
**LAND AT
BARLEYTHORPE AND
OAKHAM NORTH
RUTLAND**

GEOPHYSICAL SURVEY

**Work undertaken for
LARKFLEET HOMES**

September 2010

**Report produced by
S J Malone BSc PhD MifA**

OASIS ref: archaeo11-83688
National Grid Reference: SK 8532 0958 - SK 8575 1052

APS Report No: **91/10**

**ARCHAEOLOGICAL
PROJECT
SERVICES**



CONTENTS

List of Figures

1.	SUMMARY	1
2.	INTRODUCTION	1
2.1	BACKGROUND	1
2.2	TOPOGRAPHY AND GEOLOGY	1
3.	AIMS	1
4.	METHODS	2
5.	RESULTS	3
6.	DISCUSSION	6
7.	ACKNOWLEDGEMENTS	7
8.	PERSONNEL	7
9.	BIBLIOGRAPHY	7
10.	ABBREVIATIONS	7

List of Figures

- Figure 1 Site location map
- Figure 2 Site location showing survey areas
- Figure 3 Area 1 - unprocessed data greyscale plot
- Figure 4 Area 1 - unprocessed data trace plot
- Figure 5 Area 1 - processed data greyscale: right - additional filtering to remove ridge and furrow
- Figure 6 Area 1 - interpretative plan
- Figure 7 Area 2A - unprocessed data greyscale plot (clipped to +/-100nT for display)
- Figure 8 Area 2A - unprocessed data trace plot
- Figure 9 Area 2A - processed data greyscale plot
- Figure 10 Area 2B - unprocessed data greyscale plot
- Figure 11 Area 2B - unprocessed data trace plot
- Figure 12 Area 2B - processed data greyscale
- Figure 13 Area 2 - processed data overall plot
- Figure 14 Area 2 overall interpretative plot
- Figure 15 Area 3 unprocessed data greyscale plot (clipped +/-100nT)
- Figure 16 Area 3 unprocessed data trace plot
- Figure 17 Area 3 processed data greyscale plot
- Figure 18 Area 3 interpretative plot
- Figure 19 Area 4 unprocessed data greyscale (clipped to +/-50nT for display)
- Figure 20 Area 4 unprocessed data trace plot
- Figure 21 Area 4 processed data greyscale
- Figure 22 Area 4 interpretative plot
- Figure 23 Area 5 unprocessed data greyscale plot (clipped +/-50nT for display)

Figure 24 Area 5 unprocessed data trace plot

Figure 25 Area 5 processed data greyscale plot

Figure 26 Area 5 interpretative plot

Figure 27 Area 6 unprocessed data greyscale plot (clipped +/-100nT for display)

Figure 28 Area 6 unprocessed data trace plot

Figure 29 Area 6 processed data greyscale plot

Figure 30 Area 6 interpretative plot

Figure 31 Areas 3-6 combined plot processed data greyscale

Figure 32 Areas 3-6 combined plot interpretative

1. SUMMARY

Geophysical survey was undertaken over areas of proposed residential development and associated works on land at Barleythorpe and North Oakham, Rutland. Survey comprised some 30ha in total.

Magnetic survey was generally successful with a good range of responses evident in the surveyed data and archaeological features identified in a number of areas.

Features identified in Area 1 potentially relate to the Anglo-Saxon remains identified in prior evaluation trenching, with the form and scale of the features suggesting further sunken-featured structures.

In Area 2 a double ring ditch was identified, potentially a prehistoric ritual monument. Linear boundary features here are earlier than the medieval ridge and furrow field systems and presumably relate to some earlier division of the landscape.

In Areas 3 and 4 a linear boundary feature, at least 500m in length, and attached rectilinear enclose with internal features are also earlier than the medieval field system. Their form suggests a later prehistoric date.

Medieval field systems were strongly represented with ridge and furrow patterns showing well across most of the areas.

2. INTRODUCTION

2.1 Background

Archaeological Project Services was commissioned by Larkfleet Homes to undertake detailed gradiometer survey over areas of proposed residential development and associated works on land

at Barleythorpe and North Oakham, Rutland. Survey comprised some 30ha in total.

