefacts/graves.	ECO	Before and during construction.
» All chance finds of the above to be physically protected and reported to the archaeologist or SAHRA.	All project staff	At all times.

Performance Indicator	The successful reporting and rescue of any fossils/artefacts/human remains exposed during construction.
Monitoring	The ECO should check with staff to see if any finds have been made and ensure that these get reported. They should also ensure compliance with the fossil Chance Finds Procedure.

8. EVALUATION OF IMPACTS RELATIVE TO SUSTAINABLE SOCIAL AND ECONOMIC BENEFITS

Section 38(3)(d) of the NHRA requires an evaluation of the impacts on heritage resources relative to the sustainable social and economic benefits to be derived from the development.

The project is needed to support a proposed Hybrid Generating Facility consisting of the already authorised Hyperion 1 and 2 PV facilities and a proposed thermal facility. While the powerline itself would not have much socio-economic benefit, the provision of electricity is important in

stabilising and enhancing electricity supply in South Africa. This is needed to drive the economy and employment, and to allow development to continue. This would result in benefits to all South Africans. While the Kathu Complex is a very significant heritage site, it is extensive and much is known about it. For this reason, the provision of electricity to South Africa outweighs the potential extra impacts to heritage.

9. CONSULTATION

There are no directly affected communities in the area. The report is part of an environmental impact assessment process and will be subjected to a full PPP. Any heritage-related issues raised during that process will be responded to as required by the heritage specialist.

10. CONCLUSIONS

The main issue for this project will be the potential to intersect archaeological resources during excavation of the pylon foundations. However, with appropriate mitigation, the impacts can be easily managed and a scientific benefit could even be derived with successful description and rescue of heritage materials. It is especially important to the archaeology of the region, and Grade I Kathu Complex, to understand both the vertical and horizontal distribution of buried archaeological resources and development projects allow opportunities to gain such insights. Because design responses to the heritage indicators are not possible, monitoring will be required to ensure that the indicators are met (Table 5). No areas have been identified for avoidance.

Table 5: Heritage indicators and project responses.

Indicator	Project Response
Fossils should not be disturbed, destroyed or removed from their context without study by a palaeontologist.	Monitoring by the ECO and archaeologist will serve to minimise impacts.
Archaeological materials should not be disturbed, destroyed or removed from their context without study by an archaeologist.	Monitoring by the ECO and archaeologist will serve to minimise impacts.
Graves should not be disturbed, destroyed or moved without study by an archaeologist.	Monitoring by the ECO (including prior to construction) and archaeologist will serve to minimise impacts.

10.1. Reasoned opinion of the specialist

Because the potential impacts to heritage resources can be easily managed with implementation of appropriate mitigation measures, it is the opinion of the heritage specialist that the proposed powerline development should be authorised in full.

11. RECOMMENDATIONS

It is recommended that the proposed development be allowed to proceed but subject to the following recommendations which should be incorporated into the conditions of approval and/or EMPr as required:

- An archaeologist must be appointed to conduct inspections of the pylon foundations. Where suitable archaeological materials are found, small column samples (e.g. $1m^2$) should be taken in order to establish the stratigraphy, density and significance of the materials;
- The ECO must examine the final alignment prior to the start of construction to determine whether any obvious graves might be present;

- When the archaeologist is not on site, the ECO must monitor the construction phase work for the presence of heritage materials (fossils, stone artefacts, graves); and
- If any palaeontological material, archaeological material or human burials are uncovered during the course of development then work in the immediate area should be halted. The find would need to be reported to the heritage authorities and may require inspection by a palaeontologist or archaeologist. Such heritage is the property of the state and may require excavation and curation in an approved institution.

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APPENDIX 1 – Curriculum Vitae

Curriculum Vitae

Jayson David John Orton

ARCHAEOLOGIST AND HERITAGE CONSULTANT

Contact Details and personal information:

Address: 40 Brassie Street, Lakeside, 7945
Telephone: (021) 789 0327
Cell Phone: 083 272 3225
Email: jayson@asha-consulting.co.za

Birth date and place: 22 June 1976, Cape Town, South Africa
Citizenship: South African
ID no: 760622 522 4085
Driver's License: Code 08
Marital Status: Married to Carol Orton
Languages spoken: English and Afrikaans

Education:

SA College High School	Matric	1994	
University of Cape Town	B.A. (Archaeology, Environmental & Geographical Science)	1997	
University of Cape Town	B.A. (Honours) (Archaeology)*	1998	
University of Cape Town	M.A. (Archaeology)		2004
University of Oxford	D.Phil. (Archaeology)	2013	

*Frank Schweitzer memorial book prize for an outstanding student and the degree in the First Class.

Employment History:

Spatial Archaeology Research Unit, UCT	Research assistant	Jan 1996 – Dec 1998
Department of Archaeology, UCT	Field archaeologist	Jan 1998 – Dec 1998
UCT Archaeology Contracts Office	Field archaeologist	Jan 1999 – May 2004
UCT Archaeology Contracts Office	Heritage & archaeological consultant	Jun 2004 – May 2012
School of Archaeology, University of Oxford	Undergraduate Tutor	Oct 2008 – Dec 2008
ACO Associates cc	Associate, Heritage & archaeological consultant	Jan 2011 – Dec 2013
ASHA Consulting (Pty) Ltd	Director, Heritage & archaeological consultant	Jan 2014 –

Professional Accreditation:

Association of Southern African Professional Archaeologists (ASAPA) membership number: 233
CRM Section member with the following accreditation:

- Principal Investigator: Coastal shell middens (awarded 2007)
  Stone Age archaeology (awarded 2007)
  Grave relocation (awarded 2014)
- Field Director: Rock art (awarded 2007)
  Colonial period archaeology (awarded 2007)

