making sense of heritage

Aylesham Village Expansion
Aylesham, Kent

Detailed Gradiometer Survey Report

Ref: T18172.01
September 2014

geoservices

Aylesham Village Expansion
Aylesham, Kent

Detailed Gradiometer Survey Report

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* I = Internal Draft; E = External Draft; F = Final

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Summary

A detailed gradiometer survey was conducted over land to the north of Aylesham in Kent. The project was commissioned by AMEC with the aim of establishing the presence, or otherwise, and nature of detectable archaeological features on the site ahead of a proposed development.

The site comprises several fields to the north of Aylesham, bordering the existing housing development. The detailed gradiometer survey covered 19.1 ha and has demonstrated the presence of anomalies of archaeological interest within the survey area, along with regions of increased magnetic response and two former quarry pits.

A network of rectilinear ditches has been identified near the centre of the Site, forming a complex that probably extends to the south of Dorman Road North. Whilst the function of these enclosures is unclear from the geophysical dataset alone, the lack of dense pit clusters and other anomalies would suggest that they are associated with agricultural or pastoral activities rather than settlement.

The two quarry pits detected by the survey coincide with ones marked on historic maps, suggesting that they were former landscape features although the date of their infilling is uncertain.

Dense ploughing trends can be seen throughout the dataset, indicating that some truncation of the archaeological features will have taken place. However, few anomalies of possible archaeological interest were identified away from the central portion of the Site.

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Detailed Gradiometer Survey Report

Acknowledgements

The detailed gradiometer survey was commissioned by AMEC. The assistance of Ken Whittaker is gratefully acknowledged in this regard.

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 Richard Milwain. The project was managed on behalf of Wessex Archaeology by Paul Baggaley.

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1 INTRODUCTION

1.1 Project background

1.1.1 Wessex Archaeology was commissioned by AMEC to carry out a geophysical survey of land at Aylesham, Kent (**Figure 1**), hereafter "the Site" (centred on NGR 623419 152760). 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 The Site

1.2.1 The survey area comprises several fields to the north of the centre of Aylesham, occupying the northern extents of the existing town (**Figure 1**). Detailed gradiometer survey was undertaken over all accessible parts of the Site, a total of 19.1 ha.

1.2.2 The Site lies within gently undulating farmland, sloping from 65m above Ordnance Datum (aOD) at the northeastern corner to c. 75m aOD at the southwestern boundary. The survey area was bounded by Adisham Road to the west, Dorman Road North and the existing housing estate to the south and southeast, and by fields to the north.

1.2.3 The soils underlying the Site are likely to be typical brown calcareous earths of the 511f (Combe 1) association (SSEW 1983). 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 between 18th and 29th August 2014. Field conditions at the time of the survey were generally good; one small part of the Site was inaccessible at the time of survey, as it was occupied by other contractors.

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 (±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. 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 1:3,000 (**Figures 2** and **3**). The data are displayed at -2nT (white) to +3nT (black) for the greyscale image and ±25nT at 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 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 and are not referred to, unless considered relevant to the archaeological interpretation.

3.2 Gradiometer Survey Results and Interpretation

3.2.1 Near the centre of the Site, rectilinear anomalies **4000** vary in magnitude, although they are consistent with a network of small enclosures extending northeast (**4001** and **4002**) and southwest (**4003** and **4004**). Beyond **4001** and **4003**, the anomalies weaken and

become indistinguishable from the magnetic background, although it is unclear whether this is associated with the physical size or composition of the archaeological features; dense ploughing trends indicate that truncation through agricultural activity is likely.

3.2.2 Due to the presence of the fenced-off compound, it is not possible to determine the extents of the enclosures to the south beyond **4002**. It is assumed that the extents of this cluster of features extends at least 250m E-W by at least 175m N-S, although it is difficult to ascertain the density of internal features within the enclosures.

3.2.3 Several sub-circular regions of increased magnetic response can be seen in close associated with the enclosure ditches, although their relationship is unclear from the geophysical data alone. Other ferrous anomalies appear close to existing boundaries and are considered likely to be modern in provenance.

