(NET PHASE 2)
TOTON PARK AND RIDE
TOTON LANE
NOTTINGHAM

GEOPHYSICAL SURVEY

Work undertaken for
SLR Consulting

January 2012

Report produced by
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OASIS Ref: archaeol1-117633
National Grid Reference: 449700 335900

APS Report No: **6/12**

ARCHAEOLOGICAL
PROJECT
SERVICES

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1. SUMMARY

Detailed magnetic gradiometer survey was undertaken for SLR Consulting, acting on behalf of VINCI Construction UK Ltd, in connection with construction of a park and ride facility and tram terminus at Toton Lane, Toton, Nottingham. The survey totalled 6ha.

Few clearly archaeological features have been identified within the geophysical survey. A strong L-shaped anomaly may represent a cut feature although the response is strong and akin to more obviously modern responses elsewhere. Two sides of a possible enclosure can be seen as a negative response and may represent an archaeological feature. Although only faintly expressed, the alignment crosses a former field boundary and does not clearly conform to the modern field layout.

Very strong bipolar responses occur extensively in the west of Area 1 covering a large area south of the hardstanding and immediately east of Toton Lane. Online aerial photography shows this to be the former site of a travelling circus. Large amounts of metallic debris may account for the responses here, although the intensity of the response could indicate infill/made ground.

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 SLR Consulting on behalf of VINCI Construction UK Ltd, in connection with construction of a park and ride facility and tram terminus at Toton Lane (B6003), Toton, Nottingham. The survey totalled 6ha and was carried out between the 9th and 12th January 2012.

2.3 Topography and Geology

Thie site is located c. 8km southwest of Nottingham city centre. The park and ride site lies site lies on the north edge of Toton adjacent to Toton Lane immediately south of Bardills Garden Centre at NGR 449700 335900 (Fig. 1).

The site is situated between *c*. 50m and 60m AOD on higher ground above the valley of the River Trent to the south. The area is fairly level lying at the head of a small west-east stream running though Chilwell and down to the river. The bedrock geology comprises Tarporley Siltstone in the south and west of the site; Mercia Mudstone in the north and east. The majority of the site is currently arable agricultural land with areas of hardstanding and dumped rubble at the western and northern edges.

2.4 Archaeological Background

Archaeological background to the site is laid out in the Environmental Statement prepared for the scheme (ERM 2006).

A series of cropmarks have been identified

at Wheatgrass Farm, approximately 350m to the north of the east end of the survey area. Although undated, these may represent ditched enclosures or boundaries of archaeological significance.

Two Roman coins have been found at separate points in Highfield Road, Chilwell, approximately 500m south-east of the east end of the survey area, suggests a Roman site of some archaeological potential in this area.

3. AIMS AND OBJECTIVES

The aims and objectives of the survey were:

Aims

- to contribute to establishing the extent and significance of any archaeological remains which may exist within the Site.

Objectives

- to establish the location, and extent of any archaeological features which provide suitable magnetic responses; and

- to identify the extent of any areas devoid of archaeological features.

4. GEOPHYSICAL SURVEY

4.1 Methods

The location and layout of the survey area are shown in Figure 2. The survey extended over five or six land parcels (some partially amalgamated). For the purposes of survey and reporting these are broken down into Areas 1 to 4. Weather and ground conditions during the survey were dry. The majority of the area was under arable cultivation with low cereal crop and in good condition for survey. Hardstanding and dumped rubble precluded survey in the northwest part of the site. The western side of Area 1 was under short grass, but very overgrown in the southwest corner.

Survey was undertaken in accordance with a WSI from Mouchel (2011) and method statement from SLR (2011), and with English Heritage (2008) and IfA (2010) guidelines and codes of conduct.

The magnetic survey was carried out using a dual sensor Grad601-2 Magnetic Gradiometer manufactured by Bartington Instruments Ltd. Although the changes in the magnetic field resulting from differing features in the soil are usually weak, 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 an estimate of the type of material present beneath the surface. Strong magnetic anomalies will be generated by buried iron-based objects or by kilns or hearths. More subtle anomalies representing pits and ditches can be seen where they 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). Wall foundations can 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 ArchaeoSurveyor 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. 'Despiking' is also performed to remove the anomalies resulting from small iron objects often found on agricultural land. Once the basic processing has flattened the background it is then possible to carry out further processing which may include low pass filtering to reduce 'noise' in the data and hence emphasise the archaeological or man-made anomalies.

The following shows 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): +/-3 nT or +/-2nT.

4.2 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, 7, 8, 11, 12), together with greyscale plots of the processed data (Figs 5, 9, 13, 15). Magnetic anomalies have been identified and plotted onto interpretative drawings (Figs 6, 10, 14, 16) and are described below.

Areas 1 and 2 (Figs 3-6)

Positive linear anomalies
Positive anomalies of possible archaeological origin are sparse. An L-shaped feature **A** may represent a cut feature although the response is strong and akin to more obviously modern responses. A series of much fainter straight parallel and closely-spaced linear anomalies across the centre of the area is doubtless agricultural in origin.

Negative linear anomalies
A faint linear negative response at **B** runs east-west crossing a former field boundary before turning southwards (here possibly

shadowed by an internal positive response, but the north/south alignment is very close to that of the agricultural features). Although only faintly responsive, the east/west part at least does not conform to the modern layout and the whole feature may represent an archaeological feature. Two further negative linear responses **C** and **D** run parallel to, and either side of, an extant boundary and probably relate to modern land use.

Area positive anomalies
The survey area is generally 'noisy'. Localised anomalies, even where not obvious bipolar spikes, are difficult to interpret given the degree of modern disturbance. Most within the plot represent little more than individual elevated readings and none are distinctive as to form.

Modern/magnetic disturbance
Very strong bipolar responses occur extensively in the west of Area 1 south of the area of hardstanding and alongside Toton Lane. Some variation within this can be seen in the unclipped plot (Fig. 3) but overall the concentration of magnetic material here completely overwhelms any potential subtler responses. Magnetic disturbance is seen more widely alongside boundaries and former boundaries and in localised area responses (**E**, **F**, **G**) which perhaps reflect larger buried items. The electricity pylons in Area 2 have also had a strong effect on adjacent instrument readings.

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 across all the survey areas with concentrations around the larger areas of disturbance. They are not noted further.

Area 3 (Figs 7-10)

Agricultural features
Parallel north/south responses are visible towards the western end of the area. These are parallel to the extant field boundary and of probable agricultural origin.

Area 4 (Figs 11-14)

Negative linear anomalies
Two faint negative linear responses at **H** run parallel to the extant field boundary and probably relate to modern land use.

Modern/magnetic disturbance
A very strong bipolar response is present at the northwest corner of the plot adjacent to the field boundary and the entrance into this field from the north indicating some large metal item either buried or in the hedgerow.

5. DISCUSSION

Few clearly archaeological features have been identified within the geophysical survey. A strong L-shaped anomaly may represent a cut feature although the response is akin to more obviously modern responses elsewhere. Two sides of a possible enclosure can be seen as a negative response. Although only faintly expressed, the alignment crosses a former field boundary and does not clearly conform to the modern field layout. This may represent an archaeological feature. Elswhere, faint parallel linear anomalies appear to reflect only modern agricultural use of these fields.

Very strong bipolar responses occur

extensively in the west of Area 1 covering a large area south of the hardstanding and immediately east of Toton Lane. Online aerial photography shows this to have been the site of a travelling circus, presumably on a regular basis. Large amounts of metallic debris may account for the responses here, although the intensity of the response could indicate infill/made ground. Magnetic disturbance is also seen more widely alongside boundaries and former boundaries and in localised area responses which perhaps reflect larger buried items.

6. ACKNOWLEDGEMENTS

Archaeological Project Services wishes to acknowledge the assistance of Gavin Kinsley of SLR who commissioned the project on behalf of VINCI Construction UK Ltd provided background information on the site, and reviewed the report. Tom Lane (APS) edited the report.

7. PERSONNEL

Project coordinator: Steve Malone
Geophysical Survey: Andy Failes, Jonathon Smith, Bryn Leadbetter
Survey processing and reporting: Steve Malone

8. BIBLIOGRAPHY

Clark, A., 1996. *Seeing Beneath the Soil*, London, 2nd edn.

English Heritage, 2008. *Geophysical Survey in Archaeological Field Evaluation.*

ERM 2006. *Nottingham Express Transit Phase Two Environmental Statement*, (Archaeology and Cultural Heritage dealt with in Chapter 11).

