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**PALAEONTOLOGICAL IMPACT ASSESSMENT FOR THE PROPOSED DEVELOPMENT OF A
CLUSTER OF RENEWABLE ENERGY FACILITIES BETWEEN SOMERSET EAST AND
GRAHAMSTOWN IN THE EASTERN CAPE**

Palaeontological Addendum –Wind Garden and Fronteer projects

1 BACKGROUND

**Information Provided by Savannah Environmental (Pty) Ltd*

The proposed Eastern Cape Renewable Energy Facilities comprise of six wind energy facilities (WEF) and associated grid connection infrastructure, within the Eastern Cape Province. The proposed development is in the Cookhouse Renewable Energy Development Zone (REDZ) and the Eastern Corridor of the Strategic Transmission Corridors. The cluster of projects is divided into two sections, namely the Western Section and the Eastern Section, with the Western Section situated near Somerset East and the Eastern Section near Grahamstown. The western section comprises of seven (7) of the nine projects and the eastern section the remaining two (2) projects. The proposed development is divided in an eastern and western block.

The layout for the proposed Eastern Cape Renewable Energy Facilities is presented in **Figure 1** below.

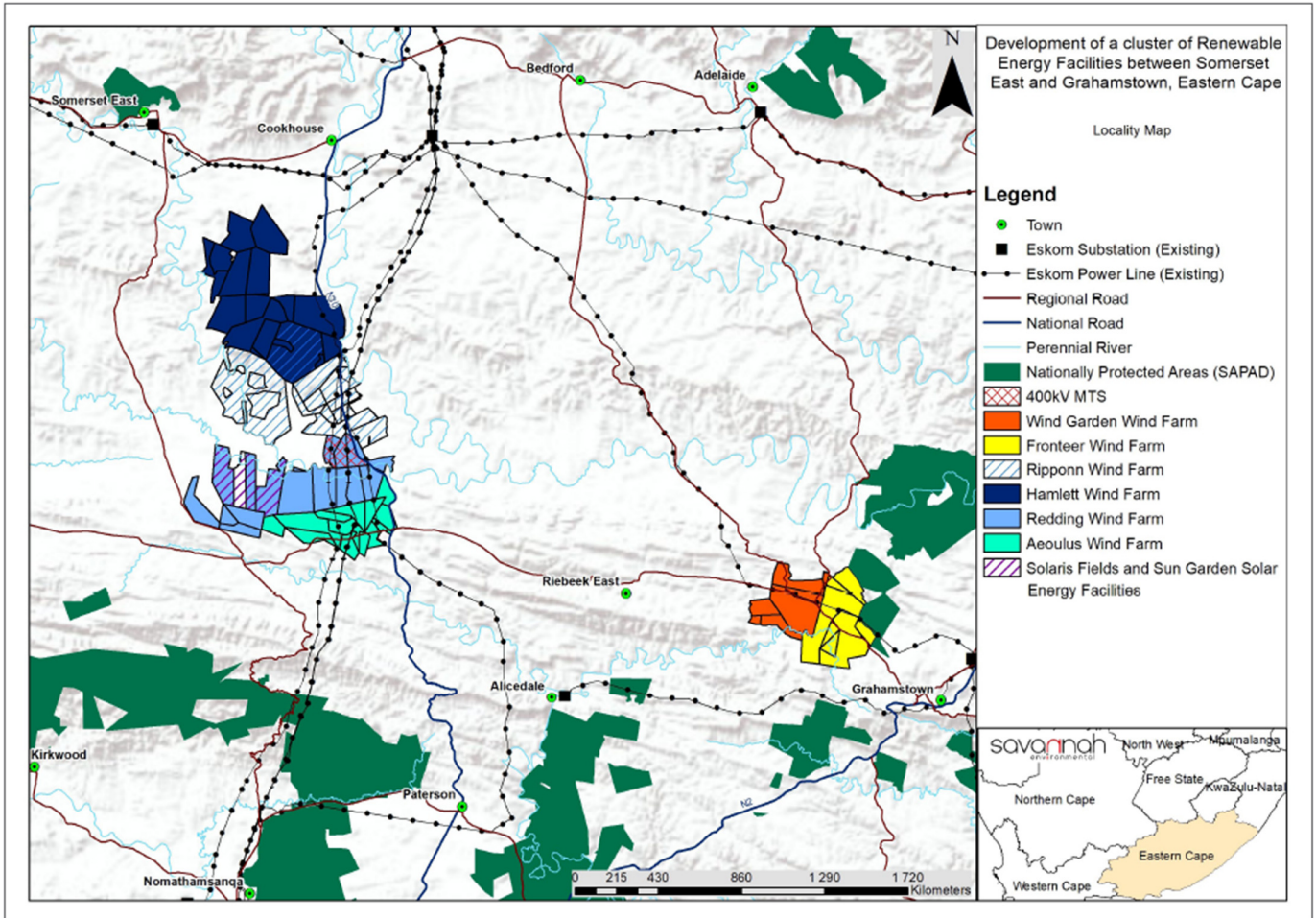


Figure 1: Locality of the renewable energy facilities located between Somerset East and Grahamstown

The following addendum to the original report is proposed: the optimization of the Wind Garden and Frontier layout with a reduced numbers of turbines as well as a slightly smaller hub height of 115m instead of the originally proposed 120m. The rotor diameter will remain at 150m. This further optimisation was required in order to address outstanding comments raised by I&APs.

