Rep. Lundy Field Soc. 43

GEOPHYSICAL SURVEYS OF ARTEFACT CONCENTRATIONS SOUTH OF QUARTER WALL

By

C. J. Webster

Somerset County Council, Department for the Environment, County Hall, Taunton, Somerset TA1 4DY.

INTRODUCTION

This report presents the results of the geophysical prospection carried out as part of a large-scale survey of the artefact scatters in the, until recently, cultivated parts of Lundy to the south of Quarter Wall. The primary technique used has been test-pit excavation and the results of this have been reported in previous Annual Reports (Schofield 1988, Schofield and Webster 1989, 1990). This work has identified artefact concentrations from three main periods: the mesolithic, the bronze age and the sixteenth-seventeeth centuries AD. Geophysical techniques have been applied to these concentrations in an attempt to provide information on the process that is producing the artefact scatters. In addition a large-scale survey has been undertaken to measure the soil magnetic susceptibility in an attempt to locate and define occupation that may not be producing artefact concentrations.

The results of the first year's work have already been reported (Webster and Schofield 1988) but subsequently the work was carried out in different seasons on different sites and it is only with the completion of the fieldwork that all the results from each site can be presented together. In addition it is now clear from geological mapping that many of the anomalies detected in the survey have been caused by intrusive dykes.

TECHNIQUES

Two techniques have been used in the survey of the individual artefact scatters. Details of the methods were given previously (Schofield 1988) and a full account can be found in Clark (1990). Briefly, resistivity survey measures the electrical resistance of the soil. The main determinant of this is soil-water content and high resistance readings indicate drier conditions and are typical of walls and other 'hard' features. Low readings are caused by buried ditches, pits and similar features which tend to collect water. Soil depth has an important background effect.

Magnetic survey uses a sensitive meter to measure variations in the earth's magnetic field caused by buried features. The meter samples the field just above the soil and also at a fixed height above it. Using the difference between these two readings eliminates large-scale changes in the magnetic field (see Roberts, 1991, for a discussion of these regional effects).

The third technique used was the measurement of soil magnetic susceptibility. This provides a measure of how easily iron compounds in the soil can be magnetised. Chemical changes in the soil caused by human activity (such as decaying refuse in pits or compaction of the soil by trampling) can enhance the susceptibility. The technique was used to sample the entire area that had been test-pitted.

EQUIPMENT

A Geoscan RM4 resistance meter was used in a twin-probe configuration with probe spacing of 0.5m. Readings were taken on a grid at 1m intervals and recorded automatically. The magnetic survey was undertaken using a Philpot DM02 fluxgate gradiometer with traverses at 1m spacing and readings recorded automatically at 0.25m along each traverse. A Bartington Instruments MS2 susceptibility meter was used with a MS2D field coil to take readings at 10m intervals on the National Grid. These were recorded manually.

GEOLOGICAL CONSIDERATIONS

Recent work by Roberts (1991 and pers comm) has mapped the locations of the intrusive dykes in the geology of the island, using their magnetic properties and this has confirmed the geological origin of many of the anomalies located during the archaeological survey. The dykes have affected not just the magnetic work but also appear to have produced resistance anomalies in some cases. In places areas of low resistance can be seen to follow the course of a dyke mapped magnetically. This can be explained by three factors. The dolerite forming the dyke will be preferentially eroded and form a deeper soil and as this line of deeper soil runs downhill it may form a subterranean water-course. Both these factors will increase the soil-water content and lead to lower resistance. The soil formed from the dyke will also be less sandy, with more clay minerals, which will again lower the resistivity. Not all possible dykes have been mapped by the geological work and some weaker magnetic dykes may well only be revealed by the more sensitive instrument used for the archaeological survey.

SURVEY AREAS

Six areas have now been surveyed in detail (Fig. 1).

Area A lies around a large scatter of post-medieval pottery in the west of Brick Field. This was subjected to magnetic and resistivity survey in 1988 (Schofield 1988) and the resistivity measurements were repeated in 1990 (below).

Area B lies around a flint scatter of mesolithic character on the top of the cliff to the east of area A and was surveyed magnetically in 1988 (Schofield 1988, Fig. 6). This indicated a massive anomaly which is now seen to be caused by the most magnetic dyke located by the geological mapping (Roberts pers. comm). The smaller curving anomaly is also caused by part of this structure.

