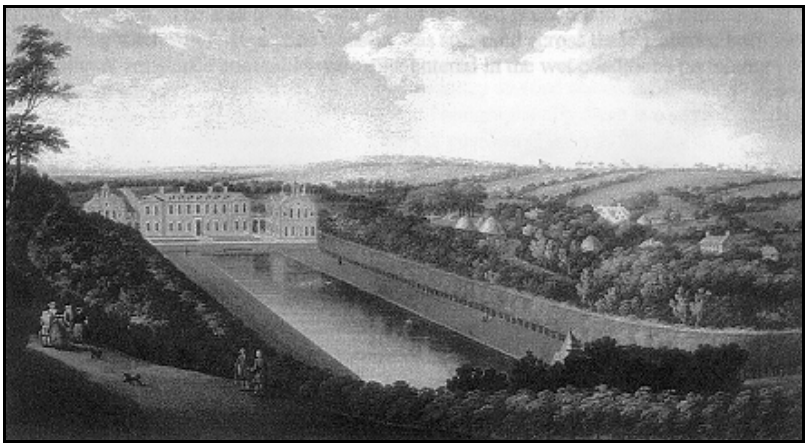
Hurstbourne Priors
Geophysical Survey Report
October 2002



Compiled by K. Strutt

Archaeological Prospection
Services of Southampton

University
of Southampton

List of Contents

List of Illustrations

Summary

This report presents the results of a geophysical survey undertaken at The Grange, Hurstbourne Priors, in the Spring of 2002. It specifies the survey methodology together with an interpretation and discussion of the survey results. Although a series of ephemeral features were recorded in the survey results, the survey was unsuccessful in locating the remains of the 18th century manor house in the vicinity of the parish church, to the east of the Bourne rivulet.

1. Introduction

On 23rd April 2002 a geophysical survey was undertaken at Hurstbourne Priors (Fig. 1), by the Department of Archaeology at the University of Southampton, on behalf of Dr Alison Deveson. The survey represented the second phase of work undertaken at Hurstbourne Priors in an effort to locate the remains of the 18th century manor house. The previous surveys, carried out by Dr Kate Clark, succeeded in locating some potential structural anomalies to the south east of St. Andrews church, although the results did not suggest any extensive or substantial archaeological remains indicative of the 18th century house (Clark 2001).

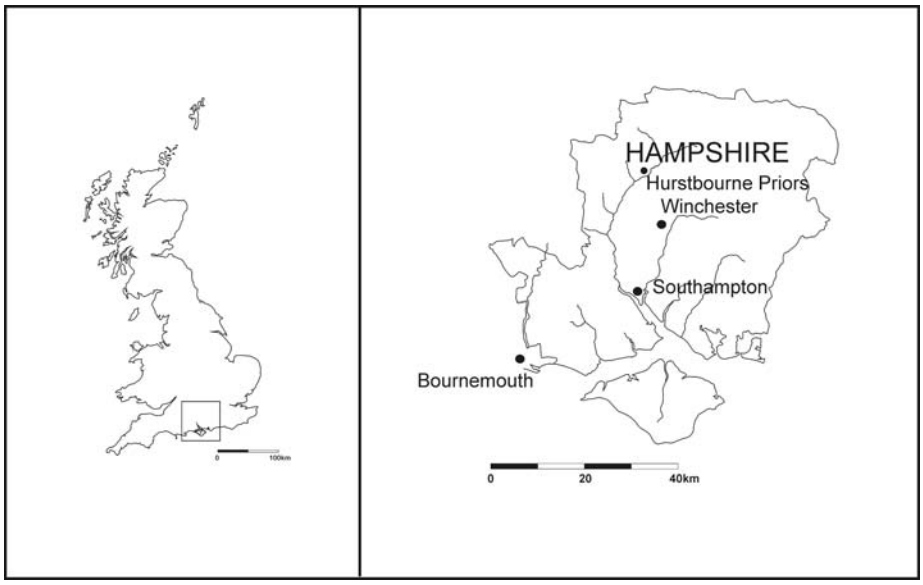


Fig. 1 Location map of Hurstbourne Priors, Hampshire

1.1 Location and Background

The village of Hurstbourne Priors is situated on the valley floor and terraces next to the Bourne rivulet (Fig. 2), 16km to the north west of Winchester and 6km to the east of Andover, Hampshire. The village itself is probably medieval in origin, and is located around the church of St. Andrews, with the manorial estate parklands to the east.

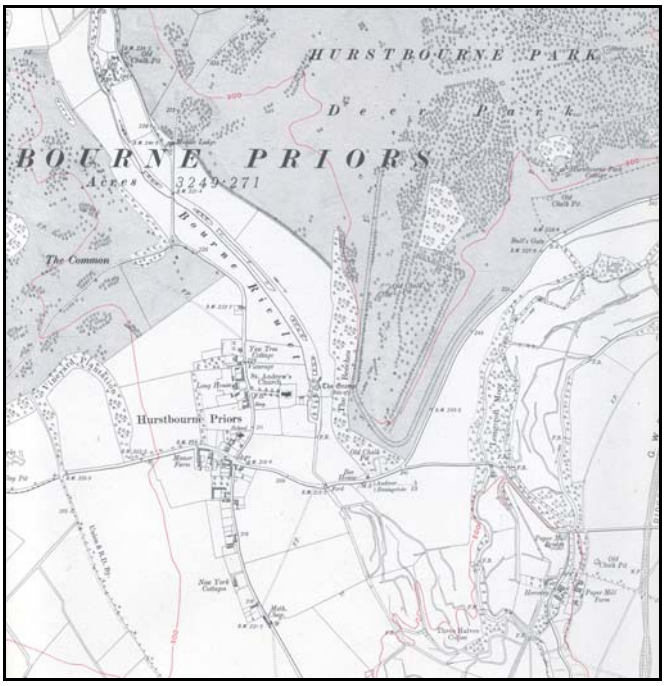


Fig. 2 Location map of the village of Hurstbourne Priors, taken from the Ordnance Survey map of 1911

