HERITAGE IMPACT ASSESSMENT: PROPOSED THERMAL POWER DUAL FUEL GENERATOR ON FARM 432/REM AND ACCESS ROAD ON 432/REM, 457/1, 457/2 and 457/rem, NORTH OF KATHU, KURUMAN MAGISTERIAL DISTRICT, NORTHERN CAPE

Report for:

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1st draft: 13 January 2021
Final report: 21 January 2021

SUMMARY

ASHA Consulting (Pty) Ltd was appointed by Savannah Environmental (Pty) Ltd to provide a heritage assessment for the proposed development of a dual fuel thermal power generation plant to be located on Farm Lyndoch 432/rem and an access road to cross Farm Lyndoch 432/rem, Farm Cowley 457/1, 457/2 and 457/rem to join the N14. The site is located some 15 km north of Kathu. The power generator plant would be centred on S27° 33′ 13.7″ E23° 03′ 53.3″, while the southern end of its access road would be at S27° 35′ 46.9″ E23° 07′ 18.9″. The road would be approximately 15 m wide and would be tarred.

The study area is generally sandy but the section of access road that follows the existing access road is gravelled, sometimes through the importation of gravel and at other times from road grading having penetrated the underlying natural gravel. Vegetation in the area includes grass, bushes and thorn trees. The site was not specifically subjected to a field survey because good data for the area are already on record from a previous survey (July 2018) that covered much of the study area. These data were used to compile this assessment.

Palaeontological aspects are covered by a separate specialist study. The survey has shown that in sandy areas archaeological materials are virtually absent from the surface. However, the surface exposure of an area of ironstone gravel with associated artefacts to the southeast of the generator site and another tiny exposure within it shows that such material extends beneath the sand cover. The same was observed along the existing access road where it has intersected the natural gravel layer in some places. It is thus likely that, depending on the sand depth, excavations for foundations would intersect the gravel and reveal archaeological materials. Graves are an ever-present but very unlikely type of heritage resource that could be present. Two historical structures (>60 years) occur alongside the access road but have no heritage significance and will not be affected other than through minor alteration of their context. The main issue for this project will be the potential to intersect archaeological resources during excavations for both the generator and the road. 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 through subsurface observations.

It is recommended that the proposed generator and access road should be authorised and that the following recommendations should be included in the authorisation conditions or EMPr as appropriate (note that palaeontological conditions should be consulted in the palaeontological specialist report):

- An archaeologist should be appointed to conduct test excavations and sampling of the archaeology in areas where *in situ* gravel may be intersected by foundations, trenches and the access road. If geotechnical work is done in time, the results of such work could inform the archaeological fieldwork. This work should aim primarily to understand the distribution of archaeology on the landscape through sampling many small areas, although if any dense archaeology is encountered it may be necessary to expand excavations; and
- If any fossils, 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 an archaeologist or palaeontologist. 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

EO: Environmental 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

PV: Photovoltaic

SAHRA: South African Heritage Resources Agency

SAHRIS: South African Heritage Resources Information System

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1. INTRODUCTION

ASHA Consulting (Pty) Ltd was appointed by Savannah Environmental (Pty) Ltd to provide a scoping heritage assessment for the proposed development of a dual fuel thermal power generation plant to be located on Farm Lyndoch 432/rem and an access road to cross Farm Lyndoch 432/rem, Farm Cowley 457/1, 457/2 and 457/rem to join the N14. The power generator site is located some 15 km north of Kathu, while the southern end of the road on the N14 would be about 12 km northeast of Kathu (Figures 1 & 2). The generator plant would be centred on S27° 33' 13.7" E23° 03' 53.3", while the southern end of its access road would be at S27° 35' 46.9" E23° 07' 18.9".

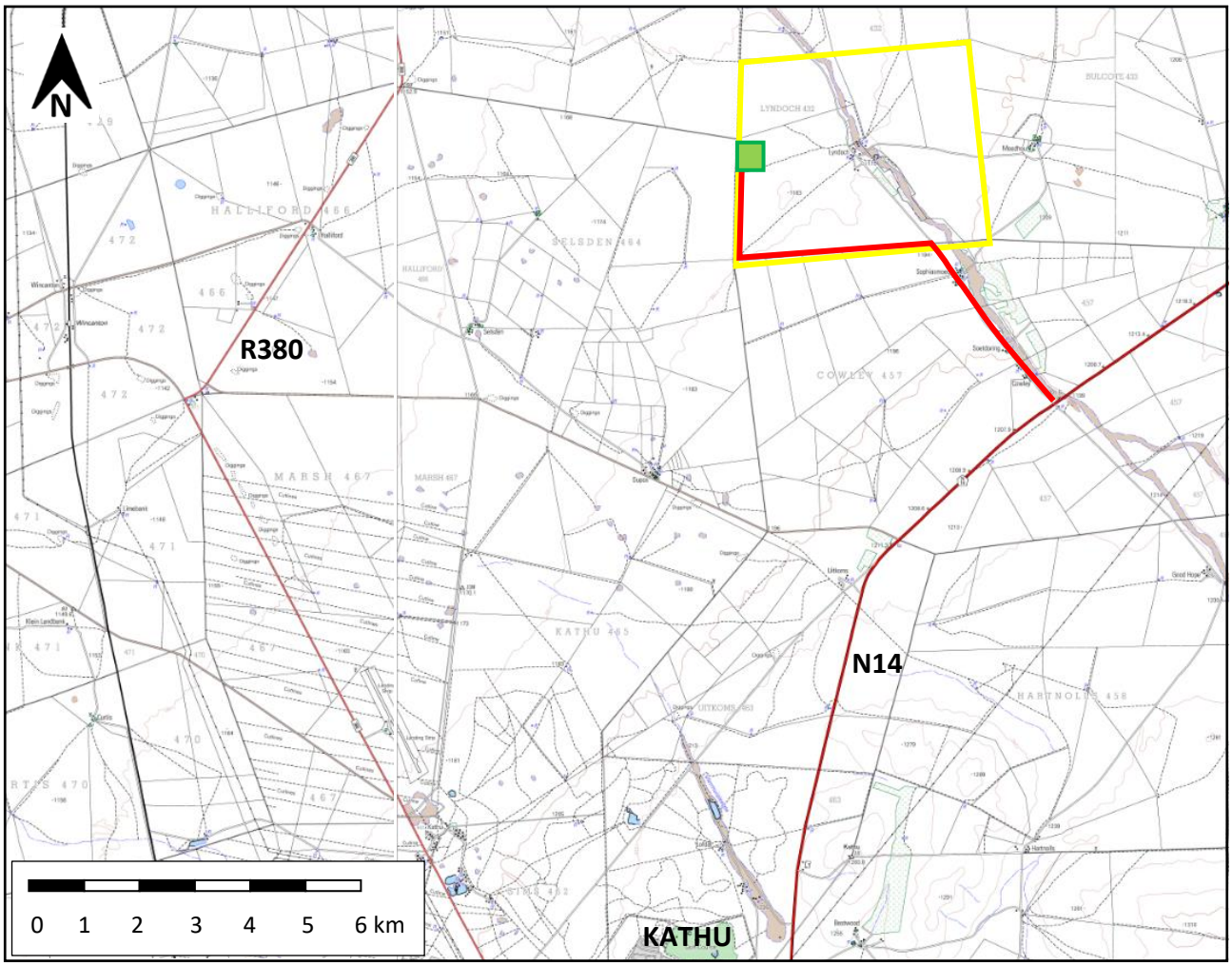

Figure 1: *Extract from 1:50 000 topographic maps 2722DB & 2723CA showing the location of the authorised Hyperion PV Cluster (yellow polygon), the proposed dual fuel generator (green polygon) and the proposed access road line (red line) relative to the town of Kathu in the south. Source of basemap: Chief Directorate: National Geo-Spatial Information. Website: www.ngi.gov.za.*

