REPORT:

PALAEONTOLOGICAL SURVEY OF PROPOSED WIND ENERGY FACILITY AT COOKHOUSE, EASTERN CAPE PROVINCE

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1. Introduction

A palaeontological survey was done in the area demarcated for the development of a wind energy facility near Cookhouse. This field survey was required by the South African Heritage Resources Agency (SAHRA) due to the high palaeontological significance of the region. According to the Desktop Study of the study area there is a possibility of finding fossilized invertebrates, bone, wood and trackways in this particular geological horizon known as the Balfour Formation of the Beaufort Group of the Karoo Supergroup which dates back to the end of the Permian.

2. Terms of reference for the report

According to the South African Heritage Resources Act (Act 25 of 1999) (Republic of South Africa, 1999), certain clauses are relevant to palaeontological aspects for a terrain suitability assessment.

- **Subsection 35(4)** No person may, without a permit issued by the responsible heritage resources authority-
- (a) destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site or any meteorite;
- (b) destroy, damage, excavate, remove from its original position, collect or own any archaeological or palaeontological material or object or any meteorite;
- (c) trade in, sell for private gain, export or attempt to export from the republic any category of archaeological or palaeontological material or object, or any meteorite; or
- (d) bring onto or use at an archaeological or palaeontological site any excavation equipment or any equipment which assist with the detection or recovery of metals or archaeological material or objects, or use such equipment for the recovery of meteorites.
- **Subsection 35(5)** When the responsible heritage resources authority has reasonable cause to believe that any activity or development which will destroy, damage or alter any archaeological or palaeontological site is under way, and where no application for a permit has been submitted and no heritage resources management procedures in terms of section 38 has been followed, it may-
- (a) serve on the owner or occupier of the site or on the person undertaking such development an order for the development to cease immediately for such period as is specified in the order;
- (b) carry out an investigation for the purpose of obtaining information on whether or not an archaeological or palaeontological site exists and whether mitigation is necessary;
- (c) if mitigation is deemed by the heritage resources authority to be necessary, assist the person on whom the order has been served under paragraph (a) to apply for a permit as required in subsection (4); and
- (d) recover the costs of such investigation form the owner or occupier of the land on which it is believed an archaeological or palaeontological site is located or from the person proposing to undertake the development if no application for a permit is received within two weeks of the order being served.

South Africa’s unique and non-renewable palaeontological heritage is protected in terms of the NHRA. According to this Act, heritage resources may not be excavated, damaged, destroyed or otherwise impacted by any development without prior assessment and without a permit from the relevant heritage resources authority.

As areas are developed and landscapes are modified, heritage resources, including palaeontological resources, are threatened. As such, both the environmental and heritage legislation require that development activities must be preceded by an assessment of the impact undertaken by qualified professionals. Palaeontological Impact Assessments (PIAs) are specialist reports that form part of the wider heritage component of:

- Heritage Impact Assessments (HIAs) called for in terms of Section 38 of the National Heritage Resources Act, Act No. 25, 1999 by a heritage resources authority.
- Environmental Impact Assessment process as required in terms of other legislation listed in s. 38(8) of NHRA;
- Environmental Management Plans (EMPs) required by the Department of Mineral Resources.

HIAs are intended to ensure that all heritage resources are protected, and where it is not possible to preserve them in situ, appropriate mitigation measures are applied. An HIA is a comprehensive study that comprises a palaeontological, archaeological, built environment, living heritage, etc specialist studies. Palaeontologists must acknowledge this and ensure that they collaborate with other heritage practitioners. Where palaeontologists are engaged for the entire HIA, they must refer heritage components for which they do not have expertise on to appropriate specialists. Where they are engaged specifically for the palaeontology, they must draw the attention of environmental consultants and developers to the need for assessment of other aspects of heritage. In this sense, Palaeontological Impact Assessments that are part of Heritage Impact Assessments are similar to specialist reports that form part of the EIA reports. The standards and procedures discussed here are therefore meant to guide the conduct of PIAs and specialists undertaking such studies must adhere to them. The process of assessment for the palaeontological (PIA) specialist components of heritage impact assessments, involves:

Scoping stage in line with regulation 28 of the National Environmental Management Act (No. 107 of 1998) Regulations on Environmental Impact Assessment. This involves an **initial assessment** where the specialist evaluates the scope of the project (based, for example, on NID/BIDs) and advises on the form and extent of the assessment process. At this stage the palaeontologist may also decide to compile a **Letter of Recommendation for Exemption from further Palaeontological Studies**. This letter will state that there is little or no likelihood that any significant fossil resources will be impacted by the development. This letter should present a reasoned case for exemption, supported by consultation of the relevant geological maps and key literature.

