SAHRA Case ID: _____

BASIC PALAEONTOLOGICAL IMPACT ASSESSMENT

PROPOSED ESKOM MUISVLAKTE BATTERY ENERGY STORAGE SYSTEM, RICHTERSVELD MUNICIPALITY, NAMAKWALAND DISTRICT, NORTHERN CAPE

BY

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CLIENT

ESKOM

4 FEBRUARY 2019

FINAL

DECLARATION OF INDEPENDENCE

BASIC PALAEONTOLOGICAL IMPACT ASSESSMENT.

PROPOSED ESKOM MUISVLAKTE BATTERY ENERGY STORAGE SYSTEM, RICHTERSVELD MUNICIPALITY, NAMAKWALAND DISTRICT, NORTHERN CAPE.

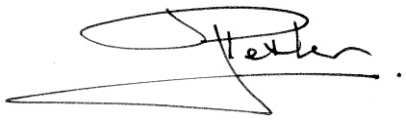
Terms of Reference

This assessment forms part of the Heritage Assessment and it assesses the overall palaeontological (fossil) sensitivities of formations underlying the Project Area.

Declaration

I …**John Pether**……, as the appointed independent specialist hereby declare that I:

- act/ed as the independent specialist in the compilation of the above report;
- regard the information contained in this report as it relates to my specialist input/study to be true and correct, and
- do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations, 2014 and any specific environmental management Act;
- have and will not have any vested interest in the proposed activity proceeding;
- have disclosed to the EAP any material information that has or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the NEMA, the Environmental Impact Assessment Regulations, 2014 and any specific environmental management act;
- have provided the EAP with access to all information at my disposal regarding the application, whether such information is favourable to the applicant or not; and
- am aware that a false declaration is an offence in terms of regulation 48 of the 2014 NEMA EIA Regulations.



Signature of the specialist

Date: 4 FEBRUARY 2019

CURRICULUM VITAE

John Pether, M.Sc., Pr. Sci. Nat. (Earth Sci.)

Independent Consultant/Researcher recognized as an authority with 38 years' experience in the field of coastal-plain and continental-shelf palaeoenvironments, fossils and stratigraphy, mainly involving the West Coast/Shelf of southern Africa. Has been previously employed in academia (South African Museum) and industry (Trans Hex, De Beers Marine). At present an important involvement is in Palaeontological Impact Assessments (PIAs) and mitigation projects in terms of the National Heritage Resources Act 25 (1999) (~300 PIA reports to date) and is an accredited member of the Association of Professional Heritage Practitioners (APHP). Continues to be involved as consultant to offshore and onshore marine diamond exploration ventures. Expertise includes:

- Coastal plain and shelf stratigraphy (interpretation of open-pit exposures, on/offshore cores and exploration drilling).
- Sedimentology and palaeoenvironmental interpretation of shallow marine, aeolian and other terrestrial surficial deposits.
- Marine macrofossil taxonomy (molluscs, barnacles, brachiopods) and biostratigraphy.
- Marine macrofossil taphonomy.
- Sedimentological and palaeontological field techniques in open-cast mines (including finding and excavation of vertebrate fossils (bones).

Membership of Professional Bodies

- South African Council of Natural Scientific Professions. Earth Science. Reg. No. 400094/95.
- Geological Society of South Africa.
- Palaeontological Society of Southern Africa.
- Southern African Society for Quaternary Research.
- Association of Professional Heritage Practitioners (APHP), Western Cape. Accredited Member No. 48.

Past Clients Palaeontological Assessments

AECOM SA (Pty) Ltd.	Guillaume Nel Environmental Management Consultants.
Agency for Cultural Resource Management (ACRM).	Klomp Group.
AMATHEMBA Environmental.	Megan Anderson, Landscape Architect.
Anél Blignaut Environmental Consultants.	Ninham Shand (Pty) Ltd.
Arcus Gibb (Pty) Ltd.	PD Naidoo & Associates (Pty) Ltd.
ASHA Consulting (Pty) Ltd.	Perception Environmental Planning.
Aurecon SA (Pty) Ltd.	PHS Consulting.
BKS (Pty) Ltd. Engineering and Management.	Resource Management Services.
Bridgette O'Donoghue Heritage Consultant.	Robin Ellis, Heritage Impact Assessor.
Cape Archaeology, Dr Mary Patrick.	Savannah Environmental (Pty) Ltd.
Cape EAPrac (Cape Environmental Assessment Practitioners).	Sharples Environmental Services cc
CCA Environmental (Pty) Ltd.	Site Plan Consulting (Pty) Ltd.
Centre for Heritage & Archaeological Resource Management (CHARM).	SRK Consulting (South Africa) (Pty) Ltd.
Chand Environmental Consultants.	Strategic Environmental Focus (Pty) Ltd.
CK Rumboll & Partners.	UCT Archaeology Contracts Office (ACO).
CNdV Africa	UCT Environmental Evaluation Unit
CSIR - Environmental Management Services.	Urban Dynamics.
Digby Wells & Associates (Pty) Ltd.	Van Zyl Environmental Consultants
Enviro Logic	Western Cape Environmental Consultants (Pty) Ltd, t/a ENVIRO DINAMIK.
Environmental Resources Management SA (ERM).	Wethu Investment Group Ltd.
Greenmined Environmental	Withers Environmental Consultants.

