

**PHASE 1 HERITAGE IMPACT ASSESSMENT: STRAITS  
CHEMICALS PROPOSED CHLOR-ALKALI & SALT PLANT,  
COEGA, EASTERN CAPE**

**Prepared for:** SRK Consulting  
P O Box 21842  
Port Elizabeth  
6000

**Prepared by:** Dr Lita Webley  
Albany Museum  
Somerset Street  
Grahamstown  
6139

Mr Robert Gess  
c/o Albany Museum

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## EXECUTIVE SUMMARY

The heritage impact assessment considered archaeology, palaeontology and other potential heritage issues during a desk top review and survey of the footprint area identified for the construction of the desalination plant and Straits Chlor-Alkali/Salt Plant at the Coega IDZ as well as the construction of a sea-water pipeline across the coastal dune system.

*With regard the Archaeological heritage of the footprint area*, it is recommended that the construction of the desalination plant and the chlor-alkali/salt plant may take place on land which, although it contains a low surface scatter of stone artefacts, does not appear to require mitigation. Mitigation is not needed prior to construction, but may be required once earth-moving takes place. The impact of the development (without mitigation) will have: Consequence (low); probability (possible); significance (very low) with confidence (medium). The impact of development (with mitigation): Consequence (very low), probability (possible); significance (very low) and confidence (high)

*With regard the Archaeological heritage of the coastal dunefields (pipeline area)*, **it is recommended that mitigation is essential before the pipeline is constructed.** There are a large number of shell middens in the dune area. Some are associated with pottery (belonging to the Khoekhoen peoples) and one contains a very rare iron arrowhead. These remains need to be professionally sampled and dated. Archaeological sites are non-renewable and once destroyed, the information is lost forever. Without mitigation, the impact of development will have: Consequence (High), Probability (Probable), Significance (high) and Confidence (high). With mitigation the Consequence will be (Low), Probability (Probable), Significance (Low) and Confidence (High).

Moving the pipeline, so that it crosses a different section of the dunefields, will not make any difference to the impact. The entire coastal dune area is rich in archaeological sites. Once proposal is that the pipeline is constructed on pylons to cross the dunes, rather than being dug into the dunes, but it is not known whether this is feasible.

*With regard the Palaeontological heritage of the area*, is recommended that the proposed footprint development may take place on potentially fossiliferous beds of the Alexandria Formation. A consultant will therefore be required to carry out an inspection of foundation trenches, prior to the throwing of foundations, to log and sample any important exposures.

The same procedure should be followed where the route of the sea-water pipeline crosses strata of the Alexandria Formation.

Where it is proposed that the pipeline should pass through the dune field, an interesting geologically recent peaty soil horizon was identified, associated with archaeological artefacts. In addition a vlei deposit and both bird and mammal bones were identified. These should be studied in conjunction with archaeological material prior to the introduction of earth moving equipment into the area. It is recommended that, to minimise disturbance the pipeline is raised on pillars rather than buried in this area. Excavation of foundation holes for these pillars should be performed in the presence of a heritage consultant.

## **1. BACKGROUND TO THE NATIONAL HERITAGE RESOURCES ACT (1999)**

Section 28 of the National Heritage Resources Act No 25 of 1999 makes provision for a compulsory HIA when constructing a road or similar linear developments exceeding 300m in length or developing an area exceeding 5000 m<sup>2</sup> in extent. The developer is required to notify the responsible heritage resources authority or SAHRA. SAHRA will in turn advise whether an impact assessment report is needed before development can take place. This is to determine if the area contains heritage sites and to take the necessary steps to ensure that they are not damaged or destroyed during development; alternatively to ensure that mitigation of threatened sites take place prior to development.

With regard the built environment Section 34 of the Act stipulates that no person may alter or demolish any structure or part of a structure, which is older than 60 years without a permit issued by the relevant provincial heritage resources authority.

Section 35 of the Act specifies that “No person may, without a permit issued by the responsible heritage resources authority – destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site or a meteorite.”

With regard burial grounds and graves, Section 36 (3) of the Act clearly stipulates that no person may, without a permit issued by the relevant heritage authority or SAHRA, (a) destroy, damage or exhume the grave of the victim of conflict; (b) destroy, damage or exhume any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority.

