Case No. 14072909

HERITAGE IMPACT ASSESSMENT

THE PROPOSED WESKUSFLEUR SUBSTATION NEAR CAPE TOWN

Prepared for:

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Att: Mr Frank van der Kooy
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On behalf of:

ESKOM HOLDINGS SOC LIMITED

By

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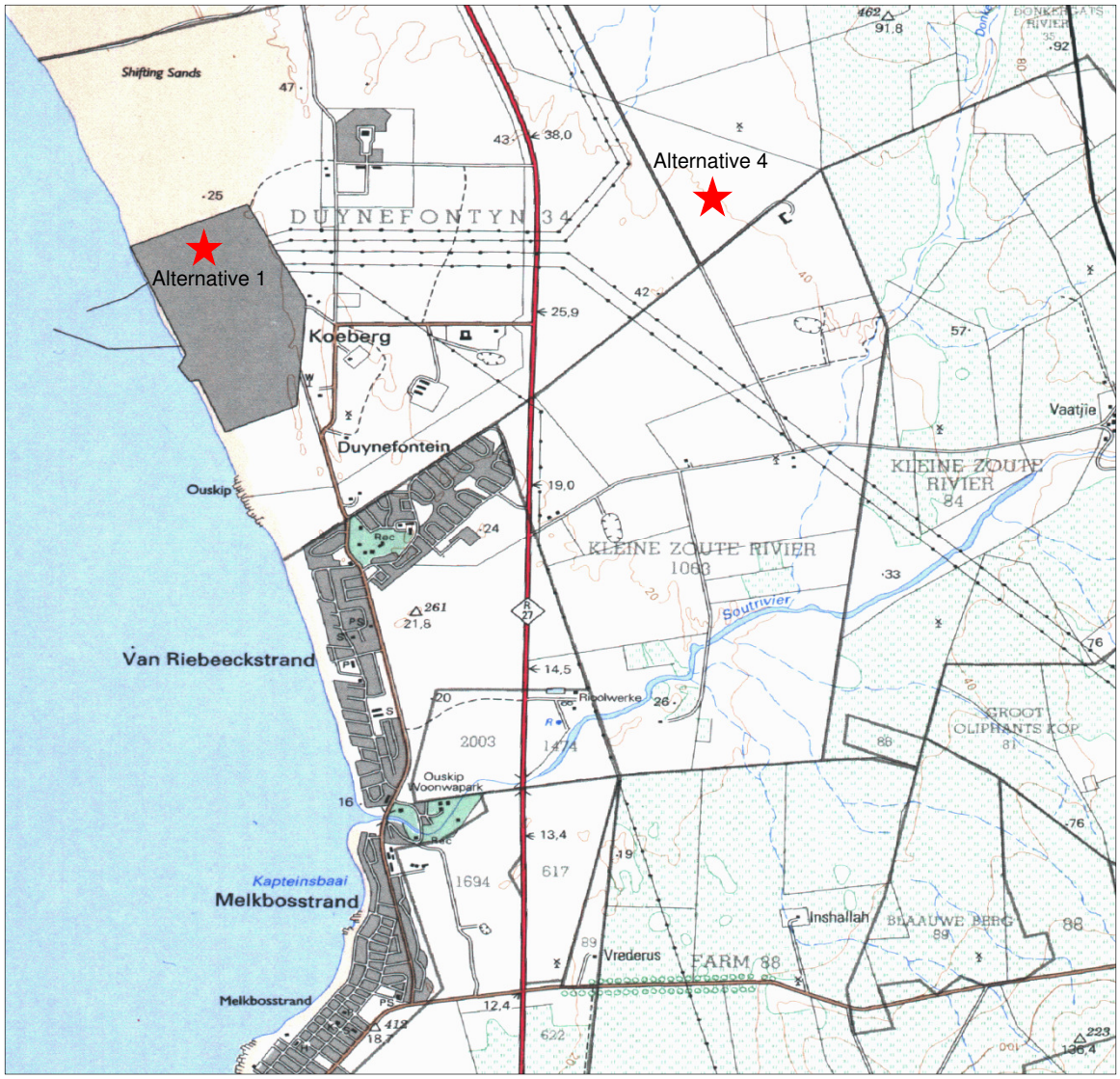
Executive summary

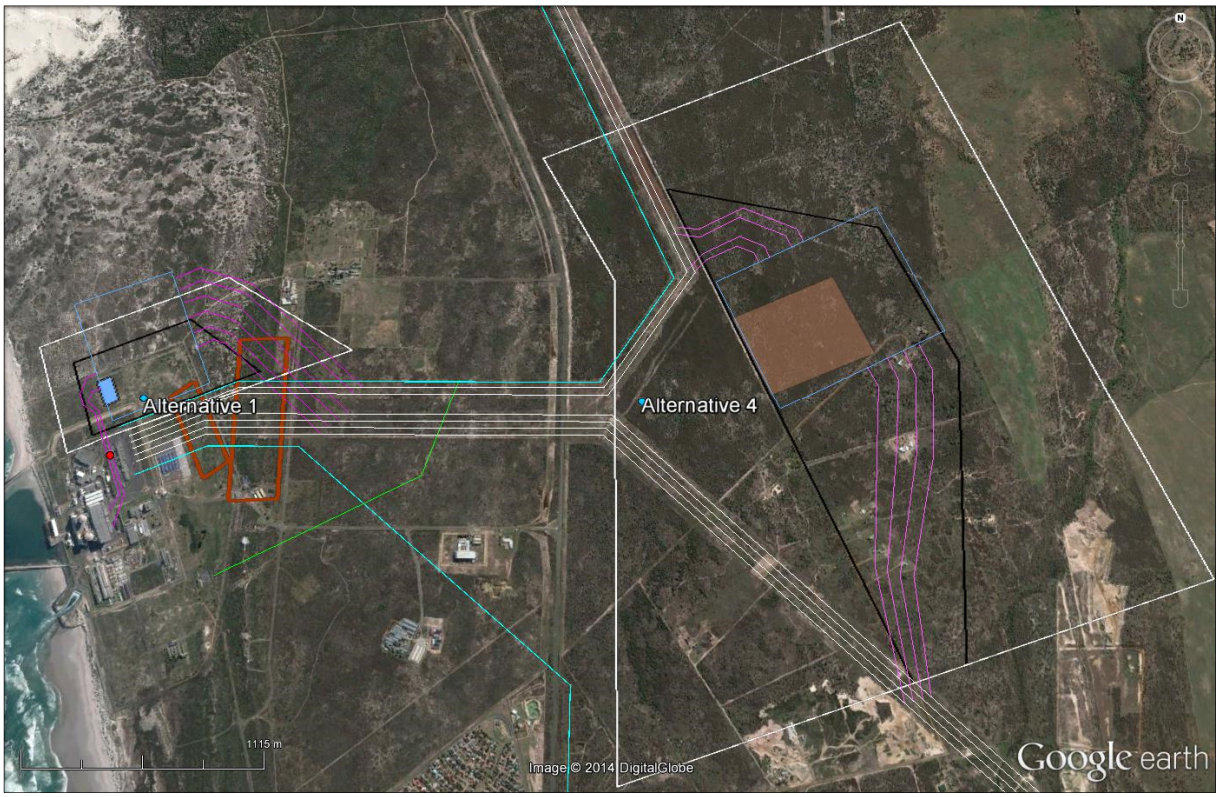
1. **Site Name**: Proposed Weskusfleur Substation near Cape Town

2. **Location**: Koeberg Nuclear Power Station - Cape Farm 34, Duynefontein. GPS co-ordinates: S33 40.315 E18 26.033

3. **Locality Plan**:



Locality Map (3318 CB Melkbosstrand) showing the location of the proposed site alternatives.



Google aerial photograph indicating the alternative location sites for the proposed Weskusfleur Substation. The purples lines represent the proposed powerline requirements

4. Description of Proposed Development

Eskom Holdings SOC Limited (Eskom) currently generates approximately 95% of the electricity used in South Africa and the provision of electricity is vital for industrial development in the country.

The existing 400 kV Gas Insulated System (GIS) substation at Koeberg has been in operation for almost 30 years and there is a concern regarding its reliability as it has become difficult to repair as a result of discontinued and ageing technology. There is also no space for additional 132 kV feeder bays at the substation to accommodate future requirements for new powerlines.

Eskom has therefore initiated a study to investigate possible alternatives and solutions to address the long term reliability and improvement of the existing 400 kV GIS substation at the Koeberg Nuclear Power Station north of Cape Town. The study includes an assessment of the future, long-term transformation requirements at the existing substation, which is critical for grid stability in the Western Cape.

The required area size for the proposed new substation is approximately 760 m x 550 m, while the length of the diversion lines will be determined by the substation's final location.

Five site alternatives were assessed by J. Kaplan of ACRM during a Heritage Scoping Study for the proposed new substation. With the completion of feasibility and technical

studies, two sites (Alternative 1 & Alternative 4) have been identified as potential locations sites for the new substation, while Alternatives 2, 3 and 5 have been screened out of the study.

