WYAS Archaeological Services

Land off Marton Road

Gargrave

North Yorkshire

Geophysical Survey

Report no. 3683
December 2021

Client: RN Wooler & Co Ltd

Land off Marton Road, Gargrave, North Yorkshire

Geophysical Survey

Summary

A geophysical (magnetometer) survey was undertaken on approximately 1.4 hectares of land located to the south of Marton Road, Gargrave, North Yorkshire. Isolated and linear geological responses have been identified throughout. Possible evidence of medieval ridge and furrow has also been detected, along with anomalies synonymous of modern ploughing cultivation. Ferrous responses have also been detected scattered across the Site, with magnetic disturbance identified along its periphery associated with metal fencing within modern field boundaries.

WYAS Archaeological Services

Report Information

Client:	RN Wooler & Co Ltd
Report Type:	Geophysical Survey
Location:	Gargrave
County:	North Yorkshire
Grid Reference:	SD 92628 53865
Period(s) of activity:	post-medieval/modern
Report Number:	3683
Project Number:	XE10
Site Code:	MRG21
OASIS ID:	archaeol1-503158
Date of fieldwork:	November 2021
Date of report:	December 2021
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1 Introduction

Archaeological Services ASWYAS has been commissioned by RN Wooler & CO Ltd (the client) to undertake a geophysical survey at land off Marton Road, Gargrave, North Yorkshire. This was undertaken in line with current best practice (CIfA 2020; Schmidt *et al.* 2016). The survey was carried out on 19th November 2021 to provide additional information on the archaeological resource of the Site.

Site location, topography and land-use

The Site is located at SD 92628 53865 (approximate centre), comprising *c.* 1.4ha situated to the south west of Gargrave (see Fig. 1).

The Site is situated to the south of Marton Road with land consisting of pasture. It is bounded to the west by additional pasture land, to the south by Mosber Lane, and to the west by residential housing associated with Walton Close. The Site lies at 126m (above Ordnance Datum) aOD in the south, falling to approximately 119m aOD in the north.

Soils and geology

The recorded bedrock geology comprises Hodder Formation – mudstone, a sedimentary bedrock that formed approximately 337 to 347 million years ago in the Carboniferous Period. Superficial deposits have been recorded as Till, Devensian across the majority of the Site that formed up to 2 million years ago in the Quaternary Period. Soils are described as slowly permeable seasonally wet acid loamy and clayey soils (Soilscape 17) (LANDIS 2021).

2 Archaeological Background

The earliest evidence of occupation of the Gargrave area is presented at Kirk Sink, situated 1.3km south east of the development Site. Partial excavations, undertaken between 1968 and 1974 revealed a pair of post-defined structures and remains of a 2nd century Roman Villa (Scheduled Monument 24545) and probable associated field systems (Hartley 1968, 1969, 1973, 1974).

The earliest buildings identified at the complex comprised a pair of circular post-defined structures, which may have formed part of an ‘unromanised settlement’. One of these buildings is thought to have survived into the villa period (English Heritage 1995; Hartley 1969).

The villa consisted a 2nd-century corridor type house, divided into a number of room decorated with mosaic flooring. Surrounding the house were a number of contemporary structures including a bathhouse and two cottage type houses, which, again were found to contain mosaic flooring. These buildings are suggested to have remained in use up to the end

of the 3rd century or beginning of the 4th century before being demolished (English Heritage 1995).

The villa was encompassed with a double ditch enclosure, which was itself positioned within a larger enclosed area. This larger enclosure consisted of a further double ditch to the north-east side of the villa with a further two ditches running off at right angles to intersect a north-west to south-east lane. A series of parallel ditches to the north and east of the villa are believe to form part of an associated Romano-British field system (Hartley 1969). No archaeological investigations however, have been undertaken in these areas to confirm the interpretation.

Gargrave is recorded in the Doomsday survey of 1086 as comprising two manors divided by the River Aire. The development Site is situated in the northern manor of Gargrave, which is associated with the Fee of Clifford and Skipton Castle. Little is known about the extent and survival of the medieval settlement, although an excavation at the former Pennine Motors Services Grouse Garage, on the High Street, uncovered the remains of a medieval post-hole suggesting structural remains may survive in this location.

