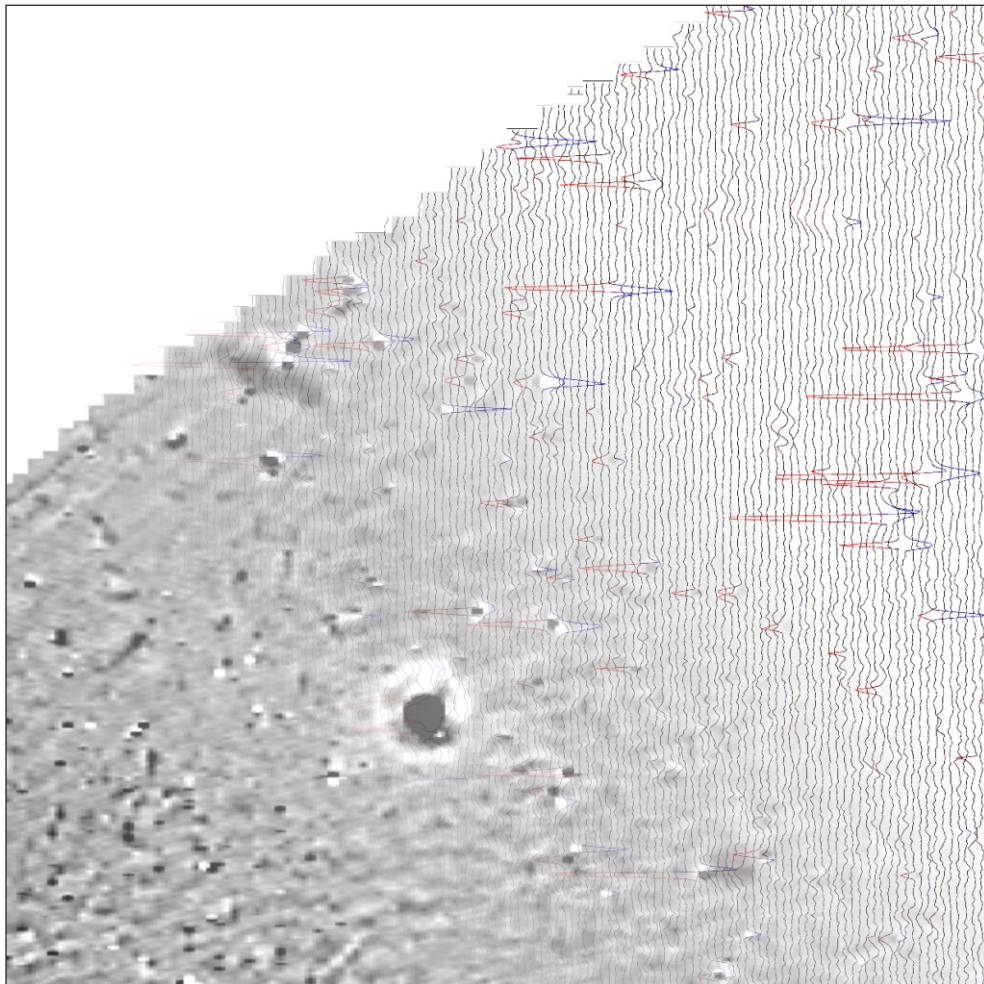




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# Scotspoor Barrow Collingbourne Ducis, Wiltshire

Detailed Gradiometer Survey Report



Ref: 100940.03  
October 2013



**Scotspoor Barrow  
Collingbourne Ducis, Wiltshire**

**Detailed Gradiometer Survey Report**

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# Scotspoor Barrow Collingbourne Ducis, Wiltshire

## Detailed Gradiometer Survey Report

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# Scotspoor Barrow Collingbourne Ducis, Wiltshire

## Detailed Gradiometer Survey Report

### Summary

A detailed gradiometer survey was conducted over land around Scotspoor Barrow, north-east of Collingbourne Ducis, Wiltshire (centred on NGR 428475, 156050). The project was commissioned by Mr Jonathan Sykes with the aim of establishing the presence and significance, or otherwise, of detectable archaeological features around Scotspoor Barrow, a Scheduled Monument thought to be a prehistoric barrow, likely a long or oval barrow or Neolithic date. This information will support an application for a Higher Level Stewardship and aims to inform the nature and extent of any future change of use for the farmland on which the barrow is situated.

The site comprises part of one arable field, approximately 4.85km north-east of the centre of Collingbourne Ducis. The site occupies an area of relatively flat land on top of a spur that falls away in all directions.

The detailed gradiometer survey was undertaken on the 10<sup>th</sup> September 2013 and covered a total of 1.8ha. This survey has demonstrated the presence of anomalies of definite, probable and possible archaeological interest within the survey area including a ditch-like anomaly within the Scheduled Monument.

It is interesting to note that only a single ditch-like anomaly has been identified within the monument boundary, rather than two parallel ditches, as would normally be expected of such a monument. However the nature, size and orientation of this linear feature do in fact appear to correspond well to the (albeit sparse) recorded information and documentary sources relating to the Scheduled Monument. Therefore it seems likely that the single linear anomaly identified within the curtilage of the Scheduled Monument does in fact represent the surviving elements of the probable long barrow, however atypical its form.

To the south-east and east of the monument, several large pit-like anomalies have been detected, although no relationship can be demonstrated between them.

The geophysical data has also revealed a strongly positive anomaly to the south of the scheduled area that is considered to either represent a pit of archaeological interest or possibly unexploded ordnance. There is no evidence to suggest a link between this anomaly and the Scheduled Monument to the north.

Strong ploughing trends can be seen on at least two orientations and other isolated pit-like anomalies are of uncertain origins; the frequent ferrous anomalies are presumed to be modern in origin and related to agricultural activity. The southern portion of the site shows widespread diffuse responses typical of near-surface geological changes.



# Scotspoor Barrow Collingbourne Ducis, Wiltshire

## Detailed Gradiometer Survey Report

### Acknowledgements

The detailed gradiometer survey was commissioned Mr Jonathan Sykes, for which his assistance in this regard is gratefully acknowledged.

The fieldwork was undertaken by Jennifer Smith and Clara Dickinson. Ben Urmston processed the geophysical data and this was interpreted by Ross Lefort who also wrote this report. The geophysical work was quality controlled by Ben Urmston. Illustrations were prepared by Linda Coleman. The project was managed on behalf of Wessex Archaeology by Chloe Hunnisett.



