REPORT ON GEOPHYSICAL SURVEY

Site : Kidwelly Castle, Dyfed

Report : 90 / 97

Winter 1991

Client : Cadw

GEOPHYSICAL SURVEYS

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REPORT ON GEOPHYSICAL SURVEY

Survey Number: 90 / 97

Site: Kidwelly Castle, Dyfed

Date: Winter 1991

NGR: SN 409071

Location, and topography:
The site consists of the north bailey of Kidwelly Castle , Dyfed. Until recently the area has been partly rough grazing and partly scrub covered. This has now been cleared and is suitable for survey. The subsoil is an aluvial clay.

Archaeology:
Kidwelly Castle was one of the major fortresses of the Norman Conquest of SW Wales. The original 12th century earthwork castle consisted of a D-shaped ringwork at its centre and 2 large baileys to the north and south-west.

The ringwork was successively modified into an impressive masonry castle and the south-west bailey became a small walled town. The north bailey does not seem to have been much modified except for an internal ditch dug in the early 15th century. It was possibly developed into a late medieval castle garden or rabbit warren.

Aim of Survey:
A magnetometer survey of the whole area is required as well as sufficient samll areas of resistivity to show if the outer bank carried a stone wall..

Instrumentation:

Magnetometer : Geoscan FM36 with ST1 automatic trigger

Resistance Meter : Geoscan RM4 with DL10 datalogger

Survey Method:

Magnetic readings are logged at 0.5m intervals along one axis (in 1.0m traverses, 800 readings per 20m x 20m grid) over the survey area. Resistance readings are logged at 1.0m intervals (400 per grid). The data are then transferred to a Compaq SLT/286 and stored on 3.5" floppy discs. Field plots are produced on a portable Hewlett Packard Thinkjet. Further processing is carried out back at base on a Dell/Mission 386 linked to appropriate printers.

The location of the survey area is shown in Figure 1.

TECHNICAL AND DISPLAY INFORMATION

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

(1) Instrumentation

(a) Fluxgate Gradiometer

This instrument comprises two fluxgates mounted vertically apart, at a distance of 500mm. The gradiometer is carried by hand, with the bottom sensor some 100-300mm from the ground surface. At each survey point, the difference in magnetic field between the two fluxgates is conventionally measured in nanoTesla (nT) or gamma. The fluxgate gradiometer suppresses any diurnal or regional effects. If multiple readings are logged, then unless specified elsewhere in the report, it may be assumed that they are taken in the direction of grid north.

(b) Resistance meter

This measures the electrical resistance of the earth, using a system of four electrodes (two current, two potential). Depending on the arrangement of these electrodes, an exact measurement of a similar volume of earth may be acquired. In such a case the amount measured may be used to calculate the earth resistivity. Using a 'Twin-Probe' arrangement the terms 'resistance' and 'resistivity' may be interchanged. This arrangement involves the pairing of electrodes (one current and one potential), with one pair remaining in a fixed position whilst the other measures the resistivity variation across a fixed grid. Resistance is measured in ohms, whilst resistivity is measured in ohm-meters.

(c) Magnetic susceptibility

The instrument employed for measuring this culturally enhanced phenomenon is a laboratory based susceptibility bridge. Standard 50g soil samples are collected in the field.

(2) Display Options

The following is a description of the display options used. Unless specifically mentioned in the text, it may be assumed that no filtering or smoothing has been used to enhance the data. For any particular report only one type of display mode may be used, although where necessary a number of the options may be presented.

(a) X-Y Plot

This involves a line representation of the data. Each succesive row of data is equally incremented in the Y axis, to produce a 'stacked' profile effect. This display may incorporate a 'hidden-line removal' algorithm, which blocks out lines behind the major peaks and can aid interpretation.

