INSTALLATION OF HF RADAR ON THE SOUTH COAST OF RSA: OUWERF.

BACKGROUND INFORMATION DOCUMENT

PREPARED FOR:

DEAET, Heritage Eastern Cape and Kou-Kamma Municipality

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1 INTRODUCTION

The area of Ouwerf where the HF radar system will be installed, comprising 14 slim-line antennae, 1 container/work station, connecting cables and 1 solar panel, will be towards the southern/coastal edge of the grazing land on the farm. The precise location of individual components is to be confirmed with radar specialists on site and agreed with the landowner before installation.

2 NEED FOR AND DESIRABILITY OF LAND BASED RADAR

Lwandle Technologies (Pty) Ltd (Lwandle) in technical partnership with Actimar Operational Oceanography (Actimar) plan to provide near real time, remotely sensed, environmental data on sea surface current and wave conditions to the South African coastal and maritime sectors.

Such data would be useful to a number of government initiatives including for example: SAWS for coastal weather prediction and warnings; SAMSA for providing vessel navigation warnings; Eskom for Tsunami warnings; the South African government's Operation Phakisa[1]. for promoting marine aquaculture, harbour, and oil and gas developments. It would also be of great benefit to the South African Marine Research and Exploration Forum (SAMREF).

The offshore oceanographic regime in the vicinity of the Agulhas Current is hostile and in situ data collection through marine buoys is risky, logistically demanding and expensive. Accordingly, Lwandle and Actimar propose that a land based, non-invasive, high frequency radar system be tested as an alternative means of gathering such data.

Because the oil and gas industry invests billions of dollars in vessels and drilling rigs in the Agulhas Current region and needs detailed data on ocean surface conditions to, for example, estimate operational downtime for safety reasons, it was decided to look to this industry to sponsor the test. Total/ TEPSA have elected to be an anchor client in this system test.

3 DESCRIPTION OF THE HF RADAR SYSTEM

The system as proposed will collect data over an area extending to beyond 200 km offshore. This requires installation of radar arrays at three locations on the coast. Amongst other aspects, technology and location alternatives and local environmental issues have been considered in siting the antennae.

[1] *I.R.O. Operation Phakisa's Project B3 has the primary objective of growing public sector research on the marine and oceanic environment through opportunities provided by the private sector and including the exchange of information and data.*

The proposed layout of the system is illustrated, approximately, in Figure 3.1; where Site 1 is on a farm called Eco Marine Lodge west of Gouritzmond, Site 2 refers to the farm Cairnbrogie west of Plettenbeg Bay, and Site 3 is on the farm called Ouwerf west of Cape St Francis which is the subject of this report.

