Geophysical Surveys of Bradford
Geophysical Surveys of Bradford
Geophysical Surveys of Bradford
Geophysical Surveys of Bradford
Geophysical Surveys of Bradford
Geophysical Surveys of Bradford
Geophysical Surveys of Bradford
Geophysical Surveys of Bradford
Geophysical Surveys of Bradford
Geophysical Surveys of Bradford
Geophysical Surveys of Bradford
Geophysical Surveys of Bradford
Geophysical Surveys of Bradford
Geophysical Surveys of Bradford
Geophysical Surveys of Bradford
Geophysical Surveys of Bradford
Geophysical Surveys of Bradford
Geophysical Surveys of Bradford
Geophysical Surveys of Bradford
Geophysical Surveys of Bradford
Geophysical Surveys of Bradford
Geophysical Surveys of Bradford
Geophysical Surveys of Bradford
Geophysical Surveys of Bradford
Geophysical Surveys of Bradford
Geophysical Surveys of Bradford
Geophysical Surveys of Bradford
Geophysical Surveys of Bradford
Geophysical Surveys of Bradford
Geophysical Surveys of Bradford
Geophysical Surveys of Bradford
Geophysical Surveys of Bradford
Geophysical Surveys of Bradford
Geophysical Surveys of Bradford
Geophysical Surveys of Bradford
Geophysical Surveys of Bradford
Geophysical Surveys of Bradford
Geophysical Surveys of Bradford
Geophysical Surveys of Bradford
Geophysical Surveys of Bradford
Geophysical Surveys of Bradford
Geophysical Surveys of Bradford
Geophysical Surveys of Bradford

The Old Sunday School,
Kipping Lane,
Thornton,
Bradford,
BD13 3EL.
Tel: (01274) 835016
Fax: (01274) 830212

REPORT ON GEOPHYISCAL SURVEY

New Farm
South Warnborough

Report number 95/34

Work commissioned by :

Hampshire
COUNTY COUNCIL

SITE SUMMARY SHEET #

95 / 34 New Farm, South Warnborough

NGR: SU 725 458

Location, topography, and geology

The village of South Warnborough lies approximately 6 km due south of Junction 5 of the M3 motorway and 8 km south-east of Basingstoke, Hampshire. New Farm is situated approximately 1 km south of South Warnborough and 1 km due east of the B3349 road. The field under investigation is under permanent pasture and the ground slopes downhill to the south. There is a small quarry, now disused, in the middle of the field. The soil consists of clay with flints and overlies chalk.

Archaeology

A heavy scatter of Roman tile fragments (tegulae, imbrices and flue tiles) and red brick tesserae are recorded as having been brought to the surface by past ploughing of the site in the 1950s and 60s. Today, a slight rise is visible on the ground that is suggestive of a building platform. Additionally, in the northern face of the quarry wall foundations and floor surfaces, possibly associated with a small building, are visible.

Aims of Survey

The geophysical survey at New Farm forms part of a joint investigation with the **Royal Commission on the Historical Monuments of England (RCHME)** into a series of potential villa sites for **Hampshire County Council (HCC).**

Summary of Results

The gradiometer survey located two or three discrete areas of magnetic noise and a few other anomalies of potential archaeological interest. The resistance survey, which was initially targeted on the main area of magnetic noise, identified a very clear plan of a villa building, and when the survey was expanded several other archaeological features were also observed. The results indicate a multi-celled building measuring approximately 38m x 18m with a room, possibly apsidal in shape, attached to the western side.

Background information supplied by **RCHME.**

SURVEY RESULTS

95 / 34 New Farm, South Warnborough

1. Survey Area

1.1 The gradiometer survey covered an area of approximately 1.8 ha and the resistance survey approximately 1.6 ha; their respective locations are shown in Figure 1 at a scale of 1:2000.

1.2 The survey grids were set out by **Geophysical Surveys of Bradford** and tied in by **RCHME** staff.

2. Display

2.1 The results are displayed in a variety of display formats that are discussed in the *Technical Information* section at the end of the text.

2.2 Figure 2 shows the gradiometer data displayed as XY traces and Figure 3 the resistance data as a grey-scale image, both at a scale of 1:1000. A summary interpretation of both data sets is included in Figure 4, also at a scale of 1:1000.

2.3 Archive data plots and interpretation diagrams, all at a scale of 1:625, are included for both the magnetic and resistance results in Figures 5 to 11. Figure 10 shows a variety of plots of the resistance data displayed at no particular scale.

2.4 Letters and numbers in parentheses in the text that follows refer to labels on the interpretation diagrams (Figures 8 and 11).

3. General Considerations - Complicating Factors

3.1 In general, survey conditions were good, the ground being largely flat and under short grass. Modern fencelines surrounding the quarry hampered survey in the central area of the field, but fortunately these have not affected the results too greatly.

