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MILNERTON MAGNETOMETER SURVEY 2015 REPORT

1. Introduction

The methods and results are given here of a beach survey in close proximity to the suburb of Milnerton. The objective was to locate any anomalies under the beach surface that may indicate buried wreckage. The survey was undertaken as part of the 'Haarlem' Project that aims to locate the remains of the wreck of this Dutch East India Company ship and an associated survivor camp.

Field work was carried out during April and November 2015. The method used was that of a magnetic survey, employing the 'GEM 19' magnetometer. This non-intrusive survey was undertaken on the strength of a permit that was issued by the South African Heritage Resources Agency (SAHRA) in terms of Section 35(4) of the National Heritage Resources Act (Act 25 of 1999). The maximum survey area was defined as follows. Northern border: $33^{\circ} 48' 56.84''S$ and $18^{\circ} 28' 20.26''E$; southern border: $33^{\circ} 51' 30.61''S$ and $18^{\circ} 29' 20.00''E$; whereas the low and high water marks indicated the western and eastern borders respectively.

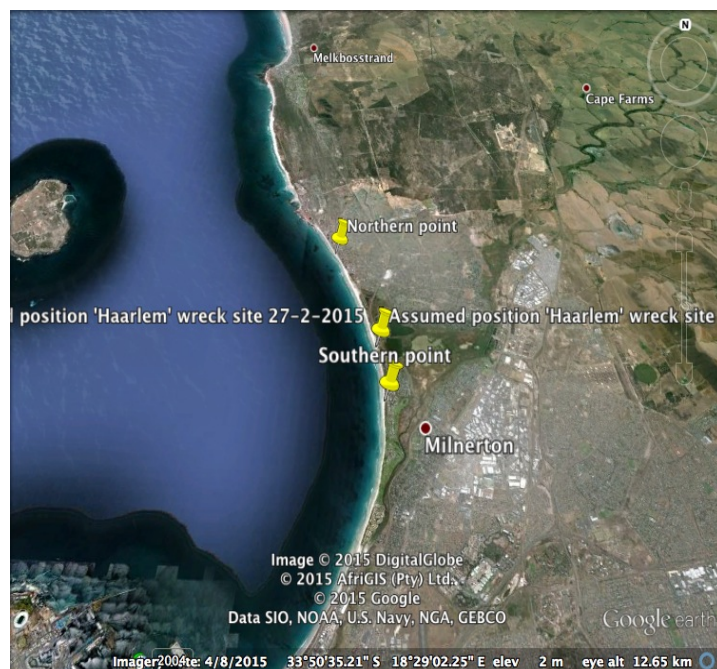


Figure 1: Overview of the survey area

2. Instrumentation, data collection methods and reduction procedure

2.1 Instrumentation

A GEM 19 Magnetometer system was employed. This is a standard proton magnetometer, utilizing one sensor. The whole system is carried in a harness, with the console in the front so as the operator may change parameters and incoming information that may be deemed incorrect and can be deleted, then a new reading may be captured. The sensor pod is supported by a framework as shown in the picture below. The sensor is a dual coil system and is contained in proton rich liquid. In addition, a standard Garmin hand-held GPS was used for position fixing.



Figure 2: The author with a GEM 19 magnetometer and hand held GPS

2.2 Data collection

Data was collected by a push-button at each station (10m) along with a GPS reading. The Magnetometer data was also written down in a small note-book in case of a magnetometer malfunction.

2.3 Data reduction and presentation

The field-collected data is downloaded to a desktop computer, in an ASCII format (.csv). This is then read into MS Excel for filtering and sorting. Five columns are then set up “Fiducial #; time; X metres; Y metres; Mag data. A sample appears below (Fig. 3).

Table 1: Processed data

Fid #	Time	X metres	Y metres	Mag nT
105	134050	248223.2	6551035	25963.23
106	134052	248223.2	6551035	25962.61
107	134054	248223.2	6551035	25963.11
108	134056	248223.4	6551035	25958.71
109	134058	248224.1	6551036	25956.93

1. Once the data has been captured and processed, a graph is created so as to be able to view anomalies, if present, that are marked. The anomalies are compared to the GPS data for further action.
2. A contour plot of the magnetometer data is created using propriety software (the plot below was derived from the April survey – notice the magnetic anomalies in the centre of the plot).

