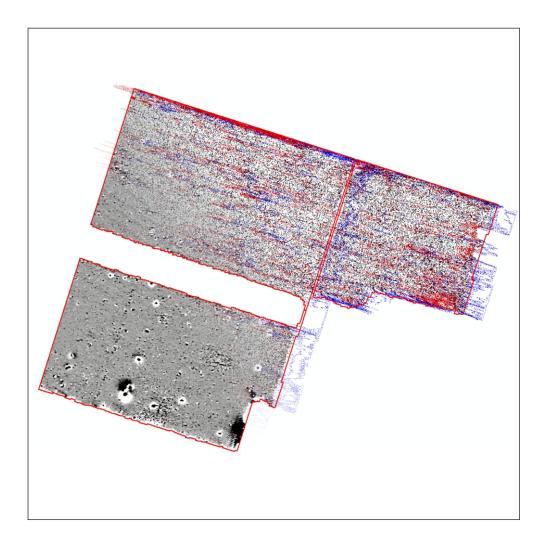


making sense of heritage

Grove Road, Harwell Oxfordshire

Phase II Detailed Gradiometer Survey



Ref: 87554.02 March 2015

geoservices



Grove Road, Harwell, Oxfordshire Phase II

Detailed Gradiometer Report

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Grove Road, Harwell, Oxfordshire Phase II

Detailed Gradiometer Report

Summary

Wessex Archaeology was commissioned by Taylor Wimpey (Oxfordshire) to undertake a detailed gradiometer survey at Harwell, near Didcot, Oxfordshire centred on NGR 448990,189630. The aim of the work was to establish the presence, or otherwise, and nature of detectable archaeological features on the site.

The site is located on the northwest edge of Harwell, Oxfordshire. Harwell is found approximately 3.4km west of the centre of Didcot and 16km south of Oxford. The site comprises three arable fields with the survey extents defined by hedgerows and trees on the south, east and north and by the site limits on the west side.

Detailed gradiometer survey was undertaken over all accessible parts of the site, a total of *c*.7.4ha, and has demonstrated the presence of anomalies of possible archaeological interest within the survey area, along with anomalies of increased magnetic response.

The anomalies of archaeological interest include several oval shaped and curvilinear positive anomalies interpreted as ditch and pit-type features, including at least three linear alignments which may represent former field boundaries. Evidence of ridge and furrow agriculture has been identified and several further linear alignments. The proximity to known archaeological features to the south of the Site suggests that some features may be of archaeological significance.

The geophysical survey was undertaken between the 13th and 14th January 2015.

Grove Road, Harwell, Oxfordshire Phase II

Detailed Gradiometer Report

Acknowledgements

This project was commissioned by Taylor Wimpey (Oxfordshire) and Wessex Archaeology is grateful to Sally Appleyard in this regard.

The fieldwork was carried out by Laura Andrews and Rachel Williams. The geophysical data was processed and interpreted by Laura Andrews and Lizzie Richley. This report was written by Lizzie Richley. The geophysical work was quality controlled by Lucy Learmonth and Genevieve Shaw. Illustrations were prepared by Lizzie Richley and Karen Nichols. The project was managed on behalf of Wessex Archaeology by Andrew Manning.

Detailed Gradiometer Report

1 INTRODUCTION

1.1 Project Background

- 1.1.1 Wessex Archaeology was commissioned by Taylor Wimpey (Oxfordshire) to undertake a detailed gradiometer survey at Harwell, Oxford (**Figure 1**) hereafter 'the Site' (centred on NGR 448990, 189630).
- 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 Site Location and Topography

- 1.2.1 The Site is located on the north western edge of Harwell, Oxfordshire. Harwell is located approximately 3.4km west of Didcot and 16km south of Oxford (**Figure 1**). The site comprises three arable fields, with the survey extents defined by trees and hedgerows to the north, east and south and the Site limits to the west.
- 1.2.2 The Site lies on a gentle north facing slope, with the eastern side at an approximate height above Ordnance Datum (aOD) of 85m and the western side at approximately 75 aOD. No watercourses are present within the survey area.