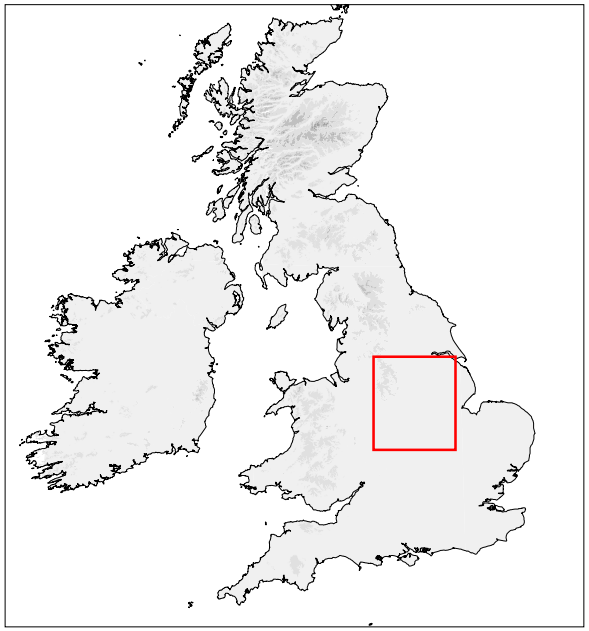
IfA, 2011. *Standard and Guidance for Geophysical Survey.*

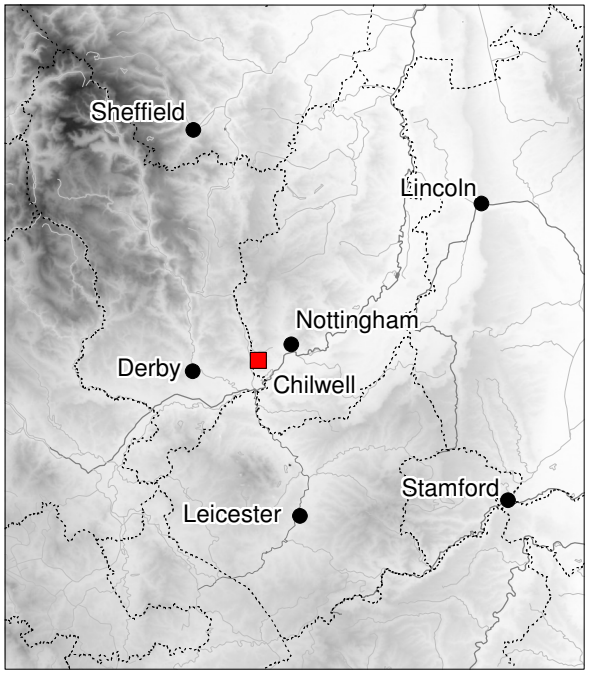
Mouchel, October 2011. *Written Scheme of Investigation for Geophysical Survey NET2 Work Package B16.*

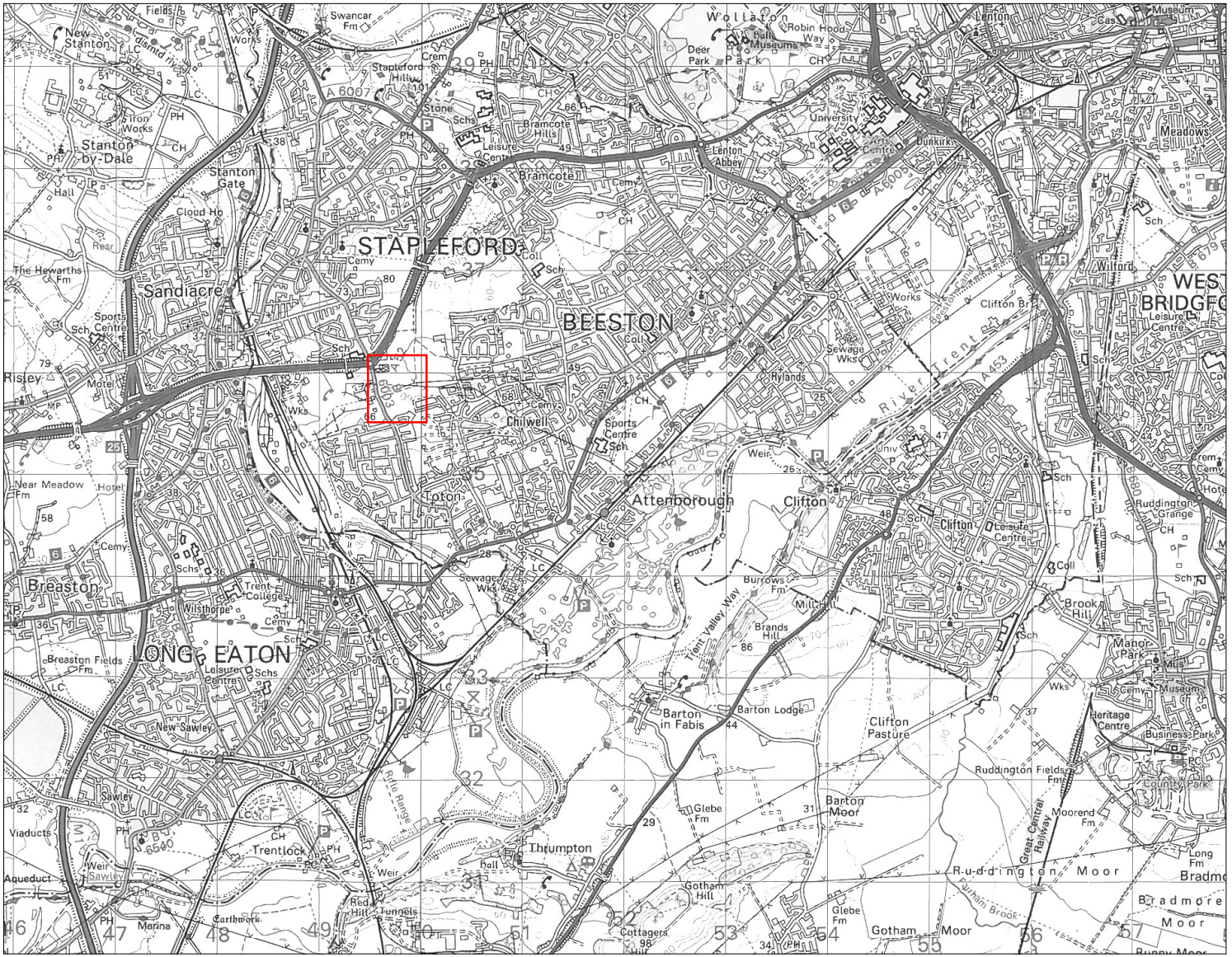
SLR Consulting, December 2011. *Nottingham Express Transit Phase 2- Toton Park and Ride; Method Statement for Geophysical Survey.*

9. ABBREVIATIONS

APS	Archaeological Project Services
BGS	British Geological Survey
EH	English Heritage
IfA	Institute for Archaeologists
HER	Historic Environment Record







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Archaeological Project Services		
Project: Chilwell Park and Ride (CPRG11)		
Scale: varies	Drawn by: SJM	Report No: 6/12

