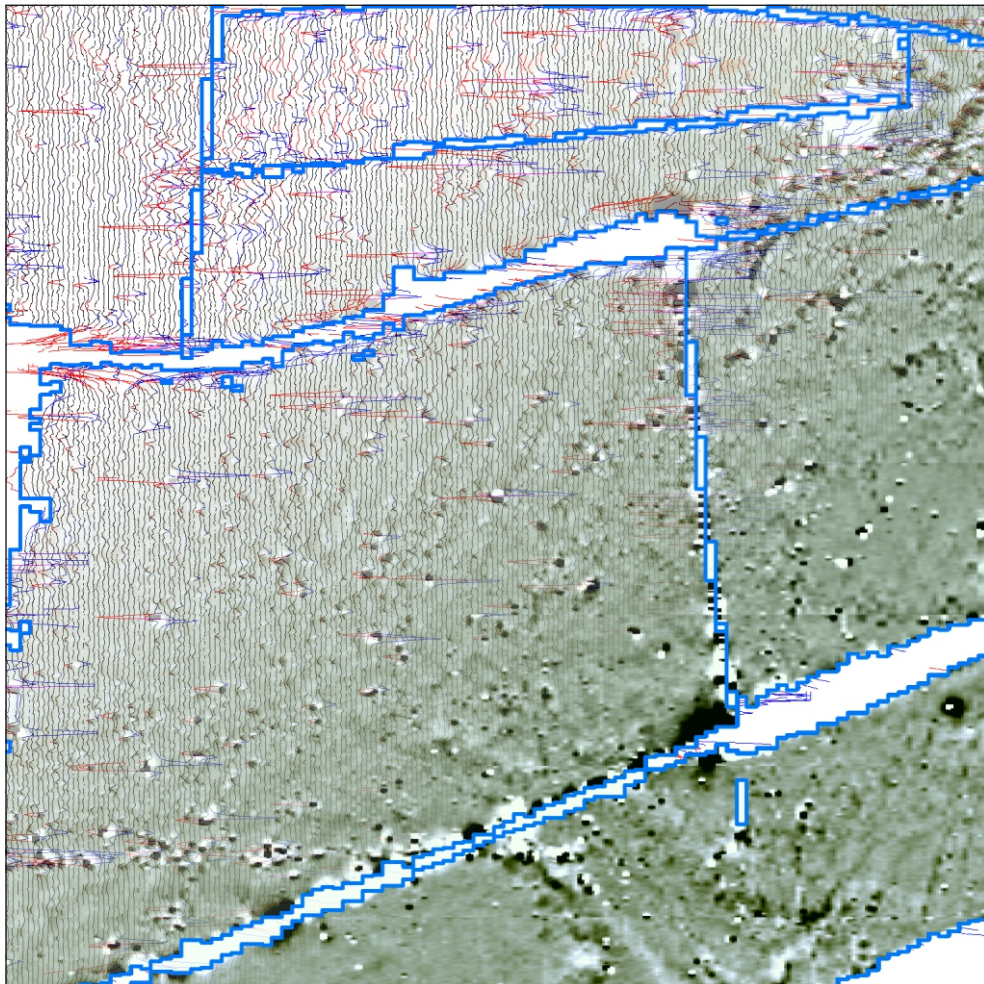




making sense of heritage

Stapehill Solar Park Wimbourne, Dorset

Detailed Gradiometer Survey Report



Ref: 109250.02
June 2015



Stapehill Solar Park Wimbourne, Dorset

Detailed Gradiometer Survey Report

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Summary

A detailed gradiometer survey was conducted over land at Stapehill Farm, Wimbourne, Dorset (centred NGR 404490, 100832.) The project was commissioned by Terence O'Rourke, working on behalf of Solstice Renewables, with the aim of establishing the presence, or otherwise, and nature of detectable archaeological features in support of a planning application for the installation of a photovoltaic solar array within the site.

The site comprises arable fields located to the northwest of Stapehill, covering an area of 7.5ha. The geophysical survey was undertaken between 5th and 8th May 2015. The gradiometer survey has demonstrated the presence of a number of anomalies of potential archaeological interest almost entirely within the southern fields.

The anomalies identified as being of archaeological interest consist of ditch and pit-type features. In the southern fields linear ditch features possibly represent an enclosure and in the northern fields there are several possible pit-like features alongside unclassified trends seen throughout the Site.

