

**HERITAGE IMPACT ASSESSMENT  
A PROPOSED TRANSIENT INTERIM STORAGE FACILITY AT  
CAPE FARM 1552 (KOEBERG)  
WESTERN CAPE PROVINCE**

A specialist study component of an EIA  
Prepared for:  
SRK (Pty) Ltd

July 2015



**ACO Associates cc**  
Archaeology and Heritage Specialists

Prepared by  
Tim Hart

ACO Associates CC  
Unit D17 Prime Park  
Mocke Road  
Diep River  
7800

Email [tim.hart@aco-associates.com](mailto:tim.hart@aco-associates.com)  
Phone 021 7064104

## **EXECUTIVE SUMMARY**

ACO Associates CC was appointed to assess the heritage impacts of the proposed construction of a Transient Interim Storage Facility (TISF) for used nuclear fuel on the Cape Farm 1552, within the Koeberg Nuclear Power Station (KNPS) protected area. The ACO team was requested by SRK (Pty) Ltd on behalf of Eskom Holdings to assess the possible impacts that the proposed activities would have on cultural heritage.

The study was carried out in terms of section 38 of the National Heritage Resources Act and is presented as a specialist report in the overall EIA for the project. The proposed activity involves the construction of a large concrete pad (design to be completed) on which either cement or metal used-fuel dry storage casks, will be placed. The present used-fuel storage facility at the KNPS will shortly reach its maximum storage capacity, hence the need to construct additional storage for used nuclear fuel to see the plant through to the end of its operating life. The used nuclear fuel loses 95% of its radio-activity after a 10 year rest period, after which it can be recycled or disposed of in a deep storage facility. Two alternative sites (Alternative 1 is the CSB Site, the preferred alternative, Alternative 2 is the Ekhaya Site) have been identified to the immediate south, and north of the existing power station, within the protected area as well as a potential haul road.

### **Impact assessment**

The study has revealed that the general area is potentially rich in buried archaeological and palaeontological resources, which range from Pleistocene archaeology and palaeontology to ancient Pliocene and Miocene palaeontology of the deeper sediments. Both site alternatives and haul road for the proposed activity, are situated in areas which were heavily transformed when the KPNS was built in the 1970's. This means that the relatively shallow excavations for this facility are unlikely to result in any negative impacts to either *in situ* archaeological or palaeontological material.

None of the other activities associated with the proposed activity (such as formalisation of the haul road) are likely to result in negative impacts to heritage, either due to the shallow depth of impact or the fact that much of the land involved has been subject to prior disturbance.

### **Fatal flaws**

There are no fatal flaws associated with heritage impacts.

### **Alternatives**

Both alternatives 1 and 2 are acceptable from a heritage perspective. Alternative 1 (CSD site) is preferred by the proponent.

## Conclusion and recommendations

The proposed activity is considered to be acceptable in heritage terms. The following impact rating table would be applicable to either site alternative during the construction phase. No further impacts are expected during the operational phase.

<b>Impact</b>	<b>Consequence</b>	<b>Probability</b>	<b>Significance</b>	<b>Status</b>	<b>Confidence</b>
Impacts to Archaeological sites	low	Improbable	<b>Low</b>	Neutral	High
With Mitigation	Low	Improbable	<b>Low</b>		High
Impacts to landscape and setting	Low	Improbable	<b>Low</b>	Neutral	High
With Mitigation	Low	Improbable	<b>Low</b>	Neutral	High

## GLOSSARY

**Archaeology:** *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.*

**Calcrete:** *A soft sandy calcium carbonate rock related to limestone which often forms in arid areas.*

**Cenozoic:** *The most recent of the three major geological times periods ongoing since 65 million years ago.*

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

**Geophysical survey:** *A scientific study generally conducted by geologists and sedimentologists to describe and assess the below ground conditions of a given area.*

**Heritage:** *That which is inherited and forms part of the National Estate (Historical places, objects, fossils) as defined by the National Heritage Resources Act of 2000.*

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

**Palaeontology:** *Any fossilised remains or fossil trace of animals or plants which lived in the geological past, other than fossil fuels or fossiliferous rock intended for industrial use, and any site which contains such fossilised remains or trace.*

**Pleistocene:** *A geological time period (of 3 million – 20 000 years ago).*

**Pliocene:** *A geological time period (of 5 million – 3 million years ago).*

**Miocene:** *A geological time period (of 23 million - 5 million years ago).*

**SAHRA:** *South African Heritage Resources Agency.*

**Structure (historic):** *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. Protected structures are those which are over 60 years old.*

**Varswater Formation:** *Sediments laid down under estuarine circumstances by the proto-Berg River during the Pliocene. Certain members of this formation are highly fossiliferous.*

**Velddrif Formation:** *Shelly estuarine sands of the last interglacial (Pleistocene) that can be consolidated into calcrete.*

**Wreck (protected):** *A ship or an aeroplane or any part thereof that lies on land or in the sea within South Africa is protected if it is more than 60 years old.*

