Archaeological Services
University of Durham

Land at Hob Moor, York

geophysical survey

for
On-Site Archaeology

on behalf of
Friends of Hob Moor

Report 1823
February 2008

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25A Milton Street, York YO10 3EP

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Contents

1. Summary

The project

1.1 This report presents the results of a geophysical survey conducted on land at Hob Moor in York. The works comprised geomagnetic survey of the north-eastern part of the moor, an ancient common.

1.2 The works were commissioned by On-Site Archaeology on behalf of the Friends of Hob Moor and conducted by Archaeological Services in accordance with instructions provided by On-Site Archaeology.

Results

1.3 All the anomalies detected in the survey almost certainly reflect ferrous and/or fired materials, some incorporated within a man-made bank and others comprising near-surface litter.

1.4 No evidence for the former mill was identified in the survey. Concentrations of intense anomalies in the north-eastern part of the survey could possibly mask the presence of weaker anomalies associated with mill remains, or indeed the mill could lie outside the surveyed area, under existing gardens or to the south between the survey area and the railway line.

Recommendations

1.5 A different geophysical technique, electrical resistance survey, could prove useful for locating any mill remains in this area (if stone footings survive) since it is not adversely affected by the presence of ferrous materials in the soil and any stone features will typically produce clear high resistance anomalies.

1.6 Further investigation by means of trial trenching would almost certainly confirm the nature of the anomalies detected in this survey and could also be used in areas where survey was either impracticable or the data inconclusive.

2. Project background

Location (Figure 1)

2.1 Hob Moor is located between the Acomb, Holgate and Dringhouses areas of the City of York. The survey area, known as the 'Triangle', occupies the north-eastern corner of Hob Moor at NGR: SE 5865 5065 and is bounded by a residential estate and the East Coast Main Line to the north and east, and the larger part of Hob Moor to the south and west.

Objective

2.2 The Friends of Hob Moor (FOHM) commissioned this geomagnetic survey through On-Site Archaeology in order to further research the history of Hob Moor, an ancient common, and specifically to try to establish the location of a 16th-century watermill in this part of the common.

2.3 The broader objective of the survey was to assess the nature and extent of any sub-surface features of potential archaeological significance within this part of Hob Moor, so that an informed decision could be made regarding the nature and scope of any further scheme of archaeological works that the Friends might initiate.

Methods statement

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

Dates

2.5 Fieldwork was undertaken on the 31st January 2008. This report was prepared between 1st and 15th February 2008.

Personnel

2.6 Fieldwork was conducted by Duncan Hale and Lorne Elliott. This report was prepared by Duncan Hale, the Project Manager, with illustrations by David Graham and Janine Wilson.

Archive/OASIS

2.7 The site code is **YHM08,** for **Y**ork **H**ob **M**oor 20**08**. The survey archive will be supplied on CD to On-Site Archaeology 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 **archaeol3-37981**.

Acknowledgements

2.8 Archaeological Services is grateful for the assistance of the Friends of Hob Moor and Dr Jon Kenny, Community Archaeologist, in facilitating this scheme of works.

3. Archaeological and historical background

3.1 The following information is from the Friends of Hob Moor website, where more detailed information can be found: http://www.friendsofhobmoor.org.uk/History

3.2 During the visitations of the plague in the 16th and 17th centuries, victims were brought from the city and housed in wooden lodges on Hob Moor. They would pay for food brought out to them by placing money in water or vinegar in the central depression in the Plague Stone. Beside the Plague Stone is the Hob Stone, an effigy of a knight of the de Roos family sculpted in about 1315.

3.3 There is documentary evidence from 1563 for a watermill, later called Folly Mill, in the north-east corner of Hob Moor (the current survey area), and the beck and drain in that area may be part of the water management associated with the mill. This land parcel was incorporated into Hob Moor in 1826.

3.4 Hob Moor is an Area of Archaeological Importance. Existing features on the moor (though not apparent within the Triangle) include:

- medieval ridge and furrow
- narrow ridge and furrow dating from the Napoleonic Wars (early 1800s)
- the line of the former city boundary
- greens and bunkers remaining from the golf course (1920-1946)
- an old causeway, part of a path leading across the fields outside the city towards the Minster, which can be clearly seen from Hob Moor

4. Landuse, topography and geology

4.1 At the time of survey the Triangle comprised raised sandy heath bounded by a drain and stream. Dense bramble and other vegetation, together with hawthorn scrub, trees and steep banks prevented data collection in some places. Hob Moor, the majority of which is unimproved pasture, was declared a Local Nature Reserve in 2003. Cattle graze on the main expanse of the moor from May to October each year.