Alterntative 1

Alternative 1 is located directly north of the permiter fence surrounding the Koeberg Nuclear Power Station, on Cape Farm No. 34 Duynefontein. The proposed development site was levelled in the 1980s prior to construction of the power station, and the proposed footprint area (a powerline servitude) north of the reactor buildings is sparsely vegetated, and covered in kweek grass, weeds, and succulent ground cover. In the past, the surface of the site included low dunes of the Witzand Formation, and deflated exposures of calcrete and yellow sand deposits of the Springfontyn Formation. During the course of the preparation of the reactor site, excavated material was dumped over this area.

Alternative 4

Alternative 4 is located about one kilometer east of the R27/West Coast Road, on the Farm Brakkefontein 32/1. The entire property is covered in extremely dense invasive alien vegetation. There are no significant landscape features on the site.

A Notification of Intent to Develop (NID) was submitted to Heritage Western Cape (HWC) in August 2014, who requested that an HIA (HWC Case No. 14072909GT0826E), consisting of an archaeological and palaeontological study must be done, including an integrated set of recommendations.

The HIA included a desk top study/literature survey, and a field assessment (archaeology).

J. Kaplan of ACRM was commissioned to undertake the specialist archaeological study, and to facilitate the HIA.

Archaeozoologist, Dr G. Avery was appointed to undertake the specialist palaeontological study, which included an assessment of the potential impacts of the development on buried Pleistocene archaeological deposits.

5. Heritage Resources Identified

A field assessment of the proposed site alternatives was undertaken by ACRM in October and September, 2014.

The following observations were made:

Alternative 1

Archaeological heritage was encountered on the surface of the proposed development site, but none were deemed to be of high significance. These, included a few isolated quartz chunks and flakes, a limestone flake, a bored stone with a grooved edge, and several Later Stone Age (LSA) and Middle Stone Age (MSA) silcrete flakes. A small scatter of silcrete flakes and chips, were recorded north of perimeter fence/gravel road

surrounding the power station. Some blackened Miocene fossil bone (possibly whale) was encountered as well. Thin scatters of edge rounded and water worn shellfish (limpet, black mussel, Lutraria & white sand mussel) were also mapped. A dump, containing road metal, building rubble, glass, beach gravels and water rounded shell was recorded near the main parking area, alongside the powerline servitude. A fragment of bleached fossil bone was recorded in the proposed powerline servitude.

Alternative 4

The footprint area of the proposed development site is infested with invasive alien vegetation (mainly Port Jackson), and large areas are covered in kweek and Kikuyu grass resulting in poor archaeological visibility. Only a single small red silcrete flake (of low significance) was found in the small sandy track that cuts through the site.

No archaeological heritage was encountered in the proposed powerline servitude.

6. **Anticipated Impacts on Heritage Resources**

Alternative 1

The palaeontological study has shown that most of the significant archaeological and palaeontological heritage is likely to be deeply buried and will only be exposed during construction activities. For example, Early and Middle Stone Age tools, vertebrate fossils (i. e. bone) and shell may be found embedded, or lying on ancient, buried land surfaces underlying the sands of the Witzand Formation, during excavations for the substation. Light orange coloured sands of the Springfontyn Formation are also indicators shown to have been associated with Middle Pleistocene fossils and Stone Age tools.

According to Avery, Alternative 1 is located in a palaeontologically-sensitive region with a hard rock base of Malmesbury Group shale, which outcrops along the coast. Any excavation for foundations and/or infrastructure that penetrates into underlying terrestrial and/or deeper marine sediments may encounter fossils. Since such occurrences are not normally preserved, fossil finds would be significant and would require careful recording and possible systematic excavation. Excavations into deep sediments, not normally accessible to palaeontologists, should also be seen as providing opportunities to recover potentially-important fossil material that enables observations to be made on geology, past sea levels, climates, environments and biodiversity that would otherwise not be possible.

Pre-colonial Khoisan burials may also be exposed during bulk earthworks. Burials provide important information on our pre-colonial antecedents. Any Pleistocene human skeletal material, for example, would be of international significance, which according to the archaeologist Tim Hart, `is possible in this geological context'.

Alternative 4

Early, Middle and Later Stone Age remains have been encountered east of the R27/West Coast Road, in surrounding farmland, and therefore may be exposed during vegetation clearing operations. Significant archaeological heritage is, however less likely to be encountered during the construction phase of the project.

Although palaeontological material is as yet unknown on Alternative 4 (most known observations occur within a kilometer of the coast), the possibility that fossils may occur inland of the R27 cannot be excluded. It is possible that fossils or sub-fossils will be encountered during any excavations that cut into underlying sediments that have been preserved. Large areas further inland are vegetated or under agriculture, and sub-aerial sediments have not been exposed, so the overall extent of the fossiliferous deposits remains to be confirmed.

Summary of Impacts

	Construction	Operational	Decommission	Cumulative
Alternative 1				
With mitigation	medium	low	low	low
Without mitigation	high	low	low	low
No Go Alternative	zero	zero	zero	zero
Alternative 4				
With mitigation	medium	low	low	low
Without mitigation	high	low	low	low
No Go Alternative	zero	zero	zero	zero
Transmission Lines				
With mitigation	low	low	low	low
Without mitigation	medium	medium	low	low
No Go Alternative	zero	zero	zero	zero

7. Recommendations

The following recommendations are made, which are subject to the approval of Heritage Western Cape.

Alternative 1

- A series of linear test pits must be dug across the proposed footprint area prior to construction work commencing. This could also form part of a geotechnical investigation of sub-surface sediments/Formations. Excavations that extend into light orange coloured sands of the Springfontyn Formation may encounter undisturbed fossils (bone & shell), and Stone Age artefacts. It is important to establish the archaeological significance of buried sub-surface deposits before bulk earthworks commence, as it will enable the archaeologist and palaeontologist to develop an appropriate mitigation action plan.

- Fossils and Stone Age artefacts are protected by law. Should anything of a palaeontological/palynological nature be found on site by the contractor (or any other party), e.g. bones not previously visible, work is to be stopped in that area immediately, and the Environmental Control Officer (ECO) notified. Failure to do so will result in a penalty and this must be carefully explained to workers during the Environmental Education Induction Programme undertaken by the ECO. The

archaeologist must also assist with the induction programme. No palaeontological or archaeological material may be removed from the site without a permit from Heritage Western Cape, the Provincial Heritage Authority.

- Permits to recover fossils and archaeological material should be applied for (by the monitoring heritage specialist) in advance of the Construction Phase commencing.

- Bulk earthworks and excavation for foundations/infrastructure must be monitored by a palaeontologist or archaeologist with appropriate palaeontological knowledge. The frequency of this to be worked out *a priori* with the contractor to minimize time spent on site.

- If possible, geotechnical information together with the proposed locations and depths of excavations for foundations and/or infrastructure should be provided prior to the commencement of construction. This may enable a better estimation of the time(s) when monitoring would be necessary.

- Protocols for dealing with palaeontological/palynological (fossil pollens) monitoring and possible further mitigation must be included in the Environmental Management Plan (EMP).

- Funds must be available *a priori* to cover costs of monitoring and any additional fieldwork and radiocarbon dates, should the opportunity/need arise.

- Should palaeontological and/or archaeological material be encountered, the ECO will advise on demarcation of this area and notify the specialist (palaeontologist/archaeologist with appropriate experience) to view material and ascertain whether further study of the area will be required.

- Should a specialist confirm a genuine fossil or sub-fossil and recommend further study of the area, work in the applicable area is to cease until further notice. Heritage Western Cape is to be informed immediately.

- Should any human remains be disturbed, exposed or uncovered during excavation, work in that area must stop and the find shall immediately be reported the South African Police Service and the monitoring heritage specialist. If it is suspected that the remains are older than 60 years, then the South African Heritage Resource Agency - SAHRA (021 462 4502) must be informed and established protocols followed.

- The removal of discovered palaeontological remains by a contracted specialist shall be at the Developer's expense. This will include the cost of dating.

- All palaeontological and archaeological material will be lodged in an appropriate Iziko Museums of South Africa collection.

The above recommendations must be included with the Environmental Management Plan for the project.

Alternative 4

- Fossils and Stone Age artefacts are protected by law. Should anything of a palaeontological/palynological nature be found on site by the Contractor (or any other party), e.g. bones not previously visible, work is to be stopped in that area immediately, and the Environmental Control Officer (ECO) notified. Failure to do so will result in a penalty and this must be carefully explained to workers during the Environmental Education Induction Programme undertaken by the ECO. The archaeologist must also assist with the induction programme. No palaeontological or archaeological material may be removed from the site without a permit from Heritage Western Cape, the Provincial Heritage Authority.

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- The above recommendations must be included with the Environmental Management Plan for the project.

Alternative 1 powerline requirements

- Palaeontology and buried archaeology – monitoring of tower footing excavations is required. Eskom to contract an archaeologist or palaeontologist before construction, to agree on a monitoring plan.

- *Surface archae*ology – archaeologist to undertake a `walk-down' survey of the proposed final alignment to steer potential impacts.

Alternative 4 powerline requirements

- Palaeontology and buried archaeology – monitoring of tower footing excavations is required. Eskom to contract an archaeologist or palaeontologist before construction, to agree on a monitoring plan.

- *Surface archae*ology – archaeologist to undertake a `walk-down' survey of the proposed final alignment to steer potential impacts.

