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FLUXGATE GRADIOMETER SURVEY, LAND SOUTH OF SPALDING ROAD, BOURNE LINCOLNSHIRE

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Report prepared for Lincolnshire County Council
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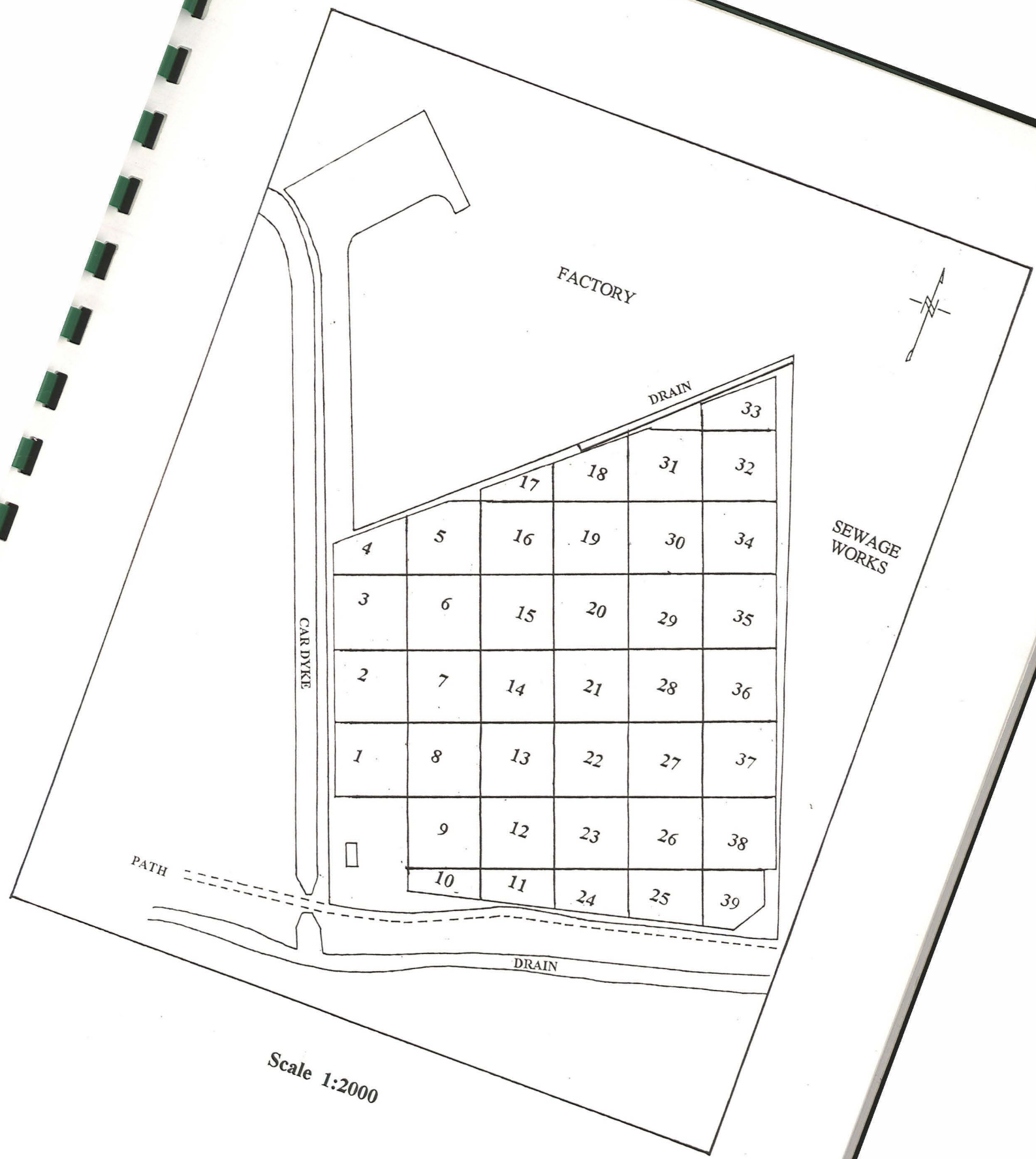
Summary

- *A detailed fluxgate gradiometer survey took place to evaluate the archaeological potential of land at Bourne, Lincolnshire.*
- *The survey detected magnetic variation, predominantly caused by modern services and land drains.*
- *A faint curvilinear anomaly was detected which may have archaeological significance.*
- A *number of smaller anomalies were detected, mainly localised dipolar, indicating the presence of ferrous-based material of probable modern origin.*

Fig. 1: Site location (1:10,000)



Scale 1:2000

Fig.2 Location of survey grids.

