Archaeological Services
University of Durham

Land at Snipe House Farm, Darlington

geophysical surveys

on behalf of
Scott Wilson

Report 1667
May 2007

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Contents

1. Summary

The project

1.1 This report presents the results of geophysical surveys conducted in advance of proposed residential development at Snipe House Farm, Darlington. The works comprised gradiometer surveys of three areas.

1.2 The works were commissioned by Scott Wilson Ltd.

Results

1.3 The proposed development area contained a considerable amount of ferrous debris, though this has not prevented identification of potential archaeological features.

1.4 Traces of probable former ridge and furrow cultivation aligned broadly north-south were detected across the two large survey areas, Areas A and B.

1.5 One possible ditch feature was detected in each of Areas A and B.

1.6 A group of probable soil-filled pits, each 2-3m in diameter, was detected in the central southern part of Area B.

1.7 Changes to the magnetic background or 'texture' evident in the survey results correspond to former smaller land parcels and different former land uses.

2. Project background

Location (Figures 1 & 2)

2.1 The proposed development area is at Snipe House Farm on the south side of Darlington (NGR centre: NZ 291 125) and covers an area of *c*.10ha (Fig 1). The development area is bounded to the north by housing along Arkle Crescent and Tyne Crescent, to the east by a dismantled coal railway branch line, to the south by the A66 and to the west by Snipe House Farm. The geophysical survey was divided into three areas: A, A1 and B.

Development proposal

2.2 The proposal is for residential development at Snipe House Farm, Darlington (Planning Application No. 06/00959/FUL).

Objective

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

Methods statement

2.4 The surveys have been undertaken in accordance with a specification supplied by Scott Wilson (Appendix II).

Dates

2.5 Fieldwork was undertaken between the 15th and 17th May 2007. This report was prepared between the 22nd and 24th May 2007.

Personnel

2.6 Fieldwork was conducted by Richie Villis (supervisor) and Ed Davies. This report was prepared by Duncan Hale with illustrations by Janine Wilson. The Project Manager was Duncan Hale.

Archive/OASIS

2.7 The site code is **DSH07**, for **D**arlington **S**nipe **H**ouse Farm 20**07**. The survey archive is currently held by Archaeological Services Durham University and will be transferred to Scott Wilson for deposition with the project archive in due course. 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 project is **archaeol3-27181**.

3. Archaeological and historical background

3.1 The survey specification includes the archaeological and historical background for the study area (Appendix II).

3.2 Former field boundaries and plough regimes, possibly including ridge and furrow, are evident on a recent aerial photograph of the proposed development area (Microsoft Virtual Earth 2006).

4. Landuse, topography and geology

4.1 At the time of survey the proposed development area comprised rough pasture/scrub land, which had been used for the dumping of various materials, both earthen spoil and ferrous debris including bicycles and steel rope. There was a small waterlogged area in the eastern part of Area A, which had been partly infilled with rubble and other materials. Deep wheel ruts crossed parts of the site.

4.2 The land occupied predominantly level ground at a mean elevation of approximately 40m OD.

4.3 The underlying solid geology of the area comprises the Edlington Formation, red-brown Mudstone with subordinate siltstone and greenish grey Sandstone (Sirius 2006), which is overlain by glacial drift and till.

5. Geophysical survey

Standards

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

Technique selection

5.2 Geophysical surveying enables the relatively rapid and non-invasive identification of potential archaeological features within landscapes and can involve a variety of complementary techniques such as magnetometry, electrical resistivity, 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, may 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 Three survey areas were set out and their coordinates recorded by means of a Trimble Pathfinder Pro XRS global positioning system (GPS) with RINEX calibration (Figure 2).