Additionally, this archaeological investigation has detected areas of increased magnetic response possibly related to the linear ditch features, areas of superficial geology and evidence for historic cultivation.



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Detailed Gradiometer Survey Report

Acknowledgements

Wessex Archaeology would like to thank Terence O'Rourke for commissioning the geophysical survey. The assistance of John Trehy and Jo Baker is gratefully acknowledged in this regard.

The fieldwork was undertaken by Laura Andrews and Vi Pieteron. Laura Andrews processed the geophysical data and Garreth Davey interpreted the data and wrote the report. The geophysical work was quality controlled by Genevieve Shaw and Lucy Learmonth. Illustrations were prepared by Garreth Davey. The project was managed on behalf of Wessex Archaeology by Caroline Budd.



Stapehill Solar Park Wimbourne, Dorset

Detailed Gradiometer Survey Report

1 INTRODUCTION

1.1 Project background

1.1.1 Wessex Archaeology was commissioned by Terence O'Rourke, working on behalf of Solstice Renewables, to carry out a geophysical survey at Stapehill Farm, Wimbourne, Dorset (hereafter "the Site", centred on NGR 404490, 100832) (**Figure 1**). The survey forms part of an ongoing programme of archaeological works being undertaken in support of a planning application for the installation of a photovoltaic solar array within the Site.

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 approximately 950m northwest of Stapehill and 10km northwest of Bournemouth, Dorset.

1.2.2 The Site occupies an area of 7.5ha of agricultural land, currently utilised for pasture. The Site is bounded by the A31 to the southeast, woodland to the northeast and northwest, residential properties to the west and southwest and further agricultural land to the south.

1.2.3 The Site lies on a south facing slope from 55m above Ordnance Datum (aOD) at the northern edge to approximately 37m aOD at the southern edge.

1.3 Soils and geology

1.3.1 The solid geology comprises silty clay of the Broadstone clay member to the north of the Site with the rest of the site recorded as sand, silt and clay of the Poole formation. These are overlain by superficial deposits of River terrace sand and gravels as well as areas of Head formation clay, silt, sand and gravels (BGS 2015).

1.3.2 The soils underlying the Site are likely to consist of typical gray-podzols of the 641bg (Sollom 2) association (SSEW SE Sheet 5-2 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 The potential for the survival of buried archaeological remains and details of relevant sites within a 1km Survey area have been summarised below and are included to provide context and inform the geophysical interpretation. This information has been compiled from data provided by the Dorset Historic Environment Record (DHER) and the National Heritage List for England (NHLE).
- 1.4.2 There are no World Heritage Sites, Registered Parks and Gardens, Conservation Areas or Historic Battlefields identified within the Study Area however there are three Scheduled Monuments and five Grade II listed buildings.
- 1.4.3 The scheduled ancient monuments in the area are all recorded bowl barrows. Three of these are located in the wooded area directly adjacent to the north of the Site between 50m-400m (NMR 29557). The western barrow is 10m in diameter x 1m high with an associated visible depression showing a quarry ditch. The central barrow is 16.5m in diameter x 1m high with no surviving evidence of a quarry ditch. The eastern barrow is 28m in diameter x 2.6m high with a visible 3m depression showing the quarry ditch. These have been interpreted as Bronze Age in origin and are all comparatively well preserved.
- 1.4.4 Further bowl barrows are evident within the 1km survey area. The first is located 500m southeast of the Site and is 16m in diameter x 1.9m high surrounded by a quarry ditch evident as a depression. This barrow has been slightly hollowed and may have been subject to unrecorded excavation. Another is located 650m southeast of the Site which is 14m in diameter x 1m high with an in-filled quarry ditch. These have both been categorised as well preserved and of Bronze Age origin also. Another is recorded 1.3km south-east of the Site.
- 1.4.5 Given the presence of multiple barrow sites, it is likely that the Site falls within an important burial landscape and the presence of archaeological features is considered likely.
- 1.4.6 There are no recorded sites or finds of Romano-British, Saxon or Medieval period within the survey area. The listed buildings within the area consist of a post-medieval 18th century public house, Holy Cross Abbey built in the mid-19th century, a lodge to Canford Magna House and lastly Manor farmhouse, a remodelled 16th century farmhouse with associated buildings also listed.

