

# Archaeology Wales

## Land at Tyddyn Cae Farm, Boduan Gwynedd

### Geophysical Survey



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Report No. 1276

# Archaeology Wales

## Land at Tyddyn Cae Farm Boduan, Gwynedd

Geophysical Survey

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Report No: 1276

Date: October 2014

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# Non-Technical Summary

*This report results from work undertaken by Archaeology Wales Ltd (AW) for Lightsource Renewable Energy Ltd. It draws on the results of a geophysical survey that took place on land at Tyddyn Cae Farm, Boduan, Pwllheli, Gwynedd, and was carried out in support of a proposed planning application for the construction of a solar farm and associated landscaping, access routes and infrastructure.*

*The survey identified a small number of potential archaeological features including a rectilinear enclosure and a building platform dating to the late 19<sup>th</sup> century or earlier. Evidence of former cultivation furrows, ditches and track-ways were also located.*

*Whilst the 19<sup>th</sup> century building platform was known from cartographic sources and had been identified during a recent site visit (Wylie, 2014), the location of the rectilinear enclosure and the cultivation furrows were previously unknown. The cultivation furrows, ditches and track-ways, although of interest in their capacity to illuminate the history of land use at the farmstead, are not archaeologically important. The enclosure, however, is potentially of regional significance.*

## 1 Introduction

### 1.1 Location and scope of work

- 1.1.1 In October 2014 Archaeology Wales Ltd (AW) carried out a geophysical survey on land at Tyddyn Cae Farm, Boduan, Pwllheli, Gwynedd. The assessment area totalled 20.2 hectares and was centred on NGR 233465 337785 (Figs 1 & 2). The work was carried out at the request of Lightsource Renewable Energy Ltd in order to support a planning application submission (C14/0885/33/LL) for the creation of a solar farm.
- 1.1.2 The assessment area was the subject of a previous Cultural Heritage Desk Based Assessment and Site Visit by Hyder Consulting (UK) Ltd. The report on this work concluded that the area has a low potential for archaeological remains and that if features are present they are likely to relate to past agricultural practices (Wylie, 2014).
- 1.1.3 A Specification for the geophysical survey was drawn up by Chris E Smith (MifA) of Archaeology Wales Ltd (AW). This was subsequently approved by Gwynedd Archaeological Planning Services (GAPS). A copy is included in Appendix 2 of this report.

### 1.2 Geology and topography

- 1.2.1 The underlying solid geology of the assessment area is primarily made up of sedimentary formations of Caradoc rocks from the Ordovician era (Geological Survey Map, 2001).

- 1.2.2 The solid geology of the assessment area is overlain by loamy and clayey, slowly permeable, seasonally wet, acid soils with impeded drainage (Geological Survey Map, 2001).
- 1.2.3 The assessment area is located on land sloping to the south from a height of 56m above ordnance datum down to 43m. It is located to the north east of the village of Boduan and is bounded to the east by an area of woodland.

### **1.3 Historical Background**

- 1.3.1 The Desk Based Assessment of the project area (Wylie, 2014) highlighted the location of a 19<sup>th</sup> century structure observed on OS maps dating from 1880 to 1920.
- 1.3.2 Also noted were the cloddiau (clawdd banks and stone walls), which the field boundaries of the area around, and including, Tyddyn Cae farm. These are thought to be 19<sup>th</sup> century in date (Wylie, 2014).
- 1.3.3 The Iron Age hillfort of Garn Boduan is located 2.4km to the northwest of the assessment area. Further evidence of prehistoric activity comes from two standing stones located 1.5km to the north east.
- 1.3.4 A small medieval motte is located 1.3km to the east of the assessment area, although this does not appear to have had associated contemporary settlement. Medieval occupation in the area is likely in the village of Boduan to the west of the site. The current church of Boduan dates from 1765, but it is on the site of an earlier medieval foundation (Salter, 1993).
- 1.3.5 There have been no recorded archaeological investigations or interventions within, or located close to, the assessment area.

## **2 Aims and Objectives**

### **2.1 Geophysical Survey**

2.1.1 The geophysical survey was undertaken to:

- Locate any features of likely archaeological significance within the area of proposed development
- Provide sub-surface data to inform any future on-site works

### 3 Methodology

#### 3.1 Geophysical Survey

- 3.1.1 Previous research has shown that fired, or cut and backfilled, archaeological features such as kilns and hearths, ditches and pits often have an anomalously higher magnetic susceptibility than the surrounding subsoil due to burning and biological processes. Differences in magnetic susceptibility within the subsoil and archaeological features can be detected as changing magnetic flux by magnetometers such as that used in the current survey. Data from magnetometer surveys may be mapped at closely spaced regular intervals, to produce an image that can be interpreted to locate buried archaeological features (Clark, 1997) (Aspinall *et al*, 2011).
- 3.1.2 The machine used for the survey was a duel flux Bartington Grad601 Magnetometer operated in mapped survey mode. The survey was carried out in grids of 20m x 20m along parallel traverses spaced at 2m intervals, recording data points spaced at 0.25m intervals to a maximum instrument sensitivity of 0.1nT in accordance with English Heritage Guidelines. The survey mode was set to bi-directional (traverses walked alternately south-north/north-south). At regular intervals the data was downloaded in the field onto a laptop computer for storage and assessment. The location of the survey area was then surveyed using a Topcon GTS 725 total station.

#### 3.2 Data Processing and Presentation

- 3.2.1 Following the completion of the survey, processing and analysis took place using the Terrasurveyor software package. After downloading, the results were plotted in 2D. A greyscale image was used to visualising the data, with each data point represented as a shade of grey, set with black and white defining the two ends of the data range. A number of standard operations, including destripping and despiking, were carried out to process the data. The mean level of each traverse of data was reduced to zero and all grids matched so that there were no differences between background levels. The data was then analysed using a variety of parameters and styles and the most useful of these were saved as \*JPEG 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.
- 3.2.2 All works were undertaken in accordance with the IfA's Standards and Guidance for a geophysical survey (2008) and current Health and Safety legislation.
- 3.2.3 The site work was undertaken by Hywel Keen, Simon Ratty and Peter Aherne. The project was managed by Chris E Smith (MifA).

