WYAS Archaeological Services

Land at Thirsk

Thirsk

North Yorkshire

Geophysical Survey

Report no. 2825
November 2015

Client: MAP Archaeological Practice

Land at Thirsk,
Thirsk,
North Yorkshire

Geophysical Survey

Summary

A geophysical (magnetometer) survey, covering approximately 5 hectares, was carried out on agricultural land located west of the B1448 at Cocked Hat Park near Sowerby, Thirsk, North Yorkshire. The survey was undertaken prior to the proposed development of the site. Large areas of magnetic disturbance were present caused by dumping and ground disturbance. Anomalies corresponding to geological variation and former field boundaries were also noted. No anomalies of obvious archaeological potential have been identified within the survey area, yet anomalies of possible archaeological origin have been detected. Consequently the archaeological potential of this site is deemed to be low to moderate.

WYAS
Archaeological
Services

Report Information

Client:	MAP Archaeological Practice
Address:	Showfield Lane, Malton, North Yorkshire, YO17 6BT
Report Type:	Geophysical Survey
Location:	Sowerby, Thirsk
County:	North Yorkshire
Grid Reference:	SE 42245 80720
Period(s) of activity:	Modern
Report Number:	2825
Project Number:	6264
Site Code:	LIK15
OASIS ID:	Archaeol11-231936; Archaeol11-232430
Planning Application No.:	N/A
Museum Accession No.:	N/A
Date of fieldwork:	November 2015
Date of report:	November 2015
Project Management:	Chris Sykes BA MSc
Fieldwork:	Chris Sykes BA MSc
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	Emma Brunning BSc MCIfA
Report:	Ashely Green
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Photography:	Chris Sykes
Research:	N/A

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

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1 Introduction

Archaeological Services WYAS (ASWYAS) was commissioned by MAP Archaeological Practice (the Client) on behalf of their clients Linden Homes North and Taylor Wimpey, to undertake a geophysical (magnetometer) survey on the outskirts of Sowerby in Thirsk, North Yorkshire, to inform a proposed planning application. The work was undertaken in accordance with a Project Design (Green 2015). Guidance contained within the National Planning Policy Framework (DCLG 2012) was also followed, in line with current best practice (CIfA 2014; David *et al*. 2008). The survey was carried out on 20th and 30th November 2015, to provide additional information on the archaeological resource of the site.

Site location, topography and land-use

The Proposed Development Area (PDA) is located on the south-west periphery of Thirsk, approximately 35km north-east of Harrogate and 14km south of Northallerton, centred at SE 42245 80720 (see Fig. 1). The PDA comprises agricultural land with modern housing being built to the immediate south and a railway line to the west.

The PDA is composed of gently undulating agricultural land. The site is at an elevation of 33m above Ordnance Datum (aOD) across the survey area.

Soils and geology

The underlying bedrock for the site is from the Mercia mudstone group, a sedimentary bedrock (British Geological Survey 2015). Superficial soil deposits are sandy/silty/gravelly of the Breighton sand formation. The soils belong to the Newport 1 and Blackwood formations, identified as sandy and coarse loamy soils sometimes affected by groundwater (Soil Survey of England and Wales 1983).

2 Archaeological Background

Whilst no known archaeological sites are located within the immediate survey area, an analysis of the Pastscape database demonstrated archaeological evidence within 1km of the survey area. Cropmarks resembling a ditch feature possibly associated with an enclosure is visible on aerial photographs to the south of the survey area (Pastscape 2015). Cartographic evidence also suggests a possible Roman Road approximately 300m north-east of the survey area. Additionally, a pre-conquest watch tower is located on Gravel Hole Lane east of the survey area (Pastscape 2015).

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 processed magnetometer data at a scale of 1:2500. Figure 3 shows processed greyscale magnetometer data at a scale of 1:1000. The minimally processed XY traceplot is presented in Figure 4 at a scale of 1:1000. An overall interpretation of data is shown in Figure 5, again 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

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.

An area of disturbance occurs around a former mound of material, which has been reduced. Similarly dumped building material has been detected, and is visible on the ground surface.