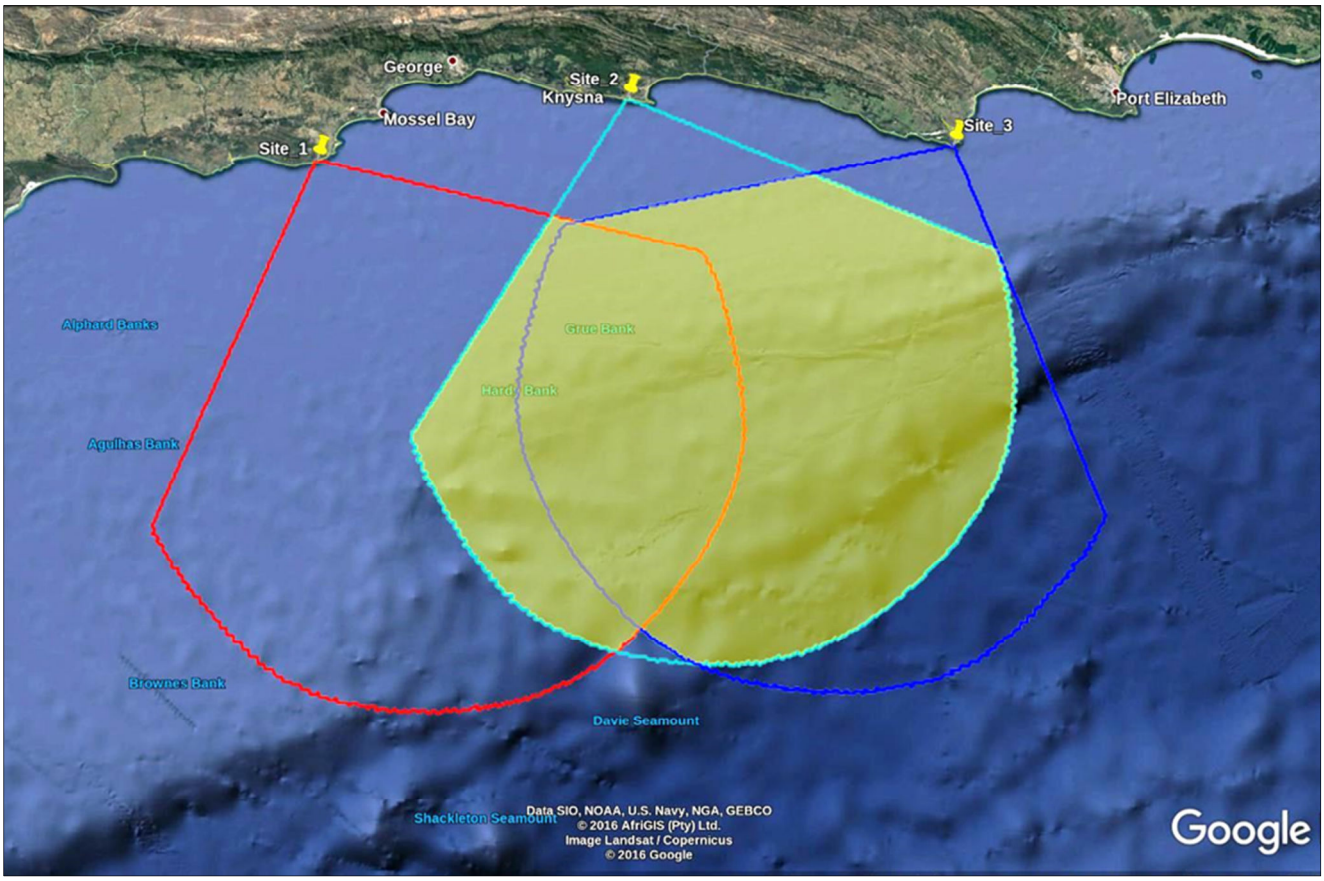

Figure 3.1: Google Earth image showing the approximate locations of proposed radar transmitter and receiver sites on the coast and the focus area of radar coverage (source Actimar 2017).

The swath of overlapping data collected should be of very high resolution and allow for an early detection of, for example, approaching severe seas.

It is intended that the WERA system be installed in October and November 2017 and that data be collected initially until February 2019. Any continuation would be subject to renewed agreements with the landowners.

Each Site will house 4 radar transmitter and 12 receiver antennae, connected by cables, controlled by a computer and powered by a solar panel array with battery backup. These system components are described and illustrated in the next section.

Data collected and stored on the computer onsite would be transmitted via GSM to an ftp site accessible to Lwandle in Cape Town and Actimar in France to use for modelling and

interpretation; time averaged snapshot maps of the ocean surface would be produced. The full data set would be manually retrieved from each site during a monthly maintenance inspection.

Further technical information about the system, including examples of the outputs from the modelling, are available on the Helzel website at http://www.helzel.com/de/9310-wera-ocean-data.

4 FACILITIES REQUIRED AT THE SITE

Figure 4.1 shows images of what WERA's HF radar antennae and a container look like in situ at a site in England; here protection against damage by cattle is necessary. Because the proposed site on the South African south coast is also in a cattle grazing area the same sort of protection using wooden poles will be provided; the solar panel array might also require wooden fencing for the same reason.

Figure 4.1: Example of the appearance of antennae with "bull-proof" protection and a container at an operational radar station in Cornwall, England (source: Actimar).