5.6 Measurements of vertical geomagnetic field gradient were determined using Bartington Grad601-2 fluxgate gradiometers with automatic datalogging facilities. A zig-zag traverse scheme was employed. 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 v.3 software was used to process the geophysical data and to produce both continuous tone greyscale images and trace plots of the raw (unfiltered) data. The greyscale images and interpretations are presented at 1:1000 in Figures 3-5; the trace plots are provided in Appendix I. In the greyscale images, positive magnetic anomalies are displayed as dark grey and negative magnetic anomalies as light grey. A palette bar relates the greyscale intensities to anomaly values in nanoTesla.

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

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.
Despike	locates and suppresses random iron spikes in gradiometer data.
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 gradiometer data have been interpolated to 0.25 x 0.25m intervals.

Interpretation: anomaly types

5.10 A colour-coded geophysical interpretation plan is provided in Figure 4. 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 A colour-coded archaeological interpretation plan is provided in Figure 5.

5.12 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.

5.13 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 A

5.14 A series of parallel, broad and diffuse, positive magnetic anomalies were detected across the northern part of this area aligned north-west/south-east. These anomalies almost certainly reflect traces of former ridge and furrow cultivation.

5.15 A change in the magnetic nature of the soils in the southern part of this area corresponds to a former field boundary evident on aerial photographs. The former land use of this southern area has removed virtually all traces of ridge and furrow remains or other features of archaeological interest.

5.16 Very weak positive magnetic anomalies in the northern part of Area A may reflect the truncated remains of a ditch feature.

5.17 A number of anomalies of more recent origin were detected by the survey: a waterlogged area in the east contains many small dipolar magnetic anomalies which reflect fired and fired debris used as infill; a pair of curvilinear negative magnetic anomalies corresponds to deep wheel ruts; other dipolar magnetic anomalies reflect a telegraph pole, a geotechnical borehole and dumps of ferrous litter.

Area A1

5.18 No features of potential archaeological significance were identified in this small area. A generally high concentration of ferrous litter was detected here.

Area B

5.19 A general scatter of ferrous litter was noted across this area also, evident in the data as dipolar magnetic anomalies.

5.20 Probable traces of former ridge and furrow cultivation were detected across this area, aligned north-west/south-east as in Area A.

5.21 A series of weak parallel negative magnetic lineations aligned broadly east-west in this area may reflect land drains. A number of open gullies or drains were noted in the field on this alignment.

5.22 As in Area A, a change in the magnetic nature of the soils in the southernmost part of this area corresponds to a former field boundary evident on aerial photographs. The former land use of this southern area has removed all traces of ridge and furrow remains or other features of archaeological interest.

5.23 Positive magnetic anomalies reflecting probable ditch and pit remains were also detected in this area. A discontinuous anomaly in the north could represent truncated ditch remains. In the central southern part of the survey a cluster of potential pits was identified. The anomalies appear to measure approximately 3m in diameter and are arranged in a grid-like pattern with rows aligned north-south and east-west.

6. Conclusions

6.1 Geophysical surveys have been carried out on proposed development land at Snipe House Farm on the south side of Darlington.

6.2 The proposed development area contained a considerable amount of ferrous debris, though this has not prevented identification of potential archaeological features.

6.3 Traces of probable former ridge and furrow cultivation aligned north-west/south-east were detected across the majority of the area.

6.4 One possible truncated ditch feature was detected in each of Areas A and B.

6.5 A group of probable soil-filled pits, each 2-3m in diameter, was detected in the central southern part of Area B.

6.6 Changes to the magnetic background or 'texture' evident in the survey results correspond to former smaller land parcels and different former land uses.

6.7 Anomalies of recent origin have also been identified.

7. References

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

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

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

Sirius Geotechnical & Environmental Ltd, 2006 *Preliminary Appraisal for land adjacent Snipe House Farm, Darlington* (unpublished)

