Archaeological Services
University of Durham

Knabs Ridge, Harrogate, North Yorkshire

geophysical surveys

on behalf of

Entec

ASUD Report 1285
June 2005

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Knabs Ridge, Harrogate, North Yorkshire geophysical surveys

ASUD Report 1285
June 2005

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on behalf of

Entec UK Ltd
Canon Court North, Abbey Foregate, Shrewsbury, Shropshire, SY2 5DE

Contents

1. Summary

The project

1.1 This report presents the results of geophysical surveys conducted on land at Knabs Ridge, near Harrogate, North Yorkshire, in advance of a proposed wind farm development.

1.2 The works were commissioned by Entec UK, and conducted by Archaeological Services University of Durham in accordance with a written scheme of investigation provided by the Heritage Section of North Yorkshire County Council, with amendments to the brief verbally approved by the Senior Archaeologist.

Results

1.3 Geophysical surveys have been carried out on land at Knabs Ridge, between Skipton Road (A59) and Penny Pot Lane, Felliscliffe, near Harrogate, North Yorkshire.

1.4 Anomalies possibly reflecting a ditched trackway or enclosure were detected in Area 3, together with sub-circular and curvilinear soil-filled features of uncertain origin.

1.5 A large curvilinear anomaly in Area 5 may reflect a ditch-like feature, unrelated to the drainage systems present.

1.6 Weak anomalies possibly reflecting remains of ridge and furrow cultivation were detected in Area 6, with additional earthworks observed in unsurveyed areas of the field, probably associated with the former Knabs Ridge farmstead. Weak anomalies possibly reflecting ridge and furrow remains have also been detected in Areas 1 and 9.

1.7 A cropmark in Area 8 identified by aerial photography was not detected by gradiometer survey. This may mean its origin is spurious, geological, or that archaeological formation processes have rendered the feature undetectable by this method. On examination of the aerial photographs, however, it is considered that the interpretation of cropmarks in this field as one coherent feature is tentative.

1.8 Systems of land drainage were detected in most areas, most clearly in Area 2, including systems of open dikes in Areas 4 and 5.

2. Project background

Location (Figure 1 & 2)

2.1 The study area is located on land at Knabs Ridge, between Skipton Road (A59) and Penny Pot Lane, Felliscliffe, near Harrogate, North Yorkshire (NGR centre: SE 23069 55923).

Development proposal

2.2 The surveys have been carried out in connection with a planning proposal comprising the erection of eight wind turbines, access routes and associated buildings and equipment.

Brief

2.3 The surveys have been undertaken in accordance with a written scheme of investigation prepared by North Yorkshire County Council Heritage Section, with amendments to the brief verbally approved by the Senior Archaeologist.

Objective

2.4 The principal aim of the surveys was to investigate the potential for the presence of the remains of past settlement, activity and land-use and to test for the survival of associated, buried archaeological features, to enable an informed assessment of the archaeological impact of the development proposals. One survey was located to test for the presence of a possible cropmark in Area 8 (Figure 2).

Dates

2.5 Fieldwork was undertaken between 31st May and 7th June 2005. This report was prepared between 8th June and 16th June 2005.

Personnel

2.6 Fieldwork was conducted by Sam Roberts (Supervisor), Graeme Attwood and Lorne Elliot. This report was prepared by Sam Roberts, with illustrations by Janine Fisher. The Project Manager was Duncan Hale.

Archive/OASIS

2.7 The site code is **KRH05**, for **K**nabs **R**idge, **H**arrogate 20**05**. The paper and data archive is currently held at Archaeological Services, University of Durham. It is anticipated that the data archive will be transferred to the Archaeology Data Service in due course. Archaeological Services University of Durham 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 archaeol3-8661.

3. Archaeological and historical background

3.1 Although no sites are recorded in the North Yorkshire Historic Environment Record (HER) within the proposed development area, this region has experienced relatively little field investigation. The potential for discovering

previously unrecorded archaeology has been demonstrated by community projects in the area (e.g. Dacre Pasture Project 2004) which have recorded remains associated with various industries from the Iron Age through to post-medieval periods, together with the discoveries of prehistoric rock art, often incorporated into dry stone walling (NYCC 2005). These findings indicate long-term human presence and exploitation of the landscape which has often gone unnoticed, furthermore there are a number of sites recorded surrounding the proposal site which might indicate the possibility for the survival of early land-use, management and potentially settlement within the study area.

3.2 The proposal site lies within the former Forest of Knaresborough, to the north-east of two Scheduled Ancient Monuments: John of Gaunts' Castle, a medieval royal hunting lodge (National Monument number: 29547); and the Bank Slack Camp earthworks (County Monument number NY133). The Roman road known as Watling Street lies to the north, with an associated area of building platforms, believed also to be Roman, recently discovered to the west (NYCC 2005).

3.3 A number of cropmarks are recorded in the Historic Environment Record for the surrounding area, including a group of rectilinear enclosures to the north of the A59 (NYM 14991), a group of rectilinear enclosures to the south of the A59 aligned upon a trackway orientated northeast-southwest, whose projected alignment could extend into the proposal area (NYM 14961), as well as cropmarks representing possible rectilinear enclosures and trackways to the north and south of Penny Pot Lane (NYM 15003, NYM 14977, NYM 13379). To the west of the application area there is evidence for former quarrying, and a possible medieval boundary stone situated to the north of Penny Pot Lane and west of Constable Ridge Road (NYCC 2005).

3.4 A number of previously unknown crop and soil-mark features were also identified in this area during the production of an Environmental Statement by Entec (NYCC 2005). Of these, one, a possible rectilinear enclosure, falls within the area to be impacted upon by development and is located within Area 8 (Figure 2).

4. Landuse, topography and geology

4.1 At the time of survey the study area mainly consisted of grassland used for the grazing of livestock or set aside for silage production. An area of acid grassland was present in the centre of the study area, which was also used for animal grazing. The survey area was subdivided into a number of rectangular areas, bounded by dry stone walls, modern fencelines, and hedged boundaries. Many of the modern fencelines were situated on or adjacent to stone revetted banks and drainage ditches, which are likely to be earlier field boundaries.

4.2 The study area occupied a gently undulating ridge situated at a mean elevation of *c*.210m AOD.

4.3 The underlying solid geology of the area is the Millstone Grit Series, comprising a succession of alternating sandstone and shale strata. The eastern half of the site is directly underlain by sandstone, the western half by sandstone and shales. Drift deposits are not present, whilst the soils on site mainly consist of peaty topsoils and loamy subsoils (Wilcocks I Association). Artificial drainage on site has rendered these soils suitable for livestock grazing.

5. Geophysical survey

Standards

5.1 The surveys and reporting were conducted in accordance with English Heritage (1995) Research and Professional Services Guideline No.1, *Geophysical survey in archaeological field evaluation*; the Institute of Field Archaeologists (2001) *Standard and Guidance for Archaeological Field Evaluation* and (2002) Paper No.6, *The use of geophysical techniques in archaeological evaluations*; and the Archaeology Data Service (2001) *Geophysical Data in Archaeology: A Guide to Good Practice*.

Technique selection

5.2 Geophysical surveying enables the relatively rapid and non-invasive identification of potential archaeological features within landscapes and can involve a variety of complementary techniques such as magnetometry, electrical resistance, ground-penetrating radar and electromagnetic survey. Some techniques are more suitable than others in particular situations, depending on a variety of 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, given the anticipated shallowness of the targets and the non-igneous geological environment of the study area a geomagnetic technique, fluxgate gradiometry, was considered appropriate for detecting each of the types of feature mentioned above. This technique has previously been shown to be effective in the general area (ASUD 2005). The technique involves the use of hand-held magnetometers to detect and record minute perturbations, or 'anomalies', in the vertical component (i.e. gradient) of the Earth's magnetic field caused by variations in soil magnetic susceptibility or permanent magnetisation; such anomalies can reflect the presence of archaeological features.

Field methods

5.4 Gradiometer surveys were carried out in Areas 1-9 (Figure 2), located to correspond with the areas of likely ground disturbance owing to the location of turbines, buildings and access routes in the development proposal. Area 6 was located to the northeast of a tumbledown building and associated low banked rectilinear enclosure, which are presumed to be the remains of the former Knabs Ridge farm. The survey in Area 8 was positioned so as to test for the

presence of a previously identified rectilinear cropmark as well as to sample the proposed access corridor.

5.5 A 30m grid was established across each survey area. The survey grids were tied-in to known, mapped Ordnance Survey points using a Leica TR307 total survey station instrument and datalogger equipped with *penmap* software.

5.6 Measurements of vertical geomagnetic field gradient were determined using Bartington Grad601-2 fluxgate gradiometers with automatic datalogging facilities. A zig-zag traverse scheme was employed and data were logged in 30m grid units. The instrument sensitivity was set to 0.1nT, the sample interval to 0.25m and the traverse interval to 1.0m, thus providing 3600 sample measurements per 30m grid unit.

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

Data processing

5.8 Geoplot v3 software was used to process the geophysical data and to produce both continuous tone greyscale images and trace plots of the raw data. The greyscale images and interpretations are presented in Figures 2-27; a general location plan is shown in Figure 1; the trace plots are provided in Appendix I. In the greyscale images, positive magnetic anomalies are displayed as dark grey and negative magnetic anomalies as light grey. A palette bar relates each greyscale intensity to anomaly values in nanoTesla.

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

Clip – clips, or limits 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.

Despike – locates and suppresses localised spikes in gradiometer data caused by near-surface ferrous litter.

Interpolate – increases the number of data points in a survey; to match sample and traverse intervals and so create a smoother appearance to the data. In this instance the data have been interpolated to 0.25 x 0.25m intervals.

Interpretation: anomaly types

5.10 Colour-coded geophysical interpretation plans are provided for each survey area. 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 (Figures 2-27)

5.11 Colour-coded archaeological interpretation plans are provided for each survey area.

Area 1 (Figures 3-5)

5.12 A number of very weak negative magnetic linear anomalies aligned northeast-southwest and northeast-southwest may reflect buried land drains.

5.13 A weak texture in the magnetic data, consisting of very weak positive and negative linear magnetic anomalies aligned north-south, may reflect recent ploughing or the remains of ridge and furrow.

5.14 An intense dipolar linear magnetic anomaly in the southwest corner of the survey area reflects a modern fenceline.

5.15 A scatter of small dipolar magnetic anomalies reflects near-surface ferrous and fired materials, an almost ubiquitous feature found in ploughsoils.

Area 2 (Figures 6-8)

5.16 A series of parallel linear positive magnetic anomalies orientated northeast-southwest joining a linear negative magnetic anomaly orientated northwest-southeast almost certainly reflects a system of land drains.

5.17 A variation in background texture to the east of the survey area corresponds to a change from pasture to more marshy, higher ground.

5.18 Intense dipolar linear magnetic anomalies situated on the edges of the survey area reflect modern fencelines.

5.19 A scatter of dipolar magnetic anomalies reflecting fired and/or ferrous debris in the topsoil is again present. A larger, more intense, dipolar anomaly on the southern edge of the survey area reflects the presence of a large pile of building debris next to a metal gate at the entrance to the field.

Area 3 (Figures 9-11)

5.20 The survey in Area 3 is divided by a modern field boundary. This is reflected by the intense linear dipolar magnetic anomaly separating the 30m wide survey strip from the 90m square survey.

5.21 The only anomalies present in the 30m wide survey strip are a scatter of dipolar magnetic anomalies reflecting fired and ferrous debris in the topsoil.

5.22 In the northern square survey area, a set of two weakly positive linear magnetic anomalies and two weakly negative parallel rectilinear magnetic anomalies have been detected. The weak nature of these anomalies make them difficult to interpret, but they may reflect a ditched trackway or possibly the corner of an enclosure.

5.23 To the west of these, a number of positive magnetic anomalies, subcircular and curvilinear in form, have been detected. These anomalies may reflect soil-filled features.

5.24 Towards the centre of the survey area, two curvilinear positive magnetic anomalies, measuring approximately 10m in length, have been detected. Whilst of uncertain origin, these anomalies may also reflect soil-filled features.

Area 4 (Figures 12-14)

5.25 The relatively non-magnetic background with few anomalies reflecting ferrous or fired soil debris detected in Area 4 is a consequence of the acid bog vegetation and organic peat soils covering this area, which have not been subject to ploughing in recent times.

5.26 This area is cross-cut by drainage dikes, slowly becoming infilled by peat deposits; and faint positive magnetic anomalies crossing the area are likely to reflect these features.

Area 5 (Figures 15-17)

5.27 Area 5 is situated over similar vegetation to Area 4, and is similarly cross-cut by drainage dikes. A low concentration of background dipolar magnetic anomalies is also apparent, combined with faint positive linear magnetic anomalies probably reflecting the slowly infilling drainage ditches.

5.28 A large curvilinear positive magnetic anomaly detected in the northeast corner of the survey area probably reflects a soil-filled ditch-like feature. This feature seems to be of different character to those interpreted as dikes, and may not be related to drainage.

5.29 An increase in dipolar magnetic anomalies in the southeast corner of the survey area almost certainly reflect remnants of fencing wire noted during the

survey, whilst intense linear dipolar magnetic anomalies on the north and eastern edges of the survey area reflect modern fencelines.

Area 6 (Figures 18-20)

5.30 A linear dipolar magnetic anomaly leading to an intense dipolar anomaly reflects a buried water pipe surfacing in a watering area for animals. A pipe also led into this watering area from the east, detected as a dipolar anomaly in the northeast corner of the survey area. An intense dipolar magnetic anomaly in the southeast corner of the survey area is likely to be a buried drain cover, or other large ferrous item.

5.31 Weak negative and positive linear magnetic anomalies at the eastern extent of the survey area, aligned roughly north-south, may reflect the remains of ridge and furrow cultivation.

5.32 Faint earthworks of ridge and furrow were noted aligned east-west at the western extent of the survey area; these have not been clearly detected by the survey.

