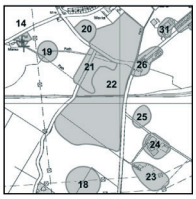
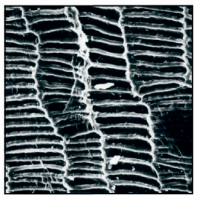
HRSO20










LAND AT HUTTON ROAD, SOUTHBURN, DRIFFIELD, EAST RIDING OF YORKSHIRE

GEOPHYSICAL SURVEY REPORT

commissioned by Ian Pick & Associates
on behalf of JSR Farms

December 2020

HEADLAND ARCHAEOLOGY

REGISTERED ORGANISATION CIfA

LAND AT HUTTON ROAD, SOUTHBURN, DRIFFIELD, EAST RIDING OF YORKSHIRE

GEOPHYSICAL SURVEY REPORT

commissioned by Ian Pick & Associates
on behalf of JSR Farms

December 2020

This report adheres to the quality standard of ISO 9001:2015

PROJECT INFO:

HA Project Code **HRSO20** / NGR **SE 9969 5346** / Parish **Kirkburn** / Local Authority **East Riding of Yorkshire Council** / OASIS Ref. **headland5-409397**

PROJECT TEAM:

Project Manager **David Harrison** / Author **Alistair Webb** / Fieldwork **Robbie House, Olivier Vansassenbrouck** / Graphics **David Harrison, Julia Bastek-Michalska**

Approved by **David Harrison** D Harrison .....

Headland Archaeology Yorkshire & North
Units 23–25 & 15 | Acorn Business Centre | Balme Road | Cleckheaton BD19 4EZ
t 0113 387 6430
e yorkshireandnorth@headlandarchaeology.com
w www.headlandarchaeology.com

