



WYAS
**Archaeological
Services**

Bracken Lane

Retford

Nottinghamshire

Geophysical Survey

Report no. 3030
October 2017

Client: Lanpro



**Bracken Lane,
Retford,
Nottinghamshire**

Geophysical Survey

Summary

A geophysical (magnetometer) survey, covering approximately 2 hectares (of the available 3), was undertaken on land to the north of Bracken Lane, Retford. Strong magnetic responses were detected in the east of the proposed development area and are possibly associated with brick manufacturing. A handful of agricultural linear anomalies have also been detected along with small scale ferrous responses. The archaeological potential for the site is considered to be low.

Report Information

Client: Lanpro
Address: Office 16, Retford Enterprise Centre, Randall Way, Retford,
DN22 7GR
Report Type: Geophysical Survey
Location: Bracken Lane, Retford
County: Nottinghamshire
Grid Reference: SK 715 801
Period(s) of activity: modern
Report Number: 3030
Project Number: 6867
Site Code: BLR17
OASIS ID: Archaeol11-299152
Date of fieldwork: October 2017
Date of report: October 2017
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Report: Emma Brunning
Illustrations: Emma Brunning
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Research: Emma Brunning

Authorisation for
distribution: -----



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1 Introduction

Archaeological Services WYAS (ASWYAS) were commissioned by Lanpro to undertake a geophysical (magnetometer) survey on land to the north of Bracken Lane, Retford. 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 on the 6th October 2017.

Site location, topography and land-use

The site is located to the southeast of Retford, approximately 13km to the east of Worksop and 14km to the southwest of Gainsborough. The survey area is bound to the south by Bracken Lane and Bracken Lane Primary and Nursery School, to the west by residential housing and to the north by sports playing fields (see Fig. 1). Ground cover consisted of overgrown arable. The survey area, totaling approximately 3ha, is centred at SK 715 801 and the topography of this site is level with a height above Ordnance Datum (aOD) of 19m.

Soils and geology

The underlying bedrock geology of the site is sand and gravel overlying mudstone. The overlying soils belong to the Worcester association (431) described as brown rendzinas, calcareous soils over chalk limestone or extremely unconsolidated material (SSEW 1983).

2 Archaeological Background

No known historic assets were identified within the survey area, however analysis of the Pastscape record (www.pastscape.org.uk 2017) identifies Retford as a medieval borough first mentioned in document of 1225. Therefore, given the known archaeological context, the site is thought to have a moderate archaeological potential.

To the northwest of the survey area a 'Brickworks at East Retford' (monument number MNT15496) is listed on Heritage Gateway (www.heritagegateway.org.uk 2017). Described as a disused brickyard and clay pit. The Ordsall tithe map of 1838 marks the field to the immediate east of the site as Brick Kiln Close.

A further analysis of Old maps (www.old-maps.co.uk 2017) illustrates that the PDA had the same field structure in 1887 as it does today.

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). Parts of the PDA were unsuitable for survey due to the overgrowth (see plates), it was impossible to walk through these areas with the instruments.

The general objectives of the geophysical survey were:

- to provide information about the nature and possible interpretation of any magnetic and resistance 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 1m 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 the survey location at a scale of 1:1250. 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 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 5)

Geological anomalies

Strong magnetic responses have been located in the east of the data. These are stronger than one would expect from natural variations in the soils. There is a water course to the immediate east and these responses may be associated with waterlogging. However, another interpretation is that they are associated with brick manufacturing. To the northwest of site lies a disused brickworks and the field to the immediate east is marked as 'Brick Kiln Close' on the tithe maps. It is therefore possible that these responses are associated with extraction of natural materials.

Agricultural anomalies

A handful of linear responses within the datasets are likely to be associated with agricultural practises and are not thought to be of any archaeological interest.

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

The magnetic survey has detected a group of strong responses which may be associated with extraction of natural material for brick manufacture, although other interpretations are possible such as flooding. Little else of interest has been detected and therefore based on this the archaeological potential of the survey area is low.

