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ARCHAEOLOGICAL SERVICES WYAS

Ripon Flood Alleviation Scheme
Birkby Nab
North Yorkshire

Geophysical Survey

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Ripon Flood Alleviation Scheme

Birkby Nab

North Yorkshire

Geophysical Survey

Contents

Summary

Geophysical (magnetometer) survey was carried out at several locations adjacent to the River Laver at Birkby Nab, north-west of Ripon in advance of proposed flood alleviation works. Numerous magnetic anomalies have been identified although many are caused by recent agricultural activity (ploughing and drainage), whilst others have a geological origin being caused either by deposition resulting from flooding, the accumulation of material at the base of slopes, the silting up of former meanders or the presence of magnetic river cobbles or river gravels. In addition several anomalies of archaeological potential have been identified. Three probable 'enclosures' have been identified of which two appear to have been deliberately positioned adjacent to a former river course. There is possible evidence for occupational activity at the third enclosure. Other less coherent anomalies are also considered to have archaeological potential although the discontinuous nature of some of these anomalies suggests there may be a degree of truncation due to plough damage.

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Archaeological Services WYAS
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1. Introduction and Archaeological Background

1.1 Archaeological Services WYAS was commissioned by Neale Davies of Fugro Engineering Services Ltd on behalf of Halcrow Group Ltd and the Environment Agency to carry out a geophysical (magnetometer) survey at Birkby Nab approximately 3km north-west of Ripon (see Fig. 1) in advance of flood alleviation works.

1.2 The current survey was carried out at three locations adjacent to the River Laver, in total covering an area of approximately 16 hectares (see Fig. 2). Immediately north of the river Block 1, covering 1 hectare, was located at the confluence of Kex Beck and the River Laver (SE 2755 7265) and was positioned to cover an area identified for the disposal of granular backfill material. Two hundred metres to the east Block 2 covered the location of the proposed dam on the south side of the river. The largest of the sites, Block 3, centred at SE 2760 7230, comprised a single field of approximately 13 hectares, located south of the river and immediately north of High Birkby. This field encompassed one of the locations identified as being suitable for a borrow pit. The results and interpretation of a magnetometer survey (Block 4) undertaken by the Environment Agency (Catherall 2004) at an alternative borrow pit location are also included in this report.

1.3 Topographically the site gently rises to the north-west being situated at about 60m Above Ordnance Datum. The geology of the site comprises drift deposits of sands and gravels and alluvial material overlying Lower Magnesian Limestone. The soils are classified in the East Keswick 1 association being typically deep, well-drained, fine loams that are prone to slight seasonal waterlogging. The survey was carried out between March 20th and 31st 2006 at which time the fields were mainly under arable crop and permanent pasture. No problems were encountered during the survey although the sub-division of Block 2 into horse paddocks prevented the full survey of this area.

1.4 Prior to the current survey the magnetometer survey undertaken by the Environment Agency (see Fig. 2 – Block 4) had identified magnetic anomalies indicative of archaeological activity in the field to the east of Dick Hill Wood and south-east of the recorded site of Studley Parva, also known as Studley Roger, a deserted medieval village, which is recorded in the Domesday Book (Stollai). No other information on the archaeological potential of the site was known.

2. Methodology and Presentation

2.1 The general aim of the survey was to obtain information that would contribute to an evaluation of the archaeological significance of the area likely to be affected by the proposed flood alleviation works. This information would then enable further evaluation and/or mitigation measures to be designed in advance of the finalising of the flood alleviation works, particularly regarding the location of the borrow pit.

2.2 More specifically the survey aimed to determine the presence, extent and layout of buried archaeological remains in the defined survey areas by the

identification and interpretation of any magnetic anomalies indicative of such activity.

2.3 These objectives were to be achieved by undertaking selected detailed magnetometer survey at all the sites that might be impacted by the flood alleviation works. Detailed survey employs the use of a sample trigger to automatically take readings at predetermined points, typically at 0.25m intervals, on traverses 1m apart. These readings are stored in the memory of the instrument and are later downloaded to computer for processing and interpretation. Further details are given in Appendix 1. Detailed survey allows the visualisation of weaker anomalies that may not have been identifiable by less rigorous evaluation techniques such as magnetic scanning or magnetic susceptibility survey.

2.4 A Bartington Grad601 magnetic gradiometer was used during the survey with readings being taken at 0.25m intervals on zig-zag traverses 1m apart within 20m by 20m grids. The readings were stored in the memory of the instrument and later downloaded to computer for processing and interpretation using Geoplot 3 software.

