

A Report for

**R. G. STEPHENS
AND SONS LTD.**

on a

Geophysical Survey

carried out at

**Summer Ground,
Little Comberton, Worcs.**

November 2000

Job Ref. No. 1503



Authors

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CONTENTS

- 1 Summary of results
 - 2 Introduction
 - 2.1 Background synopsis
 - 2.2 Site location
 - 2.3 Description of site
 - 2.4 Site history and archaeological potential
 - 2.5 Survey objectives
 - 2.6 Survey methods
 - 3 Methodology
 - 3.1 Date of fieldwork
 - 3.2 Grid locations
 - 3.3 Descriptions of techniques and equipment configuration
 - 3.4 Sampling interval, depth of scan, resolution and data capture
 - 3.5 Processing, presentation of results and interpretation
 - 4 Results
 - 5 Conclusions and Recommendations
- Figure 1 1:50 000 General location plan
- Figure 2 1:10 000 Detailed location plan
- Figure 3 1:1000 Site plan showing location of grids and referencing
- Figure 4 1:1500 Plot of magnetometer scanning results
- Figure 5 1:1000 Plot of raw magnetometer data
- Figure 6 1:1000 Trace plot of raw magnetometer data showing positive values
- Figure 7 1:1000 Trace plot of raw magnetometer data showing negative values
- Figure 8 1:1000 Plot of processed magnetometer data
- Figure 9 1:1000 Abstraction and interpretation of magnetometer anomalies

1 SUMMARY OF RESULTS

The magnetometer scanning located areas of general activity which were targeted with two areas of detailed magnetometry. The results of the detailed survey showed possible pits and some feint positive linear anomalies which may be of archaeological significance.

2 INTRODUCTION

2.1 Background synopsis

Stratascan was commissioned to undertake a geophysical survey over an area proposed for development. The planning application submitted proposes the erection of new grain storage buildings with dryer, chemical store and weighbridge with associated works and landscaping. The geophysical forms part of an archaeological assessment of the site being carried.

2.2 Site location

The site is located to the north-west of the village of Little Comberton which is situated south-east of Pershore in Worcestershire at OS ref. 96004383.

2.3 Description of site

The area of survey is a field of approximately 6ha. It is currently laid down to arable use and was covered with stubble at the time of survey. The topography is fairly flat with an underlying geology of Lower Lias (British Geological Survey South Sheet, Third Edition Solid, 1979). There are two types of overlying soils on the site. In the northern half of the survey the soils are known as Evesham 2 which are typical calcareous pelosols and consist of slowly permeable calcareous clayey soils. The southern half contain soils known as Badsey 1 which are typical brown calcareous earths and consist of well drained calcareous and non-calcareous fine loamy soils over limestone gravel (Soil Survey of England and Wales, Sheet 3 Midland and Western England).

2.4 Site history and archaeological potential

The site lies within a broad band of archaeological activity. In particular prehistoric and Romano-British farmsteads have been identified through aerial photography and fieldwalking. However, no cropmarks have been located within the actual area of survey.

2.5 Survey objectives

The objective of the survey was to locate any features of possible archaeological significance.

2.6 Survey methods

Areas of magnetic activity were located with magnetometer scanning. These areas were then targeted with detailed magnetometry. More information regarding these techniques are included in the Methodology section below.

3 **METHODOLOGY**

3.1 Date of fieldwork

The fieldwork was carried out over two days. The reconnaissance survey was undertaken on Thursday 16th November 2000 and the detailed was carried out on Friday 17th November 2000 when the weather was cold and sunny.

3.2 Grid locations

The location of the survey grids has been plotted in Figure 3.

3.3 Description of techniques and equipment configurations

3.3.1 Magnetometer scanning

This was carried out using an FM36 Fluxgate Gradiometer in scanning mode, manufactured by Geoscan Research. The display on the magnetometer was visually monitored and anomalous readings marked for further investigation.

3.3.2 Magnetometer

Although the changes in the magnetic field resulting from differing features in the soil are usually weak, changes as small as 0.2 nanoTesla (nT) in an overall field strength of 48,000nT, can be accurately detected using an appropriate instrument.

The mapping of the anomaly in a systematic manner will allow an estimate of the type of material present beneath the surface. Strong magnetic anomalies will be generated by buried iron-based objects or by kilns or hearths. More subtle anomalies such as pits and ditches can be seen if they contain more humic material which is normally rich in magnetic iron oxides when compared with the subsoil.

To illustrate this point, the cutting and subsequent silting or backfilling of a ditch may result in a larger volume of weakly magnetic material being accumulated in the trench compared to the undisturbed subsoil. A weak magnetic anomaly should therefore appear in plan along the line of the ditch.

Both the magnetometer scanning and the detailed magnetometer survey was carried out using an FM36 Fluxgate Gradiometer, manufactured by Geoscan Research. The instrument consists of two fluxgates mounted 0.5m vertically apart, and very accurately aligned to nullify the effects of the earth's magnetic field. Readings relate to the difference in localised magnetic anomalies compared with the general magnetic background.

3.4 Sampling interval, depth of scan, resolution and data capture

3.4.1 Sampling interval

Magnetometer scanning

Traverses were made at approximately 20m centres across the survey area.

Magnetometer

Readings were taken at 0.5m centres along traverses 1m apart. This equates to 800 sampling points in a full 20m x 20m grid. All traverses are surveyed in a "parallel" rather than "zigzag" mode.

