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**LAND AT  
WOODLANDS DRIVE  
COLSTERWORTH  
LINCOLNSHIRE**

**GEOPHYSICAL SURVEY**

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**Work undertaken for  
Larkfleet Homes Ltd**

**November 2012**

**Report produced by  
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**OASIS Ref: archaeo11-137614  
National Grid Reference: SK 93245 24388**

APS Report No: **88/12**

**ARCHAEOLOGICAL  
PROJECT  
SERVICES**





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## 1. SUMMARY

*Detailed magnetic gradiometer survey was undertaken for Larkfleet Homes Ltd, in connection with proposed residential development on land adjacent to Woodlands Drive, Colsterworth, Lincolnshire. The survey totalled 5.2ha.*

*A number of discrete and linear positive anomalies of probable archaeological origin were identified within the geophysical survey. These are concentrated in the south and east of the survey area, probably representing a series of enclosures and related linear features which may extend further to the south and east. A small number of possible (and possibly related) pit features can be seen further to the west, but none extend into the northern fields. The features in the south and east are overlain by a pattern of ridge and furrow cultivation showing more strongly in places, the medieval ploughing having possibly spread earlier occupation material.*

*Apart from possible continuation of the pattern of ridge and furrow nothing was picked up in the northern fields. A modern pipeline/service runs SW-NE across this area. Other strong bipolar responses reflect extant fencelines and subdivision of these fields.*

## 2. INTRODUCTION

### 2.1 Definition of an Evaluation

Geophysical survey is a non-intrusive method of archaeological evaluation. Evaluation is defined as *'a limited programme of non-intrusive and/or intrusive fieldwork which determines the presence or absence of archaeological features, structures, deposits, artefacts or ecofacts within a specified area or site. If*

*such archaeological remains are present Field Evaluation defines their character and extent, quality and preservation, and it enables an assessment of their worth in a local, regional, national or international context as appropriate'* (IFA 2008).

### 2.2 Background

Archaeological Project Services was commissioned by Larkfleet Homes to undertake detailed magnetometer survey totalling 5.2ha on land adjacent to Woodlands Drive, Colsterworth, Lincolnshire. The survey was carried out on the 24<sup>th</sup> to 26<sup>th</sup> October 2012.

### 2.3 Topography and Geology

Colsterworth lies 19km northwest of Stamford in the South Kesteven district of Lincolnshire. The site lies on the northern edge of the village, to the north of Woodlands Drive and east of the High Street, centred on National Grid Reference SK 93245 24388 (Figs 1, 2). It is situated at c. 100m AOD on a north-facing slope leading down to a small watercourse draining west into the upper reaches of the River Witham. Soils at the site are shallow well drained calcareous soils of the Elmton 1 Association developed on the Lincolnshire limestone (Hodge *et al.* 1984, 179; BGS 50000 scale digital geology).

## 3. GEOPHYSICAL SURVEY

### 3.1 Methods

Location and layout of the survey areas is shown in Figure 2. Area 1 comprises the larger, southern, field. Area 2 covers the northern fields. Both areas were down to pasture, the northern fields more closely cropped, but on the whole all in good condition for survey. A small area in the northwest corner of the site was used to

corral the horses occupying this field and was unavailable for survey. Weather was generally overcast and damp.

Survey was undertaken in accordance with English Heritage (2008) and IfA (2011) guidelines and codes of conduct.

The magnetic survey was carried out using a dual sensor Grad601-2 Magnetic Gradiometer manufactured by Bartington Instruments Ltd. This records subtle changes in the magnetic field resulting from differing features in the soil. Changes as small as 0.2 nanoTesla (nT) in an overall field strength of c. 49,000nT can be accurately detected using this instrumentation, although in practice instrument interference and soil noise can limit sensitivity.

The mapping of anomalies in a systematic manner allows interpretation of the type of material present beneath the surface. Strong magnetic anomalies are generated by buried iron-based objects or by kilns or hearths, usually resulting in a bipolar (positive/negative) response. More subtle positive anomalies representing pits and ditches can be seen where these contain more topsoil which is normally richer in magnetic iron oxides and provides a contrast with the natural subsoil (but this can vary depending on the nature of the underlying deposits). A negative anomaly may result from upcast bank material. Wall foundations can also show as negative anomalies where the stone is less magnetic than the surrounding soil, or as stronger positive and negative anomalies if of brick, but are not always responsive to the technique. It should be noted that not all features will be responsive and absence of anomalies does not necessarily indicate absence of archaeological features.

Magnetometers measure changes in the Earth's magnetic field. With two sensors

configured as a gradiometer the recorded values indicate the difference between two magnetic measurements separated by a fixed distance. The Grad601-2 consists of two high stability fluxgate gradiometers suspended on a single frame with a 1m separation between the sensing elements giving a strong response to deep anomalies.

#### *Sampling interval and data capture*

Readings were taken at 0.25m centres along traverses 1m apart. This equates to 3600 sampling points in a full 30m x 30m grid. The Grad 601 has a typical depth of penetration of 0.5m to 1.0m although a greater range is possible where strongly magnetic objects have been buried in the site.

Readings are logged consecutively into the data logger which is downloaded daily either into a portable computer whilst on site or directly to the office computer. At the end of each job, data is transferred to the office for processing and presentation.

#### *Processing and presentation of results*

Processing is performed using specialist ArcheoSurveyor software. This can emphasise various aspects contained within the data but which are often not easily seen in the raw data. Basic processing of the magnetic data involves flattening the background levels with respect to adjacent traverses and adjacent grids (Destripe or zero mean traverse). Despiking is also performed to reduce the effect of the anomalies resulting from small iron objects often found on agricultural land. Further processing can then be carried out which may include low pass filtering to reduce 'noise' in the data and hence emphasise the archaeological or man-made anomalies.

The following are the processing techniques carried out on the processed

gradiometer data used in this report:

1. DeStripe (sets the background mean of each traverse within a grid to zero and is useful for removing striping effects)

2. Despike (useful for display and allows further processing functions to be carried out more effectively by removing extreme data values)

Parameters: X radius = 1; Y radius = 1; Threshold = 3SD; Spike replacement = mean

3. Clip (excludes extreme values allowing better representation of detail in the mid range): -4 to 4nT and -5 to 5nT.

### 3.2 Results

The presentation of the data for the site involves a print-out of the raw or minimally processed data as greyscale and trace plots (Figs 3, 4, 6, 7; clipped for display but otherwise unprocessed), together with greyscale plots of the processed data (Figs 5, 8, 9). Magnetic anomalies have been identified and plotted onto an interpretative drawing (Fig. 10) and are described below.

#### *Positive linear anomalies*

A series of strong positive anomalies in the south and east of the survey area are indicative of ditched features of probable archaeological origin. These form two apparent enclosures at **A** and **B** with a number of possibly related linear features to the east and north. **C** is quite well defined, running NW-SE close to the eastern boundary. **D** runs on a similar alignment, possibly curving to join **E** and connecting with enclosures **A** and **B**. Although **E** is rather weaker and somewhat intermittent, the alignment is reinforced by the concentration of discrete pit-like anomalies along this line. **F** and **G** are quite different in character, very straight

and fitting in with the observed pattern of ridge and furrow. There may be a coincidence of alignment here, but it seems more likely that the stronger response is due to earlier occupation material being spread by medieval ploughing (**F** in particular passes through a large pit-like anomaly).

