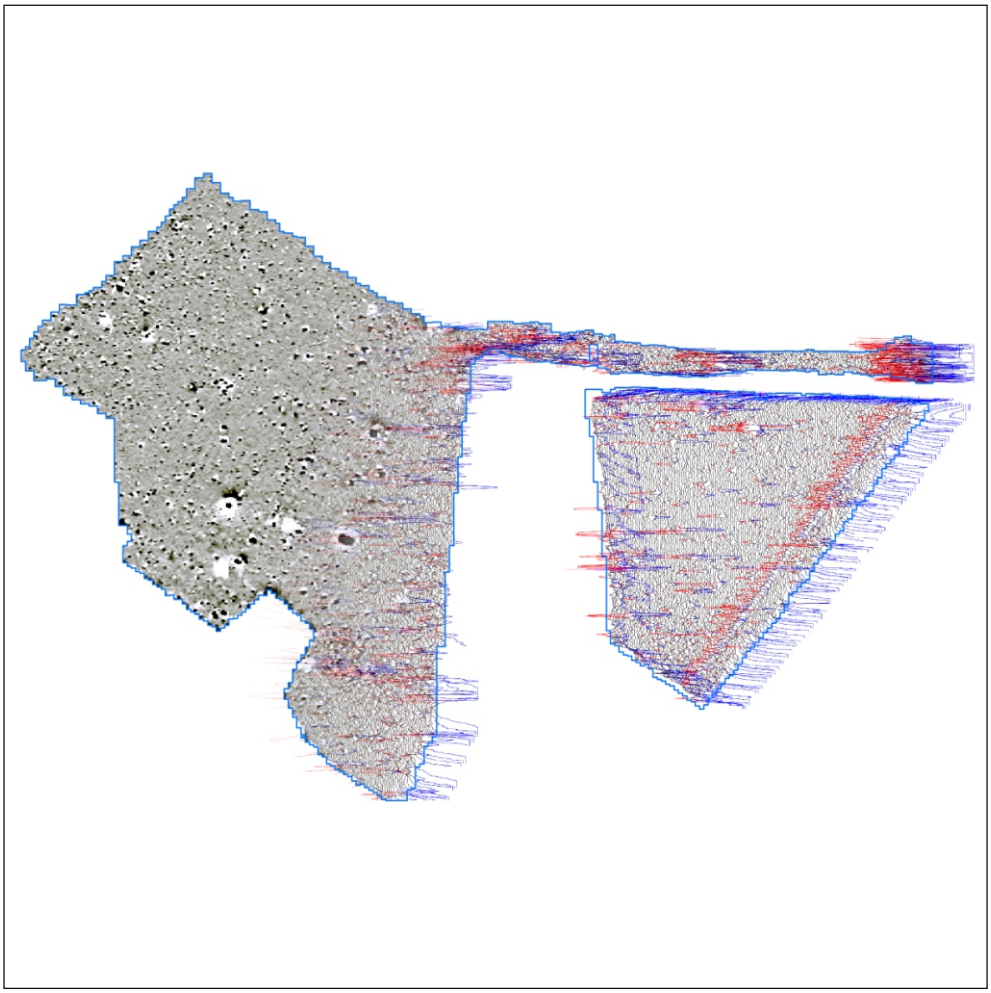
making sense of heritage

University Of Reading Science And Innovation Park

Detailed Gradiometer Survey Report



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geoservices

University Of Reading Science And Innovation Park

Detailed Gradiometer Survey Report

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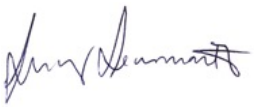
v01	E	*GJD*	*LJL*		13/05/2015
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* I= Internal Draft; E= External Draft; F= Final

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Summary

A detailed gradiometer survey was conducted over land northeast of Shinfield, Berkshire (centred on NGR 473700, 169000). The project was commissioned by Parsons Brinckerhoff on behalf of the University of Reading with the aim of establishing the presence, or otherwise, and nature of detectable archaeological features on the site ahead of Phase One of the proposed development of the new Science and Innovation Park.

The site comprises arable fields located northeast of the lane between Cutbush House and Land End Farm, covering an area of approximately 5.8ha. The geophysical survey was undertaken on 13th and 14th April 2015. The detailed gradiometer survey has demonstrated the presence of a number of anomalies of archaeological interest across the site.

The anomalies identified as being of archaeological interest are primarily pit-like and ditch-like features. Features identified in the western field are likely to represent possible small enclosures whilst the eastern field presents little evidence for further archaeological features.

Additionally, this archaeological investigation has detected evidence for a former field boundary as well as areas of increased magnetic response, superficial geology and evidence for some historic cultivation.

