

# **HERITAGE IMPACT ASSESSMENT FOR PROPOSED POWER LINES AND SUBSTATIONS NEAR SALDANHA BAY, HOPEFIELD AND VREDENBURG MAGISTERIAL DISTRICTS, WESTERN CAPE**

Required under Section 38 (8) of the National Heritage Resources Act (No. 25 of 1999).

HWC Case No.: 15091511GT0916E

*Report for:*

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*On behalf of:*

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1<sup>st</sup> draft: 12 September 2016

Final report: 14 October 2016

## EXECUTIVE SUMMARY

1. **Site Name**

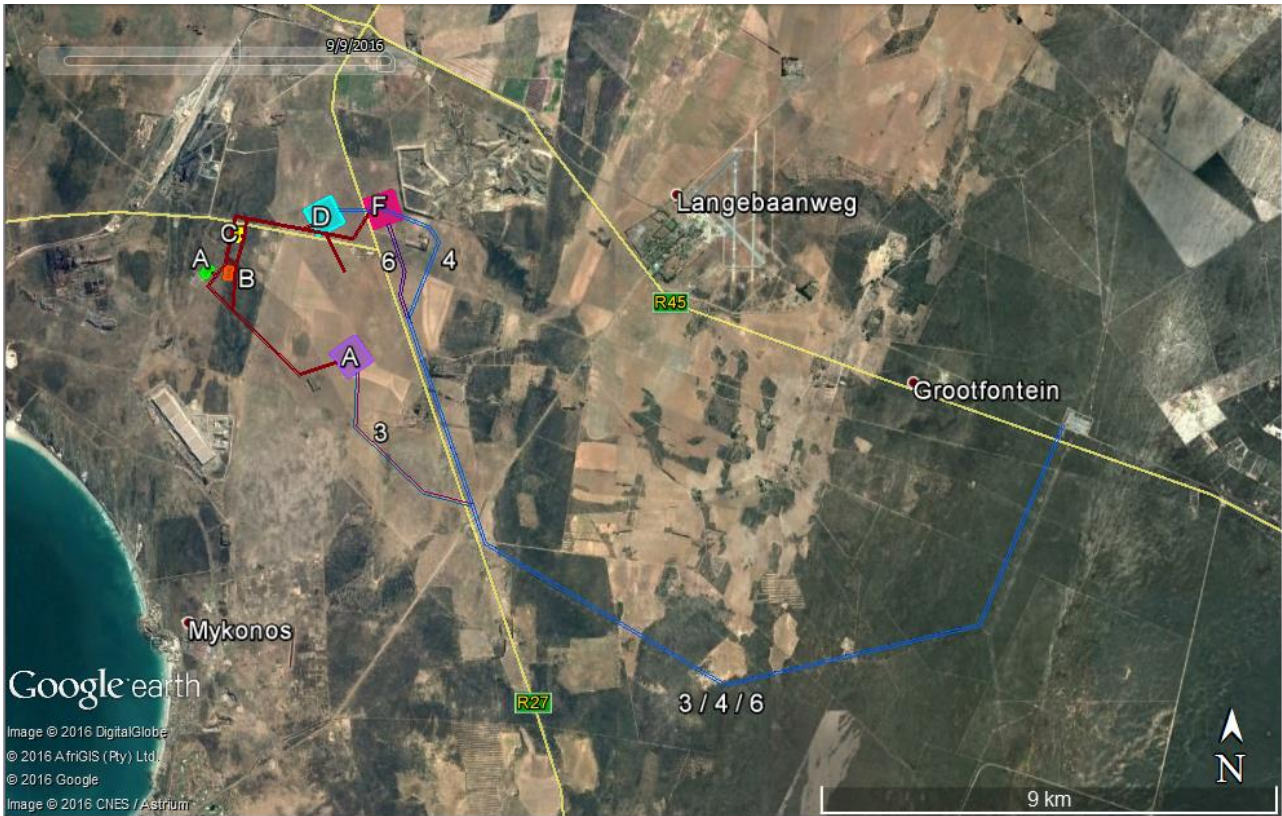
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2. **Location** (Street address/farm name, town/district, erf number and GPS coordinates)

The project is located near Saldanha Bay. The western end of the study area is at 32° 58' 40" S 18° 03' 00" E, while the eastern end is at 33° 00' 25" S 18° 14' 00" E. The following farm portions may be affected, depending on the final selection of project alternatives:

<b>Farm name</b>	<b>Farm number</b>	<b>Portion number</b>
Adjoining Springfontein	174	Remainder
Driehoeks Fontein	176	Remainder
Yzerfontein	178	8
Yzerfontein	178	3
Zoutekuilien	179	Remainder
Waschklip	183	Remainder
Langeberg	187	Remainder
Langeberg	187	1
Langeberg	187	4
Langeberg	187	11
Langeberg	188	Remainder
Langeberg	188	6
Uyekraal	189	Remainder
Uyekraal	189	1
Everts Hope	190	Remainder
Farm 1162	1162	Remainder

### 3. Locality Plan



### 4. Description of Proposed Development

The scope of Saldanha Bay network strengthening project includes the following:

- » Construction of a new 400/132kV Transmission Substation in the Saldanha Bay area with a planned capacity of 3 x 500 MVA transformers. The transmission substation footprint will be 600m x 600m. A number of alternative sites were identified but after the Scoping Phase of the project only Alternatives A, D and F have been carried forward into the EIA Phase;
- » Construction of a new 132/66kV Distribution Substation near the current Blouwater Substation in the Saldanha Bay area. The distribution substation footprint will be 120m x 120m. Three Alternatives – A, B and C – are being assessed in the EIA Phase;
- » The construction of two 400kV power lines (approximately 35 - 40 km) from the Aurora Substation to the new proposed distribution and transmission substations. A servitude of 55m is required for each power line. A number of alternative routes were identified but after the Scoping Phase of the project only Alternatives 3, 4 and 6 have been carried forward into the EIA Phase. More than half of the distance is shared by the three alternatives and runs parallel to a number of existing power lines extending westwards from the Aurora Substation;
- » Replacing two of the four existing 250 MVA 400/132 kV transformers with 2 x 500 MVA transformers at Aurora Substation; and
- » Establishing 2 x 132 kV feeder bays around Aurora Substation.

## 5. Heritage Resources Identified

The identified heritage indicators include:

- » archaeological resources in the form of several historical ruins that lie beneath the proposed Transmission Line Alternative 4 and 6 alignments (largely Grade IIIC but some NCW);
- » palaeontological resources in the form of buried fossils are likely to occur widely beneath the broader area (largely Grade IIIB but potentially as high as Grade I); and
- » the cultural landscape which is a combination of a historical agricultural landscape, an area of relatively natural landscape and a modern electrical and industrial landscape (Grade IIIC).

Although other resources like structures (suggested up to Grade IIIB) and the R45 scenic route (suggested Grade IIIB) are present, they will not be unduly impacted.

## 6. Anticipated Impacts on Heritage Resources

Archaeological resources (historical ruins) may require demolition but this is as yet unknown. Palaeontological resources are likely to be disturbed, damaged and/or destroyed during excavations for foundations, especially for the substations. The power lines are of less concern because of the small size of the required foundations. The cultural landscape will not experience significant impacts because the project will merely add to the electrical infrastructure layer that is already present on the landscape. The project alternatives are tabulated below along with their expected impacts.

Project alternative	Preference (1 = most; 3 = least)	Motivation
Transmission Line 3	1	Keeps electrical infrastructure grouped to the west of the R27
Transmission Line 4	3	Introduces large electrical infrastructure to the east of the R27 and is very close to the WCFP
Transmission Line 6	2	Introduces large electrical infrastructure to the east of the R27
Transmission Substation A	1	Keeps large electrical infrastructure grouped to the west of the R27
Transmission Substation D	2	Its large foundation excavations are still fairly close to the WCFP
Transmission Substation F	3	Introduces large electrical infrastructure to the east of the R27 and its large foundation excavations would be very close to the WCFP. Although impacts could be extensive, the potential positive impact of revealing new fossils and the screening effect of the large berm mean that this option is not fatally flawed
Distribution Substation A	1	Adjoins existing substation and reduces proliferation of impacts
Distribution Substation B	2	Located away from existing substation but is further from nearby road
Distribution Substation C	3	Located away from existing substation and also in close proximity to nearby road

## 7. Recommendations

Because the mitigation and management of any archaeological and palaeontological impacts that might arise are entirely feasible, it is recommended that the proposed project be allowed to proceed from a heritage point of view. However, the preference for Transmission Line Alternative 3, Transmission Substation Alternative A and Distribution Substation Alternative A are stressed (but see preference ranking above). The following recommendations are relevant and should be incorporated into the environmental authorisation for the project as relevant:

- » If Transmission Line Alternatives 4 or 6 are authorized, then archaeological mitigation of the historic ruins should take place under a workplan approved by HWC if they cannot be preserved *in situ*;
- » Full-time palaeontological monitoring of both authorized substation foundations (any Alternatives) and ad hoc monitoring of power line foundations is required under a workplan approved by HWC. The workplan must include provision for the collection and recording of any fossils unearthed during construction;
- » Training in the identification of fossils should be provided to project staff (construction workers, excavator operators and the Environmental Control Officer (ECO) who should be instructed to watch for fossils and report any discoveries;
- » Any fossil material recovered during the course of the project should be properly recorded and then lodged with an appropriate repository; and
- » If any further archaeological and/ or palaeontological material or human burials are uncovered during the course of development then work in the immediate area should be halted. The find would need to be reported to the heritage authorities and may require inspection by an archaeologist or palaeontologist. Such heritage is the property of the state and may require excavation and curation in an approved collection repository.

## 8. Author/s and Date

Heritage Impact Assessment: Dr Jayson Orton, ASHA Consulting (Pty) Ltd, & Dr Graham Avery

Responsibilities: Dr Jayson Orton – archaeological aspects and HIA reporting  
Dr Graham Avery – palaeontological aspects and HIA review

Date: 14 October 2016

## Glossary

**Early Stone Age:** Period of the Stone Age extending approximately between 2 million and 200 000 years ago.

**Fossil:** The petrified physical remains of a plant or animal (body fossil) or an impression (trace fossil) embedded and preserved in rock or other sediment.

**Holocene:** The geological period spanning the last approximately 10-12 000 years.

**Hominid:** a group consisting of all modern and extinct great apes (i.e. gorillas, chimpanzees, orangutans and humans) and their ancestors.

**Hominin:** a smaller group consisting of modern humans, extinct species of humans and all their immediate ancestors.

**Later Stone Age:** Period of the Stone Age extending over the last approximately 20 000 years.

**Middle Stone Age:** Period of the Stone Age extending approximately between 200 000 and 20 000 years ago.

**Pleistocene:** The geological period beginning approximately 2.5 million years ago and preceding the Holocene.

**Sub-fossil:** A bone which has not completely fossilised, either because of insufficient time or inappropriate mineralisation conditions.

## Abbreviations

**APHP:** Association of Professional Heritage Practitioners

**ASAPA:** Association of Southern African Professional Archaeologists

**CRM:** Cultural Resources Management

**DEA:** National Department of Environmental Affairs

**ECO:** Environmental Control Officer

**EIA:** Environmental Impact Assessment

**ESA:** Early Stone Age

**GPS:** global positioning system

**HIA:** Heritage Impact Assessment

**HWC:** Heritage Western Cape

**ka:** Thousand years ago

**LSA:** Later Stone Age

**Ma:** Million years ago

**MSA:** Middle Stone Age

**NEMA:** National Environmental Management Act (No. 107 of 1998)

**NHRA:** National Heritage Resources Act (No. 25) of 1999

**NID:** Notification of Intent to Develop

**PHS:** Provincial Heritage Site

**SAHRA:** South African Heritage Resources Agency

**SAHRIS:** South African Heritage Resources Information System

**WCFP:** West Coast Fossil Park.

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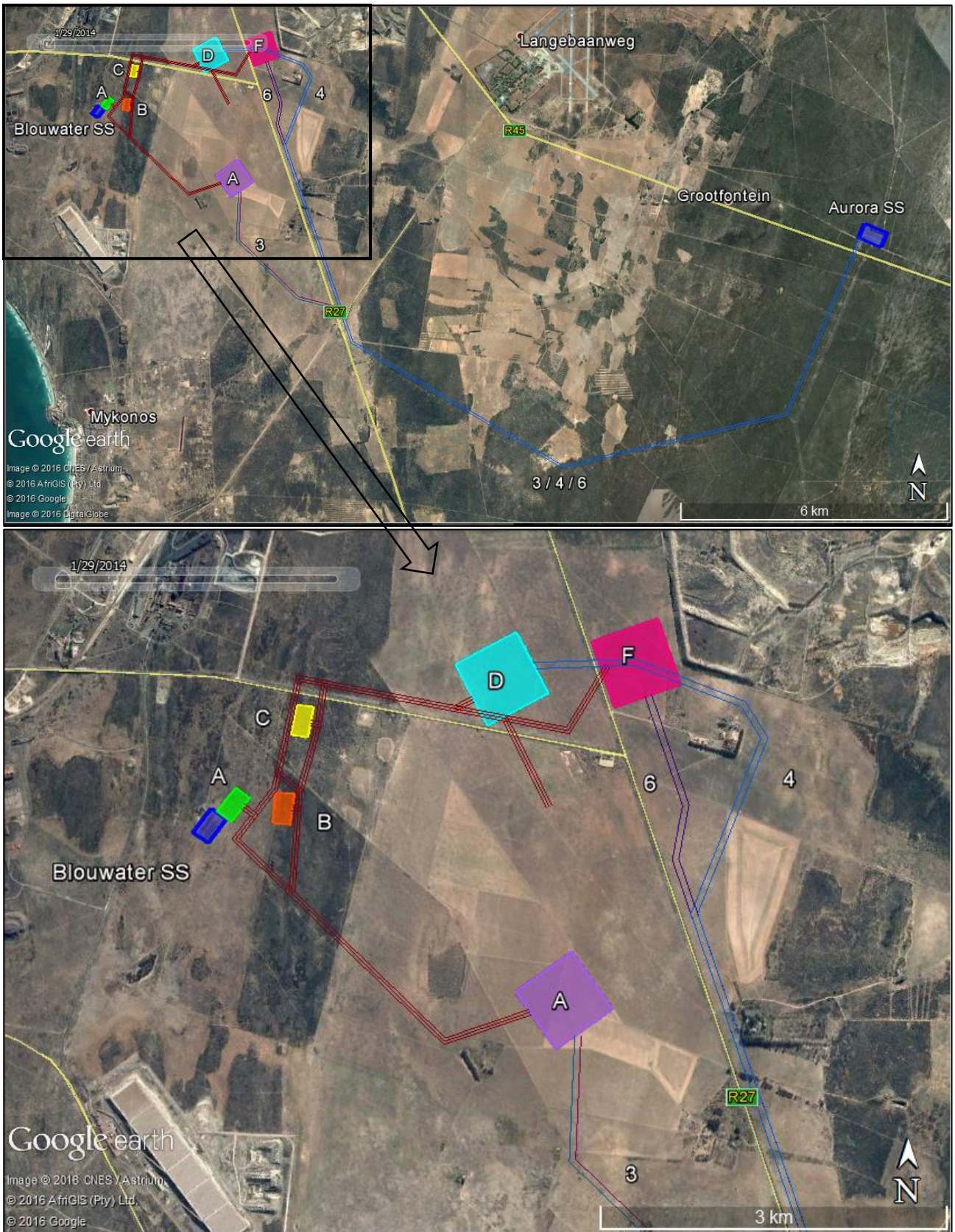


# 1. INTRODUCTION

ASHA Consulting (Pty) Ltd was appointed by Savannah Environmental (Pty) Ltd to conduct an assessment of the potential impacts to heritage resources that might occur through the proposed construction of power lines and substations near Saldanha Bay, in the Hopefield and Vredenburg Magisterial Districts (Figures 1 & 2). The western end of the study area is at 32° 58' 40" S 18° 03' 00" E, while the eastern end is at 33° 00' 25" S 18° 14' 00" E.



**Figure 1:** Map showing the location of the site. All project alternatives lie within the red shaded polygon (see Figure 2 for details).



**Figure 2:** Aerial view of the study area showing the transmission line alternatives (labelled 3, 4 and 6), the transmission substation alternatives (coloured squares labelled A, D and F) and the distribution substation alternatives (coloured rectangles labelled A, B and C). The existing Blouwater and Aurora Substations are in blue and labelled. Source: Google Earth Professional.

As part of the envisaged developments in the Saldanha Bay area, Eskom has reassessed the capability of the existing electricity network in the area in order to meet the forecasted load requirements from industrial customers, the Industrial Development Zone (IDZ) and local distributors, and also to facilitate the integration of renewable power generation. Power to the Saldanha Bay area is supplied from Aurora Substation which is located 28km east of Saldanha Bay. Aurora Substation supplies the Blouwater, Saldanha Steel and Smelter Distribution Substations. From the load forecast, it is evident that there will be a constraint at Aurora Substation. The projected new load of approximately 200 MVA that will be realised in the area together with the natural load growth will increase demand on the Aurora Substation from 517 MVA to approximately 890 MVA by the year 2030. The firm capacity in the area will be exceeded in 2018 if the additional loads are to be supplied from Aurora Substation. The transformation capacity is also insufficient to evacuate all of the potential renewable generation planned in the area, amounting to 2 885 MW.

### 1.1. Project description

The scope of Saldanha Bay network strengthening project includes the following:

- Construction of a new 400/132kV Transmission Substation in the Saldanha Bay area with a planned capacity of 3 x 500 MVA transformers. The transmission substation footprint will be 600m x 600m. A number of alternative sites were identified but after the Scoping Phase of the project only Alternatives A, D and F have been carried forward into the EIA Phase;
- Construction of a new 132/66kV Distribution Substation near the current Blouwater Substation in the Saldanha Bay area. The distribution substation footprint will be 120m x 120m. Three Alternatives – A, B and C – are being assessed in the EIA Phase;
- The construction of two 400kV power lines (approximately 35 - 40 km) from the Aurora Substation to the new proposed distribution and transmission substations. A servitude of 55m is required for each power line. A number of alternative routes were identified but after the Scoping Phase of the project only Alternatives 3, 4 and 6 have been carried forward into the EIA Phase. More than half of the distance is shared by the three alternatives and runs parallel to a number of existing power lines extending westwards from the Aurora Substation;
- Replacing two of the four existing 250 MVA 400/132 kV transformers with 2 x 500 MVA transformers at Aurora Substation; and
- Establishing 2 x 132 kV feeder bays around Aurora Substation.

Table 1 presents a list of all the farm portions that may possibly be affected by the project, although certain portions may be excluded depending on the final alignments and locations chosen for implementation.