Association of Professional Heritage Practitioners (APHP) membership number: 43

- Accredited Professional Heritage Practitioner

➢ *Memberships and affiliations:*

South African Archaeological Society Council member		2004 – 2016
Assoc. Southern African Professional Archaeologists (ASAPA) member	2006 –	
UCT Department of Archaeology Research Associate	2013 –	
Heritage Western Cape APM Committee member	2013 –	
UNISA Department of Archaeology and Anthropology Research Fellow	2014 –	
Fish Hoek Valley Historical Association		2014 –
Kalk Bay Historical Association	2016 –	
Association of Professional Heritage Practitioners member		2016 –

Fieldwork and project experience:

Extensive fieldwork and experience as both Field Director and Principle Investigator throughout the Western and Northern Cape, and also in the western parts of the Free State and Eastern Cape as follows:

Feasibility studies:

- Heritage feasibility studies examining all aspects of heritage from the desktop

Phase 1 surveys and impact assessments:

- Project types
  - Notification of Intent to Develop applications (for Heritage Western Cape)
  - Desktop-based Letter of Exemption (for the South African Heritage Resources Agency)
  - Heritage Impact Assessments (largely in the Environmental Impact Assessment or Basic Assessment context under NEMA and Section 38(8) of the NHRA, but also self-standing assessments under Section 38(1) of the NHRA)
  - Archaeological specialist studies
  - Phase 1 archaeological test excavations in historical and prehistoric sites
  - Archaeological research projects
- Development types
  - Mining and borrow pits
  - Roads (new and upgrades)
  - Residential, commercial and industrial development
  - Dams and pipe lines
  - Power lines and substations
  - Renewable energy facilities (wind energy, solar energy and hydro-electric facilities)

Phase 2 mitigation and research excavations:

- ESA open sites
  - Duinefontein, Gouda, Namaqualand
- MSA rock shelters
  - Fish Hoek, Yzerfontein, Cederberg, Namaqualand
- MSA open sites
  - Swartland, Bushmanland, Namaqualand
- LSA rock shelters
  - Cederberg, Namaqualand, Bushmanland
- LSA open sites (inland)
  - Swartland, Franschhoek, Namaqualand, Bushmanland
- LSA coastal shell middens
  - Melkbosstrand, Yzerfontein, Saldanha Bay, Paternoster, Dwarskersbos, Infanta, Knysna, Namaqualand
- LSA burials
  - Melkbosstrand, Saldanha Bay, Namaqualand, Knysna
- Historical sites
  - Franschhoek (farmstead and well), Waterfront (fort, dump and well), Noordhoek (cottage), variety of small excavations in central Cape Town and surrounding suburbs
- Historic burial grounds
  - Green Point (Prestwich Street), V&A Waterfront (Marina Residential), Paarl

Awards:

Western Cape Government Cultural Affairs Awards 2015/2016: Best Heritage Project.

APPENDIX 2 – Fossil Chance Finds Procedure

<table>
<tr><th colspan="3">CHANCE FOSSIL FINDS PROCEDURE: KATHU LYNDOCH SOLAR PROJECT NEAR KATHU</th></tr>
<tr><td>Province & region:</td><td colspan="2">NORTHERN CAPE, Kuruman District</td></tr>
<tr><td>Responsible Heritage Management Authority</td><td colspan="2">SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Phone: +27 (0)21 462 4502. Fax: +27 (0)21 462 4509. Web: www.sahra.org.za</td></tr>
<tr><td>Rock unit(s)</td><td colspan="2">Kalahari Group, consolidated older alluvial / pan deposits, buried dolines</td></tr>
<tr><td>Potential fossils</td><td colspan="2">Bones, teeth, horn cores of mammals as well as calcretised burrows (e.g. termite nests, plant root and stem casts), non-marine molluscs</td></tr>
<tr><td rowspan="5">ECO protocol</td><td colspan="2">1. Once alerted to fossil occurrence(s): alert site foreman, stop work in area immediately (N.B. safety first!), safeguard site with security tape / fence / sand bags if necessary.</td></tr>
<tr><td colspan="2">2. Record key data while fossil remains are still in situ:
• Accurate geographic location – GPS co-ordinates, describe and mark on site map / 1: 50 000 map / satellite image / aerial photo
• Context – describe position of fossils within stratigraphy (rock layering), depth below surface
• Photograph fossil(s) in situ with scale, from different angles, including images showing context (e.g. rock layering)</td></tr>
<tr><td>3. If feasible to leave fossils in situ:
• Alert Heritage Management Authority and project palaeontologist (if any) who will advise on any necessary mitigation
• Ensure fossil site remains safeguarded until clearance is given by the Heritage Management Authority for work to resume</td><td>3. If not feasible to leave fossils in situ (emergency procedure only):
• Carefully remove fossils, as far as possible still enclosed within the original sedimentary matrix (e.g. entire block of fossiliferous rock)
• Photograph fossils against a plain, level background, with scale
• Carefully wrap fossils in several layers of newspaper / tissue paper / plastic bags
• Safeguard fossils together with locality and collection data (including collector and date) in a box in a safe place for examination by a palaeontologist
• Alert Heritage Management Authority and project palaeontologist (if any) who will advise on any necessary mitigation</td></tr>
<tr><td colspan="2">4. If required by Heritage Management Authority, ensure that a suitably-qualified specialist palaeontologist is appointed as soon as possible by the developer.</td></tr>
<tr><td colspan="2">5. Implement any further mitigation measures proposed by the palaeontologist and Heritage Management Authority</td></tr>
<tr><td>Specialist palaeontologist</td><td colspan="2">Record, describe and judiciously sample fossil remains together with relevant contextual data (stratigraphy / sedimentology / taphonomy). Ensure that fossils are curated in an approved repository (e.g. museum / university / Council for Geoscience collection) together with full collection data. Submit Palaeontological Mitigation report to Heritage Management Authority. Adhere to best international practice for palaeontological fieldwork and Heritage Management Authority minimum standards.</td></tr>
</table>