The remains of a medieval moated site, associated with the Old Hall and situated off West Street were excavated in both the 1970s and in 1997 (Falkingham 2003). Excavations associated with the Old Hall at this site were undertaken during the 1970s. These recorded occupation from the 13th-century and a probable moated complex with later activities both within the moated area and also extending away from the moat platform (Williams 1983). Later excavation during 1997 confirmed the area to be a 12th or 13th-century medieval moated site with structures housed on a platform and a large moat ditch, which was later recut and shown to have been used up until the 15th-century. Further structural remains where revealed fronting on to West Street. These were on a different alignment to the present-day structures on West Street. The excavation revealed evidence of agricultural activity and a small scale smithing dating to the 12th and 13th-centuries. This appears to post-date a lime-kiln of a similar date (MAP 1997 and 1998).

Archaeological Services WYAS (ASWYAS) undertook an archaeological evaluation at High Street during 2003. Only one trench was found to contain archaeological remains, comprising two undercutting graves, containing human remains (Martin 2003). Subsequent excavations were undertaken in late 2003, these uncovered evidence of previously unknown Late Iron Age and Roman activity, represented by six graves which appear to belong to a cemetery. The area then appeared to be undisturbed until the medieval period. Two phases of 11th to early 13th-century medieval activity were identified during the excavations. The first was associated with a group of linear ditches and associated pits forming possible tenement plots. This phase was followed by the construction of post-holes and pits, of an unknown function.

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 processed magnetometer data at a scale of 1:1000 whilst 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*. 2016) and by the Chartered Institute for Archaeologists (CIfA 2020).

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 due to be linked to metal fencing within the field boundaries and interference from the adjacent roads.

Geological anomalies

The survey has detected a number of anomalies that have been interpreted as geological in origin. It is thought that the responses have been detected because of the variation in the composition and depth of the deposits of superficial material in which they derive.

To some degree, past cultivation has also spread magnetic material across the Site making it difficult to determine any coherent patterns. Fragmented, linear responses have also been interpreted as geological in origin. They likely represent desiccation cracks in the subsurface due to evaporated water that was once deposited in the soil. These trends also appear to follow the topographical incline found on Site and may therefore be linked to the drainage in the soils.

Agricultural anomalies

Parallel linear trends can be seen within the survey area and are associated with both modern ploughing and medieval ridge and furrow cultivation. Given the small sample size of the Site any coherent patterns are difficult to firmly interoperate.

No former field boundaries have been detected in the survey area (NLS 2021).

5 Conclusions

The geophysical survey has detected a number of magnetic anomalies associated with geological and agricultural origins.

Medieval ridge and furrow cultivation has been recorded along with modern ploughing. Magnetic disturbance around the periphery of the fields are due to metal fencing within the boundaries and ferrous responses can be seen throughout. Geological anomalies have been recorded across Site due to variations within the soils, with some possible linear trends being linked to drainage.

Overall the archaeological potential of this site is deemed to be low.

