LAND OFF GEORGE STREET, HELPRINGHAM, LINCOLNSHIRE

GEOPHYSICAL SURVEY

Work undertaken for
Robert Doughty Consultancy Ltd

On behalf of
T. Ireland, Cooper Brothers (Butterwick) Ltd

Report produced by
Andrew Failes BA (Hons), MA

April 2014

National Grid Reference: TF 1392 4024
The Collection, Archive no.: LCNCC: 2014.57
OASIS Reference No.: archaeol1-177882

APS Report No: 34/14

ARCHAEOLOGICAL
PROJECT
SERVICES

Quality Control

GEOPHYSICAL SURVEY
LAND OFF
GEORGE STREET,
HELPRINGHAM,
LINCOLNSHIRE

Project Coordinator	Gary Taylor
Site Staff	Andrew Failes
Survey processing and report	Andrew Failes

Checked by Project Manager	Approved by Senior Archaeologist
Gary Taylor	Tom Lane
Date: 28/4/14	Date: 29-4-14

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1. SUMMARY

Detailed magnetic gradiometer survey was undertaken in connection with proposed development on land off George Street, Helpringham, Lincolnshire. The survey area totalled c. 1ha.

The survey did not reveal any features of potential archaeological origin and most of the responses recorded were due to modern disturbance in the form of a service pipe and fencing around field boundaries. A negative area anomaly was recorded at the western edge of the field, but is probably modern in origin and relates to material in the field entrance. Slight linear banding may represent ridge and furrow ploughing.

2. INTRODUCTION

2.1 Definition of an Evaluation

Geophysical survey is a non-intrusive method of archaeological evaluation. Evaluation is defined as *'a limited programme of non-intrusive and/or intrusive fieldwork which determines the presence or absence of archaeological features, structures, deposits, artefacts or ecofacts within a specified area or site. If such archaeological remains are present Field Evaluation defines their character and extent, quality and preservation, and it enables an assessment of their worth in a local, regional, national or international context as appropriate'* (IfA 2008).

2.2 Background

Archaeological Project Services was commissioned by Robert Doughty Consultancy Ltd, on behalf of T. Ireland, Cooper Bothers (Butterwick) Ltd, to undertake detailed magnetometer survey totalling approximately 1ha on land off George Street, Helpringham, Lincolnshire in connection with proposed development of the area. The survey was carried out on the 21st of March 2014. A Saxon spindle whorl was found immediately to the west of the site. Ridge and furrow has also been noted in the area.

2.3 Topography and Geology

Helpringham is located 9km southeast of Sleaford and 19km west of Boston in the administrative district of North Kesteven, Lincolnshire (Fig. 1).

The site is 500m south of the village centre as defined by St. Andrew's parish church. It is located to the east of George Street at National Grid Reference TF 1392 4024 (Fig. 2), just north of the railroad tracks at a height of *c*. 5m OD.

Local soils are of the Beccles 3 Association, typically fine loamy over clay soils (Hodge *et al.* 1984, 121). These soils are developed on a drift geology of glaciofluvial outwash overlying boulder clay which in turn seals a solid geology of Jurassic Oxford Clay (BGS 1995)

3. GEOPHYSICAL SURVEY

3.1 Methods

Location and layout of the survey areas is shown in Figure 3. The field was not under crop and in good condition for survey.

Survey was undertaken in accordance with English Heritage (2008) and IfA (2011) guidelines and codes of conduct.

The magnetic survey was carried out using a dual sensor Grad601-2 Magnetic Gradiometer manufactured by Bartington Instruments Ltd. This records subtle changes in the magnetic field resulting from differing features in the soil. Changes as small as 0.2 nanoTesla (nT) in an overall field strength of c. 49,000nT can be accurately detected using this instrumentation, although in practice instrument interference and soil noise can limit sensitivity.

Magnetometers measure changes in the

Earth's magnetic field. With two sensors configured as a gradiometer the recorded values indicate the difference between two magnetic measurements separated by a fixed distance. The Grad601-2 consists of two high stability fluxgate gradiometers suspended on a single frame with a 1m separation between the sensing elements giving a strong response to deep anomalies.

The mapping of anomalies in a systematic manner allows interpretation of the type of material present beneath the surface. Strong magnetic anomalies are generated by buried iron-based objects or by kilns or hearths, usually resulting in a bipolar (positive/negative) response. More subtle positive anomalies representing pits and ditches can be seen where these contain more topsoil which is normally richer in magnetic iron oxides and provides a contrast with the natural subsoil (but this can vary depending on the nature of the underlying deposits). A negative anomaly may result from upcast bank material. Wall foundations can also show as negative anomalies where the stone is less magnetic than the surrounding soil, or as stronger positive and negative anomalies if of brick, but are not always responsive to the technique.

It should be noted that not all features will be responsive and absence of anomalies does not necessarily indicate absence of archaeological features.

Sampling interval and data capture
Readings were taken at 0.25m centres along traverses 1m apart. This equates to 3600 sampling points in a full 30m x 30m grid. The Grad 601 has a typical depth of penetration of 0.5m to 1.0m although a greater range is possible where strongly magnetic objects have been buried in the site.

