Geophysical Survey Report

Land off Ratcliffe Drive, Huncote, Leicestershire

For

RPS Group

On Behalf Of

Jelson

Magnitude Surveys Ref: MSSP1609

HER Event Number: TBC

OASIS Number: TBC

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Abstract

Magnitude Surveys was commissioned to assess the subsurface archaeological potential of c. 8.1ha of land off Ratcliffe Drive, Huncote, Leicestershire. A fluxgate gradiometer survey was successfully completed across the majority of the survey area, with c. 0.3ha unable to be surveyed due to the presence of overgrown vegetation. Anomalies relating to a former tramway visible on historical OS mapping were identified. Multiple mapped field boundaries have been detected in the survey area in addition to ridge and furrow cultivation, drainage features and linear anomalies likely relating to modern ploughing. Anomalies classified as 'undetermined' have been detected and although these are likely to be a result of natural processes or agricultural activities, an archaeological origin cannot be ruled out completely. The impact of modern activity on the site is visible in magnetic interference caused by perimeter fencing.

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1. Introduction

1.1. Magnitude Surveys Ltd (MS) was commissioned by RPS Group on behalf of Jelson to undertake a geophysical survey over a c. 8.1ha area of land off Ratcliffe Drive, Huncote, Leicestershire (SP 51888 97025).

1.2. The geophysical survey comprised quad-towed, cart-mounted GNSS-positioned fluxgate gradiometer survey. 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 (Stoddart 2023).

1.5. The survey commenced on 24/07/2023 and took one day 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. 200m south-west of Huncote, Leicestershire (Figure 1). Gradiometer survey was undertaken across one field under arable cultivation. The survey area was bordered to the north by housing, to the east by agricultural fields, to the south by the River Soar and to the west by a playground (Figure 2). An area of c.0.3ha was unable to be surveyed due to overgrown vegetation.

4.2. Survey considerations:

Survey Area	Ground Conditions	Further Notes
1	The survey area consisted of a field under arable cultivation that sloped down to the south.	The survey areas northern border consisted of a wooden fence with a wooden gate at the eastern end. The eastern, southern and western borders consisted of hedgerows.

4.3. The underlying geology comprises Edwalton Member mudstone. Superficial deposits consist of a small area of Oadby Member diamicton in the northeast, Thrussington Member diamicton in the east, a band of River Terrace Deposits sand and gravel in the west and Alluvium clay, silt, sand and gravel in the southwestern end of the survey area respectively (British Geological Survey, 2023).

4.4. The soils consist of freely draining slightly acidic loamy soils in the majority of the survey area with loamy and clayey floodplain soils with naturally high groundwater in the southwestern end of the survey area (Soilscapes, 2023).

5. Archaeological Background

5.1. The following is a summary of an Archaeological Desk-Based Assessment, produced and provided by RPS Group (Behrendt, 2023).

5.2. Previous archaeological work has been carried out within the survey area and its surrounding landscape. Firstly, a geophysical survey was carried out within the northern end of the survey area, and in the adjacent area to the north (ELE6900). The survey did not record any anomalies suggestive of archaeological activity, with the exception of a very weak anomaly possibly associated with an enclosure (MLE17862). Subsequent trial trenching could not confirm the presence of the enclosure; However, it identified an undated posthole on the northern boundary of the survey area. Three programmes of systematic fieldwalking were carried out within the eastern end of the survey area (ELE71, ELE107 and ELE8226). The fieldwalking recovered flint, Roman, Saxon, Medieval and Post-Medieval pottery sherds, shell, bone and slag, suggested the presence of a Roman site and identified a possible Saxon burial site in close proximity to a former now ploughed-out Bronze Age barrow. A geophysical survey, test pitting and trial trenching were carried out approximately 100m southwest of the survey area, across Thurlaston Brook (ELE5686). Paleochannels, Mesolithic and Neolithic activity were recorded in close proximity to Thurlaston Brook c. 200m south of the survey area and Iron Age/Roman activity in the form of a possible field system was recorded to the immediate west of the survey area.

5.3. Archaeological activity has also been recorded in the wider landscape of the survey area. A Palaeolithic handaxe was found c.100m east of the survey area (MLE6042). Paleochannels associated with Thurlaston brook c.200m southeast of the site contained worked and struck flint, mammal bones and other waterlogged environmental deposits (MLE20945). A possible Mesolithic/Neolithic settlement site was excavated c. 500m southeast of the survey area (MLE63). Roughly 40 pieces of worked and struck flint were recovered, all of either Mesolithic or Neolithic date as well as some possible remains of round houses. Additional Mesolithic and Neolithic flints were recorded to the immediate east (MLE6995), c.150m east (MLE17257), c.700m southwest (MLE20944) and c.600m and c.850m north-west (MLE6445 and MLE9836) of the survey area. A possible Bronze Age barrow was recorded from cropmarks directly adjacent to the east of the survey area (MLE144). A Bronze Age axe hammer was also located approximately 550m northwest of the survey area.

5.4. Two findspots of Iron age coins (MLE6446 and MLE6447) as well as a Roman coin and brooch (MLE7705 and MLE7709), were identified within the survey area. A concentration of Roman finds was identified within the northeastern part of the survey area (MLE249) the finds included r 30 coins, pottery, tile and brooches. The finds have been suggested to indicate the presence of a Roman site in this area. A possible Iron Age D-shaped enclosure is recorded as a cropmark c.600m northwest of the survey area (MLE153). Iron Age and Roman pottery sherds were found in this sport during field walking. The Roman Road of Fosse Way is located c.950m southeast of the survey area (MLE1380).

5.5. A possible Saxon burial site was recorded immediately to the east of the survey area, in the location of the ploughed-out Bronze Age barrow (MLE146). Isolated finds of Saxon origin were also located c.150m north (MLE6088) and c.300m northeast of the survey area. A possible Saxon mill was found c.400m northwest of the survey area (MLE147). The settlement of Huncote, approximately 100m northwest (MLE9986), and Croft (previously Crebre MLE9335), c700m southwest of the survey area were recorded in the Domesday book and are at least of Saxon origin. The survey area likely forms the agricultural hinterland of the settlement of Huncote.

5.6. Four medieval findspots have been recorded in the survey area, mostly consisting of metal objects including coins, a buckle and a strap end (MLE6636, MLE6638, MLE6641 and MLE16488), found during metal detecting. A possible medieval site is recorded within the southern end of the survey area, based on the finds of six sherds of pottery and four coins (MLE158).

5.7. The HER records earthworks associated with a dismantled tramway that crossed the northern end of the survey area. However, no visible earthworks survive above ground.

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 GNSS-positioned system.

6.1.4.1. MS' cart 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 (Figure 3). 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 (Figure 6). 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 (2023) 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 (Figure 7).

7.2.2. A fluxgate gradiometer survey was successfully completed across the survey area with c. 0.3ha unable to be surveyed due to overgrown vegetation. Anomalies related to a former tramway, agricultural activity, and undetermined origins were recorded. The impact of modern activity is limited and consistent with magnetic interference caused by perimeter fencing.

7.2.3. Multiple anomalies relating to a former tramway have been identified in the north of the survey area (Figure 5). These anomalies broadly align with a former tramway visible on 1910 historical maps onwards (Figure 7).

7.2.4. Evidence of historical agricultural activity has been identified throughout the survey area a series of former mapped field boundaries which correspond with historical OS mapping have been identified (Figure 5). Ridge and furrow regimes have been detected in the northeast of the survey area indicating the area has been under cultivation since at least the medieval/post-medieval period (Figure 5). Drainage features and modern ploughing regimes have been detected as linear anomalies across the survey area (Figure 5).

7.2.5. A small cluster of undetermined anomalies in the northeast of the survey area, coincide with the location of a possible Roman site discussed in section 5.4 (Figure 5). However, there was not enough morphological evidence to distinguish them from similar anomalies across the survey area, as such they were categorised as undetermined. Anomalies of an undetermined origin have been identified throughout the survey area. Whilst these anomalies are likely of agricultural, natural, or modern origin, an archaeological origin cannot be ruled out.

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. **Former Tramway** – Located in the north of the survey area, multiple curvilinear anomalies displaying varying levels of magnetic enhancement, have been detected **[1a]** (Figure 5). These anomalies roughly correspond with a former tramway visible on 1910s Historical OS mapping, as well as cropmarks visible on satellite imagery. As such, it is likely these anomalies represent remains or debris associated with the former tramway.

7.3.2.2. Agricultural (Weak/Spread) – Throughout the survey area, numerous weak positive linear anomalies have been detected **[1b]** and **[1c]** (Figure 5). The majority of these anomalies roughly correspond with former field boundaries visible on historical OS mapping (Figure 7). A small spread of strongly enhanced magnetic anomalies has been detected in close proximity to **[1b]** (Figure 5). Due to the close proximity to former mapped field boundaries, it is likely that these anomalies represent ploughed remnants associated with the former field boundaries.

7.3.2.3. Ridge and Furrow – Regularly-spaced weak negative, linear and curvilinear anomalies have been identified in the northeast of the survey area (Figure 5). These anomalies roughly correspond with cropmarks visible on satellite imagery. The regular spacing and curvilinear shape of these anomalies is indicative of ridge and furrow regimes, that for the most part do not align with modern field boundaries and crop directions.

7.3.2.4. Agricultural (Trend) -Weak linear trends have been identified across the survey area. These anomalies correspond with modern ploughing visible on satellite imagery (Figures 7).

7.3.2.5. Drainage Features – Multiple alignments of continuous linear anomalies are noted across the survey area (Figure 5). Two types of magnetic response have been recorded. The first response consists of a weak, dipolar signal indicative of modern clay-fired pipe. The second response consists of weak negative signal indicative of modern drainage systems. The alignment and orientation of these relative to one another within the survey area is characteristic of a managed field drainage system.

7.3.2.6. Undetermined (Strong/Weak) -Throughout the survey area multiple small, strong positive, discrete anomalies were detected (Figure 5). A small cluster of these anomalies coincides with a possible Roman site (Section 5.4), in the northeast of the survey area **[1d].** However, these anomalies have no discernible features or characteristics to distinguish them from similar anomalies across the survey area. The remainder of the discrete anomalies across the survey area, were also categorised as undetermined as they have a

similar morphology to the cluster **[1d].** As such they have been categorised as undetermined. Throughout the survey area numerous weak positive, linear and curvilinear anomalies were detected (Figure 5). These anomalies lack context or clear morphologies to allow a confident interpretation, as such they have been classified as 'Undetermined'. Whilst it is possible these anomalies are of agricultural, natural, or modern origin, an archaeological origin cannot be ruled out.

8. Conclusions

8.1. A fluxgate gradiometer survey was successfully undertaken across the survey area. The survey technique responded well to the environment of the survey area, detecting anomalies relating to the historical and agricultural nature of the survey area. An area totalling c. 0.3ha was unable to be surveyed due to overgrown vegetation. Magnetic disturbance was limited to fencing at the perimeter of the survey area.

8.2. Anomalies related to a Former Tramway, visible on historical OS mapping were identified in the north of the survey area.

8.3. Evidence of agricultural use of the land has been detected across the survey area in the form of former mapped field boundaries, ridge and furrow regimes, drainage features and linear anomalies likely related to modern ploughing regimes.

8.4. Several anomalies have been classified as 'Undetermined' due to lack of context, or any clear pattern or morphology which would enable a confident interpretation. Nevertheless, an archaeological origin for these cannot be excluded.

9. Archiving

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

9.2. 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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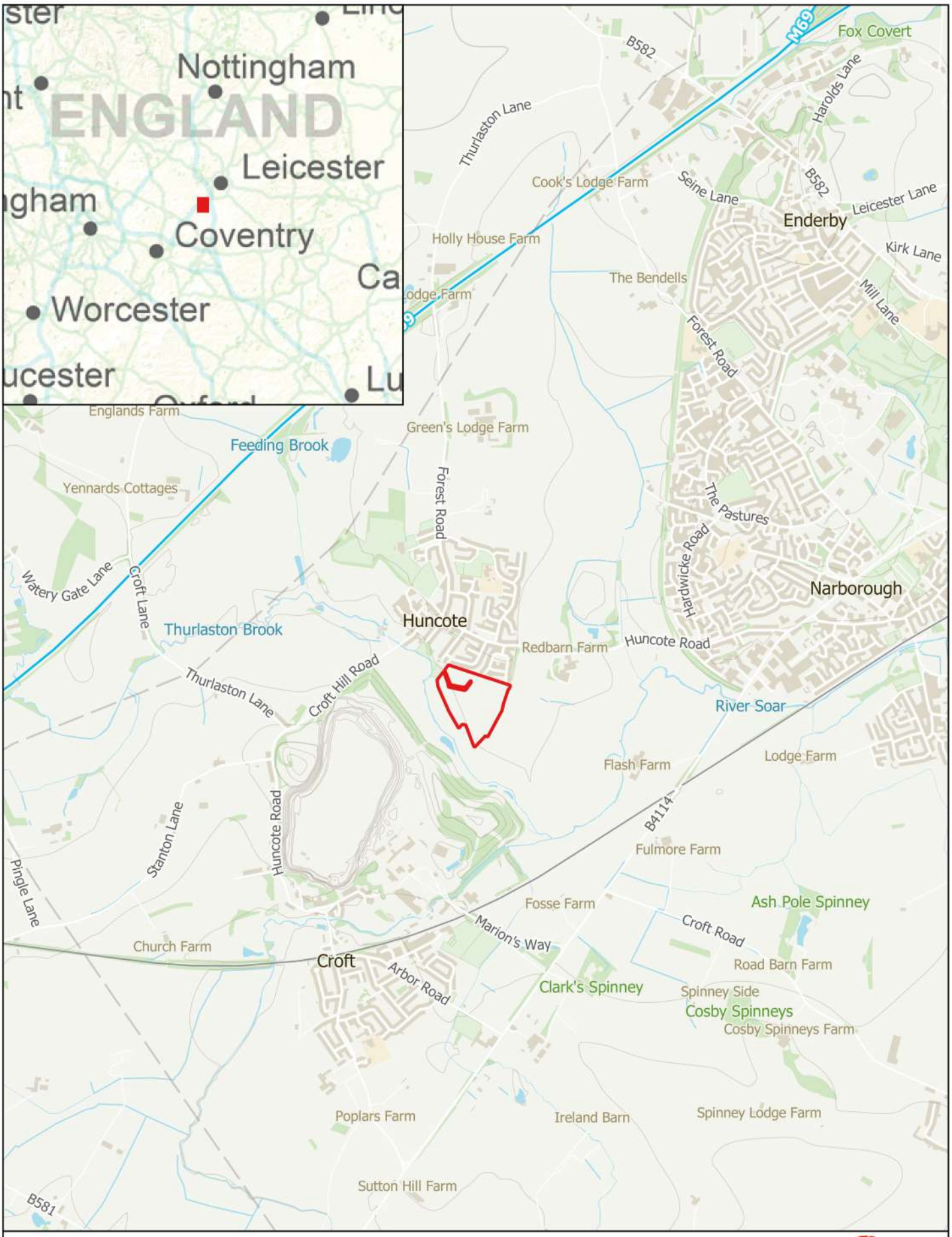
12. Project Metadata

MS Job Code	MSSP1609
Project Name	Land Off Ratcliffe Drive, Huncote
Client	RPS Group
Grid Reference	SP 51888 97025
Survey Techniques	Magnetometry
Survey Size (ha)	8.1ha (Magnetometry)
Survey Dates	2023-07-24 to 2023-07-25
Project Lead	Dr. Chrys Harris MCIfA
Project Officer	Alexander C Stoddart BA
HER Event No	TBC
OASIS No	TBC
S42 Licence No	N/A
Report Version	0.5

13. Document History

Version	Comments	Author	Checked By	Date
0.1	Initial draft for Project Lead to Review	ACS	LAG	03 August 2023
0.2	Changes Following Review	ACS	LAG	04 August 2023
0.3	Additional Changes	ACS	FPC	04 August 2023
0.4	Changes Following Director Review	ACS	FPC	04 August 2023
0.5	Client Changes and Arch Background	ACS	FPC	31 August 2023



MSSP1609 - Huncote
Figure 1 - Site Location
1:25,000 @ A4

Site Boundary

N

0 0.5 1 km

magnitude surveys

451000

452000

297000

297000

Allotments

Huncote Community Primary School

Cheney End

Chantry Close

Forest Road

Duncan Avenue

School Lane

Denman Lane

Huncote

Main Street

Alexandra House

St James' Church

The Green

Narborough Road

St James Close

Public Park Or Garden

Redbarn Farm

Huncote Road

Ratcliffe Drive

Peers Way

Preston Way

Play Space

Croft Hill Road

Area 1

Flash Farm

B4114

MSSP1609 - Huncote
Figure 2 - Location of Survey Area
1:5,000 @ A3

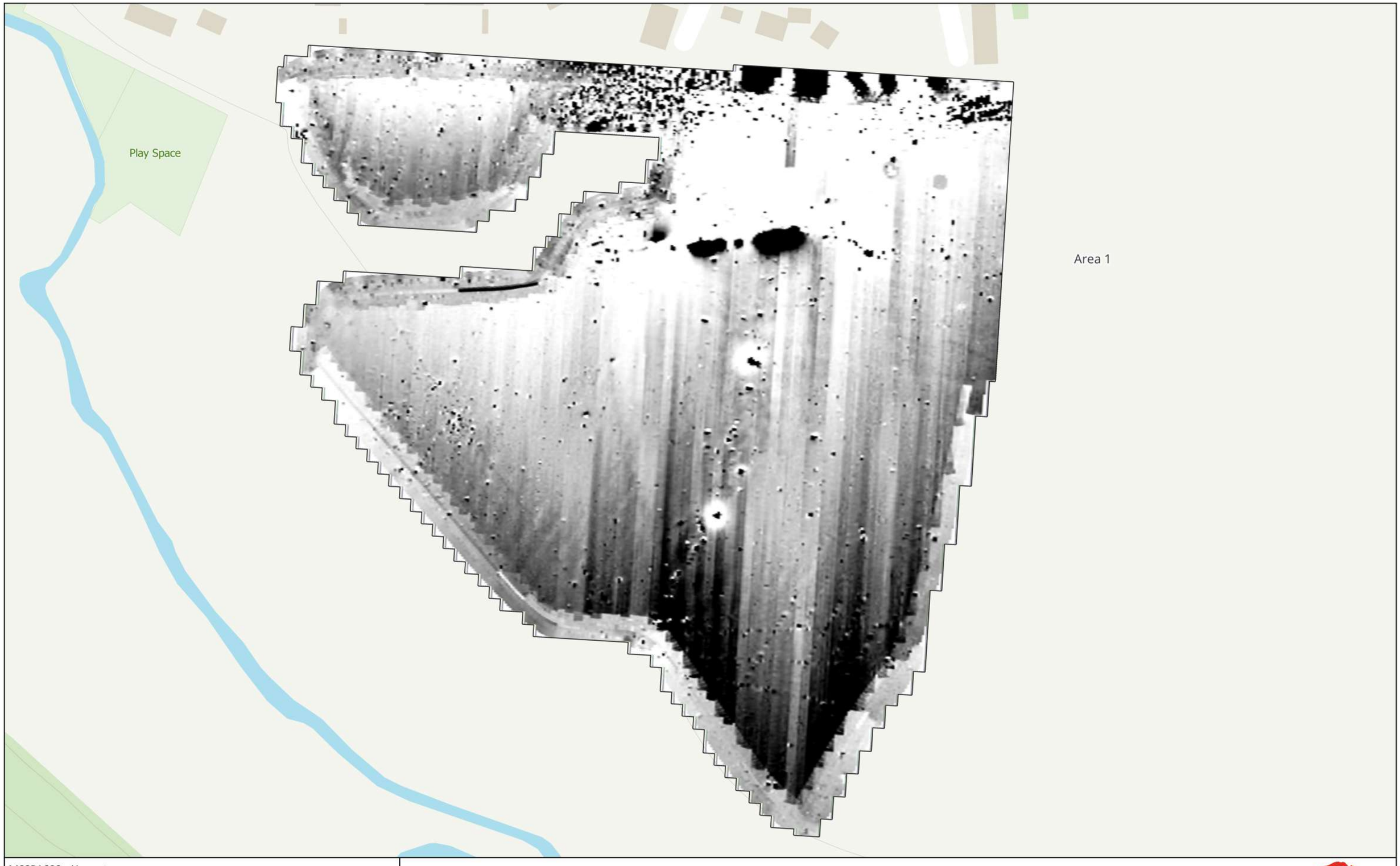
Survey extent

Unable to be surveyed

N

0 150 300 450 m

magnitude surveys



MSSP1609 - Huncote
Figure 3 - Magnetic Total Field
1:1,500 @ A3

48,990 nT 49,020

N

0 50 100 150 m

magnitude surveys

Play Space

Area 1

MSSP1609 - Huncote
Figure 4 - Magnetic Gradient
1:1,500 @ A3

-1 nT 2

N

0 50 100 150 m

magnitude surveys

Play Space

Area 1

1a

