Environmental Statement

Appendix 9.2: Geophysical Survey Report

Land at Lower Berse Farm, Wrexham

On behalf of Redrow Homes Ltd

July 2024



magnitude surveys

Geophysical Survey Report

of

Land at Ruthin Road

Wrexham

For

Heritage Archaeology

Magnitude Surveys Ref: MSSJ1452

HER Event Number: TBC

OASIS Number: TBC

December 2022

magnitude surveys

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Abstract

Magnitude Surveys was commissioned to assess the subsurface archaeological potential of a c. 74.5ha of land at Ruthin Road, Wrexham, Wales. A fluxgate gradiometer survey was successfully completed across the survey area. Both probable and possible archaeological activity have been identified, with anomalies of linear and curvilinear morphology suggestive of ditches and enclosures present. Agricultural features including possible agricultural buildings, historic extraction, ridge and furrow cultivation, former mapped and unmapped field boundaries, modern ploughing and drains have also been identified. Natural deposits are present throughout the survey area and likely reflect changes in the underlying geology. Some anomalies classified as 'Undetermined' were identified within the survey area and archaeological interpretations for these cannot be excluded. The impact of modern activity on the site is limited to magnetic interference around field perimeters and that caused by pylons, telegraph poles, masts and footings and buried services.

Haniaethol

Comisiynwyd Magnitude Surveys i asesu potensial archaeolegol o dan yr wyneb tua 74.5ha o dir oddi ar Ffordd Rhuthun, Wrecsam, Cymru. Llwyddwyd i gynnal arolwg â theclyn mesur fflwcs magnetig (fluxgate gradiometer) ar draws ardal yr arolwg. Mae gweithgareddau archaeolegol tebygol a phosibl wedi cael eu nodi, gydag anomaleddau o forffoleg llinol a cromlinog yn awgrymu ffosydd a chlostiroedd. Mae nodweddion amaethyddol gan gynnwys adeiladau amaethyddol posibl, echdynnu hanesyddol, amaethu cefnen a rhych, hen ffiniau caeau wedi'u mapio a heb eu mapio, ac aredig a draeniau modern hefyd wedi cael eu nodi. Mae dyddodion naturiol yn bresennol drwy ardal yr arolwg ac maent yn debygol o adlewyrchu newidiadau yn y ddaearegwaelodol. Nodwyd rhai anghysonderau a ddosbarthwyd fel rhai 'amhenodol' yn ardal yr arolwg ac ni ellir eithrio dehongliadau archaeolegol ar gyfer y rhain. Mae effaith gweithgarwch modern ar y safle wedi'i chyfyngu i ymyriant magnetig o amgylch perimedrau caeau a'r hyn a achosir gan beilonau, polion telegraff, mastiau a sylfeini a gwasanaethau wedi'u claddu.

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1. Introduction

1.1. Magnitude Surveys Ltd (MS) was commissioned by Heritage Archaeology on to undertake a geophysical survey over a c. 74.5ha area of land at Ruthin Road, Wrexham, Wales (SJ 31219 50082).

1.2. The geophysical survey comprised quad-towed, cart-mounted and hand-carried GNSS-positioned fluxgate gradiometer surveys. Magnetic survey is the standard primary geophysical method for archaeological applications in the UK due to its ability to detect a range of different features. The technique is particularly suited for detecting fired or magnetically enhanced features, such as ditches, pits, kilns, sunken featured buildings (SFBs) and industrial activity (David *et al*., 2008).

1.3. The survey was conducted in line with the current best practice guidelines produced by Historic England (David *et al*., 2008), the Chartered Institute for Archaeologists (CIfA, 2020) and the European Archaeological Council (Schmidt *et al.,* 2015).

1.4. It was conducted in line with a WSI produced by MS (Dyulgerski, 2022).

1.5. The survey commenced on 24th October 2022 and took five days to complete.

2. Quality Assurance

2.1. Magnitude Surveys is a Registered Organisation of the Chartered Institute for Archaeologists (CIfA), the chartered UK body for archaeologists, and a corporate member of ISAP (International Society for Archaeological Prospection).

2.2. The directors of MS are involved in cutting edge research and the development of guidance/policy. Specifically, Dr Chrys Harris has a PhD in archaeological geophysics from the University of Bradford, is a Member of CIfA and is the Vice-Chair of the International Society for Archaeological Prospection (ISAP); Finnegan Pope-Carter has an MSc in archaeological geophysics and is a Fellow of the London Geological Society, as well as a member of GeoSIG (CIfA Geophysics Special Interest Group); Dr Paul Johnson has a PhD in archaeology from the University of Southampton, is a Fellow of the Society of Antiquaries of London and a Member of CIfA, has been a member of the ISAP Management Committee since 2015, and is currently the nominated representative for the EAA Archaeological Prospection Community to the board of the European Archaeological Association.

2.3. All MS managers, field and office staff have degree qualifications relevant to archaeology or geophysics and/or field experience.

3. Objectives

3.1. The objective of this geophysical survey was to assess the subsurface archaeological potential of the survey area.

4. Geographic Background

4.1. The survey area was located c. 1.5km southwest of Wrexham (Figure 1). Gradiometer survey was undertaken across 17 fields under arable cultivation and pasture. The survey area is bordered by the A483 to the west, the A525 to the north, Homestead Lane to the east and the B5099 to the south. (Figure 2).