This radar site will require:

- vehicle access for installation, monthly checking and then eventual uninstalling;
- a container either 2.4 m or 6 m long x 2.4 m wide x 2.4 m high, to house the computer for storing the data collected, and ~10 batteries for storing solar power, as shown in Figure 4.2;
- ~60 m^2 of solar panels, to supply approximately 17.28 kWh/day of power as shown in Figure 4.3;
- electrical and antenna cables, in protective black plastic tubes (Figure 4.4) laid on the ground surface, or buried if required for protection against trampling by cattle;

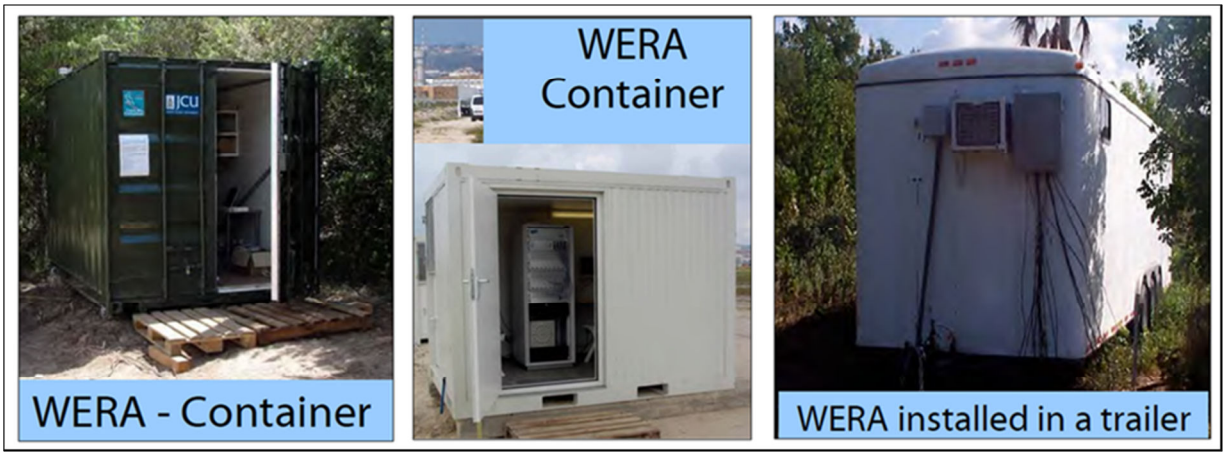

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Figure 4.3: Example of solar panel array, but which would be angled at ~35^0 instead of the ~65^0 illustrated. Batteries would be fixed to the back of the panels or housed in the container.

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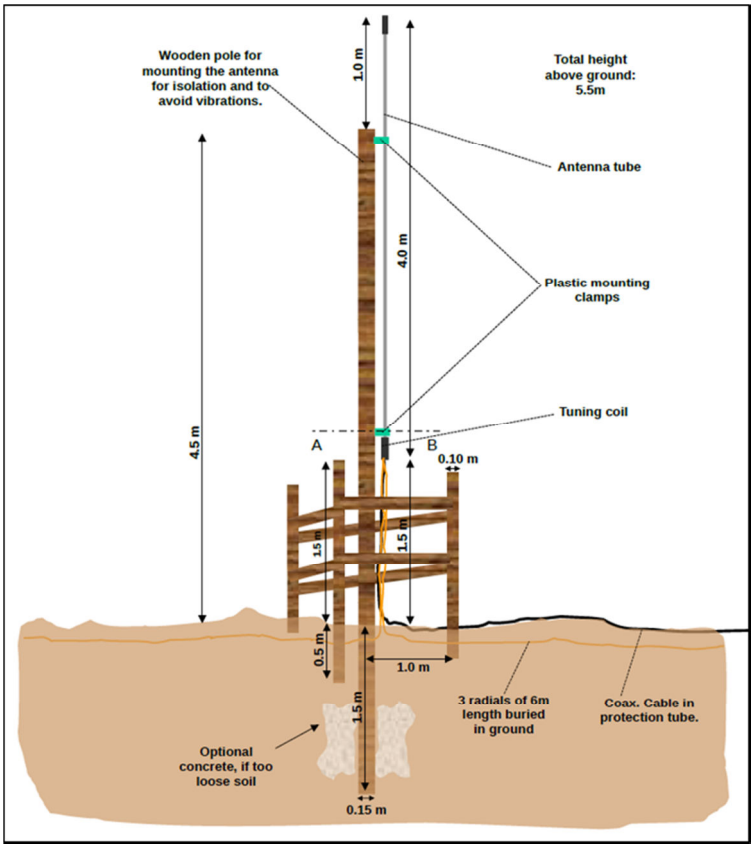
- radar signals transmitted at 5.25 MHz frequency which is an extremely low/ non-invasive electromagnetic force used by oceanographic research vessels;
- 4 transmission (TX) antennae, and 12 reception antennae (RX), with supporting poles, reaching 5.5 m high, as illustrated in Figure 4.5 , Figure 4.6 and Figure 4.7. This height is lower than a telephone transmission pole, and about half the height of the majority of wooden poles used for power transmission lines. For technical reasons the **bases** of the 12 RX antennae need to be at the same height off the ground and thus follow the topography, but for good transmission the **tops** of the 4 TX antennae need to be at the same elevation so their length would differ to compensate for any differences in ground level;
- the antennae will be placed approximately 28 m apart, and
- protective wooden fencing around antennae where necessary as illustrated in Figure 4.1, Figure 4.5 and Figure 4.6.



