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**Land at the University of Warwick:
Cryfield Pitches**

Geophysical Survey Report MSSP14B

For



**Cotswold
Archaeology**

Andover • Cirencester • Exeter • Milton Keynes

On Behalf Of

University of Warwick

Magnitude Surveys Ref: MSSP14B

March 2016



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Date Issued:

18 March 2016

Abstract

No anomalies of probable or possible archaeological origin have been detected within the survey area. The geophysical results primarily depict the effects of modern features, such as the football goal posts and the corner flags' sockets. The modern landscaping to create the playing fields has also caused ferrous type anomalies.

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1. Introduction

- 1.1. Magnitude Surveys Ltd (MS) was commissioned by Cotswold Archaeology (CA) on behalf of the University of Warwick (UW) to undertake a geophysical survey on land at the University of Warwick, Coventry (SP 296 753). The geophysical survey comprised:
 - 1.1.1. Hand pulled, cart-mounted fluxgate gradiometer survey.
- 1.2. The survey was conducted in line with the current best practice guidelines produced by Historic England (David et al., 2008), the Chartered Institute of Field Archaeologists (CIfA, 2014) and the European Archaeological Council (Schmidt et al., 2015).
- 1.3. The survey was undertaken on the 01 February 2016.

2. Quality Assurance

- 2.1. Project management, survey work, data processing and report production have been carried out by qualified and professional geophysicists to standards exceeding the current best practice (CIfA, 2014; David et al., 2008, Schmidt et al., 2015).
- 2.2. Magnitude Surveys is a corporate member of ISAP (International Society of Archaeological Prospection).
- 2.3. Graeme Attwood is a Member of the Institute for Archaeologists (CIfA), the chartered UK body for archaeologists, as well as a member of GeoSIG, the CIfA Geophysics Special Interest Group.
- 2.4. Finnegan Pope-Carter is a Fellow of the London Geological Society, the chartered UK body for geophysicists and geologists, as well as a member of GeoSIG, the CIfA Geophysics Special Interest Group.

3. Objectives

- 3.1. The geophysical survey aimed to assess the potential archaeological landscape of the survey area.
- 3.2. The survey forms part of the archaeological mitigation required by the planning archaeologist and shall be used to inform the location of any trenches, should they be required.

4. Geographic Background

- 4.1. The underlying geology comprises Tile Hill mudstone formation and Kenilworth sandstone formation; no superficial deposits have been recorded (BGS, 2016). Historic England guidelines state that responses over mudstones and sandstones can vary from poor to generally good (David et al., pg. 15, 2008).
- 4.2. The soils consist freely draining slightly acid loamy soils (Soilscapes, 2016).
- 4.3. Survey was undertaken over three football pitches.

5. Archaeological Background

- 5.1. Within the greater landscape of the survey area is a wealth of Iron Age/Roman activity.

- 5.2. An Iron Age/Roman period banjo enclosure is located approximately 1 km north of the survey area, which lies partly under the Westwood Campus running track. Visible on aerial photographs, the enclosure was subject to turf stripping in 1993, which recovered pottery sherds and an Iron Age/Roman period axe (Coventry HER No: MCT988). The Iron Age settlement within the vicinity of this enclosure was subject to rescue excavation. The excavation results revealed traces of 14 round houses, as well as pits, gullies and ditches, with pottery sherds and animal bones recovered from some of these features. Excavation results also suggest the presence of both industrial and domestic activity on the site (Coventry HER No: MCT2011). Approximately 100 m west of these excavated Iron Age features is another possible Iron Age enclosure and pits, identified in an aerial photograph (Coventry HER: MCT2084).
- 5.3. Approximately 500 m east of the survey area in Tocil Wood is another possible Iron Age enclosure. Excavations in the mid-1980s revealed a defensive system of ditches, berms and banks (Coventry HER: MCT208).

