

Haswell Wind Farm, Haswell, County Durham

geophysical surveys

on behalf of
Halcrow Group Ltd

Report 1652
April 2007

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1. Summary

The project

- 1.1 This report presents the results of geophysical surveys conducted in advance of a proposed wind farm and associated infrastructure on land at Haswell Moor Farm, Haswell, County Durham.
- 1.2 The works were commissioned by Halcrow Group Limited and conducted by Archaeological Services in accordance with a methods statement provided by Archaeological Services and approved by the Assistant County Archaeologist.

Results

- 1.3 The results of the geophysical survey included a rectilinear enclosure in Area 2, approximately 30m square. Additional soil-filled features detected in this area possibly reflect associated ditches and ring-ditch. The shape and size of these is typical of Iron Age settlement.
- 1.4 Probable archaeological features were detected in each survey area, except for Area 5. Several of these appear to correspond to former field boundaries as indicated on the OS 1st edition map of 1857, others represent traces of ridge and furrow cultivation, which can date from the Medieval period to the late 19th century.
- 1.5 Curvilinear anomalies detected in Area 1 may represent the remains of ditches or possibly former channels associated with a spring as illustrated on the OS 1st edition map. The remaining anomalies are of indeterminate origin.
- 1.6 An intense dipolar magnetic anomaly detected on the western boundary of the study area appears to correspond to 'Limekiln Hill Old Quarry' also depicted on the OS map of 1857 and may reflect spoil associated with the quarry.

2. Project background

Location (Figure 1 & 2)

- 2.1 The study area is located at Haswell Moor Farm, Haswell, County Durham (NGR centre: NZ 3562 4237). The site is bounded by open fields to the west, and the farm lane to the north, with Durham Lane (B1283) traversing the eastern and southern parts of the study area. Six surveys were undertaken, totalling 13 ha.

Development proposal

- 2.2 The geophysical surveys were conducted in advance of a planning application for a proposed wind farm that would comprise five turbines, a meteorological mast, an access track and a cable route.

Objective

- 2.3 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 advance of development.

Methods statement

- 2.4 The surveys have been undertaken in accordance with instructions provided by Halcrow Group Limited and a methods statement prepared by Archaeological Services, approved by the Assistant Archaeologist at Durham County Council.

Dates

- 2.5 Fieldwork was undertaken between 10th and 18th April 2007. This report was prepared between 19th and 30th April 2007.

Personnel

- 2.6 Fieldwork was conducted by Lorne Elliott (Supervisor) and Dana Millson. This report was prepared by Lorne Elliott with illustrations by Janine Wilson. The Project Manager was Duncan Hale.

Archive/OASIS

- 2.7 The site code is **HWF07**, for **Haswell Wind Farm 2007**. The survey archive will be supplied on CD to the Bowes Museum. Archaeological Services is registered with the **Online Access to the Index of archaeological investigationS** project (OASIS). The OASIS ID number for this project is **archaeol3-26465**.

3. Archaeological and historical background

- 3.1 The proposed development site lies within the modern parish of Haswell, in the District of Easington, County Durham. The name Haswell is believed to derive from the Anglo-Saxon word *Hessewelle*, meaning 'Hazel Well' or 'Hazel Spring'. This name suggests an Anglo-Saxon presence in the Haswell

area, and would indicate that the settlement is of considerable age. This is further reinforced by the proximity of Ludworth village to the south of the study site. This also has an Old English place name, this time meaning 'Luda's farmstead' or possibly 'farmstead on the loud stream' although no direct evidence of Anglo-Saxon inhabitation has been found in the Haswell area.

- 3.2 A desk based assessment undertaken for this project in May 2006 (Halcrow 2006) indicates there is no prehistoric evidence pre-dating the Bronze Age in the study area. Features that are recorded comprise a finds scatter representing a Bronze Age site (SMR 50) and a Bronze Age Hammer (SMR 8939). No further sites firmly dating to the prehistoric period lie within the study area, although known prehistoric activity in the wider environs includes a Bronze/Iron Age settlement at Pig Hill (SMR 402) approximately 2km to the north-east of Haswell Moor Farm.
- 3.3 A desk based assessment undertaken in November 2006 (Archaeological Services 2006) of land to the immediate north of the proposed development area indicates that Haswell was a small, fragmented settlement during the medieval period, with the village of High Haswell as the nucleus of the community. Haswell, Haswell Plough, Haswell Moor and Elemore Grange known as Little Haswell are referred to as subdivisions of the settlement.
- 3.4 The 12" OS map of 1854 and 6" OS map of 1857 record a stream running NE-SW just to the west of the study area with a spring just within the boundary of the site along this watercourse. 'Shadforth Beck' is also shown along the southern boundary of the application site. These watercourses may have been a favourable resource from the early prehistoric period onwards.
- 3.5 Three Scheduled Ancient Monuments are located within the surrounding area. Ludworth Tower (SAM DU76) is just over 500m to the south of the application boundary. Haswell Colliery Engine House (SAM 30930) is approximately 800m to the east of the site and Haswell Medieval Chapel (SAM 34584) about 1.3km north of the application boundary.
- 3.6 The only other features identified comprised the now demolished structures to the east of Haswell Moor Farm, at the junction of farm lane and Durham Lane. These are recorded as 'Blue Houses' and 'The George Inn' on a map of 1854, possibly representing accommodation associated with a roadside Public House.

4. Landuse, topography and geology

- 4.1 At the time of surveys the proposed development area comprised five fields of pasture. These were grazed by bullocks apart from Area 5 which was a silage field.
- 4.2 The elevation of the site ranges between c.130m and c.150m OD.

- 4.3 The underlying solid geology of the area comprises Magnesian Permian Limestone, which is overlain by boulder clay and morainic drift.

5. Geophysical survey

Standards

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

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, based on desktop evidence, it was considered possible 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 each of the types of feature mentioned above. This technique involves the use of hand-held magnetometers to detect and record minute 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 The study area comprised five land parcels containing six separate survey areas measuring c.13ha. For surveying purposes Area 4 was divided into 4a and 4b. These were located to cover all areas of ground disturbance associated with the proposed development (Figure 2).
- 5.6 A 30m grid was established across each survey area and tied-in to known, mapped Ordnance Survey points using a Leica GS50 global positioning system (GPS) with real-time calibration.

- 5.7 Measurements of vertical geomagnetic field gradient were determined using a Bartington Grad601-2 fluxgate gradiometer. 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.
- 5.8 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

- 5.9 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 (unfiltered) data. The greyscale images and interpretations are presented in Figures 3-9; 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 the greyscale intensities to anomaly values in nanoTesla.

- 5.10 The following basic processing functions have been applied to each dataset:

<i>Clip</i>	clips, or limits data to specified maximum or minimum values; to eliminate large noise spikes; also generally makes statistical calculations more realistic.
<i>Zero mean traverse</i>	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.
<i>Destagger</i>	corrects for displacement of anomalies caused by alternate zig-zag traverses.
<i>Interpolate</i>	increases the number of data points in a survey to match sample and traverse intervals. In this instance the gradiometer data have been interpolated to 0.25 x 0.25m intervals.

Interpretation: anomaly types

- 5.11 Colour-coded geophysical interpretation plans are provided. Three types of geomagnetic anomaly have been distinguished in the data:

<i>positive magnetic</i>	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.
<i>negative magnetic</i>	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

5.12 Colour-coded archaeological interpretation plans are provided.

General comments

5.13 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 furrows, ditches or pits) whose magnetic susceptibility has been enhanced by decomposed organic matter or by burning.

5.14 Series of parallel weak positive magnetic anomalies reflecting former ridge and furrow cultivation have been detected across Areas 1, 2, 3, 4a and 4b.

5.15 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. A sample of these is shown on the geophysical interpretation plans, however, they have been omitted from the archaeological interpretation plans and the following discussion.

Area 1 (Figures 4-6)

5.16 Several curvilinear positive magnetic anomalies with varying levels of magnetic susceptibility have been detected in the northern part of this area. These anomalies almost certainly represent the remains of soil-filled ditches or former spring channels as noted on the OS 1st edition map.

5.17 A weak linear positive magnetic anomaly aligned approximately north-south in the northwest corner of the survey was detected. This corresponds to a former field boundary shown on the OS map of 1857.

5.18 Two discontinuous parallel magnetic anomalies traversing broadly east-west across the central part of the survey may reflect a double-ditched trackway alongside another former field boundary depicted on the OS 1st edition map of the area.

5.19 A concentration of relatively strong positive magnetic anomalies detected in the central and eastern parts of the survey may reflect pits, possibly of archaeological origin.

5.20 A series of parallel weak positive magnetic anomalies reflecting traces of former ridge and furrow cultivation have been detected in the northeast corner of the survey with a north-south orientation. Additional parallel positive magnetic anomalies detected to the south of the probable track, aligned

northwest-southeast and parallel to the present field boundary, possibly reflect a second phase of ploughing.

- 5.21 The dipolar magnetic anomaly at the southeast limit of the survey reflects two metal gates on the present field boundary.

