LEVENS PARK,
LEVENS,

CUMBRIA

Geophysical Survey Report

Oxford Archaeology North

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Levens Local History Group

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The magnetometer survey was carried out by Karl Taylor, the report was written by Mike Birtles. The drawings were prepared by Mark Tidmarsh. The project was managed by Karl Taylor, who also edited the report.

SUMMARY

To further understand and record archaeological features in Levens Park, Levens, Cumbria, LLHG carried out a survey in April 2016 identifying fifteen putative archaeological features not previously recorded on the Cumbria Historic Environment Record (HER) formerly known as the Sites and Monument Record (SMR). There has been some considerable confusion regarding the exact position of sites listed on the SMR/HER and LLHG commissioned Oxford Archaeology North (OA North) to carry out a programme of magnetic geophysical survey on an area including sites SMR 5238, SMR 5240 and SMR 2645, which was undertaken out on 31st October 2016. One of the aims of the survey was to try to narrow down the locations of these sites. At the same time, LAS undertook the electrical resistance survey. OA North was commissioned to prepare the report of both geophysical survey techniques.

Levens Park contains some of the most archaeologically rich areas in South Cumbria, with sites representing evidence of human occupation over several millennia. The park lies on the banks of the River Kent and was created as part of the Levens Hall estate during the fourteenth century, later being remodelled into its current form during the eighteenth century. The park contains many extant archaeological earthwork features, suggesting a long period of occupation from the Mesolithic onwards. Lithic scatters dating to the Mesolithic have been identified in at least two locations, including one located below a Bronze Age mound, which was found to contain two inhumations, and a second lithic scatter has been identified within a settlement area that was previously thought to be medieval (SMR 2645). In addition, several barrow mounds and cairns dating to the Bronze Age are scattered around the park, and a Romano-British site, 'Diana's Temple', has yielded material dating to the first century in addition to superimposed post-Roman structures, although the exact location of this feature and its entry on the SMR remains unclear.

The geophysical surveys were undertaken by OA North and LAS assisted by volunteers from LLHG. The magnetometer survey covered an area totalling 1.89 ha, approximately half of which was surveyed with electrical resistance. The results of the geophysical survey confirmed the presence and locations of features probably attributable to sites identified on the HER/SMR and the locations of earthworks surveyed by LLHG.

Both the magnetic and resistance data has been successful in clearly demonstrating the high potential for archaeological remains associated with sites recorded on the HER/SMR and surveyed by LLHG. The exact positions of many sites within Levens Park has been open to conjecture but the geophysical survey has more clearly defined the locations of several responses associated with some of the these sites. In particular, several circular responses within the eastern side of the survey area probably reflect the locations of sites SMR 5238 and5240, although there is more than one response indicative of archaeological features.

At the western end of the survey area, several responses correspond to earthworks associated with SMR 2645 surveyed by LLHG, some of which are visible on the ground. The responses are indicative of ditches probably associated with the earthworks.

Given the nature of the archaeological resource in this area, it is highly likely that many of the responses are of archaeological potential. Ground truthing in the form of targeted trial trench excavations will help to more clearly define the nature of some of these features

1. INTRODUCTION

1.1 CIRCUMSTANCES OF THE PROJECT

1.1.1 To further understand and record archaeological features in Levens Park, Levens, Cumbria, LLHG carried out a survey in April 2016 identifying fifteen putative archaeological features not previously recorded on the SMR/HER. There has been some considerable confusion regarding the exact locations of sites listed on the SMR/HER, and LLHG commissioned OA North to carry out a magnetic geophysical survey on an area including sites SMR 5238, SMR 5240 and SMR 2645, which was undertaken on 31st October 2016. At the same time, LAS undertook the electrical resistance survey. OA North was commissioned to prepare the report of both geophysical survey techniques.

1.1.2 Levens Park contains some of the most archaeologically rich areas in South Cumbria with sites representing evidence of human occupation over several millennia (Hodgkinson 2015). Of interest, is a cluster of monuments on the east bank of the River Kent at the northern end of the deer park (*ibid*).

1.1.3 The geophysical surveys were assisted by volunteers from LLHG under the supervision of OA North and LAS, the magnetometer survey covered an area totalling 1.89 ha approximately half of which was surveyed with resistivity (0.99ha). The results of the geophysical survey confirmed the presence and locations of features probably attributable to sites identified on the HER/SMR and the locations of earthworks surveyed by LLHG.

1.2 LOCATION AND BACKGROUND TO THE AREA

1.2.1 ***Location, Geology and Topography:*** Levens Park is located on the banks of the River Kent and is bounded to the east by the A590 dual carriageway (Fig 1). The park is approximately 1.3km to the east of Levens Village and 1.4km north of Heversham. The survey site is located on the east bank of the river (SD 504861). The area slopes gently from east to west with a maximum elevation of 31m aOD (Fig 2). The east bank of the river drops away steeply and was not surveyed.

