Centre for Archaeology Report 89/2002

Framlingham Castle, Framlingham, Suffolk. Report on Geophysical Surveys, July 2002

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ISSN 1473-9224

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Summary

Magnetometer and earth resistance surveys were conducted over the outer bailey and lower court areas at Framlingham Castle, Framlingham, Suffolk. Results were mixed, but most notably confirmed the presence of buried walls under the banks of the lower court.

Keywords

Geophysics

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FRAMLINGHAM CASTLE, Framlingham, Suffolk.

Report on geophysical survey, July 2002.

Introduction

Geophysical surveys of approximately 1.7 hectares were conducted over the outer bailey and Lower Court at Framlingham Castle, Framlingham, Suffolk (SAM: SF3; Monument Number 390442). These two areas were highlighted as needing particular further research after analysis of the earthworks of the castle by the English Heritage Archaeological Investigations team (Cambridge office) in January and February of 2002 (see Brown 2002).

The two areas have been little studied in the past, often interpreted as extraneous to the main castle buildings, merely providing 'extra space for men and horses' (EH 1988). However, various surveys and plans show the presence of fishponds in the Lower Court and one plan notes that the bailey was once planted as a 'pleasaunce' (Brown 2002, 9-12, figs 4, 6). Questions arising from the recent study of Framlingham include: identifying the nature of the broad eroded bank in the bailey; assessing any damage caused by the use of part of the bailey as allotments, and more recently, as an overflow car park and venue for other events; and identifying evidence for walls drawn on the banks surrounding the Lower Court in the 1959 EH guidebook, that were not evident on the 1931 plan on which it was based (Brown 2002, 25, fig8). There was also the question of the full extent of the Anglo-Saxon cemetery known to extend ~ 45m east of the entrance road.

The aim of this survey was to address some of the above questions by providing a sub-surface investigation of the Lower Court, to clarify the extent of any buried walls, and of the outer bailey where there is limited knowledge as to the nature of the past use of this area. Both the earthwork and geophysical surveys were undertaken to assist in the preparation of a Conservation Plan for the site, being compiled by Oxford Archaeology.

The castle (TM 287 638) lies on calcareous clayey soils of the Hanslope association (Soil Survey of England and Wales 1983) developed over Lowestoft Till underlain by Crag (Institute of Geological Sciences 1966). At the time of the survey the two areas were under grass and used as leisure areas by those visiting the castle.

Method

Magnetometer survey

Magnetometer survey was used to reconnoitre the outer bailey area and also to make some attempt at locating the Anglo-Saxon cemetery. The survey was conducted using the standard method outlined in note 2 of Annex 1, and its location is shown on Figure 1. Plots of the data-set are presented as both an X-Y traceplot and a linear greyscale, at a scale of 1:1250 on Plan A. A plot is also superimposed over the earthwork plan provided the Archaeological Investigations team on Figure 2 (1:2000).

The corrections made to the measured values displayed in the plots were to zero-mean each instrument traverse to remove heading errors and to 'despike' the data through the application of a 2m by 2m thresholding median filter (Scollar *et al* 1990; 492) to reduce the detrimental effects produced by surface iron objects. In addition the lower and upper values of the data have been trimmed for presentation as traceplots.

Earth resistance

An earth resistance survey was conducted over all the shaded grid-squares (see Figure 1), in both the bailey and the Lower Court. The flattest areas on the high banks around the Lower Court were also surveyed in an attempt to locate the walls marked on the plan that appeared in the 1959 guidebook. Measurements were collected with a Geoscan RM15 resistance meter, PA1 mobile probe array in the Twin-Electrode configuration. Readings were collected using the standard method outlined in note 1 of Annex 1. Plots of the data-set from the bailey are presented as both an X-Y traceplot and a linear greyscale, at a scale of 1:1250, in Plan B and at a scale of 1:1000, from the Lower Court in Plan C. A linear greyscale of high-pass filtered data has been superimposed over the earthwork plan provided by the Archaeological Investigations team on Figure 3 (1:2000).

Results

Magnetometer survey

A graphical summary of the significant anomalies discussed in the following text is provided on Figure 4a.

The outer bailey
The overall magnetic response is rather 'noisy' (>$\pm$1nT), especially in the area [1] to the south of the broad bank across the bailey. The latter disturbance is likely to derive from modern activity, such as allotments and overflow car parking. Specific areas of magnetic noise e.g. [2] and [3] have been recorded alongside ferrous fencing and at [4] and [5], most probably responses to buried pipes. The partially negative response of [4] suggests this could be a plastic water pipe. This is further supported by the observation of two taps in the vicinity of the extremities of this anomaly.

A slightly curving linear positive magnetic anomaly [6], perhaps caused by a ditch, is just detectable running through the southern part of the bailey but its definition is very poor. Although this could have some archaeological significance it is not possible to define its purpose. A barely discernible linear anomaly [7] may abut [6], but any such interpretation is speculative.

Various discrete pit-type positive magnetic anomalies can be seen at [8-10], in the northern half of the bailey. There may well be similar occurrences in the southern part, such as at [11], but the response to pits etc is obscured by the extensive magnetic disturbance here.

Earth resistance

A graphical summary of the significant anomalies discussed below is provided on Figure 4b.

The outer bailey
Modern disturbance has been recorded at [R1] over a vehicle track into the field. Two linear low-high resistance anomalies [R2-3] are likely to be the service pipes as seen in the magnetic data at [4] and [5] respectively.

A broad band of very slightly lower resistance readings has been recorded at [R4]. Though this approximately corresponds with the wide bank recorded in the earthwork survey an offset is apparent suggesting that this relationship should not be over-stressed.

An area of higher resistance is apparent to the west of [R5]. Within this there appears to be a series of significantly higher resistance linear anomalies [R6] enclosing an area between the road and ditch – perhaps indicating the presence of structural foundations. The linear magnetic anomaly [5] falls between [R5] and [R6]. It is not clear how these all relate to one another, but their proximity to the gatehouse/main entrance is intriguing. Over the remainder of the site there are a series of high resistance linear anomalies e.g. at [R7-9] that possibly correlate with structural remains. There is no obvious patterning to these and no suggestion of a formal arrangement of buildings can be deduced.

The Inner Court
Several high resistance linear anomalies [R10-12] are evident on the banks around the Lower Court. It is not possible to establish an exact layout of these structures as the topography and vegetation limited the surveyable area; however, these results corroborate the presence of walls as recorded on the 1931 survey. A high resistance rectilinear anomaly [R13] is suggestive of a further possible structure within the court.

An unclear pattern of high and low resistance readings [R14] in the middle of the Lower Court does not elucidate the nature of activity here. There is no apparent correlation between the resistance readings and the suggested outline of fishponds (Brown 2002).

Conclusion

The magnetometer survey in the outer bailey area has not been very informative. Widespread ferrous debris of probable modern origin has disturbed much of the survey data, extending over the probable location of the cemetery, hampering the identification of archaeological anomalies. Graves themselves are, additionally, notoriously difficult to identify with standard geophysical techniques. There has been no obvious response to the broad bank across the bailey and the concentration of disturbance to the south of this is likely to be through modern use of this feature as a division. Of possibly more significance are the few pit-type responses and a linear anomaly [6] that may have enclosed an area adjacent to the road.

