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**Melsonby and The Tofts, Stanwick-St-John,
North Yorkshire**

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geophysical surveys

ASUD Report 1234

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Archaeological Services University of Durham

on behalf of

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1. Summary

The project

- 1.1 This report presents the results of geophysical surveys conducted on land near Melsonby and at The Tofts in Stanwick-St-John, North Yorkshire.
- 1.2 The works were commissioned by Professor Colin Haselgrove (then University of Durham, now University of Leicester) and contribute to ongoing research by Professor Haselgrove and Professor Fitts (Dickinson College).

Results

- 1.3 The presence of ridge and furrow and service pipes at each site have hindered the interpretation of weaker anomalies of probable archaeological significance. Nevertheless, many archaeological features have been recorded across both sites, including parts of field systems, sub-circular and sub-rectangular enclosures, probable ring-ditches and hearths, pits and miscellaneous soil-filled features.
- 1.4 The surveys have provided added value to existing knowledge, gained from previous surveys and excavations at the two sites.

2. Project background

Location (Figure 1)

- 2.1 The survey areas are located 2km apart, 5km north-north-west of Scotch Comer in North Yorkshire. The Melsonby survey was undertaken on the west side of a small wood, 1.5km north of the village, at NGR: NZ 19901015. The presumed findspot of the pre-Roman Iron Age ‘Stanwick hoard’ of 1843 lies 25m to the north of the current survey area, in an area surveyed in 1992 (Fitts *et al.* 1999). The south-eastern corner of the late Iron Age Stanwick fortifications lies 1km to the north-west and Scots Dyke lies 400m to the west.
- 2.2 The Stanwick survey was undertaken at The Tofts, immediately north of Stanwick-St-John village, within the fortifications at NGR: NZ 18401170.

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. This information would augment the results of previous investigations. An additional objective of the Melsonby survey was to gain further information regarding the archaeological context of the hoard.

Dates

- 2.4 The Melsonby survey was undertaken in September 2004 and the Stanwick survey in November 2004. This report was prepared between December 2004 and March 2005.

Personnel

- 2.5 The fieldwork and reporting was conducted by Duncan Hale, with illustrations by Martin Railton.

Acknowledgements

- 2.6 Archaeological Services is grateful to English Heritage and the landowners and farmers for their cooperation with this project.

Archive/OASIS

- 2.7 The survey archive is currently held at Archaeological Services, University of Durham. It is anticipated that it will be transferred to the Archaeology Data Service in due course. Archaeological Services University of Durham is registered with the Online Access to the Index of archaeological investigations project (OASIS). The OASIS ID number for the Melsonby survey is archaeol3-7940. The OASIS ID number for the Stanwick survey is archaeol3-7942.

3. Landuse, topography and geology

Melsonby

- 3.1 At the time of fieldwork the study area carried cereal stubble from the recent harvest. The survey area was part of what is now one huge field, virtually all of the 19th century field boundaries having been removed.

- 3.2 The landscape is gently undulating, with the survey area occupying a gradual north-facing slope between 105-110m AOD. The local solid geology comprises Namurian Millstone Grit, which is overlain by boulder clay.

Stanwick

- 3.3 At the time of fieldwork the study area comprised pasture for sheep and cattle.
- 3.4 The survey area occupied a predominantly level platform at c.100m AOD and a north-east-facing slope on which ridge and furrow earthworks were visible. The local solid geology comprises Namurian Millstone Grit, which is overlain by boulder clay.

4. Geophysical survey methods

Standards

- 4.1 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

- 4.2 Given the anticipated shallowness of targets (<1.5m in depth) and the non-igneous geological environment of the study area a geomagnetic technique, fluxgate gradiometry, was considered appropriate for detecting any cut, built and fired archaeological features which might be present. This technique involves the use of hand-held magnetometers to detect and record anomalies in the vertical component of the Earth's magnetic field; such anomalies often reflect archaeological features.

Field methods

- 4.3 A 30m grid was established across each survey area and tied-in to known, mapped Ordnance Survey.
- 4.4 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.
- 4.5 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

- 4.6 Geoplot v3(P) software was used to process the geophysical data and to produce both continuous tone greyscale images and trace plots of the raw data.

The greyscale images and interpretations are presented in Figures 2-7; 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.

4.7 The following basic processing functions have been applied to each 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.

Despike – locates and suppresses random iron spikes in gradiometer data.

