ARCHAEOLOGICAL SERVICES
DURHAM UNIVERSITY

on behalf of
CgMs Consulting

Land at Whessoe Grange Farm Darlington

geophysical survey

report 2546
November 2010

Durham University

Contents

Figures

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1. Summary

The project

1.1 This report presents the results of geophysical surveys conducted on land at Whessoe Grange Farm, Darlington. The works comprised 20 geomagnetic surveys in the western part of a 141.5ha proposed development site.

1.2 The works were commissioned by CgMs Consulting and conducted by Archaeological Services Durham University.

Results

1.3 Detailed geomagnetic survey was undertaken on land at Whessoe Grange Farm near Darlington prior to proposed development.

1.4 Former field boundaries have been identified in areas 1, 2, 3, 7, 10, 12, 16, 17.

1.5 Former ridge and furrow cultivation has been identified in areas 2, 3, 5, 7, 8, 9, 10, 11, 12, 14, 15, 16, 17 and 18.

1.6 Other probable soil-filled features have been identified in areas 1, 3, 5, 6, 7, 10, 11, 12, 13, 14 and 15.

1.7 The remains of a probable enclosed settlement, including possible round houses, have been identified in area 10.

1.8 Probable enclosure ditches have been identified in area 12.

1.9 Possible pond features have been identified in areas 7 and 15.

1.10 Probable services and land drains have been identified in areas 1, 2, 3, 5, 9, 11, 13, 15 and 16.

1.11 Tracks have been identified in areas 7, 17 and 21.

2. Project background

Location (Figure 1)

2.1 The proposed development area comprised land at Whessoe Grange Farm, north of Faverdale Business Park, on the north side of Darlington (NGR centre: NZ 27570 18227). The site is bounded to the north by an unclassified road, Burtree Lane, and to the south by Rotary Way, the northern access road for Faverdale Business Park. At the time of survey the site boundary encompassed 141.5ha.

2.2 The proposed development area was divided into two for geophysical survey purposes; this report concerns the surveys undertaken across the western part of the area, Area A, comprising 80.2ha. Twenty geomagnetic surveys were undertaken. The eastern part of the proposed development area (Area B) has been surveyed by Pre-Construct Geophysics (PCG).

Development proposal

2.3 The proposed development is a storage facility for electronic data, consisting of four buildings and infrastructure including electricity sub-stations, fuel stores, security fencing, roads, service connections, a transport hub and landscaping to including topographical remodelling, re-instatement work and tree planting.

Objective

2.4 The principal aim of the surveys was to assess the nature and extent of any sub-surface features of potential archaeological significance within the proposed development area, so that an informed decision may be made regarding the nature and scope of any further scheme of archaeological works that may be required in relation to the development.

Methods statement

2.5 The surveys were undertaken in accordance with a specification prepared by the Assistant Archaeology Officer at Durham County Council and a written scheme of investigation (WSI) prepared by Archaeological Services and approved by the Assistant Archaeology Officer at Durham County Council.

2.6 The works were undertaken in accordance with current national standards and guidance (see para. 5.1 below).

Dates

2.7 The surveys were undertaken between 27th October and 11th November 2010. This report was prepared for 30th November 2010.

Personnel

2.8 Fieldwork was conducted by Jamie Armstrong, Matthew Claydon, Edward Davies, David Graham, Duncan Hale, Natalie Swann (Supervisor) and Richie Villis (Supervisor). The geophysical data were processed by Duncan Hale (the Project Manager). This report was prepared by Duncan Hale and Richie Villis, with illustrations by Edward Davies and Janine Watson.

Archive/OASIS

2.9 The site code is **DGP10**. The survey archive will be supplied on CD to the client for deposition with the project archive in due course. Archaeological Services Durham University is registered with the **O**nline **A**cces**S** to the **I**ndex of archaeological investigation**S** project (**OASIS**). The OASIS ID number for this project is **archaeol3-88041**.

3. Historical and archaeological background

3.1 An archaeological desk-based assessment of the proposed development area has been conducted by CgMs Consulting (CgMs 2010).

3.2 The site lies to the immediate north and west of a significant Roman civilian settlement, however, relatively little else has previously been identified in the immediate vicinity (Archaeological Services 2010a & 2010b; PCG 2004 & 2007).

3.3 The known archaeological sites within the curtilage of the development area consist of the site of a Grade II Listed building (HER 1528) and deserted medieval village (HER 1529). The listed building remains were those of a 12th-century chapel, later converted into a 16th-century manor house. The upper storey was described as having traces of wall paintings still surviving. The building has been demolished. Until the 1950s earthwork remains of a medieval period village, probably the central village for the parish of Whessoe, were visible in the 'Village Field' south of Whessoe Grange Farm. These earthworks were bulldozed in the 1950s and many large stones were reportedly encountered. Despite the destruction of the earthworks, recent geophysical survey has detected interference in this area consistent with structural traces below ground.

