Final Report of Excavations at Robben Island - Old Power Station Cooling Pond

(SAHRA PERMIT NO)

Prepared for

Ron Viney

of Ad Astra Festina

on behalf of his client

Dept. of Public Works, Cape Town

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By

Mary Patrick, Cedric Poggenpoel & Anthony Manhire

Cape Archaeological Survey cc

Unit 2 Greenwich Grove

Duke Road,

Rondebosch 7700

Tel :(021) 685 1658

Fax: (021) 685 2817

Email: maryp@method1.co.za

EXECUTIVE SUMMARY

A First Phase Archaeological Investigation of the Old Power Station and the associated Cooling Pond on Robben Island was undertaken at the request of Ron Viney of Ad Astra Festina on behalf of his clients, Groenewald Preller Architects and the Department of Public Works, National Office. The investigation was prompted by the planned renovation of the disused World War Two Power Station as a part of the Robben Island World Heritage site. The investigation should be seen as both contributing to our understanding of historical and military archaeology.

A five day excavation was undertaken, the objective of which was to establish the exact position and layout of the Cooling Pond and to clarify the method of construction. Prior to the excavation the precise location of the underground Cooling Pond was uncertain and little was known of its form of construction. The excavation showed the Cooling Pond to be situated at some distance in front of the Power Station and the walls of the Pond directly in line with the Gravity Tank Platform. The initial method of construction for the Cooling Pond is of a type used in the 1930s where the structure was placed directly onto a pebble horizon with the weight of the walls evenly distributed over the pebbles. The Cooling Pond was found to be covered by cement capping which extends beyond the margins of the Pond, as far as the perimeter fence, and this is consistent with the archival record that notes that between the years 1951-1960 a capping was placed over the Pond to prevent the growth of algae.

The majority of the deposits associated with the Cooling Pond were shown to be the result of fill and were not in situ, despite deposits encountered during the excavation that are consistent with a raised beach, and dune sand thought to date to the Late Pleistocene. It is thought that these deposits may have been extracted from at least four borrow pits located on the Island.

The excavation demonstrated that the Cooling Pond was sound in structure and should be preserved as a heritage item. It should be considered as a significant World War 2 feature, built by the Military, as an example of a cooling system which differs from other power stations which normally have cooling towers. In this case the Cooling Pond was use to cool water that passed through the diesel engines in the Old Power Station, and not as a cooling system to extract steam.

It is recommended that the next phase of the investigation should focus on the removal of the cement capping, which could be done under archaeological supervision, the exposure of the piping that extends from the Cooling Pond into the Old Power Station, undertaken by the

archaeologist, the full exposure of the cooling pond walls, undertaken under archaeological supervision and three trial excavations at key locations around the Old Power Station to understand the in situ stratigraphy of the site.

An integrated GIS map that highlights all the mapping projects, conducted over several years by geologists, archaeologists and social historians should form the basis for an interpretive planning tool that indicates the successive layering and occupation of the island.

The technical constraints associated with any additional phases of archaeological investigation include ranking the biohazards that may exist while removing deposits contaminated with copper sulphate, and any other chemicals, that were used to prevent the corrosion of the WW 2 piping that connected the Old Power Station to the Cooling Pond.

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1. INTRODUCTION

A first Phase Archaeological Investigation of the disused Power Station and the adjacent Cooling Pond on Robben Island was commissioned by Ron Viney of Ad Astra Festina on behalf of his client the Department of Public Works. The work was undertaken under a Section 27 application to the South African Heritage Resources Agency (SAHRA), as strictly speaking the site did not fall within the legal definition of an 'archaeological site' under a Section 35 permit application to Heritage Western Cape (HWC). The initial brief was to locate and describe a Cooling Pond, which functioned as a component of the now disused diesel – electric Old Power Station (OPS) built in 1941 during the Second World War. The long term plan for the power station buildings is that they be preserved as part of the of the Robben Island World Heritage site, and that the building is reused as a repository for artifacts from the Robben Island Museum (RIM) currently stored at the Mayibuye Centre at the University of the Western Cape. The Cooling Pond will house the air conditioning plant (Viney 2011:2).

Figure 1 shows the geographical position of the Robben Island situated at 33" 48'16' 28" S and 18" 22' 09'43" E located in the Atlantic Ocean, .approximately 11 km from the mainland in Table Bay.

2. HISTORICAL BACKGROUND

The geological formation of Robben Island has been described by Hall et al [1] (1993) and Rowe et al [2] (2010). The island is underlain by the Tygerberg Formation, part of the Neoproterozoic to early Cambrian Malmesbury Group of the Saldana Belt. The ancient Malmesbury shales (600 - 550 million years) are overlain by a thick layer of fossilised dune sands cemented together with calcium carbonates from the Langebaan formation (125 million years), made up of limestone or calcrete (Rowe 2010:1). The island was connected with the mainland several times during the Pleistocene and it is possible that ancient archaeological sites exist on it, although none have been found to date (Hart et al 1998:5).

[1] Hall, M.J., Miller, D. & Moore, J. 1993. Provenance studies for stone from the castle gateway, Cape Town. *South African Journal of Science. 89: 110-112.*

[2] Rowe, C.D , Backberg,N.R. Van Rensburg, T.. Ma Clennan, S.A . Faber, C. Curtis, C. Viglietti l – P.A. 2010 Structural Geology of Robben Island: Implications for the Tectonic Environment of Saldanian Deformation *South African Journal of Geology, March 2010, v. 113, p. 57-72, doi:10.2113/gssajg.113.1-57*

Deacon [3] (1996) has written a detailed and comprehensive account of the history of Robben Island from 1488 until 1990. Her research covers the various functions to which the Island has been use; a 'pantry' for passing ships in the 15th century; a penal colony for political prisoners from the eastern and northern Cape in the 17 and 18th century, an infirmary for the chronic sick, 'lunatics' and lepers in the 19th century, its use by the Military from 1930 until the 1960s, the struggle years, and Robben Island after 1976. Several important early maps are included in this account which highlights the spatial occupation of the Island.

The archaeological history of the island is included in inventories produced by the National Monuments Council (NMC) by Riley [4] (1993) and a Baseline Archaeological Assessment by the Archaeological Contracts Office (ACO) by Hart [5] et al (1998). These assessments outline built environment features with archaeological potential, the results of various Archaeological Impact Assessments (AIA), undertaken by Vos [6], Seeman [7] and the ACO [8] own assessments since the mid 1980s ending in 2003.

Hart's 1998 assessment systematically identifies features, which covers both the natural and cultural environment. He identifies palaeontological and archaeological features in the historical landscape, assigns impact significance to them and provides suggested mitigation and management strategies. The reader is referred to this report as a standard in which to understand the wider archaeological sensitivity of Robben Island.