# Scotspoor Barrow Collingbourne Ducis, Wiltshire

## Detailed Gradiometer Survey Report

### 1 INTRODUCTION

#### 1.1 Project background

1.1.1 Wessex Archaeology was commissioned by English Heritage on behalf of Mr Jonathan Sykes to carry out a geophysical survey of land around Scotspoor Barrow, Collingbourne Ducis, Wiltshire (**Figure 1**), hereafter “the Site” (centred on NGR 428475, 156050). The survey forms part of a programme of archaeological works being undertaken to inform decisions regarding potential future development at the Site.

1.1.2 The aim of the geophysical survey is set out in the Written Scheme of Investigation (WSI) and the overall aim is to establish the presence/absence, extent and character of detectable archaeological remains within the survey area (WA 2013). The specific aim is to determine the location and extent of the detectable archaeological features relating to the ploughed out remnants of Scotspoor Barrow, a Scheduled Monument on the National Heritage List for England (NHLE, 1004731).

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 The Site

1.2.1 The survey area comprises part of one arable field measuring 2ha in area, located approximately 4.85km north-east of Collingbourne Ducis (**Figure 1**). A detailed gradiometer survey was undertaken covering the total available area of the Site (1.8ha).

1.2.2 The Site is located on a gently sloping area of the landscape on a high point; the surrounding landscape undulates quite dramatically in places. The land within the survey area lies at a height of approximately 235m above Ordnance Datum (aOD); the highest point in the local area is located further south at New Zealand Farm (238m aOD). The land slopes downhill in all directions from this area. The limits of the survey area were defined by the client.

1.2.3 The underlying solid geology is made up of chalk (Cretaceous) with superficial deposits of clay with flints (Quaternary) close by (Ordnance Survey 1957 and 1977). The soils underlying the Site are most likely to be typical palaeo-argillic brown earths of the 581d (Carstens) association (SSEW 1983). Soils derived from such geological parent material have been shown to produce magnetic contrasts suitable for the detection of archaeological remains through magnetometer survey.

#### 1.3 Archaeological Background

1.3.1 Scotspoor Barrow (NHLE 1004731) is recorded as an oval mound considered to be a Neolithic long barrow. Human remains were discovered at this site during excavation in 1934 (ref). The excavations apparently revealed a circular arrangement of human skulls



approximately at the centre of the mound, each placed on a flat stone. Two skeletons, obviously intrusive burials, were found just to the south. A further circular arrangement of skulls and long bones was found at the south-east end of the mound, together with an arrowhead of unknown type ([http://www.pastscape.org.uk/hob.aspx?hob\\_id=224193](http://www.pastscape.org.uk/hob.aspx?hob_id=224193)). The typology and date of this any other finds remains uncertain, however on the basis of the English Heritage listing for the Scheduled Monument, it is assumed that these were consistent with a Neolithic date.

- 1.3.2 The recorded information relating to the barrow is somewhat sparse and the original sources could not be consulted for the purposes of this survey. However, the monument is recorded as “An oval shaped mound...orientated south east to north west” ([http://www.pastscape.org.uk/hob.aspx?hob\\_id=224193](http://www.pastscape.org.uk/hob.aspx?hob_id=224193)). A single flanking ditch is mentioned, stated to be 18m long and located on the south-west side of the mound.
- 1.3.3 A scheduled linear earthwork is located close to the barrow and runs parallel to White Lane from Rag Copse to Scotspoor Plantation (NHLE 1003792). The relationship of this earthwork to the barrow is unclear but there are other funerary monuments and field systems of varying date in the wider landscape.

## 2 METHODOLOGY

### 2.1 Introduction

- 2.1.1 The detailed magnetometer survey was conducted using a Bartington Grad601-2 dual fluxgate gradiometer system. The survey was conducted in accordance with English Heritage guidelines (2008).
- 2.1.2 The geophysical survey was undertaken by Wessex Archaeology’s in-house geophysics team on the 10<sup>th</sup> September 2013. Field conditions at the time of the survey were good with the field having been drilled and rolled prior to the survey.

### 2.2 Method

- 2.2.1 Individual survey grid nodes were established at 30m x 30m intervals using a Leica Viva RTK GNSS system, which is precise to approximately 0.02m and therefore exceeds English Heritage recommendations (2008).
- 2.2.2 The magnetometer survey was conducted using a Bartington Grad601-2 fluxgate gradiometer instrument, which has a vertical separation of 1m between sensors. Data collected for the detailed survey were acquired at 0.25m intervals along transects spaced 1m apart. The system used has an effective sensitivity of 0.03nT, in accordance with EH guidelines (2008). Detailed data were collected in the zigzag method.
- 2.2.3 Data from the detailed survey was subject to minimal data correction processes. These comprise a zero mean traverse (ZMT) function (typically  $\pm 5$ nT thresholds) applied to correct for any variation between the two Bartington sensors used, a deslope function to remove errors created by the ZMT function in areas of broad and strong anomalies, and a de-step function to account for variations in traverse position due to varying ground cover and topography. No interpolation was applied to the data.
- 2.2.4 In addition to these three processing steps a periodic filter had to be applied to four grids in the southwest corner of the dataset. This was required to remove periodic noise from the data that was present due to operator error; under normal circumstances, the data within these grids would have been re-collected, however the error was not identified in the field. The filtered and unfiltered data is presented in this report (**Figures 5 to 8**).





- 2.2.5 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 gradiometer survey has been successful in identifying anomalies of definite, probable and possible archaeological interest across the Site. Results are presented as a series of greyscale and XY plots, and archaeological interpretations, at a scale of 1:1000 (**Figures 2 to 8**). The data are displayed at -2nT (white) to +3nT (black) for the greyscale images and  $\pm 50$ nT at 25nT per cm for the XY trace plots. Additional greyscale and XY plots of the raw and minimally processed data have been included to show the data in its unfiltered form (**Figures 5 to 8**)
- 3.1.2 The interpretation of the datasets highlights the presence of potential archaeological anomalies, ferrous/burnt or fired objects, and magnetic trends. 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 detailed survey dataset. These are presumed to be modern in provenance and are not referred to, unless considered relevant to the archaeological interpretation.