Figure 1 Site location map

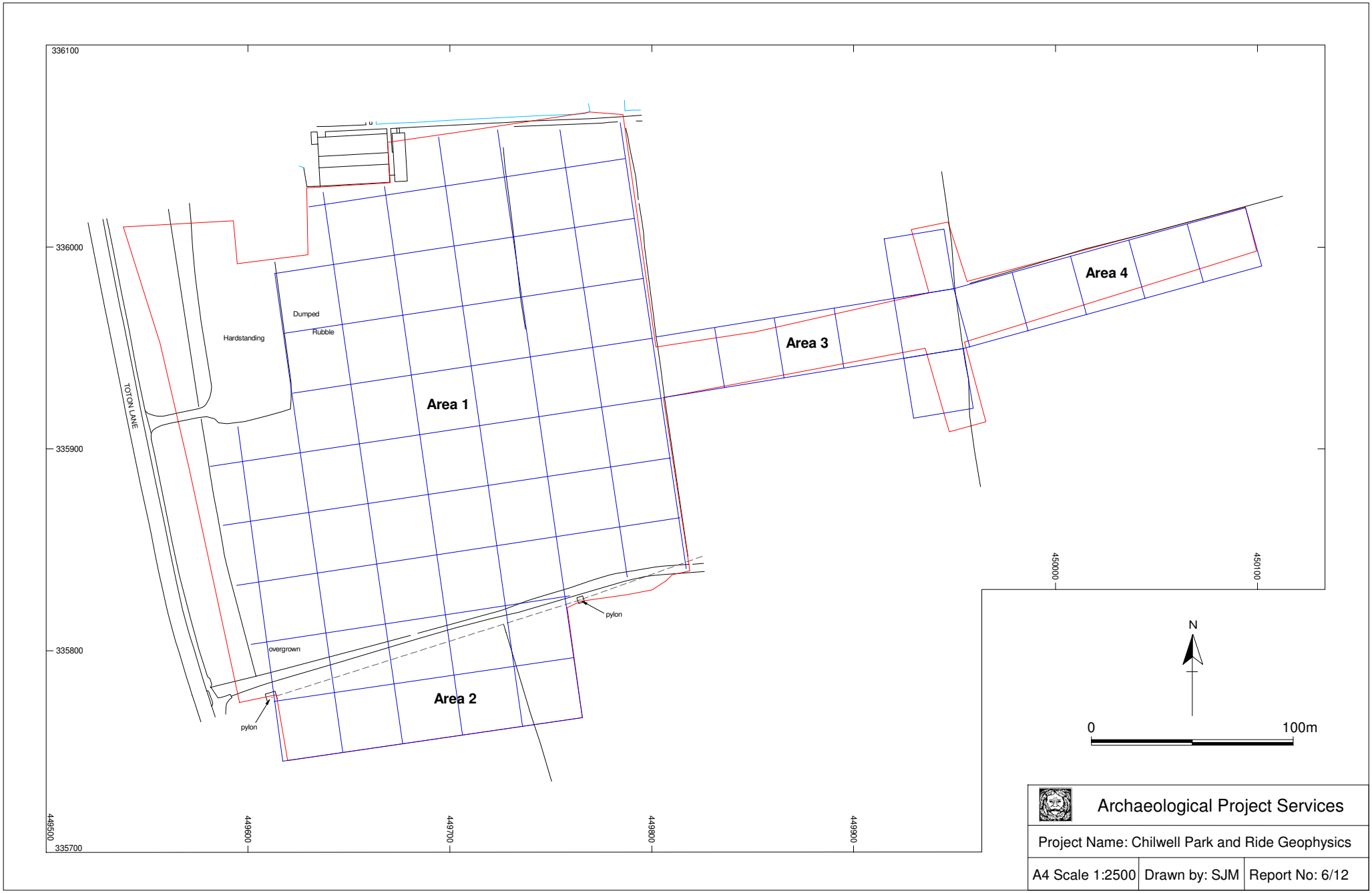


Figure 2 Location and layout of survey areas

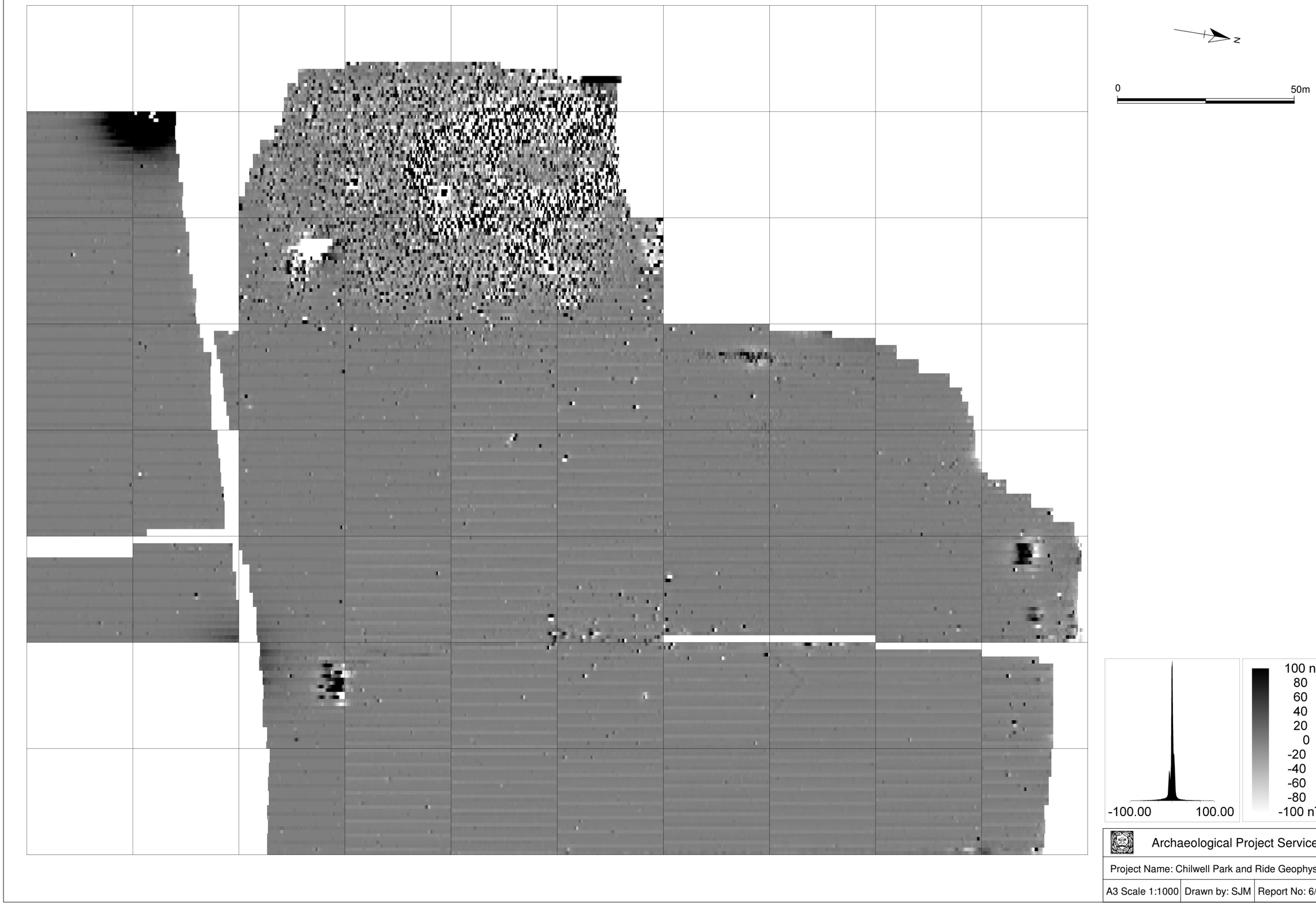


Figure 3 Areas 1 and 2 unprocessed data greyscale plot

