ARCHAEOLOGY WALES

Geophysical Survey:

Land at Kronospan, Holyhead Road, Whitehurst, Chirk, Wrexham

June 2022

Report No. 2102

By

Jennifer Muller BA (Hons) MA

REGISTERED ORGANISATION CIfA

ARCHAEOLOGY WALES

Geophysical Survey:

Land at Kronospan, Holyhead Road, Whitehurst, Chirk, Wrexham

June 2022

Edited by: Rhiannon Philp Signed:  Position: Post Excavation Manager Date: 28/06/2022	Authorised by: Irene Garcia Rovira Signed:  Position: Project Manager Date: 28/06/22

Version	Date	Sections Revised	Prepared/Revised by	Checked by
01	28/06/22	Original	Jennifer Muller BA (Hons) MA	Rhiannon Philp

Prepared for Axis P.E.D. Ltd

By

Jennifer Muller BA (Hons) MA

Report No. 2102

Archaeology Wales Limited
Main Office, Unit D11.6 Treforest Industrial Estate
Pontypridd - CF37 5UR
Tel: +44 (0) 1686 440371
Email: admin@arch-wales.co.uk
Web: arch -wales.co.uk

Contents

Figures

Summary

This report results from work carried out by Archaeology Wales Ltd for Axis P.E.D. Ltd following recommendations from Clwyd Powys Archaeological Trust – Development Control (henceforth – CPAT-DC), advisors to the local planning authority, Wrexham County Borough Council (WCBC). It draws upon results of an investigative geophysical survey undertaken in relation to the proposed construction of an access road, lorry park, 132kV substation and other ancillary works on 7 hectares of land at Kronospan, Holyhead Road, Whitehurst, Chirk, Wrexham, LL14 5AT, centred on NGR SJ 28844 39312.

The aim of the geophysical survey was to determine the nature and extent of any buried archaeological features within the proposed development area. The survey was carried out with a Bartington Grad601 dual-fluxgate gradiometer.

The geophysical survey identified anomalies of possible archaeological origin in Fields A and B, namely positive curvilinear anomalies, one of which is a ditch-like feature in Field A that extends outside the survey area; and a sub-rectangular enclosure in the northern end of Field B.

The work was carried out to the Standard and Guidance set out by the Chartered Institute for Archaeologists for Archaeological Geophysical Survey (CIfA 2020) and completed in accordance with EAC Guidelines for the Use of Geophysics in Archaeology (Schmidt A. et al. 2015)

Crynodeb

Mae'r adroddiad hwn yn deillio o waith a wnaed gan Archaeology Wales Cyf i AxisPED Cyf yn dilyn argymhellion gan Ymddiriedolaeth Archeolegol Clwyd Powys - Rheoli Datblygiadau (a elwir yn CPAT-DC o hyn allan), sef cynghorwyr yr awdurdod cynllunio lleol, Cyngor Bwrdeistref Sirol Wrecsam (WCBC). Mae'n seiliedig ar ganlyniadau arolwg geoffisegol archwiliadol a gynhaliwyd mewn perthynas â'r gwaith arfaethedig i adeiladu ffordd fynediad, parc lorïau, is-orsaf 132kV a gwaith ategol arall ar 7 acer o dir yn Kronospan, Holyhead Road, Whitehurst, Y Waun, Wrecsam, LL14 5AT, y mae ei ganolbwynt wedi'i leoli yn NGR SJ 28844 39312.

Bwriad yr arolwg geoffisegol oedd pennu natur a hyd a lled unrhyw nodweddion archeolegol o fewn yr ardal ddatblygu arfaethedig. Cynhaliwyd yr arolwg gyda gradiomedr 'fluxgate' deuol Bartington Grad601.

Nododd yr arolwg geoffisegol anomaleddau o darddiad archeolegol posibl yng Nghaeau A a B, sef anomaleddau cromlinog cadarnhaol, yr oedd un ohonynt yn nodwedd ar ffurf ffos yng Nghae A sy'n estyn y tu hwnt i ardal yr arolwg; a man caeedig hirsgwar ym mhen gogleddol Cae B.