## **4 Geophysical Survey Results**

### **4.1 Ground Conditions**

- 4.1.1 The survey was undertaken during a three week period of mixed weather that included both wet and dry conditions. Owing to the nature of the soil, water puddled in some locations. This may have had a negative impact on the survey results in those areas.

### **4.2 Survey Location and Summary**

- 4.2.1 The assessment area was surveyed using a total of 340 grids (20m x 20m) laid out using a Topcon GTS 725 total station. Some fences and gates bounding the site contained metallic elements, so a sufficient distance was maintained to ensure that they did not impact on the results of the survey. Similarly, a distance was maintained from stationary farm equipment.

### **4.3 Results of the Survey**

- 4.3.1 The results of the geophysical survey are clear for the majority of the areas surveyed, although water puddling may have negatively impacted upon the results from certain areas within fields B, D, E, G and I (Figs 3-8).
- 4.3.2 A moderate amount of features of potential archaeological interest are located within the survey area (Figs 3-8). The majority of these are from Field A in the northeast of the site although further features are evident within fields C, D, E, F, G and H.
- 4.3.3 Figures 7&8 show a traced interpretation of the features identified on the geophysical survey.

### **4.4 Field A**

- 4.4.1 Field A shows the largest number of both linear and discrete geophysical anomalies. Up to twenty roughly parallel and criss-crossing linear features overlie each other in the north of field A.
- 4.4.2 A possible rectilinear enclosure is identified within the centre of field A.
- 4.4.3 Two further short linear features are noted within the south of field A.
- 4.4.4 Five discrete geophysical anomalies, possibly representative of archaeological features, are also located within field A.
- 4.4.5 Non-archaeological/significant features within field A include parallel striations in the south of the lot, representing past cultivation furrows, and a likely geological formation in the north of the area.

### **4.5 Field B**



4.5.1 Areas of field B were found to be very wet underfoot. This appears to have negatively impacted upon approximately 50% of the survey in this area.

4.5.2 A single possible discrete geophysical anomaly is present towards the south of the area though, given the amount of disturbance from standing water, confidence in the feature is low.

#### **4.6 Field C**

4.6.1 Most notable within field C are the parallel cultivation furrows and evidence of the post-medieval house platform (identified through cartographic sources within the desk based assessment) on the eastern edge of the plot. The likely geological anomaly identified in field A appears to continue into field C, being noted immediately to the north of the house platform.

4.6.2 Two linear anomalies are evident from the survey of field C. One appears irregular in plan and heads roughly north-south whilst the other is straight, running approximately north east – south west, and appearing to continue beneath the post-medieval house platform.

4.6.3 A single discrete anomaly is located immediately to the south of Tyddyn Cae farm within field C.

#### **4.7 Field D**

4.7.1 The survey of field D shows two well defined areas of disturbance from puddling/standing water on the eastern and western edges of the plot.

4.7.2 Three small discrete anomalies appear within the centre of the plot.

4.7.3 Although very faint north-south striations are noted within the plot, these are felt to be natural in origin.

#### **4.8 Field E**

4.8.1 Field E contains a small area of disturbance towards the south of the plot due to standing water/puddling. Past cultivation furrows running parallel with the north west – south east field boundaries are also evident.

4.8.2 A total of 15 linear geophysical anomalies are located within the plot as well as 3 discrete anomalies.

#### **4.9 Field F**

4.9.1 Field F contains 8 linear geophysical anomalies, six of which appear to run parallel and close to another. Up to seven discrete geophysical anomalies are also noted.

- 4.9.2 Three areas of bipolar readings appear to represent either combustion episodes or large amounts of ferrous debris.

#### **4.10 Field G**

- 4.10.1 Up to 50% of the survey of field G (southern half) appears to have been affected negatively by standing water/puddling.
- 4.10.2 A small area of parallel cultivation furrows is evident within the north west of the plot as well as four areas of bipolar readings representing possible combustion/ferrous debris.
- 4.10.3 A single short linear anomaly and a single discrete anomaly are located in the north of the plot.
- 4.10.4 Faint east to west striations across the middle of the plot are deemed likely to be natural in origin and appear to line up with the route of a watercourse.

#### **4.11 Field H**

- 4.11.1 Field H appears to contain three short lengths of curvilinear anomaly. The most northerly and easterly of these appear to show bipolar readings which may be suggestive of a geological origin.
- 4.11.2 Three areas of bipolar readings appear to represent either combustion episodes or large amounts of ferrous debris.

#### **4.12 Field I**

- 4.12.1 The whole survey of field I has been negatively impacted upon by standing water/puddling within the field. No significant geophysical anomalies are visible.

## **5 Interpretation and Discussion**

### **5.1 Field A**

- 5.1.1 Field A shows the largest amount of geophysical anomalies, the majority of which are likely anthropogenic in origin. The parallel nature of some of the linear features may indicate that some are actually representative of cultivation furrows and/or drainage features.
- 5.1.2 Two sets of parallel linear features running roughly east-west may represent previous trackways.
- 5.1.3 The likely enclosure in the centre of field A is likely to be the most significant feature identified by the survey. The enclosure is not marked on any of the historic mapping so is likely to be of at least post-medieval date.

## **5.2 Field B**

- 5.2.1 Within field B only a single discrete feature of unknown, though likely anthropogenic, origin was located.

## **5.3 Field C**

- 5.3.1 Within field C, the house platform identified within the desk based assessment is readily visible on the survey. The geophysical results suggest that the remains of the house platform extend further than is visible with the naked eye.
- 5.3.2 A linear feature is shown on the survey to underlie the house platform and cultivation furrows. It is noted that this linear does not appear to continue into field A. This is most likely representative of a former field boundary.
- 5.3.3 The remaining linear within the field is felt more likely to be natural in origin, likely representing a defunct watercourse.
- 5.3.4 The relatively large (10x12m) discrete feature in this area may represent disturbance associated with the adjacent Tyddyn Cae farmhouse.

## **5.4 Field D**

- 5.4.1 Within field D only three small discrete feature of unknown, possibly anthropogenic, origin were located.

## **5.5 Field E**

- 5.5.1 A series of linear features not dissimilar in appearance to those of field A were noted within field E. The longest linear feature in field E, aligned north west – south east, appears to coincide with a similar linear feature in field F, thus suggesting a former field boundary continuation.
- 5.5.2 The remaining features within field E, including three discrete anomalies, are likely of anthropogenic origin though their form and function remains unclear.

## **5.6 Field F**

- 5.6.1 The survey of field F has shown eight linear features, six of which appear to run parallel with one another. Though the southern linears within field F are likely to represent a continuation of a field boundary noted within field E, the remainders may represent trackways similar to those identified within field A.
- 5.6.2 Seven discrete anomalies, of likely anthropogenic origin, though of unknown form and function, were similarly located within field F.

## **5.7 Field G**

- 5.7.1 Only two small features, a short linear and a small discrete feature, were noted within field G. These may be anthropogenic origin. A previous watercourse appears to bisect the centre of the field.

## **5.8 Field H**

- 5.8.1 Field H showed three possible linear features, two of which are more likely to be of natural geological origins. The remaining feature, a curvilinear anomaly in the centre of the plot, may be of anthropogenic origin though its form and function are undetermined.

## **5.9 Field I**

- 5.9.1 Field I appeared to contain no features of interest though the survey was negatively impacted by the standing water/puddling within the area.

## **5.10 Overall interpretation**

- 5.10.1 The geophysical survey has identified a number of potential archaeological features, both linear and discrete in nature, the majority of which are located in fields A, E & F.
- 5.10.2 The possible enclosure located in field A is not represented on any of the readily available historical maps, so is likely to be at least post-medieval in date, probably earlier.
- 5.10.3 The building platform located within field C is shown on late 19<sup>th</sup> century maps of the site and was recorded during the site visit undertaken as part of the recent Desk-based Assessment (Wylie 2014). The date of the original building or buildings located in this area is unknown. From the survey it is possible to identify what appears to be an older linear feature overlain by the house platform.

## **5.11 Discussion**

- 5.11.1 The geophysical survey carried out at Tyddyn Cae shows a number of potential archaeological features. The most readily identifiable of these are the rectilinear enclosure in field A and the building platform in field C.
- 5.11.2 The majority of the remaining features are probably ditch lines representing former field boundaries, drainage, track-ways associated with access and egress from Tyddyn Cae Farm, and cultivation furrows.
- 5.11.3 The presence of former cultivation furrows shows that the area has, at some point in the past, been used as arable land.
- 5.11.4 It rained during the survey and consequently there were a few areas of standing water in Fields B, D, E, G and I. This could have had a slightly adverse effect on the results of the work, masking the presence of subtler archaeological features in those areas.

## **6 Acknowledgements**

- 6.1.1 Thanks are due to Aimee Cannon of Lightsource Renewable Energy Ltd and to Hywel Keen, Simon Ratty and Peter Aherne (AW) for undertaking the survey.

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## 7 Bibliography and References

