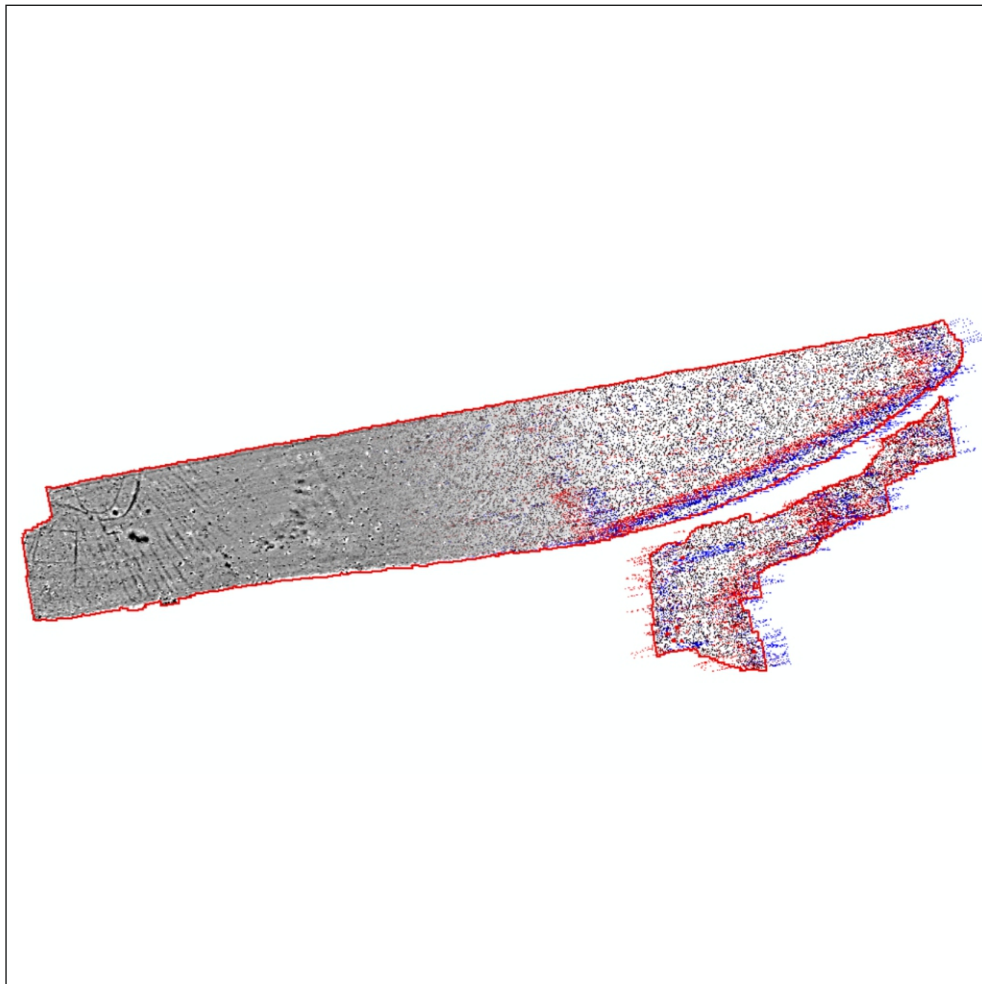




making sense of heritage

Land at College Fields Marlborough, Wiltshire

Detailed Gradiometer Survey Report



Ref: 108830.01
May 2015



Land at College Fields Marlborough, Wiltshire

Detailed Gradiometer Survey Report

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Land at College Fields Marlborough, Wiltshire

Detailed Gradiometer Survey Report

Summary

A detailed gradiometer survey was conducted over land at College Fields, Marlborough, Wiltshire (NGR 417533, 169065) with the aim of establishing the presence, or otherwise, and nature of detectable archaeological features to inform a planning application for housing and a new primary school; to be submitted to Wiltshire Council. The project was commissioned by Edgars Limited on behalf of Marlborough College following the recommendations of a desk-based assessment undertaken by Wessex Archaeology which established the potential for the presence of buried archaeological remains.