Area C lies around the spring on the east side of Tillage Field in one of the areas called Newtown in the eighteenth and nineteenth centuries (Langham 1990). This was surveyed magnetically in 1988 (Schofield 1988. Fig. 7) and by resistivity in 1991 (below).

Area D lies at the north end of Airfield and had not previously been surveyed. It lay around a concentration of flints of bronze-age type. Magnetic and resistivity surveys were undertaken in 1991.

Areas E lies to the south of this where a large, diffuse spread of post-medieval pottery had been located. Resistivity in 1990 and magnetic survey in 1991 covered the area at the north of the spread where the concentrations were highest.

The long-known site of Bull's Paradise was also surveyed, using resistivity, as a separate exercise. In the light of the geological information it is possible that some of the large low resistance anomalies detected (A and possibly B and E in Webster 1991, Fig. 1) are caused by underlying dykes. The geological survey work has not yet confirmed this and their alignments are still consistent with other field boundaries known in the area. The presence of anomalies running at right-angles to the trend of the dyke-swarm which appear to link A and B also argues for anthropogenic origin. If anomaly A follows the line of quarrying then both interpretations may be correct.

AREA A (fig 2)

This area covered a concentration of post-medieval pottery and, based on the interpretation of the previous geophysical survey, it is suggested that a small settlement lay next to the main island track which appears to have run further to the east at this time. As the nature and scale of the post-medieval settlement of Lundy is poorly known this site was thought to merit further investigation. A slightly larger area was surveyed using the resistivity meter in the hope that a survey in the late summer would yeald clearer results. In the event the results were less clear than previously although the main features were still evident. A large anomaly (A in Scholfield 1988) crossed the area from north to south which may represent the line of the former track. Test-pit results indicate that this line forms the eastern edge of the concentration of pottery. To the east is an