3.4.2 Depth of scan and resolution

Magnetometer scanning

See magnetometer.

Magnetometer

The FM36 has a typical depth of penetration of 0.5m to 1.0m. This would be increased if strongly magnetic objects have been buried in the site. The collection of data at 0.5m centres provides an optimum resolution for the technique.

3.4.3 Data capture

Magnetometer scanning

The display is visually monitored and any anomalous readings noted as areas of activity. No data was logged.

Magnetometer

The readings are logged consecutively into the data logger which in turn is daily downloaded into a portable computer whilst on site. At the end of each job, data is transferred to the office for processing and presentation.

3.5 Processing, presentation of results and interpretation

3.5.1 Processing

Magnetometer scanning

No processing was carried out

Magnetometer

Processing is performed using specialist software known as *Geoplot 3*. This can emphasise various aspects contained within the data but which are often not easily seen in the raw data. Basic processing of the magnetic data involves 'flattening' the background levels with respect to adjacent traverses and adjacent grids. 'Despiking' is also performed to remove the anomalies resulting from small iron objects often found on agricultural land. Once the basic processing has flattened the background it is then possible to carry out further processing which may include low pass filtering to reduce 'noise' in the data and hence emphasise the archaeological or man-made anomalies.

The following schedule shows the basic processing carried out on all processed magnetometer data used in this report:

<i>Zero mean grid</i>	<i>Threshold = 0.25 std. dev.</i>
<i>Zero mean traverse</i>	<i>Last mean square fit = off</i>
<i>Despike</i>	<i>X radius = 1 Y radius = 1</i>
	<i>Threshold = 3 std. dev.</i>
	<i>Spike replacement = mean</i>

3.5.2 Presentation of results and interpretation

The presentation of the data from the magnetometer scanning survey has been plotted in Figure 4. The data from the detailed survey involves a print-out of the raw data both as grey scale (Figure 5) and trace plots (Figure 6 and 7), together with a grey scale plot of the processed data (Figure 8). Magnetic anomalies from the detailed survey have been identified and plotted onto the 'Abstraction and Interpretation of Anomalies' drawing for the site (Figure 9).

4 RESULTS

4.1 Magnetometer scanning

The magnetometer scanning results are plotted in Figure 4. A number of anomalies were located scattered across the site of which many were of a weak response. There were no anomalies noted which were of any particular significance. Therefore, it was decided to position the areas of detailed magnetometry over general areas of activity.

4.2 Detailed magnetometry

Area 1

The majority of the anomalies located in Area 1 belong to ferrous objects. These have been plotted in the interpretation diagram Figure 9. These can be recognised by a discrete positive anomaly with a negative return. However, there are some very small and discrete anomalies with a low magnitude positive response only which have been abstracted and interpreted as possible pits in Figure 9. In addition, there are also two very feint positive curvilinear anomalies which may be either archaeological or agricultural in origin.