Readings are logged consecutively into the data logger which is downloaded daily either into a portable computer whilst on site or directly to the office computer. At the end of each job, data is transferred to the office for processing and presentation.

Processing and presentation of results
Processing is performed using specialist ArcheoSurveyor software. 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 (Destripe or zero mean traverse). Despiking is also performed to reduce the effect of the anomalies resulting from small iron objects often found on agricultural land. Further processing can then be carried out which may include low pass filtering to reduce 'noise' in the data and hence emphasise the archaeological or man-made anomalies.

The following are the processing techniques carried out on the processed gradiometer data used in this report:

1. DeStripe (sets the background mean of each traverse within a grid to zero and is useful for removing striping effects)

2. Despike (useful for display and allows further processing functions to be carried out more effectively by removing extreme data values)
Parameters: X radius = 1; Y radius = 1; Threshold = 3SD; Spike replacement = mean

3. Clip (excludes extreme values allowing better representation of detail in the mid range): -5 to 5nT.

3.2 Results

The presentation of the data for the site involves a print-out of the raw or minimally processed data as greyscale and trace plots (Figs 4-5; clipped for display but otherwise unprocessed), together with greyscale plots of the processed data (Figs 6 & 8). Magnetic anomalies have been identified and plotted onto an interpretative drawing (Figs 7 & 9) and are described below.

Negative area anomalies
A negative area anomaly was recorded at the western edge of the field (Figs 6-9). However, this corresponds to where the field entrance is and where recent disturbance has taken place.

Magnetic disturbance
Strong area bipolar response generally results from larger metal items (either buried or at the surface) but may also be caused by concentrations of debris at field margins or by metal elements in fencing of boundaries. They are notable here in the form of a service pipe aligned on an approximately east-west alignment through the central part of the field and at the field boundaries where fencing remained.

Iron spikes (discrete bipolar anomalies)
Iron items within the topsoil give a distinctive localised bipolar (strong positive with associated strong negative) response. Such items usually derive from relatively recent management or agricultural use of the land – broken or discarded pieces of agricultural machinery or other modern debris. Few examples were noted and they are fairly widely scattered with no particular concentrations.

Agricultural features
A series of fairly weak parallel linear responses occur across the site. These may reflect earlier ridge and furrow cultivation.

4. DISCUSSION

Detailed magnetic gradiometer was undertaken on land off George Street, Helpringham, Lincolnshire in order to assess the potential for archaeological remains at the site. However, other than slight traces of possible ridge and furrow ploughing, no clear indications of potential archaeological features were identified during the investigation.

5. ACKNOWLEDGEMENTS

Archaeological Project Services wishes to acknowledge the assistance of Julie Robinson of Robert Doughty Consultancy Ltd who commissioned the project on behalf of T. Ireland, Cooper Brothers (Butterwick) Ltd and arranged access; Gary Taylor and Tom Lane (APS) edited the report.

6. PERSONNEL

Project coordinator: Gary Taylor
Geophysical Survey: Andrew Failes
Survey processing and reporting: Andrew Failes

7. BIBLIOGRAPHY

English Heritage, 2008 *Geophysical Survey in Archaeological Field Evaluation.*

Hodge, CAH, Burton, RGO, Corbett, WM, Evans, R and Seale, RS, 1984 *Soils and their use in Eastern England*, Soil Survey of England and Wales 13

