

RISO/02



BORDON GARRISON REDEVELOPMENT, HAMPSHIRE

AREA 4, PHASE B (BORDON AND OAKHANGER SPORTS CLUB)
GEOPHYSICAL SURVEY

commissioned by Amec Foster Wheeler

55587/001

March 2018

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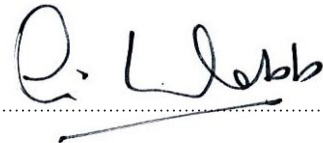
March 2018

project info

HA JOB NO. RISO/02
NGR SU 78550 36600
PARISH Whitehill
LOCAL AUTHORITY East Hampshire
OASIS REF. headland5-262106

project team

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PROJECT SUMMARY

Headland Archaeology (UK) Ltd undertook a geophysical (magnetometer) survey, covering 0.7 hectares, in advance of the proposed redevelopment of Area 4, Phase B, part of the former Bordon Garrison site in Hampshire. The survey has identified ferrous spike anomalies and broader areas of magnetic disturbance which are consistent with the modern use of the site for military and recreational purposes. The high magnitude of these responses could mask the much weaker responses from archaeological deposits, if present. The effect of modern activity on the archaeological resource (if present) is unknown. However, based on the results of the survey, the archaeological potential of the site is assessed as very low.