2.5 The survey methodology, report and any recommendations comply with guidelines outlined by English Heritage (David 1995) and by the IFA (Gaffney, Gater and Ovenden 2002). All figures reproduced from Ordnance Survey mapping are done so with the permission of the controller of Her Majesty's Stationery Office. © Crown copyright.

2.6 A general site location plan, incorporating the 1:50000 Ordnance Survey mapping, is shown in Figure 1. Figure 2 shows the processed magnetometer data superimposed onto a digital map base at a scale of 1:4000. The processed (greyscale) and unprocessed (XY trace plot) data, together with accompanying interpretation diagrams, are presented in Figures 3 to 23 inclusive at a scale of 1:1000 and 1:2000.

2.7 Technical information on the equipment used, data processing and magnetic survey methodology is given in Appendix 1. Appendix 2 details the survey location information and Appendix 3 describes the composition and location of the site archive.

The figures in this report have been produced following analysis of the data in 'raw' and processed formats and over a range of different display levels. All figures are presented to most suitably display and interpret the data from this site based on the experience and knowledge of Archaeological Services staff.

3. Results

3.1 General

3.1.1 Isolated dipolar anomalies ('iron spikes' - see Appendix 1) have been identified in all survey areas. These 'iron spike' anomalies are caused by ferrous objects or other magnetic material on the ground surface or contained within the upper soil horizons. Although archaeological artefacts may cause these anomalies they are more often caused by modern cultural debris that has been introduced into the topsoil usually as a consequence of manuring,

especially in fields that have been under an arable regime for a considerable period of time. There is no apparent clustering to these responses and consequently they are not thought to be of any archaeological significance.

3.2 Block 1 (Figs 3, 4 and 5)

3.2.1 Three curvilinear anomalies where the magnetic readings are above or below the magnetic background have been identified in this block. However, none of these anomalies is interpreted as having an underlying archaeological cause.

3.2.2 From the figures it can be seen that the anomaly at the northern edge of the survey area correlates with the line of an educational and ward boundary. It would seem likely that this line was formalised along the line of an existing physical boundary, either a land division or perhaps, more probably given the curving nature of the boundary, a former stream course or river meander.

3.2.3 At the eastern edge of the block a negative curvilinear anomaly can be seen. This anomaly is also thought to be due to a topographical feature or boundary and may mark the extent of material deposited following flooding or perhaps result from subsidence from a former riverbank.

3.2.4 The much broader, weak central area of magnetic enhancement is also considered to have a geological origin being due probably due to the deposition of alluvium following a period of inundation or by other localised variations in the composition of the topsoil.

3.2.5 A small discrete area of magnetic enhancement has also been identified towards the western edge of the block. Whilst an infilled feature such as a pit could cause this anomaly, in the absence of any other archaeological evidence, it is considered equally likely that the anomaly could be due to a localised pocket of magnetic gravel.

3.3 Block 2 (Figs 6, 7 and 8)

3.3.1 This block can be divided into three distinct areas. To the north-east the land is much lower than the rest of the block being on the flood plain of the River Laver. The central area is slightly higher and is off the flood plain. Several electric fences split this area into a series of horse paddocks; a drilling rig prevented survey over part of this block. To the south of a small copse the remainder of this block was located in an arable field.

3.3.2 In the northern section the data is characterised by a plethora of discrete, strongly magnetic anomalies that give the data from this part of the block a speckled appearance. There is no obvious pattern or clustering to the anomalies that cover almost all of this part of the part of the block and no visible explanation for the observed responses. Consequently it is thought that these anomalies have a geological cause being due to magnetic pebbles or gravels mixed in with the alluvium present on the flood plain; it is noticeable that these type of anomalies are absent from the data from the higher ground to the south-west.

3.3.3 A dipolar, linear anomaly running from north-east to south-west runs through the central part of this block and is also identified in Block 3 to the south-west. This anomaly is caused by a ferrous pipe leading to the covered reservoirs located south-west of Block 3a (see Fig. 10). The magnetic effect of this pipe partially masks a linear anomaly that runs from north-east to south-west. This

anomaly could be due to an infilled archaeological ditch although a modern field boundary ditch could also explain this anomaly. Two isolated pit type anomalies have also been noted. Again a geological interpretation is considered equally valid.

