PALAEONTOLOGICAL WALKDOWN ASSESSMENT FOR THE PROPOSED UMSINDE EMOYENI WIND ENERGY FACILITY AND ASSOCIATED INFRASTRUCTURE, NEAR MURRAYSBURG, WESTERN AND NORTHERN CAPE PROVINCES.

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Client:	Nala Environmental
PGS Project No:	602HIA

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Declaration of Independence

I, Elize Butler, declare that –

General declaration:

- I act as the independent palaeontological 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 favorable to the applicant
- I declare that there are no circumstances that may compromise my objectivity in performing such work.
- I have expertise in conducting palaeontological impact assessments, 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 will consider, to the extent possible, the matters listed in section 38 of the NHRA when preparing the application and any report relating to the application.
- 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.
- I will ensure that information containing all relevant facts in respect of the application is distributed or made available to interested and affected parties and the public and that participation by interested and affected parties is facilitated in such a manner that all interested and affected parties will be provided with a reasonable opportunity to participate and to provide comments on documents that are produced to support the application.
- I will provide the competent authority with access to all information at my disposal regarding the application, whether such information is favorable to the applicant or not
- All the particulars furnished by me in this form are true and correct.
- I will perform all other obligations as expected a palaeontological specialist in terms of the Act and the constitutions of my affiliated professional bodies; and
- I realize that a false declaration is an offense in terms of regulation 71 of the Regulations and is punishable in terms of section 24F of the NEMA.

Disclosure of Vested Interest

I do not have and will not have any vested interest (either business, financial, personal or other) in the proposed activity proceeding other than remuneration for work performed in terms of the Regulations.

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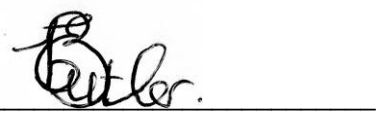
SIGNATURE: 

ACKNOWLEDGEMENT OF RECEIPT

Report Title	***Palaeontological Walk down for the Umsinde Emoyeni Wind Energy Facility and Associated Infrastructure, Near Murraysburg, Western and Northern Cape Provinces.***		
Control	**Name**	**Signature**	**Designation**
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Reviewed			
Client			

CLIENT: Nala Environmental

CONTACT PERSON: **Arlene Singh**

SIGNATURE: 

EXECUTIVE SUMMARY

Umsinde Emoyeni Wind Farm (Pty) Ltd was issued with an Environmental Authorisation (EA) for the proposed construction of the Umsinde Emoyeni Wind Energy Facility (hereafter referred to as “Umsinde WEF”) (previously Phase 1) , near Murraysburg in the Western Cape. Province.

In their Final Comment issued on 16-03-2018, SAHRA requested a pre-construction walkdown of the final layout of the proposed turbines, roads as well as electricity infrastructure and that a Chance find procedure should be set in place and implemented if substantial fossils remains (e.g. vertebrate bones and teeth, plant fossils or trace fossils like trackways and fossil burrows) are uncovered by excavations in the development footprint

Banzai Environmental was appointed by PGS Heritage (Pty) Ltd to conduct the Palaeontological Walkdown to assess the authorised Umsinde Emoyeni Wind Energy Facility (WEF) [DEA 14/12/16/3/3/2/686]. The Umsinde WEF development is underlain by the Permian bedrocks of the Lower Beaufort Group (Karoo Supergroup) as well as highland areas (koppies) underlain by Karoo dolerite. The Beaufort Group has a Very High Palaeontological Significance while that of the Karoo Dolerite is Zero as it is unfossiliferous. Thus, only development areas underlain by a High Palaeontological Sensitivity has been surveyed.

No fossil heritage was located during the walkdown but it does not imply that the area is unfossiliferous. The absence of fossils during this walkdown could be attributed to vegetation cover and unexposed fossils in the study area. If undocumented fossils are uncovered during the construction phase of the development the Chance Find Protocol included in this report should be implemented immediately. However, extensive fieldwork by South African researchers have been conducted in the Murraysburg area and over time almost 2000 fossils have been collected. These fossils are now housed in Museums in Southern Africa. This information has been included in this report.

Based on the walkdown, and taking the updated layout into account, it is not expected that the proposed WEF (development of turbines, associated roads and electricity infrastructure) will negatively impact on the palaeontological heritage of the development footprint. As such there is no objection to the proposed layout and final alignment of the Umsinde WEF and associated infrastructure from a palaeontological perspective.

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TERMINOLOGY AND ABBREVIATIONS

Archaeological resources

This includes:

- 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 artifacts, human and hominid remains, and artificial features and structures.
- rock art is 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;
- 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 in the Maritimes Zones Act, 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.
- features, structures, and artifacts associated with a military history which are older than 75 years and the site on which they are found.

Cultural significance

This means aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance

Development

This means any physical intervention, excavation, or action, other than those caused by natural forces, which may in the opinion of the heritage authority in any way result in a change to the nature, appearance or physical nature of a place or influences its stability and future well-being, including:

- construction, alteration, demolition, removal or change in use of a place or a structure at a place.
- carrying out any works on or over or under a place.
- subdivision or consolidation of land comprising a place, including the structures or airspace of a place.
- constructing or putting up for display signs or boards.
- any change to the natural or existing condition or topography of land; and
- any removal or destruction of trees, or removal of vegetation or topsoil

Fossil

Mineralized bones of animals, shellfish, plants, and marine animals. A trace fossil is the track or footprint of a fossil animal that is preserved in stone or consolidated sediment.

Heritage

That which is inherited and forms part of the National Estate (historical places, objects, fossils as defined by the National Heritage Resources Act 25 of 1999).

Heritage resources

This means any place or object of cultural significance and can include (but not limited to) as stated under Section 3 of the NHRA,

- places, buildings, structures, and equipment of cultural significance.
- places to which oral traditions are attached or which are associated with living heritage.
- historical settlements and townscapes.
- landscapes and natural features of cultural significance.
- geological sites of scientific or cultural importance.
- archaeological and palaeontological sites.
- graves and burial grounds, and
- sites of significance relating to the history of slavery in South Africa.

Holocene

The most recent geological time period which commenced 10 000 years ago.

Palaeontology

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.

Table 1 – Abbreviations

Abbreviations	Description
APM	Archaeology, Palaeontology and Meteorites
ASAPA	Association of South African Professional Archaeologists
BAR	Basic Assessment Report
CRM	Cultural Resource Management
DEFF	Department of Environmental Department of Environment, Forestry and Fisheries
ECO	Environmental Control Officer
EIA practitioner	Environmental Impact Assessment Practitioner
EIA	Environmental Impact Assessment
ESA	Early Stone Age
GPS	Global Positioning System
HIA	Heritage Impact Assessment
I&AP	Interested & Affected Party
LSA	Late Stone Age
LIA	Late Iron Age
MSA	Middle Stone Age
MIA	Middle Iron Age
NECSA	Nuclear Energy Corporation of South Africa
NEMA	National Environmental Management Act
NHRA	National Heritage Resources Act
PDA	Palaeontological Desktop Assessment
PIA	Palaeontological Impact Assessment
PHRA	Provincial Heritage Resources Authority
PSSA	Palaeontological Society of South Africa
REDZs	Renewable Energy Development Zones
SADC	Southern African Development Community
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System
WEF	Wind Energy Farm

1 INTRODUCTION

Nala Environmental (Nala) was commissioned by Umsinde Emoyeni Wind Farm (Pty) Ltd to conduct the final layout walkdowns for the Umsinde Emoyeni Wind Energy Facility (Umsinde WEF) and associated infrastructure near Murraysburg in the Western Cape Province. Nala employed PGS Heritage (Pty) Ltd (PGS) to develop the Heritage Management Plan (HMP) for the heritage resources while Banzai Environmental was appointed by PGS to conduct the Palaeontological walkdown for the Umsinde WEF development.

1.1 Background

The Emoyeni Wind Farm Project Propriety Limited first proposed the development of the Umsinde Emoyeni wind energy facility (Phases 1 & 2) in 2014. The Umsinde Emoyeni Wind Energy Facility was previously referred to as the Phase 1 of the Umsinde Emoyeni Wind Energy Facility. ACO Associates conducted the first Heritage Impact Assessment for the project.

Hart and Almond, 2015. Heritage Impact Assessment for the Proposed Umsinde Emoyeni Wind Energy Facility.

In this study highly significant palaeontological heritage were identified in the larger Umsinde Emoyeni development footprint. The development is located in the Northern Cape as well as the Western Cape Province[1]. SAHRA could only comment on the area in the Northern Cape Province while Heritage Western Cape was responsible for comments in the Western Cape Province. Palaeontological recommendations by SAHRA (for the Northern Cape) included a pre-construction palaeontological study to be undertaken in areas underlain by bedrocks of the Lower Beaufort Group.

Subsequent reports with layout revisions, name change as well as a Heritage addendum was submitted.

Hart, T, 2018. Project addendum. UmSinde Emoyeni Wind Farm Project, Heritage Component of EIA process.