Stratigraphic consulting including palaeontology

Afri-Can Marine Minerals Corp	Council for Geoscience
De Beers Marine (SA) Pty Ltd.	De Beers Namaqualand Mines.
Geological Survey Namibia	IZIKO South African Museum.
Namakwa Sands (Pty) Ltd	NAMDEB

CONTENTS

SUMMARY

The electricity power supply network in the Port Nolloth area is currently overstrained. To alleviate the demand ESKOM proposes to install a 2-Megawatt hour Battery Energy Storage System (BESS) for the purpose of load leveling at the Muisvlakte Substation, just north of Port Nolloth (Figure 1).

The Site Development Plan (Figure 2) shows that the footprint of the installation is small relative to the Alexkor mining operations (Figure 4). The battery units will be placed on slabs which will be shallowly embedded in the surficial sands (150 mm). Other subsurface disturbances which may be involved in construction are also likely to be of limited extent and/or of superficial depth. It is anticipated that only the surficial coversand of the site and the underlying surface of calcrete will be affected.

The abundance of fossil bone material in the affected deposits is very sparse. Given the small excavation footprint, the improbability of a find of fossil bones and the expected, geologically-recent ("sub-fossil") age of any material that might occur, it is considered that the anticipated palaeontological impact of the installation of the Muisvlakte Battery Energy Storage System is LOW. Nevertheless, a Fossil Finds Procedure is provided in case of a chance find of buried fossil or archaeological material (Appendices 3 & 4).

There are no impediments to the construction of the Muisvlakte Battery Energy Storage System in terms of palaeontological sensitivity and no pre-construction mitigation requirements.

Palaeontological sensitivity GIS mapping: A GIS shape file is not appended as the site has a uniform rating of LOW applicable to shallow excavations in the coversands.

1 BACKGROUND

The electricity power supply network in the Port Nolloth area is currently overstrained. To alleviate the demand ESKOM proposes to install a 2-Megawatt hour Battery Energy Storage System (BESS) for the purpose of load leveling at the Muisvlakte Substation, just north of Port Nolloth (Figure 1). Environmental Impact Management Services (EIMS) has been appointed by Eskom to conduct the Basic Assessment process and the Agency for Cultural Resource Management (ACRM) is undertaking the Heritage Assessment.

The intention of this brief report is to provide a summary of the main aspects of the geology and the palaeontological sensitivity of the proposed site. It is concluded that, due to the low fossil potential and the limited extend of earth works, the project will have low palaeontological impact. Nevertheless, a basic Fossil Finds Procedure is provided in case of a chance find of buried fossil or archaeological material.

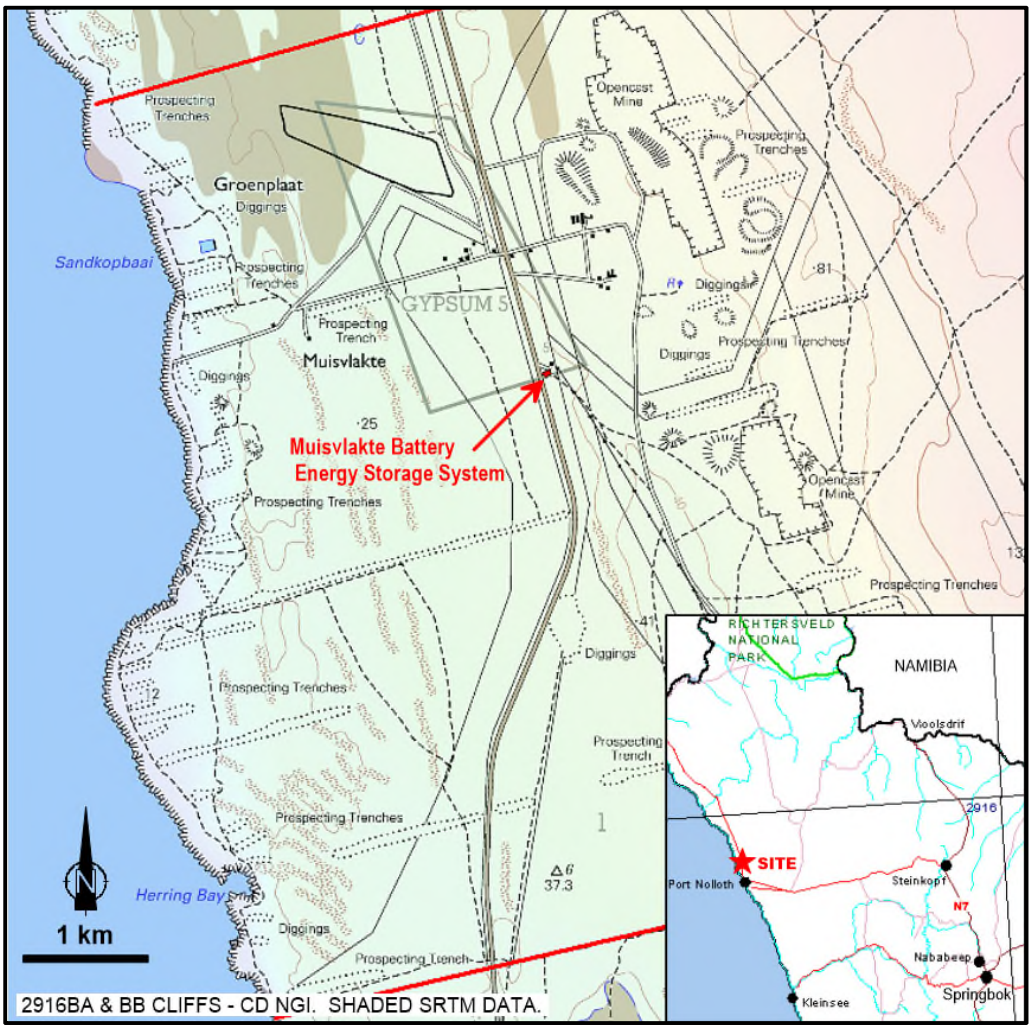


Figure 1. Location of the proposed Muisvlakte Battery Energy Storage System.

