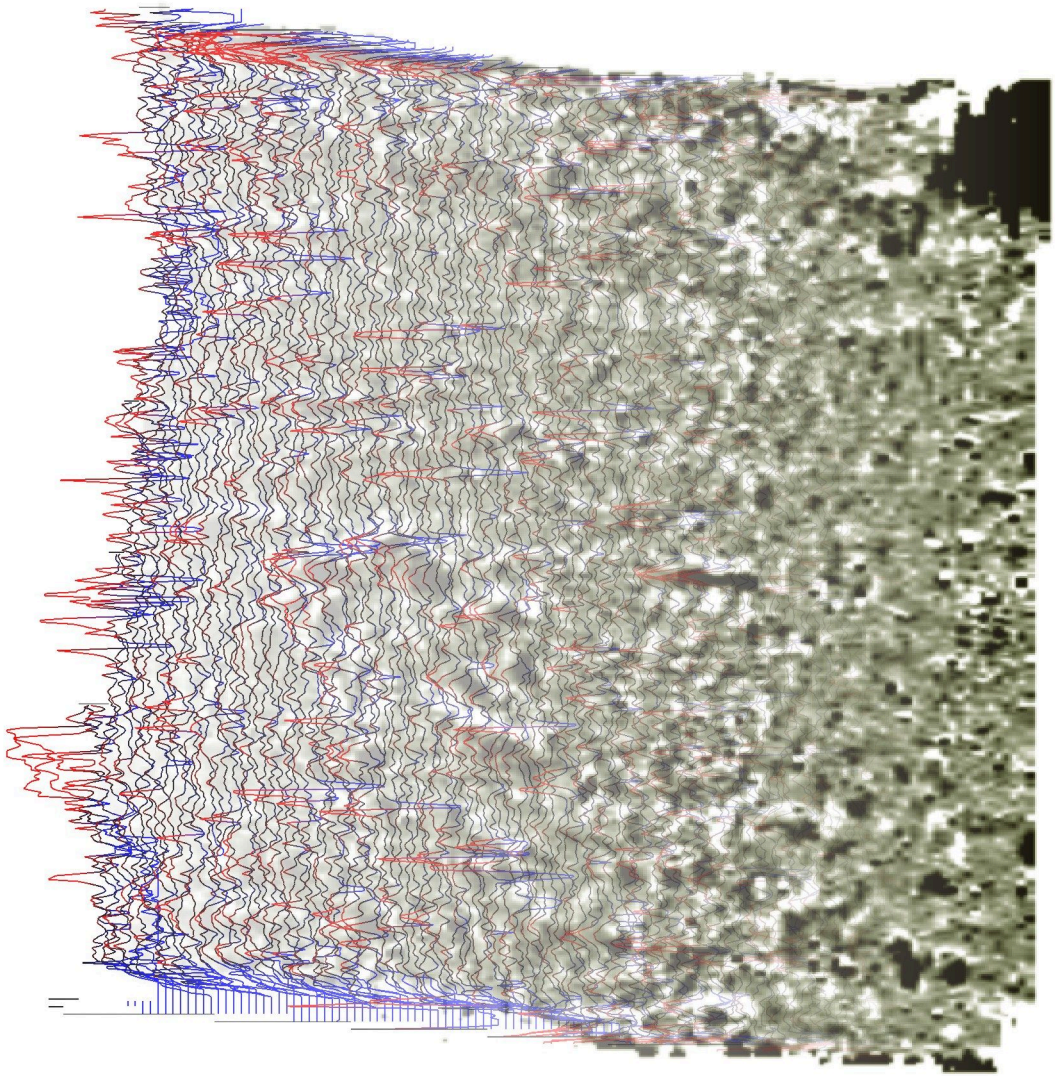
WA Heritage

Land at Kingsdown
Swindon

Detailed Gradiometer Survey Report



Ref: 66712.01

November 2008

WA Heritage

LAND AT KINGSDOWN,

SWINDON

Detailed Gradiometer Survey Report

Prepared for:

