

ARCHAEOLOGICAL  
SERVICES  
DURHAM UNIVERSITY

on behalf of  
CgMs Consulting

Hameldon Wind Farm Extension  
Burnley  
Lancashire

geophysical survey

report 2744  
October 2011

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## **1. Summary**

### **The project**

- 1.1 This report presents the results of a geophysical survey conducted in advance of proposed development at Hameldon Wind Farm near Burnley in Lancashire. The works comprised geomagnetic survey of approximately 2ha.
- 1.2 The works were commissioned by CgMs Consulting and conducted by Archaeological Services Durham University.

### **Results**

- 1.3 Large areas of disturbed ground (dumping) were detected in the north-west and north-east of the survey area.
- 1.4 Smaller concentrations of ferrous/fired materials or burnt areas were detected at the top of the slope near the remains of Hapton Tower.
- 1.5 A concentration of small anomalies was detected over and around the remains of Hapton Tower.
- 1.6 No features of probable archaeological significance were identified.

## 2. Project background

### Location (Figure 1)

- 2.1 The survey area was located at Hameldon Wind Farm, on the northern slopes of Hameldon Hill near Burnley in Lancashire (NGR centre: SD 805 302). One survey was undertaken covering approximately 2ha, bounded to the south by a stone wall and to the east by a track. The remains of Hapton Tower were present at the southern boundary of the survey. The existing wind farm of three turbines occupies land immediately north and east of the survey area.

### Development proposal

- 2.2 Planning permission for the construction of three turbines, access tracks, substation and temporary construction compound has been granted (application no. APP/2009/0756). It is proposed that one of the turbines (Turbine 3) will be sited within the survey area (Figure 4).

### Objective

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

### Methods statement

- 2.4 The survey was undertaken in accordance with instructions from the client and with national standards and guidance (see para 5.1).

### Dates

- 2.5 Fieldwork was undertaken on 27th September 2011. This report was prepared for 10th October 2011.

### Personnel

- 2.6 Fieldwork was conducted by Duncan Hale and Catrin Jenkins. Geophysical data processing and report preparation was by Duncan Hale, the Project Manager, with illustrations by David Graham.

### Archive/OASIS

- 2.7 The site code is **BHW11**, for **Burnley Hameldon Wind Farm 2011**. The survey archive will be supplied on CD to the client for deposition with the project archive in due course. Archaeological Services Durham University is registered with the **Online AccesS to the Index of archaeological investigationS project (OASIS)**. The OASIS ID number for this project is **archaeol3-111503**.

## 3. Historical and archaeological background

- 3.1 The archaeological background of the site is presented in Chapter 8 of the Hameldon Hill Wind Farm Extension Environmental Statement (AECOM, December 2009). The following summary information is taken from a specification prepared by CgMs Consulting (no date).

- 3.2 A number of Mesolithic tools have been recorded at the summit of Hameldon Hill. A possible Neolithic long barrow (it is possible that it may be quarry spoil) is recorded

in the area. There are three Bronze Age ritual/burial sites, two of which are unlocated and the third is a possible burial cairn. There are no Iron Age remains recorded within the site or the wider ES study area. No remains of these periods were recorded during the watching brief on the construction of the existing Hameldon Hill Wind Farm. Therefore, the site is considered to have low potential for remains of all prehistoric periods.

- 3.3 A rectangular earthwork enclosure of possible Roman date was recorded during the watching brief for the existing wind farm to the north-west of the Turbine 3 of the extension scheme. The date of this feature has not been confirmed by investigation and so while it is thought to be Roman, it could also be a 19th-century feature associated with Hapton Tower and park. The lack of other remains of a Roman date in the study site would imply that this is not of Roman date. Therefore, as the enclosure could be of Roman date, the site is considered to have a moderate potential for Roman remains. However, it should be noted that no Roman finds or features were recorded during the existing wind farm watching brief.
- 3.4 The site lies to the south of Hapton Castle which built in the 12th century. Hapton Tower lies to the south of Turbine 3. This was built in 1510 by Sir John Townley although the deer park may date to the 14th century. The tower had become derelict by 1725 at which time it stood six yards high. It appears to have been a square tower with three cylindrical towers along one wall and two entrances opposite one another. Several dwellings had been erected from within the outbuildings of the tower. The earthwork remains of ridge and furrow survive within the site (partially mapped during the wind farm watching brief). Therefore, there is a high potential for previously unrecorded medieval remains to exist within the site.
- 3.5 During the post-medieval period industrial activities, generally mineral extraction, expanded considerably within the area of Hameldon Hill. The watching brief on the construction of the existing wind farm revealed a number of features of post-medieval date (Oxford Archaeology North 2006).

