WYAS Archaeological Services

Beighton Road

Woodhouse

Sheffield

Archaeological Evaluation

Report no. 2850
March 2016

Client: Persimmon Homes West Yorkshire

REGISTERED CIfA ORGANISATION

West Yorkshire Joint Services

Beighton Road, Woodhouse, Sheffield

Geophysical Survey

Summary

A geophysical (magnetometer) survey of approximately 1.5 hectares, was carried out on scrubland and grassland at Beighton Road, Woodhouse, South Yorkshire. Approximately half of the original 3 hectares was unsuitable for survey. The survey was undertaken prior to the proposed development of the site. No anomalies of archaeological interest have been detected by the magnetometer survey. The majority of responses are of a modern origin. The data in the north eastern section are dominated by magnetic disturbance which may be the result of demolished Nissen huts. Consequently, based upon the geophysical dataset the archaeological potential of the site is deemed to be low.

WYAS
Archaeological Services

Report Information

Client:	Persimmon Homes West Yorkshire
Address:	3 Hepton Court, York Road, Leeds LS9 6PW
Report Type:	Geophysical Survey
Location:	Woodhouse
County:	South Yorkshire
Grid Reference:	SK 4250 8442
Period(s) of activity:	Modern
Report Number:	2850
Project Number:	6294
Site Code:	BRS16
OASIS ID:	archaeol11-245222
Museum Accession No.:	N/A
Date of fieldwork:	February 2016
Date of report:	February 2016
Project Management:	Chris Sykes BA MSc
Fieldwork:	Emma Brunning BSc MCIfA
	Rebecca Goulding, BSc MSc
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Photography:	Emma Brunning

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

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1 Introduction

Archaeological Services WYAS (ASWYAS) was commissioned by Persimmon Homes (the Client), to undertake a geophysical (magnetometer) survey of Land at Beighton Road, Woodhouse, in advance of a planning application. Guidance contained within the National Planning Policy Framework (DCLG 2012) and in line with current best practice (CIfA 2014; David *et al*. 2008) was followed. The survey was carried out on the 12th February 2016, to provide additional information on the archaeological resource of the site.

Site location, topography and land-use

The proposed development area (PDA) is located in the village of Woodhouse centred at SK 4250 8442, approximately 7.5 km to the southeast of Sheffield (see Fig. 1). The site is bound by Beighton Road to the north, a residential hospice to the east, housing to the west and Shirebrook Valley Nature Reserve to the south. The PDA totals approximately 3ha consisting of grass and overgrown areas, of which approximately 1.5 hectares was unsuitable for survey (see Fig 2). The surveyed areas are divided into north and south and will be referred to as such in the results section. The site is at an elevation of approximately 85m above Ordnance Datum (aOD).

Soils and geology

The underlying bedrock geology comprises of the Pennine middle coal formation – sandstone. No superficial deposits have been recorded (BGS 2016). Soils of the survey area belong to the Rivington 1 (541f) association; well drained coarse loamy soils over sandstone (SSEW 1983).

2 Archaeological Background

Cartographic evidence from 1956 (Old Maps 2016) show a series of buildings located to the northeast of the PDA. These were pre-fabricated Nissen huts which provided accommodation for miners training at the nearby Birley East Colliery. The huts were retained on site after the colliery closed and later used as a mushroom farm until 1970, when they were finally demolished (PDS 2015).

No other known heritage assets are within the PDA and the immediate surrounding area.

3 Aims and Methodology

The main aim of the geophysical survey was to provide sufficient information to enable an assessment to be made of the impact of the development on potential sub-surface archaeological remains and for further evaluation or mitigation proposals, if appropriate, to be recommended. To achieve this aim, a magnetometer survey covering all amenable parts of the PDA was undertaken (see Fig. 2).

The general objectives of the geophysical survey were:

- to provide information about the nature and possible interpretation of any magnetic anomalies identified;
- to therefore determine the presence/absence and extent of any buried archaeological features; and
- to prepare a report summarising the results of the survey.

Magnetometer survey

The site grid was laid out using a Trimble VRS differential Global Positioning System (Trimble 5800 model). The survey was undertaken using Bartington Grad601 magnetic gradiometers. These were employed taking readings at 0.25m intervals on zig-zag traverses 1.0m apart within 30m by 30m grids, so that 3600 readings were recorded in each grid. These readings were stored in the memory of the instrument and later downloaded to computer for processing and interpretation. Geoplot 3 (Geoscan Research) software was used to process and present the data. Further details are given in Appendix 1.

Reporting

A general site location plan, incorporating the 1:50000 Ordnance Survey (OS) mapping, is shown in Figure 1. Figure 2 displays an overview of the processed magnetometer data at a scale of 1:2500. The processed and minimally processed data, together with an interpretation of the survey results are presented in Figures 3 to 5 inclusive at a scale of 1:1000.