DPDS Consulting Group
Old Bank House
5 Devizes Road
Swindon
SN1 4BJ

On behalf of:

Persimmon Special Projects Western Ltd
and
Primegate Properties (Blunsdon) Ltd

By:

Wessex Archaeology
Portway House
Old Sarum Park
Salisbury
SP4 6EB

Ref: 66712.01

November 2008

LAND AT KINGSDOWN,

SWINDON

Detailed Gradiometer Survey Report

Ref: 66712.01

Summary

Wessex Archaeology was commissioned by Persimmon Special Projects Western Ltd and Primegate Properties (Blunsdon) Ltd to undertake geophysical survey of land at Kingsdown, to the north-east of Swindon, centred on NGR 415680 189430. The survey was undertaken as part of a staged archaeological evaluation of the Site designed to inform a proposed Environmental Impact Statement to be submitted in support of an outline planning application for development of the Site.

The proposed survey area comprised some 10ha. A total of 7.5ha was suitable for detailed gradiometer survey, with the remainder being unavailable through dense vegetation, electric fencing and modern buildings.

Several linear anomalies of probable and possible archaeological interest have been identified, and are likely to represent former field boundaries. A number of clusters of what may be pits are distributed throughout the western portion of the proposed development area, although these lack definition due to a strong magnetic background. Numerous linear trends and isolated anomalies may be the result of former ploughing strategies and field divisions.

LAND AT KINGSDOWN,

SWINDON

Detailed Gradiometer Survey Report

Acknowledgements

The scanning and detailed gradiometer surveys were commissioned by Persimmon Special Projects Western Ltd and Primegate Properties (Blunsdon) Ltd.

The geophysical survey was managed on behalf of Wessex Archaeology by Paul Baggaley. The fieldwork was directed by Ben Urmston, and assisted by Daniel Hart, Gareth Owen and Nathan Thomas. Ben Urmston processed and interpreted the geophysical data and compiled this report. The geophysical survey was managed by Paul Baggaley. Illustrations were prepared by Ken Lymer.

LAND AT KINGSDOWN,

SWINDON

Detailed Gradiometer Survey Report

Contents

LAND AT KINGSDOWN,

SWINDON

Detailed Gradiometer Survey Report

1 PROJECT BACKGROUND

1.1 Wessex Archaeology was commissioned by DPDS Consulting Group, on behalf of Persimmon Special Projects Western Ltd and Primegate Properties (Blunsdon) Ltd, to undertake geophysical survey on land at Kingsdown, Swindon (**Figure 1**), approximately centered on NGR 415680 189430 (hereafter 'the Site').

1.2 The aim of the project was to undertake geophysical survey in order to establish the presence/absence, extent, character and date of archaeological remains in advance of the proposed development and associated services and infrastructure.

1.3 This report presents a brief description of the methodology followed, the reconnaissance and detailed survey results, and the archaeological interpretation of the geophysical data.

2 SURVEY AREAS

2.1 The Site was sub-divided into thirteen areas for detailed survey (**Figure 1**). These areas were defined by the presence of field boundaries and electric fencing. However, the areas are referred to as a whole in this report.

2.2 The proposed investigation area totalled approximately 10ha, with *c.*7.5ha of this suitable for detailed gradiometer survey. The remainder was occupied by dense vegetation, buildings and field boundaries. A notable exception was the south-easternmost field, which was covered by long grass at the time of survey. The vegetation was sufficiently dense to prevent a constant and safe walking speed, and only a 20m-wide strip of grids was surveyed along the northern boundary.

2.3 The underlying solid geology of the Site is predominantly Upper Corallian limestone, transitioning to silts and sands. The drift geology of the survey areas are largely the brown rendzinas of the 343d Sherborne association and the typical calcareous pelosols of the 411b Evesham 2 association (SSEW 1983). These superficial geologies are considered likely to produce a magnetic contrast suitable for the identification of archaeological remains using a Bartington Grad 601-2 gradiometer system.