The survey area consists of two adjacent fields situated approximately 1km from the centre of Marlborough, one large arable field and another smaller recreational space. The detailed gradiometer survey was undertaken between 7th and 9th April 2015 using Bartington Grad601 instruments, and has demonstrated the presence of anomalies of potential archaeological interest along with ridge and furrow, superficial geology, ploughing, some trends of uncertain origin and a modern service.

In the northwestern section of the survey area, the geophysical data revealed several interconnecting linear and curvilinear anomalies, interpreted as ditches and enclosures. They may indicate the presence of settlement activity. The archaeological evidence from previous archaeological evaluations and geophysical survey on land to the east of the site suggests such settlement activity may originate in the prehistoric or Romano-British periods.

Other features identified included several rounded anomalies interpreted as pits of various sizes, irregular areas of superficial geology across the survey area and ridge and furrow along with other ploughing trends. The southern field is heavily disturbed by a large amount of ferrous material, although some ploughing trends were identified; few anomalies of archaeological potential have been identified in this area.



Land at College Fields Marlborough, Wiltshire

Detailed Gradiometer Survey Report

Acknowledgements

The detailed gradiometer survey was commissioned by Edgars Limited, on behalf of Marlborough College, and Wessex Archaeology is grateful to Paul Slater in this regard

The fieldwork was directed by Laura Andrews with assistance from Diana Chard and Vi Pieteron. The geophysical data was processed by Laura Andrews and Diana Chard. Laura Andrews interpreted the geophysical data in addition to writing this report. The geophysical work was quality controlled by Lizzie Richley and Lucy Learmonth. Illustrations were prepared by Richard Milwain. The project was managed on behalf of Wessex Archaeology by Steve Beach.



Land at College Fields, Marlborough, Wiltshire

Detailed Gradiometer Survey Report

1 INTRODUCTION

1.1 Project background

1.1.1 Wessex Archaeology (WA) was commissioned by Edgars Limited, on behalf of Marlborough College, to carry out a geophysical survey on land at College Fields, Marlborough, Wiltshire (**Figure 1**), hereafter “the Site” (centred on NGR 417533, 169065). The geophysical survey forms part of an ongoing programme of archaeological works being undertaken in support of a planning application for the development of the Site for housing and a new primary school. A Desk-Based Assessment (DBA) has been completed by WA, which established the likelihood of the presence of buried archaeological remains (WA 2015).

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 known as College Fields is located some 300m north of the A4, approximately 1km west of the centre of Marlborough, Wiltshire (**Figure 1**). The Site measures approximately 9.45ha and comprises two fields. The northern part of the Site is currently an arable field while the southern part is an open recreational space within the College Fields housing estate.

1.2.2 The survey extents were defined by limits set by the Edgars Limited. The Site is bounded to the southern extents by the College Fields housing estate and Morris Road. The northern extents are demarcated by hedgerows and trees. A public right of way lies along the northern boundary within the survey area. A total area of 8.9ha was surveyable; this reduced area was due to the width of field boundaries.

1.2.3 The southern part of the Site occupies a steep northwest facing slope from around 150m above Ordnance Datum (aOD) at the southern extents towards approximately 162m at the boundary between the two fields. The northern field occupies a general gentle slope from around 165m aOD in the northeast to around 152m aOD in the southwest extents. A dry valley runs from north to south towards the west of the Site at levels of around 149m aOD to approximately 144m aOD.

1.3 Soils and Geology

1.3.1 The bedrock geology under much of the Site is recorded as the Lewes Nodular Chalk Formation, Seaford Chalk Formation and Newhaven Chalk Formation, with superficial deposits of clay-with-flints recorded in the eastern parts of the Site (British Geological



Survey). No superficial deposits were recorded immediately to either side of the dry valley or in the western extents of the site. The geology for the dry valley is recorded as the Holywell Nodular Chalk Formation and the New Pit Chalk Formation with superficial River Terrace deposits (BGS). This would indicate the currently dry valley was once a watercourse.

- 1.3.2 The soils underlying most of the Site are likely to be a mix of brown rendzinas of the 343h (Andover 1) association, typical brown calcareous earths of the 511f (Coombe 1) association and typical paleo-argillic brown earths of the 581d (Carstons) 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.