APPENDIX 3 – Site Sensitivity Verification

A site sensitivity verification was undertaken in order to confirm the current land use and environmental sensitivity of the proposed project area. The details of the site sensitivity verification are noted below:

Date of Site Visit	21 July 2018 (for different project)
Specialist Name	Dr Jayson Orton
Professional Registration Number	ASAPA: 233; APHP: 043
Specialist Affiliation / Company	ASHA Consulting (Pty) Ltd

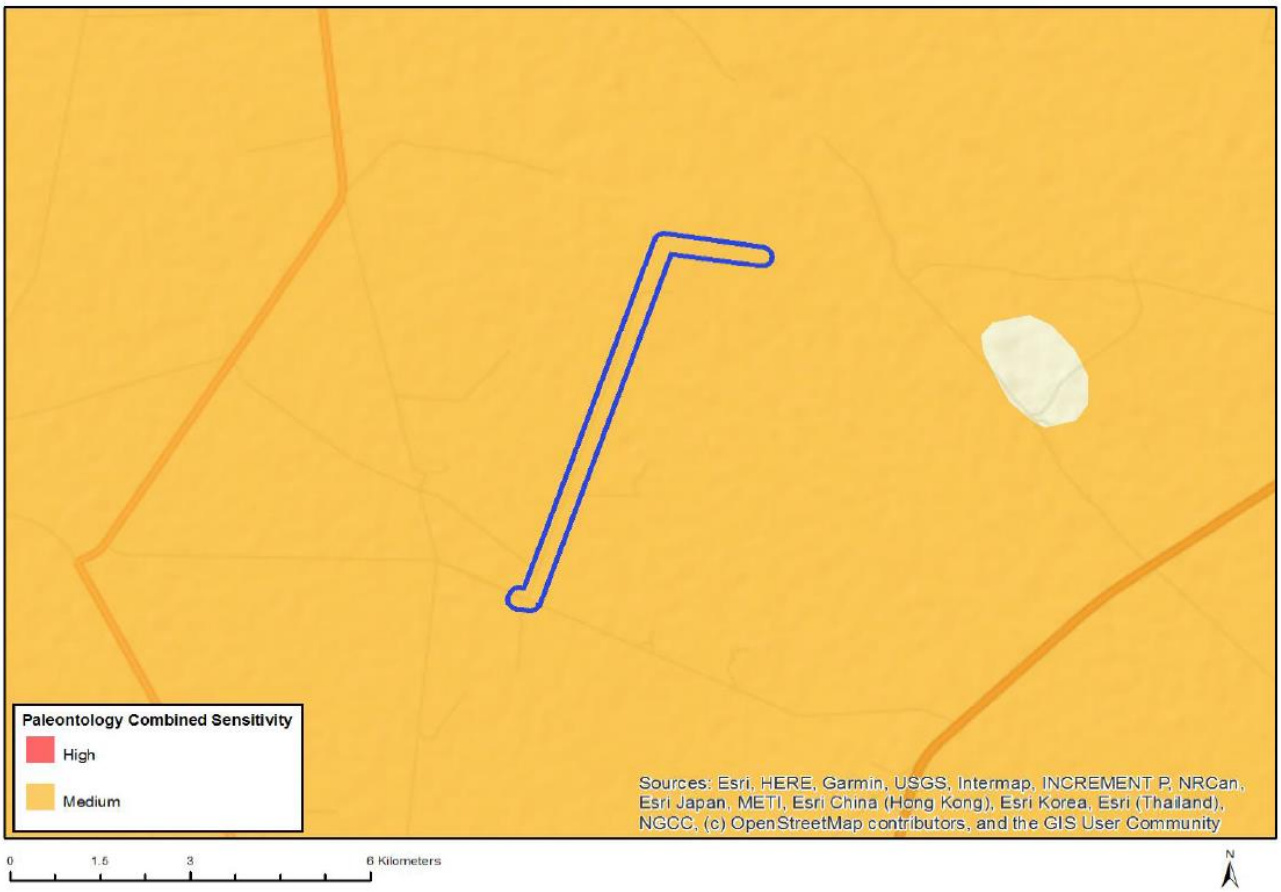
- Provide a description on how the site sensitivity verification was undertaken using the following means:
(a) desk top analysis, using satellite imagery;
(b) preliminary on -site inspection; and
(c) any other available and relevant information.

Although fieldwork for an earlier project did visit the area, no fieldwork was specifically undertaken for this project because previous observations suggested this would be pointless. Satellite aerial photography was used in combination with the author's accumulated knowledge of the local landscape to confirm that the expected landscape character prevailed throughout the study rea. Desktop research was also used to inform on the heritage context of the area. This information is presented in the report (Sections 5.2.1 and 5.5.1).

- Provide a description of the outcome of the site sensitivity verification in order to:
(a) confirm or dispute the current use of the land and the environmental sensitivity as identified by the screening tool, such as new developments or infrastructure, the change in vegetation cover or status etc.; and
(b) include a motivation and evidence (e.g. photographs) of either the verified or different use of the land and environmental sensitivity.

There is no screening tool map for archaeology and cultural heritage which denotes a low sensitivity for the entire project area. Although no site visit was undertaken specifically for this project, the specialist's knowledge of the area from other work suggests that the surface is all sand with some calcrete in the south and that archaeological materials are likely to be completely absent from the surface. This means that the surface sensitivity is confirmed as low. However, because ironstone gravels that bear artefacts are known to occur below the surface, but at unknown depth, the site is better considered as of medium or medium-low sensitivity. The calcrete area in the south is considered low sensitivity because it is known that archaeological materials are largely absent from such areas. Because of the likely absence of surface heritage and no site visit for this project, there is no photographic record documenting the archaeological heritage.

