



**magnitude**  
surveys

**Geophysical Survey Report MSTL73**  
of  
**Bakers Lane, Braiswick**  
**Colchester, Essex**

For  
**Pegasus Group**

On Behalf Of  
**Gladman Developments Ltd**

Magnitude Surveys Ref: MSTL73

December 2017



# magnitude surveys

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## Abstract

Magnitude Surveys was commissioned to assess the subsurface archaeological potential of a c. 8.8 ha area of land at Bakers Lane, Braiswick, Colchester. A hand pulled, cart-mounted fluxgate gradiometer survey was successfully completed and no anomalies of probable or possible archaeological origin were detected. The geophysical results primarily reflect modern ferrous activity and natural variations. The site contains a scheduled monument; this area was not surveyed.

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## 1. Introduction

- 1.1. Magnitude Surveys Ltd (MS) was commissioned by Pegasus Planning Group (PPG) on behalf of Gladman Developments Ltd to undertake a geophysical survey on a c.8.8 ha area of land at Bakers Lane, Braiswick, Colchester, Essex (TL 9749 2669). The site contains a scheduled monument (Moat Farm Dyke, NHLE ref. 1019964); this area was not surveyed.
- 1.2. The geophysical survey comprised hand pulled, cart-mounted 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 of Field Archaeologists (CIfA, 2014) and the European Archaeological Council (Schmidt et al., 2015).
- 1.4. The survey was conducted in line with a Written Scheme of Investigation WSI submitted to Colchester Borough Council Archaeological Advisor.
- 1.5. The survey commenced on 30 November and took three days to complete.

## 2. Quality Assurance

- 2.1. Project management, survey work, data processing and report production have been carried out by qualified and professional geophysicists to standards exceeding the current best practice (CIfA, 2014; David et al., 2008, Schmidt et al., 2015).
- 2.2. Magnitude Surveys is a corporate member of ISAP (International Society of Archaeological Prospection).
- 2.3. Director Graeme Attwood is a Member of the Chartered Institute for Archaeologists (CIfA), the chartered UK body for archaeologists, as well as a member of GeoSIG, the CIfA Geophysics Special Interest Group. 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. Director Chrys Harris is a doctoral candidate in archaeological geophysics at the University of Bradford.
- 2.4. All MS managers have postgraduate qualifications in archaeological geophysics. All MS field staff have relevant archaeology or geophysics degrees and supervisors have at least three years' field experience.

## 3. Objectives

- 3.1. The geophysical survey aimed to assess the subsurface archaeological potential of the survey area.

## 4. Geographic Background

- 4.1. The underlying geology comprises London Clay Formation with superficial deposits of cover sand to the north, no superficial deposits are recorded on the south of the site. (British Geological Survey, 2016).
- 4.2. The soils are described as slightly acid and loamy and clayey soils with impeded drainage (Soilscapes, 2016).
- 4.3. The site is located approximately 0.5 miles west of Braiswick, Colchester. The survey was undertaken over 3 fields. Access to the fields was off Bakers Lane, which runs to the east of survey Area 3 and to the west of survey Area 1. The Great Eastern train line borders survey Areas 1 and 2 to the south. The local topography is characterised by undulating hills, with survey Areas 1 and 2 sloping moderately down to the south and survey Area 3 sloping gently down to the north.

