HERITAGE IMPACT ASSESSMENT: PROPOSED PAULPUTS WIND ENERGY FACILITY AND ASSOCIATED GRID CONNECTION NEAR POFADDER, KENHARDT MAGISTERIAL DISTRICT, NORTHERN CAPE

Required under Section 38(8) of the National Heritage Resources Act (No. 25 of 1999).

SAHRA Case No: 13356

Report for:

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On behalf of:

WKN Windcurrent SA (Pty) Ltd

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1st draft: 01 July 2019
Revised: 9th July 2019

EXECUTIVE SUMMARY

ASHA Consulting (Pty) Ltd was appointed by Arcus Consultancy Service South Africa (Pty) Ltd to conduct an assessment of the potential impacts to heritage resources that might occur through the proposed development of (1) a wind energy facility (WEF) on the farms Scuit-Klip 92/3, 92/4 and 92/5 and Lucas Vlei 93/1, 93/2 and 93/4 and (2) a power line that would link the proposed WEF to either the nearby existing Paulputs Substation or a nearby existing 132 kV transmission line. The two project components are being applied for in a single application. The study area is located some 37 km northeast of Pofadder, Northern Cape (S28° 56' 40" E19° 44' 00").

The study area is generally very flat but with very low rises in places. The exceptions are a number of small, steep rocky hills that dot the landscape. Watercourses are ephemeral and far more common in the north than the south. Vegetation is sparse, but bushy patches do occur, primarily along the watercourses.

This assessment finds that numerous Stone Age archaeological resources occur throughout the WEF study area but that they are generally associated with water sources and rocky hills. The sensitive locations are all in the northern part of the WEF site where watercourses are more frequent. They have been deliberately avoided during formulation of the proposed layout and impacts to these heritage resources are thus not expected. The power line routes were not physically examined but some sites may be associated with hills or watercourses along the various options. There is still a small chance that isolated water holes with associated archaeological sites can be located in open areas but these could only be identified once the final facility layout is surveyed before construction.

The landscape is more natural than cultural but will experience visual impacts. The important part of this is that, although not a designated tourism route (SiVest 2019, Visual Impact Assessment), the N14 is considered by the heritage specialist to be a route of cultural significance because of the aesthetic and scenic qualities of the landscape through which it passes. Turbines are proposed to be placed on both sides of the N14 meaning that motorists would have to pass through the development. The power lines and substation, on the other hand, present a far more limited impact and, if the WEF is constructed then the associated power line would have a negligible further impact. In general, substation locations further away from the N14 are better. Despite the WEF straddling the road, and considering the benefits to the economy, the impacts to the N14 are not significant enough to be a fatal flaw, largely because the turbines would be in a cluster and not spread out over a lengthy section of the road in what is a very extensive landscape.

RECOMMENDATIONS

Because impacts of high significance are not expected to occur, it is recommended that the proposed WEF, power line and associated infrastructure (including all three substation locations) can be authorised. The following conditions must be included in the Environmental Authorisation should one be granted:

- The final authorised layout for the WEF, all internal roads, the power line, substation and any other areas to be disturbed must be surveyed by an archaeologist prior to construction in order to identify any remaining potential impacts that may need mitigation;

- Although it is noted that approval is being sought for all three substation locations and that all three are suitable from a heritage point of view, Option A is slightly preferred for construction over Options B & C because it is further from the N14;
- Identified sensitive sites must be treated as no-go areas throughout the lifetime of the project;
- If any turbines are removed as a result of the use of larger turbines at a later stage then priority should be given to removing turbines close to the N14; and
- If any 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. Such heritage is the property of the state and may require excavation and curation in an approved institution.

Specialist Declaration

environmental affairs
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF THE SPECIALIST, DECLARATION OF INTEREST AND UNDERTAKING UNDER OATH

	(For official use only)
File Reference Number:	
NEAS Reference Number:	DEA/EIA/
Date Received:	

Application for authorisation in terms of the National Environmental Management Act, Act No. 107 of 1998, as amended and the Environmental Impact Assessment (EIA) Regulations, 2014, as amended (the Regulations)

PROJECT TITLE

Proposed Paulputs Wind Energy Facility and Associated Electrical Grid Connection, Northern Cape Province

Kindly note the following:

1. This form must always be used for applications that must be subjected to Basic Assessment or Scoping & Environmental Impact Reporting where this Department is the Competent Authority.
2. This form is current as of 01 September 2018. It is the responsibility of the Applicant / Environmental Assessment Practitioner (EAP) to ascertain whether subsequent versions of the form have been published or produced by the Competent Authority. The latest available Departmental templates are available at https://www.environment.gov.za/documents/forms.
3. A copy of this form containing original signatures must be appended to all Draft and Final Reports submitted to the department for consideration.
4. All documentation delivered to the physical address contained in this form must be delivered during the official Departmental Officer Hours which is visible on the Departmental gate.
5. All EIA related documents (includes application forms, reports or any EIA related submissions) that are faxed; emailed; delivered to Security or placed in the Departmental Tender Box will not be accepted, only hardcopy submissions are accepted.

Departmental Details

Postal address:
Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Private Bag X447
Pretoria
0001

Physical address:
Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Environment House
473 Steve Biko Road
Arcadia

Queries must be directed to the Directorate: Coordination, Strategic Planning and Support at:
Email: EIAAdmin@environment.gov.za

1. SPECIALIST INFORMATION

Specialist Company Name:	ASHA Consulting Pty) Ltd			
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	4	Percentage Procurement recognition	0
Specialist name:	Dr Jayson Orton			
Specialist Qualifications:	D.Phil (Archaeology, Oxford, UK)			
Professional affiliation/registration:	ASAPA CRM Section Member No 233 APHP member No 043			
Physical address:	40 Brassie Street, Lakeside, 7945			
Postal address:	P.O. Box 46, Noordhoek			
Postal code:	7979	Cell:	083 272 3225	
Telephone:	021 783 0557	Fax:	n/a	
E-mail:	jayson@asha-consulting.co.za			

2. DECLARATION BY THE SPECIALIST

I, JAYSON ORTON, declare that –

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the Specialist

ASHA CONSULTING (PTY) LTD

Name of Company:

11-07-2019

Date

3. UNDERTAKING UNDER OATH/ AFFIRMATION

I, JAYSON ORTON, swear under oath / affirm that all the information submitted or to be submitted for the purposes of this application is ~~true~~ and correct.

Signature ~~of the Specialist~~

ASHA CONSULTING (PTY) LTD

Name of Company

11-07 2019

Date

M. MAHOBO CST

Signature of the Commissioner of Oaths

Date 2019-07-11

SUID-AFRIKAANSE POLISIEDIENS
GEMEENSKAPDIENS SENTRUM
11 JUL 2019
COMMUNITY SERVICE CENTRE
VISHOEK/FISH HOEK K.P./C.P.
SOUTH AFRICAN POLICE SERVICE

Compliance with requirements of Appendix 6 – GN R326 EIA Regulations 7 April 2017

Requirements of Appendix 6 – GN R326 of NEMA EIA Regulations as amended (7 April 2017)	**Where addressed in Specialist Report:**
1. (1) A specialist report prepared in terms of these Regulations must contain- a) details of- i. the specialist who prepared the report; and ii. the expertise of that specialist to compile a specialist report including a curriculum vitae;	Section 1.4 & Appendix 1
b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	Page vii-viii
c) an indication of the scope of, and the purpose for which, the report was prepared; (ca) an indication of the quality and age of base data used for the specialist report; (cb) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 1.3 n/a Sections 7.3, 7.4 & 7.5
d) the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 3.2
e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Section 3
f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure inclusive of a site plan identifying site alternatives;	Section 1.1.1 Figure 3
g) an identification of any areas to be avoided, including buffers;	Section 9
h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Figure 28
i) a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 3.5
j) a description of the findings and potential implications of such findings on the impact of the proposed activity or activities;	Sections 6, 7 & 8
k) any mitigation measures for inclusion in the EMPr;	Section 9.1
l) any conditions for inclusion in the environmental authorisation;	Section 12
m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Section 9.2
n) a reasoned opinion- i. whether the proposed activity, activities or portions thereof should be authorised; (ia) regarding the acceptability of the proposed activity or activities; and ii. if the opinion is that the proposed activity or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	Section 12
o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	Section 3.6
p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	n/a
q) any other information requested by the competent authority.	n/a
(2) Where a government notice gazetted by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	n/a

Glossary

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

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

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.

Abbreviations

APHP: Association of Professional Heritage Practitioners

ASAPA: Association of Southern African Professional Archaeologists

CRM: Cultural Resources Management

ECO: Environmental Control Officer

EIA: Environmental Impact Assessment

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

REDZ: Renewable Energy Development Zone

SAHRA: South African Heritage Resources Agency

SAHRIS: South African Heritage Resources Information System

Contents

1. INTRODUCTION

ASHA Consulting (Pty) Ltd was appointed by Arcus Consultancy Services South Africa (Pty) Ltd (Arcus) to conduct an assessment of the potential impacts to heritage resources that might occur through the proposed development of (1) a wind energy facility (WEF) on the farms Scuit-Klip 92/3, 92/4 and 92/5 and Lucas Vlei 93/1, 93/2 and 93/4 and (2) a power line that would link the proposed WEF to the nearby existing Paulputs Substation. The two project components are being applied for in a single application. The study area is located some 37 km northeast of Pofadder, Northern Cape (Figures 1 & 2; S28° 56' 40" E19° 44' 00").

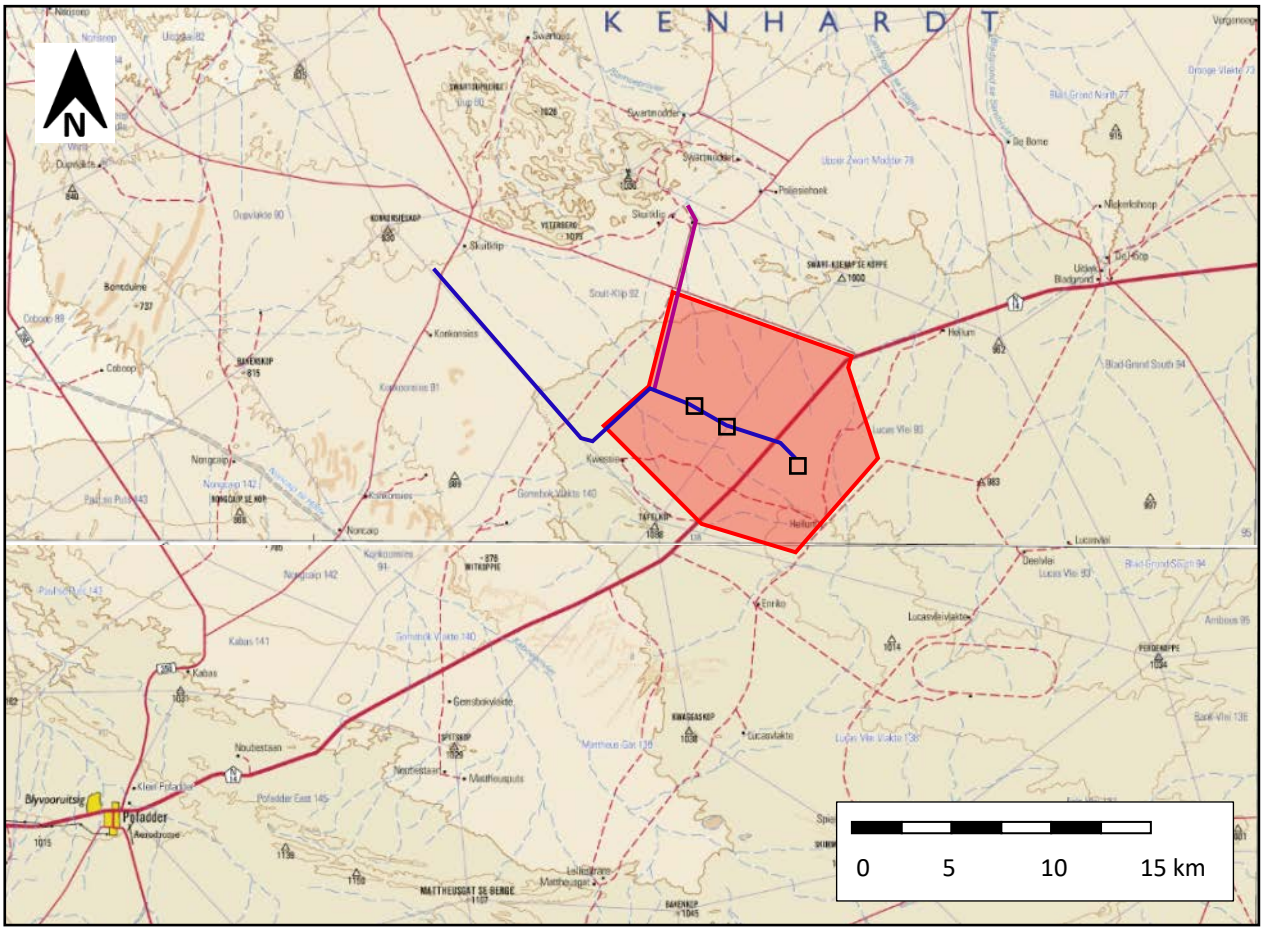

Figure 1: *Extract from 1:250 000 topographic maps 2818 & 2819 showing the location of the WEF site (red polygon), substation alternatives (black squares) and power line route alternatives (blue and purple lines). Source: Chief Directorate: National Geo-Spatial Information. Website: www.ngi.gov.za.*

1.1. Project description: wind energy facility

It is proposed to construct a 300 MW WEF on a site measuring approximately 11 800 ha in extent. The infrastructure footprint would be less than 5% of the study area. The project would include the following:

- Up to 75 turbines of 3 MW each but fewer turbines if larger machines (up to 6 MW each) are used. The maximum height at the blade tip of 230 m;
- Each turbine base to be approximately 0.35 ha in extent;

- Hub height to be up to 140 m, blade length to be up to 90 m;
- Up to 80 km of access roads of 6 m width but with up to 3 m of space either side for construction and drainage purposes;
- Two laydown areas, one temporary and one permanent, each measuring about 1 ha;
- A 132 kV on-site substation of approximately 1.1 ha enclosed by a wire mesh fence of 2.6 m height; and
- Operations and maintenance building of about 0.5 ha.

1.2. Project description: grid connection

It is proposed to construct a 132 kV power line of between 15 km and 25 km length to evacuate the power to the national electricity grid. The power line would connect to either the existing ESKOM Paulputs Substation (Options A & B) or to an existing Eskom 132 kV transmission line (Option C). This project would entail the following:

- Either monopole or lattice structures of up to 30 m high;
- Servitude width would be 31 m; and
- Service road of approximately 5 m width.

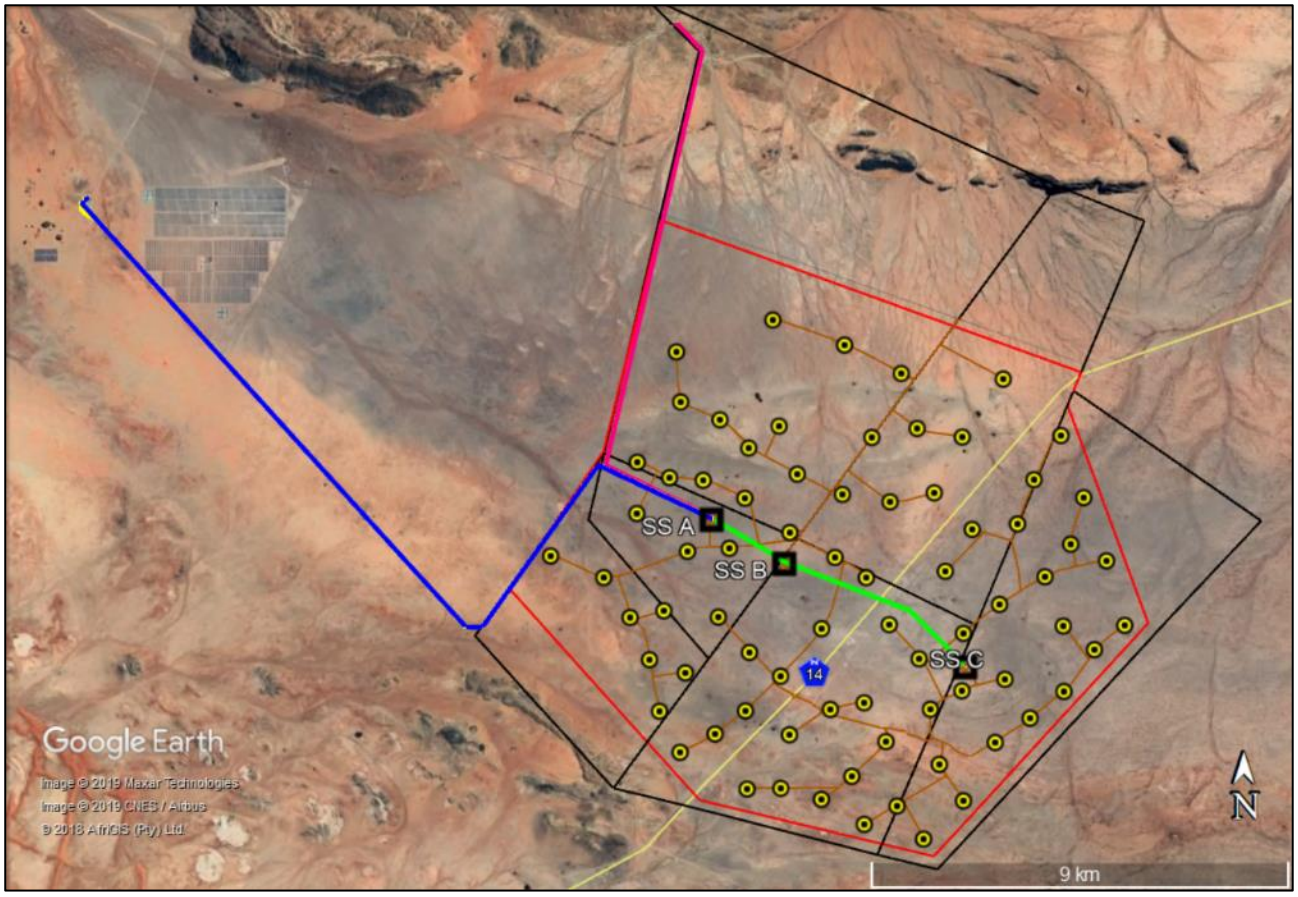

Figure 2A: *Aerial view of the study area (red polygon) showing the farm portions for the WEF (black polygons), the proposed turbine layout (yellow dots), the Options A (blue), B (yellow) and C (pink) power lines (note that Options A & B are almost identical with a very minor deviation in the northwest), the section of powerline shared by all Options depending on which substation is used and the three substation alternatives (pink squares). See details below.*

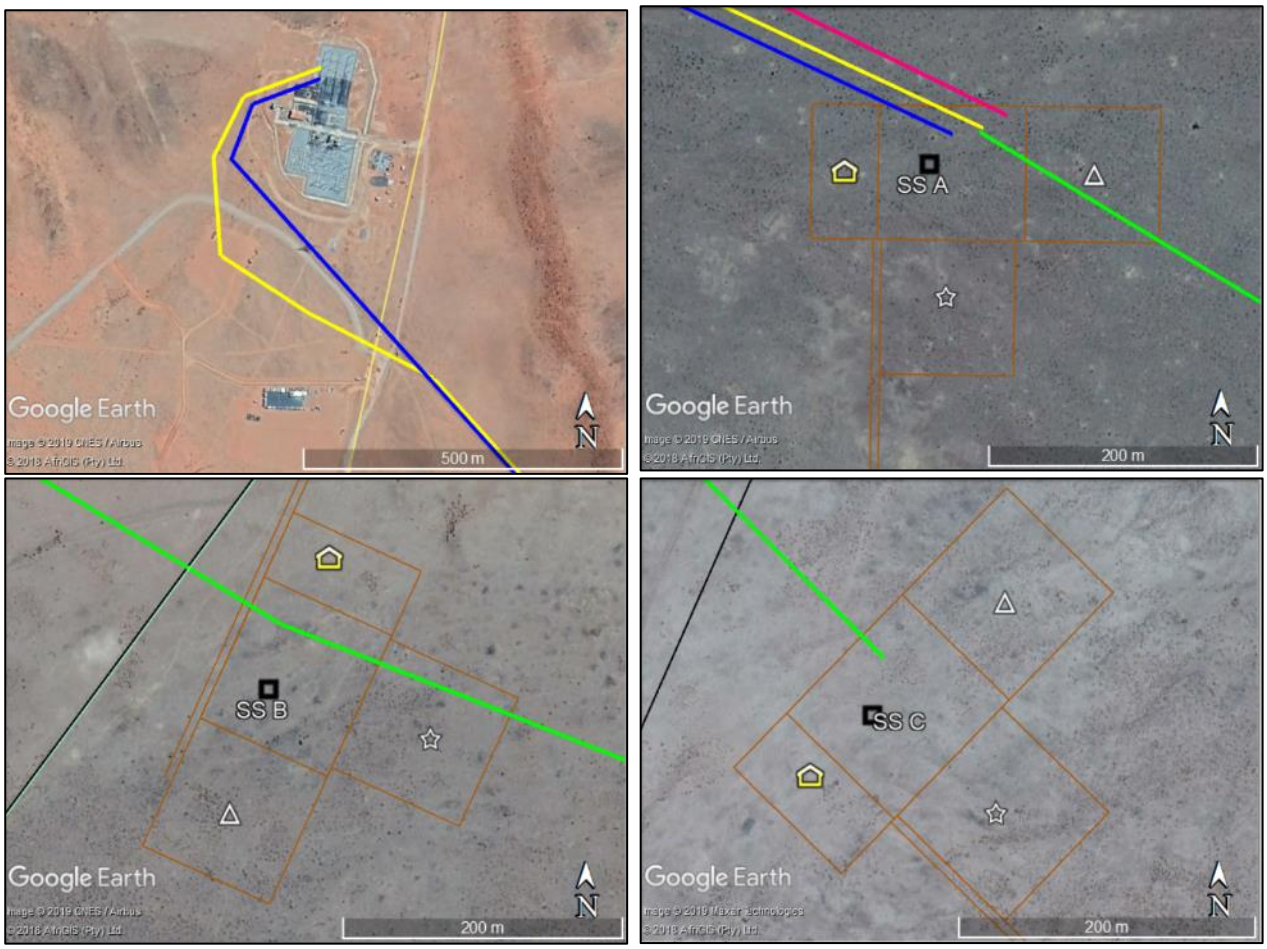

Figure 2B: *Details showing the Options A (blue) and B (yellow) power lines (top left) where they connect to the Paulputs substation and the on-site Substation Options A to C (black labelled squares) with their accompanying offices (house symbols), permanent laydown areas (stars) and temporary construction laydown areas (triangles).*

1.1.1. Aspects of the project relevant to the heritage study

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

1.2. Terms of reference

ASHA Consulting was asked to compile a heritage impact assessment (HIA) for the project. The report was to be based on both desktop research and field observations.

