

ARCHAEOLOGICAL  
SERVICES  
DURHAM UNIVERSITY

on behalf of  
The Northumberland Estates

Scaffold Hill  
North Tyneside

geophysical survey

report 2806  
December 2011

## Contents

1.	Summary	1
2.	Project background	2
3.	Historical and archaeological background	2
4.	Aerial photograph assessment	3
5.	Landuse, topography and geology	4
6.	Geophysical survey	4
7.	Conclusions	8
8.	Sources	8

## Figures

Figure 1:	Site location
Figure 2:	Survey overview
Figure 3:	Area 1 geophysical survey and interpretations
Figure 4:	Area 2 geophysical survey and interpretations
Figure 5:	Area 3 geophysical survey and interpretations
Figure 6:	Area 4 geophysical survey and interpretations
Figure 7:	Area 5 geophysical survey and interpretations
Figure 8:	Area 6 geophysical survey and interpretations
Figure 9:	Area 7 geophysical survey and interpretations
Figure10:	Area 8 geophysical survey and interpretations
Figure 11:	Area 9 geophysical survey and interpretations
Figure 12:	Area 10 geophysical survey and interpretations
Figure 13:	Area 11 geophysical survey and interpretations
Figure 14:	Trace plots of geomagnetic data
Figure 15:	Trace plots of geomagnetic data
Figure 16:	Land use overview

## **1. Summary**

### **The project**

- 1.1 This report presents the results of geophysical surveys conducted in advance of proposed development at Scaffold Hill, North Tyneside. The works comprised the geomagnetic survey of 15ha of mixed use farm land. A plan of land use and areas of extant ridge and furrow was also prepared, and aerial photographs examined.
- 1.2 The works were commissioned by The Northumberland Estates and conducted by Archaeological Services Durham University.

### **Results**

- 1.3 Possible soil-filled ring ditches were identified in Areas 5 and 6. Other possible soil-filled ditches were identified in Areas 1, 3 and 4.
- 1.4 Ridge and furrow cultivation was identified in Area 9 where there are upstanding earthworks. A former field boundary was detected in Area 1.
- 1.5 Former waggonways were detected in Areas 1 and 2.
- 1.6 Evidence of ground disturbance or dumping of mining waste was identified in Areas 7, 10 and 11.
- 1.7 Services and land drains were detected in nearly all the areas surveyed with the exception of Areas 7, 8, 10 and 11.

## 2. Project background

### Location (Figure 1)

- 2.1 The survey area is located at Scaffold Hill, to the east of Forest Hall and northwest of Willington, North Tyneside (NGR centre: NZ 3050 6950). Eleven surveys totalling 15ha were conducted in ten land parcels. To the west is farmland, to the north and south is a housing estate, to the east is the A19.

### Development proposal

- 2.2 The proposed development comprises two parts. The north part will incorporate an eco-friendly residential housing development with sustainable infrastructure, open spaces and play areas. The south part comprises leisure facilities including pony trekking, camping and a garden centre and improved links to the existing Rising Sun Centre.

### 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 relation to the development.

### Methods statement

- 2.4 The surveys have been undertaken in accordance with instructions from the client and in line with national standards and guidelines (paragraph 5.1 below). A plan of land use and areas of extant ridge and furrow was also prepared (Figure 16), and aerial photographs examined (below, Section 4).

### Dates

- 2.5 Fieldwork was undertaken between 21st and 24th November 2011. This report was prepared for 23rd December 2011.

### Personnel

- 2.6 Fieldwork was conducted by Tony Liddell, Stephanie Piper and Natalie Swann (Supervisor). Aerial photographs were assessed by Judith Roberts. The geophysical data were processed by Natalie Swann. This report was prepared by Natalie Swann with illustrations by Tony Liddell and edited by Duncan Hale, the Project Manager.

### Archive/OASIS

- 2.7 The site code is **TSH11**, for **Tyneside Scaffold Hill 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 **archaeol3-115764**.

## 3. Historical and archaeological background

- 3.1 A detailed archaeological desk-based assessment has been undertaken for the site (Archaeological Services 2010). The results of that assessment are summarised here.



- 3.2 There is no direct evidence of prehistoric activity in the proposed development area. However, there is evidence that the surrounding area was exploited in prehistory. Excavations at Burradon (Jobey 1970, 51-95), to the northwest of the proposed development area, revealed an enclosed settlement of Early Iron Age date, and crop marks recorded on aerial photographs identified further occupation in this area. It appears there is more activity from this period around Backworth to the north and the area north of Shiremoor. Lithic artefacts were recovered at West Allotment of possible Neolithic or Bronze Age date. A crop mark possibly relating to the prehistoric period was identified in 1981 at Shiremoor. This showed a rectilinear enclosure with a small central circle and a larger circle to the south east, plus a larger trapezoidal enclosure to the west. It is therefore possible that a resource relating to the prehistoric period may survive within the proposed development area. There is however no evidence of Roman activity.
- 3.3 There is little evidence of medieval activity within or surrounding the site although the area may have been exploited for farming. Farming practices relating to the post-medieval period have been identified in the form of extant ridge and furrow earthworks close to Scaffold Hill Farm. Further sub-surface evidence for this type of activity may survive elsewhere across the area.
- 3.4 A post-medieval windmill once stood in the south part of the proposed development area. Evidence for this and associated structures may remain.
- 3.5 Two former waggonways are recorded within the area. The Scaffold Hill Farm track could also be a former waggonway. Evidence for the construction of these may be preserved. Mining shafts, bell pits and evidence for coal mines may also be present. There is a former quarry in the southern part of the site.
- 3.6 A hexagonal pill-box and a searchlight battery accommodation unit survive within the site, dating to World War Two.

#### 4. Aerial photograph assessment

- 4.1 The following aerial photographs were examined:

**NMR photographs:**

RAF/CPE/UK/2352	RP 3151	04/10/1947
RAF/CPE/UK/2352	RP 3152	04/10/1947
RAF/58/B/32	V 5555	16/05/1948
RAF/58/B/32	V 5556	16/05/1948
RAF/58/B/32	V 5612	16/05/1948
RAF/58/B/32	V 5613	16/05/1948
RAF/540/1381 F21	464	07/08/1954
RAF/540/1381 F21	465	07/08/1954
RAF/540/1792 F21	13	13/03/1956
RAF/540/1792 F21	14	13/03/1956
RAF/106G/UK/1193	RS 4176	27/02/1946
RAF/106G/UK/1193	RS 4177	27/02/1946
OS/88051	V 29	14/04/1988
OS/88051	V 71	14/04/1988
OS/88052	V 135	14/04/1988
OS/88052	V 135	14/04/1988

OS/66232	V 193	24/08/1966
OS/70180	V 57	05/06/1970
OS/90135	V 0	25/06/1990
OS/90136	V 3	25/06/1990
OS/90136	V 4	25/06/1990
OS/92057	V 27	19/04/1992
OS/92057	V 28	19/04/1992
OS/93161	V 57	19/05/1993
OS/93161	V 58	19/05/1993

- 4.2 There is slight evidence of a track or waggonway joining the waggonway between New Benton and Willington in the northern part of the site. The junction and extension is visible in photographs:

RAF/540/1792	F21 13	13/03/1956
RAF/540/1792	F21 14	13/03/1956
OS/88051	V 29	14/04/1988

No archaeological features other than those noted on the HER (Archaeological Services 2010) were seen on these photographs.