Area 2

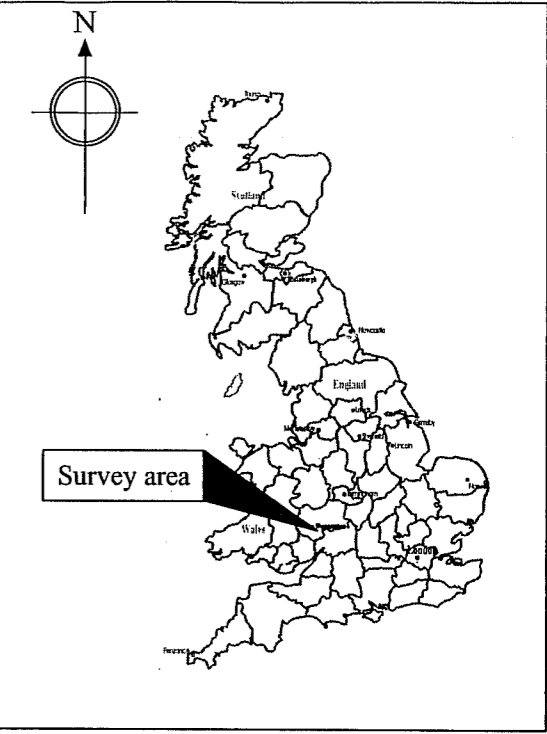
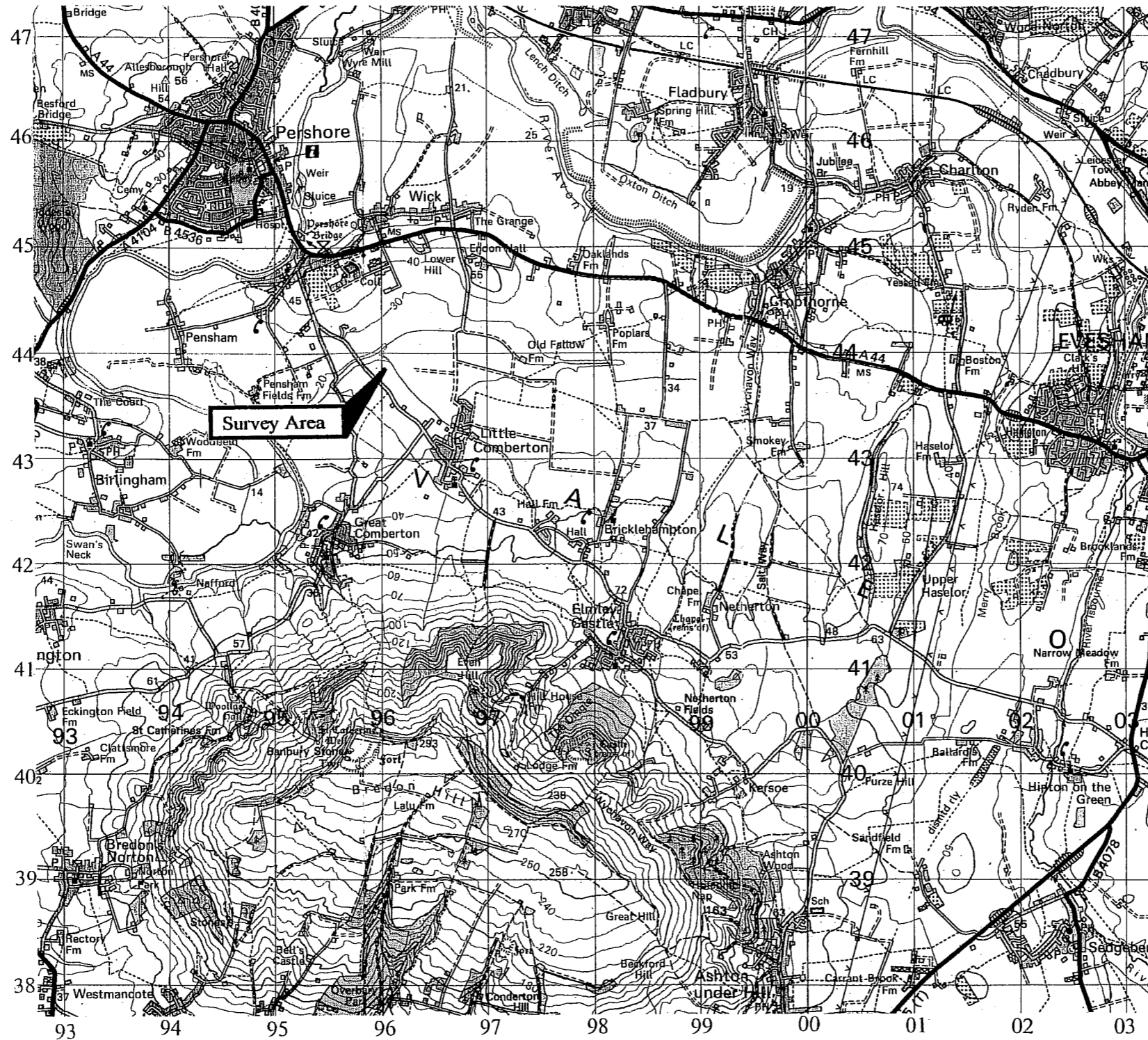
The detailed survey for Area 2 also located a number of possible pits as plotted in Figure 9. These discrete low magnitude positive anomalies can be seen more clearly in the trace plots Figures 6 and 7. A number of feint positive linear anomalies have also been abstracted. As with Area 1 it is difficult to be able to decipher their origin as they may be agricultural. However, they appear to be intermixed with the possible pits and so may be archaeological in origin.

On the northern edge of the survey area a scatter of ferrous objects have been abstracted and interpreted in Figure 9.

5 CONCLUSIONS AND RECOMMENDATIONS

The magnetometer scanning located a number of anomalies but there did not appear to be any of significance. Therefore, two areas of general activity were targeted with detailed survey (Areas 1 and 2). The results from both areas located a number of ferrous objects. However, there are also anomalies reminiscent of possible pits, particularly in Area 2, along with some feint positive linears which may be of archaeological interest. These would have to be investigated further to determine their significance.

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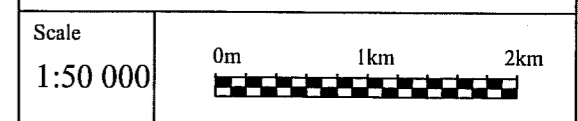
Site centred on NGR SO 96004383

Figure No.	Job no.	Date	Drawn
1	1503	Nov. 2000	FET/EJFM
			Checked PPB

Client
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Project Title
**Geophysical Survey,
 Summer Ground, Pershore Road,
 Little Comberton, Worcs.**