4.2 The study area was uneven, with elevations between 10-15m OD, but with a broadly level area in its central part.

4.3 The underlying solid geology of the area comprises Permian and Triassic strata of the Sherwood Sandstone Group, which are overlain by Devensian glaciolacustrine and glaciofluvial deposits.

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 2nd edition* (David forthcoming); 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 survey enables the relatively rapid and non-invasive identification of sub-surface features of potential archaeological significance and can involve a variety of complementary techniques such as magnetometry, earth electrical resistance, 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 previous research, it was considered likely that cut and built features such as ditches and wall-footings might be present on the site, and that other types of feature such as trackways, pits 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 the types of feature mentioned above. This technique involves the use of hand-held magnetometers to detect and record 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 A 30m grid was established across the survey area and tied-in to known, mapped Ordnance Survey points using a Trimble Pathfinder Pro XRS global positioning system (GPS) with real-time correction providing sub-metre accuracy.

5.6 Measurements of vertical geomagnetic field gradient were determined using a Bartington Grad601-2 dual fluxgate gradiometer. 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 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 a continuous tone greyscale image of the raw (unfiltered) data. The greyscale image and interpretations are presented in Figures 2-4. 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 data:

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 iron spikes in gradiometer data
interpolate	increases the number of data points in a survey to match sample and traverse intervals. In this instance the data have been interpolated to 0.25m x 0.25m intervals

Interpretation: anomaly types

5.10 A colour-coded geophysical interpretation plan is provided in Figure 3. One type of geomagnetic anomaly has been distinguished in the data:

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 A colour-coded feature interpretation plan is provided in Figure 4.

5.12 The only geomagnetic anomalies detected here are intense dipolar magnetic anomalies of various sizes. Three of the largest anomalies, all in the central part of the Triangle, almost certainly reflect ferrous materials, with anomaly values in excess of ±3000nT (archaeological soil-filled ditches and stone wall footings are typically in the range ±5nT). The central anomaly corresponds to the former location of a dumped bedstead (pers. comm. Liz Smith of FOHM) and almost certainly reflects the remains of steel springs and other bed parts.

5.13 The majority of anomalies detected comprise small, discrete dipolar magnetic anomalies. These almost certainly reflect items of near-surface ferrous and/or fired debris, for example clinker, horseshoes and brick fragments, and in most cases have little or no archaeological significance. Some of these anomalies are in concentrations with one such concentration corresponding to a man-made bank noted in the field. The bank runs along the eastern side of Holgate Beck, which appears to have been canalised here; a drain along the eastern side of the

Triangle was probably the original course of the beck, perhaps at the time of the watermill.

5.14 Between 1920 and 1946, Hob Moor was used as a golf course belonging to the North Eastern Railway Institute. A plan of the course in 1935 shows a green and bunkers for the 14th hole at the northern limit of the current survey area, though it has not been possible to identify anomalies specifically related to these features. The tee for the 15th hole appears to have been located on the bank adjacent to Holgate Beck, though again is has not been possible to distinguish this amongst the concentration of intense anomalies detected there.

6. Discussion and recommendations

6.1 It has not been possible to identify features associated with a former mill in the current survey area. If the mill was stone-built then some footings might be expected to survive in situ, giving rise to negative magnetic anomalies, however, if it was a timber construction its remains would be more difficult to detect. Concentrations of small intense dipolar magnetic anomalies in the north-eastern part of the survey could possibly mask the presence the weaker anomalies reflecting remains associated with the mill, or indeed any remains of the mill could lie outside the surveyed area, under existing gardens or to the south between the survey area and the railway line.

6.2 Another geophysical technique, earth electrical resistance survey, could prove useful for locating any mill remains in this area (if stone footings survive) since it is not adversely affected by the presence of ferrous materials in the soil and any stone features will produce clear high resistance anomalies.

6.3 Further investigation by means of trial trenching would almost certainly confirm the nature of the anomalies detected in this survey and could also be used in areas where survey was either impracticable or the data inconclusive.

