

HERITAGE IMPACT ASSESSMENT FOR THE PROPOSED SALDANHA REGIONAL MARINE OUTFALL PROJECT, VREDENBURG MAGISTERIAL DISTRICT, WESTERN CAPE

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

HWC Case No.: 14070705AS0707E

Report for:

Council for Scientific and Industrial Research

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On behalf of:

Frontier Saldanha Utilities (Pty) Ltd



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EXECUTIVE SUMMARY

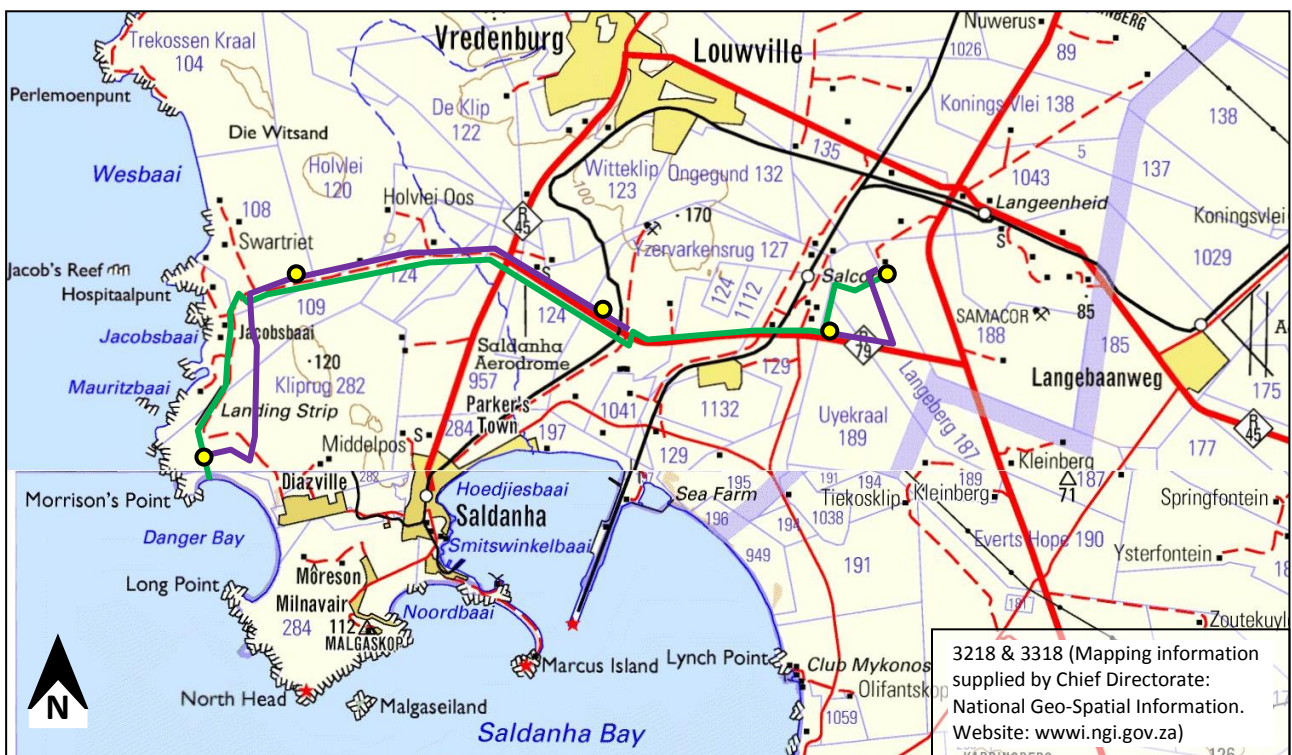
1. Site Name

Not applicable. Project is referred to as the Saldanha Regional Marine Outfall (SRMO) Project.

2. Location

The pipeline will traverse a large number of properties but will begin on Portion 6 of Farm 188 in the east and end on Portion 3 of Farm 282 in the west. It lies along several local roads in the vicinity of Saldanha Bay, Vredenburg Magisterial District. The end points are at 32° 57' 13" S 18° 04' 09" E (eastern end) and 33° 00' 05" S 17° 53' 09" E.

3. Locality Plan



4. Description of Proposed Development

The development entails laying a 900 mm diameter pipeline along a 27 km route to allow for the disposal of treated industrial effluent into Danger Bay. Five small pump stations will be required along the route and these will need access roads and electrical connections. It is presently proposed to utilise the same marine outfall as the already authorised West Coast District Municipality (WCDM) Desalination Plant but should construction of that project be delayed then a temporary outfall will be laid for this project until completion of the WCDM desalination plant.

5. Heritage Resources Identified

Palaeontological and archaeological resources may be affected by the proposed development. Palaeontological impacts, in the form of disturbance or destruction of fossil material may occur anywhere along the route with the Velddrif and Prospect Hill Formations being most sensitive.

Archaeological impacts to shell scatters and middens will occur in the western part of the study area, closest to the coast.

6. Anticipated Impacts on Heritage Resources

Palaeontological and archaeological resources may experience direct impacts during the construction phase. Particular palaeontological impact may only be identified during inspection of the trenches during construction. The archaeological sites numbered JB001 and DB022 are of concern and will require mitigation actions. Test excavations along the last 200 m of the pipeline north of Danger Bay will also be needed to check for further buried shell middens in that area.

7. Recommendations

It is recommended that the proposed project be allowed to proceed from the point of view of heritage. However, several mitigation requirements will need to be included in the environmental authorisation should this be granted:

- A pre-construction palaeontological survey of the chosen alignment should take place where the Velddrif and Prospect Hill Formations will be crossed;
- Monitoring and site inspection should take place for palaeontology during construction;
- Archaeological test excavation should take place at site JB001 and along the route within about 200 m of Danger Bay;
- *In situ* recording or full excavation should take place at JB001 depending on the outcome of the test excavation;
- Full mitigation of site DB022 will be required if this site cannot be avoided during construction; and
- Construction workers must be informed about the possibility of encountering fossils, shell middens and human burial during excavation and instructed to protect and report any such finds immediately. Work in the immediate area should be halted as the find may require inspection by an archaeologist. Such heritage is the property of the state and may require excavation and curation in an approved institution.

8. Author/s and Date

Dr Jayson Orton of ASHA Consulting (Pty) Ltd: HIA and specialist archaeologist.

John Pether: specialist palaeontologist.

12th August 2014

Glossary

Background scatter: Artefacts whose spatial position is conditioned more by natural forces than by human agency.

Bifacial Point: a type of stone artefact worked on both faces to produce a long, leaf-shaped artefact pointed at both ends.