3.2.4 To the south of Dorman Road North, further rectilinear enclosures **4005** can be seen on a similar orientation to **4000-4004**. It is therefore probable that these anomalies indicate a continuous network of former fields or enclosures.

3.2.5 Near the easternmost extent of this southwesternmost survey area and immediately east of **4005**, region of magnetic disturbance **4006** is consistent with an infilled quarry or hollow; this anomaly is coincident with a quarry marked on historic mapping and is therefore considered to be of probable archaeological interest. Anomaly **4007** is similar in character and also coincides with a quarry on historic maps; however, a region of increased response **4008** to the north may also be of archaeological interest.

3.2.6 Band of increased response **4009** is consistent with a former track; the responses are probably associated with the material used as hardcore for its construction.

3.2.7 Regions of increased response **4010** and **4011** exhibit sinuous anomalies typical of geological features and are likely to coincide with changes in the near-surface geology; it is possible that these are areas of alluvium. However, several regions of more coherent response can be seen at **4010**, which appear to have different origins and may therefore be of archaeological interest.

3.2.8 Ploughing trends can be seen throughout the survey area, generally oriented E-W and are relatively dense, indicating that some truncation of any archaeological features will have occurred. However, several clusters of ploughing trends can be seen on other alignments and their spacing suggests that they may relate to former ridge and furrow, although little evidence for medieval or post-medieval field systems can be discerned in the dataset.

4 CONCLUSION

4.1.1 The detailed gradiometer survey has identified a cluster of anomalies of archaeological interest within the Site, in addition to regions of increased magnetic response and ploughing.

4.1.2 The majority of anomalies likely to be of archaeological interest lie near the centre of the Site, comprising rectilinear ditches forming a system of enclosures. Typically late prehistoric and Romano-British settlements are associated with dense clusters of pits and other small and discrete features, of which there is little trace in this dataset. This may suggest that these enclosures were used for agricultural activities, either for cultivation or animal husbandry; there is not sufficient evidence to rule out settlement entirely however.

4.1.3 The two former quarry pits may prove to be of interest, depending upon their date. It is also conceivable that the backfill of the quarries may also contain artefacts of interest, assuming that they were infilled historically rather than recently.

4.1.4 The majority of the Site exhibits a low density of anomalies of possible archaeological interest, with isolated pit-like responses and weak trends seen on varying orientations. The detection of ephemeral ploughing trends and identification of the enclosures at the centre of the Site suggests that archaeological features would have produce measurable magnetic anomalies.

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

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, Soils of South East 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 two main categories: archaeological and unidentified responses.

