WYAS Archaeological Services

Land at Doncaster Road
Harlington, Doncaster
South Yorkshire

Geophysical Survey

Report no. 3407
March 2020

Client: Harron Homes

Registered CIfA Organisation

West Yorkshire Joint Services

Land at Doncaster Road, Harlington, Doncaster, South Yorkshire

Geophysical Survey

Summary

A geophysical (magnetometer) survey was undertaken on approximately 2 hectares of land located to the southeast of Harlington, South Yorkshire. Anomalies of both a probable and a possible archaeological origin have been detected including ditches, a possible pit alignment, and a possible enclosure. Modern responses of magnetic disturbance have been recorded along the periphery of the survey areas due to metal fencing.

WYAS
Archaeological Services

Report Information

Client:	Harron Homes
Address:	Colton House, Temple Point, Bullerthorpe Lane, Leeds, LS15 9JL
Report Type:	Geophysical Survey
Location:	Harlington
County:	South Yorkshire
Grid Reference:	SE 48372, 02362
Period(s) of activity:	Prehistoric/ Modern
Report Number:	3407
Project Number:	X163
Site Code:	HLT20
OASIS ID:	archaeol11-389561
Date of fieldwork:	March 2020
Date of report:	March 2020
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Photography:	Christopher Sykes
Research:	Christopher Sykes
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Authorisation for distribution:	----------

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Document Issue Record

Ver	Status	Author(s)	Reviewer	Approver	Date
1.0	Draft	EB	DW		Mar 2020
2.0	Final	EB			Mar 2020

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1 Introduction

Archaeological Services ASWYAS were commissioned by Lanpro Services on behalf of Harron Homes to undertake a geophysical survey on land to the south of Doncaster Road, Harlington, South Yorkshire. This was undertaken in line with current best practice (CIfA 2014; Schmidt *et al.* 2015). The survey was carried out on the 10th March 2020 to provide additional information on the archaeological resource of the site.

Site location, topography and land-use

The survey area is centred on National Grid Reference SE 48372, 02362, located to immediate south east of Harlington, approximately 8 miles from the centre of Doncaster. (Fig. 1). The proposed geophysical survey area is approximately 2 hectares consisting of horse paddocks. It is bound to the north by Doncaster Road (A638), to the west by Mill Lane and to the east and the south by agricultural land. The site lies at approximately 19m above Ordnance Datum (aOD) in the north sloping down to approximately 14m aOD in the south.

Soils and geology

The recorded bedrock geology comprises the Pennine Middle Coal Measures Formation - Mudstone, Siltstone and Sandstone. This is a sedimentary bedrock that formed approximately 310 to 318 million years ago in the Carboniferous Period (BGS 2020). The soils of the survey area are characterised as belonging to the Brickfield 3 association (713g) described as slowly permeable seasonally waterlogged fine loamy, fine loamy over clayey and clayey soils (SSEW 1983).

2 Archaeological Background

The following information has been gathered from information contained on the Heritage Gateway website (www.heritagegateway.co.uk), and cropmark information from the Magnesium Limestone project (Roberts 2010).

Iron Age / Roman field boundaries, trackways, ditches and a ditched enclosure are visible on aerial photographs approximately 250m to the east of the survey (monument number 1431500). These cropmarks have also been recorded in the Magnesium Limestone project which are shown in Figure 2. Of direct relevance to the site is the cropmark located directly to the south that could extend into the survey area.

A Bronze Age burial mound is thought to lie roughly 600m to the northwest of site and consisted of possibly three small tumuli, which have now been destroyed (HER number 01214/01.

Very well preserved ridge and furrow appear to lead to a pond that lies approximately 600m to the north of the site. The pond has a definite bank around it and a medieval date is suggested for both the features (HER number 03549/01).

Approximately 500m to the west of the survey area a post medieval mill pond and a medieval/post medieval trackway and banks are visible as earthworks on aerial photographs (monument number 1431426).

900m to the northeast a 15th - 16th century octagonal dovecote is located. Barnburgh Hall Dovecote is a scheduled monument (listing number 1004800) and grade II* listed building (1314757).

3 Aims, Methodology and Presentation

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 and to inform an assessment of the archaeological potential of the site. To achieve this aim, a magnetometer survey covering all amenable parts of the site 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. Bespoke 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 the location of processed magnetometer data at a scale

of 1:2000. Processed and minimally processed data, together with 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 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 anomalies and magnetic disturbance

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.

Magnetic disturbance along the limits of the survey areas are, on the whole due to metal fencing. A pylon in the southwest of the survey area has caused a large area of magnetic disturbance.