8. **Authors' Note**

Kaplan, J. 2014. Heritage Impact Assessment, the proposed Weskusfleur Substation near Cape Town. Report prepared for Lidwala Consulting Engineers (SA) (Pty) Ltd. ACRM Cape Town

Avery, G. 2014. Palaeontological Assessment Weskusfleur Substation, Alternatives 1 and 4. 1:50 000 3318CB Melkbosstrand. Report prepared for Lidwala Consulting Engineers (SA) (Pty) Ltd Archaeozoology, Stone Age Archaeology and Quaternary Palaeontology. Cape Town

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1. INTRODUCTION

1.1 Background

ACRM was appointed by Lidwala Consulting Engineers (SA) (Pty) Ltd, on behalf of Eskom Holdings SOC Limited (Eskom), to conduct a Heritage Impact Assessment (HIA) for the proposed construction of the Weskusfleur 400/132 kV substation north of Cape Town in the Western Cape (Figure 1).

Eskom currently generates approximately 95% of the electricity used in South Africa and the provision of electricity is vital for industrial development in the country.

Eskom has initiated a study to investigate possible alternatives and solutions to address the long term reliability and improvement of the existing 400 kV Gas Insulated System (GIS) substation at the Koeberg Nuclear Power Station north of Cape Town. The study includes an assessment of the future, long-term transformation requirements at the existing substation, which is critical for grid stability in the Western Cape.

The required area size for the proposed new Weskusfleur substation is approximately 760 m x 550 m, while the length of the diversion powerlines will be determined by the substation's final location.

Five proposed site alternatives were assessed during a Heritage Scoping study of the proposed Eskom, Weskusfleur (Kaplan 2013). With the completion of feasibility and technical studies, two site alternatives (Alternative 1 & Alternative 4) have been identified as potential locations sites for the new substation (Figure 2), while Alternatives 2, 3 and 5 have been screened out of the study.

Alterntative 1 is located directly north of the permiter fence surrounding the Koeberg Nuclear Power Station, on Cape Farm No. 34 Duynefontein.

Alternative 4 is located about 1 kilometer east of the R27/West Coast Road, on the Farm Brakkefontein 32/1.

A Notification of Intent to Develop (NID) was submitted to Heritage Western Cape (HWC) in August 2014, who requested that an HIA (HWC Case No. 14072909GT0826E), consisting of an archaeological and palaeontological study must be done, including an integrated set of recommendations.

The HIA included a desk top study/literature survey, and a field assessment (archaeology).

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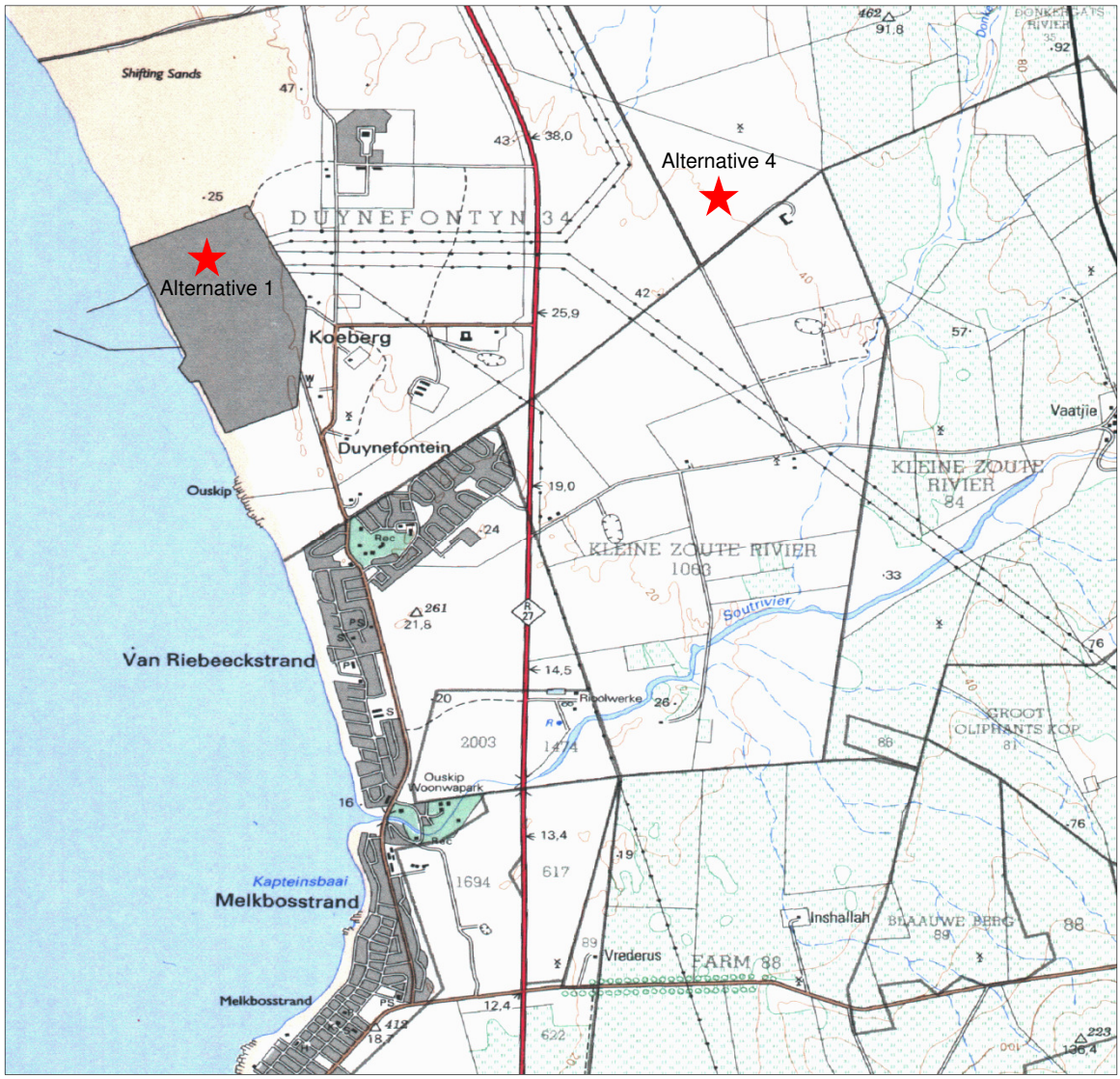

Figure 1. Map (3318 CB Melkbosstrand) showing the location of the proposed site alternatives.

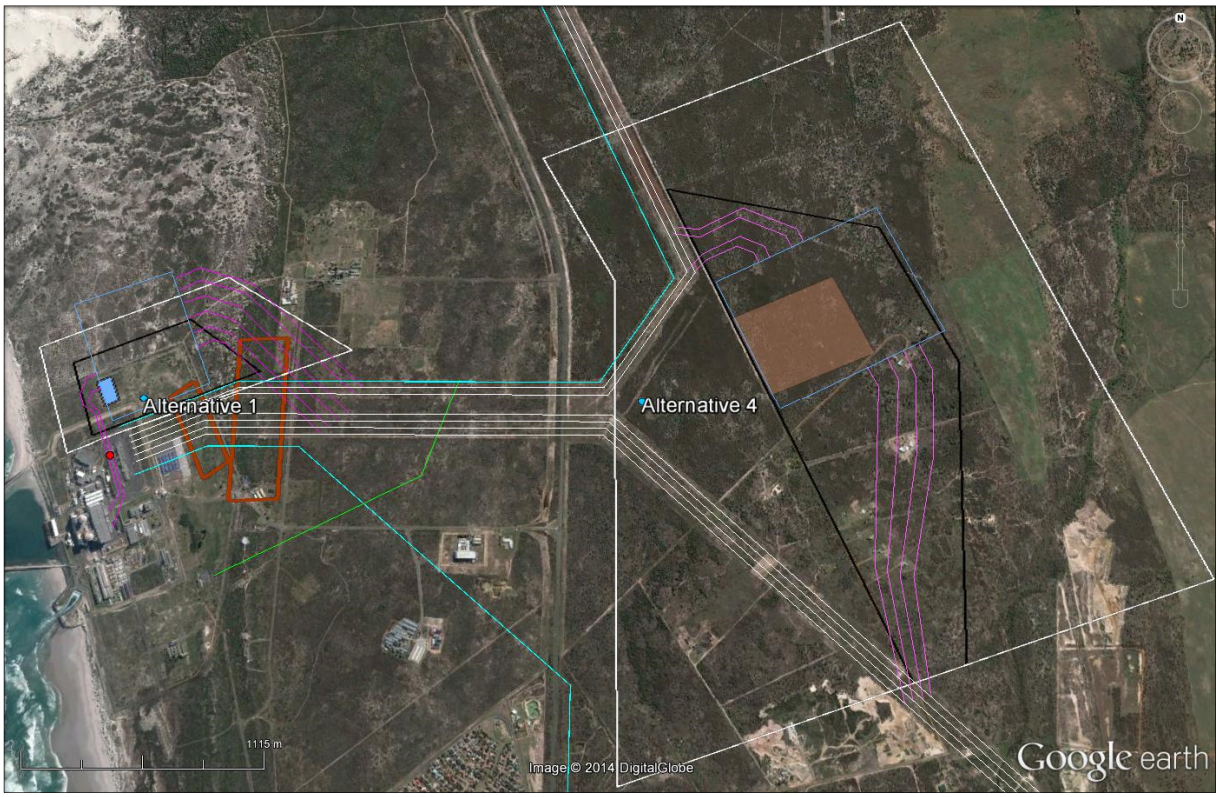

Figure 2. Google aerial photograph indicating the alternative location sites for the proposed Weskusfleur substation. The purples lines represent proposed powerline requirements

1.2 Objectives of the report

The objective of the report is to assess the potential impact of the proposed construction of the Weskusfleur substation (Alternative 1 & Alternative 4), including associated activities on archaeological and palaeontological heritage, to assess the significance of the potential impacts on heritage resources and to recommend measures to mitigate impacts during the construction phase of the development.