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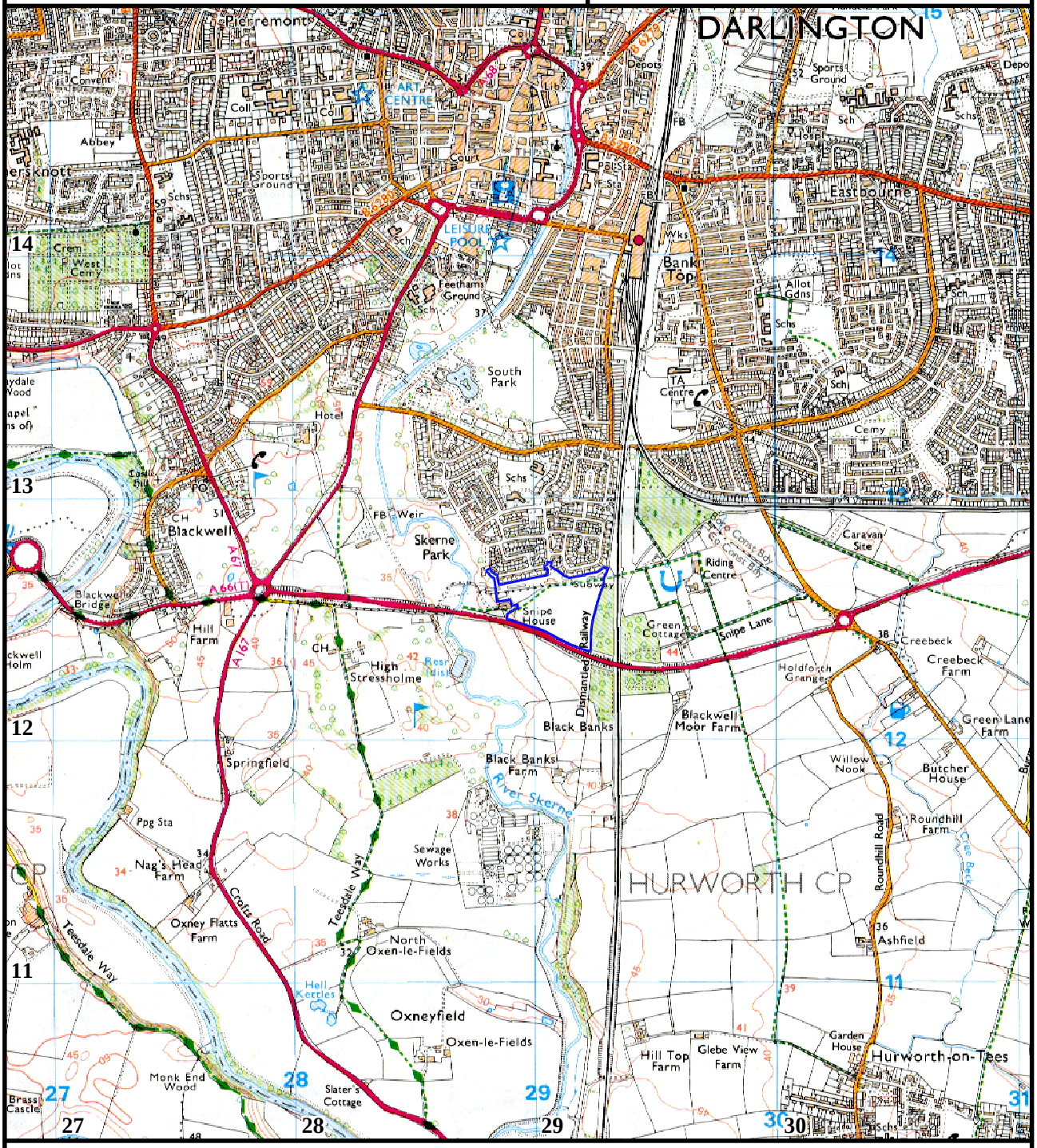
Figure 1
Location of proposed development area

