A57 Link Roads
TR010034
6.5 Environmental Statement
Appendix 6.4 Geophysical Survey Report
November 2020

APFP Regulation Regulation 5(2)(a)
Planning Act 2008 Infrastructure Planning (Applications: Prescribed

Forms and Procedure) Regulations 2009

June 2021

magnitude surveys

Geophysical Survey Report

Mottram

Greater Manchester

For

Oxford Archaeology

Magnitude Surveys Ref: MSSJ798

April 2021

magnitude surveys

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Report By:

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Report Approved By:

[redacted]

Issue Date:

19 April 2021

Abstract

Magnitude Surveys was commissioned to assess the subsurface archaeological potential of 21.62ha of land near Mottram in Longdendale, Greater Manchester. In particular, the geophysical survey was intended to identify landscape features that would either be attractive to prehistoric humans or would preclude such activity, and to identify possible locations of the Roman ford. The western survey area was located on the western edge of the village of Mottram in Longdendale and the eastern survey area was approximately 1.5 km east of the village. An electromagnetic survey was successfully completed over 16.36ha; the remaining area was unsurveyable due to poor ground conditions. The survey has been effective in detecting variations in conductivity and magnetic susceptibility datasets, with anomalies relating to known features such as the Mottram tunnel and the Mottram Old Mill. Anomalies have also been identified that may relate to variations in superficial deposits and possible palaeolandscape features. It has not been possible to confidently establish the origin of all anomalies, and some are therefore classified as 'Undetermined'. Interference from modern activity has had a minimal impact on the interpretation.

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1. Introduction

1.1. Magnitude Surveys Ltd (MS) was commissioned by Oxford Archaeology on behalf of Atkins to undertake a geophysical survey on approximately 21.62 ha area of land near Mottram in Longdendale, Greater Manchester (SJ 987957, SK 009955).

1.2. The geophysical survey comprised a hand-carried, GNSS-positioned, electromagnetic survey (EM survey). EM survey measures both soil electrical conductivity and magnetic susceptibility and is particularly suited for the detection of palaeo-landscape features, such as paleochannels.

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 (Cantarano, 2020).

1.5. The survey commenced on 9th November 2020 and took three days to complete.

2. Quality Assurance

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

2.2. The directors of MS are involved in the cutting edge of research and the development of guidance/policy. Specifically, [redacted] has a PhD in archaeological geophysics from the University of Bradford, is a Member of CIfA and is the Vice-Chair of ISAP; [redacted] 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); [redacted] has a PhD in archaeological geophysics from Bournemouth University, is a Member of CIfA, the Editor of ISAP News, and is the UK Management Committee representative for the COST Action SAGA; [redacted] has a PhD in archaeology from the University of Southampton, 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 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. There is the potential for early prehistoric activity to the east and west of the scheme – there is known Mesolithic settlement evidence at Grange Farm in the extreme west and a Roman fort and possible ford leading to it in the extreme east.

3.2. In order to inform a future programme of boreholes, test pits and trenches, the objectives of this geophysical survey were:

3.2.1. To identify features in the east and west of the scheme area that would either be attractive to prehistoric humans or would preclude such activity.

3.2.2. If present in results, the geophysical survey will also endeavour to identify possible locations of the Roman ford in the east of the survey area.

4. Geographic Background

4.1. The survey area was split into two main areas: the western area was located on the western edge of the village of Mottram in Longdendale and the eastern area was located approximately 1.5 km east of the village (Figure 1). Electromagnetic survey was undertaken across nine fields under pasture in the west and two fields under pasture in the east. The western survey area was bounded by adjacent pasture fields to the north and west and to the east and south, by housing (Figure 2). 5.26 ha hasn't been surveyed due to poor ground conditions relating to presence of a stream, dense vegetation, waterlogged ground and in the eastern area the presence of large metallic items within a relatively small area that would have an adverse effect on data quality.

4.2. Survey considerations:

Survey Area	Ground Conditions	Further Notes
1	Flat pasture field.	Bounded on all sides except the south by a barbed wire fence; a tree line formed the southern boundary. A line of trees was also present along the north-eastern boundary. The field contained a manhole cover close to the southwest and a stone building surrounded by barbed wire in the north-eastern corner. A small area in the south-western corner was unsurveyable due to overgrown vegetation.
2	Flat pasture field with waterlogged ground.	Bounded by a barbed wire fence and hedges to the southwest and southeast, and a ditch and excavated depression to the northeast. There was no physical boundary to the northwest. A metal gate was located in the western corner.
3	Pasture field. Undulating terrain, with a depression across the north-western quadrant.	Bounded by a barbed wire fence and hedge to the northeast, barbed wire fence to the southeast, and a ditch with vegetation/trees to the southwest. There was no physical boundary to the northwest. A pond was located adjacent

