

ARCHAEOLOGICAL EVALUATION REPORT:

GEOPHYSICAL SURVEY BY MAGNETOMETRY ON LAND OFF SCOTHERN ROAD, NETTLEHAM, LINCOLNSHIRE

NGR: TF 0143 7594

AAL Site Code: NESR 14

OASIS Reference Number: allenarc1-189533

Lincolnshire Museum Accession Code: LCNCC: 2014.170



Report prepared for Truelove Property and Construction

By

Allen Archaeology Limited
Report Number AAL2014100

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Allenarchaeology



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Executive Summary

- A geophysical survey by magnetometry was undertaken by Allen Archaeology Limited for Truelove Property and Construction on an 8.5 ha area at land off Scothern Road, Nettleham, Lincolnshire.
- The site is located to the north of the village and east of Scothern Road, and comprises 3 separate land parcels (Fields 1 – 3), centred on NGR TF 0143 7594. The site is currently agricultural land that has been recently harvested. There is evidence for prehistoric and Roman activity in the vicinity of the site, with a cropmark of a possible prehistoric enclosure approximately 500m to the southeast and a major Roman road recorded approximately 2 km to the south.
- The survey identified a number of anomalies of potential archaeological interest. At the eastern edge of the survey there appear to be a series of former enclosure ditches, and potentially a number of pits or hollows of likely human origin. Across the entire site are linear trends almost certainly related to ridge and furrow agricultural cultivation practices.
- The walkover survey for the site identified no earthwork features, soilmarks or artefact concentrations.
- The geophysical survey has suggested a low potential for archaeological deposits of interest to be present beyond potential medieval ridge and furrow features. Field 2 has a high potential for archaeological deposits, focussed on the eastern edge of the site and beyond the proposed development area.

1.0 Introduction

- 1.1 A geophysical survey using magnetometry was undertaken by Allen Archaeology Limited for Truelove Property and Construction, on land off Scothern Road, Nettleham, Lincolnshire, prior to the submission of a planning application for a residential development.
- 1.2 The site works and reporting conform to current national guidelines, as set out in '*Geophysical Survey in Archaeological Field Evaluation*' (English Heritage 2008), '*The Use of Geophysical Techniques in Archaeological Evaluations*' (IFA Paper 6), the Institute for Archaeologists '*Standard and guidance for archaeological geophysical survey*' (IfA 2011), the local guidelines in the Lincolnshire Archaeological Handbook (LCC 2012), and a specification prepared by this company (AAL 2014).
- 1.3 The documentary archive for this scheme will be deposited with The Collection Museum in Lincoln, where it will be stored under the museum accession code LCNCC 2014:170. The agreed date of deposition is December 2014.

2.0 Site Location and Description

- 2.1 Nettleham is situated in the administrative district of West Lindsey District Council, approximately 5km northeast of central Lincoln. The site comprises a block of agricultural land of approximately 8.2 hectares, at the northern extent of the village and east of Scothern Road, centred on NGR TF 0143 7594.
- 2.2 The bedrock geology is split between Blisworth Limestone for the northern part of the site and Rutland Formation of argillaceous rocks with subordinate sandstone and limestone for the southern part of the site; there are no superficial deposits recorded (<http://mapapps.bgs.ac.uk/geologyofbritain/home.html?location=nettleham&gobBtn=go>).

3.0 Planning Background

- 3.1 A planning application has not yet been submitted for this site; it is intended in due course to submit an application for a residential development. Prior to submission of the application, the Historic Environment Team at Lincolnshire County Council has advised for a programme of geophysical survey of the proposed development area, in order to provide further information concerning the archaeological potential of the site. Dependent upon the results of the geophysical survey, further evaluation work may be required prior to determination of the application, in order and to allow the planning authority to establish appropriate measures to mitigate the effect of the proposed development upon the archaeological resource.
- 3.2 The approach adopted is consistent with the recommendations of the current National Planning Policy Framework (NPPF), with the particular chapter of relevance being '*Chapter 12: Conserving and enhancing the historic environment*' (Department for Communities and Local Government 2012).