1.2.2 The underlying bedrock comprises Great Scar Limestone overlain by superficial deposits of glacial till (British Geological Survey 2017). The soils are freely draining slightly acid loam (Farewell *et al* 2011).

1.2.3 The survey area lies within a single field that was laid down to pasture with remnants of wire fencing and at the time of survey, deer were freely roaming the site. The area is bounded to the east by woodland and deer fencing and to the west by the River Kent. Running through the centre of the survey area is a tree-lined avenue.

1.2.4 ***Background:*** The following background is a precis of information gathered to place the results in a historical context.

1.2.5 ***Prehistoric Period:*** There are a number of sites in Levens Park that provide evidence of prehistoric activity from at least 6000 years ago. Lithic artefacts dating to the Late Mesolithic were discovered under a mound containing two beaker

burials interpreted as being a prehistoric ring cairn (SMR 2645) (Greenlane Archaeology 2011).

1.2.6 A large complex of Bronze Age monuments within Levens Park include two barrows (HER 2668 and 5240), a rectangular mound (HER 5238), a round mound (HER 5241), a scooped settlement (HER 5238), and two cairns (HER 5241 and HER 2650) (*ibid*).

1.2.7 In the wider area, a Bronze Age cremation cemetery has been found at Allithwaite, west of Levens (OA North 2007). Five Iron Age crouched inhumation burials have been discovered at a plot of land in Nelson Square, Levens, no artefacts were found accompanying the burials, which were dated as 172-44 cal BC (2089±24 BP, KIA 24385) (*ibid*).

1.2.8 ***Roman Period:*** The pattern of rural settlement changed little in the North West with the exception of the appearance of Roman military sites such as Kendal, Ambleside and Lancaster. There are records of scattered Roman finds from across the area including a coin hoard at Cartmel (OA North 2007).

1.2.9 The 'Temple of Diana', a site within Levens Park has yielded First Century material with superimposed post-Roman structures (*ibid*).

1.2.10 ***Medieval Period:*** The Levens district belonged to the Earl of Northumberland before being forfeit to Roger de Poitou after the Norman Conquest and was granted to Normannus de Hieland, Yealand by the Baron of Kendal *c* 1170 (Greenlane Archaeology 2011). Levens Hall was probably originally constructed in the early part of the fourteenth century by the Redmans, previously Redmayne, in the form of a Pele tower in defence from the Scots (*ibid*). Levens Park was formed in the fourteenth Century and later remodelled in the eighteenth century (*ibid*).

1.2.11 ***Post-medieval period:*** The area around the Lyth Valley was utilised as a source of peat during the seventeenth and eighteenth centuries, however a drainage system was implemented between 1803 and 1843 creating a large plain for farmland cultivation (OA North 2007).

2. METHODOLOGY

2.1 PROJECT DESIGN

2.1.1 The following methodology was used as the basis for the survey, and the work was consistent with the relevant standards and procedures of Historic England (English Heritage 2008) and the Chartered Institute for Archaeologists (CIfA 2014a and 2014b), and generally accepted best practice. Two techniques were used for the survey, magnetometry and electrical resistance.

2.2 GEOPHYSICAL SURVEY

2.2.1 ***Magnetometer Survey:*** the preferred geophysical technique in the detection of many archaeological remains is a magnetometer area survey, which is effective in locating 'positively magnetic' material, such as iron-based (or 'ferrous') features and objects, or those subjected to firing, such as kilns, hearths, and even the buried remains of brick walls. This technique is also widely used to locate more subtle magnetic features associated with settlement and funerary remains, such as boundary or enclosure ditches and pits or post-holes, which have been gradually infilled with more humic material. The breakdown of organic matter through micro-biotic activity leads to the humic material becoming rich in magnetic iron oxides when compared with the subsoil, allowing the features to be identified by the technique. In addition, variations in magnetic susceptibility between the topsoil, subsoil and bedrock have a localised effect on the Earth's magnetic field. This enables the detection of features, such as silted-up or backfilled pits, due to the fact that the topsoil has more magnetic properties than the subsoil or bedrock, resulting in a positive magnetic anomaly. Conversely, earthwork or embankment remains can also be identified with magnetometry as a 'negative' feature due to the action in creating the earthwork of depositing the relatively low magnetic subsoil on top of the more magnetic topsoil. In this way, magnetometry is a very efficient technique and is recommended in the first instance by Historic England (2008) for such investigations.