on behalf of
Scott Wilson Ltd



proposed development area

0 1km

scale 1:25 000 - for A4 plot

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Figure 2

Location of geophysical surveys

on behalf of
Scott Wilson Ltd

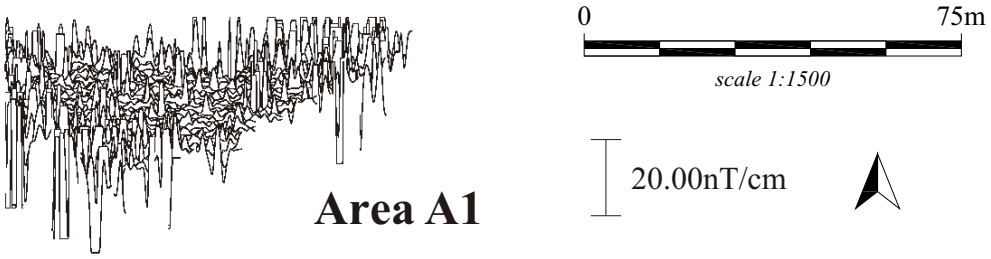
0 250m

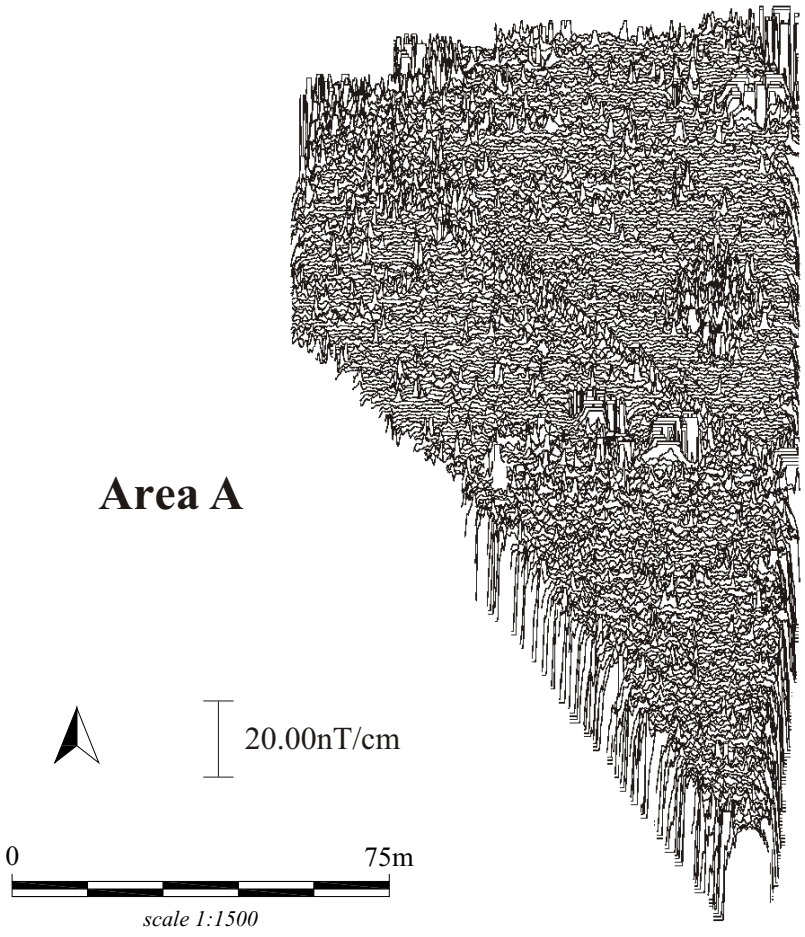
scale 1:5000 - for A3 plot

proposed development area

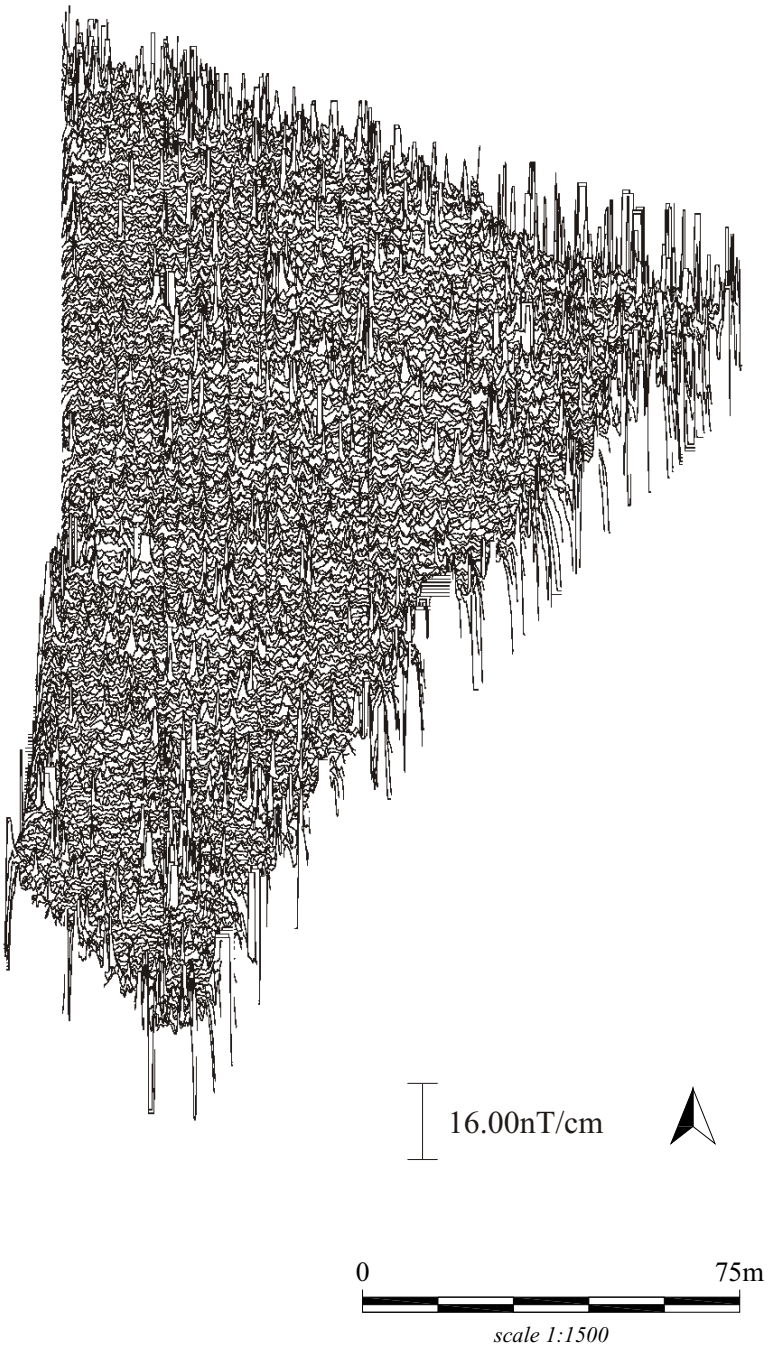
outline of survey area

Appendix I: Trace plots of geophysical data





Area B



Appendix II: project specification

Miller Homes Ltd – North East Region

Magnetometer Survey Specification
Snipe House Farm, Darlington

May 2007

Prepared for:

Miller Homes Ltd – North East Region
Snipe House Farm, Darlington

Magnetometer Survey Specification

Snipe House Farm, Darlington
May 2007

Rev	Date	Details	Prepared by	Reviewed by	Approved by
01	May 2007	Draft	David Aspden Assistant Archaeological Consultant	Neil Macnab Senior Archaeological Consultant	Annette Roe Associate
02	May 2007	Final	**David Aspden** Assistant Archaeological Consultant	**Neil Macnab** Senior Archaeological Consultant	**Annette Roe** Associate

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Appendices

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1 Introduction

Client Instructions

1.1.1 Scott Wilson has been commissioned by Miller Homes Ltd – North East Region to undertake a geophysical survey in advance of residential development at Snipe House Farm, Darlington. This programme of investigation will contribute to the provision of mitigation strategies in compliance with an archaeological planning condition placed on the site (Planning Application No. 06/00959/FUL, Condition 7).