4.0 Archaeological and Historical Background

- 4.1 An important hoard of late Bronze Age metalwork was found in Nettleham in 1860, containing bronze axes, palstaves and spearheads of later Bronze Age date (May 1976), but the precise provenance of this find is unknown. In the vicinity of the site, a Bronze Age bronze palstave is recorded 300m to the south (Lincolnshire Historic Environment Record (hereafter LHER) Reference 52382). A cropmark enclosure of possible prehistoric date has been recorded by aerial photography c.500m to the southeast, but this feature was not apparent on a recent geophysical survey of the area (AAL 2014).
- 4.2 The proposed development area is situated c.2km to the north of a major Roman Road, running from Lincoln eastwards into the fens, possibly reaching the coast somewhere in the vicinity of Skegness (Whitwell 1992). Nearer to the site, a scatter of Roman pottery is recorded immediately to the south (LHER Reference 52381), as well as a Roman coin of the Emperor Constantine, the grid reference for which places the find spot either within or just to the east of the site (LHER Reference 52386).
- 4.3 The place name Nettleham is probably of Old English origin, meaning ‘the homestead, estate where the nettles grow’ (Cameron 1998). There is some limited evidence for Anglo-Saxon activity in the vicinity of the site, with a fragment of annular brooch found c.250m southeast of the site (LHER Reference 52394), and a complete 6th century Saxon brooch c.300m to the west (LHER Reference 52413). Approximately 1.1km to the southwest, on the site of the medieval Bishops Manor, is the site of a former Saxon manor owned by Edith, wife of Edward the Confessor, who is recorded in the Domesday Book as the owner of the Nettleham estate prior to 1066 (Morgan and Thorn 1986). Elements of this early phase of activity that have been identified on site included a hearth of Saxon date, and loomweights of 8th to 11th century date (LHER Reference 54198).
- 4.4 By the time of the Domesday Book, Nettleham was a holding of the King, with a small plot also held by Gilbert of Ghent. The king’s estates included 41 villagers of varying status, which along with their dependents, suggests a reasonably populous settlement (Morgan and Thorn 1986).
- 4.5 The site of the Anglo-Saxon manor was later developed as a Manor of the Bishops of Lincoln, probably established in the late 11th century (LHER Reference 54198), following the gifting of the Domesday estate from the King to the Church. The manor site is occupied by a complex series of earthworks, although excavation and geophysical survey have exposed several elements of the site, including walls, a well, and the western boundary ditch of the site with an associated entrance (*ibid.*)

5.0 Methodology

- 5.0.1 The geophysical survey consisted of a detailed gradiometer survey of the maximum available area of the development site, extending to c.8.2ha.
- 5.0.2 The fieldwork was carried out over a period of two working days, Monday 1st September 2014 and Tuesday 2nd September 2014, by two teams of experienced geophysicists. The site was divided into 30m by 30m grids, established on site with reference to local fixed boundaries and accurately tied into the National Grid with Ordnance Survey base mapping using a Leica GS08 Net rover receiving RTK corrections.

- 5.0.3 The survey was undertaken using Bartington Grad601-2 Dual Fluxgate Gradiometers with onboard automatic DL601 data logger. This instrument is a highly stable magnetometer which utilises two vertically aligned fluxgates, one positioned 1m above the other. This arrangement is then duplicated and separated by a 1m cross bar. The 1m vertical spacing of the fluxgates provides for deeper anomaly detection capabilities than 0.5m spaced fluxgates. The dual arrangement allows for rapid assessment of the archaeological potential of the site. Data storage from the two fluxgate pairs is automatically combined into one file and stored using the onboard data logger.
- 5.0.4 Data collection was undertaken in a zigzag traverse pattern, using a sample interval of 0.25m and a traverse interval of 1m.
- 5.0.5 The fieldwork and reporting were carried out in accordance with the procedures in 'Geophysical Survey in Archaeological Field Evaluations' (English Heritage 2008) and 'The Use of Geophysical Techniques in Archaeological Evaluations: IfA Paper 6' (Gaffney et al. 2002).

5.1 Summary of Survey Parameters

5.1.1 Fluxgate Magnetometers

Instrument 1:	Bartington Grad601-2 Dual Fluxgate Gradiometer
Sample interval:	0.25m
Traverse interval:	1.00m
Traverse separation:	1.00m
Traverse method:	Zigzag
Resolution:	0.01 nT
Processing software:	Terrasurveyor 3.0.25.1
Surface conditions:	Stubble
Area surveyed:	3.6 ha
Date surveyed:	Monday 1 st and Tuesday 2 nd September 2014
Geophysical Surveyor:	Robert Evershed
Survey Assistant:	Marta Alberti
Data interpretation:	Robert Evershed

Instrument 2:	Bartington Grad601-2 Dual Fluxgate Gradiometer
Sample interval:	0.25m
Traverse interval:	1.00m
Traverse separation:	1.00m
Traverse method:	Zigzag
Resolution:	0.1 nT
Processing software:	Terrasurveyor 3.0.25.1
Surface conditions:	Stubble
Area surveyed:	3.8 ha
Date surveyed:	Monday 1 st and Tuesday 2 nd July 2014
Geophysical Surveyor:	Iain Pringle
Survey Assistant:	Bryn Leadbetter
Data interpretation:	Iain Pringle