The respective layouts for the amended Frontier and Wind Garden Wind Energy Facilities (Eastern Block) layout are presented in **Figure 2** and **Figure 3** below.

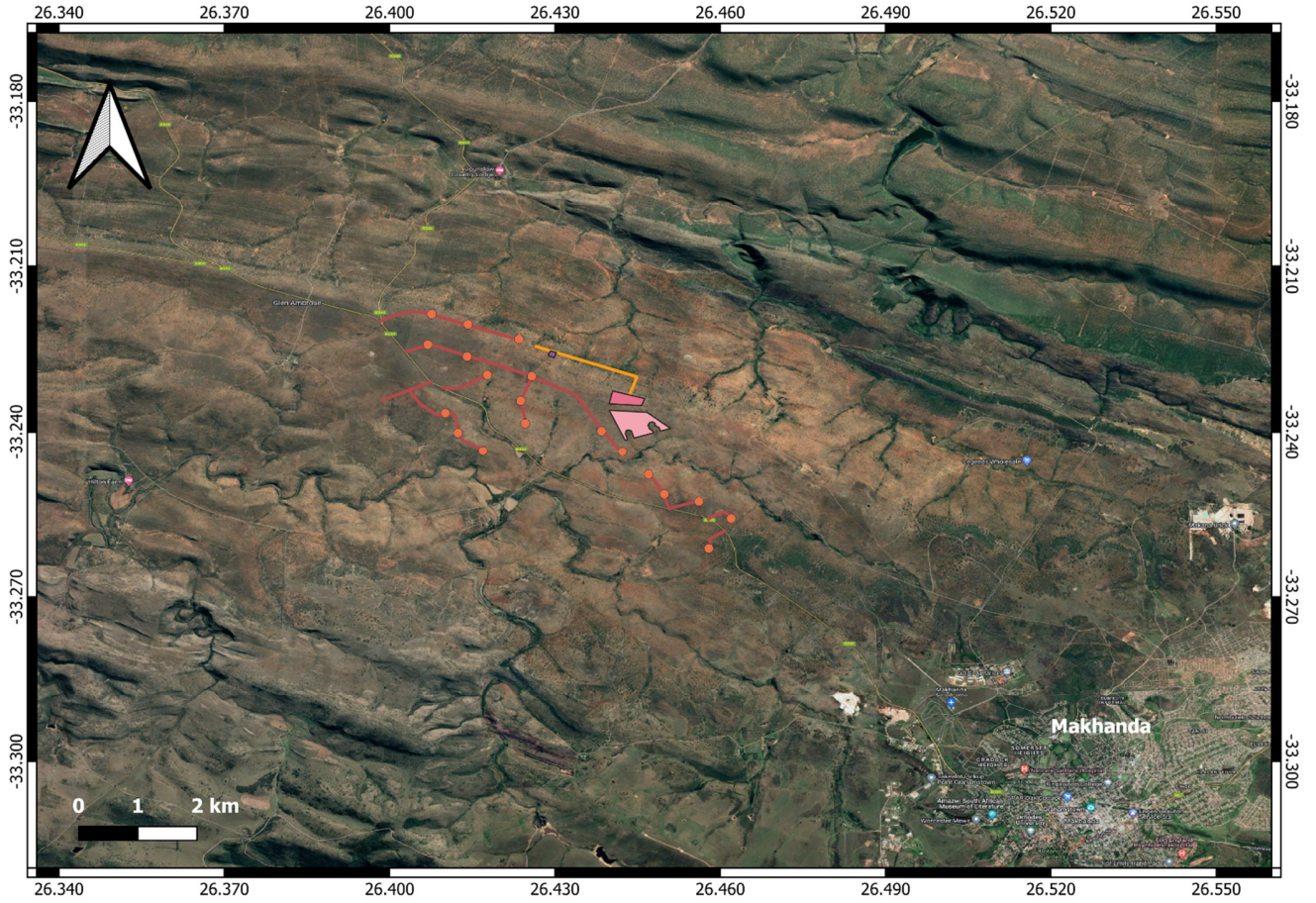


Figure 2: Layout map for proposed Frontier Wind Energy Facility

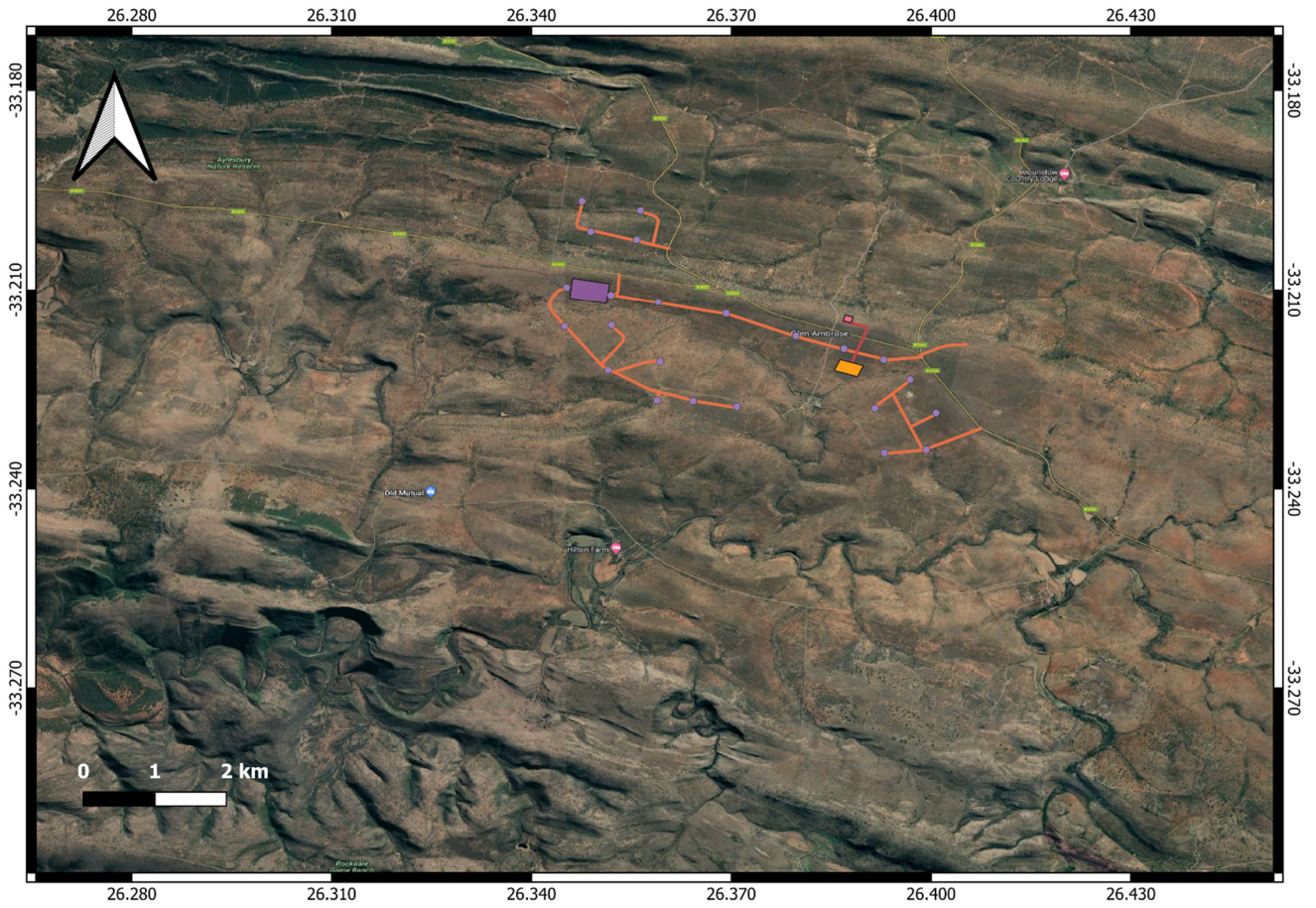


Figure 3: Layout map for proposed Wind Garden Wind Energy Facility

2 INTRODUCTION

This comment letter has been compiled by Mrs Elize Butler. She has conducted approximately 300 palaeontological impact assessments for developments in the Free State, KwaZulu-Natal, Eastern, Central, and Northern Cape, Northwest, Gauteng, Limpopo, and Mpumalanga. She has an MSc (*cum laude*) in Zoology (specializing in Palaeontology) from the University of the Free State, South Africa and has been working in Palaeontology for more than twenty-five years. She has experience in locating, collecting, and curating fossils. She has been a member of the Palaeontological Society of South Africa (PSSA) since 2006 and has been conducting PIAs since 2014.

The original Palaeontological impact assessment for the Eastern Cape Energy projects was conducted by Mrs. Elize Butler and is referenced below.

Butler. E., 2021. Palaeontological Impact Assessment for the Proposed Development of a Cluster of Renewable Energy Facilities Between Somerset East and Grahamstown in the Eastern Cape

The present amendment letter must be read in conjunction with the original PIA report mentioned above.

3 PROJECT DESCRIPTION

The proposed development is in the Cookhouse Renewable Energy Development Zone (REDZ) and the Eastern Corridor of the Strategic Transmission Corridors, Gazetted in February 2018 by the Minister of Environmental Affairs (GN 114). The entire extent of the projects is located within the Sarah Baartman District Municipality. The western section is located within the Blue Crane Route Local Municipality and the eastern section within the Makana Local Municipality.