- 4.3 Photographs from the North Tyneside Council Planning Department taken on 28th August 1974 showed only field drains and narrow ridge and furrow earthworks. No other archaeological features were noted. The Newcastle University Collection (now housed in the Discovery Museum) had no photographs of the area around Scaffold Hill.

## 5. Landuse, topography and geology

- 5.1 The survey area comprised four fields of arable land, five fields of pasture and an area of overgrown public parkland. Figure 16 shows land use within the proposed development area including the location of extant ridge and furrow earthworks.
- 5.2 The proposed development area was predominantly level across the north and central part of the site with a mean elevation of approximately 72-75m OD. The land falls away and slightly undulates towards the east and south, dropping to around 66-68m OD.
- 5.3 The underlying solid geology of the area comprises sandstone of the Pennine Middle Coal Measures overlain by Devensian Till.

## 6. Geophysical survey Standards

- 6.1 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* (2011); 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* (Schmidt & Ernenwein 2011).

### Technique selection

- 6.2 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.
- 6.3 In this instance, based on the desk-based assessment, 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.
- 6.4 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**

- 6.5 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 corrections (RTK) typically providing 10mm accuracy.
- 6.6 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.
- 6.7 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**

- 6.8 Geoplot v.3 software was used to process the geophysical data and to produce both continuous tone greyscale images and trace plots of the raw (minimally processed) data. The greyscale images and interpretations are presented in Figures 3-13; the trace plots are provided in Figures 14-15. 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.
- 6.9 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>despike</i>	locates and suppresses iron spikes in gradiometer data
<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**

- 6.10 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
<i>dipolar magnetic</i>	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**

#### **General comments**

- 6.11 Colour-coded archaeological interpretation plans are provided.
- 6.12 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. In Area 8 these were the only type of anomaly detected therefore this area has also been omitted from the following discussion.
- 6.13 Series of parallel positive magnetic anomalies have been detected in Areas 1, 2, 4, 5 and 6 which are likely to reflect land drains.

#### **Area 1**

- 6.14 A pair of linear positive magnetic anomalies was detected aligned northwest-south east in the southwest corner of this area. These anomalies are likely to represent the remains of a waggonway shown on historic maps of the site and identified on aerial photographs.
- 6.15 Several other linear positive magnetic anomalies have been detected across this area which may reflect soil-filled features such as ditches. The linear positive

magnetic anomaly aligned approximately east-west in the northern part of the area corresponds to a former field boundary shown on historic maps of the site.

- 6.16 The intense dipolar magnetic anomaly on the northeast edge of this area reflects the remains of a recent bonfire.

#### **Area 2**

- 6.17 Two parallel positive magnetic anomalies were detected in the southeast corner of this area aligned north-south; these anomalies reflect the remains of the Holystone waggonway. The dipolar magnetic anomaly at the north end of the waggonway may reflect part of the Holystone Colliery.
- 6.18 A series of parallel positive magnetic anomalies was detected aligned approximately north-south which is likely to reflect a former plough regime.

#### **Area 3**

- 6.19 Three linear positive magnetic anomalies were detected in the east corner of this area; two aligned approximately north-south and one northwest-southeast. These anomalies may reflect soil-filled ditches.

#### **Area 4**

- 6.20 A curvilinear positive magnetic anomaly was detected on the west edge of this area which may reflect a soil-filled feature such as a ditch.
- 6.21 A chain of dipolar magnetic anomalies aligned northeast-southwest in the southeast corner of this area is likely to reflect a modern service pipe.

#### **Area 5**

- 6.22 Five curvilinear positive magnetic anomalies were detected in area which may reflect soil-filled features such as ring-ditches.

#### **Area 6**

- 6.23 A circular positive magnetic anomaly was detected in this area which may reflect a small soil-filled ring-ditch.
- 6.24 A chain of dipolar magnetic anomalies was detected aligned northwest-southeast; this is likely to reflect a modern service. Two intense dipolar magnetic anomalies detected reflect horse feeders.

#### **Areas 7, 10 and 11**

- 6.25 These areas are covered in intense dipolar magnetic anomalies that may reflect ground disturbance or dumping of mining material. Area 10 is situated on a rise next to the site of the Scaffold Hill Quarry indicating this may be a spoil heap.

#### **Area 9**

- 6.26 A series of alternate parallel positive and negative magnetic anomalies was detected aligned northeast-southwest across this survey area. These anomalies reflect the upstanding ridge and furrow earthworks.
- 6.27 A broad diffuse positive magnetic anomaly was detected aligned approximately east-west; this reflects a break of slope noted in this area.

- 6.28 An intense linear dipolar magnetic anomaly was detected aligned northeast-southwest which almost certainly reflects a modern service. The intense dipolar magnetic anomaly on the south edge of the survey area reflects an electric fence and a telegraph pole.