		to the south-western boundary, and a metal gate was located in the northern corner.
4	Pasture field. Undulating terrain with a linear depression running across the north-eastern corner.	Bounded by a ditch with vegetation/trees to the northeast and trees and a ditch to the southwest. There was no physical boundary to the northwest. To the southeast the field was bounded by hedges and the A57, but areas within this boundary were unsurveyable due to overgrown vegetation, reeds and waterlogging. A pylon was located in the north of the area, with overhead cables running north-south.
5	Pasture field. Sloping gently down from northwest to southeast. Wet, with standing water in the southeast.	Bounded to the northeast by a ditch and trees, and to the southwest by a barbed wire fence and trees with reeds in the western corner. There was no physical boundary to the northwest. The field was bounded to the southeast by a hedge and the road, but standing water made the south-eastern zone unsurveyable. Overhead cables ran north-south across the eastern corner of the area, with additional overhead cables following the south-western boundary. A borehole cap was located within the south-western boundary.
6	Pasture field. Sloping gently down from north to south, with a steep excavated depression across the western corner.	Bounded to the northeast and southeast by a barbed wire fence with several isolated trees, and to the southwest by a ditch. Bounded to the northwest by a steep excavated depression and a ditch.
7	Pasture field. Sloping gently down from southeast to northwest. Waterlogged in places.	Bounded to the northwest by a large overgrown area of the field, and to the southwest and east by trees and barbed wire fencing. There was no physical boundary to the southeast. An area of hardstanding was located in the eastern corner.
8	Pasture field. Sloping gently down from east to west.	Bounded to the east by gardens, to the south by trees and a barbed wire fence, and to the west and north by overgrown vegetation.
9	Pasture field. Undulating terrain, sloping generally down from northwest to southeast. Wet and waterlogged.	Bounded to the northeast by a (modern) earthen bank, to the southeast by a hedge, and to the southwest and west by trees with a barbed wire fence. There was no physical boundary to the north; a pond was located immediately outside the northern boundary. A metal gate was located in the southern corner. Small areas within the south-western boundary were unsurveyable due to overgrown vegetation/ waterlogged ground.
10	Flat pasture field.	Bounded on all sides by a barbed wire fence, with the A57 and River Etherow immediately outside this to the east and south/west respectively, and buildings to the north. A linear earthen mound ran along the inside of the

		northern and eastern boundaries. Two concrete ramps, smaller earthen mounds, farm equipment, a manger and a bath were located within the northern quarter of the survey area. A tree was located in the south-eastern corner.
11	Pasture field. Sloping down towards the river in the northeast.	Bounded by a barbed wire fence with hedges/trees on all sides. The River Etherow runs immediately outside the north-eastern boundary. Metal gates were located in the south-eastern, northern and north-eastern corners.

4.3. The underlying geology comprises Marsden Formation mudstone and siltstone across the majority of both survey areas, with bands of Fletcher Bank Grit sandstone occurring along the north-western edge of the western area and the northern tip of the eastern area. This is overlain by Devensian till (diamicton) across the western survey area, with glaciofluvial ice contact deposits (Devensian sand and gravel) recorded over the extreme western tip; a band of alluvium (clay, silt, sand and gravel) associated with an extant watercourse runs northeast-southwest across the centre of the area. Alluvium (clay and silt) is recorded across the eastern survey area; a deposit of head (diamicton) is located west of this survey area, with these deposits recorded as extending just inside the western boundary of the survey area (British Geological Survey, 2021).

4.4. Soils across most of the western survey area consist of slowly permeable wet very acidic upland soils with a peaty surface; the soils of the eastern quarter of this survey area have not been classified. Soils in the eastern survey area consist of loamy and clayey floodplain soils with naturally high groundwater (Soilscapes, 2021).

5. Archaeological Background

5.1. The following is a summary of relevant information contained in a geoarchaeological assessment and deposit model report produced and provided by Oxford Archaeology North (Rutherford, 2018) and the cultural heritage Desk-Based Assessment (Highways England, 2018) also provided by Oxford Archaeology North.

5.2. Evidence for prehistoric settlement and agriculture (unspecified) is recorded less than 500m northwest of the western survey area, on the slopes of Harrop Edge. A scatter of Mesolithic flints has been found approximately 400m south of the eastern survey area.

5.3. Known Roman activity (unspecified) within 500m of the survey areas is focused to the west and south of the eastern survey area, and includes Melandra Castle, a fort located approximately 400m south, on the raised ground overlooking the River Etherow.

5.4. The remains of Mottram Old Mill are located on the northern boundary of the western survey area; documentary evidence suggests it may have medieval origins, but this was not verified during investigations undertaken in 2001. Small areas of medieval/post-medieval ridge and furrow in surrounding fields are visible in satellite imagery and LiDAR data. A number of post-medieval field boundaries marked on historical mapping have been removed during the 20th century.

5.5. The report also notes the presence of at least one palaeochannel, associated with the River Etherow and fossilised in the historical landscape as the field boundary forming the western edge of the eastern survey area. The results of the borehole deposit modelling suggest superficial sediment sequences are relatively consistent with BGS mapping. No significant Holocene alluvial or peat deposits were found over the majority of the survey area, with topsoil/made ground directly overlying till and/or head deposits. However, alluvium and peat were found to be associated with Hurstclough Brook and the River Etherow (located in the western and eastern survey areas respectively).