Although it is suspected that a manor house was built in the vicinity of the parish church in the 18th century, no physical trace of the building has survived. Two sources of evidence exist for the possible location of the house, and both are of a somewhat dubious nature. The first, a painting by Jan Griffier dating to 1748, does not include the parish church in the scene, but appears to be a view looking south, showing the house and gardens, including water features. The second piece of evidence is Isaac Taylor's map of 1759, which depicts the house to the south west of St. Andrews church (Clark 2001).

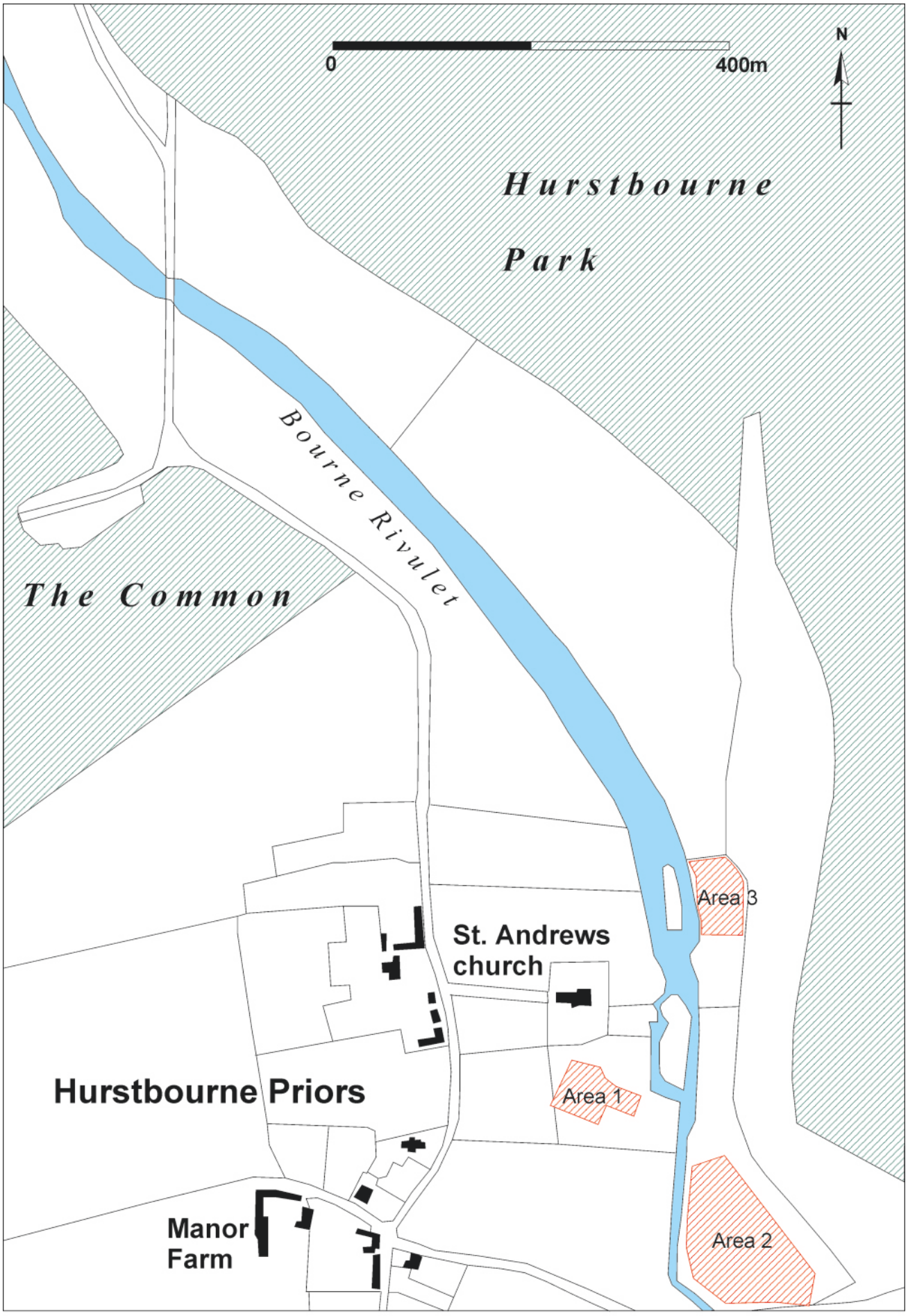


Fig. 3 location of the 2002 survey area(Area 3), and the survey areas at the Grange from the 2001 season (Areas 1 and 2)

1.2 Aims of Survey

The geophysical survey was initiated with the aim of locating and mapping the remains of the 18th century manor house The survey in 2001 effectively completed a resistivity survey in two areas, over the supposed location of 'The Grange'. The first was located to the south east of the parish church, and the second to the west of the 'Bee House' (Clark 2001; Fig. 3). These surveys did not reveal any features which suggested the location of a large structure or hall. The decision was therefore made to survey a third area to the north along the east side of the Bourne Rivulet, to the north east of St. Andrews church.