3.4 Block 3 (Figs 9 to 18 inclusive)

3.4.1 Numerous linear trend anomalies have been identified on various alignments within this block. These anomalies are caused by recent ploughing regimes.

3.4.2 The two areas of magnetic disturbance in the east of the block (one in 3B and one in 3C) are caused by borehole pipes and inspection covers. Fences on field boundaries and magnetic material that has built up around these boundaries cause the rest of the magnetic disturbance.

3.4.3 Several broad areas of magnetic enhancement have been identified throughout the block most noticeably in 3C, where these anomalies are interpreted as having a geological origin being caused by the accumulation of soil (colluvium) along the base of a slope. The more extensive curvilinear areas of enhancement identified in 3A are not explained by topographic variation but are also thought to be due to change in the composition of the topsoil.

3.2.3 Strong positive anomalies caused by the infilled ditches of an enclosure are present immediately to the north-west of the ferrous pipe that bisects Block 3A. The enclosure is D-shaped having what appears to be an entrance on the south-east side and several positive discrete anomalies within the enclosure are indicative of other archaeological features such as pits or areas of burning. Three discrete anomalies areas noted immediately outside the enclosure to the south-east might also be archaeological in nature.

3.4.4 A cluster of seven discrete anomalies that form an apparent right angle adjacent to two discontinuous, linear anomalies have been identified in 3B which might be indicative of archaeological features. However, it is difficult to confidently interpret these anomalies due to their relatively weak and fragmented nature.

3.5 Block 4 (Figs 19 to 23 inclusive)

3.5.1 As in Block 3 linear trend anomalies have been located throughout the block on various alignments. With the exception of a much stronger anomaly parallel with the north-west edge of the block that is interpreted as a former boundary all these anomalies are interpreted as having an agricultural origin being caused by ploughing or field drains, the latter being located in the southern corner of 4B. Two intersecting ferrous pipes have also been located in 4A.

3.5.2 Broad, sinuous areas of magnetic enhancement indicative of a geological or geopmorphological origin are also again in evidence. These anomalies are thought to locate former river courses or to mark areas of deposition following flooding.

3.5.3 Interestingly rectilinear anomalies have been identified adjacent to, and in one case respecting the edge of, the two most extensive geological anomalies adding credence to the interpretation that these geological anomalies are more likely to be caused by old river or stream courses. Both of these rectilinear anomalies, interpreted as some form of land division or partial open-ended enclosure, are on the same basic north-west to south-east alignment. In both

cases there is no anomaly to the north-west side to suggest a total enclosure although there is a possible entrance on the south-eastern side of the Enclosure A.

3.5.4 In the south-western corner of 4A a weak curvilinear anomaly might be further evidence for another, much smaller, enclosure. Another curving anomaly to the east of the possible enclosure might also be indicative of archaeological activity.

4. Discussions and Conclusions

4.1 The geophysical surveys carried out adjacent to the River Laver have identified numerous magnetic anomalies. Many of these anomalies reflect recent agricultural activity (ploughing and drainage), whilst others have a geological origin being caused either by deposition resulting from flooding, the accumulation of material at the base of slopes, the silting up of former meanders or the presence of magnetic river cobbles or river gravels.

4.2 In addition several anomalies of archaeological potential have been identified. Three probable 'enclosures' have been identified although in each case only three sides are detectable as magnetic anomalies. Of particular interest are the two 'enclosures' in Block B that would appear to have been deliberately positioned adjacent to the interpreted river meander. There is possible evidence for occupational activity in the 'enclosure' in Block 3 attested by the discrete anomalies inside the 'enclosure'. Other less coherent anomalies in Block 3 are also considered to have archaeological potential although the discontinuous nature of some of these anomalies suggests there may be a degree of truncation due to plough damage.

4.3 In conclusion it is considered that, on the basis of the geophysical surveys, the site of the dam and of the area (Block 1) mooted as the possible location for granular infill have a low archaeological potential. However, in the two fields identified as the possible locations for a borrow pit anomalies have been identified that indicate archaeological activity. If either of these areas is selected as the location for the borrow pit further archaeological work may be required to more fully evaluate the extent of the archaeological activity revealed to date.

The results and subsequent interpretation of data from geophysical surveys should not be treated as an absolute representation of the underlying archaeological and non-archaeological remains. Confirmation of the presence or absence of archaeological remains can only be achieved by direct investigation of sub-surface deposits.

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Acknowledgements

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Appendices