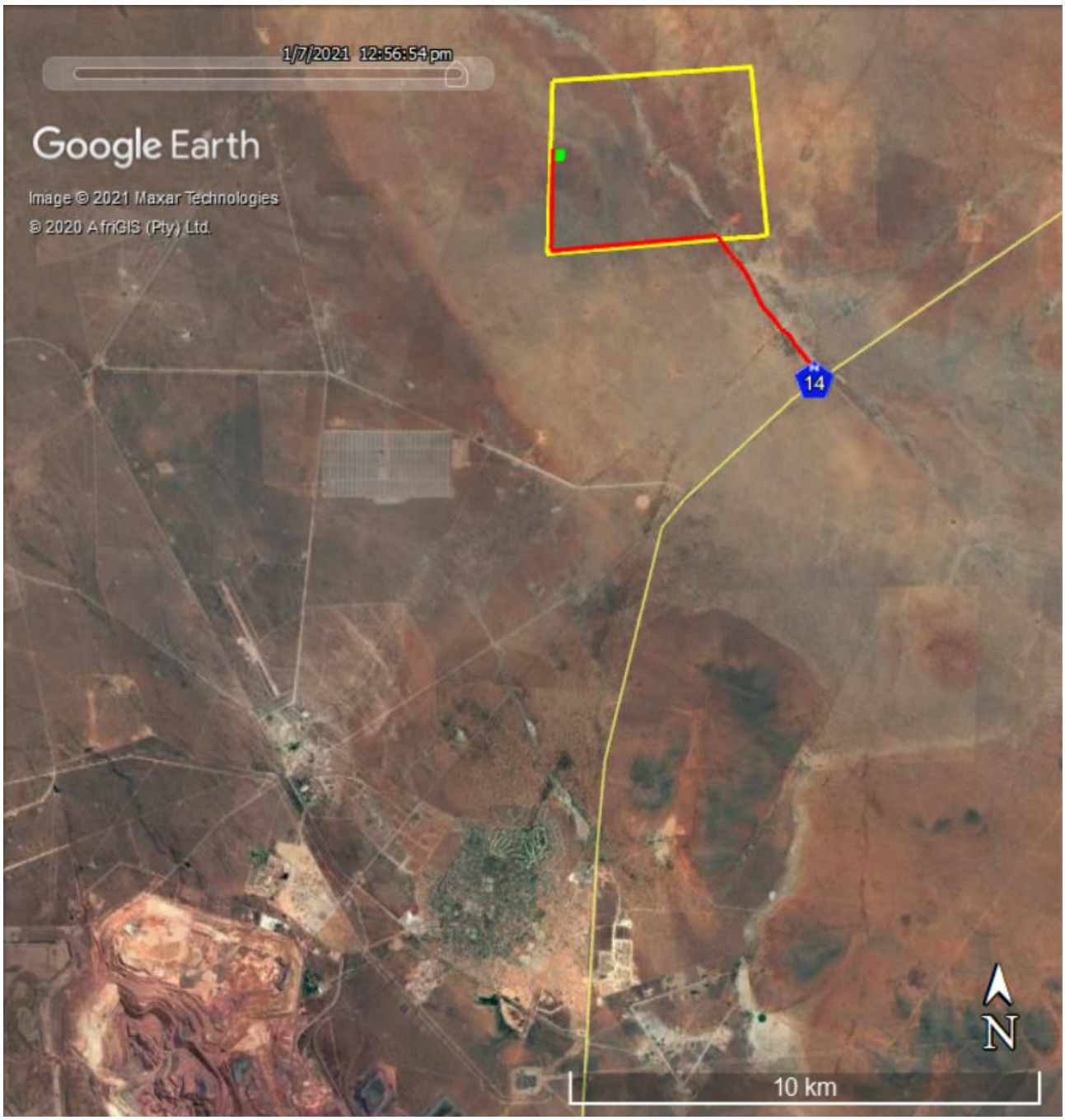

Figure 2: *Aerial view of the study area showing the location of Lyndoch 432/rem. (yellow polygon), the proposed generator site (green polygon) and the proposed access road (red line).*

1.1. The proposed project

1.1.1. *Project description*

The facility will be a hybrid facility consisting of a dispatchable, dual fuel (liquid or gas) thermal generation plant in combination with a solar plant. There will be a single point of connection to the utility (Eskom). The facility will aim to meet the bid requirement of being 100% dispatchable between the hours of 05h00 and 21h30. Where possible and where available, solar power will be utilised to meet the demand however where solar power is not available (typically between the hours of 5h00 and 07h00 and again between 18h00 and 21h30), thermal generation will be utilised. It is currently estimated that between 50 – 65% of the demand will be met utilising solar power with

the remaining 35 – 50 % being met with thermal generation. The facility will be controlled by a joint controller that will have the capability of assessing the demand and regulating the power supply from the solar and thermal facilities accordingly.

The thermal generation plant will include the following infrastructure:

- Reciprocating gas engines;
- Access road;
- Truck entrance and parking facility;
- Regasification plant and fuel preparation plant;
- Dry cooling system for operating oils/chemicals;
- Fuel off-loading facility;
- Fuel storage facility;
- Water demineralisation plant; and
- Cabling, O&M building, fencing, warehouses and workshops.

The tallest part of the facility will be a chimney stack which would be about 27.50 m high, while the building would be about 10.035 m high.

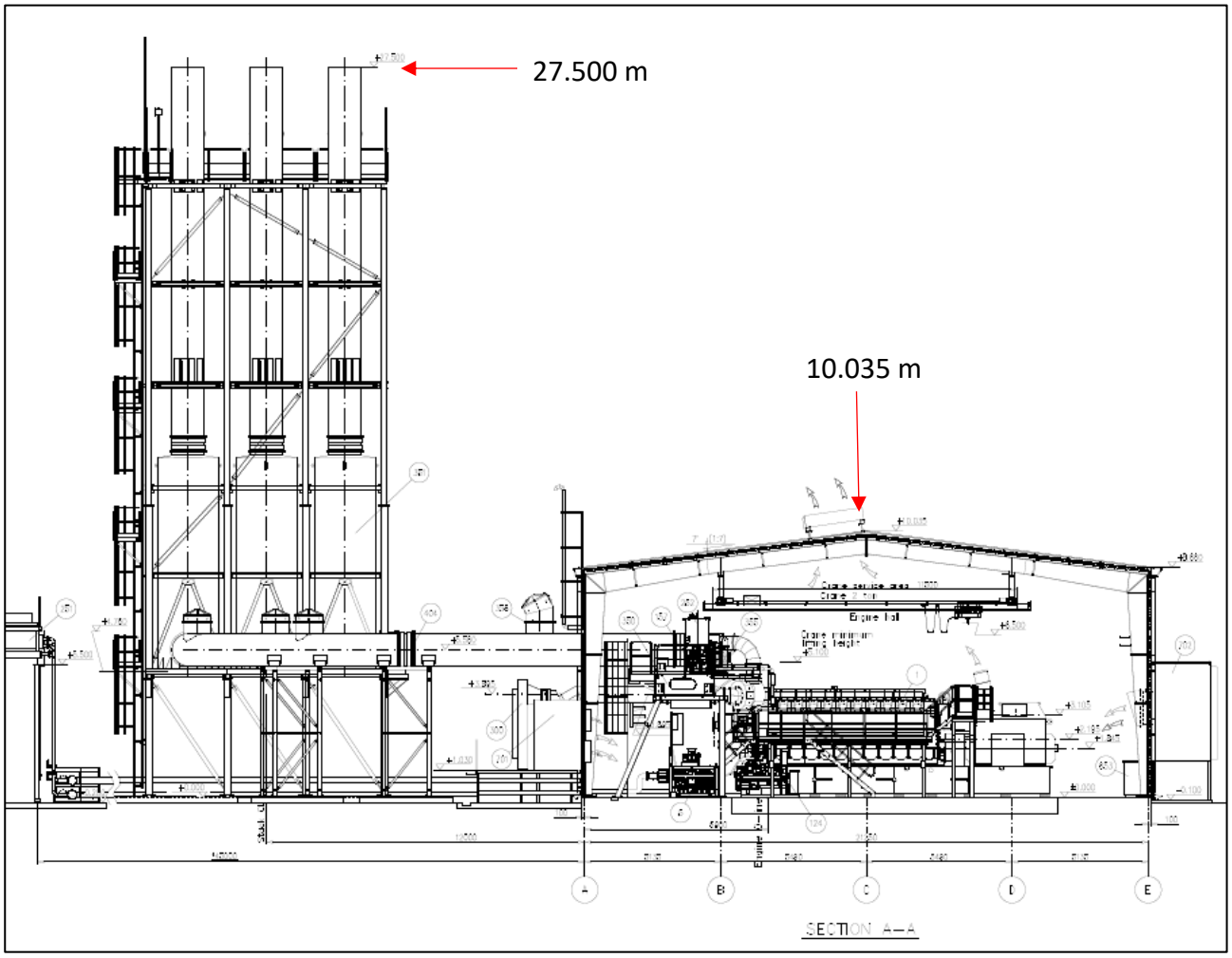

Figure 3: *Cross-section through the proposed generator structure indicating heights above natural ground level.*

The proposed access road that will run north-westwards from the N14 following an existing gravel road to the southern edge of farm Lyndoch 432/rem. It would then run along the inside of the farm boundary towards the west and then northwards inside the western boundary until

it reaches the generator site. The road would be up to 9.5 km long and would have a surfaced width of 15 m.

1.1.2. *Identification of alternatives*

No alternative sites for the generator are being considered because this site was chosen specifically to be within the footprint of the already authorised Hyperion solar PV development. Similarly, other technologies are not being considered since the project is designed to run on two fuel types and to support a solar plant at times of higher demand. Four access road alignments to the Hyperion PV cluster were considered during an earlier impact assessment and the present road to the generator site is designed to make use of the already authorised alignment rather than creating an entirely new road. As such, no other road alternatives are being considered during the present assessment. Therefore, this assessment will consider only the preferred and No-Go alternatives.

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 full heritage impact assessment (HIA) that would assess the potential impacts to heritage resources that may occur. Due to the heritage consultant's knowledge of the site, it was agreed that the study should be a desktop assessment but should reference the earlier fieldwork as required. The assessment 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 the National Department of Environment, Forestry and Fisheries (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.

As already noted, scoping reports are not required under the NHRA but the above describes the types of heritage for which protection is provided and that are considered in this scoping assessment.

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, among other project, the Hyperion PV Cluster (Orton 2019a, 2019b, 2019c, 2019d) which includes the present site (Figure 3) and the Kalahari Solar development (Orton & Walker 2015) which lies 6.5 km south of the generator study area. These projects 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.

Nonetheless, because the assessment is based on earlier fieldwork for a PV Facility project, it is noted that the greater site was surveyed on 20 to 22 July 2018. The survey had relatively low-density coverage because of the surface sand cover. Focus was placed on areas where archaeological materials were expected to be found. This was during winter but, in this very dry area, the season makes no meaningful difference to vegetation covering and hence the ground visibility for the archaeological survey. Other heritage resources are not affected by seasonality. During the survey the positions of finds and survey tracks were recorded on a hand-held Global

Positioning System (GPS) receiver set to the WGS84 datum. Photographs were taken at times in order to capture representative samples of both the affected heritage and the landscape setting of the proposed development. 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.