HEADLAND ARCHAEOLOGY

part of the RSK Group

REGISTERED ORGANISATION CIfA

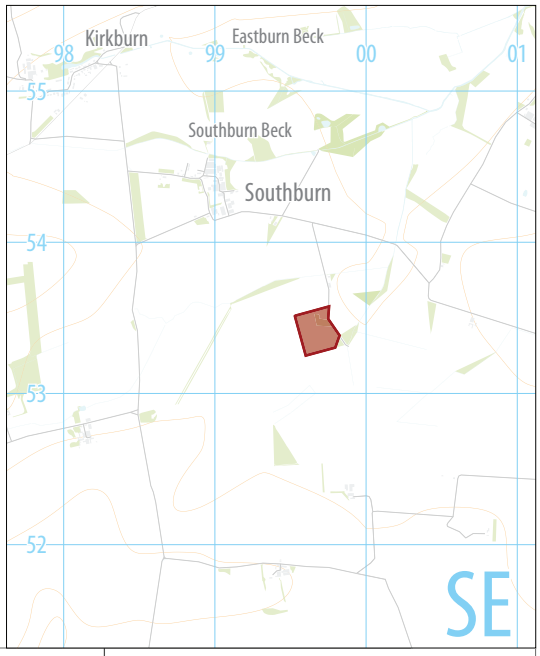
PROJECT SUMMARY

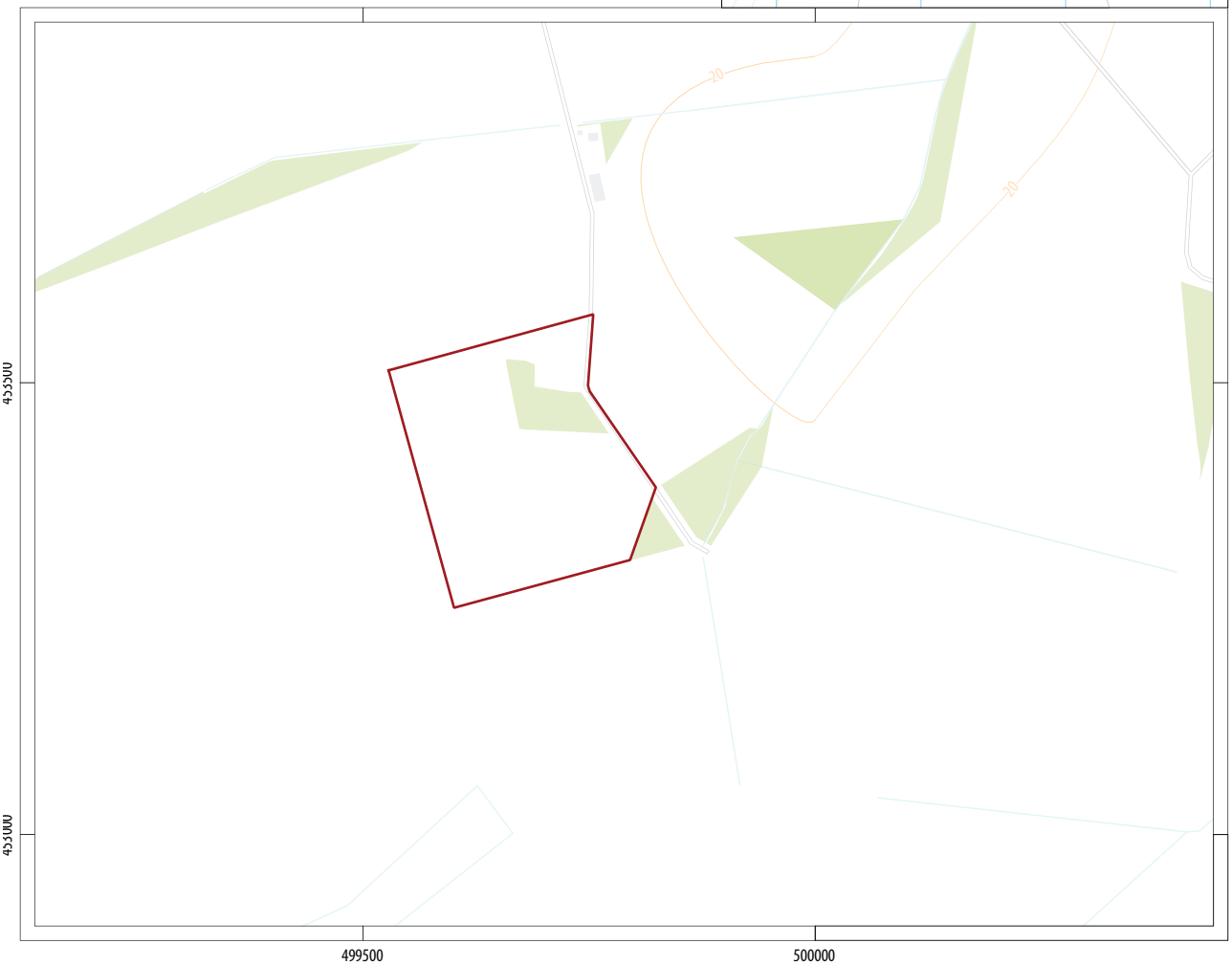
Headland Archaeology (UK) Ltd undertook a geophysical (magnetometer) survey of a 6-hectare site at Southburn, near Driffield, East Yorkshire where a new pig unit is proposed. Anomalies due to field drains, geological variation and tipping/ infilling around an existing structure have been identified. No anomalies of likely archaeological origin have been identified by the survey. The site is therefore assessed as having very low archaeological potential.

CONTENTS

LIST OF ILLUSTRATIONS

Land at Hutton Road
Southburn
East Riding of Yorkshire





HEADLAND ARCHAEOLOGY
Headland Archaeology Yorkshire & North
Units 23–25 & 15 | Acorn Business Centre | Balme Road | Cleckheaton BD19 4EZ
t 0113 387 6430
e yorkshireandnorth@headlandarchaeology.com
w www.headlandarchaeology.com

ILLUS 1 Site location

LAND AT HUTTON ROAD, SOUTHBURN, DRIFFIELD, EAST RIDING OF YORKSHIRE

GEOPHYSICAL SURVEY REPORT

1 INTRODUCTION

Headland Archaeology (UK) Ltd was commissioned by Ian Pick & Associates (the Agent) on behalf of JSR Farms (the Client), to undertake a geophysical (magnetometer) survey on land at Hutton Road, Southburn, near Driffield, east Yorkshire, where a new pig unit is proposed. The results of the survey provide information in support of a planning application and will also inform future archaeological strategy at the site, if required.

The survey was undertaken in order to assess the impact of the proposed development on the historic environment and was undertaken in accordance with an Archaeological Written Scheme of Investigation (WSI) (Harrison 2020), which was submitted to and approved by James Goodyear, Development Management Archaeologist at Humber Historic Environment Record, who act as archaeological advisors to the East Riding of Yorkshire, with guidance within the National Planning Policy Framework (MHCLG 2019) and in line with current best practice (Chartered Institute for Archaeologists 2014, Europae Archaeologia Consilium 2016).