Early Stone Age: Period of the Stone Age extending approximately between 2 million and 20 000 years ago.

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.

Shell midden: Heap of shells and other debris left behind during pre-colonial times when people camped close to the shoreline.

Abbreviations

ASAPA: Association of Southern African Professional Archaeologists

CRM: Cultural Resources Management

DEA&DP: Western Cape Department of Environmental Affairs and Development Planning

ECO: Environmental Control Officer

EIA: Environmental Impact Assessment

ESA: Early Stone Age

GPS: global positioning system

HIA: Heritage Impact Assessment

HWC: Heritage Western Cape

LSA: Later Stone Age

MSA: Middle Stone Age

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

NID: Notification of Intent to Develop

SAHRA: South African Heritage Resources Agency

SAHRIS: South African Heritage Resources Information System

SRMO: Saldanha Regional Marine Outfall

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1. INTRODUCTION

ASHA Consulting (Pty) Ltd was appointed by the CSIR to conduct an assessment of the potential impacts to heritage resources that might occur as a result of the proposed construction of a pipeline to be known as the Saldanha Regional Marine Outfall (SRMO). The pipeline will run from an industrial site southwest of the R45/R27 intersection westwards towards Jacobsbaai and then south to its terminus in Danger Bay (Figure 1). Two alternative routes have been proposed. These largely run on opposite sides of the road linking the R27 with Jacobsbaai, but one section towards the east is shared on the north side of the road. In the far west one option follows the road through Jacobsbaai while the other runs several hundred metres further inland towards Danger Bay before turning west towards its terminus. The pipeline will traverse a large number of properties but will begin on Portion 6 of Farm 188 in the east and end on Portion 3 of Farm 282 in the west. Appendix 1 provides a full list of all properties that might be affected by the project.

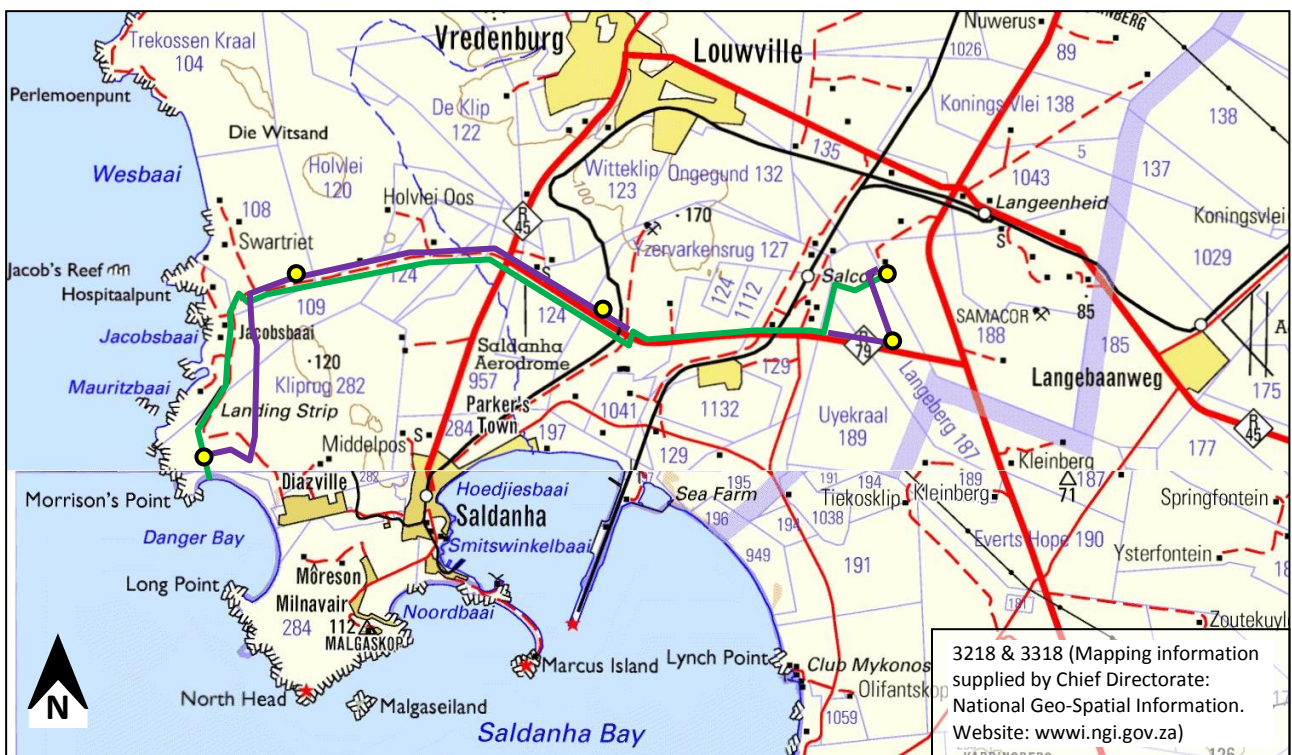


Figure 1: Map showing the location of the proposed pipeline. The two project alternatives are indicated in purple and green, while the yellow circles denote the proposed positions of small pump stations.

1.1. Project description

The proposed SRMO pipeline transfer system will discharge into Danger Bay approximately 8 to 9 Mega litres per day of treated industrial effluent generated from three sources:

- The Rare Earth Element (REE) Separation Plant proposed by Frontier Separation Pty (Ltd) (Frontier Separation), referred to as the Saldanha Separation Plant (SSP), which will refine REE feedstock mined at the Zandkopsdrift Mine in southern Namaqualand by Sedex Minerals (Pty) Ltd.

- The associated Chlor-Alkali Production Facility (CAPF) proposed by Chlor-Alkali Holdings Pty (Ltd) (CAH), a supplier of reagents situated adjacent to the SSP.
- A regional Waste Water Treatment Works (WWTW) proposed by the Saldanha Bay Municipality (SBM).

The present proposal will see the effluent disposed via the brine return disposal infrastructure of the proposed West Coast District Municipality (WCDM) seawater reverse osmosis desalination plant, planned to be located at Danger Bay (Environmental Authorisation granted on 13 August 2013). However, should the desalination plant not have been constructed by the time the SRMO is required, an interim pipeline will be laid and then decommissioned once the desalination plant is commissioned (CSIR 2014).

The project will consist of the following components:

- a 900 mm diameter pipeline approximately 27 km long which will largely utilise the same servitude as that for the fresh water pipeline linking the proposed WCDM desalination plant to the Besaansklip Reservoir;
- five pump stations to be located along the route;
- power lines connecting the pump stations to the electrical supply;
- short gravel roads to provide access to the pump stations; and
- the marine outfall in Danger Bay.

