WYAS Archaeological Services

Richard Johnston Ltd.

Land at Harling Road, Snetterton, Norfolk, NR16 2JU

Geophysical Survey

Report no. 2824
November 2015

Client: NPS Archaeology

Richard Johnston Ltd.
Land at Harling Road,
Snetterton, Norfolk,
NR16 2JU

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Summary

A geophysical (magnetometer) survey, covering approximately 8.5 hectares, was carried out on agricultural land at Snetterton, Norfolk. Linear anomalies of possible archaeological interest have been detected, some of which are associated with parts of enclosures. A large area of magnetic disturbance and a service pipe are also visible in the dataset.

WYAS
Archaeological Services

Report Information

Client:	NPS Archaeology
Address:	Scandic House, 85 Mountergate, Norwich, NR1 1PY
Report Type:	Geophysical Survey
Location:	Snetterton
County:	Norfolk
Grid Reference:	TM 011907
Period(s) of activity:	Prehistoric to modern
Report Number:	2824
Project Number:	6209
Site Code:	SNT15
OASIS ID:	archaeol11-229031
Planning Application Ref.:	3PL/2012/0476/O; 3PL/2015/0889/F
NHER Event No.:	53397; 57475
Date of fieldwork:	October 2015
Date of report:	October 2015
Project Management:	Christopher Sykes BA MSc
Fieldwork:	Christopher Sykes, Becky Goulding BSc MSc MPhil
Report:	Emma Brunning BSc MCIfA
Illustrations:	Emma Brunning
Photography:	Christopher Sykes

Authorisation for distribution: ----------

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1 Introduction

Archaeological Services WYAS (ASWYAS) was commissioned by NPS Archaeology to undertake a geophysical (magnetometer) survey of approximately 8.5 hectares on land at Snetterton, Norfolk. Norfolk Historic Environment Service recommended archaeological evaluation of the site, provided a brief for magnetometer survey and this current work is in response to and meets that brief. NHER Event numbers 53397 and 57475 fall in or adjacent to the survey area. The work was undertaken in order to inform a planning application, (reference numbers 3PL/2012/0476/O and 3PL/2015/0889/F) for the proposed development of the site and in accordance with the National Planning Policy Framework (DCLG 2012), in line with current best practice (CIfA 2014; David *et al*. 2008) and to a Project Design (Goulding 2015).

Site location, topography and land-use

The survey area is located approximately 1.5km to the north-east of Snetterton Circuit and 6km to the south-west of Attleborough, Norfolk. It is bound on its northern edge by London Road (A11), agricultural land to the east and an industrial estate to the west and south. It comprises a single area under agricultural management. The site is centred at TM 011 907 at a height of approximately 44m above Ordnance Datum (aOD).

Soils and geology

The underlying bedrock for the site is from the Lewes nodular chalk, Seaford chalk, Newhaven chalk and the Culver chalk formations, overlain by superficial deposits of Croxton sand and gravel (BGS 2015). Soils of the area belong to the Newport 3 (551f) formation and are identified as deep well drained sandy and coarse loamy soils (Soil Survey of England and Wales 1983).

2 Archaeological Background

Although the proposed development site contains almost no known archaeological remains, there is evidence relating to historical human occupation in all of the surrounding fields. Archaeological features of late prehistoric date were excavated at Grange Farm, north of the A11 trunk road (Robertson 2004), a prehistoric round barrow is known nearby and prehistoric flint tools and pottery have been collected to the southwest, east and northeast of the current site. A possible Roman road is known to the southwest and pottery of Roman date has been found to the east and north of the site. Finds of Anglo-Saxon, medieval and post-medieval material suggest occupation or activity in the environs of the site during these periods. Crop-marks of two ditches immediately to the south of the site may represent historical field boundaries, NHER number 57475 (NPS Archaeology 2015).

