Archaeological Services
University of Durham

A1(T) Dishforth to Barton Improvement, North Yorkshire

Phase 4 geophysical surveys near Scotch Corner

on behalf of

AMEC
Faber Maunsell

for
Highways Agency

Report 1763
November 2007

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Contents

1. Summary

The project

1.1 This report presents the results of a fourth programme of geophysical survey 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 and June 2006 (Archaeological Services 2005a, 2006a, 2006c).

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 comprise geomagnetic survey along a corridor of land covering approximately 7ha to the west of the existing A1(T) road, north of Scotch Corner.

Results

1.4 The surveys have detected evidence for former ridge and furrow cultivation of much of the survey corridor.

1.5 Three small groups of possible ring-ditches may indicate areas of former small-scale occupation.

2. Project background

Location (Figure 1)

2.1 The study area comprised a 60m-wide corridor through five land parcels immediately west of the A1(T) road to the north of Scotch Corner, between Dishforth and Barton in North Yorkshire. The northern end of this corridor lies at NGR NZ 2150 0700 and the south end at NZ 2155 05901.

2.2 The current surveys have been undertaken in addition to the 127 surveys (225ha) undertaken during the earlier survey programmes (Archaeological Services 2005a, 2006a, 2006c). Areas in the immediate vicinity which have been previously surveyed for this project are also shown in Figure 1. Features of probable low 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, 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

2.6 The surveys were undertaken between the 4th September and 8th October 2007. This report was prepared between 10th October and 6th November 2007.

Personnel

2.7 The fieldwork was conducted by Graeme Attwood (supervisor), Edward Davies, Andy Platell, Louise Robinson and Richie Villis. This report was prepared by Graeme Attwood and Duncan Hale with illustrations by David Graham and Janine Wilson. The Project Manager was Duncan Hale.

Acknowledgements

2.8 Archaeological Services is grateful to Blaise Vyner and the landowners and tenants for facilitating these surveys.

Archive/OASIS

2.9 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 programme of survey is '**archaeol3-33590**'.

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). 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, 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 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).

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 survey corridor comprised five fields, three of pasture (249-251) and two arable (246, 247) to the west of the existing carriageway. The northernmost area (251) contained a tarmac farm road.

4.2 The land rises from an elevation of *c*.128m OD at the survey corridor's northernmost point to *c*.143m OD at its southernmost point.

4.3 The site lies on the approximate boundary between the Carboniferous Limestone Series and the Millstone Grit Series, here overlain by Boulder Clay and morainic drift.

5. The geophysical surveys

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 Paper No.6, *The use of geophysical techniques in archaeological evaluations* (Gaffney *et al*. 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, 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 across each survey area. The locations of the grid and various known, mapped, Ordnance Survey points were recorded 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 (Figure 2) have been imported directly into digital basemaps supplied by Faber Maunsell. 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. Trace plots are provided in Appendix I.

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.
despike	locates and suppresses random iron spikes in gradiometer data.
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 plans however, they have been omitted from the archaeological interpretation plans and the following discussion.

Area 251

5.13 Parallel, alternate positive and negative magnetic anomalies aligned approximately north-south have been detected in the north of this survey area. These almost certainly reflect previous agricultural activity in the form of ridge and furrow cultivation.

5.14 Probable ridge and furrow traces have also been detected in Areas 250, 249 and 246.

5.15 A group of positive magnetic anomalies which were detected in the south-western part of this survey area could reflect soil-filled features such as pits.

5.16 Two chains of dipolar magnetic anomalies have been detected crossing this area, which almost certainly reflect buried services.

5.17 A broad curvilinear band of small dipolar magnetic anomalies detected here corresponds to a farm track, which incorporates brick rubble or clinker as hardcore.

Area 250

5.18 Several curvilinear positive magnetic anomalies have been detected in the central and southern parts of the survey area; these almost certainly reflect soil-filled features. The two horseshoe-shaped anomalies measure approximately 12m across and could represent ring-ditches possibly associated with former roundhouses.

Also detected: ridge and furrow aligned broadly north-east/south-west

5.19 Two chains of dipolar magnetic anomalies have been detected here, which almost certainly reflect buried services; on is a continuation of a pipe detected in Area 251.

Area 249

5.20 A chain of dipolar magnetic anomalies has been detected in this area, again almost certainly indicating a service pipe. A second service pipe may be located immediately east of Areas 249, 247 and 246, adjacent to the field boundary.

Also detected: possible traces of ridge and furrow

Area 247

5.21 A cluster of curvilinear positive magnetic anomalies has been detected in the southern part of the survey area. These anomalies probably reflect soil-filled ditches. These are similar in nature to those detected in Area 250, and possibly in 246, and could indicate former settlement.

5.22 Two series of regularly spaced positive magnetic anomalies have been detected in this area. These almost certainly reflect extensive field drainage systems.