Technical information on the equipment used, data processing and survey methodologies are given in Appendix 1. Technical information on locating the survey area is provided in Appendix 2. Appendix 3 describes the composition and location of the archive. A copy of the OASIS form is included in Appendix 4.

The survey methodology, report and any recommendations comply with 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).

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.

4 Results and Discussion (see Figures 3-5)

Ferrous anomalies

Due to the large amount of ferrous disturbance the plotting parameters used on Figs. 2 and 3 are higher (-2 to 5 nT) than those which are normally used (-1 to 2 nT).

Ferrous anomalies, as individual 'spikes', or as large discrete areas are typically caused by ferrous (magnetic) material, either on the ground surface or in the plough-soil, or the proximity of the survey area to magnetic material in boundary fences, 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 modern 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.

Both datasets are dominated by such anomalies and in the case of the northern section all of the data are magnetically disturbed. It is possible that demolition rubble from the Nissen huts are responsible for this. The southern dataset have a more sporadic spread of disturbance which are caused by areas of modern dumping and metal fencing. The location of a borehole pipe was present and is marked by **BH** on the interpretation diagram (Fig. 5).

Geological anomalies

A handful of anomalies have been interpreted as having a geological origin; these are thought to be caused by variations in the depth and composition of the soils and the superficial deposits from which they derive.

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.

5 Conclusions

The magnetic survey has not detected anomalies of an archaeological origin. The majority of responses are of a modern nature such as ferrous debris and areas of magnetic disturbance. The northern dataset is dominated by the latter response and possibly relates to the location of demolished Nissen huts. Based upon the geophysical datasets the archaeological potential of the site is deemed to be low.

