Archaeological Services
University of Durham

Area 12, Langwith Farm, Nosterfield, North Yorkshire

geophysical surveys

on behalf of

On-Site Archaeology

Report 1350
October 2005

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Contents

1. Summary

The project

1.1 This report presents the results of geophysical surveys conducted in advance of a possible extension to Nosterfield Quarry near Thornborough, North Yorkshire. The study area is referred to as 'Area 12'.

1.2 The works were commissioned by On-Site Archaeology, on behalf of Mike Griffiths Associates, and conducted by Archaeological Services in accordance with instructions provided by On-Site Archaeology.

Results

1.3 Features relating to modern land-use were detected, including features possibly related to post-war agricultural land improvements.

1.4 A number of other ditch and pit features were detected throughout the study area. Some of these pit features may be of natural origin; sink-holes are a common occurrence across areas underlain by limestone bedrock in this region.

1.5 Features resembling palaeochannels and areas of ancient inundation were also detected. These may be related to a lake known to have existed in the early Holocene directly to the south of the survey area.

2. Project background

Location (Figure 1)

2.1 The study area, known as Area 12, is located on land to the north-east of Nosterfield in North Yorkshire (NGR centre: SE 2885 8130) and covers approximately 10ha. It is located within fields which are bounded to the north by Long Lane, to the east and west by hedgerows, and to the south by Ings Goit.

Development proposal

2.2 The surveys have been carried out in advance of a possible proposal to extend Nosterfield Quarry to the north of its present site.

Objective

2.3 The principal aim of the surveys 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.

Brief

2.4 The surveys have been undertaken in accordance with instructions provided by On-Site Archaeology.

Dates

2.5 Fieldwork was undertaken between 4th and 6th October 2005. This report was prepared between 10th and 20th October 2005.

Personnel

2.6 Fieldwork was conducted by Graeme Attwood and Sam Roberts. This report was prepared by Sam Roberts and Duncan Hale with illustrations by Martin Railton. The Project Manager was Duncan Hale.

Archive/OASIS

2.7 The site code is **LFT05[12]**, for **L**angwith **F**arm, **T**hornborough 20**05, [**Area **12]**. The paper and data archive is currently held by Archaeological Services. 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 **archaeol3-10768**.

3. Archaeological and historical background

3.1 The area under investigation lies to the north-east of the early Neolithic complex of monuments known as the Thornborough Rings, consisting of three main circular henges, associated with an earlier cursus monument and later pit alignments. Although some distance away from our investigation area, the scale of this monumental complex requires the landscape to be interpreted with these in mind. These monuments were a centre of ritual activity throughout the

Neolithic, and acted as a focal point for later activity demarcating and dividing the prehistoric landscape, with domestic settlement only being found some distance away from the henges.

3.2 Their importance in the landscape continued into the Bronze Age, seemingly acting as a hub for burial activity, with both inhumations and cremations having been discovered in the vicinity. Although an integral part of the ritual landscape of the Bronze Age, there is little evidence for domestic settlement, implying that landscape divisions formed in the Neolithic continued to be a factor in the Bronze Age.

3.3 There is little evidence so far for Iron Age activity in the area, however, burials and pit alignments discovered to the north of the henges (south-west of the current investigation area) have shown that this area was in use through this period, and seemingly with a similar focus on ritual activity. Evidence for a number of pit alignments dug during this period suggests that there may have been a re-structuring of landscape divisions during the Iron Age.

3.4 There is more evidence for settlement in the surrounding area during the Roman period. One of the main arterial Roman roads, Dere Street, lies to the east of the investigation area, with forts situated at regular intervals along its course. Villa complexes discovered in the area attest to a Romanisation of the surrounding landscape. A Roman bath-house discovered at Well, just 2km to the north-west, together with a portion of tesselated pavement suggest that a villa complex of fairly high status would have been situated here. A corn-drying oven found just to the south in Nosterfield Quarry further illustrates that this landscape was utilised for agricultural purposes during the Roman period.

3.5 Little evidence is available regarding the post-Roman and early medieval period. The nearby settlement of Well has a church with features dating from the 12th century, and the surrounding land, including the investigation area, is likely to have been agricultural land, either as strip fields or common land. Most of this strip-field farming system would have been lost during the post-medieval period, as more and more land was taken by the Enclosure acts. These enclosed areas have in turn been replaced by more open fields as hedgerows have been removed during the 20th century to facilitate arable farming and larger grazing herds.