Geological anomalies

In the south-west portion of the survey area discrete low magnitude anomalies (areas of magnetic enhancement) have been identified. These are interpreted as geological in origin and are thought to be caused by variations in the depth and composition of the soils and the superficial deposits from which they derive. In this instance, these anomalies are likely to be a result of variations in geological formations associated with waterlogged areas or modern disturbance.

Agricultural anomalies

Three segments of former field boundaries can be seen across the dataset. These were indicated on OS mapping from 1893, having been removed by 1956. Modern ploughing was also detected in the north-east portion, aligned north-south along the road and east-west across the rest of the PDA.

Possible archaeological anomalies

Unless otherwise stated, anomalies of possible archaeological origin are thought to be caused by infilled cut features, such as ditches. They cannot be satisfactorily interpreted as either being modern, agricultural or geological in origin and are therefore classed as possible archaeological anomalies.

Possible archaeological anomalies (**P1**-**P4**) are located in close proximity to the reduced mound. The anomalies are categorised by the morphology and magnitude of the responses; however, they have no clear pattern that can be positively associated with an archaeological feature. Anomalies (**P5**-**P6**), located along the north-east periphery of the survey area, also have the potential to be of an archaeological origin. These anomalies have been assigned in this category due to their similarities in magnetic response to either archaeological or

geological anomalies. A definitive interpretation of the origin of these anomalies cannot be reached due to the ground disturbance.

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 survey has not detected anomalies that can be considered to be of definitive archaeological origin. Large areas of magnetic disturbance that have been identified are attributed to ground disturbance caused by ploughing. Former field boundaries were identified in the east portion of the survey area as indicated by OS mapping dated 1893. Responses consistent with variations in the underlying geology have also been identified. Anomalies consistent with both a geological or archaeological origin were classed as possible archaeology. These anomalies have no clear pattern definitively associated with an archaeological feature, possibly due to the ground disturbance, and as such they cannot be positively classed as archaeological anomalies. Consequently the archaeological potential of this site is deemed to be low to moderate.