## Contents

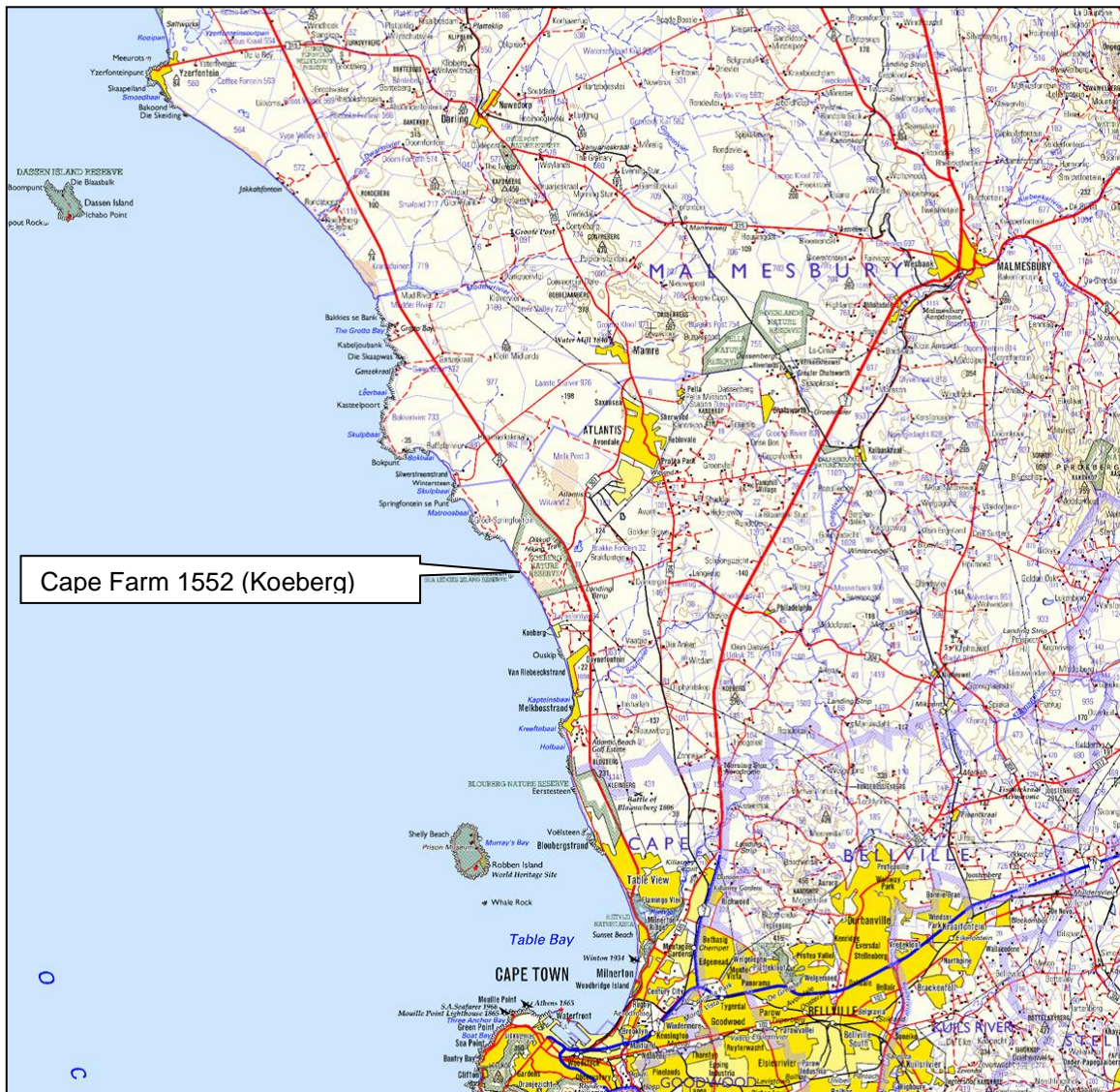
1	Introduction .....	2
1.1	Terms of reference.....	2
1.2	The proposed activity .....	4
2	The study approach .....	5
2.1	Legislative framework.....	6
2.2	Information base.....	7
2.3	Assumptions.....	7
2.4	Limitations.....	7
2.5	Methodology.....	7
3	Description of the study area, context and setting .....	8
4	Heritage context of the proposed activities and identification of heritage resources .....	9
4.1.1	<i>The regional heritage context</i> .....	9
5	Findings .....	10
5.1	Baseline conditions .....	10
5.1.1	<i>Recent history of the farm 1552</i> .....	10
5.1.2	<i>Pleistocene archaeology and palaeontology</i> .....	14
5.1.3	<i>Pliocene and Miocene palaeontology</i> .....	14
6	Assessment of impacts.....	15
6.1	The ways in which heritage can be impacted.....	15
6.2	Impacts caused by the proposed activities.....	16
6.3	Assessment of alternatives .....	16
6.4	The no-go alternative.....	17
7	Conclusion.....	17
8	References .....	18

## **1 Introduction**

ACO Associates CC was appointed by SRK (Pty) Ltd (on behalf of Eskom SOC) to conduct a Heritage Impact Assessment for the construction of a proposed Transient Interim Storage Facility (TISF) within the Koeberg Nuclear Power Station (KNPS) protected area on Cape Farm 1552 in the West Coast area, some 30 km north of Cape Town. The two alternative sites (Alternative 1: the CSB Site is the preferred alternative, and Alternative 2: the Ekhaya Site) proposed for this activity lie within the Koeberg protected area immediately north and south of the reactor units. The proposed facility is for the storage of used nuclear fuel.

### **1.1 Terms of reference**

- Describe the existing baseline characteristics of the study area and place this in a regional context;
- Identify and assess potential impacts of the Project and the alternatives, including impacts associated with the construction and operation phases, using SRK's prescribed impact rating methodology;
- Indicate the acceptability of alternatives and recommend a preferred alternative;
- Identify and describe potential cumulative impacts of the proposed development in relation to proposed and existing developments in the surrounding area;
- Recommend mitigation measures to avoid and/or minimise impacts and/or optimise benefits associated with the proposed Project; and
- Recommend and draft a monitoring campaign, if applicable.