#### **4. Landuse, topography and geology**

- 4.1 The survey covered a roughly triangular area of rough grazing. Parts of the area had been used for the dumping of building rubble and earth; hydrocarbons and other materials were also present. One small part of the survey area was too steep for data collection while other parts were boggy and covered with clumps of tall reed grasses; these factors prevented survey across the whole area.
- 4.2 The survey occupied a north-north-west facing slope with the earthwork and rubble remains of Hapton Tower at the top of the slope at approximately 275m OD. The elevation at the north end of the area was approximately 260m OD.
- 4.3 The underlying solid geology of the area comprises Westphalian mudstone, siltstone and sandstone of the Pennine Lower Coal Measures Formation, overlain by glaciofluvial sand and gravel.

## 5. Geophysical survey Standards

- 5.1 The surveys and reporting were conducted in accordance with English Heritage guidelines, *Geophysical survey in archaeological field evaluation* (David, Linford & Linford 2008); the Institute for Archaeologists (IfA) *Standard and Guidance for archaeological geophysical survey* (2010); the IfA Technical Paper No.6, *The use of geophysical techniques in archaeological evaluations* (Gaffney, Gater & Ovenden 2002); and the Archaeology Data Service *Guide to Good Practice: Geophysical Data in Archaeology* (draft 2nd edition, Schmidt & Ernenwein 2011).

### Technique selection

- 5.2 Geophysical survey enables the relatively rapid and non-invasive identification of sub-surface features of potential archaeological significance and can involve a suite of complementary techniques such as magnetometry, earth electrical resistance, ground-penetrating radar, electromagnetic survey and topsoil magnetic susceptibility survey. Some techniques are more suitable than others in particular situations, depending on site-specific factors including the nature of likely targets; depth of likely targets; ground conditions; proximity of buildings, fences or services and the local geology and drift.
- 5.3 In this instance, based on known remains, it was considered likely that cut features such as ditches and pits might be present on the site, and that other types of feature such as trackways, wall foundations and fired structures (for example kilns and hearths) might also be present.
- 5.4 Given the anticipated shallowness of targets and the non-igneous geological environment of the study area a geomagnetic technique, fluxgate gradiometry, was considered appropriate for detecting the types of feature mentioned above. This technique involves the use of hand-held magnetometers to detect and record anomalies in the vertical component of the Earth's magnetic field caused by variations in soil magnetic susceptibility or permanent magnetisation; such anomalies can reflect archaeological features.

### Field methods

- 5.5 A 30m grid was established across each survey area and tied-in to known, mapped Ordnance Survey points using a Leica GS15 global navigation satellite system (GNSS), with real time kinematic (RTK) correction typically providing accuracy of approximately 10mm.
- 5.6 Measurements of vertical geomagnetic field gradient were determined using Bartington Grad601-2 dual fluxgate gradiometers. A zig-zag traverse scheme was employed and data were logged in 30m grid units. The instrument sensitivity was nominally 0.03nT, the sample interval was 0.25m and the traverse interval was 1m, thus providing 3,600 sample measurements per 30m grid unit.
- 5.7 Data were downloaded on site into a laptop computer for initial processing and storage and subsequently transferred to a desktop computer for processing, interpretation and archiving.