4. Landuse, topography and geology

4.1 At the time of survey the study area comprised ploughed and newly cropped fields. The study area was sub-divided into three areas by drainage ditches and hedgerows; for the purposes of this report these are referred to as survey Areas A, B and C (Figure 2). Areas A and C had been recently ploughed, whilst Area B was under new crop. Three areas of land were not under cultivation but set-aside; one area in the south-west corner of Area A, another in the south-east corner of Area B and a small area at the western extent of Area C.

4.2 The study area was predominantly level at a mean elevation of *c*.40m AOD. The land rises gently to the north of the study area.

4.3 The underlying solid geology of the area comprises Magnesian Limestone, which is overlain by sands and gravels.

5. Geophysical survey

Standards

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

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, based on existing aerial photographic cropmark evidence and experience of previous surveys in vicinity, 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 potential 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. Recent work in the near vicinity involving geophysical survey and archaeological evaluation trenching has shown that this method is effective in detecting sub-surface archaeological features (Archaeological Services 2005a, 2005b; Garner-Lahire *et al.* 2005). This technique involves the use of hand-held magnetometers to detect and record minute perturbations in the vertical component of the Earth's magnetic field caused by variations in soil magnetic susceptibility or permanent magnetisation; such anomalies can reflect archaeological features.

Field methods

5.5 A 30m grid was established across each survey area and located using a Leica GPS50 global positioning system.

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 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 laptop computers 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 continuous tone greyscale images and trace plots of the raw data. The greyscale images and interpretations are presented in Figures 2-11; the images have been imported directly into a digital basemap supplied by On-Site Archaeology. 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 the dataset:

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. In this instance the gradiometer data have been interpolated to 0.25 x 0.25m intervals.

Interpretation: anomaly types

5.10 Colour-coded geophysical interpretation plans are provided for each area. 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

5.11 Colour-coded archaeological interpretation plans are provided for each area. The anomalies described have been assigned feature [F] numbers, some of which represent feature groups, in the following discussion.

Area A (Figures 3-5)

5.12 An irregular curvilinear band of positive and negative magnetic anomalies [F1], which traverses Area A on a rough north-west/south-east alignment, corresponds to a visible change in topography that is likely to reflect the edge of peat deposits to the south. These anomalies may indicate some form of drainage ditch or former stream which follows the topography of the peat deposits. It is likely that this feature is a continuation of the former stream detected in Area C to the west and shown on OS mapping.

5.13 To the north of [F1], in the north-western corner of the survey area, a series of parallel linear positive magnetic anomalies [F2], aligned north-west/south-east, almost certainly reflect land drains feeding into the drainage ditch separating Areas A and B.

5.14 To the east of [F2], a second group of weaker positive magnetic lineations [F3] reflect soil-filled features such as shallow ditches or gullies, and may also correspond to a system of land drains.

5.15 A stronger positive magnetic linear anomaly [F4] crosses [F3], traversing the survey area in a north-east/south-west direction. To the east of and parallel to [F4], a weaker positive magnetic lineation [F5] traverses the northern part of the survey area. These anomalies, reflecting soil-filled ditch features, are most likely to represent drainage ditches and are on a similar alignment to the existing open drains constituting field boundaries.

5.16 To the south of [F1], a large concentration of dipolar magnetic anomalies [F6] is present across the western quarter of the survey area. These anomalies correspond to, but exceed in size, patches of burning observed on the ground, and result from an episode where the underlying peat deposits caught fire and burned slowly for a number of months. The majority of these anomalies fall within the area set-aside from cultivation.

5.17 In the south-eastern corner of the survey area, a positive magnetic linear anomaly [F7] reflects another drain, which although shown on OS mapping was not visible in the field.

5.18 Linear positive and negative magnetic anomalies aligned broadly east-west [F8] towards the southern boundary of the survey area reflect the change from ploughed land to a strip of set-aside along the field boundary. Narrow, parallel striations of positive and negative magnetisation [F9] aligned north-east/south-west directly north of this change correspond to the current plough regime. Whilst modern ploughing can often give rise to magnetic anomalies of this type, they are normally less pronounced.

5.19 A scatter of discrete, dipolar magnetic anomalies, representing fired and ferrous debris within the topsoil, is also present, although these anomalies are only discernible in the northern half of the survey area due to the large concentrations of dipolar magnetic anomalies caused by burning in the southern half.

