

**ARCHAEOLOGICAL EVALUATION REPORT:  
GEOPHYSICAL SURVEY BY MAGNETOMETRY ON LAND OFF BRIGSLEY ROAD, WALTHAM, NORTH-EAST  
LINCOLNSHIRE**

NGR: TA 2533 0324  
AAL Site Code: WABR 14  
OASIS Reference Number: allenarc1-226158  
Planning Reference: pre-planning



Report prepared for Cyden Homes

By  
Allen Archaeology Limited  
Report Number AAL2015175

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Allenarchaeology



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*Cover image: View across the main part of the site looking southeast*

## **Executive Summary**

- An archaeological evaluation by geophysical survey was undertaken by Allen Archaeology Limited for Cyden Homes, on land off Brigsley Road in Waltham, Lincolnshire, prior to the submission of a planning application for a residential development.
- The survey identified a few potential features that may represent archaeological activity. A series of parallel positive linear features running northwest to southeast and northeast to southwest that are likely to represent ridge and furrow cultivation were recorded across the western part of the site. There are a number of positive linear and curvilinear features in the eastern part of the site that could relate to ditches, paths, trackways or natural features such as palaeochannels.
- A few areas to the east and west of the site could not be surveyed due to ground conditions.
- Overall, the site is concluded to have a low archaeological potential, but the possible ridge and furrow may mask earlier activity.

## **1.0 Introduction**

- 1.1 An archaeological evaluation by geophysical survey was undertaken by Allen Archaeology Limited for Cyden Homes, on land off Brigsley Road in Waltham, Lincolnshire, prior to the submission of a planning application for a residential development.
- 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*' (Gaffney et. al. 2002), and the Chartered Institute for Archaeologists '*Standard and guidance for archaeological geophysical survey*' (CIfA 2014).

## **2.0 Site Location and Description**

- 2.1 Waltham is situated in the administrative district of North-East Lincolnshire Council, approximately 5km south of central Grimsby. The proposed development site is on the southern edge of the village, west of Brigsley Road and is currently an irregular shaped block of rough pasture, extending to c.7 hectares, centred on NGR TA 2533 0324.
- 2.2 The superficial geology comprises glacial till, and seals a bedrock geology of Burnham Chalk, with outcrops of glacial sand and gravel across the central portion of the site and Lacustrine alluvium to the east (British Geological Survey 1990).

## **3.0 Planning Background**

- 3.1 The proposed development consists of a residential scheme, although the details have yet to be finalised. During pre-planning consultation, the Archaeologist at North-East Lincolnshire Council has advised for a programme of geophysical survey prior to submission of the application, in order to provide further information concerning the archaeological potential of the proposed development area, and to allow the planning authority to establish appropriate measures to mitigate the effect of the proposed development upon the archaeological resource.
- 3.2 The approach adopted is consistent with the recommendations of the National Planning Policy Framework (NPPF), with the particular chapter of relevance being '*Chapter 12: Conserving and enhancing the historic environment*' (Department for Communities and Local Government 2012).

## **4.0 Archaeological and Historical Background**

- 4.1 There is very limited evidence for prehistoric and Roman activity in the vicinity of the site, although a Neolithic polished stone axe has been found c.100m south of the site (North-East Lincolnshire Historic Environment Record (hereafter NLHER) Reference 0120/1/0).
- 4.2 There is no physical evidence for Anglo-Saxon activity in the vicinity of the site, and it lies some distance to the southwest of the historic village core. However, the place name is of Old English origin, meaning 'the wold estate', and Waltham is a place name that has been taken to indicate a possible Saxon royal estate (Cameron 1998). In the Domesday Book of 1086, Waltham is an estate of Count Alan, and included a church and a priest (Morgan and Thorn 1986).

## 5.0 Geophysics Methodology

- 5.0.1 The geophysical survey consisted of a detailed gradiometer survey of the maximum available area of the proposed development, totalling approximately 6 hectares. The survey was undertaken in a series of 30m grids across the site.
- 5.0.2 The fieldwork was carried out over a period of two working days, Thursday 16<sup>th</sup> and Friday 17<sup>th</sup> July 2015, by a team of two experienced geophysicists. 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 Net rover 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.
- 5.0.5 The fieldwork and reporting were carried out in accordance with the procedures in 'Geophysical Survey in Archaeological Field Evaluations' (English Heritage 2008) and 'The Use of Geophysical Techniques in Archaeological Evaluations: IfA Paper 6' (Gaffney et al. 2002).