The World War Two (WW2) landscape of the Island is considered regionally unique, due to the high number of sites that still exist there today (Riley quoted in Hart 1998:25). The Old Power Station (OPS) should be seen as an integral part of this landscape, which is primarily a military building. This is better understood in the context of bringing an electrical power supply on the island in the 1930s. Viney [7] (2011) has highlighted this process and the

[3] Deacon, H 1996 The Island: A History of Robben Island 1488-1990. *Howard Phillip*
[4] Riley, P. 1993. Conservation Study of Robben Island. *Unpublished Report. National Monuments Council.*
[5] Hart, T, Halkett, D & Mutti, B. 1998 Baseline Archaeological Assessment of Robben Island. *Unpublished Report prepared for Environmental Risk Services.*
[6] Vos H. 1987. Robben Eiland, ondersoek van mop. Unpublished report, Stellenbosch Museum.
[7] Seeman, U.1998. Historical/archaeological sites along a proposed sewer pipe line. *Unpublished report prepared for Kayad Consulting Engineers and Department of Public Works.*
[8] Hart, T 2003 Conservation Statement on the Proposed Upgrade of Murray's Bay Harbour and Rehabilitation Options for the Northwest Quarry. *Unpublished Report prepared for the Planning Partners.*
[7] Viney, R. 2011 Heritage Statement: Robben Island, Old Power Station, *Unpublished Report prepared for the Department of Public Works.*

subsequent maintenance of the OPS until its decommissioning. The following account draws heavily on his work.

In 1939 Captain George Anderson was seconded from the Royal engineers to the Union Defence Force's Directorate of Fortifications and Coastal Works. His responsibility, amongst other things was to upgrade the Union of South Africa's coastal defence systems (Viney 2011:10). The defensive structures on Robben Island consisted of 2 main gun emplacements positioned on the south and north east of the island (Hart 2001:25, see also appendix 1). The primary aim of the OPS was to supply auxiliary electrical power to these guns; which were built at the same time (Crook pers comm). An example of this was a supply of power to a radar station at Windy Ridge, an electrical supply to the village, the harbour and later the maximum security prison (Von Haggen pers comm). Prior to this the Island had no electrical power apart, from a small generator operated by the light house keeper.

In 1941 Captain Anderson was tasked with designing the OPS and reticulation network for the existing village and new houses that were being built along Shearer Avenue. The completed design, which provided for 3 diesel driven alternators, was forwarded to the Authorities Committee in Pretoria for the necessary funds to be allocated. The OPS supplied electricity to the expanding Village during World War 2 and used continuously over the next 50 years (Viney 2011: 10).

The OPS was decommissioned in 1992 when the New Power Station (NPS) was built at the harbour (Viney pers comm).

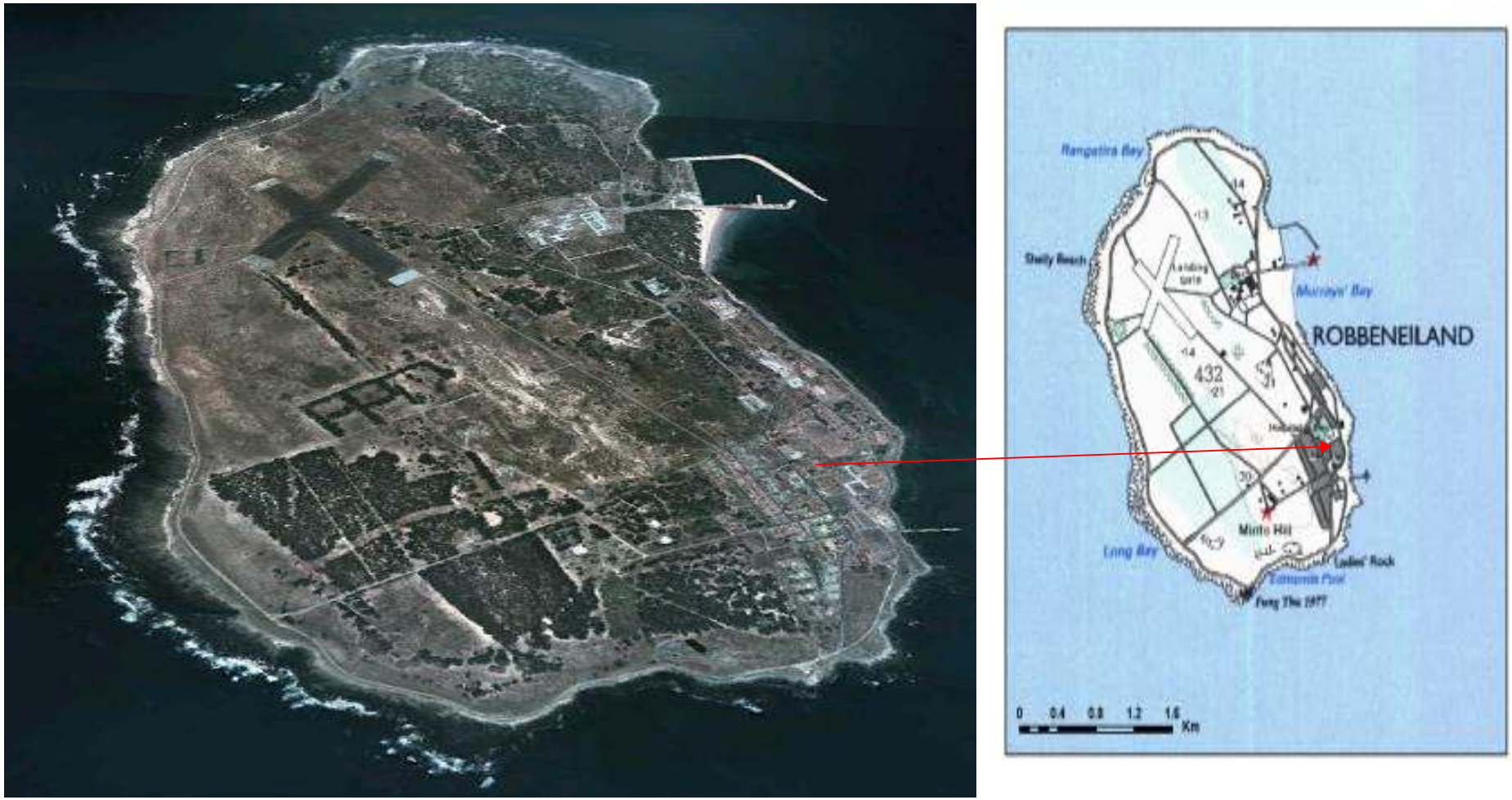


Figure 1: Google Map of Robben Island situated in the Atlantic Ocean 11 kms from Table Bay and a 1:50 000 map showing the approximate position of the World War Two Power Station (Reference 3318CD Cape Town).

3. SITE DESCRIPTION

The site is located to the East of Murray's Bay and is reached by travelling along Church Street and turning left at the Post Office, opposite the Garrison Church, show in figure two. Figure 3 shows the spatial layout of the power station in relation to Robben Island topography and the general cultural landscape that existed in the early 20th century.

The area where the cooling pond is located was previously invaded by sea gulls and a substantial guano deposit, and the carcass of dead birds, overlay the site both externally, and inside the OPS itself. These deposits were removed by the Department of Public Works prior to the archaeological excavations. This was done to minimize the risk of archaeologists contracting Histoplasmosis from fungal spores embedded in the guano deposits.