1b

1c

1d

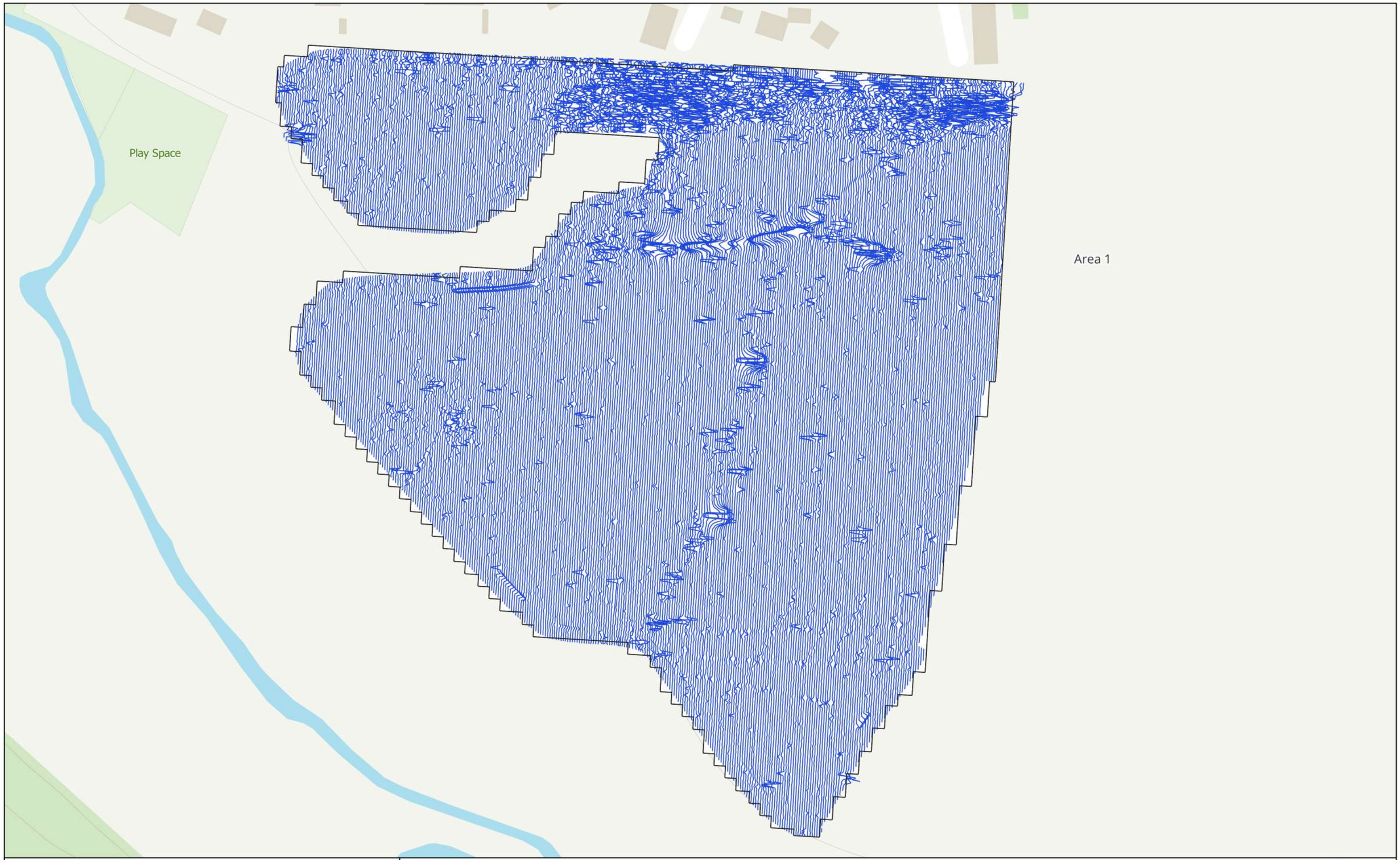
MSSP1609 - Huncote
Figure 5 - Magnetic Interpretation
1:1,500 @ A3

- Former Tramway
- Agricultural (Weak)
- Agricultural (Spread)
- Natural (Spread)
- Magnetic Disturbance
- Ferrous/Debris (Spread)
- Undetermined (Strong)
- Undetermined (Weak)
- Agricultural (Trend)
- Ridge and Furrow (Trend)
- Drainage Feature
- Ferrous (Spike)

N

0 50 100 150 m

magnitude surveys



MSSP1609 - Huncote
Figure 6 - XY Trace Plot
30nT/cm at 1:1,500 @ A3

N

0 50 100 150 m

magnitude surveys

MSSP1609 - Huncote
Figure 7 - Magnetic Interpretation Over Historical Maps and Satellite Imagery
1:3,000 @ A3

- Former Tramway
- Agricultural (Weak)
- Agricultural (Spread)
- Magnetic Disturbance
- Ferrous/Debris (Spread)
- Natural (Spread)
- Undetermined (Strong)
- Undetermined (Weak)
- Agricultural (Trend)
- Ridge and Furrow (Trend)
- Drainage Feature
- Ferrous (Spike)

N

0 100 200 300 m

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