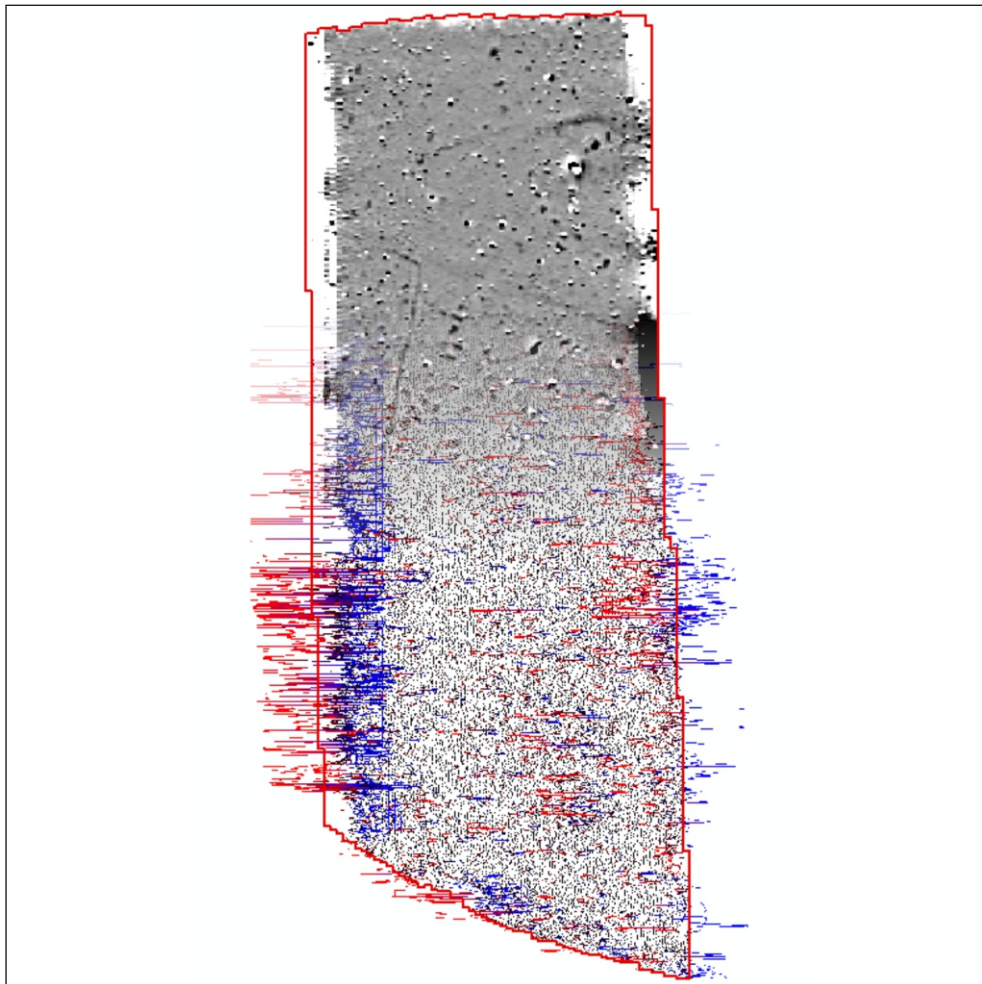




making sense of heritage

Magdalen Hill Cemetery Extension Alresford Road Winchester, Hampshire

Detailed Gradiometer Survey Report



Ref: 109420.02
June 2015



**Magdalen Hill Cemetery Extension
Alresford Road, Winchester, Hampshire**

Detailed Gradiometer Survey Report

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Detailed Gradiometer Survey Report

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Detailed Gradiometer Survey Report

Summary

A detailed gradiometer survey was conducted over land off Alresford Road, Winchester, Hampshire (centred on NGR 451473, 129262). The project was commissioned by Pre-Construct Archaeology Ltd. (West) with the aim of establishing the presence, or otherwise, and nature of detectable archaeological features in support of a planning application for the extension of Magdalen Hill cemetery.

The site comprises an arable field located to the south of Alresford Road, covering an area of 3.3ha. The geophysical survey was undertaken on 21st- 22nd May 2015. The detailed gradiometer survey has demonstrated the presence of a number of anomalies of potential archaeological interest in the field.

