

Shorter notes

Resistivity survey of two settlement sites at Tofts Ness, Sanday, Orkney

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INTRODUCTION

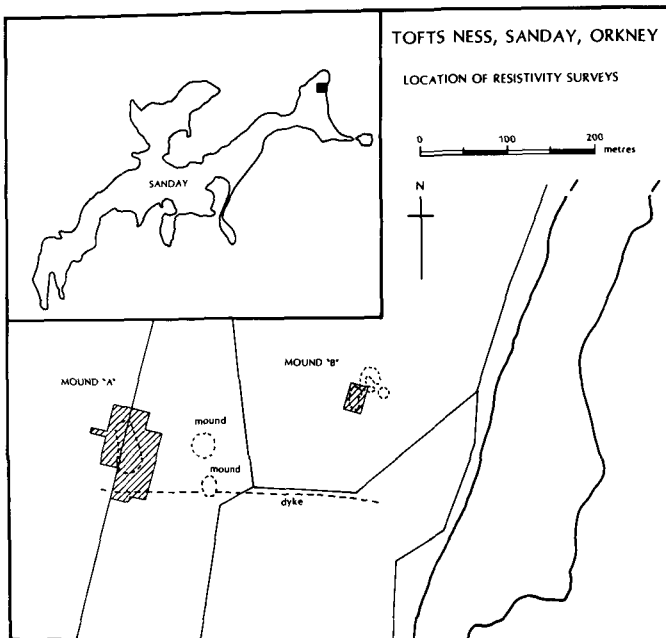
Resistivity as a method of geophysical survey is potentially ideally suited to the location of archaeological sites and component features of the important archaeological landscape surviving at Tofts Ness, Sanday, Orkney. The presence of stone archaeological anomalies should be seen in strong contrast against the surrounding surface geology of a machair-type of sand subsoil in conjunction with a relatively high water table. This is supported by the positive results of a preliminary resistivity survey in 1983 over known archaeological features (Dockrill 1984, 586–8).

In 1984 two suspected settlement sites (mounds A and B, *illus 1*) were surveyed using the resistivity survey method. Both of these sites had been identified as broad mounds and planned by conventional field-survey techniques by J B Stevenson (RCAMS). Evidence of a partially exposed sub-circular structure upon the north-west edge of mound A, together with midden deposits exposed in rabbit burrows in both sites, are suggestive of an occupational function. A detailed conventional plan of the sub-circular structure was made, using a planning frame upon the resistivity grid (*illus 4*). It was hoped that such a detailed plan of a known feature would enable direct comparison with the resistivity results. The aim of the survey was to supplement the conventional earthwork survey of the above-ground remains to show the extent of archaeological deposits and to reveal any structural features within the two mounds.

The geophysical survey was performed with the use of a Geoscan RM4 resistivity meter using the twin probe configuration. This particular resistance meter was used because of its digital display and tolerance of resistivity extremes present upon this site. Resistivity readings were taken at one metre intervals over the survey area. An area of 5200 sq m was examined over mound A and one of 600 sq m was surveyed over mound B. The data were processed upon an Epson HX20 micro-computer to allow on-site analysis. Final analysis and presentation as dot-density plots (*illus 2 & 3*) were made with the use of a Hewlett Packard 2100 mini-computer.

High resistance features are generally associated with areas containing concentrations of stone such as rubble or walling, where there is less moisture in the soil thus providing a high resistance. Such an anomaly upon a dot-density plot is seen as a strong concentration of dots. Low resistance anomalies are associated with features containing a greater moisture content such as fills of ditches and would appear as areas of few or no dots upon the plots. A number of anomalies can be identified upon the plots and these are described below.

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ILLUS 1 Location map

THE SURVEY

The archaeological material forming mound A can be seen in strong contrast to the surrounding area (illus 2). A background in the region of 40 to 70 ohm for the area surrounding the mound can be compared with the values for the mound which vary between 70 and 500 ohm. The mound as represented by the resistivity data appears to extend beyond the limits of the physical mound (indicated by the broken line, illus 1). Anomalies of high and low resistance have been highlighted by the use of the range of 100 to 300 ohm. (High resistance features identified on illus 2 are numbered 1, 3, 6 and 8 while the low resistance anomalies have been identified as 2, 4 and 5.)