(b) Dot-Density

In this display, minimum and maximum cut-off levels are chosen. Any value that is below the minimum cut- off value will appear 'white', whilst any value above the maximum cut - off value will appear 'black'. Any value that lies between these two cut-off levels will have a specified number of dots depending on the relative position between the two levels. The focus of the display may be changed using different levels and a contrast factor (C.F.). When the contrast is equal to 1, then the scale between the two cut-off levels is linear. A C.F.>1 helps to enhance the higher readings. To assess lower than normal readings involves the use of an inverse plot. This plot simply reverses the minimum and maximum values, resulting in the lower values represented by more dots. In either representation, each reading is allocated a unique area dependent on its position on the survey grid, within which the numbers of the dots is randomly placed.

(c) Contour

This display joins data points of an equal value by a contour line. Displays are either generated on the computer screen or plotted directly on a flat bed plotter / inkjet printer. The former will generate either colour or black and white copies depending on the printer used.

(d) 3-D Mesh

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

(e) Grey-Scale

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

(3) Interpretation

This is the most important part of the report and is based on a consideration of not only the display plots , but also a study of the raw data. It should be emphasised that the final interpretation is not based only on the diagrams reproduced in this report.

In some instances geological and pedological anomalies may arise which are impossible to distinguish from those normally associated with archaeological features - in all cases of doubt trial excavation work is recommended to ascertain the nature of the observed anomalies.

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

Report on the Geophysical Survey at Kidwelly Castle, Dyfed.

Introduction

The aim of this geophysical survey, commissioned by Cadw, was to locate any archaeological features within the North Bailey of the castle. The North Bailey is divided in two by a ditch and bank. Both areas were surveyed by the magnetic technique, with small sample areas being covered by the resistance technique to show if the outer bank had a wall. The fieldwork was carried out by two operators during one day on site. This included the time taken to set out the survey grids, the location of which is shown in Figure 1.

For each area the results are displayed as dot density plots and grey-scale images. On the interpretation plan (Figure 4) letters refer to magnetic anomalies, and are discussed below.

Results

Area A

Magnetic Data (Figures 2 - 3)

The area of magnetic disturbance (A) is associated with wire fencing and ferrous debris. There is a series of anomalies (B) which are in the vicinity of the entrance to the castle, and may be associated with it. The strong anomaly (C) may be significant. A kiln or oven hearth is a possible interpretation, although a non-archaeological origin is plausible.

Resistance Data (Figure 5)

A section of the outer edge of the bailey, indicated on the location plan, was surveyed using the resistance technique. The survey failed to detected the presence of an outer wall. There is a general increase in resistance at the edge, but this is diffuse and primarily topographic in nature, being associated with the very steep-sided ditch.

Area B

Magnetic Data (Figure 6)

The magnetometer survey of this area revealed little. The area was covered with ferrous debris, and the remains of a camp-fire produced a strong anomaly at (A).

Conclusions

The magnetometer survey at Kidwelly Castle revealed few anomalies of potential archaeological significance, although one possible area of a kiln/hearth (C) was pinpointed. The resistance survey of the outer bank failed to detect an associated wall.

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Project Assistants: Dan Shiel and Paul Spoerry