**Figure 1 Location of study area.**

(Mapping information supplied by: Chief Directorate: Surveys and Mapping. Website: [w3sli.wcape.gov.za](http://w3sli.wcape.gov.za) Map 3318 Scale 1:250 000)

## 1.2 The proposed activity

The Project entails the construction of an interim used fuel dry storage facility (the TISF) for the storage of dry casks on site to accommodate used fuel from the reactors for the life of KNPS, thereby ensuring the continued operation of KNPS. The TISF will be constructed on vacant land within the Koeberg Protected Area. The TISF will house a number of used fuel dry storage casks fabricated from metal or concrete. The TISF will meet the National Nuclear Regulator (NNR) requirements and will be built and managed according to International Atomic Energy Agency (IAEA) standards. Eskom has identified two viable alternative sites for the TISF within the Koeberg Protected Area.

At present used fuel assemblies are stored in the spent fuel storage pools (SFP) at the KNPS. By 2018 this storage facility will be full. This means that provision must be made for further storage of used fuel assemblies on site as space will be needed in the SFPs. This will be accomplished by moving the used fuel assemblies from the spent fuel pools (SFP) into dry storage casks.

Typically in a pressurized water reactor of this kind at KNPS, once the fissile nuclear fuel is used up to the extent that it no longer is able to sustain a useful reaction, the fuel assemblies need to be removed from the reactors and stored in pools containing a boron rich water solution to cool and allow the residual radio-activity to reduce. Once the used fuel assemblies have cooled sufficiently (after a number of years) they can be removed from the SFPs and transferred into used fuel dry casks. KNPS has now reached a point where it is necessary to transfer fuel assemblies from the SFPs into dry casks for interim storage. There are presently four dry storage casks in the existing cask storage building (CSB) and another seven on order. Hereafter a facility needs to be built to accommodate additional used fuel casks which will accumulate over the life of the power station (circa 2060). Each cask is typically 2-3 meters wide and up to 6 meters in height. The exact appearance of the casks cannot be indicated as there are a variety of forms available and as yet a service provider has not been appointed. The TISF will consist of a large concrete pad on which the casks will be placed until transported to a longer term storage facility or recycled.

It is envisaged that the proposed concrete pad will consist of a slab of concrete that will be filled in a modular fashion over a number of years to reach a full extent of 12 800m<sup>2</sup>. The facility is entirely open air and un-roofed.

A short haul road has been identified which will be used by vehicles that transfer to dry fuel casks from the spent fuel pool building to the TISF. The haul road follows existing roads within KPNS.



Two alternatives for the TISF have been proposed (Figure 2). Alternative 1 is the CSB Site immediately to the north of the reactors and Alternative 2 is the Ekhaya Site, immediately to the south of the reactors. Alternative 1 is the preferred site. Only one alternative has been proposed for the haul road, however different parts of this road will be used, depending on which TISF site alternative is selected.



**Figure 1.** The haul road and two alternative sites for the TISF (figure provided by SRK (Pty) Ltd)

## 2 The study approach

Cape Farm 1552 has been subject to a significant amount of palaeontological and archaeological research. Reference is made to the international team of archaeologists and palaeontologists who worked at the Duinefontein 2 archaeological site (in the nature reserve north of the KNPS) for periods of time since the 1970's and again in 1995-2005. Furthermore, KNPS has been subject to an extensive EIA process for "Nuclear 1" and the proposed Pebble Bed Modular Reactor (PBMR). The author of this report has been involved in all of these projects and is familiar with their findings which have contributed to this study. The alternative sites and haul road were subject to a site inspection.

## 2.1 Legislative framework

The basis for all heritage impact assessment is the National Heritage Resources Act 25 (NHRA) of 1999, which in turn prescribes the manner in which heritage is assessed and managed. In the case of Environmental Impact Assessments the guidelines published by the Provincial Department of Environmental Affairs and Tourism are directly based on the provisions of the National Heritage Resources Act (Winter and Baumann 2005).

Loosely defined, *heritage is that which is inherited*. The National Heritage Resources Act 25 of 1999 has defined certain kinds of heritage as being worthy of protection, by either specific or general protection mechanisms. In South Africa the law is directed towards the protection of human made heritage, although places and objects of scientific importance are covered. The National Heritage Resources Act also protects intangible heritage such as traditional activities, oral histories and places where significant events happened. Generally protected heritage which must be considered in any heritage assessment includes:

- Cultural landscapes
- Buildings and structures (greater than 60 years of age)
- Archaeological sites (greater than 100 years of age)
- Palaeontological sites and specimens
- Shipwrecks and aircraft wrecks
- Graves and grave yards.

Section 38 of the NHRA requires that Heritage Impact Assessments (HIA's) are required for certain kinds of development such as rezoning of land greater than 10 000 square (sq) m in extent or exceeding 3 or more subdivisions, or for any activity that will alter the character or landscape of a site greater than 5000 sq m. "Standalone HIA's" are not required where an EIA is carried out as long as the EIA contains an adequate HIA component that fulfils Section 38 provisions. In this instance, the size of the proposed activity which exceeds 5000 sq m triggers section 38 of the NHRA.

Heritage Western Cape (HWC) is responsible for the management and protection of all Provincial Heritage sites (grade 2), generally protected heritage, and structures (grade 3a-grade 3c) in the Western Cape Province. In terms of this particular project they are an important commenting authority, but are not responsible for final compliance, as this study forms part of an EIA process for which the Department of Environmental Affairs is the compliance authority in terms of section 38.10 of the National Heritage Resources Act.

