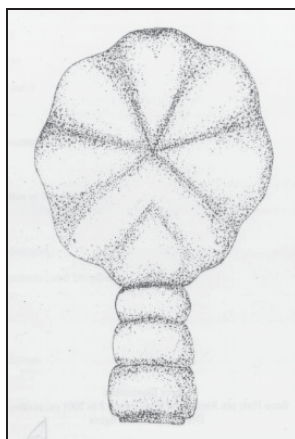


**Brows Farm, Liss
Geophysical Survey Report
November 2003**



SREP 11/2003

Compiled by K. Strutt

Archaeological Prospection Services of Southampton



**University
of Southampton**

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Brows Farm, Liss: Geophysical Survey Report November 2003

Summary

This report presents the results of a geophysical survey undertaken at Brows Farm, near Liss in Hampshire. The survey was carried out in 2003 on behalf of the Liss Heritage Association, and West Sussex Archaeology. The report specifies the survey methodology together with an archaeological interpretation and discussion of the results. The survey at Brows Farm was successful in locating a number of archaeological features associated with a potential Roman villa on the site, including possible structures and field boundaries.

1. Introduction

Between 5th September and 18th November 2003 a geophysical survey was carried out at the site of Brows Farm, near Liss in Hampshire (Fig. 1). The survey represented a season of fieldwork for the Liss Historical Society (LHS), implementing non-destructive techniques of archaeological prospection to investigate the remains of a potential villa site in north Hampshire.

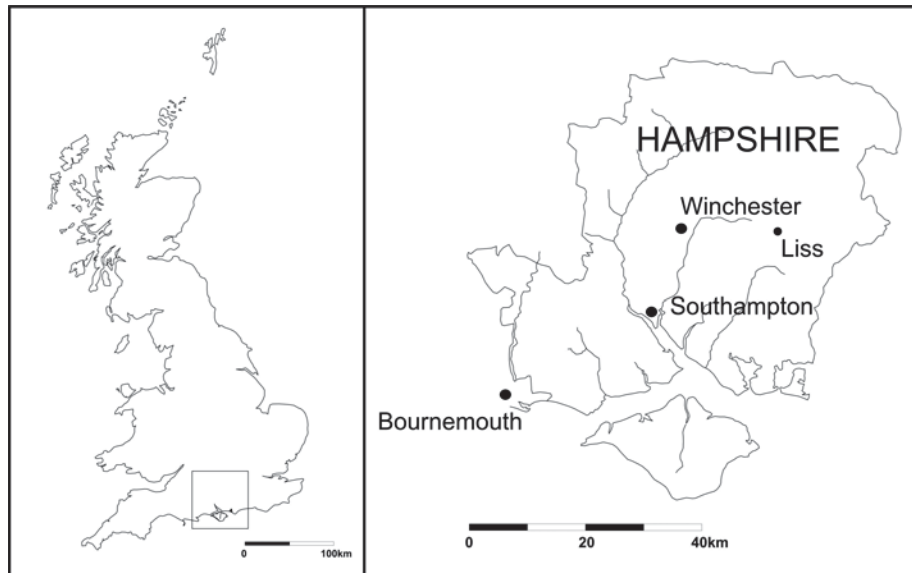


Fig 1. Location map for Liss, Hampshire

The current geophysical investigation at Brows Farm concentrated on an area immediately to the west of the A3 road from Portsmouth to London, where concentrations of ceramic material had been found by a member of the Historical

Society (Wilgoss 2002a). Work was undertaken by members of the Department of Archaeology at the University of Southampton in collaboration with the Liss Historical Society and West Sussex Archaeology.

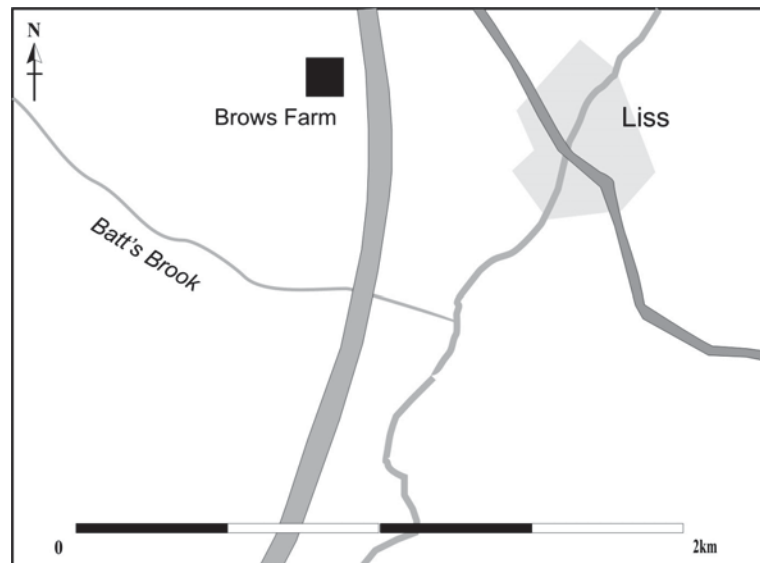


Fig. 2 Location map of the site near Brows Farm, Liss

The geophysical survey was initiated with the aim of locating and mapping the remains of sub-surface archaeological features in the vicinity of excavations which had uncovered the remains of the villa. It was hoped that the survey would locate the extensive remains of the villa or farm, and the full extent of the settlement, over a two hectare area.

1.1 Location and Background

The site is located 0.5km to the west of the village of Liss, along the route of the A3 from Petersfield to Guildford (SU 769 280; Fig. 2). It is situated on the south facing slope of a small hill overlooking Batt's Brook. The hill is separated from the Brook and valley by a substantial lynchet which runs west-east from the site towards Liss. The eastern edge of the field is marked by a cutting for the line of the A3 road. The geology of the area consists of green sand, with a band of Gault clay on the east side of the area (Wilgoss 2002a, 8).

The archaeological site under present scrutiny first came to the attention of the Liss Historical Society (LHS) in 1996, when it was discovered by Yvette Cook (Wilgoss 2001, 3). An abundance of archaeological material was noted on the surface of a field immediately to the west of the A3, and was reported to the SMR.

In 2000, a programme of fieldwalking was undertaken by LHS, supervised by the Butser Ancient Farm Field Archaeology Service (BAFFAS). Material was found on the site dating from the early Bronze Age, including Iron Age and Roman ceramics (Wilgoss 201, 4; Wilgoss 2002a, 3ff). The Roman period ceramics were mainly

course ware, including Grey Ware, Black Burnished Ware and late Roman grog tempered wares (Wilgoss 2002a, 3). In addition, high status material was located including Terra Sigillata and Terra Negra. These finds suggest that a substantial and high status Roman site is located in the field (ibid., 6). The location of concentrations of slag also led the team to believe that a degree of industrial activity had taken place at the site. A limited resistivity survey was conducted in 2000 and verified the existence of some structural remains. The existence of building foundations was proven during excavations in 2001, when walls of greensand blocks were located in two excavation trenches, together with mortar and Opus Signinum flooring.

1.2 Aims of Survey

The geophysical survey in 2003 concentrated on the entire field to the west of the A3 (Fig. 3). It was initiated with the aim of locating and mapping any buried structural remains associated with habitation on the site, in particular to trace the walls and features already known to exist from the 2001 excavation season.

2. Methodology

2.1 Survey Method

For the survey at Brows Farm, two forms of geophysical prospection techniques were applied; resistivity and magnetometry. Many other methods of geophysical survey could have been used, but knowledge of the geology of the area suggested that the use of both a resistance survey and a fluxgate gradiometer survey would produce positive results, and serve as a trial of both techniques. Magnetometer survey was chosen as a relatively time-saving and efficient survey technique (Gaffney *et al.* 1991, 6), suitable for detecting kilns, hearths, ovens and ditches, but also walls (Geoscan Research 1996a; Scollar *et al.* 1990, 362ff). However, because of the possibility of a poor response to magnetometry from the greensand building materials, resistance survey was also chosen as the primary technique for locating larger stone and brick foundations, pits and walls.

2.2 Survey Strategy

For the survey, grids of 30m by 30m were set out using a Leica TC 600 series total station. The grid was located on a north-south axis, with transects running in a west-east direction. The magnetometer survey was conducted using a Geoscan Research FM36 Fluxgate Gradiometer. In all cases, readings were taken on 1m traverses, at 0.5m intervals (see Appendix 1). Due to the open nature of the terrain, an automatic trigger was used with the gradiometer to record measurements. The resistivity survey was carried out using a Geoscan Research RM15 Resistance Meter. Readings were recorded at 1m intervals along 1m traverses. To optimise the integration of the different sets of results, the same survey grids were utilised for each method, and recording was initiated in the same direction for magnetometry and resistivity.

