
GEOPHYSICAL SURVEY REPORT

Project

BROGAN SOLAR FARM

Location

TALWRN BACH, LLANFYLLIN, POWYS

Client

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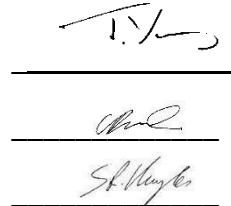
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Archaeology Wales

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1 EXECUTIVE SUMMARY

A magnetic gradiometry survey was conducted at Talwrn Bach, Llanfyllin, Powys (NGR SJ 17648 18931), on behalf of Archaeology Wales. The survey was commissioned as part of the archaeological assessment of the proposed Brogan Solar Farm, a 7 MWp solar energy development by Fuse Renewables Ltd, and was carried out in accordance with a Written Scheme of Investigation (Archaeology Wales Project No. 3247) agreed with the Clwyd-Powys Archaeological Trust.

The survey covered approximately 12.1 hectares across three parcels of agricultural land using a vehicle-towed Sensys Magneto MXV3 multi-sensor array with RTK GNSS positioning. Data quality was good throughout. Subsequent to the completion of the survey, the eastern field was removed from the proposed development area, which now comprises two western fields totalling approximately 9.44 hectares (Plate 2). The full surveyed area is retained in this report to provide a complete record of the geophysical evidence.

The survey identified a range of anomalies of archaeological, agricultural, geological, and modern origin. The site straddles a low ridge of Devensian till flanked by alluvial floodplains, and two palaeochannels were identified from the magnetic data, supplementing the mapped superficial geology.

The principal archaeological features comprise two substantial ditched enclosures (**c**, **d**) in the southern part of the site, a ring-ditch approximately 12 m in diameter (**e**), and several smaller enclosures on the ridge top (**l**, **m**, **n**). A curvilinear enclosure (**o**) was identified on the valley floor. Linear anomalies interpreted as elements of a former field system or trackway (**f**, **g**, **h**, **t**, **u**) extend along the ridge, and a possible lynchet or boundary ditch (**j**) with associated linear features (**i**, **k**) was recorded on the eastern slopes. Ridge-and-furrow cultivation (**p**) is present in the northern part of the survey area.

Additional anomalies of possible archaeological origin include probable field drains in the south-eastern field and a tentative enclosure (**s**) adjacent to the former Llanfyllin Branch Railway. Modern disturbance was limited principally to a service trench in the north-western corner (**b**) and a probable quarry within the glaciofluvial deposits (**a**).

The results indicate that the site has significant archaeological potential, with activity probably spanning from the prehistoric through to the post-medieval period. The archaeological features are concentrated along the ridge between the two river valleys, a topographic setting consistent with the potential identified in the desk-based assessment. The results should inform the mitigation strategy for the proposed development within the reduced 9.44-hectare development area, while the features recorded in the eastern field provide wider landscape context.

2 INTRODUCTION

This report describes a geophysical magnetic gradiometry survey conducted at Talwrn Bach, Llanfyllin, Powys, on behalf of Archaeology Wales. The survey was commissioned as part of the archaeological assessment of the proposed Brogan Solar Farm, a 7 MWp solar energy development by Fuse Renewables Ltd. The geophysical survey forms part of a staged programme of archaeological investigations to inform the planning application for the proposed development.

The proposed development area is located approximately 1 km east of Llanfyllin, Powys, in the vicinity of Talwrn Bach Barn (SY22 5LQ). The geophysical survey covered approximately 12.1 hectares across three separate parcels of greenfield agricultural land. Subsequent to the completion of the survey, the eastern field was removed from the proposed development, which now comprises two western fields totalling approximately 9.44 hectares (Plate 2). The results of the survey across the full 12.1-hectare area are presented in this report.

The fieldwork and this reporting adhere to the standards set out in the Chartered Institute for Archaeologists (CIfA) Standard and Guidance for Archaeological Geophysical Survey (2020) and the Europae Archaeologiae Consilium (EAC) Guidelines for the Use of Geophysics in Archaeology (2016).

The survey was conducted in accordance with a Written Scheme of Investigation (WSI, Archaeology Wales Project No. 3247, March 2026) prepared by Archaeology Wales and agreed with the Clwyd-Powys Archaeological Trust (CPAT).

TerraDat complies with BS EN ISO 9001:2015 for Quality Management, ISO 14001:2004 for Environmental Management, OHSAS 18001 for Health and Safety, and BS 5930:2015 for Site Investigation.

2.1 Site Description

The survey area comprises approximately 12.1 hectares of agricultural land to the east of Llanfyllin, centred on National Grid Reference SJ 17648 18931. The site is bounded to the south by Talwrn Bach, Llanfyllin and to the north-east by the buildings and yard of Talwrn Bach Barn.

Land use at the time of survey was predominantly arable. Access to the site is obtained directly from the B4393, which runs along the western boundary of the proposed development area. The surrounding landscape is predominantly rural, consisting of open agricultural fields bounded by hedgerows and interspersed with dispersed farmsteads.