**Table 1:** List of farm portions that might be affected by the proposed project.

Farm name	Farm number	Portion number
Adjoining Springfontein	174	Remainder
Driehoeks Fontein	176	Remainder
Yzerfontein	178	8
Yzerfontein	178	3
Zoutekuilen	179	Remainder
Waschklip	183	Remainder
Langeberg	187	Remainder
Langeberg	187	1
Langeberg	187	4
Langeberg	187	11
Langeberg	188	Remainder
Langeberg	188	6

<b>Farm name</b>	<b>Farm number</b>	<b>Portion number</b>
Uyekraal	189	Remainder
Uyekraal	189	1
Everts Hope	190	Remainder
Farm 1162	1162	Remainder

### **1.1.1. Aspects of the project relevant to the heritage study**

All aspects of the proposed development are relevant since excavations for foundations may impact on archaeological and/or palaeontological remains, while the above-ground aspects create potential visual (contextual) impacts to the cultural landscape and any significant heritage sites that might be visually sensitive.

### **1.2. Terms of reference**

ASHA Consulting (Pty) Ltd was requested to compile and submit to Heritage Western Cape (HWC) a Notification of Intent to Develop (NID) and then, once a response had been received, compile and submit a Heritage Impact Assessment (HIA). The assessment was to include a field survey. Corridors of 1 km width around all the proposed linear infrastructure were provided as the study area.

On submission of the NID, HWC responded with the following request on 30<sup>th</sup> September 2015:

**Requirement:**

You are hereby notified that, since there is reason to believe that the proposed development will impact on heritage resources, HWC requires that a Heritage Impact Assessment (HIA) that satisfies the provisions of section 38(3) of the NHRA be submitted.

All three routes described in the NID documentation cross a sensitive landscape.

This HIA must have specific reference to the following:

- Impacts to archaeological heritage resources
- Impacts to palaeontological heritage resources

The required HIA must have an integrated set of recommendations.

The comments of relevant registered conservation bodies and the relevant Municipality must be requested and included in the HIA where provided. Proof of these requests must be supplied.

It should also be noted, however, that following S.38(3) of the National Heritage Resources Act (No. 25 of 1999), even though certain specialist studies may be specifically requested, all heritage resources should be identified and assessed.

### **1.3. Scope and purpose of the report**

An HIA is a means of identifying any significant heritage resources before development begins so that these can be managed in such a way as to allow the development to proceed (if appropriate) without undue impacts to the fragile heritage of South Africa. This HIA report aims to fulfil the requirements of the heritage authorities such that a comment can be issued by them for consideration by the National Department of Environmental Affairs (DEA) who will review the Environmental Impact Assessment (EIA) and grant or refuse authorisation. The HIA report will outline any management and/or mitigation requirements that will need to be complied with from a heritage point of view and that should be included in the conditions of authorisation should this be granted.

## 1.4. The authors

Dr Jayson Orton has an MA (UCT, 2004) and a D.Phil (Oxford, UK, 2013), both in archaeology, and has been conducting Heritage Impact Assessments and archaeological specialist studies in the Western Cape and Northern Cape provinces of South Africa since 2004 (Please see curriculum vitae included as Appendix 1). He has also conducted research on aspects of the Later Stone Age in these provinces and published widely on the topic. He is an accredited heritage practitioner with the Association of Professional Heritage Practitioners (APHP) and also holds archaeological accreditation with the Association of Southern African Professional Archaeologists (ASAPA) CRM section (Member #233) as follows:

- Principal Investigator: Stone Age, Shell Middens & Grave Relocation; and
- Field Director: Colonial Period & Rock Art.

Dr Graham Avery has an MA (UCT, 1976) and PhD (UCT, 1990), both in archaeology but has worked extensively in the palaeontological field, focusing on the south-western coast of South Africa and in both research and commercial contexts (please see curriculum vitae included as Appendix 1). He has conducted research on a variety of Early, Middle and Later Stone Age and palaeontological sites and published the findings. He is a member of the Palaeontological Society of South Africa. He holds archaeological accreditation with the Association of Southern African Professional Archaeologists (ASAPA) CRM section (Member #008) as follows:

- Principal Investigator: Stone Age, Shell Middens Middle Pleistocene studies & archaeozoology.

## 1.5. Declaration of independence

ASHA Consulting (Pty) Ltd and its consultants have no financial or other interest in the proposed development and will derive no benefits other than fair remuneration for consulting services provided.

## 2. HERITAGE LEGISLATION

The National Heritage Resources Act (NHRA) No. 25 of 1999 protects a variety of heritage resources as follows:

- Section 34: structures older than 60 years;
- Section 35: palaeontological, prehistoric and historical material (including ruins) more than 100 years old;
- Section 36: graves and human remains older than 60 years and located outside of a formal cemetery administered by a local authority; and
- Section 37: public monuments and memorials.

Following Section 2, the definitions applicable to the above protections are as follows:

- Structures: "any building, works, device or other facility made by people and which is fixed to land, and includes any fixtures, fittings and equipment associated therewith";
- Palaeontological material: "any fossilised remains or fossil trace of animals or plants which lived in the geological past, other than fossil fuels or fossiliferous rock intended for industrial use, and any site which contains such fossilised remains or trace";
- Archaeological material: a) "material remains resulting from human activity which are in a state of disuse and are in or on land and which are older than 100 years, including artefacts, human and hominid remains and artificial features and structures"; b) "rock art, being any form of painting, engraving or other graphic representation on a fixed rock surface or loose rock or stone, which was executed by human agency and which is older than 100 years, including any area within 10m of such representation"; c) "wrecks, being any vessel or aircraft, or any part thereof, which was wrecked in South Africa, whether on land, in the internal waters, the territorial waters or in the maritime culture zone of the Republic, as defined respectively in sections 3, 4 and 6 of

the Maritime Zones Act, 1994 (Act No. 15 of 1994), and any cargo, debris or artefacts found or associated therewith, which is older than 60 years or which SAHRA considers to be worthy of conservation"; and d) "features, structures and artefacts associated with military history which are older than 75 years and the sites on which they are found";

- Grave: "means a place of interment and includes the contents, headstone or other marker of such a place and any other structure on or associated with such place"; and
- Public monuments and memorials: "all monuments and memorials a) "erected on land belonging to any branch of central, provincial or local government, or on land belonging to any organisation funded by or established in terms of the legislation of such a branch of government"; or b) "which were paid for by public subscription, government funds, or a public-spirited or military organisation, and are on land belonging to any private individual."

While landscapes with cultural significance do not have a dedicated Section in the NHRA, they are protected under the definition of the National Estate (Section 3). Section 3(2)(c) and (d) list "historical settlements and townscapes" and "landscapes and natural features of cultural significance" as part of the National Estate. Furthermore, Section 3(3) describes the reasons a place or object may have cultural heritage value; some of these speak directly to cultural landscapes.

Section 38 (2a) states that if there is reason to believe that heritage resources will be affected then an impact assessment report must be submitted. This report fulfils that requirement.

Under the National Environmental Management Act (No. 107 of 1998; NEMA), as amended, the project is subject to an EIA. HWC is required to provide comment on the proposed project in order to facilitate final decision making by DEA.

### **3. METHODS**

#### **3.1. Literature survey and information sources**

A survey of available literature was carried out to assess the general heritage context into which the development would be set. This literature included published material, unpublished commercial reports and online material, including reports sourced from the South African Heritage Resources Information System (SAHRIS). The 1:50 000 map and historical aerial images were sourced from the Chief Directorate: National Geo-Spatial Information. Geological and palaeontological information was sourced from 1:125 000 and 1:250 000 geological maps and published and unpublished reports.

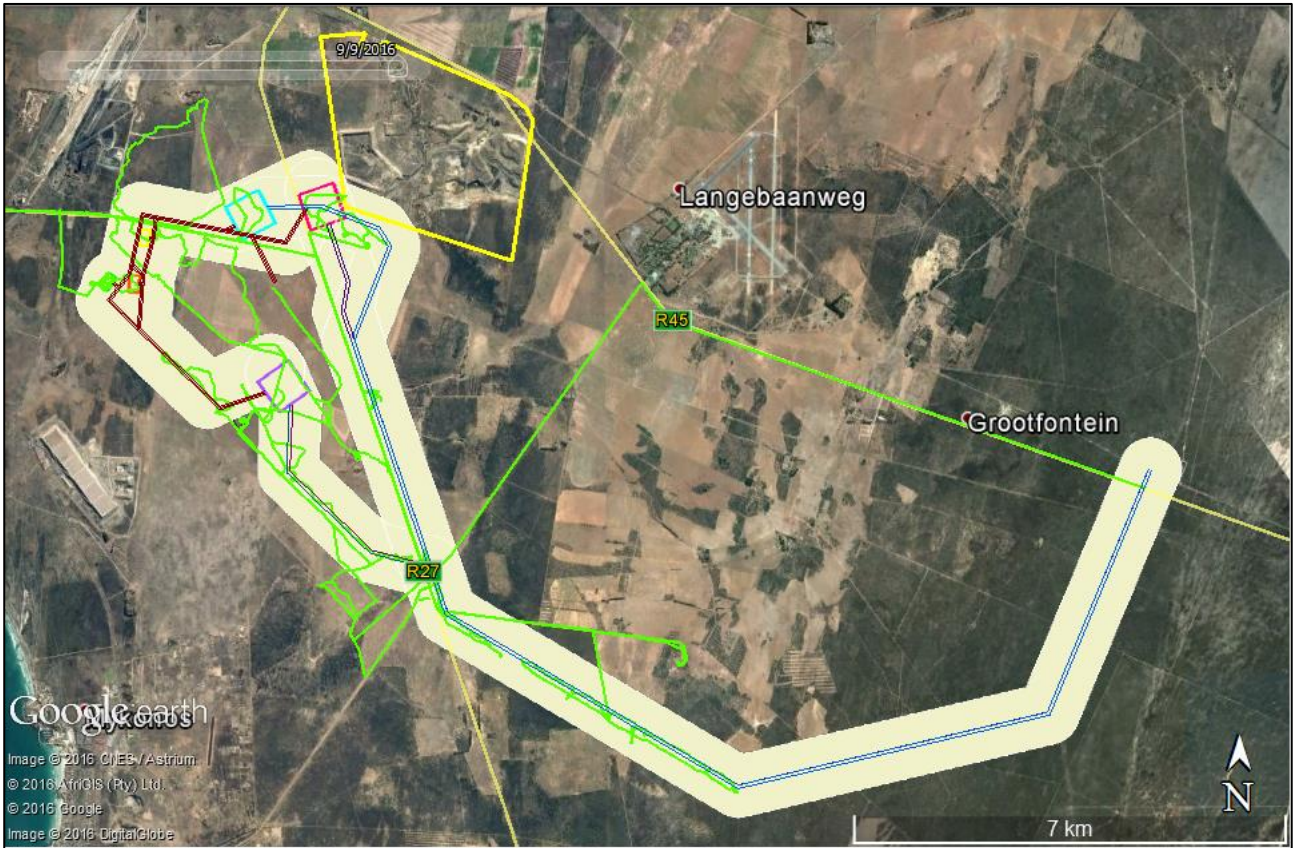
#### **3.2. Field survey**

The site was surveyed on 17<sup>th</sup> and 18<sup>th</sup> August 2016. This was during winter and plant growth, especially of annuals, was quite advanced. This meant that visibility was not ideal but, given our knowledge of the area, was sufficiently adequate not to have had a negative effect on the outcomes of the report. Data from two earlier surveys (Orton 2011, 2014) were also included in the project because of the overlapping study areas. During the surveys the positions of finds were recorded on a hand-held GPS receiver set to the WGS84 datum. Note that the locations of some gum tree lines were plotted on aerial photography from the desktop. Photographs were taken at times in order to capture representative samples of both the affected heritage and the landscape setting of the proposed development.

Although it is well known that Stone Age archaeological resources and fossil material are very unlikely to be found on the surface in the study area, the main foci of the survey were as follows:

- » Check for any disturbances or excavations in the study area that may provide subsurface observations to confirm existing knowledge;

- » Check for the presence of any small fossil bone fragments in the southern part of the study area that might indicate an extension of the Elandsfontein occurrence; and
- » Locate historical sites in the study area because these are known to occur in places.



**Figure 3:** Aerial view of the study area (white shading) showing the proposed infrastructure (see Figure 2 for details) and the walk and drive paths recorded during the survey (green lines). The yellow polygon indicates the West Coast Fossil Park.

### 3.3. Specialist studies

This report includes specialist assessments of both archaeology (by Dr Jayson Orton) and palaeontology (by Dr Graham Avery). Both assessments are included within the body of the report.

### 3.4. Impact assessment

For consistency, the impact assessment was conducted through application of a scale supplied by Savannah Environmental (Pty) Ltd.

### 3.5. Grading

S.7(1) of the NHRA provides for the grading of heritage resources into those of National (Grade I), Provincial (Grade II) and Local (Grade III) significance. Grading is intended to allow for the identification of the appropriate level of management for any given heritage resource. Grade I and II resources are intended to be managed by the national and provincial heritage resources authorities respectively, while Grade III resources would be managed by the relevant local planning authority. These bodies are responsible for grading, but anyone may make recommendations for grading.

It is intended under S.7(2) that the various provincial authorities formulate a system for the further detailed grading of heritage resources of local significance but this is generally yet to

happen. Heritage Western Cape (2016), however, uses a system in which resources of local significance are divided into Grade IIIA, IIIB and IIIC. These approximately equate to high, medium and low local significance, while sites of very low or no significance (and generally not requiring mitigation or other interventions) are referred to as Not Conservation Worthy (NCW).

### 3.6. Assumptions and limitations

The field study was carried out at the surface only and hence any completely buried archaeological and palaeontological sites would not be readily located. Similarly, it is not always possible to determine the depth of such material visible at the surface. We were limited to a degree by the vegetation cover, especially in areas of indigenous vegetation.

We were limited by not being able to contact one of the landowners (Farm 1162, Portions 3 and 8 of Farm 178) and not being allowed onto one of the farms (Remainder of Farm 176).

## 4. PHYSICAL ENVIRONMENTAL CONTEXT

### 4.1. Site context

The site varies greatly from west to east. The western part is quite industrialised with a number of large factories present in the surrounding area. In keeping with the fact that this area is part of the Industrial Development Zone (IDZ) many large industrial-type development applications have been made for the area in recent years. The existing Blouwater Substation occurs at this end of the proposed development area. Much of the land in the west and central parts is currently agricultural land. Towards the east the project crosses over mostly undisturbed natural vegetation with the Aurora Substation located at the eastern end. Existing power lines link the above-mentioned substations and the various industrial facilities in the area.

### 4.2. Site description

The landscape is generally flat, although one large, low hill occurs in the central/southern part of the study area. In the west the agricultural lands were covered with low vegetation (Figures 4 & 5). The surface was sandy, but in places there were patches of calcrete gravel (Figure 6) and, at times, small expanses of solid calcrete were visible at the surface (Figure 7). Although the vast majority of the area is sandy, granite bedrock protrudes in a few places in the west (Figure 8). In the east the bulk of the land is covered with fairly dense indigenous vegetation with very few areas of open agricultural land (Figures 9 & 10).



**Figure 4:** View towards the east of the Blouwater Substation and, to its left, the proposed Alternative A distribution substation site. Alternative B lies further east in the distance, while Alternative C is out of view towards the left.





**Figure 5:** View towards the southwest across the proposed Alternative F site for the transmission substation. Alternative D lies in the background, while Alternative A is in the distance at far left of this picture. This view is from the berm along the western margin of the West Coast Fossil Park.



**Figure 6:** Typical agricultural land in the western part of the study area with calcrete gravel on the surface. This view is towards the east across the Alternative F transmission substation site and the western berm of the West Coast Fossil Park lies in the background.



**Figure 7:** Exposed patches of intact surface calcrete near transmission substation Alternative A (Source: Orton 2011: figure 7).



**Figure 8:** A small granite outcrop along a transmission line Alternative 3 in the western part of the study area.



**Figure 9:** View towards the west across the southern part of the study area from the hill to the east of the R27.



**Figure 10:** View towards the south from the R45 with the Aurora Substation behind the viewer.

## 5. HERITAGE CONTEXT

This section of the report contains the desktop study and establishes what is already known about heritage resources in the vicinity of the study area. What was found during the field survey may then be compared with what is already known in order to gain an improved understanding of the significance of the newly reported resources.

### 5.1. Archaeological aspects

The broader area around Langebaan, Saldanha Bay and the Vredenburg Peninsula contains some highly significant archaeological sites including Middle Stone Age (MSA) shell middens (Avery *et al.* 2008; Berger & Parkington 1995; Churchill *et al.* 2000; Kyriacou *et al.* 2015; Stynder *et al.* 2001; Will *et al.* 2013; Volman 1978). Bifacial points commonly associated with the MSA period known as “Still Bay” have also been found on the Vredenburg Peninsula (Bateman 1946; Smith 2006).

Later Stone Age (LSA) material is more common, however, and sites of this period occur widely, but with a focus on the coastline and prominent rocky outcrops. The Kasteelberg hill, located 10 km northwest of Vredenburg is particularly important as a centre of regular settlement (Klein and Cruz-Urbe 1989; Sadr *et al.* 2003; Smith 2006; Smith *et al.* 1991; Volman 1978). Other outcrops at Vredenburg and Honingklip have also revealed archaeological occupation sites (Smith *et al.* 1991). One site of significance that has been documented in the open lands around Kasteelberg is KFS5 where it was suggested that a Khoekhoe kraal may once have been present (Fauvelle-Aymar *et al.* 2006). Various studies on the plains in the western part of the present study area have shown that archaeological material is virtually entirely absent away from the immediate coastline and larger granite outcrops (Hart 2003; Hart & Pether 2008; Kaplan 2007; Orton 2007, 2011; Smith 2011). Within the West Coast Fossil Park (WCFP) boundary, however, is a large deflation hollow on a low hill called Anyskop. In addition to occasional ESA and MSA artefacts, numerous LSA artefacts and burnt stones indicative of hearths have been recorded there (Dietl *et al.* 2005; Kandel and Conard 2012). This site lies 1.5 km from the Alternative 4 transmission line route. Kaplan (2007) also recorded an ephemeral LSA scatter in a shallow blowout to the southeast of Anyskop.

LSA shell middens occur behind the rocky outcrops in the vicinity of Club Mykonos some 7 km southwest of the present study area (Hart 2001; Hart and Gribble 1998; Hart & Jerardino 1998), while another very large midden, Diaz Street Midden was destroyed during construction

of the Saldanha Bay police station (Orton 2009). The entire coastline of the Vredenburg Peninsula has shell middens and scatters of varying density all around it (see references in Orton 2014), while the northern shores of Saldanha Bay have revealed a number of smaller sites (e.g. Hart 2003; Kaplan 1994).