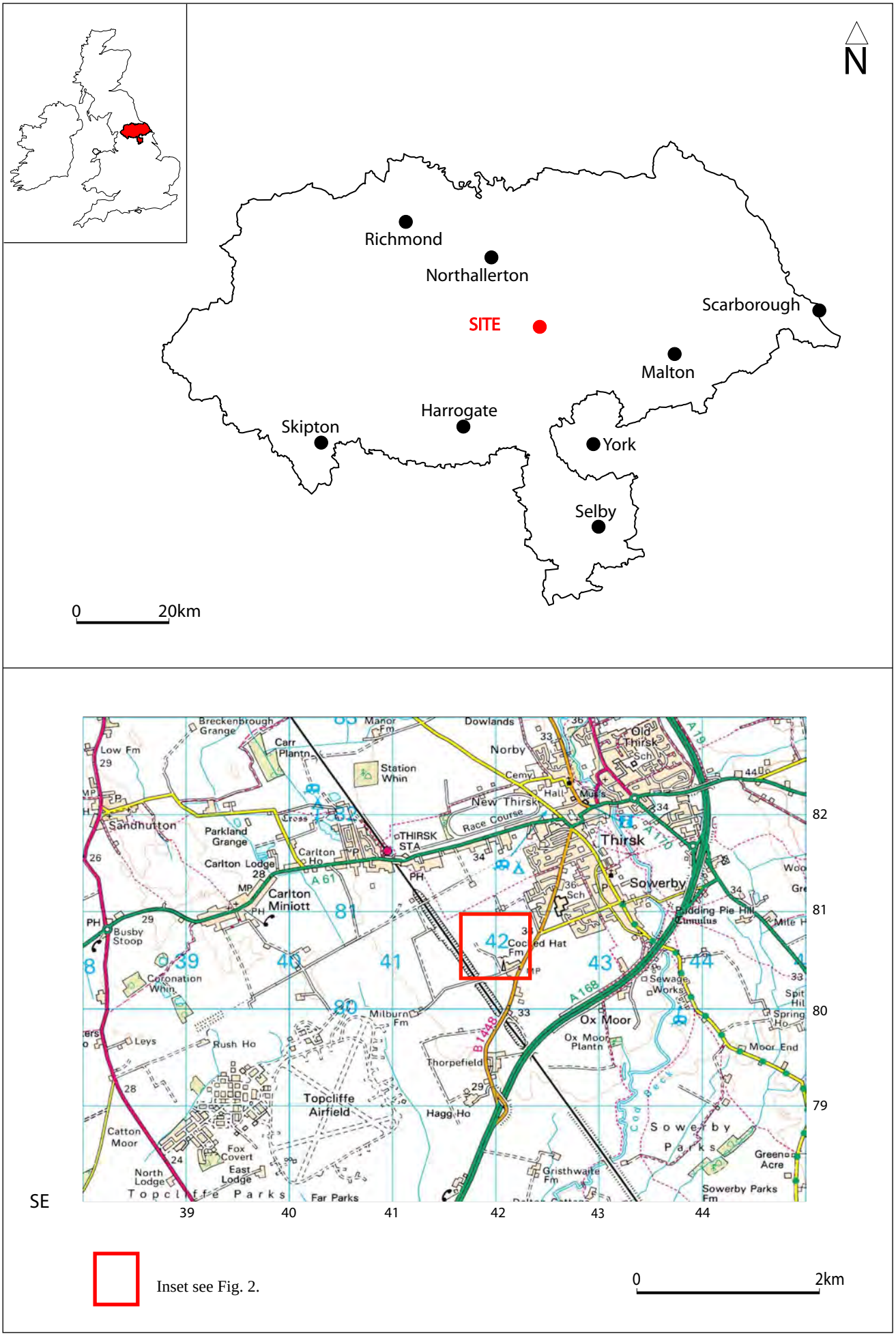

Fig. 1. Site location

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

SURVEY BOUNDARY

UNSURVEYABLE LAND

N

4808 00

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

4419 00

4421 00

0 50m

Fig. 3. Processed greyscale of magnetometer data (1:1000 @ A3)

UNSURVEYABLE LAND

N

480800

20.0 nT/cm

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

441900

442100

0 50m

Fig. 4. XY traceplot of minimally processed magnetometer data (1:1000 @ A3)

UNSURVEYABLE LAND

TYPE OF ANOMALY		INTERPRETATION
	MAGNETIC DISTURBANCE	FERROUS MATERIAL
	LINEAR TREND	AGRICULTURAL
	MAGNETIC ENHANCEMENT	GEOLOGY
	MAGNETIC ENHANCEMENT	POSSIBLE ARCHAEOLOGY
	DIPOLAR ISOLATED	FERROUS MATERIAL
	LINEAR TREND	FIELD BOUNDARY

N

P1

P2

P3

P4

P5

P6

480850

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

419000

421000

0 50m

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

Plate 1. General view of survey area, looking south-west

Plate 2. General view of survey area, looking east

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 North Yorkshire Environment Record).

Appendix 4: OASIS Form

OASIS DATA COLLECTION FORM: England

Printable version

OASIS ID: archaeol11-231936

Project details

Project name	Land at Thirsk
Short description of the project	A geophysical (magnetometer) survey, covering approximately 3.5 hectares, was carried out on agricultural land located west of the B1448 at Cocked Hat Park near Sowerby, Thirsk, North Yorkshire. The survey was undertaken prior to the proposed development of the site. Large areas of magnetic disturbance were present caused by dumping and ground disturbance. Anomalies corresponding to geological variation and former field boundaries were also noted. No anomalies of obvious archaeological potential have been identified within the survey area, yet anomalies of possible archaeological origin have been detected. Consequently the archaeological potential of this site is deemed to be low.
Project dates	Start: 20-11-2015 End: 20-11-2015
Previous/future work	No / Not known
Type of project	Field evaluation
Site status	None
Current Land use	Cultivated Land 4 - Character Undetermined
Monument type	N/A None
Significant Finds	N/A None
Methods & techniques	"Geophysical Survey"
Development type	Not recorded
Prompt	Planning condition
Position in the planning process	Not known / Not recorded
Solid geology (other)	Mercia Mudstone
Drift geology	SAND AND GRAVEL OF UNCERTAIN AGE OR ORIGIN
Techniques	Magnetometry