Gwnaed y gwaith yn unol â'r Safonau a'r Canllawiau a nodir gan Sefydliad Siartredig yr Archeolegwyr ar gyfer Arolwg Geoffisegol Archeolegol (Sefydliad Siartredig yr Archeolegwyr 2020) ac fe'i cwblhawyd yn unol â Chanllawiau Cyngor Archeolegol Ewrop ar gyfer y Defnydd o Geoffiseg mewn Archeoleg (Schmidt A. et al. 2015).

1 Introduction

1.1.1 From the 13th to 17th of June 2022, Archaeology Wales Ltd carried out a geophysical survey on land north of Kronospan, Maesgwyn Farm, Chirk, Wrexham (NRG SJ 28844 39312) (Figures 1-2).

1.1.2 The survey was undertaken in relation to the proposed construction of an access road, lorry park, 132kV substation and other ancillary works. The aim of the survey was to provide a better understanding of the nature and precise location of the archaeological resource of the area.

1.1.3 The work was managed by Irene Garcia Rovira MClfA, AW Project Manager, and the site work was undertaken by Daniel Moore, Jack Dowling and Daniel Morgan.

1.1.4 All work conformed to the *Standard and Guidance for Geophysical Survey* (ClfA 2020) and was undertaken by suitably qualified staff to the highest professional standards.

2 Site Description and Geology

2.1.1 The survey area, encompassing 8.3 hectares, is located immediately north of Kronospan complex. It is bounded to the east by the B5070 and Chirk, to the west by the disused railway and Shropshire Union Canal, to the south by the main industrial complex, and to the north by open fields. The proposed development has been used in recent years to grow crops and for grazing purpose.

2.1.2 The underlying geology is comprised of mudstone, siltstone sandstone, coal, ironstone and ferricrete from the Pennine Lower Coal Measures and the South Wales Lower Coal Measures, formed during the Carboniferous Period. This is overlain by superficial deposits of Till - Diamicton, formed during the Quaternary Period (BGS 2022).

3 Aims and Objectives

3.1.1 The geophysical survey was undertaken in order to locate and describe archaeological features that may be present within the survey area.

3.1.2 The aim of this report is to provide information which is sufficiently detailed to allow any underlying archaeological resource to be better understood. The results will assess the potential/limitations of the proposed development within the selected area and will be key to future development designs.

4 Methodology

4.1 Geophysical Survey

4.1.1 The survey was carried out using a Bartington Grad601-2 dual sensor fluxgate gradiometer. This instrument has been chosen due to its proven efficient and effective method of locating sub-surface archaeological anomalies on greenfield sites. The machine consists of two high stability fluxgate sensors suspended on a single frame, accurately aligned, that can detect localised magnetic anomalies compared with the general magnetic background. When mapped in a systematic manner this allows changes in the magnetic field resulting from differing features in the soil to be plotted. Strong magnetic anomalies will be generated by iron-based objects or areas modified by heat, such as hearths and kilns. More subtle anomalies may be generated by changes, typically in the iron-oxide content, of underlying soils, compared to the natural subsoil. This enables the detection of material infilling sub-surface archaeological features such as ditches, pits and structural remains. Data from this may be mapped at closely spaced regular intervals, to produce an image that may be interpreted to locate buried archaeological features (Aspinall et al, 2011).

4.1.2 Moreover, Fluxgate gradiometry has the advantage of being able to identify the broadest range of sub-surface archaeological feature types and can detect such anomalies at a range of soil depths (typically 0.3 - 1m).

4.1.3 The site was located by GPS. All survey points were located with the GPS and plotted onto an O.S. base map. The on-site survey was undertaken in a single phase lasting sixteen days. Detailed survey was carried out in grids of 30m x 30m along zig-zag and parallel traverses spaced at 1m intervals, recording data points spaced at 0.25m intervals to a maximum instrument sensitivity of 0.1nT in accordance with Historic England Guidelines. The survey mode was set to bi-directional (traverses walked alternately north/south). Incomplete survey lines resulting from irregular area boundaries or obstacles were completed using the 'dummy log' key. At regular intervals, the data was downloaded in the field onto a laptop computer for storage and assessment.

4.2 Data Processing and Presentation

4.2.1 Following the completion of the detailed survey, processing and analysis took place using the TerraSurveyor v.3 software package.

4.2.2 A composite of each detailed survey area has been created and processed using TerraSurveyor v.3.0.37.1. The report includes raw and

unclipped data in greyscale. Every effort has been made to reduce the instrument directional sensitivity in the field rather than reliance on post data-collection processing.

4.2.3 The final results have been presented at an appropriate scale tied to the Ordnance Survey National Grid.

4.2.4 The most typical method of visualising the data is as a greyscale image. In a greyscale plot, each data point is represented as a shade of grey, from black to white at extreme of the data range. A limited number of standard operations can be carried out to process the data, including clipping, destriping and graduated shade. The data was analysed using a variety of parameters and styles and the most useful of these were saved as *TIF images and displayed using Adobe Illustrator software. The results of the survey were then overlaid onto a digital map of the study area. This was then used to produce interpretation figures.

4.2.5 All works were undertaken in accordance with the standard required by The Chartered Institute for Archaeologist's *Standard and Guidance for Archaeological Geophysical Survey* (2014) and current Health and Safety legislation.

5 Archaeological and Historic Background

5.1.1 In March 2022, Archaeology Wales Ltd carried out a Desk Based Assessment (DBA) for the proposed development (Garcia Rovira 2022). The DBA highlights:

5.1.2 The history of Chirk and its surroundings can be traced back to the Roman period. A Roman Vexillation camp is recorded southeast of the town of Chirk. Furthermore, the projected line for a Roman Road – Rhyn Park to Rhug PRN 47505 - is documented in the HER running adjacent to the eastern boundary of the proposed development area.

5.1.3 Offa's Dyke (SM DE198) and Chirk Castle (PRN 145757) lie approximately 1.5km and 2km to the west of the site, respectively. There is a possibility that one of the historic roads leading to Chirk Castle runs through the proposed development site; an historic map (Rocque 1752) illustrates this as a possibility. However, the lack of accuracy of such a map makes it impossible to know whether that road passed directly through the site.

5.1.4 The town of Chirk (PRN 142411) contains evidence of human activity going back to the medieval period (11th/12th centuries); however, there are no indications that the proposed development site has been heavily impacted in the past. Historic maps show it has been used as agricultural land continuously, and there are no find spots in the general area.

6 Geophysics Investigation - Overview

6.1 Limitations

6.1.1 One small field at the southwestern end of the site was avoided due to health and safety risks. The entire field was overgrown with vegetation including brambles, some of which exceeded head height. This field was therefore excluded from the survey. The north-eastern edge of Field B was fenced off for a wildlife strip and therefore also had to be excluded from the survey.

6.2 Introduction to Results

6.2.1 The three fields comprising the survey are designated as Fields A-C, from north to south.

6.2.2 A number of response types with differing polarities were captured across the site. Polarity is the phrase used to describe the measurement of the magnetic response. Anomalies with positive polarity (shown as black) have values above 0nT, while anomalies with a negative polarity (shown as white) have values below 0nT. It is possible for anomalies to have values of both positive and negative polarity.

6.2.3 A number of terms are used below to describe the different types of anomalies recorded within the dataset. These are:

- **Dipolar:** these anomalies consist of a single positive anomaly with an associated negative response. There should be no separation between the two polarities of response. These anomalies will be created by a single feature and the interpretation will depend on the magnitude of the magnetic measurements.
- **Bipolar:** these anomalies are comprised of both positive and negative responses. They can be made up of any number of positive and negative responses. The interpretation of the anomaly will depend on the magnitude of the magnetic field strength. A weak response may be caused by a clay field drain while a strong response will probably be caused by a metallic service.
- **Positive:** These anomalies are usually related to backfilled cut features, where the fill material is magnetically enhanced compared to the surrounding matrix. These anomalies can be caused by features of archaeological origin, but they can also be caused by former field boundaries and ploughing. It is possible that some may be of natural origin.

- **Positive anomaly with associated negative response:** These responses are caused by a single feature. Such responses could be caused by the cables of modern services, although magnetically weaker responses could relate to earthworks and field boundaries.
- **Negative:** These anomalies are generally caused by raised earthen features where material has built up that has a lower magnetic magnitude relative to the background soil.
- **Magnetic debris:** this consists of numerous dipolar responses spread over an area. Weaker responses could represent general ground disturbance with stronger responses being more indicative of a spread of ferrous debris. Moderately strong responses may be the result of a spread of thermoremanent material such as bricks or ash.

6.2.4 It is important to note that gradiometer data is made up of responses that are generally larger than the actual size of the feature (Gaffney & Gator 2003, 113).

6.2.5 Throughout all of the fields are numerous small dipoles, which may be either isolated ferrous detritus, or thermoremanent magnetic materials, such as fragments of burnt stone, brick or tile depending on their magnitude.

7 Results and Interpretations (Figures 3-5)

7.1 Field A

7.1.1 Only a section of the southern part of Field A was surveyed in an area designated for the construction of a pond. The remaining areas within the field were not designated for development.

7.1.2 A positive, slightly curved linear anomaly (**F1**) runs across the entirety of the Field A data in a northeast-southwest direction. It continues beyond the limit of survey at both ends. Positive linears are characteristic of dug out features such as ditches, gullies or historic field boundaries. There is a very slight negative response mostly on the northern side of F1, which could indicate the resultant bank created by the displaced soil. The anomaly itself is approximately 2m wide.

7.2 Field B

7.2.1 Throughout Field B are areas containing diffuse, positive magnetic anomalies which are likely to represent geological or geomorphological magnetic variations.

7.2.2 The northern end of Field B contains several anomalies of archaeological potential. The spread of magnetic debris (**F2**) in the northwest corner is made up of a mix of high amplitude responses with moderate ones. It measures approximately 26m x 17m. This could be indicative of burnt material, or potentially the remains of a structure with ferrous debris present. Immediately west of F2 is a strong and wide positive linear anomaly (**F3**) orientated east-west. With no associated response indicating the formation of a bank, it is likely that this is a worn area, such as a path. Its proximity and orientation to the spread indicate a possible connection between the two. Consultation of satellite imagery via Google Earth Pro shows a well-worn path, probably from regular use by vehicles, in the exact location of F3, and a generally dry and worn area where F2 appears between 2006 and 2010. In 2018, the location of F2 was left unploughed, and at other times looks dryer than the field around it. Lidar results (Garcia Rovira 2022, 35) also depict a rectangular platform-type feature where F2 occurs. It is probable that these two features are related to the farm immediately west of the site.

7.2.3 To the east of F2 is a faint, positive curvilinear anomaly that is oval/sub-rectangular with rounded corners (**F4**). A further partial curvilinear anomaly is evident directly to its eastern side. Also on the east side are two distinct, symmetrical points with equal, positive polarity. The feature measures approximately 38m long x 27.5m wide, though the top of it fades away on the north side, likely due to magnetic interference which is visible at the edge of the field. Like F1, it is a positive anomaly with a slight negative response, indicative of a ditch or gully.

7.2.4 To the south of F4 is a large positive point with a negative response (**F5**) and another similar point further to the southeast (**F6**). The magnetism of these anomalies is not strong enough to merit ferrous material, but their size is significant, with both measuring approximately 5m in diameter. These could be human-made pits or natural features such as tree throws. When investigated more closely and looking at the raw data (Figure 5), the response at the centre of the points is not as strongly positive as the edges of the positive area. In the case of F6 it becomes negative towards the edge. This shows that the centre of the anomalies contains something less magnetic than their surround and indicates there is likely an object inside (natural or human-made).

