

Ancient Monuments Laboratory
Report No. 14/99

HEMYOCK CASTLE, HEMYOCK, DEVON.
REPORT ON GEOPHYSICAL SURVEY,
FEBRUARY 1999

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Ancient Monuments Laboratory Report 14/99

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Louise Martin.

Summary

A resistivity survey was conducted over an area of approximately 0.1ha that was believed to contain the remains of the western curtain wall and other associated features at Hemyock Castle, Hemyock, Devon. These features had failed to be conclusively identified in an earlier architectural survey incorporating limited excavations. The geophysical survey revealed a number of significant high resistance anomalies believed to be related to the curtain wall and perhaps an interval tower or western entrance. However, there is some discrepancy between the positions of these anomalies and predictions from excavation. The geophysical response is difficult to interpret on account of the topography of the site and recent levelling.

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HEMYOCK CASTLE, Hemyock, Devon.

Report on geophysical survey, February 1999.

Introduction

A geophysical survey of approximately 0.1 ha was conducted over the possible location of the western wall and gatehouse or interval tower at Hemyock Castle, East Devon. Hemyock Castle was originally founded in 1380, the year it received licence to crenellate. This survey extends the archaeological assessment of the site carried out by the Exeter Museums Archaeological Field Unit in 1989 (Blaylock, 1989). This previous work had incorporated some limited excavation, revealing possible fragments of wall and robbed out sections that were believed to be evidence of an interval tower along the suggested line of the western curtain wall. The evidence was far from conclusive and it was felt that a more detailed investigation of the site was needed, in advance of a proposal by the owner to dredge the silted up moat on the western edge of the castle.

The aim of the survey was to investigate the geophysical response to the possible remains of the western curtain wall and to locate evidence for the speculative interval tower or second entrance discussed by Blaylock (1989). It was hoped that the survey results would both improve the current interpretation of the site and inform future management decisions.

The castle (ST 135 133) is situated on a low lying area of Keuper Marl (Mercian Mudstone) (Institute of Geological Sciences 1966). Soils developed over the site consist of stagnogleyic argillic brown earths of the Whimple 3 association (Soil Association of England and Wales 1983). At the time of the survey the site was part of a garden and various fences, trees and chicken coops constricted the extent of land available for survey.

Method

Resistivity survey

The geophysical survey technique chosen for this site was resistivity (see Annex 1, note 1), as the main aim was to locate the stone wall foundations of the castle. It was hoped that a significant contrast in moisture retention would exist between the subsoil and any surviving stonework.

The survey covered approximately 0.1 ha, but due to the layout of the site and modern obstacles, the measurements were taken on two separately orientated grids. Each area was surveyed using a Geoscan RM15 resistivity meter, MPX 15 multiplexer and an adjustable PA5 electrode frame. Data was collected with both 0.5m and 1.0m mobile probe spacings over each 30m grid. A greater separation of the mobile-probe electrodes forces the applied electric current to penetrate further into the ground and can detect anomalies arising from more deeply buried features (Scollar *et al* 1990, 321-4; Linford 1993). Readings for the shallow (0.5m probe spacing) survey

were collected at 0.5m (EW) x 0.5m (NS) sample intervals. For the deeper penetrating survey (1.0m probe separation) the sample interval was adjusted to 0.5m x 1.0m.

Both raw and processed data from each of the two mobile probe spacings are illustrated in Plan A. Blank spaces in the data correspond with areas which could not be surveyed, due to surface obstructions such as trees, bushes, fences and chicken coops. A graphical summary of significant anomalies discussed in the following text is provided in Figure 3.

Results

General response and modern interference

Following the results of Blaylock's study (1989), a layer of stones was laid out to represent the former south-west tower based on the findings of the excavation trenches. These stones interfered with the resistivity survey, as in some instances it was difficult to gain adequate contact with the ground surface, resulting in an area of possibly spurious high resistance [1]. There is no equivalent high resistance near the north-west tower where an outline row of stones has been used to indicate the proposed course of the original curtain wall.

The remains of a recent bonfire are apparent as an area of low resistance [2]. To the west of this there is a linear low resistance anomaly [3] (more visible on Plan A.5 and 6), which corresponds with a fence separating the garden from the sloping sides of the moat. A rectangular shape [4], composed of a low resistance linear anomaly, is apparent to the north (see Plan A.2 and 3), coinciding with the borders of an extant vegetable patch.