5.33 Linear dipolar magnetic anomalies on the north and western periphery of the survey area reflect corrugated iron sheep pens and modern wire fencing.

5.34 A scatter of dipolar magnetic anomalies reflecting fired and ferrous debris in the soil litter is also evident.

Area 7 (Figures 21-22)

5.35 No significant anomalies were detected in this area. A linear dipolar magnetic anomaly on the western edge of the survey reflects a modern fence line and gate. Dipolar magnetic anomalies detected almost certainly reflect fired and ferrous soil debris.

Area 8 (Figures 23-24)

5.36 Modern fencelines have been detected as linear dipolar magnetic anomalies on the east and west boundaries. An intense dipolar magnetic anomaly in the northeastern corner of the survey area reflects a metal gate opening into Area 7. Dipolar magnetic anomalies detected almost certainly reflect fired and ferrous soil debris.

5.37 A cropmark previously identified by aerial photography was not detected by the gradiometer survey, which could mean its origin is either due to a change in underlying geology or spurious rather than archaeological, or that it was undetectable for other reasons. The nature of the soils in this area should be well suited for identifying features using magnetometry, however in some cases features may not be easily detected. Whereas cropmarks tend to reflect differences in soil moisture content, gradiometer surveys detect anomalies based upon differences in the magnetic susceptibilities of soils. Topsoils normally have greater magnetic susceptibilities than subsoils, and this susceptibility can be enhanced by activities connected with human occupation.

When gradiometer surveys detect features such as ditches or pits, it is due to the contrast between the feature being cut into subsoil and later silting up with topsoil or filled with refuse material. If the feature in question has been back-filled with similar material to that excavated, however, or is not directly associated with human occupation, then there may be insufficient magnetic susceptibility contrast between the fill of the ditches and the surrounding subsoil.

Area 9 (Figures 25-27)

5.38 An intense dipolar anomaly in the southwestern corner of the survey reflects the presence of an anemometer mast. Radiating support wires prevented any further survey in this corner.

5.39 A very weak negative magnetic anomaly crossing the survey area aligned east-west corresponds to a stone revetted field boundary bank.

5.40 Very weak negative and positive linear magnetic anomalies, aligned northeast-southwest, may reflect remains of ridge and furrow.

5.41 Extremely weak linear positive magnetic anomalies detected in the western half of the survey area may reflect soil-filled features, possibly plough marks, land drains or the remains of ridge and furrow.

5.42 The only other anomalies in this detected in this area are dipolar magnetic anomalies reflecting a scatter of fired and ferrous debris in the topsoil, and a fenceline in the northwestern corner.

6. Conclusions

6.1 Geophysical surveys have been carried out on land at Knabs Ridge, between Skipton Road (A59) and Penny Pot Lane, Felliscliffe, near Harrogate, North Yorkshire.

6.2 Anomalies possibly reflecting a ditched trackway or enclosure were detected in Area 3, together with sub-circular and curvilinear soil-filled features of uncertain origin. Aerial photographs of this area (MAL/67080/077, OS/70416/250, MAL/77003/225) show a trackway leading to the former Knabs Ridge farmstead, which may account for the of the anomalies detected.

6.3 A large curvilinear anomaly in Area 5 may reflect a ditch-like feature.

6.4 Weak anomalies possibly reflecting remains of ridge and furrow cultivation were detected in Area 6, with additional earthworks observed in unsurveyed areas of the field, probably associated with the former Knabs Ridge farmstead. Very weak anomalies possibly reflecting ridge and furrow remains have also been detected in Areas 1 and 9.

6.5 A cropmark in Area 8 previously identified in aerial photographs was not detected by gradiometer survey. This may mean its origin is spurious,

geological, or that archaeological formation processes have rendered the feature undetectable by magnetometry. However, upon inspection of aerial photography showing the area (OS/70416/337), it is considered that the interpretation of cropmarks in this field as a coherent feature is tentative.

6.6 Systems of land drainage were also detected in most areas, most clearly in Area 2, including systems of open dikes in Areas 4 and 5.

7. References

Archaeology Data Service (2001) *Geophysical Data in Archaeology: A Guide to Good Practice*. Arts and Humanities Data Service.

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Institute of Field Archaeologists (2001) *Standard and Guidance for Archaeological Field Evaluation*. http://www.archaeologists.net/modules/icontent/inPages/docs/codes/fldeval2001.pdf

Institute of Field Archaeologists (2002) Technical Paper No.6, *The use of geophysical techniques in archaeological evaluations (revised edition)*. Birmingham.

NYCC (2005) *Written Scheme of Investigation for Archaeological Evaluation by Geophysical Survey: Land at Knabs Ridge, between Skipton Road (A59) & Penny Pot Lane, Felliscliffe, North Yorkshire.* North Yorkshire County Council Heritage Section

Aerial Photographs:

Source	Film Number	Frame Number	Date
National Monuments Record	MAL/67080	077	21/08/1967
National Monuments Record	OS/70416	250	29/09/1970
National Monuments Record	OS/70416	337	29/09/1970
National Monuments Record	MAL/77003	225	26/02/1977

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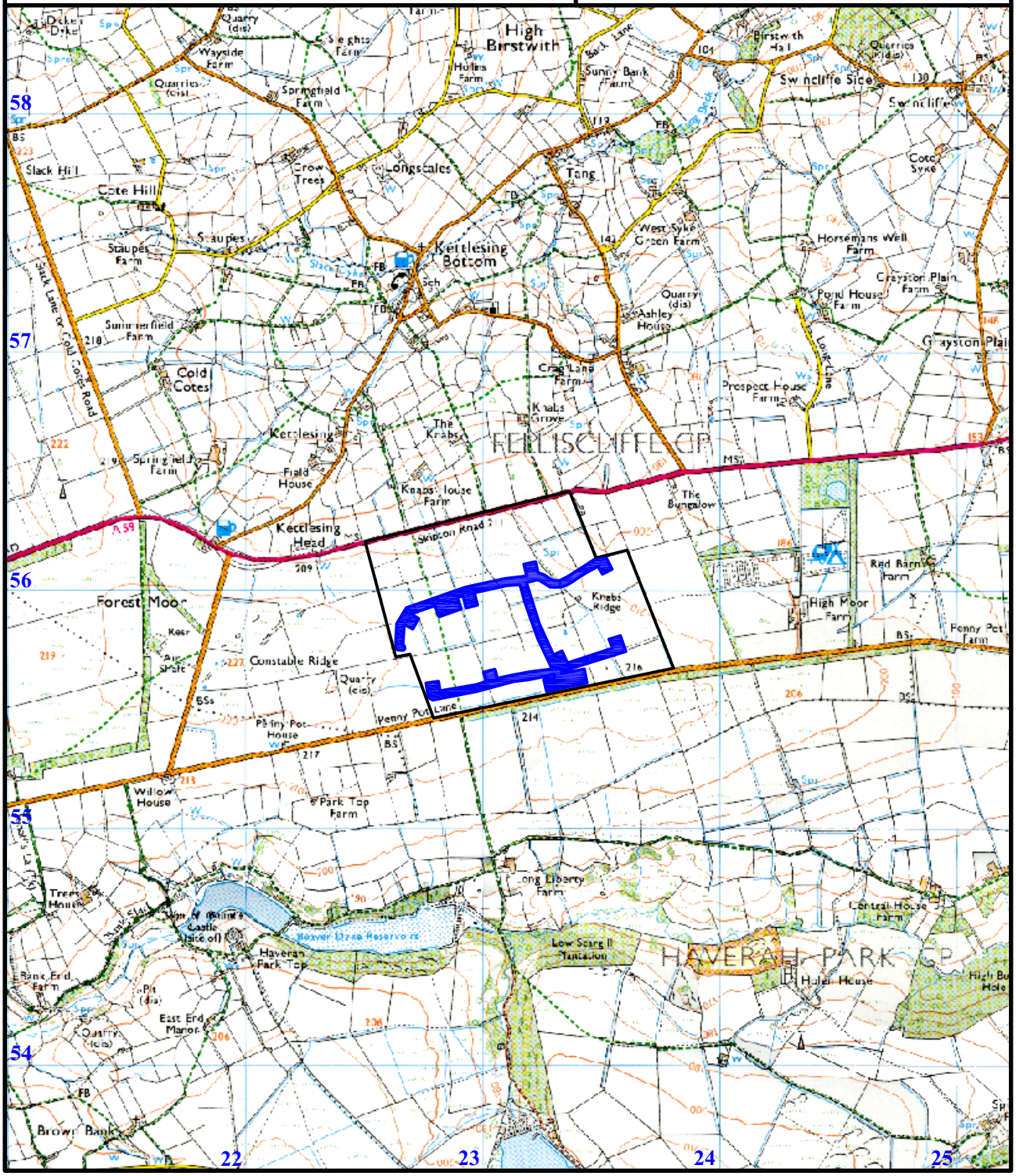
Figure 1
Location map (showing area of proposed development in blue)



