LIME LANE,
OAKWOOD
DERBYSHIRE

Report on geophysical survey conducted in October 2015

Prepared by P. Johnson

October 2015

TPA Project Code – LLC

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SUMMARY

- Trent & Peak Archaeology was commissioned by Locus Consulting, to conduct a geophysical survey on land off Lime Lane, Oakwood, Derbyshire, centred on NGR SK 37917 39235 at a height of c. 102m OD (Fig. 1).

- The work was carried out from the 28th September to the 2nd October, in accordance with standard, accepted practices for archaeological geophysical surveys (EH 2008).

- The site is situated on deposits of Mercia Mudstone & Tarporley Siltstone, with superficial Till recorded across the greater part of the site.

- The site was composed of two discrete areas within the fields immediately to the south of Mansfield Road and Lime Lane, Oakwood, Derbyshire.

- Ground conditions for the survey were generally satisfactory, the land had been in use for arable cropping but had been harvested prior to the survey.

- Geophysical survey demonstrated the presence of potential buried archaeological features, these comprised:

  - Probable archaeological features indicating an enclosure system [10]–[13], [15]–[36], [38]–[43], [54], [55], [58], and [60]–[64].
  - Probable remains of structures or settlement [45]–[47], and [49]–[52].
  - Possible structures ([71], [72], [73], and [74]); ([82], [83], [84], and [85]).
  - Possible pits or post-holes [59].
  - Possible discrete archaeological features of indeterminate nature [5], [6], and [7].
  - Possible concentrations of highly-magnetic material below the ground surface ([1], [66], [67], [68], and [69]); ([14], and [37]).
  - Possible evidence of agricultural practices or boundaries [81], and [87].

Report on the geophysical survey of land at Lime Lane, Oakwood, Derbyshire.
NGR SK 37917 39235

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ACKNOWLEDGEMENTS

The Project Manager for the work undertaken was Paul Johnson. The Project advisor was Lee Elliott. The Project Team comprised Povilas Cepauskas and Joe Groarke.

1. INTRODUCTION

1.1. Trent & Peak Archaeology was commissioned by Locus Consulting on behalf of JGP Properties, to conduct a geophysical survey on land off Lime Lane, Oakwood, Derbyshire, centred on NGR SK 37917 39235 at a height of c. 102m OD (Fig. 1).

1.2. The fieldwork was conducted between the 28th September and the 2nd October 2015 on an approximately 10 hectare area of land to the southwest of Lime Lane, Oakwood, Derbyshire.

1.3. The site is located on deposits of Mercia Mudstone and Tarporley Siltstone; Sedimentary Bedrocks formed approximately 200 to 251 million years, and 237 to 250 million years ago in the Triassic Period. Superficial deposits of Till, formed up to 2 million years ago in the Quarternary period, are recorded overlying the bedrock across the southern part of the site (British Geological Survey).

1.4. Topographically the site lies immediately to the southwest of Lime Lane. The site is bounded by agricultural fencing/hedgerows and comprised of land currently used for agriculture. The site displays some topographical variation, sloping upwards by c. 8m from west to east and c.7m from north to south.

1.5. Archaeological remains are known within the site of the survey, the western part of the proposed development area is within a site on the Derbyshire HER (32830), the probable deserted medieval settlement of 'Nether Breadsall'

2. PROJECT BACKGROUND

2.1. Potential Remains

2.1.1. The archaeological potential of the site is considered to be moderate with potential for remains of medieval and perhaps Roman/Early Medieval date.

- *Prehistoric*
  No prehistoric remains are recorded within the survey area.

- *Roman*
  Roman pottery has been recovered at HER 18901 (120m to the west of the site) and HER 32419 (270m to the west of the site).

- *Mediaeval*
  Early Medieval potential is suggested by the find of an Anglo-Saxon gold sheet just to the east (Portable Antiquities Scheme) with Medieval pottery recovered 270m to the west on Breadsall Hill. Medieval settlement continues to be visible within the archaeological landscape of the study area. All Saints Church (1328833), within the nearby village of Breadsall, contains medieval elements (12th–14th century), as does the nearby Old Hall (1141230, 14th century). The Derbyshire HER notes a possible deserted Medieval settlement to the southwest at Oakward (HER 32830), however this is based on largely on documentary sources with little archaeological evidence recovered (Medieval pottery; HER 32419).

- *Post-Mediaeval*
  No Post-Medieval or Modern heritage assets are recorded as being within the survey area. Within Breadsall village, there are a number of domestic properties, including four Grade II listed buildings (1141228, 1141232, 1205253, 1328832), dating to the 17th century. These form part of a historic village core in the area surrounding the Medieval Church, alongside a number of later domestic and industrial structures.
  The closest designated heritage asset to the survey area is a Wesleyan Methodist Chapel built in 1826 (1498337). This brick and slate structure lies c.600m to the northwest, with no direct views to the site.