Significant anomalies

There are several anomalies that appear to reflect the structure of the castle. An area of high resistance [5] around the northern interval tower and following a line towards the north-western tower suggests that the inner half of the interval tower and western section of the northern curtain wall still survive in some form below ground. Two strong linear anomalies [6] and [7], separated by a line of low resistance [8], suggest the presence of the western curtain wall. [8] may reflect the construction of the wall from two dressed stone facings packed with loose rubble and earth giving rise to an area of lower resistance. However, the irregular nature of [6] and [7] is perhaps more indicative of a rubble spread than the precise line of a wall footing. Whilst such rubble may well be due to the remains of the collapsed curtain wall, a more recent origin related to levelling in the 1970's (Blaylock 1989, 15) should also be considered. Such levelling could also account for the large area of low resistance [9] on the northern half of the land nearest to the moat.

Anomalies at [10] may indicate the position of an interval tower or second entrance directly opposite the eastern gatehouse. The stronger anomalies here may indicate better-preserved masonry whilst the more widespread and weaker anomalies may possibly represent rubble.

On the north-east side of the survey a curious area of low resistance [11] appears. This may well represent the deliberate excavation of rubble from the site or, perhaps, the location of a former garden feature (cf Cole *et al* 1997).

Other anomalous areas of high resistance at [12], [13] and [14], may well be indicative of rubble from internal buildings although no particular building plan is visible. However, a small rectangle of high resistance at [15] may indicate the presence of preserved wall foundations.

Conclusions

Although the survey data confirms the course of the wall at [5] (the northern interval tower), various discrepancies are apparent elsewhere.

The north-west corner tower is surrounded in part by areas of particularly low resistance with no indication of its missing circumference. Perhaps the eastern edge of the moat is positioned closer to the castle here and this and other features have been obscured by recent levelling.

On the geophysical evidence, the line of the western curtain wall would seem to be set incongruously too far to the east, apparently contradicting the evidence for foundations recorded by excavation (Trenches 1 - 3; Blaylock 1989).

Despite some apparent inconsistencies, therefore, the resistivity survey of Hemyock castle has revealed a number of significant anomalies that would appear to relate to the castle lay-out. Tentative evidence for the course of the western curtain wall has been provided with the additional suggestion of a second entrance or interval tower. Various other anomalies may be indicative of further medieval activity at the castle, but there is no patterning and the influence of levelling in the 1970's is a complicating factor.

Surveyed by: N Linford
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Reported by: L Martin

Date of survey: 4-5/2/99
Date of report: 3/3/99

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Acknowledgments

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References

- Blaylock, S.R., 1989, An Archaeological survey of Hemyock Castle, *Exeter Museum Archaeological Field Unit, Report 89.03*.
- Cole, M.A., David, A.E.U., Linford, N.T., Linford, P.K., Payne, A.W., 1997, Non-destructive techniques in English Gardens: Geophysical Prospecting, *Journal of Garden History* **17**, 26-39.
- Institute of Geological Sciences, 1966, Wellington, England and Wales Sheet 311, Drift Geology, 1:50,000.
- Linford, N.T., 1993, Reigate Priory, Surrey, Report on Geophysical Surveys June 1993, *Ancient Monuments Laboratory Report 44/93*.
- 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 5, South West England.

List of enclosed figures and plans:

- Figure 1* *Location plan of resistivity surveys (1:2500).*
- Figure 2* *False colour image of geophysical survey superimposed over general site plan (1:500).*
- Figure 3* *Graphical summary of significant anomalies superimposed over general site plan (1:500).*
- Plan A* *Traceplots and greyscales of raw resistivity data, and greyscales of data following Pratt's crispening operation for both 0.5m and 1.0m mobile probe spacings (1:500).*

Annex 1: Notes on standard procedures

- 1) **Resistivity Survey:** Each 30 metre square is surveyed by making repeated parallel traverses across it, all aligned parallel to one pair of the 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 square edge. Readings are taken along each traverse at 1 metre intervals, the first and last readings being 0.5 metres from the nearest 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 (Ω m).

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 Ancient Monuments Laboratory using desktop workstations.

- 2) **Magnetometer Survey:** Each 30 metre square is surveyed by making repeated parallel traverses across it, all parallel to that pair of 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 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 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 Ancient Monuments Laboratory 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.