LSA burials are relatively uncommon from this area (Morris 1992), although as many as six burials were found in Diaz Street Midden in Saldanha Bay (Dewar 2010).

Historical material is uncommon in the area, but a few sites are on record. About 1.5 km north of distribution substation Alternative C, Kaplan (1996) recorded a shepherd's hut and collected an associated scatter of late 19<sup>th</sup> century material. Orton (2007) found a scatter of late 19<sup>th</sup> or early 20<sup>th</sup> century glass and ceramics some 8.5 km west of the distribution substation sites but the scatter did not appear to be associated with anything. About 4 km southwest of these substation sites Kruger (2016) located an historical farm complex that included ruins, a threshing floor and two middens with historical artefacts.

## **5.2. Palaeontological aspects**

The bedrock formations in the study area are Malmesbury Group shales and Cape Granite Suite rocks; these are of no palaeontological interest. However, the overlying younger deposits have yielded important fossil finds in a number of localities, especially from the Langebaan, Springfontyn and Velddrif Formations (Pether 2014). Table 2 and Figure 11 summarise the regional stratigraphic and lithological sequence for the study area. Although sparsely distributed, mineralized or sub-fossil palaeontological remains may be encountered in any of the fossiliferous deposits described, including the earliest formations above bedrock which occur at significant depth and are only reached by extensive wind erosion, such as at Elandsfontein, or the deep excavations related to mining, at Langebaanweg and other locations. The earlier Formations are not expected to be encountered during the construction of the powerline, but deeper excavations at the substations may do so as evidenced at the WCFP, Saldanha Steel and the Langeberg borehole (Table 2; Gavin Stigling, personal communication 2016).

In the most recent superficial Witzand Formation rare sub-fossil and more recent remains from archaeological sites and chance finds provide historical distributional information that supplements a sparse published record (Boshoff, Landman, and Kerley 2016; Skead 2011). Coastal dune plumes, some extending many kilometers inland, are a feature of the area. From Yzerfontein, a significant coastal dune plume extends in a roughly north-easterly direction towards and beyond Hopefield (>45 km) (Roberts *et al.* 2009; Roberts & Smith 2008) and from Saldanha Bay and other coastal areas (Roberts *et al.* 2013); over time pulses of advancing aeolian sediments of Middle and Late Pleistocene and Holocene age, interspersed with re-vegetation and erosion, have contributed to this feature, which overlies the older Langebaan Formation, which, in turn, is also subdivided into older and younger elements (Table 2).

Tracts of Recent Witzand Formation sediments overlie the Springfontyn Formation sediments, which are known to include fossils of Pleistocene age, including the significant occurrence at Elandsfontein. On the coast, marine mollusc deposits occur in the Velddrif and other Formations (Pether 2014; Kilburn & Tankard 1975; Rogers 1980).

Partially exposed, and underlying these deposits, is the ubiquitous calcareous Langebaan Formation, which is the white-coloured calcrete visible over large surface areas; it has yielded terrestrial and marine fossils (Hendey 1981, 1982; Rogers 1980). Langebaan Formation aeolian deposits are known to contain isolated fossil terrestrial snails, tortoises, ostrich bones and eggshell fragments and other sparsely scattered bones. Significant also are bone concentrations associated with erosion hollows in older Langebaan calcrete in which Middle and Late Pleistocene hyenas have left large accumulations of their prey at Sea Harvest (Grine and Klein 1993), Hoedjiespunt (Berger and Parkington 1995; Stynder 1997; Klein 1983), the

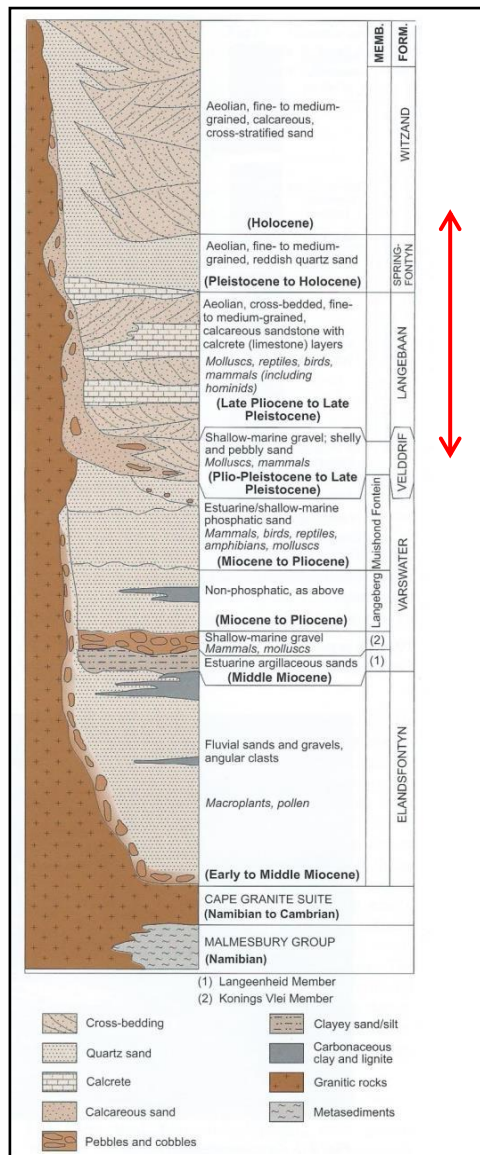
Saldanha Yacht Club (Avery 2013, 2014; Manthi 2002) and Besaansklip (Brink 2005). Fossils can also be found within calcrete and between layers of calcrete. Dune slacks with accumulated water may have attracted animals in the past and such localities can produce rich fossil assemblages.

The Langebaan Formation is underlain by the late Pliocene Uyekraal Formation and early Pliocene Varswater Formation, which includes Langebaanweg, and the middle Miocene Prospect Hill Formation, which has yielded important evidence of an extinct ostrich, and the lowermost, Elandsfontyn Formation, of fluvial origin, known primarily for microfossils and, in particular, plant remains, which have provided details of the middle Miocene palaeoenvironment, which included forest trees and palms (Rogers 1980; Coetzee 1978; Roberts *et al.* 2013) (Table 1).

Although palaeontological remains are not normally associated with very ancient rocks like the Cape Granite suite and Malmesbury Group bedrock, such rocks (and some older Langebaan Formation calcretes) may, nevertheless, provide features, such as holes and overhangs that were used by animals who in turn left the bones of their prey in these contexts.

**Table 2:** Summary of the stratigraphy and lithology of the Sandveld Group (Pether *et al.* 2000), Pether (2014), Roberts *et al.* (2006) and G. Avery (pers. observation). Source: modified from Pether (2013: table 2).

<b>Formation</b>	<b>Age and Lithologies</b>	<b>Fossil Potential</b>
Witzand	Holocene and recently active calcareous dune fields and cordons (<-12 ka)	Rare sub-fossils of importance for historical faunal distribution. Mainly Later Stone Age archaeological sites.
Springfontyn	Pleistocene to Recent (Holocene) quartzose sand dunes, silts and peats (<-2 Ma)	Mineralized bones generally sparse, but can be prolific in some areas, e.g. Elandsfontein and part of Baard's Quarry. High significance
Langebaan	Late Quaternary aeolianites <-3 Ma	Mineralized bones moderately common. Local to high significance. Extends under sea. Local to high significance
Velddrif	Quaternary raised beaches and estuarine deposits <-1.2 Ma. Sea levels below ~15 m asl	Marine molluscs common and rare bones at or near the coast. High significance
<b>Marine erosion surfaces below ~15 m asl.</b>		
<b>Old indet. sands</b>		
Langebaan	Late Pliocene to mid- Quaternary aeolianites. <~3 Ma	Molluscs and sparse (can be patchy concentrations, e.g. Langebaanweg, bones of terrestrial and marine forms. Extends under sea. Local to high significance
Uyekraal -- Previously subsumed in the upper Varswater Fm	Mid-Pliocene marine deposits ~3 Ma. Sea-level max. ~35 m asl	Shell fossils common, local significance. Fossil bones very sparse, high significance
<b>Marine erosion surface to ~35 m asl</b>		
<b>Old indet. sands</b>		
Langebaan	Earlier Pliocene aeolianites <~3 Ma.	Fossil bones moderately common, local to high significance
Varswater – upper	Later early Pliocene regressive deposits of wider area. 5-4 Ma. Sea-level max. ~50-60 m asl	Fossil bone rare, high significance. Poorly known, fossil shells of high significance
Varswater – lower	Early Pliocene transgressive marine deposits in embayments (upper KGM?, LQSM and MPPM members	Fossil bone common locally, high significance. Shells very sparse, high significance
<b>Marine erosion surface to ~60 m asl</b>		
<b>Very old indet sands</b>		
Prospect Hill	Miocene aeolianite 12 to 9 Ma	Fossils very sparse – high significance
Saldanha	Mid-Miocene marine deposits (predicted presence), 17-14 Ma. Sea-level max. ~90 m asl. May include the lower KGM?	Very few fossils recovered, high significance if found.
<b>Marine erosion surface to ~100 m asl</b>		
Langeenheid Clayey Sand -- Previously a member of the Lower Varswater Fm	Mid Miocene early-transgression estuarine deposits (prev. LCSM Member in lower Varswater Fm.). 18-17 Ma.	Plant microfossils – high significance
Elandsfontyn	Middle to late Miocene fluvial coarse, angular sands, muds and carbonaceous sediments. ~15 Ma to ~12 Ma	Microfossils, including pollens, and macro remains of plants, high significance



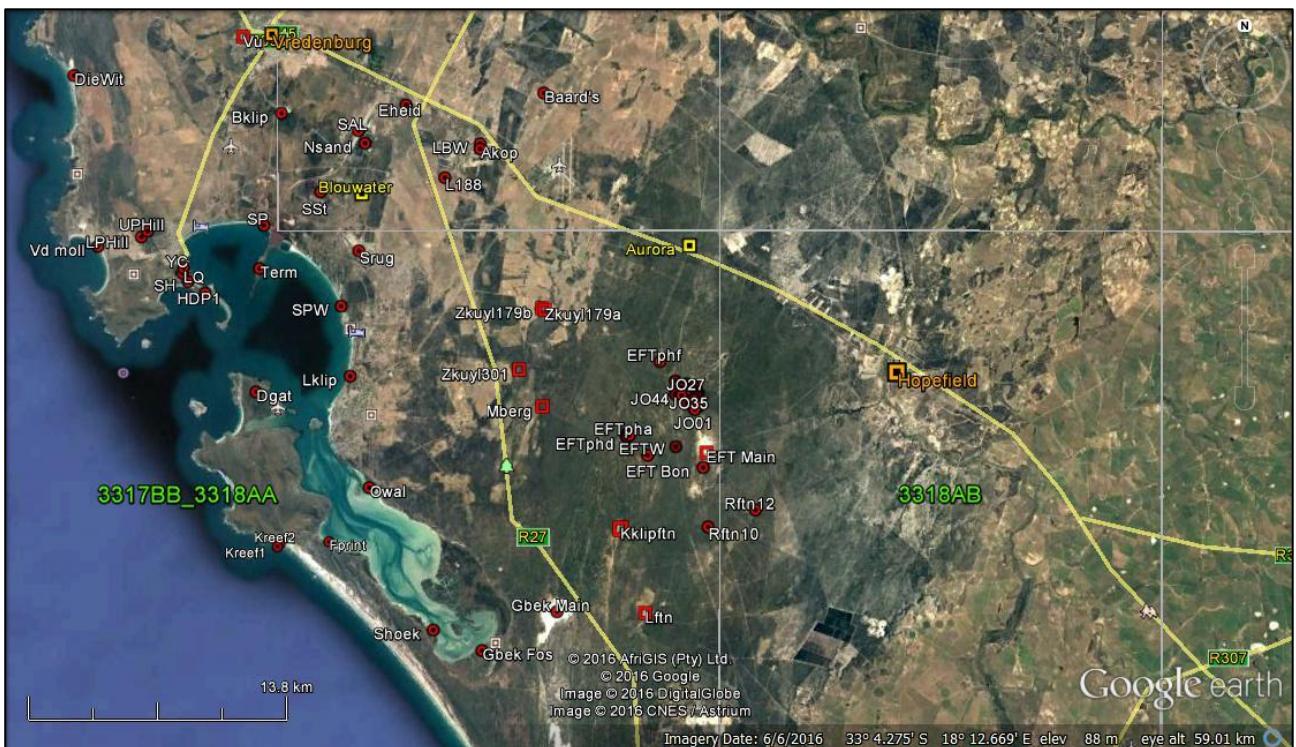
**Figure 11:** Composite summary of Sandveld Group Lithostratigraphy in the Saldanha region (Roberts *et al.* 2006). Formations most likely to yield palaeontological remains are arrowed.

The Springfontyn, Langebaan, Velddrif and Uyekraal Formations would be the most likely sediments to yield palaeontological material, although considerably-deeper fossil-bearing sediments (Lower Langebaan, Uyekraal, Varswater, Prospect Hill, Saldanha, Langeenheid and Elandsfontyn Formations) also underlie the project area (Roberts *et al.* 2006; Roberts *et al.* 2011; Roberts and Brink 2002; Pether 2013). In this context, preserved Pleistocene archaeological material is unlikely to be older than the Springfontyn Formation (Braun, Levin, Stynder, *et al.* 2013; Klein *et al.* 2007; Avery, in preparation a & b; Fuchs *et al.* 2008; Felix-Henningsen *et al.* 2003; Kandel & Conard 2012) where it overlies, or is in the topmost, Langebaan Formation, as at Elandsfontein and Anyskop.

Locations of local palaeontological sites are shown on Figure 12. Highly significant sites are remarkably rich and include, for example, the well-known Early Pliocene terrestrial, fluvial and marine palaeontological occurrence in the Varswater Formation at the WCFP with deposits laid down during a higher sea level. It should be noted that the WCFP, which was declared a National Heritage Site (NHS) on 28 November 2014 for its outstanding scientific value, lies immediately east of the northern end of transmission line Alternative 4 and transmission substation Alternative F. The gazetted notice contained the following description of its significance (SAHRA n.d.):

The West Coast Fossil Park at Langebaanweg is a five million year old fossil bed that was discovered in the floor of an open cast phosphate mine in the 1960s. Since then, researchers at the Iziko: South African Museum have amassed over one million vertebrate fossils from controlled excavations, surface collecting and bulk sampling in different parts of the mine. These fossils have achieved international acclaim by scientists for their superb preservation, abundance and richness in diversity to the extent that this locality is now widely regarded as possibly the most important Early Pliocene terrestrial fossil occurrence in the world.

Research into the deposits of the WCFP has been extensive (Eze & Meadows 2014; Franz-Odendaal *et al.* 2002; Franz-Odendaal 2002; Govender 2014; Govender *et al.* submitted; Govender & Chunsamy 2013; Haarhof 1988; Halkett & Hart 1999; Hendey 1969, 1981; Manegold *et al.* 2014; Matthews *et al.* 2015; Merceron & Unger 2005; Olson 1985; Pavia *et al.* 2014; Pether 2009; Rich 1980; Rich & Haarhof 1985; Roberts *et al.* 2011; Rossouw *et al.* 2009; Simpson 1975, 1979; Singer 1961; Smith & Haarhof 2006).



**Figure 12:** Locations of known palaeontological sites in the Saldanha area (details in Table 3).

Equally well-known is Elandsfontein (Archer 2010; Avery 1988; Braun, Levin, Stynder, *et al.* 2013; Inskip and Hendey 1966; Klein 1978, 1988; Klein & Cruz-Urbe 1991; Klein *et al.* 2007; Luyt *et al.* 2000; Mabutt 1956; Singer 1954; Singer & Wymer 1968; Smith & Stynder 2015; Stynder 2009; Vrba 1982) which lies within 6 km of the transmission route to the south of the Aurora Substation. This site is a declared Provincial Heritage Site (PHS) and has ESA, MSA and LSA remains as well as a diverse terrestrial fauna in the context of water bodies. Spreeuwalle, which has yielded far fewer fossils (unpublished data referenced in Klein *et al.* 2007), and the 117 000 year old human and animal tracks (trace fossils) preserved in aeolianite (Roberts & Berger 1997) both lie along the shores of the Langebaan Lagoon. Also important is the Early Pliocene marine Varswater occurrence at Saldanha Steel (Roberts 1997b).

Fossils, many in Middle Pleistocene hyaena accumulations, have been found in Langebaan Formation sediments in a number of excavations in the vicinity, including at the Namakwa Sands smelter (Pether 2006; 1.5 km north of distribution substation Alternative C), Besaansklip Mine (Brink 2005), SALKOR (Pether 2011), and on the coast at Sea Harvest (Grine & Klein 1993) and Hoedjiespunt (Berger and Parkington 1995; Churchill, Berger, and

Parkington 2000; Hare and Sealy 2013; Matthews, Denys, and Parkington 2005; Stynder et al. 2001; Stynder 1997; Klein 1983). The latter site also yielded human remains. These and other sites contribute significantly to knowledge on past biodiversity and the development of past human behaviour. The area is palaeontologically and archaeologically sensitive; however, with a few notable exceptions, it remains understudied.

**Table 3:** Summary details for palaeontological and Pleistocene archaeological sites shown in Figure 12. See Table 2 for regional stratigraphy and lithological and chronological details.

