



Water for Life,
Havant, Hampshire
BH303

Gradiometer Survey Report

Document Ref.: 271401.04
Feb 2023



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Document Information


Document title Water for Life, Havant, Hampshire BH303
Document subtitle Gradiometer Survey Report
Document reference 271401.04

Commissioned by The Clancy Group Ltd
Address Clare House,
Copper Mill Lane,
Harefield,
Middlesex,
UB9 6HZ

Site location Portsdown Hill Road, Havant, PO6 1BG
County Hampshire
National grid reference NGR 466964 106323 (SU 66964 06323)
Statutory designations None
Planning authority Portsmouth City Council

WA project name Water for Life Hampshire
WA project code 271401
Date of fieldwork 31 October 2022
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Quality Assurance

Issue	Date	Author	Approved by
1	10/02/2023	BH	 TR

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Summary

A gradiometer survey was conducted over land at Water for Life, Havant, Hampshire (centred on NGR 466606 106648). The project was commissioned by The Clancy Group Ltd with the aim of establishing the presence, or otherwise, and nature of detectable archaeological features. The survey comprises 0.66 ha of agricultural land, currently utilised for crop. The geophysical survey was undertaken on 31 October 2022.

The gradiometer has not identified any anomalies thought to be associated with archaeological remains. There is no evidence of funerary activity which is noted in the surrounding area from the Neolithic to Anglo-Saxon period. The anomalies identified are modern, relating to a service, and fencing surrounding the site.

Acknowledgements

Wessex Archaeology would like to thank The Clancy Group Ltd for commissioning the geophysical survey. The assistance of Paul Taylor is gratefully acknowledged in this regard.

The fieldwork was undertaken by Pamela Warne and Jake Bishop. Brett Howard processed and interpreted the geophysical data and also wrote this report. The geophysical work was quality controlled by Tom Richardson and Illustrations were prepared by Brett Howard. The project was managed on behalf of Wessex Archaeology by Tom Richardson.



Water for Life, Havant, Hampshire BH303

Gradiometer Survey Report

1 INTRODUCTION

1.1 Project background

1.1.1 Wessex Archaeology was commissioned by The Clancy Group Ltd to carry out a geophysical survey at land off New Down Lane, Havant, Hampshire (centred on NGR 466606 106648) (**Figure 1**). The survey forms part of an ongoing programme of archaeological works being undertaken in support of the Hampshire Water Transfer and Water Recycling Project.

1.2 Scope of document

1.2.1 This report presents a brief description of the methodology followed by the detailed survey results and the archaeological interpretation of the geophysical data.

1.3 The site

1.3.1 The site is located 600 m north of Drayton and 3.1 km north of Portsmouth, in the county of Hampshire.

1.3.2 The survey comprises 0.66 ha of agricultural land, currently utilised for crop. The site is bounded by hedgerow to the north, south, and east, with further agricultural land to the west.

1.3.3 The site is on an east facing slope, which declines from 68 m above Ordnance Datum (aOD) at the western edge to 65 m aOD at the eastern edge of the site.

1.3.4 The solid geology comprises Chalk of the Spetisbury Chalk Member. No overlying superficial geological deposits are recorded (BGS 2023).

1.3.5 The soils underlying the site are likely to consist of grey rendzinas of the 342a (Upton 1) association (SSEW SE Sheet 6 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 Introduction

2.2 The following historical and archaeological background has been compiled using publicly available online resources, combined with the results of Wessex Archaeology's previous investigations in the area, and in-house resources.

2.3 Summary of the archaeological resource

2.3.1 The site is situated between two scheduled late 19th century forts built on top of Portsdown Hill. Fort Widley (NHLE 1001862) is located 90 m to the west and Fort Purbrook (NHLE 1001842) 1.1 km to the east. Both form part of a group of defences known as the Palmerston Forts, which encircle Portsmouth and were constructed to deal with the perceived threat of a French invasion. They were also later variously used in WWI and WWII.



- 2.3.2 There are a small number of listed buildings in the vicinity of the site, the closest being the Grade II listed George Inn on Portsdown Hill road, which is 210 m south-east of the site. 250 m east-south-east of the site on London Road, is the Grade II listed Christ Church.
- 2.3.3 There is limited earlier prehistoric activity recorded in the vicinity of the site, but a Neolithic chambered long barrow is located on the southern side of Portsdown Hill. This is 220 m south of the site and includes 12 inhumations, possibly forming part of a later nucleus of an early Saxon cemetery.
- 2.3.4 Further evidence for prehistoric funerary activity is located 570 m east-south-east of the site, where a possible twin or oval Bronze Age barrow known as Gob's Barrow was excavated in the early 20th century. The site is now levelled and forms the lawn of Winton House.
- 2.3.5 A possible Iron Age settlement and two Anglo-Saxon inhumations were found during excavations prior to road works to the east of the George Inn on Portsdown Hill in 1966. It has been suggested that these burials were probably outliers of the cemetery found on Portsdown Hill. In addition, a few sherds of Iron Age pottery and earlier flint tools were recovered from the surface of a ploughed field 700 m east of the site, and a possible stock enclosure has been identified as cropmarks 160 m to the south-east.
- 2.3.6 There are a small number of Romano-British findspots near the site, comprising Roman coins found in Rectory Garden near Gob's Barrow to the north of the site and a further Roman coin located 700 m south-east of the site near Downend Road.
- 2.3.7 A small amount of Anglo-Saxon activity is recorded in the area, principally relating to the cemetery on the south side of Portsdown Hill. However, an 8th century Anglo-Saxon sceatte was found 1.3 km south of the site on Mansvid Avenue in Cosham.
- 2.3.8 There is a concentration of WWII activity 400 m south-west of the site surrounding the Cliffdale Tunnel Shelters, which are an extensive deep air raid shelter constructed in 1942 in Portsdown Hill. To the south and west of this are two WWII pillboxes located south of Portsdown Hill road.

