

T H A M E S V A L L E Y

ARCHAEOLOGICAL

S E R V I C E S

**Land at Westhaven and Green View, The Green,
Ludgershall, Buckinghamshire**

Geophysical Survey (Magnetic)

by Kyle Beaverstock

Site Code: WGL21/242

(SP 6621 1768)

Land at Westhaven and Green View, The Green, Ludgershall, Buckinghamshire

Geophysical Survey (Magnetic) Report

for Mr Richard Harris

by Kyle Beaverstock

Thames Valley Archaeological Services Ltd

Site Code
WGL 21/242

November 2021

Summary

Site name: Land at Westhaven and Green View, The Green, Ludgershall, Buckinghamshire

Grid reference: SP 6621 1768

Site activity: Magnetometer survey

Date and duration of project: 4th November 2021

Project coordinator: Tim Dawson

Site supervisor: Kyle Beaverstock

Site code: WGL21/242

Area of site: c.0.31ha

Summary of results: The geophysical survey detected a number of magnetic anomalies. These may be evidence of structural remains or potential magnetically-enhanced debris from later activity.

Location of archive: The archive is presently held at Thames Valley Archaeological Services, Reading in accordance with TVAS digital archiving policies.

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Report edited/checked by: Steve Ford ✓ 02.12.21 Tim Dawson ✓ 02.12.21
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Land at Westhaven and Green View, The Green, Ludgershall, Buckinghamshire A Geophysical Survey (Magnetic)

by Kyle Beaverstock

Report 21/242

Introduction

This report documents the results of a geophysical survey (magnetic) carried out at Westhaven, The Green, Ludgershall, Buckinghamshire (SP 6621 1768) (Fig. 1). The work was commissioned by Mr Richard Harris of Green View, The Green, Ludgershall, Buckinghamshire, HP18 9NZ.

Planning permission (19/04081/APP) has been gained from Buckinghamshire Council to erect 3 new houses on a parcel of land at Westhaven and Green View. The consent is subject to a planning condition (15) relating to archaeology. This is in accordance with the *National Planning Policy Framework* (NPPF 2019), and the County's policies on archaeology. The field investigation was carried out to a specification based upon a design brief prepared by Ms Lucy Lawrence of Buckinghamshire County Archaeological Service. The fieldwork was undertaken by Kyle Beaverstock on the 4th of November and the site code is WGL21/242.

The archive is presently held at Thames Valley Archaeological Services, Reading in accordance with TVAS digital archiving policies.

Location, topography and geology

The site is located in the north-east of the village of Ludgershall, between Bicester and Aylesbury in western Buckinghamshire (Fig. 1). The site is bounded by residential properties on Salters Lane in the north, east and west and farmland to the south. It is a relatively flat, square parcel of land that sits at a height of c.72m above Ordinance Datum and is currently being utilised as a sporting field. The underlying geology is stated as Middle Oxford Clay (Stewartby Member) (BGS 1994).

Site history and archaeological background

The archaeological potential of the site has been highlighted in a briefing document prepared by Ms Lucy Lawrence of Buckinghamshire County Archaeological Service, and in the results of a search (8/10/2021) of the Buckinghamshire Historic Environment Record (Ref 1208).

In summary, the site lies within the historic core of Ludgershall. Ludgershall has late Saxon origins and is mentioned in Domesday Book (Williams and Martin 2002). No heritage assets are recorded for the site itself but a number of components of the historic (medieval) village are recorded nearby mainly as earthworks which may include house platforms hollow ways and parts of the medieval fields (ridge and furrow), which was observed in evaluation c.600m to the south east (JMHS 2006). A watching brief 400m to the west of the site (JMHS 2001) revealed post-medieval deposits (a cobbled yard), and evaluation c.350m to the south west recorded further post-medieval deposits. Of particular interest is the discovery of a late medieval tile manufactory site 150m to the east (Blinkhorn and Saunders, 2006).

Further away to the south west and south east, various investigations have recorded medieval and post-medieval deposits elsewhere within the village, and a number of post-medieval listed buildings are recorded to the west of the site. The environs of Brill, Boarstall and to some extent Ludgershall are noteworthy for the presence of a major medieval and early post-medieval pottery industry (McCarthy and Brooks, 1988, 281) and there is a possibility that kiln sites may be present on the proposal site.

