AD036

Springville,
East Sleekburn,
Northumberland

Archaeological Geophysical Survey

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EXECUTIVE SUMMARY

This geophysical survey was undertaken by AD Archaeology in advance of the proposed construction of a new residential development on land adjoining the northwest side of East Sleekburn village, Northumberland.

The geophysical survey identified a series of linear anomalies in the southern portion of the site that do not coincide with any cartographic evidence from earlier Ordnance Survey maps investigated during the Rapid Desk-Based Assessment. The origin of these linear positive anomalies, which probably represent ditches or gullys, remains uncertain. Similar enclosures and subdivisions elsewhere in Northumberland have been identified associated with Iron-Age settlement.

Alternatively, it is possible that the anomalies may be related to activity on the periphery of East Sleekburn village associated with a former track that crossed the site from West Sleekburn Farm (the site of a deserted medieval village), 1.25km to the west.

The nature, date and extent of the anomalies could only be established through investigative trenching.

1 INTRODUCTION

1.1 The Project (Figure 1)

1.1.1 Dysart Developments commissioned AD Archaeology to carry out a geophysical survey (magnetometry) of land at East Sleekburn in advance of a planning application for a proposed housing development.

1.1.2 The site, known as Springville, is centred at NGR NZ 287 836 and consists of one field of pasture adjoining the northwest side of East Sleekburn, Northumberland (fig 1). The Site as defined on figure 1 occupies a total area of 1.4 hectares.

1.1.3 The geophysical survey was carried out in December 2013.

1.2 Aims and Objectives

1.2.1 The objective of the geophysical survey was to evaluate the presence of sub-surface archaeological remains on the site by means of the location and interpretation of geophysical anomalies.

1.3 Archaeological and Historical Background (Figure 2)

1.3.1 Although there is no direct evidence for prehistoric activity on the site, there is widespread archaeological evidence elsewhere of settlement across the Northumberland Coastal plain indicative of a relatively high density of occupation during the later prehistoric period (Hodgson, McKelvey and Muncaster 2013). Many of these sites are characterised by enclosed settlements rectilinear in plan that were typically established in the period around 200 BC (Hodgson *etal*. 2013, 189). One such site (HER23393) shows as a well-defined cropmark near Sleekburn Grange Farm, 75m south of Sleek Burn.

1.3.2 Whilst there is no direct evidence of early medieval activity at East Sleekburn, Sleekburn (Scliceburn) was one of the dependencies of Bedlingtonshire, a pre-Conquest estate, purchased by Cutheard last Bishop of Lindisfarne and first of Chester le Street (AD900-915) (Hodgson 1832, 349, Aird 1997, 37). Very little is known of the early nature and extent of settlement from this period and therefore the possibility of evidence of activity cannot be excluded, particularly due to the sites location on the periphery of the medieval village of East Sleekburn.

1.3.3 East Sleekburn formed a vill or township in the medieval period and it is likely that the present village lies on the site of a shrunken medieval village. An indication of the earlier village layout can be inferred from later mapping, and the distinctive pattern of tofts associated with individual plots can be discerned clearly on the first edition Ordnance Survey map (AD Archaeology 2013, fig. 3). Aerial Photography (OS67306_024, 1967; RAF/58/2657_99,1958) shows widespread cropmarks of ridge and furrow, that probably originated from open field agricultural system during the medieval period, across many of the fields surrounding the village, including the Springville site itself which probably lay beyond the limits of the medieval village.

1.3.4 A track is shown across the site on the Second Ordnance Survey edition map of 1898 joining the village with West Sleekburn Farm, the site of West Sleekburn deserted medieval village (HER11762) in the neighbouring vill,1.25km to the west.

1.3.5 The township of East Sleekburn remained largely unchanged despite development of the surrounding area associated with the coal field, including the construction during the twentieth century of the massive Cambois Power Station to the east (now demolished).

1.4 Geology and Topography (Figure 1)

1.4.1 The Springville site measures approximately 1.40ha in area and occupies one field adjoining the northwest corner of the village (centred on NGR NZ 287 836). The field is bounded to the south by the village; to the east by Brock Lane leading north from it; to the north and west by a small plantation that lies alongside Brock Lane and a slip road to the A189 respectively.

1.4.2 The underlying bedrock geology of East Sleekburn is formed by Pennine Middle Coal Measures Formation, Mudstone, Siltstone and Sandstone from the Carboniferous Period. The bedrock is masked by Quaternary glacial deposits of Devensian Till (British Geological Survey).

