Land at Arreton
Isle of Wight

Detailed Gradiometer Survey Report

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Summary

A detailed gradiometer survey was conducted over land at Arreton, Isle of Wight (centred on NGR 452875, 86450). The project was commissioned by RPS Planning & Development with the aim of establishing the presence and significance, or otherwise, of detectable archaeological features within the proposed development area. This information is intended to inform discussions on the nature and extent of proposed development at the site and highlight any potential archaeological issues.

The site comprises parts of two fields, approximately 4.2km southeast of the centre of Newport. The site occupies the head of a stream valley with the land falling from to the northwest to the southeast. The detailed gradiometer survey covered 2.7ha. This survey has demonstrated the presence of anomalies of probable and possible archaeological interest within the survey area.

The geophysical survey has revealed some isolated anomalies of probable and possible archaeological interest, which are consistent with isolated segments of ditch and pit-like responses. It is difficult to identify any coherent distributions within these anomalies and it is likely that this is the result of the construction of the motocross track and associated infrastructure; the majority of anomalies of probable and possible archaeological origins have been identified within regions of quieter magnetic background.

Whilst it is possible that remnants of archaeological features exist within these areas of modern intrusion, the extents of magnetic disturbance associated with modern activity will have effectively masked them; given the relative lack of anomalies of clear archaeological interest within the rest of the site and the extents of modern intrusion, however, it is considered unlikely that significant archaeological remains survive.

The dataset is dominated by regions of increased magnetic response and other anomalies relating to the former motocross track within the Site. Curvilinear anomalies likely to indicate the course of the former track have been identified, along with other regions of magnetic disturbance likely to be associated with crowd facilities and other related infrastructure. Several regions of increased response have been identified as being of probable geological origin.

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Acknowledgements

The detailed gradiometer survey was commissioned by RPS Planning & Development. The assistance of Dan Slatcher is gratefully acknowledged in this regard.

The fieldwork was directed by Laura Andrews and was assisted by Clara Dickinson. Clara Dickinson processed the geophysical data and Ross Lefort interpreted the geophysical data in addition to writing this report. The geophysical work was quality controlled by Dr. Paul Baggaley. Illustrations were prepared by Linda Coleman. The project was managed on behalf of Wessex Archaeology by Ben Urmston.

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1 INTRODUCTION

1.1 Project background

1.1.1 Wessex Archaeology was commissioned by RPS Planning & Development to carry out a geophysical survey of land at Arreton, Isle of Wight (**Figure 1**), hereafter "the Site" (centred on NGR 452875 86450). The survey forms part of a programme of archaeological works being undertaken to inform decisions regarding 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 parts of two fields (one arable and another pasture/grassland) measuring 3.87ha in area, located approximately 4.2km southeast of Newport (**Figure 1**). A detailed gradiometer survey was undertaken covering parts of the Site suitable for geophysical survey, a total of 2.7ha.

1.2.2 The Site is located at the head of a stream valley that forms a tributary of the River Yar. The land slopes downwards to the southeast with the highest point of the Site lying at a height of approximately 65m above Ordnance datum (aOD) with the land dropping to around 45m aOD at the south eastern extent of the survey area. The survey area is partially defined by field boundaries and the road (A3056) in the southeast and by the limit of the proposed development in the northwest.

1.2.3 The underlying geology of the area is made up of a ferruginous sands formation (Cretaceous). Superficial deposits are present in places across the Site with undifferentiated river terrace deposits consisting of Quaternary sand and gravel. The soils underlying most of the Site are most likely typical argillic brown earths of the 571g (Fyfield 4) association, with typical palaeo-argillic brown earths of the 581b (Sonning 1) association are recorded in the northwest of the survey area (SSEW 1983).

1.2.4 Soils derived from such geological parent material have been shown to produce magnetic contrasts acceptable for the detection of archaeological remains through magnetometer survey. It is possible that increasing thicknesses of overburden, such as gravel deposits, may obscure archaeological anomalies.