Low pass filter – is useful for smoothing data or for enhancing larger weak features.

Interpolate – increases the number of data points in a survey; to match sample and traverse intervals and so create a smoother appearance to the data. In this instance the gradiometer data have been interpolated to 0.25 x 0.25m intervals.

5. Geophysical interpretation

5.1 Colour-coded geophysical interpretation plans are provided for each survey 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, stone drains 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.

5.2 A scatter of small dipolar magnetic anomalies has been detected throughout each survey area. These anomalies almost certainly reflect small items of near-surface ferrous and/or fired litter and are excluded from the following discussions.

6. Melsonby survey discussion (Figures 2-4)

Previous survey

- 6.1 In August 1992 a gradiometer survey was undertaken by Phil Howard (University of Durham) on land immediately north of the present survey area (Fitts *et al.* 1999). The survey measured 160m by 60m (0.96ha) and numerous features of probable archaeological significance were detected, including a ring-ditch and various linear ditches, some of which were excavated in 1994 and 1995 (*ibid.*).
- 6.2 The 1992 survey was undertaken using a Geoscan FM36 fluxgate gradiometer over a 20m grid, walked in parallel fashion collecting data at 1m intervals along traverses 1m apart. Those data have been re-processed and presented with the current data on Figure 2.

2004 survey

- 6.3 This survey measured 150m x 120m (1.8ha). Colour-coded geophysical and archaeological interpretation plans are provided in Figures 3 and 4.
- 6.4 A great many geomagnetic anomalies of likely archaeological origin have been detected, despite the presence of two sets of parallel linear anomalies traversing the survey area. It is likely, however, that many more archaeological features are present, but are obscured by these overlying textures. The more prominent set of positive magnetic lineations is aligned broadly east west, with anomalies typically spaced at 7-8m intervals; these almost certainly reflect the remains of ridge and furrow cultivation. The weaker lineations are more closely spaced, aligned north-east/south-west, and are likely to reflect the current ploughing regime. A linear positive magnetic anomaly which traverses the northern part of the survey area, parallel to the ridge and furrow, corresponds to the location of a former banked field boundary.
- 6.5 The most prominent feature detected comprises a chain of intense dipolar magnetic anomalies, which reflects the presence of a ferrous pipe. The pipe continues northwards into the 1990s survey and excavation areas.
- 6.6 A number of relatively strong positive magnetic anomalies have been detected across the survey area. These anomalies reflect relatively high magnetic susceptibility materials, typically sediments in negative archaeological features such as furrows, ditches or pits, which contain decomposed organic matter and/or burning. In this instance the majority of these anomalies appear to reflect ditched boundaries forming a rectilinear system of small fields.
- 6.7 Various anomalies of different intensities and forms have been detected both in and around these small enclosures. Whilst these anomalies almost certainly reflect soil-filled features also, they are evidently not all contemporary with the field system. Although weak, the arcuate and sub-circular anomalies could represent the remains of ring-ditches; they are comparable in size to the ring-ditch excavated in 1994/95 (located at the boundary between the 1992 and 2004 survey areas), which was found to be a drainage gully around a roundhouse ('Circular Structure 1' in Fitts *et al.* 1999). At the approximate

centre of each of the possible ring-ditches identified in the current survey is an intense dipolar magnetic anomaly. The orientation of these anomalies, with the negative part of the anomaly on the northern side, could indicate the remains of *in situ* hearths or ovens. Similar anomalies elsewhere in the survey could also reflect burnt features.

7. Stanwick survey discussion (Figures 5-7)

Previous surveys

- 7.1 In the early 1980s the Ancient Monuments Laboratory undertook fluxgate gradiometer surveys at The Tofts, Forcett and Kirkbridge Farm, in order to assess the feasibility of magnetic detection at Stanwick and to examine parts of the site for evidence of archaeological activity (David 1981; Bartlett 1983; Haselgrove *et al.* 1990a). The survey in The Tofts detected anomalies representing intensive settlement, as previously indicated by Wheeler's trial excavations in 1951-52 (Wheeler 1954).
- 7.2 Earth electrical resistance surveys were undertaken by Durham University in The Tofts in 1985-88 as part of the Department of Archaeology's Stanwick Research Project, which included excavations between 1983-89 (Haselgrove & Tumbull 1986; Fitts & Haselgrove 1987; Haselgrove *et al.* 1989, 1990b & 1990c). Further geophysical survey was undertaken by Durham University in 1989, which traced a continuation of the Duchess's Walk earthwork around the southern edge of The Tofts (P Howard in Haselgrove *et al.* 1990b).