#### *Discrete positive anomalies*

These are largely concentrated in the same area of the field as the linear anomalies and probably represent related pit features. The majority spread in a roughly linear arrangement from the south of enclosures **A/B** towards **E**, with a further group towards the eastern boundary at **C**. A few more scattered discrete responses in the west of Area 1 may represent similar features.

#### *Agricultural features*

A series of fairly weak parallel linear responses can be seen in the east of the survey area probably reflecting earlier ridge and furrow cultivation. Two alignments are evident: southwest-northeast at the easternmost edge of the field and southeast-northwest immediately west of this. This latter arrangement extends north beyond the current boundary between Areas 1 and 2. The pattern probably extends further westward but is here aligned quite close to the direction of the survey transects which affects the clarity of representation (the standard destriping filter can adversely affect parallel features on or near to the traverse alignment).

#### *Modern/magnetic disturbance*

Strong bipolar responses occur alongside extant boundaries owing to the presence of metallic/electric fencing. The more extensive noisy response in the southwest corner of Area 1 at **H** probably reflects some larger dumped or buried metallic items here. Strong linear bipolar responses

I across Area 2 indicate the presence of modern piped services/utility. A more intermittent line of bipolar responses J across the eastern side of Area 2 probably reflects some relatively recent, perhaps temporary, subdivision of this land parcel.

*Iron spikes (discrete bipolar anomalies)*

Iron items within the topsoil give a distinctive localised bipolar (strong positive with associated strong negative) response. Such items usually derive from relatively recent management or agricultural use of the land – broken or discarded pieces of agricultural machinery or other modern debris. These are fairly widely scattered but without any particular concentration.

#### 4. DISCUSSION

A number of discrete and linear positive anomalies of probable archaeological origin have been identified within the geophysical survey. These are concentrated in the south and east of the survey area probably representing a series of enclosures and related linear features which may extend further to the south and east. A small number of possible (and possibly related) pit features can be seen further to the west, but none extend into the northern fields. The features in the south and east are overlain by a pattern of ridge and furrow cultivation showing more strongly in places, the medieval ploughing having possibly spread earlier occupation material.

Strong modern disturbance due to dumped or buried metallic items is evident in the southwest corner. Apart from possible continuation of the pattern of ridge and furrow nothing was picked up in the northern fields. A modern pipeline/service runs SW-NE across these fields. Other strong bipolar responses reflect extant

fencelines and subdivision of these fields.

#### 5. ACKNOWLEDGEMENTS

Archaeological Project Services wishes to acknowledge the assistance of Tony Sibson of Larkfleet Homes who commissioned the project and arranged access. Tom Lane (APS) edited the report.

#### 6. PERSONNEL

Project coordinator: Gary Taylor  
Geophysical Survey: Neil Jefferson, Jonathon Smith  
Survey processing and reporting: Steve Malone

#### 7. BIBLIOGRAPHY

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Hodge, C.A.H., Burton, R.G.O., Corbett, W.M., Evans, R. and Seale, R.S., 1984 *Soils and their use in Eastern England*, Soil Survey of England and Wales **13**

IfA, 2008 *Standard and Guidance for Field Evaluation*.

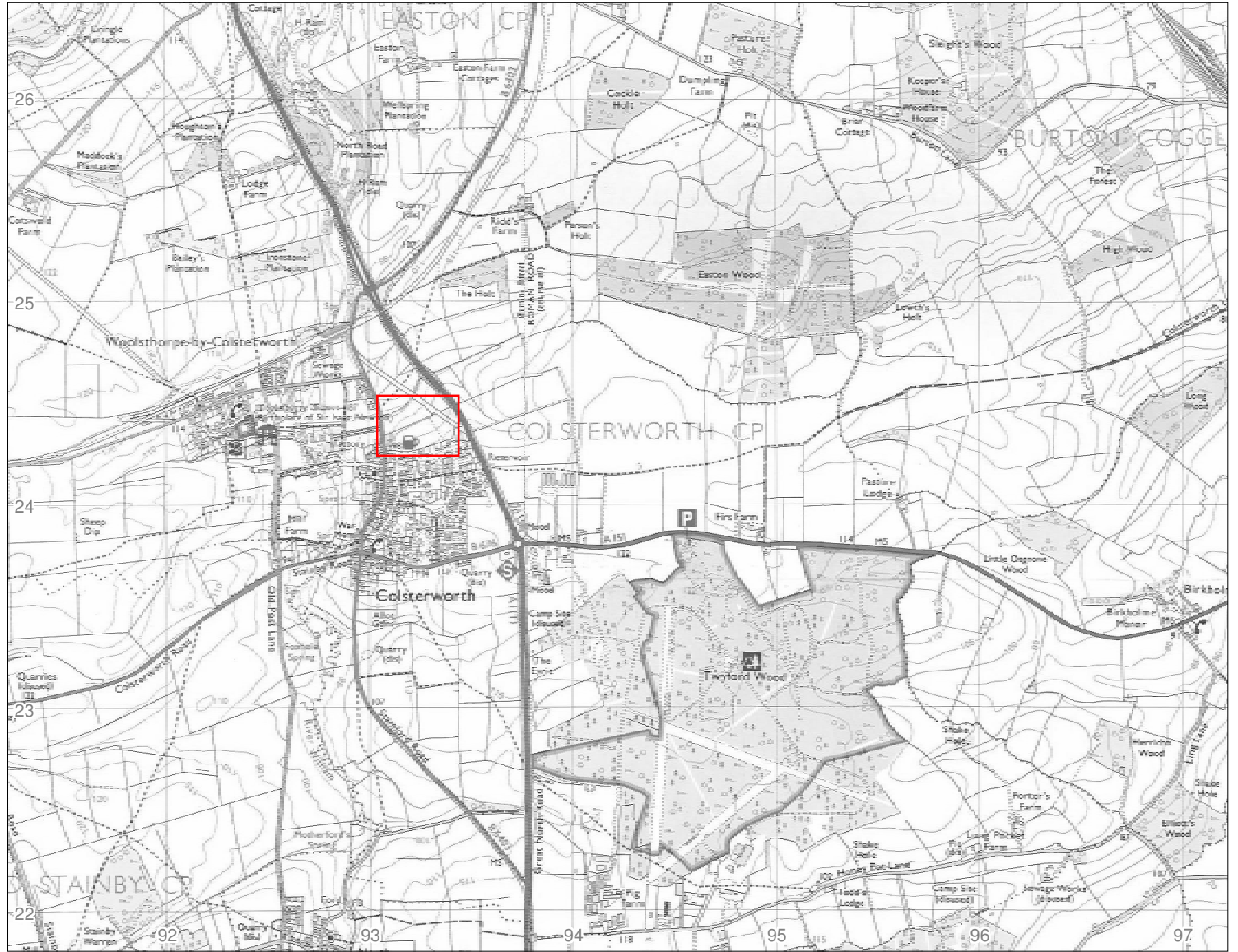
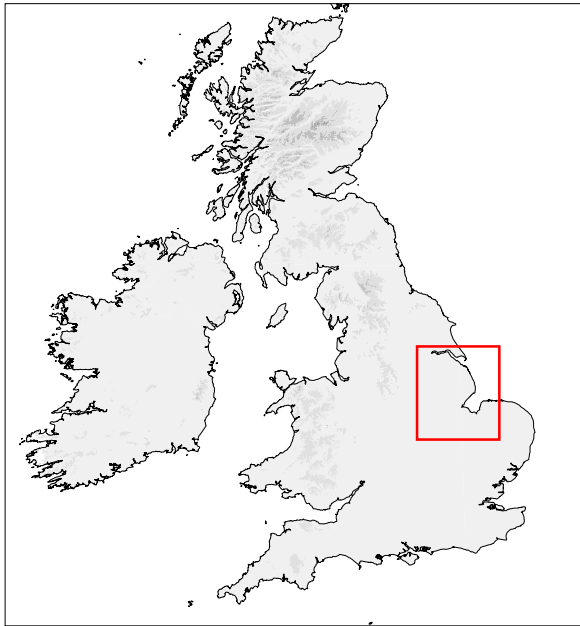
IfA, 2011 *Standard and Guidance for Geophysical Survey*.