## 7. Conclusions

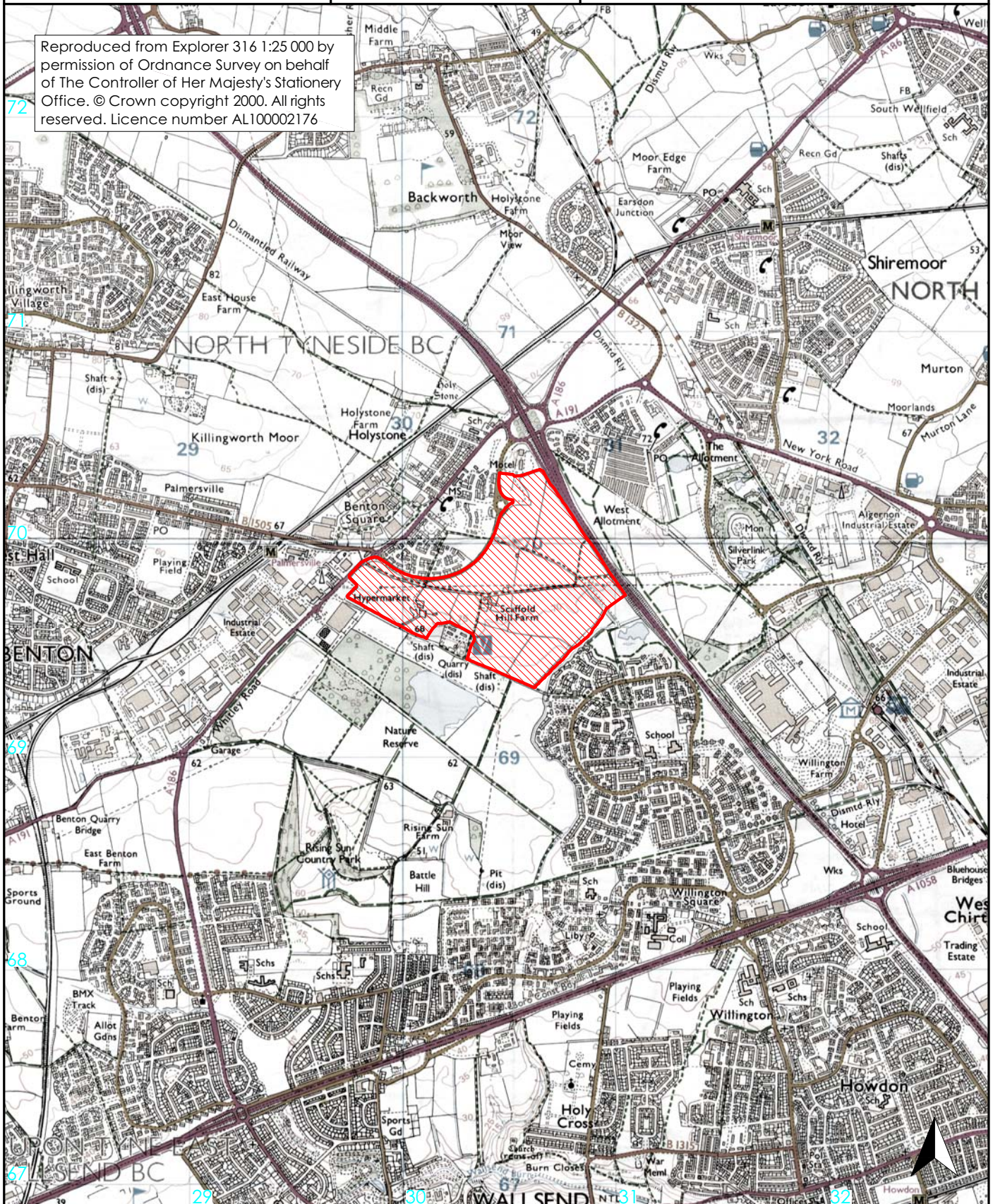
- 7.1 15 ha of geomagnetic survey were undertaken at Scaffold Hill, North Tyneside prior to proposed development.
- 7.2 Possible soil-filled ring ditches were identified in Areas 5 and 6. Other possible soil-filled ditches were identified in Areas 1, 3 and 4.
- 7.3 Ridge and furrow cultivation was identified in Area 9 where there are upstanding earthworks. A former field boundary was detected in Area 1.
- 7.4 Former waggonways were detected in Areas 1 and 2. These are recorded historically and on aerial photographs.
- 7.5 Evidence of ground disturbance or dumping of mining waste was identified in Areas 7, 10 and 11.
- 7.6 Services and land drains were detected in nearly all the areas surveyed with the exception of Areas 7, 8, 10 and 11.

## 8. Sources

- Archaeological Services 2010 *Scaffold Hill, North Tyneside: archaeological desk based assessment*. Unpublished report **2447**, Archaeological Services Durham University.
- 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 2011 *Standard and Guidance for archaeological geophysical survey*. Institute for Archaeologists
- Jobey, G, 1970 An Iron Age Settlement and Homestead at Burradon, Northumberland. *Archaeol Aeliana*, 4<sup>th</sup> series, **48**, 51-95
- Schmidt, A, & Ernenwein, E, 2011 *Guide to Good Practice: Geophysical Data in Archaeology*. Archaeology Data Service



Reproduced from Explorer 316 1:25 000 by permission of Ordnance Survey on behalf of The Controller of Her Majesty's Stationery Office. © Crown copyright 2000. All rights reserved. Licence number AL100002176



0 1km  
scale 1:25 000 for A4 plot



Reproduction in whole or in part is prohibited without the prior permission of The Northumberland Estates