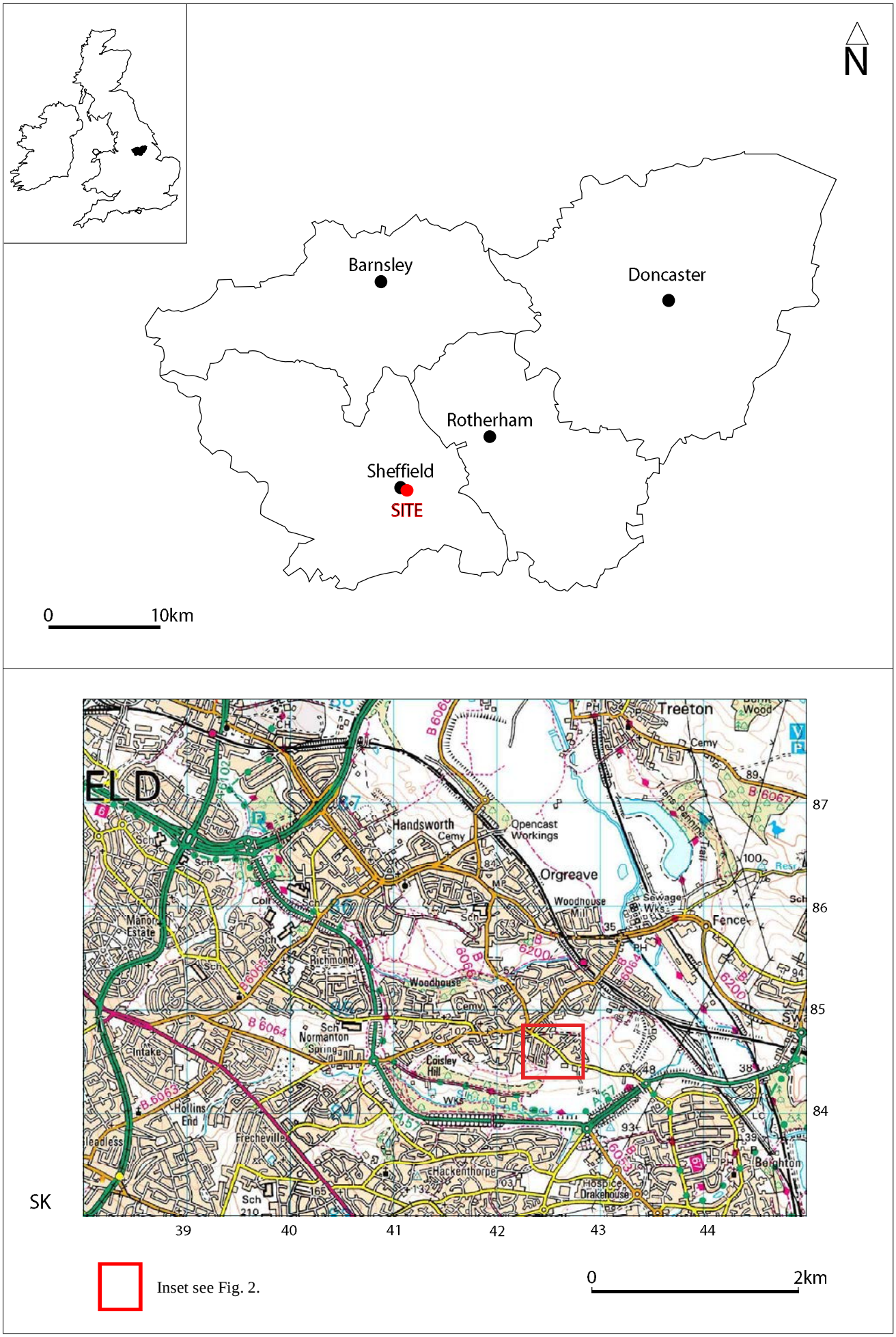

Fig. 1. Site location

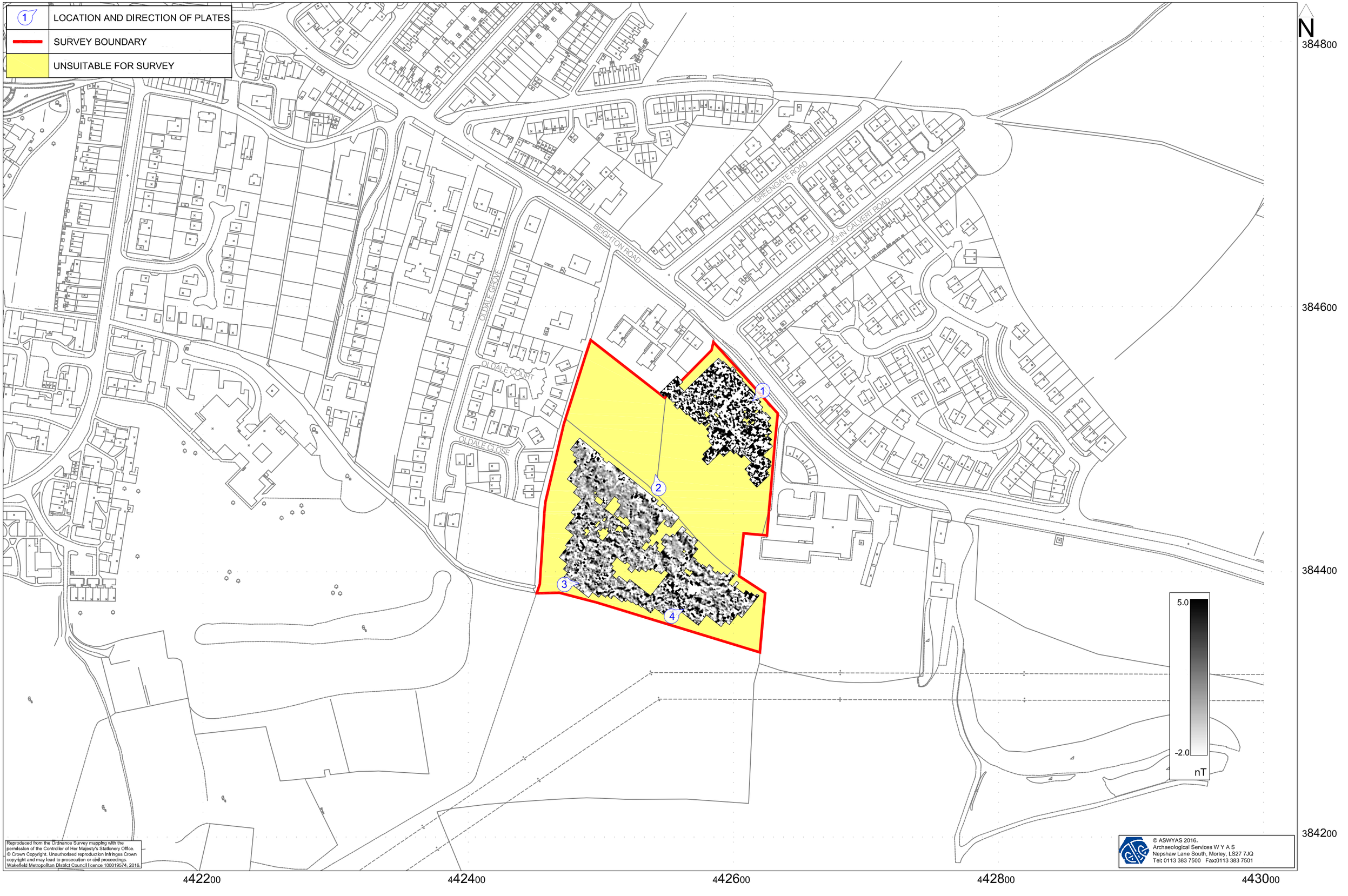

Fig. 2. Survey location showing greyscale magnetometer data (1:2500 @ A3)