Methodology

Sample interval

Data collection involved the traversing of the survey area along straight and parallel lines using two cart-mounted Bartington Grad601-2 fluxgate gradiometers. Even coverage was achieved with the use of regularly spaced markers at the ends of traverses and the real-time positional trace plot. Readings were taken at 0.25m intervals along traverses 1m apart, providing an appropriate methodology balancing cost and time with resolution. Traverses were walked at an alternating zig-zag pattern along a north to south orientation across the survey area. No significant obstructions were encountered, conditions were damp and overcast.

The Grad 601-2 has a typical depth of penetration of 0.5m to 1.0m. This would be increased if strongly magnetic objects have been buried in the site. Under normal operating conditions it can be expected to identify buried features >0.5m in diameter. Features which can be detected include disturbed soil, such as the fill of a ditch, structures that have been heated to high temperatures (magnetic thermoremnance) and objects made from ferro-magnetic materials. The strength of the magnetic field is measured in nano Tesla (nT), equivalent to 10^{-9} Tesla, the SI unit of magnetic flux density.

Equipment

The purpose of the survey was to identify geophysical anomalies that may be archaeological in origin in order to inform a targeted archaeological investigation of the site prior to development. The survey and report generally follow the recommendations and standards set out by both European Archaeological Council (EAC 2015) and the Chartered Institute *for* Archaeologists (2002, 2014).

Magnetometry was chosen as a survey method as it offers the most rapid ground coverage and responds to a wide range of anomalies caused by past human activity. These properties make it ideal for the fast yet detailed surveying of an area.

The detailed magnetometry survey was carried out using two dual sensor Bartington Instruments Grad 601-2 fluxgate gradiometers mounted upon a Bartington non-magnetic cart. A two-wheeled lightweight structure pushed by hand, the cart consisted a bank of four vertically-mounted Bartington Grad601-2 magnetic sensor tubes at 1m apart and a Trimble Geo 7x centimetre edition GPS. Readings were collected by two Bartington Grad601-2 loggers and collated using MLgrad601 software on a Linx 12x64 tablet running Windows 10 mounted at the rear of the cart. This enables readings to be taken of both the general background magnetic field and any localised anomalies with the difference being plotted as either positive or negative buried features. All sensors are calibrated to cancel out the local magnetic field and react only to anomalies above or below this base line. On this basis, strong magnetic anomalies such as burnt features (kilns and hearths) will give a high response as will buried ferrous objects. More subtle anomalies such as pits and ditches can be seen from their infilling soils containing higher proportions of humic material, rich in ferrous oxides, compared to the undisturbed subsoil. This will stand out in relation to the background magnetic readings and appear in plan following the course of a linear feature or within a discrete area.

The Trimble Geo7x centimetre edition GPS system with centimetre real-time accuracy was used to tie the cart traverses into the Ordnance Survey national grid. This unit offers both real-time correction and post-survey processing; enabling a high level of accuracy to be obtained both in the field and in the final post-processed data.

Data gathered in the field was processed using the TerraSurveyor software package. This allows the survey data to be collated and manipulated to enhance the visibility of anomalies, particularly those likely to be of archaeological origin. The table below lists the processes applied to this survey, full survey and data information is recorded in Appendix 1.

Process

Clip from -22.00 to 22.10 nT
-5.50 to 5.53 nT

Effect

Enhance the contrast of the image to improve the appearance of possible archaeological anomalies.

De-stripe: median, all sensors	Removes the striping effect caused by differences in sensor calibration, enhancing the visibility of potential archaeological anomalies.
De-spike: threshold 1, window size 3×3	Compresses outlying magnetic points caused by interference of metal objects within the survey area.
De-stagger: all grids, both by -1 intervals	Cancels out effects of site's topography on irregularities in the traverse speed.

The raw data plot is presented as a greyscale plot shown in relation to the site (Fig. 2) with the processed data then presented as a second figure (Fig. 3), followed by a third plan to present the abstraction and interpretation of the magnetic anomalies (Fig. 4). Anomalies are shown as colour-coded lines, points and polygons.

The greyscale plot of the processed data is exported from TerraSurveyor in a georeferenced portable network graphics (.PNG) format, a raster image format chosen for its lossless data compression and support for transparent pixels, enabling it to easily be overlaid onto an existing site plan. The data plot is combined with grid and site plans in QGIS 2.18.15 and exported again in .PNG format in order to present them in figure templates in Adobe InDesign CS5.5, creating .INDD file formats. Once the figures are finalised they are exported in .PDF format for inclusion within the finished report.