2.2. Proposed Fieldwork

2.2.1. In order to evaluate the potential archaeological remains in this area, the following fieldwork investigation was proposed:

- Geophysics – Geomagnetic survey at standard (1m x 0.25m) sampling density across an area totalling c. 10 ha.

3. OBJECTIVES

3.1. In light of the archaeological potential of the site, the Development Control Archaeologist for Derbyshire County Council recommended a scheme of archaeological evaluation by geophysical survey to be carried out.

3.2 The aim of the present work is to provide an evaluation and understanding of any potential archaeological remains through an evaluation by geophysical survey (geomagnetic) to determine the presence and location of any sub-surface remains, in accordance with NPPF para' 128, prior to determination of a planning application for the development of up to 250 residential dwellings and associated infrastructure on the site (ref: 04/15/00449).

3.3. The archaeological work undertaken through this project aims to provide information that will enable the remains to be placed within their local, regional, and national context, and for their significance to be assessed.

3.4. The survey results will be used to inform the planning application and the necessity or otherwise of any further archaeological conditions.

4. METHODOLOGY

4.1. Geophysical Survey: Geomagnetic

4.1.1. The decision to use magnetic gradiometry to survey the site was based on its efficiency as a survey technique suitable for detecting the buried remains of a range of materials based on differences in their magnetic characteristics as compared to the geological background of the area (Gaffney et al. 1991, 6; 2003).

4.1.2. The results of this method are, however, severely restricted in areas of modern disturbance and by the presence of ferrous material (Scollar et al. 1990, 362ff). Because of the presence of metal fencing within the field boundaries, these features were given a wide-berth with an average distance of 3m being allowed to limit their effect on the archaeological data. Although a number of alternative geophysical survey techniques could be applied to the site (Appendix B), magnetometry represented the best compromise between speed and quality of data retrieval for an initial investigation.

4.1.3. The magnetometer survey was undertaken, within the guidelines advocated by English Heritage (David et al. 2008), by a two-person team using a Bartington Instruments Grad 601-2 fluxgate gradiometer. This equipment allowed the survey to be conducted rapidly as the area was relatively free of obstructions. Readings were taken at 0.25m intervals along traverses of 1m spacing walking east. This enabled a sufficiently high density of data for the purposes of archaeological evaluation to be collected across the site in the relatively short time allotted for the survey to be completed.

4.1.4. The geophysical survey grids of 30m by 30m were set out using a Leica GS15 GPS with SmartNet, in the Ordnance Survey National Grid coordinate system. The use of a north-south orientation for the survey grids was employed in the expectation that any surviving remains would be intersected by the survey traverses at an angle of approximately 30°.

4.1.5. The geophysical survey data were processed in Geoplot 3.0 software to remove any environmental disturbances or variations produced in the course of the survey. Firstly, data were manipulated to remove any distorting 'spikes' from the survey results. A high-pass filter was then also used to reduce the effect of geological anomalies in the data-set. Low-pass filtering was then used to improve the resolution of larger archaeologically derived anomalies. Finally, the data were interpolated to produce uniform data-densities equivalent to 0.25m x 0.25m.

4.1.6. The results were exported as greyscale, raster images and inserted into the AutoCAD plan of the site, generated from Ordnance Survey data, for georeferencing and production of a descriptive, vector overlay. The anomalies presented here were identified visually and manually digitised to produce the vectorised plans which are discussed in the results section of this report. The final print-versions of these plans were elaborated and prepared for printing in Adobe Illustrator CS6.

Ground Conditions

4.1.7. Ground conditions for the survey were satisfactory. The site had been used as pasture, but was overgrown at the time of the survey.

5. RESULTS
(Figures 2-4)

5.1. Geomagnetic Survey
5.1.1. Within the area surveyed, the site exhibited a generally good response to the geomagnetic survey. The survey area was divided into two discrete parts by the presence of a modern field-boundary. Geophysical anomalies can be observed across the whole area surveyed, and buried features can be clearly discerned against the geological background. There is some noise in the dataset, particularly to the west of the site. The overall magnetic response is low, although spikes within the dataset extend the range of unfiltered values to $^{+}/_{-}$ 100nT the standard deviation of the raw-data remained within c. 10 nT of the mean. Any cut features are likely to show against this background as areas of positive magnetism. Positively magnetic anomalies are likely to result from the presence of settlement activity and deposition of thermo-remanent, or depositionally-remanent magnetised material.

5.1.2. The results are presented below as a greyscale image of the processed data (Fig. 2), and a complementary numbered interpretative plan to which the following description relates (Fig. 3). This description is organised broadly from west to east. Unprocessed survey data are also presented below (Fig. 5). These data are unfiltered and hence show striping resulting from slight but consistent imbalances between the two sensors used for the survey.