3.2 There are numerous iron spikes visible in the gradiometer data (see Figures 2, 5 and 6). These are invariably associated with modern ferrous material, such as horseshoes or other miscellaneous iron objects, scattered in the topsoil. However, given the context of the present survey, a Roman villa site, it is possible that some or even many of the anomalies reflect either ferrous archaeological artefacts or fired bricks and tiles. Unfortunately it is not possible to distinguish which, if any, might be significant.

4. Gradiometer results - Figures 2, 4, 5, 6, 7 and 8.

4.1 Entries in the National Monuments Record (NMR) suggested that two areas of the field might benefit from initial investigation. One reference indicating a possible building coincides with a slight platform (SU 72584583) to the north of the quarry and a second reference associated with a scatter of artefacts (SU 72574575) lies south-west of the quarry.

4.2 Scanning with the gradiometer indicated that the field was magnetically noisy, with several areas where there was a distinct increase in background noise. A particularly disturbed area coincided with the slight platform referred to above (Section 4.1). It was decided, therefore, to establish the detailed grids over this point and expand the survey grid outwards, towards the second reference area mentioned in Section 4.1.

4.3 The detailed gradiometer results confirmed the findings of the scanning. There is a major area of magnetically disturbed readings (A) that coincides with the postulated building platform. The erratic nature of the anomalies is due to the fired bricks, tile, and rubble material associated with the former villa building. The results are typical of those observed at other sites where the gradiometer responds to the general villa debris without necessarily identifying individual wall foundations (see for example Corney *et al.* 1995, and references therein).

4.4 Elsewhere, there are two other areas of magnetically noisy results (B) and (C) and while they are not as extensive as (A) the readings are suggestive of further possible buildings.

4.5 There are several large anomalies (D to K) which indicate the likely presence of substantial pits. Some (D, J and K) are particularly well defined and may be in the order of 5 metres, or more, in diameter. It is possible that some of the responses are associated with former quarry pits that were abandoned.

4.6 There is only one clearly defined length of ditch (L) but this has no particular shape and it is difficult to see if it relates to any other archaeological features. This apparent lack of ditches is interesting in that many villa sites that have been investigated geophysically outside Hampshire tend to have ditches, enclosures and field systems close to the buildings. Clearly a much larger area would need to be surveyed, together with other sites in the region, in order to better understand the wider significance of such results.

4.7 No particular anomalies of interest were found at the second point referred to in the NMR (see Section 4.1).

5. Resistance Results - Figures 4, 8, 9, 10 and 11

5.1 There is quite a broad range in the resistance data, from a minimum of around 8 ohms to maximum readings in the order of 45 ohms. The general variations are thought to reflect the changes in the depth of topsoil to the underlying bedrock, though individual high readings are due to wall foundations. The increase in resistance in the southern half of the field is thought to coincide with the more sloping ground in this part of the survey and may mark an area of former consolidation.

5.2 The clearest anomalies are the high resistance responses that coincide with the villa building (M). The main structure measures approximately 38 metres by 18 metres. There appear to be 9 or 10 rooms or corridors, with an apsidal shaped room (N), presumably a bath-house, attached to the western side of the building. It is interesting that the building is a complete structure; there are no walls extending southwards. However, some 4 metres away from the southern edge of the building, in the quarry edge, there are other wall foundations visible. The results, therefore, seem to indicate that most of the building relating to the quarried area must have been lost during extraction of the chalk.

5.3 Immediately west of the presumed bath-house are other anomalies (P) which appear to shadow the building, but they are on a slightly different alignment. It is possible that they represent a path outside the building.

5.4 There are two well-defined anomalies (Q and R) which would appear to be associated with former boundary walls, but whether they are connected with the villa is difficult to ascertain. The same problem with interpretation applies to the linear anomalies (S). These may represent wall foundations or possibly a path. Alternatively, they might be connected with stone capped drains or culverts.

5.5 Bounded to the north and west by the anomalies (S) is a broad sub-rectangular area of higher resistance anomalies (T), together with a small block of very high readings (U). The latter is probably associated with a small, perhaps 4 metres square building, sited in the north-east corner of a possible yard or area of compacted ground.

5.6 Interpretation of the high resistance readings at (V) is also perplexing. The anomalies suggest the presence of a large building, perhaps 20 metres by 10 metres in size, though the southern wall is not complete. There is a high resistance anomaly (W) which may link the building (V) with the wall (R).

5.7 To the south-east of the villa building is a small area of high resistance readings (X) which coincides with one of the areas of magnetic disturbance (C). Although no wall lines are visible, it is possible that the responses are associated with the remains of a small outbuilding.

5.8 The smoothed data plot (Figure 10) suggests that there may be another structure (Y) lying south-west of the villa building and it is possible to identify the same anomalies in the raw data. Although the evidence is tentative, the results indicate a possible structure measuring 13 metres by 10 metres.

5.9 Two low resistance anomalies (Z) coincide with two of the magnetic pit-like responses (D and K). The evidence supports an interpretation of the features as being large quarry scoops backfilled with rubbish or midden type deposits.

5.10 A low resistance linear anomaly (1) also coincides with the magnetic anomaly (L) and confirms the existence of a ditch-like feature.