#### 3.2 Detailed Gradiometer Survey Results and Interpretation

##### Scotspoor Barrow

- 3.2.1 The closest anomaly to the recorded location of Scotspoor Barrow is a weak and diffuse positive anomaly at **4000** (**Figure 4**). This feature has an elongated shape in plan measuring at least 15.5m in length and 3m in width with magnetic values around +1.5nT; it is aligned roughly NW-SE.
- 3.2.2 The anomaly **4000** is located within the curtilage of the Scheduled Monument. This feature is considered to represent a feature of probable archaeological origin in the form of a ditch, and may therefore form part of a quarry ditch linked to the barrow. The orientation of ditch **4000** does not appear to be consistent with the orientation of the monument as indicated by the form and orientation of the Scheduled Monument, which encompasses an oval area oriented south-west to north-east (**Figure 4**). However although orientated at right angles to the scheduled area, the form of linear anomaly **4000** does in fact seem to be consistent with what recorded information exists in relation to the barrow (para 1.3.2), including its north-west to south-east orientation and its length of c.15.5m (there is mention of an 18m long ditch).
- 3.2.3 The geophysical survey did not identify any evidence of either a second ditch, or a mound in relation to the barrow. A second parallel ditch cannot be seen in the data close to **4000**; there are no dense concentrations of ferrous that would obscure another ditch. However although this is atypical for a monument which is considered likely to represent a Neolithic long barrow, the recorded information only makes mention of a single ditch, so once again anomaly **4000** appears to be consistent with this ([http://www.pastscape.org.uk/hob.aspx?hob\\_id=224193](http://www.pastscape.org.uk/hob.aspx?hob_id=224193)).
- 3.2.4 It should be noted that it is difficult to determine the full extents of archaeological anomalies within the Scheduled area, as the existing field boundary and track to the northwest preclude geophysical survey. The weak linear trends visible in the vicinity of the Scheduled monument are oriented north-east to south-west parallel with the existing



boundary and other ploughing trends within the dataset. Consequently it is considered that there are no detectable anomalies clearly associated with anomaly **4000** identified within the Scheduled Monument, and that no anomalies of clear archaeological potential have been identified in the immediate vicinity.

### Additional results

- 3.2.5 To the south of this probable ditch is a peculiar positive anomaly with a negative halo at **4001**; the positive anomaly is sub-oval in shape and measures 7.1m in length with magnetic values around +30nT. The negative halo at **4002** and **4003** forms a regular sub-annular shape around this positive anomaly with an area of background values separating the positive from the negative anomaly. This negative may not be a feature in itself but possibly an effect of the strong positive in the centre.
- 3.2.6 This feature is difficult to interpret as its shape in the XY trace (**Figure 3**) suggests it could either be a cut feature such as a pit or a very deeply buried ferrous object such as unexploded ordnance (UXO). The positive anomaly has been interpreted as probable archaeology whereas the negative halo has been interpreted as possible archaeology as it may be that it does not correspond to any buried remains.
- 3.2.7 The two remaining anomalies of probable archaeological interest are two sub-oval diffuse positive anomalies at **4004** and **4005**, towards the north-eastern and south-eastern extents of the survey area respectively. These features have magnetic values around +1.5nT to +3nT and appear to represent cut features although it is not clear whether they are archaeological features such as pits or are natural cuts from tree throws. These anomalies have been interpreted as probable archaeology to reflect this uncertainty in their interpretation.
- 3.2.8 There are two positive anomalies of possible archaeological interest at **4006** and **4007**; the former is an elongated ditch-like anomaly and the latter is a slightly irregular shaped pit-like anomaly. The remaining anomalies are small positive anomalies that are mainly sub-oval or sub-rounded in shape. These features could prove to be either small archaeological features such as postholes or geological features. As they do not have any significant patterning in their spatial distribution they have been classed as possible archaeology, although similar anomalies nearby are more likely to be geological in origin.
- 3.2.9 There are numerous trends visible throughout the survey data; most of these trends appear to be ploughing trends created by recent land use. There are other trends that are not clearly related to ploughing such as at **4008** and **4009** and include linear and curvilinear trends; these anomalies may prove to be archaeological.
- 3.2.10 A wide area of geological responses has been observed in the data; this area is characterised by a concentration of very weak and diffuse-edged positive and negative responses. This spread of geology is not considered strong enough to mask strongly magnetised archaeological features.

### **3.3 Gradiometer Survey Results and Interpretation: Modern Services**

- 3.3.1 There are no modern services visible in the data. Gradiometer data will not be able to locate and identify 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 DISCUSSION

### 4.1 Summary

- 4.1.1 The detailed gradiometer survey has been successful in detecting anomalies of definite, probable and possible archaeological interest within the Site. In particular a linear anomaly has been detected within the scheduled area of Scotspoor Barrow.
- 4.1.2 The anomaly within the Scheduled area (**4000**) is considered to represent a feature of probable archaeological origin in the form of a ditch, and may therefore form part of a quarry ditch of the barrow. Although orientated at right angles to the scheduled area, the form of linear anomaly **4000** does in fact seem to be consistent with recorded information relating to the barrow, including its north-west to south-east orientation and the length of its ditch. The geophysical survey did not identify any evidence of either a second ditch, or a central mound in relation to the barrow. However although this is atypical for such a monument, which generally comprise two parallel ditches from which the mound material is excavated, the recorded information only refers to a single ditch. Therefore the balance of the evidence suggests that the single linear feature (**4000**) identified within the Scheduled Monument area does in fact represent a buried archaeological feature relating to the probable Neolithic long barrow, and as such is likely to represent a key surviving element of the Scheduled Monument.
- 4.1.3 There are no additional detectable anomalies of clear archaeological potential identified in the immediate vicinity which might be associated with the barrow.
- 4.1.4 The geophysical data has also revealed another strongly magnetised feature at **4001**; this feature has proved difficult to interpret conclusively and could be considered to be a cut feature with a strongly magnetised fill or is a very deeply buried large ferrous object. A piece of UXO has been highlighted as a possibility simply as large bombs can impact to a substantial depth in some instances.
- 4.1.5 The remaining responses relate to the more recent agricultural use of the survey area, with ploughing trends and metallic debris apparent throughout. The identification of ephemeral features such as ploughing scars suggests that more substantial archaeological remains would produce detectable magnetic anomalies, should any be present.
- 4.1.6 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 encountered than have been identified through geophysical survey.