Area 2 (Figures 4-6)

- 5.22 A rectilinear positive magnetic anomaly approximately 30m square, with an adjacent curvilinear positive magnetic anomaly roughly 10m in diameter has been detected in the southern half of the survey. These almost certainly reflect an enclosure and a ring-ditch, possibly associated with a roundhouse. The size and shape of these features are typical of an Iron Age enclosure.
- 5.23 An alignment of small discrete positive magnetic anomalies with a northwest-southeast orientation traverses the northern edge of the rectilinear enclosure. This almost certainly reflects an alignment of pits or postholes. At the southern end of this anomaly the orientation changes to northeast-southwest possibly forming a field boundary.
- 5.24 Two further linear positive magnetic anomalies also aligned northwest-southeast; one weak, one strong, occur north and south of the enclosure respectively. These possibly reflect ditches along the hillside, which slopes downwards from north to south. An increase in intensity is noted down slope for these anomalies.
- 5.25 A series of linear positive magnetic anomalies detected at the northern and southern ends of the survey almost certainly represent traces of ridge and furrow aligned broadly east-west. Several weak linear anomalies aligned approximately north-south along the survey probably represent a further phase of ploughing.
- 5.26 A small linear negative magnetic anomaly aligned approximately northwest-southeast possibly reflects a land drain.
- 5.27 An intense dipolar magnetic anomaly on the western limit of the survey appears to correspond to 'Limekiln Hill Old Quarry' noted on the OS map of 1857 and may reflect spoil associated with the quarry.
- 5.28 A cluster of small dipolar magnetic anomalies detected across the center of the survey reflect an existing track from the access gate. This track probably contains pieces of rubble and ferrous debris.

Area 3 (Figures 4-6)

- 5.29 Ridge and furrow cultivation was detected across the whole of this survey area. This was recorded as a series of parallel, slightly curving, positive magnetic anomalies aligned northwest-southeast and spaced at 4-5m intervals.
- 5.30 Four linear positive magnetic anomalies detected in this area almost certainly reflect soil-filled ditches. Three of these ditches have the same alignment as

the ridge and furrow, the fourth cuts across perpendicular. These may represent former field boundaries of medieval or later origin. The eastern most of these boundaries corresponds to a former field boundary shown on the OS map of 1857.

5.31 A sinuous positive magnetic anomaly in the northwest corner of the survey may reflect a soil-filled feature, possibly a continuation of the ditch detected in Area 2.

5.32 A chain of dipolar magnetic anomalies along the eastern boundary almost certainly reflects a ferrous service pipe the other side of the wire fencing.

Area 4a and 4b (Figures 7-9)

5.33 A chain of intense dipolar magnetic anomalies aligned broadly northeast-southwest across both area almost certainly reflects a ferrous service pipe.

5.34 A series of weak positive magnetic anomalies aligned broadly northwest-southeast in both surveys represent further traces of ridge and furrow.

5.35 A series of weak parallel negative magnetic anomalies detected at 20m intervals and aligned broadly north-south and east-west perpendicular to the slope of the terrain, almost certainly reflect land drains.

5.36 A group of small linear and discrete positive magnetic anomalies detected in the northeast corner of the survey, reflect soil-filled features of indeterminate origin.

5.37 A linear positive magnetic anomaly in the central part of Area 4b and parallel to the traces of ridge and furrow appears to correspond to a former field boundary indicated on the OS map of 1857. A possible continuation of this field boundary occurs in Area 4a as a linear concentration of discrete dipolar anomalies aligned northwest-southeast. This was noted as a flattened and slightly waterlogged area between two slopes, possibly as a result of infill.

Area 5 (Figures 7-9)

5.38 A chain of intense dipolar anomalies detected along the northern boundary reflect a wire fence or possible ferrous service pipe. A small chain of intense dipolar magnetic anomalies detected with a broadly north-south orientation possibly reflects part of a ferrous pipe. No other anomalies were detected apart from the small, discrete dipolar magnetic anomalies reflecting items of near-surface ferrous and/or fired debris, such as horseshoes and brick fragments.

6. Conclusions

- 6.1 Fluxgate gradiometer surveys have been undertaken on land at Haswell Moor Farm, Haswell, County Durham, in advance of a proposed wind farm and associated infrastructure.
- 6.2 The surveys identified a rectilinear enclosure in Area 2, approximately 30m across, with an adjacent ring-ditch 10m in diameter. Additional soil-filled features detected in this area, probably reflect further ditches and an alignment of pits or postholes. The shape and size of these features is typical of Iron Age settlement.
- 6.3 Further curvilinear, linear and discrete positive magnetic anomalies almost certainly reflect soil-filled features in Areas 1, 3, 4a and 4b. Several of these linear features appear to correspond to former field boundaries as indicated on the OS six inch map of 1857. Curvilinear anomalies occurring in Area 1 may represent the remains of ditches or possibly former channels associated with a spring as illustrated on the OS 1st edition map. The remaining anomalies are of indeterminate origin.
- 6.4 Traces of ridge and furrow cultivation, which can date from the medieval period to the late 19th century, have been detected throughout the study area, apart from Area 5.
- 6.5 An intense anomaly detected on the western boundary of Area 2 appears to correspond to 'Limekiln Hill Old Quarry', also depicted on the OS map of 1857, and may reflect spoil associated with the quarry.

7. Sources

Archaeological Services 2006 *Haswell Wind Farm, Haswell, County Durham; archaeological desk-based assessment*, unpublished report **1561** for Wardell Armstrong International, Archaeological Services Durham University

David, A, 1995 *Geophysical survey in archaeological field evaluation*, Research and Professional Services Guideline **1**, English Heritage

Halcrow 2006 *Haswell Wind Farm, Environmental Impact Assessment*, unpublished report for e-on, Halcrow Group Limited

Gaffney, C, Gater, J, & Ovenden, S, 2002 *The use of geophysical techniques in archaeological evaluations*, Technical Paper **6**, Institute of Field Archaeologists

Schmidt, A, 2001 *Geophysical Data in Archaeology: A Guide to Good Practice*, Archaeology Data Service, Arts and Humanities Data Service



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Haswell Wind Farm, Haswell, County Durham

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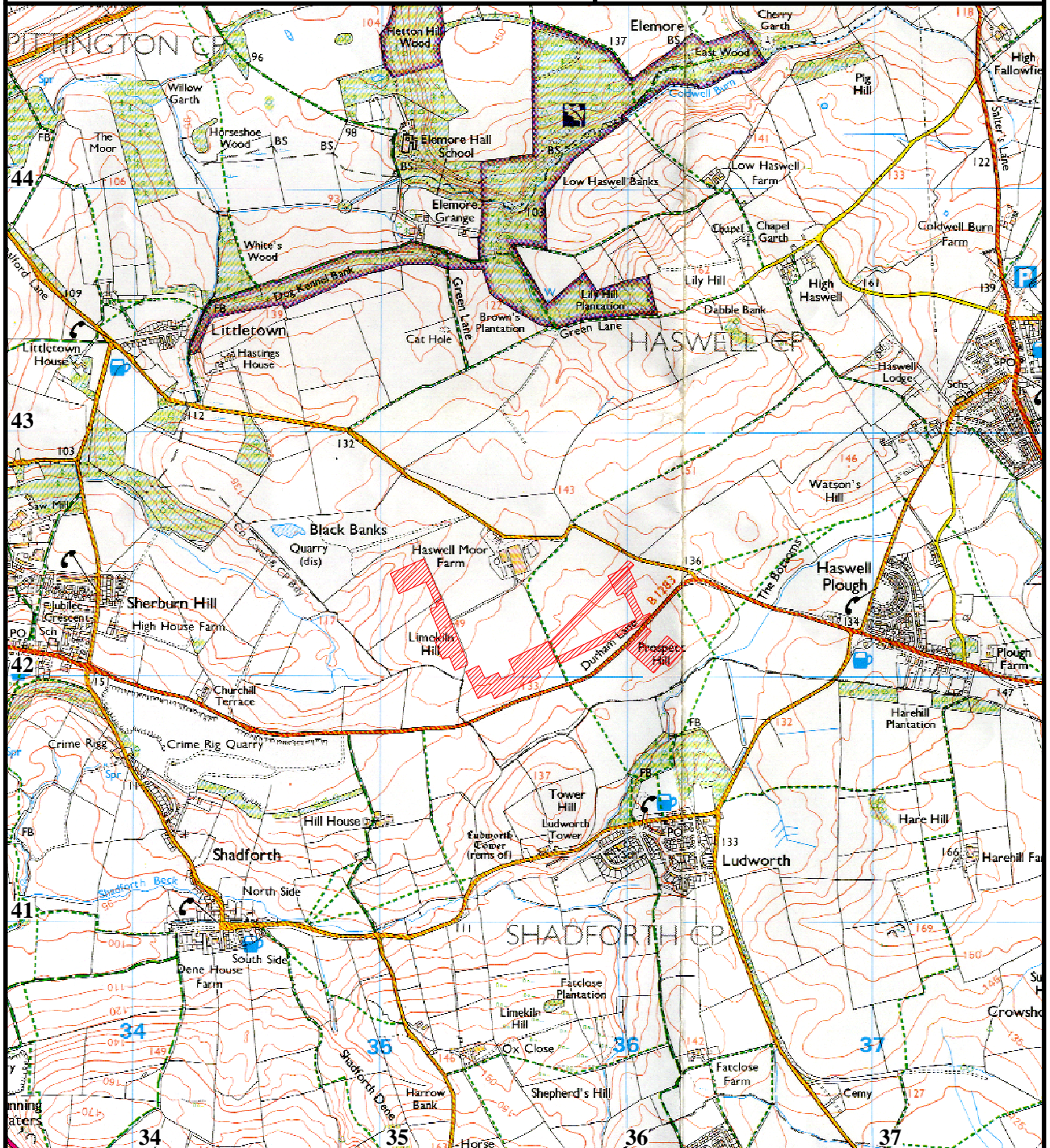
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Figure 1