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 by Wessex Archaeology's in-house geophysics team between 18th and 19th March 2013. Field conditions at the time of the survey were variable, with the majority of the survey area situated on the side of a steep slope. The southern portion of the survey area was not suitable for geophysical survey due to the presence of modern ridge and furrow associated with an arable crop, with waterlogging and soft ground conditions preventing survey being carried out.

2.2 Method

2.2.1 Individual survey grid nodes were established at 30m x 30m intervals using a Leica Viva RTK GNSS system, 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. Detailed gradiometer data were acquired at 0.25m intervals along transects spaced 1m apart. The system used has an effective sensitivity of 0.03nT, in accordance with EH guidelines (2008). Detailed data were collected in the zigzag method.

2.2.3 Data from the detailed survey was subject to minimal data correction processes. These comprise a zero mean traverse function (-8nT to +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 definite, probable and possible archaeological interest across the Site, together with a number of modern features relating to a recent motocross track. Results are presented as a series of greyscale and XY plots, and archaeological interpretations, at a scale of 1:2,000 (**Figure 2**). The data are displayed at -2nT (white) to +3nT (black) for the greyscale images 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. 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 Detailed Gradiometer Survey Results and Interpretation

3.2.1 The only anomalies of archaeological interest detected were a number of relatively short positive linear anomalies. The strongest is found at **4000** and has values around +5nT; the other examples present at **4001** and **4002** are weaker with values around +2.5nT. All of these features are considered to be cut features such as ditch segments.

3.2.2 A further short linear is present at **4003** but this has negative values around -3nT and is classed as possible archaeology as this feature may prove to be geological. Other positive anomalies nearby are small with irregular to sub-circular shapes and are considered to be possible archaeology, although they form no significant patterns in their spatial distribution. The largest of these positive anomalies at **4004** may prove to be geological. The remaining features detected are weakly contrasting linear and curvilinear trends; some are considered to be modern while others may prove to be archaeological.

3.2.3 The other noticeable anomalies are a series of curvilinear positive anomalies; these are considered likely to relate to the course of the former motocross track that existed here until recently. The curvilinear features at **4005** and **4006** are considered likely to define the circuit and a linear at **4007** partially defines the edge of an area of increased magnetic response at **4008**.

3.2.4 Given its regular edge the area of increased response extending from **4008** is considered to relate to the use of this area as a motocross track although the cause of this magnetic enhancement is not known; it is possible that the enhancement is associated with the consolidation of the field surface, although it is also possible that this enhancement is an effect of the strong ploughing in this part of the site. Some of the curvilinear trends identified in the data are aligned with the track and are considered to be related to this modern activity.

3.2.5 The most notable anomalies in this dataset are the numerous ferrous anomalies and the broad geological responses, e.g. at **4009**. These areas of geology are defined by elongated, broad bipolar responses with magnetic values ranging from -15nT to +20nT (strongly white to black respectively). These regions are considered to relate to areas of gravel deposits that have been enhanced due to the heavier iron rich stones accumulating in river beds while lighter iron-deficient stones are carried away. There are some areas of increased magnetic response that may prove to be geological, although their form is less clearly differ in form to the clear geological features.

3.3 Gradiometer Survey Results and Interpretation: Modern Services

3.3.1 No modern services were identified in the dataset. 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 DISCUSSION

4.1 Summary

4.1.1 The detailed gradiometer survey has been successful in detecting anomalies of probable and possible archaeological interest within the Site, in addition to regions of increased magnetic response and anomalies associated with the former motocross track.

4.1.2 The geophysical data has revealed a number of anomalies of probable and possible archaeological interest, although they do not appear to form wider connected complexes. Given the relative lack of clear archaeological anomalies within the Site, the extent of any impact upon such remains, should any be present, is not clear.

4.1.3 It should be noted that regions of relatively quiet magnetic background are evident within the dataset, appearing between regions of magnetic disturbance and increased response. Anomalies have been identified with greater confidence in such areas through their increased contrast with the magnetic background.

4.1.4 The remaining anomalies identified are considered to be associated with the recent use of this area with motocross track features and spreads of ceramic building material and metallic debris present. It is possible that the interrupted appearance of a number of the anomalies of possible and probable archaeological interest may be the result of this modern activity, perhaps associated with crowd facilities and other related infrastructure rather than with the construction of the track itself.