### Data processing

- 5.8 Geoplot v.3 software was used to process the geophysical data and to produce both a continuous tone greyscale image and a trace plot of the raw (minimally processed) data. The greyscale image and interpretations are presented in Figures 2-4; the trace plot is provided in Figure 5. 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.
- 5.9 The following basic processing functions have been applied to each dataset:

<i>clip</i>	clips 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>interpolate</i>	increases the number of data points in a survey to match sample and traverse intervals; in this instance the data have been interpolated to 0.25m x 0.25m intervals

### Interpretation: anomaly types

- 5.10 A colour-coded geophysical interpretation plan is provided. One type of geomagnetic anomaly has been distinguished in the data:
- |                         |  |
|-------------------------|--|
| <i>dipolar magnetic</i> | paired positive-negative magnetic anomalies, which typically reflect ferrous or fired materials (including building rubble, fences and service pipes) and/or fired structures such as kilns or hearths |
|-------------------------|--|

### Interpretation: features

#### General comments

- 5.11 A colour-coded archaeological interpretation plan is provided.
- 5.12 The survey results are dominated by large concentrations of intense dipolar magnetic anomalies. These reflect brick rubble and other building materials which have been dumped at the site. The rubble in the north-west is not visible, lying under turf. The rubble is visible in the north-east, where some has been laid to form a firm level surface on otherwise boggy ground.
- 5.13 Several smaller concentrations of ferrous/fired materials or burnt areas were also detected as intense dipolar magnetic anomalies at the top of the slope near the remains of Hapton Tower.
- 5.14 Many small, discrete magnetic anomalies were detected over and around the visible remains of Hapton Tower, however, individual features have not been identified.
- 5.15 A scatter of small, discrete magnetic anomalies was recorded across most of the survey area. These almost certainly reflect further 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 plan.