Geophysical Surveys of Bradford
1st March 1991

KIDWELLY CASTLE

Location Diagram

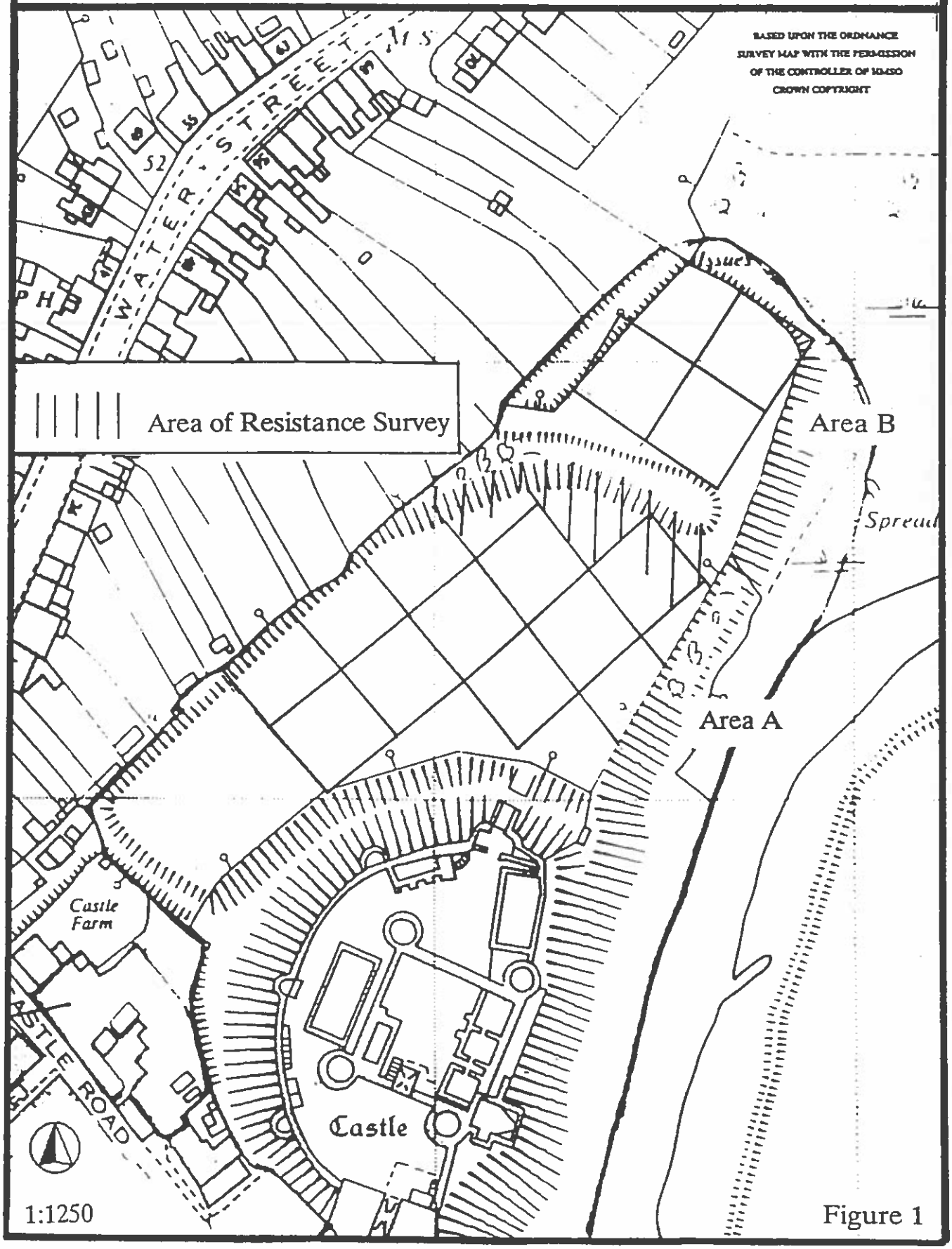
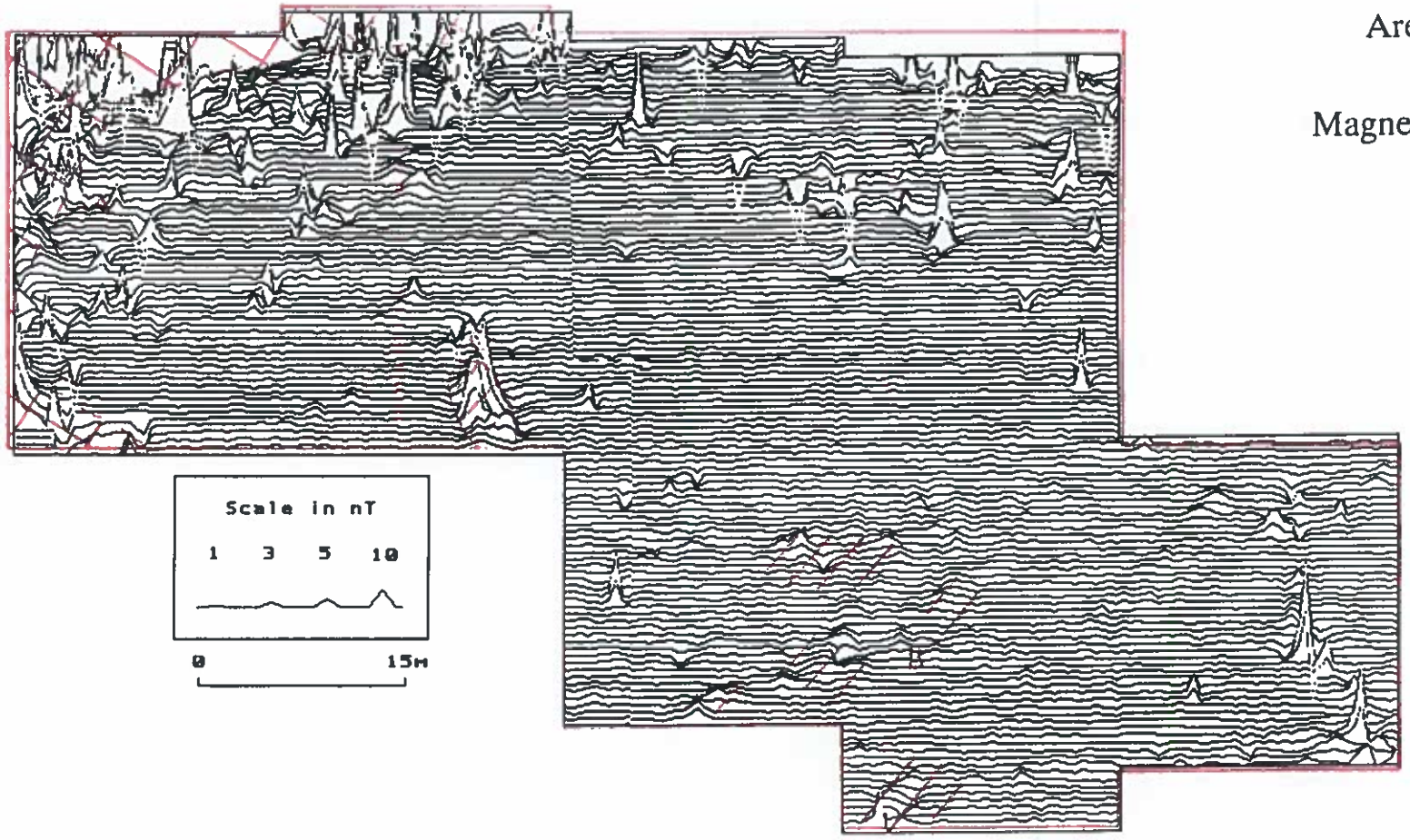