The main anomaly identified as being of archaeological interest is a possible ditched enclosure, partly visible in the western section of the field. Features identified near to this are likely to represent possible pits and further archaeology whilst the southern area of the field presents evidence for historic cultivation.



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Acknowledgements

Wessex Archaeology would like to thank Pre-Construct Archaeology Ltd. for commissioning the geophysical survey. The assistance of Paul McCulloch is gratefully acknowledged in this regard.

The fieldwork was undertaken by Diana Chard and Vi Pieteron. Diana Chard processed and interpreted the geophysical data and wrote this report. The geophysical work was quality controlled by Elizabeth Richley and Lucy Learmonth. Illustrations were prepared by Richard Milwain. The project was managed on behalf of Wessex Archaeology by Lucy Learmonth.



Magdalen Hill Cemetery Extension Alresford Road, Winchester, Hampshire

Detailed Gradiometer Survey Report

1 INTRODUCTION

1.1 Project background

1.1.1 Wessex Archaeology was commissioned by Pre-Construct Archaeology Ltd. to carry out a geophysical survey at land off Alresford Road, Winchester, Hampshire (hereafter “the Site”, centred on NGR 451473, 129262, **Figure 1**). The survey forms part of an ongoing programme of archaeological works being undertaken in support of a planning application for the development of the Site as an extension to the nearby Magdalen Hill Cemetery.

1.1.2 The aim of the geophysical survey was to establish the presence/absence, extent and character of detectable archaeological remains within the survey area.

1.1.3 This report presents a brief description of the methodology followed, the detailed survey results and the archaeological interpretation of the geophysical data.

1.2 Site location and topography

1.2.1 The Site is located north-east of the village Chilcomb and 3.5km east of the city of Winchester in the county of Hampshire.

1.2.2 The Site occupies an area of 3.3ha of agricultural land, currently utilised for pasture. The Site is bounded by Alresford Road (B3404) to the north, Magdalen Hill Cemetery to the west, Wykeham Park caravan site to the east and further agricultural land to the south.

1.2.3 The Site is on a moderate gradient sloping from 108m aOD at the northern edge to approximately 119m aOD at the southern edge.

1.3 Soils and geology

1.3.1 The solid geology comprises chalkstones of the Lewes Nodular Chalk Formation with superficial deposits of clay with flint. (BGS 2015).

1.3.2 The soils underlying the Site are likely to consist of Rendzic Leptosol soils of the 342a (Upton 1) association (SSEW SE Sheet 3 1983). Soils derived from such geological parent material have been shown to produce magnetic contrasts acceptable for the detection of archaeological remains through magnetometer survey.

1.4 Archaeological background

1.4.1 An Archaeological Desk-Based Assessment (DBA) undertaken by Pre-Construct Archaeology Ltd. (2015) examined the potential for the survival of buried archaeological remains within the development area and a 1km Study Area. This DBA used information provided by the Winchester Historic Environment Record (WHER). The following background is summarised from the DBA.



- 1.4.2 There are no designated historical assets within the Site; however the DBA has identified a number of known archaeological sites, monuments and artefacts within a 1km study radius.
- 1.4.3 The DBA aimed to identify the potential for archaeology within the site, based on a 1km study area. Archaeology has been split into prehistory, Romano-British, Saxon, Medieval, post-medieval and modern.
- 1.4.4 The DBA identified that the Site lies in an area of widespread late prehistoric activity represented by evidence of funerary and settlement remains and as such the potential for archaeology of prehistoric origin in the Site is moderate.
- 1.4.5 There are no entries of sites or monuments within the Site or wider study area of Romano-British date. However there is one find spot dating from this period within the 1km study radius, comprising a rotary quern and pottery sherd. Due to the evidence of Iron Age settlement and agricultural practice in the area, it is likely for settlement to have continued into the Romano-British period. Potential of the site to contain Roman archaeology is therefore deemed moderate.
- 1.4.6 There are four entries pertaining to medieval activity within the 1km study area; three are artefacts and the fourth is the nearby St Mary Magdalen Leper Hospital. On evaluation, the DBA estimates the Saxon potential for the Site to be low.
- 1.4.7 Post-medieval records of the study area include the nearby Magdalen Hill Cemetery, dating to the early 20th century, and a First World War army camp identified during an archaeological watching brief in 2004.
- 1.4.8 The map regression exercise indicated that the Site area has been in use as arable fields from at least the 19th century to present, however internal boundaries have been added over time.

