Archaeological Services
University of Durham

A1(T) Dishforth to Barton Improvement, North Yorkshire

Phase 5 geophysical surveys at Healam Beck North & South

on behalf of

AMEC
AECOM

for
Highways Agency

Report 2209
June 2009

Archaeological Services
Durham University
South Road
Durham DH1 3LE
Tel: 0191 334 1121
Fax: 0191 334 1126
archaeological.services@durham.ac.uk
www.durham.ac.uk/archaeological.services

A1(T) Dishforth to Barton Improvement, North Yorkshire

Phase 5 geophysical surveys at Healam Beck North & South

Report 2209

June 2009

Archaeological Services Durham University

on behalf of

for

Highways Agency

Contents

Figures (inside back cover)

1. Summary

The project

1.1 This report presents the results of a fifth programme of geophysical surveying on land adjacent to the A1(T) between Dishforth and Barton in North Yorkshire, in advance of proposed road improvement. The earlier survey programmes were completed in March 2005, May 2006, June 2006 and November 2007 (Archaeological Services 2005a, 2006a, 2006c, 2007).

1.2 The works were commissioned by AMEC/Alfred McAlpine JV and conducted by Archaeological Services Durham University in accordance with instructions from Blaise Vyner acting on behalf of the Highways Agency.

1.3 The current works comprised six geomagnetic surveys on the east side of the existing A1(T) road to the north and south of Healam Beck.

Results

1.4 The surveys have detected two possible soil-filled features in Area 3, though these may be associated with former ploughing.

1.5 A pit and several probable ditch features have been detected in Areas 4, 5 and 5a, some of which could possibly be parts of enclosures or small ring-ditches. Areas 5 and 5a lie just east of the Roman fort and features detected there could be associated with the *vicus* or may belong to an earlier or later phase of activity.

1.6 Traces of former ridge and furrow cultivation and a former headland have almost certainly been detected in Area 4.

1.7 The course of an existing service pipe has been recorded across these areas.

2. Project background

Location (Figure 1)

2.1 The study area comprised land immediately north and south of Healam Beck (NGR centre: NZ 3240 8380), east of the existing A1(T) road, prior to improvement works between Dishforth and Barton in North Yorkshire.

2.2 The six surveys undertaken in this fifth phase of survey are in addition to the 132 surveys (232ha) undertaken during the earlier survey programmes (Archaeological Services 2005a, 2006a, 2006c, 2007). Areas in the immediate vicinity which have been previously surveyed for this project are also shown in Figure 1. Features of potential archaeological significance were detected in those nearby surveys.

Development proposal

2.3 The development proposal is to improve the A1(T) road between Dishforth and Barton in North Yorkshire.

Objective

2.4 The principal aim of the survey programmes was to determine the extent and nature of any sub-surface features of likely archaeological interest, including cut, built and fired features, which would assist the client and the planning authority in determining appropriate mitigation strategies should archaeological deposits be found to survive within the study area.

Dates

2.5 The surveys were undertaken on four days between the 19th August 2008 and 8th June 2009. This report was prepared between 12th and 30th June 2009.

Personnel

2.6 The fieldwork was conducted by Graeme Attwood (supervisor), Janet Beveridge, Matt Claydon, David Graham (supervisor), Natalie Swann (supervisor) and Richie Villis. This report was prepared by Duncan Hale (the Project Manager) with illustrations by Janine Watson.

Acknowledgements

2.7 Archaeological Services is grateful to Blaise Vyner, Stephen Sherlock and the landowners and tenants for facilitating these surveys.

Archive/OASIS

2.8 The project code is **A1D2B5**, for **A1 D**ishforth **2 B**arton Phase **5**. The survey archive is currently held at Archaeological Services Durham University. Archaeological Services 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 phase of survey is '**archaeol3-61474**'.

3. Previous geophysical surveys

3.1 The results of many previous geophysical surveys along the Dishforth to Barton section of the A1(T) have been described in our earlier reports (Archaeological Services 2005a, 2006a, 2006c, 2007) and by other surveyors (below). Archaeological remains detected during the A1D2B project include occasional ditches and pits, medieval ridge and furrow, former enclosed field systems and trackways, Roman roads, a possible early Roman camp, parts of two Roman forts and *vici*, a large part of a Roman roadside settlement and parts of a Roman town. Stone-founded buildings, kilns and evidence for other industrial activities were almost certainly detected in and around the settlements. In some locations the surveys confirmed the results of previous investigations, and in many cases they provided added value to existing knowledge with the recording of many new features and more extensive mapping of settlements and field systems, particularly around Bainesse Farm at Catterick.