3 METHODOLOGY

3.1 WA designed a geophysical specification to investigate the proposed Study Area, areas of which border on sites of known archaeology, identified in the previous survey (Wessex Archaeology 2008b). The methodology consisted of detailed

gradiometer survey using a Bartington Grad 601-2 dual gradiometer system in accordance with English Heritage Guidelines for Geophysical Surveys (2008).

3.2 The detailed survey was conducted by WA staff in accordance with English Heritage Guidelines, and was undertaken from 6th to 8th October 2008. Survey grids were established at 20m x 20m using a Leica 1200 RTK GPS system, which is able to provide locations in real-time, accurate to within 2cm, and therefore exceeds English Heritage recommendations for geophysical surveys.

3.3 Further details of the geophysical and survey equipment, methods and processing are described in **Appendix I**.

4 RESULTS AND INTERPRETATION

4.1 Introduction

4.1.1 The detailed gradiometer surveys were successful in identifying anomalies of anthropogenic origin and the results are presented as greyscale and XY trace plots (**Figure 2**). The results are discussed numerically.

4.1.2 The interpretation of the datasets highlights the presence of potential archaeological anomalies, trends, ferrous or fired objects, and areas of increased magnetic response (**Figure 3**). Full definitions of these terms are provided in **Appendix II**.

4.1.3 Numerous small-scale ferrous anomalies are visible throughout the detailed survey dataset. These are presumed to be modern in provenance and are not referred to again in the report, unless thought to be relevant to the archaeological interpretation.

4.2 Detailed Survey Results and Interpretations

4.3.1 The most prominent features of archaeological potential are the three linear anomalies **4001, 4002** and **4003**, all oriented approximately east to west. It is likely that they represent the remains of a former field boundary, although **4003** is lost to the east amidst ferrous disturbance. Linear anomalies **4004** and **4005** lie on similar alignments to the above anomalies, and it is possible that they also represent former boundaries.

4.3.2 Numerous clusters of pit-like anomalies, **4006** to **4010**, appear throughout the north-western portion of the survey area. The apparent lack of coherent distribution hampers definitive interpretation, as does the marked textural change in the magnetic background to the west. This makes the interpretation of the individual anomalies less certain, although it is likely that these groupings have some archaeological significance. Elsewhere, isolated anomalies consistent with responses due to pits and short linear features appear throughout the dataset. Whilst some of these will be of archaeological interest, their interpretation is hindered by the frequent interruptions in their responses.

4.3.3 Two areas of increased magnetic response are apparent within the data. The larger region occupies the north-western portion of the survey area, and is clearly bounded

to the east by the extant field boundary, becoming less distinct to the south. A smaller region, oriented approximately east to west along the southern extent of the survey area, may well extend into the unsurveyed area to the east. Both of these regions of increased response appear as textural changes in the magnetic background, making interpretation of isolated anomalies more difficult as their contrast with the magnetic background is reduced. It is likely that these two regions are the result of former land use, perhaps demarking fossilised agricultural enclosures; it is conceivable that changes in the superficial geology immediately underlying the Site may be responsible, however.

4.3.4 Numerous linear and sub-linear trends appear throughout the dataset. Given the strongly textured magnetic background of some fields, it is possible that these are simply chance alignments; however, many are oriented east to west, north-east to south-west and north-west to south-east, suggesting that they may reflect former ploughing strategies.

4.3.5 It should be noted that numerous isolated ferrous responses are distributed throughout the majority of the survey area, with larger areas of ferrous disturbance apparent near field boundaries and entrances. The majority of these are the result of modern contamination, and are mostly likely the result of the current use of most of the land as equestrian paddocks. The relative extensiveness of ferrous contamination has had a clear effect upon the data quality with reference to the archaeological interpretation, as weaker anomalies of possible archaeological interest will have been masked by these modern disturbances.

5 CONCLUSIONS

5.1 Of the 10ha comprising the Study Area, a total of some 7.5ha was suitable for detailed survey. Survey in the remaining area was precluded by dense vegetation and other obstructions, including electric fencing and buildings.