5.11 There is a peculiar linear high resistance response (2) that may represent a former bank, field boundary or possible trackway. Clearly a much larger survey area would need to be surveyed in order to verify this interpretation.

5.12 There are two areas (3 and 4) in the southern half of the survey where the resistance readings are higher and there are suggestions of some of the responses being archaeological in origin. While this is possible, as already stated in Section 5.1 it is thought that these results are due to pedological variations. The smoothed data plot (Figure 11) tends to highlight these anomalies, yet the shaded relief plots indicate a more pock-marked effect that would support a view of small-scale ground disturbance, perhaps associated with past quarrying. A larger survey would be necessary in order to fully understand the significance of the results.

6. Conclusions

6.1 The geophysical survey has succeeded in pinpointing a structure that, given the artefactual evidence, can confidently be interpreted as being a villa building. In addition, there are several other possible buildings visible in the resistance data, though none of the results are as clear as those associated with the main structure. Several walls, drains, conduits or tracks have also been identified, though the interpretation of some of these remains speculative. Although the gradiometer, and in some cases the resistance survey, has identified numerous pit-like anomalies it is possible that these are associated with past quarrying activity, that may or may not be linked with the villa complex. The results suggest a lack of field systems or enclosures in the immediate vicinity of the villa.

References

Corney, M., Gaffney, C., & Gater, J., 1995 **Geophysical Surveys at the Charlton Villa, Wiltshire, England,** *Journal of Archaeological Prospection,* Volume 1, Number 2

Project co-ordinator:
J Gater

Project Assistants:
M Copley, N Nemcek, A Shields & C Stephens

Date survey commenced:
27th March 1995

Date of report:
24th May 1995

TECHNICAL INFORMATION

The following is a description of the equipment and display formats used in **GEOPHYSICAL SURVEYS OF BRADFORD** reports. It should be emphasised that whilst all of the display options are regularly used, the diagrams produced in the final reports are the most suitable to illustrate the data from each site. The choice of diagrams results from the experience and knowledge of the staff of **GEOPHYSICAL SURVEYS OF BRADFORD.**

All survey reports are prepared and submitted on the basis that whilst they are based on a thorough survey of the site, no responsibility is accepted for any errors or omissions.

Magnetic readings are logged at 0.5m intervals along one axis in 1m traverses giving 800 readings per 20m x 20m grid, unless otherwise stated. Resistance readings are logged at 1m intervals giving 400 readings per 20m x 20m grid. The data are then transferred to portable computers and stored on 3.5" floppy discs. Field plots are produced on a portable Hewlett Packard Thinkjet. Further processing is carried out back at base on computers linked to appropriate printers and plotters.

Instrumentation

(a) Fluxgate Gradiometer - Geoscan FM36

This instrument comprises of two fluxgates mounted vertically apart, at a distance of 500mm. The gradiometer is carried by hand, with the bottom sensor approximately 100-300mm from the ground surface. At each survey station, the difference in the magnetic field between the two fluxgates is conventionally measured in nanoTesla (nT) or gamma. The fluxgate gradiometer suppresses any diurnal or regional effects. Generally features up to one metre deep may be detected by this method.

(b) Resistance Meter - Geoscan RM4 or RM15

This measures the electrical resistance of the earth, using a system of four electrodes (two current and two potential.) Depending on the arrangement of these electrodes an exact measurement of a specific volume of earth may be acquired. This resistance value may then be used to calculate the earth resistivity. The "Twin Probe" arrangement involves the paring of electrodes (one current and one potential) with one pair remaining in a fixed position, whilst the other measures the resistance variations across a fixed grid. The resistance is measured in Ohms and the calculated resistivity is in Ohm-metres. The resistance method as used for area survey has a depth resolution of approximately 0.75m, although the nature of the overburden and underlying geology will cause variations in this generality. The technique can be adapted to sample greater depths of earth and can therefore be used to produce vertical "pseudo sections".

(c) Magnetic Susceptibility

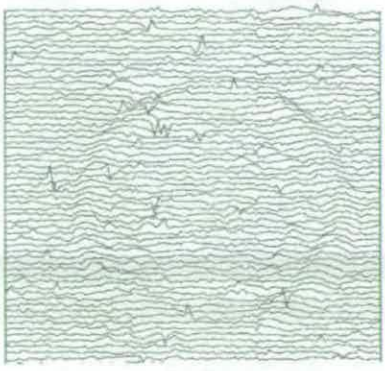
Variations in the magnetic susceptibility of subsoils and topsoils occur naturally, but greater enhanced susceptibility can also be a product of increased human/anthropogenic activity. This phenomenon of susceptibility enhancement can therefore be used to provide information about the "level of archaeological activity" associated with a site. It can also be used in a predictive manner to ascertain the suitability of a site for a magnetic survey. The instrument employed for measuring this phenomenon is either a field coil or a laboratory based susceptibility bridge. For the latter 50g soil samples are collected in the field.

