WYAS Archaeological Services

Land off Beech Drive

Thornton

Leicestershire

Geophysical Survey

Report no. 3389
February 2020

Client: Barwood Homes Limited

Land off Beech Drive
Thornton
Leicestershire

Geophysical Survey

Summary

A geophysical (magnetometer) survey, was undertaken on approximately 3 hectares on land off Beech Drive, Thornton, Leicestershire. Faint evidence of agricultural anomalies have been detected which possibly relate to medieval cultivation. Ferrous and magnetic disturbance responses have also been identified along with isolated anomalies of a geological origin, in which a curvilinear trend may be of some archaeological interest, but is tentative. Based upon the results from this survey, the archaeological potential is of this site, is low.

WYAS
Archaeological
Services

Report Information

Client:	Barwood Homes Ltd
Address:	Grovelands Business Park, West Haddon Road, East Haddon, Northamptonshire, NN6 8FB
Report Type:	Geophysical Survey
Location:	Thornton
County:	Leicestershire
Grid Reference:	SK 46422 07759
Period(s) of activity:	Modern
Report Number:	3389
Project Number:	X101
Site Code:	TNC20
OASIS Number:	archaeol11-384876
Date of fieldwork:	January 2020
Date of report:	February 2020
Project Management:	Emma Brunning BSc MCIfA
Fieldwork:	Jake Freeman BA
	Amy Chatterton BSc MA
Report:	Christopher Sykes BA MSc MCIfA
Illustrations:	Christopher Sykes
Research:	Christopher Sykes

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

Nepshaw Lane South, Morley, Leeds LS27 7JQ
Telephone: 0113 535 0163
Email: admin@aswyas.com

Contents

Document Issue Record

Ver	Status	Author(s)	Reviewer	Approver	Date
1.0	Draft	CS	DW	EB	Feb 20
2.0	Issue	CS	DW	EB	Feb 20

List of Figures

List of Plates

1 Introduction

Archaeological Services WYAS (ASWYAS) were commissioned by Environmental Dimension Partnership (EDP) on behalf of their client Barwood Homes to undertake a geophysical (magnetometer) survey on Land off Beech Drive, Thornton, Leicestershire. Guidance contained within the National Planning Policy Framework (MHCLG 2019) was followed, in line with current best practice (CIfA 2014; Schmidt *et al*. 2015). The survey was carried out between 29th and 30th January 2020, in order to provide additional information on the archaeological resource of the Proposed Development Area (PDA).

Site location, topography and land-use

The site is situated on agricultural land directly southeast of the residential properties along Beech Drive, located centrally within the village of Thornton, approximately 3.7km to the southwest of Markfield, and centred on SK 46422 07759 (Fig. 1). It is bound to the northeast by residential properties of Main Street, to the southeast by strip fields and pasture fields to the southwest. The survey area, comprises of a single diamond shaped field, covering an area of approximately 3ha with a strip of new trees across the southern part of the site (see plates 1-4). The topography of the site slopes from 140m above Ordnance Datum (aOD) in the east, down to approximately 130m aOD in the west.

Soils and geology

The survey area sits upon a band of three bedrock layers. The first, comprises the sedimentary Gunthorpe member mudstone, the second, is the Cotgrave sandstone member and finally, the Edwalton member of mudstone, all of which were formed during the Triassic Period. No superficial deposits have been recorded (British Geological Survey 2020). The soils of the area are characterized as belonging to the Whimple 3 association (572f) and are described as fine loams of silts over clay (Soil Survey of England and Wales 1983).

2 Archaeological Background

A Desk-based Assessment (DBA) (Dawson 2016) for the survey area exists and was used as a basis for the archaeological background of the site. The focus of this archaeological background is upon sub-surface remains likely to be encountered within a 1km radius of the site, supplemented with additional information from the Heritage Gateway website.

Whilst there are no identified artefacts from the prehistoric period, there is evidence of a possible Bronze Age ring ditch, to the north of Thornton reservoir (MLE9007). To the south of the site, an enclosure with a suggested prehistoric data has been identified from 1970's aerial photographs (MLE2682).