On receipt of the scoping report, SAHRA requested that EIA phase HIA report be submitted along with a specialist palaeontological desktop study.

It should also be noted, however, that following S.38(3) of the National Heritage Resources Act (No. 25 of 1999), even though certain specialist studies may be specifically requested, all heritage resources should be identified and assessed.

SAHRA also commented in their response to the scoping report that a minimum buffer of 3 km was expected to be applied around National Roads unless a reduction in this distance was specifically motivated for. Motivation was provided and accepted by SAHRA.

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 Environmental Affairs (DEA) 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: palaeontological, prehistoric and historical material (including ruins) more than 100 years old as well as military remains more than 75 years old;
- 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, Section 3(3) describes the reasons a place or object may have cultural heritage value; some of these speak directly to cultural landscapes.

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

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 1:250 000 maps were sourced from the Chief Directorate: National Geo-Spatial Information.

3.2. Field survey

The site was subjected to a detailed foot survey on 30 November to 2 December 2018. This was in early summer but in this dry area seasonality makes no meaningful difference to the vegetation cover and hence ground visibility. 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 the survey was done during the scoping phase and its results were used to inform the final layout to be assessed. This was done to reduce the chances of significant impacts occurring.

3.3. Specialist studies

A specialist palaeontological desktop study was produced by Dr John Almond of Natura Viva cc.

3.4. Impact assessment

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

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

3.7. Assumptions and limitations

The field study was carried out at the surface only and hence any completely buried archaeological and/or palaeontological sites would not be readily located. Similarly, it is not always possible to determine the depth of archaeological material visible at the surface. However, desktop work and prior experience in the area suggests that the chances of buried archaeology out on the open are very low and this is assumed to be true of the present study area as well.

The study area is very large and could obviously not be covered in detail. The survey aimed to locate heritage resources rather than examine turbine footprints, since it was assumed that the usual pattern of sites being associated with rocky hills and water sources would hold true.

One camp in the WEF study area was not accessed due to it being locked but it was possible to climb over the fence to examine some rocky hills close to its edge. However, the landscape is very consistent across the greater study area and no particular variation is expected in this or any other unexamined areas.

The power line routes could not be examined because access had not been negotiated. For this reason a desktop study was undertaken using information already on record and the experience of the author in the study area. A 2 km section of Options A & B have, however, been surveyed by the

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

present author for a different project. Power line Option C was only proposed after the scoping phase and was not considered at all during that phase.

4. PHYSICAL ENVIRONMENTAL CONTEXT

4.1. Site context

The study area is bisected by the N14 highway that links Pofadder in the west and Kakamas in the east. The study area is in a rural context with minimal historical development. Farms are very large and lack infrastructure with houses being widely spaced. The area is used primarily for small stock grazing, but several renewable energy facilities – all solar energy facilities – have recently been constructed in the area. They are all located to the northwest of the present WEF study area around the Paulputs Substation which lies 17 km northeast of the centre of the present study area. As a result of these facilities, there are also several power lines traversing the broader area. One of these runs through the study area along the south-eastern side of the N14. This electrical infrastructure has resulted in a significant change to the character of the local landscape.

Figure 3: *View towards the northeast from the western edge of the study area showing the N14 as it passes through the study area (photograph dated 2010 and taken from Google Earth).*

4.2. Site description

The WEF study area is flat and largely covered in sand and fine granitic gravel. The vegetation is very sparse and composed of grass with scattered small bushes (Figures 4 - 7), although denser bush can occur along the ephemeral water courses. Numerous small rock outcrops (granite, metamorphic rocks, dolerite, quartz) occur at surface level while taller conical dolerite hills (Figure 8) and low hills of metamorphic rocks occur sporadically. Ephemeral watercourses cross the landscape, especially in the north where the largest ones were seen (Figure 9).

Figure 4: *View from a dolerite hill towards the southeast across the north-western part of the WEF study area showing the typical ground cover. Another low dolerite hill is visible in the distance.*

Figure 5: *Panoramic view from a dolerite hill in the western part of the WEF study area and looking towards the south showing the typical ground cover. Another low dolerite hill is visible in the distance.*

Figure 6: *Panoramic view from a dolerite hill in the north-western part of the WEF study area towards the southeast and showing the typical ground cover.*

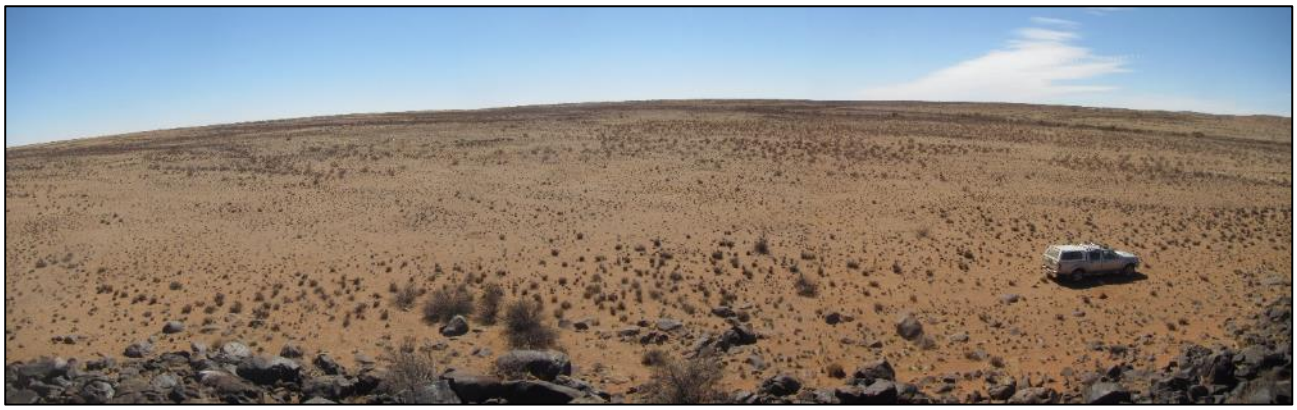

Figure 7: *Panoramic view from a rocky hill in the south-eastern part of the WEF study area towards the north showing the typical ground cover.*

Figure 8: *One of the many conical dolerite hills in the WEF study area.*

Figure 9: *One of the largest water courses seen in the northern part of the WEF study area.*

The power line routes were not physically examined but a previous survey covered a short section of the Option A & B alignment in its far northern part (Figure 11). These observations show that the greater landscape is fairly consistent throughout.

Figure 10: *View towards the north along the Option C power line route towards the granite hills that lie just beyond the end of this Option (photograph dated 2010 and taken from Google Earth).*

Figure 11: *View towards the southeast in the northern part of the Option 1 power line route. This was in early winter after rain and was taken on a different project. One of the existing solar farms can be seen in the distance to the left.*

5. ARCHAEOLOGICAL AND HISTORICAL CONTEXT

This section of the report contains the desktop study and establishes what is already known about heritage resources in the vicinity of the study area. What was found during the field survey as presented below may then be compared with what is already known in order to gain an improved understanding of the significance of the newly reported resources.

5.1. Archaeological aspects

Several archaeological sites have been found and excavated from Konkoonsies 91/6. These were located some 15 km northwest of the centre of the present study area (Orton 2015a, 2016a). These sites were late Holocene sites that included mostly stone artefacts, ostrich eggshell and pottery but also occasional other finds such as bone, charcoal and a historical glass bead. Most were located around granite bedrock outcrops that had depressions or fissures that held water after rain and thus attracted settlement. The outcrops also had smooth, shallow depressions on them that are interpreted as grinding patches (Orton 2016a). These patches are a particular feature of Bushmanland and are frequently found in close proximity to any water source, no matter how temporary. They are assumed to have functioned as lower grindstones for the processing of food. As other examples, Orton (2018) located some at a granite outcrop about 15 km west of the present study area, while Orton & Webley (2012) recorded more to the southwest of Pofadder. Orton (2016b) and Morris (2013) have also found them around water holes to the west and south of Aggeneys respectively.

Two surveys by Pelser (2011, 2012) recorded a number of scatters of ostrich eggshell some 4 km northeast of the present study area, although some of these may have been quite ephemeral. He also found scatters of quartz artefacts. All were ascribed to the Later Stone Age (LSA). They occurred in open areas as well as around the foot of small rocky koppies. Morris (2012) worked slightly further to the northeast and found ostrich eggshell fragments, a small quartz outcrop quarry and a scatter of Early (ESA) and Middle Stone Age (MSA) artefacts.

Examination of the SAHRIS database shows that many small scale mining operations have been applied for and approved in the mountains to the northeast of the Paulputs Substation. For the most part, heritage studies do not appear to have been requested for these projects. However, a survey of certain areas in and around these granite mountains and the larger koppies further to the northeast yielded a variety of Stone Age sites. These included artefact scatters, sometimes with pottery, ostrich eggshell and bone and also granite bedrock outcrops with a number of grinding grooves (Orton & Webley 2013). Historical sites were also found including some stone-packed graves and a stone-built animal trap ('tierhok').

More generally, it can be noted that archaeological sites in the area tend to be more commonly encountered around the fringes of granite hills, on sand dunes or around pans (Beaumont et al. 1995). Other surveys in the region support this contention (Halkett 2010; Morris 2011).

5.2. Historical aspects and the built environment

Because it lies so far from the original Cape Colony (i.e. Cape Town), this area was colonised quite late with most farms only surveyed and granted in the very late 19th or even early 20th centuries. As a result very few historical structures and features exist on the landscape. The majority of buildings date to the early-mid-20th century and tend to be of low or no heritage significance. A number of surveys in the Bushmanland area have recorded possible isolated graves represented by unusual rocks (either isolated standing rocks or unnatural clusters). These could be related to early '*trekboers'* passing through the area. Because they lived a very nomadic lifestyle, their physical traces are extremely ephemeral. The ruins of small stone structures that are occasionally found alongside rock outcrops in Bushmanland are likely to represent huts and small livestock enclosures built either by 19th century '*trekboers*' or by early 20th century shepherds.

6. FINDINGS OF THE HERITAGE STUDY

Appendix 2 provides a list of all finds recorded during the archaeological survey. They are mapped in Appendix 3.

6.1. Palaeontology

Dr John Almond (pers. comm. 2018) notes that the general area is underlain by Precambrian basement rocks that are entirely unfossiliferous. They are intruded by small-scale, ring-shaped Jurassic dolerites that are of zero palaeontological sensitivity. These are rocks belonging to the Namaqua-Natal Province (grey shading on Figure 12). There are late Caenozoic superficial deposits including alluvium, gravels and aeolian sands that overlie the basement rocks are generally of low to very low palaeontological sensitivity. When they occur along water courses, the superficial deposits may contain very rare inclusions of isolated mammalian bones and teeth or freshwater molluscs which can be more significant. Organic-rich alluvial deposits can also contain pollens, spores and diatoms. On the present site the green-shaded areas on Figure 12 are shown on the geological map to be feldspathic gravels ("Grus") derived from weathering of local granites. These are actually of low palaeontological sensitivity.

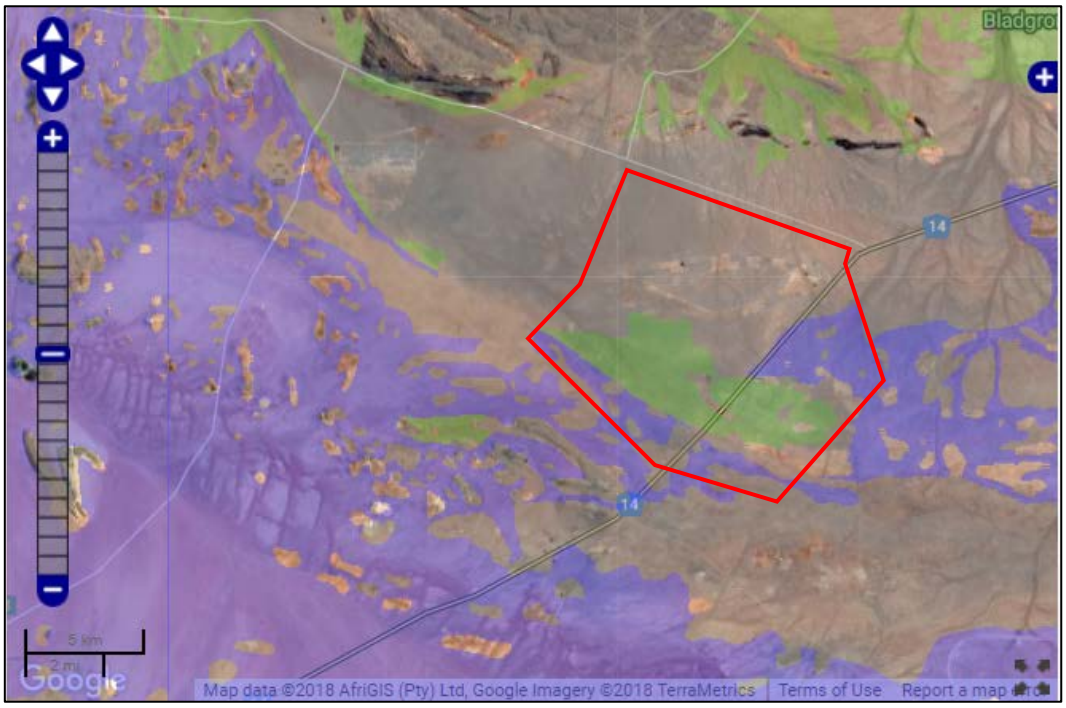

Figure 12: *Extract from the SAHRIS Palaeontological Sensitivity Map showing the study area to be of variably zero (grey shading), low (blue shading) or medium palaeontological sensitivity (green shading).*

The Precambrian basement rocks and Karoo dolerites that underlie the WEF and grid connection study areas are unfossiliferous, while the overlying Late Caenozoic superficial deposits (sandy to gravelly alluvium, gravels, aeolian sands etc) which cover the bedrock in most areas are generally of low to very low palaeontological sensitivity. Narrow belts of Late Caenozoic alluvium associated with minor water courses might contain fossils or subfossils such as isolated mammalian bones and teeth or freshwater molluscs but, if present, these would be very rare. These fossils are likely to be protected within existing buffers along water courses.

Overall, Almond (2019) expects there to be no palaeontologically sensitive areas that would require further attention. No fossils were seen during the archaeological survey with all surface sediments tending to be granitic and hence not fossiliferous.

6.2. Archaeology

Archaeological resources were found to be thinly spread throughout the WEF study area. As expected, they were concentrated around landscape features such as rock outcrops and pans. Although water courses are known to have sites located along their margins, they are generally very rare in such contexts because the streams likely only flow for a few hours. Places that trap water were thus better suited to precolonial occupation.

The sites found during the present survey can be grouped into four types:

1. Artefact scatters associated with or located on top of dolerite hills;
2. Quartz outcrops exploited for stone for making stone tools;
3. Bedrock outcrops that trap water and bear ground patches; and
4. Artefact scatters associated with pans.

These four types are consistent with observations from nearby surveys (e.g. Orton 2015a, 2015b, 2016a, 2018) and are discussed in turn. Artefact scatters were located on and around some, but not all, of the dolerite hills. Why there are no traces of precolonial use on the others is not known. Figure 13 shows perhaps the most interesting of these sites. It had a dense scatter of quartz artefacts and ostrich eggshell fragments within the cleared area (Figure 14) and, unusually, two ground patches were found on rocks around the clearing (Figures 15 & 16). Figure 17 shows another example, but this time one that contained only ostrich eggshell fragments and no stone artefacts. A few small stone-walled structures were also found. Figure 18 shows an example of what is termed a windbreak (Hart 1989). It is a semi-circular structure that may have functioned to protect people from wind or was perhaps used to hide behind while looking out for prey. This example had quartz artefacts and ostrich eggshell fragments associated with it. Several small circular structures were also noted. Figure 19 shows an example that is quite tumbled. Others were better preserved. None had artefacts in them and they may have functioned as '*lammerhok*' kraals (Hart 1989). These are small enclosures in which lambs were placed overnight. The three examples of such features were all found near to each other at the foot of two hills in the north-western part of the WEF study area.

Figure 13: *A clearing on the top of a dolerite hill at waypoint 581.*

Figure 14: *Artefacts and ostrich eggshell fragments at waypoint 581.*

Figure 15: *Another view of the clearing on the top of a dolerite hill at waypoint 581. One of the ground patches is visible at right (arrowed).*

Figure 16: *One of the two ground patches associated with the clearing and artefact scatter at waypoint 581.*

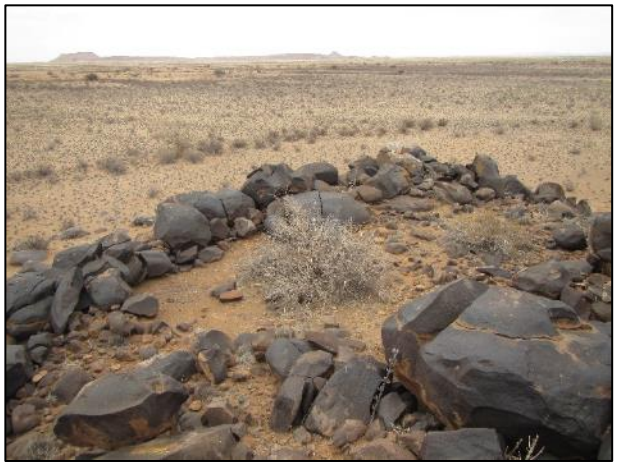

Figure 17: *A clearing on the top of a dolerite hill at waypoint 499. This clearing contained only ostrich eggshell fragments.*

Figure 18: *A small stone windbreak located on a dolerite hill at waypoint 519.*

Figure 19: *A stone circle constructed at the foot of a dolerite hill and located at waypoint 505.*

Flaked quartz outcrops were seen in a few places. Figure 20 shows an example from waypoint 526. None of them were heavily flaked. The outcrops essentially functioned as large cores from which flakes were removed and taken away for further flaking or use.