An architects drawing, taken from a plan dated 1963, shows a Cooling Pond located 3 meters away from the South East corner of the main power station building (see Figure 4). The cooling pond measures 20 x 20 (Imperial Feet) and was 5 feet deep. The drawing also shows a wooden louver ventilation grid above the Cooling Pond.

Figure 2: A 2010 Google image that shows the layout of the Old Power Station in relation to the existing Post Office and Garrison church along Church Street (extract from Viney 2011:3).

Figure 3: Map of Robben Island (No 8132/74) drawn by FR Bartley, Cape Topo Party June 1939, amended March 1948. The red arrow shows the approximate position of the Old Power Station.

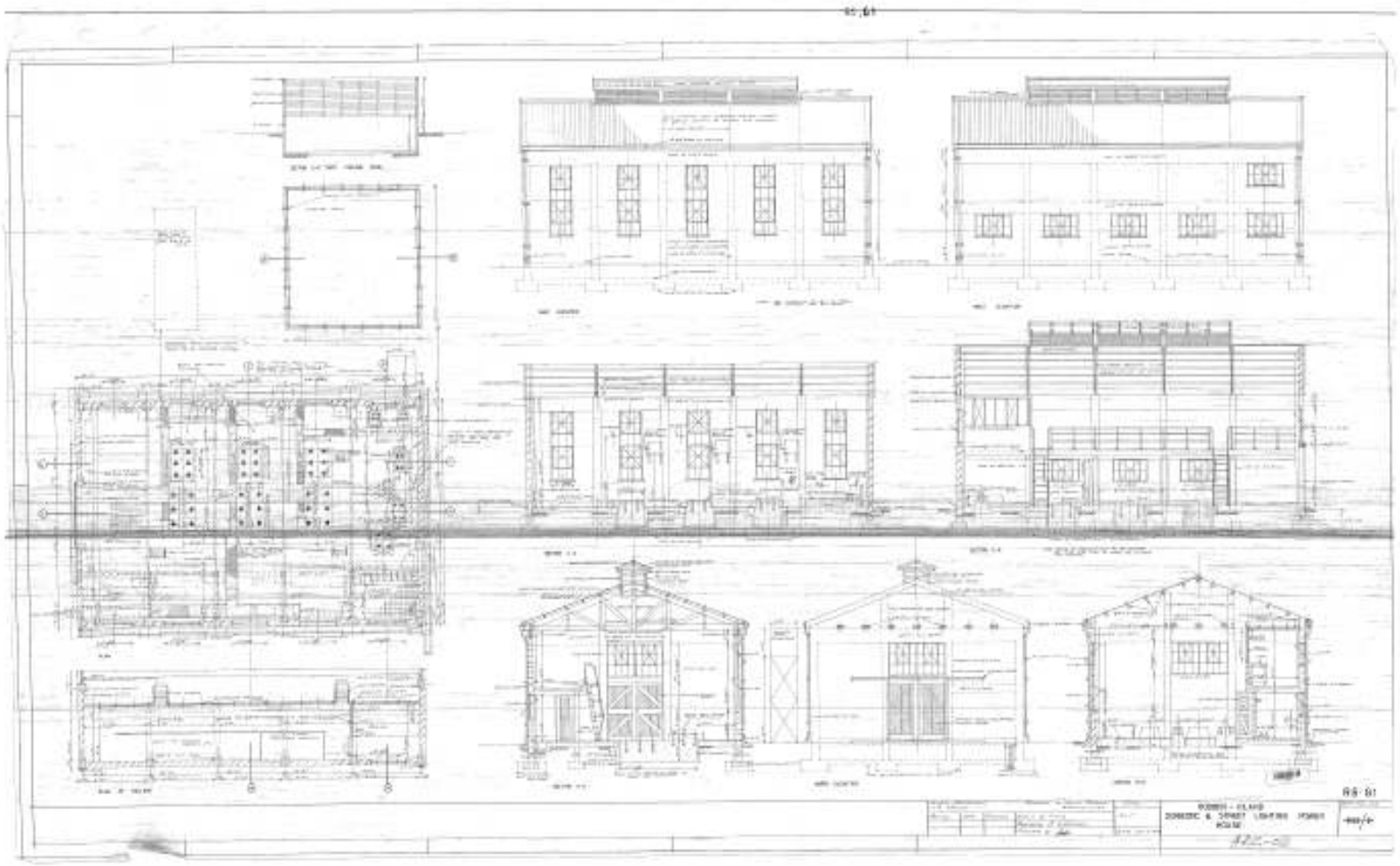
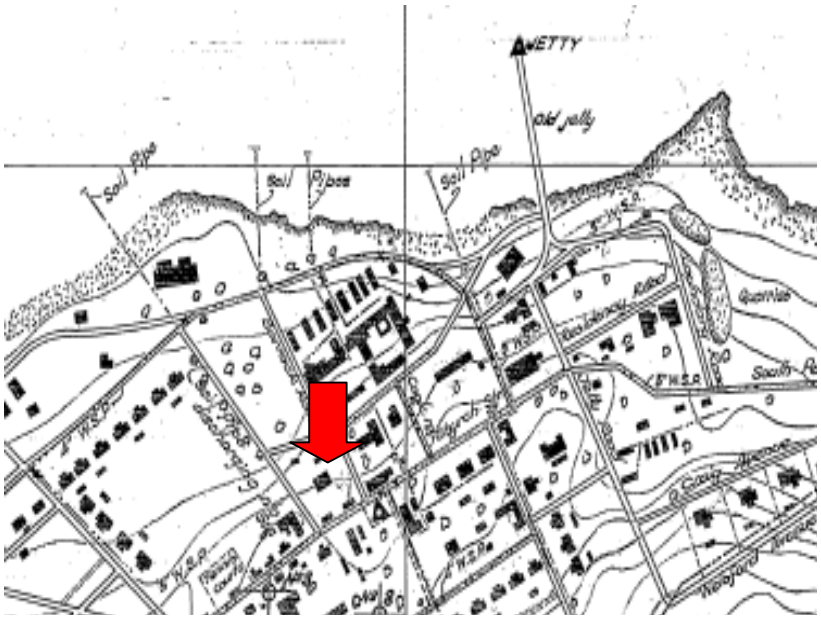
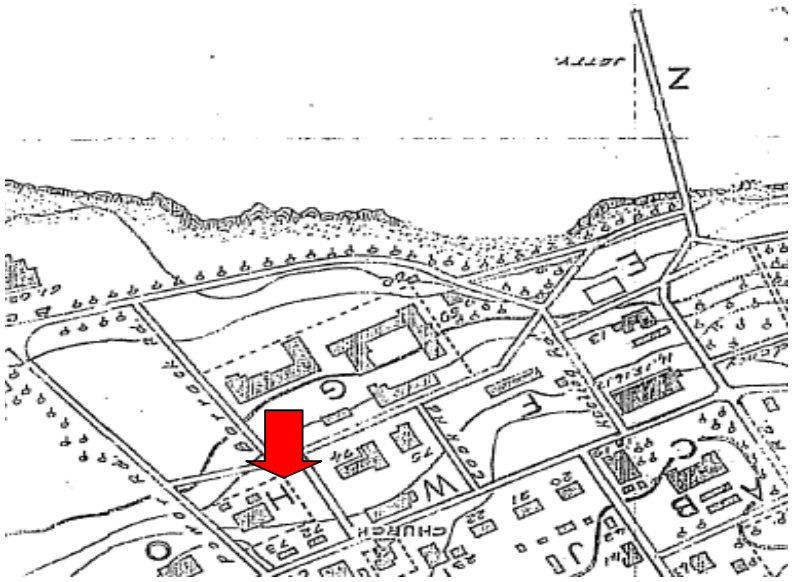


Figure 4: Extract from an architectural drawing (scale 1:100 - 1963) showing the layout of the cooling pond, louvered capping and the design of the Power Station (Ref: Viney 2011;3).