Anomaly 1 represents the partially exposed sub-circular structure, together with a band of high resistance running south towards the low resistance area 5. Anomaly 1 appears as an area of very high resistance with many readings over 400 ohm due to the combination of the presence of stone walling and rubble together with the improved drainage of this feature which in places is over 0.5 m higher than the surrounding mound. Possibly associated with this structure is anomaly 3, which appears as a circular band of high resistance some 10 m in diameter. This feature may represent another circular structure, similar to that in 1.

Anomalies 2, 4 and 5 represent sub-circular bands of low resistance containing areas of approximately 10 m in diameter. A similar anomaly can be identified within mound B as feature 9 (illus 3). A slight bank visible on the surface appears to correspond to this anomaly. Rabbit burrowing here has exposed the presence of large stones and of midden material.

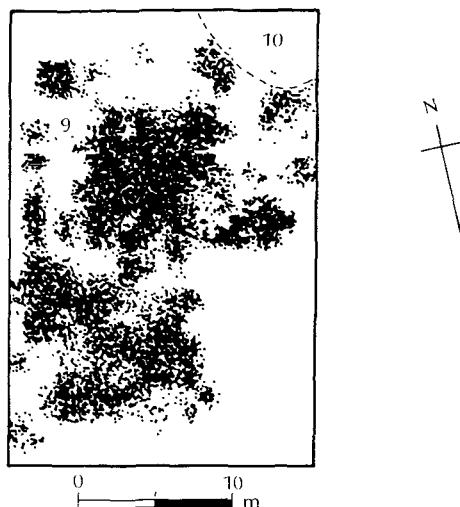
Anomalies 6 and 8 represent areas of high resistance which may indicate concentrations of stones; filtering within the data failed to produce any clear definition of these features. Anomaly 8 appears as a low physical mound on the alignment of an east/west bank identified by J B Stevenson as a Treb Dyke.¹ The bank appears as a weak anomaly to the west of 8 only; the lack of contrast to the east is probably due to recent ploughing which has levelled the monument. Anomaly 7 is a high



ILLUS 2 Mound A: dot-density plot of the 1984 resistivity survey (range 100–300 ohm)

resistance band running north/south parallel to the modern fence line. It is probable that this is associated with modern land use.

Mound B, unlike mound A, appeared in contrast to its background because of the lack of contact resistance upon the area surrounding the mound. Recent ploughing has resulted in a loosely consolidated sandy soil and only the archaeological material of the mound produced a resistance value. The sub-circular feature 9 has been referred to above, with reference to anomalies 2, 4 and 5. Anomaly 10 represents the edge of the main mound to the north of B. This appears as a low resistance feature due to moisture retention in the soil of the mound which, where exposed, appears to be derived from midden.



ILLUS 3 Mound B: dot density plot of the 1984 resistivity survey (range 500–1000 ohm)

The partially exposed structure (*illus 4*) appears to have a double-faced stone-lined wall varying in width from 1 m to over 2.5 m. Rabbit burrowing has severely damaged the site and exposed wall core in many places which appears to be composed of a mixture of stone, sand and midden.

The low resistance anomalies, 2, 4, 5 and 9 are likely to represent midden material whether retained as wall core within a structure or as banks possibly containing structures. A midden-derived soil appears to retain moisture and is seen in contrast with the surrounding sandy soils as a low resistivity anomaly. It is possible that such a low resistance anomaly may mask the presence of large stones such as those present in the slight bank represented by anomaly 9. An increase of drainage caused by the greater elevation of the exposed structure anomaly 1 appears to produce a high resistance anomaly for the wall core.