1.4 Archaeological Background

- 1.4.1 A DBA undertaken by Wessex Archaeology (2015) examined the potential for the survival of buried archaeological remains within the development area and a 1km Study Area, using information provided by the Wiltshire and Swindon Historic Environment Record (WSHER) and the National Heritage List (NHL). The following background is summarised from the DBA.
- 1.4.2 Manton Barrow falls within the survey area to the west of the Site. This is a Bronze Age barrow which contained a burial with multiple gold ornaments and other exotic items (WA178, WA203.) Another barrow lies 1km west of this outside the Study Area and it is likely that more barrows may have existed in the area with contemporary bronze axes being found in the area.
- 1.4.3 Romano-British archaeology in the area includes a possible road at the west of the Study Area, field systems at Granham Hill (WA208) and a possible bowl barrow (WA207). Spot finds of coins and pottery sherds have also be recorded within the survey area. Approximately 670m southeast of the site a carved eagle on a ball was also recovered.
- 1.4.4 Saxon finds are limited but pottery has been recovered within the Study Area. Medieval finds are also recorded within Manton. Churches within Manton include St Marys Church, a 12th century church is thought to be on the site of an earlier church and the Church of St Peter and St Paul which are dated to the 15th century. A motte and bailey castle at Marlborough Mound is documented from 1110 but was known to be in ruins by the end of the 16th century. The land is now encompassed within the college grounds as a landscape feature.
- 1.4.5 Preshute contains further evidence for medieval occupation. The Church of St George is dated to the 12th century with earthworks on the eastern edge of the village thought to show shrinkage. Water meadows dating from the 17th century are also known to the north of Preshute in the river valley.
- 1.4.6 The Site is likely associated with Barton Farm due to its close proximity. The farm is a former grange farm associated with ecclesiastical institutions. The farm has an 18th century farm house, stable and granary with two 15-16th century barns also attached.
- 1.4.7 No archaeological investigations are known to have been carried out within the Site or in advance of the construction of the adjacent College Fields development. However, a number of smaller scale excavations and watching briefs have been carried out in the Study Area, largely associated with development within the town of Marlborough.



- 1.4.8 The DBA concluded that archaeological remains are likely to be present and these would be indicative of prehistoric, Romano-British or medieval activity associated with rural or agricultural activity. References to archaeological information from the DBA are included where relevant to the geophysical interpretation.

2 METHODOLOGY

2.1 Introduction

- 2.1.1 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).

- 2.1.2 The geophysical survey was undertaken by Wessex Archaeology's in-house geophysics team between 7th and 9th April 2015. Field conditions at the time of the survey were good.