3.4 To the south of the development area, geophysical survey and excavation for the Argos site at Faverdale East (by PCA) demonstrated the presence of remains dateable to a period between the later 1st century BC and 4th century AD, some of high status. The features identified during the work included field systems and a series of enclosures, both demonstrably evolving over the time period, and later stone-built structures including an important two-roomed building with hypocaust. There was considered to be potential for features associated with a settlement of this nature to extend into the development area.

3.5 Ridge and furrow remains are evident in many of the fields both within and around the proposed development area.

4. Landuse, topography and geology

4.1 At the time of survey the proposed development area comprised 11 fields of pasture, 8 fields of arable land, and one field of former arable land left for pasture.

Area	Landuse	NGR
1	arable, ploughed	NZ 26736 17394
2	pasture, cows	NZ 26728 17456
3	pasture, cows	NZ 26851 17620
4	arable, ploughed	NZ 26842 17351
5	pasture, sheep	NZ 27023 17392
6	pasture, sheep	NZ 27064 17561

Area	Landuse	NGR
7	pasture, sheep	NZ 27186 17478
8	pasture, sheep	NZ 27078 17656
9	pasture, sheep	NZ 27151 17658
10	pasture, sheep	NZ 27324 17545
11	pasture, sheep	NZ 27125 17736
12	former arable left for pasture	NZ 27336 17893
13	arable, young cereal crop	NZ 27042 17892
14	arable, ploughed	NZ 27448 18072
15	arable, ploughed	NZ 27447 18216
16	arable, ploughed	NZ 27220 18191
17	arable, ploughed (incorporates area 19)	NZ 26994 18229
18	arable, ploughed	NZ 27210 18483
20	pasture, sheep	NZ 27044 17318
21	pasture, sheep	NZ 27277 17338

4.2 The proposed development area occupies undulating land which rises to the north, with elevations of between *c*. 65m OD to 80m OD.

4.3 The underlying solid geology of the area comprises Late Permian Dolostone of the Ford Formation which is overlain by Devensian Till.

5. Geophysical survey

Standards

5.1 The surveys and reporting were conducted in accordance with English Heritage guidelines, *Geophysical survey in archaeological field evaluation* (David, Linford & Linford 2008); the Institute for Archaeologists (IfA) *Draft Standard and Guidance for archaeological geophysical survey* (2010); the IfA Technical Paper No.6, *The use of geophysical techniques in archaeological evaluations* (Gaffney, Gater & Ovenden 2002); and the Archaeology Data Service *Guide to Good Practice: Geophysical Data in Archaeology* (draft 2nd edition, Schmidt & Ernenwein 2010).

Technique selection

5.2 Geophysical survey enables the relatively rapid and non-invasive identification of sub-surface features of potential archaeological significance and can involve a suite of complementary techniques such as magnetometry, earth electrical resistance, ground-penetrating radar, electromagnetic survey and topsoil magnetic susceptibility survey. Some techniques are more suitable than others in particular situations, depending on site-specific factors including the nature of likely targets; depth of likely targets; ground conditions; proximity of buildings, fences or services and the local geology and drift.

5.3 In this instance, based on previous work, it was considered likely that cut features such as ditches and pits would be present on the site, and that other types of feature such as trackways, wall foundations and fired structures (for example kilns and hearths) might also be present.

5.4 Given the anticipated shallowness of targets and the non-igneous geological environment of the study area a geomagnetic technique, fluxgate gradiometry, was considered appropriate for detecting the types of feature mentioned above. This technique involves the use of hand-held magnetometers to detect and record anomalies in the vertical component of the Earth's magnetic field caused by

variations in soil magnetic susceptibility or permanent magnetisation; such anomalies can reflect archaeological features.

Field methods

5.5 A 30m grid was established across each survey area and tied-in to known, mapped Ordnance Survey points using a Trimble Pathfinder Pro XRS global positioning system with real-time correction.

5.6 Measurements of vertical geomagnetic field gradient were determined using Bartington Grad601-2 dual fluxgate gradiometers. A zig-zag traverse scheme was employed and data were logged in 30m grid units. The instrument sensitivity was nominally 0.03nT, the sample interval was 0.25m and the traverse interval was 1m, thus providing 3,600 sample measurements per 30m grid unit.

5.7 Data were downloaded on site into a laptop computer for initial processing and storage and subsequently transferred to a desktop computer for processing, interpretation and archiving.

Data processing

5.8 Geoplot v.3 software was used to process the geophysical data and to produce both continuous tone greyscale images and trace plots of the raw (minimally processed) data. The greyscale images and interpretations are presented in Figures 2-8; the trace plots are provided in Figures 9-10. In the greyscale images, positive magnetic anomalies are displayed as dark grey and negative magnetic anomalies as light grey. Palette bars relate the greyscale intensities to anomaly values in nanoTesla.