Project location

Country	England
Site location	NORTH YORKSHIRE HAMBLETON THIRSK Thirsk
Study area	3.5 Hectares
Site coordinates	SE 42245 80720 54.220295558343 -1.35203313231 54 13 13 N 001 21 07 W Point

Height OD / Depth	Min: 33m Max: 34m

Project creators

Name of Organisation	Archaeological Services WYAS
Project brief originator	MAP Archaeological Practice Ltd
Project design originator	Archaeological Services WYAS
Project director/manager	C. Sykes
Project supervisor	C. Sykes

Project archives

Physical Archive Exists?	No
Digital Archive recipient	MAP Archaeological Practice
Digital Contents	"Survey"
Digital Media available	"Geophysics","Images raster / digital photography","Images vector","Survey"
Paper Archive recipient	N/A
Paper Contents	"Survey"
Paper Media available	"Survey "

Project bibliography 1

Publication type	Grey literature (unpublished document/manuscript)
Title	Land at Thirsk
Author(s)/Editor(s)	Green, A.
Other bibliographic details	2825
Date	2015
Issuer or publisher	ASWYAS
Place of issue or publication	Morley, Leeds
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Entered by	Ashely Green (ashely.green@aswyas.com)
Entered on	26 November 2015

OASIS:

Please e-mail Historic England for OASIS help and advice
 Created by Jo Gilham and Jen Mitcham, email Last modified Wednesday 9 May 2012
Cite only: http://www.oasis.ac.uk/form/print.cfm for this page

OASIS DATA COLLECTION FORM: England

Printable version

OASIS ID: archaeol11-232430

Project details

Project name	Land at Thirsk
Short description of the project	A geophysical (magnetometer) survey, covering approximately 3.5 hectares, was carried out on agricultural land located west of the B1448 at Cocked Hat Park near Sowerby, Thirsk, North Yorkshire. The survey was undertaken prior to the proposed development of the site. Large areas of magnetic disturbance were present caused by dumping and ground disturbance. Anomalies corresponding to geological variation and former field boundaries were also noted. No anomalies of obvious archaeological potential have been identified within the survey area, yet anomalies of possible archaeological origin have been detected. Consequently the archaeological potential of this site is deemed to be low to moderate.
Project dates	Start: 20-11-2015 End: 30-11-2015
Previous/future work	No / Not known
Type of project	Field evaluation
Site status	None
Current Land use	Cultivated Land 4 - Character Undetermined
Monument type	N/A None
Significant Finds	N/A None
Methods & techniques	"Geophysical Survey"
Development type	Not recorded
Prompt	Planning condition
Position in the planning process	Not known / Not recorded
Solid geology (other)	Mercia Mudstone
Drift geology	SAND AND GRAVEL OF UNCERTAIN AGE OR ORIGIN
Techniques	Magnetometry

Project location

Country	England
Site location	NORTH YORKSHIRE HAMBLETON THIRSK Land at Thirsk
Study area	5 Hectares
Site coordinates	SE 42245 80720 54.220295558343 -1.35203313231 54 13 13 N 001 21 07 W Point

Height OD / Depth	Min: 33m Max: 34m

Project creators

Name of Organisation	Archaeological Services WYAS
Project brief originator	MAP Archaeological Practice Ltd
Project design originator	Archaeological Services WYAS
Project director/manager	C. Sykes
Project supervisor	C. Sykes

Project archives

Physical Archive Exists?	No
Digital Archive recipient	MAP Archaeological Practice
Digital Contents	"Survey"
Digital Media available	"Geophysics","Images raster / digital photography","Images vector","Survey","Text"
Paper Archive recipient	N/A
Paper Contents	"Survey"
Paper Media available	"Survey "

Project bibliography 1

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Description	A4 report with A3 figures

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Entered on	1 December 2015

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