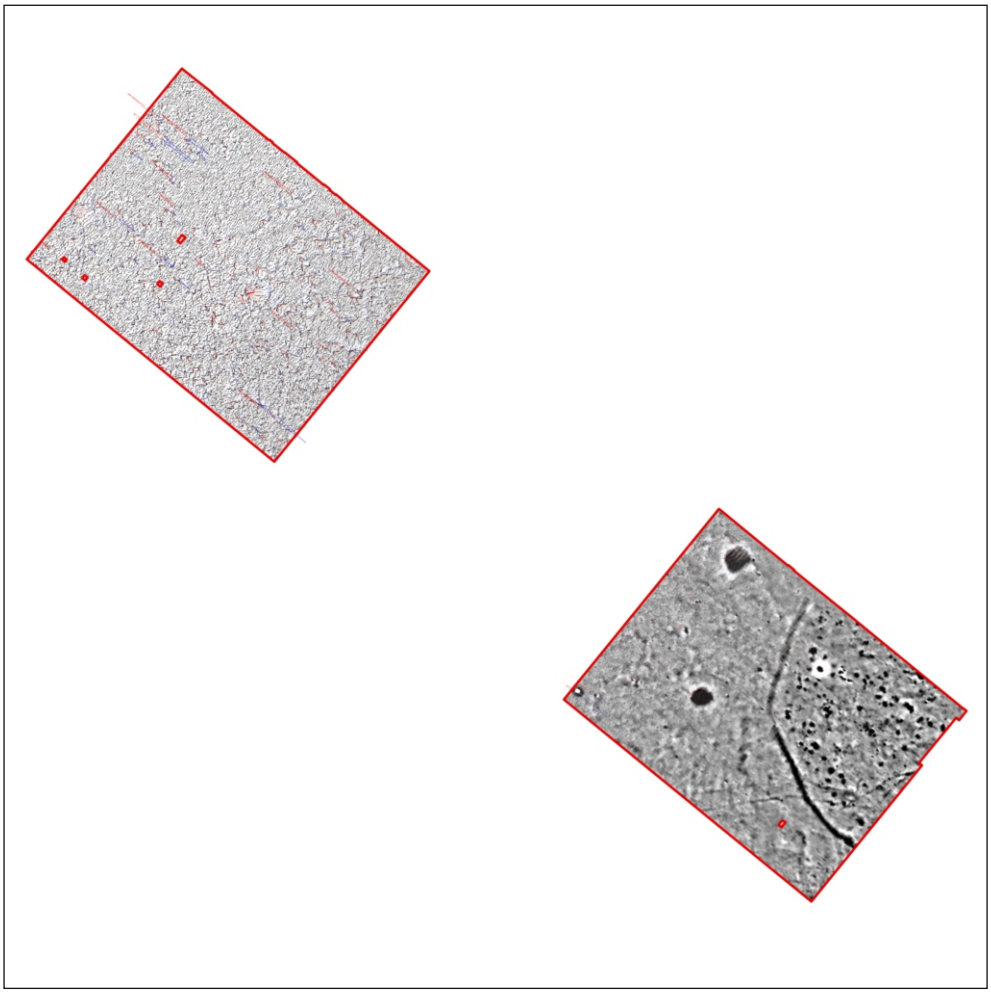
making sense of heritage

Riverdown Park
Salisbury, Wiltshire

Detailed Gradiometer Survey Report



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March 2016

geoservices

Riverdown Park
Salisbury, Wiltshire

Detailed Gradiometer Survey Report

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

Riverdown Park
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Detailed Gradiometer Survey Report

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Summary

Wessex Archaeology was appointed to undertake detailed gradiometer survey over land at Riverdown Park, Bishopdown, Salisbury, Wiltshire (centred on NGR 414900, 132100). The project was commissioned by CgMs Consulting Ltd with the aim of establishing the presence, or otherwise and nature of detectable archaeological features. The work is required ahead of proposed development of the land in support a planning application for the creation of a new country park.