The following maps (figures 5 and 6) show the spatial configuration of the OPS in the mid 1950s and again twenty years later in the 1970s. It should be noted that the configuration of the building has not changed over time.



Map 1: 1955 map which shows four rectangular shaped building on the study site (Reference: D2078 Department of Public Works, Pretoria).



Map 2: 1972 map showing the position of the Old Power Station, marked H, and highlighted by the red arrow(Reference: Drawing 8132/E1, Department of Public Works, Pretoria).

4. METHOD OF INVESTIGATION

The objectives of the Archaeological Investigations were:
(a) To conduct a series of excavations centred on the cooling pond adjacent to the disused power station and to obtain as much information as possible on the method of construction and the materials used.
(b) To identify options for archaeological mitigation in order to minimise potential negative impacts.
(c) To identify options for the next phase of archaeological investigations.
(d) To prepare and submit a report to the Department of Public Works that meets the minimum standards required by the South African Heritage Resources Agency (SAHRA) in terms of the National Heritage Resources Act, No. 25 of 1999.

The method of investigation followed the normal procedures for the excavation of historical structures, namely preparing a site grid, section drawings, photography and a detailed daily site report regarding the excavations.

Certain health and safety issues were implemented; this was necessitated by the possible exposure to fungal spores, which may cause histoplasmosis, due to bird and rodent droppings and the remains of numerous dead birds. The safety methods employed were as follows:

(a) Spray the area to be excavated with water on a daily basis to remove air borne dust and fungal spores.
(b) To wear protective masks (Double Wilson Value Air Respirator) whilst working on the excavation (these were provided by Cape Archaeological Survey) and bought under specification from Alsure Safety Equipment.
(c) To follow the instructions for the use of the masks which include changing the cartridge if dust is smelt or tasted through the mask.
(d) To cover any open wounds (or not to work on the site if this is not feasible).

5. RESULTS

The excavation is described on a daily basis as this helps to clarify the sequence of events and the progressive understanding of the structures and deposits as they were revealed. Figure 5 shows a schematic drawing of the cooling pond exposed during the excavations

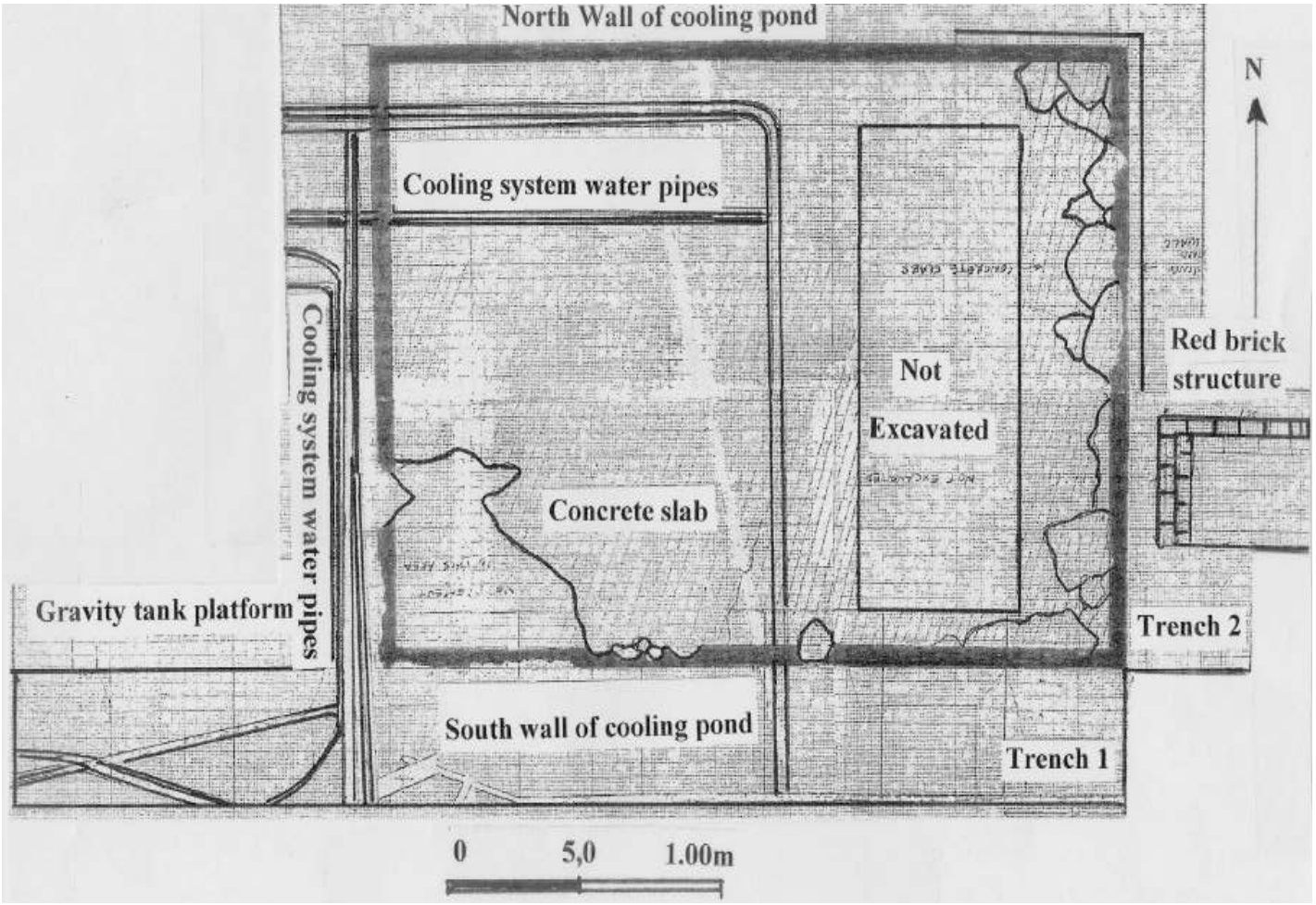


Figure 5 a: Section drawing which shows the spatial layout of the cooling pond and associated pipe and cement works. The Cooling Pond walls measure 6 m in length and 4 ½ m wide and is 1 .5 m deep (please note that these dimensions do NOT include the Gravity Tank Platform or pipe works.

