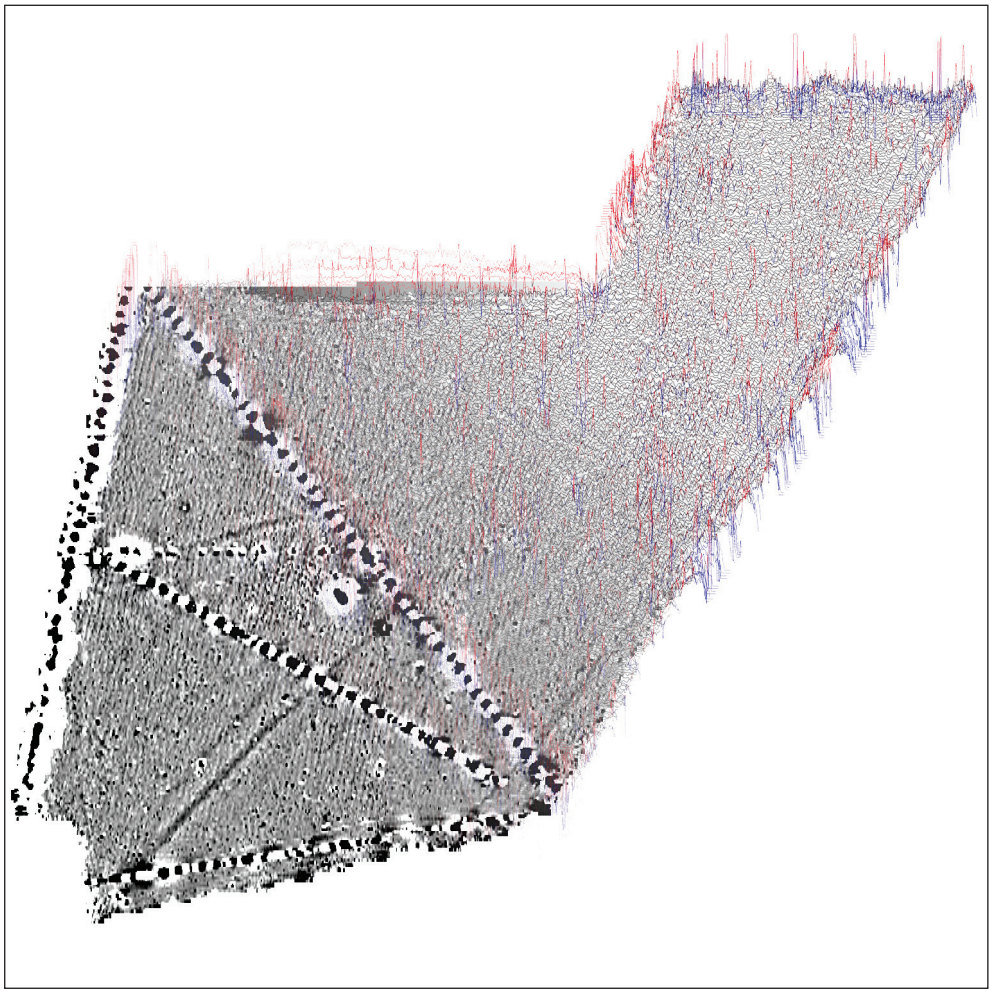
making sense of heritage

Hinton's Field, Lovedon Lane, Kings Worthy, Hampshire

Detailed Gradiometer Survey Report



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geoservices

Hinton's Field, Lovedon Lane, Kings Worthy, Hampshire

Detailed Gradiometer Survey Report

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Detailed Gradiometer Survey Report

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Summary

Wessex Archaeology was commissioned by HAB Housing to undertake a detailed gradiometer survey of land west of Lovedon Lane, Kings Worthy, Hampshire (centred on NGR 449525, 132950). The aim of the work was to establish the presence, or otherwise, and nature of detectable archaeological features on the site as part of a programme of archaeological works ahead of proposed development at the Site.

The site is located approximately 4km north of the centre of Winchester and 7.2km southeast of Sutton Scotney. The site comprises one arable field and one levelled playing field located to the west of Lovedon Lane. The arable field forms the base of a shallowly inclined valley between the two villages of Kings Worthy and Abbots Worthy.

Detailed gradiometer survey was undertaken over all accessible parts of the site, a total of 7.7ha, and has demonstrated the presence of anomalies of probable and possible archaeological significance along with several spreads of superficial geology and at least one former field boundary. The main concentration of archaeological features was located in the southern half of the survey area where a number of possible ditches were detected. Five modern services were detected running through the survey areas that were associated with higher concentrations of ferrous anomalies.