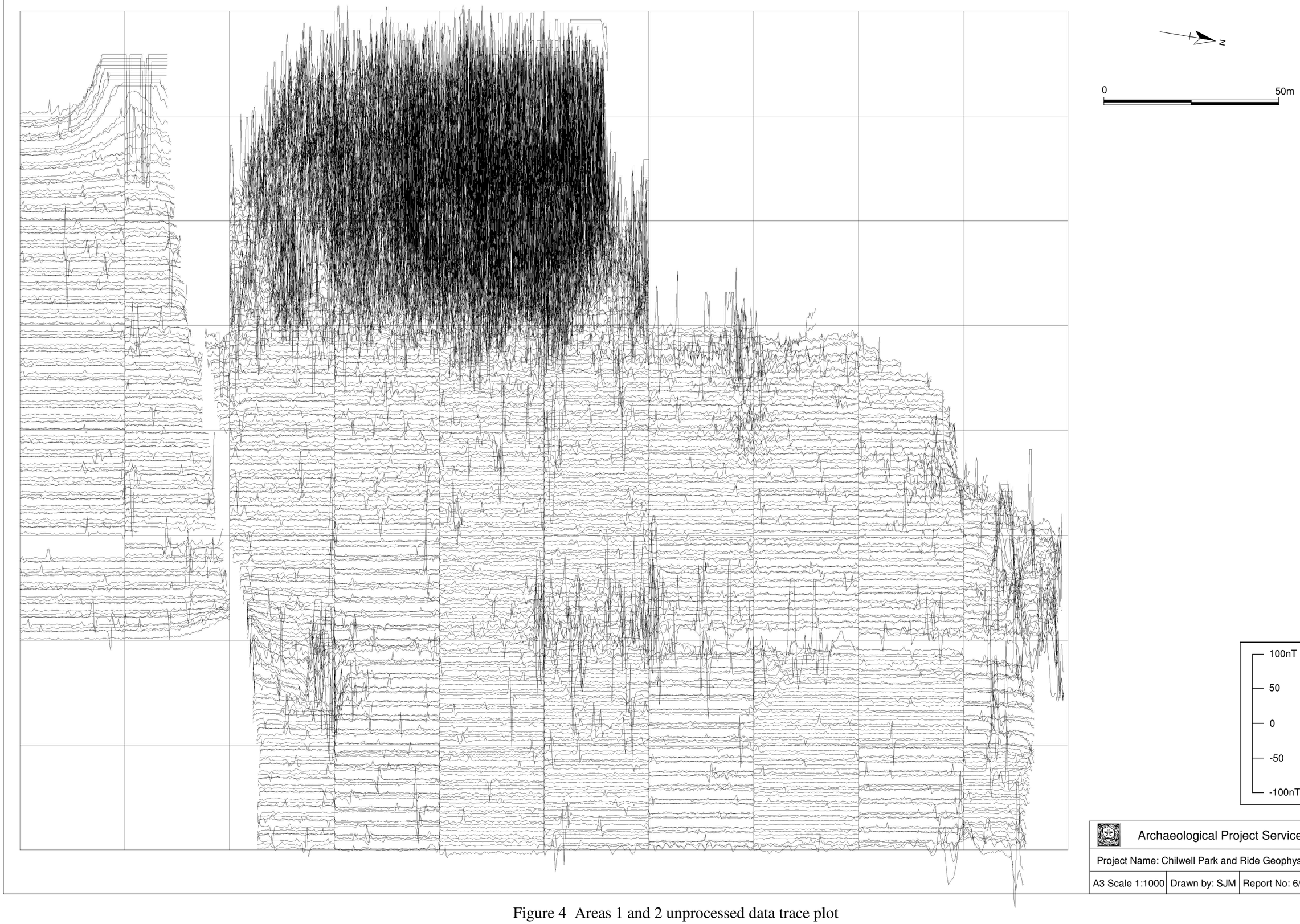


Figure 4 Areas 1 and 2 unprocessed data trace plot

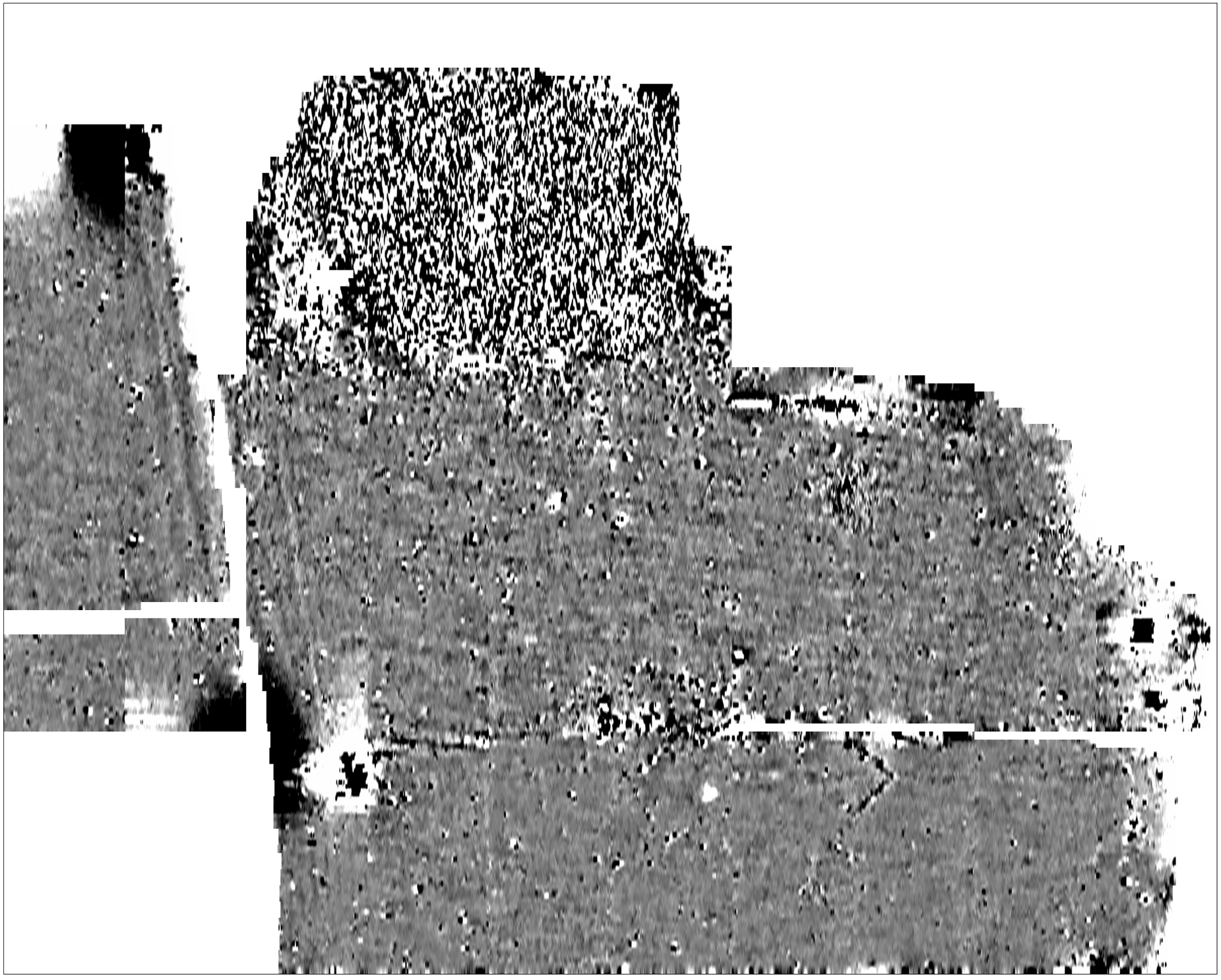


Figure 5 Areas 1 and 2 Processed data greyscale plot