2 LOCATION

The site is situated in the Richtersveld Municipality of the Namakwa District Municipality, in the Namakwaland Magisterial District of the Northern Cape Province. The Muisvlakte Substation is ~7 km north of Port Nolloth on the coastal farm originally named “Muisvlak”

(Figure 1). Muisvlak is now incorporated into Farm 1, the combined coastal properties of the state-owned Alexkor diamond mine.

1:50 000 Topo-cadastral Sheet 2916BA & BB CLIFFS. CD NGI.

1:250 000 Geological Sheet 2916 SPRINGBOK. Council for Geoscience.

Centre co-ordinate of BESS: -29.190809 °S / 16.869382 °E.

3 LOCALITY PLAN

See Figure 1.

4 DESCRIPTION OF THE PROPOSED DEVELOPMENT

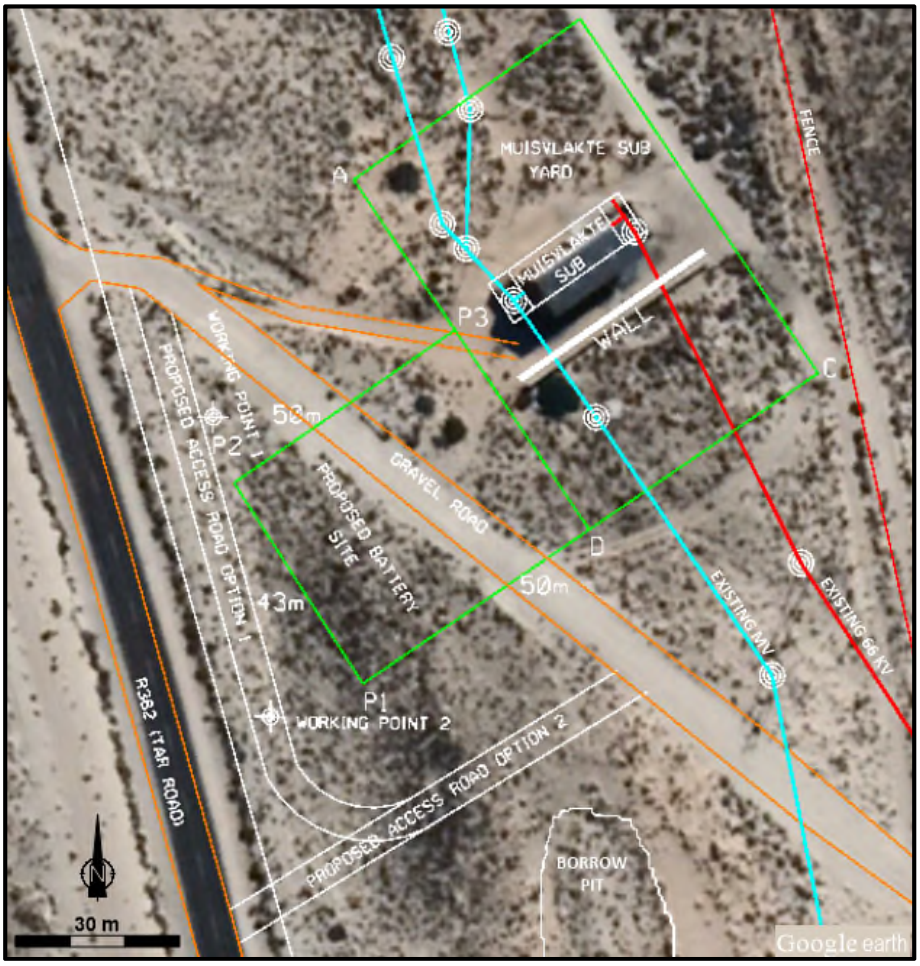


Figure 2. Site Development Plan of the proposed Muisvlakte Battery Energy Storage System.

The Site Development Plan (Figure 2) shows that the footprint of the installation is small relative to the Alexkor mining operations (Figure 4). The battery units will be placed on slabs which will be shallowly embedded in the surficial sands (150 mm). Other subsurface disturbances which may be involved in construction are also likely to be of limited extent and/or of superficial depth.

5 HERITAGE RESOURCES IDENTIFIED

The bedrock of the area consists of metasediments and lavas of the **Gariep Supergroup** of Neoproterozoic age ~770-550 Ma (Ma = million years ago) (Minnaar *et al*., 2011; Marais *et al*., 2001). The Vredefontein Formation underlies Muisvlak farm (Figure 3, Nvr) and is comprised of quartzites, sandstones and some metavolcanics. It is exposed along the rocky shore and in the mine pits and is not of palaeontological concern.