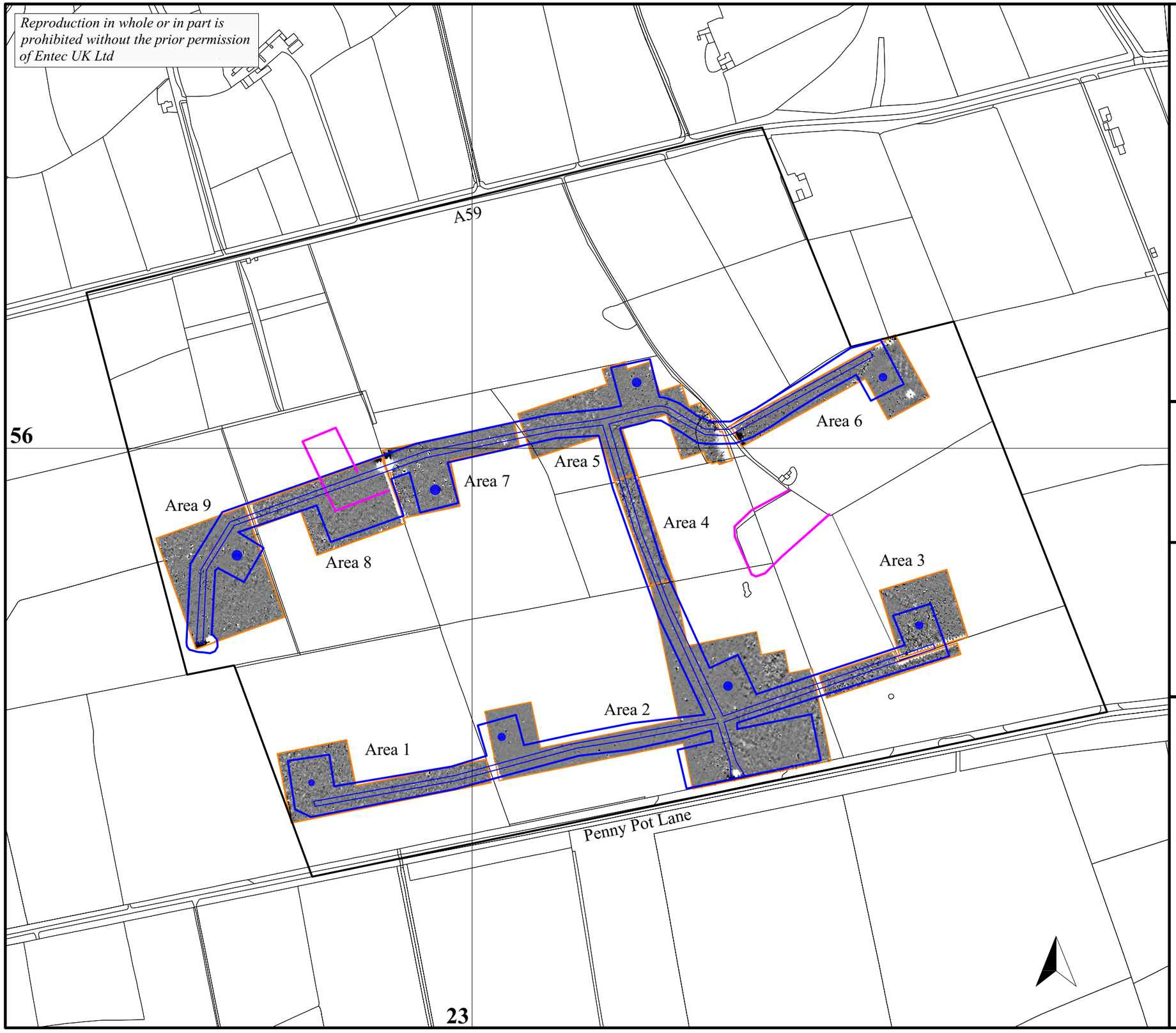


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Figure 2

Map showing location of geophysical surveys and proposed development area

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0 250m

scale 1:5000 - for A3 plot

outline of survey area

crop marks

proposed development area

557

556

555

228

229

230

Area 1

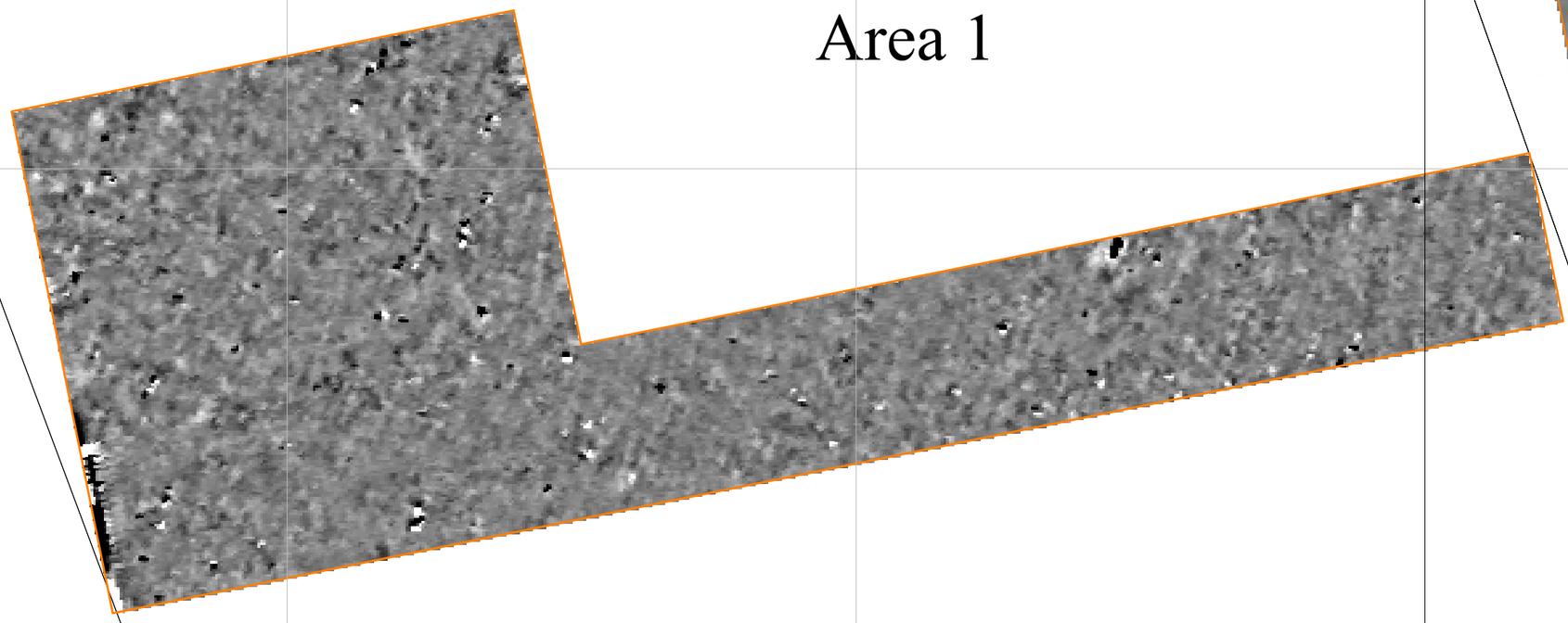

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Figure 3

Geophysical survey of Area 1

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0 50m

scale 1:1000 - for A3 plot

2.00
1.67
1.33
1.00
0.67
0.33
0.00
-0.33
-0.67
-1.00
-1.33
-1.67
-2.00 nT

557

556

555

228

229

230

Area 1

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Figure 4

Geophysical interpretation of Area 1

on behalf of

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0 50m

scale 1:1000 - for A3 plot

outline of survey area

positive magnetic anomalies

negative magnetic anomalies

dipolar magnetic anomalies

Area 1

557

556

555

228

229

230

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Figure 5

Archaeological interpretation of Area 1

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0 50m

scale 1:1000 - for A3 plot

outline of survey area

possible land drains

possible ridge and furrow

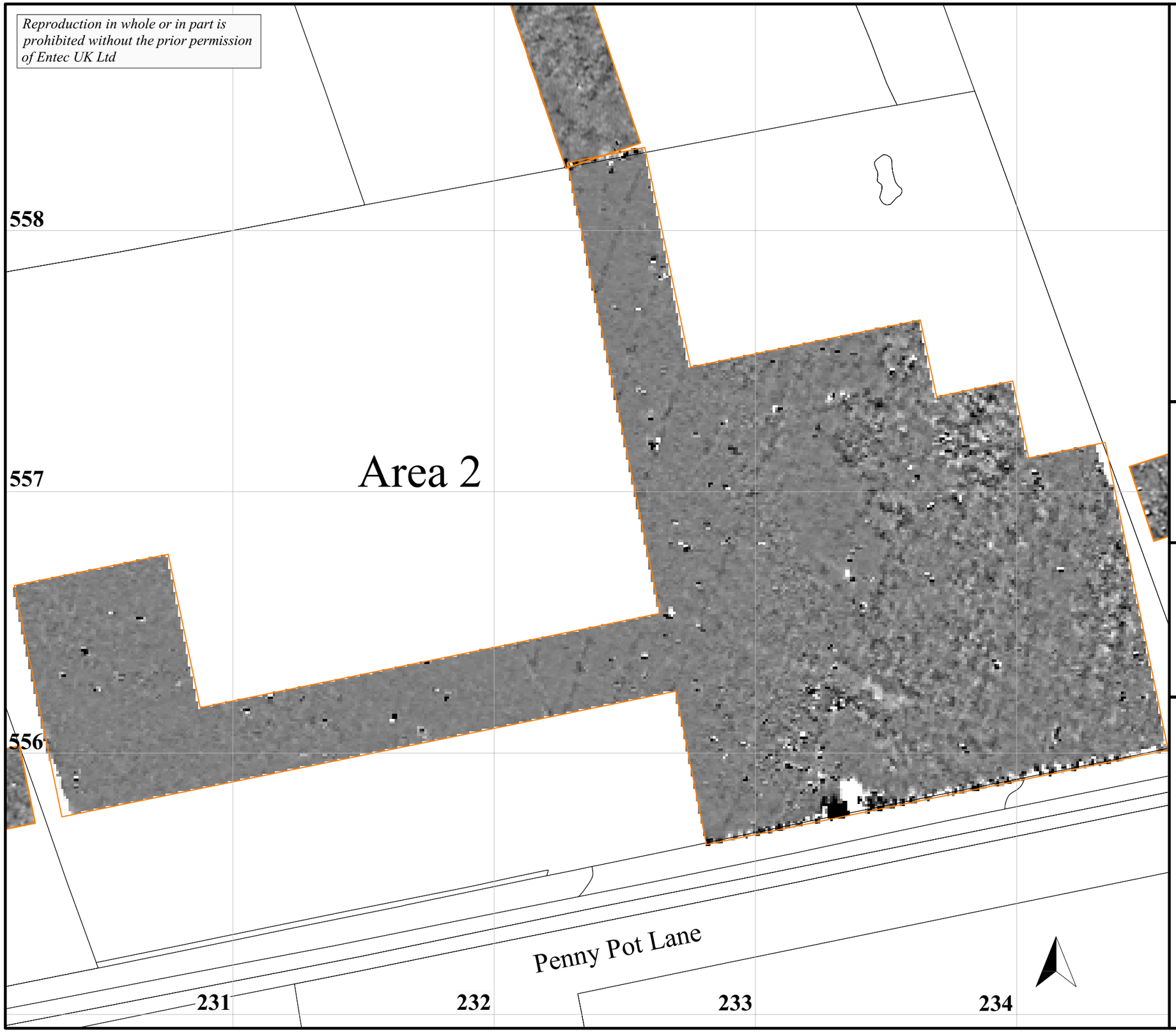

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Figure 6

Geophysical survey of Area 2

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0 50m

scale 1:1500 - for A3 plot

3.00
2.50
2.00
1.50
1.00
0.50
0.00
-0.50
-1.00
-1.50
-2.00
-2.50
-3.00 nT

Area 2

558

557

556

231

232

233

234

Penny Pot Lane

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Figure 7

Geophysical interpretation of Area 2

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0 50m

scale 1:1500 - for A3 plot

- outline of survey area
- positive magnetic anomalies
- negative magnetic anomalies
- dipolar magnetic anomalies
- marshy ground

Area 2

558

557

556

231

232

233

234

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Figure 8

Archaeological interpretation of Area 2

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0 50m

scale 1:1500 - for A3 plot

outline of survey area

land drains

marshy ground

559

558

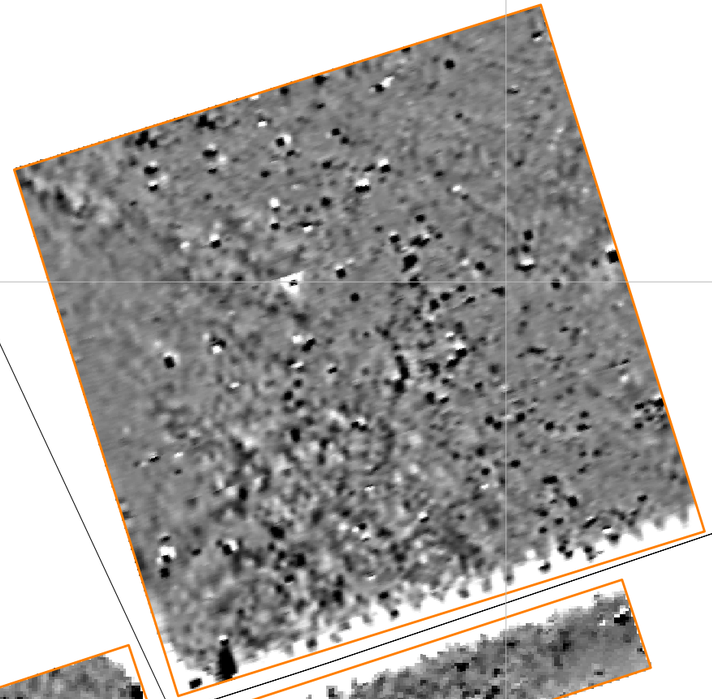
557

234

235

236

Area 3



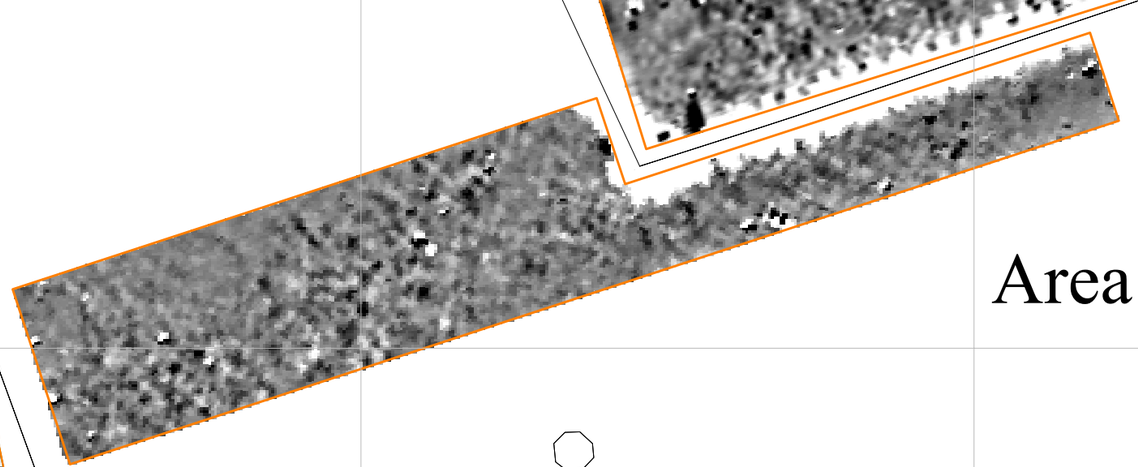


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Figure 9

Geophysical surveys of Area 3

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0 50m

scale 1:1000 - for A3 plot

(for northern area)	(for southern area)
2.00	3.00
1.67	2.50
1.33	2.00
1.00	1.50
0.67	1.00
0.33	0.50
0.00	0.00
-0.33	-0.50
-0.67	-1.00
-1.00	-1.50
-1.33	-2.00
-1.67	-2.50
-2.00 nT	-3.00 nT

559

558

557

234

235

236

Area 3

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Figure 10

Geophysical interpretation of Area 3

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0 50m

scale 1:1000 - for A3 plot

- outline of survey area
- positive magnetic anomalies
- negative magnetic anomalies
- dipolar magnetic anomalies