It should be noted that although the proposed routes follow a main road, they will not be parallel to the road all the way. This is because in certain areas the route accounts for future road widening and new interchanges in the area.

1.2. Terms of reference

ASHA Consulting (Pty) Ltd was requested to produce an integrated Heritage Impact Assessment (HIA) that addresses archaeology, palaeontology, built environment, graves, cultural landscapes and scenic routes. The palaeontological specialist study would be undertaken by another specialist, John Pether, and supplied to ASHA for the purposes of integration.

Prior to commencement of the study, a Notification of Intent to Develop (NID) for the pipeline was submitted to Heritage Western Cape (HWC). Their response requested an HIA that included specialist studies of archaeological and palaeontological resources.

It should also be noted, however, that following Section 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

A heritage impact assessment (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 for consideration by the Western Cape Department of Environmental

Affairs and Development Planning (DEA&DP) who will review the Environmental Impact Assessment (EIA) and grant or withhold authorisation. The HIA report will outline any 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 author

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. He has also conducted research on aspects of the Later Stone Age in these provinces and published widely on the topic. He is accredited with the Association of Southern African Professional Archaeologists (ASAPA) CRM section (Member #233).

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:

- 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.

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 decisionmaking by the DEA&DP.

3. METHODS

3.1. Literature survey

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).

3.2. Field survey

The HIA for the WCDM desalination plant referred to above (Orton 2012) examined some of the same ground through which the present project would run. For this reason, fieldwork was restricted to those areas that had not been examined in the earlier survey. Certain areas were subjected to a detailed foot survey, while other parts were considered from the vehicle only. The fieldwork took place on 30th July 2014. During the survey the positions of finds were recorded on a hand-held GPS receiver set to the WGS84 datum. Photographs were taken at times in order to capture representative samples of both the affected heritage and the landscape setting of the proposed development.

3.3. Grading

Grading of heritage resources is in terms of a system used by HWC (2012). The NHRA provides for three grading classes in which Grade 1 reflects national significance, Grade 2 provincial significance and Grade 3 local significance. HWC (2012) has divided Grade 3 in three subclasses which essentially equate to high (3A), medium (3B) and low (3C) local significance. Although the system is used principally for built environment resources, it can be applied to archaeology as well.

3.4. Impact assessment

For consistency, the impact assessment was conducted through application of a scale supplied by CSIR. The palaeontological specialist study was conducted at the desktop level only. It is appended to this HIA. The archaeological specialist study is wholly contained within the HIA.

3.5. Assumptions and limitations

Previous surveys have shown that archaeological remains tend not to be located on the flat lands with white aeolian sands often underlain by calcrete. Although this was taken as an assumption, one area was still walked to be certain. Otherwise, it was assumed that archaeological resources would be far more numerous closer to the coastline.

The study comprised a surface survey only and hence any completely buried archaeological sites will not be readily located. In the far eastern part of the study area there was very dense indigenous vegetation but this is unlikely to have completely hidden any archaeological sites that might have been present. In the west some areas were under wheat cultivation and these areas could not be searched for archaeological material.

4. PHYSICAL ENVIRONMENTAL CONTEXT

4.1. Site context

The project largely follows roads and is proposed to share a servitude with the proposed desalination plant mentioned above. As is often the case along roads, power lines are present along much of the project's route. In the far eastern part, another pipeline is present along the northern side of the road with brick and mortar structures located at regular intervals along its route (Figure 2). The surrounding land is largely agricultural (grazing in the east and wheat further west) or, in the far west, conservation land. However, a number of industrial facilities lie in reasonably close proximity to the eastern part of the route.

4.2. Site description

In the far east of the study area the two alternatives cross through natural vegetation and agricultural land respectively between the plant site and the main road (Figures 2 to 4). The agricultural lands are predominantly pasture used for small stock grazing. The routes then traverse largely agricultural lands until about 3 km from the coast. About 6 km from the coast the sandy plain gives way to granitic soils where dry land wheat cultivation takes place (Figures 5 & 6). Some 2.5 km from the coast is a prominent calcrete ridge that extends for about 10 km north-south. The road crosses the ridge then descends relatively steeply towards Jacobsbaai (Figure 7). In this area

there is a mix of dry land agriculture on the exposed granitic soils and grazing on the calcrete ridge.

At the north end of Jacobsbaai one of the alternatives runs through the town where it crosses land already disturbed by the installation of other services (Figure 8). The other alternative runs through old agricultural and largely undisturbed lands just east of the town (Figure 9). In the north this area is on the western side of the largest calcrete ridge, while further south the route runs into a shallow valley enclosed by calcrete ridges. Although largely undisturbed, evidence of a pipeline – in the form of elevated manholes – was noted towards the far south in this area. To the south of this both routes enter the white aeolian dune field extending north from Danger Bay.



Figure 2: View towards the west in the eastern part of the study area. Calcrete can be seen on the ground surface.



Figure 3: View south along a farm track along part of the route in the east.



Figure 4: View towards the west across dense natural vegetation in the eastern part of the study area. An industrial facility (Namakwa Sands) is visible on the neighbouring property.



Figure 5: View towards the west along the Jacobsbaai Road showing wheat cultivation along the southern side of the road.



Figure 6: View towards the east near the Jacobsbaai Road showing a farm track and, further to the right, fallow agricultural land.



Figure 7: View westwards down the hill into Jacobsbaai. The photograph is taken from near the crest of the calcrete ridge.



Figure 8: View towards the south through Jacobsbaai showing the area in which the pipeline would be laid.



Figure 9: View towards the north in the small valley between calcrete ridges southeast of Jacobsbaai. The flowering annuals indicate the sandy floor of the valley.



Figure 10: View towards the northeast across the aeolian dunes in the southwestern-most part of the study area.

5. CULTURAL HERITAGE CONTEXT

This section of the report establishes what is already known about heritage resources in the vicinity of the study area. What is 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. Palaeontological aspects

The bedrock formations in the area, Malmesbury Group shales and the Cape Granites, are of no palaeontological interest. However, a number of younger deposits occur above the bedrock and these have yielded important fossil finds in a number of localities. The Langebaan, Springfontyn, Prospect Hill, Witzand and Velddrif Formations are important in this regard (Pether 2014; Appendix 2). Aeolian deposits are expected to contain isolated fossil snails, tortoises, ostrich bones and eggshell fragments and other sparsely scattered bones. Bone concentrations are usually associated with calcrete which has formed a 'roof' beneath which hyenas can burrow. They are known to accumulate bones in their dens. Dune slacks with accumulated water may have attracted animals in the past and can produce rich fossil assemblages. Thick beds of calcrete that have built up in phases can also harbour fossils but these can be difficult to find. The fossil potential in the study area is presented in Table 1 (Pether 2014; Appendix 2).