A **Palaeontological Desktop Study** – the palaeontologist will investigate available resources (geological maps, scientific literature, previous impact assessment reports, institutional fossil collections, satellite images or aerial

photos , etc) to inform an assessment of fossil heritage and/or exposure of potentially fossiliferous rocks within the study area. A Desktop studies will conclude whether a further field assessment is warranted or not. Where further studies are required, the desktop study would normally be an integral part of a field assessment of relevant palaeontological resources.

A **Phase 1 Palaeontological Impact Assessment** is generally warranted where rock units of high palaeontological sensitivity are concerned, levels of bedrock exposure within the study area are adequate; large-scale projects with high potential heritage impact are planned; and where the distribution and nature of fossil remains in the proposed project area is unknown. In the recommendations of Phase 1, the specialist will inform whether further monitoring and mitigation are necessary. The Phase 1 should identify the rock units and significant fossil heritage resources present, or by inference likely to be present, within the study area, assess the palaeontological significance of these rock units, fossil sites or other fossil heritage, comment on the impact of the development on palaeontological heritage resources and make recommendations for their mitigation or conservation, or for any further specialist studies that are required in order to adequately assess the nature, distribution and conservation value of palaeontological resources within the study area.

A **Phase 2 Palaeontological Mitigation** involves planning the protection of significant fossil sites, rock units or other palaeontological resources and/or the recording and sampling of fossil heritage that might be lost during development, together with pertinent geological data. The mitigation may take place before and / or during the construction phase of development. The specialist will require a Phase 2 mitigation permit from the relevant Heritage Resources Authority before Phase 2 may be implemented.

A **‘Phase 3’ Palaeontological Site Conservation and Management Plan** may be required in cases where the site is so important that development will not be allowed, or where development is to co-exist with the resource. Developers may be required to enhance the value of the sites retained on their properties with appropriate interpretive material or displays as a way of promoting access of such resources to the public.

The assessment reports will be assessed by the relevant heritage resources authority, and depending on which piece of legislation triggered the study, a response will be given in the form of a Review Comment or Record of Decision (ROD). In the case of PIAs that are part of EIAs or EMPs, the heritage resources authority will issue a comment or a record of decision that may be forwarded to the consultant or developer, relevant government department or heritage practitioner and where feasible to all three.

3. Details of study area and the type of assessment:

The planned wind energy facility will be situated on top of the mountain range east of Cookhouse. A palaeontological field survey was done in the area demarcated for development on the western plateau of the mountain range, known as the Western Stage (see Figs.1, 2).

The mountain range consists of mudstone, sandstone and dolerite. The weathering of these rock formations resulted in a gently undulating plateau with a few high rises such as Suurkop and is drained by a few shallow gullies. The Poseidon Substation is situated in the southern part of the study area. The roads are unpaved and generally in a bad condition.

The area is covered in alluvium and short grass and very little rocky outcrop can be seen (see Figs.3, 4 and 5). Most of the rocky outcrops in the study area were limited to the dry gullies. Some bush occurs in the western and northern parts of the study area. A few farm buildings and wind breaks occur in the southern part of the study area.