The screening tool maps the site as being of medium palaeontological sensitivity. This is disputed by the specialist on the basis that the Hyperion PV cluster palaeontologist found the area to be of low sensitivity. On the strength of other work to the west, there is a slightly greater chance of finding fossils in the southern part of the access road alignment where it crosses an area of calcrete.



Screening tool map: palaeontological heritage theme.

Desktop Paleontological Assessment

PALAEONTOLOGICAL HERITAGE: LETTER OF EXEMPTION FROM FURTEHR SPECIALIST STUDIES

PROPOSED 132 kV POWER LINE FOR THE HYPERION HYBRID FACILITY OVER FARMS 432/REM, 464/1 & 465/REM NEAR KATHU, KURUMAN MAGISTERIAL DISTRICT NORTHERN CAPE

John E. Almond PhD (Cantab.)
***Natura Viva* cc,**
PO Box 12410 Mill Street,
Cape Town 8010, RSA
naturaviva@universe.co.za

November 2020

EXECUTIVE SUMMARY

The footprint of the proposed short 132 kV powerline linking the authorized Hyperion Hybrid Facility to the existing Eskom Kalbas Substation to the north of Kathu, Kuruman Magisterial District, Northern Cape is underlain by Late Caenozoic calcretes, aeolian sands and surface gravels of the Kalahari Group that are generally of low palaeontological sensitivity. The impact significance in terms of local fossil heritage resources without mitigation is therefore assessed as LOW (negative). Pending the potential exposure of scientifically important fossil remains (*e.g.* mammalian bones and teeth) before or during the construction phase, no further specialist palaeontological studies or mitigation are recommended here. A protocol for Chance Fossil Finds for the construction phase of the development is appended to this report and should be included in the Environmental Management Programme for the powerline development.

1. PROJECT OUTLINE & BRIEF

It is proposed to construct a short (*c*. 7 km long) 132 kV powerline to link the authorized Hyperion Hybrid Facility to the existing Eskom Kalbas Substation located to the north of Kathu in the Kuruman Magisterial District, Northern Cape. The new powerline line would start on Lyndoch 432/Rem., cross Selsden 464/1, and end on Kathu 465/Rem (Fig. 1).

According to the SAHRIS palaeosensitivity map, the proposed powerline route traverses outcrop areas of moderate to high sensitivity for palaeontological resources (Fig. 3). The SAHRA Archaeological, Palaeontological and Meteorites (APM) Committee has therefore requested that a desktop Palaeontological Assessment for the proposed development must be conducted by a qualified palaeontologist. This study contributes to the overarching Heritage Impact Assessment (Orton 2020) for the development compiled by ASHA Consulting (Pty) Ltd (Contact details: Dr J. Orton. ASHA Consulting (Pty) Ltd. 40 Brassie Street, Lakeside, 7945. Tel: (021) 788 1025 | 083 272 3225. Email: jayson@asha-consulting.co.za).

2. GEOLOGICAL CONTEXT

A desktop palaeontological heritage study for the Hyperion Hybris Facility near Kathu has been previously submitted by Almond (2018). It concluded that the probability of significant impacts on palaeontological heritage here is very low (but not zero). The hybrid facility and the associated 132 kV powerline project area is situated in flat-lying, arid terrain at *c*. 1100-1200 m amsl on the north-western side of the N14 Kathu – Kuruman tar road. *c*. 16 km NNE of Kathu, Northern Cape (Fig. 1). The geology of the Kathu region is shown on 1: 250 000 geological map 2722 Kuruman (Council for Geoscience, Pretoria) (Fig. 2), for which a sheet explanation has not yet been published, and is also outlined in previous palaeontological assessment reports by the author and others (e.g. Almond 2014, 2015a, 2015b, 2018, Pether 2011).

The Kathu region is largely underlain by Late Caenozoic continental sediments of the **Kalahari Group** (Partridge *et al.* 2006). Much of the broader study area overlies thick calcretes of the Mokolanen Formation which could be up to 5 million years old and crop out at or near-surface under the south-western third or so of the powerline route (Tl, yellow in Fig. 2). Locally overlying these are gravels of the Obobogorop Formation (not mapped) and red Kalahari aeolian sands of the **Gordonia Formation**. These aeolianites are of Pleistocene to Recent age and are mapped beneath the north-eastern two thirds or so of the powerline route (Qs, pale yellow in Fig. 2). Based on satellite imagery (Fig.1) the powerline route does not traverse any major drainage line or pans that might be associated with substantial calcretised deposits – including possible palaeo-*vlei* or pan deposits and alluvial gravels - as well as unconsolidated alluvium (*cf* Almond 2013a, 2013b 2018). Field data, including site photographs, provided by Dr J. Orton (2020) in his HIA for this project support the conclusion that potentially-sensitive bedrocks or superficial sediments are unlikely to be represented within the powerline footprint.

3. PALAEONTOLOGICAL HERITAGE

According to the SAHRIS palaeosensitivity map, the proposed powerline route traverses outcrop areas of moderate to high sensitivity for palaeontological resources (Fig. 3). The Kalahari Group deposits blanketing the landscape in the Kathu area are considered here to be of generally low palaeontological sensitivity, however (*cf* Almond 2014, 2015a, 2015b, 2018, Almond & Pether 2008, Pether 2011), although rare, localised areas of high sensitivity may occur. The main palaeontological heritage concern in the present study region would be Quaternary mammalian remains (bones, teeth and horncores), trace fossils and plant fossils associated with solution hollows as well as ancient pan or *vlei* deposits along drainage lines, such as have been recorded from the well-known Kathu Pan site situated *c*. 5.5. km NW of Kathu town (Beaumont 1990, Beaumont 2004, Beaumont *et al.* 1984) (See also Almond 2013a, 2013b). However, as outlined previously, satellite images and field photos suggest that no major drainage lines will be traversed by the proposed powerline.