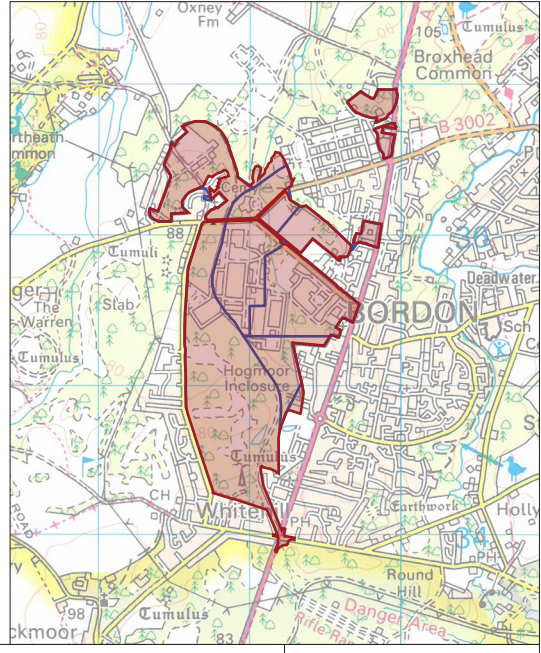
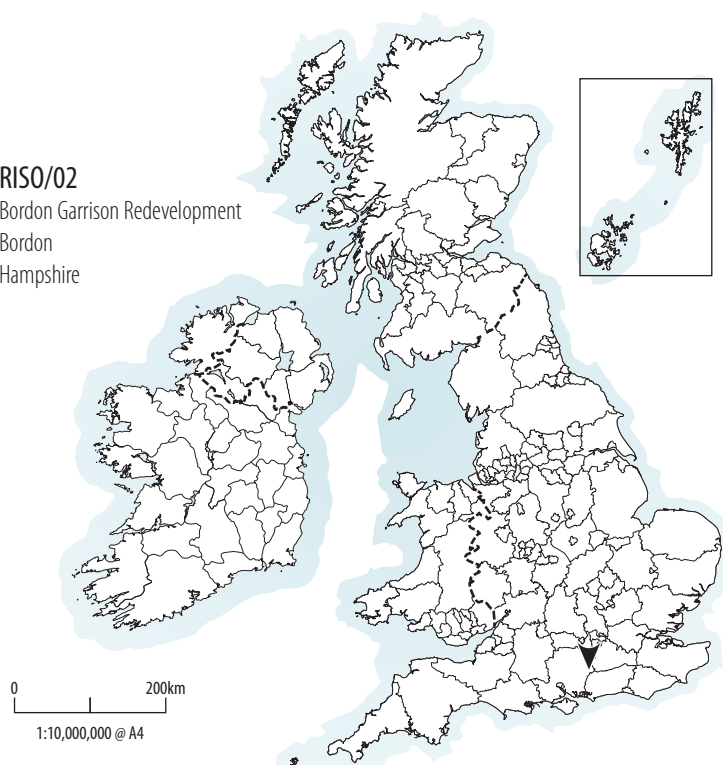
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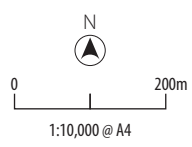
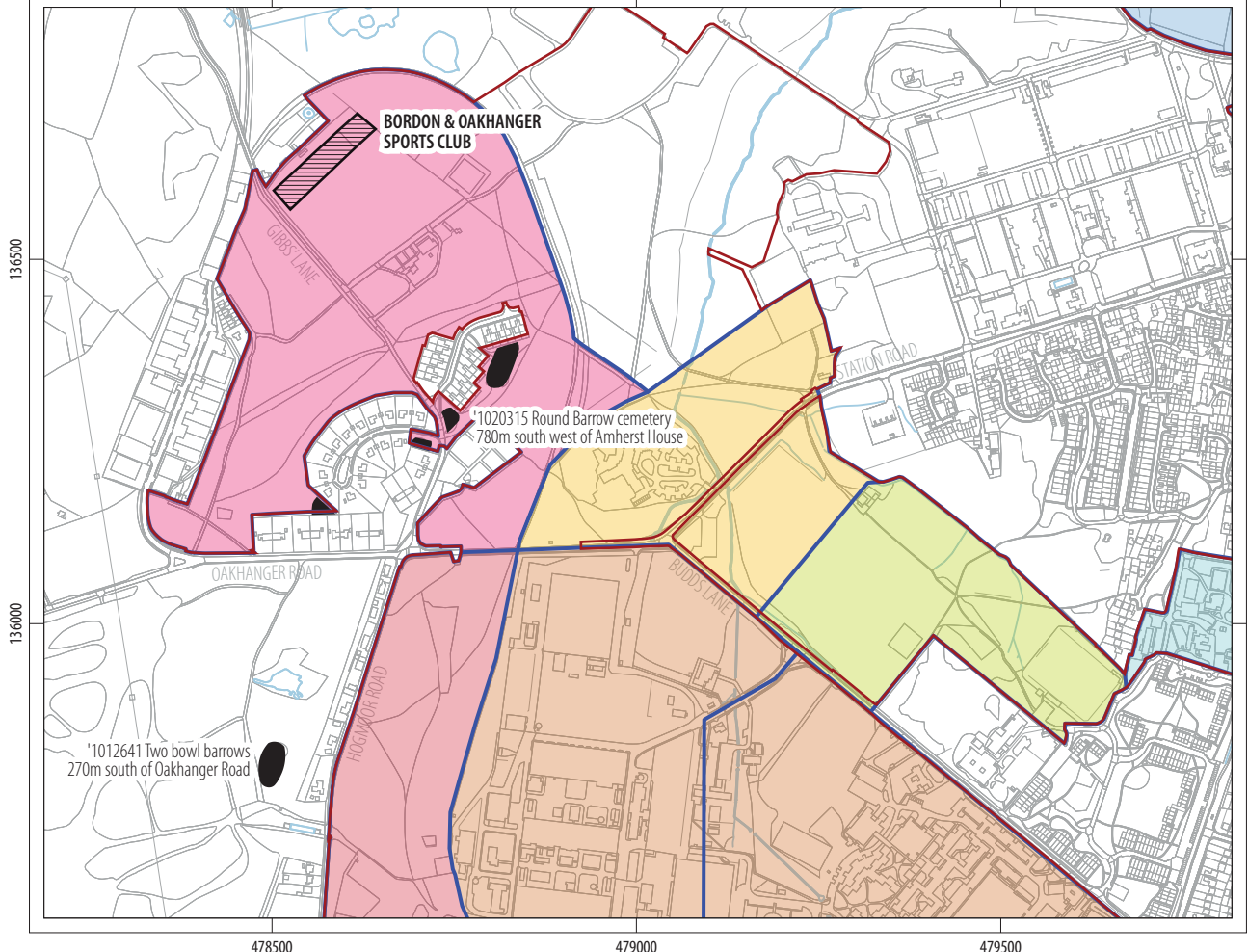
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RISO/02
 Bordon Garrison Redevelopment
 Bordon
 Hampshire