In this report Hart concluded that the layout changes did not affect the overall recommendations of the heritage specialist reports.

In the final comments (Case 6021; 2018) SAHRA had no objections to the proposed development and supported recommendations of the Heritage specialists that had to be included in the EMPr.

Recommendations included:

[1] Note that the original Umsinde Emoyeni WEF study area straddled the Northern and Western Cape. The Umsinde Emoyeni WEF (Phase 1), which is the subject of this report is however limited to the Western Cape.

- A walk down of access roads and the final turbine positions prior to construction.
- Turbine placements underlain by bedrock of the Lower Beaufort Group had to be avoided if possible. If this could not be done a “Watching Brief” during the construction phase had to be conducted.
- During Excavation monitoring of the turbine foundations as well as access roads and underground cables by a palaeontologist is recommended.
- A Chance find and Chance find Procedure has to be developed and implemented for the project.
- A monitoring report has to be submitted to SAHRA.

In 2020, Almond commented on the amended proposal of the Umsinde Emoyeni Wind Energy facility.

Almond, J. 2020. Amended proposal for the Umsinde Emoyeni Wind Energy Facility near Murraysburg, Western and Northern Cape Provinces.

Almond summarised the original 2015 report and described that the proposed development was underlain by Permian bedrocks of the Lower Beaufort Group (Karoo Supergroup) as well as upland areas underlain by Karoo dolerite that are unfossiliferous. In this report he emphasized the importance of fossils in the Murraysburg region underlain by the Lower Beaufort Group. Fossils in this region has been collected by scientists over the past hundred or more years but still are “largely understudied”. He allocated a MEDIUM Palaeontological Impact Significance (-ve) to the proposed development and following mitigation a LOW (+ve and -ve) Palaeontological Impact Significance. He proposed a walkdown of the final layout of the turbines, roads as well as electricity infrastructure and that a Chance find procedure should be implemented if substantial fossils remains (e.g., trace fossils like trackways and fossil burrows or vertebrate bones and teeth or plant fossils) are uncovered by excavations in the development footprint. He added Best Practice mitigation measures that includes employing a palaeontologist during the construction phase, establishing an on-site curation facility as well as identifying a repository for the collected specimens. These mitigation measures should be incorporated in the Environmental Management Plan (EMP) for the project.

The SAHRA letter of 3 October 2018, SAHRA stated that the Final comment issued by SAHRA were not included in the EA of the WEF. However, the Environmental Authorisation was still granted (DEA Ref: 14/12/16/3/3/2/686). The original Umsinde Emoyeni WEF also did not approve the original Environmental Management Programme for these developments and the amendments had to include all recommendations and mitigation measures mentioned in the specialist studies. Heritage Western Cape also never issued a final comment on the Wind Energy Facilities located in the Western Cape.

In the original Impact Study, no Cumulative Impacts were considered as the proposed development was the only development in a 30 to 50 km radius. With the LOW impact significance assigned to the proposed development it is concluded that the Cumulative rating will probably be LOW pre mitigation and Very LOW post mitigation.

1.2 Technical Information

Umsinde Emoyeni Wind Farm (Pty) Ltd is proposing to establish the 147 MW Umsinde Emoyeni Wind Energy Facility and associated infrastructure. The Environmental Authorisation (DFFE Ref: 14/12/16/3/3/2/686) for the proposed wind energy facility was granted on 06 September 2018 and amended on 20 April 2021 and the latest amendment on the 07 June 2022. The Umsinde Emoyeni Wind Energy Facility and associated infrastructure is located near the town of Murraysburg in the Beaufort West Local Municipality in the Western Cape Province. The proposed wind energy facility is located within the Beaufort West Renewable Energy Development Zone (REDZ). The authorised Umsinde Emoyeni WEF has been registered as a Strategic Integrated Project (SIP) as per the embedded generation investment programme with the Department of Public Works and Infrastructure.

The project will include the following infrastructure as authorised:

- Up to 33 wind turbines (capped at 147MW total capacity) with a hub height of up to 160m, blade length of 90m and rotor diameter of up to 180m;
- Permanent Hard standing area of up to 55m by 35m at each turbine;
- Three Temporary Laydown areas of up to 150m by 60m each;
- Temporary turbine laydown areas;
- Electrical cabling and on-site substation;
- Existing farm access tracks and watercourse crossings will be upgraded;
- Internal access roads;
- On-site office compound, including site offices, parking and an operation and maintenance facility including a control;
- Anemometer masts;
- Security fencing
- CCTV monitoring towers

The following properties have been identified for the Umsinde Emoyeni Wind Energy Facility and associated infrastructure

- Portion 3 (Portion of Portion 1) of the Farm Driefontein No.26
- Portion 7 (De Tafel) Portion of Portion 2) of the Farm Driefontein No.26
- Portion 10 (Portion of Portion 1 of the Farm Driefontein No.26
- Remainder of Portion 2 of Farm Driefontein No.26
- Portion 1 of the Farm Klein Driefontein No.152
- Remainder of the Farm Klein Driefontein No.152
- Portion 2, portion of Portion 9 of Farm Witteklip 32
- Remainder of the Farm De Hoop No. 30
- Portion 4 of the Farm De Hoop No.30

Umsinde Emoyeni Wind Farm (Pty) Ltd has commissioned Nala Environmental (Pty) Ltd to undertake the ground truthing and subsequent finalisation of the EMPrs in terms of NEMA EIA Regulations. As per the conditions of the Environmental Authorisations, independent specialist walkthrough's have been undertaken to inform the final layout and final Environmental Management Programme for the wind

energy facility and associated infrastructure (including (Turbines hardstands/ crane pads/ turbine laydowns within a 150m radius of the turbine base.

- Roads & MV cables: 150m either side of centreline (i.e., 300m wide corridor)
- -Substation: 300m radius around substation
- Turbines: 200m radius around WTG.

1.3 Locality

The proposed Umsinde WEF development area is located in the Western Province about 20km north-east of the town of Murraysburg (**Figure 1-2**).

Table 2 – Umsinde WEF Locality

Location	The proposed WEF is situated about 20km north-east of Murraysburg, in the Western Cape Province. It is located within the Beaufort West Local Municipality, Central Karoo District Municipality
Property	• Portion 3 (Portion of Portion 1) of the Farm Driefontein No.26 • Portion 7 (De Tafel) Portion of Portion 2) of the Farm Driefontein No.26 • Portion 10 (Portion of Portion 1 of the Farm Driefontein No.26 • Remainder of Portion 2 of Farm Driefontein No.26 • Portion 1 of the Farm Klein Driefontein No.152 • Remainder of the Farm Klein Driefontein No.152 • Portion 2, portion of Portion 9 of Farm Witteklip 32 • Remainder of the Farm De Hoop No. 30 • Portion 4 of the Farm De Hoop No.30
Topographic Map	**WEF:** 3123DD Murraysburg and 3124CC Winterhoek