## 2.2 Information base

The study has been assisted by information and experiences obtained when the existing KNPS was built and the body of knowledge, especially geological, that was obtained from the extensive studies necessary for establishing the safety of the site (Eskom 2006). Furthermore, archaeological excavations by an international team, led by Prof R.G. Klein of Stanford University, California, USA has provided valuable insights into the Pleistocene archaeology and palaeontology of the area. Within the reference collection of our own organisation are numerous reports on studies conducted in the Saldanha Bay, Koeberg, and Atlantis areas. In short, information from both published and unpublished sources are readily available. A physical site inspection of the affected areas has been carried out to evaluate the baseline situation, however the bulk of available knowledge of the site and immediate environs is based on available data and accumulated local experience.

## 2.3 Assumptions

A characteristic of the Koeberg area is that the most important archaeological and palaeontological heritage are mainly buried below the ground surface, with some of the palaeontological material being more than 10 m below surface. This means that any assessment of impacts is based primarily on existing information and published sources (which is fortunately relatively good) rather than on ground surface survey.

## 2.4 Limitations

Physical assessment of archaeological and palaeontological heritage was based on surface observations only. The study has also drawn on the knowledge of Prof Richard Klein (Stanford University, California, USA) who conducted research at Duynfontein in 1973 and observed the deep excavations for the existing power station. No trial excavations were conducted.

There were restrictions on mobile phones and electronic devices into the inner security cordon.

## 2.5 Methodology

A detailed literature review was conducted to establish the kinds of heritage material that could be affected by the proposed activities. The EIA for the proposed Nuclear 1 project and the proposed PMBR was extensive, covering both the archaeology and palaeontology of the area. The findings of this work are directly applicable to this project. The proposed alternative TISF sites and haul roads were subject to a team site inspection in June 2015.

### **3 Description of the study area, context and setting**

Cape farm 1552 is the site of the existing KNPS, its administrative offices, stores, workshops, and road infrastructure. Locally, the two reactor and generator buildings dominate the built environment of the area, being visible from Table Mountain and the Cape Town Foreshore almost 27 km to the south. This enormous industrial complex lies in a rural context outside of the physical urban edge of Cape Town and is surrounded by a development exclusion zone (radius of 5 km) which makes up much of the Koeberg Nature Reserve (situated mainly on farm Klein Springfontein, Farm 33, to the north). The undeveloped areas, once heavily infested by stands of alien vegetation have been rehabilitated by Eskom and function as a well-stocked private nature reserve with high levels of biodiversity and large expanses of Strandveld and coastal Fynbos. The public are permitted into the reserve to view game, flora and walk the coastal hiking trails that have been created.

Generally the area consists of coastal flatlands. There are active dunes systems (recent Witsand Formation) on the northern side of the reserve. Immediately north of the power station security fence is a large stable dune field, which is known to contain archaeological and palaeontological sites. Inland of the coastal dunes lies a flat coastal plain, which eventually transforms into a mosaic of alien infested undeveloped or agricultural land east of the R27. Blaauwberg Hill, some 9 km to the south, is the only prominent hill in the immediate area. Immediately to the south of the study area (1.4 km) is the settlement of Duinefontein, originally the construction and staff town for Koeberg Nuclear Power Station but now a private housing estate. This represents the most northerly encroachment of the Cape Town urban edge.

Alternative sites 1 and 2 are located immediately south and north of the existing reactor units within the Koeberg protected area. In the 1970's this area was a massive construction site which saw the deep excavation to bedrock for the nuclear plant, large amounts infrastructure such as laydown yards, container and contractors yards, crane bases, batch plants, workshops and spoil heaps (Figure 3). Today this construction site has been revegetated and rehabilitated. Chunks of calcrete and fractured shale are testimony to the prior disturbance and deep excavation.



**Figure 2.** Koeberg Nuclear Power Station during construction in the 1970's. Note the extent of transformed landscape to the north and south of the power station site which includes the proposed sites for the TISF. The damage has since been rehabilitated (photograph courtesy of Gert Greeff).

## 4 Heritage context of the proposed activities and identification of heritage resources

### 4.1.1 *The regional heritage context*

In recent years the west coast has become famous for its fossil wealth. Just inland of Langebaan is the largest Miocene (5-6 million years old) fossil deposit in the world, parts of which are on display at the West Coast Fossil Park (Hendey 1982). This material was deposited in sandbar sediments at the mouth of the proto-Berg River (an ancient river and estuary that was the precursor to the Berg River), the course of which changed over the millennia in response to sea level changes.

The excavation for the existing KNPS exposed fossiliferous formations of similar age, which were reported on by Rogers (1980). Close to Hopefield, further inland, are the Pleistocene fossil beds at Elandsfontein (last million years) famous for the discovery of the early human species *Homo ergaster* (Saldanha man). On the edges of the Langebaan lagoon Dr Dave Roberts and Dr Lee Berger discovered the 200 000 year old footprints of an early modern human fossilized in calcrete sediments. At Hoedjiespunt Prof. John Parkington has excavated the site of an ancient hyena lair where skull fragments and teeth of an early human were found showing that parts of the body of this unfortunate person were consumed by hyenas more than 300 000 years

ago (Parkington 2006). Nearby, fossilized within the calcretes and aeoleanites are shell fish, animal bone, and the ashy hearths of people who lived in the area more than 100 000 years ago (Parkington *et al.* 2004). Further south at Yzerfontein, Prof. Richard Klein, Iziko Museums of Cape Town and the ACO team have been conducting an ongoing project on one of the earliest known Middle Stone Age shell middens (Halkett *et al.* 2003).