1.3 Soils and Geology

- 1.3.1 The underlying bedrock is mapped as Upper Greensand Formation which is formed of calcareous sandstone and siltstone formed approximately 94 to 112 million years ago in the Cretaceous Period. Superficial deposits are recorded as Head which comprises clay, silt, sand and gravel; these were formed up to 3 million years ago in the Quaternary Period.
- 1.3.2 The soils underlying the site are recorded as well drained loamy soils of the 571i (Harwell) association (SSEW 1983). Soils derived from such geological parent material have been shown to produce magnetic contrasts acceptable for the detection of archaeological remains gradiometer survey.
- 1.3.3 Soils derived from such geological parent material have been shown to produce magnetic contrasts acceptable for the detection of archaeological remains through gradiometer survey.



2 ARCHAEOLOGICAL AND HISTORICAL BACKGROUND

2.1.1 The archaeological and historical background to the Site is considered in the desk-based assessment report (WA 2015) of which a summary is provided here. Where appropriate Oxford Historic Environment Record (OHER) numbers and Listed Building (LB) entries from the National List are included for reference.

2.2 Prehistoric (900,000–700 BC)

2.2.1 A number of discoveries of Neolithic and Bronze Age date have been located within the vicinity of the Site (OHER ref. MOX7435, MO7480-MOX7482, MOX7488, MOX7489, MOX7505, MOX7506 and MOX7519), suggesting activity in this area at this time. While the majority of these relate to artefacts for which little further information is known a Neolithic axe is known to have come from a pit (Evens et al. 1962, 266), while a barbed and tanged flint arrowhead is recorded as being recovered from the bottom of a well in association with human remains (Peake 1931, 248). Unfortunately detailed location information is not available for any of these records.

2.3 Iron Age and Romano-British (700 BC–410 AD)

- 2.3.1 Immediately to the south of the Site an area of Iron Age and Romano-British settlement was identified (Thompson and Andrews forthcoming), continuing further south (OHER ref. MOX26813). Excavation suggests that this was an extensive settlement occupied from the early Iron Age into the Romano-British period.
- 2.3.2 Roman coins and tile fragments recorded to the east of this (OHER ref. 10617 and 10486) suggests that later Roman settlement or associated activity may have continued further eastwards.
- 2.3.3 Several ditches were identified c.950m to the north-west of the Site which may demarcate an Iron Age hilltop enclosure on the crest of Milton Hill (OHER ref. MOX24724), Roman field boundaries were also identified in this area.

2.4 Saxon and medieval (410–1500 AD)

- 2.4.1 Throughout the Saxon period, Harwell was situated within the Kingdom of Wessex and is well documented from the mid-10th century onwards. The place-name Harwell derives from Old English words Hara and wiella meaning 'spring by the hill named Hara' (Gelling 1974). A cemetery from this period has been located at the southern end of the present village with at least seven graves located (OHER ref. MOX10488).
- 2.4.2 Harwell, recorded as Harewelle, is recorded in the Domesday Survey of 1086 as a large settlement of 56 households. The present church dates from the 13th century (LB ref. 1048238), though the listing of a church in the Domesday Survey indicates an earlier building must have been present. A number of the other buildings within the village originate in the medieval period (LB ref. 199929, 1038642, 1048205, 1048206, 1199628, 1199780, 1368618 and 1048239) and suggest settlement focused around the church, along the High Street and by the junction of Grove Road and Drewitts Corner. Medieval finds have also been recorded from the northern end of the village suggesting some activity in this area at this time (OHER ref. MOX10606).

2.5 **Post-medieval**, 19th century and modern (1500–present)

2.5.1 The further development of the village can be seen in the post-medieval period, though it remains a predominantly agricultural settlement.



- 2.5.2 The earliest detailed map available for study was the 1841 tithe map (**Figure 5, Map A**). This shows the Site to lie within two large fields which lie to the rear of the medieval and post-medieval plots that front the main roads. In the south-western corner a track or path can been seen to cross the Site. However by the 1876 First Edition Ordnance Survey (OS) maps the Site is shown within a large unenclosed area of land with the track no longer depicted.
- 2.5.3 Little change to either the Site or the village can be seen through the latter part of the 19thcentury and early 20th century (**Figure 5, Maps B and C**) until the 1933 OS edition (**Figure 5, Map D**) when the Site is shown within an area of orchards. In the southern part of the Site a complex of buildings can be seen. These are suggestive of a house of group of cottages orientated off Grove Road with associated barns and outbuildings. Though structures are still depicted on the 1 inch to a mile 1952-1961 edition nothing is shown in this area by the 1970 1:2,500 edition and by this time the former field sub-divisions have also been removed. The village itself doesn't substantially expand until the latter part of the 20th century.