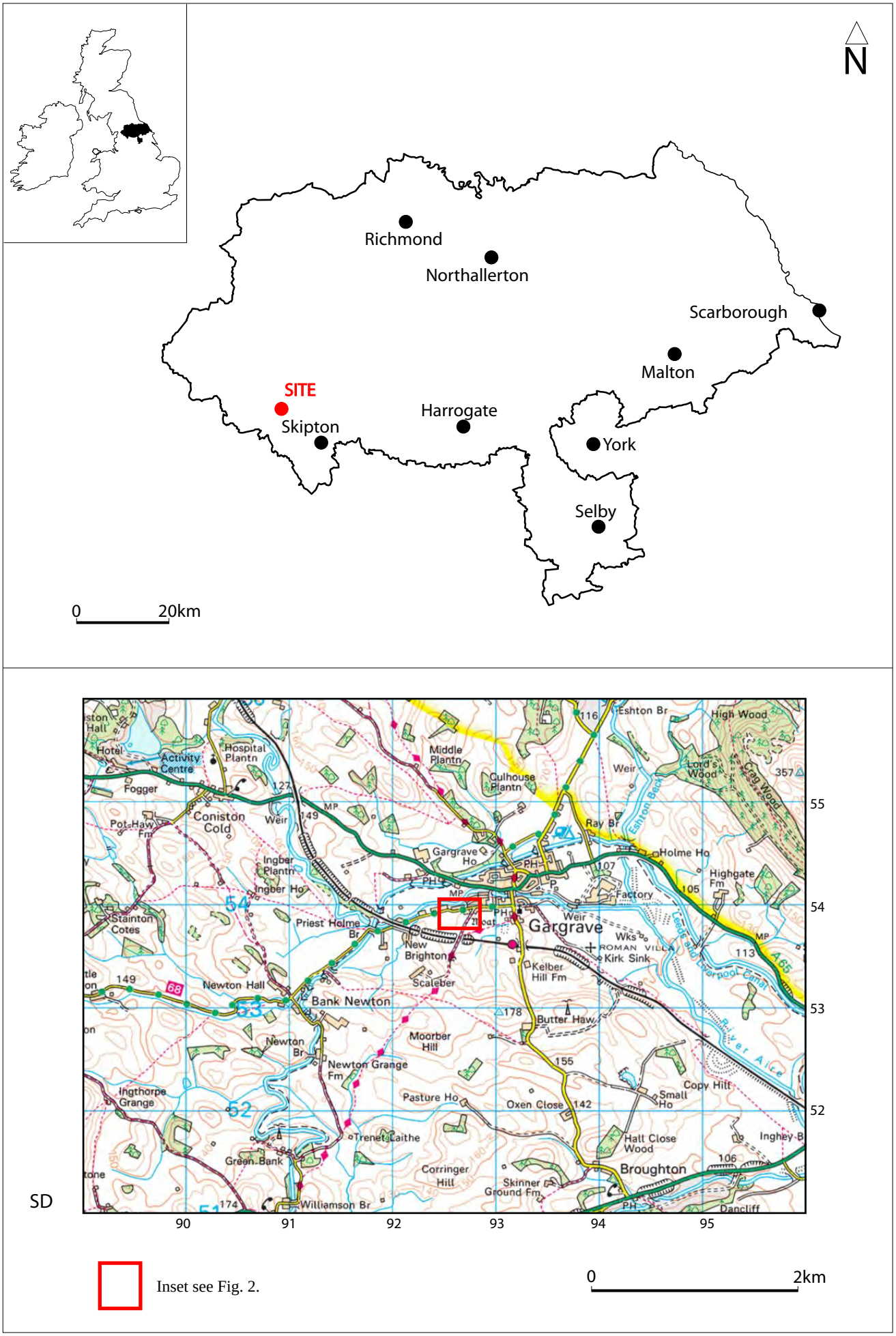


Fig. 1. Site location

Archaeological Services W Y A S,
Nepshaw Lane South, Morley, LS27 7JQ
Tel: 0113 535 0163 Email: archaeology@wyjs.org.uk www.aswyas.com