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[http://www.pastscape.org.uk/hob.aspx?hob\\_id=224193](http://www.pastscape.org.uk/hob.aspx?hob_id=224193)



## 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  $\pm 100$ 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.

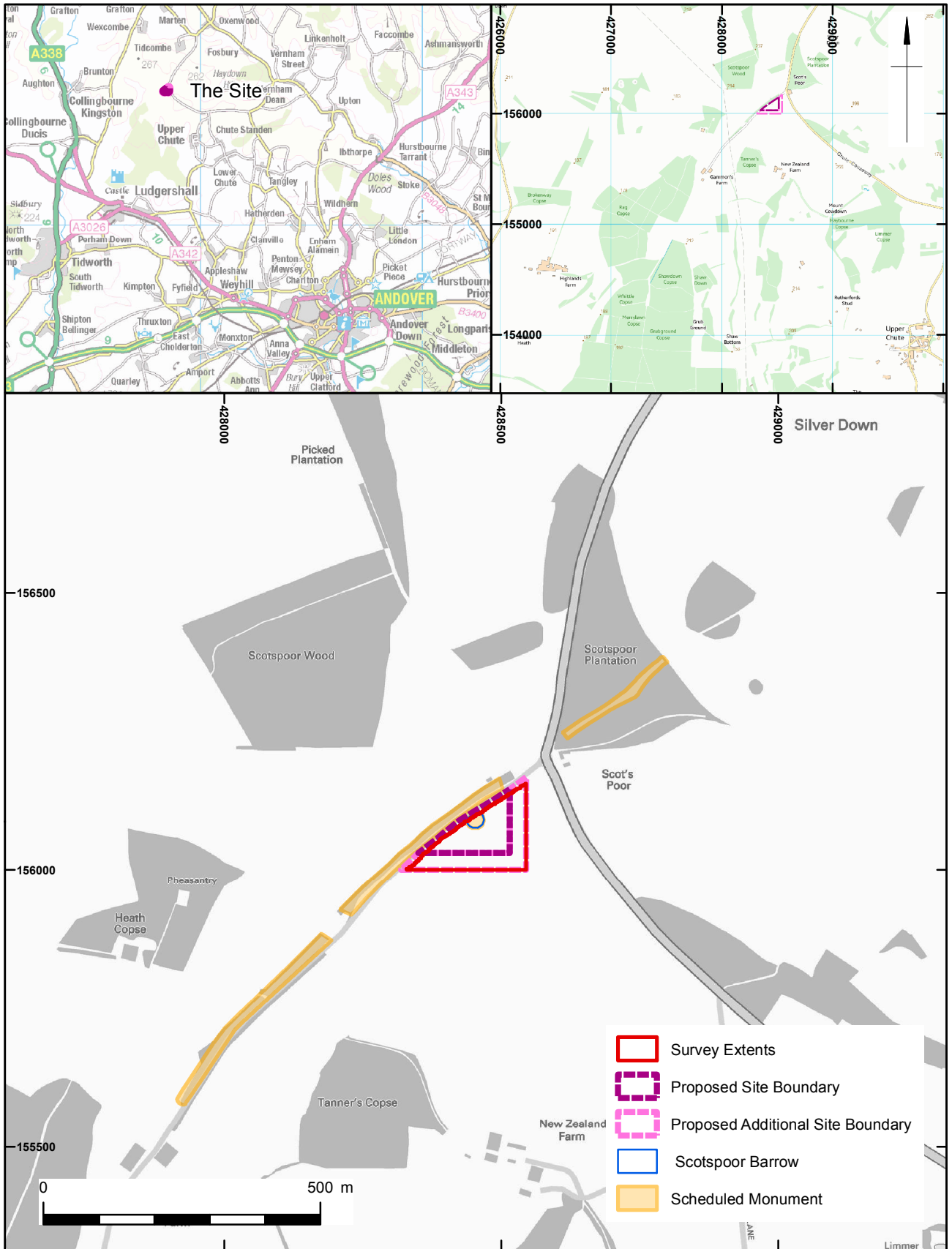
The archaeological category is used for features when the form, nature and pattern of the anomaly are indicative of archaeological material. Further sources of information such as aerial photographs may also have been incorporated in providing the final interpretation. This category is further sub-divided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