The Site comprises two areas within an arable field to the west of Bishopdown, covering a combined area of 4 ha. The geophysical survey was undertaken between the 24th and 25th February 2016. The detailed gradiometer survey has demonstrated the presence of a number of anomalies of likely and possible archaeological significance alongside agricultural and geological features.

The anomalies identified as being of archaeological interest are primarily ditch- and pit-like features, the most interesting of which is a possible enclosure ditch that has been identified in the south-eastern survey area. A number of pit-like features, which are potentially associated with this enclosure, may represent settlement activity such as post holes or rubbish pits.

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Acknowledgements

Wessex Archaeology would like to thank CgMs Consulting Ltd for commissioning the geophysical survey. The assistance of Richard Meager is gratefully acknowledged in this regard. The assistance of Clare King at Wiltshire County Council is also gratefully acknowledged.

The fieldwork was undertaken by Nick Crabb and Becky Hall. Nick Crabb processed the geophysical data, whilst Becky Hall undertook the data interpretation and wrote this report with the assistance of Lizzie Richley. The geophysical work was quality controlled by Lizzie Richley and Lucy Learmonth. The project was managed on behalf of Wessex Archaeology by Dr. Paul Baggaley.

Riverdown Park
Salisbury, Wiltshire

Detailed Gradiometer Survey Report

1 INTRODUCTION

1.1 Project Background

1.1.1 Wessex Archaeology was commissioned by CgMs Consulting Ltd (hereafter 'the Client'), to carry out a geophysical survey over land at Bishopdown Farm, Salisbury, Wiltshire (hereafter 'the Site', Figure 1), centred on National Grid Reference (NGR) 414900, 132100.

1.1.2 The geophysical survey targeted areas of proposed earthworks in two discrete locations in support of planning application 16/00048/FUL for the creation of a new country park; Riverdown Park. These areas were targeted as agreed initial mitigation as per discussion with CgMs and Clare King at Wiltshire County Council.

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 was located immediately west of Bishopdown, approximately 1.3 km south-east of Old Sarum hillfort and 2 km north-east of Salisbury city centre.

1.2.2 The Site comprises two areas of grass heathland, totalling 4 ha. It was previously utilised as arable agricultural land, however it has recently been left uncultivated and is now utilised as a recreational area.

1.2.3 The Site is located on the top of a ridge, at an elevation of approximately 100 m above Ordnance Datum (aOD).

1.3 Soils and Geology

1.3.1 The underlying geology of the Site is mapped as Cretaceous Chalk of the Newhaven Chalk Formation with overlaying superficial Quaternary and Neogene Clay-with-flint Formation deposits (British Geological Survey 2016).

1.3.2 The soils underlying the Site are likely to consist of the shallow, well drained calcareous silty soils of 0343h (Andover 1). The southern area of the Site has no associated soil information recorded however it is likely that the Andover 1 formation continues (SSEW 1983).

1.4 Archaeological Background

1.4.1 The Site is situated around 1.8 km east of the scheduled monument of Old Sarum (SM 26717); the earliest settlement of Salisbury. It was first established in the middle Iron Age and later became the focus of the Roman town of Sorviodunum where a number of Roman roads converged. The wider landscape around the Site is renowned for its rich and outstanding archaeological evidence for human activity from early prehistory onwards. A DBA was completed by WSP Environment (WSP 2008) which highlights the archaeological significance of this area.

1.4.2 Previous archaeological work 0.6 km north-east of the Site, predominantly relating to Bishopdown Park and Greentrees School developments, have revealed extensive prehistoric evidence, including linear features, pits, field systems and evidence of a Bronze Age settlement (Archaeological Survey 2008, Cotswold Archaeology 2009, Wessex Archaeology 2014, 2015).