Subject to the provision of any other law, any person who in the course of development discovers the location of a grave, the existence of which was previously unknown, must immediately cease such activity and report the discovery to the relevant heritage authority which must, in co-operation with the South African Police Service and in accordance with the regulations of the responsible heritage authority, carry out an investigation to determine whether the grave is protected in terms of the Act or is of significance to any community

Living heritage (defined in the Act as including cultural tradition, oral history, performance, ritual, popular memory, skills and techniques, indigenous knowledge systems and the holistic approach to nature, society and social relationships) is also given protection under the Act. Section 24 of the Act makes provision for provincial heritage resources authorities to maintain a register of heritage resources and to set up management plans for their preservation.

## **2. INTRODUCTION**

This report presents the results of a Phase 1 heritage impact assessment undertaken on behalf of SRK Consulting to assess the possibility that heritage sites and material could be negatively impacted during construction of the proposed Straits Chemicals Chlor-Alkali & Salt Plant at Coega, Port Elizabeth. Dr L Webley of the Albany Museum was approached to undertake a Phase 1 heritage assessment of the affected area. Mr Robert Gess, a palaeontologist, was also contracted to provide input on possible palaeontological material.

Straits Chemicals (Pty) Ltd proposes to construct a manufacturing facility at Coega which will involve the conversion of sea water to chlorine and caustic soda from the electrolysis of brine. The brine will be obtained from a desalination plant, which will concentrate the salts in sea water to produce the brine for Straits Chemicals, and produce fresh water as a by-product. The process will involve:

- The construction of a sea water pipeline;

- A desalination plant to concentrate the sea water into brine;
- Facilities for the purification of the concentrated sea water, to produce the sodium chlorine brine;
- An electrolysis plant for the manufacturing of the chlorine and caustic soda;
- Facilities for the storage and transportation of the chlorine and caustic soda.

## **2.1 Terms of Reference**

(a) The terms of reference include assessing the potential impacts associated with the construction of the Chlor-Alkali plant and associated infrastructure (including the sea-water intake pipeline and desalination plant).

(b) To recommend appropriate mitigation to minimize the negative impacts and maximize the potential benefits.

(c) The specific terms of reference for the Heritage Impact Assessment are:

- to conduct a literature survey of the known heritage resources within the area with a view to determining what heritage resources are likely to occur within the development footprint;
- Adequately describe the affected environment in terms of the potential heritage impacts;
- Conduct a site visit to identify visible heritage resources (if any) within the development footprint. This assessment should include all potential resources that would be identified in the literature review such as:
  - Palaeontological resources
  - Archaeological resources
  - Built structures older than 60 years and of cultural significance
  - Burial grounds and Graves
  - Other cultural landscapes or viewsapes
- The HIA should make recommendations regarding the mitigation of any heritage resources identified during eh assessment;
- Make recommendations regarding the potential identification of heritage resources during the construction phase;
- Attend an open house in Port Elizabeth the last week of April 2007, provisionally 23 April 2007

## **2.2 Approach to the Study**

The area was surveyed on the 12 March 2007. The survey work commenced at the coast, and followed the intended route of the sea-water pipeline, as previous archaeological surveys had indicated that there were numerous shell middens along the coast and stone artefact scatters on the calcrete surfaces. The assumptions were that the coast would be most sensitive to development, and this was proved during the survey. The limitations of the survey are related to the density of the vegetation, which covers most footprint area, as well as a section of the pipeline. These areas could only be examined in a very cursory manner. Previous reports on the area were consulted in order to determine the likelihood of various types of heritage remains being discovered. These are discussed below.