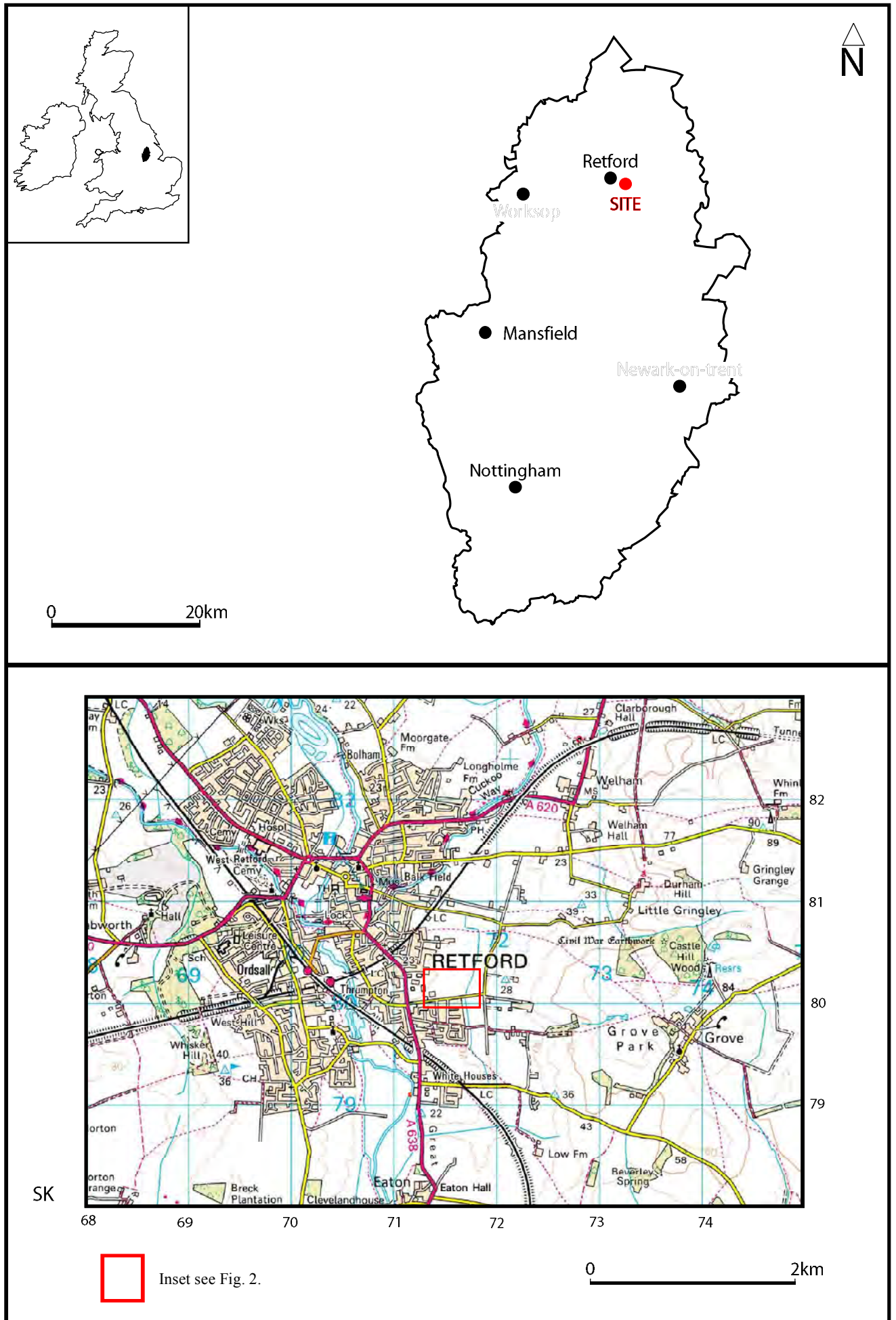


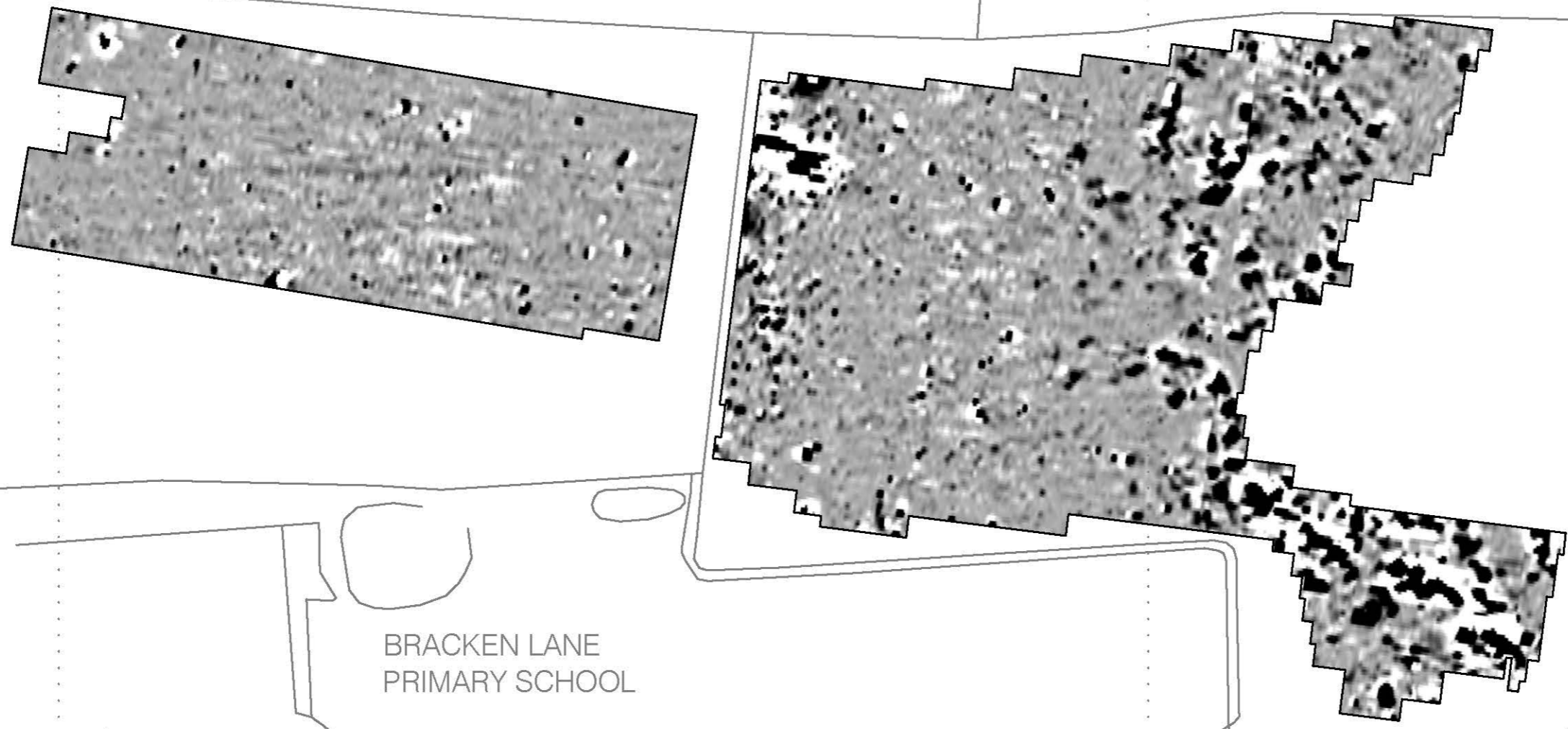
Fig. 1. Site location



Fig. 2. Survey location showing processed magnetometer data (1:1250 @ A3)