1.4.3 During excavations associated with the Bishopdown Park and Greentrees School developments, to the north-west of the Site, have identified an Early Neolithic inhumation, pits dating to the Middle Neolithic and Early Bronze Age as well as near continuous occupation of the area from the Middle Bronze age through to the Early Iron Age, including an impressive circular fenced enclosure measuring 50m in diameter, containing a large roundhouse of Late Bronze Age date, a number of smaller roundhouses, a Late Bronze Age cremation and the southern extent of a posted 'avenue' (WA 2014, 2015).

1.4.4 Previous work for a Wessex Water pipeline to the north of the Site, undertaken in 2001 and 2002, has identified further evidence for Late Bronze Age occupation in the form of roundhouses and associated pit feature (WA 2004).

1.4.5 An evaluation was undertaken by AC Archaeology in 1992 adjacent to the Site. This investigation found evidence of an Iron Age/Romano-British settlement within a few metres of the south-eastern survey area, and an undated potential settlement site to the north of the north-western survey area (AC Archaeology 1992).

1.4.6 The Wiltshire and Swindon HER website (WSHER 2016), also lists a number of prehistoric findspots within 1 km of the Site, including flint tools dating from the Palaeolithic to the Bronze Age, and Iron Age pottery.

1.4.7 There are also a number of recorded Romano-British findspots, including tile, pottery, coins, and metalwork, within 1 km of the Site.

1.4.8 Medieval evidence consisted mainly of findspots, and listed buildings located in and around Salisbury, the closest being the Granary (National Heritage List (NHL) No. 1533756) and the Barn (NHL No. 1023852) at Bishopdown Farm.

2 METHODOLOGY

2.1 Introduction

2.1.1 The geophysical survey was undertaken by Wessex Archaeology's in-house geophysics teams on the 24th and 25th February 2016.

2.1.2 Field conditions at the time of the survey were good, with dry conditions during the survey. An overall coverage of 4 ha was achieved.

2.1.3 The detailed gradiometer survey was conducted in accordance with Historic England guidelines (English Heritage 2008) and the Written Scheme of Investigation (Wessex Archaeology 2016).

2.2 Method

2.2.1 Individual survey grid nodes were established at 30 m x 30 m intervals using a Leica Viva RTK GNSS instrument, which is precise to approximately 0.02 m and therefore exceeds Historic England recommendations (2008).

2.2.2 The detailed gradiometer survey was conducted using a Bartington Grad601-2 fluxgate gradiometer instrument, which has a vertical separation of 1 m between sensors. Data were collected at 0.25 m intervals along transects spaced 1 m apart with an effective sensitivity of 0.03 nT, in accordance with Historic England guidelines (English Heritage 2008). Data were collected in the zigzag method.

2.2.3 Data for 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 throughout the survey area, 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 number of anomalies of likely and possible archaeological interest across the Site, trends, evidence of agricultural practices, geological features and ferrous/ceramic features of unknown origin. Results are presented as a series of greyscale and XY plots, with corresponding archaeological interpretations at a scale of 1:3000 (**Figures 2** to **4**). The data are displayed at -2 nT (white) to +3 nT (black) for the greyscale image and ±25 nT at 25 nT per cm for the XY trace plots.

3.1.2 The interpretation of the dataset highlights the presence of potential archaeological anomalies, ferrous/burnt or fired objects, and magnetic trends (**Figures 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 dataset. These are presumed to be modern in provenance, and are not referred to unless considered to be relevant to the archaeological interpretation.

3.1.4 It should be noted that small, weakly magnetised features may produce responses that are below the detection threshold of magnetometers. It therefore may be the case that more archaeological features are present than have been identified through this geophysical survey.

3.1.5 Although no modern services have been identified within this dataset, 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.

3.2 Gradiometer Survey Results and Interpretation

3.2.1 The clearest archaeological feature is a positive, curvilinear ditch-like feature that is evident in the south-eastern survey area (**4000**). The feature is approximately 2 m to 5 m in width, and extends for *c.* 153 m from the south-eastern survey extents to just short of the northern extents with magnetic responses between +1 and +3 nT This feature is visible in aerial imagery and can be seen to form a sub-circular enclosure and is likely to data from the Iron Age or Romano-British Periods. It is possible that the gap between the enclosure feature and the northern extent of this area may represent an entrance into the enclosure.