3 METHODOLOGY

3.1 Introduction

- 3.1.1 The geophysical survey was undertaken by Wessex Archaeology's in-house geophysics team on 31 October 2022. Field conditions were dry and conducive to survey, though fencing and groundworks resulted in obstruction from data collection. An overall coverage of 0.51 ha was achieved.
- 3.1.2 The methods and standards employed throughout the geophysical survey conform to current best practice, and guidance outlined by the Chartered Institute for Archaeologists' (CIfA 2014) and European Archaeologiae Consilium (Schmidt *et al.* 2015).

3.2 Aims and objectives

- 3.2.1 The aims of the survey comprise the following:
- To determine, as far as is reasonably possible, the nature of the detectable archaeological resource within a specified area using appropriate methods and practices; and

- To inform either the scope and nature of any further archaeological work that may be required; or the formation of a mitigation strategy (to offset the impact of the development on the archaeological resource); or a management strategy.

3.2.2 In order to achieve the above aims, the objectives of the geophysical survey are:

- To conduct a geophysical survey covering as much of the specified area as possible, allowing for on-site obstructions;
- To clarify the presence/absence of anomalies of archaeological potential; and
- Where possible, to determine the general nature of any anomalies of archaeological potential.

3.3 Fieldwork methodology

3.3.1 The cart-based gradiometer system used a Leica Captivate RTK GNSS instrument, which receives corrections from a network of reference stations operated by the Ordnance Survey (OS) and Leica Geosystems. Such instruments allow positions to be determined with a precision of 0.02 m in real-time and therefore exceeds European Archaeologiae Consilium recommendations (Schmidt *et al.* 2015).

3.3.2 The gradiometer survey was undertaken using two Bartington magnetic gradiometers spaced at 1 m intervals and mounted on a non-magnetic cart. Data were collected with an effective sensitivity of 0.03nT over ± 100 nT range at a rate of 10 Hz, producing intervals of 0.02 m along transects spaced 2 m apart.

3.4 Data processing

3.4.1 Data from the survey were subjected to minimal correction processes. These comprise a 'Destripe' function (± 5 nT thresholds), applied to correct for any variation between the sensors, and an interpolation used to grid the data and discard overlaps where transects have been collected too close together.

3.4.2 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 gradiometer survey has identified magnetic anomalies across the site, inferring modern footpaths, evidence of landscaping, and a modern service. Results are presented as a series of greyscale plots, and archaeological interpretations at a scale of 1:500 (**Figures 2 to 3**). The data are displayed at -2 nT (white) to +3 nT (black) for the greyscale image.

4.1.2 The interpretation of the datasets highlights the presence of potential archaeological anomalies, ferrous responses, burnt or fired objects, and magnetic trends (**Figure 3**). 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 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 present than have been identified through geophysical survey.



4.1.5 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.

4.2 Gradiometer survey results and interpretation

4.2.1 A strong dipolar anomaly is evident in the south-western portion of the site at **4000**. This is 29 m long, likely extending beyond the survey extents. This is indicative of a modern service, such as a pipe or cable.

4.2.2 A strong dipolar response is evident along the eastern edge of the survey area. This is likely a related to the fencing on site at the time of survey.

5 DISCUSSION

5.1.1 The gradiometer has not identified any anomalies thought to be associated with archaeological remains. There is no evidence of funerary activity which is noted in the surrounding area from the Neolithic to Anglo-Saxon period.

5.1.2 The anomalies identified are modern, being a service, and responses from the site fencing.



REFERENCES

Chartered Institute for Archaeologists [CIfA] 2014 *Standards and guidance for archaeological geophysical survey*. Reading, CIfA.

Schmidt, A., Linford, P., Linford, N., David, A., Gaffney, C., Sarris, A. and Fassbinder, J. 2015. *Guidelines for the use of geophysics in archaeology: questions to ask and points to consider*. EAC Guidelines 2, Belgium: European Archaeological Council.