5.2 Several linear anomalies of probable and possible archaeological interest have been identified, and are likely to represent the remains of former field boundaries. A number of clusters of anomalies, consistent with pits, are apparent within the dataset, although their interpretation is hampered by the strong texture of the magnetic background in certain regions of the survey area.

5.3 Numerous other weak anomalies and linear trends may be of some archaeological significance. Many of these are likely to be related to former ploughing strategies; a similar interpretation is consistent with the regions of increased magnetic response visible within the data.

5.4 The relatively high frequency of isolated ferrous anomalies is likely to be related to the current use of the majority of the survey area as equestrian paddocks. These ferrous disturbances have interrupted numerous responses and are likely to have masked any weaker archaeological anomalies.

6 REFERENCES

English Heritage, 2008. *Geophysical survey in archaeological field evaluation*. Research and Professional Service Guideline No 1.

Soil Survey of England and Wales, 1983. *Soils of South East England: Sheet 6*. Ordnance Survey, Southampton.

Wessex Archaeology, 2008a. *Land at Kingsdown, North-East Swindon, Wiltshire: Archaeological Desk-based Assessment*. Report 66710.01

Wessex Archaeology, 2008b. *Land at Kingsdown, North-East Swindon, Wiltshire: Geophysical Survey Report*. Report 66710.01

APPENDIX I: 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 a resolution of 0.1nT over a ±3000nT 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.

WA undertakes two types of magnetic surveys: scanning and detail. Both types depend upon the establishment of an accurate 20m site grid, which is achieved using a Leica 1200 RTK GPS system and then extended using tapes. The Leica 1200 RTK GPS system receives corrections from a network of reference stations operated by the Ordnance Survey and Leica Geosystems, allowing positions to be determined to an accuracy of 1-2cm in real-time and therefore exceed the level of accuracy recommended by English Heritage (1995) 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 detail surveys consist of 20m x 20m grids, and data are collected at 0.25m intervals along traverses spaced 1m apart. This gives 1600 measurements per grid and is the recommended methodology for archaeological surveys of this type (English Heritage, 1995).

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 forward or backward by a number of readings. This corrects for operator errors and is used to enhance linear features;

- Clipping – Limiting the displayed range of the processed data to either ±3nT or ±3s.d. in order to enhance the appearance of smaller anomalies.
- Despike – Filtering any data points that exceed the mean by a specified amount to reduce the appearance of dominant anomalous readings caused by modern, small ferrous objects at the surface

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 image can include a hidden line algorithm to remove certain lines and enhance the image. This type of image is useful as it shows the full range and shape 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 II: GEOPHYSICAL INTERPRETATION

The interpretation methodology used by WA separates the anomalies into two main categories: archaeological and unidentified responses.