Display Options

The following is a description of the display options used. Unless specifically mentioned in the text, it may be assumed that no filtering or smoothing has been used to enhance the data. For any particular report a limited number of display modes may be used.

(a) Dot-Density

In this display, minimum and maximum cut-off levels are chosen. Any value that is below the minimum cut-off value will appear white, whilst any value above the maximum cut-off value will appear black. Any value that lies between these two cut-off levels will have a specified number of dots depending on the relative position between the two levels. The focus of the display may be changed using different levels and a contrast factor (C.F.). Usually the C.F. = 1, producing a linear scale between the cut-off levels. Assessing a lower than normal reading involves the use of an inverse plot, This plot simply reverses the minimum and maximum values, resulting in the lower values being presented by more dots. In either representation, each reading is allocated a unique area dependent on its position on the survey grid, within which numbers of dots are randomly placed. The main limitation of this display method is that multiple plots have to be produced in order to view the whole range of the data. It is also difficult to gauge the true strength of any anomaly without looking at the raw data values. This display is much favoured for producing plans of sites, where positioning of the anomalies and features is important.



(b) X-Y Plot

This involves a line representation of the data. Each successive row of data is equally incremented in the Y axis, to produce a stacked profile effect. This display may incorporate a hidden-line removal algorithm, which blocks out lines behind the major peaks and can aid interpretation. Advantages of this type of display are that it allows the full range of the data to be viewed and shows the shape of the indiviual anomalies. Results are produced on a flatbed plotter.

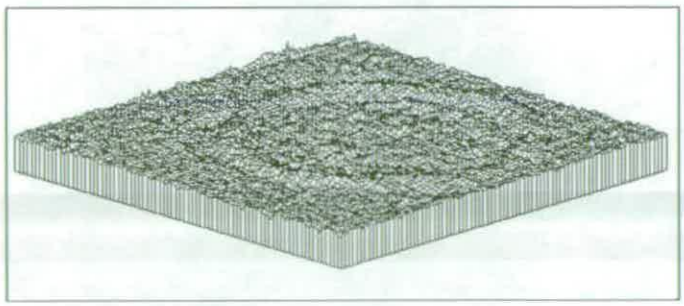
(c) Grey-Scale

This format divides a given range of readings into a set number of classes. These classes have a predefined arrangement of dots or shade of grey, the intensity increasing with value. This gives an appearance of a toned or grey scale.

Similar plots can be produced in colour, either using a wide range of colours or by selecting two or three colours to represent positive and negative values. While colour plots can look impressive and can be used to highlight certain anomalies, grey-scales tend to be more informative.

(d) Contour

This display format is commonly used in cartographic displays. Data points of equal value are joined by a contour line. Closely packed contours indicate a sharp gradient. The contours therefore highlight an anomalous region. The range of contours and contour interval are selected manually and the display is then generated on the computer screen or plotted directly on a flat bed plotter / inkjet printer.



(e) 3-D Mesh

This display joins the data values in both the X and Y axis. The display may be changed by altering the horizontal viewing angle and the angle above the plane. The output may be either colour or black and white. A hidden line option is occasionally used (see (b) above).