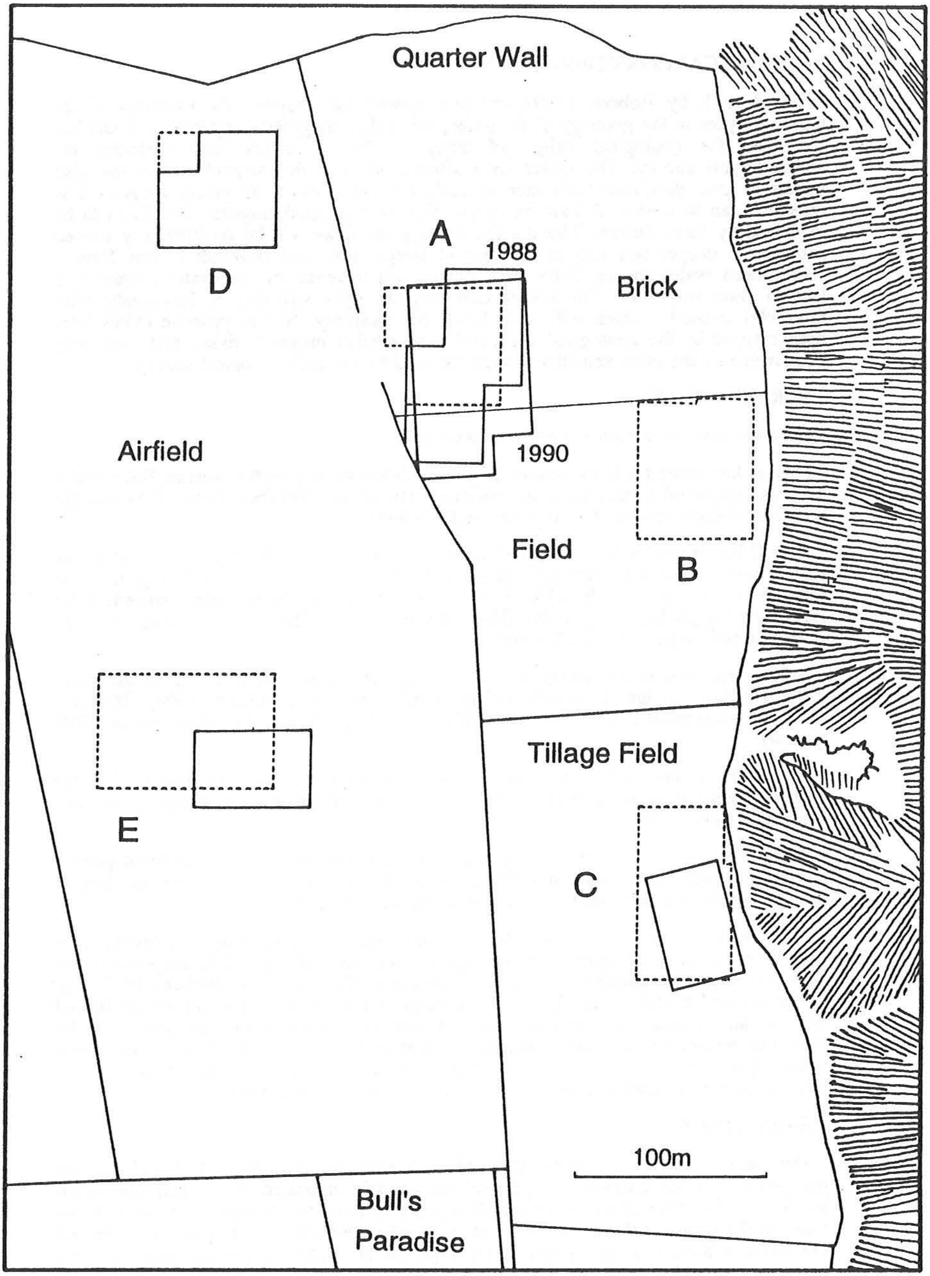

Fig. 1: Locations of survey areas. Resistance survey is indicated by a solid line, magnetometer survey areas by a broken line.

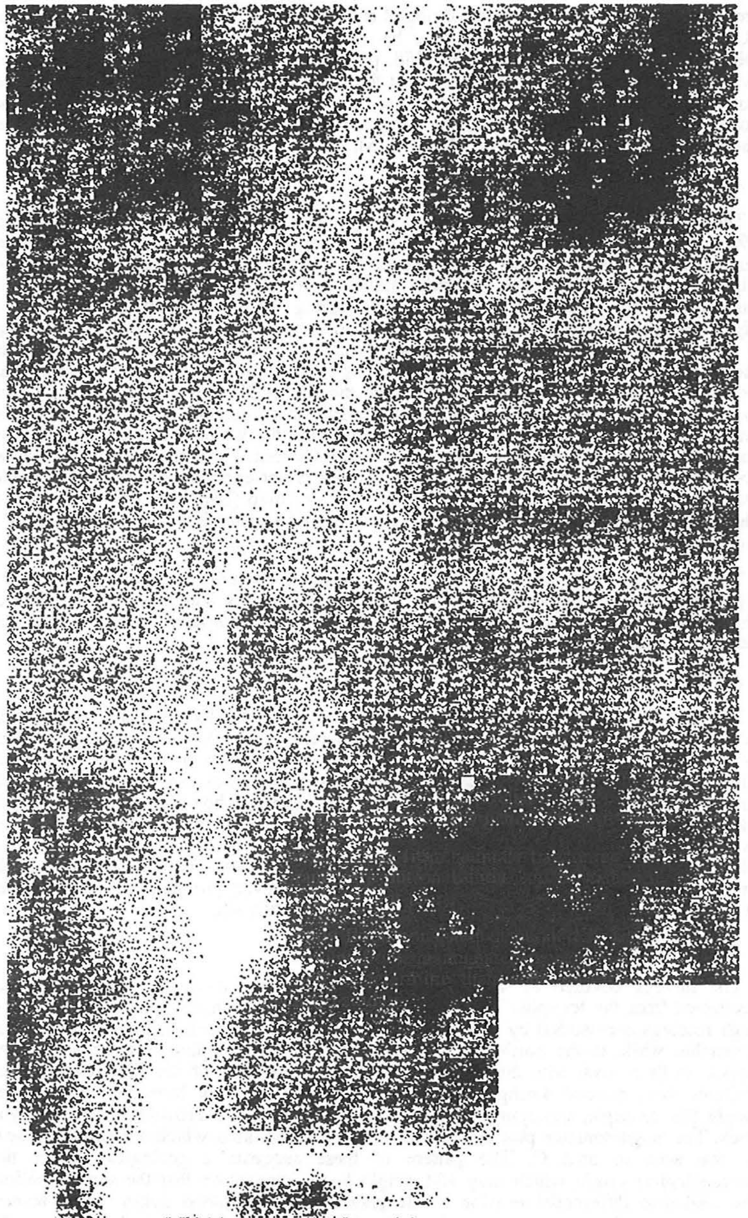

Fig. 2: Resistance survey of area A.