3.2 Geophysical surveys have previously been undertaken at numerous other locations along this section of the A1(T) road, prior to proposed road improvement or other development proposals, as outlined below.

A1 North of Leeming to Scotch Corner (North & South Sectors)

3.3 In 1993 twelve gradiometer surveys were undertaken by Geophysical Surveys of Bradford for Lancaster University Archaeological Unit. The report concluded that the results did not appreciably add to the archaeological record, and that while most of the surveys yielded some anomalies of possible archaeological significance the majority of these were weak and ephemeral (GSB 1993). Site 29 in that report corresponds to Area 77 in our earlier report (Archaeological Services 2005a).

A1 North of Leeming to Scotch Corner (Central Sector)

3.4 Also in 1993 the central sector of the above route, west of Catterick Village, was surveyed by Bartlett-Clark Consultancy for English Heritage Central Archaeology Service. Nine gradiometer surveys and two electrical resistance surveys were undertaken (English Heritage 1994). The majority of these survey areas were re-surveyed as part of the earlier phase of survey for the current project (Areas 19-27 in Archaeological Services 2005a).

A1 Dishforth to North of Leeming

3.5 Between 1993 and 1995, 25 gradiometer and electrical resistance surveys were undertaken by Geophysical Surveys of Bradford for Barton Howe Warren Blackledge (BHWB) at various locations on the above section of the A1 (BHWB 1996). Approximately half of these surveys were undertaken to the south of the southernmost survey for the current study. The majority of the remainder of surveys were undertaken at Healam Bridge; these broadly correspond to surveys undertaken for the present study (Area 46 in Archaeological Services 2005a).

Former airfield at Marne Barracks, Catterick

3.6 In 2000 Archaeological Services conducted a 41ha gradiometer survey of the former airfield at Marne Barracks, immediately east of the A1 opposite Bainesse Farm, prior to proposed development by the MoD (Archaeological Services 2001a). A number of smaller gradiometer, electrical resistance and ground-penetrating radar surveys were also undertaken within the northern, built-up area of the base (Archaeological Services 2001b). The airfield survey detected features which were subsequently proven to range in date from the late Neolithic through to the 20th century (Archaeological Services 2002, 2005b & 2006b; Hale, Platell & Millard in press).

Land north of Bainesse Farm, Catterick

3.7 Bradford University undertook trial magnetic and resistivity surveys in the field north of Bainesse Farm in 1980 (Heathcote 1980). The Ancient Monuments Laboratory undertook gradiometer surveys both here and in the field on the opposite side of the A1 in 1981 (CEU Site 46), prior to the construction of the existing 'Catterick South' junction (English Heritage 1981; Bartlett 2002). Remains of a Roman roadside settlement were identified in all of these surveys.

Catterick Bridge, Honey Pot Lane and Catterick Racecourse

3.8 The Ancient Monuments Laboratory undertook gradiometer surveys at each of the above sites between 1981 and 1984 (Bartlett 2002). Nothing of archaeological interest was detected at Catterick Bridge (Site 240). The survey at Honey Pot Lane (Site 251) detected a ditch and two possible pits. An area of occupation close to Dere Street was detected within the circuit of Catterick Racecourse (Site 273), while at the south end of the racecourse a 'native' farmstead previously identified on aerial photographs was surveyed.

Catterick Triangle

3.9 A resistivity survey was undertaken here, at the south end of Pallett Hill Quarry, by West Yorkshire Archaeology Service in 1987 (Abramson *et al*. 2002). The survey recorded the location of Dere Street and associated drains/ditches.

Cataractonium

3.10 In 1992 the Ancient Monuments Laboratory undertook a gradiometer survey over Brompton-on-Swale Playing Field prior to a proposed development (English Heritage 1994). Part of this area was re-surveyed as part of the current project, by both gradiometer and resistance techniques (Area 75 in Archaeological Services 2005a).