4.2. Survey considerations:

Survey Area	Ground Conditions	Further Notes
1	The survey area consisted of a pasture that sloped down in all directions from the centre of the survey area.	The survey area was surrounded on all sides by hedgerows. A mound of earth was located in the centre of the western border. A line of telegraph poles and overhead cables was orientated east to west across the southern border, with another line extending northwest to southeast out of this.
2	The survey area consisted of a pasture that sloped down to the east.	The survey area was surrounded on all sides by hedges and trees. A stable was located in the southwestern corner of the survey area. Feeding troughs were located in the south of the survey area.
3	The survey area consisted of a pasture that sloped down to the southeast.	The survey area was surrounded on all sides by hedgerows. A line of telegraph poles and overhead cables was orientated east to west across the southern end of the survey area.
4	Descoped	Descoped
5	The survey area consisted of a pasture that sloped down to the south.	The survey area was surrounded on all sides by hedgerows. The southern border consisted of barbed wire. A line of pylons and overhead cables was orientated east to west across the centre of the survey area.
6	Descoped	Descoped
7	The survey area consisted of a pasture that sloped down in all directions from the centre of the survey area.	The survey area was surrounded on all sides by hedgerows. A line of pylons and overhead cables was orientated north to south across the western end of the survey area.
8	Descoped	Descoped
9	The survey area consisted of an undulating field under arable cultivation.	The survey area was surrounded on all sides by hedgerows and barbed wire. A line of pylons and overhead cables was orientated north to south across the centre of the survey area.
10	The survey area consisted of a field under arable cultivation that sloped down to the southeast.	The survey area was surrounded on all sides by hedgerows.
11	The survey area consisted of a field under arable cultivation that sloped down to the east	The survey area was surrounded on all sides by hedgerows and barbed wire, with the exception of the northern end of the eastern border which had no physical boundary.

	and west from the centre of the survey area.	
12	The survey area consisted of an undulating field under arable cultivation.	The survey area was surrounded on all sides by hedgerows. A line of telegraph poles and overhead cables was orientated northeast to southwest along the centre of the survey area. An additional line of telegraph poles was orientated northwest to southeast along the centre of the survey area.
13	The survey area consisted of a field under arable cultivation that sloped down to the southeast.	The survey area was surrounded on all sides by hedgerows.
14	The survey area consisted of a pasture that sloped down to the south.	The survey area was surrounded on all sides by hedgerows. A ditch was orientated northwest to southeast across the southern end of the survey area. A borehole was located in the centre of the survey area.
15	The survey area consisted of a field under arable cultivation that sloped down to the southwest.	The survey area was surrounded on all sides by hedgerows.
16	The survey area consisted of a flat field under arable cultivation.	The survey area was surrounded on all sides by hedgerows.
17	The survey area consisted of an undulating field under arable cultivation.	The survey area's north, east and southern borders consisted of hedgerows, and the western border had no physical boundary.
18	The survey area consisted of a flat field under pasture	The north and west boundary consisted of wood and wire fencing, while the south and southern half of the east boundary were hedge with wire fencing. The rest of the east boundary was a stone wall. Part of a hedge with wire fencing ran northwest-southeast in the south of the field.
19	The survey area consisted of a flat field under pasture	The area was bordered on all sides by a hedge with wire fencing.

4.3. The underlying geology comprises Pennine Lower Coal Measures Formation and Pennine Middle Coal Measures Formation– mudstone, siltstone and sandstone in the majority of the survey area, with bands of Etruria Formation – mudstone, in the centre and west of the survey area. Superficial deposits consist of till Devensian – diamicton in the majority of the survey area with Glaciofluvial Sheet Deposits, Devensian – sand and gravel in the eastern and western ends of the survey area. A small area of Alluvium – clay, silt, sand and gravel was located in the north of Area 5 (British Geological Survey, 2022).

4.4. The soils consist of slightly acid, loamy and clayey soils with impeded drainage in the majority of the survey area, with freely draining, slightly acid, loamy soils in the north and eastern ends of the survey area (Soilscapes, 2022).

5. Archaeological Background

5.1. Awaiting Background Information (DBA or other) from Client.

6. Methodology

6.1. Data Collection

6.1.1. Magnetometer surveys are generally the most cost effective and suitable geophysical technique for the detection of archaeology in England. Therefore, a magnetometer survey should be the preferred geophysical technique unless its use is precluded by any specific survey objectives or the site environment. For this site, no factors precluded the recommendation of a standard magnetometer survey. Geophysical survey therefore comprised the magnetic method as described in the following section.

6.1.2. Geophysical prospection comprised the magnetic method as described in the following table.

6.1.3. Table of survey strategies:

Method	Instrument	Traverse Interval	Sample Interval
Magnetic	Bartington Instruments Grad-13 Digital Three-Axis Gradiometer	1m	200Hz reprojected to 0.125m

6.1.4. The magnetic data were collected using MS' bespoke quad-towed cart system and hand-carried GNSS-positioned system.

6.1.4.1. MS' hand-carried system was comprised of Bartington Instruments Grad 13 Digital Three-Axis Gradiometers. Positional referencing was through a multi-channel, multi-constellation GNSS Smart Antenna RTK GPS outputting in NMEA mode to ensure high positional accuracy of collected measurements. The RTK GPS is accurate to 0.008m + 1ppm in the horizontal and 0.015m + 1ppm in the vertical.

6.1.4.2. Magnetic and GPS data were stored on an SD card within MS' bespoke datalogger. The datalogger was continuously synced, via an in-field Wi-Fi unit, to servers within MS' offices. This allowed for data collection, processing and visualisation to be monitored in real-time as fieldwork was ongoing.

6.1.4.3. A navigation system was integrated with the RTK GPS, which was used to guide the surveyor. Data were collected by traversing the survey area along the longest possible lines, ensuring efficient collection and processing.

6.2. Data Processing

6.2.1. Magnetic data were processed in bespoke in-house software produced by MS. Processing steps conform to the EAC and Historic England guidelines for 'minimally enhanced data' (see Section 3.8 in Schmidt *et al.*, 2015: 33 and Section IV.2 in David *et al.,* 2008: 11).

Sensor Calibration – The sensors were calibrated using a bespoke in-house algorithm, which conforms to Olsen *et al*. (2003).

Zero Median Traverse – The median of each sensor traverse is calculated within a specified range and subtracted from the collected data. This removes striping effects caused by small variations in sensor electronics.