## 5. Archaeological Background

- 5.1. The following is a summary of the recorded heritage assets identified in a draft desk based assessment produced by Pegasus Group (Lucey, 2016).
- 5.2. No previous archaeological works are recorded within the site.
- 5.3. One designated heritage asset is located within the site, a scheduled monument forming the eastern boundary of the site (Moat Farm Dyke, NHLE ref. 1019964). This Dyke forms part of the Iron Age and Romano-British oppidum of Camulodunum. The scheduled area was not surveyed during this scheme of works. Further designated heritage assets comprising Grade II listed buildings are located within the study area.
- 5.4. A number of heritage assets and findspots are recorded within the site:
  - 5.4.1. A polygon, which is mapped partly within the site and extending to the west demarcates the location of a number of rectilinear cropmarks and a possible ring ditch. The rectilinear cropmarks are thought by the CUAD to be geological in origin. The evidence for the ring ditch is uncertain, as the CUAD record states that "No features were mapped for the NMP and the features are not visible on the available AP." (CUAD ref. MCC7758).
  - 5.4.2. An early medieval stirrup mount findspot (CUAD ref. MCC6072).
  - 5.4.3. An Elizabethan coin findspot (CUAD ref. MCC6162).
  - 5.4.4. Lexden Dyke and Moat Farm Dyke, an extension of Lexden Dyke, (MCC7280, MCC7281) are further recorded as non-designated heritage assets out with the scheduled section of Moat Farm dyke discussed in 5.3.
  - 5.4.5. A possible medieval tile kiln has been suggested on site due to the identification of a scatter of medieval tile, however this could be the result of manuring practices. (AMIE ref. 383838)

- 5.5. Cropmarks of a ring ditch and linear features, possibly of prehistoric date, are recorded c. 125m west of the site (CUAD ref. MCC7732). A further area of cropmarks including trackways, pits and enclosures is recorded c. 210m north west of the site (CUAD ref. MCC7720).
- 5.6. The site is located within the vast area of the oppidum of Camulodunum, a territorial complex of Late Iron Age settlements and defensive dyke systems. The oppidum was protected by a series of large defensive dykes ranging from 1.5m to 4.6m in depth of which Moat Farm Dyke is a constituent part.
- 5.7. Archaeological investigations carried out at West House Farm C. 325m south of the site have recorded a square enclosure of probable late Bronze Age to Late Iron Age data (CUAD ref. EXX2439, ECC2749, ECC3620, ECC3630).
- 5.8. A major pre-Roman and Roman settlement is recorded at Sheepen Farm 1km south east of the site (CUAD ref. MCC7487). This settlement may have originated in the Bronze or Iron Age and continued to be occupied into the Roman period.
- 5.9. A trial trench evaluation in 2016 recorded a possible gully and post holes containing quantities burnt wattle and daub material and a roman roof tile; indicating the possibility of a roman structure, in a trench c. 250m south of the site at Lexden Wood Golf Club (CUAD ref. ECC3726).
- 5.10. The closest recorded medieval settlement to the site is a moated site at Lexden Lodge/Moat Farm, c. 225m to the south-east of the site (CUAD ref. MCC7779). The site of a pair of medieval mills is recorded c. 800m south of the site (CUAD ref. MCC2291, MCC2296) and the site of a medieval pottery kiln is recorded c. 960m north of the site (CUAD ref. MCC7780).
- 5.11. The former site of the 19 century Bergholt Road Brickworks (CUAD ref. MCC5346) is recorded immediately to the east of the site beyond Moat Farm Dyke.

## 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	1 m	200 Hz reprojected to 0.125 m

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

- 6.1.3.1. MS' cart system was comprised of Bartington Instruments Grad 13 Digital Three-Axis Gradiometers. Positional referencing was through a Hemisphere S321 GNSS Smart Antenna RTK GPS outputting in NMEA mode to ensure high positional accuracy of collected measurements. The Hemisphere S321 GNSS Smart Antenna is accurate to 0.008 m + 1 ppm in the horizontal and 0.015 m + 1 ppm in the vertical.
- 6.1.3.2. Magnetic and GPS data were logged on a USB flash drive housed in MS' bespoke data-logger and transferred to a laptop computer for processing.
- 6.1.3.3. A series of temporary sight markers were established in each survey area to guide the surveyor and ensure full coverage with the cart. Data were collected by traversing the survey area along the longest possible lines, to ensure that the data was efficiently collected and processed.

### 6.2. Data Processing

6.2.1. Magnetic data were processed in bespoke in-house software produced by MS. Processing steps 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. Multiple greyscales images at different plotting ranges have been used for data interpretation. Greyscale images should be viewed alongside the XY trace plots, included in the digital archive. 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 mapping, satellite imagery and historic mapping.



