STORY HOMES

LAND SOUTH OF HENTHORN ROAD, CLITHEROE, LANCASHIRE

GEOPHYSICAL SURVEY REPORT

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SUMMARY

In June 2015 Wardell Armstrong Archaeology (WAA) undertook a geophysical survey of land south of Henthorn Road, Clitheroe, Lancashire. The survey was undertaken for Story Homes, to provide information in relation to a planning application for a residential development at the site.

The proposed development area lies to the southwest of Clitheroe, centred on Ordnance Survey grid reference SD 7322 4078. The geophysical survey area comprises three fields of pasture and measures approximately 5.1ha in total.

A heritage impact assessment for the proposed residential development is being produced by Wardell Armstrong Archaeology. Although no known archaeological remains are recorded within the proposed development area, there is potential for as-yet unrecognised archaeological remains to survive at the site.

The objective of the geophysical survey was therefore to determine the presence/absence, nature and extent of potential archaeological features within the study area, and the presence/absence of any known modern features within the survey area, which may affect the results. Geomagnetic survey was undertaken over the majority of the study area on a field by field basis, which comprised pasture land at the time of the survey.

No definite archaeological remains were detected within the geophysical survey area. The majority of the geophysical anomalies detected are believed to relate to the former agricultural use of the site, including former field boundaries, plough furrows and possible land drains.
1 INTRODUCTION

1.1 Circumstances of the Project (Figure 1)

1.1.1 Between the 23rd and 26th June 2015 Wardell Armstrong Archaeology (WAA) undertook a geophysical survey of land at Henthorn Road, Clitheroe, Lancashire. The survey was undertaken for Story Homes, to provide information in relation to a planning application for a residential development at the site (Figure 1). This is in line with government advice as set out in Section 12 of the National Planning Policy Framework (NPPF 2012).

1.1.2 The proposed development area lies to the south of Henthorn Road, southwest of Clitheroe, in Lancashire. The site lies to the east of the River Ribble and north of Pendleton Brook, to the southwest of Kenilworth Drive. The site is centred on Ordnance Survey grid reference SD 7322 4078, and measures approximately 5.1ha in total (Figure 2).

1.1.3 A heritage impact assessment for the proposed residential development is being produced by Wardell Armstrong LLP. Although no known archaeological remains are recorded within the proposed development area, there is potential for as-yet unrecognised archaeological remains to survive at the site.

1.1.4 The objective of the geophysical survey was therefore to determine the presence/absence, nature and extent of potential archaeological features within the survey area, and the presence/absence of any known modern features within the survey area, which may affect the results.

1.1.5 This report outlines the results of the geophysical survey undertaken, and includes an interpretation of the geophysical survey results, in light of the historical and archaeological background of the site.
2 METHODOLOGY

2.1 Written Scheme of Investigation

2.1.1 A written scheme of investigation (WSI) for the geophysical survey was produced by Wardell Armstrong Archaeology and was submitted to Doug Moir Planning Officer (Archaeology) at Lancashire County Council for approval, prior to the start of the survey. The WSI was adhered to in full, the survey work being consistent with Historic England guidelines (English Heritage 2008), and undertaken in accordance with the standard and guidance of the Chartered Institute for Archaeologists (CIfA 2014).

2.2 Geophysical Surveys

2.2.1 Technique Selection: geomagnetic survey was selected as the most appropriate technique, given the non-igneous environment, and the expected presence of cut archaeological features at depths of no more than 1.5m. This technique involves the use of hand-held gradiometers, which measure variations in the vertical component of the earth’s magnetic field. These variations can be due to the presence of subsurface archaeological features. Data were recorded by the instruments and downloaded into a laptop computer for initial data processing in the field using specialist software.

2.2.2 Field Methods: the geophysical study area measured c.5.1ha in total, subdivided into three separate fields. A 30m grid was established across each area and tied-in to known Ordnance Survey points with a Trimble R8 GPS. Geomagnetic measurements were determined using a Bartington Grad601-2 dual gradiometer system, with twin sensors set 1m apart. It was expected that significant archaeological features at a depth of up to 1.5m would be detected using this arrangement. The survey was undertaken using a zig-zag traverse scheme, with data being logged in 30m grid units. A sample interval of 0.25m was used, with a traverse interval of 1m, providing 3600 sample measurements per grid unit, with measurements being recorded at the centre of each grid cell. The data were downloaded on site into a laptop computer for processing and storage.