In 1973, Richard Klein discovered the site known as Duinefontein 2 (DFT 2), which comprised of fragments of fossil animal bone that were un-earthed during trial excavations for the KNPS. The archaeological/palaeontological site DFT 2 was extensively excavated between 1998 and 2003. It produced a wealth of Pleistocene fauna (about 300 000 years old) and resulted in numerous publications of the findings in international journals, putting the Koeberg Private Nature Reserve firmly on the map as a place of high archaeological and palaeontological significance (Klein *et al.* 1999, Cruz-Urbe *et al.* 2003).

Late Stone Age sites (the heritage of the Khoekhoen and San peoples of Southern Africa) are relatively numerous along the Western Cape Coast and can be observed close to any area of rocky shoreline, where shell fish and other marine resources could be exploited (Parkington 2006). These kinds of sites, mostly less than 5000 years old are characterized by piles of shellfish, stone artefacts and from time to time pottery, and used to be numerous along the west coast. Very few sites, or these types of artifacts, have been observed on Cape Farm 1552 during recent surveys, and are not considered part of the heritage significance of the area. The shoreline along this stretch of the coast is characterized by long sandy beaches and does not have any rocky outcrops where one can gather shell fish, meaning that whether or not people were present along the shore they left little evidence.

## **5 Findings**

### **5.1 Baseline conditions**

#### **5.1.1 *Recent history of the farm 1552***

Farm 1552 was consolidated by the City of Cape Town in 2015. Before it was known as Duynfontein 34. Where appropriate reference is made to the historic name of the site.

The coastal regions of the southwestern Cape were occupied in pre-colonial times by peoples who exploited marine resources for their livelihood. Human occupation of the coast is archaeologically reflected in the thousands of shell midden sites and rock shelter deposits. Herder sites, such as Kasteelberg, show occupation between 1800 and 1600 years ago. European explorers had contact with many of the Khoekhoen groups along

the coast. These peoples included the CochoqQua, whose territory stretched from Saldanha Bay to Vredenburg, and the ChariGuriQua or GuriQua, who occupied the lower Berg River area, St Helena Bay and points around Piketberg. Shell middens have been observed locally at Blouberg Beach, Atlantic Beach and Springfontein but not within the Koeberg Nature Reserve.

In the archival documentation there is reference to a Hermanus Dempers as ‘inhabitant and owner of the ‘Opstal’ on the loan place named Duynefontein’ (Cape Archives CO 3985 ref, 117, CO 3887 ref 79).

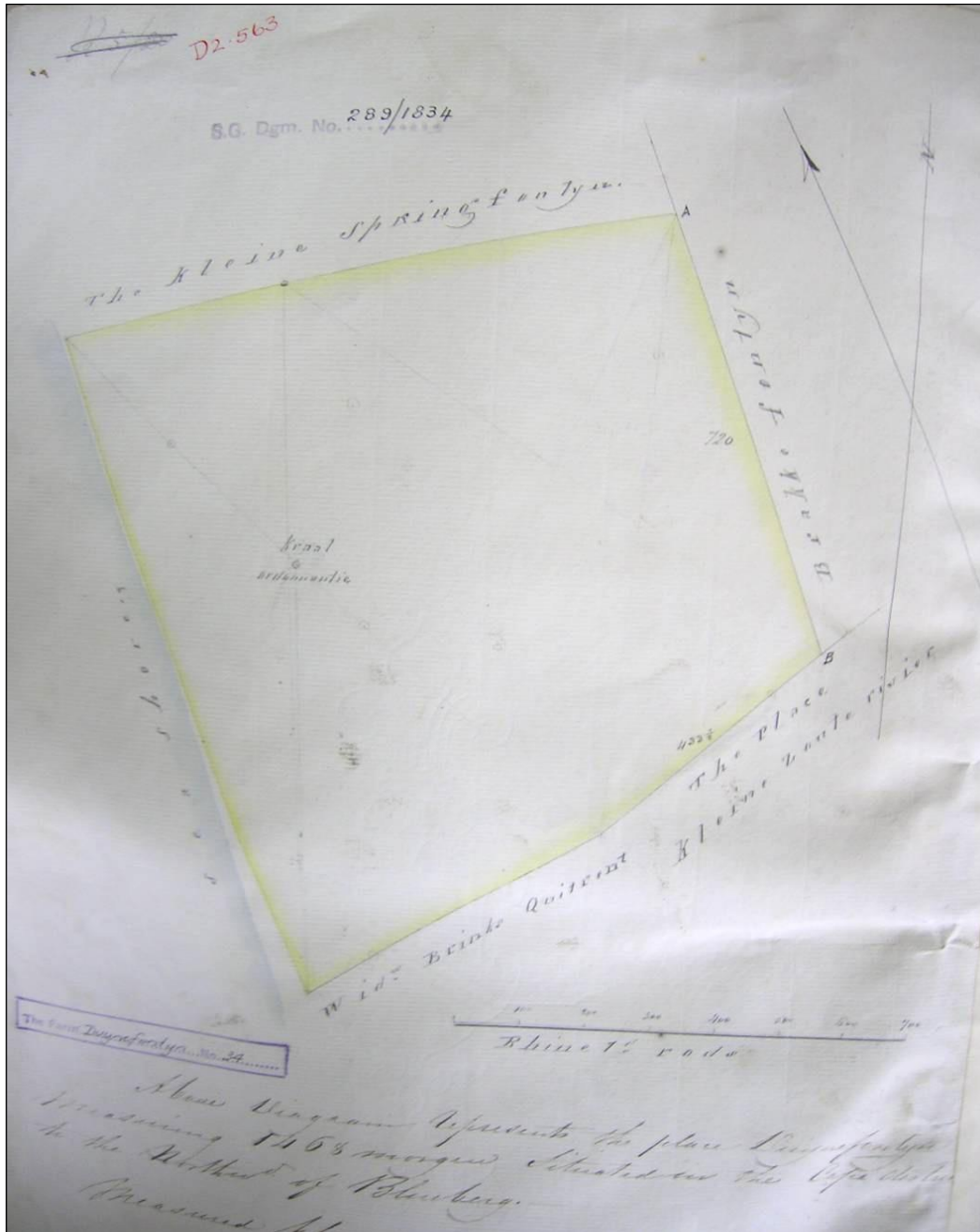
It is unclear who the first grantee was, however Dempers became the owner in 1799. It is indicated in a complaint letter lodged by Dempers (dated 26 Sept 1811) that ‘tenants’ were cutting wood that belonged to him. These tenants had apparently been awarded certain land rights in 1731, and paid rent to the Cape Government. The struggle over marginal land is demonstrated in the competing livelihoods at Duynefontein. Dempers was a brickmaker and as such was “always in great want of bushes and other small wood and for that reason never cut away any wood in the vicinity of his house at Duynefontein, but always saved it in order to let it grow to greater perfection.” The ‘illegal’ cutting of wood “even about his house” exposed his “cultivated ground to be blown away.” He laments that “to his greatest sorrow in what manner some persons make ill use of the privileges which they have obtained” and begs the authorities to protect him against the “attempts of those who are striving to injure him” (Cape Archives CO 3985 ref, 117, CO 3887 ref 79).