3. Survey Results

Overall, the magnetometer and resistivity survey at Brows Farm were moderately successful in locating a number of features associated with the site. The major concentration of features is situated in the south west of the survey area, although structural remains do appear to spread across a large proportion of the field.

3.1 Magnetometer Survey

A series of features are visible in the magnetometer survey results (Figs 4 and 5), concentrating on the brow of the slope down towards the lynchet, which runs along the southern edge of the field. To the east, a linear positive anomaly runs in a south west direction to the field's edge [m1], with a similar feature immediately to the south, cutting back in a south west direction [m2]. This feature turns, and then continues in the same direction for 40m [m3], adjoining a concentration of linear anomalies [m4]. A further linear anomaly is visible to the south [m5], running south east, then curving around. These features appear to delineate the south east side of a structure, with the possible existence of north and south wings, or at the least more prominent facades to the north and south.

The area to the west of these linear anomalies is marked by a concentration of positive maculae [m6], [m7], and [m8]. One of these [m6] marks the occupation layer of the floor found in the 2001 excavations (see below). The western portion of the survey is marked by more ephemeral linear features, two of which run parallel to one another [m9] and [m10], for a distance of 40m. They are shadowed by a similar linear feature to the south [m11], which runs from the field boundary, and an area of magnetic disturbance [m12], marking either an occupation area or a response to a kiln or hearth.

A strong and broad linear anomaly to the south, demarcates a feature [m13] which is most probably geological in nature (see the resistivity results below). The northern part of the field is cut by a linear feature [m14], some 50m in length, which runs from the eastern edge of the field to the north west, shadowed by a fainter linear feature [m15] to the north. A large dipolar anomaly also marks the northern extremity of the survey area [m16].

3.2 Resistivity Survey

Results of the resistivity survey illustrate some of the archaeological features noted in the magnetometry, but with less clarity (Fig. 6). The results are dominated by the potential archaeological and natural erosion features towards the southern end of the field (Fig. 7). Two strong broad lines of high resistance run along the contours of the hillslope [r1] and [r2], interspersed with areas of low resistance [r3] and [r4]. These may represent natural slope formation in the sand of the site, but could equally show

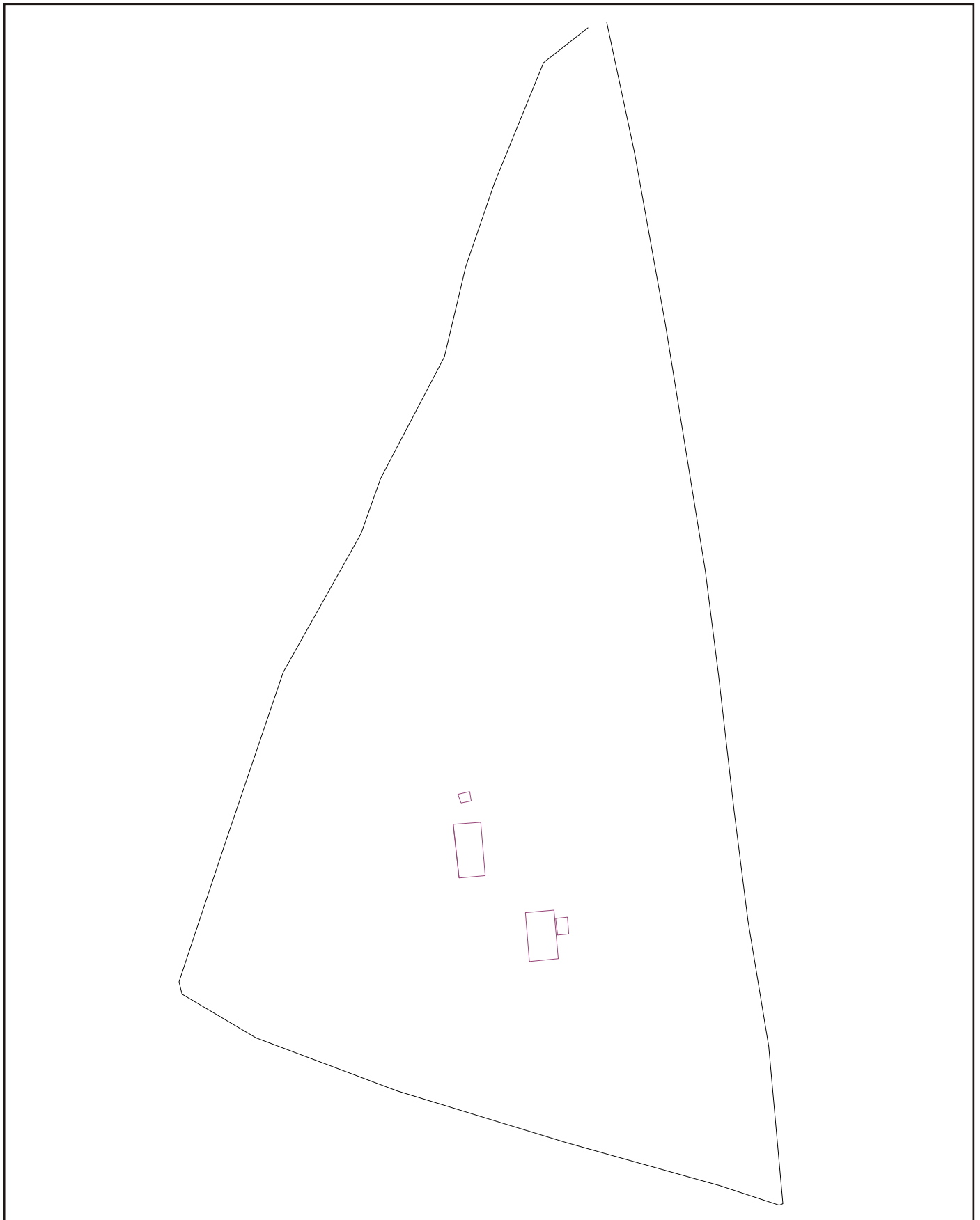


Fig. 3 Survey area at Brows Farm, showing the location of excavation trenches from 2001



**Brows Farm, Liss,
Hampshire**

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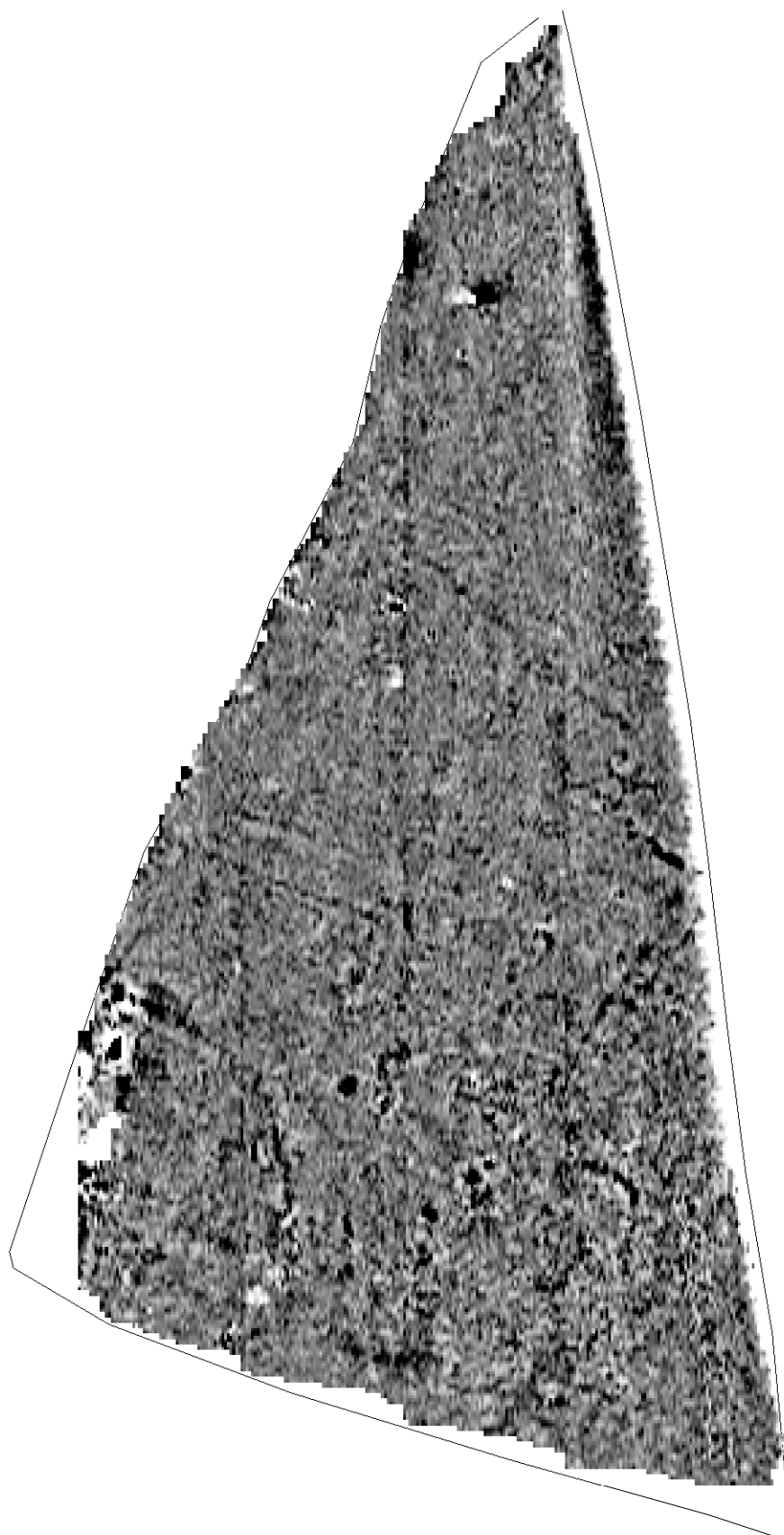