- **Palaeontological heritage assessment**

Potential impacts on local palaeontological heritage of concern in the case of the present development involve the possible disturbance, damage or destruction of fossil remains (notably mammalian fossils) as a result of surface clearance for any new access roads and excavations for pylon footings during the construction phase of the powerline. Given the short length of the powerline and the shallow pylon footing excavations anticipated here, anticipated impacts are likely

to be of LOW (negative) significance (See Table 1, largely following Orton 2020). The impact significance can be realistically reduced through consistent construction phase monitoring by the ECO and full implementation of the Chance Fossil Finds Procedure appended to this report. Residual impacts are probably unavoidable, and are likely to be very small.

4. CONCLUSIONS & RECOMMENDATIONS

The project area for the proposed 132 kV powerline is underlain by Late Caenozoic calcretes, surface gravels and aeolian sands of the Kalahari Group that are generally of low palaeontological sensitivity while the project footprint is small. The impact significance without mitigation in terms of local fossil heritage resources is therefore assessed as LOW (negative). Pending the potential exposure of scientifically important fossil remains before or during the construction phase, no further specialist palaeontological studies or mitigation are recommended here. A protocol for Chance Fossil Finds for the construction phase of the development is appended to this report and should be included in the Environmental Management Programme for the powerline development.

Table 1: Palaeontological heritage impact assessment and recommended mitigation for the proposed 132 kV powerline for the authorized Hyperion Hybrid Facility near Kathu

Nature: Direct destruction, damage or disturbance of fossils during excavation of pylon foundations and surface clearance for access road		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (4)	Minor (2)
Probability	Improbable (2)	Very improbable (1)
Significance	**Low (20)**	**Low (8)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Unlikely	Unlikely
Can impacts be mitigated?	Yes	
Mitigation: ECO, site foreman or other responsible person to monitor excavations for pylon foundations and clearance for access road for fossils and also explain to workers the need to protect and report any fossils uncovered during development. If fossils are found they must be protected *in situ*, the Chance Fossil Finds Procedure must be implemented and the finds must be reported to a qualified palaeontologist or SAHRA for evaluation. If the Chance Fossil Finds Procedure is implemented properly then this evaluation can often occur remotely.		
Residual Impacts: Unavoidable but likely to be low. It is impossible to locate every fossil and, if present, some, especially smaller ones, will always be missed and lost during excavation.		

5. KEY REFERENCES

ALMOND, J.E. 2013a. Proposed 16 Mtpa expansion of Transnet's existing manganese ore export railway line & associated infrastructure between Hotazel and the Port of Ngqura, Northern &

Eastern Cape. Part 1: Hotazel to Kimberley, Northern Cape. Palaeontological specialist assessment: combined desktop and field-based study, 85 pp. Natura Viva cc, Cape Town.

ALMOND, J.E. 2013b. Proposed new railway compilation yard at Mamathwane near Hotazel, John Taolo Gaetsewe District Municipality, Northern Cape. Palaeontological specialist assessment: combined desktop and field-based study, 29 pp. Natura Viva cc, Cape Town.

ALMOND, J.E. 2014. Residential development on Remainder and Portion 3 of Farm Bestwood RD 459 in Kathu, Gamagara Municipality, Northern Cape Province. Palaeontological specialist assessment: desktop study , 33 pp. Cape Town: Natura Viva cc.

ALMOND, J.E. 2015a. Proposed AEP Mogobe Solar PV Energy Facility on farm 460 Legoka near Kathu, Gamagara Municipality, Northern Cape. Unpublished report prepared for Cape EAPrac. Cape Town: Natura Viva cc.

ALMOND, J.E. 2015b. Rezoning and subdivision of Farm Uitkoms No. 462, Portion 1, Kathu, Gamagara Municipality, Northern Cape province. Palaeontological specialist assessment: desktop study, 25 pp. Cape Town, Natura Viva cc.

ALMOND, J.E. 2018. Kathu Hyperion Solar Project near Kathu, Northern Cape: palaeontological heritage desktop input for ASHA Consulting (Pty) Ltd, 7 pp. Natura Viva cc, Cape Town.

ALMOND, J.E. & PETHER, J. 2008. Palaeontological heritage of the Northern Cape. Interim SAHRA technical report, 124 pp. Natura Viva cc., Cape Town.

BEAUMONT, P.B. 1990. Kathu Pan. In: Beaumont, P.B. & Morris, D. (Eds.) Guide to archaeological sites in the Northern Cape, pp. 75-100 *plus* table 1, figs 1-19. McGregor Museum, Kimberley.

BEAUMONT, P.B. 2004. Kathu Pan and Kathu Townlands / Uitkoms. In: Archaeology in the Northern Cape: some key sites, pp. 50-53 plus 4 pages of figs. McGregor Museum, Kimberley.

BEAUMONT, P.B., VAN ZINDEREN BAKKER, E.M. & VOGEL, J.C. 1984. Environmental changes since 32, 000 BP at Kathu Pan, Northern Cape. In: Vogel, J.C. (Ed.) Late Cenozoic palaeoclimates of the southern hemisphere, pp. 329-338. Balkema, Rotterdam.

ERIKSSON, P.G., ALTERMANN, W. & HARTZER, F.J. 2006. The Transvaal Supergroup and its precursors. In: Johnson, M.R., Anhaeusser, C.R. & Thomas, R.J. (Eds.) The geology of South Africa, pp. 237-260. Geological Society of South Africa, Marshalltown.

ORTON, J. 2020. Proposed 132 kV power line over Farms 432/REM, 464/1 & 465/REM for the Hyperion Hybrid Facility, north of Kathu, Kuruman Magisterial District, Northern Cape. Heritage Impact Assessment, 35 pp. ASHA Consulting, Lakeside.