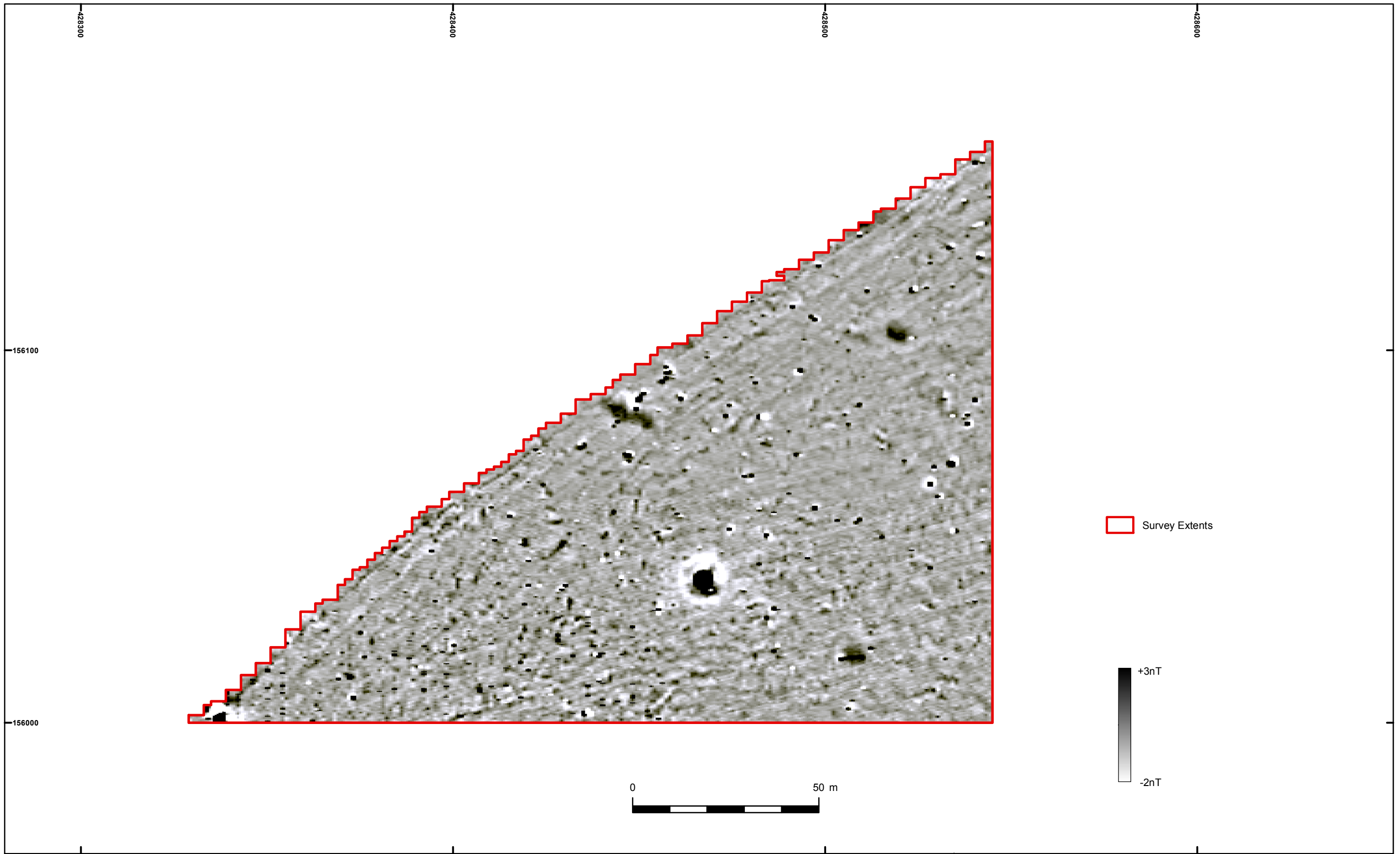


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Site and survey location plan