Project ID: XE10_MRG21

Survey location showing processed greyscale magnetometer data

Fig.2

Title

	SURVEY AREA
1	PHOTO LOCATIONS

nT -1.0 2.0

0 50m

1:1000 @ A3

Archaeological Services W Y A S,
Nepshaw Lane South, Morley, LS27 7JQ

Tel: 0113 535 0163 Email: archaeology@wyjs.org.uk www.aswyas.com

Project ID: XE10_MRG21

Processed greyscale magnetometer data

Fig. 3

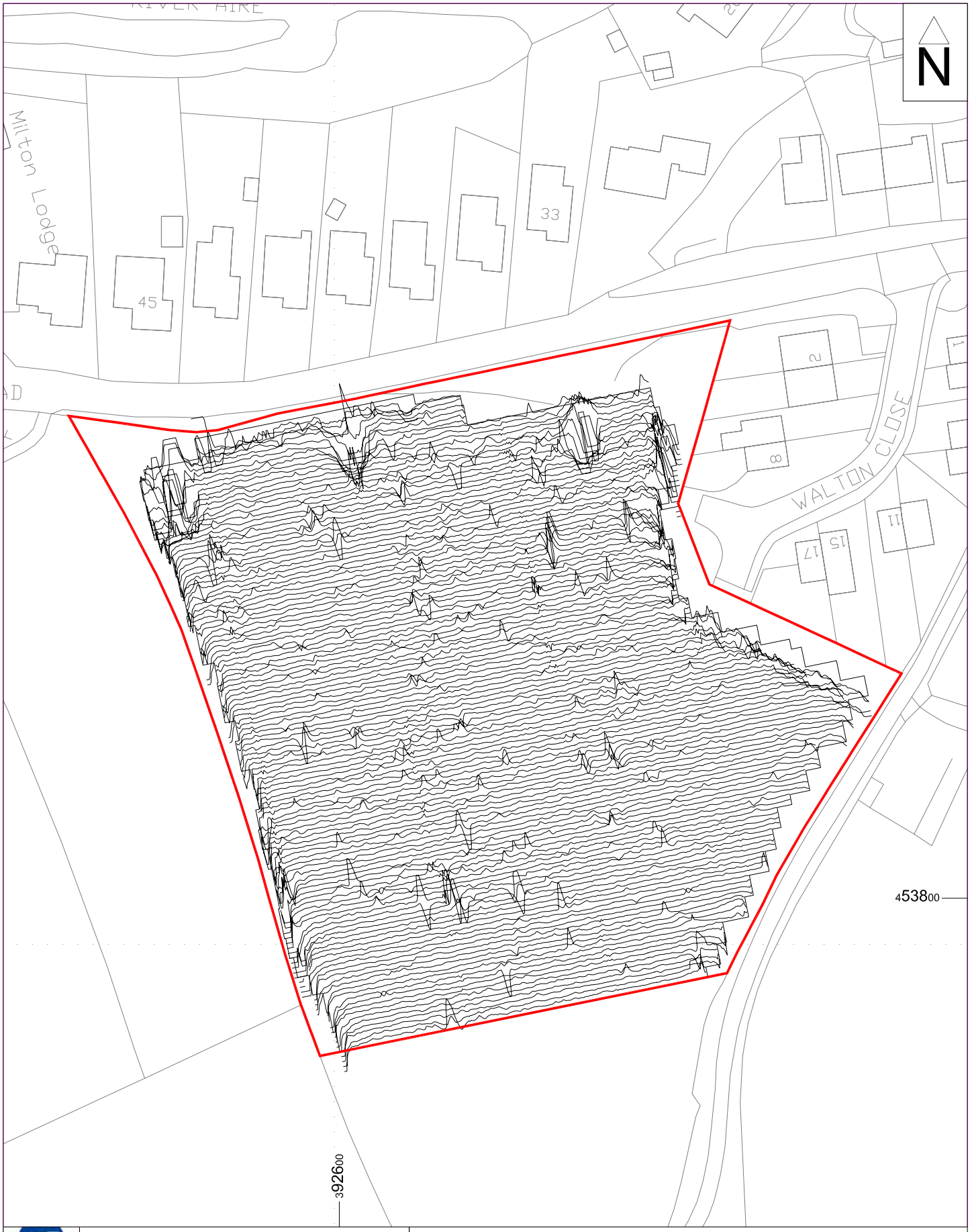
Title

SURVEY AREA

-1.0 2.0
nT

0 50m

1:1000 @ A4



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Project ID: XE10_MRG21

XY trace plot of minimally processed magnetometer data

Fig. 4

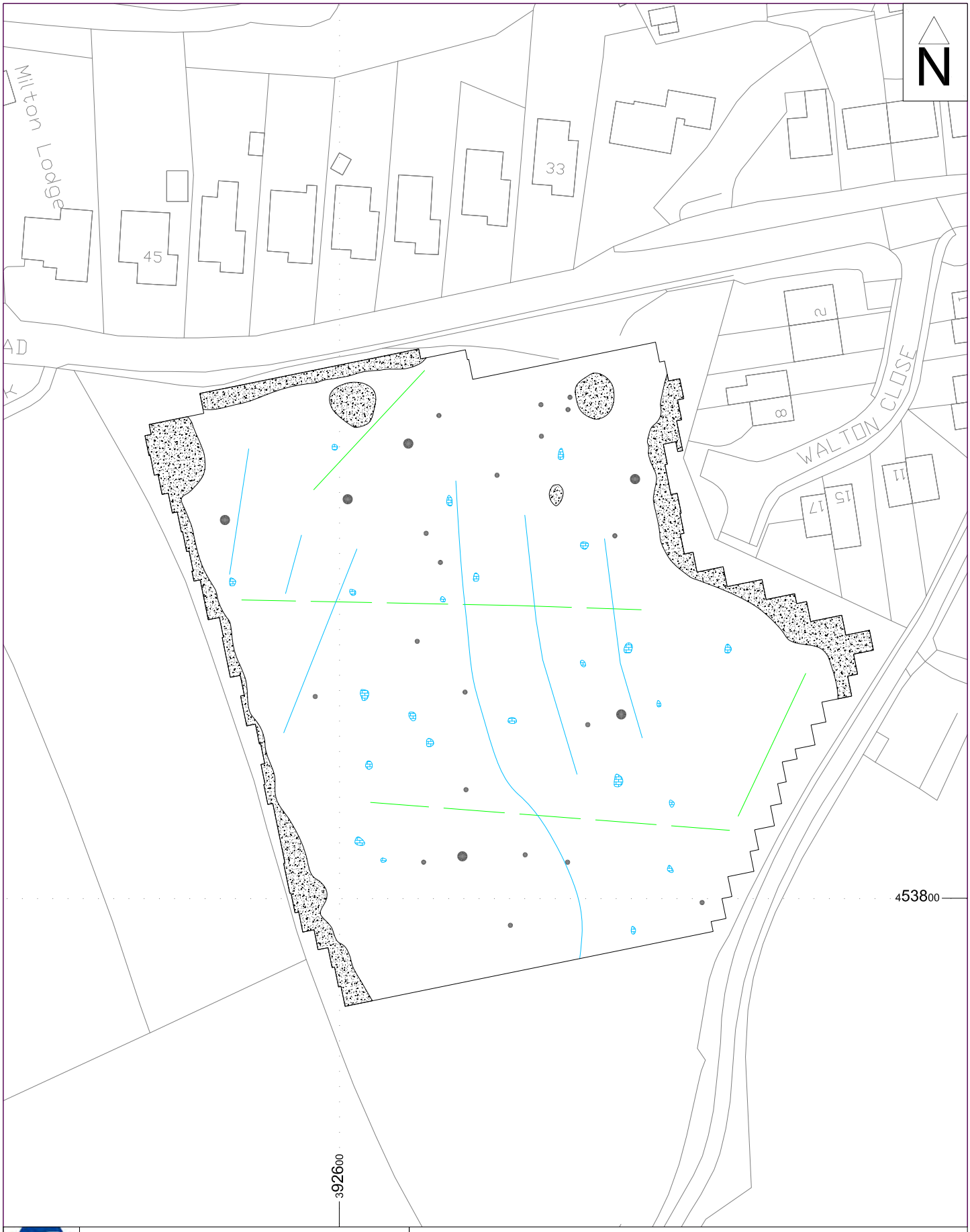
Title

SURVEY AREA

15.0 nT/cm

0 50m

1:1000 @ A4



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Project ID: XE10_MRG21

Interpretation of magnetometer data

Fig. 5

Interpretation

- FERROUS
- GEOLOGY
- MAGNETIC DISTURBANCE
- RIDGE & FURROW
- AGRICULTURAL

0 50m

1:1000 @ A4

Plate 1. General view of survey area, facing north east

Plate 2. General view of survey area, 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 and metadata

The geophysical archive comprises:-

- an archive disk containing compressed (WinZip 8) files of the raw data, report text (Microsoft Word 2000), and graphics files (Adobe Illustrator CS2 and AutoCAD 2008) files; and
- a full copy of the report.

At present the archive is held by Archaeological Services WYAS although it is anticipated that it may eventually be lodged with the Archaeology Data Service (ADS). Brief details may also be forwarded for inclusion on the English Heritage Geophysical Survey Database after the contents of the report are deemed to be in the public domain (i.e. available for consultation in the North Yorkshire Historic Environment Record).