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Detailed Gradiometer Survey Report

Acknowledgements

Wessex Archaeology would like to thank Parsons Brinckerhoff for commissioning the geophysical survey.

The fieldwork was undertaken by Alistair Salisbury and Diana Chard. Garreth Davey processed and interpreted the geophysical data and wrote the report. The geophysical work was quality controlled by Genevieve Shaw and Lucy Learmonth. Illustrations were prepared by Garreth Davey. The project was managed on behalf of Wessex Archaeology by Andy Crockett.

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Detailed Gradiometer Survey Report

1 INTRODUCTION

1.1 Project background

1.1.1 Wessex Archaeology was commissioned by Parsons Brinckerhoff on behalf of the University of Reading to carry out a geophysical survey over land northeast of Shinfield, Berkshire (centred on NGR 473700, 169000 **Figure 1**). The survey forms part of an ongoing programme of archaeological works being undertaken in support of Phase One of the proposed development of the new Science and Innovation Park.

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 is located northeast of the village of Shinfield, Berkshire between this and the M4 motorway.

1.2.2 The Site occupies an area of 5.8ha of agricultural land. The Site is bounded by the M4 motorway to the north, further arable land to the east and west and an existing water reservoir to the south.

1.2.3 The Site is on an incline sloping from approximately65m aOD at the western edge to approximately 46m aOD at the eastern edge.

1.3 Soils and geology

1.3.1 The solid geology comprises Clay, Silt and Sand of the London Clay Formation with overlying superficial geological deposits of River Terrace sand and gravel deposits to the northwest and southeast of the Site (BGS 2015).

1.3.2 The soils underlying the Site are likely to consist of Argillic Gley soils of the 841b (Hurst) association with the possibility of Stagnogley soils of the 711h (Wickham 4) association to the western extreme of the site (Soil Survey of England and Wales, 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 ARCHAEOLOGICAL BACKGROUND

2.1.1 A desk-based assessment (DBA) undertaken by CgMs (2008) examined the potential for the survival of buried archaeological remains within the development area and a 1km Study Area, using information provided by the Berkshire Historic Environment Record

(HER) and the National Heritage List (NHL) coupled with a walkover survey. The following background is summarised from the DBA.

2.1.2 Within the survey area are recorded a number of archaeological sites. These include a possible Roman road, three historic roads and an "L" shaped moat feature.

2.1.3 The route of the Roman road is however highly speculative and is presumed to be part of the Silchester to St Albans route. The historic roads are Cutbush Lane, Pearman's Lane and Hollow Lane which now form modern highways.

2.1.4 The recorded "L" shaped feature lies immediately adjacent to the Site. It is recorded on the Tithe Map of 1836 and may be the remains of a moat or an ornamental feature.

2.1.5 The Church of St Mary the Virgin is a Grade I listed building located 1km southwest of the Site. The church has origin in the 12th century with a rebuild in 14th century and further alterations and extensions in the 15th and 17th centuries.

2.1.6 The majority of listed buildings within the 1km survey area comprise Grade II farmhouses and associated buildings all with later extensions and additions. These are Church farmhouse (15th century), Oldhouse Farmhouse (17th century), Lane End Farmhouse (16th century) and Cutbush Farmhouse (16th century). Cutbush Farmhouse is located on the boundary of the Site.

2.1.7 Other listed buildings include Milton Sandford Restaurant, a gothic revival house now restaurant built around 1840 and the Lodge to the Meteorological Office built in the late 18th century.

2.1.8 Further archaeological works include a detailed gradiometer survey at the Site undertaken by Northamptonshire Archaeology in 2008 which showed no anomalies of archaeological interest. A watching brief was conducted nearby by Thames Valley Archaeological Services in 2003 which also revealed no archaeological features.

2.1.9 The map regression exercise indicated that the Site area has been in use as arable fields from at least the 19th century to present, however individual boundaries have moved as Shinfield and the surrounding farmsteads have developed.

3 METHODOLOGY

3.1 Introduction

3.1.1 The detailed gradiometer survey was conducted using a Bartington Grad 601-2 dual fluxgate gradiometer system. The survey was conducted in accordance with English Heritage guidelines (English Heritage 2008).

3.1.2 The geophysical survey was undertaken by Wessex Archaeology's in-house geophysics team between the 13th and 14thApril 2015. Field conditions at the time of the survey were good, with dry conditions throughout the period of survey. An overall coverage of 5.6ha was achieved.

3.2 Method

3.2.1 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).

3.2.2 The detailed gradiometer 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 English Heritage guidelines (2008). Data were collected in the zigzag method.