Results

The results of geological survey show a large area with magnetic anomalies with a high amplitude (Figs. 2-4), this has resulted in a wide clip value being used initially to differentiate between areas of probable magnetically-enhanced debris and potential structural remains or cut features (Fig. 3). A tighter clip value has also been used to highlight the extent of the magnetic disturbance (Fig. 4). Along the western boundary of the survey area is an area of magnetic disturbance **[Fig. 5: 1]**, this is represented by a dipolar response with a high amplitude. This was caused by ferrous material in the fence along the western boundary. Across the central and south of the site is an area of magnetic debris **[2]**, this is represented by positive and negative responses with a high amplitude in an irregular pattern across a large area. This may be a result of structural debris from potential cut features **[3]** and **[4]** or it may be from another source such as magnetically-enhanced waste material.

In the central area of the site are a number of irregular positive and negative responses **[3]**, these form two concentrated bands, one running roughly east to west and the other running south to north before bending towards the north-east. The irregular pattern makes it difficult to determine any form however the high amplitude response suggests that it may be structural in origin. Across the southern area of the site is a large area of

irregular positive and negative responses [4], this corresponds with an embankment running east to west. This may suggest further structural remains or it may be a build-up of debris.

Conclusion

The geophysical survey detected a number of magnetic anomalies mostly taking the form of irregular positive and negative responses. The irregular pattern makes it difficult to determine a form however the high amplitude suggests that these anomalies may represent structural remains or it may represent debris with some ferrous material. These anomalies may be related to the potential for medieval tile manufactory or it may be debris from post-medieval activity, however the lack of form makes it difficult to determine.

References

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- JMHS 2006, An Archaeological Watching Brief at Ludgershall Farm, Ludgershall, John Moore Heritage Services
- McCarthy, M R and Brooks, C R, 1988, *Medieval Pottery in Britain AD 900–1600*, Leicester
- Williams, A and Martin, G H, 2002, *Domesday Book, a complete translation*, London

Appendix 1. Survey and data information

Programme:

Name: TerraSurveyor
Version: 3.0.25.0

Raw data

Filename: *Lugershall RAW.xcp*
Instrument Type: *MLgrad Import*
Units:
UTM Zone: 30
Survey corner coordinates (X/Y):
Northwest corner: 466182.144669538, 217713.04702377 m
Southeast corner: 466235.834669538, 217657.27702377 m
Direction of 1st Traverse: 90 deg
Collection Method: Parallel
Sensors: 1
Dummy Value: 32702

Dimensions

Survey Size (meters): 53.7 m x 55.8 m
X&Y Interval: 0.13 m
Source GPS Points: Active: 7087, Recorded: 7087

Stats

Max: 106.81
Min: -109.72
Std Dev: 25.62
Mean: -3.51
Median: -1.60
Composite Area: 0.29943 ha
Surveyed Area: 0.21685 ha

Processed data

Filename: *Lugershall.xcp*
Stats
Max: 22.10
Min: -22.00
Std Dev: 8.71
Mean: -0.52
Median: 0.05
Composite Area: 0.29943 ha
Surveyed Area: 0.21428 ha