Fig. 4 Greyscale image of the magnetometer survey from Brows Farm, Liss



**Brows Farm, Liss,
Hampshire**

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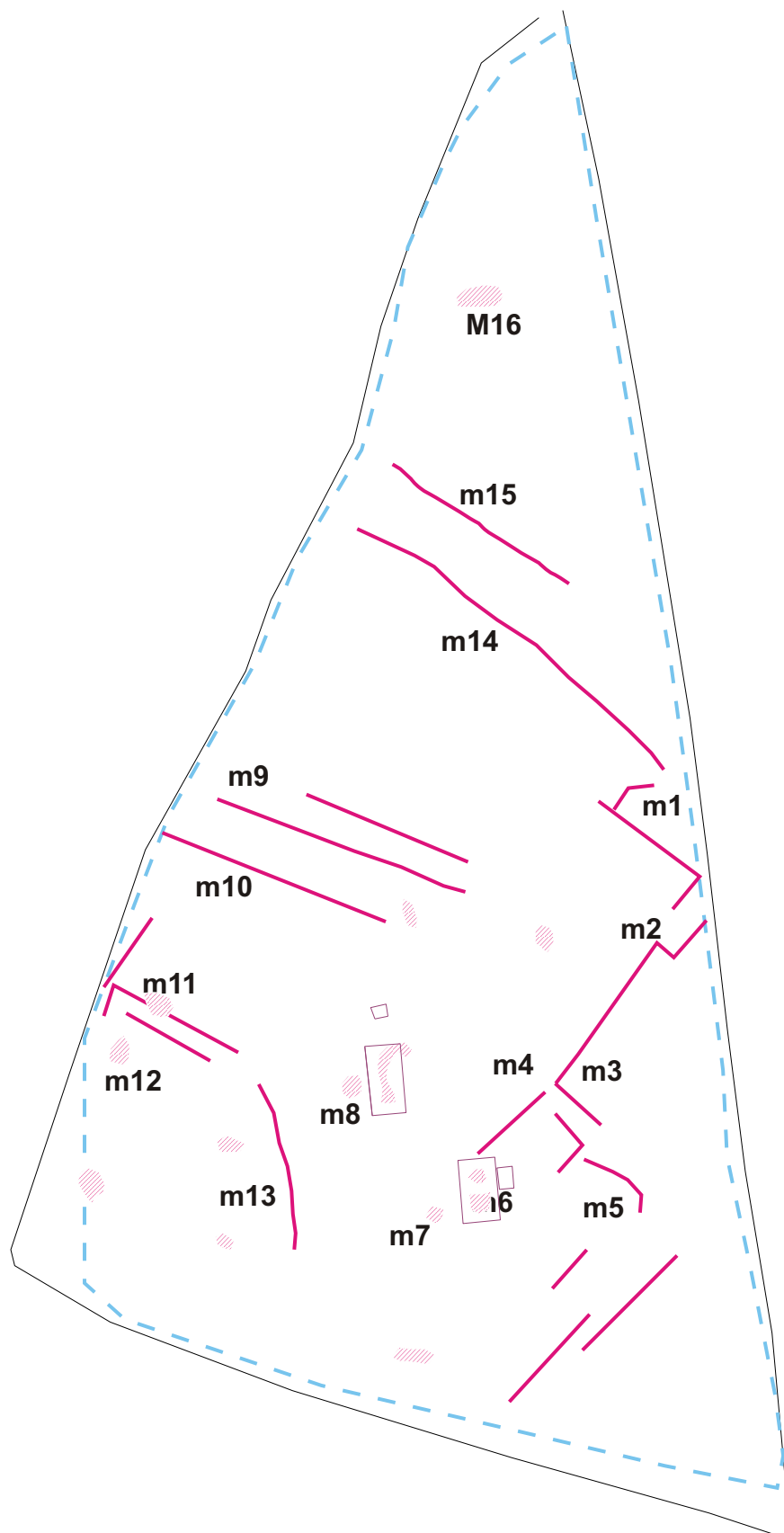


Fig. 5 Interpretation plan
derived from the magnetometer
survey from Brows Farm, Liss



0 60m

**Brows Farm, Liss,
Hampshire**

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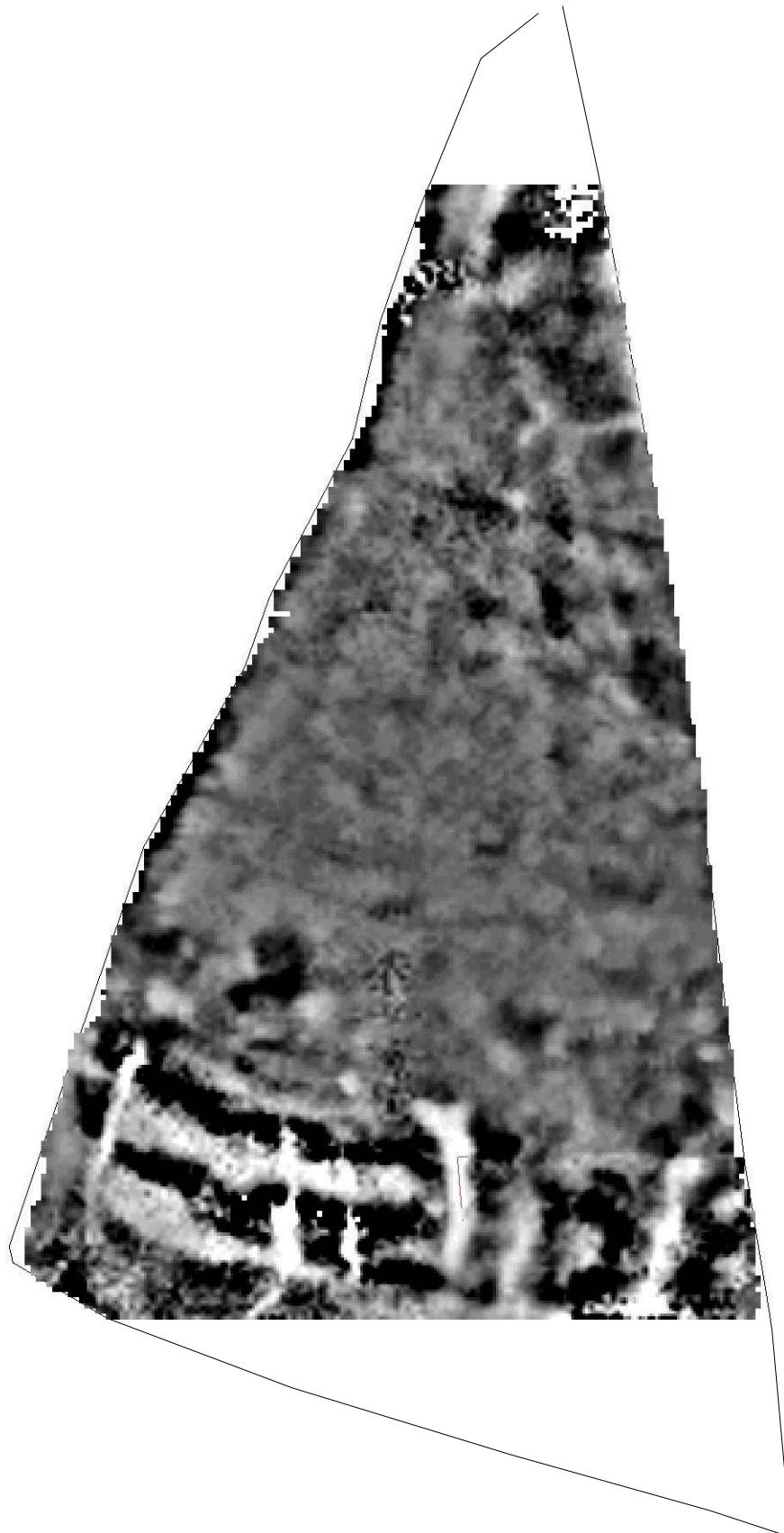