### **3. DESCRIPTION OF THE AFFECTED ENVIRONMENT: HISTORY, ARCHAEOLOGY AND PALAEOLOGY**

The Coega (or Koega) River was first mentioned by historical travellers in 1752. The name Coega is of Khoekhoen origin and means literally 'seacow' or hippopotamus. Coega Kop itself is shown on maps dating back to 1834 (Port Elizabeth Museum). The 'kop' has twin peaks, the one being quarried since the 1920s by the SA Railways and Harbours for the development of the Port Elizabeth Harbour, the other being mined since the 1970s by a private company. The 'kop' is reported to have been used as a navigation beacon by sailing ships wishing to enter the Port Elizabeth harbour in the past, however, it is likely to disappear soon with intensive quarrying. There are historical structures in the Coega Industrial Development Zone older than 60 years which are protected by legislation. However, in the survey of 1996 it was observed that most of the old buildings in the area had been badly maintained or vandalised by squatters and the Eastern Cape branch of SAHRA confirmed that there are no conservation-worthy buildings in the area.

In a survey of the Coega River estuary undertaken in 1996 (Binneman and Webley 1997) the following were observed:

- 1) Stone artefacts in the river gravels located adjoining the estuary. The old river terraces in this area do contain occurrences of Acheulian (Early Stone Age) implements. However, they are no longer in primary context and are spread over such a wide area that development of a particular area is not likely to adversely affect our knowledge of this material. The stone artefacts were rated as low priority sites.
- 2) Large numbers of flaked stone and thirteen shell middens were reported from a calcrete floor about a half a kilometre west of the river mouth. The stone artefact scatters were considered to be in secondary context and rated a low priority. The shell middens were rated as important and mitigation was recommended.
- 3) In addition, fossil bone accumulations, associated with the Middle Stone Age (30 000 to 120 000 years ago) as well as stone artefacts had been discovered in limestone deposits some 3 kilometres from the Coega estuary (towards Amsterdamplein) by Gess in 1969. The fossil bones included warthog, leopard, hyena, rhinoceros and ten different antelope species. No fossil bones were found during this survey.
- 4) Rudner (1968) reported on some shell middens to the west of the Coega River mouth but these could not be located and were probably buried under sand dunes and vegetation.

In 1999 Binneman (1999) undertook mitigation measures and excavated six of the thirteen (13) shell middens along the coast, to the east of the estuary mouth, threatened with destruction. Most of these shell middens were deflated and were of Later Stone Age (Holocene) origins. They contained very few potsherds suggesting that the middens were the result of San rather than Khoekhoen occupation. However, Binneman noted that he did not survey inland from the coast, into the dune system, and he observed that it was highly likely that further sites would be found.

All previous surveys in the area being developed for the CDZ, show that the coastal area (and this includes the coastal dune system) to be very sensitive. Very little disturbance is likely to result on the permanent loss of archaeological sites.

**Palaeontology:** The study area may be divided into two components:

- a. The factory footprint
- b. The pipeline footprint

Background information on the geology and palaeontological potential of the terrain were examined.

Within the proposed area of development the Alexandria Formation overlies the Uitenhage Group. The Alexandria Formation generally consists of alternating layers of calcareous sandstone, conglomerate and coquinite (shelly conglomerate), containing a rich assemblage of marine invertebrates. It is considered Miocene to Pliocene in age. Within the Coega region it has been measured to reach a thickness of seven meters, though over its full area of distribution, stretching from Port Elizabeth to the Kowie River, it varies between 3 and thirteen metres in thickness. In the sandstones some gastropod and pelycopod shells are preserved, as well as *in situ* *Echinodiscus* (“pansy shells”), and burrows. Oyster shells occur within the conglomerate, whereas the coquinite layer consists of about 70 percent invertebrate remains, including the remains of pelycopods, gastropods, corals, bryozoans, brachiopods, echinoids and sharks teeth. Some mammal bones have also been recorded. As the Alexandria Formation appears to have been laid down in a full range of coastal depositional environments ranging from shoreface and foreshore to lagoonal and/or estuarine it is likely that further exploration of the Alexandria Formation would provide an even greater range of fossils including possibly more vertebrate remains.

The underlying Uitenhage Group is of Early Cretaceous (+/- 140 - 120 myo) age and was deposited into the Algoa basin that opened up during the breakup of the Supercontinent Gondwana. The Sundays River Formation, a subdivision of the Uitenhage Group underlies the Alexandria Formation in the Coega region, and is classically exposed in the Coega brick quarry. It is a fully marine portion of the Uitenhage Group containing abundant marine invertebrates including Ammonites, in addition to woody material. Marine vertebrate remains, such as those of Plesiosaurs are also known from the Uitenhage Group.