3.11 In 1997 the Ancient Monuments Laboratory undertook a number of gradiometer surveys at *Cataractonium* (Cole 2002). Area 1 at Thornbrough Farm (Area 19bW in Archaeological Services 2005a) detected remains of a Roman fort, *vicus* and town defences. Area 2 at Thornbrough Farm (Area 19bE, *ibid*.) mapped the clear remains of many buildings along Dere Street and another contemporary road. Area 3 (Area 18, *ibid*.) detected a number of ditch features, obscured by later ridge and furrow remains. Area 4, within Catterick

Racecourse, detected the south-eastern corner of the town's defences, together with many internal and external anomalies, though not all likely to be of Roman origin. A broad defensive ditch was detected in Area 5, possibly enclosing an area of *vicus*. Area 6 in Cole (2002) comprises the playing field survey described above in para. 3.10.

4. Landuse, topography and geology

4.1 The current works comprised six surveys in four fields of mixed landuse, as follows:

Areas 1-3	pasture (adjacent to Area 46-3, Phase 1)
Area 4	scrubland, some impenetrable (adjacent to Area 46-4, Phase 1)
Area 5-5a	two arable crops (adjacent to Area 46-2, Phase 1)

4.2 The land is predominantly level at about 30m OD.

4.3 The solid geology of the area belongs to the Late Permian Sherwood Sandstone Group, which is generally overlain here by Devensian Till, with some alluvium alongside Healam Beck and some glaciolacustrine deposits north and east of New Inn Farm.

5. The geophysical surveys

Standards

5.1 The surveys and reporting were conducted in accordance with English Heritage guidelines, *Geophysical survey in archaeological field evaluation 2nd edition* (David, Linford & Linford 2008); the Institute for 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 2002).

Technique selection

5.2 Geophysical surveying enables the relatively rapid and non-invasive identification of potential archaeological features within landscapes and can involve a suite 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 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, 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 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 A 30m grid was established and recorded at each survey area using a Trimble Pathfinder Pro XRS global positioning system (GPS) with real-time correction.

5.6 Measurements of vertical geomagnetic field gradient were determined using Bartington Grad601-2 dual fluxgate gradiometers. A zig-zag traverse scheme was employed and data were logged in 30m grid units. The instrument sensitivity was 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 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 v3 software was used to process the geophysical data and to produce continuous tone greyscale images and trace plots of the raw (unfiltered) data. The greyscale images and interpretations (Figures 2-4) are presented on digital basemaps supplied by AECOM; trace plots are provided in Figure 5. In the greyscale images, positive magnetic anomalies are displayed as dark grey and negative magnetic anomalies as light grey. Palette bars relate the greyscale intensities to anomaly values in nanoTesla.

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

clip	clips, 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.
destagger	corrects for displacement of anomalies caused by alternate zig-zag traverses.
interpolate	increases the number of data points in a survey to match sample and traverse intervals. In this instance the data have been interpolated to 0.25m intervals.

Interpretation: anomaly types

5.10 A colour-coded geophysical interpretation plan is provided (Figure 3). 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

General comments

5.11 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.

5.12 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 plan however, they have been omitted from the archaeological interpretation plan and the following discussion. Two intense anomalies, one each in Areas 4 and 5, correspond to boreholes. A ferrous service pipe has been recorded across this general area as a broad chain of very intense dipolar magnetic anomalies.

Areas 1-3

5.13 The majority of anomalies identified in these areas reflect the known service pipe and small items of near-surface ferrous and/or fired debris, as above.

5.14 The only other anomalies were detected in Area 3 and comprise two weak positive magnetic anomalies, which could reflect traces of soil-filled features, possibly associated with former ploughing.

Area 4

5.15 Although it was not possible to survey all of this area, the data do include several anomalies of potential archaeological significance.

5.16 Positive magnetic anomalies in the north of the area almost certainly reflect former ridge and furrow cultivation and an associated headland. The possible remains of one or two ditch features were also detected between the former headland and the existing service pipe.

5.17 A further possible curvilinear ditch and large pit were detected in the southern part of this area.

Areas 5 and 5a

5.18 These areas were adjacent to the Healam Bridge Roman fort and *vicus* Scheduled Monument (34736-02), the eastern side of which was surveyed during Phase 1 of this survey project (Archaeological Services 2005a).

5.19 Two ditches, possibly forming a curvilinear feature, were detected at the northern limit of Area 5. At least one of the ditches appears to be cut by the service pipe trench.

5.20 One of the probable ditches detected in the earlier surveys (Area 46-2) continues into the southern part of Area 5a, and is almost certainly associated with further ditches there. Extremely weak, small curvilinear anomalies could possibly reflect the remains of ring-ditches within a rectilinear enclosure which abuts the more substantial ditch features.