GEOPHYSICAL SURVEYS OF BRADFORD

PROJECT: NEW FARM VILLA, HAMPSHIRE

TITLE: Location of Survey Areas

Based on a plan provided by RCHME

Gradiometer Survey

Resistance Survey

0 metres 50

Figure 1

New Farm, South Warnborough

Gradiometer Survey

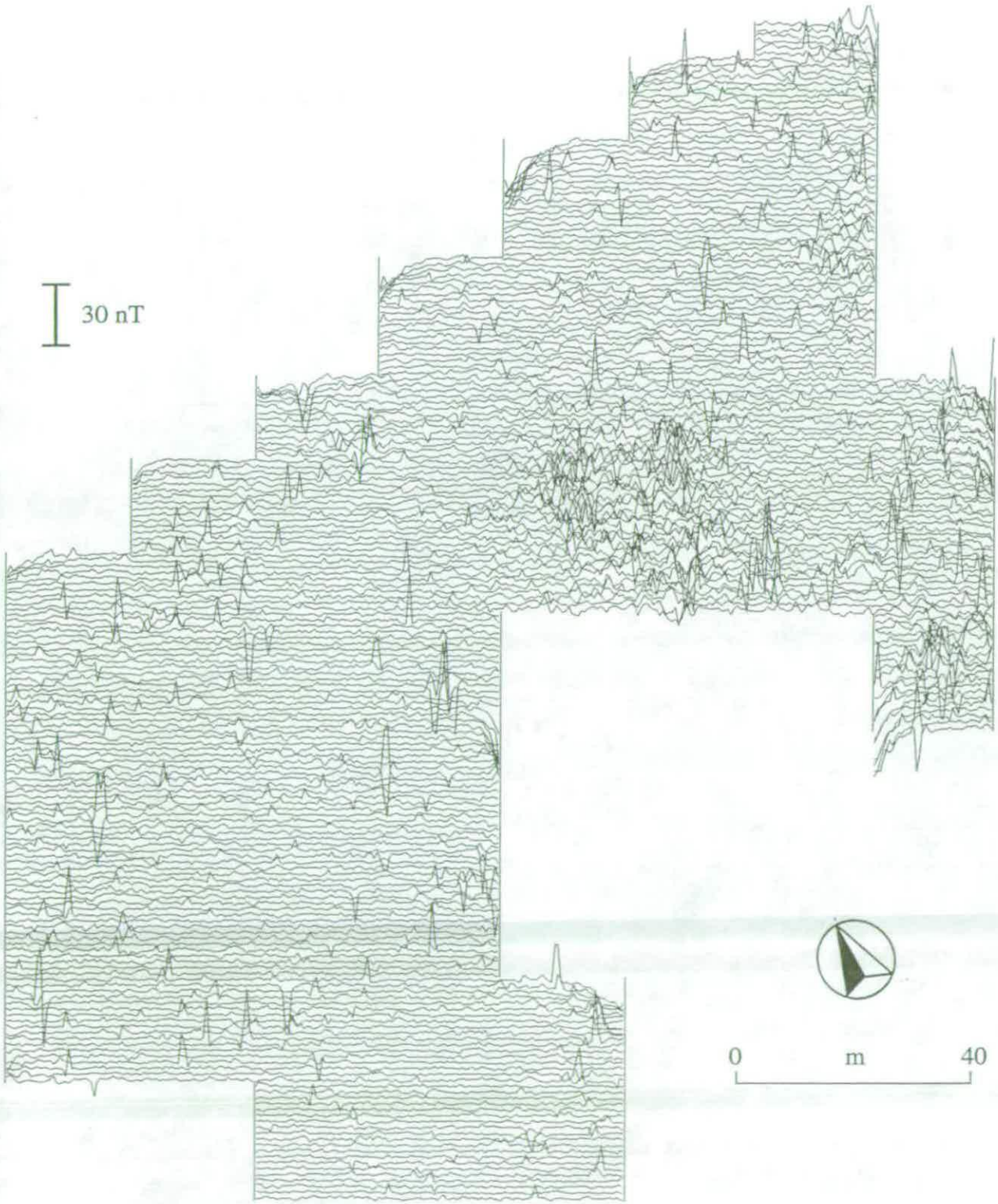
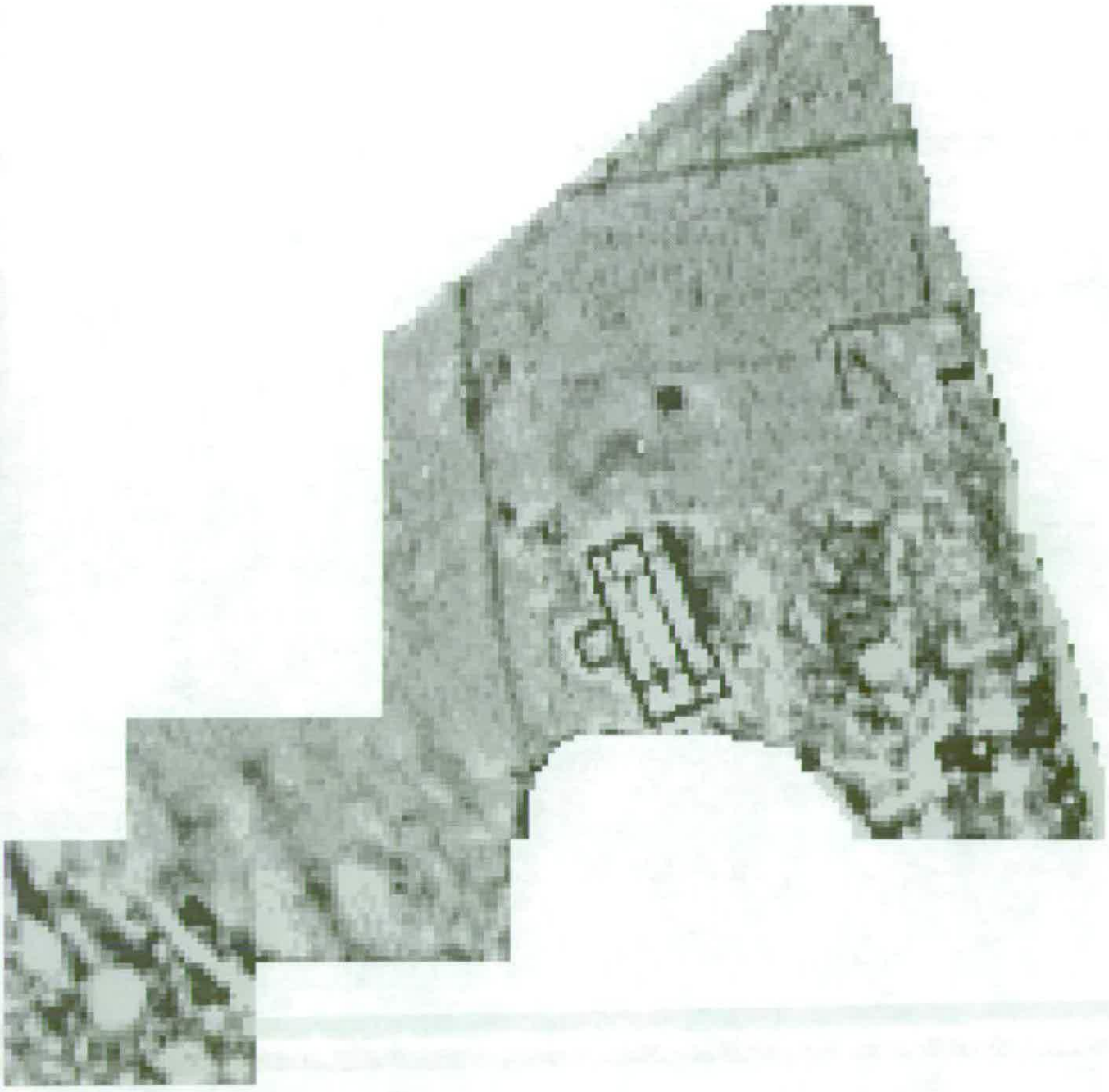