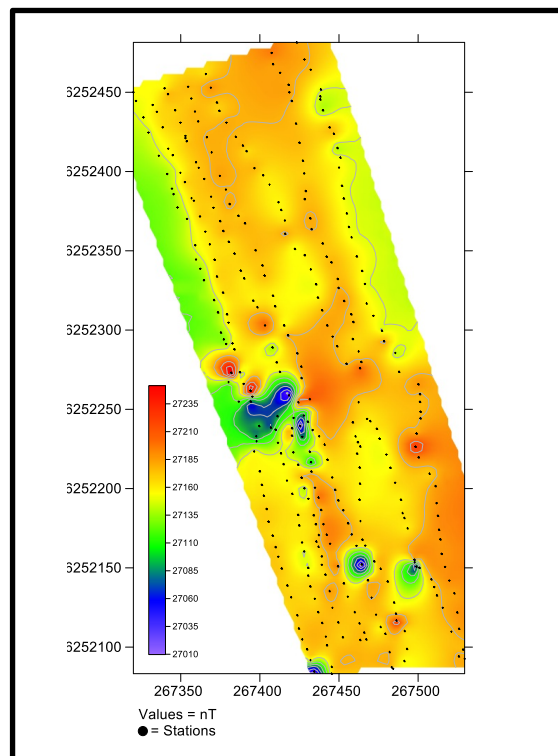


Figure 3: Contour plot of the April Survey

3. Results

The first phase of the survey, in April 2015, focused on an area where the wreck was expected. This was based on a previously undertaken desk-top study that included historical and geographical data. The geographical coordinates for the centre of this survey area are; S33 50.665 E18 29.188. The site is just below the high-water mark at the western end of a footpath through the dunes. The eastern end of the path is demarcated by a sign and a parking area. This parking area is just north of the northern-most houses in Milnerton and adjacent to the R 27 coastal road.



Figure 4: The sign that demarcates the eastern end of the footpath through the dunes

During this first phase, an anomaly was detected. The plot above (Fig. 3) represents this anomaly that also formed the start of the survey and that is referred to as the 'central anomaly' in this report. The moment the anomaly was observed, it was traversed by 8 lines, each line being 400m in a north-south orientation. Each line had a station interval of 10m which was governed by the hand held GPS. This gave reasonable resolution for an indication of any anomalies (~40 stations per line).

Once this was completed, the survey was extended to the north and south during the course of November 2015. Two lines were traversed, each line being ~1000m in length. The two lines were run in a north south direction with a separation of ~30m. This resulted in the detection of two other anomalies. The northern one is at a distance of 984 metres from the central anomaly. Its position is S33° 50.184' E18° 28.903'. The southern anomaly is situated at S33°51.215' E18° 29.318' and at a distance of ~1000 metres from the central anomaly. The total length of the area, from the northern to the southern-most anomaly, is 1984 metres.

Table 2: Start and finish of traverse lines

Line	Start (UTM)		End (UTM)	
Line 1	267317	6252455	267379	6252225
Line 2	267435	6252242	267366	6252468
Line 3	267369	6252252	267436	6252083
Line 4	267493	6252083	267434	6252273

The graph below (Fig. 5) shows four traverses. Red - northern sector. (centre point to the north); Blue - northern sector. (north to the centre point); Green - southern sector. (centre point to the south); and 'Magenta - southern sector. (south to the centre point). The extended survey could not be modelled due to the fact that there were only two lines. (This was a reconnaissance survey for further refining of the survey area).

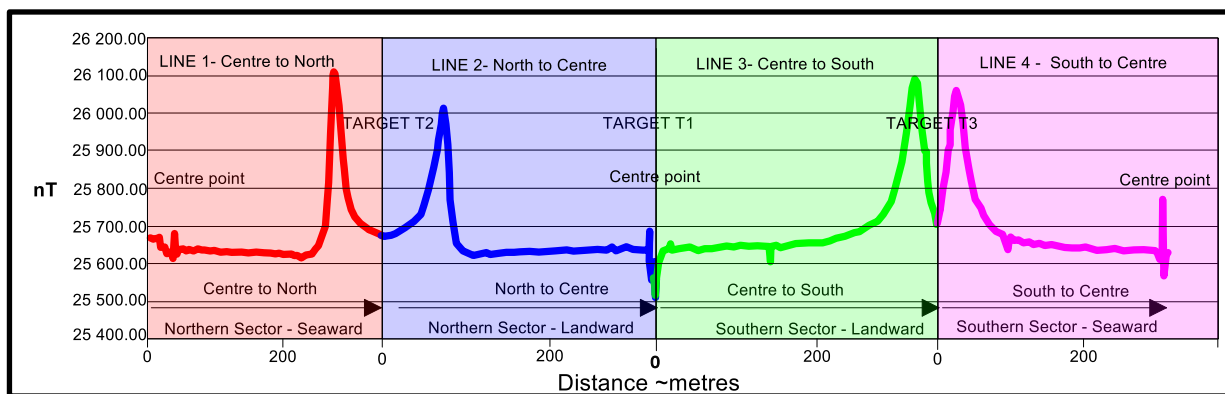


Figure 5: The four traverses over the permit area, indicating the four anomalies, plus the small central anomaly (T1, T2 and T3)

On the basis of the 2015 survey it can be concluded that a large anomaly is present near the end of the northern traverse. At the end of the southern sector there occurs another large anomaly. A smaller anomaly is present at the central point that was surveyed in detail.

It is recommended that an extended and tighter survey be carried out within the boundaries of the 2015 permit area. This should result in better coverage and show more detail of the present and possibly additional anomalies. A future survey can possibly include additional non-intrusive techniques.

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Further reading

Master, Sharad. The first stratigraphic column in South Africa, from Hondius (1652), and its modern correlatives. *South African Journal of Science* 2012; 108(1/2).

Werz, B.E.J.S. & Gerritsen, H. *Research Proposal/Project Plan. The wreck and survivor camp of the VOC Ship Haarlem (1647)*. Unpublished report, 29 May 2014, version 1.5 ©The AIMURE.