Area B (Figures 6-8)

5.20 In the north-east corner of the survey area, a parallel series of linear positive magnetic anomalies [F10], aligned north-west/south-east, are almost certainly land drains feeding into the drainage ditch separating Areas A and B.

5.21 To the south of [F10] a strong linear positive magnetic anomaly [F11] indicating a soil-filled feature extends northwards into the survey area leading from the access point into the field, a bridge crossing the drainage ditch separating Areas A and B. This anomaly appears to be a continuation of [F1] and ends at a cluster of large dipolar magnetic anomalies [F12] reflecting large ferrous items, disturbed ground or areas of burning; a raised area was noted during the survey at this point and these anomalies may reflect a drain with an associated service cover.

5.22 To the west of these anomalies, a weak and irregular series of linear positive magnetic anomalies [F13] traverses the survey area northwards. These anomalies are similar in nature to [F1] and [F11] and could reflect remains of former stream channels.

5.23 A group of diffuse positive magnetic anomalies [F14] detected to the south of [F13], within the area of peat deposits, may reflect episodes of peat burning or other isolated soil-filled features. Some of these may represent features such as pits, or could also reflect natural phenomena such as sink-holes which are known to occur over the Magnesian limestone in this area (Garner-Lahire *et al.* 2005).

5.24 A group of parallel positive and negative magnetic lineations [F15] detected in the central part of Area B, aligned north-east/south-west, appear to reflect a former double-ditched track and possible former field boundary.

5.25 A weak, positive and negative magnetic striated texture [F16] is evident in the north-west of the survey area. This texture is likely to reflect the former, though recent, ploughing regime.

5.26 A relatively intense curvilinear positive magnetic anomaly [F17] was detected at the south-western boundary of the field. This anomaly almost certainly reflects a well-defined soil-filled feature such as a ditch.

5.27 A strong, linear alignment of positive, negative and dipolar anomalies [F18] at the western edge of the survey area corresponds to a grassed-over drain. An intense magnetic anomaly [F19] in the corner of the survey area reflects the nearby presence of an access bridge across Ings Goit into the field to the south.

5.28 A scatter of discrete, dipolar magnetic anomalies, representing fired and ferrous debris within the topsoil is again present, with some larger anomalies probably representing larger ferrous items.

Area C (Figures 9-11)

5.29 A weak, positive and negative magnetic striated texture is present across the majority of the survey area. The alignment of the striations matches the north-east/south-west alignment of the current plough regime. For purposes of clarity this texture is not included in the interpretative figures.

5.30 An irregular linear, positive magnetic anomaly [F20] traversing the survey area in a rough east/west direction corresponds to a former stream/field boundary shown on OS mapping but no longer visible on the ground. This feature may also be evident in Areas A and B as [F11] and [F1].

5.31 To the north of this anomaly a series of parallel positive magnetic anomalies [FG21] was detected, aligned broadly north-east/south-west; these anomalies almost certainly reflect former ridge and furrow cultivation.

5.32 To the south of [F20] a complex arrangement of positive linear magnetic anomalies [FG22] reflect soil-filled features. These are most likely to represent a system of land drains feeding into Ings Goit which lies along the southern boundary of the survey area.

5.33 A discrete positive magnetic anomaly [F23] reflects a soil-filled feature such as a pit or natural sink-hole.

5.34 Two intense, dipolar magnetic anomalies [FG24] are likely to reflect ferrous debris or an area of burning.

5.35 Weak linear, positive, magnetic anomalies [F25] parallel to the southern boundary of the survey area correspond to the edge of the ploughed area within the field.

5.36 The only other anomalies detected in this area are a scatter of discrete, dipolar magnetic anomalies which reflect near-surface ferrous and fired litter.

6. Conclusions

6.1 A gradiometer survey has been carried out on land at Area 12, Langwith Farm, Nosterfield, North Yorkshire.

6.2 Many of the features detected relate to modern land-use and agricultural improvements, such as drainage.

6.3 Areas of peat deposits were detected in Areas A and B. The peat deposits in Area A had been subject to an episode of burning.

6.4 Other features detected within the areas of peat deposits may be of natural origin as sink-holes are a common occurrence across areas underlain by limestone bedrock in this region.

6.5 An area of ridge and furrow was detected at the northern edge of survey area C, extending northwards.

6.6 No other features of archaeological significance were identified.

7. References

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