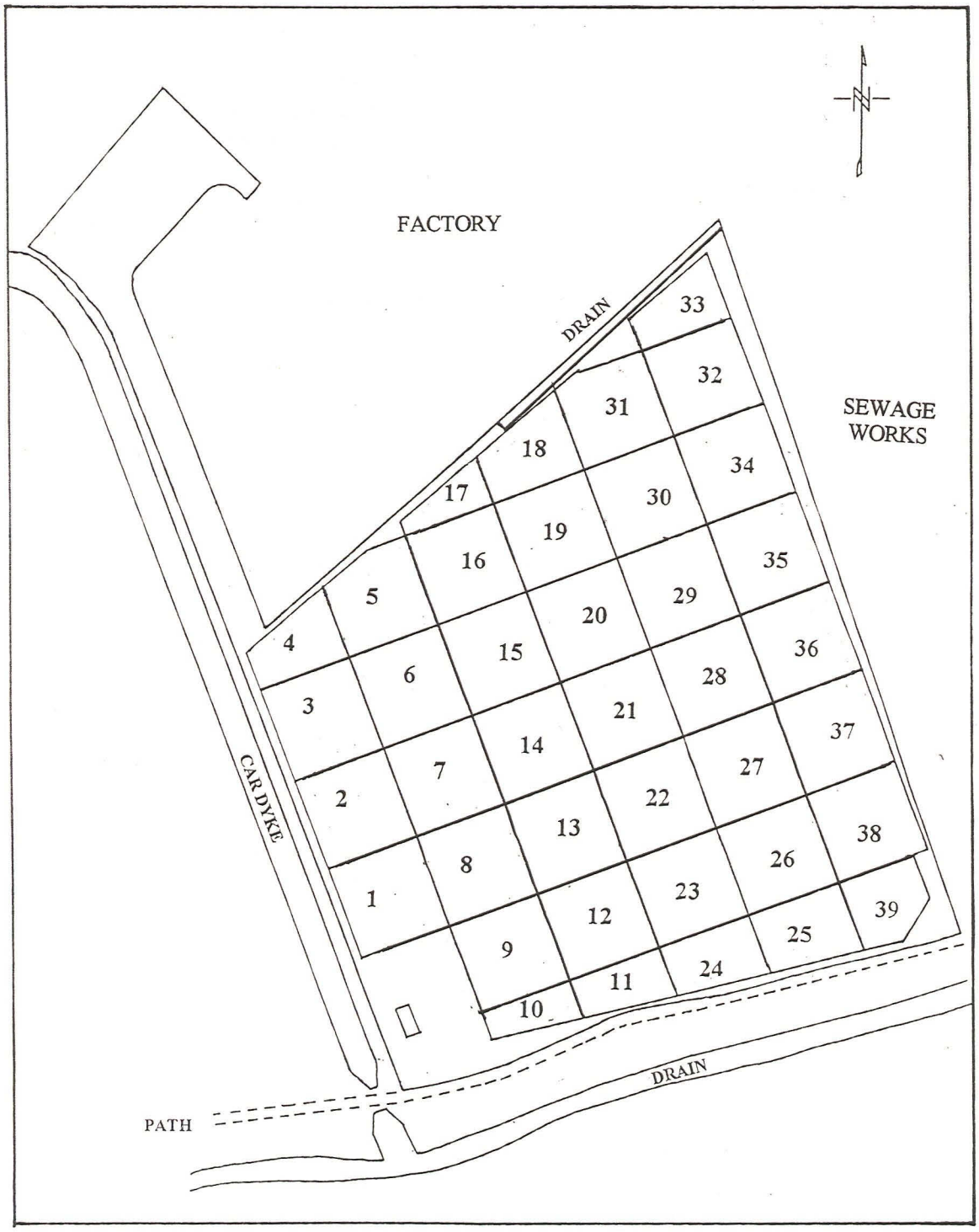


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Fig.2 Location of survey grids.