#### **4. SOURCES OF RISK, IMPACT IDENTIFICATION AND ASSESSMENT**

The survey has revealed that the greatest potential risk to the heritage of the area, in terms of the various components of the Chlor-Alkali plant, is likely to be the sea-water pipeline which will run along the servitude across the dunes. These dunes are constantly shifting, and as they move, archaeological sites are uncovered. Some of the archaeological sites are extremely important, such as Site 4, which is a dense accumulation of shell with pottery and a preserved iron arrowhead. Sites such as these contain a great deal of potential information for the archaeologist.

Re-routing the pipeline, so that it crosses the dunes at another location, will not make any difference to the potential threat to the heritage of the area. Archaeological sites are likely to be located all along this area and the construction of the pipeline infrastructure will lead to their destruction.

The footprint area, of some 60-80 hectares, which will accommodate the Chlor-Alkali Plant as well as the desalination plant, is some 2km from the coast. Quartzite flakes were sparsely and randomly distributed across the area. There were no concentrations in specific areas. This would seem to suggest that they are not *in situ*. The stone artefact scatters appear to be in secondary context. While these stone scatters will also be destroyed by the proposed project, they would be rated a low priority. However, it is difficult to predict what may be found under the surface of the soil. Since the footprint area is only 2km from the coast, it is theoretically possible that shell middens (similar to the ones found in the dune area) may be located under the soil surface.

Figure 1: Consequence Rating for the two localities surveyed:

Locality	Spatial extent	Intensity	Duration	Consequence
Sites located along the pipeline servitude, in the coastal sand dunes	Local 1	High 3	Long-term 3	High 7
The development footprint area	Local 1	Low 1	Long-term 3	Low 5

Figure 2: Probability of impact occurring:

Locality	Spatial extent	Intensity	Duration	Consequence	Probability
Sites located along the pipeline servitude, in the coastal sand dunes	Local 1	High 3	Long-term 3	High 7	Probable
The development footprint area	Local 1	Low 1	Long-term 3	Low 5	Possible

Figure 3: Significance Rating

Locality	Spatial extent	Intensity	Duration	Consequence	Probability	Significance
Sites located along the pipeline servitude, in the coastal sand dunes	Local 1	High 3	Long-term 3	High 7	Probable	High
The development footprint area	Local 1	Low 1	Long-term 3	Low 5	Possible	Very Low

The Status of the impact on both areas is going to be negative. This is because archaeological sites are non-renewable. Once destroyed, the information content they contain will be lost forever.

Figure 4: Significance rating of the Sites along the Pipeline

Site	Significance rating
Site 1	Low
Site 2	Medium
Site 3	Low
Site 4	High
Site 5	Low
Site 6	Medium
Site 7	Low
Site 8	High

Figure 5: Level of Confidence in the assessment of the impact

Locality	Spatial extent	Intensity	Duration	Consequence	Probability	Significance	Confidence
Sites located along the pipe line servitude, in the coastal sand dunes	Local 1	High 3	Long-term 3	High 7	Probable	High	High
The development footprint area	Local 1	Low 1	Long-term 3	Low 5	Possible	Very Low	Medium

My level of confidence regarding the impact of development on the archaeological sites in the sand dune area is high, due to the fact that these sites are highly visible, and clearly of archaeological importance. My level of confidence of the impact of development on the archaeology of the footprint area is medium, as it is not possible to predict what may be found beneath the soil surface until construction commences.

#### Palaeontology - potential impacts

a. In the factory footprint it is probable that the excavation of foundation trenches will intercept fossiliferous horizons of the Alexandria Formation but unlikely, due to the thickness thereof, that they will penetrate to the depth of the Uitenhage Group.

b. The route of the pipeline will also probably intercept fossiliferous horizons of the Alexandria Formation.