Site Description

1.1.2 The proposed development area lies to the south of Darlington, centred at NGR 429129 512529 and covers an area of *c.* 10ha (Fig 1). It is relatively flat rough pasture/scrub land at present. A line of trees and vegetation traversing the eastern boundary of the site in a north-south direction represents the line of the North Eastern Railway coal branch line depicted on 1855 and 1858 Ordnance Survey maps. The development area is bounded to the north by residential development along Arkle Crescent and Tyne Crescent. To the east lies scrubland with a few trees, whilst the development area is bounded by the A66 to the south and to the west by Snipe House Farm and fields.

Geology

1.1.3 The site is underlain by Glacial Drift and Till. The solid geology below this is formed by the Edlington Formation comprising red brown Mudstone with subordinate siltstone and greenish grey Sandstone (Sirius 2006).

2 Archaeological and Historical Background

2.1.1 Darlington originated as an Anglo-Saxon settlement on the River Skerne; it was then taken by the Vikings before becoming a borough after the Norman Conquest. The site lies some distance to the south of the medieval core of the town. The place name Darlington means the village or farm of Deornop's people.

2.1.2 There have been few archaeological interventions within this area of Darlington and as a result little is known regarding the archaeological potential of the area. There are no recorded archaeological remains within the site and limited evidence from its immediate surroundings. A pillbox dating to WWII is recorded to the east of the mainline railway.

2.1.3 The site has remained green fields during the early modern and modern periods and so has suffered a low level of modern disturbance. Due to the lack of known sites in the area it is difficult to estimate the level of archaeological potential associated with the site. The lack of disturbance across the site and its use as green fields during the early modern and modern periods is indicative of a potential for as yet unknown archaeological remains to be present.

2.1.4 Activity dating from the prehistoric period onwards is known from Darlington; with potential prehistoric enclosures visible on aerial photographs to the west of Stressholme golf course. Evidence for Roman activity in the Darlington area is provided by stray finds of Roman coins and two stone coffins found towards the centre of the town; Cropmarks visible on aerial photographs may represent a Roman fort, located at Hurworth-on-Tees. Excavations within the centre of Darlington have yielded evidence for the towns early settlement. These include an Anglo-Saxon cemetery and ditch providing evidence for a suggested earthwork Anglo-Saxon 'burh'.

3 Project Objectives

3.1.1 The objectives of the magnetometer survey are:

- To identify potential archaeological and non-archaeological features;
- To provide information for the formulation of a further archaeological evaluation strategy, if appropriate and required.

4 Survey Areas

4.1.1 The magnetometer survey will cover an area as defined by Figure 2. The survey consists of a number of grids that are arranged in various formations to provide the best coverage of the area. The total area to be surveyed measures *c.* 12ha.

4.1.2 If there are any areas that cannot be surveyed, the sub-contractor will inform Scott Wilson and details of these will be provided in the report.

Underground and Overhead Utilities

4.1.3 A pipeline is shown on multi-agency government mapping traversing the northern half of the site in an east west direction. An overhead power line crosses the site.

5 Methodology

5.1.1 The specification defines the methodologies to be used and adhered to. It has been produced in consultation with Lee White (Assistant Archaeology Officer for Durham County Council). All work shall be carried out in accordance with the *Standards and Guidance for Archaeological Field Evaluation* produced by the Institute of Field Archaeologist (2001), the IFA *Code of Conduct*, the guidelines for geophysical survey in archaeological field evaluation produced by English Heritage (1995) and other current and relevant best practice and standards and guidance.

5.1.2 Prospection will be carried out utilising Bartington Grad 601-2 dual-sensor fluxgate gradiometers, Geoscan FM-series gradiometers or similar equipment. The survey will record data on a grid system, every 0.25m along lines separated at 1.0m intervals. Data will be

regularly downloaded to a field computer for checking and storage, prior to transferring the information to an office based desk-top computer.