To the southwest of the site lies a former World War II military airfield which is now Snetterton motor racing circuit. The airfield opened in 1943 and was used by the United

States Army 8th Air Force. It fell into disuse after the war and became a racing circuit from 1953 onwards (PastScape 2015). Two World War II defences/spigot mortar emplacements are visible as open earthworks to the east of Snetterton Airfield, and one of these falls within the survey area. Each defence consists of a pit feature measuring up to 9m by 7m in diameter which would have contained a concrete 'thimble' and ammunition lockers to each side. The upcast spoil forms a bank around each of the pits up to 5.2m in width in some places (Norfolk Heritage Explorer 2015).

William Faden's map of 1797 shows the site as being part of Eccles Heath (Macnair 2015). An examination of Ordnance Survey (OS) historic mapping for the area revealed that since the production of the earliest available map in 1883, the layout of the field has remained unchanged. Old gravel pits are shown on the first edition OS mapping located in northern section of the field (Old-Maps 2015).

3 Aims and Methodology

Magnetometer survey

The aim of the geophysical survey as described in the Project Design (Goulding 2015) is to, as far as possible, identify the presence or absence, and extent and layout, of buried archaeological remains across the site, through the interpretation of magnetic anomalies identified following the processing of data gathered during the survey.

Magnetic survey methods rely on the ability of a variety of instruments to measure very small magnetic fields associated with buried archaeological remains. Features such as a ditch, pit or kiln can act like a small magnet, or series of magnets, that produce distortions (anomalies) in the earth's magnetic field. In mapping these slight variations, detailed plans of sites can be obtained as buried features often produce reasonably characteristic anomaly shapes and strengths (Gaffney and Gater 2003). Further information on the types of anomalies is provided in Appendix 1.

On this site a Sensys Magneto®MXPDA cart-based magnetometer system was employed. This system has five FGM650 fluxgate gradiometers mounted at 0.5m intervals with readings of between ±0.1nT and ±10,000nT recorded at 20Hz. The gradiometers are linked to a Trimble R6 Real Time Kinetic (RTK) differential Global Positioning System (dGPS) allowing for the geo-referencing of all measurement points within ±1cm accuracy. The data are recorded by Sensys Magneto®MXPDA software on a Personal Data Assistant (PeDA) device and stored on a Secure Digital (SD) memory card within the PeDA.

Data processing

The gradiometer data have been presented in this report in greyscale formats. The data in the greyscale images have been interpolated and selectively filtered to remove the effects of drift in instrument calibration and other artificial data constructs and to maximise the clarity and

interpretability of the archaeological anomalies. TerraSurveyor V3.0.25.0 software was used to process and present the data recorded by the cart-mounted system.

Presentation

A general site location plan, incorporating the 1:50000 Ordnance Survey (OS) mapping, is shown in Figure 1. Figure 2 shows the survey location together with the processed data at a scale of 1:2500. Detailed data plots and interpretative figures are presented at a scale of 1:2000 in Figures 3 to 4 inclusive.

Further information on magnetic survey and characterisation and interpretation of anomaly types is given in Appendix 1. Appendix 2 describes the composition and location of the site archive, Appendix 3 reproduces the OASIS entry and Appendix 4 shows repeat tracks from the magnetometer survey.

The survey methodology, report and any recommendations comply with the Project Design (Goulding 2015) and guidelines outlined by English Heritage (David *et al.* 2008) and by the Chartered Institute for Archaeologists (CIfA 2014). All figures reproduced from Ordnance Survey mapping are with the permission of the controller of Her Majesty's Stationery Office (© Crown copyright).

Disclaimers

The figures in this report have been produced following analysis of the data in 'raw' and processed formats and over a range of different display levels. All figures are presented to most suitably display and interpret the data from this site based on the experience and knowledge of Archaeological Services staff.

The results and subsequent interpretation of data from geophysical surveys should not be treated as an absolute representation of the underlying archaeological and non-archaeological remains. Confirmation of the presence or absence of archaeological remains can only be achieved by direct investigation of sub-surface deposits.

Archaeological Services WYAS cannot accept responsibility for errors of fact or opinion resulting from data supplied by a third party.

