WYAS Archaeological Services

Land off Melton Road

Queniborough

Leicestershire

Geophysical Survey

Report no. 3017
September 2017

Client: CgMs Consulting

Land off Melton Road, Queniborough, Leicestershire

Geophysical Survey

Summary

A geophysical (magnetometer) survey, covering approximately 10.5 hectares, across three fields, was undertaken on land to the north of Melton Road, Queniborough, Leicestershire. This was part of a programme of archaeological works in advance of a proposed development. Magnetometry has detected known archaeology through the middle of the survey area, with trackways, circular features and an enclosure in evidence. Anomalies of a possible archaeological origin have also been detected. Geological and agricultural anomalies have been identified, as have ferrous and magnetic disturbance responses, across the site. Overall the archaeological potential of the site is deemed to be low to moderate in the west, rising from moderate to high in the east.

WYAS
Archaeological Services

Report Information

Client:	CgMs Consulting Ltd
Address:	Cafferata Way, Newark NG24 2TN
Report Type:	Geophysical Survey
Location:	Queniborough
County:	Leicestershire
Grid Reference:	SK 63767 12703
Period(s) of activity:	Roman - modern
Report Number:	3017
Project Number:	6832
Site Code:	QUE17
OASIS ID:	Archaeol11-298513
Date of fieldwork:	September 2017
Date of report:	September 2017
Project Management:	Christopher Sykes BA MSc MCIfA
Fieldwork:	Alastair Trace BSc MSc
	Jake Freeman BSc
Report:	Alastair Trace
Illustrations:	Alastair Trace
Photography:	Alastair Trace
Research:	Christopher Sykes

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

Nepshaw Lane South, Morley, Leeds LS27 7JQ
Telephone: 0113 383 7500.
Email: admin@aswyas.com

Contents

List of Figures

List of Plates

1 Introduction

Archaeological Services WYAS (ASWYAS) were commissioned by CgMs to undertake a geophysical (magnetometer) survey on agricultural land to the north of Melton Road, Queniborough and to the east of the residential properties of New Zealand Road. This is in advance of a possible residential development detailed in the Charnwood Strategic Housing Land Availability Assessment of 2016. Guidance contained within the National Planning Policy Framework (DCLG 2012) was followed, in line with current best practice (CIfA 2014; David *et al*. 2008). The survey was carried out between the 11th and 13th September 2017.

Site location, topography and land-use

The site is located approximately 15km to the northeast of Leicester and approximately 16km to the southwest of Melton Mowbray (see Fig. 1). Ground cover consisted of freshly harvested hay. The survey area, totaling approximately 10.5ha, is centred at SK 63798 12774 and the topography of this site is level with a height above Ordnance Datum (aOD) of 52m.

Soils and geology

The underlying geology comprises Branscombe Mudstone with superficial deposits of Syston Member Sands and Gravels having been recorded (BGS 2017). Soils of the area belong to the Escrick 2 association (572q) consisting of well drained coarse loams (SSEW 1983).

2 Archaeological Background

The following information has been taken from the desk-based assessment for the survey area (CgMs 2017).

Aerial photography has recorded a linear cropmark (MLE 782) which extends across the survey area. In the eastern field the cropmarks have regularly spaced spur anomalies which project southwards. At the terminus of the eastern spur, a circular feature has been identified. To the north, a triangular shaped possible enclosure has also been identified. The cropmark also extents westwards, away from Three Ways Farm. In the Historic Environment Record (HER), these have been interpreted as a trackway and field system.

To the south of the survey area, Melton Road has been identified as a Roman road (MLE 8839), later evolving into a turnpike.

Again to the southeast of the survey area, geophysical survey, trial trenching and excavation, in advance of residential development of Wetherby Close, discovered Neolithic pits (MLE 9260).

LiDAR analysis was undertaken by Birmingham Archaeology in 2005 along the proposed Ashby Folville to Thurcaston pipeline, which included the southeast corner of the survey

area. They identified palaeochannels and some probable archaeological features along the route, but none within the survey area itself.

3 Aims, Methodology and Presentation

The main aim of the geophysical survey was to provide additional information on the known archaeology within the area. To achieve this, a magnetometer survey covering all available 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 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 shows a more detailed site location plan at a scale of 1:2000 with an overall interpretation of the survey area in Figure 3. The processed and minimally processed data, together with an interpretation of the survey results are presented in Figures 4 to 9 inclusive at a scale of 1:1250.