Granite bedrock outcrops with grinding patches are known from a number of parts of Namaqualand. They were only found in a limited part of the present WEF study area in the northeast. A few smaller outcrops were seen but undoubtedly the most important archaeological site located during this survey was a very large granite outcrop bearing hundreds of grinding grooves (Figure 21). The outcrop also had many hollows in it – sometimes called '*waterbakke'* – that would trap water after rain (Figures 22 & 23). Water may also have been trapped around the edges of the outcrop but this cannot be readily determined since a 'dam wall' has been pushed up around the lowermost edge during historical/recent times in order to increase the trapping of runoff. Ground patches have only been observed in close proximity to sources of water and the hollows were probably the primary source for this site. The grinding patches were mostly fairly ephemeral as is typically the case but in

a number of locations some had been used enough to start developing a shallow groove shape (Figures 24 & 25).

Figure 20: *A quartz outcrop bearing evidence of having been flaked to obtain stone for making stone artefacts.*

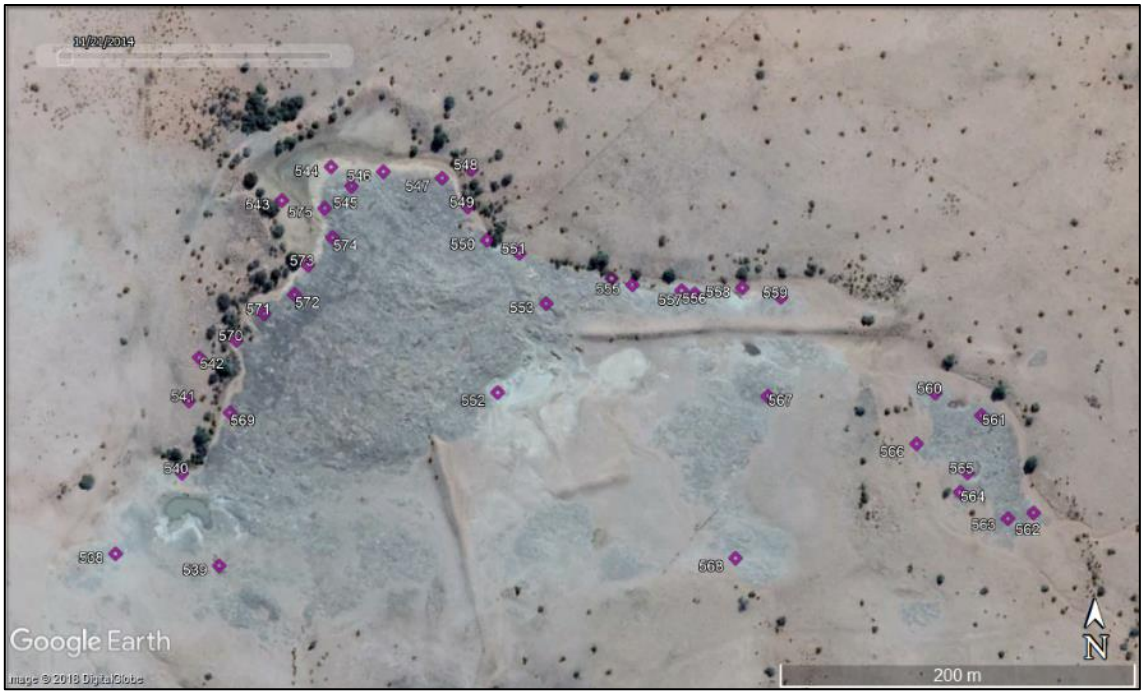

Figure 21: *Aerial view of the large granite outcrop at waypoint 552 (central waypoint) with all places bearing archaeological traces marked.*

Figure 22: *Example of a hollow that would trap water and that had about ten ground patches near it (waypoint 546).*

Figure 23: *Examples of hollows that would trap water and that had about eight grinding patches near it (waypoint 551).*

Figure 24: *Examples of grinding patches from waypoint 547. These ones are particularly clear and have approximately groove-shaped depressions.*

Figure 25: *Examples of some very clear, groove-shaped grinding patches (left) as well as some lighter and shallower examples (right) at waypoint 554.*

Around this large outcrop there were many artefacts. Although the survey did not pay particular attention to this area, the limited coverage showed that people certainly did camp around the outcrop as is to be expected. Artefacts in various materials, as well as some pottery, were noted. One particular place on the granite outcrop needs to be highlighted. It consists of a small 'cache' of artefacts at waypoint 547. Whether this dates to precolonial times or was placed during the historical or recent period cannot be determined. The cache consisted of a number of artefacts and pot sherds placed in a small hollow in the granite and partially covered by a small, smoothed stone slab (Figures 26 & 27).

Figure 26: *The artefact 'cache' at waypoint 547 as found. Scale in cm intervals.*

Figure 27: *The artefact 'cache' at waypoint 547 with the smooth stone removed. Scale in cm intervals.*

Three pans, all now excavated out to turn them into small farm dams, were located and found to have archaeological material around them. At waypoint 491 there was no clear indication of an occupation site alongside the pan but rather the artefacts seemed to be part of an elevated frequency of background scatter artefacts, no doubt related to people spending more time close to the pan. All the artefacts were of quartz (Figure 28). Unusually, at waypoint 500 just one artefact was seen on the excavated berm. It was the distal section of a bifacial point which was retouched along a single margin of each face (Figure 29). The third pan – at waypoint 530 to 533 – had an extensive artefact scatter associated with it, largely on its eastern side. The scatter included artefacts in a wide variety of materials (Figure 30) including a single platform core on local granite. An unusual artefacts was a large quartzite adze (Figures 31 & 32).

Figure 28: *Quartz artefacts found alongside a pan at waypoint 491. Scale in cm.*

Figure 29: *The bifacial point fragment from waypoint 500. Scale in cm.*

Figure 30: *A selection of the artefacts from waypoints 530-532. They include artefacts in quartz, quartzite, CCS and 'other'. Scale in cm.*

Figure 31: *Dorsal view of the large adze found at waypoint 530. Scale in cm.*

Figure 32: *Lateral views of the artefact seen in Figure 31.*

6.3. Graves

No graves were seen in or near the study areas. It is still possible that unmarked graves are present but in this rocky landscape where it is very difficult or impossible to excavate graves by hand the chances are extremely small.

6.4. Built environment

Three farm complexes (Kwessie, Hellum and an unknown one) occur on the properties under study for the WEF but all fall just outside of the area under consideration for development. Another complex (Konkoonsies) lies about 2.0 km from the proposed Options A and B power line corridors and is not considered further (a solar energy facility is presently under construction in the intervening space). The last nearby farm complex (Skuitklip) is 2.5 km from the Paulputs Substation. None of these houses was visited during the fieldwork and none would experience any direct impacts. Contextual impacts would occur, although buildings in this area tend to be no more than

early-mid-20th century in age and, although often older than 60 years, are unlikely to be of much cultural significance.

Historical aerial photography provides clues as to the age and potential significance of structures. The oldest available aerial photography series dates to 1954. At Kwessie in the western part of the study area there was just one structure present at that time, while a dark spot suggests a livestock enclosure. A second farm complex, Hellum, located in the south-eastern part of the study area was slightly more developed than Kwessie in 1954 but still far less so than it is today. The last of the three, an unnamed farm complex, lies in the far north. There is no sign of this complex at all in the 1954 image (Figure 35). Neither Skuitklip, Konkoonsies or the road linking them was present in 1954.

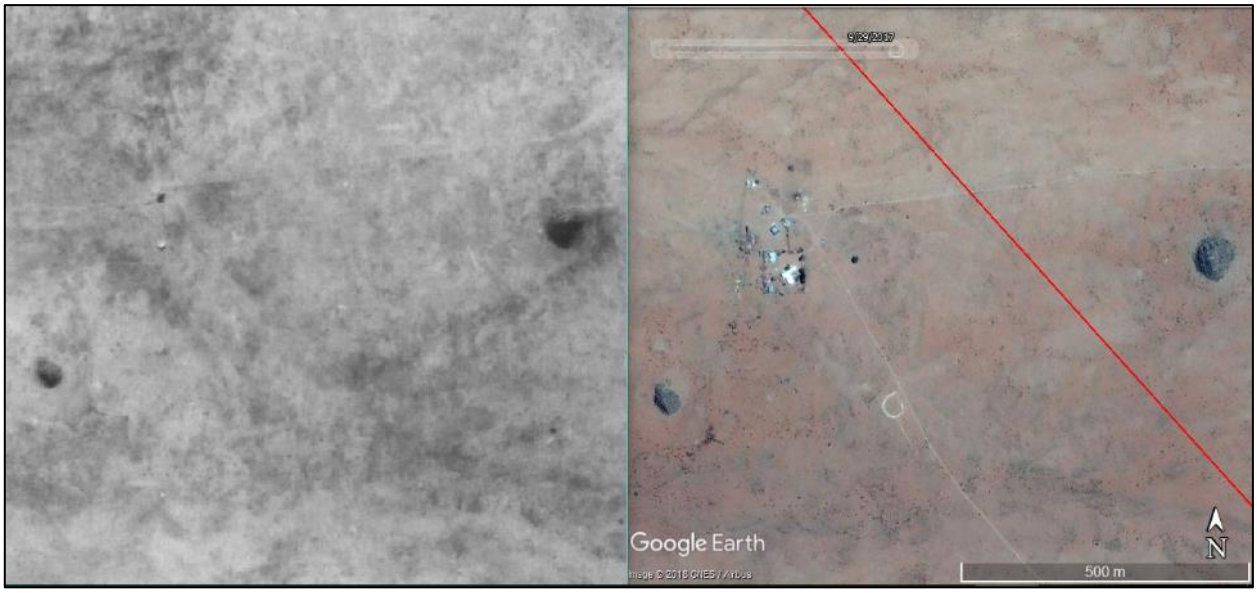

Figure 33: *1954 and modern aerial views of the Kwessie farm complex and surrounds showing extensive recent development of the complex. The WEF study area is northeast of the red line.*

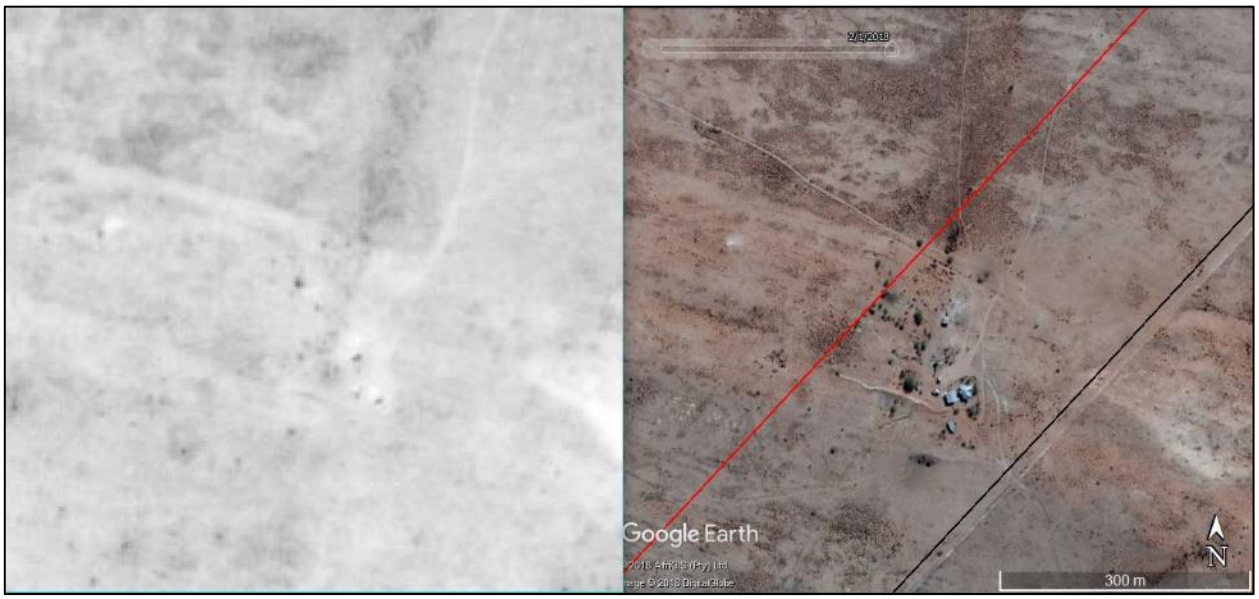

Figure 34: *1954 and modern aerial views of the Hellum farm complex and surrounds showing extensive recent development of the complex. The WEF study area is northwest of the red line.*

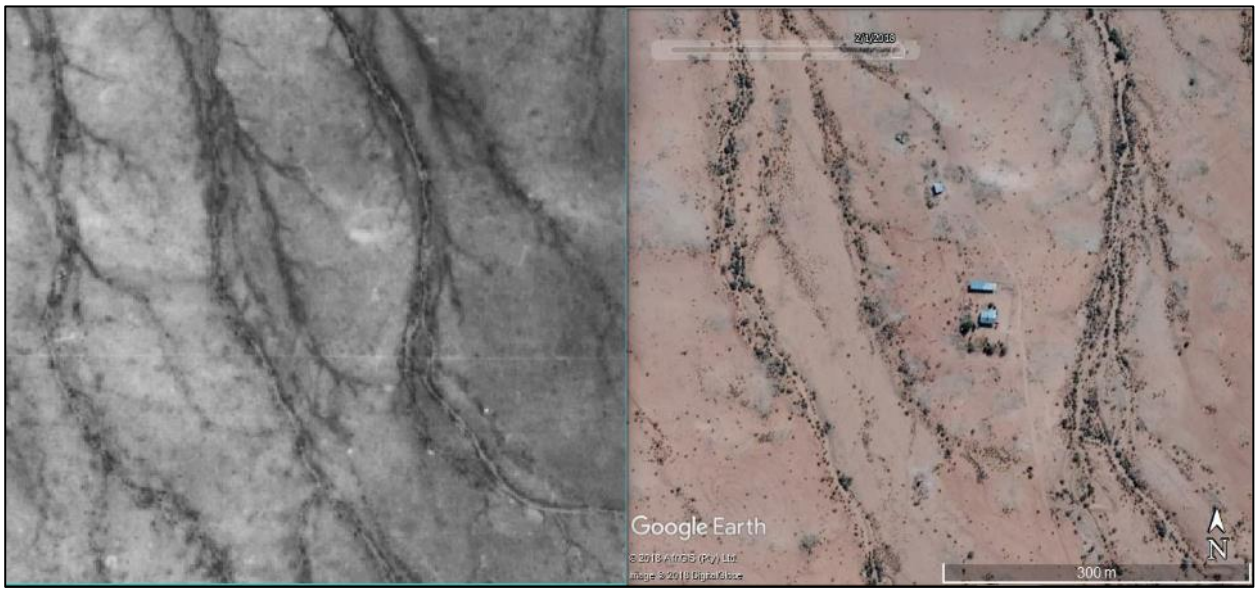

Figure 35: *1954 and modern aerial views of the unnamed farm complex and surrounds showing no sign of the complex at the earlier date. The WEF study area is out of picture towards the south.*

6.5. Cultural landscapes and routes of cultural significance

The general area is very poorly developed from a cultural landscape point of view with only minimal human interventions into an otherwise natural landscape. The human interventions include farm complexes, fences, dams, wind pumps and livestock enclosures. All these elements tend to be very widely spaced on the landscape such that the overall historical human footprint is extremely light. From the discussion of farm complexes above, it is also evident that these historical interventions are in fact largely quite recent.

Stone Age material is very sparse and can be considered infrequent enough as to make discussion of the wider precolonial cultural landscape not worthwhile. However, one area in the northeast of the WEF study area represented by waypoints 538 to 575 can be considered as a small precolonial cultural landscape. It consists of a multitude of ephemeral archaeological occurrences that probably accumulated over a long period of time with the reason being the exposed granite and the water that surrounds it after rain. This would make it a Type 2 precolonial cultural landscape (Orton 2016c).

In contrast, a modern electrical layer with a heavy footprint is slowly being added. Thus far it consists of three solar farms a large substation and several power lines. Another solar farm is currently under construction, while others are still undergoing investigation. The area does not fall in one of the approved REDZs (Renewable Energy Development Zones) nor is it included in one of the newly proposed draft zones that are still under assessment.

Although it is not a designated tourism route (Sivest 2019), the N14 freeway which bisects the site from southwest to northeast can be considered a route of some cultural significance for its aesthetic qualities. This route passes through some quite spectacular, but admittedly monotonous at times,

semi-desert landscape and would be used by tourists travelling west towards Springbok during flower season and possibly also those travelling east towards Augrabies Falls. The Onseepkans Border Crossing into Namibia lies north of Pofadder, some 45 km from the study area. Although the western part of the site would be partially screened from the southwest, due to a range of hills, the generally flat landscape and the size of the turbines means that the proposed project would largely be openly visible. Significantly, the other electrical facilities in the local landscape are all located at some distance from the N14 and would not be easily visible from that road. Given the nature of the landscape and its generally very long views, it could be argued that a WEF would add a point of interest to a journey along the N14. This, of course, is an inherently subjective question with different people likely to have quite different opinions.

6.6. Summary of heritage indicators

The only heritage indicators of any concern are the archaeological resources that lie dotted across the landscape and the landscape itself through which N14 passes. Known significant archaeological resources have been avoided by the proposal. The landscape along the N14 will experience visual impacts as a result of the project but it is debatable as to how significant these impacts would likely be; they may even be considered positive by some people. Maximising the distance between the N14 and the nearest turbines will reduce the impacts.

While isolated fossils may be present, the chances of finding any are extremely low. Structures greater than 60 years of age do occur in the landscape but there are very few and they are unlikely to be very much older than 60 years. While isolated unmarked graves could be present, the chances are considered to be extremely small.

6.7. Statement of significance and provisional grading

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

The archaeological resources are deemed to have medium cultural significance for their scientific value. The most important site can be considered as a Grade IIIA resource (the granite outcrop at waypoint 522), while the remainder are considered to be GP A (in the case of the artefacts scatter alongside the pan at waypoint 530) or GP B (the rest).

Graves are deemed to have high cultural significance for their social value but none are yet known from the study area.

The buildings greater than 60 years old, although not physically examined, are likely to be of low cultural significance for their architectural and historical values.

The landscape through which the N14 passes can be considered to have cultural significance for its aesthetic and scenic qualities but due to the relative monotony of the landscape it is accorded only medium significance.

7. ASSESSMENT OF IMPACTS

This section presents impact assessments for each heritage type that is of concern. Separate assessments are provided for the WEF and the power line.

Note that graves are included with archaeological impacts because of the similar nature of their occurrence (i.e. both in or on the ground) and the built environment is not assessed further because no significant impacts are considered possible.

7.1. Wind energy facility

7.1.1. Impacts to archaeological resources and graves

Impacts to archaeological resources and graves would occur during the construction phase when the ground surface is disturbed, when vegetation is cleared and foundations are excavated. These would be direct impacts. However, the very minimal amount of archaeology likely to be present in the development footprint and the rarity of graves means that the impacts would be of limited intensity. The possibility does remain, however, that a site or grave might fall within the footprint and the intensity is thus rated as medium. The kinds of sites likely to be found are of local heritage significance so the extent of impacts would be local. Impacts to archaeological resources are destructive and hence permanent but the probability of impacts occurring is deemed to be low because of the effort made by the developer to avoid pans, rock outcrops and rocky hills which are the most sensitive parts of the study area. The overall impact significance before mitigation is thus likely to be **low** (Table 1). Should any sites end up being within the development footprint then the nature of the archaeology in this area (shallow, surface occurrences only) means that mitigation could be very easily effected. Graves may not be detectable at the surface and might only be discovered during construction. It is recommended that a pre-construction archaeological survey be carried out within the authorised footprint in order to identify any residual issues and recommend mitigation as may be required. Although there is a low probability of sites being found, the chances are not zero and some significant sites have been found and mitigated in this way (Orton 2016a). The intensity of impacts would reduce to low and the impact significance after mitigation would be **low**. There are no fatal flaws in terms of archaeology.

Table 1: *Assessment of impacts to archaeology and graves.*

Impact Phase: Construction							
Potential impact description: Impacts to archaeological resources and graves Archaeological resources on the ground (artefacts, occupation debris) and graves can be damaged and/or destroyed during construction activities.							
	Intensity	**Extent**	**Duration**	**Status**	**Probability**	**Significance**	**Confidence**
Without Mitigation	M	L	H	Negative	L	L	H
With Mitigation	L	L	H	Negative	L	L	H
Can the impact be reversed?			NO.				
Will impact cause irreplaceable loss of resources?			YES.				