Where it passes through the dune field, the use of machinery alone, in addition to any excavation required, either to bury the pipe, or to anchor concrete pillars therefore is likely to cause extensive damage to the delicate record of past geographic patterns within this area.

a. The footprint of the proposed Desalination plant:

Affects: Low consequence (5) as:

- Localised (1)
- Low intensity (1)



Long term (3)

Probable

Therefore low significance –ve confidence high

**With mitigation this would become: low significance +ve confidence high**

b. Pipeline through the dunes

Affects: High consequence (7) as:

Regional loss of data (2)

Medium intensity damage (2)

Long term loss (3)

Definite

Therefore high significance -ve confidence high

**With mitigation this would be reduced to: low significance -ve confidence high**

## 5. RECOMMENDED MITIGATION MEASURES AND MANAGEMENT ACTIONS

The development of the sea-water pipeline in the coastal sand dune area should not continue without mitigation, in this case the excavation of certain archaeological sites, and the collection of stone artefact material on the calcrete surface. **In other words, mitigation is essential.** Without the necessary excavation and collection by a qualified archaeologist, the sites will be destroyed and the information will be lost forever. Some of these sites appear to be of Grade 2 significance, i.e. of Provincial importance, (in terms of Section 7 of the National Heritage Resources Act).

Figure 5: Impact assessment of the coastal dunefields

	<b>Spatial extent</b>	<b>Intensity</b>	<b>Duration</b>	<b>Consequence</b>	<b>Probability</b>	<b>Significance</b>	<b>Confidence</b>
Without mitigation	Local 1	High 3	Long-term 3	High 7	Probable	High	High
With mitigation	Local 1	Low 1	Long term 3	Low 5	Probable	Low	High

The development of the footprint area does not appear to require mitigation from the surface inspection carried out on the 12 March. **Mitigation is optional.** However, it is possible that important sites may be buried beneath the bush, and care should be taken during the bulldozing of the area.

Figure 6: Impact assessment of the footprint area

	Spatial extent	Intensity	Duration	Consequence	Probability	Significance	Confidence
Without mitigation	Local 1	Low 1	Long-term 3	Low 5	Possible	Very Low	Medium
With mitigation	Local 1	Low 1	Long-term 3	Very Low 5	Possible	Very Low	High

### Palaeontology: Mitigation Measures

a. It is recommended that after the excavation of foundation trenches for the factory, and prior to the throwing of foundations, a qualified consultant should be contracted to examine the trenches to log and sample any significant exposures.

b. It is recommended that where the pipeline passes over/ through the Alexandria formation, on completion of trenching or foundation excavation and prior to filling thereof a qualified consultant should be contracted to examine the excavations in order to log and sample any significant exposures.

Where the pipeline passes through the dunefield, a suitable professional should be asked to examine the vlei deposit and peaty deposit in conjunction with the archaeological team, prior to the introduction of industrial equipment into the area. Burial of the pipeline in this area should not be envisaged due to the extreme disturbance that would result. It is recommended that the pipeline should be borne on a series of concrete pillars. Excavation of foundations for these pillars should be monitored by at least one heritage assessor.

## 6. CONCLUSIONS REACHED AFTER PREVIOUS RESEARCH

A specialist archaeological study of harbour development of the Coega IDZ was commissioned and undertaken by the archaeologists at the Albany Museum in 1996. However, the study by Binneman and Webley focused only on the estuary and adjacent coastal region rather than on the entire zone. The reasons for doing so were (i) that there was no reason to suppose that the rest of the 10 000 ha property would include important cultural sites and (ii) that the area was heavily vegetated and it was not possible to survey the area properly.

In January 1997, Dr J Deacon, previously of the National Monuments Committee (now SAHRA) was approached by the CSIR Division of Water, Environment and Forestry Technology at Stellenbosch, to comment on the report by Binneman and Webley (see copy of report attached).

Deacon commented on the absence of a complete survey of the Zone, noting that it was difficult to determine whether this would have implications for the future. One of the implications of the COEGA IDZ is that all archaeological sites in the Zone will eventually be damaged or destroyed during the course of development. For this reason she recommended that **“it is vital that project-specific EIAs be done for each development so that an accurate record is kept of all archaeological sites. Planning for future stages of development must therefore include mandatory provision for the survey of sites once the vegetation cover has been removed, and for the subsequent mitigation of sites that may be considered significant. She recommended that archaeologists be consulted whenever specific sites are to be development and should be informed when any sites are found accidentally”**.