Evidence of Roman activity within he wider landscape has also been recorded. There is a possible Roman site to the north of the reservoir which has identified through pottery scatters (MLE2685). This may have been a settlement site associated perhaps linked to the *Via*

Devana, the road between Colchester and Chester which is located approximately 1km to the north (MLE4345).

Thornton itself has the plan of a linear medieval settlement with rows of tofts and crofts preserved in the modern buildings fronting the northeast and southwest orientated Main Street. These medieval land divisions may also have been depicted on First Edition OS mapping (Old-Maps 2020) of the site which shows that the survey area has changed little in size or shape. Further medieval agricultural activity is also present in the form of ridge and furrow identified to the northwest of the survey area.

In the wider landscape medieval activity is also present in the form of Bagworth Park located towards the northwest of the village. This has its origins as part of a medieval deerpark which used to belong to the Bishops of Durham until 1411 after which it passed into private ownership (MLE2695). The park is depicted on Saxton's map of 1576 and contains fishponds which are likely to have a medieval date (MLE921288).

Located just to the northwest of the survey area is the proposed site of a watermill and perhaps a windmill (MLE2680). In 1279 Anthony le Bek is recorded as owning a watermill and a windmill and by 1373 a watermill is also recorded again. The medieval watermill is probably on the site of the post-medieval Thornton Mill (MLE 2683).

3 Aims and Methodology

The aims and objectives of the programme of geophysical survey were to gather sufficient information to establish the presence/absence, character and extent, of any archaeological remains within the specific area to inform an assessment of the archaeological potential of the site. 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 R6 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 4 (Geoscan Research) and in-house 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 1:1000. 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. Appendix 4 includes the Oasis form.

The survey methodology, report and any recommendations comply with guidelines outlined by the European Archaeological Council (Schmidt *et al.* 2015) 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 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 to 5)

Ferrous and magnetic disturbance 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. 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.

Around the edges of the two areas, there is evidence of magnetic disturbance, which is associated with magnetic material used to create fences and boundaries for properties to the northeast and northwest.

An isolated area of magnetic disturbance in area 2 has been caused by a telegraph pole within the centre of the survey area.

Geological anomalies

Low magnitude responses have been recorded throughout the data and have been interpreted as having a geological origin. It is thought that the responses have been detected because of the variation in the composition and depth of the soils and deposits of superficial material in which they derive.

A magnetically weak curvilinear trend has been recorded along the western boundary of area 2. This is situated midway down the boundary measuring approximately 15m in diameter and is just about visible against the background levels. Whilst it has been interpreted as geology, there is the possibility of this anomaly being of an archaeological origin, such as a roundhouse, especially taking into account the location being on a south facing slope. However, this interpretation must be taken with caution.