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- KEY**
- application area
 - proposed development area
 - geophysical survey area
 - scheduled monuments
 - Area 1
 - Area 2
 - Area 3 – Phase A
 - Area 3 – Sub-priority 3
 - Area 3 – Phase D
 - Area 4 – Employment zone
 - Area 4 – Phase B



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BORDON GARRISON REDEVELOPMENT, HAMPSHIRE

AREA 4, PHASE B (BORDON AND OAKHANGER SPORTS CLUB) GEOPHYSICAL SURVEY

1 INTRODUCTION

Headland Archaeology (UK) Ltd was commissioned by Amec Foster Wheeler (the Client) on behalf of Whitehill and Bordon Regeneration Company Limited (the Developer) to undertake a geophysical (magnetometer) survey at Bordon Garrison, Hampshire (see Illus 1). The survey will inform forthcoming archaeological strategy in advance of the proposed redevelopment of the site and the adjoining land into residential and commercial units, transport links and open space (East Hampshire District Council Planning Ref. 55587/001). This report covers Area 4, Phase B (Bordon and Oakhanger Sports Club) of the overall proposed development area (PDA) only.

The work was undertaken in accordance with a Written Scheme of Investigation (Headland Archaeology 2016) which was submitted to Hampshire County Council's Historic Environment Team, with guidance contained within the National Planning Policy Framework (DCLG 2012) and in line with current best practice (English Heritage 2008).

The survey was carried out on May 3rd 2016 in order to provide information on the archaeological potential of the Area 4, Phase B PDA.

1.1 SITE LOCATION, TOPOGRAPHY AND LAND-USE

The overall Application Boundary comprises former Ministry of Defence land on the western side of the A325 between Bordon and Whitehall, Hampshire, centred on NGR SU 790 352. This site is subdivided into several PDA's (see Illus 1). This report is concerned with Area 4, Phase B (Bordon and Oakhanger Sports Club) only.

The survey area is centred at NGR SU 785 366 and comprised a strip of rough grassland at the north-western edge of a cricket ground (see Illus 2). Areas of hard-standing and concrete footings were apparent during the course of the survey which relate to the sites recent use as tennis courts. The survey area is flat, being at 77m above Ordnance Datum (aOD).

1.2 GEOLOGY AND SOILS

The underlying bedrock comprises sandstone of the Folkestone Formation. No superficial deposits are recorded (NERC 2016).

The soils are classified in the Soilscape 14 association, characterised as freely draining very acid sandy and loamy soils (Cranfield University 2016). However, it is worth considering that, owing to recent land use (both military and sports/recreational) there is likely to be some disparity between this classification and the actual condition of the soils across the PDA.

2 ARCHAEOLOGICAL BACKGROUND

No known archaeological remains are recorded within the geophysical survey area. However, a Heritage Statement (AMEC 2014) for the wider PDA concluded that:

'...there is a strong likelihood that sub-surface archaeological remains will be present within some of the application areas but not in all. Heritage assets potentially affected include Mesolithic artefact scatters and working floors, Bronze Age ritual and funerary remains and 20th century military remains, including extant structures.'

There is significant evidence for Bronze Age funerary remains 350m south-east of the survey area where a round barrow cemetery (Scheduled Monument 1020315; see Illus 1) comprising five prehistoric burial mounds is recorded. In addition a further twenty burial mounds (including another five scheduled monuments) are recorded within 2km of the application area.



ILLUS 2 General view of Area 4, Phase B (Bordon and Oakhanger Sports Club), looking north-east

3 AIMS, METHODOLOGY AND PRESENTATION

The main aim of the geophysical survey was to identify and assess the nature and extent of any anomalies which may relate to sub-surface features or deposits of archaeological interest within the footprint of the PDA. The survey also aimed to identify any areas of disturbance or activity which may have affected the archaeological evaluation and establish the suitability of site conditions (geology, soils etc.) and any variability within the site as evidence from the responses encountered during the survey.