Known highly significant palaeontological resources in the area are remarkably rich including such sites as the famous Langebaanweg Fossil Park which lies some 3.5 km east of the study area (Halkett & Hart 1999; Hendey 1969; Singer 1961) and Elandsfontein further to the south (Klein 1988; Klein et al. 2007; Singer 1954; Singer & Wymer 1968). Spreeuwalles, 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 along the shores of the Langebaan Lagoon. Further detailed review of the palaeontological context is contained in the appended specialist report by Pether (2014).

Table 1: Surface formations of the Sandveld Group in the study area (Source: Pether 2014; Appendix 2).

FORMATION	Age and description	Sensitivity
WITZAND - Q5	Holocene and recently active dune fields and cordons <~12 ka.	Mainly archaeological sites.
SPRINGFONTYN - Q1 & Q2	Quaternary to Holocene, mainly quartzose dune and sandsheet deposits, interbedded palaeosols, basal fluvial deposits <~2 Ma.	Fossil bones very sparse, local to high signif. Basal fluvial deposits locally – high signif.
VELDDRIF - VD	Quaternary raised beaches & estuarine deposits, <~1.2 Ma. Sea-levels below ~15 m asl.	Shell fossils common, local signif. Fossil bones very sparse, high signif.
LANGEBAAAN - LB	Late Pliocene to Late Quaternary aeolianites <~3 Ma to ~60 ka.	Fossil bones mod. common, local to high signif.
PROSPECT HILL - PH	Late Miocene aeolianite 12-9 Ma?	Fossils very sparse – high signif.

5.2. Archaeological aspects

Several Middle Stone Age (MSA) shell middens occur in this part of South Africa (Avery *et al.* 2008; Berger & Parkington 1995; Stynder *et al.* 2001); these are of international significance. 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 age are widely distributed in the landscape. The Kasteelberg hill, located 10 km northwest of Vredenburg is particularly important as it attracted much settlement (Sadr *et al.* 2003; Smith 2006; Smith *et al.* 1991). The agricultural lands around the hill contain rare isolated artefacts and very few concentrations of artefacts large enough to be referred to as sites (Webley *et al.* 2010). 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 have once been present (Fauvelle-Aymar *et al.* 2006). Various studies on the plains in the eastern part of the study area have shown that archaeological material in that area is virtually entirely absent away from the immediate coastline (Hart 2003; Hart & Pether 2008; Orton 2011; Smith 2011). Within the grounds of the Langebaanweg Fossil Park 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 found there (Dietl *et al.* 2005; Kandel & Conard n.d.).

LSA shell middens occur behind the rocky outcrops in the vicinity of Club Mykonos (Hart 2001; Hart and Gribble 1998; Hart & Jerardino 1998), while another very large midden (now completely destroyed) was located in the town of Saldanha Bay (Orton 2009). The south-western and western coastline of the Vredenburg Peninsula has also been found to have many shell middens and scatters of varying density (Buchanan *et al.* 1978; Glenn 2003; Hart 2010; Hine 2004; Kaplan 2011; Robertshaw 1977, 1979; Sadr 2009; Sadr & Gribble 2010; K. Sadr, pers. comm. 2011); the desalination plant survey showed a number to be present in the white aeolian dunes around the shores of Danger Bay (Orton 2012).

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

5.3. Historical aspects

Throughout the early history of the occupation of the Cape, the Dutch used Saldanha Bay extensively. Gribble (2009:81) notes that 'Saldanha Bay had been seen as a fine anchorage, a safe haven for vessels in need, and had proven itself to be a pantry for the settlement, a rich source of fish, seal and penguin meat and oil, birds' eggs and salt, and a source of stock bartered from the indigenous Khoi Khoi population'.

Historical records suggest that European settlers were living in the area from quite early on, but the only historical archaeological site known from this region is Oudepost, a Dutch East India Company outpost on the Churchhaven Peninsula (Schrire *et al.* 1990). To the east of Saldanha Bay town a scatter of late 19th or early 20th century glass and ceramics was located in agricultural lands but these were not associated with anything specific (Orton 2007).

5.4. Built environment

Farm houses and outbuildings dating to the 19th and 20th centuries are common on the Vredenburg Peninsula, but Franssen (2004) documents relatively few as significant heritage resources. Saldanha Bay was still a very small village in the early 20th century (Figure 11) and was centred strongly on the north-westernmost corner of the bay. By 1938 it had not expanded much at all (Figure 12). Most development is thus fairly recent. A pipeline was constructed during World War II to bring water from the Berg River to the town (Visser & Monama 2008). This laid the platform for development of the town. Just north of Jacobsbaai, Hart (2010) recorded a typical vernacular fisherman's cottage built of local calcrete and still in reasonable condition. Such structures are now rare.

5.5. Maritime archaeology

Many shipwrecks have occurred around the Vredenburg Peninsula and in Saldanha Bay (Burman & Levin 1974; Gribble 2009; Turner 2009; J. Boschhoff, pers. comm. 2012). These include the "*City of Hankow*" wrecked in the southern part of Danger Bay in December 1942 (Marine Casualty Database Southern African Coast. n.d.) and the "*Haddon Hall*" wrecked on the rocks south of Jacobsbaai in February 1913 (Marine Casualty Database Southern African Coast. n.d.).

5.6. Military History

The Saldanha Bay area has a long military history. Since the early days of the Cape Colony Saldanha Bay was recognised as a good natural and strategic harbour and was frequently used as a port. World War II structures and an old air strip are present to the north of Danger Bay, just west of the proposed pipeline route (Orton 2012).

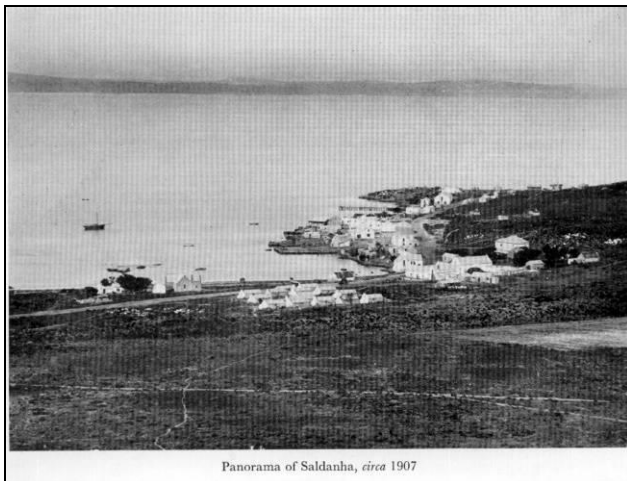


Figure 11: Early 20th century view of Saldanha Bay looking towards the southwest (Wide Blue, n.d.).