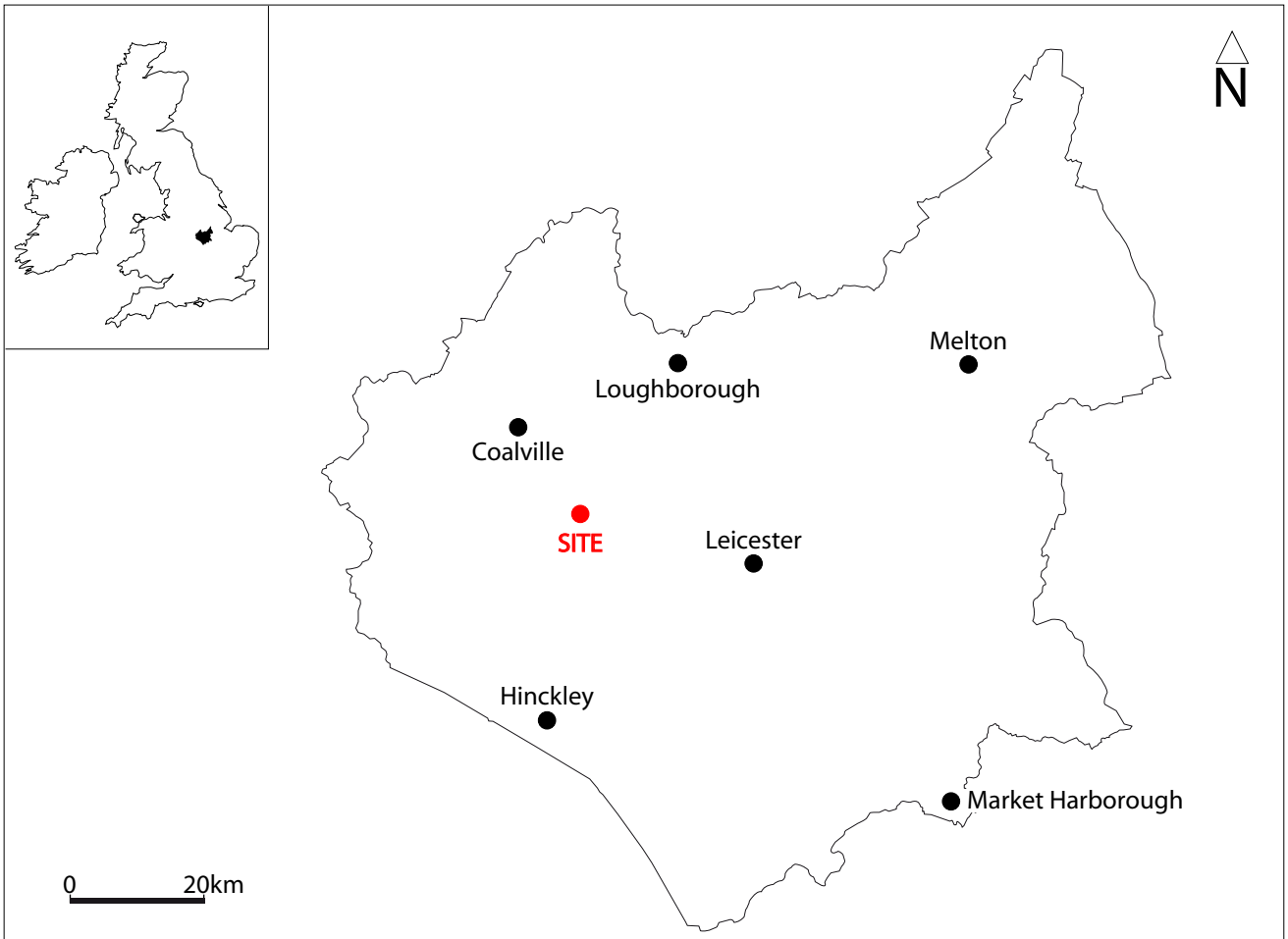
Agricultural anomalies

Faint and low magnitude responses have been recorded throughout the data and have been interpreted as being of an agricultural origin. These are orientated northeast to southwest and follow the course of former field boundaries on Ordnance Survey (OS) mapping. It is possible, due to the surrounding medieval tofts and crofts that these agricultural trends are ridge and furrow cultivation, forming part of a wider medieval landscape.

5 Conclusions

The magnetic survey has detected anomalies throughout including a weak curvilinear trend which has been interpreted as geological but there is the possibility that it is of an archaeological origin such as a roundhouse. Parallel linear trends have been recorded suggesting likely medieval ridge and furrow, although they could also be of a more modern date.

Areas of magnetic disturbance and discrete ferrous anomalies have also been identified. Overall, based on the findings of this geophysical survey, the archaeological potential of this site is considered to be low.