5.1.3 Following the survey, graphic plots of the data will be georeferenced to scale maps of the site area. A technical report will be written and will include interpretation diagrams from the results.

5.1.4 The data will be downloaded at regular intervals on-site into a laptop computer for initial processing and storage. This will ultimately be transferred to a desktop computer for further processing, interpretation and archiving. Geoplot v.3 software (or comparable) will be used to interpolate the data to form an array of regularly spaced values at 0.25m x 0.25m intervals. Continuous tone greyscale images of raw data and an x/y trace plot will also be produced. Palette bars relating the greyscale intensities to anomaly values in ohms will be included with the images.

5.1.5 The raw and processed data will be presented in the report. The processed drawings will be accurately located and presented in relation to the Ordnance Survey base plan for the development area and the survey markers will be accurately plotted to aid in the laying out of subsequent evaluation or excavation areas, as appropriate and necessary. Interpretation plots will be included in the report.

5.1.6 The survey will be undertaken by an experienced operator to provide consistent results with regard to pattern recognition, and to provide initial screening of noise resulting from possible recent ferrous disturbance and local magnetic pollution.

5.1.7 During the survey a record should be made of surface conditions and sources of modern geophysical interference that might have a bearing on subsequent interpretation of field data.

5.1.8 The survey grid/transects must be established by electronic means (using an EDM Total station or similar instrument). This must be accurately tied in with the National Grid and the survey reference points established during the detailed magnetometry survey. This should be internally accurate to ± 10 cm, and the grid locatable on the 1: 2500 Ordnance Survey map.

6 Reporting

6.1.1 Verbal progress reports will be provided to Scott Wilson on request and upon completion of the archaeological works, and a **draft of the interpretative plots will be issued to Scott Wilson within 48 hours of completion of the surveys.**

6.1.2 An assessment report will be submitted within 3 weeks of the completion of fieldwork. The report will include the following and will follow those guidelines set by English Heritage (1995; 5):

- A non-technical summary;
- Site location;
- Archaeological and historical background;
- Methodology;

- Aims and objectives;
- Results (to include full description, assessment of condition, quality and significance of results identified);
- General and detailed plans showing the location of the surveyed areas accurately positioned on an Ordnance Survey map base (to a known scale);
- Colour/grey scale plots to aid interpretation. The plots will be contoured (if appropriate) to allow trends to be shown superimposed over data without obscuring it;
- An interpretative plot;
- Statement of potential with recommendations for future survey;
- Conclusion.

6.1.3 One copy of the completed report will be submitted to Scott Wilson as a draft. In finalising the report the comments of Scott Wilson will be taken into account.

6.1.4 Five bound hard copies, one unbound master-copy and a digital version of the report and illustrations will be produced within one week of the receipt of comments on the draft report. The digital report shall comprise a CD containing a complete version of the report in PDF format and separate digital text (in Microsoft Word format) and CAD mapping files (in ESRI GIS or AutoCAD format) and any other illustrations or plates (in native format).

6.1.5 The raw and processed data will be presented in the report. The processed drawings will be accurately located and presented in relation to the Ordnance Survey base plan for the area and the survey markers should be accurately plotted to aid in the laying out of subsequent surveys.

7 Archive Deposition

7.1.1 Scott Wilson will, prior to the start of fieldwork, liase with Durham County Council to obtain agreement in principle of the acceptance of the documentary archive for long term storage and curation. The archive will be produced to the standards outlined by English Heritage (1991) and *Management of Research Projects in the Historic Environment* (English Heritage 2006).

8 Monitoring

8.1.1 The contractor will be subject to regular monitoring by Scott Wilson who will be given full access to site records or any other information.

8.1.2 Scott Wilson will liase with Lee White (Assistant Archaeology Officer for Durham County Council) to inform her of the commencement of site works and to offer her the opportunity to visit and monitor the work in progress.

9 Confidentiality and Publicity

9.1.1 All communication regarding this project is to be directed through Scott Wilson. The sub-contractor will refer all inquiries to Scott Wilson without making any unauthorised statements or comments.