The original report states that the **Eastern Block** of the WEF and associated grid connection infrastructure, is underlain by the Dwyka and Witteberg Group (Lake Mentz, Witpoort and Weltevrede Formations) of the Cape Supergroup. The Eastern Block is depicted on the 1:250 000 Grahamstown 3326 (1976) Geological Map (Council of Geosciences, Pretoria). The **Western Block** of the WEF and associated grid connection infrastructure is underlain by the Dwyka Group; the Fort Brown Formation of the Eccu Group (Karoo Supergroup), Adelaide Subgroup (Koonap and Middleton Formations) of the Beaufort Group (Karoo Supergroup) and the Witteberg Group of the Cape Supergroup, Karoo Dolerite (Karoo Supergroup), and

Quaternary deposits. The geology of the Western Block is indicated on the 1: 250 000 3224 Graaff-Reinet (1993) and 3324 Port Elizabeth (1990) Geological Maps.

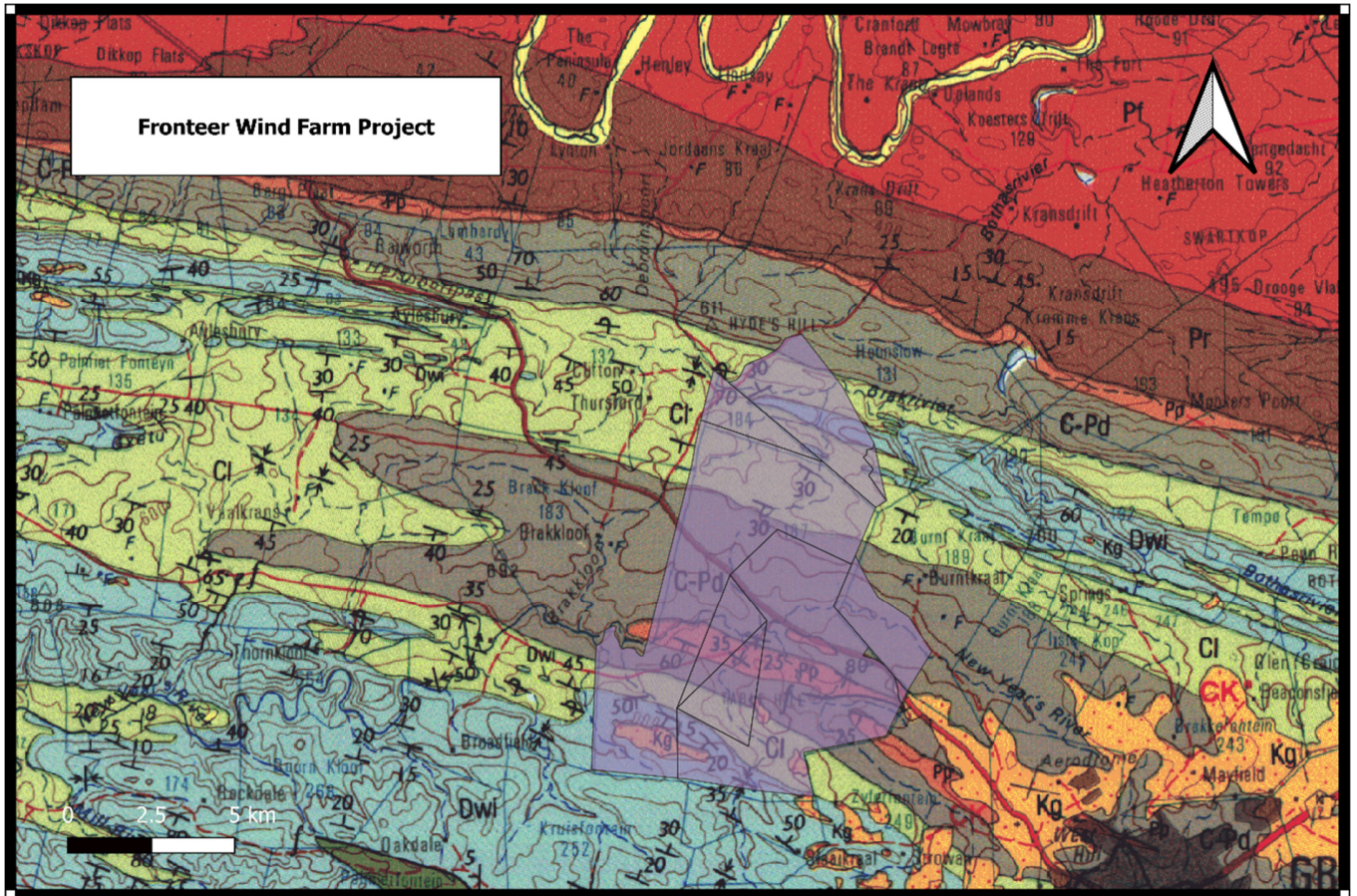


Figure 4: Extract of the 1:250 000 Grahamstown 3326 (1976) Geological Map (Council of Geosciences, Pretoria) indicating the Frontier Wind Farms in the Eastern Block.