2.2.2 ***Magnetometry Equipment:*** the strength of the present geomagnetic field in Great Britain is approximately 50,000nT (nanoTesla). Most buried archaeological features usually result in very weak changes of less than 1nT to the magnetic field (Clark 1990, 65). The instrument used for this survey was a *Bartington* Grad 601-2 dual sensor fluxgate gradiometer, which has a sensitivity of 0.1nT when used in the 100nT range setting.

2.2.3 ***Electrical Resistance or Resistivity:*** the use of electrical resistance area survey is often seen as being complementary to magnetometry and is recommended by Historic England where there is a strong presumption that buried structures or buildings are present that are not easily identifiable with magnetic methods. The technique requires injecting a small electric current into the ground via steel probes, and measuring the response with an earth resistance meter. The technique relies on the variable ability of the soil to resist an applied electrical current by the resistance meter from a pair of mobile probes to a corresponding pair of remote, static probes. The resulting resistance measurements (in ohms) can be used identify to buried features, which often have either a higher or lower resistance to the current than the background soil. Cut features that have been subsequently infilled, tend to be less

resistant to the current flow and appear as low-resistance anomalies, whereas solid features such as structural remains tend to more resistant to the current flow and appear as high-resistance anomalies. One of the main disadvantages of the technique, when compared with magnetometry, is that data collection over the same size of area is a much slower process.

2.2.4 ***Resistivity Equipment:*** the instrument used for this survey was an M.M. Resistivity Meter; Model 216M with a bespoke frame set to single twin mode.

2.2.5 ***Sampling Interval***: the survey area was divided into 30m x 30m grids. Magnetometry sampling was at 0.25m intervals, with inter-transect distances of 1m, equating to 3600 sample readings per grid. The survey was carried out in 'zigzag' mode, with precautions to minimise any heading error during the magnetometry survey. In total, an area of approximately 1.89ha was surveyed with magnetometry (Fig 2). Resistivity sampling was at 1m intervals with inter-transect distances of 1m, equating to 900 sample readings per grid. In total, an area of 0.99ha was surveyed with resistivity (Fig 2). All survey grid nodes were staked out with canes using a *Leica* 1200 series RTK GPS system. Survey guidelines and traverse canes were then staked out.

2.2.6 ***Data Capture and Processing:*** magnetometry data were captured in the internal memory of the instrument and downloaded to a portable computer on-site and backed-up on to a USB drive. Resistance data were captured in the internal memory and downloaded by LAS later off-site and forwarded to OA North. The individual grids were combined to produce an overall plan of the surveyed area, or 'composite'. The results were analysed and basic initial processing was carried out using Terrasurveyor by *DW Consulting*.

2.2.7 Final processing of magnetometry raw data was undertaken off site in accordance with Historic England guidelines (English Heritage 2008) to remove any instrument error or survey effects in order to enhance subtler anomalies normally associated with archaeological features. All data were clipped by the appropriate values where necessary and the following processing steps carried out:

- Zero median grid/traverse was applied to correct slight baseline shifts between adjacent survey lines;
- The data were selectively 'de-staggered' where necessary, to remove any displacement caused by surveying in zigzag mode. This is sometimes required when surveys are carried out on boggy, wet, overgrown or steeply-sloped areas.

2.2.8 Final processing of resistivity raw data was undertaken off site in accordance with Historic England guidelines (English Heritage 2008) to remove any instrument error or survey effects in order to enhance subtler anomalies normally associated with archaeological features. All data were clipped by the appropriate values where necessary and the following processing steps carried out:

- The data sets were de-spiked in order to remove high contact readings;
- The grids were edge matched in order to correct for changes in the position of the remote probes;
- A high pass filter was applied which removes variations in the background geological response;

- A low pass filter was applied where appropriate, which can improve the visibility of weak archaeological features.

2.2.9 ***Presentation of the results and interpretation:*** the presentation of the data for the site involves a print-out of the processed data as a grey-scale plot for the magnetometry survey (Fig 3) and resistivity survey (Fig 4), together with individual (Figs 5 & 6) interpretation plots.

2.3 ARCHIVE

2.3.1 A full professional archive has been compiled in accordance with current CIfA and Historic England guidelines. The project archive represents the collation and indexing of all the data and material gathered during the project.

2.3.2 The deposition of a properly ordered and indexed project archive in an appropriate repository is considered an essential and integral element of all archaeological projects by the CIfA in that organisation's code of conduct. OA North conforms to best practice in the preparation of project archives for long-term storage. OA North practice is to deposit the original record archive of projects with the appropriate repository.

2.3.3 The Arts and Humanities Data Service (AHDS) online database project *Online Access to index of Archaeological Investigations* (OASIS) will be completed as part of the archiving phase of the project.

2.3.4 The geophysical survey data will be archived with the Archaeology Data Service (ADS) in accordance with the guidelines published by the ADS (Schmidt 2002).