2. Methodology

2.1 Survey Method

Although a number of different geophysical survey techniques could have been applied to locate the hall at Hurstbourne Priors (Appendix 2), the previous work in 2001 had shown that resistivity was successful in recording sub-surface changes and anomalies associated with the geology and archaeology of the area.

Whilst magnetometer survey is a more time-saving and efficient survey technique (Gaffney *et al*. 1991, 6), suitable for detecting kilns, hearths, ovens and ditches, it was thought that resistivity would be more useful in locating the walls and platforms of such a large structure as the house at Hurstbourne Priors. Therefore the 2002 survey was conducted using resistivity.

2.2 Survey Strategy

For the geophysical survey, grids of 20m by 20m were set out using 30 metre tapes. The grid was located to optimise the potential results of the survey by first assessing the orientation of potential archaeology, with transects running approximately in a west-east direction.

The resistivity survey was undertaken using a Geoscan Research RM15 Resistance Meter. In all cases readings were taken on 1m traverses, at 1m intervals. Grids of size 20m by 20m were used. The geophysical survey data were processed using Geoplot 3.0 software.

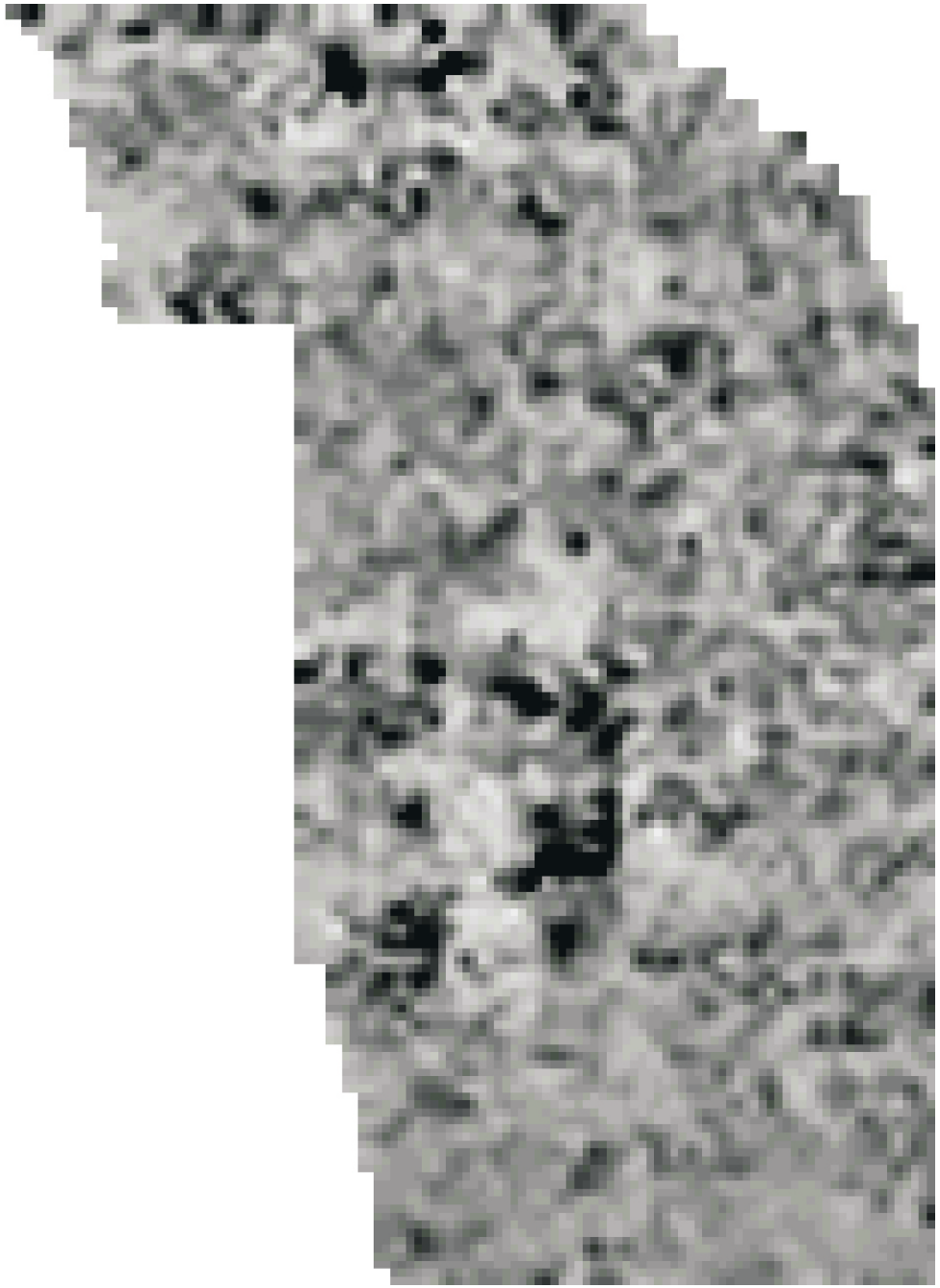
3. Survey Results

In total an area of 0.32 hectares was covered by the 2002 resistivity survey, between the Bourne Rivulet and the edge of Hurstbourne Park (Fig. 4). The results of the survey proved to be quite 'noisy', with a large variation in the range of responses across the survey area. This may have been in part due to the extensive disturbance of the topsoil by recent animal activity. Although no evidence of a large house structure was evident, a number of smaller features are clearly discernable (Fig. 5).