2 METHODOLOGY

2.1 Introduction

- 2.1.1 The detailed gradiometer survey was conducted using a Bartington Grad 601-2 dual fluxgate gradiometer system. The survey was conducted in accordance with English Heritage guidelines (English Heritage 2008).
- 2.1.2 The geophysical survey was undertaken by Wessex Archaeology's in-house geophysics team between the 22nd- 23rd May 2015. Field conditions at the time of the survey were variable, with sunshine and heavy showers at the time of survey. An overall coverage of 3.3ha was achieved.

2.2 Method

- 2.2.1 Individual survey grid nodes were established at 30m x 30m intervals using a Leica Viva RTK GNSS instrument, which is precise to approximately 0.02m and therefore exceeds English Heritage recommendations (2008).
- 2.2.2 The detailed gradiometer survey was conducted using a Bartington Grad601-2 fluxgate gradiometer instrument, which has a vertical separation of 1m between sensors. Data were collected at 0.25m intervals along transects spaced 1m apart with an effective



sensitivity of 0.03nT, in accordance with English Heritage guidelines (2008). Data were collected in the zigzag method.

- 2.2.3 Data from the survey was subject to minimal data correction processes. These comprise a zero mean traverse function ($\pm 5\text{nT}$ thresholds) applied to correct for any variation between the two Bartington sensors used, and a de-step function to account for variations in traverse position due to varying ground cover and topography. These two steps were applied throughout the survey area, with no interpolation applied.
- 2.2.4 Further details of the geophysical and survey equipment, methods and processing are described in **Appendix 1**.

3 GEOPHYSICAL SURVEY RESULTS AND INTERPRETATION

3.1 Introduction

- 3.1.1 The detailed gradiometer survey has identified magnetic anomalies across the Site, along with areas of increased magnetic response and a large amount of ferrous. Results are presented as a series of greyscale plots, XY plots and archaeological interpretations at a scale of 1:1250 (**Figures 2 to 4**). The data are displayed at -2nT (white) to $+3\text{nT}$ (black) for the greyscale image and $\pm 25\text{nT}$ at 25nT per cm for the XY trace plots.
- 3.1.2 The interpretation of the datasets highlights the presence of potential archaeological anomalies, ferrous/burnt or fired objects, and magnetic trends (**Figure 4**). Full definitions of the interpretation terms used in this report are provided in **Appendix 2**.
- 3.1.3 Numerous ferrous anomalies are visible throughout the dataset. These are presumed to be modern in provenance and are not referred to, unless considered relevant to the archaeological interpretation.
- 3.1.4 It should be noted that small, weakly magnetised features may produce responses that are below the detection threshold of magnetometers. It may therefore be the case that more archaeological features may be present than have been identified through geophysical survey.

3.2 Gradiometer survey results and interpretation

- 3.2.1 The most significant feature detected by the gradiometer survey lies on the western edge part of the Site. A linear feature **4000** can be seen on a southwest to northeast alignment and extends for approximately 150m before turning a 90 degree corner towards the north-west. This feature appears to extend beyond the western edge of the survey boundary. This feature has a positive magnetic response of approximately $+3\text{nT}$. It is likely to represent an infilled ditch, possibly indicating an enclosure or former field boundary. A secure interpretation cannot be ascertained as the feature appears to run beyond the survey area. It is likely that this feature continues into the adjoining field of the cemetery.
- 3.2.2 Several possible archaeological features have been identified at the centre and towards the north of the Site, at **4001**, **4002** and **4003**. These could be pits due to their shape, size and level of magnetic response. Historical maps however show that there may have been a small orchard in the northern part of this field around 1936 (Sheet 123 *Land Utilisation Survey of Britain*, oldmapsonline.org, 2015), and as such these features may represent in-filled tree bowls.