## **7. RECOMMENDATIONS PRIOR TO DEVELOPMENT**

The designated line of the sea-water pipeline crosses the sand dunes which have been shown to contain dense scatter of archaeological materials, some on the surface, but others likely to be buried beneath the dunes. Mitigation of this area is essential. Archaeological sites such as visible shell middens should be excavated. Stone artefact scatters should be collected.

There is only a random scatter of stone tools on the surface of the footprint area, and this does not appear to require mitigation prior to development.

## **8. RECOMMENDATIONS DURING CONSTRUCTION PHASE**

It has been shown elsewhere, that shell middens can be buried up to 5m below the level of the sand dunes, and these sites will only be exposed during construction, or after the dunes have moved again. It is important that a qualified archaeologist be present if any bulldozing of the coastal dunefields takes place.

The development of the footprint area will result in considerable earth-moving and landscaping of the terrain. If there are any significant archaeological sites, they are likely to be destroyed. It is important to remember that archaeological and historical sites are non-renewable. Once destroyed, they cannot be returned to their original state. For this reason every effort must be made to monitor the site during earth-moving development. Archaeological sites, including fossilized bone or human remains, should be reported to SAHRA and to the archaeologists at the Albany Museum, immediately.

When leveling of the soil for the Chlor-Alkali/Salt plant takes place, contractors should look for the following features:

- 1) Shell middens
- 2) Concentrations of stone tools
- 3) Bones, including fossilized bones
- 4) Human remains, including burials
- 5) Remains of earlier (European) stone structures

If any of the above is discovered, further development of the property must stop immediately and archaeologists as well as the South African Heritage Resources Agency should be contacted to determine the significance of the discovery.

## **9. RESULTS OF SURVEY**

### Coastal Dunefields

We commenced the survey at the coast, following the proposed future servitude across the sand dunes, in the approximate direction of the sea-water pipeline. This area consists of very high sand dunes, which clearly move in the direction of the prevailing winds. Between these sand dunes are deflated hollows, sometimes with a hard subsurface which could be calcrete or fossilised sand.