3.2.3 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 throughout the survey area, with no interpolation applied.

3.2.4 Further details of the geophysical and survey equipment, methods and processing are described in **Appendix 1**.

4 GEOPHYSICAL SURVEY RESULTS AND INTERPRETATION

4.1 Introduction

4.1.1 The detailed gradiometer survey has identified magnetic anomalies across the Site, along with areas of increased magnetic response and high content of ferrous. Results are presented as a series of greyscale plots, XY plots and archaeological interpretations at a scale of 1:1500 (**Figures 2** to **4**). 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.

4.1.2 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**.

4.1.3 Numerous ferrous anomalies are visible throughout the dataset. These are presumed to be modern in provenance and are not referred to, unless considered relevant to the archaeological interpretation.

4.1.4 Gradiometer data will not be able to locate and identify 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.

4.2 Gradiometer Survey Results and Interpretation

4.2.1 Magnetic anomalies have been identified in both of the fields. Anomalies in the western field are likely to represent small pit-like features whilst those in the eastern field appear to present a linear feature.

4.2.2 To the south of the western field at **4000** an area of +1-2nT magnetic responses forming a small linear feature is apparent. These anomalies represent cut features which as a group could form either a pit-alignment or linear feature of approximately 17m x 3m aligned roughly east-west.

4.2.3 Another small group of +1-2nT positive anomalies at **4001**) show ditch-like features forming a potential linear of 14m north-south with a 10m perpendicular linear joining from the west.

4.2.4 A weak +1nT linear feature can be seen at **4002** aligned northwest-southeast, approximately 20m x 2-3m. Small pit-like anomalies at either end of the linear to the east may represent a turn of the feature and could show a small rectilinear enclosure.

4.2.5 A small length of linear at **4003** is presented by +1nT positive anomalies. This may be related to **4002** given its proximity and southwest-northeast alignment. This may represent an extension to the enclosure or possibly another form of land division such as a field system.

4.2.6 In the eastern field, linear strong +3nT positive anomalies at **4004** are evident as an approximately 165m x 3m linear ditch-like feature aligned northeast-southwest. Given the correlation of this feature to the existing boundary, coupled with evidence on historic mapping, this is likely to represent a former field boundary.

4.2.7 Curvilinear trends have been highlighted at **4005**. These are extremely weak responses and so are difficult to interpret however these may form a circular feature with a roughly 33m diameter.

5 CONCLUSION

5.1.1 The detailed gradiometer survey has been successful in detecting anomalies of interest in both fields. In addition to these, anomalies interpreted as ploughing trends, areas of increased magnetic response and superficial geology have also been identified.

5.1.2 The anomalies of archaeological interest are primarily pit-like and ditch-like features. Features identified in the western field are likely to represent possible small enclosures whilst the eastern field presents little evidence for further archaeological features.

5.1.3 The majority of features with archaeological potential are evident in the eastern extents of the western field at (**4000, 4001, 4002**). Within these areas, small pit and linear features have been identified with archaeological potential and consist of likely pit-like and ditch-like features of unknown origin and date. These are likely to relate to enclosures or field systems and given the archaeological background of the area it is possible to speculate that these maybe Roman in provenance.

5.1.4 Some ploughing trends are visible across the Site. These are likely to be medieval, post-medieval and modern in provenance.

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6.2 Cartographic and Documentary Sources

Ordnance Survey Map 1:2,500 1874-78

Ordnance Survey Map 1:2,500 1899

Ordnance Survey Map 1:2,500 1911

Ordnance Survey Map 1:2,500 1936

Ordnance Survey Map 1:2,500 1965

Ordnance Survey Map 1:2,500 1975

Ordnance Survey Map 1:2,500 1959-87

Ordnance Survey Map 1:2,500 1970-73

Ordnance Survey Map 1:2,500 1987-89

Ordnance Survey Map 1:2,500 1974

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

6.3 Online Resources

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UK Soil Observatory 2015, www.ukso.org [accessed April 2015]

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.