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# *Archaeology Wales*

## **APPENDIX I:** Figures

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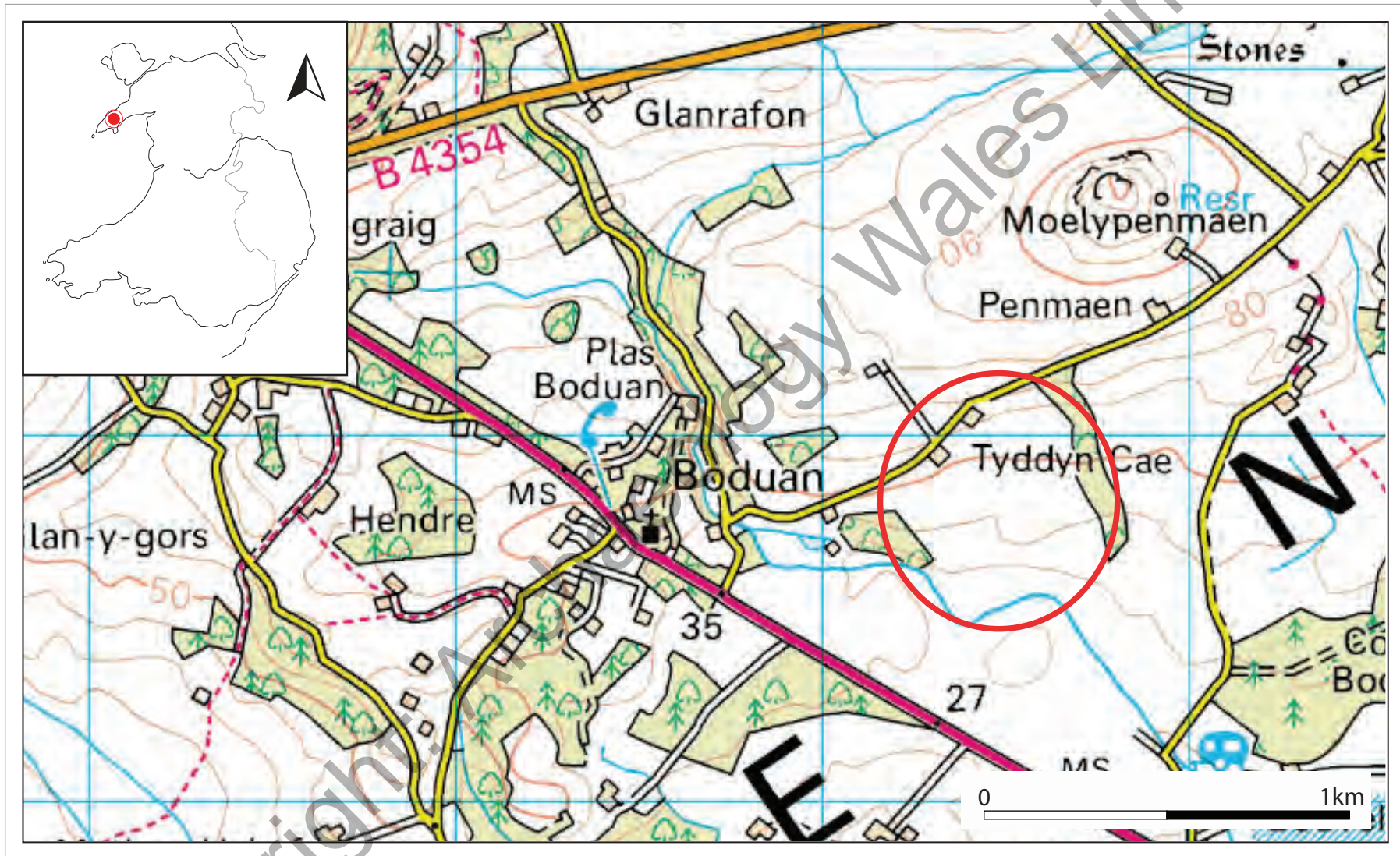
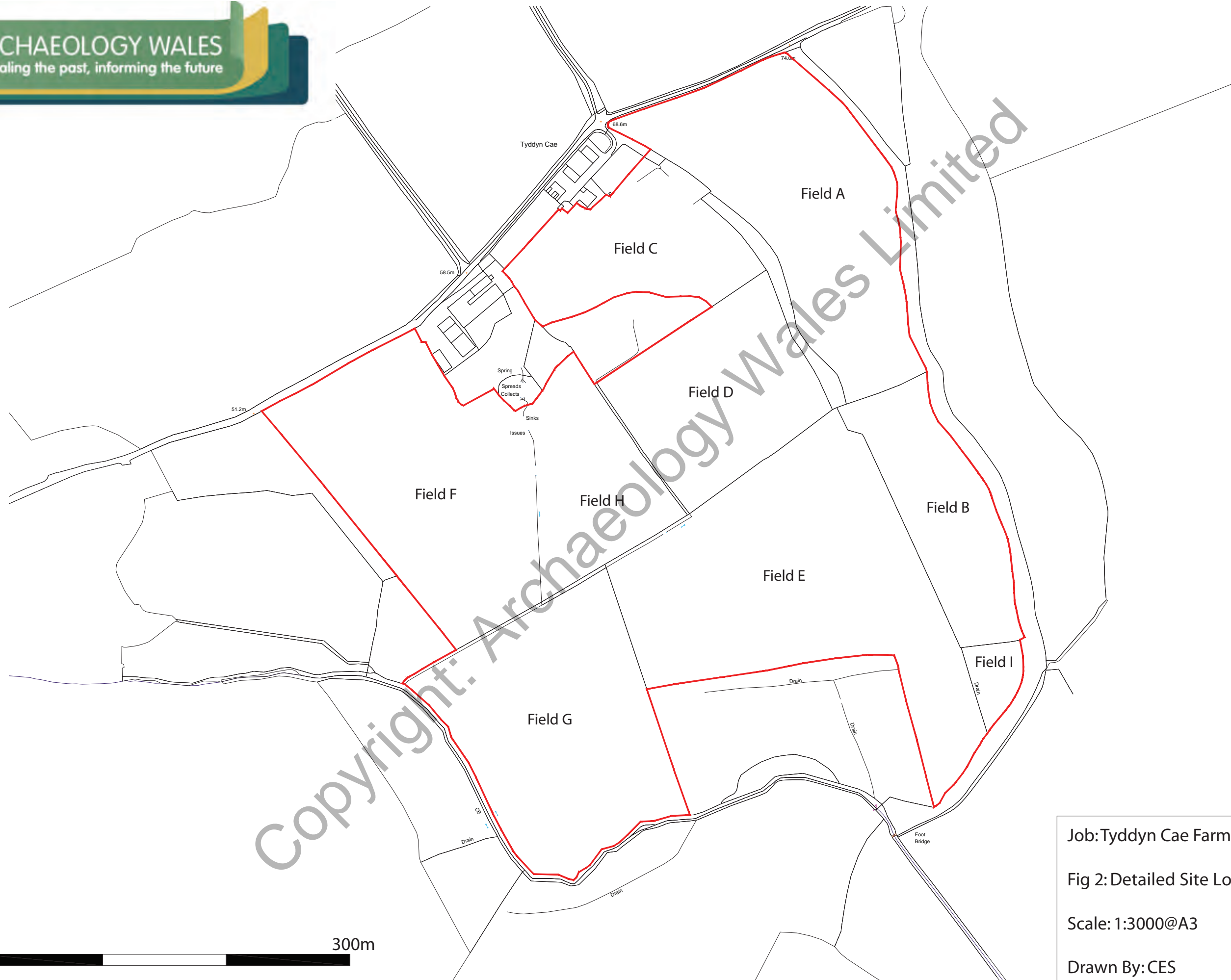


Fig 1: Map showing location of assessment area





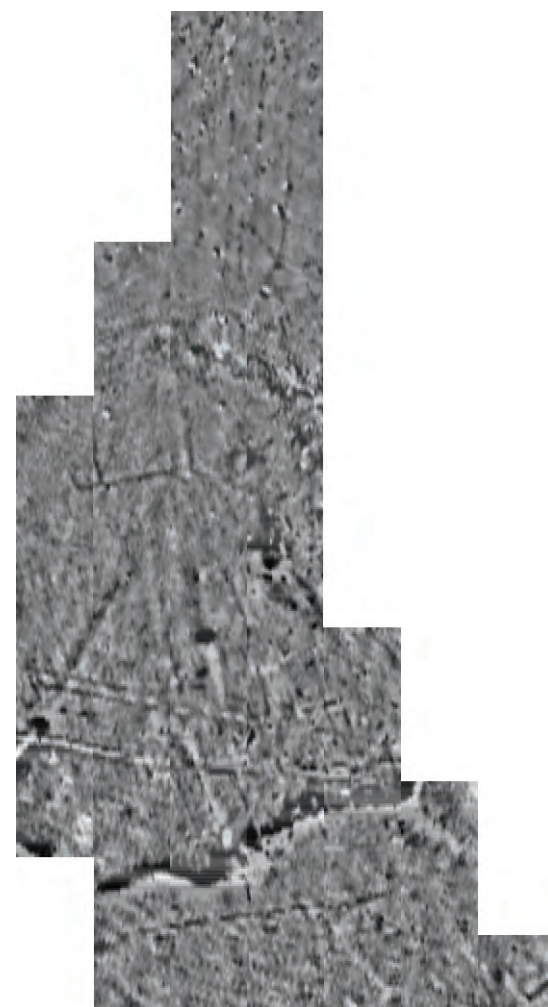
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Job: Tyddyn Cae Farm, Boduan

Fig 2: Detailed Site Location

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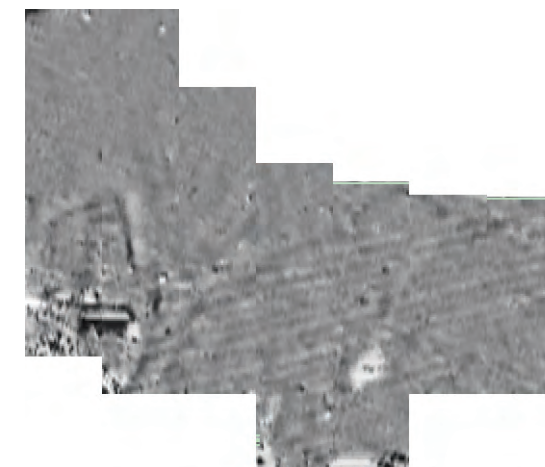
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Field A



Field B



Field C

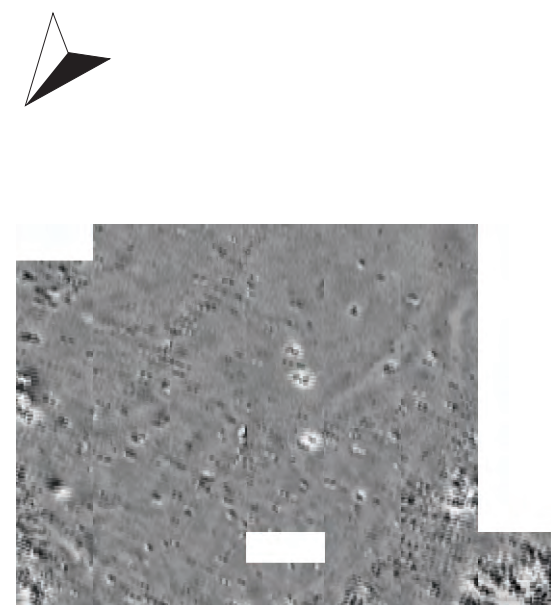
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Job: Tyddyn Cae Farm, Boduan

Fig 3: Greyscale results fields A-C

Scale: 1:2250@A3

Drawn By: CES



Field D



Field E



Field F

0 300m

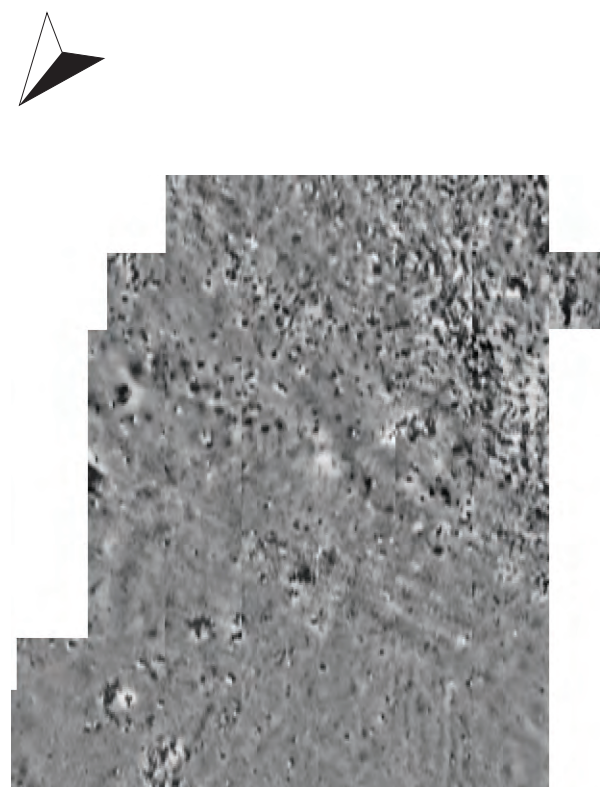
Job: Tyddyn Cae Farm, Boduan

Fig 4: Greyscale results fields D-F

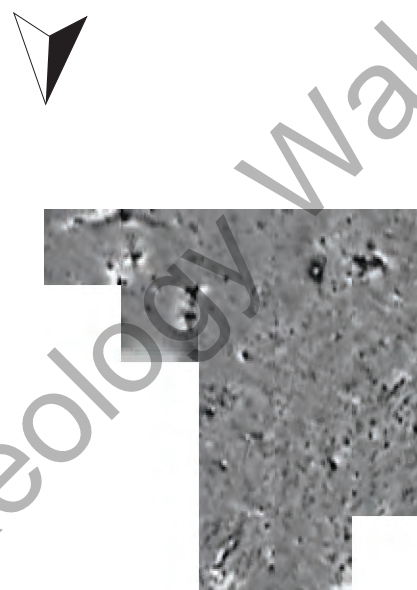
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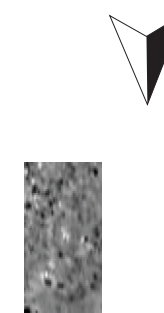




Field G



Field H



Field I

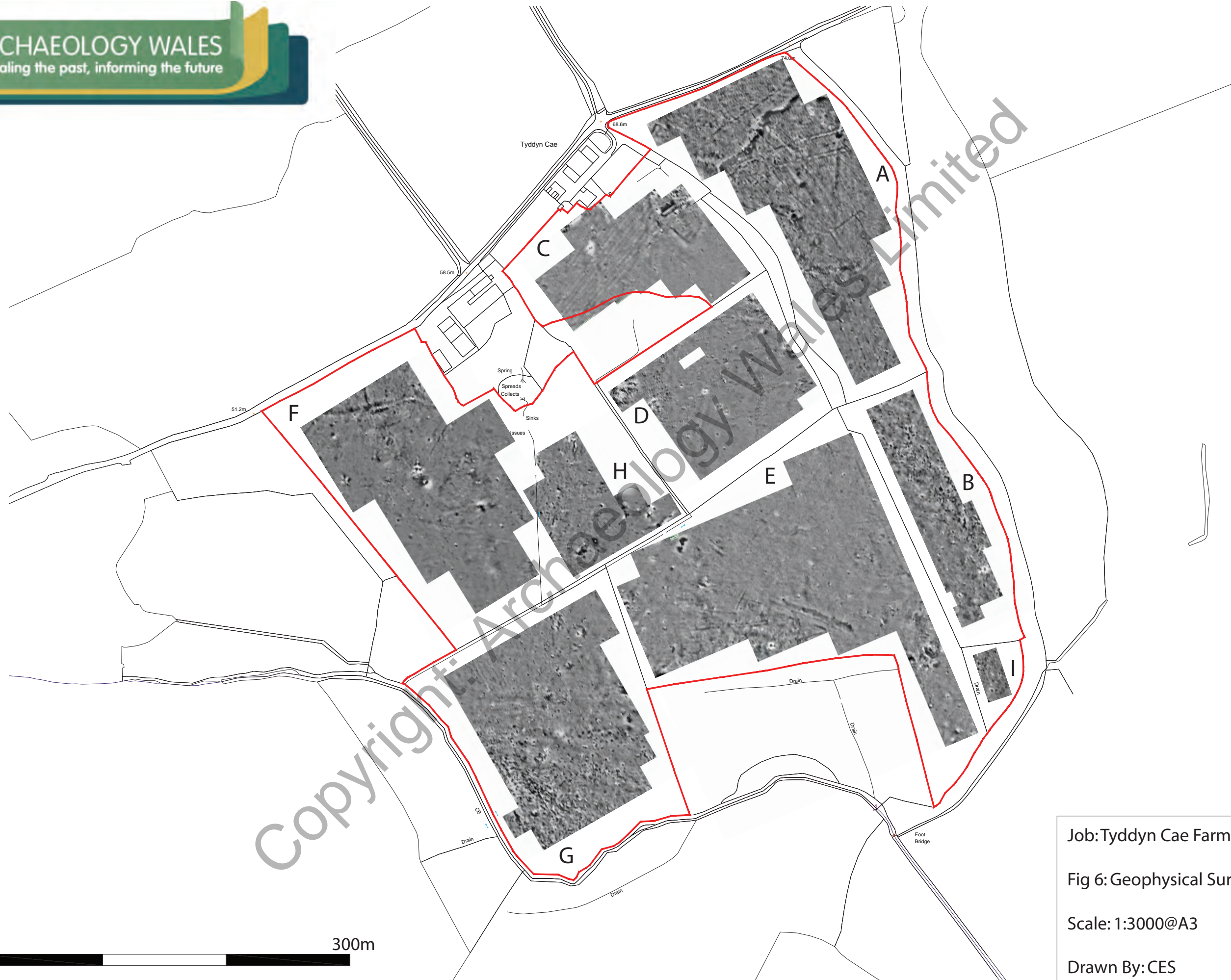
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Job: Tyddyn Cae Farm, Boduan

