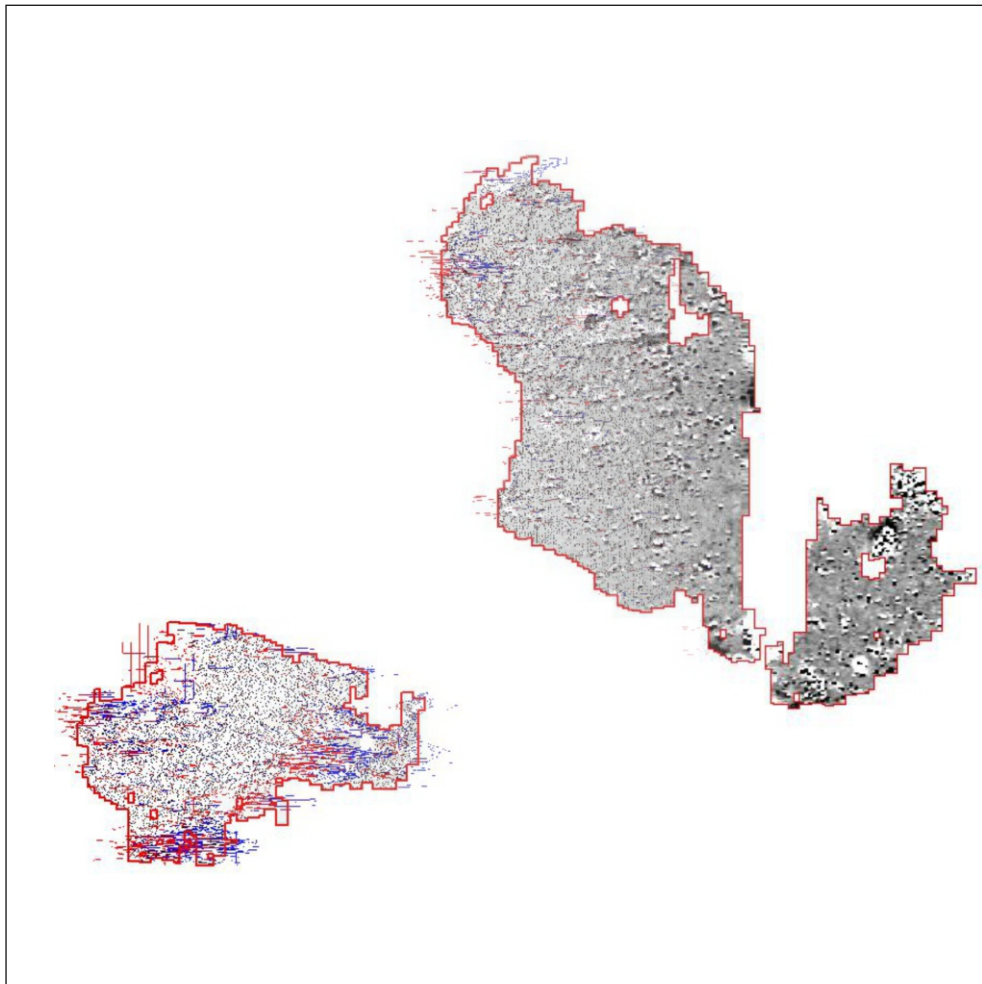




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# Land at St. John's Road Hedge End, Hampshire

Detailed Gradiometer Survey Report



Ref: 88971.01  
November 2012



**Land at St. John's Road  
Hedge End, Hampshire**

**Detailed Gradiometer Survey Report**

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# Land at St. John's Road Hedge End, Hampshire

## Detailed Gradiometer Survey Report

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# **Land at St. John's Road Hedge End, Hampshire**

## **Detailed Gradiometer Survey Report**

### **Summary**

A detailed gradiometer survey was conducted over land off St. John's Road, to the west of Hedge End, Hampshire. The project was commissioned by the Highwood Residential Limited with the aim of establishing the presence, or otherwise, and nature of detectable archaeological features on the site ahead of a proposed development. The survey follows a Heritage Statement prepared by Wessex Archaeology earlier in 2013.