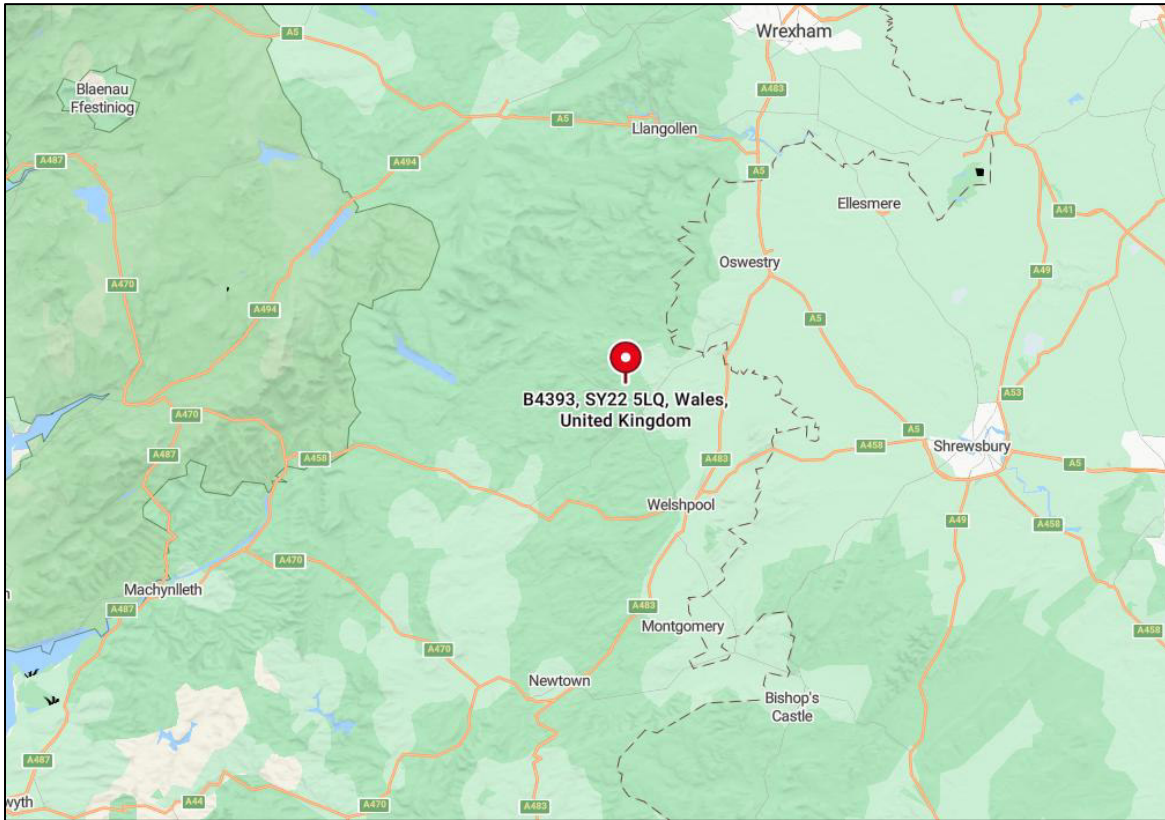


Plate 1: Site Location



Plate 2: Detail of survey area, showing the current proposed development area (red hatching) and the eastern field now excluded from the development (blue hatching).

2.2 Geology

2.2.1 Bedrock Geology

The bedrock geology of the survey area is defined by the Allt-tair-ffynnon Formation, comprising interbedded siltstone and mudstone formed during the Ordovician Period (British Geological Survey, 2025).

2.2.2 Superficial Geology

Superficial deposits vary across the site. The eastern field and the eastern portions of the other fields are underlain by Devensian-age glacial till. The western parts of the site are characterised by alluvial deposits consisting of clay and silt of Quaternary age, while the central northern area is associated with glaciofluvial sand and gravel deposits, also dating to the Quaternary Period (British Geological Survey, 2025).

2.2.3 Effect of Geology on Geophysics

The geology is generally favourable for magnetometer survey. The Ordovician sedimentary bedrock (interbedded siltstones and mudstones of the Allt-tair-ffynnon Formation) typically has low magnetic susceptibility, providing a uniform magnetic background against which features with enhanced magnetism can be detected. The overlying glacial till deposits are similarly of low to moderate magnetic susceptibility.

The principal geophysical consideration at this site is the presence of the former Llanfyllin Branch Railway, which crossed the survey area. Ferrous debris from the railway infrastructure may locally mask or obscure subtler responses from earlier archaeological features. The alluvial deposits in the western part of the site may produce diffuse magnetic anomalies associated with variations in the superficial geology, and the glaciofluvial sand and gravel deposits in the central northern area are likely to generate a distinctive magnetic response at the contact with surrounding deposits.

2.3 Archaeological Background

There are no Scheduled Monuments or other designated heritage assets recorded within the proposed development area. In November 2025, Archaeology Wales carried out a desk-based assessment (DBA) associated with the proposed solar farm (Stratton 2025).

The DBA concluded that no known archaeological remains are recorded within the proposed development area itself, although several heritage assets are present in the wider landscape. Within a 1.5 km search radius, 199 HER records and ten RCAHMW records were identified, representing activity from the prehistoric through to the post-medieval period.

Despite the absence of recorded remains within the site, the assessment identified a degree of archaeological potential. The site appears to have experienced limited ground disturbance and occupies slightly elevated ground between watercourses, a location considered favourable for prehistoric settlement or ritual activity, while medieval agricultural activity is indicated nearby by ridge-and-furrow remains and historic field names. The DBA recommended a geophysical survey to investigate the presence and character of any sub-surface archaeological remains within the proposed development area.

2.4 Survey Objectives

The primary objective of the geophysical survey is to locate and describe any detectable buried archaeological features present within the survey area. The specific objectives are to:

1. Identify and locate areas of archaeological potential within the survey area
2. Characterise the nature and extent of any detected archaeological anomalies
3. Assess the likely significance of identified features within their local and regional context
4. Inform the archaeological mitigation strategy for the proposed development
5. Provide baseline data to support the Environmental Statement

2.5 Quality Control and Archiving

The geophysical data were collected in accordance with the standard operating procedures and quality management system of TerraDat (UK) Ltd. Quality assurance includes checking of survey data by an experienced member of staff, high-level review for overall suitability and quality, compliance with ClfA standards and guidance, data quality and integrity checks, and accurate interpretation and reporting. On completion of the survey, the data were downloaded from the survey instruments and subject to quality checks before processing. TerraDat's quality control standards are BS EN ISO 9001:2015 certified. Final interpretation and quality control have been undertaken by Dr Tim Young of GeoArch.

All data created during the survey will be prepared for archiving in line with the guidance contained in the Archaeology Data Service (ADS) publication *Geophysical Data in Archaeology: A Guide to Good Practice* (Schmidt and Ernenwein, 2013) and Cadw's *Standards and Guidance for the Collection, Documentation, Conservation and Research of Archaeological Archives in Wales*. The finalised report will be supplied to Archaeology Wales for onward submission to Heneb: The Trust for Welsh Archaeology for inclusion in the Regional Historic Environment Record (HRER) for Powys.

3 SURVEY DESCRIPTION

3.1 Non-technical summary

TerraDat conducted the magnetic gradiometry survey of the site using a specialised vehicle-mounted system. The equipment consists of eight magnetic sensors mounted on a non-magnetic trailer, spaced half a metre apart, towed behind an all-terrain vehicle (ATV) at approximately 15 km/h.

The survey works by measuring magnetic gradiometry (the vertical gradient of the Earth's magnetic field, using two sensors positioned one above the other) across the survey area.

Ferromagnetism – exhibited by ferrous metal objects, which typically produce strong positive and negative magnetic responses appearing as distinct black and white dots on the survey plots. Accumulations of iron objects, such as former wire fences or demolition debris, create a characteristic speckled appearance.

Remanent magnetism – a permanent magnetic field acquired when heated materials cool, seen in hearths, kilns, and ceramic building materials (CBM). Spreads of brick rubble produce lower-amplitude speckled responses.