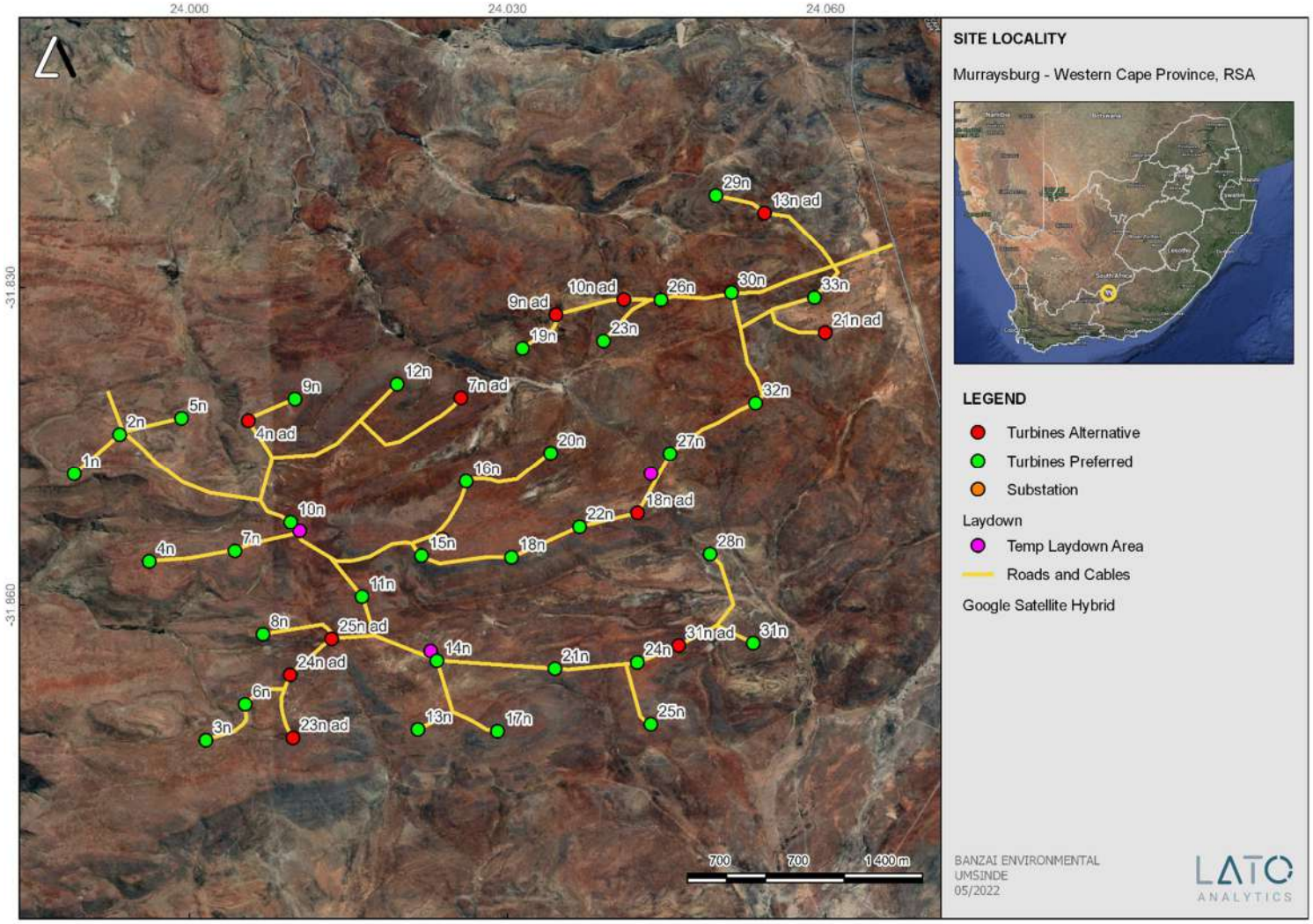


Figure 1 – Google Earth (2021) image of the proposed Umsinde Emoyeni WEF walkdown layout near Murraysburg in the Western Cape Province.

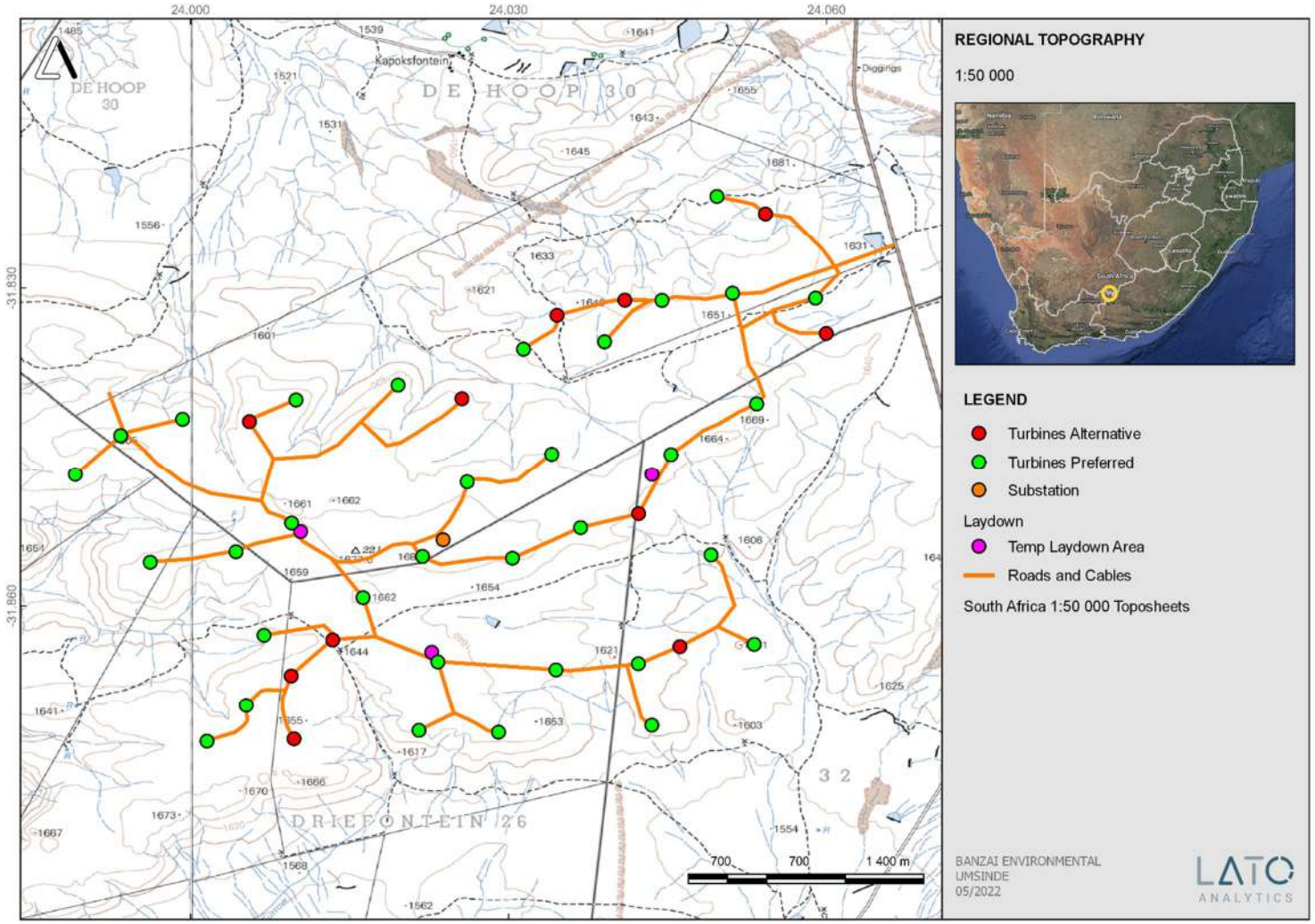


Figure 2 – Locality Map of the proposed Umsinde Emoyeni WEF walkdown layout near Murraysburg in the Western Cape Province.

(1:50 000 Topographical maps 3123DD Murraysburg and 3124CC Winterhoek)

1.4 General Site description

The proposed Umsinde WEF development area is located in the Western Cape Provinces about 20km north-east of the town of Murraysburg. The WEF is accessible via the R63 as well as by informal dirt roads. The proposed WEF development is located in the arid Karoo that is sparsely to moderately vegetated. The study area has been disturbed by local infrastructure that includes the construction of local roads, fences, radio masts and windmills. The WEF study area is in a rural setting and much of the farmland is utilised for grazing (cattle, sheep, goats and game).

The landscape of the area consists of flat flood plains, hills, ridges, gullies and rocky outcrops. The flood planes were mantled by vegetation (normally sparce to moderately vegetated but with the rainfall this season vegetation was dense). Rainfall varies between 500mm in the eastern mountain regions (Sneeuberge) to 200mm in the western parts area. In wintertime snow occurs in the mountains. The summers are hot while the winters are cold and windy.

The vegetation type is Upper Karoo Hardeveld and Eastern Upper Karoo (Mucina & Rutherford, 2006; Sanbi, 2022). Sour grass and fynbos are present in the mountains while karooveld is typical in most of the region. Shrubs and *Acasia karoo* (thorn trees) are present along watercourses.

The Upper Karoo Hardeveld vegetation consist of "*Steep slopes of Koppies, butts, mesas and parts of the Great Escarpment covered with large boulders and stones supporting sparse dwarf Karoo scrub with drought-tolerant grasses of genera such as Aristida, Eragrostis and Stipagrostis*" (Mucina & Rutherford, 2006).

And the Eastern Upper Karoo vegetation is characterised by "*Flats and gently sloping plains (interspersed with hills and rocky areas of Upper Karoo Hardeveld in the west, Besemkaree Koppies Shrubland in the northeast and Tarkastad Montane Shrubland in the southeast), dominated by dwarf microphyllous shrubs, with 'white' grasses of the genera Aristida and Eragrostis (these become prominent especially in the early autumn months after good summer rains). The grass cover increases along a gradient from southwest to northeast"* (Mucina & Rutherford, 2006; Sanbi, 2022).

Figure 3 – Typical low vegetation with deposition of sand during the recent rains.

Figure 4 – Dolerite koppie with dense grassy vegetation in the foreground.

Figure 5 – Dolerite outcrop

Figure 6 – Typical view of the development footprint (low vegetation without outcrops)

The proposed Umsinde WEF falls entirely within the Renewable Energy Development Zone (REDZ) 11 (Beaufort-West REDZ), which was officially gazetted on 16 February 2018 by the Minister of Environmental Affairs (GN 114).

2 ASSESSMENT METHODOLOGY

In their Final Comment issued on 16-03-2018 SAHRA requested:

- a pre-construction walkdown of the final turbine layout, roads, cables, associated infrastructure and laydown areas.
- Chance finds procedure should be set in place and implemented if substantial fossils remain (e.g., trace fossils like trackways and fossil burrows or vertebrate bones and teeth or plant fossils) are uncovered by excavations in the development footprint

2.1 Physical Survey and Assessment:

An overall 6-day site-specific field survey of the development footprint was conducted on foot and by 4x4 motor vehicle during April and May 2022. (The field was extremely wet in April and the site visit

was postponed to May 2022, although circumstances had not much improved). Photographs of topography were taken, logged and mapped.