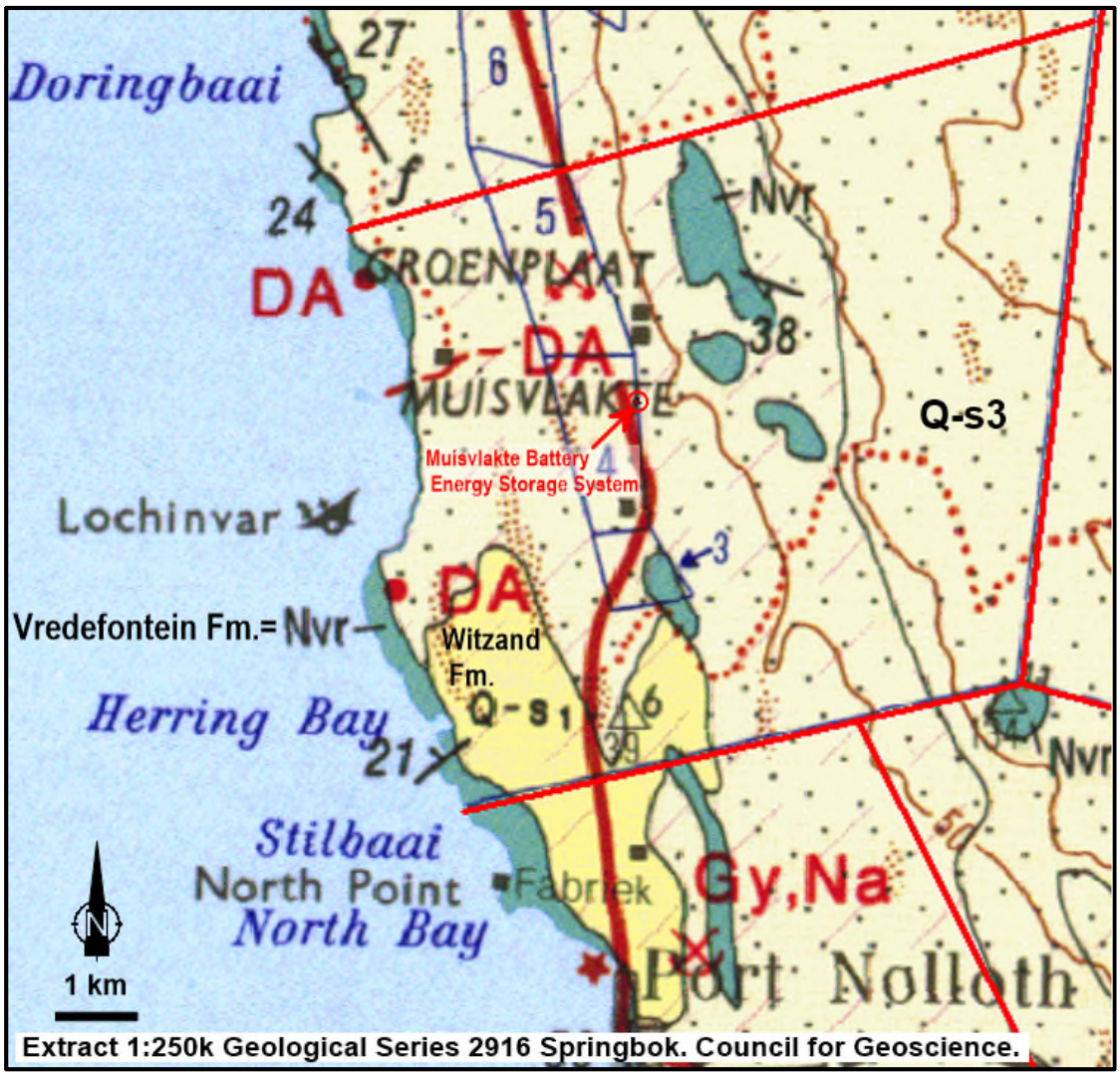


Figure 3. Surface geology of the Muisvlak area.

The coastal plain was largely inundated by the sea during periods of global warmth at about 16 million years ago (Ma), again at about 5 Ma and the last major marine transgression took place around 3 Ma. When the sea retreated during the intervening periods of global cooling the corresponding marine formations bearing extinct fossil faunas were deposited, *viz*. the mid-Miocene Kleinzee Formation, the early Pliocene Avontuur Formation and the late Pliocene Hondeklipbaai Formation. Respectively, these formations occupy the bedrock terraces areas named the Grobler, Upper and Middle terraces in Alexkor terminology. The Lower Terrace is overlain by three, successive mid to late Quaternary “raised beaches” comprised of shelly sands and gravels with ages of about 400 ka (ka = thousand years), about 125 ka (the Last Interglacial and 7—3 ka (the Holocene High).

Terrestrial formations overlie the wind-eroded surfaces of the marine deposits and consist mainly of dune and sandsheet deposits, with embedded pan and stream deposits in places and colluvial deposits shed off nearby bedrock hill slopes. These older terrestrial sands are now consolidated to cemented and of reddish and brown hues due to pedogenic, soil-forming processes. The sequence is capped by a major calcrete. Although the fossils of land animals are quite sparse in these formations, they have been the source of fossil finds which have been critical for insights into their ages and the ancient faunas of Namaqualand.