4 Results and Discussion (see Figs 3-4 inclusive)

Archaeological anomalies

A number of linear trends have been identified in the data which have potential to be of archaeological interest and show former field systems and enclosures. An enclosure (**A**) measures approximately 60m along its width, unfortunately due to the magnetic halo from the service pipe (see below) its length cannot be determined. A smaller enclosure (**B**) can be seen in the southeast of (**A**) measuring approximately 15m x 15m. Hints of another smaller

enclosure have been identified at (**C**), but again, due to the magnetic halo from the service pipe some of the anomaly has been masked.

Long linear trends (**D**) running on a northeast to southwest alignment have the potential to represent field systems. These trends are likely to be the continuation of two undated linear ditch cropmarks (NHER number 57475) that are visible on aerial photographs in the field to the immediate south (Norfolk Heritage Explorer 2015). They also seem to be on a similar alignment as fields shown to the south on the 1840s Tithe map (Norfolk County Council 2015).

At least two differing alignments of archaeological anomalies have been identified, this could be indicative of more than one period of activity on site. The number of finds within the vicinity of various dates also suggests that this is likely.

Ferrous anomalies

Ferrous responses, either as individual 'spike' anomalies or more extensive areas of magnetic disturbance, are typically caused by modern ferrous (magnetic) debris, either on the ground surface or in the plough-soil, or are due to the proximity of magnetic material in field boundaries, buildings or other above ground features. Little importance is normally given to such anomalies, unless there is any supporting evidence for an archaeological interpretation, as ferrous debris or material is common on rural sites, often being present as a consequence of manuring or tipping/infilling. There is no obvious pattern or clustering to their distribution to suggest anything other than a random background scatter of ferrous debris in the plough-soil.

A single linear dipolar anomaly was identified running on a northwest to southeast alignment. This strong ferrous response represents a buried service pipe and has unfortunately masked some of the potential archaeological anomalies within the immediate vicinity.

A large area of magnetic disturbance in the north of the data corresponds to a change in the crop depicted on aerial images. The ferrous material could be associated with the construction of the A11 or deconstruction of the old London Road. It was also noted that on old mapping (Old-Maps 2015) two old gravel pits were shown in this location. A rectangular area of reduced noise (**E**) is in the location of a World War II defence/spigot mortar emplacement (NHER number 53397) as mentioned in the archaeological background section. The data have been affected in the southwest of the survey area by the nearby industrial buildings.

5 Conclusions

The geophysical survey has identified a number of anomalies of archaeological potential. A large enclosure and two smaller enclosures have been located along with long linear trends

possibly indicating prehistoric field systems. Some of these responses are magnetically weak which may be indicative of shallow features.

The northern section of the data are dominated by magnetic disturbance which may be associated with the nearby A11. An area within this disturbance is likely to be associated with a World War II spigot mortar enclosure. A linear dipolar anomaly representing a buried service pipe has been located bisecting the data. Unfortunately, these ferrous responses will have masked any other archaeological remains, if present.