2.2 Assumptions and Limitations

The Umsinde WEF development is underlain by the Permian bedrocks of the Lower Beaufort Group (Karoo Supergroup) as well as highland areas (koppies) underlain by Karoo dolerite. The Beaufort Group has a Very High Palaeontological Significance while that of the Karoo Dolerite is Zero as it is unfossiliferous. Thus, only development areas underlain by a High Palaeontological Sensitivity has been surveyed.

No fossil heritage was located during the walkdown but it does not imply that the area is unfossiliferous. The absence of fossils during this walkdown may be attributed to vegetation cover and unexposed fossils in the Umsinde WEF study area. If undocumented fossils are uncovered during the construction phase of the development the Chance Find Protocol included in this report should be implemented immediately.

Extensive fieldwork by South African researchers have been conducted in the Murraysburg area and over time almost 2000 fossils have been collected. These fossils are now housed Museums in South Africa. This information has been included in this report.

3 GEOLOGICAL AND PALAEONTOLOGICAL HERITAGE

The proposed Umsinde WEF development is depicted on two 1:250 000 Geological Maps (Council of Geoscience, Pretoria; **Figure 7; Table 4-5**). The largest portion of the development is depicted on the 1:250 000 Victoria West 3122 (1989) Geological Map in the west while a small portion of the development is depicted on the 3124 Middelburg (1997) Geological Map in the east. These maps indicates that the proposed development is underlain by the Balfour (Pb, green) Formation of the Adelaide Subgroup (Beaufort Group, Karoo Supergroup) while large areas of the development footprint are underlain by Jurassic dolerite (Jd, red). Recent Shape files compiled by the Council of Geosciences (Pretoria) is depicted in **Figure 8**.

The PalaeoMap of the South African Heritage Resources Information System indicates that the Palaeontological Sensitivity of the Jurassic Dolerite is Zero as it is igneous in origin (and thus unfossiliferous) while that of the Adelaide Subgroup is Very High (Almond and Pether, 2009; Almond *et al*., 2013, **Figure 8**).

The proposed turbine, access roads and associated infrastructure is largely concentrated on the higher-lying areas in the central areas of the proposed development. These areas are underlain by Karoo dolerite while a relatively small area of the development is underlain by potentially fossiliferous Lower Beaufort sedimentary bedrocks and older consolidated alluvium. Beaufort Group Formations represented in the development footprint is the *Cistecephalus* en *Daptocephalus* Assemblage Zones of the Adelaide Subgroup (Beaufort Group, Karoo Supergroup). These Assemblage Zones include gorgonopsians, therocephalian and cynodont (Therapsid) predators as well as herbivorous dicynodonts. Tetrapod groups are well represented in the Lower Bedford Group exposures. Trace fossils include invertebrate trace fossils as well as vertebrate burrows. Plant remains include those of vascular plants.

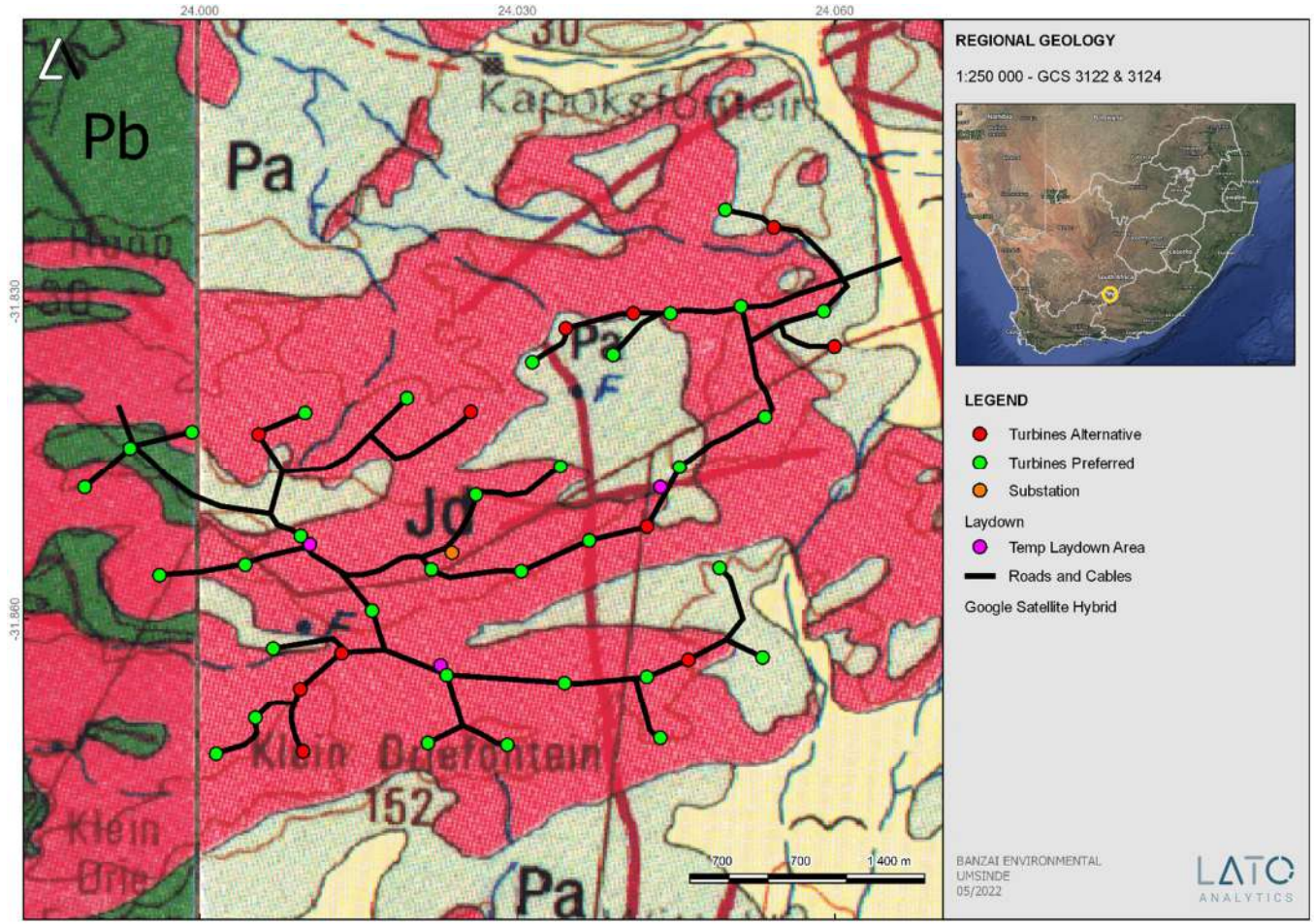


Figure 7 – Extract of the 1:250 000 Victoria West 3122 (1989) and 3124 Middelburg (1997) Geological map (Council of Geoscience, Pretoria) indicating the surface geology of the walkdown layout. The proposed development is mainly underlain by the Jurassic dolerite (Jd), while the rest is underlain by the by the Balfour (Pb, green), Adelaide Subgroup (Beaufort Group, Karoo Supergroup.

Table 3 – Legend of the 1:250 000 3122 Victoria West Geological map (1989) (Council of Geoscience, Pretoria)