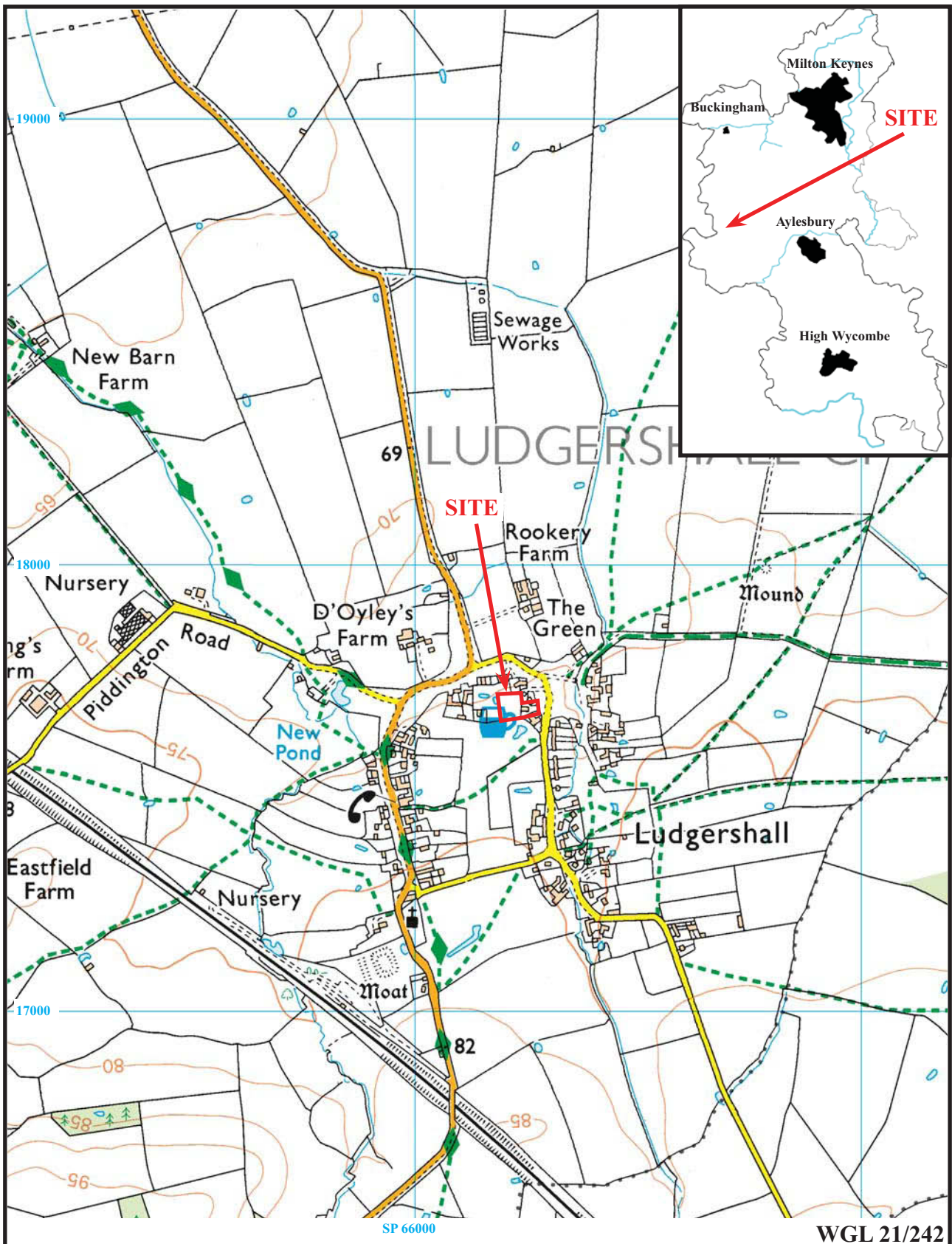
GPS based Proce7

- 1 Base Layer.
- 2 Unit Conversion Layer (Lat/Long to UTM).
- 3 DeStripe Median Traverse:
- 4 Clip from -20.00 to 20.00
- 5 DeStagger by: 10.00cm, Shift Positions
- 6 DeStagger by: 10.00cm, Shift Positions
- 7 DeStagger by: 10.00cm, Shift Positions

Filename: *Lugershall B.xcp*
Stats
Max: 5.53
Min: -5.50
Std Dev: 3.14
Mean: -0.14
Median: 0.02
Composite Area: 0.29943 ha
Surveyed Area: 0.21428 ha

GPS based Proce8

- 1 Base Layer.
- 2 Unit Conversion Layer (Lat/Long to UTM).
- 3 DeStripe Median Traverse:
- 4 Clip from -20.00 to 20.00
- 5 DeStagger by: 10.00cm, Shift Positions
- 6 DeStagger by: 10.00cm, Shift Positions
- 7 DeStagger by: 10.00cm, Shift Positions
- 8 Clip from -5.00 to 5.00