6. Methodology

6.1. Data Collection

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

6.1.2. Table of survey strategies:

Method	Instrument	Traverse Interval	Sample Interval
Magnetic	Bartington Instruments 1000L fluxgate gradiometer	1 m	10 Hz reprojected to 0.125 m

6.1.3. The magnetic data were collected using MS' bespoke hand-pulled cart system.

6.1.3.1. The cart system supports the magnetic and GPS instruments with a bespoke datalogger. The magnetic instruments comprise two Bartington Instruments 1000L fluxgate gradiometers operating in NMEA mode. Positional referencing is through a Hemisphere S320 RTK GPS outputting in NMEA mode. Corrections were made through Topcon TopNet. Data from both instruments were logged in a bespoke datalogger. Data were transferred to a laptop computer for processing.

6.1.3.2. A series of temporary sight markers were established in each survey area to guide the surveyor and ensure full coverage with the cart. Data were collected by traversing the survey area along the longest possible lines, to ensure that the data was efficiently collected and processed.

6.2. Data Processing

6.2.1. Magnetic data were processed in bespoke in-house software produced by MS. Processing steps were limited to:

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. Assessment between filtered and unfiltered data ensures linear trends running parallel to the survey direction are not removed.

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

6.3.1. Magnetic greyscales should be viewed alongside the accompanying XY trace plots, which are available on the archive disk. XY trace plots visualise the magnitude and form of the geophysical response, aiding in anomaly interpretation.

7. Survey Considerations

Survey Area	Surveyed Y/N	Ground Conditions	Further notes:
1	Y	Flat, freshly cut and rolled	The area has been heavily modified landscaped. The terracing and levelling of the survey area to create the sports pitches is visible on ground surface. The sports pitches' features, such as the goal posts and sockets for the corner flags, have caused ferrous anomalies.

Refer to Figure 2 for survey area.

8. Results

8.1. Qualification

8.1.1. *Geophysical techniques 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 of further work in order to constantly improve our knowledge and service.*

8.2. Discussion

8.2.1. The geophysical results, both greyscale images and XY traces, were interpreted in consideration with historic mapping (Ordnance Survey, 6" 2nd edition c.1882-1913; see Figure 5), and satellite imagery (Google Earth, 2016; see Figure 6).

8.2.2. The geophysical survey has been noticeably affected by the modern land modification and usage of the site. This landscaping and modern site usage will have impeded the ability of geophysical instruments to detect buried archaeological features by introducing strong, ferrous-type anomalies. The geophysical results primarily depict the effects of modern features, such as the football goal posts and the corner flags' sockets.

8.3. Interpretation

8.3.1. General Statements

8.3.1.1. Geophysical anomalies will be discussed broadly as classification types across the survey area. Only anomalies that are distinctive or unusual will be discussed individually. Specific anomalies discussed within the text have been assigned numbers, which are emboldened within square parenthesis e.g. [**1**].

8.3.1.2. **Undetermined** – Anomalies are classified as Undetermined when the anomaly origin is ambiguous through the geophysical results and there is no supporting or correlative evidence to warrant 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 not ferrous in nature.

8.3.1.3. **Ferrous** – A number of discrete ferrous-like anomalies have been mapped throughout the survey area. These responses are likely to be the result of modern metallic disturbance on or near the ground surface. Broad ferrous responses from modern metallic features may mask any weaker underlying archaeological anomalies should they be present.

8.3.2. Magnetic Results - Specific Anomalies

8.3.2.1. **Ferrous** – Magnetic ‘halos’ can be seen around the individual football goal posts. The goal at [1] is positioned above a pond depicted on the historic mapping (Ordnance Survey, 2016; Figure 5). While it is possible that some of this anomaly’s [1] signal originates from the pond, it is unlikely due to the levelling that occurred in this area of the pitch. Similarly, two boundaries that are denoted on the historic mapping have not been detected within the survey area. The excavation of material for the levelling of the pitches would have likely removed evidence of these boundaries, had any remained.

8.3.2.2. **Ferrous** – A number of large, strong magnetic anomalies can be seen throughout the survey area. In the southernmost pitch, there is a substantial spread of small, discrete ferrous-like anomalies. These are very likely related to the area’s landscaping to create the pitches.