5.1.3. The western end of the survey area can be defined by the presence of remnants of a previous field-boundary and contains a number of discrete anomalies. Adjacent to the western edge of the survey is a c. 60m-long, highly irregular, east–west orientated, dipolar anomaly [1]. Approximately 115m from the western extent of the survey and located within 30m of the northern edge of the survey area, is a cluster of dipolar maculae [2], covering a total area of approximately 960m^2. Approximately 64m to the southeast of [1], is a pair of large (c. 8m-diameter), dipolar maculae [3]. Immediately to the east of these dipolar responses is a group of smaller dipolar maculae [4], arranged in an approximate "L-shape", measuring 26m x 30m, and orientated east–west. Immediately to the west of the angle formed by this group of dipolar responses is a "C-shaped", positively-magnetic anomaly [5], measuring c. 6.5m in diameter and open to the east. Approximately 25m to the east of this feature is a c. 5m-long, linear, positively-magnetic anomaly [6], orientated east–southeast–west-northwest. Approximately 19m to the east of [1], is an east–west aligned, c. 20m-long irregular, broadly linear, positively-magnetic anomaly [7]. Adjacent to the southern extent of [2], is a cluster of 3, c. 2m-diameter, positively-magnetic maculae [8], which describe an arc of 17m-diameter, open to the east. Approximately 17m to the east of [7] is a c. 18m-long, north-northwest–south-southeast aligned, sinuous, curvilinear alignment of positively-magnetic maculae [9].

5.1.4. The central part of the site exhibits the greatest density of geomagnetic responses. Approximately 20m from the northern edge of the survey area is a c. 87m-long, linear alignment of positively-magnetic anomalies [10], [11], [12], & [13], orientated east-northeast–west-southwest. Approximately 25m to the south of this alignment is a c. 260m^2 elongated dipolar macula [14], aligned broadly east–west. Approximately 4m to the south of this feature is a 25m-long alignment of three, positively-magnetic, linear anomalies [15], orientated parallel to [12]. Approximately 1.5m to the east of, and apparently coaxial to [13], is a c. 17m-long, broadly linear, positively-magnetic anomaly [16]. Approximately 3.5m to the north of this feature and aligned parallel to it, is a c. 34.5m-long, linear, positively-magnetic anomaly [17]. Approximately 5m to the east of this feature, and continuing its alignment is a 15m-long, linear, positively-magnetic anomaly [18]. Immediately adjacent to the eastern end of this feature is an irregular, broadly "L-shaped", positively magnetic anomaly [19], orientated on the same alignment as [18], and measuring 27.5m by 13m, with its return to the south. Approximately 4m from the southern extent of this feature is a spur projecting to the west, the line of this spur is picked up c. 6m from its western tip by a 7.5m-long, positively-magnetic, linear anomaly

[20]. Approximately 1m to the south of [19], a positively-magnetic, linear feature running parallel to [18]/[19] over a distance of c. 38.5m is defined by [21], [22], and [23]. This alignment is picked up a further 19m to the west by a positively-magnetic, linear anomaly [24]. Approximately 8m to the west of this feature, its alignment is continued by a positively-magnetic, linear anomaly [25].

5.1.5. Approximately 6m to the south of [22] is a rectilinear, positively-magnetic anomaly [26], orientated north–south. Approximately 1m to the south of this feature is an "L-shaped", positively-magnetic anomaly [27], orientated east–west and measuring 7m by 3.5m. approximately 10m to the west of this feature is an "L-shaped", positively-magnetic anomaly [28], mirroring the previously described anomaly and measuring 6m by 5.5m. Approximately 7m to the west of this feature, is a 28m-long, positively-magnetic, linear anomaly [29], running parallel to [17], at a distance of 17m to its south. Approximately 1m to the west of this linear feature is an irregular rectilinear, "L-shaped", positively-magnetic anomaly [30], orientated north–south and measuring 21m by 16m. Approximately 1m to the south of this feature is a 7m by 4m, squat, linear, positively-magnetic anomaly [31], continuing the north–south alignment of the previously described feature. Approximately 23m to the east of the previously described feature, and 30m to the south of [29], is a 14m-long, positively-magnetic, linear anomaly [32], orientated broadly east–west. Approximately 5m to the east of this feature is a 14.5m-long, linear, positively-magnetic, east-northeast–west-southwest orientated anomaly [33]. Approximately 3m to the north of the eastern end of this feature is a c. 10m-long, irregular, linear, east–west orientated, positively-magnetic anomaly [34]. Approximately 6m to the east of this feature is a rectilinear, "T-shaped", 7m by 10m, positively-magnetic anomaly [35], aligned to the north–south component of [19]. Immediately to the north of this feature, and continuing its alignment to the north is a "mirrored-L-shaped", positively-magnetic anomaly [36], measuring 9m by 5m. Immediately to the west of this feature is a large dipolar macula [37], covering an area of c. 215m^2.