Figure 1

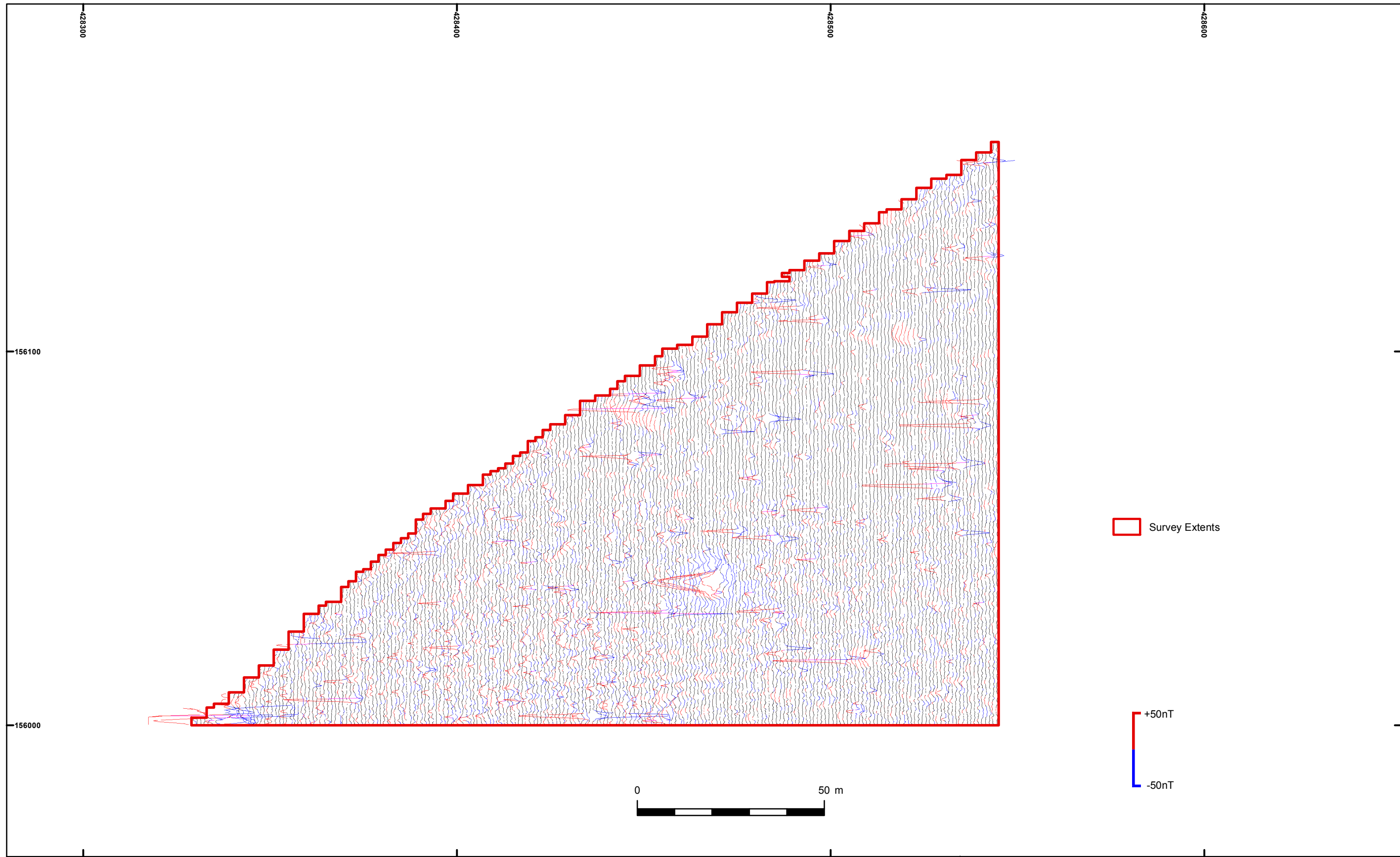




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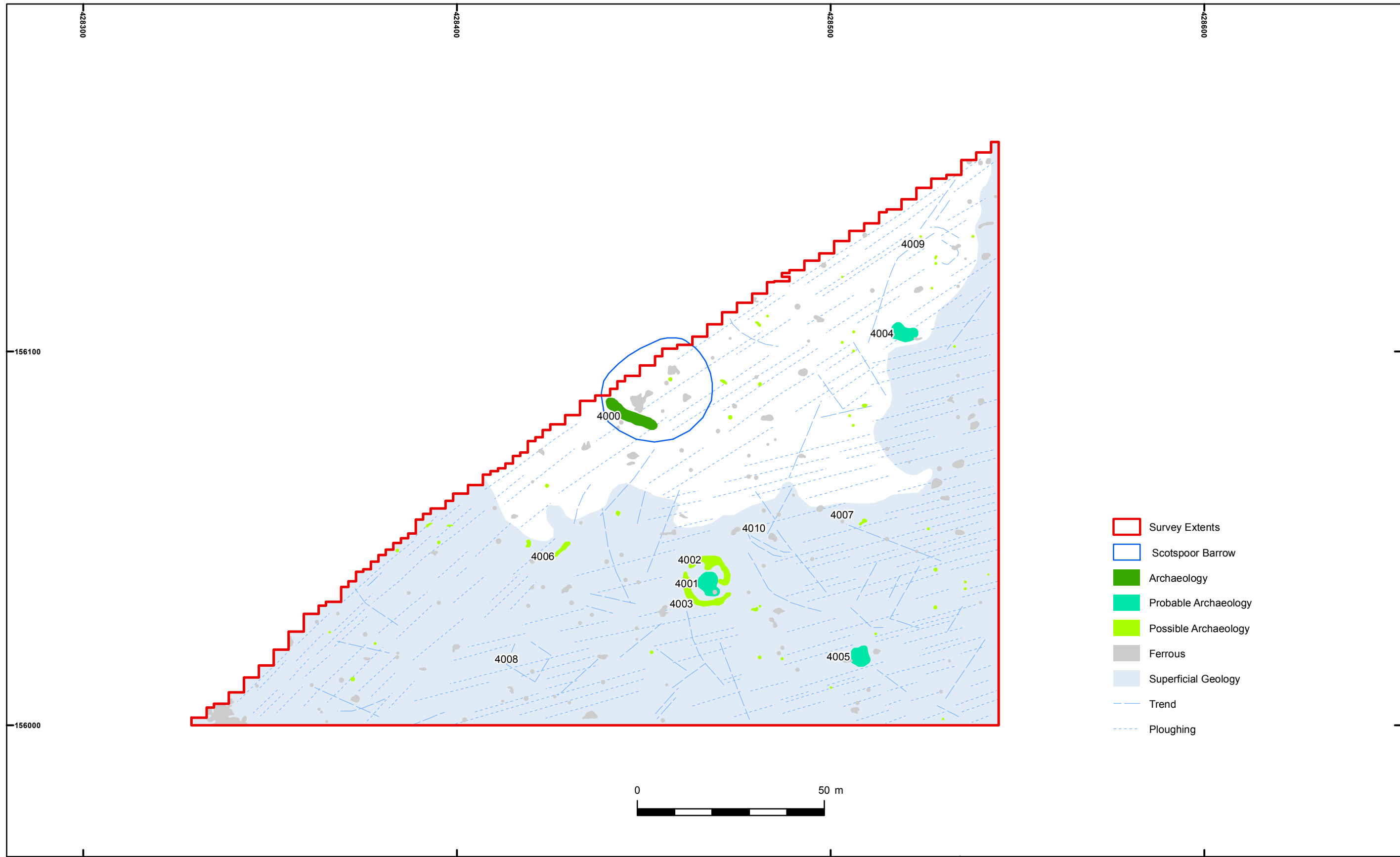




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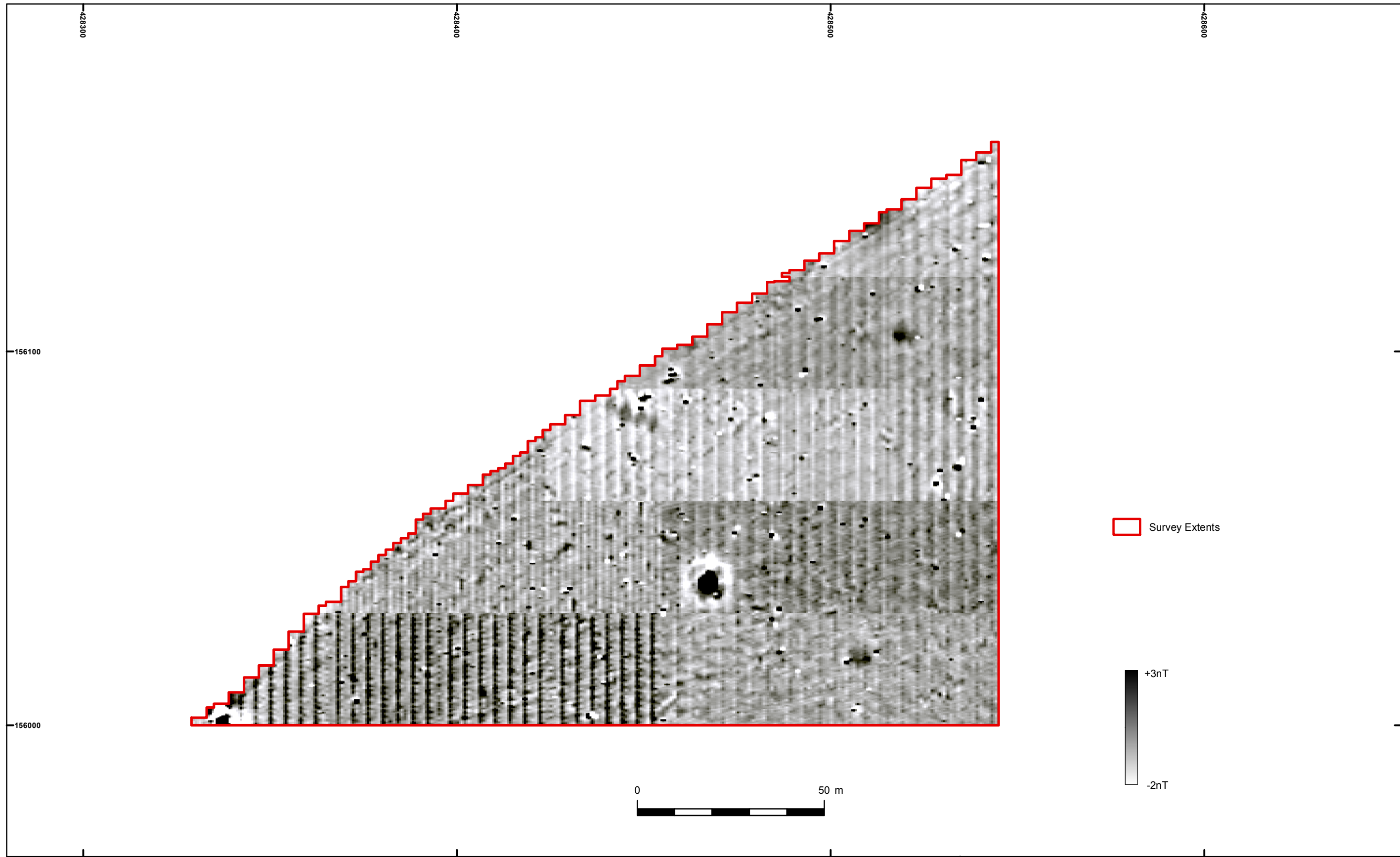
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- Scotspor Barrow
- Archaeology
- Probable Archaeology
- Possible Archaeology
- Ferrous
- Superficial Geology
- Trend
- Ploughing