The survey was undertaken between 24th and 26th November 2014.

Hinton's Field, Lovedon Lane, Kings Worthy, Hampshire

Detailed Gradiometer Survey Report

Acknowledgements

The detailed gradiometer survey was commissioned by HAB Housing Ltd. and Wessex Archaeology is grateful to Tom Griffiths in this regard.

The fieldwork was carried out by Laura Andrews, Patrick Dresch and Alistair Salisbury. The geophysical data was processed and interpreted by Alistair Salisbury who also wrote this report. The geophysical work was quality controlled by Ross Lefort. Illustrations were prepared by Ross Lefort and Karen Nichols. The project was managed on behalf of Wessex Archaeology by Andrew Manning.

Hinton's Field, Lovedon Lane, Kings Worthy, Hampshire

Detailed Gradiometer Survey Report

1 INTRODUCTION

1.1 Project Background

1.1.1 Wessex Archaeology was commissioned by HAB Housing Ltd. to carry out a programme of geophysical survey over land to the west of Lovedon Lane, Kings Worthy, Hampshire (**Figure 1**) hereafter "the Site" (centred on NGR 449525, 132950). The survey forms part of an ongoing programme of archaeological works being undertaken ahead of proposed development at the Site.

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 Site Location and Topography

1.2.1 The Site comprises two fields separated by a public walkway: an arable field to the south and a smaller playing field to the north (**Figure 1**). The survey area is located less than 1km to the southeast of the centre of the village Kings Worthy. The survey areas are defined by field boundaries and fences in all directions with Lovedon Lane running along the northeast edge of the Site and the Roman road, Basingstoke Road, along the southeast edge.

1.2.2 The survey area lies at the base of a shallow dry valley orientated NNE-SSW. The height of the land falls from just over 65m above Ordnance Datum (aOD) at the western corner to under 55m aOD at the base of the valley before it again rises to 62m aOD at the eastern corner of the Site. The nearest watercourse is the River Itchen located less than 400m to the south and the dry valley running through this Site leads directly to it.

1.3 Soils and Geology

1.3.1 The bedrock geology beneath the Site is composed of firm white chalk beds of the Seaford Chalk Formation from the Cretaceous Period. These beds contain nodular and tabular flint seams with large to very large nodules. There are few superficial deposits recorded with only some head deposits (clay, silt, sand and gravel) from the Quaternary Period running along the base of the dry valley.

1.3.2 The soils underlying the Site are unsurveyed, however the soils directly neighbouring and surrounding the survey area are defined as brown rendzinas of the 343h (Andover 1) association (SSEW 1983). These soils are shallow and well drained silty soils with deep fine silty soils in valley bottoms. Soils derived from such geological parent material have been shown to produce magnetic contrasts acceptable for the detection of archaeological remains through magnetometer survey.

1.4 Archaeological Background

1.4.1 An archaeological Desk-Based Assessment (DBA) was carried out by Wessex Archaeology (2014). This revealed that medieval finds (possibly relating to manuring practices) and a Palaeolithic hand axe have been recovered from within the Site. The Roman road linking Winchester and Silchester (Basingstoke Road) runs past the southeast edge of the Site. The assessment concluded that there is a potential for buried remains dating to the Iron Age and Romano-British period. The results of this assessment will be referred to, where relevant, during the interpretation of the geophysical data.

2 METHODOLOGY

2.1 Introduction

2.1.1 The detailed magnetometer survey was conducted using Bartington Grad601-2 dual fluxgate gradiometer systems. 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 between 24th and 26th November 2014. Field conditions at the time of the survey were mixed, with the southern field being ploughed and soft from wet weather and the north western field being used as a recreation ground. In total the geophysical survey covered 7.7ha of the available 8.4ha with only a small area lost at the edges of field boundaries.

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 were subject to minimal data correction processes. These comprise a Zero Mean Traverse (ZMT) function (±5nT 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. The deslope and add functions were used to account for errors in the ZMT function and to remove grid edge discontinuities. These four 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 identified a few anomalies of archaeological interest; these anomalies include a north-south aligned linear anomaly running from the Roman road. Results are presented as a series of greyscale plots, XY trace plots and an archaeological interpretation, at a scale of 1:1500 (**Figures 2** to **4**). The data are displayed at -2nT (white) to +3nT (black) for the greyscales and ±25nT at 25nT per cm for the XY traces.

3.1.2 The interpretation of the datasets highlights the presence of potential archaeological anomalies, ferrous/burnt or fired objects, and magnetic trends (**Figure 4**). 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 although many may relate to the twentieth century military occupation in the area.