5.9 The following basic processing functions have been applied to the data:

clip	clips data to specified maximum or minimum values; to eliminate large noise spikes; also generally makes statistical calculations more realistic
zero mean traverse	sets the background mean of each traverse within a grid to zero; for removing striping effects in the traverse direction and removing grid edge discontinuities
destagger	corrects for displacement of geomagnetic anomalies caused by alternate zig-zag traverses
interpolate	increases the number of data points in a survey to match sample and traverse intervals; in this instance the data have been interpolated to 0.25m x 0.25m intervals

Interpretation: anomaly types

5.10 A colour-coded geophysical interpretation plan is provided. Three types of geomagnetic anomaly have been distinguished in the data:

positive magnetic	regions of anomalously high or positive magnetic field gradient, which may be associated with high magnetic susceptibility soil-filled structures such as pits and ditches

negative magnetic	regions of anomalously low or negative magnetic field gradient, which may correspond to features of low magnetic susceptibility such as wall footings and other concentrations of sedimentary rock or voids
dipolar magnetic	paired positive-negative magnetic anomalies, which typically reflect ferrous or fired materials (including fences and service pipes) and/or fired structures such as kilns or hearths

Interpretation: features

5.11 Colour-coded archaeological interpretation plans are provided.

5.12 Except where stated otherwise in the text below, positive magnetic anomalies are taken to reflect relatively high magnetic susceptibility materials, typically sediments in cut archaeological features (such as ditches or pits) whose magnetic susceptibility has been enhanced by decomposed organic matter or by burning.

5.13 Small, discrete dipolar magnetic anomalies have been detected in all of the survey areas. These almost certainly reflect items of near-surface ferrous and/or fired debris, such as horseshoes and brick fragments, and in most cases have little or no archaeological significance. Strong dipolar magnetic anomalies at the edges of some of the areas reflect wire fences and steel pylons.

Area 1

5.14 A linear, positive magnetic anomaly has been detected in the north-east corner of the survey area. This could reflect a former field boundary, or a stream bank or channel.

5.15 Linear, positive magnetic anomalies have been detected in the south-west of the survey area. These may reflect soil-filled ditch features.

5.16 A single, discrete, sub-circular, positive magnetic anomaly has been detected in the south of the survey area. This is likely to reflect a soil-filled pit feature.

5.17 A number of very narrow, north-west/south-east aligned positive magnetic anomalies have been detected in this area. These are likely to reflect land drains.

5.18 The strong dipolar magnetic anomaly detected in the centre of the north edge of the area reflects the position of a steel pylon.

Area 2

5.19 Two, almost parallel, linear, positive magnetic anomalies have been detected in this area. These are aligned broadly north/south and correspond to the position of a former field boundary marked on the 1st edition Ordnance Survey (OS) map. These anomalies are likely to reflect this former field boundary and a probable adjacent ditch. Two other field boundaries are also shown on the OS map but have not been detected geophysically.

5.20 Series of parallel, weak, positive magnetic anomalies which almost certainly reflect former ridge and furrow cultivation have been detected across the survey area aligned broadly north-east/south-west.

5.21 The two large and strong dipolar magnetic anomalies detected on the south edge of the survey area reflect the position of steel pylons.

5.22 The discrete, strong, dipolar magnetic anomaly detected at the north-west corner of the survey area reflects the position of a manhole cover.

Area 3

5.23 A linear, positive magnetic anomaly, aligned broadly east/west, has been detected in the north of the survey area. This follows the line of an existing low bank and ditch and corresponds to a former field boundary shown on the 1st edition OS map.

5.24 To the north of the former field boundary, paired, parallel, weak positive and negative magnetic anomalies have been detected aligned broadly east/west. These almost certainly reflect former ridge and furrow cultivation.

5.25 To the south of the former field boundary, series of parallel, weak, positive magnetic anomalies aligned broadly north/south reflect the former ridge and furrow cultivation.

5.26 Series of parallel, weak, negative magnetic anomalies aligned broadly north-west/south-east, may reflect a later ploughing regime.

5.27 A linear, negative magnetic anomaly has been detected parallel to the south edge of the survey area. This may reflect the position of a land drain.

5.28 A number of linear positive magnetic anomalies have also been detected in this area. These may reflect the remnants of soil-filled ditch features.

Area 4

5.29 No features of archaeological significance have been detected in this area.

Area 5

5.30 Series of parallel, weak, positive magnetic anomalies which almost certainly reflect former ridge and furrow cultivation have been detected aligned broadly north/south across the survey area.

5.31 A number of parallel negative magnetic anomalies have been detected, aligned broadly east/west. These connect to a perpendicular negative magnetic anomaly detected in the centre of the survey area. These are likely to reflect a system of land drainage.