5.21 A series of weak lineations, aligned north-west/south-east across both Areas 5 and 5a, corresponds to the plough regime at the time of survey. A prominent negative magnetic anomaly on this alignment corresponds to the change in landuse/crop evident on the ground.

6. Conclusions

6.1 Six geomagnetic surveys have been conducted on land to the east of the existing A1(T) road at Healam Beck, comprising a fifth phase of survey in advance of proposed road improvement between Dishforth and Barton in North Yorkshire.

6.2 The surveys have detected two possible soil-filled features in Area 3, though these may be associated with former ploughing.

6.3 A pit and several probable ditch features have been detected in Areas 4, 5 and 5a, some of which could possibly be parts of enclosures or small ring-ditches. Areas 5 and 5a lie just east of the Roman fort and features detected there could be associated with the *vicus* or may belong to an earlier or later phase of activity.

6.4 Traces of former ridge and furrow cultivation and a former headland have almost certainly been detected in Area 4.

6.5 The course of an existing service pipe has been recorded across these areas.

7. References

Abramson, P, Turner, R, and Turner, L (2002) Geophysical survey at Catterick Triangle (Site 425), in PR Wilson (ed) *Roman Catterick (Cataractonium): A Roman town and its hinterland. Excavations and research 1958-1997*. CBA Research Report **128**, Council for British Archaeology

Archaeological Services (2001a) *Archaeological Investigations at Marne Barracks, Catterick Garrison, North Yorkshire. Phase 1: Assessment report*, unpublished report **703** for GVA Grimley and Ministry of Defence, Archaeological Services Durham University

Archaeological Services (2001b) *Archaeological Investigations at Marne Barracks, Catterick Garrison, North Yorkshire. Phase 2: Geophysical evaluation*, unpublished report **801** for GVA Grimley and Ministry of Defence, Archaeological Services Durham University

Archaeological Services (2002) *Archaeological Investigations at Marne Barracks, Catterick Garrison, North Yorkshire. Phase 3: Evaluation*, unpublished report **911** for GVA Grimley and Ministry of Defence, Archaeological Services Durham University

Archaeological Services (2005a) *A1(T) Dishforth to Barton Improvement, North Yorkshire: geophysical surveys Vols I-III*, unpublished report **1121** for AMEC, Archaeological Services Durham University

Archaeological Services (2005b) *Marne Barracks, Catterick, North Yorkshire: archaeological excavation: assessment*, unpublished report **1219** for Gallifordtry Construction and Ministry of Defence, Archaeological Services Durham University

Archaeological Services (2006a) *A1(T) Dishforth to Barton Improvement, North Yorkshire: Phase 2 geophysical surveys*, unpublished report **1368** for AMEC, Archaeological Services Durham University

Archaeological Services (2006b) *Marne Barracks, Catterick, North Yorkshire: post-excavation analysis report*, unpublished report **1387** for Gallifordtry Construction and Ministry of Defence, Archaeological Services Durham University

Archaeological Services (2006c) *A1(T) Dishforth to Barton Improvement, North Yorkshire: Phase 3 geophysical surveys,* Unpublished report **1463** for AMEC, Archaeological Services Durham University.

Archaeological Services (2007) *A1(T) Dishforth to Barton Improvement, North Yorkshire: Phase 4 geophysical surveys near Scotch Corner*. Unpublished report **1763** for AMEC, Archaeological Services Durham University

Bartlett, A, (2002) Geophysical surveys by the Ancient Monuments Laboratory at Bainesse (Site 46), Catterick Bridge (Site 240), Honey Pot Road (Site 251) and Catterick Racecourse (Site 273), in PR Wilson (ed) *Roman Catterick (Cataractonium): A Roman town and its hinterland.*

Excavations and research 1958-1997. CBA Research Report **128**, Council for British Archaeology

BHWB (1996) *A1 Dishforth to North of Leeming Improvements*. Unpublished report by Barton Howe Warren Blackledge (BHWB)

Cole, M, (2002) Magnetometer surveys by the Ancient Monuments Laboratory within the scheduled area of *Cataractonium*, in PR Wilson (ed) *Roman Catterick (Cataractonium): A Roman town and its hinterland. Excavations and research 1958-1997*. CBA Research Report **128**, Council for British Archaeology