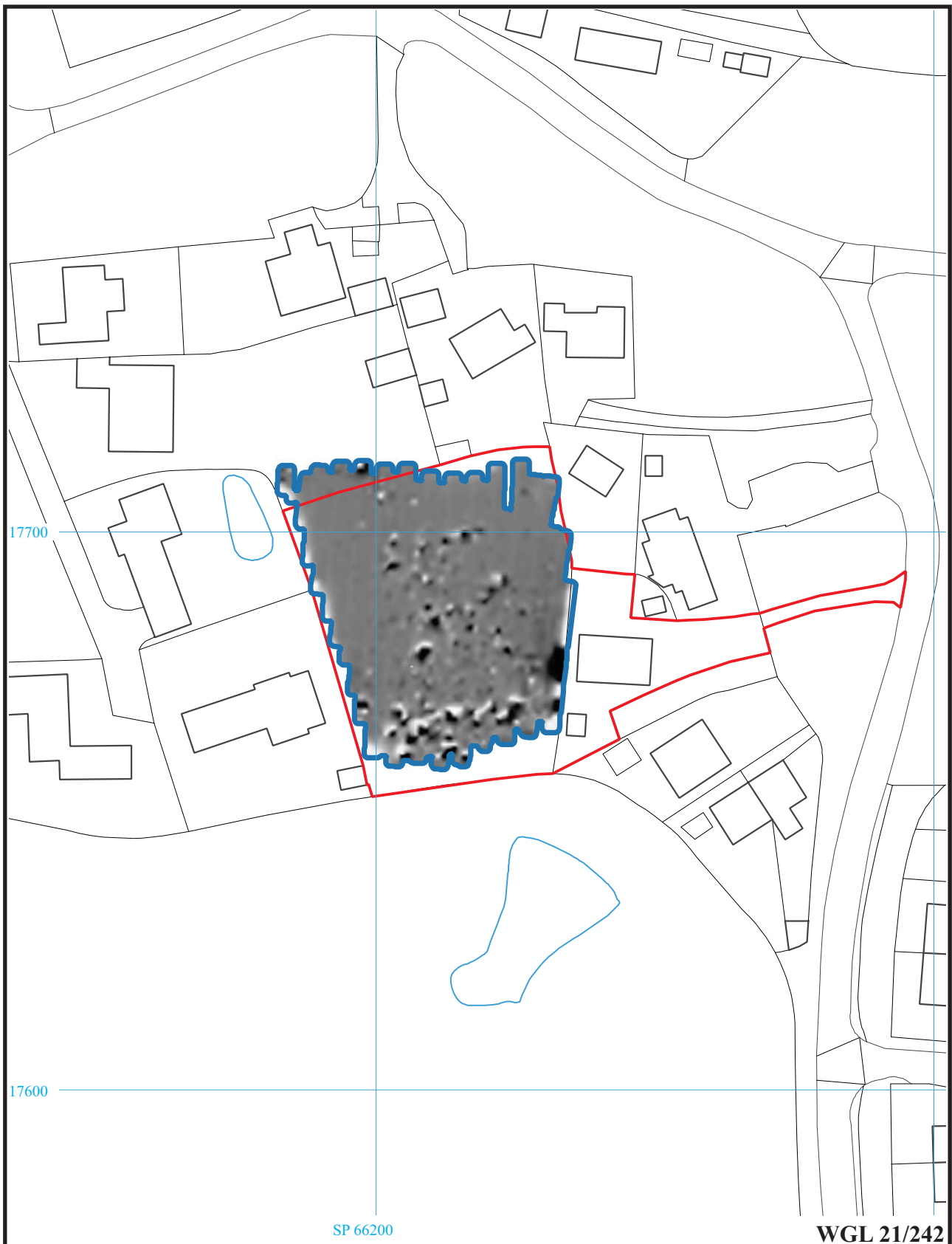
**Land at Westhaven and Green View, The Green,
Ludgershall, Buckinghamshire, 2021
Geophysical Survey (Magnetic)**

**Figure 1. Location of site within Ludgershall and
Buckinghamshire.**

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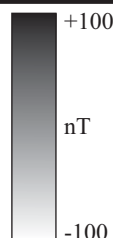
WGL 21/242



WGL 21/242

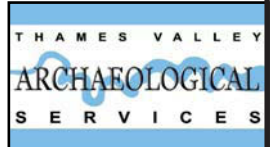
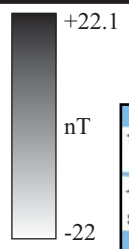


**Land at Westhaven and Green View, The Green,
Ludgershall, Buckinghamshire, 2021
Geophysical Survey (Magnetic)**
Figure 2. Plot of raw gradiometer data.