Subject
**GENERAL LOCATION
 PLAN**

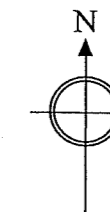


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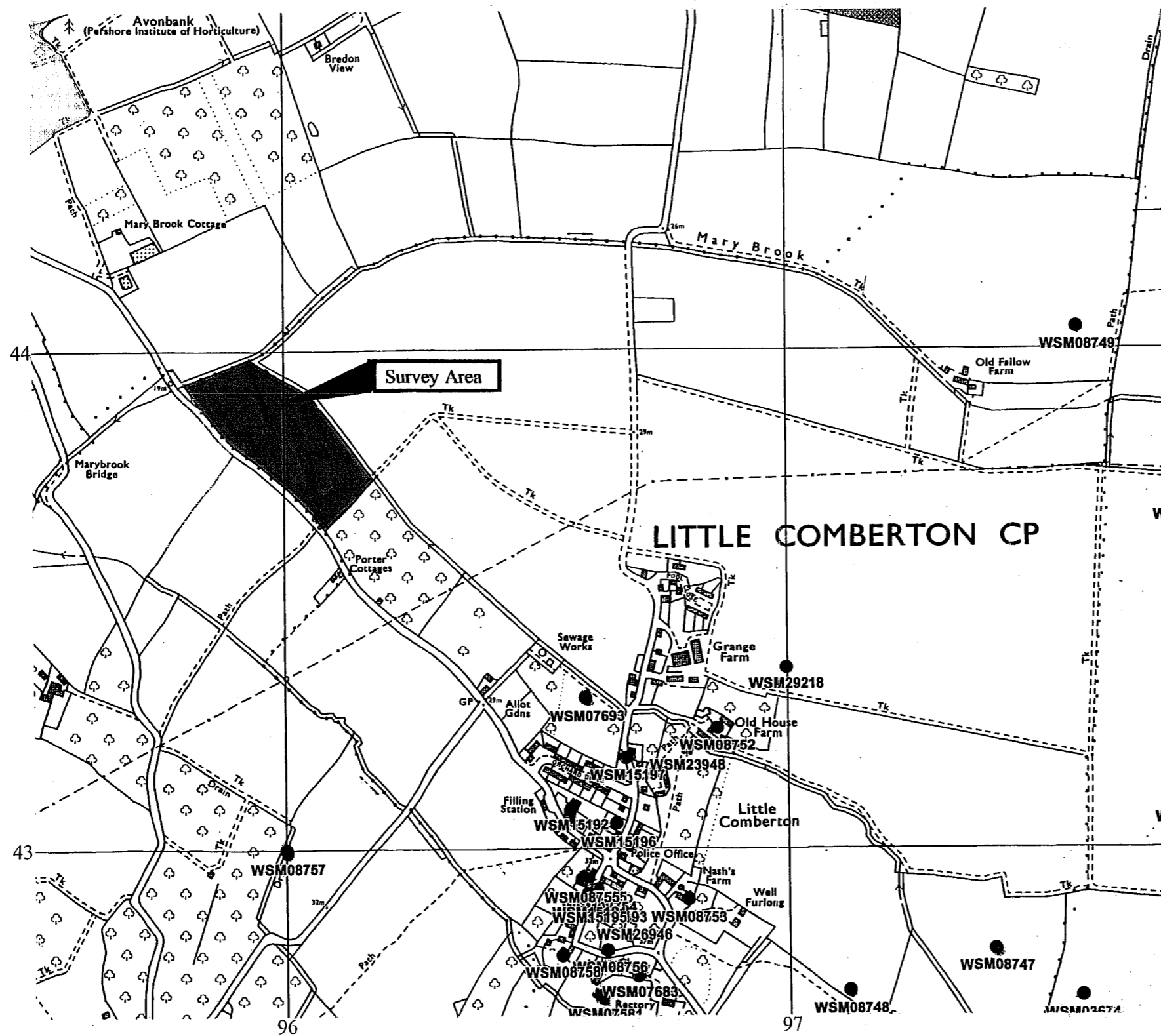
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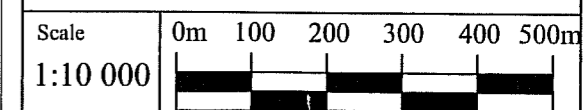


Site centred on NGR SO 96004383			
Figure No.	Job no.	Date	Drawn
2	1503	Nov. 2000	FET/EJFM
			Checked
			PPB

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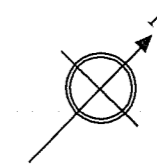
Subject
**DETAILED LOCATION
 PLAN**



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REFERENCING INFORMATION			
Y-Z	36.62m	A-B	60m
X-W	98m	W-B	72.08m
W-A	40m	C-D	60m
B&C	Grid node pegs		
W, A&Z	Baseline points		
X&Y	Intersection/corner of fenceline		
W&Z	Referencing points on fenceline		
FCD&E	Colinear points		
2	Grids surveyed		
Areas 1 & 2 on same grid			