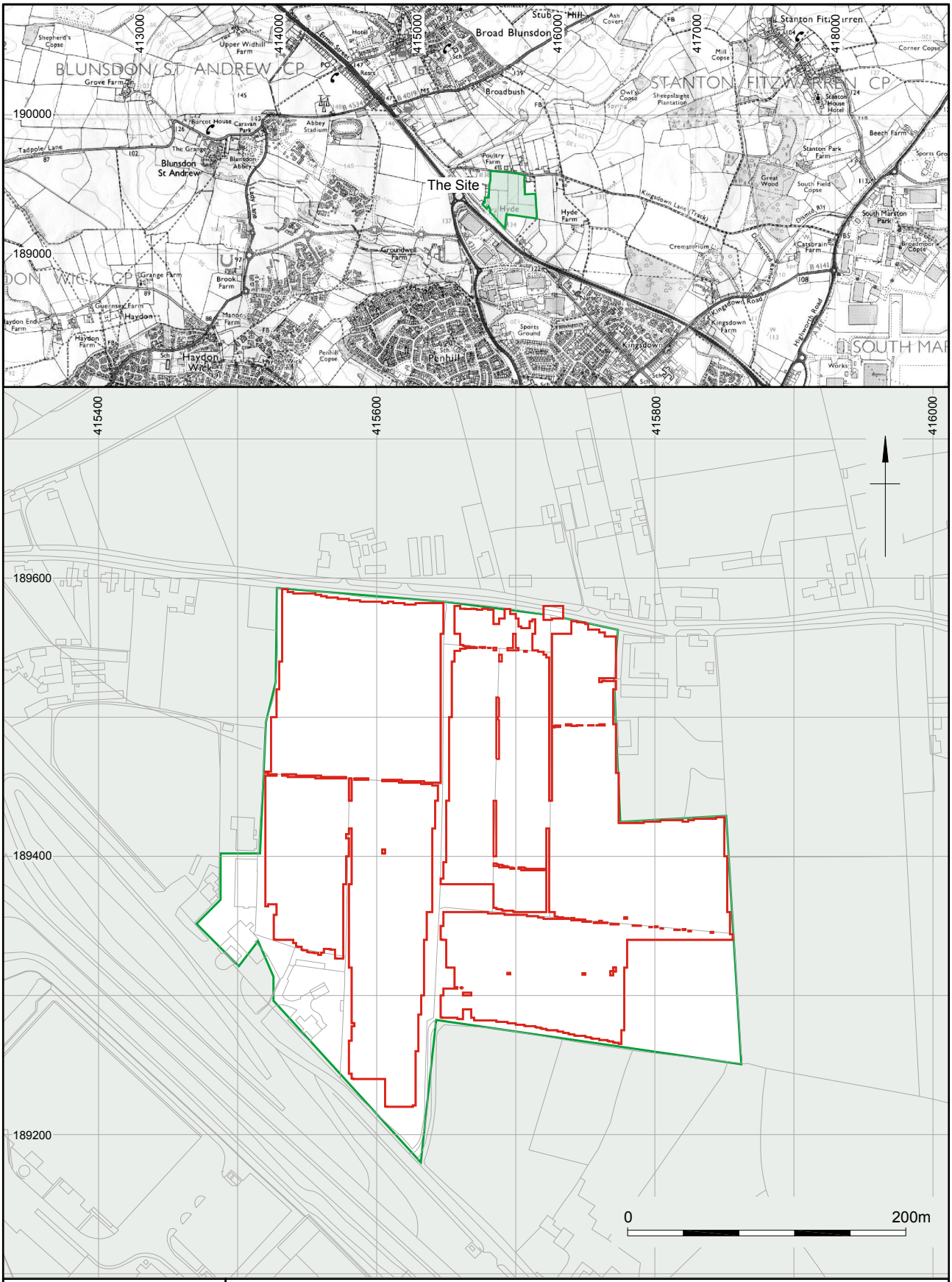
The archaeological category is used for features when the form, nature and pattern of the anomaly are indicative of archaeological material. Further sources of information such as aerial photographs may also have been incorporated in providing the final interpretation. This category is further sub-divided 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.

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:

- Possible archaeology – used for features which give a response but which form no discernable pattern or trend.
- 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.