1.3. Legislative framework

The National Heritage Resources Act (Act No. 25 of 1999) makes provision for a compulsory Heritage Impact Assessment (HIA) when an area exceeding 5000 m² is being developed. This is to determine if the area contains heritage sites and to take the necessary steps to ensure that they are not damaged or destroyed during development.

The NHRA provides protection for the following categories of heritage resources:

- Landscapes, cultural or natural (Section 3 (3))
- Buildings or structures older than 60 years (Section 34);
- Archaeological sites, palaeontological material and meteorites (Section 35);
- Burial grounds and graves (Section 36);

- Public monuments and memorials (Section 37);

- Living heritage (defined in the Act as including cultural tradition, oral history, performance, ritual, popular memory, skills and techniques, indigenous knowledge systems and the holistic approach to nature, society and social relationships) (Section 2 (d) (xxi)).

In addition, Section 38 (1) (a) of the Act specifically indicates that any person constructing a powerline, pipeline or road, or similar linear development or barrier exceeding 300m in length is required to notify the responsible heritage resources authority, who will in turn advise whether an impact assessment report is needed before development can take place.

1.4 Study approach and methodology

A field assessment was undertaken by the archaeologist (J. Kaplan). Both site Alternatives were subjected to a ground truth survey. The fieldwork took place on 21st October, and 15th September, 2014. The powerline route requirements for Alternative 4 (refer to Figure 2) were assessed during the Heritage Scoping Study in 2013 (Kaplan 2013).

The position of all archaeological remains encountered during the field study was recorded on a hand-held GPS device set on the WGS 84 datum.

A track path of the survey was captured.

A desk top study/literature survey was done to assess the general heritage context of the study area. The literature survey included both published material and unpublished commercial archaeology reports. The archaeologists Tim Hart and Professor Richard Klein were consulted.

The Palaeontological Impact Assessment by Dr G. Avery, which includes an assessment of the potential impacts of proposed activities on sub-surface Pleistocene archaeology, was limited to a desk top study. According to Avery (2014), palaeontological heritage indicators (such as fossil bone) may sometimes appear on the surface of a site (brought up by dune mole rat activity, or from excavation dumps), but *in-situ* deposits are assumed to occur below the surface deposits.

1.5 Assumptions and potential risks

Alternative 1

Based on available information (Deacon 1975; Hart 2008, 2010; Klein 1975; Klein et al 1999; Pether 2007), it is assumed that potentially significant sub-surface archaeological and palaeontological heritage will be impacted by excavations for the proposed substation. Early and Middle Stone Age tools, vertebrate fossils (i. e. bone) and shell may be found embedded, or lying on ancient, buried land surfaces underlying the sands of the Witzand Formation. Light orange coloured sands of the Springfontyn Formation are also indicators shown to have been associated with Middle Pleistocene fossils and Stone Age tools (Avery 2014).

According to Avery (2014), the proposed development site is located in a palaeontologically-sensitive region. Any excavation for foundations and/or infrastructure that penetrates into underlying terrestrial and/or deeper marine sediments, if preserved, may also encounter fossils.

The field assessment has shown that Later Stone Age (LSA) archaeological heritage will be impacted by proposed activities, but the development site and surrounding area is already transformed. In the past, the surface of the site included low dunes of the Witzand Formation, and deflated exposures of calcrete and yellow sand deposits of the Springfontyn Formation. During the course of the preparation of the reactor site, excavated material was dumped over this area (Avery 2014).

Holocene Khoisan burials may be uncovered or intersected during bulk earthworks and excavations. Burials provide important information on our pre-colonial antecedents. Any Pleistocene human skeletal material would, however be of international significance, `which is possible in this geological context' (Hart 2008).

Impacts on significant colonial period heritage resources are unlikely to occur (Hart 2010).

Alternative 4

ESA, MSA and LSA archaeological heritage may be uncovered or exposed during vegetation clearing operations, but the risk of locating significant archaeological heritage during construction activities is rated as being low.

According to Avery (2014), it is possible that fossils or sub-fossils could be encountered during any excavations that cut into underlying sediments that have been preserved.

1.6 Limitations

Alternative 1

There were no limitations associated with the study. Ground visibility was very good.

Alternative 4

The study site is infested with alien vegetation, thick grass, weeds, dead branches and leaf litter, resulting in very poor archaeological visibility. Access over the site was very difficult and limited to a single sandy track, with a few small woodcutters trails leading into impenetrable bush.

2. DESCRIPTION OF THE PROJECT

The current 400 kV GIS Koeberg substation has been in operation for almost 30 years and there is a concern regarding its reliability as it has become difficult to repair as a result of discontinued and ageing technology. There is also no space for additional 132 kV feeder bays at the substation to accommodate future requirements for new powerlines.

It is for these reasons that a new, 400/132 kV substation (to be called the Weskusfleur Substation) will be required in the vicinity of the Koeberg Nuclear Power Station to:

- Improve the existing 400 kV reliability
- Cater for future load growth on the 132 kV network
- Prevent overloading of existing 400 kV busbar
- Replace ageing technology/equipment

To improve the reliability of Koeberg MTS, several options were investigated and the option to build a new 2 x 250MVA, 400/132 kV substation in the vicinity of the existing Koeberg GIS substation was the preferred one. The main activities may include:

- Build a new 2 x 250 MVA; 400/132 kV substation;
- Construct the new 400 kV busbar with space capability of 3 x 250 MVA, 400/132 kV transformation;
- Equip new 2 x 250 MVA, 400/132 kV transformers;
- Re- route the transformers to the new 400 kV busbar;
- Re-route the outgoing 400 kV feeders;
- Divert the 400 kV Ankerlig Sterrekus line around the yard's position to minimize line crossings;
- Temporary storage of large volumes of transformer oil on site to be deposited into transformers;
- Temporary storage of any hazardous chemical substances to be used during the construction phase;
- The clearance of vegetation as a result of the construction of the substation and associated infrastructure, and
- Decommissioning some of the existing substation infrastructure and lines.

3. TERMS OF REFERENCE

The assessment included the following:

- A field assessment and literature/desk top study to determine the importance of the archaeological and palaeontological heritage of the proposed site alternatives.
- The rating of significance of heritage resources on the affected properties.

- An assessment of whether the proposed development including associated activities will result in a loss of significant heritage resources.

- Recommendations for mitigation action.

4. DESCRIPTION OF THE AFFECTED ENVIRONMENT

Two site alternatives have been identified for the proposed Weskusfleur substation (refer to Figure 2).

4.1 Alternative 1

Alterntative 1 is a level piece of ground located directly north of the permiter fence surrounding the Koeberg Nuclear Power Station reactor units and generator buildings on Cape Farm No. 34 Duynefontein.

According to Avery (2014), the low hummock dunes surrounding the power station were levelled to (create a servitude) when, construction of the reactor units commended in the 1980's. The proposed site is currently covered in Kweek grass, weeds, succulent groundcover and shrubs. The area is regularly trimmed to keep the servitude open (Figures 3-8). The proposed development site constitutes a severely transformed landscape.

Figure 3. View of the proposed development site with the reactor building to the left of the plate.

Figure 4. View of the proposed development site.

Figure 5. View of the proposed development site

Figure 6. Receiving environment for the diversion lines. View facing north

Figure 7. Receiving environment for the diversion lines. View facing west

Figure 8. Receiving environment for the diversion lines. View facing south west

4.2 Alternative 4

Alternative 4 is located about 1 kilometer east of the R27/West Coast Road, on the Farm Brakkefontein 32/1.

The large footprint area is infested with invasive Port Jackson vegetation, Kikuyu and Kweek grass, weeds, dead wood, leaf litter and branches (Figures 9-13). There is a single sandy access track that cuts through the site in the north, and a random network of small woodcutter trails that peter out into the surrounding dense bush. There are no significant landscape features on the site. Surrounding land use is agriculture, small holdings and vast tracts of vacant land covered in alien vegetation.

Figure 9. Access to the site is via the gate in the corner of the plate.

Figure 10. View of the site facing north east

Figure 11. Single access sandy track. View facing north

Figure 12. View of the site facing south

Figure 13. View of the proposed site facing south east.

5. HERITAGE CONTEXT

5.1 Archaeological and palaeontological heritage

Alternative 1

Superficial Witzand Formation sands cover most of the Duinefontein dune field (Avery 2014). This Holocene element of the Duinefontein Dune Plume, which extends from the coast towards Darling, overlies sandy Springfontyn Formation sediments. Surface scatters of Later Stone Age (LSA) tools, shellfish, marine molluscs, bone, pottery, ostrich eggshell and hearth features have been encountered in the Duinefontein dunes in the Koeberg Nature Reserve north of the power station, but these types of sites are quite sparse and ephemeral (Hart 2010; Kaplan 1993; Klein 1975). Sub-fossil remains from the more recent Witzand sands can also provide records of species present in the past 10,000 years and the historical period. For example, the remains of a black rhinoceros

found in the Witsand dune field provide a specimen record confirming observations by the first European settlers in the area (Avery 2014).