5.1.6. Approximately 18m to the south of [31] is a "hook-shaped", rectilinear, positively-magnetic anomaly [38], conforming to the dominant alignment of features in this part of the site, and measuring c. 75m by 14m. The southern return of this feature is continued c. 11m to the west of its terminus by an 11m-long, linear, positively-magnetic anomaly [39]. The alignment of this feature is further continued c. 21.5m to the west by a 13m-long, positively-magnetic, linear anomaly [40]. The alignment described by [39] and [40] is picked up c. 13.5m to the east of [38] by a 37.5m-long, linear, positively-magnetic anomaly [41]. This feature is paralleled approximately 4m to the south of [40] by a 9.5m-long, linear, positively-magnetic anomaly [42]. The alignment defined by [42] is picked up c. 24.5m to the east by an intermittent, 21m-long, linear, positively-magnetic anomaly [43]. Approximately 21m to the south of [42] is a group of discontinuous, positively-magnetic anomalies [44], extending for c. 16.5m on an east–west orientation. Approximately 19.5m to the east of [44], and 14.5m south of [43], is a rectilinear, positively-magnetic anomaly [45], measuring c. 20m by 20m. Approximately 4m to the west of this feature is a 10m-long, north–south orientated, broadly-linear, positively-magnetic anomaly [46]. Approximately 6m to the southwest of this feature is a pair of positively-magnetic, anomalies [47], describing an 8.5m-long, north–south alignment. Approximately 8m to the west of this feature, adjacent to a gap in the survey necessitated by the former field boundary, is a similar, 9m-long, alignment of positively-magnetic anomalies [48]. Approximately 7.5m to the east of the southern extent of [48] and 4m south of [47], is an 18m-long, positively-magnetic, linear, east–west orientated anomaly [49]. Approximately 4m to the south of [45] is a 15m-long, linear, positively-magnetic anomaly [50], orientated parallel to the southern side of [45]. This feature is paralleled 8m to the south by an 11m-long, linear, positively-magnetic anomaly [51], broadly aligned with [49]. Approximately 4.5m further to the south is a c. 22.5m-long, linear, positively-magnetic anomaly [52], also orientated parallel to the previously described features. Approximately 28m to the south of [49], and parallel to it, is a c. 10.5m-long linear, positively-magnetic anomaly [53]. A further 25m to the south is a c. 40m-long, linear, east-northeast–west-southwest orientated, positively-magnetic anomaly [54]. The alignment of this feature is picked up c. 5m to the east by a 9m-long, linear, positively-magnetic anomaly [55].

5.1.7. The southern edge of the survey area exhibits few significant geomagnetic anomalies. Approximately 20m to the south of the eastern end of [54] is a c. 7m-long, east–west orientated, linear, positively-magnetic anomaly [56]. Approximately 12m northeast of this feature is a second c. 7m-long, east–west orientated, linear, positively-magnetic anomaly [57].

5.1.8. Approximately 21m to the east of [55] is a c. 19.5m-long, east–west aligned, linear, positively-magnetic, anomaly [58]. This feature appears to define the southern limit of a 615m^2 area of small, discrete, positively-magnetic maculae [59]. Approximately 10m to the east of this area of positively-magnetic maculae is a c. 53m-long, linear anomaly [60], which picks up the alignment of [35], [36], and [19]. This alignment is continued to the north by a "T-shaped", 25m by 31m, positively-magnetic anomaly [61]. Immediately to the north of this feature, the alignment is continued by a further, 27m by 11m, broadly "T-shaped", positively-magnetic anomaly [62]. The western projection of this feature is continued by a c. 9.5m-long, linear, positively-magnetic anomaly [63]. The continuation of this alignment is completed by a third "T-shaped", positively-magnetic anomaly [64], measuring c. 36.5m by 10m. This area of anomalies is overlain by a series of parallel, c. 105m-long, positively-magnetic, linear anomalies [65], which probably result from the modern agricultural regime.

5.1.9. The eastern part of the western field surveyed exhibits a number of large dipolar anomalies. To the east of [35], is a 151m^2 elongated dipolar macula [66], orientated broadly east-northeast–west-southwest. Approximately 10m to the northeast of this feature is an 8m-diameter dipolar macula [67]. Approximately 14m to the south of this feature is an irregular, 152m^2 dipolar macula [68]. Approximately 4m to the northeast of this feature is a 156m2, irregular dipolar macula [69]. This area of the survey also exhibits a series of long, linear responses [70], probably resulting from modern agricultural practices. The northern corner of the survey area demonstrates the presence of a group of four positively-magnetic anomalies [71], [72], [73], and [74], which define a broadly rectilinear area of 21m by 12m, aligned east–west. The northern edge of the survey area is paralleled over a distance of c. 96m by three linear, positively-magnetic anomalies [75], [76], and [77].