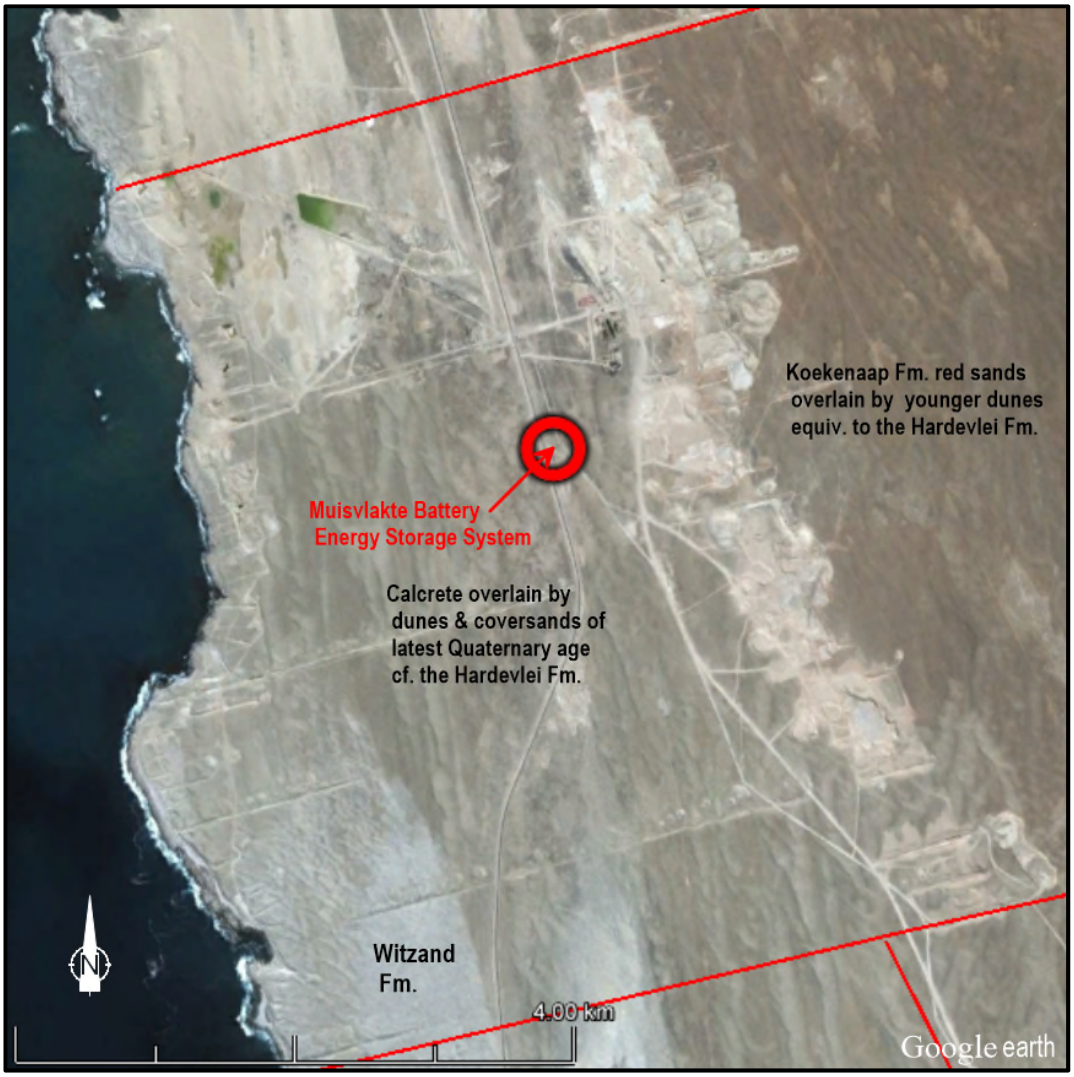


Figure 4. Coversand formations of the Muisvlak area.

The hard surface on top of the older terrestrial formations is overlain by unconsolidated dunes and sand sheets varying from older, reddened, quasi-stable coversands and degraded dunes, intermediate-age, semi-mobile dunes of paler pink to yellow hues, and active, white to pale grey dunes. On the geological map the surficial coversands are included in the category "White to light pink sand" (Figure 3, Q-s3) and only the active coastal dune plume is distinguished (Q-s1, Witzand Formation). Now that detailed colour aerial imagery has become freely available (Figure 4) the surficial cover of the coastal plain can be analysed and mapped in more detail. The general equivalents of the formations proposed by De Beer (2010) are indicated (Figure 4).

6 ANTICIPATED IMPACTS ON PALAEONTOLOGICAL HERITAGE RESOURCES

Due to the shallow nature of earth works involved in the proposed installation of the Muisvlakte Battery Energy Storage System, it is anticipated that only the surficial coversand of the site will be affected. This loose sand is evidently not very thick in the vicinity and is closely underlain by the calcrete capping of the older aeolian formation/s. It is probable that this underlying calcrete surface will be exposed during construction of the slab foundations.

Based on observations wider afield, the bones and shells enclosed in the shallow coversands are usually in an archaeological context, along with artefacts. Fossil bones in the coversands deposited due to natural mortality, predation and scavenging are quite rare and burial is required for preservation, such as being covered by sand, or being cached in burrows by small carnivores or hyaenas.

Material previously in the coversand has also been concentrated by periodic sand movement onto the calcrete surface beneath the loose sands. Consequently, the concentrated material may include fossils of different ages, origins and states of preservation and both Middle and Late Stone Age artefacts. The fossil bones may also be much degraded by long-term exposure before final burial and be comprised of mainly nondescript fragments with scattered teeth, the latter being very important for their diagnostic value.