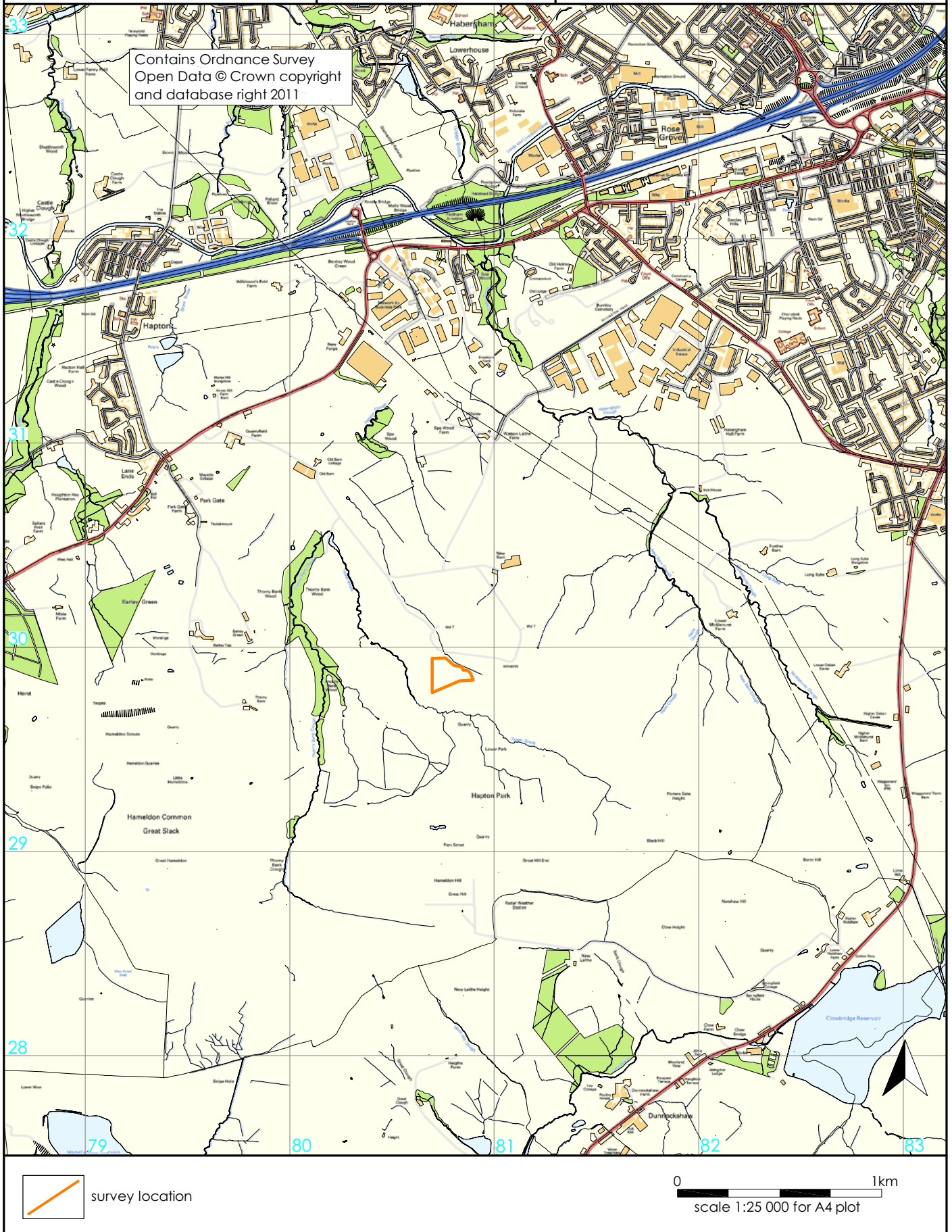
## **6. Conclusions**

- 6.1 Two hectares of geomagnetic survey were undertaken at Hameldon Wind Farm near Burnley prior to a proposed extension.
- 6.2 Large areas of disturbed ground (dumping) were detected in the north-west and north-east of the survey area.
- 6.3 Smaller concentrations of ferrous/fired materials or burnt areas were detected at the top of the slope near the remains of Hapton Tower.
- 6.4 A concentration of small anomalies was detected over and around the remains of Hapton Tower.
- 6.5 No features of probable archaeological significance were identified.

## **7. Sources**

- AECOM 2009 *Hameldon Hill Wind Farm Extension Environmental Statement*
- CgMs Consulting (no date) *Specification for an Archaeological Watching Brief and Earthwork Survey, Hameldon Hill Wind Farm Extension, Lancashire*
- David, A, Linford, N, & Linford, P, 2008 *Geophysical Survey in Archaeological Field Evaluation*. English Heritage
- Gaffney, C, Gater, J, & Ovenden, S, 2002 *The use of geophysical techniques in archaeological evaluations*. Technical Paper 6, Institute of Field Archaeologists
- IfA 2010 *Standard and Guidance for archaeological geophysical survey*. Institute for Archaeologists
- Oxford Archaeology North 2006 *Hameldon Hill Wind Cluster, New Barn farm, Burnley, Lancashire: Archaeological Watching Brief*.
- Schmidt, A, & Ernenwein, E, 2011 (draft) *Guide to Good Practice: Geophysical Data in Archaeology*. Archaeology Data Service