5.1.10. The eastern survey area exhibited a slightly lower density of geomagnetic responses than the larger, western part. The northern end of this area is dominated by the presence of a large, 13.5m-wide band of dipolar magnetic response [78], running for c. 110m from the northern edge of the survey to a point approximately 85m south along the eastern edge of the area surveyed. Approximately 19m to the east of this feature, and adjacent to the northern edge of the survey area, is a c. 9m-long, linear, positively-magnetic anomaly [79], orientated broadly east–west. The eastern extent of the survey is occupied by a series of discrete, small, c. 2m-diameter, dipolar maculae [80]. The centre of the eastern survey area demonstrates the presence of a c. 31m-long, linear, positively-magnetic anomaly [81], aligned north-northeast–south-southwest. Approximately 6.5m to the south of this feature is a c. 9m-long, linear, east–west orientated, positively-magnetic anomaly [82]. Immediately to the east of this feature is a broadly "L-shaped", positively-magnetic anomaly [83], orientated east–west and measuring 7m by 4m. Approximately 4m to the south of this feature is a 7m-long, positively-magnetic, linear anomaly [84], also orientated east–west. Approximately 7m to the west of this feature is a c. 10.5m-long, linear, positively-magnetic anomaly [85], orientated northwest–southeast. Approximately 20m to the south of this feature is a c.5m-long curvilinear, positively-magnetic anomaly [86], orientated broadly northeast–southwest. Towards the southern end of the survey area is a c. 80m-long, south-southwest–north-northeast orientated, linear, positively-magnetic anomaly [87].

6. DISCUSSION

6.1. Geomagnetic Survey

6.1.1. The geomagnetic response to the survey revealed a high density of anomalies across the majority of the survey area, and several features with archaeological potential could be clearly recognised within the dataset. The scale of these features is varied, with some possible evidence for agricultural activity. Likely archaeological features were generally represented by positive magnetic anomalies. The overall character of the geophysical anomalies revealed by the survey suggests a possibility for the presence of archaeological remains within the area surveyed.

6.1.2. The group of features [10]–[13], [15]–[36], [38]–[43], [54], [55], [58], and [60]–[64] appear to suggest the presence of a large complex enclosure, possibly a system of ditches.

6.1.4. The group of features [45]–[47], and [49]–[52] appear to suggest the probable presence of buried structures and/or other settlement features.

6.1.5. The group of features [71], [72], [73], and [74] appear to suggest the presence of buried archaeological features of an as-yet indeterminate nature.

6.1.6. Features [5], and [6] may represent small, discrete archaeological features.

6.1.7. Feature [7] may represent some form of buried archaeological feature.

6.18. Features [14], and [37] may represent disposal of highly magnetic material within the enclosure system discussed above.

6.1.9 Features [1], [66], [67], [68], and [69] appear to represent a concentration of highly magnetic material below the ground surface.

6.1.10. The anomalies which comprise [59] are possibly a result of pitting or the creation of other small stratigraphically-negative features.

6.1.11. Features [81], and [87] are likely to result from agricultural practices, though the historical significance of these cannot be determined directly from the geomagnetic survey results alone.

6.1.12. Features [82], [83], [84], and [85] appear to represent possible archaeological remains of a small structure or enclosure.

7. CONCLUSION

7.1. Geophysical survey suggested the presence of potential buried archaeological features.

These comprised:

- Probable archaeological features indicating an enclosure system [10]–[13], [15]–[36], [38]–[43], [54], [55], [58], and [60]–[64].
- Probable remains of structures or settlement [45]–[47], and [49]–[52].
- Possible structures ([71], [72], [73], and [74]); ([82], [83], [84], and [85]).
- Possible pits or post-holes [59].
- Possible discrete archaeological features of indeterminate nature [5], [6], and [7].
- Possible concentrations of highly-magnetic material below the ground surface ([1], [66], [67], [68], and [69]); ([14], and [37]).
- Possible evidence of agricultural practices or boundaries [81], and [87].

7.2. The distribution of geophysical anomalies across the areas surveyed should probably be seen as representative of the presence of archaeological features within the survey area and no significant biases in survival/detection of these remains appear to be present within the dataset.

8. BIBLIOGRAPHY

David, et al. (2008) *Geophysical Survey in Archaeological Field Evaluation*. English Heritage

Gaffney, C., Gater, J. & Ovendon, S. 1991. *The Use of Geophysical Survey Techniques in Archaeological Evaluations*. Institute of Field Archaeologists Technical Paper No. 9.

Scollar et al. (1990) *Archaeological Prospecting and Remote Sensing*. Cambridge: Cambridge University Press.

