

**ARCHAEOLOGICAL EVALUATION REPORT:
GEOPHYSICAL SURVEY BY MAGNETOMETRY
ON LAND AT PROPOSED SCROGGY WELLSITE, NEAR STONEGRAVE, NORTH YORKSHIRE**

Planning Reference: Pre-Planning
Oasis ID: allenarc1-158734
NGR: TA 0142 7394
AAL Site Code: HOVI 13



Report prepared for Viking UK Gas Limited

By
Allen Archaeology Limited
Report Number 2013109

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Allenarchaeology



Contents

Executive Summary	1
1.0 Introduction	2
2.0 Site Location and Description	2
3.0 Planning Background	2
4.0 Archaeological and Historical Background	3
5.0 Methodology	3
5.1 Summary of Survey Parameters	3
5.2 Data Collection and Processing	4
6.0 Magnetometer Survey Results	5
7.0 Discussion and Conclusions	5
8.0 Effectiveness of Methodology	5
9.0 Acknowledgements	5
10.0 References	6

List of Figures

- Figure 1:** Site location outlined in red
Figure 2: Map showing the location of the site
Figure 3: Greyscale raw data and processed trace plot
Figure 4: Processed greyscale plot and interpretation
Figure 5: Processed greyscale plot located in real space
Figure 6: Interpretative plot in real space

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Cover image: View of site taken from the northeast corner looking southwest

Executive Summary

- Allen Archaeology Limited was commissioned by Viking UK Gas Limited to undertake a geophysical survey by magnetometry for the proposed Scroggy Well site, near Stonegrave, North Yorkshire in order to inform a planning application for proposed exploratory petroleum drilling.
- The geophysical survey revealed no evidence for significant archaeological features. Scattered randomly throughout the site are a number of strong and weak dipolar responses. The characteristic dipole response of pairs of positive and negative 'spikes' suggests near-surface ferrous metal or other highly fired material.

1.0 Introduction

- 1.1 Allen Archaeology Limited was commissioned by Viking UK Gas to undertake a geophysical survey by magnetometry on the proposed Scroggy Well site, near Stonegrave, North Yorkshire to inform a planning application for an exploratory well site.
- 1.2 The site works and reporting conform to current national guidelines, as set out in '*Geophysical Survey in Archaeological Field Evaluation*' (English Heritage 2008), '*The Use of Geophysical Techniques in Archaeological Evaluations*' (IFA Paper 6) and the Institute for Archaeologists '*Standard and guidance for archaeological geophysical survey*' (IfA 2011). A specification for the works was also adhered to (AAL 2013a).
- 1.3 The site is archaeologically sensitive, lying in an area of archaeological interest and potential.

2.0 Site Location and Description (Figures 1 and 2)

- 2.1 The proposed well site (hereafter referred to as 'the site') is located within the parish of Stonegrave, in the administrative district of Ryedale District Council, approximately 27km north-northeast of central York and 13km northwest of Malton (Figure 1). The site is located 1.6km east of Stonegrave and is centred on NGR SE 6734 7752. The site comprises a rectangular block of land of c.1 hectares and access road of c. 30m length (Figure 2).
- 2.2 The bedrock geology comprises Amphill Clay Formation and Kimmeridge Clay Formation (Undifferentiated) Mudstone, with overlying superficial deposits of Sand and Gravel of Uncertain Age and Origin recorded (<http://mapapps.bgs.ac.uk/geologyofbritain/home.html>). The site is flat, lying at a height of c.30m above Ordnance Datum.

3.0 Planning Background

- 3.1 A planning application will shortly be submitted for the construction for the drilling of up to two petroleum exploration boreholes followed by the subsequent testing of the supply. During pre-planning consultation, the Development Management Archaeologist at North Yorkshire County Council advised for a scheme of archaeological evaluation, and the first stage of these investigations is a non-intrusive geophysical survey.
- 3.2 The purpose of the current works is to provide detailed information that will aid the determination of the nature and extent of the potential archaeological resource within the proposed development area. The information from the geophysical survey will be used by the Development Management Archaeologist at North Yorkshire County Council to make an informed decision as to whether further archaeological investigations will be required for the proposed development.
- 3.3 The approach adopted is consistent with the guidelines that are set out in the National Planning Policy Framework (Department for Communities and Local Government 2012).