5.2 Data Collection and Processing

- 5.2.1 The grids were marked out using pre-programmed coordinates on the Leica GS08 Net rover. The collection of magnetic data using a north – south traverse pattern is preferable for a magnetic survey, as enhancements to the magnetic field caused by buried features is mapped increasingly stronger the closer the traverse direction can get to a magnetic north – south direction (Breiner 1999). On this occasion magnetic data was collected on a north-northwest – south-southeast alignment due to the orientation of the survey grids and the field. Data was collected by making successive parallel traverses across each grid in a zigzag pattern. Several key points of the survey grids were accurately tied into the National Grid with Ordnance Survey base mapping using a Leica GS08 Net rover receiving RTK corrections.
- 5.2.2 The data collected from the survey has been analysed using the current version of Terrasurveyor 3.0.25.1. The resulting data set plots are presented with positive nT/m values and high resistance as black and negative nT/m values and low resistance as white.

The data sets have been subjected to processing using the following filters:

- De-stripe
- Clipping
- De-staggering

- 5.2.3 The de-stripe process is used to equalise underlying differences between grids or traverses. Differences are most often caused by directional effects inherent to magnetic surveying instruments, instrument drift, instrument orientation (for example off-axis surveying or heading errors) and delays between surveying adjacent grids. The de-stripe process is used with care however as it can sometimes have an adverse effect on linear features that run parallel to the orientation of the process.
- 5.2.4 The clipping process is used to remove extreme data point values which can mask fine detail in the data set. Excluding these values allows the details to show through.
- 5.2.5 The de-staggering process compensates for data correction errors caused by the operator commencing the recording of each traverse too soon or too late. It shifts each traverse forward or backwards by a specified number of intervals.
- 5.2.6 Plots of the data are presented in processed linear greyscale (smoothed) with any corrections to the measured values or filtering processes noted, and as separate simplified graphical interpretations of the main anomalies detected.

6.0 Results

- 6.1 For the purposes of interpreting the anomalies, the survey data has been processed to the values of -3 to 3 nT/m (Figure 3). This enhances faint anomalies that may otherwise not be noted in the data. The survey results revealed a number of anomalies across the data set, and these are discussed in turn and noted as two digit numbers in square brackets.

Field 1

- 6.2 The area of magnetic noise [01] at the northwest corner of the field produced readings of approximately -20 to 20nT/m, which may be related to a former building noted on historic OS maps.

- 6.3 Orientated northwest – southeast across the entire of Field 1 are positive and negative linear anomalies [02] (only the positive anomalies have been drawn for clarity). These produced readings of between -1 and 1nT/m and likely represent ridge and furrow agricultural practices.
- 6.4 At the northern end of Field 1, there is a positive linear anomaly [03] orientated north northwest – south southeast, readings -1 to 1nT/m, which may represent a ditch or former path. However it may also be part of the ridge and furrow seen in the rest of the field.
- 6.5 Joining Fields 1 and 2 is a small area of magnetic noise [04]. This has produced readings of -40 to 60nT/m, and likely represents a drainage pipe running in the ditch between the fields to maintain water flow.

Field 2

- 6.6 Three quarters of the way down the eastern edge of Field 2 is a roughly rectangular positive anomaly [05] that extends beyond the survey area to the east, producing readings of 4 to 8nT/m. This appears to be associated with other parallel and perpendicular linear positive features in this area which have produced similar readings. The anomaly, which is positioned on the highest point of the field, is likely to represent a former enclosure of unknown date.
- 6.7 Running roughly southwards from [05] is a pair of parallel positive linear anomalies [06] producing readings of 2 to 4 nT/m. These likely represent former ditches, possibly relating to a trackway, running southwards towards Nettleham Beck. The orientation and positioning suggest these anomalies may relate to [05].
- 6.8 Along the eastern edge of the survey there are a large number of small amorphous positive anomalies [07] producing readings of 4 – 8nT/m. These could represent pits, former ponds or filled in hollows, possibly in association with the probable enclosure.
- 6.9 There appear to be parallel linear trends [08] orientated west northwest – east southeast running across Field 2. These relate to modern cultivation trends.
- 6.10 Running north northwest – south southeast across Field 2 are parallel positive linear anomalies [09], (1 to 2nT/m) that likely represent ridge and furrow agricultural trends.