PARTRIDGE, T.C., BOTHA, G.A. & HADDON, I.G. 2006. Cenozoic deposits of the interior. In: Johnson, M.R., Anhaeusser, C.R. & Thomas, R.J. (Eds.) The geology of South Africa, pp. 585-604. Marshalltown: Geological Society of South Africa.

PETHER, J. 2011. Brief palaeontological impact assessment (desktop study) proposed Kathu and Sishen Solar Energy Facilities Portions 4 & 6 of the farm Wincanton 472 Kuruman District, Northern Cape. Unpublished report prepared for Savannah Environmental (Pty) Ltd. Kommetjie: John Pether.

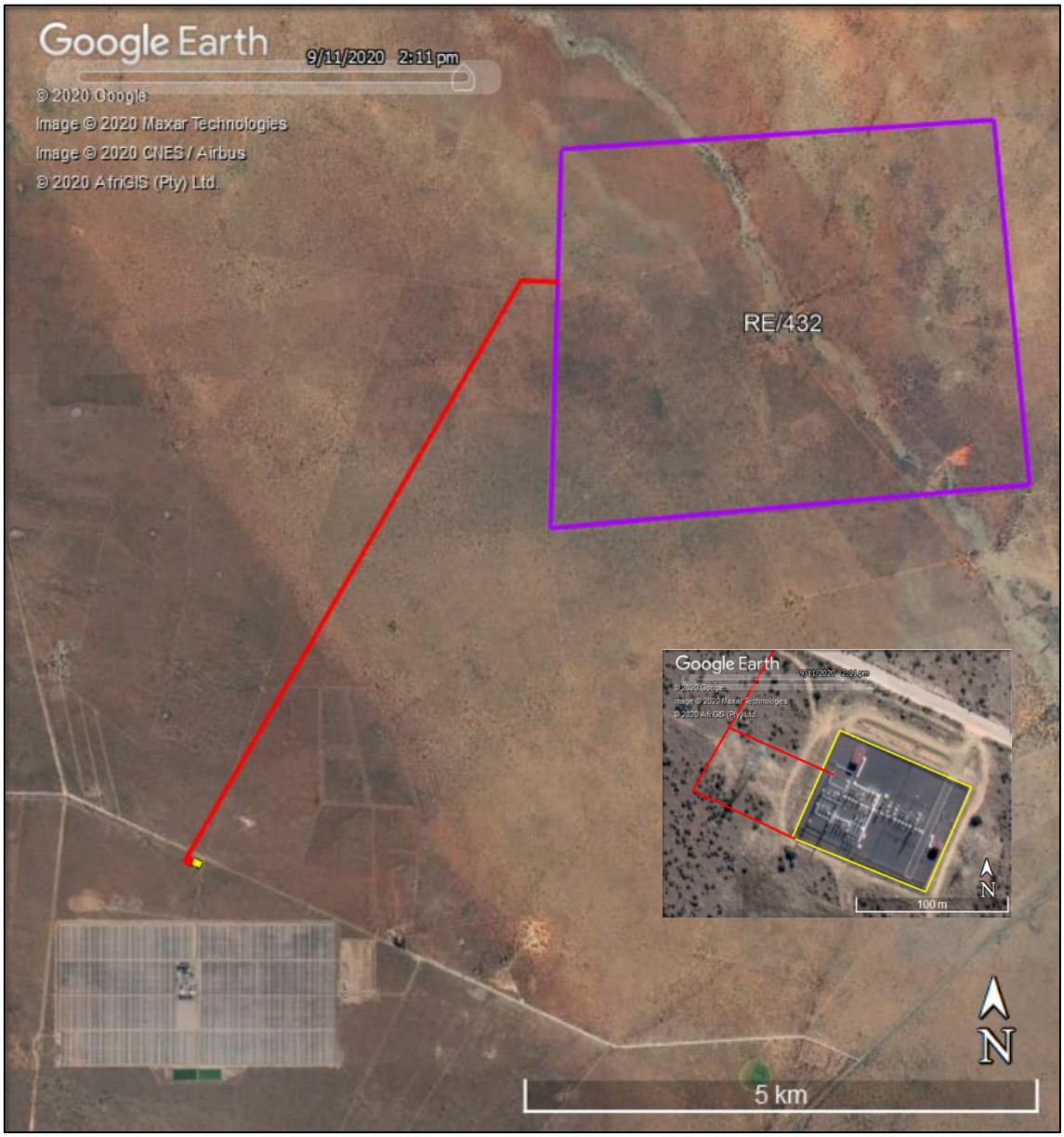


Figure 1: Google Earth© satellite image showing the proposed 132 kV powerline route (red line) to the authorized Hyperion Hybrid Facility near Kathu (purple polygon) from the existing Kalbas Substation (small yellow rectangle). The powerline route traverses land parcels 432/REM, 464/1 & 465/REM and does not cross any potentially palaeosensitive major drainage lines. The inset shows the Kalbas Substation connection (Image abstracted from the HIA report by J. Orton 2020).