on behalf of  
The Northumberland  
Estates

Scaffold Hill  
North Tyneside

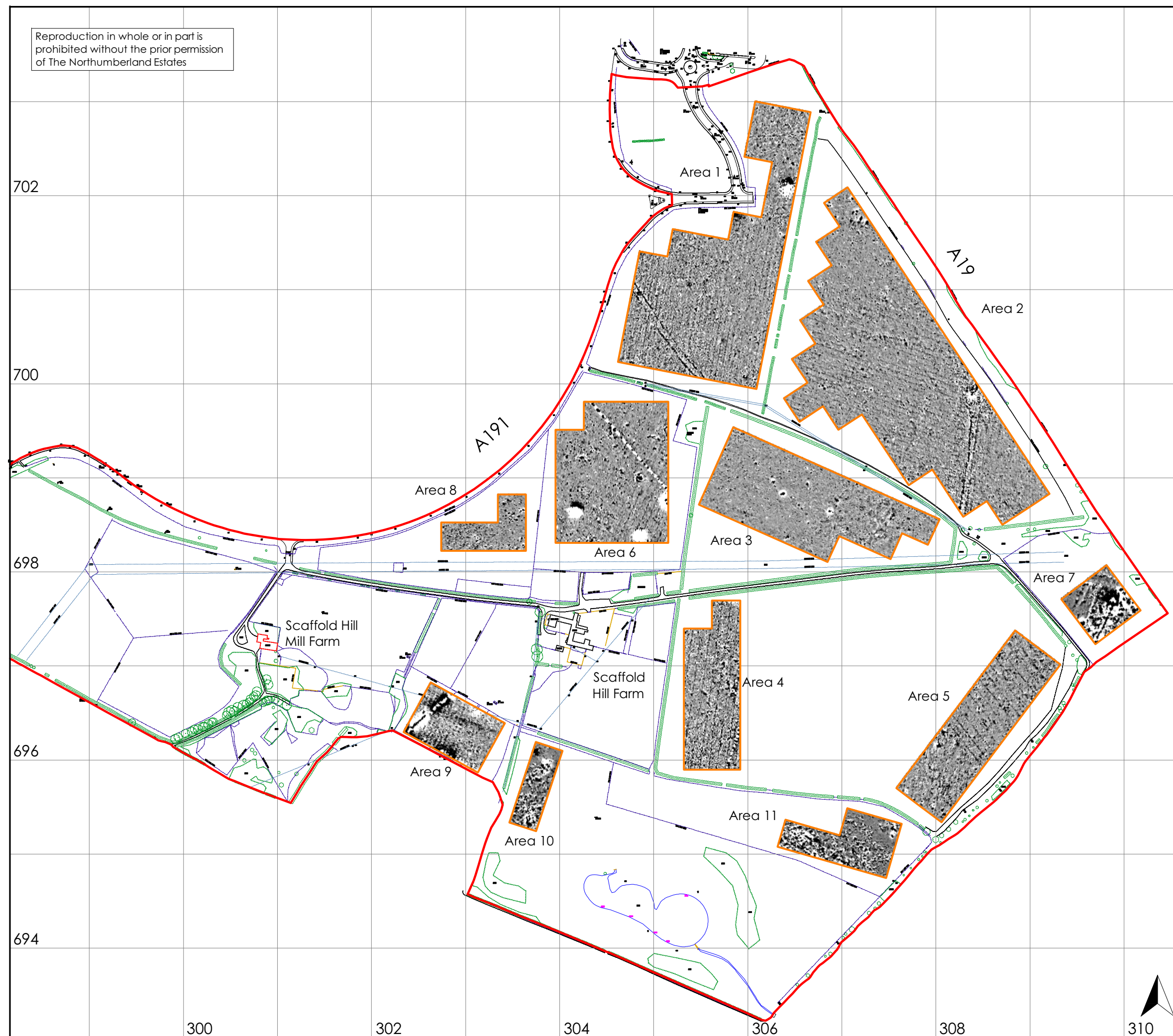
geophysical survey  
report 2806

Figure 2: Survey overview

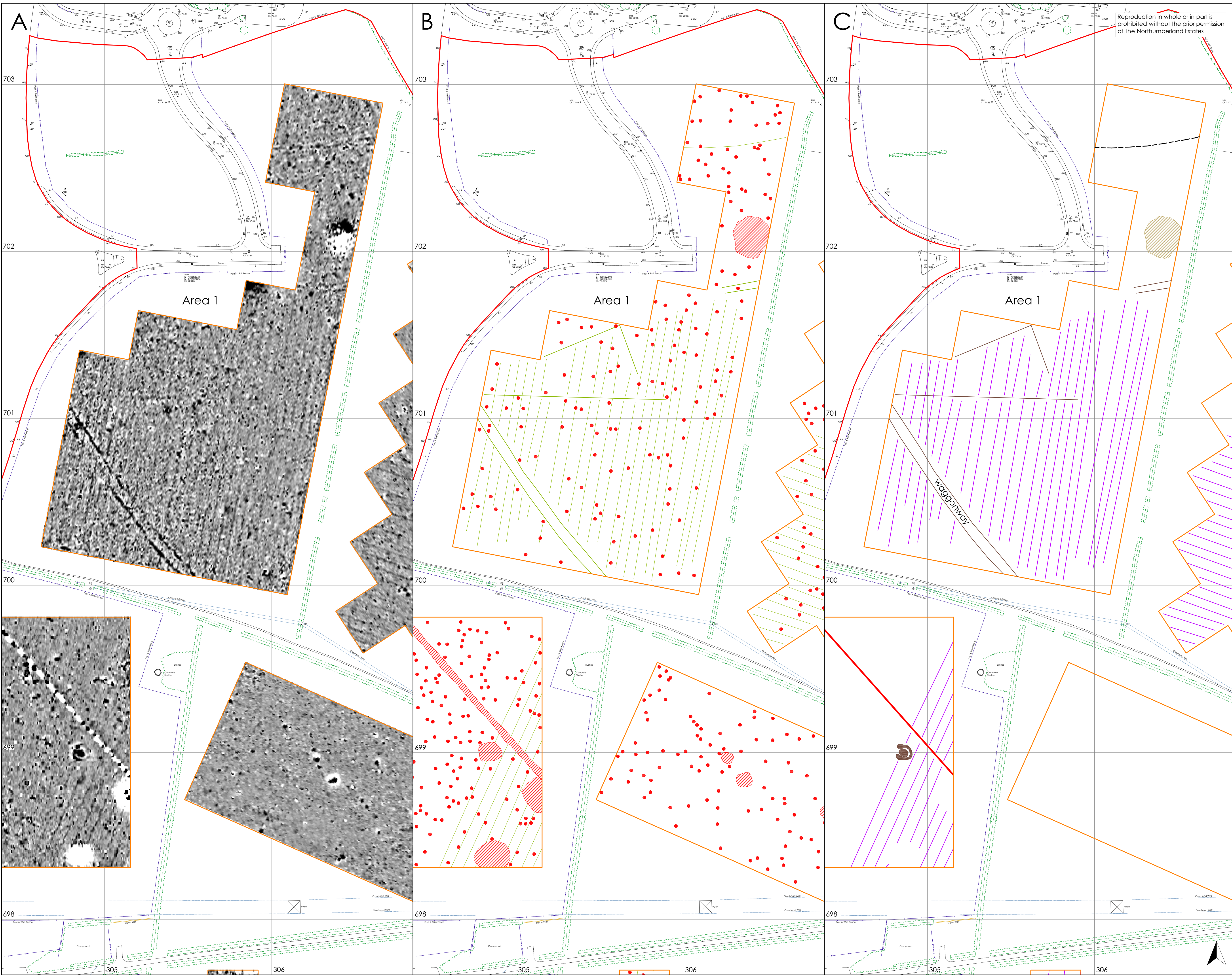
0 200m  
scale 1:4000 for A3 plot

magnetic survey

-5 5  
nT







Reproduction in whole or in part is prohibited without the prior permission of The Northumberland Estates

site boundary

A - geophysical survey

magnetic survey

5 nT 5

B - geophysical interpretation

dipolar magnetic anomaly

positive magnetic anomaly

C - archaeological interpretation

soil-filled feature

area of recent bonfire

land drain

former field boundary

0 50m  
scale 1:1000 for A1 plot

**ARCHAEOLOGICAL SERVICES**  
DURHAM UNIVERSITY

on behalf of  
The Northumberland Estates

Scaffold Hill  
North Tyneside  
geophysical survey  
report 2806

Figure 3: Area 1 geophysical survey and interpretations



Reproduction in whole or in part is prohibited without the prior permission of The Northumberland Estates

site boundary

A - geophysical survey

magnetic survey

5 nT

B - geophysical interpretation

dipolar magnetic anomaly

positive magnetic anomaly

C - archaeological interpretation

soil-filled feature

former plough

land drain

0 50m  
scale 1:1000 for A0 plot

ARCHAEOLOGICAL  
SERVICES  
DURHAM UNIVERSITY

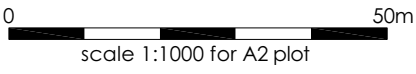
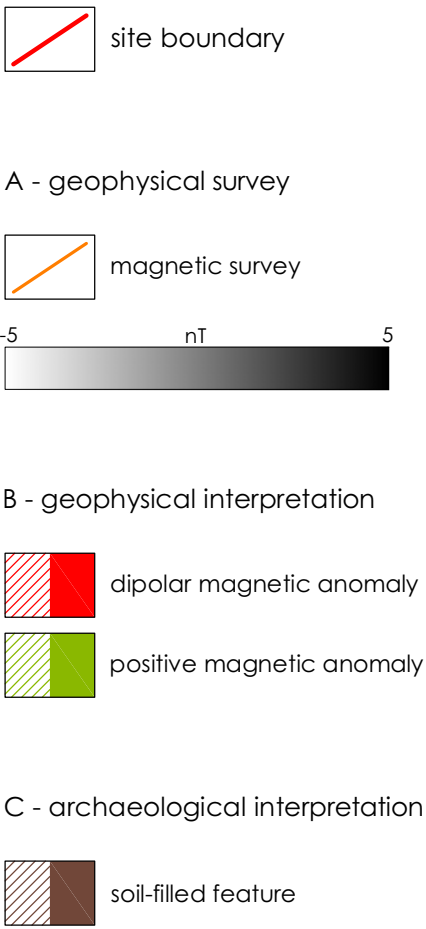
on behalf of  
The Northumberland  
Estates