1.4.3 The site is under pasture and generally flat. A large heap of manure and straw in the northern portion of the site (fig. 4) prevented surveying in this area. The area around the heap particularly on the eastern side was heavily scored by a number of wheel ruts.

2 THE GEOPHYSICAL SURVEY

2.1 Technique

2.1.1 Geophysical survey is a method by which examination of the Earth's physical properties takes place using non-invasive ground survey techniques in order to reveal buried sub-surface features and anomalies (Gaffney and Gater 2004). A hand-held magnetic fluxgate gradiometer records differences in electromagnetic field to a depth of approximately 1 metre into the ground. Differences or disturbances in sub-soil magnetic susceptibility can be the result of archaeological features, geology or modern intrusions.

2.1.2 This geophysical survey was conducted in line with all professional guidelines and recommendations as laid out and presented in *Geophysical survey in archaeological field evaluation* (David, Linford and Linford 2008), *Geophysical Data in*

Archaeology (Schmidt 2001), and discussed in, *Revealing the Buried Past: Geophysics for Archaeologists* (Gaffney & Gater 2004).

2.2 Methodology (Figure 2)

2.2.1 The magnetometer survey was carried out using a *Bartington Grad 601-2* fluxgate gradiometer, which scanned and stored all magnetic data. The sample interval was set at 0.25m and the traverse interval at 1m using a north-south traverse direction in a zigzag scheme. The data was then downloaded onto a laptop computer on site for assessment, and later processed on a PC.

2.2.2 The survey contained 20 full and partial 30m by 30m grids set out using Trimble R6 GPS surveying equipment (Fig 2).

2.2.3 An area in the northern portion of te site could not be surveyed because of a large dump of manure.

2.2.4 All grid locations have been accurately tied in to Ordnance Survey mapping and NGR co-ordinates.

2.3 Post-Processing

2.3.1 *ArchaeoSurveyor version 2.4.0.23* software was used to process all of the data recorded. AutoCAD software was used for the presentation of the figures.

2.3.2 The post-processing of the recorded raw data includes the application of certain functions in order to aid both the presentation and interpretation of the results. In this instance, data has been 'de-striped' to negate the effect of a zig-zag traverse a cause of striped data; '*clipped'* to limit it to specified minimum and maximum values; thus removing extreme data point values and '*despiked*' to remove data spikes caused by small surface iron anomalies usually the result of metal 'rubbish' in the topmost surface layers. The data presentation includes two formats: Greyscale Plots (demonstrating processed data; Fig 3) and Magnetic Anomaly Interpretation Plans (identifying possible archaeological features, modern features and other anomalies; Fig 4). Trace plots of the raw survey data were not informative and as such are not included in this report.

3 SURVEY RESULTS

3.1 Magnetic Anomaly Interpretation

3.1.1 The data displays three different types of magnetic anomalies:

A. *Positive magnetic anomalies* identifiable through darker grey shades on the greyscale images, which can be suggestive of soil-filled pit and ditch type features representing high magnetic susceptibility.

B. *Negative magnetic anomalies* are identifiable through lighter grey shades on the greyscale images, which can be suggestive of wall footings and other stone concentrations or features representing low magnetic susceptibility.

C. *Dipolar magnetic anomalies* identifiable through concentrations of mixed dark and light grey shades on the greyscale images which can be suggestive of fired and ferrous materials and structures; and/or modern intrusion and disturbance, representing paired positive-negative magnetic susceptibility.

3.2 **Modern disturbance** (Figures 3, 4)

3.2.1 A modern service trench caused a strong magnetic response forming a linear series of dipolar anomalies (no.1, marked in blue, Fig 4) running north-south across the eastern portion of the field with another service probably represented by linear dipolar anomalies (2) along the eastern edge of the site. A linear series of dipolar anomalies (3) running east-west at the northern end of the site corresponds with the line of an overhead power line.

3.2.2 A cluster of small dipolar anomalies (4) at the southeast edge of the eastern site boundary corresponds with an area of stone hard standing at the gateway to the field. Anomalies caused by magnetic interference from ferrous material can be seen along the edges of the field boundary.

3.2.3 Many of the isolated dipolar anomalies (blue, red), and smaller dipoles visible as black dots (unmarked) across the field are probably related to stray ferrous objects from agricultural activity. Three dipolar anomalies correspond with geotechnical test pits (marked TP, Fig 4).