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 5th and 8th May 2015. Field conditions at the time of the survey were good, with dry conditions throughout the period of survey. An overall coverage of 5.9 ha was achieved with areas lost to field boundaries, artificial obstruction and clusters of trees.



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 (English Heritage 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 (English Heritage 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 (± 5 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 of potential archaeological interest 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 1:1500 (**Figures 2 to 4**). The data are displayed at -2nT (white) to +3nT (black) for the greyscale image and ± 25 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 Extremely weak positive magnetic responses at **4000** and **4001** show a curving linear feature aligned northwest-southeast and then turning westwards. This feature may continue along the route indicated by **4001** however the responses here are exceptionally weak and have been characterised as Possible Archaeology. They may represent ditch-like features often associated with enclosures. The scale of this potential enclosure is unknown due to the possible continuation of the features beyond the extents of the survey area.



- 3.2.2 Another linear feature with a magnetic strength of +1-2nT is evident at **4002** also aligned northwest-southeast similar to **4000**. This is a shorter length of ditch which does not continue to the survey extents but appears to terminate within the field.
- 3.2.3 Elsewhere in the survey are a small number of short linear or roughly oval-shaped positive anomalies that have been characterised as Possible Archaeology, such as at **4003**. These anomalies do not appear to form enclosures or larger features and are more consistent with possible pits or small sections of ditch. Due to their weak magnetic response and the fact that they do not form a significant spatial distribution they are also potentially natural in origin such as tree-throws or in response to changes in the superficial geology.
- 3.2.4 Weak positive responses at **4004** appear to show another small length of ditch-like feature on a northeast –southwest alignment.
- 3.2.5 Areas of positive and irregular shaped magnetic responses have been identified in several areas of the survey. They are large and broad in shape and response and form discontinuous areas. Responses such as these are often evident on sites where the superficial geological deposits are primarily sand and gravel based.
- 3.2.6 Numerous unidentified trends have been highlighted in the dataset, these show areas where magnetic responses either are extremely weak or present no clear pattern.

3.3 Modern Services

- 3.3.1 There were no modern services detected within the survey area. It should however 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 anomalies of potential archaeological interest throughout the site. In addition to these, anomalies interpreted as ploughing trends, areas of increased magnetic response and former field boundaries have also been identified.
- 4.1.2 The archaeological background of the Site suggests a potential for Bronze Age archaeology, however none of the features identified in the dataset correspond to the known features in the surrounding area. Features of archaeological potential onsite appear to be primarily ditch-like and pit-like features represented by extremely weak magnetic responses. This is due to the poor level of contrast to the background responses which are likely caused by the underlying geology. These features cannot be dated by the geophysics alone.
- 4.1.3 Frequent ploughing trends are visible across the Site on differing alignments. This is likely due to variable boundaries and different farming processes but these are likely to be medieval, post-medieval and modern in provenance.



5 REFERENCES

5.1 Bibliography

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 5, Soils of Midland and Western England*. Ordnance Survey: Southampton.

5.3 Online resources

British Geological Survey, <http://www.bgs.ac.uk> [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.