5.6. In the western survey area are two round brick towers that served as airshafts for Mottram tunnel. One is in the north-eastern corner of Area 1 and the second is in the north-western corner of Area 4. The tunnel, which transported water to Manchester, has an approximate east-west alignment and was built using the cut and cover technique.

6. Methodology

6.1. Data Collection

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

6.1.2. Table of survey strategies:

Method	Instrument	Traverse Interval	Sample Interval
Electromagnetic Induction – Conductivity and Magnetic Susceptibility	GF Instruments CMD Explorer in HCP orientation	4 m	5Hz reprojected to 0.25 m

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

6.1.4. The electromagnetic method was selected to provide multiple datasets from various depths below the ground. The instrument records data related to the conductivity and magnetic susceptibility that roughly correspond with the bulk soil volume under investigation. Changes in these properties can be related to material variations in superficial deposits and assist with the identification of target features.

6.1.4.1. MS' hand-carried system comprised the GF Instruments CMD Explorer in HCP orientation to facilitate greater depth penetration. Positional referencing was through a multi-channel, multi-constellation RTK GNSS Smart Antenna outputting in NMEA mode to ensure high positional accuracy of collected measurements. The RTK GNSS is accurate to 0.008 m + 1ppm in the horizontal and 0.015 m + 1ppm in the vertical.

6.1.4.2. Electromagnetic and GNSS 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 integrated with the RTK GNSS 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. Electromagnetic 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 Section 4.2 in David *et al.*, 2008: 11).

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. The quadrature-phase and in-phase results are presented as colour images. Multiple images at different plotting ranges have been used for data interpretation, which accounts for the relative variation between survey areas. The EM interpretation is partly derived from the quadrature phase, which is a proxy for apparent electrical conductivity. These datasets are referred to as C1, C2, and C3 and roughly correspond with a bulk soil volume equated to c. 2.2 m, 4.2 m and 6.7 m below ground level. However, as the EM is measuring a bulk soil volume, it will be sensitive to features above and below these theoretical exploration depths.

6.3.2. The second set of EM interpretation is derived from the in-phase component of the EM response which relates to the soil's magnetic susceptibility, making it a complementary technique to a fluxgate magnetometer. The in-phase roughly corresponds with a bulk soil volume of half that of the quadrature-phase. The different receiving coil responses are referred to as I1, I2, and I3 for the magnetic susceptibility. These depths are described as comparatively shallow, middle, and deep soil volumes, respectively.

6.3.3. Geophysical results have been interpreted using colour images in a layered environment, overlaid against open street maps, satellite imagery, historic maps, and soil and geology maps. Google Earth (2021) was consulted as well, to compare the results with recent land usages.

6.3.4. 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 historical maps, Figures 6 and 8.

7.2.2. The electromagnetic survey has generally responded well to the environment of the survey area. The EM survey, informed by satellite imagery, has been effective in detecting variations in conductivity and magnetic susceptibility across the survey area. These have been interpreted as relating to variations in superficial deposits and possible palaeolandscape features. Other responses have been identified that possibly relate to a former mill and the route of the Mottram tunnel (see Section 5.4), as well as services and footpaths.

7.2.3. It should be noted that the level of confidence in the interpretation is limited by the relatively small size of some of the survey areas. The interpretation of geophysical anomalies relating to superficial deposits of the type in this area is complicated by the potentially heterogeneous nature of these deposits; better results can be obtained over larger areas that provide contextual comparison. Interference from modern activity has had a minimal impact on the interpretation.

7.2.4. In areas of high conductivity, this may be due to a relatively high moisture or clay content. During data collection in Areas 6 and 9 in the western survey area, an area noted as being wetter correlates well with the area of high conductivity. It is possible that this represents a natural drainage route. However, in contrast to this, in the eastern survey area, there was no discernible variation in the ground saturation at the time of survey, but areas of high conductivity have also been detected. It is possible that the area of high conductivity identified in Area 11 indicates increased moisture or clay at a greater depth and may therefore indicate a possible palaeochannel.

7.2.5. Areas of low conductivity may be explained by a relative increase in porosity, possibly associated with an increase in sand or gravel content, which facilitates an increase in permeability. This allows more rapid drainage and relatively lower moisture content. It is possible that these areas represent possible palaeochannels that have been filled with poorly sorted material, creating larger pore-spaces.

7.2.6. The in-phase responses relate to the magnetic susceptibility of the buried materials. Low in-phase anomalies are likely to relate to deposits with an increased porosity with a relatively high air or moisture content. High in-phase anomalies are likely to reflect accumulations of magnetically enhanced material, which are more likely to relate to human activity.

7.2.7. It has not been possible to identify anomalies that relate to a Roman ford, although this lack of confirmation does not prove its absence.

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. **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.

7.3.2. Specific Anomalies (western area)

7.3.2.1. **Probable Mottram Tunnel –** A sharp-edged linear low conductivity and low magnetic susceptibility anomaly running roughly east-west crosses Areas 1, 2 and 3 and has been identified in all datasets. Its location and orientation correspond well to the extant air shafts that are present on historical maps. The low response in the conductivity data suggests a material with open texture, possibly associated with a backfilling event, and it has been interpreted as indicating the Mottram tunnel [**1a**]. The Mottram tunnel is known to have transported water to Manchester and to have been constructed using a cut and cover method (see Section 5.6). It has been suggested that this type of construction method leaves a wide footprint and the width of the response identified would support that suggestion.