Cartographic references

BGS British Geological Survey: England and Wales (online) Solid and Drift Geology: 1: 50,000

OS Ordnance Survey 1: 50,000 Landranger Map

Ordnance Survey Maps: All editions 1859-1992

Appendix A: Details of Survey Strategy
Date of Survey: 28th September–3rd October 2015
Site: LLC – Lime Lane, Chaddesdon (Derbyshire)
Region: Derbyshire
Grid Reference: NGR SK 37917 39235
Surveyor: Trent and Peak Archaeology
Personnel: Povilas Cepauskas, Joe Groarke
Geology: Mercia Mudstone, Tarporley Siltstone/Till
Survey Type 1: Geomagnetic, fluxgate gradiometry
Approximate area: 10 hectares
Grid size: 30m
Traverse Interval: 1m
Reading Interval: 0.25m
Instrument: Bartington Instruments Grad 601-2
Resolution: 0.1nT
Traverse mode: Zig-zag

Appendix B: Geophysical Prospection Methods

Magnetic Survey

Magnetic prospection of soils is based on the measurement of differences in magnitudes of the earth's magnetic field at points over a specific area. The iron content of a soil provides the principal basis for its magnetic properties. Presence of magnetite, maghaematite and haematite iron oxides all affect the magnetic properties of soils.

Although variations in the earth's magnetic field which are associated with archaeological features are weak, especially considering the overall strength of the magnetic field of around 48,000 nano-Tesla (nT), they can be detected using specific instruments (Gaffney et al. 1991).

Three basic types of magnetometer are available to the archaeologist; proton magnetometers, fluxgate gradiometers, and alkali vapour magnetometers (also known as caesium magnetometers, or optically pumped magnetometers).

Fluxgate Gradiometer

Fluxgate instruments are based around a highly permeable nickel iron alloy core (Scollar et al. 1990, 456), which is magnetised by the earth's magnetic field, together with an alternating field applied via a primary winding. Due to the fluxgate's directional method of functioning, a single fluxgate cannot be utilised on its own, as it cannot be held at a constant angle to the earth's magnetic field. Gradiometers therefore have two fluxgates positioned vertically to one another on a rigid staff. This reduces the effects of instrument orientation on readings.

Fluxgate gradiometers are sensitive to 0.5nT or below depending on the instrument. However, they can rarely detect features which are located deeper than 1m below the surface of the ground.

Archaeological features such as brick walls, hearths, kilns and disturbed building material will be represented in the results, as well as more ephemeral changes in soil, allowing location of foundation trenches, pits and ditches. The results are however extremely dependent on the geology of the particular area, and whether the archaeological remains are derived from the same materials.