3. SURVEY RESULTS

3.1 GENERAL OBSERVATIONS

3.1.1 The magnetometry data in the eastern and western thirds of the site are 'noisy' and fairly complex. This appears to correlate with archaeological features recorded in the HER and by further survey, some of which are visible as upstanding earthworks, particularly on the west side. The tree-lined avenue can be seen crossing the centre of the survey area together with a parallel, linear service route. Either side of the avenue are two bands of fairly 'quiet' data. There is a further service pipe running along the eastern edge of the survey area, close to the deer fence. The results of the magnetic survey are plotted in Figures 3 and 5.

3.1.2 The resistance survey area was divided into two due to time limitations, the central drive being omitted from the survey for both time and logistical reasons. The background resistance was even and there was good contrast between high and low resistance responses. The data exhibits a series of potential rectangular features of archaeological origin visible as trends of medium/high resistance. Other features within the resistance data are likely to be due to modern disturbance and/or geology. There is no clear evidence of sites SMR 5238 and 5240 within the data. The results of the resistance survey are plotted in Figures 4 and 6.

3.2 RESULTS

3.2.1 The eastern half of the magnetometry survey area is defined by a series of positively magnetic sub-circular features which roughly correlate with the positions of cairns and mounds recorded including SMR 5238 and 5240. The responses are of moderate amplitude and several mounds and depressions were also visible on the ground.

3.2.2 There are several curvilinear, positively magnetic responses within this area and many of these are likely to be archaeological in origin. Other positively magnetic discrete responses are visible across the wider survey area. Responses such as these are indicative of features such as pits and given the proximity of the settlement (SMR 5238) and burial features, they are likely to be of archaeological potential. A number of linear and curvilinear high resistance responses are visible, also suggestive of archaeological features. Some of these, particularly in the western survey area correspond with magnetic responses and are probably associated with site SMR 2645. Many of the linear and curvilinear responses correlate with the earthworks visible both on the ground and surveyed by LLHG.

3.2.3 There are several more regular, linear trending features visible within the resistance data exhibiting parallel high and low resistance responses suggestive of banks and ditches. These are quite obvious in the eastern survey area and are not visible in the magnetic data.

3.2.4 An area of magnetic disturbance along the eastern edge of the magnetic survey area is likely to be associated with extant deer fencing. A strong linear dipolar response running parallel with the edge of the survey area is likely to be a modern buried service. There is a second service running adjacent to the avenue and magnetic

disturbance within the central area of this linear response suggests that the area has been disturbed, probably associated with the excavation of the service.

3.2.5 There is an area of magnetic disturbance adjacent to the western edge of the survey area. This may be associated with modern disturbance, but given its general appearance and the moderate amplitude, it may be archaeological in origin.

4. CONCLUSIONS

4.1 DISCUSSION

4.1.1 Both the magnetic and resistance data has been successful in clearly demonstrating the high potential for archaeological remains associated with sites recorded on the HER/SMR and surveyed by LLHG. The exact positions of many sites within Levens Park has been open to conjecture but the geophysical survey has helped to more clearly locate features associated with some of the these sites. In particular, several circular responses within the eastern side of the survey area probably reflect the more accurate locations of sites SMR 5238 and 5240, although there is more than one response indicative of archaeological features.

4.1.2 At the western end of the survey area, several responses correspond to features associated with SMR 2645 surveyed by LLHG, some of which are visible on the ground. The responses are indicative of ditches probably associated with the earthworks.

4.1.3 Ultimately, given the nature of the archaeological resource in this area, it is highly likely that most of the responses (other than clearly modern features) are of archaeological potential. Ground truthing in the form of targeted trial trench excavations will help to more clearly define the nature of some of these features.