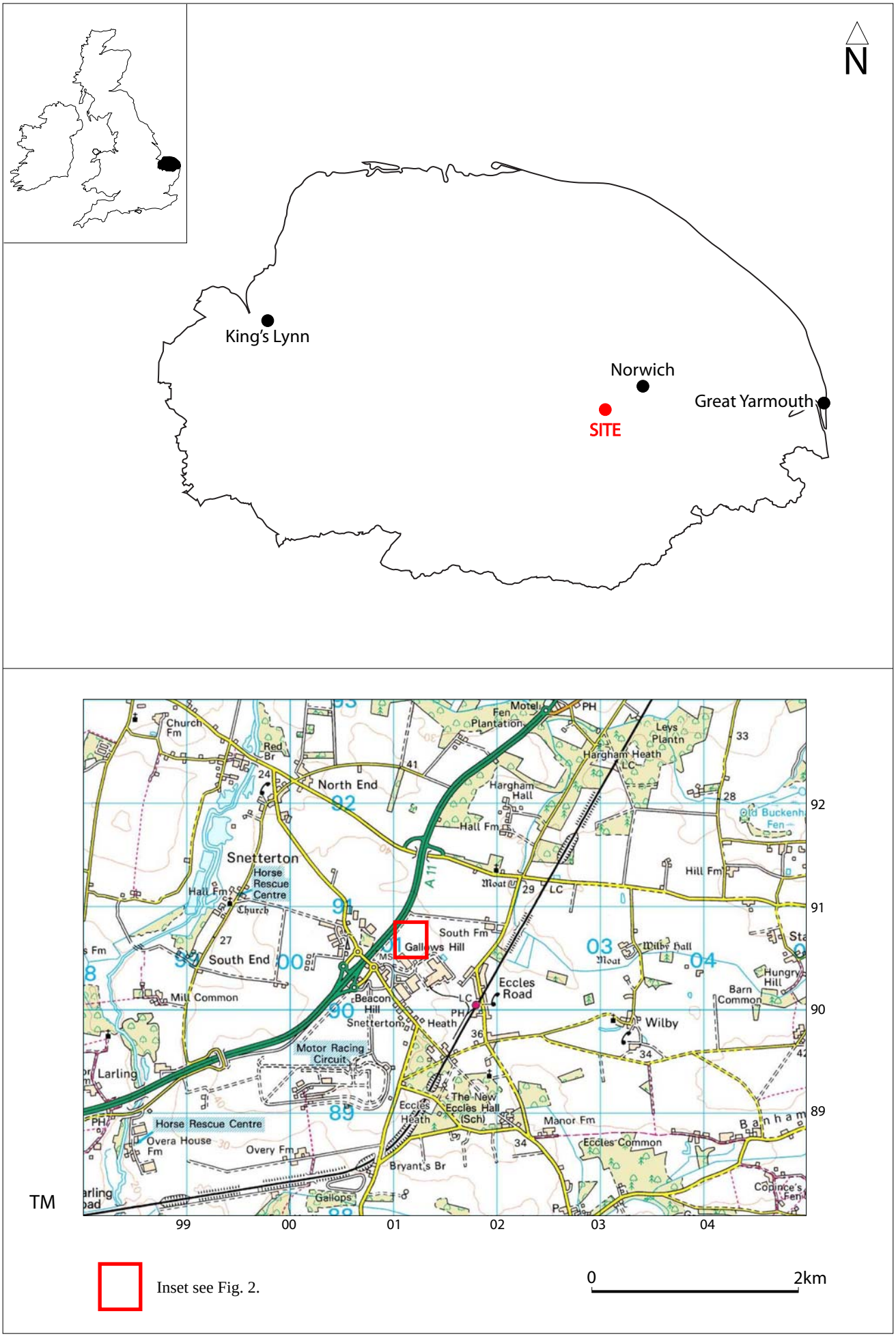

Fig. 1. Site location

SURVEY BOUNDARY

LOCATION AND DIRECTION OF PLATES

N

y Houses

Drain

Poultry Houses

El Sub Sta

Pond

Drain

Pond

Posts

MS

Repeater Station

Def

A 11

A 11

A 11

BM 42.10m

Track

Track

Slurry Pit

1

2

2.0

-1.0

nT

2908 00

6008 00

6014 00

0 100m

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Fig. 2. Survey location showing greyscale magnetometer data (1:2500 @ A3)

N

2908 00

Def

A 11

Def

MS

Track

Slurry Pit

2.0

-1.0

nT

Archaeological Services W Y A S
Nepshaw Lane South, Morley, LS27 7JQ
Tel: 0113 383 7500 Fax:0113 383 7501

6010 00

6014 00

0 100m

Fig. 3. Processed greyscale magnetometer data (1:2000 @ A3)