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 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 was 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 (± 5 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 a few anomalies of likely, probable and possible archaeological interest across the Site, along with ploughing trends, ridge and furrow, areas of superficial geology and regions of increased magnetic response. A system of modern services has also been identified. Results are presented as a series of greyscale and XY plots, with corresponding archaeological interpretations, at a scale of 1:2000 (**Figures 2 to 4**). The data are displayed at -2nT (white) to +3nT (black) for the greyscale image and ± 25 nT 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 The most significant anomalies are concentrated in the very western extents within an area approximately 110m x 80m. They have been interpreted as two separate sets anomalies due to differences in their form. The relationship between the two cannot be determined from the geophysical data alone.
- 3.2.2 The most northern set of features (**4000** and **4001**) comprise four linear and curvilinear positive anomalies, one seemingly enveloping the other, which is sub-angular in appearance. These have been interpreted as ditches of archaeological interest and appear to extend outside the survey area to the north. The inner ditch **4000**, measuring 2nT, forms a tight curvilinear bend with both ends extending towards the north boundary. The outer ditch **4001**, measuring 2-3nT appears to be on the same alignment to the southeast, but more linear to the west (on a northwest alignment as it extends out of the survey area) and to the south (curves towards the east where it terminates). They have been interpreted as likely enclosures of unknown origin although the DBA infers such features may be prehistoric, Romano-British or medieval in origin (Wessex Archaeology 2015). It is not apparent whether these two sets of ditches relate to each other from the geophysical data alone.
- 3.2.3 The features to the south (**4002**, **4003** and **4006**) are very regular and more angular in appearance. **4002** comprises four interconnecting linear anomalies interpreted as ditches on an almost north south to east west alignment, forming an enclosure. A gap in the north linear is likely to be an entrance although it is possible that this may have become truncated at a later date. The ditch to the east extends further south where it terminates, and a weak trend on the western edge suggests this may occur on the other side also. A weak positive linear response at **4006** has been interpreted as a possible ditch that may relate to the enclosure. The second linear anomaly (**4003**) is located just west of the enclosure, it is on the same alignment so has been interpreted as a related ditch feature and is likely to extend out of the survey area to the north and south.
- 3.2.4 An irregular anomaly measuring approximately 15m x 5m (**4004**) has been identified immediately to the southeast of **4001**. The proximity of this anomaly to the likely enclosure features, in addition to its relative size and similar magnetic value of 3-4nT, has led to this anomaly being interpreted as likely archaeology of uncertain origin but is likely to represent a cut feature, such as a ditch.
- 3.2.5 Within the vicinity of the interpreted northern enclosure lie two large sub-rounded positive anomalies, 4nT in value, interpreted as pits of approximately 3m in diameter (**4005**). These have been classified as probable archaeology and may be associated with the surrounding previously identified anomalies (**4000**, **4001**, **4004**).
- 3.2.6 Anomaly **4007** is an isolated, weak positive linear anomaly of 0.5nT interpreted as possible archaeology. It could be a ditch or possible field boundary, however it is on a different alignment to the surrounding features and its size and weak response means this is unclear. A very weak linear trend seems to cross this anomaly at a perpendicular angle and it is unclear whether these features are related.
- 3.2.7 Several small sub-rounded positive anomalies such as those at **4008** have been identified across the Site, interpreted as small pits and classified as possible archaeology of uncertain origin.
- 3.2.8 In the westernmost extents of the Site lies an array of linear anomalies orientated northwest to southeast (**4009**). These have been interpreted as ridge and furrow most



commonly associated with agricultural activity from the medieval period. It is unclear if there is a relationship between this agricultural system and the interpreted archaeology or whether they represent different phases of occupation. A similar though weaker response has been identified as trends at **4017** in the southern extents of the smaller field, however the alignment runs from northeast to southwest, and the linear anomalies are more irregular.

- 3.2.9 Across the length of the northernmost field, an array of numerous weak positive linear anomalies such as those at **4010** have been identified on a northeast to southwest alignment and are interpreted as ploughing trends. These are thought to be modern in origin as the field had been ploughed on the same alignment at the time of survey.
- 3.2.10 The long, thin linear (**4011**) that extends along the northernmost boundary of the Site is thought to be the public footpath and has been interpreted as agricultural as it is used as a track way between fields.
- 3.2.11 Anomalies such as the small irregular areas of positive and negative response at **4012**, **4013** and the much larger region at **4014**, have been interpreted as changes in the superficial geology within the Site. The linear anomaly of weak positive and negative response at **4015** aligned north to south in a region with noticeably fewer responses is thought to be associated with the dry valley. The large area at **4014** is in the same region of the Site that is mean to be covered by a clay-with-flints deposit with a small area of fewer responses towards the east of the Site.
- 3.2.12 Several weak positive and negative anomalies such as those at **4016** have been identified as isolated weak trends of uncertain origin. These trends are likely to represent a circular archaeological features but the surrounding superficial geology and weak responses of the trends themselves make any further interpretation difficult.
- 3.2.13 A large area of increased magnetic response was identified along the east extents of the southern field at **4018**, caused possibly by the proximity to the College Fields housing estate. It is in this area that the DBA identified the presence of a partial enclosure (Wessex Archaeology 2015). As no evidence for this enclosure has been identified from the geophysical data it must be concluded that any weaker responses of archaeological potential may have been obscured by the strong ferrous responses in this area.

3.3 Gradiometer Survey Results and Interpretation: Modern Services

- 3.3.1 A modern service has been identified at **4019** with the main section running almost parallel with the southern boundary of the northern field. There is a perpendicular linear response at each end, the one to the west running north before terminating in the field, the one to the north east extending out of the field at each end.
- 3.3.2 It is not clear from the geophysical data whether the services identified are in active use. It should also 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 CONCLUSION

- 4.1.1 The detailed gradiometer survey has been successful in detecting anomalies of likely, probable and possible archaeology as well as ploughing and agricultural trends,



numerous trends of uncertain origin, large areas of geological disturbance, a region of magnetic disturbance and a modern service.