3.2.2 At **4001**, there are numerous strong positive anomalies densely scattered within the extents of the feature at **4000**. There is no clear alignment or orientation to those anomalies however there are some trends visible at **4005** and **4006** that may be related. These are considered to be of possible archaeological significance and may represent pits or postholes. Archaeological evaluation undertaken by WA (WA2015; 2016) identified a number of postholes and pits associated with Iron Age settlement activity to the north of the Site, it is possible these are similar features.

3.2.3 Two weakly positive linear anomalies (+0.5 -1.5 nT) can be seen at **4002** and **4003**. These appear to run through the feature at **4000** however it is not possible to identify the chronological sequence of features from the gradiometer data alone. These features run parallel to one another and have similar magnetic properties suggesting that they are

related, perhaps representing ditches, however these suppositions cannot be confirmed without further investigation

3.2.4 Lying to the east of **4002** and **4003** are two further parallel linear features, **4004**. These extend into the survey area from the eastern extent, with the northern of the two extending for *c.* 38 m on a south-west orientation and the southern extending for *c.* 21 m on a south-west-south orientation. These two linear features display stronger positive magnetic properties (+2-3 nT) than **4002** and **4003**, and alongside their diverse orientation, suggest they are not related. Further investigation would be needed to confirm or refute this interpretation.

3.2.5 A very weakly positive curvilinear trend at **4005** appears to connect a series of smaller strongly positive readings. This may suggest the presence of a curvilinear structure. A similar trend appears at **4006**, but does not intersect with any pit-like features.

3.2.6 A number of large, strong positive features which measure between 2 to 6 nT have been identified at **4007**, **4008**, **4009** and **4010**. The diameters of these features vary from 6 m (**4010**) and *c.* 12 m for the largest (**4008**). No comparable features have been revealed in the excavations to the north of the Site (WA 2015). Given the archaeological context of the landscape, these have been interpreted as possible archaeology; however their provenance is unknown from the gradiometer data alone and may be modern in provenience given their regular form and distribution in the vicinity.

3.2.7 There are several faintly curvilinear trends apparent in the north-western survey area; these may be archaeological or geological in origin alongside agricultural plough marks.

3.2.8 There are also many fainter superficial geological trends apparent in the data, characterised by highly irregular weakly positive and negative anomalies.

4 CONCLUSION

4.1.1 The detailed gradiometer survey has been successful in detecting anomalies of likely and possible archaeological interest as well as ploughing and geological responses across the Site.

4.1.2 The most interesting anomaly detected is the curvilinear enclosure ditch (**4000**) that is visible in the south-eastern survey area. This feature extends from the south-eastern extent of the survey area and curves round to the north-east; the length recorded in the gradiometer survey is *c.* 153 m, with the width between 3 to 5 m. This enclosure is visible in aerial photography and can be seen to extend beyond the extents of this survey; covering an area of approximately 0.64 ha.

4.1.3 Within the enclosure a number of pit-like features have been identified (**4001**) and many are likely to be relatively contemporary with the enclosure ditch. During excavations undertaken by AC Archaeology (AC 1992) evidence for an Iron Age settlement was encountered that included a 'V' profiled ditch and a number of storage pits (WSP 2008).

4.1.4 A number of other linear ditch-like features have been identified in the south-eastern survey area. These appear to cross the enclosure ditch however their provenance is unknown from the gradiometer data alone.

4.1.5 The remaining anomalies detected appear to be modern, agricultural or geological in origin.

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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 ±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 Historic England (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 (English Heritage 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 Historic England (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.