Figure No.	Job no.	Date	Drawn
3	1503	Nov. 2000	FET/EJFM
			Checked PPB

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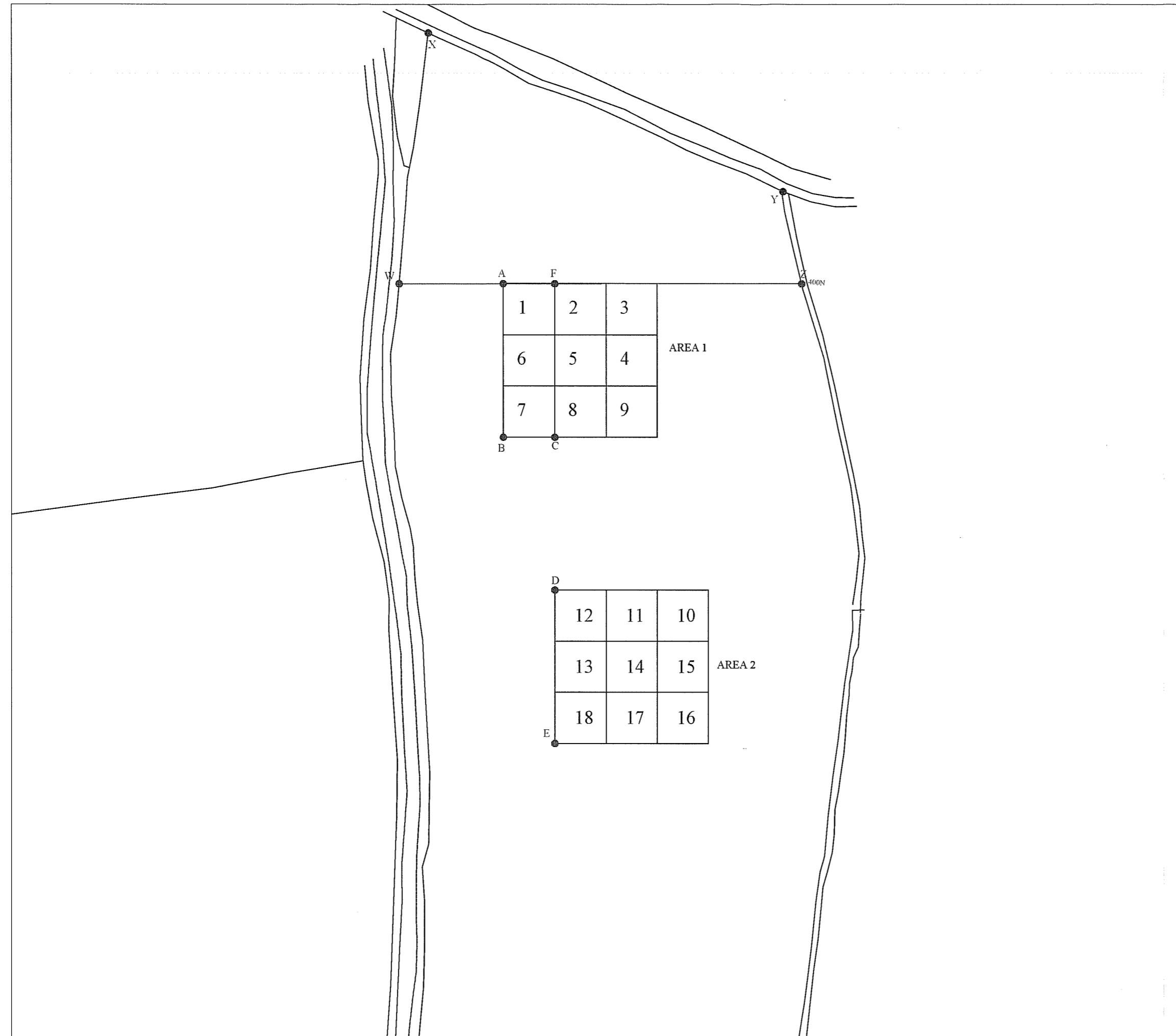
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LOCATION OF SURVEY GRIDS
AND REFERENCING**

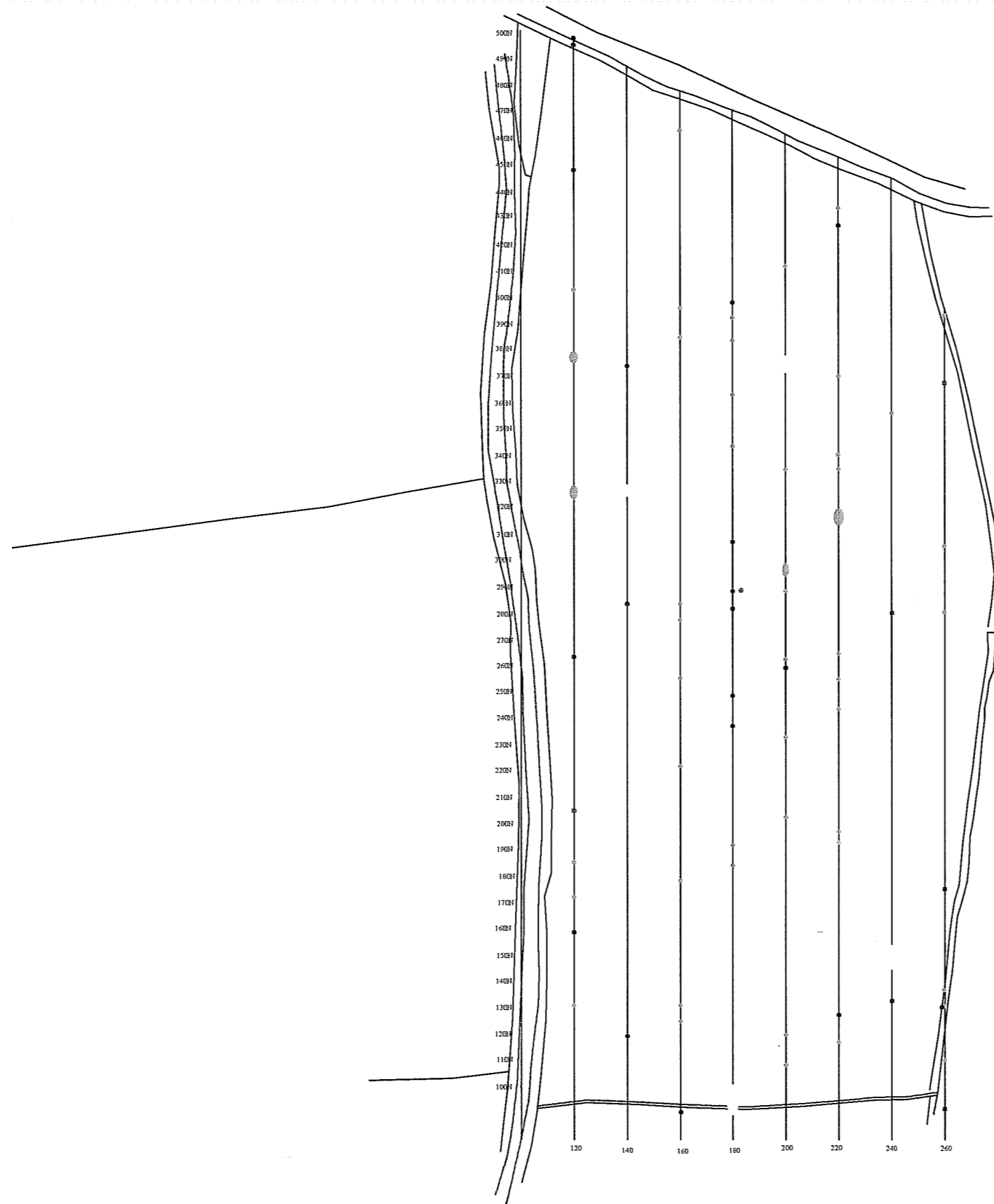
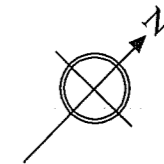
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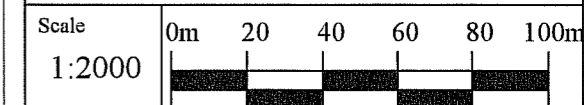
	Strong magnetic anomaly
	Area of increased activity
	Magnetic spike
	Weak discrete magnetic anomaly
	Medium discrete magnetic anomaly