#### 8. ABBREVIATIONS

BGS British Geological Survey

IfA Institute for Archaeologists





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 <b>Archaeological Project Services</b>		
<b>Project: Colsterworth Woodlands Drive</b>		
Scale: varies	Drawn by: SJM	Report No: 88/12

Figure 1 Site location map

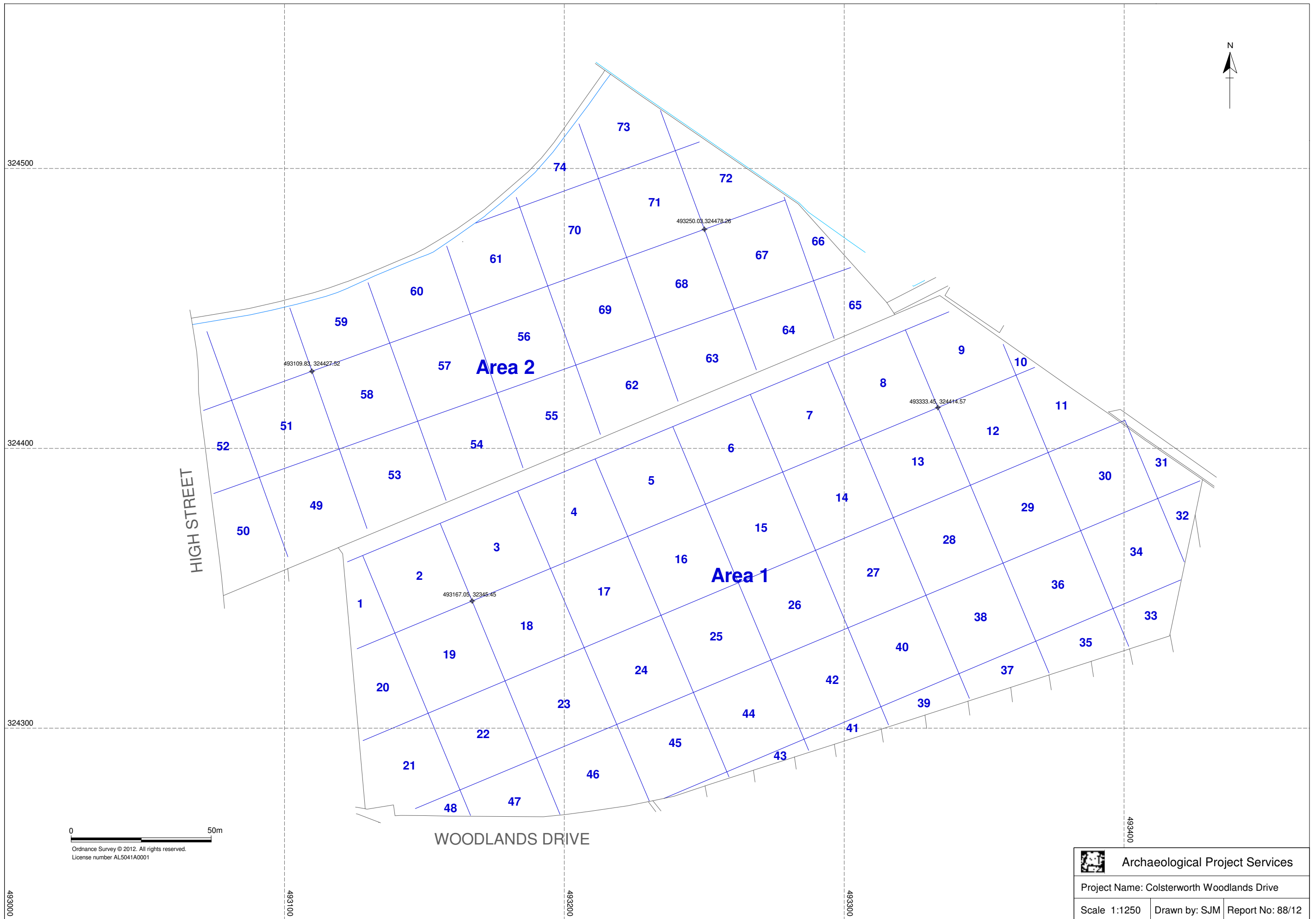
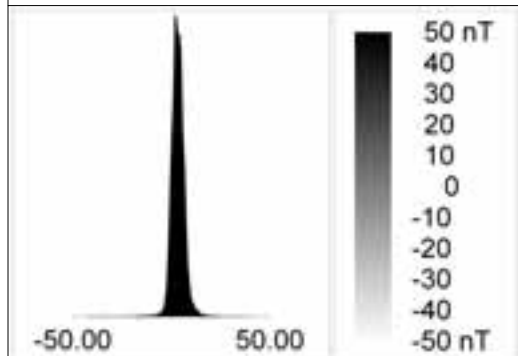
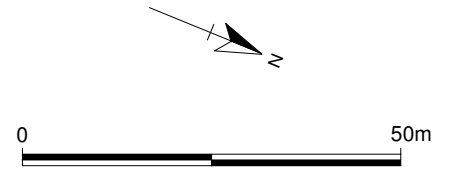
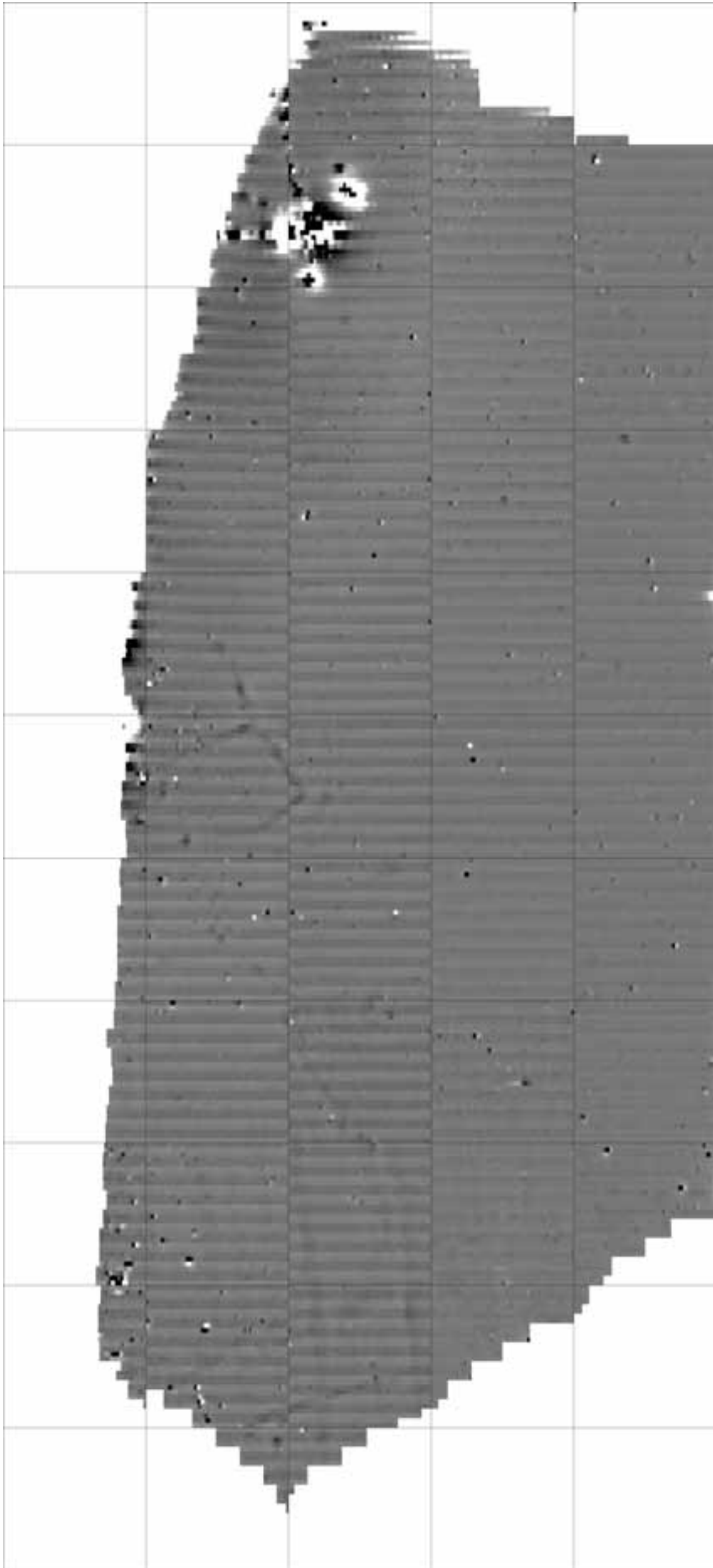