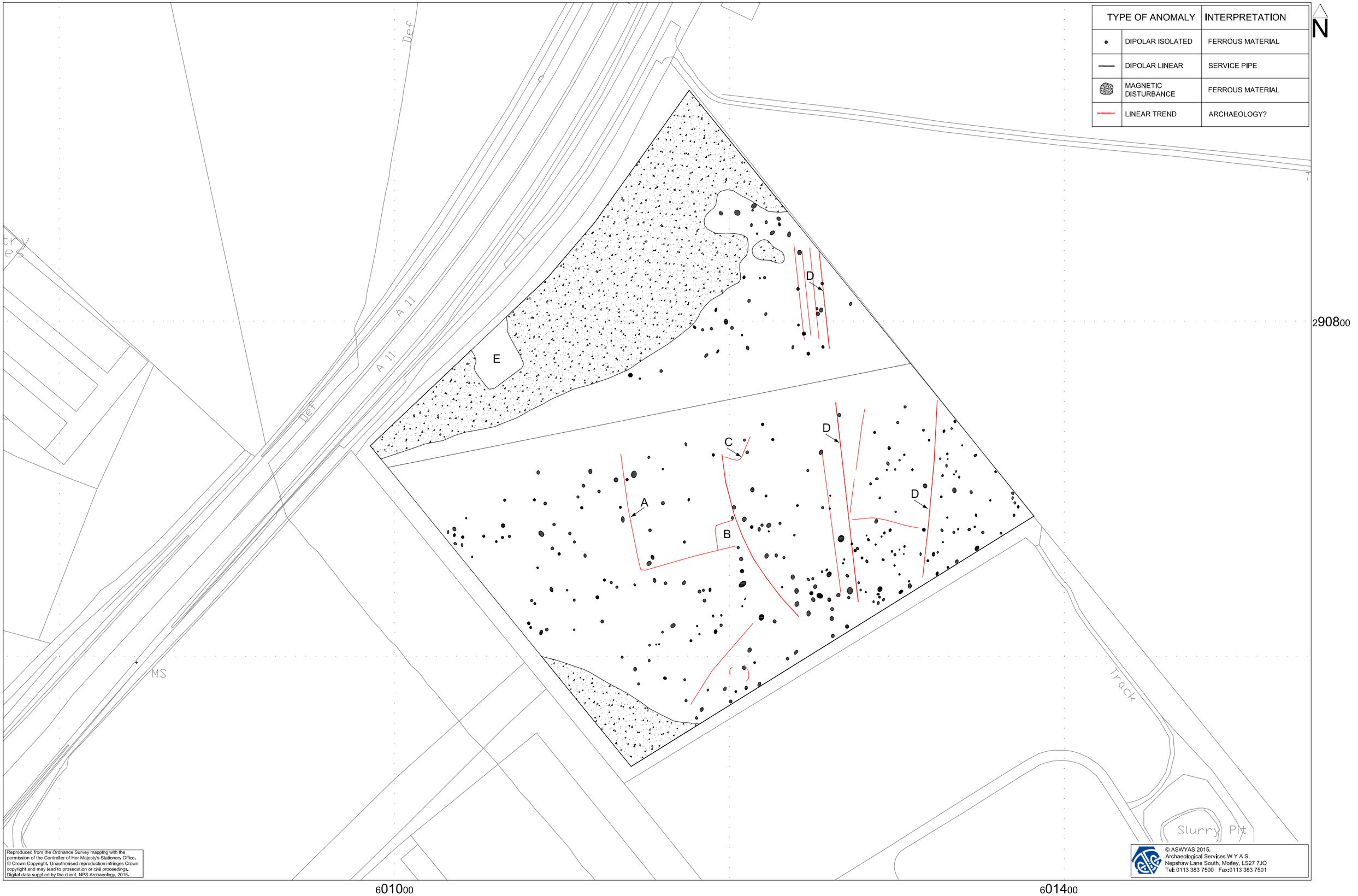

Fig. 4. Interpretation of processed greyscale magnetometer data (1:2000 @ A3)

Plate 1. General view of survey area, looking south from the northeast corner

Plate 2. General view of survey area, looking northwest from the southeast corner