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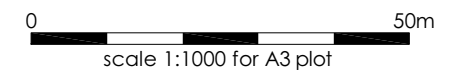
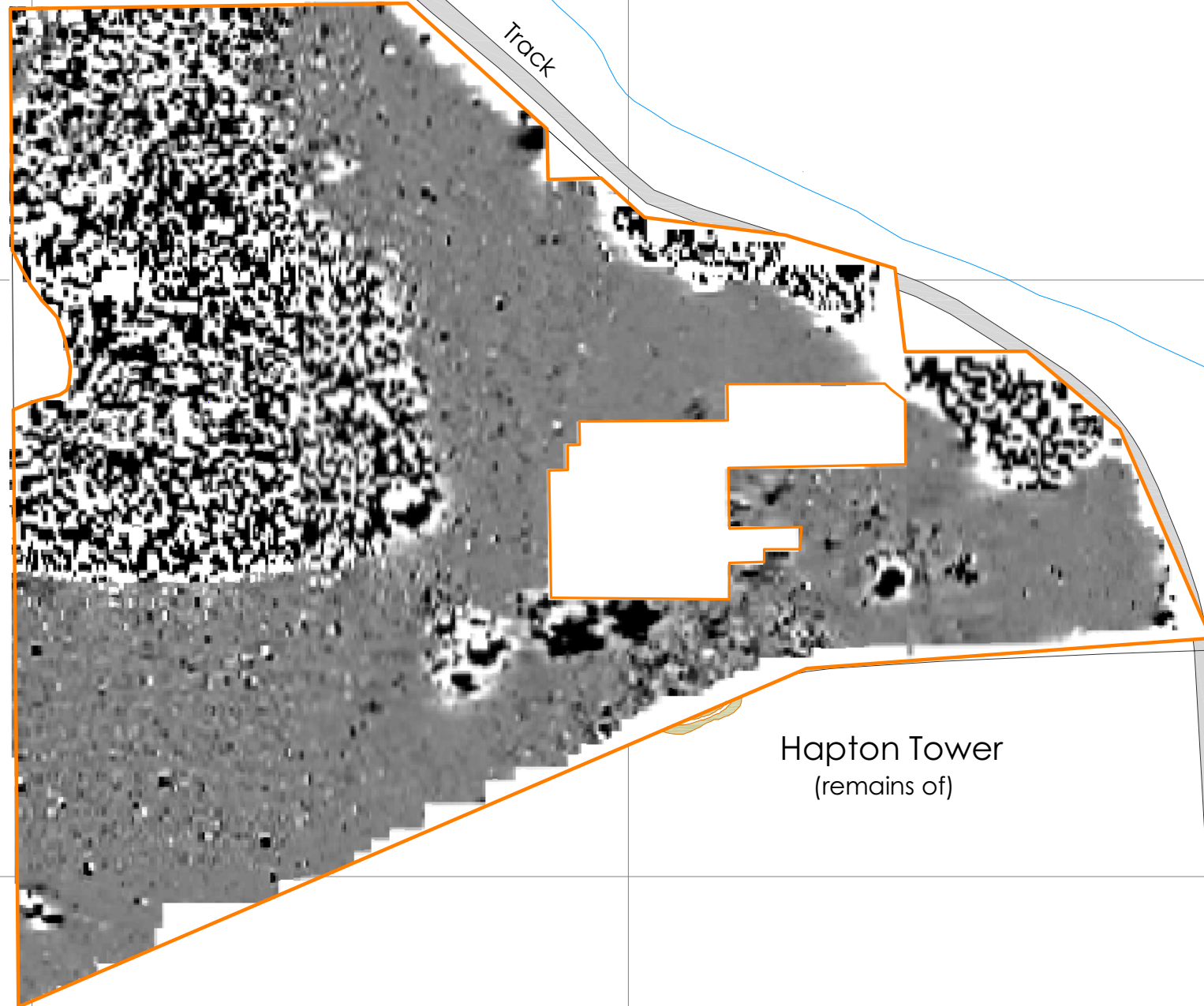
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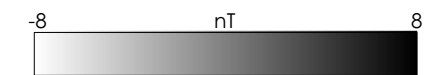
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Figure 2: Geophysical survey

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 magnetic survey



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Hapton Tower  
(remains of)