Site	Formation	Selected References	Type of Occurrence	Acronym
Besaansklip	Langebaan	(Brink 2005); National Museum, Bloemfontein	Palaeontology. Hyaena den accumulation in Langebaan Formation.	Bklip
Brandsfontein		(Pether 2013)	Palaeontological. Farm name only. (Pether 2013), Fig. 5. In same area as the JO sites, which are plotted.	JO
Danger Bay	Velddrif	(Pether 2014)	Palaeontological. Molluscs in raised beach deposits <15 m asl.	DangerB
Die Witsand		(Pether 2013)	Palaeontological. Farm name only. (Pether 2013), Fig. 5.	DieWit
Donkergat – Military area	Langebaan (upper)	G Avery pers. observation	Palaeontological. Bones of small terrestrial vertebrate ( <i>Bathergus suillus</i> ) in upper aeolianite exposure.	Dgat
Eensaamheid – Wind Farm proposal	Springfontyn Langebaan ?Varswater	(Avery and Avery 2009)	Palaeontology. Langebaan Formation included fossil gastropod <i>Trigonephrus globulus</i> .	Ens
Elandsfontein	Springfontyn- Langebaan erosion surface?	(Orton 2007); GAvery pers Observation; (Avery 2015)	Palaeontology and Pleistocene archaeology. Scattered mineralized bone fragments and artefacts in blow outs NNW of the “Main” Site.	JO; Rftn; EFTph
Elandsfontein	Springfontyn- Langebaan mixed exposure	(Avery 2015; Avery, in preparation a & b; Plasket 2013; Halkett and Webley 2015)	Eroded Langebaan Formation outcrops. Sparse fragments of mineralized bone and sparse MSA/ESA artefacts (and see Elandsfontein Wes).	J-LP
Elandsfontein – “Bone Circle”	Langebaan	(Inskeep and Hendey 1966; Luyt, Lee-Thorp, and Avery 2000); Iziko South African Museum Cenozoic Collections	Palaeontological. Hyaena accumulation.	EFT bon
Elandsfontein – “Main” Site	Springfontyn; Langebaan; Varswater; Elandsfontyn	(Archer 2010; Avery 1988, in preparation a & b; Braun, Levin, Roberts, et al. 2013; Braun, Levin, Stynder, et al. 2013; Inskeep and Hendey 1966; Klein et al. 2007; Klein 1978; Klein and Cruz-Uribe 1991; Luyt, Lee-Thorp, and Avery 2000; Roberts and Braun 2014; Smith and Stynder 2015 In Press; Stynder 2009; Singer and Wymer 1968; Rogers 1980; Drennan 1953, 1954; Klein 2009; Volman 1984; Goodwin 1953); Iziko South African Museum Cenozoic Collections, UCT	Palaeontological and Pleistocene Archaeological. Provincial Heritage Site. Well-preserved fossils and artefacts exposed in dune slacks by wind erosion. Diverse terrestrial vertebrate taxa, plants (pollens); Early Stone Age (ESA) – Late Acheulean. In probable association with fossils in the Cutting 10 excavation. Rare Middle Stone Age (MSA) – Still Bay artefacts. Early <i>Homo sapiens</i> ( <i>Homo heidelbergensis</i> ) cranial remains contemporary with ESA. Hyaena accumulations contiguous with general surface.	EFT Main
Elandsfontein – Phosphate Mine terraces		(Goodwin 1953; Mabbutt 1956; Avery, in preparation a & b; Halkett and Webley 2015)	Palaeontological and Archaeological. In the past deflated areas extended west and south of Elandsfontein “Main”. Scattered fossils and Pleistocene artefacts were reported. Such scatters on the Springfontyn/Langebaan Formation erosion surface have been encountered during excavations for infrastructure. Finds on spoil heaps were collected, but are not plotted on Figure 18 since their provenience is unknown.	EFTPh

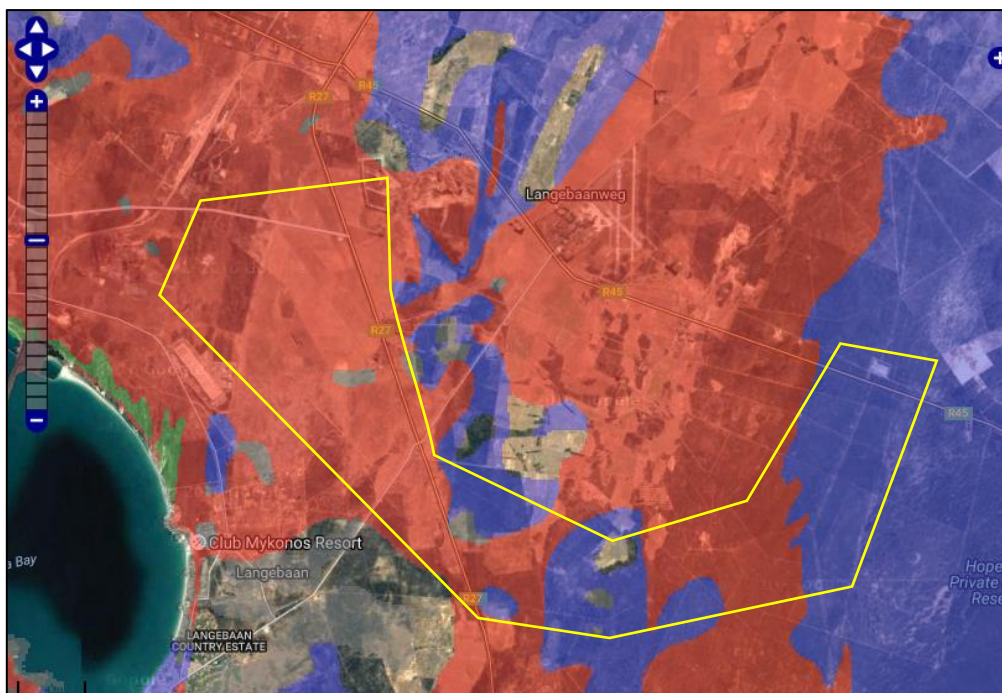


Site	Formation	Selected References	Type of Occurrence	Acronym
Elandsfontein Wes	Springfontyn-Langebaan erosion surface	(Mabbutt 1956; Singer and Wymer 1968; Roberts and Braun 2014; Plasket 2013; Avery, in preparation a & b; Goodwin 1953; Halkett and Webley 2015)	Palaeontology and Pleistocene archaeology. Sparsely scattered mineralized bones, very rare stone artefacts, exposed in blow outs and by excavations for mine infrastructure.	EFT W
Geelbek – dunes	Springfontyn ; Langebaan	(Felix-Henningsen, Kandel, and Conard 2003; Kandel, Felix-Henningsen, and Conard 2003; Fuchs et al. 2008; Dale and McMillan 1999)	Palaeontological. Terrestrial vertebrates. MSA artefacts. Not in Saldanha Municipal area.	Gbek Main
Geelbek – old road	?Springfontyn	G Avery pers. observation	Palaeontological. Between old road and head of lagoon Mineralized fragments, including elephant. Not in Saldanha Municipal area.	Gbekfos
Groenheuvel – Massenberg		(Pether 2013)	Palaeontological. Farm name only (Pether 2013), Fig. 5.	Mberg
Hoedjiespunt – hyaena	Langebaan	(Klein 1983; Berger and Parkington 1995; Churchill, Berger, and Parkington 2000; Hare and Sealy 2013; Stynder et al. 2001; Stynder 1997; Woodborne 2000; Grine and Klein 1993); Iziko South African Museum Cenozoic Collections	Palaeontological. Brown hyaena den in eroded ridge of Langebaan Formation with terrestrial and marine taxa and modern <i>Homo sapiens</i> remains.	HDP1
Hoedjiespunt – Middle Stone Age	Langebaan	(Woodborne 2000; Kyriacou et al. 2015; Stynder et al. 2001; Stynder 1997; Will et al. 2013); Iziko South African Museum Cenozoic Collections, UCT	Middle Stone Age artefacts associated with shell midden, which includes terrestrial and marine vertebrate taxa.	HDP1
Kalkklipfontein		(Pether 2013)	Palaeontological. Farm name only provided (Pether 2013), Fig. 5).	Kklipftn
Kraalbaai	Langebaan (Kraalbaai Member)	(Roberts and Berger 1997; Roberts and Brink 2002)	Trackway of modern human <i>Homo sapiens</i> footprints; spoor of probable hyaena. Exposed between fractured cross-bedded structures of aeolianite. Rare vertebrate bones.	Fprint
Kraalbaai	Langebaan (lower?)	(Rogers 1980; Compton and Franceschini 2005; Pether 2013; Theron et al. 1992; Almond 2012)	Marine Molluscs underlying aeolianite.	Fprint
Kreeftebaai – Tierbank, Postberg	Velddrif	(Flemming 1977; Pether 2013); G Avery pers. observation	Palaeontological. Molluscs, including extinct <i>Crepidula capensis praerugulosa</i> in calcrete. (Pether 2013), Fig. 5.	Kreef2
Kreeftebaai – Tierbank, Postberg	?Velddrif	(Flemming 1977; Pether 2013) G Avery pers. observation	Palaeontological. Molluscs in loose raised beach deposits above HWS. Palaeontological. (Pether 2013), Fig. 5.	Kreef1
Langebaanweg – E Quarry	Elandsfontyn	(Coetzee 1978); Iziko South African Museum Cenozoic Collections	Macro and micro plant remains, underlying Varswater Formation, encountered during boring for water.	LBW
Langebaanweg – E Quarry	Langebaan; Varswater (including Saldanha)	(Hendey 1974; Grine and Hendey 1981; Hendey 1981; Roberts et al. 2011); Iziko South African Museum Cenozoic Collections	Palaeontological. National Heritage Site of global importance. Sub-surface, reached during mining. Highly diverse terrestrial, aquatic, marine vertebrate taxa; marine molluscs. Most taxa extinct. Plant taxa (pollens). Primates very rare, no hominins. Sea level > 40 m.	LBW
Langebaanweg – Baard's Quarry	?Langebaan; Varswater	(Hendey 1978); Iziko South African Museum Cenozoic Collections	Palaeontological. Sub-surface, reached during mining. Probably mixed Pliocene and Lower Pleistocene in river channels. Terrestrial and marine/estuarine vertebrate taxa.	Baard's
Langebaanweg – Anyskop	Springfontyn	(Dietl, Kandel, and Conard 2005); Iziko South African Museum Cenozoic	Middle and Late Pleistocene archaeological. Early Stone Age (ESA) artefacts – Late Acheulean – and Middle Stone Age –	Akop

Site	Formation	Selected References	Type of Occurrence	Acronym
		Collections	Howiesons Poort.	
Langeberg 188	Langebaan or Varswater	G Avery, this survey. Gavin Stigling – owner – pers com.	Palaeontological. Sub-surface, reached in borehole. Langebaan Fm. Encountered marine shells at 15 m. This is the depth at which Varswater Fm. Marine shell deposit was recorded during the Saldanha Steel plant excavations (Roberts 1997b).	L188
Langfontein	Varswater; Uyekraal	(Pether 2013)	Palaeontological. Farm name only provided (Pether 2013), Fig. 5.	Lftn
Lime Quarry – Hoedjiesbaai	Langebaan	(Cooke 1955; Hende 1974)	Palaeontological. Marine fossils. First fossil otariid seal recorded in South Africa, (Cooke 1955), p166.	LQ
Namaqua Sands Smelter	Langebaan ?Uyekraal ?Varswater	(Pether 2006)	Palaeontology. Bones, from Langebaan Formation noted in nearby borrow pit. Likelihood of intersecting fossiliferous formations if excavation is deep enough.	Nsand
Oosterwal	Langebaan	(R. Govender, pers. comm.); Iziko South African Museum Cenozoic Collections	Palaeontological. Marine fish and mollusc remains on intertidal platform.	Owal
Prospect Hill – lower quarry	Langebaan (Diaz Member)	(Almond 2012; Roberts and Brink 2002; Avery 1997; Roberts 1997a; Pether 2012; Pether 1995)	Palaeontological. Younger calcareous deposit abutting on upper Prospect Hill deposits with marine molluscs in lime mine, abutting against older Prospect Hill. Terrestrial molluscs.	LPH
Prospect Hill – upper	Prospect Hill	(Avery 1997; Roberts and Brink 2002; Pether 1995; Pether 2012); Iziko South African Museum Cenozoic Collections	Palaeontological. Calcareous aeolianites with terrestrial vertebrates and fossil gastropod <i>Trigonephrus globulus</i> .	UPH
Rietfontein		(Avery 2015; Pether 2013; Webley and Halkett 2015)	Ephemeral traces of mineralized bone and stone artefacts.	Rftn
Saldanha Bay – Iron Ore Terminal	Langebaan; Varswater	(Hart and Pether 2008) 2008); G Avery pers. observation); Iziko South African Museum Cenozoic Collections	Palaeontological. Fossils recovered from sediments during dredging.	Term
Saldanha Port – Portion 16 Pienaars Poort 197	?Velddrif	G Avery pers. observation	Palaeontological. Marine molluscs exposed in borrow pit.	SP
Saldanha Steel	Langebaan; Varswater	(Pether 1995; Roberts 1997a; Avery and Klein 2011; Avery 1994); Iziko South African Museum Cenozoic Collections	Palaeontological. Sub-surface, reached during deep excavation for foundations. Some terrestrial <i>Trigonephrus globulus</i> in Langebaan Fm. In the Varswater Fm. mostly marine molluscs with sparse marine vertebrate species, some extinct. Recorded presence of “crocodile” is incorrect – teeth are of fish.	SSt
Saldanha Yacht Club – Barn Owl	Langebaan	(Manthi 2002)	Palaeontological. Barn Owl roost with micromammal taxa.	YC
Saldanha Yacht Club – hyaena	Langebaan	(Avery 2014, 2013); Iziko South African Museum Cenozoic Collections	Palaeontological. Brown hyaena den with terrestrial taxa.	YC
Sea Harvest – hyaena	Langebaan	(Grine and Klein 1993; Butzer 2004; Klein 1983); Iziko South African Museum Cenozoic Collections	Palaeontological. Brown hyaena den with terrestrial and marine taxa and modern <i>Homo sapiens</i> remains. In crevices eroded into the Langebaan Formation. Rhizoliths (root castes) and <i>Trigonephrus globulus</i> in aeolianites.	SH
Sea Harvest – Middle Stone Age	Langebaan	(Grine and Klein 1993; Volman 1978; Butzer 2004); Iziko South African Museum Cenozoic Collections	Archaeological. Middle Stone Age shell midden contiguous with adjacent hyaena dens. In eroded Langebaan Formation crevice/overhang.	SH
Skurwerug	Langebaan	(Hende 1974; Cooke 1985; Tankard 1976; Rogers 1982); Iziko South African Museum Cenozoic Collections	Palaeontological. Excavations for crude oil storage encountered a small patch of important terrestrial fossils, including an extinct pig.	Srug

Site	Formation	Selected References	Type of Occurrence	Acronym
Spreeuwalle	Langebaan	(Flemming 1977; Avery et al., in preparation); Iziko South African Museum Cenozoic Collections	Palaeontological and Pleistocene archaeological. Diverse terrestrial taxa; aquatic and terrestrial molluscs. Date on overlying calcrete duricrust of 59 ka (W. Sharp, pers. comm.). Intertidal – formed during period of lower sea level.	SPW
Vredenburg – urban	?	P. Haarhof, pers. comm., G Avery, pers. observation	Palaeontological. Small pocket of bones against granite mass. Probably collected by hyaena.	Vu
Zoutekuyl		(Pether 2013)	Palaeontological. Farm name only. (Pether 2013), Fig. 5.	Zkuyl

Figure 13 indicates the expected palaeontological sensitivity of the area as sourced from the SAHRIS Palaeo-sensitivity map. This is only a guide and local variations in the density of fossils can result in higher or lower significances being applicable. It is clear, though, that the bulk of the study area does have the potential to bear important subsurface palaeontological heritage resources.



**Figure 13:** Extract from the SAHRIS Palaeosensitivity map indicating areas expected to be of very high (red shading), moderate (green shading) and low (blue shading) sensitivity. Unshaded areas are unknown.

### 5.3. Built environment

Old buildings of significance are uncommon in this area. Fransen (2004) reports a number of important heritage structures around Langebaan Lagoon, largely within the West Coast National Park. However, he also lists the house at Was(ch)klip which he estimates to be from about 1860 and to which he assigns a 'minor monument' significance rating. This house lies 1.5 km southwest of the shared power line corridor. Orton (2011) reported a suite of old buildings on the farm Uyekraal (Figure 11) and which lie just across the R27, some 300 m west of the Alternative 4 and 6 transmission line routes. Three of the structures on this farm, one of them in partial ruin, were suggested to be of Grade IIIB significance.



**Figure 14:** A typical stone-walled, tin-roofed vernacular farm structure on the farm Uyekraal 189 (Source: Orton 2011:figure 14).

## 6. FINDINGS OF THE HERITAGE STUDY

This section describes the heritage resources recorded in the study area during the course of the project. Table 4 provides a list of findings.

**Table 4:** List of heritage resources recorded in the study area. Note that although corridors are being assessed the distances from project components given here are as measured from the indicative layout provided by the client.