Figure No.	Job no.	Date	Drawn
4	1503	Nov. 2000	FET/EJFM
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			PPB

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Subject
PLOT OF MAGNETOMETER
SCANNING SURVEY

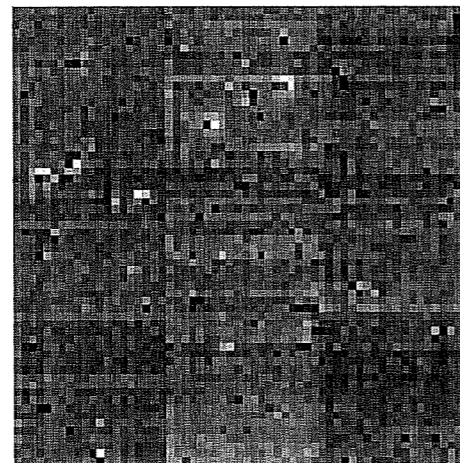
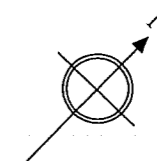


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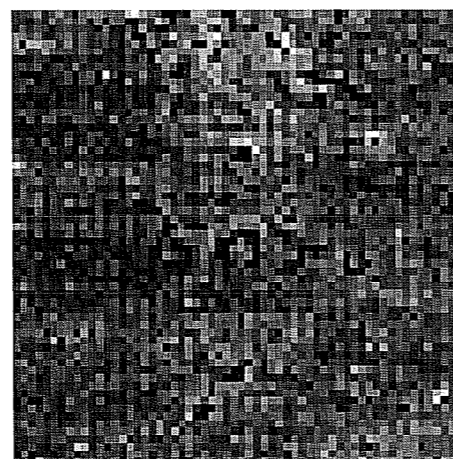
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AREA 1



AREA 2

Plotting parameters - Area 1
Minimum - 5.08nT (white)
Maximum + 4.66nT (black)

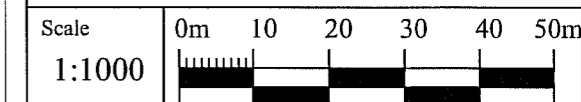
Plotting parameters - Area 2
Minimum - 2.56nT (white)
Maximum + 2.95nT (black)

Figure No.	Job no.	Date	Drawn FET/EJFM
5	1503	Nov. 2000	Checked PPB

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Subject
RAW MAGNETOMETER
DATA

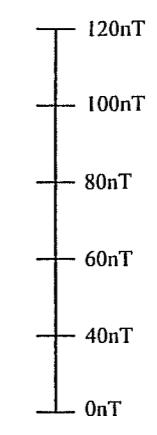
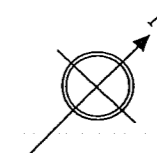


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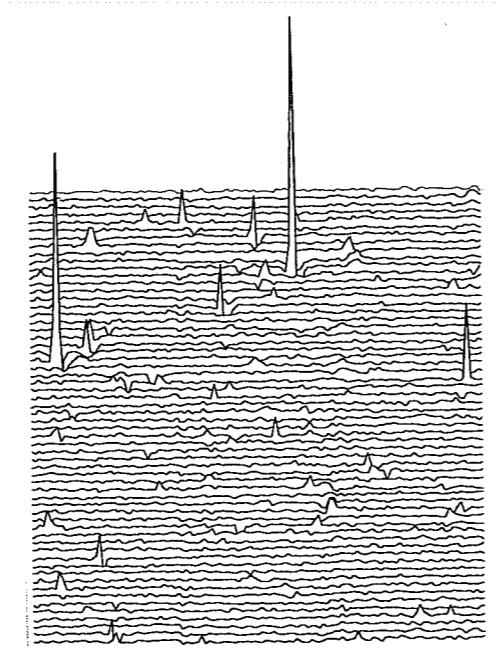
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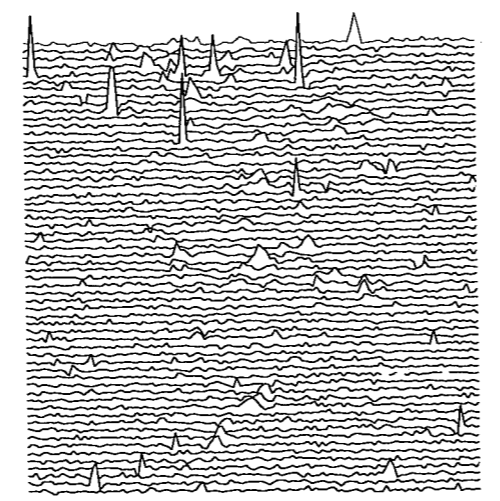
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Plotting parameters
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(Positive values displace above the trace line. Hidden values have not been plotted)