3.3 **Other Anomalies** (Figures 3, 4)

3.3.1 A series of positive linear anomalies extend across the southern portion of the site (magenta, Fig 4). A long, faint, discontinuous curvilinear anomaly (5) forms their western limit, running north-south across the site, curving slightly westwards at its southern end. The northern end meets a large irregular shaped dipolar anomaly (no.6, marked red) that corresponded on the ground with a localised hollow. It is notable that the area west of anomaly 5 contains few dipolar anomalies compared to the majority of the site.

3.3.2 Two linear anomalies (7, 8) run broadly parallel (44m apart) in an east-southeast orientation, their eastern extent unclear due to magnetic interference from the site boundary. At their western extent both anomalies meet a north-south orientated anomaly (9) which appears to form the western end of an enclosure. Anomaly 7 turns southwestwards beyond the intersection with anomaly 9 heading in the direction of the curvilinear anomaly (5). Both anomalies 7 and 8 have apparent breaks along their length. Anomaly 9 extends a short distance north of anomaly 8 where it meets the southernmost of two broadly parallel short linear anomalies 10, which head westwards towards a gap between two dipolar anomalies (6) beyond the limit of anomaly 5.

3.3.3 The interior of the area enclosed between linear anomalies 7, 8 and 9 is subdivided by a network of linear anomalies (10-13). Anomalies 10 and 11 lie at approximate right-angles and together form a sub-enclosure within the northwest corner with an ‘entrance’ formed by a gap along the length of anomaly 8 with another ‘entrance’ gap between 10 and 11. Curvilinear anomaly 12 runs across the northwest corner of the sub-enclosure. Anomaly 13 runs parallel, 13m to the north of the eastern length of anomaly 7. The origin of a number of dipolar anomalies (red) that lie within the area defined by linear anomalies 7, 8 and 5 is unknown.

3.3.4 Several shorter anomalies (14) lie in the southern end of the zone defined by linear anomalies 5 and 7, including two parallel linear anomalies and a curvilinear anomaly.

4 DISCUSSION (Figures 1, 4)

4.1 The geophysical survey has identified a series of linear anomalies (5-14) of possible archaeological interest in the southern portion of the site that do not coincide with any cartographic evidence from Ordnance Survey maps investigated during the earlier Rapid Desk-Based Assessment (AD Archaeology 2013). The origin of these linear positive anomalies, which probably represent ditches or gullys remains uncertain. Similar enclosures and subdivisions have been identified associated with Iron-Age settlement elsewhere in Northumberland such as Pegswood (Proctor 2009) or Blagdon Park 1 (Hodgson *etal.* 2012).

4.2 An alternative possibility is that the anomalies are related to the position of the site straddling the route of a track from the neighbouring settlement and DMV at West Sleekburn Farm (1.3.4). The anomalies may be associated with an earlier route way with enclosures developed alongside it on the periphery of East Sleekburn village.

4.3 The nature, date and extent of the anomalies could only be established through investigative trenching.

5 BIBLIOGRAPHY

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APPENDIX 1:

Method Statement for Geophysical Survey of Land Northwest and Southeast of East Sleekburn, Northumberland

1 Introduction

1.1 Dysart Developments have submitted a proposal for the residential development of farmland at two sites at East Sleekburn. The Springville site adjoins the northwest of portion of East Sleekburn, south of Brock Lane (centred on NGR NZ 287 836), and measures 1.4ha. The Orchard site adjoins the east end of the south side of the village extending down to the banks of the Sleek Burn to the south (centred on NGR NZ 291 833), and measures 2.98ha. Northumberland County Council (NCC) has recommended that the archaeological potential of the two sites is assessed by a geophysical survey following on from an earlier rapid desk-based assessment.

1.2 The geophysical survey will be a survey of all accessible areas of the sites that will be disturbed by the proposed development. The geophysical survey will aim to determine the nature, preservation and extent of any sub-surface features and anomalies that could represent archaeological potential within the survey area.