Figure 1

KIDWELLY CASTLE

Area A

Magnetic Data



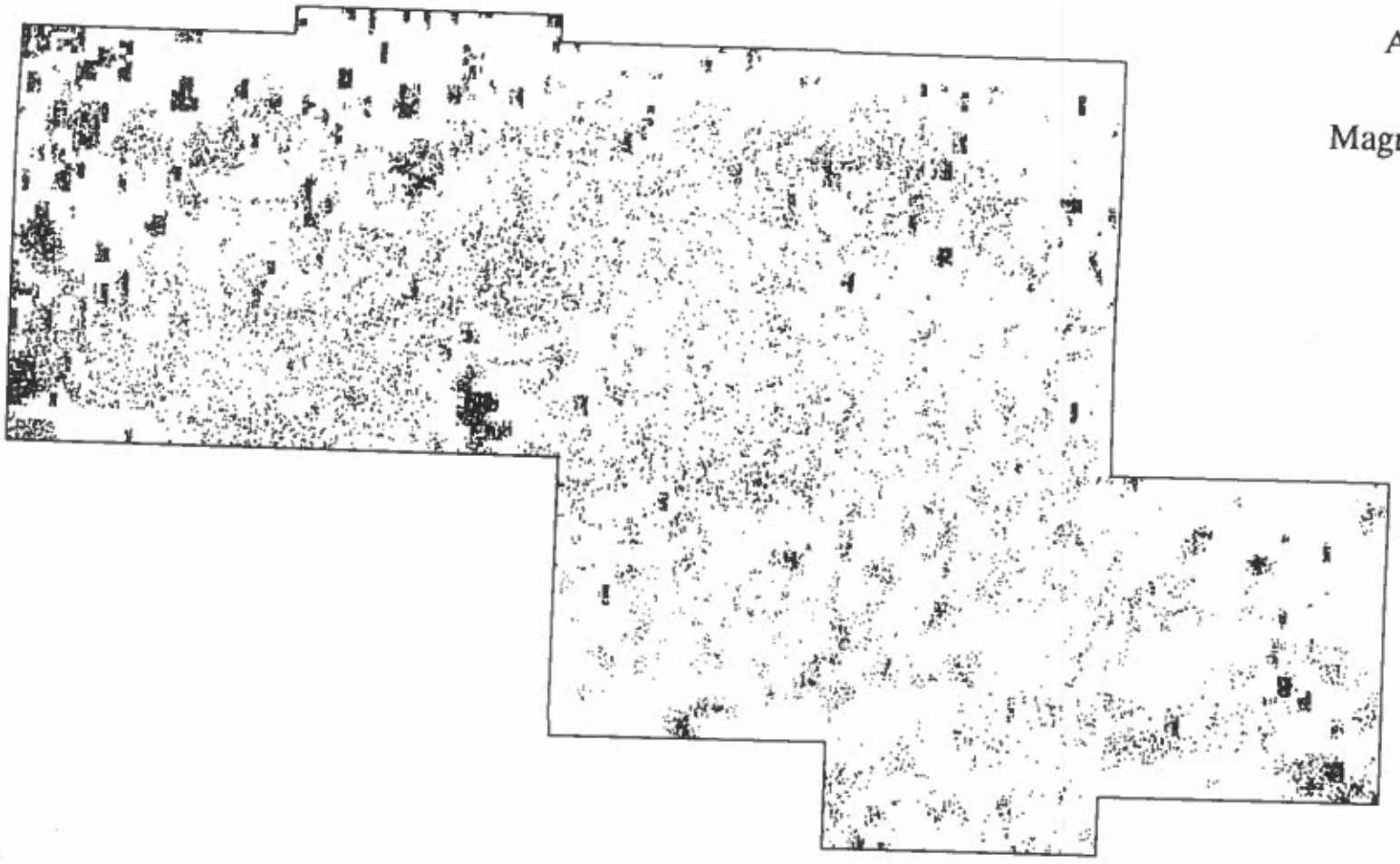
1:500

Figure 2

KIDWELLY CASTLE

Area A

Magnetic Data



nT