4.0 Archaeological and Historical Background

- 4.1 A desk-based assessment detailing the archaeological setting of the site has been prepared (AAL 2013b), the results of which are summarised below.
- 4.2 There is evidence for extensive prehistoric activity within the vicinity of the site. Cropmark evidence for prehistoric activity has been identified on Caulkleys Bank to the north of the development site and also to the southwest. The density of prehistoric evidence in the search area indicates there was the potential for previously unknown prehistoric remains to be found on the site.
- 4.3 There is no recorded evidence for significant activity from other periods. Medieval ridge and furrow is recorded from aerial photographs although no trace remains of this on the ground.

5.0 Methodology

- 5.0.1 The geophysical survey consisted of a detailed gradiometer survey of the footprint of the development including the access track. This totalled 1.2ha.
- 5.0.2 The fieldwork was carried out by a team of two experienced geophysicists from AAL over a period of one working day, Wednesday 4th September 2013. The site was divided into 30m by 30m grids, established on site with reference to local fixed boundaries and accurately tied into the National Grid with Ordnance Survey base mapping using a Leica GS08 Netover receiving RTK corrections.
- 5.0.3 The survey was undertaken using a Bartington Grad601-2 Dual Fluxgate Gradiometer with an onboard automatic DL601 data logger. This instrument is a highly stable magnetometer which utilises two vertically aligned fluxgates, one positioned 1m above the other. This arrangement is then duplicated and separated by a 1m cross bar. The 1m vertical spacing of the fluxgates provides for deeper anomaly detection capabilities than 0.5m spaced fluxgates. The dual arrangement allows for rapid assessment of the archaeological potential of the site. Data storage from the two fluxgate pairs is automatically combined into one file and stored using the onboard data logger.
- 5.0.4 Data collection was undertaken in a zigzag traverse pattern, using a sample interval of 0.25m and a traverse interval of 1m.

5.1 Summary of Survey Parameters

5.1.1 Fluxgate Magnetometer

Instrument:	Bartington Grad601-2 Dual Fluxgate Gradiometer
Sample interval:	0.25m
Traverse interval:	1.00m
Traverse separation:	1.00m
Traverse method:	Zigzag
Resolution:	0.1 nT
Processing software:	Terrasurveyor 3.0.22.1
Surface conditions:	Recently harvested crops

Area surveyed:	1.2 ha
Date surveyed:	Wednesday 4 th September 2013
Surveyor:	Edward Oakley
Survey assistants:	Bill Baker
Data interpretation:	Edward Oakley

5.2 Data Collection and Processing

5.2.1 The grids were marked out using a Leica GS08 Net rover receiving RTK corrections. The collection of magnetic data using a north – south traverse pattern is preferable for a magnetic survey, as enhancements to the magnetic field caused by buried features is mapped increasingly stronger the closer the traverse direction can get to a magnetic north – south direction (Breiner 1999). On this occasion magnetic data was collected close to the preferred alignment due to the orientation of the survey grids. Data was collected by making successive parallel traverses across each grid in a zigzag pattern. Several key points of the survey grids were accurately tied into the National Grid with Ordnance Survey base mapping.

5.2.2 The data collected from the survey has been analysed using the current version of Terrasurveyor 3.0.22.1. The resulting data set plots are presented with positive nT/m values and high readings as black and negative nT/m values and low readings as white.

The data sets have been subjected to processing using the following filters:

- De-stripe (also known as Zero Mean Traverse or ZMT)
- Clipping

5.2.3 The de-stripe process is used to equalise underlying differences between grids or traverses. Differences are most often caused by directional effects inherent to magnetic surveying instruments, instrument drift, instrument orientation (for example off-axis surveying or heading errors) and delays between surveying adjacent grids. The de-stripe process is used with care however as it can sometimes have an adverse effect on linear features that run parallel to the orientation of the process.

5.2.4 The clipping process is used to remove extreme data point values which can mask fine detail in the data set. Excluding these values allows the details to show through.