3 METHODOLOGY

3.1 Introduction

- 3.1.1 The detailed gradiometer survey was conducted using Bartington Grad601-2 dual fluxgate gradiometer systems. The survey was conducted in accordance with English Heritage guidelines (2008).
- 3.1.2 The geophysical survey was undertaken by Wessex Archaeology's in-house geophysics team between 13^h and 14th January 2015. Field conditions at the time of the survey were wet but no problems were encountered during survey. In total the geophysical survey covered 7.4ha.

3.2 Method

- 3.2.1 Individual survey grid nodes were established at 30m x 30m intervals using a Leica Viva RTK GNSS instrument, which is precise to approximately 0.02m and therefore exceeds English Heritage recommendations (2008).
- 3.2.2 The magnetometer survey was conducted using a Bartington Grad601-2 fluxgate gradiometer instrument, which has a vertical separation of 1m between sensors. Data were collected at 0.25m intervals along transects spaced 1m apart with an effective sensitivity of 0.03nT, in accordance with EH guidelines (2008). Data were collected in the zigzag method.
- 3.2.3 Data from the survey were subject to minimal data correction processes. These comprise a Zero Mean Traverse (ZMT) function (±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. The deslope and add functions were used to account for errors in the ZMT function and to remove grid edge discontinuities. These four steps were applied to all survey areas, with no interpolation applied.
- 3.2.4 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 anomalies of possible archaeological interest many of which form small cut features, as well as rectilinear trends that could be of archaeological interest. Results are presented as a series of greyscale plots, XY trace plots, and archaeological interpretations at a scale of 1:1500 (Figures 2 to 4). The data are displayed at -2nT (white) to +3nT (black) for the greyscales and ±25nT at 25nT per cm for the XY traces.
- 4.1.2 The interpretation of the datasets highlights the presence of definite, probable and possible potential archaeological anomalies, ferrous/burnt or fired objects, and magnetic trends (**Figure 4**). 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 detailed survey dataset. These are presumed to be modern in provenance and are not referred to, unless considered relevant to the archaeological interpretation.

4.2 Gradiometer Survey Results and Interpretation

- 4.2.1 The southernmost field contains a dense spread of anomalies; a large ferrous anomaly **4000** and the neighbouring area of increased magnetic response **4001** are likely to relate to the buildings that were present in this area; as noted on the available 1933 Ordnance Survey (OS) mapping (**Figure 5, Map D**).
- 4.2.2 There are three linear trends in this field, **4002**, **4003** and **4004**, largely visible by the alignments of ferrous and strong positive features running north-south. It is likely again that these relate to features seen in the 1933 OS map where subdivisions can be seen segmenting the land when it under orchard (**Figure 5**, **Map D**). It is possible that the two large ferrous anomalies (**4005**) on the eastern side of this field are also related to these features as they are on a similar size and alignment; they have also been interpreted as a former field boundary.
- 4.2.3 To the west of **4002** is an elongated oval shaped positive anomaly, it extends in a north west direction from the current field boundary and possibly represents a ditch.
- 4.2.4 At **4006** are two areas of interest, both containing weakly contrasting positive anomalies. A pair of positive linear parallel anomalies and an L-shaped positive anomaly could suggest overall rectangular features and possibly represent cut features such as ditch. A possible third rectilinear feature is identified as a series of linear and curvilinear trends, it is unclear what the origin of these is but their shape suggests that they may be of archaeological interest.
- 4.2.5 There are numerous small oval positive anomalies across the Site such as those seen at **4006**, **4007** or around **4009**, these have been interpreted as possible archaeology and are considered to be cut features such as pits or post holes. They are numerous across the Site but particularly around larger positive anomalies such as groups of ditches that suggest settlement activity.
- 4.2.6 Lying on the eastern edge of the north-western field is a large area of increased magnetic response **4008**. It is possibly a spread of debris including ceramic and ferrous material that are creating the dipolar responses and would be attributed to post-medieval or



modern activity such as at **4000** and **4001**; however there are two oval shaped positive anomalies within the area that possibly represent a ditch and/or pit.