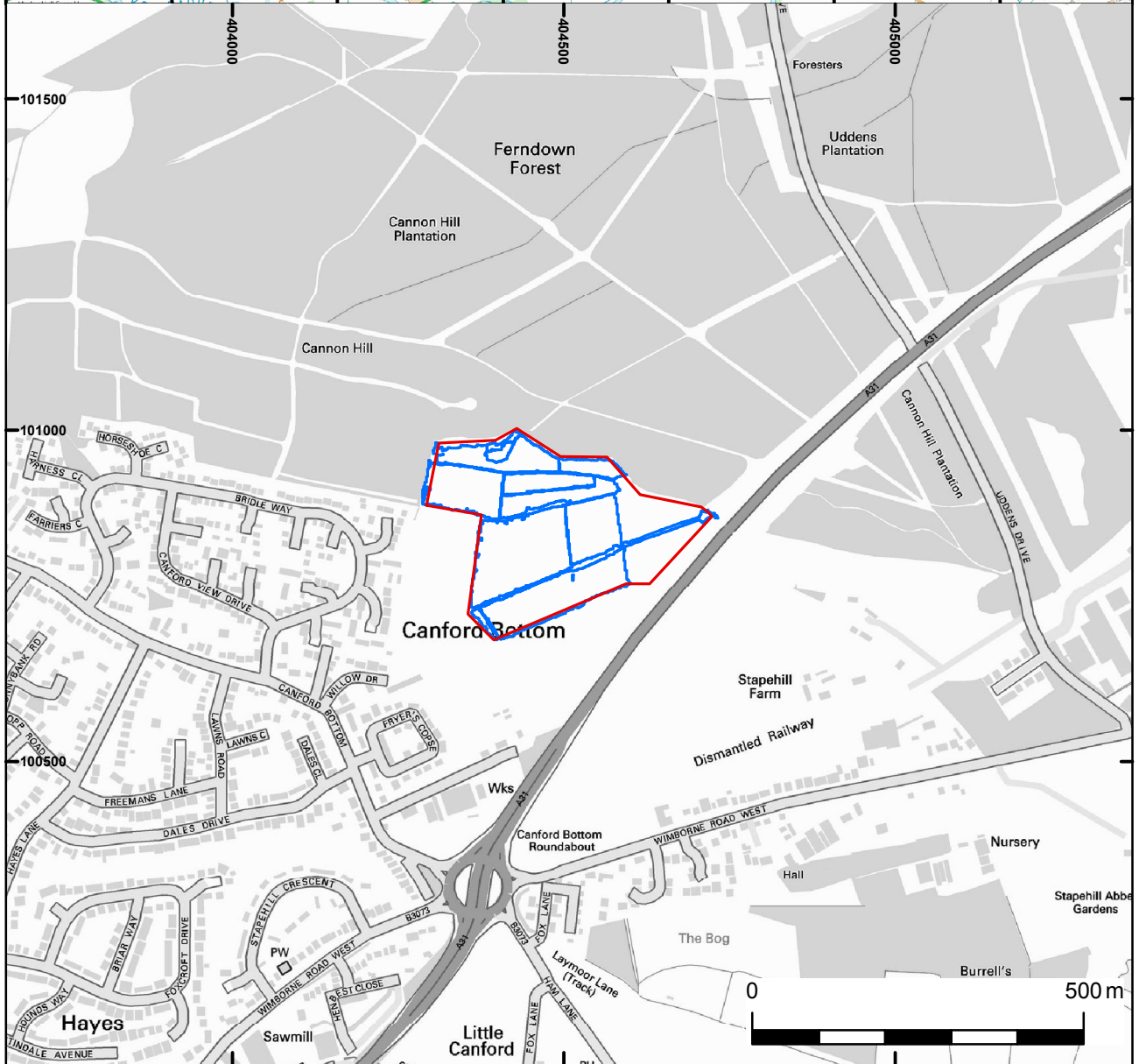
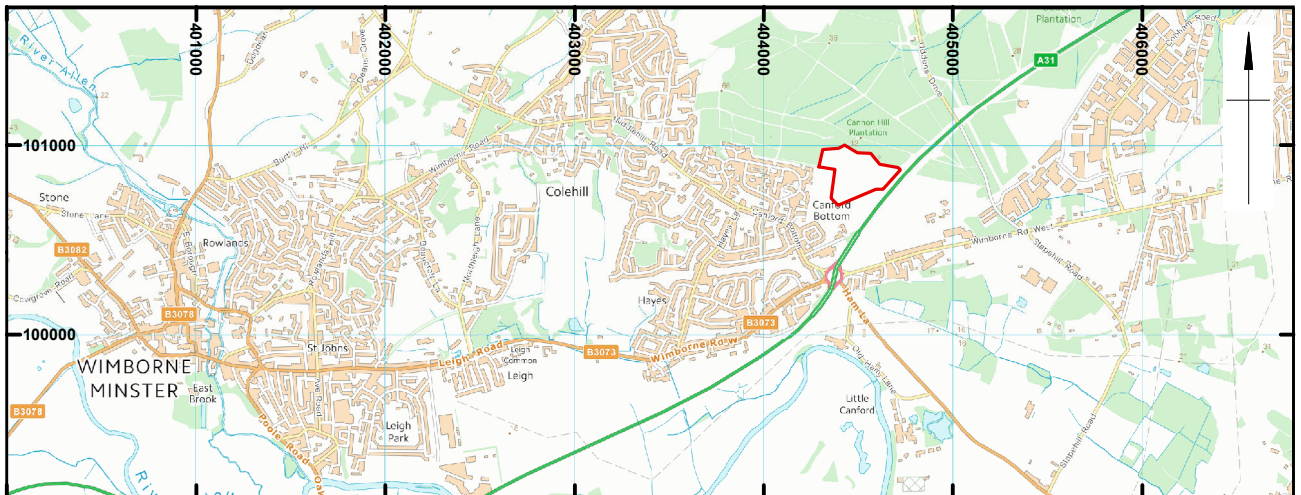
The archaeological category is used for features when the form, nature and pattern of the anomaly are indicative of archaeological material. Further sources of information such as aerial photographs may also have been incorporated in providing the final interpretation. This category is further sub-divided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