Fig. 3. Greyscale plot of magnetometer data (1:1000 @ A3)

Fig. 4. XY trace plot of magnetometer data (1:1000 @ A3)

TYPE OF ANOMALY		INTERPRETATION
•	DIPOLAR ISOLATED	FERROUS MATERIAL
	MAGNETIC DISTURBANCE	FERROUS MATERIAL
	MAGNETIC ENHANCEMENT	GEOLOGY

OLDALE COURT

OLDALE CLOSE

BH

N

384400

424400

426600

0 50m

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Fig. 5. Interpretation of magnetometer data (1:1000 @ A3)

Plate 1. General view, looking southwest

Plate 2. View of the area unsuitable for survey, looking northwest

Plate 3. General view, looking east

Plate 4. General view, looking northeast

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.

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.

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 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.

Methodology: Gradiometer Survey

The main method of using the fluxgate gradiometer for commercial evaluations is referred to as ***detailed survey*** and requires the surveyor to walk at an even pace carrying the instrument within a grid system. A sample trigger automatically takes readings at predetermined points, typically at 0.25m intervals, on traverses 1m apart. These readings are stored in the memory of the instrument and are later dumped to computer for processing and interpretation.

During this survey a Bartington Grad601 magnetic gradiometer was used taking readings on the 0.1nT range, at 0.25m intervals on zig-zag traverses 0.5m apart within 30m by 30m square grids. The instrument was checked for electronic and mechanical drift at a common point and calibrated as necessary. The drift from zero was not logged.

The gradiometer data have been presented in this report in processed greyscale format. 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.

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

Appendix 2: Survey location information

An initial survey station was established using a Trimble VRS differential Global Positioning System (Trimble R6 model). The data were geo-referenced using the geo-referenced survey station with a Trimble RTK differential Global Positioning System (Trimble R6 model). The accuracy of this equipment is better then 0.01m. The survey grids were then super-imposed onto a base map provided by the client to produce the displayed block locations. However, it should be noted that Ordnance Survey positional accuracy for digital map data has an error of 0.5m for urban and floodplain areas, 1.0m for rural areas and 2.5m for mountain and moorland areas. This potential error must be considered if co-ordinates are measured off hard copies of the mapping rather than using the digital co-ordinates.

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

Appendix 3: 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 CS2 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 South Yorkshire Historic Environment Record).

Appendix 4: OASIS form

OASIS DATA COLLECTION FORM: England

OASIS ID: archaeol11-245222

Project details

Project name	Beighton Road, Sheffield
Short description of the project	A geophysical (magnetometer) survey of approximately 1.5 hectares, was carried out on scrubland and grassland at Beighton Road, Woodhouse, South Yorkshire. Approximately half of the original 3 hectares was unsuitable for survey. The survey was undertaken prior to the proposed development of the site. No anomalies of archaeological interest have been detected by the magnetometer survey. The majority of responses are of a modern origin. The data in the north eastern section are dominated by magnetic disturbance which may be the result of demolished Nissen huts. Consequently, based upon the geophysical dataset the archaeological potential of the site is deemed to be low.
Project dates	Start: 12-02-2016 End: 12-02-2016
Previous/future work	No / Not known
Any associated project reference codes	6294 - Sitecode
Type of project	Field evaluation
Current Land use	Grassland Heathland 2 - Undisturbed Grassland
Monument type	NISSEN HUTS Modern
Significant Finds	NISSEN HUTS Modern
Methods & techniques	"Geophysical Survey"
Development type	Housing estate
Prompt	National Planning Policy Framework - NPPF
Position in the planning process	Not known / Not recorded
Solid geology (other)	Pennine Middle Coal Formation
Drift geology	ALLUVIUM
Techniques	Magnetometry

Project location

Country	England
Site location	SOUTH YORKSHIRE SHEFFIELD SHEFFIELD Beighton Road, Woodhouse, Sheffield
Study area	3 Hectares
Site coordinates	SK 425 844 53.354506099539 -1.361407137961 53 21 16 N 001 21 41 W Point
Height OD / Depth	Min: 85m Max: 85m

Project creators

Name of Organisation	Archaeological Services WYAS
Project brief originator	Persimmon Homes
Project design originator	Persimmon Homes
Project director/manager	C. Sykes
Project supervisor	E Brunning

Project archives

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

Project bibliography 1

Publication type	Grey literature (unpublished document/manuscript)
Title	Beighton Road, Woodhouse, Sheffield
Author(s)/Editor(s)	Brunning, E
Date	2016
Issuer or publisher	ASWYAS
Place of issue or publication	Morley, Leeds
Description	A4 report with A3 figures

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Entered on	9 March 2016

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