IfA, 2008 *Standard and Guidance for Field Evaluation.*

IfA, 2011 *Standard and Guidance for Geophysical Survey.*

8. ABBREVIATIONS

GSGB Geological Survey of Great Britain

IfA Institute for Archaeologists

Figure 1 - General location plan

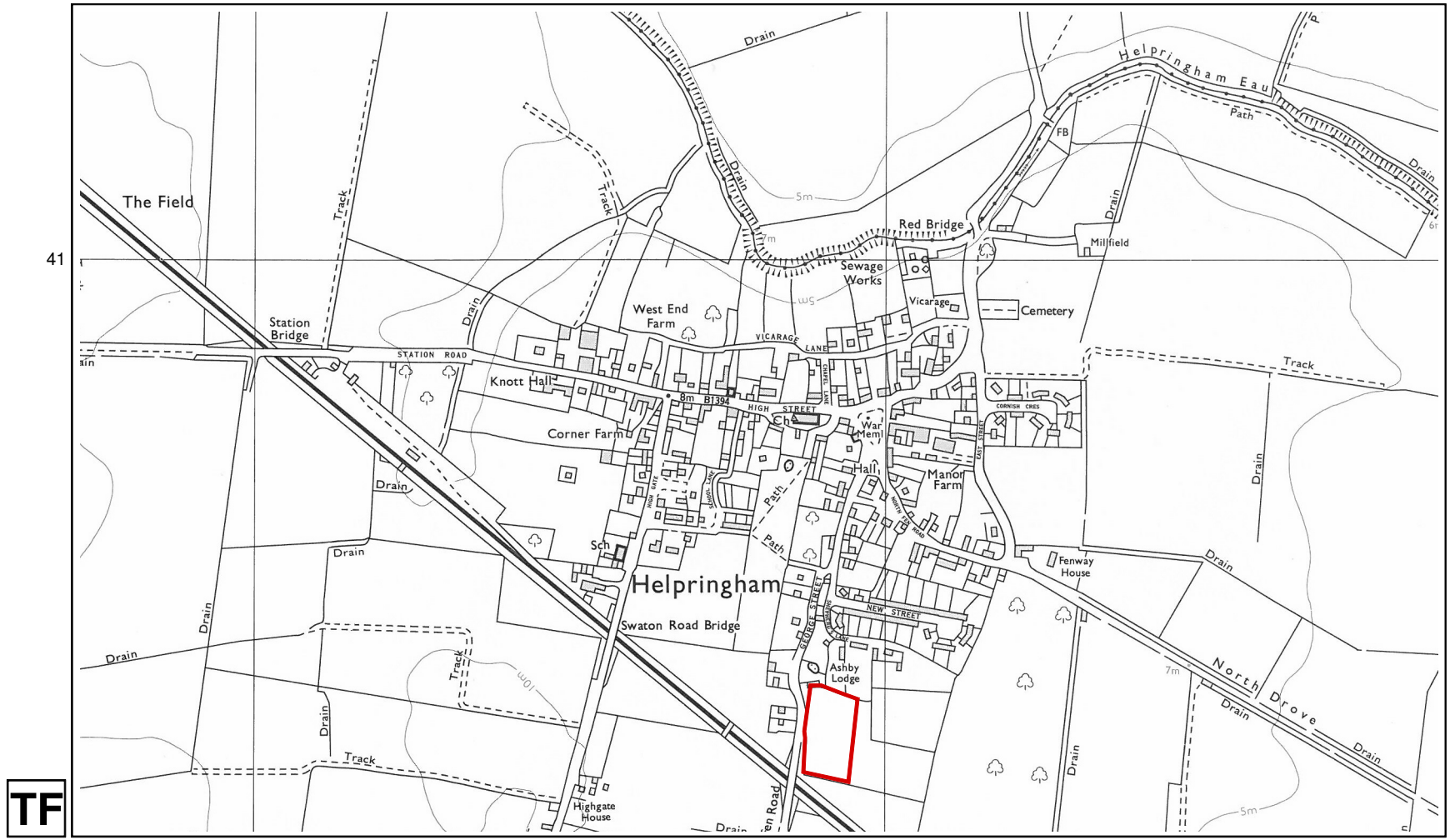

Figure 2 - Site location plan

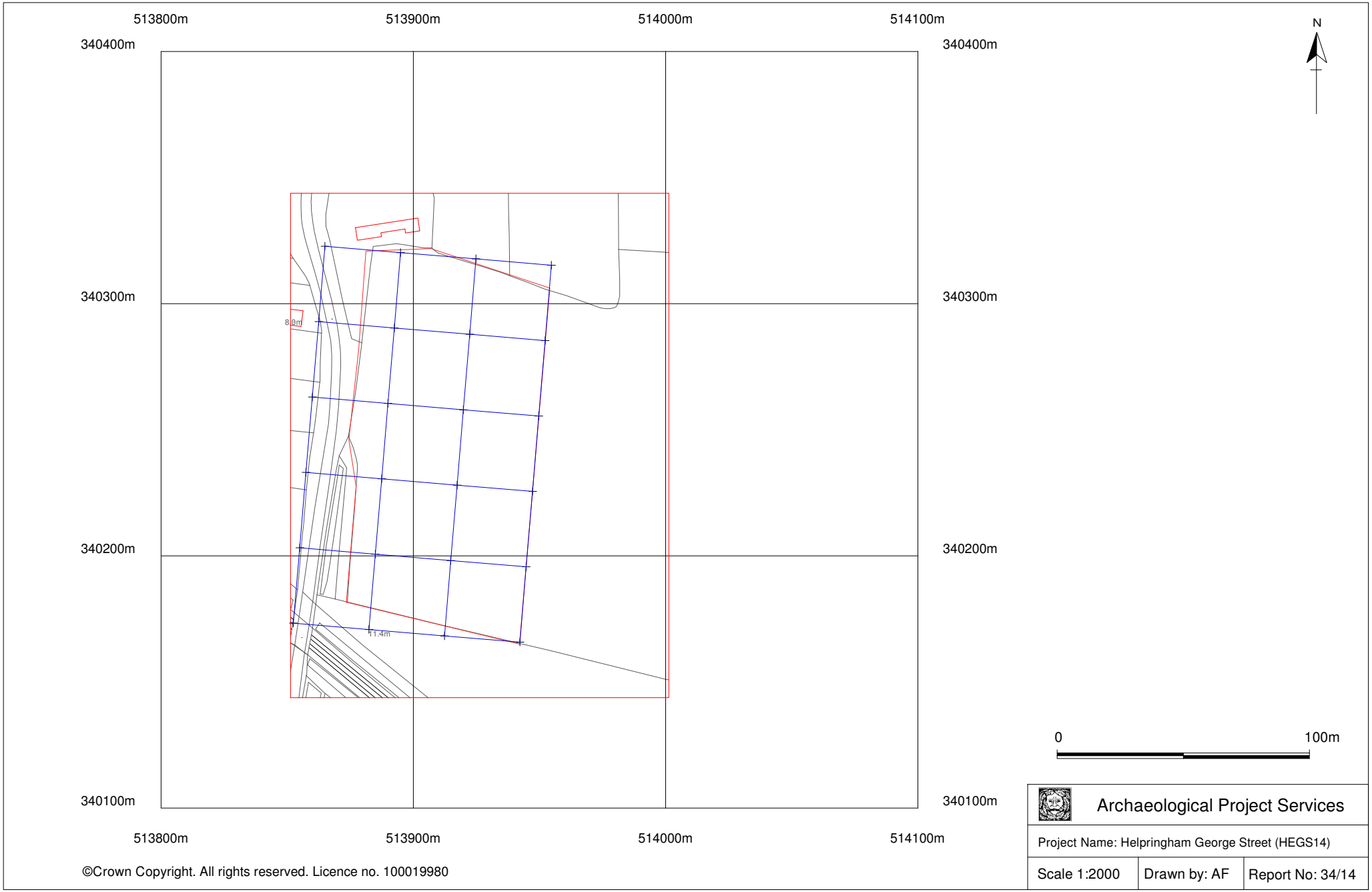

Figure 3 - Location and layout of survey area

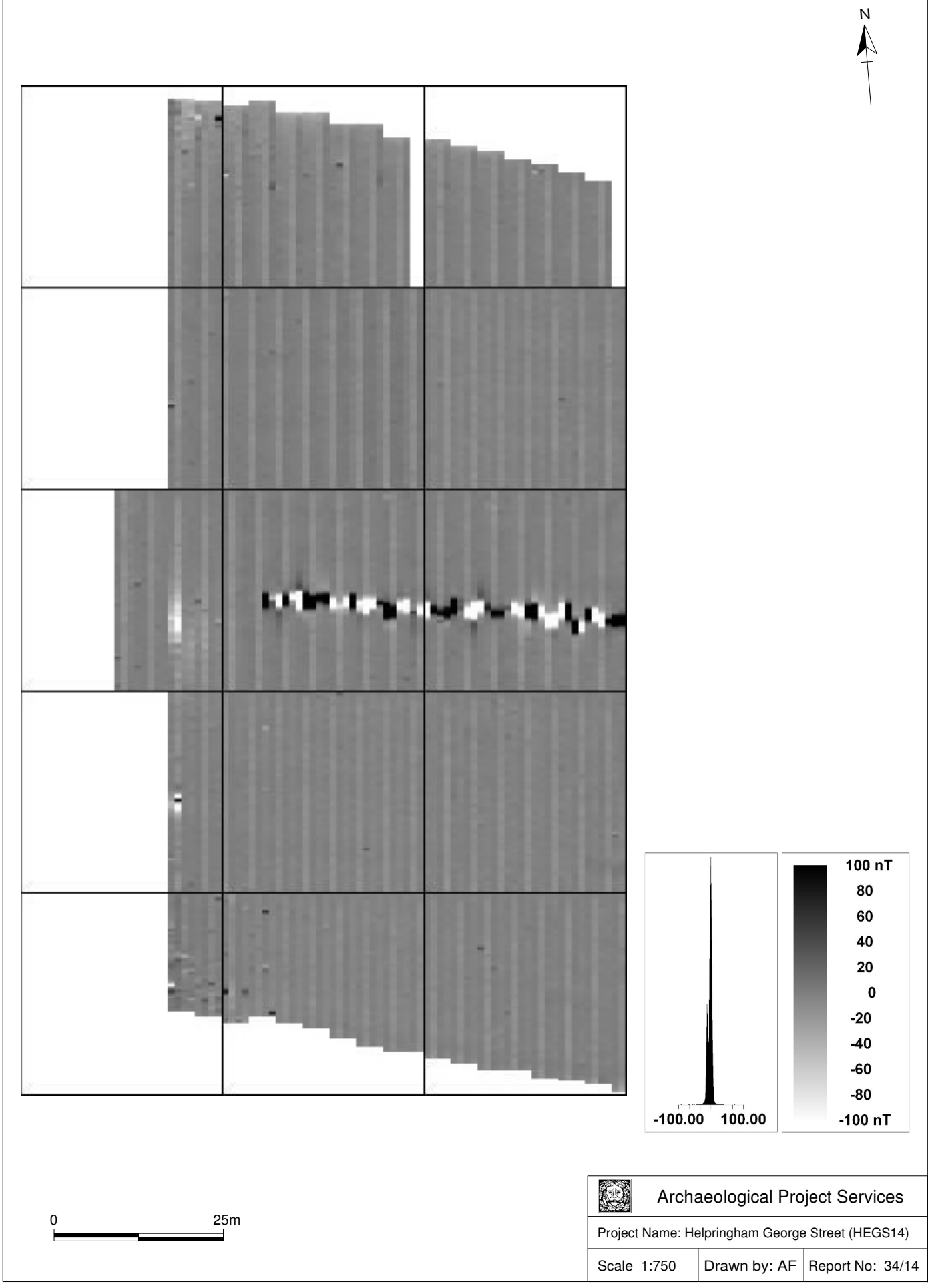

Figure 4 - Minimally processed data greyscale plot

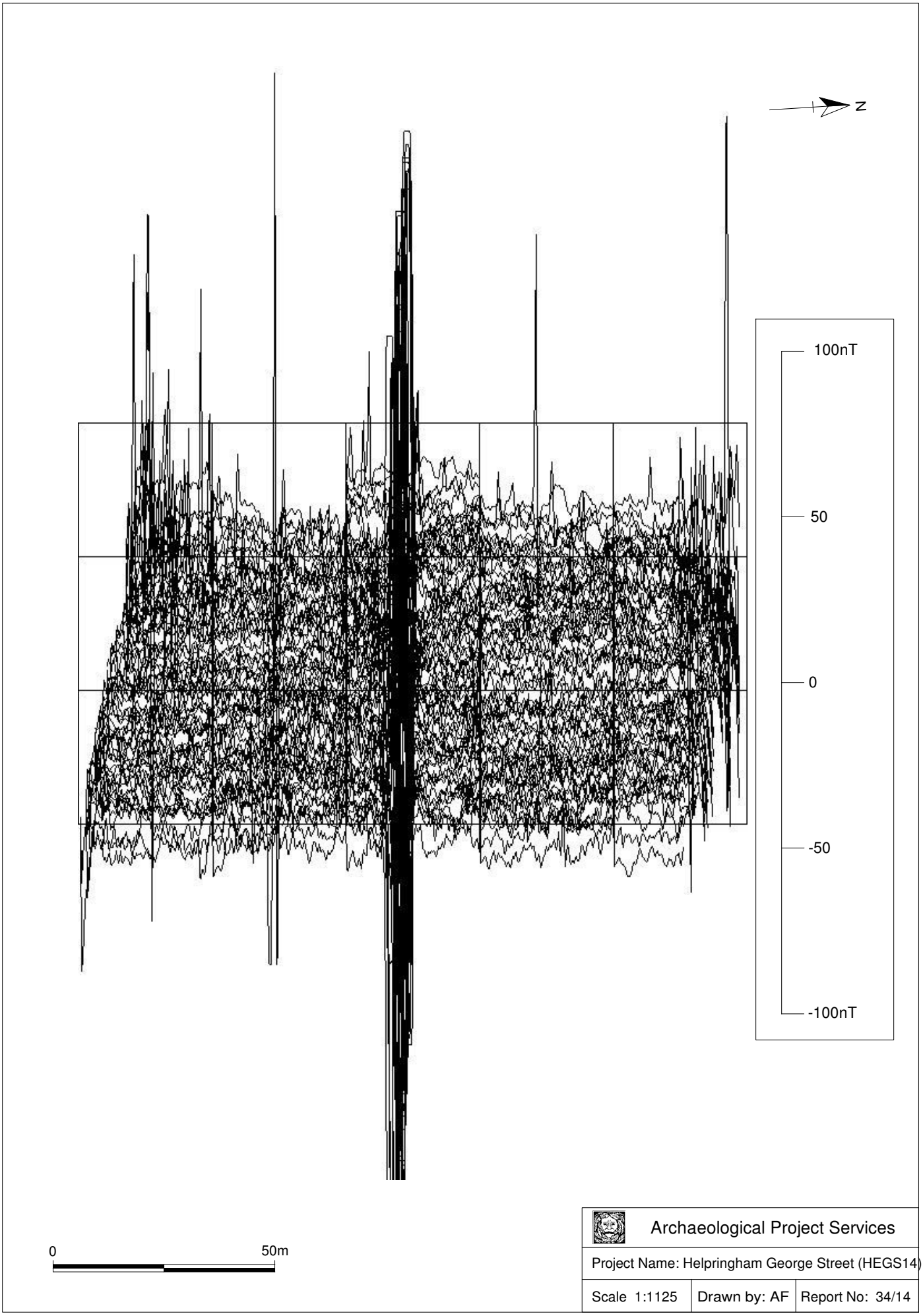

Figure 5 - Minimally processed data trace plot

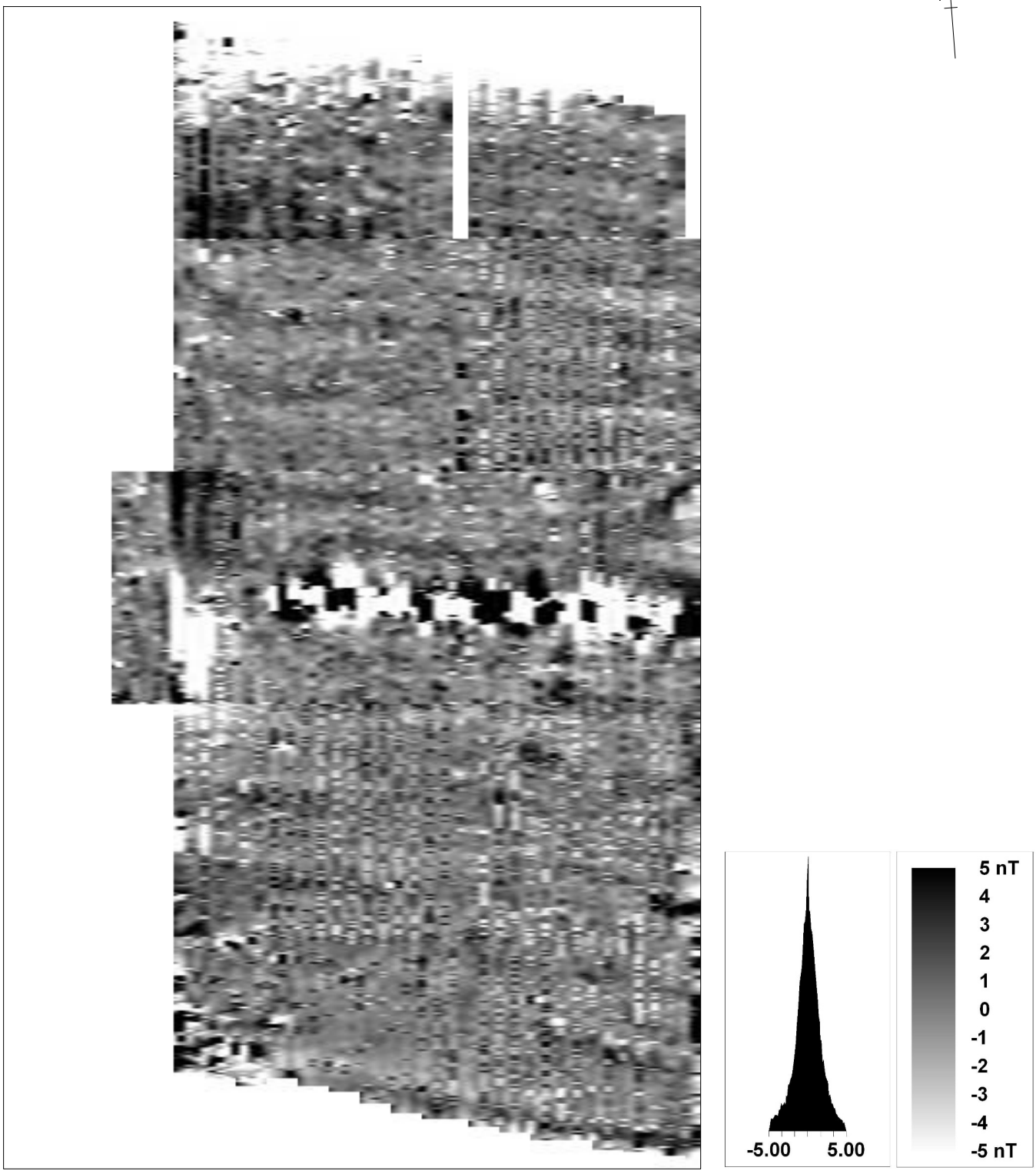

Figure 6 - Processed data greyscale plot

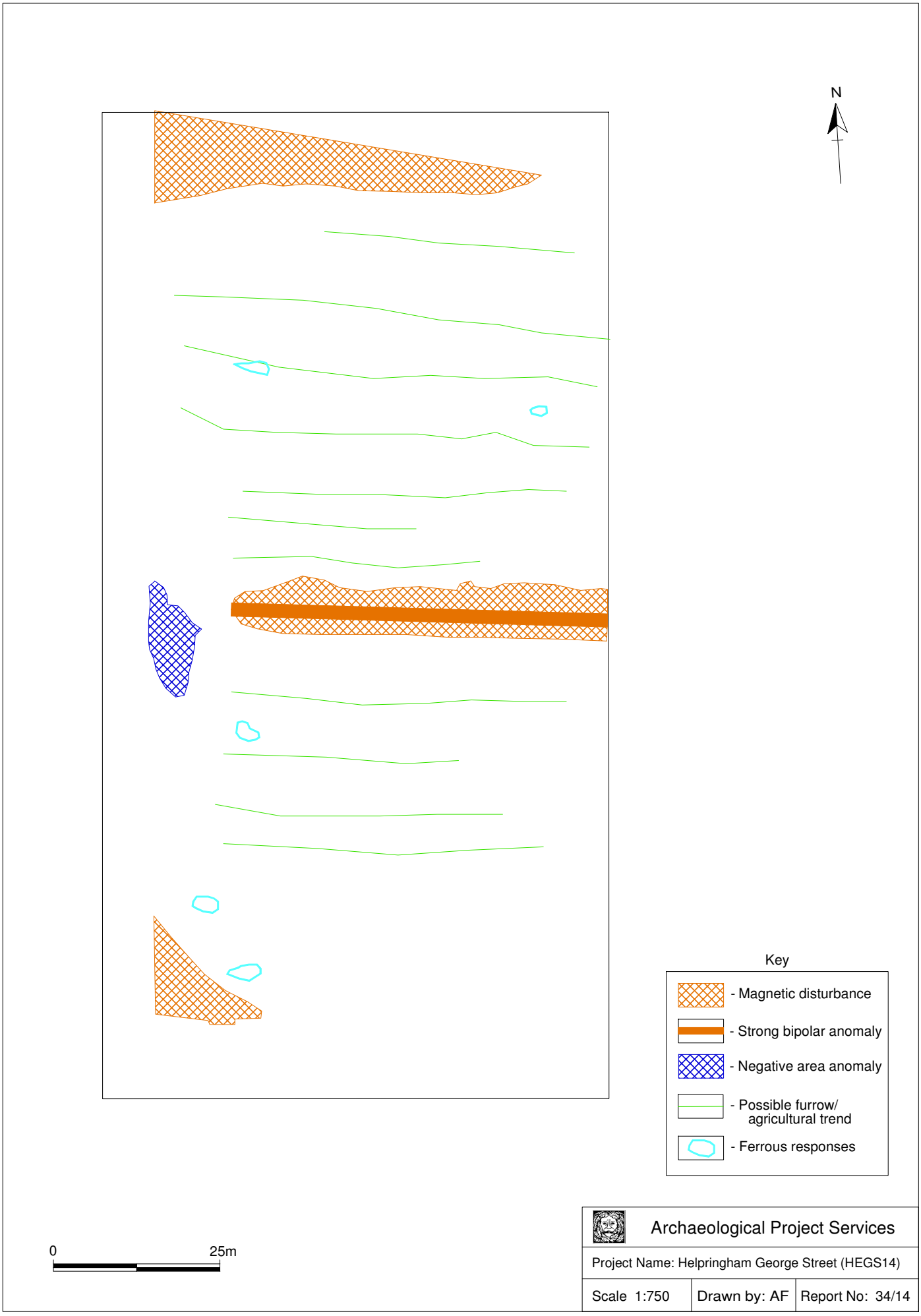

Figure 7 - Interpretative plot

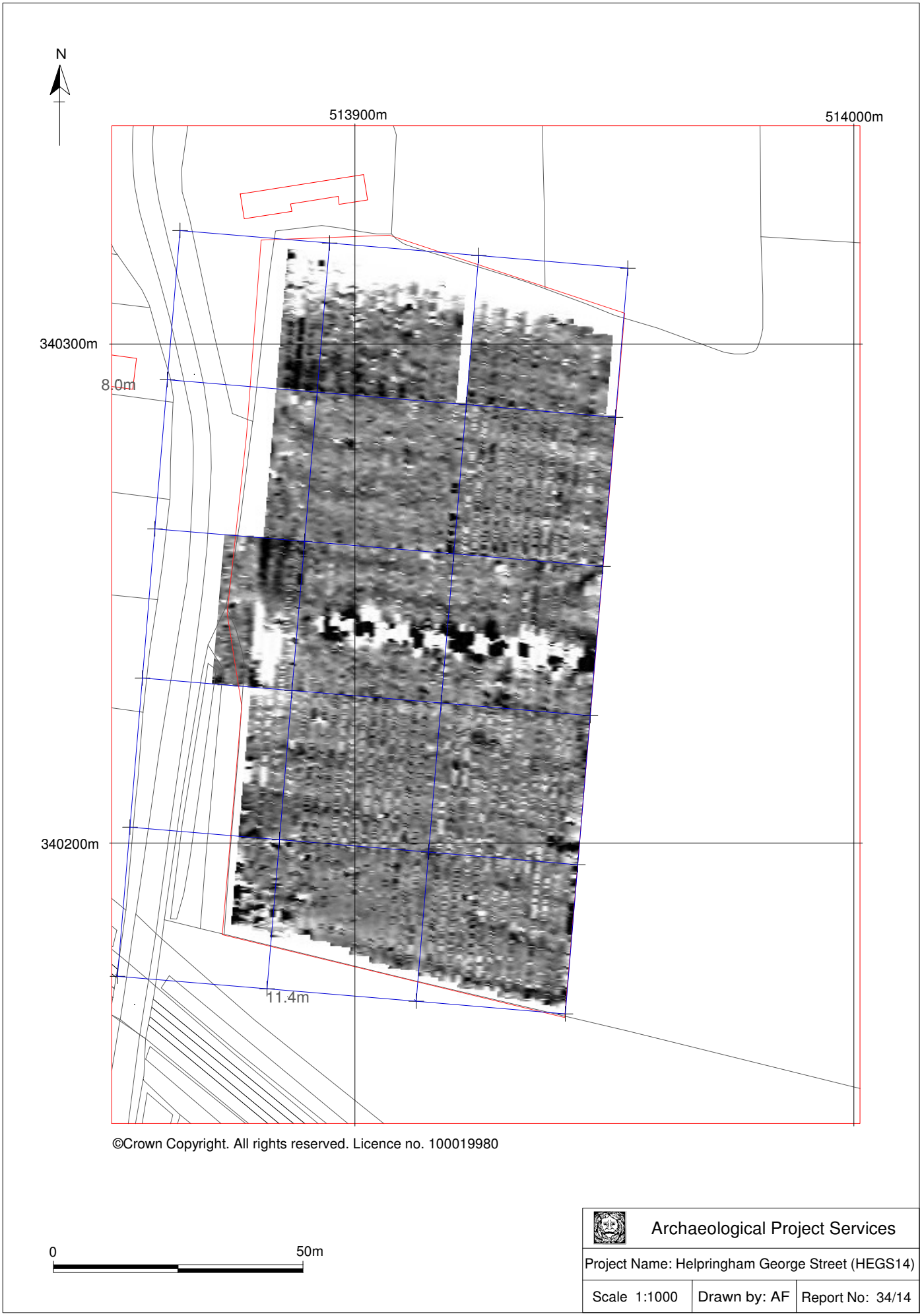