- 3.2.3 At **4004**, towards the southern end of the field, a number of crop marks aligned north-west south-east are present. Further evidence of these can be seen at **4005** with a roughly east to west alignment. These may represent different phases of agricultural activity in this field through time.
- 3.2.4 A few weakly magnetic linear features can be seen across the Site, at **4006** and **4007** for example. With unclear formation it is not possible to say whether they relate to former field boundaries or whether the anomalies have no archaeological provenance. The evidence suggested during the map regression exercise indicated that the field has only ever been larger than it is now.
- 3.2.5 Responses such as those seen at **4008** and **4009** show magnetic readings often associated with superficial geology and generally unrelated to archaeological activity on the Site.
- 3.2.6 A large area of increased magnetic response towards the southern end of the Site, at **4010** represents a dense scattering of ferrous objects. This area is not archaeological in nature, and may represent an area of modern building debris from previous nearby developments.
- 3.2.7 An area of extremely strong positive and negative anomalies along the western edge of the survey area at **4011** represents the interference from wrought iron railings surrounding the cemetery. These are highly ferrous and as such give off an extreme magnetic response. These are not archaeological in nature.

3.3 Modern Services

- 3.3.1 There were no modern services detected within the survey area.
- 3.3.2 It should be noted that gradiometer survey may not detect all services present on Site. This report and accompanying illustrations should not be used as the sole source for service locations and appropriate equipment (e.g. CAT and Genny) should be used to confirm the location of buried services before any trenches are opened on Site.

4 CONCLUSION

- 4.1.1 The detailed gradiometer survey has been successful in detecting probable archaeological features within the Site survey area.
- 4.1.2 The most striking feature present is the probable ditch enclosure (**4000**) on the western edge of the field. In close proximity to this feature are several smaller possible pit or posthole features which may be associated. However, it is not possible to ascertain with certainty stratigraphic relationships of features from gradiometer data alone. Further investigation would be required to provide definite interpretations of the anomalies highlighted within this report.
- 4.1.3 Several weak linear trends across the site demonstrate the variance in agricultural practices on the Site through consecutive periods. The differing alignments of these are likely due to variable boundaries and different farming processes, and thought to be medieval, post-medieval and/or modern in provenance.



5 REFERENCES

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Pre-Construct Archaeology Ltd., February 2015. *Archaeological Desk-Based Assessment, Magdalen Hill Cemetery Extension, Alresford Road, Winchester, Hampshire*. Unpublished Client Report.

English Heritage, 2008. *Geophysical Survey in Archaeological Field Evaluation*. Research and Professional Service Guideline No 1, 2nd edition.

5.2 Cartographic and documentary sources

Soil Survey of England and Wales, 1983. *Sheet 3, Soils of Midland and Western England*. Ordnance Survey: Southampton.

5.3 Online resources

British Geological Survey, <http://www.bgs.ac.uk> [accessed May 2015]

Old Maps Online, <http://www.oldmapsonline.org> [accessed May 2015]



APPENDIX 1: SURVEY EQUIPMENT AND DATA PROCESSING

Survey methods and equipment

The magnetic data for this project was acquired using a Bartington 601-2 dual magnetic gradiometer system. This instrument has two sensor assemblies fixed horizontally 1m apart allowing two traverses to be recorded simultaneously. Each sensor contains two fluxgate magnetometers arranged vertically with a 1m separation, and measures the difference between the vertical components of the total magnetic field within each sensor array. This arrangement of magnetometers suppresses any diurnal or low frequency effects.

The gradiometers have an effective resolution of 0.03nT over a ± 100 nT range, and measurements from each sensor are logged at intervals of 0.25m. All of the data are stored on an integrated data logger for subsequent post-processing and analysis.

Wessex Archaeology undertakes two types of magnetic surveys: scanning and detail. Both types depend upon the establishment of an accurate 20m or 30m site grid, which is achieved using a Leica Viva RTK GNSS instrument and then extended using tapes. The Leica Viva system receives corrections from a network of reference stations operated by the Ordnance Survey and Leica Geosystems, allowing positions to be determined with a precision of 0.02m in real-time and therefore exceed the level of accuracy recommended by English Heritage (2008) for geophysical surveys.

Scanning surveys consist of recording data at 0.25m intervals along transects spaced 10m apart, acquiring a minimum of 80 data points per transect. Due to the relatively coarse transect interval, scanning surveys should only be expected to detect extended regions of archaeological anomalies, when there is a greater likelihood of distinguishing such responses from the background magnetic field.

The detailed surveys consist of 20m x 20m or 30m x 30m grids, and data are collected at 0.25m intervals along traverses spaced 1m apart. These strategies give 1600 or 3600 measurements per 20m or 30m grid respectively, and are the recommended methodologies for archaeological surveys of this type (EH, 2008).