1.1 SITE LOCATION, TOPOGRAPHY AND LAND-USE

The Proposed Development Area (PDA) comprises a sub rectangular block of land, within a single field, south of Hutton Road, Southburn, centred at SE 9969 5346. The field is bound to the east by an access track leading to Hutton Road and is bounded by arable fields to all sides.

The PDA is flat at varying between 20m and 21m AOD (Above Ordnance Datum) and had been recently seeded with a sprouting arable crop.

The survey was carried out on 19th November 2020.

1.2 GEOLOGY AND SOILS

The bedrock geology comprises Flamborough Chalk Formation which is overlain by superficial deposits of sand and gravel of uncertain age and origin (NERC 2020).

The soils are classified in the Soilscape 5 Association, characterised as freely draining lime rich loams (Cranfield University 2020).

2 ARCHAEOLOGICAL BACKGROUND

Following consultation, James Goodyear (see above) advised that:

> *The proposed development site lies within a landscape containing significant archaeological remains dating from the prehistoric and Romano-British periods. This part of the Wolds has been intensively occupied for the best part of the last 10,000 years; crop-mark evidence for that occupation has been recorded in the area immediately adjoining the proposal site. To the north, between the proposal site and Hutton Road are the cropmarks of a Romano-British occupation site. The cropmarks here included at least ten enclosures aligned on an east to west trackway. Finds from the area of the cropmarks have included*

Romano-British pottery and a quern. To the east of the proposal site the cropmarks of a late Iron Age/Romano-British multiple ditch system have been recorded. The intermittently visible ditches are on a north-west to south-east alignment and have two field boundaries perpendicular to them. To the south and west are the extensive cropmarks of a long linear trackway heading in an east to west direction. Alongside this are many enclosures, field systems, branching trackways and ring ditches. (Humber HER Ref HER/DE/CONS/28266).

3 AIMS, METHODOLOGY AND PRESENTATION

The general aim of the geophysical survey was to provide enough information to establish the presence/absence, character and extent of any archaeological remains within the PDA. This will therefore enable an assessment to be made of the impact of the proposed development on any sub-surface archaeological remains, if present.

The specific archaeological objectives of the geophysical survey were:

- to gather enough information to inform the extent, condition, character and date (as far as circumstances permit) of any archaeological features and deposits within the PDA;
- to obtain information that will contribute to an evaluation of the significance of the scheme upon cultural heritage assets; and
- to prepare a report summarising the results of the survey.

3.1 MAGNETOMETER SURVEY

Magnetic survey methods rely on the ability of a variety of instruments to measure very small magnetic fields associated with buried archaeological remains. A feature such as a ditch, pit or kiln can act like a small magnet, or series of magnets, that produce distortions (anomalies) in the earth's magnetic field. In mapping these slight variations, detailed plans of sites can be obtained as buried features often produce reasonably characteristic anomaly shapes and strengths (Gaffney & Gater 2003). Further information on soil magnetism and the interpretation of magnetic anomalies is provided in Appendix 1.

The survey was undertaken using four Bartington Grad601 sensors mounted at 1m intervals (1m traverse interval) onto a rigid carrying frame. The system was programmed to take readings at a frequency of 10Hz (allowing for a 10–15cm sample interval) on roaming traverses (swaths) 4m apart. These readings were stored on an external weatherproof laptop and later downloaded for processing and interpretation. The system was linked to a Trimble R8s Real Time Kinetic (RTK) differential Global Positioning System (dGPS) outputting in NMEA mode to ensure a high positional accuracy for each data point.

MLGrad601 and MultiGrad601 (Geomar Software Inc.) software was used to collect and export the data. Terrasurveyor V3.0.35.1 (DWConsulting) software was used to process and present the data.

3.2 REPORTING

A general site location plan is shown in Illus 1 at a scale of 1:10,000. Illus 2 shows the survey swaths at a scale of 1:2,500. Illustrations 3 and 4 show the data in processed (greyscale), minimally processed (XY trace formats), also at a scale of 1:2,500 whilst Illus 5 is an interpretation plot of the data.

Technical information on the equipment used, data processing and magnetic survey methodology is given in Appendix 1. Appendix 2 details the survey location information and Appendix 3 describes the composition and location of the site archive. Data processing details are presented in Appendix 4. A copy of the OASIS entry (Online Access to the Index of Archaeological Investigations) is reproduced in Appendix 5.