The Site

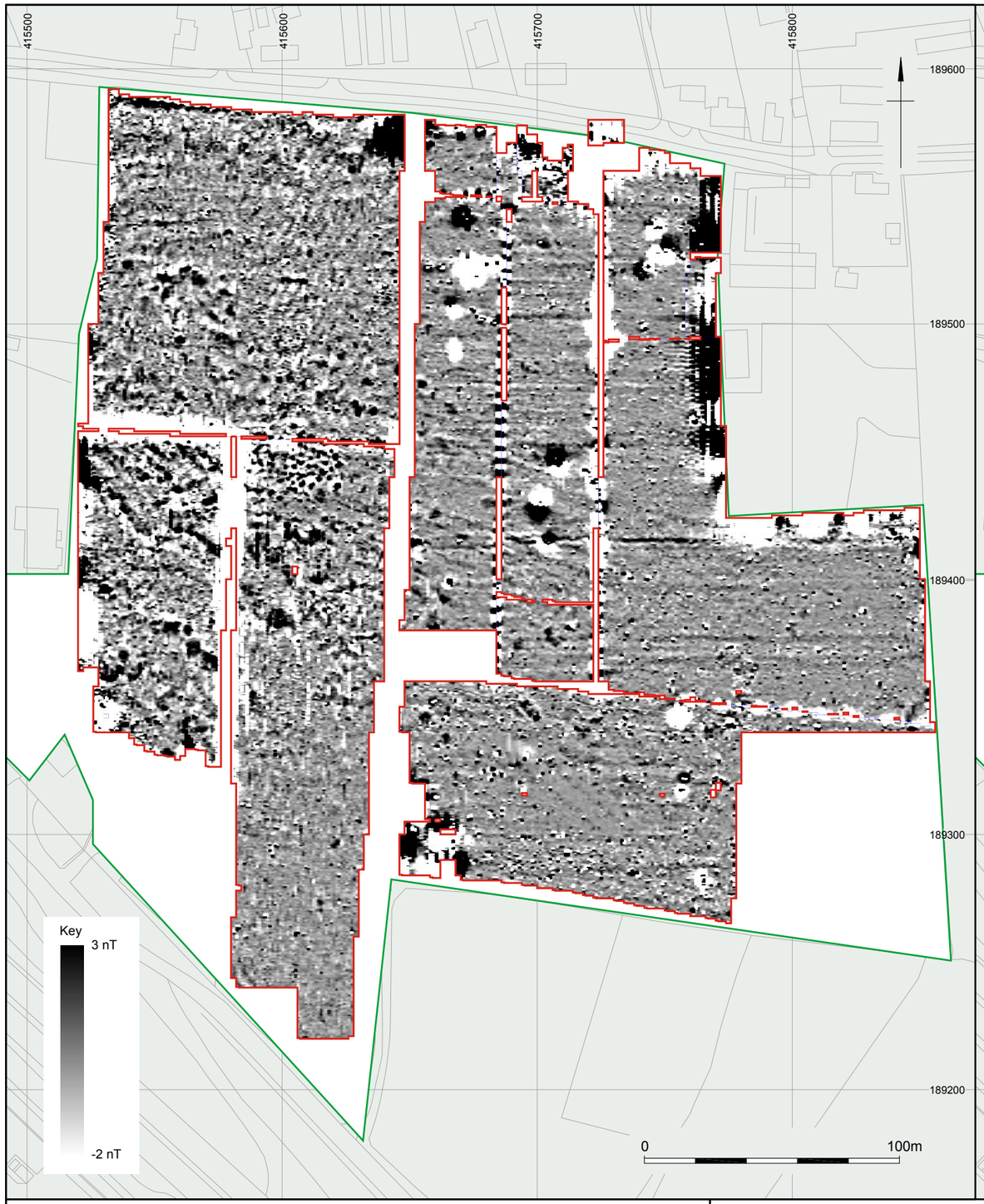
Detailed survey area

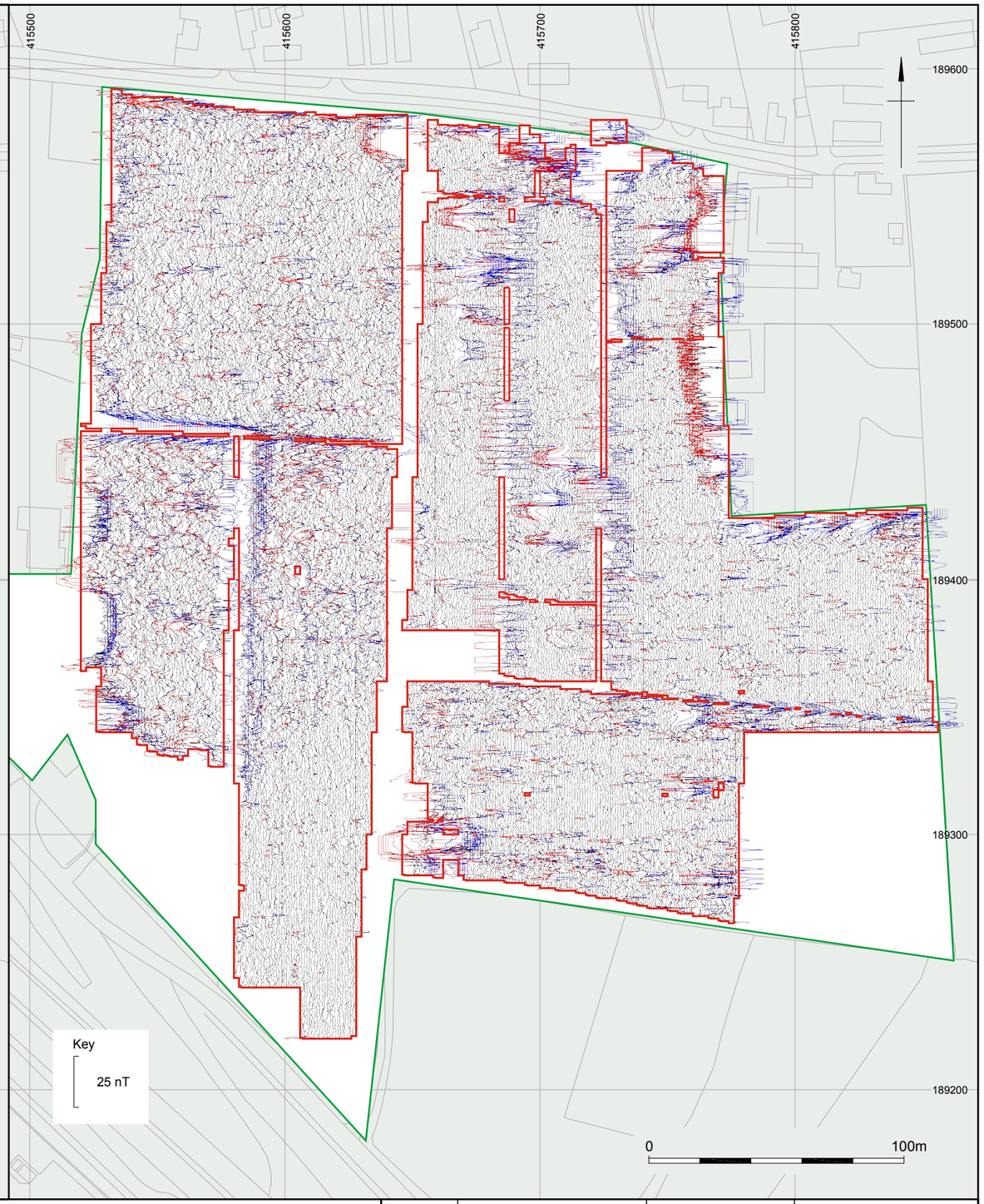
WA Heritage

Date:	28/10/08	Revision Number:	0
Scale:	1:40000 & 1:4000	Illustrator:	KL
Path:	Y:\PROJECTS\66712\Drawing Office\Report Figures\geo\08_10\66712_geo_f1.dwg		