2004 survey

- 7.3 This survey was conducted under a licence issued by English Heritage, under Section 42 of the Ancient Monuments and Archaeological Areas Act 1979. The survey measured 240m x 120m (maximum width), covering an area of c.2.4ha. Colour-coded geophysical and archaeological interpretation plans are provided in Figures 6 and 7, showing the principal features. Clearly, a number of phases of activity are represented by the palimpsest of magnetic anomalies detected throughout the survey area.
- 7.4 Some of the most prominent geomagnetic anomalies detected here are not associated with the Iron Age or Roman periods at Stanwick. Two ferrous service pipes traverse the central part of the survey area, aligned north-south and north-east/south-west; a strong positive magnetic lineation between these two pipes might reflect another service pipe. Ridge and furrow earthworks survive across much of this part of The Tofts and have given rise to strong magnetic lineations which almost certainly obscure many weaker anomalies of archaeological interest. Two alignments of ridge and furrow have been recorded in this survey.
- 7.5 A number of enclosures, or at least parts of enclosures, have been detected. These are represented by particularly strong positive magnetic anomalies reflecting soil-filled ditches, which have been disturbed to varying degrees by the service pipes and ridge and furrow. The ditch of a trapezoidal enclosure in the north-eastern part of the survey area appears to be reasonably well-

preserved, for the most part. The main anomaly measures *c.*4m in width and based on previous experience this is likely to be a reasonably accurate reflection of the actual ditch width. A causewayed entrance on the north-eastern side of the enclosure measures 4-5m in width. The main ditch encloses an area of some 1300sqm. Whilst geomagnetic anomalies have been detected within the enclosure it has not been possible to determine their true form due to the effects of the overlying ridge and furrow. Some of the internal anomalies may reflect the heavily disturbed remains of an earlier curvilinear ditch, while others could reflect pits, although Wheeler discussed the complete absence of storage pits from his investigations at 'Site F', and from the north of the country in general (Wheeler 1954, 9 & 27/28).

- 7.6 The remains of a sub-circular enclosure have been detected 20m to the south of the trapezoidal enclosure. The current survey has detected more of this enclosure circuit than is evident in the 1981 survey interpretation (David 1981), particularly on the southern side. As above, the enclosure will almost certainly have been damaged by the insertion of a service pipe. There is also an apparent break in the circuit on its eastern side, measuring *c.*1.8 in length. The anomaly reflecting the main ditch measures *c.*2m in width, which corresponds well with Wheeler's excavation of the south-western part of this ditch (Wheeler 1954, 9). Again anomalies have been detected within the enclosure which no doubt reflect archaeological features, but they have been obscured and possibly damaged by the ridge and furrow.
- 7.7 Two substantial ditches, each measuring *c.*2m in width, appear to be associated with the above sub-circular enclosure, both aligned south-east from the eastern and southern sides of the enclosure. A number of arcuate anomalies between these two ditches could reflect the remains of ring-ditches. Another substantial ditch has been detected in this south-eastern corner of the survey area, aligned north-south and turning north-east at its northern end. The ditches in this corner of the survey appear to have been damaged by north-east/south-west oriented ridge and furrow.
- 7.8 Several anomalies detected immediately south-west of the sub-circular enclosure reflect features which were excavated at Wheeler's Site F, including a roundhouse gully (Wheeler 1954).
- 7.9 The area between, and west of, the two service pipes contains a great many anomalies of probable archaeological origin. The remains of a number of linear ditches, ring-ditches and pits appear to be present, almost certainly representing a number of different phases of occupation.
- 7.10 In the western part of the survey area the remains of part of a large oval enclosure have been detected. The enclosure is defined by a ditch, which appears rather discontinuous in the magnetic data, and contains internal divisions. A considerable part of the interior of this enclosure was excavated by Durham University in the 1980s.

8. Conclusions

- 8.1 The surveys at both sites have detected a great many features of likely archaeological interest. Ridge and furrow cultivation and the more recent laying of service pipes have almost certainly damaged the earlier features at each site and the anomalies produced by these later features have undoubtedly obscured much archaeological detail. In some places the surveys have confirmed the results of previous investigations, and overall they have provided added value to existing knowledge with more extensive mapping and the recording of many new features.

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