7.2.5 Just south of F5 are a series of faint, positive magnetic linear anomalies (**F7**) grouped in a northwest-southeast alignment in the centre of the field. These are likely remnants of former plough marks.

7.2.6 Further positive anomalies appear in the field that are of more questionable archaeological potential: one linear immediately south of F6 is orientated in the same direction as F7 (**F8**); two faint curvilinear anomalies sit at the west end of F8 (**F9**); and two further linear anomalies are oriented approximately north-south from the southern end of the field (**F10**) and (**F11**).

7.2.7 Another spread of magnetic debris (**F12**), similar to F2 but with a weaker magnetic signature, is positioned at the southwest edge of Field B, adjacent to the stream. It measures 21m long but its width at 5.5m is cut off by the limit of the survey. The low to moderate response indicates F12 may represent general ground disturbance.

7.3 Field C

7.3.1 Field C contains further positive linear anomalies that appear to be related to former agricultural (ploughing) activity (**F13**), possibly enclosed by former field boundaries (**F14**). Consultation of historic OS maps did not reveal any such field boundaries, so they could date to before the mid-1800s.

7.3.2 A fragment of a negative linear anomaly (**F15**) continuing beyond the limit of survey in the southwest corner of the field is a possible non-magnetic service cable.

7.3.3 Another positive linear anomaly orientated northeast-southwest (**F16**) is located to the eastern extent of Field C.

8 Discussion and Conclusions

8.1.1 The works carried out by Archaeology England in June 2022 focused on surveying 8.3 hectares of land at Kronospan, Maesgwyn Farm, Chirk, Wrexham. The aim of the geophysical survey was to determine the nature and extent of any buried archaeological features within the development area.

8.1.2 The survey identified several anomalies characteristic of possible archaeological features in Fields A and B.

8.1.3 Anomaly F1 in Field A produced a wide, gently curving linear, indicating the presence of a potential enclosure ditch. The feature appears to follow the contour of the topography. However, because it extends beyond the survey area, further interpretation is difficult.

8.1.4 The oval/sub-rectangular anomaly F4 is also of interest, especially with its equal, distinctive anomalies directly to the east. It appears to be an enclosure of unclear date and might warrant closer investigation.

8.1.5 Anomalies F5 and F6 warrant further investigation due to their size and the negative polarity associated with their centres, which might indicate archaeological features.

8.1.6 Aerial photography and lidar have identified F2 as a possible former platform for a structure, which could be related to the adjacent farm.

8.1.7 The remaining features in Field B (F8, F9, F10, and F11) appear to all be the result of former agricultural activity or field boundaries, though the geographical relation of F6, F8, and F9 might merit further exploration.

8.1.8 Further archaeological investigation in the form of a trenching evaluation would allow the anomalies highlighted above to be examined, in order to further assess their archaeological potential.

9 Bibliography and References

Aspinall, A, Gaffney, C & Schmidt, A. 2011. *Magnetometry for Archaeologists*. Altamira, London.

Chartered Institute for Archaeologists. 2020. *Standards and Guidance for Geophysical Surveys*.

Gaffney, C & Gater, J. 2003. *Revealing the Buried Past: Geophysics for Archaeologist*. The History Press, Stroud.

Gaffney, C., Gater, J. and Ovenden, S. 2002. *The use of Geophysical Techniques in Archaeological Evaluations IFA Paper No. 6*. Institute of Field Archaeologists, Reading.

Garcia Rovira, I. 2022. *Kronospan, Holyhead Road, Chirk Access road, lorry park, 132kV substation and other ancillary works: Desk Based Assessment and Site Visit*. Report 2080 [Unpublished report].

Schmidt A. 2011. *Geophysical Data in Archaeology: A Guide to Good Practice*. Archaeology Data Service and Digital Antiquity.

Schmidt A. et al. 2015. *EAC Guidelines for the Use of Geophysics in Archaeology, Questions to ask and points to consider 2015*. EAC Guidelines 2.

Online Maps:

Rocque, J. 1752. *Actual survey of the county of Salop, 1*. Accessed: 22-06-22, www.oldmapsonline.org.

Figure 1. Site Location.

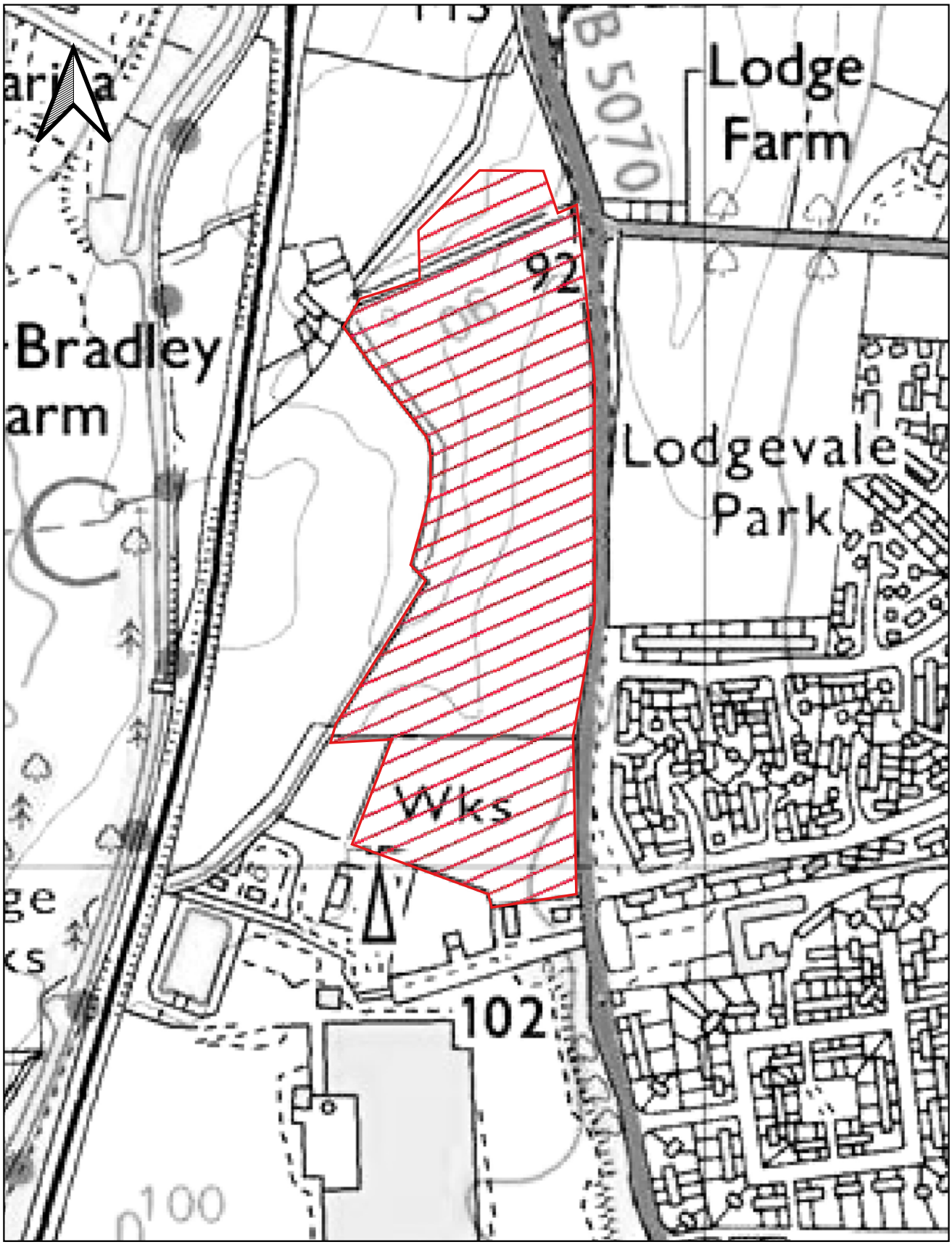

Figure 2. Surveyed Area.

ARCHAEOLOGY WALES