WYAS Archaeological Services

Manor Farm

Old Malton

North Yorkshire

Geophysical Survey

Report no. 2947
March 2017

Client: Prospect Archaeology

West Yorkshire Joint Services

Manor Farm,
Old Malton,
North Yorkshire

Geophysical Survey

Summary

A geophysical (magnetometer) survey, covering approximately 1.3 hectares was undertaken on pastoral land at Manor Farm, Old Malton. This was part of a programme of archaeological works in advance of a proposed development. Possible archaeological anomalies have been identified in the form of ditches forming part of an enclosure. Agricultural trends which may be associated with ridge and furrow cultivation have also been detected. A service pipe along with areas of magnetic disturbance can also be seen within the data. Therefore the archaeological potential of the survey area is deemed to be medium.

WYAS
Archaeological Services

Report Information

Client:	Prospect Archaeology Ltd.
Address:	Prospect House, Garden Lane, Leeds, LS25 6AT
Report Type:	Geophysical Survey
Location:	Old Malton
County:	North Yorkshire
Grid Reference:	SE 796726
Period(s) of activity:	?Prehistoric/ Modern
Report Number:	2947
Project Number:	6611a
Site Code:	PEA17
OASIS ID:	archaeol11-278672
Date of fieldwork:	February 2017
Date of report:	February 2017
Project Management:	Emma Brunning BSc MCIfA
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1 Introduction

Archaeological Services WYAS (ASWYAS) were commissioned by Prospect Archaeology Ltd., to undertake a geophysical (magnetometer) survey on land at Manor Farm, Old Malton to inform on proposed development. 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 February 2017 to provide additional information on the archaeological resource of the Proposed Development Area (PDA).

Site location, topography and land-use

The PDA consists of three fields totaling approximately 1.3ha and lies within closed pastoral fields surrounding Manor Farm, to the west of Town Street Old Malton. The site is located approximately 1.3km to the northeast of Malton (see Fig. 1). At the time of survey, ground cover consisted mostly of grazed pasture, a small area was overgrown in which only part could be surveyed. It is centered at SE 796726. Topography of the site is generally level with a height above Ordnance Datum (aOD) of approximately 22m.

Soils and geology

The underlying geology comprises of the Coralline Oolite formation – limestone, ooidal. Superficial deposits are recorded as clay, silt and sand that formed up to 3 million years ago in the Quaternary Period (BGS 2017). Soils of the area belong to the Landbeach association (512b) consisting of permeable calcareous coarse loamy soils affected by groundwater over chalky gravel (SSEW 1983).

2 Archaeological Background

The following is a synopsis of the archaeological background of the immediate survey area drawn from the Pastscapes (2017) website. Along Town Street, to the east of site a number of listed buildings are located and there is also the remains of Gilbertine Priory (monument number 59881), founded 1147 – 1154 and now part of St Mary's Church. Surviving monastic parts include the west part of the nave and two-thirds of the façade.

Approximately 300m to the southwest of site a rectangular enclosure (monument number 1011935) is seen as a cropmark. Ditches of an unknown date form three sides of the enclosure with minimum dimensions of 80m by 80m.

To the northwest of the PDA probable medieval or later ridge and furrow have been seen as earthworks (monument number 1024849).

3 Aims and Methodology

The main aim of the geophysical survey was to provide sufficient information to enable an assessment to be made of the impact of the development on potential sub-surface archaeological remains and for further evaluation or mitigation proposals, if appropriate, to be recommended. To achieve this aim, a magnetometer survey covering all amenable parts of the PDA was undertaken (see Fig. 2).

The general objectives of the geophysical survey were:

- to provide information about the nature and possible interpretation of any magnetic anomalies identified;
- to therefore determine the presence/absence and extent of any buried archaeological features; and
- to prepare a report summarising the results of the survey.

Magnetometer survey

The site grid was laid out using a Trimble VRS differential Global Positioning System (Trimble 5800 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 displays processed magnetometer data at a scale of 1:2500. 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 Figures 3 to 5)

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.

The middle field is dominated by magnetic disturbance in which the strength of the responses can be seen best in Fig. 4. Whilst a handful of curvilinear anomalies can be seen through the disturbance it is difficult to ascertain what these can be. Similar strength responses can be seen along the limits of the survey areas which reflects the metal fencing in the field boundaries. A service pipe has been detected which runs on a northwest to southeast alignment in the southern field.