Can impact be avoided, managed or mitigated?	YES, archaeological mitigation can be easily implemented. Graves can be exhumed and/or relocated.
Mitigation measures to reduce residual risk or enhance opportunities: - Commission a pre-construction archaeological survey to check the actual footprint of the development. This survey will identify any sites that require mitigation. - Protect and report any graves or dense concentrations of artefacts found during vegetation clearing or excavation of foundations.	

7.1.2. Impacts to palaeontological resources

Impacts to palaeontological resources could occur during the construction phase. The chances of fossils being found on the site are very low because the nature of the geology is generally not conducive to fossils being present. It remains possible, however, that rare, isolated bones might be present and could be damaged or destroyed during construction activities. Because of the rarity of such finds, the impact intensity could be medium. Destruction of fossils is permanent but the chances of this occurring are very low. Before mitigation the impacts are likely to be of **low** significance (Table 2). Mitigation would involve protecting and reporting any fossils that are found so that they can be examined and collected (if necessary) by a palaeontologist. Post-mitigation significance becomes **low** positive because fossils would never be found without construction and there is thus the potential for an advancement of scientific knowledge. There are no fatal flaws in terms of impacts to palaeontology.

Table 2: *Assessment of impacts to palaeontology.*

Impact Phase: Construction							
Potential impact description: Impacts to palaeontological resources Palaeontological resources in the ground (fossil bones) can be damaged and/or destroyed during construction activities.							
	Intensity	**Extent**	**Duration**	**Status**	**Probability**	**Significance**	**Confidence**
Without Mitigation	M	L	H	Negative	L	L	H
With Mitigation	L	L	H	Positive	L	L	H
Can the impact be reversed?			NO.				
Will impact cause irreplaceable loss of resources?			YES.				
Can impact be avoided, managed or mitigated?			YES, palaeontological mitigation can be implemented but the chances of it being effective are limited.				
Mitigation measures to reduce residual risk or enhance opportunities: - Protect and report any fossil bones found during vegetation clearing or excavation of foundations.							

7.1.3. Impacts to the cultural landscape and routes of cultural significance

The cultural landscape and N14 route traversing it would be impacted during all stages of the development since it is the presence of the facility and associated construction equipment (industrial character) within the rural/natural landscape that results in impacts. Although the industrial nature of the facility is distinctly different to the surrounding landscape, the landscape is large and can likely absorb the development. Furthermore, although not within a Renewable Energy Development Zone, the area has been identified for renewable energy development with several

solar energy facilities already present nearby. The intensity of impacts is thus likely to be medium. The impacts will be of local extent but, if construction goes ahead, they would definitely occur. The significance of impacts before mitigation is likely to be **medium** (Table 3). Aside from removing turbines which would make the project unfeasible, no other mitigation measures that can reduce impacts are feasible but best practice visual mitigation measures such as ensuring effective rehabilitation and minimising lighting should still be implemented. The visual impact assessment would make further recommendations in this regard. Because mitigation cannot hide the turbines, the significance of impacts after mitigation remains **medium**. There are no fatal flaws in terms of impacts to the cultural landscape.

Table 3: *Assessment of impacts to the cultural landscape and routes of cultural significance.*

Impact Phase: All phases							
Potential impact description: Impacts to the cultural landscape and routes of cultural significance The rural/natural landscape is affected by the visual intrusion into it of electrical infrastructure and construction equipment and machinery.							
	Intensity	**Extent**	**Duration**	**Status**	**Probability**	**Significance**	**Confidence**
Without Mitigation	M	L	H	Negative	H	M	H
With Mitigation	M	L	H	Negative	H	M	H
Can the impact be reversed?			YES.				
Will impact cause irreplaceable loss of resources?			NO.				
Can impact be avoided, managed or mitigated?			NO, but minor visual mitigation measures should still be applied as best practice.				
Mitigation measures to reduce residual risk or enhance opportunities: - Maximise the distance between the turbines and the N14; - Ensure effective rehabilitation of areas not required during operation (e.g. temporary laydown areas); - Minimise lighting; and - Any other best practice visual mitigation measures suggested by the visual specialist.							

Note that because of the very minimal amount of archaeology present on the site the precolonial cultural landscape has been considered under archaeology above (Section 7.1.1.).

<u>Consideration of a 3 km N14 buffer</u>

During the scoping phase it was suggested that the developer could consider omission of the turbines from the south-eastern side of the N14 in order to reduce impacts to the landscape. In their response to the scoping report, SAHRA suggested that a minimum 3 km buffer along the N14 should be applied. A motivation to reduce the 3 km buffer was provided to and accepted by SAHRA. Nevertheless, further points in respect of this reduced buffer are provided here:

- While the N14 does have scenic value that is considered to have cultural significance, it is also notable that the route is very long and can be monotonous. Undoubtedly opinions on this will vary, but the important aspect is that similar views to those obtained in the study area can be seen both to the west and east. The N14 runs for about 55 km westwards before reaching the edge of the Springbok REDZ, while eastwards one has to travel about 116 km to reach the Upington REDZ (Figure 36);

- Even though the WEF would be visible from a long way off and local hills are all too small to provide screening, the visual impact is thus relatively brief because of the length of the N14;
- WEFs tend to present greater visual impacts to the landscape when the turbines compete with natural elements like tall mountains, and especially when they are viewed along the same skyline as the natural environment. In the present context the scale of the turbines is totally different to the natural landscape which would be viewed between the turbine towers and form a separate, lower skyline in the background; and
- The WEF is "contained" by the shape of the study area and is not spread out over long ridges. Concentration of impacts is important in reducing the significance because the extent is reduced. It is preferred to have the turbines closer to the road over a limited area than well spread out but further from the road.

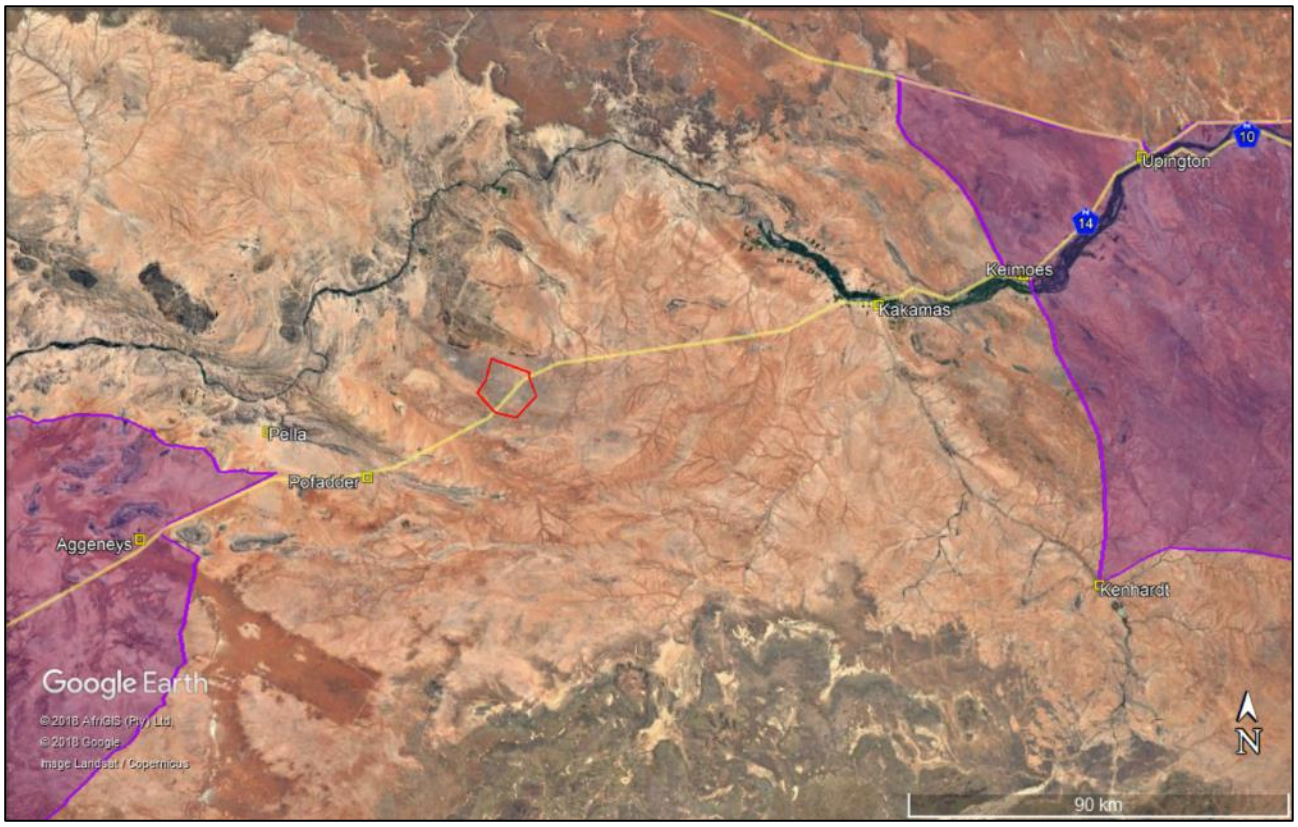

Figure 36: *Aerial view of the region around the study area (red polygon) showing the Springbok and Upington REDZs (west and east purple shaded polygons respectively).*

7.2. Power line and substations

7.2.1. Impacts to archaeological resources and graves

The assessment of impacts to archaeology and graves for the power line and substation is identical to that for the wind energy facility as presented in Section 7.1.1. Although all three Options pass through areas that could possibly contain archaeology and that have not been surveyed yet, the very light footprint of a power line means that the probability of impacts occurring remains low. There is no difference between the substation alternatives and, because of the minimal amount of archaeology on the landscape, the length of the associated power line also makes no difference to the assessment.

7.2.2. Impacts to palaeontological resources

The assessment of impacts to palaeontology for the power line and substation is identical to that for the wind energy facility as presented in Section 7.1.2. There is no difference between the substation alternatives and, because of the very low chance of encountering fossils, the length of the associated power line also makes no difference to the assessment.

7.2.3. Impacts to the cultural landscape and routes of cultural significance

The cultural landscape and N14 traversing it would be impacted during all stages of the development since it is the presence of the powerline, substation and associated construction equipment within the rural/natural landscape that results in impacts. The landscape is large and can likely absorb the development. Furthermore, several power lines and substations are already present nearby, both associated with the national grid and the existing solar energy facilities. The intensity of impacts is thus likely to be low. The impacts will be of local extent but, if construction goes ahead, they would definitely occur. The significance of impacts before mitigation is likely to be **medium** (Table 4). No mitigation measures that can reduce impacts are feasible but best practice visual mitigation measures such as ensuring effective rehabilitation of areas disturbed during construction should be implemented. The visual impact assessment would make further recommendations in this regard. Because mitigation cannot hide the power line, the significance of impacts after mitigation remains **medium**. There are no fatal flaws in terms of impacts to the cultural landscape.

It should be noted that the significance rating in Table 4 is calculated. It is the long term duration of the impacts that has the greatest bearing on the significance and hence despite the intensity being lower than that for the wind turbines, the significance still calculates to medium.

Table 4: *Assessment of impacts to the cultural landscape and routes of cultural significance.*

Impact Phase: All phases							
Potential impact description: Impacts to the cultural landscape and routes of cultural significance The rural/natural landscape is affected by the visual intrusion into it of electrical infrastructure and construction equipment and machinery.							
	Intensity	**Extent**	**Duration**	**Status**	**Probability**	**Significance**	**Confidence**
Without Mitigation	L	L	H	Negative	H	M	H
With Mitigation	L	L	H	Negative	H	M	H
Can the impact be reversed?			YES.				
Will impact cause irreplaceable loss of resources?			NO.				
Can impact be avoided, managed or mitigated?			NO, but minor visual mitigation measures should still be applied as best practice.				
Mitigation measures to reduce residual risk or enhance opportunities: - Ensure effective rehabilitation of areas not required during operation (e.g. temporary laydown areas); and - Any other best practice visual mitigation measures suggested by the visual specialist.							

Because a power line would have to cross the N14 anyway to link the two parts of the WEF, there is little to no difference in the intensity of the impacts for the various proposed substations. In general, however, it would be preferred to construct at Option A due to its greater distance from the N14.

Note that because of the very minimal amount of archaeology present on the site the precolonial cultural landscape has been considered within archaeology.

7.3. Existing impacts to heritage resources

There are currently no obvious significant threats to heritage resources on the site. Impacts would occur from:

- Natural degradation, weathering and erosion that will affect archaeological materials and, if they become exposed at the surface, fossils;
- Trampling of artefacts and/or fossils by grazing animals and/or farm vehicles; and
- Existing renewable energy facilities, substations and power lines occur in the landscape but primarily to the north of the site.

7.4. Cumulative impacts

7.4.1. Cumulative impacts to archaeological resources and graves

Cumulative impacts to archaeological resources and graves would occur during the construction phase when the ground surface is disturbed when vegetation is cleared and foundations are excavated. These would be direct impacts. In this relatively arid environment archaeological resources tend to occur in close proximity to water sources and to rocky outcrops and hills. These are areas typically protected from development which means that cumulative impacts are of limited concern in terms of archaeology. Furthermore, mitigation of archaeological sites is easily effected which means that the cultural significance of the archaeology is largely retained. Together these factors determine a low intensity of cumulative impacts to archaeology in this general area. The kinds of sites likely to be found are of local heritage significance so the extent of impacts would be local. Impacts to archaeological resources are destructive and hence permanent but the probability of impacts occurring is deemed to be low because of the efforts generally made (including by the present developer) to avoid pans, rock outcrops and rocky hills which are the most sensitive parts of the broader landscape. The locations of graves cannot be predicted and they are very rarely encountered. The overall impact significance before mitigation is thus likely to be **low** (Table 5). Pre-construction archaeological surveys within the authorised footprints of renewable energy developments would identify any issues and recommend mitigation as may be required. Although there is a low probability of sites being found, the chances are not zero and some significant sites have been found and mitigated in this way (Orton 2016a). The intensity of impacts would remain low and the impact significance after mitigation would be **low**. Overall, cumulative impacts to archaeology and graves are of little concern and there are no fatal flaws.

Table 5: *Assessment of cumulative impacts to archaeology and graves.*

Impact Phase: Construction							
Potential impact description: Impacts to archaeological resources and graves Archaeological resources on the ground (artefacts, occupation debris) and graves can be damaged and/or destroyed during construction activities.							
	Intensity	**Extent**	**Duration**	**Status**	**Probability**	**Significance**	**Confidence**

Without Mitigation	L	L	H	Negative	L	L	H
With Mitigation	L	L	H	Negative	L	L	H
Can the impact be reversed?			NO.				
Will impact cause irreplaceable loss of resources?			YES.				
Can impact be avoided, managed or mitigated?			YES, archaeological mitigation can be easily implemented. Graves can be exhumed and/or relocated.				
Mitigation measures to reduce residual risk or enhance opportunities: - Commission pre-construction archaeological surveys to check the actual footprint of the developments. Such surveys would identify any sites that require mitigation. - Protect and report any graves or dense concentrations of artefacts found during vegetation clearing or excavation of foundations.							

7.4.2. Cumulative impacts to palaeontological resources

Cumulative impacts to palaeontological resources could occur during the construction phase. The chances of fossils being found in the broader area are very low because the nature of the geology is generally not conducive to fossils being present. The majority would likely be associated with alluvial deposits along water courses which are generally excluded from development. It remains possible, however, that rare, isolated bones might be present and could be damaged or destroyed during construction activities. Because of the rarity of such finds, the great difficulty in spotting them during excavation and consequent low likelihood that they would be reported and rescued, the impact intensity could be medium. Destruction of fossils is permanent but the chances of this occurring are generally very low. Before mitigation the impacts are likely to be of **low** significance (Table 6). Mitigation would involve protecting and reporting any fossils that are found so that they can be examined and collected (if necessary) by a palaeontologist. Post-mitigation significance remains at the **low** level. There are no fatal flaws in terms of cumulative impacts to palaeontological resources.

Table 6: *Assessment of cumulative impacts to palaeontology.*

Impact Phase: Construction							
Potential impact description: Impacts to palaeontological resources Palaeontological resources in the ground (fossil bones) can be damaged and/or destroyed during construction activities.							
	Intensity	**Extent**	**Duration**	**Status**	**Probability**	**Significance**	**Confidence**
Without Mitigation	M	L	H	Negative	L	L	H
With Mitigation	L	L	H	Negative	L	L	H
Can the impact be reversed?			NO.				
Will impact cause irreplaceable loss of resources?			YES.				
Can impact be avoided, managed or mitigated?			YES, palaeontological mitigation can be implemented but the chances of it being effective are limited.				
Mitigation measures to reduce residual risk or enhance opportunities: - Protect and report any fossil bones found during vegetation clearing or excavation of foundations.							

7.4.3. Cumulative impacts to the cultural landscape and routes of cultural significance

The cultural landscape and N14 traversing it would be impacted during all stages of the development since it is the presence of the infrastructure and associated construction equipment (industrial character) within the rural/natural landscape that results in impacts. Although not within a Renewable Energy Development Zone, several solar energy facilities, substations and power lines are already present in the area and it is seen as desirable to cluster such facilities in the landscape rather than spreading them out. Although the industrial nature of renewable energy facilities and electrical infrastructure is distinctly different to the surrounding landscape, the landscape is large and can likely absorb these developments, especially if they are kept in a cluster. Because they are generally lower to the ground and merge with the landscape when seen from afar, the solar energy facilities result in less cumulative impacts than WEFs do. The intensity of impacts is thus likely to be medium. The impacts will be of local extent because they are clustered but, if construction goes ahead, they would definitely occur. The significance of impacts before mitigation is likely to be **medium** (Table 3). Because of the size of the infrastructure under consideration, no mitigation measures that can reduce impacts are feasible but best practice visual mitigation measures such as ensuring effective rehabilitation and minimising lighting should be implemented. The visual impact assessment would make further recommendations in this regard. Because mitigation cannot hide the facilities, the significance of impacts after mitigation remains **medium**. There are no fatal flaws in terms of cumulative impacts to the cultural landscape.

Table 3: *Assessment of cumulative impacts to the cultural landscape.*

Impact Phase: All phases							
Potential impact description: Impacts to the cultural landscape The rural/natural landscape is affected by the visual intrusion into it of electrical infrastructure and construction equipment and machinery.							
	Intensity	**Extent**	**Duration**	**Status**	**Probability**	**Significance**	**Confidence**
Without Mitigation	M	L	H	Negative	H	M	H
With Mitigation	M	L	H	Negative	H	M	H
Can the impact be reversed?			YES.				
Will impact cause irreplaceable loss of resources?			NO.				
Can impact be avoided, managed or mitigated?			NO, but minor visual mitigation measures should still be applied as best practice.				
Mitigation measures to reduce residual risk or enhance opportunities: - Cluster renewable energy facilities and related infrastructure; - Ensure effective rehabilitation of areas not required during operation (e.g. temporary laydown areas); - Minimise lighting; and - Any other best practice visual mitigation measures suggested by the visual specialist.							

Note that because of the very minimal amount of archaeology present on the site the precolonial cultural landscape has been considered within archaeology.

7.5. Levels of acceptable change

Any impact to an archaeological or palaeontological resource or a grave is deemed unacceptable until such time as the resource has been inspected and studied further if necessary. Impacts to the landscape are difficult to quantify but in general a development that visually dominates the landscape from many vantage points is undesirable. Because of the height of the proposed development, it will be highly visible but from a moderate distance it would not strongly dominate the landscape. This is partly due to the fact that the turbines would be placed in a cluster.

8. INPUT TO THE ENVIRONMENTAL MANAGEMENT PROGRAM

- The final layout of the facility should be walked by an archaeologist at least six months prior to construction in order to determine whether any further archaeological sites may be present within the footprint. Recommendations for mitigation may need to be made at that time and such work would need to be carried out prior to construction.
- The only monitoring required as part of the Environmental Management Program (EMPr) is to ensure that the identified no-go areas are not transgressed during the construction, operation and, if applicable, decommissioning of the facility.

9. 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 will provide limited employment but, more importantly, will contribute electricity to the South African power grid. This is important for stabilising electricity supply and encouraging economic growth. The relatively limited heritage impacts are certainly outweighed by this economic benefit to the country. It is also notable that the project would assist South Africa with reaching its renewable energy target.

10. CONCLUSIONS

This assessment finds that numerous Stone Age archaeological resources occur throughout the WEF study area but that they are generally associated with water sources and rocky hills. The sensitive locations are all in the northern part of the WEF site. These are areas typically protected from development for various reasons and impacts to these heritage resources are not expected. The same applies to the power line routes, although these were not physically examined. There is still a small chance that isolated water holes with associated archaeological sites can be located in open areas but these could only be identified once a final road layout is available and surveyed.