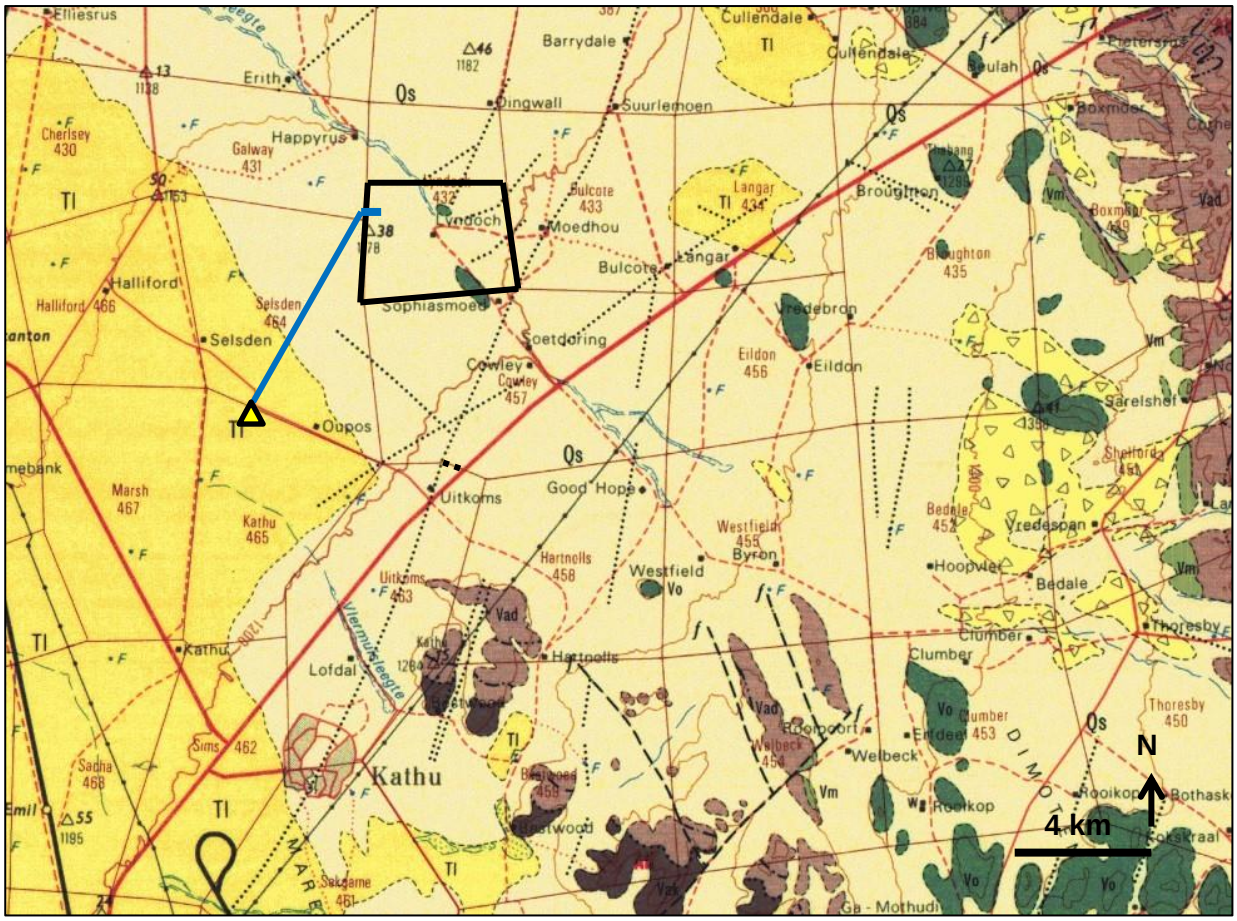


Figure 2: Extract from 1: 250 000 geological map 2722 Kuruman (Council for Geoscience, Pretoria) showing the proposed 132 kV powerline route (blue line) to the authorised Hyperion Hybrid Facility near Kathu (black polygon) from the existing Kalbas Substation (small yellow triangle).

Geological units represented within the broader study region on sheet 2722 Kuruman include the following (*N.B.* Some of these units are only represented subsurface within the study area itself):
Vo (dark green) – Ongeluk Formation lavas (Postmasburg Group)
Tl (dark yellow) – calcretes ("surface limestone") of the Kalahari Group
Qs (pale yellow) – Quaternary aeolian sands of the Gordinia Formation, Kalahari Group
Blue stippled areas = pans and water courses (usually dry)

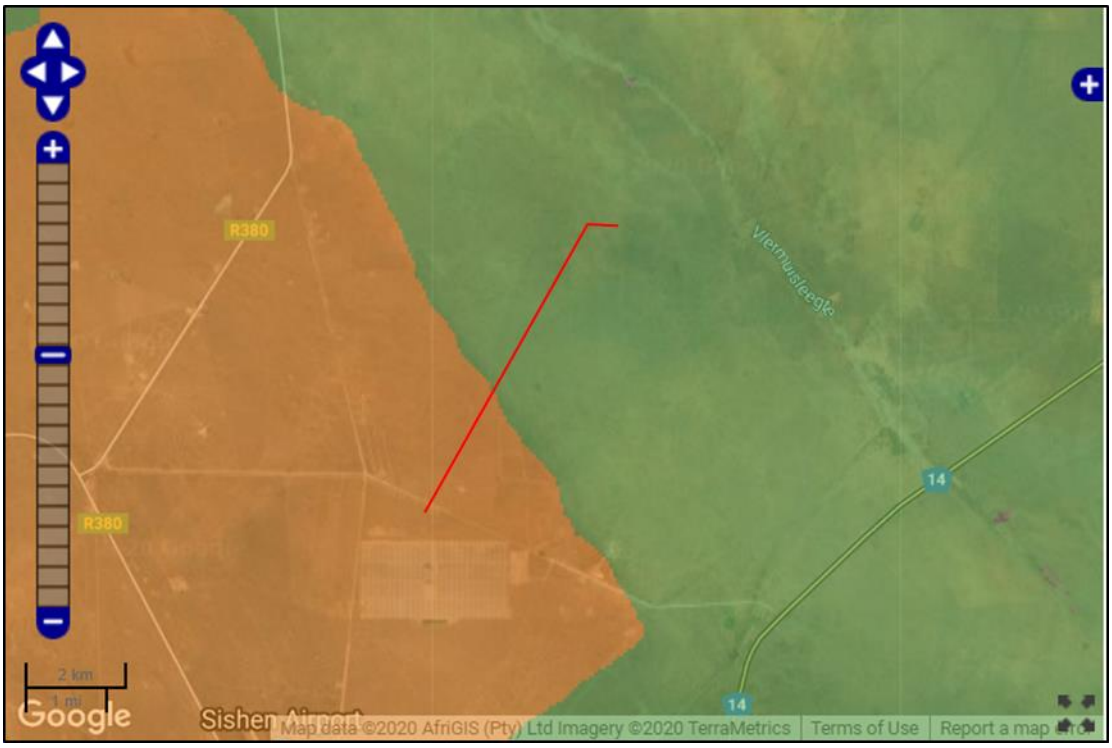


Figure 3: Extract from the SAHRIS palaeosensitivity map showing that the proposed powerline traverses outcrop areas of moderate (green shading) to high (orange shading) sensitivity (Image provided by J. Orton of ASHA).