7. Sources

David, A, forthcoming *Geophysical survey in archaeological field evaluation, 2nd edition,* Research and Professional Services Guideline **1**, English Heritage

Friends of Hob Moor 2008 (website) http://www.friendsofhobmoor.org.uk

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

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Figure 1
Location of the survey area

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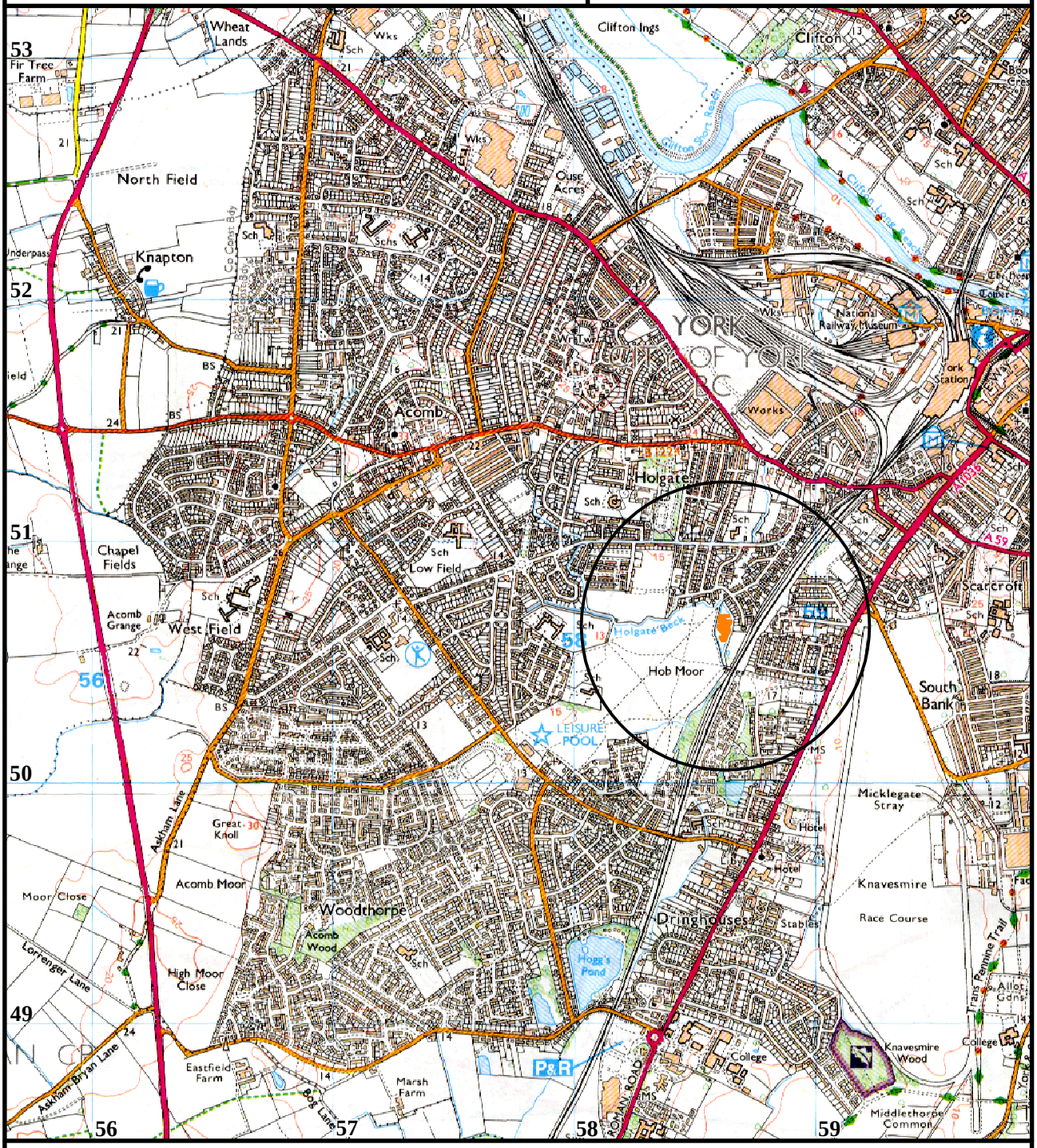

survey area

0 1km

scale 1:25 000 - for A4 plot

507

Micklegate Stray

30

Drain

Path (um)