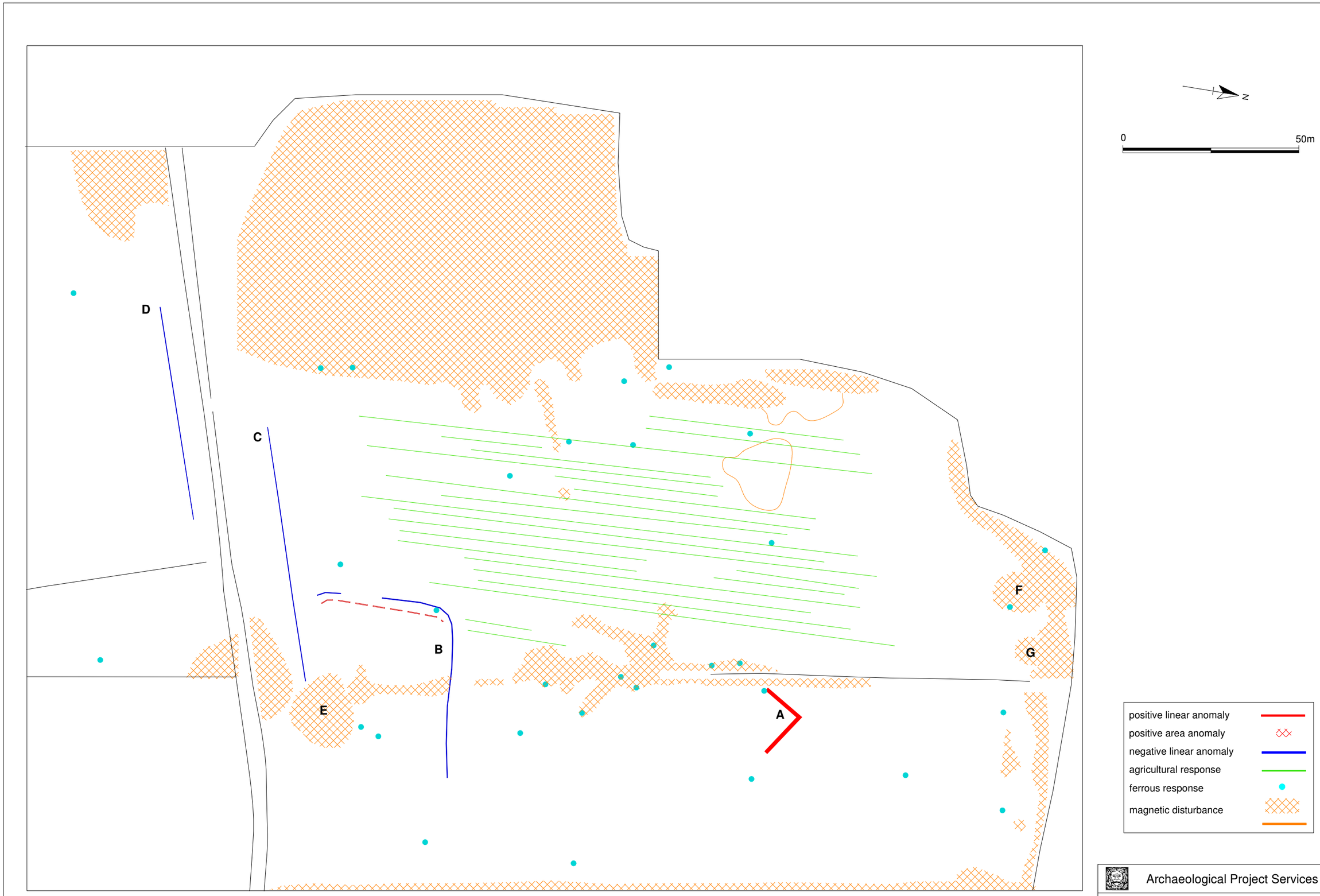


Figure 6 Areas 1 and 2 interpretative plot

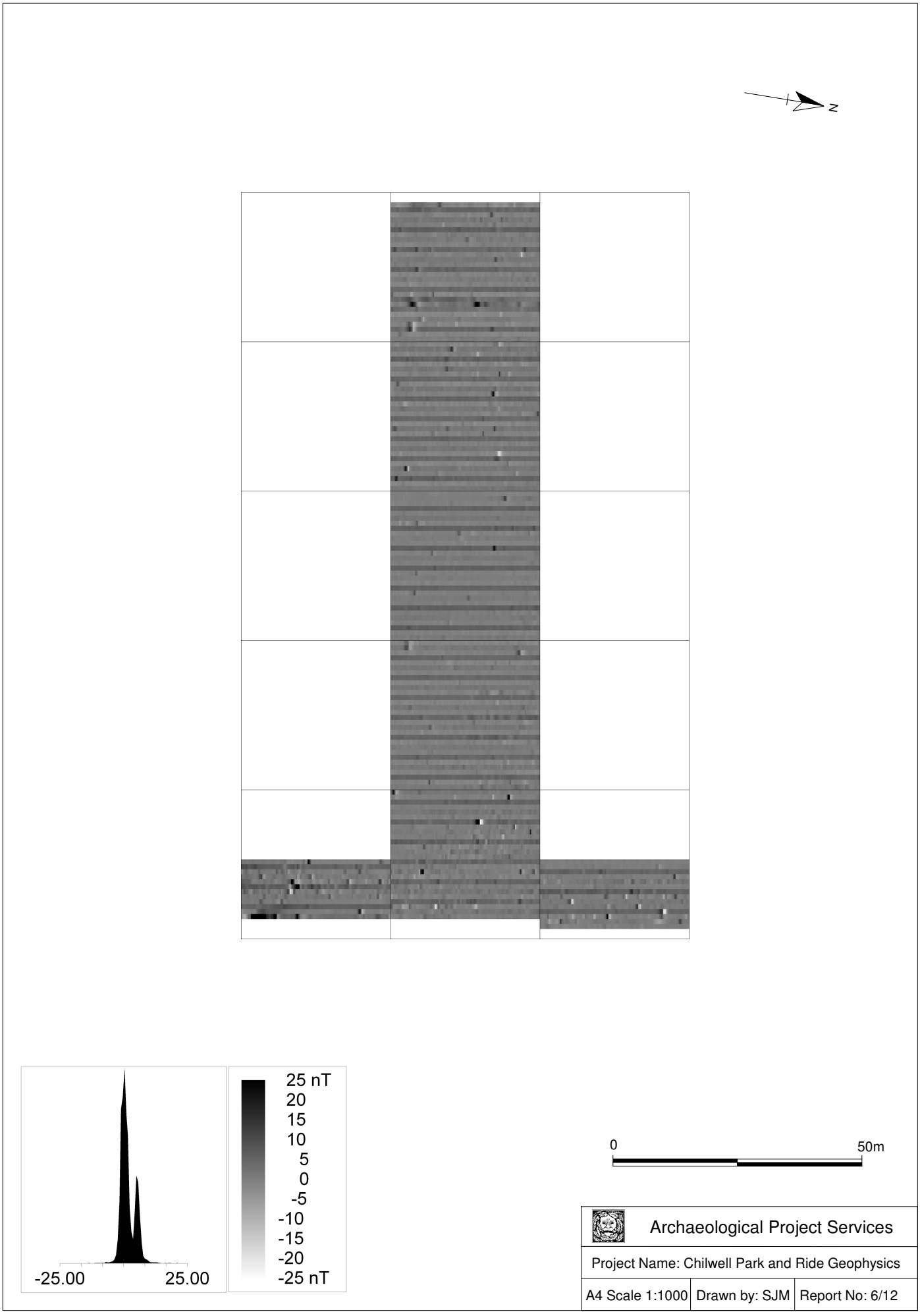
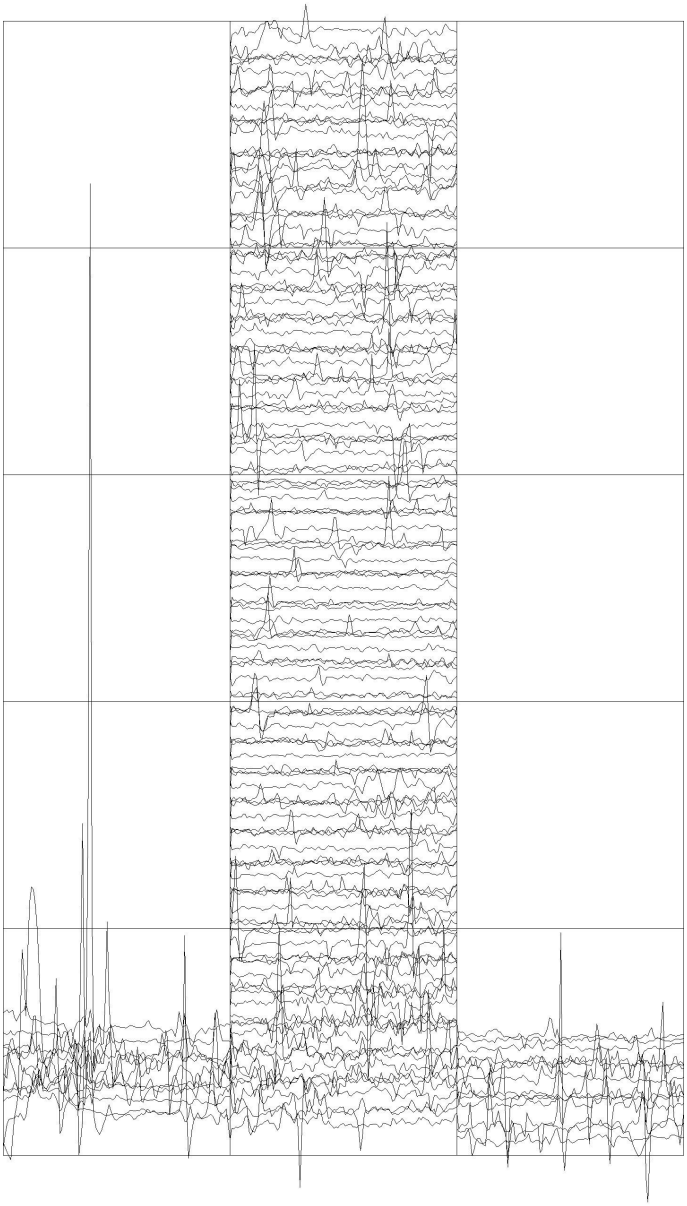