- 4.2.7 The two northern fields contain several large linear striations on an east-west alignment **4009** and **4010** approximately 10m apart. It is likely these represent agricultural activity either from ridge and furrow or ploughing. Orchards are recorded across these fields therefore the ridge and furrow type anomalies could possibly be associated with this activity (**Figure 5, Map D**).
- 4.2.8 The north-east field has fewer anomalies of archaeological potential with only a few positive oval shaped anomalies, interpreted as possible pits, identified across this field, especially when compared with the number of possible anomalies elsewhere on the Site. This is perhaps due to the larger amount of dipolar anomalies visible in this field suggesting a spread of modern debris possibly masking weaker contrasting features. This field is also nearer to the modern village of Harwell and modern development.
- 4.2.9 There are several linear trends across the Site that have no discernible origin, they appear random and do not form a discernible layout or concentration. The anomalies across the Site are generally of low contrast therefore there is the potential that some of these weak, ephemeral trends are archaeological in origin.

4.3 Gradiometer Survey Results and Interpretation: Modern Services

4.3.1 No modern services have been identified in the geophysical data however it should be noted that 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.

5 CONCLUSION

- 5.1.1 The detailed gradiometer survey has been successful in detecting anomalies of possible archaeological interest. Identified anomalies are several possible ditch and pit-type features, curvilinear and linear alignments and trends of potential archaeology not thought to be consistent with ploughing trends. They are possibly the weakly contrasting ephemeral responses of once more substantial cut features such as ditches. Of particular note are the possible rectangular and L-shaped features at **4006** as they exhibit a different form and layout to the Iron Age/Romano-British ring ditches discovered further to the south of the Site (**Figure 6**).
- 5.1.2 The northern two fields between **4008** and **4010** are categorised by the ridge and furrow type linear alignments that are consistent between the two fields. The linear alignments are approximately 10m apart and regularly spaced and although ridge and furrow is one possible explanation this area is marked on the 1933 OS mapping as orchards with trees planted in regular rows (**Figure 5, Map D**). The linear alignments identified here as ridge and furrow are distinct from the modern ploughing trends such as near **4005**, they are possibly associated with the managed orchards detailed across these fields.
- 5.1.3 Several strong dipolar ferrous anomalies in a linear alignment at **4003** to **4006** are in the location and orientation of internal field divisions visible on OS mapping and are interpreted as possible former field boundaries (**Figure 5, Map D**).
- 5.1.4 Excavations to the south of the Site revealed that areas of increased magnetic response were composed of spreads of debris that included roman brick/tile/pot and/or Anglo-Saxon



material (WA 2014). It is possible that the areas of increased magnetic response identified in the Site are of a similar composition.

- 5.1.5 The proximity of the Site to known archaeological features to the south would suggest that many of the trends and other anomalies are likely to be of archaeological significance. The geophysical survey on land to the south of the Site identified several ring ditches, linear ditches and numerous pits with the archaeological evaluation excavating many more in and around the anomalies that were identified. Although no definite archaeological anomalies such as ring ditches have been interpreted here, numerous possible features of ditch-type anomalies, pits and trends of archaeological potential all suggest that the settlement activity uncovered to the south of the Site extends to the north into this Site.
- 5.1.6 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 encountered than have been identified through geophysical survey.

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- Wessex Archaeology, 2015, Grove Road, Harwell, Oxfordshire, Phase II: Archaeological Desk-Based Assessment, unpublished report, ref 87554.05

6.2 Cartographic Sources

British Geological Survey http://www.bgs.ac.uk/discoveringgeology/geologyofbritain/viewer.html

Ordnance Survey, 1957. *Sheet 5, Geological Map of Great Britain: England and Wales.* Ordnance Survey: Chessington.

Soil Survey of England and Wales (SSEW), 1983: *Sheet 5, Soils of South West England.* Ordnance Survey: Southampton.