## 7. Results

### 7.1. Qualification

Geophysical techniques are not a map of the ground and are instead a direct measurement of subsurface properties. Detecting and mapping features requires that said features have properties that can be measured by the chosen technique(s) and that these properties have sufficient contrast with the background to be identifiable. The interpretation of any identified anomalies is inherently subjective. While the scrutiny of the results is undertaken by qualified, experienced individuals and rigorously checked for quality and consistency, it is often not possible to classify all anomaly sources. Where possible an anomaly source will be identified along with the certainty of the interpretation. The only way to improve the interpretation of results is through a process of comparing excavated results with the geophysical reports. MS actively seek feedback on their reports as well as reports of further work in order to constantly improve our knowledge and service.

### 7.2. Survey Considerations

Survey Area	No. Survey Blocks	Surveyed Y/N	Ground Conditions	Further notes:
1	1	Y	Sloping down to the south. Soft and muddy, with a short crop.	Bounded to the north, south and west by wire fences. The boundary on the eastern edge was formed by a hedgerow.
2	1	Y	Sloping down to the south. Soft and muddy, with a short crop.	Bounded to the north, south and east by wire fences. The boundary on the western edge was formed by a hedgerow.
3	1	Y	Sloping gently down to the north. Good footing, grass covered.	A bonfire pit in the north-eastern corner prevented surveying. A metallic football goal present in the middle of the survey area. Overhanging tree coverage in south western corner may have blocked GPS satellite signal.

Refer to Figure 2 for survey area locations.

### 7.3. Discussion

7.3.1. The geophysical results, both greyscale images and XY traces, are interpreted in consideration with satellite imagery (Bing, 2016) and historic mapping (Ordnance Survey, 6" 2<sup>nd</sup> edition c.1882-1913).

7.3.2. The magnetic survey has responded well to the survey area's environment. The site was magnetically "quiet" with some responses reflecting weak variations in the soils and geology. Hints of a former field boundary have also been detected. No anomalies of archaeological origin have been identified however, the detection of weak soil changes suggests the survey has been successful, and would have detected any anomalies of archaeological origin had any been present and contained a sufficient magnetic contrast with the natural soils.

7.3.3. A medieval tile kiln is purported to be present towards the southern end of the site (See Para. 5.4.5). No anomalies thought to have been a tile kiln have been detected by the survey, neither have any large zones of ferrous type anomalies, which would be expected with spreads of fired material and kiln waste.

## 7.4. Interpretation

### 7.4.1. General Statements

7.4.1.1. Geophysical anomalies will be discussed broadly as classification types across the survey area. Only anomalies that are distinctive or unusual will be discussed individually.

7.4.1.2. **Undetermined** – Anomalies are classified as Undetermined when the anomaly origin is ambiguous through the geophysical results and there is no supporting or correlative evidence to warrant a more certain classification. These anomalies are likely to be the result of geological, pedological or agricultural processes--although an archaeological origin cannot be entirely ruled out. Undetermined anomalies are generally not ferrous in nature.

7.4.1.1. **Ferrous (Discrete/Spread)** – Discrete ferrous-like, dipolar anomalies are likely to be the result of modern metallic disturbance on or near the ground surface. A ferrous spread refers to a concentrated scattering of these discrete, dipolar anomalies. Broad dipolar ferrous responses from modern metallic features, such as fences, gates, neighbouring buildings and services, may mask any weaker underlying archaeological anomalies should they be present.

### 7.4.2. Magnetic Results - Specific Anomalies

7.4.2.1. **Agricultural (Weak)** – Hints of a very weak linear response are noted in Area 1, running roughly NW-SE. It is on the same orientation as a former boundary shown on historic mapping, but offset from the mapped feature. Despite this it most probably reflects the former boundary, the offset arising from early mapping inaccuracies.

7.4.2.2. **Natural (Spread)** – Responses reflecting natural variations in the soils have been detected, mainly in Area 3. Most of these broad, amorphous responses classified as *Natural* are collocated with marks visible on satellite imagery. The broad and weak magnetic signal produced by these features is characteristic of natural processes and pedological variation. Similar responses in areas 1 and 2 are not visible in satellite imagery due to the crop coverage, though likely reflect similar natural variations.