Figure 7 Area 3 unprocessed data greyscale plot



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25
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-25
-50nT

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Archaeological Project Services

Project Name: Chilwell Park and Ride Geophysics

A4 Scale 1:1000	Drawn by: SJM	Report No: 6/12

Figure 8 Area 3 unprocessed data trace plot

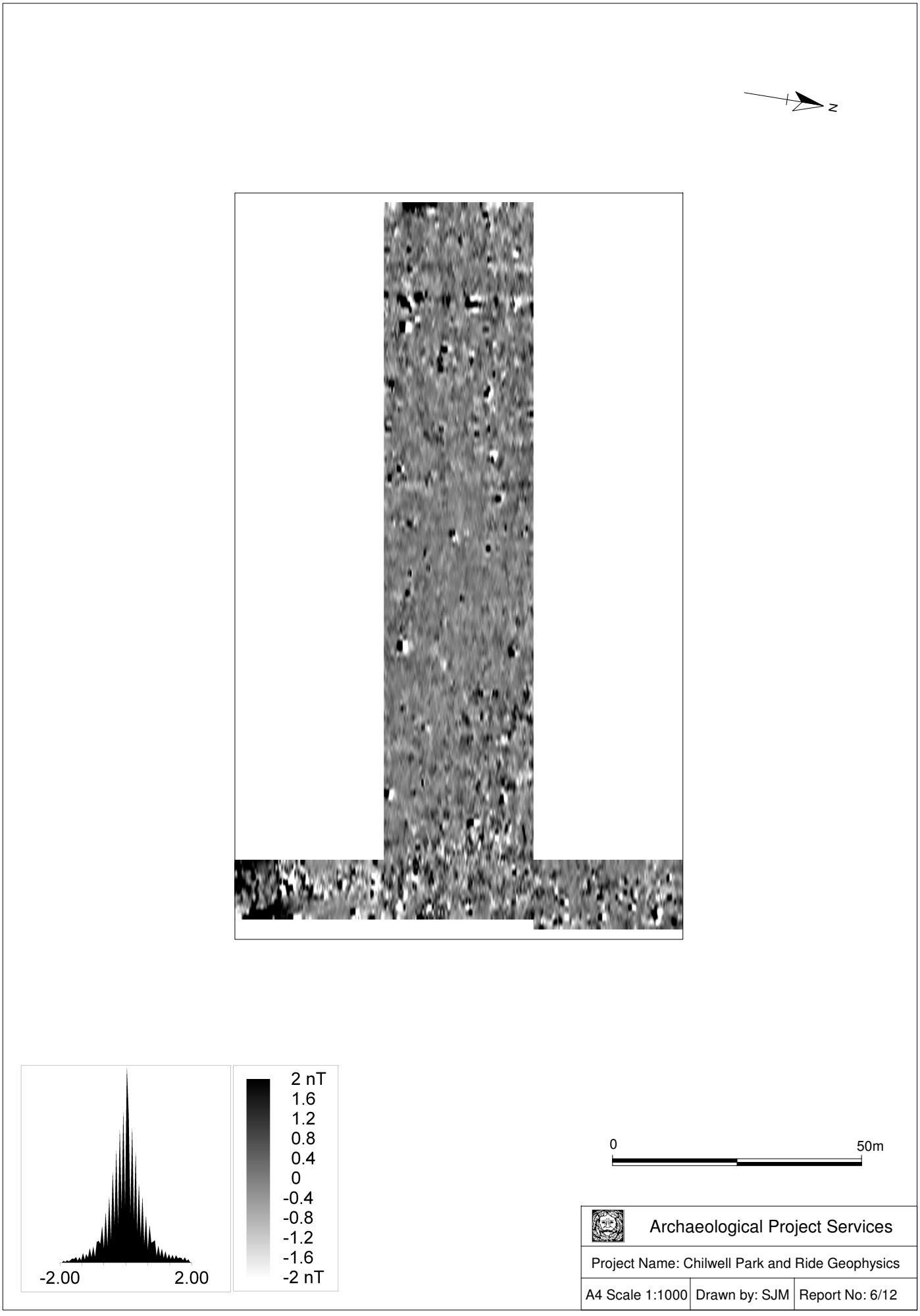

Figure 9 Area 3 processed data greyscale plot

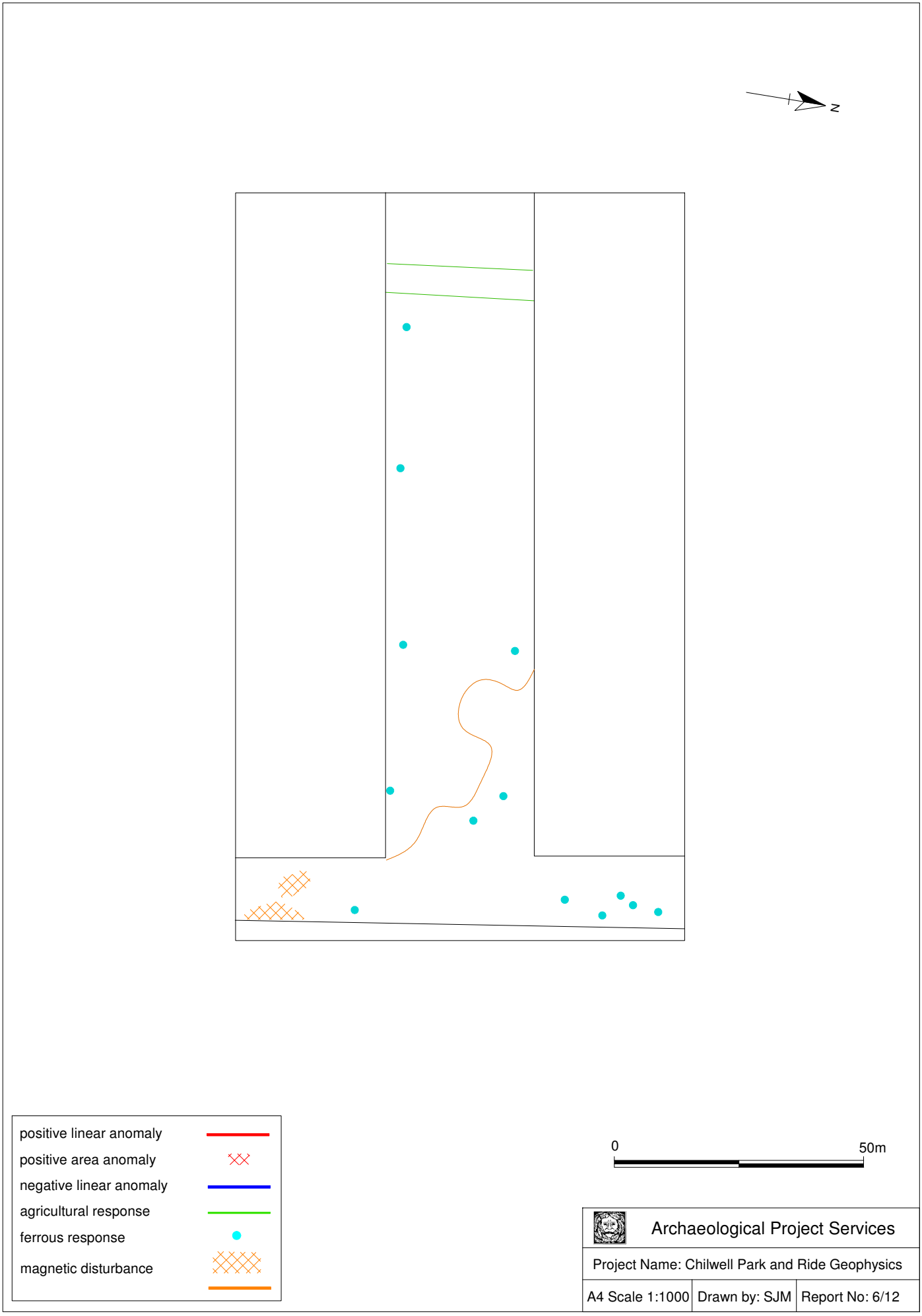

Figure 10 Area 3 interpretative plot

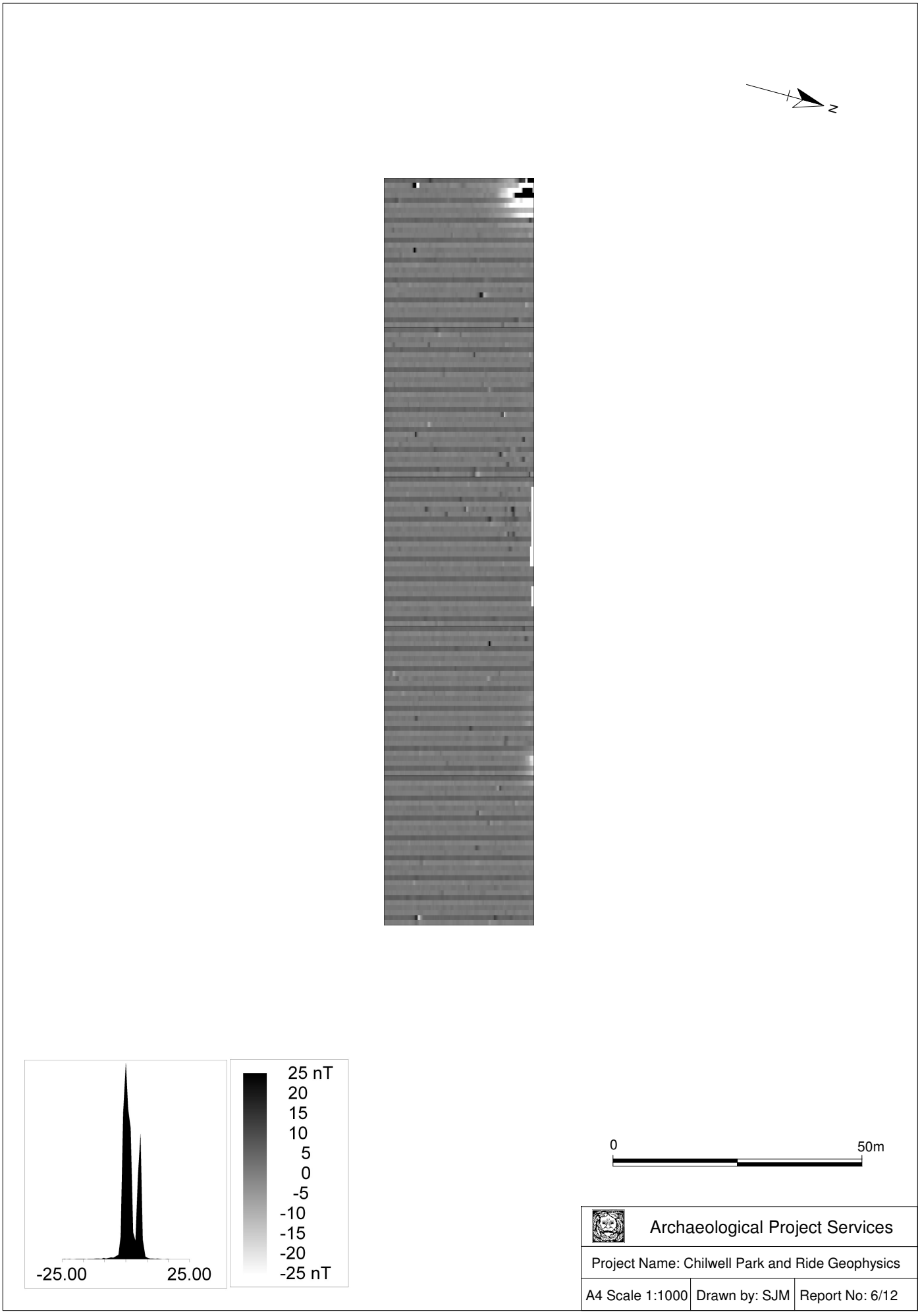

Figure 11 Area 4 unprocessed data greyscale plot

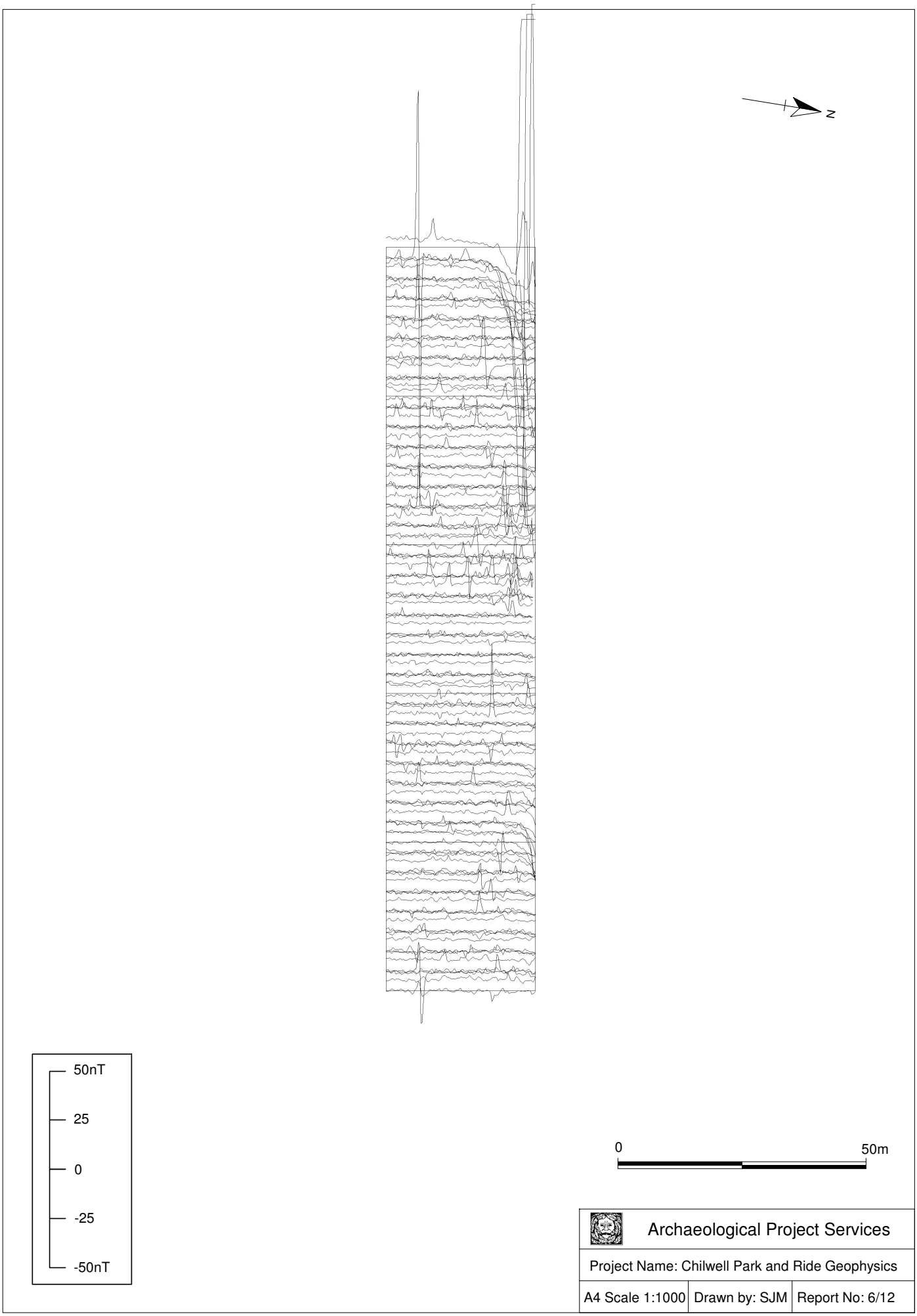

Figure 12 Area 4 unprocessed data trace plot

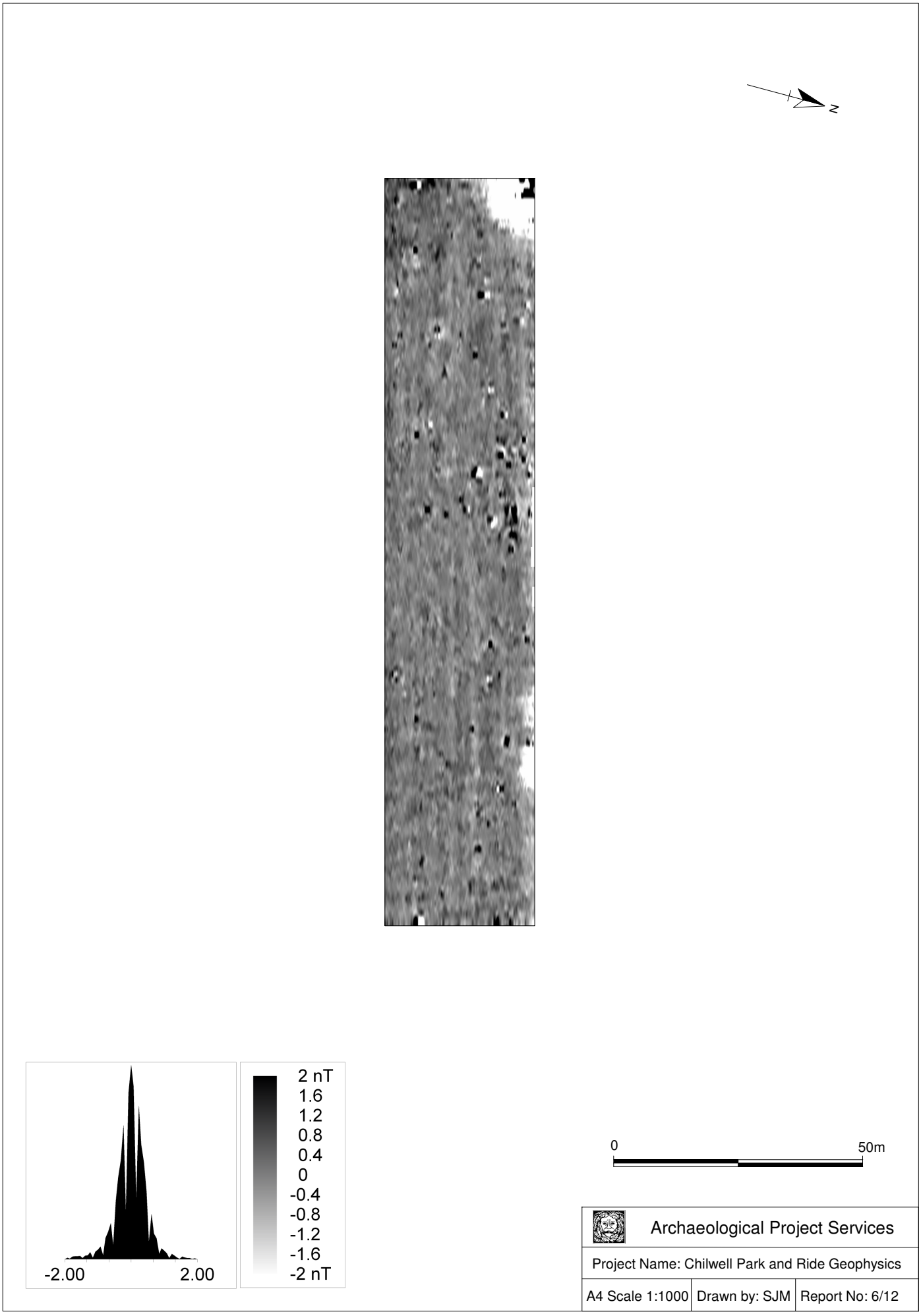

Figure 13 Area 4 processed data greyscale plot

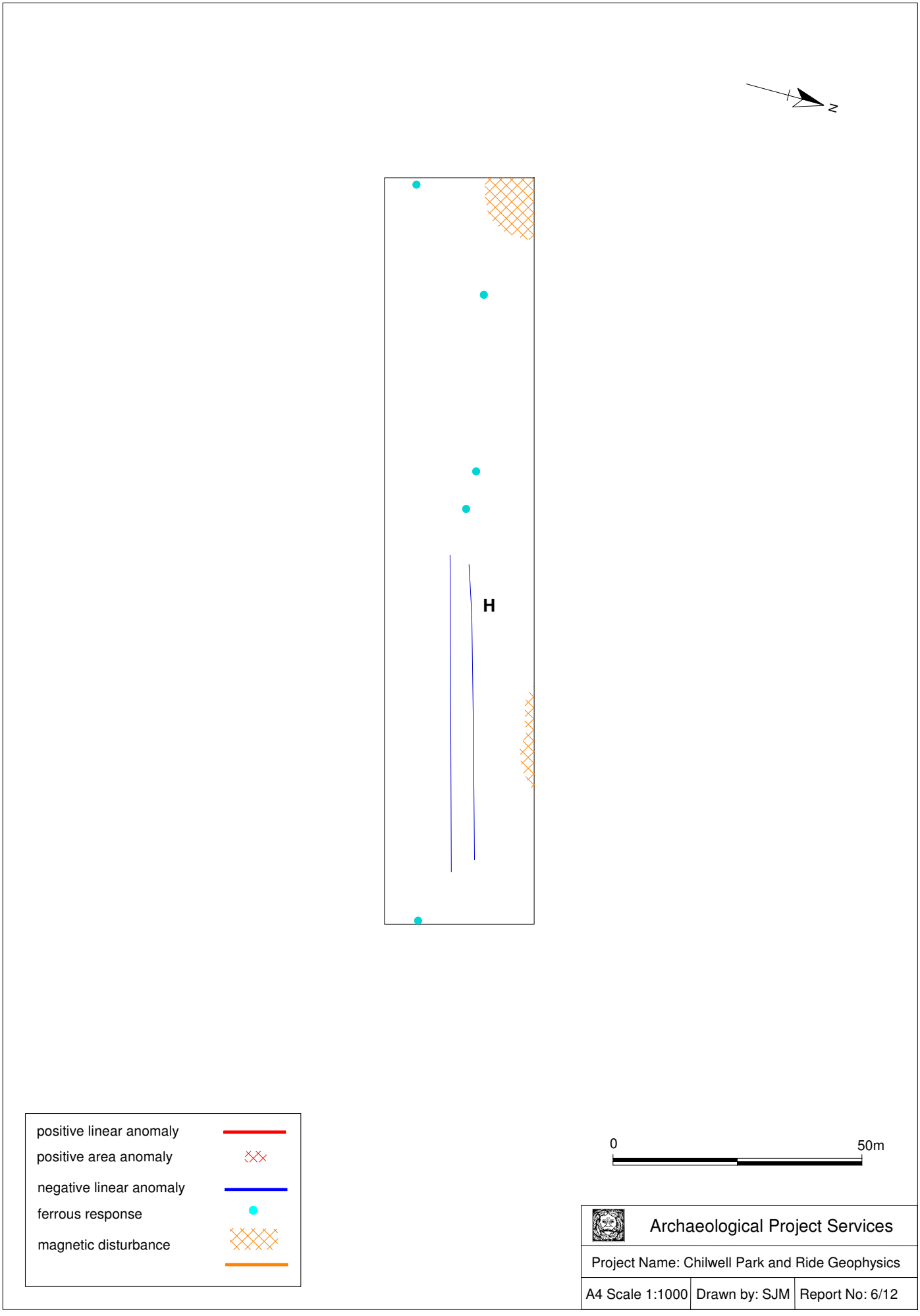

Figure 14 Area 4 interpretative plot

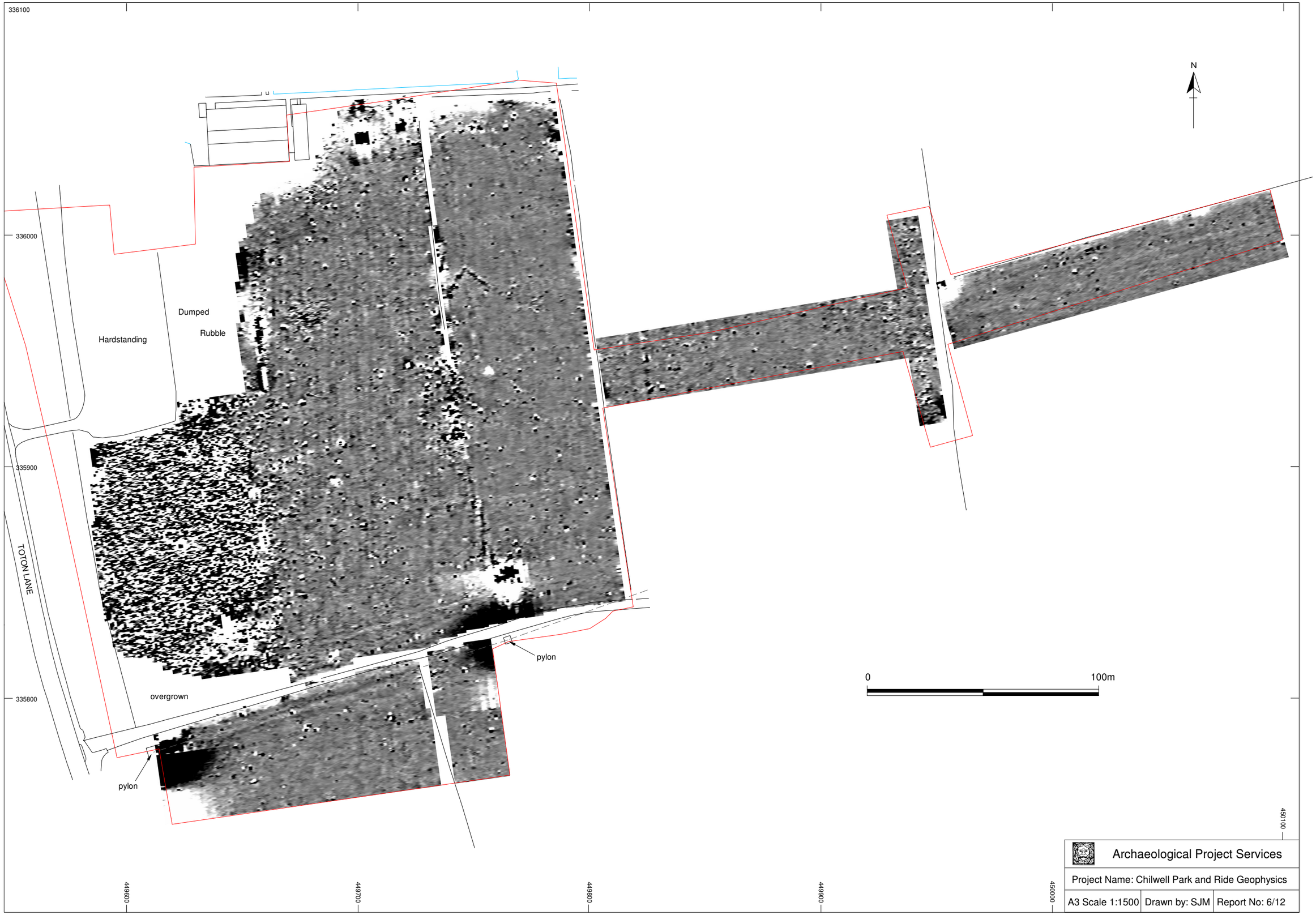

Figure 15 Overall plot processed greyscale

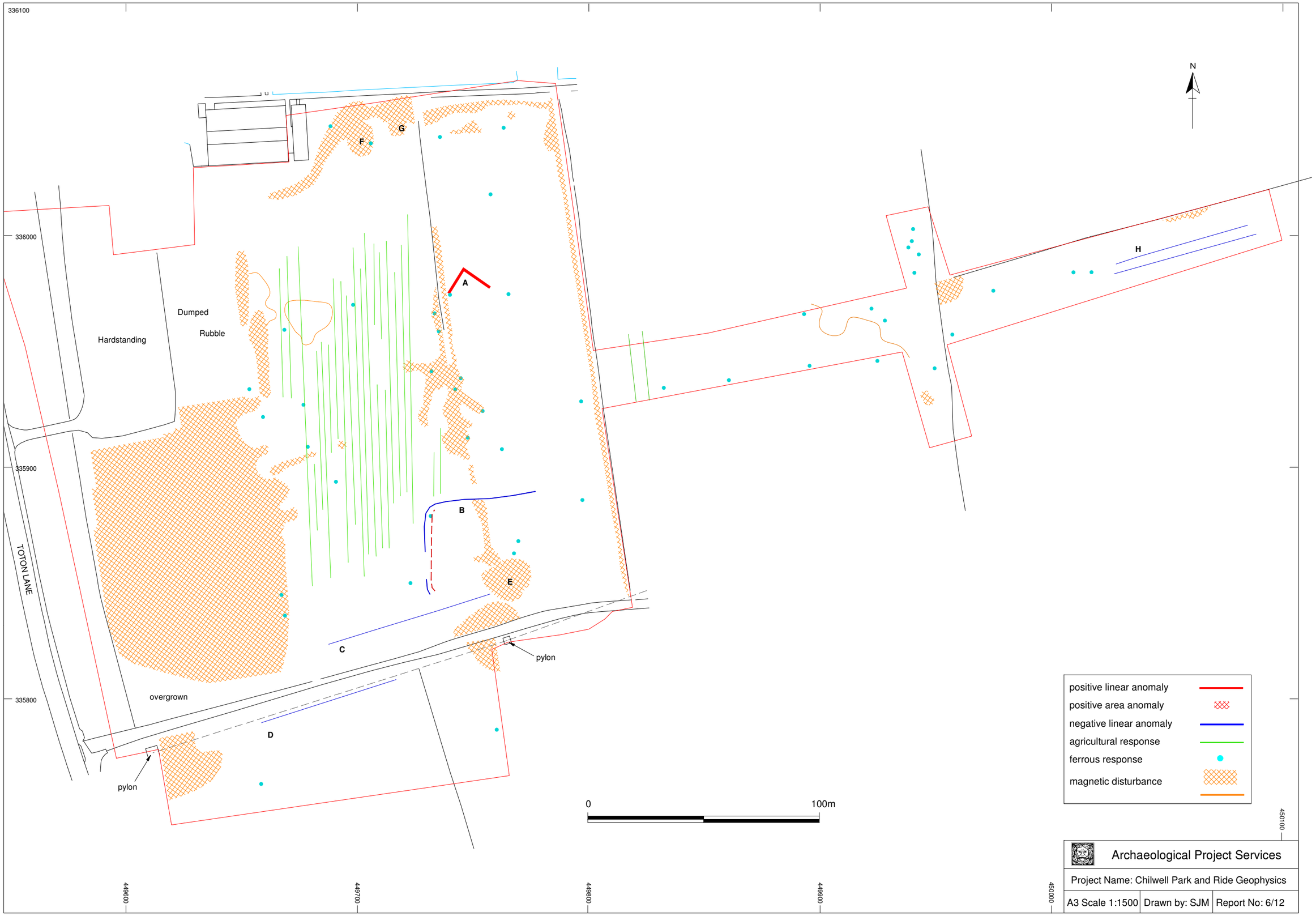

Figure 16 Overall interpretative plot

Appendix 1
THE ARCHIVE

The archive consists of:

4 Daily record sheets
1 Report text and illustrations
Digital data