When the property was surveyed in 1834 for the quitrent grant, there is no indication of houses or any built structures. There is, however, a ‘Kraal Ordannantie’ which features on the diagram (Figure 4) as well as the later 1890 SW Cape survey map (Figure 5).

The land ownership of Duynefontein is summarized as follows:

<b>Deed</b>	<b>Date</b>	<b>To</b>	<b>From</b>	<b>Extent</b>
C.Q 8.10	25.07.1834	Petrus Johannes Wohl & Johannes Christian Kotze		Grant 1468 M
2052	04.05.1892	Pieter Joseph Vink	PJ Vink	whole
12822	15.12.1926	Pieter Loubser	Est. PJ Vink	whole
4774	17.04.1945	Jacob Eliza de Villiers Loubser	Est P Loubser	whole
21209	13.09.1967	Elektrisitie Kommisee	JE de Villiers Loubser	whole





**Figure 4.** Old Kraal indicated on surveyors diagram of Farm Duynfontein 34 (now Cape Farm 1552). Cape Quitrent 8.10, dd 25.7.1834 Dgm 289/1834





**Figure 5.** Detail from SW Cape Survey Map c.1890

The colonial period history of Duynfontein is interesting, however it does not reveal any particular significance in terms of associations with events, or important historical personalities. The early surveyor's diagrams have been superimposed over modern plans of the farm in an effort to locate the historic kraal. The kraal location appears to be outside of the study area. The site of Demper's house is not known, nor any of his tenants. It is possible that ephemeral evidence of its presence may lie under the dune sands somewhere on in the area.

Before the existing power station was built, Duynfontein (Farm 1522) was a rural landscape of sandy and mainly un-farmed land, and prior to the construction of the R27, very remote. Although from the efforts of the Koeberg Private Nature Reserve staff, the property has retained its natural qualities in places, the power station is an exceptionally powerful visual intrusion, which together with its support structures and access roads has completely transformed the place into a peculiar combination of an industrial and rural ambience.

#### 5.1.2 *Pleistocene archaeology and palaeontology*

One of the greatest difficulties experienced in terms of the assessment of archaeological and palaeontological heritage is the fact that most of the significant material is buried. It is known that at the site of DFT 2 in the Koeberg Nature Reserve just a few kilometers from KNPS, there are at least 3 buried horizons (ancient land surfaces) (Klein 1999), each of which represents different ages in the Pleistocene and Holocene history of the region. Klein and his team found the fossilized remains of ancient Pleistocene fauna on a 300 000 year old land surface along with traces of human activity. The animals included many species not seen in the Cape today, as well as several extinct species such as the giant buffalo, giant pigs, extinct species of elephant, hippopotamus and the cape horse. The main fossil horizon lay roughly 1 m below the surface of the present day wind blown sands. Nodular calcretes had developed over the fossil horizon making excavation very difficult at times. Deep soundings by Klein and his team revealed the presence of an even older deeper horizon; however groundwater at a depth of 2 m prevented its detailed excavation. Klein (pers. comm.) is of the opinion that archaeological and palaeontological deposits such as those found at Duinefontein 2 have the potential to exist anywhere within the Eskom held property and beyond, however more detailed surveys conducted since, show that the main fossil beds lie in the portion of the nature reserve to the north of the power station.