Field 3

- 6.11 Immediately noticeable in Field 3 is the large area of magnetic noise [10], producing readings of -100 – 100nT/m. This likely represents a dump of modern waste and soil. It is clearly seen on the surface as a low mound apparently serving as a small animal warren/burrow.
- 6.12 Along the northern edge of Field 3 is another area of magnetic noise [11], -20 – 20nT/m, that likely represents modern waste and detritus, possibly associated with construction of the houses in the adjacent plot of land.
- 6.13 Running south-southeast down from feature [10] is a slightly amorphous linear positive anomaly [12] producing readings of 2 – 4nT/m. This likely represents some of the slightly magnetic material from feature [10] being ploughed into the field.
- 6.14 There are parallel linear positive anomalies running north northwest to south-southeast across Field 3 producing readings of 1 – 2nT/m. These are likely to relate to ridge and furrow agricultural trends similar to [02] and [09].

- 6.15 Scattered randomly throughout the site are a number of strong and weak dipolar responses [14]. The characteristic dipolar response of pairs of positive and negative 'spikes' suggest near surface ferrous metal or other highly fired material in the soil.
- 6.16 [15] is highlighted as it appears incorrectly to show a positive anomaly. Instead a slight balancing error in the equipment resulted in one transect producing anomalous readings that were revealed following processing (de-striping). This 'positive' linear therefore does not reflect the location of a potential archaeological deposit.

7.0 Discussion and Conclusions

- 7.1 The survey identified a number of potential archaeological features across the site. Field 1 showed linear trends running northwest to southeast likely related to ridge and furrow agricultural cultivation of broadly medieval date. Ridge and furrow was also present within Fields 2 and 3, although in these fields it was orientated north-northwest to south-southeast.
- 7.2 The main area of archaeological potential is within Field 2 along the eastern border of the survey area. Within the northern two thirds of the field the topography gently slopes downwards to the southeast. It then slopes downwards more steeply in the final third towards Nettleham Beck. Immediately before the start of the steeper slope there are a number of positive linear anomalies that appear to form a rectangular shape. These are likely to represent former enclosure ditches of a very regular appearance. They appear to cut the ridge and furrow cultivation suggesting a later date, although the phasing of geophysical anomalies in this way is far from certain. Also within this area and slightly further to the north are a large number of amorphous positive anomalies that may reflect human activity in association with the possible enclosure. It was noted that a large amount of fragments of limestone were present on the ground surface across this area of the field, possibly suggesting only a shallow ploughsoil was present over limestone bedrock in this area.
- 7.3 A possible trackway extended southwards from the enclosure towards and probably over Nettleham Beck, and may be associated with the enclosure feature.
- 7.4 The walkover survey for the site identified no earthwork features, soilmarks or finds concentrations within the ploughsoil.
- 7.5 The survey overall suggests a low archaeological potential for Fields 1 and 3, and a high potential for Field 2, especially towards its eastern edge and extending beyond the proposed development area.

8.0 Effectiveness of Methodology

- 8.1 The non-intrusive evaluation methodology employed was appropriate to the scale and nature of the site surveyed, and has identified some archaeological potential for the proposed development area, focussed at the east end of Field 2. Magnetometry surveying was the prospection technique best suited to the identification of archaeological remains on the site. Other techniques would have required justification and may have proved too time consuming or cost-prohibitive.