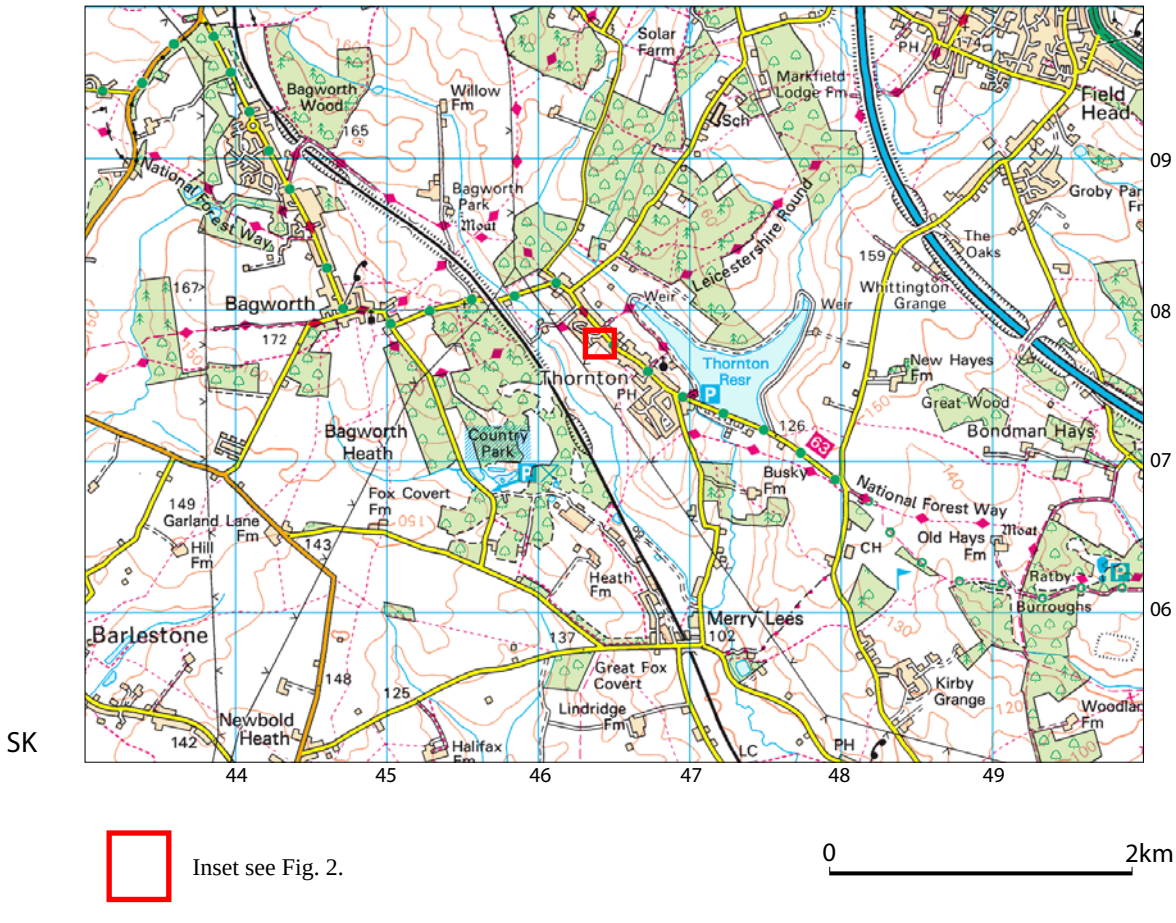
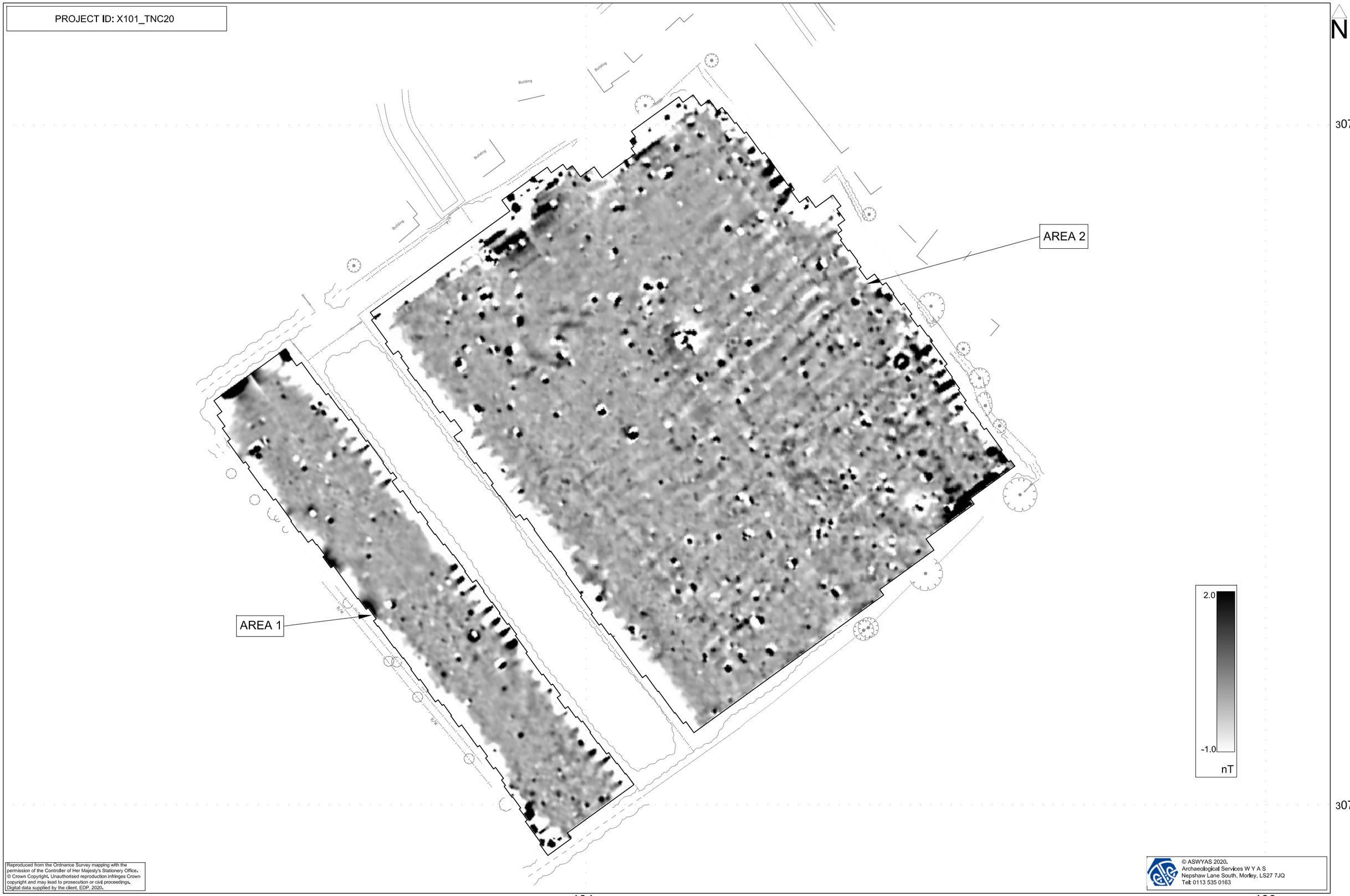