The earth resistance survey of the outer bailey has recorded further potential enclosure features in the same area, though the exact function of these is unclear. However, they are unlikely to relate to the allotment as they do not match with any feature visible on an aerial photograph of this (Brown 2002, fig 15). Elsewhere in the bailey possible structures have been recorded, although these form no obvious pattern.

The banks of the Lower Court do seem to be constructed over the remains of walls though it has not been possible to delimit these structures. There is no clear evidence for fishponds here, or any other coherent patterning to the resistance readings in the middle of the Court - apart from one potential building extending under the southern bank.

Surveyed by: A Payne
L Martin

Date of survey: 1-5/07/2002

Reported by: L Martin

Date of report: 06/09/2002

Archaeometry Branch,
English Heritage,
Centre for Archaeology.

References

British Geological Survey, 1996, Saxmundham, England and Wales Solid and Drift, Sheet 191, 1:50,000.

Brown, M 2002 'Framlingham Castle, Framlingham, Suffolk, Survey Report'. *Archaeological Investigation Series* **24/2002**. English Heritage, draft copy.

English Heritage, 1995, 'Geophysical survey in archaeological field evaluation' *Research and Professional Guidelines No 1*. English Heritage, London.

English Heritage, 1988, *Framlingham and Orford Castles*. English Heritage Guide Book.

Scollar, I, Tabbagh, A. Hesse, A. and Herzog, I. (eds.), 1990, *Archaeological Prospecting and Remote Sensing*. Cambridge.

Soil Survey of England and Wales, 1983, Soils of England and Wales, Sheet 4, Eastern England.

List of enclosed figures.

Figure 4 Graphical summary of significant geophysical anomalies (1:2000).

Plan A Traceplot and linear greyscale of magnetometer data from the bailey (1:1250).

Plan B Traceplot and linear greyscales of earth resistance data from the bailey (1:1250).

Plan C Traceplot and linear greyscales of earth resistance data from the Lower Court (1:1000).

Annex 1: Notes on standard procedures

1) **Earth Resistance Survey:** Each 30 metre grid square is surveyed by making repeated parallel traverses across it, all aligned parallel to one pair of the grid square's edges, and each separated by a distance of 1 metre from the last; the first and last traverses being 0.5 metres from the nearest parallel grid square edge. Readings are taken along each traverse at 1 metre intervals, the first and last readings being 0.5 metres from the nearest grid square edge.

Unless otherwise stated the measurements are made with a Geoscan RM15 earth resistance meter incorporating a built-in data logger, using the twin electrode configuration with a 0.5 metre mobile electrode separation. As it is usually only relative changes in resistivity that are of interest in archaeological prospecting, no attempt is made to correct these measurements for the geometry of the twin electrode array to produce an estimate of the true apparent resistivity. Thus, the readings presented in plots will be the actual values of earth resistance recorded by the meter, measured in Ohms (Ω). Where correction to apparent resistivity has been made, for comparison with other electrical prospecting techniques, the results are quoted in the units of apparent resistivity, Ohm-m (Ωm).

Measurements are recorded digitally by the RM15 meter and subsequently transferred to a portable laptop computer for permanent storage and preliminary processing. Additional processing is performed on return to the Centre for Archaeology using desktop workstations.

2) **Magnetometer Survey:** Each 30 metre grid square is surveyed by making repeated parallel traverses across it, all parallel to that pair of grid square edges most closely aligned with the direction of magnetic North. Each traverse is separated by a distance of 1 metre from the last; the first and last traverses being 0.5 metre from the nearest parallel grid square edge. Readings are taken along each traverse at 0.25 metre intervals, the first and last readings being 0.125 metre from the nearest grid square edge.

These traverses are walked in so called 'zig-zag' fashion, in which the direction of travel alternates between adjacent traverses to maximise survey speed. However, the magnetometer is always kept facing in the same direction, regardless of the direction of travel, to minimise heading error.

Unless otherwise stated the measurements are made with a Geoscan FM36 fluxgate gradiometer which incorporates two vertically aligned fluxgates, one situated 0.5 metres above the other; the bottom fluxgate is carried at a height of approximately 0.2 metres above the ground surface. The FM36 incorporates a built-in data logger that records measurements digitally; these are subsequently transferred to a portable laptop computer for permanent storage and preliminary processing. Additional processing is performed on return to the Centre for Archaeology using desktop workstations.

It is the opinion of the manufacturer of the Geoscan instrument that two sensors placed 0.5 metres apart cannot produce a true estimate of vertical magnetic gradient unless the bottom sensor is far removed from the ground surface. Hence, when results are presented, the difference between the field intensity measured by the top and bottom sensors is quoted in units of nano-Tesla (nT) rather than in the units of magnetic gradient, nano-Tesla per metre (nT/m).

3) **Resistivity Profiling:** This technique measures the electrical resistivity of the subsurface in a similar manner to the standard resistivity mapping method outlined in note 1. However, instead of mapping changes in the near surface resistivity over an area, it produces a vertical section, illustrating how resistivity varies with increasing depth. This is possible because the resistivity meter becomes sensitive to more deeply buried anomalies as the separation between the measurement electrodes is increased. Hence, instead of using a single, fixed electrode separation as in resistivity mapping, readings are repeated over the same point with increasing separations to investigate the resistivity at greater depths. It should be noted that the relationship between electrode separation and depth sensitivity is complex so the vertical scale quoted for the section is only approximate. Furthermore, as depth of investigation increases the size of the smallest anomaly that can be resolved also increases.

Typically a line of 25 electrodes is laid out separated by 1 or 0.5 metre intervals. The resistivity of a vertical section is measured by selecting successive four electrode subsets at increasing separations and making a resistivity measurement with each. Several different schemes may be employed to determine which electrode subsets to use, of which the Wenner and Dipole-Dipole are typical examples. A Campus Geopulse earth resistance meter, with built in multiplexer, is used to make the measurements and the Campus Imager software is used to automate reading collection and construct a resistivity section from the results.