4.1.5 It should be noted that small, weakly magnetised features may produce responses that are below the detection threshold of magnetometers, particularly given the extensive magnetic disturbance associated with the motocross track and the probable geological anomalies. 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 5, South West England*, Ordnance Survey, Southampton.

APPENDIX 1: SURVEY EQUIPMENT AND DATA PROCESSING

Survey Methods and Equipment

The magnetic data for this project was acquired using a Bartington 601-2 dual magnetic gradiometer system. This instrument has two sensor assemblies fixed horizontally 1m apart allowing two traverses to be recorded simultaneously. Each sensor contains two fluxgate magnetometers arranged vertically with a 1m separation, and measures the difference between the vertical components of the total magnetic field within each sensor array. This arrangement of magnetometers suppresses any diurnal or low frequency effects.

The gradiometers have an effective resolution of 0.03nT over a ±100nT range, and measurements from each sensor are logged at intervals of 0.25m. All of the data are stored on an integrated data logger for subsequent post-processing and analysis.

Wessex Archaeology undertakes two types of magnetic surveys: scanning and detail. Both types depend upon the establishment of an accurate 20m or 30m site grid, which is achieved using a Leica Viva RTK GNSS instrument and then extended using tapes. The Leica Viva system receives corrections from a network of reference stations operated by the Ordnance Survey and Leica Geosystems, allowing positions to be determined with a precision of 0.02m in real-time and therefore exceed the level of accuracy recommended by English Heritage (2008) for geophysical surveys.

Scanning surveys consist of recording data at 0.25m intervals along transects spaced 10m apart, acquiring a minimum of 80 data points per transect. Due to the relatively coarse transect interval, scanning surveys should only be expected to detect extended regions of archaeological anomalies, when there is a greater likelihood of distinguishing such responses from the background magnetic field.

The detailed surveys consist of 20m x 20m or 30m x 30m grids, and data are collected at 0.25m intervals along traverses spaced 1m apart. These strategies give 1600 or 3600 measurements per 20m or 30m grid respectively, and are the recommended methodologies for archaeological surveys of this type (EH, 2008).

Data may be collected with a higher sample density where complex archaeological anomalies are encountered, to aid the detection and characterisation of small and ephemeral features. Data may be collected at up to 0.125m intervals along traverses spaced up to 0.25m apart, resulting in a maximum of 28800 readings per 30m grid, exceeding that recommended by English Heritage (2008) for characterisation surveys.

Post-Processing

The magnetic data collected during the detail survey are downloaded from the Bartington system for processing and analysis using both commercial and in-house software. This software allows for both the data and the images to be processed in order to enhance the results for analysis; however, it should be noted that minimal data processing is conducted so as not to distort the anomalies.

As the scanning data are not as closely distributed as with detailed survey, they are georeferenced using the GPS information and interpolated to highlight similar anomalies in adjacent transects. Directional trends may be removed before interpolation to produce more easily understood images.

Typical data and image processing steps may include:

- Destripe – Applying a zero mean traverse in order to remove differences caused by directional effects inherent in the magnetometer;
- Destagger – Shifting each traverse longitudinally by a number of readings. This corrects for operator errors and is used to enhance linear features;
- Despike – Filtering isolated data points that exceed the mean by a specified amount to reduce the appearance of dominant anomalous readings (generally only used for earth resistance data)

Typical displays of the data used during processing and analysis:

- XY Plot – Presents the data as a trace or graph line for each traverse. Each traverse is displaced down the image to produce a stacked profile effect. This type of image is useful as it shows the full range of individual anomalies.
- Greyscale – Presents the data in plan view using a greyscale to indicate the relative strength of the signal at each measurement point. These plots can be produced in colour to highlight certain features but generally greyscale plots are used during analysis of the data.

APPENDIX 2: GEOPHYSICAL INTERPRETATION

The interpretation methodology used by Wessex Archaeology separates the anomalies into 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.