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6. ILLUSTRATIONS

LIST OF FIGURES

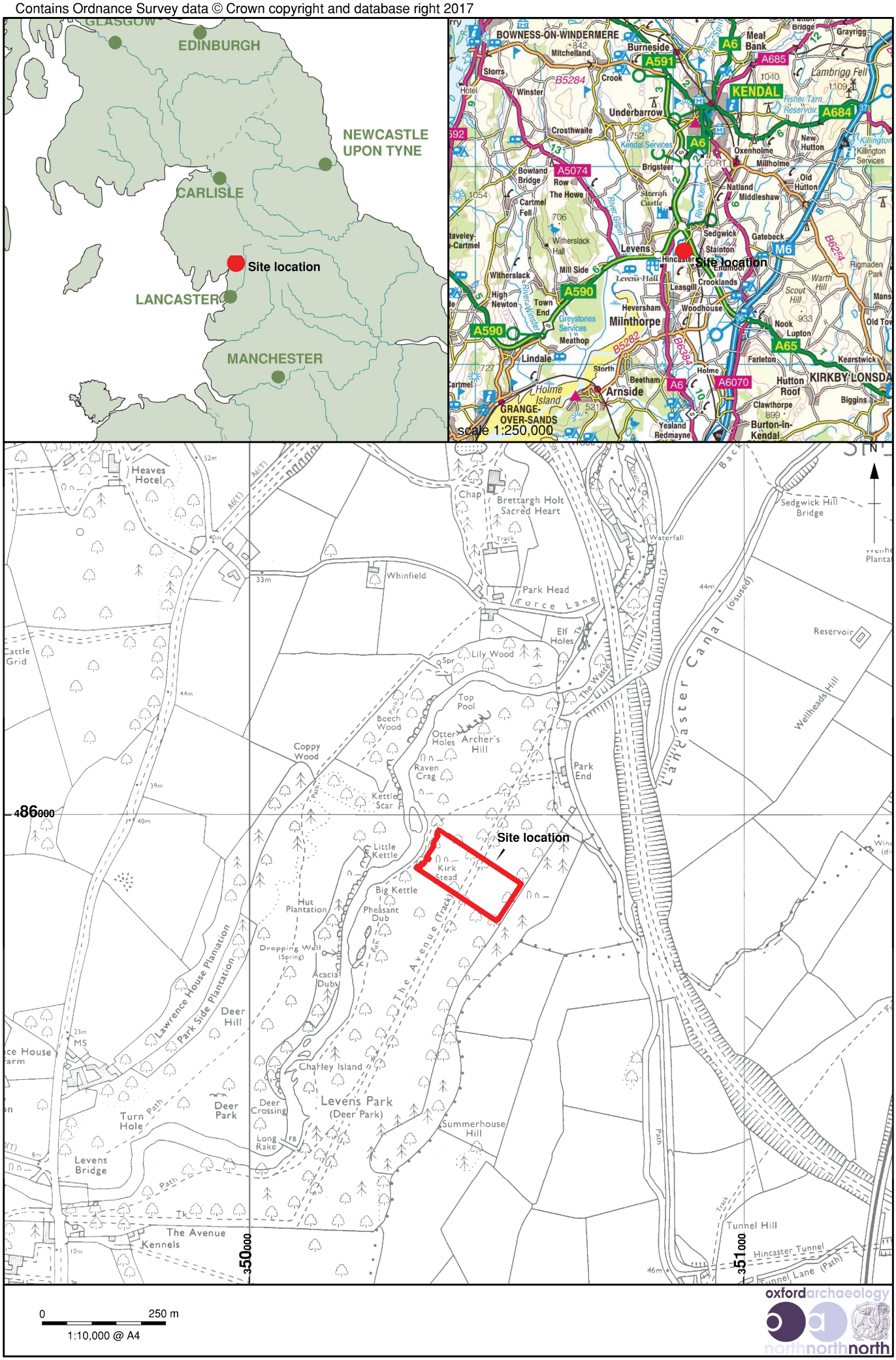

Figure 1: Site location