7.3.2.2. **Possible Natural Drainage Route –** In Area 6 an area of high conductivity has been identified in C1, C2 and C3 data, [**6a**]. During acquisition, this area was particularly wet under foot and it is possible that this area forms a natural drainage channel running towards the Hurstclough Brook. Further north, adjacent to a small pond in Area 9 (on the survey boundary), a second conductivity high [**9a**] has been identified that may relate to the same drainage system.

7.3.2.3. **Archaeology Probable (Structure) –** The remains of Mottram Old Mill are located on the northern boundary of Area 9. Earthworks and small, partially buried stone structures were observed during data acquisition and its location correlates with a short linear conductivity low in the C1 dataset [**9b**], suggestive of stone material with a shallow burial depth.

7.3.2.4. **Possible Service -** A small, linear high conductivity response [**1b**] has been identified in the C2 and C3 datasets as a possible service that occurs deep in the ground. The location, in the southern corner of Area 1, correlates with a manhole cover and the lack of response in the in-phase data suggests that this is a non-metallic service.

7.3.2.5. **Possible Footpaths –** In Area 4, two anomalies have been identified in the I1 data that correlate with footpaths shown on historical maps. The increased magnetic susceptibility response is related to the compaction of the ground as magnetic susceptibility is a mass specific measurement.

7.3.2.6. **Industrial/Modern** – In Area 1, an anomaly has been identified that correlates with the extant brick-built air shaft associated with the Mottram tunnel. In Area 4, two anomalies have been identified close to the north-western boundary. The larger of these appears to correlate with a second brick-built air shaft associated with the Mottram tunnel. The smaller low conductivity anomaly correlates with the pylon also present in this area. In Area 7, two areas of modern construction were identified during data collection. The anomaly identified in the north-eastern corner of this area is possibly associated with the hardstanding area present. The anomaly south of this, correlates with the presence of a concrete slab that may have formed the foundation for a small modern structure.

7.3.2.7. **Undetermined** – Two areas of high conductivity in Area 1 have been identified. The largest of these is located along the north-western boundary and has an approximate southwest-northeast alignment. The smaller area of high conductivity is located close to the eastern field boundary. In Area 5, two areas of conductivity high response have been detected on the northern and southern boundaries. In the centre of Area 5 is an amorphous area of low conductivity. In Area 6 an area of low conductivity has been identified located near the access point in the south-eastern corner of the field. In Areas 7 and 8, two conductivity highs have been identified. Three amorphous areas of low conductivity response have been identified in Area 9. With no other supporting or correlative evidence, the origins of these anomalies are difficult to identify.

7.3.3. Specific Anomalies (eastern area)

7.3.3.1. **Possible Palaeochannel (Strong) –** Towards the southern boundary of Area 11, an area of high conductivity has been identified in C1, C2 and C3 data [**11a**]. Unlike the larger high conductivity area identified in the western survey area, this ground was not waterlogged. The nature of this response is suggestive of a material with a relative increase in moisture or clay content that extends for several meters below the ground that contrasts with the surround material. It has therefore been interpretated as a possible palaeochannel.

7.3.3.2. **Low Conductivity (Weak) and Low In-phase (Weak)** – A few metres north of the conductivity high in Area 11 is a relatively low conductivity response, most apparent in the C2 and C3 datasets, [**11b**]. This suggests that this response has a deeper origin and may relate to the in-phase low in the I3 dataset. This I3 response is a relatively expansive low magnetic susceptibility anomaly identified in a similar location to the conductivity low. In the I3 dataset the geometry is seen as three lobes, one to the north, west and south adjacent to a more linear east-west orientated response. It is possible that these coincident responses are related to a material with increased air or moisture content, due to relatively high porosity, such as a poorly sorted sand and gravel, as might be expected in palaeochannel deposits.

7.3.3.3. **Data Artefact** – Within Area 10 is a single data profile that displays higher values than those adjacent to it [**10b**]. It is likely that this represents a data artefact rather than a discrete feature detected in a single profile.

7.3.3.4. **Industrial/ Modern** – Around the boundary of Area 10 is a banked area that has concrete ramps in the northwest and northeast corners of the field. These modern construction materials have been identified in the data. In Area 11 the linear response that is present in all datasets and is located along the northern boundary is possibly related to the boundary fence or possibly a buried service.

8. Conclusions

8.1. Electromagnetic induction survey has been successfully undertaken over 21.69 ha, divided between two areas, a western survey area and an eastern survey area. 16.36 ha could not be surveyed due to poor ground conditions (relating to the presence of a stream, dense vegetation and waterlogged ground) and, in the eastern area, the presence of large metallic items within a relatively small area.

8.2. Given the relatively small size of some of the survey areas it is difficult to provide a high level of confidence in the interpretation. The interpretation of geophysical anomalies relating to superficial deposits is complicated by their potentially heterogeneous nature and requires large areas to be investigated for comparison.