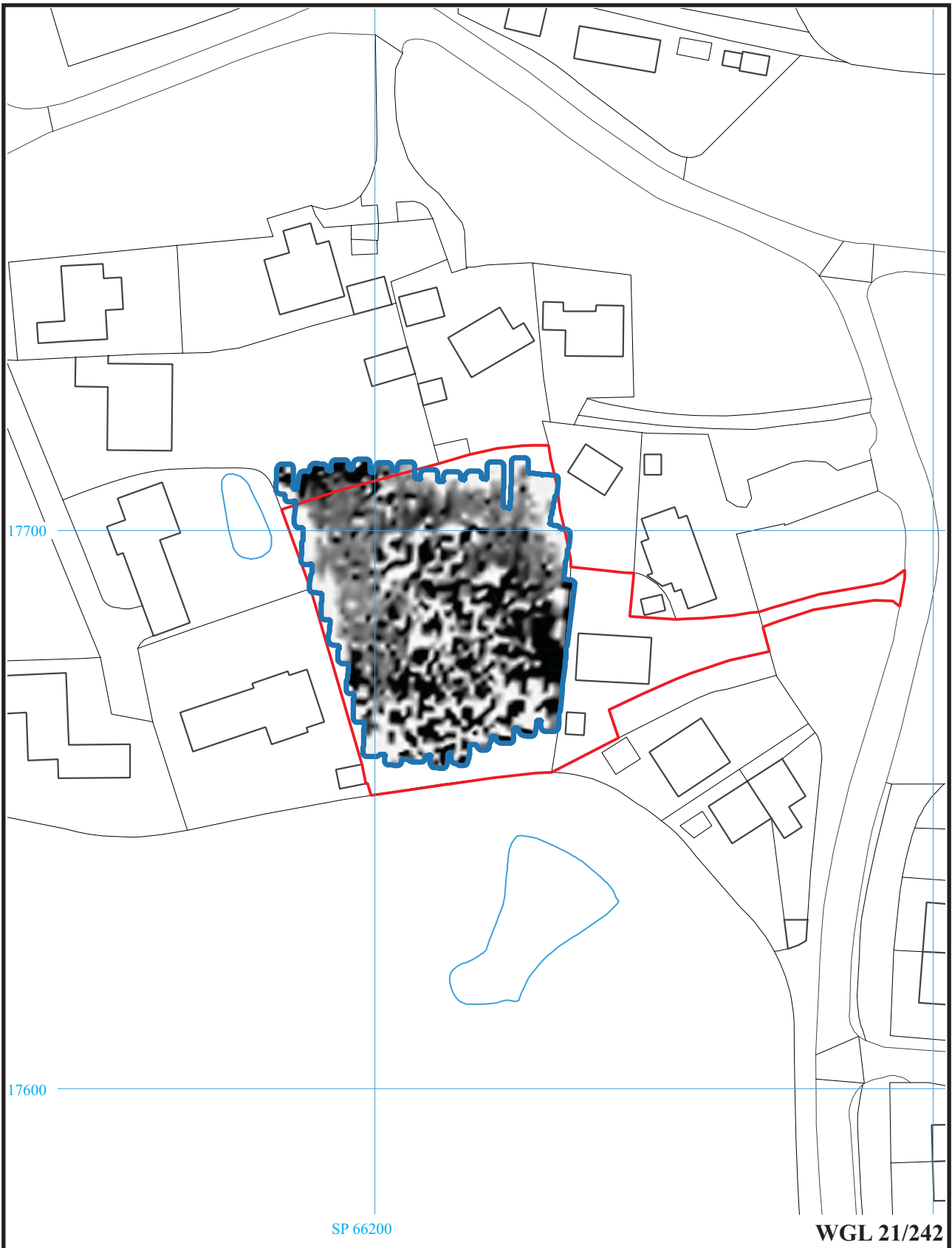




**Land at Westhaven and Green View, The Green,
Ludgershall, Buckinghamshire, 2021**
Geophysical Survey (Magnetic)
 Figure 3. Plot of processed gradiometer data.



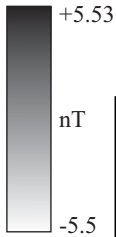
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**Land at Westhaven and Green View, The Green,
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Figure 4. Plot of processed gradiometer data.