Survey Extents

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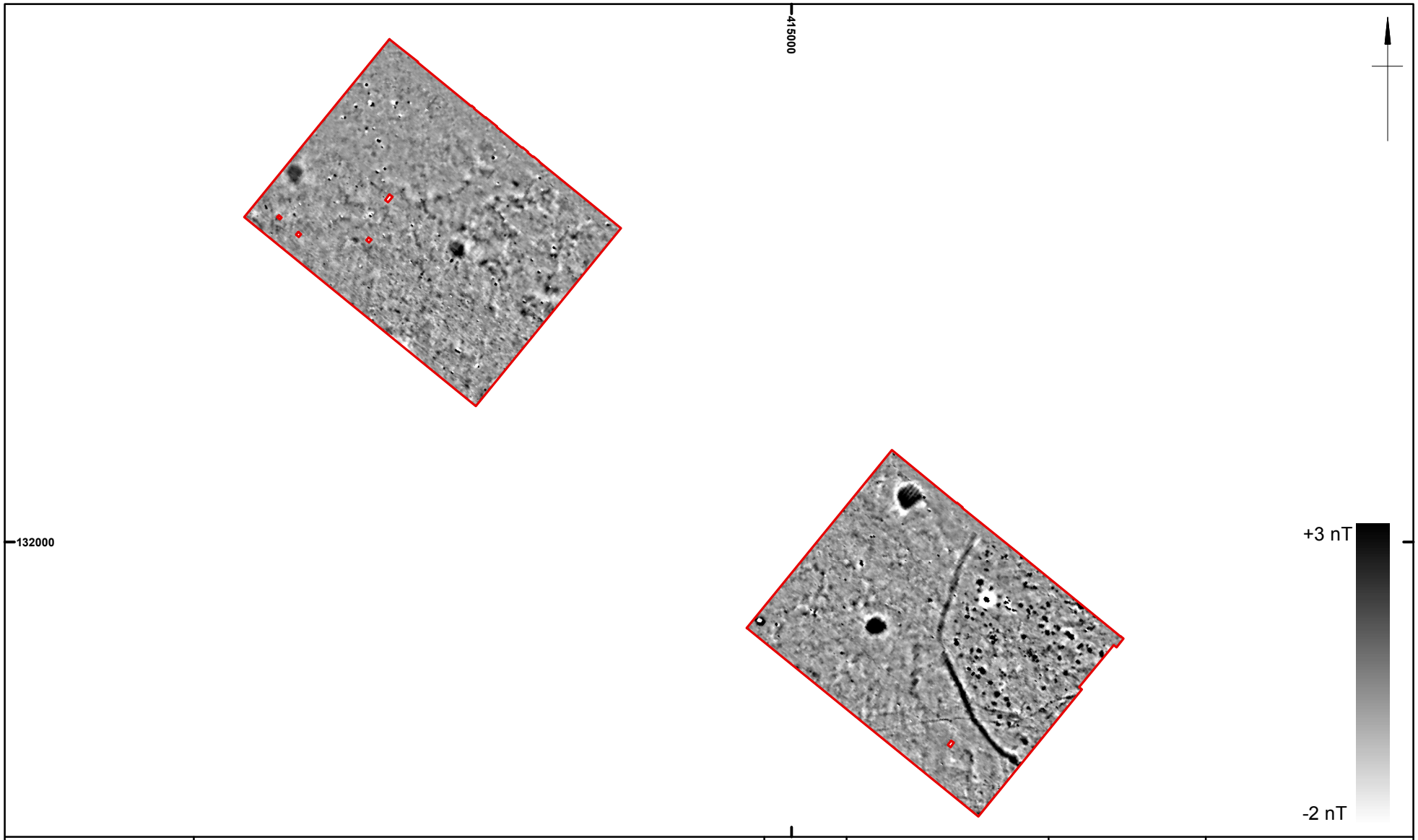
Site Location and Detailed Survey Extents