Archaeological and possible archaeological anomalies

Anomalies of both a definite and possible archaeological origin have been recorded within the dataset. A strong ditched response (**A1**) in the western half of the survey area is almost certainly archaeological in origin. Although there is no corroborative evidence for this, the cropmark evidence in the immediate vicinity adds weight to this interpretation. Further archaeological anomalies can also be seen in the southeast. Anomalies (**A2**) appear to consist

of a double array of pit type responses, possibly suggesting a pit alignment, which lead to a fragmented linear (**A3**) to the north. Equally this anomalies could be a segmented ditch or a ditch that has been impacted upon by modern ploughing. It is possible that anomalies **A1** – **A3** are all contemporary adding to the known prehistoric landscape in the area which has been mapped from the cropmark evidence.

Possible archaeological responses (**P1**) have been recorded in the northeast and could possibly indicate a rectangular enclosure, however, as only two sides have been recorded and the surrounding magnetic disturbance, this interpretation is tentative. Given the paddock configuration of the site it could also be the remnants of a well-established sub-division.

Anomalies (**P2**) in the northeast are roughly on a northeast to southwest alignment and have the potential to be of some archaeological interest. Elsewhere in the data other potential archaeological responses have been recorded at **P3** and **P4**. The anomalies at **P4** may indicate further pits as they are in the vicinity of the potential pit alignment at **A2**. They have been assigned as possible archaeological origin as the magnetic signature is not as strong as those at **A2.**

5 Conclusions

The geophysical survey has detected a number of magnetic anomalies associated with probable and possible archaeological origins in the forms of ditches, pits and possible enclosures. Given the modern land usage of the site some caution must be applied to the possible archaeological anomalies, the wider landscape does however suggest there is some potential for archaeological feature to be present on site.

Magnetic disturbance around the periphery of the fields are due to the presence of metal fencing within the boundaries. An electricity pylon has also added to the disturbance in the southwest of the data.