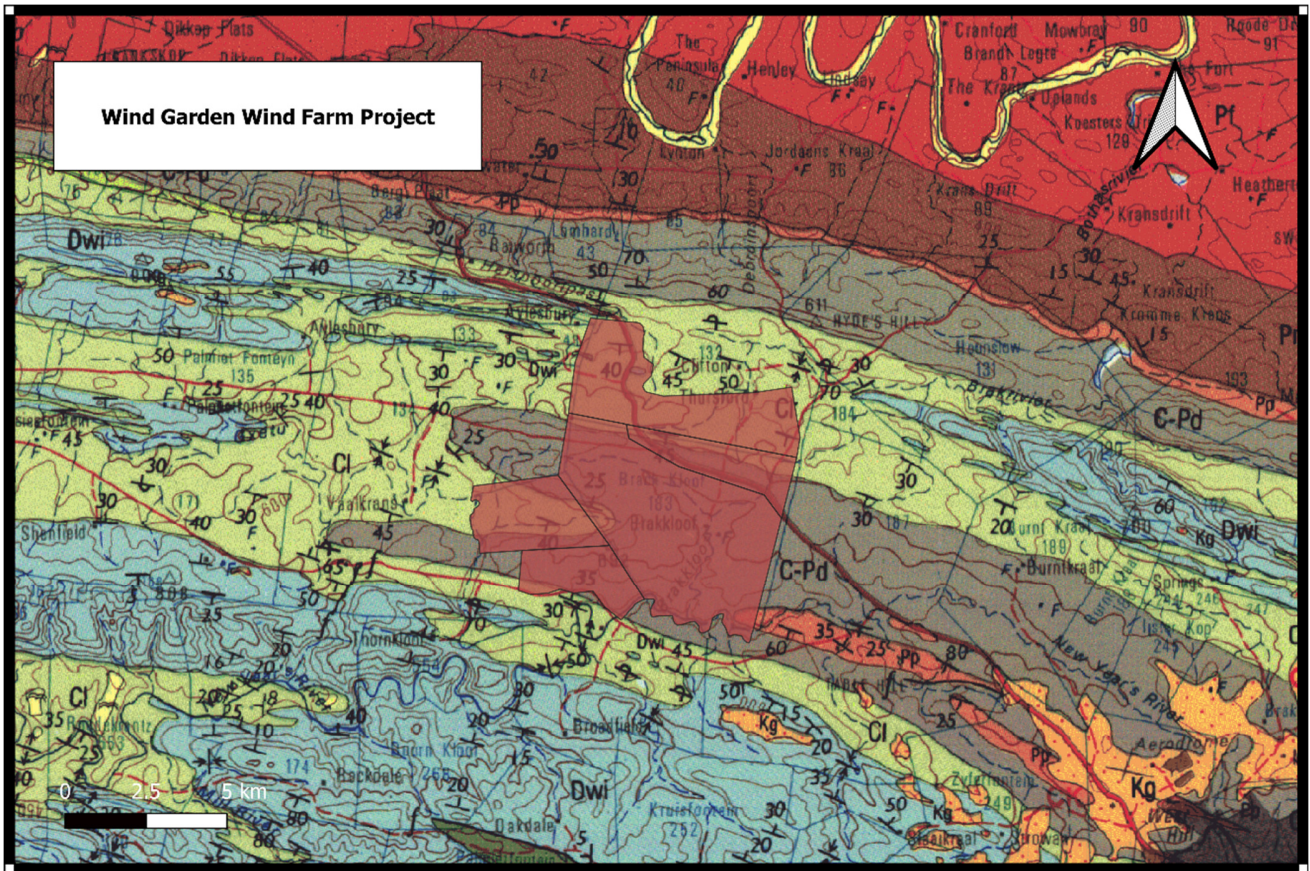


Figure 5: Extract of the 1:250 000 Grahamstown 3326 (1976) Geological Map (Council of Geosciences, Pretoria) indicating the Garden Wind Farms Eastern Block.

In the 2021 report it was stated that the **Eastern Block** (Figure 4-5) is underlain by the:

- Dwyka Group
- Witteberg Group of the Cape Supergroup
 - Lake Mentz Formation, Witteberg Group of the Cape Supergroup
 - Witpoort Formation, Witteberg Group of the Cape Supergroup
 - Weltevrede Formation, Witteberg Group of the Cape Supergroup

The **Permo-Carboniferous Dwyka Group** is the oldest deposit in the Karoo Supergroup and spans the Late Carboniferous to Early Permian. The Dwyka Group overlies the glaciated Precambrian bedrocks in the north and unconformably and paraconformably the Cape Supergroup in the south. In the east, it overlies the Natal Group and Msikaba Formation unconformably. Glacial pavements underlying the Dwyka Group has well-developed striations (specifically in the north) (Johnson et al, 2006). The Dwyka Group is believed to be deposited in a marine basin (Visser, 1989). South Africa was covered by an ice sheet during the Dwyka. These deposits were thus deposited in a cold, glacially dominated environment. This Group consists mainly of gravelly sediments with mudstones with scraped and faceted pebbles and subordinate varved shales. Dark grey tillite was deposited by retreating glaciers (Visser et al, 1987) and thus the Dwyka is known for its rich assemblage of dropstones of various sizes.