506

586

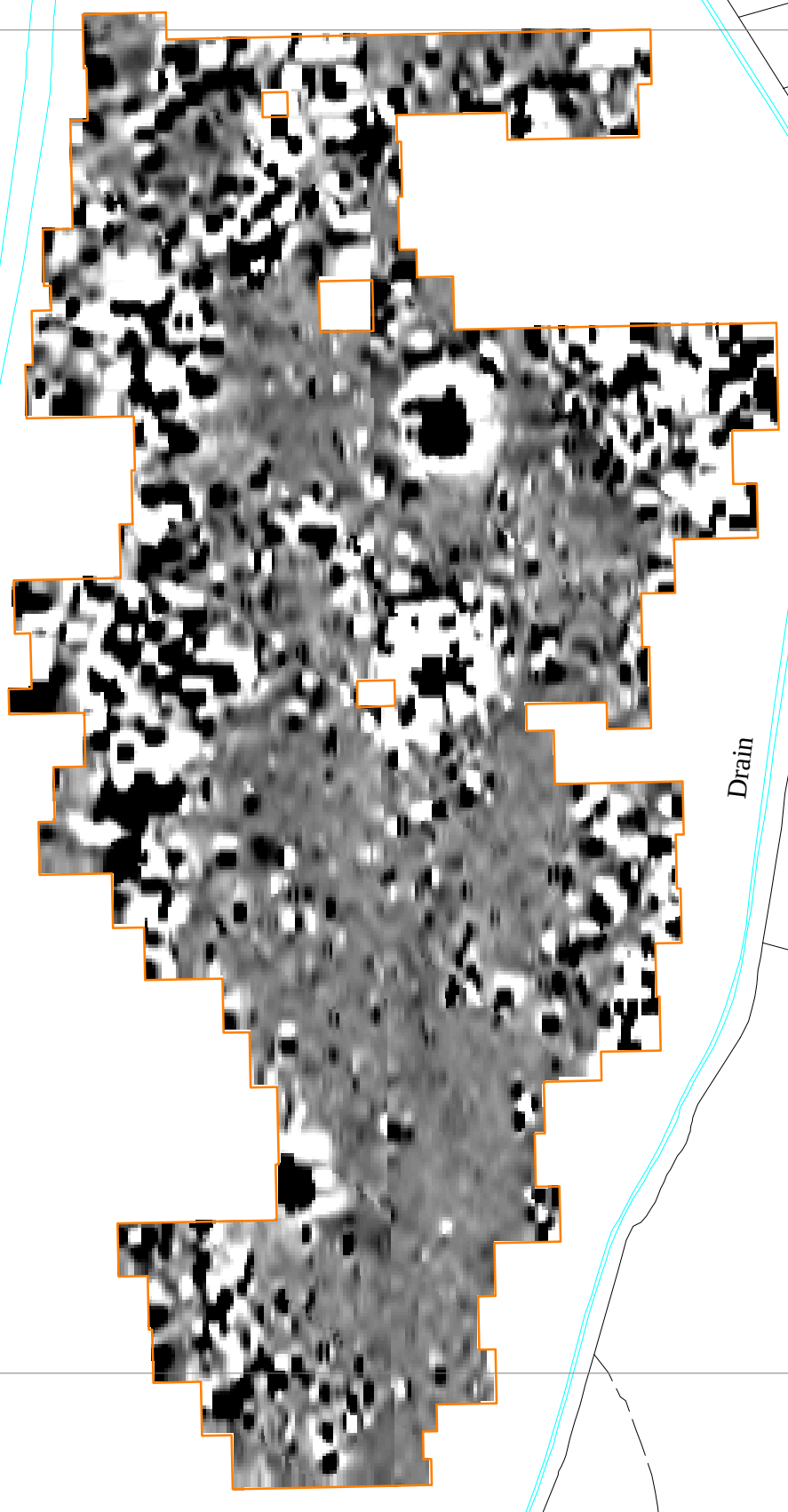

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Figure 2

Geophysical survey

for
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0 25m

scale 1:500 - for A3 plot

outline of survey area

8.00
6.67
5.33
4.00
2.67
1.33
0
-1.33
-1.66
-4.00
-5.33
-6.67
-8.00 nT

507

Micklegate Stray

30

Drain

Path (um)

506

586

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Figure 3

Geophysical interpretation

for
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0 25m

scale 1:500 - for A3 plot

outline of survey area

dipolar magnetic anomalies

507

Micklegate Stray

30

Drain

Path (um)

506

586

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Figure 4

Feature interpretation

for
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0 25m

scale 1:500 - for A3 plot

outline of survey area

bank

ferrous/fired materials