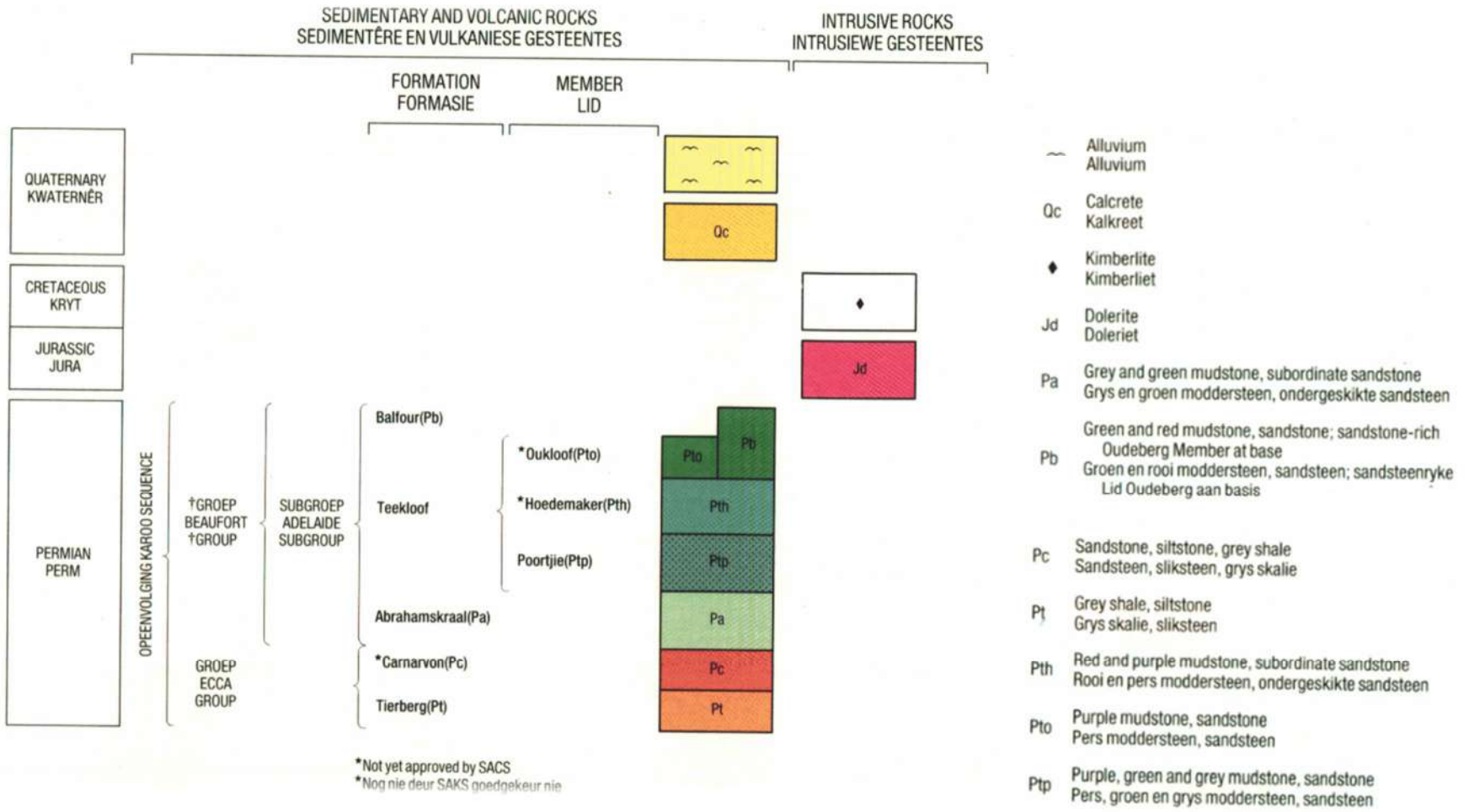
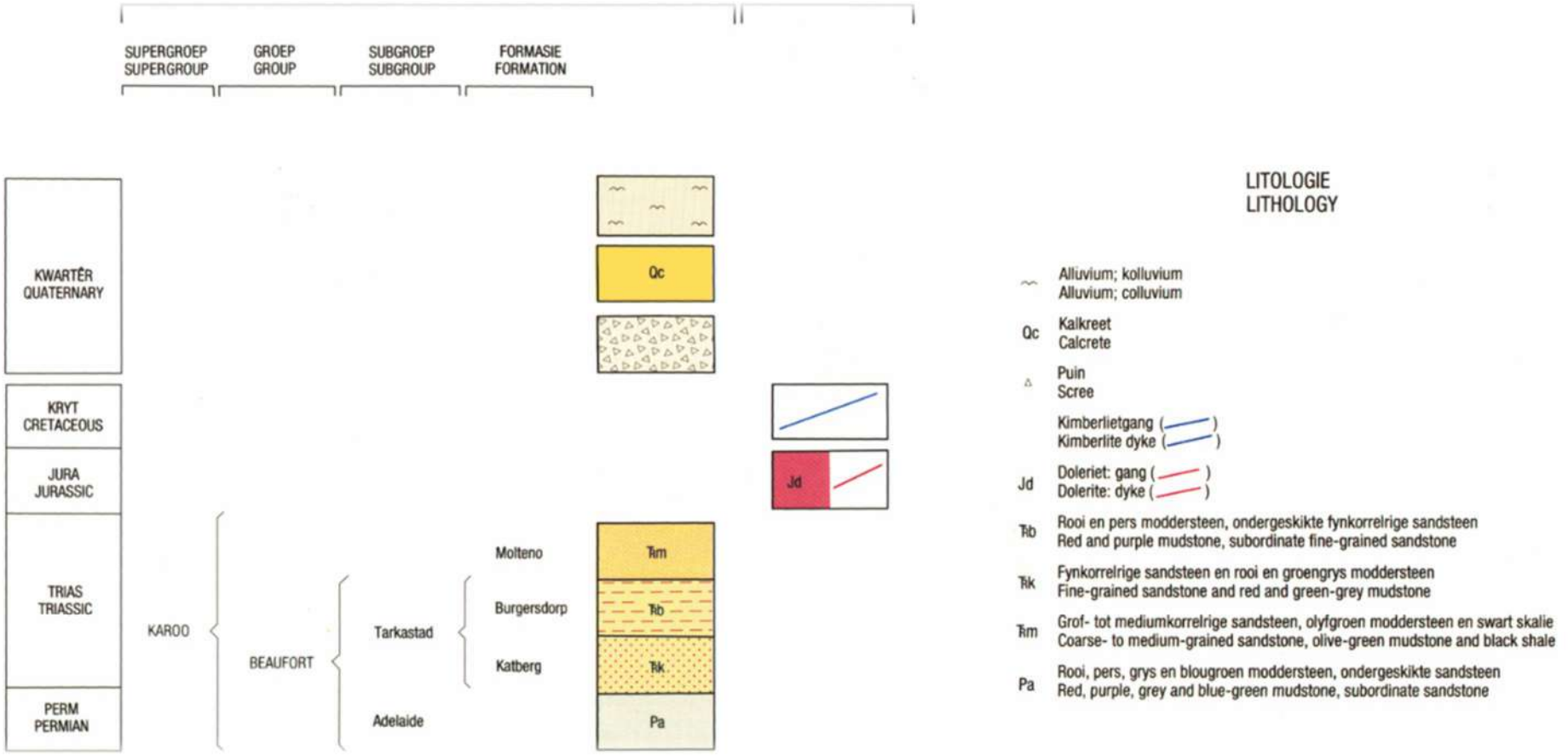


Table 4 – Legend of the 1:250 000 Middelburg 3124 (1997) Geological Map (Council of Geoscience, Pretoria).



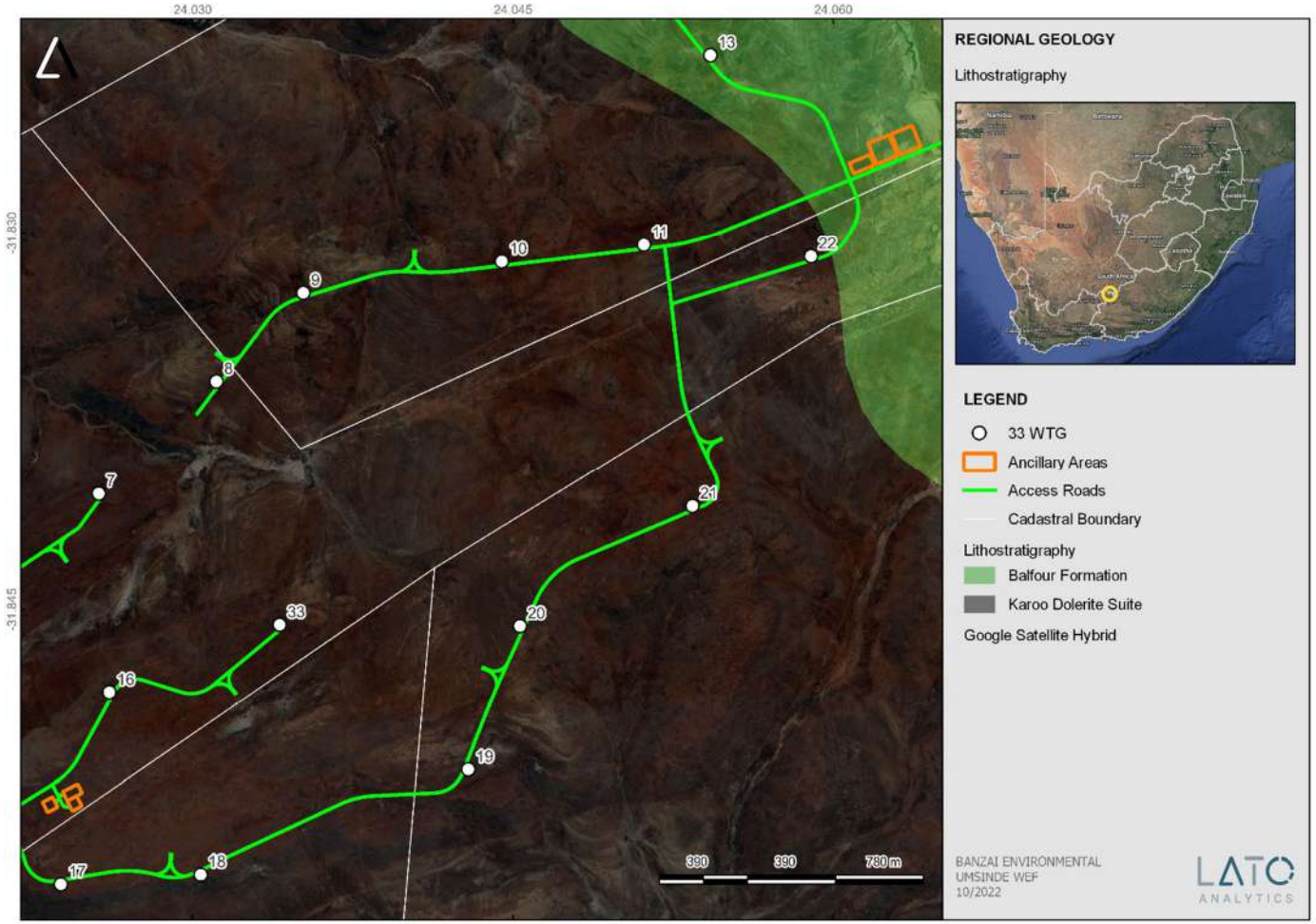


Figure 8 – Updated geology (compiled by the Council of Geosciences, Pretoria) indicates that the proposed walkdown layout is underlain the Balfour Formation of the Beaufort Group (Karoo Supergroup) and mainly by Jurassic Dolerite.