In view of the decreasing prevalence of archaeological material with distance from the coast and the very patchy occurrence of archaeological sites and non-anthropogenic fossil bone occurrences, the probability of a palaeontological find is low. Due to the active aeolian environment, the expected age of any preserved material is geologically young (“sub-fossil”), of latest Quaternary age, and is likely to represent members of the modern fauna.

In conclusion, the overall abundance of fossil bone material in the affected deposits is very sparse. Given the low palaeontological sensitivity and the small excavation footprint it is improbable that a concentration of fossil bones will be encountered. The anticipated palaeontological impact of the installation of the Muisvlakte Battery Energy Storage System is therefore LOW.

7 RECOMMENDATIONS

In view of the above, no additional palaeontological study is required prior to installation of the Muisvlakte Battery Energy Storage System.

The small excavation footprint and context renders a significant fossil find improbable, but it may be pointed out that chance discoveries in shallow coversands have occasionally occurred during the construction of developments on the coastal plains.

It is recommended that a requirement to be alert for a possible chance fossil bone find (and buried archaeological material) be included in the Environmental Management Programme (EMP) for the installation of the proposed Muisvlakte Battery Energy Storage System. Appendix 3 outlines measures for the EMP and Appendix 4 provides the Fossil Finds Procedure.

8 REFERENCES

Almond, J.E. & Pether, J. 2009. Palaeontological Heritage of the Northern Cape. SAHRA Palaeotechnical Report, Natura Viva cc., Cape Town.

De Beer, C.H. 2010. The Geology of the Garies Area. Explanation: 1:250000 Sheet 3017 Garies. Council for Geoscience South Africa. 100 pp

Marais, JAH., Agenbacht, ALD., Prinsloo, M. & Basson, WA. 2001. The Geology of the Springbok Area. Explanation: 1:250000 Geology Sheet 2916 Springbok. Council for Geoscience, Pretoria. 103 pp.

Minnaar, H., Botha, P.W.M., Macey, P.H. & Roberts, D. 2011. The Geology of the Alexander Bay Area. Explanation: 1:250000 Sheet 2816 Alexander Bay. Council for Geoscience.

9 APPENDIX 1. IMPACT ASSESSMENT – CONSTRUCTION PHASE

9.1 NATURE OF THE IMPACT OF BULK EARTH WORKS ON FOSSILS

Fossils are rare objects, often preserved due to unusual circumstances. This is particularly applicable to vertebrate fossils (bones), which tend to be sporadically preserved and have high value with respect to palaeoecological and biostratigraphic (dating) information. Such fossils are non-renewable resources. Provided that no subsurface disturbance occurs, the fossils remain sequestered there.

Overall the palaeontological sensitivity of coastal deposits is HIGH (Almond & Pether, 2009) due to previous fossil finds of high scientific importance. When excavations are made they furnish the "windows" into the coastal plain depository that would not otherwise exist and thereby provide access to the hidden fossils. The impact is positive for palaeontology, if efforts are made to watch out for and rescue the fossils. Fossils and significant observations will be lost in the absence of management actions to mitigate such loss. This loss of the opportunity to recover them and their contexts when exposed at a site is irreversible. The status of the potential impact for palaeontology is not neutral or negligible. The very scarcity of fossils makes for the added importance of looking out for them. There remains a medium to high risk of valuable fossils being lost despite management actions to mitigate such loss. Machinery involved in excavation may damage or destroy fossils, or they may be hidden in "spoil" of excavated material.

This impact assessment, according to the rating scheme provided by EIMS, addresses the occurrence of the fossil bones in the coversand.

9.2 EXTENTS

The physical extent of impacts on potential palaeontological resources relates directly to the extents of subsurface disturbance involved in the installation of infrastructure during the Construction Phase, *i.e.* limited to the areas of construction ACTIVITY (1).

However, unlike an impact that has a defined spatial extent (*e.g.* loss of a portion of a habitat), the cultural, heritage and scientific impacts are of regional to national extent, as is implicit in the National Heritage Resources Act No. 25 (1999) and, if scientifically important specimens or assemblages are uncovered, are of international interest. This is evident in the amount of foreign-funded palaeontological research that takes place in South Africa by scientists of other nationalities.

9.3 DURATION

The initial duration of the impact is immediate (<1 year) and primarily related to the Construction Phase when excavations for infrastructure are made. This is the "time window" for mitigation.

The impact of both the finding or the loss of fossils is permanent. The found fossils must be preserved "for posterity"; the lost, overlooked or destroyed fossils are lost to posterity. The duration of impact is therefore PERMANENT with or without mitigation (5).

9.4 MAGNITUDE/INTENSITY

The intensity or magnitude of impact relates to the palaeontological sensitivities of the affected formations (Appendix 2). Due to the overall sparse distribution of fossil bones in the coversands, the young age of expected material and the small footprint of the activity the palaeontological sensitivity is considered to be LOW (2).

9.5 REVERSIBILITY

Palaeontological resources are unique and their loss is IRREVERSIBLE (5).

9.6 PROBABILITY

In consideration of the small scale of subsurface disturbance there is a very low possibility that fossil bones will be unearthed, *i.e*. IMPROBABLE (1).

9.7 CONSEQUENCE (C)

Consequence Rating C = (E+D+M+R)/4 X N

N = Nature of impact (or Status) which is positive for a beneficial outcome or negative for a detrimental outcome.