1841 Harwell Tithe map and apportionment (BRO ref. D/D1/64/1)

Ordnance Survey maps:

- 1876 25"
- 1899 25"
- 1912 25"
- 1933 25"

1960 1:10.560

1970 1:2,500

1991-1992 1:2,500





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 $\pm 100nT$ 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.

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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 subdivided 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:

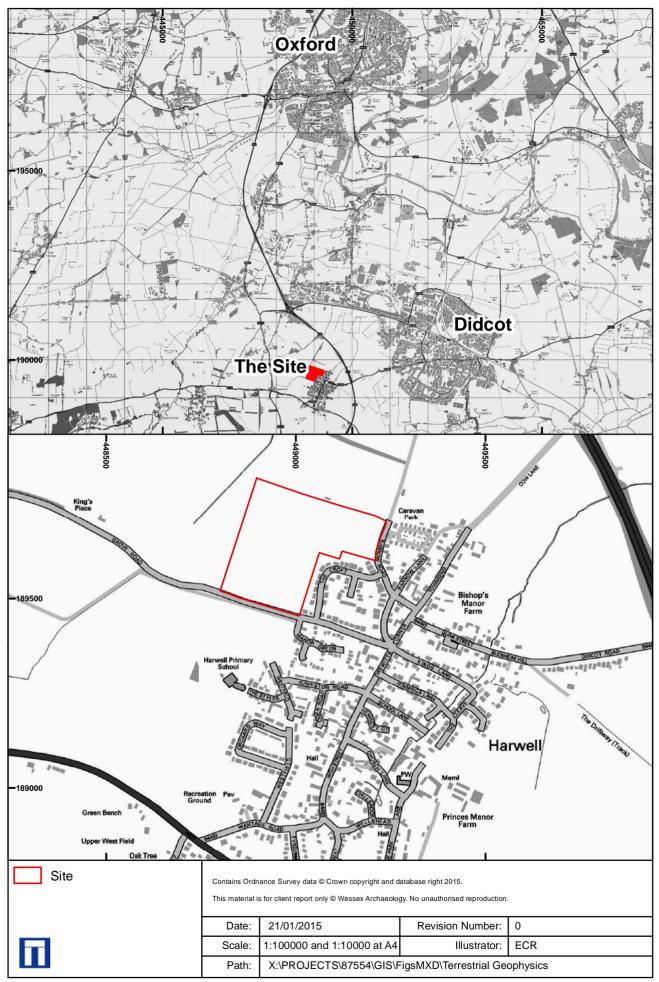
- Ferrous used for responses caused by ferrous material. These anomalies are likely to be of modern origin.
- Modern service used for responses considered relating to cables and pipes; most are composed of ferrous/ceramic material although services made from non-magnetic material can sometimes be observed.

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:

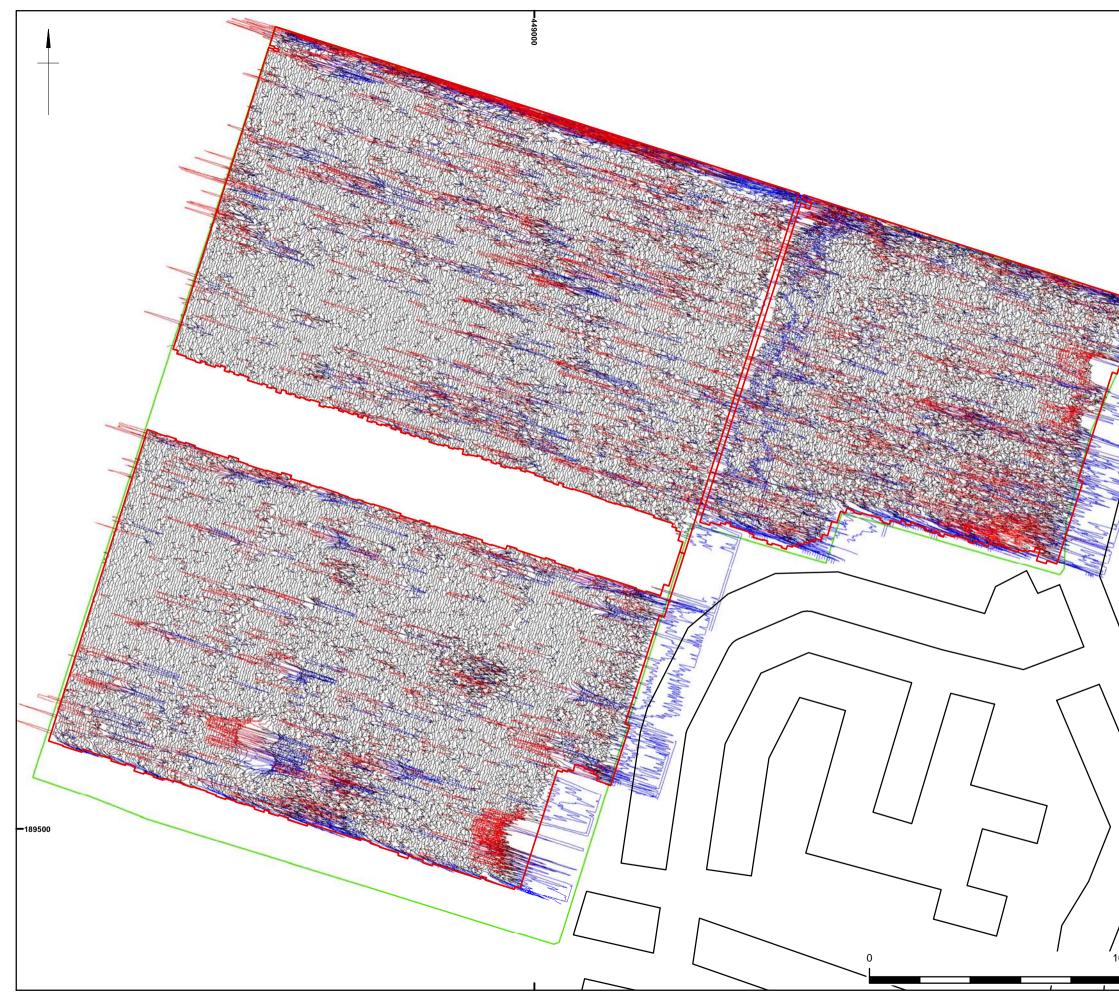
- Increased magnetic response used for areas dominated by indistinct anomalies which may have some archaeological potential.
- Trend used for low amplitude or indistinct linear anomalies.
- Superficial geology used for diffuse edged spreads considered to relate to shallow geological deposits. They can be distinguished as areas of positive, negative or broad bipolar (positive and negative) anomalies.