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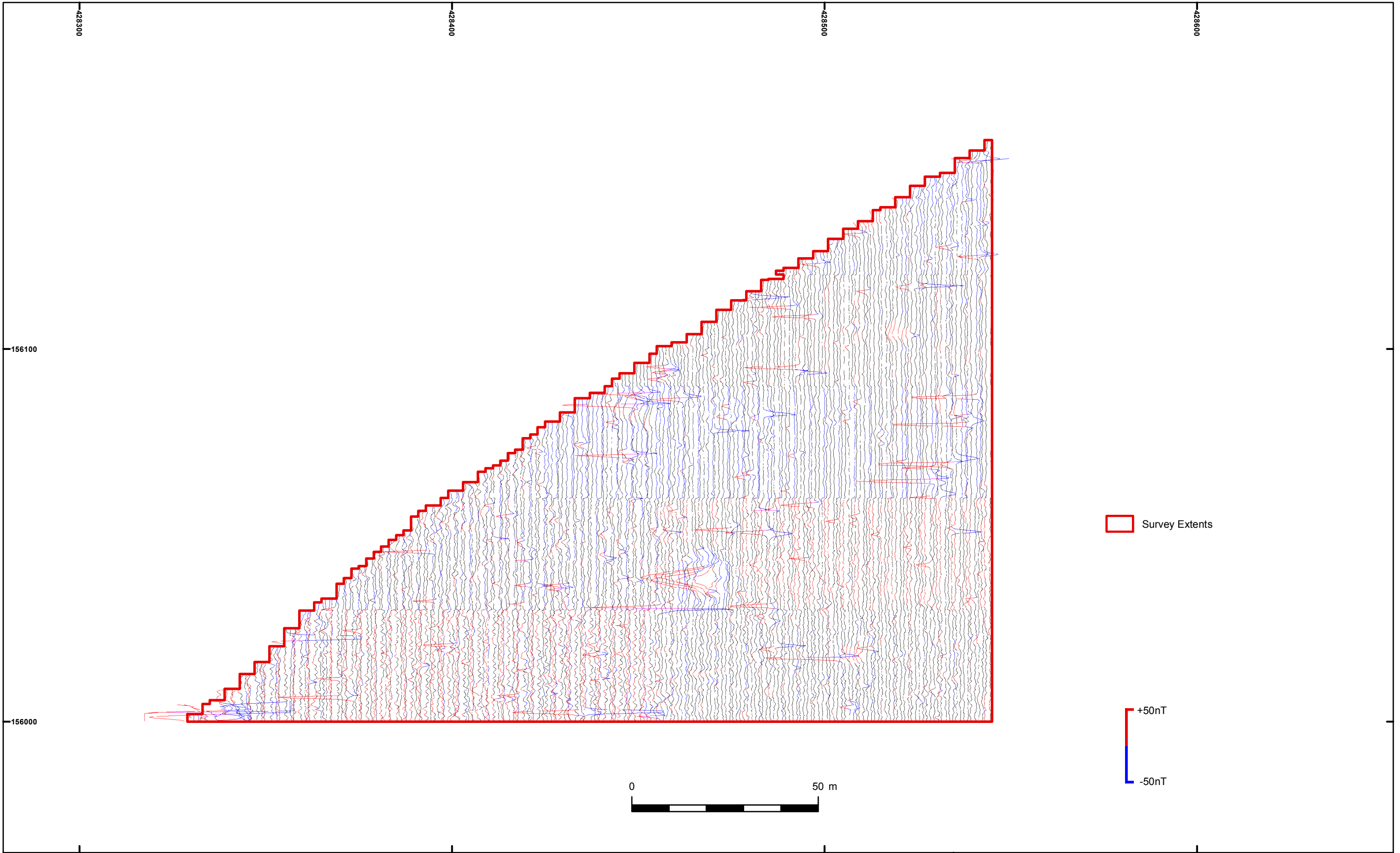
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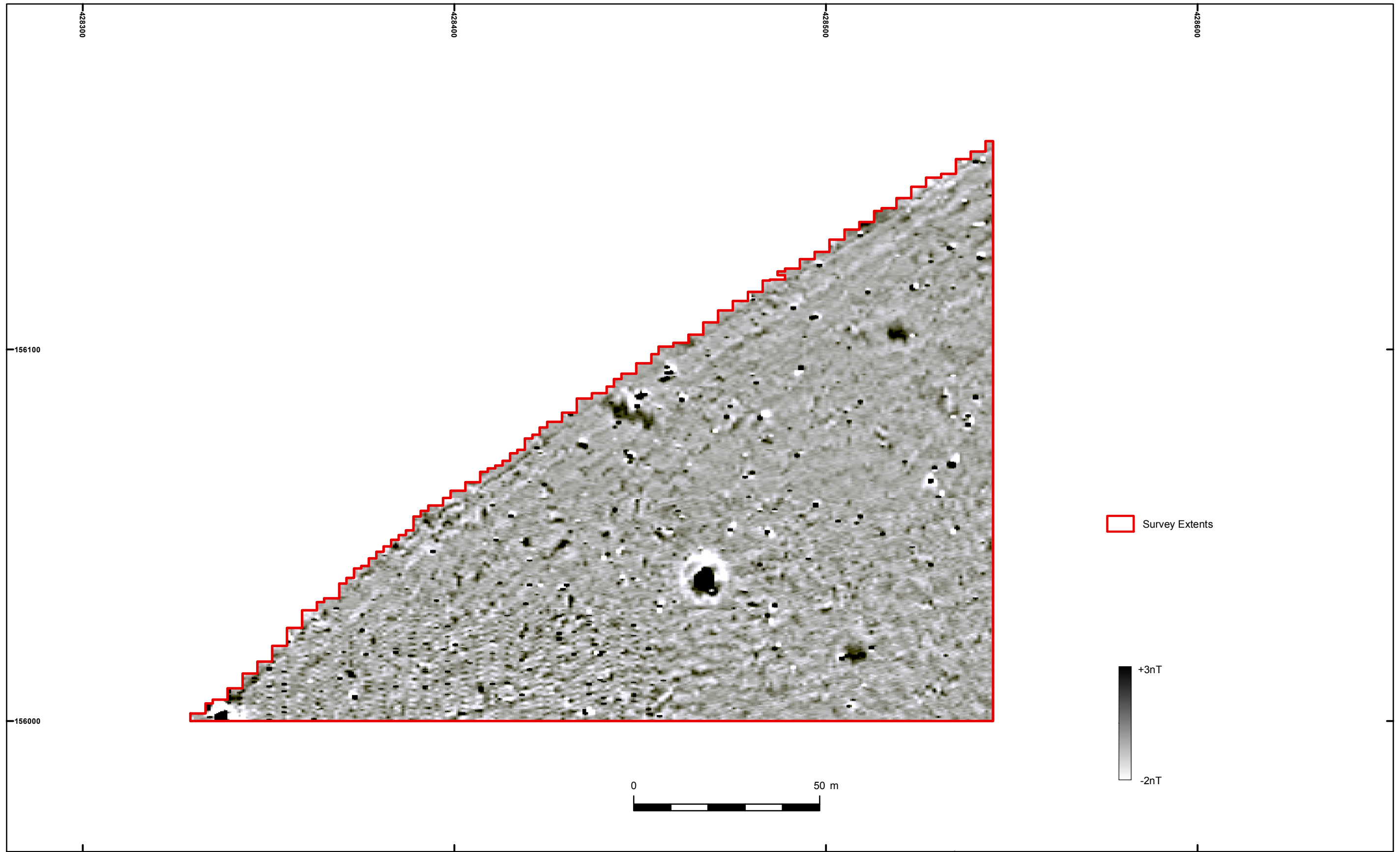