#### 5.1.3 *Pliocene and Miocene palaeontology*

When the excavation for KNPS took place in the 1970's, a deep sequence of fossil bearing sediments was exposed. The most recent sands and calcretes contained Pleistocene mammalian fossils as well as evidence of Early Stone Age occupation in the form of stone artefacts (Klein pers. comm.). Deeper down in the sequence the sediments contained marine fossils of the Miocene period deposited during periods of marine transgression. The proposed site of the Pebble-bed Modular Reactor at Koeberg is adjacent to the existing nuclear power station. The fossil material that will be exposed in the excavations will thus be similar to those described by Rogers (1980, 1982), observed during the latter phases of construction of the extant plant during 1978. Palaeontologist John Pether (2007) has indicated that these early deposits are deeply buried at 10-14 m below surface level, underneath a vertical section of 24-28 m of sediment.

The excavations necessary for the construction of the TISF are relatively shallow, therefore will not impact these deep fossil rich sediments.

## **6 Assessment of impacts**

Although vegetation has re-established itself at both alternatives 1 and 2, the entire area should be considered highly disturbed during construction of the KNPS. The chances of finding in-tact shell midden material or any other form of surface archaeology within a radius of 500 m from the existing power station is very low, as this was a very large construction site that housed numerous temporary structures and facilities. Careful rehabilitation which has resulted in an acceptably scenic landscape, has hidden the massive disturbance which occurred here in the past.

### **6.1 The ways in which heritage can be impacted**

Destruction of tangible heritage inevitably takes place during the construction process of development activities rather than during the operational phases as the main source of impact normally is due to the disturbance of undisturbed ground or landscape and/or demolition of structures and places protected by the National Heritage Resources Act 25 of 1999. Invariably the kinds of impacts are irreversible and of permanent duration. Cultural landscapes are highly sensitive to accumulative impacts and large scale development activities that change the character and public memory of a place, however this particular site does not lie within an easily definable cultural landscape context – there are no significant streetscapes or concentrations of historic structures in, or close, to the area. Impacts to the visual environment are the subject of a separate specialist study.

Archaeological sites, Pleistocene palaeontology, and graves are highly fragile and context sensitive, which means that their value is very easily destroyed when the landscape in which they are situated is disturbed by bulk excavation, or during the installation of services. Mitigation can be achieved through scientific recording, sampling or excavation - however these are also destructive processes. In general, full rectification of heritage impacts is not normally possible in the case of archaeology, but is possible to a degree in the context of built environment, where restoration and reconstruction can be achieved (but with loss of authenticity). Generally, the best way to avoid impacts is to identify potential sensitivities first, then to take pro-active measures to avoid impacting the resource and ensure conservation thereafter.

Although palaeontological material could also be destroyed by bulk earthmoving and mining operations, palaeontological resources tend to be extensive (depending on the resource) and are rather more resistant to impact than archaeological material for the simple reason is that there is more of it. Because palaeontological

material is often very deeply buried, scientists often rely on human intervention in the land surface to collect data. Aside from natural exposures, open cast mines, quarries and deep road cuttings often present the only opportunities for palaeontologists to examine deep sediments that under normal circumstances they may not have access to. In short, provided that palaeontologists can use the opportunity arising from major construction works to adequately sample and record profiles and exposed material as part of the environmental management process, a potential negative impact can be transformed into a positive opportunity to increase the levels of knowledge about a locality and the species of fauna and flora that were present in the past.

## 6.2 Impacts caused by the proposed activities

The construction of the TISF will see the laying of a large concrete slab, which over time will be populated by metal or concrete used-fuel dry casks. Indications are that preparatory excavations for this will not be more than 2m deep into superficial deposits that have already been levelled and disturbed. The chances of impacting undisturbed palaeontological or archaeological material are low.

During the operational phase impacts to landscape and setting will be negligible given that the proposed facility (both alternatives) lies in the shadow of the reactor units, turbine hall and associated industrial features. The TISF will be visually dwarfed within its context and make very little overall difference to the appearance of the site.

The formalisation of the haul road which is presently an existing road at the power station is also a surface development that will require a minimum of landscape modification and lies within the highly transformed landscape adjacent to the reactor units. No impacts are expected. Given the limited extent of impacts, no mitigation is required other than the reporting of any unexpected finds to Heritage Western Cape or an archaeologist. In the event of a find occurring, mitigation measures suited to the nature of the find and circumstances thereof can be agreed on and implemented (see section 7.1 below).

## 6.3 Assessment of alternatives

Neither alternatives 1 nor 2 will result in any significant heritage impacts and the impact rating table below applies to both alternatives. No heritage impacts would be associated with the operation of the TISF and as such these impacts are not assessed. Both alternatives are equally acceptable which means that the choice of alternatives will need to be based on the best technological solution and other environmental factors.

**Table 1. Summary of impacts TISF site (Alternatives 1 and 2)**

	Extent	Intensity	Duration	Consequence	Probability	Significance	Status	Confidence
Without mitigation	Local 1	Low 1	n/a 1	Low 3	<b>Improbable</b>	<b>Very Low</b>	<b>Neutral</b>	<b>High</b>
Essential mitigation measures: n/a Best practice mitigation measures: n/a								
With mitigation	Local 1	Low 1	n/a 1	Low 3	<b>Improbable</b>	<b>Very Low</b>	<b>Neutral</b>	<b>High</b>

## 6.4 The no-go alternative

Exercising the no go alternative will maintain the status-quo in terms of impacts to heritage.

## 7 Conclusion

Research has shown that Duynefontein (now Koeberg) is not a farm that played any major role within the history of the Cape (that is until recently as the construction of the power station is an historical event in itself). It contains no buildings or landscape of heritage significance. Although Holocene archaeological sites are known to be fairly prolific on the west coast, the ground surface of the proposed TISF sites is highly disturbed and of low heritage potential. There is a possibility that there is paleontological material greater than 10 m below surface, which is too deep for impacts to occur.