8.3.2.3. **Ferrous** – A magnetically strong anomaly on a north-south alignment [2] has been detected within the survey of the westernmost pitch. This anomaly has been classified as a service or a pipe. To the east of [2], is an area of ferrous spread, which appears to be further evidence of the disturbance caused during the construction of the sports pitches.

9. Conclusions

- 9.1. No anomalies of probable or possible archaeological potential have been detected. The geophysical results primarily reflect the modern landscaping and usage of the site. A service or pipe, as well as the football goal posts and related sports features, have produced strong, ferrous responses within the data.
- 9.2. Two boundaries depicted on the historic mapping were not detected. This lack of detection is likely related to the levelling and landscaping of the areas during the construction of the pitches.

10. Archiving

- 10.1. MS maintains an in-house digital archive, which is based on Schmidt and Ernenwein (2013).
- 10.2. MS contributes all reports to the ADS Grey Literature Library subject to any time embargo dictated by the client.
- 10.3. Whenever possible, MS has a policy of making data available to view in easy to use forms on its website. This can benefit the client by making all of their reports available in a single repository, while also being a useful resource for research. Should a client wish to impose a time embargo on the availability of data this can be achieved in discussion with MS.

11. Copyright

- 11.1. Copyright and the 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

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12. References

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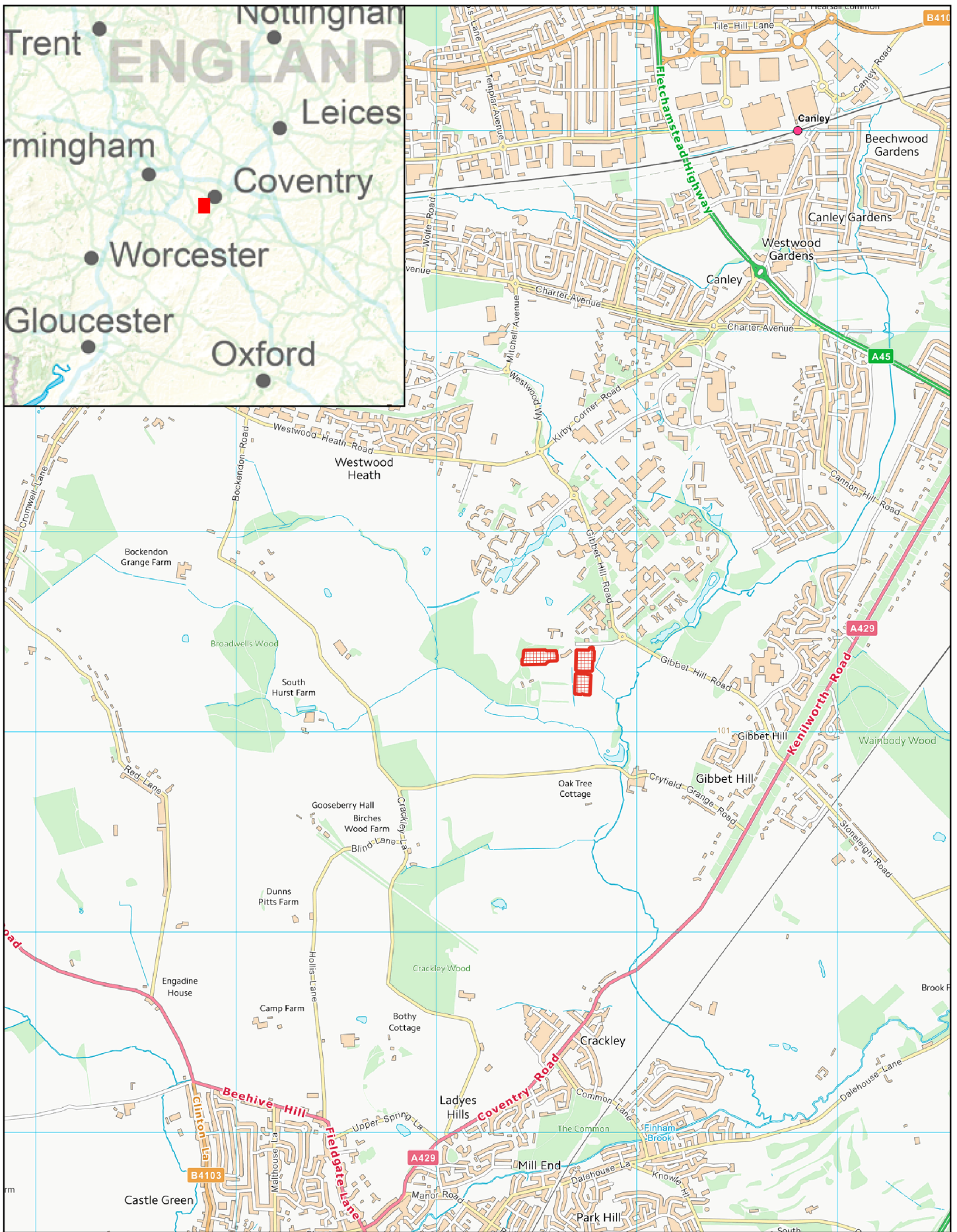
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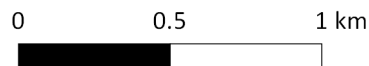
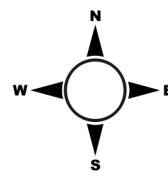
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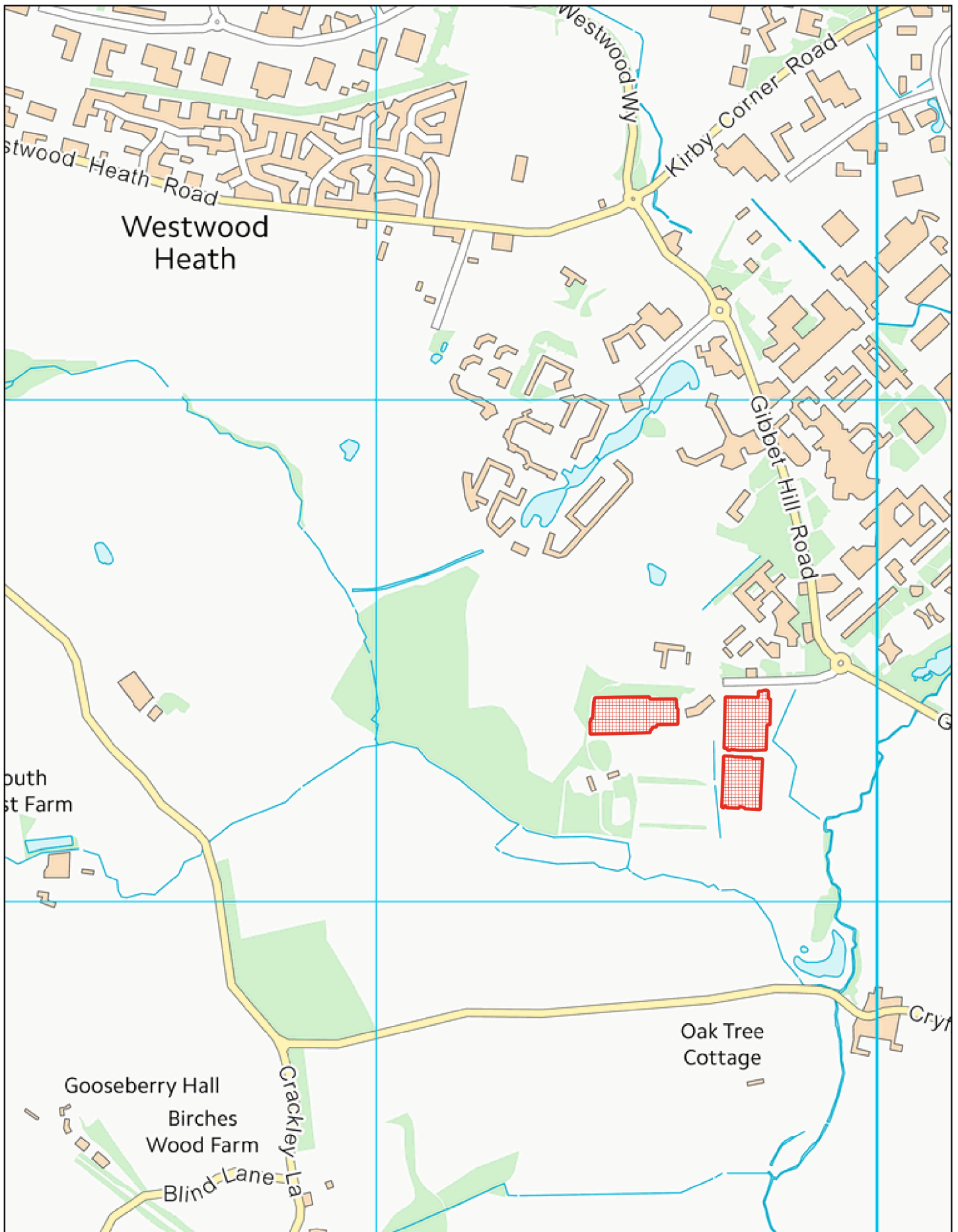


MSP14B - Land at the University of Warwick: Cryfield Pitches.
 Figure 1 - Site Location
 1 : 25,000 @ A4
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 Survey Area




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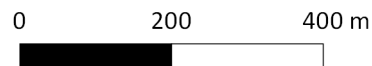
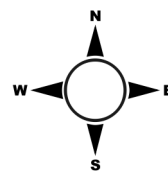
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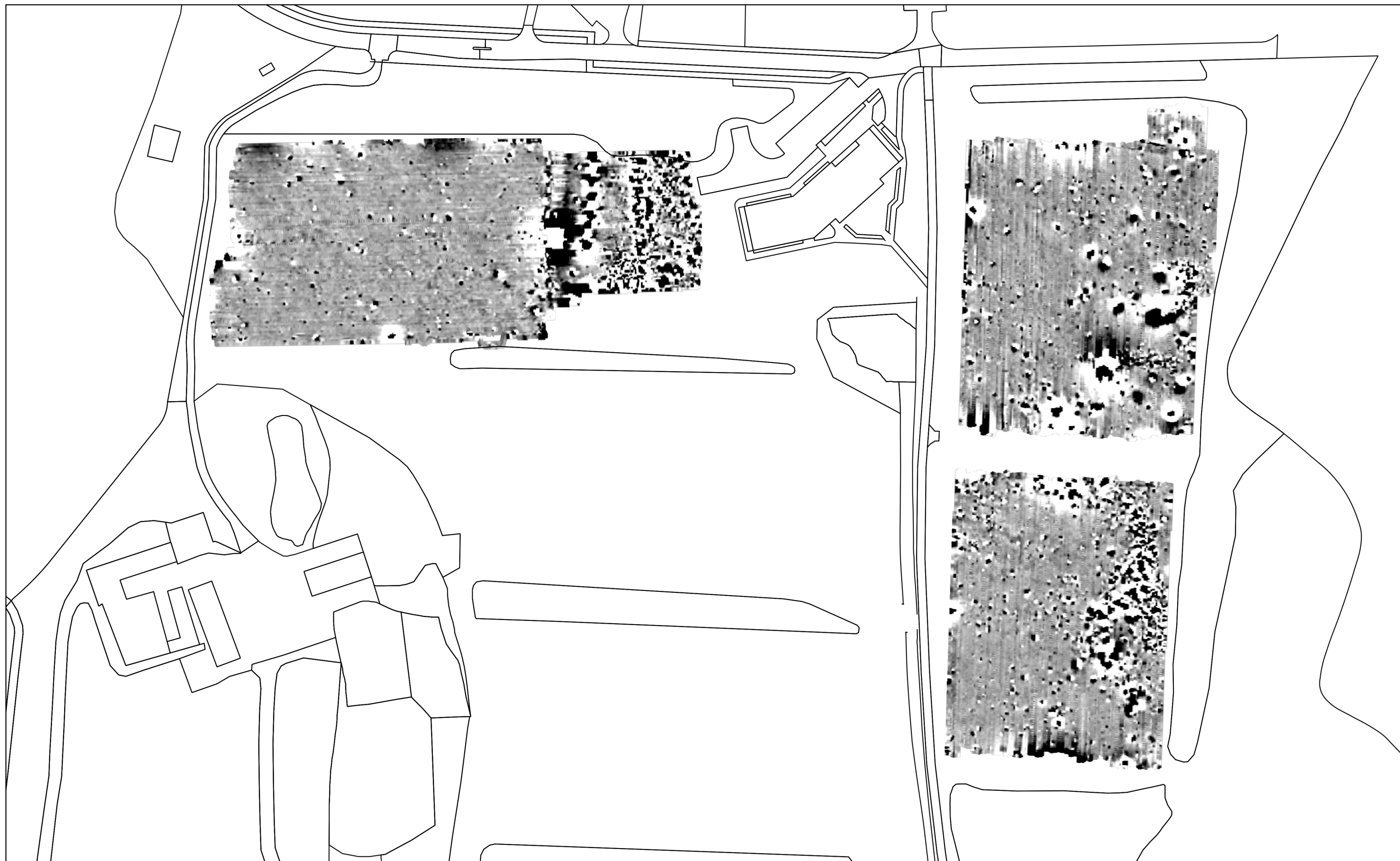
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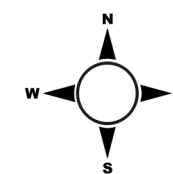
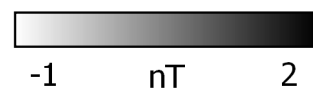
 Survey Area



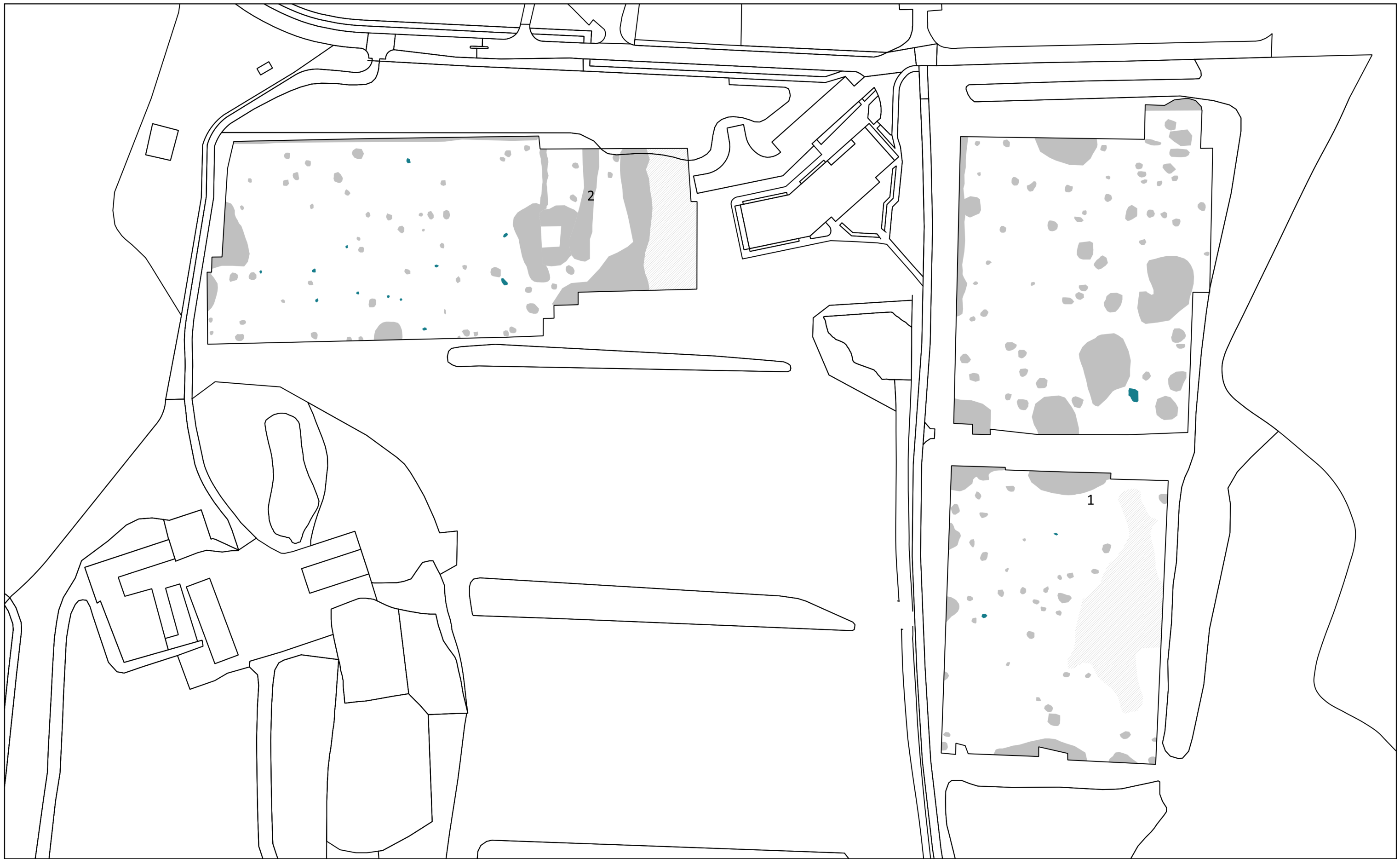
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Figure 3 - Magnetic Greyscale
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OS (100056946)