The landscape is more natural than cultural but will experience visual impacts. The important part of this is that the N14 is considered a *route of cultural significance* because of the aesthetic and scenic qualities of the landscape through which it passes. Turbines would be placed on both sides

of the road meaning that motorists would have to pass through the development. The power lines and substation, on the other hand, present a far more limited impact and, if the WEF is constructed then the associated power line would have a negligible further impact. In general, substation locations further away from the N14 are better. Despite the WEF straddling the road, and considering the benefits to the economy, the impacts to the N14 and surrounding landscape are not significant enough to be a fatal flaw, largely because the turbines would be in a cluster and not spread out over a lengthy section of the road in what is a very extensive landscape.

Figure 37 shows the locations of all areas known to be sensitive and which should be avoided if possible. It is best practice to avoid all significant heritage sites but, if this is not possible, mitigation can still be effected if necessary. Note that this map refers to the WEF site only, since the power line routes have not been surveyed. If sensitive sites are found along the powerline route it may be possible to span them with the cables but the service track would have to be routed around the site. Given that, in such dry landscapes with no bush to guide repeated use of the track, there is no guarantee that the sites would not get driven over in the future, mitigation may be seen as preferred in such instances.

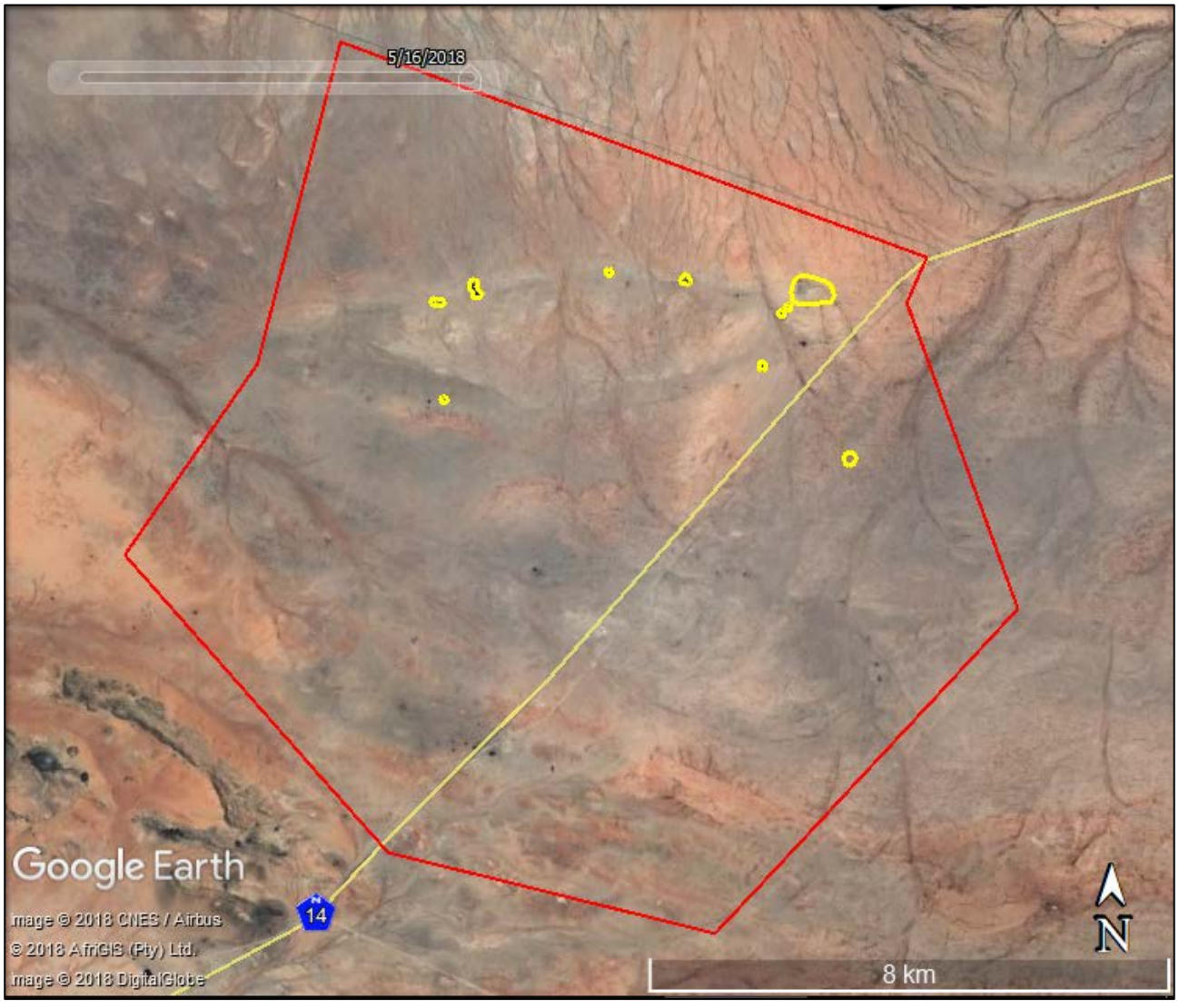

Figure 37: *Aerial view of the project study area (red polygon) showing the no-go areas identified during the survey (yellow ovals).*

11. RECOMMENDATIONS

Because impacts of high significance are not expected to occur, it is recommended that the proposed WEF, power line and associated infrastructure (including all three substation locations) can be authorised. The following conditions must be included in the Environmental Authorisation should one be granted:

- The final authorised layout for the WEF, all internal roads, the power line, substation and any other areas to be disturbed must be surveyed by an archaeologist prior to construction in order to identify any remaining potential impacts that may need mitigation;
- Although it is noted that approval is being sought for all three substation locations and that all three are suitable from a heritage point of view, Option A is slightly preferred for construction over Options B & C because it is further from the N14;
- Identified sensitive sites must be treated as no-go areas throughout the lifetime of the project;
- If any turbines are removed as a result of the use of larger turbines at a later stage then priority should be given to removing turbines close to the N14; and
- If any 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. 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:

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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 – List of finds

Waypoint	Location	Site name	Description	Significance
490	S28 59 22.7 E19 41 38.5	---	Stone feature near a rocky hill that may represent a grave.	Unknown
491	S28 57 44.5 E19 41 22.7	---	Quartz artefact scatter near a small pan. It is really just an increased density of background scatter.	Low
492	S28 57 47.6 E19 41 21.9	---	Quartz artefact scatter near the same pan as 491. It is really just an increased density of background scatter.	Low
493	S28 57 42.2 E19 40 09.0	SK2018/001	A light quartz artefact scatter at the north-western edge of a dolerite hill.	Low
494	S28 57 42.3 E19 40 11.7	SK2018/002	A light quartz artefact scatter at the north-eastern edge of the same dolerite hill as 493.	Low
495	S28 57 43.9 E19 40 11.2	SK2018/003	A light quartz artefact scatter at the south-eastern edge of the same dolerite hill as 493.	Low
496	S28 56 19.7 E19 40 30.9	---	Historical (probably 20th century) dam with drystone walling at the overflow point. Two screw top bottles were noted nearby.	Low
497	S28 55 57.0 E19 42 22.0	SK2018/004	A low stone alignment at the north-western edge of a dolerite hill.	Low
498	S28 55 57.1 E19 42 23.1	SK2018/005	A low stone alignment at the north-eastern edge of a dolerite hill.	Low
499	S28 55 57.1 E19 42 30.9	SK2018/006	A clearing on the top of a dolerite hill with ostrich eggshell fragments in it.	Low-medium **AVOID**
500	S28 55 01.2 E19 41 27.7	---	An isolated quartz bifacial point found on the berm of an excavated 'dam'. There may well have been a pan here before. The artefacts is only retouched along one edge of each face.	Low
501	S28 55 08.1 E19 42 25.0	SK2018/007	A clearing on top of a dolerite hill with ostrich eggshell fragments in it. The clearing is entirely natural (although some rocks may have been removed from its sandy floor). A smaller clearing located immediately to the northeast and just below the top of the hill has a clearly built up wall but no archaeological material on its floor.	Low-medium **AVOID**
502	S28 55 08.7 E19 42 28.4	SK2018/008	A clearing on top of a dolerite hill with flaked quartz artefacts and ostrich eggshell fragments in it. The clearing is entirely natural (although some rocks may have been removed from its sandy floor).	Low-medium **AVOID**
503	S28 55 08.6 E19 42 28.8	SK2018/009	A very small stone-walled enclosure on the east side of the same hill as 502. There was no archaeological material on its floor.	Low-medium **AVOID**

504	S28 54 58.8 E19 42 48.2	SK2018/010	A small, circular stone enclosure built against two small boulders. The site is at the foot and to the north of a dolerite hill. It resembles a lammerhok kraal.	Low-medium **AVOID**
505	S28 54 58.7 E19 42 47.2	SK2018/011	A slightly larger circular stone-walled enclosure with discontinuous, tumbled walling located just west of 504.	Low-medium **AVOID**
506	S28 55 01.3 E19 42 46.9	SK2018/012	A clearing on the side of a dolerite hill with flaked quartz artefacts and ostrich eggshell fragments in it. The clearing is entirely natural (although some rocks may have been removed from its sandy floor). An upright dolerite slab has had its top broken off and it may have been used as a 'rock gong'. However, it is noted that many ideal gong rocks (with good rings) were found in the study area but none of them bore the characteristic marks of such gongs as recorded elsewhere.	Low-medium **AVOID**
507	S28 55 01.4 E19 42 47.2	SK2018/013	A clearing on the top of the same dolerite hill as 506 with flaked quartz artefacts in it. The clearing is entirely natural (although some rocks may have been removed from its sandy floor).	Low-medium **AVOID**
508	S28 55 00.5 E19 42 47.1	SK2018/014	A clearing on the top the same dolerite hill as 506 with ostrich eggshell fragments in it. The clearing is entirely natural (although some rocks may have been removed from its sandy floor).	Low-medium **AVOID**
509	S28 55 01.5 E19 42 47.6	SK2018/015	A clearing on the top the same dolerite hill as 506 with ostrich eggshell fragments in it. The clearing is entirely natural (although some rocks may have been removed from its sandy floor).	Low-medium **AVOID**
510	S28 55 02.1 E19 42 47.9	SK2018/016	A clearing on the side of the same dolerite hill as 506 with flaked quartz artefacts and ostrich eggshell fragments in it. The clearing is entirely natural (although some rocks may have been removed from its sandy floor).	Low-medium **AVOID**
511	S28 55 04.5 E19 42 48.6	SK2018/017	A clearing on the side of a small dolerite hill immediately south of the 506 hill and with flaked quartz artefacts in it. The clearing is entirely natural (although some rocks may have been removed from its sandy floor).	Low-medium **AVOID**
512	S28 55 04.1 E19 42 49.8	SK2018/018	A clearing on the top of the same dolerite hill as 511 with flaked quartz artefacts in it. The clearing is entirely natural (although some rocks may have been removed from its sandy floor).	Low-medium **AVOID**
513	S28 55 04.3 E19 42 50.2	SK2018/019	A series of three clearings on the top of the same dolerite hill as 511 with flaked quartz	Low-medium **AVOID**

			artefacts and ostrich eggshell fragments in it. The clearing is entirely natural (although some rocks may have been removed from its sandy floor).	
514	S28 54 34.0 E19 44 09.3	SK2018/020	A granite bedrock outcrop with 'waterbakke' (natural holes that accumulate water after rain) in it and bearing a number of grinding patches. 414 = 3 patches; 415 = 1 patch; 416 = 1 patch; 417 = 3 patches; 418 – 1 patch. No associated archaeology was seen.	Low
515	S28 54 33.4 E19 44 09.5			
516	S28 54 34.0 E19 44 10.9			
517	S28 54 34.6 E19 44 10.9			
518	S28 54 34.4 E19 44 11.6			
519	S28 54 53.0 E19 44 04.3	SK2018/021	A stone-walled wind break built on top of a dolerite hill and with flaked quartz artefacts and ostrich eggshell fragments inside it.	Low-medium **AVOID**
520	S28 54 29.4 E19 44 54.9	SK2018/022	A granite bedrock outcrop with 'waterbakke' in it and with a slightly elevated background scatter of quartz artefacts around it. No concentrations were seen.	Low
521	S28 54 57.1 E19 44 46.8	LV2018/001	A moderate density flaked quartz artefacts scatter at the northern foot of a dolerite hill.	Low-medium **AVOID**
522	S28 54 57.0 E19 44 48.6	LV2018/002	A clearing on the top of the dolerite hill alongside 511 with flaked quartz artefacts in it. The clearing is entirely natural (although some rocks may have been removed from its sandy floor).	Low-medium **AVOID**
523	S28 54 57.5 E19 44 49.0	LV2018/003	A large relatively clear area on the top of the same dolerite hill as 522 with flaked quartz artefacts and ostrich eggshell fragments in it. The clearing is entirely natural (although some rocks may have been removed from its sandy floor).	Low-medium **AVOID**
524	S28 54 55.8 E19 44 47.9	---	Other end of the quartz scatter at 521. The scatter extends between the two points.	Low-medium **AVOID**
525	S28 55 00.2 E19 44 15.3	---	A pair of small dolerite hills that has several fragments of 20th century glass and tin cans scattered around it. They no doubt relate to a stock post that was located in the lee of the hills. Likely not old enough to be archaeology.	---
526	S28 59 46.7 E19 43 21.5	LV2018/004	Quartz outcrop quarry.	Low
527	S28 59 36.4 E19 42 30.5	---	Farm reservoir, may be older than 60 years.	Low
528	S28 59 16.0 E19 43 43.0	---	Low density quartz scatter over the top of a granite hill. Also the base of a Stellenbosch farmer's Winery brandy bottle and a cup	Low

			made from a tin can with a handle fastened on to it.	
529	S28 59 10.5 E19 45 27.4	---	Farm reservoirs, may be older than 60 years.	Low
530	S28 56 24.6 E19 46 21.2	LV2018/005	An old pan that has been excavated out to catch more water. It was a widespread low-medium density artefacts scatter, probably mostly LSA but occasional pieces seem to be MSA. Materials present include quartz, quartzite, CCS, hornfels and 'other'.	Low-medium **AVOID OR MITIGATE**
531	S28 56 26.7 E19 46 21.4			
532	S28 56 25.1 E19 46 22.6			
533	S28 56 23.1 E19 46 17.5	LV2018/006	A second area of artefact scatter of varying age located to the west of the same pan as at 530 but this scatter is disturbed by a farm track and the 'dam wall' and is also less extensive.	Low
534	S28 57 36.3 E19 46 17.8	LV2018/007	A light quartz flaked artefact scatter on a dolerite hill.	Low
535	S28 57 23.2 E19 45 22.5	LV2018/008	A light quartz flaked artefact scatter on a dolerite hill.	Low
536	S28 59 47.9 E19 44 40.4	LV2018/009	Quartz outcrop quarry.	Low
537	S28 55 11.0 E19 45 46.7	LV2018/010	Historical stone-built kraal in very good condition and still in use.	Medium **AVOID**
539	S28 55 05.2 E19 45 52.2	---	Granite quarry site from where slabs of rock were sourced to build the nearby kraal.	Low
540	S28 55 03.5 E19 45 51.4	---	Granite quarry site from where slabs of rock were sourced to build the nearby kraal.	Low
542	S28 55 01.4 E19 45 51.8	---	A small square stone feature near a large granite bedrock outcrop and that is certainly of historical origin. Its function is unknown. A fragment of a clear embossed glass bottle was also found here.	Low
552	S28 55 02.0 E19 45 58.0	LV2018/011	A large granite bedrock outcrop with pans around it and many '*waterbakke'* on top of it. There are numerous grinding patches around the edges of the granite (210 were counted but this is not likely to be accurate) and a light to moderate artefact scatter in various places on the surrounding ground. In addition to stone artefacts of quartz, quartzite and CCS, there were also some pot sherds. Note that the surrounding area was only minimally surveyed and further artefact scatters may well be present. Waypoint 547 was particularly interesting as there was a smoothed slab lying over a small hollow in the bedrock. Beneath the slab were a selection of items as follows: another smaller smoothed stone (broken piece), a	Medium **AVOID**

			quartz crystal, a quartz flake and chunk, a CCS flake and bipolar core, two fibre-tempered pot sherds and one mineral-tempered pot sherd. Waypoints 538-575 were taken at this site but waypoint 552 is taken as an approximate mid-point.	
553	S28 55 00.4 E19 45 59.0	---	Granite quarry site from where slabs of rock were sourced to build the nearby kraal.	Low
576	S28 57 22.0 E19 43 23.9	LV2018/012	A quartz flaked artefact scatter on the southern side of a dolerite hill. Much natural quartz as well so hard to tell how much flaked material is present.	Low
578	S28 57 21.0 E19 43 21.9	LV2018/013	A quartz flaked artefact scatter on the west side of the same dolerite hill as 576.	Low
579	S28 55 40.6 E19 45 31.5	LV2018/014	A quartz flaked artefact scatter on the southern side of a dolerite hill. A few pieces of ostrich eggshell are also present.	Low
580	S28 55 39.5 E19 45 32.2	LV2018/015	A quartz artefact scatter in a clearing on the side of a dolerite hill.	Low-medium **AVOID**
581	S28 55 39.9 E19 45 31.9	LV2018/016	A clearing on top of a dolerite hill with a dense flaked quartz artefacts and ostrich eggshell fragments in it. The clearing looks as though it has had rocks removed to be as clear as it is. There are also two ground patches on the surrounding boulders.	Low-medium **AVOID**
582	S28 55 38.9 E19 45 31.7	LV2018/017	A dense quartz artefact scatter in a clearing on the side of a dolerite hill.	Low-medium **AVOID**
583	S28 55 28.1 E19 45 55.5	LV2018/018	A quartz scatter in a clearing on top of a dolerite hill. The clearing has been further cleared in recent times and a track cleared up the side of the hill to allow for some drilling. Original state of the site is thus unknown due to the extensive disturbance.	Low
584	S28 55 28.7 E19 45 54.4	---	A rock with a ground patch at the foot of the same dolerite hill as waypoint 583. It lies at the lower end of the cleared path so it is unknown whether it may have been caused by something rubbing there recently. However, a second ground patch occurs on a small rock a few meters away from the path.	Low
585	S28 55 10.7 E19 45 59.5	LV2018/019	An area of exposed granite bedrock with two ground patches on it.	Low
586	S28 55 14.7 E19 45 43.2	LV2018/020	A quartz scatter at the foot of a dolerite hill. There was also a single hand-painted white earthenware fragment.	Low
587	S28 55 13.2 E19 45 42.8	LV2018/021	A clearing on the top of a dolerite hill with flaked quartz artefacts and ostrich eggshell fragments in it. The clearing is entirely natural (although some rocks may have been removed from its sandy floor).	Low-medium **AVOID**