area that may indicate some form of ridged cultivation (E). The low-resistance anomalies B, C and D from 1988 were less clear but there was some evidence that B and C are joined. The other features noted in 1988, particularly the curving feature F, were less evident. One new feature was observed at the southern end of the survey where one, or possibly two, low resistance anomalies can be seen running to the east. It is likely that none of these features relate to the presence of dykes as the magnetometer survey showed no anomalies (Schofield 1988, Fig. 5).

AREA C (fig. 3).

The survey of this area was intended to complement the magnetic survey carried out in 1988 which indicated an anomaly running towards the settlement, known from documents as Newtown, near the spring on the cliff-top (Webster and Schofield 1988, Fig. 7, Langham 1990). The resistivity survey again shows a (low resistance) feature running from the north-west to the site of the spring. To the south of this is an area of high resistance, which appears to be surrounded by a sub-square band of low readings. If the low resistance anomalies are caused by ditches and the high resistance by rubble, the plot could be showing a collapsed building in the northern corner of a yard. There are some difficulties in reconciling this with the site of Newtown as depicted on early maps (Langham 1990, figs 1-5). These are mostly in agreement in showing a building within an enclosure (and at the north-east corner) but the walls of this are aligned more east-west than the geophysical anomalies. It should be noted that the edges of the survey were not aligned north-south (see Fig. 1) but this is not enough to bring the anomalies into east-west alignment. The 1820 Ordnance Survey map (Langham 1990, Fig. 2) does show a diagonal wall to the north of Newtown but in general the field pattern runs at right angles to the cliff top.

The geological work has indicated that the magnetic anomaly is certainly caused by a dyke which is also followed by the low resistance anomalies. The other features seen on the resistivity survey are less obviously associated with geological structures and may relate to the site of Newtown cottages.

AREA D (fig. 4)

The tight focus of the scatter of bronze-age material at this location had suggested the possibility of a habitation site with possible structures, as are known from the north end of the island. In the event the resistivity survey revealed no features of definite archaeological origin. Several linear (low resistance) anomalies can be seen crossing the area which converge and cross to the south. It is believed, however, that these may be caused by the waterlogged sheep paths noticed during the survey. To the north east there is an area of high resistance which may have structural or geological origins. The centre of the concentration of flintwork lies in this area, some 10m in from the corner of the survey. The magnetometer survey (not illustrated), however, produced no anomalies and this may suggest that there is no structural evidence at this site.

AREA E (figs 5 and 6)

The surveys covered an area where quantities of post-medieval pottery had been recovered from the test-pits. The resistivity results show a complex picture of an area of high readings surrounded by low areas. To the south there appear to be two curving low anomalies while to the north-east a straight band of high readings can be seen. These appear to tie in well with the surface conditions of this area of the field where several hollows were noticed during the survey. These hollows may have an archaeological origin (for example, quarrying) or they may be related to the erosion of the underlying rock. The magnetometer plot also shows features in this area which are similar in scale to that seen in area C. The pattern of these suggests a geological, rather than archaeological origin which may add weight to the suggestion that the surface hollows are related to differential erosion of the granite and/or intruded dykes. These features have not been located by the geological mapping work but may well be too weakly magnetic to be detected with certainty by the techniques employed. If the geological origin is correct then the patterns of archaeological material spreading to the south are yet to be explained.

MAGNETIC SUSCEPTIBILITY SURVEY (fig. 7)

The extension of magnetic susceptibility survey to cover the Airfield and Lighthouse Field has not led to a great number of new discoveries. In contrast to Brick and Tillage Fields the picture is more uniform which may relate to the smaller amount of recent cultivation in these fields. Several features are evident, however. The area of very high (up to 167 SI units) readings, noticed in 1988, crossing Brick Field can be seen to continue and is related to a large dyke crossing the island (also seen in the magnetic survey of area B and located by the geological work). The feature is discontinuous with a distinct jump to the north at its western end. Further to the south another linear area of high susceptibility can be seen. This is also aligned along the trend of the dyke swarm but has not been detected in the geological mapping. A less consistent line of high readings running roughly parallel to the western wall of the Airfield follows the line of a dyke which continues under the church.