1.0 Introduction

In response to a recommendation by the Community Archaeologist for South Kesteven, a detailed fluxgate gradiometer survey was commissioned by Lincolnshire County Council to evaluate the archaeological potential of land south of Spalding Road at Bourne. An outline planning application for industrial and warehouse development has been submitted to South Kesteven District Council by the prospective purchaser.

The significance of Bourne as an important area of medieval and post- medieval pottery production is well established. The recovery of substantial amounts of pottery sherds and the excavation of two kilns in the proximity of the site suggest possible archaeological potential.

The gradiometer survey was undertaken in accordance with the guidelines set out in the Lincolnshire County Council Archaeology Section publication *'Lincolnshire Archaeological Handbook; A Manual of Archaeological Practice'*, 1998, and in accordance with the guidelines set out in the English Heritage document *'Geophysical Survey in Archaeological Field Evaluation'*, 1995.

2.0 Location and description

Bourne lies in the administrative district of South Kesteven approximately 15km west of Spalding, 22km south-east of Grantham. The proposed development site is to the east of the town, south of Spalding Road and to the east of Car Dyke (NGR: TF 10741 20096), and comprises an irregular unit of approximately 4 hectares.

The site is largely stubble apart from a small weed covered area to the north, unsuitable for this survey method. Drains enclose the site to the south, north-east and west; a factory and sewage works (bounded by a metal fence) to the north and east respectively. The site contains a building and concrete parking area in the southwest corner.

3.0 Methodology

Detailed area survey using a fluxgate gradiometer is a non-intrusive means of evaluating the archaeological potential of a site. The fluxgate gradiometer detects (often discrete) magnetic anomalies caused by areas of high or low magnetic susceptibility. These areas are caused by changes in the composition of the subsoil or the underlying geology. Archaeological features are the result of man-made changes to the composition of the soil and the introduction of intrusive materials such as brick, charcoal and pottery. These features will create detectable magnetic variability. Activities which involve heating and burning will create magnetic anomalies, as will the presence of ferrous metal objects. By examining the anomalies detected by a fluxgate gradiometer survey, geophysicists can often translate the data into archaeological interpretation.

The area survey was conducted using a *Geoscan Research* fluxgate gradiometer (model FM36) with an electronic sample trigger set to take 4 readings per metre (a

sample interval of 0.25m). The zigzag traverse method of survey was used, with 1m wide traverses across 30m x 30m grids. The base line was established parallel to the boundary to the west, 5m from the centre of the bank along the Car Dyke and 20m from the north-west corner of the building on the south-west corner of the site. Pegs were left in the ground indicating the position of the base line.

The sensitivity of the machine was set to detect magnetic variation in the order of 0.1 nanoTesla.

The data from the survey was processed using *Geoplot* version 3.0. It was desloped (a means of compensating for sensor drift during the survey by subjecting the data to a mathematical bias sloping in the opposite direction of the bias created by sensor drift). The data was clipped to reduce the distorting effect of extremely high or low readings caused by ferrous metals on the site, and the results were plotted as a number of greyscale images.

The survey was carried out by James Snee and David Bunn on the 26th –28th October 1999. The weather was clear and fine. The area surveyed measured approximately 3.2 hectares.

4.0 Results

The survey revealed little of archaeological significance. Large areas of the site contained modern services associated with the factory and sewage works (Figs.3 and 7 (1)). Disturbance on the west boundary may also relate to the building. The data was re-processed to exclude these strong anomalies, which potentially masked the weaker readings of possible archaeological features (Figs.3, 4, 5 and 6).

Several diffuse, parallel linear anomalies traversed the mid section of the site on a south/west to north/east axis; also a stronger, broken linear in a north/south direction was recorded (Fig.7 (2) and (3)). These are probably land drains of modern origin.

A strong circular dipolar anomaly, located in the extreme southeast corner, and an area on the southern edge (Fig.7 (4)), possibly relates to the modern services.

The northeast and east edges of the survey produced strong anomalies; caused by a metal chain link fence and modern ditching respectively (Figs.7 (5) and (6)).

Faint linear anomalies (Fig.7 (7)) parallel and close to the north edge of the survey are probably the result of modern agricultural machinery; farm traffic and consequent land compaction tends to be heavier on field edges.

A faint, curvilinear, positive anomaly, to the southwest of the survey (Fig.7 (8)), may be archaeologically significant and represent some form of enclosure or ditch. This interpretation is tentative, given the close proximity of the modern service and associated land disturbance, which may have affected definition.

Across the whole of the survey were a number of small discrete positive or dipolar (positive and negative) anomalies. It is likely that the majority of these are caused by ferrous debris and/or manurial scatter in the topsoil.

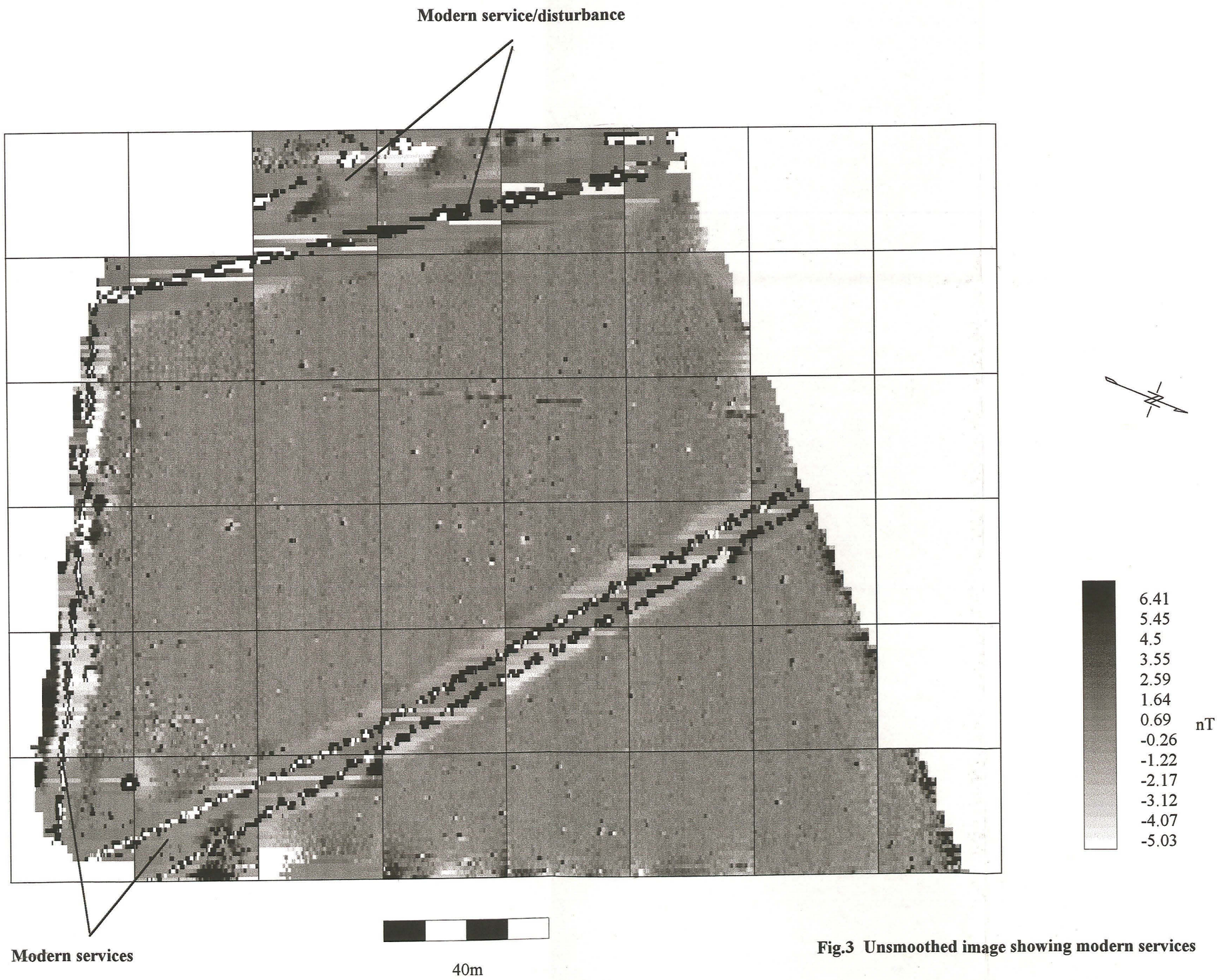


Fig.3 Unsmoothed image showing modern services

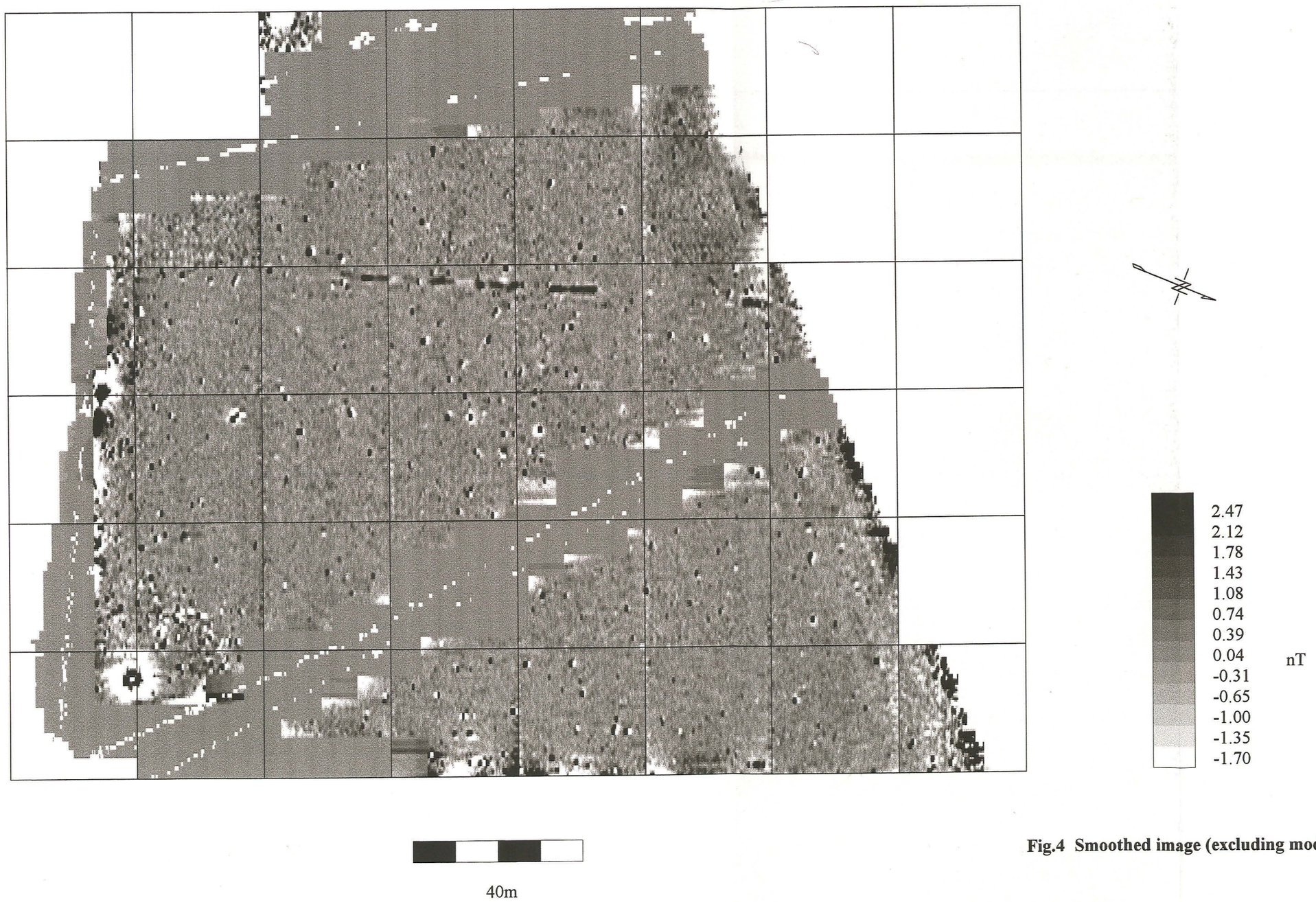
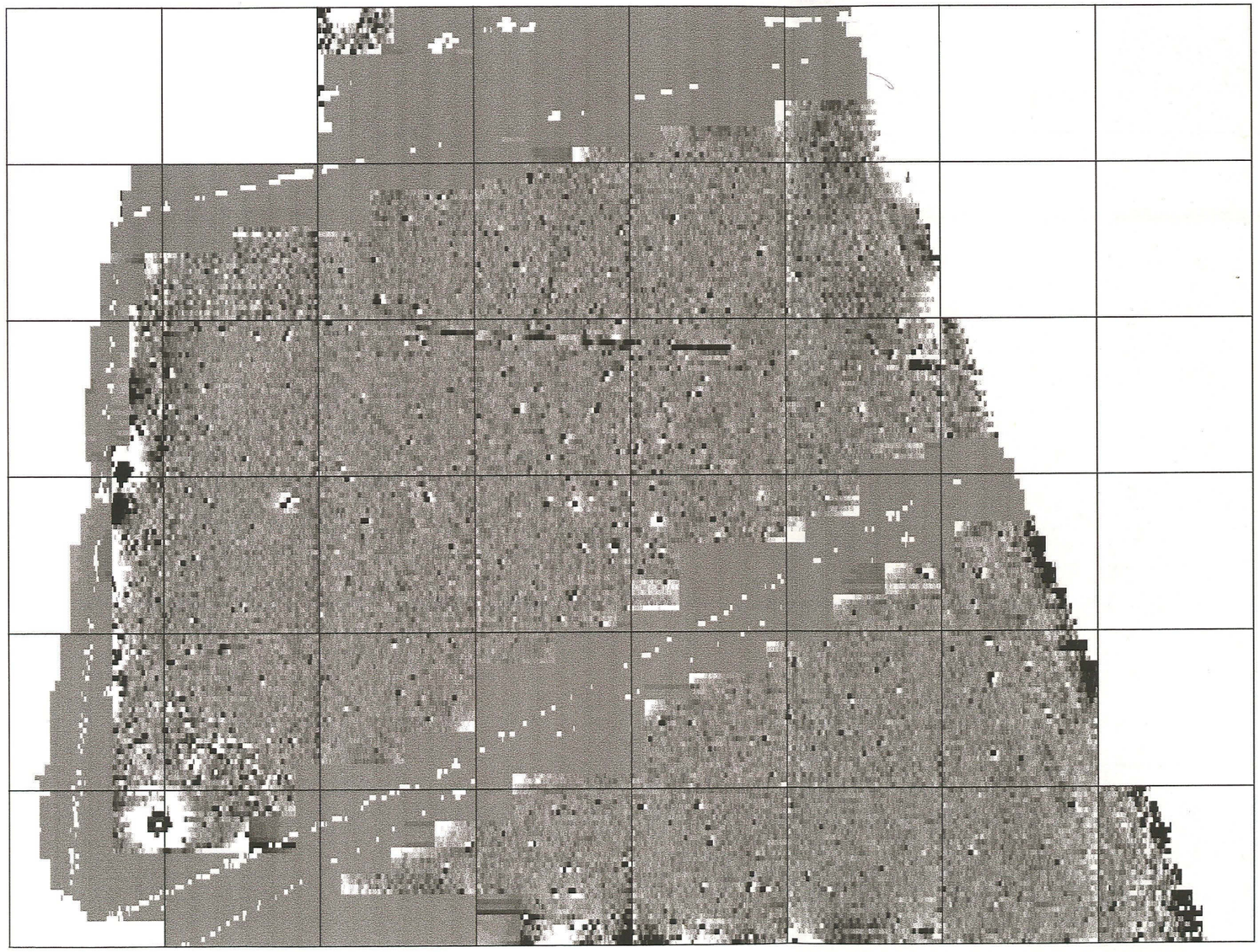