7.4.2.3. **Undetermined (Strong & Weak)** – A relatively strong curvilinear anomaly has been identified in Area 3, lying within a ferrous spread. Given the wider context, an archaeological origin cannot be completely ruled out; however, its limited extent and the surrounding ferrous noise makes it difficult to interpret with any certainty. A second (shorter) curving response is identified in Area 1. Lying directly on the

edge of a small ferrous spread, its precise form is difficult to ascertain and not all of the response can be definitively related to the adjacent ferrous spread.

A single weak linear anomaly is located close to the northern edge of Area 1. Extending only a short distance from a band of ferrous responses, nothing can be determined regarding its nature or origin.

Discrete pit-like anomalies have been identified in areas 1 and 2, these anomalies are likely to be of natural or modern origin; however, given the strength of magnetic response an archaeological origin cannot be entirely ruled out.

7.4.2.4. **Ferrous (Dipolar & Spread)** – Broad-scale ferrous responses along the boundaries of the survey area are caused by modern features. Areas 1 and 2 were each bounded on three sides by wire fences. Point dipolar responses reflect scattered debris on or near the ground surface. Two small concentrations (spreads) of dipolar responses have been detected, one each in Areas 1 and 3.

## 8. Conclusions

- 8.1. The magnetic survey has responded well to the survey area's environment. The site was magnetically "quiet" with some responses reflecting weak variations in the soils and geology. No anomalies of probable or possible archaeological origin were detected. No evidence of the geological features and putative ringditch recorded as cropmarks (5.4.1.), or the suggested tile kiln (5.4.5) have been detected by the survey. However, the presence of anomalies both weak and strong in magnitude and varying in origin (natural and anthropogenic), demonstrate the technique has worked successfully on site. The majority of the results reflect modern activity in the form of ferrous debris, and natural responses.
- 8.2. An anomaly attributed to a former boundary (classified as *Agricultural*) has been identified in Area 1.
- 8.3. Natural responses are present in each of the survey areas, though Area 3 contains the highest concentration. These responses reflect slight variations in the soils and geology.
- 8.4. Two short curving anomalies have been identified (in Areas 1 and 3). Unfortunately, in both cases, adjacent ferrous disturbance has precluded any clear assessment of their possible origin or significance and they are classified as *Undetermined*. Other Undetermined responses comprise a weak short linear response (Area 1) and a few small pit-like anomalies (Areas 1 and 2); these are all likely to be natural or modern in origin.
- 8.5. Ferrous responses indicate modern activity across the site. The small scale ferrous anomalies are the result of modern metallic debris. Broad dipolar features around the boundaries of the survey area are due to larger metallic features such as wire fencing, nearby buildings or railway tracks.