5.2.5 Plots of the data are presented in processed linear greyscale (smoothed) with any corrections to the measured values or filtering processes noted, and as separate simplified graphical interpretations of the main anomalies detected.

6.0 Magnetometer Survey Results (Figures 3 – 6)

- 6.1 For the purposes of interpreting the anomalies, the survey data has been processed to the values of -3 to 3 nT/m (Figure 3). This enhances faint anomalies that may otherwise not be noted in the data; however it also includes all ferrous and other magnetically enhanced material within the study area, making the resulting greyscale image particularly 'noisy'. The survey results revealed few anomalies across the data set.

- 6.2 The survey results show no anomalies likely to be of archaeological origin. A number of dipolar responses were detected across the survey area, with some examples highlighted as yellow circles on the interpretative plot (Figure 4). These are likely to be associated with ferrous waste or highly fired material within the ploughsoil. Areas of magnetic noise were recorded along the eastern site boundary and towards the north end of the access road. This is typical of assorted detritus accumulating along the field margins.

7.0 Discussion and Conclusions

- 7.1 The survey revealed no anomalies of archaeological origin. There was no trace of potential prehistoric or Roman activity indicated within the results. There was also no trace of the medieval ridge and furrow previously identified by aerial photography. This suggests that it has been destroyed by recent ploughing. The survey results suggest a negligible archaeological potential for the site.

8.0 Effectiveness of Methodology

- 8.1 The non-intrusive evaluation methodology employed was particularly appropriate to the scale and nature of the site to be surveyed. Magnetometry surveying was the prospection technique best suited to the identification of archaeological remains on the site. Other techniques would have required justification and may have proved too time consuming or cost-prohibitive.

9.0 Acknowledgements

- 9.1 Allen Archaeology would like to thank Viking UK Gas Limited for this commission.

10.0 References

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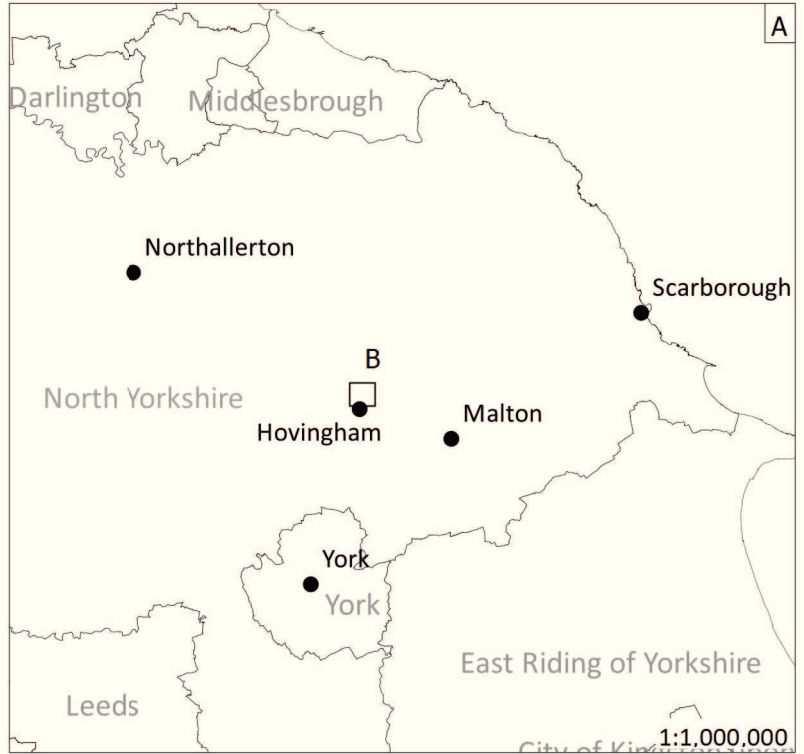
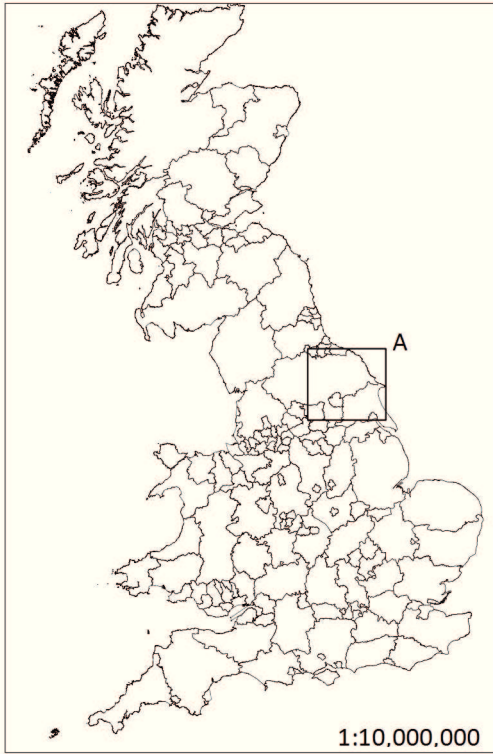