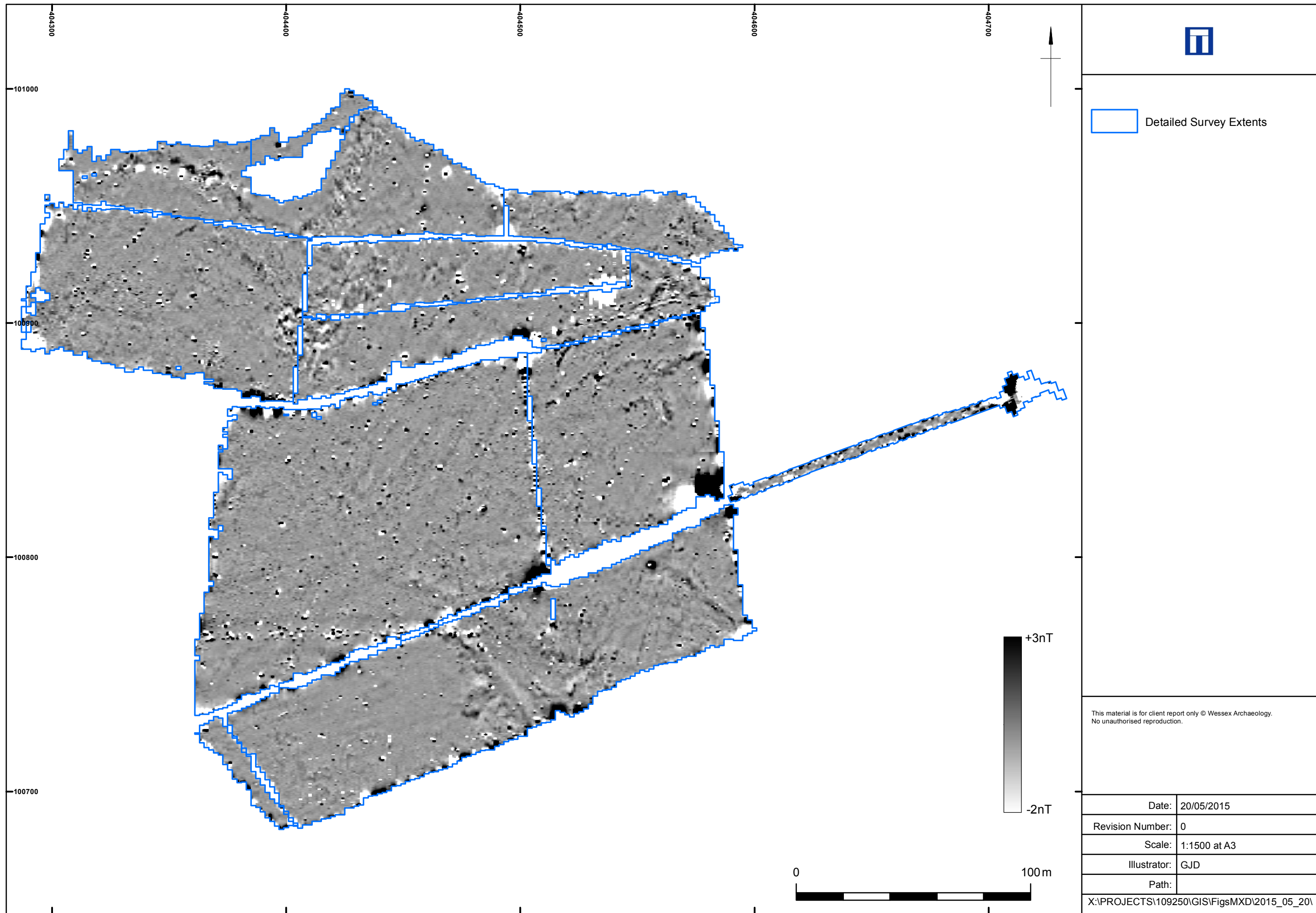
Finally, services such as water pipes are marked where they have been identified