Fig. 6 Greyscale image of the resistivity survey from Brows Farm, Liss



0 60m

**Brows Farm, Liss,
Hampshire**

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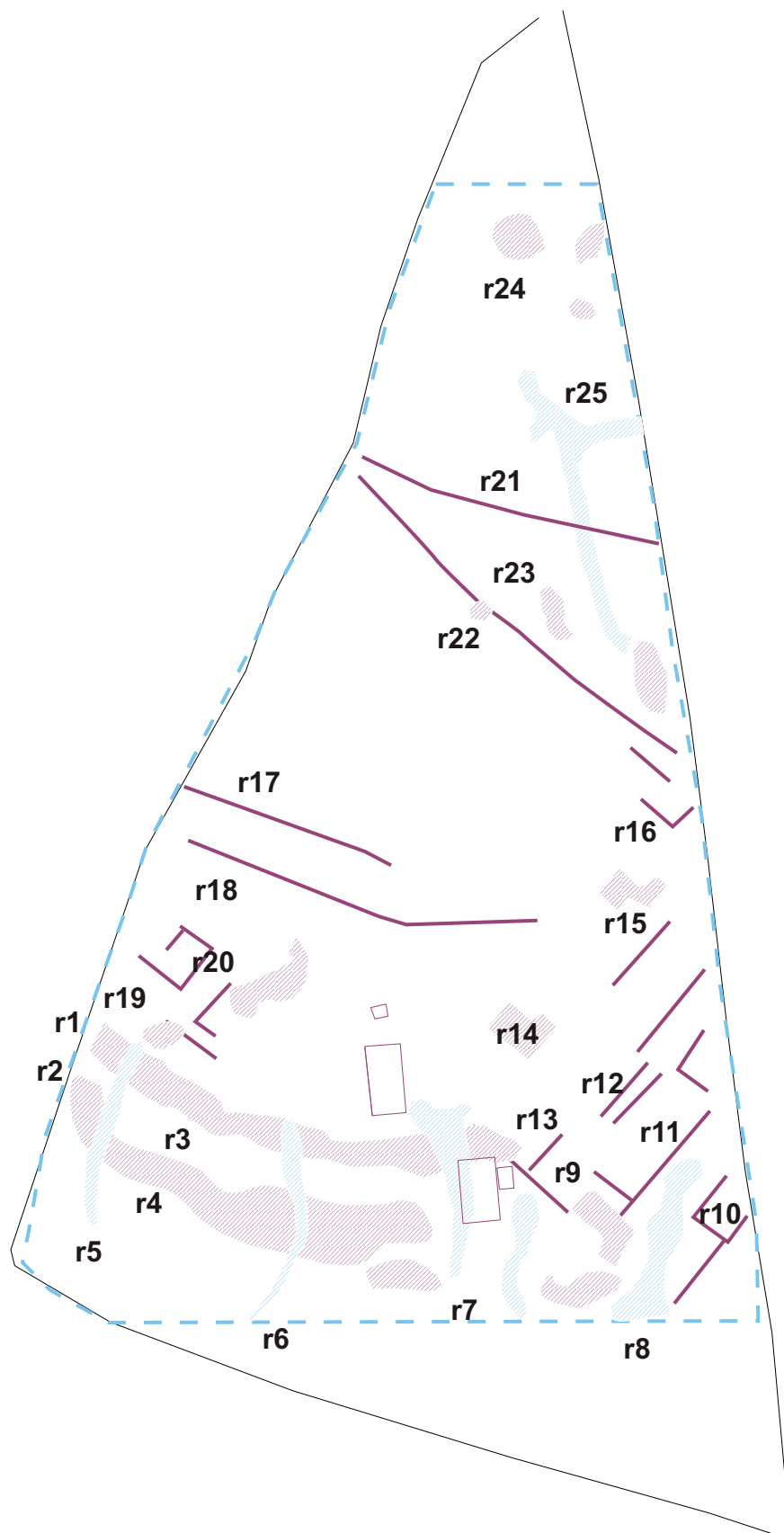


fig. 7 interpretation plan
derived from the resistivity
survey from brows farm, liss



**Brows Farm, Liss,
Hampshire**

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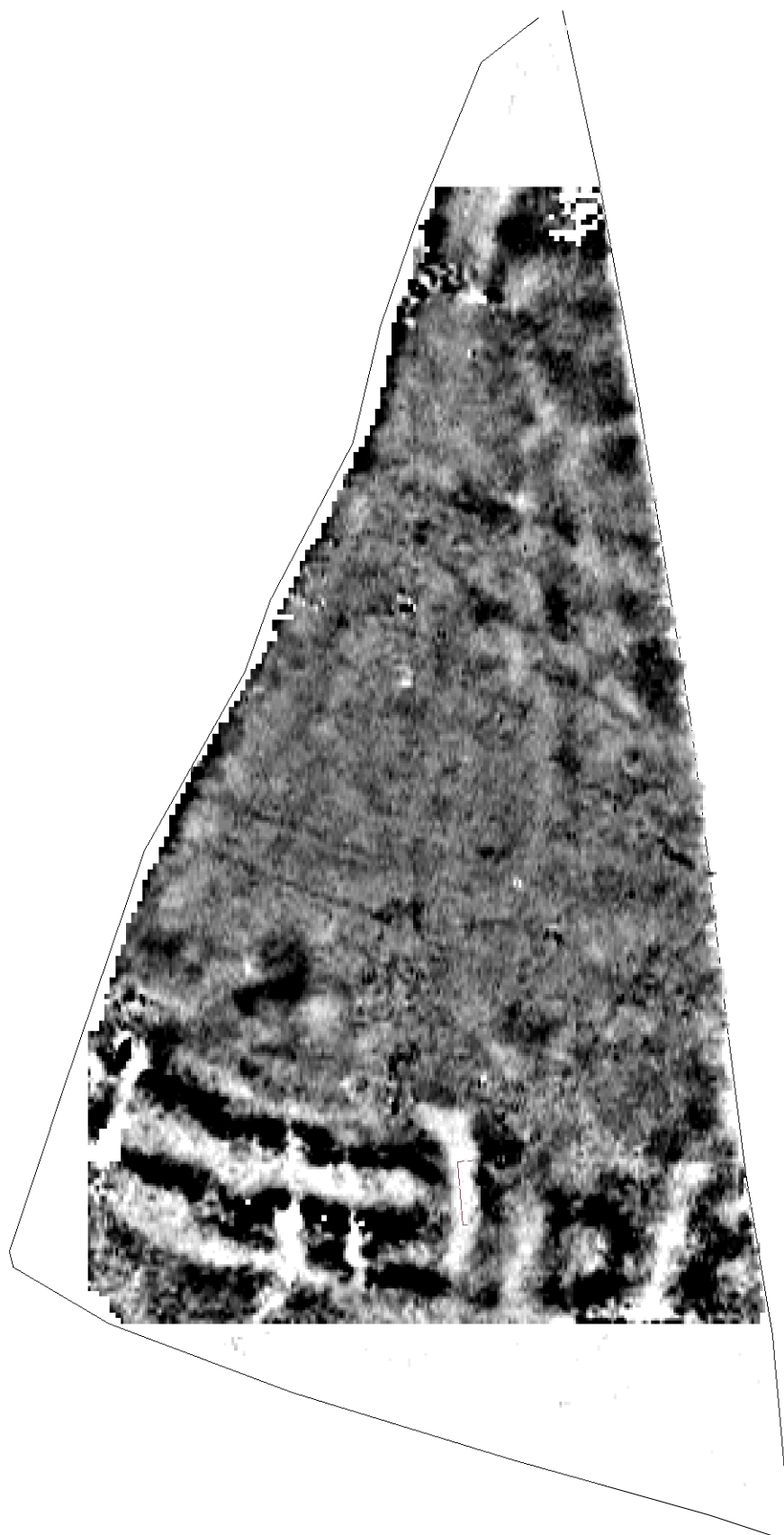


Fig. 8 Greyscale image of the survey results showing the integrated resistivity and magnetometry results



**Brows Farm, Liss,
Hampshire**

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the formation of terraces on the hillside below the main archaeological site. These features are cut by a number of low resistance erosion gullies [r5], [r6], [r7] and [r8].