Location of geophysical surveys

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geophysical surveys

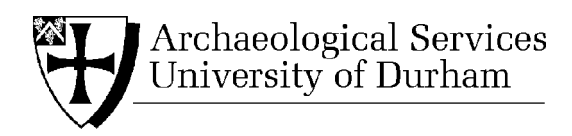
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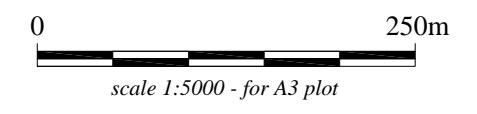
geophysical survey

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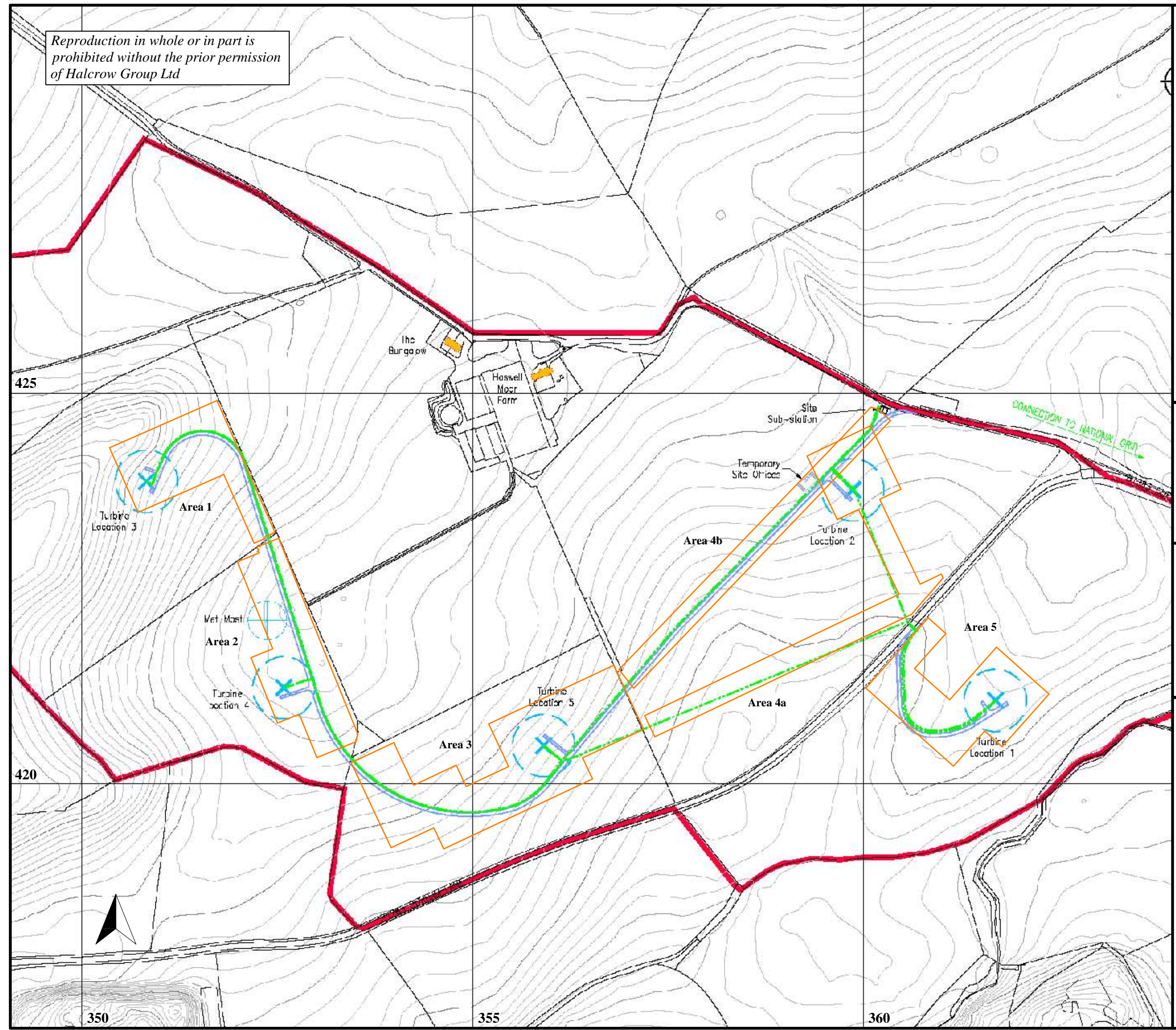
Figure 2

Location of geophysical surveys and proposed development

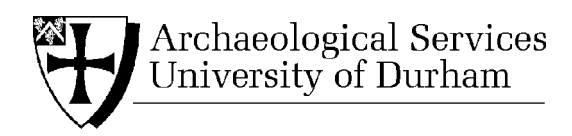
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- outline of survey area
- proposed development
- proposed location of turbines



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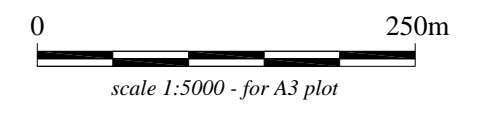
geophysical survey

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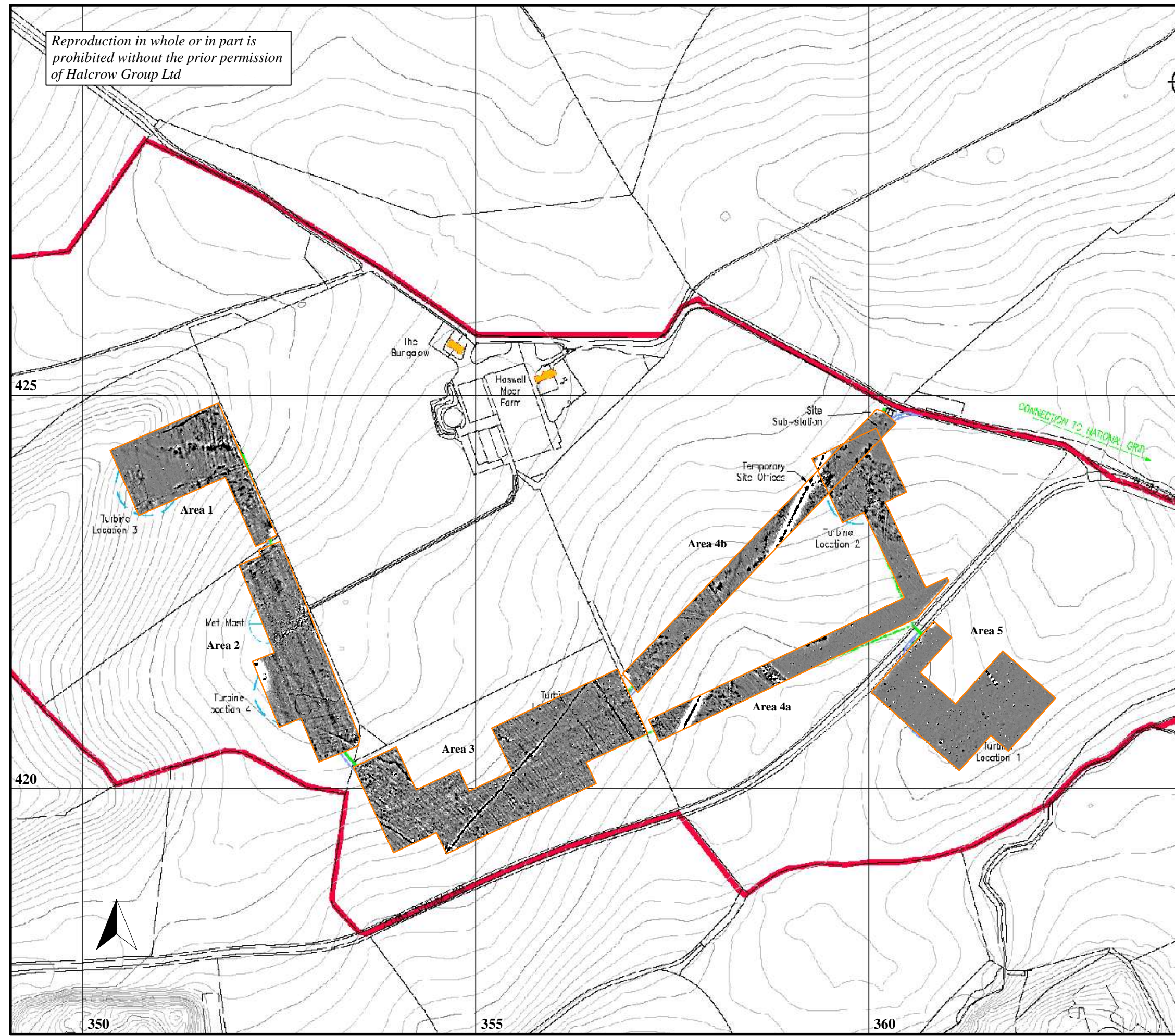
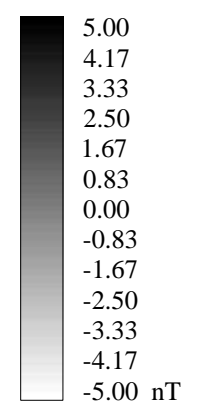
Figure 3