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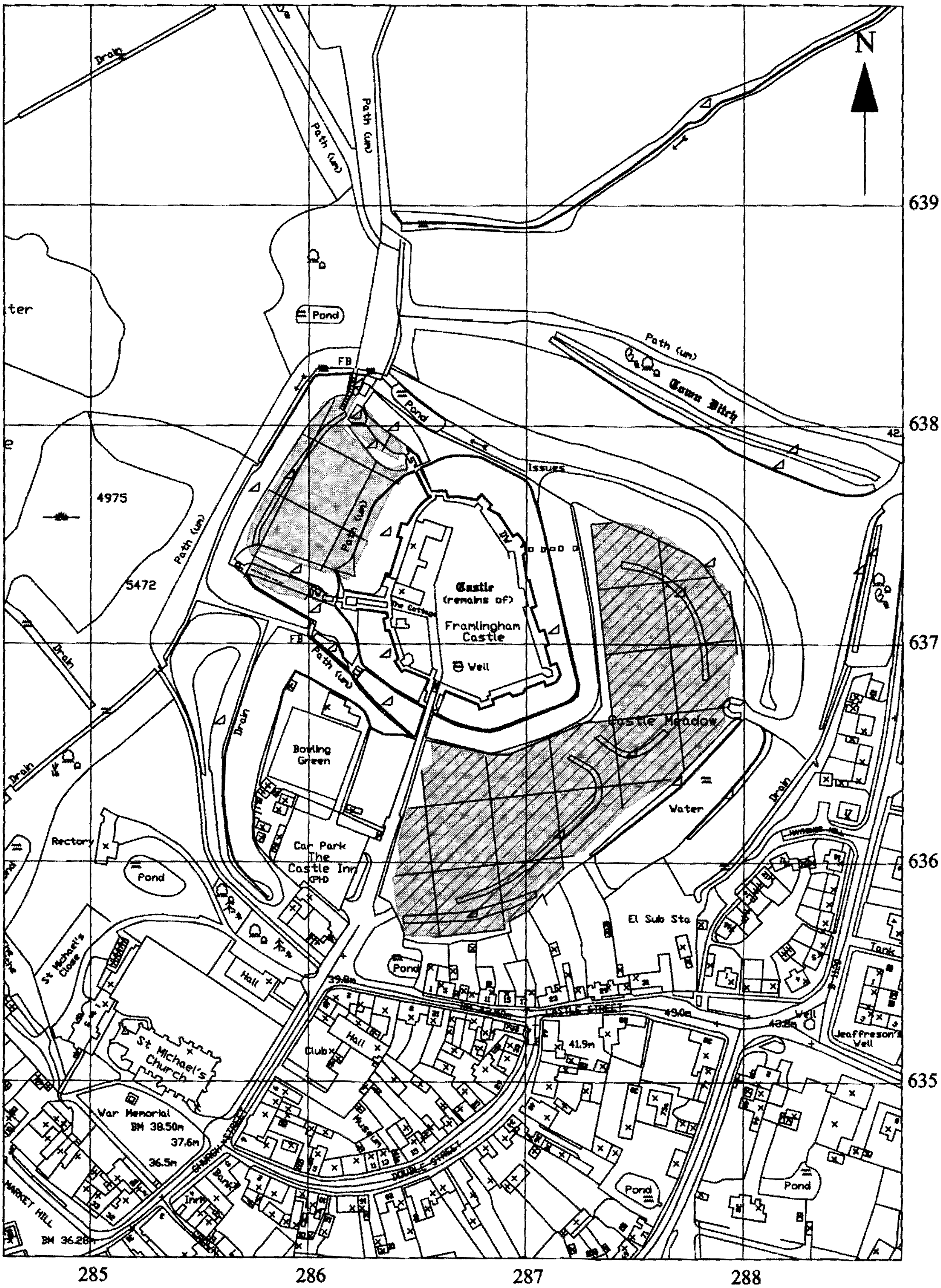
Location of geophysical surveys, July 2002.

Figure 1

TM2863



Earth resistance survey

Magnetometer survey

0 — 90m

1:2500

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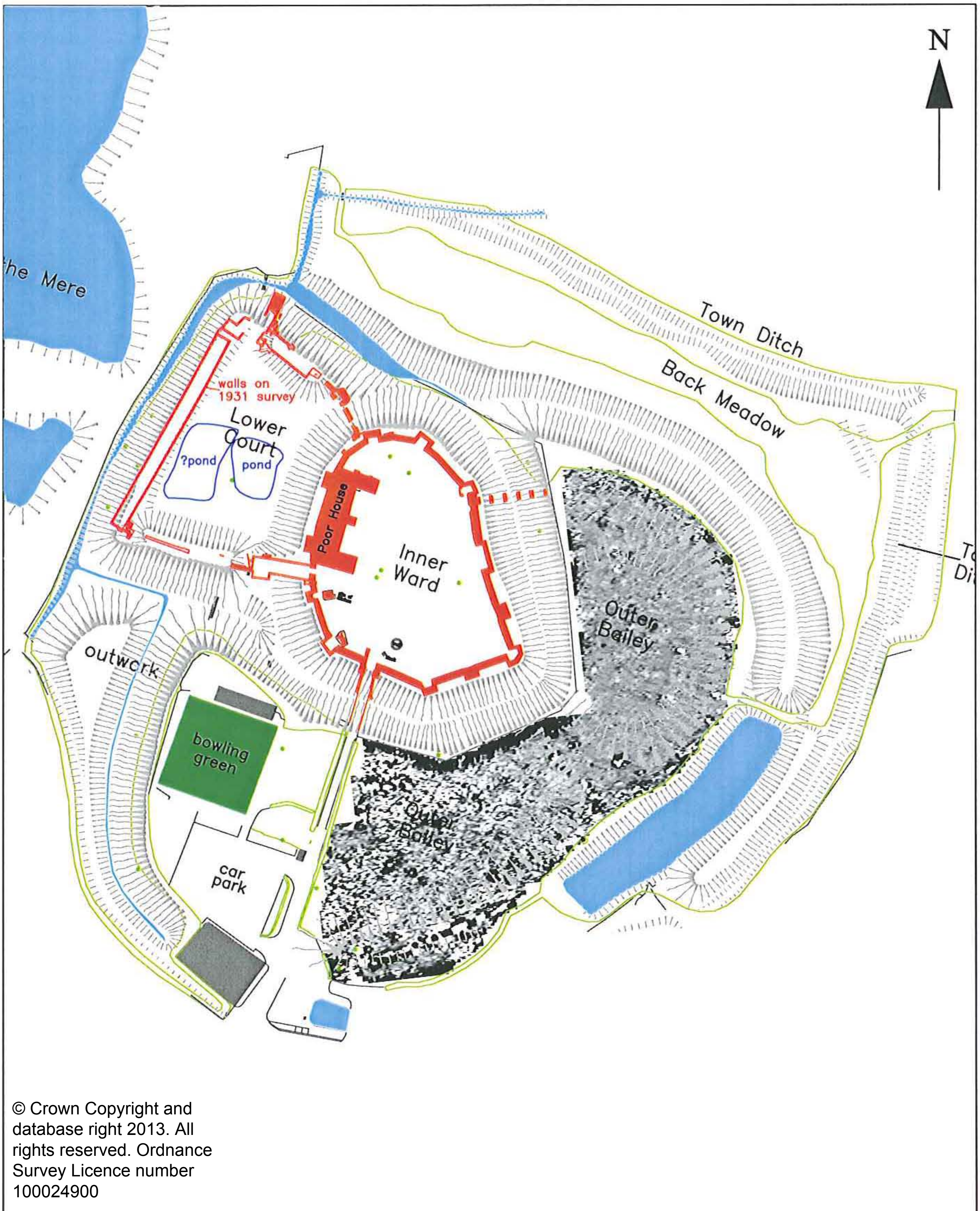
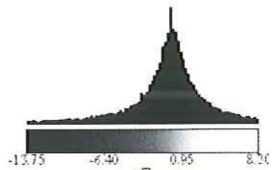
Location of magnetometer survey, July 2002.

Figure 2





0 60m
1:2000

Base plan after Brown 2002.