Figure 1



Survey Extents

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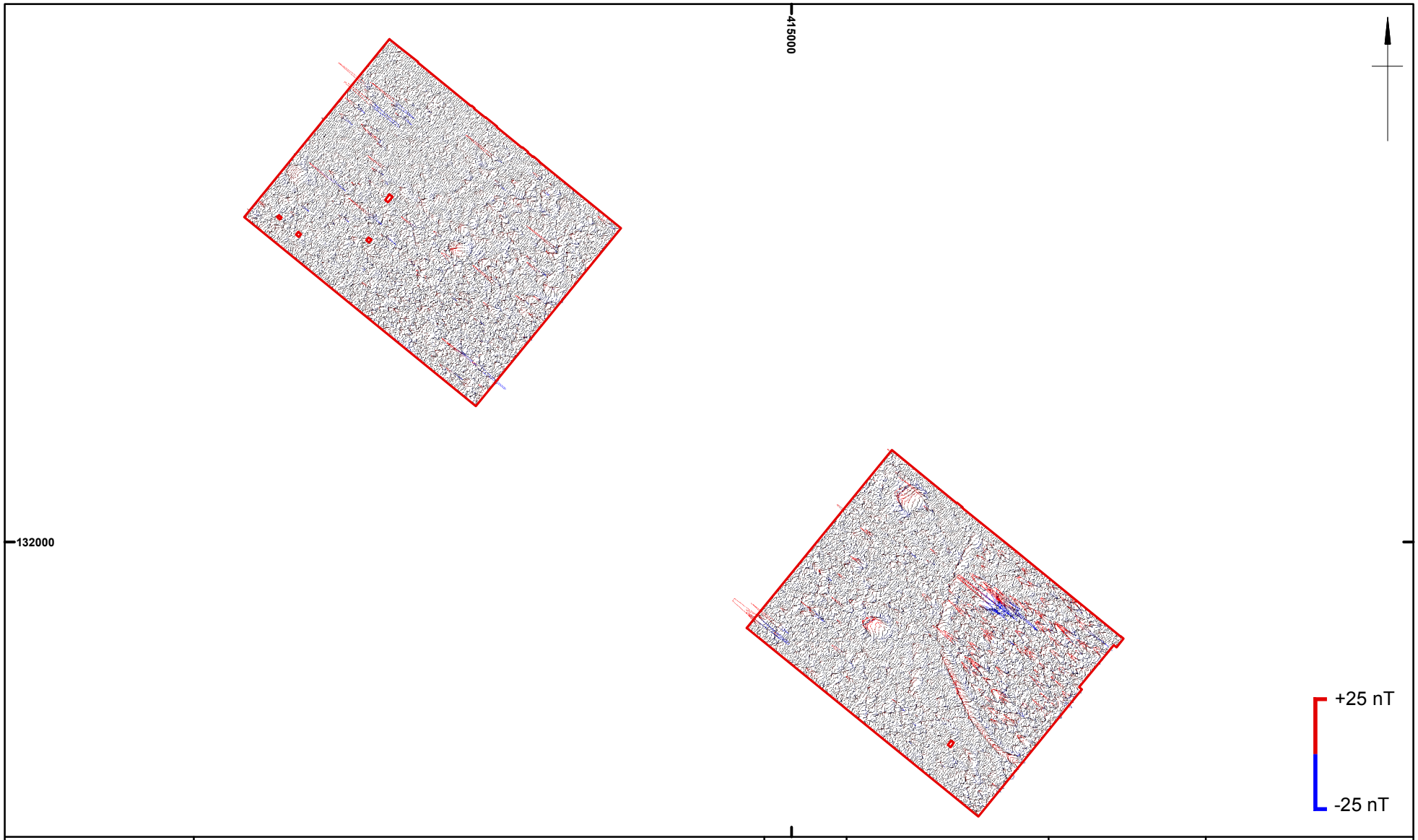
Gradiometer Results - Greyscale Plot