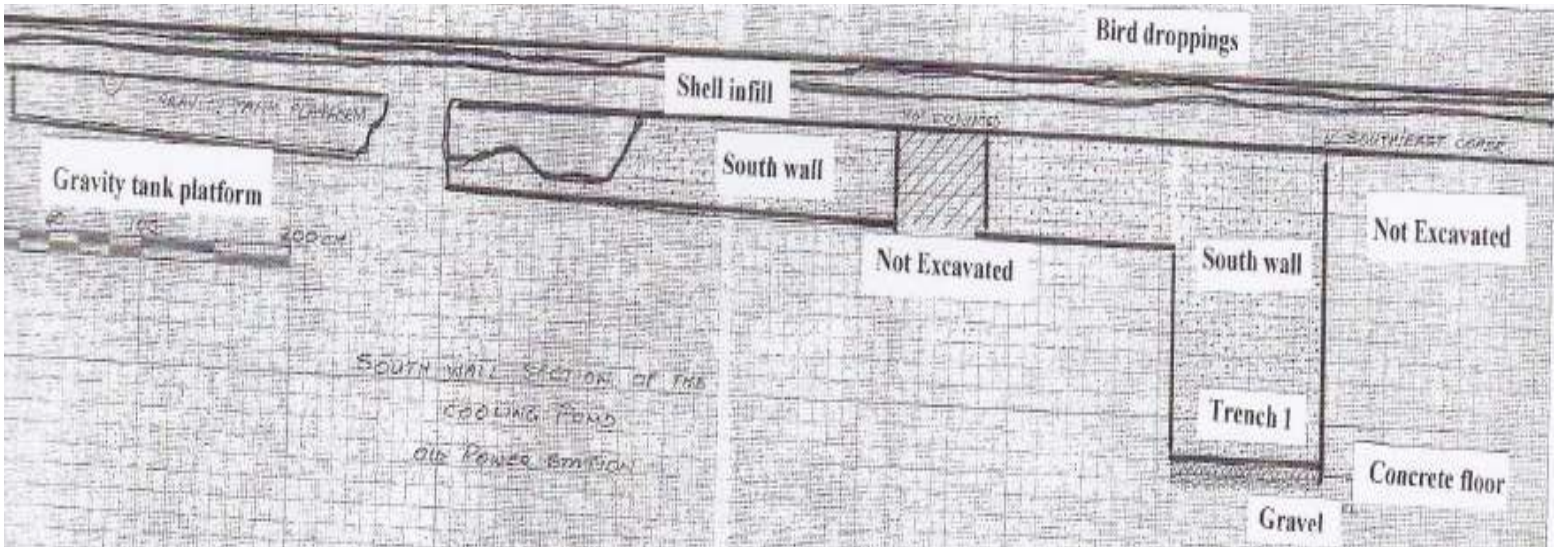


Figure 5 b: Transect of the South wall of the cooling pond and the gravity tank which measures 9 meters long and the depth to which the cooling pond wall was exposed during Phase One excavations (1.5 meters).

5.1 Day 1 (March 5th) west trench 1

The investigation began by laying out a grid in the open space between the power station building and the gravity tank platform covering the area where the cooling pond was presumed to be situated on an East West axis (Figure 7 & Frontispiece). The first trench was excavated close to the power station building, running in a west to east direction (Figure 7), in order to try and locate the subsurface wall of the cooling pond. The first important discovery was that the cooling pond has a cement capping. The subsequent removal of the overlying surface deposits demonstrated that the cement capping is continuous over the entire cooling pond and extend beyond the edge of the pond to the retaining fence.

Once the surface of the cement capping had been exposed over much of the area the next task was to establish the exact position of the cooling pond walls and to what extent the capping overlapped the walls. A trench was excavated along the southern of section of the cooling pond which exposed a section of the wall and also confirmed that the capping extended beyond the wall. The upper deposits are mainly crushed shell approximately 10 cm thick. The shell lies on top of the concrete slab and is not in situ. Below the concrete slab is a light brown deposit which appears to be part of the Late Pleistocene dune formation which is commonly found around the Table Bay area (see Figure 8).

Figure 6: View of cement capping in front of Power Station.

Figure 7: View of trench 1 excavated next to east wall of cooling pond.

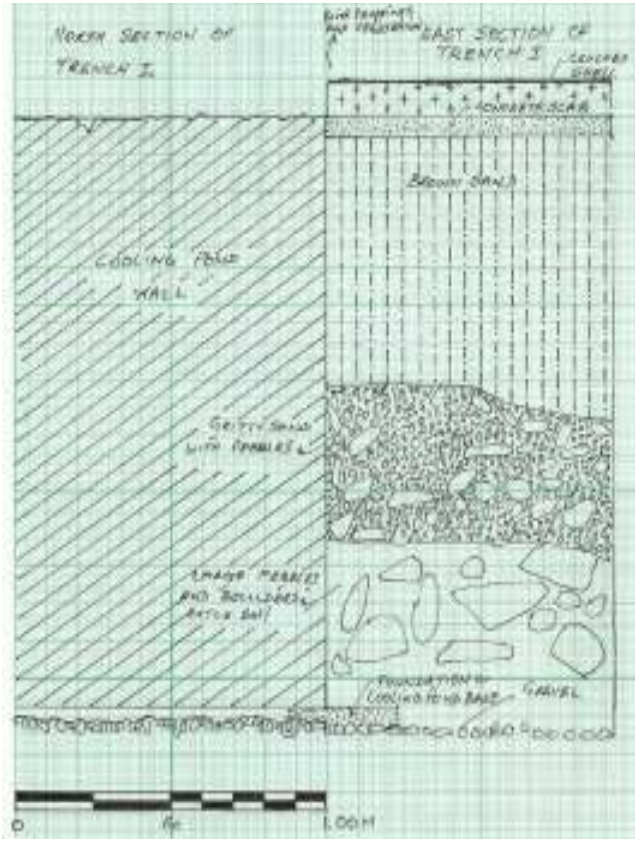


Figure 8: Section drawing (North & East) which shows the stratigraphic profile for trench 1

5.2 Day 2 (March 6th) trench 2

Continuing excavations on the south and east sides of the cooling pond produced some interesting discoveries. The first was that the cooling pond wall continues north to the power station and is not separate as was originally thought. The second was that there are a number of rusty pipes on the outside wall of the cooling pond (Figures 9 & 10). Bulk sections were left untouched at the places where the pipes emerge from the wall as a conservation measure. The concrete capping of the pond actually continues south, away from the power station, as far as the perimeter fence and the entrance to the gate.

Further excavation revealed that the southern wall of the gravity tank platform is directly in line with the cooling pond's southern wall. At this stage, no archaeological material (in the form of artefacts) had been found and the dune sand beneath the concrete capping appears to be sterile. About 1 metre along the eastern section from the southern wall there is a square structure that looks like a manhole that has been filled in. There are some small red tile fragments in the fill which probably originate from the power station; which can still be seen is situ today.