No mitigation is recommended, other than the reporting of any unexpected finds during excavations for the concrete slab to Heritage Western Cape or an archaeologist. In the event of a find being made the matter must be reported to Heritage Western Cape and/or an archaeologist. Agreement on suitable mitigation can be arrived at to suite the nature of the find and circumstances under which mitigation, if necessary would need to be accomplished.

The kinds of finds that could occur are primarily fossil bone, which may take the form of complete animal bones as well as fragments. Fossil bone tends to be hard and heavy and picks up colour from the surrounding soils, which in this case will be brown-orange or yellow.

Any finds of such material should be reported to the project ECO, who should then contact Heritage Western Cape. Photographs of finds can also be emailed to ACO Associates (admin @aco-associates.com) for further examination. If the find is significant then a plan for mitigation can be devised. It is important that

photographs should not only be of the find itself but also the broader context where the find was made (security issues permitting).

## 8 References

Eskom 2006. *Seismology and Geology* In: Koeberg Site Safety Report.

Cruz-Uribe, K., Klein, R. G., Avery, G., Avery, M., Halkett, D., Hart, T., Milo, R. G., Sampson, C. G., & Volman, T. P. 2003. Excavation of Buried Late Acheulean (Mid-Quaternary) Land Surfaces at Duinefontein 2, Western Cape Province, South Africa. *Journal of Archaeological Science*. 30: 559-575.

Hendey Q.B. 1982. *Langebaanweg, a record of past life*. Cape Town: South African Museum.

Halkett, D., Hart, T., Yates, R., Volman, T.P., Parkington, J.E., Klein, R.J., Cruz-Uribe, K. & Avery, G. 2003. First excavation of intact Middle Stone Age layers at Ysterfontein, western Cape province, South Africa: implications for Middle Stone Age ecology. *Journal of Archaeological Science*

Halkett, D 2005. *Trail excavations for a proposed training centre, Duinefontein 34*. Unpublished ACO report prepared for Eskom

Klein, R. G., G. Avery, K. Cruz-Uribe, D. Halkett, T. Hart, R. G. Milo, and T. P. Volman. 1999. Duinefontein 2: An Acheulean Site in the Western Cape Province of South Africa. *Journal of Human Evolution* 37(2): 153-190.  
Parkington, JE 2006. *Shorelines, Strandlopers and shell middens*. Cape Town: Krakadouw Trust.

Parkington, JE. Poggenpoel, C. Halkett, D. & Hart, T. 2004 Initial observations from the Middle Stone Age Coastal settlement in the Western Cape In Conard, N. Eds. *Settlement dynamics of the Middle Paleolithic and Middle Stone Age*. Tübingen: Kerns Verlag.

Pether, J, Roberts, D.L. and Ward, J.D. 2000. Deposits of the West Coast (Chapter 3). In: Partridge, T.C. and Maud, R.R. eds. *The Cenozoic of Southern Africa*. Oxford Monographs on Geology and Geophysics No. 40. Oxford University Press.

Rogers, J. 1980. First report on the Cenozoic sediments between Cape Town and Elands, Bay. *Geological Survey of South Africa Open File* 136.

Rogers, J. 1982. Lithostratigraphy of Cenozoic sediments between Cape Town and Eland's Bay. *Palaeoecology of Africa* 15: 121-137.

Rogers, J. 1983. Lithostratigraphy of Cenozoic sediments on the coastal plain between Cape Town and Saldanha Bay. *Technical Report of the Joint Geological Survey/University of Cape Town Marine Geoscience Unit* 14: 87-103.



## environmental affairs

Department:  
Environmental Affairs  
REPUBLIC OF SOUTH AFRICA


### DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

File Reference Number:	(For official use only)
NEAS Reference Number:	12/12/20/ or 12/9/11/L
Date Received:	DEA/EIA

Application for integrated environmental authorisation and waste management licence in terms of the-

- (1) National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2014; and
- (2) National Environmental Management Act: Waste Act, 2008 (Act No. 59 of 2008) and Government Notice 921, 2013

### PROJECT TITLE

EIA for the Proposed Used Nuclear Fuel Transient Interim Storage Facility at Koeberg Nuclear Power Station

Specialist:	Timothy Hart		
Contact person:	Timothy Hart		
Postal address:	8 Jacobs Ladder, St James 7945		
Postal code:	7945	Cell:	0731418618
Telephone:	021 7064104	Fax:	086 6057195
E-mail:	Tim.Hart@aco-associates.com		
Professional affiliation(s) (if any)	Member ASAPA, Member APHP		

Project Consultant:	SRK Consulting (South Africa) (Pty) Ltd		
Contact person:	Sharon Jones		
Postal address:	Postnet Suite #206, Private Bag X18, Rondebosch		
Postal code:	7701	Cell:	082 876 0638
Telephone:	021 659 3060	Fax:	021 685 7105
E-mail:	sjones@srk.co.za		

4.2 The specialist appointed in terms of the Regulations\_

I, Timothy James Graham Hart , declare that --

General declaration:

I act as the independent specialist in this application;

I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;

I declare that there are no circumstances that may compromise my objectivity in performing such work;

I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;

I will comply with the Act, Regulations and all other applicable legislation;

I have no, and will not engage in, conflicting interests in the undertaking of the activity;

I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;

all the particulars furnished by me in this form are true and correct; and

I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.



Signature of the specialist:

ACO Associates CC

Name of company (if applicable):

8 November 2016

Date: