Cranfield UNIVERSITY

GEOPHYSICAL SURVEY AT BOSWORTH BATTLEFIELD, SHENTON, LEICESTERSHIRE

Central Grid Ref: SP 3905 9861

Cranfield Forensic Institute Report No. 018

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ILLUSTRATIONS

ABSTRACT

Gradiometer and resistivity surveys were carried out in the vicinity of the Bosworth battlefield between Shenton and Stoke Golding, Leicesetershire.

The survey was carried out to locate the remains of a known Roman Road with a ford to assess the potential for peat deposits on one of the traditional sites of the Bosworth battlefield.

Four areas were surveyed at Shenton; Field 1 revealed the remains of a former stream/brook with possible indications of a ford crossing. Field 2 indicated no significant anomalies relating to a Roman road alignment. Field 3 did not show any indications of mass graves but did reveal the remains of a 19th century barn. Field 4 to the north of Fenn Lanes was surveyed in order to assess the potential to map the extent of the peat deposits but the results did not prove sufficiently effective to enable the wider use of the technique to prospect for other peat deposits.

1.0 INTRODUCTION

The Battlefield Trust commissioned the Centre for Archaeological and Forensic Analysis to undertake a geophysical survey on land being investigated as part of the Bosworth battlefield survey (Foard, 2004).

The purpose of the survey was to detect the exact alignment of a Roman Road and associated ford to which certain events of the battle may be associated, to the extent of a known peat deposit and to test a traditional site of a supposed mass grave. The work was carried out between November 2007 and March 2008.

The survey methodology described in this report was based upon guidelines set out in the English Heritage document *'Geophysical Survey in Archaeological Field Evaluation'* (David, 1995).

2.0 LOCATION AND DESCRIPTION

The information contained within sections 2 and 3 of this report is based on information supplied by Glenn Foard.

Four areas were surveyed, two immediately to the south of Fenn Lanes on the approximate line of the Roman road from Mancetter to Leicester and two other areas some distance to the north of Fenn Lane.

The site of the battlefield is located to the north-east of Hinkley, to the south of Shenton and west of Sutton Cheney, Leicestershire (Fig 1: central grid ref NGR SP 3905 9861).

All fields surveyed are currently under pasture cultivation, low-lying and flat. The soils are slow-permeable, seasonally wet and consist mostly of loams and clays.

The surface geology is composed of the Mercian Mudstone Group with alluvium. The magnetic susceptibility of these types of geologies is generally average depending on depth and target being detected (Gaffney & Gater 2003, 78; David 1995, 10; Clark 1990, 92).

3.0 BACKGROUND INFORMATION

The Battle of Bosworth was fought on 22 August 1485 and was one of the most influential battles to be contested on English soil.

The exact location of the battlefield has not been precisely determined. The Roman Road follows the approximate line of Fenn Lanes. However, a report by the farmer of a concentration of stone, listed on the SMR, together with observation by Foard of an apparent cambered metalled surface at NGR 4392 2984 suggests the Roman alignment is briefly abandoned before the modern road in this area. While a sand pit has destroyed the land immediately to the NE of the cambered surface no disturbance exists to the SE and further to the NE. Geophysics was therefore undertaken to test the alignment.

Fieldwork reported by Gearey et al 2008 had identified a peat deposit to the north of Fenn Lane at NGR 4391 2986. The extent of the deposit had been closely defined by further augering. Geophysics was required to test whether it could provide an effective but more rapid, method of identifying the presence and extent of any peat deposits.

4.0 METHODOLOGY

Gradiometry

Gradiometry is a non-intrusive scientific prospecting technique used to determine the presence/absence of some classes of sub-surface archaeological features (eg pits, ditches, kilns, and occasionally stone walls). By scanning the soil surface, geophysicists identify areas of varying magnetic susceptibility and can interpret such variation by presenting data in various graphical formats and identifying images that share morphological affinities with diagnostic archaeological as well as other detectable remains (Clark 1990).

Gradiometry is used to establish the presence/absence of buried magnetic anomalies, which may reflect sub-surface archaeological features.

The area survey was conducted using a Bartington Grad 601 dual fluxgate gradiometer with DL601 data logger 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 sensitivity of the machine was set to detect magnetic variation in the order of 0.1 nanoTesla.

Resistivity

Resistivity survey measures the electrical resistance of the earth's soil moisture content. A twin probe configuration is normally used, which involves the pairing of electrodes (one current and one potential), with one pair remaining in a fixed position (remote probes), whilst the mobile probes measure resistivity variations across the survey grids. Resistance is measured in ohms, and this method is generally effective to a depth of 1m.

Features such as wall foundations are usually identified as high resistance anomalies, as well as rubble spreads, made surfaces (ie yards and paths) and metalled roads and trackways. In contrast, low resistance values are normally associated with water-retentive features such as large pits, ditches, drains and gulleys.

The resistivity survey was carried out using a Geoscan RM15 Resistance Meter with a twin probe array configuration in mobile probe spacing of 0.5m. The zigzag traverse method of survey was used, with 1m wide traverses across 20m x 20m grids.

The data was processed using *Archeosurveyor v.1.3.2.8*. The results are plotted as greyscale and trace plot images (Figs. 2-8).

The enhanced data was processed by using zero-mean functions to correct the unevenness of the image in order to produce a smoother graphical appearance. It was also processed using an algorithm to remove magnetic spikes, thereby reducing extreme readings caused by stray iron fragments and spurious effects due to the inherent magnetism of soils. The data was also clipped to reduce the distorting effect of extremely high or low readings caused by discrete pieces of ferrous metal.

5.0 INTERPRETATION AND ANALYSIS OF RESULTS (Figs. 2-9)

Field 1 (Figs. 2 and 3)

An area covering about 1ha was surveyed immediately to the south of Fenn Lanes. A series of linear dipolar anomalies (orange lines) were detected denoting the presence of land drains. At the westernmost part of the survey, an area of magnetic disturbance was recorded caused by a large steel storage container. A sinuous curvilinear anomaly (**1**) running in a north-east to south-west direction possibly indicates the presence of a former stream channel as shown by the presence of high magnetism. This magnetic signature is caused by natural features such as peaty mineralised deposits. At the northern end of this possible palaeochannel, the resultant plot indicates the stream to be slightly wider at the point (circled blue) where the Roman road is projected to cross it. It is at this point where the stream/brook would have been forded. However, this widening could have been caused by an east-west orientated land drain that may have dragged some of the buried deposits from the former stream (dashed orange line). This will be addressed in future trenching report and the geophysical evidence re-assessed.

Other ephemeral anomalies (circled green) are typical of natural features such as magnetic signatures from peaty/mineralised deposits due to the low lying ground. Today this field is subject to seasonal flooding especially after heavy downpours.

No other significant anomalies were detected.

Field 2 (Figs. 2 and 4)

An area covering about 0.9ha was surveyed in the western half of this field. This area lies immediately to the east of field 1 and was surveyed to locate the remains of the Roman road alignment projected to cross the northern half of this field. Slight earthwork remains of ridge and furrow exist and run in an east-west direction as defined in a forthcoming report on the field system by Hall. The results clearly show the remnants of these (dashed green lines). A series of north-south linear striations are likely to reflect an image processing artefact rather than ridge and furrow cultivations lines.

A series of land drains similar to those detected in Field 1 were recorded in the resultant image (orange lines). A discrete amorphous shaped dipolar anomaly (circled orange) was detected on the western side of the field. This denotes a former infilled sand pit as depicted on the first edition Ordnance survey map of 1885 (www.old-maps.co.uk Leicestershire 1:10560 series).

No magnetic traces of the Roman road were detected in this field.

Field 3 (Figs 2, 5, and 6)

Field 3 was surveyed to locate the remains of an alleged mass grave. The survey area covered 2ha of ground.

Two linear anomalies (yellow lines) were detected, the southernmost one with two large oak trees still standing along its alignment, denote the remains of former field boundaries as depicted on the first edition Ordnance Survey map of 1885 (www.old-maps.co.uk Leicestershire 1:10,560 series). The northern field boundary shows a discrete group of dipolar anomalies (circled pink) indicating modern ferrous activity possibly caused by the removal of the former hedge line.

A linear dipolar anomaly (blue line) runs parallel to the eastern hedge boundary indicating the presence of a service trench. At the northern end of this service trench, a discrete amorphous zone (circled pink) indicating modern ferrous disturbance denotes the remains of a former barn as depicted on the first edition Ordnance Survey map of 1885. The service may have once been connected to the building.

A series of discrete individual anomalies (small pink circles) can be seen across the entire image. These indicate iron spikes possibly representing ferrous remains such as horseshoes, stray iron fragments and other ferrous objects.

A series of ephemeral curvilinear anomalies (dashed red lines) were detected on the western side of the field close to the gate and footpath entrance. These are likely to represent animal tracks created by sheep or where people have been constantly

walking. They do not appear to indicate features of archaeological interest due to their faint nature.

No further significant anomalies were detected.

Field 4 (Figs 2, 6 and 7)

Three 10m wide strips were surveyed in this field in order to assess the effectiveness of geophysics in mapping the peat deposits.

The strips indicate some significant anomalies. A series of discrete amorphous high magnetic anomalies (circled green) were detected indicating possible natural features such as peat deposits and appear blotchy in the resultant plot.

No other magnetic anomalies were detected.

Resistivity Survey (Figs. 2 and 9)

An area measuring 20m x 40m was surveyed in order to detect the remains of the former Roman road alignment in Field 1.

A number of anomalies were recorded but none appear to resemble a Roman road. Two swathes of low resistance were detected (outlined in green) are likely to reflect former stream channels. Two zones of high resistance anomalies (circled yellow) along the edge of the plot are likely to indicate compacted ground or slightly raised ground denoting the hedge boundary.

An amorphous zone of higher resistance (outlined in red) may indicate compacted ground or a slight change in the underlying soil or geology.

A series of unrecorded transects were carried out in Field 2 to determine whether there would be any change in background resistance to indicate the presence of a possible road alignment. Where higher resistance was encountered over a wider area, the central point was recorded by GPS and mapped (Fig. 2). A line of significant resistance was recorded. Further detailed resistance survey will be required to determine whether the resistance noted would indicate the presence of a Roman road alignment.

6.0 CONCLUSIONS

The survey has identified few significant anomalies relating to the Bosworth Battlefield. The detection of a mass grave has yet to be pinpointed but the area of the marshy ground has been partly ascertained. A series of transects were surveyed using resistivity, which indicated the likely presence of a possible road alignment although initial results have not revealed the presence of a Roman Road. The ridge and furrow detected in Field 2 appears to be aligned only east-west. The north-south striations appear to be an artefact as a result of data processing and the effects from the post and wire fencing along the northern field boundary.

Based on the survey results, it is concluded that the areas of investigation did not confirm the line of the Roman road or mass grave. However, traces of peat deposits were recorded and have allowed the possibility of mapping this further to determine the extent of the marshy ground known at the time of the battle.

It is recommended that further geophysical investigations need to clarify the presence of the Roman road alignment in Field 2 and to map the extent of peat deposits as well as pinpoint the location of the mass grave.

7.0 ACKNOWLEDGEMENTS

Cranfield University, Centre for Archaeological and Forensic Analysis would like to thank Glenn Foard, Battlefield Trust Officer and Richard McKinder, Project Manager, Leicestershire County Council for this commission.

8.0 BIBLIOGRAPHY

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Gearey, B., Howard, A., and Marshall, P., 2008 '*Bosworth Fields, Leicestershire: Palaeoenvironmental Survey and Assessment' Birmingham Archaeo-Environmental.*

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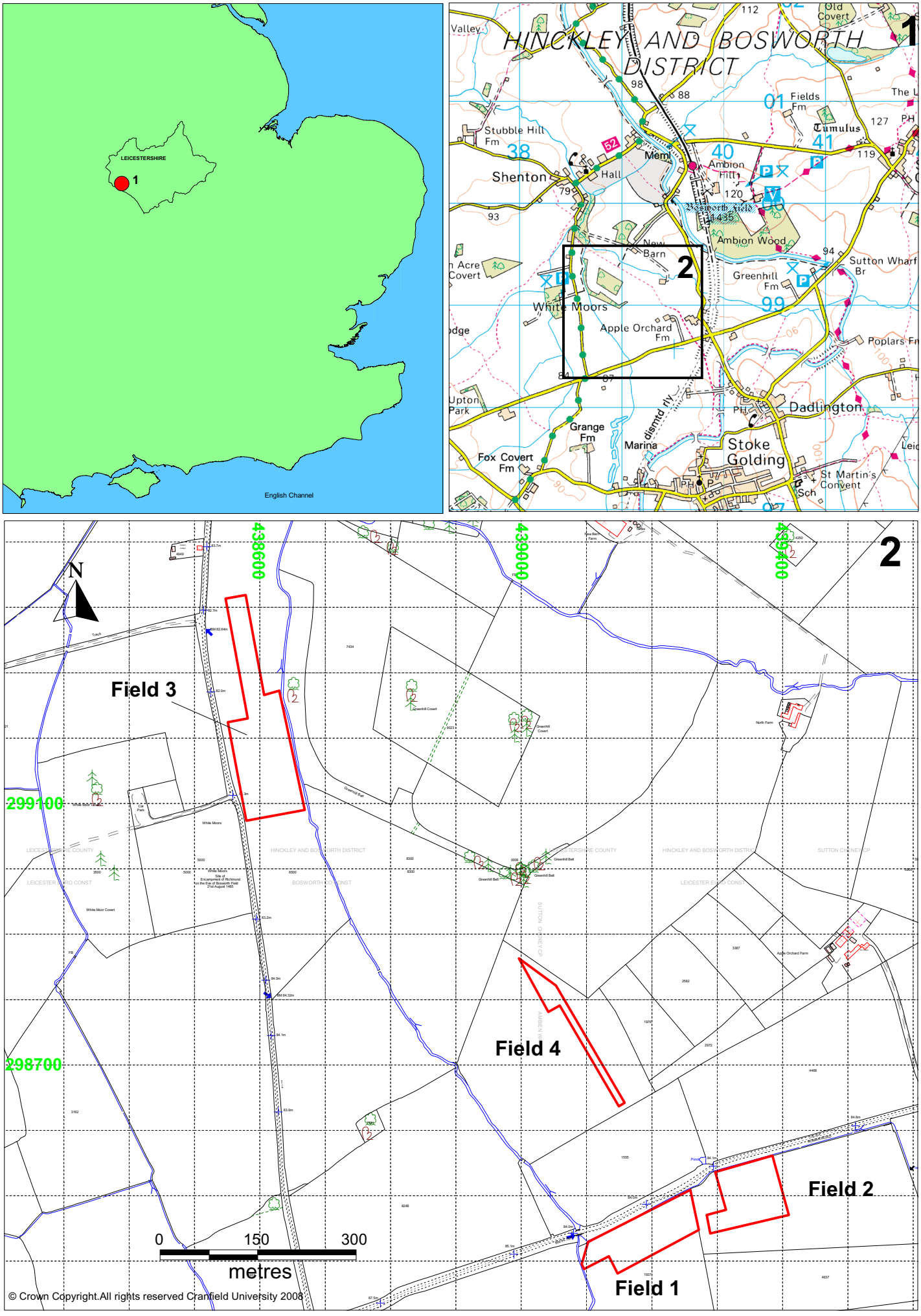


Fig. 1 - Location plan

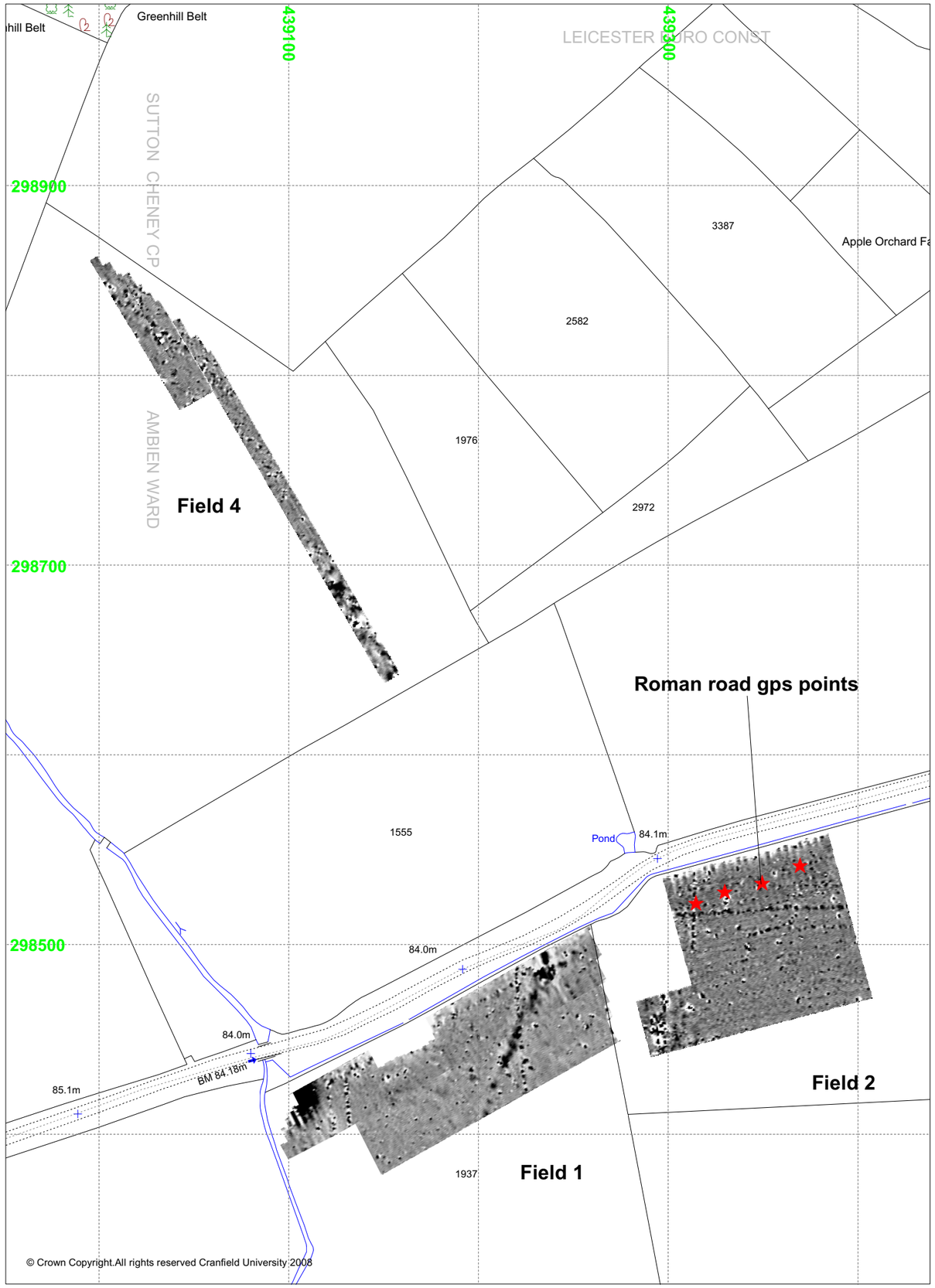


Fig. 2a- Geophysical Survey locations, scale: 1:2500

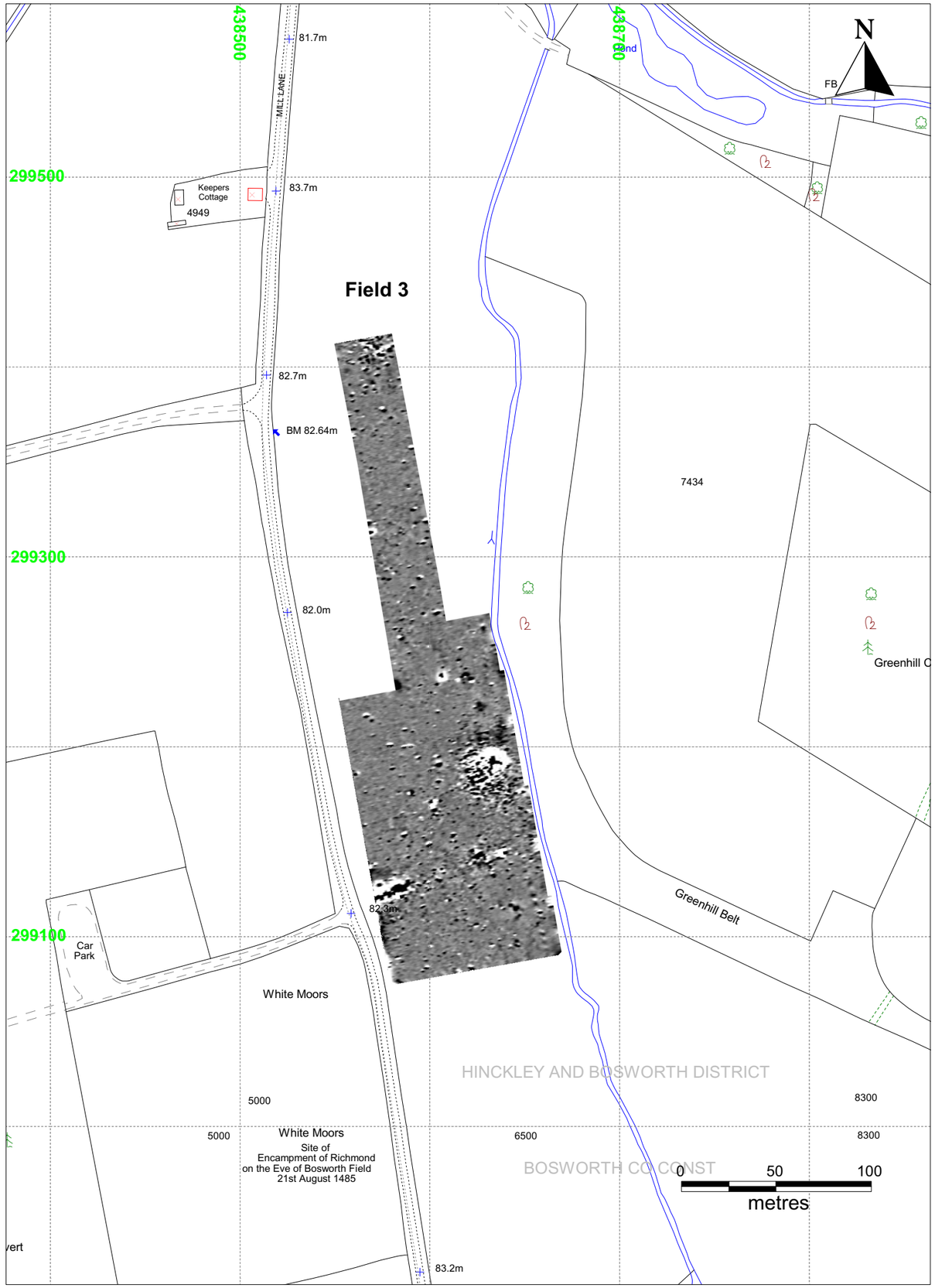
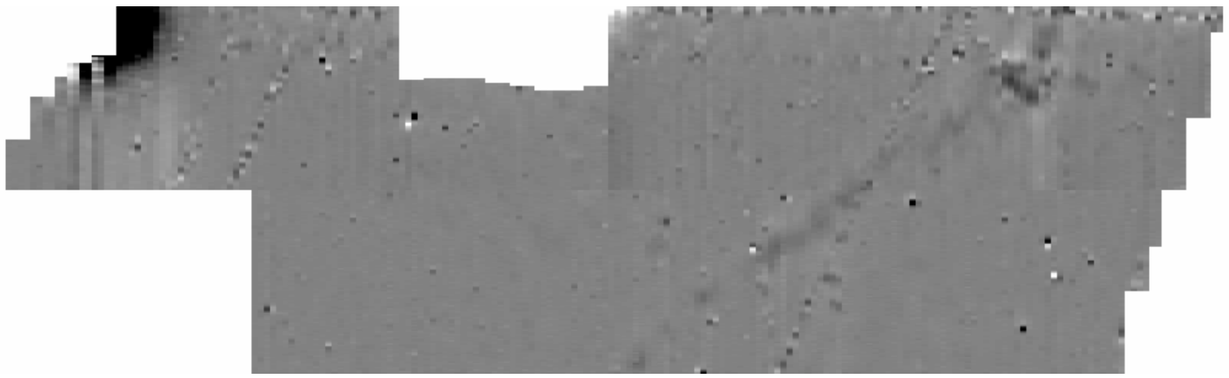


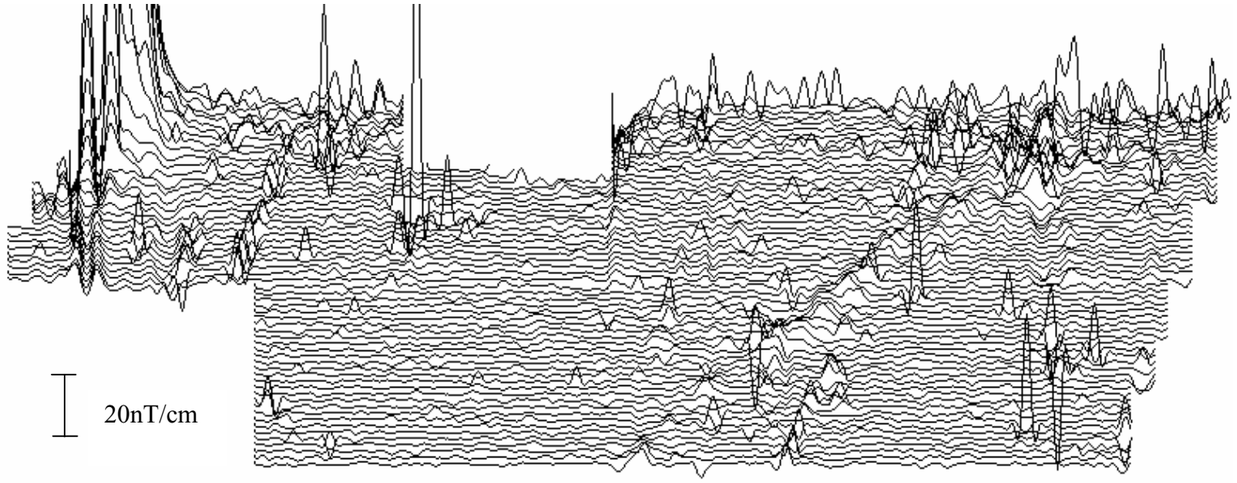
Fig. 2b- Geophysical Survey locations, scale: 1:2500

RAW DATA



-36.6 nT 100

TRACE PLOT OF RAW DATA



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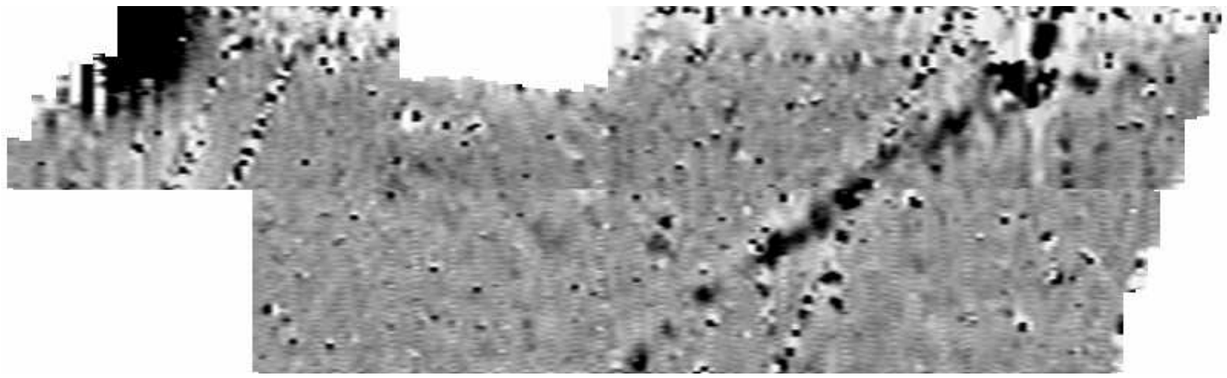

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INTERPRETATION

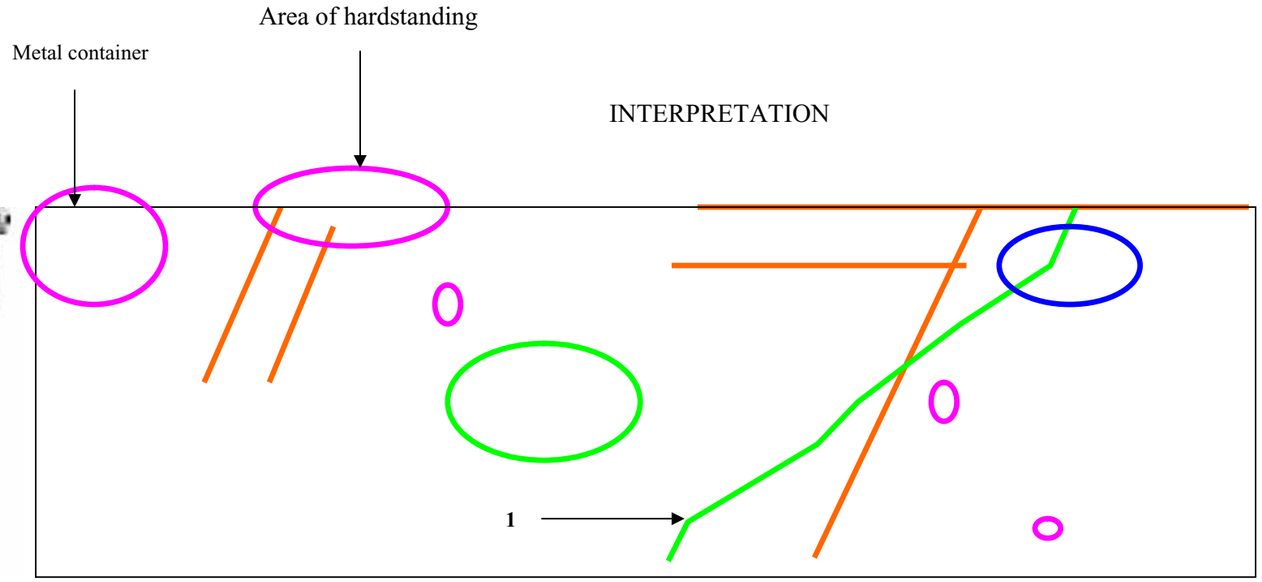
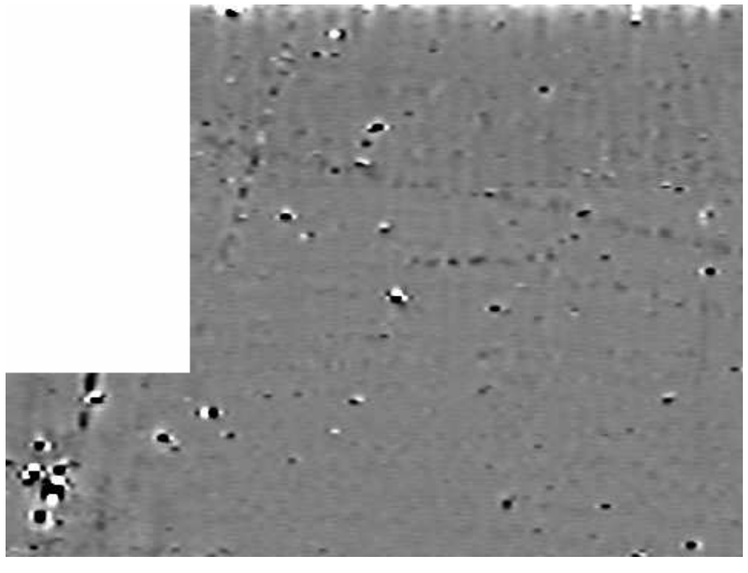


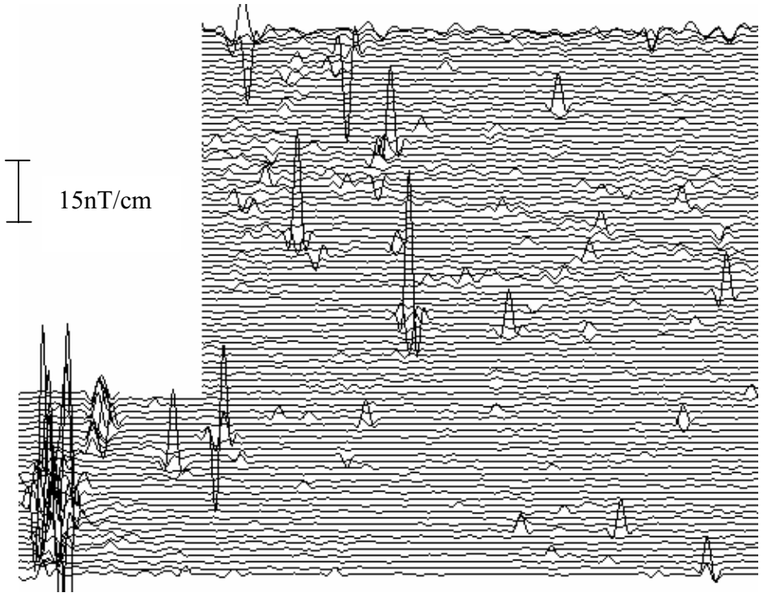
Fig. 3 – Field 1-Greyscale and trace plots of raw and enhanced data with interpretive plan, scale – 1:1000

RAW DATA



-72.5 nT 72.6

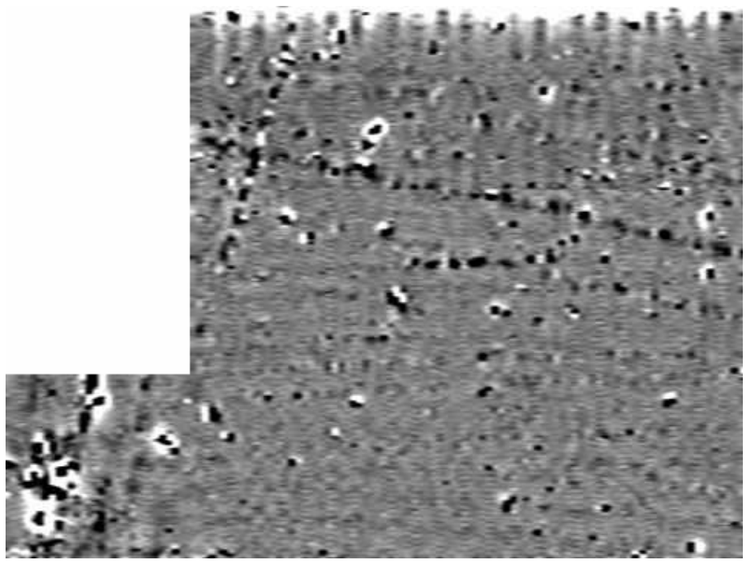
TRACE PLOT OF RAW DATA



N

60m

ENHANCED DATA



-1 nT 1

INTERPRETATION

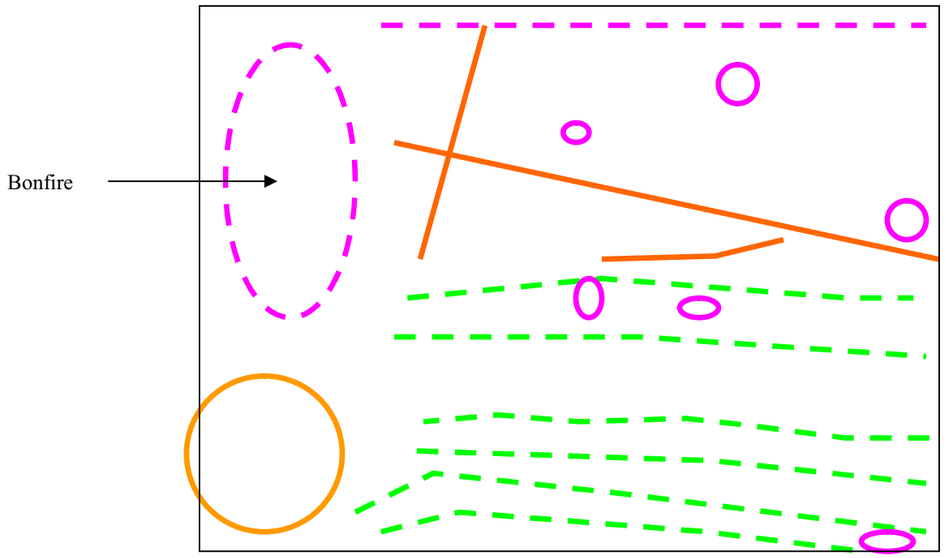


Fig. 4 – Field 2-Greyscale and trace plots of raw and enhanced data with interpretive plan, scale – 1:1000

RAW DATA

TRACE PLOT

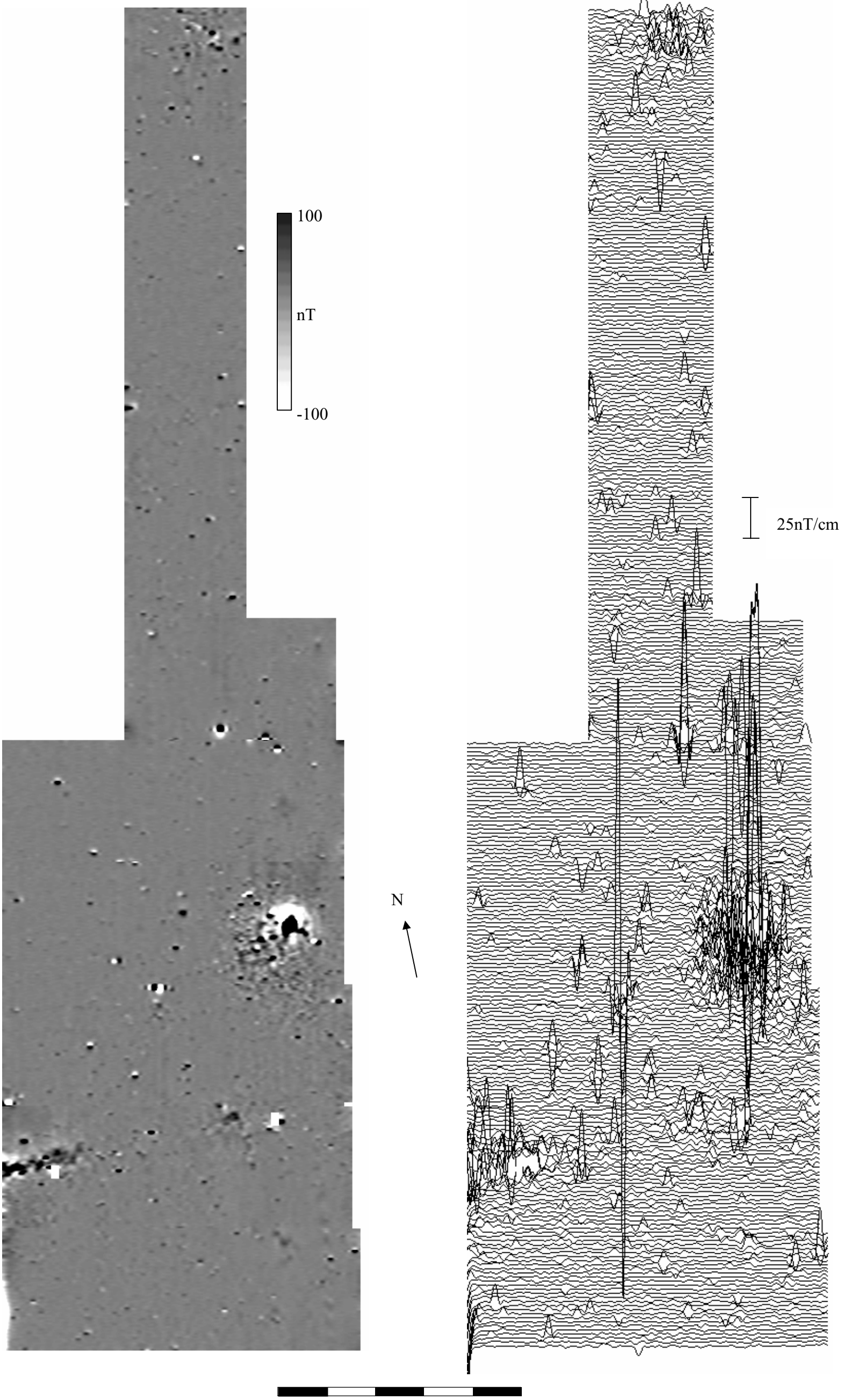
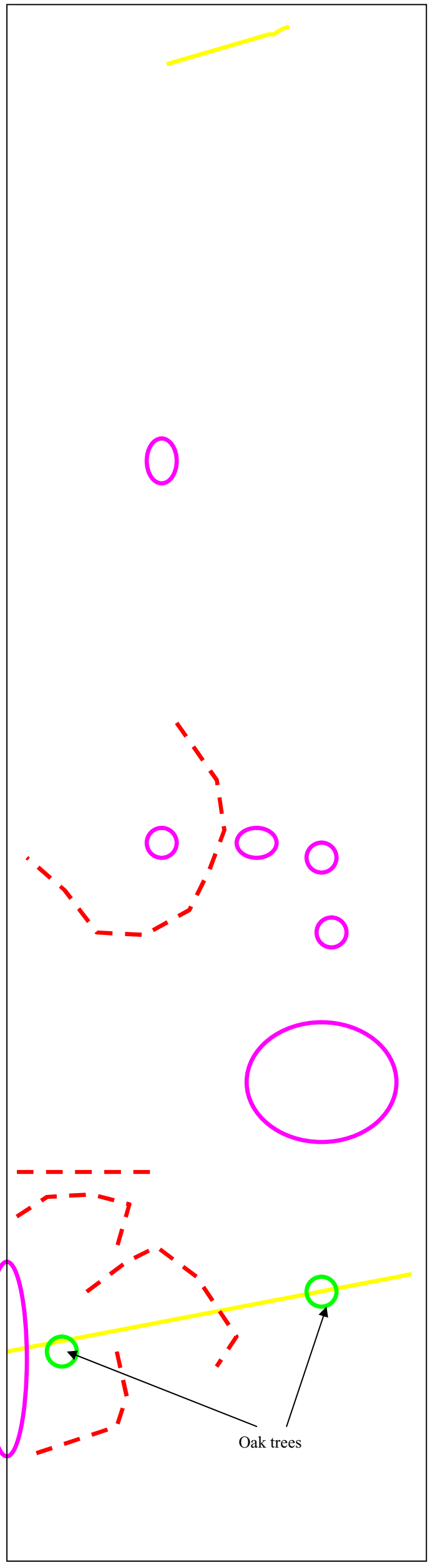