6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.1

1:500

Figure 3

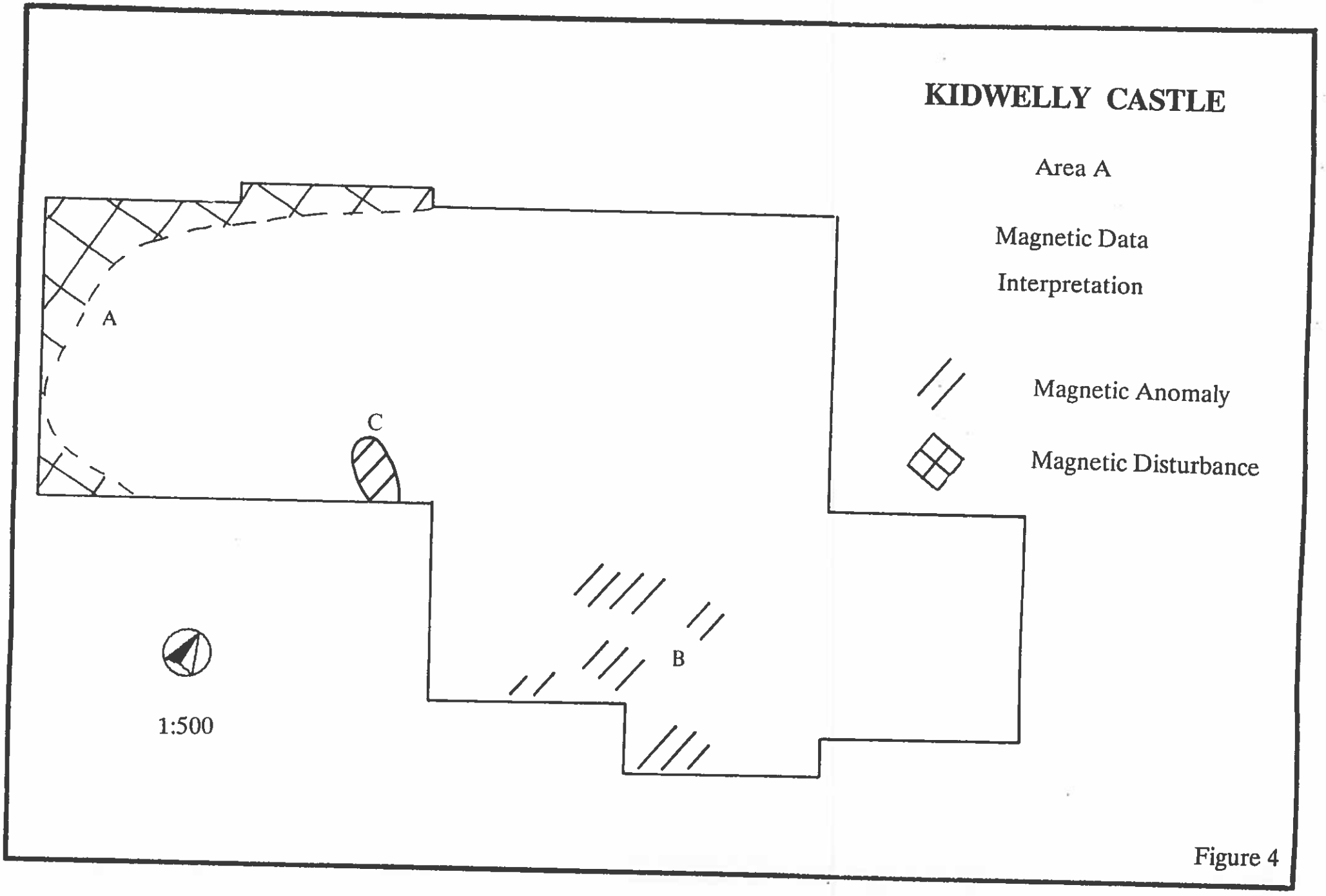
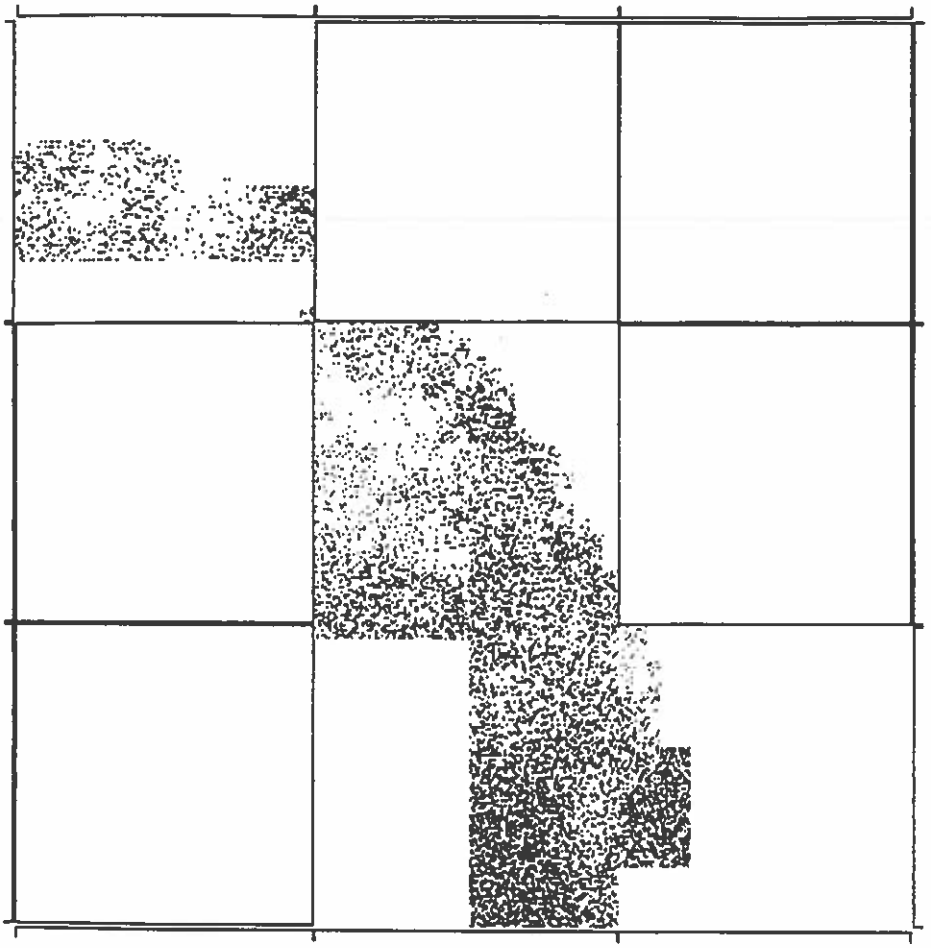