Another, similar but less pronounced, anomaly in the northeast corner of Lighthouse Field, seems to continue the line of the 'quarry' recorded in Bulls Paradise (Gardner 1961) and the low resistance anomaly recorded in 1990 (Webster 1991). This may argue for a geological origin for both features although possibly augmented by quarrying.

Although it is confused by the presence of the large east-west dyke there is an area of significant enhancement over the site in area A which may have an anthropogenic origin. The highest readings were recorded in the area of highest pottery concentration and this may suggest that this area was a rubbish dump. Otherwise only in the area of Newtown (area C) is there any correlation between the archaeological evidence, as obtained from test-pitting, and the magnetic susceptibility results, although there are several areas of higher susceptibility that do not seem to be related to geological structures.

CONCLUSIONS

The magnetic survey has indicated only geological effects and it is likely that, on Lundy, it is of limited use. The survey conducted around the castle by the Ancient Monuments Laboratory (Bartlett 1980) certainly indicated this and the geological mapping has indicated that the magnetic picture on the shale at the south of the island is complex. It has also shown, however, that the granite areas between intrusive dykes are magnetically quiet (Roberts pers comm). It is possible that archaeological survey may be possible in these regions.

The resistivity survey has also been complicated by the presence of geological effects producing anomalies that can be misinterpreted. If these geological effects can be isolated the technique appears to be producing consistent results enabling some interpretation of structural remains to be made. Excavation would be required to evaluate the significance of the anomalies detected and would increase the interpretive power of the technique.

The magnetic susceptibility survey has again been complicated by geology which has been spread in the topsoil by ploughing and produced a blurred reflection of the dykes below. Some enhancements caused by human activity have been detected on Lundy and the technique has proved valuable in other, less magnetic places. It might prove useful to carry out surveys across known sites in the north of the island to further investigate the interactions of the geological and anthropogenic effects.

ACKNOWLEDGEMENTS

The geophysical surveys formed part of a project initiated by John Schofield to study the buried archaeology of the southern end of Lundy. The work was carried out by students and ex-students from the University of Southampton who gave up their free time to participate. The equipment was loaned by the University. The work was funded by the British Academy, the Royal Archaeological Institute, the Prehistoric Society and the Lundy Field Society. The Landmark Trust generously waived the accommodation and travel charges for the 1990 season. Special thanks are due to the people of Lundy for making our stays so enjoyable and for lending a soldering iron in our hour of need.

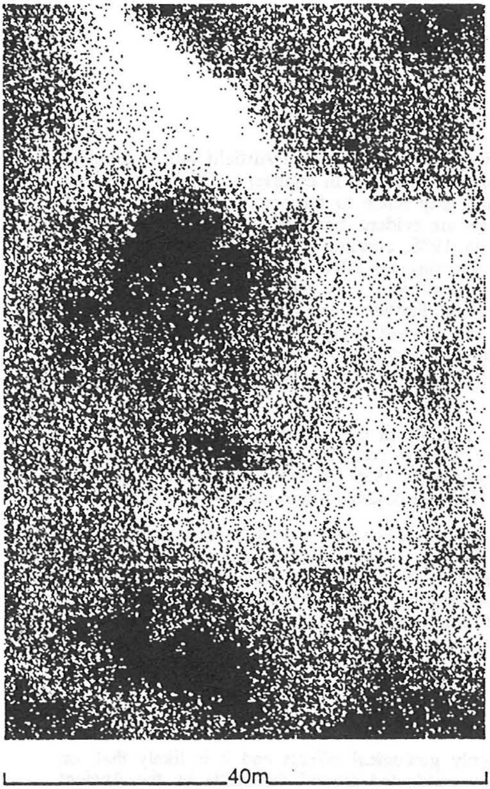

Fig. 3 : Resistance survey of area C.