Fig. 5 – Field 3-Greyscale and trace plots of raw data, scale – 1:1000

ENHANCED DATA

INTERPRETATION



60m

Fig. 6– Field 3-Greyscale of enhanced data with interpretive plan, scale – 1:1000

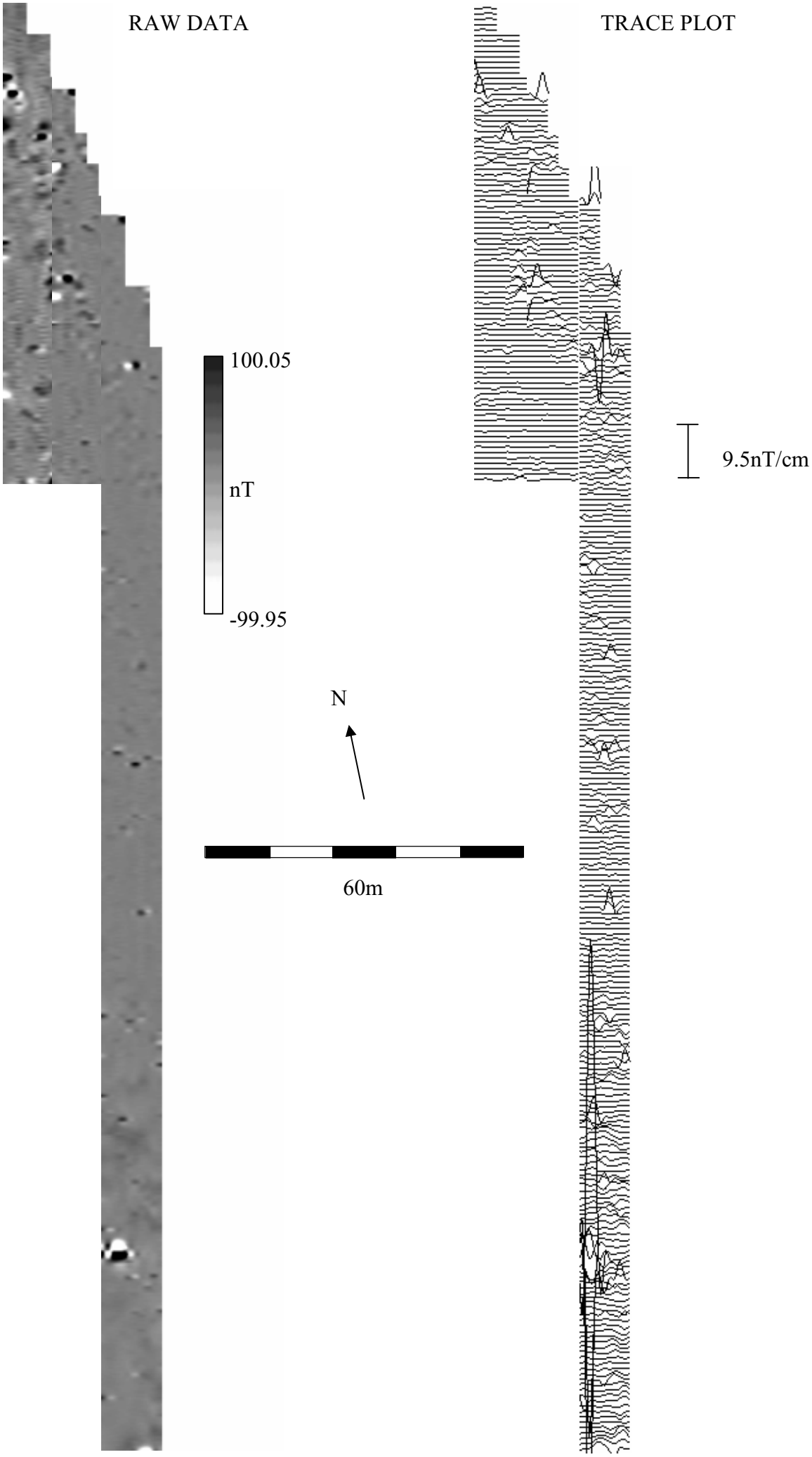


Fig. 7 – Field 4-Greyscale and trace plots of raw data, scale – 1:1000