The general archaeological objective of the geophysical survey was to produce a full report to include the analysis and interpretation of the survey, and to include commentary on the perceived effectiveness of the survey in response to ground conditions. This will inform decisions regarding the nature and scope of any further scheme of archaeological works that may be required.

3.1 MAGNETOMETER SURVEY

Magnetic survey methods rely on the ability of a variety of instruments to measure very small magnetic fields associated with buried archaeological remains. A feature such as a ditch, pit or kiln can act like a small magnet, or series of magnets, that produce distortions (anomalies) in the earth's magnetic field. In mapping these slight variations, detailed plans of sites can be obtained as buried features often produce reasonably characteristic anomaly

shapes and strengths (Gaffney & Gater 2003). Further information on soil magnetism and the interpretation of magnetic anomalies is provided in Appendix 1.

The Area 4, Phase B survey was undertaken using standard dual sensor Bartington Grad601 instruments. Data collected with this system was processed using Geoplot V4 software. Readings were taken at 0.25m intervals on zig-zag traverses 1m apart within 30m by 30m grids, so that 3600 readings were recorded in each grid. The site grid was laid out using a Trimble VRS differential Global Positioning System (Trimble GeoXR model).

3.2 REPORTING

A general site location plan is shown in Illus 1 at a scale of 1:10,000. Illus 2 is a general site condition photograph. The processed data is presented in greyscale and XY trace formats at a scale of 1:1,250 in Illus 3 and Illus 4 with an interpretative illustration at the same scale in Illus 5.

Technical information on the equipment used, data processing and magnetic survey methodology is given in Appendix 1. Appendix 2 details the survey location information and Appendix 3 describes the composition and location of the site archive. A copy of the OASIS entry (Online Access to the Index of Archaeological Investigations) is reproduced in Appendix 4.

The survey methodology, report and any recommendations comply with the Written Scheme of Investigation (Headland Archaeology

2016) and guidelines outlined by English Heritage (English Heritage 2008) and by the Chartered Institute for Archaeologists (CIfA 2014). All illustrations reproduced from Ordnance Survey mapping are with the permission of the controller of Her Majesty's Stationery Office (Ó Crown copyright).

The illustrations in this report have been produced following analysis of the data in 'raw' and processed formats and over a range of different display levels. All illustrations are presented to most suitably display and interpret the data from this site based on the experience and knowledge of management and reporting staff.

4 RESULTS AND DISCUSSION

Magnetic background

The magnetic dataset is dominated by high magnitude ferrous anomalies and this, combined with the small size of the survey area, makes confident assessment of the background magnetic contrast difficult.

4.1 FERROUS ANOMALIES

Ferrous anomalies, characterised as individual 'spikes', are typically caused by ferrous (magnetic) material, either on the ground surface or in the plough-soil. Little importance is normally given to such anomalies, unless there is any supporting evidence for an archaeological interpretation, as modern ferrous debris or material is common on most sites, often being present as a consequence of manuring or tipping/infilling. Across this site there are a large number of ferrous spikes throughout, coalescing into broader areas of magnetic disturbance. The extent of the ferrous contamination is indicative of recent infilling and landscaping and is consistent with the known recent land usage.

Two high magnitude dipolar linear anomalies (FF1 and FF2 see Illus 3–5) probably locate the footings of former fences.