HEMYOCK CASTLE, HEMYOCK, DEVON.
Location of Resistivity Surveys, February 1999.

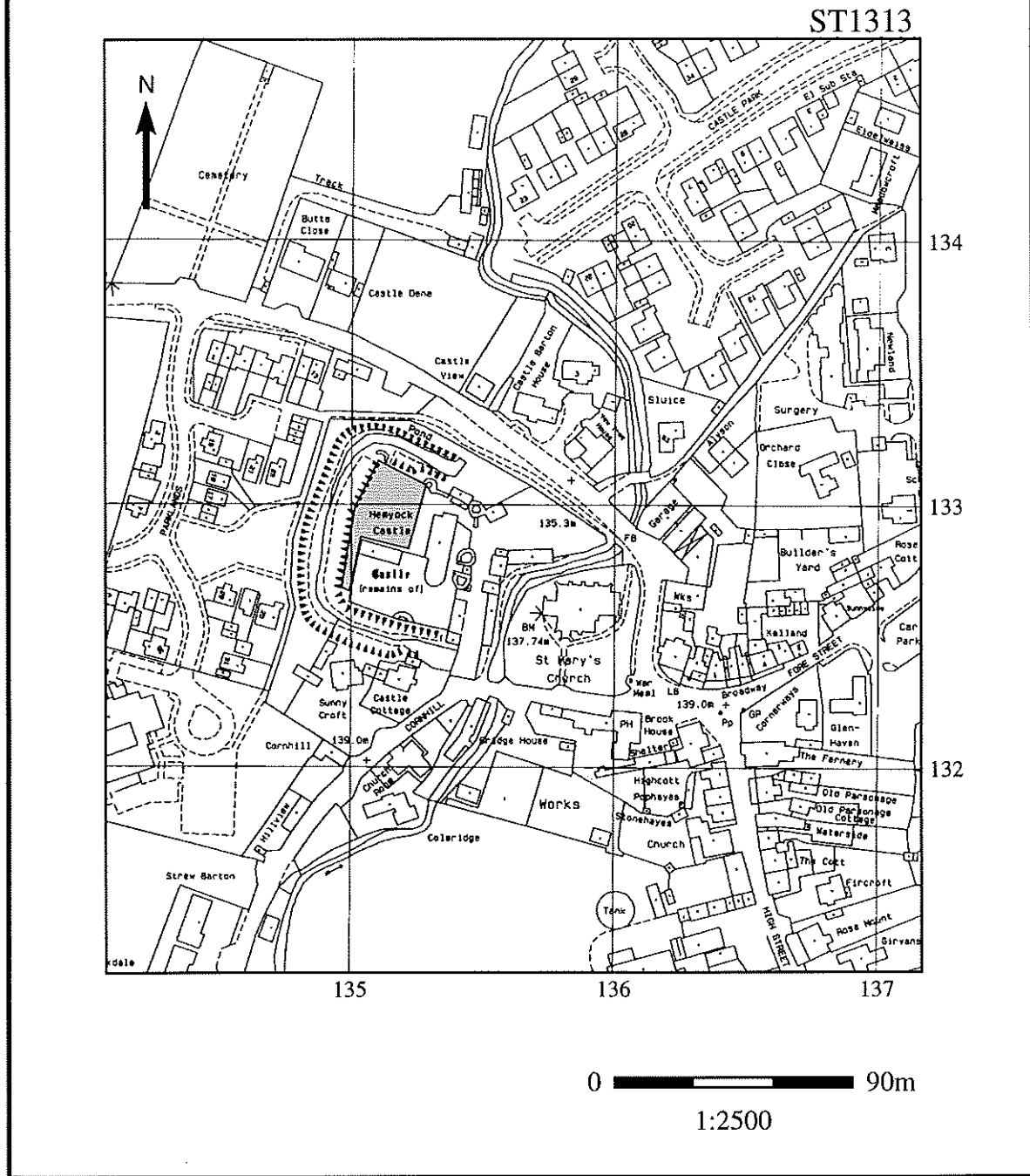