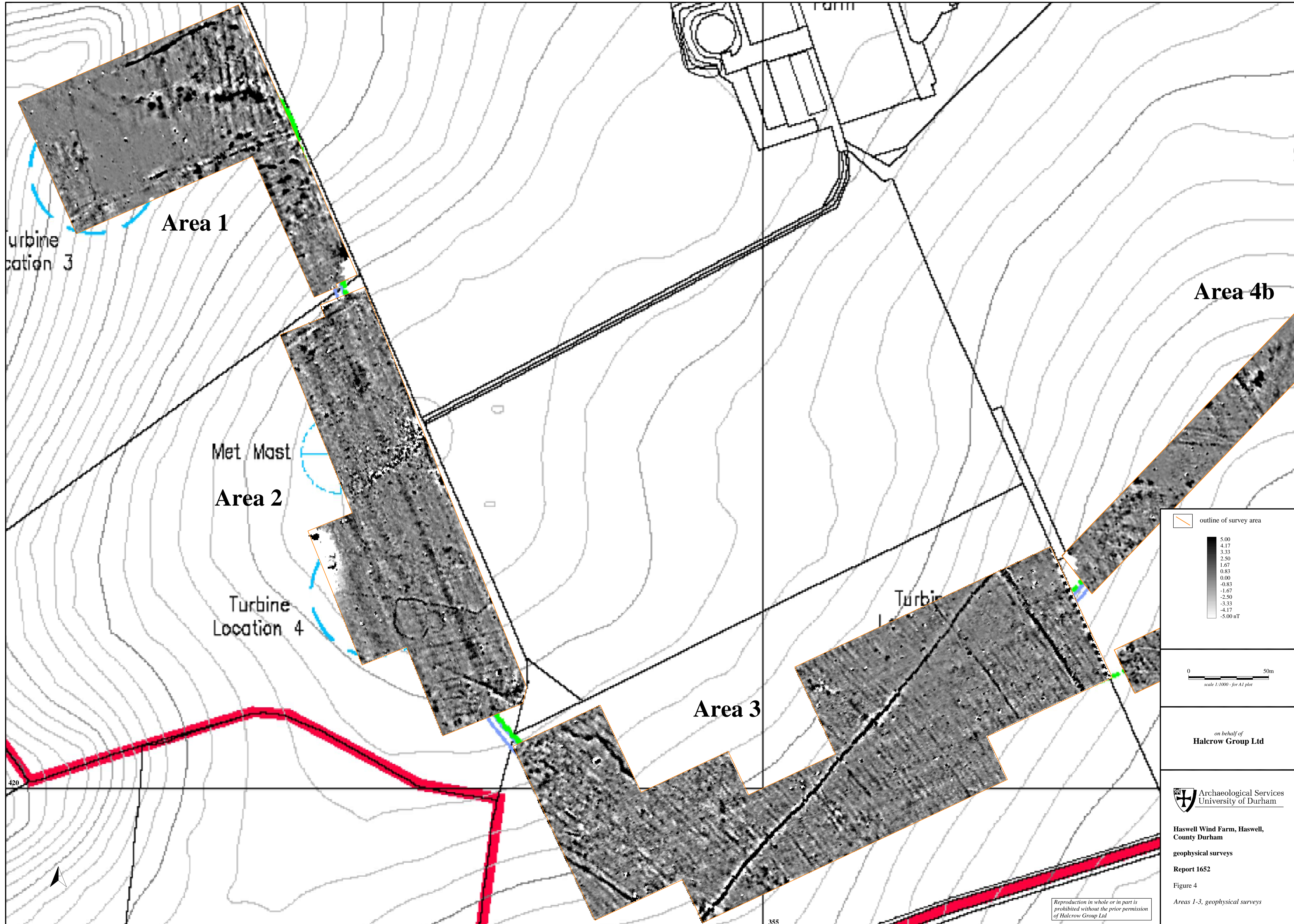
Location of geophysical surveys

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outline of survey area





Turbine
Location 3

Area 1

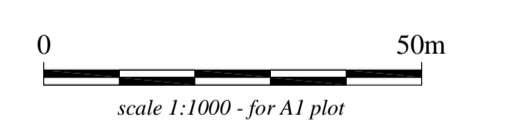
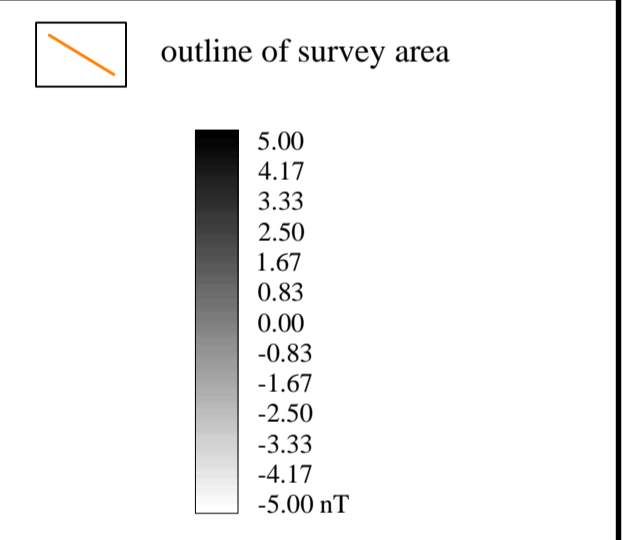
Met Mast

Area 2

Turbine
Location 4

Area 3

Area 4b



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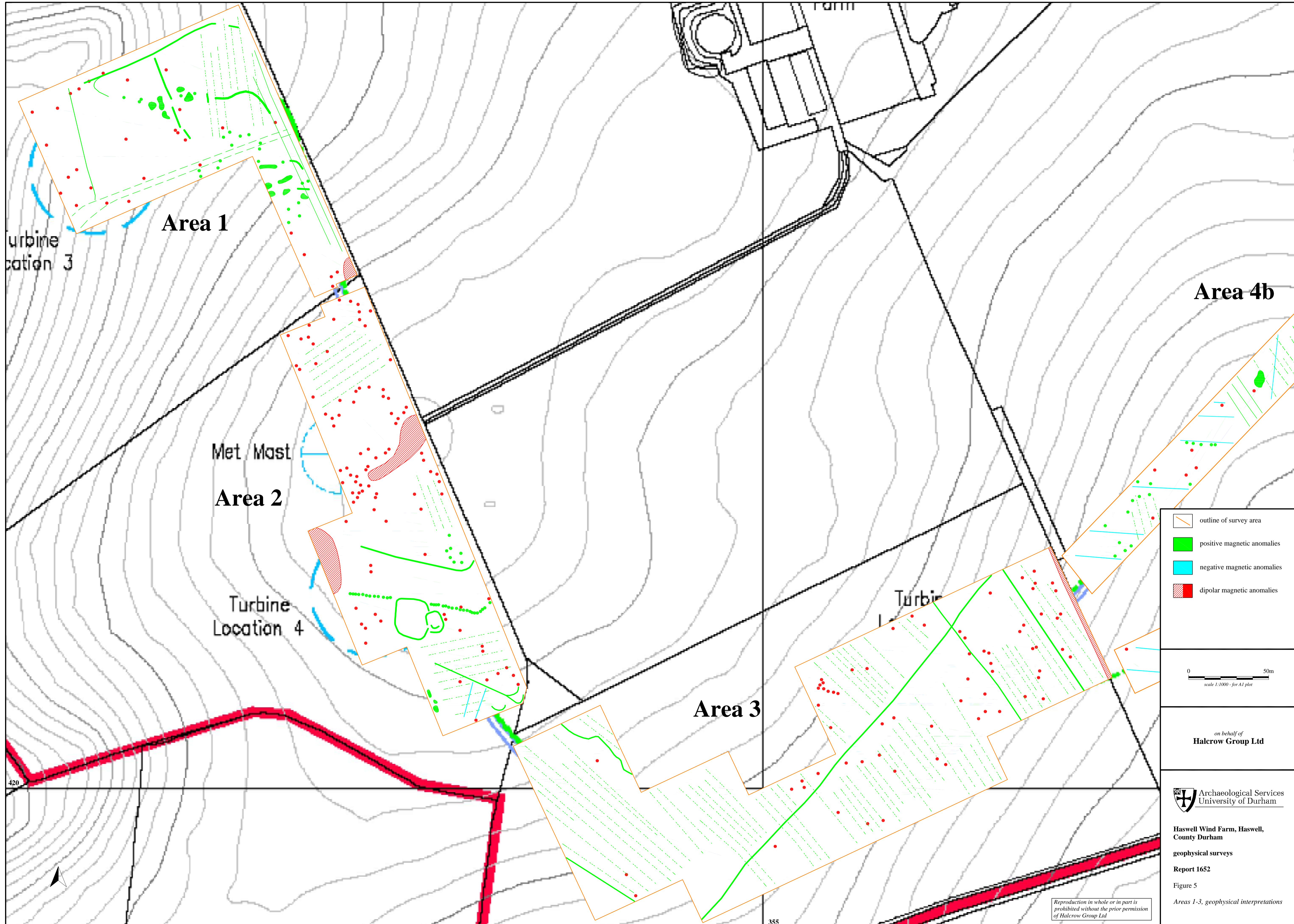
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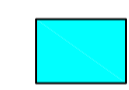