David, A, Linford, N, & Linford, P, 2008 *Geophysical Survey in Archaeological Field Evaluation, 2nd edition*. English Heritage

English Heritage (1981) *Report on Geophysical Surveys by AML at Catterick, North Yorkshire*. Unpublished Ancient Monuments Laboratory report for English Heritage

English Heritage (1994) *A1 Motorway, Leeming to Scotch Corner, Central Sector: Archaeological Assessment Stage 3*. Unpublished report by English Heritage Central Archaeology Service

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

GSB (1993) *A1 North of Leeming to Scotch Corner.* Unpublished report **93/130** by Geophysical Surveys of Bradford for Lancaster University Archaeological Unit

Hale, DN, Platell, A & Millard AR (in press) A late Neolithic palisaded enclosure at Marne Barracks, Catterick, North Yorkshire. *Proceedings of the Prehistoric Society* vol.75, pp.

Heathcote, C, (1980) *Catterick South junction improvement*. Unpublished University of Bradford typescript report

Schmidt, A (2002) *Geophysical Data in Archaeology: A Guide to Good Practice,* Archaeology Data Service, Arts and Humanities Data Service

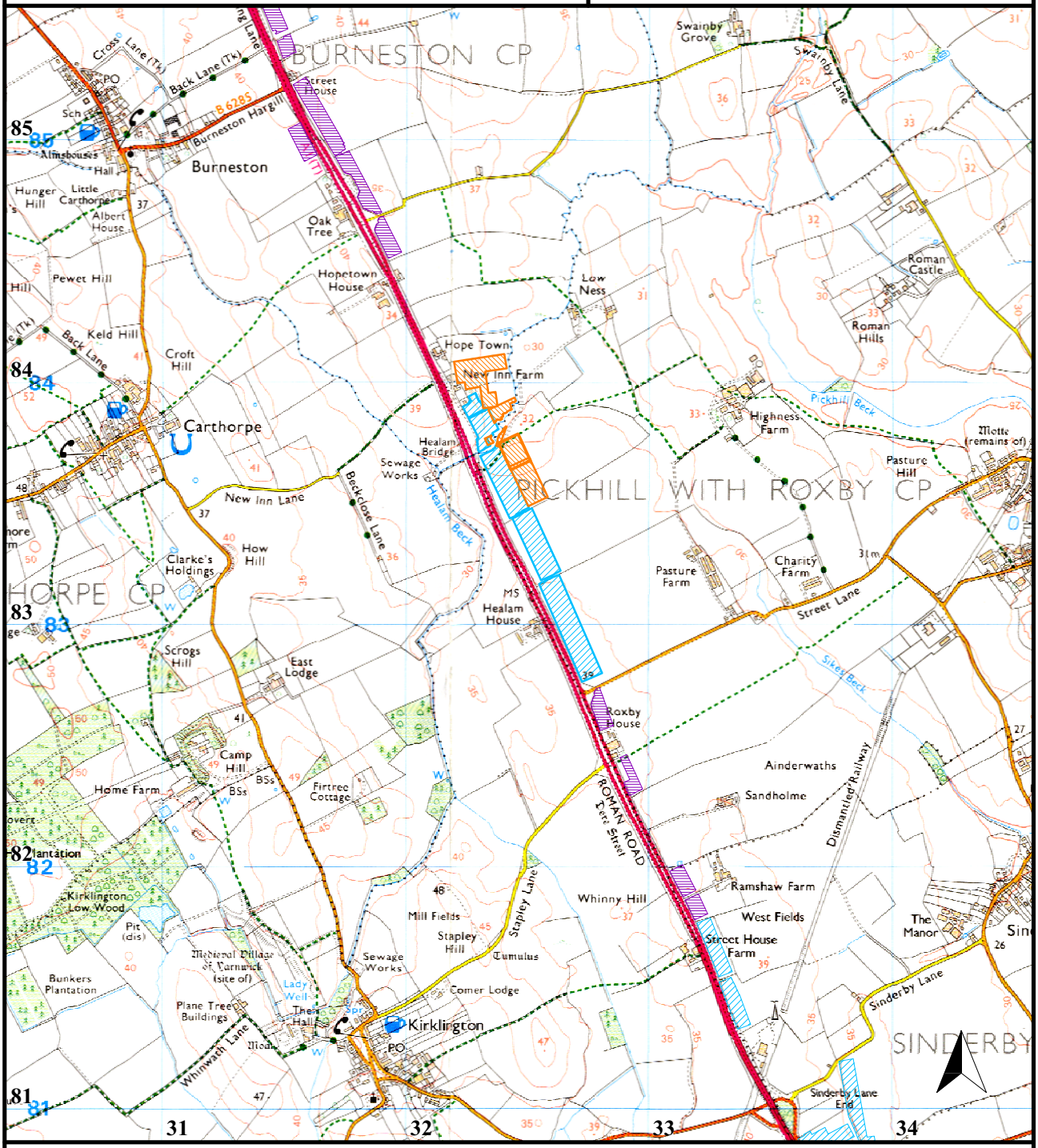
Archaeological Services
University of Durham