GPS	Co-ordinates	heritage resource	description	significance, grade and mitigation
229	S33° 00'19.9" E18° 05'44.4"	Uyekraal farm complex	Complex including a number of vernacular buildings of varying age, function and intactness. See full description in Orton (2011). 1868 survey diagram shows a 'dwelling house' in this location. Nearest structures are some 300 m from the proposed Alternative 4 and 6 transmission lines.	<ul style="list-style-type: none"> <li>» Medium</li> <li>» Grade IIIB</li> <li>» No mitigation required</li> </ul>
230	S33° 00' 4.5" E18° 05' 53.3"	Gum tree line (cultural landscape)	A gum tree line of some 850 m in length that lies on the boundary between Everts Hope 190 and Langeberg 187. The trees are smaller towards the east and a number of spaces occur. The Alternative 4 and 6 transmission lines pass through this tree line.	<ul style="list-style-type: none"> <li>» Low</li> <li>» Grade IIIC</li> <li>» Remove as few as possible</li> </ul>
232	S32° 59' 54.7" E18° 05' 52.9"	Gum tree line (cultural landscape)	A gum tree line of some 500 m in length separating farm portions. The trees are smaller towards the east. The Alternative 4 and 6 transmission lines pass within 20 m of the west end of this tree line.	<ul style="list-style-type: none"> <li>» Low</li> <li>» Grade IIIC</li> <li>» Remove as few as possible</li> </ul>
233	S32° 59' 49.0" E18° 05' 49.1"	Ruined historic cottage	Ruined vernacular long house with all walls intact but roof and joinery are missing. The walls were of rough calcrete blocks and mud with plaster outside. Door frames still present. One window frame surrounded by red brick and cement was obviously a later addition. Possibly late 19 <sup>th</sup> /early 20 <sup>th</sup> century. Very large pepper tree occurs immediately alongside the structure to its west. Site lies directly within the path of the Alternative 4 and 6 transmission lines.	<ul style="list-style-type: none"> <li>» Low-medium</li> <li>» Grade IIIC</li> <li>» Avoid, or else record in detail before demolition</li> </ul>

234	S32° 59' 51.4" E18° 05' 49.1"	Old pepper trees (cultural landscape)	Three old pepper trees, one with very broad trunk (>1 m diameter) and several old prickly pears in a cluster between sites 233 & 235. Site lies directly within the path of the Alternative 4 and 6 transmission line routes.	» Low » Grade IIIC » Avoid
235	S32° 59' 54.6" E18° 05' 47.6"	Ruined historic cottage	Ruined vernacular long house with walls mostly tumbled/partially demolished. They were built of rough calcrete blocks and mud, although one collapsed section showed the use of some red bricks and cement in a later addition. Medium-sized manitoka and pepper trees occur alongside the ruin. Possibly late 19 <sup>th</sup> /early 20 <sup>th</sup> century. Site lies some 30 m west of the Alternative 4 and 6 transmission line routes.	» Very low » NCW » Avoid or else record before demolition
236	S32° 59' 47.9" E18° 05' 50.6"	Ruined historic structure	Ruined remains of a small farm structure of unknown form and function. Very poor state of repair. Site lies some 50 m east of the Alternative 4 and 6 transmission line routes.	» Very low » NCW » No mitigation required
237	S32° 59' 46.4" E18° 05' 50.6"	Ruined historic kraal complex	Ruined historic kraal and barn complex. Roof and original joinery all missing but a few more recent gates and fences occur. Site lies some 75 m east of the Alternative 4 and 6 transmission line routes.	» Low » Grade IIIC » Avoid or else record before demolition
238	S32° 59' 45.9" E18° 05' 49.0"	Gum tree line (cultural landscape)	A 70 m long line of old gum trees that lies within 30 m of and parallel to the Alternative 4 and 6 transmission line routes.	» Very low » NCW » No mitigation required
239	S32° 58' 24.4" E18° 05' 30.5"	Ruined historic structure	Ruined vernacular stone and mud long house (it was L-shaped at an early date) but has been added to over time and the roof raised to become a typical rectangular mid-20 <sup>th</sup> century farm cottage. Some old door and window frames and some 20 <sup>th</sup> century examples and roof beams present but all other joinery is missing. Visible in 1938 aerial photography. The site lies 280 m southwest of the Alternative 4 transmission line and 170 m east of the Alternative 6 transmission line.	» Low » Grade IIIC » No mitigation required
240	S32° 58' 25.1" E18° 05' 30.5"	Historic and modern dump	Low density dump of 19 <sup>th</sup> and 20 <sup>th</sup> century glass, ceramics, metal, etc. located 20 m south of the ruin at site 239.	» Very low » NCW » No mitigation required
241	S32°58'33.4" E18° 05'41.7"	Gum tree line (cultural landscape)	An L-shaped line of old gum trees on the southern and eastern sides of a farm complex. The two arms of this tree line are 410 and 220 m long respectively. Post-dates 1938.	» Low » NCW » No mitigation required
242	S33° 00' 55.7" E18° 05' 28.2"	cultural landscape	Broken wind pump and small cement reservoir that form part of the rural landscape. The site lies directly within the Alternative 3 transmission line route.	» Very low » NCW » No mitigation required
243	S33° 00' 02.4" E18° 04' 26.1"	Demolished 20 <sup>th</sup> century farm complex	Several structures and features of a 20 <sup>th</sup> century farm complex that have been demolished. One structure remains standing. They were built of stone, brick and cement. Most materials seem to be modern but some dressed calcrete blocks	n/a

			and a broken vernacular styled low wall betray the presence of older fabric. Includes a main house, outbuildings (one of which is the standing structure) and a round brick and cement reservoir. Some decorative breeze blocks in one area. A number red clay frog bricks at the main house have "KB&T Co" imprinted on them may have been imported from the USA where the Kansas Brick and Tile Company has been in operation since 1954 (Lusco Brick & Stone Company n.d.). The bulk of the complex appears to be less than 100 years old and is thus not protected under the NHRA, although the 1938 aerial photograph shows a busy farm complex to have been present, but with a different configuration. It lies 250-350 m south of the distribution line routes.	
244	S33° 00' 2.1"S E18° 04' 21.4"	Gum tree line (cultural landscape)	A 270 m long line of old gum trees that lies west of site 243. A small clump of gum trees some 120 m to the east protected the main house from the southeast wind. Post-dates 1938.	<ul style="list-style-type: none"> <li>» Low</li> <li>» Grade IIIC</li> <li>» Remove as few as possible</li> </ul>
245	S33° 01' 28.4" E18° 05' 15.8"	Ruined historic structure	Ruined vernacular gabled farm house with loft accommodation and an external masonry staircase on the intact northern gable. The southern end has a large hearth-and-chimney stack, but the gable has collapsed. The front of the house (west face) has a door and three windows. A large room was added to the rear (east) face with a large (tractor-sized) opening bearing a concrete lintel and animal feeding troughs. A room was also added to the north of this room extending beyond the original north gable. The structure is built from beautifully dressed calcrete and cement and is likely early 20 <sup>th</sup> century in age. Whether it is more than 100 years old and legally protected or not remains unknown. The 1938 aerial photography appears to show the original section of the house without the addition to the east, although this is not clear. It also seems that there were one or more structures to the northwest that have since been entirely removed. The house does not appear on an 1870 survey diagram, although another does at the main Waschkliip farm complex. The house is 950 m southwest of the Alternative 3 transmission line and will not be affected.	<ul style="list-style-type: none"> <li>» Medium</li> <li>» Grade IIIB</li> <li>» None (located outside study area)</li> </ul>

## 6.1. Archaeology

No Stone Age archaeological resources were located. This was expected and is consistent with the finding of other assessments as described above.

A number of historical archaeological resources were found. These included a variety of structures in varying states of ruin as well as a scatter of glass, ceramic and metal artefacts located close to one of the ruins. Details of these finds are presented in Table 4. The ruins are

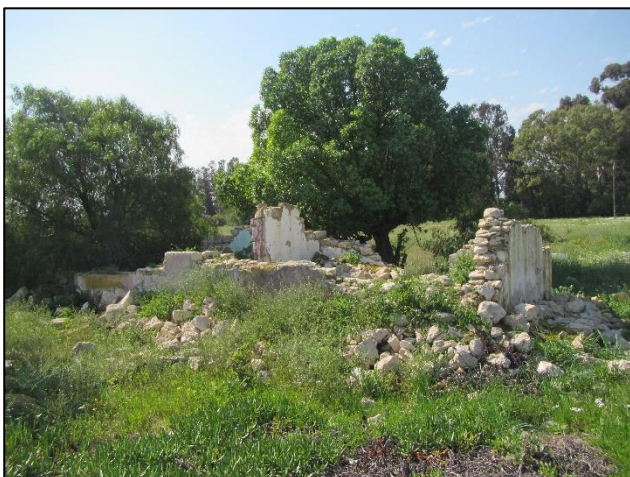
strongly vernacular and are built in styles and with methods that are typical of the Vredenburg Peninsula area. Walls are frequently of calcrete blocks and are built with two skins of rocks. The space between the skins was filled with rubble and mud. Figures 15 to 18 show examples of two farm labourers' cottages that were located on the periphery of the historical farm complex on Langeberg 187 (see aerial photography below). Other structures forming part of the complex are situated nearby and presumably functioned as a barn/stable and livestock enclosures (Figures 16 & 20). At least one further structure is preserved and still in use on a neighbouring property (a relatively recent subdivision) but it was not visited and its intactness is unknown. A number of other structures have been completely removed from the complex, while many modern structures have been added on the subdivided portion to allow its use as an accommodation and function venue. It is almost certain that the majority of these structures are at least late 19<sup>th</sup> century in age. An 1868 survey diagram for the property shows a 'dwelling house' in the vicinity of this farm complex which means that at least some part of the complex is around 150 years of age, whether a standing structure or not remains unknown.



**Figure 15:** The north gable of the ruin at waypoint 233.



**Figure 16:** Interior of the ruin at waypoint 233.



**Figure 17:** The ruin at waypoint 235 with showing surrounding trees.



**Figure 18:** The ruin at waypoint 235 the walls made with two calcrete skins and a rubble fill.



**Figure 19:** Historical farm complex at waypoint 237, to the north of the two cottages. The structure to the right seems to have been a barn/stable.



**Figure 20:** Feeding trough inside part of the historic farm complex at waypoint 237. Note the calcrete block walls.

The location of the Langeberg 188 farm complex had very few historical buildings. Some may be preserved in the modern complex but this was not determined on site. Nearby there is an outlying ruin that began as an L-shaped, probably late 19<sup>th</sup> century house but was extended during the mid-twentieth century to become a rectangular house (Figures 21 & 22). Outside this ruin, to its southwest, there was a scatter of historical artefacts that included glass, ceramics and metal (Figures 23 & 24). The scatter includes both obvious 19<sup>th</sup> and 20<sup>th</sup> century materials but with the bulk likely to be late 19<sup>th</sup> century. The scatter is of low density and cannot be referred to as a midden.



**Figure 21:** The ruin at waypoint 239 as seen from the southwest.



**Figure 22:** The interior of the ruin at waypoint 239.





**Figure 23:** Artefacts from the historical scatter at course waypoint 240. Scale in cm.



**Figure 24:** A fragment of Asian porcelain 'ginger jar'. Scale in cm.

The most impressive ruin seen during the survey was on the farm Waschklip at waypoint 245. It was not located within the prescribed study area but, because of the amount of architectural information still preserved it is deemed to have value and be worthy of noting for the record. It was quite an impressive farm house but, oddly, it was not marked on survey diagrams; the main farm complex for this farm lies well to the south. Waschklip was formed through the consolidation in 1870 of Zoutkuil (granted 1845) and Teekoes Klip (granted 1835). The Waschklip complex lies on the old Zoutkuil, while the ruin is on the Teekoes Klip portion suggesting that it could predate 1870. It was a gabled house with loft accommodation, an external masonry staircase, a hearth and chimney stack that were not integrated with the southern gable wall and, on the east side, a barn section with feeding troughs that was added later (Figures 25 to 27). It is evident that the house has had changes over time but it maintained its strong vernacular character. The standing gable has a concrete lintel over the oft door suggesting that the gable may have been rebuilt at some point during the 20<sup>th</sup> century. It is not possible to tell whether the roof was thatched or corrugated iron originally, but the aerial photography examined below suggests that, in 1938 at least, it might have been thatch. Corrugated iron sheets are present in the ruined additions on the east side of the main house.



**Figure 25:** View of the north-western corner of the ruin at waypoint 245 showing the external staircase. The front faces west (right hand side), while additions are visible to the east.



**Figure 26:** Inside view of the still standing north gable showing the concrete lintel above the loft door.



**Figure 27:** The ruin at waypoint 245 as viewed from the south-eastern corner. The added on barn/stabling lies to the right with a wooden feeding trough still visible. The inset shows the internal opening of the hearth.

## 6.2. Palaeontology

With the exception of terrestrial land snails *Trigonephrus globulus*, which occur commonly, but patchily, in Langebaan formation surface calcrete exposures, no other fossil material was seen during the survey. There was little opportunity to examine subsurface deposits, although two borrow pits into calcrete were located in the south-western part of the study area (Figure 28). No fossils were evident at either location.



**Figure 28:** Cutting through calcrete along the east side of the R27 within corridor occupied by all three transmission alternatives.

Based on the desktop review above, it is highly likely that sub-surface, probably sparsely-scattered, fossils will be present in the study area. The scientifically important finds at the WCFP, Saldanha Steel and Elandsfontein, point to the very high palaeontological sensitivity of the general area. Known occurrences are primarily sub-surface and have usually been encountered during mining and other large excavations, as at the WCFP, the residue dam at Namaqua Sands (Pether 2006) and at the Besaansklip quarry (Brink 2005).

A recent borehole on Langeberg 188, just west of the WCFP, yielded marine shells at 15 m below the surface (Gavin Stigling, personal communication 2016). This depth is coincidental with that at which fossil marine shells and marine vertebrates were encountered during

construction of the Saldanha Steel precinct and suggests that similar finds might be encountered should any excavations proceed to that depth at any of the substation sites which are all in the same area.

On Anyskop, 2 km east of transmission substation Alternative F, Middle Pleistocene MSA stone artefacts and rare bone occur on deflated surfaces of the sandy Springfontyn Formation show that surface finds can occur in the study area. Similar surface finds come from Elandsfontein to the southeast of the study area.

Although many important fossil collections have been made in the Saldanha Bay area, the intervening areas should be treated as unknown, although it can be predicted that sparse fossils may be encountered. As examples of potential, the richness of the globally important WCFP fossil landscape (Hendey 1981), Prospect Hill localities, Elandsfontein (Klein *et al.* 2007), Sea Harvest (Grine & Klein 1993), Hoedjiespunt (Berger & Parkington 1995) and Besaansklip (Brink 2005) localities and their important scientific contributions to knowledge of past animal life should be noted.

### 6.3. Cultural landscape

The landscape in the study area is characterised by three primary land uses. The first, which dominates the western parts, is the rural/agricultural landscape used for dryland agriculture and livestock grazing (Figures 2, 5, 6 & 7). The area was far more open in 1938 with none of the large sheltering wind rows and clusters of gum trees present (e.g. Figure 29). These tree lines do, nevertheless, contribute to the character of the cultural landscape as it stands today.

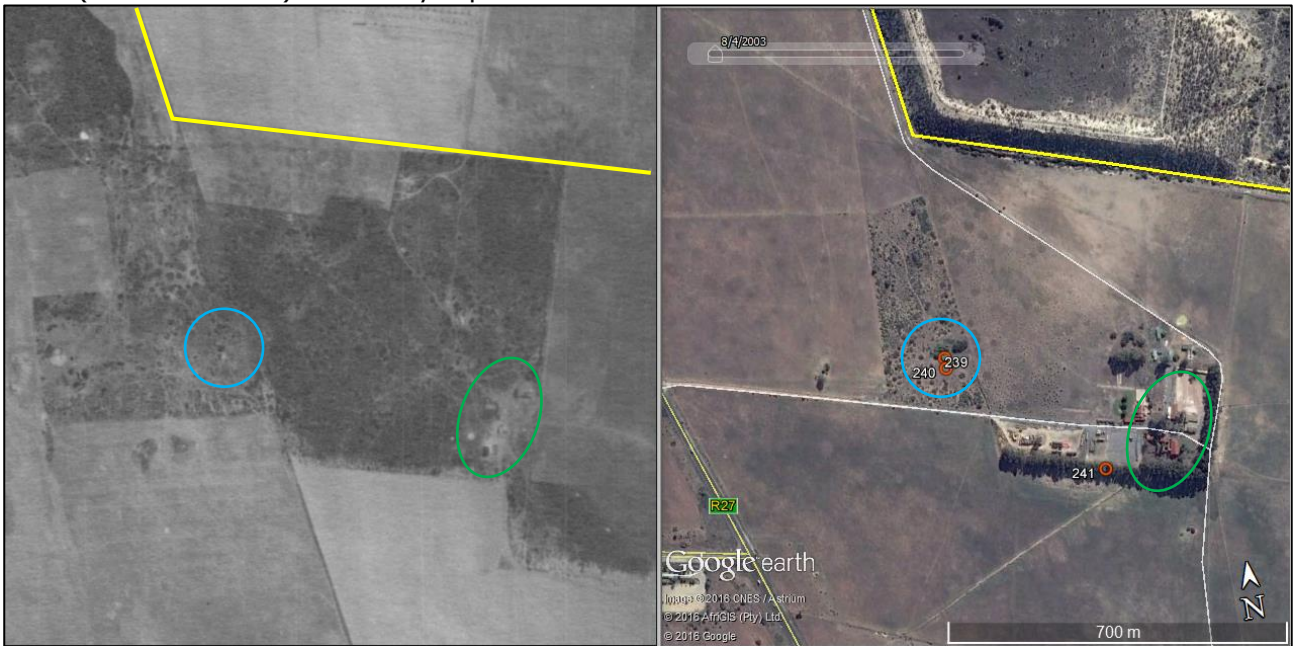


**Figure 29:** View towards the north of the gum tree line at waypoint 230 that separates Uyekraal 189 and Langeberg 187. This tree line was not present in 1938.

The second landscape type is the relatively undisturbed natural landscape which dominates on the nutrient-poor sands in the eastern parts of the study area (Figures 2, 9 & 10). This is essentially a natural landscape with the only cultural aspects relating to farm tracks and fences. The third landscape aspect is the modern industrial and electrical landscape that is so prevalent throughout the study area. The proposed project will add further electrical infrastructure to this landscape. The presence of the Saldanha Bay IDZ means that further industrial infrastructure will be constructed in the area in the future which will further entrench the industrial nature of the area.

A survey of historical aerial imagery is helpful to examine the ways in which the landscape has changed over time. It is quite evident that the agricultural aspects (structures, gum tree lines and clusters, ploughed lands) have changed considerably. In Figure 30 we see historical and modern views of the Langeberg 188 farm complex and surrounds. It is evident that many

structures have been added to the complex, the large windrow at waypoint 241 was planted after 1938, new lands were cleared for planting, new roads were added and the phosphate mine (now the WCFP) was not yet present.

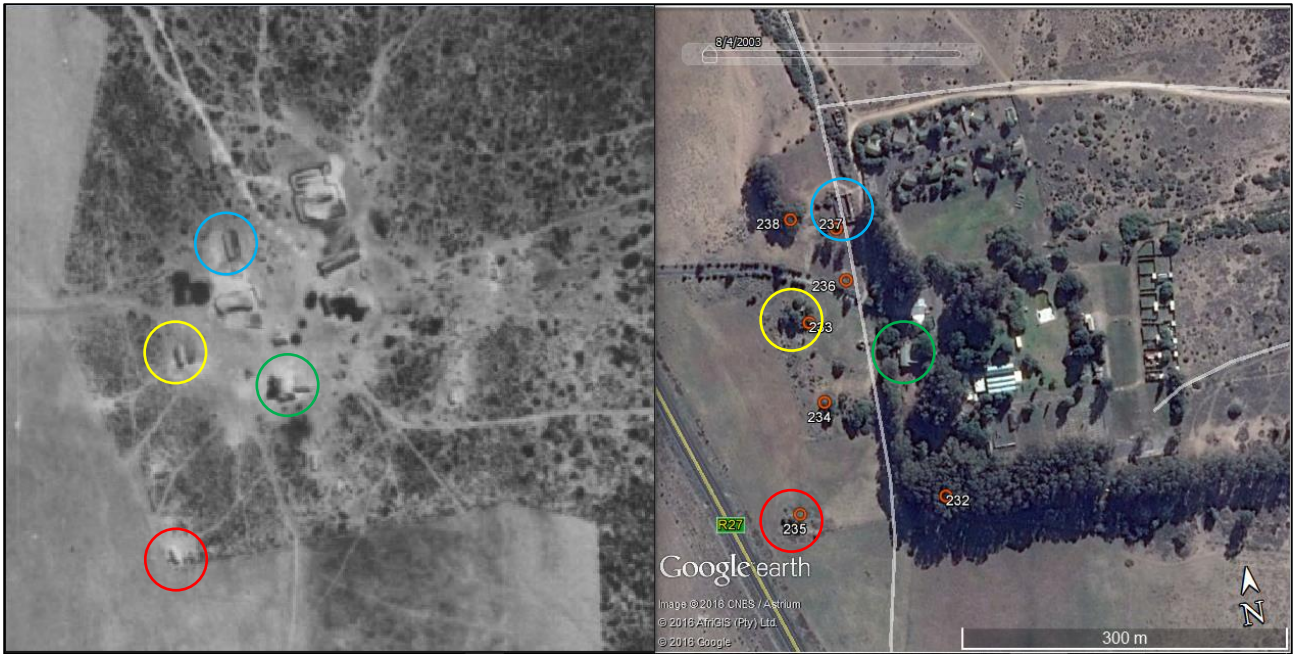


**Figure 30:** Historical aerial photograph from 1938 (Job 126, strip 19, photograph 10132) and equivalent modern view showing the house at waypoint 239 and its pepper tree (blue circle) and the farm complex (green oval) on Langeberg 188 in the northern part of the study area. The yellow outline is the south-western corner of the WCFP.