Across the area, but particularly in the north and central portions of the survey (Fig.6), there are a series of discrete high resistance responses, displaying no articulate form. To the north these are located close to the modern fenceline **[1]**, and may be associated with disturbance or a small lynchet visible in the present topography. Further to the south, though, these anomalies continue, particularly in the centre of the area, closer to the line of the Bourne Rivulet **[2]**. The variation in responses then decreases in the south of the survey area, providing a more stable background **[3]**.

A number of linear and rectilinear features are visible in the resistivity results, although they are not clearly defined, and are mostly ephemeral. In the north west of the area, a series of high readings demarcates a rectilinear feature, running in a northwest to south east direction **[4]**. Similar linear anomalies are also present in the centre of the survey area **[5]**, and to the east **[6]**, south east and west **[7]** and **[8]**. These features do not appear to represent a solid form or large structure, however. Potentially they may be related to the location of the old mill, purported to have been situated across the Bourne immediately to the west.

Fig. 4 Results of the resistivity survey from the 2002 season



Hurstbourne Priors

348.12
289.82
231.51
173.21
114.91
56.60
-1.70
-60.00
-118.31
-176.61
-234.92
-293.22
-351.52 ohm

N

Palette : grey55.ptt

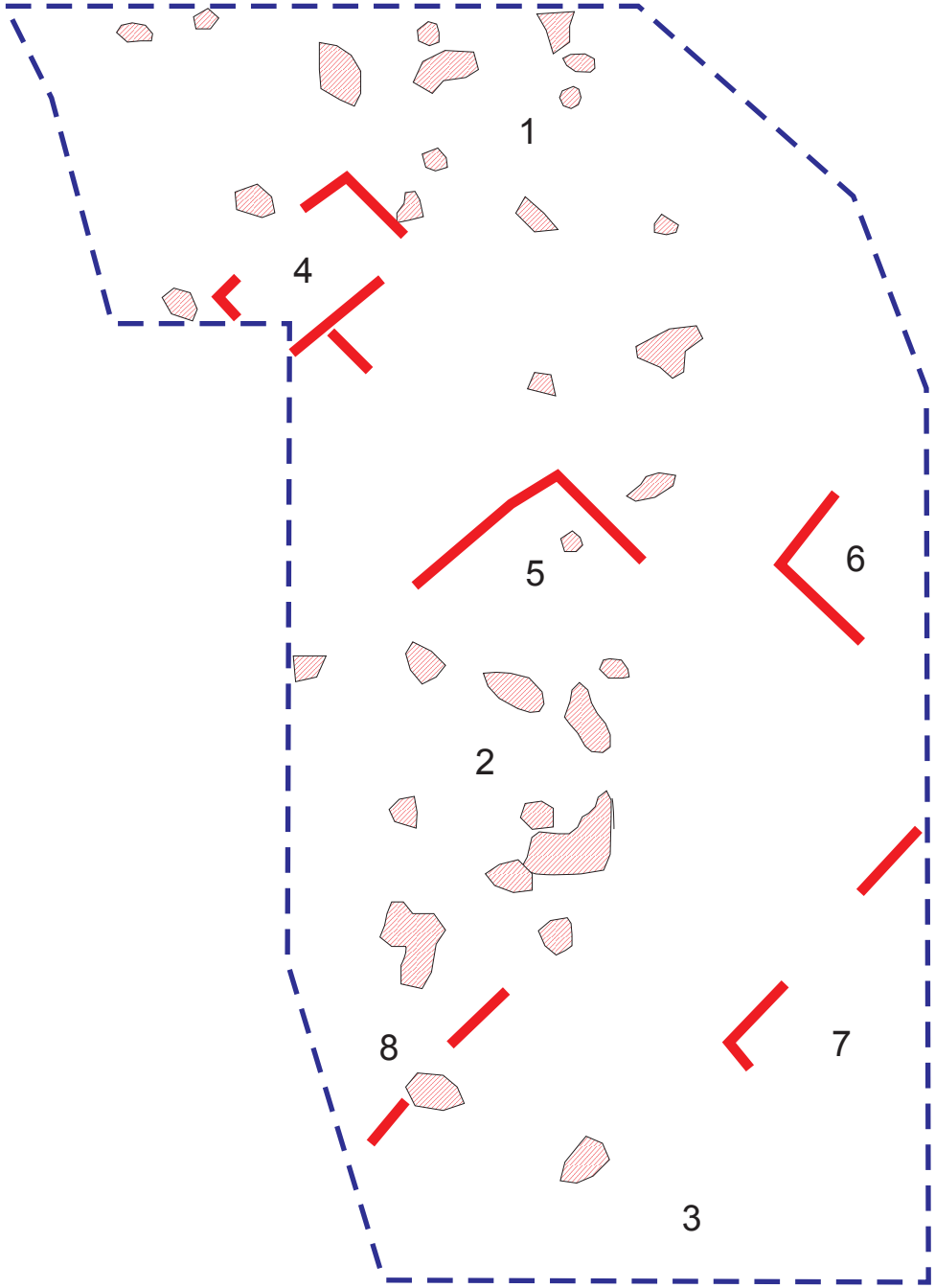
0 10m
Size : x 2

-3SD Mean 3SD

Clip Parameters

Mimimum	-3
Maximum	3
Contrast	1
Units	Std Dev

Fig. 5 Greyscale image of the 2002 resistivity survey results



Hurstbourne Priors

Fig. 6 Interpretation plan derived from the resistivity survey results

4. Discussion

The 2002 resistivity survey at The Grange was unsuccessful in locating the remains of the 18th century manor house. Whilst the results show signs of disturbance of the ground, and some potential ephemeral features, there do not appear to be any traces of large building foundations, walls, or traces or hearths or even tumble material between the Bourne and Hurstbourne Park.