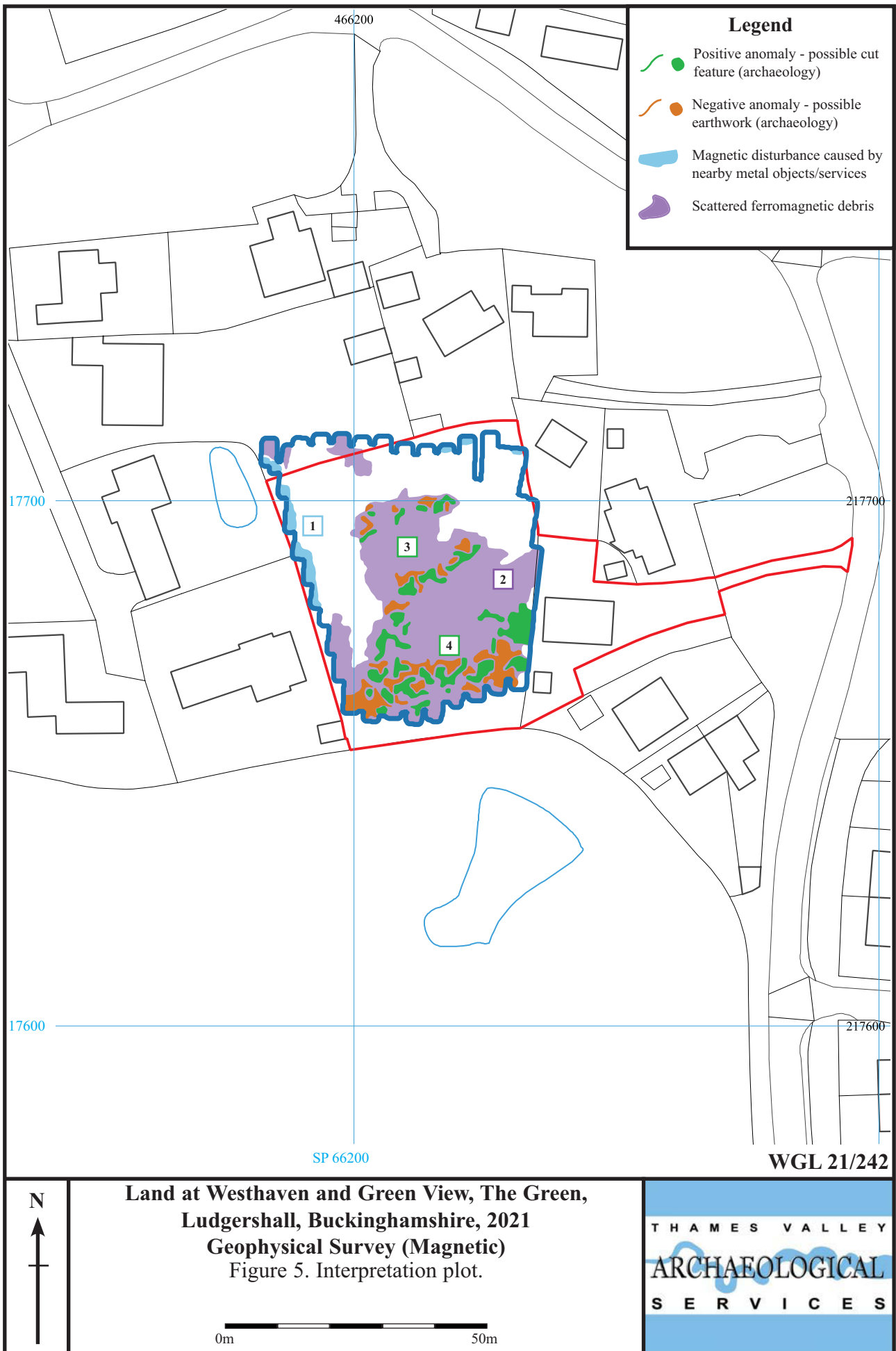




Plate 1. Western area of the site looking south-east from the north-western corner.



Plate 2. Southern area of the site including small embankment west from the south-eastern corner.