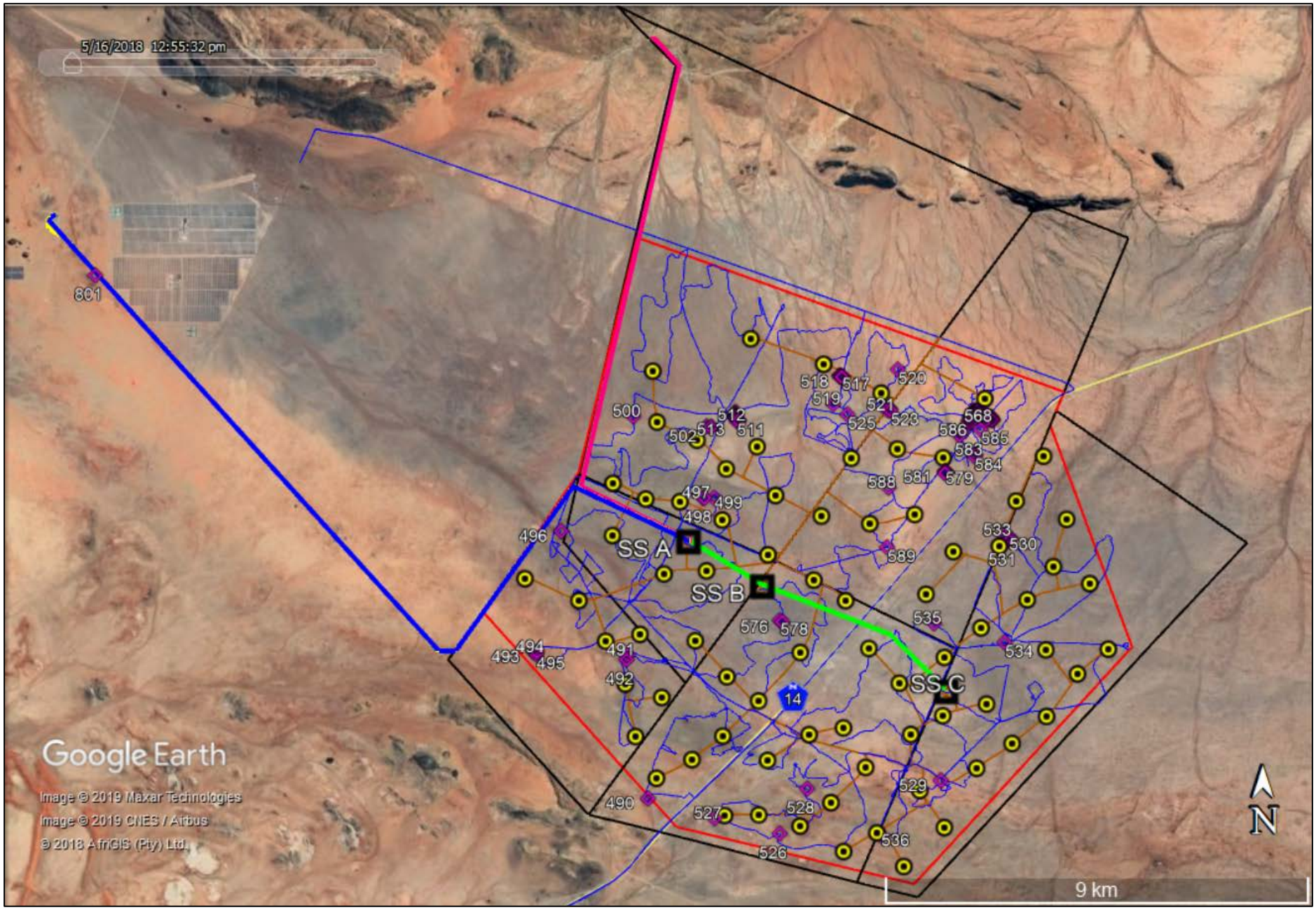
588	S28 55 50.3 E19 44 47.4	---	A ground patch on a dolerite boulder on a low dolerite hill.	Low
589	S28 56 31.2 E19 44 45.9	LV2018/022	An area of exposed granite bedrock with six ground patches on it.	Low
801	S28 53 22.9 E19 34 24.7	KK2018/036	A quartz outcrop with evidence of flaking. Recorded by Orton (2018).	Low

APPENDIX 3 – Mapping

The aerial views below show the following:

- Farm portions under consideration for the WEF (black polygons);
- The land area under consideration for the WEF (red polygon);
- Proposed wind turbine locations (yellow dots);
- Proposed power pine corridor alternatives (blue [Option 1], yellow [Option 2] and pink (Option 3) with centre lines);
- Proposed substation location alternatives within the WEF site (black squares along power line corridor, Option A to the NW, Option C to the SE – note that all three are being applied for);
- All survey tracks (blue lines);
- All recorded waypoints (numbered pink diamond symbols);
- Site outlines where large sites occur (two locations, white polygons); and
- Areas to be avoided (50 m buffers from site waypoints or polygons, yellow polygons).

The first map shows the entire project area, the second and third show the WEF site in two parts, while the remainder show close-ups of the sensitive parts of the WEF site.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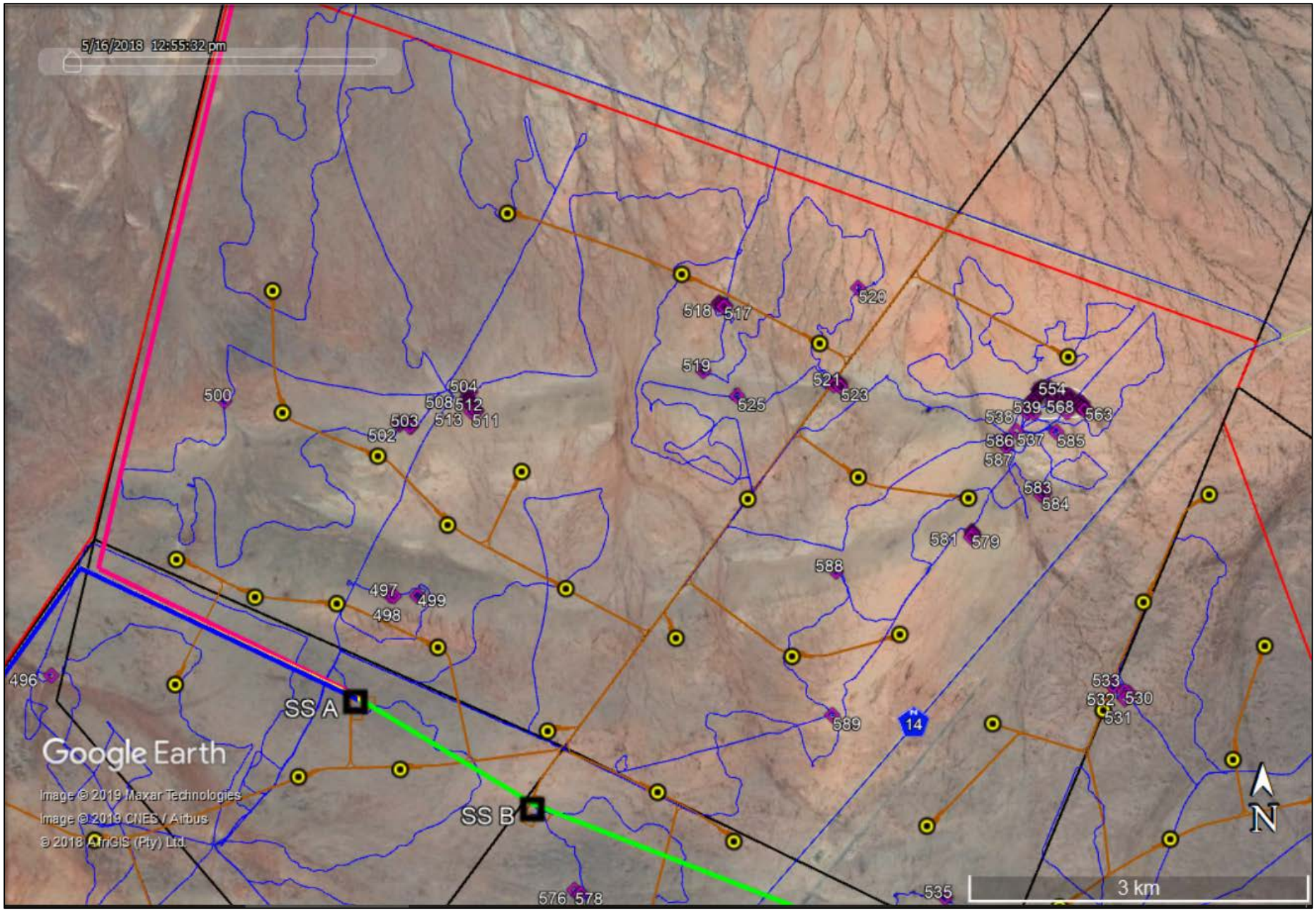
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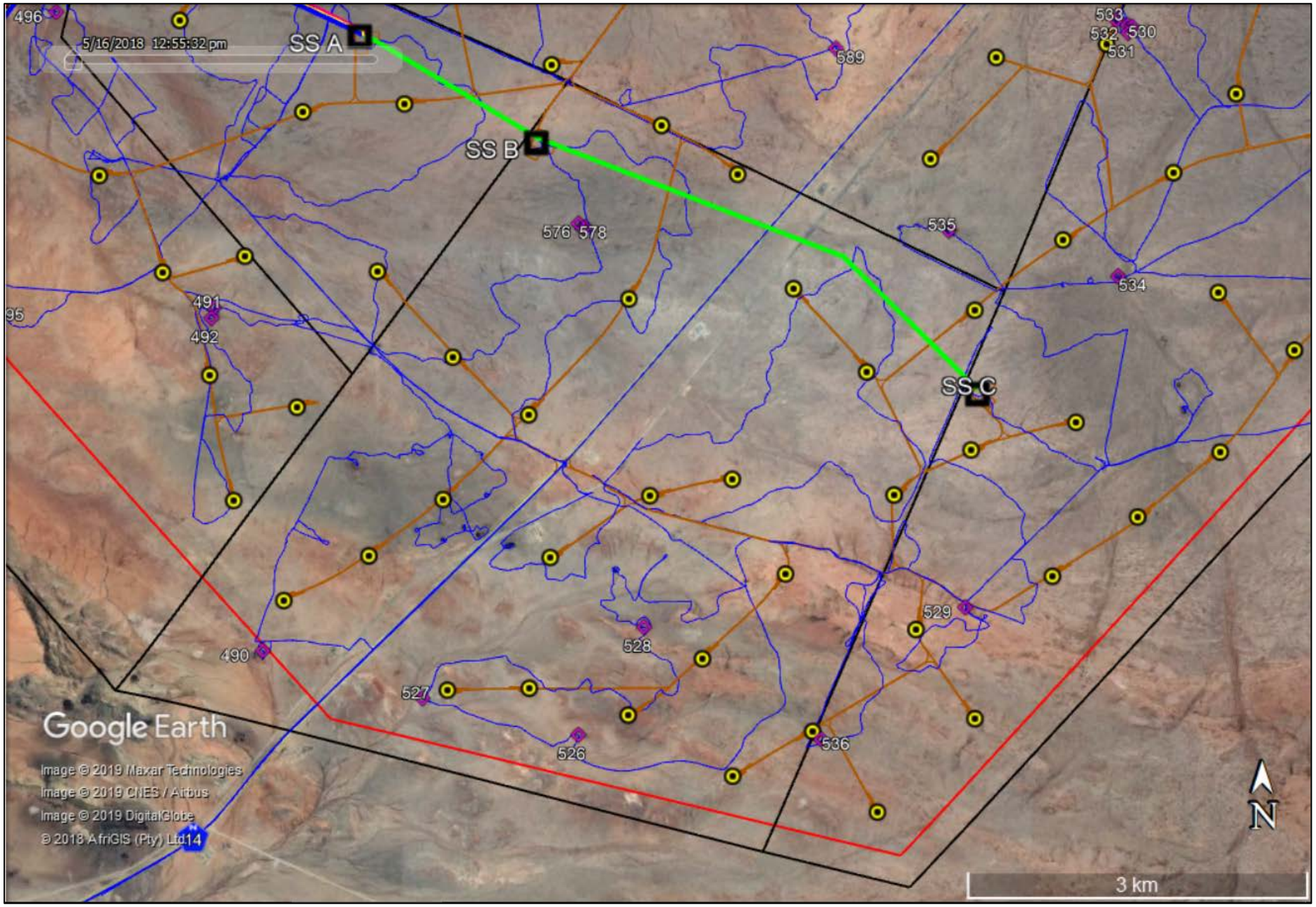
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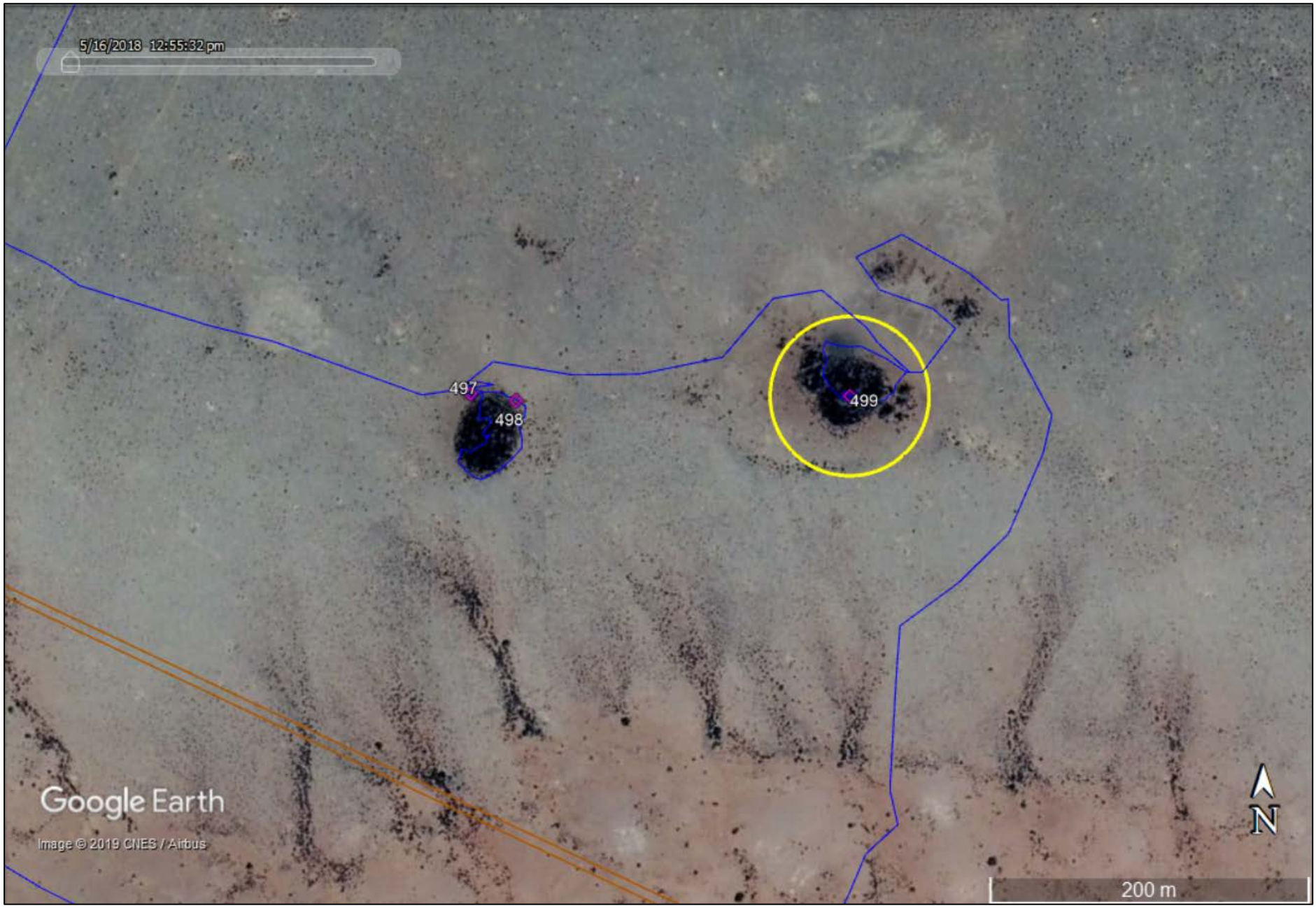
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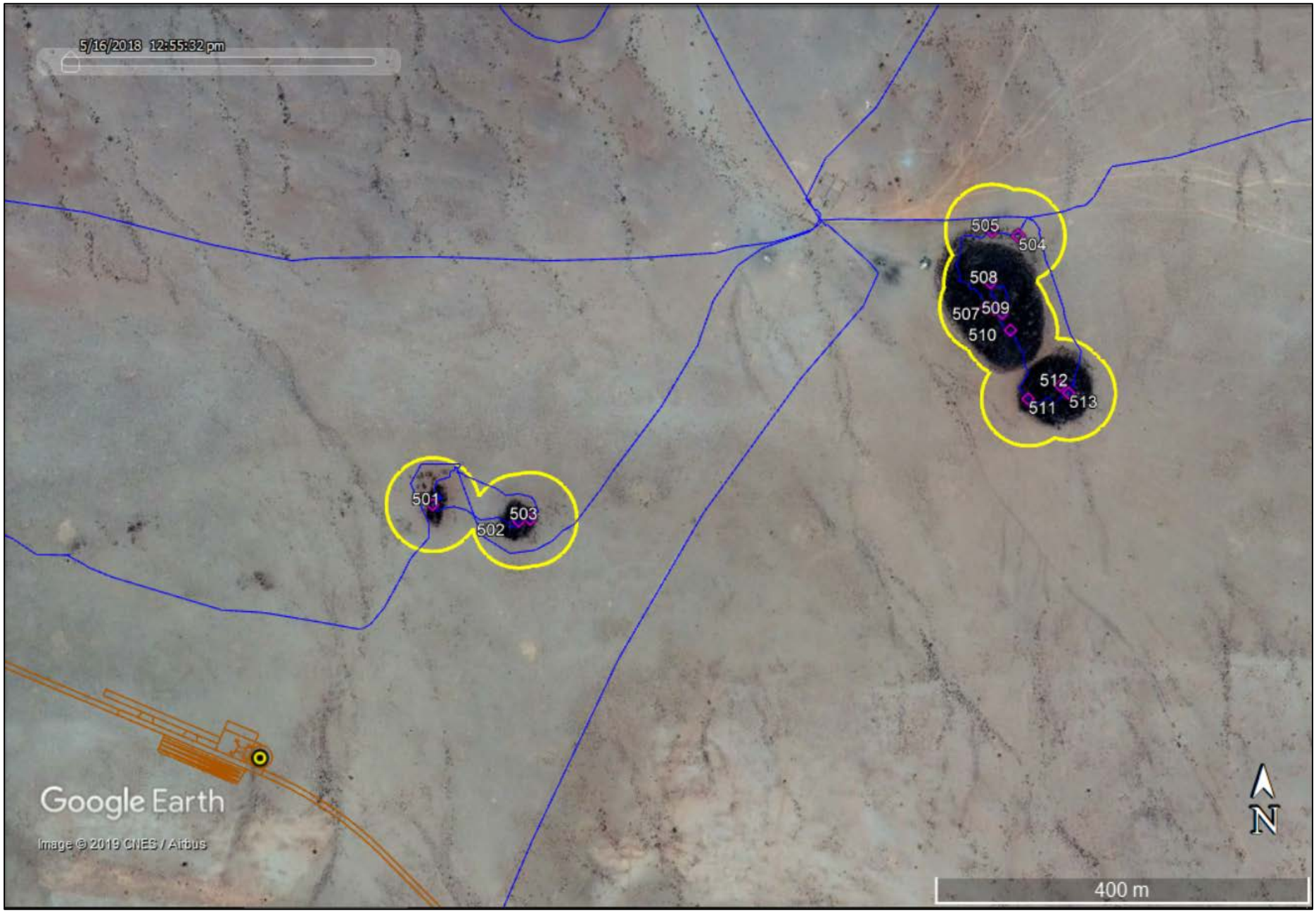
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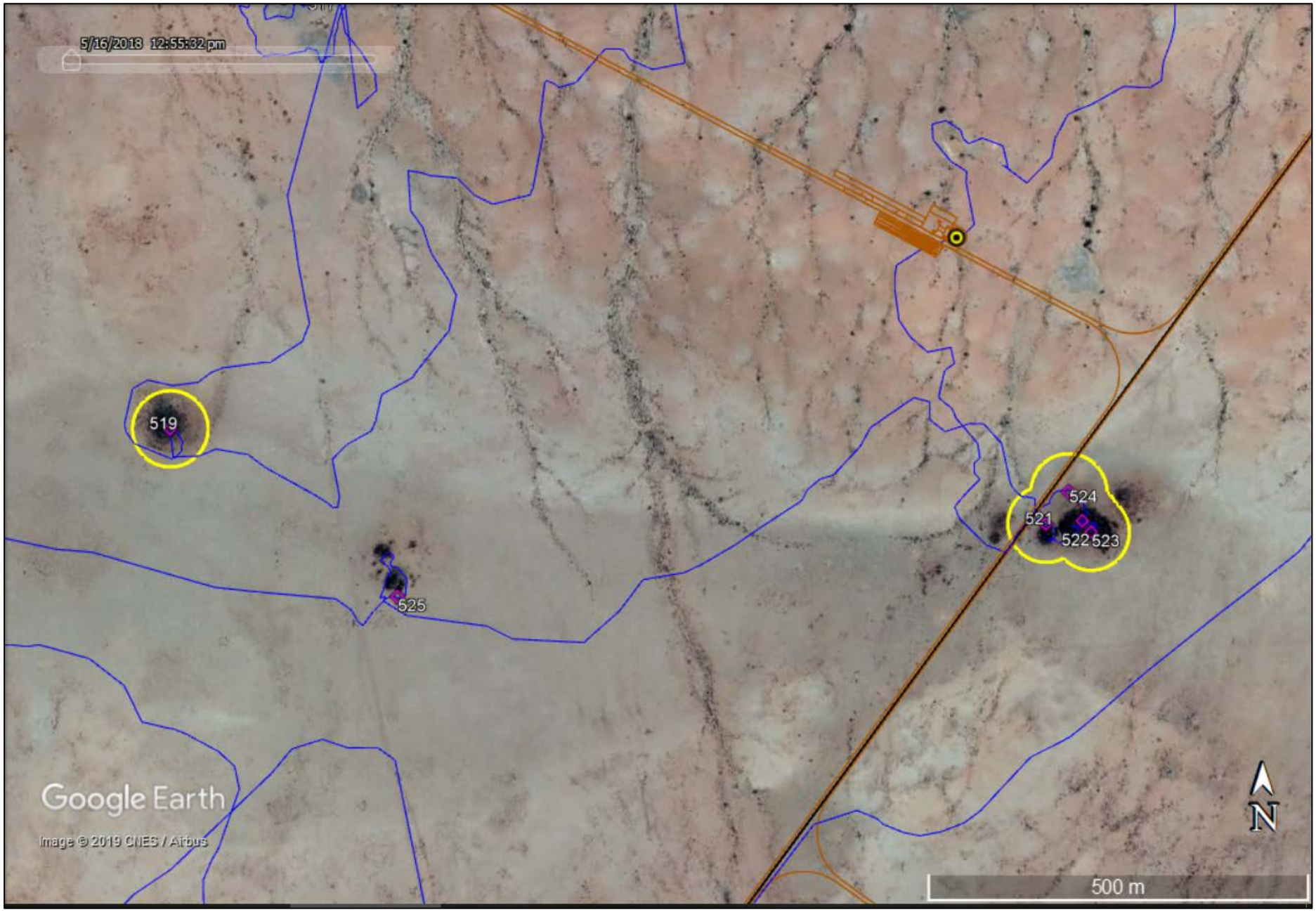
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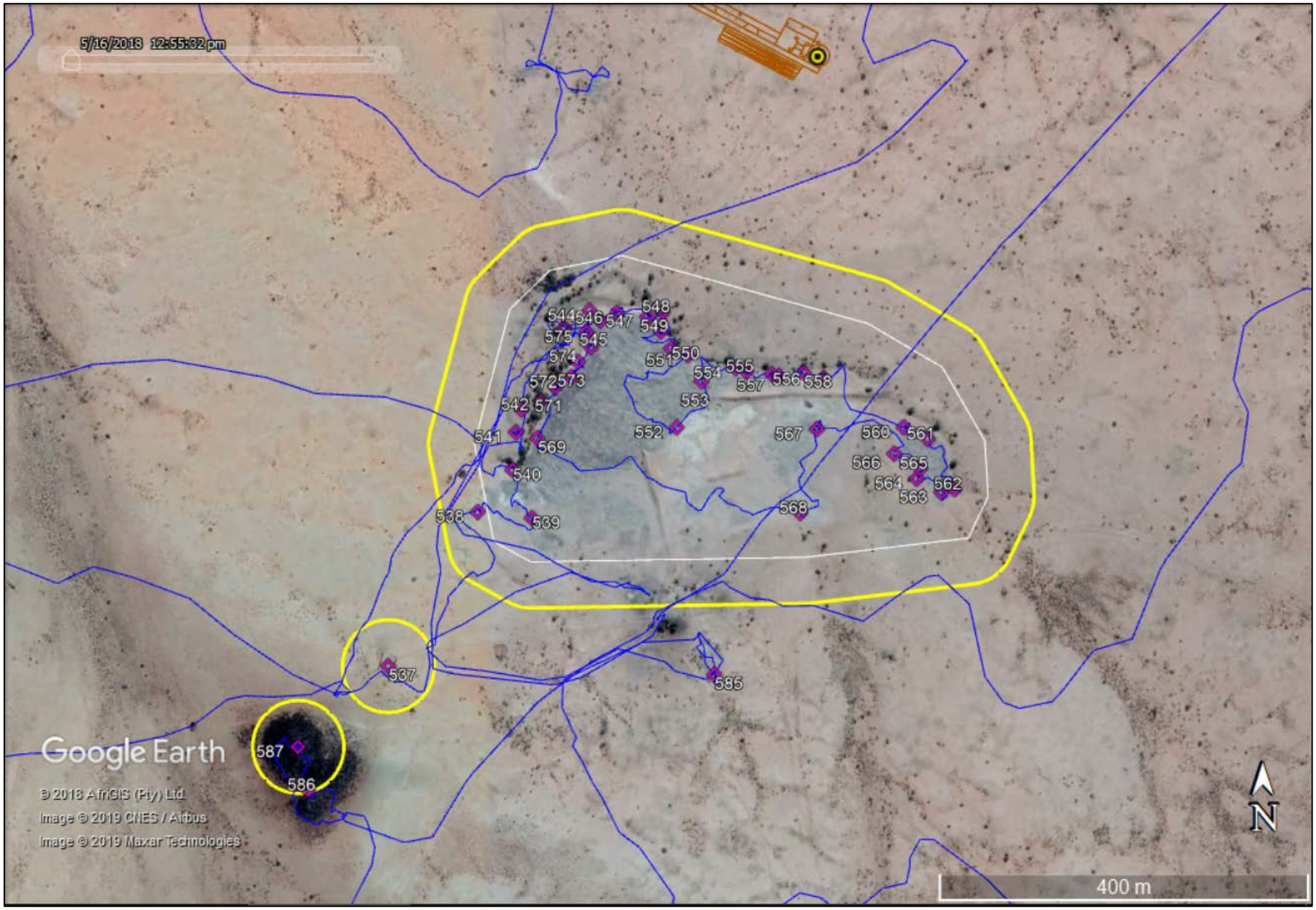
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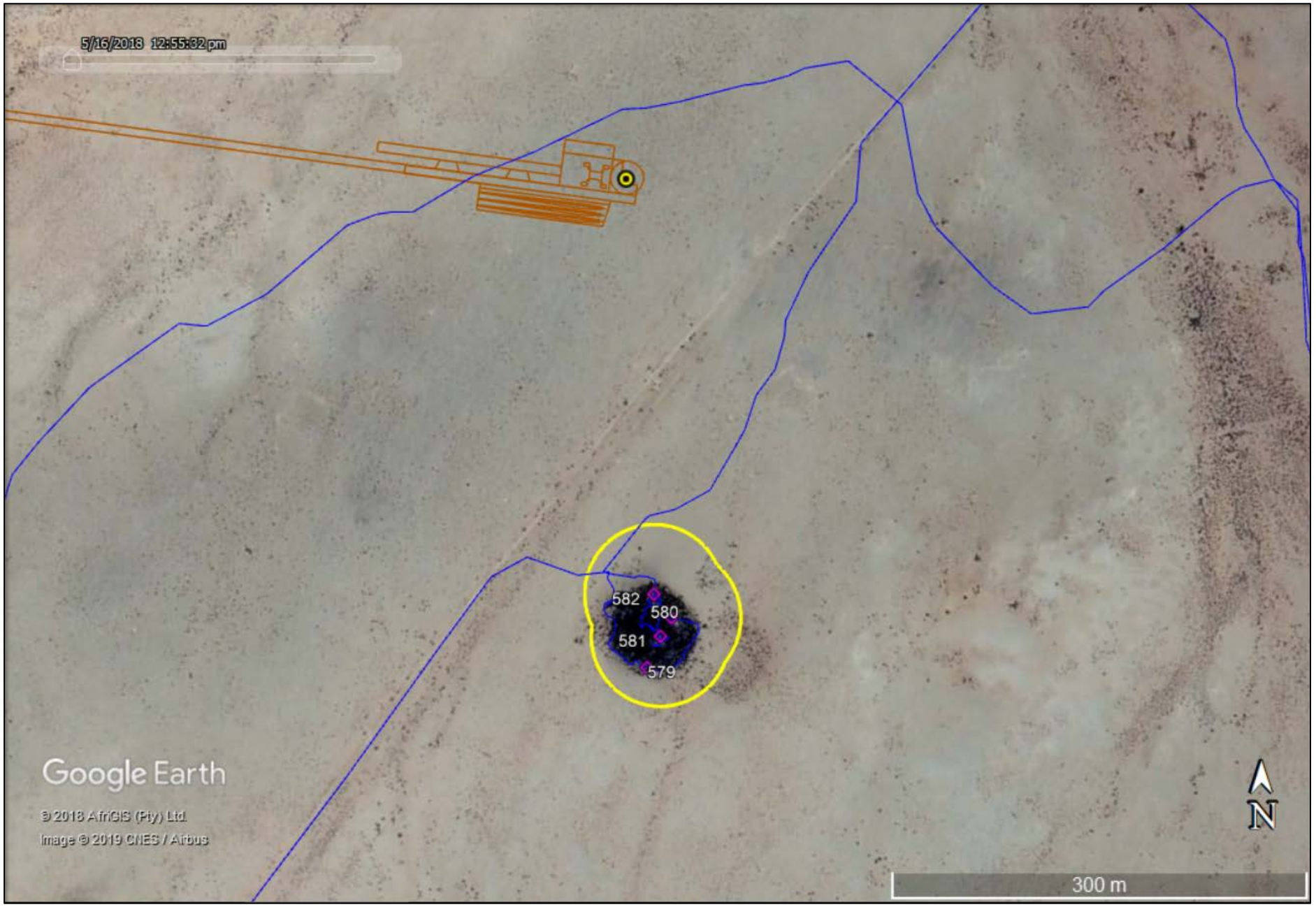
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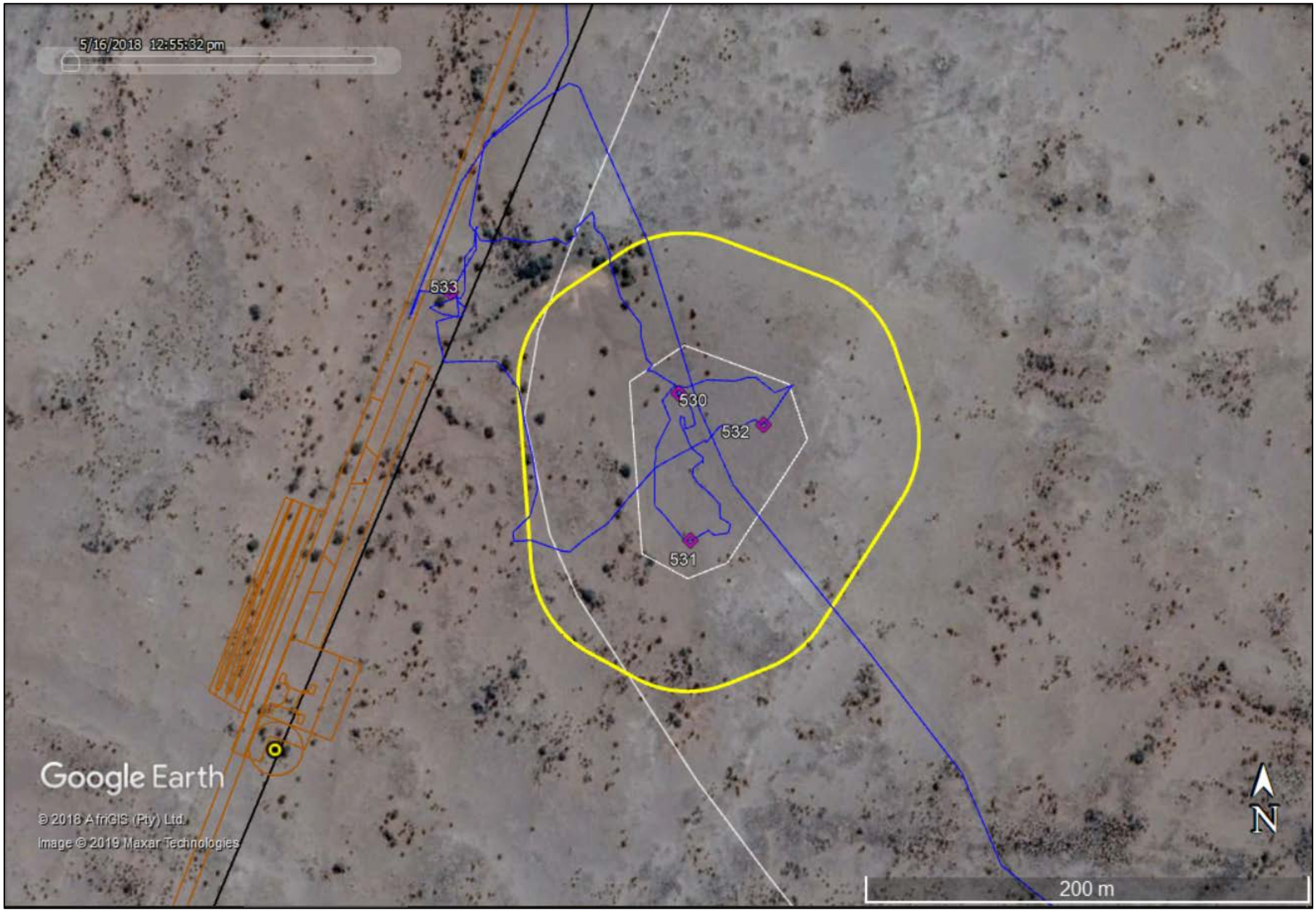
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PALAEONTOLOGICAL HERITAGE ASSESSMENT: DESKTOP STUDY