The survey methodology, report and any recommendations comply with the Written Scheme of Investigation (Harrison 2020), guidelines outlined by Europae Archaeologia Consilium (EAC 2016) and by the Chartered Institute for Archaeologists (CIfA 2014). All illustrations from Ordnance Survey (OS) mapping are reproduced with the permission of the controller of Her Majesty's Stationery Office (© Crown copyright).

The illustrations in this report have been produced following analysis of the data in 'raw' and processed formats and over a range of different display levels. All illustrations are presented to most suitably display and interpret the data from this site based on the experience and knowledge of management and reporting staff.

4 RESULTS AND DISCUSSION

Ground conditions were good throughout contributing to a high data quality requiring only minimal processing. The magnetic background was uniform with a few vague trends indicative of variations in the underlying geology. The exception was around the north-eastern corner of the survey area where the readings were elevated, possibly due to the spreading of slurry from the adjacent storage area and tipping/infilling around the entrance to the field.

4.1 FERROUS AND MODERN ANOMALIES

Ferrous anomalies, characterised as individual 'spikes', 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 is common on most sites, often being present as a result of manuring or tipping/infilling. There is no obvious clustering to these ferrous anomalies which might indicate an archaeological origin. Far more probable is that the 'spike' responses are likely caused by the random distribution of ferrous debris in the upper soil horizons.

4.2 AGRICULTURAL ANOMALIES

Throughout the western half of the PDA are a series of faint (mostly) parallel linear trend anomalies aligned north-north-west/south-south-east, parallel with the long axis of the field. These anomalies are due to field drains.

4.3 GEOLOGICAL ANOMALIES

In the eastern half of the survey are several vague curvilinear anomalies and localised areas of slightly enhanced readings. These anomalies are interpreted as being caused by variations in the superficial sand and gravel deposits.

5 CONCLUSION

The survey has successfully evaluated the PDA and has only identified anomalies of modern, agricultural or geological origin. No anomalies of likely archaeological origin have been identified. On the basis of the survey the archaeological potential of the site is assessed as very low.

6 REFERENCES

Chartered Institute for Archaeologists (ClfA) 2014 ***Standard and guidance for archaeological geophysical survey*** (Reading) http://www.archaeologists.net/sites/default/files/ClfAS%26GGeophysics_2.pdf accessed 23 November

Cranfield University 2019 ***Cranfield Soil and Agrifood Institute Soilscapes*** http://www.landis.org.uk/soilscapes/ accessed 23 November

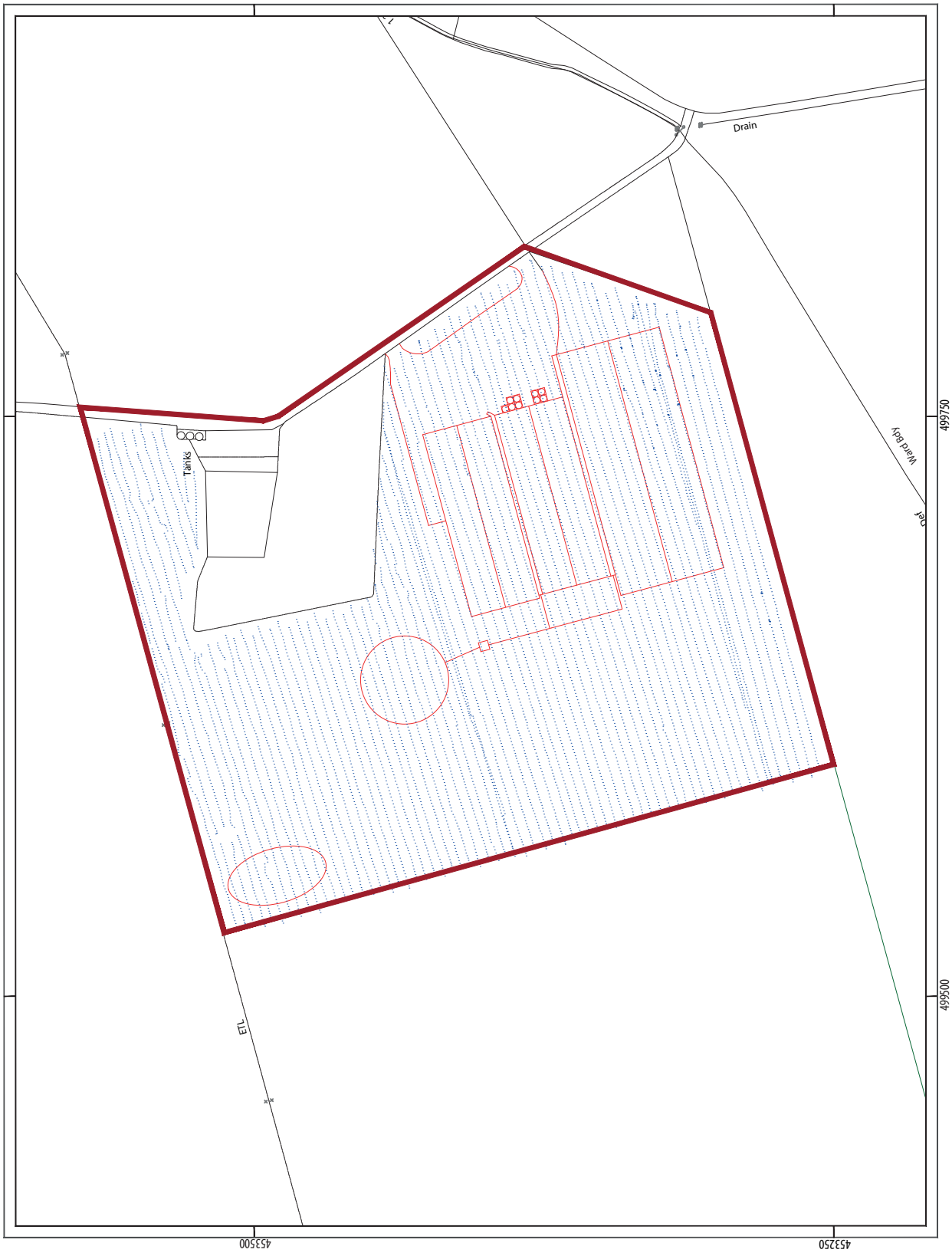
Europae Archaeologia Consillium (EAC) 2016 ***EAC Guidelines for the Use of Geophysics in Archaeology: Question to Ask and Points to Consider*** (Namur, Belgium) http://www.old.europeanarchaeological-council.org/files/eac_guidelines_2_final.pdf accessed 23 November