### 5.1 Summary of Survey Parameters

#### 5.1.1 Fluxgate Magnetometers

Instrument 1:	Bartington Grad601-2 Dual Fluxgate Gradiometer
Sample interval:	0.25m
Traverse interval:	1.00m
Traverse separation:	1.00m
Traverse method:	Zigzag
Resolution:	0.01 nT
Processing software:	Terrasurveyor 3.0.27
Surface conditions:	Slightly overgrown grass
Area surveyed:	4.3ha
Date surveyed:	Thursday 16 <sup>th</sup> and Friday 17 <sup>th</sup> July 2015
Geophysical Surveyor:	Robert Evershed
Survey Assistant:	Ryan Godbold
Data interpretation:	Robert Evershed

### 5.2 Data Collection and Processing

- 5.2.1 The grids were marked out using pre-programmed coordinates on the Leica GS08 Net rover. The collection of magnetic data using a north – south traverse pattern is preferable as the fluxgate gradiometer is set up and balanced with respect to the cardinal points. Since the data

is plotted as north-south traverses there is considerable merit sampling the north – south response of a magnetic anomaly with as many data points as is possible, this is accomplished as the density collected along the traverse line is greater than that between traverses (Aspinall 2008). On this occasion magnetic data was collected on a north-northwest to south-southeast alignment due to the orientation of the pre-programmed survey grids.

5.2.2 The data collected from the survey has been analysed using the current version of Terrasurveyor 3.0.27. The resulting data set plots are presented with positive nT/m values and high resistance as black and negative nT/m values and low resistance as white.

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

- De-stripe
- Clipping
- De-staggering

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 The de-staggering process compensates for data correction errors caused by the operator commencing the recording of each traverse too soon or too late. It shifts each traverse forward or backwards by a specified number of intervals.

5.2.6 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 Results

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. The survey results revealed a number of anomalies across the dataset, and these are discussed in turn and noted as one and two digit numbers in square brackets.

6.2 There were a couple of area where it was not possible to survey. These included the very east end of the site which was heavily overgrown and served as a storage area. The field to the very west was too overgrown to survey as well.

6.3 Immediately noticeable in the survey results are the two large dipolar areas at the southeastern corner of the site [1] and [2]. These produced readings of -100 to 100 nT/m. These represent two large items of farm machinery within the survey area.

6.4 The linear dipolar feature [3] running roughly west-northwest to east-southeast in the southeastern corner of the site, -100 to 100 nT/m, represents part of a metal fence.

- 6.5 A series of parallel positive linear features in the northwestern part of the survey area have been recorded, running northwest to southeast [4], 1 to 2 nT/m. With an average of approximately 8m between the linears it is likely that these represent the remains of medieval ridge and furrow cultivation.
- 6.6 The parallel positive linear features [5] running northeast to southwest across the western part of the site, producing readings of 1 to 2 nT/m, with one area as high as 3 nT/m, also likely represent ridge and furrow cultivation.
- 6.7 Across the site are a number of amorphous positive anomalies [6], producing readings of 2 to 4 nT/m. These may represent pits, soil-filled hollows or former ponds.
- 6.8 In the eastern most part of the surveyed area there are a number of positive linear and curvilinear features [7], 1 to 2 nT/m. The long linear running northwest to southeast may represent a continuation of the ridge and furrow cultivation. The remaining linears/curvilinears could represent ditches (possibly enclosure in nature), paths, trackways or even palaeochannels/natural geological variation.
- 6.9 There are various areas of magnetic noise around the edges of the site [8], [9] and [10]. These have produced readings of -25 to 5 nT/m, -15 to 5 nT/m and -10 to 10 nT/m respectively. There are higher spikes within [10] of -40 to 100 nT/m. These areas and the other areas of magnetic noise across the site likely represent a build-up of modern waste/detritus or possible small isolated dumps of this material.
- 6.10 Throughout the site are a number of strong and weak dipolar responses [11]. The characteristic dipolar response of pairs of positive and negative 'spikes' suggest near surface ferrous metal or other highly fired material in the soil.