Fig 5: Greyscale results fields G-I

Scale: 1:2250@A3

Drawn By: CES



Job: Tyddyn Cae Farm, Boduan

Fig 6: Geophysical Survey Results

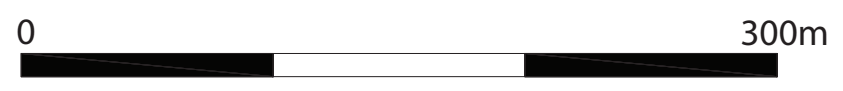
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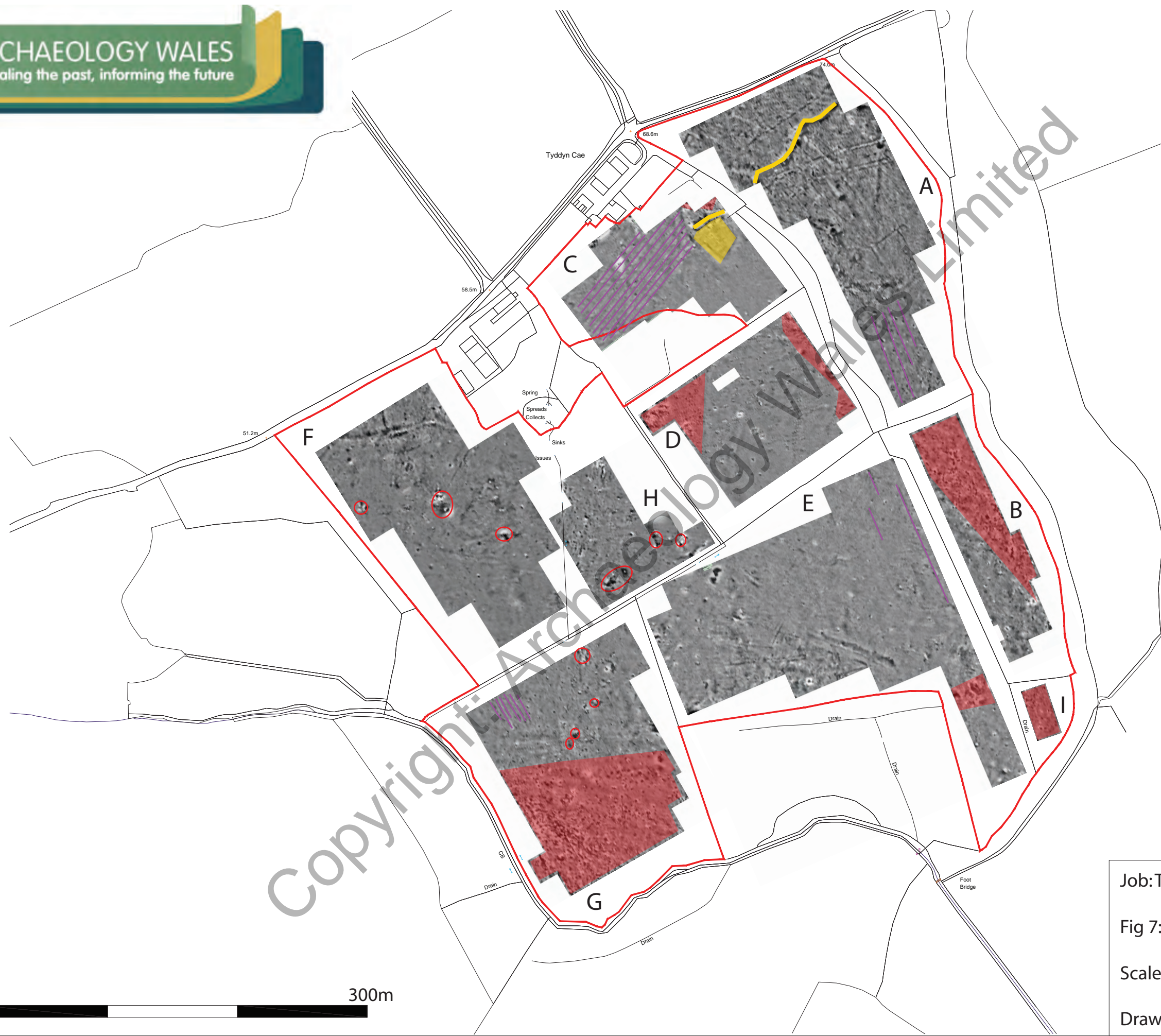




- Anomalous results due to standing water
- Possible combustion/ Ferrous debris
- Platform identified through cartography
- Cultivation Furrows
- Geological anomaly



Job: Tyddyn Cae Farm, Boduan  
Fig 7: Results Plan A  
Scale: 1:3000@A3  
Drawn By: CES







- Linear geophysical anomaly
- Discrete geophysical anomaly

0 300m

Job: Tyddyn Cae Farm, Boduan

Fig 8: Results Plan B

Scale: 1:3000@A3

Drawn By: CES

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## **APPENDIX II:** Specification

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## **ARCHAEOLOGY WALES LIMITED:**

### **Specification**

**for a geophysical survey**

**at**

**Tyddyn Cae Farm, Boduan  
Pwllheli, Gwynedd**

**Prepared for:  
Lightsource Renewable Energy Ltd**

**Project No: 2274**

**September 2014**

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## NON TECHNICAL SUMMARY

*This Written Scheme of Investigations details a proposal for a geophysical survey of land around Tyddyn Cae Farm, Boduan, Pwllheli, Gwynedd designed as an investigation of potential buried archaeology within the proposed area of solar farm and associated developments (Planning Application No. C14/0885/33/LL). It has been prepared by Archaeology Wales Ltd for Lightsource Renewable Energy Ltd.*

### 1 Introduction

The proposed development is for a solar power farm (Photovoltaic panels) on land at Tyddyn Cae Farm, Boduan, Pwllheli (Henceforth – the site) and comprises the construction of PV panels across several fields comprising 20.2ha. The development has been proposed by Lightsource Renewable Energy Ltd on behalf of their clients. The planning application number is C14/0885/33/LL. The local planning authority is Gwynedd County Council, to whom the Gwynedd Archaeological Planning Services (GAPS) act as advisors. The site is centred around NGR 233465 337785 (Figure 1).

Jenny Emmett (GAPS) has determined that the proposed development may potentially affect buried archaeological remains, but as yet they have insufficient information to identify the form, character, type, or date of the buried archaeology. Consequently, GAPS have requested that a geophysical survey is carried out across all areas.

This Specification has been prepared by Chris Smith (MIfA), Project Manager, Archaeology Wales Ltd (Henceforth - AW) at the request of Lightsource Renewable Energy Ltd. It provides information on the methodology which will be employed by AW during the proposed geophysical survey.

AW is a Registered Organisation with the Institute for Archaeologists (IfA). The proposed work will be managed by Chris Smith, all field-work will be undertaken by suitably qualified staff and in accordance with the standards and guidelines of the IfA.

### 2 Archaeological Background

A cultural heritage assessment for the site, undertaken by Hyder in September 2014, concluded that the application site is located within a study area that contains little known archaeological activity until the medieval period when evidence of human occupation and exploitation of the landscape for agriculture begins. Prior to the medieval period there is some evidence for ceremonial and funerary activity on the edge of the study area, as evidenced by the standing stones and early medieval burial (SM1), but there is no indication that this activity extended to the application site.

As there is little known about the below ground archaeology of the assessment area, it is intended that the geophysical survey will provide this information.

### 3 Objectives

The primary objectives of the work will be to locate and describe, by means of geophysical survey, archaeological features that may be present within the development area.

The proposed archaeological work will attempt to elucidate the presence or absence of archaeological material that might be affected by the scheme, in particular its character, distribution, and extent.

A report will be produced that will provide information which is sufficiently detailed to allow informed planning decisions to be made that can safeguard the archaeological resource. The information could then be used to determine further archaeological investigation or appropriate mitigation strategies for any archaeological remains within the area to be implemented prior to or during the proposed development. The report will be used to allow a decision to be made on any subsequent planning application.

#### **4 Method statement for geophysical survey**

The area to be surveyed will include all of the development area (see the attached plan, Figure 1).

The site will be located by GPS. All survey points will be located with a total station and plotted onto an O.S. base map.

The on-site survey will be undertaken in a single phase lasting approximately three weeks. This will be followed by report production.

The survey will be carried out using a Bartington Grad601 Magnetometer. Each survey area will be divided into 20m square grids along a common alignment.

Within each grid, parallel traverses 1m apart will be walked at rapid pace along the same orientation. Instrument readings will be logged at 0.25m intervals, with an average cycle of 4 using an ST1 internal sample trigger. Incomplete survey lines resulting from irregular area boundaries or obstacles will be completed using the "dummy log" key.

Further survey information will be completed on the relevant pro-forma sheet. All data will be downloaded in the field into a laptop computer. The location of the grid corners will be recorded using a total station so that results can be accurately placed onto an OS map.

A composite of each detailed survey area will be created and processed using the software package Geoplot V.3. A variety of processing tools will be used to enhance any potential archaeology. The final results will be presented at an appropriate scale tied to the Ordnance Survey National Grid.

#### **5 Monitoring**

GAPS will be contacted at least one week prior to the commencement of site works and subsequently once the work is underway.

Any changes to this Written Scheme of Investigations that AW may wish to make after approval will be communicated to GAPS for approval on behalf of Planning Authority.

GAPS will be given access to the site so that they can monitor the progress of the work, they will be kept regularly informed about developments, both during the site works and subsequently during the post-fieldwork programme.

## 6 Archiving and Reporting

### Site archive

An ordered and integrated project archive will be prepared in accordance with the National Monuments Record (Wales) agreed structure and be deposited within an appropriate body upon completion of the work.

### Final reporting

The client report will contain, as a minimum, the following elements:

- Concise non-technical summary of the results
- Detailed plans of the site and survey results (greyscales & colour variants)
- Site illustrations, related to Ordnance Datum
- Written description & interpretative plans
- Statement of local and regional context
- Conclusions as appropriate
- Bibliography
- A copy of the AW Written Scheme of Investigations

Copies of the report will be sent to Lightsource Renewable Energy Ltd, the archaeological advisors (GAPS), to the local planning authority, and for inclusion in the regional HER. Digital copies will be provided in pdf format if required.

A summary report of the work will be submitted for publication to a national journal (eg Archaeology in Wales) no later than one year after the completion of the work.

## 7 Resources and timetable

### Standards

The field evaluation will be undertaken by AW staff using current best practice. AW is an IFA Registered Archaeological Organisation and all work will be undertaken to the standards and guidelines of the IFA.

### Staff

The project will be undertaken by suitably qualified AW staff. Overall management of will be undertaken by Chris E Smith MIFA.

### Equipment

The project will use a Bartington Grad601 set to standard specifications.

### Timetable of archaeological works

A provisional start date for the survey of Monday 22<sup>nd</sup> September 2014 has been agreed between AW and the client. Work is anticipated to last a total of three weeks on-site.

### Insurance

Archaeology Wales Limited (AW) is an affiliated member of the CBA, and holds Insurance through the CBA insurance service.

### Health and safety

All members of staff will adhere to the requirements of the *Health & Safety at Work Act*, 1974, and the AW Health and Safety Policy.

If AW has sole possession of the site, then AW will produce a detailed Risk Assessment

for approval by the client before any work is undertaken. If another organisation has responsibility for site safety, then AW employees will be briefed on the contents of all existing Risk Assessments, and all other health and safety requirements that may be in place.

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## **APPENDIX III:** Archive Cover Sheet

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# ARCHIVE COVER SHEET

**Tyddyn Cae, Boduan, Gwynedd**

Site Name:	Tyddyn Cae
Site Code:	TCS/14/GEO
PRN:	-
NPRN:	-
SAM:	-
Other Ref No:	Planning Ref C14/0885/33/LL
NGR:	NGR 233465 337785
Site Type:	Green Field
Project Type:	Geophysical Survey
Project Manager:	Chris E Smith
Project Dates:	Sept-Oct 2014
Categories Present:	Modern, Unknown
Location of Original Archive:	AW
Location of duplicate Archives:	RCAHMW
Number of Finds Boxes:	NA
Location of Finds:	NA
Museum Reference:	NA
Copyright:	AW
Restrictions to access:	None

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**Archaeology Wales Limited**

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