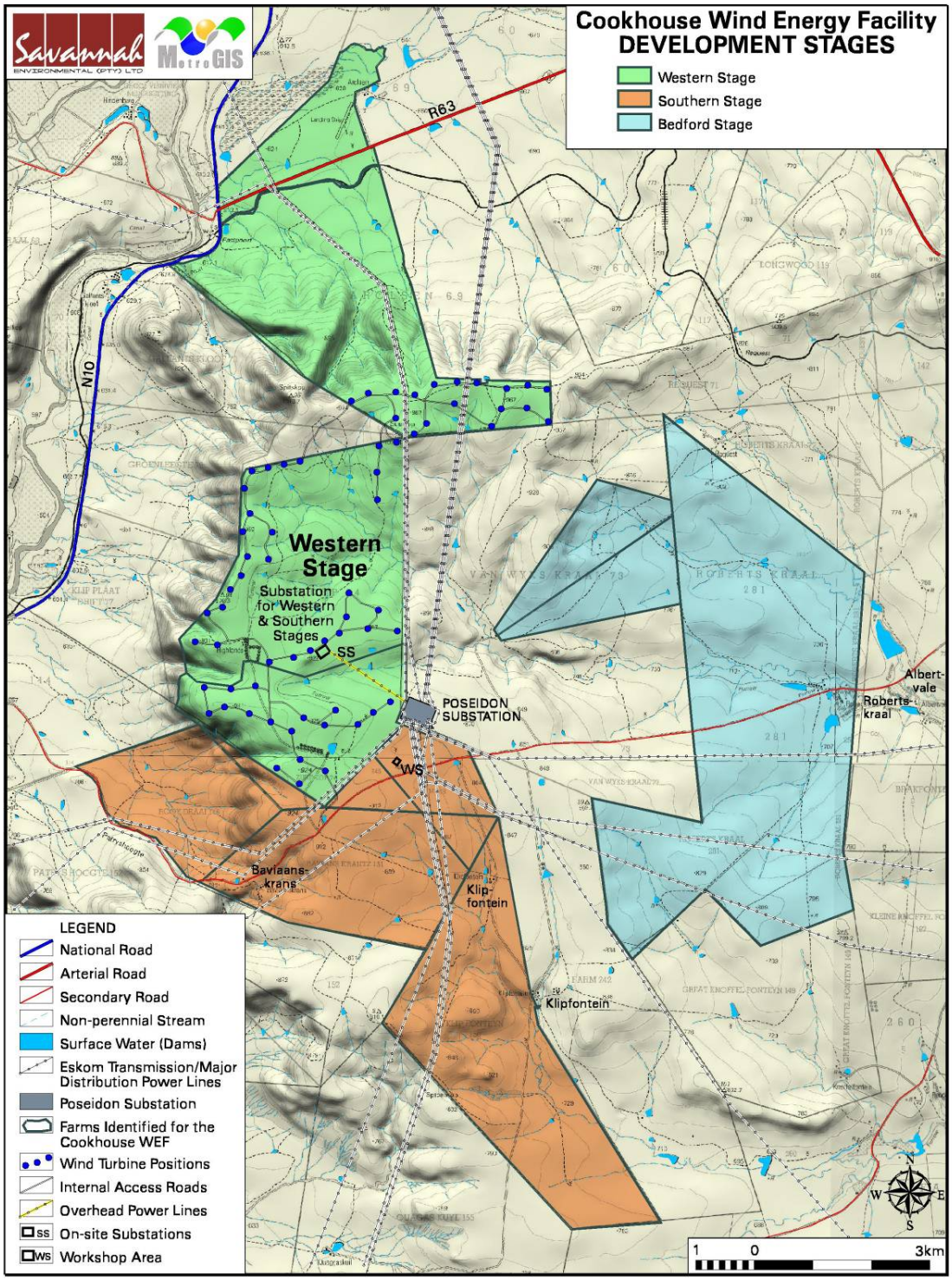
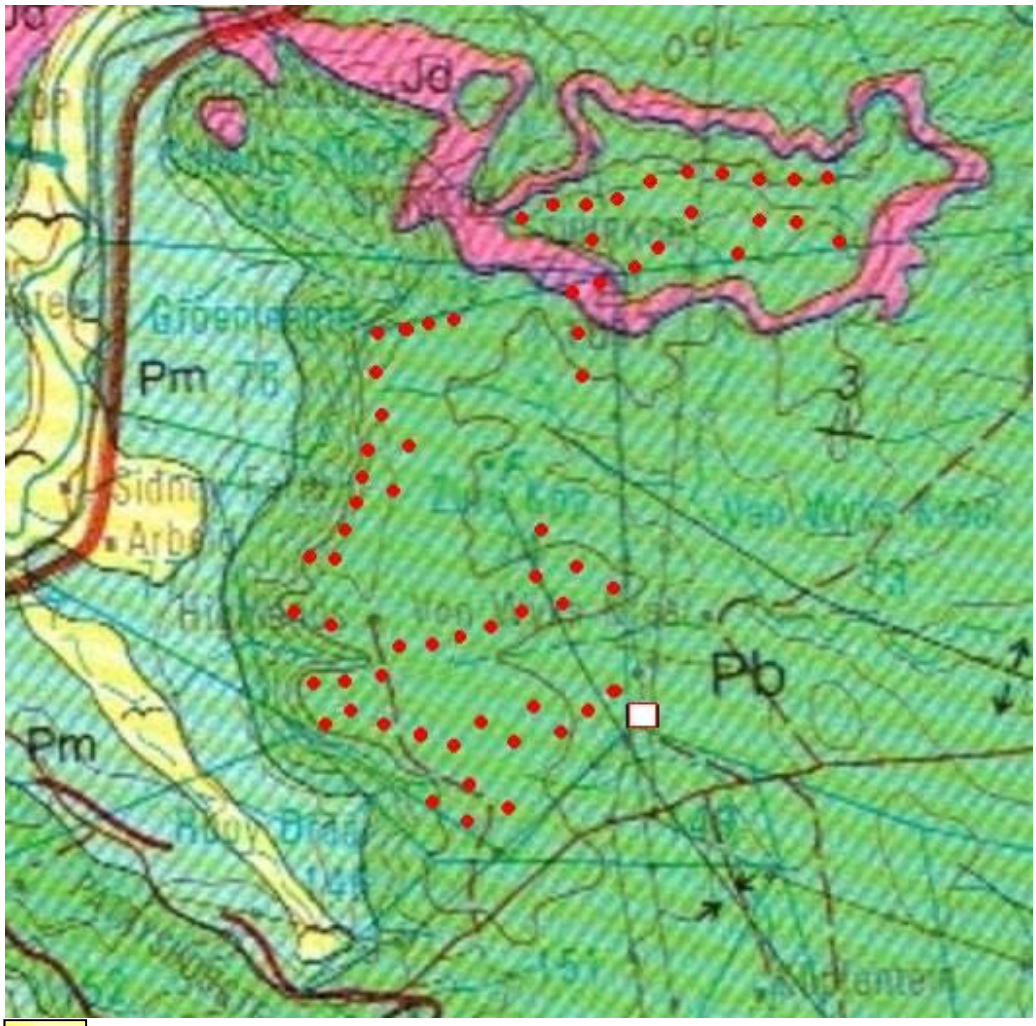