2.2 Topography and Geology

Oakham is located 14km southeast of Melton Mowbray and 26km east of Leicester in the county of Rutland (Figure 1). Geophysical surveys were undertaken in six blocks: Area 1 lies just east of Main Road on the northern edge of Barleythorpe at SK 8494 0997. Area 2 comprised the former Rutland Agricultural Showground and Oakham Rugby Club centred on SK 8532 0958 on the northeastern edge of Oakham. Areas 3-6 cover a block of farmland to the north of the A606 Burley Park Way on the north side of Oakham centred on SK 8575 1052 (Fig. 2).

The sites lie between c. 115m and 125m O.D. on the gently sloping or fairly level ground of the Vale of Catmose.

In Areas 1 and 2 soils are mapped as well drained fine and coarse loamy ferruginous soils of the Banbury Association developed on ironstone (Hodge *et al.* 1984, 103). Areas 3-6 have loamy over clayey soils of the Denchworth Association developed on Whitby mudstone (Hodge *et al.* 1984, 155).

3. AIMS

The aim of the survey was to locate any features of possible archaeological significance in the proposed development areas in order to assist in the assessment of the impact of the development on potential archaeological remains.

Area 1 was specifically focused on the location of a previous evaluation trench, which had discovered Anglo-Saxon remains, including a possible sunken-

featured building (Holt and Cope-Faulkner 2008). Close-interval survey was undertaken over a 60m x 60m area centred on the trench in order to see if further associated features could be identified.

4. METHODS

The fieldwork was carried out between 3rd and 29th September 2010. Location and key to survey areas is shown in Figure 2. Weather and ground conditions during the survey varied over the course of the survey but were generally dry. Survey areas were all under grass and in good condition for survey.

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 48,000nT can be accurately detected using this instrumentation.

The mapping of magnetic anomalies in a systematic manner provides an indication of the type of material present beneath the surface. Strong magnetic anomalies are generated by buried iron-based objects or by highly-fired structures such as kilns or hearths. Pits and ditches can also be seen well where they contain more humic material which is generally richer in magnetic iron oxides and provides a contrast with the natural subsoil. However, these anomalies are more subtle and response 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.

Readings relate to the difference in localised magnetic anomalies compared with the general magnetic background. The Grad601-2 consists of two high stability fluxgate gradiometers suspended on a single frame. Each gradiometer has a 1m separation between the sensing elements so enhancing the response to weak anomalies.

Sampling interval and data capture

The close-interval survey undertaken in Area 1 comprised readings at 0.125m centres along traverses 0.5m apart. Other areas were surveyed with readings at 0.25m centres along traverses 1m apart. This equates to 14400 sampling points per 30m x 30m grid in Area 1 and 3600 sampling points per 30m grid in the remaining Areas. The Grad601 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 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 basic processing carried out on all 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 = 3 std. dev.; Spike replacement = mean

3. Clip (excludes extreme values allowing better representation of detail in the mid range): clipping parameters for each individual block are detailed in the accompanying figures.

NB The DeStripe filter is used as standard to remove striping effects caused by slight mismatches between the sensor pairs and by directional effects. The downside is that features aligned exactly on the survey traverses can be weakened or removed by the filter, hence comparison with the unfiltered data is always advisable. The effect is particularly evident in places here where ridge and furrow is aligned on or close to the direction of surveying.

5. RESULTS

The presentation of the data for the site involves a print-out of the raw data as greyscale and trace plots (Figs 3, 4, 7, 8, 10, 11, 15, 16, 19, 20, 23, 24, 27, 28), together with a greyscale plot of the

processed data (Figs 5, 9, 12, 13, 17, 21, 25, 29, 31). Magnetic anomalies have been identified and plotted onto interpretative drawings (Figs 6, 14, 18, 22, 26, 30, 32) and are described by Areas below.

Area 1 (Figs 3-6)

Discrete positive anomalies

Discrete positive area responses are widespread, although some may result from background variability. The stronger, more coherent, responses are highlighted as of possible archaeological origin. In the context of earlier discoveries (Holt and Cope-Faulkner 2008), **A** and **B** particularly stand out as potential further Anglo-Saxon features.