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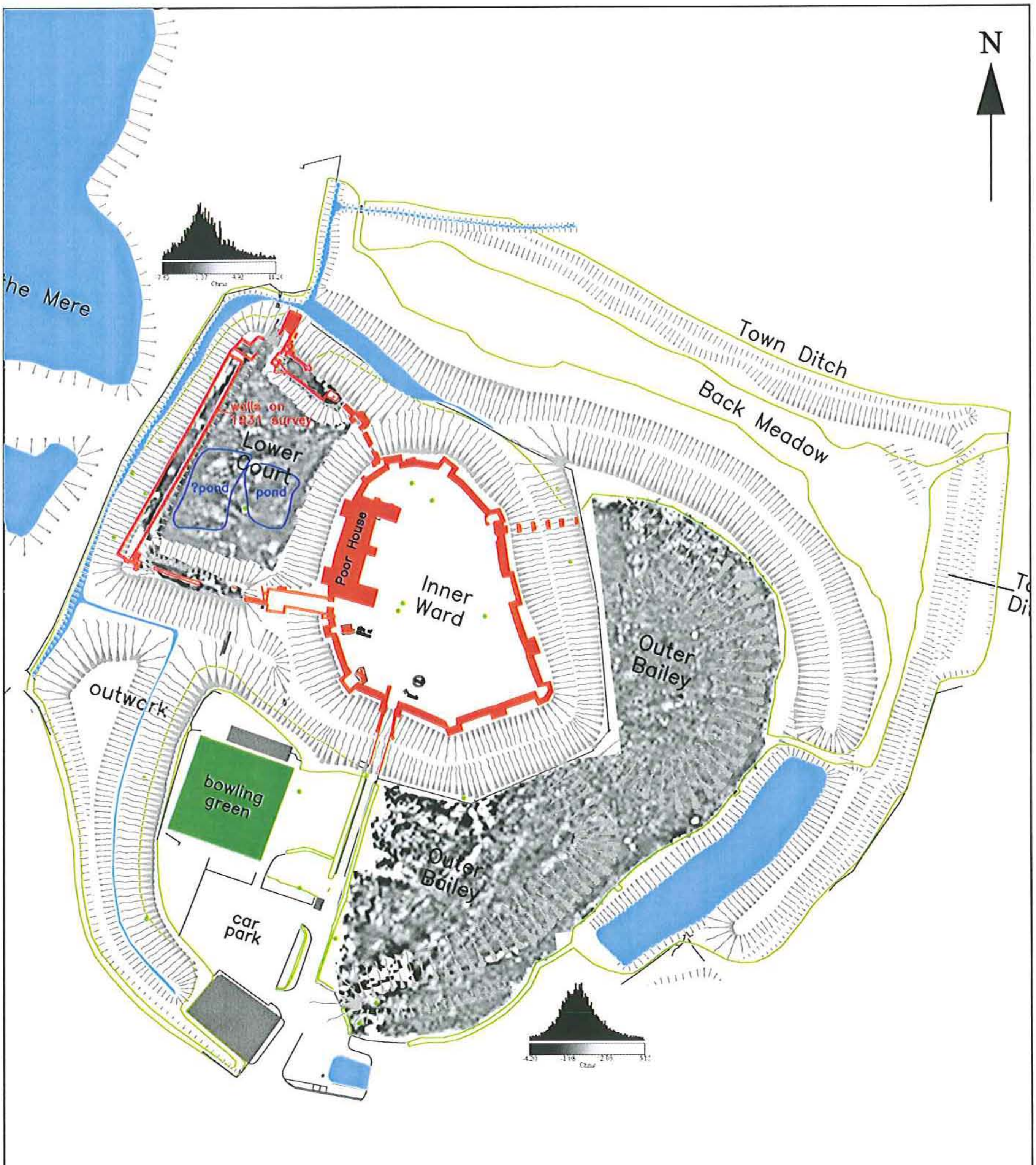
Location of earth resistance survey, July 2002.

Figure 3



0 — 60m

1:2000

Base plan after Brown 2002.