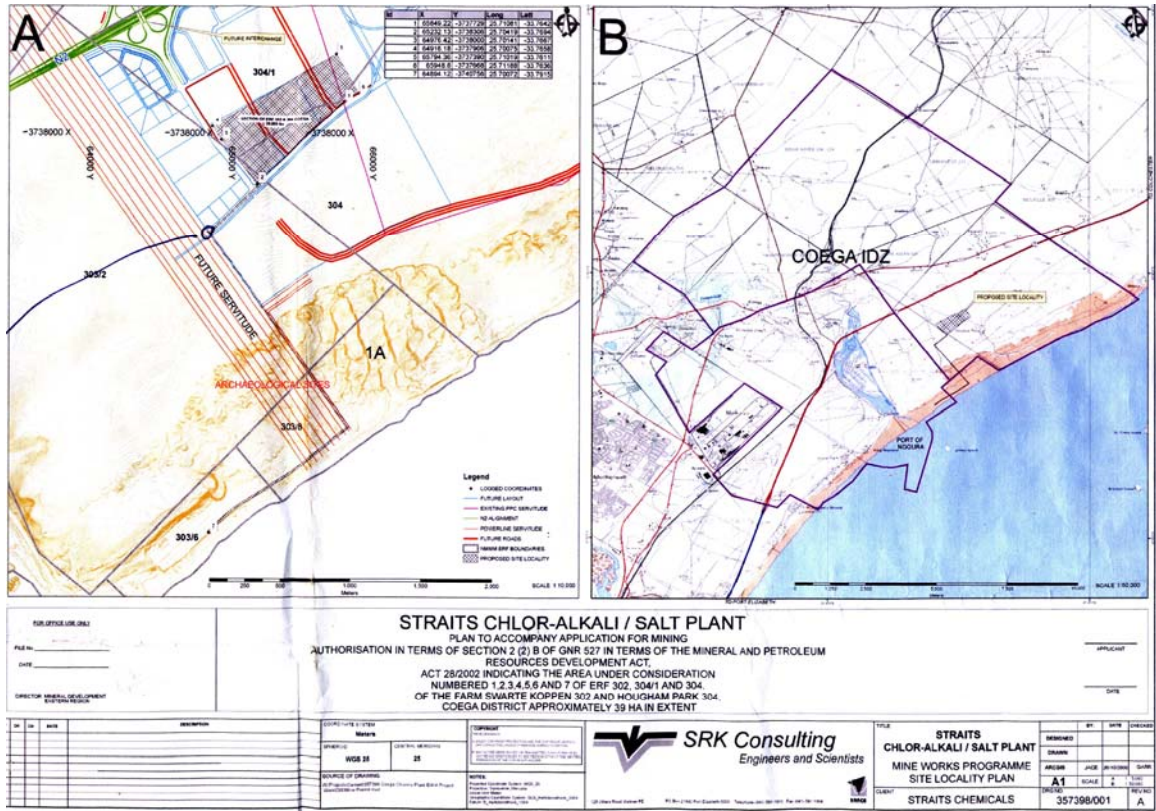


Figure 1: Location of proposed Salt Plant.



Figure 2: The location of the sites recorded in this survey.

Site 1

Close to the sea is a very large flat surface (several hundred metres in extent), with a sparse distribution of marine shells (such as oyster and mussels) and the occasional stone tool. These stone tools comprise a mixture of Middle and Later Stone Age flakes on both quartzites and silcretes. The shells and stone tools are not concentrated in one area, and do not appear to be *in situ*. We did not observe any bone or pottery in this area.

GPS

S 33°47'01,3"

E 25°42'46,9"

Site 2

Moving in a north-westerly direction, in an attempt to follow the pipeline, we found an isolated wedge (about 5 metre squared) of fossilised dune sands on the edge of large dunes. The sand was of a darker colour, perhaps containing more humic material. A number of quartzite flakes were observed wedged into the darker soil.

GPS

S 33°46'57,3"

E 25°42'47,0"

#### Site 3

There is a slight concentration of shell (about 5 metre squared) in this deflation hollow, less stone tools, but a number of bone fragments, including the mandible of a large bovid.

GPS

S 33°46'55,0"

E 25°42'46,2"

#### Site 4

This site comprises a very dense concentration of shells (clearly a shell midden), between a number of very large dunes. It would appear that this midden is either being exposed, or else in imminent danger of being covered by sand. The midden is about 12m by 8m in size, and consists of white and brown mussel. There are a number of large quartzite cobbles and flakes but no evidence of retouched stone tools. There are two separate concentrations of potsherds, one in the centre of the midden, and one on the edge. The central concentration is composed of potsherds with very thin walls but no decoration or rims. In close association with this midden is a small metal arrowhead. The concentration of potsherds on the edge of the midden contains a large lug (pottery handle). These potsherds appear to lie on a darker soil horizon.



Site 4: Metal arrowhead in midden



Site 4: Midden with potsherds at feet of R Gess

GPS

S 33°46'54,8"

E 25°42'48,3"

#### Site 5

This large deflation hollow appears to be of a more permanent nature, as it contains a large number of bushes and smaller plants. It is also characterised by a number of small pedestals of fossilized sand which appear to contain evidence of past root structures. The deflation bay snakes around a dune and continues in a northerly direction for some distance (it is several hundred metres in length and around 50 metres in width). At the south-east end there is heap of fossilised dune chunks which appears to resemble a cairn and could possibly be a burial. It is difficult to be certain about this.

GPS

S 33°46'44,6"

E 25°42'45"

#### Site 6

Following the deflation bay in a northerly direction, there is a small hill covered with a large tree. In front of the hill is a scatter of pottery and stone tools (about 3 metre squared). The potsherds are grit-tempered.

GPS

S 33°46'39,1"

E 25°42'44,9"

Behind the hill, is a small shell midden (about 3 metre squared) dominated by mussel shells.