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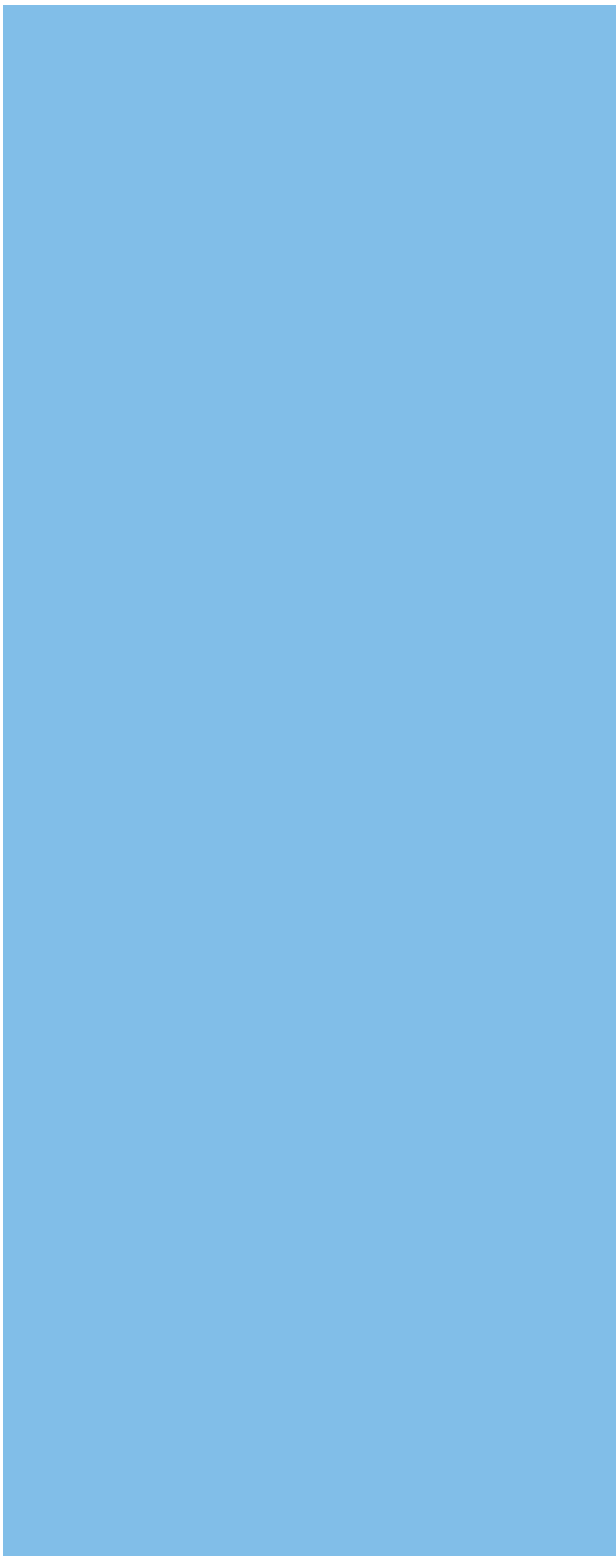
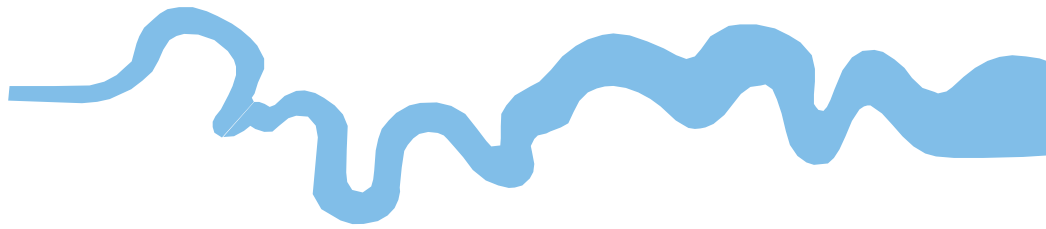
**Land at Westhaven and Green View, The Green,
Ludgershall, Buckinghamshire, 2021
Geophysical Survey (Magnetic)
Plates 1 and 2.**

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TIME CHART

	Calendar Years
Modern _____	AD 1901
Victorian _____	AD 1837
Post Medieval _____	AD 1500
Medieval _____	AD 1066
Saxon _____	AD 410
Roman _____	AD 43 AD 0 BC
Iron Age _____	750 BC
Bronze Age: Late _____	1300 BC
Bronze Age: Middle _____	1700 BC
Bronze Age: Early _____	2100 BC
Neolithic: Late	3300 BC
Neolithic: Early	4300 BC
Mesolithic: Late	6000 BC
Mesolithic: Early	10000 BC
Palaeolithic: Upper	30000 BC
Palaeolithic: Middle	70000 BC
Palaeolithic: Lower	2,000,000 BC





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