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Figure 4

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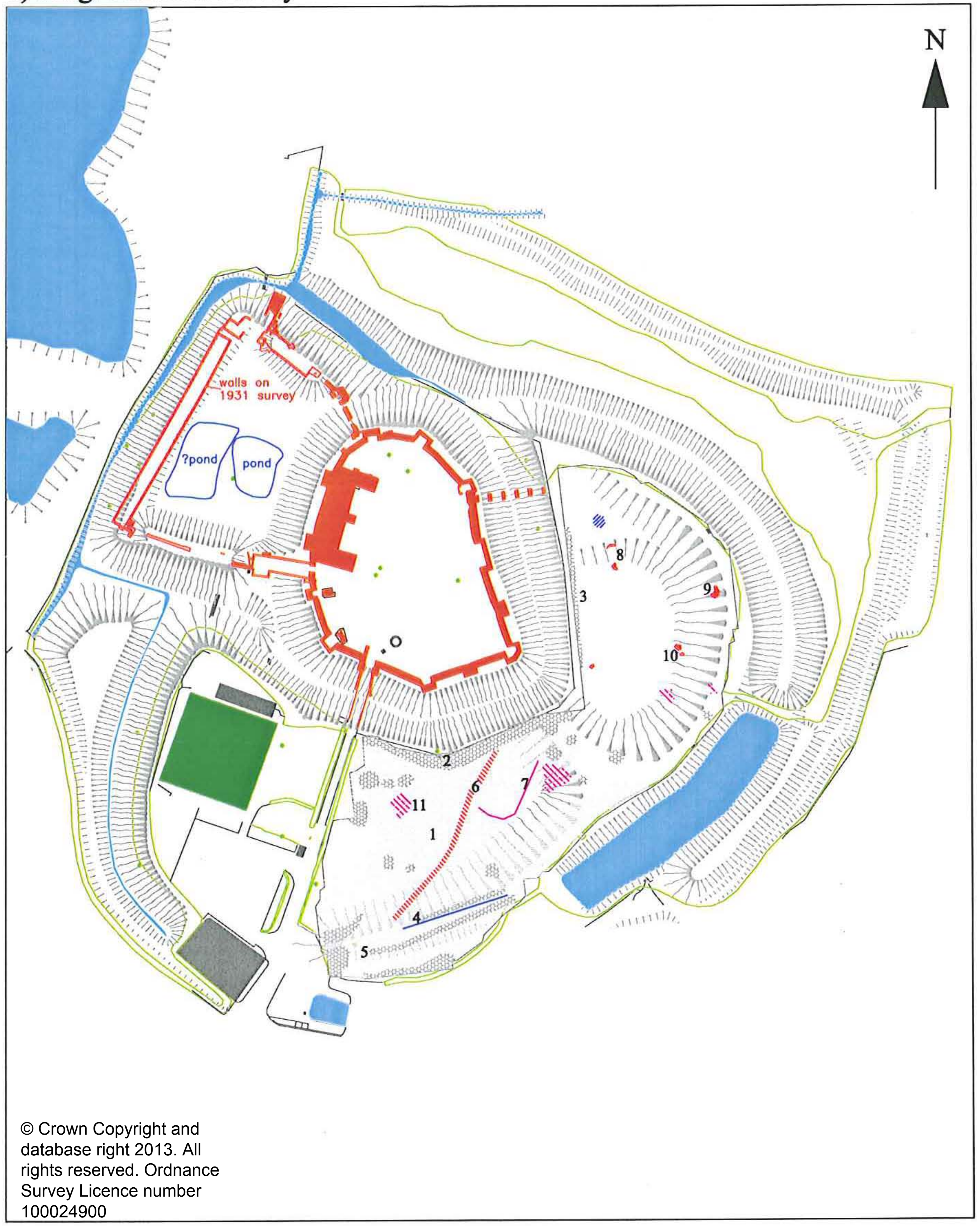
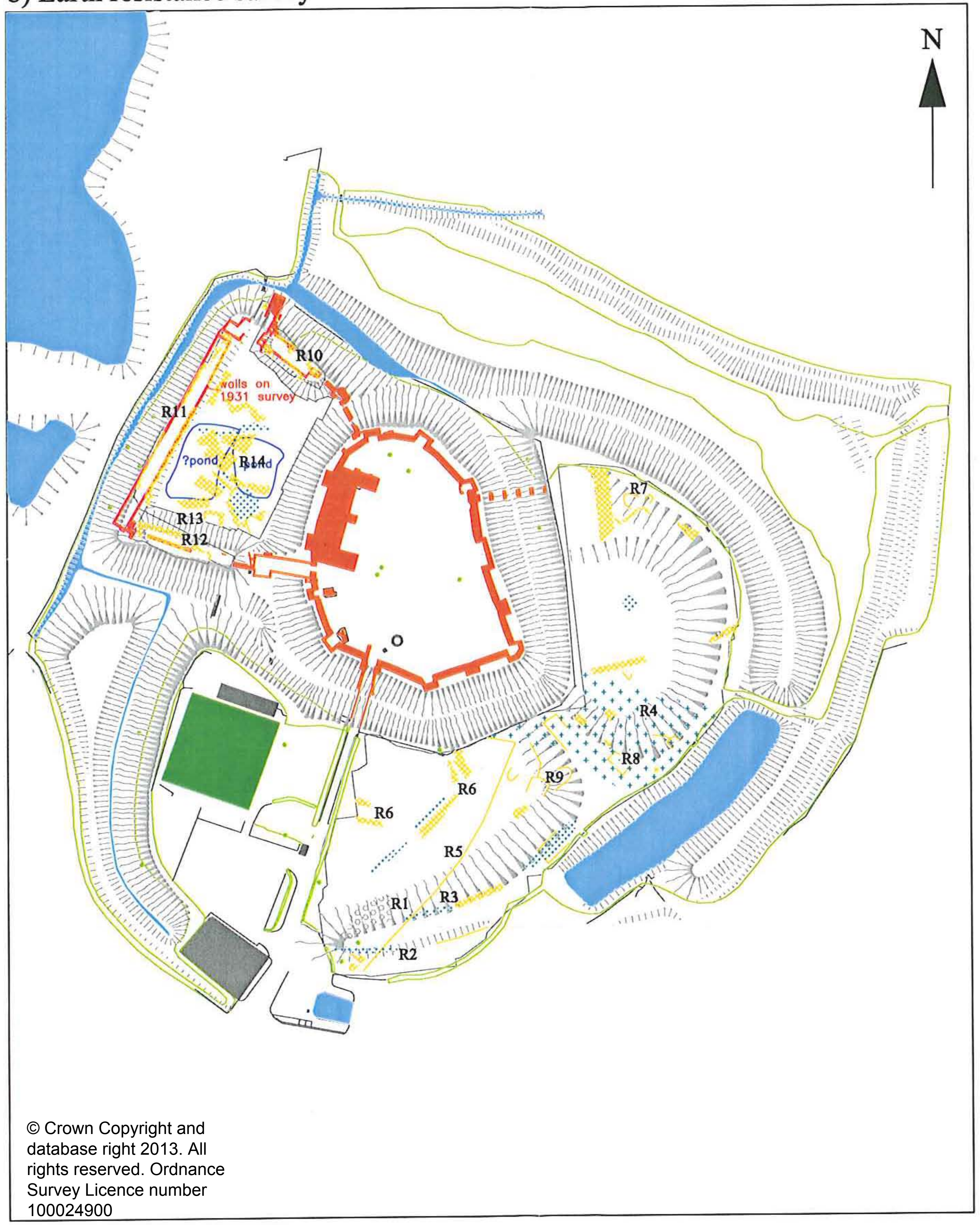
Graphical summary of significant geophysical anomalies, July 2002.

a) Magnetometer survey



b) Earth resistance survey



Positive magnetic anomalies

Negative magnetic anomalies

Area of magnetic disturbance

Slight magnetic anomalies

Raised magnetic response

High resistance

Low resistance

Modern disturbance

0 60m

1:2000

Base plan after Brown 2002.

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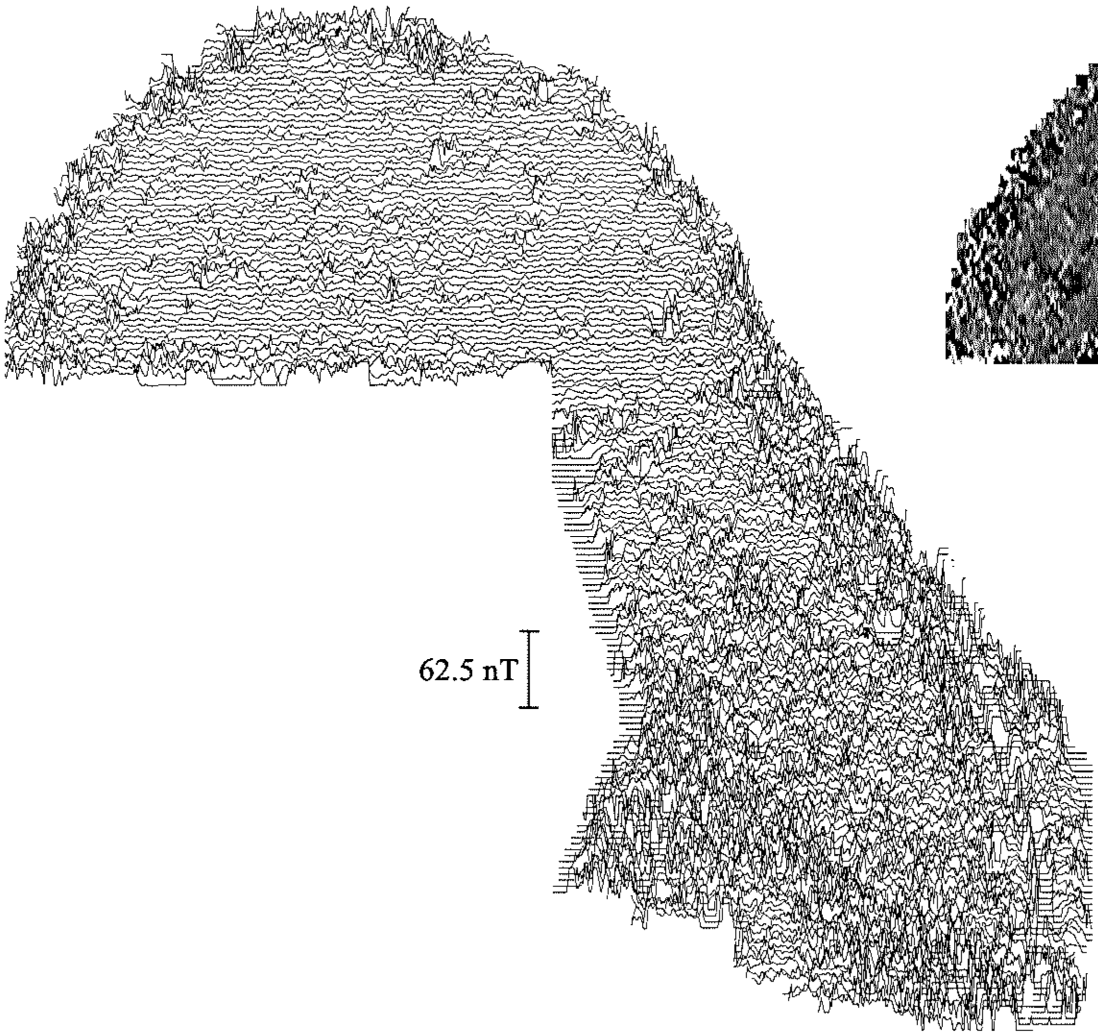
PLAN A