Projection to a Regular Grid – Data collected using RTK GPS positioning requires a uniform grid projection to visualise data. Data are rotated to best fit an orthogonal grid projection and are resampled onto the grid using an inverse distance-weighting algorithm.

Interpolation to Square Pixels – Data are interpolated using a bicubic algorithm to increase the pixel density between sensor traverses. This produces images with square pixels for ease of visualisation.

6.3. Data Visualisation and Interpretation

6.3.1. This report presents the gradient of the sensors' total field data as greyscale images, as well as the total field data from the lower sensors. The gradient of the sensors minimises external interferences and reduces the blown-out responses from ferrous and other high contrast material. However, the contrast of weak or ephemeral anomalies can be reduced through the process of calculating the gradient. Consequently, some features can be clearer in the respective gradient or total field datasets. Multiple greyscale images of the gradient and total field at different plotting ranges have been used for data interpretation. Greyscale images should be viewed alongside the XY trace plot (Figures 9, 12, 15, 18 and 21). XY trace plots visualise the magnitude and form of the geophysical response, aiding anomaly interpretation.

6.3.2. Geophysical results have been interpreted using greyscale images and XY traces in a layered environment, overlaid against open street maps, satellite imagery, historical maps, LiDAR data, and soil and geology maps. Google Earth (2022) was also consulted, to compare the results with recent land use.

6.3.3. Geodetic position of results – All vector and raster data have been projected into OSGB36 (ESPG27700) and can be provided upon request in ESRI Shapefile (.SHP) and Geotiff (.TIF) respectively. Figures are provided with raster and vector data projected against OS Open Data.

7. Results

7.1.Qualification

7.1.1. Geophysical results are not a map of the ground and are instead a direct measurement of subsurface properties. Detecting and mapping features requires that said features have properties that can be measured by the chosen technique(s) and that these properties have sufficient contrast with the background to be identifiable. The interpretation of any identified anomalies is inherently subjective. While the scrutiny of the results is undertaken by qualified, experienced individuals and rigorously checked for quality and consistency, it is often not possible to classify all anomaly sources. Where possible, an anomaly source will be identified along with the certainty of the interpretation. The only way to improve the interpretation of results is through a process of comparing excavated results with the geophysical reports. MS actively seek feedback on their reports, as well as reports from further work, in order to constantly improve our knowledge and service.

7.2.Discussion

7.2.1. The geophysical results are presented in combination with satellite imagery and historical maps (Figures 4 and 6).

7.2.2. A fluxgate gradiometer was successfully completed across the entire survey area. The survey has responded well to the survey area. Natural deposits have produced areas of magnetically enhanced material which could have obscured weaker anomalies if present. However, the geophysical survey has detected a wide variation of anomalies related to probable and possible archaeological activity and historical and modern agricultural activity. The impact of modern activity on the results is generally limited to magnetic interference from pylons, telegraph poles, mast and associated footings and fencing.

7.2.3. Probable archaeological anomalies have been identified in Areas, 7, 9, 11, 13 and 17 (Figures, 8, 11, 14 and 17). The signal for these anomalies is strong and indicative of cut features. These linear and curvilinear anomalies, which are not recorded on the historical OS mapping (Figure 4 and 6) could potentially reflect field enclosures or stock management. These types of features are not indicative of a specific date range and could represent activities occurring in any period between Late Prehistory to the Medieval Period.

7.2.4. Several further linear and curvilinear anomalies have been identified within the survey area and have been categorised as possible archaeology (Figures 4 and 6). A possible archaeological origin has been ascribed to these anomalies because they have defined edges and morphology consistent with cut features, such as ditches but are weaker than the anomalies discussed above. However, they also demonstrate no clear organisation or shape and therefore a confident interpretation cannot be given.

7.2.5. In Area 2 and 12 strong rectilinear anomalies with sharp clearly defined edges have been identified **[2a and 12a]** (Figure 14 and 20). These anomalies do not appear on any available satellite imagery or historical mapping. However due to their strong magnetic signal, the close proximity to historical mapped field boundaries and modern agricultural buildings it is possible that they are former agricultural buildings. Possible extraction has been identified in Area 10 and 16**.** The morphology and signal of these broad anomalies are indicative of infilled extraction pits or ponds.

7.2.6. Evidence of agricultural activity has been detected throughout the survey area in the form of ridge and furrow cultivation in several fields and numerous mapped and unmapped field boundaries in Areas 10, 11, 12, 13, 16 and 18 (Figures 4 and 6). The presence of ridge and furrow ploughing regimes indicate that the area has been under cultivation since at least the medieval/post-medieval period. Modern ploughing trends and drainage features have also been detected across most of the survey area.

7.2.7. Throughout most of the survey area anomalies that have been classified as 'Undetermined' have been identified. Some of these, characterised by strong dipolar signal might be representatives of burning activity. All of these anomalies have limited context or lack any clear pattern or morphology to enable a confident interpretation. Nevertheless, an archaeological origin cannot be excluded.

7.3.Interpretation

7.3.1. General Statements

7.3.1.1. Geophysical anomalies will be discussed broadly as classification types across the survey area. Only anomalies that are distinctive or unusual will be discussed individually.

7.3.1.2. **Ferrous (Spike)** – Discrete dipolar anomalies are likely to be the result of isolated pieces of modern ferrous debris on or near the ground surface.

7.3.1.3. **Ferrous/Debris (Spread)** – A ferrous/debris spread refers to a concentration of multiple discrete, dipolar anomalies usually resulting from highly magnetic material such as rubble containing ceramic building materials and ferrous rubbish.

7.3.1.4. **Magnetic Disturbance** – The strong anomalies produced by extant metallic structures, typically including fencing, pylons, vehicles and service pipes, have been classified as 'Magnetic Disturbance'. These magnetic 'haloes' will obscure weaker anomalies relating to nearby features, should they be present, often over a greater footprint than the structure causing them.