## **7.0 Discussion and Conclusions**

- 7.1 The survey identified a small number of potential features that may represent archaeological activity. The survey revealed long parallel positive linear features running northwest – southeast and northeast – southwest that likely represent ridge and furrow cultivation, typical of medieval agriculture. There are a number of positive linear and curvilinear features in the eastern part of the site that could relate to ditches, paths, trackways or natural features such as palaeochannels.
- 7.2 Overall, the site is concluded to have a low archaeological potential, although it is possible that the ridge and furrow may mask earlier land uses.

## **8.0 Effectiveness of Methodology**

- 8.1 The non-intrusive evaluation methodology employed was appropriate to the scale and nature of the site surveyed, and has identified a low archaeological potential for the proposed development area. Magnetometry surveying was the prospection technique best suited to the initial 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 Limited would like to thank Cyden Homes for this commission.

## 10.0 References

Aspinall, A., Gaffney C. and Schmidt A., 2008, *Magnetometry for Archaeologists*. Altamira Press, Plymouth

British Geological Survey, 1990. *Grimsby. England and Wales Sheet 90/91. Solid and Drift Edition. 1:50000 Series*. Keyworth, Nottingham: British Geological Survey

Cameron K., 1998, *A Dictionary of Lincolnshire Place-names*, English Place-Name Society, University of Nottingham, Nottingham

CIfA, 2014, *Standard and Guidance for Archaeological Geophysical Survey*, Chartered Institute for Archaeologists, Reading