Figure 2 Location and layout of survey area




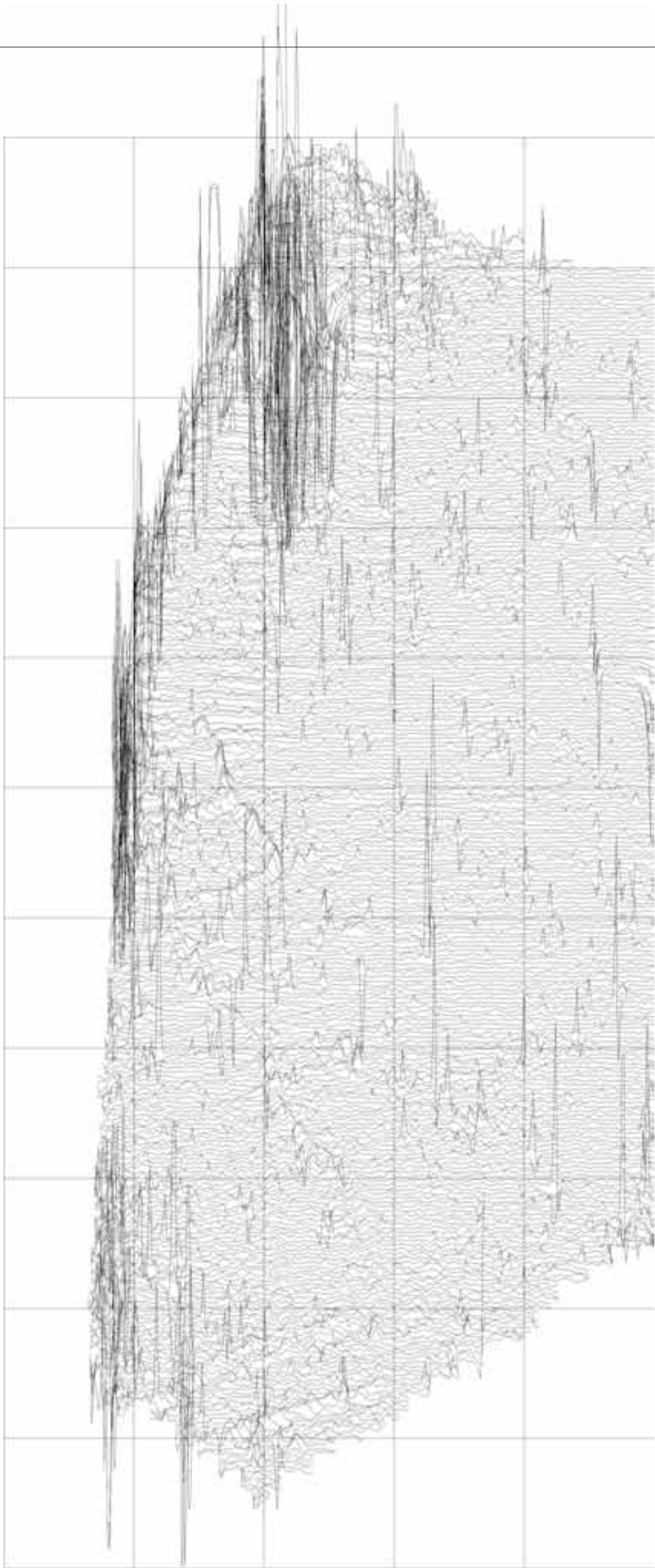
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Project Name: Colsterworth Woodlands Drive  
Scale 1:1000 | Drawn by: SJM | Report No: 88/12