A1(T) Dishforth to Barton Improvement, North Yorkshire
Phase 5 geophysical surveys at Healam Beck North & South

Report 2209
Figure 1 *Survey location*

on behalf of

A1 d2b



Phase 1 surveys

Phase 2 surveys

Phase 5 surveys

0 1km

scale 1:25 000 - for A4 plot

841
840
839
838
837
322
323
324
325

Area 4
Area 4
Area 46-4
Area 1
Healam Beck
Area 3
Area 46-3
Area 2
Area 5
Area 5a
Area 46-2
Area 46-1

Phase 5 surveys

Phase 1 surveys

10.41
8.68
6.94
5.21
3.47
1.74
0
-1.74
-3.47
-5.21
-6.94
-8.68
-10.41 nT

0 50m

scale 1:1000 - for A1 plot

on behalf of

A1 d2b

Archaeological Services
University of Durham

A1(T) Dishforth to Barton Improvement, North Yorkshire

Phase 5 geophysical surveys at Healam Beck North & South

Report 2209

Figure 2

Geophysical surveys

841

840

839

838

837

322

323

324

325

Area 4

Area 4

Area 1

Area 46-4

Area 46-3

Area 2

Area 3

Area 5

Area 5a

Area 46-2

Area 46-1

Healam Beck

Phase 5 surveys

Phase 1 surveys

positive magnetic anomalies

negative magnetic anomalies

dipolar magnetic anomalies

0 50m