FIGURES

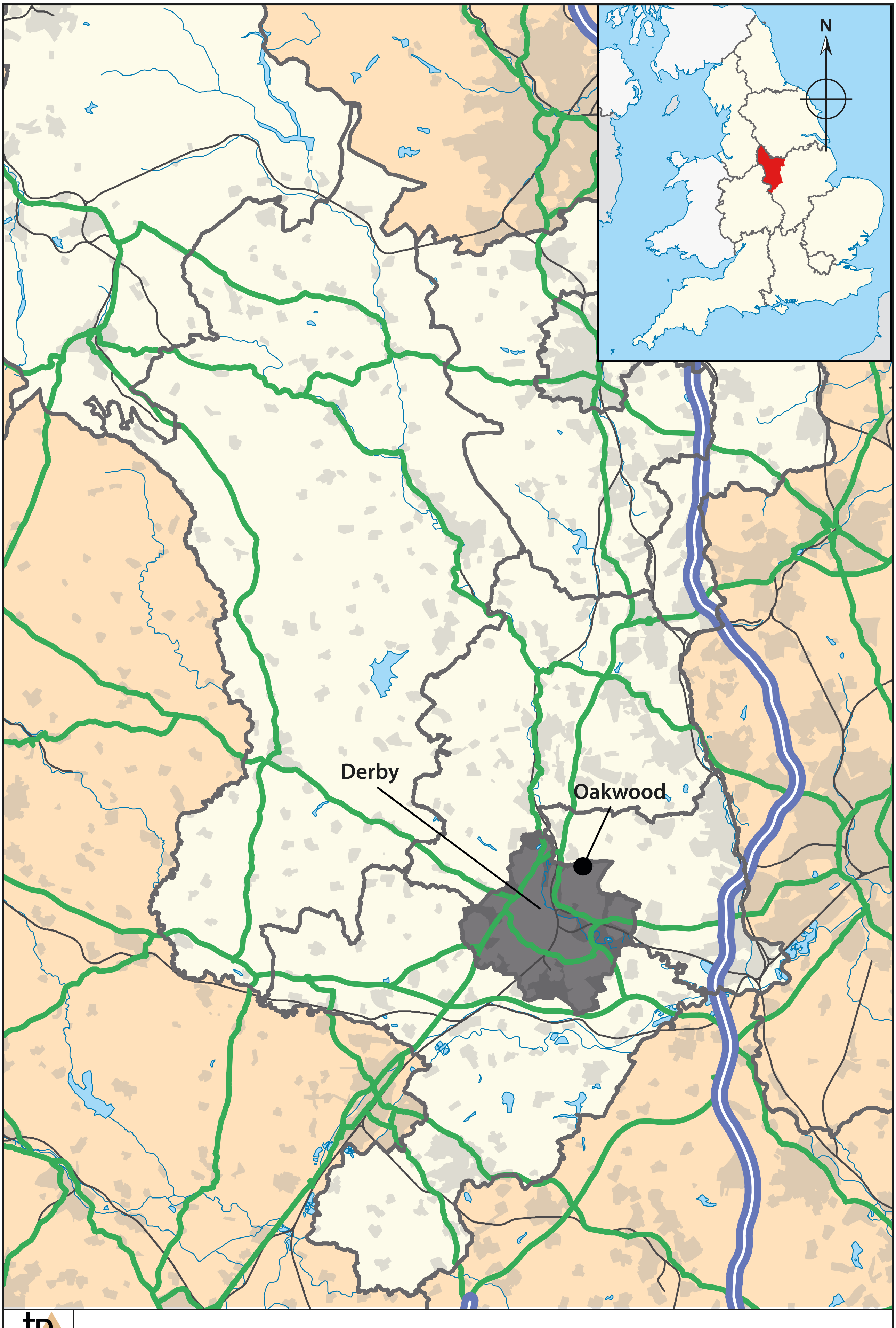

Fig. 1: Site Location within Derby

Fig. 2: Greyscale plot of geo-magnetic survey results

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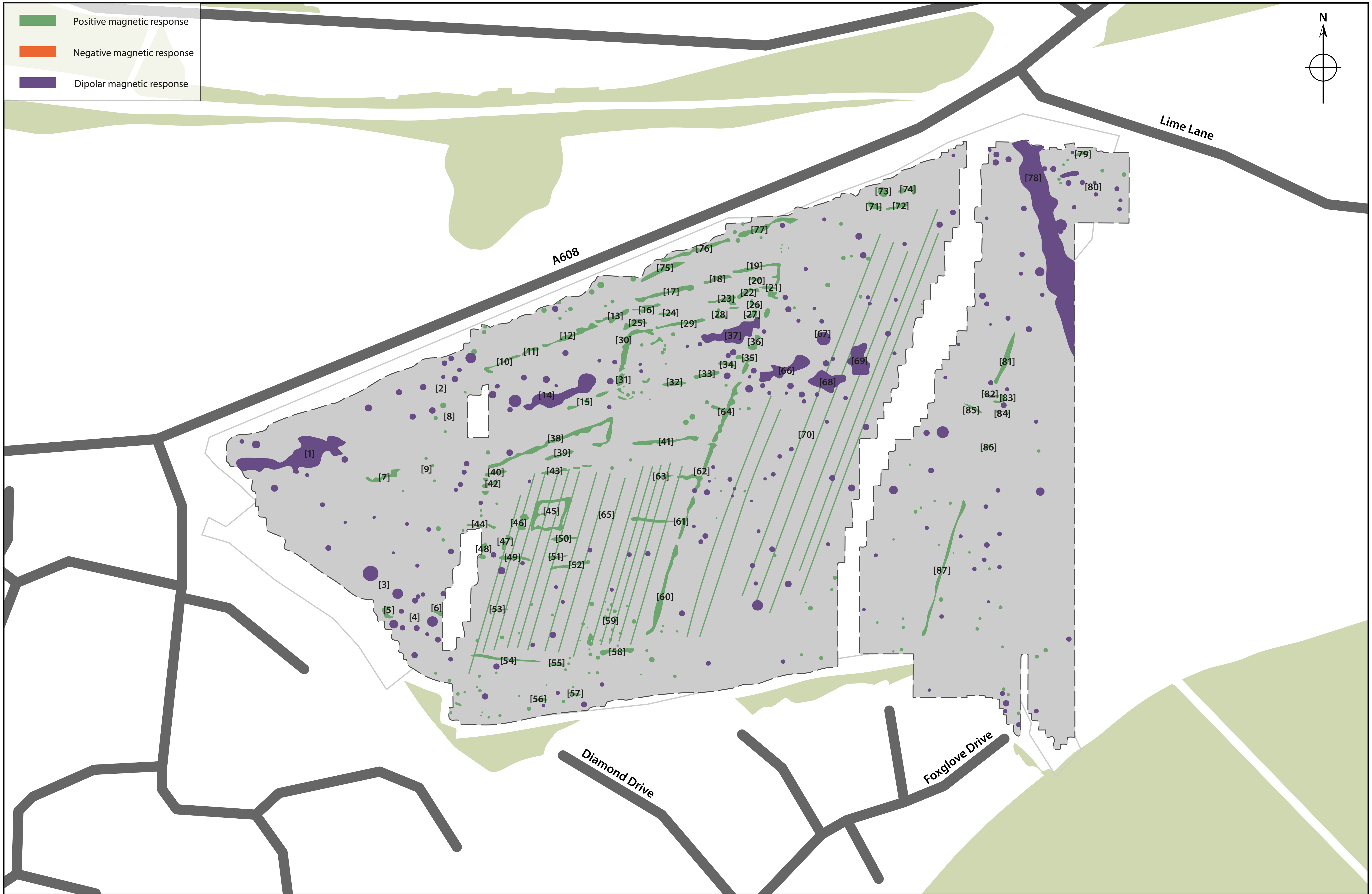