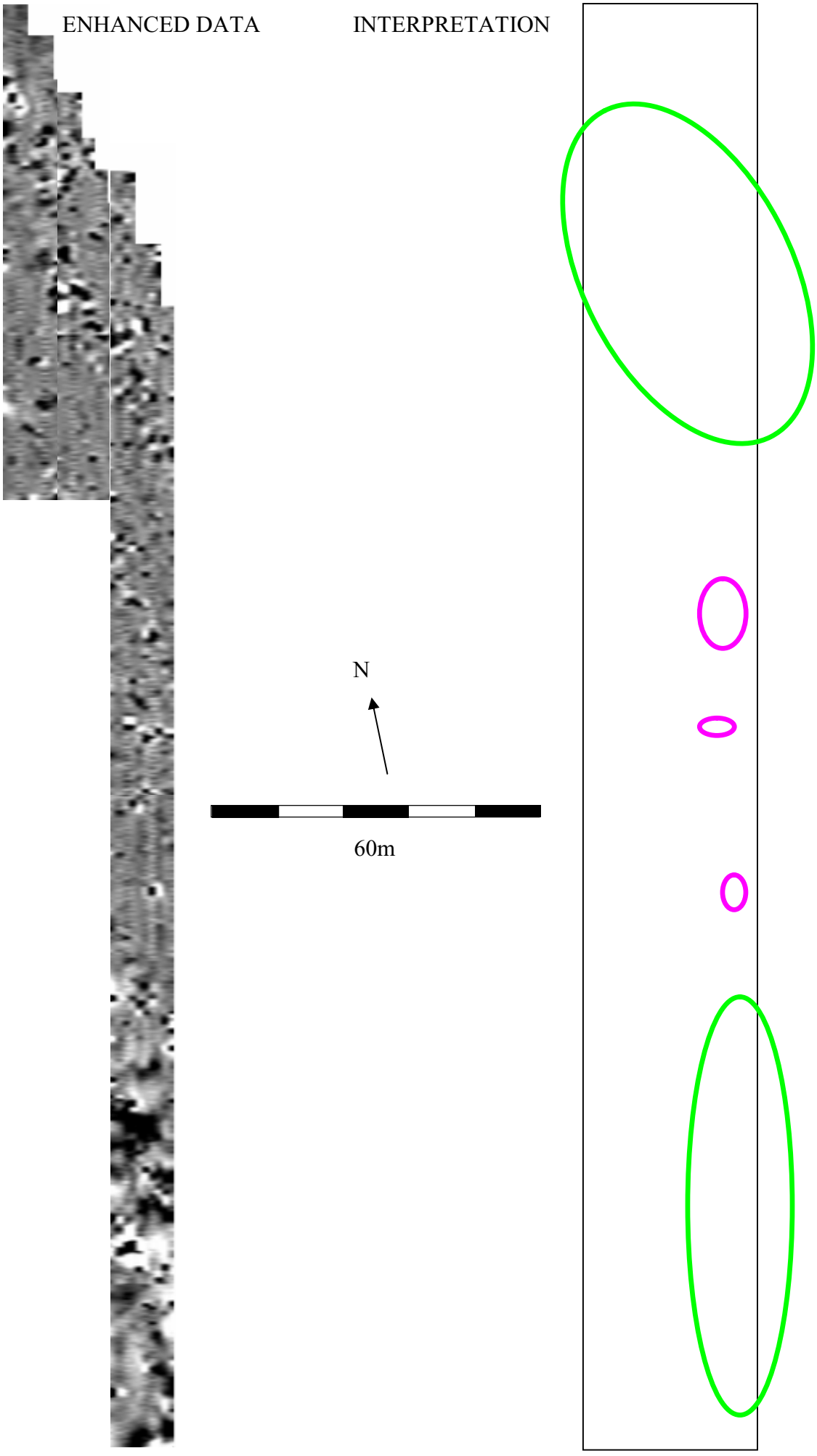


Fig. 8 – Field 4-Greyscale of enhanced data with interpretive plan, scale – 1:1000

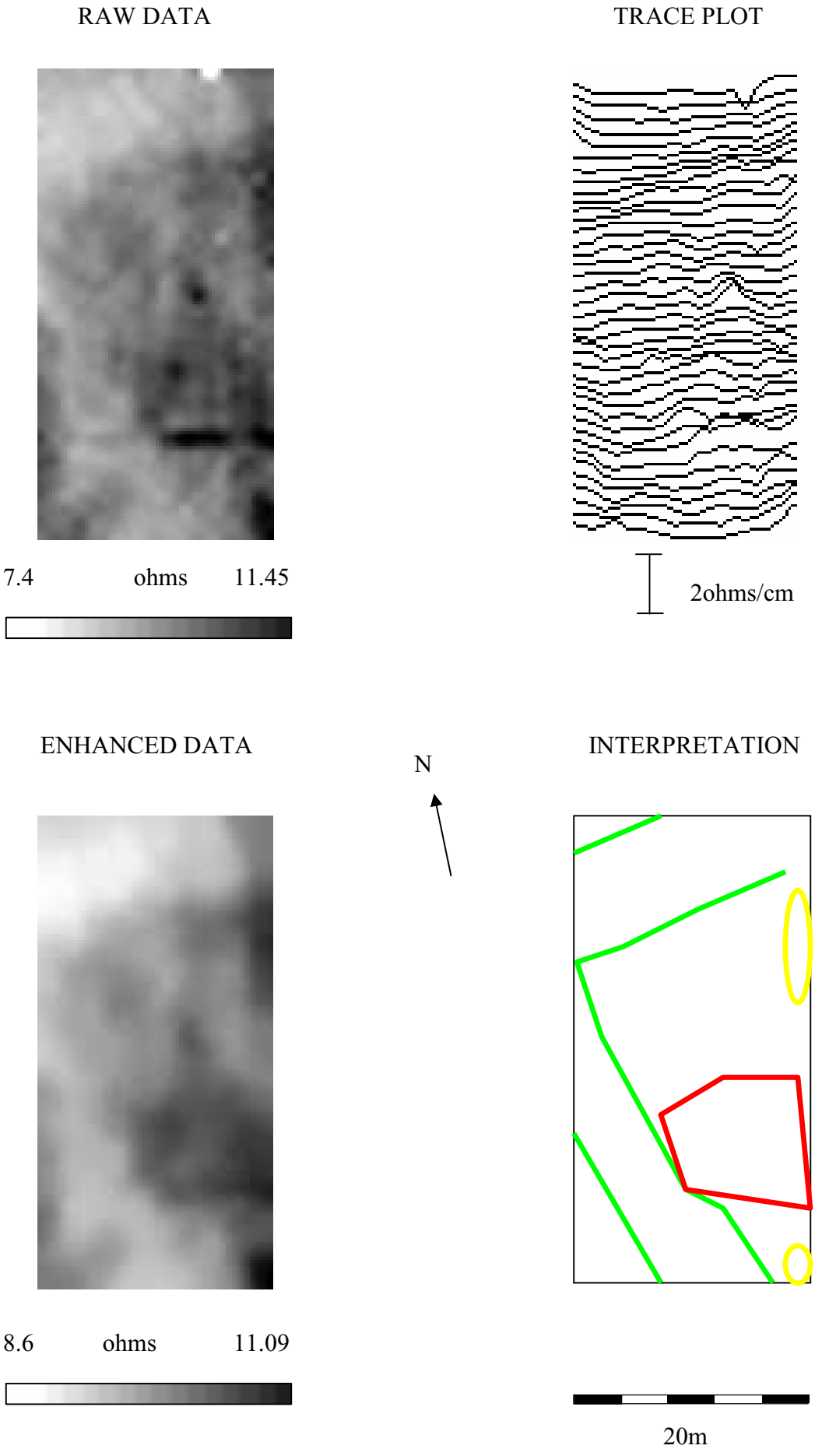


Fig. 9– Field 1-Greyscale and trace plots of raw and enhanced data with interpretive plan, scale – 1:500