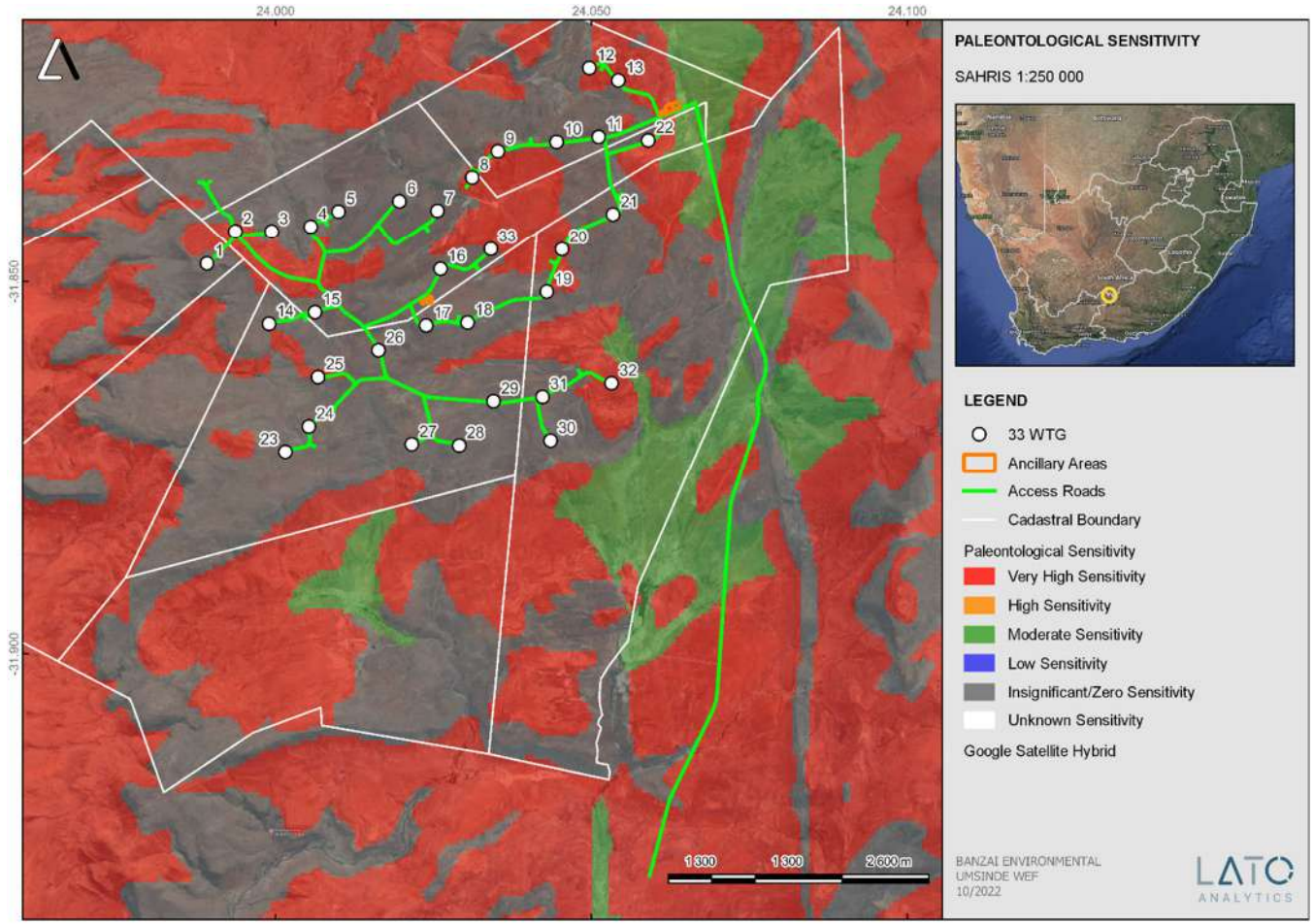


Figure 9 – SAHRIS PalaeoMap indicating the Palaeontological Sensitivity of the proposed walkdown layout.

According to the SAHRIS Palaeosensitivity map (**Figure 9)** the proposed development is underlain by sediments with a Very High (red), Moderate (green) and Zero (grey) Palaeontological Sensitivity.

Table 5 – Palaeontological Sensitivity on SAHRIS

Colour	Sensitivity	Required Action
RED	**VERY HIGH**	**field assessment and protocol for finds is required**
ORANGE/YELLOW	HIGH	desktop study is required and based on the outcome of the desktop study; a field assessment is likely
GREEN	MODERATE	desktop study is required
BLUE	LOW	no palaeontological studies are required however a protocol for finds is required
GREY	**INSIGNIFICANT/ZERO**	**no palaeontological studies are required**
WHITE/CLEAR	UNKNOWN	these areas will require a minimum of a desktop study. As more information comes to light, SAHRA will continue to populate the map.

The colours on the PalaeoMap indicate the following degrees of sensitivity: red = very highly sensitive; orange/yellow = high; green = moderate; blue = low; grey = insignificant/zero.

4 FINAL LAYOUTS OF THE UMSINDE EMOYENI WIND ENERGY FACILITY

Final layouts of the proposed development were compiled after careful assessments of all specialist reports during the walkdown. The updated layout of the Umsinde WEF indicates that the WEF is located on dolerite koppies with only a very small area in the north-east underlain by the Balfour Formation (Beaufort Group, Karoo Supergroup).

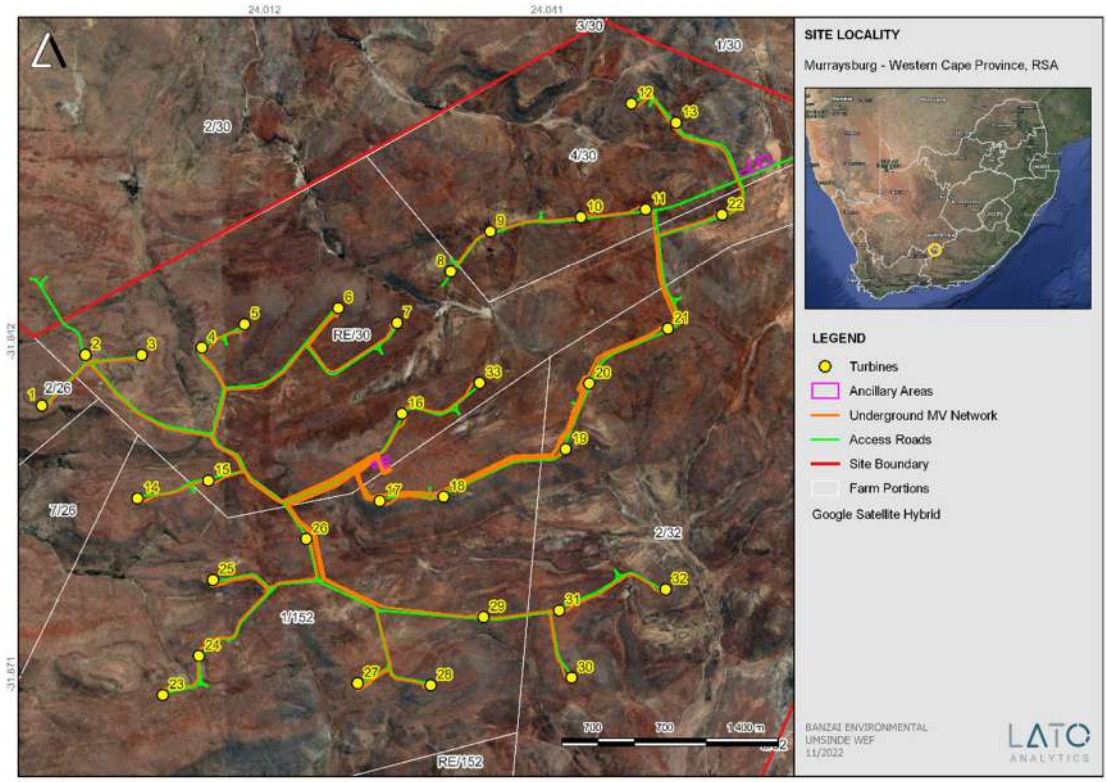


Figure 10 – Extract of Google Earth (2022) indicating the final layout of the Umsinde Emoyeni Wind Energy Facility