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 completed 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 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 Figs 3 to 9)

Archaeological anomalies

A magnetic response which corresponds with the known cropmark (**A**), detailed in the aerial photography (CgMs 2017) has been detected (Fig. 6). This trackway anomaly is bisected by Three Ways Farm and measures approximately 78m in the western field and 88m in the eastern field. It is orientated along a northeast to southwest axis and has been identified as MLE 782.

In the large eastern field, where the anomaly is at its most prominent, a series of spurs (**B**) to the south have also been identified. Of these, the collection of anomalies closest to Three Ways Farm, appear to form an enclosure with internal divisions (Fig. 6) which measures approximately 23m x 17m.

At the terminus of the easternmost spur, a putative circular anomaly (**C**) has been discovered. It's extrapolated diameter measures approximately 7m (Fig. 6).

To the north of **A,** a linear spur (**D**), forming the western boundary of a triangular enclosure identified in the aerial photographs, has been recorded. The relationship between the eastern part of this enclosure and anomaly **E** is not clear. Anomaly **E**, located within this enclosure, defines a sub-circular area and may represent a truncated roundhouse or a small sub-enclosure.

Possible archaeological anomalies

Within the area of known archaeology there are a number of anomalies which have been given a possible archaeological interpretation. These are most prominent within the eastern field, notably close to Melton Road. These responses on the periphery of the area may represent geological material which has been brought to the surface via modern agricultural practice, but given their location within an area of known archaeological activity, a possible archaeological interpretation has been given (Fig. 6).

Geological anomalies

Small discrete low magnitude anomalies have been identified throughout and are thought to be caused by variations in the depth and composition of the soils and the superficial deposits from which they derive.

Although previously identified via LiDAR, no obvious collection of anomalies have been interpreted as a palaeochannel or remnant material from the course of the Churnell Brook.

Agricultural anomalies

The small field in the northwest corner of the survey area has revealed evidence of ridge and furrow. This contrasts with the close plough furrows, seen across the east and west fields, indicative of modern agricultural practice.

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. 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 in this survey to suggest anything other than a random background scatter of ferrous debris in the plough-soil.

5 Conclusions

This magnetometer survey has been able to detect known archaeological features within the landscape reinforcing the findings of earlier aerial photographs of the site. These indicate enclosures, sub-enclosures and/or a putative roundhouse. Some magnetic anomalies, with a possible archaeological origin have also been detected in the eastern field, with a number located close to Melton Road.

Across the survey area, anomalies indicative of geological material which has been brought to the surface, have been detected. Modern plough trends and those indicative of ridge and furrow have also been detected.

Ferrous responses have been identified around the periphery of the survey area and within the fields, along with a service which runs the length of the eastern field, to the east of Three Ways Farm.

Based on this survey, the archaeological potential of this site is low to moderate in the west and north, rising from moderate to high in the east.