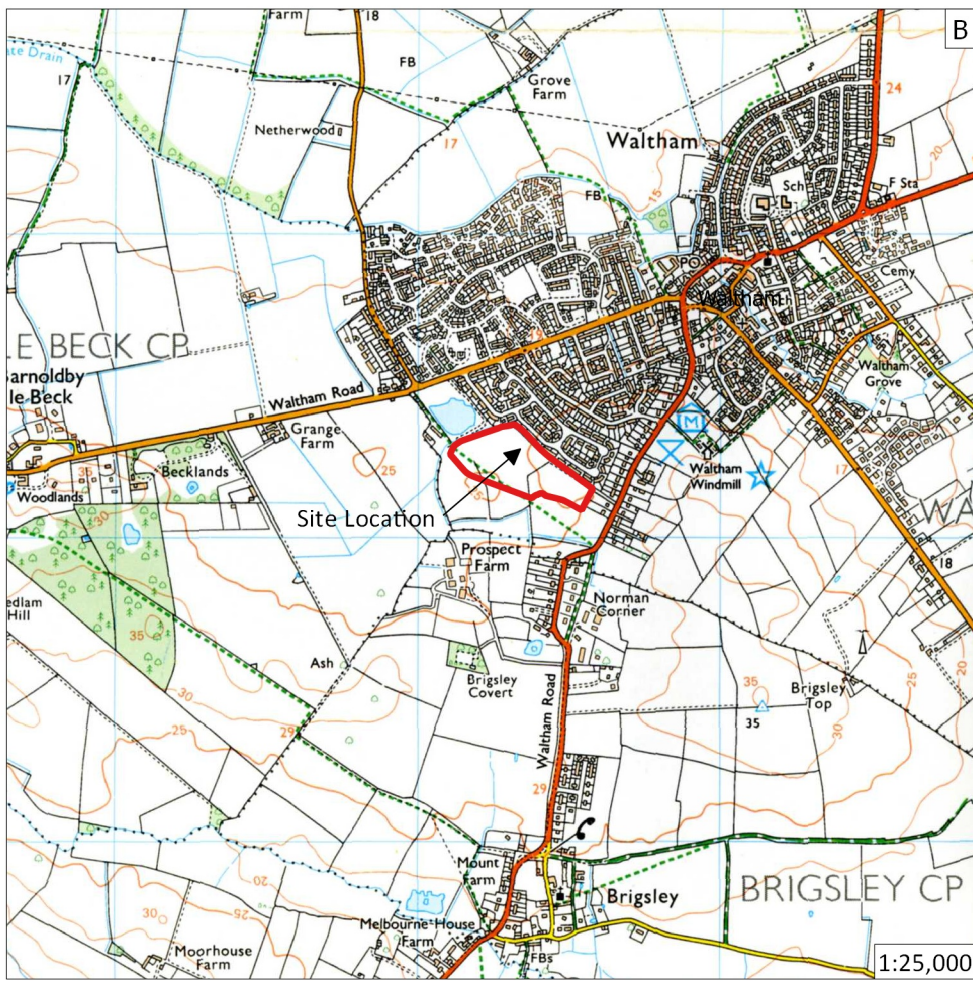
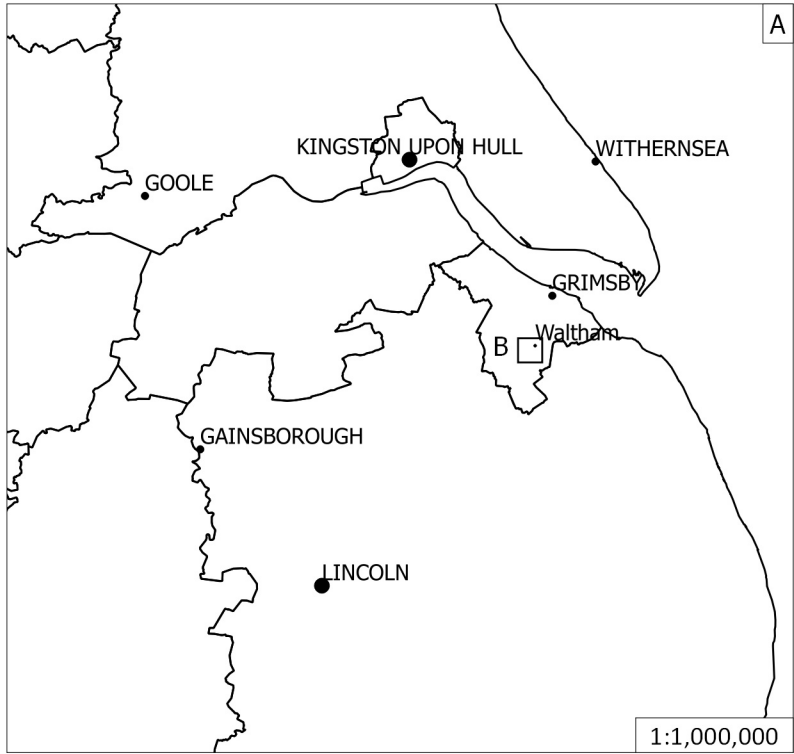
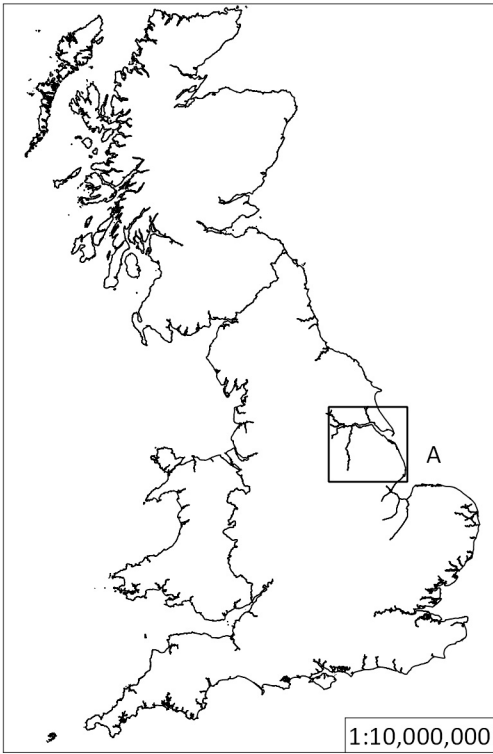
Department for Communities and Local Government, 2012, *National Planning Policy Framework*, Department for Communities and Local Government, London

English Heritage, 2008, *Geophysical Survey in Archaeological Field Evaluation*. English Heritage

Gaffney, C., Gater, J., and Ovenden, S., 2002, *The Use of Geophysical Techniques in Archaeological Evaluations. IFA Paper No.6*. The Institute for Archaeologists

Morgan P., & Thorn C., (eds.), 1986, *Domesday Book: vol.31: Lincolnshire*, Phillimore & Co. Ltd, Chichester





