

**Temple Park, Woodhouse Way,
Nuthall, Nottingham**

Report on Archaeological Geophysical Survey 2013

Survey commissioned by:

**Oxford Archaeology East
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on behalf of:

WSP Group plc

Report by:

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Introduction

This report describes the results from a geophysical survey which is to form part of an archaeological field evaluation of a proposed development site adjacent to Junction 26 of the M1 at Nuthall on the north western edge of Nottingham.

The survey was commissioned from Bartlett Clark Consultancy, Specialists in Archaeogeophysics of Oxford, by Oxford Archaeology East on behalf of WSP Group plc. Fieldwork for the survey was done between 29 January and 1 February 2013. Data plots showing the survey findings were subsequently supplied to Oxford Archaeology, and are now included in this report.

The Site

The following notes are adapted in part from the background information included in the Method Statement for the project, as submitted to Oxford Archaeology by Bartlett Clark Consultancy on 17 January 2013.

Geology and topography

The site is an area of pasture and arable farmland centred at NGR SK 514435. It is located alongside the motorway to the south and east of J26, as indicated on figure 1. The evaluation area covers a total of 32.4ha, but includes an area of woodland which is unsuitable for a magnetometer survey. Substantially complete coverage was achieved from the remainder of the site, which amounts to 30.1ha.

The site is on a bedrock of Permian limestone, with Carboniferous mudstone immediately to the west, and appears to be free of drift deposits. These conditions should not present any particular difficulties for a magnetometer survey, although we are told the bedrock is generally at a depth of between 0.5 and 1.5m. The presence of shallow bedrock could mean that the depth of detectable fill in ditches or other cut features is limited, but this does not appear to have weakened the response from the cropmark enclosure, as mentioned below.

Archaeological background

The site contains at least one cropmark enclosure, which is visible on Google earth towards the southern end of the site, as notified to us by Oxford Archaeology.

The site is also reported to contain a number of former mineshafts described as perhaps between 1m and 3m in diameter, and backfilled with rubble or stone. The suspected

locations of the shafts are marked (as coloured circles) on the map extract shown inset in figure 8. [This map is reproduced from a site plan (figure 5) supplied to Oxford Archaeology by WSP.] Shaft locations which lie within the survey area have been marked (as blue and green circles) for comparison with the survey findings on the data plots and interpretative plans (figures 4-9).

We would expect there usually to be a scatter of magnetically detectable debris in the vicinity of any former structure or mine workings but, in the event, this appears not to be the case, as commented on below. The detectability of mineshafts themselves will depend on the composition of the filling and the depth and nature of any overburden. Shafts containing brick rubble or ferrous debris should be detectable, but a stone or earth filling might be less clearly distinguishable from surrounding disturbances.

Survey Procedure

The site was investigated by means of a recorded magnetometer survey. Readings were collected along transects 1m apart using Bartington 1m fluxgate gradiometers, and are plotted at 25cm intervals along each transect. The results of the survey are presented at 1:2000 scale as a grey scale plot (figures 2-3), and as graphical (x-y trace) plots at 1:1250 (figures 4-7). Comparison of these alternative presentations allows the detected magnetic anomalies to be examined in plan and profile respectively. An interpretation of the findings is shown superimposed on figures 4-7 (which permits the interpreted outlines to be compared with the underlying data), and is reproduced separately to provide a summary of the findings (figures 8-9).

The graphical plots show the magnetometer readings after minimal pre-processing which includes adjustment for irregularities in line spacing caused by variations in the instrument zero setting, and slight linear smoothing. Additional 2D low pass filtering has been applied to the grey scale plots to reduce background noise levels.

Colour coding has been used in the interpretation to distinguish different effects. The interpretation is intended to be schematic and illustrative, and not to reproduce the detail of the grey scale plots.

Magnetic anomalies of potential archaeological interest are outlined in red, and stronger (perhaps recent) disturbances are in brown. Cultivation markings are indicated schematically in green. (The lines as drawn indicate the orientation of cultivation effects, and do not represent all the lines visible in the grey scale plots.) A weak, and possibly natural, linear marking is shown in light green (K), and possible former tracks or boundaries in light brown. Some of the more conspicuous ferrous objects (identifiable as narrow spikes in the graphical plots) are outlined in light blue, and industrial debris in grey.