Figure 9: View of the gravity tank and pipes in front of power station.

Figure 10: Pipes in the east wall of cooling Pond (trench 2).

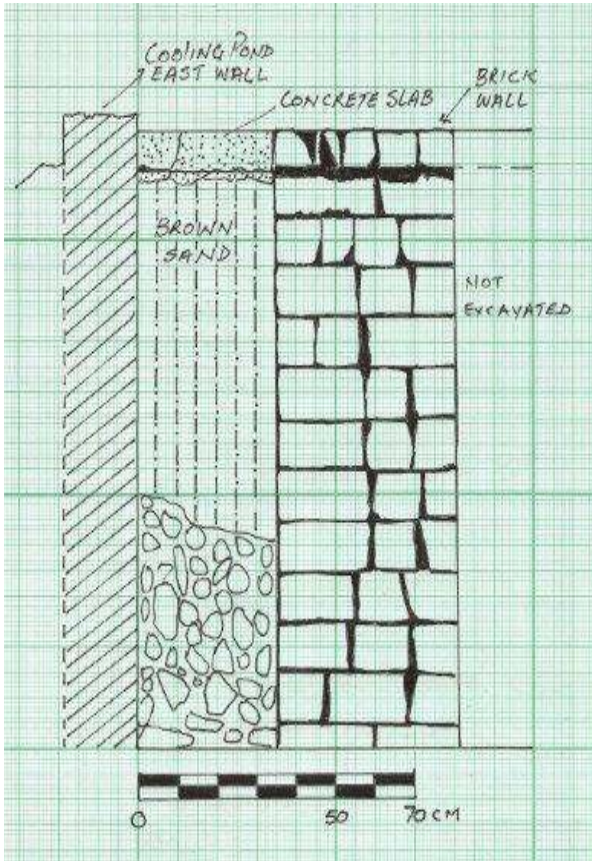


Figure 11: Section drawing (north) showing the stratigraphic profile from trench 2 with the red brick structure that could be a manhole.

5.3 Day 3 (March 7th) – Western Wall

Having satisfactorily located the eastern wall of the cooling pond the next challenge was to find the western wall. The SW corner of the wall was fairly easily established but the NW corner was completely covered in concrete and could not be seen until the concrete was removed (Figure 12). Part of the western wall was located but in one place there is a gap, roughly 10 cm wide, between the wall and the edge of the concrete capping. It would seem that this area was not covered with concrete but filled in later with rubble. It also appears that there were two episodes of concrete application to the NE corner of the wall as there is a truncation with a second layer of concrete being added as reinforcement from the outside of the wall. More rusty piping was discovered close to the gravity tank platform (Figure 13) and there are a number of pipes running along the length of the western wall.

Figure 12: NE corner of cooling pond exposed.

Figure 13: Rusty pipes in trench.

5.4 Day 4 (March 8th)

Most of the surface deposits along the perimeter of the concrete capping have now been removed and enough of the cooling pond wall exposed to be able to confirm the outlines of the wall (Figure 14). It is also clear, from the trenches dug along the sides of the eastern and southern walls, that no foundation trenches were dug when the cooling pond wall was constructed. It also seems that most of the deposits surrounding the wall are not in situ but are the result of fill added from different sources/burrow-pits from the Island.

The upper deposit, covering the cement capping and the gravity tank platform is mainly crushed shell. Below the cement capping there is a light brown deposit reminiscent of Late Pleistocene dune sands. Below this, there is a layer of light brown soil mixed with clay and small pebbles. Underneath the deposits are large boulders (Figure 15,16,17) which may be derived from a raised beach source although, again, they are not in situ. All these deposits appear to be introduced fill. The only original deposit located at a depth of 1.6 m is a layer of small pebbles upon which the wall was built, it measures 5 cms in diameter.

Figure 14: NE corner of cooling pond wall.

Figure 15: View of deposits with boulders at the base.

Figure 16 Pleistocene dune sands.

Figure 17: Deposits consistent with a raised beach

5.5 Day 5 (March 9th)

The final day of the excavation was devoted to recording the cooling pond walls, sections drawings and backfilling the trenches.

6. CONCLUSIONS

The archaeological investigation of the Old Power Station and Cooling Pond clearly demonstrated the value of excavation techniques in revealing the precise nature and location of hitherto hidden structures. Prior to the excavation the exact location of the underground cooling pond was uncertain and the established preconceptions of its form and position were shown to be erroneous.

The excavation revealed several interesting facts that were not previously known. The Cooling Pond is situated at some distance (3 meters) in front (i.e. to the east) of the power station and is actually directly in line with the Gravity Tank platform; together they measures 9 meters of continuous engineering work. The Gravity Tank measures 3 meters, the Cooling Pond 6 meters on the North/South axis and 4 1/2 meters on the East/West axis. The Cooling Pond is covered by cement capping which extends beyond the margins of the pond and is continuous with the cement slabs on which the Gravity Tank was constructed. There is an extensive system of piping which connect the Cooling Pond to both the Power Station and the Gravity Tank. The foundations for the Cooling Pond walls were placed directly onto a 5

cm pebble horizon, a building technique used in the 1930s, where the weight/load of the structure is carried evenly through the pebble base (Honikman pers comm).

The deposits exposed around the perimeter of the Cooling Pond walls, were shown to consist mainly of non-in situ fill imported onto the site. The cement capping of the pond was covered by a layer of crushed shell. The deposits exposed next to the walls showed a layer of light brown sandy fill which most likely originated from Late Pleistocene dune sands (600 - 30 000 BP). Below this, there is a layer of light brown soil mixed with clay and small pebbles. Underneath the deposits are large boulders which may be derived from a raised beach source although, again, they are not in situ. There is no evidence of truncation through any of the deposits exposed during the current series of archaeological investigation and the only original deposit is a surface of small pebbles upon which the Cooling Pond wall was built.

The fill is thought to have been extracted from four different burrow pits; please see appendix 2 which shows a geological map of the Island. The upper deposits, which consist of marine shell, come from either a beach, or a raised beach in the vicinity of the OPS. The concrete floor of the Cooling Pond rests on a dark brown soil which comes from a Late Pleistocene dune, the exact location of which is unknown. Below these deposits a loose brown, sometimes grey, sand is encountered with 5 - 7 cm pebbles mixed through it which are well rounded (Osr) and are thought to come possibly from the quarry located to the West of the OPS. The layer below this contains large boulders (25 x 38 cms) made up of mainly Malmesbury shale with occasional boulders of quartzite. Most of the boulders are water worn and the cortex suggests that the stone had been exposed for a long period of time. These deposits are of great antiquity and are dated between 600 - 300 million years before the present.

The original ground surface is a loose gravel deposit which can be seen at several locations on the Island.

A search of archival documents demonstrates that the cement capping over the Cooling Pond can be located in time and relates to reports written between 1951-1960 by the Department of Agriculture and Chemical Laboratories in Portswood Road. The cement capping was used as a light-cover to prevent the growth of Algae in the pond, after it was established that the dose of copper sulphate used to treat Algae was highly corrosive (see appendix 3).