## 9. Archiving

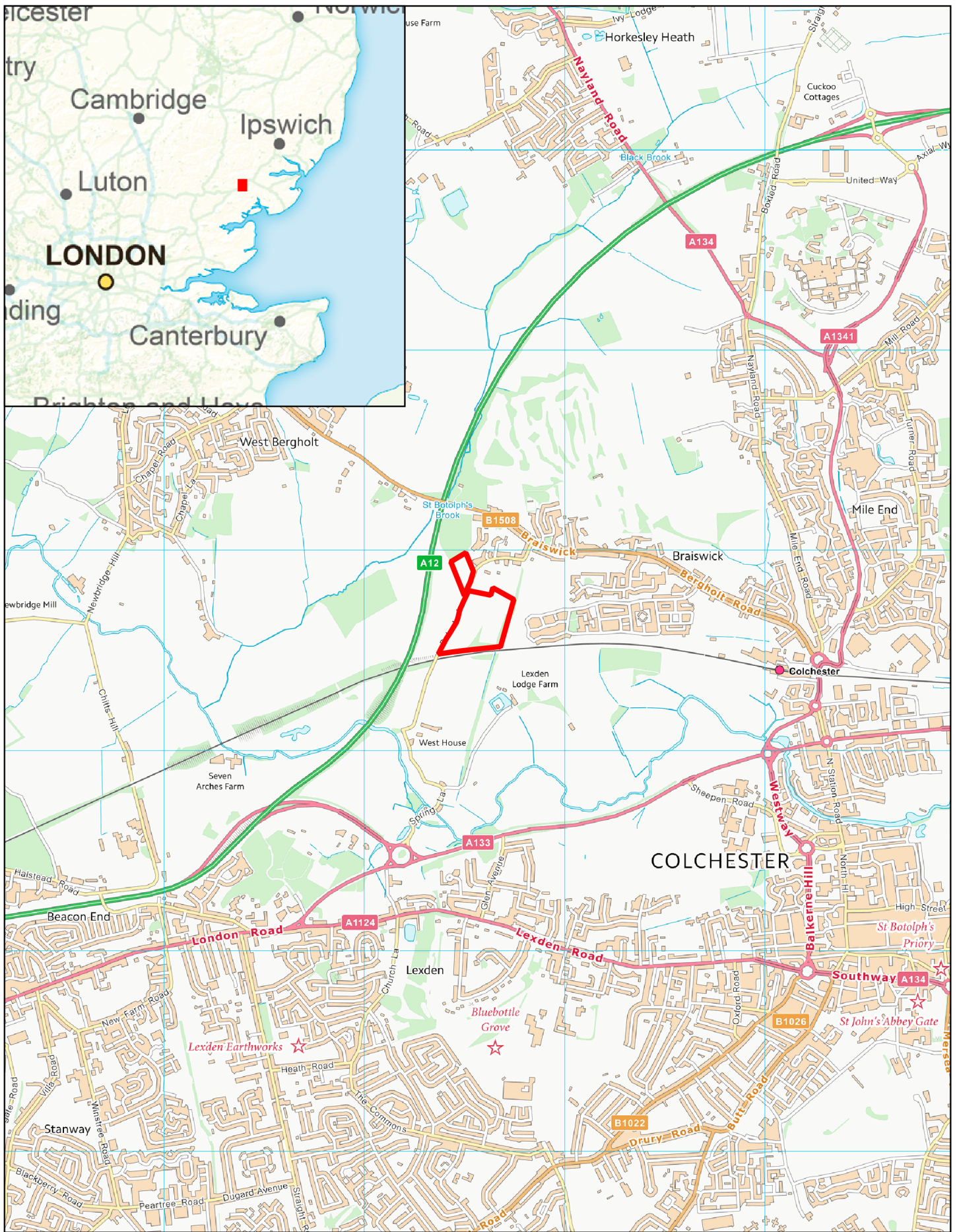
- 9.1. MS maintains an in-house digital archive, which is based on Schmidt and Ernenwein (2013). This stores the collected measurements, minimally processed data, georeferenced and un-georeferenced images, XY traces and a copy of the final report.
- 9.2. MS contributes all reports to the ADS Grey Literature Library subject to any time embargo dictated by the client.
- 9.3. Whenever possible, MS has a policy of making data available to view in easy to use forms on its website. This can benefit the client by making all of their reports available in a single repository, while also being a useful resource for research. Should a client wish to impose a time embargo on the availability of data, this can be achieved in discussion with MS.

## 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

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Figure 1 - Site Location

1 : 25,000 @ A4

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OS (100056946)