Figure 8 - Processed data greyscale geophysical survey plot overlain on map

Figure 9 - Geophysical survey, interpretative plot overlain on map

Appendix 1
THE ARCHIVE

The archive consists of:

1 Daily record sheet
1 Report text and illustrations
Digital data

File names	01.xgd 02.xgd 03.xgd 04.xgd 05.xgd 06.xgd 07.xgd 08.xgd 09.xgd 10.xgd 11.xgd 12.xgd 13.xgd 14.xgd 15.xgd	02-a.xgd 03-a.xgd 04-a.xgd 05-a.xgd 06-a.xgd 07-a.xgd 08-a.xgd 10-a.xgd 11-a.xgd 12-a.xgd 13-a.xgd HEGS1401-a.xgd	HEGS14survey.xcp
Explanation of codes used in file names	xgd files are magnetometer grids, named with site code and number in the order surveyed. Suffix "-a" indicates rotation to consistent orientation of first line (south from northeast corner). xcp files are composites containing record of all the data and processes used to produce the end product		
Description of file formats	All files are in plain text xml format with header data defining survey and processing parameters		
List of codes used in files	D indicates a "dummy" value within the composite data		
Hardware, software and operating systems	ArchaeSurveyor 2.5.19 running under Windows 7		
Date of last modification	22-01-14		
Indications of known areas of weakness in data	None		

All primary records are currently kept at:

Archaeological Project Services, The Old School, Cameron Street, Heckington, Lincolnshire, NG34 9RW

The ultimate destination of the project archive is:

The Collection
Art and Archaeology in Lincolnshire
Danes Terrace
Lincoln
LN2 1LP

Accession Number: LCNCC: 2014.57