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

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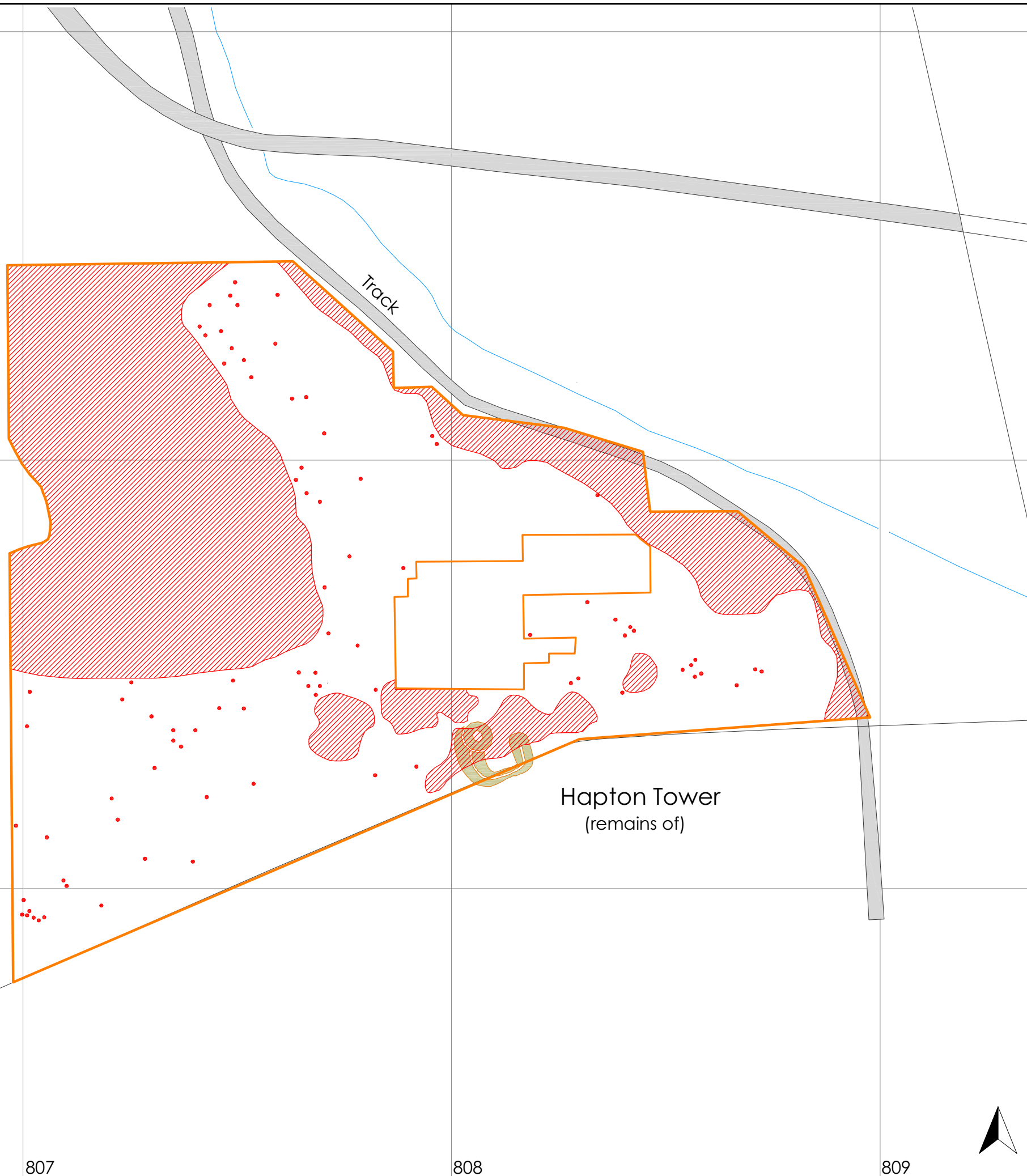
Figure 3: Geophysical interpretation

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0 50m  
scale 1:1000 for A3 plot

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-  magnetic survey
-  dipolar magnetic anomaly



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Figure 4: Archaeological interpretation

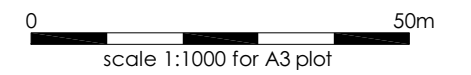
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