559

558

557

234

235

236

Area 3

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Figure 11

Archaeological interpretation of Area 3

on behalf of

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0 50m

scale 1:1000 - for A3 plot

outline of survey area

soil-filled features

possible ditched trackway

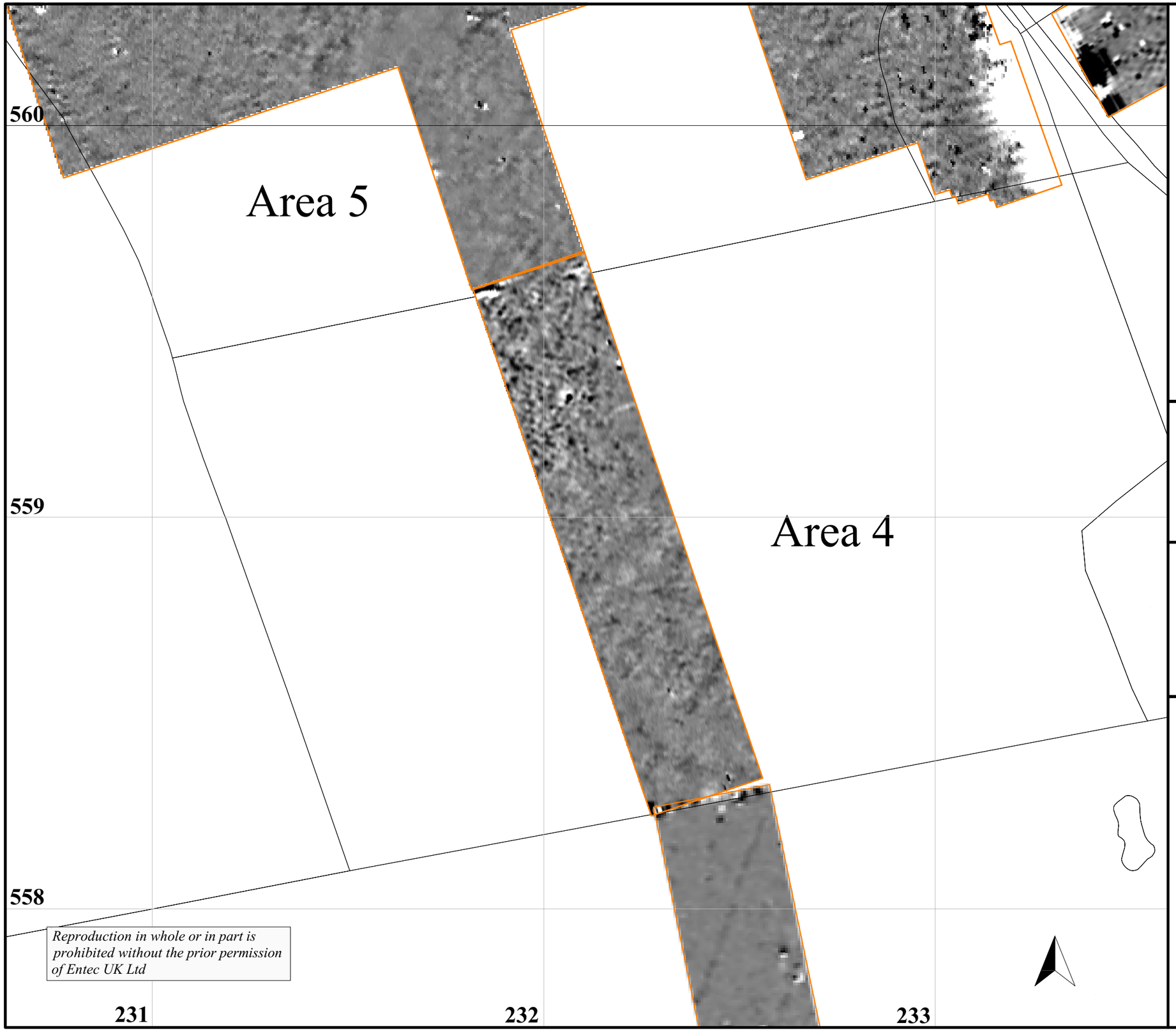

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Figure 12

Geophysical survey of Area 4

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0 50m

scale 1:1000 - for A3 plot

1.00
0.83
0.67
0.50
0.33
0.17
0.00
-0.17
-0.33
-0.50
-0.67
-0.83
-1.00 nT

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Figure 13

Geophysical interpretation of Area 4

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0 50m

scale 1:1000 - for A3 plot

outline of survey area

positive magnetic anomalies

dipolar magnetic anomalies

Area 5

Area 4

560

559

558

231

232

233

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Figure 14

*Archaeological interpretation
of Area 4*

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0 50m

scale 1:1000 - for A3 plot

Area 5

Area 4

560

559

558

231

232

233

outline of survey area

cross-cutting dikes

561

560

Area 5

231

232

233

Area 4

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Figure 15

Geophysical survey of Area 5

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0 50m

scale 1:1000 - for A3 plot

2.00
1.67
1.33
1.00
0.67
0.33
0.00
-0.33
-0.67
-1.00
-1.33
-1.67
-2.00 nT

561

560

Area 5

231

232

233

Area 4

Archaeological Services
University of Durham

Knabs Ridge, Harrogate, North Yorkshire

geophysical surveys

ASUD Report 1285

Figure 16

Geophysical interpretation of Area 5

on behalf of

Entec

0 50m

scale 1:1000 - for A3 plot

outline of survey area

positive magnetic anomalies

dipolar magnetic anomalies

561

560

Area 5

231

232

233

Archaeological Services
University of Durham

Knabs Ridge, Harrogate, North Yorkshire

geophysical surveys

ASUD Report 1285

Figure 17

Archaeological interpretation of Area 5

on behalf of

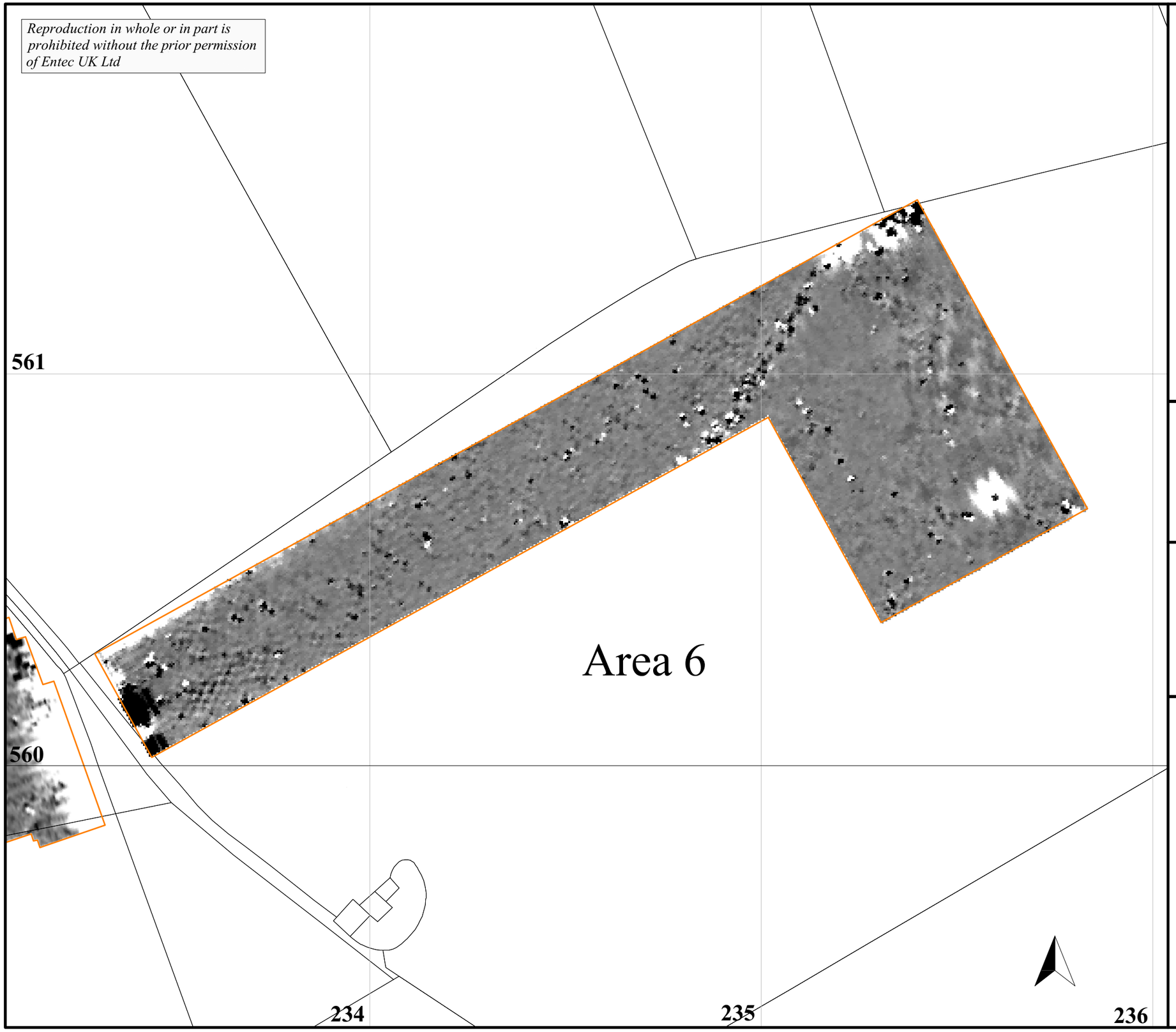
Entec

0 50m

scale 1:1000 - for A3 plot

outline of survey area

cross-cutting dikes



Archaeological Services
University of Durham

Knabs Ridge, Harrogate, North Yorkshire

geophysical surveys

ASUD Report 1285

Figure 18

Geophysical survey of Area 6

on behalf of

Entec

0 50m

scale 1:1000 - for A3 plot

3.00
2.50
2.00
1.50
1.00
0.50
0.00
-0.50
-1.00
-1.50
-2.00
-2.50
-3.00 nT

Archaeological Services
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North Yorkshire**

geophysical surveys

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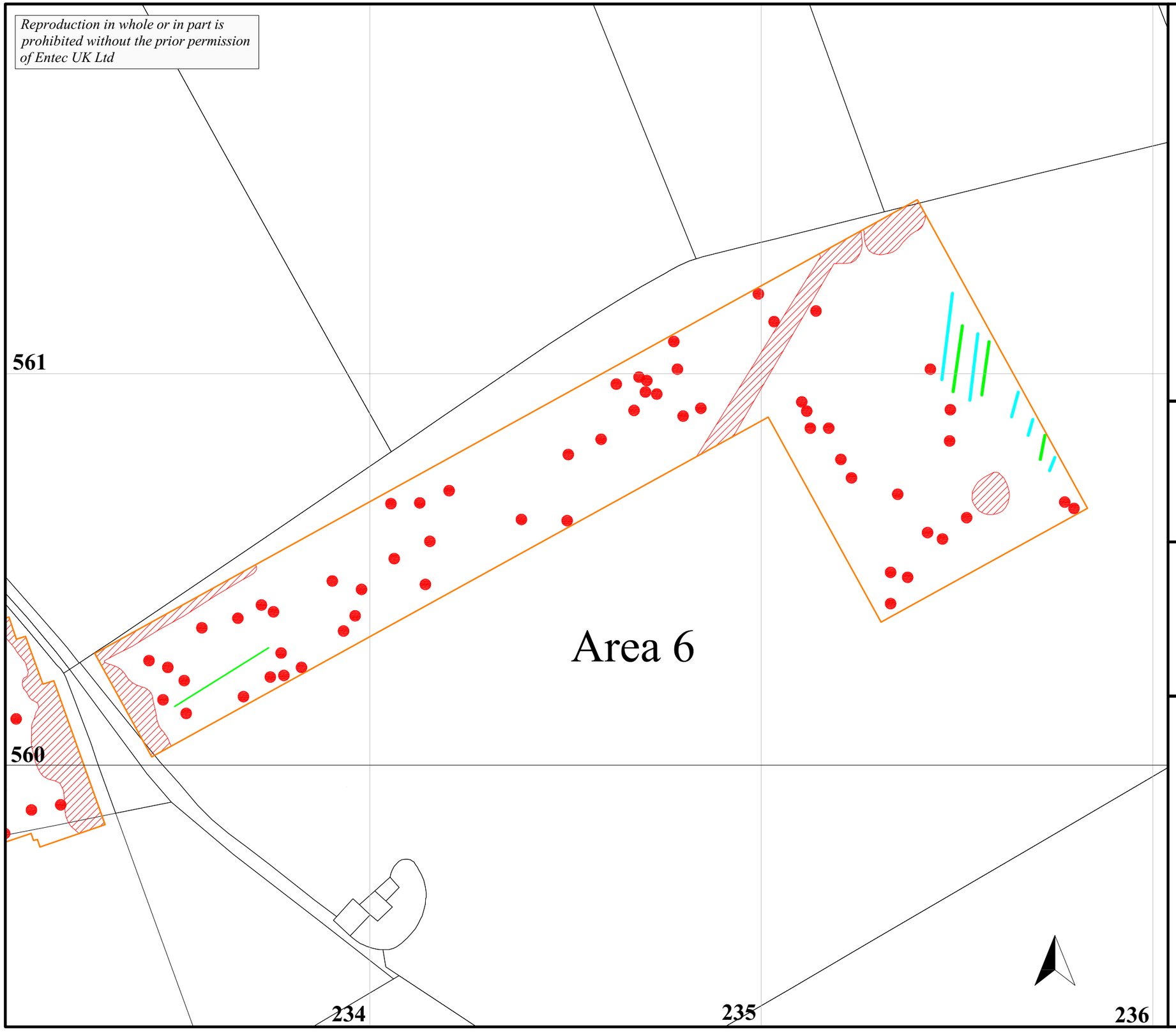
Figure 19

Geophysical interpretation of Area 6

on behalf of

Entec



0 50m

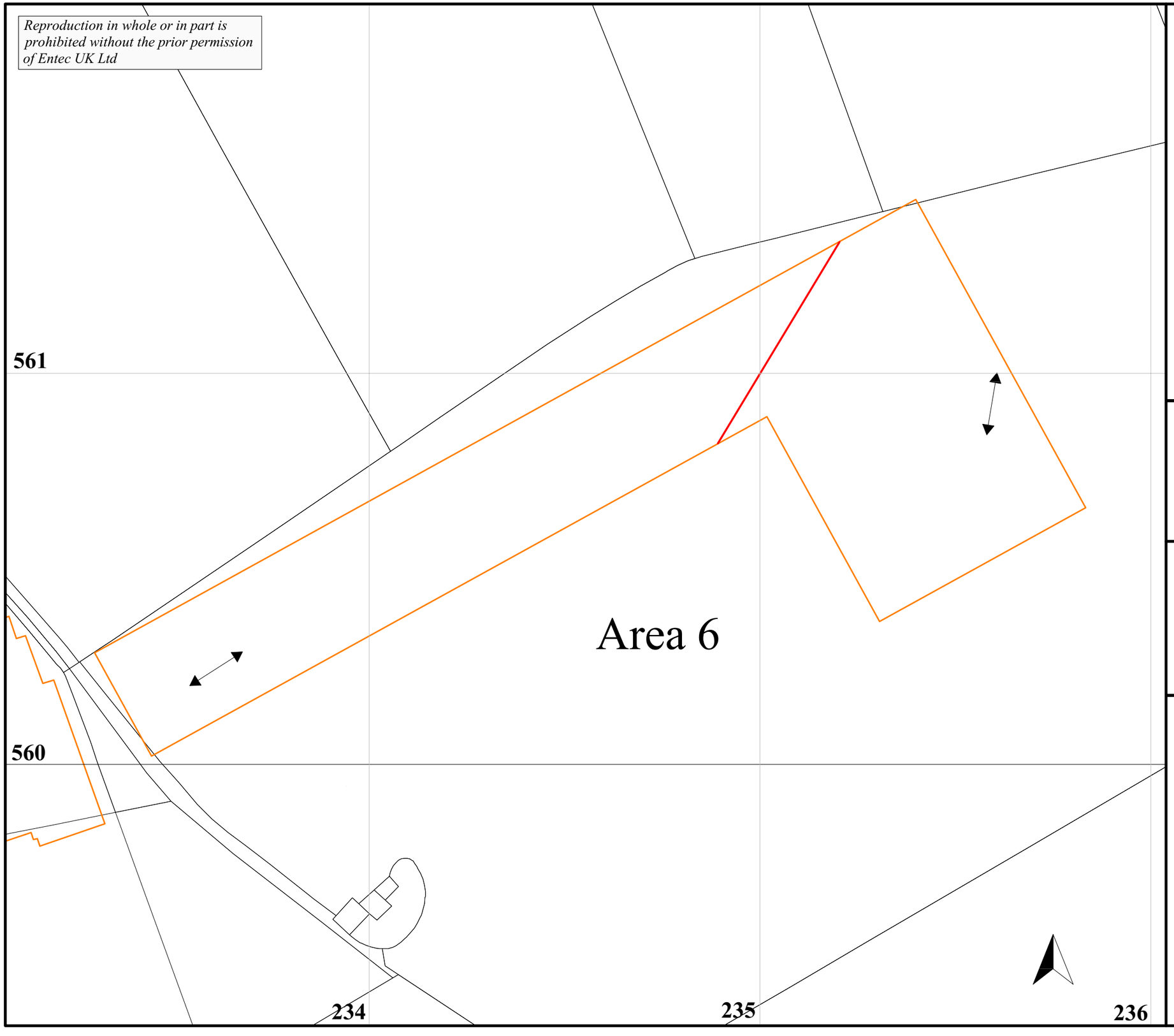
scale 1:1000 - for A3 plot

outline of survey area

positive magnetic anomalies

negative magnetic anomalies

dipolar magnetic anomalies



Archaeological Services
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geophysical surveys

ASUD Report 1285

Figure 20

Archaeological interpretation of Area 6

on behalf of

Entec

0 50m

scale 1:1000 - for A3 plot

outline of survey area

orientation of ridge and furrow

service pipe

561

560

559

229

230

231

Area 7

Archaeological Services
University of Durham

**Knabs Ridge, Harrogate,
North Yorkshire**

geophysical surveys

ASUD Report 1285

Figure 21

Geophysical survey of Area 7

on behalf of

Entec

0 50m

scale 1:1000 - for A3 plot

2.00
1.67
1.33
1.00
0.67
0.33
0.00
-0.33
-0.67
-1.00
-1.33
-1.67
-2.00 nT

Area 7

561

560

559

229

230

231

Archaeological Services
University of Durham

**Knabs Ridge, Harrogate,
North Yorkshire**

geophysical surveys

ASUD Report 1285

Figure 22

Geophysical interpretation of Area 7

on behalf of

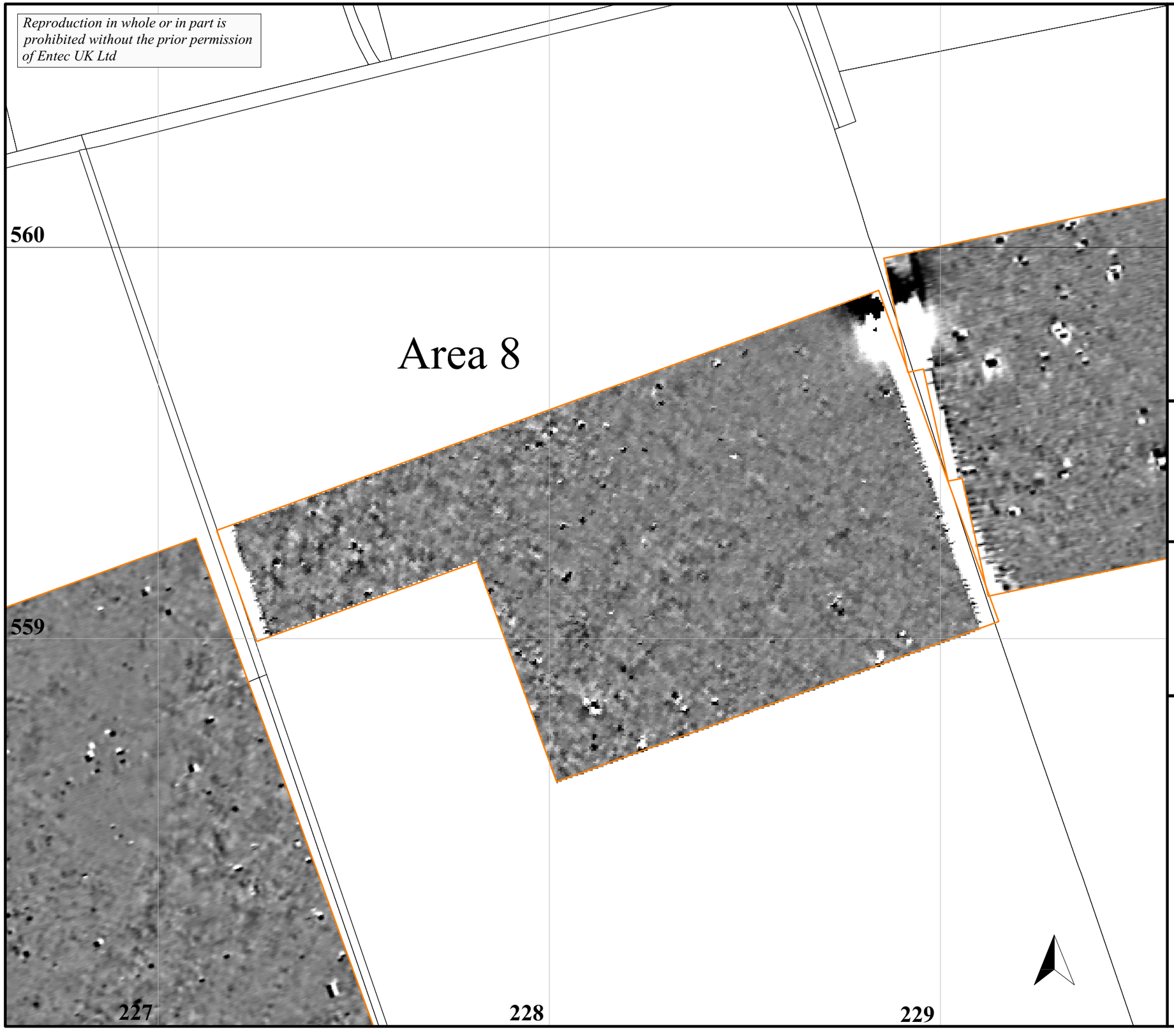
Entec

0 50m

scale 1:1000 - for A3 plot

outline of survey area

dipolar magnetic anomalies



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Knabs Ridge, Harrogate, North Yorkshire