Fig. 1. Site location

Fig. 2. Survey location showing processed greyscale of magnetometer data and plate locations (1:1000 @ A3)

PROJECT ID: X101_TNC20



Archaeological Services W Y A S
Nepshaw Lane South, Morley, LS27 7JQ
Tel: 0113 535 0163

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

PROJECT ID: X101_TNC20

N

307800

AREA 2

AREA 1

15.0 nT/cm

307600

Archaeological Services W Y A S
Nepshaw Lane South, Morley, LS27 7JQ
Tel: 0113 535 0163

464600

466600

0 50m

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

PROJECT ID: X101_TNC20

TYPE OF ANOMALY		INTERPRETATION
•	DIPOLAR ISOLATED	FERROUS MATERIAL
	MAGNETIC DISTURBANCE	FERROUS MATERIAL
	LINEAR TREND	MODERN PLOUGHING
	MAGNETIC ENHANCEMENT	GEOLOGY
	LINEAR TREND	GEOLOGY

N

AREA 2

AREA 1

3078 00

3076 00

4464 00

4466 00

0 50m

Archaeological Services W Y A S
Nepshaw Lane South, Morley, LS27 7JQ
Tel: 0113 535 0163

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

Plate 1. General view of area 1, facing southeast

Plate 2. General view of area 2, facing east

Plate 3. General view of area 2, facing southwest

Plate 4. General view of area 2, facing north

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.