Fig. 3: Vectorised plan of geo-magnetic survey results

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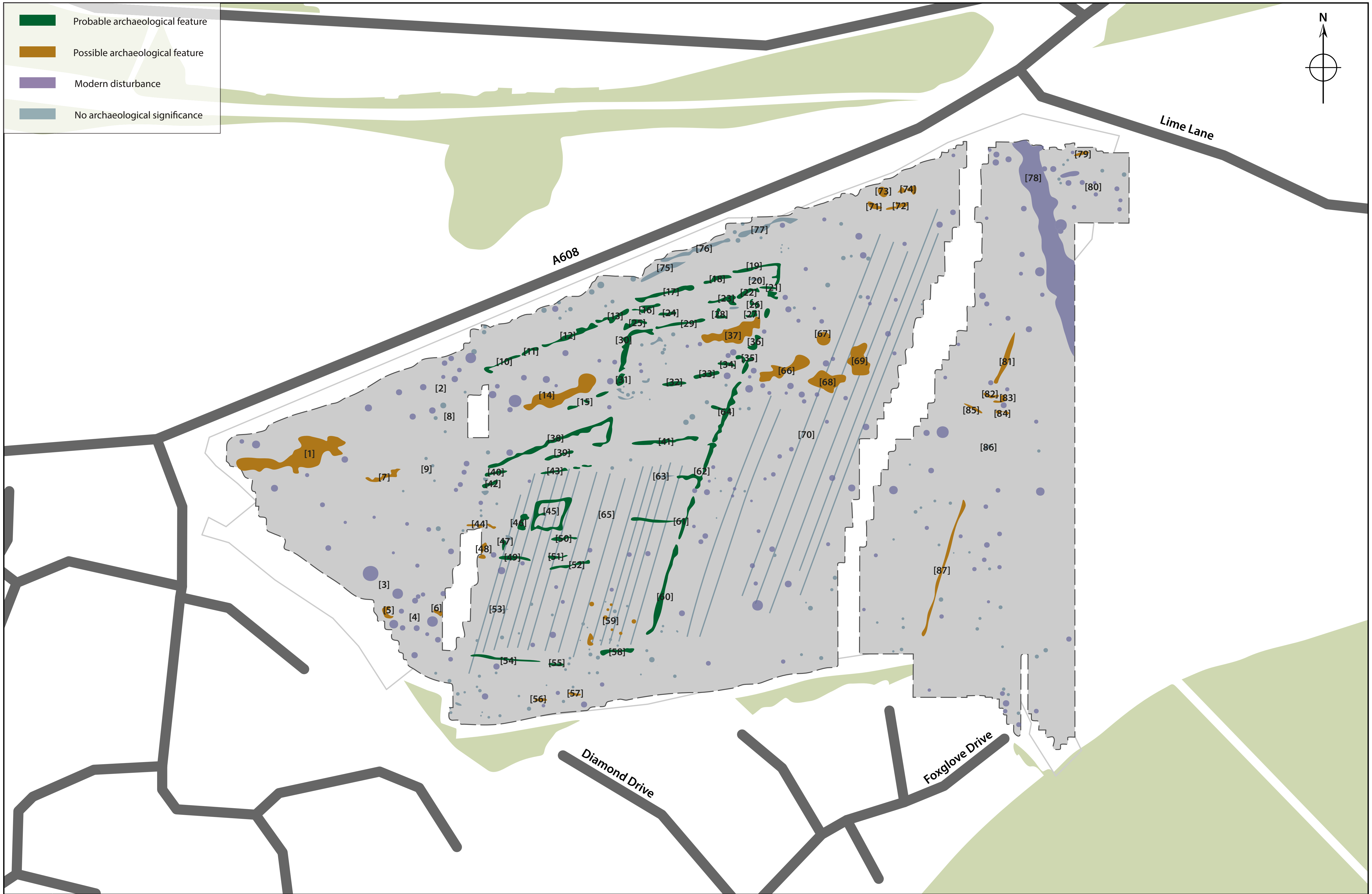

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Fig. 4: Archaeological interpretation plan of geo-magnetic survey results

100m

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Fig. 5: Unfiltered greyscale plot of geo-magnetic survey results