Site Location and detailed survey extents



Gradiometer Survey Results - Greyscale Plot

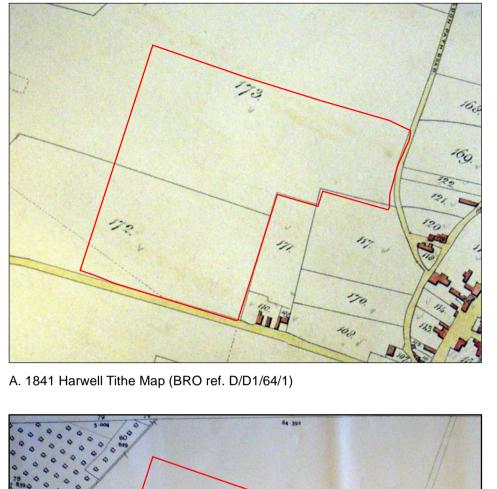


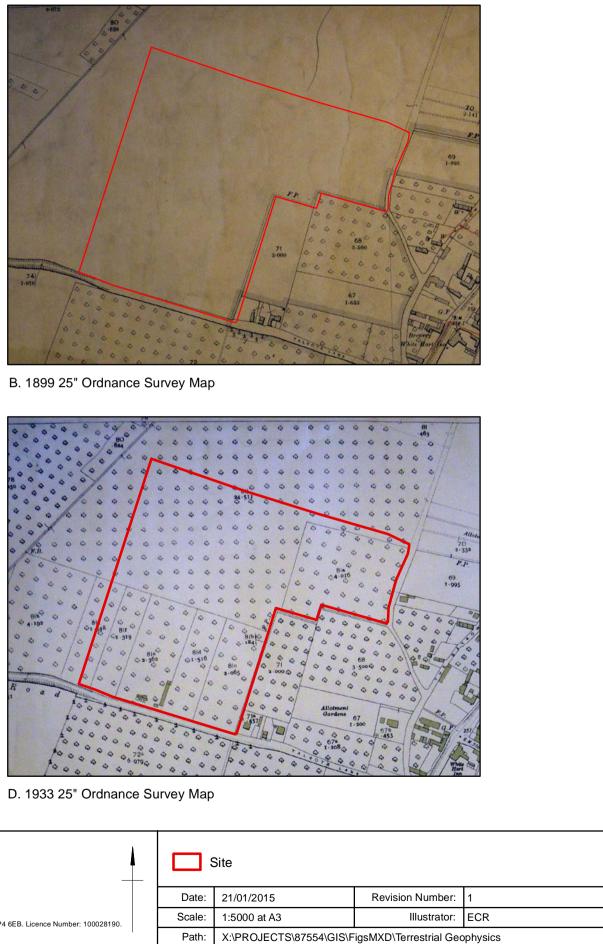
Gradiometer Survey Results - XY Plot

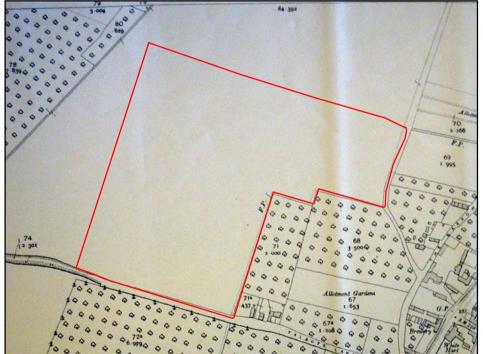
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	Contains Ordnance Survey data © Crown copyright and database right 2015. This material is for client report only © Wessex Archaeology. No unauthorised reproduction.		
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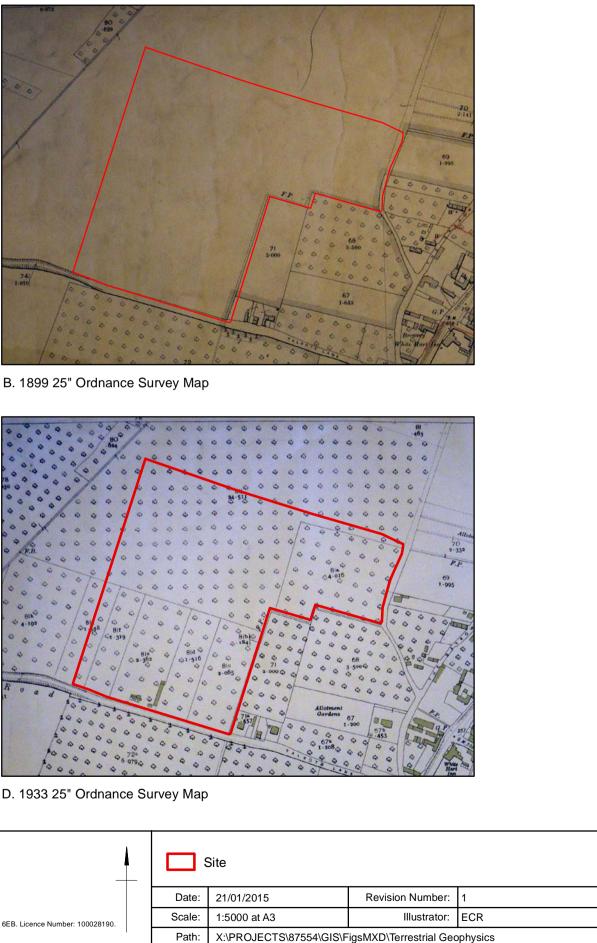
Gradiometer Survey Results - Interpretation







C. 1912 25" Ordnance Survey Map



<u> </u>		Site
	Date:	21/01/2015
Reproduced from the1899, 1912 and 1933 Ordnance Survey 25 inch maps © Crown Copyright Wessex Archaeology, Portway House, Old Sarum Park, Salisbury, Wiltshire, SP4 6EB. Licence Number: 100028190.	Scale:	1:5000 at A3
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Excavation and geophysics results from field to south of Site

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Survey Survey Trend Probab Former Ridge a Ploughi		
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