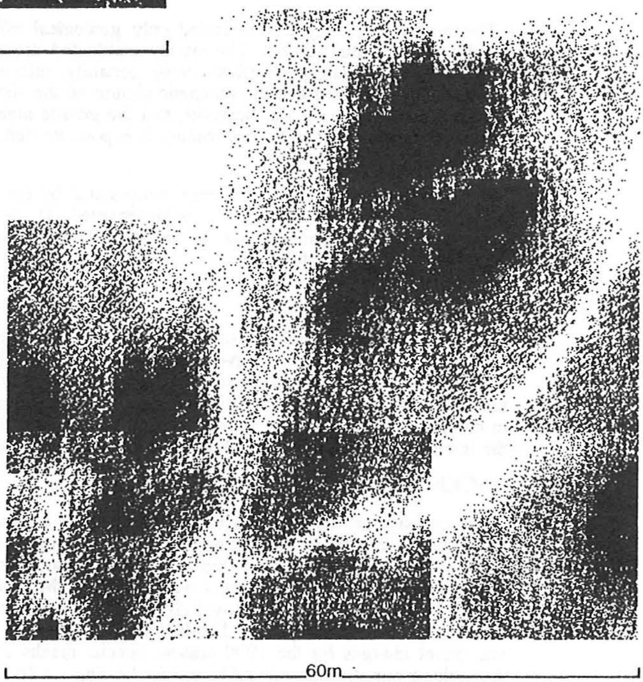

Fig. 4: Resistance survey of area D.

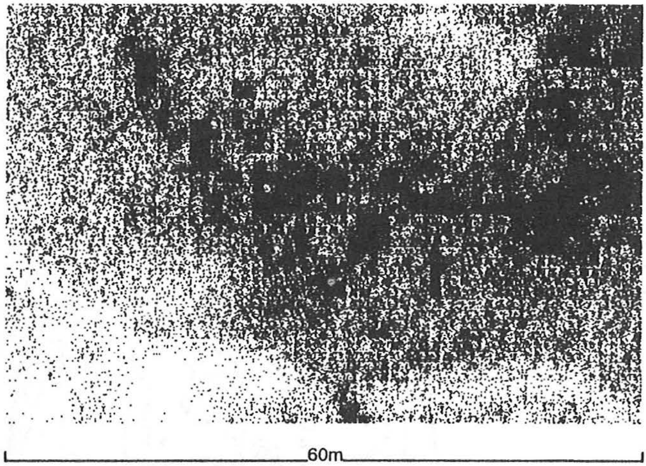

Fig. 5 : Resistance survey of area E.

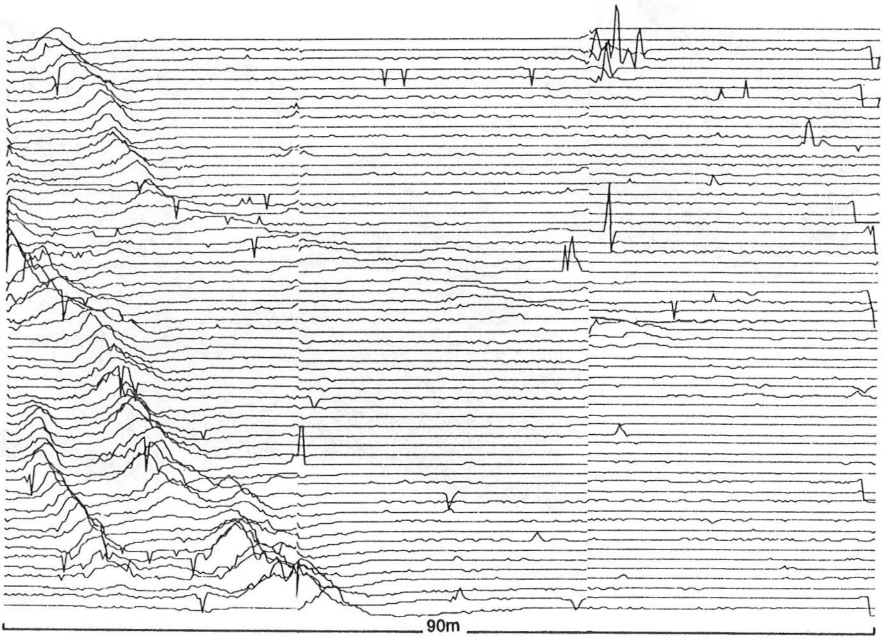

Fig. 6: Magnetometer survey of area E.