File names	cprg12-01.xgd cprg12-02-a.xgd cprg12-02.xgd cprg12-03-a.xgd cprg12-03.xgd cprg12-04-a.xgd cprg12-04.xgd cprg12-05-a.xgd cprg12-05.xgd cprg12-06-a.xgd cprg12-06.xgd cprg12-07-a.xgd cprg12-07.xgd cprg12-08-a.xgd cprg12-08.xgd cprg12-09-a.xgd cprg12-09.xgd cprg12-10-a.xgd cprg12-10.xgd cprg12-11-a.xgd cprg12-11.xgd cprg12-12-a.xgd cprg12-12.xgd cprg12-13-a.xgd cprg12-13.xgd cprg12-14-a.xgd cprg12-14.xgd cprg12-15-a.xgd cprg12-15.xgd cprg12-16-a.xgd cprg12-16.xgd cprg12-17-a.xgd cprg12-17.xgd cprg12-18.xgd cprg12-19.xgd cprg12-20.xgd cprg12-21.xgd cprg12-22.xgd cprg12-23.xgd cprg12-24.xgd cprg12-25-a.xgd cprg12-25.xgd cprg12-26-a.xgd cprg12-26-aa.xgd cprg12-26.xgd cprg12-27-a.xgd cprg12-27.xgd	cprg12-28-a.xgd cprg12-28.xgd cprg12-29-a.xgd cprg12-29.xgd cprg12-30-a.xgd cprg12-30.xgd cprg12-31-a.xgd cprg12-31.xgd cprg12-32-a.xgd cprg12-32.xgd cprg12-33-a.xgd cprg12-33.xgd cprg12-34-a.xgd cprg12-34.xgd cprg12-35-a.xgd cprg12-35.xgd cprg12-36-a.xgd cprg12-36.xgd cprg12-37-a.xgd cprg12-37.xgd cprg12-38-a.xgd cprg12-38.xgd cprg12-39-a.xgd cprg12-39.xgd cprg12-40-a.xgd cprg12-40.xgd cprg12-41-a.xgd cprg12-41.xgd cprg12-42.xgd cprg12-43.xgd cprg12-44.xgd cprg12-45.xgd cprg12-46-a.xgd cprg12-46.xgd