Scaffold Hill  
North Tyneside  
geophysical survey  
report 2806

Figure 4: Area 2 geophysical survey and  
interpretations







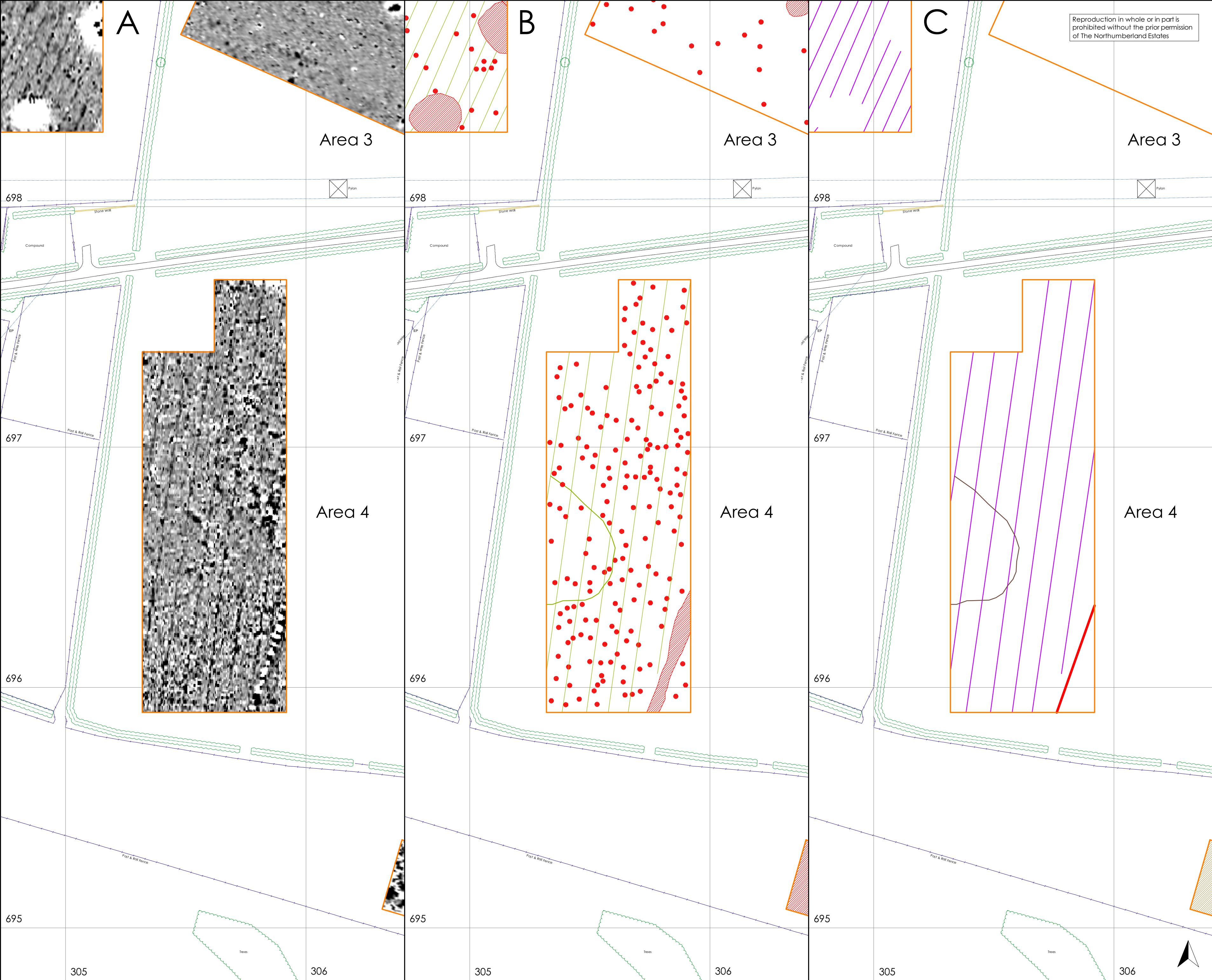
ARCHAEOLOGICAL  
SERVICES  
DURHAM UNIVERSITY

on behalf of  
The Northumberland Estates

Scaffold Hill  
North Tyneside  
geophysical survey  
report 2806

Figure 5: Area 3 geophysical survey  
and interpretations

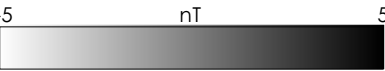




Reproduction in whole or in part is prohibited without the prior permission of The Northumberland Estates

A - geophysical survey

magnetic survey



B - geophysical interpretation

dipolar magnetic anomaly

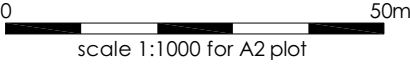
positive magnetic anomaly

C - archaeological interpretation

soil-filled feature

service pipe

land drain



ARCHAEOLOGICAL  
SERVICES  
DURHAM UNIVERSITY

on behalf of  
The Northumberland Estates

Scaffold Hill  
North Tyneside  
geophysical survey  
report 2806

Figure 6: Area 4 geophysical survey and interpretations







Reproduction in whole or in part is prohibited without the prior permission of The Northumberland Estates

- site boundary
- A - geophysical survey
  - magnetic survey
  - 5 nT 5
- B - geophysical interpretation
  - dipolar magnetic anomaly
  - positive magnetic anomaly
- C - archaeological interpretation
  - soil-filled feature
  - land drain