Figure 3 Area 1: minimally processed data greyscale plot



0 50m

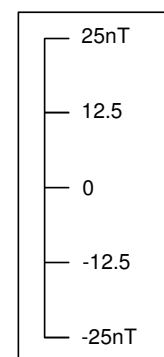
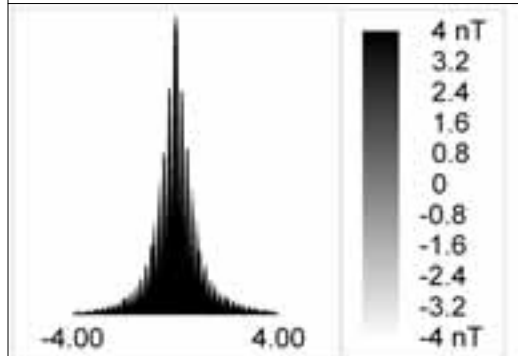
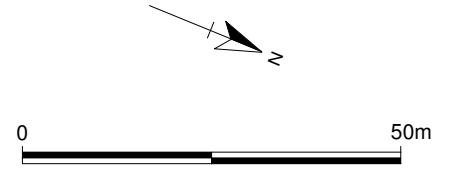
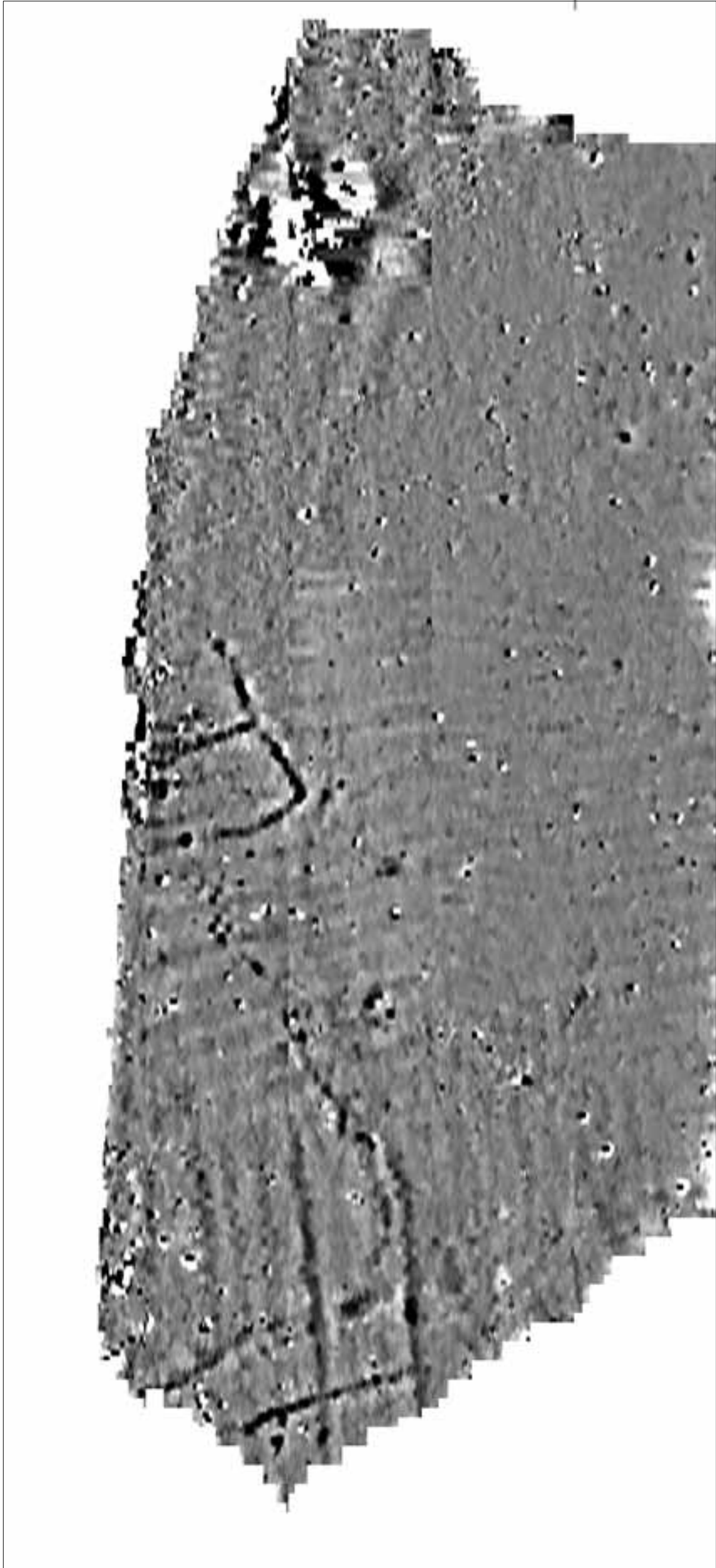


Figure 4 Area 1: minimally processed data trace plot




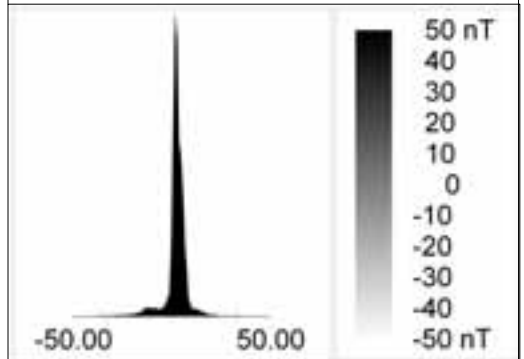
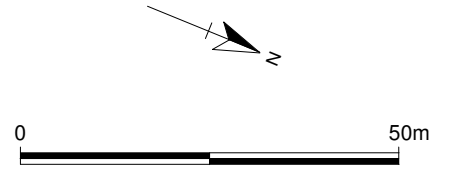
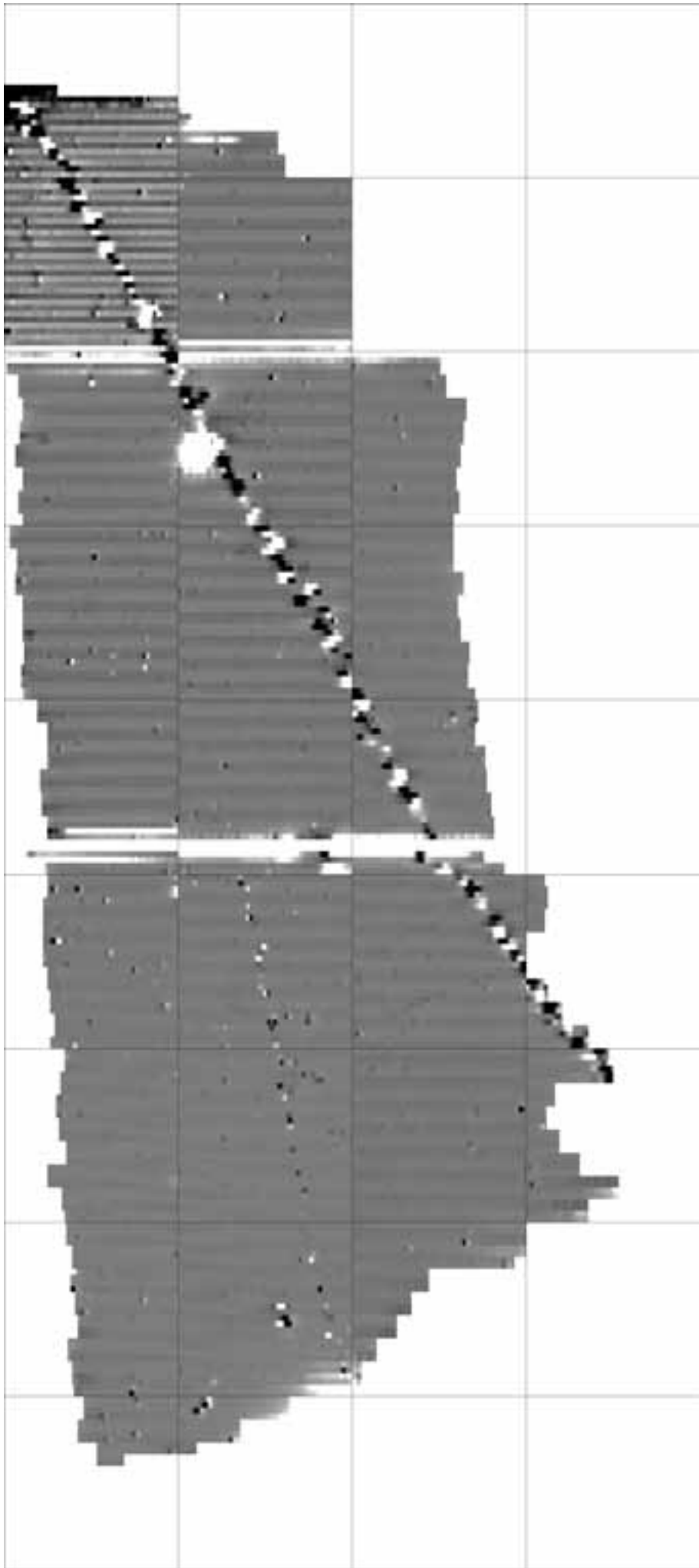