Figure 12: 1938 aerial photograph of Saldanha Bay. The well-known Hoedjieskop is visible at bottom centre.

6. FINDINGS OF THE HERITAGE STUDY

The heritage resources recorded in the study area during the course of the project are described in this section. Tables 2 and 3 list the points recorded during the survey while Figures 13 to 16 show the tracks created and the positions of finds in the landscape.

Table 2: List of findings as recorded during the present survey. Archaeological sites are allocated site numbers based on an abbreviation of the farm name on which they lie as follows: KR: Kliprug 282; JB: Jacobs Bay 109; PK: Philips Kraal 124.

Waypoint	Site number	Co-ordinates	Description	Significance
001		S32 57 12.9 E18 04 02.1	Farm outbuilding made with decorative breeze blocks. May be 1930s or 1940s in age.	Low
002	PK001	S32 57 07.8 E17 56 29.5	Scatter of quartz artefacts in a ploughed field on granitic soil. LSA.	Low
003		S32 58 00.7 E17 53 31.4	Ephemeral scatter of small shell fragments in disturbed area alongside road. LSA. Possibly largely due to mole activity.	Very low
004		S32 59 31.8 E17 53 53.5	Small calcrete foundation, c. 2 m diameter. 20 th century.	Very low
005		S32 59 17.3 E17 53 55.2	Drinking trough made of calcrete, cement and some brick. 'MAHLERS' inscribed in cement. 20 th century.	Very low
006		S32 59 14.6 E17 53 49.0	Modern ruins (braai area/camp site) of calcrete and cement. Not a heritage resource.	n/a
007	JB001	S32 58 36.0 E17 53 51.6	Shell scatter of 15 m diameter with <i>S. argenvillei</i> , <i>C. granatina</i> , <i>Burnupena</i> sp., <i>S. barbara</i> and <i>S. cochlear</i> shells. LSA.	Low-medium
008	JB002	S32 58 28.7 E17 53 50.4	Very ephemeral shell scatter with <i>S. argenvillei</i> and <i>C. granatina</i> , <i>S. granularis</i> . LSA.	Low

Waypoint	Site number	Co-ordinates	Description	Significance
009		S32 58 23.1 E17 53 50.3	Quartz flake and silcrete chunk. Probably MSA background scatter.	Very low
010		S32 58 05.5 E17 53 49.9	Old agricultural landscape on Jacobs Bay 109 with disturbed areas, piles of stones removed from fields and scattered manitoka trees.	Very low
011	KR001	S32 58 41.3 E17 54 06.9	Extensive shell midden on the west-facing slope of a calcrete ridge. The site is approximately 60 m by 45 m in size. <i>S. argenvillei</i> , <i>C. granatina</i> , <i>S. granularis.</i> , <i>S. barbara</i> , <i>Burnupena</i> sp., <i>C. meridionalis</i> , ostrich eggshell fragments, bone fragments, stone artefacts on quartz porphyry. The site is 1.6 km from the nearest shoreline.	High

Table 3: List of findings relevant to the present development but recorded during the earlier survey (Orton 2012).

Site number	Co-ordinates	Description	Significance
DB008	S33 00 03.3 E17 52 58.8	Shell midden 10 m x 30 m.	Low-Medium
DB009	S33 00 02.4 E17 53 00.9	Shell scatter.	Low
DB010	S33 00 01.5 E17 53 00.6	Ephemeral shell scatter.	Low
DB011	S33 00 01.1 E17 52 58.9	Shell scatter with lower grindstone (found right way up).	Low
DB019	S33 00 02.7 E17 53 09.1	Shell scatter on calcrete outcrop, 15 m diameter.	Low
DB020	S33 00 02.4 E17 53 07.5	Ephemeral shell scatter and cluster of c. 12 manuports, 15 m diameter.	Low
DB021	S33 00 2.4 E17 53 7.1	Shell scatter with some burnt calcrete fragments.	Low
DB022	S33 00 03.3 E17 53 10.0	Massive shell midden on southern crest of dune, 25 – 30 m diameter.	Medium
DB023	S33 00 02.4 E17 53 11.8	Ephemeral shell scatter on calcrete outcrop.	Low