Geological anomalies

The survey has detected a small cluster of low magnitude anomalies and 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 soils and deposits of superficial material in which they derive.

Some of the geological anomalies in close proximity to the detected possible archaeology may have an anthropogenic origin. They have been interpreted as being geological due to the strength of the responses and that they form no clear patterns.

Agricultural anomalies

A handful of ploughing trends have been detected in the southwest of the survey area. It is possible that these relate to medieval ridge and furrow cultivation. Curvilinear trends located in the central field are visible through the magnetic disturbance. These are thought to be agricultural and possibly associated with landscaping of the field.

Possible archaeological anomalies

Ditch type anomalies (**A**) form three sides of a large enclosure aligned north-south. The eastern edge has not been detected but may lie outside the survey area. It measures 57m along western edge. A handful of pit-like anomalies can also be seen within the 'enclosure'. It is unfortunate that the service pipe cuts through the feature which has masked any further archaeological remains in this vicinity. The archaeological background section of this report notes an enclosure approximately 300m to the southwest of the PDA. It is possible that these are contemporary with one another.

Anomalies (**B**) are made up of a series of linear and curvilinear trends located to the northwest of **A**. Whilst an archaeological interpretation is preferred it is also possible that they are of an agricultural origin, therefore caution must be taken when viewing these responses.

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.

5 Conclusions

Possible archaeological responses have been recorded within the magnetic survey in the form of linear ditches forming three sides of an enclosure. Further linear trends and possible pits have also been detected which may be associated.

Ploughing trends that may be associated with ridge and furrow cultivation can be seen in the southwest of the PDA. A service pipe along with magnetic disturbance have also been detected.

Based on the results of the geophysical survey, archaeological potential of the site is deemed to be medium.