Figure 2

New Farm, South Warnborough

Resistance survey
Smoothed data: Box filter = 10



0 m 40

Figure 3

GEOPHYSICAL SURVEYS OF BRADFORD

PROJECT: NEW FARM VILLA, HAMPSHIRE

TITLE: Summary Interpretation

Based on a plan provided by RCHME

Area of Increased Magnetic Response - ?Archaeology

Magnetic Anomaly - ?Archaeology

Magnetic Anomaly - ??Archaeology

High Resistance - Villa Building

High Resistance - ?Wall/Bank/Track

Area of Higher Resistance - ?Archaeology

Low Resistance - ?Ditch/Pit

Figure 4

New Farm, South Warnborough
Gradiometer Data

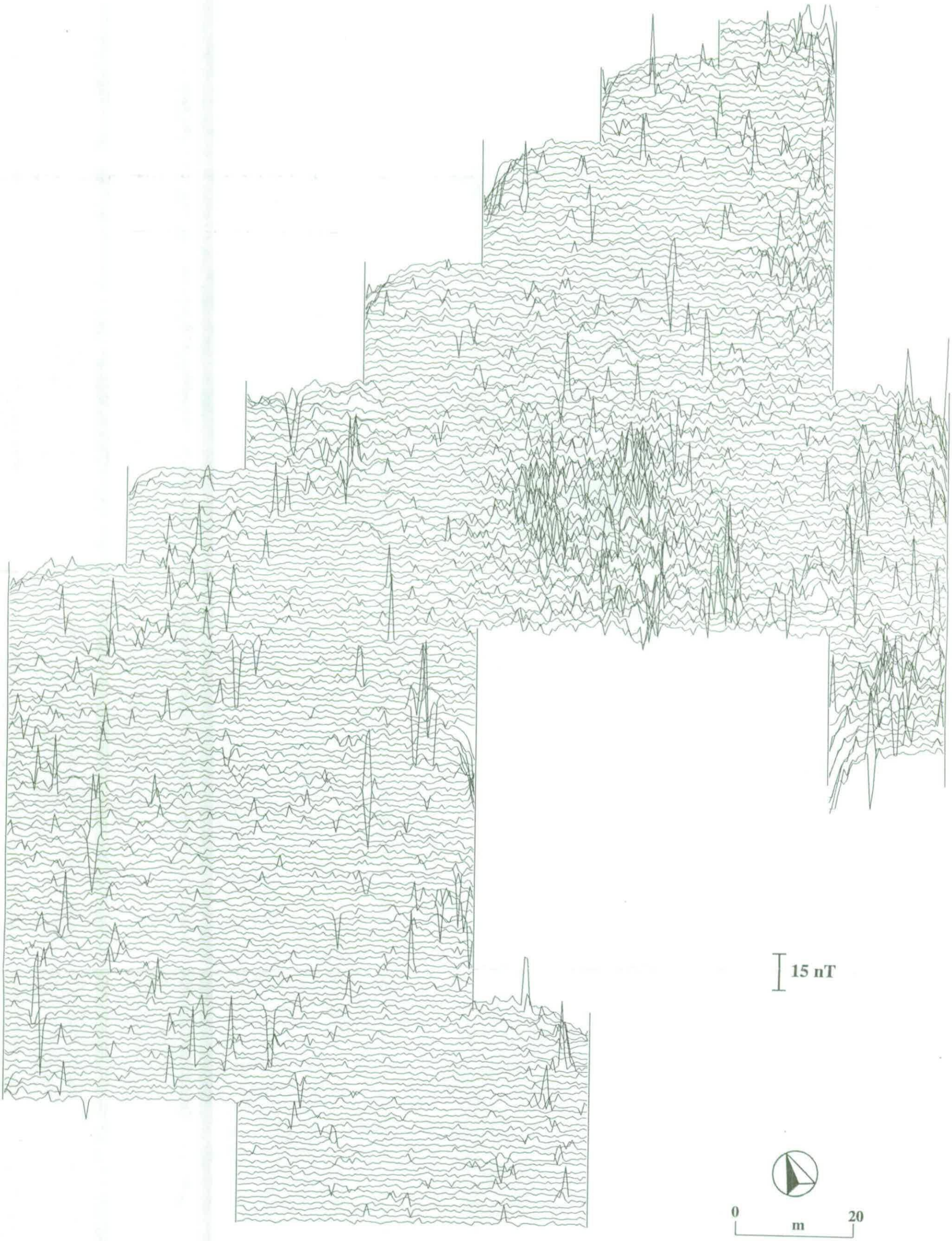


Figure 5

New Farm, South Warnborough
Gradiometer Data

Figure 6

New Farm, South Warnborough
Gradiometer Data

Figure 7

GEOPHYSICAL SURVEYS OF BRADFORD

PROJECT: NEW FARM VILLA, HAMPSHIRE

TITLE: Interpretation of Gradiometer Data

Area of Increased Magnetic Response - ?Archaeology

?Archaeology

??Archaeology

Ferrous

Figure 8

New Farm, South Warnborough
Resistance Data

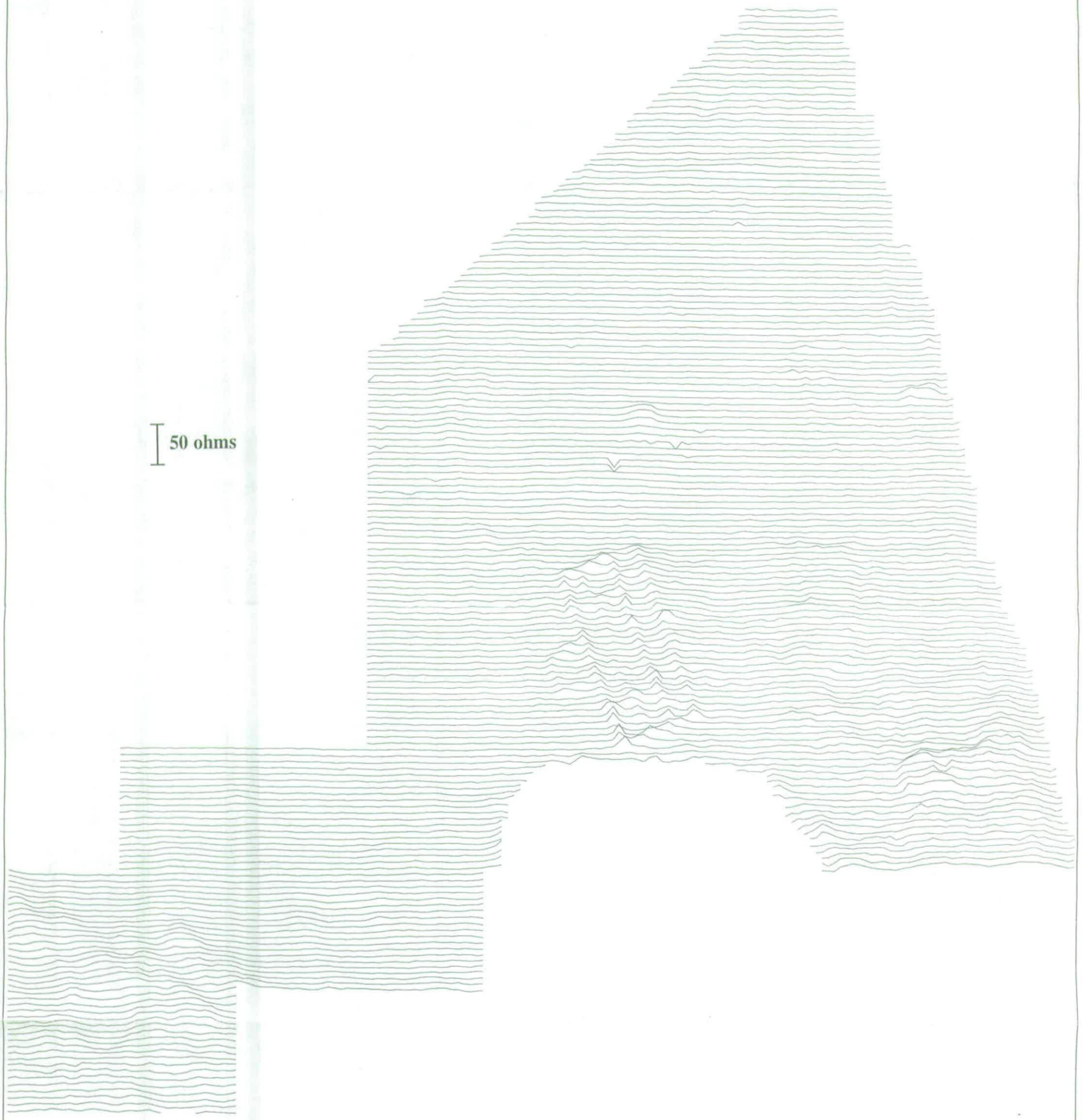
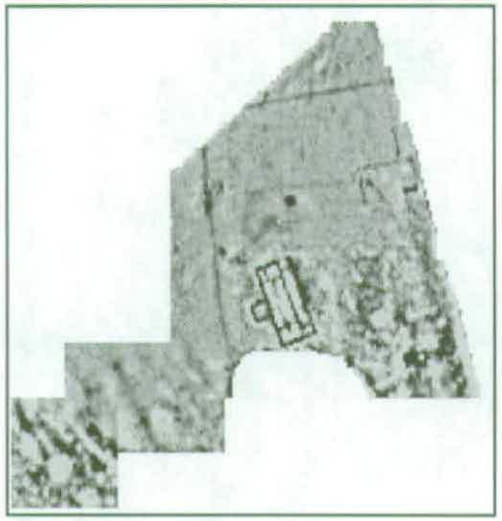