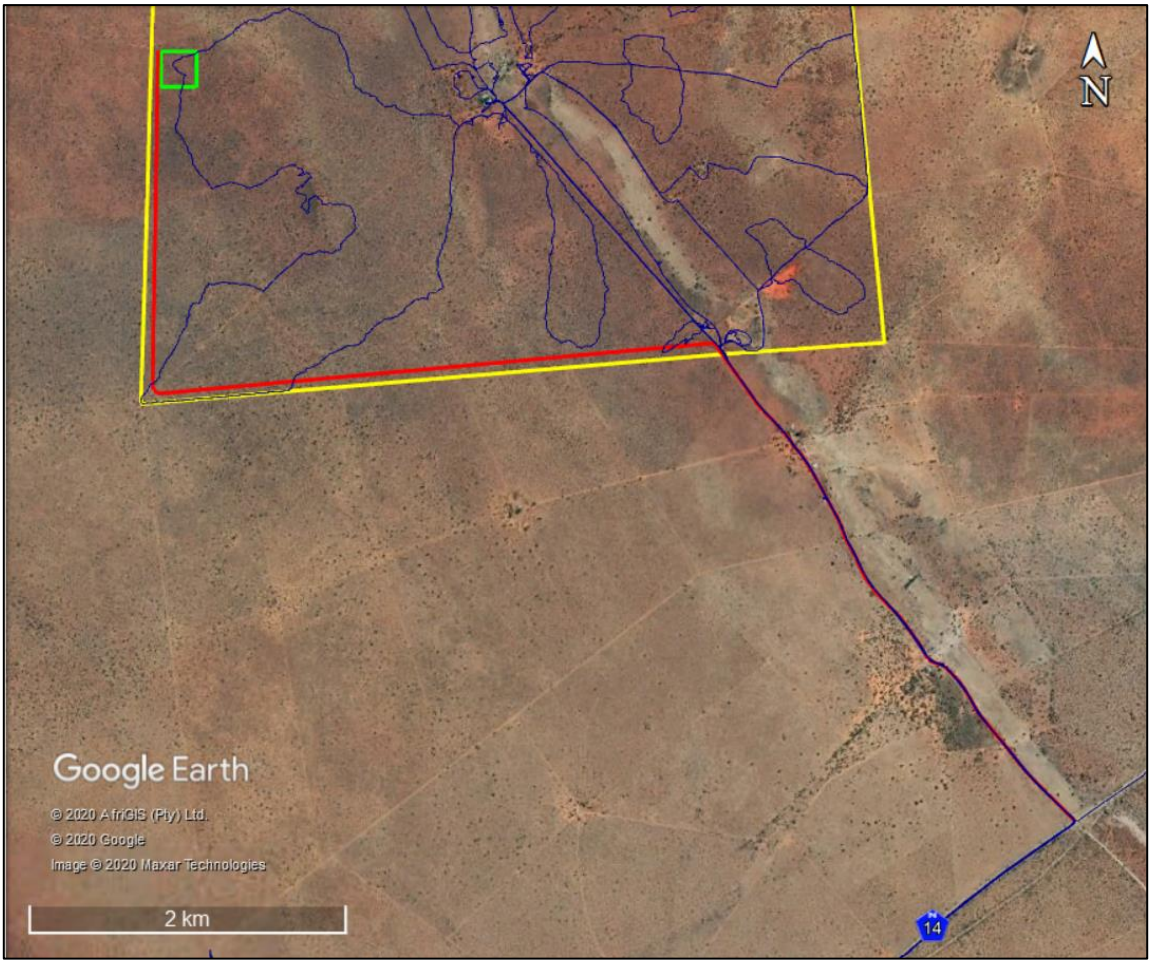

Figure 3: *Aerial view of the proposed generator site (green polygon) and its access road (red line) showing the 21 July 2018 survey track (blue line) passing through the generator site. The yellow line is the farm boundary.*

3.3. Specialist studies

Dr John Almond of Natura Viva cc was commissioned to provide a specialist desktop assessment covering the palaeontological aspects of the assessment. His report is provided separately but should be read in conjunction with the HIA.

3.4. Impact assessment

For consistency among specialist studies, the impact assessment was conducted through application of a methodology 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 a heritage impact assessment (HIA) but, since the present heritage scoping study falls within the context of an EIA which includes a public participation process (PPP), no dedicated consultation was undertaken as part of the present study. 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

The field study was carried out at the surface only and hence any completely buried archaeological sites would not be readily located. Similarly, it is not always possible to determine the depth of archaeological material visible at the surface. It is assumed that what was recorded in the various gravel exposures on the greater site will be representative of what occurs beneath the sand more generally. The whole length of the current access road was not searched and, based on observations from the entire 2018 project area, it is assumed that the observations made along this road will reflect the situation in the intervening gaps as well. The depth of excavations required for the road and generator are unknown, but it is assumed that fairly substantial excavations (e.g. up to *c.* 2 m depth) will be required on the generator site. Given the flat topography, only minimal excavation is likely to be required for the road.

4. PHYSICAL ENVIRONMENTAL CONTEXT

4.1. Site context

The study area lies to the north of Kathu which is a modern, rapidly developing 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 located 6.5 km south of the proposed generator site. The N14 road lies to the southeast of the site, about 7.0 km southeast of the generator site and is the starting point of the proposed access road. 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.

[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.

4.2. Site description

The study area is coated in red Kalahari sand which supports grass, bushes and thorn trees. Figure 4 shows a view taken from within the generator site. It illustrates the general landscape context into which the facility and north-western part of the access road would be placed. The Vlermuisleegte runs from northwest to southeast through Lyndoch 432/rem. This dry watercourse lies several meters below the level of the surrounding plains and, as a result, its margins reveal the gravels that underlie the sand deposits of the area. The current access road (the T26) runs along the south-western bank and gravel is exposed in many places along its length.

Figures 5 to 8 show the varying nature of the existing T26 road that leads from the N14 to the edge of Farm 432/rem. It is generally approximately 5 m wide. It is sometimes level with the surrounding landscape and sometimes cut in. In places the cutting has gone into the naturally occurring subsurface gravels, while elsewhere gravel has been brought in – either from other parts of the road or from a secondary source – in order to create a wearing course.

Figure 4: *View towards the south from a survey beacon within the generator site (taken on 21 July 2018). The access road would approach this point from the south.*

Figure 5: *View along access road to be upgraded looking towards the northwest.*

Figure 6: *View along access road to be upgraded looking towards the northwest.*

Figure 7: *View along access road to be upgraded looking towards the southeast.*

Figure 8: *View across road to be upgraded looking towards the northeast.*

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 studied by a separate specialist, it is noted here that the SAHRIS Palaeosensitivity Map indicates that the generator site and the access road are of moderate palaeontological sensitivity (Figure 9). The palaeontological specialist study should be read in conjunction with the present report.

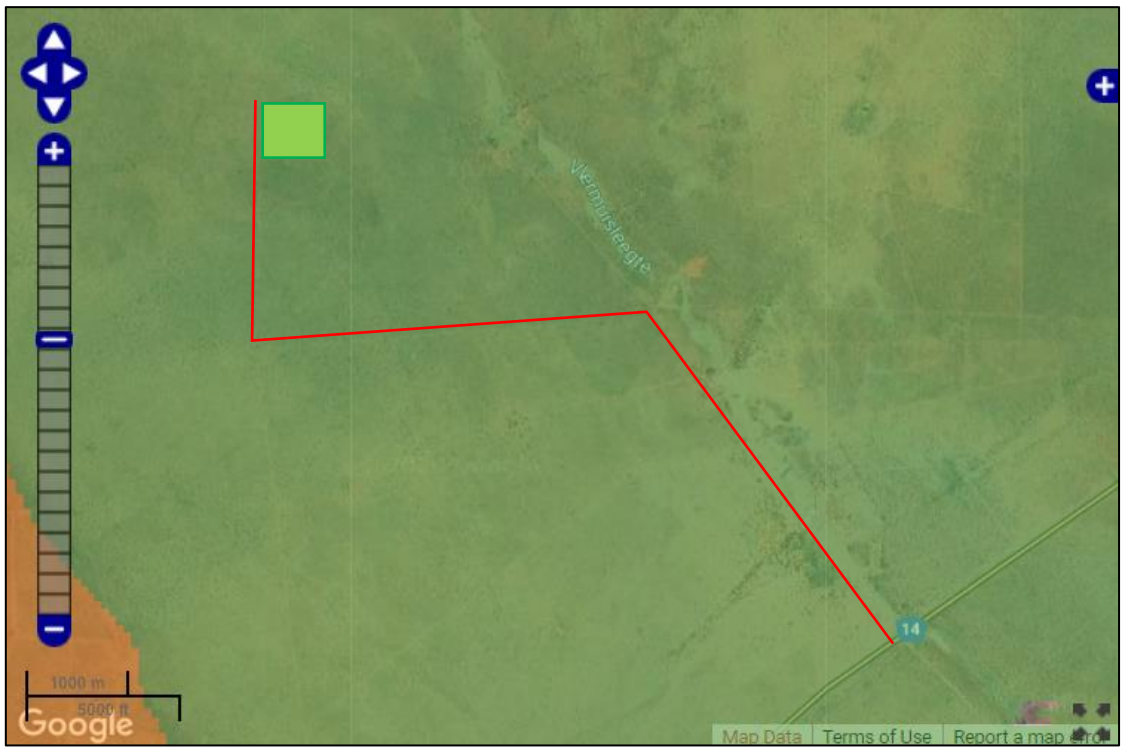

Figure 9: *Extract from the SAHRIS Palaeosensitivity map showing the study area to be of moderate sensitivity (green shading).*

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 10 locates the sites relative to Kathu and the project 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.