2 Methodology

2.1 A program of geophysical survey will be undertaken which aims to provide 100% coverage of the proposed development areas, with the exception of areas found to be disturbed or non-conducive to geophysical survey. These areas will be excluded as they cannot be suitably relied upon in producing archaeologically valuable results.
Non-conducive areas may include:

- Steep gradients
- Vegetation/crops greater than 12 inches in height (contact with the sensors and obstructive to operators) – survey delayed until harvested.
- Standing water deeper than 12 inches (contact with the sensors and obstructive to operators)
- Recent ploughing (produces erroneous results; fields must be harrowed before being surveyed)
- Hay bales and, to a lesser extent, hay rows (obstruction)

2.2 The survey aims to map subsoil disturbances and locate anomaly-producing structures or deposits which may indicate the presence of archaeological features.

- The survey will be a detailed magnetometer survey.
- The data will be logged in 30m by 30m grid units.
- The sample interval will be set to 0.25m and the traverse interval to 1m.
- The survey is to use zigzag traverses.
- The survey will be conducted with two Bartington 601-2 fluxgate gradiometer magnetometers which have a measurement sensitivity of 0.1nT.
- The survey grid will be tied into known Ordnance Survey points with a total station, GPS etc.
- The survey grid will be set out with a Trimble R6 GPS system.
- Survey data will be checked on site, at the end of each day, to verify integrity.

Data Analysis

2.3 Following the completion of the on-site survey, copies of the following plots will be produced :

- grey scale
- interpretative

2.4 Minimal processing will be applied to geophysical data; however, in certain instances it can be advantageous to process the data in order to aid both interpretation and presentation. As such, all geophysical data that requires processing will be so done using the ArcheoSurveyor software package. As part of this process certain functions may be applied e.g. Clipping: limiting all data to specified minimum and maximum values, thus removing extreme data point values; DeStripe: equalizing underlying differences between individual grids and any directional effects inherent to magnetic instruments; Interpolate: increasing or decreasing the resolution of the selected survey area; DeSpike: removing spikes generally caused by small surface iron modern anomalies; DeStagger: compensating for any data collection errors by slightly altering traverse start and end points. The extent to which exact data processing functions are to be used will not be known until completion of the geophysical survey.

Project Staff

2.5 The appointed archaeological contractor (AD Archaeology) is a specialist in geophysical survey techniques and all staff understands the project aims and methodologies. All staff will be professional field archaeologists with appropriate skills and experience to undertake work to the highest professional standards. The works will be undertaken in compliance with the codes of practice of the Institute for Archaeologists.

2.6 The geophysical survey will be led by Warren Muncaster, (BA (Hons) a field archaeologist of 18 years and Jonathon Mckelvey BA (Hons) PgDip (Prac. Arch), a field archaeologist of 25 years. Both staff members have conducted several magnetometry surveys to the requirements and satisfaction of clients and County Archaeology Officers over the last five years. The data analysis and production of the report will be carried out by W. Muncaster and Jamie Scott (BA (Hons).

3 Report

3.1 The reports must have the following features:-

1. Site location plan and grid reference
2. Plan of proposed development
3. Details of field work undertaken by the consultant
4. Geology of site
5. Site land use, ground conditions, topography, solid and drift geology, soil-type and weather
6. Methodology – equipment, instrument and techniques employed and why, technique used for data processing, software used
7. Results – description and analysis of results and their interpretation.
8. Conclusions – discussion of the survey results with reference to the original objectives. Summary of the archaeological significance of the survey findings, the need for future archaeological work
9. Plots and plans:
   - Survey location plan demonstrating relationships to other mapped features.
   - A grayscale plot, or dot density plot.
   - One or more interpretative plans or diagrams.
10. Brief discussion of the potential of the site in relation to NERRF, EH research agenda and other relevant agenda
11. A card cover with title, date, author, consultant organisation and commissioning client

12. Some form of binding which allows easy copying of the report
13. Copy of this method statement

3.3 One paper copy of each report needs to be submitted:
for deposition in the County HER

3.4 Three pdf copies on CD are needed:

- one for the commissioning client
- one for the planning authority – to be submitted formally by the developer with the appropriate fee
- one for deposition in the County HER - to be sent with the paper report but not attached to it and will also include the grayscale plot in a format that can be uploaded into the HER GIS system (Arcview 9.2) so that any archaeological features can be accurately digitized.

4 Site Archive

4.1 The archive will be deposited in the appropriate local museum, within 6 months of completion of the post-excavation work and report. This should comprise:

- A copy of the report.
- Raw data and original illustrations which are not included in the report.
- A digital copy of the report and illustrations, where appropriate.