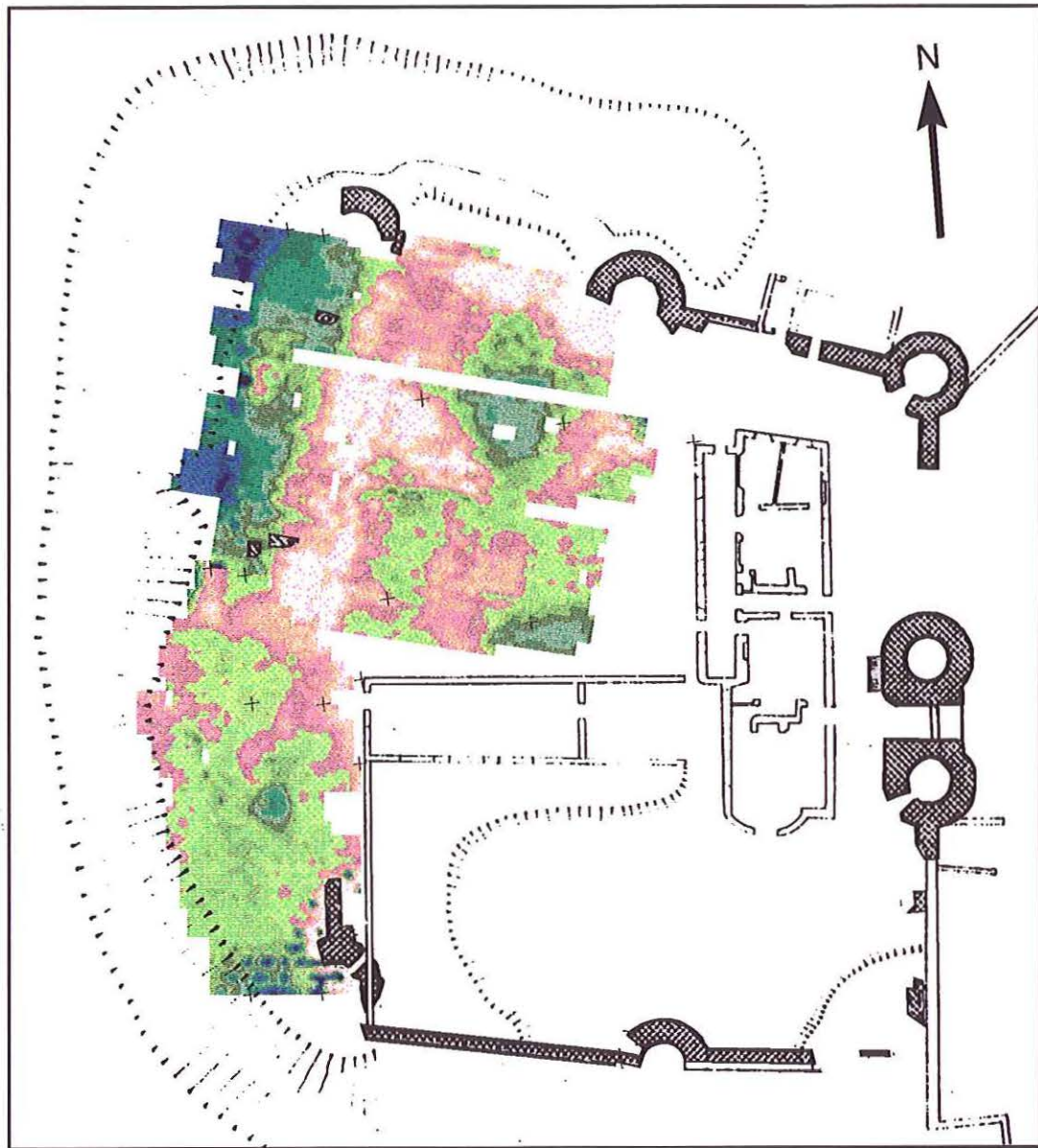
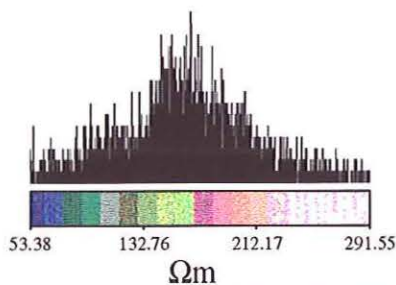