Figure 1: Site location outlined in red

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Drawn by	E Oakley
Date	05/09/13

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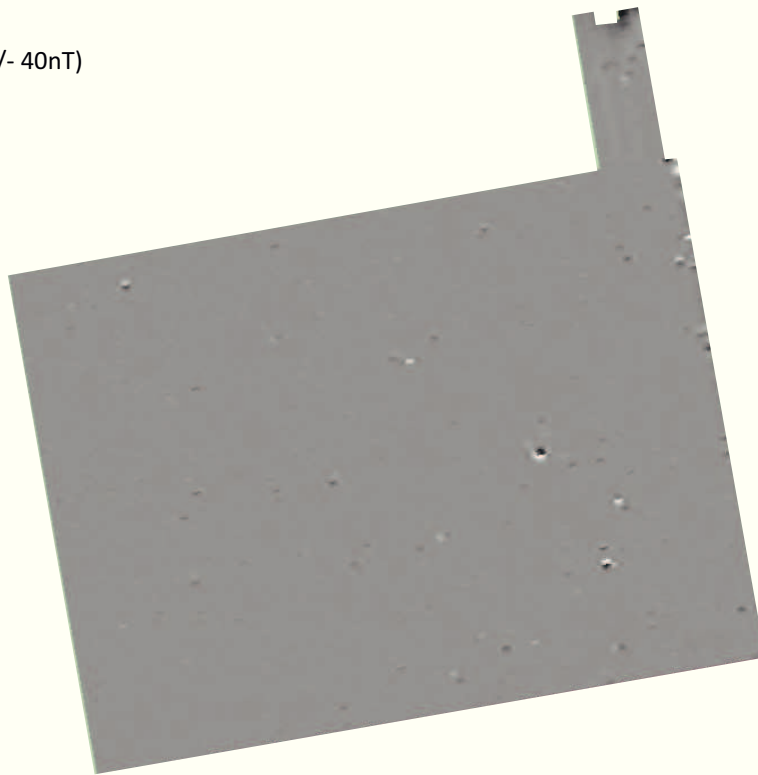
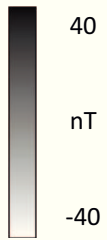
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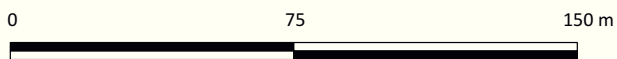
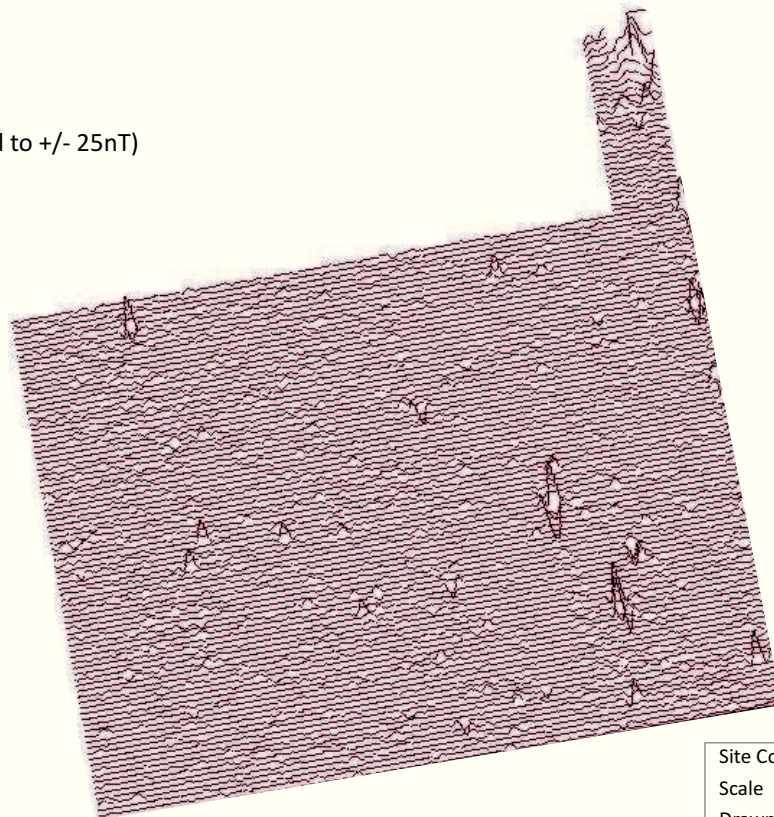