geophysical surveys

ASUD Report 1285

Figure 23

Geophysical survey of Area 8

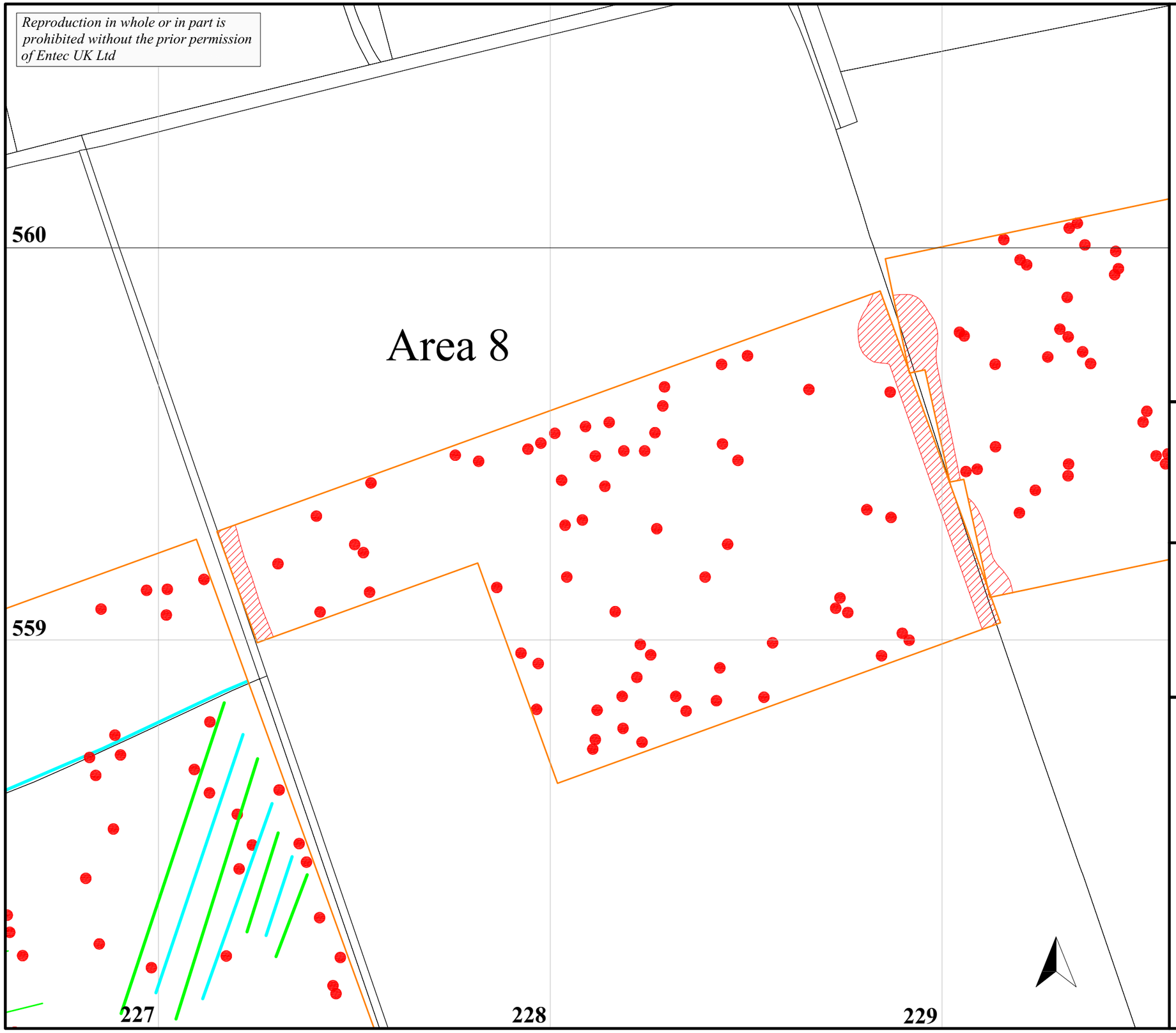
on behalf of

Entec

0 50m

scale 1:1000 - for A3 plot

2.00
1.67
1.33
1.00
0.67
0.33
0.00
-0.33
-0.67
-1.00
-1.33
-1.67
-2.00 nT



Archaeological Services
University of Durham

Knabs Ridge, Harrogate, North Yorkshire

geophysical surveys

ASUD Report 1285

Figure 24

Geophysical interpretation of Area 8

on behalf of

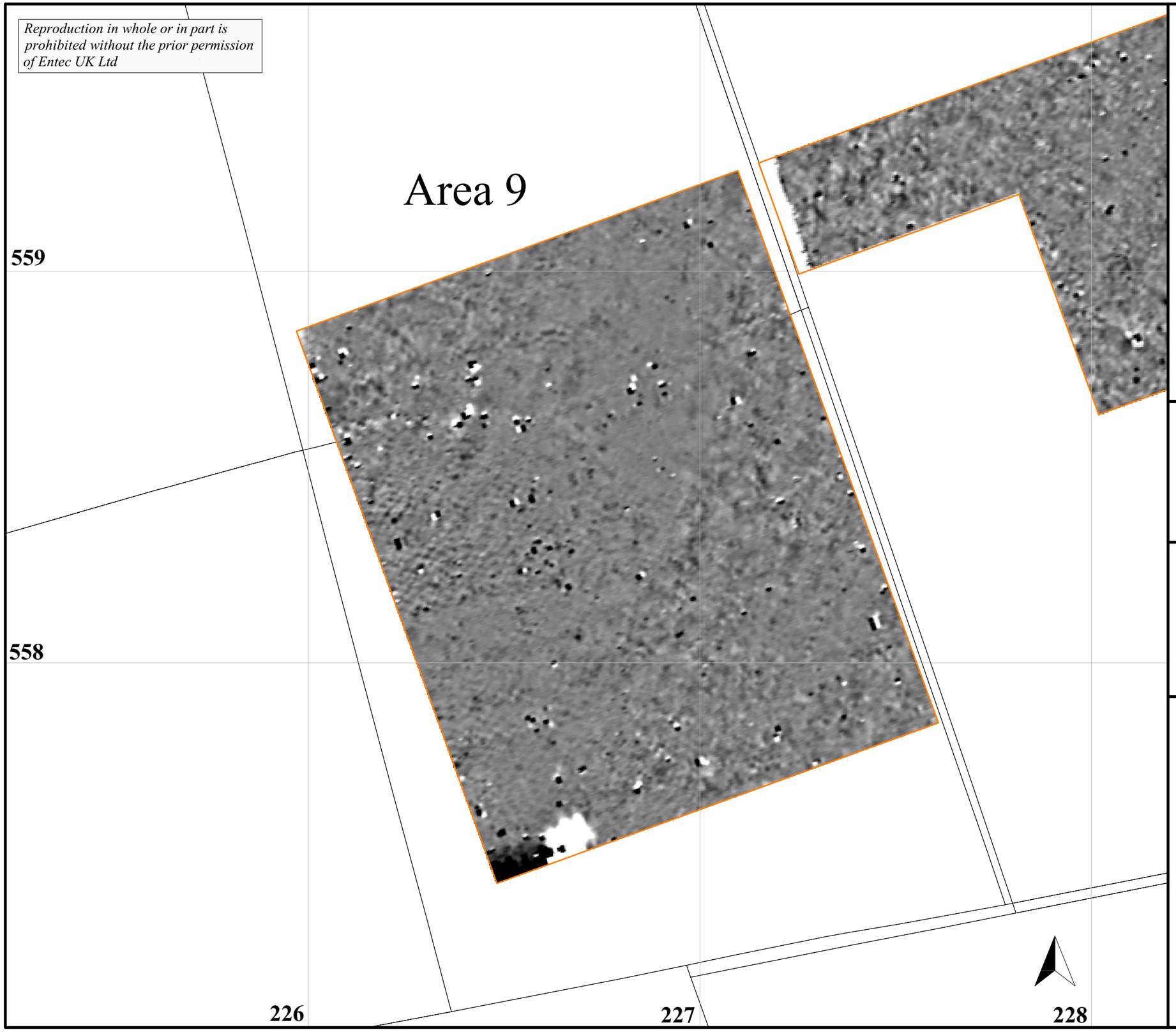
Entec

0 50m

scale 1:1000 - for A3 plot

outline of survey area

dipolar magnetic anomalies



Archaeological Services
University of Durham

Knabs Ridge, Harrogate, North Yorkshire

geophysical surveys

ASUD Report 1285

Figure 25

Geophysical survey of Area 9

on behalf of

Entec

0 50m

scale 1:1000 - for A3 plot

3.00
2.50
2.00
1.50
1.00
0.50
0.00
-0.50
-1.00
-1.50
-2.00
-2.50
-3.00 nT

Area 9

559

558

226

227

228

Archaeological Services
University of Durham

**Knabs Ridge, Harrogate,
North Yorkshire**

geophysical surveys

ASUD Report 1285

Figure 26

Geophysical interpretation of Area 9

on behalf of

Entec

0 50m

scale 1:1000 - for A3 plot

outline of survey area

positive magnetic anomalies

negative magnetic anomalies

dipolar magnetic anomalies

Area 9

field boundary

559

558

226

227

228

Archaeological Services
University of Durham

Knabs Ridge, Harrogate, North Yorkshire

geophysical surveys

ASUD Report 1285

Figure 27

Archaeological interpretation of Area 9

on behalf of

Entec

0 50m

scale 1:1000 - for A3 plot

outline of survey area

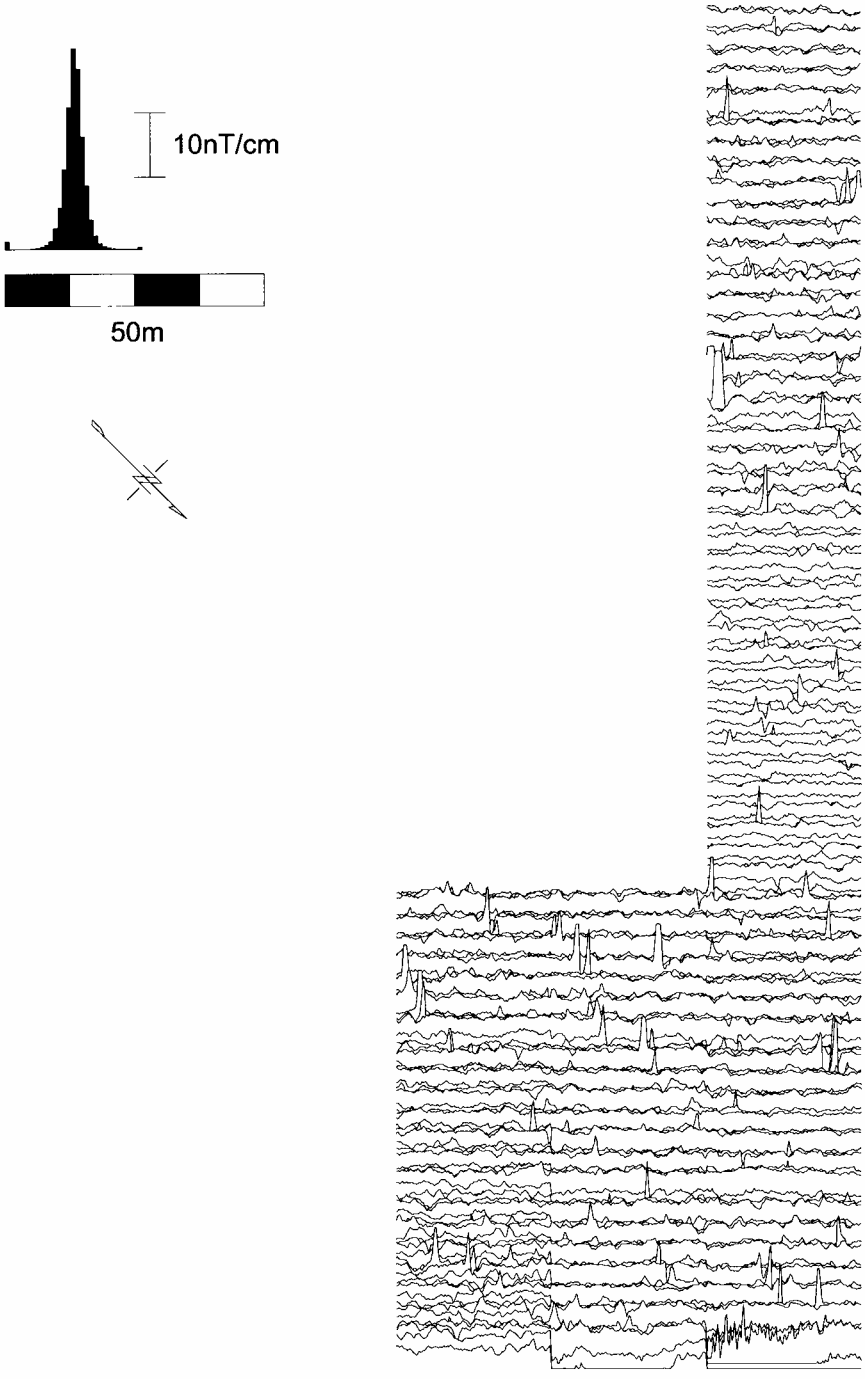
soil-filled features

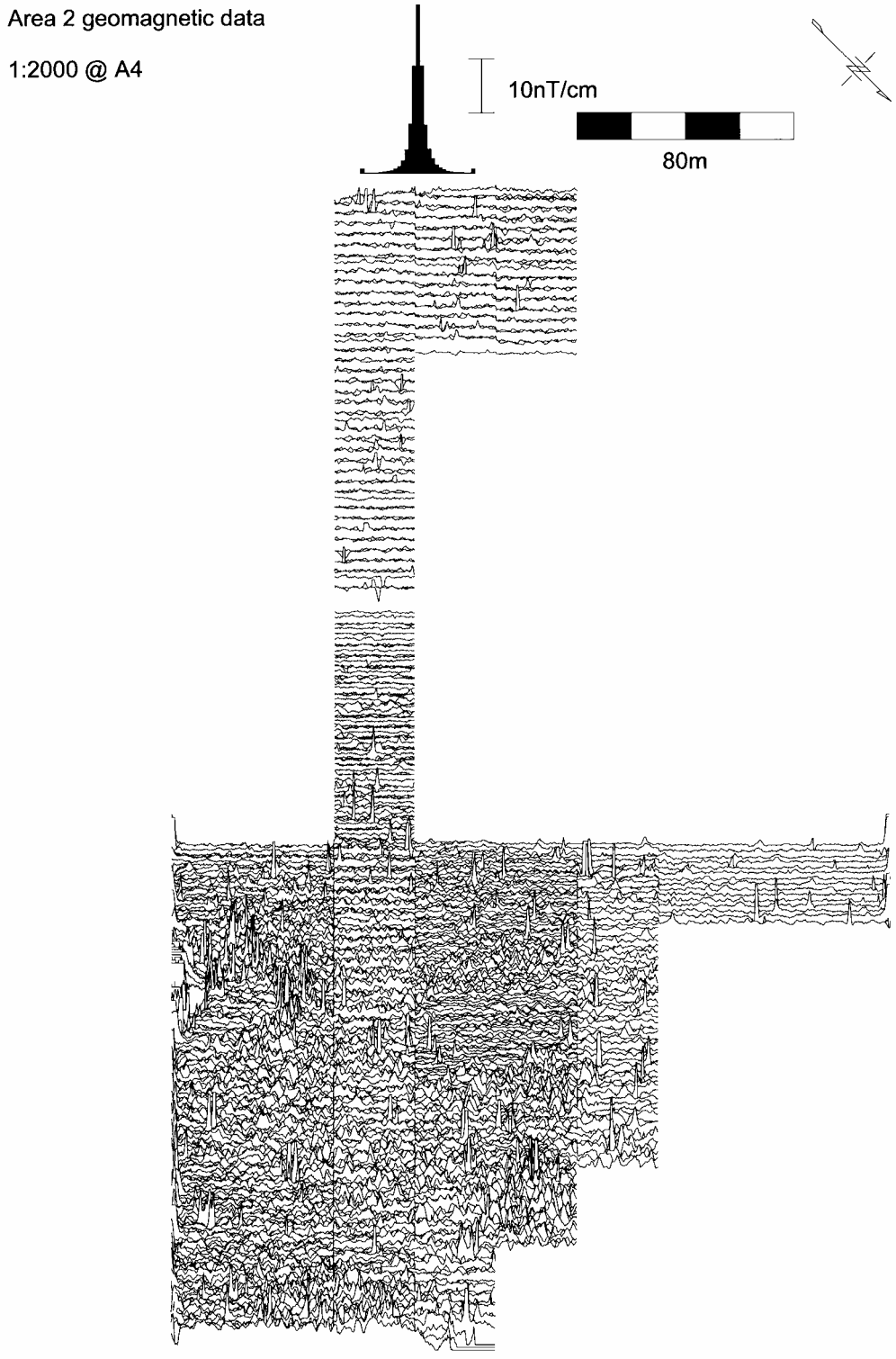
possible ridge and furrow

Appendix I: Trace plots of geophysical data

Area 1 geomagnetic data

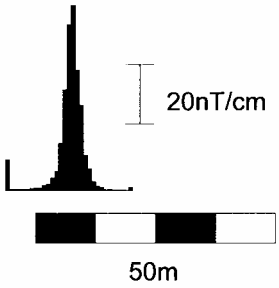
1:1250 @ A4

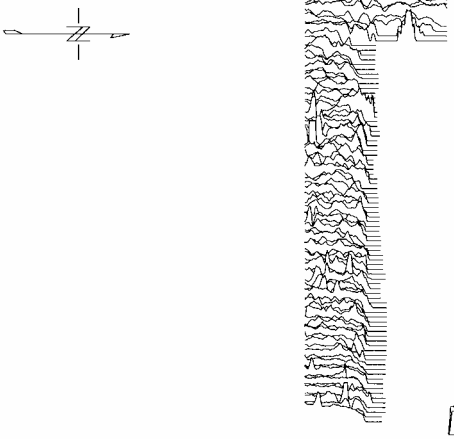


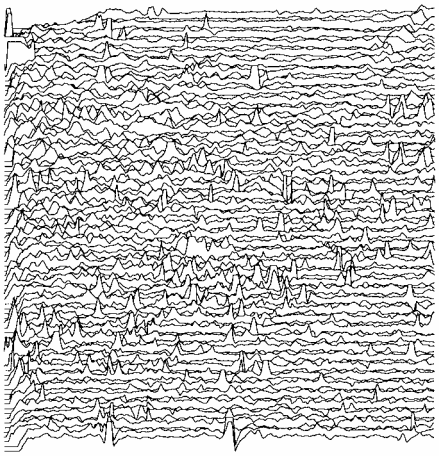

Area 2 geomagnetic data
1:2000 @ A4
10nT/cm
80m

Area 3 geomagnetic data

1:1250 @ A4

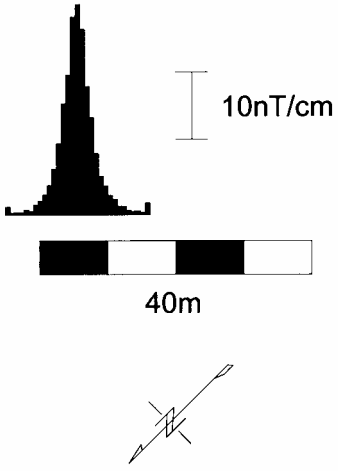


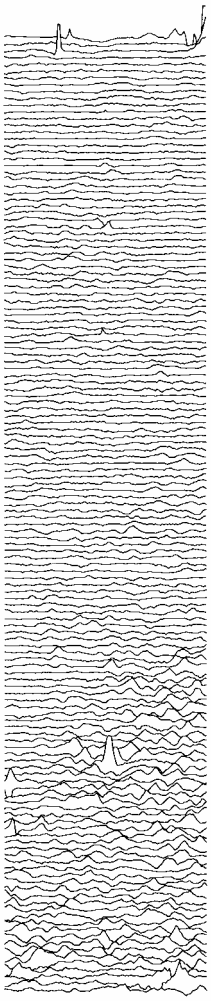




Area 4 geomagnetic data

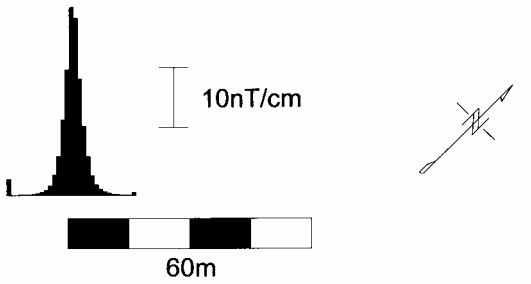
1:1000 @ A4

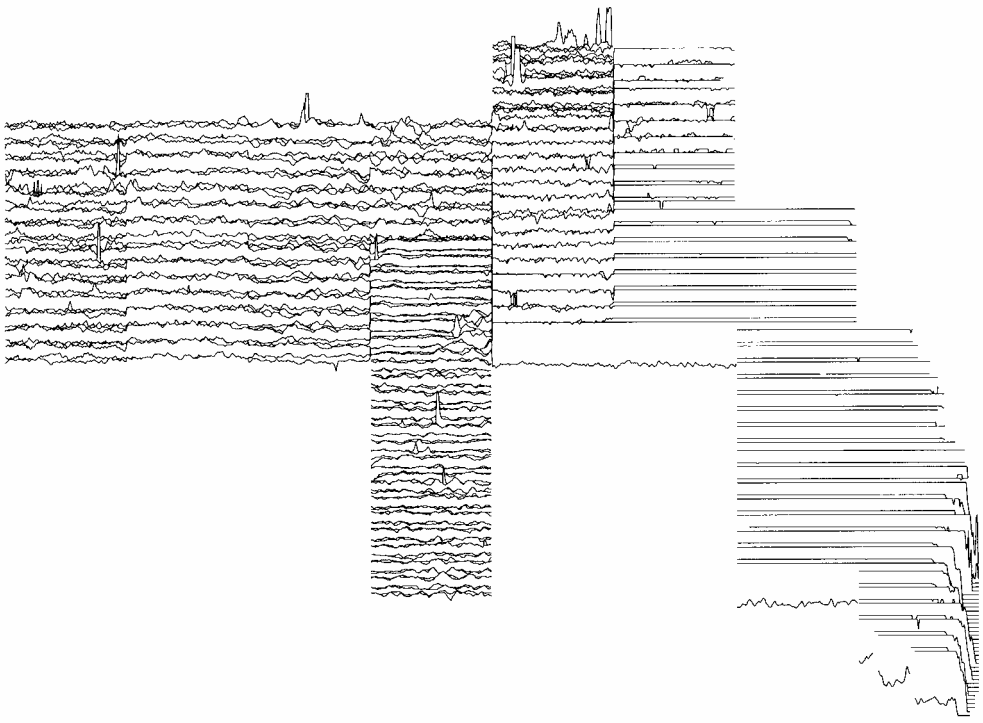




Area 5 geomagnetic data

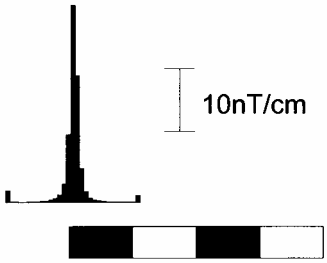
1:1500 @ A4

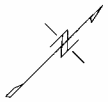




Area 6 geomagnetic data

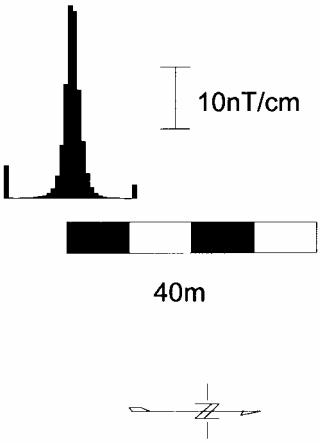
1:1000 @ A4

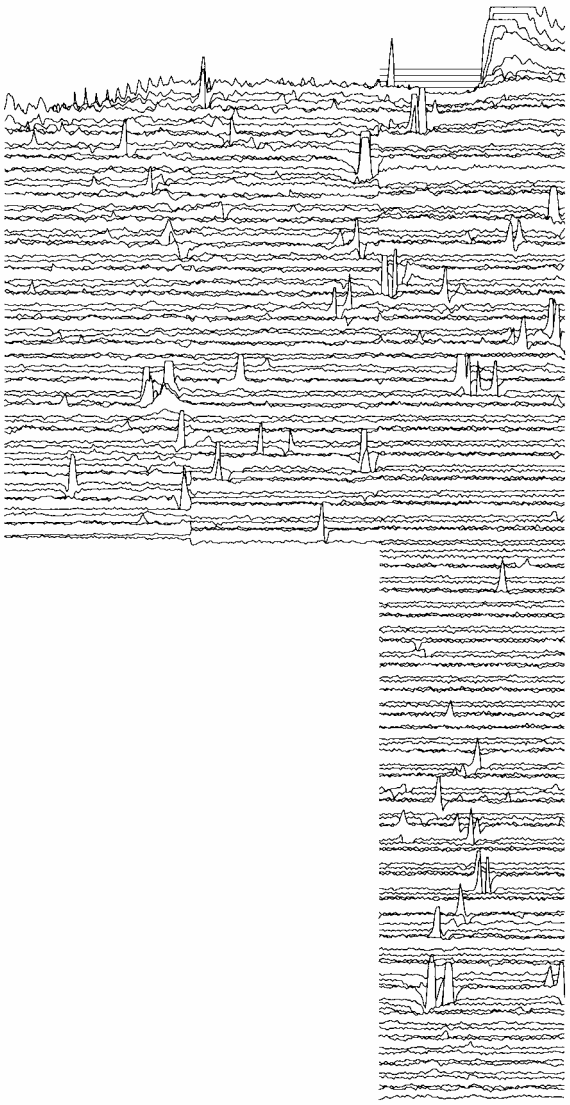




Area 7 geomagnetic data

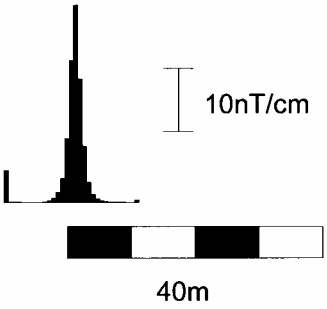
1:1000 @ A4

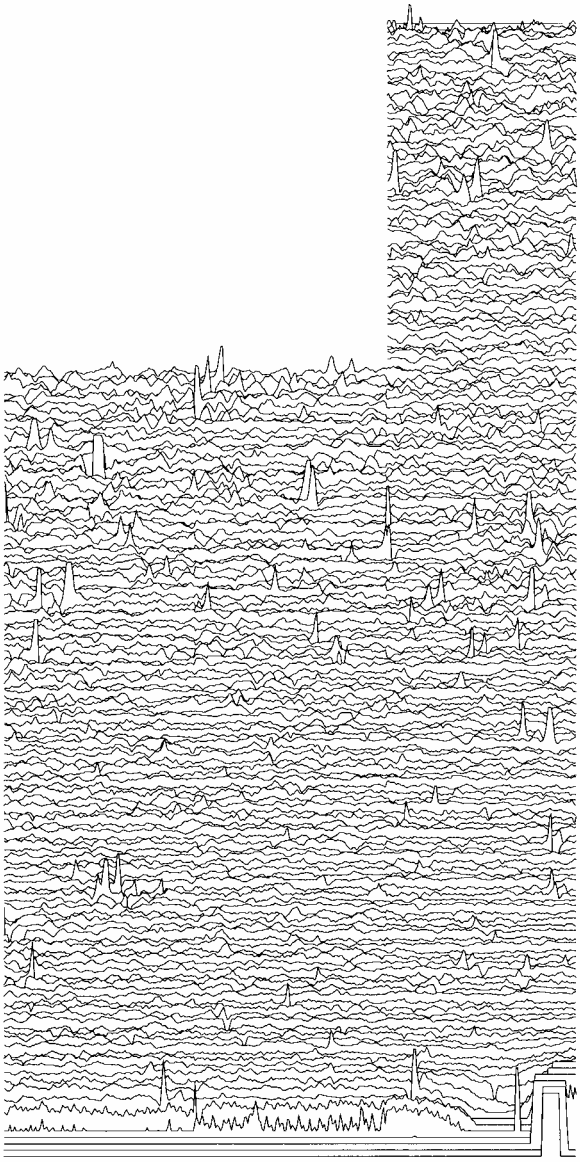




Area 8 geomagnetic data

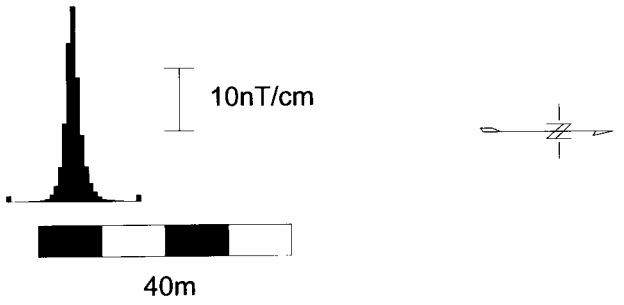
1:1000 @ A4

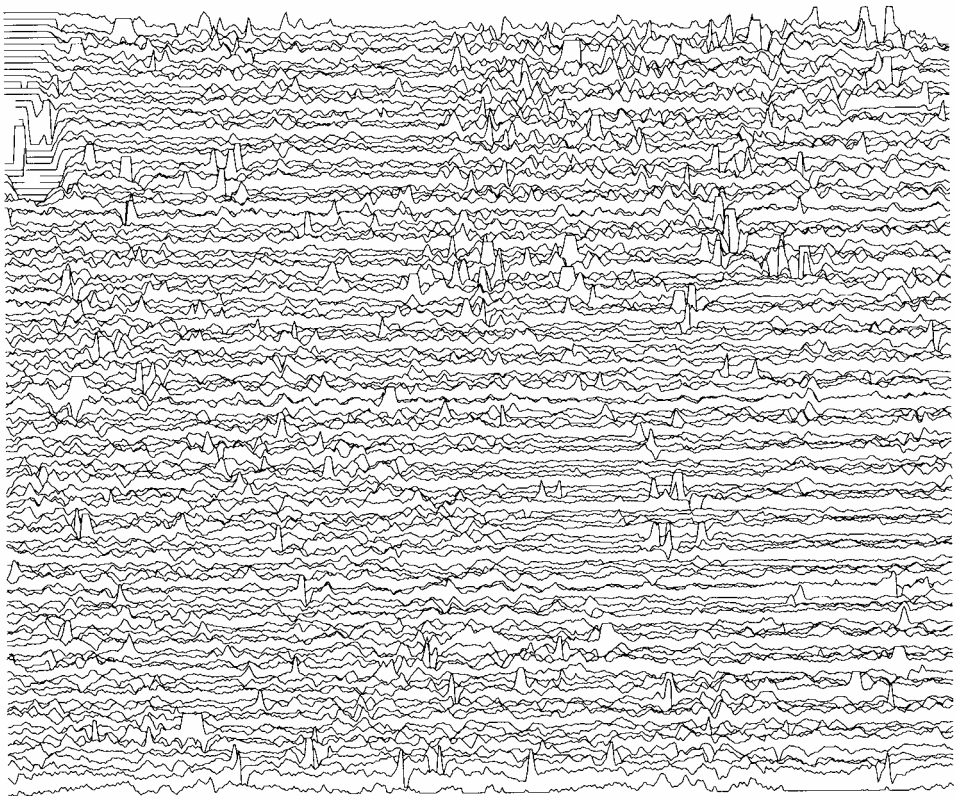




Area 9 geomagnetic data

1:1000 @ A4





Appendix II: Written scheme of investigation

WRITTEN SCHEME OF INVESTIGATION FOR ARCHAEOLOGICAL EVALUATION BY GEOPHYSICAL SURVEY

LAND AT KNABS RIDGE, BETWEEN SKIPTON ROAD (A59) & PENNY POT LANE, FELLISCLIFFE, NORTH YORKSHIRE

NGR SE 23069 55923

Prepared for National Wind Power

by

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Heritage Section
Countryside Service
Planning & Countryside Unit