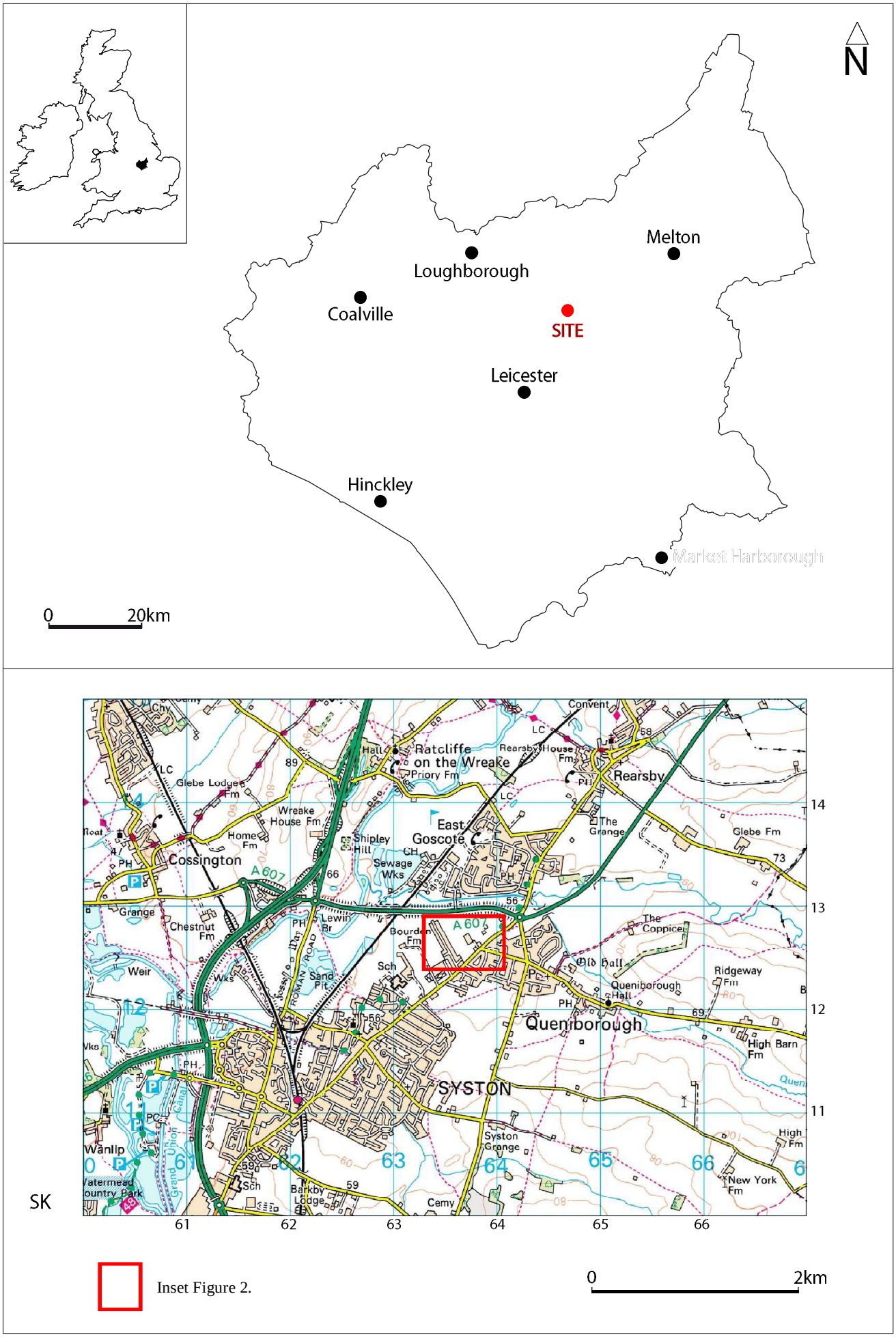

Fig. 1. Site location

PROJECT ID: QUE17	
	SURVEY BOUNDARY
	SECTOR BOUNDARY
1	LOCATION AND DIRECTION OF PLATES

N

2.0
-1.0
nT

SECTOR 1
SEE FIGS 4-6

SECTOR 2
SEE FIGS 7-9

Three Ways Farm

NEW ZEALAND LANE

DOSNEY AVENUE

CURZON CLOSE

SYSTON ROAD

AVENUE CL

AVENUE ROAD

MARSDEN AVENUE

Nursery

Tank

Gas Gov

+55.6m

+56.0m

+58.3m

+57.0m

3128 00

3126 00

4634 00

4636 00

4638 00

4640 00

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

0 50m

Fig. 2. Survey location showing greyscale magnetometer data (1:2000 @ A3)

PROJECT ID: QUE17	
	SECTOR BOUNDARY

TYPE OF ANOMALY		INTERPRETATION
•	DIPOLAR ISOLATED	FERROUS MATERIAL
	LINEAR TREND	SERVICE PIPE
	MAGNETIC DISTURBANCE	FERROUS MATERIAL
	LINEAR TREND	RIDGE AND FURROW
	LINEAR TREND	AGRICULTURAL
	MAGNETIC ENHANCEMENT	GEOLOGY
	MAGNETIC ENHANCEMENT	ARCHAEOLOGY?
	MAGNETIC ENHANCEMENT	ARCHAEOLOGY

N

312800

312600

463400 463600 463800 464000

D E A B C F A

SECTOR 1
SEE FIGS 4-6

SECTOR 2
SEE FIGS 7-9

Three Ways Farm

NEW ZEALAND LANE

DOSNEY AVENUE

CURZON CLOSE

SYSTON ROAD

AVENUE CL

AVENUE ROAD

MARSDEN AVENUE

Nursery

Tank

+55.6m

+56.0m

+56.3m

+57.0m

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

0 50m

Fig. 3. Overall interpretation of magnetometer data (1:2000 @ A3)

PROJECT ID: 6832_QUE17

SECTOR BOUNDARY

N

312800

312600

463600

463800

2.0

-1.0

nT

NEW ZEALAND LANE

Three Ways Farm

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

0 30m

Fig. 4. Processed greyscale magnetometer data; Sector 1 (1:1250 @ A3)