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Scale 1:1000 | Drawn by: SJM | Report No: 88/12

Figure 5 Area 1: processed data greyscale plot

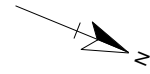
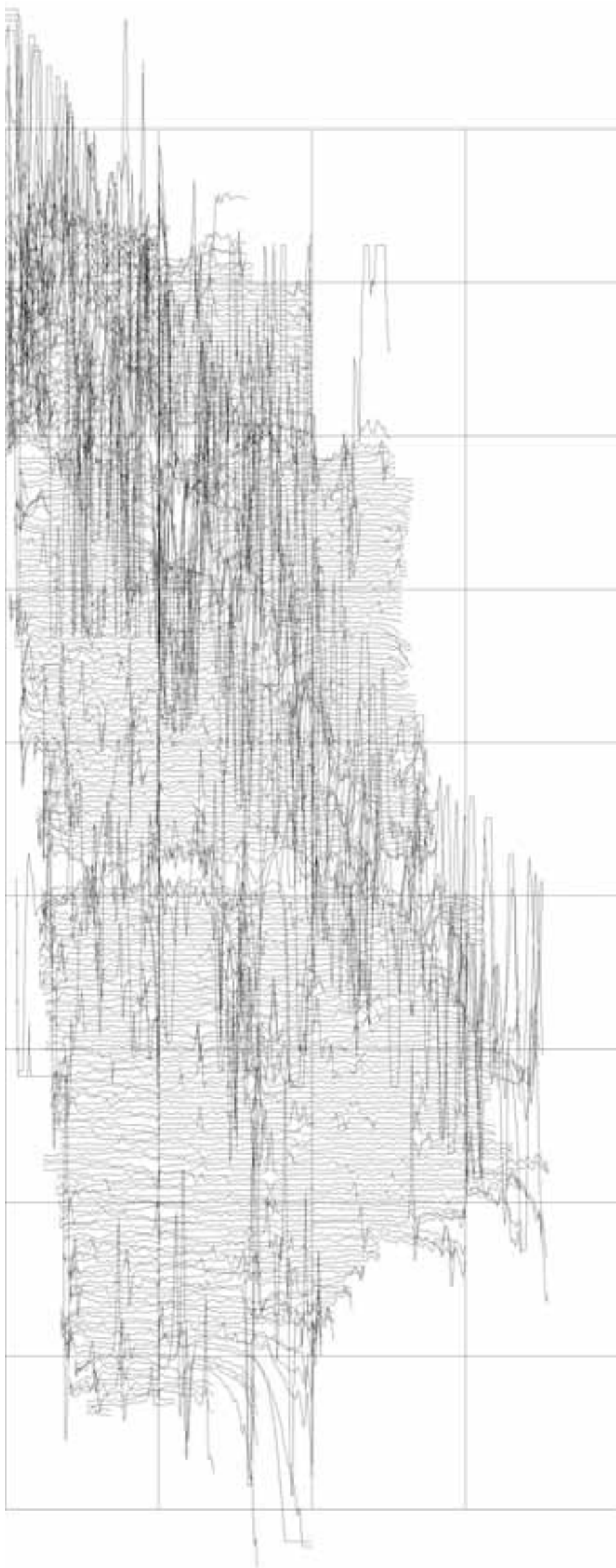


 Archaeological Project Services

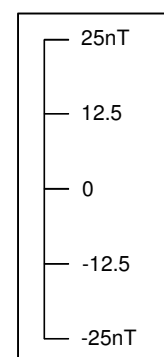
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Figure 6 Area 2: minimally processed data greyscale plot