Figure 31 shows the farm complex on Langeberg 187, just to the south. It is evident that some structures have been demolished to make way for new ones and the large wind row of gum trees (waypoint 232) and smaller one to the northwest (waypoint 232) both post-date 1938. Despite their size, the pepper trees and prickly pears at waypoint 234 appear to not have been present in 1938, or were perhaps too young to be discernible on aerial photography.

In Figure 32 we see the now demolished farm complex in the south-western part of Uyekraal 189. The changes evident over the last 78 years include the planting of a large windrow (waypoint 244), the clearing of further lands around the complex and the subsequent demolition of the entire complex.

Figure 33 shows the north-western Waschklip farmhouse at waypoint 245. In 1938 a second large structure was present just to the north, while a smaller structure, presumably a labourer’s cottage, lay to the southwest. Although we did not specifically look in these areas, there was obviously little enough left that no evidence of their existence could be seen from a short distance away. There is no sign of them on modern aerial photography. Interestingly, the roof of the main house seems to be dark with a north-south pale line. This could well indicate a thatch roof.



**Figure 31:** Historical aerial photograph from 1938 (Job 126, strip 22, photograph 08553) and equivalent modern view showing the house at waypoint 233 (yellow circle), the house at 235 (red circle) and the farm buildings at 237 (blue circle) on Langeberg 187. Another structure that was not visited was also present (green circle) but others to the north have been demolished.



**Figure 32:** Historical aerial photograph from 1938 (Job 126, strip 22, photograph 08552) and equivalent modern view showing the demolished farm complex on Uyekraal 189.



**Figure 33:** Historical aerial photograph from 1938 (Job 126, strip 23, photograph 10843) and equivalent modern view showing the ruined farmhouse at waypoint 245 on Waschklip 183.

Although already discussed under palaeontology, it is worth noting that Winter and Oberholzer (2013) regarded the WCFP as a Grade II palaeontological landscape (it was at the time a PHS) with the potential to be recognised as a World Heritage Site. It has subsequently been elevated to NHS status as already noted.

#### **6.4. Built environment resources**

Three extant farm complexes lie within the study area. The first two lie on Langeberg 187 and Langeberg 188, while the third straddles the boundary of Uyekraal 189 and Everts Hope 190 (the complex was split and the western portion added to Uyekraal through a subdivision and consolidation in 1954). The first and last each have a 'dwelling house' marked on an 1868 survey diagram. A fourth complex (now demolished) lies further to the west on Uyekraal 189 and is of no interest here (see Figure 32 above).

The Langeberg 187 complex is now split across two properties and, although falling within the study area corridor, the smaller property was not deemed to be an affected landowner and that property was not examined. At least one standing structure on that property is likely to include old fabric because it corresponds with a structure visible in the 1938 aerial photograph (Figure 31 above). The majority of older structures in this complex have fallen into ruin with useable building materials no doubt having been salvaged over the years. These ruined structures were examined in Section 6.1 above. The standing structures are well-shielded by gum trees and are of no further concern here.

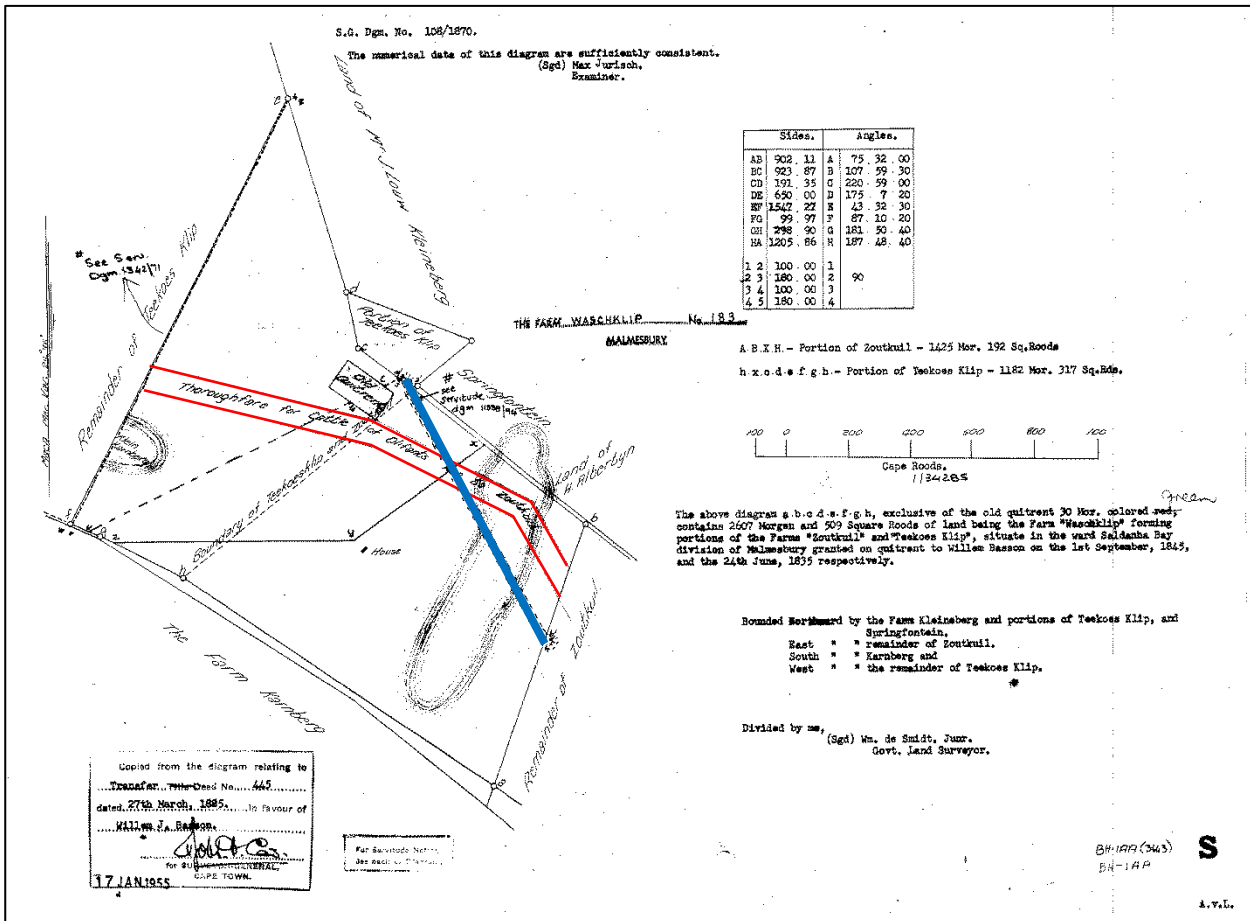
The Langeberg 188 complex is largely modern with at least one structure likely to be old, or to have an old core. Which one was not determined. The project will avoid the complex and it is well-shielded by gum trees.

The Uyekraal/Everts Hope complex was described in Orton (2011) and mentioned in the desktop review above (Section 5.3). It lies to the west of the R27, on the opposite side to the planned transmission lines and only just inside the edge of the study area. It would not be unduly affected by the development.

## 6.5. Other heritage resources

### 6.5.1. Cattle thoroughfare

The 1868 survey diagram for Waschklip 183 shows the presence of a cattle thoroughfare over the property (Figure 34). There is absolutely no sign of this thoroughfare today, either in property boundaries, fence lines, or vegetation patterns. It is labelled "Thoroughfare for cattle of Olifants Kop to Zoutkuil". This suggests that the same person may have owned both farms and was keen to have a passage between them. Olifants Kop was a farm at modern day Langebaan to the southwest.



**Figure 34:** 1870 survey diagram for Waschklip 183 showing the two farm portions that were consolidated to create the farm, the cattle thoroughfare (red outline) and the more recent Eskom servitude which the present project also follows (blue line).

### 6.5.2. Graves

Although no graves were encountered anywhere in the study area, there is always the possibility that unmarked precolonial graves could be found during development, especially in the sandy areas. However, given the extremely sparse Stone Age archaeology in the inland areas, the chances of this are negligible and do not merit further concern.

### 6.5.3. Scenic routes

Although the R27 can be regarded as a scenic route, the vicinity of the study area is already heavily compromised in terms of its scenic qualities by the extensive electrical and industrial development that already exists in the area. Winter and Oberholzer (2013) did not identify it as such, however. They did note the R45 lining Vredenburg and Malmesbury as being a Grade III scenic resource. This road passes the existing Aurora Substation in the east and will be

crossed by all three transmission line alternatives in that area (in parallel with existing transmission lines). It then veers north of the study area as it continues towards Vredenburg.

## **6.6. Statement of significance**

Section 38(3)(b) of the NHRA requires an assessment of the significance of all heritage resources. In terms of Section 2(vi), "cultural significance" means aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance.

The archaeological resources, in this instance largely historical ruins, are deemed to have low cultural significance for their architectural, social and technological value.

Any palaeontological resources encountered in the Springfontyn or Langebaan Formations would be considered rare finds and would have high, or even very high, scientific value.

The broader (surface) cultural landscape is highly compromised but there is still a fairly strong sense of place to the Saldanha Bay region and it is thus considered to be of low-medium significance for its aesthetic value. The buried fossil landscape of the area is considered to have high cultural significance for the tremendous scientific value that it has.

The few historical buildings in the Uyekraal/Everts Hope farm complex are of at least medium significance for their architectural and social value. Other structures in the study area may be heavily modified which would reduce their significance to low.

The cattle thoroughfare is of low cultural significance for its historical value. Graves are highly unlikely to be encountered but are deemed to have high cultural significance for their social value. The scenic route (R45) is of medium cultural significance for its aesthetic value.

## **6.7. Summary of heritage indicators and provisional grading**

The main heritage indicators of concern here are archaeological resources (largely Grade IIIC but some NCW), palaeontological resources (largely Grade IIIB but potentially as high as Grade I) and the cultural landscape (Grade IIIC). Although other resources like structures (suggested up to Grade IIIB) and the R45 scenic route (suggested Grade IIIB) are present, they will not be unduly impacted and are not considered further.

## **7. ASSESSMENT OF IMPACTS**

It should be noted that all impacts to archaeological and palaeontological heritage are expected to occur during the construction phase. Impacts to the cultural landscape will also occur during construction but would continue through operation but with no change in the ratings. The proposed project is not expected to have a decommissioning phase. As such, only a construction phase assessment is provided for each relevant heritage component.

### **7.1. Impacts to archaeological resources**

The only project components likely to result in archaeological impacts are Transmission Line Alternatives 4 and 6 because they run directly above some historical ruins. As a worst case scenario it is assumed that these ruins may need to be levelled in order to clear the transmission corridor. Because of the low cultural significance of these sites, this would not be considered a fatal flaw and the extent of the impacts would be local. Indirect impacts are not expected. Table 5 shows that with total destruction of the historical ruins along Transmission Line Alternatives 4 and 6 the impacts could be of medium significance. With mitigation this would be reduced to low significance. Impacts to archaeological resources for all other potential project components are considered to be of low significance (Table 6). Because no impacts are expected, no mitigations measures are proposed.



**Table 5:** Assessment of archaeological impacts for Transmission Line Alternatives 4 and 6.

<b>Nature:</b> Direct disturbance and/or destruction of archaeological resources within the development footprint.		
	<b>Without mitigation</b>	<b>With mitigation</b>
<b>Extent</b>	Local (1)	Local (1)
<b>Duration</b>	Permanent (5)	Permanent (5)
<b>Magnitude</b>	Low (4)	Small (1)
<b>Probability</b>	Probable (3)	Very improbable (1)
<b>Significance</b>	<b>Medium (30)</b>	<b>Low (7)</b>
<b>Status (positive or negative)</b>	Negative	Negative
<b>Reversibility</b>	Low	Low
<b>Irreplaceable loss of resources?</b>	Yes	No
<b>Can impacts be mitigated?</b>	Yes	
<b>Mitigation:</b> The ideal mitigation in this instance is to avoid the ruins in question and leave them as they are. The alternative would be to record their layouts (measured drawings) and construction techniques and materials in detail prior to demolition.		

**Table 6:** Assessment of archaeological impacts for Transmission Line Alternative 3 and all Distribution Line and Transmission and Distribution Substation Alternatives.

<b>Nature:</b> Direct disturbance and/or destruction of archaeological resources within the development footprint.		
	<b>Without mitigation</b>	<b>With mitigation</b>
<b>Extent</b>	Local (1)	Local (1)
<b>Duration</b>	Permanent (5)	Permanent (5)
<b>Magnitude</b>	Small (0)	Small (0)
<b>Probability</b>	Very improbable (1)	Very improbable (1)
<b>Significance</b>	<b>Low (5)</b>	<b>Low (5)</b>
<b>Status (positive or negative)</b>	Negative	Negative
<b>Reversibility</b>	Low	Low
<b>Irreplaceable loss of resources?</b>	Yes	Yes
<b>Can impacts be mitigated?</b>	n/a	
<b>Mitigation:</b> Because no significant impacts are expected and the chances of any impacts at all are very low, no mitigation measures are suggested.		

The potential cumulative impacts to archaeological resources for Transmission Line Alternatives 4 and 6 are likely to be of low significance both before and after mitigation (Table

7). The potential cumulative impacts to archaeological resources for all other project components will likely be of low significance and no mitigation is required (Table 8).

**Table 7:** Cumulative assessment of archaeological impacts for Transmission Line Alternatives 4 and 6.

<b>Nature:</b> Direct disturbance and/or destruction of archaeological resources within the development footprint.		
	<b>Without mitigation</b>	<b>With mitigation</b>
<b>Extent</b>	Local (1)	Local (1)
<b>Duration</b>	Permanent (5)	Permanent (5)
<b>Magnitude</b>	Minor (2)	Small (1)
<b>Probability</b>	Probable (3)	Very improbable (1)
<b>Significance</b>	<b>Low (24)</b>	<b>Low (7)</b>
<b>Status (positive or negative)</b>	Negative	Negative
<b>Reversibility</b>	Low	Low
<b>Irreplaceable loss of resources?</b>	Yes	No
<b>Can impacts be mitigated?</b>	Yes	
<b>Confidence in findings:</b> High		
<b>Mitigation:</b> The ideal mitigation in this instance is to avoid the ruins in question and leave them as they are. The alternative would be to record their layouts (measured drawings) and construction techniques and materials in detail prior to demolition.		

**Table 8:** Cumulative assessment of archaeological impacts for Transmission Line Alternative 3 and all Distribution Line and Transmission and Distribution Substation Alternatives.

<b>Nature:</b> Direct disturbance and/or destruction of archaeological resources within the development footprint.		
	<b>Without mitigation</b>	<b>With mitigation</b>
<b>Extent</b>	Local (1)	Local (1)
<b>Duration</b>	Permanent (5)	Permanent (5)
<b>Magnitude</b>	Small (0)	Small (0)
<b>Probability</b>	Very improbable (1)	Very improbable (1)
<b>Significance</b>	<b>Low (6)</b>	<b>Low (6)</b>
<b>Status (positive or negative)</b>	Negative	Negative
<b>Reversibility</b>	Low	Low
<b>Irreplaceable loss of resources?</b>	Yes	Yes
<b>Can impacts be mitigated?</b>	n/a	

**Confidence in findings:**

High

**Mitigation:**

Because no significant impacts are expected and the chances of any impacts at all are very low, no mitigation measures are suggested.

## 7.2. Impacts to palaeontological resources

The regional palaeontological potential varies with substrate and depth of potentially-fossiliferous deposits from the surface. For this reason the assessments below have been grouped into substation and power line components – the substations are likely to result in larger and deeper excavations than the power lines are. The assessments consider both individual palaeontological resources and the broader fossil landscape with the latter thus excluded from the cultural landscape assessment in Section 7.3 below. Contextual impacts to the WCFP are not of great significance because of the very large vegetated berm that is in place around the south-western part of the Park which would largely screen it from the proposed developments.

It is entirely possible that excavations into sediments not normally accessible to palaeontologists will encounter fossils in sub-surface deposits, particularly in the Velddrif, Springfontyn, Langebaan and Varswater Formations. Although the potential to impact on highly significant palaeontological material does exist, such material would be unknown to science until such time as the impact occurs. For this reason, the impact, if mitigated appropriately, is regarded as being a positive one because it may provide opportunities to recover potentially important fossils that enable observations that could otherwise not have been made. Although extensive impacts could occur, the above positive aspect and the screening from the berm means there is no fatal flaw.

In spite of relatively good borehole coverage, which provides a framework, the depth of potentially fossil-bearing sediments is largely unknown and difficult to assess without excavation; it is thus not possible to exclude the possibility that sparsely-distributed sub-surface fossils may be encountered during any excavations into the surface. Small pockets of bone can 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 sub-fossils.

Table 9 shows the impact assessment for all the substation alternatives. Because of the potentially high cultural significance of fossils in the study area (and known national significance of the WCFP), the extent of impacts is given a high rating. Because of the potential size and depth of excavations, the overall significance of impacts before mitigation is rated as being high. After mitigation the impacts would only be of medium significance but would be considered positive because of the potential contribution that mitigation could make to science. Indirect impacts are not expected. Because the excavations required for the various power line alternatives would be far smaller than those for the substations, the potential impacts for all power lines alternatives are less likely to occur and are rated as of low significance both before and after mitigation (Table 10).

**Table 9:** Assessment of palaeontological impacts for all Transmission and Distribution Substation Alternatives.

**Nature:**

**Direct disturbance and/or destruction of palaeontological resources within the development footprint.**

	Without mitigation	With mitigation
<b>Extent</b>	Regional (5)	Regional (5)

<b>Duration</b>	Permanent (5)	Permanent (5)
<b>Magnitude</b>	High (8)	Minor (2)
<b>Probability</b>	Highly probable (4)	Highly probable (4)
<b>Significance</b>	<b>High (74)</b>	<b>Medium (48)</b>
<b>Status (positive or negative)</b>	Negative	Positive
<b>Reversibility</b>	Low	low
<b>Irreplaceable loss of resources?</b>	Yes	Yes
<b>Can impacts be mitigated?</b>	Yes	
<b>Mitigation:</b> Full-time monitoring by an appropriately-qualified person must be carried out at all substation locations until bulk earthworks are completed. Any fossils found must be recorded following accepted palaeontological standards and the material collected for curation in an approved repository where it will be available for future research.		