8.3. The electromagnetic survey has generally responded well to the environment of the survey area and a range of different anomalies have been identified. Anomalies have been interpreted as relating to variations in superficial deposits and possible palaeolandscape features. Other responses have been identified that possibly relate to a former mill (see Section 5.4), the route of the Mottram tunnel, as well as a possible service and footpaths. It has not been possible to identify anomalies that relate to a Roman ford, although this lack of confirmation does not prove an absence of such features.

8.4. Interference from modern sources was minimal in the EM results. A manhole cover and associated buried service were detected but their impact was confined to the immediate vicinity of the features.

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.

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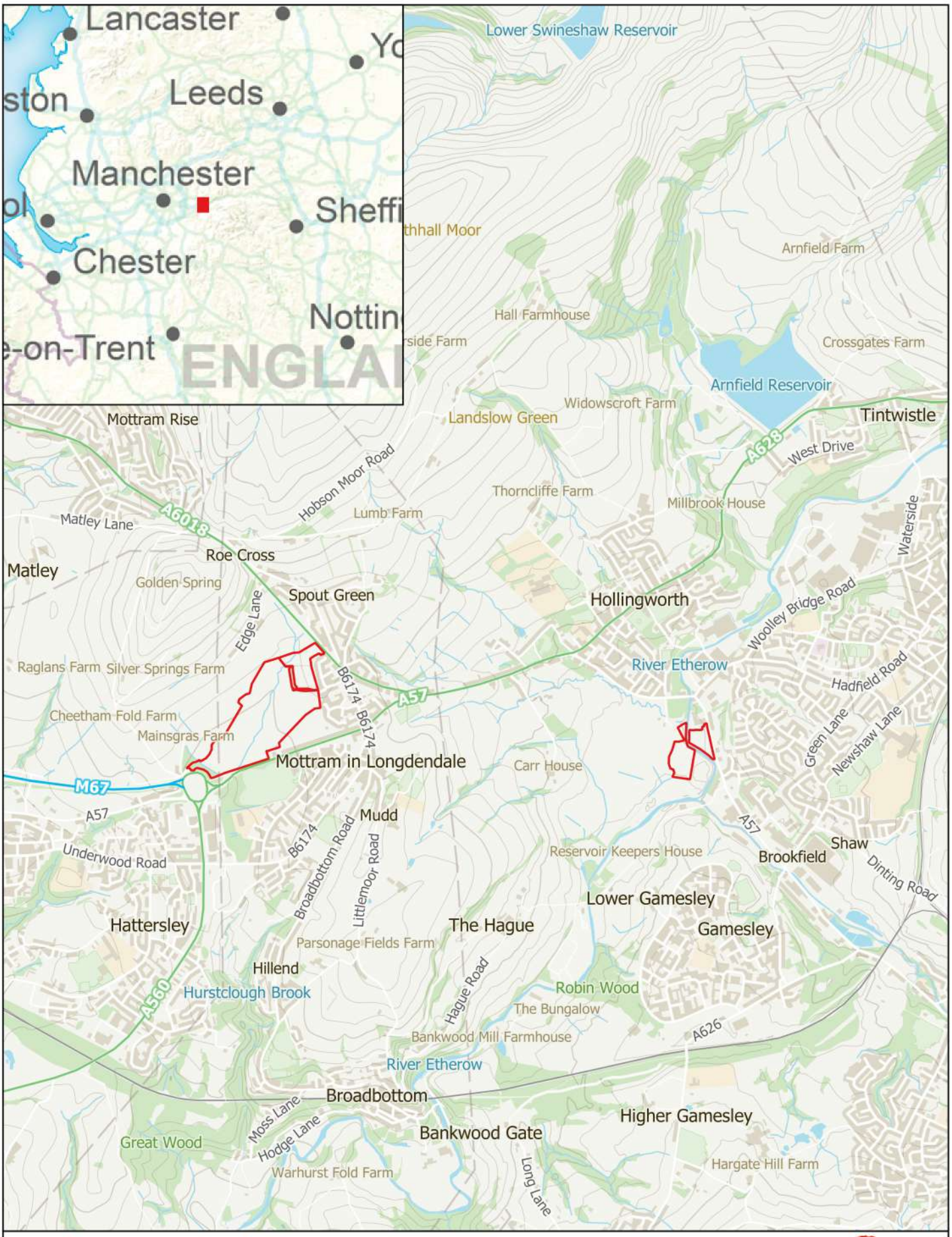
12. Project Metadata

MS Job Code	MSSJ798
Project Name	Mottram, Greater Manchester
Client	Oxford Archaeology
Grid Reference	SJ 987957, SK 009955
Survey Techniques	Electromagnetic Induction – Conductivity and Magnetic Susceptibility
Survey Size (ha)	21.62ha
Survey Dates	2020-11-09 to 2020-11-11
Project Lead	[redacted]
Project Officer	[redacted]
HER Event No	N/A
OASIS No	N/A
S42 Licence No	N/A
Report Version	1.0