5.32 Two positive magnetic anomalies have been detected which are very similar in size and orientation to the anomalies identified as land drains. These are likely to reflect the system of land drainage rather than soil-filled ditch features of archaeological origin.

5.33 A curvilinear, positive magnetic anomaly has been detected in the south-west corner of the survey area. This could reflect a soil-filled ditch feature.

5.34 The strong, discrete, dipolar magnetic anomaly detected near the centre of the west edge of the survey area reflects the position of a geotechnical borehole.

5.35 The large and strong dipolar magnetic anomalies detected at the east edge of the survey area reflect the positions of a manhole cover close to a water trough.

Area 6

5.36 Series of parallel positive magnetic anomalies have been detected aligned east/west across the survey area. These are likely to reflect a former ploughing regime.

5.37 Two curvilinear, weak, positive magnetic anomalies have been detected in the centre of the survey area. These could reflect soil-filled ditch features.

Area 7

5.38 A linear, positive magnetic anomaly, aligned broadly east/west, has been detected in the centre of the survey area. This corresponds to the position of a field boundary shown by the 1st edition OS map.

5.39 A linear positive magnetic anomaly has been detected south of the former field boundary. This could reflect a soil-filled ditch feature, and could reflect the partial remains of another field boundary.

5.40 Parallel positive magnetic anomalies have been detected aligned broadly north/south in this area. These almost certainly reflect the presence of former ridge and furrow cultivation, some of which survives as earthworks.

5.41 The strong negative magnetic anomaly aligned north/south across the centre of the survey area reflects the position of a hardcore track. Although this track now bends right through a defile towards the roundabout on Rotary Way to the south of the survey area, the former course of the track has been detected to the east at the south end.

5.42 A rectilinear positive magnetic anomaly has been detected at the east of the survey area. This could reflect a soil-filled ditch feature.

5.43 The dipolar magnetic anomaly and dummy readings at the east of the survey area reflect the position of a pond. A further dipolar magnetic anomaly to the south of this may reflect the former position of another pond feature.

Area 8

5.44 Paired positive and negative magnetic anomalies almost certainly reflecting former ridge and furrow cultivation have been detected in this area, aligned east/west.

5.45 The large and strong dipolar magnetic anomaly detected at the north edge of the survey area reflects the position of a steel pylon.

5.46 The smaller dipolar magnetic anomaly at the east edge of the survey area reflects the position of a trough.

Area 9

5.47 Paired positive and negative magnetic anomalies almost certainly reflecting former ridge and furrow cultivation have been detected in this area, aligned east/west.

5.48 The chain of strong dipolar magnetic anomalies detected in the middle of the survey area almost certainly reflects the line of a service pipe.

5.49 The discrete dipolar magnetic anomaly detected east of the service pipe reflects the position of a trough.

Area 10

5.50 A rectilinear positive magnetic anomaly has been detected in the north of this area. It measures *c*. 55m x 45m and almost certainly reflects an enclosure ditch.

5.51 A number of rectilinear and curvilinear positive magnetic anomalies have been detected within this enclosure. At least two of these could represent the remains of ring-ditches with diameters of *c*. 10m and 5m.

5.52 These features pre-date the ridge and furrow cultivation and, given the proximity of later Iron-Age occupation within the vicinity, are likely to be associated with roundhouses.

5.53 To the east of the enclosure system a linear positive magnetic anomaly has been detected. This corresponds to the position of a former field boundary shown on the 1st edition OS. This former field boundary extends southwards and corresponds to the curvilinear dipolar magnetic anomaly detected in the centre of the survey area. The line of the former field boundary extending south of this has not been detected.

5.54 North/south aligned positive magnetic anomalies have been detected across the area. These almost certainly reflect former ridge and furrow cultivation. These anomalies are stronger across the enclosure ditch and associated features, reflecting the ploughing out of magnetically susceptible materials from these features. This means the enclosure ditches and other features must pre-date the ridge and furrow.

5.55 The anomalously high concentration of dipolar anomalies detected in the north-west corner of the survey area, close to the current farm buildings, are likely to reflect dumped fired and ferrous waste.

Area 11

5.56 A number of linear, rectilinear and curvilinear positive magnetic anomalies have been detected in this area. These could reflect soil-filled ditch features.

5.57 Parallel positive magnetic anomalies, which almost certainly reflect former ridge and furrow cultivation, have been detected aligned broadly east/west.

5.58 The large and strong dipolar magnetic anomaly detected in the south-west corner of the area reflects the position of a steel pylon.

5.59 The large and strong dipolar magnetic anomaly detected at the south-east corner of the survey area reflects the proximity of metal sheds and farm buildings.

5.60 The chain of dipolar magnetic anomalies detected across the south of the survey is likely to reflect the position of a service pipe.

Area 12

5.61 A number of linear and rectilinear positive magnetic anomalies have been detected in this area. These could reflect the position of soil-filled ditch features, such as the remains of former field systems and enclosures.