Appendix 1: Magnetic survey - technical information

Magnetic Susceptibility and Soil Magnetism

Iron makes up about 6% of the Earth's crust and is mostly present in soils and rocks as minerals such as maghaemite and haemetite. These minerals have a weak, measurable magnetic property termed magnetic susceptibility. Human activities can redistribute these minerals and change (enhance) others into more magnetic forms. Areas of human occupation or settlement can then be identified by measuring the magnetic susceptibility of the topsoil because of the attendant increase (enhancement) in magnetic susceptibility. If the enhanced material subsequently comes to fill features, such as ditches or pits, localised isolated and linear magnetic anomalies can result whose presence can be detected by a magnetometer (fluxgate gradiometer).

In general, it is the contrast between the magnetic susceptibility of deposits filling cut features, such as ditches or pits, and the magnetic susceptibility of topsoils, subsoils and rocks into which these features have been cut, which causes the most recognisable responses. This is primarily because there is a tendency for magnetic ferrous compounds to become concentrated in the topsoil, thereby making it more magnetic than the subsoil or the bedrock. Linear features cut into the subsoil or geology, such as ditches, that have been silted up or have been backfilled with topsoil will therefore usually produce a positive magnetic response relative to the background soil levels. Discrete feature, such as pits, can also be detected. The magnetic susceptibility of a soil can also be enhanced by the application of heat and the fermentation and bacterial effects associated with rubbish decomposition. The area of enhancement is usually quite large, mainly due to the tendency of discard areas to extend beyond the limit of the occupation site itself, and spreading by the plough. An advantage of magnetic susceptibility over magnetometry is that a certain amount of occupational activity will cause the same proportional change in susceptibility, however weakly magnetic is the soil, and so does not depend on the magnetic contrast between the topsoil and deeper layers. Susceptibility survey is therefore able to detect areas of occupation even in the absence of cut features. On the other hand susceptibility survey is more vulnerable to the masking effects of layers of colluvium and alluvium as the technique, using the Bartington system, can generally only measure variation in the first 0.15m of ploughsoil.

Types of Magnetic Anomaly

In the majority of instances anomalies are termed 'positive'. This means that they have a positive magnetic value relative to the magnetic background on any given site. However some features can manifest themselves as 'negative' anomalies that, conversely, means that the response is negative relative to the mean magnetic background.

Where it is not possible to give a probable cause of an observed anomaly a '?' is appended.

It should be noted that anomalies interpreted as modern in origin might be caused by features that are present in the topsoil or upper layers of the subsoil. Removal of soil to an archaeological or natural layer can therefore remove the feature causing the anomaly.

The types of response mentioned above can be divided into five main categories that are used in the graphical interpretation of the magnetic data:

Isolated dipolar anomalies (iron spikes)

These responses are typically caused by ferrous material either on the surface or in the topsoil. They cause a rapid variation in the magnetic response giving a characteristic 'spiky' trace. Although ferrous archaeological artefacts could produce this type of response, unless there is supporting evidence for an archaeological interpretation, little emphasis is normally given to such anomalies, as modern ferrous objects are common on rural sites, often being present as a consequence of manuring.

Areas of magnetic disturbance

These responses can have several causes often being associated with burnt material, such as slag waste or brick rubble or other strongly magnetised/fired material. Ferrous structures such as pylons, mesh or barbed wire fencing and buried pipes can also cause the same disturbed response. A modern origin is usually assumed unless there is other supporting information.

Linear trend

This is usually a weak or broad linear anomaly of unknown cause or date. These anomalies are often caused by agricultural activity, either ploughing or land drains being a common cause.

Areas of magnetic enhancement/positive isolated anomalies

Areas of enhanced response are characterised by a general increase in the magnetic background over a localised area whilst discrete anomalies are manifest by an increased response (sometimes only visible on an XY trace plot) on two or three successive traverses. In neither instance is there the intense dipolar response characteristic exhibited by an area of magnetic disturbance or of an 'iron spike' anomaly (see above). These anomalies can be caused by infilled discrete archaeological features such as pits or post-holes or by kilns. They can also be caused by pedological variations or by natural infilled features on certain geologies. Ferrous material in the subsoil can also give a similar response. It can often therefore be very difficult to establish an anthropogenic origin without intrusive investigation or other supporting information.