Raw data (clipped to +/- 40nT)



Trace Plot (ZMT and clipped to +/- 25nT)

25nT



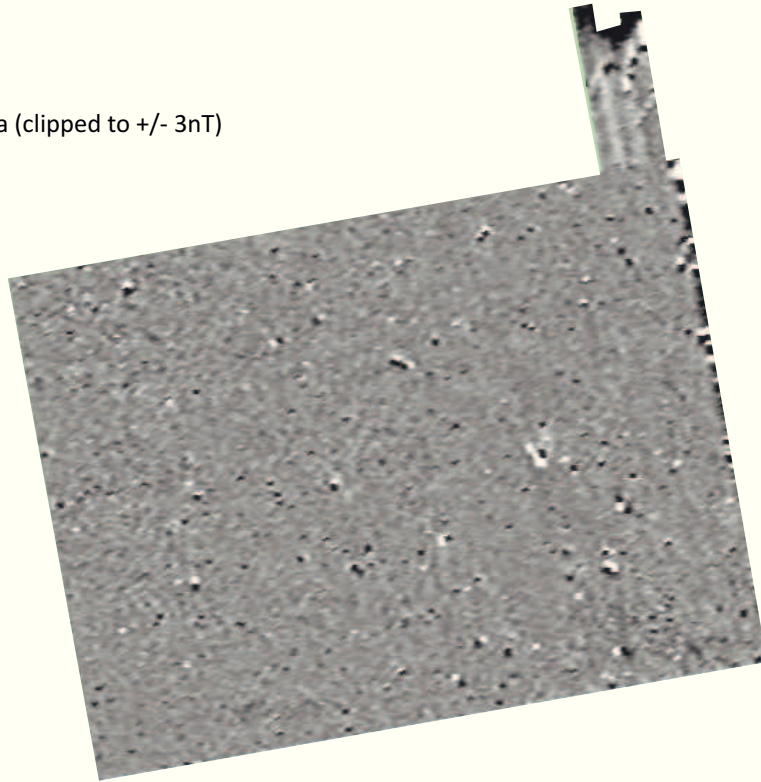
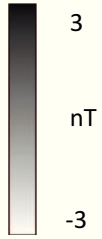
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Scale	1:1250 @ A4
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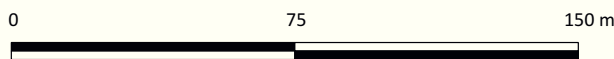
Figure 3: Greyscale raw data and processed trace plot




Processed data (clipped to +/- 3nT)




Interpretation Plot



Key

-  Area of anomalous magnetic noise

-  Examples* of individual dipolar responses
Indicative of ferrous or highly fired material
*smaller responses omitted for clarity

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Figure 4: Processed greyscale data and interpretation



Figure 5: Processed greyscale image in real space



- Key**
- Site Location
 - Area of anomalous magnetic noise
 - Examples* of individual dipolar responses
Indicative of ferrous or highly fired material
*smaller responses omitted for clarity

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Figure 6: Interpretative plot in real space



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