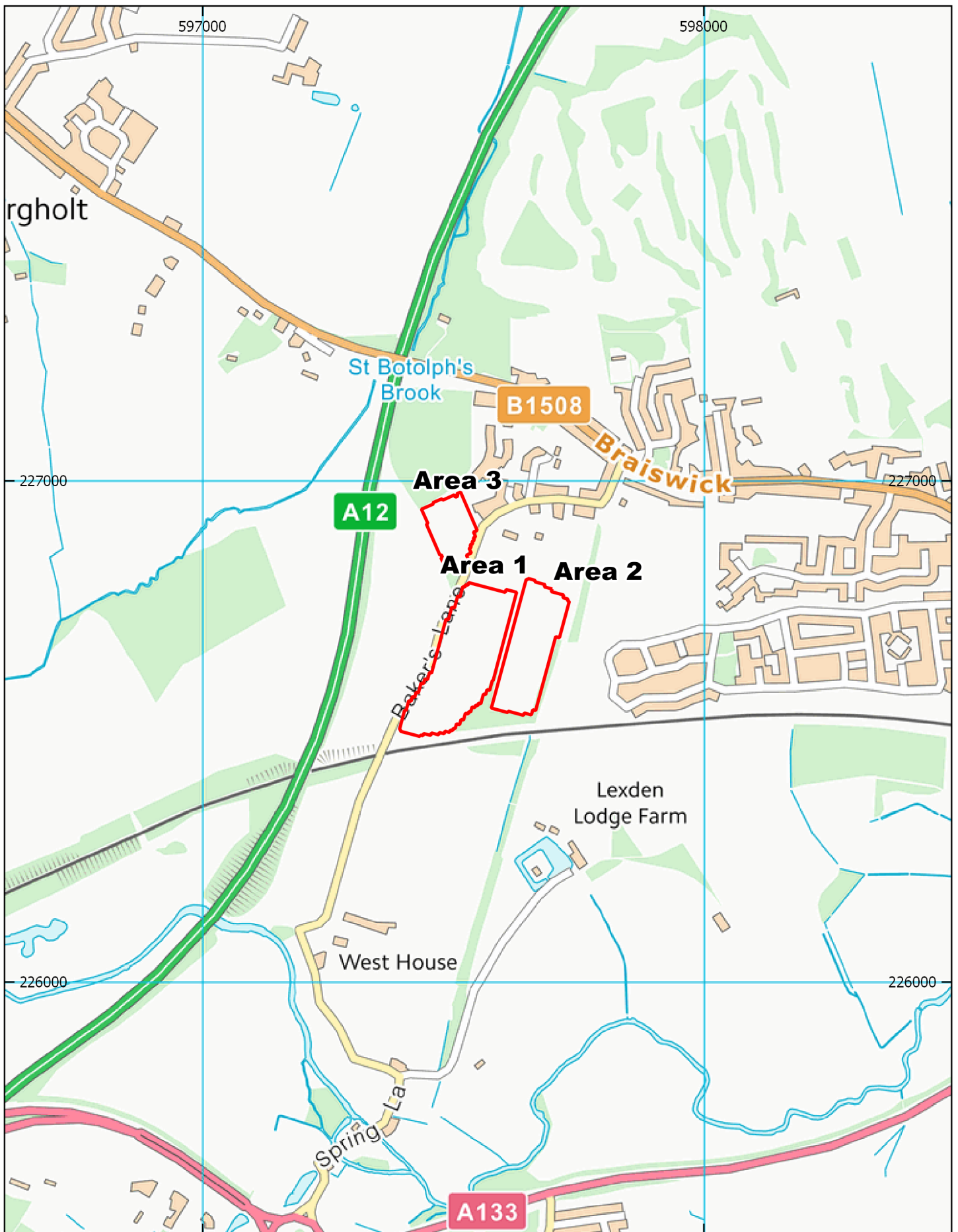
 Site Boundary



0 0.5 1 km




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Figure 2 - Survey Areas

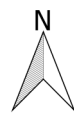
1 : 10,000 @ A4

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