**Figure 1:** Site location outlined in red

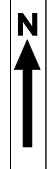
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Site Code	WABR 14
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Drawn by	R Evershed
Date	15/12/15

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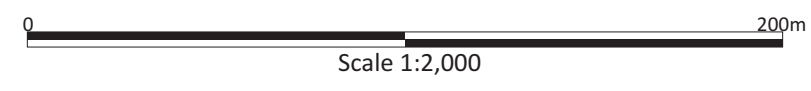
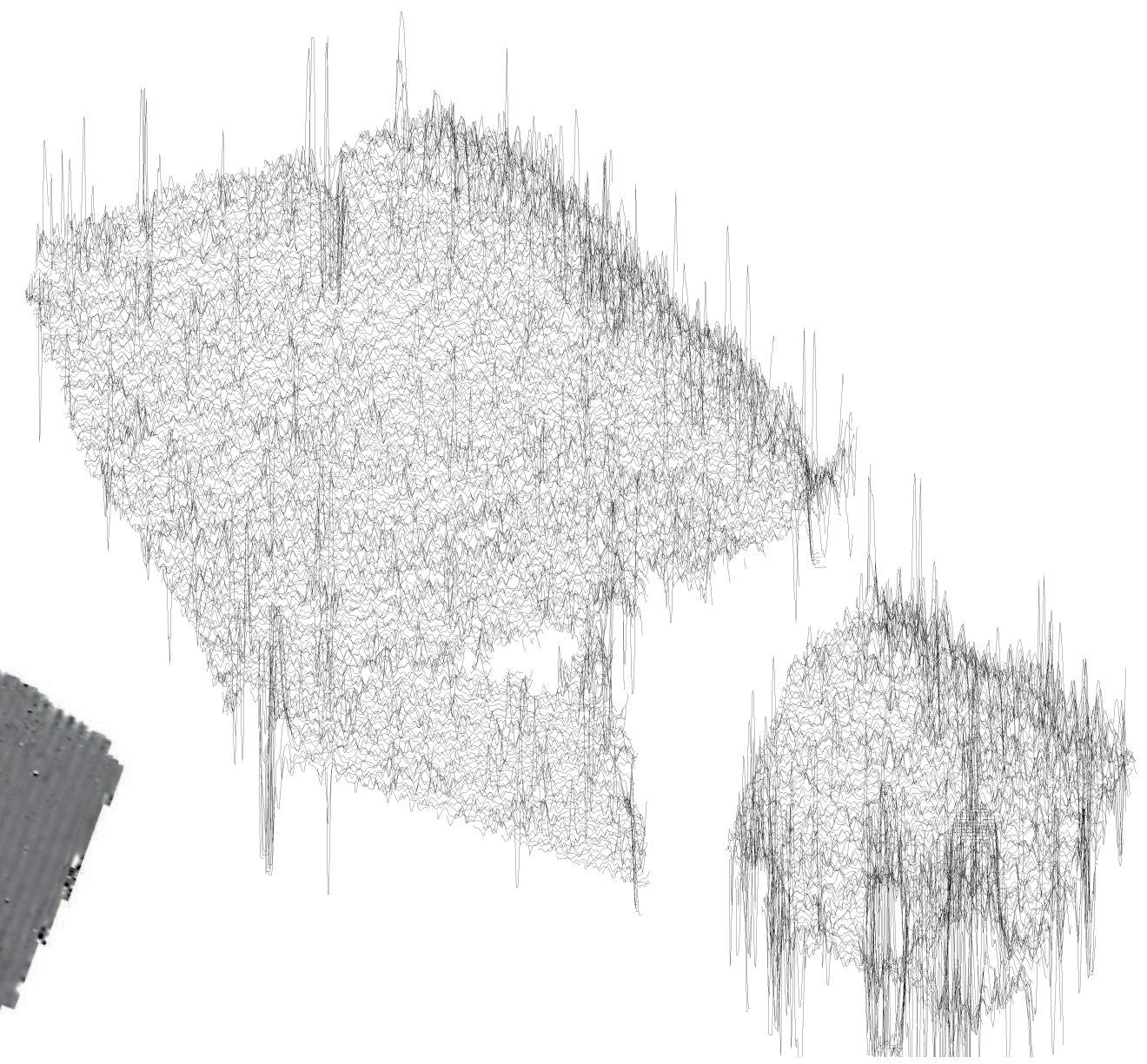
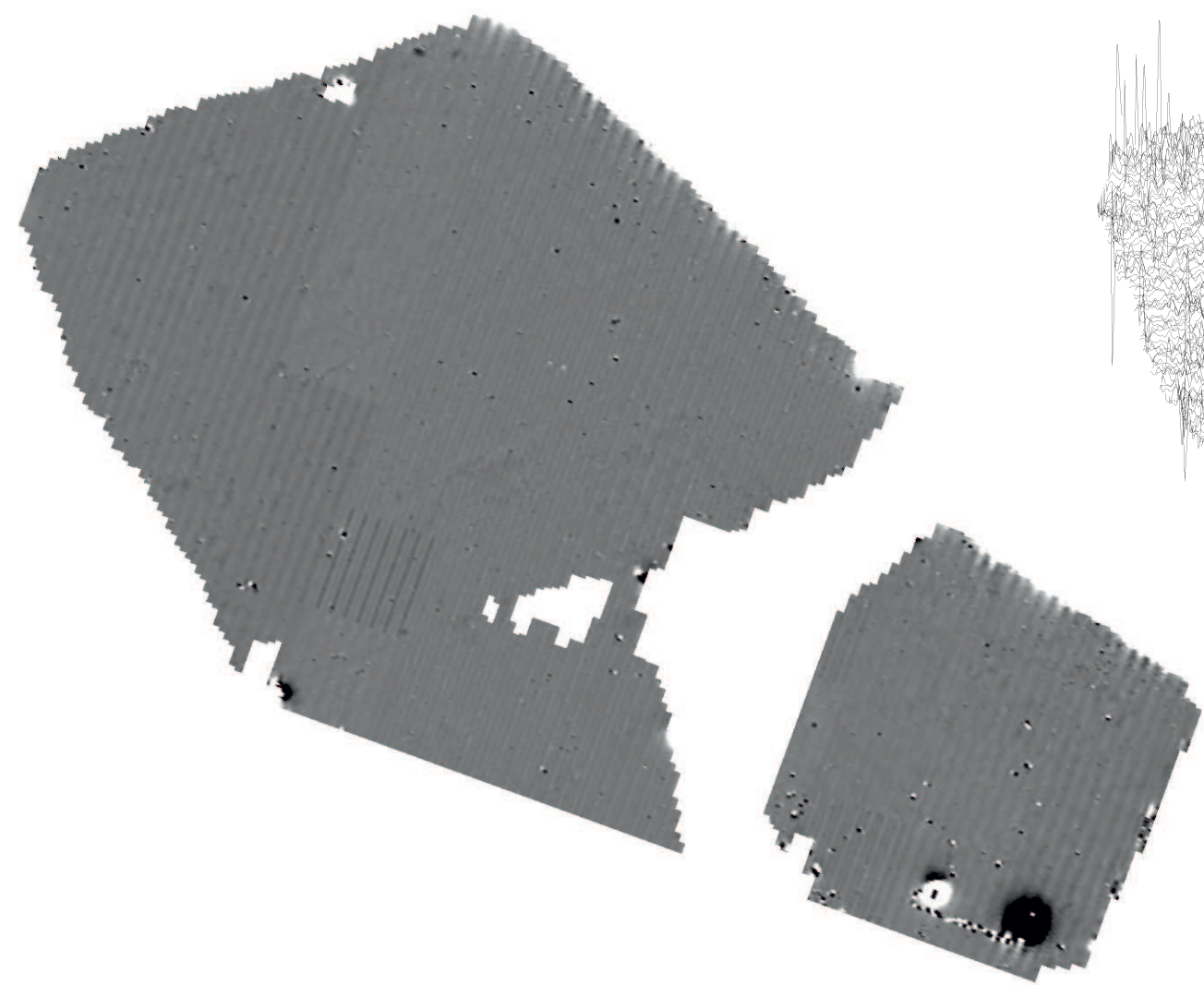
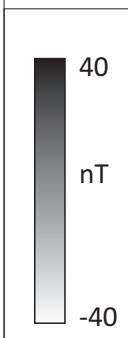
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Raw data (clipped to +/- 40 nT)