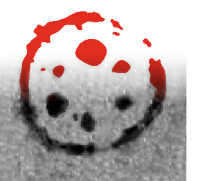
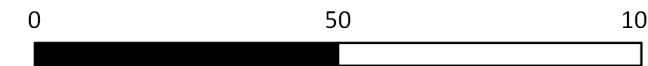
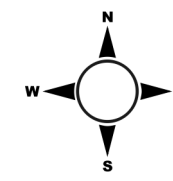


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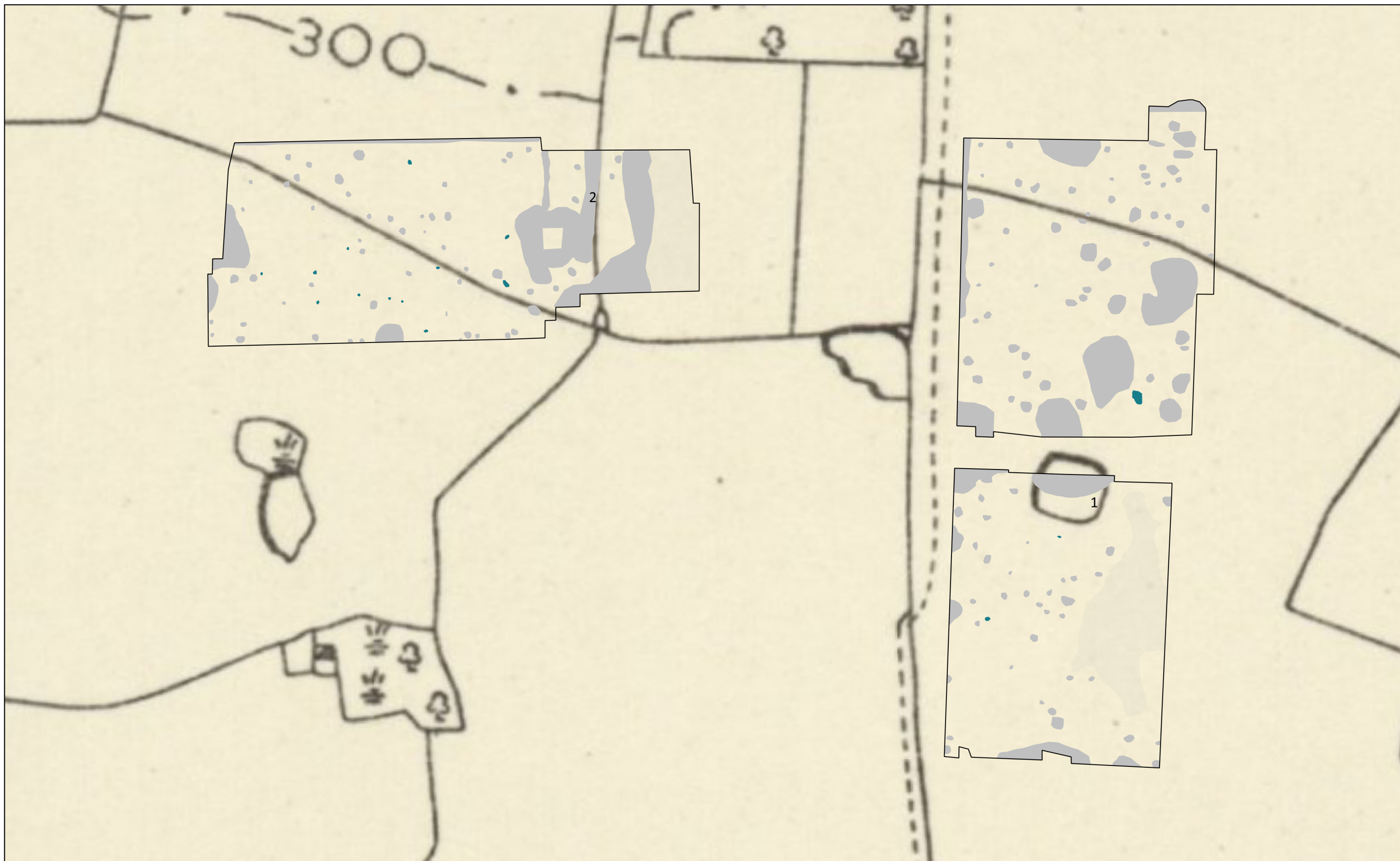


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 Figure 4 - Magnetic Interpretation
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 OS (100056946)

- Undetermined (Strong)
- Ferrous (Dipolar)
- Ferrous (Spread)
- Survey Border



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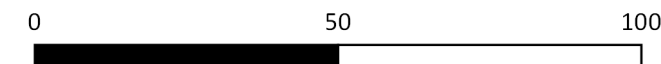
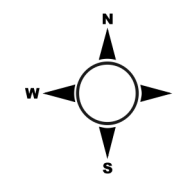
Figure 6 - Magnetic Interpretation over Historic Mapping

1 : 1250 @ A3

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Historic mapping Ordnance Survey, 6" 2nd edition c.1882-1913. National Library of Scotland

- Undetermined (Strong)
- Ferrous (Dipolar)
- Ferrous (Spread)
- Survey Border

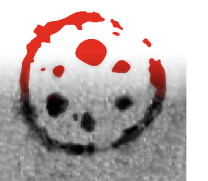
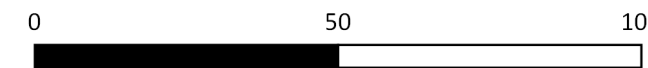
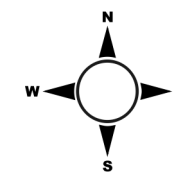


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 Figure 6 - Magnetic Interpretation on Satellite imagery
 1 : 1250 @ A3
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- Undetermined (Strong)
- Ferrous (Dipolar)
- Ferrous (Spread)
- Survey Border



100 m **magnitude**
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