Consequence Rating without mitigation = (1+5+2+5)/4 X -1 = -3.25

Consequence Rating with mitigation = (1+5+2+5)/4 X 1 = 3.25.

9.8 ENVIRONMENTAL RISK (ER)

Environmental Risk (ER) = Consequence X Probability (C X P).

Without mitigation = -3.25 X 1 = -3.25.

With mitigation = 3.25 X 1 = 3.25.

The ER score is <9, *i.e*. LOW - unlikely to be a significant risk.

9.9 PUBLIC RESPONSE (PR)

It is unlikely that the possible occurrence of fossil bones in the coversand will be an issue raised in the public responses. *i.e*. LOW (1).

9.10 CUMULATIVE IMPACT (CI)

The cumulative impact of coastal developments and coastal mining is the inevitable and permanent loss of fossils and the associated scientific implications. As mentioned, the impact of both the finding or the loss of fossils is permanent. Diligent and successful mitigation contributes to a positive cumulative impact as the rescued fossils are preserved and accumulated for scientific study. Even though just a very minor portion of the bone fossils exposed in coastal excavations has been seen and saved, the rescued fossils have proved to be of fundamental scientific value.

However, in the specific context of this project, with its small excavation footprint, the improbability of a find of fossil bones and the expected, geologically-recent ("sub-fossil") age of any material that might occur, it is considered that the project will not appreciably contribute to the cumulative impact of unnoticed and destroyed fossils. The specific cumulative impact is therefore rated as LOW (1).

9.11 IRREPLACEABLE LOSS OF PALAEONTOLOGICAL RESOURCES (LR)

For the same reasons given above, this specific project is unlikely to result in the irreplaceable loss of fossil resources and the rating is therefore LOW (1).

9.12 PRIORITISATION FACTOR

The Priority Rating takes into account the Public Response (PR), the Cumulative Impact (CI) and the Irreplaceable Loss of Resources (LR).

Priority = PR + CI + LR = 1+1+1 = 3.

The Prioritisation Factor (PF) determined from the table provided by EIMS is ranked as LOW with a PF of 1.

9.13 FINAL ENVIRONMENTAL SIGNIFICANCE RATING

The final impact significance is the PF multiplied by the ER of the post mitigation scoring, which in this case = 3.25.

This Final Environmental Significance Rating is <10, i.e. LOW and therefore the palaeontological impact does not have a direct influence on the decision to construct the Muisvlakte Battery Energy Storage System at the specific site.

9.14 SUMMARY IMPACT RATING TABLE

Impact Name	Destruction/loss of fossils during construction of the Muisvlakte Battery Energy Storage System				
Alternative	**#N/A**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature	-1	1	Magnitude	2	2
Extent	1	1	Reversibility	5	5
Duration	5	5	Probability	1	1
Environmental Risk (Pre-mitigation)					-3.25
Mitigation Measures					
Monitoring of all construction-phase excavations for fossil materials. See Appendix 3.					
Environmental Risk (Post-mitigation)					3.25
Degree of confidence in impact prediction:					HIGH
Impact Prioritisation					
Public Response					1
It is unlikely that the possible occurrence of fossil bones in the coversand will be an issue raised in the public responses.					
Cumulative Impacts					1
In the specific context of this project, with its small excavation footprint, the improbability of a find of fossil bones and the expected, geologically-recent ("sub-fossil") age of any material that might occur, it is considered that the project will not appreciably contribute to the cumulative impact of unnoticed and destroyed fossils.					
Degree of potential irreplaceable loss of resources					1
This specific project is unlikely to result in the irreplaceable loss of fossil resources.					
Prioritisation Factor					1
Final Significance					3.25

9.15 PALAEONTOLOGICAL SENSITIVITY MAPPING FOR EIA GIS

The palaeontological sensitivity of the site has a uniform rating of LOW applicable to the footprint of the construction excavations.

10 APPENDIX 2. PALAEONTOLOGICAL SENSITIVITY RATING

Palaeontological Sensitivity refers to the likelihood of finding significant fossils within a geologic unit.

VERY HIGH: Formations/sites known or likely to include vertebrate fossils pertinent to human ancestry and palaeoenvironments and which are of international significance.

HIGH: Assigned to geological formations known to contain palaeontological resources that include rare, well-preserved fossil materials important to on-going palaeoclimatic, palaeobiological and/or evolutionary studies. Fossils of land-dwelling vertebrates are typically considered significant. Such formations have the potential to produce, or have produced, vertebrate remains that are the particular research focus of palaeontologists and can represent important educational resources as well.

MODERATE: Formations known to contain palaeontological localities and that have yielded fossils that are common elsewhere, and/or that are stratigraphically long-ranging, would be assigned a moderate rating. This evaluation can also be applied to strata that have an unproven, but strong potential to yield fossil remains based on its stratigraphy and/or geomorphologic setting.