9.1.2 The archaeological sub-contractor will not disseminate information or images associated with the project for publicity or information purposes without the prior written consent of Scott Wilson.

10 Copyright

10.1.1 The archaeological sub-contactor will assign copyright in all reports and documentation/images produced as part of this project to Scott Wilson. The sub-contractor retains the right to be identified as the author/originator of the material. This applies to all aspects of the project.

10.1.2 The archaeological sub-contractor may apply in writing to use/disseminate any of the project archive or documentation (including images). Such permission will not be unreasonably withheld.

10.1.3 The results of the survey will be submitted to Lee White of Durham County Council by Scott Wilson and will ultimately be made available for public access.

11 Resources and Timetable

11.1.1 All archaeological personnel involved in the project should be suitably qualified and experienced professionals.

11.1.2 The survey is to be implemented during the week commencing the 14 May 2007, and will be completed in 3 days.

12 Insurances and Health and Safety

12.1.1 The archaeological sub-contractor will provide Scott Wilson with details of public and professional indemnity insurance.

12.1.2 The archaeological sub-contractor will have their own Health and Safety policies compiled using national guidelines and which conform to all relevant Health and Safety legislation. A copy of the Health and Safety policy will be submitted to Scott Wilson in advance of fieldwork.

12.1.3 The archaeological sub-contractor will undertake a risk assessment detailing project specific Health and Safety requirements. The risk assessment shall be submitted to Scott Wilson in advance of commencement of site work. Health and Safety will take priority over archaeological issues.

13 Access Arrangements

13.1.1 Scott Wilson will arrange access to the survey areas, and provide contact details for on-site personnel as necessary.

14 General Provisions

14.1.1 The archaeological sub-contractor will undertake the works to the specification issued by Scott Wilson and in any subsequent written variations. No variation from, or changes to, the specification will occur except by prior agreement with Scott Wilson in consultation with Lee White of Durham County Council.

14.1.2 All communication on archaeological matters will be directed through Scott Wilson.

15 References

English Heritage, 1991, Management of Archaeological Projects

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APPENDIX 1
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Institute of Field Archaeologists, 2004, *Guidelines to the Standards for recording Human Remains*, (IFA Paper No 7)

McKinley, J.I. and Roberts, C., 1993, *Excavation and Post-excavation Treatment of Cremated and Inhumed Human Remains* (IFA Technical Paper No 3)

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FIGURES

Area A1

Area B

Area A

Arkle Crescent

Arkle Crescent

Arkle Crescent

Tyne Crescent

Snipe House

A66

127

126

125

124

288

289

290

291

292

proposed development area

outline of survey area

3.00
2.50
2.00
1.50
1.00
0.50
0.00
-0.50
-1.00
-1.50
-2.00
-2.50
-3.00 nT

0 50m

scale 1:1000 - for A2 plot

on behalf of
Scott Wilson Ltd

Archaeological Services
University of Durham

Snipe House Farm, Darlington

geophysical surveys

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Figure 3

Geophysical surveys

Area A1

Area B

Area A

A66

Arkle Crescent

Arkle Crescent

Arkle Crescent

Tyne Crescent

Snipe House

127

126

125

124

288

289

290

291

292

proposed development area

outline of survey area

positive magnetic anomalies

negative magnetic anomalies

dipolar magnetic anomalies

0 50m

scale 1:1000 - for A2 plot

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Figure 4

Geophysical interpretations

Area A

Area A1

Area B

Arkle Crescent

Arkle Crescent

Arkle Crescent

Tyne Crescent

Snipe House

infilled, waterlogged area

wheel ruts

former field boundary

wheel ruts

former field boundary

A66

127

126

125

124

288

289

290

291

292

proposed development area

outline of survey area

soil-filled features

service pipes

orientation of ridge and furrow

land drains

telegraph pole

manhole cover

borehole

0 50m

scale 1:1000 - for A2 plot

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Figure 5

Archaeological interpretations