0 50m  
scale 1:1000 for A1 plot

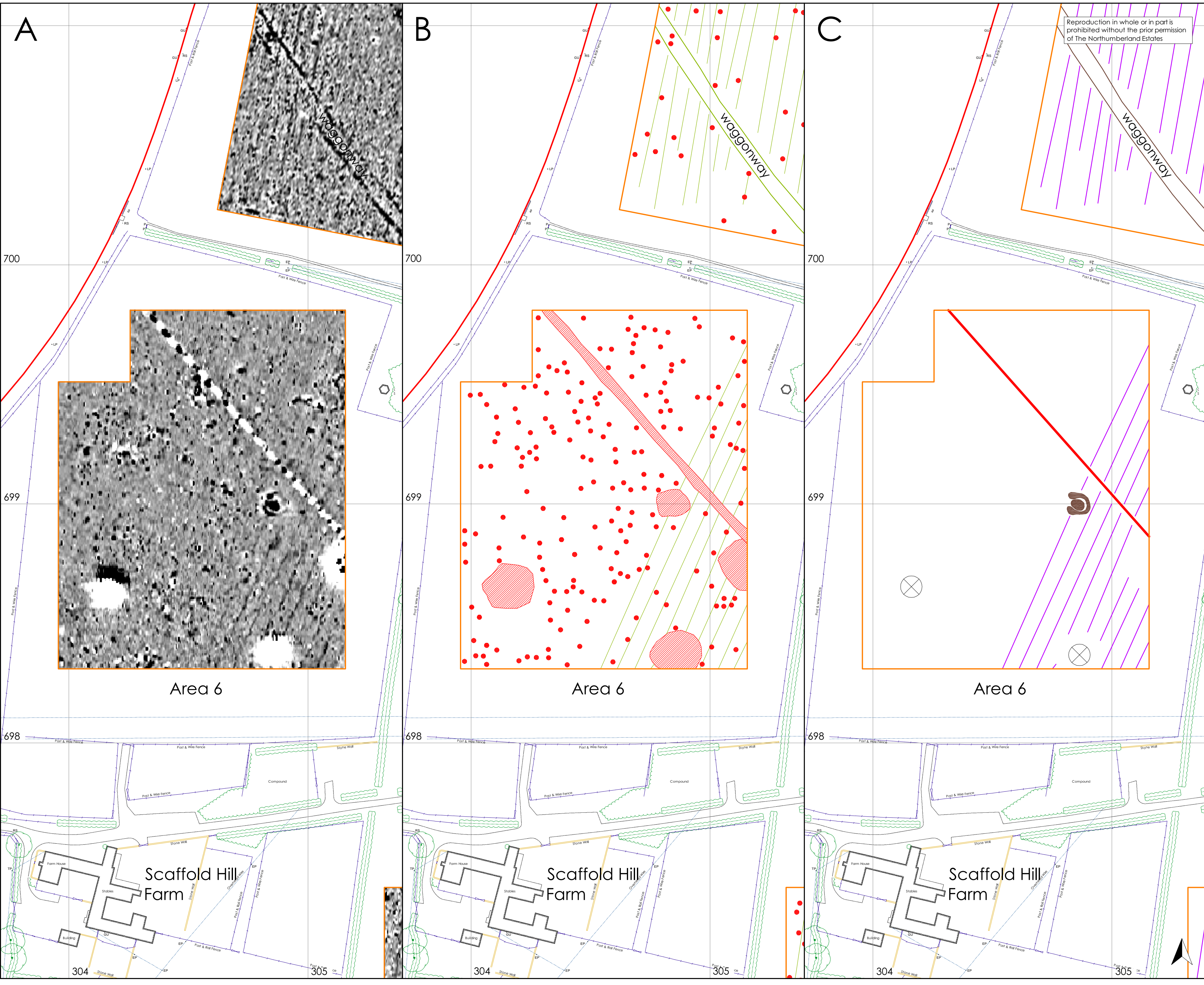
ARCHAEOLOGICAL SERVICES  
DURHAM UNIVERSITY

on behalf of  
The Northumberland Estates

Scaffold Hill  
North Tyneside  
geophysical survey  
report 2806  
Figure 7: Area 5 geophysical survey and interpretations







site boundary

A - geophysical survey

magnetic survey

-5 nT 5

B - geophysical interpretation

dipolar magnetic anomaly

positive magnetic anomaly

C - archaeological interpretation

soil-filled feature

service pipe

land drain

horse feeder

0 50m  
scale 1:1000 for A2 plot

ARCHAEOLOGICAL  
SERVICES  
DURHAM UNIVERSITY

on behalf of  
The Northumberland Estates

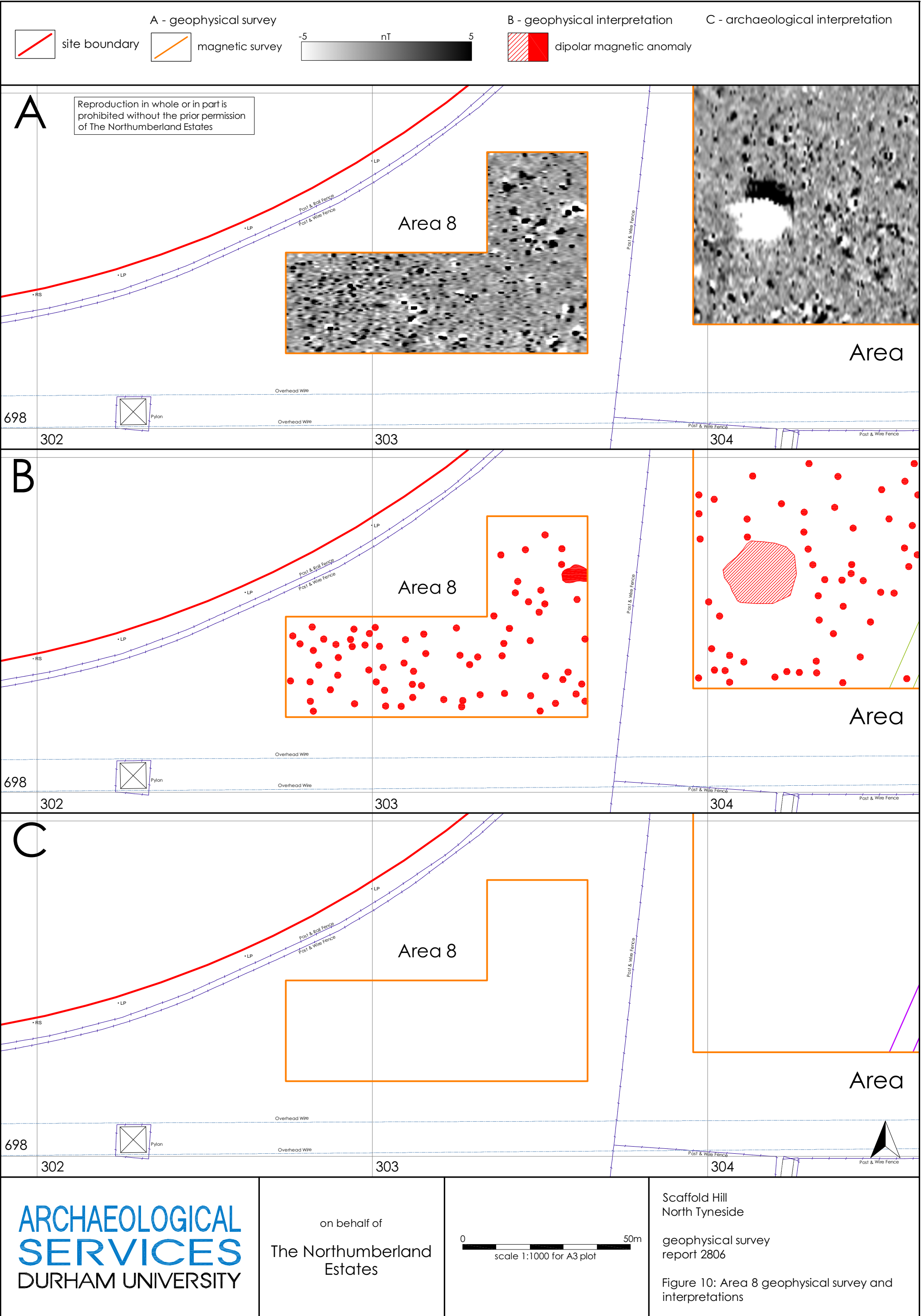
Scaffold Hill  
North Tyneside  
geophysical survey  
report 2806