13. Document History

Version	Comments	Author	Checked By	Date
0.1	Initial draft for Project Lead to Review	[redacted]		27 November 2020
0.2	Draft to Director for Sign-off			30 November 2020
1.0	Client's Corrections – Issued as Final			19 April 2021



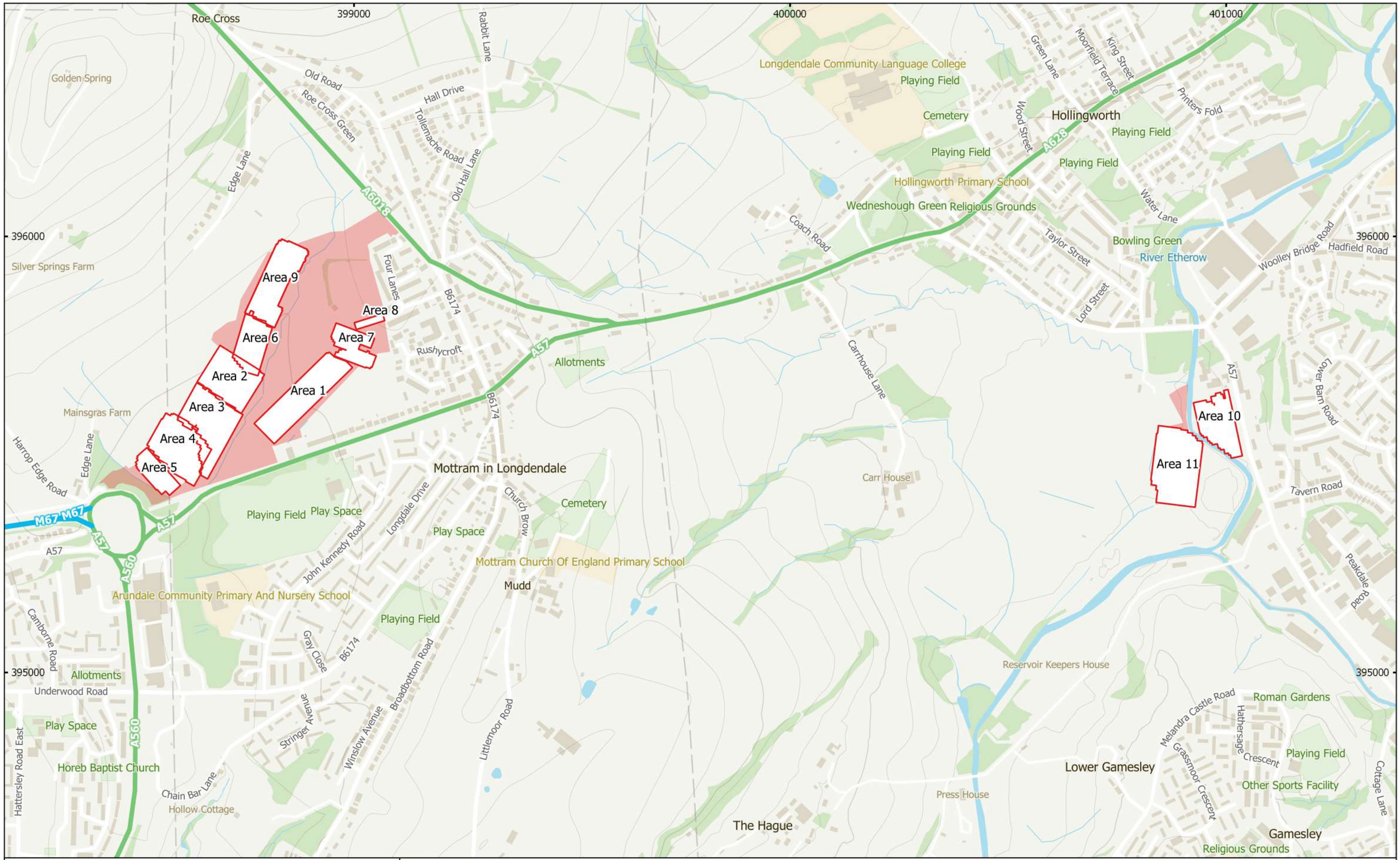
MSSJ798 - Mottram
Figure 1 - Site Location
1:25,000 @ A4

Site Boundary

N

0 0.5 1 km

magnitude surveys



MSSJ798 - Mottram, Greater Manchester
Figure 2 - Location of Survey Areas
1:10,000 @ A3

Survey Extent
Unsurveyable

N

0 250 500 750 m

magnitude surveys

Conductivity Coil 1

Conductivity Coil 2

Conductivity Coil 3

Inphase Coil 1

Inphase Coil 2

Inphase Coil 3

Area 1
Area 2
Area 3
Area 4
Area 5
Area 6
Area 7
Area 8
Area 9

Low
High

Play Space

Four Lanes
John Kennedy Road
A57

398500
399000
396000
395500

MSSJ798 - Mottram, Greater Manchester
Figure 3 - Electromagnetic Conductivity and Inphase (Overview - West)
1:5,500 @ A3