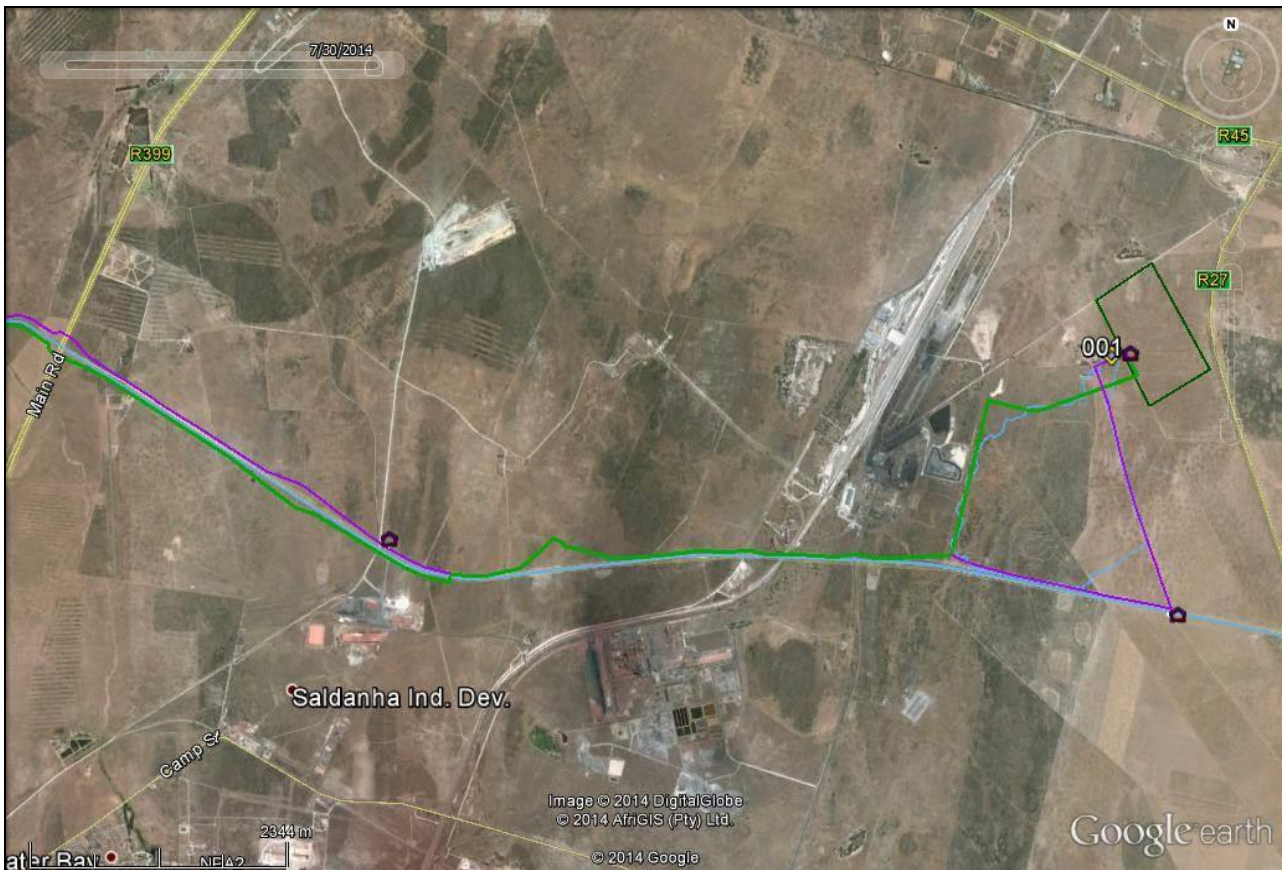


Figure 13: Aerial view of the eastern part of the study area showing the two alternatives (purple and green lines), the pump station locations purple house symbols, and the tracks (blue lines) and finds (numbered yellow diamonds) recorded during the survey.

6.1. Palaeontology

Since the palaeontological specialist study undertaken by John Pether was done from the desktop only with no field study, there are no particular findings to report. However, Table 1, as presented in the desktop background review, indicates the palaeontological remains that might be expected to occur during implementation of the proposed pipeline. The archaeological field study did not reveal any fossils on the surface.

6.2. Archaeology

The majority of the archaeological material that might be affected by the proposed development was recorded during the fieldwork for the desalination plant (Orton 2012). These findings (Table 2) are briefly summarised here, while new finds made during the present study are detailed more fully.

As expected, the inland areas with aeolian sands overlying calcrete produced no archaeological finds. However, given the findings of previous work in the vicinity (Webley *et al.* 2010), it was expected that stone artefacts might be present on granitic soils. Unfortunately, only one short area of the route was in fallow land with wheat growing elsewhere on the granite. Nevertheless, one scatter of quartz artefacts was located in this area on the south side of the Jacobsbaai Road (Figures 17 & 18). Although the artefacts were well-dispersed, no doubt due to repeated

ploughing, it was clear that they were present in a restricted area whose length was longest in the direction of ploughing.

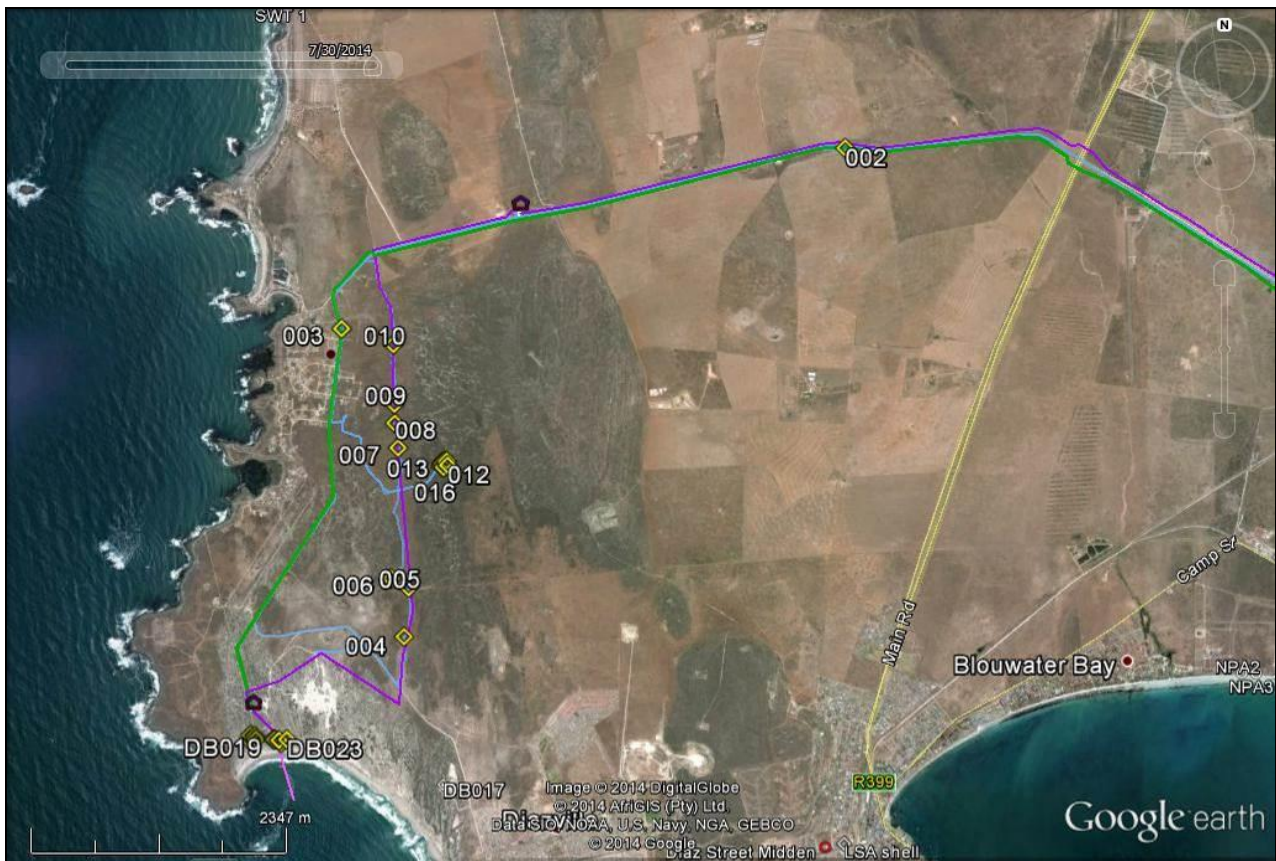


Figure 14: Aerial view of the western part of the study area showing the two alternatives (purple and green lines), the pump station locations (purple house symbols), and the tracks (blue lines) and finds (numbered yellow diamonds) recorded during the survey. The points in the far south were recorded by Orton (2012).