Figure 8: Area 6 geophysical survey  
and interpretations









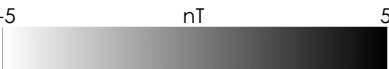




site boundary

A - geophysical survey

magnetic survey



B - geophysical interpretation

dipolar magnetic anomaly

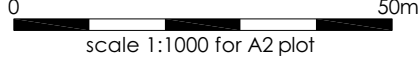
positive magnetic anomaly

negative magnetic anomaly

C - archaeological interpretation

service pipe

ridge and furrow



ARCHAEOLOGICAL  
SERVICES  
DURHAM UNIVERSITY

on behalf of  
The Northumberland Estates

Scaffold Hill  
North Tyneside  
geophysical survey  
report 2806  
Figure 11: Area 9 geophysical survey  
and interpretations



on behalf of  
The Northumberland Estates

Scaffold Hill  
North Tyneside  
geophysical survey  
report 2806  
Figure 12: Area 10 geophysical survey  
and interpretations

0 50m  
scale 1:1000 for A3 plot

- site boundary
- A - geophysical survey
- magnetic survey
- 5 nT 5
- B - geophysical interpretation
- dipolar magnetic anomaly
- C - archaeological interpretation
- disturbed ground



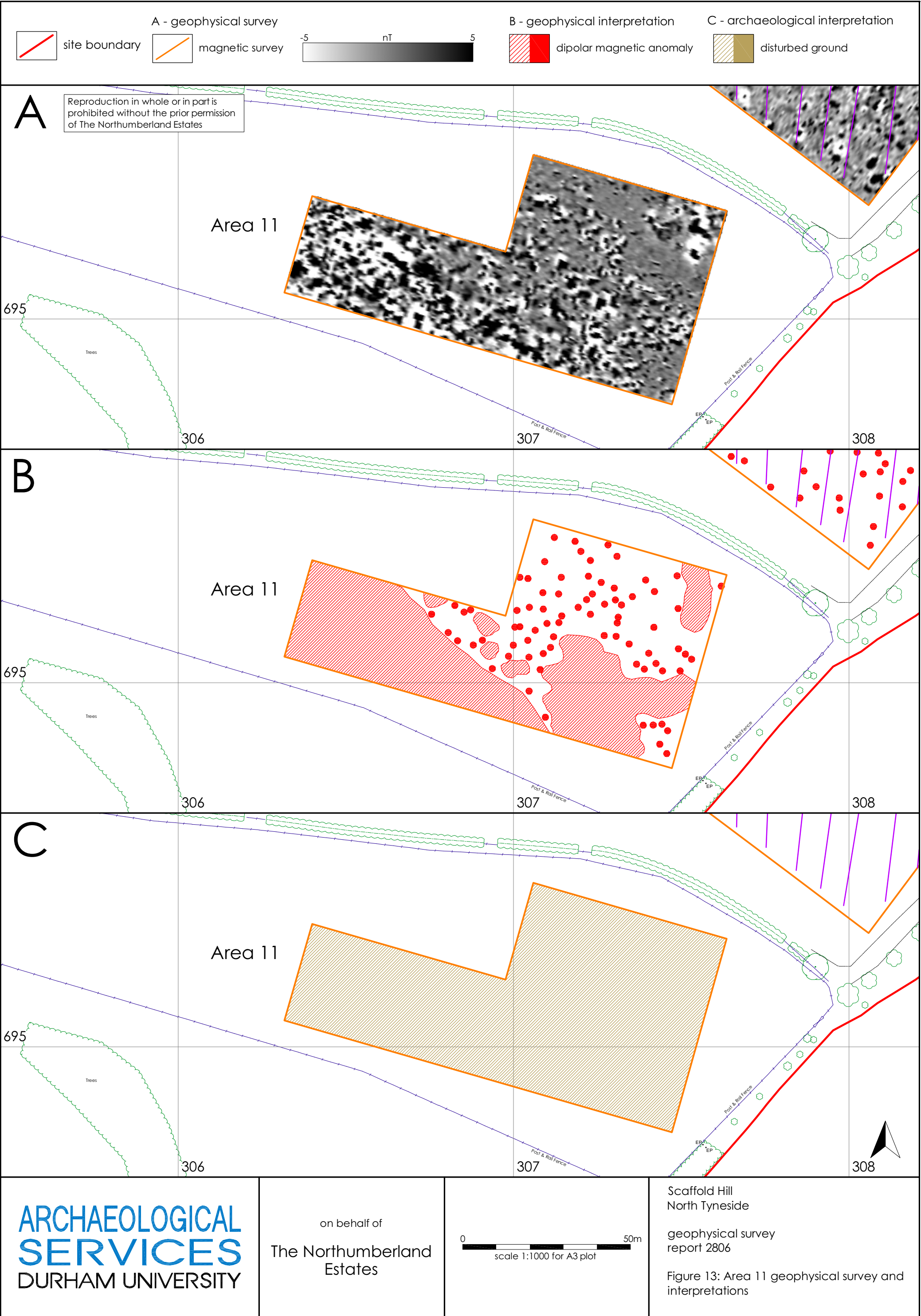




Figure 14: Trace plots of geomagnetic data

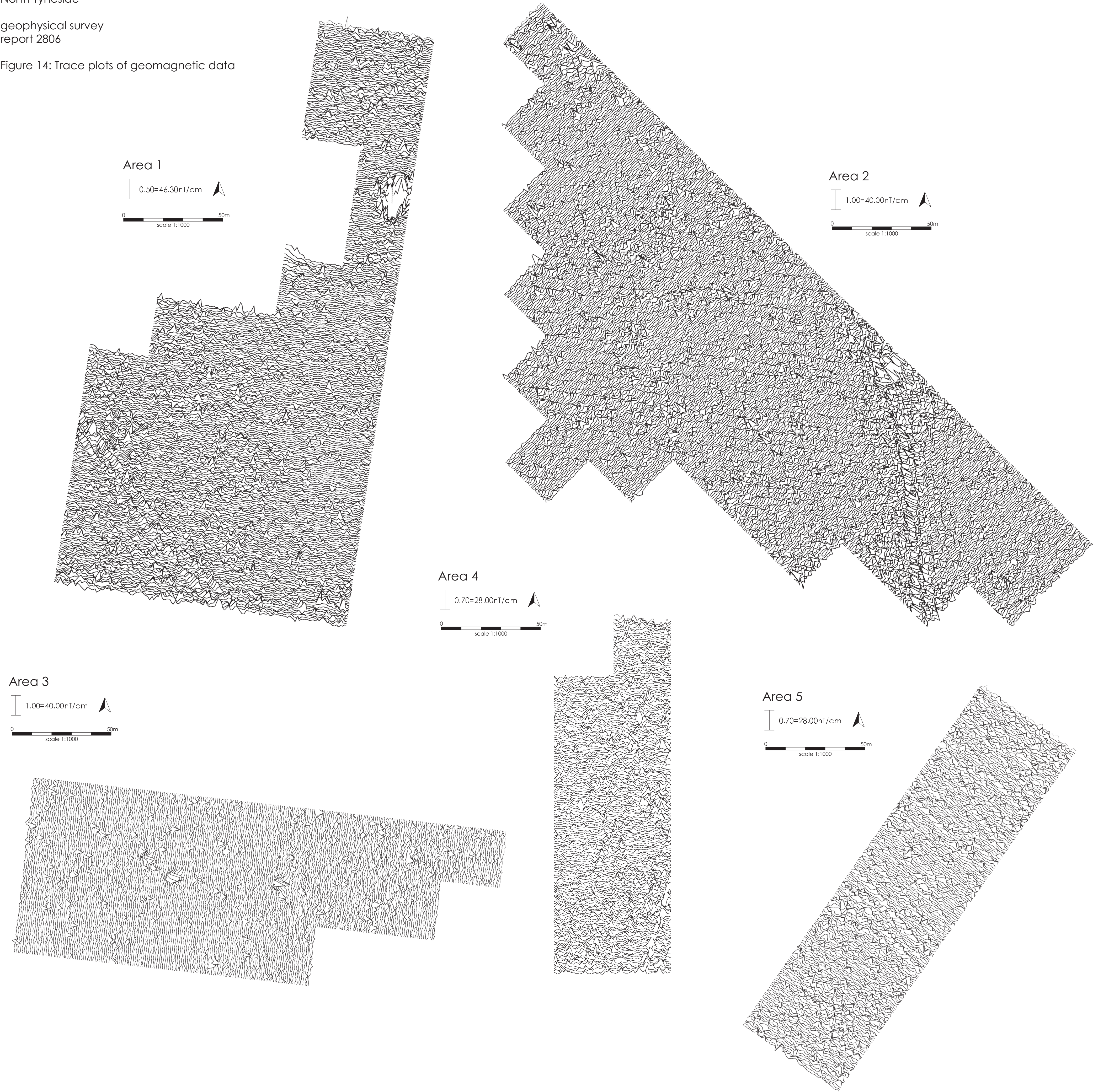
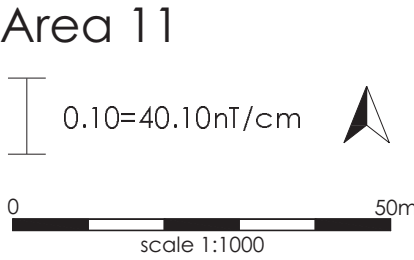
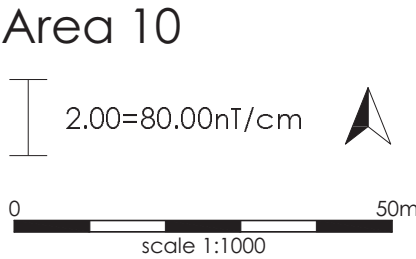
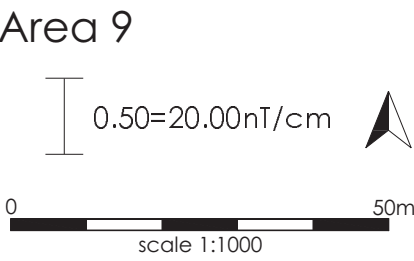
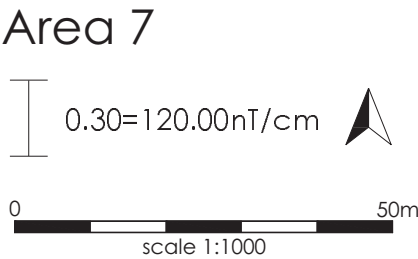
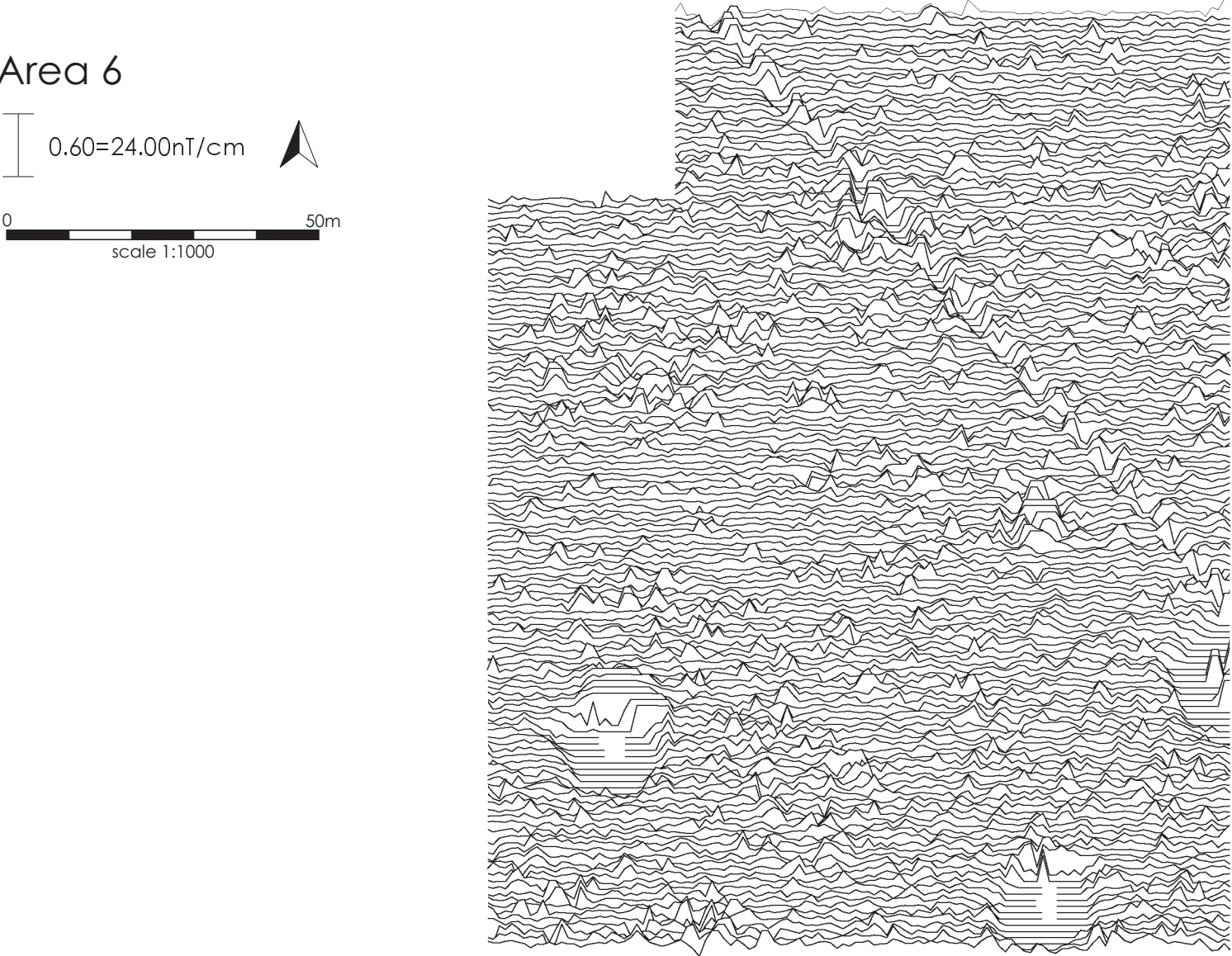




Figure 15: Trace plots of geomagnetic data



Reproduction in whole or in part is prohibited without the prior permission of The Northumberland Estates

on behalf of  
The Northumberland Estates

Scaffold Hill  
North Tyneside  
  
geophysical survey  
report 2806  
  
Figure 16: Land use overview



- site boundary
- current land use