0 50m




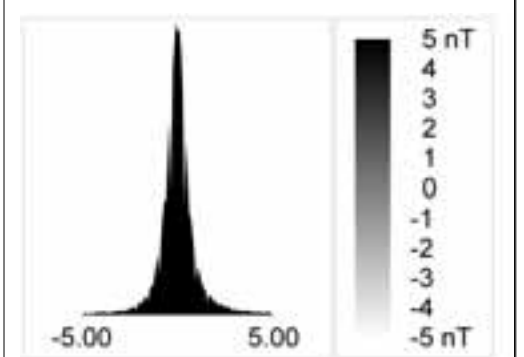
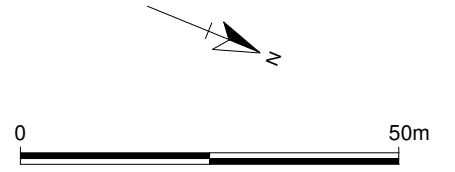
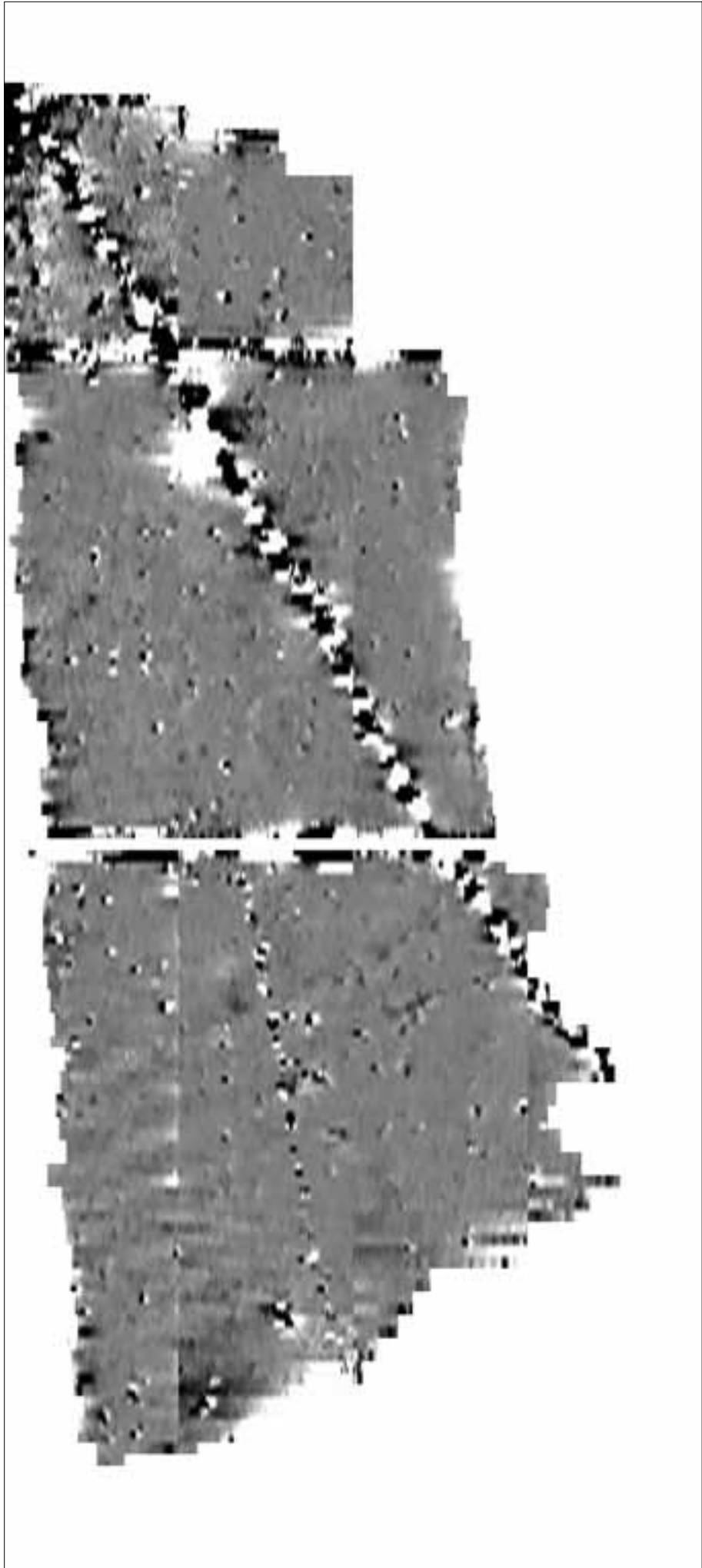
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Figure 7 Area 2: minimally processed data trace plot




 Archaeological Project Services  
Project Name: Colsterworth Woodlands Drive  
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Figure 8 Area 2: processed data greyscale plot