3.2 Gradiometer Survey Results and Interpretation

3.2.1 The most noticeable feature in the southern survey area is an anomaly striking north-south at **4000** defined as probable archaeology. It is a linear anomaly exhibiting well defined boundaries. Typical magnetic values along its length range are around +1nT and this feature is considered to represent a ditch. In contrast, the neighbouring anomaly described as possible archaeology is not as well defined and has lower magnetic values around +0.5nT. A similar anomaly is aligned roughly northeast-southwest at **4001** and has also been interpreted as probable archaeology.

3.2.2 There are a three weak linear positive anomalies running along the base of the dry valley at **4002**, **4003** and next to **4000**. They have diffuse edges and weak magnetic values but have a regular form in plan. These have been classed as possible archaeology and may represent agricultural features of unknown date.

3.2.3 There are a few small isolated positive anomalies scattered throughout the data with a small group visible around **4004**. These anomalies are sub-oval in shape and measure around 1.5m in length. These anomalies could represent archaeological features such as small pits or postholes but could equally represent natural features such as tree throws. Due to this uncertainty they have been interpreted as possible archaeology and should be regarded as having a low archaeological potential.

3.2.4 The linear at **4005** represents a former field boundary dating back to at least 1897 according to historic mapping consulted in the DBA (Wessex Archaeology 2014). The relatively recent addition of this field boundary may explain the high concentration of ferrous responses along the length of the anomaly.

3.2.5 Weak regions of superficial geology run along and near the base of the dry valley running through this Site. An irregular linear can be seen at **4006** and this may represent a geological feature such as a palaeochannel.

3.2.6 Several modern services can be seen running through the data at **4007** to **4009**; these will be discussed in more detail in the next section of the report.

3.2.7 The field to the north consists of a levelled recreation ground. The two large ferrous anomalies either side of the field are goal posts while other smaller ferrous anomalies behind these were children's play equipment.

3.3 Gradiometer Survey Results and Interpretation: Modern Services

3.3.1 A number of modern services have been identified in the geophysical data at **4007** to **4009**; there are at least five services visible and all look to possibly represent pipes. The function of these services is unclear.

3.3.2 A number of modern services have been identified in the geophysical data however it should be noted that gradiometer survey may not detect all services present on Site. This report and accompanying illustrations should not be used as the sole source for service locations and appropriate equipment (e.g. CAT and Genny) should be used to confirm the location of buried services before any trenches are opened on Site.

4 DISCUSSION

4.1 Summary

4.1.1 The detailed gradiometer survey has been successful in detecting anomalies a few anomalies of probable and possible archaeological interest, in addition to spreads of superficial geology and at least one former field boundary.

4.1.2 The geophysical data has revealed a number of weakly magnetised ditch-like anomalies all aligned roughly north-south. The function and date of these features is unclear although an agricultural explanation seems likely for them.

4.1.3 A former field boundary was detected that can be seen in maps dating to the 19th century. This is characterised by a weakly positive linear and a band of ferrous readings running NE-SW centrally across the southern field. Other agricultural features detected include ploughing scars of a probable modern date.

4.1.4 The relative dimensions of the modern services identified by the gradiometer survey are indicative of the strength of their magnetic response, which is dependent upon the materials used in their construction and the backfill of the service trenches. The physical dimensions of the services indicated may therefore differ from their magnetic extents in plan; it is assumed that the centreline of services is coincident with the centreline of their anomalies, however. Similarly, it is difficult to estimate the depth of burial of the services through gradiometer survey.

4.1.5 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

5.1 Bibliography

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

Wessex Archaeology, 2014, Hinton's Field, Kings Worthy, Hampshire. Archaeological Desk-Based Assessment. Report Ref: 106870.01

5.2 Cartographic Sources

British Geological Survey
http://www.bgs.ac.uk/discoveringgeology/geologyofbritain/viewer.html

Soil Survey of England and Wales (SSEW), 1983: *Sheet 5, Soils of South West England*. Ordnance Survey: Southampton.

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 ±100nT 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 four main categories: archaeological, modern, agricultural and uncertain origin/geological.