9.0 Acknowledgements

9.1 Allen Archaeology Limited would like to thank Truelove Property and Construction for this commission.

10.0 References

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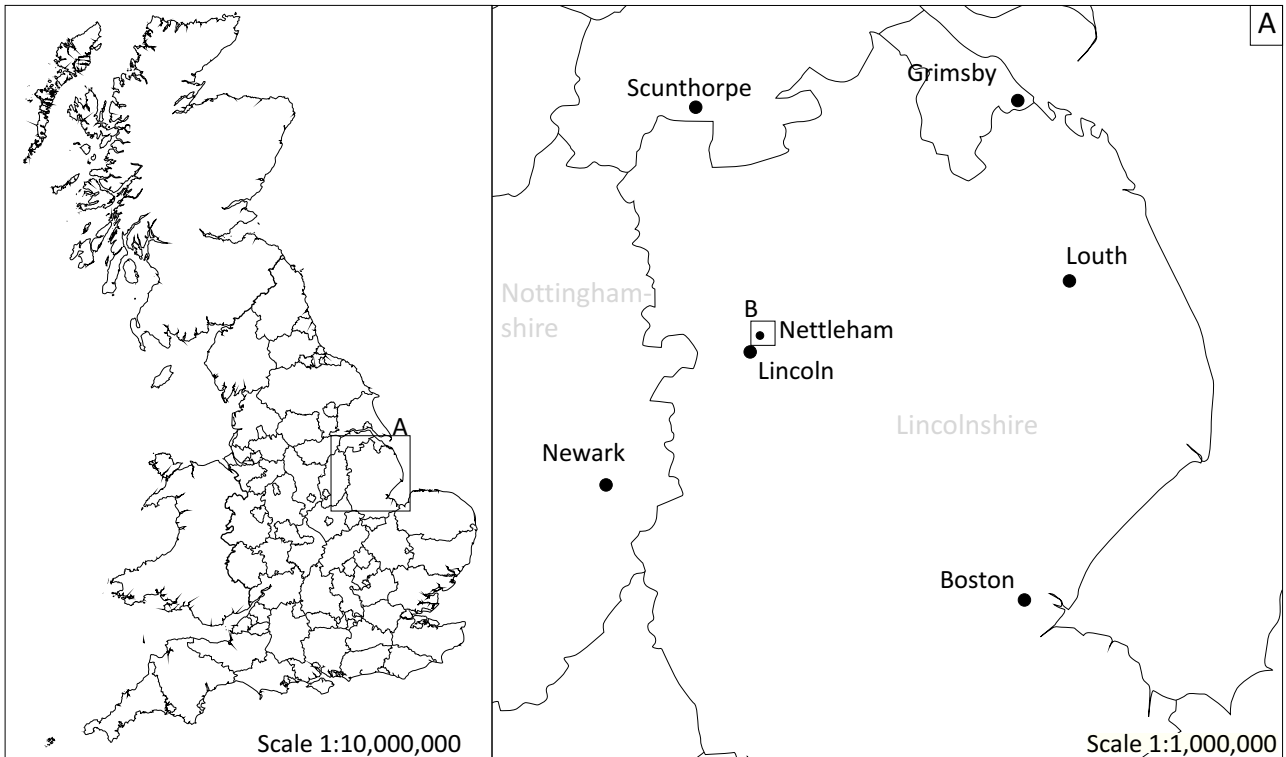


Figure 1: Site location outlined in red
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Site Code	NESR 14
Scales	1:10,000,000 1:1,000,000 1:25,000 @ A4
Drawn by	R Evershed
Date	04/09/2014

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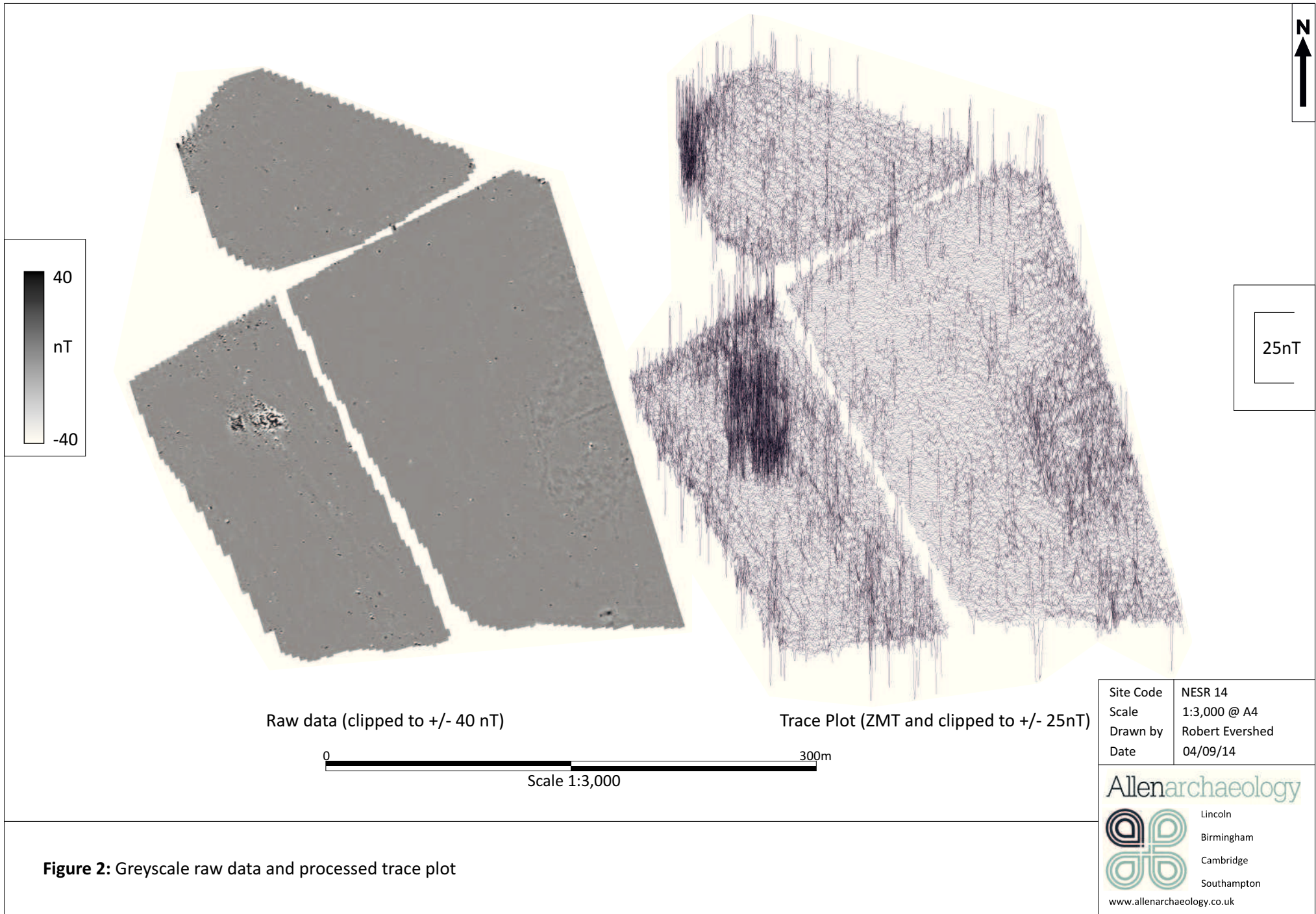