N

0 100 200 300 m

magnitude surveys

Conductivity Coil 1

Conductivity Coil 2

Conductivity Coil 3

Inphase Coil 1

Inphase Coil 2

Inphase Coil 3

401000

395500

Area 10

Area 11

A57

Potter Road

Tavern Road

Low

High

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Figure 4 - Electromagnetic Conductivity and Inphase (Overview - East)
1:4,000 @ A3

N

0 100 200 300 m

magnitude surveys

Edge Lane
Area 9
Area 6
Area 2
Area 3
Area 4
Area 5
Area 7
Area 8
Area 1
A57
A57
A57
Playing Field
Play Space
John Kennedy Road

Edge Lane
Area 9
9b
9a
Area 6
6a
Area 2
Area 3
Area 4
Area 5
Area 7
Area 8
1a
Area 1
1b
A57
A57
A57
Playing Field
Play Space
John Kennedy Road

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Figure 5 - Conductivity - Coil 2 and Interpretation (West)
1:3,000 @ A3

Low
High

- Archaeology Probable Structure
- Probable Mottram Tunnel
- Possible Paleochannel
- Possible Paleochannel (Weak)
- Industrial/Modern Structure
- Probable Footpath
- High Conductivity (Strong) - Undetermined
- Low Conductivity (Strong) - Undetermined
- Low Conductivity (Weak) - Undetermined
- Service

N
0
50
100
150 m

magnitude surveys

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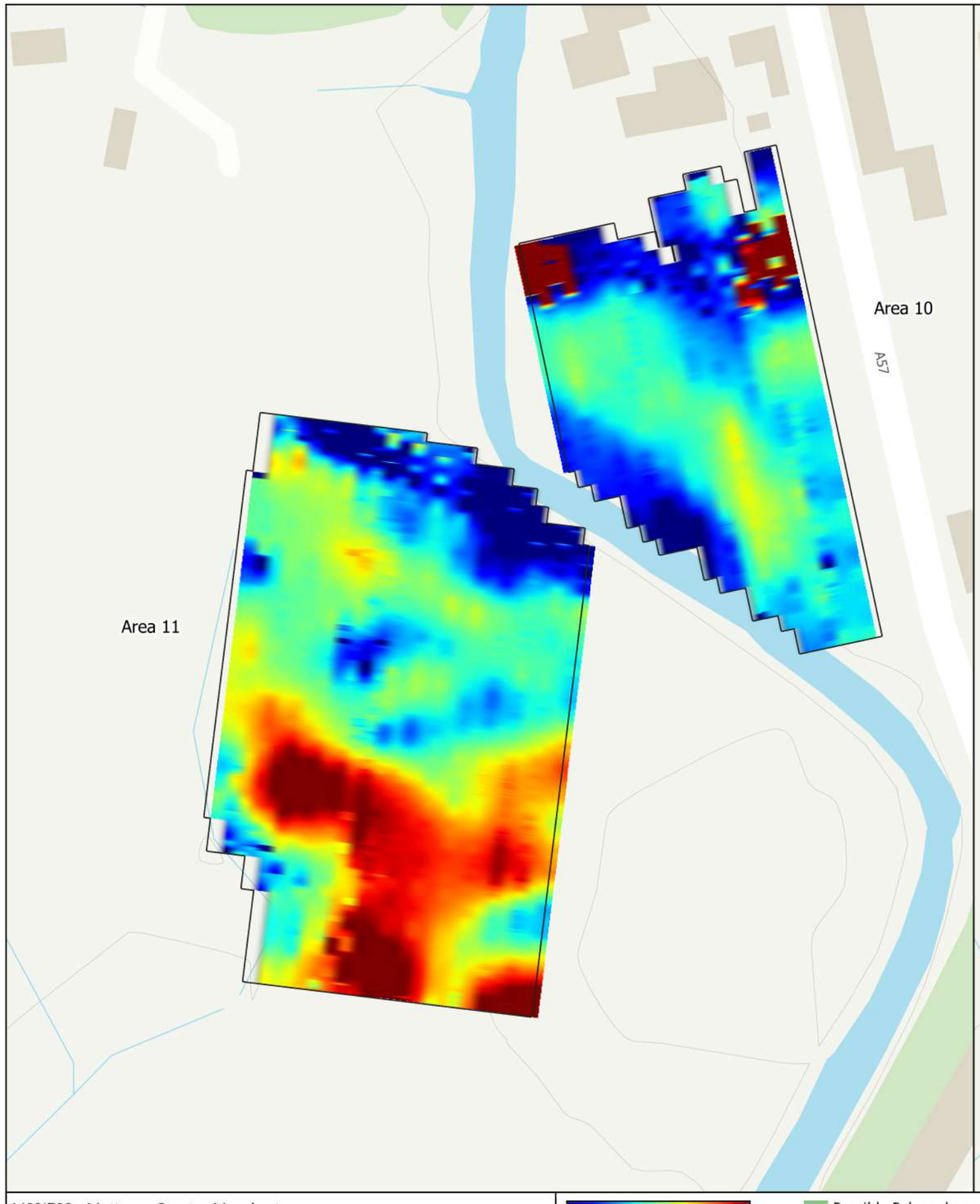
Figure 6 - Combined Interpretation Over Historical Maps And Satellite Imagery (West)
1:2,000 @ A3