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 modern category is used for anomalies that are presumed to be relatively modern in date:

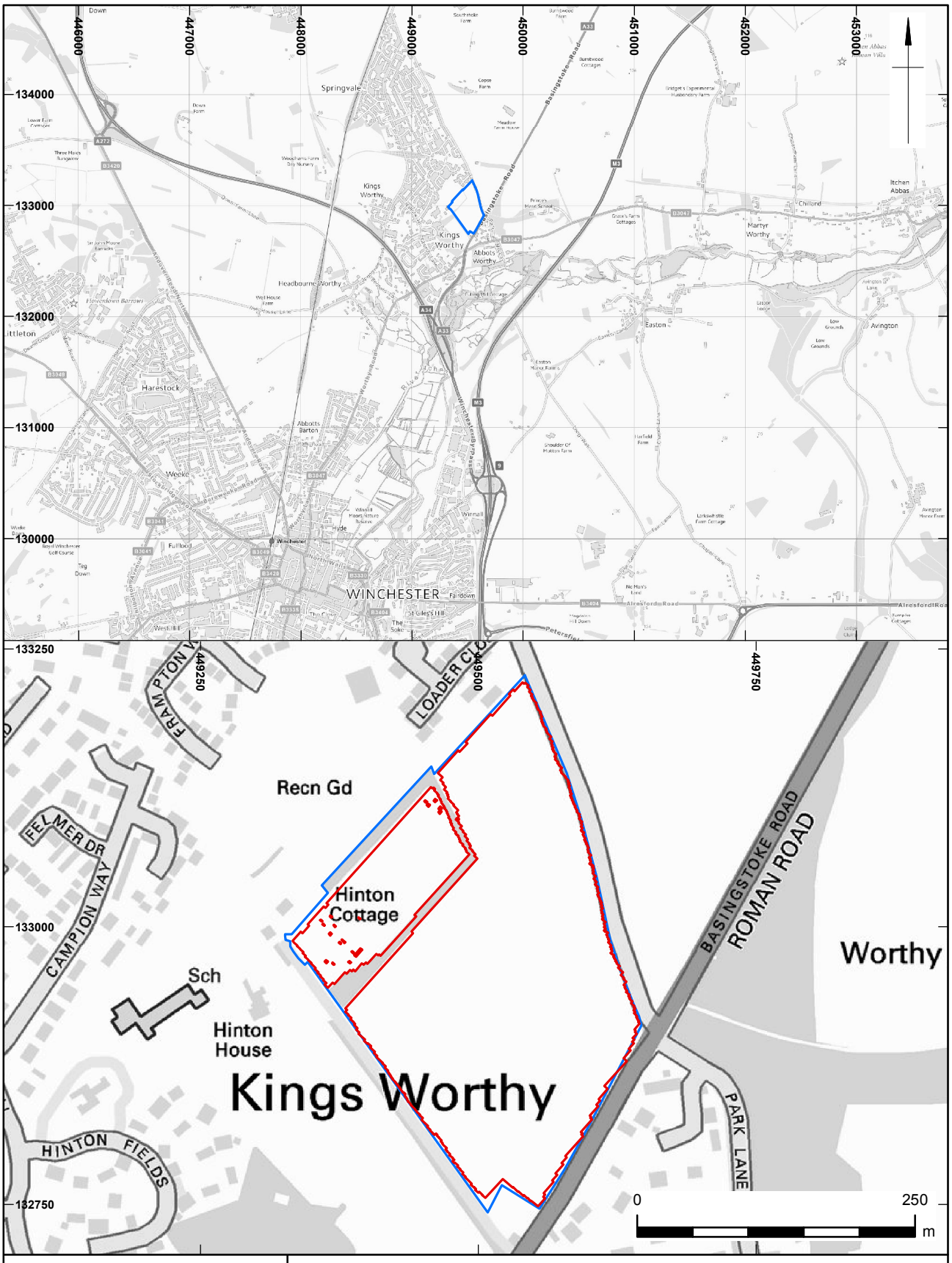
- Ferrous – used for responses caused by ferrous material. These anomalies are likely to be of modern origin.
- Modern service – used for responses considered relating to cables and pipes; most are composed of ferrous/ceramic material although services made from non-magnetic material can sometimes be observed.

The agricultural category is used for the following:

- Former field boundaries – used for ditch sections that correspond to the position of boundaries marked on earlier mapping.
- Agricultural ditches – used for ditch sections that are aligned parallel to existing boundaries and former field boundaries that are not considered to be of archaeological significance.
- Ridge and furrow – used for broad and diffuse linear anomalies that are considered to indicate areas of former ridge and furrow.
- Ploughing – used for well-defined narrow linear responses, usually aligned parallel to existing field boundaries.
- Drainage – used to define the course of ceramic field drains that are visible in the data as a series of repeating bipolar (black and white) responses.

The uncertain origin/geological 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.
- Superficial geology – used for diffuse edged spreads considered to relate to shallow geological deposits. They can be distinguished as areas of positive, negative or broad bipolar (positive and negative) anomalies.