KIDWELLY CASTLE
Area A
Magnetic Data
Interpretation
Magnetic Anomaly
Magnetic Disturbance
A
B
C
1:500

Figure 4

KIDWELLY CASTLE

Area A

Resistance Data



Range: 85 to 115 ohms

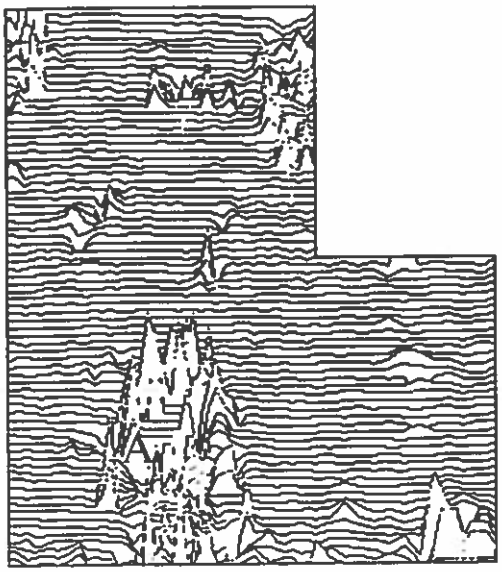
1:500

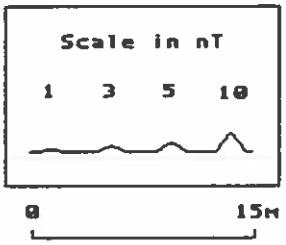
Figure 5

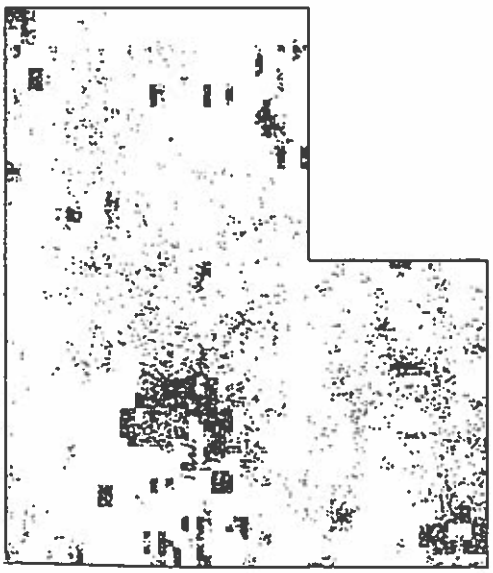
KIDWELLY CASTLE

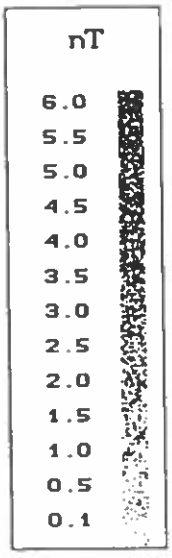
Area B

Magnetic Data









1:500

Figure 6