PROJECT ID: 6832_QUE17

SECTOR BOUNDARY

N

15.0 nT/cm

Three Ways Farm

NEW ZEALAND LANE

312800

312600

463600

463800

0 30m

Fig. 5. XY traceplot of minimally processed magnetometer data; Sector 1 (1:1250 @ A3)

PROJECT ID: 6832_QUE17

SECTOR BOUNDARY

TYPE OF ANOMALY		INTERPRETATION
	DIPOLAR ISOLATED	FERROUS MATERIAL
	DIPOLAR LINEAR	SERVICE PIPE
	MAGNETIC DISTURBANCE	FERROUS MATERIAL
	LINEAR TREND	RIDGE AND FURROW
	LINEAR TREND	AGRICULTURAL
	MAGNETIC ENHANCEMENT	GEOLOGY
	MAGNETIC ENHANCEMENT	ARCHAEOLOGY?
	MAGNETIC ENHANCEMENT	ARCHAEOLOGY

N

312800

312600

463600

463800

A

B

C

D

E

F

F

Three Ways Farm

1578

1580

NEW ZEALAND LANE

75

73

69

65

61

57

55

47

42

0 30m

Fig. 6. Interpretation of magnetometer data; Sector 1 (1:1250 @ A3)

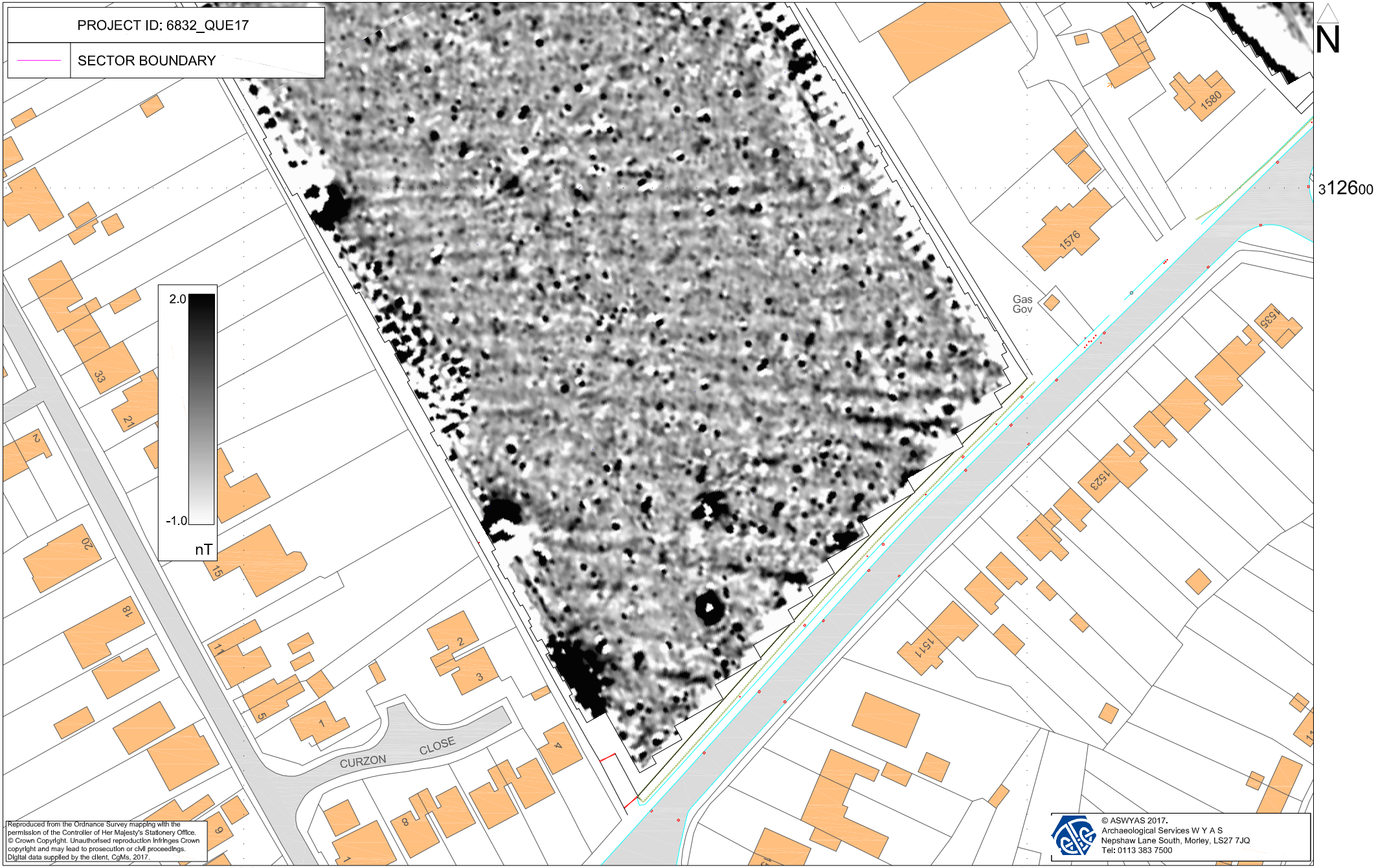

Fig. 7. Processed greyscale magnetometer data; Sector 2 (1:1250 @ A4)

Fig. 8. XY traceplot of minimally processed magnetometer data; Sector 2 (1:1250 @ A4)

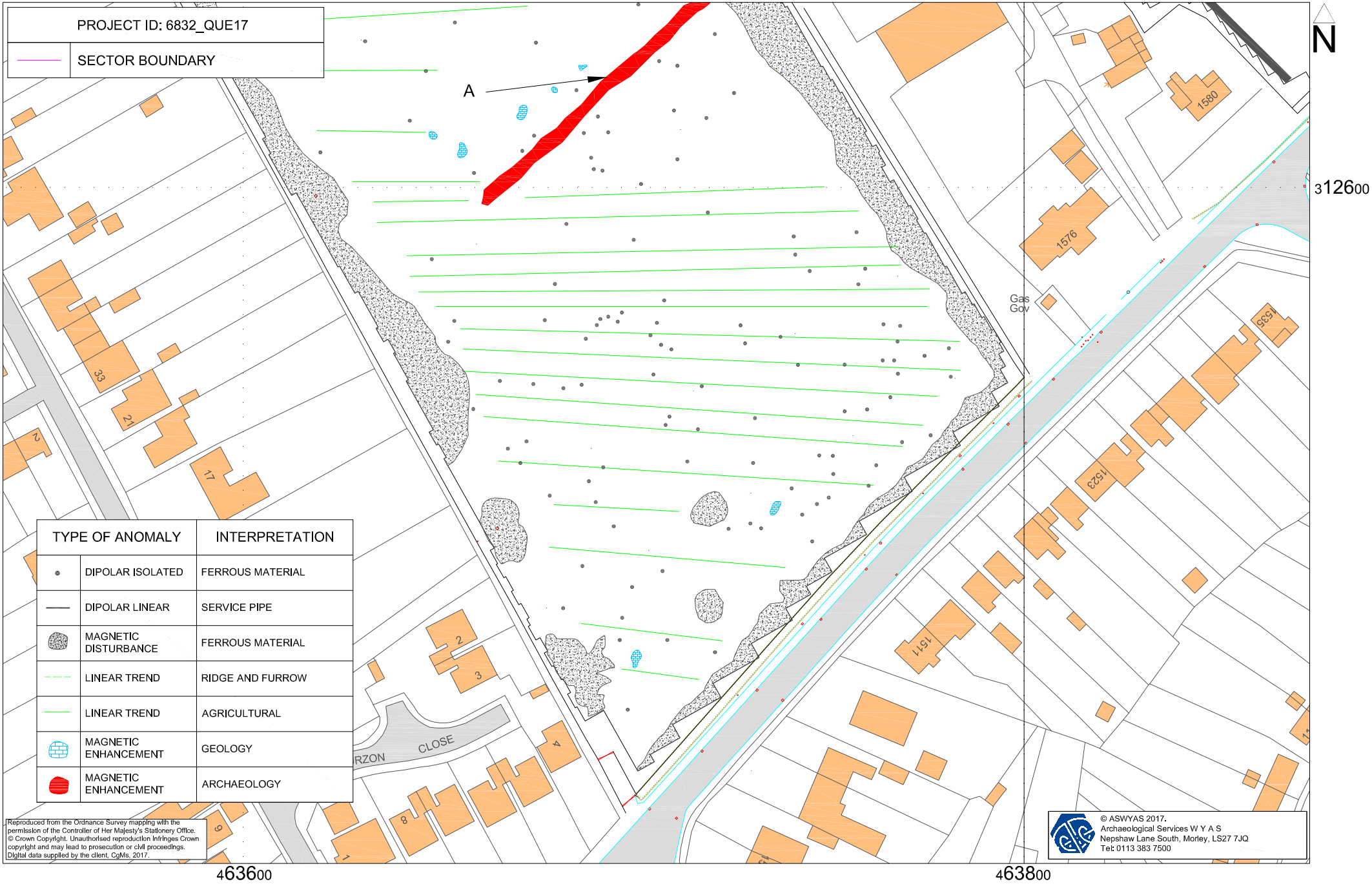

Fig. 9. Interpretation of magnetometer data; Sector 2 (1:1250 @ A4)