5.2.1.1 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).

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).

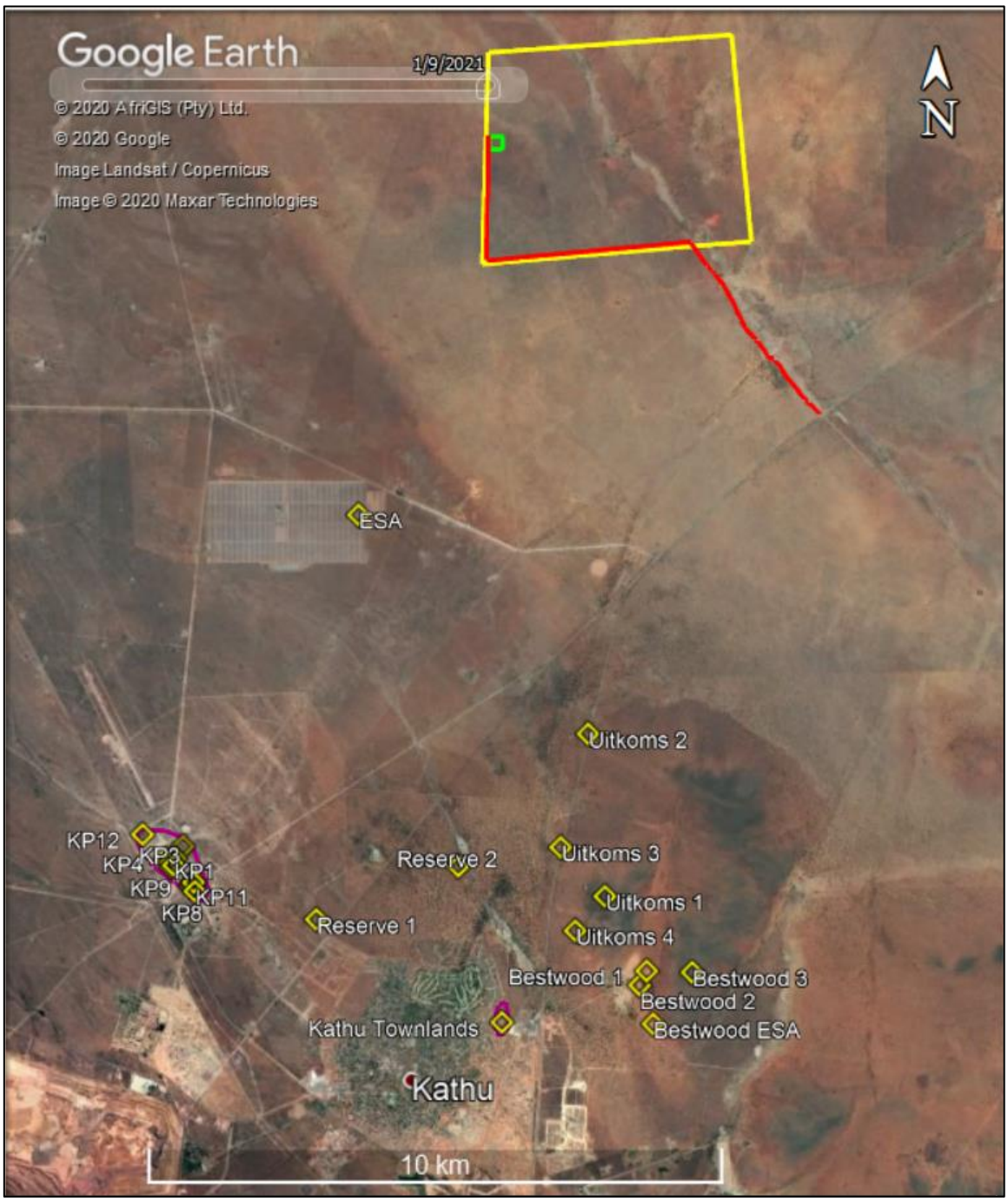

Figure 10: *Aerial view of the Kathu area showing the locations of previously recorded archaeological occurrences (labelled yellow symbols). Key as per Figures 1 and 2.*

5.2.1.2 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).

5.2.1.3 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).

5.2.1.4 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).

5.2.1.5 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 1.0 km southeast of the generator site was found to be an outcropping area of ironstone gravel with many associated artefacts. Within the generator site 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. These observations prove that archaeological materials do occur beneath the aeolian sand. Near the southern end of the proposed access road Orton (2015) noted MSA artefacts scattered around two small pans. Just south again, Orton and Walker (2015) examined a section of the same calcrete area that is intersected by the southern end of the proposed access road and found calcrete exposed at the surface with artefacts virtually absent. Moving eastwards, however, the calcrete gave way to BIF gravel and the number of artefacts increased dramatically.

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. In a survey further just north of Kathu, Dreyer (2010) found nothing. Gaigher (2013) examined an area about 8 km west of the proposed access road 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 11). 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.

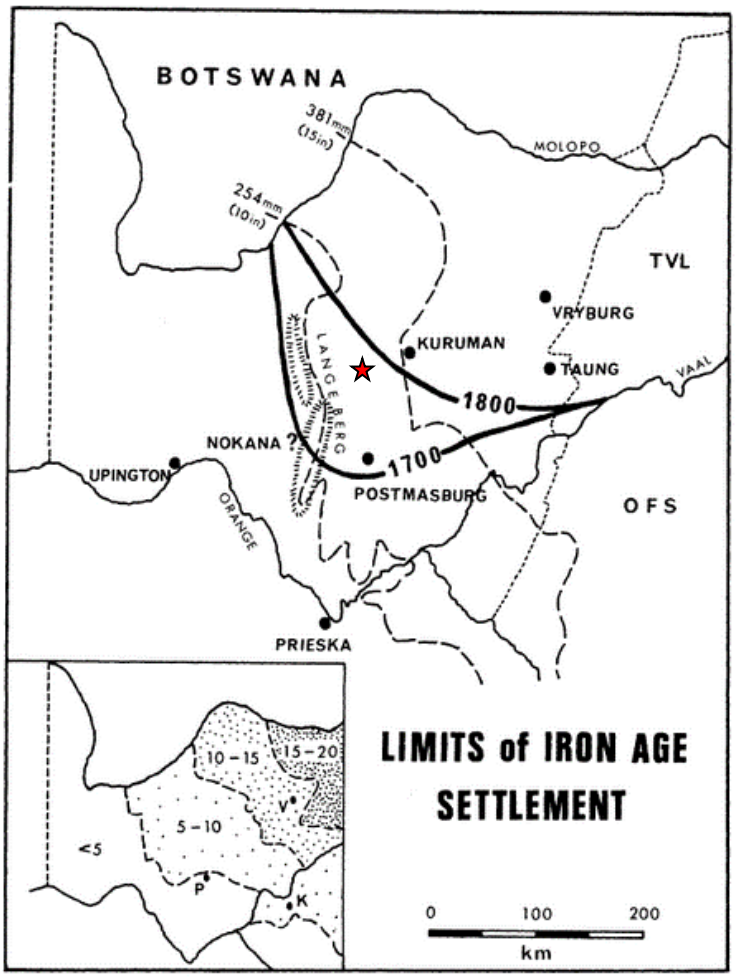

Figure 11: *Map showing the approximate south-western limits of Iron Age settlement in the Northern Cape. Source: Humphreys (1976: fig. 1). The red star indicates the position of Kathu.*

5.2.2. ***Site visit***

Table 1 provides a list of all the finds made during the survey. Note that it is copied directly from Orton 2018 but that waypoints not relevant to the current application have been removed. Figures 12 and 13 map the finds, distinguishing them by relevance.

Table 1: *List of finds from the 2018 archaeological survey (includes only the red points in Figure 12).*

Waypoint	Location	Description	Significance
1194	S27 35 31.2 E23 07 03.0	Stone artefacts in imported road gravel on current access road.	---
1195	S27 35 24.0 E23 06 56.4	House on west side of current access road.	Local significance
1196	S27 35 18.2 E23 06 52.4	Stone artefacts in gravel on and beneath current access road along the south-western bank of the Vlermuisleegte.	GPA
1197	S27 35 12.3 E23 06 44.6	House on east side of current access road.	Local significance
1198	S27 34 58.1 E23 06 32.0	Stone artefacts in imported road gravel on current access road. Excavation alongside the road shows deep sand cover.	---
1199	S27 34 50.7 E23 06 27.6	An exposure of solid calcrete in the current access road.	---

1200	S27 34 47.1 E23 06 25.9	Stone artefacts in gravel on and beneath current access road along the south-western bank of the Vlermuisleegte.	GPA
1201	S27 34 41.0 E23 06 22.1	Stone artefacts in gravel on and beneath current access road along the south-western bank of the Vlermuisleegte. An excavation alongside the road goes directly into dense gravel.	GPA
1202	S27 34 31.8 E23 06 15.8	An exposure of solid calcrete in the current access road.	---
1203	S27 34 27.8 E23 06 12.6	Stone artefacts in gravel on and beneath current access road along the south-western bank of the Vlermuisleegte. This is a high point along the road.	GPA
1204	S27 34 25.0 E23 06 09.6	Stone artefacts in gravel on and beneath current access road along the south-western bank of the Vlermuisleegte. An excavation alongside the road goes directly into dense gravel.	GPA
1205	S27 34 16.8 E23 06 02.4	Stone artefacts in imported road gravel on current access road. Excavation alongside the road shows deep sand cover.	---
1223	S27 33 15.0 E23 03 54.7	Stone artefacts in gravel on a very small raised gravel area. Trig beacon built on this area.	GPC
1226	S27 34 08.9 E23 05 51.7	Gravel exposure with artefacts in disused quarry on the south-western bank of the Vlermuisleegte.	GPA

During the 2018 survey the generator site was visited. This revealed a small exposure of gravel with occasional artefacts (Figure 14) that was present at the base of the trigonometric beacon that occurs there. It is possible that the beacon was built there because of the gravel exposure (a foundation in the gravel would have been better) or it might be that the gravel was only turned up during excavation for the beacon. Either way, it shows that the gravel is present not far below the surface and that artefacts are indeed associated with it there.