7.3.1.5. Undetermined – Anomalies are classified as Undetermined when the origin of the geophysical anomaly is ambiguous and there is no supporting contextual evidence to justify a more certain classification. These anomalies are likely to be the result of geological, pedological or agricultural processes, although an archaeological origin cannot be entirely ruled out. Undetermined anomalies are generally distinct from those caused by ferrous sources.

7.3.2. Magnetic Results - Specific Anomalies

7.3.2.1. **Probable Archaeology (Strong/Weak)** – Located in the southeast of Area 13, and the centre of Area 11 a series of strong and weak linear, curvilinear and diffuse anomalies have been detected **[11a]** and **[13a]** (Figures 11 and 17). These anomalies which are indicative of cut features with magnetically enhanced fill, are not marked on the available historical mapping, nor on satellite imagery (Figures 4 and 6). Their linear morphology and pattern are suggestive of possible enclosures or components of a field system, and therefore have been classified as probable historical field system of unknown date.

7.3.2.2. Probable Archaeology (Strong/Weak) – Located in the northwest of Area 7 and the southeast of Area 9 are a series of strong and weak linear, and curvilinear anomalies **[7a]** and **[9a]** (Figures 8, 11 and 14). These anomalies, which have a different alignment to the anomalies identified in Area 11 and 13, predominantly have a weak positive magnetic enhancement consistent with cut features with a slightly magnetically enhanced fill. However, they are somewhat obscured by natural anomalies and magnetic disturbance which does not allow to identify their full extent**.**

7.3.2.3. **Probable Archaeology (Strong/Weak)** – Several diffused anomalies **[13a]** (Figure 17) located in the centre of Area 13 have also been identified. These anomalies, which align with the topographical slope, have a strong magnetic signal that appear to form a double ditched enclosure.

7.3.2.4. **Possible Archaeology (Strong/Weak)** – In Areas 11 and 13 several positive linear and curvilinear anomalies displaying both strong and weak magnetic signals have been detected (Figures 11 and 17). The morphology of these anomalies is more obscure than the nearby probable archaeology, making a confident interpretation difficult. However, due to the close proximity to probable archaeological anomalies, they have been classified as being of possible archaeological origin.

7.3.2.5. **Possible Archaeology (Weak)** – Located in the northeast of Area 5 and the centre of Area 17 series of weak linear and curvilinear anomalies have been detected **[5a and 17a]** (Figure 8 and 11). These anomalies are heavily obscured by a spread of naturally enhanced material. The signal and morphology of these anomalies is very weak and ephemeral, however it is possible they also have anthropogenic origin. These anomalies could form part of a former field system or parts of enclosures, yet they lack characteristics that would allow for a confident interpretation.

7.3.2.6. **Industrial/Modern (Strong)** – Located in the east of Area 12 and the centre of Area 2 are a series of strongly enhanced rectilinear features **[2a and 12a]** (Figure 20). These anomalies do not appear on any available historical maps, or satellite imagery. However, due to the close proximity to former mapped field boundaries, and modern agricultural buildings, it is possible these anomalies are former agricultural buildings and have been given the wider 'Industrial/Modern' classification.

7.3.2.7. **Industrial/Modern (Spread)** – In the centre of Area 10 and 16, two amorphous anomalies containing strongly enhanced discrete anomalies have been identified **[10a and 16a]** (Figure 17). These anomalies have a different morphology to natural anomalies identified within the survey area, more characteristic of quarried or extracted material. As such they have been given the wider 'Industrial/Modern' classification.

7.3.2.8. **Agricultural (Strong/Weak/Trend)** – In Areas 11, 12, 13 and 16 strong and weak positive and negative linear and curvilinear anomalies have been identified (Figures 4 and 6). These anomalies all roughly collocate with former mapped field boundaries and as such have been given the wider 'agricultural' classification. In Areas 10, 13 and 18 linear anomalies have also been identified. These anomalies do not appear on any available historical mapping; However, they have a similar morphology to the mapped boundaries, with the former boundary in Area 18 visible in satellite imagery.

7.3.2.9. **Agricultural (Trend)**- Weak linear trends have been identified across the survey area. These anomalies correspond with modern ploughing visible on satellite imagery (Figure 4 and 6).

7.3.2.10. **Ridge and Furrow (Trend)** – Arrangements of regularly-spaced parallel weak linear and curvilinear anomalies have been identified, located in Areas 1,5, 9, 13, 15 and 16. These anomalies are indicative of ridge-and-furrow regimes.

7.3.2.11. **Natural (Strong/Weak/Spread)** – In Areas 5, 7, 9, 10, 11, 12, 13, 16, 17 and 18 a series of diffuse anomalies and spreads of magnetically enhanced material are visible (Figures 4 and 6). These anomalies likely reflect changes in the underlying geology and superficial deposits as discussed in 4.3. in areas where the natural geology is more prevalent, weaker anomalies may be obscured is present.

7.3.2.12. **Drainage Features** – Multiple alignments of continuous weak linear anomalies are noted across the survey area. The alignment and orientation of these relative to one another within the survey area is characteristic of a managed field drainage system.

7.3.2.13. Undetermined (Strong/Weak) - Several discrete anomalies have been identified that all have inverted dipolar magnetic signals (Figures 8, 11, and 14). These atypical dipolar magnetic signals may be associated with in situ burning however, these are difficult to distinguish confidently from the anomalies caused by modern ferrous debris and therefore have been recorded as undetermined. Throughout the survey area, a series of small linear and curvilinear anomalies have been also identified. Similarly, to the strong anomalies, they have limited context and no distinctive signal or shape, but an archaeological origin cannot be ruled out.

8. Conclusions

8.1. A fluxgate gradiometer survey was successfully completed across the survey area. Magnetic disturbance was identified as haloes caused by fencing, pylons and buried lines. The survey environment was somewhat obscured in places by magnetic disturbance and natural anomalies, but for the most part it presented a relatively clear and consistent magnetic background against which anomalies of archaeological, agricultural, modern and agricultural origin have been identified.