6. QUALIFICATIONS & EXPERIENCE OF THE AUTHOR

Dr John Almond has an Honours Degree in Natural Sciences (Zoology) as well as a PhD in Palaeontology from the University of Cambridge, UK. He has been awarded post-doctoral research fellowships at Cambridge University and in Germany, and has carried out palaeontological research in Europe, North America, the Middle East as well as North and South Africa. For eight years he was a scientific officer (palaeontologist) for the Geological Survey / Council for Geoscience in the RSA. His current palaeontological research focuses on fossil record of the Precambrian - Cambrian boundary and the Cape Supergroup of South Africa. He has recently written palaeontological reviews for several 1: 250 000 geological maps published by the Council for Geoscience and has contributed educational material on fossils and evolution for new school textbooks in the RSA.

Since 2002 Dr Almond has also carried out palaeontological impact assessments for developments and conservation areas in the Western, Eastern and Northern Cape, Mpumalanga, Free State, Limpopo, Northwest and KwaZulu-Natal under the aegis of his Cape Town-based company *Natura Viva* cc. He has been a long-standing member of the Archaeology, Palaeontology and Meteorites Committee for Heritage Western Cape (HWC) and an advisor on palaeontological conservation and management issues for the Palaeontological Society of South Africa (PSSA), HWC and SAHRA. He is currently compiling technical reports on the provincial palaeontological heritage of Western, Northern and Eastern Cape for SAHRA and HWC. Dr Almond is an accredited member of PSSA and APHP (Association of Professional Heritage Practitioners – Western Cape).

Declaration of Independence

I, John E. Almond, declare that I am an independent consultant and have no business, financial, personal or other interest in the proposed project, application or appeal in respect of which I was appointed other than fair remuneration for work performed in connection with the activity, application or appeal. There are no circumstances that compromise the objectivity of my performing such work.

Dr John E. Almond
Palaeontologist
***Natura Viva* cc**

<table>
<tr><td colspan="3">APPENDIX - CHANCE FOSSIL FINDS PROCEDURE: 132 kV POWERLINE TO HYPERION HYBRID FACILITY NEAR KATHU</td></tr>
<tr><td>Province & region:</td><td colspan="2">NORTHERN CAPE, Kuruman District</td></tr>
<tr><td>Responsible Heritage Management Authority</td><td colspan="2">SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Phone: +27 (0)21 462 4502. Fax: +27 (0)21 462 4509. Web: www.sahra.org.za</td></tr>
<tr><td>Rock unit(s)</td><td colspan="2">Kalahari Group aeolain sands (Gordonian Fm) and calcretes</td></tr>
<tr><td>Potential fossils</td><td colspan="2">Bones, teeth, horn cores of mammals as well as calcretised burrows (e.g. termite nests, plant root and stem casts) , non-marine molluscs</td></tr>
<tr><td rowspan="5">ECO protocol</td><td colspan="2">1. Once alerted to fossil occurrence(s): alert site foreman, stop work in area immediately (N.B. safety first!), safeguard site with security tape / fence / sand bags if necessary.</td></tr>
<tr><td colspan="2">2. Record key data while fossil remains are still in situ:
• Accurate geographic location – describe and mark on site map / 1: 50 000 map / satellite image / aerial photo
• Context – describe position of fossils within stratigraphy (rock layering), depth below surface
• Photograph fossil(s) in situ with scale, from different angles, including images showing context (e.g. rock layering)</td></tr>
<tr><td>3. If feasible to leave fossils in situ:
• Alert Heritage Management Authority and project palaeontologist (if any) who will advise on any necessary mitigation
• Ensure fossil site remains safeguarded until clearance is given by the Heritage Management Authority for work to resume</td><td>3. If not feasible to leave fossils in situ (emergency procedure only):
• Carefully remove fossils, as far as possible still enclosed within the original sedimentary matrix (e.g. entire block of fossiliferous rock)
• Photograph fossils against a plain, level background, with scale
• Carefully wrap fossils in several layers of newspaper / tissue paper / plastic bags
• Safeguard fossils together with locality and collection data (including collector and date) in a box in a safe place for examination by a palaeontologist
• Alert Heritage Management Authority and project palaeontologist (if any) who will advise on any necessary mitigation</td></tr>
<tr><td colspan="2">4. If required by Heritage Management Authority, ensure that a suitably-qualified specialist palaeontologist is appointed as soon as possible by the developer.</td></tr>
<tr><td colspan="2">5. Implement any further mitigation measures proposed by the palaeontologist and Heritage Management Authority</td></tr>
<tr><td>Specialist palaeontologist</td><td colspan="2">Record, describe and judiciously sample fossil remains together with relevant contextual data (stratigraphy / sedimentology / taphonomy). Ensure that fossils are curated in an approved repository (e.g. museum / university / Council for Geoscience collection) together with full collection data. Submit Palaeontological Mitigation report to Heritage Management Authority. Adhere to best international practice for palaeontological fieldwork and Heritage Management Authority minimum standards.</td></tr>
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