Figure 2: Greyscale raw data and processed trace plot

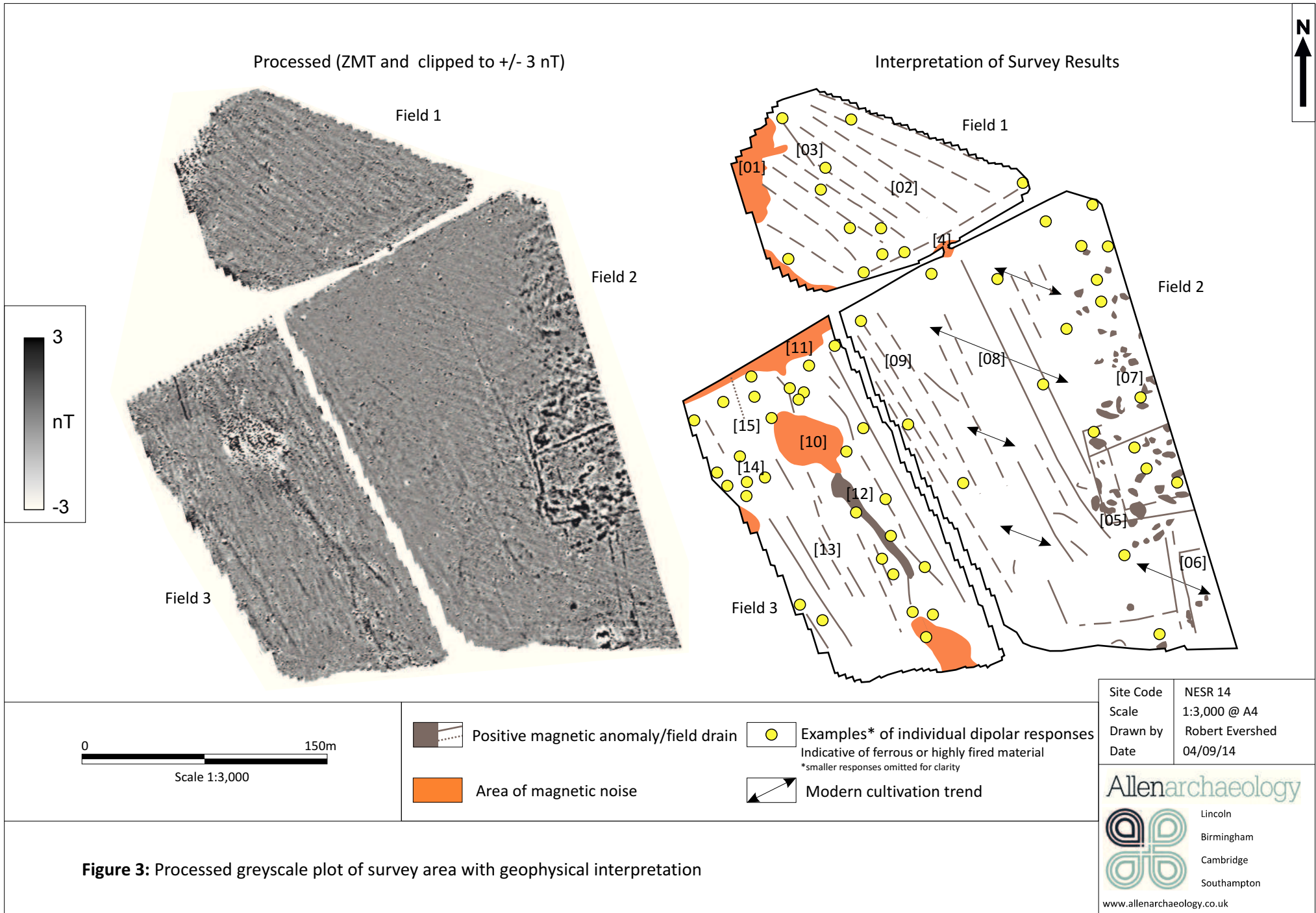
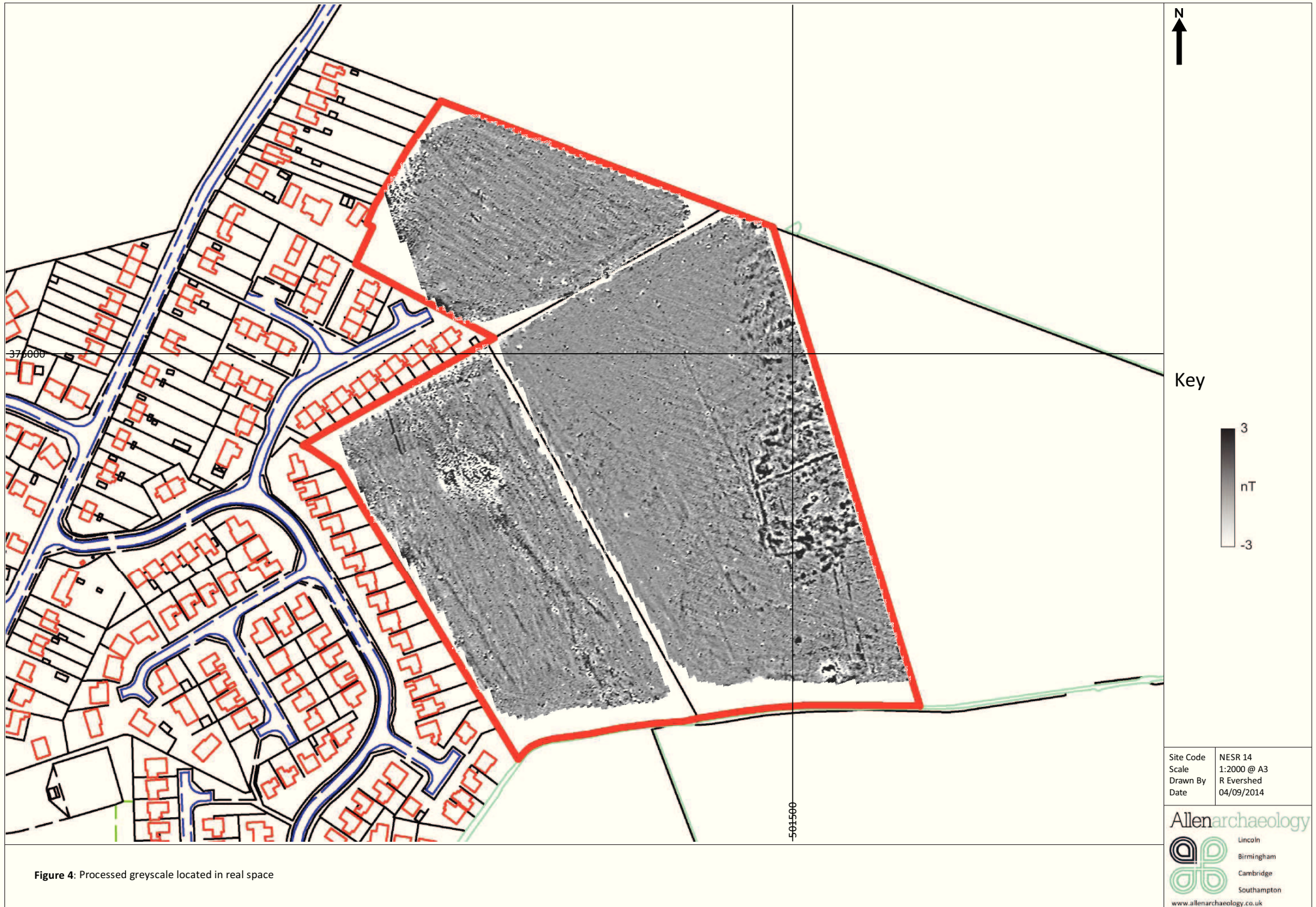
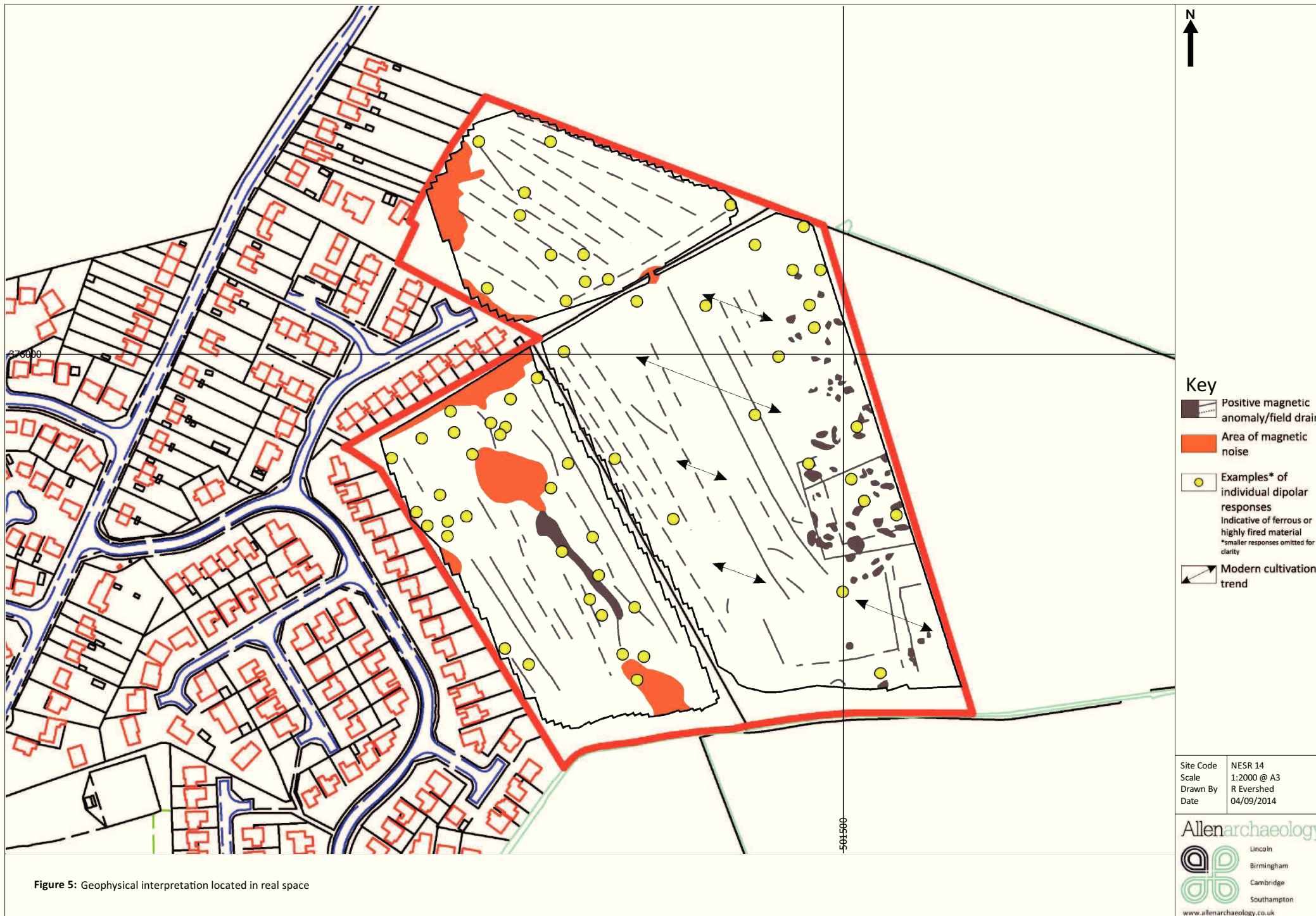






Figure 3: Processed greyscale plot of survey area with geophysical interpretation





- Key**
-  Positive magnetic anomaly/field drain
 -  Area of magnetic noise
 -  Examples* of individual dipolar responses
Indicative of ferrous or highly fired material
*smaller responses omitted for clarity
 -  Modern cultivation trend

Site Code	NESR 14
Scale	1:2000 @ A3
Drawn By	R Evershed
Date	04/09/2014

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Figure 5: Geophysical interpretation located in real space



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