Fig.4 Smoothed image (excluding modern services).



40m

Fig.5 Unsmoothed image (excluding services).

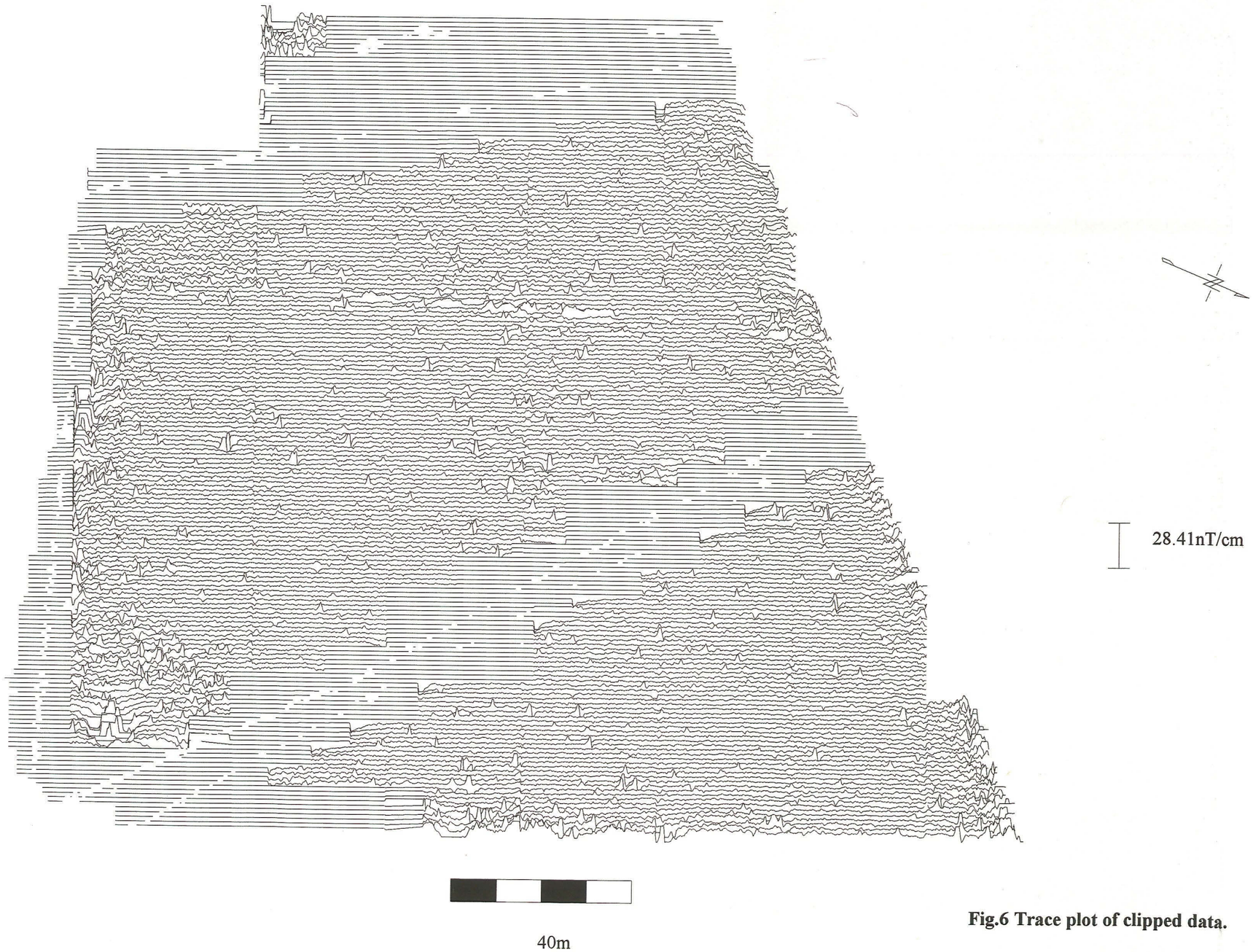


Fig.6 Trace plot of clipped data.