PROPOSED PAULPUTS WIND ENERGY FACILITY AND ASSOCIATED GRID CONNECTION NEAR POFADDER, KENHARDT MAGISTERIAL DISTRICT, NORTHERN CAPE

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June 2019

EXECUTIVE SUMMARY

It is proposed to construct a wind energy facility of *c.* 300 MW generation capacity on the farms Scuit-Klip 92/3, 92/4 and 92/5 and Lucas Vlei 93/1, 93/2 and 93/4 near Pofadder, Northern Cape, as well as a 132 kV overhead power line linking the proposed WEF to either the nearby existing Paulputs Substation or to an existing 132 kV Eskom transmission line to the north of the study area.

Precambrian basement rocks and Karoo dolerites underlying the Pofadder WEF project area at depth are unfossiliferous while the overlying Late Caenozoic superficial deposits (sandy to gravelly alluvium, gravels, aeolian sands *etc*) are generally of low to very low palaeontological sensitivity. No sensitive palaeontological sites or no-go areas have been identified within the WEF project area. Narrow zones of Late Caenozoic alluvium associated with minor water courses in the study region might contain fossils or subfossils such as isolated mammalian bones and teeth or freshwater molluscs but these are probably very sparse, at most. These fossils are likely to be protected within existing buffers along water courses.

Precambrian basement rocks and Karoo dolerites underlying the Pofadder WEF grid connection project area at depth are unfossiliferous while the overlying Late Caenozoic superficial deposits (sandy to gravelly alluvium, gravels, aeolian sands *etc*) which mantle the majority of the power line corridor footprint are generally of low to very low palaeontological sensitivity. No sensitive palaeontological sites or no-go areas have been identified within the grid connection project area. Narrow zones of Late Caenozoic alluvium associated with minor water courses in the study region might contain fossils or subfossils such as isolated mammalian bones and teeth or freshwater molluscs but these are probably very sparse, at most. These fossils are likely to be protected within existing buffers along water courses. There is no preference on palaeontological heritage grounds for either one of the grid connection route alternatives (Options 1 and 2), nor for any one of the three site options for the WEF substation (A, B, C).

Pending the potential discovery of significant fossil remains (*e.g.* mammalian bones or teeth) during the construction phase, no further specialist palaeontological studies or mitigation are recommended for the Pofadder WEF and associated electrical infrastructure developments. Chance fossil finds such as vertebrate bones and teeth or shells should be safeguarded - preferably *in situ* - and reported by the ECO as soon as possible to the South African Heritage Resources Agency, SAHRA (Contact details: 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). This is so that appropriate mitigation (*i.e.* recording, sampling or collection) by a palaeontological specialist can be considered and implemented (Please refer to the tabulated Chance Fossil Finds Procedure appended to this report). The palaeontologist concerned with mitigation work would need a valid fossil collection permit from SAHRA and any material collected would have to be curated in an approved depository (*e.g.* museum or university collection). These

recommendations should be incorporated into the Environmental Management Programme (EMPr) for the proposed developments.

1. INTRODUCTION & BRIEF

It is proposed to construct (1) a wind energy facility (WEF) of *c.* 300 MW generation capacity on a 11 800 ha site situated on the farms Scuit-Klip 92/3, 92/4 and 92/5 and Lucas Vlei 93/1, 93/2 and 93/4 as well as (2) an overhead power line that would link the proposed WEF to the existing Paulputs Substation nearby. The WEF and grid connection study area is situated either side of the N14 tar road *c*. 40 km to the northeast of Pofadder in the Kenhardt Magisterial District, Northern Cape (Figs. 1 & 2).

The WEF project would include the following main infrastructural components:

• Up to 75 turbines of 3 MW each but fewer turbines if larger machines (up to 6 MW each) are used;
• Approximately 80 km of roads with an average width of 8 m (mostly 6 m wide up to 12 m wide in places, average 8 m); and
• Three on-site substation compounds of 4 ha each.

The proposed grid connection will comprise a 132 kV power line of between 15 km and 25 km length to evacuate the power to the national electricity grid by connecting to either the existing ESKOM Paulputs Substation or an existing 132 kV Eskom transmission line to the north of the WEF study area.

The present short palaeontological desktop report (PIA), largely based on previous desktop PIAs for the Pofadder region by the author and others (*e.g.* Almond 2017, 2018, Pether 2010), contributes to the comprehensive heritage impact assessments for the Pofadder WEF and associated grid connection compiled by Dr Jayson Orton of ASHA Consulting (Pty) Ltd (Contact details: ASHA, 40 Brassie Street, Lakeside, 7945. E-mail: jayson@asha-consulting.co.za. Tel: 021 783 0557. Cell: 083 272 3225. Website: www.asha-consulting.co.za).

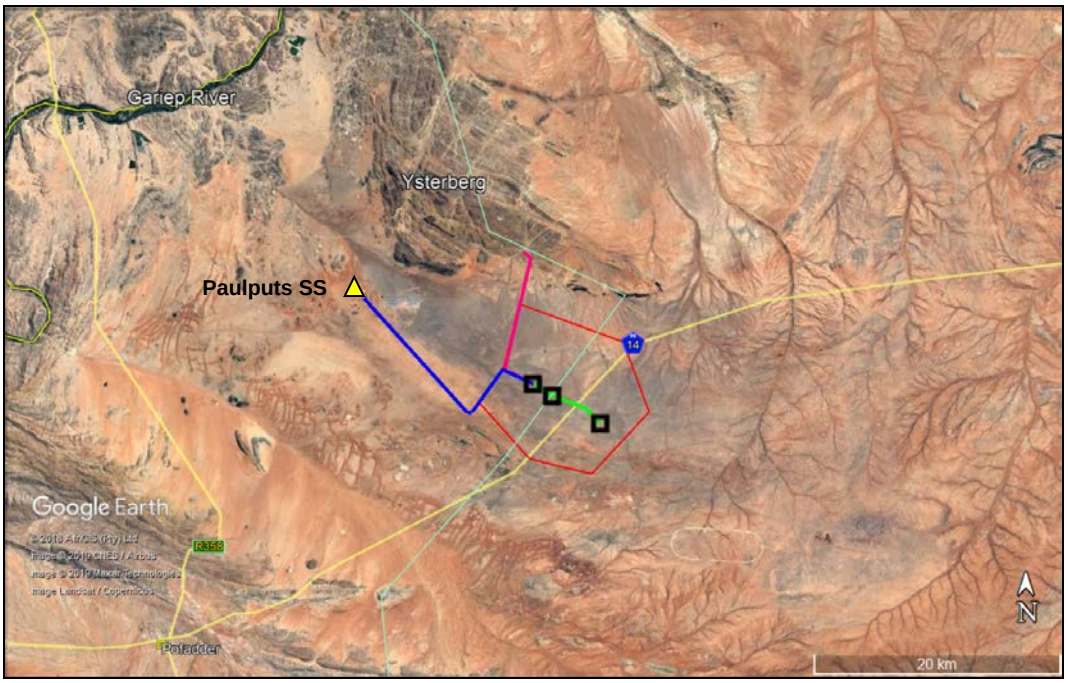

Figure 1: Google Earth© satellite image showing the location of the proposed Paulputs Wind Energy Facility (red polygon) on the farms Scuit-Klip 92/3, 92/4 and 92/5 and Lucas

Vlei 93/1, 93/2 and 93/4 as well as the associated grid connection options to the existing Paulputs Substation (blue corridor) or a nearby 132 kV transmission line (pink corridor). The black squares are the substation sites. The study area is situated either side of the N14 tar road *c.* 40 km to the northeast of Pofadder in the Kenhardt Magisterial District, Northern Cape.