Magnetic susceptibility – the most important property for archaeological prospection. Weathering and human activity (particularly heating) enhance soil magnetic susceptibility. Filled ditches and pits typically appear as positive anomalies; stone structures usually show negative anomalies.

Precise positioning was maintained throughout the survey using a GPS system, allowing centimetre-level accuracy.

The survey covered the entire field by driving parallel lines across it, ensuring full coverage of the survey area.

After fieldwork, the raw data underwent several processing steps to remove noise and enhance the geophysical signal before interpretation.

3.2 Topographic survey/grid layout

The SENSYS MAGNETO MXV3 data acquisition is controlled by proprietary software MONMX, which provides a real-time graphical display of ground coverage based on the RTK GPS system mounted on the trailer. Traverses are driven to provide minimal overlap and minimal gaps between passes, as straight as is reasonably practicable, until the entire survey area is covered. Headland files are subsequently acquired at field edges to ensure maximum coverage.

3.3 Positional control

Survey data were acquired using a Carlson BRx7 multi-frequency GNSS receiver operating in RTK mode with network corrections from TopNET, delivered via a cellular connection in RTCM 3.2 format. The receiver tracked GPS, GLONASS, Galileo, and BeiDou signals across 800+ channels, achieving horizontal positional accuracy of 8 mm + 1 ppm RMS. All measurements were recorded in WGS84 and subsequently transformed to OSGB36 National Grid (EPSG:27700) during post-processing.

3.4 Magnetic survey

Magnetic surveys are designed to exploit the subtle deviation in the Earth's magnetic field caused by variable magnetic properties in the subsurface. The recorded data value is the magnetic gradient – the difference in magnetic field strength recorded by two vertically separated fluxgate magnetometers.

A plan image showing the variation in the magnetic gradient of the site survey area is produced. Based on the recorded magnetic variation, it is possible to identify buried features such as walls, hearths, kilns, ditches, and pits.

3.4.1 Magnetic survey - field activity

The magnetic gradiometry data were acquired using an 8-probe multi-sensor array (fluxgate gradiometer probes at 0.5 m sensor separation) mounted on a specialist modular non-magnetic platform (Sensys Magneto MXV3; Plate 5). Network-corrected RTK GPS provides real-time positioning. The trailer is towed across the survey area behind an ATV at approximately 15 km/h, enabling the acquisition of 0.5 m horizontal-resolution gradiometry data within a 3.5 m-wide swath. Data were acquired at 100 Hz, providing a nominal along-traverse spacing of 0.025 m.

Coverage of all accessible land within the survey boundary was achieved.



Plate 5: ATV and Sensys Magneto MXV3 (library photograph).

3.4.2 Magnetic survey - data processing

The gradiometry data were acquired using SENSYS' proprietary software MONMX, which produces a data file for each survey line. These files are compiled in DLMGPS, which associates each data point with a GPS coordinate calculated for each sensor within the array, creating a single swathe of data up to 3.5 m wide. The software applies a constant median filter to normalise data within each swathe; data are then exported as raw ASCII files.

The ASCII files output from DLMGPS are further processed using TerraDat's proprietary software, MultiMag (Plate 6), to remove poor-quality data and to apply 50 Hz and rolling median filters. The 50 Hz filter removes artefacts principally associated with electrical power lines; the median filter equalises the background across swathes, removing apparent striping. Plate 7 shows an example of raw data alongside filtered data. Table 1 outlines the processing steps applied.

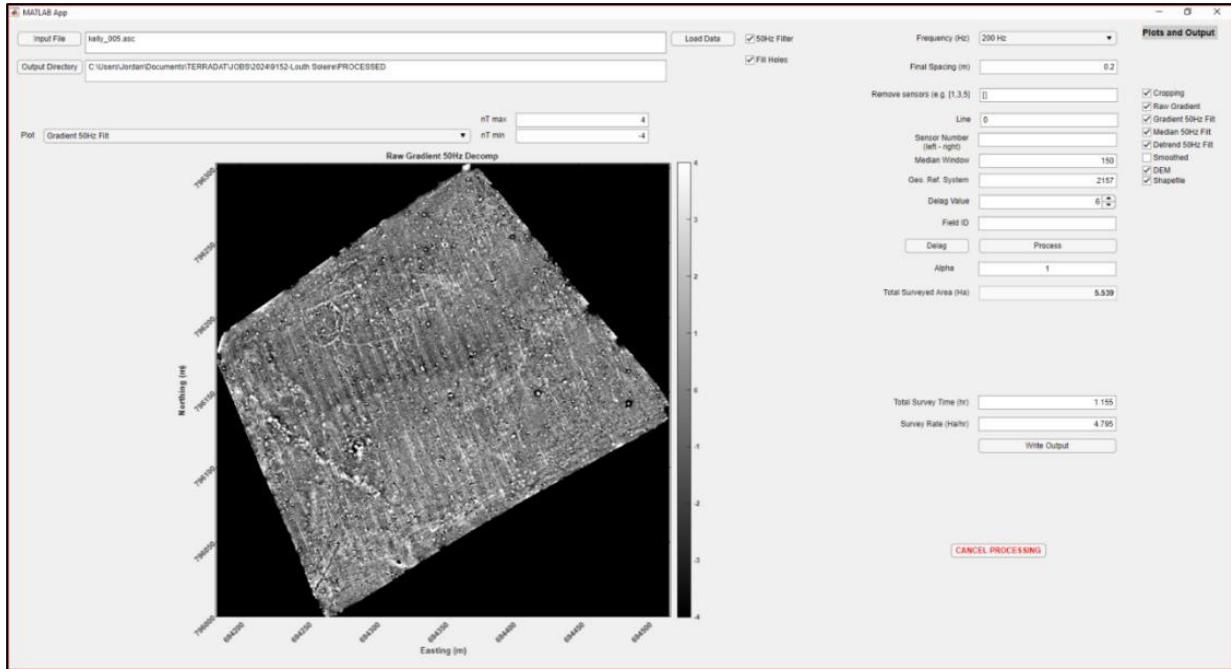


Plate 6: TerraDat proprietary software MultiMag.