The features on the eastern part of the hillslope are slightly different. The responses are still strong, but number of rectilinear shapes are visible, one approximately 10m across [r9] and the other some 6m across [r10]. These could indicate a continuation off the terracing, but their alignment with the archaeological features to the north suggests the existence of structures and collapsed building material. these linear features continue to the north east, with a high resistance line [r11] adjoining a rectilinear feature [r12]. Similar lines can be seen to the west [r13], although the results are less clear. A number of similarly aligned high resistance areas are visible [r14] and [r15], suggesting building remains, and tumbled material in potential rooms. Further traces of structures are visible to the north [r16]. To the west, a few features corroborate the results of the magnetometer survey, showing linear features cutting across the field [r17] and [r18]. They are matched by rectilinear anomalies along the edge of the field [r19], and a macula of high resistance to the east [r20].

Results from the northern part of the field are altogether less clear. Two linear features are visible [r21] and [r22], but a number of other maculae [r23] and [r24], and low resistance features [r25] are present. These may indicate disturbance to the area from the construction of the A3 cutting to the east.

To provide a clearer indication of the features present in both sets of results, the values of each dataset were normalised so that their values ran between 0 and 1, and the two datasets were combined to form an integrated set of readings for the entire survey area (Fig. 8). Similar integration has helped with the archaeological interpretation of results at other sites (Neubauer and Eder-Hinterleitner 1997), and some of the features present in the results at Brows Farm become much more distinctive via this method of integration. In particular the structures along the eastern side of the field just above the terrace do appear to indicate at least two phases of building on slightly different alignments. Many of the field boundaries and banks to the west also show more clearly.

4. Discussion

It is apparent from the survey results at Brows Farm, that a large number of archaeological features are present across the area, a number of which draw particular attention. There appears to be a large structure present in the eastern half of the survey area, aligned approximately north east to south west, and rectilinear in shape [m1] – [m4]. This shows signs of presenting a villa-type structure, demonstrating two ‘wings’ at either end of the feature, and with an alignment similar to that of other villas such as Brading Roman Villa on the Isle of Wight (Rule and Sturgess 1974).

There is also evidence for other related structures in the centre and western portions of the field, as well as two potential field boundaries, possibly demarcating the approach of a road or track [m9] and [m10].

The probable walled and winged villa-type structure near the A3, while substantial, is difficult to envisage as a structure on the scale of the Fishbourne proto-palace and palace-villa (Cunliffe 1971). It is feasible that the evidence represents a dwelling on the scale of Brading. The lack of any concentrations of pit features or enclosure ditches would suggest that the habitation is grander in scale than the early phases of Houghton Down (Cunliffe and Poole 2000) or Barton Court Farm in Oxfordshire (Miles 1986). At these sites, the archaeological evidence was marked by earlier pit and ditch features, the pits comprising the footings for an earlier timber-framed hall. There do not appear to be any significant patterns of low resistance features at Brows Farm. This may be due to the aridity of the soil during the period of the survey, or a complete lack of early timber structure at the site.

The location of slag in the field was thought to indicate industrial workings on the site. Some possible kilns or hearths were noted in the magnetometer results [m7], [m8], [m12], although the exact nature of these features would require verification.

Different alignments of features were noted in the integrated dataset (Fig. 8), showing possible building remains on two separate alignments. There is a particular difference between the main concentration of possible structures on the slope of the terrace [r9], and the possible buildings to the north. These differences in alignment may only represent traces of earlier field boundaries underlying the later structures, however.

The boundaries visible to the north are also present on different alignments. It is difficult to say whether or not these represent earlier or later boundaries, or indicate the limit of the extent of the Roman settlement towards the north. In addition, the two clear parallel boundaries may well represent the line of an approach road or track to the villa from the west.

5. Conclusions

The results of the geophysical survey at Brows Farm located and mapped a large number of archaeological features. These features all appear to be associated with a Roman villa or settlement at the site, made evident by previous excavations by the Liss Historical Society in 2001. Remains of a possible range or winged building, and other rooms or structures were most evident, together with potential field boundaries and terraces to the west and south of the main concentration of buildings. The ephemeral nature of many of the structural features is due both to the fabric of the buildings, predominantly of local green sandstone, and the poor state of preservation of material on the site, due to the agricultural regime. This means that the geophysical survey results require verification through targeted excavation of specific anomalies.

6. Recommendations

- The geophysical survey at Liss was moderately successful in locating traces of the Roman settlement. The results certainly indicate remains of a number of buildings and surrounding boundary features, although the nature of the archaeology in relation to the background geology mean that some of the features are unclear.
- Although the use of geophysical survey techniques has facilitated an understanding of the villa and the potential location of buildings, the data is of limited value in assessing the phasing and chronology of the development of the site. It would therefore be beneficial for small-scale excavations to be situated over features of particular interest in the results, to improve our understanding of the structural fabric and changes of the complex.
- The relatively poor response to the techniques overall is most probably due to the badly eroded and thin ploughsoil, and the sandy nature of the sub-soil, made worse by the particularly dry weather in 2003. It may be worth testing the techniques used in adjacent fields, also allowing the archaeology to be traced beyond the immediate curtailage of the current field.

7. Statement of Indemnity

Whilst every effort has been made to ensure that interpretation of the survey presents an accurate indication of the nature of sub-surface remains, any conclusions derived from the results form an entirely subjective assessment of the data. Geophysical survey facilitates the collection of data relating to variations in the form and nature of the soil. This may only reveal certain archaeological features, and may not record all the material present.

Acknowledgements

Considerable advice and assistance were received from a number of sources in the completion of this survey. Primarily thanks go to the Liss Historical Society for commissioning the survey, and the dedication of Colin Dring, the Society chairman, Pat White the archivist, and John Brown. The kind permission and assistance of the landowners, Mr and Mrs Duncan Petty, was also vital to the undertaking of the survey. The assistance of George Anelay, from West Sussex Archaeology is also gratefully acknowledged. Completion of the survey would have been difficult without the considerable skill and dedication of the field team. Grateful thanks go to Mr Dominic Barker, Miss Pina Franco, Miss Sophie Hay, Mr Jason Lucas and Mr Edward Oakley. The survey was funded by Hampshire County Council, with the backing of Mr David Hopkins, the County Archaeologist.

Appendix 1 Details of Survey Strategy

Date of Survey: 5th September – 18th November 2003

Site: Brows Farm, Liss

Region: Hampshire

Grid Reference: SU 769 280

Surveyor: University of Southampton

Personnel: Dominic Barker, Pina Franco, Sophie Hay, Jason Lucas, Ed Oakley, Kristian Strutt

Geology: Lower Greensand, some Gault clay

Survey Type 1: Magnetometer

Approximate area: 2 hectares

Grid size: 30m

Traverse Interval: 1m

Reading Interval: 0.5m

Instrument: Geoscan Research FM36

Resolution: 0.1 nT

Trigger: Encoder

Survey Type 2: Resistivity

Approximate area: 2 hectares

Grid size: 30m

Traverse Interval: 1m

Reading Interval: 1m

Instrument: Geoscan Research RM15

Resolution: 0.1 Ω

Probe Configuration: Twin electrode

Probe Separation: 0.5m

Appendix 2 - Archaeological Prospection Techniques Utilised by APSS

The following appendix presents a summary of prospection methods, implemented by Archaeological Prospection Services of Southampton (APSS) to determine the extent and nature of sub-surface archaeological structures, remains and features. The methodology usually applied by APSS places an emphasis on the integration of geophysical, geochemical and topographic survey to facilitate a deeper understanding of a particular site or landscape.

Geophysical Prospection

A number of different geophysical survey techniques can be applied by archaeologists to record the remains of sub-surface archaeological structures. Magnetometer survey is generally chosen as a relatively time-saving and efficient survey technique (Gaffney *et al.* 1991, 6), suitable for detecting kilns, hearths, ovens and ditches, but also walls, especially when ceramic material has been used in construction. In areas of modern disturbance, however, the technique is limited by distribution of modern ferrous material. Resistivity survey, while more time consuming is generally successful at locating walls, ditches, paved areas and banks, and the application of resistance tomography allows such features to be recorded at various depths. APSS also implement close contour topographic survey over areas of prospection, to record any important relic of archaeological features in the present topography, but also provide vital information on the changing ground surface for the geophysical prospection results. A summary of the survey techniques is provided below.