scale 1:1000 - for A1 plot

on behalf of

A1 d2b

Archaeological Services
University of Durham

A1(T) Dishforth to Barton Improvement, North Yorkshire

Phase 5 geophysical surveys at Healam Beck North & South

Report 2209

Figure 3

Geophysical interpretation

841

840

839

838

837

322

323

324

325

Area 4

Area 4

Area 46-4

Area 1

Area 46-3

Area 3

Area 2

Area 5

Area 46-2

Area 5a

Area 46-1

pond

borehole

borehole

Healam Beck

change in landuse

change in landuse

Phase 5 surveys

Phase 1 surveys

soil-filled features

service pipes

orientation of ridge and furrow

disturbed area

0 50m

scale 1:1000 - for A1 plot

on behalf of

d2b

Archaeological Services
University of Durham

A1(T) Dishforth to Barton Improvement, North Yorkshire

Phase 5 geophysical surveys at Healam Beck North & South

Report 2209

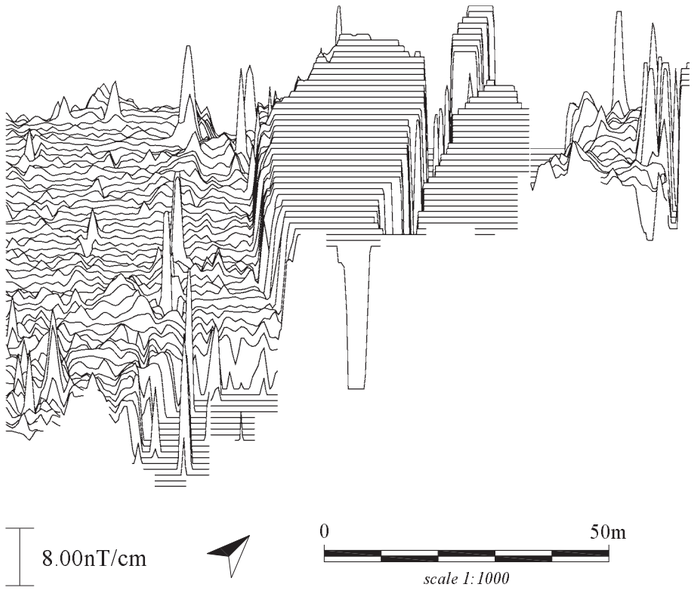
Figure 4

Archaeological interpretation

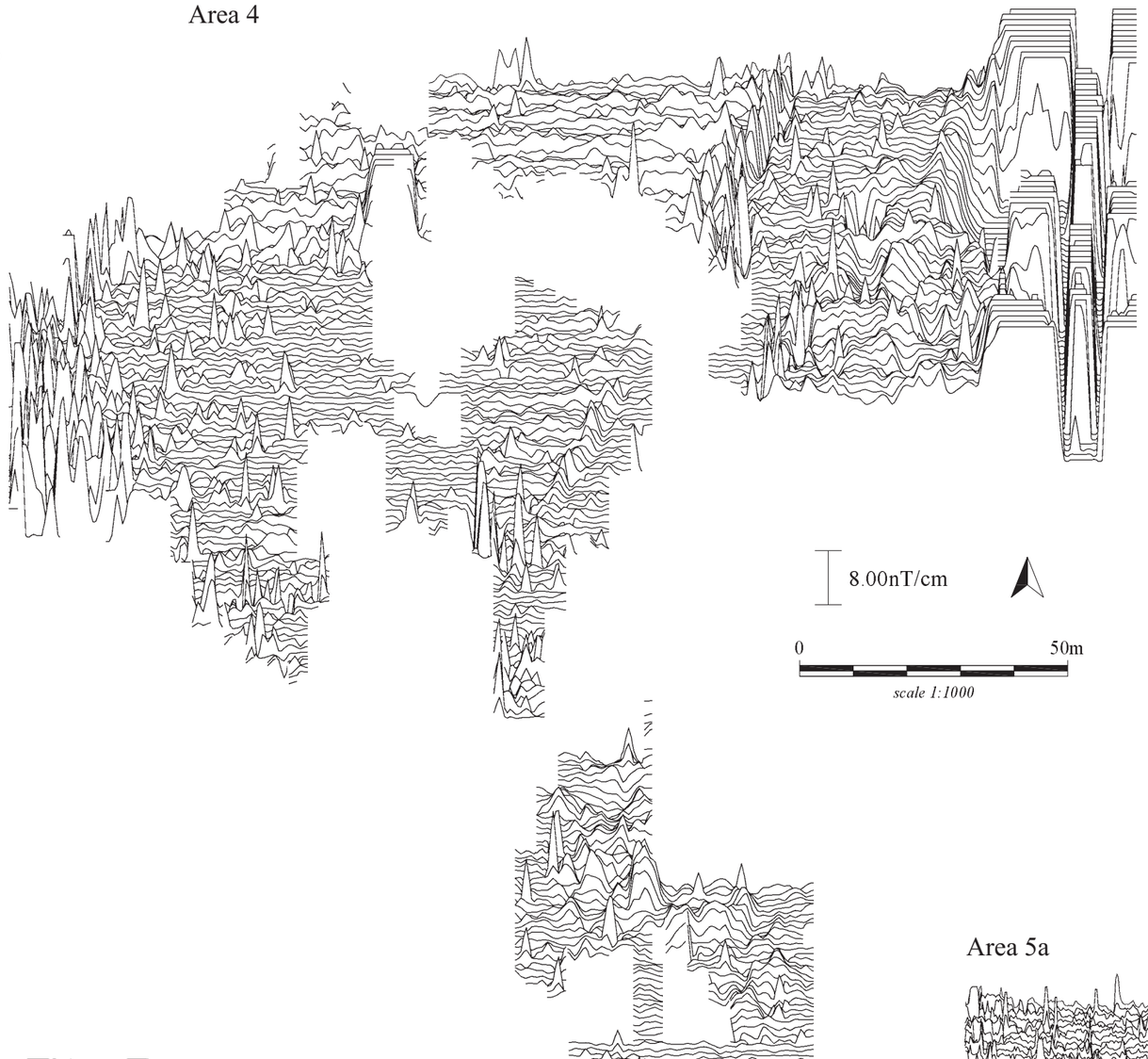
A1(T) Dishforth to Barton Improvement, North Yorkshire, Phase 5 geophysical surveys at Healam Beck North & South, Report 2209