Figure 1; Hemyock Castle, Devon, Location of resistivity surveys, February 1999.

HEMYOCK CASTLE, HEMYOCK, DEVON.
Location of Resistivity Survey, February 1999.



Base map of castle derived from
General Site Plan, Blaylock 1989.

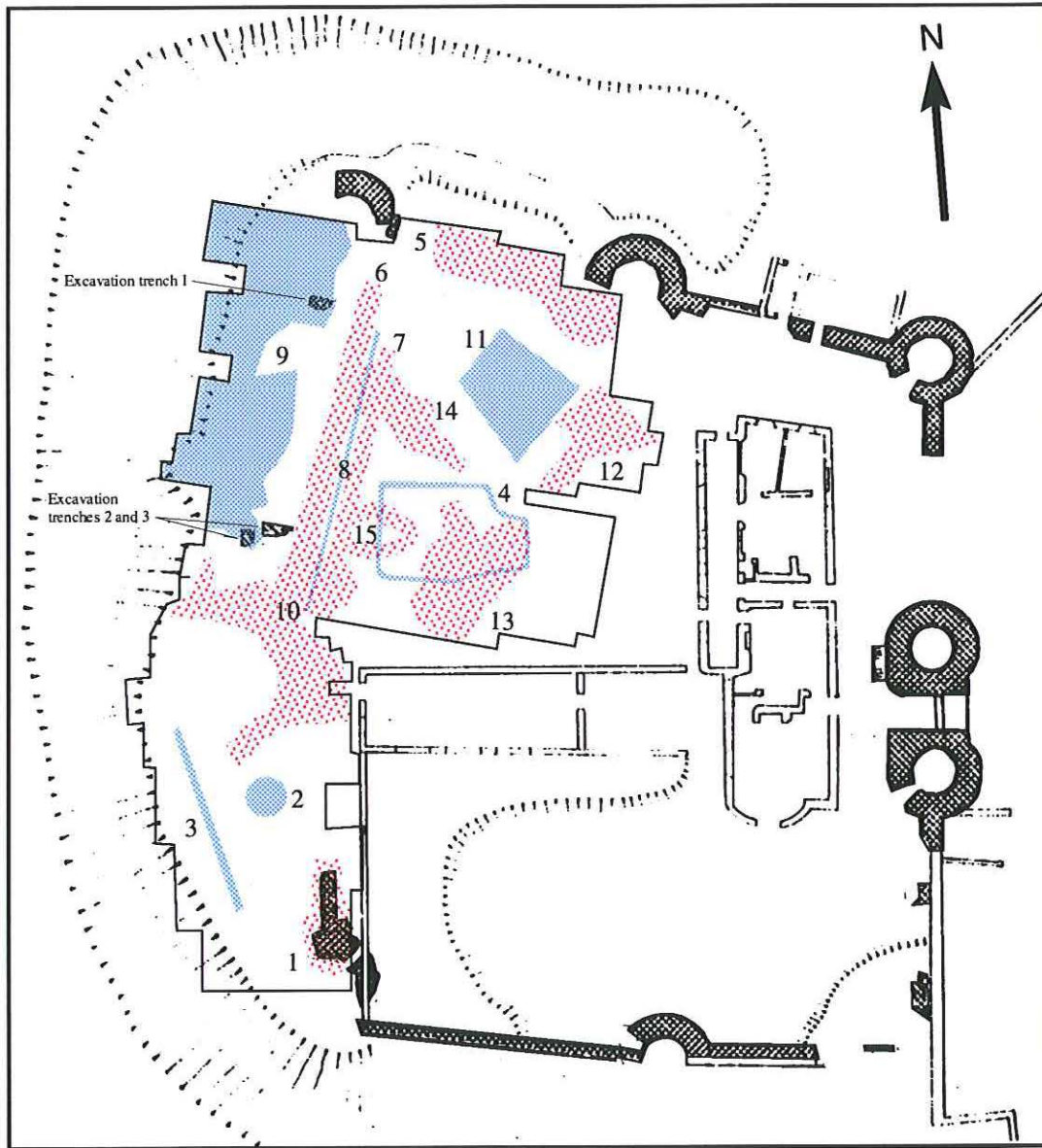



0 ————— 15m
1:500


Figure 2; Hemyock Castle, Devon, False colour image of 0.5m mobile probe spacing resistivity data superimposed over General Site Plan.

HEMYOCK CASTLE, HEMYOCK, DEVON.