The site comprises pasture fields to the south of St. John's Road and east of the M27, approximately 1km southwest of Hedge End and 6km east of Southampton. The site lies near the summit of a low ridge, with the land sloping gently downwards from north to south. The gradiometer survey covered 2.2 ha and has demonstrated the presence of a number of anomalies of possible archaeological interest within the survey area, along with extensive magnetic disturbance.

A cluster of linear anomalies and pit-like responses can be seen towards the southwestern extent of the Site, falling into three apparent groups. Several linear anomalies at the west are oriented parallel with nearby boundaries and it is possible that they form part of a former field system; close by to the north, further linear anomalies and trends aligned NW-SE are more typical of former fields and ploughing, and a cluster of anomalies near the eastern extent of this field are consistent with the remnants of former buildings. The Heritage Statement identified a possible Roman road crossing the southwestern portion of the Site and several of these anomalies lie on a similar orientation; however, it is not possible to determine the origin of these anomalies with any certainty.

In the central field, a possible former field boundary has been identified. Elsewhere, numerous small scale ferrous responses can be seen, which are presumed to be modern in origin, with magnetic disturbance associated with field boundaries and modern structures. Increased magnetic responses in the easternmost survey area may be associated with a 19<sup>th</sup> century brickworks identified in the Heritage Statement.



# **Land at St. John's Road Hedge End, Hampshire**

## **Detailed Gradiometer Survey Report**

### **Acknowledgements**

The detailed gradiometer survey was commissioned by the Highwood Residential Limited. The assistance of Nick Meek is gratefully acknowledged in this regard.

The fieldwork was directed by Jen Smith and assisted by Rachel Williams. Ben Urmston processed and interpreted the geophysical data in addition to writing this report. The geophysical work was quality controlled by Dr. Paul Baggaley. Illustrations were prepared by Adela Murray Brown. The project was managed on behalf of Wessex Archaeology by Sue Farr.



# Land at St. John's Road Hedge End, Hampshire

## Detailed Gradiometer Survey Report

### 1 INTRODUCTION

#### 1.1 Project background

- 1.1.1 Wessex Archaeology (WA) was commissioned by the Highwood Residential Limited to carry out a geophysical survey of land at St. John's Road, Hedge End, Hampshire (**Figure 1**), hereafter "the Site" (centred on NGR 448450 111885). The survey forms part of an ongoing programme of archaeological works being undertaken ahead of proposed development at the Site and follows a Heritage Statement (HS, WA 2013).
- 1.1.2 The aim of the geophysical survey was to establish the presence/absence, extent and character of detectable archaeological remains within the survey area.
- 1.1.3 This report presents a brief description of the methodology followed, the detailed survey results and the archaeological interpretation of the geophysical data.

#### 1.2 The Site

- 1.2.1 The Site comprises several pasture fields immediately east of the M27 and south of St. John's Road, approximately 1km southwest of Hedge End and some 6km east of the centre of Southampton (**Figure 1**). Detailed gradiometer survey was undertaken over all accessible parts of the Site, a total of 2.2 ha.
- 1.2.2 The Site is located within a slightly undulating area of land at an elevation of approximately 60m above Ordnance Datum (aOD), sloping gently downwards from north to south. The Site was bounded to the west by the M27, to the north and east by St. John's Road, Foord Road and Bursledon Road, and to the south by woodland and pasture fields.
- 1.2.3 The soils underlying the Site are likely to be typical stagnogleys of the 711 (Wickham) association (SSEW 1983), although the Site is marked as unsurveyed on the soil survey and other soil types are present in the vicinity. However, soils derived from such geological parent material have been shown to produce magnetic contrasts acceptable for the detection of archaeological remains through magnetometer survey.

### 2 METHODOLOGY

#### 2.1 Introduction

- 2.1.1 The detailed magnetometer survey was conducted using a Bartington Grad601-2 dual fluxgate gradiometer system. The survey was conducted in accordance with English Heritage guidelines (2008).
- 2.1.2 The geophysical survey was undertaken by Wessex Archaeology's in-house geophysics team on 7<sup>th</sup> and 8<sup>th</sup> November 2013. Field conditions at the time of the survey were good,



with the surveyable areas under pasture. However, extensive areas of woodland were present, and one of the westernmost fields proved unsuitable for survey due to the extent of overgrown vegetation within the field.

## 2.2 Method

- 2.2.1 Individual survey grid nodes were established at 30m x 30m intervals using a Leica Viva RTK GNSS instrument, which is precise to approximately 0.02m and therefore exceeds English Heritage recommendations (2008).
- 2.2.2 The magnetometer survey was conducted using a Bartington Grad601-2 fluxgate gradiometer instrument, which has a vertical separation of 1m between sensors. Data were collected at 0.25m intervals along transects spaced 1m apart with an effective sensitivity of 0.03nT, in accordance with EH guidelines (2008). Data were collected in the zigzag method.
- 2.2.3 Data from the survey was subject to minimal data correction processes. These comprise a zero mean traverse function ( $\pm 5\text{nT}$  thresholds) applied to correct for any variation between the two Bartington sensors used, and a de-step function to account for variations in traverse position due to varying ground cover and topography. These two steps were applied to all survey areas, with no interpolation applied.
- 2.2.4 Further details of the geophysical and survey equipment, methods and processing are described in **Appendix 1**.

## 3 GEOPHYSICAL SURVEY RESULTS AND INTERPRETATION

### 3.1 Introduction

- 3.1.1 The gradiometer survey has been successful in identifying anomalies of possible archaeological interest across the Site, along with a number of modern services. Results are presented as a series of greyscale and XY plots, and archaeological interpretations, at a scale of 1:2,000 (**Figure 2**). The data are displayed at -2nT (white) to +3nT (black) for the greyscale image and 25nT per cm for the XY trace plots.
- 3.1.2 The interpretation of the datasets highlights the presence of potential archaeological anomalies, ferrous/burnt or fired objects, and magnetic trends (**Figure 3**). Full definitions of the interpretation terms used in this report are provided in **Appendix 2**.
- 3.1.3 Numerous ferrous anomalies are visible throughout the detailed survey dataset. These are presumed to be modern in provenance and are not referred to, unless considered relevant to the archaeological interpretation.

### 3.2 Gradiometer Survey Results and Interpretation

- 3.2.1 Near the westernmost extent of the survey, cluster of linear anomalies **4000** are oriented E-W and NE-SW, with a number of possible pit-like anomalies close by; the linear anomalies are consistent with ditches and are aligned parallel with nearby boundaries. Whilst it is not possible to exclude an archaeological interpretation, it is considered more likely that these anomalies are more recent and agricultural in origin.
- 3.2.2 Towards the north of the westernmost field, several short linear anomalies **4001** extend NW-SE across the survey area, coincident with numerous faint ploughing trends. Given the longest segment of possible ditch to the south, these anomalies probably represent part of a former field system.





- 3.2.3 At the eastern extent of the western field, cluster of anomalies **4002** lie within a rectangular region of magnetic disturbance. Given their form in plan, it is possible that these anomalies relate to the remnants of buildings or barns at the Site.
- 3.2.4 At the northwestern extent of the central survey area, linear anomaly **4003** extends approximately NNE-SSW, which is consistent with a former field boundary. Further east, a rectangular region of increased response **4004** is of uncertain origin; whilst an archaeological origin cannot be excluded, it is considered more likely to be agricultural or modern in origin, given the presence of debris and bonfires in this field.
- 3.2.5 The magnetic background of the southern part of the field is notably quieter than the north, e.g. **4005**. Occasional linear trends are visible, which may relate to the former field system, although they are not well defined from the magnetic background.
- 3.2.6 Within the southeasternmost field, no anomalies of archaeological interest have been identified, although extensive magnetic disturbance can be seen. Several linear trends **4006** can be seen at the centre of the field, although their origins are uncertain.