The north-western part of the road was not specifically covered but it is envisaged that very little or, more likely, no archaeology would have been seen on the sandy surface as was the case throughout the majority of the Hyperion PV Cluster area (Orton 2019a, b, c, d). The northwest to southeast trending section of the access road that currently exists but will require upgrading and widening revealed archaeological materials in several areas that were examined. In some cases, the material was clearly in a secondary context in gravel that had been imported and spread over the sand to create the road surface. In other cases, however, it was evident that the natural gravel was higher and had been intersected by the road building. It is quite possible that gravel from these areas was in fact moved to the sandy areas when the road was built. Importantly, however, all spots examined revealed artefacts in association with the gravel which offers further evidence for their presence all along the margins of the Vlermuisleegte. Figures 14 to 18 illustrate the archaeology from the existing road area.

These artefacts seem most likely to pertain to the MSA. Diagnostic artefacts were rare but it is noted that an MSA Still Bay point fragment was seen elsewhere on the farm. Although it cannot be guaranteed that this piece was indeed from the Still Bay period, it is the only such artefact known to the present author from inland Northern Cape.

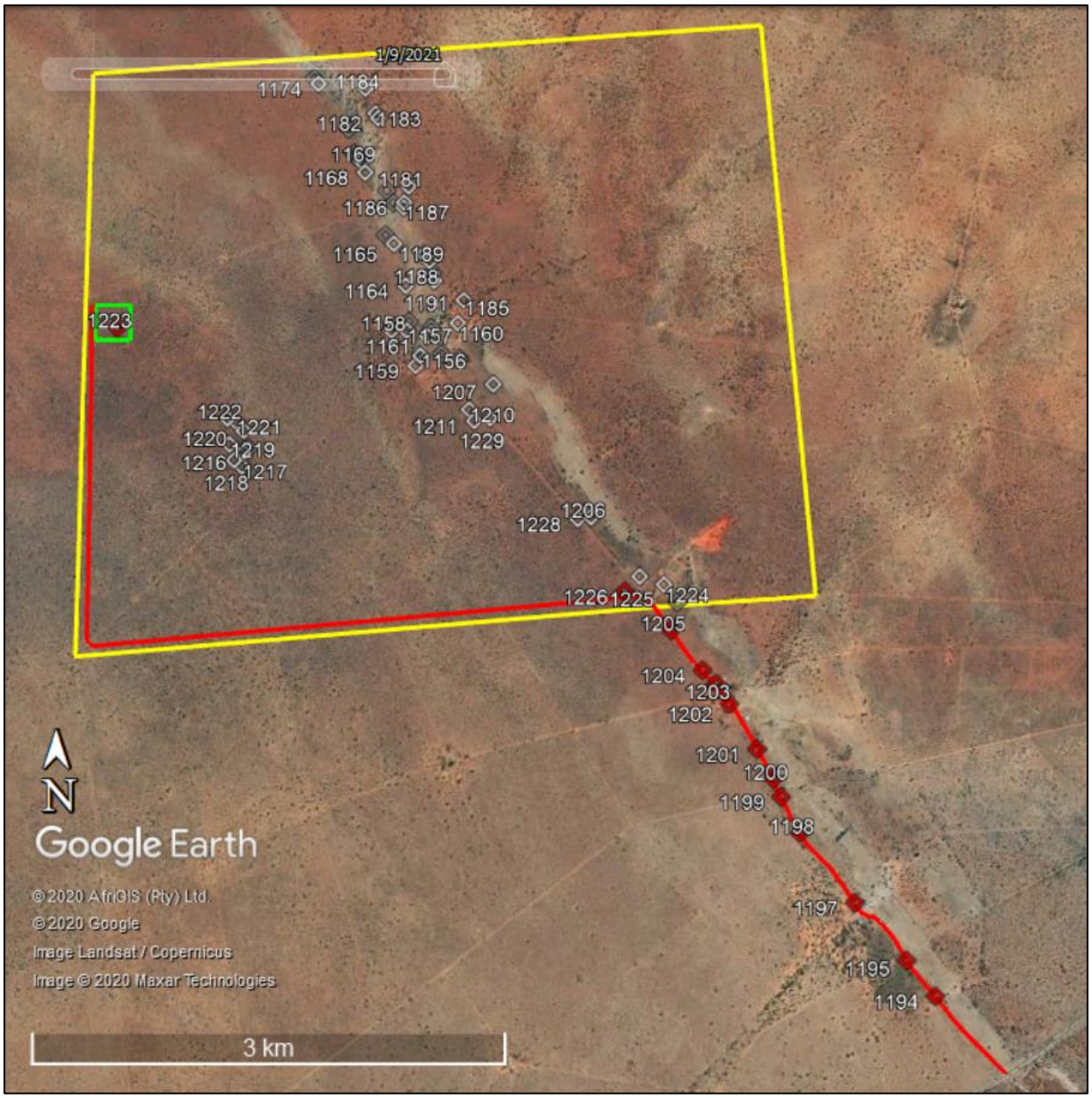

Figure 12: *Aerial view of the study area showing the farm boundary (yellow polygon), finds relevant to the present application (numbered red symbols) and other finds on the farm (numbered white symbols).*