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



Site Code	WABR 14
Scale	1:2,000 @ A3
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**Figure 2:** Greyscale raw data and processed trace plot

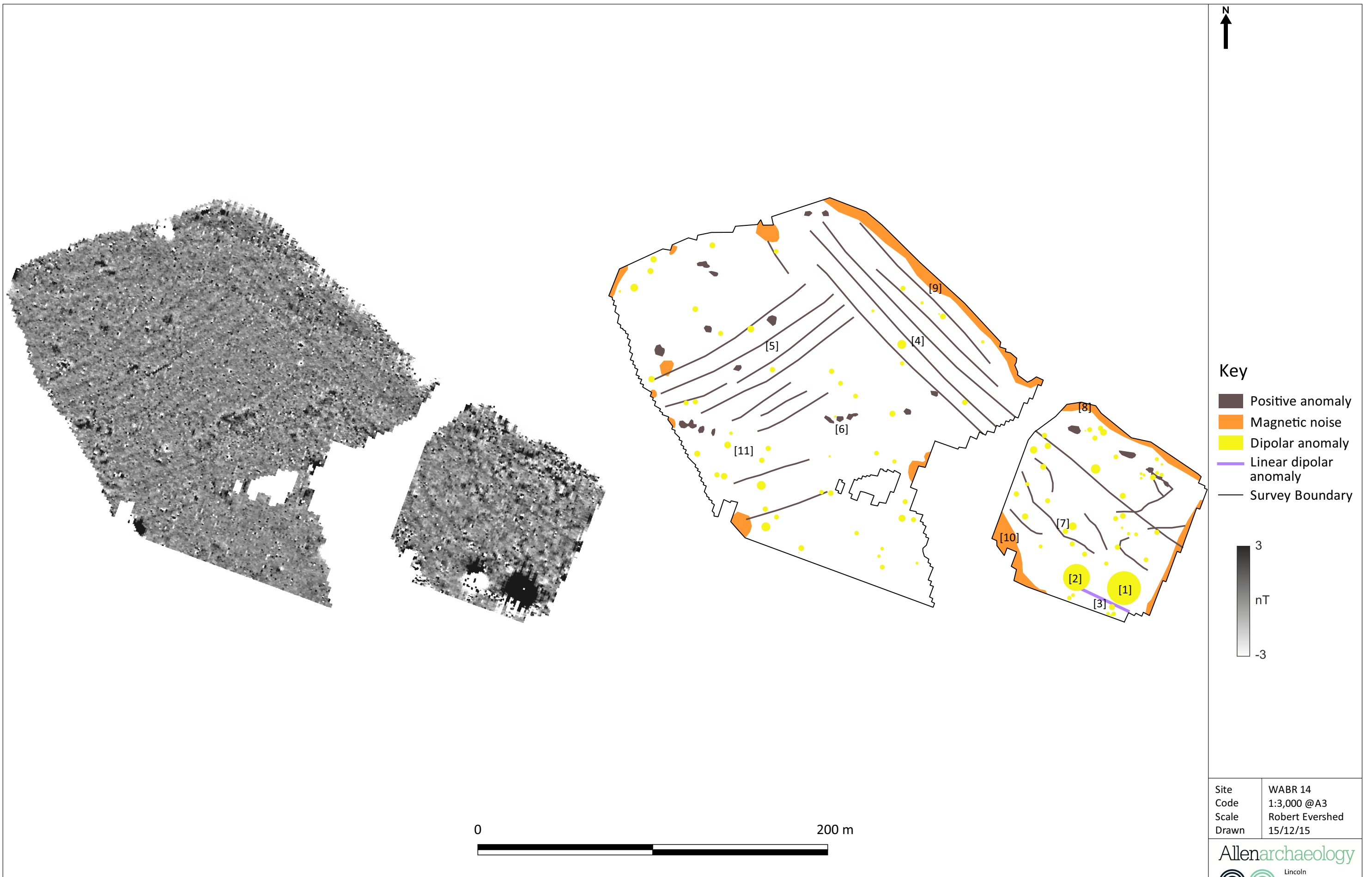


Figure 3: Processed greyscale plot and interpretation