GPS

S 33°46'37,8"

E 25°42'43,8"

We continued walking along this deflation bay until we reached the end of the sand dune system. The dunes end abruptly, and the bush is dense and impenetrable. It was not possible to follow the proposed route of the pipeline any further northwards.

#### Site 7

We returned to the coast, travelling southward but at an angle in order to cover other deflation bays. Site 7 is located in a deflation bay which connects with the one discussed above. The bay contains short grass, and fossilised dune outcrops and very little evidence for human settlement with the exception of a large, granite grindstone.

GPS

S 33°46'38,3"

E 25°42'51,4"

#### Site 8

There are quite a number of smaller concentrations of artefactual remains in this large deflation bay located close to the coast (about 100 metres in length and around 50 metres in width). There are numerous pottery fragments (some fine grained and also some rim sherds), as well as fish vertebrae, ostrich eggshell fragments, flaked quartzite stone pieces, etc. There are a number of reddish coloured quartzite stone flakes which appear to have been flaked from the same core.

There is a small midden close to the beach which contains a portion of a clay pot.

GPS

S 33°46'46,9"

E 25°42'53,9"

**Palaeontology:** The proposed course of the pipeline initially passes over Alexandria Formation strata before entering the coastal dune field. Here it passes over a peaty, Geologically Recent, horizon that underlies or intercalates with the dune field, as well as the remains of a shallow waterhole or vlei, the muds of which are, in places, exposed and include large terrestrial gastropod remains. The peaty layer is associated with archaeological artefacts and mammal bones. Remains of large to small mammals, including antelope and seals, in addition to birds, were seen in the area.

#### Footprint Area

From the coastal dune system, we travelled to the footprint area. We attempted to visit the old farmhouse of Hougham Park and its adjoining graveyard. However, the farmworker at the gate indicated to us that the previous owner (who was now renting the property) would not

welcome us without a prior appointment. In view of the fact that the farmhouse and graveyard lie outside the footprint area, we did not pursue this matter.

The footprint area is covered in low bush, with occasional small trees. There is very little disturbed soil which makes it difficult to examine the sub-surface soil. On a number of occasions we noted small scatters of quartzite flakes, but they seemed to be randomly scattered and due to the bush it was not possible to determine the extent of the scatter.

#### Site 9

Two quartzite flakes.

GPS

S 33°45'50,6"

E 25°42'20,7"

#### Site 10

One quartzite flake and one flaked quartzite core.

GPS

S 33°46'01,7"

E 25°42'06,3"

#### Site 11

This consists of some quartzite flakes on the edge of a small rise.

GPS

S 33°45'42,8"

E 25°42'24,7"

**Palaeontology:** The factory footprint lies on a flat planar surface with thin soils overlying calcareous sediments belonging to the Alexandria Formation, which in turn overlies the Uitenhage Group.

Within the factory footprint area a number of small disturbances of the overlying soil profile allow examination of the immediately underlying strata. This consisted largely of calcrete, which forms an altered capping over much of the Alexandria Formation. No fossils were observed, however, the lack of cuttings or river beds within the area precluded more than superficial examination.

## **10. TERMINOLOGY**

**Early Stone Age:** the earliest ESA assemblages date from 1,7 million years ago. By around 1,5 million years ago distinctive stone tools called handaxes appear and this seems to coincide with the appearance of *Homo erectus* peoples. These tools continue to be made in the same pattern until around 200 000 years ago.

**Middle Stone Age:** Stone tools from this period are quite different from those of the ESA; they are often made of fine-grained stone and they reflect a more controlled use of flaking properties. These tools date between 200 000 and 40 000 years ago.

**Later Stone Age:** LSA peoples were ancestral to the San (Bushmen) and lived in South Africa between 40 000 years ago and colonial times. Later Stone Age tools are typically made on fine grained cherts and chalcedonies, although quartz tools are also very common. They



are generally microlithic in size and conform to certain designs, such as scraper, segments and adzes. They are easy to recognize and date.

**Middens:** are open-air shell accumulations, which have resulted from human occupation in the area. Middens may measure between 1m and 20m in diameter. They consist primarily of shellfish but may also contain bone remains and cultural artifacts. They are the most common type of archaeological site found within 5km of the coast.

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