8.2. The geophysical results identified anomalies of both probable archaeological and possible archaeological origin. These anomalies have been primarily interpreted as probable and possible enclosures and field systems of unknown date.

8.3. Anomalies that likely relate to former agricultural buildings have also been identified in close proximity to former and current field boundaries. Possible areas of extraction were also identified by the survey.

8.4. The geophysical results appear to reflect the long-term agricultural use of the survey area in the form of former mapped and unmapped field boundaries, ridge and furrow regimes and drainage systems. Modern ploughing was also identified across parts the survey area.

8.5. Several anomalies throughout the site have been classified as undetermined because it has not been possible to definitively determine whether these anomalies are the result of archaeological, agricultural, or natural processes.

9. Archiving

9.1. MS maintains an in-house digital archive, which is based on Schmidt and Ernenwein (2013). This archive stores the collected measurements, minimally processed data, georeferenced and un-georeferenced images, XY traces and a copy of the final report. A copy of this archive will be included on a disk with a final printed report.

9.2. The digital archive will be sent to the Clwyd Powys Archaeological Trust (CPAT) HER, as well as the National Monuments Record, RCAHMW at Aberystwyth.

9.3. MS contributes reports to the ADS Grey Literature Library upon permission from the client, subject to any dictated time embargoes.

10. Copyright

10.1. Copyright and intellectual property pertaining to all reports, figures and datasets produced by Magnitude Services Ltd is retained by MS. The client is given full licence to use such material for their own purposes. Permission must be sought by any third party wishing to use or reproduce any IP owned by MS.

11. References

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12. Project Metadata

MS Job Code	MSSJ1452
Project Name	Land at Ruthin Road, Wrexham
Client	Heritage Archaeology
Grid Reference	SJ 31219 50082
Survey Techniques	Magnetometry
Survey Size (ha)	74.5ha (Magnetometry)
Survey Dates	2022-10-24 to 2022-10-28
Project Lead	Krasimir Dyulgerski BA MRes
Project Officer	Krasimir Dyulgerski BA MRes
HER Event No	TBC
OASIS No	TBC
S42 Licence No	TBC
Report Version	0.6

13. Document History

Version	Comments	Author	Checked By	Date
0.1	Initial draft for Project Lead to Review	ACS	AC	23 November 2022
0.2	Corrections Following Project Lead Review	ACS	KD	25 November 2022
0.3	Interim Report for Director Sign off	KD	FPC	25 November 2022
0.4	Draft Report for Director Sign Off	DN, KD	FPC	02 December 2022
0.5	Areas 4, 6 and 8 Descoped	IT	JD	09 December 2022
0.6	Corrections following Client feedback	IT	KD	20 December 2022



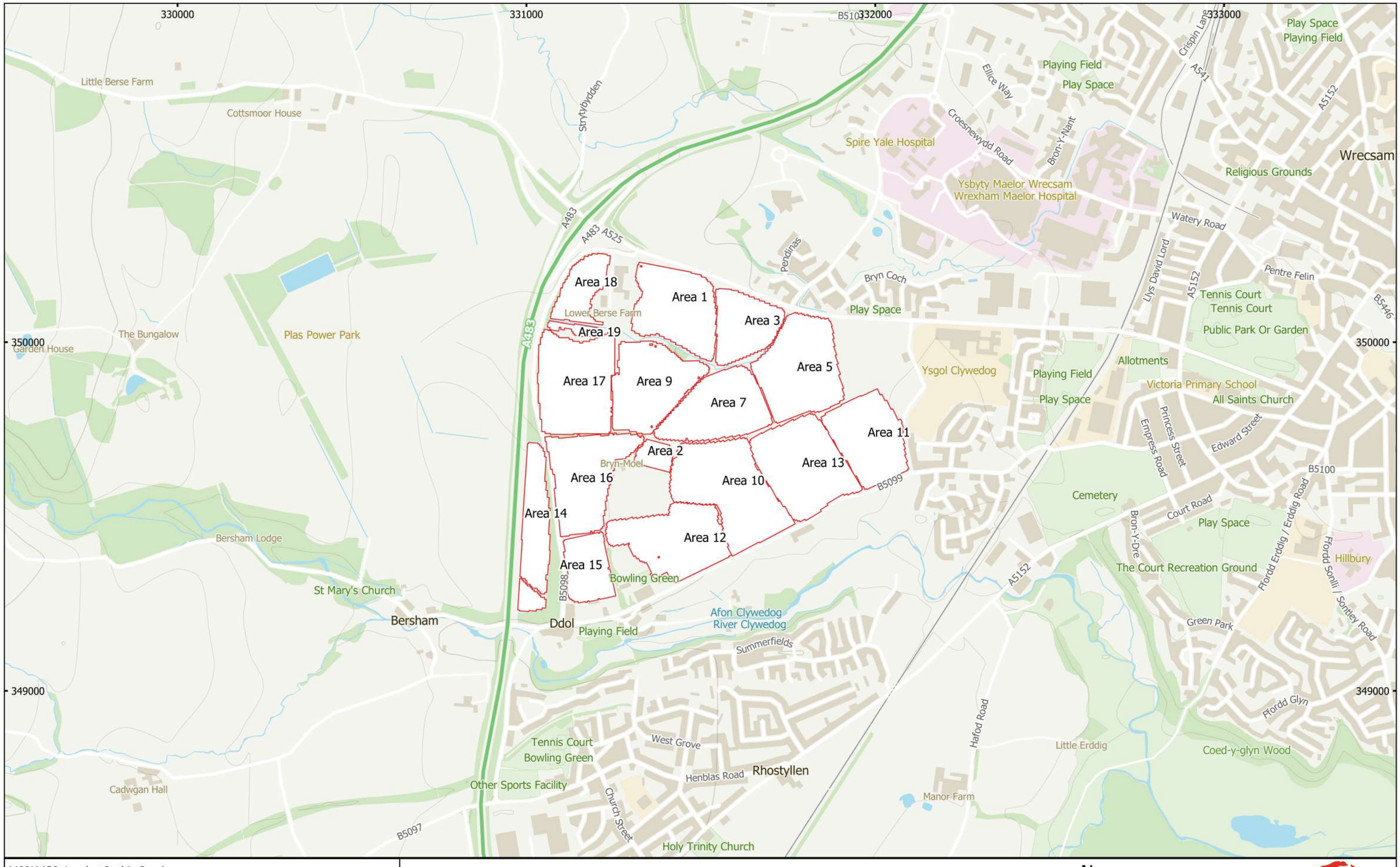
MSSJ1452: Land at Ruthin Road
Figure 1 - Site Location
1:25,000 @ A4
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Site Boundary