Summary of Significant Geophysical Anomalies.



 low earth resistance anomalies

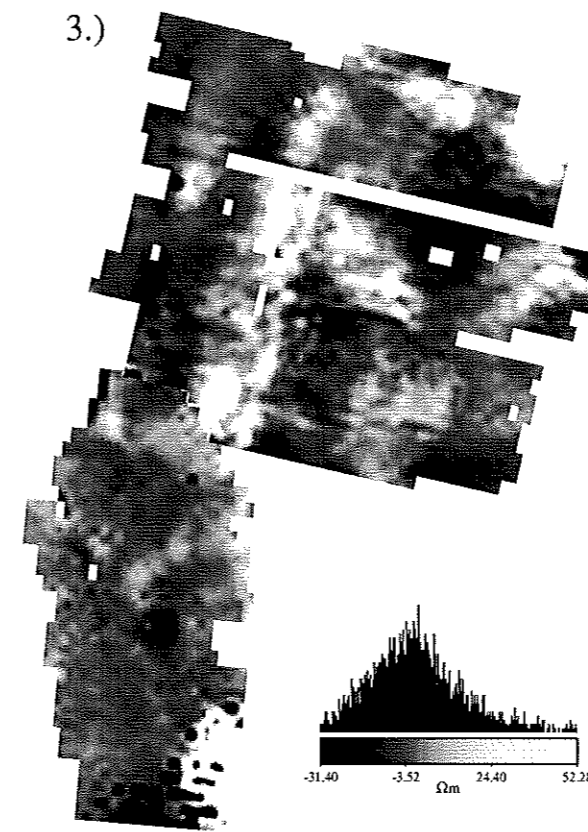
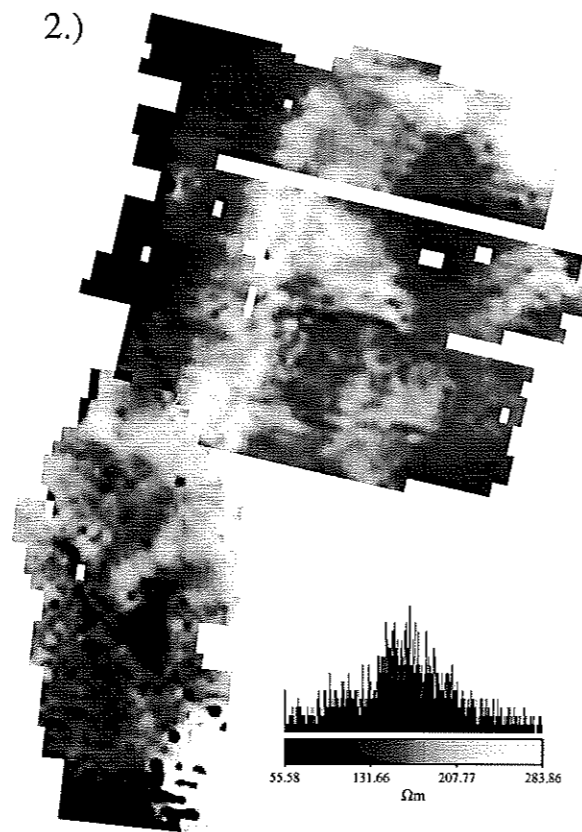
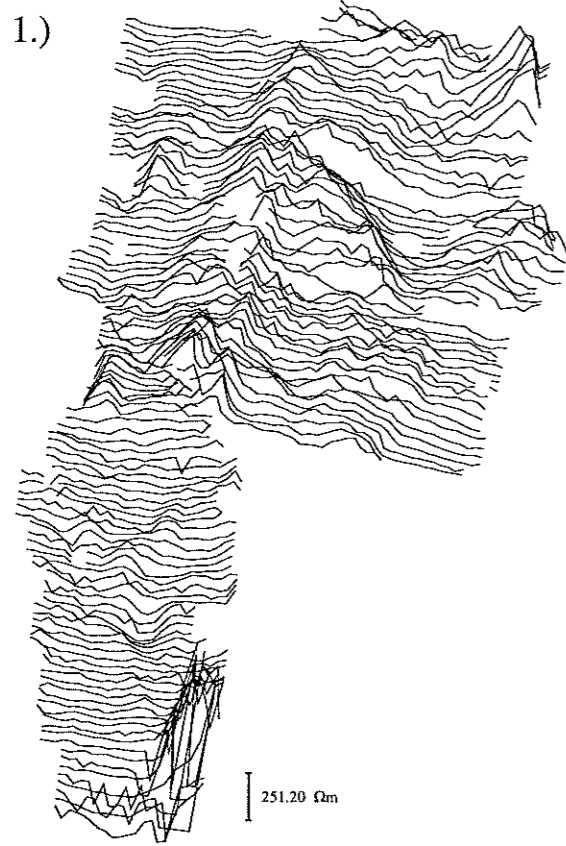
 high earth resistance anomalies

Base map of castle derived from General Site Plan, Blaylock 1989.