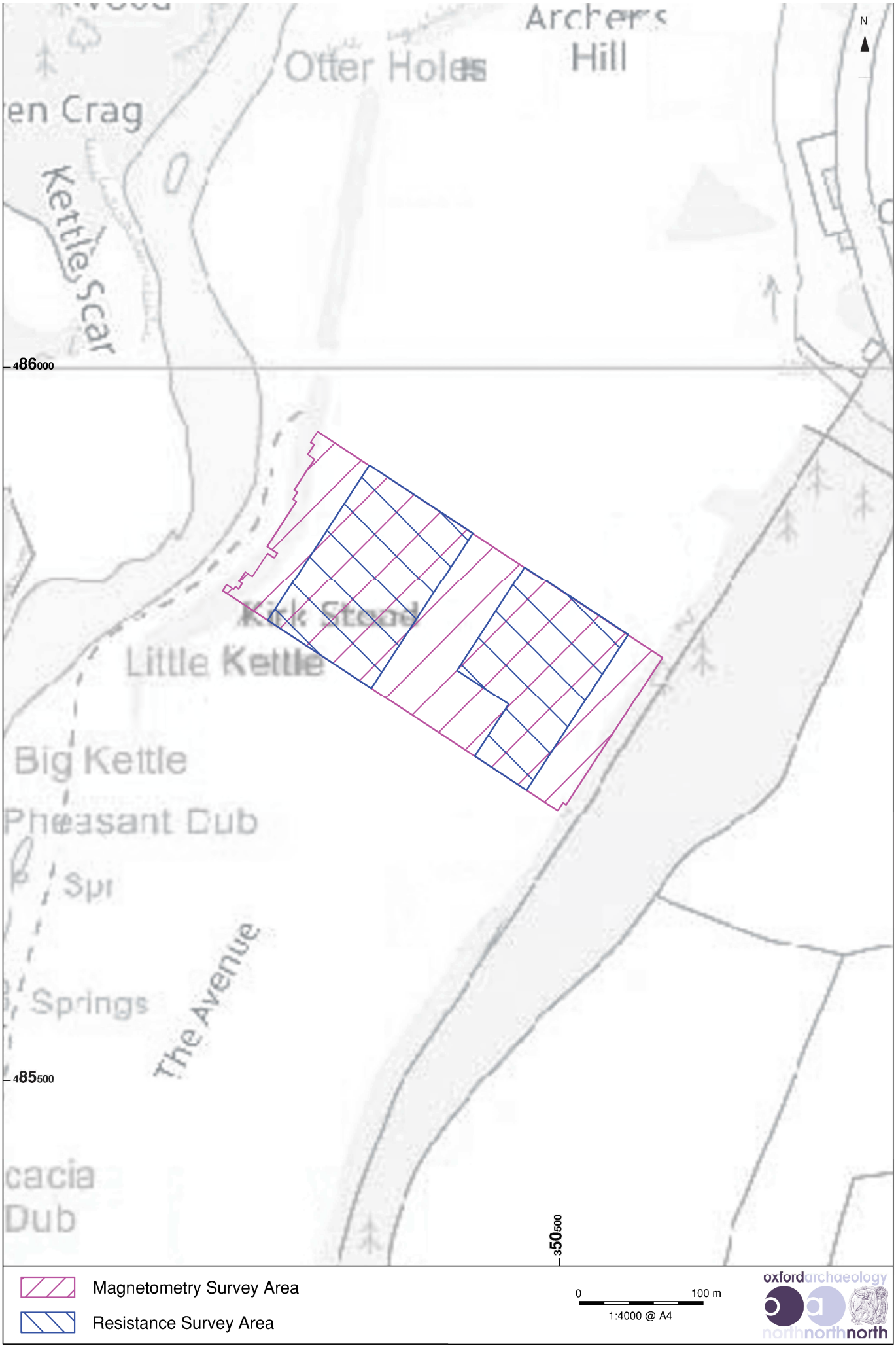

Figure 2: Extent of the geophysical survey area

Figure 3: Greyscale plot of the processed magnetometer data

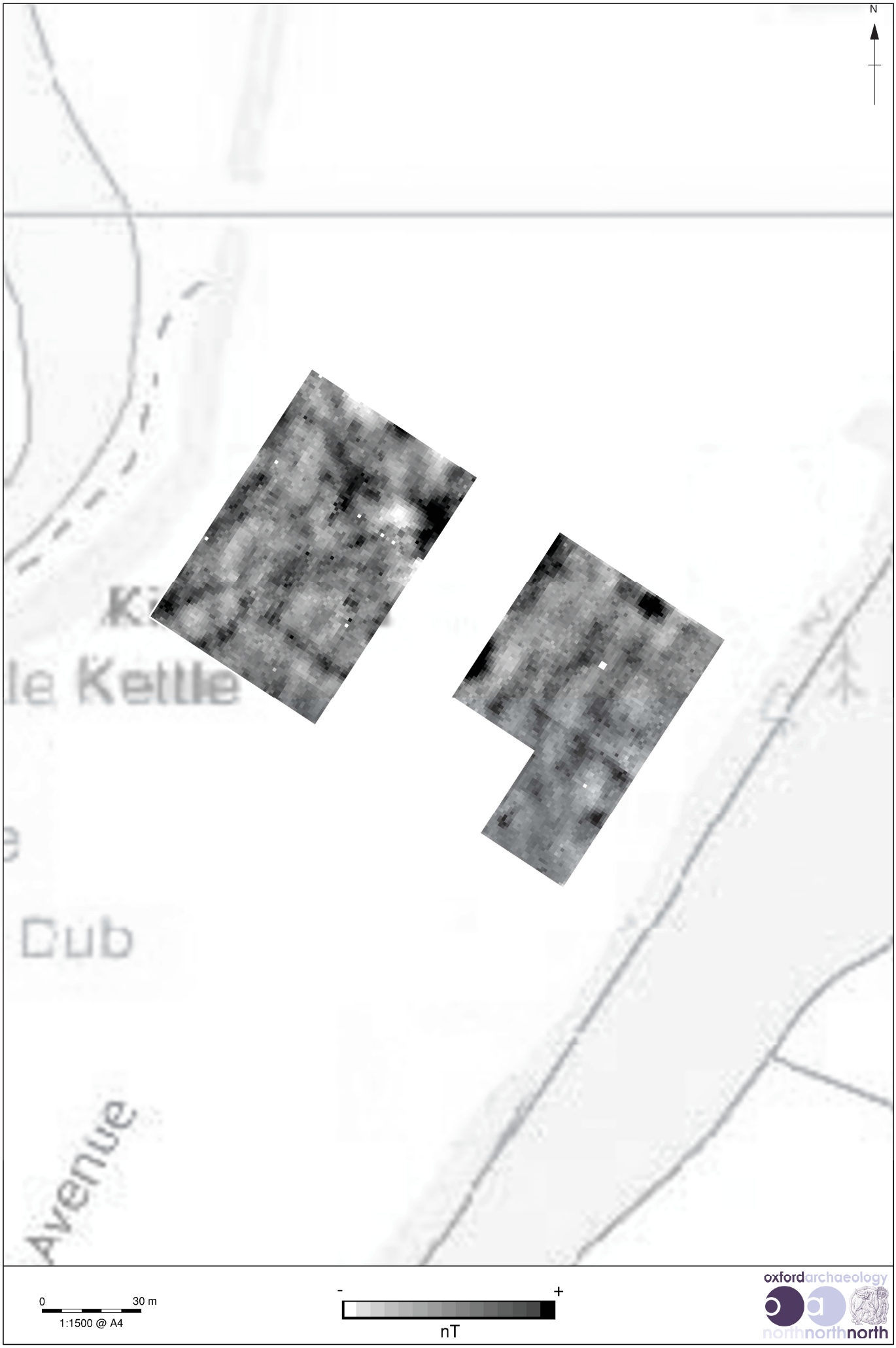