To the east of Jacobsbaai three shell sites were recorded. Two were shell scatters, while the third was dense enough to be called a midden. This last, KR001, was located 400 m east of the assessment corridor but was pointed out by a local resident who was justifiably concerned that it might be important. This midden is very large (45 m x 60 m) and located 1.6 km from the coast. It is not certain why this particular place was chosen for habitation but the extensive shell deposit makes it clear that the site was used repeatedly over an extended period (Figure 19). The dense shell has actually resulted in a different vegetation cover over the midden compared to the surroundings (Figure 20). In two areas there is exposed calcrete and both have holes leading in under the rock – one of these is visible in Figure 20. These appear to be animal burrows but some shell has fallen down into them. Whether these might relate to the positioning of the archaeological site in some way remains unknown. The other two sites, JB001 and JB002 are small scatters of shell with one (JB002) being very ephemeral.



Figure 15: Detail of the western part of the study area showing finds recorded east of Jacobsbaai.



Figure 16: Detail of the south-western part of the study area showing finds recorded by Orton (2012) to the north of Danger Bay.



Figure 17: View west in the area where site PK001 was documented.



Figure 18: Quartz artefacts from site PK001. Scale in 1 cm intervals.



Figure 19: View of the shell on KR001.



Figure 20: The lighter coloured vegetation marks the shell midden at KR001.

Several shell middens were found during the earlier survey. These are fully described in Orton (2012), but photographs of DB022 are included here to fully illustrate the range of shell midden deposits relevant to this project (Figures 21 & 22).



Figure 21: A shell midden draped over a deflating dune at 051 (DB022).



Figure 22: View towards the west towards the DB022 shell midden (inside dashed oval). Source: Orton (2012: fig. 18).

6.3. Built environment

A number of buildings are located in close proximity to the proposed pipeline corridor with some being as near as 30 m away from the proposed routes. These include a modern farm shed along the Jacobsbaai Road, the modern houses of Jacobsbaai and a modern camp site in the southern part of the corridor east of Jacobsbaai. In the far east of the study area the pipeline will pass within about 30 m of a farm werf which incorporates some older structures. The nearest structure to the proposed pipeline route is an outbuilding made of decorative breeze blocks and which probably dates to the mid-20th century (Figure 23). It is of little heritage significance. The 1938 aerial photograph is very indistinct in terms of identifying structures (both in terms of their existence and which is which) but it does seem as though the building in question was not yet built at that time. It also appears as though quite a lot of change has occurred on the werf over the years. The 1960 aerial photograph is also unclear but the structure may, in fact, not have even been present by that time.

Another small farm building, probably a labourer's cottage, was located some 70 m north of the Jacobsbaai Road on the farm Philips Kraal 124 (Figure 24). This structure is probably 19th century in age. The original farm buildings of Jacobsbaai (clearly visible in the 1938 aerial photograph – see Figure 12) lie 195 m to the west of the proposed pipeline route. Being a largely subsurface development, no contextual impacts to historical structures are anticipated.



Figure 23: Mid-20th century structure at the east end of the proposed pipeline routes.



Figure 24: Small labourer's cottage on Philips Kraal.

6.4. Military and maritime heritage

A large number of World War II structures exist in the south-western part of the study area. All are located to the west of the proposed pipeline corridors and none will be impacted. The HIA for the desalination plant (Orton 2012) examined the potential for maritime heritage to be impacted in Danger Bay and it was found to be highly unlikely.

6.5. Graves

No graves were found anywhere along either of the alternative routes. However, there is a possibility of uncovering unmarked pre-colonial graves located in the dunes north of Danger Bay.

6.6. Scenic routes and cultural landscapes

The Jacobsbaai Road can certainly be regarded as a scenic route of minor importance, but, since the proposed pipeline will be laid underground, no long term impacts are expected. The Vredenburg Peninsula has a strongly embedded cultural landscape of wide, open agricultural lands dotted with farmsteads. However, the eastern and western ends of the present study area have been severely compromised through industrial and dense residential development respectively. Impacts to scenic routes and the landscape would be short term and related to the construction period only. The pump stations are not deemed to be big enough to create an intrusive presence in the landscape but could be designed to be in sympathy with the vernacular West Coast architecture.

6.7. Summary of heritage indicators and provisional grading

The only significant impacts likely to occur are to palaeontological and archaeological resources. Palaeontological impacts could occur anywhere along the route but impacts to archaeology are expected to occur largely east of the town of Jacobsbaai and in the dunes north of Danger Bay. Impacts to unmarked human burials are possible but unlikely. With the exception of burials which have obvious importance, and palaeontological resources which might be rated 3A or 3B (depending on what is revealed), none of these resources could be provisionally graded more than 3C on current information. These impacts will be formally assessed below.

7. ASSESSMENT OF IMPACTS

7.1. Palaeontology

There is a chance of encountering buried fossils during the construction phase, thereby incurring direct impacts. These impacts are of medium significance, do not constitute a fatal flaw and can be mitigated to some extent (Table 4). Successful mitigation would actually result in positive impacts because new fossils and new information on the local geology could be brought to light. Impacts are only expected during the construction phase, since, once the trenches have been excavated, no new impacts would occur during maintenance work or during decommissioning, even if the pipe line was removed. Cumulative impacts are of relatively low significance, since the overall area to be impacted is quite small. In certain geological formations, that have a more limited spatial extent, such as the Prospect Hill Formation, cumulative impacts could be slightly greater.

Mitigation is essential for this project and would entail inspection of the trenches during the construction phase. The aim of this mitigation is two-fold: (1) to identify and record information that can assist in understanding the formation of the landscape and (2) to collect fossils and record the provenience of any fossil material that is uncovered by the excavations. At the start of the construction phase a palaeontologist will need to be contracted and a monitoring schedule established.

7.2. Archaeology

A number of archaeological sites were identified along the proposed routes. Some would definitely be impacted while others might be, depending on the width of the disturbance corridor.

Direct, negative impacts of medium significance could be expected (Table 4). These do not constitute a fatal flaw. Successful mitigation would reduce the impacts to low significance. Impacts are only expected at the construction phase, since, once the trenches are excavated, no new impacts would occur during maintenance work or during decommissioning, even if the pipe line was removed. Cumulative impacts are of relatively low significance because large numbers of archaeological sites do remain on the Vredenburg Peninsula. However, it should be remembered that such resources are irreplaceable and unique.