The Permo-Carboniferous Dwyka Group is known for its trackways (trace fossils) that was formed by fish and arthropods, while fossilized faeces have also been recovered. Body fossils consist of gastropods, invertebrates, and marine fish. Fossil plants from this group include a rich diversity of conifers, cordaitaleans, glossopterids, ginkgoaleans, horsetails, lycopods, pollens and spores ferns (Almond and Pether, 2008).

The **Cape Supergroup** is about 10 km thick and represents approximately 170 million years of Earth's history from the Early Ordovician to the Early Carboniferous. This Supergroup is divided into three subdivisions namely the Table Mountain, Bokkeveld and Witteberg Groups. These Groups are lithologically distinctive and form the southern mountain ranges of the Eastern Cape and Western Cape Provinces. The Witteberg Group decreases in thickness from the eastern part to the southwestern part of the basin. This Group consists basically of micaceous mudrock and quartzitic sandstone which occur in almost equal proportions. The Weltevrede Subgroup forms the basal unit of the Cape supergroup and is Devonian in age. The Witpoort Formation forms the top unit of the Weltevrede Subgroup. The Witteberg was terminated by a gap in the geological record (an unconformity) of approximately 30 million years, the Dwyka Formation were then deposited, signifying the end of the ice age. This corresponds with palaeomagnetic interpretations which suggests that, at the time of deposition the Witteberg Group (what is now South Africa), was within the Antarctic Circle.

The thickness of the Witteberg Group decreases from approximately 1700 m in the east to 1200 in the southwestern portion of the basin becoming thinner northwards along the western margin. In the Eastern Cape, the Weltevrede Subgroup is not as thick as in the west and is mostly exposed along the coastal plain, making it difficult to map as it is deeply weathered. The Weltevrede Subgroup comprises of sediments deposited along the shoreline of the cold-water Agulhas Sea, by rivers flowing into delta systems. The

Weltevrede Formation is characterised by shallow marine sandstone and mudrocks. Rare shelly invertebrates including brachiopods, molluscs, rare trilobites as well as trace and plant fossils (e.g., lycopods) are known from the Weltevrede Subgroup.

The Lake Mentz Subgroup (Witteberg Group, Cape Supergroup) is early to mid-Carboniferous in age. This Subgroup was deposited during the last phase of the Agulhas Sea when it became sedimented and partially cut off from the open sea. The upper portion of the Lake Mentz Subgroup was dominated by ray-finned-fish (Actinopterygii) as well as a sharks and spiny sharks (Acanthodii).