**Figure 4:** Processed greyscale location

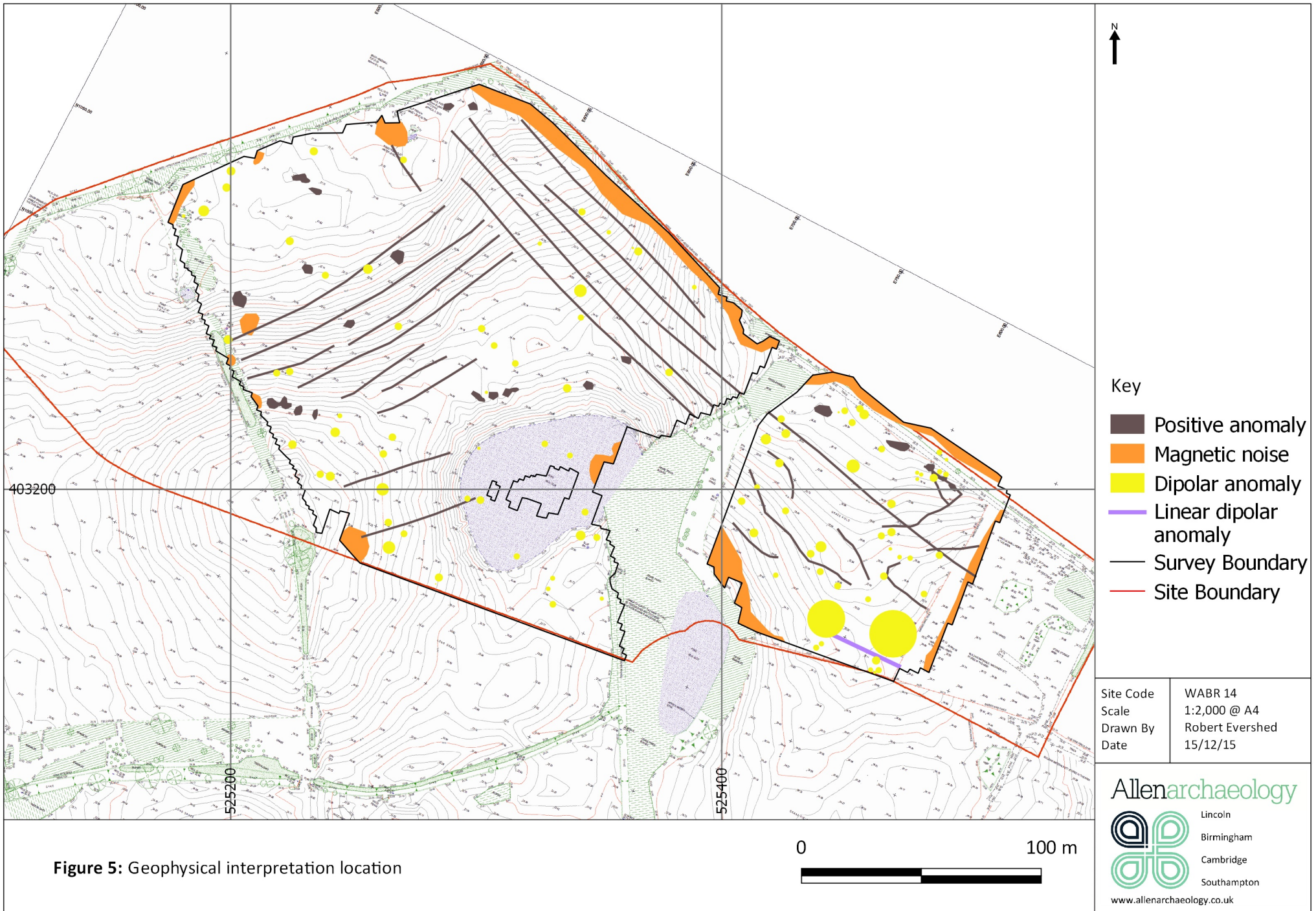


Figure 5: Geophysical interpretation location

Key

- Positive anomaly
- Magnetic noise
- Dipolar anomaly
- Linear dipolar anomaly
- Survey Boundary
- Site Boundary

Site Code	WABR 14
Scale	1:2,000 @ A4
Drawn By	Robert Evershed
Date	15/12/15

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