Data may be collected with a higher sample density where complex archaeological anomalies are encountered, to aid the detection and characterisation of small and ephemeral features. Data may be collected at up to 0.125m intervals along traverses spaced up to 0.25m apart, resulting in a maximum of 28800 readings per 30m grid, exceeding that recommended by English Heritage (2008) for characterisation surveys.

Post-processing

The magnetic data collected during the detail survey are downloaded from the Bartington system for processing and analysis using both commercial and in-house software. This software allows for both the data and the images to be processed in order to enhance the results for analysis; however, it should be noted that minimal data processing is conducted so as not to distort the anomalies.

As the scanning data are not as closely distributed as with detailed survey, they are georeferenced using the GPS information and interpolated to highlight similar anomalies in adjacent transects. Directional trends may be removed before interpolation to produce more easily understood images.

Typical data and image processing steps may include:



- Destripe – Applying a zero mean traverse in order to remove differences caused by directional effects inherent in the magnetometer;
- Destagger – Shifting each traverse longitudinally by a number of readings. This corrects for operator errors and is used to enhance linear features;
- Despike – Filtering isolated data points that exceed the mean by a specified amount to reduce the appearance of dominant anomalous readings (generally only used for earth resistance data)

Typical displays of the data used during processing and analysis:

- XY Plot – Presents the data as a trace or graph line for each traverse. Each traverse is displaced down the image to produce a stacked profile effect. This type of image is useful as it shows the full range of individual anomalies.
- Greyscale – Presents the data in plan view using a greyscale to indicate the relative strength of the signal at each measurement point. These plots can be produced in colour to highlight certain features but generally greyscale plots are used during analysis of the data.



APPENDIX 2: GEOPHYSICAL INTERPRETATION

The interpretation methodology used by Wessex Archaeology separates the anomalies into two main categories: archaeological and unidentified responses.

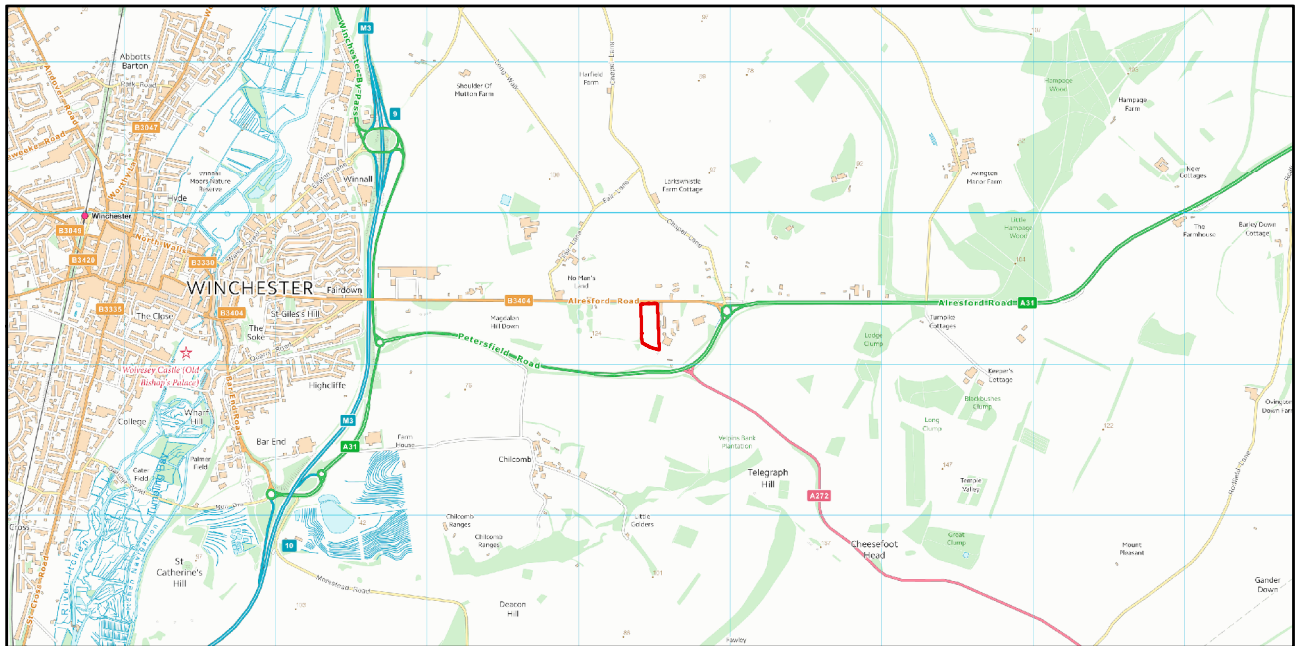
The archaeological category is used for features when the form, nature and pattern of the anomaly are indicative of archaeological material. Further sources of information such as aerial photographs may also have been incorporated in providing the final interpretation. This category is further sub-divided into three groups, implying a decreasing level of confidence:



- Archaeology – used when there is a clear geophysical response and anthropogenic pattern.
- Probable archaeology – used for features which give a clear response but which form incomplete patterns.
- Possible archaeology – used for features which give a response but which form no discernible pattern or trend.

The unidentified category is used for features when the form, nature and pattern of the anomaly are not sufficient to warrant a classification as an archaeological feature. This category is further sub-divided into:

- Increased magnetic response – used for areas dominated by indistinct anomalies which may have some archaeological potential.
- Trend – used for low amplitude or indistinct linear anomalies.
- Ferrous – used for responses caused by ferrous material. These anomalies are likely to be of modern origin.

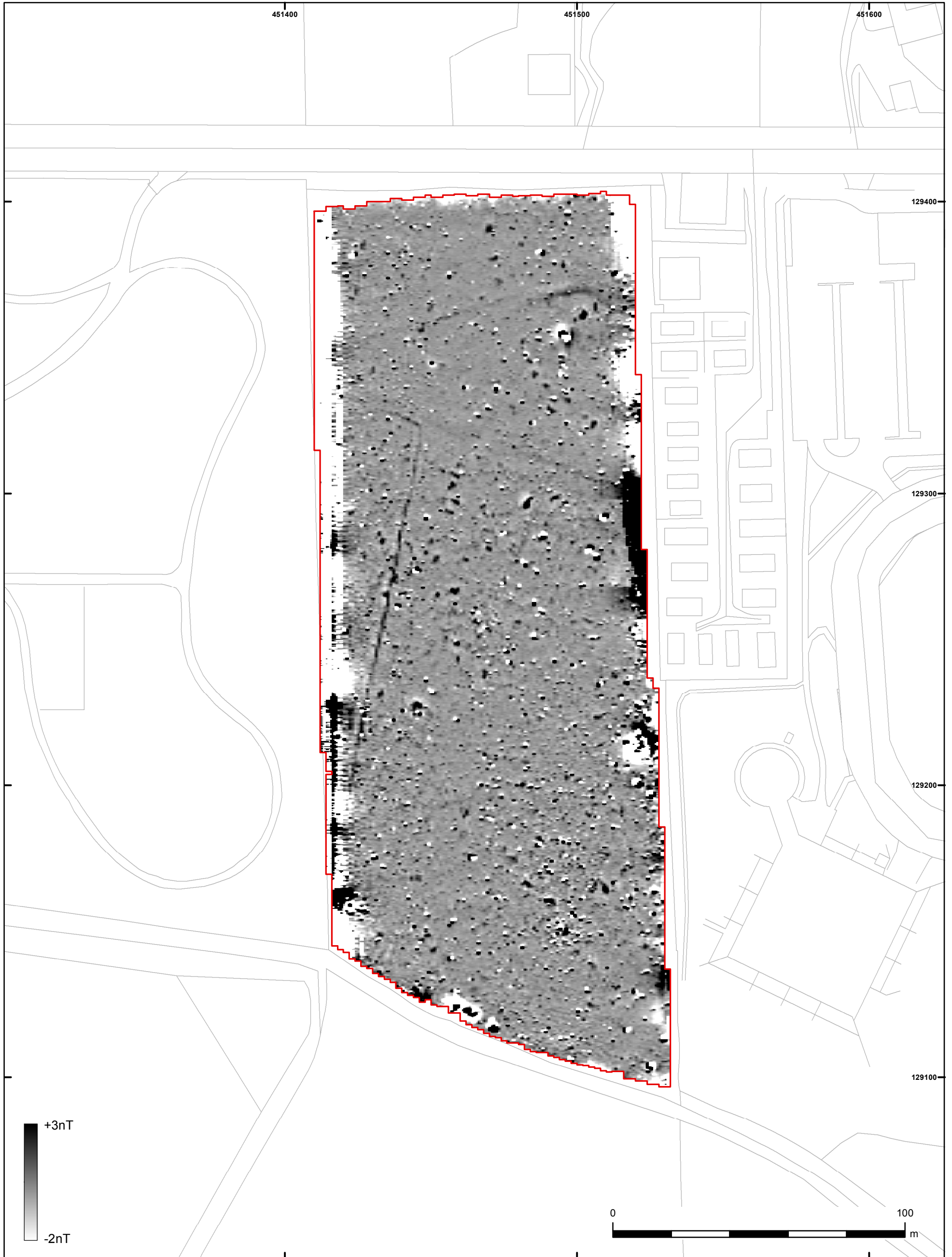
Finally, services such as water pipes are marked where they have been identified