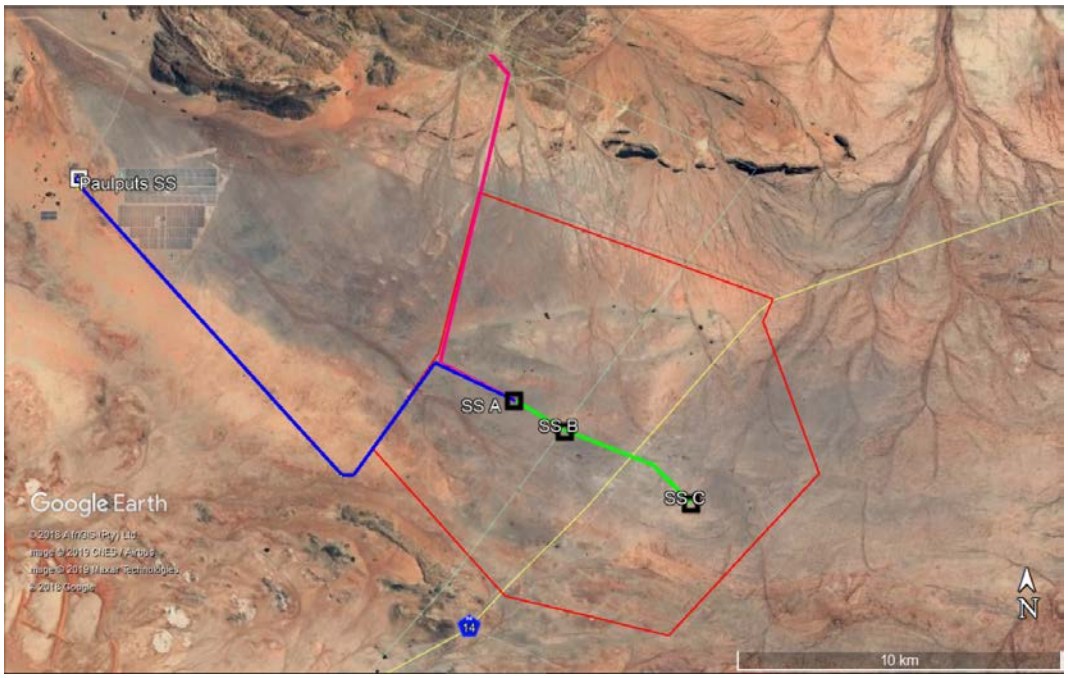

Figure 2: Google Earth© satellite image showing the terrain in the project areas for the proposed Paulputs Wind Energy Facility (red polygon) and the associated grid connection options to the existing Paulputs Substation (blue corridor) or an existing 132 kV transmission line (pink corridor). Three substation sites are indicated as black squares. The desert terrain in this part of northern Bushmanland, situated on the southern margins of the Ysterberg, features sandy to gravelly *vlaktes* (pale brown / orange), networks of aeolian sand dunes (orange), plains of weathered granitic gravels or *Grus* (grey), shallow intermittent stream beds and numerous small, isolated Inselberge of basement rocks (dark hues). The edge of a shallow alluvial fan extends from the Ysterberg into the WEF project area along its northern margins.

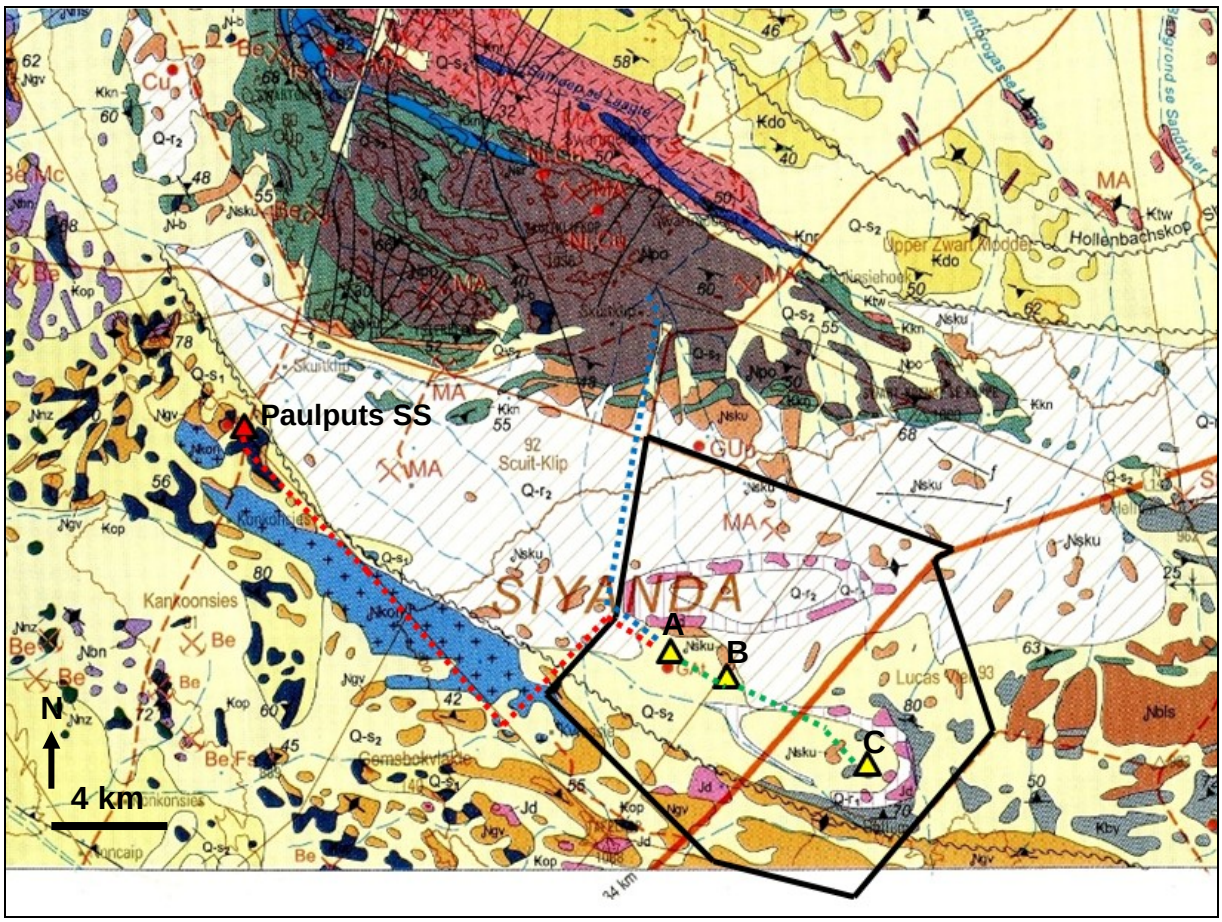

Figure 3: Extract from 1: 250 000 geology sheet 2818 Onseepkans (Council for Geoscience, Pretoria) showing the main rock units represented in the Pofadder WEF (black polygon) and associated grid connection (green, blue and red dotted lines) and substation (yellow triangle) project areas. These rocks include several different units of Late Precambrian metasediments and granitoid intrusive rocks of the Namaqua-Natal Province that build the rocky Inselberge shown in dark colours (*e.g.* Nkon, middle blue – Konkonsies Granite; Ngv, orange – Gemsbokvlakte Gneiss) as well as dolerite intrusions of the Early Jurassic Karoo Dolerite Suite (Jd, purple), all of which are unfossiliferous. The igneous and metamorphic bedrocks are mantled with a range of Late Caenozoic superficial deposits – such as aeolian sands (Qs1, darker yellow), scree, rock rubble, sandy and gravelly soils (Qs2, paler yellow), granitic gravels or *Grus* (Q-r2, white with cross-hatch) as well as sandy to gravelly alluvium. The superficial deposits can be broadly included within the Quaternary to Recent Kalahari Group and are, at most, sparsely fossiliferous. Crossed hammer symbols marked Be, Fs, MA are defunct or active beryllium, feldspar and granite mines. The small southernmost sector of the Pofadder WEF project area that falls within the adjoining 1: 250 000 sheet 2918 Pofadder is underlain by more or less identical geology (primarily basement metasediments and sandy to gravelly soils).

2. GEOLOGICAL BACKGROUND

The Pofadder WEF and associated grid connection project area is situated within a very arid region of northern Bushmanland on the south-eastern side of the Orange River (Gariep), spanning the N14 tar road between Pofadder and Kakamas (Figs. 1 & 2). This mixed sandy and rocky desert region – assigned to the Lower Vaal & Orange Valleys Geomorphic Province of Partridge *et al.* (2010) – shows low relief between 800 and 1000 m amsl and is drained by small, intermittently-flowing tributaries of the Gariep drainage system. It is located on the south-eastern margins of the Ysterberg (1075 m amsl) from which a gently-sloping alluvial fan extends into the northern margins of the WEF project area. The surface terrain within the majority of the project area, away from the

rocky *rante* and *koppies*, is predominantly sandy to gravelly, with low hills and patchy outcrops of basement rocks as well as a number of shallow, ephemeral streams.

The geology of the Pofadder study region is shown on 1: 250 000 geological map 2818 Onseepkans (Council for Geoscience, Pretoria) (Fig. 3) (Moen & Toogood 2007) and has been outlined in a recent palaeontological assessment reports for the proposed Aggeneis-Paulputs 400 kV Transmission Powerline (Almond 2017), the Paulputs PV Solar Farm (Almond 2018) as well as a desktop palaeontological study for the Farm Scuit-Klip 92 by Pether (2010). The scattered small basement inliers here are composed of a variety of resistant-weathering igneous and high grade metamorphic rocks - mainly granites, gneisses, schists, quartzites and amphibolites - of Late Precambrian (Mokolian / Mid-Proterozoic) age. These ancient basement rocks are assigned to the Namaqua Sector of the **Namaqua-Natal Province** and are approximately one to two billion years old (Cornell *et al.* 2006, Moen 2007, Agenbacht 2007, Moen & Toogood 2007). Much younger, Early Jurassic intrusions of the **Karoo Dolerite Suite** (Jd, pink in Fig. 3) (Duncan & Marsh 2006) also occur here and appear to be ring-shaped. Since none of these bedrock units is fossiliferous, they will not be treated in more detail in this report.

The flatter, lower-lying portions of the study area are underlain by a spectrum of mostly unconsolidated superficial sediments of Late Caenozoic age. These are largely mapped as **Quaternary to Recent sands and gravels** of probable braided fluvial or sheet wash origin (**Q-s_2** in Fig. 3) as well as weathered gravels and sands of granitic origin (*Grus*; Q-r2 in Fig. 3). The alluvial and colluvial sediments are locally overlain, and perhaps also underlain, by unconsolidated aeolian (*i.e.* wind-blown) sands of the **Gordonia Formation** (**Kalahari Group**) that are Pleistocene to Holocene in age (**Q-s_1** in Fig. 3; see network of orange dunes to the SW of the grid connection project area on satellite images, *e.g.* Fig. 2). All these superficial sediments can be broadly subsumed into the Late Cretaceous to Recent **Kalahari Group**, the geology of which is reviewed by Haddon (2000) and Partridge *et al.* (2006). Narrow strips of Late Caenozoic **sandy to gravelly alluvium** occur along local drainage courses that are unlikely to be directly impacted by the proposed development.

3. PALAEONTOLOGICAL HERITAGE

The Mid Proterozoic (Mokolian) igneous and metasedimentary basement rocks of the **Namaqua-Natal Province** as well as the Jurassic intrusions of the **Karoo Dolerite Suite** are entirely unfossiliferous (Almond & Pether 2008). Fossil biotas recorded from each of the main sedimentary rock units mapped in the Aggeneys region and along the Orange River to the north have been reviewed in several previous palaeontological heritage assessments by Almond (*e.g.* 2011, 2012, 2013a, 2013b, 2014, 2015, 2016, 2017, 2018; see also Almond & Pether 2008, Almond 2009, Pether 2010, Almond *in* Macey *et al.* 2011 and extensive references therein).

The various younger superficial deposits of the **Kalahari Group** in Bushmanland, including aeolian sands, alluvium, surface gravels, calcretes and pan deposits, are poorly known in palaeontological terms. The fossil record of the Kalahari Group as a whole is generally sparse and low in diversity; no fossils are recorded here in the adjoining Pofadder and Onseepkans geology sheet explanations by Agenbacht (2007) and Moen and Toogood (2007) respectively. The Kalahari beds may very occasionally contain important Late Caenozoic fossil biotas, notably the bones, teeth and horn cores of mammals (usually isolated and abraded; *cf* Klein 1984) as well as remains of reptiles like tortoises, non-marine molluscs (bivalves, gastropods), ostrich egg shells, trace fossils (*e.g.* calcretised termitaria, coprolites), plant remains such as peats or palynomorphs (pollens, spores) in organic-rich alluvial horizons as well as siliceous diatoms in pan sediments. Fossil remains are most likely to be encountered within well- to semi-consolidated older alluvial deposits of probable Pleistocene age, occasionally in association with stone artefacts. Calcrete hardpans might also contain trace fossils such as rhizoliths, termite nests and other insect burrows, or even mammalian trackways.

4. CONCLUSIONS & RECOMMENDATIONS

4.1. Pofadder WEF project area

Precambrian basement rocks and Karoo dolerites underlying the Pofadder WEF project area at depth are unfossiliferous while the overlying Late Caenozoic superficial deposits (sandy to gravelly alluvium, gravels, aeolian sands *etc*) are generally of low to very low palaeontological sensitivity. No sensitive palaeontological sites or no-go areas have been identified within the WEF project area. Narrow zones of Late Caenozoic alluvium associated with minor water courses in the study region might contain fossils or subfossils such as isolated mammalian bones and teeth or freshwater molluscs but these are probably very sparse, at most. These fossils are likely to be protected within existing buffers along water courses.

4.2. Pofadder WEF grid connection project area

Precambrian basement rocks and Karoo dolerites underlying the Pofadder WEF grid connection project area at depth are unfossiliferous while the overlying Late Caenozoic superficial deposits (sandy to gravelly alluvium, gravels, aeolian sands *etc*) which mantle the majority of the power line corridor footprint are generally of low to very low palaeontological sensitivity. No sensitive palaeontological sites or no-go areas have been identified within the grid connection project area. Narrow zones of Late Caenozoic alluvium associated with minor water courses in the study region might contain fossils or subfossils such as isolated mammalian bones and teeth or freshwater molluscs but these are probably very sparse, at most. These fossils are likely to be protected within existing buffers along water courses.

There is no preference on palaeontological heritage grounds for either one of the grid connection route alternatives, connecting either with the Paulputs Substation or an existing nearby 132 kV transmission line, nor for any one of the three site options for the WEF substation (A, B, C).

Impacts on unique or irreplaceable fossil heritage resources due to the proposed WEF and grid connection developments are improbable and their severity is anticipated to be negligible since (1) significant fossil sites are unlikely to be affected, (2) the footprints involved are small, and (3) in most cases any impacts can be mitigated through application of an appropriate Chance Fossil Finds Procedure (See Appendix). The overall impact significance of the proposed Pofadder WEF and associated electrical infrastructure developments (overhead power lines, on-site substations) is rated as VERY LOW in terms of palaeontological heritage resources. This assessment applies equally to all power line route options and substation site options under consideration. Given the general low palaeontological sensitivity of the region, cumulative impacts inferred for the various powerline and alternative energy developments in the Aggeneys – Pofadder – Paulputs region of the Northern Cape are assessed as very low.

Pending the potential discovery of significant fossil remains (*e.g.* mammalian bones or teeth) during the construction phase, no further specialist palaeontological studies or mitigation are recommended for the Pofadder WEF and associated electrical infrastructure developments. Chance fossil finds such as vertebrate bones and teeth or shells should be safeguarded - preferably *in situ* - and reported by the ECO as soon as possible to the South African Heritage Resources Agency, SAHRA (Contact details: 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). This is so that appropriate mitigation (*i.e.* recording, sampling or collection) by a palaeontological specialist can be considered and implemented (Please refer to the tabulated Chance Fossil Finds Procedure appended to this report). The palaeontologist concerned with mitigation work would need a valid fossil collection permit from SAHRA and any material collected would have to be curated in an approved depository (*e.g.* museum or university collection) (SAHRA 2013). These recommendations should be incorporated into the Environmental Management Programme (EMPr) for the proposed developments.

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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, Limpopo, Northwest, Mpumalanga, KwaZulu-Natal and the Free State under the aegis of his Cape Town-based company *Natura Viva* cc. He has previously served as 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 development 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><th colspan="3">CHANCE FOSSIL FINDS PROCEDURE: Pofadder WEF and associated grid connection near Pofadder. Northern Cape</th></tr>
<tr><td>Province & region:</td><td colspan="2">Northern Cape, Kenhardt Magisterial District</td></tr>
<tr><td>Responsible Heritage Resources 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">Late Caenozoic alluvium along water courses</td></tr>
<tr><td>Potential fossils</td><td colspan="2">Bones, teeth and horn cores of mammals, freshwater molluscs, petrified wood, calcretised termitaria and other trace fossils</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 Resources 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 Resources 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 Resources Authority and project palaeontologist (if any) who will advise on any necessary mitigation</td></tr>
<tr><td colspan="2">4. If required by Heritage Resources 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 Resources 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 Resources Authority. Adhere to best international practice for palaeontological fieldwork and Heritage Resources Authority minimum standards.</td></tr>
</table>

environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF THE SPECIALIST, DECLARATION OF INTEREST AND UNDERTAKING UNDER OATH

	(For official use only)
File Reference Number:	
NEAS Reference Number:	DEA/EIA/
Date Received:	

Application for authorisation in terms of the National Environmental Management Act, Act No. 107 of 1998, as amended and the Environmental Impact Assessment (EIA) Regulations, 2014, as amended (the Regulations)

PROJECT TITLE

Proposed Paulputs Wind Energy Facility and associated grid connection near Pofadder, Northern Cape

Kindly note the following:

1. This form must always be used for applications that must be subjected to Basic Assessment or Scoping & Environmental Impact Reporting where this Department is the Competent Authority.
2. This form is current as of 01 September 2018. It is the responsibility of the Applicant / Environmental Assessment Practitioner (EAP) to ascertain whether subsequent versions of the form have been published or produced by the Competent Authority. The latest available Departmental templates are available at https://www.environment.gov.za/documents/forms.
3. A copy of this form containing original signatures must be appended to all Draft and Final Reports submitted to the department for consideration.
4. All documentation delivered to the physical address contained in this form must be delivered during the official Departmental Officer Hours which is visible on the Departmental gate.
5. All EIA related documents (includes application forms, reports or any EIA related submissions) that are faxed; emailed; delivered to Security or placed in the Departmental Tender Box will not be accepted, only hardcopy submissions are accepted.

Departmental Details

Postal address:
Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Private Bag X447
Pretoria
0001

Physical address:
Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Environment House
473 Steve Biko Road
Arcadia

Queries must be directed to the Directorate: Coordination, Strategic Planning and Support at:
Email: EIAAdmin@environment.gov.za

1. SPECIALIST INFORMATION

Specialist Company Name:	NATURA VIVA CC			
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	4	Percentage Procurement recognition	100
Specialist name:	Dr John Edward Almond			
Specialist Qualifications:	PhD (palaeontology)			
Professional affiliation/registration:	Palaeontological Society of Southern Africa, Association of Professional Heritage Practitioners (WCape)			
Physical address:	76 Breda Park, Breda Street, Oranjezicht, CAPE TOWN 8001			
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E-mail:	naturaviva@universe.co.za			

2. DECLARATION BY THE SPECIALIST

I, **Dr John Edward Almond**, declare that –

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the Specialist:

Name of Company: NATURA VIVA CC

Date: 11 July 2019

3. UNDERTAKING UNDER OATH/ AFFIRMATION

I, **Dr John Edward Almond**, swear under oath / affirm that all the information submitted or to be submitted for the purposes of this application is true and correct.

Signature of the Specialist:

Name of Company: NATURA VIVA CC

Date* 11 July 2019

Signature of the Commissioner of Oaths:

Date:

SUID-AFRIKAANSE POLISIEDIENS
STASIE KOMMISSARIS
KAAPSTAD
2019 -07- 11
CAPE TOWN
STATION COMMANDER
SOUTH AFRICAN POLICE SERVICE