**Table 10:** Assessment of palaeontological impacts for all Transmission and Distribution Line Alternatives.

<b>Nature:</b> Direct disturbance and/or destruction of palaeontological resources within the development footprint.		
	<b>Without mitigation</b>	<b>With mitigation</b>
<b>Extent</b>	Regional (3)	Regional (3)
<b>Duration</b>	Permanent (5)	Permanent (5)
<b>Magnitude</b>	Low (4)	Minor (2)
<b>Probability</b>	Improbable (2)	Improbable (2)
<b>Significance</b>	<b>Low (24)</b>	<b>Low (20)</b>
<b>Status (positive or negative)</b>	Negative	Positive
<b>Reversibility</b>	Low	Low
<b>Irreplaceable loss of resources?</b>	Yes	Yes
<b>Can impacts be mitigated?</b>	Yes	
<b>Mitigation:</b> Because of the limited likelihood of encountering significant fossils, monitoring can be conducted on an ad hoc basis by the palaeontologist at times when suitable holes are exposed. The environmental control officer (ECO) and by project staff should also be appropriately briefed beforehand to ensure that they are able to recognise and rescue any fossils found during excavations. Any fossils found must be protected, preferably <i>in situ</i> , and reported to a palaeontologist for inspection, assessment and collection if necessary. The find should be recorded following accepted palaeontological standards and the material deposited for curation in an approved repository where it will be available for future research.		

Almost all developments in the Saldanha Bay region that involve excavations will result in some sort of impacts to palaeontological resources. Cumulative impacts are thus almost certain to occur. For the substations, which would likely require fairly substantial foundation excavations, the significance of cumulative impacts without mitigation is regarded as high and negative. However, application of the suggested mitigation measures would reduce this to medium significance but the impacts would be positive because of the potential contributions to science that may result from successful mitigation (Table 11). The power line alternatives would all require far smaller excavations which means that the chances of encountering fossils is much less. Nevertheless, similar excavations across the broader area would probably result in potential cumulative impacts of medium significance both before and after mitigation (Table 12).

**Table 11:** Cumulative assessment of palaeontological impacts for all Transmission and Distribution Substation Alternatives.

<b>Nature:</b> Direct disturbance and/or destruction of palaeontological resources within the development footprint.		
	<b>Without mitigation</b>	<b>With mitigation</b>
<b>Extent</b>	Regional (5)	Regional (5)
<b>Duration</b>	Permanent (5)	Permanent (5)
<b>Magnitude</b>	High (8)	Minor (2)
<b>Probability</b>	Highly probable (4)	Highly probable (4)
<b>Significance</b>	<b>High (74)</b>	<b>Medium (48)</b>
<b>Status (positive or negative)</b>	Negative	Positive
<b>Reversibility</b>	Low	low
<b>Irreplaceable loss of resources?</b>	Yes	Yes
<b>Can impacts be mitigated?</b>	Yes	
<b>Confidence in findings:</b> Medium		
<b>Mitigation:</b> Full-time monitoring by an appropriately-qualified person must be carried out at all substation locations until bulk earthworks are completed. Any fossils found must be recorded following accepted palaeontological standards and the material collected for curation in an approved repository where it will be available for future research.		

**Table 12:** Cumulative assessment of palaeontological impacts for all Transmission and Distribution Line Alternatives.

<b>Nature:</b> Direct disturbance and/or destruction of palaeontological resources within the development footprint.		
	<b>Without mitigation</b>	<b>With mitigation</b>
<b>Extent</b>	Regional (3)	Regional (3)
<b>Duration</b>	Permanent (5)	Permanent (5)
<b>Magnitude</b>	Low (4)	Minor (2)

<b>Probability</b>	Probable (3)	Probable (3)
<b>Significance</b>	<b>Medium (36)</b>	<b>Medium (30)</b>
<b>Status (positive or negative)</b>	Negative	Positive
<b>Reversibility</b>	Low	Low
<b>Irreplaceable loss of resources?</b>	Yes	Yes
<b>Can impacts be mitigated?</b>	Yes	
<b>Confidence in findings:</b> High		
<b>Mitigation:</b> Because of the limited likelihood of encountering significant fossils, monitoring can be conducted on an ad hoc basis by the palaeontologist at times when suitable holes are exposed. The environmental control officer (ECO) and by project staff should also be appropriately briefed beforehand to ensure that they are able to recognise and rescue any fossils found during excavations. Any fossils found must be protected, preferably in situ, and reported to a palaeontologist for inspection, assessment and collection if necessary. The find should be recorded following accepted palaeontological standards and the material deposited for curation in an approved repository where it will be available for future research.		

### 7.3. Impacts to the cultural landscape

It should be noted that the assessment in this section refers only to the surface landscape as viewed and experienced by people in the area. It specifically excludes impacts to the fossil landscape which have been assessed under palaeontological impacts (Section 7.2).

Because of the already highly compromised nature of the landscape within and around the study area, impacts are likely to be of low significance. The proposed developments would only be adding to an existing electrical infrastructure layer on the landscape. There are no fatal flaws. Although the impacts are not considered significant from a heritage point of view, it should be noted that the calculated impact significance comes out as medium in Table 13 because of the permanent duration and certainty that the impacts would happen. Mitigation of cultural landscape impacts would generally involve screening the development. However, because of the nature and size of the proposed new infrastructure, there are no feasible/practical mitigation measures that could be suggested to reduce the expected impacts.

**Table 13:** Assessment of cultural landscape impacts for all project components.

<b>Nature:</b> <b>Disruption/degradation of the cultural landscape within the broader area.</b>		
	<b>Without mitigation</b>	<b>With mitigation</b>
<b>Extent</b>	Local (1)	Local (1)
<b>Duration</b>	Permanent (5)	Permanent (5)
<b>Magnitude</b>	Minor (1)	Minor (1)
<b>Probability</b>	Definite (5)	Definite (5)
<b>Significance</b>	<b>Medium (35)</b>	<b>Medium (35)</b>
<b>Status (positive or negative)</b>	Negative	Negative

<b>Reversibility</b>	High	High
<b>Irreplaceable loss of resources?</b>	No	No
<b>Can impacts be mitigated?</b>	No practical measures possible	
<b>Mitigation:</b> There are no feasible/practical mitigation measures that could reduce the impacts to the landscape.		

For the same reasons stated above, the potential cumulative impacts to the cultural landscape are considered to be of low significance from a heritage point of view, although, once more, the permanent nature and certainty that they would occur result in a calculated impact significance of medium.

**Table 14:** Cumulative assessment of cultural landscape impacts for all project components.

<b>Nature:</b> Disruption/degradation of the cultural landscape within the broader area.		
	<b>Without mitigation</b>	<b>With mitigation</b>
<b>Extent</b>	Local (1)	Local (1)
<b>Duration</b>	Permanent (5)	Permanent (5)
<b>Magnitude</b>	Minor (1)	Minor (1)
<b>Probability</b>	Definite (5)	Definite (5)
<b>Significance</b>	<b>Medium (35)</b>	<b>Medium (35)</b>
<b>Status (positive or negative)</b>	Negative	Negative
<b>Reversibility</b>	High	High
<b>Irreplaceable loss of resources?</b>	No	No
<b>Can impacts be mitigated?</b>	No practical measures possible	
<b>Confidence in findings:</b> High		
<b>Mitigation:</b> There are no feasible/practical mitigation measures that could reduce the impacts to the landscape.		

## 8. INPUT TO THE ENVIRONMENTAL MANAGEMENT PROGRAM

Certain measures will need to be adhered to in order to reduce the impacts to archaeological and palaeontological resources. These are detailed below. Note that in the case of archaeology, the measures described are only to be implemented if the relevant sites cannot be avoided and preserved *in situ*. There are measures for implementation by an archaeologist, a palaeontologist and the project environmental control officer (ECO).

### 8.1. Archaeology

**OBJECTIVE:** To ensure that archaeological resources (historical ruins) are fully recorded and described prior to their destruction.

<b>Project component/s</b>	Transmission Line Alternatives 4 and 6 .
<b>Potential Impact</b>	Destruction of the resources and loss of all information about them.
<b>Activity/risk source</b>	Clearing of transmission line servitude in advance of construction.
<b>Mitigation: Target/Objective</b>	Suitable recording, including measured drawings, should be carried out so as to rescue information regarding the form and construction details of the ruins.

<b>Mitigation: Action/control</b>	<b>Responsibility</b>	<b>Timeframe</b>
The ruins should be measured and have plans drawn. Details regarding the methods of construction and materials used should be recorded. A report on this work must be submitted to HWC for approval.	The project archaeologist will need to implement the measures under a workplan approved by HWC.	The mitigation should be completed and approved by HWC prior to commencement of demolition of the ruins.

<b>Performance Indicator</b>	The mitigation report is completed and approved by HWC prior to construction.
<b>Monitoring</b>	The ECO should ensure that the approval of HWC is obtained prior to commencement of construction in the vicinity of the ruins.

## 8.2. Palaeontology

**OBJECTIVE:** To ensure that fossils and information about their context are rescued during implementation.

<b>Project component/s</b>	Palaeontological resources are affected by all subsurface foundation excavations.
<b>Potential Impact</b>	Destruction and loss of fossils and contextual information.
<b>Activity/risk source</b>	Bulk earthworks for foundations.
<b>Mitigation: Target/Objective</b>	Successful rescue of significant fossils and relevant contextual data during the construction period.

<b>Mitigation: Action/control</b>	<b>Responsibility</b>	<b>Timeframe</b>
For substation foundation excavations full-time specialist palaeontological monitoring will be required under a workplan approved by HWC. The project palaeontologist will be responsible for reporting to HWC. For the power line foundation excavations monitoring can be conducted on an ad hoc basis by the palaeontologist at times when suitable holes are exposed. The environmental control officer (ECO) and project staff should also be appropriately briefed beforehand to ensure that they are able to recognise and rescue any fossils found during excavations. Any fossils so discovered must be reported to the palaeontologist for assessment as part of the monitoring report.	For substation foundation excavations a specialist palaeontologist should be appointed. For the power line foundation excavations the ECO should ensure that any isolated fossils are protected and/or rescued and reported to a palaeontologist. All project staff, construction workers, etc should be made aware of the need to watch for fossils and report them when found.	Monitoring needs to occur during all earthworks. At the substation sites monitoring must be full-time. For the power lines project staff can be aware of what is being excavated as they work, while periodic visits from the ECO are conducted.

<b>Performance Indicator</b>	Fossils are successfully rescued and relevant scientific data are captured.
<b>Monitoring</b>	The ECO should ensure that the approval of HWC has been obtained within a reasonable period (refer project palaeontologist for advice) once the bulk earthworks have been completed. The project ECO should examine any spoils from power line foundation excavations whenever possible, while project staff should be aware of potential fossil finds at all times. Finds should be reported to the ECO/palaeontologist.



## **9. EVALUATION OF IMPACTS RELATIVE TO SUSTAINABLE SOCIAL AND ECONOMIC BENEFITS**

Section 38(3)(d) requires an evaluation of the impacts on heritage resources relative to the sustainable social and economic benefits to be derived from the development. The present project will ensure a sustainable electricity supply for the further industrial development of the Saldanha Bay IDZ. The negative impacts to heritage resources are not of such a significance as to outweigh the social benefits of the project. In addition, the palaeontological impacts will be positive with mitigation.

## **10. CONSULTATION WITH HERITAGE CONSERVATION BODIES**

As requested by HWC, the draft HIA was submitted to the Saldanha Bay Municipality (SBM) and the WCFP for comment. This was done on 13<sup>th</sup> September 2016. A follow-up email was sent by way of a reminder on 11<sup>th</sup> October 2016 because it is strongly preferred that comments be included.

SBM submitted a comment on 13<sup>th</sup> October 2016 indicating that they had no additional information that might be added to the HIA. The WCFP sent a brief email on the same day indicating that more palaeontological monitoring should be built in to the construction phase works and that the alternatives located further from the WCFP should be preferred.

The WCFP comment resulted in a change to the monitoring requirements, while the HIA already gave preference to the project alternatives located furthest west.

Please find screen shots of the above-mentioned correspondence in Appendix 2 (note that the original email files were submitted electronically with this report).

## **11. CONCLUSIONS**

Although archaeological resources and the cultural landscape may be negatively affected by the proposed project, the significance of impacts to these resources will be low. There is, however, the potential for highly significant impacts to palaeontological resources to occur. These are deemed manageable and, in fact, positive impacts will be felt with the implementation of successful palaeontological mitigation. Given the limited information available at present, any fossil finds should be treated as significant and would require careful recording and possible systematic excavation in order to ensure that benefits are derived.

This assessment has demonstrated that the proposed project is feasible and that there are no fatal flaws from a heritage perspective. The requirement of HWC to specifically assess archaeological and palaeontological resources as part of the HIA has been met.

### **11.1. Preference for alternatives**

Because of the archaeological resources located along the shared Transmission Line Alternative 4 and 6 corridor, the use of Transmission Line Alternative 3 is preferred. This will also reduce the degree to which the power lines are visible from the R27, and result in better clustering of the lines. As such, Transmission Substation Alternative A is also preferred so that the majority of electrical infrastructure can be placed on the western side of the R27 where all other industrial and electrical infrastructure currently sits. Should Transmission Line Alternative 4 or 6 be used, then Transmission Substation D is preferred over Alternative F so that the majority of infrastructure will be west of the R27 and the substation would be further away from the WCFP.

In terms of the Distribution Substations, Alternative A is preferred purely because it concentrates impacts alongside the existing Blouwater Substation. Distribution Substation

Alternative C is least preferred because of its proximity to a main road. The preferences are ranked and motivated in Table 15.

**Table 15: Ranking of alternatives.**

Project alternative	Preference (1 = most; 3 = least)	Motivation
Transmission Line 3	1	Keeps electrical infrastructure grouped to the west of the R27
Transmission Line 4	3	Introduces large electrical infrastructure to the east of the R27 and is very close to the WCFP
Transmission Line 6	2	Introduces large electrical infrastructure to the east of the R27
Transmission Substation A	1	Keeps large electrical infrastructure grouped to the west of the R27
Transmission Substation D	2	Its large foundation excavations are still fairly close to the WCFP
Transmission Substation F	3	Introduces large electrical infrastructure to the east of the R27 and its large foundation excavations would be very close to the WCFP. Although impacts could be extensive, the potential positive impact of revealing new fossils and the screening effect of the large berm mean that this option is not fatally flawed
Distribution Substation A	1	Adjoins existing substation and reduces proliferation of impacts
Distribution Substation B	2	Located away from existing substation but is further from nearby road
Distribution Substation C	3	Located away from existing substation and also in close proximity to nearby road

## 12. RECOMMENDATIONS

Because the mitigation and management of any archaeological and palaeontological impacts that might arise are entirely feasible, it is recommended that the proposed project be allowed to proceed from a heritage point of view. However, the preference for Transmission Line Alternative 3, Transmission Substation Alternative A and Distribution Substation Alternative A are stressed (but see preference ranking above). The following recommendations are relevant and should be incorporated into the environmental authorisation for the project as relevant:

- » If Transmission Line Alternatives 4 or 6 are authorized, then archaeological mitigation of the historic ruins should take place under a workplan approved by HWC if they cannot be preserved *in situ*;
- » Full-time palaeontological monitoring of both authorized substation foundations (any Alternatives) and ad hoc monitoring of power line foundations is required under a workplan approved by HWC. The workplan must include provision for the collection and recording of any fossils unearthed during construction;
- » Training in the identification of fossils should be provided to project staff (construction workers, excavator operators and the ECO) who should be instructed to watch for fossils and report any discoveries;
- » Any fossil material recovered during the course of the project should be properly recorded and then lodged with an appropriate repository; and
- » If any further archaeological and/ or palaeontological material or human burials are uncovered during the course of development then work in the immediate area should be

halted. The find would need to be reported to the heritage authorities and may require inspection by an archaeologist or palaeontologist. Such heritage is the property of the state and may require excavation and curation in an approved collection repository.

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## APPENDIX 1 – Curriculum Vitae



*Curriculum Vitae*

**Jayson David John Orton**

ARCHAEOLOGIST AND HERITAGE CONSULTANT

### Contact Details and personal information:

**Address:** 6A Scarborough Road, Muizenberg, 7945  
**Telephone:** (021) 788 8425  
**Cell Phone:** 083 272 3225  
**Email:** jayson@asha-consulting.co.za

**Birth date and place:** 22 June 1976, Cape Town, South Africa  
**Citizenship:** South African  
**ID no:** 760622 522 4085  
**Driver's License:** Code 08  
**Marital Status:** Married to Carol Orton  
**Languages spoken:** English and Afrikaans

### Education:

SA College High School	Matric	1994
University of Cape Town 1997	B.A. (Archaeology, Environmental & Geographical Science)	
University of Cape Town 1998	B.A. (Honours) (Archaeology)*	
University of Cape Town	M.A. (Archaeology)	2004
University of Oxford	D.Phil. (Archaeology)	2013

\*Frank Schweitzer memorial book prize for an outstanding student and the degree in the First Class.