There do appear to be traces of features in this area, but they are ephemeral in nature. It is feasible that these are associated with the mill which supposedly straddled the Bourne to the west, and where the present central island divides the waters of the Bourne in two.

Overall, the resistivity survey coverage to the south and east of St. Andrews church in 2001 and 2002 has not managed to locate the remains of the house depicted in Griffier's painting. Because of the lack of evidence for a precise location, the house may well be located anywhere along the line of the Bourne upstream from the church. The relatively small scale of coverage from the three resistivity surveys means that much of the area to the north may hide the buried remains of the house.

5. Conclusions

Although the survey was successful in locating a number of small ephemeral anomalies, it did not recover evidence of the 18th century house suggested by the painting of Jan Griffier. The slight anomalies represented in the results may be archaeological in origin, but are most likely to be related to the mill on the Bourne, as opposed to the manor house.

6. Recommendations

- Resistivity has proved to be an effective technique at Hurstbourne Priors for the identification of likely archaeological remains. This method could therefore be applied in future in an effort to locate archaeological structures associated with the village.

- Although resistivity survey is effective, it is recommended that an integrated approach to further survey should be implemented, using both resistivity and magnetometry. A magnetometer survey would locate the remains of burned materials, brick foundations and structures, hearths and pits, and would therefore be ideal for the location of the remains of the 18th century house.

- The application of resistivity in the three areas of The Grange makes it apparent that to locate the area where building remains are situated would require more complete coverage of the field to the north, where the house may be situated. It is recommended that the geophysical survey should continue at The Grange to complete the geophysical prospection in the fields to the north.

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.

Acknowledgments

Considerable advice and assistance was received from a number of sources in the completion of this survey. Primarily, thanks go to Dr Alison Deveson for permission to undertake the work. The assistance of Dr Kate Clark is gratefully acknowledged, both during the survey, and for her comments during the processing of the data. Thanks also go to other members of staff at Southampton University, in particular Prof. David Peacock for supporting the work, and to Mrs Lisa Griffith for her support.

Appendix 1 - Details of Survey Strategy

Date of Survey: 23rd April 2002
Site: The Grange, Hurstbourne Priors
Local Authority: Basingstoke and Dean
District Parish: Hurstbourne Priors
County: Hampshire
Grid Reference: SU 439467
Surveyor: Southampton University
Personnel: Kate Clark, Kristian Strutt
Geology: Alluvial deposits

Survey Type: Resistivity
Approximate area: 3.1 hectares
Grid size: 20m
Traverse Interval: 1m
Reading Interval: 1m
Instrument: Geoscan Research RM15

Appendix 2 – Methods of Geophysical Survey: Resistivity and Magnetometry

The following presents a summary of two geophysical prospection methods which are available to the archaeologist in determining the extent and nature of sub-surface structures and remains; resistivity and magnetometry.

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 movement of an electrical current through them. 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 1990, 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.

Twin Electrode Configuration

This array represents the most popular configuration used in British archaeology (Clark 1990; 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). Twin probe array configuration utilises two probes on a mobile frame, with two remote probes located at least 30 times the distance between mobile probes away from the mobile frame.

Alterations can be made to suit different conditions. For extremely dry soils, a range of 0.1mA can be used. If background resistance is lower than 100Ω, then a gain of x10 should be used. If background resistance is lower than 10Ω, then gain of x100 can be used. In an urban situation, it may be necessary to alter the range and gain of the instrument to 10mA and x1 respectively.

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.

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 Gradiometer

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.

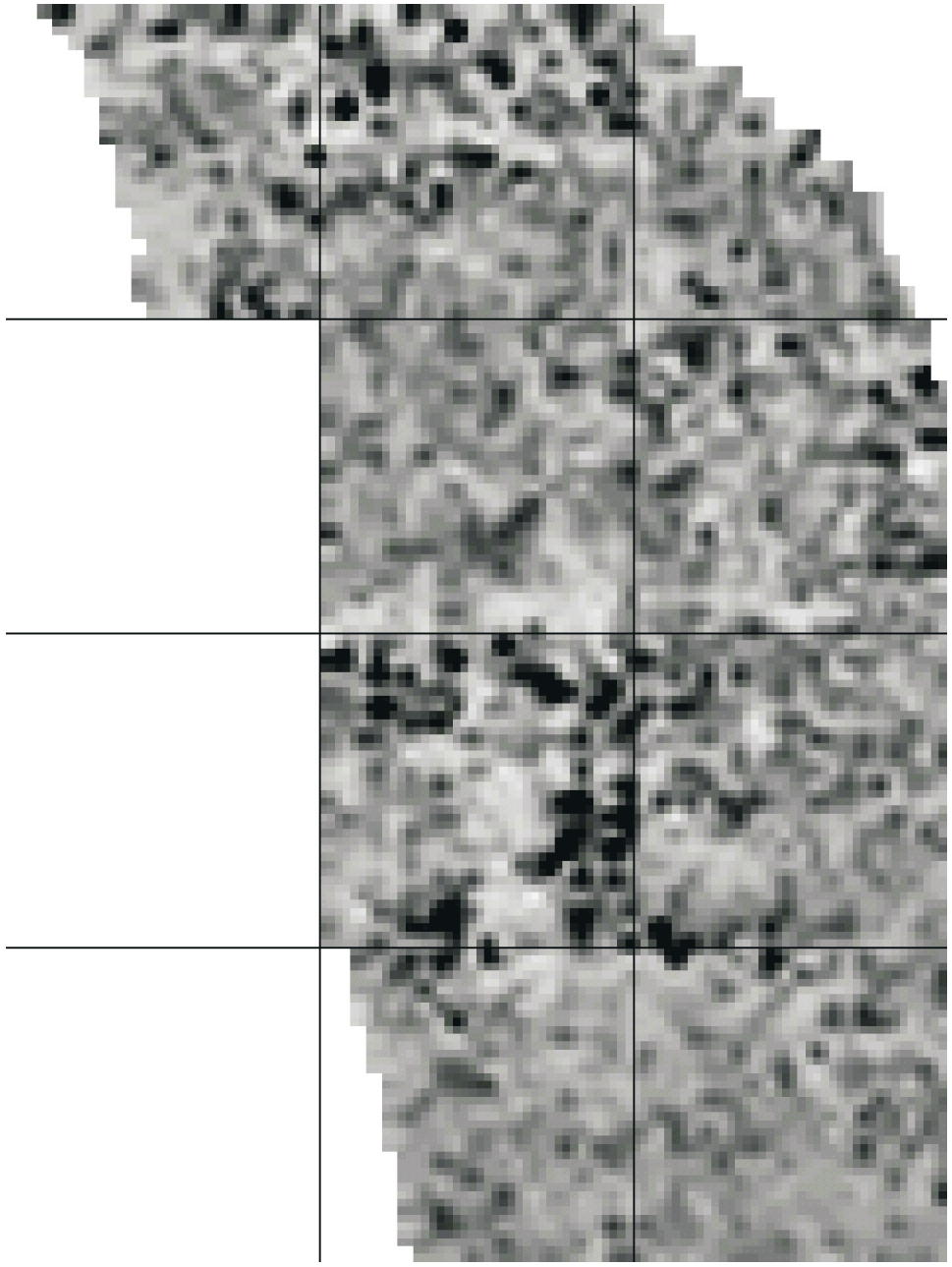
Appendix 3 – Trace Plots and Colour Shade Plots of the Survey Results