Environmental Services
County Hall
Northallerton
North Yorkshire
DL7 8AH
Tel. 01609 532839
Fax. 01609 532558
23 May 2005

LAND AT KNABS RIDGE, BETWEEN SKIPTON ROAD (A59) & PENNY POT LANE, FELLISCLIFFE, NORTH YORKSHIRE

WRITTEN SCHEME OF INVESTIGATION FOR ARCHAEOLOGICAL EVALUATION BY GEOPHYSICAL SURVEY

1. Summary

1.1 A wind farm development of eight wind turbines is proposed on land at Knabs Ridge, between Skipton Road and Penny Pot Lane, Felliscliffe, North Yorkshire. The site lies within an area of archaeological interest, with the potential for the survival of remains of prehistoric and later date. In response to consultation on the planning application for the development of the site, the Senior Archaeologist, Heritage Section, North Yorkshire County Council has advised that as a preliminary stage of archaeological evaluation, a geophysical survey be undertaken over part of the proposed development area.

1.2 Geophysical survey is recommended to investigate the potential for the presence of the remains of past settlement, activity and land-use and to test for the survival of associated, buried archaeological features. Should this survey indicate the presence of likely archaeological features, a scheme of trial trenching will be recommended to ascertain the nature, date, extent, quality of survival and significance of any remains.

1.3 The aim of this work is to establish the nature, location, extent and state of preservation of archaeological remains within the proposed development area. The survey results will enable an informed assessment of the archaeological impact of the development proposals. This scheme of investigation has been prepared to define the scope of the geophysical survey for National Wind Power.

2. Purpose

2.1 This written scheme of investigation represents a summary of the broad rchaeological requirements to enable an assessment of the impact of development proposals upon the archaeological resource. This is in accordance Policy HD4 the Harrogate District Local Plan (2001) and the guidance of Planning Policy Guidance note 16 on *Archaeology and Planning*, 1990. The scheme does not comprise a full specification or Bill of Quantities, and the County Council makes no warranty that the works are fully or exactly described. No work on site should commence until the implementation of the scheme is the subject of a standard ICE Conditions of Contract for Archaeological Investigation agreement between the Client and the selected archaeological contractor.

3. Location and Description (centred at NGR SE 23069 55923)

3.1 A full planning application was submitted by National Wind Power to Harrogate Borough Council in April 2004, application ref. 6.99.144.A.EIAMAJ. The development proposal comprises the erection of eight wind turbines, one anemometer, the formation of new vehicular access and the erection of a substation and associated equipment on land at Knabs Ridge, Felliscliffe, North Yorkshire, designed for an operational life of 20 years. Planning permission for the development was refused in November 2004 and a Public Inquiry is to be held in August 2005.