5 CONCLUSION

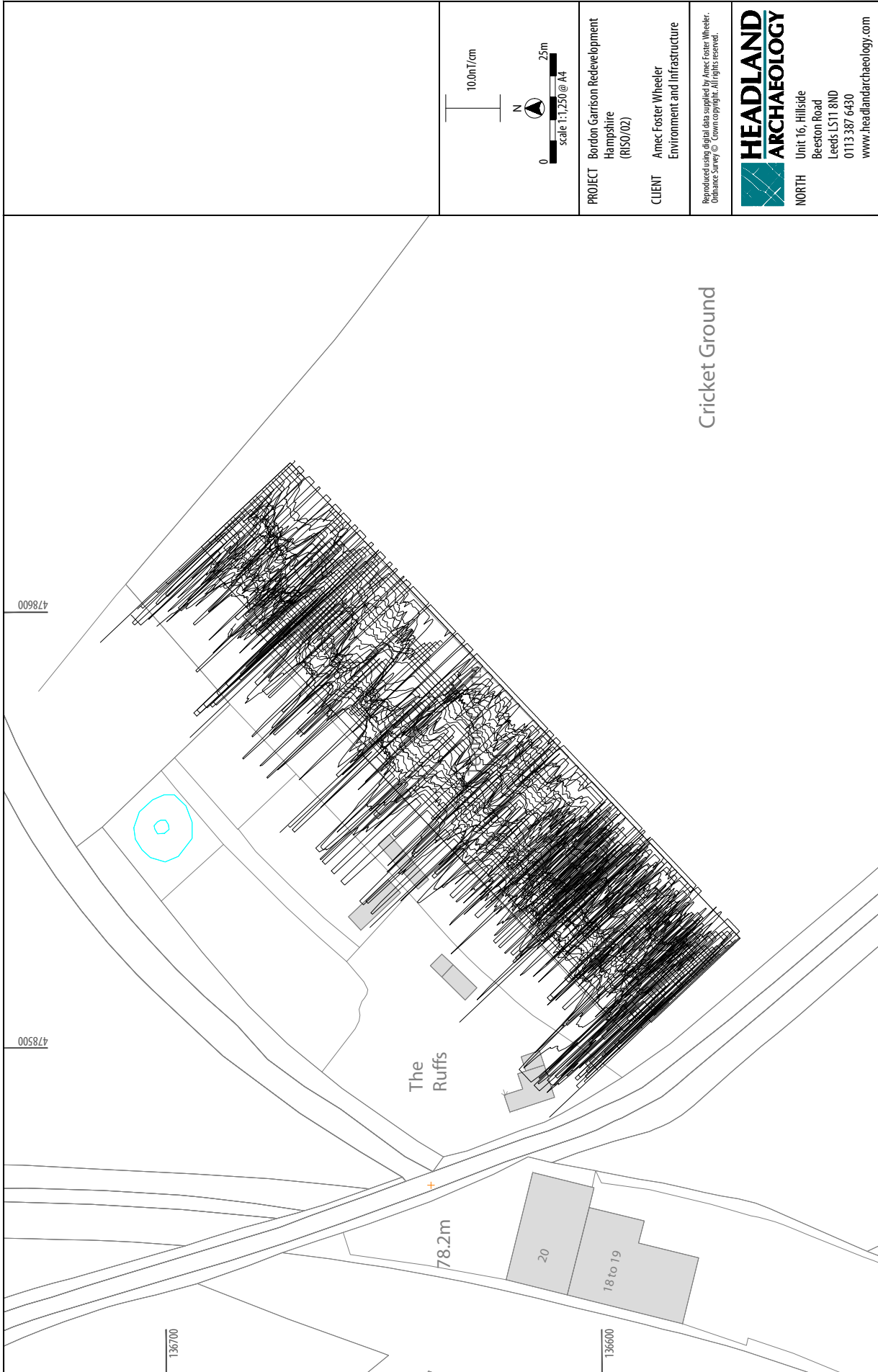
The survey has detected numerous ferrous anomalies and broader areas of magnetic disturbance which are consistent with, and typical of, the modern use of the Area 4, Phase B PDA for recreational purposes. Broader areas of magnetic disturbance may mask or obscure weaker anomalies of archaeological potential within the affected areas. However, on the basis of the survey, the archaeological potential of Area 4 is assessed as very low.