Survey location

The survey grid was set out and tied to the OS grid using a differential GPS system. The plans are therefore geo-referenced, and OS co-ordinates of map locations can be read from the AutoCAD version of the plans, which can be supplied with this report.

Results

The four fields which have been investigated are labelled A-D in figures 1 and 8-9 (as is the case also in a site plan supplied by WSP). We comment on the findings below by fields in the order as labelled.

The survey has detected a variety of subsurface features and disturbances, some of which are clearly of archaeological significance. These appear to be located mainly in the southern part of the site, where the previously identified cropmark enclosure was detected, together with other features nearby. Findings elsewhere include cultivation effects, mining spoil, and other more recent disturbances. Magnetic susceptibility values taken during the survey confirm that conditions at the site should be favourable for a magnetometer survey, as is indicated also by the strength of response to the cropmark, and to the cultivation effects in the arable fields B and D. High susceptibility readings were obtained, both from the pasture field A (70×10^{-5} SI), and the arable land elsewhere ($140-200 \times 10^{-5}$ SI). These readings suggest that features containing a silted earth fill should usually be detectable, but also that minor or superficial displacements of the topsoil might give rise to observable magnetic anomalies.

Field A

This pasture field contains the site of a former colliery spoil mound, as is indicated by black cross hatching on the mineshaft plan inset in figure 8, together with a nearby mineshaft. Numerous items of modern debris could be seen on the ground surface.

Findings include a broad parallel cultivation pattern, which is stronger towards the north of the field. This is visible in the grey scale plot, and indicated in part by green lines in the interpretation. The linear markings could perhaps represent traces of ridge and furrow.

The field boundary curves around an area of concentrated magnetic disturbances corresponding to the site of a former colliery spoil tip (at A as labelled in figure 8). The strength of the magnetic response here suggests the tip could contain brick rubble or other debris (or that the spoil includes excavated metamorphic rock). Trackways composed of similar material extend to each side of the field from A. Weak linear markings (visible in the grey scale plot) suggest there could have been a further track (free of magnetic debris) extending from the spoil heap to the NW corner of the field (B).

No specifically archaeological features are clearly identifiable in field A, but there is a possible irregular ditch-like feature at C. This could perhaps indicate a former northward continuation of the adjacent boundary between fields A and B.

Field A contains only one recorded mineshaft at a location near the spoil heap. There are various other groups and clusters of strong magnetic anomalies of a kind which could result from the presence of rubble, or ferrous and other debris, packed into a narrow shaft. Several of these (as indicated by areas of blue cross hatching) lie within a scatter of other disturbances towards the north of the field at D. Other such features are similarly marked elsewhere in the field. It cannot be confirmed from the survey findings that these disturbances represent mineshafts rather than other (perhaps recent) debris, but these

locations could perhaps be examined again if there is a need to test further for the presence of mineshafts.

Field B

Findings here include a well-defined group of ditched enclosures of clear archaeological significance across the southern part of the field. The strongest is a rectilinear enclosure at E. This corresponds to the cropmark, but there are others (not visible as cropmarks) extending to the west. Groups of pit-like magnetic anomalies (outlined in red) at E, and around F, suggest the presence of occupation remains within the enclosures.

Curving linear features could represent a ditched trackway at G. This is stronger than other more recent possible boundaries and trackways (as at B, J), and so could be an archaeological feature. The archaeological enclosures are intersected by linear markings at H. These are broader and weaker than at G, and could perhaps be a relatively insubstantial former hedge line or track. Other weak linear markings could indicate a former E-W hedge towards the north of the field at J. A further weak irregular linear feature at K could be a natural or topographic effect.

The narrow linear N-S cultivation pattern which is visible in fields B and D aligns with present boundaries, and so is likely to result from modern ploughing. Linear disturbances corresponding to ploughing headlands are visible at several locations alongside field boundaries.