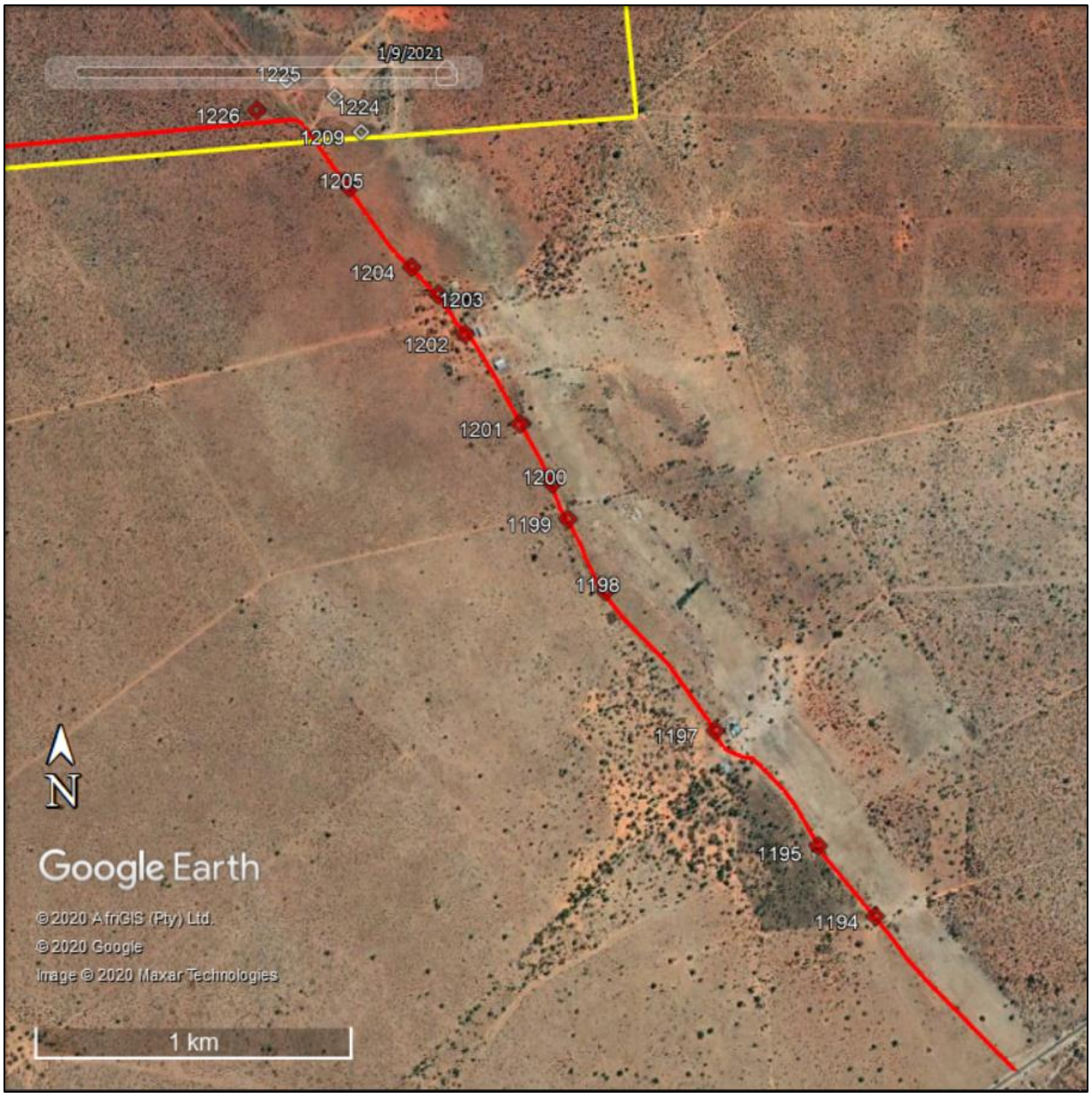

Figure 13: *Close up of Figure 12 showing the access road area.*

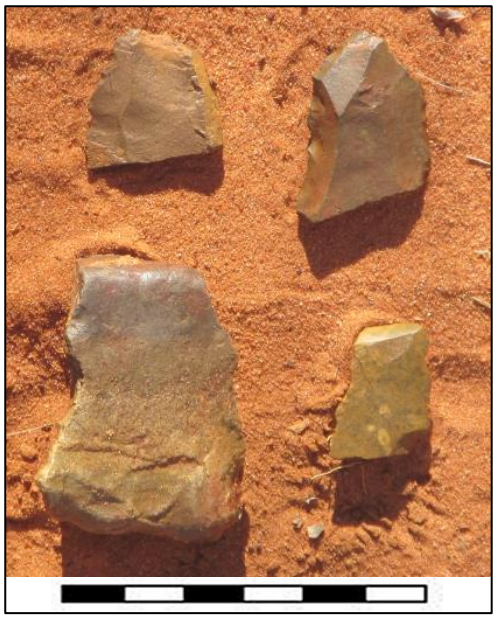

Figure 14: *Four artefacts seen in the gravel at waypoint 1223. Scale in cm.*

Figure 15: *A long blade with cobble cortex from waypoint 1201. Scale in cm.*

Figure 16: *Stone artefacts (flakes and a few cores) seen in the gravel at waypoint 1200. Scale in cm.*

Figure 17: *Stone artefacts seen in the gravel at waypoint 1203. Scale in cm.*

Figure 18: *A pile of gravel bulldozed directly from the substrate along the access road at waypoint 1204. There were stone artefacts in this gravel.*

5.3. Graves

It is unlikely that historical graves will occur in remote locations (i.e. away from farmsteads). Five farm workers' graves were found 1.6 km east of the generator site close to the Farm 432/rem farmhouse. The only dated one was from 1973. Nearby, 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). The only other historical graves reported in previous studies were a set of 12-15 graves close to Kathu Pan (Pelser 2018). One of the three dated graves is now older than 60 years making it a heritage resource. 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. It is far from the proposed development area though.

5.4. Historical aspects and the Built environment

5.4.1. ***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.

5.4.2. ***Site visit***

The 2018 site visit and a study of aerial photography showed that no historical or built heritage features occur in or close to the project within farm 432/rem. A trigonometrical survey beacon lies within the generator site. It is built on a base of unknown age but the beacon is marked on the 1972 topographic map of the area. Regardless of its age, the beacon and its base have no heritage value. However, two houses greater than 60 years of age do occur alongside the section of the existing access road that is to be upgraded (Figures 19 and 20). Both are mid-20th century structures of low heritage significance and neither will be affected by the project other than that their rural context will be slightly reduced through tarring of the access road.

Figure 19: *Farmhouse along the current access road at waypoint 1195.*

Figure 20: *Farmhouse along the current access road at waypoint 1197.*

5.5. 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, mining and electrical development. The archaeological landscape is comprised of all the sites discussed in Section 5.2 above and is not repeated here, save to note that this is a significant landscape that has Grade I status under the NHRA. The graded area relates specifically to a number of sites in and around Kathu town and does not affect the current study area but does, nonetheless, provide an indication of the importance of the subsurface archaeological materials in the wider area.

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 photovoltaic (PV) solar development just south of the present study area. Two other PV plants have been constructed some 13-15 km west of the current generator study area. 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. The N14 does increase in scenic value towards the northeast as it approaches the Kuruman Hills, although it is noted that renewable energy facilities have been proposed in that area too.

5.6. 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 addressed in a separate specialist report.

The small patch of artefacts known to exist in the generator footprint is of low significance, but more dense materials may be present beneath the surface. The existing stretch of access road has many archaeological artefacts associated with it and the significance in that area is higher. Throughout the study area there is a good chance that further archaeological materials will be located below the surface, especially if ironstone gravels are encountered, but the density of artefacts present remains unknown. Although the Kathu Complex is of very high significance for its scientific value and is a Grade I archaeological cultural landscape, the studies by Orton (2019a, b, c, d) and Orton and Walker (2015) suggest that artefact densities are likely to be far lower in the present study area than within the Kathu Complex area. Any materials likely to be encountered during excavations for the project 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.

5.7. Summary of heritage indicators

Although assessed by another specialist, palaeontological indicators are considered here for the sake of completeness. 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 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.

None of these indicators can be fully met through design interventions and mitigation measures will be required in order to minimise impacts.

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 historical buildings are of little heritage concern and the potential contextual impacts to them are negligible. These aspects are thus not assessed further and require no mitigation or management measures. The only heritage issues that have been identified as potential concerns for the proposed generator and access road development are palaeontology (assessed by another specialist), archaeology and graves (both assessed below).

6.1. Potential impacts to archaeological resources

Potential impacts to archaeological resources would occur during the construction phase only and would be in the form of direct impacts. The spatial extent of impacts would generally be limited to the local area but it should be remembered that all archaeology in the Kathu region has the potential to add value to the Grade I Kathu Complex. Impacts of some sort are guaranteed because of the widespread distribution of archaeology within the gravels of the area and their known presence in both the generator and access road footprints. In areas with deeper sand the chances are greatly diminished.

Because of the national importance of the nearby Kathu Complex, impacts to archaeology for this development are considered of potentially regional extent. The archaeology is clearly not as important as the Kathu Complex but further knowledge of the archaeology on site would contribute to a broader understanding of the region. The magnitude is thus rated as moderate. Destruction of archaeology is a permanent impact and impacts will definitely occur if the development is implemented. These ratings lead to a calculated significance rating of **high negative** before mitigation (Table 2). Mitigation will result in a benefit to science but, because of the extent of archaeological materials present the residual impacts are likely to result in a final significance rating after mitigation of **low negative**. There are no fatal flaws in terms of archaeology. Note that this assessment applies equally to the proposed generator site and the access road.

Table 2: *Assessment of archaeological impacts.*

Nature: Direct destruction of archaeological materials during construction activities.		
	Without mitigation	**With mitigation**
Extent	Regional (3)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Moderate (6)	Minor (2)
Probability	Definite (5)	Improbable (2)
Significance	**70 (High)**	**16 (Low)**
Status (positive or negative)	Negative	Negative
Reversibility	Irreversible	Irreversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	
Mitigation: Test excavations and sampling of artefacts and also protection and reporting of chance finds for further actions as needed. Geotechnical investigations can inform on where gravel is likely to be intersected during development and mitigation work should focus on such areas.		
Cumulative impacts: The destruction of any archaeology around the Kathu Complex would be considered to be a negative cumulative impact but, pending the significance of the materials on site being found to be high, such cumulative impacts are unlikely to be of concern. Potential cumulative impacts to archaeology		

are thus rated as being of **low** significance. Because the site is dominated by MSA archaeology rather than the ESA that is prevalent elsewhere, sampling of this archaeology may in fact result in a positive cumulative impact in terms of our understanding of the regional archaeological sequence.
Residual Impacts: It is not possible to locate every single stone artefact and there is certain that artefacts will be lost during the development process. Of concern would be the loss of denser patches of archaeology but this cannot yet be determined because the vast majority of material lies deeply buried. Successful sampling of the archaeology on site would greatly reduce the residual impacts.

Measures for inclusion in the draft EMPr are as follows:

OBJECTIVE: To minimise the destruction of significant archaeological resources	
Project component/s	All components requiring subsurface excavations (e.g. foundations, cable/pipe trenches, roadworks).
Potential Impact	Destruction and disturbance of stone artefacts.
Activity/risk source	All bulk earthworks.
Mitigation: Target/Objective	To rescue significant archaeological artefacts and data prior to disturbance or destruction.

Mitigation: Action/control	**Responsibility**	**Timeframe**
Test excavations and sampling of artefacts to be carried out prior to development (generator site and access road).	Archaeologist	6 months before construction.

Performance Indicator	The successful completion of archaeological mitigation and rescuing of data.
Monitoring	The Environmental Officer (EO) should ensure that the mitigation work has been completed and a comment issued by SAHRA prior to the commencement of construction.

6.2. Potential impacts to unmarked graves

Potential impacts to unmarked graves would occur during the construction phase only and would be in the form of direct impacts. The spatial extent of impacts would be very limited. Because graves are so rarely encountered in the local landscape, the probability of graves being impacted within the development area is deemed to be very low. There are no fatal flaws in terms of graves since, although they are important, their locations cannot be predicted and they can only be dealt with on a case-by-case basis if discovered during construction. Because of the very low probability of impacts occurring, the significance of potential impacts before mitigation is rated as **low**. With mitigation, which would involve reporting and exhuming graves, the significance would remain **low** (Table 6). Note that this assessment applies equally to the proposed generator site and the access road.