In the final review of the OPS in its current landscape it is interesting to note that Hart et al (1998) has noted that much of the built environment on Robben Island has been remodelled. He quotes Riley as having stated that 80% of the buildings currently seen in the village were built in the last 50 years. Of the 85 buildings identified in the village in 1905, only 10 have survived in anything close to their original form and very little remains of the male and female *lunatic* asylums, or staff houses and infrastructure (Hart 1998:19-20).

Viney in his 2011 heritage review considers that much of the industrial aesthetics of the World War 2 structure was removed in the 1970,s. He concludes that there were four distinct parts to the Old Power Station, built in different periods. The main structure in ca 1941 with a cooling pond; the main building no longer exists. In 1967 the small building adjoining the older section of the Power Station, on the north - west corner of the front façade, was built as the transformer room with the installation of the new generators. Some time after this a section was added on to the south façade, and in 1987 additions was made which gave the building and the guard house its present floor plan (see appendix 4).

Despite the changes to the original building, the Cooling Pond has survived and remains an interesting WW2 feature. Its significance and value rests in the fact that it was used as a system to cool the diesel - electric engines of the Old Power Station. It is unclear how many of these systems still exist and this should be the focus of additional research into WW2 artefacts.

7. RECOMMENDATIONS

Although the excavations of the Old Power Station and Cooling Pond have yet to be completed it is evident that they are structurally sound and, as unique examples of World War Two building practice, and should be preserved as part of the Robben Island World Heritage site. The next stage of the ongoing excavation process should focus on the removal of the cement capping to expose in full the extent and nature of the Cooling Pond. The Power Station itself should be preserved as a museum focus as noted by Viney in his discussions with the SAHRA.

Since the deposits excavated around the Cooling Pond are not considered in situ any interpretation of the site geology remains unclear. In order to address these issue three trial excavations should be undertaken at the following key locations:

1. Immediately outside the perimeter fence on the East side towards the seaboard
2. At the entrance to the site off Schultze Road.
3. Behind the Old Power Station Building next to the building previously know as the servant's quarters.

We support Hart et al (1998) interpretation that the village has high archaeological potential as the foundations and associated artefacts from other historical layers may exist under the current WW 2 building, including the original configuration of the Old Power Station. In light of this we recommend;

1. Any trenching activities envisaged as part of the wider refurbishment of the Old Power Station that may disturb below surface features, such as dumps, the footing of old buildings or palaeontological material, must be monitored by an archaeologist.

2. An integrated GIS map that highlights all the mapping projects, conducted over several years by geologists, archaeologists and social historians should form the basis for an interpretive planning tool that indicates the successive layering and occupation of the island.

8. ACKNOWLEDGEMENT

We thank Ron Viney of Ad Astra Festina for access to his original research, which is still in preparation for his client. We also grateful acknowledge the support of Tim Hart of the ACO, University of Cape Town, who provided copies of the ACO reports on all the work undertaken on the Island, and for his permission to use the Basic Archaeological Assessment as a standard on which to rank archaeological features from Robben Island.

We also thank Colonel Lionel Crook, SA Artillery (Ltd) and Andri Von Haggen, MLB Architects for assistance and comment while preparing this report and Ms Estelle van Tonder, HOD of the Bookshop and Unpublished reports, Council for Geoscience in Pretoria, who provided the geological map.

Richard Honikman, from Richard Honikman Architects is thanked for his advice regarding early building techniques.

9. CAS TEAM

Project Management: Mary Patrick

Field Work: Cedric Poggenpoel, Mary Patrick, assisted by Mpakamo Sassa, Ntandazo Ziema and Llewellyn Guillelm

Report Writing: Mary Patrick, Tony Manhire and Cedric Poggenpoel.

Appendix 1 : Extract from Hart WW2 structures (8A, 8B)

***Description*:** Robben Island has a high concentration of WW2 sites and as such, is regionally unique[2]. The density and variety of features from this period is such that it warrants an extensive separate study of its own. However, we have taken this opportunity to make a number of general observations concerning impacts and management of the WW2 heritage. The Cornelia and Robben Island batteries are indicated on Figure 4.

The defensive structures of Robben Island consist of 2 main gun emplacements positioned on the south and north east sides of the island respectively. These are the Robben Island Battery (8A) consisting of three 9.2" inch naval guns (south) and the Cornelia Battery (8B) which consisted of two 6" quick firing naval guns (since dismantled) to cover the northern entrance to the Blouberg Channel. Each gun battery was equipped with underground bunkers, shell and cordite magazines and hoists. In addition to the main batteries, there are a number of forward observation posts, fire control towers, watchtowers, command posts, search lights, stores and an airstrip. An underground power station near the Robben Island battery and a power station in the village provided electric power for the military facilities and village. A complex of regularly spaced machine guns posts ("pill boxes") protected the shoreline of the island. The Blouberg channel was protected by submarine detection cables (8C). In addition there are numerous foundations and remains of permanent and temporary structures (barracks and stores) throughout the island.

Potential: high. The tourism and educational possibilities of the WW2 facilities are excellent.

Impacts: high. Many of the WW2 sites have been, and continue to be impacted by a variety of factors; the most serious of which is corrosion of the steel components. Much of the metal work on structures immediate to the shoreline is already beyond rescue. Of particular concern are structures where the metal work is now exposed to the elements as a result of degradation of the paintwork. Without quick intervention many of the steel doors and windows will corrode to a point where their conservation will no longer be possible. Other previous impacts we have noted are theft and vandalism, flooding of underground buildings and improper use of structures.

Management: The following points apply.

a) Steel doors and shutters that are still in a condition worthy of conservation need to be unidentified and treated. Ideally, each door, shutter, or any other components needs to be removed from the buildings and subject to electrolytic cleaning and stabilisation. The parts then need to be primed, painted and reattached. Sand blasting, then repainting with a suitable primer and paint may also be affective in the short term but will not halt deep-seated corrosion. Steel hinges on doors and shutters need to be regularly oiled and maintained.

b) The Coastal Artillery Maintenance Unit maintained the three 9.2" naval guns until the 1980's when the unit was disbanded. Since that time degeneration and corrosion of the turrets and training mechanisms has accelerated. The rust will need to be removed and the turrets treated and repainted. The mechanical components of the guns need to be regularly greased

[2] Riley, P. 1993. Conservation study of Robben Island. Unpublished report. National Monuments Council.

and mechanisms (motors and hydraulic pumps) kept free of corrosion. The bronze breech blocks and other components of the cannons have been removed to prevent the guns from being used. Their whereabouts needs to be established and the components returned and refitted (if possible). The navy may be able to assist in this regard.