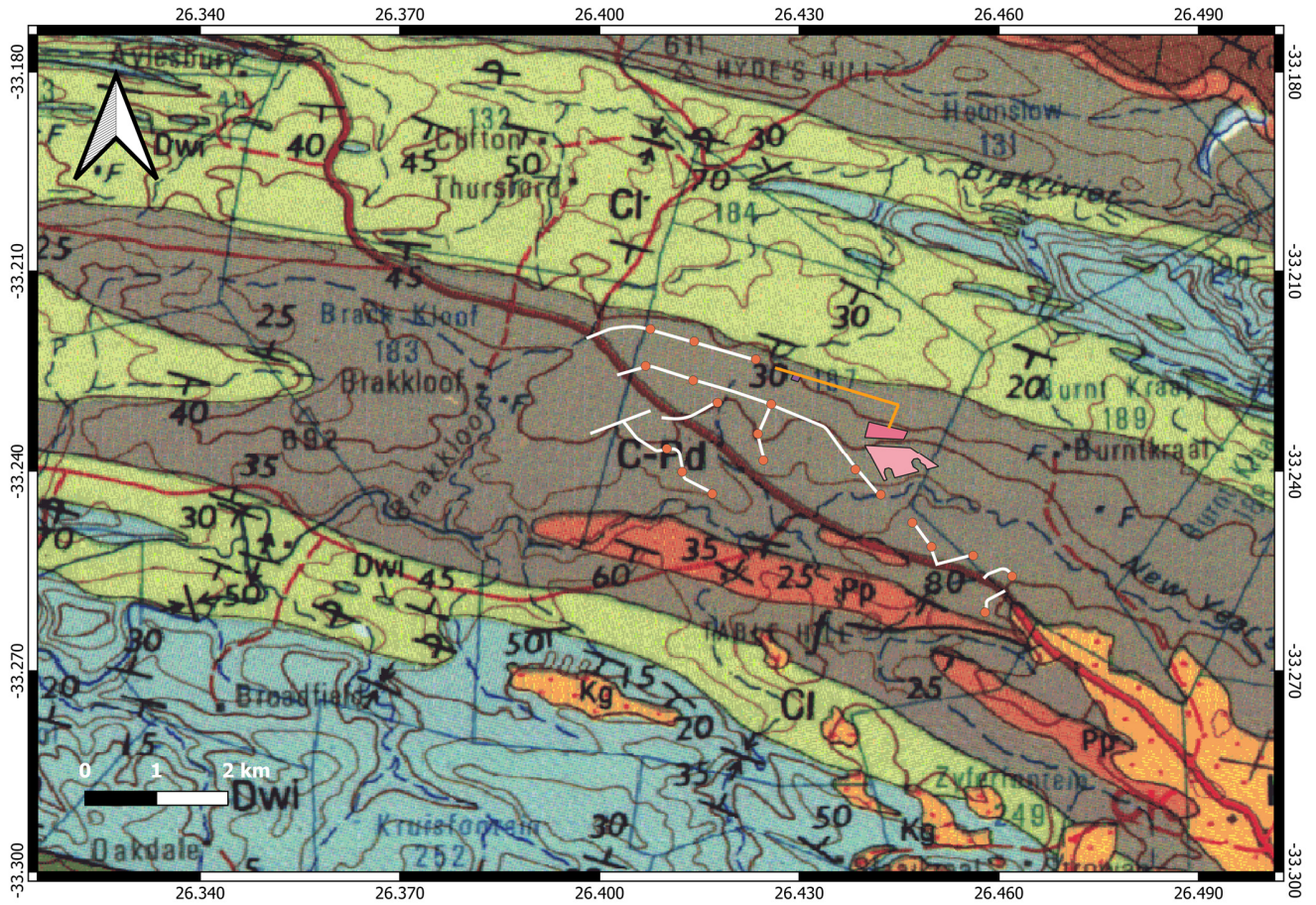


Figure 64: Extract of the 1:250 000 Grahamstown 3326 Geological Map (Council of Geosciences [Pretoria]) indicating the Fronteer Wind Farms. The amended layout is entirely underlain by the Dwyka Group (C-Pd).