AREA 1



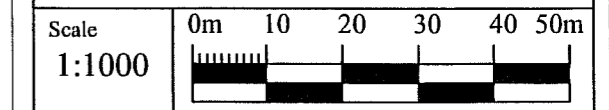
AREA 2

Figure No.	Job no.	Date	Drawn
6	1503	NOV. 2000	FET/EJFM
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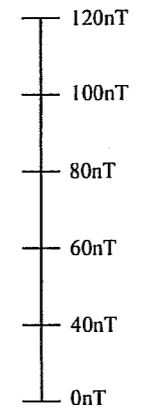
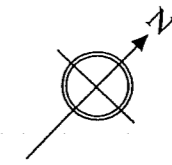
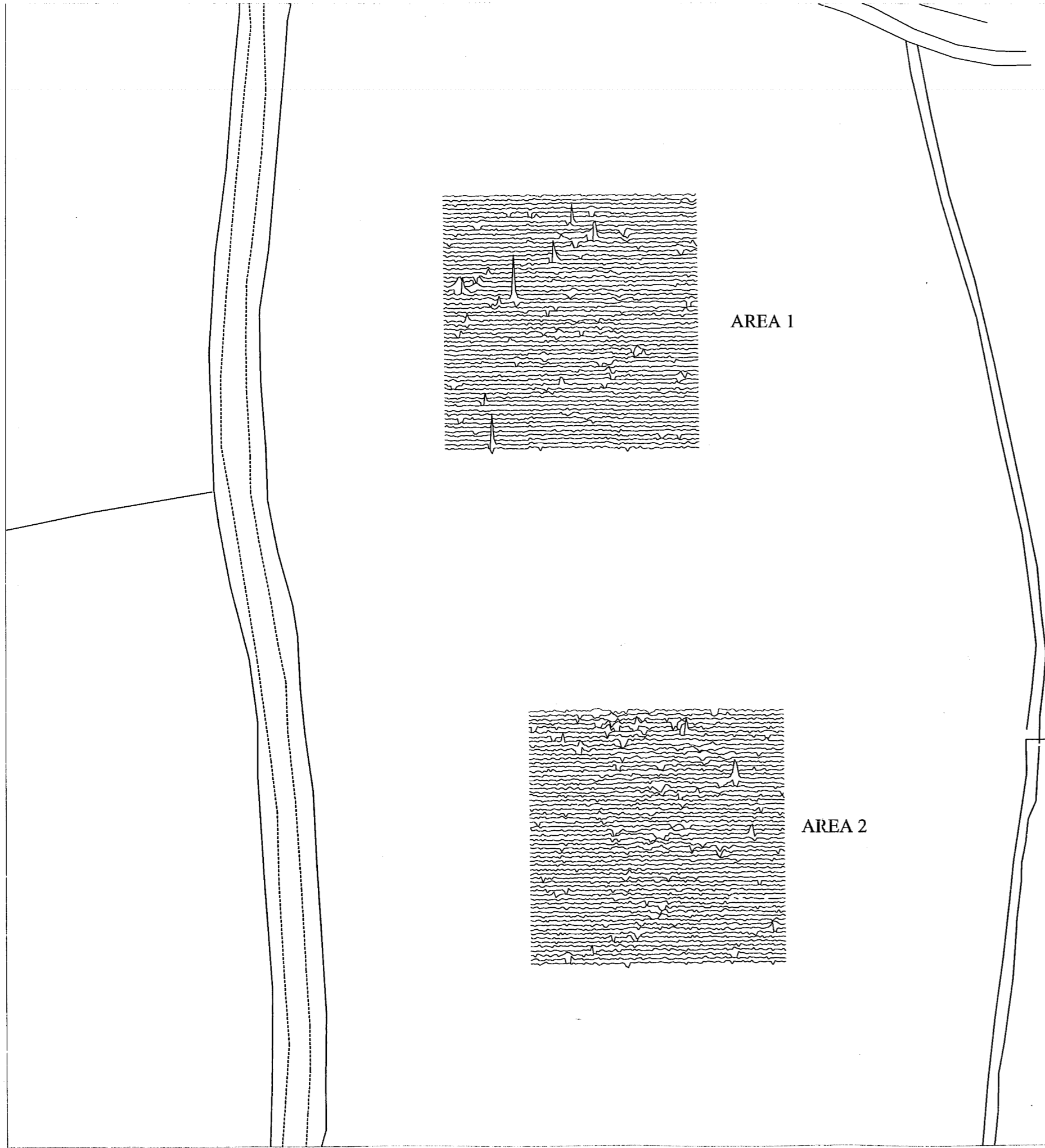
Subject
**TRACE PLOT OF RAW
MAGNETOMETER DATA
SHOWING POSITIVE VALUES
ONLY**