5.62 These anomalies are strongest in the south of the area, where they are similar to those detected to the south in area 10, however it is not known if these features are related.

5.63 Micheson's 1601 survey of Whessoe shows a number of field boundaries in this area, so it is probable that some of these ditch features may reflect these.

5.64 Parallel positive magnetic anomalies almost certainly reflecting former ridge and furrow cultivation have been detected aligned broadly east/west in this area.

5.65 The strong, discrete, dipolar magnetic anomalies in the north-east and south-west corners of the survey area reflect the positions of geotechnical boreholes.

Area 13

5.66 A number of linear positive magnetic anomalies have been detected in this area.

5.67 The series of parallel, equally spaced, weak positive magnetic anomalies is likely to reflect land drains.

5.68 The more diffuse positive magnetic anomalies could reflect soil-filled ditch features. These include a circular feature *c*. 5m in diameter, which could reflect a possible ring-ditch.

Area 14

5.69 Parallel positive and negative magnetic anomalies almost certainly reflecting former ridge and furrow cultivation have been detected aligned broadly east/west in this area.

5.70 Two, parallel, positive magnetic anomalies have been detected in the south-east corner of this area. These may reflect soil-filled ditch features.

Area 15

5.71 The series of interconnected positive and dipolar magnetic anomalies detected in this area are likely to reflect the presence of field drains. The central "trunk", aligned broadly north-west/south-east, lines up with a system of land drains identified in the PCG survey to the north.

5.72 Parallel, positive magnetic anomalies, aligned broadly east/west, have been detected across the survey area. These almost certainly reflect former ridge and furrow cultivation.

5.73 A broad and diffuse, sub-circular, positive magnetic anomaly has been detected in the west of the survey area. This could represent a broad and shallow feature, such as a pond.

Area 16

5.74 A linear, positive magnetic anomaly has been detected, aligned broadly east/west, in the north of the survey area. This corresponds to the position of a former field boundary as shown by Micheson's 1601 survey.

5.75 To the south of this former field boundary parallel, positive magnetic anomalies have been detected. These are aligned broadly north/south and almost certainly reflect former ridge and furrow cultivation.

5.76 North of the former field boundary ridge and furrow cultivation has been detected aligned broadly east/west and north/south. These could represent multi-phase agricultural cultivation.

5.77 The two strong, discrete, dipolar magnetic anomalies in the south of the area reflect the position of geotechnical boreholes.

5.78 The chain of dipolar anomalies along the north edge of the survey area may reflect the position of a service pipe respecting the current field boundary.

5.79 The large and strong dipolar magnetic anomalies on the west of the survey area are likely to reflect dumps of ferrous and fired waste along the field boundary.

Area 17

5.80 A linear, positive magnetic anomaly has been detected, aligned broadly east/west, in the north of the survey area. This corresponds to the position of a former field boundary as shown by Micheson's 1601 survey.

5.81 Parallel, weak, positive magnetic anomalies have been detected across the survey area. These almost certainly reflect former ridge and furrow cultivation. In the north of the area, these are aligned north-west/south-east. To the north of the former field boundary the ridge and furrow is aligned broadly east/west. To the south of the former field boundary the ridge and furrow is aligned north/south.

5.82 The linear, strong dipolar magnetic anomaly, aligned north-west/south-east, detected in the north-east of the survey area reflects the position of a hardcore track.

5.83 Two of the dipolar magnetic anomalies in the north of this area reflect the position of geotechnical boreholes.

Area 18

5.84 Parallel, positive magnetic anomalies, which almost certainly reflect former ridge and furrow cultivation, have been detected aligned east/west across this area.

Area 20

5.85 No features of archaeological significance have been detected in this area.

Area 21

5.86 The high concentration of dipolar anomalies detected at the west of this area is likely to reflect an area of disturbance related to the former access track identified to the north in area 7.

6. Conclusions

6.1 Detailed geomagnetic survey was undertaken on land at Whessoe Grange Farm near Darlington prior to proposed development.

6.2 Former field boundaries have been identified in areas 1, 2, 3, 7, 10, 12, 16, 17.

6.3 Former ridge and furrow cultivation has been identified in areas 2, 3, 5, 7, 8, 9, 10, 11, 12, 14, 15, 16, 17 and 18.