Gaffney C & Gater J 2003 ***Revealing the Buried Past: Geophysics for Archaeologists*** Stroud

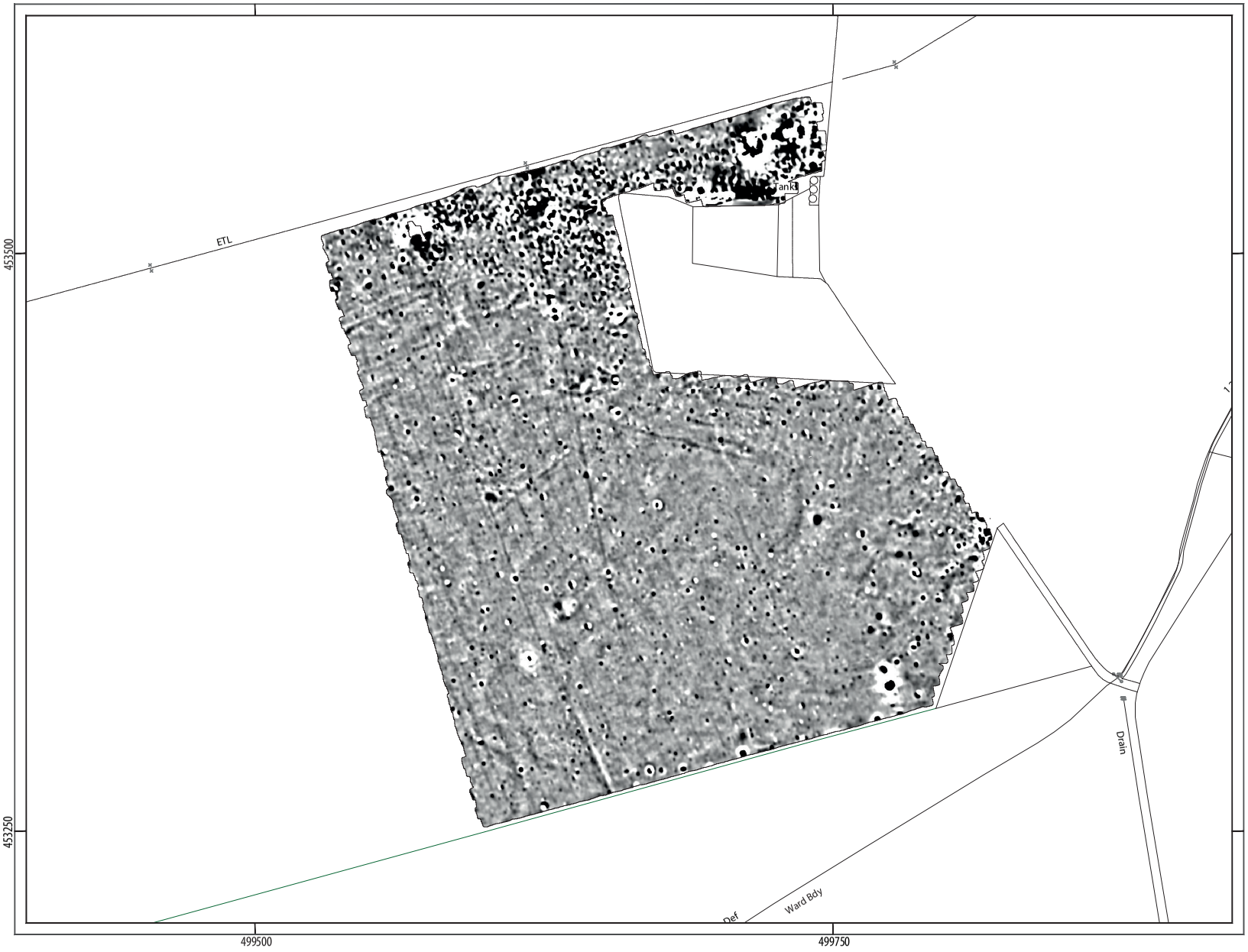
Harrison D 2020 ***Land at Hutton Road, Southburn, Driffield, East Riding of Yorkshire; Written Scheme of Investigation for Geophysical Survey*** [unpublished client document] Headland Archaeology Ref HESH20