A number of former mineshafts are recorded in field B, but none are at locations where the survey shows any evidence of ground disturbance. It could be the case that a narrow shaft filled only with stone and clean topsoil taken from the immediate surroundings would not contain any magnetically contrasting fill, and so would not be detected in the survey, but the mine workings, if so, must have given rise to only minimal ground disturbances in comparison with the archaeological and agricultural activities at the site. An alternative possibility is that the mineshafts are at other locations, as suggested also in field A. Two further magnetic anomalies of a kind which could indicate debris within or near to a former shaft are marked (in blue) in field B. The most distinct of these is towards the east of the field at L. Individual and isolated pit-like magnetic anomalies (as outlined in red at M) could also perhaps indicate pits 1-2m in diameter, but these appear to contain earth rather than rubble fill, and are not associated with other nearby disturbances.

Field C

A dense scatter of strong and probably recent magnetic anomalies covers the entire field, and obscures any other findings. The position of this field next to the M1 junction suggests it could have been used as a construction yard or camp when the road was built.

Field D

Findings here include narrow (and probably recent) cultivation effects, as in field B, together with ploughing headlands parallel to the north and east boundaries. There is also a possible rectilinear feature (N), which could be a further ditched enclosure, as in field B. It aligns in part with other parallel linear markings (O), which could perhaps be traces of an

earlier cultivation pattern beneath the recent ploughing.

Conclusions

The main archaeological finding is a sequence of ditched enclosures across the southern end of field B. These may contain occupation remains suggesting a late prehistoric or Romano-British settlement site. There could be another less well-defined enclosure in field D, but potential archaeological findings elsewhere are limited to isolated pits (as at M).

There appear to be distinct traces of ridge and furrow in field A, and perhaps (more doubtfully) in field D. There was a strong response to the colliery spoil heap and associated trackways in field A, but there are no magnetic disturbances to suggest the presence of similar disturbances in the vicinity of the recorded mineshafts. Various magnetic anomalies which could represent shafts filled with rubble or debris are indicated in the interpretation, but their significance cannot be confirmed from the survey evidence alone. Strong disturbances in field C suggest it was used as a motorway construction site.

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The fieldwork for this survey was done by C. Oatley, N. Paveley and P. Heykoop.

**Nuthall, Nottingham: Geophysical Survey
Appendix : Inventory of Selected Findings**

This list notes the more significant findings from the magnetometer survey of this site. The grading (1-4) given alongside each entry refers in part to the reliability of the geophysical evidence, but the potential archaeological relevance of detected features is also taken into account. Magnetic disturbances which may be mentioned in the text or indicated on plans are not necessarily included if they appear to be of clearly natural or non-archaeological origin. [Magnetic disturbances associated with coal mining activities at the Nuthall site are listed here as non-archaeological.]

- Grade 1: Distinct magnetic anomalies of probable archaeological origin.
- Grade 2: Weaker or more isolated magnetic anomalies which could in part be archaeologically significant.
- Grade 3: Distinct magnetic anomalies, but probably recent or natural, or of other non-archaeological origin.
- Grade 4: Weaker or more isolated magnetic anomalies of probably non-archaeological origin.

Field	Feature		Grade
A		Broad parallel linear markings could indicate former ridge and furrow, particularly in northern part of field.	1-2
A	A	Strong magnetic disturbances at site of colliery spoil heap, and along trackways to east and west.	3
A	B	Weak linear markings suggest former track from A to NW corner of field.	4
A	C	Ditch like feature: perhaps a former continuation of nearby field boundary.	3
A	D	Group of magnetic disturbances perhaps indicating a spread of colliery spoil or debris (as at A), and containing strong individual magnetic anomalies which (if not recent or superficial) could possibly represent accumulations of debris within former mineshafts.	3
B	E	Ditched enclosure (with internal pits) corresponding to cropmark.	1
B	F	Possible occupation features within additional enclosures.	1
B	G	Curving ditched trackway, perhaps associated with archaeological features.	1
B	H, J	Weak linear markings perhaps indicating former field boundaries (hedge lines or trackways).	3-4
B	K	Irregular linear marking; perhaps topographic or natural.	4

B	L	Example of strong magnetic disturbances of a kind which could represent debris within a former mineshaft (as at D).	3
B	M	Isolated pit-like features.	2
D	N	Possible ditched enclosure (but aligns in part with possible cultivation effects at O).	2
D	O	Linear markings could indicate traces of ridge and furrow beneath recent ploughing.	2