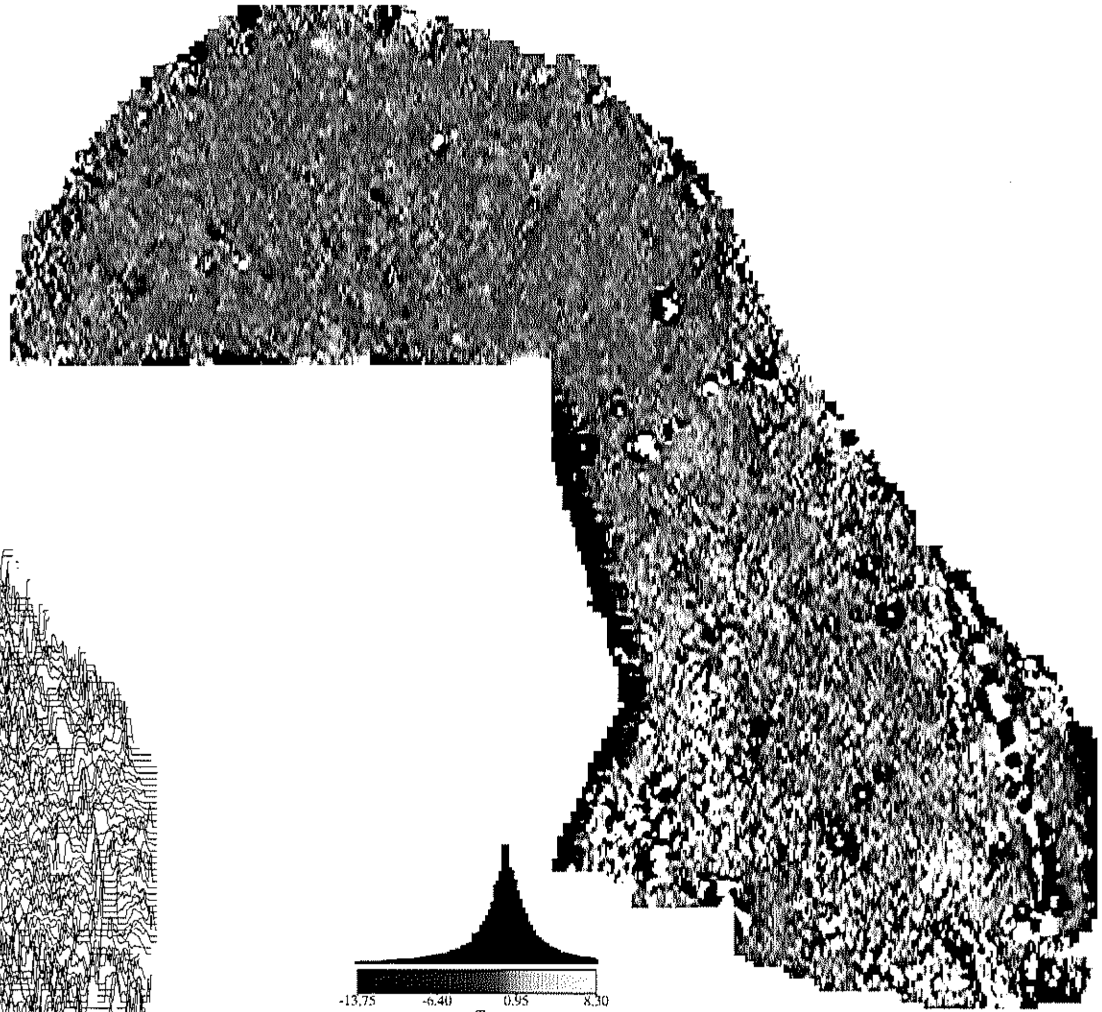
Magentometer survey of the bailey (Castle Meadow), July 2002.

N

1) Traceplot of raw magnetometer data.



2) Linear greyscale of raw magnetomter data.