Limited mitigation is suggested in order to minimise the loss of potentially significant archaeological resources. This includes test excavation and *in situ* recording of site JB001 and of the pipeline route (full width of the disturbance corridor should be borne in mind because indirect impact could be caused by construction vehicles on site) through the dunes north of Danger Bay. If the tested site should prove significant then full mitigation should be carried out. Site DB022 must be avoided or, if this is not possible, excavated. During the implementation of the project, workers should be instructed to keep a lookout for dense shell lenses and, if intersected, these will need to be reported to an archaeologist or HWC.

7.3. Scenic routes

Scenic routes will experience very limited indirect temporary impacts during construction work (Table 4). These impacts are of very low significance and need not be considered further. No impacts would occur during operation and decommissioning phase impacts would likely be similar to those of the construction phase, but only if the pipeline is removed from its trench.

7.4. Graves

There is a very small chance that unmarked human burials could be found during the construction phase. Impacts would be of high significance but they are easily mitigated if the graves are protected immediately on discovery and then reported to an archaeologist for exhumation (Table 4). It is important that all workers are aware of the possibility and instructed to report any human remains found during excavation.

8. CONCLUSIONS

Palaeontological and archaeological resources may be impacted by the proposed project but both could be satisfactorily mitigated. There are no fatal flaws. Being a subsurface development, no contextual impacts to the landscape or built environment are expected.

Table 4: Assessment of impacts for either alternative.

Nature of impact	Status (Negative or positive)	Extent	Duration	Intensity	Probability	Reversibility	Irreplaceability	Significance (no mitigation)	Mitigation/Management Actions	Significance (with mitigation)	Confidence level
Construction Phase											
Loss of Palaeontological resources	Negative and Positive	Site Specific	Permanent	High	Probable	Irreversible	Low	Medium (negative)	<ul style="list-style-type: none"> - Inspection of the final route should take place in areas where it crosses the Prospect Hill and Velddrif Formations. - Inform workers of the possibility of finding fossils and to report it to an Archaeologist or HWC immediately. - Monitoring and inspection of excavations during construction. 	Medium (Positive), since new fossils and new information on the local geology could be brought to light	High
Loss of Archaeological resources	Negative	Site Specific	Permanent	High	Highly Probable	Irreversible	Low	Medium	<ul style="list-style-type: none"> - Test excavation and, if of low significance, in situ recording of JB001. If medium-high significance then full mitigation required. - Avoid site DB022. If it cannot be avoided then full mitigation is required. - Test excavations along pipeline route within 200 m of Danger Bay to check for buried shell middens. It is important to establish the width of the disturbance corridor prior to commencement. - Keep disturbance corridor as narrow as possible. - Monitoring of excavations by workers/ECO in case of buried shell middens being intersected. 	Low	High
Impact on scenic routes	Negative	Local	Temporary	Low	Definite	Reversible	High	Very Low	<ul style="list-style-type: none"> - Keep construction period as short as possible. 	Very Low	High
Impact to unmarked graves	Negative	Site Specific	Permanent	High	Improbable	Irreversible	Low	High	<ul style="list-style-type: none"> - During construction, any graves intersected should be immediately protected and reported to an Archaeologist or to HWC. Exhumation by an archaeologist will be required. 	Low	High

9. RECOMMENDATIONS

It is recommended that the proposed project be allowed to proceed from the point of view of heritage. However, several mitigation requirements will need to be included in the environmental authorisation should this be granted:

- A pre-construction palaeontological survey of the chosen alignment should take place where the Velddrif and Prospect Hill Formations will be crossed;
- Monitoring and site inspection should take place for palaeontology during construction;
- Archaeological test excavation should take place at site JB001 and along the route within about 200 m of Danger Bay;
- *In situ* recording or full excavation should take place at JB001 depending on the outcome of the test excavation;
- Full mitigation of site DB022 will be required if this site cannot be avoided during construction; and
- Construction workers must be informed about the possibility of encountering fossils, shell middens and human burial during excavation and instructed to protect and report any such finds immediately. Work in the immediate area should be halted as the find may require inspection by an archaeologist. Such heritage is the property of the state and may require excavation and curation in an approved institution.

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APPENDIX 1: PROPERTY LIST

Table A1.1: List of properties potentially affected by the proposed development. This list covers all alternatives and all components of the proposed project.

PROPERTY NUMBER AND PORTION	SURVEYOR GENERAL CODE	PROPERTY NUMBER AND PORTION	SURVEYOR GENERAL CODE
188/6	C0460000000018800006	1112/0	C04600000000111200000
129/3	C04600000000012900003	129/9	C04600000000012900009
189/3	C04600000000018900003	187/1	C04600000000018700001
187/9	C04600000000018700009	11915	C04600120001191500000
325	C04600180000032500000	195/2	C04600000000019500002
890	C04600180000089000000	196/0	C04600000000019600000
892	C04600180000089200000	127/11	C04600000000012700011
108/0	C04600000000010800000	282/3	C04600000000028200003
108/7	C04600000000010800007	282/5	C04600000000028200005
108/50	C04600000000010800050	282/7	C04600000000028200007
109/0	C04600000000010900000	949/0	C04600000000094900000
109/5	C04600000000010900005	957/0	C04600000000095700000
109/7	C04600000000010900007	282/10	C04600000000028200010
109/16	C04600000000010900016	1112/2	C04600000000111200002
889	C04600180000088900000	1132/0	C04600000000113200000
109/1	C04600000000010900001	1135/0	C04600000000113500000
124/0	C04600000000012400000	1139/0	C04600000000113900000
125/0	C04600000000012500000	1135/1	C04600000000113500001
127/2	C04600000000012700002	119/0	C04600000000011900000
127/6	C04600000000012700006	198/9	C04600000000019800009
127/10	C04600000000012700010	282/9	C04600000000028200009
127/13	C04600000000012700013	282/10	C04600000000028200010
957/8	C04600000000095700008	957/9	C04600000000095700009
108	C04600180000010800000	127/23	C04600000000012700023
127/39	C04600000000012700039	109/9	C04600000000010900009
129/0	C04600000000012900000	282/9	C04600000000028200009
129/2	C04600000000012900002	124/1	C04600180000012400001
299	C04600180000029900000	127/36	C04600180000012700036
127/15	C04600180000012700015	282/13	C04600000000028200013
129/1	C04600000000012900001	1112/0	C04600000000111200000
282/18	C04600000000028200018	306	C04600180000030600000
1135/0	C04600000000011350000	307	C04600180000030700000

APPENDIX 2: SPECIALIST PALAEOLOGICAL STUDY