Appendix 4: Oasis form

Summary for archaeol11-503158

OASIS ID (UID)	archaeol11-503158
Project Name	Geophysical Survey at Land off Marcham Road, Marcham, Oxfordshire
Activity type	Geophysical Survey
Project Identifier(s)	Land off Marton Road, Gargrave, North Yorkshire
Planning Id	
Reason For Investigation	Planning requirement
Organisation Responsible for work	Archaeological Services WYAS
Project Dates	19-Nov-2021 - 19-Nov-2021
Location	Land off Marcham Road, Marcham, Oxfordshire NGR : SD 92628 53865 LL : 53.9807885457532, -2.11389833167786 12 Fig : 392628,453865
Administrative Areas	Country : England County : North Yorkshire District : Craven Parish : Gargrave
Project Methodology	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.

Project Results	A geophysical (magnetometer) survey was undertaken on approximately 1.4 hectares of land located to the south of Marton Road, Gargrave, North Yorkshire. Isolated and linear geological responses have been identified throughout. Possible evidence of medieval ridge and furrow has also been detected, along with anomalies synonymous of modern ploughing cultivation. Ferrous responses have also been detected scattered across the Site, with magnetic disturbance identified along its periphery associated with metal fencing within modern field boundaries. Overall the archaeological potential of this site is deemed to be low,
Keywords	
HER	North Yorkshire HER - unRev - STANDARD
HER Identfiers	
Archives	

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