0 90m

1:1250

PLAN B

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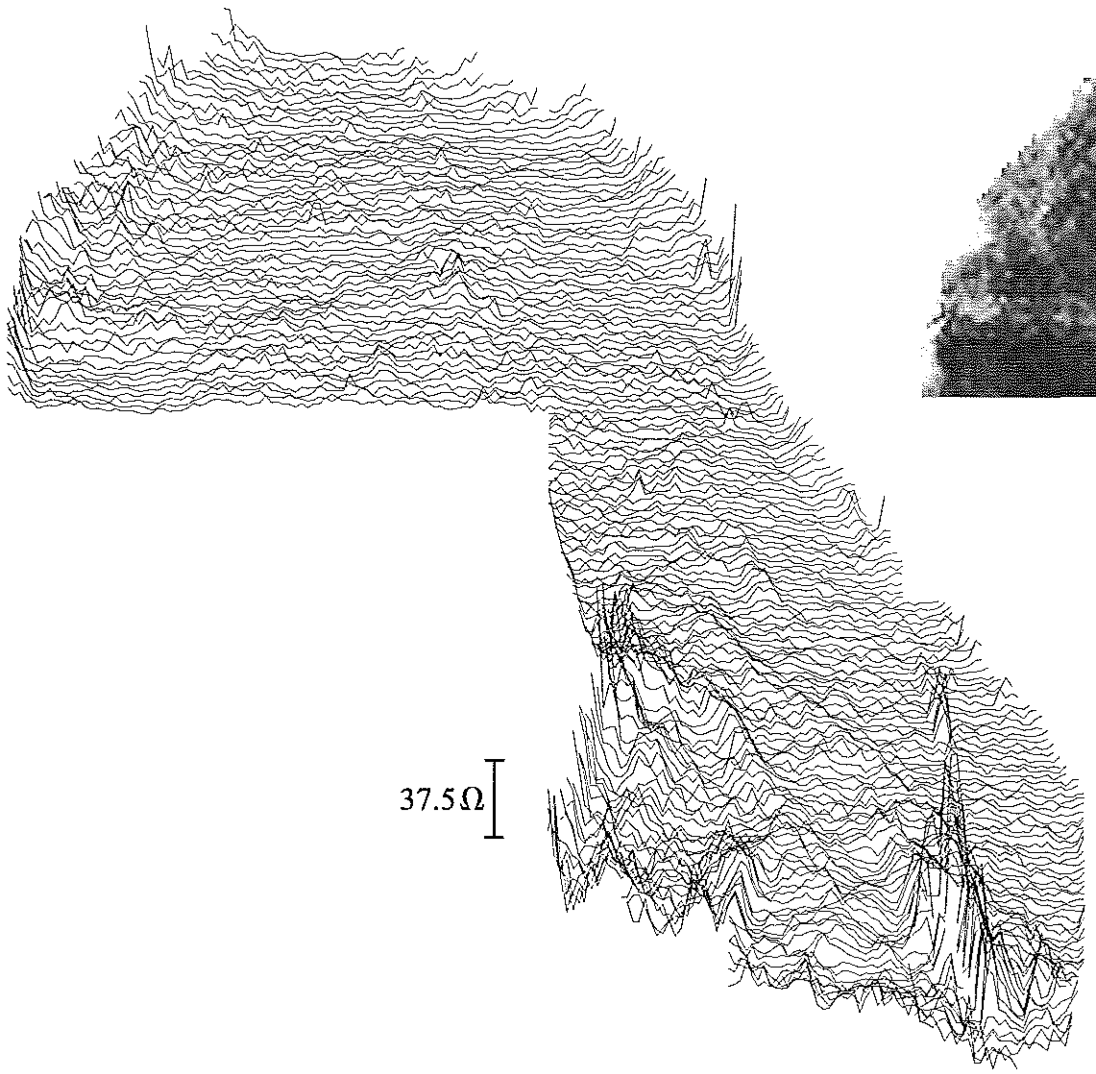
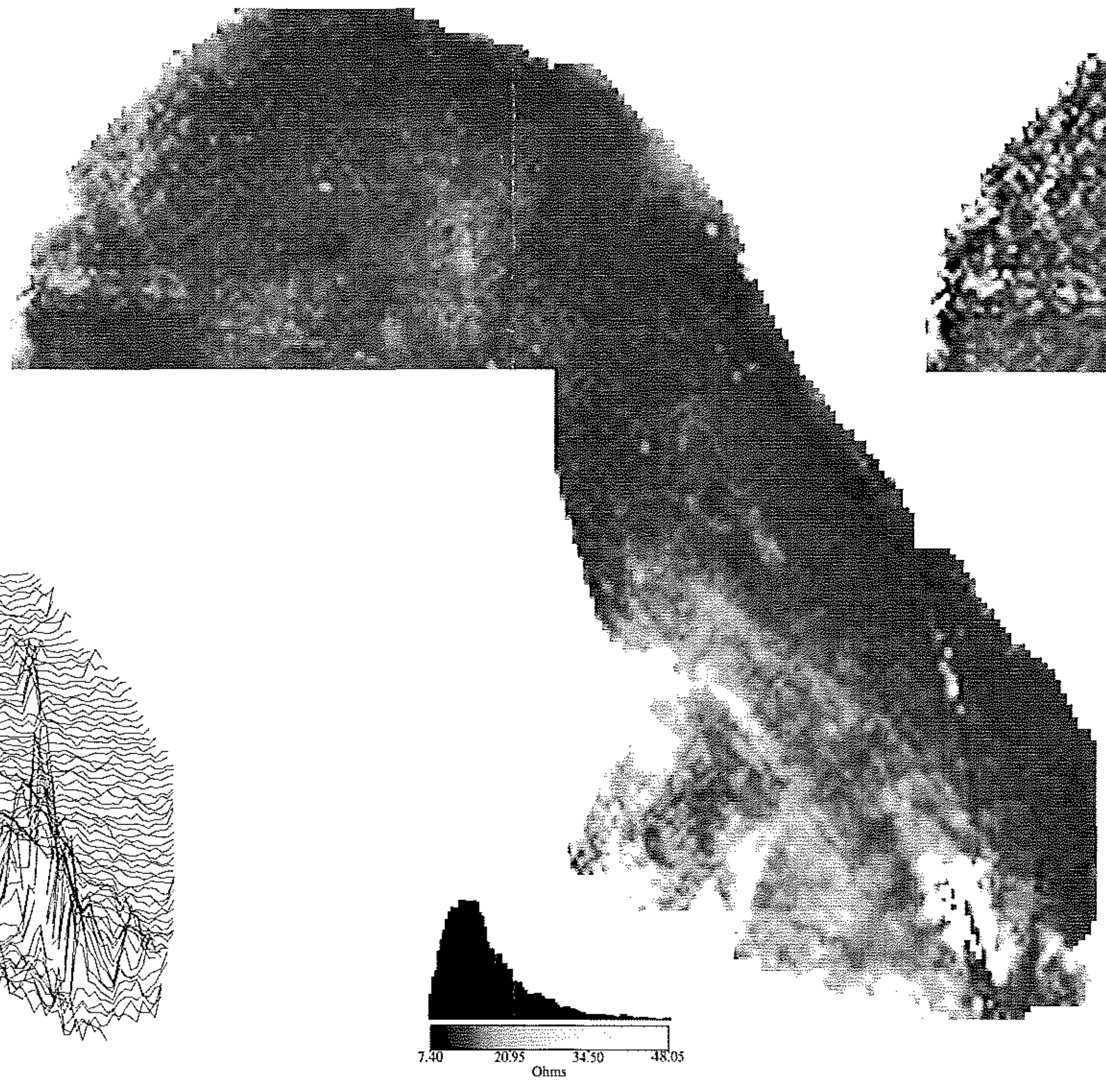
Earth Resistance survey of the bailey (Castle Meadow), July 2002.