Ministry of Housing, Communities and Local Government (MHCLG) 2019 ***National Planning Policy Framework*** https://assers.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/81017/NPPF_Feb_2019_revised.pdf accessed 23 November 2020

Natural Environment Research Council (NERC) 2018 ***British Geological Survey*** http://www.bgs.ac.uk/ accessed 23 November 2020



ILLUS 2 Survey location showing GPS swaths (1:2,500)



PROJECT HRSO20
Land at Hutton Road
Southburn
Driffield

CLIENT JSR Farms

HEADLAND ARCHAEOLOGY

Headland Archaeology Yorkshire & North
Units 23-25 | Acorn Business Centre | Balme Road
Cleckheaton | BD19 4EZ
t 0113 387 6430
w www.headlandarchaeology.com

ILLUS 3 Processed greyscale magnetometer data (1:2,500)

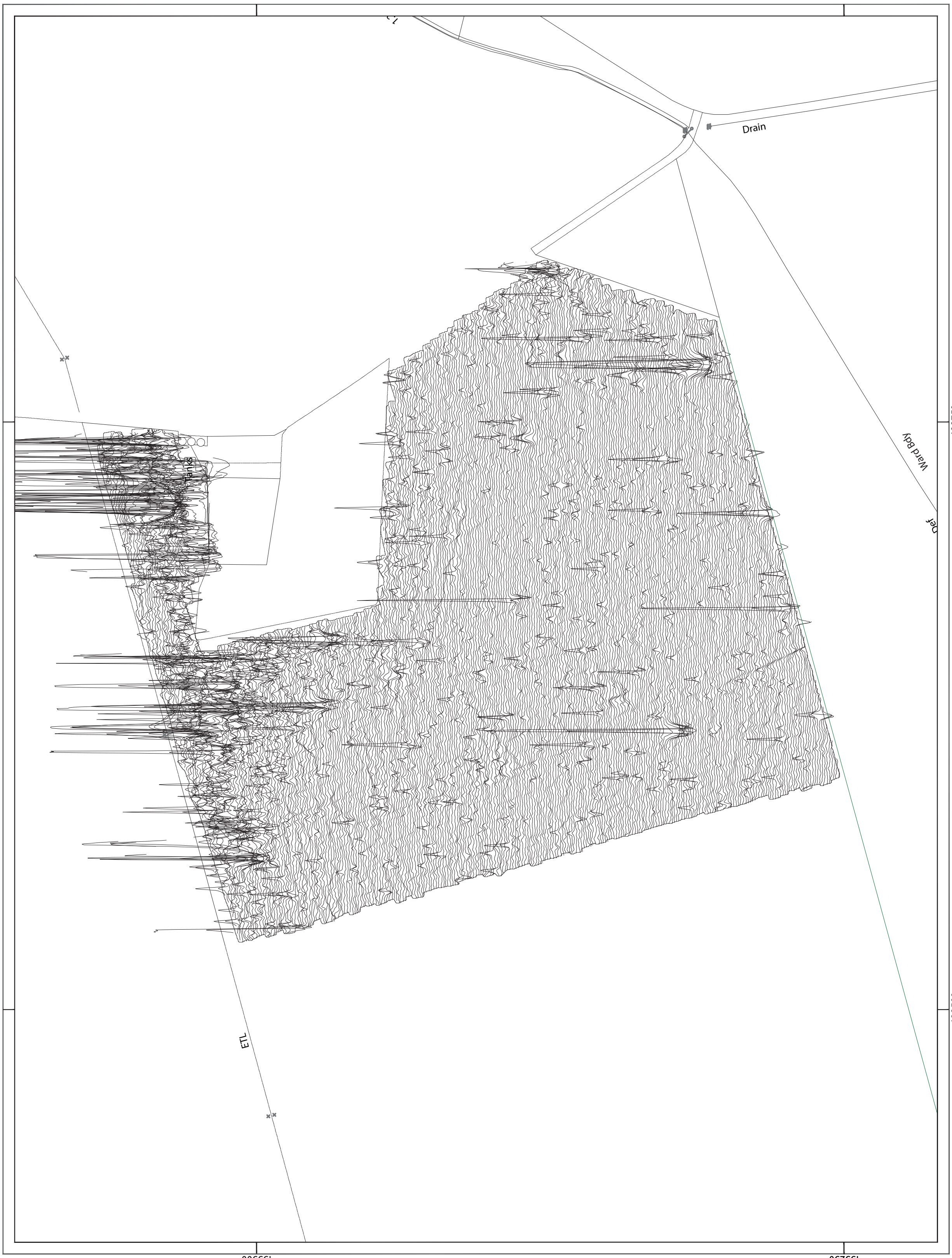
25.0nT/cm

0 — 50m
1:2,500 @ A4

PROJECT **HRS020**
Land at Hutton Road
Southburn
Driffield
CLIENT JSR Farms

HEADLAND ARCHAEOLOGY

Headland Archaeology Yorkshire & North
Units 23-25 | Acorn Business Centre | Balme Road
Cleckheaton | BD19 4EZ
t 0113 387 6430
w www.headlandarchaeology.com



ILLUS 4 XY trace plot of minimally processed magnetometer data (1:2,500)

TYPE OF ANOMALY	INTERPRETATION
dipolar isolated	ferrous material
magnetic disturbance	ferrous material
linear trend	field drain
linear trend	geological variation
magnetic enhancement	geology

0 50m
1:2,500 @ A4

PROJECT HRSO20
Land at Hutton Road
Southburn
Driffield

CLIENT JSR Farms

HEADLAND ARCHAEOLOGY
Headland Archaeology Yorkshire & North
Units 23-25 | Acorn Business Centre | Balme Road
Cleckheaton | BD19 4EZ
t 0113 387 6430
w www.headlandarchaeology.com

ILLUS 5 Interpretation of magnetometer data (1:2,500)

7 APPENDICES

APPENDIX 1 MAGNETOMETER SURVEY

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 haematite. 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 so that by measuring the magnetic susceptibility of the topsoil, areas where human occupation or settlement has occurred can be identified by virtue 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. This effect can lead to the detection of features such as hearths, kilns or areas of burning.

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.

Lightning-induced remnant magnetisation (LIRM) LIRM anomalies are thought to be caused in the near surface soil horizons by the flow of an electrical currents associated with lightning strikes. These observed anomalies have a strong bipolar signal which decreases with distance from the spike point and often appear as linear or radial in shape.

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 (sometimes only visible on an XY trace plot) 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.

APPENDIX 2 SURVEY LOCATION INFORMATION

An initial survey base station was established using a Trimble VRS differential Global Positioning System (dGPS). The magnetometer data was georeferenced using a Trimble RTK differential Global Positioning System (Trimble R8s model).

Temporary sight markers were laid out using a Trimble VRS differential Global Positioning System (Trimble R8s model) to guide the operator and ensure full coverage. The accuracy of this dGPS equipment is better than 0.01m.

The survey data 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 coordinates are measured off hard copies of the mapping rather than using the digital coordinates.

Headland Archaeology cannot accept responsibility for errors of fact or opinion resulting from data supplied by a third party.