Plate 1. General overview of field 2, facing southeast

Plate 2. General overview of field 1, facing east

Plate 3. General overview unsurveyable area, facing southeast

Plate 4. General overview of field 3, facing 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.

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.

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 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 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 Leicestershire Historic Environment Record).

Appendix 4: Oasis form

OASIS DATA COLLECTION FORM: England

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

Printable version

OASIS ID: archaeol11-298513

Project details

Project name	Land off Melton Road
Short description of the project	A geophysical (magnetometer) survey, covering approximately 10.5 hectares, across three fields, was undertaken on land to the north of Melton Road, Queniborough, Leicestershire. This was part of a programme of archaeological works in advance of a proposed development. Magnetometry has detected known archaeology through the middle of the survey area, with trackways, circular features and an enclosure in evidence. Anomalies of a possible archaeological origin have also been detected. Geological and agricultural anomalies have been identified, as have ferrous and magnetic disturbance responses, across the site. Overall the archaeological potential of the site is deemed to be low to moderate in the west, rising from moderate to high in the east.
Project dates	Start: 11-09-2017 End: 13-09-2017
Previous/future work	No / Not known
Any associated project reference codes	QUE17 - Contracting Unit No.
Any associated project reference codes	6832 - Contracting Unit No.
Type of project	Recording project
Site status	None
Current Land use	Cultivated Land 3 - Operations to a depth more than 0.25m
Monument type	NONE None
Significant Finds	NONE None
Investigation type	"Geophysical Survey"
Prompt	National Planning Policy Framework - NPPF
Solid geology (other)	Branscombe Mudstone
Drift geology (other)	Syston Member Sands and Gravels
Techniques	Magnetometry

Project location

Country	England
Site location	LEICESTERSHIRE CHARNWOOD QUENIBOROUGH Land off Melton Road
Study area	10 Hectares
Site coordinates	SK 63767 12703 52.707888545073 -1.056074399455 52 42 28 N 001 03 21 W Point
Height OD / Depth	Min: 50m Max: 52m

Project creators

Name of Organisation	Archaeological Services WYAS
Project brief originator	CgMs
Project design originator	ASWYAS
Project director/manager	C. Sykes
Project supervisor	A. Trace
Type of sponsor/funding body	Developer
Name of sponsor/funding body	CgMs

Project archives

Physical Archive Exists?	No
Digital Archive recipient	ASWYAS
Digital Contents	"none"
Digital Media available	"Geophysics"
Paper Archive Exists?	No

Project bibliography 1

Publication type	Grey literature (unpublished document/manuscript)
Title	Land off Melton Road, Queniborough, Leicestershire: Geophysical Survey
Author(s)/Editor(s)	Trace, A.
Other bibliographic details	3017
Date	2017
Issuer or publisher	Archaeological Services WYAS

Place of issue or publication	Morley
Description	A4 bound paper report
Entered by	zoe horn (zoe.horn@aswyas.com)
Entered on	17 October 2017

OASIS:

Please e-mail Historic England for OASIS help and advice

Cite only: http://www.oasis.ac.uk/form/print.cfm for this page

Bibliography

BGS, 2017. www.bgs.ac.uk/discoveringGeology/geology OfBritain/viewer.html. British Geological Survey (viewed September 2017)

CgMs, 2017. *Land off Melton Road, Queniborough, Leicestershire Desk-based assessment* unpublished

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

David, A., N. Linford, P. Linford and L. Martin, 2008. *Geophysical Survey in Archaeological Field Evaluation: Research and Professional Services Guidelines (2nd edition)* English Heritage

DCLG, 2012. *National Planning Policy Framework*. Department of Communities and Local Government

Gaffney, C. and Gater, J., 2003. *Revealing the Buried Past: Geophysics for Archaeologists* Tempus Publishing Ltd

SSEW, 1983. *Soils of Eastern England, Sheet 4.* Soil Survey of England and Wales