4.2 Before the commencement of fieldwork, contact will be made with the landowners and with the Woodhorn Museum and Archives to make the relevant arrangements

5 OASIS

5.1 The Northumberland County Council Archaeologist supports the Online Access to the Index of Archaeological Investigations (OASIS) project. This project aims to provide an online index/access to the large and growing body of archaeological grey literature, created as a result of developer-funded fieldwork.

5.2 The archaeological contractor is therefore required to register with OASIS and to complete the online OASIS form for their geophysical survey at http://www.oasis.ac.uk/.

5.3 Once the OASIS record has been completed and signed off by the HER and NMR the information will be incorporated into the English Heritage Excavation Index, hosted online by the Archaeology Data Service.

6 Monitoring

6.1 The County Archaeologist will be informed on the start date and timetable for the geophysical survey in advance of work commencing.

6.2 Reasonable access to the site for the purposes of monitoring the archaeological scheme will be afforded to the County Archaeologist or his/her nominee at all times.

6.3 Regular communication between the archaeological contractor, the County Archaeologist and other interested parties must be maintained to ensure the project aims and objectives are achieved.

7 Health and Safety

7.1 The projects will be carried out in accordance with safe working practices and in line with all Health and Safety policy.

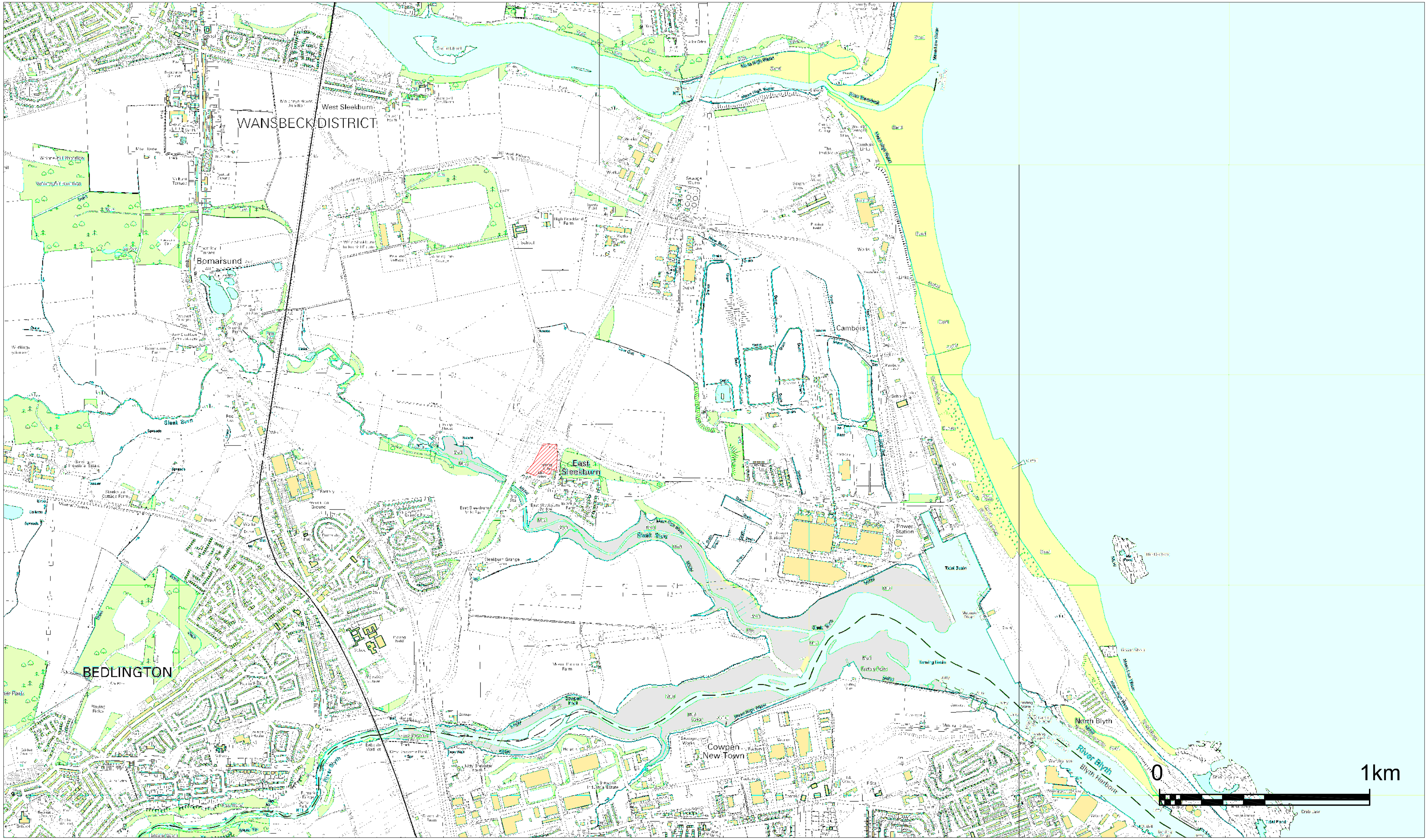

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Figure 1: General Location of Site

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Figure 3: Plan of site and geophsical survey grid

AD archaeology

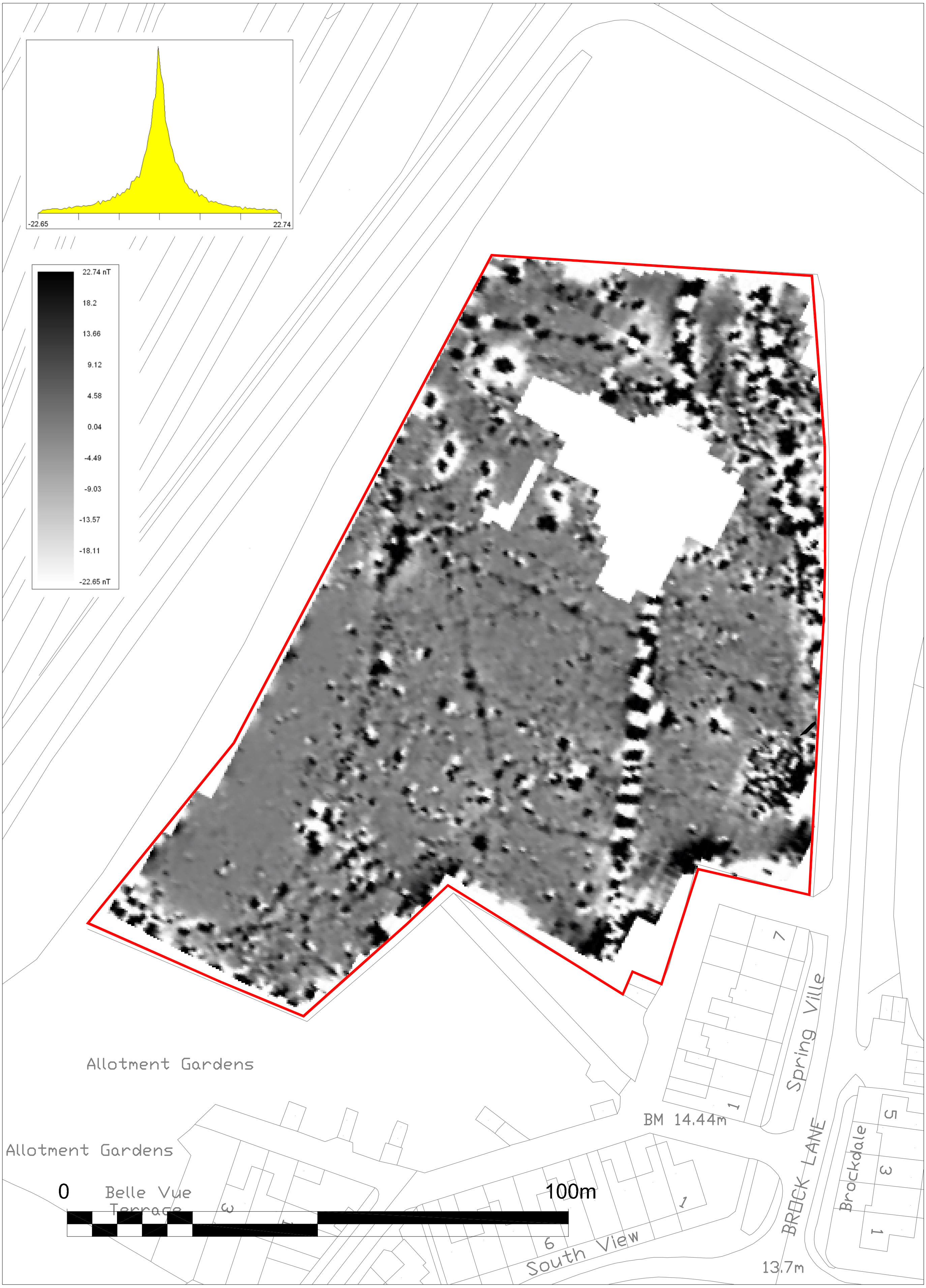

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Figure 3: Greyscale plan of geophysical survey