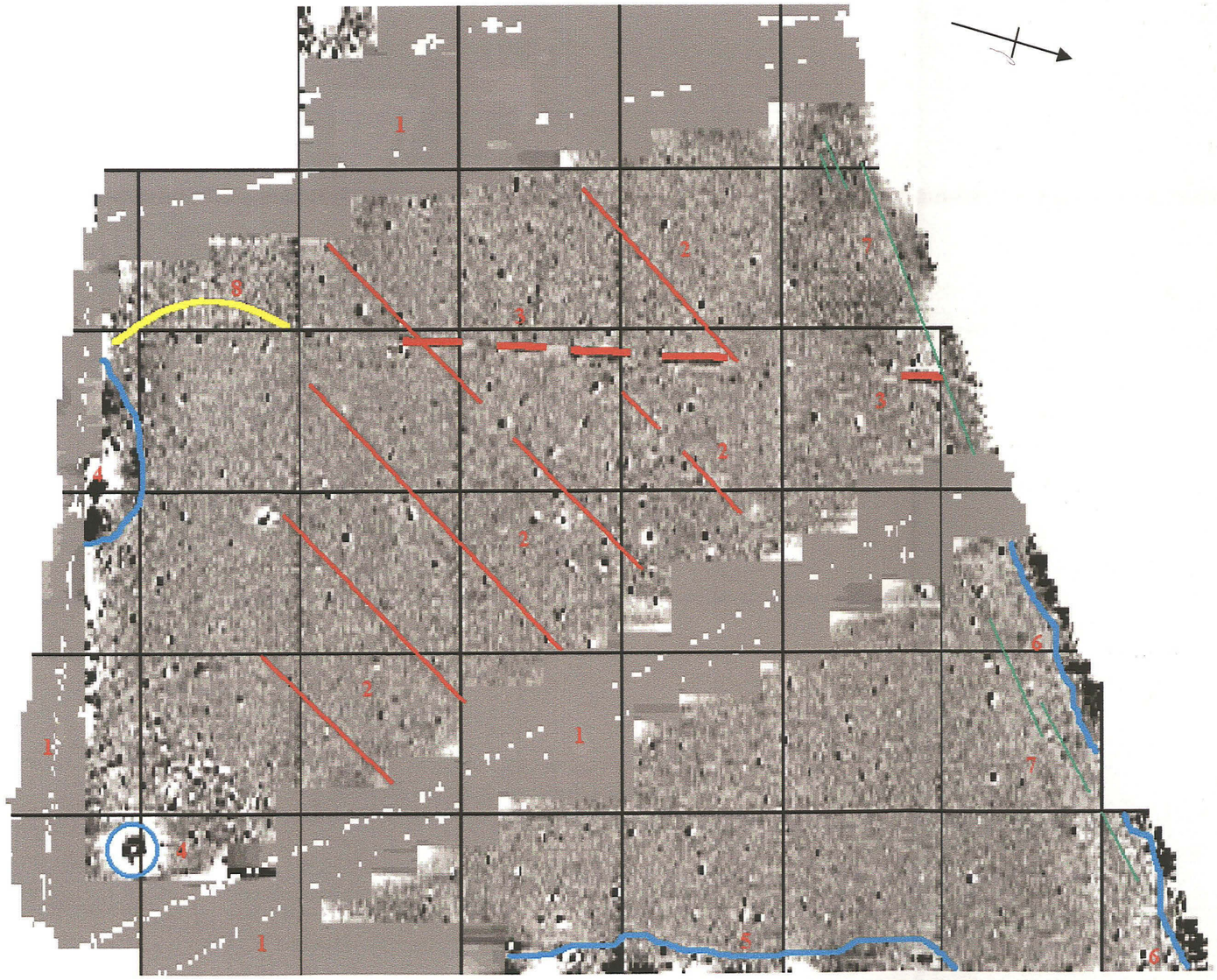


Fig. 7 Interpretive greyscale image. Scale 1:1000

5.0 Conclusions

The site has produced few anomalies of potential archaeological significance. The majority of the magnetic variation detected was the result of modern activity. Some of the small discrete positive anomalies may be of some archaeological significance (e.g. as artefacts in the topsoil or subsoil), although this cannot be proved on present evidence.

The diffuse curvilinear anomaly detected on the southwest edge of the survey may be significant.

It is concluded on the basis of the survey carried out that the site is probably of limited archaeological potential. If important remains are located on the site, then they are probably:

a) not responsive to magnetic survey or
b) too deeply buried to be detected by detailed gradiometry or
c) masked by the magnetic strength of modern services.

Detailed survey by fluxgate gradiometer is only capable of detecting features that alter the magnetic susceptibility of soils or are magnetically different to the soils around them. It remains a possibility that there are archaeological features within the survey area that are not detectable.

6.0 Acknowledgements

Pre-Construct Geophysics would like to thank PCA and Dickens Watts &Wade for this commission.

7.0 Appendices

7.1 Bibliography

Clark, A J — 1990 *'Seeing beneath the soil.'*

David, A — 1995 *Research & Professional Services Guidelines* No 1; 'Geophysical Survey in Archaeological Field Evaluation.'

Gaffney, C, Gater, J & Ovenden, S — 1991 *IFA Technical Paper No 9; 'The use of Geophysical techniques in archaeological evaluations'*.

Palmer-Brown, C — 1999 Land South-East of Spalding Road, Bourne, Lincolnshire*: Specification for an archaeological field evaluation.*

7.2 Summary of survey parameters

Instrument:	Geoscan Research Fluxgate Gradiometer FM 36 with Sample Trigger ST1.
Resolution:	0.1 nT
Grid size:	30m x 30m
Sample interval:	0.25m
Traverse interval:	1m
Traverse method:	zigzag