Linear and curvilinear anomalies

Such anomalies have a variety of origins. They may be caused by agricultural practice (recent ploughing trends, earlier ridge and furrow regimes or land drains), natural geomorphological features such as palaeochannels or by infilled archaeological ditches.

Appendix 2: Geophysical archive

The geophysical archive comprises:-

- an archive disk containing compressed (WinZip 8) files of the raw data, report text (Microsoft Word 2000), and graphics files (Adobe Illustrator CS6 and AutoCAD 2008) files; and
- a full copy of the report.

At present the archive is held by Archaeological Services WYAS although it is anticipated that it may eventually be lodged with the Archaeology Data Service (ADS). Brief details may also be forwarded for inclusion on the English Heritage Geophysical Survey Database after the contents of the report are deemed to be in the public domain (i.e. available for consultation in the Norfolk Historic Environment Record).

Appendix 3: OASIS form

OASIS DATA COLLECTION FORM: England

Printable version

OASIS ID: archaeol11-229032

Project details

Project name	Land at Harling Road, Snetterton
Short description of the project	A geophysical (magnetometer) survey, covering approximately 8.5 hectares, was carried out on agricultural land at Snetterton, Norfolk. Linear anomalies of possible archaeological interest have been detected, some of which are associated with parts of enclosures. A large area of magnetic disturbance and a service pipe are also visible in the dataset.
Project dates	Start: 20-10-2015 End: 26-10-2015
Previous/future work	No / Not known
Any associated project reference codes	3PL/2015/0889/F - Planning Application No.
Any associated project reference codes	3PL/2012/0476/O - Planning Application No.
Any associated project reference codes	53397 - HER event no.
Any associated project reference codes	57475 - HER event no.
Type of project	Field evaluation
Site status	None
Current Land use	Cultivated Land 2 - Operations to a depth less than 0.25m
Monument type	WWII SPIGOT MORTAR Modern
Monument type	CROPMARKS Uncertain
Significant Finds	DITCHES Uncertain
Significant Finds	ENCLOSURES Uncertain
Methods & techniques	"'Geophysical Survey'"
Development type	Not recorded
Prompt	Planning condition

Position in the planning process	Pre-application
Solid geology	CHALK (INCLUDING RED CHALK)
Drift geology	SAND AND GRAVEL OF UNCERTAIN AGE OR ORIGIN
Techniques	Magnetometry

Project location

Country	England
Site location	NORFOLK BRECKLAND QUIDENHAM Land at Harling Road, Snetterton, Norfolk
Study area	8.5 Hectares
Site coordinates	TM 011 907 52.476653482264 0.961511700891 52 28 35 N 000 57 41 E Point
Height OD / Depth	Min: 42m Max: 44m

Project creators

Name of Organisation	Archaeological Services WYAS
Project brief originator	NPS Archaeology
Project design originator	NPS Archaeology
Project director/manager	C. Sykes
Project supervisor	B Goulding

Project archives

Physical Archive Exists?	No
Digital Archive recipient	NPS Archaeology
Digital Contents	"Survey"
Digital Media available	"Geophysics","Images raster / digital photography","Text"
Paper Archive Exists?	No

Project bibliography 1

Publication type	Grey literature (unpublished document/manuscript)
Title	Richard Johnston Ltd. Land at Harling Road, Snetterton, Norfolk, NR16 2JU
Author(s)/Editor(s)	Sykes, C
Date	2015
Issuer or publisher	ASWYAS
Place of issue or publication	Leeds
Description	A4 report with A3 figures

Appendix 4: Repeat track

N

A 11

A 11

Track

2908 00

2906 00

6012 00

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0 100m

Appendix 4. Location of repeated tracks (1:2000 @ A3)

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