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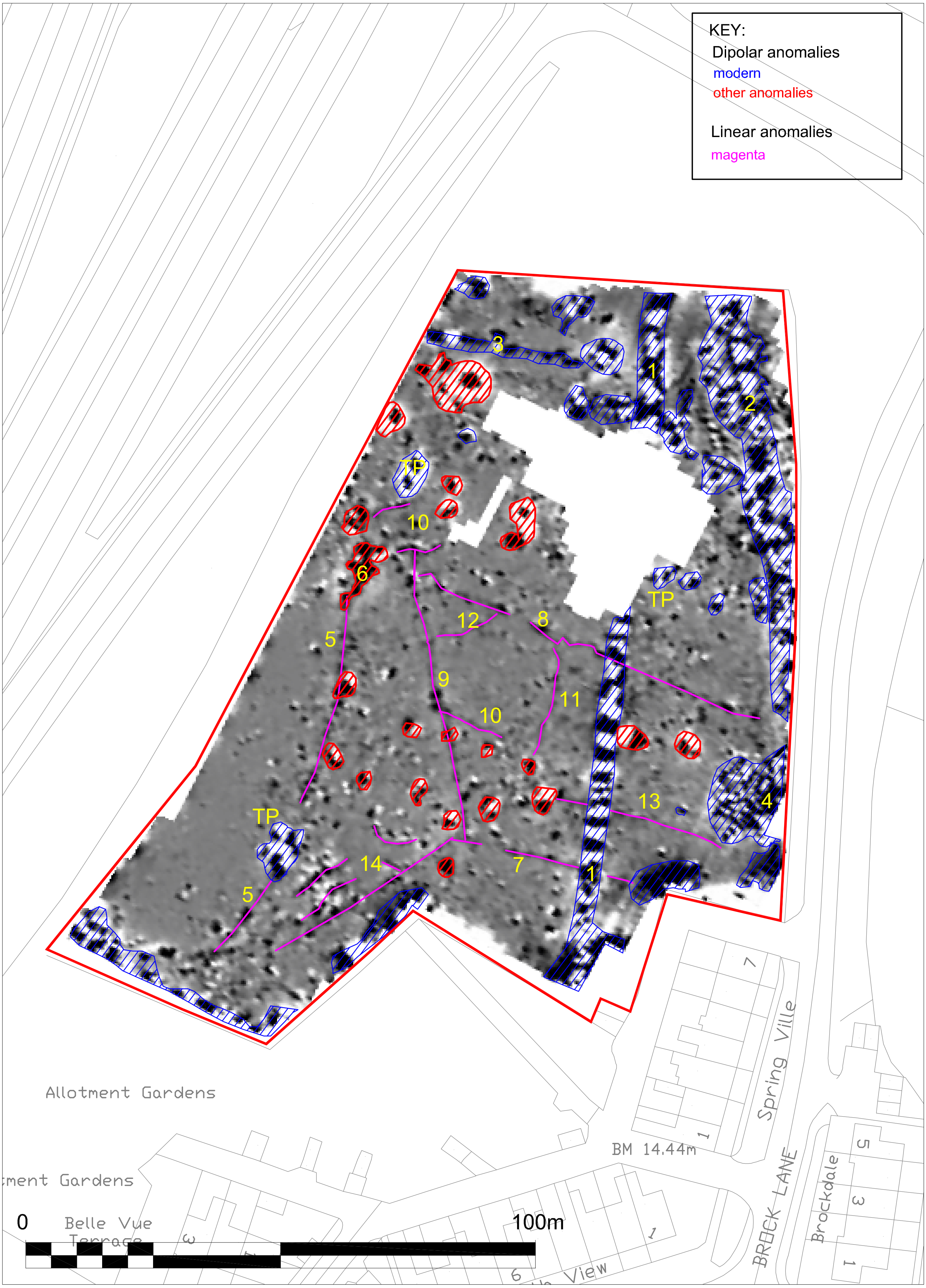

Figure 4: Interpretative plan of geophysical survey

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