Figure 4: Greyscale plot of the processed resistance data

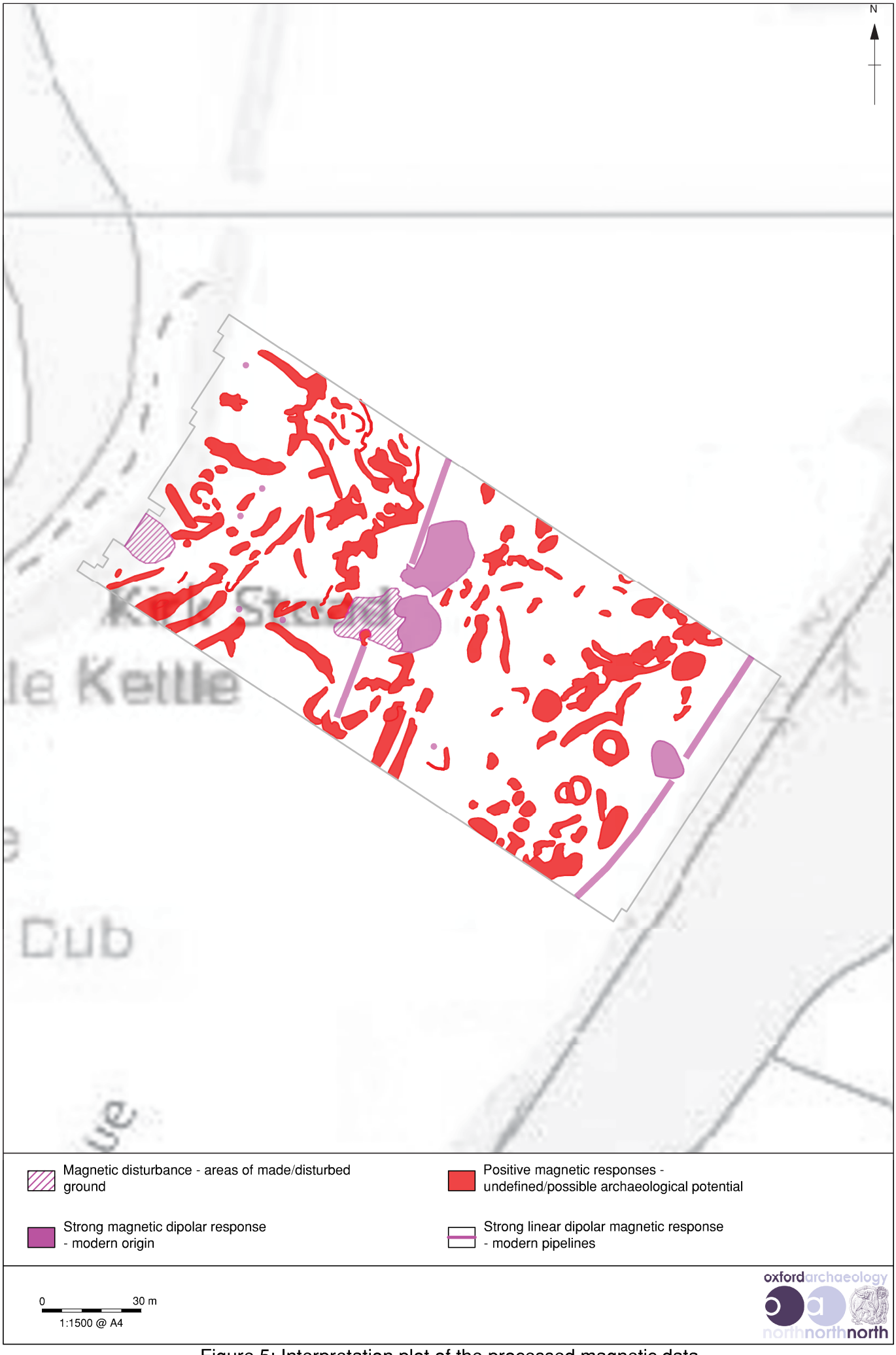

Figure 5: Interpretation plot of the processed magnetic data