N

0 0.5 1 km

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MSSJ1452: Land at Ruthin Road
Figure 2 - Location of Survey Areas
1:10,000 @ A3
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Survey Extent

N

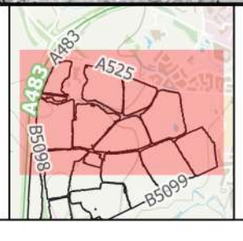
0 250 500 750 m

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MSSJ1452: Land at Ruthin Road
Figure 3 - Magnetic Total Field (Lower Sensor) (Overview) (Northern Areas)
1:3,000 @ A3
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48,990 nT 49,020



N

0 50 100 150 m

magnitude surveys



MSSJ1452: Land at Ruthin Road
Figure 4 - Magnetic Interpretation Over Historical Maps and Combined Satellite Imagery (Overview) (Northern Areas)
1:3,000 @ A3
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Contains historical mapping © CLS Data 2022: Ordnance Survey, 6" 2nd edition c. 1882-1913
Contains Satellite Imagery © Bing 2022

- Agricultural (Strong)
- Agricultural (Weak)
- Archaeology Possible (Strong)
- Archaeology Possible (Weak)
- Archaeology Probable (Strong)
- Archaeology Probable (Weak)
- Magnetic Disturbance
- Ferrous/Debris (Spread)
- Natural (Spread)
- Natural (Strong)
- Natural (Weak)
- Undetermined (Strong)
- Undetermined (Weak)
- Industrial/Modern (Spread)
- Industrial/Modern
- Agricultural (Trend)
- Service
- Ridge and Furrow (Trend)
- Drainage Feature
- Ferrous (Spike)



N

0 50 100 150 m

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MSSJ1452: Land at Ruthin Road
Figure 5 - Magnetic Total Field (Lower Sensor) (Overview) (Southern Areas)
1:3,000 @ A3
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48,990 nT 49,020



N

0 50 100 150 m

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331200
331600
332000
Area 5
Area 11
Area 9
Area 7
Area 2
Area 14
Area 16
Area 13
Area 10
Area 12
Area 15
349600
349200
Sur. 352.0
Fawnog
Esless Mills
Laurel Grove
Mill Pond
Pen-y-ddol
Ddol
Spring
Mill Race
Black Lion
300

MSSJ1452: Land at Ruthin Road
Figure 6 - Magnetic Interpretation Over Historical Maps and Combined Satellite Imagery (Overview) (Southern Areas)
1:3,000 @ A3
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Contains historical mapping © CLS Data 2022: Ordnance Survey, 6" 2nd edition c. 1882-1913
Contains Satellite Imagery © Bing 2022

- Agricultural (Strong)
- Agricultural (Weak)
- Archaeology Possible (Strong)
- Archaeology Possible (Weak)
- Archaeology Probable (Strong)
- Archaeology Probable (Weak)
- Magnetic Disturbance
- Ferrous/Debris (Spread)
- Natural (Spread)
- Natural (Strong)
- Natural (Weak)
- Undetermined (Strong)
- Undetermined (Weak)
- Industrial/Modern (Spread)
- Industrial/Modern
- Agricultural (Trend)
- Service
- Ridge and Furrow (Trend)
- Drainage Feature
- Ferrous (Spike)



N
0 50 100 150 m

magnitude surveys

331000
331200
331400
350200
350000
Area 1
Area 18
Area 19
Area 17
A483
A483
A483
B5098
B5098
A525
Lower Berse Farm

MSSJ1452: Land at Ruthin Road
Figure 7 - Magnetic Gradient (North-western Areas)
1:1,500 @ A3
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-1 nT 2

N

0 30 60 90 m

magnitude surveys

331000
331200
331400
350200
350000
A483
B5098
A525
Area 1
Area 18
Area 19
Area 17
17a
9a
Lower Berse Farm

MSSJ1452: Land at Ruthin Road
Figure 8 - Magnetic Interpretation (North-western Areas)
1:1,500 @ A3
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Agricultural (Strong)
Archaeology Possible (Weak)
Archaeology Probable (Weak)
Magnetic Disturbance
Ferrous/Debris (Spread)
Natural (Spread)
Natural (Strong)
Natural (Weak)
Undetermined (Strong)
Undetermined (Weak)
Agricultural (Trend)
Service
Ridge and Furrow (Trend)
Drainage Feature
Ferrous (Spike)

N
0
30
60
90 m

magnitude surveys

331000
331200
331400
350200
350000
A483
A483
A483
B5098
B5098
A525
Area 1
Area 18
Area 19
Area 17
Lower Berse Farm

MSSJ1452: Land at Ruthin Road
Figure 9 - XY Trace Plot (North-western Areas)
30nT/cm at 1:1,500 @ A3
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N
0
30
60
90 m

magnitude surveys

331600
331800
332000
A525
350000
350000
Area 5
Area 11
349800
349800
Homestead / Homestead Lane
Area 7

MSSJ1452: Land at Ruthin Road
Figure 10 - Magnetic Gradient (North-eastern Areas)
1:1,500 @ A3
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-1 nT 2