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Site location and survey extents

Figure 1



 Detailed Survey Extents

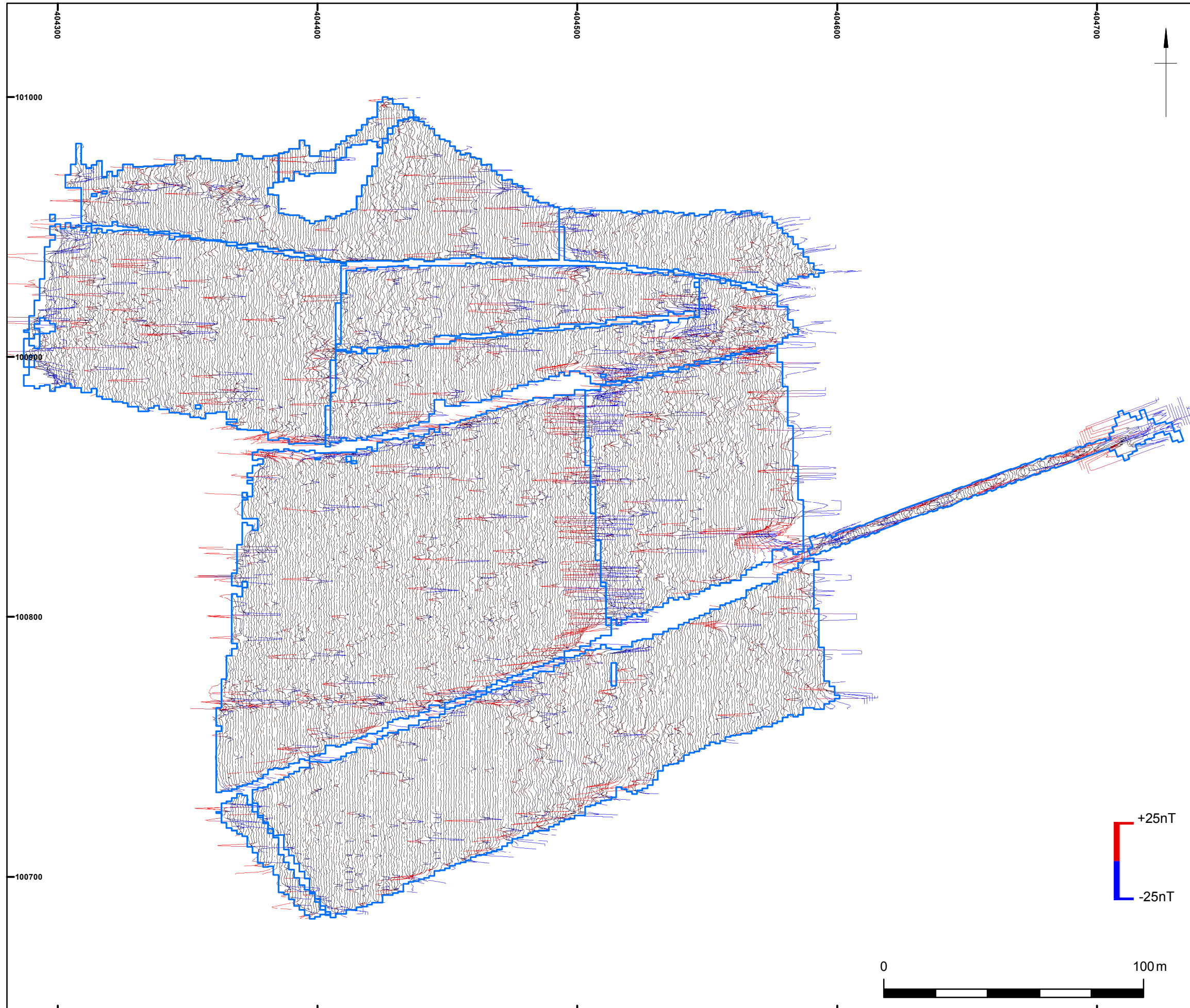
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Greyscale Plot