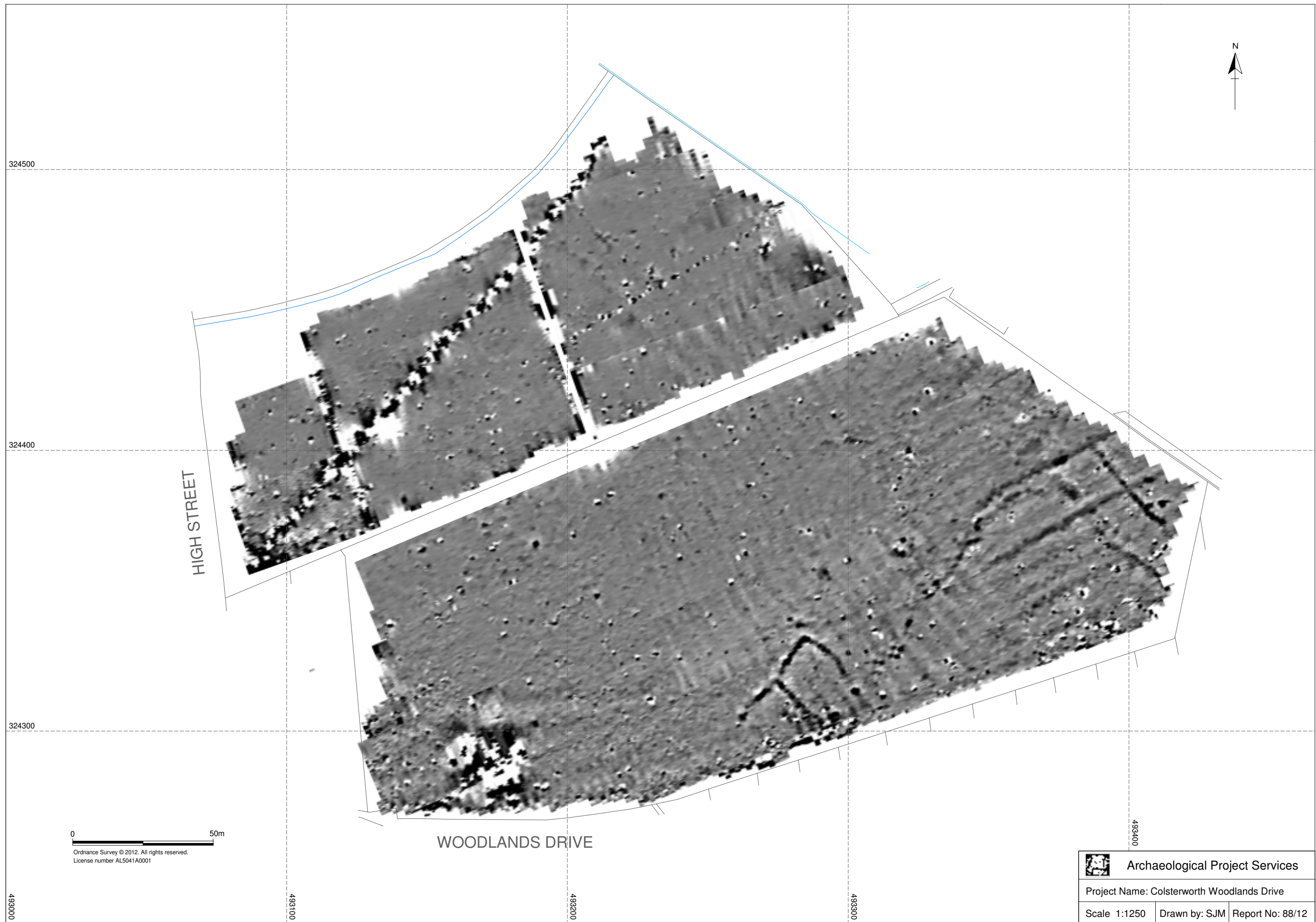


Figure 9 Areas 1 and 2 processed survey greyscales

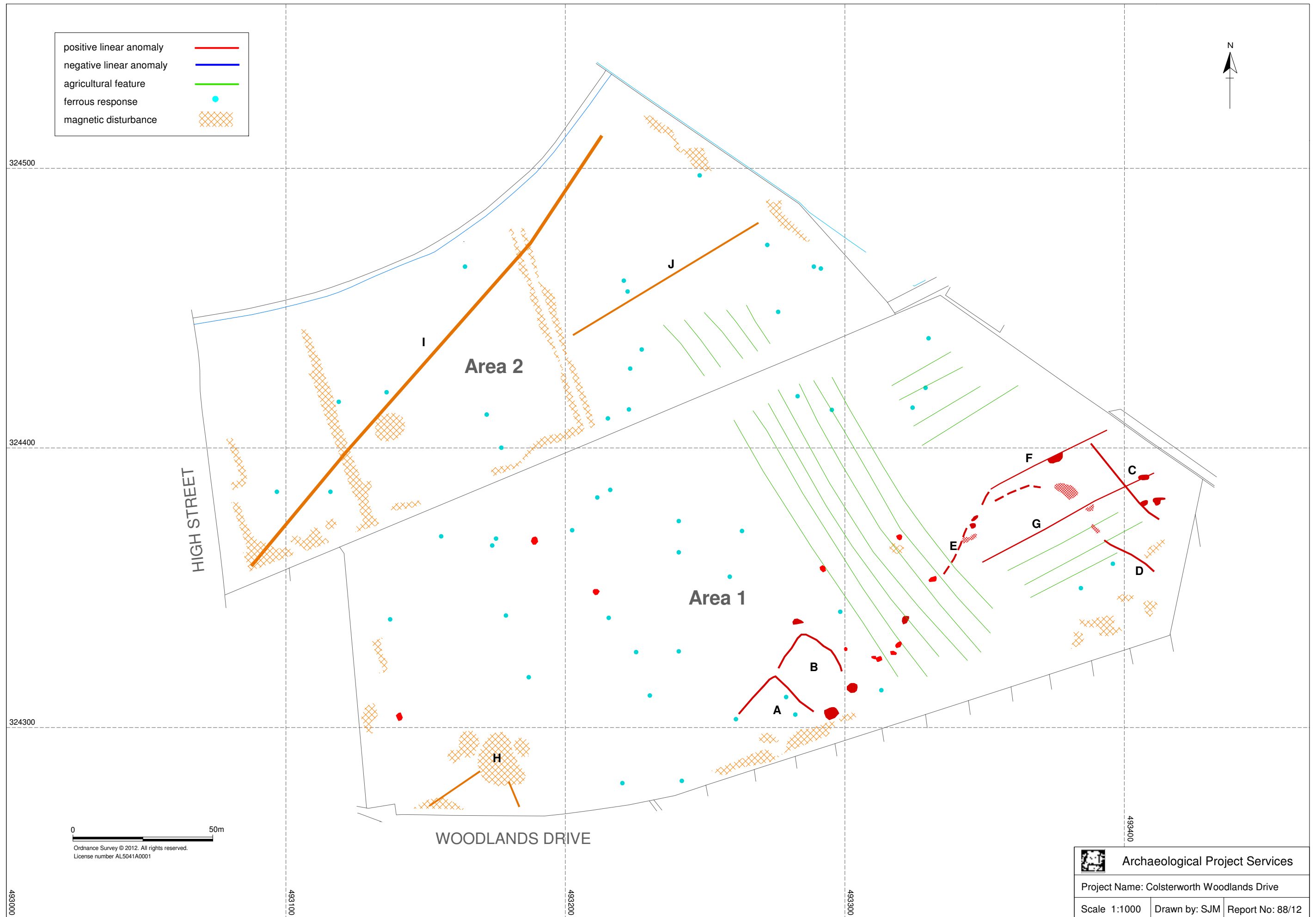


Figure 10 Areas 1 and 2 interpretative plot

## Appendix 1 THE ARCHIVE

The archive consists of:

- 3 Daily record sheets
- 1 Report text and illustrations
- Digital data

File names	cowl12-01.xgd cowl12-02.xgd cowl12-03.xgd cowl12-04.xgd cowl12-05.xgd cowl12-06.xgd cowl12-07.xgd cowl12-08.xgd cowl12-09.xgd cowl12-10.xgd cowl12-11.xgd cowl12-12.xgd cowl12-13.xgd cowl12-14.xgd cowl12-15.xgd cowl12-16.xgd cowl12-17.xgd cowl12-18.xgd cowl12-19.xgd cowl12-20.xgd cowl12-21.xgd cowl12-22.xgd cowl12-23.xgd cowl12-24.xgd cowl12-25.xgd cowl12-26.xgd cowl12-27.xgd	cowl12-28.xgd cowl12-29.xgd cowl12-30.xgd cowl12-31.xgd cowl12-32.xgd cowl12-33.xgd cowl12-34.xgd cowl12-35.xgd cowl12-36.xgd cowl12-37.xgd cowl12-38.xgd cowl12-39.xgd cowl12-40.xgd cowl12-41.xgd cowl12-42.xgd cowl12-43.xgd cowl12-44.xgd cowl12-45.xgd cowl12-46.xgd cowl12-47.xgd cowl12-48.xgd cowl12-49.xgd cowl12-50.xgd cowl12-51.xgd cowl12-52.xgd cowl12-53.xgd cowl12-54.xgd	cowl12-55.xgd cowl12-56.xgd cowl12-57.xgd cowl12-58.xgd cowl12-59.xgd cowl12-60.xgd cowl12-61.xgd cowl12-62.xgd cowl12-63.xgd cowl12-64.xgd cowl12-65.xgd cowl12-66.xgd cowl12-67.xgd cowl12-68.xgd cowl12-69.xgd cowl12-70.xgd cowl12-71.xgd cowl12-72.xgd cowl12-73.xgd cowl12-74.xgd cowl12-75.xgd cowl12-76.xgd cowl12-77.xgd cowl12-78.xgd  cowl12-c1.xcp cowl12-c2.xcp
Explanation of codes used in file names	xgd files are magnetometer grids, named with site code and number in the order surveyed. xcp files are composites containing record of all the data and processes used to produce the end product		
Description of file formats	All files are in plain text xml format with header data defining survey and processing parameters		
List of codes used in files	D indicates a "dummy" value within the composite data		
Hardware, software and operating systems	ArcheoSurveyor 2.5.15 running under Windows XP Service Pack 3		
Date of last modification	30/10/12		
Indications of known areas of weakness in data			

All primary records are currently kept at:

Archaeological Project Services, The Old School, Cameron Street, Heckington, Sleaford, Lincolnshire NG34 9RW

The ultimate destination of the project archive is:

Lincolnshire City and County Museum  
 The Collection  
 Danes Terrace  
 Lincoln  
 LN2 1LP

Accession number:  
APS Site Code:

LCNCC:2012.160  
COWD12

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