But undoubtedly, it is the excavations in the Duinefontein dune field, about 1 km north of the nuclear reactor that established Koeberg as a `place of world class scientific discovery' (Hart 2010:27). During the 1950s and 1960s the Duinefontein dune field extended from Melkbosstrand to Groot Springfontein (Avery 2014). The archaeological site known as Duinefontein 2 (DFT 2) was first discovered in 1973 when fragments of fossil bone were uncovered during geotechnical excavations for the power station (G. Avery & R. Klein pers. comm.) and has been excavated during the mid-1970's and late 1990's/early 2000s. DFT 2 has produced a wealth of Pleistocene fauna (about 330 000 years old), and associated ESA implements on buried land surfaces around wetlands (Cruz-Uribe *et al* 2003; Klein *et al* 1999). Hart (2010 & pers. comm. 2013) has argued that the Duinefontein archaeological deposits were not a fortuitous discovery, and that similar deposits lie buried beneath the windblown sands of the Witzand Formation, in what he calls the Nuclear - 1 Corridor both north and south of the reactor.

In Duinefontein (now part of the Koeberg Nature Reserve), the Varswater Formation includes Late Miocene-Early Pliocene marine palaeontological material dating to about 5 million years (Ma) and Middle Pleistocene Springfontyn sediments, which are of particular relevance to this study, include palaeontological and archaeological material dated to 330 000 years (ka). Avery (2014) notes that, although Late Pleistocene MSA artefacts have been recovered elsewhere in the area, the DFT 2 artefacts, which were originally ascribed to the MSA, were in fact shown to be ESA during later excavations at the site.

Other significant excavated samples in the Duinefontein dune field include hyaena dens, which yielded a wide range of fossils of terrestrial mammals and birds; material from the excavations for the reactor yielded the earliest example of the South African Fur Seal, and ESA artefacts on ancient land surfaces (Avery 2014).

According to Avery (2014) material from the excavations for the reactors was dumped between the fore dunes and access track just north of the security fence near Jan se Gat. Fragments of fossilized bone and bones of seabirds can be found when the surface is eroded. This area coincides with Alternative 1 and overlies the original surface on which Middle Pleistocene fossils were, and may still be, encountered during construction activities.

Alternative 4

ESA and MSA archaeological remains have been encountered east of the R27/West Coast Road (Halkett 2006; Hart et al 2010; Kaplan 2012a, 2000a, 2000b, 2002a, 1996), but these occur mostly in a disturbed and isolated context, as much of the receiving environment has been heavily transformed by agriculture. According to Orton (pers. comm.), ESA flakes have also been found on the farm Brakkefontein 32/1 (south of Atlantis), which has been identified for the proposed new City of Cape Town landfill. This indicates quite strongly that there may be sub-surface material on Alternative 4.

LSA sites with scatters of tools, pottery and ostrich eggshell have been documented between the R27 and the N7, on the Farms Blaauwberg/Joyce's Dairy (Kaplan 2012b; Orton 2007), Groot Oliphantskop (Kaplan 1996; Orton & Hart 2004), and alongside the

densely vegetated Sout River on the farms Vaatjie, Brakkuil and Keet de Khoe (Kaplan 2000b, 2007). A small scatter of LSA silcrete tools were recorded alongside the Donkergat River, on the Farm Kleine Zoute Rivier (Halkett 2006).

LSA silcrete quarry sites/outcrops, some associated with scatters of tools, have been documented at Groot Oliphantskop and Keet de Koe (Kaplan 1996, 2007), at Vissershok alongside the N7 (Kaplan 2002b), and near the Philadelphia turnoff between the N7 and the M19 (Orton 2010).

5.2 Burials

Historical graves are usually well marked and mostly occur in small farm graveyards. Pre-colonial graves, on the other hand, can occur at any location where sand suitable for excavation and burial exists. This is particularly the case in the coastal area where dunes abound. No unmarked or buried pre-colonial human remains have been recovered at Koeberg or in the Duinefontein dune fields, but Melkbosstrand has produced a large number of burials (Morris 1992). Nearly 60 Khoisan burials have so far been recovered between Milnerton and Melkbosstrand (Orton 2010) including a rare double burial near Ou Skip at Duinefontein Village (Kaplan 2013; Friedling 2013).

Unmarked human remains are routinely discovered during excavations for water pipelines, substations, foundations, roads and bulk services. Two burials associated with stone tools and ostrich eggshell beads were excavated from a sand dune on the farm Groot Oliphantskop east of the R27 (Kaplan 1996).

The recovery of any Pleistocene human skeletal material at Koeberg (Alternative 1), for example, would be of international significance, which, according to Hart (2008), is possible in this geological context.

6. FINDINGS

6.1 Alternative 1

This section describes the heritage resources encountered during the field assessment. A spreadsheet of waypoints and description of the archaeological finds is presented in Table 1. Track paths and illustration of GPS waypoints is presented in Figure 14.

Archaeological resources are sparsely distributed over Alternative 1. This is possibly due to the transformed nature of the receiving environment. The proposed development site previously comprised a series of hummock dunes, but these were levelled prior to construction of the Nuclear Power Station (Avery 2014 & R. Klein pers. comm.).

Some shellfish, mostly water worn limpet, white sand mussel and black mussel was encountered over the proposed development site, but their distribution is very thin. A fragment of Lutraria (fossil) shell (Site 160) was also found. Building rubble, water worn shell, glass, quartz and beach gravels (Site 161) were located alongside the parking area, in the powerline servitude and are likely the remains of a dump/fill.

Archaeological remains recorded include a limestone flake (Site 157), several quartz flakes and chunks (Sites 169, 172, 174, 179 & 209), three LSA several silcrete flakes (Sites 171, 196 & 197), a MSA silcrete flake (164) and a partially retouched fragment of white sand mussel (Site 209).

The most compelling find is a flat bored stone (Site 181) with a ground groove alongside one edge (Figure 15). A small scatter of silcrete flakes and chips including a large chunk of pink silcrete (Site 208) was also found close to the gravel road alongside the perimeter fence (Figures 17 & 18).

Eight pieces of highly weathered fossil bone (possibly whale), was also found on the proposed development site (Figure 16), of which one piece (Site 178) was found on top of a dune mole rat heap suggesting that it may have been brought up from below the surface. Alternatively, it may have derived from dump material. Avery (2014) reports that sediments, including fragments of fossilized bones and bones of seabirds from the excavations for the reactors was dumped between the fore dunes and access track just north of the security fence.

Site	Name of Farm	Lat/long	Description of finds	Significance	Suggested mitigation
Alternative 1	Cape Farm No. 34, Duynefontein				
156		S33 40.315 E18 26.033	Quartz chunk & tiny piece of weathered limpet underneath servitude	Low	None required
157		S33 40.257 E18 26.068	Possible limestone flake	Low	None required
158		S33 40.284 E18 26.113	Limpet fragment	Low	None required
160		S33 40.317 E18 26.118	Fragment of Lutreria shell	Low	None required
161		S33 40.405 E18 26.196	Building rubble, water worn shell - limpet & sand mussel, bits of quartz & shale alongside parking lot in powerline servitude.	Low	None required
162		S33 40.236 E18 26.163	Fragments of white sand mussel	Low	None required
163		S33 40.256 E18 26.024	Fossil bone	Low	None required
164		S33 40.259 E18 26.020	MSA silcrete flake	Low	None required
165		S33 40.261 E18 26.006	Fragments of water worn limpet, and piece of quartz	Low	None required
166		S33 40.231 E18 26.095	Fragments of water worn Black Mussel & fragment of Perlemoen	Low	None required
167		S33 40.221 E18 26.020	Water worn mussel fragment	Low	None required
168		S33 40.223 E18 25.959	Fragments of Black mussel & bits of soft calcrete.	Low	None required
169		S33 40.222 E18 25.969	Quartz broken chunk and fragment of round shale/beach cobble	Low	None required
170		S33 40.207 E18 26.002	Split shale/beach cobble with possible retouch edge	Low	None required
171		S33 40.190 E18 26.115	Silcrete flake	Low	None required
172		S33 40.187 E18 26.083	Quartz flake	Low	None required