A525

N

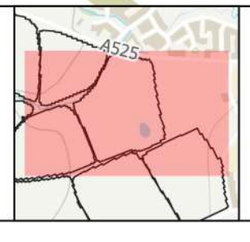
0 30 60 90 m

magnitude surveys

331600
331800
332000
A525
350000
350000
5a
Area 1
Area 5
Area 11
7a
349800
349800
11b
Area 7
Homestead / Homestead Lane

MSSJ1452: Land at Ruthin Road
Figure 11 - Magnetic Interpretation (North-eastern Areas)
1:1,500 @ A3
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- Agricultural (Weak)
- Archaeology Possible (Strong)
- Archaeology Possible (Weak)
- Archaeology Probable (Strong)
- Archaeology Probable (Weak)
- Magnetic Disturbance
- Ferrous/Debris (Spread)
- Natural (Spread)
- Natural (Strong)
- Natural (Weak)
- Undetermined (Strong)
- Undetermined (Weak)
- Agricultural (Trend)
- Service
- Ridge and Furrow (Trend)
- Ferrous (Spike)



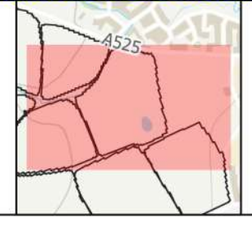
N

0 30 60 90 m

magnitude surveys

331600
331800
332000
A525
350000
350000
Area 1
Area 5
Area 11
349800
349800
Area 7
Homestead / Homestead Lane

MSSJ1452: Land at Ruthin Road
Figure 12 - XY Trace Plot (North-eastern Areas)
30nT/cm at 1:1,500 @ A3
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N
0 30 60 90 m
magnitude surveys

331000
331200
331400
349800
349800
Area 17
A483
B5098
Area 9
Area 2
Area 14
Bryn-Moel
Area 16
349600
349600

MSSJ1452: Land at Ruthin Road
Figure 13 - Magnetic Gradient (Western Areas)
1:1,500 @ A3
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-1 nT 2

A483 B5098 Bryn-Moel

N

0 30 60 90 m

magnitude surveys

331000
331200
331400
349800
349600
17a
9a
7a
2a
Area 17
Area 9
Area 2
Area 14
Area 16
A483
B5098
Bryn-Moel

MSSJ1452: Land at Ruthin Road
Figure 14 - Magnetic Interpretation (Western Areas)
1:1,500 @ A3
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- Agricultural (Strong)
- Agricultural (Weak)
- Archaeology Possible (Weak)
- Archaeology Probable (Strong)
- Archaeology Probable (Weak)
- Magnetic Disturbance
- Ferrous/Debris (Spread)
- Natural (Spread)
- Natural (Strong)
- Natural (Weak)
- Undetermined (Strong)
- Undetermined (Weak)
- Industrial/Modern (Spread)
- Industrial/Modern
- Agricultural (Trend)
- Ridge and Furrow (Trend)
- Drainage Feature
- Ferrous (Spike)

N
0 30 60 90 m
magnitude surveys

331000

331200

331400

349800

Area 17

A483

B5098

Area 9

Area 2

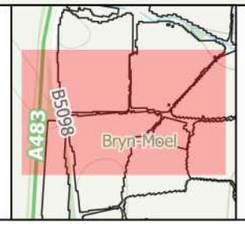
Area 14

Bryn-Moel

Area 16

349600

MSSJ1452: Land at Ruthin Road
Figure 15 - XY Trace Plot (Western Areas)
30nT/cm at 1:1,500 @ A3
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N

0 30 60 90 m

magnitude surveys

331600
331800
332000
349600
349400
Lon Homestead / Homestead Lane
Area 11
Area 13
Area 10
B5099

MSSJ1452: Land at Ruthin Road
Figure 16 - Magnetic Gradient (South-eastern Areas)
1:1,500 @ A3
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-1 nT 2

N

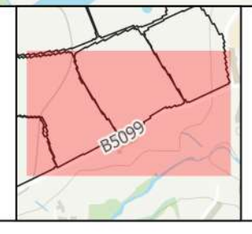
0 30 60 90 m

magnitude surveys

331600
331800
332000
349600
349400
10a
11a
13a
Area 10
Area 11
Area 13
B5099
Lon Homestead / Homestead Lane

MSSJ1452: Land at Ruthin Road
Figure 17 - Magnetic Interpretation (South-eastern Areas)
1:1,500 @ A3
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- Agricultural (Strong)
- Agricultural (Weak)
- Archaeology Possible (Weak)
- Archaeology Probable (Strong)
- Archaeology Probable (Weak)
- Magnetic Disturbance
- Ferrous/Debris (Spread)
- Natural (Spread)
- Natural (Strong)
- Natural (Weak)
- Undetermined (Weak)
- Industrial/Modern (Spread)
- Industrial/Modern
- Agricultural (Trend)
- Service
- Ridge and Furrow (Trend)
- Drainage Feature
- Ferrous (Spike)



N
0 30 60 90 m

magnitude surveys

331600

349600

349400

Area 11

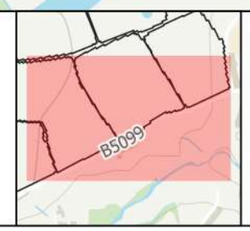
Area 13

Area 10

B5099

Lon Homestead / Homestead Lane

MSSJ1452: Land at Ruthin Road
Figure 18 - XY Trace Plot (South-eastern Areas)
30nT/cm at 1:1,500 @ A3
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N

0 30 60 90 m

magnitude surveys

331000
331200
331400
349400
349200
Area 14
A483
B5098
B5099
Area 15
Area 12
Bowling Green

MSSJ1452: Land at Ruthin Road
Figure 19 - Magnetic Gradient (South-western Areas)
1:1,500 @ A3
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-1 nT 2