6 REFERENCES

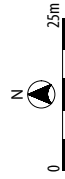
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ILLUS 3 Processed greyscale magnetometer data; Area 4, Phase B (Bordon and Oakhanger Sports Club) (1:1,250)



10.0m/1cm



scale 1:1,250 @ A4

PROJECT Bordon Garrison Redevelopment
Hampshire
(RISO/02)

CLIENT Amec Foster Wheeler
Environment and Infrastructure

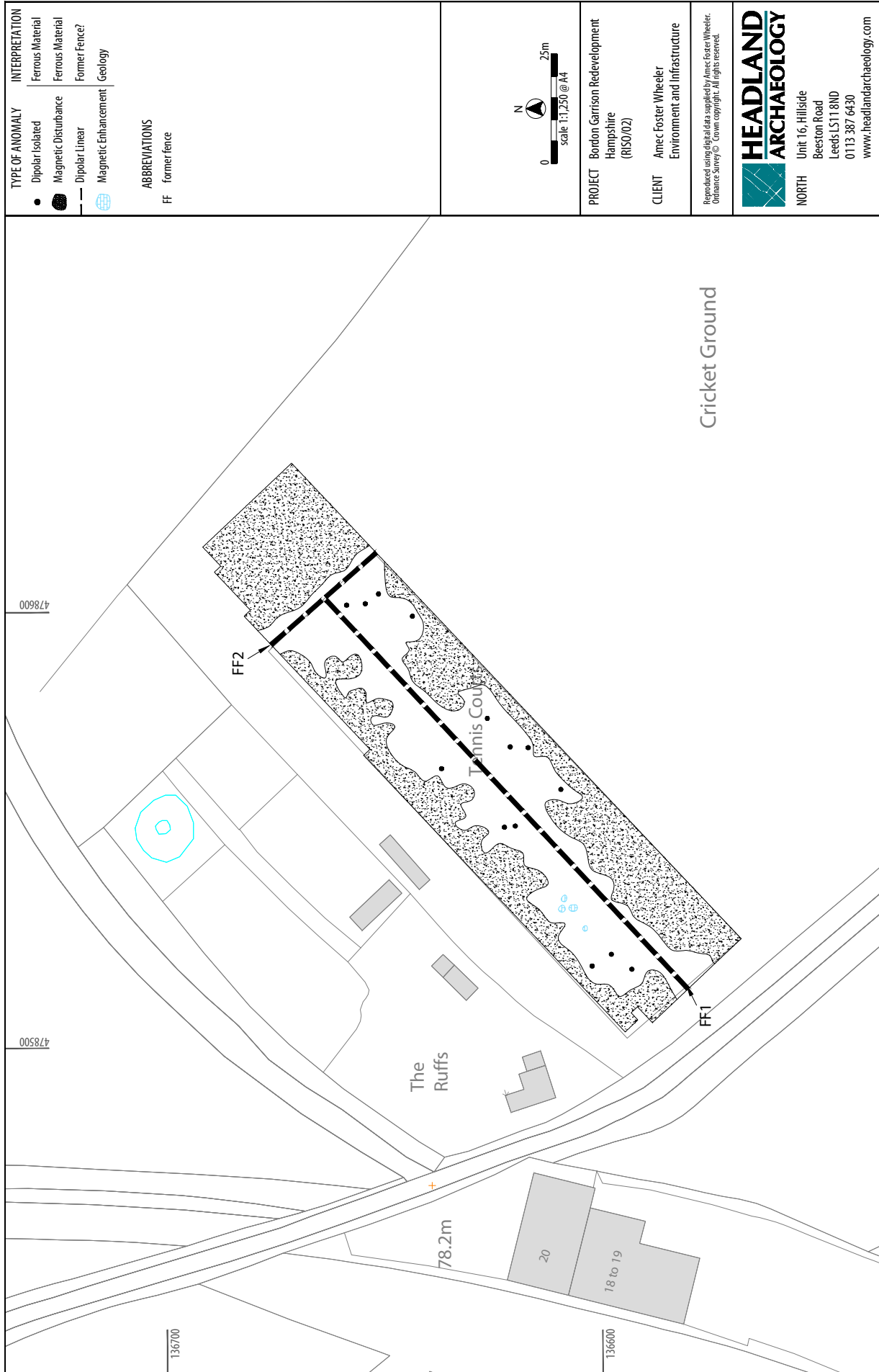
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Cricket Ground

ILLUS 4 XY trace plot of magnetometer data; Area 4, Phase B (Bordon and Oakhanger Sports Club) (1:1,250)



ILLUS 5 Interpretation of magnetometer data; Area 4, Phase B (Bordon and Oakhanger Sports Club) (1:1,250)