App 3.1 – Greyscale plot of the resistivity survey results, with the grid superimposed

App 3.2 – Trace plot of the resistivity survey results

App 3.3 – Colour shade plot of the resistivity survey results

App 3.4 – Relief shade plot of the resistivity survey results



Hurstbourne Priors

348.12
289.82
231.51
173.21
114.91
56.60
-1.70
-60.00
-118.31
-176.61
-234.92
-293.22
-351.52 ohm

N

Palette : grey55.ptt

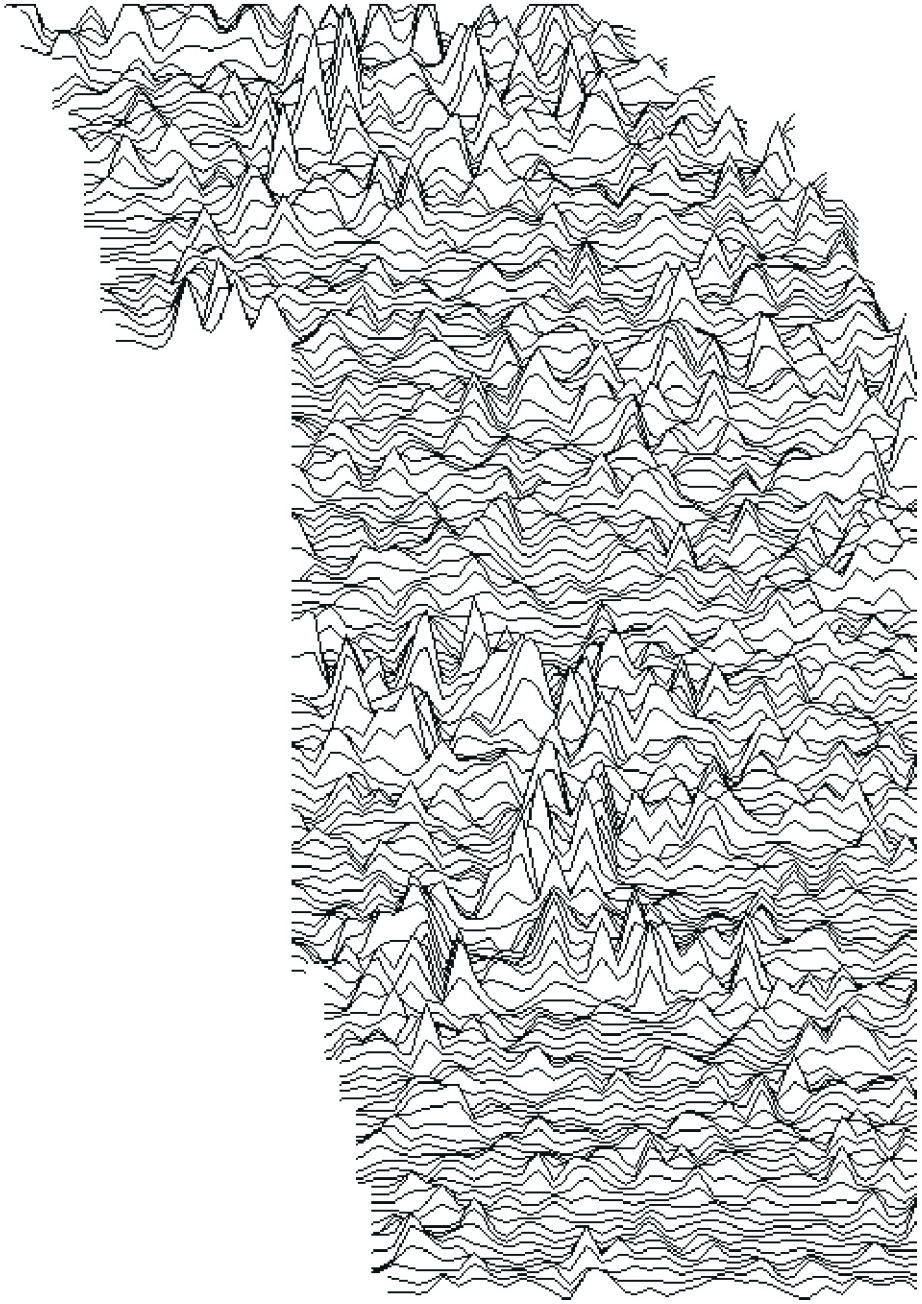
0 10m
Size : x 2

-3SD Mean 3SD

Clip Parameters

Mimimum	-3
Maximum	3
Contrast	1
Units	Std Dev

App 3.1 Greyscale plot of the resistivity survey results, with the survey grid superimposed