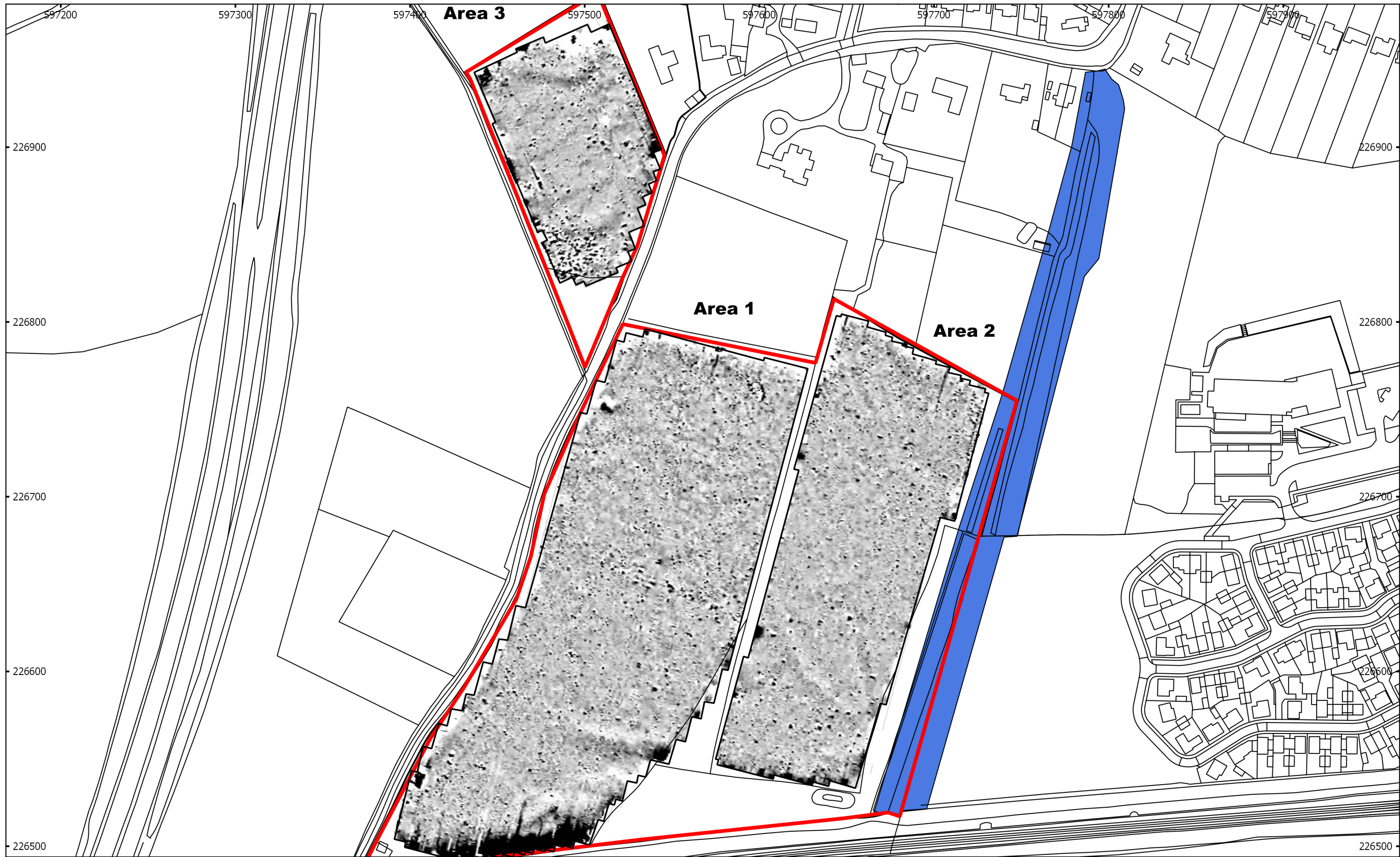
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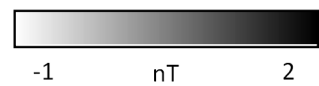
 Survey Areas



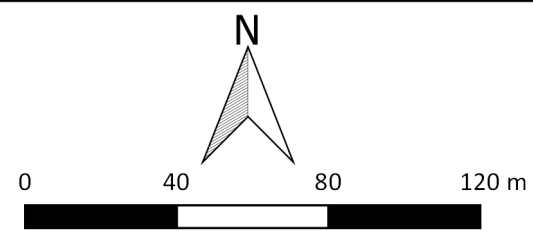
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surveys