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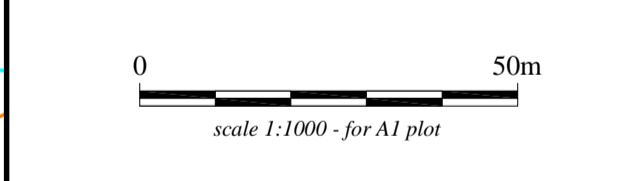
Figure 4

Areas 1-3, geophysical surveys

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



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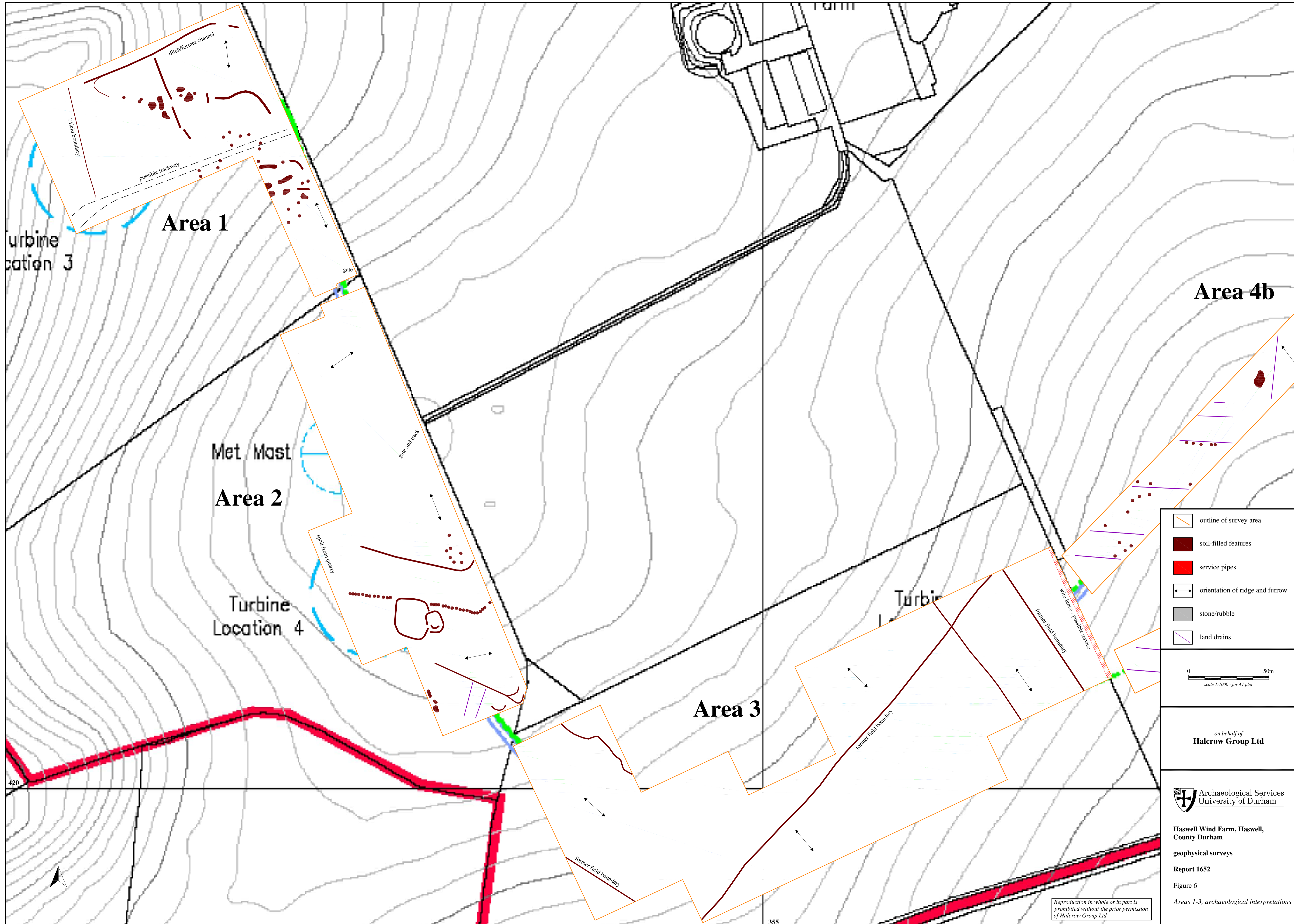
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Figure 5

Areas 1-3, geophysical interpretations

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Area 1

Met Mast

Area 2

Turbine Location 4

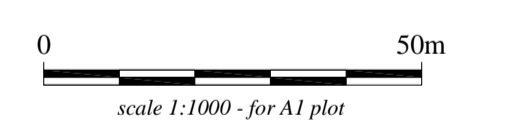
Area 3

Area 4b

Turbine Location 3

Turbine Location 1

- outline of survey area
- soil-filled features
- service pipes
- orientation of ridge and furrow
- stone/rubble
- land drains



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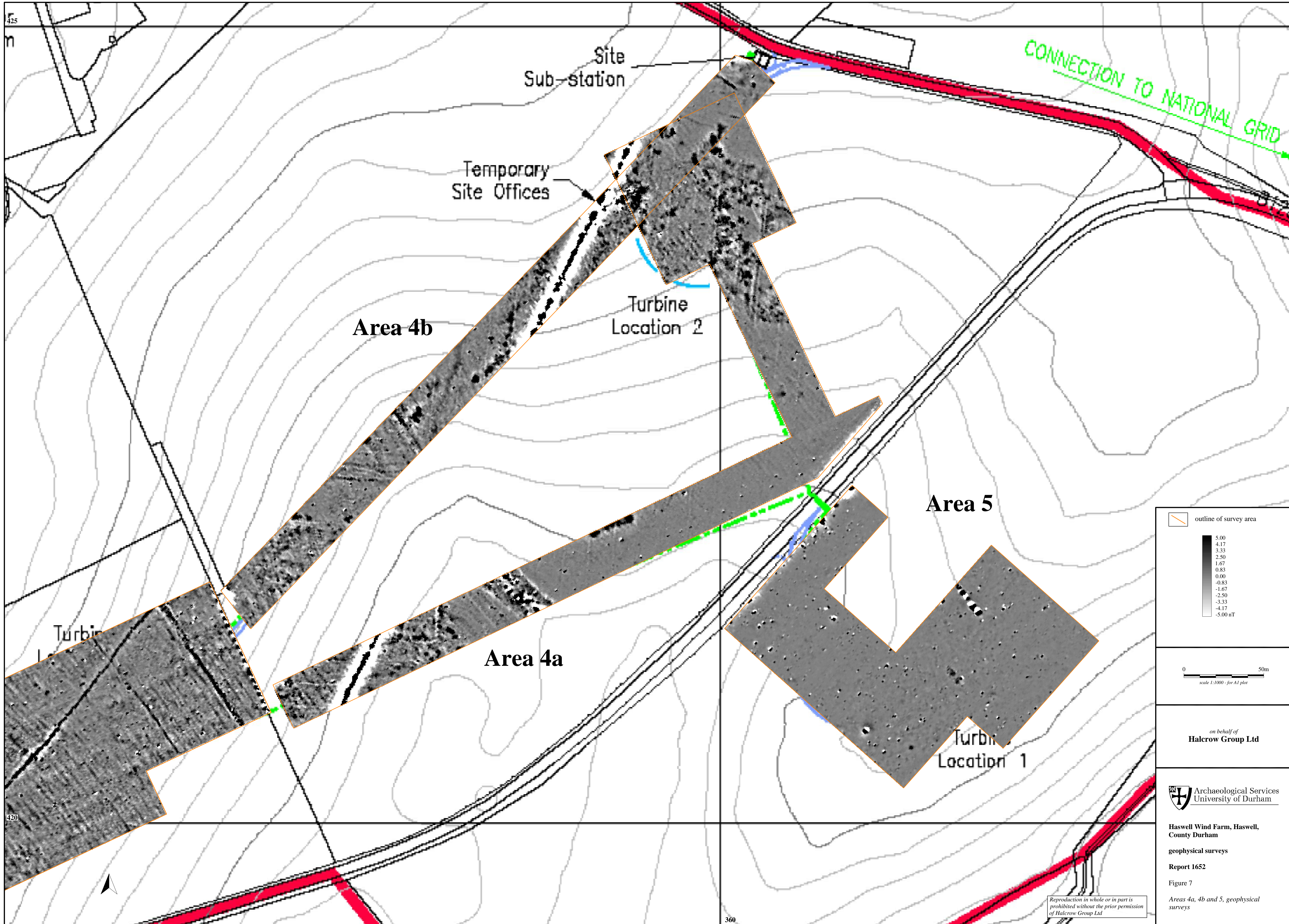
Figure 6