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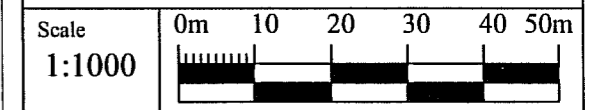
Plotting parameters
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 (Negative values displace above the trace line. Hidden values have not been plotted)

Figure No. 7	Job no. 1503	Date NOV. 2000	Drawn FET/EJFM
			Checked PPB

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Subject
 TRACE PLOT OF RAW
 MAGNETOMETER DATA
 SHOWING NEGATIVE
 VALUES ONLY

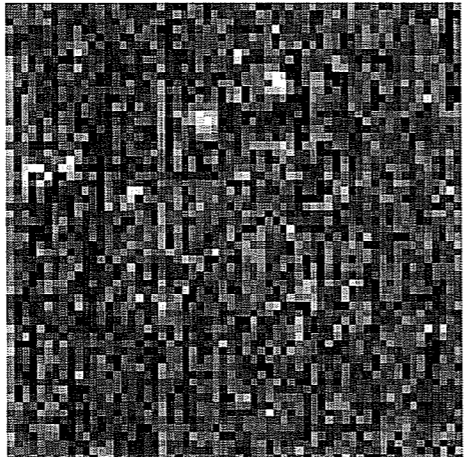
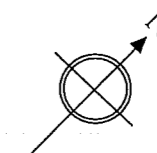


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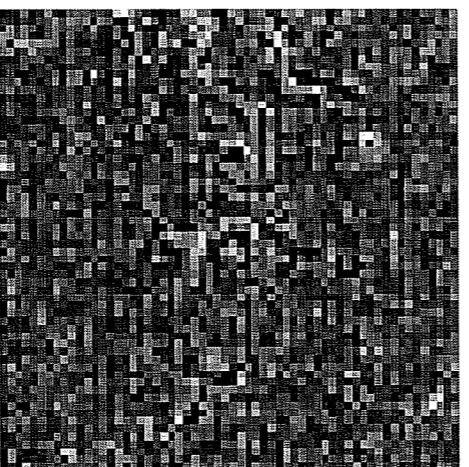
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AREA 1



AREA 2

Plotting parameters - Area 1
Minimum - 1.74nT (white)
Maximum + 1.71nT (black)

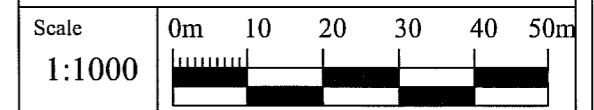
Plotting parameters - Area 2
Minimum - 1.93nT (white)
Maximum + 1.92nT (black)

Figure No.	Job no.	Date	Drawn
8	1503	Nov. 2000	FET/EJFM
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Project Title
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Little Comberton, Worcs.

Subject
**PROCESSED
MAGNETOMETER DATA**

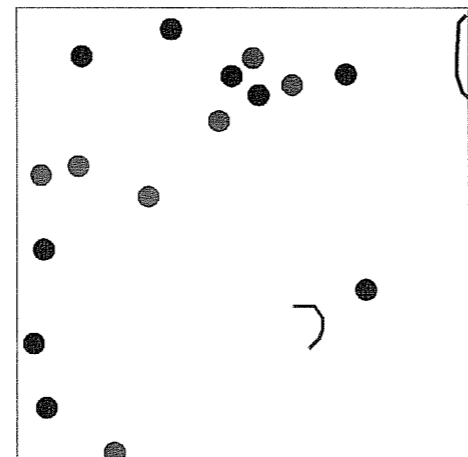
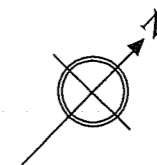


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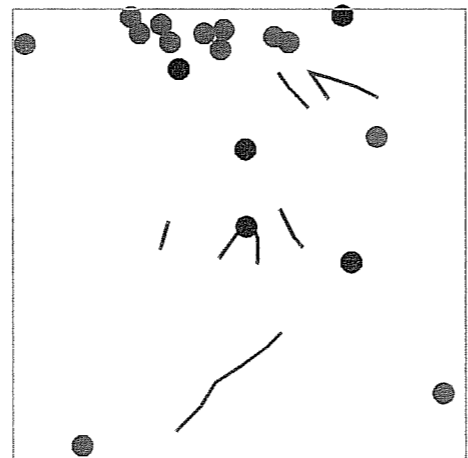
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AREA 1



AREA 2

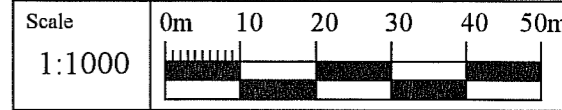
	Discrete positive anomaly with negative return - ferrous object
	Discrete low magnitude positive anomaly - possible pit
	Feint positive linear anomaly - cut feature of possible archaeological/agricultural origin

Figure No.	Job no.	Date	Drawn
9	1503	Nov. 2000	FET/EJFM
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Project Title
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 Summer Ground, Pershore Road,
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Subject
**ABSTRACTION AND
 INTERPRETATION OF
 MAGNETOMETER DATA**



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