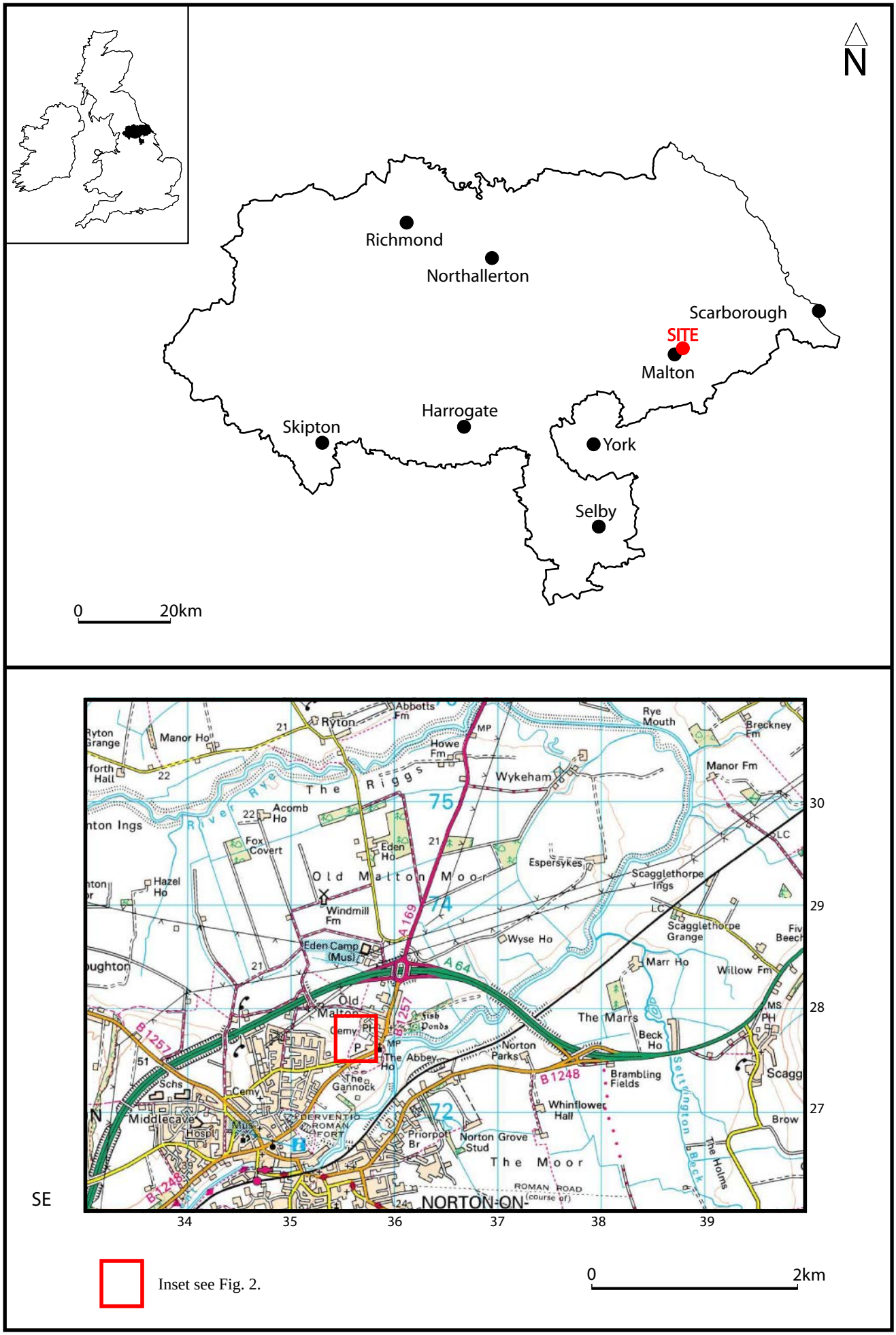

Fig. 1. Site location

PROJECT ID: 6611_Manor Farm

1 LOCATION AND DIRECTION OF PLATES

N

4728 00

4726 00

4724 00

4722 00

4794 00

4796 00

4798 00

2.0

-1.0

nT

0 100m

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Fig. 2. Survey location showing greyscale magnetometer data (1:2500 @ A3)