7 APPENDICES

APPENDIX 1 MAGNETOMETER SURVEY

Magnetic susceptibility and soil magnetism

Iron makes up about 6% of the earth's crust and is mostly present in soils and rocks as minerals such as maghaemite and haematite. These minerals have a weak, measurable magnetic property termed magnetic susceptibility. Human activities can redistribute these minerals and change (enhance) others into more magnetic forms so that by measuring the magnetic susceptibility of the topsoil, areas where human occupation or settlement has occurred can be identified by virtue of the attendant increase (enhancement) in magnetic susceptibility. If the enhanced material subsequently comes to fill features, such as ditches or pits, localised isolated and linear magnetic anomalies can result whose presence can be detected by a magnetometer (fluxgate gradiometer).

In general, it is the contrast between the magnetic susceptibility of deposits filling cut features, such as ditches or pits, and the magnetic susceptibility of topsoils, subsoils and rocks into which these features have been cut, which causes the most recognisable responses. This is primarily because there is a tendency for magnetic ferrous compounds to become concentrated in the topsoil, thereby making it more magnetic than the subsoil or the bedrock. Linear features cut into the subsoil or geology, such as ditches, that have been silted up or have been backfilled with topsoil will therefore usually produce a positive magnetic response relative to the background soil levels. Discrete feature, such as pits, can also be detected.

The magnetic susceptibility of a soil can also be enhanced by the application of heat. This effect can lead to the detection of features such as hearths, kilns or areas of burning.

Types of magnetic anomaly

In the majority of instances anomalies are termed 'positive'. This means that they have a positive magnetic value relative to the magnetic background on any given site. However some features can manifest themselves as 'negative' anomalies that, conversely, means that the response is negative relative to the mean magnetic background.

Where it is not possible to give a probable cause of an observed anomaly a '?' is appended.

It should be noted that anomalies interpreted as modern in origin might be caused by features that are present in the topsoil or upper layers of the subsoil. Removal of soil to an archaeological or natural layer can therefore remove the feature causing the anomaly.

The types of response mentioned above can be divided into five main categories that are used in the graphical interpretation of the magnetic data:

Isolated dipolar anomalies (iron spikes)

These responses are typically caused by ferrous material either on the surface or in the topsoil. They cause a rapid variation in the magnetic response giving a characteristic 'spiky' trace. Although ferrous archaeological artefacts could produce this type of response, unless there is supporting evidence for an archaeological interpretation, little emphasis is normally given to such anomalies, as modern ferrous objects are common on rural sites, often being present as a consequence of manuring.

Areas of magnetic disturbance

These responses can have several causes often being associated with burnt material, such as slag waste or brick rubble or other strongly magnetised/fired material. Ferrous structures such as pylons, mesh or barbed wire fencing and buried pipes can also cause the same disturbed response. A modern origin is usually assumed unless there is other supporting information.

Linear trend

This is usually a weak or broad linear anomaly of unknown cause or date. These anomalies are often caused by agricultural activity, either ploughing or land drains being a common cause.

Areas of magnetic enhancement/positive isolated anomalies

Areas of enhanced response are characterised by a general increase in the magnetic background over a localised area whilst discrete anomalies are manifest by an increased response (sometimes only visible on an XY trace plot) on two or three successive traverses. In neither instance is there the intense dipolar response characteristic exhibited by an area of magnetic disturbance or of an 'iron spike' anomaly (see above). These anomalies can be caused by infilled discrete archaeological features such as pits or post-holes or by kilns. They can also be caused by pedological variations or by natural infilled features on certain geologies. Ferrous material in the subsoil can also give a similar response. It can often therefore be very difficult to establish an anthropogenic origin without intrusive investigation or other supporting information.

Linear and curvilinear anomalies

Such anomalies have a variety of origins. They may be caused by agricultural practice (recent ploughing trends, earlier ridge and furrow regimes or land drains), natural geomorphological features such as palaeochannels or by infilled archaeological ditches.

APPENDIX 2 SURVEY LOCATION INFORMATION

Standard Bartington Grad601 survey

The site grid was laid out using a Trimble VRS differential Global Positioning System (Trimble GeoXR model). The accuracy of this equipment is better than 0.01m.