2.2.3 In addition, a visual survey was undertaken to identify any earthworks and topographic features at the site which may require topographic survey, however, none were identified.
2.2.4 **Data Processing:** geophysical survey data were processed using Terra Surveyor software, which was used to produce ‘grey-scale’ images of the raw data. Positive magnetic anomalies are displayed as dark grey, and negative magnetic anomalies are displayed as light grey. A palette bar shows the relationship between the grey shades and geomagnetic values in nT.

2.2.5 Raw data were processed in order to further define and highlight the archaeological features detected. The following basic data processing functions were used:

- **Despike:** to locate and suppress random iron spikes in the gradiometer data (despike was performed on all survey grids using a window of 11x3 and threshold of 2.0).
- **Destripe:** to reduce the effect of striping in the gradiometer data, sometimes caused by misalignment of the twin sensors (zero mean traverse was performed on all survey grids using a threshold of 2 standard deviations).
- **Destagger:** to reduce location inaccuracies in the gradiometer data, sometimes caused by operator error (destagger applied in both x directions by -2 readings).
- **Clip:** to clip data to specified maximum and minimum values, in order to limit large noise spikes in the geophysical data (clipped from -3nT to 3nT).
- **Interpolate:** to match the resolution of the sample intervals in the x and y directions (doubled in the y direction).

2.2.6 **Interpretation:** four types of geophysical anomaly were detected in the gradiometer data:

- **positive magnetic:** regions of anomalously high or positive magnetic data, which may be associated with the presence of high magnetic susceptibility soil-filled features, such as pits or ditches.
- **negative magnetic:** regions of anomalously low or negative magnetic data, which may be associated with features of low magnetic susceptibility, such as stone-built features, geological features, land-drains or sub-surface voids.
- **dipolar magnetic:** regions of paired positive and negative magnetic anomalies, which typically reflect ferrous or fired materials, including fired/ferrous debris in the topsoil, or fired structures, such as kilns or hearths.
- **magnetic disturbance:** areas of high amplitude magnetic disturbance or interference, which may be associated with the presence of modern structures, such as services, fences or buildings.
2.2.7 **Presentation:** the grey-scale images were combined with site survey data and Ordnance Survey data to produce the geophysical survey figures. A colour-coded geophysical interpretation diagram is provided, showing the locations and extent of positive, negative, and dipolar magnetic anomalies and areas of magnetic disturbance. An archaeological interpretation diagram is also provided, which is based on the interpretation of the geophysical survey results in light of the archaeological and historical context of the site.

2.2.8 X-Y plots of the raw unprocessed data are included in Appendix 1, which are clipped for display purposes only from -5nT to 5nT.

2.3 **Archive**

2.3.1 The data archive for the geophysical survey has been created in accordance with the recommendations of the Archaeology Data Service (ADS 2013). This archive is held at the company offices at Carlisle, Cumbria. The archive comprises a compressed (zipped) file folder, containing the geophysics data, documentation (metadata), and other project material (report and field notes).

2.3.2 One copy of the final report will be deposited with the County Historic Environment Record, where viewing will be available on request. The project is registered with the Online AccesS to the Index of archaeological investigationS (OASIS). The OASIS reference for the project is: wardella2-216241.
3  BACKGROUND

3.1  Location and Context

3.1.1 The survey area lies within three fields to the south of Henthorn Road on the southwest side of Clitheroe, in Lancashire. The site lies to the east of the River Ribble and north of Pendleton Brook, to the southwest of Kenilworth Drive. The site is centred on Ordnance Survey grid reference SD 7322 4078, and measures approximately 5.1ha in total (Figure 2).

3.1.2 The underlying geology at the site comprises limestone and mudstone, known as Clitheroe Limestone Formation and Hodder Mudstone Formation. This sedimentary bedrock was formed approximately 335 to 352 million years ago in the Carboniferous Period (BGS 2001). This is overlain by glacial till deposits.

3.1.3 In the field to the north of the site in 2013 an archaeological desk-based assessment, geophysical survey and archaeological trial trench evaluation, was undertaken as a planning condition for the construction of 270 units by Taylor Wimpey North West. The only features detected by the Geophysical survey were possible land-drains and evidence for former ploughing activity. However, one area was highlighted for further archaeological mitigation following the discovery of a prehistoric polished stone axe (Slater 2013). No further prehistoric material or features were present.

3.1.4 The Ordnance Survey county map of 1848-50 shows the proposed development area was previously subdivided into three larger fields. This was further sub-divided in the 20th century, but field boundaries have recently been removed from the east side of the site to create the present layout.