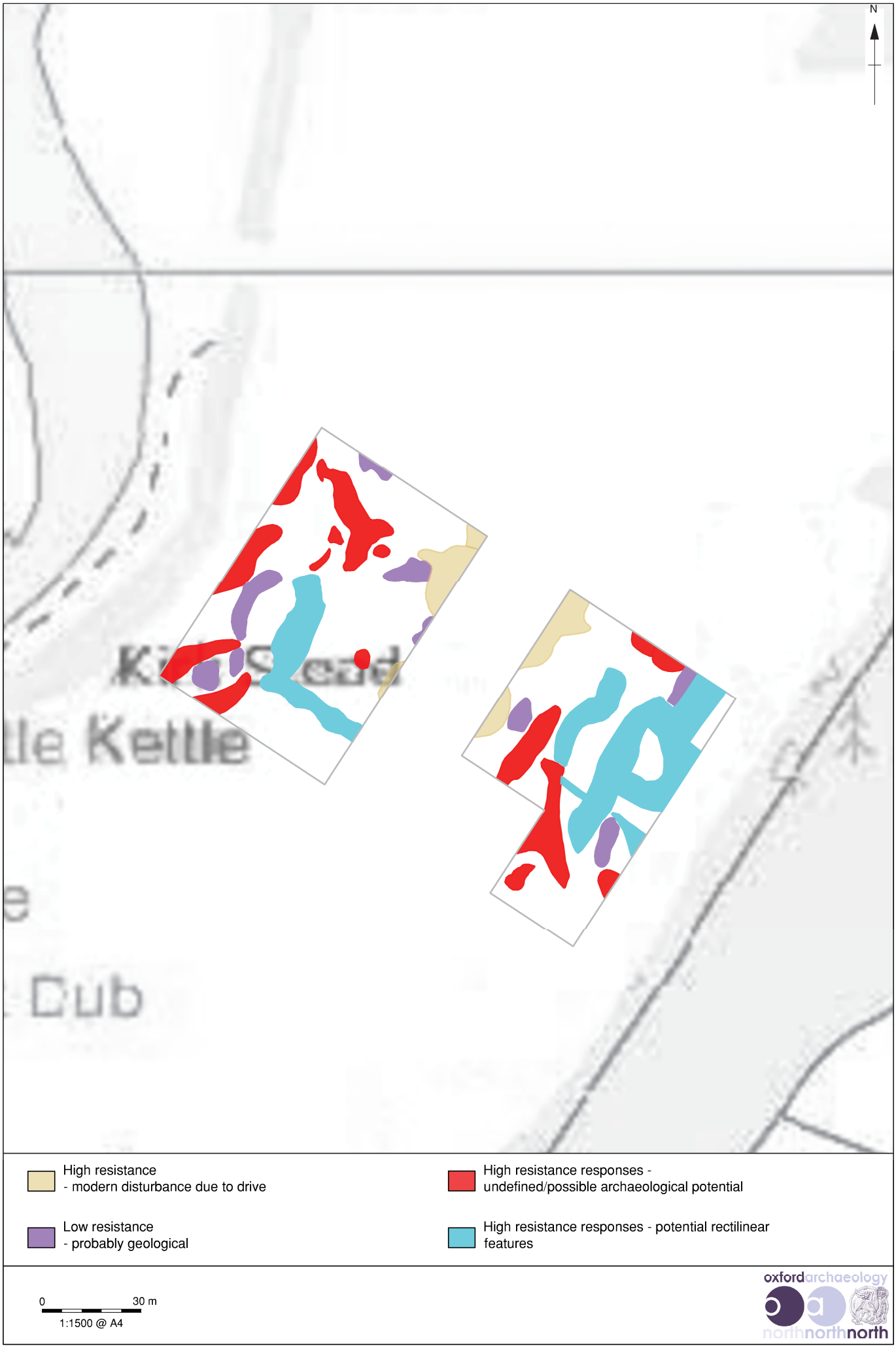

Figure 6: Interpretation plot of the processed resistance data

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