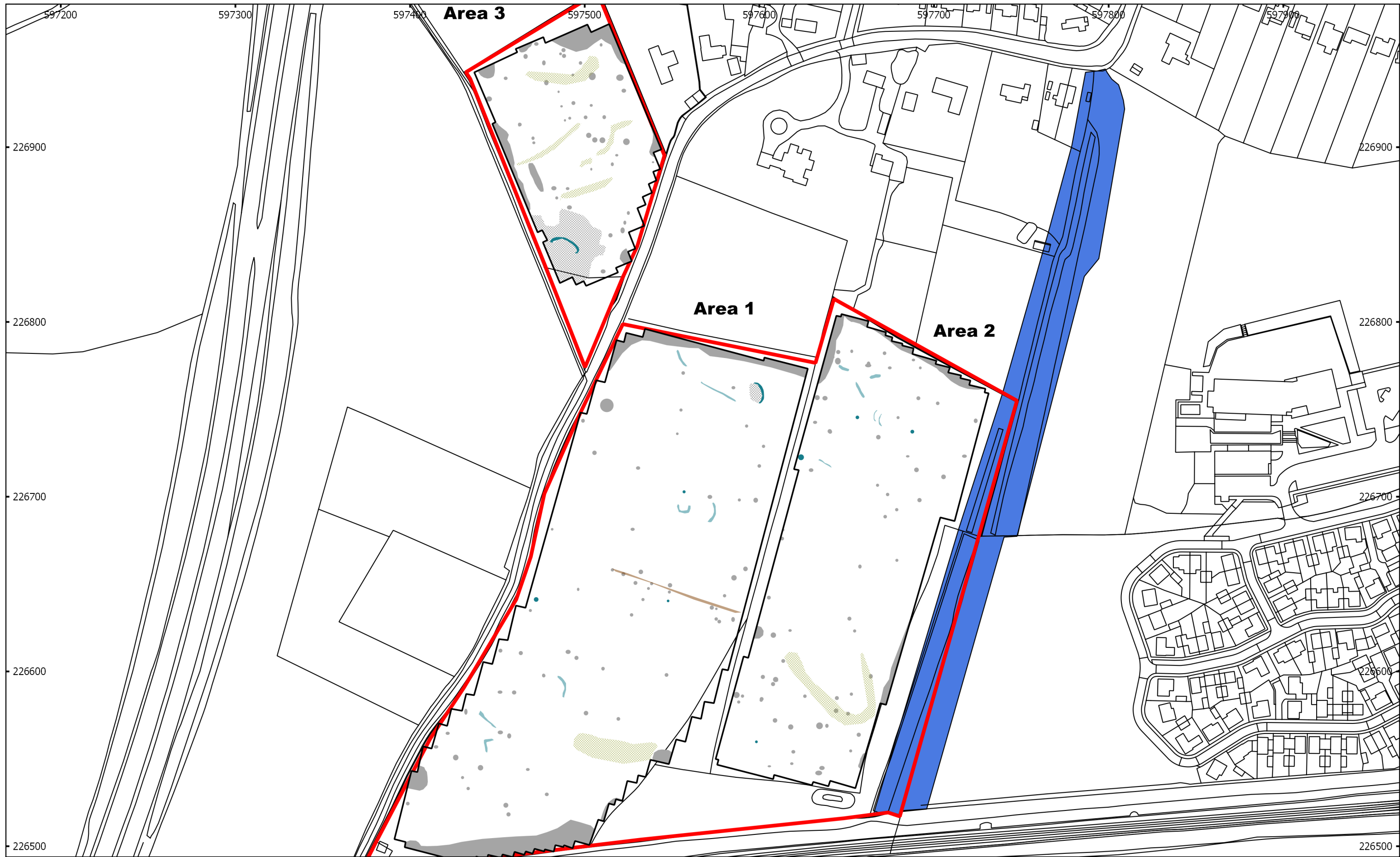


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 Figure 3 - Magnetic Greyscale  
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■ Scheduled Monument





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 Figure 4 - Magnetic Interpretation  
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- |                     |                       |
|---------------------|-----------------------|
| Agricultural (Weak) | Undetermined (Strong) |
| Ferrous (Dipolar)   | Undetermined (Weak)   |
| Ferrous (Spread)    | Site Boundary         |
| Natural (Spread)    | Scheduled Monument    |