## 4 CONCLUSION

- 4.1.1 The detailed gradiometer survey has been successful in detecting anomalies of possible archaeological interest within the Site, in addition to regions of magnetic disturbance.
- 4.1.2 The majority of anomalies of possible archaeological interest are located within the southwesternmost survey area. The presence of modern structures, machinery and other debris has caused extensive magnetic disturbance and suggests that the anomalies identified are likely to be modern or agricultural in origin. The parallel ploughing trends noted across the northern part of the field (**4001**) are consistent with the orientation of the former field system identified in the Heritage Statement (WA 2013).
- 4.1.3 A putative Roman road is marked as crossing the southwestern part of the Site, although no definite anomalies have been identified associated with such a feature. It is conceivable that elements of **4000** and **4001** may form part of such a structure, particularly those oriented E-W on the same alignment as the road; however, there is no other evidence for these anomalies being archaeological in origin and the length of road falling within the survey area is relatively limited.
- 4.1.4 Whilst linear anomaly **4003** is consistent with a former boundary, there are few other anomalies nearby to suggest archaeological activity. Given that the land appears to have been largely unenclosed in 1815, with a number of subdivisions visible by 1845 (WA 2013), it is suggested that these boundaries are of relatively recent origin.
- 4.1.5 A former 19<sup>th</sup> century brickworks has been identified in the eastern part of the Site, and it is possible that the extensive magnetic disturbance seen there is associated with this activity.
- 4.1.6 The extent of magnetic disturbance associated with the services and the frequency of small-scale ferrous anomalies have reduced the area in which it is possible to detect archaeological features. Given the identification of probable former boundaries, it is considered likely that more substantial archaeological features would have produced measurable magnetic anomalies.
- 4.1.7 It should be noted that small, weakly magnetised features may produce responses that are below the detection threshold of magnetometers. It may therefore be the case that



more archaeological features may be encountered than have been identified through geophysical survey.



## 5 REFERENCES

English Heritage, 2008. *Geophysical Survey in Archaeological Field Evaluation*. Research and Professional Service Guideline No 1, 2nd edition.

Soil Survey of England and Wales, 1983. *Sheet 6, South East England*. Ordnance Survey, Southampton.

Wessex Archaeology, 2013. *Land at St. John's Road, Hedge End, Hampshire: Heritage Statement*. Client report 88970.01



## APPENDIX 1: SURVEY EQUIPMENT AND DATA PROCESSING

### *Survey Methods and Equipment*

The magnetic data for this project was acquired using a Bartington 601-2 dual magnetic gradiometer system. This instrument has two sensor assemblies fixed horizontally 1m apart allowing two traverses to be recorded simultaneously. Each sensor contains two fluxgate magnetometers arranged vertically with a 1m separation, and measures the difference between the vertical components of the total magnetic field within each sensor array. This arrangement of magnetometers suppresses any diurnal or low frequency effects.

The gradiometers have an effective resolution of 0.03nT over a  $\pm 100$ nT range, and measurements from each sensor are logged at intervals of 0.25m. All of the data are stored on an integrated data logger for subsequent post-processing and analysis.

Wessex Archaeology undertakes two types of magnetic surveys: scanning and detail. Both types depend upon the establishment of an accurate 20m or 30m site grid, which is achieved using a Leica Viva RTK GNSS instrument and then extended using tapes. The Leica Viva system receives corrections from a network of reference stations operated by the Ordnance Survey and Leica Geosystems, allowing positions to be determined with a precision of 0.02m in real-time and therefore exceed the level of accuracy recommended by English Heritage (2008) for geophysical surveys.

Scanning surveys consist of recording data at 0.25m intervals along transects spaced 10m apart, acquiring a minimum of 80 data points per transect. Due to the relatively coarse transect interval, scanning surveys should only be expected to detect extended regions of archaeological anomalies, when there is a greater likelihood of distinguishing such responses from the background magnetic field.

The detailed surveys consist of 20m x 20m or 30m x 30m grids, and data are collected at 0.25m intervals along traverses spaced 1m apart. These strategies give 1600 or 3600 measurements per 20m or 30m grid respectively, and are the recommended methodologies for archaeological surveys of this type (EH, 2008).

Data may be collected with a higher sample density where complex archaeological anomalies are encountered, to aid the detection and characterisation of small and ephemeral features. Data may be collected at up to 0.125m intervals along traverses spaced up to 0.25m apart, resulting in a maximum of 28800 readings per 30m grid, exceeding that recommended by English Heritage (2008) for characterisation surveys.



## *Post-Processing*

The magnetic data collected during the detail survey are downloaded from the Bartington system for processing and analysis using both commercial and in-house software. This software allows for both the data and the images to be processed in order to enhance the results for analysis; however, it should be noted that minimal data processing is conducted so as not to distort the anomalies.

As the scanning data are not as closely distributed as with detailed survey, they are georeferenced using the GPS information and interpolated to highlight similar anomalies in adjacent transects. Directional trends may be removed before interpolation to produce more easily understood images.