Bryn-Moel
A494
B5098
Bowling Green
Ddol
B5099

N

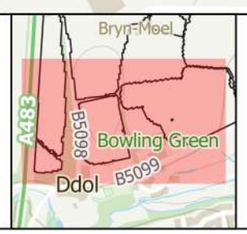
0 30 60 90 m

magnitude surveys

331000
331200
331400
349400
349200
16a
12a
Area 14
Area 15
Area 12
A483
B5098
B5099
Bowling Green

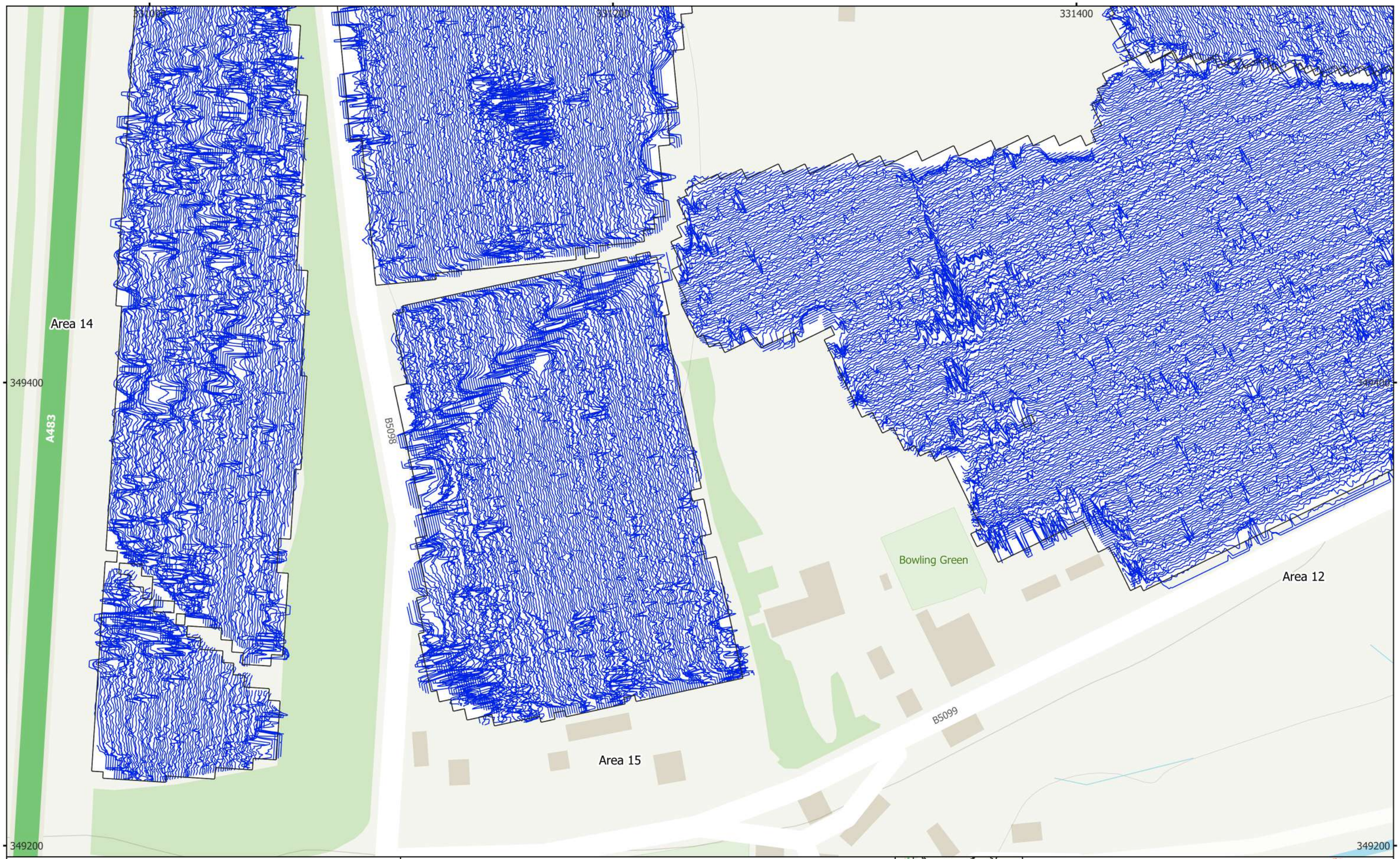
MSSJ1452: Land at Ruthin Road
Figure 20 - Magnetic Interpretation (South-western Areas)
1:1,500 @ A3
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- Agricultural (Strong)
- Agricultural (Weak)
- Magnetic Disturbance
- Ferrous/Debris (Spread)
- Natural (Spread)
- Natural (Strong)
- Natural (Weak)
- Undetermined (Strong)
- Undetermined (Weak)
- Industrial/Modern (Spread)
- Industrial/Modern
- Agricultural (Trend)
- Service
- Ridge and Furrow (Trend)
- Drainage Feature
- Ferrous (Spike)

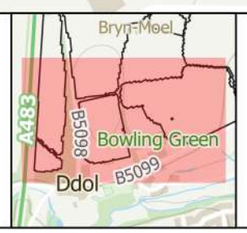


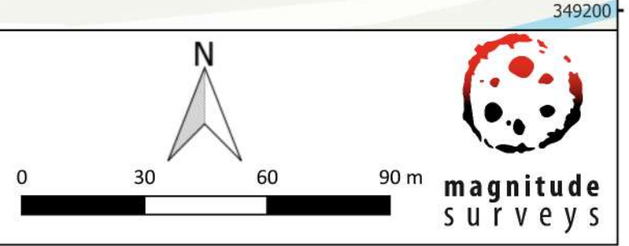
N
0 30 60 90 m

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MSSJ1452: Land at Ruthin Road
Figure 21 - XY Trace Plot (South-western Areas)
30nT/cm at 1:1,500 @ A3
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