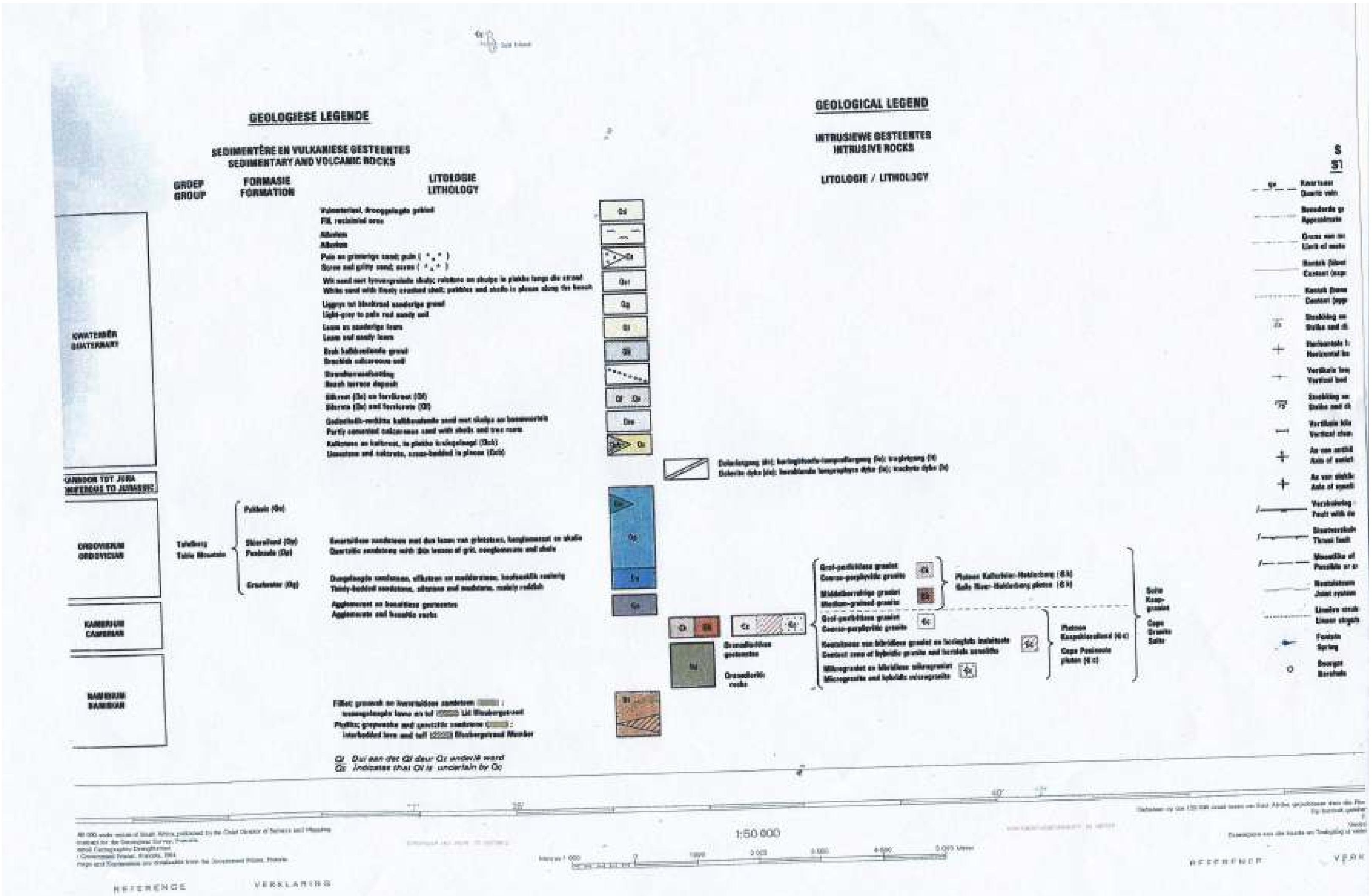
c) The underground magazines and cordite hoists of both the Cornelia and Robben Island batteries are either flooded or filled with debris. These need to cleared and drained under the supervision of an archaeologist, then made safe for specialist tour visits. Artefacts found during this process will need to be collected and conserved. Of particular concern is the power station bunker, which is flooded. An inspection of the interior revealed that original components and WW2 paintwork still exists. These will deteriorate rapidly unless the drainage system of the bunkers is maintained.

d) Most of the concrete machine gun posts are filled with debris or the entrances blocked with vegetation. A selection of these needs to be cleaned out and made safe for specialised tours. Those in the vicinity of the penguin colony could also double as bird watching hides.

e) Cannon shells of 9.2" and 6" caliber have been used throughout the island as landscape features and the bases to barriers around road islands. These are part of the historical landscape and should not be moved. Any shells that are not associated with landscape features should be positioned at the respective batteries after their locations have been recorded. It is also important to establish that the shells are checked for safety.

f) An immediate concern is the collection of oral histories and historic material relating to the experiences of persons stationed on the island during the war years. It is imperative that as many veterans as possible who were stationed on the island are interviewed and videoed/recorded as soon as possible. The veterans are now elderly, which means that in a few years time oral histories from this period will be lost. Photographs and archival material needs to collected to form the basis of a small museum of the WW2 period.

Appendix 2: 15 000 Geological Map (Sheet 3318CD Cape Town) that shows the position of geological deposits on Robben (legend on page 31).


GEOLOGIESE LEGENDE
SEDIMENTÊRE EN VULKANIESE GESTEENTES
SEDIMENTARY AND VOLCANIC ROCKS
GROEP
GROUP
FORMASIE
FORMATION
LITOLOGIE
LITHOLOGY
KWATERNÊR
QUATERNARY
ORDOVISIUM
ORDOVICIAN
KAMBRIUM
CAMBRIAN
GEOLOGICAL LEGEND
INTRUSIEWE GESTEENTES
INTRUSIVE ROCKS
LITOLOGIE / LITHOLOGY
1:50 000

Appendix 3: Extract from Letter and report from Department of Agriculture, Chemical

1951-1960	"Corrosion problems Robben Island. Algae in cooling water. The circulating cooling water [treated with sodium chromate inhibitor 0.5 lbs per 100 gallons] after being pumped through the water jackets of the diesel engines is discharged into a large cement reservoir [capacity 15 000 gallons]. The surface being open and exposed to light encourages a flourishing algae growth. Understand that 10 lbs of copper sulphate has been added to combat this. Apart from this dosage being far too high [1 in 15 000], metallic copper is deposited on the interior of pipes and cooling surface and a high corrosion rate is to be expected. The use of copper sulphate in such cooling systems is to be deprecated. Algae growth can be arrested by preventing light from reaching the surface of the cooling water by means of suitable light proof covers." Report from CSIR. "The dosing of the cooling water in the diesel –electric plant at Robben Island by means of chromate has been found to be effective in inhibiting rust in the cooling system as well as suppressing algal growth." Resident Engineer is Mr Gardner.	PWDC 81, CT 1/8132 v1 Gen building, Letter and report from Department of Agriculture, Chemical Laborotories, Portswood Rd, CT to District Representative PWD, CT dated 24 December 1952, p.2 of 3; PWDC 81, CT 1/8132 v1 Gen building, Letter from CSIR, National Chemical Laboratories to District Representative PWD, CT dated 3 December 1953.

Appendix 4: Extract from Viney (2011:8) which highlights the various phases of building at the Old Power Station, Robben Island.