APPENDIX 3 GEOPHYSICAL SURVEY ARCHIVE

The geophysical archive comprises an archive disk containing the raw data in XYZ format, a raster image of each greyscale plot with associate world file, and a PDF of the report.

The project will be archived in-house in accordance with recent good practice guidelines (http://guides.archaeologydataservice.ac.uk/g2gp/Geophysics_3). The data will be stored in an indexed archive and migrated to new formats when necessary.

APPENDIX 4 DATA PROCESSING

The gradiometer data has been presented in this report in processed greyscale and minimally processed XY trace plot format.

Data collected using RTK GPS-based methods cannot be produced without minimal processing of the data. The minimally processed data has been interpolated to project the data onto a regular grid and de-striped to correct for slight variations in instrument calibration drift and any other artificial data.

A high pass filter has been applied to the greyscale plots to remove low frequency anomalies (relating to survey tracks and modern agricultural features) in order to maximise the clarity and interpretability of the archaeological anomalies.

The data has also been clipped to remove extreme values and to improve data contrast.

APPENDIX 5 OASIS DATA COLLECTION FORM: ENGLAND

OASIS ID: headland5-409397

PROJECT DETAILS	
Project name	Land at Hutton Road, Southburn, Driffield, East Riding of Yorkshire
Short description of the project	Headland Archaeology (UK) Ltd undertook a geophysical (magnetometer) survey of a 6-hectare site at Southburn, near Driffied, East Yorkshire where a new pig unit is proposed. Anomalies due to field drains, geological variation and tipping/infilling around an existing structure have been identified. No anomalies of likely archaeological origin have been identified by the survey. The site is therefore assessed as having very low archaeological potential.
Project dates	Start: 19.11.2020 End: 19.11.2020
Previous/future work	No / Yes
Any associated project reference codes	HRSO20 - Contracting Unit No.
Type of project	Field evaluation
Site status	None
Current Land use	Cultivated Land 4 - Character Undetermined
Monument type	None
Monument type	None
Significant Finds	None
Significant Finds	None
Methods & techniques	''Geophysical Survey''
Development type	Farm infrastructure (eg barns, grain stores, equipment stores, etc)
Prompt	National Planning Policy Framework - NPPF
Position in the planning process	Pre-application
Solid geology	chalk (including red chalk)
Drift geology	sand and gravel of uncertain age or origin
Techniques	Magnetometry
PROJECT LOCATION	
Country	England
Site location	East Riding of Yorkshire East Riding of Yorkshire Kirkburn Land at Hutton Road, Southburn
Study area	6 hectares
Site coordinates	SE 9969 5346 53.967390780137–0.480151095446 53 58 02 N 000 28 48 W Point
PROJECT CREATORS	
Name of Organisation	Headland Archaeology
Project brief originator	Local Authority Archaeologist and/or Planning Authority/advisory body
Project design originator	Headland Archaeology
Project director/manager	Harrison David
Project supervisor	Vansassenbrouck Olivier
Type of sponsor/funding body	Developer
PROJECT ARCHIVES	
Physical Archive Exists?	No
Digital Archive recipient	In house

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

PROJECT BIBLIOGRAPHY 1

Publication type	Grey literature (unpublished document/manuscript)
Title	Land at Hutton Road, Southburn, Driffield, East Riding of Yorkshire; Geophysical Survey Report
Author(s)/Editor(s)	Webb Alistair
Date	2020
Issuer or publisher	Headland Archaeology
Place of issue or publication	Cleckheaton
Description	PDF[A]
Entered by	David Harrison (david.harrison@headlandarchaeology.com)
Entered on	30 November 2020

part of the RSK Group

Headland Archaeology Scotland
13 Jane Street
Edinburgh EH6 5HE
t 0131 467 7705
e scotland@headlandarchaeology.com

Headland Archaeology Yorkshire & North
Units 23–25 & 15 | Acorn Business Centre | Balme Road
Cleckheaton BD19 4EZ
t 0113 387 6430
e yorkshireandnorth@headlandarchaeology.com

Headland Archaeology South & East
Building 68C | Wrest Park | Silsoe
Bedfordshire MK45 4HS
t 01525 861 578
e southandeast@headlandarchaeology.com

Headland Archaeology Midlands & West
Unit 1 | Clearview Court | Twyford Rd
Hereford HR2 6JR
t 01432 364 901
e midlandsandwest@headlandarchaeology.com

Headland Archaeology North West
Fourways House | 57 Hilton Street
Manchester M1 2EJ
t 0161 236 2757
e northwest@headlandarchaeology.com

www.headlandarchaeology.com