173		S33 40.187 E18 26.077	Fossil bone	Low	None required
174		S33 40.189 E18 26.060	Quartz chunk	Low	None required
175		S33 40.185 E18 26.045	Broken shale chunk	Low	None required
176		S33 40.184 E18 26.022	Broken shale chunk	Low	None required
177		S33 40.227 E18 25.935	Smooth, flat fossil bone	Low	None required
178		S33 40.156 E18 26.069	Fossil bone on dune mole rat heap	Low	None required
179		S33 40.147 E18 26.064	Quartz chunk	Low	None required
180		S33 40.183 E18 25.955	Shale chunk	Low	None required
181		S33 40.244 E18 25.905	Flat bored stone with ground groove	Low	None required
194		S33 40.216 E18 25.894	Quartzite cobble	Low	None required
196		S33 40.206 E18 25.877	Silcrete flake & weathered limpet fragments	Low	None required
197		S33 40.214 E18 25.867	Silcrete flake	Low	None required
198		S33 40.216 E18 25.864	A few fragments of white sand mussel	Low	None required
199		S33 40.218 E18 25.858	Indurated shale cobble/chunk	Low	None required
200		S33 40.226 E18 25.861	Shale cobble/chunk	Low	None required
202		S33 40.235 E18 25.887	Shale chunk& fragments of white sand mussel	Low	None required
203		S33 40.255 E18 25.902	Adiagnostic fossil bone	Low	None required
204		S33 40.284 E18 25.909	Shale chunk	Low	None required
205		S33 40.243 E18 25.888	Adiagnostic fossil bone	Low	None required
206		S33 40.241 E18 25.862	Shale chunk	Low	None required
207		S33 40.293 E18 25.892	Adiagnostic fossil bone	Low	None required
208		S33 40.292 E18 25.888	Small scatter of pink silcrete, including several fakes, chips and large lump of pink silcrete	Low	None required
209		S33 40.270 E18 25.885	Quartz chunk, slightly nicked white mussel fragment.	Low	None required
201		S33 40.263 E18 25.891	Shale chunk	Low	None required
211		S33 39.975 E18 26.248	Recent bone	Low	None required
212		S33 40.447 E18 26.154	Adiagnostic fossil bone	Low	None required
Alternative 2	Brakke Fontein No. 32/1			Low	None required
182		S33 39.896 E18 28.552	Silcrete chip	Low	None required

Table 1. Spreadsheet of waypoints and description of archaeological finds

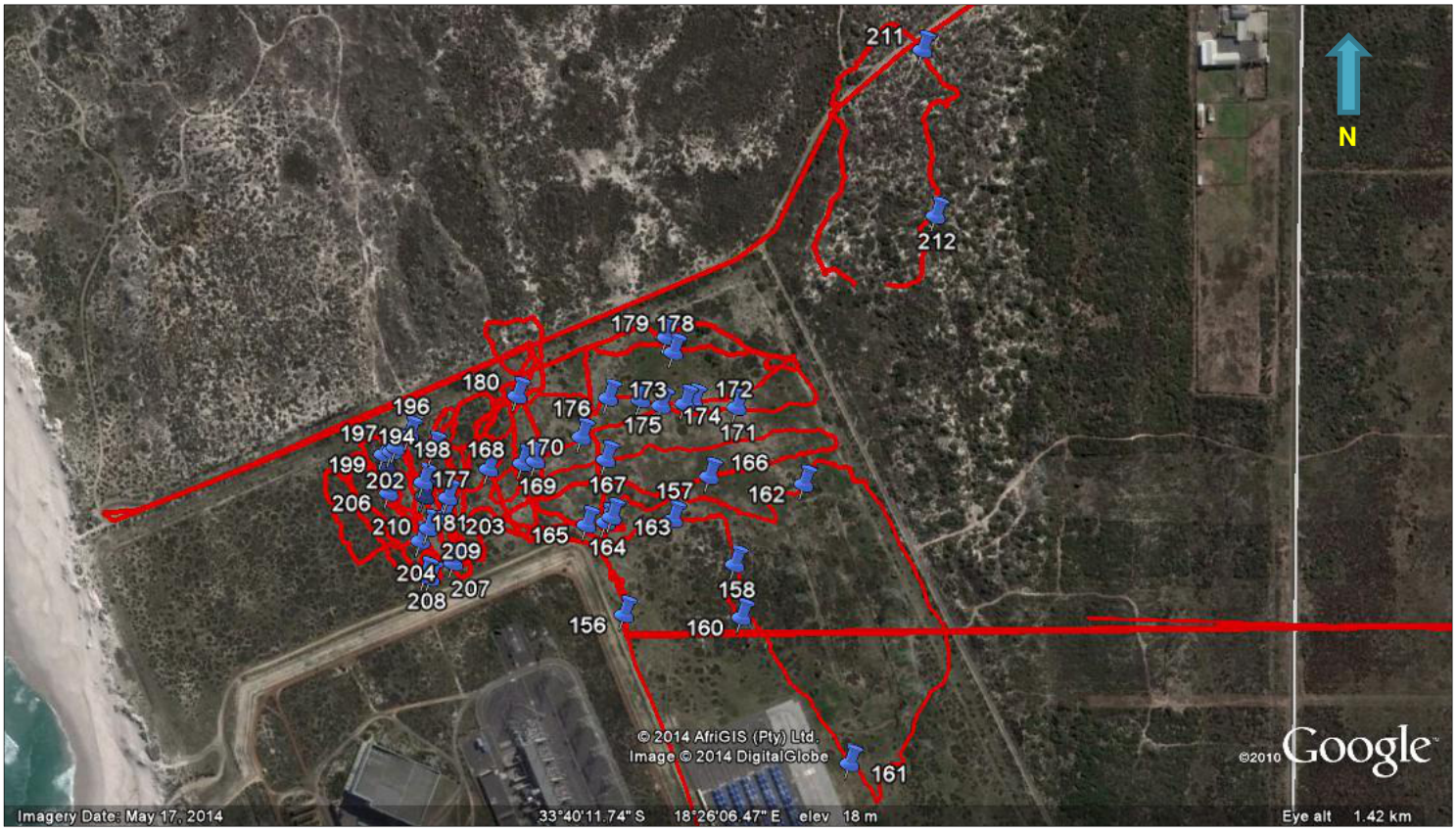

Figure 14. Alternative 1. Track paths and waypoints

6.1.1 Alternative 1 powerline requirements

With regard the proposed Alternative 1 powerline requirements, a large weathered fragment of adiagnostic fossil bone (Site 212) was found among the dunes north of the existing 400 kV overhead powerlines (refer to Figure 14 & Figure 19).

A small fragment of adiagnostic bone (Site 211) was found alongside the track.

The final route of the diversion lines must still be established.

Figure 15. Alternative 1. Collection of artefacts. Scale is in cm

Figure 17. Site 208. Arrow indicates lump of silcrete

Figure 16. Alternative 1. Fossil bone (possibly whale). Scale is in cm

Figure 18. Site 208. Scale is in cm

Figure 19. Collection of finds. Scale is in cm

6.2 Alternative 4

One red silcrete chip (Site 182) was found in the north eastern corner of the proposed development site (Figure 20).

6.2.1 Alternative 4 powerline requirements

The proposed 400kV powerline over Farms 1063/1, 1063/2, 1063/3, 1063/23 and 1063/4, south of Brakkefontein No. 32/1, will not impact on any buildings of historical or cultural significance. This was confirmed during a site visit undertaken by the heritage practitioner on 13 July, 2013. All of the buildings on the affected farms/smallholdings were built in the last 20 years (Kaplan 2013).

No pre-colonial archaeological heritage was found.

The final route of the diversion lines must still be established.

Figure 20. Alternative 2. Track paths and waypoints

6.3 No-Go Alternative

In heritage terms the No-Go Alternative will maintain the status quo and not result in further negative impacts, however this will be detrimental for security of power supply.

7. ASSESSMENT OF IMPACTS

Alternative 1:

- Construction phase

The proposed site is adjacent to a known sequence revealed by excavations for the Koeberg nuclear reactors. Excavation into the surface dump material is likely to encounter fossils, but these are sparse.

Excavation that extends into the original surface, calcretes and pale-orange Springfontyn Formation sediments are likely to encounter undisturbed fossils and stone artefacts. These will have to be dealt with in accordance with the provisions of the National Heritage Resources Act.

Alternative 1 - Construction									
Potential Impact	**Mitigation**	**Extent (E)**	**Duration (D)**	**Magnitude (M)**	**Probability (P)**	**Significance (S=(E+D+M)*P)**		**Status (+ve or -ve)**	**Confidence**
	Nature of impact:	Palaeontology and Sub-surface Archaeology							
	with	1	5	2	5	**40**	**Medium**		10%
	without	5	5	10	5	**100**	**High**		90%
	degree to which impact can be reversed:	significant							90%
	degree of impact on irreplaceable resources:	Total							100%

Alternative 1 - no-go option Construction									
Potential Impact	**Mitigation**	**Extent (E)**	**Duration (D)**	**Magnitude (M)**	**Probability (P)**	**Significance (S=(E+D+M)*P)**		**Status (+ve or -ve)**	**Confidence**
	Nature of impact:	Palaeontology and Sub-surface Archaeology							
	with	1	1	0	5	**10**	**Low**		100%
	without	1	1	0	5	**10**	**Low**		100%
	degree to which impact can be reversed:	Total							100%
	degree of impact on irreplaceable resources:	Zero							100%

- Operational phase

  Any future excavation may encounter fossils and stone artefacts as described for the construction phase and would require similar treatment.

Alternative 1 - Operational									
Potential Impact	**Mitigation**	**Extent (E)**	**Duration (D)**	**Magnitude (M)**	**Probability (P)**	**Significance (S=(E+D+M)*P)**		**Status (+ve or -ve)**	**Confidence**
	Nature of impact:	Palaeontology and Sub-surface Archaeology							
	with	2	1	0	5	**15**	**Low**		90%
	without	3	5	10	1	**18**	**Low**		10%
	degree to which impact can be reversed:	Significant							90%
	degree of impact on irreplaceable resources:	Total							100%

- De-commissioning phase

  Unknown. However, unless excavation or disturbance is contemplated, there should be no impact.