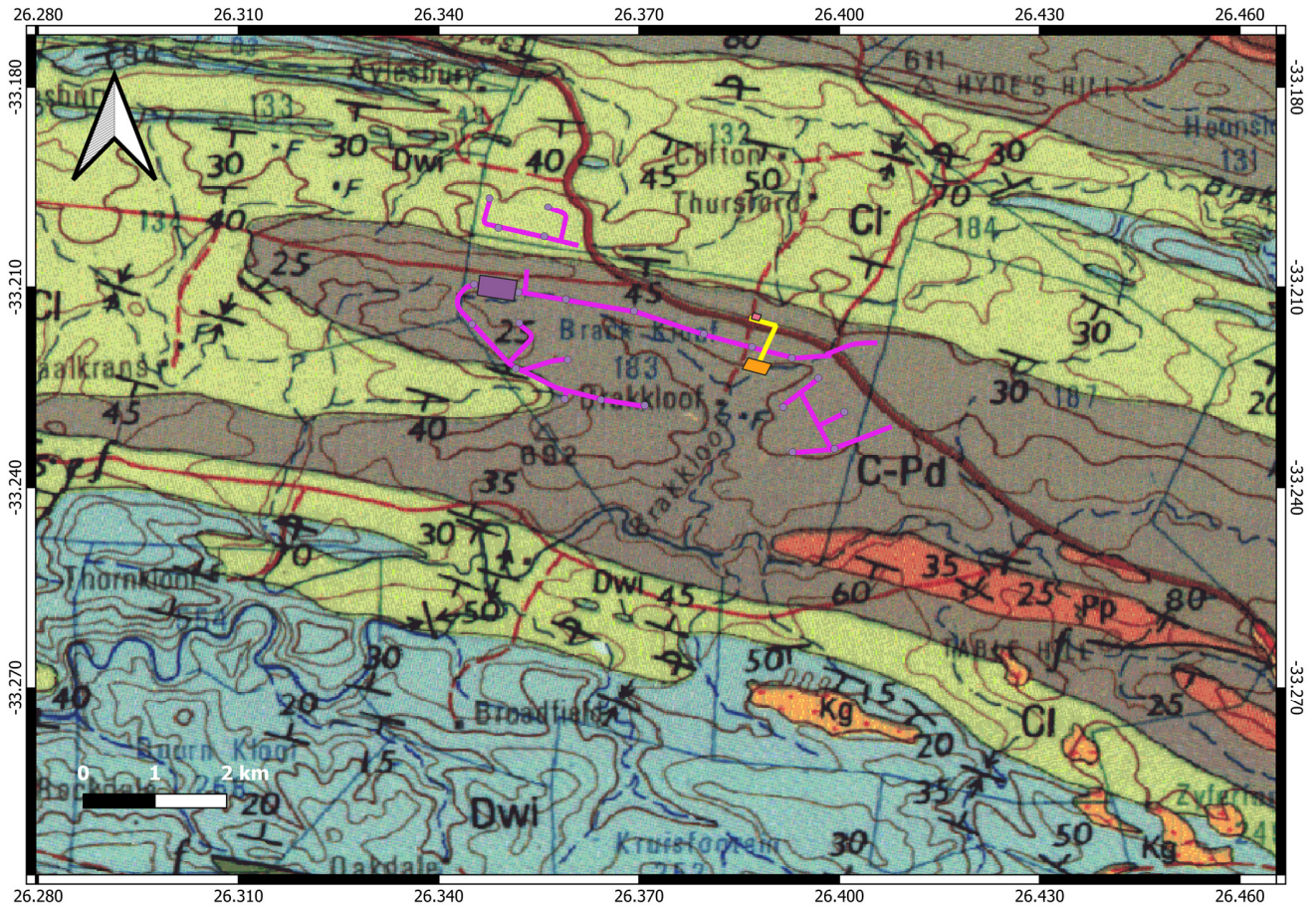


Figure 75: Extract of the 1:250 000 3326 Grahamstown Geological Map (Council of Geosciences, Pretoria) indicating the Wind Garden Wind Farms. The amended layout is largely underlain by the Dwyka Group (C-Pd) with a small portion underlain by the Lake Mentz Subgroup of the Witteberg Group.

According to the PalaeoMap of SAHRIS the Palaeontological Sensitivity of the Dwyka Group is Low and that of the Witteberg Group is High (Almond *et al*, 2013; SAHRIS website).

4 METHODOLOGY

The Methodology used for this letter is the same as the original report (Butler, 2021).

Impact Summary

Environmental parameter	Issues	Rating prior to mitigation	Average	Rating post mitigation	Average
Loss of fossil heritage Frontier Wind Farm	Destroy or permanently seal-in fossils at or below the ground surface that are then no longer available for scientific study	-56	Negative medium impact	+6	Negative low impact
Loss of fossil heritage Wind Garden Wind Farm	Destroy or permanently seal-in fossils at or below the ground surface that are then no longer available for scientific study	-56	Negative medium impact	+6	Negative low impact

It is therefore considered that the proposed development is deemed appropriate and feasible and will not lead to detrimental impacts on the palaeontological reserves of the area. Thus, the construction of the development may be authorised in its whole extent, as the development footprint is not considered sensitive in terms of palaeontological resources.

Loss of fossil heritage will have a negative impact. Only the affected properties (WEF localities) will be affected by the proposed development. The expected duration of the impact is assessed as potentially

permanent. In the absence of mitigation procedures, the damage or destruction of any palaeontological materials will be permanent. Impacts on palaeontological heritage during the construction phase could potentially occur and are regarded as having a high probability. The significance of the impact occurring will be high before mitigation and Low after mitigation.

As the geology of the original Frontier and Garden Wind Facilities is the same as the amended layouts, there will be no differences on the Impacts affecting these two WEFs. The Significance for these two WEFs will be the same as originally assessed.

4.1 National Heritage Resources Act (25 of 1999) (NHRA)

Cultural Heritage in South Africa, includes all heritage resources, is protected by the National Heritage Resources Act (Act 25 of 1999) (NHRA). Heritage resources as defined in Section 3 of the Act include **“all objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects and material, meteorites and rare geological specimens”**.

Palaeontological heritage is unique and non-renewable and is protected by the NHRA. Palaeontological resources may not be unearthed, broken moved, or destroyed by any development without prior assessment and without a permit from the relevant heritage resources authority as per section 35 of the NHRA.

This Palaeontological Impact Assessment was undertaken as part of this proposed amendment and adheres to the conditions of the Act. According to **Section 38 (1)** of the NHRA, a HIA is required to assess any potential impacts to palaeontological heritage within the development footprint where:

- the construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;
- the construction of a bridge or similar structure exceeding 50m in length;
- any development or other activity which will change the character of a site—
 - a. (exceeding 5 000 m² in extent; or
 - b. involving three or more existing erven or subdivisions thereof; or
 - c. involving three or more erven or divisions thereof which have been consolidated within the past five years; or
 - d. the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority

- e. the re-zoning of a site exceeding 10 000m² in extent;
- or any other category of development provided for in regulations by SAHRA or a Provincial heritage resources authority.

5 SPECIALIST COMMENT

The original report states that the **Eastern Block** of the WEF and associated grid connection infrastructure, is underlain by the Dwyka and Witteberg Group (Lake Mentz, Witpoort and Weltevrede Formations) of the Cape Supergroup.

This geology concurs with the new proposed layouts and there will be no differences on the Impacts affecting these two WEFs from that originally assessed.

From a Palaeontological perspective there will be no advantages or disadvantages of the proposed optimized layout.

Yours sincerely



Elize Butler