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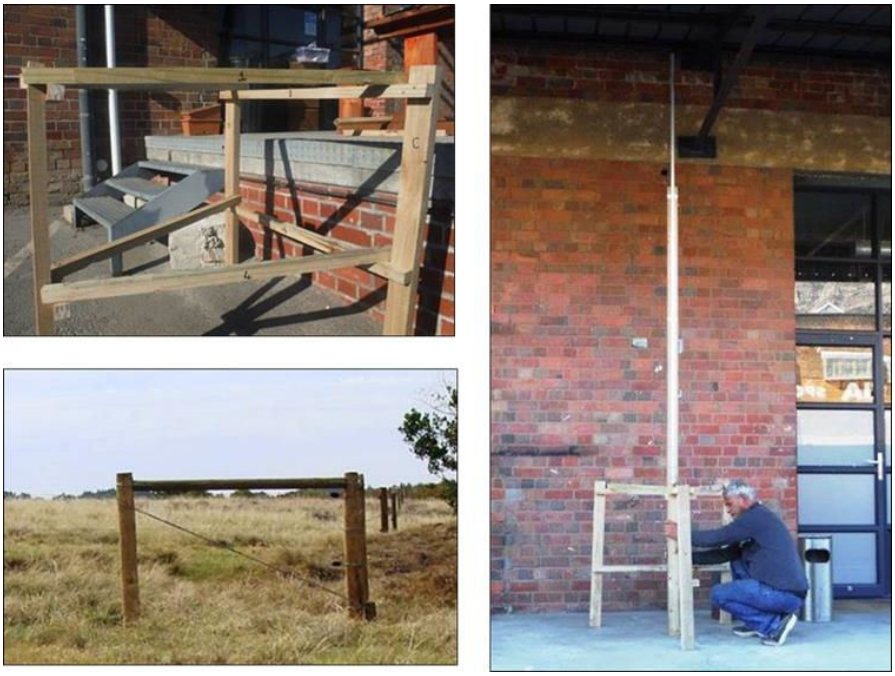

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Figure 4.7: The arrow points to a single antenna with guy ropes, erected to demonstrate visibility on one of the South African south coast farms where it is proposed to install the radar. The inset is a close-up image of the same antenna.

The final configuration of the above mentioned components on each site is slightly flexible and depends on site characteristics such as substrate type, vegetation height and topography.

4.1 Estimation of ground areas and soil volumes to be disturbed

The radar system will have a "disturbance footprint" compatible with existing farm infrastructure in that:

- existing roads and tracks would be used for access;
- the antennae would be secured by wooden fence poles of the same type as already used on the farm;
- the antennae would be spaced about 28 m apart so movement of farm machinery or animals would not be restricted;
- cabling would be unobtrusive as it would be buried in areas trampled by cattle and otherwise fed on the surface between plants and rocks or along existing fence-lines;