Alternative 1 - De-Commissioning									
Potential Impact	**Mitigation**	**Extent (E)**	**Duration (D)**	**Magnitude (M)**	**Probability (P)**	**Significance (S=(E+D+M)*P)**		**Status (+ve or -ve)**	**Confidence**
	Nature of impact:	Palaeontology and Sub-surface Archaeology							
	with	1	1	2	1	**4**	**Low**		90%
	without	1	1	2	1	**4**	**Low**		90%
	degree to which impact can be reversed:	Significant							90%
	degree of impact on irreplaceable resources:	Total							100%

- Cumulative impacts

  Any further excavation or development of infrastructure during the life of the structure should be treated in the manner outlined in this report.

  Unknown. Any additional disturbance may need monitoring.

Alternative 1 - Cumulative									
Potential Impact	**Mitigation**	**Extent (E)**	**Duration (D)**	**Magnitude (M)**	**Probability (P)**	**Significance (S=(E+D+M)*P)**		**Status (+ve or -ve)**	**Confidence**
	Nature of impact:	Palaeontology and Sub-surface Archaeology							
	with	1	1	2	1	**4**	**Low**		90%
	without	1	1	2	1	**4**	**Low**		90%
	degree to which impact can be reversed:	Significant							90%
	degree of impact on irreplaceable resources:	Total							100%

Alternative 4:

- Construction phase

  Unknown. However, given what is known elsewhere, any excavation that extends into original surface, calcretes and pale-orange Springfontyn Formation may encounter undisturbed fossils and stone artefacts.

Alternative 4 - Construction									
Potential Impact	**Mitigation**	**Extent (E)**	**Duration (D)**	**Magnitude (M)**	**Probability (P)**	**Significance (S=(E+D+M)*P)**		**Status (+ve or -ve)**	**Confidence**
	Nature of impact:	Palaeontology and Sub-surface Archaeology							
	with	1	5	2	5	**40**	**Medium**		90%
	without	4	5	6	5	**75**	**High**		90%
	degree to which impact can be reversed:	Significant							90%
	degree of impact on irreplaceable resources:	Total							100%

Alternative 4 - no-go option Construction								
Potential Impact	**Mitigation**	**Extent (E)**	**Duration (D)**	**Magnitude (M)**	**Probability (P)**	**Significance (S=(E+D+M)*P)**	**Status (+ve or -ve)**	**Confidence**
	Nature of impact:	Palaeontology and Sub-surface Archaeology						
	with	1	1	0	5	**10**	**Low**	100%
	without	1	1	0	5	**10**	**Low**	100%
	degree to which impact can be reversed:	Total						100%
	degree of impact on irreplaceable resources:	Zero						100%

- Operational phase

  What is encountered during the construction phase should provide an assessment of whether further impact is probable. Should fossils or stone artefacts be encountered during any future excavation they will have to be dealt with in accordance with the provisions of the National Heritage Resources Act.

Alternative 4- Operational								
Potential Impact	**Mitigation**	**Extent (E)**	**Duration (D)**	**Magnitude (M)**	**Probability (P)**	**Significance (S=(E+D+M)*P)**	**Status (+ve or -ve)**	**Confidence**
	Nature of impact:	Palaeontology and Sub-surface Archaeology						
	with	2	1	0	5	**15**	**Low**	90%
	without	3	5	10	1	**18**	**Low**	10%
	degree to which impact can be reversed:	Significant						90%
	degree of impact on irreplaceable resources:	Total						100%

- De-commissioning phase

  Unknown. However, unless excavation or disturbance is contemplated, there should be no impact.

Alternative 4 - De-Commissioning									
Potential Impact	**Mitigation**	**Extent (E)**	**Duration (D)**	**Magnitude (M)**	**Probability (P)**	**Significance (S=(E+D+M)*P)**		**Status (+ve or -ve)**	**Confidence**
	Nature of impact:	Palaeontology and Sub-surface Archaeology							
	with	1	1	2	1	**4**	**Low**		90%
	without	1	1	2	1	**4**	**Low**		90%
	degree to which impact can be reversed:	Significant							90%
	degree of impact on irreplaceable resources:	Total							100%

- Cumulative impacts

  Any further excavation or development of infrastructure during the life of the structure should be treated in the manner outlined in this report.

Alternative 4 - Cumulative									
Potential Impact	**Mitigation**	**Extent (E)**	**Duration (D)**	**Magnitude (M)**	**Probability (P)**	**Significance (S=(E+D+M)*P)**		**Status (+ve or -ve)**	**Confidence**
	Nature of impact:	Palaeontology and Sub-surface Archaeology							
	with	1	1	2	1	**4**	**Low**		90%
	without	1	1	2	1	**4**	**Low**		90%
	degree to which impact can be reversed:	Significant							90%
	degree of impact on irreplaceable resources:	Total							100%

Transmission lines: Corridor 1:

- Construction phase

As for Alternative 1

Transmission Line - Corridor 1 - Construction									
Potential Impact	**Mitigation**	**Extent (E)**	**Duration (D)**	**Magnitude (M)**	**Probability (P)**	**Significance (S=(E+D+M)*P)**		**Status (+ve or -ve)**	**Confidence**
	Nature of impact:	Palaeontology and Sub-surface Archaeology							
	with	1	1	2	4	**16**	**Low**		75%
	without	2	3	4	4	**36**	**Medium**		75%
	degree to which impact can be reversed:	Significant							90%
	degree of impact on irreplaceable resources:	Total							100%

Transmission Line - Corridor 1 - No-Go Alternative									
Potential Impact	**Mitigation**	**Extent (E)**	**Duration (D)**	**Magnitude (M)**	**Probability (P)**	**Significance (S=(E+D+M)*P)**		**Status (+ve or -ve)**	**Confidence**
	Nature of impact:								
	with	1	1	0	5	**10**	**Low**		100%
	without	3	3	4	1	**10**	**Low**		100%
	degree to which impact can be reversed:	Total							100%
	degree of impact on irreplaceable resources:	Zero							100%

- Operational phase

  As for Alternative 1

Transmission Line – Corridor 1 - Operational Phase									
Potential Impact	**Mitigation**	**Extent (E)**	**Duration (D)**	**Magnitude (M)**	**Probability (P)**	**Significance (S=(E+D+M)*P)**		**Status (+ve or -ve)**	**Confidence**
	Nature of impact:	Palaeontology and Sub-surface Archaeology							
	with	2	1	0	5	**15**	**Low**		90%
	without	3	5	10	1	**18**	**Low**		10%
	degree to which impact can be reversed:	Significant							90%
	degree of impact on irreplaceable resources:	Total							100%

- De-commissioning phase

  As for Alternative 1

Transmission Line – Corridor 1 – De-Commissioning									
Potential Impact	**Mitigation**	**Extent (E)**	**Duration (D)**	**Magnitude (M)**	**Probability (P)**	**Significance (S=(E+D+M)*P)**		**Status (+ve or -ve)**	**Confidence**
	Nature of impact:	Palaeontology and Sub-surface Archaeology							
	with	1	1	2	1	**4**	**Low**		90%
	without	1	1	2	1	**4**	**Low**		90%
	degree to which impact can be reversed:	Significant							90%
	degree of impact on irreplaceable resources:	Total							100%

- Cumulative impacts

  As for Alternative 1

Transmission Line - Corridor 1 Cumulative								
Potential Impact	**Mitigation**	**Extent (E)**	**Duration (D)**	**Magnitude (M)**	**Probability (P)**	**Significance (S=(E+D+M)*P)**	**Status (+ve or -ve)**	**Confidence**
	Nature of impact:	Palaeontology and Sub-surface Archaeology						
	with	1	1	2	1	**4**	**Low**	90%
	without	1	1	2	1	**4**	**Low**	90%
	degree to which impact can be reversed:	Significant						90%
	degree of impact on irreplaceable resources:	Total						100%

- Alternative Corridor 2:

  Construction phase

  As for Alternative 4

Transmission Line - Corridor 2 - Construction								
Potential Impact	**Mitigation**	**Extent (E)**	**Duration (D)**	**Magnitude (M)**	**Probability (P)**	**Significance (S=(E+D+M)*P)**	**Status (+ve or -ve)**	**Confidence**
	Nature of impact:	Palaeontology and Sub-surface Archaeology						
	with	1	1	2	4	**16**	**Low**	75%
	without	2	3	4	4	**36**	**Medium**	75%
	degree to which impact can be reversed:	Significant						90%
	degree of impact on irreplaceable resources:	Total						100%

Transmission Line – Corridor 2 - No-Go Alternative - Construction									
Potential Impact	**Mitigation**	**Extent (E)**	**Duration (D)**	**Magnitude (M)**	**Probability (P)**	**Significance (S=(E+D+M)*P)**		**Status (+ve or -ve)**	**Confidence**
	Nature of impact:								
	with	1	1	0	5	**10**	**Low**		100%
	without	3	3	4	1	**10**	**Low**		100%
	degree to which impact can be reversed:	Total							100%
	degree of impact on irreplaceable resources:	Zero							100%