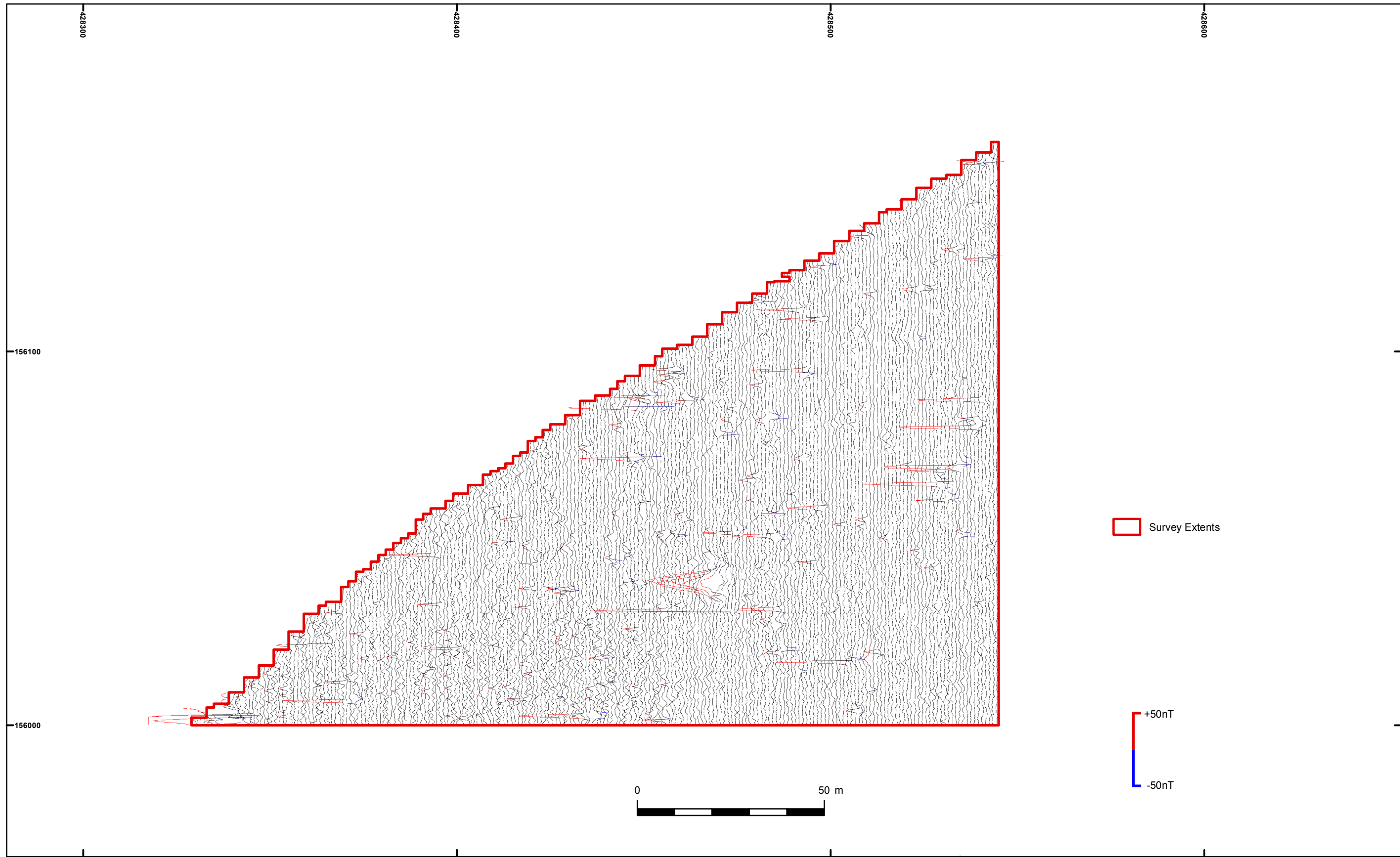
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Path:	X:\PROJECTS\100940\GIS\FigsMXD\Geophys		



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XY trace: minimally processed data



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Figure 8



salisbury rochester sheffield edinburgh



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