cprg12-47-a.xgd cprg12-47.xgd cprg12-48-a.xgd cprg12-48.xgd cprg12-49-a.xgd cprg12-49.xgd cprg12-50-a.xgd cprg12-50.xgd cprg12-51-a.xgd cprg12-51.xgd cprg12-52-a.xgd cprg12-52.xgd cprg12-53-a.xgd	cprg12-53.xgd cprg12-54-a.xgd cprg12-54.xgd cprg12-55-a.xgd cprg12-55.xgd cprg12-56-a.xgd cprg12-56.xgd cprg12-57-a.xgd cprg12-57.xgd cprg12-58-a.xgd cprg12-58.xgd cprg12-59-a.xgd cprg12-59.xgd cprg12-60-a.xgd cprg12-60.xgd cprg12-61-a.xgd cprg12-61.xgd cprg12-62-a.xgd cprg12-62.xgd cprg12-63-a.xgd cprg12-63.xgd cprg12-64-a.xgd cprg12-64.xgd cprg12-65-a.xgd cprg12-65.xgd cprg12-66-a.xgd cprg12-66.xgd cprg12-67-a.xgd cprg12-67.xgd cprg12-68-a.xgd cprg12-68.xgd cprg12-69-a.xgd cprg12-69.xgd cprg12-70-a.xgd cprg12-70.xgd cprg12-71.xgd cprg12-72.xgd cprg12-73-a.xgd cprg12-73.xgd cprg12-74-a.xgd cprg12-74.xgd cprg11-c1.xcp cprg11-c2.xcp cprg11-c3.xcp cprg11-c4.xcp
Explanation of codes used in file names	xgd files are magnetometer grids, named with site code and number in the order surveyed. Grids rotated to first traverse north are suffixed with “-a” 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	12/01/12
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:

Site Code: CPRG11
Accession no: