Geophysical Survey Report

Of

symmetry park, Huyton

Merseyside

For

Salford Archaeology

On Behalf Of

dbsymmetry

Magnitude Surveys Ref: MSSJ489

OASIS: magnitud1-367828

September 2019

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Draft 1.0	First draft to line manager.	Robert Legg BSc MSC Andrés Pérez Arana BA(Hons) MA PCIfA	Andrés Pérez Arana BA(Hons) MA PCIfA Robert Legg BSc MSc	Leanne Swinbank BA ACIfA	04 September 2019
Draft 1.1	Line manager corrections	Leanne Swinbank BA ACIfA	Leanne Swinbank BA ACIfA	Dr. Chrys Harris MCIfA	06 September 2019
Draft 1.2	Project manager corrections	Leanne Swinbank BA ACIfA	Leanne Swinbank BA ACIfA	Dr. Chrys Harris MCIfA	10 September 2019
Final 2.0	Corrections from client	Alison Langston BA PCIfA	Alison Langston BA PCIfA	Leanne Swinbank BA ACIfA	23 September 2019

Abstract

Magnitude Surveys was commissioned to assess the subsurface archaeological potential of a c. 11ha area of land at symmetry park, Huyton, Merseyside. A fluxgate gradiometer survey was successfully completed across the site. The geophysical results are characterised by strongly enhanced magnetic anomalies related to drainage features and modern disturbance. The north-eastern end of the survey area in particular has been affected by quantities of modern ferrous material in the near surface. No clear indications of archaeological activity have been identified, however historic agricultural land usage has been detected in the form of recorded former field boundaries and trackways. In addition, anomalies have been detected which possibly relate to the former Cronton colliery which borders the survey area to the south.

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1. Introduction

1.1. Magnitude Surveys Ltd (MS) was commissioned by Salford Archaeology on behalf of dbsymmetry to undertake a geophysical survey on a c.11ha area of land at symmetry park, Huyton, Merseyside (NGR: SJ 4718 8953).

1.2. The geophysical survey comprised hand-carried GNSS-positioned fluxgate gradiometer survey.

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, 2014) and the European Archaeological Council (Schmidt et al., 2015).

1.4. It was conducted in line with a WSI produced by MS (2019).

1.5. The survey commenced on 29/08/2019 and took two days to complete.

2. Quality Assurance

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

2.2. Director Dr. Chrys Harris is a Member of CIfA, has a PhD in archaeological geophysics from the University of Bradford and is the Vice-Chair of ISAP. Director 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. Reporting Analyst Dr. Kayt Armstrong has a PhD in archaeological geophysics from Bournemouth University, is the Vice Conference Secretary and Editor of ISAP News for ISAP, and is the UK Management Committee representative for the COST Action SAGA.

2.3. All MS managers have relevant degree qualifications to archaeology or geophysics. All MS field and office staff have relevant archaeology or geophysics degrees 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 site is located c.2.6km south-east from Huyton (Figure 1). Survey was undertaken across two fields, a large arable field and a smaller pasture field. The site is bounded by the M62 to the north, Halsnead Farm to the east and forested land to the south and west (Figure 2). Approximately 0.4 ha could not be surveyed due to overgrown vegetation.

4.2. Survey considerations:

Survey Area	Ground Conditions	Further Notes
1	Pasture, gently sloping down to the west.	Bounded entirely by a wooden fence, the M62 also ran to the north of the field boundary. A pylon was located within the north boundary, and a second pylon was located in the centre north of the survey area. A metal water tank was located on the southern boundary.
2	Arable land, barley stubble at the time of survey. The field sloped down towards the west with some undulation.	Bounded by woodland to the south and west, a wooden fence bound the north side, the M62 also ran to the north of the field boundary; a metal fence was located on the eastern edge and an area of uncultivated grass bound the survey area on its western edge.

4.3. The underlying geology comprises a band of sandstone from the Pennine Middle Coal Measures Formation on the western half of the survey area and a band of mudstone, siltstone and sandstone from the Pennine Middle Coal Measures Formation on the eastern half of the survey area; a region in the north-eastern corner lays over sandstone from the Kinnerton Sandstone Formation, and a small section of the south-eastern corner is over Sandstone from the Pennine Middle Coal Measures Formation. Devensian Diamicton till overlies all the bedrock in the survey area. (British Geological Survey, 2019).

4.4. The soils are base rich, loamy and clayey, slowly permeable and seasonally wet (Soilscapes, 2019).

5. Archaeological Background

5.1. The following is a summary of an Archaeology Baseline Assessment produced by Mott MacDonald (2017) and provided by Salford Archaeology.

5.2. Prehistoric activity has been recorded in the wider environs. Two early Mesolithic to late Neolithic flint scatters (MM37) have been identified approximately 230m and 340m south of the survey area.

5.3. A Romano-British enclosure was identified during excavations for the construction of the M57-A561 Tarbock-Widnes Link Road approximately 340m south of the survey area (Cowell, 1997).

5.4. Medieval activity has been recorded in the wider environs as pottery findspots (MM30 & MM42-MM47) c.400m east and south of the survey area. Further activity has been recorded as evidence of medieval structures, the closest c.140m west of the survey area (MM69, MM74, MM81 and MM86).

5.5. The survey area is bordered to the south by the formerly active Cronton Colliery. The site was levelled and landscaped in the 1980s and the shafts were capped with concrete. Evidence of mining activity may exist beneath the surface of the survey area.

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 Grad-13 Digital Three-Axis Gradiometer	1m	200Hz reprojected to 0.125m

6.1.3. The magnetic data were collected using MS' bespoke hand-carried GNSS-positioned system.

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

6.1.3.2. 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.

6.1.3.3. 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 Historic England's standards for "raw or minimally processed data" (see sect 4.2 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 at different plotting ranges have been used for data interpretation. Greyscale images should be viewed alongside the XY trace plot (Figure 8). XY trace plots visualise the magnitude and form of the geophysical response, aiding in 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, historic maps, LiDAR data, and soil and geology maps. Google Earth (2019) was consulted as well, to compare the results with recent land usages.

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 of further work in order to constantly improve our knowledge and service.

7.2.Discussion

7.2.1. The geophysical results are presented in consideration with satellite imagery and historic maps (Figure 6).

7.2.2. The fluxgate gradiometer survey has responded variably to the environment of the survey area. The geophysical data in the north-eastern part of the site is characterised by ferrous debris and rubble material. The perimeters of the survey areas have also been affected by strong ferrous halos related to perimeter fencing and adjacent pylons. The soil and sediment development on the site, related to the topography has produced bands of more strongly enhanced deposits which run along the contours.

7.2.3. Historic land-use has been identified in the form of a former trackway which led up to Old Halsnead Hall, and a former field boundary both of which are recorded on historic maps (Figure 6). More recent agricultural activity includes modern ploughing regimes and drainage systems.

7.2.4. To the southwest of Old Halsnead Hall a group of anomalies have been classified as ‘Possible Industrial’, due to the strength of their magnetic signal and the proximity of former Cronton Colliery to the south.

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. **Magnetic Disturbance** – The strong anomalies produced by extant metallic structures along the edges of the field have been classified as ‘Magnetic Disturbance’. These magnetic ‘haloes’ will obscure the response of any weaker underlying features, should they be present, often over a greater footprint than the structure they are being caused by.

7.3.1.3. **Ferrous (Spike)** – Discrete ferrous-like, dipolar anomalies are likely to be the result of isolated modern metallic debris on or near the ground surface.

7.3.1.4. **Ferrous/Debris (Spread)** – A ferrous/debris spread refers to a concentrated deposition of discrete, dipolar ferrous anomalies and other highly magnetic material.

7.3.1.5. **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.

7.3.2. Magnetic Results - Specific Anomalies

7.3.2.1. **Possible Industrial** – Located in the northeastern corner of Area 2, a group of strong positive anomalies lie within an area c.25m by 30m [**2A**]. This group of four anomalies have unique magnetic signatures: a strong positive signal with associated negative signal. Given the consistency of the anomalies this group is not indicative of the dumping of material. The location of these anomalies being in close proximity to the former Cronton colliery may indicate an industrial origin, the strength of the anomalies would support this interpretation.

7.3.2.2. **Agricultural** – A continuous, strong positive curvilinear anomaly has been identified following the line of the north-west boundary of Area 2 for 305m [**2B**]. The anomaly follows the route of trackway leading to Old Halsnead Hall in historic Ordnance Survey maps (Figure 6). A second linear anomaly has been identified abutting the approximate centre of [**2B**] at an alignment of south-southwest to north-northeast, [**2C**]. A former field boundary recorded on historic maps (Figure 7) corresponds with linear anomaly.

8. Conclusions

8.1. A fluxgate gradiometer survey has successfully been undertaken across the site. The geophysical survey has detected a range of different types of anomalies, however no clear indications of archaeological activity have been identified. Anomalies identified include natural variations in the soils likely related to colluvial processes, drainage systems across the survey area, and agricultural activity. The survey area has also been impacted by modern activity in the form of ferrous debris or rubble in the north, overhead powerlines and ferrous halos related to perimeter fencing.

8.2. Possible industrial activity has been detected in the east of the survey area in the form of strongly positively enhanced magnetic anomalies. The largescale of these anomalies and the proximity of Cronton colliery to the south has led to the 'Possible Industrial' classification.

8.3. Agricultural anomalies in the form of recent ploughing regimes, extensive drainage patterns, a recorded former field boundary, and a former trackway have been identified.

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 the any dictated time embargoes.

10. Copyright

10.1. 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 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

British Geological Survey, 2019. Geology of Britain. Huyton, Merseyside [http://mapapps.bgs.ac.uk/geologyofbritain/home.html/]. [Accessed 02/09/2019].

Chartered Institute for Archaeologists, 2014. Standards and guidance for archaeological geophysical survey. CIfA.

Cowell, R., 1997. M57-A562 Tarbock Widnes Link Road, Merseyside: Archaeological Assessment and Updated Project Design. Field Archaeology Section, Liverpool Museum. Unpublished report.

David, A., Linford, N., Linford, P. and Martin, L., 2008. Geophysical survey in archaeological field evaluation: research and professional services guidelines (2nd edition). Historic England.

Google Earth, 2019. Google Earth Pro V 7.1.7.2606.

Magnitude Surveys, (2019). Written Scheme of Investigation for a Geophysical Survey of symmetry park Huyton, Merseyside.

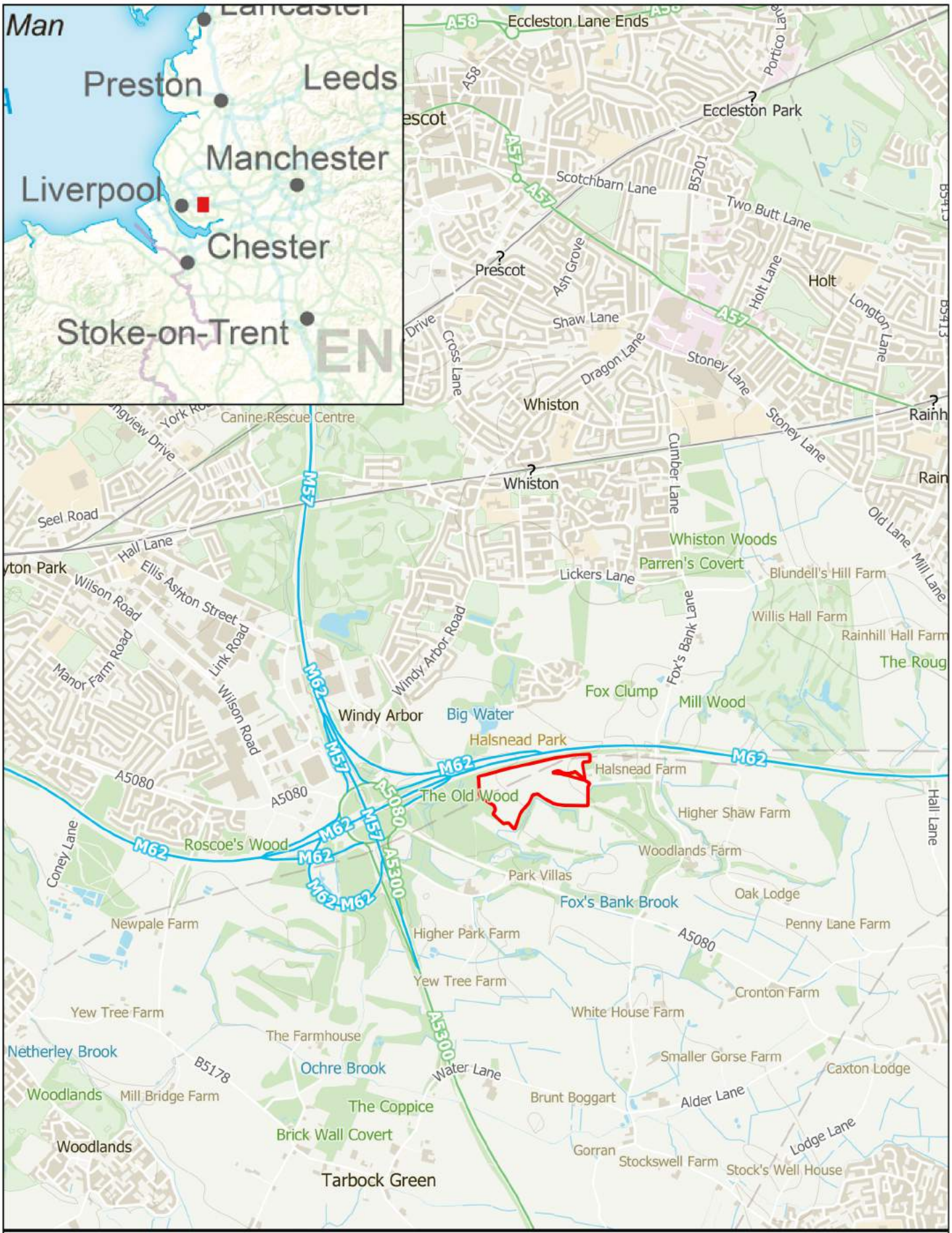
Mott MacDonald, (2017). Archaeology Baseline Assessment, Halsnead Masterplan SPD.

Olsen, N., Toffner-Clausen, L., Sabaka, T.J., Brauer, P., Merayo, J.M.G., Jorgensen, J.L., Leger, J.M., Nielsen, O.V., Primdahl, F., and Risbo, T., 2003. Calibration of the Orsted vector magnetometer. *Earth Planets Space* 55: 11-18.

Schmidt, A. and Ernenwein, E., 2013. Guide to good practice: geophysical data in archaeology. 2nd ed., Oxbow Books, Oxford.

Schmidt, A., Linford, P., Linford, N., David, A., Gaffney, C., Sarris, A. and Fassbinder, J., 2015. Guidelines for the use of geophysics in archaeology: questions to ask and points to consider. EAC Guidelines 2. European Archaeological Council: Belgium.

Soilscapes, 2019. Huyton, Merseyside. Cranfield University, National Soil Resources Institute [http://landis.org.uk]. [Accessed 02/09/2019].



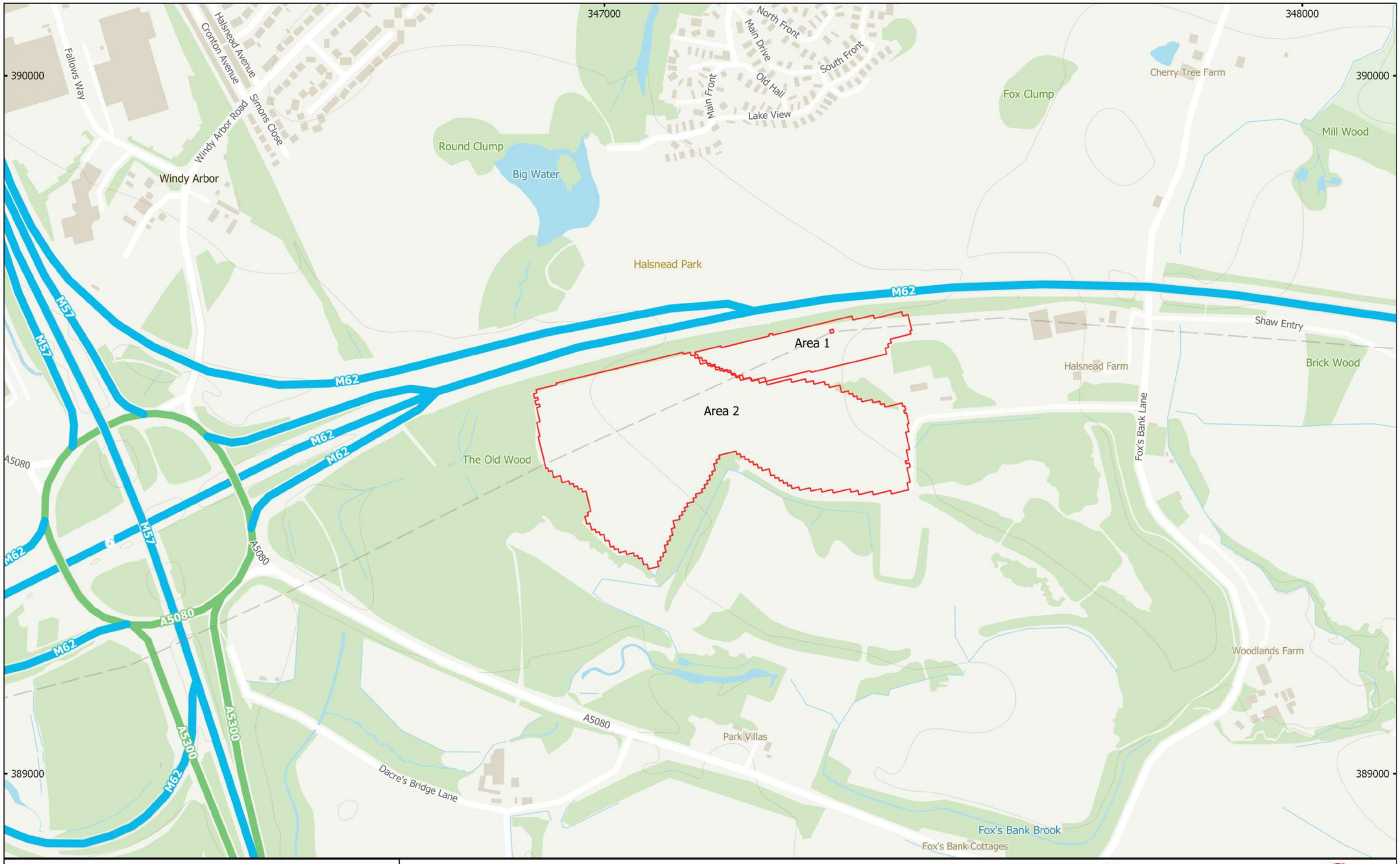
MSSJ489 - symmetry park, Huyton
Figure 1 - Site Location
1:25,000 @ A4

Site boundary

N

0 0.5 1 km

magnitude surveys



MSSJ489 - symmetry park, Huyton
Figure 2 - Location of Survey Areas
1:5,000 @ A3

Survey Extent

N

0 100 200 300 m

magnitude surveys

389600

347000

M62

347200

347400

389600

Area 1

389400

Area 2

389400

MSSJ489 - symmetry park, Huyton
Figure 3 - Magnetic Gradient
1:1,500 @ A3

-2 nT 3

N

0 40 80 120 m

magnitude surveys

389600

347000

M62

347200

347400

Area 1

389600

389400

Area 2

389400

MSSJ489 - symmetry park, Huyton
Figure 4 - Magnetic Gradient
1:1,500 @ A3

-1 nT 2

N

0 40 80 120 m

magnitude surveys

389600
347000
M62
347200
347400
389600
2B
Area 1
2C
2A
389400
Area 2
389400

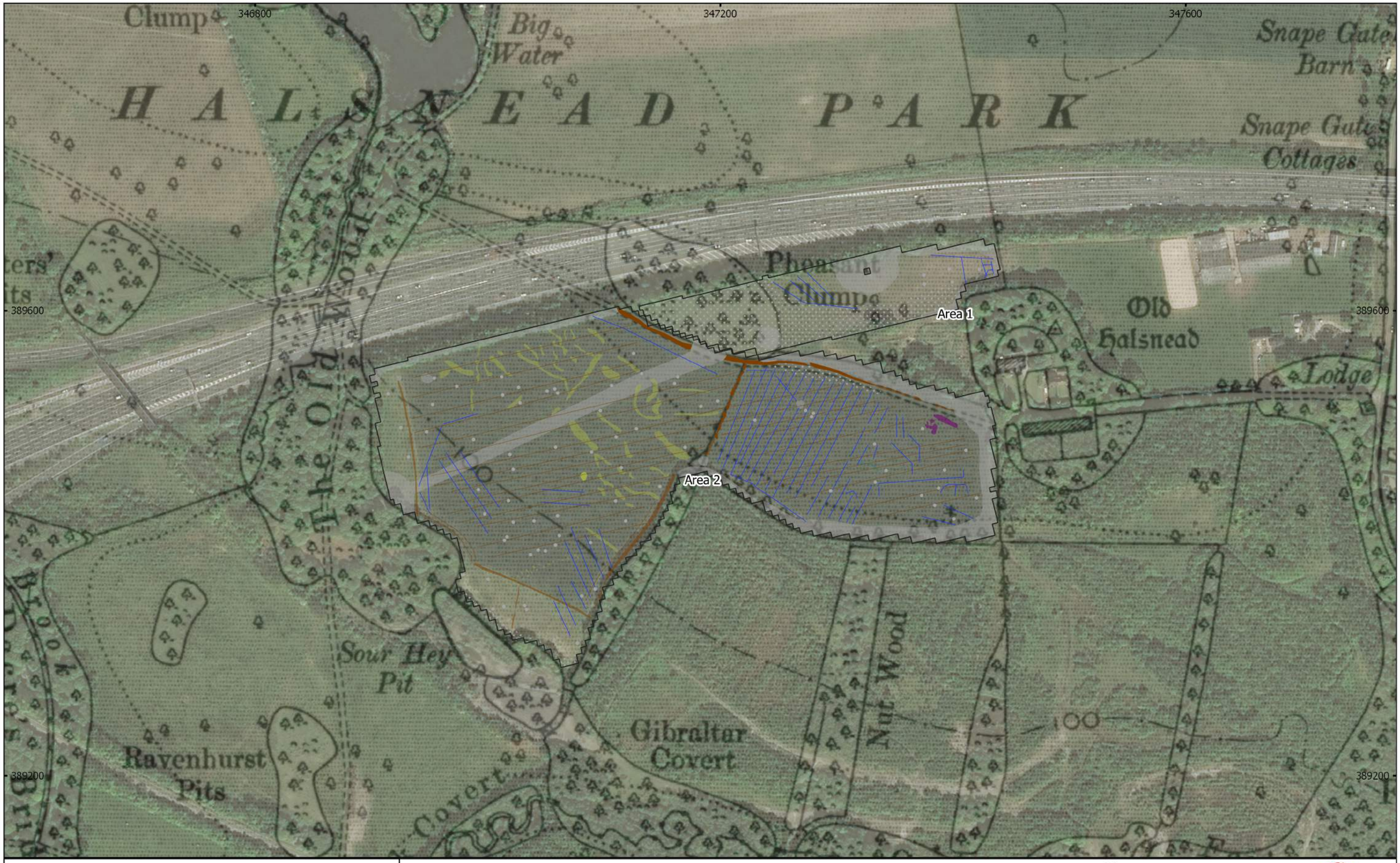
MSSJ489 - symmetry park, Huyton
Figure 5 - Magnetic Interpretation
1:1,500 @ A3

- Natural (Weak)
- Undetermined (Strong)
- Undetermined (Weak)
- Possible Industrial
- Agricultural (Strong)
- Agricultural (Weak)
- Agricultural (Trend)
- Drainage Feature
- Magnetic Disturbance
- Ferrous/Debris (Spread)
- Ferrous Point

N

0 40 80 120 m

magnitude surveys



MSSJ489 - symmetry park, Huyton
Figure 6 - Magnetic Interpretation Over Historic Maps and Satellite Imagery
1:3,000 @ A3

Contains historic maps: Ordnance Survey, 6" 2nd edition c. 1882-1913 © National Library of Scotland and Satellite Imagery © Bing 2019

- Natural (Weak)
- Undetermined (Strong)
- Undetermined (Weak)
- Possible Industrial
- Agricultural (Strong)
- Agricultural (Weak)
- Agricultural (Trend)
- Drainage Feature
- Magnetic Disturbance
- Ferrous/Debris (Spread)
- Ferrous Point

N

0 90 180 270 m

magnitude surveys

389600

347000

M62

347200

347400

Area 1

389600

389400

Area 2

389400

MSSJ489 - symmetry park, Huyton
Figure 7 - XY Trace Plot
30nT/cm at 1:1,500 @ A3

N

0 40 80 120 m

magnitude surveys

OASIS DATA COLLECTION FORM: England

Printable version

OASIS ID: magnitud1-367828

Project details

Project name	symmetry park, Huyton, Merseyside
Short description of the project	Magnitude Surveys was commissioned to assess the subsurface archaeological potential of a c. 11ha area of land at symmetry park, Huyton, Merseyside. A fluxgate gradiometer survey was successfully completed across the site. The geophysical results are characterised by strongly enhanced magnetic anomalies related to drainage features and modern disturbance. The north-eastern end of the survey area in particular has been affected by quantities of modern ferrous material in the near surface. No clear indications of archaeological activity have been identified, however historic agricultural land usage has been detected in the form of recorded former field boundaries and trackways. In addition, anomalies have been detected which possibly relate to the former Cronton colliery which borders the survey area to the south.
Project dates	Start: 29-08-2019 End: 23-09-2019
Previous/future work	Not known / Not known
Any associated project reference codes	MSSJ489 - Contracting Unit No.
Type of project	Field evaluation
Current Land use	Cultivated Land 4 - Character Undetermined
Current Land use	Grassland Heathland 5 - Character undetermined
Monument type	FORMER FIELD BOUNDARIES Uncertain
Significant Finds	NONE None
Methods & techniques	"Geophysical Survey"
Development type	Not recorded
Prompt	Unknown
Position in the planning process	Not known / Not recorded
Solid geology (other)	Pennine Middle Coal Measures sandstone, Kinnerton Sandstone Formation
Drift geology (other)	Devensian Diamicton till
Techniques	Magnetometry

Project location

Country	England
Site location	MERSEYSIDE KNOWSLEY CRONTON symmetry park, Huyton, Merseyside

Postcode	L35 3SU
Study area	11 Hectares
Site coordinates	SJ 4718 8953 53.399687952614 -2.7945013271 53 23 58 N 002 47 40 W Point

Project creators

Name of Organisation	Magnitude Surveys Ltd
Project brief originator	Mott MacDonald
Project design originator	Magnitude Surveys Ltd
Project director/manager	Finnegan Pope-Carter
Project supervisor	William Rigby
Type of sponsor/funding body	Developer

Project archives

Physical Archive Exists?	No
Digital Archive recipient	Magnitude Surveys
Digital Archive ID	MSSJ489
Digital Contents	"Survey"
Digital Media available	"GIS","Geophysics","Text"
Paper Archive Exists?	No

Project bibliography 1

Publication type	Grey literature (unpublished document/manuscript)
Title	symmetry park, Huyton, Merseyside
Author(s)/Editor(s)	Legg, R., Pérez Arana, A., Swinbank, L., Langston, A.
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