- Archaeology Probable Structure
- Probable Mottram Tunnel
- Possible Paleochannel
- Possible Paleochannel (Weak)
- Industrial/Modern Structure
- Probable Footpath
- High Conductivity (Strong) - Undetermined
- Low Conductivity (Strong) - Undetermined
- Low Conductivity (Weak) - Undetermined
- Service

N

0 50 100 150 m

magnitude surveys



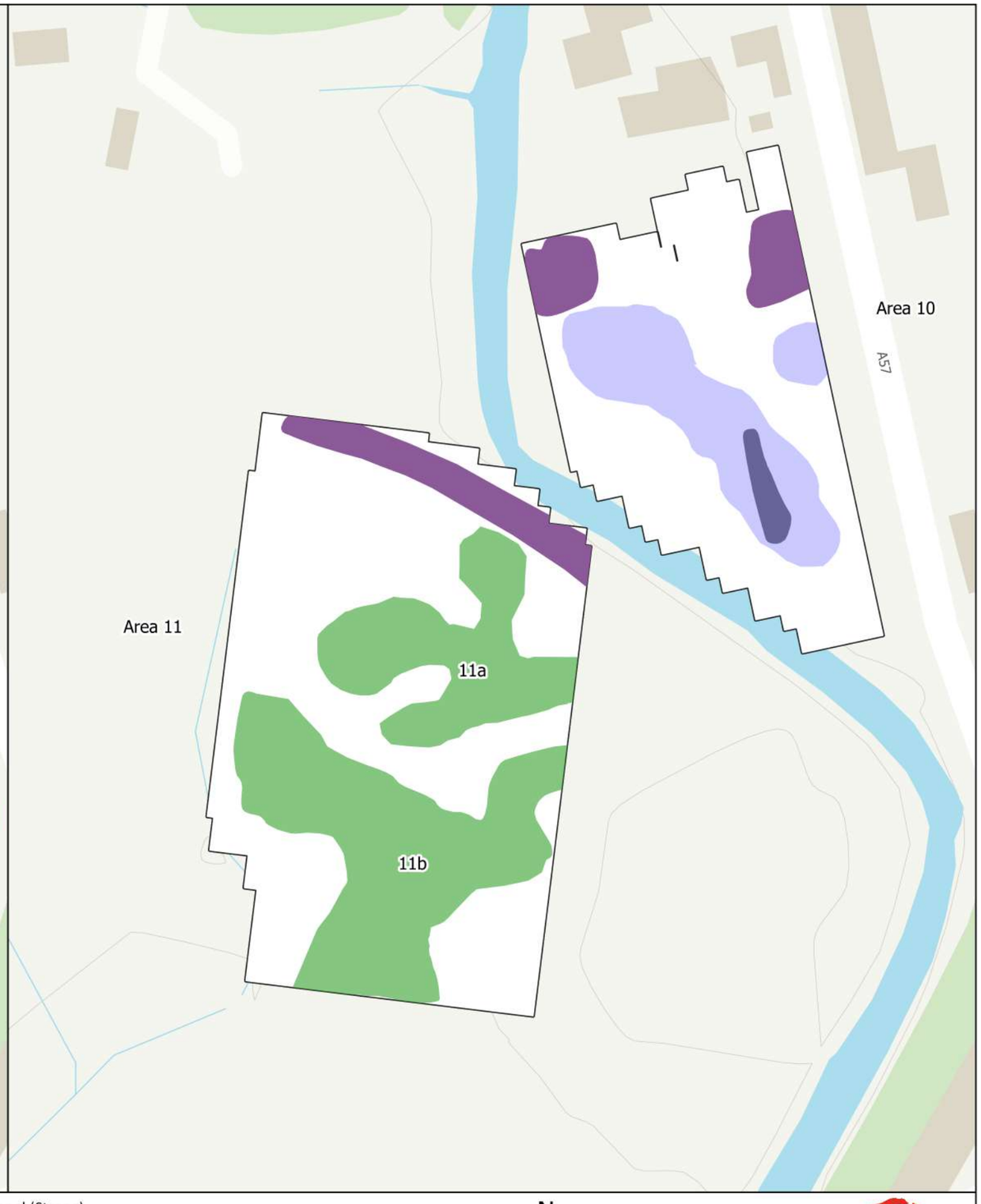


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Figure 7 - Conductivity - Coil 2 and Interpretation (East)
1:1,500 @ A3

Low — High

- Possible Palaeochannel (Strong)
- Industrial/Modern Structure
- High Conductivity (Weak) - Undetermined
- Data Artefact

N

0 50 100 150 m

magnitude surveys

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Figure 8 - Combined Interpretation Over Historical Maps And Satellite Imagery (East)
1:1,500 @ A3

- Possible Palaeochannel (Strong)
- Industrial/Modern Structure
- High Conductivity (Weak) - Undetermined
- Data Artefact

N

0 50 100 150 m

magnitude surveys