Figure 2





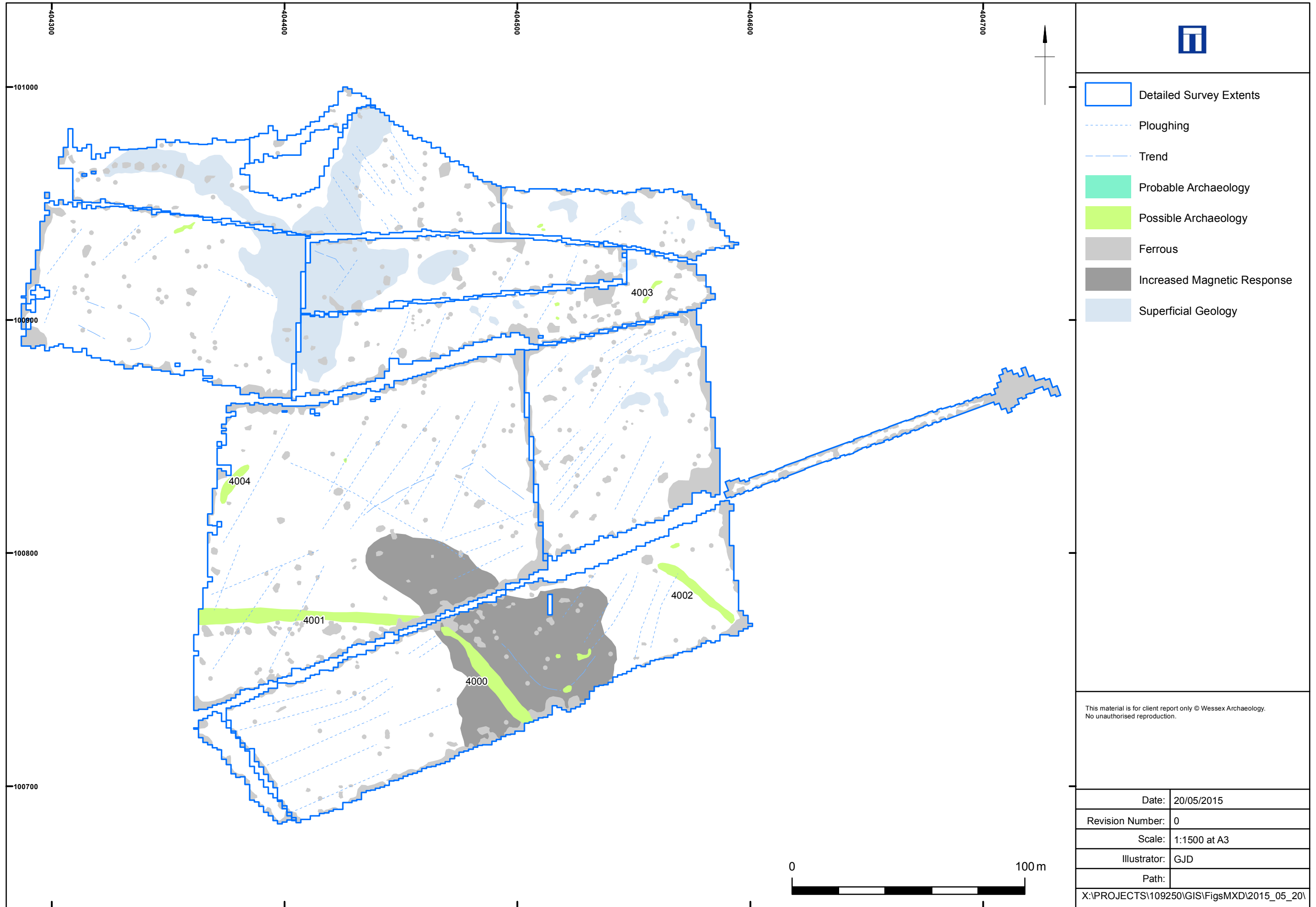
 Detailed Survey Extents

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XY Trace Plot

Figure 3





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