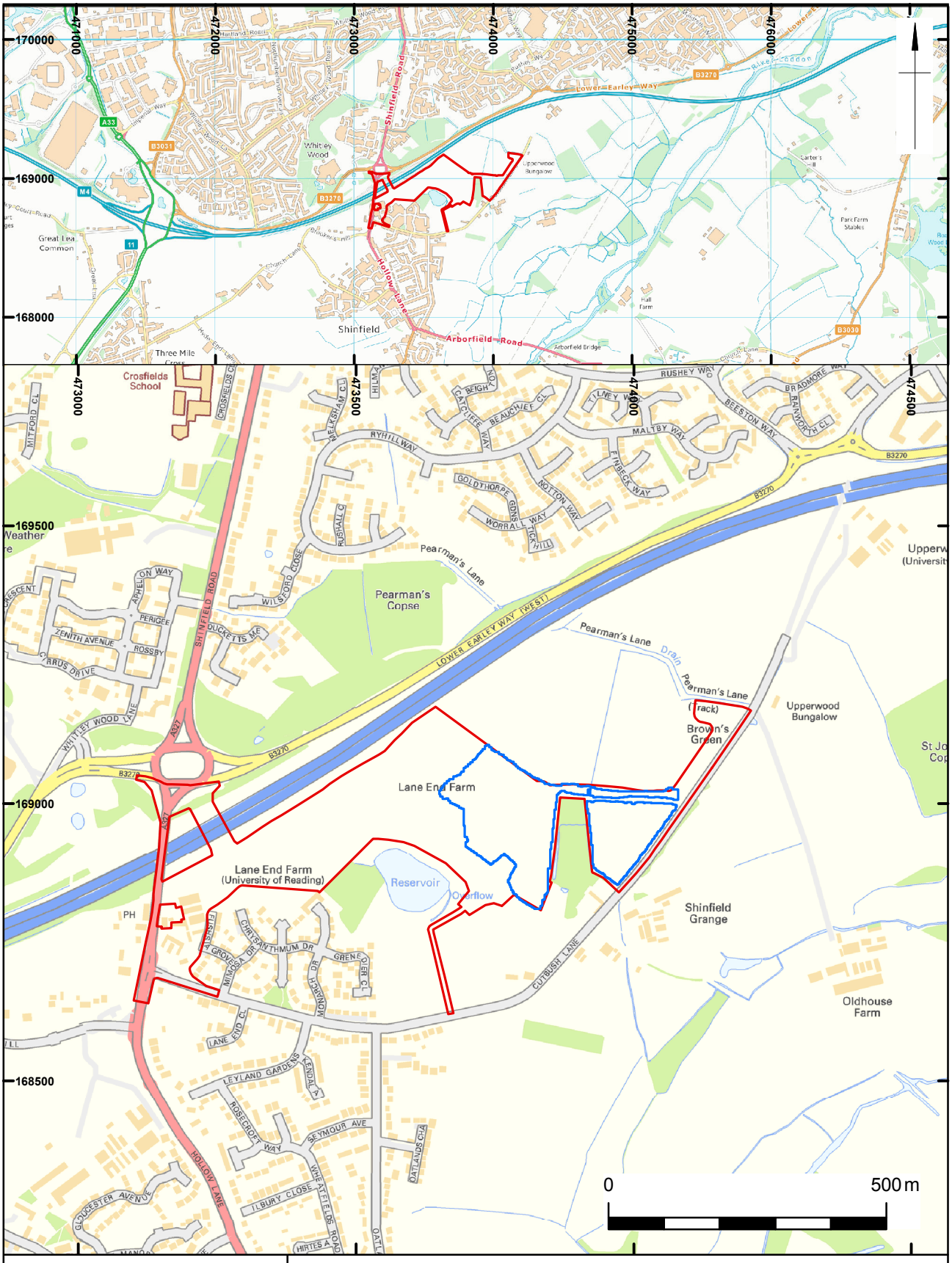
The archaeological category is used for features when the form, nature and pattern of the anomaly are indicative of archaeological material. Further sources of information such as aerial photographs may also have been incorporated in providing the final interpretation. This category is further sub-divided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

Site Boundary

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Scale:	1:40000 and 1:10000 at A4	Illustrator:	GJD
Path:	X:\PROJECTS\107621\GIS\FigsMXD\Fig01.mxd		

Site location and survey extents

Figure 1

473600
473700
473800
473900
474000
474100

169100
169000
168900
168800

+3nT
-2nT

0
100 m

Survey Extents

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Date:	27/04/2015	Revision Number:	0
Scale:	1:1500 at A3	Illustrator:	GJD
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Greyscale plot

Figure 2

473600
473700
473800
473900
474000
474100
169100
169000
168900
168800
+25nT
-25nT
0
100 m
Survey Extents
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Date:	27/04/2015	Revision Number:	0
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XY Trace plot

Figure 3

473600
473700
473800
473900
474000
474100
169100
169000
168900
168800
4006
4005
4004
4002
4003
4001
4000
Survey Extents
Archaeology
Probable Archaeology
Possible Archaeology
Ridge and Furrow
Ploughing
Drainage
Trend
Former Field Boundary
Modern Service
Agricultural
Ferrous
Superficial Geology
Increased Magnetic Response
0
100 m
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Archaeological Interpretation

Figure 4

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