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 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.

Appendix 2: Survey location information

An initial survey station was established using a Trimble VRS differential Global Positioning System (Trimble R6 model). The data was 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 than 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 Historic England Geophysical Survey Database after the contents of the report are deemed to be in the public domain (i.e. available for consultation in the Leicestershire Historic Environment Record).

Appendix 4: OASIS Form

OASIS DATA COLLECTION FORM: England

OASIS ID: archaeol11-384876

Project details

Project name	Land off Beech Drive, Thornton, Leicestershire
Short description of the project	A geophysical (magnetometer) survey, was undertaken on approximately 3 hectares on land off Beech Drive, Thornton, Leicestershire. Faint evidence of agricultural anomalies have been detected which possibly relate to medieval cultivation. Ferrous and magnetic disturbance responses have also been identified along with isolated anomalies of a geological origin, in which a curvilinear trend may be of some archaeological interest, but is tentative. Based upon the results from this survey, the archaeological potential is of this site, is low.
Project dates	Start: 29-01-2020 End: 30-01-2020
Previous/future work	No / Not known
Any associated project reference codes	3389 - Sitecode
Type of project	Field evaluation
Monument type	NONE None
Significant Finds	NONE None
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	TRIASSIC MUDSTONES
Drift geology (other)	silts and clay
Techniques	Magnetometry

Project location

Country	England
Site location	LEICESTERSHIRE HINCKLEY AND BOSWORTH BAGWORTH Beech Drive, Thornton

Study area	3 Hectares
Site coordinates	SK 46422 07759 52.665208340842 -1.313501296125 52 39 54 N 001 18 48 W Point
Height OD / Depth	Min: 130m Max: 140m

Project creators

Name of Organisation	Archaeological Services WYAS
Project brief originator	Environmental Dimension Partnership
Project design originator	Environmental Dimension Partnership
Project director/manager	E Brunning
Project supervisor	J Freeman

Project archives

Physical Archive Exists?	No
Digital Archive recipient	Environmental Dimension Partnership
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	Land off Beech Drive, Thornton
Author(s)/Editor(s)	Sykes, C
Date	2020
Issuer or publisher	ASWYAS
Place of issue or publication	Leeds
Description	A4 report with A3 figures

Entered by	Emma Brunning (emma.brunning@aswyas.com)
Entered on	14 February 2020

Bibliography

British Geological Survey, 2020. www.bgs.ac.uk/discoveringGeology/geologyOfBritain/viewer.html. British Geological Survey (viewed February 2020)

CIfA, 2014. *Standard and Guidance for Archaeological Geophysical Survey.* Chartered Institute for Archaeologists

Dawson, M 2016 *Land at Beech Drive, Thornton, Leicestershire, Archaeology Desk Based Assessment CgMs Ref MD/17896* unpublished

Kearey, P., and Brooks, M., *An Introduction to Geophysical Exploration (2nd Edition)* Blackwell Science

MHCLG, 2019. *National Planning Policy Framework*. Ministry of Housing, Communities and Local Government

Old Maps, 2020. www.old-maps.co.uk (viewed February 2020)

Schmidt, A., P. Linford, N. Linford, A. David, C. Gaffney, A. Sarris and J. Fassbinder, 2015. *EAC Guidelines for the use of Geophysics in Archaeology: Questions to Ask and Points to Consider. EAC Guidelines 2* Europae Archaeologiae Consilium

Soil Survey of England and Wales, 1983. Soils of Midland and Western England Sheet 3. Soil Survey of England and Wales