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31 March 2017

THE HERITAGE OFFICER

South African Heritage Resources Agency

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SAHRA CaseID Number: 10604.

PALAEONTOLOGICAL ASSESSMENT STATUS

REALIGNMENT OF A SECTION OF THE ROAD MN73 TO ACCOMMODATE THE NEW PAULPUTS CONCENTRATED SOLAR POWER TOWER FACILITY AND POFADDER THERMAL SOLAR PLANT
Portion 4 of Scuitklip 92, Northern Cape

A section of the existing MN73 road crosses the footprint of the future Paulputs Concentrated Solar Power (CSP) Facility situated on Portion 4 of Scuit-Klip 92, near Pofadder. It is proposed to re-route this road section around the perimeter of the Paulputs CSP.

A desktop Palaeontological Impact Assessment (PIA) of this entire property has previously been prepared at the request of Savannah Environmental (Pty) Ltd., *viz*.:

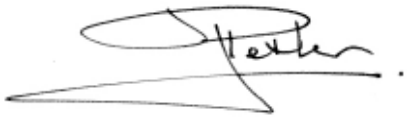
> Pether, J. 2010. Brief Palaeontological Impact Assessment (Desktop Study). Proposed Pofadder Solar Thermal Plant. Portion 4 of the Farm Scuit-Klip 92, Kenhardt District, Northern Cape. 3 December 2010. For Savannah.

An extended summary of the previous PIA, with updated figures showing the proposed realignment, is provided. The property straddles a sediment-choked drainage plain crossed by ephemeral, braided stream flows produced in a sheetflood and flashflood sediment-transport regime. Colluvial and aeolian deposits occur along the drainage-plain margins.

The road realignment entails shallow disturbance of these superficial, geologically young (Quaternary) deposits which have low palaeontological potential and sensitivity. Very few fossils have been found in this context in the Northern Cape. Hence, though of low probability, any find will be considerable importance.

It is concluded that, in view of the low fossil potential, field surveys and monitoring of bulk earth works by a specialist are not justified. Other independent PIAs for solar power installations in similar terrains in the Northern Cape also do not recommend monitoring by a palaeontologist. As for previous works on the property, it is recommended that a requirement to be alert for possible fossils be included in the EMP for the Construction Phase of the road realignment. This “Fossil Find Procedures” includes guidelines for potential finds and a reporting/action protocol for when finds are uncovered.

Yours faithfully,



John Pether

SAHRA CaseID Number: 10604

BRIEF PALAEONTOLOGICAL ASSESSMENT (DESKTOP STUDY)

REALIGNMENT OF A SECTION OF THE ROAD MN73 TO ACCOMMODATE THE NEW PAULPUTS CONCENTRATED SOLAR POWER TOWER FACILITY AND POFADDER THERMAL SOLAR PLANT
Portion 4 of Scuitklip 92, Northern Cape

By

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For

Northern Cape Department of Roads and Public Works

24 MARCH 2017

1. PROJECT NAME

The realignment of a section of the MN73 to accommodate solar energy facilities near Paulputs Substation, Northern Cape Province.

2. LOCATION

Scuit-Klip 92, Portion 4. The relevant 1:50000 topo-cadastral map is 2819DC SWARTOUP.

3. LOCALITY PLAN

The proposed MN73 road realignment around the authorised Paulputs CSP Tower plant is shown in Figure 1.

4. PROPOSED DEVELOPMENT

The construction of a third CSP facility on Scuit-Klip 92/4, called the Paulputs CSP, received an environmental authorisation on 16 November 2016. The facility is of the tower and heliostat array type in which moving mirrors focus heat on a central, tower-mounted receiver. The existing MN73 road crosses the footprint of the Paulputs CSP (Figure 1) and thus a re-routing of the road is required to ensure road safety. The Northern Cape Department of Roads and Public Works (NC DR&PW) propose a new section of road ~4km in length and ~7m wide, to be constructed to the NC DR&PW plans and standards. Abengoa Solar Power South Africa (Pty) Ltd will undertake the construction and the NC DR&PW will undertake subsequent operation and maintenance.

The NC DR&PW has appointed Savannah Environmental (Pty) Ltd to conduct an Environmental Authorisation Application for the proposed realignment of this section of the MN73. The South African Heritage Resources Agency (SAHRA) has issued an Interim Comment (CaseID 10604, 17/02/2017) requesting a Palaeontological Desktop Study.

This report forms part of the Heritage Impact Assessment (HIA) and its brief is to inform about the palaeontological sensitivity of the proposed MN73 realignment and the probability of fossils being uncovered in the subsurface and being disturbed or destroyed in the process of construction.

5. PALAEONTOLOGICAL HERITAGE RESOURCES IDENTIFIED

A desktop Palaeontological Impact Assessment (PIA) applicable to the entirety of Scuit-Klip 92/4 had previously been prepared at the request of Savannah Environmental (Pty) Ltd. (Pether, 2010). The relevant information and findings is summarised herein, with figures updated to reflect the current status.

The triangle-shaped property straddles a sediment-choked drainage line that traverses the gentle decline from the Bushmanland Plateau down towards the Gariep River (Figure 1). The bedrock of the area is comprised of hard rocks of the Namaqua-Natal Metamorphic Province, Namaqua Sector, Kakamas Terrane (Cornell *et al*., 2006). These are a variety of metasediments, gneisses and granites (Figure 2), ranging in age from 2000-1000 million years ago and which are unfossiliferous.

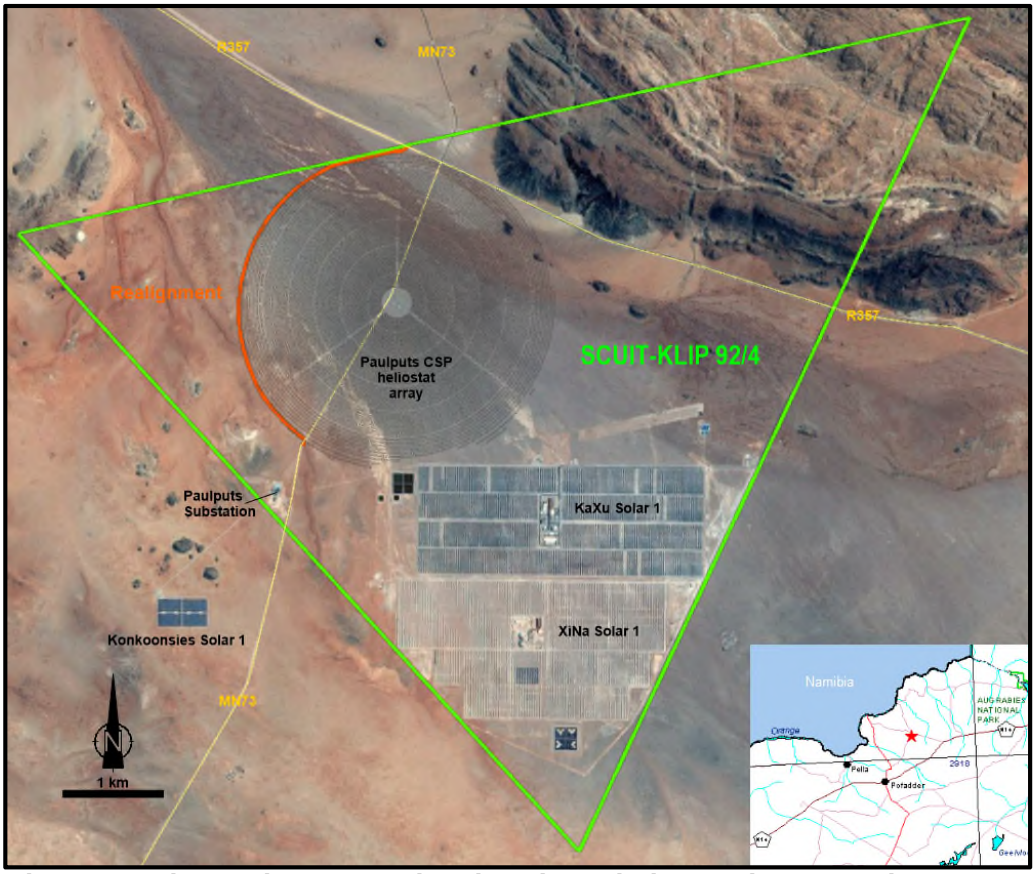


Figure 1. The Project Area showing the existing and new Paulputs CSP and MN73 road realignment.

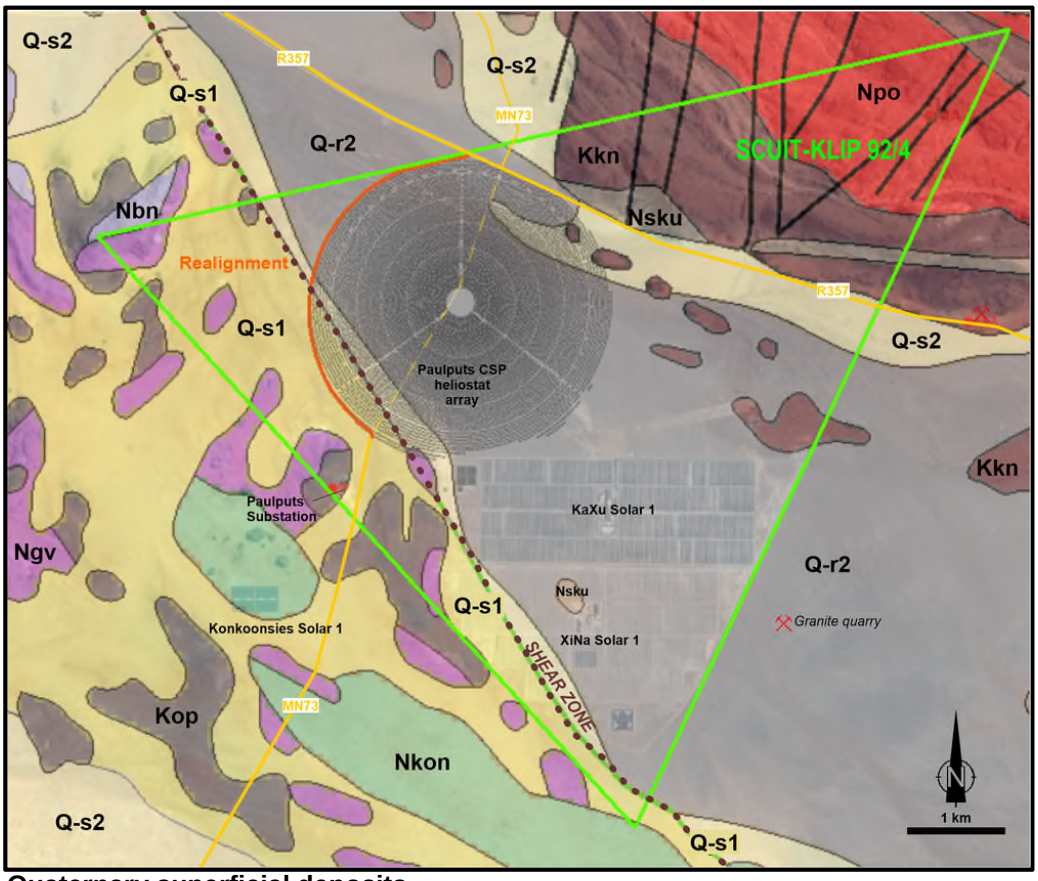
Surrounding bedrock inselbergs and the flatter bedrock outcrops are areas of colluvium comprised of bedrock scree, gravelly soils and reddened sands depicted as Q-s2 (Figure 2). These colluvia merge with the sediment-filled drainage plain (Q-r2) wherein coarse gravels derived from the bedrock have been deposited by ephemeral, braided stream flows that converge in the north. The current sediment-transport regime is sheetflood and flashflood. Windblown red sands and dune ridges (Q-s1) occur in the west on slightly higher ground, overlying the bedrock colluvia.

The existing and planned CSP facilities are mainly situated on the gravelly drainage plain Q-r2 deposits (Figure 2), marginally overlapping onto the surrounding colluvia and aeolian cover. Similarly, the MN73 realignment traverses the aeolian cover and colluvia in the west, then curves eastwards across the drainage plain gravels to intersect the R357 road.

6. ANTICIPATED IMPACTS

Ephemeral drainage deposits are poorly fossiliferous, but abraded bone fragments and teeth may occur sparsely in channel lags. Similarly, the fossil record in bedrock colluvia is very sparse. In the arid terrain the bones of animals remain exposed and have poor preservation potential due to weathering and bioerosion (gnawing) by rodents and insects.

Figure 2. Geology of the Project Area. From 1:250000 Sheet 2818 Onseepkans, Council for Geoscience.



Quaternary superficial deposits
Q-s1: Aeolian sand.
Q-r2: Feldspathic gravelly sands.
Q-s2: Colluvium. Scree, gravelly soil and red sand.
Namaquan Intrusives
Nkon: Konkonsies Granite
Nsku: Skuitklip Granite.
Ngv: Gemsbokvlakte Gneiss
Npo: Polisiehoek Gneiss.
Nbn: Beenbreek Gneiss.
Arribees Group – Kheisian supracrustal metasediments
Kkn: Koenap Formation. Calc-silicate rocks, marble
Kop: Oupvlakte Formation. Granulites, minor quartz-feldspar gneiss and calc-silicate rocks.

Notable fossil finds in the region are the Kangnas dinosaur and the Areb *Hipparion* (three-toed ancestor of the horse). The Kangnas dinosaur was found in a well dug into the crater-lake deposits of a small volcano of late Cretaceous age (80-66 million years ago, Ma) (De Wit *et al*., 1992). The Areb *Hipparion* fossil teeth (age 6-4 Ma) were also found in a well digging which

intersected local drainage deposits beneath ~15 m of calcreted colluvia (Pickford *et al*., 1999). Other fossil finds occurred beneath pans which now mark defunct river courses *e.g*. Bosluispan, 16-15 Ma. These finds were found at depth and were deposited in environments that pertained during wetter climates of the distant past.

The road realignment entails shallow disturbance of superficial, geologically young (Quaternary) deposits which have low palaeontological potential and sensitivity.

Notwithstanding, the history of these vast tracts of sands, gravels and pedocretes of the Northern Cape is very poorly known, with very few fossils to rely on. Hence, though of low probability, any find will be of considerable importance.

7. RECOMMENDATIONS

In view of the low fossil potential, monitoring of bulk earth works during construction by a specialist is not justified or required. Notwithstanding, the sporadic fossil occurrences are then particularly important and efforts made to spot them are often rewarded. It is recommended that a requirement to be alert for possible fossils and buried archaeological material be included in the EMPr for the Construction Phase for the road re-alignment.

Appendix 1 is a “Fossil Find Procedures” guideline to be followed by on-site personnel in the event of fossil bone finds. The appointed palaeontologist will assess the information provided and liaise with the developer and the ECO and a suitable response will be established.

8. REFERENCES

Cornell D.H. et al. 2006. The Namaqua-Natal Province. In: Johnson, M. R., Anhaeusser, C. R. and Thomas, R. J. (eds.), The Geology of South Africa. Geological Society of South Africa, Johannesburg/Council for Geoscience, Pretoria. 325-379.

De Wit, M. C. J., Ward, J. D. & Spaggiari, R. I. 1992 A reappraisal of the Kangnas dinosaur site, Bushmanland, SouthAfrica. S. Afr. J. Sci.,88: 504-507.

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Pickford, M., Eisenmann, V. and Senut, B. 1999. Timing of landscape development and calcrete pedogenesis in northern Namaqualand, South Africa. S. Afr. J. Sci., 95, 357-359.

1 APPENDIX 1 - FOSSIL FIND PROCEDURES

In the context under consideration, it is improbable that fossil finds will require declarations of permanent "no go" zones. At most a temporary pause in activity at a limited locale may be required. The strategy is to rescue the material as quickly as possible.

The procedures suggested below are in general terms, to be adapted as befits a context. They are couched in terms of finds of fossil bones that usually occur sparsely, such as in the aeolian deposits. However, they may also serve as a guideline for other fossil material that may occur.

Bone finds can be classified as two types: isolated bone finds and bone cluster finds.

1.1 ISOLATED BONE FINDS

In the process of digging the excavations, isolated bones may be spotted in the hole sides or bottom, or as they appear on the spoil heap. By this is meant bones that occur singly, in different parts of the excavation. If the number of distinct bones exceeds 6 pieces, the finds must be treated as a bone cluster (below).

Response by personnel in the event of isolated bone finds

- **Action 1:** An isolated bone exposed in an excavation or spoil heap must be retrieved before it is covered by further spoil from the excavation and set aside.
- **Action 2:** The site foreman and ECO must be informed.
- **Action 3:** The responsible field person (site foreman or ECO) must take custody of the fossil. The following information to be recorded:
    - Position (excavation position).
    - Depth of find in hole.
    - Digital image of hole showing vertical section (side).
    - Digital image of fossil.
- **Action 4:** The fossil should be placed in a bag (*e.g.* a Ziplock bag), along with any detached fragments. A label must be included with the date of the find, position info, depth.
- **Action 5:** ECO contacts the standby archaeologist and/or palaeontologist. ECO to describe the occurrence and provide images asap. by email.

Response by Palaeontologist in the event of isolated bone finds

The palaeontologist will assess the information and liaise with the developer, the environmental consultant and the ECO and a suitable response will be established.

1.2 BONE CLUSTER FINDS

A bone cluster is a major find of bones, *i.e*. several bones in close proximity or bones resembling part of a skeleton. These bones will likely be seen in

broken sections of the sides of the hole and as bones appearing in the bottom of the hole and on the spoil heap.

Response by personnel in the event of a bone cluster find

- **Action 1:** Immediately stop excavation in the vicinity of the potential material. Mark (flag) the position and also spoil that may contain fossils.
- **Action 2:** Inform the site foreman and the ECO.
- **Action 3:** ECO contacts the standby archaeologist and/or palaeontologist. ECO to describe the occurrence and provide images asap. by email.

Response by Palaeontologist in the event of a bone cluster find

The appointed palaeontologist will assess the information and liaise with the developer and the environmental consultant and a suitable response will be established. It is likely that a Field Assessment by the palaeontologist will be carried out asap.

It will probably be feasible to "leapfrog" the find and continue the excavation farther along, or proceed to the next excavation, so that the work schedule is minimally disrupted. The response time/scheduling of the Field Assessment is to be decided in consultation with developer/owner and the environmental consultant.

The field assessment could have the following outcomes:

- If a human burial, the appropriate authority is to be contacted. The find must be evaluated by a human burial specialist to decide if Rescue Excavation is feasible, or if it is a Major Find.
- If the fossils are in an archaeological context, an archaeologist must be contacted to evaluate the site and decide if Rescue Excavation is feasible, or if it is a Major Find.
- If the fossils are in a palaeontological context, the palaeontologist must evaluate the site and decide if Rescue Excavation is feasible, or if it is a Major Find.

1.3 RESCUE EXCAVATION

Rescue Excavation refers to the removal of the material from the "design" excavation. This would apply if the amount or significance of the exposed material appears to be relatively circumscribed and it is feasible to remove it without compromising contextual data. The time span for Rescue Excavation should be reasonably rapid to avoid any or undue delays, *e.g*. 1-3 days and definitely less than 1 week.

In principle, the strategy during mitigation is to "rescue" the fossil material as quickly as possible. The strategy to be adopted depends on the nature of the occurrence, particularly the density of the fossils. The methods of collection would depend on the preservation or fragility of the fossils and whether in loose or in lithified sediment. These could include:

- On-site selection and sieving in the case of robust material in sand.
- Fragile material in loose/crumbly sediment would be encased in blocks using Plaster-of Paris or reinforced mortar.

If the fossil occurrence is dense and is assessed to be a “Major Find”, then carefully controlled excavation is required.

1.4 MAJOR FINDS

A Major Find is the occurrence of material that, by virtue of quantity, importance and time constraints, cannot be feasibly rescued without compromise of detailed material recovery and contextual observations.

A Major Find is not expected.

Management Options for Major Finds
In consultation with the developer and the environmental consultant, the following options should be considered when deciding on how to proceed in the event of a Major Find.

Option 1: Avoidance

Avoidance of the major find through project redesign or relocation. This ensures minimal impact to the site and is the preferred option from a heritage resource management perspective. When feasible, it can also be the least expensive option from a construction perspective.

The find site will require site protection measures, such as erecting fencing or barricades. Alternatively, the exposed finds can be stabilized and the site refilled or capped. The latter is preferred if excavation of the find will be delayed substantially or indefinitely. Appropriate protection measures should be identified on a site-specific basis and in wider consultation with the heritage and scientific communities.

This option is preferred as it will allow the later excavation of the finds with due scientific care and diligence.

Option 2: Emergency Excavation

Emergency excavation refers to the “no option” situation wherein avoidance is not feasible due to design, financial and time constraints. It can delay construction and emergency excavation itself will take place under tight time constraints, with the potential for irrevocable compromise of scientific quality. It could involve the removal of a large, disturbed sample by excavator and conveying this by truck from the immediate site to a suitable place for “stockpiling”. This material could then be processed later. Consequently, emergency excavation is not a preferred option for a Major Find.

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