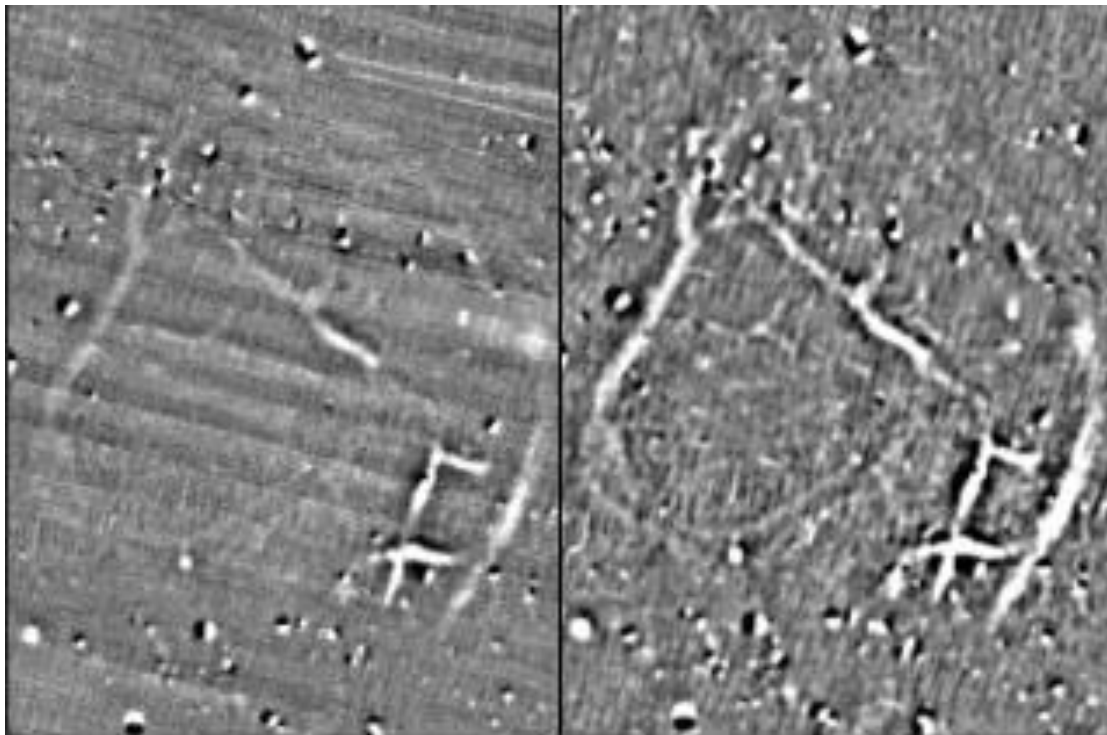


Plate 7: Raw data (left) and filtered data (right).

Processing Step	Description
Raw data input	Raw data (.asc) file is imported and X,Y,Z,gradient,Time_stamp,sensor columns retained. All other columns removed.
Truncate Time_Stamp	Alphanumeric Time_stamp is truncated to last digits to create unique IDs for each line.
Create line_number	Variable 'line_number' (1 to #lines) created by identifying all unique Time_stamp values.
Rolling median	The median filter is calculated per line, per sensor, on values within ± 20 nT and removed from the gradient to create a new 'GM' column. Window length 400 data points (~10 m), centred on the input value.
Filter 50 Hz noise	50 Hz noise from electrical utilities removed through wavelet analysis, signal decomposition, and a 50 Hz Bandstop filter. Multiple combinations of median and 50 Hz filters created for comparison.
Calculate mean spacing	Mean along-track spacing is calculated.
Thin data	Data thinned to the specified output resolution using the calculated mean spacing.
Crop overlapping data	Bounding polygons calculated around each line. Data within reverse-ordered overlapping polygons removed.
Display data	Thinned and cropped data are plotted together with 50 Hz filtered and median-filtered data.
Write output file	Output file written: X,Y,Z,gradient,Time_stamp,sensor,Gm,G50,G50M,linenum,G50BS,G50BSM.
Write output GPS	Output X,Y,Z GPS file written using centre (actual GPS) data.

Table 1: Processing steps applied to the raw magnetic gradiometry data

The magnetic gradiometry data are output as raw and filtered 'XYZ' files in CSV format. These files are gridded in Oasis Montaj using minimum-curvature gridding with a 0.125 m grid cell size, exported as 900 DPI GeoTIFF images, and then imported into QGIS. Features of interest are digitised to produce summary archaeological interpretation plans. Final figures are produced in Inkscape; SHP files are included with the report.

4 RESULTS AND DISCUSSION

The final processed magnetometry data are of good quality. Minor data gaps exist where adjacent traverses failed to overlap properly. These gaps constitute only a small percentage of the total survey area and do not compromise the overall integrity of the results.

The data are presented as grey-scaled plots showing variations in magnetic gradient intensity. Positive values appear white and negative values appear black. Both raw and processed data are included to support interpretation, presented at a scale of ± 4 nT. Figures are presented at 1:2000 when printed at A3.

Grid references in the results section are marked with letter codes corresponding to labelled locations on the figures.

The results are presented in two complementary forms to facilitate both objective and interpretive assessment of the magnetic data.

Transcription plots (Figure 3) present the geophysical data categorised by geophysical character, as shown in the key in Plate 8. These provide an objective representation of the magnetic response, allowing assessment of anomalies based solely on their geophysical properties.

Summary archaeological interpretive plots (Figure 4) group anomalies according to their interpreted archaeological origin, using the key shown in Plate 9. These plots synthesise the geophysical evidence with archaeological knowledge, assigning probable origins and periods to detected features where sufficient diagnostic characteristics are present. They are also presented overlaid on the site's topography, derived from GPS data collected during the magnetometry survey, to allow the features to be appreciated in their topographic context (Figure 5).

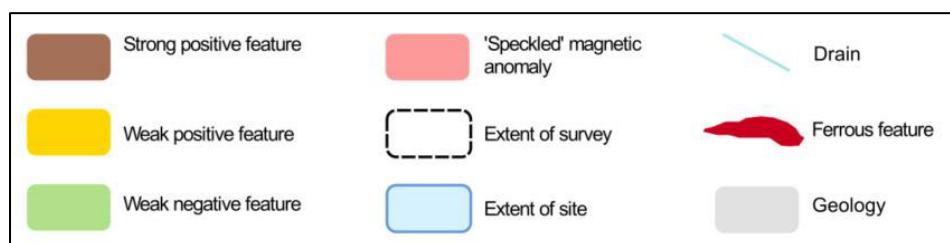


Plate 8: Legend to be used in conjunction with the transcription plots.

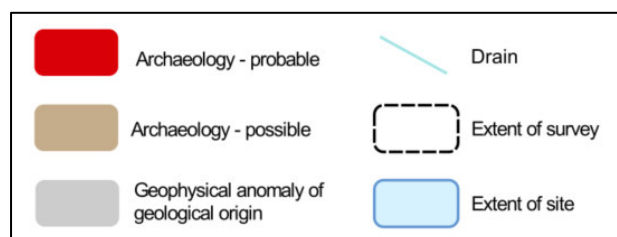


Plate 9: Legend to be used in conjunction with the interpretive plots.

4.1 Magnetic gradiometry

Magnetic gradiometry (measurement of the vertical gradient of the Earth's magnetic field, using two sensors positioned one above the other at 1.0 m separation) developed from single-sensor magnetometry to free magnetic surveys from the constraint of requiring base-station measurements to compensate for diurnal variation in field strength.

The identified magnetic anomalies (areas where the magnetic gradient deviates from the typical site background) may result from **ferromagnetism** (exhibited by ferrous metal objects), **remanent magnetism** (a permanent magnetic field acquired during the cooling of heated objects, seen in hearths, kilns, and ceramic building material [CBM]), or **magnetic susceptibility** ([MS] – the temporary sympathetic magnetic field generated by a body in an ambient field).

Weathering typically elevates magnetic susceptibility, so soils have a higher MS than their parent rock; anthropogenic processes (particularly heating) may further enhance MS. The fills of archaeological cut features, therefore, typically show higher MS than the surrounding substrate and appear as positive anomalies. Stone structures usually show negative anomalies.

Ferrous materials typically produce strong but spatially limited anomalies. Accumulations of iron objects generate a speckled appearance typical of demolition debris or former wire fences. CBM produces textures similar to, but lower in amplitude than, the speckled textures.

5 GEOPHYSICAL INTERPRETATION

5.1 General

The site straddles a low ridge underlain by Devensian till, dropping either side to alluvium (of the Afon Cain to the northwest and the Brogan to the southeast). Within the floodplain of the Afon Cain, there is a small outcrop of Devensian glaciofluvial deposits.

The magnetometry survey adds to the BGS-mapped geology by identifying two palaeochannels, flowing either side of the glaciofluvial gravels. The western channel shows a marked negative magnetic anomaly down its centre in the northern part of the survey area, possibly indicating that it survived as a narrow stream or ditch after the channel's abandonment. The eastern runs along the foot of the slope of the till ridge.

The mapped outcrop of the glaciofluvial deposits lies on a topographic high and exhibits a marked peripheral magnetic anomaly associated with the lithological change. A strong anomaly within the outcrop (**a**) corresponds to a hollow and cropmark; it is likely that this corresponds to a small quarry.

Moderately strong irregular anomalies on the flood plain just to the north of this suggest that the glaciofluvial deposits reach the surface over a larger area than the topographic feature, although the northernmost of these corresponds with a point where aerial images suggest there may have been modern soil dumping into an area within the former palaeochannel that is prone to flooding.

Cartographic evidence suggests a high degree of stability of the field system from the Tithe Map of the 1840s onwards. However, the Llanfyllin Branch railway was constructed across the area, opening in 1863. This necessitated some minor changes to the field boundaries. Later, during the 20th century, the large field in the northwest of the survey area was created through the amalgamation of two pre-existing fields. None of these various removed field boundaries has any geophysical expression. The fields show a strong modern agricultural lineation from ploughing.

The northwestern corner (**b**) of the survey shows some strong magnetic anomalies, suggesting the spreading of material of high magnetic susceptibility by ploughing. The hedge is disrupted at this point, and there is a service trench through the adjacent road surface. These anomalies are interpreted as the result of recent work on a service.

5.2 Anomalies interpreted to be associated with archaeological features

This section describes anomalies associated with features likely to be of archaeological interest, from south to north.

In the southwest of the area, a substantial positive magnetic anomaly (**c**) marks a ditch approximately 3.5m wide, with a fill of high magnetic susceptibility, suggesting a significant

component from occupation or industrial activity. The ditch runs on a NNW – SSE course and is interrupted by a 4m-wide entrance (centred upon [317456, 318749]). Two small positive magnetic anomalies lie on the SW side of the entrance, possibly indicating gateposts.

On the northeast side of the entrance, a narrow (1m) ditch is suggested by a linear positive magnetic anomaly. This passes from the south side of the entrance outwards towards the north, then runs 9m from the large ditch, parallel to it, towards the palaeochannel.

A second substantial ditched enclosure (**d**) lies 80m to the northeast of (**c**). To the southwest of this enclosure, the main ditch is 2.5m wide and has a second narrow feature outside it. These pass downslope for 38m. Again, the anomaly is very strong, at least in its southwest. The enclosure ditch continues along the margin of the palaeochannel for almost 90m before turning back up the slope, probably reappearing to the southeast of the former railway line, 72m from the palaeochannel. There are some minor positive magnetic anomalies within the enclosure, but it is unclear if these are of archaeological origin.

To the east of this enclosure lies an annular positive magnetic anomaly (**e**), suggestive of a ring-ditch 12m in diameter, 1m in width, centred upon [317689, 318794] and possibly open to the southeast. The east side shows a few particularly strong anomalies on the line of the ditch. A ferrous anomaly, possibly coincidentally, lies at the centre of the ring-ditch. Some very low-amplitude anomalies, only just above background, provide a suggestion of the northern side of a possible concentric anomaly 7.5m outside the main ring-ditch.

To the west of the railway line, extensive but extremely low amplitude linear magnetic anomalies appear to define elements of a field system or trackway. Narrow anomaly (**f**) runs from the east side of enclosure (**d**) at [317620, 318817] to [317747, 318908], where it turns northwest to cross the eastern palaeochannel and the anomaly is lost just northwest of it. A parallel similar anomaly is seen for a short distance at [317665.4, 318840.5] (**g**) and may form the opposing side of a trackway, which becomes more visible as anomaly (**h**), running northwest from [317764, 318916] parallel to (**f**) to [317731, 318960] where it turns northeast to [317784, 319056].

Linear anomalies of similar character are also seen further west, (**t**) and (**u**).

A strong linear positive anomaly (**j**) lies low on the ground towards the Brogan, running between [317730, 318700] and [317875, 318780]. Although such an anomaly would normally be interpreted as a cut feature, it is also possible that it represents a ploughed-out lynchet similar to those occurring to the northeast, outside the survey area.

A prominent but discontinuous and slightly diffuse positive magnetic anomaly (**i**) that runs north and southwest from feature (**j**). This probably represents a discontinuous archaeological feature – such as a grubbed-out hedge-line. A somewhat similar anomaly (**k**) runs to the southeast of feature (**j**). These three features may have functioned together as part of a former system of field division.

On the ridge top at (*l*) narrow, but high-amplitude positive magnetic anomalies appear to form parts of two sides of an enclosure. There are two parallel anomalies, each 1m wide or slightly less, approximately 4m apart, to the north, but only one to the west. The enclosed area contains several very strong monopolar point anomalies, which may indicate pits. This site is centred at [317780, 318930]. 30m northeast of (*l*) a cluster of similar, very narrow, but high amplitude anomalies (*m*) suggest another small enclosure 30m across. To the southeast of (*l*), in the north corner of the southeast field ([317785, 318875]), perpendicular linear positive anomalies may define one corner of an enclosure at (*n*). The orientation of the west side of this possible enclosure is close to that of the west side of (*l*) and thus the two may be related.

On the valley floor to the northwest, a partial curvilinear enclosure appears as a narrow (up to 1m), very low-amplitude positive anomaly (*o*), centred upon [317662, 319034]. It measures approximately 28m east-west; the south side is not imaged.

To the north of the apparent termination of trackway (*h*), a zone of approximately east-west ridge and furrow cultivation is imaged by slight positive magnetic anomalies (*p*). The furrows are on an approximately 7m spacing and show the characteristic 'reverse-S' shape in plan. The eastern headland probably lies immediately west of the eastern palaeochannel.

In the northeast of the survey there are two small, semicircular areas of positive magnetic anomaly (*q*) close to the northern margin of the field. These lie near a small, semi-circular, divided section of the field on the Tithe Map that is suggestive of a pond. These two features are accordingly tentatively interpreted as infilled ponds.

5.3 Anomalies interpreted to be of possible archaeological origin

This section describes anomalies associated with features of lower amplitude and less certain archaeological origin, discussed from south to north.

Monopolar anomalies are present across the site. While these may be associated with archaeological features (particularly pits), most are likely of geological origin associated with magnetic stone clasts within the soil/subsoil.

Low-amplitude linear positive anomalies of great lateral extent and mostly rather straight in plan occur widely in the field in the southeast of the site. These are interpreted, with some qualification, as drains. Their uniform positive sense suggests that they may be cut features filled with a material of slightly raised magnetic susceptibility, so they are likely to be French drains. They typically occur in sets with a spacing of approximately 10m between. In general, the examples in the northwest part of the field are slightly arcuate but approximately east-west, whereas those in the southeastern part of the field are straighter and more northwest-southeast oriented. Such groups of slightly arcuate drains may often be associated with drains laid in the furrows of areas of former ridge and furrow cultivation, and such may be the case here.

To the north of **(i)**, there is a very dubious curvilinear anomaly set **(r)** that might just define an arcuate feature centred upon [317791.3E, 318813.5N] and 20m across. These anomalies are barely, if at all, above background variation, but might just be interpretable as being of archaeological origin.

Along the margins of the former railway line, there are various low-amplitude anomalies, whose distinctiveness is often obscured by noisy data at the edges of the fields. A positive magnetic anomaly, suggestive of parts of three sides of a square feature 8m across, centred upon [317687, 318820], is possibly of archaeological origin **(s)**.

5.4 Summary and discussion

The site shows abundant archaeological features that are probably indicative of the evolution of land use from prehistoric to modern. It embraces a river floodplain with two palaeochannels in the west and a central ridge and lower ground on the east.

The probable early activity is mainly concentrated along the ridge between the river valleys – a line later followed by the Llanfyllin Branch Railway. Two substantial enclosures exist towards the south (**(c)** and **(d)**), a ring-ditch **(e)** slightly further north and smaller enclosures (**(l)**, **(m)** and **(n)**) towards the north. One possible curvilinear enclosure also exists in the river floodplain **(o)**.

Elements of a field system, including a possible lynchet (**(i)**, **(j)** and **(k)**), lie on the eastern slopes of the ridge, where the pattern of probable field drains hints at the possible former presence of ridge-and-furrow ploughing. A more certain example of ridge-and-furrow cultivation occurs in the north of the area **(p)**. This area may have been accessed by a track, including features **(f)**, **(g)** and **(h)**, that runs northeast along the ridge before descending to the floodplain and dog-legging across the eastern palaeochannel. Other minor linear anomalies resemble those of the trackway and may define associated land divisions (**(t)** and **(u)**).

More recent activity may be evidenced by a possible quarry **(a)** and ponds **(q)**.

The current proposed development area of 9.44 hectares encompasses the two western fields. The principal archaeological features – including the two ditched enclosures **(c)**, **(d)**, the ring-ditch **(e)**, the ridge-top enclosures **(l)**, **(m)**, the curvilinear enclosure **(o)**, and the ridge-and-furrow **(p)** – all fall within or immediately adjacent to the current development boundary. Features recorded in the eastern field, including the possible lynchet and associated linear features **(i)**, **(j)**, **(k)**, enclosure **(n)**, and probable field drains, provide additional landscape context but lie outside the current development area.

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Disclaimer

This report represents an interpretive assessment of the geophysical data. It is intended to guide follow-up investigation. Features that do not produce measurable geophysical anomalies, or that are masked by other features, may remain undetected. Geophysical surveys complement invasive and destructive methods; they do not represent all ground conditions within the surveyed area.

Appendices

Appendix a: Glossary

A

Anomaly: A deviation from the expected background geophysical reading that may indicate the presence of buried features, geological variations, or modern disturbance.

ATV: All-Terrain Vehicle — in this survey, a John Deere Gator was used to tow the magnetometer array.

B

Background signal: The typical magnetic reading for an area, against which anomalies are identified and interpreted.

BGS: British Geological Survey — the UK's national geological survey organisation.

C

CBM: Ceramic Building Material — fragments of brick, tile, or other fired clay that retain magnetic properties.

CifA: Chartered Institute for Archaeologists — the professional body setting standards for archaeological work in the UK.

CPAT: Clwyd-Powys Archaeological Trust — the regional curatorial advisor for this project.

D

DLMGPS: Proprietary SENSYS software that compiles raw MONMX data files, associates each data point with a GPS coordinate calculated for each sensor within the array, and exports the combined dataset as ASCII files for further processing in MultiMag.

DTM: Digital Terrain Model — computer representation of ground surface elevation derived from survey data.

E

EAC: Europae Archaeologiae Consilium — European archaeological organisation providing professional guidelines for geophysical surveys.

F

Ferromagnetism: Strong magnetic property exhibited by iron and steel objects, producing distinctive dipolar anomalies in magnetic surveys.