Areas 1-3, archaeological interpretations

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420

355



425

m

Site Sub-station

CONNECTION TO NATIONAL GRID

Temporary Site Offices

Area 4b

Turbine Location 2

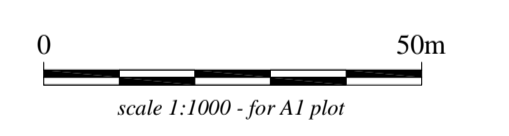
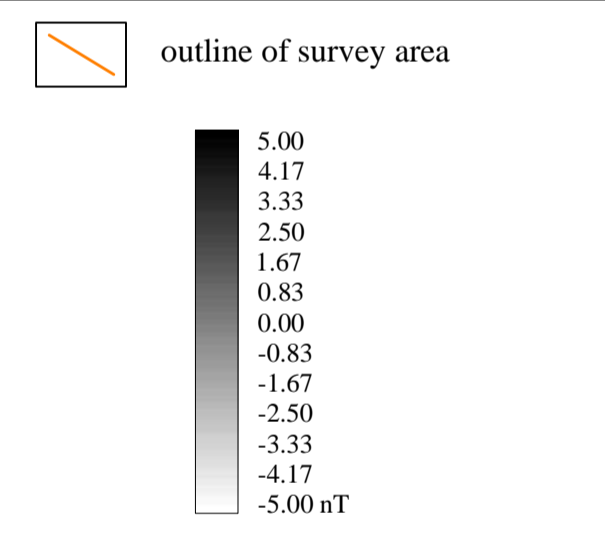
Area 5

Area 4a

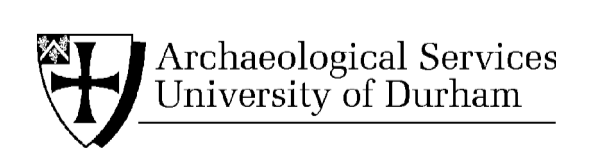
Turbine Location

Turbine Location 1

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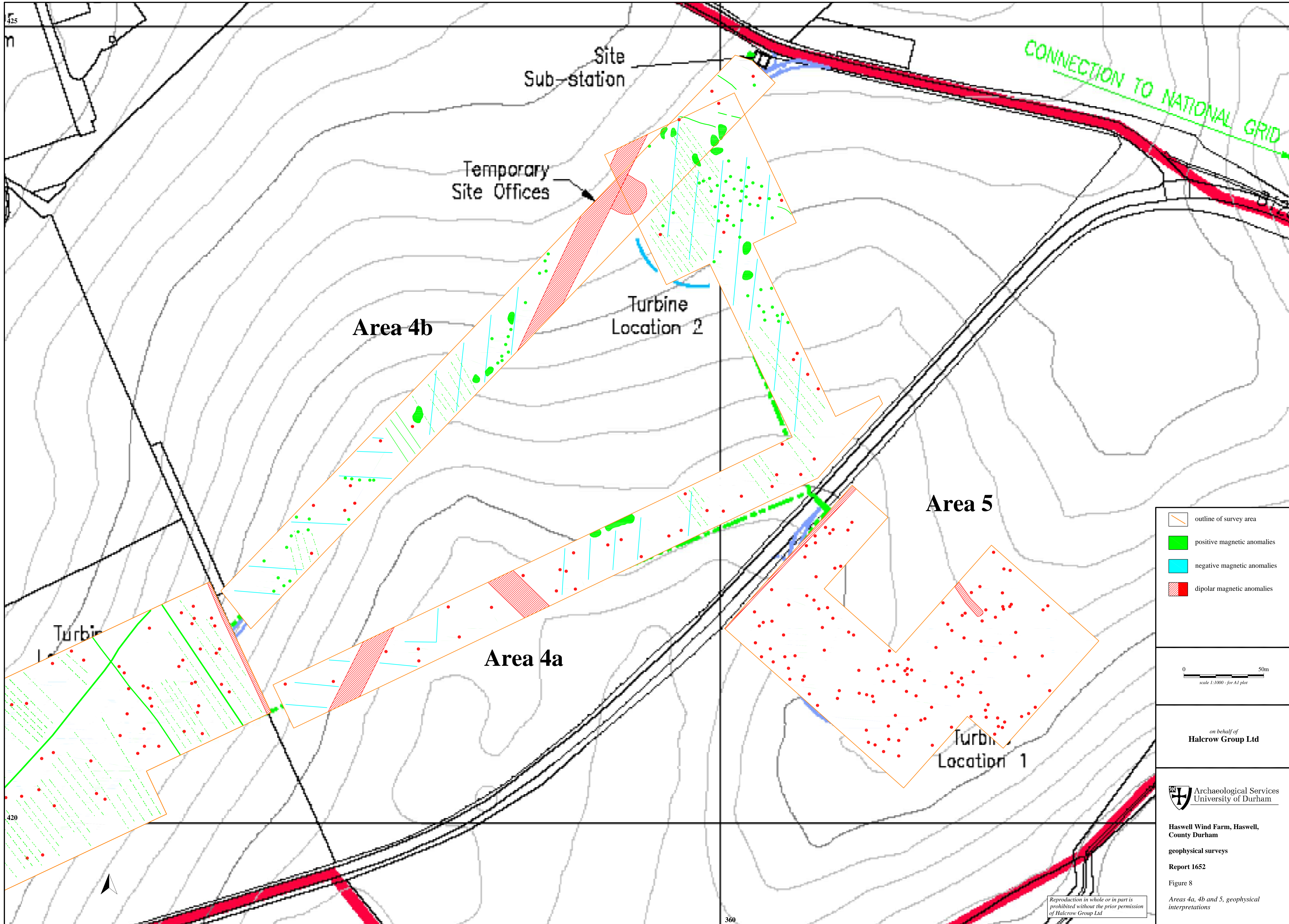
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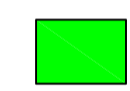
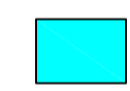



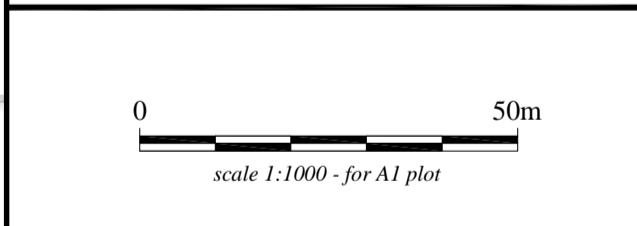
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Figure 7
Areas 4a, 4b and 5, geophysical surveys