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

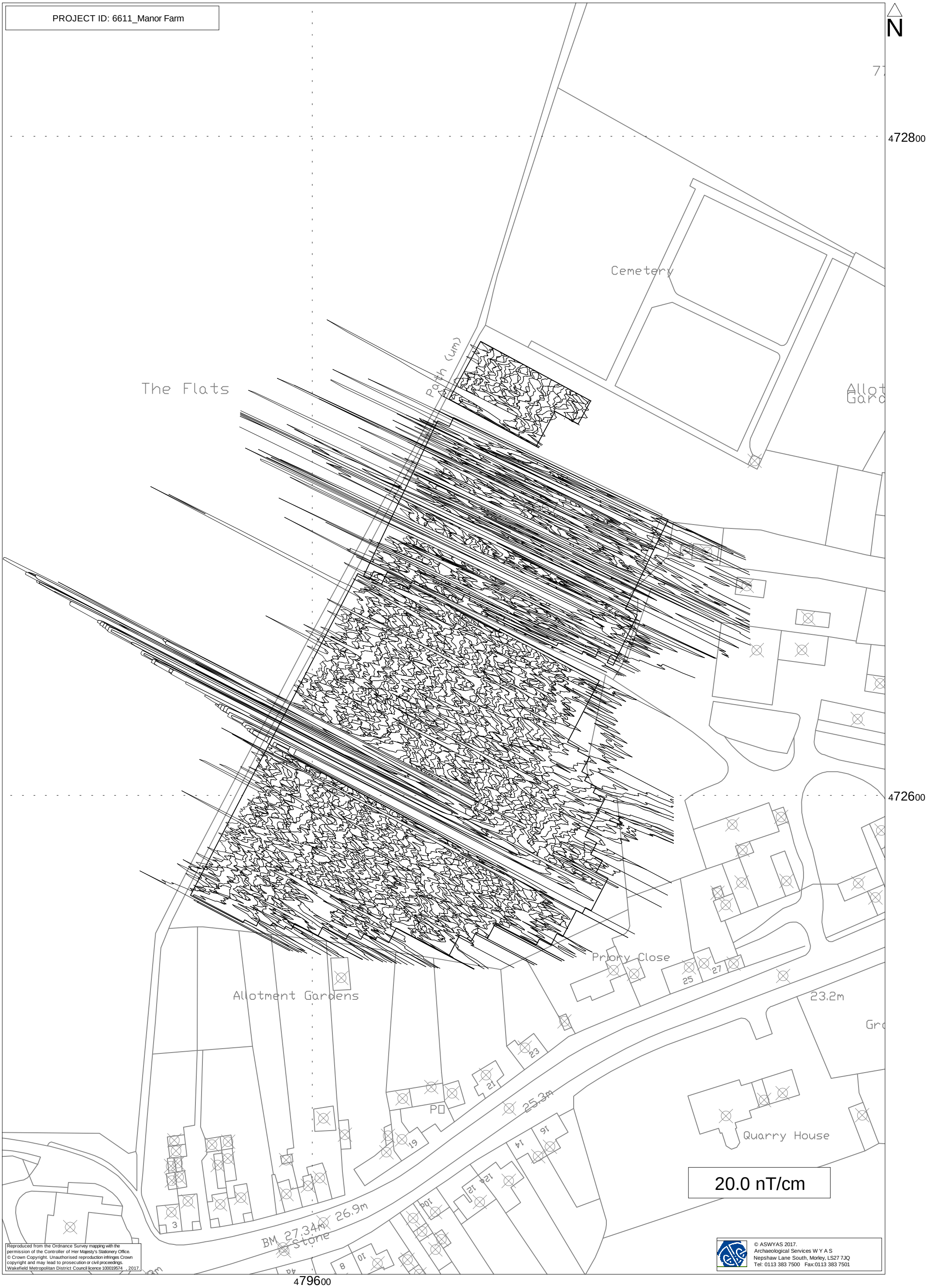

Fig. 4. XY trace plot of minimally processed magnetometer data (1:1000 @ A3)

PROJECT ID: 6611_Manor Farm

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

N

4728 00

4726 00

4796 00

The Flats

Path (um)

Cemetery

Allot
Gard

6667

B

A

A

Allotment Gardens

Priory Close

25

27

23.2m

Gr

23

21

PO

25.3m

19

16

14

12A

12

10A

10

8

Quarry House

BM 27.34m
Stone

26.9m

3

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0 50m

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

Plate 1. General view of survey area, looking southeast

Plate 2. General view of survey area, looking northwest

Plate 3. General view of survey area, looking northwest

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 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

OASIS DATA COLLECTION FORM: England

OASIS ID: archaeol11-278672

Project details

Project name	Manor Farm, Old Malton
Short description of the project	A geophysical (magnetometer) survey, covering approximately 1.3 hectares was undertaken on pastoral land at Manor Farm, Old Malton. This was part of a programme of archaeological works in advance of a proposed development. Possible archaeological anomalies have been identified in the form of ditches forming part of an enclosure. Agricultural trends which may be associated with ridge and furrow cultivation have also been detected. A service pipe along with areas of magnetic disturbance can also be seen within the data. Therefore the archaeological potential of the survey area is deemed to be medium.
Project dates	Start: 06-02-2017 End: 06-02-2017
Previous/future work	No / Not known
Any associated project reference codes	6611 - Sitecode
Type of project	Field evaluation
Current Land use	Grassland Heathland 4 - Regularly improved
Monument type	NONE None
Significant Finds	ENCLOSURE Uncertain
Methods & techniques	"Geophysical Survey"
Development type	Not recorded
Prompt	National Planning Policy Framework - NPPF
Position in the planning process	Pre-application
Solid geology	OOLITE - UNDIFFERENTIATED
Drift geology	SAND AND GRAVEL OF UNCERTAIN AGE OR ORIGIN
Techniques	Magnetometry

Project location

Country	England
Site location	NORTH YORKSHIRE RYEDALE MALTON Manor Farm, Old Malton

Study area	1.3 Hectares
Site coordinates	SE 796 726 54.142881467272 -0.781328210222 54 08 34 N 000 46 52 W Point
Height OD / Depth	Min: 22m Max: 22m

Project creators

Name of Organisation	Archaeological Services WYAS
Project brief originator	Prospect Archaeology Ltd
Project design originator	Prospect Archaeology Ltd
Project director/manager	E Brunning
Project supervisor	E Brunning

Project archives

Physical Archive Exists?	No
Digital Archive recipient	Prospect Archaeology
Digital Contents	"Survey"
Digital Media available	"Text","Geophysics","Images raster / digital photography"
Paper Archive Exists?	No

Project bibliography 1

Publication type	Grey literature (unpublished document/manuscript)
Title	Manor Farm, Old Malton
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	8 March 2017

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