Wessex Archaeology, 2013, Land at *Pashley Solar Farm, East Sussex. Detailed Gradiometer Survey Report*. Unpublished report document ref: 100541

Cartographic and documentary sources

Ordnance Survey 1983 *Soil Survey of England and Wales Sheet 6, Soils of Eastern England*. Southampton.

Online resources

British Geological Survey Geology of Britain Viewer (accessed November 2022)
<http://mapapps.bgs.ac.uk/geologyofbritain/home.html>

Google Earth website <http://earth.google.com> (accessed November 2022)

Historic England (HE) website <https://historicengland.org.uk/listing/the-list/map-search> (accessed November 2022)

Historic England Aerial Photography Maps <https://historicengland.maps.arcgis.com/> (Accessed November 2022)

Heritage Gateway website <https://www.heritagegateway.org.uk/gateway> (accessed November 2022)

National Library of Scotland (NLS) <https://maps.nls.uk/geo/explore/> (accessed November 2022)

APPENDICES

Appendix 1

Survey methods and equipment

The magnetic data for this project was acquired using a Bartington 601-2 dual magnetic gradiometer cart-based system. This instrument has a number of sensor pairs fixed horizontally 1 m apart allowing multiple traverses to be recorded simultaneously. Each sensor contains two fluxgate magnetometers arranged vertically with a 1 m 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 0.03 nT over a ± 100 nT range, and measurements from each sensor are logged at intervals of 0.15 m. All of the data are then relayed to a Leica Captivate tablet, running the MLgrad601 program, which is used to record the survey data from the array of Grad601 probes at a rate of 10 Hz. The program also receives measurements from a GPS system, which is fixed to the cart at a measured distance from the sensors, providing real time locational data for each data point.

The cart-based system relies upon accurate GPS location data which is collected using a Leica Captivate RTK GNSS system. This 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 European Archaeologiae Consilium (Schmidt *et al.* 2015) for geophysical surveys.

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 0.125 m intervals along traverses spaced up to 0.25 m apart exceeding recommendation by European Archaeologiae Consilium (Schmidt *et al.* 2015) for characterisation surveys.

Post-processing

The magnetic data collected during the detail survey are downloaded from the Bartington cart 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.

The cart-based system generally requires a lesser amount of post-processing than the handheld Bartington Grad 601-2 fluxgate gradiometer instrument. This is largely because mounting the gradiometers on the cart reduces the occurrence of operator error; caused by inconsistent walking speeds and deviation in traverse position due to varying ground cover and topography.

Typical data and image processing steps may include:

- GPS Destripe – Determines the median of each transect and then subtracts that value from each data point in the transect. May be used to remove the striping effect seen within a survey caused by directional effects, drift, etc.
- GPS Base Interpolation – Sets the X & Y interval of the interpolated data and the track radius (area around each datapoint that is included in the interpolated result).
- Discard Overlaps - Intended to eliminate a track(s) that have been collected too close to one another. Without this, the results of the interpolation process can be distorted as it tries to accommodate very close points with potentially differing values.



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.
- 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.
- 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.



Appendix 3 OASIS form

Project Details:

Project name	Water for Life, Havant, Hampshire, Borehole 303				
Type of project	Detailed gradiometer survey (Field evaluation)				
Project description	The project was commissioned by The Clancy Group Ltd with the aim of establishing the presence, or otherwise, and nature of detectable archaeological features in support of a planning application for the development of the site. The survey comprises 0.66 ha of scrub land, currently utilised as agricultural land. The geophysical survey was undertaken on 31/10/2022. The detailed gradiometer has not identified any anomalies thought to be associated with archaeological remains. The detectable anomalies comprise a modern service in the south-western portion of the site and increased ferrous response from the surrounding fencing.				
Project dates	Start: 31-10-2022		End: 31-10-2022		
Previous work	N/A				
Future work	Borehole monitoring				
Project Code:	271401	HER event no.	If relevant	OASIS form ID:	wessexar1-510536
		NMR no.	N/A		
		SM no.	N/A		
Planning Application Ref.	N/A				
Site Status	None				
Land use	Agricultural land (Crop)				
Monument type	N/A	Period			

Project Location:

Site Address	Land off of New Down Lane, Drayton, Portsmouth,			Postcode	PO7 5BB
County	Hampshire	District	Winchester	Parish	Southwick and Widley
Study Area	0.66 ha	Height OD	68 – 65 m aOD	NGR	466606 106648

Project Creators:

Name of Organisation	Wessex Archaeology			
Project brief originator	The Clancy Group Ltd	Project design originator	N/A	
Project Manager	Tom Richardson	Project Supervisor	Pamela Warne	
Sponsor or funding body	The Clancy Group Ltd	Type of Sponsor	N/A	

Project Archive and Bibliography:

Physical archive	N/A	Digital Archive	Geophysical survey and report	Paper Archive	N/A
Report title	Water for Life, Havant, Hampshire Borehole 303: Gradiometer survey report			Date	2022
Author	Wessex Archaeology	Description	Unpublished report	Report ref.	271401.04



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