- Operational phase

  As for Alternative 4

Transmission Line – Corridor 2 - Operational Phase									
Potential Impact	**Mitigation**	**Extent (E)**	**Duration (D)**	**Magnitude (M)**	**Probability (P)**	**Significance (S=(E+D+M)*P)**		**Status (+ve or -ve)**	**Confidence**
	Nature of impact:	Palaeontology and Sub-surface Archaeology							
	with	2	1	0	5	**15**	**Low**		90%
	without	3	5	10	1	**18**	**Low**		10%
	degree to which impact can be reversed:	Significant							90%
	degree of impact on irreplaceable resources:	Total							100%

- De-commissioning phase

  As for Alternative 4

Transmission Line – Corridor 2 – De-Commissioning								
Potential Impact	**Mitigation**	**Extent (E)**	**Duration (D)**	**Magnitude (M)**	**Probability (P)**	**Significance (S=(E+D+M)*P)**	**Status (+ve or -ve)**	**Confidence**
	Nature of impact:	Palaeontology and Sub-surface Archaeology						
	with	1	1	2	1	**4**	**Low**	90%
	without	1	1	2	1	**4**	**Low**	90%
	degree to which impact can be reversed:	Significant						90%
	degree of impact on irreplaceable resources:	Total						100%

- Cumulative impacts

  As for Alternative 4

Transmission Line - Corridor 2 Cumulative								
Potential Impact	**Mitigation**	**Extent (E)**	**Duration (D)**	**Magnitude (M)**	**Probability (P)**	**Significance (S=(E+D+M)*P)**	**Status (+ve or -ve)**	**Confidence**
	Nature of impact:	Palaeontology and Sub-surface Archaeology						
	with	1	1	2	1	**4**	**Low**	90%
	without	1	1	2	1	**4**	**Low**	90%
	degree to which impact can be reversed:	Significant						90%
	degree of impact on irreplaceable resources:	Total						100%

8. CONCLUSION

The study has shown that the construction of the proposed Eskom Weskusfleur Substation will not impact on any significant surface archaeological heritage.

Unmarked human burials may be discovered during bulk earthworks at both site alternatives and any Pleistocene human skeletal material would be of international significance.

Alternative 1 is located in a palaeontologically and archaeologically sensitive area of the Cape west coast, adjacent to a known palaeo-sequence, which has yielded important fossils and Stone Age artefacts.

Any excavation for foundations and/or infrastructure that penetrates into deeper underlying terrestrial and/or deeper marine sediments, if preserved, may also encounter fossils. Since such occurrences are not normally preserved, fossil finds would be significant and would require careful recording and possible systematic excavation.

Excavations into sediments not normally accessible to palaeontologists should also be seen as providing opportunities to recover potentially-important fossil material that enables observations to be made on geology, past sea levels, climates, environments and biodiversity, that would otherwise not be possible.

Small pockets of bone can also occur, for instance, where bone accumulators like hyaenas, Jackals or porcupines used holes/burrows dug by aardvarks. Older and younger sediments, too, may contain ancient wetland deposits and/or more-recent fossils. In addition to fossil bones and molluscs, there is also the potential for encountering macro-plant remains and pollens of considerable age in wetland deposits. Although palaeontological material is as yet unknown on Alternative 4, the possibility that fossils may occur cannot be excluded. It is possible that fossils or sub-fossils will be encountered during any excavation that cuts into any underlying sediments that have been preserved (Avery 2014). The presence of ESA and MSA remains in agricultural lands east of the R27 does suggest there is a possibility that there may be sub-surface material on Alternative 4

9. MITIGATION AND MANAGEMENT ACTIONS

It is recommended that the proposed project be allowed to proceed, subject to the following recommendations and the approval of Heritage Western Cape.

9.1 Alternative 1

- A series of linear test pits must be dug across the proposed footprint area prior to construction work commencing. This could also form part of a geotechnical investigation of sub-surface sediments/Formations. Excavations that extend into light orange coloured sands of Springfontyn Formation deposits, may encounter undisturbed fossils (bone & shell), and Stone Age artefacts. It is important to establish the archaeological significance of buried sub-surface deposits before bulk earthworks commence, as it will enable the archaeologist and palaeontologist to develop an appropriate mitigation action plan.

- Fossils and Stone Age artefacts are protected by law. Should anything of a palaeontological/palynological nature be found on site by the Contractor (or any other party), e.g. bones not previously visible, work is to be stopped in that area immediately, and the Environmental Control Officer (ECO) notified. Failure to do so will result in a penalty and this must be carefully explained to workers during the Environmental Education Programme undertaken by the ECO. No palaeontological or archaeological material may be removed from the site without a permit from Heritage Western Cape.

- Permits to recover fossils and archaeological material should be applied for (by the monitoring specialist) in advance of the Construction Phase commencing.

- Bulk earth works and excavation for foundations/infrastructure should be monitored by a palaeontologist or archaeologist with appropriate palaeontological knowledge. The frequency of this to be worked out *a priori* with the contractor to minimize time spent on site.

- If possible, geotechnical information together with the proposed locations and depths of excavations for foundations and/or infrastructure should be provided prior to the commencement of construction. This may enable a better estimation of the time(s) when monitoring would be necessary

- Protocols for dealing with palaeontological/palynological (fossil pollens) monitoring and possible further mitigation must be included in the Environmental Management Plan (EMP).

- Funds must be available *a priori* to cover costs of monitoring and any additional fieldwork and two dates should the opportunity/need arise.

- Should palaeontological and/or archaeological material be encountered, the ECO will advise on demarcation of this area and notify the specialist (palaeontologist/archaeologist with appropriate experience) to view material and ascertain whether further study of the area will be required.

- Should a specialist confirm a genuine fossil or sub-fossil and recommend further study of the area, work in the applicable area is to cease until further notice. Heritage Western Cape is to be informed immediately by the ECO.

- Should any human remains be disturbed, exposed or uncovered during excavation, work in that area must stop and the find shall immediately be reported the South African Police Service and the monitoring specialist. If suspected that the remains are older than 60 years, the SAHRA (021 462 4502) must be informed and established protocols followed.

- The removal of discovered palaeontological remains, by a contracted specialist shall be at the Developer's expense. This will include the cost of dating.

- All palaeontological and archaeological material will be lodged in an appropriate Iziko Museums of South Africa collection.

- The above recommendations must be included in the Environmental Management Plan for the proposed project.

9.2 Alternative 4

- Fossils and Stone Age artefacts are protected by law. Should anything of a palaeontological/palynological nature be found on site by the Contractor (or any other party), e.g. bones not previously visible, work is to be stopped in that area immediately, and the Environmental Control Officer (ECO) notified. Failure to do so will result in a penalty and this must be carefully explained to workers during the Environmental Education Programme undertaken by the ECO. No palaeontological or archaeological material may be removed from the site without a permit from Heritage Western Cape.

- Permits to recover fossils and archaeological material should be applied for (by the monitoring specialist) in advance of the Construction Phase commencing.

- Bulk earth works and excavation for foundations/infrastructure should be monitored by a palaeontologist or archaeologist with appropriate palaeontological knowledge. The frequency of this to be worked out *a priori* with the contractor to minimize time spent on site.

- If possible, geotechnical information together with the proposed locations and depths of excavations for foundations and/or infrastructure should be provided prior to the commencement of construction. This may enable a better estimation of the time(s) when monitoring would be necessary

- Protocols for dealing with palaeontological/palynological (fossil pollens) monitoring and possible further mitigation must be included in the Environmental Management Plan (EMP).

- Funds must be available *a priori* to cover costs of monitoring and any additional fieldwork and two dates should the opportunity/need arise.

- Should palaeontological and/or archaeological material be encountered, the ECO will advise on demarcation of this area and notify the specialist (palaeontologist/archaeologist with appropriate experience) to view material and ascertain whether further study of the area will be required.

- Should a specialist confirm a genuine fossil or sub-fossil and recommend further study of the area, work in the applicable area is to cease until further notice. Heritage Western Cape is to be informed immediately by the ECO.

- Should any human remains be disturbed, exposed or uncovered during excavation, work in that area must stop and the find shall immediately be reported the South African Police Service and the monitoring specialist. If suspected that the remains are older than 60 years, the SAHRA (021 462 4502) must be informed and established protocols followed.

- The removal of discovered palaeontological remains, by a contracted specialist shall be at the Developer's expense. This will include the cost of dating.

- All palaeontological and archaeological material will be lodged in an appropriate Iziko Museums of South Africa collection.

- The above recommendations must be included in the Environmental Management Plan for the proposed project.

9.3 Alternative 1 powerline requirements

- Palaeontology and buried archaeology – monitoring of tower footing excavations required. Eskom to contract an archaeologist or palaeontologist before construction to agree on a monitoring plan.

- Surface archaeology – archaeologist to undertake a `walk-down' survey of the proposed final alignment to steer potential impacts.

- The recommendation must be included in the Environmental Management Plan for the proposed project.

9.4 Alternative 4 powerline requirements

- Palaeontology and buried archaeology – monitoring of tower footing excavations required. Eskom to contract an archaeologist or palaeontologist before construction to agree on a monitoring plan.

- Surface archaeology – archaeologist to undertake a `walk-down' survey of the proposed final alignment to steer potential impacts.

- The recommendation must be included in the Environmental Management Plan for the proposed project.

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