Hurstbourne Priors

699.65 ohm

N

0 10m

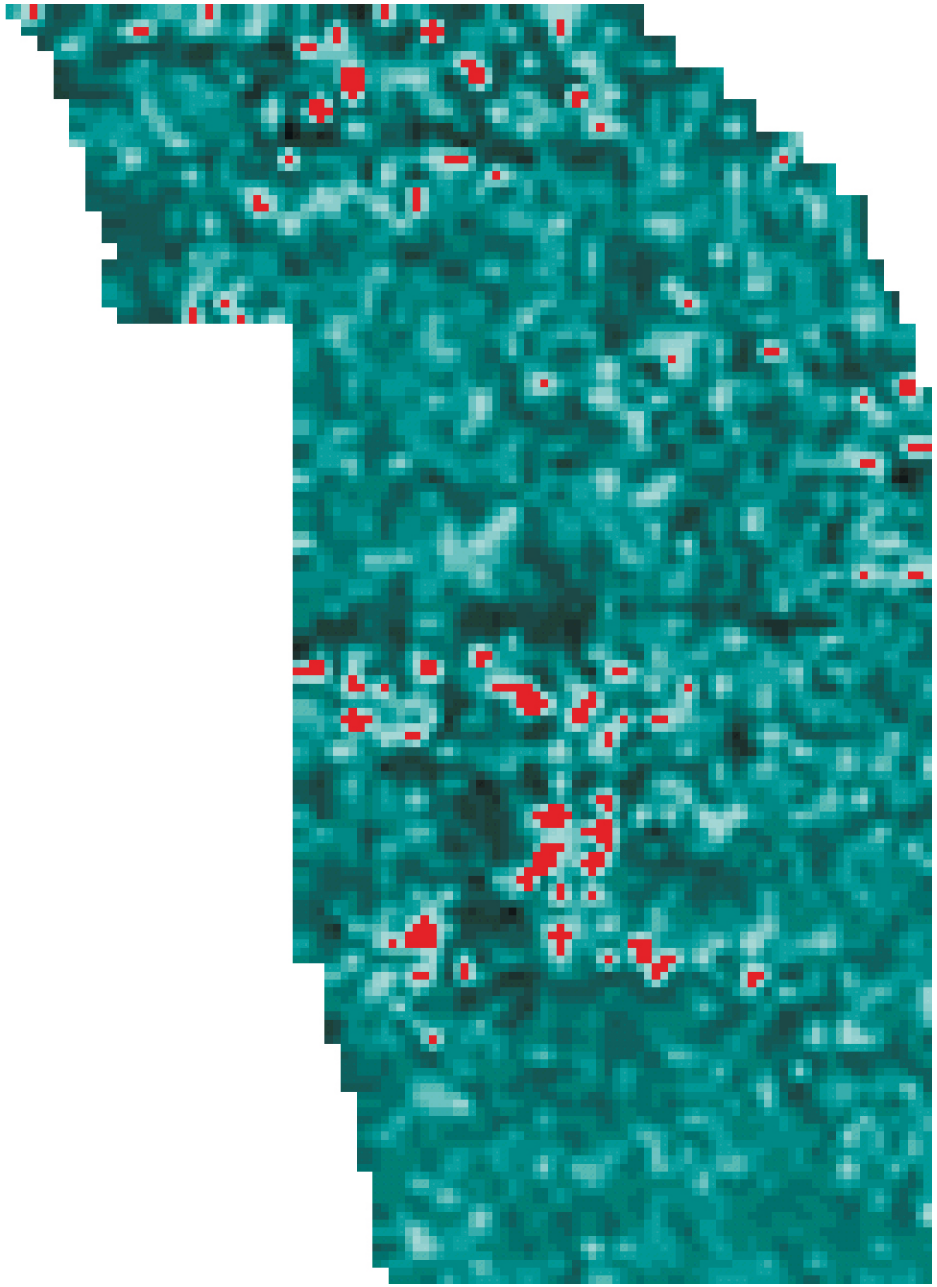
Size : x 2

-3SD Mean 3SD

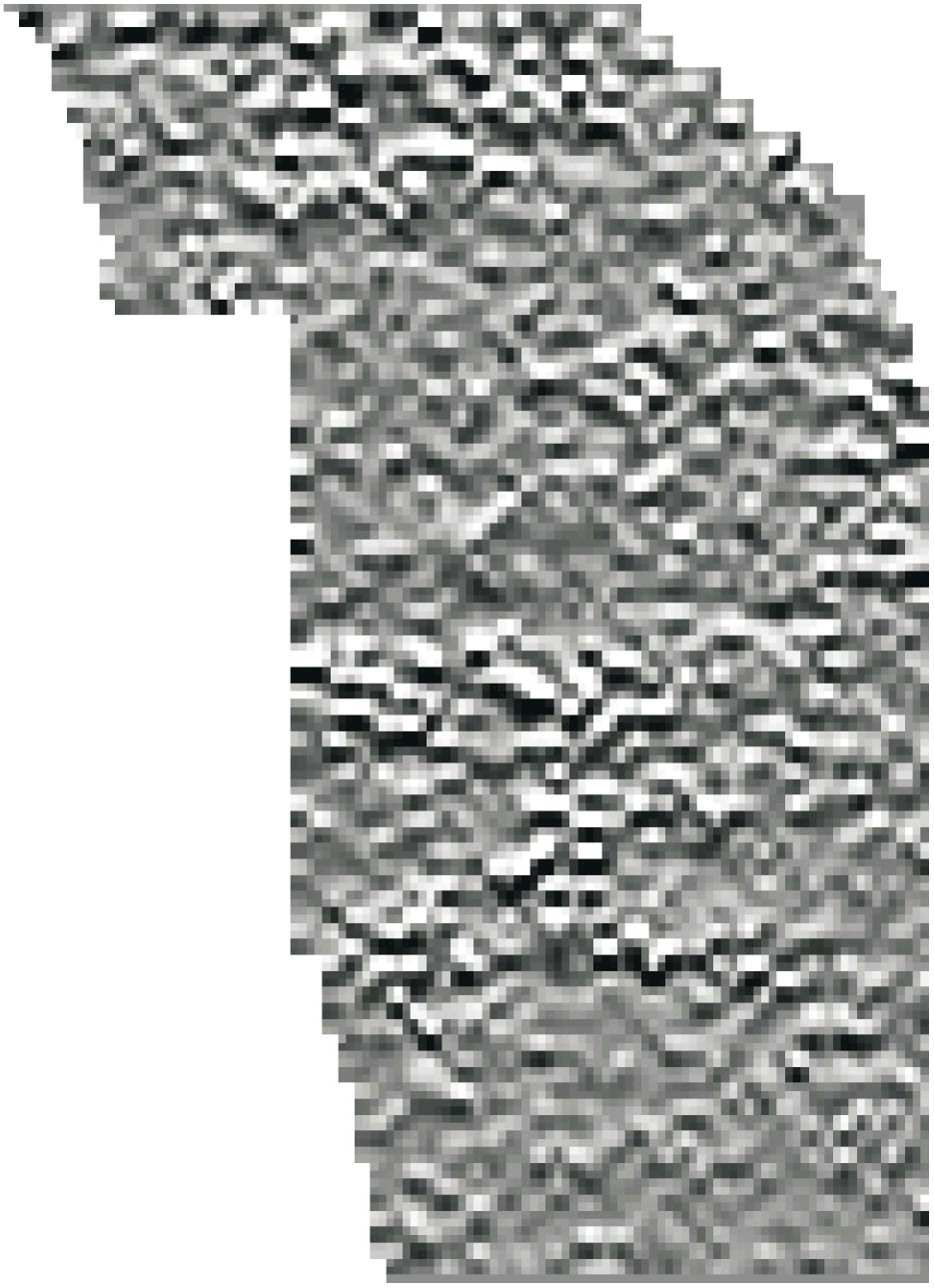
Standard Parameters

View	Front
X Disp.	0
Y Exp.	0
Hidden Line	On
Resolution	0.15
Units	Std Dev

App 3.2 Trace plot of the resistivity survey results



App 3.1 Colour shade plot of the resistivity survey results



Hurstbourne Priors

178.18
122.94
86.20
57.34
32.69
10.50
-10.24
-30.21
-49.91
-69.78
-90.22
-111.68
-134.65 ohm

N

Palette : grey55.ptt

0 10m

Size : x 2

-3SD Mean 3SD

Relief Parameters

Scaling	2
Sun Dir.	90
Sun Elev.	30

App 3.4 Relief shade plot of the resistivity survey results

References

Clark, A 1990, *Seeing Beneath the Soil: Prospecting Methods in Archaeology*. London; Batsford.

Clark, K. 2001, *Resistivity Survey: Hurstbourne Priors, Hampshire. October 2001*. Unpublished Survey Report.

Coates, R 1989, *The Place-Names of Hampshire*. London; Batsford.

David, A 1995, *Geophysical Survey in Archaeological Field Evaluation*. Research and Professional Services Guideline No. 1. English Heritage.

Gaffney, C., Gater, J. and Ovendon, S 1991, *The Use of Geophysical Survey Techniques in Archaeological Evaluations*. Institute of Field Archaeologists Technical Paper No. 9.

Geoscan Research 1996a, *Fluxgate Gradiometer: Instruction Manual* Version 1.2.

Geoscan Research 1996b, *RM15 Resistance Meter: Instruction Manual* Version 2.4.

Scollar, I., Tabbagh, A., Hesse, A. and Herzog, I. 1990, *Archaeological Prospecting and Remote Sensing*. Cambridge University Press.

University of Southampton

Archaeology
School of Humanities

Kristian Strutt
Geophysical Researcher
Archaeological Prospection
Services of Southampton.

University of Southampton
Avenue Campus
Highfield
Southampton
SO17 1BF

Direct: + 44 (0)23 8059 6866
Fax: + 44 (0)23 8059 3032
E-Mail: kds@soton.ac.uk