Typical data and image processing steps may include:

- Destripe – Applying a zero mean traverse in order to remove differences caused by directional effects inherent in the magnetometer;
- Destagger – Shifting each traverse longitudinally by a number of readings. This corrects for operator errors and is used to enhance linear features;
- Despike – Filtering isolated data points that exceed the mean by a specified amount to reduce the appearance of dominant anomalous readings (generally only used for earth resistance data)

Typical displays of the data used during processing and analysis:

- XY Plot – Presents the data as a trace or graph line for each traverse. Each traverse is displaced down the image to produce a stacked profile effect. This type of image is useful as it shows the full range of individual anomalies.
- Greyscale – Presents the data in plan view using a greyscale to indicate the relative strength of the signal at each measurement point. These plots can be produced in colour to highlight certain features but generally greyscale plots are used during analysis of the data.



## APPENDIX 2: GEOPHYSICAL INTERPRETATION

The interpretation methodology used by Wessex Archaeology separates the anomalies into two main categories: archaeological and unidentified responses.

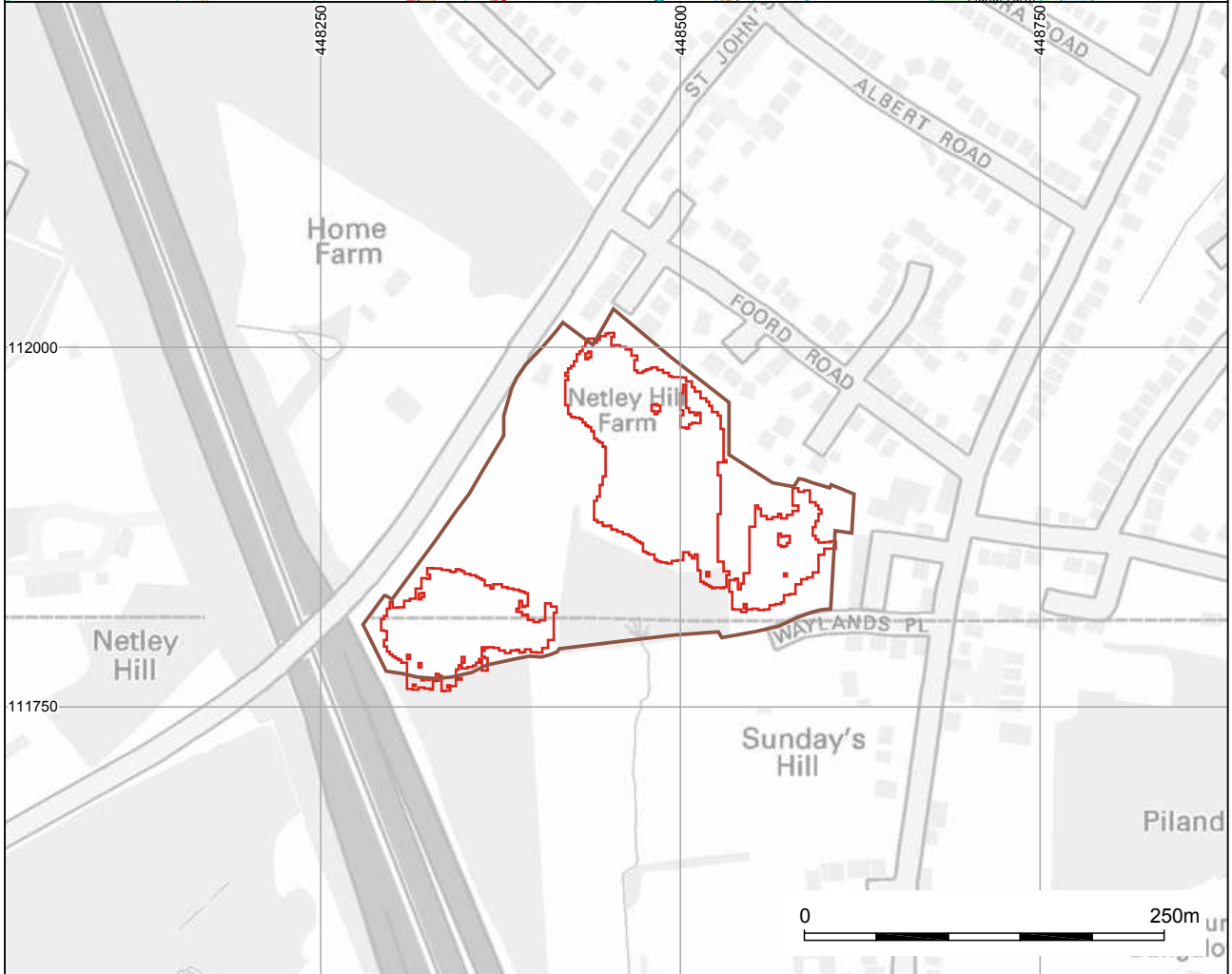
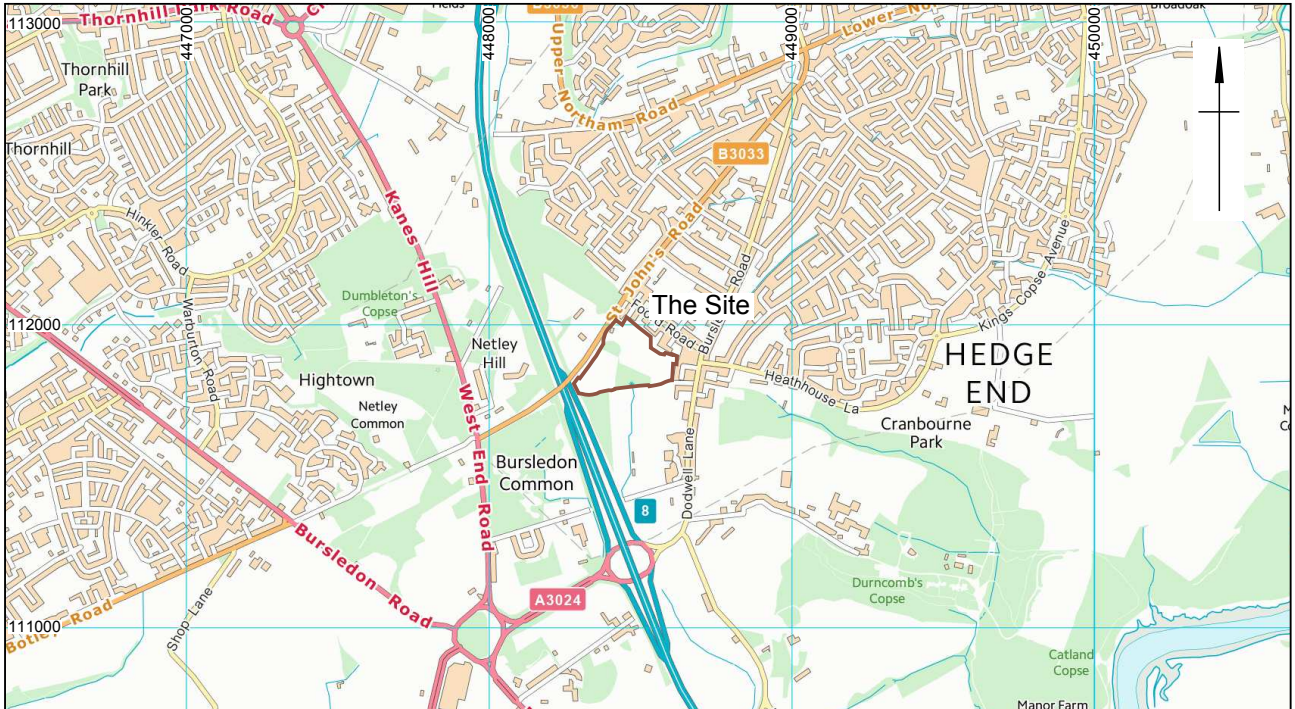
The archaeological category is used for features when the form, nature and pattern of the anomaly are indicative of archaeological material. Further sources of information such as aerial photographs may also have been incorporated in providing the final interpretation. This category is further sub-divided into three groups, implying a decreasing level of confidence:

- Archaeology – used when there is a clear geophysical response and anthropogenic pattern.
- Probable archaeology – used for features which give a clear response but which form incomplete patterns.
- Possible archaeology – used for features which give a response but which form no discernible pattern or trend.