### Employment History:

Spatial Archaeology Research Unit, UCT	Research assistant	Jan 1996 – Dec 1998
Department of Archaeology, UCT	Field archaeologist	Jan 1998 – Dec 1998
UCT Archaeology Contracts Office	Field archaeologist	Jan 1999 – May 2004
UCT Archaeology Contracts Office	Heritage & archaeological consultant	Jun 2004 – May 2012
School of Archaeology, University of Oxford	Undergraduate Tutor	Oct 2008 – Dec 2008
ACO Associates cc	Associate, Heritage & archaeological consultant	Jan 2011 – Dec 2013
ASHA Consulting (Pty) Ltd	Director, Heritage & archaeological consultant	Jan 2014 –

### Memberships and affiliations:

South African Archaeological Society Council member	2004 –
Assoc. Southern African Professional Archaeologists (ASAPA) member	
2006 –	
ASAPA Cultural Resources Management Section member	2007 –
UCT Department of Archaeology Research Associate	
2013 –	
Heritage Western Cape APM Committee member	2013 –
UNISA Department of Archaeology and Anthropology Research Fellow	
2014 –	
Fish Hoek Valley Historical Association	2014 –

### **Professional Accreditation:**

Association of Southern African Professional Archaeologists (ASAPA) membership number: 233  
CRM Section member with the following accreditation:

- Principal Investigator: Coastal shell middens (awarded 2007)  
Stone Age archaeology (awarded 2007)  
Grave relocation (awarded 2014)
- Field Director: Rock art (awarded 2007)  
Colonial period archaeology (awarded 2007)

Association of Professional Heritage Practitioners (APHP)

- Accredited Professional Heritage Practitioner

### **Fieldwork and project experience:**

Extensive fieldwork as both Field Director and Principle Investigator throughout the Western and Northern Cape, and also in the western parts of the Free State and Eastern Cape as follows:

#### Phase 1 surveys and impact assessments:

- Project types
  - Notification of Intent to Develop applications (for Heritage Western Cape)
  - Heritage Impact Assessments (largely in the Environmental Impact Assessment or Basic Assessment context under NEMA and Section 38(8) of the NHRA, but also self-standing assessments under Section 38(1) of the NHRA)
  - Archaeological specialist studies
  - Phase 1 test excavations in historical and prehistoric sites
  - Archaeological research projects
- Development types
  - Mining and borrow pits
  - Roads (new and upgrades)
  - Residential, commercial and industrial development
  - Dams and pipe lines
  - Power lines and substations
  - Renewable energy facilities (wind energy, solar energy and hydro-electric facilities)

#### Phase 2 mitigation and research excavations:

- ESA open sites
  - Duinefontein, Gouda
- MSA rock shelters
  - Fish Hoek, Yzerfontein, Cederberg, Namaqualand
- MSA open sites
  - Swartland, Bushmanland, Namaqualand
- LSA rock shelters
  - Cederberg, Namaqualand, Bushmanland
- LSA open sites (inland)
  - Swartland, Franschhoek, Namaqualand, Bushmanland

- LSA coastal shell middens
  - Melkbosstrand, Yzerfontein, Saldanha Bay, Paternoster, Dwarskersbos, Infanta, Knysna, Namaqualand
- LSA burials
  - Melkbosstrand, Saldanha Bay, Namaqualand, Knysna
- Historical sites
  - Franschhoek (farmstead and well), Waterfront (fort, dump and well), Noordhoek (cottage), variety of small excavations in central Cape Town and surrounding suburbs
- Historic burial grounds
  - Green Point (Prestwich Street), V&A Waterfront (Marina Residential), Paarl

## Curriculum Vitae - Dr Graham Avery

### Contact Details

Home Address: 25 San Bernado  
18 De Lorentz Street  
Upper Gardens  
Cape Town 8001

### Business Details

Graham Avery (Sole Proprietor): Archaeozoology, Stone Age Archaeology and Quaternary Palaeontology.

- ☐ Telephone: (021) 4241285 (H)
- ☐ Cell: 083 441 0028
- ☐ Email: gavery@iziko.org.za; drgavery97@gmail.com

### Professional Qualifications

- ☐ PhD (archaeology) 1990 “*Archaeological and palaeoenvironmental interpretation of avian remains from archaeological sites*”. University of Cape Town.
- ☐ MA (archaeology) 1976 “*Systematic Investigation of Coastal Shell Middens in the South Western Cape*”. University of Cape Town.
- ☐ BA (Archaeology, Social Anthropology, African History, History and Geography) 1969 University of Cape Town.

### Current Position

Retired 31 January 2012.

Associate Natural History Collections Department, Cenozoic Studies, Iziko South African Museum (April 2012–).

Research Associate, Archaeology Department, University of Cape Town (July 2012–).

### Positions Held

- ☐ Archaeozoologist, Curator of Quaternary Collections, Cenozoic Studies Section, Natural History Department, Iziko South African Museum (2002–January 2012). [moved to Natural History Collections Department when Iziko came into being]
- ☐ Head of Human Sciences Division, South African Museum (1993–2002).
- ☐ Head of Archaeology Department, South African Museum (1990–1993).
- ☐ Acting Head of Archaeology Department, South African Museum (1985–1990).
- ☐ Researcher, Archaeology Department, South African Museum (1980–2002).
- ☐ Manager: Archaeological Data Recording Centre, South African Museum (1974–1979).
- ☐ Environmental Archaeologist, South African Museum (1970–1973).
- ☐ Manager (temporary): Archaeological Data Recording Centre, South African Museum (1969).

### Research

#### Research Interests

The Late Quaternary palaeoecology of south-western Africa covering material from the Pliocene to the Holocene:

- ☐ Archaeozoological studies—mammals, birds and molluscs in the palaeo-ecological and human history of South Africa;
- ☐ Experimental and comparative actualistic studies – taphonomy of human and non-human bone accumulations resulting from carnivores, scavengers and raptors, such as hyaenas, jackals, leopards, eagles and the larger owls. These include a 29-year long-term project monitoring beached birds and mammals;
- ☐ Past climates and environments using evidence from birds and mammals (including pollens from hyaena coprolites); and
- ☐ The application of archaeozoological and palaeontological research to modern issues of global change, conservation, heritage resource management and education.

#### Research Projects

- ☐ Taphonomy of Verreaux’s Eagle prey (with Aaron Armstrong, University of Minnesota).
- ☐ Prey of Verreaux’s Eagles in the Cedarberg and Sandveld (with Megan Murgatroyd, UCT) – ongoing.
- ☐ Prey of African Crowned Eagle in Urban areas of Kwazulu Natal (with Malan, et al.). 2008 – 2014. Paper submitted to Ostrich.
- ☐ Taphonomy and pathology of seal remains from the Langebaanweg Early Pliocene fossil site (with R. Govender, Iziko Museums of South Africa).
- ☐ Interpreting the environment of human development in eastern Africa (with D.M. Avery, Iziko SA Museum and F.K. Manthi and S. Mucila, National Museums of Kenya. Funding from PAST 2009 – ongoing.
- ☐ Spreeuwalle Late Pleistocene Wetland on The Western Cape Coast, South Africa, And its Implications for the Pleistocene History of the Fynbos (with R.G. Klein, Stanford University, USA, C. Cordova, Oklahoma State University, USA, E. Bergh, Iziko South African Museum, Warren Sharp, UC Berkeley, USA and Julie Luyt, University of Cape Town). Funding From Leakey Foundation and PAST. 2003 – Ongoing.
- ☐ Uniab brown hyaena den: Taphonomy of a modern hyaena den on the Uniab delta fan, Skeleton Coast Park, Namibia (with P. Fosse, CNRS, Université de Toulouse Mirail, France, J-B. Fourvel, Université de Toulouse Mirail, France, J-F. Tournepiche, Angolême Museum, D.M. Avery, Iziko Museums of South Africa, R. Loutit and S. Braine).



- ❑ Pathologies on Gemsbok at the Uniab brown hyaena den (with R. Govender, Iziko Museums of South Africa).
- ❑ Human behavior, taphonomy, biodiversity and palaeoecology from osteological remains of birds from archaeological and palaeontological sites in the western and Eastern Cape Provinces: Includes a range of Middle and Late Pleistocene occurrences.
- ❑ CNRS/NRF International Co-operation Project on taphonomy of spotted hyaena bone accumulating habits. (with P. Fosse, CNRS, Université de Toulouse Mirail, France, J-F. Tournepiche, Angoulême Museum and J-B Fourvel, Université de Toulouse Mirail, France). 2002 – ongoing.
- ❑ Late Pleistocene Middle Stone Age shell midden at Ysterfontein (with R.G. Klein, Stanford University, T.E. Steele, UC Davis, D. Halkett, University of Cape Town): excavation and study of the bird remains. 2002–2007.
- ❑ Records of Middle and Upper Pleistocene birds in fossil and archaeological sites. – ongoing.
- ❑ Palaeo-ecology of the Western Cape Coast. (with Klein, R.G., Stanford University, L. Scott, University of the Free State). Funded initially by NRF grant to A. Chinsamy-Turan, Iziko Museums of Cape Town). 2002 – ongoing.
- ❑ Prey of black sparrow hawks in the western Cape (with R. Simmons, Percy FitzPatrick Institute for African Ornithology, University of Cape Town, and O. Curtis, Cape Technikon Nature Conservation MA student). 2002 – ongoing.
- ❑ Cercopithecoid and other remains in crowned and black eagle prey assemblages. (with J. P. Kerbis, Field Museum, Chicago, USA; G. Malan, Tshwane University of Technology; A. Armstrong, University of Minnesota, USA). 2001 – ongoing.
- ❑ Co-Director of Duinefontein Project (with R.G. Klein, Stanford University and K. Cruz-Urbe, Northern Arizona University): excavation and overall interpretation; avian remains; palaeo-environment (carbon and oxygen isotopes with J. Lee-Thorp, University of Cape Town); pollens in hyaena coprolites (with L. Scott). NSF and Leakey Foundation funding allocated to RGK. 1997–2002.
- ❑ Co-Director of Die Kelders Cave Project (with R.G. Klein Stanford University, F.E. Grine and C. Marean, State University of New York at Stony Brook). NSF funding allocated to RGK. 1992–1995.
- ❑ Prey of black, martial and crowned eagles in the Cape Province (with A. Boshoff and G.N. Palmer, Cape Nature Conservation). 1988–1994.
- ❑ Late Quaternary palaeoecology of south-western Africa – avian fauna project, taphonomy of modern and archaeological/fossil bone accumulations and an investigation of the Middle Pleistocene hominid and other occurrences at the Elandsfontein fossil site, south-western Cape. Funding through colleagues involved in the project. Now part of “Palaeo-ecology of the Western Cape Coast Project” 1980 – ongoing.
- ❑ Avian fauna, palaeoenvironments and palaeoecology in the Pleistocene/Holocene of the southern and western Cape (PhD). Funding through colleagues involved in excavation projects. 1978–1990.
- ❑ Monthly survey of dead seabirds and marine mammals on South African beaches. 1977–2006.
- ❑ Archaeological salvage of historical material from the Cape Town Station Concourse and Golden Acre Sites. Excavation and preservation of Wagenaar's Reservoir. 1974–1979.
- ❑ Systematic investigation of open-station shell midden sites along the south-western Cape coast (MA). CSIR, HSRC, Museum funding to GA. 1970–76.

### **Fieldwork Experience**

- ❑ Extensive fieldwork (survey and excavation) at a range of archaeological and palaeontological sites dating from the Miocene to the Holocene (see Appendices 1 & 2).
- ❑ Surveys and collections of modern prey of mammals and raptors for taphonomic and palaeo-environmental studies.
- ❑ Monthly surveys for beached seabirds birds and marine mammals over 29 years.
- ❑ Initial development of the avian comparative osteology collection and contributions to its subsequent expansion and to that of the mammal comparative osteology collection. Assisted in the collection of barn owl pellets and in bird atlassing. This and other study material (above) led to the establishment of the Iziko Taphonomic Collection in Cenozoic Studies.

## **Curatorial and Museology**

### **Collections Management**

Planning, management, curation and co-ordination of the archaeological, physical anthropology and Quaternary collections of Iziko SA Museum, as well as the Archaeological Data Recording Centre. Using databases of different types. Writing contracts for collections, external loans and impact assessments. Overseeing the input of the archaeological, physical anthropology and Quaternary mollusc collections on Excel spreadsheets to make them more accessible and contributing to the improvement and upgrading of the LogosFlow Humanities Database, used by the African Studies section. Assisting in the development of a LogosFlow Archaeology/Quaternary Database to capture data for individual cultural items, fossils and assemblages with a view to simplifying transfer of data already on spreadsheets to an Access relational database.

### **Collections Policy Development**

Assisting in the development of Archaeology, Human Remains and Palaeontology collection policies.

### **Sensitive Collections**

Best practices for sensitive collections (human remains). Organized a workshop on sensitive collections, the results of which led to greater understanding of museum and social issues, which have significantly changed the way in which many museums in South Africa treat human remains in particular. Contributed to public forums on the issues of museums and human remains and a member of the Iziko Reference Group on Human Remains, which developed Iziko's current Policy on Human Remains.

### **Collection Development and Access**

Development of the archaeology, Quaternary, Comparative Osteology and Taphonomy collections.

Encouraged researchers to use the museum as an institutional base and to deposit their material in Iziko's collections leading to significant additions to Iziko holdings at virtually no cost to the museum. As visitors, they have helped to create critical mass in

cultural archaeology, archaeozoology, and Quaternary palaeontology, added scientific value to the collections and enhanced public and academic perceptions (local and international) of the museum.

Marketing Iziko's archaeological and Quaternary collections, which have been increasingly studied by local and international researchers and postgraduate students.

## **Cultural Resource Management**

Extensive experience in this field.

## **Contributions to Development and Training**

Lectures to university and technikon students and courses on the curation and conservation of collections and collection management. Provided in-service training and mentoring for museum staff, university students, postdocs and interns. Participated in training programmes for tour guides and museum volunteers.

## **Membership of Professionally-Related Societies**

- Royal Society of South Africa.
- Association of Southern African Professional Archaeologists (ASAPA). Professional Member #008 with Cultural Resource Management (CRM) accreditation.
- South African Society for Quaternary Research (SASQUA).
- International Council for Archaeozoology (ICAZ).
- South African Archaeological Society.
- Southern African Museums Association (SAMA) (Life Member).

## **Other primary interests**

Conservation, particularly participation in processes aimed at engendering and promoting civil and State understanding and the implementation of sound practices in environment and resource use. To this end, I have been active in promoting the principles, policies and actions of WESSA of which I have been a Regional Chairman, National Councilor, Board member and, as national President, Chairman of the Council and Board of Directors. I am a strong supporter of the Society's initiatives in environmental education and conservation, empowerment of communities and networking with other environmental NGOs.

## **Honorary Positions**

Honorary Research Associate, Iziko South African Museum (2012–).

Research Associate, Archaeology Department, University of Cape Town (2012–).

Editor *RSSAfNews* (2012–).

Editor *Piscator* (2012–).

Council Member Royal Society of South Africa (RSSAf) (2010–).

Member Cape Town Science Centre Scientific Advisory Board (2008–).

Member of Cape Nature Klipgat Development Group (2004–2007).

Past President and Honorary Life Member Wildlife and Environment Society of South Africa (WESSA) (2004–).

Member: Permit Review Committee, Amafa aKwaZulu-Natali (Heritage KwaZulu-Natal) (2001–ongoing).

Chairperson, Southern African Association of Archaeologists (now ASAPA) (2000–2004).

Specialist Advisor: Archaeology, Palaeontology & Meteorite Permit Committee, South African Heritage Resources Agency (SAHRA) (2000–2003).

Research Associate, University of Cape Town (UCT/Iziko MOU) (1999–2011).

Member of the Percy FitzPatrick Institute for African Ornithology Advisory Board (Representing WESSA) (1999–).


Trustee, World Wildlife Fund South Africa (WWF SA) (1999–).


Trustee, Klipgat Trust for coastline and heritage between Die Kelders Cave (Klipgat) and Gansbaai (1998–).


## APPENDIX 2 – Proof of Consultation

Original email sent to SBM and WCFP on 13 September 2016:

### Saldanha Strengthening: Heritage Consultation

 From "Jayson Orton" <jayson@asha-consulting.co.za>  
to "Duarte, Nazeema" <Nazeema.Duarte@sbm.gov.za> and other 2 people Tue 2016-09-13 04:11 PM

 You replied to this message on 11 October 2016 11:03:08 PM.


 Saldanha Strengthening HIA.pdf (6,8 MB)

Dear Nazeema and Pippa

As you are both aware, HWC requires consultation with affected parties who have an interest i heritage resources. I have, with the help of Dr Graham Avery, just completed an HIA for the proposed new substations and power lines in the Saldanha Bay area for Eskom. I have attached the draft report here and request that you provide any comment that you may have in relation to any aspect of heritage resources. Should you not have any comment then please indicate as much so I know.

Many thanks for your time on this.


Best wishes  
Jayson



**Jayson Orton**  
ASHA Consulting (Pty) Ltd  
6A Scarborough Road, Muizenberg, 7945  
[jayson@asha-consulting.co.za](mailto:jayson@asha-consulting.co.za)  
T: 021 788 8425 | C: 083 272 3225  
[www.asha-consulting.co.za](http://www.asha-consulting.co.za)

Follow-up email sent to SBM and WCFP on 11 October 2016:

### Re: Saldanha Strengthening: Heritage Consultation

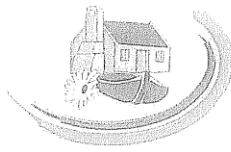
 From "Jayson Orton" <jayson@asha-consulting.co.za>  
to "Duarte, Nazeema" <Nazeema.Duarte@sbm.gov.za> and other 2 people Tue 2016-10-11 11:03 PM

Dear Nazeema and Pippa

I just wanted to send a reminder regarding the email below as the 30 day comment period required by HWC is almost over. I would still prefer to include any comments you both may have but also do not want to unduly delay the project.

with all best wishes  
Jayson

Comment received from SBM:



**SALDANHA BAY**  
MUNISIPALITEIT | MUNICIPALITY | uMASIPALA

REF NO:

12/1/2/71

ENQUIRIES:

N Duarte, Ms

ASHA Consulting  
Dr Jayson Orton  
6A Scarborough Road  
Muizenburg  
7945

REGISTERED MAIL  
jayson@asha-consulting.co.za

Dear Sir

HERITAGE IMPACT ASSESSMENT FOR PROPOSED POWER LINES AND SUBSTATIONS NEAR SALDANHA BAY, HOPEFIELD AND VREDENBURG MAGISTERIAL DISTRICTS, WESTERN CAPE

1. The Heritage Impact Assessment for Proposed Power lines and Substations Near Saldanha Bay, Hopefield and Vredenburg Magisterial Districts, Western Cape dated 12 September 2016 has reference.
2. The Saldanha Bay Municipality has undergone a process of drafting a first phase Heritage Survey and whatever additional information is welcomed, to include when the survey is updated.
3. For this report, the SBM does not have additional information or recommendations.

pp: MUNICIPAL MANAGER

Date 13/10/2016

T: (022) 701 7000 • F: (022) 715 1518  
mun@sbm.gov.za • www.sbm.gov.za  
Private Bag X12• Vredenburg • 7380

*Serve, Grow and Succeed Together*

Comment received from WCFP:

**RE: Re[2]: Saldanha Strengthening: Heritage Consultation**



From "Pippa Fossilpark mailbox" <pjh@fossilpark.org.za>  
to "Jayson Orton" <jayson@asha-consulting.co.za>

11:04:25 PM




 You replied to this message on 13 October 2016 11:09:39 PM.

 image001.png (7 kB)

Hi Jayson

Sorry – have been in town all day.

Please do include more palaeo monitoring and the works to be located as far away from the Park as possible

This lovely west coast is going to be changed so much...

Regards

Pippa