Resistivity Survey

Resistivity survey is based on the ability of sub-surface materials to conduct an electrical current passed through them. All materials will allow the passing of an electrical current through them to a greater or lesser extent. There are extreme cases of conductive and non-conductive material (Scollar *et al.* 1990, 307), but differences in the structural and chemical make-up of soils mean that there are varying degrees of resistance to an electrical current (Clark 1996, 27).

The technique is based on the passing of an electrical current from probes into the earth to measure variations in resistance over a survey area. Resistance is measured in ohms (Ω), whereas resistivity, the resistance in a given volume of earth, is measured in ohm-metres (Ω/m).

Four probes are generally utilised for electrical profiling (Gaffney *et al.* 1991, 2), two current and two potential probes. Survey can be undertaken using a number of different probe arrays; twin probe, Wenner, Double-Dipole, Schlumberger and Square arrays.

The array used by APSS utilises a Geoscan Research RM15 Resistance Meter in twin electrode probe formation. This array represents the most popular configuration used in British archaeology (Clark 1996; Gaffney *et al.* 1991, 2), usually undertaken with a

0.5m separation between mobile probes. Details of survey methodology are dealt with elsewhere (Geoscan Research 1996).

A number of factors may affect interpretation of twin probe survey results, including the nature and depth of structures, soil type, terrain and localised climatic conditions. Response to non-archaeological features may lead to misinterpretation of results, or the masking of archaeological anomalies. A twin probe array of 0.5m will rarely recognise features below a depth of 0.75m (Gaffney et al 1991). More substantial features may register up to a depth of 1m. With twin probe arrays of between 0.25m and 2m, procedures are similar to those for the 0.5m twin probe array.

Although changes in the moisture content of the soil, as well as variations in temperature, can affect the form of anomalies present in resistivity survey results, in general, higher resistance features are interpreted as structures which have a limited moisture content, for example walls, mounds, voids, rubble filled pits, and paved or cobbled areas. Lower resistance anomalies usually represent buried ditches, foundation trenches, pits and gullies. In addition to the normal twin electrode method of survey, a Geoscan Research MPX15 multiplexer can be utilised with the Resistance Meter, allowing multiple profiles of resistivity to be recorded simultaneously, or resistance tomography to be carried out up to a depth of 1.5m. APSS generally survey, as with the twin electrode configuration, to a resolution of 1 or 0.1 Ω , with readings every metre or half metre.

Magnetic Survey

Magnetic prospection of soils is based on the measurement of differences in magnitudes of the earth's magnetic field at points over a specific area. Principally the iron content of a soil provides the basis for its magnetic properties. Presence of magnetite, maghaemite and haematite iron oxides all affect the magnetic properties of soils. Although variations in the earth's magnetic field which are associated with archaeological features are weak, especially considering the overall strength of the magnetic field of around 48,000 nanoTesla (nT), they can be detected using specific instruments (Gaffney et al. 1991).

Three basic types of magnetometer are available to the archaeologist; proton magnetometers, fluxgate gradiometers, and alkali vapour magnetometers (also known as caesium magnetometers, or optically pumped magnetometers). Fluxgate instruments are based around a highly permeable nickel iron alloy core (Scollar et al. 1990, 456), which is magnetised by the earth's magnetic field, together with an alternating field applied via a primary winding. Due to the fluxgate's directional method of functioning, a single fluxgate cannot be utilised on its own, as it can not be held at a constant angle to the earth's magnetic field. Gradiometers therefore have two fluxgates positioned vertically to one another on a rigid staff. This reduces the effects of instrument orientation on readings.

Fluxgate gradiometers are sensitive to 0.5nT or below depending on the instrument. However, they can rarely detect features which are located deeper than 1m below the surface of the ground.

Archaeological features such as brick walls, hearths, kilns and disturbed building material will be represented in the results, as well as more ephemeral changes in soil, allowing location of foundation trenches, pits and ditches. Results are however extremely dependent on the geology of the particular area, and whether the

archaeological remains are derived from the same materials. For fluxgate gradiometer survey, the Geoscan Research FM36 is used. Survey is carried out at 0.1nT resolution, with readings taken every 1m by 0.5m. Around 1.5 to 2 hectares are surveyed each day.

Topographic Survey

The modern ground surface or topography often contains important information on the conditions and nature of an archaeological site, and the potential existence of structures buried beneath the soil (Bowden 1999). The changes in topography can also have a great influence on determining the nature of features in a geophysical survey. Therefore it is vital to produce a detailed and complete topographic survey as part of the field survey of any given site. This generally entails the recording of elevations across a grid of certain resolution, for instance 5 or 10m intervals, but also the recording of points on known breaks of slope, to emphasis archaeological features in the landscape.

Survey is usually undertaken by APSS using a total station or electronic theodolite, although Global Positioning Satellite systems (GPS) are also utilised, to record the survey points. Computer software is then used to produce Digital Elevation Models of the results. Normally, survey is carried out using a Leica total station, with readings taken every 4 metres, and also on the breaks of slope of important topographical features. The resolution can be increased where necessary. Up to 5 hectares per day can be covered.

Integrated Survey Methodology

The survey work carried out by Southampton is always produced as part of an integrated survey strategy, designed to affiliate all of the geophysical survey techniques to the same grid system, which would be used for geochemical soil sampling and surface collection. Surveys are normally based on an arbitrary grid coordinate system, tied into a national system or to a series of hard points on the ground corresponding to points on a map. A set of 30m grids are then set out to provide the background for the magnetometry, resistivity, and other survey techniques which will complement the results, for instance fieldwalking and geochemical sampling.

Appendix 3 – Relief Plots and Colour Shade Plots of the Survey Results

App 3.1 – Greyscale image of the magnetometer survey results from Brows Farm, with the survey grid superimposed.

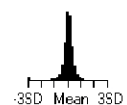
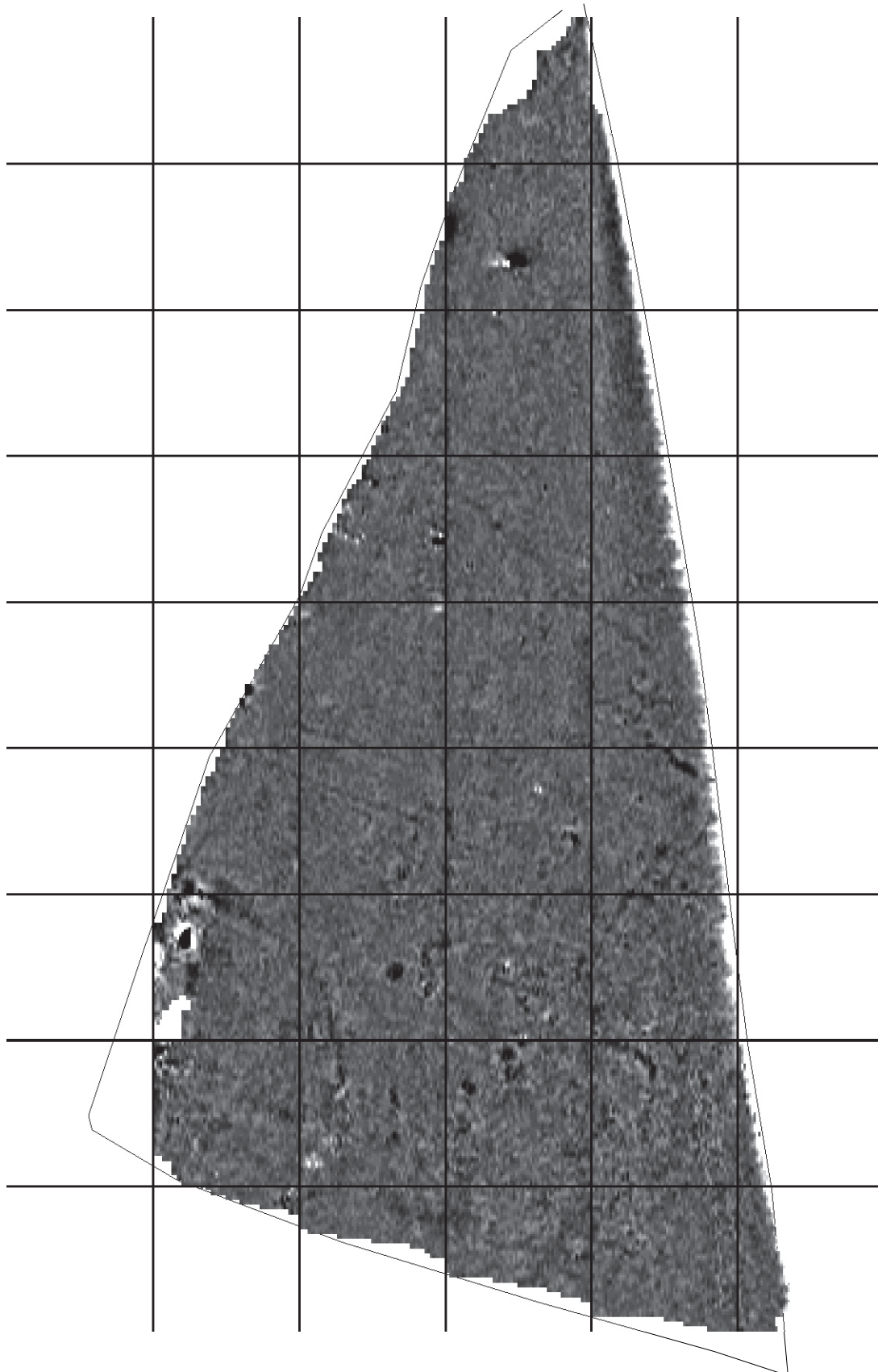
App 3.2 – Relief shade image of the magnetometer survey results from Brows Farm.