Area 246

5.23 Three very weak curvilinear positive magnetic anomalies have been detected here, which could reflect soil-filled ring-ditches. These anomalies are similar to those detected in Areas 250 and 247 and could also represent past human occupation.

Also detected: heavily truncated ridge and furrow

6. Conclusions

6.1 Five geomagnetic surveys have been conducted on land to the west of the present A1(T) road north of Scotch Corner in order to identify possible archaeological features in advance of proposed road improvement.

6.2 The surveys have detected evidence for former ridge and furrow cultivation of much of the survey corridor.

6.3 Three small groups of possible ring-ditches in Areas 250, 247 and 246 could indicate areas of former small-scale occupation.

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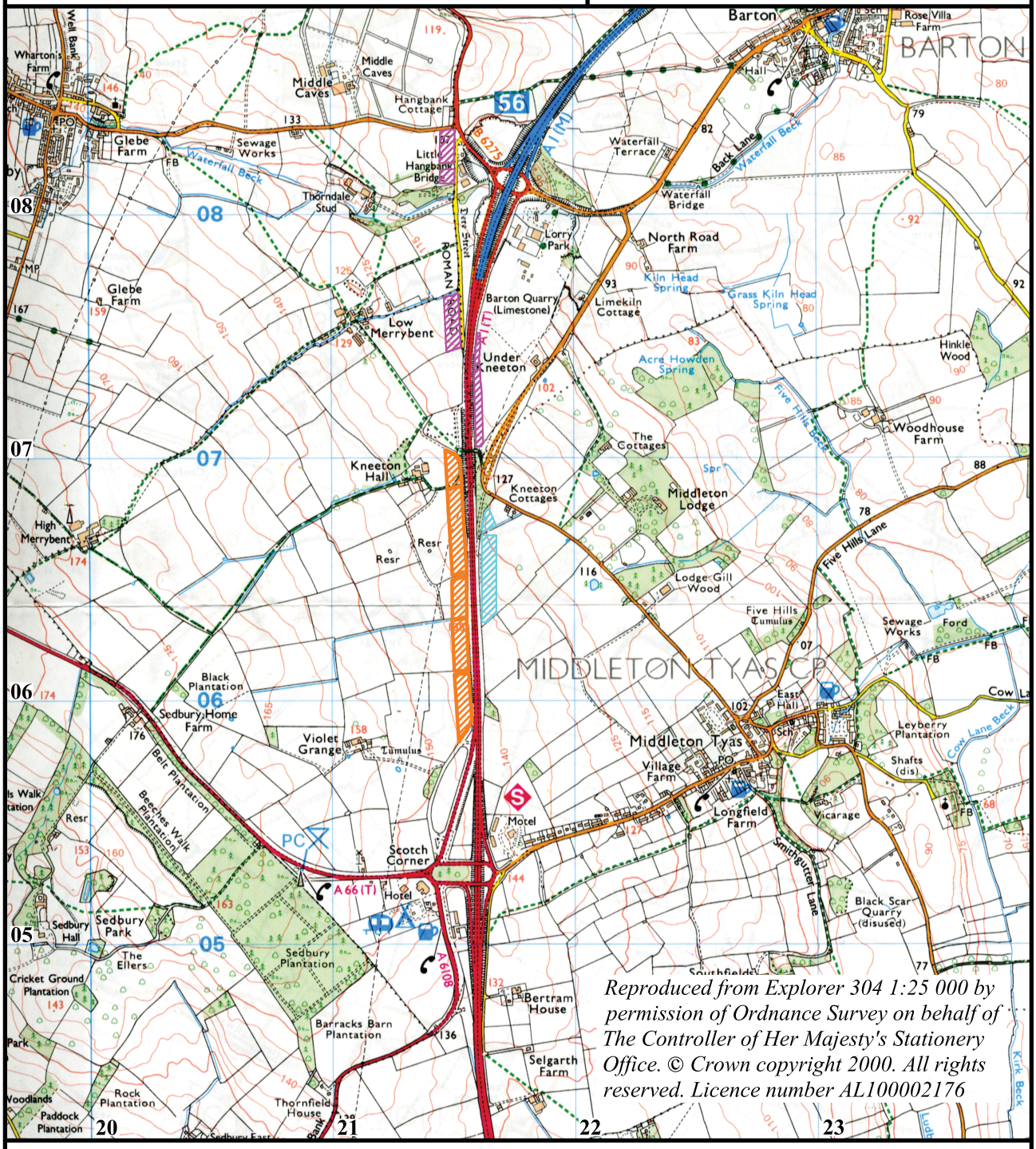
Figure 1
Location map