380200



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471400

471600

460400

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



PROJECT ID: 6867_BLR17



380200



BRACKEN LANE
PRIMARY SCHOOL

BRACKEN LANE

20.0 nT/cm

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471400





471600

460400

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

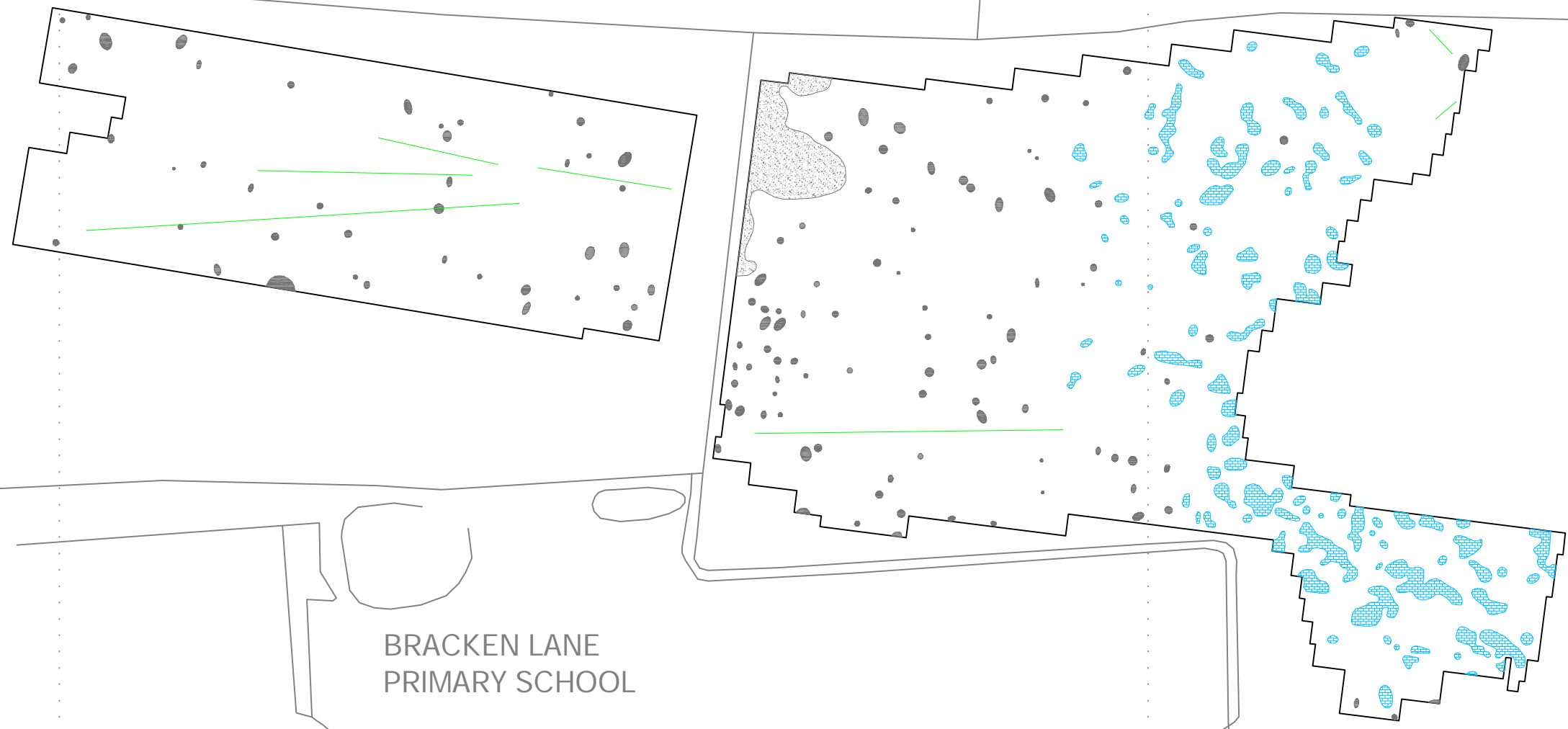


PROJECT ID: 6867_BLR17

TYPE OF ANOMALY		INTERPRETATION
	MAGNETIC ENHANCEMENT	NATURAL / EXTRACTION
	LINEAR TREND	AGRICULTURAL
	DIPOLAR ISOLATED	FERROUS MATERIAL
	MAGNETIC DISTURBANCE	FERROUS MATERIAL




380200



BRACKEN LANE
PRIMARY SCHOOL

BRACKEN LANE

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471400

471600

460400

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





Plate 1. View of Area 1, looking south



Plate 2. View of Area 1, looking west



Plate 3. View of Area 2, looking east



Plate 4. View of Area 2, looking 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.

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 Nottinghamshire 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: archaeol11-299152

Project details

Project name	Bracken Lane, Retford
Short description of the project	A geophysical (magnetometer) survey, covering approximately 2 hectares (of the available 3), was undertaken on land to the north of Bracken Lane, Retford. Strong magnetic responses were detected in the east of the proposed development area and are possibly associated with brick manufacturing. A handful of agricultural linear anomalies have also been detected along with small scale ferrous responses. The archaeological potential for the site is considered to be low.
Project dates	Start: 06-10-2017 End: 06-10-2017
Previous/future work	No / Not known
Any associated project reference codes	6867 - Sitecode
Type of project	Field evaluation
Current Land use	Cultivated Land 4 - Character Undetermined
Monument type	NONE None
Significant Finds	NONE None
Methods & techniques	"Geophysical Survey"
Development type	Not recorded
Prompt	National Planning Policy Framework - NPPF
Position in the planning process	Not known / Not recorded
Solid geology (other)	mudstone
Drift geology (other)	chalk
Techniques	Magnetometry

Project location

Country	England
Site location	NOTTINGHAMSHIRE BASSETLAW EAST RETFORD Bracken Lane, Retford

Study area	3 Hectares
Site coordinates	SK 715 801 53.312729247231 -0.926698985328 53 18 45 N 000 55 36 W Point
Height OD / Depth	Min: 19m Max: 19m

Project creators

Name of Organisation	Archaeological Services WYAS
Project brief originator	Lanpro Services
Project design originator	Lanpro Services
Project director/manager	E Brunning
Project supervisor	A. Trace

Project archives

Physical Archive Exists?	No
Digital Archive recipient	Lanpro Services
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	Bracken Lane, Retford, Nottinghamshire
Author(s)/Editor(s)	Brunning, E
Date	2017
Issuer or publisher	ASWYAS
Place of issue or publication	Morley, Leeds
Description	A4 report with A3 figures
Entered by	Emma Brunning (emma.brunning@aswyas.com)
Entered on	23 October 2017

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