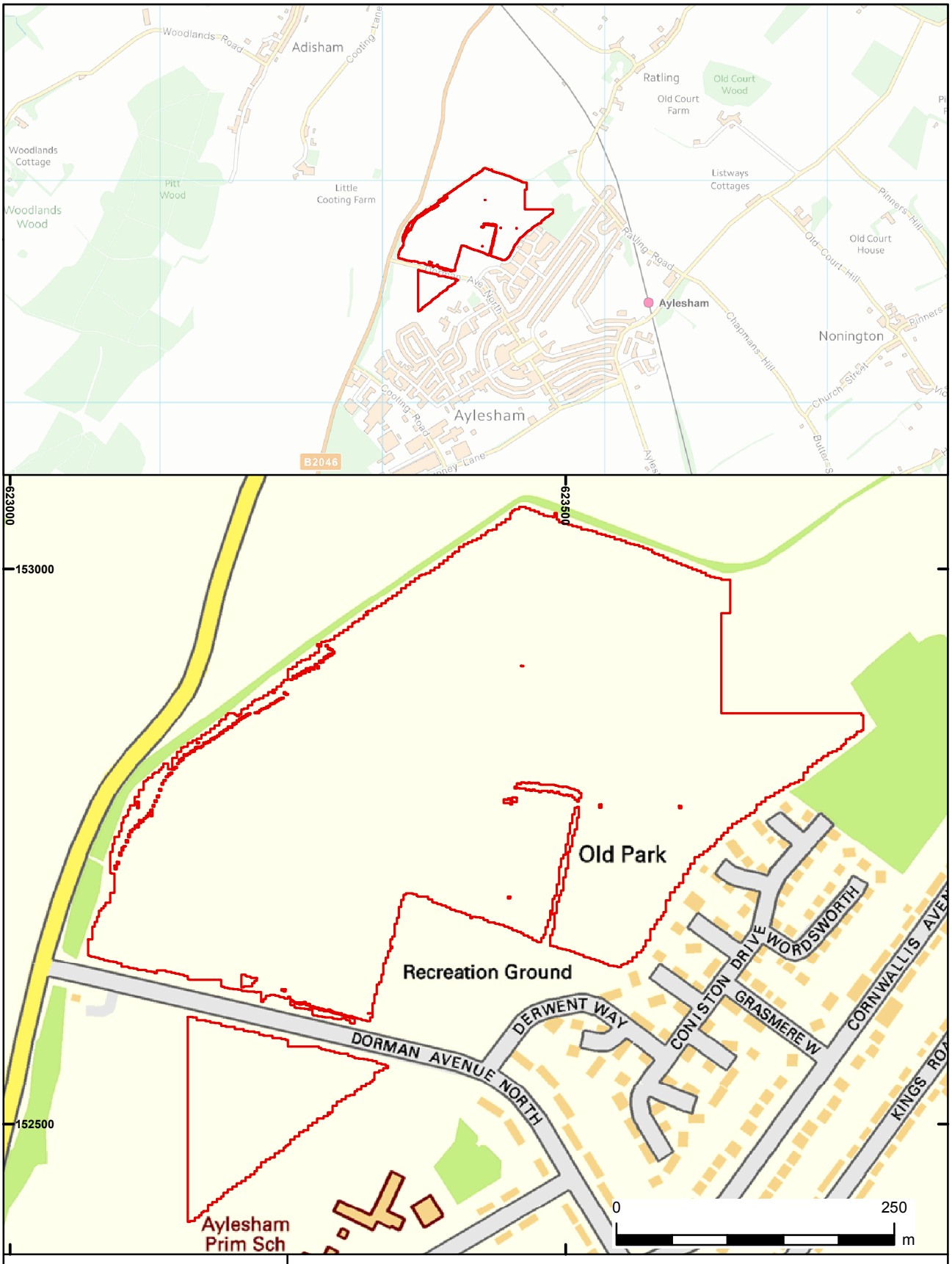
The archaeological category is used for features when the form, nature and pattern of the anomaly are indicative of archaeological material. Further sources of information such as aerial photographs may also have been incorporated in providing the final interpretation. This category is further sub-divided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



Survey Extents

Date:	18/09/14	Revision Number:	0
Scale:	1:25000 and 1:5000 at A4	Illustrator:	RAM
Path:	X:\PROJECTS\T18172\GIS\FigsMXD\T18172_Fig01.mxd		

Site location and survey extents

Figure 1

623000
623200
623400
623600
623800
153000
152800
152600
152400
+3nT
-2nT
0
100
m
Survey Extents

Date:	18/09/14	Revision Number:	0
Scale:	1:3000 at A3	Illustrator:	RAM
Path:	X:\PROJECTS\T18172\GIS\FigsMXD\T18172_Fig02.mxd		