N

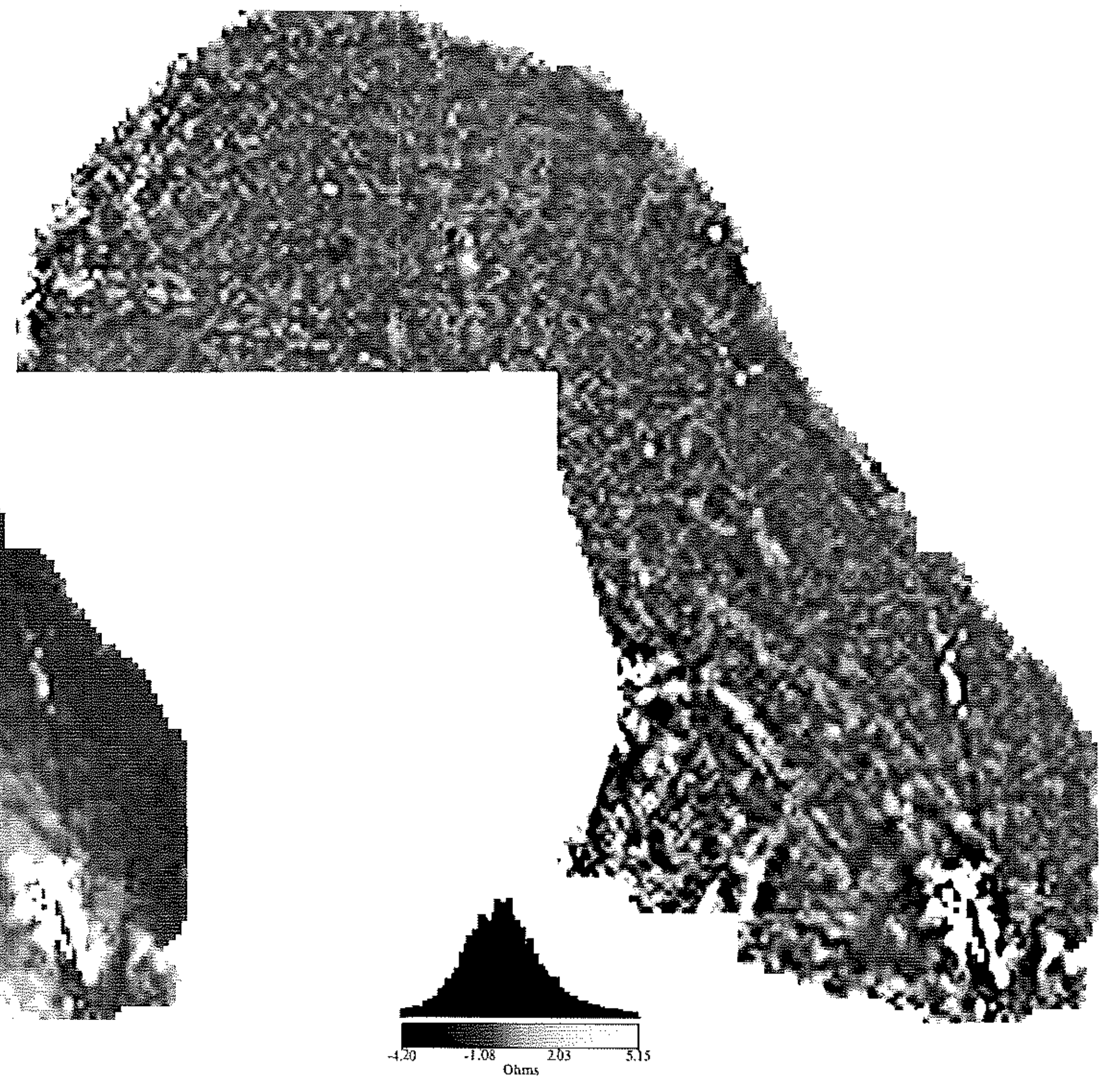
1) Traceplot of raw earth resistance data.



2) Linear greyscale of raw earth resistance data.



3) Linear greyscale of filtered earth resistance data.



0 90m

1:1250

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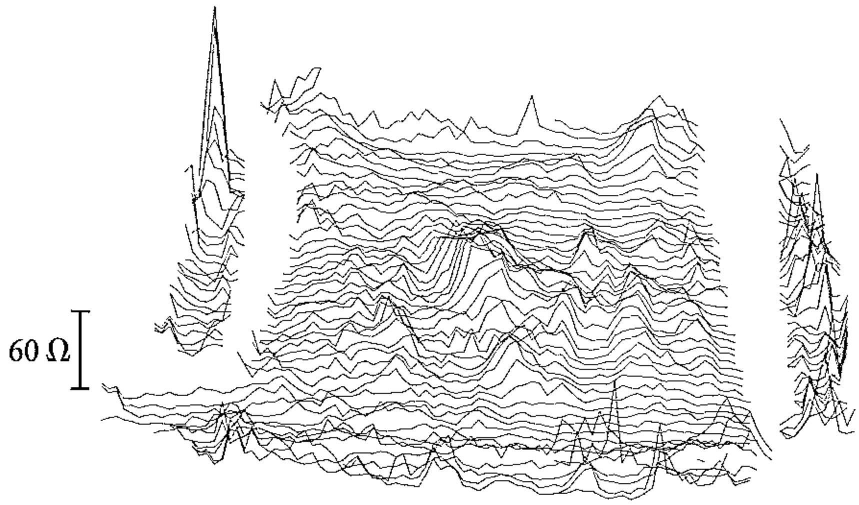
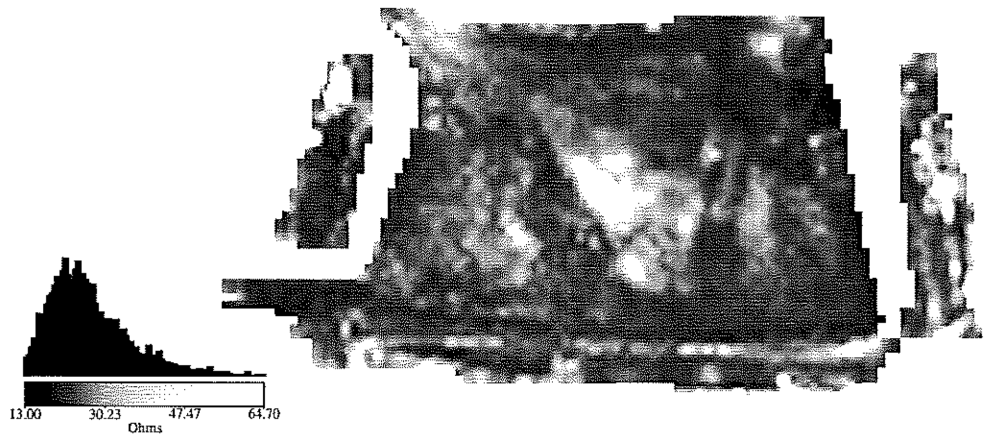
PLAN C

Earth Resistance survey of the Lower Court, July 2002.

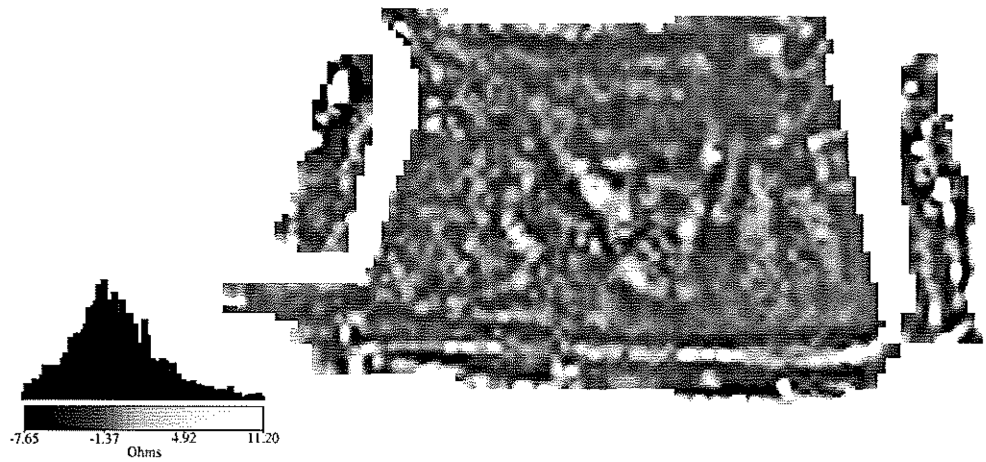
1) Traceplot of raw earth resistance data.



2) Linear greyscale of raw earth resistance data.



3) Linear greyscale of filtered earth resistance data.



0 90m

1:1000