The unidentified category is used for features when the form, nature and pattern of the anomaly are not sufficient to warrant a classification as an archaeological feature. This category is further sub-divided into:

- Increased magnetic response – used for areas dominated by indistinct anomalies which may have some archaeological potential.
- Trend – used for low amplitude or indistinct linear anomalies.
- Ferrous – used for responses caused by ferrous material. These anomalies are likely to be of modern origin.

Finally, services such as water pipes are marked where they have been identified.



- The Site boundary
- Detailed survey extents

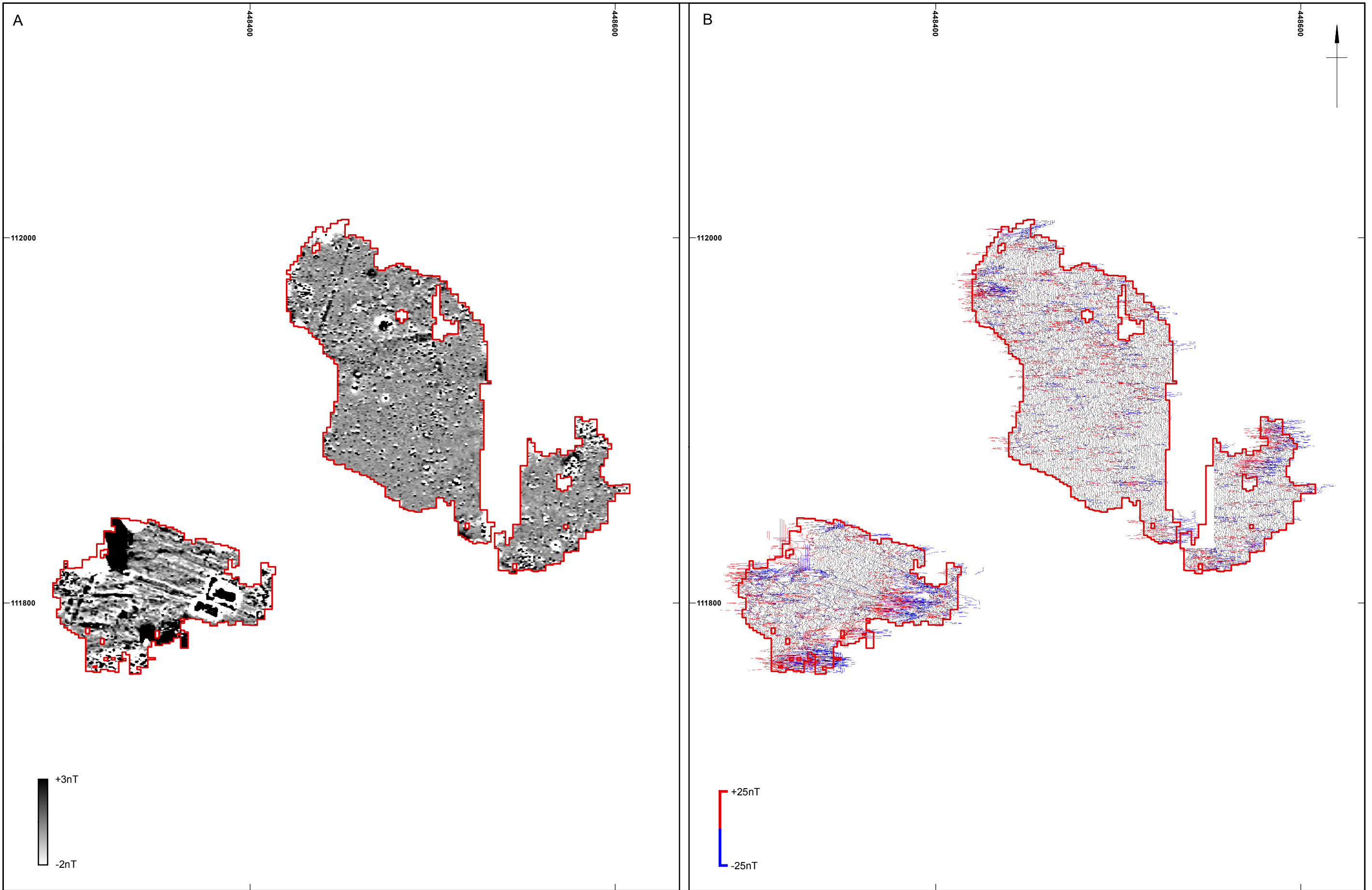


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Site location plan

Figure 1



 **Detailed survey extents**  
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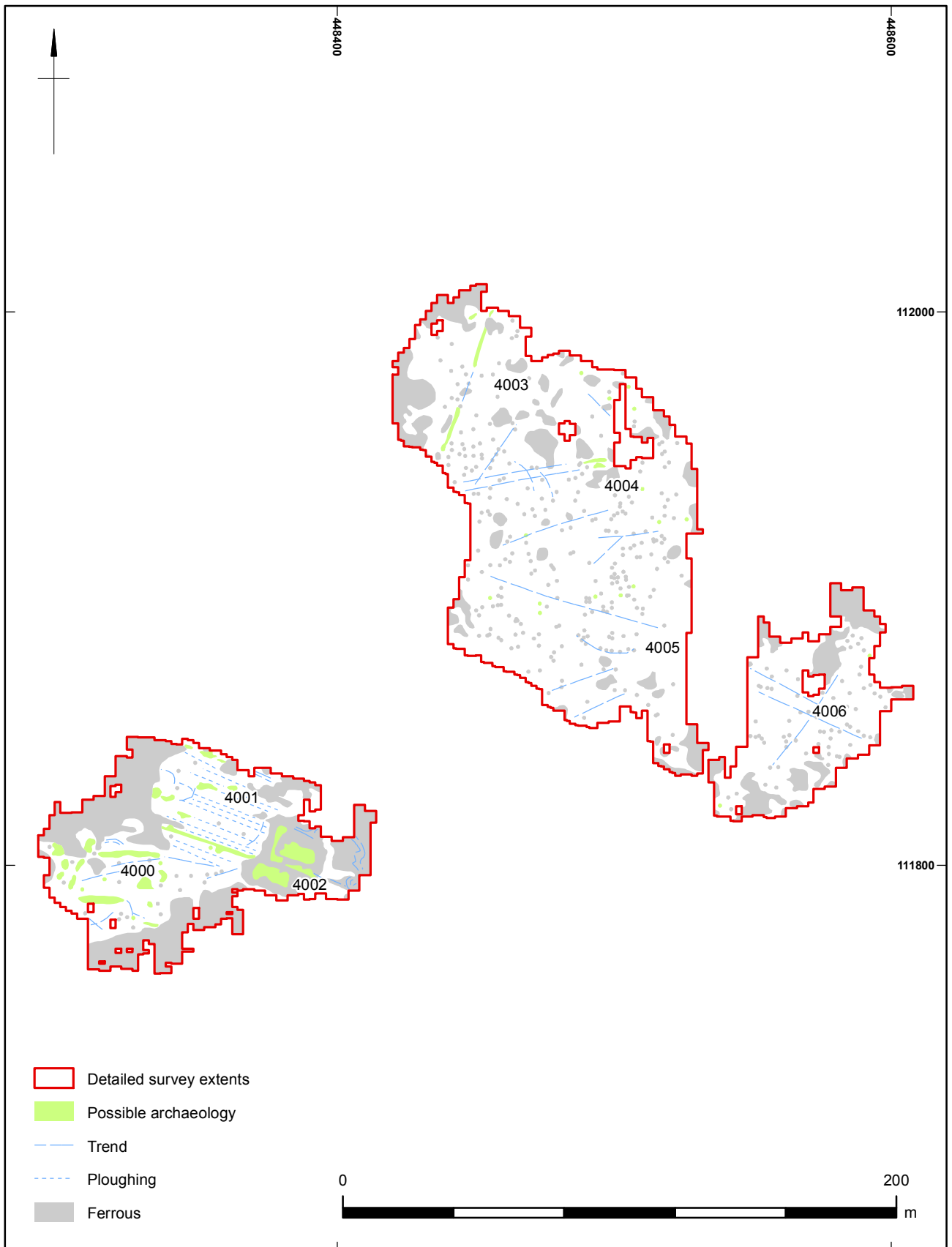


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A: Greyscale; B: XY Trace


Figure 2





- Detailed survey extents
- Possible archaeology
- Trend
- Ploughing
- Ferrous



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