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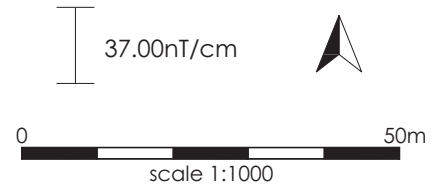
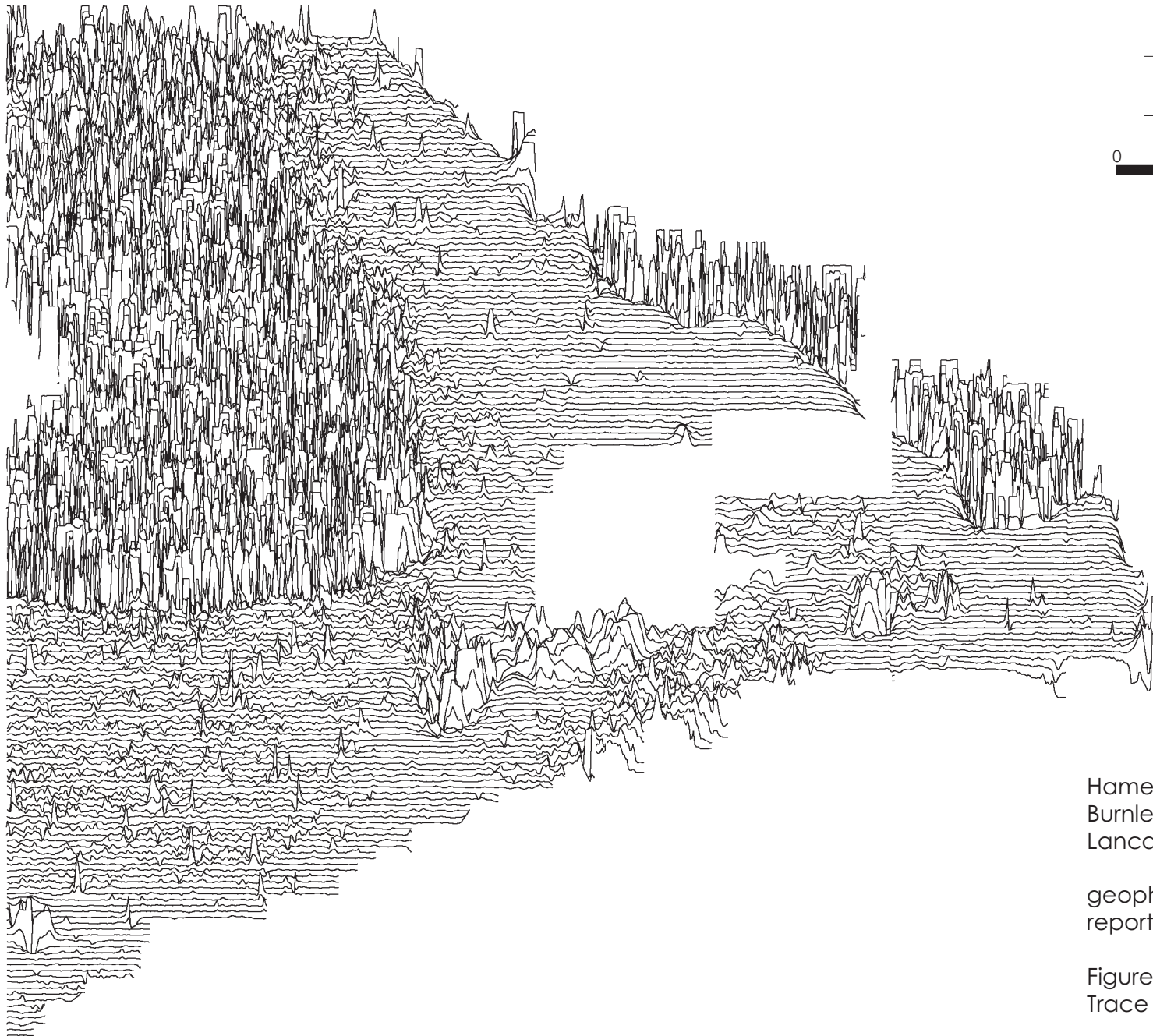
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-  magnetic survey
-  tower remains
-  disturbed area
-  original T3 location
-  revised T3 location





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Figure 5:  
Trace plot of geomagnetic data