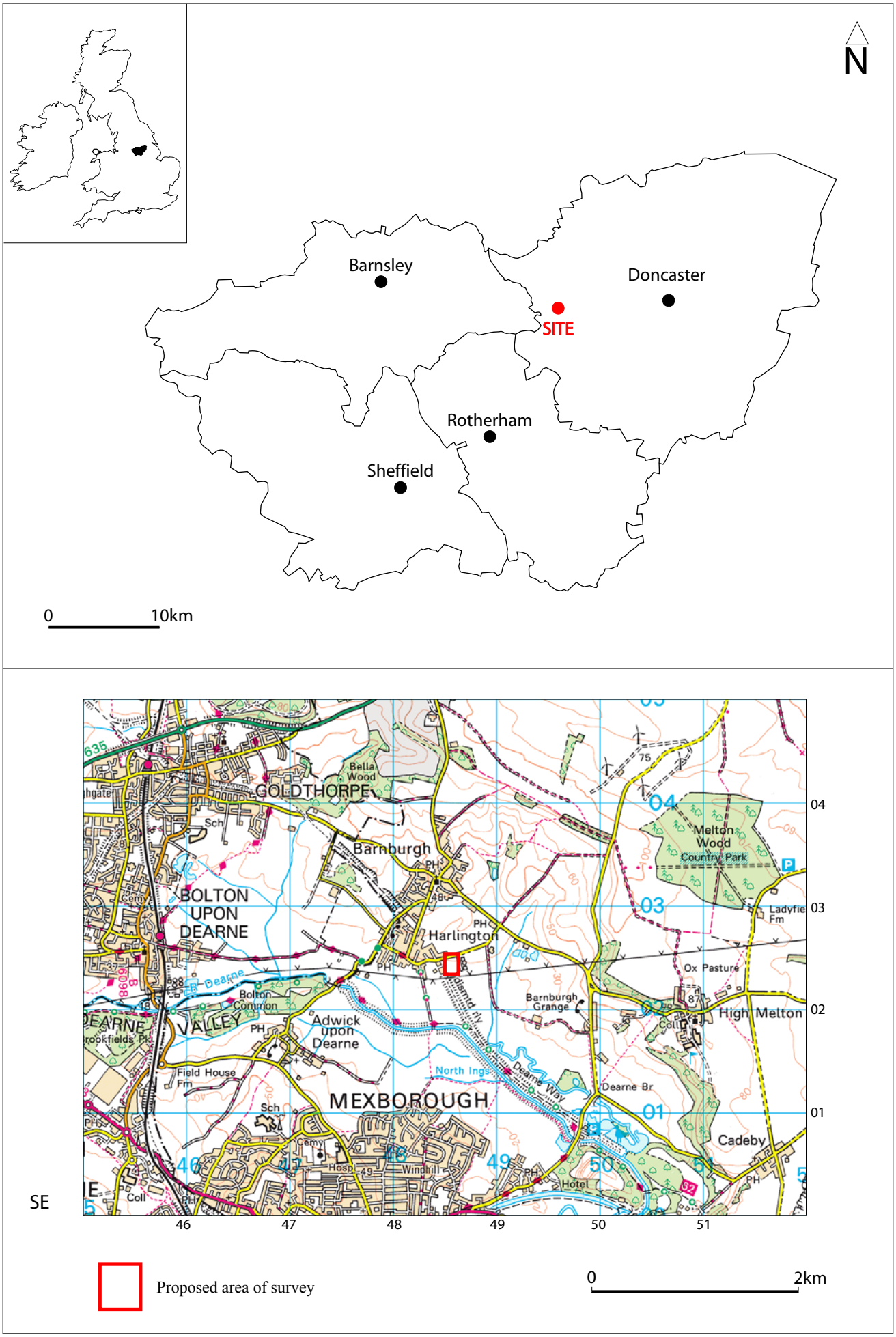

Fig. 1. Site location

Fig. 2. Overall location of greyscale magnetometer data and cropmark data (1:2000 @ A3)

PROJECT ID: X163_HLT20

N

WINDSOR CLOSE

21.1m

19.5m

22.2m

Harlington Nursery

Pumping Station

ETL

MILL LANE

2.0

-1.0

nT

4024 00

4022 00

4484 00

0 50m

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

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

PROJECT ID: X163_HLT20

N

TYPE OF ANOMALY		INTERPRETATION
	DIPOLAR ISOLATED	FERROUS MATERIAL
	MAGNETIC DISTURBANCE	FERROUS MATERIAL
	LINEAR TREND	ARCHAEOLOGY?
	MAGNETIC ENHANCEMENT	ARCHAEOLOGY?
	LINEAR TREND	ARCHAEOLOGY
	MAGNETIC ENHANCEMENT	ARCHAEOLOGY

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4024 00

4022 00

448400

0 50m

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

Plate 1. General view of survey area, facing southwest

Plate 2. General view of survey area, facing southwest

Plate 3. General view of survey area, facing southeast

Plate 4. General view of survey area, facing southwest

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 English Heritage Geophysical Survey Database after the contents of the report are deemed to be in the public domain (i.e. available for consultation in the South Yorkshire Historic Environment Record).

Appendix 4: Oasis form

OASIS DATA COLLECTION FORM: England

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

Printable version

OASIS ID: archaeol11-389561

Project details

Project name	Harlington, Doncaster
Short description of the project	A geophysical (magnetometer) survey was undertaken on approximately 2 hectares of land located to the southeast of Harlington, South Yorkshire. Anomalies of both a probable and a possible archaeological origin have been detected including ditches, a possible pit alignment, and a possible enclosure. Modern responses of magnetic disturbance have been recorded along the periphery of the survey areas due to metal fencing.
Project dates	Start: 10-03-2020 End: 10-03-2020
Previous/future work	No / Not known
Any associated project reference codes	HLT20 - Sitecode
Type of project	Field evaluation
Monument type	NONE None
Significant Finds	DITCH Uncertain
Methods & techniques	"Geophysical Survey"
Development type	Housing estate
Prompt	National Planning Policy Framework - NPPF
Position in the planning process	Not known / Not recorded
Solid geology (other)	Pennine Middle Coal Formation
Drift geology	CLAY WITH FLINTS
Techniques	Magnetometry

Project location

Country	England
Site location	SOUTH YORKSHIRE DONCASTER BARNBURGH Harlington, Doncaster
Study area	2 Hectares

Site coordinates	SE 4837 0236 53.515440938757 -1.270453780456 53 30 55 N 001 16 13 W Point
Height OD / Depth	Min: 14m 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	C. Sykes

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	Harlington, Doncaster
Author(s)/Editor(s)	Brunning, E
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	20 March 2020

Bibliography

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

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

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

Roberts, I. 2010. *Understanding the Cropmark Landscapes of the Magnesian Limestone.* Archaeological Services WYAS

Schmidt, A. Linford, P., Linford, N., David, A., Gaffney, C., Sarris, A, and Fassbinder, J. 2015. *EAC Guidelines for the Use of Geophysics in Archaeology*. English Heritage

SSEW, 1983. *Soil Survey of England and Wales, Sheet 1*. Soil Survey of England and Wales