Figure 2



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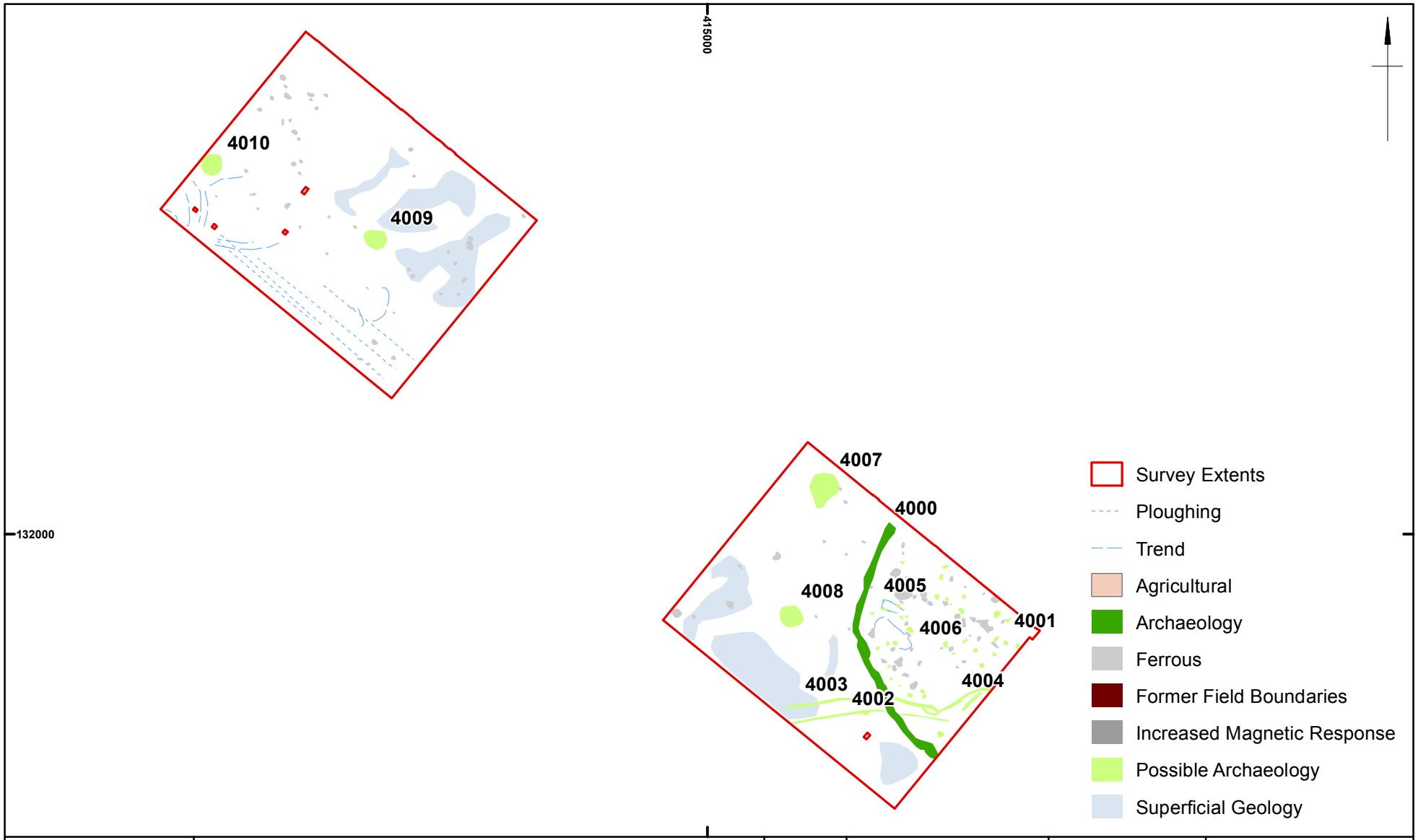
Gradiometer Results - XY Trace Plot

Figure 3



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Gradiometer Results - Archaeological Interpretations

Figure 4

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