CONCLUSION

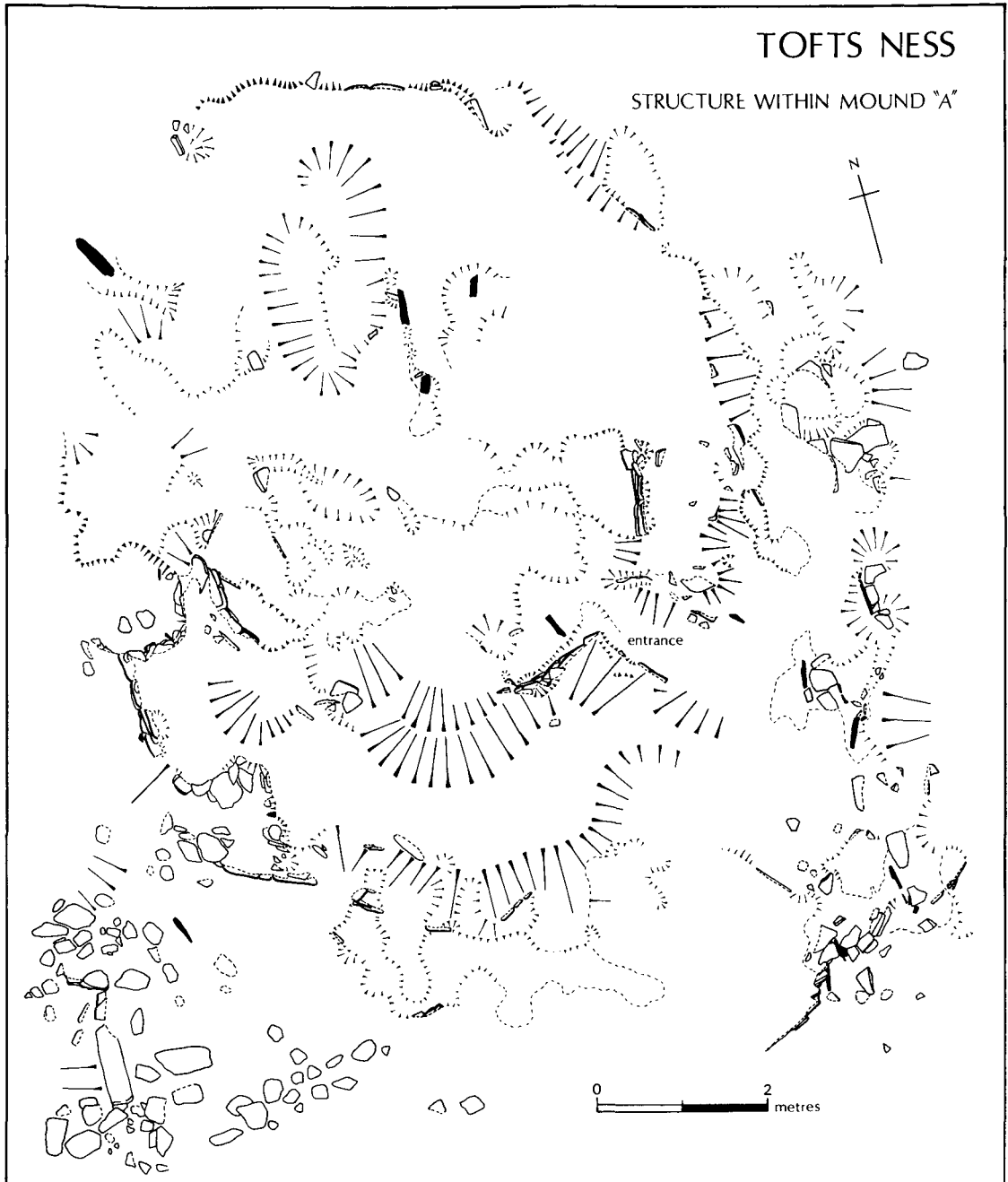
Without excavation, comment cannot be made on the archaeological context and date of these features; however, resistivity survey has identified a number of anomalies apparently associated with structures within the two sites examined, which are not visible in the physical appearance of the mounds.

NOTE

- 1 Tofts Ness field survey, by J B Stevenson, RCAMS; unpublished.

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ILLUS 4 Structure within mound A

REFERENCE

Dockrill, S J 1984 'A resistivity survey at Tofts Ness, Sanday', *Proc Soc Antiq Scot*, 114 (1984), 586-88.