LOW: Formations that are relatively recent or that represent a high-energy subaerial depositional environment where fossils are unlikely to be preserved, or are judged unlikely to produce unique fossil remains. A low abundance of invertebrate fossil remains can occur, but the palaeontological sensitivity would remain low due to their being relatively common and their lack of potential to serve as significant scientific resources. However, when fossils are found in these formations, they are often very significant additions to our geologic understanding of the area. Other examples include decalcified marine deposits that preserve casts of shells and marine trace fossils, and fossil soils with terrestrial trace fossils and plant remains (burrows and root fossils)

MARGINAL: Formations that are composed either of volcaniclastic or metasedimentary rocks, but that nevertheless have a limited probability for producing fossils from certain contexts at localized outcrops. Volcaniclastic rock can contain organisms that were fossilized by being covered by ash, dust, mud, or other debris from volcanoes. Sedimentary rocks that have been metamorphosed by the heat and pressure of deep burial are called metasedimentary. If the meta sedimentary rocks had fossils within them, they may have survived the metamorphism and still be identifiable. However, since the probability of this occurring is limited, these formations are considered marginally sensitive.

NO POTENTIAL: Assigned to geologic formations that are composed entirely of volcanic or plutonic igneous rock, such as basalt or granite, and therefore do not have any potential for producing fossil remains. These formations have no palaeontological resource potential.

Adapted from Society of Vertebrate Paleontology. 1995. Assessment and Mitigation of Adverse Impacts to Nonrenewable Paleontologic Resources - Standard Guidelines. News Bulletin, Vol. 163, p. 22-27.

11 APPENDIX 3. MEASURES FOR THE CONSTRUCTION PHASE EMP

OBJECTIVE: To see and rescue fossil material that may be exposed in the excavations made for installation of the proposed Muisvlakte Battery Energy Storage System.		
Project components	Foundation excavations, trenches for cabling & infrastructure, powerline footings, spoil from excavations.	
Potential impact	Loss of fossils by their being unnoticed and/ or destroyed.	
Activity/ risk source	All bulk earthworks.	
Mitigation: target/ objective	To facilitate the likelihood of noticing fossils and ensure appropriate actions in terms of the relevant legislation.	
MITIGATION: ACTION/ CONTROL	**RESPONSIBILITY**	**TIMEFRAME**
Inform staff of the need to watch for potential fossil occurrences.	The Client, the EIA practitioner, the ECO & contractors.	Pre-construction.
Inform staff of the Fossil Finds Procedures to be followed in the event of fossil occurrences.	ECO.	Pre-construction.
Monitor for presence of fossils.	Contracted personnel and ECO.	Construction.
Liaise on nature of potential finds and appropriate responses.	ECO and specialist, SAHRA.	Construction.
Obtain permit from SAHRA for fossil finds collection.	Specialist.	Construction
Excavate main finds, inspect pits & record and sample excavations.	Specialist.	Construction.
Performance Indicator	Reporting of and liaison about possible fossil finds. Fossils noticed and rescued. Scientific record of fossil contexts and temporary exposures in earthworks.	

12 APPENDIX 4. FOSSIL FINDS PROCEDURE

12.1 MONITORING

A constant monitoring presence over the period during which excavations for developments are made, by either an archaeologist or palaeontologist, is generally not practical.

The field supervisor/foreman and workers involved in digging excavations must be encouraged and informed of the need to watch for potential fossil and buried archaeological material. Workers seeing potential objects are to report to the field supervisor who, in turn, will report to the ECO. The ECO will inform the archaeologist and/or palaeontologist contracted to be on standby in the case of fossil finds.

To this end, responsible persons must be designated. This will include hierarchically:

- The field supervisor/foreman, who is going to be most often in the field.
- The Environmental Control Officer (ECO) for the project.
- The Project Manager/Site Agent.

12.2 RESPONSE BY PERSONNEL IN THE EVENT OF FOSSIL FINDS

In the process of digging the excavations fossils may be spotted in the hole sides or bottom, or as they appear in excavated material on the spoil heap.

- Stop work at fossil find. The site foreman and ECO must be informed.
- Protect the find site from further disturbance and safeguard all fossil material in danger of being lost such as in the excavator bucket and scattered in the spoil heap.
- The ECO or site agent must immediately inform the South African Heritage Resources Agency (SAHRA) and/or the contracted standby palaeontologist of the find and provide via email the information about the find, as detailed below.
    - Date.
    - Position of the excavation (GPS) and depth.
    - A description of the nature of the find.
    - Digital images of the excavation showing vertical sections (sides) and the position of the find showing its depth/location in the excavation.
    - A reference scale must be included in the images (tape measure, ranging rod, or object of recorded dimensions).
    - Close-up, detailed images of the find (with scale included).

The South African Heritage Resources Agency (SAHRA) and/or the contracted standby palaeontologist will assess the information and a suitable response will be established which will be reported to the developer and the ECO, such as whether rescue excavation or rescue collection by a palaeontologist is necessary or not.

The response time/scheduling of the rescue fieldwork is to be decided in consultation with developer/owner and the ECO. It will probably be feasible to “leapfrog” the find and proceed to the next excavation, or continue an excavation farther along, so that the work schedule and machine time are minimally disrupted. The strategy will be to rescue the material as quickly as possible.

12.3 APPLICATION FOR A PERMIT TO COLLECT FOSSILS

A permit from SAHRA is required to excavate fossils. The applicant should be the qualified specialist responsible for assessment, collection and reporting (palaeontologist).

Should fossils be found that require collecting, application for a palaeontological permit must be made to SAHRA immediately. Only a professional palaeontologist may excavate uncovered fossils with a valid mitigation permit from SAHRA.

In addition to the information and images of the find, the application requires details of the registered owners of the sites, their permission and a site-plan map.

All fossils must be deposited at a SAHRA-approved institution.