6.4 Other soil-filled features have been identified in areas 1, 3, 5, 6, 7, 10, 11, 12, 13, 14 and 15.

6.5 The remains of a probable enclosed settlement, including possible round houses, have been identified in area 10.

6.6 Probable enclosure ditches have been identified in area 12.

6.7 Possible pond features have been identified in areas 7 and 15.

6.8 Probable services and land drains have been identified in areas 1, 2, 3, 5, 9, 11, 13, 15 and 16.

6.9 Tracks have been identified in areas 7, 17 and 21.

7. Sources

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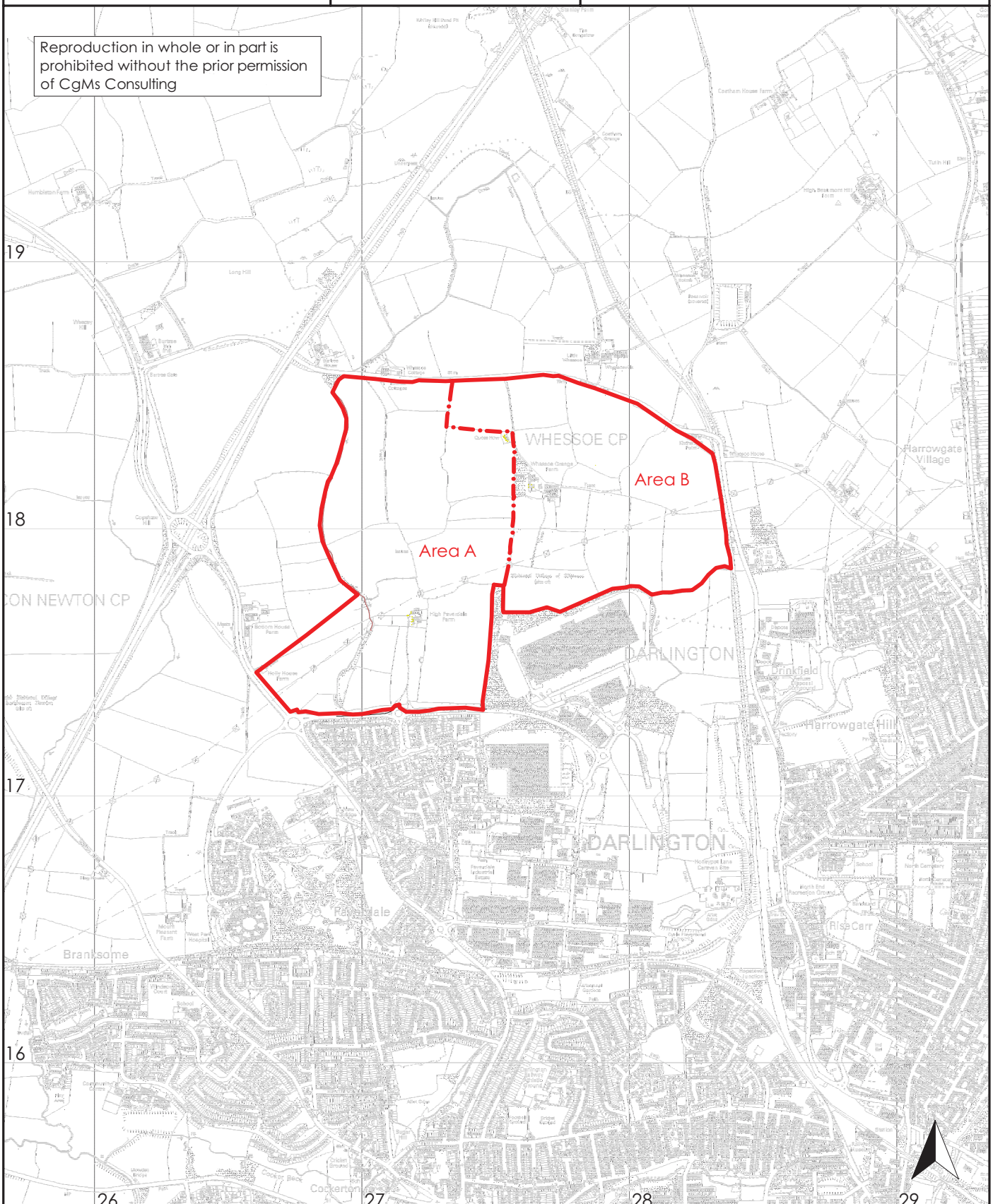
Figure 1: Site location



survey areas

0 1km

scale 1:20 000 for A4 plot

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0 200m

scale 1:4000 for A3 plot

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Figure 2: Geophysical survey overview

Area 13

Area 11

Area 3

Area 8

Area 9

Area 10

Area 7

Area 6

Area 2

Area 5

Area 1

Area 4

Area 20

Area 21

ROTARY WAY

178
177
176
175
174
173

266 267 268 269 270 271 272 273 274 275

magnetic survey

-5 nT 5

pgc surveys 2004

0 50m

scale 1:1000 for A0 plot

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Figure 3: Southern part - geophysical survey

Area 13

Area 11

Area 3

Area 8

Area 9

Area 10

Area 7

Area 6

Area 2

Area 5

Area 1

Area 4

Area 20

Area 21

ROTARY WAY

178
177
176
175
174
173

266 267 268 269 270 271 272 273 274 275

dipolar magnetic anomaly
positive magnetic anomaly
negative magnetic anomaly

0 50m
scale 1:1000 for A0 plot

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Figure 4: Southern part - geophysical interpretation