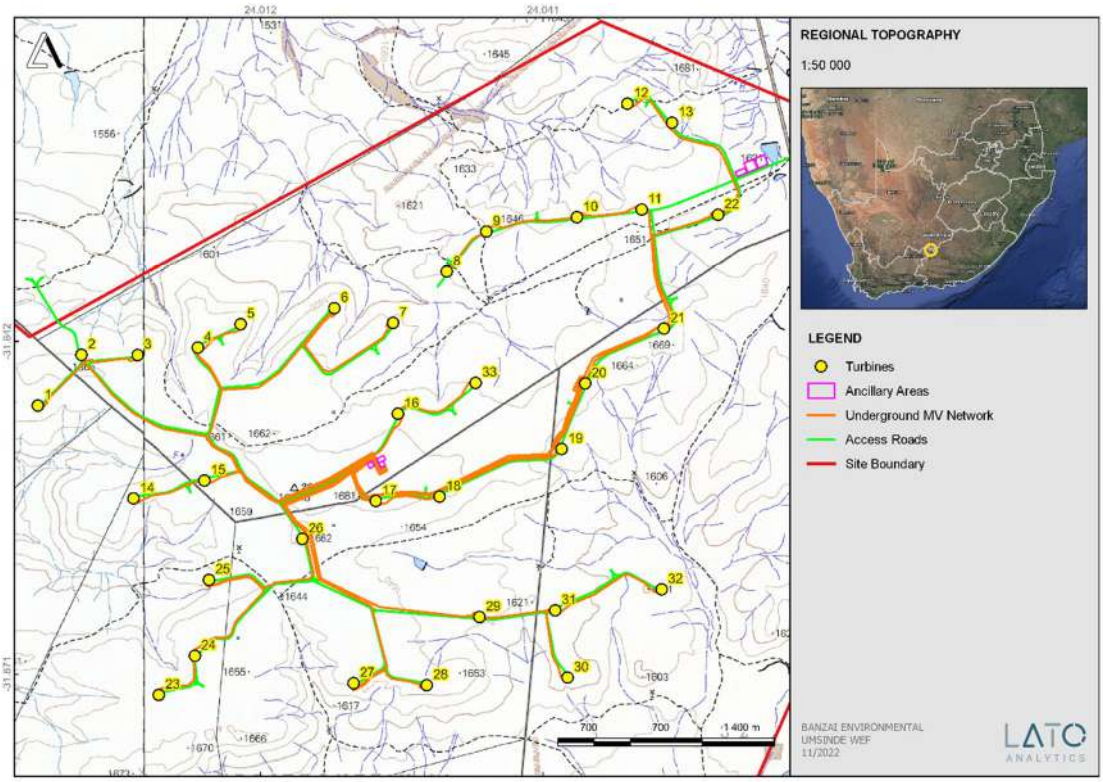


Figure 11 – Topographic Image indicating the final layout of the Umsinde Emoyeni Wind Energy Facility.

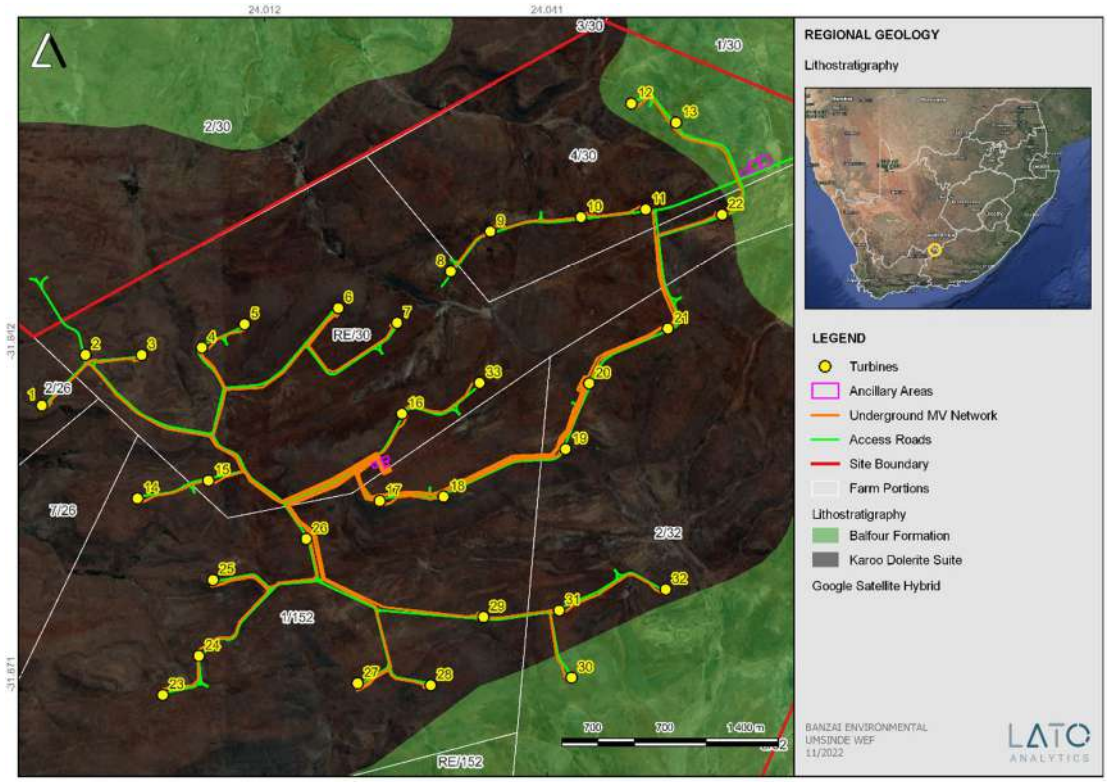


Figure 12 – Updated geology (compiled by the Council of Geosciences, Pretoria) of the Final Umsinde layout indicates that the proposed development is underlain by a very small portion of the Balfour Formation (Beaufort Group, Karoo Supergroup) while the largest portion of the development is underlain by Jurassic Dolerite.

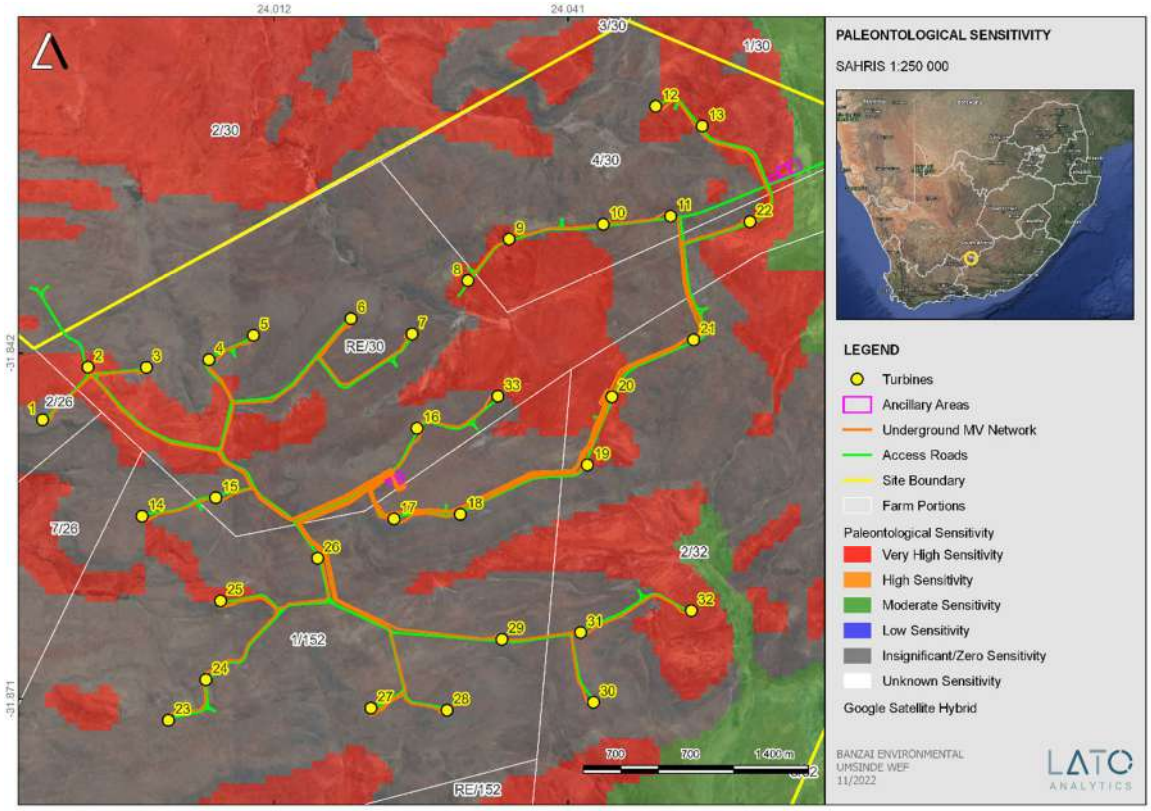


Figure 13 – SAHRIS PalaeoMap of the final Umsinde WEF layout

The wind turbines and infrastructure of the final layouts are mostly located on unfossiliferous dolerite koppies and only a portion of an access road is underlain by the Balfour Formation. The geology of the updated layout is thus similar to the layouts of the walkdowns of the Umsinde WEF and thus there is no difference in the acceptability of the updated and previous Umsinde WEF layout. As such there is no objection to the proposed layout and final alignment of the updated layouts of the Umsinde WEF and associated infrastructure from a palaeontological perspective.