Fluxgate gradiometer: Instrument used to measure magnetic field gradients, consisting of two vertically separated magnetic sensors.

G

GNSS: Global Navigation Satellite System — collective term for satellite-based positioning systems including GPS (USA), GLONASS (Russia), Galileo (EU), and BeiDou (China). The Carlson BRx7 receiver used in this survey tracked signals from all four constellations to achieve centimetre-level positioning accuracy.

Gradiometry: Measurement of the difference in magnetic field strength between two vertically separated points, used to detect buried features.

H

HRER: Regional Historic Environment Record — maintained by Heneb: The Trust for Welsh Archaeology.

M

Magnetic gradient: The rate of change of magnetic field strength with distance, measured in nanotesla per metre (nT/m).

Magnetic susceptibility (MS): A measure of how easily a material becomes magnetised in response to an applied magnetic field; enhanced by weathering and heating.

Magnetometry: Geophysical technique measuring variations in the Earth's magnetic field to detect buried features.

MONMX: Proprietary SENSYS software controlling data acquisition from the MAGNETO MXV3 system.

Monopolar anomaly: A magnetic anomaly characterised by a single positive peak with little or no associated negative component. In archaeological contexts, monopolar anomalies are typically produced by pits, hearths, furnaces, or other features containing thermally enhanced or magnetically susceptible fills.

MultiMag: TerraDat's proprietary software used for processing magnetic gradiometry data.

N

Nanotesla (nT): Unit of magnetic field strength used in archaeological geophysics.

O

Oasis Montaj: Commercial geophysical data processing and visualisation software (Seequent/Geosoft) used in this survey to grid XYZ data files using minimum curvature interpolation and to export GeoTIFF images for import into QGIS.

OSGB36: Ordnance Survey Great Britain coordinate reference system (EPSG:27700), used for all positional data.

Q

QGIS: Open-source Geographic Information System software used to import georeferenced survey data, digitise anomalies, and produce final interpretation figures.

R

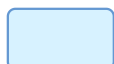
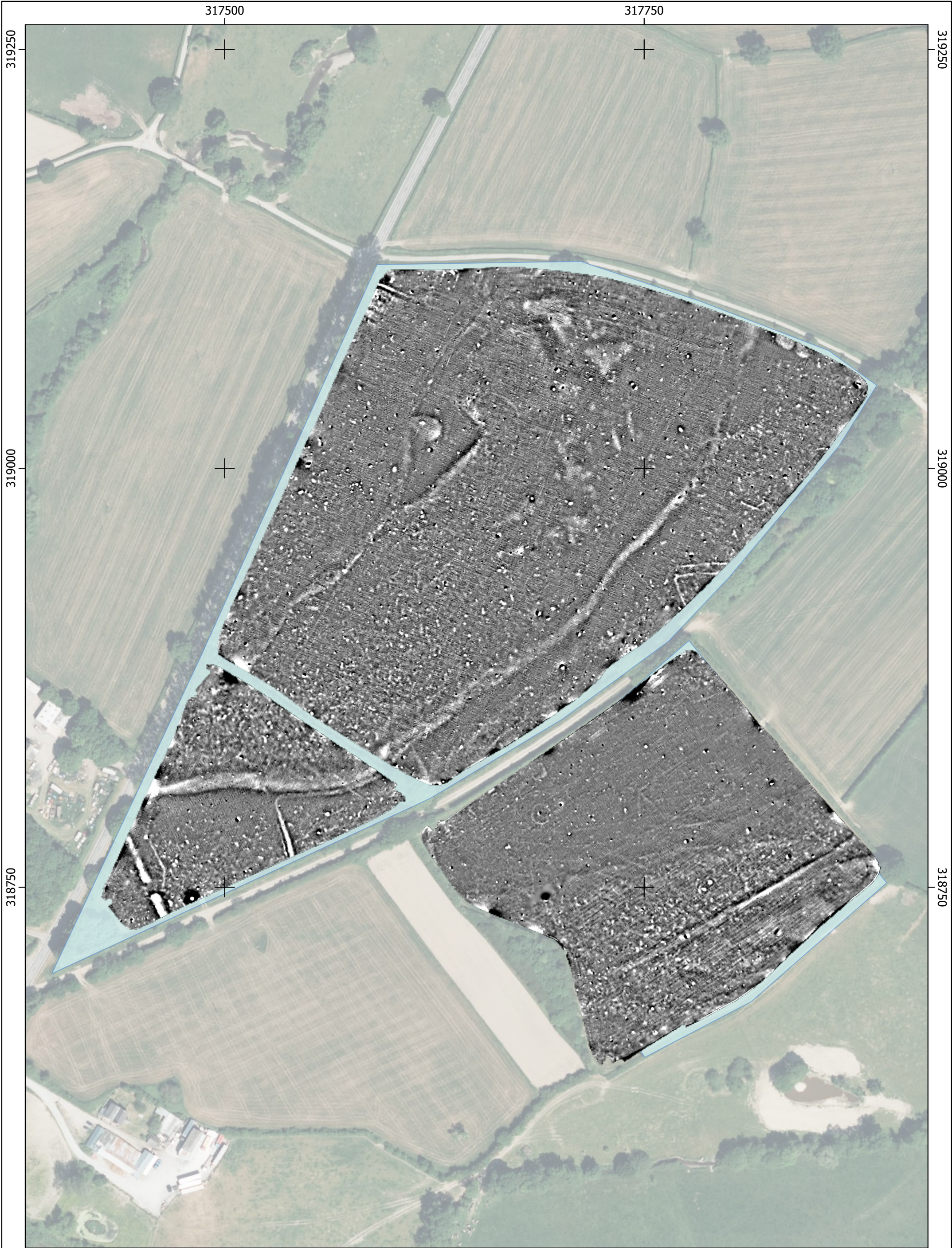
Remanent magnetism: Permanent magnetisation retained by materials after exposure to heat or strong magnetic fields.

RTK GPS: Real-Time Kinematic GPS — high-precision positioning achieving centimetre-level accuracy.

W

WSI: Written Scheme of Investigation — document outlining proposed archaeological methodology and standards (Archaeology Wales Project No. 3247, March 2026).

Figures



Extent of site

Magnetic Gradient (nT)



-4

4

Title:
PROCESSED MAGNETIC GRADIOMETRY
DATA PRESENTED AT +4 NT

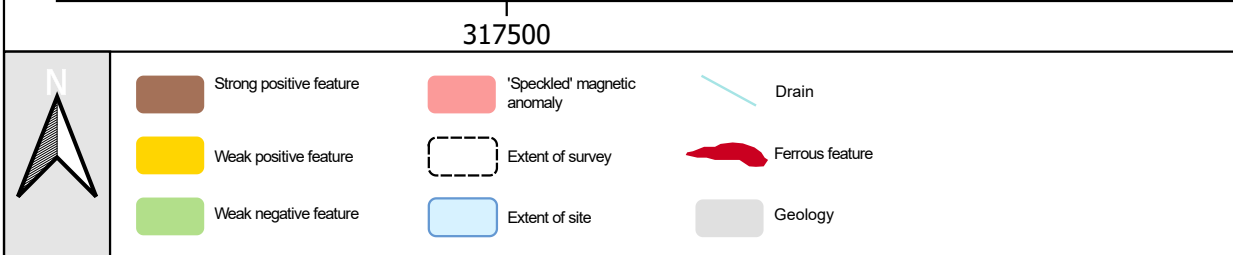


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Project:
BROGAN SOLAR FARM

Scale: 1:2000 at A3
Drawn by/Ref: CB/9917/2
Date: 02/04/2026

FIGURE 2



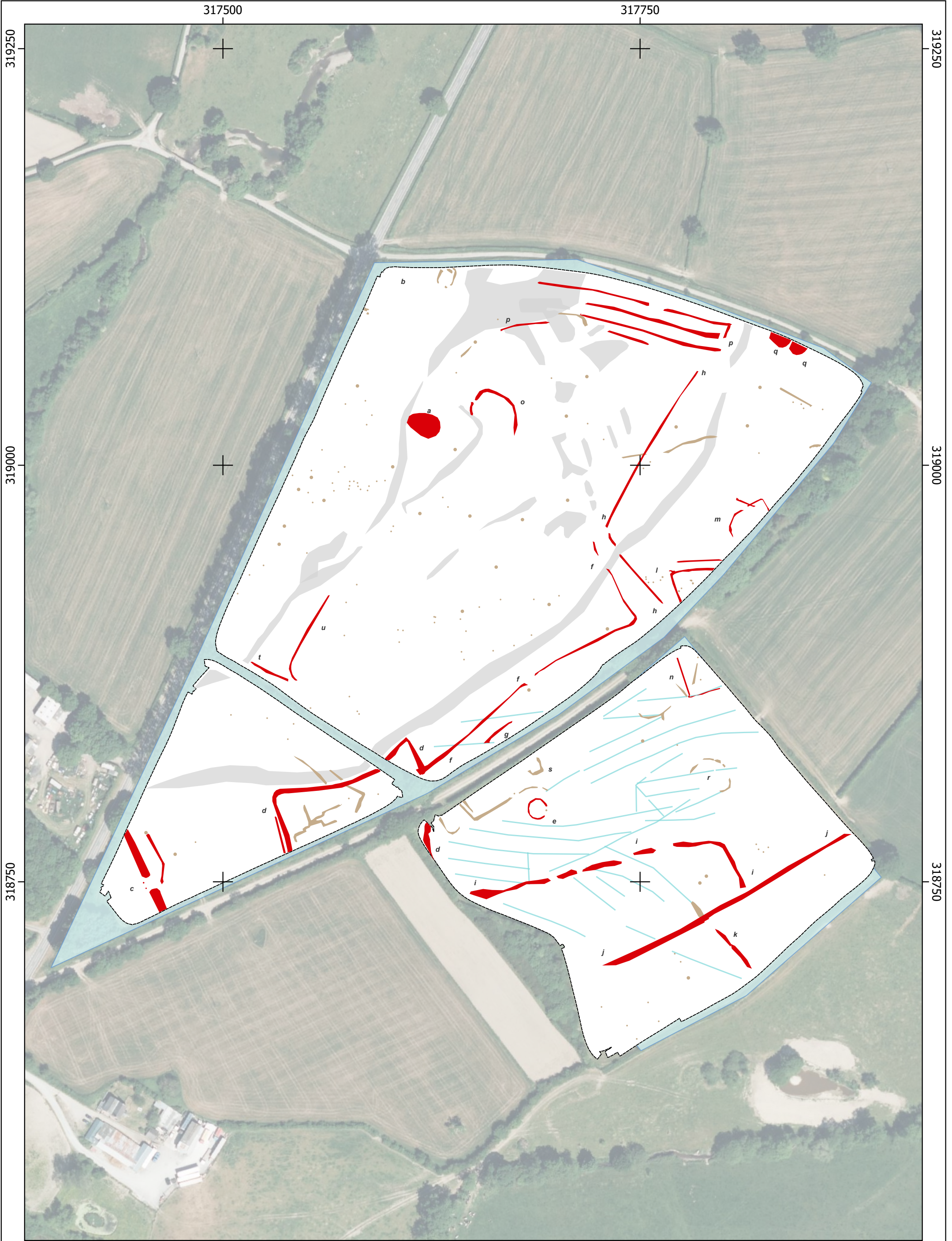
Title:
TRANSCRIPTION OF GEOPHYSICAL ANOMALIES

Project:
BROGAN SOLAR FARM

TERRA DAT Earth & Earth Geophysics Tel: +44 (0) 2920 700127
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Scale: 1:2000 at A3
Drawn by/Ref: CB/9917/3
Date: 02/04/2026

FIGURE 3



- Archaeology - probable
- Archaeology - possible
- Geophysical anomaly of geological origin
- Drain
- Extent of survey
- Extent of site

Title:
SUMMARY ARCHAEOLOGICAL INTERPRETATION

Project:
BROGAN SOLAR FARM

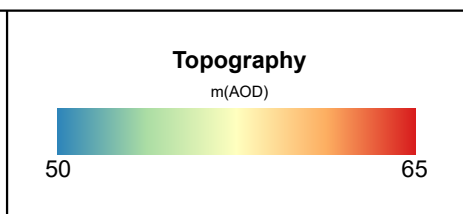
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 Email: web@terra-dat.co.uk

Scale: 1:2000 at A3
 Drawn by/Ref: CB/9917/4
 Date: 02/04/2026

FIGURE 4



	Archaeology - probable	Drain
	Archaeology - possible	Extent of survey
	Geophysical anomaly of geological origin	Extent of site



Title:
SUMMARY ARCHAEOLOGICAL
INTERPRETATION WITH TOPOGRAPHY

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	Scale: 1:2000 at A3 Drawn by/Ref: CB/9917/5 Date: 02/04/2026

FIGURE 5