3.1.5 The only modern developments to have taken place at the site appear to be the construction of modern housing to the east of the site, which has gradually encroaching on the proposed development throughout the 20th century.

3.1.6 A heritage impact assessment for the proposed residential development is being produced by Wardell Armstrong LLP, and will be presented in a separate report. No known previous archaeological interventions have taken place at the site.
4 THE GEOPHYSICAL SURVEYS

4.1 Introduction (Figure 2)

4.1.1 The geophysical surveys were undertaken between 23rd and 26th June 2015. Geomagnetic survey was undertaken over the majority the study area, which comprised three fields of pasture at the time of the survey.

4.1.2 The survey areas were bounded by hedgerows with post and wire fences, with modern gardens and houses to the east, and Henthorn Road to the north. These fences produced very strong magnetic disturbance around the periphery of the survey areas.

4.1.3 Small discrete dipolar magnetic anomalies were detected across the whole of the study area. These are almost certainly caused by fired/ferrous litter in the topsoil, which is typical for modern agricultural land. These anomalies are indicated on the geophysical interpretation drawings, but not referred to again in the subsequent interpretations.

4.2 Area 1 (Figures 3 & 5)

4.2.1 Area 1 comprised a large area of land on the northeast side of the proposed development area, which incorporated parts of two former fields of pasture. A former field boundary, aligned northeast to southwest, subdivided the east side of this area. The field boundary is first depicted on the Ordnance Survey county map of 1848-50, but has recently been removed. A concentration of small dipolar magnetic anomalies was detected at the west end of this feature, which probably represents accumulated fired/ferrous debris.

4.2.2 A series of strong linear positive magnetic anomalies, and some aligned strong dipolar magnetic anomalies, were detected crossing the east side of Area 1, aligned northwest to southeast, which probably represent land drains or possibly modern ditches or water pipes.

4.2.3 A series of weak parallel linear positive magnetic anomalies was detected crossing the west side of Area 1, aligned northeast to southwest, which almost certainly represent former plough furrows.

4.2.4 A series of other weak linear positive magnetic anomalies were also detected on the east side of Area 1, aligned northeast to southwest and northwest to southeast, which may represent soil-filled features, possibly further land drains.
4.3 **Area 2 (Figures 4 & 5)**

4.3.1 Area 2 comprised a smaller field to the southwest of Area 1, subdivided by a stream. A series of weak discrete positive magnetic anomalies were detected in this area, which may possibly represent soil-filled features, but are likely to be geological.

4.4 **Area 3 (Figures 3 & 5)**

4.4.1 Area 3 comprised another small field to the south of Area 1. A very strong positive magnetic anomaly was detected on the east side of Area 3, which may represent a soil-filled pit. The size and strength of this anomaly may suggest a modern fill. A similar weaker anomaly was detected to the east.

4.4.2 A series of parallel linear positive and negative magnetic anomalies was detected crossing the south side of Area 3, aligned northeast to southwest, which almost certainly represent former plough furrows. This may be indicative of former ridge and furrow cultivation.

4.5 **Discussion (Figure 6)**

4.5.1 The majority of the geophysical anomalies detected are believed to relate to the former agricultural use of the site, including former plough furrows, and possible land drains. These anomalies were most distinct on the east side of the proposed development where former ridge and furrow cultivation is also indicated.

4.5.2 A number of other weak linear features were detected in Area 1 and Area 2, which may relate soil-filled field features, but may represent further land drains.
5 CONCLUSIONS

5.1 Conclusions

5.1.1 Geomagnetic survey has been conducted on land south of Henthorn Road, Clitheroe, to provide information in relation to a proposed residential development at the site.

5.1.2 No definite archaeological remains were detected within the geophysical survey area. The majority of the geophysical anomalies detected are believed to relate to the former agricultural use of the site, including possible former field boundaries, plough furrows and possible land drains.
6 BIBLIOGRAPHY

6.1 Secondary Sources

Archaeology Data Service (2013) Geophysical Data in Archaeology: A Guide to Good Practice, Arts and Humanities Data Service


CIfA (2014) Standard and guidance for archaeological geophysical survey, Institute for Archaeologists, Birmingham


APPENDIX 1 – TRACE PLOTS
Area 1
APPENDIX 2 – FIGURES
Figure 1: Site location.

PROJECT: Land south of Henthorn Road, Clitheroe, Lancashire

SCALE: 1:25,000 at A4

REPORT No: CP11351

CLIENT: Story Homes

DRAWN BY: AB

DATE: June 2015

FIGURE: 1
Figure 2: Location of the geophysical survey areas (Areas 1-3).