Table 3: *Assessment of impacts to graves.*

Nature: Direct destruction of graves during construction activities.		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Moderate (6)	Minor (2)
Probability	Very improbable (1)	Very improbable (1)
Significance	**12 (Low)**	**8 (Low)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	
Mitigation: *In situ* protection and reporting of any graves discovered during construction work so that they can be recorded and removed to safety.		
Cumulative impacts: Because graves are very rarely found in the area, no significant cumulative impacts to graves are expected. Potential cumulative impacts to graves are thus rated as being of **low** significance.		
Residual Impacts: There may still be graves that are never identified and preserved or rescued. However, for preserved or rescued graves there would be almost zero residual impact.		

Measures for inclusion in the draft EMPr are as follows:

OBJECTIVE: To minimise the destruction of graves	
Project component/s	All components requiring subsurface excavations (e.g. foundations, cable trenches, roadworks).
Potential Impact	Destruction and disturbance of graves.
Activity/risk source	All bulk earthworks.
Mitigation: Target/Objective	To rescue human remains prior to disturbance or destruction.

Mitigation: Action/control	**Responsibility**	**Timeframe**
EO to alert workers to the possibility of encountering human remains.	EO	Before and during construction.

Performance Indicator	The successful rescue of any human remains exposed during construction.
Monitoring	The EO should check whether any finds have been made and ensure that these get reported.

6.3. 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, especially in the existing access road. Such impacts are very slow and are of negligible significance.

6.4. 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, archaeological materials and their contexts. This is enhanced along the gravel road due to vehicular traffic.

6.5. Cumulative impacts to heritage resources

Archaeological resources are the only heritage considered to be an issue from the perspective of cumulative impacts. The present project will result in some impacts to archaeological resources and some developments in Kathu have been implemented without archaeological mitigation. In addition, even with mitigation, the residual impacts from other projects could be significant. Given that the site seems to be dominated by MSA archaeology rather than ESA, as occurs more frequently closer to Kathu (and within the Grade 1 archaeological landscape), the opportunity to explore the archaeology can be seen as a positive cumulative impact of medium significance for regional archaeology (Table 4).

Table 4: *Cumulative impact assessment for all aspects of heritage.*

Nature: Direct impacts to heritage resources. The focus is on archaeological resources which have the greatest potential for significant impacts and which can be physically disturbed or destroyed during construction activities.		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local (1)	Low (2)
Duration	Permanent (5)	Permanent (5)
Magnitude	Minor (2)	Low (4)
Probability	Improbable (2)	Probable (3)
Significance	**16 (Low)**	**Medium (33)**
Status (positive/negative)	Negative	Positive
Reversibility	Low	Low
Loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	
Confidence in findings: High.		
Mitigation: Test excavations and sampling of artefacts and also protection and reporting of chance finds for further actions as needed. Geotechnical investigations can inform on where gravel is likely to be intersected during development and mitigation work should focus on such areas.		

6.6. Levels of acceptable change

Any impact to an archaeological 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.

7. 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 cluster of renewable energy (solar PV) developments. It is intended to provide additional power during peak times or when the PV facilities are producing less power. The broader project will assist with 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 at the national level, it is extensive, and fairly well understood. For this reason and because there is a potential benefit to heritage if the archaeology on site is well-studied, the provision of electricity to South Africa is considered to outweigh the potential negative impacts to heritage.

8. 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.

9. CONCLUSIONS

The main issue for this project will be the potential to intersect archaeological resources during excavations for both the generator and the road. However, with appropriate mitigation, the impacts can be easily managed and a scientific benefit could 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. Table 5 lists the heritage indicators presented in Section 5.7 and notes the project responses.

Table 5: *Heritage indicators and design responses.*

Indicator	Project Response
Fossils should not be disturbed, destroyed or removed from their context without study by a palaeontologist.	This indicator cannot be met through project design and mitigation and/or management measures will be required (please see separate specialist report).
Archaeological materials should not be disturbed, destroyed or removed from their context without study by an archaeologist.	This indicator cannot be met through project design and mitigation measures will be required. Mitigation will aim to determine the extent and significance of archaeological resources and will sample significant areas thereby creating an archaeological record for the study area. Although only a tiny fraction of the archaeology is likely to be sampled, this will result in a benefit to science.
Graves should not be disturbed, destroyed or moved without study by an archaeologist.	This indicator cannot be met through project design and impacts cannot be predicted. As such, this aspect will require reporting of chance finds during development. Rescue of burials would then need to take place.

There are no areas that require avoidance or buffering (it is likely that avoiding one area will result in impacts in another area). Although impacts along the existing road may be quite intense, it is considered better from a landscape and visual perspective to reuse the existing alignment and to achieve a benefit to archaeology through the implementation of mitigation measures. As such, the project is supported.

9.1. Reasoned opinion of the specialist

Because negative impacts can be readily managed and a positive impact to archaeology is likely with mitigation, it is the opinion of the heritage specialist that the development should be authorised in full using the layouts indicated in this report.

10. RECOMMENDATIONS

It is recommended that the proposed generator and access road should be authorised and that the following recommendations should be included in the authorisation conditions or EMPr as appropriate (note that palaeontological conditions should be consulted in the palaeontological specialist report):

- An archaeologist should be appointed to conduct test excavations and sampling of the archaeology in areas where *in situ* gravel may be intersected by foundations, trenches and the access road. If geotechnical work is done in time, the results of such work could inform the archaeological fieldwork. This work should aim primarily to understand the distribution of archaeology on the landscape through sampling many small areas, although if any dense archaeology is encountered it may be necessary to expand excavations; and
- If any fossils, 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 an archaeologist or palaeontologist. 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 – 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 Hyperion PV Cluster)
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.

Satellite aerial photography was used in combination with the author's accumulated knowledge of the local landscape and the results of a 2018 survey in the same area to confirm that the expected landscape character prevailed throughout the study area. Desktop research was also used to inform on the heritage context of the area. The desktop research and site visit information are presented in Section 5 of the report, with general site photographs in Section 4.2.

- 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.

The screening tool assessment provided no maps for the archaeology and cultural heritage theme which indicates the entire study area as being of low sensitivity. This is disputed by the heritage specialist. The site visit to the generator area and the specialist's knowledge of the surroundings confirms that the majority of the area is of low sensitivity at the surface. However, outcrops of ironstone gravel with artefacts show that the subsurface strata are more sensitive and a sensitivity rating of medium or low-medium is more appropriate for these areas. The exception is the south-eastern half of the access road alignment (the existing road) which crosses a number of areas of exposed gravel alongside the Vlermuisleegte. This area is considered as of at least medium sensitivity because stone artefacts are known to be present. Photographs of the heritage resources found on site are presented in Section 5 of the report.

Paleontological Assessment

PALAEONTOLOGICAL HERITAGE: LETTER OF EXEMPTION FROM FURTHER SPECIALIST STUDIES

PROPOSED THERMAL POWER DUAL FUEL GENERATOR ON FARM 432/REM AND ACCESS ROAD ON 432/REM, 457/1, 457/2 and 457/REM, NEAR KATHU, KURUMAN MAGISTERIAL DISTRICT, NORTHERN CAPE

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January 2021

EXECUTIVE SUMMARY

It is proposed to develop (1) a dual fuel (liquid or gas) thermal power generation plant to be located within the project area of the authorized Hyperion Hybrid Facility as well as (2) a short (*c*. 9.5 km) access road to the N14, situated some 16 km NNE of Kathu in the Kuruman Magisterial District, Northern Cape. The project area for the proposed thermal power plant and associated access road is largely underlain by Late Caenozoic aeolian sands of the Kalahari Group as well as Precambrian lavas of the Ongeluk Formation (Postmasburg Group) that are generally of low to very 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 thermal power plant and access road developments.

1. PROJECT OUTLINE & BRIEF

It is proposed to develop (1) a dual fuel (liquid or gas) thermal power generation plant to be located within the authorized Hyperion Hybrid Facility, situated on Farm Lyndoch 432/Rem some 15 km north of Kathu in the Kuruman Magisterial District, Northern Cape, as well as (2) an access road connecting this plant to the N14. The proposed tarred access road will be approximately 15 wide and 9.5 km long, traversing Farms Lyndoch 432/Rem, Cowley 457/1, 457/2 and 457/Rem, (Figure 1). The thermal generation plant will comprise the following components:

- Reciprocating gas engines;
- Access road;
- Truck entrance and parking facility;
- Regasification plant and fuel preparation plant;
- Dry cooling system for operating oils/chemicals;
- Fuel off-loading facility;
- Fuel storage facility;
- Water demineralisation plant; and

- Cabling, O&M building, fencing, warehouses and workshops.

According to the SAHRIS palaeosensitivity map, the proposed thermal generation plant and access road overlie outcrop areas of moderate sensitivity for palaeontological resources. This desktop palaeontological heritage comment 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). The Environmental Assessment Practitioner responsible for this project is Savannah Environmental (Pty) Ltd, Sunninghill (Contact details: Ms Jana de Jager. Savannah Environmental (Pty) Ltd. P.O. Box 148, Sunninghill, 2157**.** Tel +27 (0)11 656 3237. Fax: +27 (0) 86 684 0547. E-mail: jana@savannahsa.com).