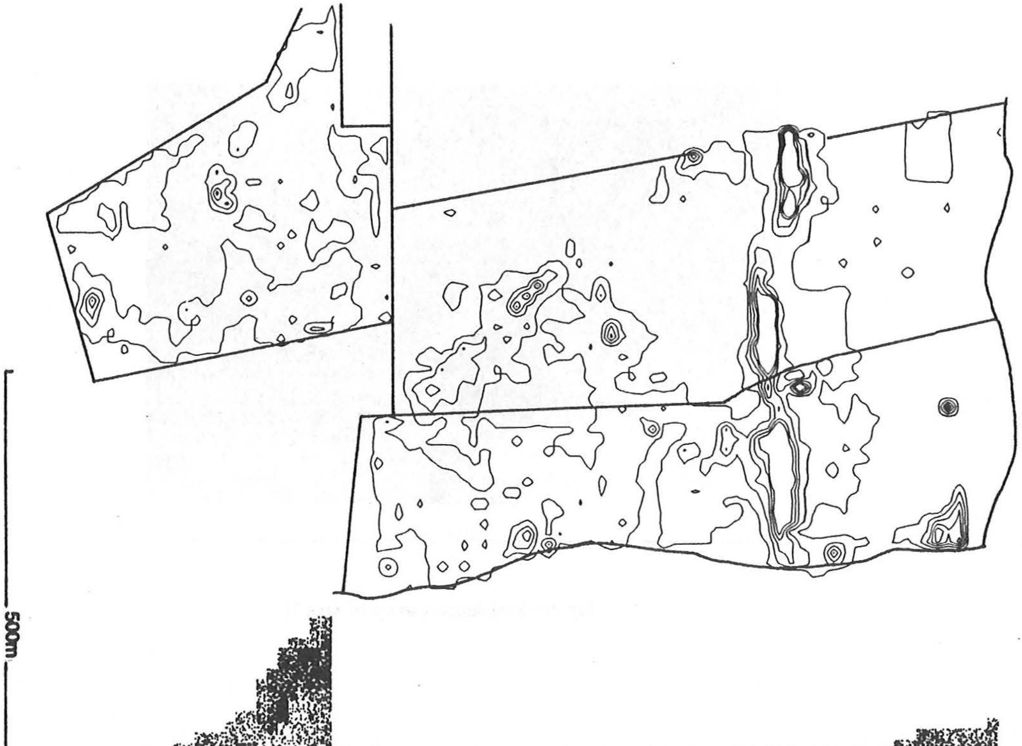

Fig. 7 : Magnetic susceptibility survey. Contour intervals 10, 20, 30, 50 SI units.

REFERENCES

Bartlett, A., 1980. *Report of Geophysical Survey on Lundy Island.* Ancient Monuments Laboratory Report 20/78. DoE.

Clark, A. J., 1990. *Seeing beneath the soil.* Batsford.

Gardner, K. S., 1961. Preliminary report on archaeological investigations in the Bulls Paradise, Lundy 1961. *Annual Report of the Lundy Field Society* 14, 22-26.

Langham, A.F. 1990. Newtown, Lundy: A lost Georgian settlement. *Annual Report of the Lundy Field Society* 41, 55-64.

Roberts, C.L., 1991. Magnetic considerations of the volcanic dykes on Lundy Island. *Annual Report of the Lundy Field Society* 42, 34-41.

Schofield, A.J., 1988. Archaeological Fieldwork 1988: the results of test-pit excavations and geophysical prospection south of Quarter Wall. *Annual Report of the Lundy Field Society* 39, 31-45.

Schofield, A.J. and Webster, C.J., 1989. Archaeological Fieldwork 1989: further test-pit excavations south of Quarter Wall. *Annual Report of the Lundy Field Society* 40, 34-47.

Schofield, A.J. and Webster, C.J., 1990. Archaeological Fieldwork 1990: further investigations of artefact concentrations south of Quarter Wall. *Annual Report of the Lundy Field Society* 41, 34-52.

Webster, C.J., 1991. A geophysical survey of the archaeology of Bull's Paradise. *Annual Report of the Lundy Field Society* 42, 66-69.

Webster, C.J. and Schofield, A.J., 1988. Geophysical prospection in Schofield 1988.