App 3.3 – Colour shade image of the magnetometer survey results from Brows Farm.

App 3.4 – Greyscale image of the resistivity survey results from Brows Farm, with the survey grid superimposed.

App 3.5 – Relief shade image of the resistivity survey results from Brows Farm.

App 3.6 – Colour shade image of the resistivity survey results from Brows Farm.



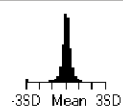
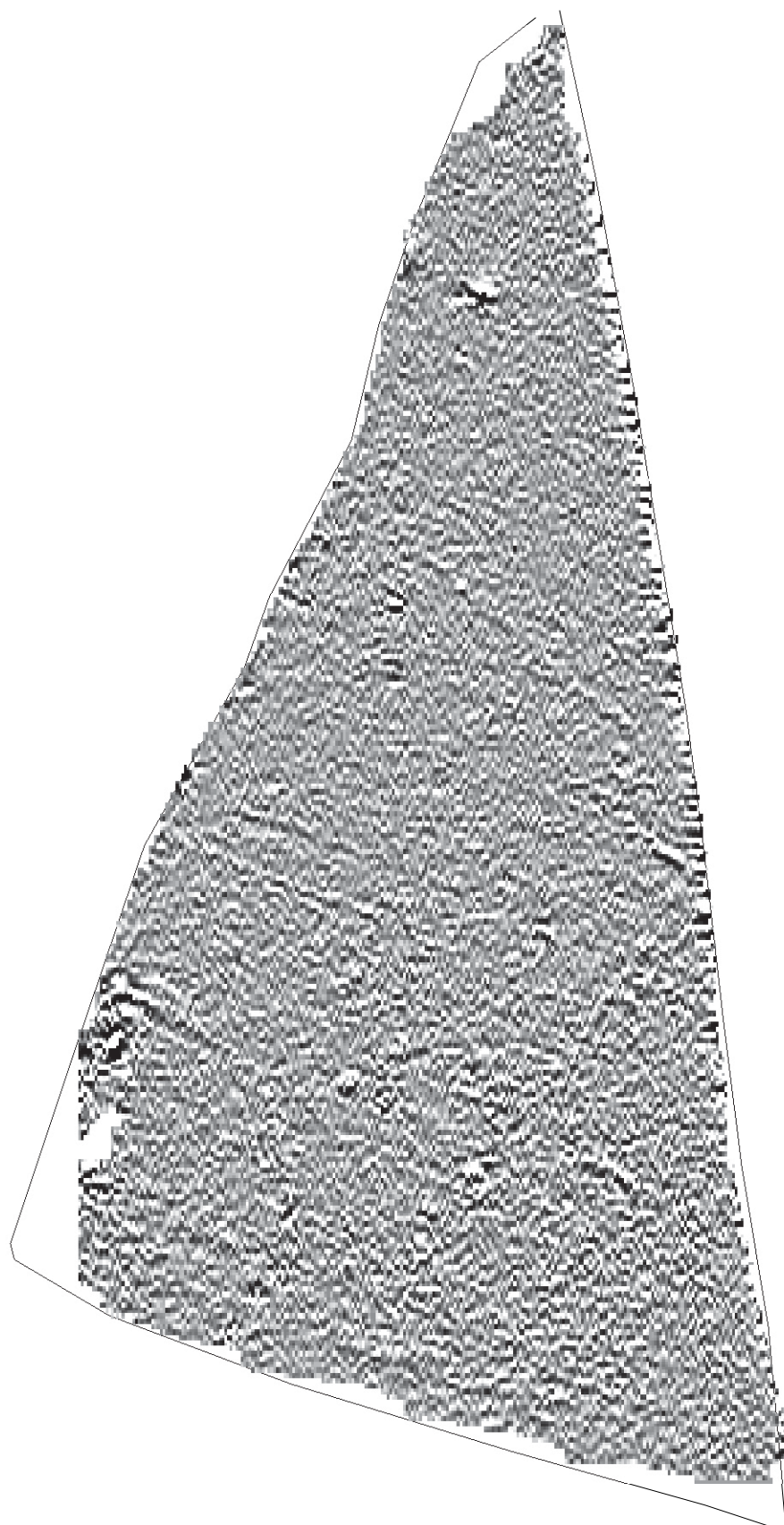
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Maximum	4
Contrast	0.8
Units	Absolute



App 3.1 Greyscale image of the magnetometer survey results from Brows Farm, with the survey grid superimposed

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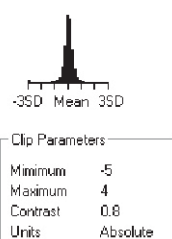
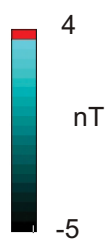
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Scaling	.7
Sun Dir.	90
Sun Elev.	20



App 3.2 Relief shade image of the magnetometer survey results from Brows Farm

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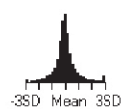
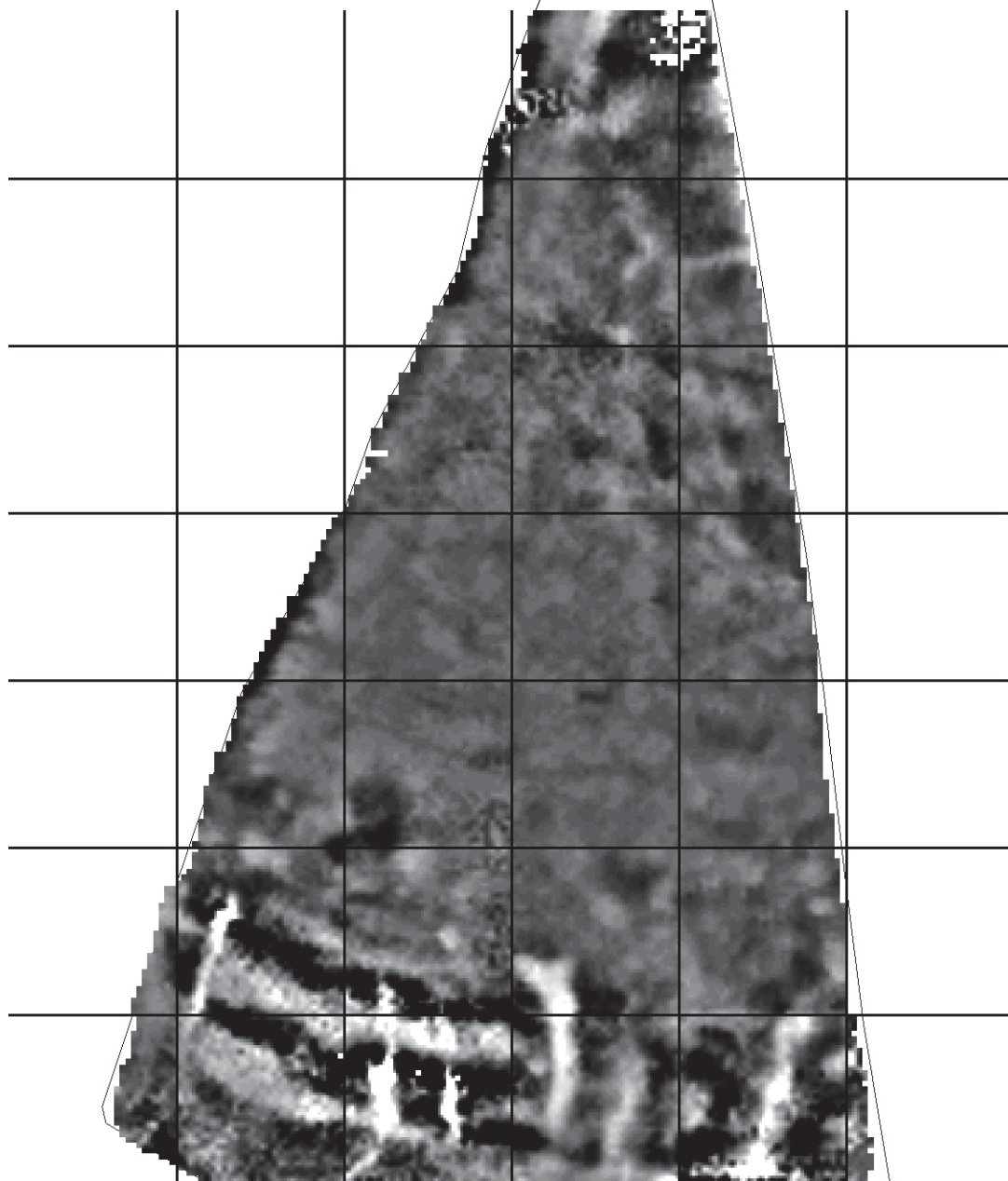