3.2 The application site covers an area of approximately 80 hectares within Felliscliffe parish, and the infrastructure of the wind farm itself will affect an area of approximately 2.5 hectares. Direct impacts will be caused by the construction of the access track routes, installation of service trenches for cables, areas for turbine and structure foundations and other areas of hardstanding, such as crane areas, needed to facilitate the construction of the wind farm. The access will comprise a 2.2km length of new track that will normally be excavated to a width of 5m and geotextile material will be laid onto exposed subsoil following the removal of topsoil (Entec 2004, section 6.3.2). The temporary construction compound will affect an area of 6000m2 at the southern boundary of the site adjacent to Penny Pot Lane and will be stripped of topsoil (Entec 2004, section 6.4.1). Turbine foundations will be formed of reinforced concrete to a diameter of 14.5m and a depth of 2m, plus an associated area of hardstanding for use as a crane working area and for component assembly during construction. The total area of hardstanding at each turbine location, including foundations and crane pad will be *c*. 900m2. In addition, the substation will require an area of hardstanding *c*. 30m by 15m and a single-storey

building with a footprint of 15m by 6m (Entec 2004, section 6.4.3 and Non-Technical Summary page vii).

3.3 The proposed wind farm site lies approximately five miles to the west of Harrogate, between the A59 Skipton Road to the north and Penny Pot Lane to the south, within the parish of Felliscliffe. The main land-use of the application site is grassland for the grazing of livestock. The area is subdivided into a number of regular enclosures, delimited by dry stone walls, fenced and hedged boundaries and drainage ditches, traversed by a number of trackways. There is a spring in the north eastern part of the site, to the north of the farmstead known as Knabs Ridge, which is linked by a trackway to the A59 road to the north. There are a small number of wetter areas of
heath and bog vegetation. A gas pipeline crosses the south-east corner of the site, as does a BT microwave link. Details of the proposed site layout and construction of the wind farm are provided within Chapter 6 and Figure 6.1 of the Environmental Statement for the proposal (Entec 2004).

3.4 The soils of the area are of the Wilcocks 1 Association (ref 721c), cambic stagnohumic gley soils with humose or peaty topsoils with a fine loamy subsoil, mainly occurring in upland areas and often waterlogged near the surface without artificial drainage and Dunkeswick (ref 711p), typical stagnogley soils (Soil Survey of England & Wales 1983). The solid geology of the area is Millstone Grit Series of Namurian (Carboniferous) age, mainly comprising a succession of alternating sandstone and shale strata (Institute of Geological Sciences 1979). The eastern half of the site is underlain by sandstone, and the western half by sandstone and shales. There are no significant drift deposits across the site (Entec 2004, 12.4.1).

4. Historical and Archaeological Background

4.1 The proposal site lies within the former Forest of Knaresborough, to the north east of two Scheduled Ancient Monuments: the medieval royal hunting lodge known as John of Gaunt's Castle (National Monument Number 29547) and the Bank Slack camp earthworks (County Monument number NY133). The course of the Roman road between Ilkley and Aldborough (Margary 1973, road 720b), known as Watling Street, runs to the north of Knabs Ridge, on a north-west to south-east alignment through the parish of Felliscliffe and south of the hamlet of Kettlesing before it is followed by the course of the present A59 road, to the west of Cold Cotes Road. An associated area of building platforms believed to date to the Roman period has recently been discovered on land to the west of Corner Farm, in the general area of 'Dangerous Corner' at junction of A59 and B6451 (Fewston Community Archaeology Project, pers. comm.).

4.2 The North Yorkshire Historic Environment Record (HER) records a number of cropmarks in the area surrounding the proposal site that have been identified from aerial photographs. These comprise two rectilinear enclosures to the north of the A59 road to the west of Knabs Ash (NYM 14991); a group of rectilinear enclosures aligned upon a north-east to south-east aligned trackway to the east of Knabs Slack and south of the A59 road, the projected alignment of the trackway could extend into the proposal area (NYM 14961) and a group of possible irregular small enclosures and trackways to the east of the former Knabs Ridge farmstead, north of Penny Pot Lane (NYM 15003). Further south, in a field immediately to the south of Penny Pot Lane, there are additional cropmarks representing a group of rectilinear enclosures (NYM 14977), and a site to the south of this indicating part of a trackway and associated ditches (NYM 13379). These cropmark features indicate the potential for the survival of remains of early land use and management, and potentially settlement, prior to the
enclosure of this area of moorland following the demise of the Forest of Knaresborough in the late 18th century. To the west of the application area there is evidence for former quarrying, and a possible medieval boundary stone north of Penny Pot Lane and west of Constable Ridge Road to the north of Long Stoop Farm.

4.3 As part of the production of the Environmental Statement for this development proposal, a number of additional crop and soilmark features were identified within the application area that had not previously been known to the HER (Entec 2004; 2005). These comprise two features indicative of pits or shafts, an indistinct penannular enclosure, a possible rectilinear enclosure, and a large sub-circular cropmark. In addition, a low earth bank, probably associated with the former Knabs Ridge farm was identified. 4.4 This area of North Yorkshire is one for which there has been limited field investigation. The potential for previously unrecorded remains to be present is demonstrated by the results of a recent Local Heritage Initiative Community Archaeology Project that has focused upon an area of Dacre parish that has similar geology and topography to the proposal area (Dacre Parish Project 2004, centred on NGR SE 18584 60244). Fieldwork has demonstrated a high concentration of remains associated with industry,

including stone extraction and iron smelting, the latter utilising iron-bearing rock, local clays, timber for charcoal and water courses. This activity probably represents a continuous, if intermittent, history of iron smelting
from the Iron Age through to post-medieval periods. In addition, there have been a number of discoveries of prehistoric rock carvings, many of which have been used in the building of dry stone walls in the area.

4.5 Additional archaeological information for the area is held by the North Yorkshire Historic Environment Record (HER). The HER can be consulted by prior appointment by contacting the HER Officer, North Yorkshire County Council, Heritage Section, County Hall, Northallerton, North Yorkshire, DL7 8AH; Tel. 01609 532331, Fax. 01609 532558.

5. Objectives

5.1 The objectives of the archaeological evaluation work within the proposed evelopment area are:

.1 to determine by means of geophysical survey, the location and extent of any archaeological features within the proposals area and, where possible, to characterize the archaeology thus located. (Should this survey indicate the presence of likely archaeological features, appropriate fieldwork and/or mitigation will be explored to further investigate the anomalies and/or avoid disturbance of significant features by development proposals. Any further phase of fieldwork must be covered by a separate written scheme of investigation.)

.2 to prepare a report summarising the results of the work and assessing the archaeological implications of proposed development,

.3 to prepare and submit a suitable archive to an appropriate repository.

6. Tenders

6.1 Archaeological contractors should submit their estimates or quotations to the commissioning body with reference to the County Council's *Guidance for Developers – Archaeological Work* and *Research Questions for Assessments, Evaluations and Small Scale Interventions inNorth Yorkshire.*

7. Variations to Work

7.1 An allowance of time, or a contingent sum for bad weather, should be agreed as part of any contract. Variations to work arising from site conditions, the presence of structures or archaeological remains not anticipated by the written scheme of investigation or the archaeological contractor should be subject to consultation with the Senior Archaeologist, NYCC and the commissioning body, and put into effect as appropriate with the written agreement of the parties involved.

8. Access, Safety and Monitoring

8.1 Access to the site should be arranged through the commissioning body.

8.2 It is the archaeological contractor's responsibility to ensure that Health and Safety requirements are fulfilled.

8.3 The project will be monitored by the Senior Archaeologist, North Yorkshire County Council, to whom written documentation should be sent before the start of the survey confirming:

a) the date of commencement,
b) the names of all archaeological science specialists likely to be used in the evaluation, and
c) notification to the proposed archive repository of the nature of the works and opportunity to monitor the works.

8.4 Where appropriate, the advice of the Regional Advisor for Archaeological Science (Yorkshire) at English Heritage will be called upon.

8.5 It is the archaeological contractor's responsibility to ensure that monitoring takes place by arranging monitoring points as follows:

.1 a meeting or telephone discussion prior to the commencement of the survey to agree proposed locations for the pilot survey.

.2 progress meeting(s) and/or telephone discussions during the fieldwork phase at appropriate points in the work schedule, to be agreed.

.3 a meeting and/or telephone discussion during the post-fieldwork phase to discuss the draft report and archive before completion.

8.6 It is the responsibility of the archaeological contractor to ensure that any significant results are brought to the attention of the Senior Archaeologist, North Yorkshire County Council and the commissioning body as soon as is practically possible. This is particularly important where there is any likelihood of any contingency arrangements being required.

9. Brief

9.1 In view of the current site conditions and the nature of the potential archaeological interest, it is anticipated that a magnetometer survey will be most suitable technique to apply. A pilot survey should be undertaken initially, to determine if this technique is appropriate for use with the ground conditions on the site.

9.2 The total area of the application site covers *c*. 80 hectares and it is recommended that an 8 hectare sample (10%) of the application area is subject to a detailed magnetometer area survey, focusing primarily on the areas of proposed ground disturbance associated with the proposal, as identified in section 3.2 above, and adjoining areas where infrastructure may be relocated. Survey blocks should be of a minimum size of 60m x 60m. The maximum sampling interval is 0.5m on traverses 1.0m apart.

9.3 Preliminary scanning of the proposal area may be undertaken by the geophysicist in order to assess the most appropriate positioning of detailed survey blocks in relation to the areas of highest potential. It is suggested that a pilot survey of a sample of 2 hectares is carried out to establish if the site conditions are amenable to evaluation as outlined above; or whether an alternative evaluation technique may be more appropriate or likely to produce more informative results. It is expected that the pilot survey should be targeted over a sample both of areas of identified cropmarks and blank areas. The pilot survey results should be discussed with the Senior Archaeologist before continuing with additional survey areas.

9.4 The survey and archiving of survey data should be undertaken in a manner consistent with professional standards and guidance (David 1995, IFA 1999, Gaffney *et al* 2002 & Schmidt 2002).

9.5 The survey grid should be independently relocatable on the ground by a third party, by measurement to local permanent features. Grid tie-in information should be made available either in, or with, the final report, to enable the location plan to be relatable to the OS National Grid.

10. Copyright

10.1 Copyright in the documentation prepared by the archaeological contractor and specialist subcontractors should be the subject of an additional licence in favour of the museum accepting the archive to use such documentation for their statutory educational and museum service functions, and to provide copies to third parties as an incidental to such functions.

10.2 Under the Environmental Information Regulations 2005 (EIR), information submitted to the HER becomes publicly accessible, except where disclosure might lead to environmental damage, and reports cannot be embargoed as 'confidential' or 'commercially sensitive'. Requests for sensitive information are subject to a public interest test, and if this is met, then the information has to be disclosed. The archaeological contractor should inform the client of EIR requirements, and ensure that any information disclosure issues are resolved before completion of the work. Intellectual property rights are not affected by the EIR.

11. Report

11.1 Upon completion of the survey, the data obtained should be presented visually, in report form, and be accompanied by a written description of the survey and an interpretation of the results, indicating as far as possible the likely nature of the features giving rise to anomalies and an estimate of the reliability of the results.

11.2 The survey report should follow the guidance of English Heritage (David 1995), in particular section 6.2. It should include a title page, summary of results, introduction, methods, results,

conclusions, acknowledgements, references and appendices. A survey location plan should be included at a minimum scale of 1:2500; a plot of raw survey data at a preferred minimum scale of 1:100; a trace plot of raw magnetic data; a grey scale plot, or dot density plot. In addition, the report may optionally contain a plot of enhanced data. One or more, interpretative plots should be included. Each plan/plot must have a bar scale and accurately oriented north sign.

11.3 At least six copies of the report should be produced and submitted to the commissioning body, North Yorkshire County Council Heritage Section, the Local Planning Authority, the archive repository accepting the archive, and the English Heritage Regional Advisor for Archaeological Science.

11.4 If the archaeological fieldwork produces results of sufficient significance to merit publication in their own right, allowance should be made for the preparation and publication of a summary in a local journal, such as the *Yorkshire Archaeological Journal*. This should comprise, as a minimum, a brief note on the results and a summary of the material held within the site archive, and its location.

11.5 Upon completion of the work, the archaeological contractor should make their work accessible to the wider research community by submitting digital data and copies of reports online to OASIS (http://ads.ahds.ac.uk/project/oasis/). Submission of data to OASIS does not discharge the planning requirements for the archaeological contractor to notify the Senior Archaeologist, NYCC of the details of the work and to provide the Historic Environment Record (HER) with a report on the work.

12. Further Information

12.1 Further information or clarification of any aspects of this brief may be obtained from:

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North Yorkshire County Council
Heritage Section
Countryside Service
Planning & Countryside Unit
Environmental Services
County Hall
Northallerton **e: gail.falkingham@northyorks.gov.uk**
North Yorkshire **Tel: 01609 532839**
DL7 8AH **Fax: 01609 532558**

11.2 References

Dacre Pasture Project	2004	Dacre Pasture Project. Final Report 2004. Local Heritage Initiative Project Number YH00701
David, A	1995	*Geophysical survey in archaeological field evaluation*, English Heritage Research and Professional Services Guideline No 1, London
Entec UK Ltd	2004	Knabs Ridge Wind Farm, Environmental Statement
Entec UK Ltd	2005	Knabs Ridge Proposed Wind Farm, Analysis of Aerial Photographs – letter of 04 March 2005 from Simon Atkinson, Entec UK Ltd to Gail Falkingham, NYCC
Gaffney, C, Gater, J & Ovenden, S	2002	*The use of geophysical techniques in archaeological evaluations (revised edition)* Institute of Field Archaeologists Paper No 6
Institute of Field Archaeologists	2001	*Standard and Guidance for Archaeological Field Evaluation* http://www.archaeologists.net/modules/icontent/inPages/docs/codes/fldeval2001.pdf
Institute of Geological Sciences	1979	*Geological Map of the United Kingdom, South, 3rd Edition – Solid*

Margary, ID	1973	Roman Roads in Britain
Schmidt, A	2002	*Geophysical Data in Archaeology: A Guide to Good Practice* AHDS Guides to Good Practice http://ads.ahds.ac.uk/project/goodguides/geophys/
Soil Survey of England & Wales	1983	*Soils of Northern England, Sheet 1*