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



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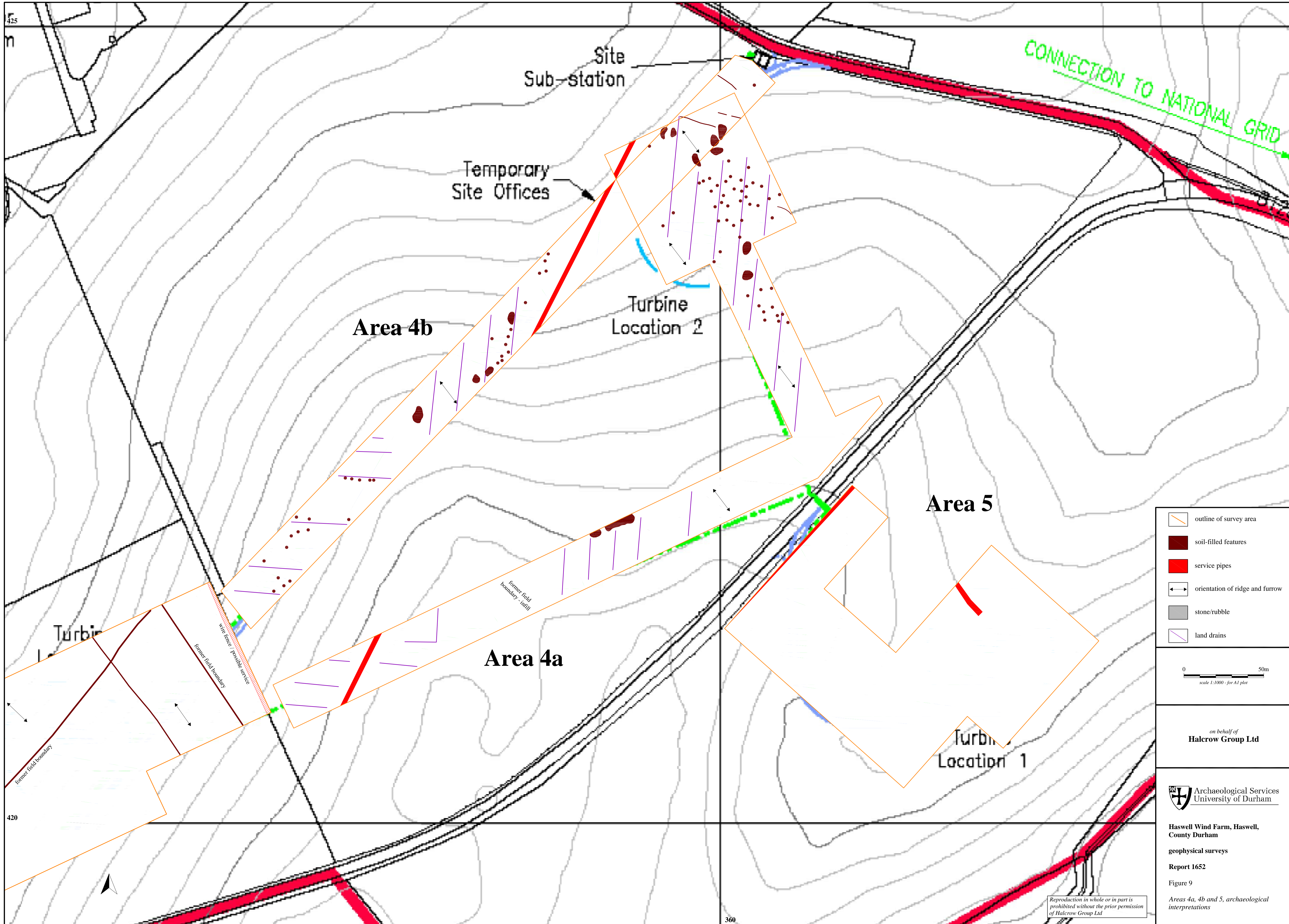
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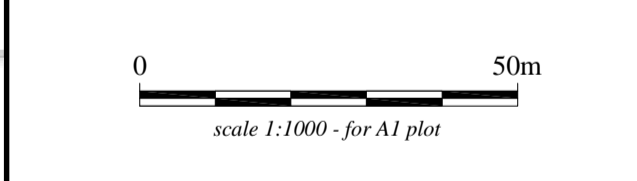
Figure 8

Areas 4a, 4b and 5, geophysical
interpretations

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- outline of survey area
- soil-filled features
- service pipes
- orientation of ridge and furrow
- stone/rubble
- land drains



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University of Durham

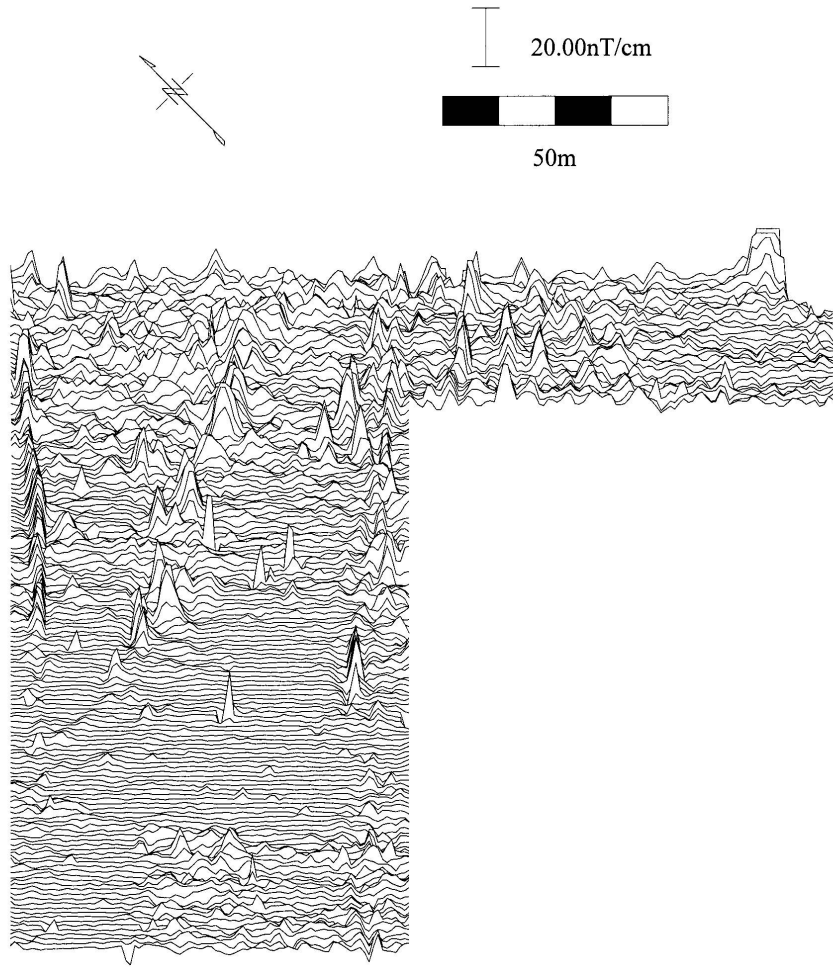
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Figure 9
Areas 4a, 4b and 5, archaeological interpretations

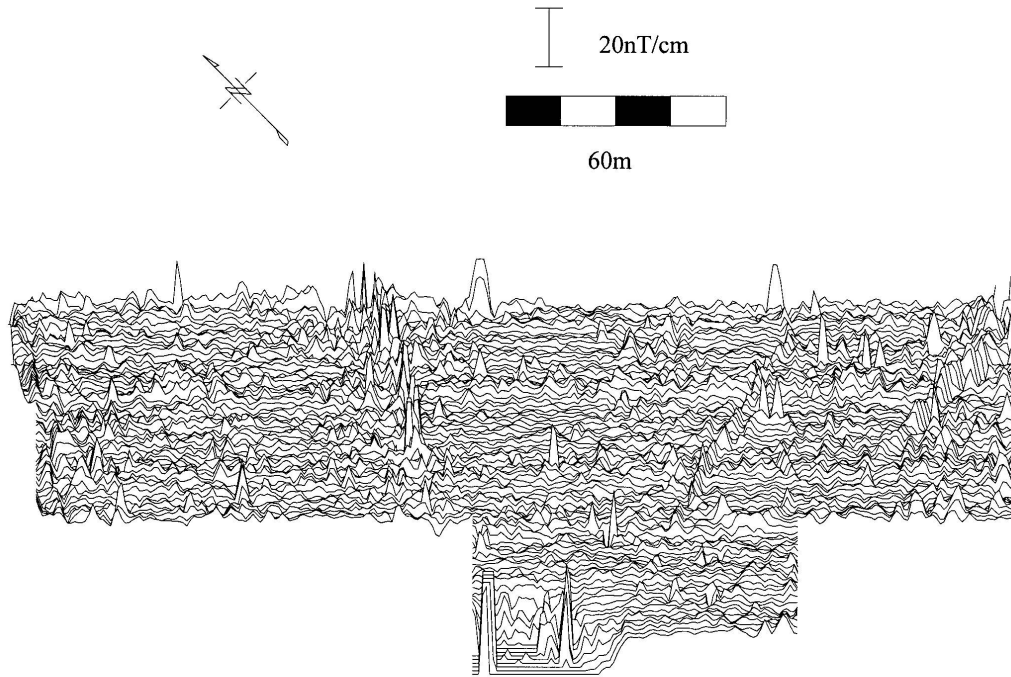
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Appendix I: Trace plots of geophysical data