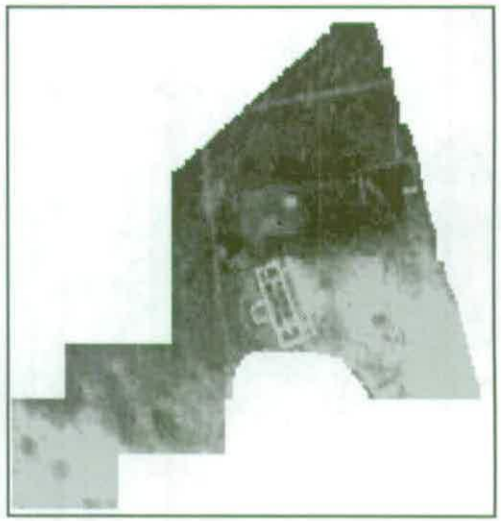
Figure 9

New Farm, South Warnborough

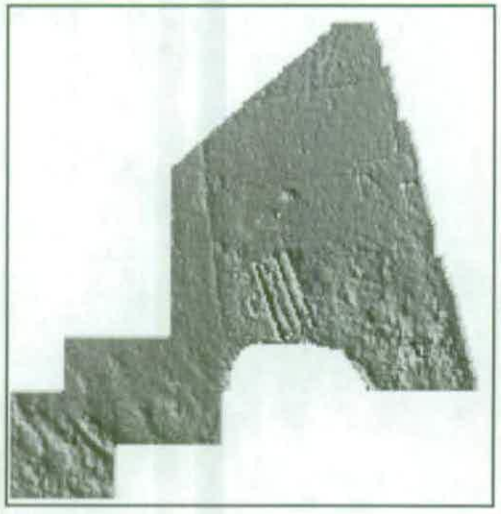
Raw data: Min 8 (white) to Max 35 (black) ohms



Smoothed data: box filter 10

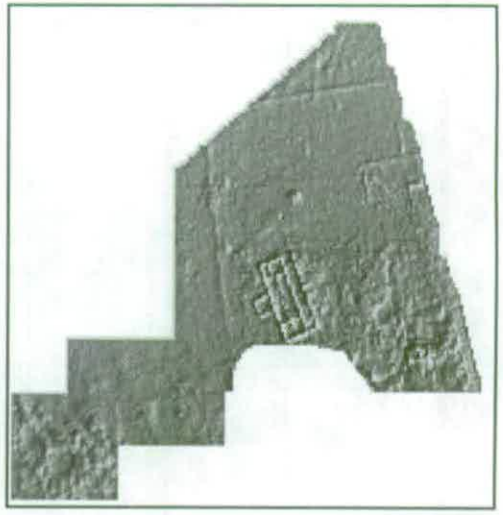


Raw data: Min 8 (black) to Max 35 (white) ohms



Shaded relief plots: Light source SW

Light source SE



Light source NE

Survey box 180m x 180m

Figure 10

GEOPHYSICAL SURVEYS OF BRADFORD

PROJECT: NEW FARM VILLA, HAMPSHIRE

TITLE: Interpretation of Resistance Data

High Resistance -
Villa Building

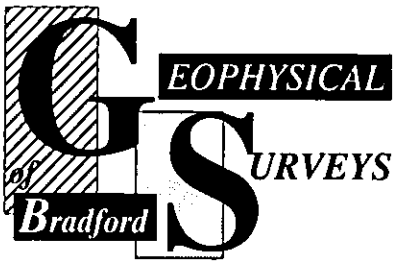
High Resistance -
?Wall/Bank/Track

Area of Higher Resistance -
?Archaeology

Area of Higher Resistance -
?Natural/??Archaeology

Low Resistance -
?Ditch/Pit

Figure 11



Specialising in Archaeological Prospecting