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Site location and survey extents

Figure 1

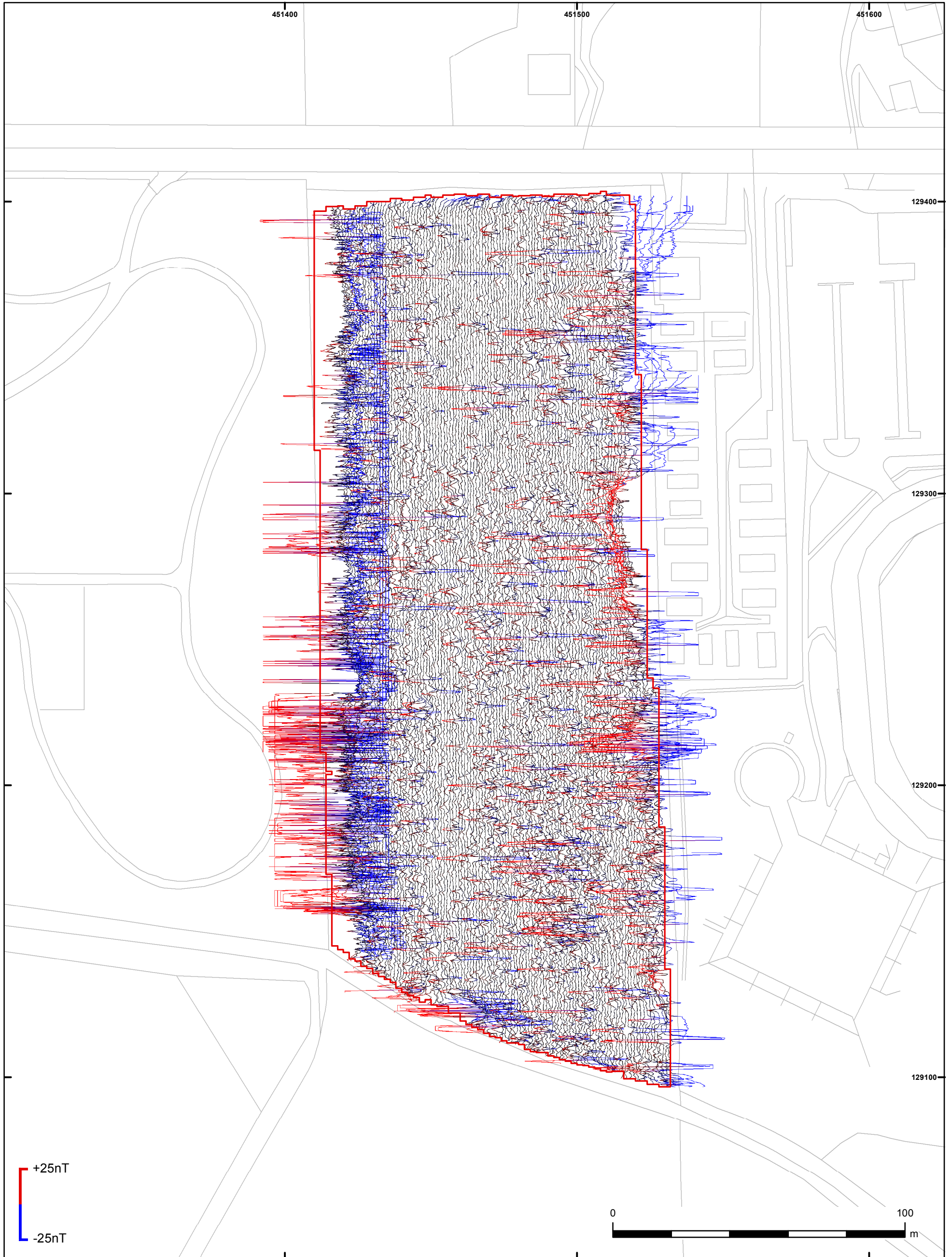


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