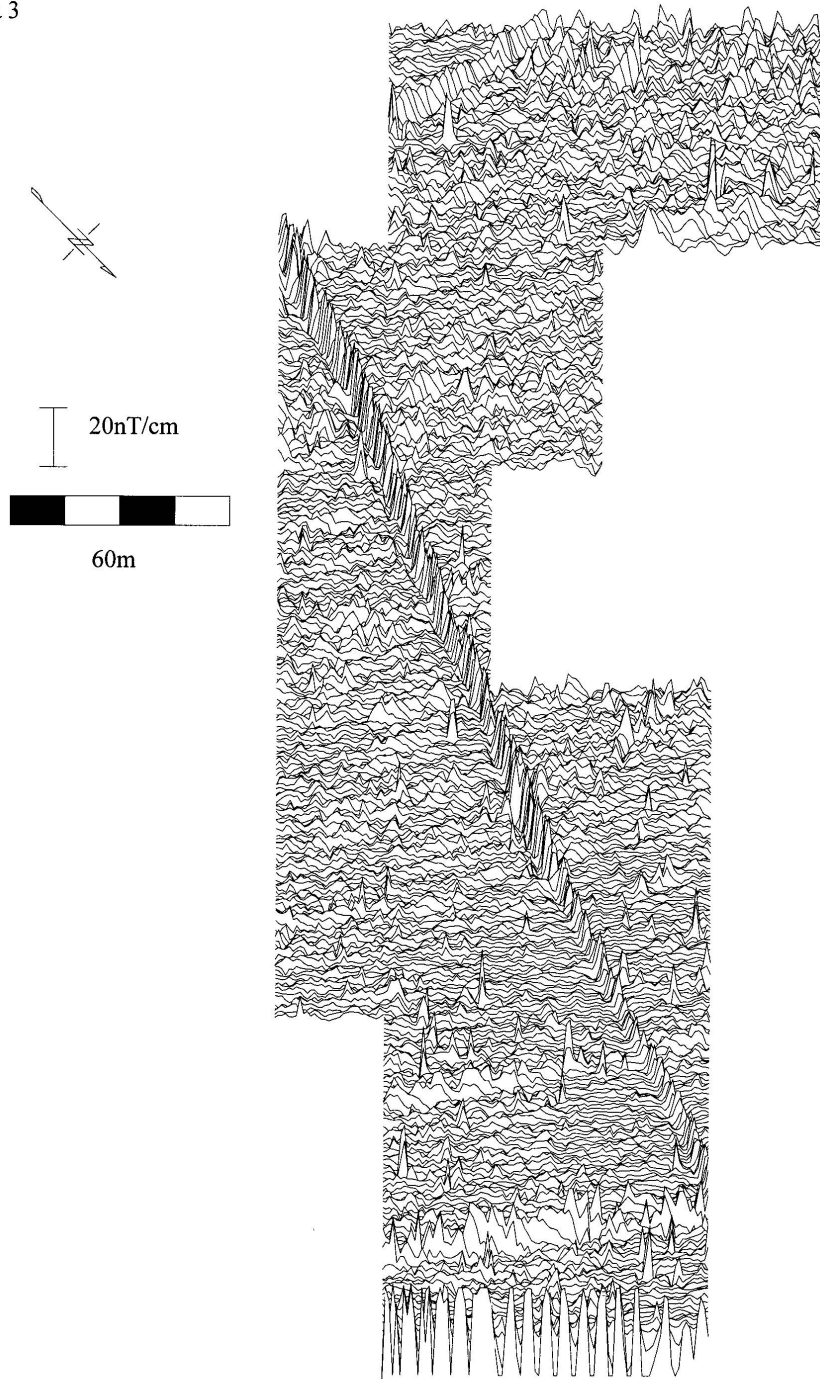
Area 1



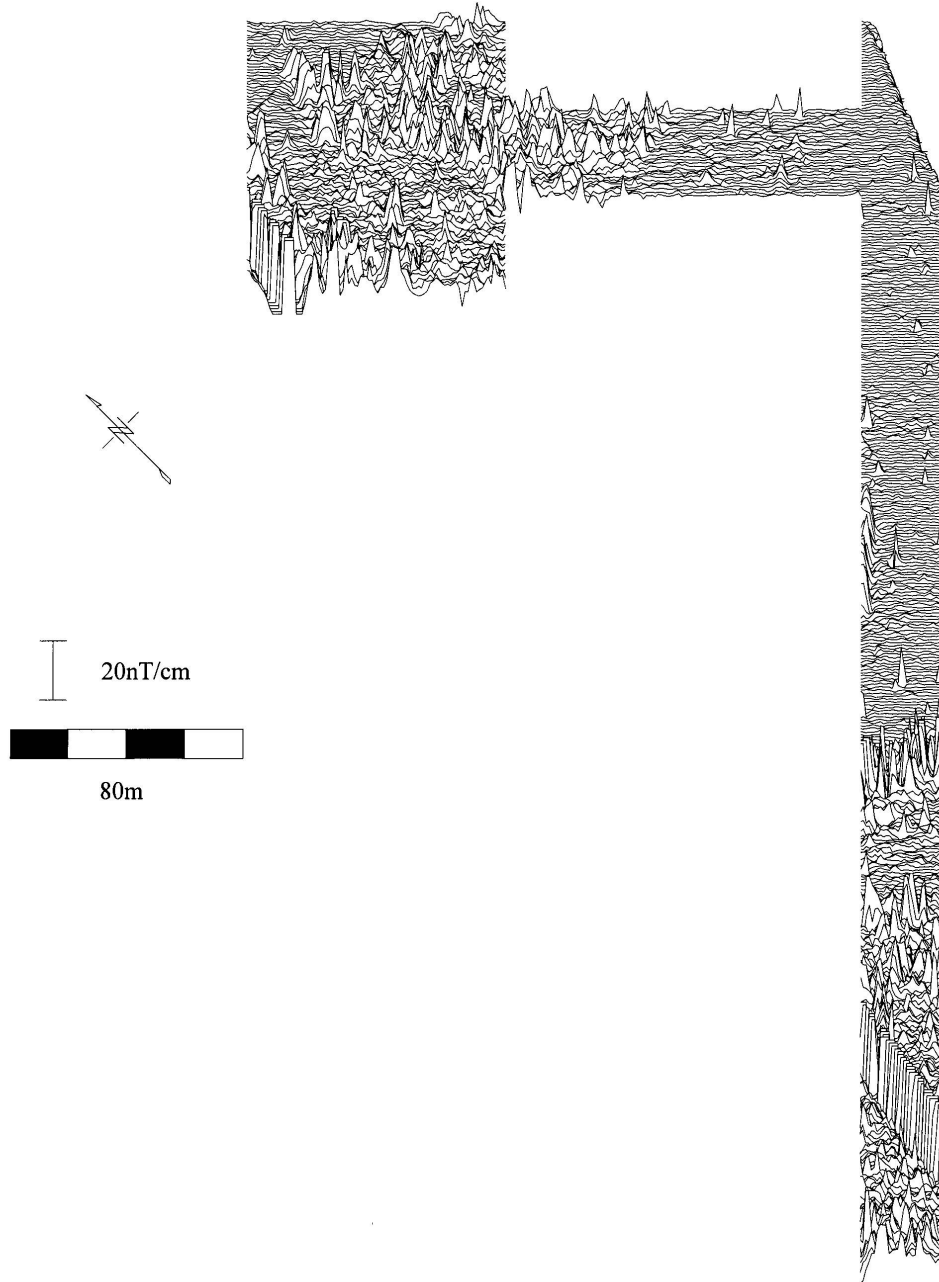
Area 2



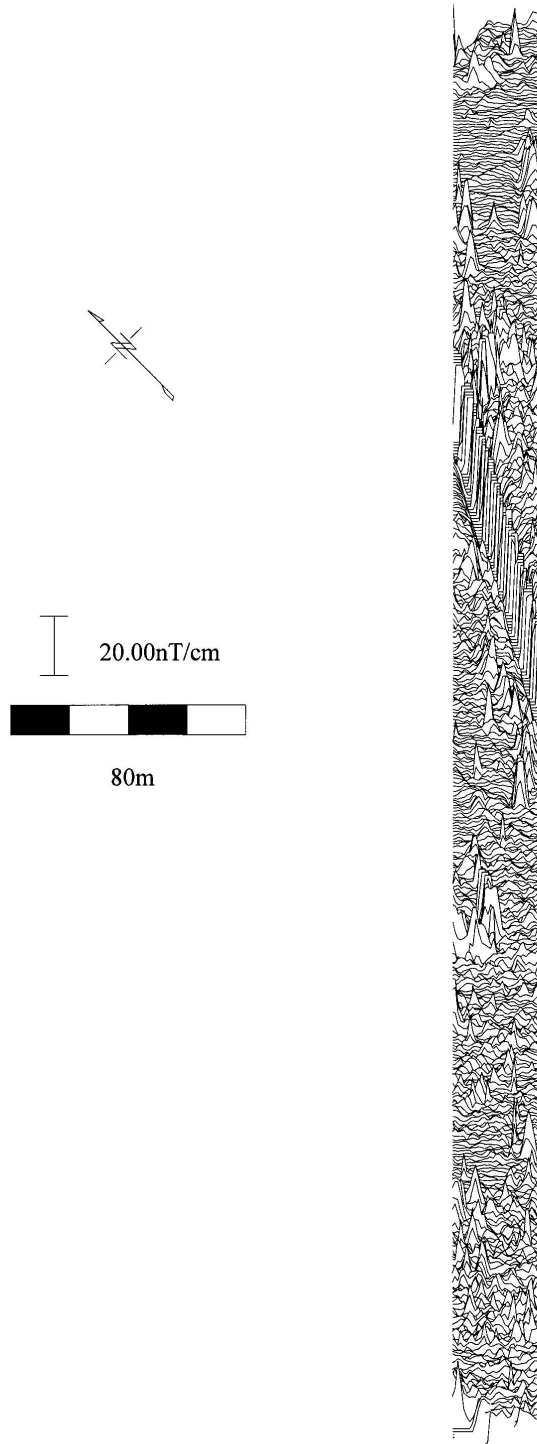
Area 3



Area 4a



Area 4b



Area 5