on behalf of

A1 d2b



phase 4 surveys

phase 1 surveys

phase 2 surveys

0 1km

scale 1:25 000 - for A4 plot

072
071
070
069
068
067
066
065
064
063
062
061
060
059
058
215
216
214

Area 249
Area 251
Area 250
Area 247
Area 246

outline of survey area

5.00
4.17
3.33
2.50
1.67
0.83
0.00
-0.83
-1.67
-2.50
-3.33
-4.17
-5.00 nT

0 50m

scale 1:1000 - for A1 plot

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Figure 2

Areas 246, 247, 249, 250 & 251 geophysical surveys

Area 251

Area 250

Area 249

Area 247

Area 246

072 071 070 069 068 067 066 065 064 063 062 061 060 059 058

214 215 216

outline of survey area

positive magnetic anomalies

negative magnetic anomalies

dipolar magnetic anomalies

0 50m

scale 1:1000 - for A1 plot

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A1 d2b

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Figure 3

Areas 246, 247, 249, 250 & 251, geophysical interpretation

Area 251

Area 250

Area 249

Area 247

Area 246

072
071
070
069
068
067
066
065
064
063
062
061
060
059
058
214
215
216

outline of survey area

soil-filled features

service pipes

orientation of ridge and furrow

land drains

0 50m

scale 1:1000 - for A1 plot

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A1 d2b

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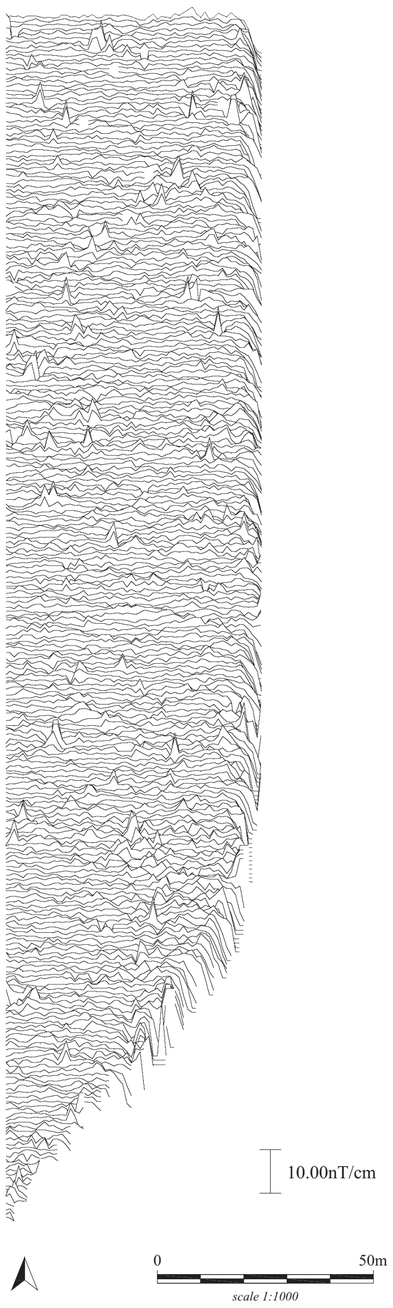
Figure 4

Areas 246, 247, 249, 250 & 251, archaeological interpretation

Appendix I: Trace plots of geophysical data

Area 246



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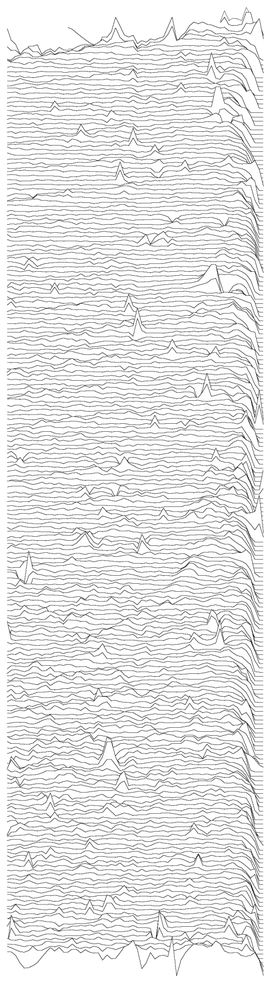

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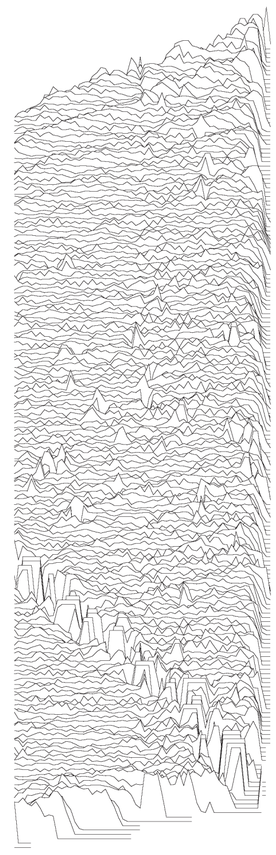

Area 250

Area 251