Detailed Survey Extents

Site Boundary

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Scale:	1:50000 and 1:5000 at A4	Illustrator:	RDL
Path:	X:\PROJECTS\106870_Reports\PDFs\Geophysics_2014_12_12		

Site location and detailed survey extents

Figure 1

449400
449500
449600
133200
133100
133000
132900
132800
+3nT
-2nT
Detailed Survey Extents
0
100
m

Date:	14/12/2014	Revision Number:	0
Scale:	1:1500 at A3	Illustrator:	RDL
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Greyscale plot

Figure 2

449400
449500
449600
133200
133100
133000
132900
132800
+25nT
-25nT
Detailed Survey Extents
0
100
m

Date:	14/12/2014	Revision Number:	0
Scale:	1:1500 at A3	Illustrator:	RDL
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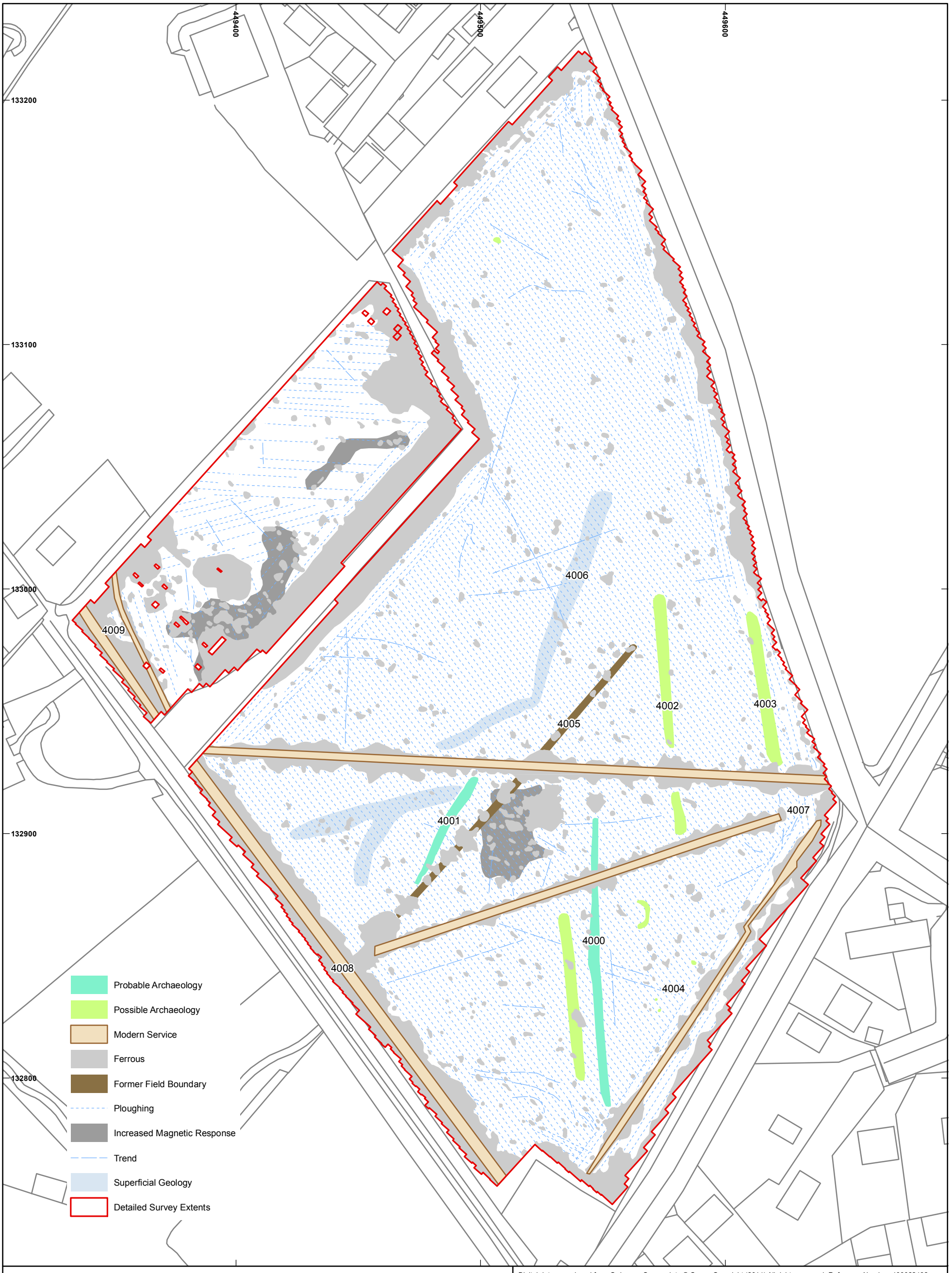
XY trace plot

Figure 3



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Interpretation

Figure 4

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