Figure 5: *Trace plots of geomagnetic data*

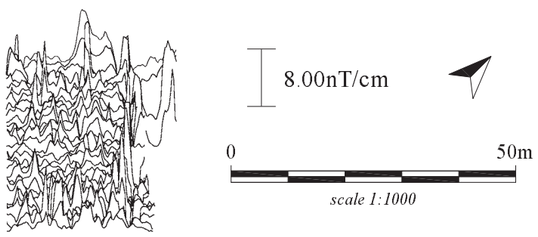
Area 1



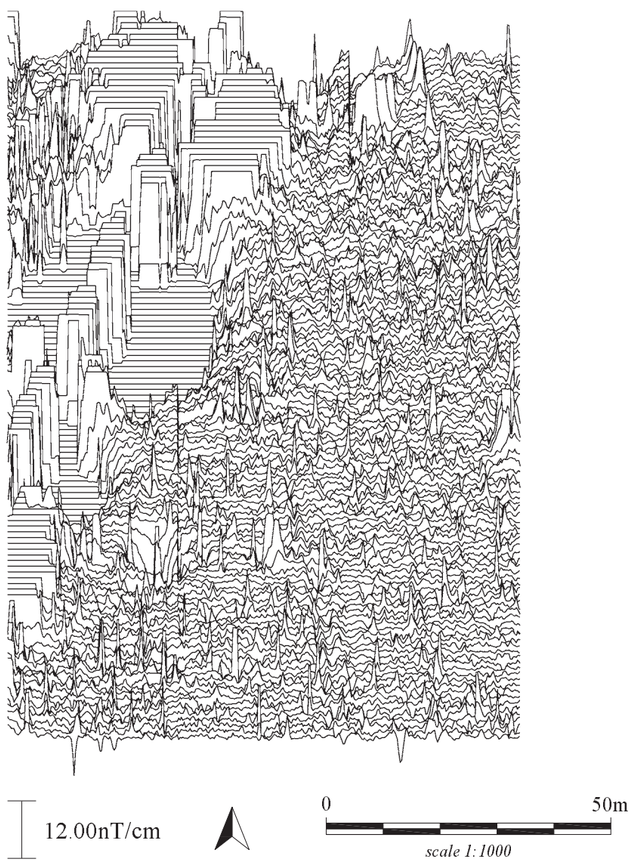
Area 4



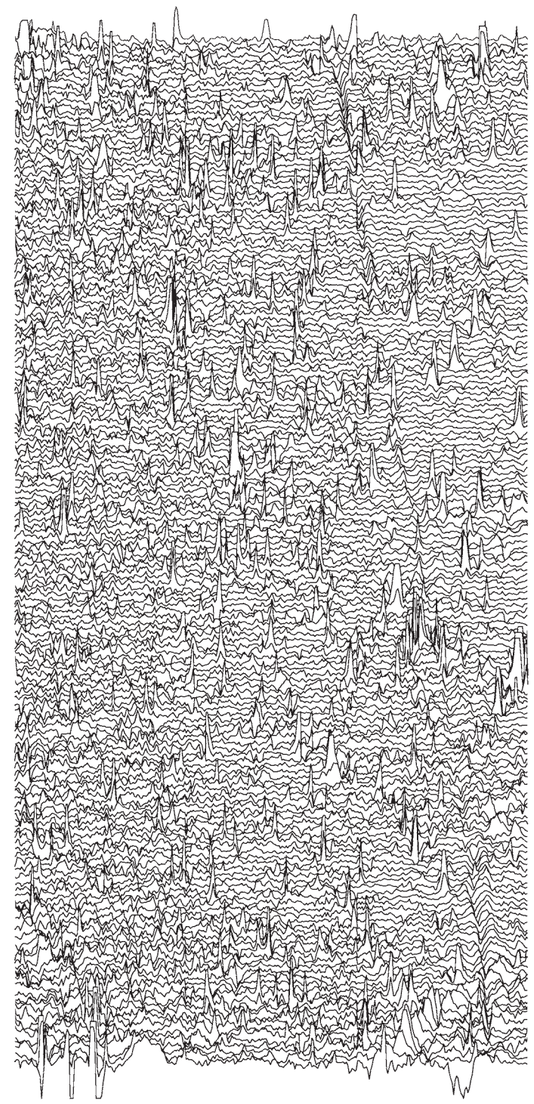
Area 2



Area 5



Area 5a



Area 3