App 3.3 Colour shade image of the magnetometer survey results from Brows Farm

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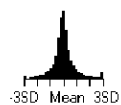
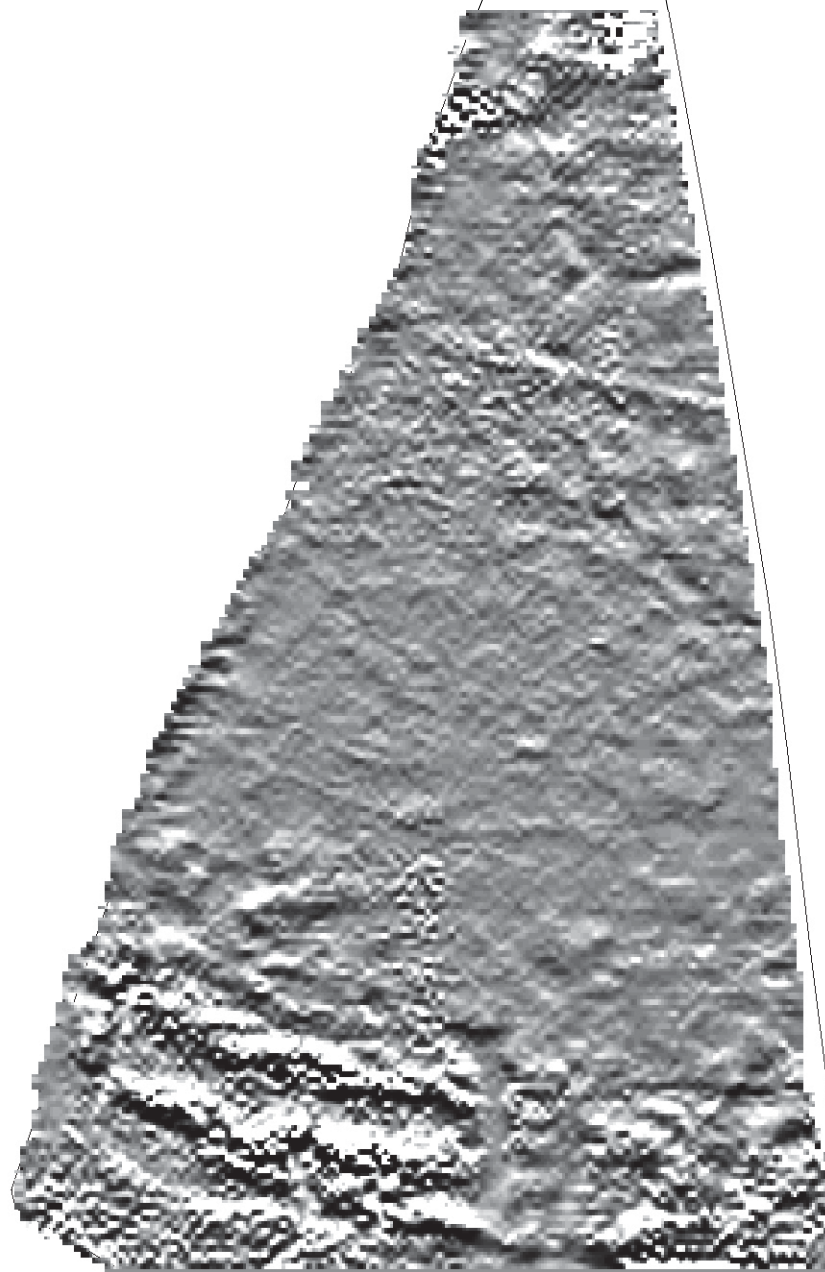
Clip Parameters	
Minimum	-20
Maximum	15
Contrast	0.8
Units	Absolute



App 3.4 Greyscale image of the resistivity survey results from Brows Farm, with the survey grid superimposed

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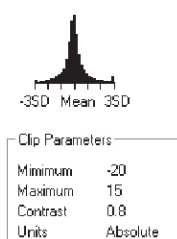
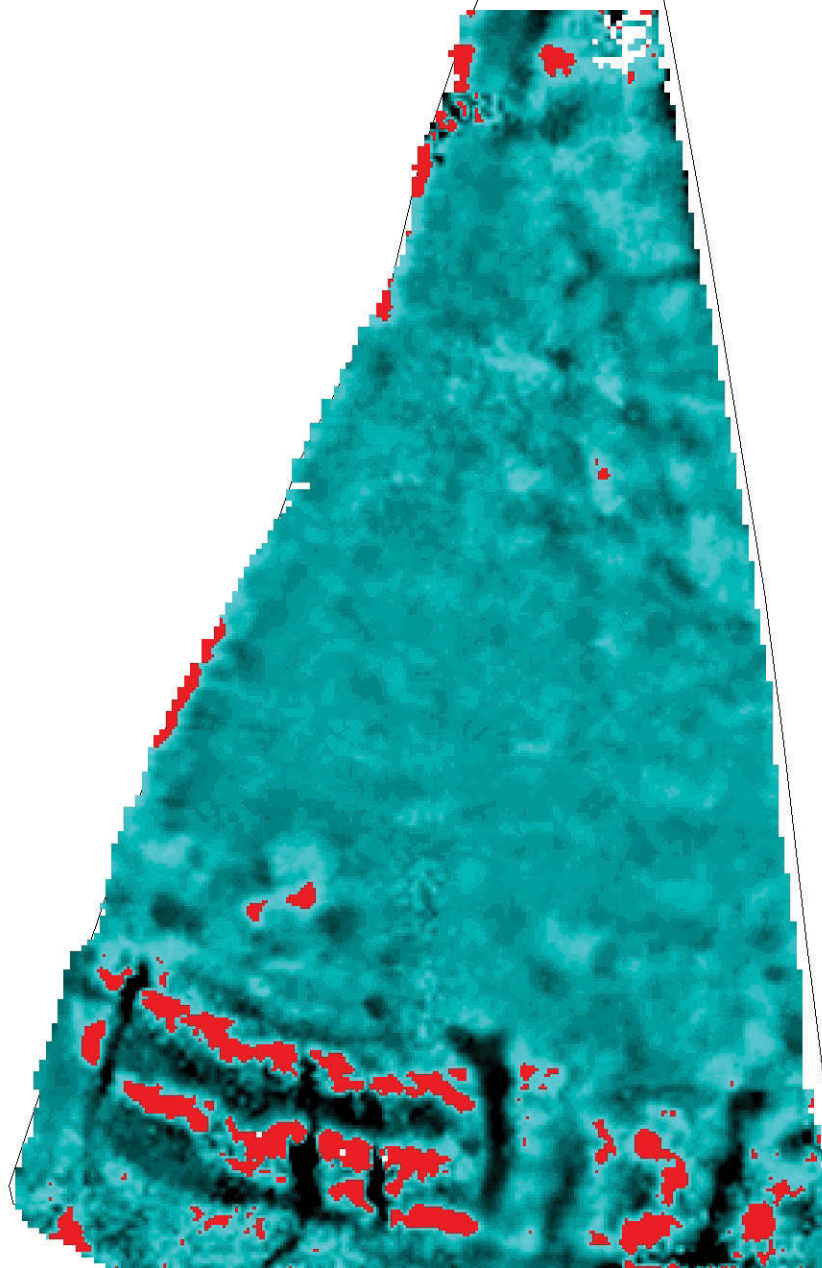
Relief Parameters	
Scaling	.6
Sun Dir.	90
Sun Elev.	25



App 3.5 Relief shade image of the resistivity survey results from Brows Farm

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App 3.6 Colour shade image of the resistivity survey results from Brows Farm

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