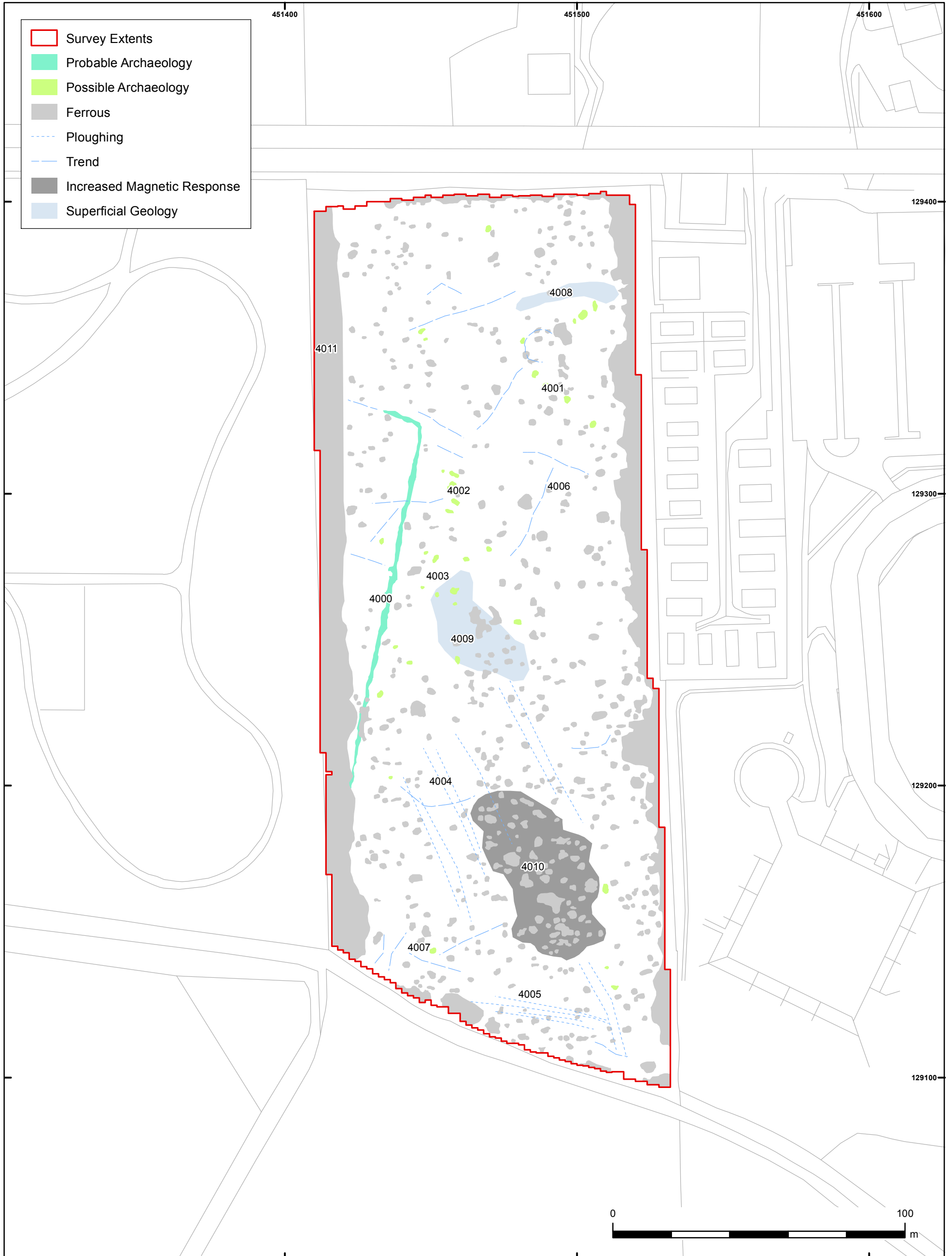


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XY trace

Figure 3



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