Greyscale

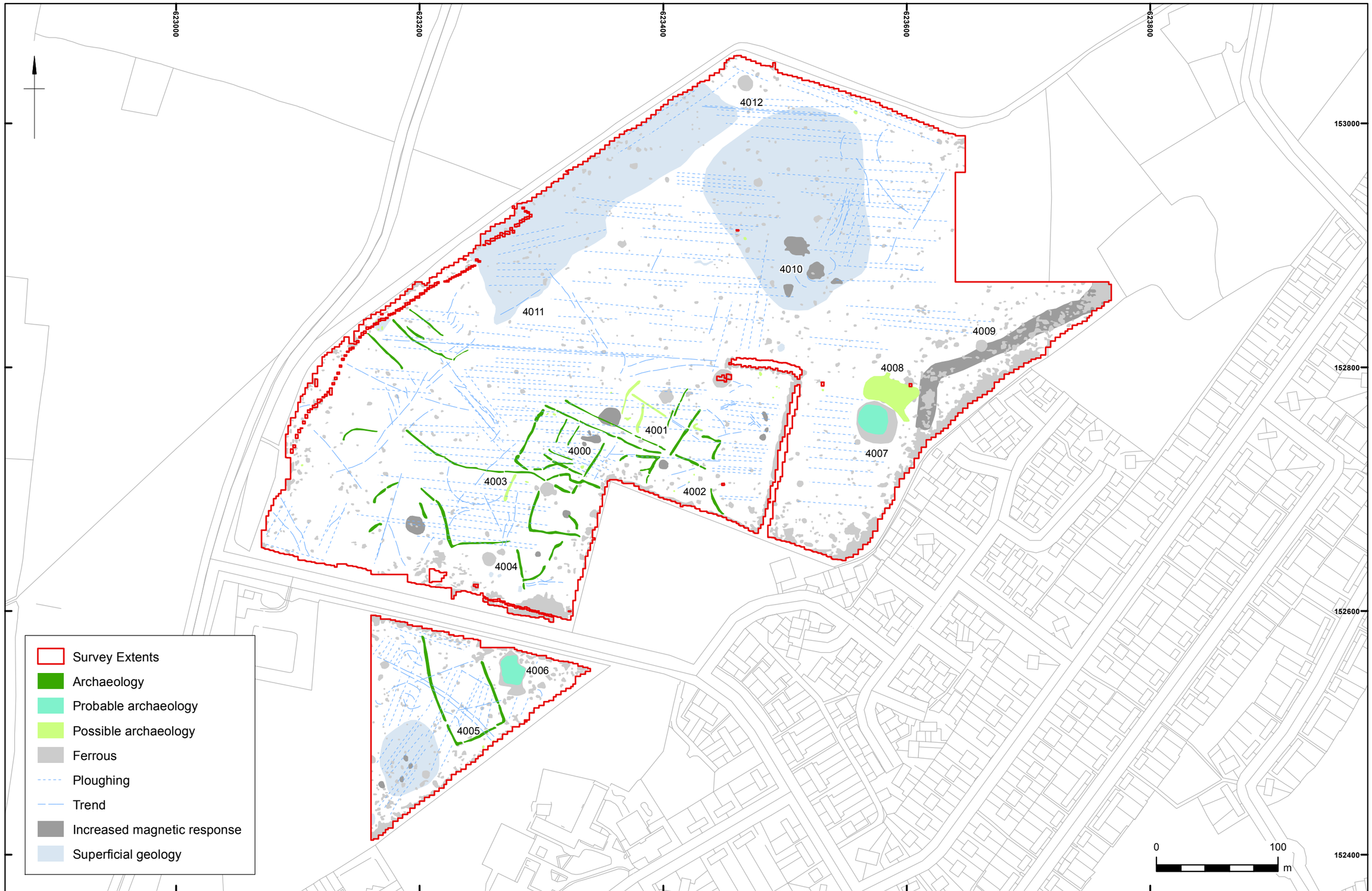
Figure 2

623000
623200
623400
623600
623800
153000
152800
152600
152400
+25nT
-25nT
0
100
m
Survey Extents

Date:	18/09/14	Revision Number:	0
Scale:	1:3000 at A3	Illustrator:	RAM
Path:	X:\PROJECTS\T18172\GIS\FigsMXD\T18172_Fig03.mxd		

XY trace

Figure 3



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Scale:	1:3000 at A3	Illustrator:	RAM
Path:	X:\PROJECTS\T18172\GIS\FigsMXD\T18172_Fig04.mxd		

Interpretation

Figure 4

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