The survey data were then super-imposed onto a base map provided by the client to produce the displayed block locations. However, it should be noted that Ordnance Survey positional accuracy for digital map data has an error of 0.5m for urban and floodplain areas, 1.0m for rural areas and 2.5m for mountain and moorland areas. This potential error must be considered if coordinates are measured off hard copies of the mapping rather than using the digital coordinates.

Headland Archaeology cannot accept responsibility for errors of fact or opinion resulting from data supplied by a third party.

APPENDIX 3 GEOPHYSICAL SURVEY ARCHIVE

The geophysical archive comprises:

- › an archive disk containing the raw data in XYZ format, a raster image of each greyscale plot with associate world file, and a PDF of the report

The project will be archived in-house in accordance with recent good practice guidelines (http://guides.archaeologydataservice.ac.uk/g2gp/Geophysics_3). The data will be stored in an indexed archive and migrated to new formats when necessary.

APPENDIX 4 OASIS DATA COLLECTION FORM: ENGLAND

OASIS ID: headland5-262106

PROJECT DETAILS	
PROJECT NAME	Bordon Garrison Redevelopment, Hampshire: Area 4, Phase B (Bordon and Oakhanger Sports Club): Geophysical Survey
SHORT DESCRIPTION OF THE PROJECT	Headland Archaeology (UK) Ltd undertook a geophysical (magnetometer) survey, covering 0.7 hectares, in advance of the proposed redevelopment of Area 4, Phase B, part of the former Bordon Garrison site in Hampshire. The survey has identified ferrous spike anomalies and broader areas of magnetic disturbance which are consistent with the modern use of the site for military and recreational purposes. The high magnitude of these responses could mask the much weaker responses from archaeological deposits, if present. The effect of modern activity on the archaeological resource (if present) is unknown. However, based on the results of the survey, the archaeological potential of the site is assessed as very low.
PROJECT DATES	Start: 03-05-2016 End: 03-05-2016
PREVIOUS/FUTURE WORK	Not known / Not known
ANY ASSOCIATED PROJECT REFERENCE CODES	RISO-02 - Contracting Unit No.
TYPE OF PROJECT	Field evaluation
SITE STATUS	None
CURRENT LAND USE	Other 14 - Recreational usage
MONUMENT TYPE	N/A None
MONUMENT TYPE	N/A None
SIGNIFICANT FINDS	N/A None
SIGNIFICANT FINDS	N/A None
METHODS & TECHNIQUES	"Geophysical Survey"
DEVELOPMENT TYPE	Not recorded
PROMPT	National Planning Policy Framework - NPPF
POSITION IN THE PLANNING PROCESS	After outline determination (eg. As a reserved matter)
SOLID GEOLOGY (OTHER)	Folkstone Formation
DRIFT GEOLOGY (OTHER)	None
TECHNIQUES	Magnetometry
PROJECT LOCATION	
COUNTRY	England
SITE LOCATION	HAMPSHIRE EAST HAMPSHIRE WHITEHILL Bordon Garrison Redevelopment, Hampshire: Area 4, Phase B (Bordon and Oakhanger Sports Club)
POSTCODE	GU35 9HG
STUDY AREA	0.7 Hectares
SITE COORDINATES	SU 7855 3664 51.123122821364 -0.87747318199 51 07 23 N 000 52 38 W Point
PROJECT CREATORS	
NAME OF ORGANISATION	Headland Archaeology
PROJECT BRIEF ORIGINATOR	AMECFW
PROJECT DESIGN ORIGINATOR	Headland Archaeology
PROJECT DIRECTOR/MANAGER	Webb, A.

PROJECT SUPERVISOR Bishop, R
TYPE OF SPONSOR/FUNDING BODY Developer

PROJECT ARCHIVES

PHYSICAL ARCHIVE EXISTS? No
DIGITAL ARCHIVE EXISTS? No
DIGITAL MEDIA AVAILABLE "Geophysics"
PAPER ARCHIVE EXISTS? No
PAPER MEDIA AVAILABLE "Report"

PROJECT BIBLIOGRAPHY 1

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