Figure 1: Map of the Western Development Stage of the Cookhouse Wind Energy Facility

4. Geological setting



Quarternary alluvial deposits

Jd Jurassic dolerite intrusions

Pb Balfour Formation

Pm Middleton Formation

Approximate position of proposed wind turbine

Position of substation

Figure 2: Geological Map of the study area and surroundings (adapted from the 1: 250 000 Geology Map 3224 Graaff Reinet, Geological Survey, 1993)

The study site is situated on the Balfour Formation of the Beaufort Group of the Karoo Supergroup. Although the soil cover is mostly not very deep there are few rocky outcrops in the study area.

There are several sandstone layers that weather out on the low rises (see Fig.6) while mudstone horizons underlay the depressions (Fig.7) and are exposed around the escarpment in the south and western parts of the study area (see Fig. 8) and in the occasional dry gully in the central and northern parts of the study area.

The mudstones consist mostly of floodplain deposits and have a blue-grey to maroon colouration, typical of the Balfour Formation. Sandstone layers alternate with the mudstone layers and are generally more resistant to weathering than the mudstone. An extensive doleritic intrusion occurs in the northern part of the study area.

Figure 3: Alluvium and grass cover in the southern part of the study area

Figure 4: Alluvium and grass cover in the western part of the study area

Figure 5: Alluvium and grass cover in the northern part of the study area

Figure 6: Sandstone underlying the alluvium in the western part of the study area

Figure 7: Mudstone underlying the alluvium in the southern part of the study area

Figure 8: Mudstone exposure in the southern part of the study area

Figure 9: Mudstone exposure in the western part of the study area

5. Methodology

The study area was visited on 5 – 8 July 2012. Entrance to the study area was gained through the gate in the south on the farm Fairworld. The study area was surveyed on foot and the sites for the proposed wind turbines were located by GPS and studied. In all cases test holes were dug and filled, leaving enough rocky material on the surface to determine the nature of the underlying geology.