Area 13

Area 11

Area 3

Area 8

Area 9

Area 10

Area 7

Area 6

Area 2

Area 5

Area 1

Area 4

Area 20

Area 21

ROTARY WAY

178
177
176
175
174
173

266 267 268 269 270 271 272 273 274 275

soil-filled feature
ridge and furrow
land drain
pylon / telegraph pole
service pipe
geotechnical borehole
manhole cover
ploughing regime
former field boundary

0 50m
scale 1:1000 for A0 plot

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Figure 5: Southern part - archaeological interpretation

Area 18

Area 16

Area 15

Area 17

Area 14

Area 12

Area 13

Area 11

186
185
184
183
182
181
180
179
178
269
270
275
276

magnetic survey

-5 nT 5

pgc surveys 2004

0 50m
scale 1:1000 for A0 plot

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Figure 6: Northern part - geophysical survey

Area 18

Area 16

Area 15

Area 17

Area 14

Area 12

Area 13

Area 11

186
185
184
183
182
181
180
179
178

269
270
271
272
273
274
275
276

dipolar magnetic anomaly

positive magnetic anomaly

negative magnetic anomaly

0 50m
scale 1:1000 for A0 plot

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Figure 7: Northern part - geophysical interpretation

Area 18

Area 16

Area 15

Area 17

former pond?

Area 14

Area 12

Area 13

Area 11

186
185
184
183
182
181
180
179
178

269 270 271 272 273 274 275 276

soil-filled feature
ridge and furrow
land drain
pylon / telegraph pole
service pipe
geotechnical borehole
manhole cover
ploughing regime
former field boundary

0 50m
scale 1:1000 for A0 plot

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Figure 8: Northern part -
archaeological interpretation

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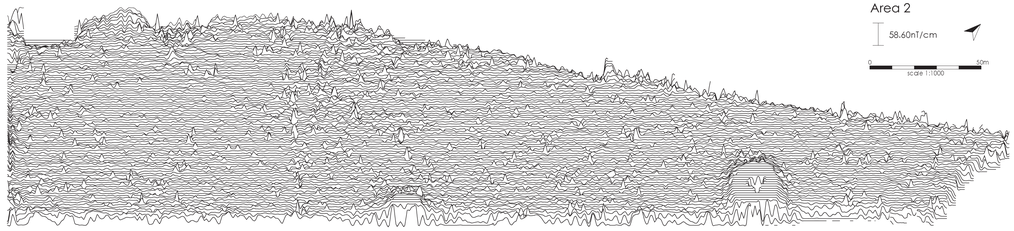
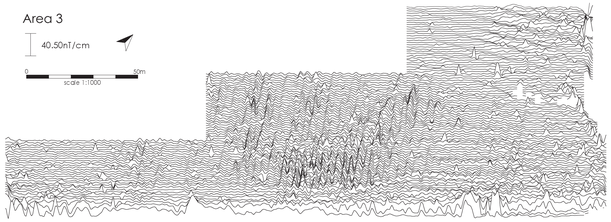
Figure 9:
Trace plots of geomagnetic data