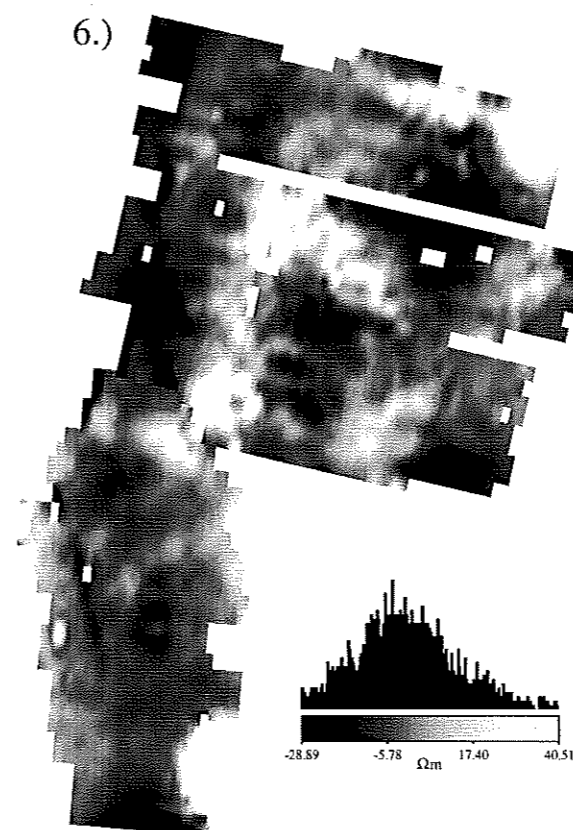
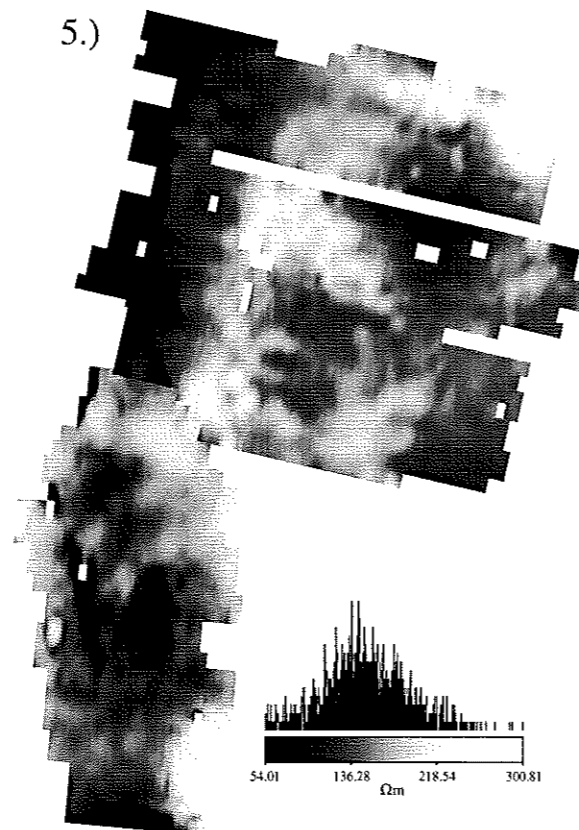
0  15m
1:500

AML 1999.

Figure 3; Hemyock Castle, Devon, Graphical summary of significant anomalies superimposed over General Site Plan.



- 1.) Traceplots of raw data at 0.5m mobile probe spacing.
- 2.) Greyscale of 1.
- 3.) Greyscale of 1 after filtering with Pratt's crispening operation.



- 4.) Traceplot of raw data at 1.0m mobile probe spacing.
- 5.) Greyscale of 4.
- 6.) Greyscale of 4 after filtering with Pratt's crispening operation.