Particular attention was given to the geology at each of these sites allocated for the erection of wind turbines and associated infrastructure including the areas demarcated for the service roads that will link the turbines and the substation. In addition, several exposures of bedrock in the gullies in the vicinity of the wind turbine sites were scrutinised for fossil material.

No invertebrate, vertebrate, plant fossils nor any fossilised footprints, were found during this study.

6. Conclusion and recommendations:

The study area is generally covered in alluvium and outcrops of the underlying geological strata are scarce in this region. The geology of the area is dominated by mudstone and sandstone of the Balfour Formation of the Beaufort Group of the Karoo Supergroup. A major dolerite intrusion occurs in the northern part of the study area. No fossils were discovered during the field survey and it is considered that the site is fossil-poor.

Even though it seems from the field survey that fossils are scarce in this region, the possibility of excavating or exposing fossils during the building phase is not excluded, albeit considered unlikely. In the light of the fossil scarcity in this region and due to the impracticality of having a palaeontologist on site full time during the construction process, which will take several months, an alternative is suggested: a person such as the Environmental Control Officer (ECO) should be appointed by the developer to take responsibility for the collection and safe storage of fossil material should any be discovered during the construction process.

If any fossiliferous material should be exposed, the rocks in which it occurs should be removed from the site by the ECO, and each block containing fossils, marked with the site number in paint or pen (on the rock itself, not the fossil). Fossiliferous material should not be stacked on top of one another and must also be protected against the elements and theft. If no fossiliferous material is found at a particular site, the ECO should also take a sample from the site, number it with the site number and keep it in safe storage for the palaeontologist to inspect at a later stage. No attempt must be made by a person not trained in palaeontology to remove the fossils from the rocks collected from the site.

Due to the subtlety and complexity of palaeontology and the cryptic nature of many fossils, it is suggested that the ECO should visit the Albany Museum, PE Museum Karoo to see the fossil collections (not just the exhibits with cleaned fossils and fossil reconstructions) or to view the private collection of Mr Steynberg at the farm Ganora outside New Bethesda to familiarise him/herself with Karoo fossils and especially unprepared fossils still encased in mudstone. The fossils, if found in the rock rubble from Cookhouse, would mostly not be recognisable to a layperson because it would mostly consist of cross sections through bones. The occurrence of non-fossiliferous, white calcareous nodules which are plentiful in the mudstones at the study site in Cookhouse, which resemble fossil bone fragments, would also confuse a novice in palaeontology.

The collection of fossils, if any are found, must comply with the regulations of SAHRA regardless whether the fossils were found by the ECO on site or the palaeontologist. This entails the acquisition of a collection permit, the collection of the fossils by a qualified palaeontologist and the storage of the fossils in a

recognised fossil repository such as a museum or university department which is involved with palaeontology.

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Higher Education Diploma (RAU), PhD Palaeontology (WITS)

Experience:
Palaeontological assessments:

- Urban development in Cradle of Humankind World Heritage Site (Gauteng): Letamo, Honingklip, Windgat, Sundowners, Ekutheni
- Urban development at Goose Bay, Vereeniging, Gauteng
- De Wildt 50 MW Solar Power Station Gauteng
- Upgrade of R21, Gauteng
- Urban development at Tubatse, Limpopo Province
- Vele Colliery, Limpopo Province
- Diamond mine on Endora, Limpopo Province
- 10 MW PV Plant Potchefstroom, North West Province
- Omega 342 50MW Solar Power Station, Viljoenskroon, Free State
- Solar power plant, Bethal, Mpumalanga
- Manganese mine south of Hotazel, Northern Cape

Palaeontological research:

- Gauteng: Wonder Cave
- KwaZulu/Natal: Newcastle, Mooi River, Rosetta, Impendle, Himeville, Underberg, Polela & Howick Districts, Sani Pass
- Eastern Cape: Cradock District, Algoa Basin
- Western Cape: Clanwilliam District
- Free State: Memel & Warden Districts
- Limpopo Province: Nyalaland (KNP), Vhembe Reserve, Pont Drift
- Zimbabwe: Sentinel Ranch, Nottingham