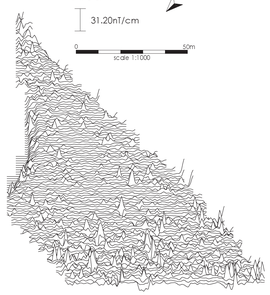
Area 1
33.00nT/cm
0 50m
scale 1:1000



Area 2
58.60nT/cm
0 50m
scale 1:1000



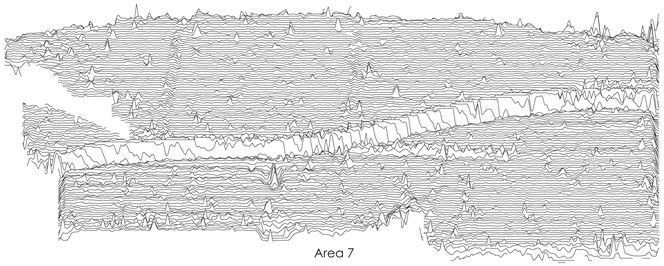
Area 3
40.50nT/cm
0 50m
scale 1:1000



Area 4
31.20nT/cm
0 50m
scale 1:1000

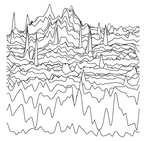
Area 5
30.50nT/cm
0 50m
scale 1:1000

Area 6
32.00nT/cm
0 50m
scale 1:1000

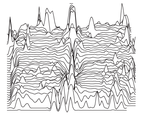


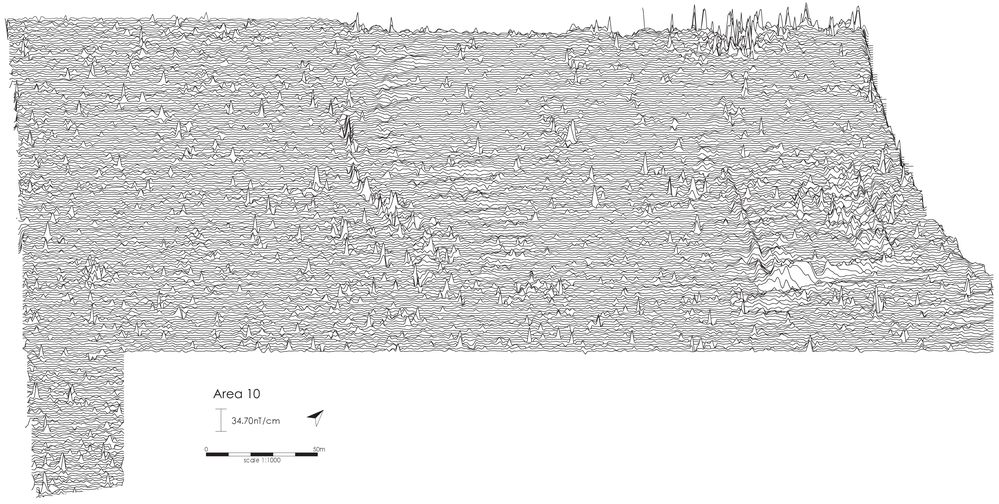
Area 7
44.10nT/cm
0 50m
scale 1:1000

Area 8
10.30nT/cm
0 50m
scale 1:1000

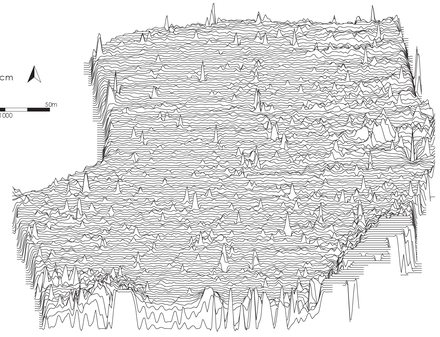


Area 9
33.70nT/cm
0 50m
scale 1:1000

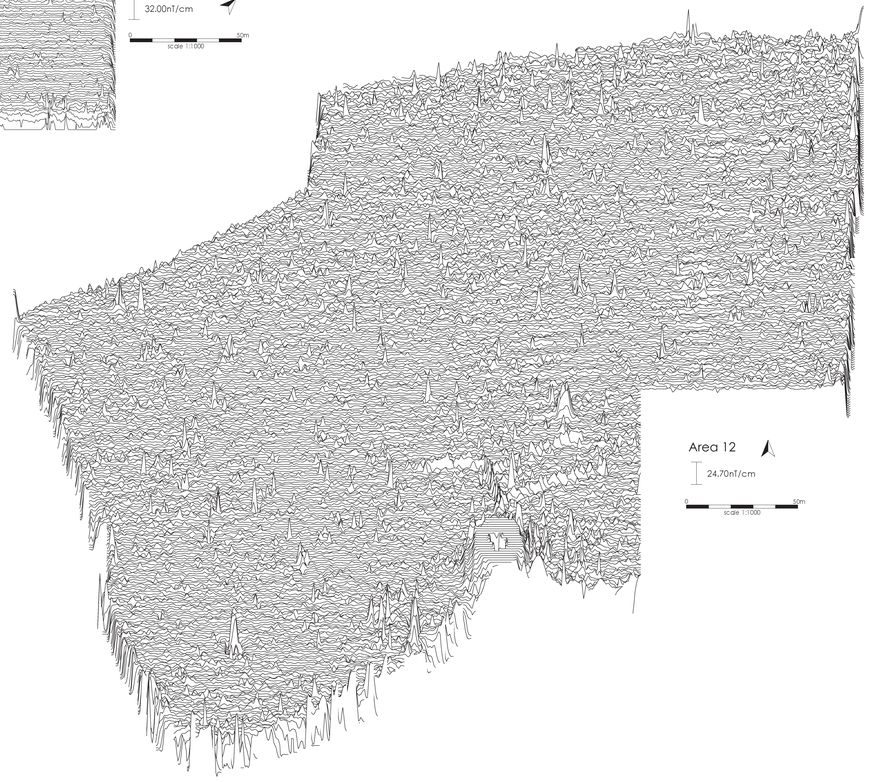




Area 10
34.70nT/cm
0 50m
scale 1:1000



Area 11
24.40nT/cm
0 50m
scale 1:1000



Area 12
24.70nT/cm
0 50m
scale 1:1000

Land at Whessoe Grange Farm
Darlington

geophysical survey
report 2546

Figure 10:
Trace plots of geomagnetic data