- 4.1.2 The Site was identified by the DBA as an area of suspected multi-period use ranging from the Bronze Age to the post-medieval and 19th century, and considered to be more used for agriculture (Wessex Archaeology 2015).
- 4.1.3 The most interesting anomalies are the interconnecting linear and curvilinear anomalies around **4000 - 4006** interpreted as enclosures and associated features of settlement.
- 4.1.4 Several smaller anomalies of probable and possible archaeological potential have been identified across the Site, interpreted as ditches and pits of weaker response.
- 4.1.5 Large areas of superficial geology have been detected, with **4015** thought to be indicative of a now dry water course.
- 4.1.6 The remaining anomalies appear to be agricultural in origin, mainly in the form of regularly spaced ridge and furrow in the western section with ploughing trends identified across the entire of the site.
- 4.1.7 The relative dimensions of the modern service identified by the gradiometer survey are indicative of the strength of their magnetic response; 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.
- 4.1.8 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. In the south-eastern area especially few anomalies of archaeological potential have been identified due to the strong magnetic response from modern services, wire fencing and areas of ferrous debris. The archaeological potential in these areas are probably low with few archaeological features surviving.



6 REFERENCES

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6.2 Cartographic Sources

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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 ± 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 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:

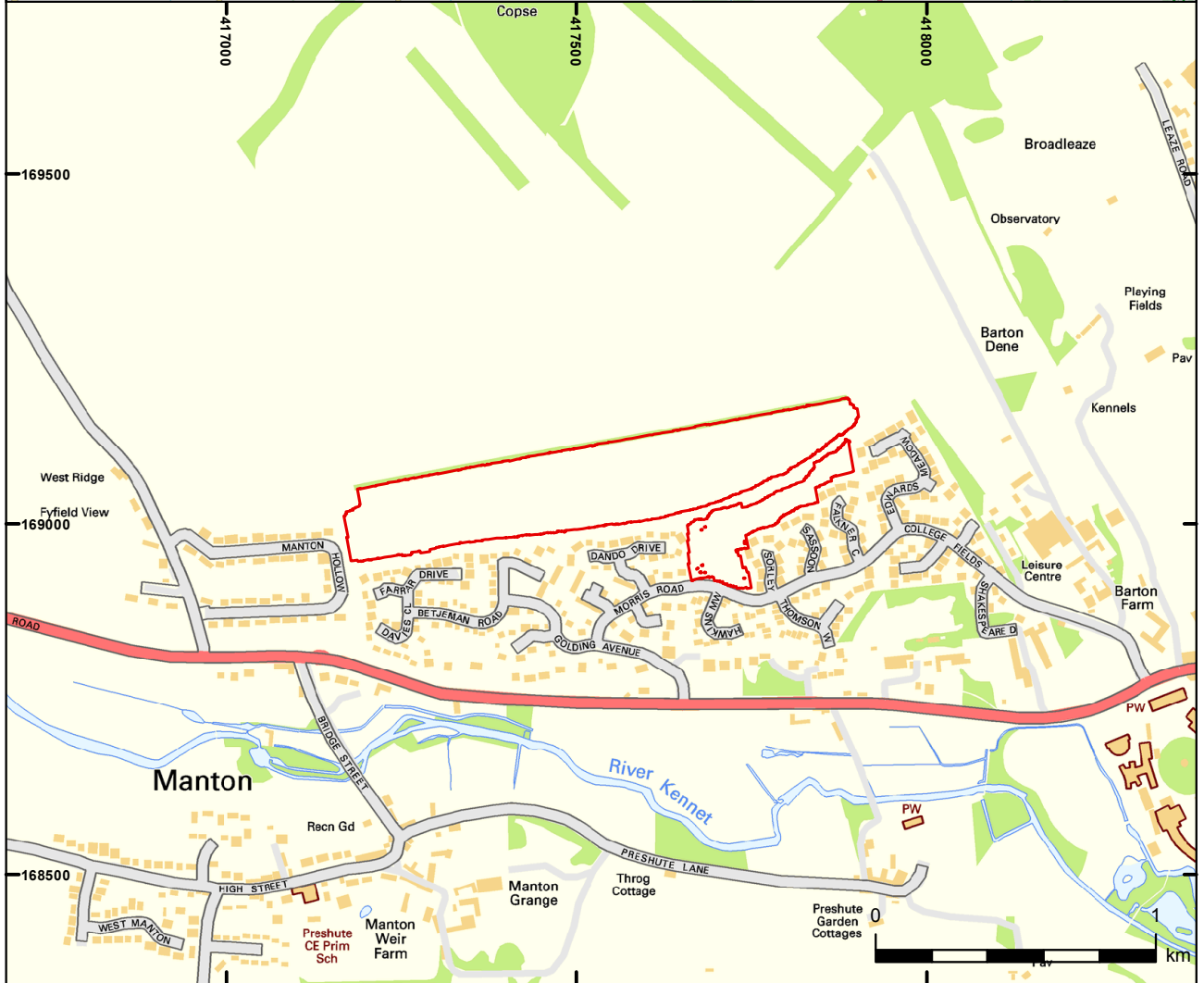
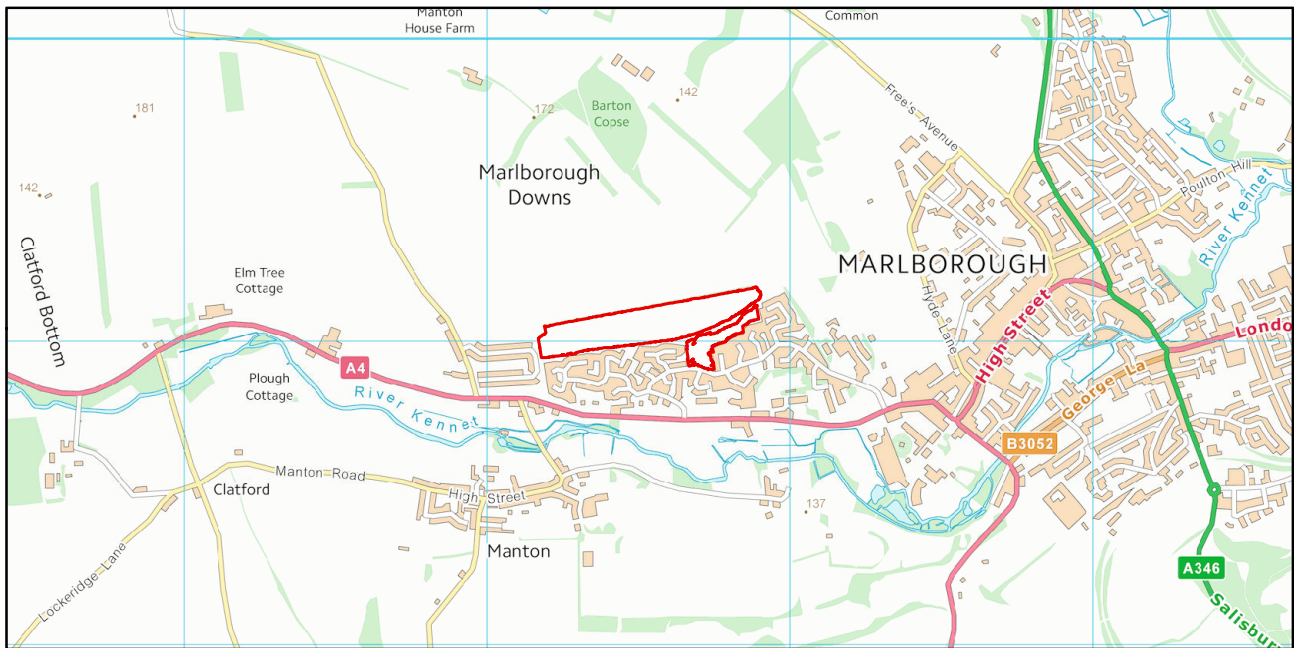
- Ferrous – used for responses caused by ferrous material. These anomalies are likely to be of modern origin.
- Modern service – used for responses considered relating to cables and pipes; most are composed of ferrous/ceramic material although services made from non-magnetic material can sometimes be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