5 ASSESSMENTS OF IMPACTS

5.1 Assessment of impact to Palaeontological Resources

Based on the Palaeontological walkdown assessment for this project, the area planned for the Umsinde WEF development has an overall low palaeontological sensitivity. No fossil heritage was located during the walkdown but it does not implicate that the area is unfossiliferous. It is not likely that the proposed development of the turbines, roads and electrical infrastructure associated with the Umsinde WEF will have a negative impact on significant palaeontological heritage. Furthermore, all recommended mitigation measures from the approved Umsinde WEF (Hart and Almond, 2015) will be applied.

6 LEGISLATION

6.1 National Heritage Resources Act (25 of 1999)

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**".

The identification, evaluation and assessment of any cultural heritage site, artefact or finds in the South African context is required and governed by the following legislation:

- National Environmental Management Act (NEMA) Act 107 of 1998
- National Heritage Resources Act (NHRA) Act 25 of 1999
- Notice 648 of the Government Gazette 45421- general requirements for undertaking an initial site sensitivity verification where no specific assessment protocol has been identified.

The next section in each Act is directly applicable to the identification, assessment, and evaluation of cultural heritage resources.
GNR 982 (Government Gazette 38282, 14 December 2014) promulgated under the National Environmental Management Act (NEMA) Act 107 of 1998

- Basic Assessment Report (BAR) – Regulations 19 and 23
- Environmental Impacts Assessment (EIA) – Regulation 23
- Environmental Scoping Report (ESR) – Regulation 21
- Environmental Management Programme (EMPr) – Regulations 19 and 23

National Heritage Resources Act (NHRA) Act 25 of 1999

- Protection of Heritage Resources – Sections 34 35, 36
- Heritage Resources Management – Section 38

The NEMA (No 107 of 1998) states that an integrated EMP should (23:2 (b)) "…*identify, predict and evaluate the actual and potential impact on the environment, socio-economic conditions and cultural heritage*".

In agreement with legislative requirements, EIA rating standards as well as SAHRA policies the following comprehensive and legally compatible PIA report have been compiled.

Palaeontological heritage is exceptional and non-renewable and is protected by the NHRA. Palaeontological resources and 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 forms part of the Heritage Impact Assessment (HIA) and adhere to the conditions of the Act. According to **Section 38 (1)**, an 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 300 m in length.
- the construction of a bridge or similar structure exceeding 50 m in length.
- any development or other activity which will change the character of a site—
- (Exceeding 5 000 m^2 in extent; or
- involving three or more existing erven or subdivisions thereof; or
- involving three or more erven or divisions thereof which have been consolidated within the past five years; or
- the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority
- the re-zoning of a site exceeding 10 000 m^2 in extent.
- or any other category of development provided for in regulations by SAHRA or a Provincial heritage resources authority.

7 CONCLUSIONS AND RECOMMENDATIONS

Based on the Palaeontological walkdown assessment for this project, the area planned for the Umsinde WEF development has an overall low palaeontological sensitivity. It is not likely that the proposed development of the turbines, roads and electrical infrastructure associated with the Umsinde WEF will have a negative impact on significant palaeontological heritage. All recommended mitigation measures from the approved Umsinde WEF (Hart and Almond, 2015) will be applied.

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APPENDIX 1

CHANCE FINDS PROTOCOL

The following procedure will only be followed if fossils are uncovered during excavation.
Adopted form Heritage Western Cape June 2016

Introduction

This document is aimed to inform workmen and foremen working on a construction and/or mining site. It describes the procedure to follow in instances of accidental discovery of palaeontological material during construction/mining activities. This protocol does not apply to resources already identified under an assessment undertaken under s. 38 of the National Heritage Resources Act (no 25 of 1999). Fossils are rare and irreplaceable. Fossils tell us about the environmental conditions that existed in a specific geographical area millions of years ago. As heritage resources that inform us of the history of a place, fossils are public property that the State is required to manage and conserve on behalf of all the citizens of South Africa. Fossils are therefore protected by the National Heritage Resources Act and are the property of the State. Ideally, a qualified person should be responsible for the recovery of fossils noticed during construction/mining to ensure that all relevant contextual information is recorded. Heritage Authorities often rely on workmen and foremen to report finds, and thereby contribute to our knowledge of South Africa's past and contribute to its conservation for future generations.

Training

Workmen and foremen need to be trained in the procedure to follow in instances of accidental discovery of fossil material, in a similar way to the Health and Safety protocol. A brief introduction to the process to follow in the event of possible accidental discovery of fossils should be conducted by the designated Environmental Control Officer (ECO) for the project, or the foreman or site agent in the absence of the ECO It is recommended that copies of the attached poster and procedure are printed out and displayed at the site office so that workmen may familiarise themselves with them and are thereby prepared in the event that accidental discovery of fossil material takes place.

Actions to be taken

One person in the staff must be identified and appointed as responsible for the implementation of the attached protocol in instances of accidental fossil discovery and must report to the ECO or site agent. If the ECO or site agent is not present on site, then the responsible person on site should follow the protocol correctly in order to not jeopardize the conservation and well-being of the fossil material. Once a workman notices possible fossil material, he/she should report this to the ECO or site agent.

Procedure to follow if it is likely that the material identified is a fossil:

- The ECO or site agent must ensure that all work ceases immediately in the vicinity of the area where the fossil or fossils have been found;
- The ECO or site agent must inform HWC of the find immediately. This information must include photographs of the findings and GPS co-ordinates;
- The ECO or site agent must compile a Preliminary Report and fill in the Fossil Discoveries: HWC Preliminary Record Form within 24 hours without removing the fossil from its original position.

The Preliminary Report records basic information about the find including:

- The date
- A description of the discovery
- A description of the fossil and its context (e.g. position and depth of find)
- Where and how the find has been stored
- Photographs to accompany the preliminary report (the more the better):
    - ➔ A scale must be used
    - ➔ Photos of location from several angles
    - ➔ Photos of vertical section should be provided
    - ➔ Digital images of hole showing vertical section (side);
    - ➔ Digital images of fossil or fossils.

Upon receipt of this Preliminary Report, HWC will inform the ECO or site agent whether or not a rescue excavation or rescue collection by a palaeontologist is necessary.

- Exposed finds must be stabilised where they are unstable and the site capped, e.g. with a plastic sheet or sand bags. This protection should allow for the later excavation of the finds with due scientific care and diligence. HWC can advise on the most appropriate method for stabilisation.
- If the find cannot be stabilised, the fossil may be collected with extreme care by the ECO or the site agent and put aside and protected until HWC advises on further action. Finds collected in this way must be safely and securely stored in tissue paper and an appropriate box. Care must be taken to remove the all-fossil material and any breakage of fossil material must be avoided at all costs.
- No work may continue in the vicinity of the find until SAHRA has indicated, in writing, that it is appropriate to proceed.

APPENDIX 2

ELIZE BUTLER

PROFESSION:	Palaeontologist
YEARS' EXPERIENCE:	30 years in Palaeontology

EDUCATION:	B.Sc Botany and Zoology, 1988 University of the Orange Free State
	B.Sc (Hons) Zoology, 1991 University of the Orange Free State
	Management Course, 1991 University of the Orange Free State
	M. Sc. *Cum laude* (Zoology), 2009 University of the Free State

Dissertation title: The postcranial skeleton of the Early Triassic non-mammalian Cynodont *Galesaurus planiceps*: implications for biology and lifestyle

MEMBERSHIP

Palaeontological Society of South Africa (PSSA)	2006-currently

EMPLOYMENT HISTORY

Part time Laboratory assistant	Department of Zoology & Entomology University of the Free State Zoology 1989-1992
Part time laboratory assistant	Department of Virology University of the Free State Zoology 1992
Research Assistant	National Museum, Bloemfontein 1993 – 1997
Principal Research Assistant and Collection Manager	National Museum, Bloemfontein 1998–currently

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