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Steeple Renewables Project

Appendix 9.2: Magnitude Surveys Geophysical Survey Interim Report

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Appendix 9.2: Magnitude Surveys Geophysical Survey Interim Report

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magnitude surveys

Geophysical Survey Report

Steeple Solar,

Nottinghamshire

For

Pegasus Planning Group

On Behalf Of

Steeple Solar Farm Ltd

Magnitude Surveys Ref: MSSK1773

March 2026

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Abstract

Magnitude Surveys was commissioned to assess the subsurface potential of c. 749ha of land at Sturton le Steeple, Nottinghamshire. A magnetic gradiometer survey has successfully been undertaken across c. 734ha, the remaining 15ha have not been able to be surveyed due to access issues. Anomalies of an archaeological origin were detected across the survey area, in particular the route of a Romano-British road, with associated enclosures and structures, was identified in the east of the survey area. Archaeological anomalies were also detected in the form of further enclosures in the west, northeast and east of the survey area. Further anomalies of a possible archaeological origin have been detected although they cannot be positively dated. In addition, anomalies relating to agricultural activity were detected across the landscape in the form of ploughing regimes, drainage features and field boundaries, both mapped and unmapped. Anomalies of an undetermined origin were also noted across the survey area. While these are likely to be of natural, modern, or agricultural origin, an archaeological origin cannot be fully excluded. Modern interference is generally limited to buried services, pylons, overhead cables, railway lines and extent field boundaries. Green waste was also present across the southwest of the survey area, which may have obscured further anomalies from being visible.

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1. Introduction

1.1. Magnitude Surveys Ltd (MS) was commissioned by Pegasus Planning Group on behalf of Steeple Solar Farm Ltd to undertake a geophysical survey over a c. 749ha area of land located around Sturton le Steeple, Nottinghamshire (SK 7870 8390).

1.2. The geophysical survey comprised of a quad-towed and hand-carried 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 (Carli, 2024).

1.5. The survey commenced on 29th of April 2024, with c. 275.5ha being completed during the first phase. The second phase of survey commenced on the 9th of July 2024, with 407.5ha completed post-harvest. The third phase of survey commenced on the 5th of November 2025, with 51ha completed.

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 was 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 Chair 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 access the subsurface archaeological potential of the survey area.

3.2 The results of the geophysical survey programme will be used to inform the next stages of investigation.

4. Geographic Background

4.1. The survey area is located c. 650m east and 330m west of Sturton le Steeple, Nottinghamshire (Figure 1). Gradiometer survey was undertaken across multiple fields under arable cultivation and pasture. The area is bordered by Wheatley and South Roads to the north, the River Trent to the east, a railway line and Northfield Road to the south and by Maumhill Wood and agricultural lands to the west. Additionally, a railway line bisect the western part of the survey area (Figure 2). An area of c. 15ha could not be surveyed due to restricted access by the farmers.

4.2. Survey considerations:

Survey Area	Ground Conditions	Further Notes
1	Flat arable field	The survey area was bordered by hedgerows on all sides.
2	Flat arable field	The survey area was bordered by farm track to the north and west and hedgerows to the east and south
3	Flat arable field	The survey area was bordered by hedgerows on all sides
4	Flat arable field	The survey area was bordered by hedgerows on all sides, except to the south which had no physical boundary
5	Flat arable field	The survey area was bordered by hedgerows on all sides, except to the south which had no physical boundary
6	Flat arable field	The survey area was bordered by hedgerows on all sides, except to the south which had no physical boundary. Additionally, pylons were located at the southern boundary with overhead cables running in a northwest to southeast direction
7	Flat arable field	The survey area was bordered by hedgerows to the north and west, a road to the south, and a drainage ditch to the east. Pylons were located in the eastern part of the area, with overhead cables running in a northwest to southeast direction.
8	Flat pasture field	The survey area was bordered by a ditch to the south, hedgerows to the north and west, and had an open boundary to the east. An area of overgrown vegetation along the northern boundary was unable to be surveyed. Overhead cables and telegraph poles extended across the eastern part of the survey area, running in a northwest to southeast direction
9	Flat arable field	The survey area was bordered by hedgerows to the south and east, and a ditch to the northwest. A pylon was present in the west, with overhead cables, oriented northwest to southeast.

10	Flat arable field	The survey area was bordered by hedgerows and trees on all sides. Towards the western boundary was a pylon with overhead cables in northwest to southeast orientation.
12	Harvested field with gentle slope from north to south.	The survey area was bordered by hedges and a ditch on all the sides except southeast. Pylon with overhead cables were running from northeast to northwest. Moreover, a small rectangular part along the southern edge was unable to be surveyed.
13	Flat fallow field	The survey area was bordered by hedgerows in all directions. Overhead cables were oriented east to west in the south of the survey area, with a pylon present on the eastern boundary.
14	Flat fallow field	The survey area had an open boundary to the north and was bordered by ditches in all other directions. Overhead cables ran east to west in the south of the survey area, with a pylon present on the western boundary
15	Flat arable field	The survey area was bordered by a ditch to the north and east, and by hedgerows to the north and south. The western edge had no physical boundary but was defined by a pylon and overhead cables.
17	Flat arable field	The survey area was bordered on all sides by hedgerows and trees. A pylon was situated near the southern boundary, with an overhead cable running through the field, bisecting both the northern and southern boundaries.
18	Flat arable field	The survey area was bordered by hedgerows on all sides, except to the east which had no physical boundary
19	Flat arable field	The survey area was bordered by hedgerows and trees on all sides, except to the northeastern side which has no physical boundary
20	Flat stubble field	All sides were bordered by hedges and ditch. The area in the west and east was heavily ploughed. Additionally, Pylon with overhead cables ran over the northeast corner.
21	Flat arable field	The survey area was bordered by a ditch to the west, and a hedgerow to the south. There was no boundary to the east, and a pylon was present to the north.
22	Flat arable field	The survey area was bordered to the north by a hedge boundary and the east by a metal wire fence and ditch, the south-west had no physical boundary but was defined by overhead cables.
23	Flat arable field	The survey area was bordered by metal fencing on all sides, except to the west, where it had an open boundary. Overhead cables were oriented

		northwest to southeast and ran over the northeast and southwest corners.
24	Undulating pasture field	The survey area was bordered by metal fencing on all sides except to the west which has an open boundary. Overhead cables were oriented northeast to southwest in the east of the survey area.
25	Flat harvested field	The survey area was bordered by hedgerows on all sides, with Wood Lane to the west and a railway track to the east.
26	Arable field with a slight slope south to north.	The survey area was bordered by a hedge backed by a railway line to the west, Station Road to the north, no physical boundary to the east and a ditch to the south. There was a powerline with two pylons in the north of the field.
27	Flat harvested field	The survey area was bordered by hedgerows and ditches on all sides.
28	Flat pasture field	The survey area was bordered by a wire fence to the south, and by hedgerows and metal fencing in all other directions.
29	Flat arable field	The survey area was bordered by a ditch to the north, a railway line to the west, a hedge to the south and no physical boundary to the east.
30	Flat arable field	The survey area was bordered on all sides by hedgerows. A road was present beyond the western border, and a farm track beyond the northern.
31	Flat arable field	The survey area was bordered by hedgerows on all sides, a road ran beyond the eastern boundary. A pylon was situated near the southwest corner of the field and overhead cables passed over the southwest section of field orientated northwest to southeast.
32	Flat arable field	The survey area was bordered by hedgerows and trees on all sides, except to the east which has no physical boundary
33	Flat pasture field	The survey area was bordered by wire fencing to the east, by wire fencing and hedgerows to the north and west, and by hedgerow and a ditch to the south. Overhead cables were oriented northwest to southeast through the southwest of the survey area along with two pylons.
34	Flat arable field	The survey area was bordered by hedgerows and trees on all sides
37	Flat arable field	The survey area was bordered on all sides by a ditch and hedge field boundary. Overhead cables crossed the northeast corner of the field.
38	Flat fallow field	The field was bordered by hedgerows and ditches in all directions.

39	Flat pasture field	The survey area was bordered by a hedgerow and road to the north, a ditch to the west, and hedgerow to the east and south.
40	Flat fallow field	The survey area was bordered by hedgerows on all sides with a railway line to the northwest.
41	Flat arable field	The survey area was bordered on all sides by a hedge and ditch boundary. A pylon situated near the east boundary and overhead cables orientated northwest to southeast cross the field from the north boundary to the east boundary.
42	Arable field with a gentle slope north to south.	The survey area was bordered by hedgerows to the north, west and south and no physical boundary to the east.
43	Flat arable field	The survey area was bordered by treelines to the north and south, a ditch to the west, and hedgerow to the south.
44	Flat arable field	The survey area was bordered by hedgerows and trees on all sides. In the southwest corner, there was a pylon with overhead cables in northwest to southeast orientation.
46	Flat arable field	The survey area was bordered by hedgerows to the north and east, a ditch to the west, and buildings to the south. In the southeastern corner of the field, there was a pylon with overhead cables running from north to southeast corner.
47	Arable field with a gentle slope north to south.	The survey area was bordered by hedgerows in all directions with a ditch to the north and west.
48	Flat pasture field	The survey area was bordered by hedgerows in all directions.
49	Flat arable field	The survey area, defined by a pylon in the southeast corner and overhead cables orientated northwest to southeast, had no physical boundary to the northeast. The south border was a ditch, and the west border was a hedge and ditch.
50	Flat arable field	The survey area was bordered by hedgerows to the north, east, and part of the south. The remaining part of the southern boundary has no physical barrier, while the western boundary was bordered by a ditch.
52	Flat arable field	The survey area was bordered by hedgerows to the north and west and a ditch to the south and east.
53	Flat arable field	The survey area was bordered by a grass verge and ditch to the north and was bordered by hedgerows in all other directions.
54	Flat arable field	The survey area is bordered by hedgerows on all side. Pylons are located at the northwestern edge of the area with the overhead cables

		running bisecting the survey area into two equal halves running through northwest to southeast direction.
55	Flat arable field	The survey area had an open boundary to the southeast and was bordered by hedgerows in all directions.
56	Mildly sloping arable field	The survey area was bordered on all sides by a hedge and ditch boundary, the east boundary was further bordered by a railway track. The survey area contained hay bales.
57	Sloping arable field	The survey area was bordered by hedgerows on all sides, with Springs Lane to the north.
58	Sloping arable field	The survey area was bordered on all sides by hedgerows, with a ditch and road beyond the north border.
61	Flat pasture field	The survey area was bordered by hedgerows to the north and west, a ditch to the south and had no physical boundary to the east.
62	Flat arable field	The survey area was bordered on all sides by hedgerows.
63	Sloping arable field	The survey area was bordered by hedgerows to the east, south, and west. To the north was a ditch.
64	Flat arable field	The survey area was bordered by hedgerows to the south and west, and had no physical boundary in all other directions.
66	Flat arable field	The survey area was bordered by hedgerows on all sides, with ditches along the eastern and southern boundaries. In the northeastern corner of the field, there was a pylon with overhead cables extending from the northern to the eastern corner.
67	Flat arable field	The survey area was surrounded by crops on all sides except in the north, where it was bordered by a hedgerow and a road. To the south, there was a pylon with overhead cables extending from the northwestern to the southeastern sides.
69	Flat arable field	The survey area was bordered by hedgerows to the north and south, and by a ditch to the east. There was no physical barrier to the west. In the eastern half of the field and along the eastern boundary, there are pylons with overhead cables in northwest to southeast orientation.
72	Flat arable field	The survey area was bordered by hedgerows to east and parts of the north and south. The remaining sections of the northern and southern boundaries have no physical barriers, while the western boundary was bordered by a ditch.
74	Flat arable field	The survey area was bordered by hedgerows to the south and west, by a ditch to the east, and

		had no physical boundary to the north. Telegraph poles and overhead cables were oriented along the southern boundary.
76	An arable field sloping gently towards the south	The survey area had no physical boundary to the east and was bordered by hedgerows in all other directions.
77	Sloping arable field	The survey area was bordered by hedgerows on all sides, with a farm track beyond the southern border. Telegraph poles and overhead cables were oriented along the eastern border.
79	Sloping arable field	The survey area was bordered by hedgerows to the west, north, east, and portion of the southern boundary. The southwest of the survey area was bordered with a grass verge.
80	Flat arable field	The survey area was bordered by crops on all sides except in the north which was bordered by hedgerow.
82	Sloping arable field	The survey area was bordered by hedgerows to the west, and by a treeline and hedgerows in all other directions.
84	Flat arable field	The survey area was bordered to the north, east, and south by hedgerows. There was a road running along the western, southern, and eastern border, and a ditch to the north.
85	Flat arable field	The survey area was bordered by a hedgerow to the north and east, and by a ditch to the south and west. Overhead cables were oriented northwest to southeast through the survey area with a pylon to the northwest and another to the south.
86	An arable field sloping gently towards the south	The survey area was bordered on all sides by hedgerows and tree lines
87	Flat arable field	The survey area was bordered on all sides by hedgerows and tree lines, except in the south which was bordered by ditch
88	Flat arable field with pasture to the west	The survey area was bordered by hedgerows to the south and west, and by a ditch in all other directions.
89	Undulating arable field	The survey area was bordered by hedgerows in all directions.
90	Flat arable field	The survey area was bordered by a treeline to the south and by hedgerows in all other directions. A pylon was present in the south of the survey area, with overhead cables oriented from northwest to southeast. Two small unable to be surveyed flooded areas were present in the south.
91	Flat arable field	The survey area was bordered by hedgerows to the south, a ditch to the west, overgrown

		vegetation to the north and had no physical boundary to east.
92	Flat arable field	The survey area was bordered by hedgerows in all directions except in the north which was bordered by ditch
93	Flat arable field	The survey area was bordered by hedgerows in all directions.
95	Flat arable field	The survey area was bordered by hedgerows in all directions except in the north which was bordered by ditch
96	Flat arable field	The survey area was bordered on all sides by hedgerows
97	Flat arable field	The survey area was bordered on all sides by hedgerows
98	Flat Arable field	The survey area was bordered by a ditch and overgrown vegetation to the north, vegetation to the east, and hedgerows with trees to the west and south. Additionally, a pylon was located along the northwestern boundary, with overhead cables bisecting the field and crossing the western and southern boundaries. A metal gate was also present at the northwestern corner of the area.
100	Flat arable field	The survey area was bordered on all sides by hedgerows. Additionally, a pylon was located in the northwestern corner, with overhead cables bisecting the field and crossing the southern boundary
101	Flat arable field	The survey area was bordered on all sides by hedgerows. Telephone poles were present in the middle of the survey area, with overhead cables, oriented east to west.
102	Flat arable field	The survey area was bordered on all sides by hedgerows.
104	Undulating arable field	The survey area was bordered by hedgerows to the east and south, and by a ditch to the north and west.
105	Flat arable field	The survey area was bordered by a ditch to the south, a treeline to the east and by hedgerows in all other directions. An area south of the field could not be surveyed due to overgrown vegetation. Overhead cables were oriented northwest to southeast through the south of the survey area.
107	Flat pasture field	The survey area was bordered by a ditch to the south and east, and by a treeline to the north and west. A metal water trough was present in the north of the survey area.
109	Undulating arable field	The survey area was bordered by a ditch to the east and by hedgerows in all other directions.

111	Undulating pasture field	The survey area was bordered by hedgerows to the west and by a ditch in all other directions.
112	Flat arable field	The survey area was bordered on all sides by hedgerows, except to the north which has no physical boundary.
113	Flat arable field	The survey area was bordered by hedgerows to the west and south, and by a ditch to the east. There was no physical boundary to the north.
114	Flat arable field	The survey area was bordered on all sides by hedgerows, except to the north which has no physical boundary.
115	Flat pasture field, with irregular and uneven clumps.	The survey area was bordered by hedges on all sides. Deep ruts were present oriented east to west across the survey area, with two small areas which could not be surveyed due to deep troughs in the east and west.
116	Flat arable field	The survey area was bordered by a treeline and hedgerows to the east and west, and by a ditch to the north and south.
117	Flat pasture field	The survey area was bordered by hedgerows on all sides.
118	Flat arable field	The survey area was bordered by hedgerows in all directions. Farm machinery ruts were present oriented east to west across the survey area.

4.3. The underlying geology comprises mudstones and dolomitic siltstones of the Mercia Mudstone Group. The superficial deposits are predominantly found on the eastern side of the survey area, represented by the Holme Pierrepont Sand and Gravel Member in the east. Alluvium deposits, consisting of clay, silt, sand, and gravel, are found in Areas 48, 53, 67, 80, 88, 91, 105, and 107, as well as the southern half of Area 38, the eastern sides of Areas 74, 801, 85, 90, and 111, and the western region of Area 64 and 85. Glaciofluvial deposits of mid-Pleistocene sand and gravel are recorded in Area 9. Additionally, bands of clay, silt, sand, and gravel of Head deposits are recorded in Areas 3, 8, 52, 55, 58, 61 and 63 (British Geological Survey, 2026).

4.4. The soils recorded across the survey primarily consist of slightly acidic loamy and clayey soils with impeded drainage in the west and naturally wet very acid sandy and loamy soils in the east. Additionally, slowly permeable seasonally wet and slightly acidic but base-rich loamy and clayey soils are recorded in Areas 1, 2, 3, 6, 7, 15, and 22. Loamy, clayey floodplain soils with naturally high groundwater are present in Areas 74, 90, 105, 107 and 111 (Soilscapes, 2026).

5. Archaeological Background

5.1. The following is a summary of an archaeological desk-based assessment produced and provided by Pegasus Planning Group (Pegasus Planning Group, 2024).

5.2. The scheduled Romano-British site at Segelocum (NHLE Ref: 1003669) is located within the southeast of the survey area, immediately north of Littleborough, also extending outside of the boundaries of the survey area south of Littleborough.

5.3. Cropmarks dating to the Romano-British period have been recorded within the south of the survey area, located south of Littleborough Road. A findspot containing artefacts dating to the Romano-British period has also been identified in the southwest of the survey area, west of Leverton Road. Romano-British activity was recorded in the surroundings of the survey area, with a Romano-British fort being located c. 700m to the southeast. It is also probable that the route of the extant Littleborough Road, located in the east of the survey area, follows the course of a past Romano-British road.

5.4. Medieval activity is recorded throughout the survey area in the form of ridge and furrow regimes. Earthworks identified in the centre-north of the survey, and specifically to the east of Sturton le Steeple, are considered likely to be the remnants of a deserted section of the medieval village of Sturton. The settlement of Sturton le Steeple itself has been recorded as early as the Domesday book.

5.5. Post-medieval and early modern activity is recorded outside of the survey area in the form of numerous listed buildings.

5.6. West Burton Power station was constructed in 1968 and is located to the immediate north of the survey area. Cottam Power Station constructed to the south in 1969 and is located c.3Km south of the survey area. A bomb crater caused by a V1 flying bomb during WWII is also recorded within the centre-east of the survey area, to the east of Sturton le Steeple.

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' cart and 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 44, 47, 50, 53, 56, 59, 62, 65 & 68). 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 (2026) 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 5, 8, 11, 14, 17, 20, 23, 26, 29, 32, 35, 38 & 41).

7.2.2. A fluxgate gradiometer survey was successfully undertaken across c. 734ha of the survey area. Approximately 15ha has not been surveyed due to restricted access by the farmers. The geophysical survey identified anomalies of archaeological, agricultural, natural, and undetermined origins. Magnetic disturbance caused by pylons, overhead cables, underground services, railway tracks, and field boundaries was primarily observed in the eastern half of the survey area. The presence of green waste across the southwest of the survey resulted in a high magnetic background, which may have masked weaker anomalies, limiting interpretation in affected areas (Figures 17 & 19).

7.2.3. Nine foci of archaeological activity have been identified across the survey area. The most notable is a part of a Romano-British street in the southeast of the survey area. This focus lies parallel to the extent Littleborough road, within Areas 85 and 90, and is representative of a street, oriented northwest to southeast, with associated enclosures and features to its north and south (Figures 42-44). The street detected likely leads to and is associated with the former Romano-British town of Segelocum, which has been recorded immediately southeast of the survey area (NHLE Ref: 1003669).

7.2.4. To the north of this focus within Area 74, anomalies of a possible archaeological activity have been identified, in the form of parallel linear anomalies, as well as two possible

rectilinear enclosures (Figures 45-47). These present differing signals and morphologies to the archaeological anomalies within Areas 85 and 90 but may be representative of archaeological features of a different time period.

7.2.5. In the northeast and east of the survey within Areas 17 and 43 anomalies of further probable archaeological activity have been identified in the form of sub-rectangular enclosures with internal divisions (Figures 48-53). Although the signal for these anomalies is weaker than that of those detected in Areas 85 and 90 the defined edges and concentration are indicative of cut features of Romano-British activity.

7.2.6. Anomalies of a possible archaeological origin have been detected to the south of Area 17 in Area 23 (Figures 51-53). These include a possible sub-rectangular enclosure with internal and external divisions and a linear anomaly. Although these anomalies have a similar morphology to the probable archaeological activity described above the signal is weaker and within an area of natural enhancement. Given these factors a more confident interpretation is not possible with the data alone.

7.2.7. Within Area 82 a group of curvilinear anomalies were identified forming a large enclosure with a break in the eastern boundary (Figures 54-56). A single linear extending from the break into the enclosure, possibly forms an internal division with a further curvilinear extending outward to the west from the east boundary, curving back around to the enclosure in a 'hook' shape. Other associated curvilinear anomalies were detected directly to the south and northeast. The collection in the northeast possibly forms an enclosure with clear boundaries on its north, west, east and south with a break in the eastern boundary and a further linear within the enclosure as a possible interior division.

7.2.8. A series of linear and curvilinear anomalies forming two distinct enclosures with further associated anomalies have been identified within Area 79 (Figures 57-59). The enclosures appear to have internal divisions formed by the inclusion of interior linears. Further associated linear anomalies could possibly be of land division use.

7.2.9. Anomalies of a possible archaeological origin were also recorded within Areas 23, 42, 52, 77, 81/100, 82 & 85 (Figures 52, 55, 61, 64 & 67). These are mostly isolated from the probable archaeology. Their discontinuous form and weaker magnetic signal are not conducive to the ascription of a positive date.

7.2.10. Agricultural activity has been identified throughout the survey area in the form of modern and historic ploughing regimes. The anomalies identified as modern ploughing trends align with modern ploughing visible in satellite imagery. Further ploughing trends identified present curving morphologies which are indicative of historical ridge and furrow ploughing.

7.2.11. Evidence of former field boundaries are present throughout the survey area. The majority of these align with boundaries visible within historic mapping (Figures 5, 8, 11, 14, 17, 20, 23, 26, 29, 32, 35, 38 & 41). Unmapped boundaries, which do not align with

any features within historical mapping, have also been identified which present signals or morphologies similar to that of the mapped former field boundaries.

7.2.12. Anomalies of a natural origin have been identified most notably in the southeast of the survey area in the form of a probable paleochannel with multiple branches. This former watercourse aligns with changes of the subsurface geology, but also lies in proximity to archaeological features. It is possible that some of these anomalies may have been reutilised for anthropogenic uses.

7.2.13. Several anomalies of an undetermined origin have been detected across the survey area. These lack the contextual evidence required for a confident classification. Although they are likely of agricultural, modern or natural in origin, an archaeological origin cannot be ruled out by the geophysical data alone.

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. **Archaeology Probable (Strong & Weak)** – A series of strong and weak linear and rectilinear anomalies have been detected within the southeast of the survey area, across Areas 85 and 90 (Figures 42-44). Some of these anomalies have been truncated by ridge and furrow ploughing, which may obscure the visibility of these or further anomalies. These anomalies follow the route of a known Romano-British Road (Section 5.2 NHLE Ref: 1003669).This road is

flanked on either side by a series of enclosures which are likely to be features related to the road. The length of the road is around 400m maintaining a consistent width of c. 16m, identifiable through the centrally negative response paralleled by a collection of broken positive linear anomalies. The rectilinear anomalies forming the possible buildings are comprised of a number of apparent 90-degree angles, some of which, creating internal divisions. Smaller discrete anthropogenic anomalies have been noted internally within features identified as buildings, which could be related to burning events or similar activities.

7.3.2.2. **Archaeology Possible (strong and Weak)** – Within Area 74, a series of parallel linear anomalies, along with linear and curvilinear anomalies forming two rectilinear alignments have been identified (Figures 45-47). These anomalies have been ascribed as possible archaeological activity because they present differing signals and morphologies to nearby archaeological anomalies within Areas 85 and 90 but may still be representative of archaeological features of a different time period.

7.3.2.3. **Archaeology Probable (Strong & Weak)** – Located in Area 79 are two collections of linear and rectilinear features indicative of infilled ditches (Figures 57-59). These anomalies appear to form large, partial, sub square enclosures occupying a total area of 2.2ha of land and are accompanied by associated linear and curvilinear anomalies. The collection in the northwest of the area forms an enclosure with clearly defined edges with further internal linear anomalies apparently denoting interior divisions. Within close proximity are multiple linear anomalies and further curvilinear directly southwest which hold no discernible formation suggestive of a structure or feature.

7.3.2.4. **Archaeology Probable (Strong & Weak)** – Within the south of Area 82, a set of curvilinear anomalies have been identified in the form of an enclosure (Figure 55). The anomalies have clear boundaries along the northeast south and west, the western boundary has a possible break which may indicate a entranceway. A linear anomaly interjects into the enclosure from the west. A further curvilinear anomaly extends eastwards from the enclosure around 30m before curving back inwards. Other curvilinear anomalies have also been identified within proximity directly to the south and again to the northeast.

7.3.2.5. **Archaeology Possible (Strong & Weak)** – In Area 23, a rectilinear anomaly containing further linear, curvilinear, and rectilinear anomalies has been identified (Figure 52). The morphology of the larger anomaly indicates an enclosure with possible sub-divisions. Nearby, a linear anomaly orientated north-south has also been identified, which may relate to the possible enclosure.

7.3.2.6. **Archaeology Possible (Strong & Weak)** – Several linear, rectilinear, and curvilinear and discrete anomalies have been within Areas 42, 52, 77, 82, 85, (Figures 43, 52, 55, 61 & 67). These anomalies could indicate land divisions and

can be considered to likely relate to further possible archaeological features. However, the lack of clear relationship with anomalies of a probable archaeological origin has resulting in their assignment of 'possible' rather than 'probable'.

7.3.2.7. **Archaeology Possible (Weak)** – Several linear, rectilinear, and discrete anomalies were identified within Areas 81, 94, and 100 (Figure 64). These anomalies may represent anthropogenic features such as partial enclosures. However, due to their lack of clear association with other confirmed archaeological features, they have been cautiously classified as possible archaeological in origin.

7.3.2.8. **Agricultural (Strong/Weak)** – Linear anomalies of differing orientations have been detected throughout the survey area (Figures 5, 8, 11, 14, 17, 20, 23, 26, 29, 32, 35, 38 & 41). The majority of these align with features visible within historical OS mapping, with those that do not still presenting similar signals and morphologies and thus likely being unmapped boundaries, trackways and tramlines.

7.3.2.9. **Natural (Strong/Weak) (Paleochannel)** – Broad, sinuous bands and spreads of a strong and weak enhanced magnetic signal have been identified in the southeast of the survey area within Areas 38, 48, 53, 64, 74, 85, 90, 91, 102, 105, 107 and 111. These anomalies have identified as a possible paleochannel due to the formation spanning across numerous areas. The path of this channel correlates with changes in the subsurface geology to that of alluvial deposits characteristic of a river course.

7.3.2.10. **Natural (Strong, Weak & Spread)** – Anomalies of natural origin were detected throughout the survey area mostly within the east and southeast. Some of these anomalies may relate to alluvial deposits, as is most likely in the southeast of the survey area.

7.3.2.11. **Drainage Feature** – Across most of the survey areas groups of parallel, linear anomalies with varying orientations were identified. These drainage features have no discernible origin period and often overlap with each other (Figures 5, 8, 11, 14, 17, 20, 23, 26, 29, 32, 35, 38 & 41).

7.3.2.12. **Ridge and Furrow (Trend)** – Anomalies indicative of ridge and furrow ploughing have been detected across the survey area (Figures 5, 8, 11, 14, 17, 20, 23, 26, 29, 32, 35, 38 & 41). The parallel, linear anomalies were detected predominantly oriented north to south or east to west. They do not align with any modern ploughing regime visible on satellite imagery. The signal of the anomalies varies across and between fields, with some anomalies detected as positive and negative signals.

8. Conclusions

8.1. A fluxgate gradiometer survey was carried out across c. 749ha at Sturton le Steeple, Nottinghamshire. Approximately 15ha has yet to be surveyed due to restricted access from the

farmers. The fluxgate gradiometer survey has generally responded well to the environment of the survey area, though green waste was present across the southwest of the survey area, which may have obscured anomalies from being visible. Anomalies of a probable and possible archaeological origin have been identified. Modern interference is generally limited to extent field boundaries, pylons, overhead cables, buried services and railway tracks.

8.2. Multiple foci of archaeological activity have been identified across the survey area, in particular the route of a Romano-British Road with associated enclosures and structures in the within the east of the survey area. Archaeological anomalies were also detected in the form of further enclosures in the west of the survey area. Further anomalies of a possible archaeological origin have been detected although they cannot be positively dated.

8.3. Agricultural activities have been identified across the survey area, in the form of modern ploughing trends, historical ridge and furrow, ploughing, mapped and unmapped field boundaries and drainage features.

8.4. Anomalies of natural origin have been identified across the survey area, including alluvial deposits likely from a paleochannel in the southeast of the survey area.

8.5. Anomalies of an undetermined origin have been detected across the survey area. These lack the contextual evidence required for a confident classification. Although likely to be agricultural, modern or natural, an archaeological origin cannot be ruled out

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.

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11. References

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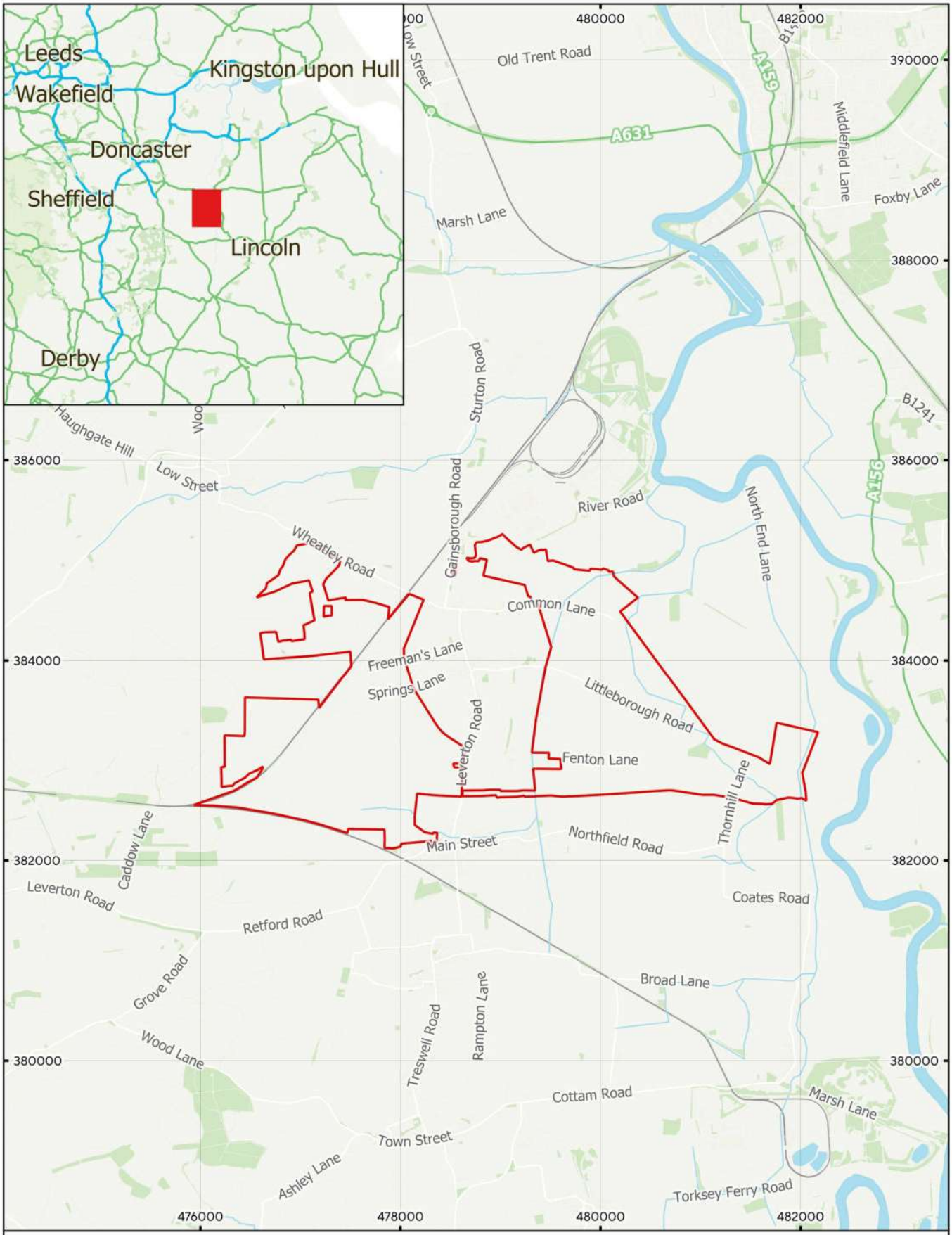
12. Project Metadata

MS Job Code	MSSK1773
Project Name	Steeple Solar, Nottinghamshire
Client	Pegasus Planning Group Ltd
Grid Reference	SK 79853 81689
Survey Techniques	Magnetometry
Survey Size (ha)	749ha 734ha of which has been surveyed
Survey Dates	29-04-2024 to 07-11-2025
Project Lead	Finnegan Pope-Carter BSc (Hons) MSc FGS
Project Officer	Leigh A. Garst BFA MSc MCIfA
Report Version	1.2

13. Document History

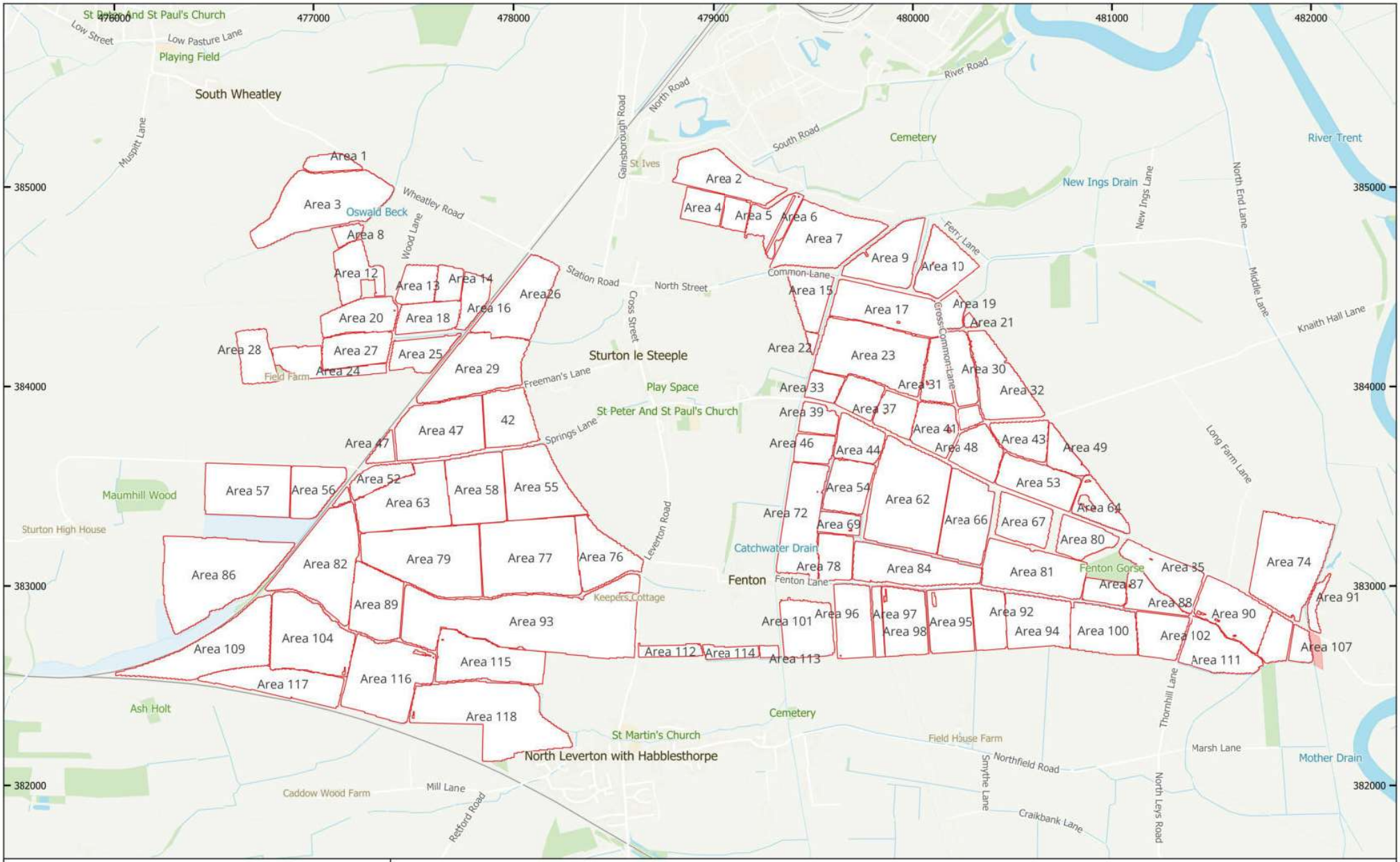
Version	Comments	Author	Checked By	Date
Interim Draft 0.1	Draft for Project Lead to Review	BO	AL	17 June 2024
Interim Draft 0.2	Second draft after Project Lead Review	IT	FPC	20 June 2024
Interim Draft 0.3	Corrections from Director, Report issued as Draft	IT	AL	21 June 2024
Draft 0.4	Draft for Project Lead to Review	TF	LAG	11 April 2025
Draft 0.5	Director Sign Off	LAG	FPC	17 April 2025
1.0	Final			
1.1	Additional survey areas	TF	LAG	16 January 2026
1.2	Client Corrections		LAG	20 March 2026



MSSK1773 - Steeple Solar, Nottinghamshire
Figure 1 - Geophysical Survey Location
1:50,000 @ A4

Geophysical Site

0 1 2 km

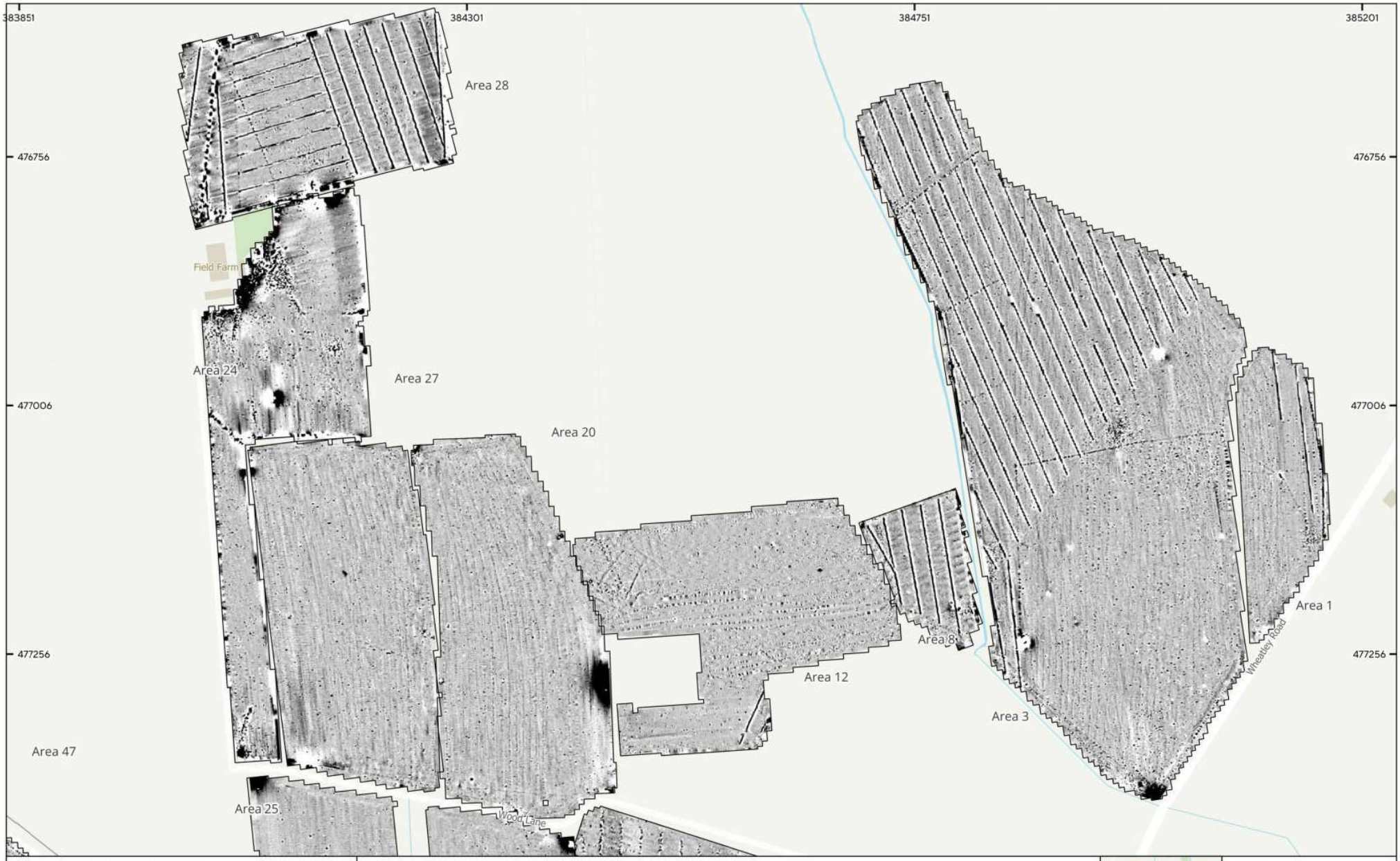


MSSK1773 - Steeple Solar, Nottinghamshire
Figure 2 - Location of Survey Areas
1:17,500 @ A3

Geophysical Site
No Access
Unsurveyable

Magnitude Surveys

0 150 300 450 600

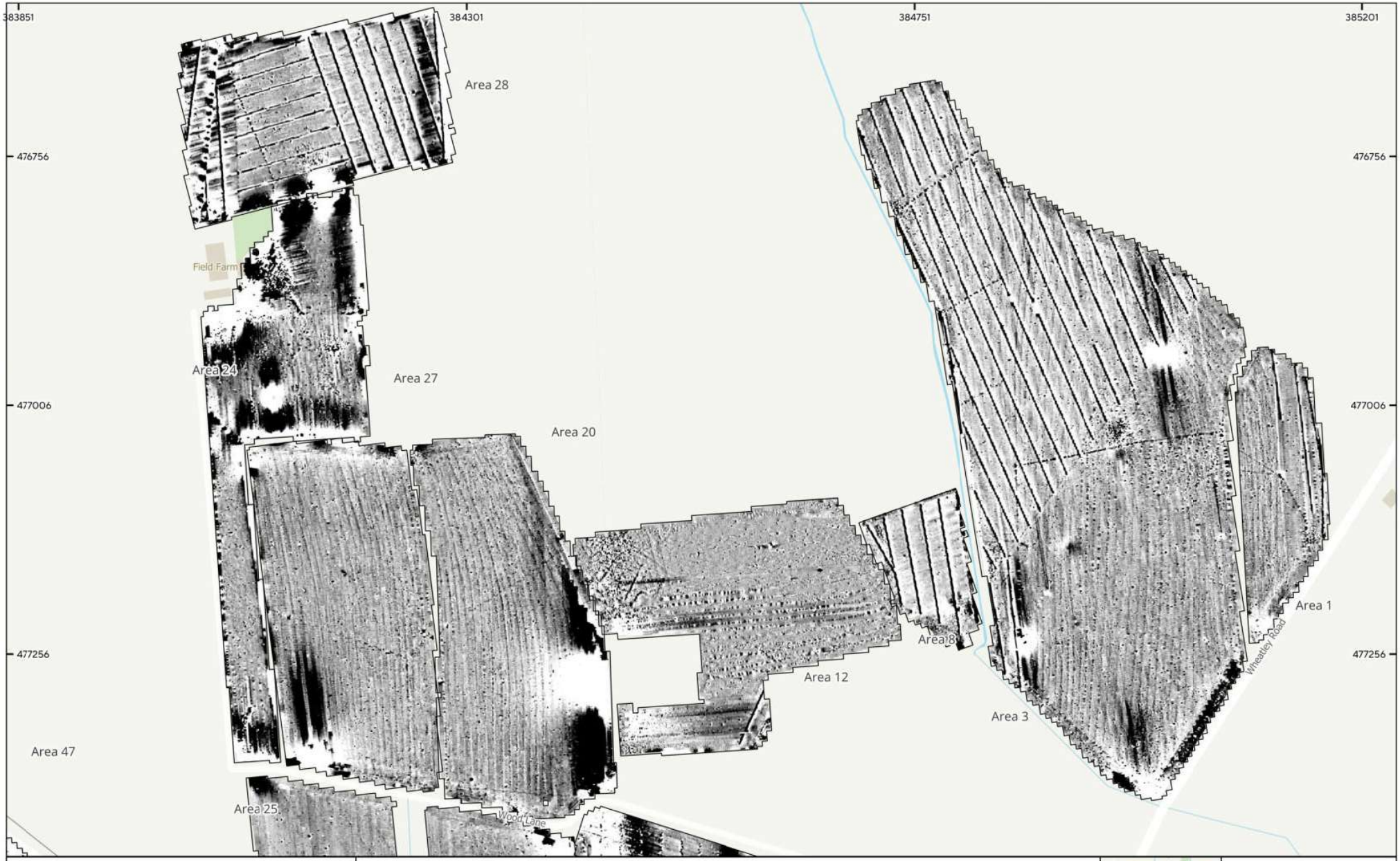


MSSK1773 - Steeple Solar, Nottinghamshire
Figure 3 - Magnetic Gradient (Areas 1, 3, 8, 12, 13, 20, 24, 27 & 28)
1:3,500 @ A3

-1 nT 2

Magnitude Surveys

0 30 60 90 120 m



MSSK1773 - Steeple Solar, Nottinghamshire
Figure 4 - Magnetic Total Field (Lower Sensors) (Areas 1, 3, 8, 12, 13, 20, 24, 27 & 28)
1:3,500 @ A3

48,997 nT 49,005

Magnitude Surveys

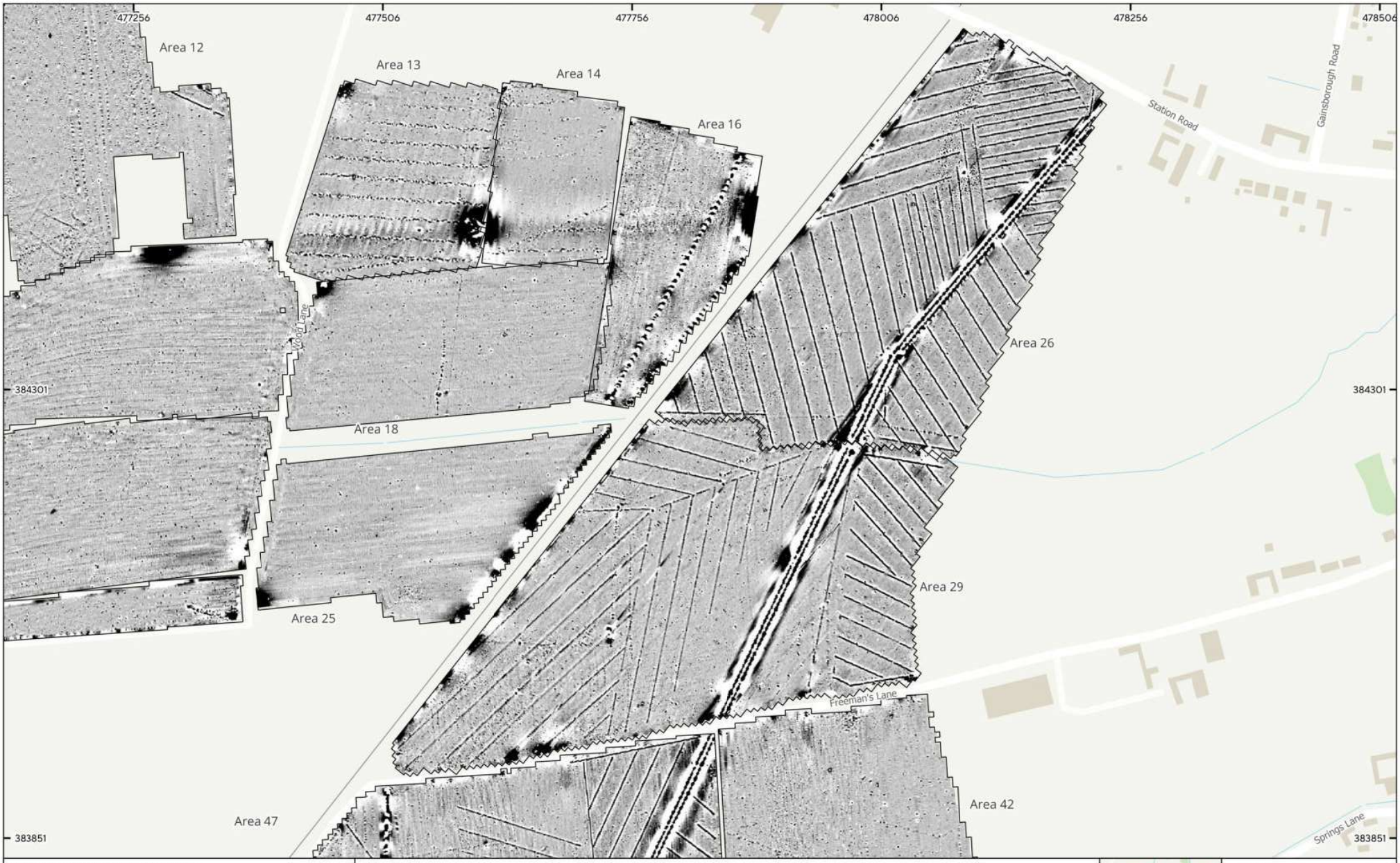
0 30 60 90 120 m

MSSK1773 - Steeple Solar, Nottinghamshire
Figure 5 - Magnetic Interpretation over Historical Mapping and Satellite Imagery (Areas 1, 3, 8, 12, 13, 20, 24, 27 & 28)
1:3,500 @ A3

Agricultural (Spread)
Agricultural (Strong)
Agricultural (Weak)
Magnetic Disturbance
Ferrous/Debris (Spread)
Undetermined (Strong)
Undetermined (Weak)
Agricultural (Trend)
Service
Ridge and Furrow (Trend)
Drainage Feature
Ferrous (Spike)

Magnitude Surveys

0 30 60 90 120 m

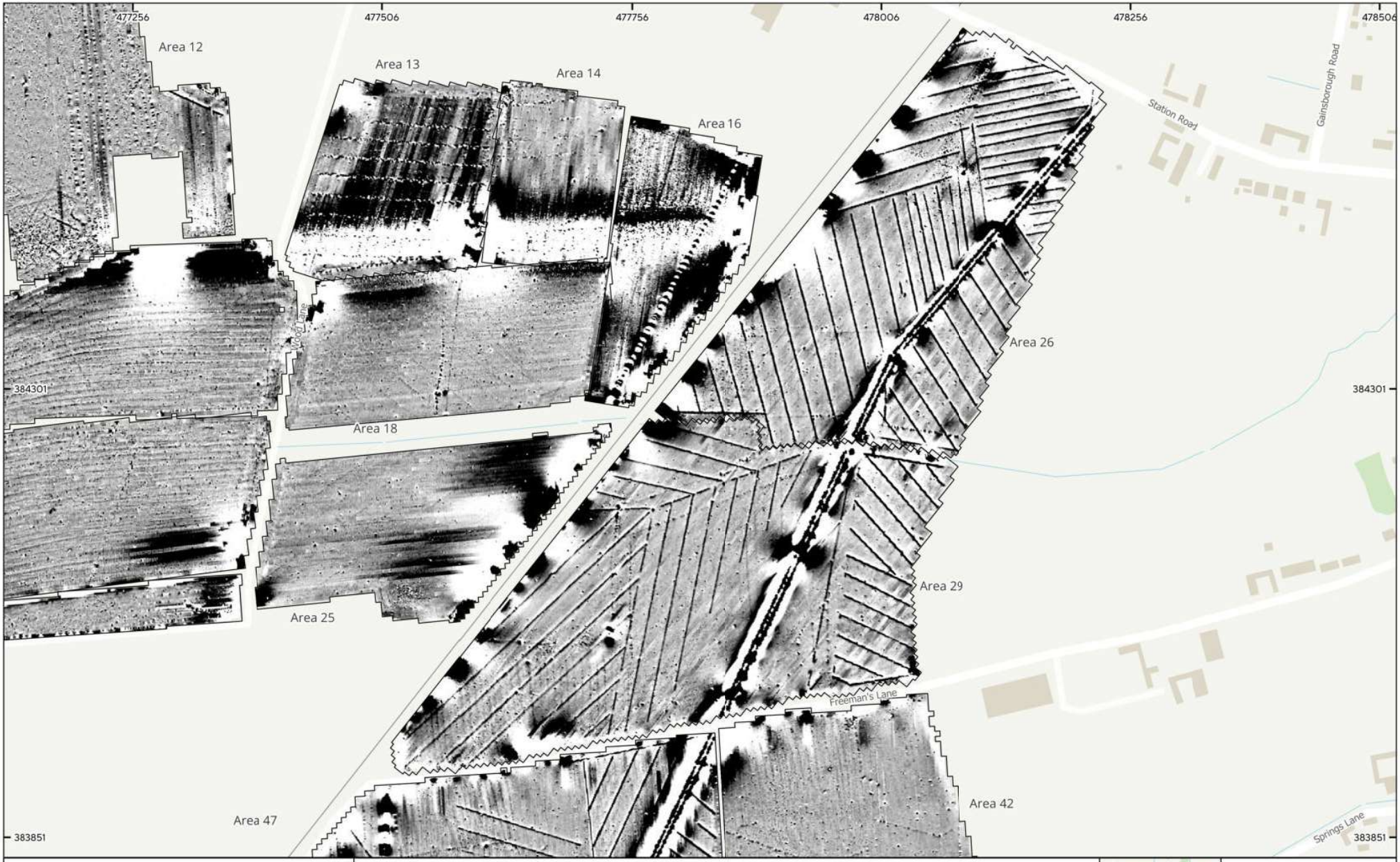


MSSK1773 - Steeple Solar, Nottinghamshire
Figure 6 - Magnetic Gradient (Areas 13, 14, 16, 18, 25, 26, 29, 42 & 47)
1:3,500 @ A3

-1 nT 2

Magnitude Surveys

0 30 60 90 120 m



MSSK1773 - Steeple Solar, Nottinghamshire
Figure 7 - Magnetic Total Field (Lower Sensors) (Areas 13, 14, 16, 18, 25, 26, 29, 42 & 47)
1:3,500 @ A3

MSSK1773 - Steeple Solar, Nottinghamshire
Figure 8 - Magnetic Interpretation over Historical Mapping and Satellite Imagery (Areas 13, 14, 16, 18, 25, 26, 29, 42 & 47)
1:3,500 @ A3

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

Magnitude Surveys

0 30 60 90 120 m

MSSK1773 - Steeple Solar, Nottinghamshire
Figure 9 - Magnetic Gradient (Areas 40, 42, 52, 56, 57, 58, 61, 63, 79, 82, 86, 89, 93, 104 & 109)
1:3,500 @ A3

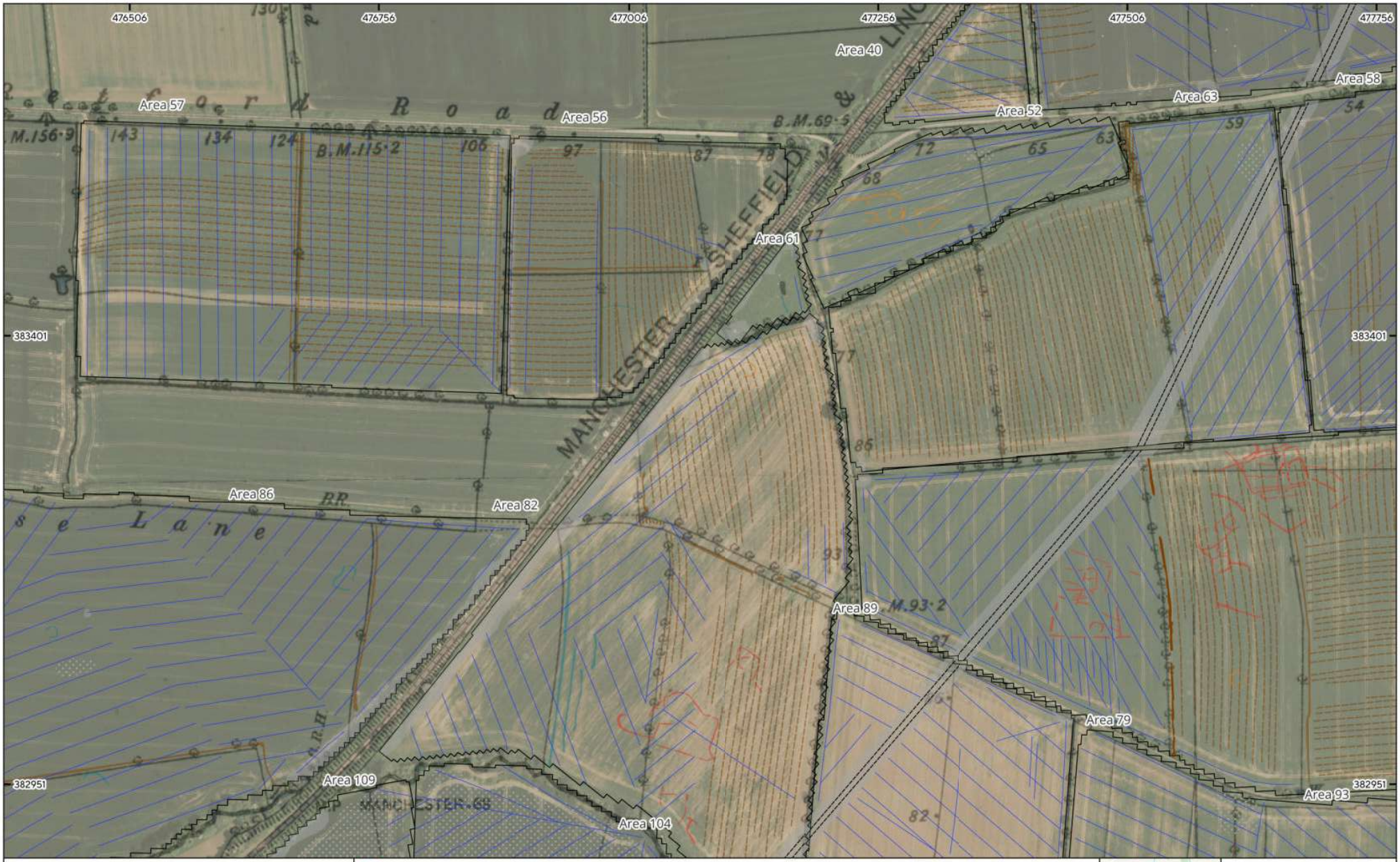
Magnitude Surveys

MSSK1773 - Steeple Solar, Nottinghamshire
Figure 10 - Magnetic Total Field (Lower Sensors) (Areas 40, 42, 52, 56, 57, 58, 61, 63, 79, 82, 86, 89, 93, 104 & 109)
1:3,500 @ A3

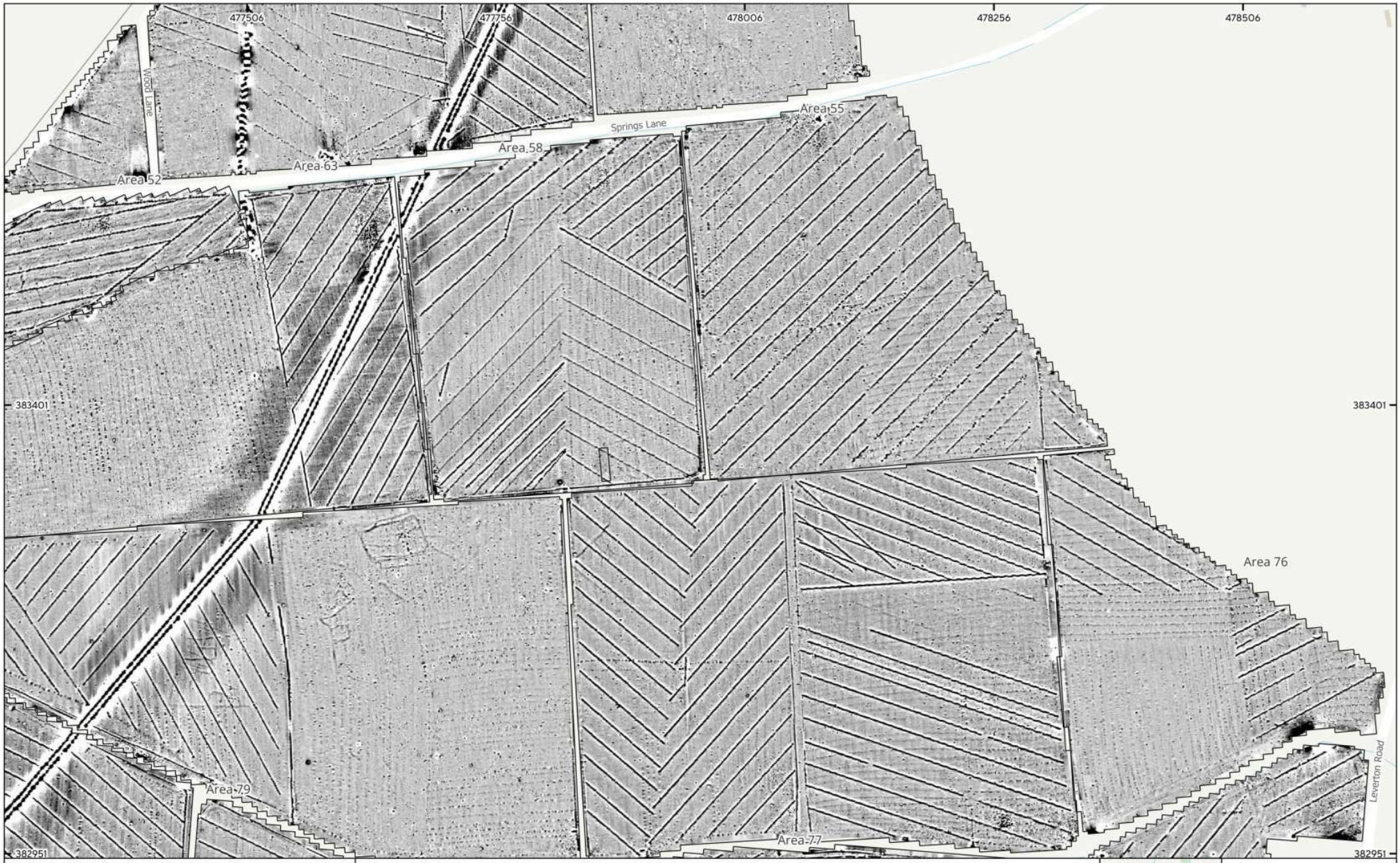
48,997 nT 49,005

Magnitude Surveys

0 30 60 90 120 m

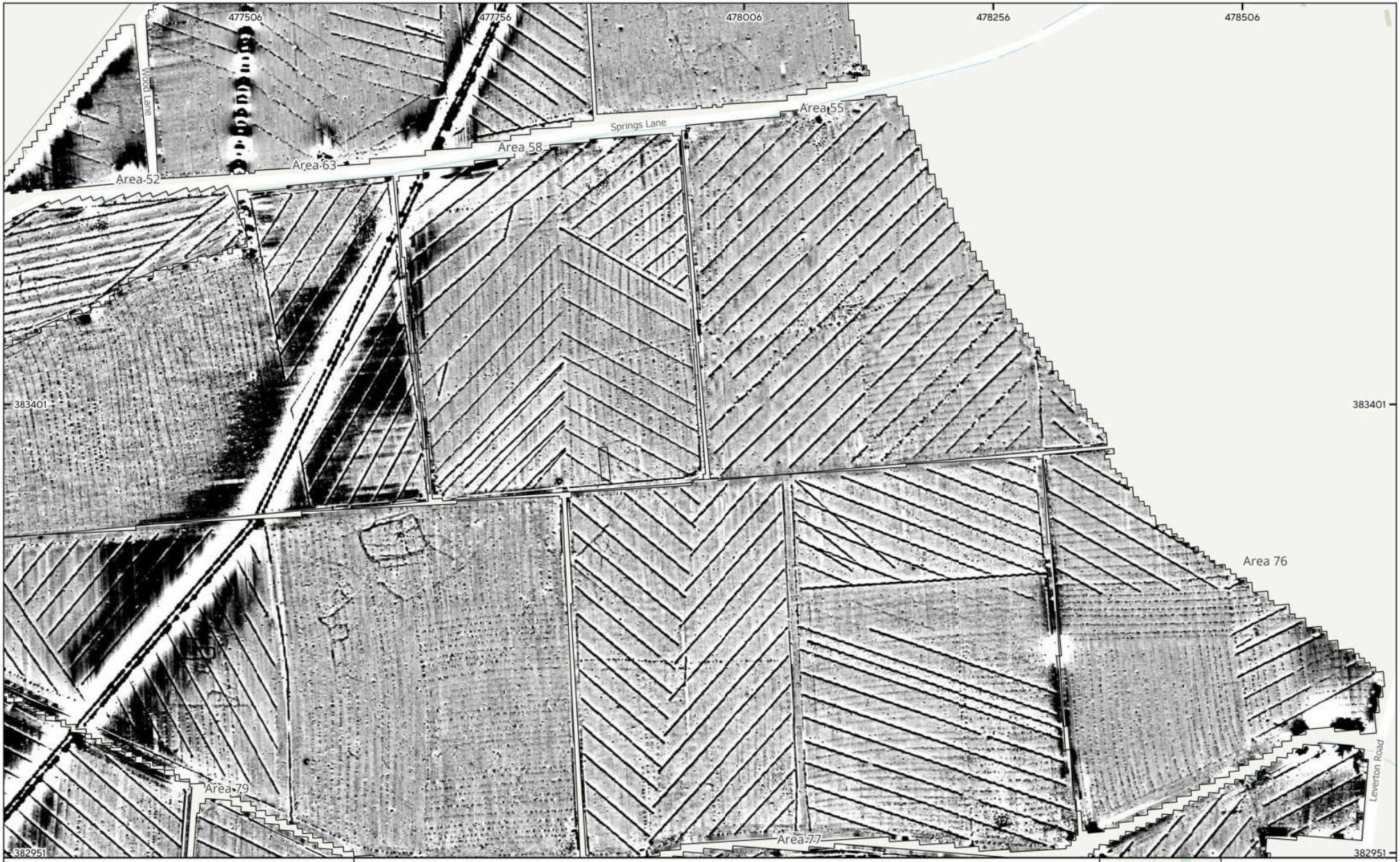


MSSK1773 - Steeple Solar, Nottinghamshire
Figure 11 - Magnetic Interpretation over Historical Mapping and Satellite Imagery (Areas 40, 42, 52, 56, 57, 58, 61, 63, 79, 82, 86, 89, 93, 104 & 109)
1:3,500 @ A3



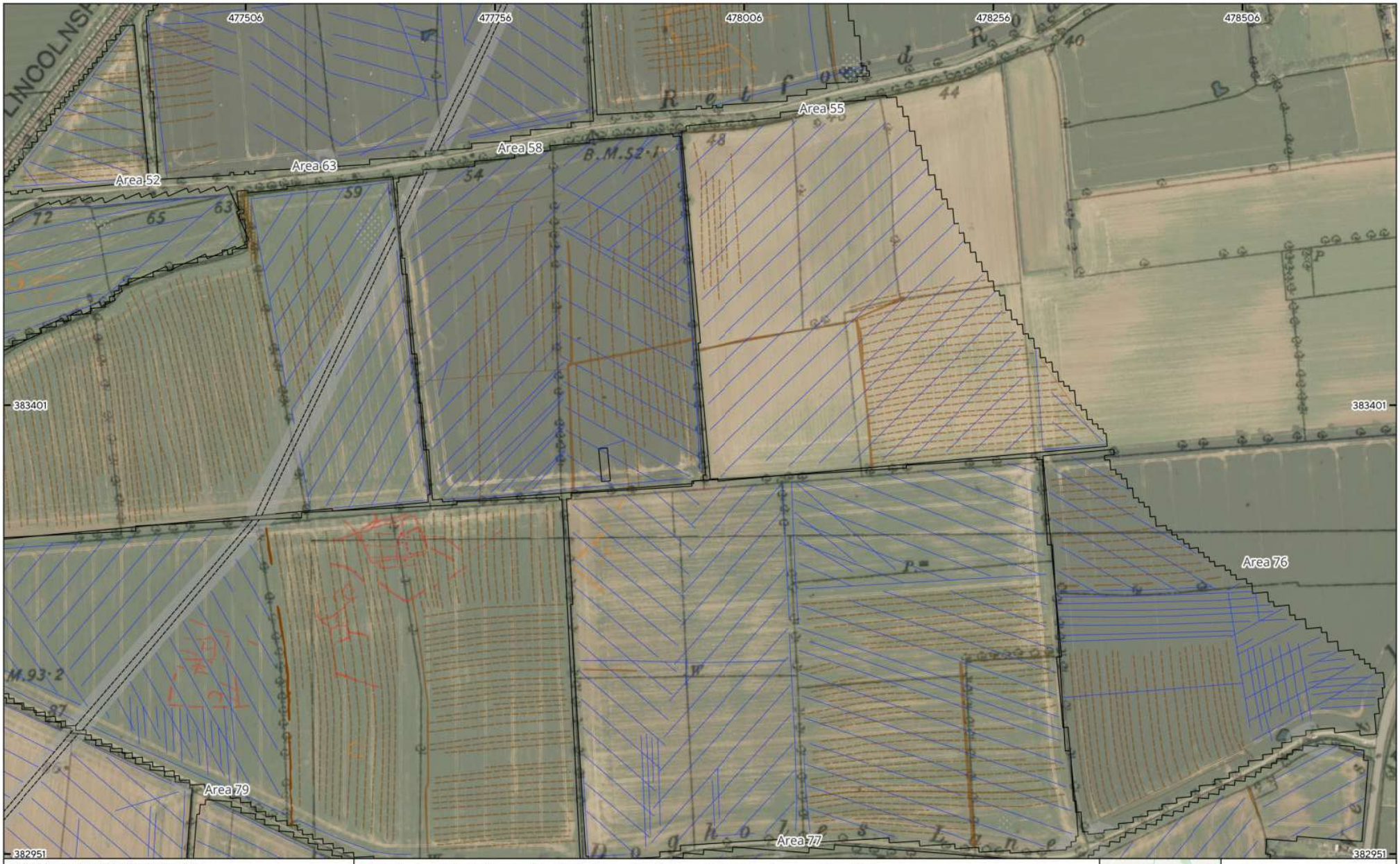
MSSK1773 - Steeple Solar, Nottinghamshire
Figure 12 - Magnetic Gradient (Areas 42, 47, 52, 55, 58, 63, 76, 77, 79, 89 & 93)
1:3,500 @ A3

Magnitude Surveys



MSSK1773 - Steeple Solar, Nottinghamshire
Figure 13 - Magnetic Total Field (Lower Sensors) (Areas 42, 47, 52, 55, 58, 63, 76, 77, 79, 89 & 93)
1:3,500 @ A3

Magnitude Surveys



MSSK1773 - Steeple Solar, Nottinghamshire
Figure 14 - Magnetic Interpretation over Historical Mapping and Satellite Imagery (Areas 42, 47, 52, 55, 58, 63, 76, 77, 79, 89 & 93)
1:3,500 @ A3

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

Magnitude Surveys

0 30 60 90 120 m