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Site location and survey extents

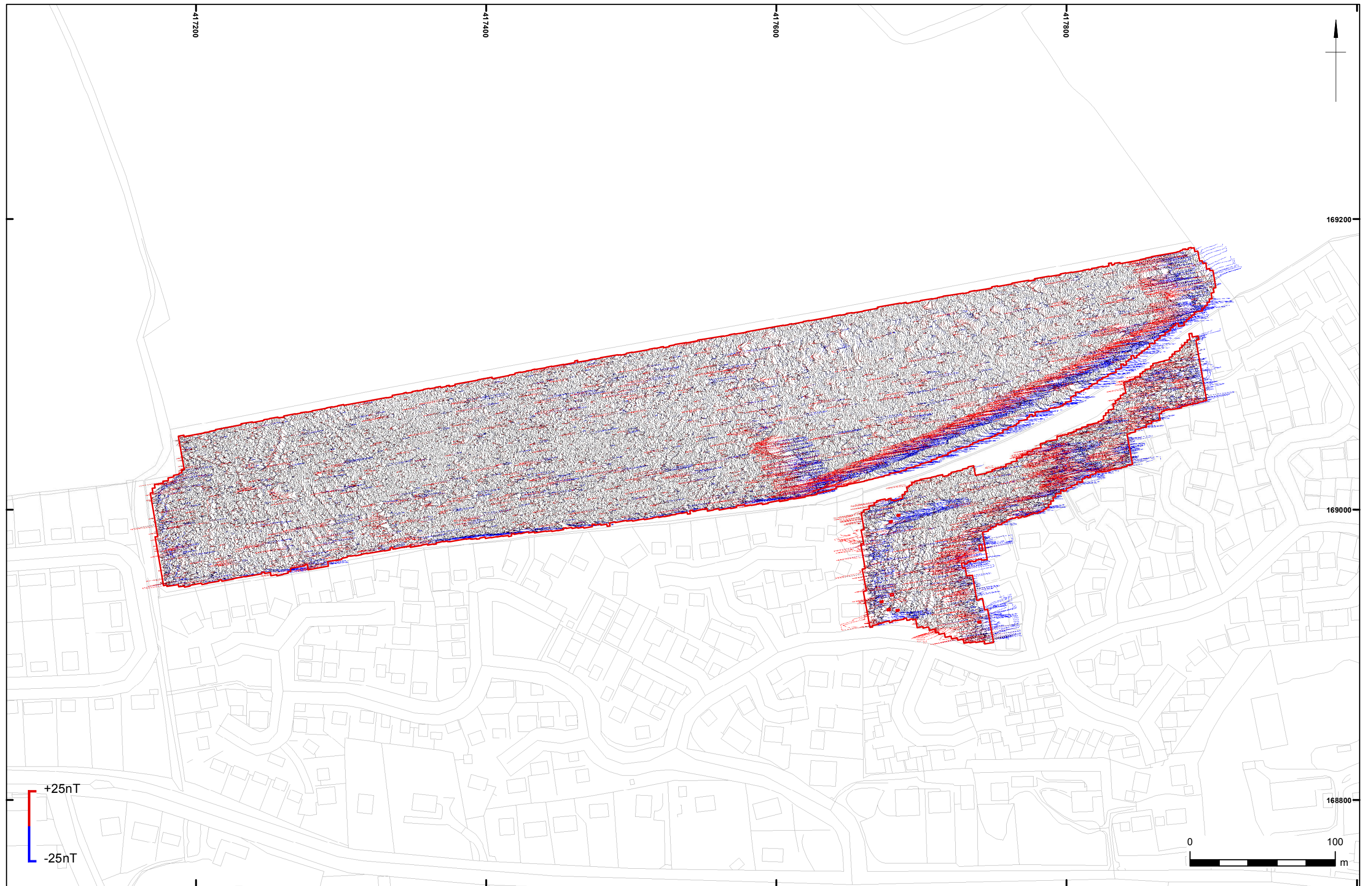
Figure 1



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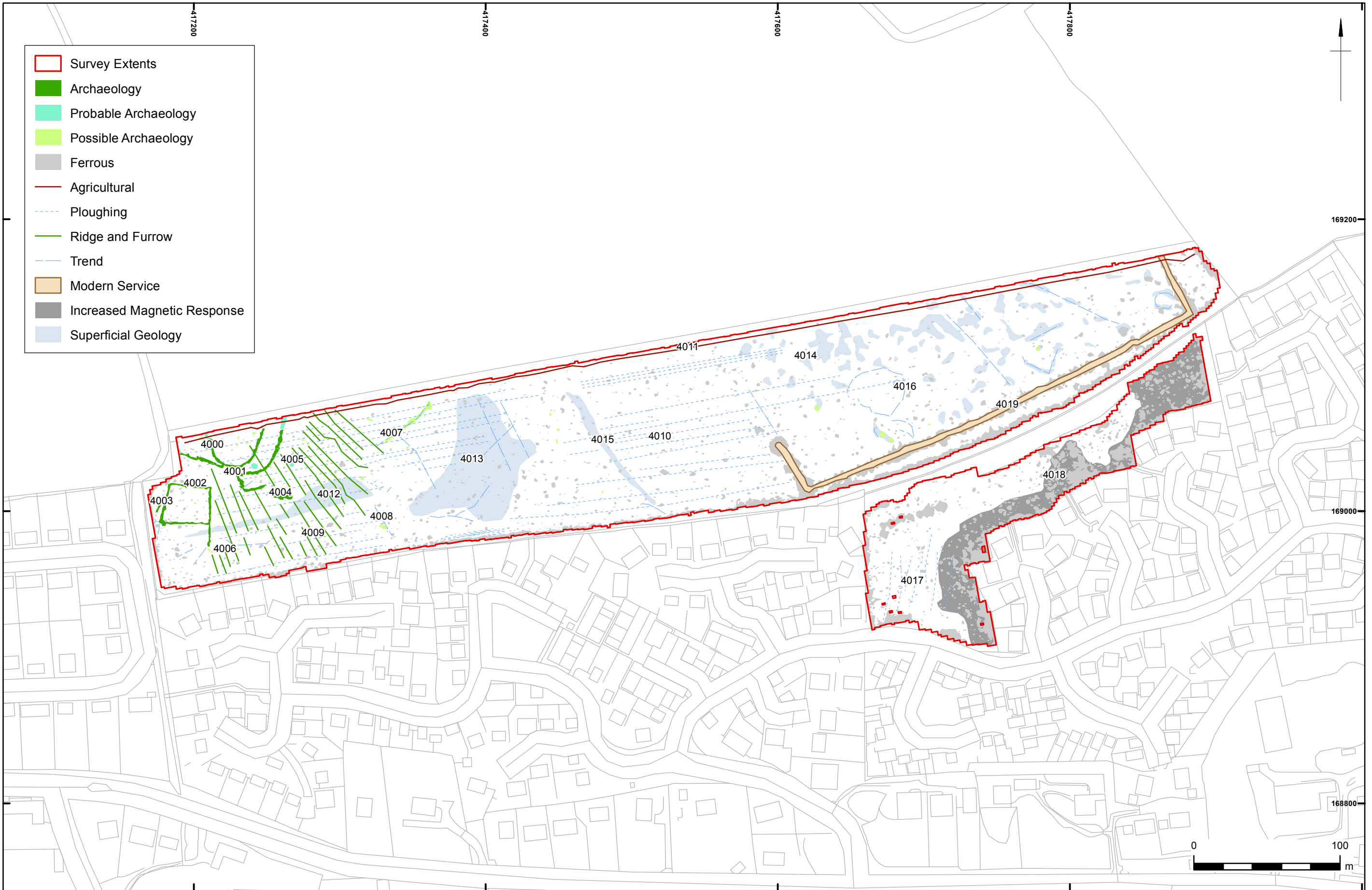
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XY trace

Figure 3



- Survey Extents
- Archaeology
- Probable Archaeology
- Possible Archaeology
- Ferrous
- Agricultural
- Ploughing
- Ridge and Furrow
- Trend
- Modern Service
- Increased Magnetic Response
- Superficial Geology



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