2. GEOLOGICAL CONTEXT

Desktop palaeontological heritage studies for the Hyperion Hybrid Facility near Kathu and the associated 132 kV powerline connection to the existing Eskom Kalbas Substation have been previously submitted by Almond (2018, 2020). It was concluded in both cases that the probability of significant impacts on palaeontological heritage here is very low (but not zero). The proposed thermal power generation plant and associated access road are 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, 2020, 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 at surface beneath the thermal power plant footprint as well as the majority of the access road route (Qs, pale yellow in Fig. 2). Based on satellite imagery (Fig.1) the proposed access road 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, 2020). A very short sector of the access road route is underlain by Precambrian basaltic to andesitic lavas of the **Ongeluk Formation** (Vo, dark green in Fig. 2) which are dated to 2.2 Ga. The first part of this major flood basalt succession was extruded sub-aerially, but later lava flows show evidence of sub-aqueous extrusion (*e.g.* pillow lavas; Eriksson *et al.* 2006). Subordinate diamictites are also found within the Ongeluk succession.

Field data, including site photographs, provided by Dr J. Orton (2020) in his HIA for the Hyperion Hybrid Facility project support the conclusion that potentially-sensitive bedrocks or superficial sediments are unlikely to be represented within the thermal power plant and access road footprint.

3. PALAEONTOLOGICAL HERITAGE

According to the SAHRIS palaeosensitivity map, the proposed thermal power plant and access route overlie outcrop areas of only low to moderate sensitivity for palaeontological heritage resources. No fossils are recorded from the volcanic **Ongeluk Formation**, although the middle and upper parts of the lava succession was probably extruded subaqueously. The Kalahari Group continental sedimentary deposits blanketing the landscape in the Kathu area are considered here to be of generally low palaeontological sensitivity (*cf* Almond 2014, 2015a, 2015b, 2018, Almond & Pether 2008, Pether 2011) although rare, localised areas of high sensitivity might 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 access road.

- **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 thermal power plant and associated access road. Given the short length of the access road and the shallow excavations expected 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 thermal power plant and associated access road near Kathu is largely underlain by Late Caenozoic aeolian sands of the Kalahari Group as well as Precambrian lavas of the Ongeluk Formation (Postmasburg Group) that are generally of low to very 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 thermal power plant and access road developments.

Table 1: Palaeontological heritage impact assessment and recommended mitigation for the proposed thermal power plant and associated access road 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: EO, 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

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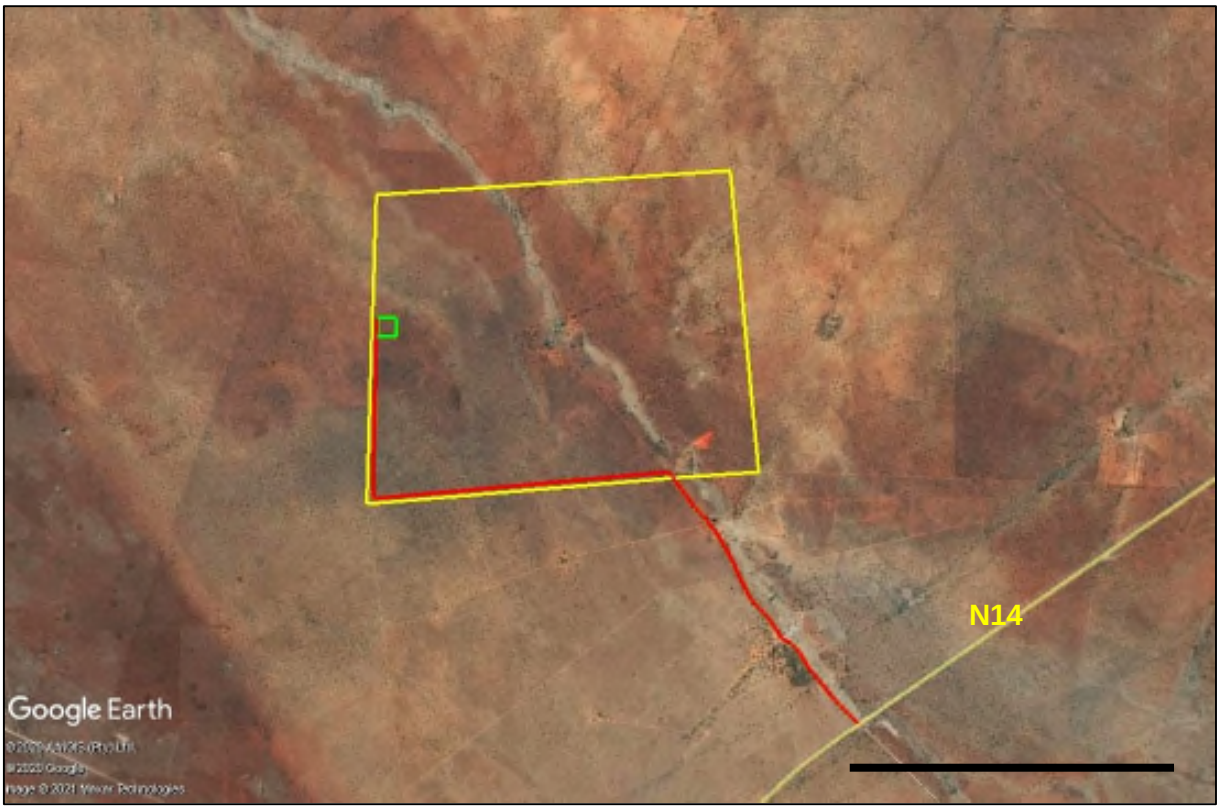

Figure 1: Google Earth© satellite image showing the footprints of the proposed thermal power plant (green rectangle) and its access road to the N14 (red line) associated with the authorized Hyperion Hybrid Facility (yellow polygon). The access road route does not cross any potentially palaeosensitive major drainage lines. Scale bar = 4 km. N is towards the top of the image.

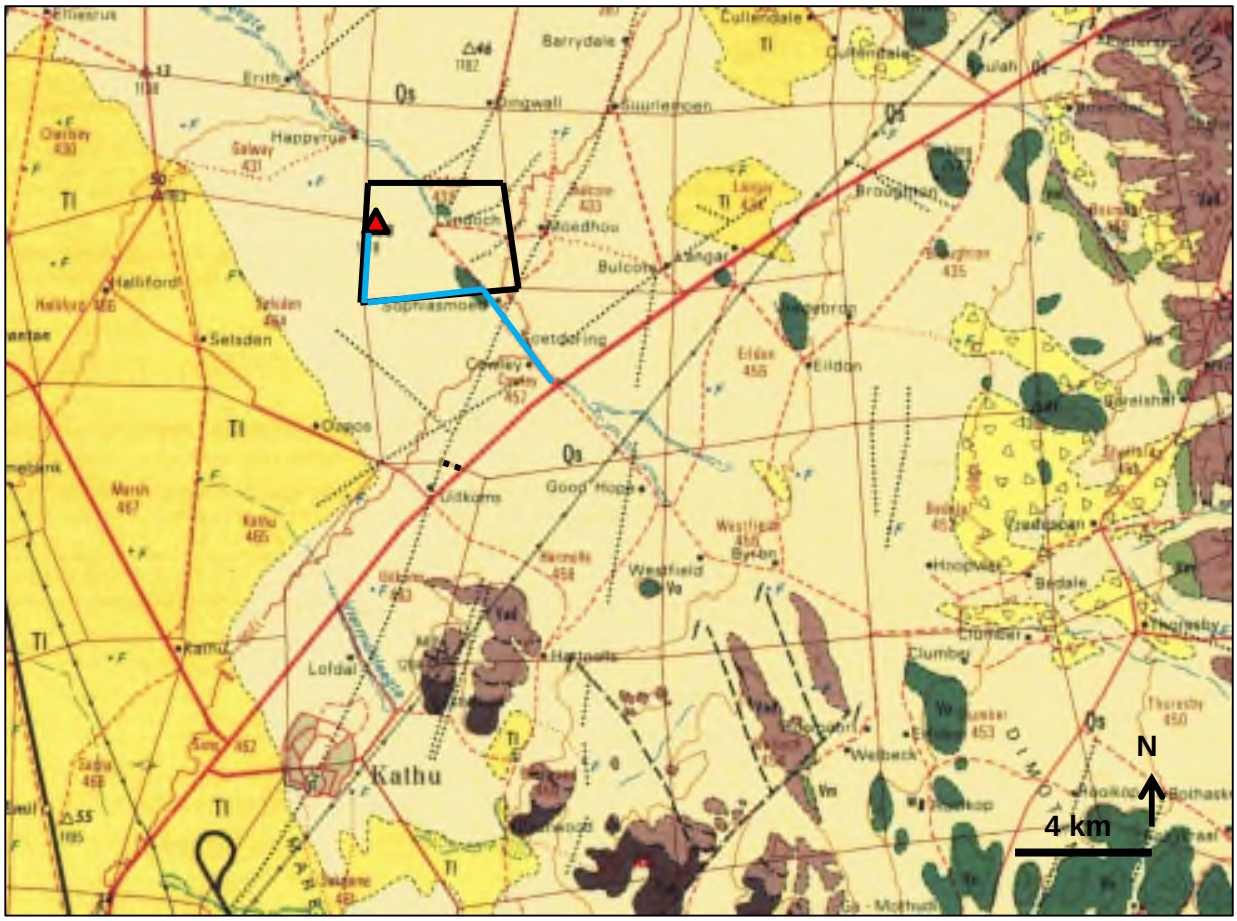

Figure 2: Extract from 1: 250 000 geological map 2722 Kuruman (Council for Geoscience, Pretoria) showing the location of the proposed thermal power plant (red triangle) and its access road (blue line) associated with the authorized Hyperion Hybrid Facility near Kathu (black polygon).

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)

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: THERMAL POWER PLANT & ACCESS ROAD 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, Ongeluk Formation (Postmasburg Group) lavas.</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>
</table>