Site location and survey extents

Figure 1





WA Heritage

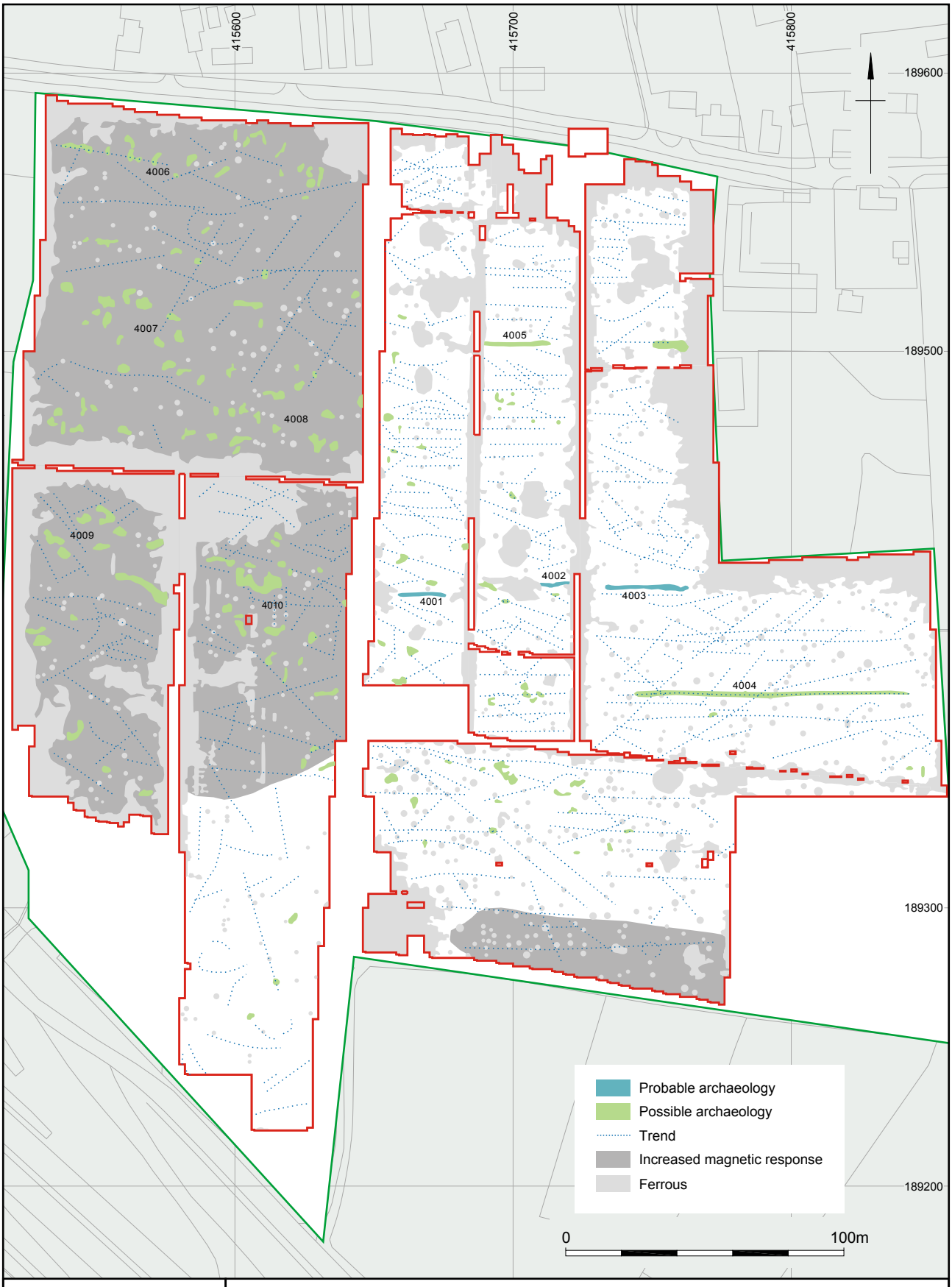
The Site

Detailed survey area

Date:	28/10/08	Revision Number:	0
Scale:	1:2000	Illustrator:	KL
Path:	Y:\PROJECTS\66712\Drawing Office\Report Figures\geo\08_10\66712_geo_f2.dwg		

Greyscale plot and XY trace

Figure 2



The Site

Detailed survey area

WA Heritage

Date:	29/10/08	Revision Number:	0
Scale:	1:2000	Illustrator:	KL
Path:	Y:\PROJECTS\66712\Drawing Office\Report Figures\geo\08_10\66712_geo_f3.dwg		

Interpretation

Figure 3

WESSEX ARCHAEOLOGY LIMITED.
Registered Head Office: Portway House, Old Sarum Park, Salisbury, Wiltshire SP4 6EB.
Tel: 01722 326867 Fax: 01722 337562 info@wessexarch.co.uk www.wessexarch.co.uk
London Office: Unit 113, The Chandlery, 50 Westminster Bridge Road, London SE1 7QY.
Tel: 020 7953 7494 Fax: 020 7953 7499 london-info@wessexarch.co.uk www.wessexarch.co.uk