Archaeological Project Services Site Code: HEGS14

OASIS DATA COLLECTION FORM: England

List of Projects | Manage Projects | Search Projects | New project | Change your details | HER coverage | Change country | Log out

Printable version

OASIS ID: archaeol1-177882

Project details

Project name	geophysical survey at George Street, Helpringham, Lincolnshire
Short description of the project	Magnetometer survey was undertaken close to a previous discovery of Saxon artefacts and in an area with ridge and furrow. Other than slight traces that might represent ridge and furrow, no archaeological remains were recorded.
Project dates	Start: 21-03-2014 End: 21-03-2014
Previous/future work	No / Not known
Any associated project reference codes	HEGS14 - Sitecode
Any associated project reference codes	2014.57 - Museum accession ID
Type of project	Field evaluation
Site status	None
Current Land use	Cultivated Land 2 - Operations to a depth less than 0.25m
Monument type	RIDGE AND FURROW Uncertain
Significant Finds	NONE None
Methods & techniques	'"Geophysical Survey"'
Development type	Not recorded
Prompt	National Planning Policy Framework - NPPF
Position in the planning process	Pre-application
Solid geology	OXFORD CLAY AND KELLAWAYS BEDS
Drift geology	GLACIAL SAND AND GRAVEL
Techniques	Magnetometry

Project location

Country	England
Site location	LINCOLNSHIRE NORTH KESTEVEN HELPRINGHAM land off George Street
Study area	1.00 Hectares
Site coordinates	TF 1392 4024 52.9471105131 -0.304337309104 52 56 49 N 000 18 15 W Point

Project creators

Name of Organisation	Archaeological Project Services
Project brief originator	None
Project design originator	Gary Taylor
Project director/manager	Gary Taylor
Project supervisor	Andrew Failes
Type of sponsor/funding body	Developer

Project archives

Physical Archive Exists?	No
Digital Archive recipient	The Collection
Digital Archive ID	2014.57
Digital Contents	"Survey"
Digital Media available	"Geophysics","Survey"
Paper Archive recipient	The Collection
Paper Archive ID	2014.57
Paper Contents	"Survey"
Paper Media available	"Correspondence","Map","Miscellaneous Material","Plan","Report","Survey "

Project bibliography 1

Publication type	Grey literature (unpublished document/manuscript)
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OASIS:

Please e-mail English Heritage for OASIS help and advice