Agricultural features

Earthwork ridge and furrow survives within this field and is clearly evident within the survey data running SW-NE. The deeper soils within the furrows give a positive response allowing these to be mapped. A weaker pattern on a different NW-SE alignment seems likely to also be agricultural in origin although there is no clear indication of any later ploughing.

Area 2 (Figs 7-14)

Positive linear/curvilinear anomalies

In the northwest of the area two concentric rings *c.* 19m and 26m in diameter can be seen (**C**). Unfortunately much of the detail is obscured by the strong response from a set of rugby goal posts which fall within the central ring. A short linear anomaly (**D**) probably represents a ditched feature to the southeast and a further possible arc (**E**) lies just to the east, but this is less distinct.

Linear anomalies **F** and **G** represent further ditched features crossing the centre of the area roughly east-west and north-south respectively, the latter turning to the northeast towards the northern boundary.

Positive area anomalies – possible pits

Background variability is a problem in interpreting localised area anomalies (either there are a huge number, or most are in fact non-archaeological). However, a number are stronger, or more coherent, and have been highlighted as possible pit features. Two areas particularly stand out. **H** has a rectilinear form, c. 30m x 10m; it perhaps indicates a former pond or quarrying, or perhaps something structural (it does appear to interrupt the ridge and furrow but does not relate to the current layout of the playing fields). **I** also appears as a possible cluster of pits quite similar in response to **H**.

Agricultural features

Despite use as playing fields, ridge and furrow is faintly evident on the ground across much of the area (slightly more strongly towards the western edge). It shows quite clearly within the survey on three different alignments. Towards the western boundary it runs SW-NE; in the centre of the area it runs roughly north-south with a slight eastward curve at the northern end (the clarity of this pattern is affected somewhat by filtering across the north-south survey traverses); in the east it runs WSW-ENE curving southwards at its western end. A broad zone of slightly elevated readings (**J**) runs at right angles to the north-south ridge and furrow. Although apparently cut by this pattern it may represent a former headland, perhaps later abandoned

Linear negative anomalies

A series of weak negative anomalies runs across much of the area. These are parallel, narrow and very straight and presumably largely relate to drainage. However, **K**, which runs from the far western boundary, cutting across the ring-ditches, towards the rugby club pavilions seems likely to be a service connection.

Strong bipolar responses

This area remains in use by rugby and football clubs. Nine pitches are present and their goalposts and other infrastructure, including advertising hoardings (**L**) and floodlights (**M**, **N**; three either side of the pitch), are responsible for a significant amount of magnetic disturbance. Modern services are responsible for the linear bipolar responses running from the eastern boundary and running between the floodlights.

Iron spikes (discrete bipolar anomalies)

Iron items within the topsoil/ploughsoil give a distinctive localised bipolar (strong negative and positive) response. Such items usually derive from relatively recent agricultural use of the land – broken or discarded pieces of agricultural machinery etc. Here, they are perhaps more likely to relate to use as sports fields or past use as the Rutland Agricultural Showground as there is an unusual concentration of strong bipolar responses (although there is local memory of wartime ploughing).

Area 3 (Figs 15-18)*Geological responses*

Background responses owing to variations in the underlying natural are evident on a generally NW-SE trend across the south of this area. These tend to be weaker and more diffuse than archaeological responses although the range of natural variation can make it harder to interpret some weaker discrete features.

Positive linear anomalies

A series of positive linear anomalies in the north of Area 3 form an enclosure (**O**), 50m-60m across and 115m in length, attached to a linear boundary (**P**). These can be seen to be cut by the furrows of the medieval field system. Internal features are also evident and parts of the southern boundary show evidence for multiple ditches/recuts. The northern boundary of

the enclosure may extend further eastwards (roughly parallel to boundary P), but lies at the very edge of the survey. The elevated reading here might merely reflect proximity to the field boundary, but the effect is not seen further to the west or east.

A series of narrow, weak positive linear features can also be seen in the south of the field. These are very straight and show much weaker responses than the archaeological features to the north and run on roughly parallel alignments. These perhaps represent post-medieval drainage features as seen elsewhere, although one at least (**Q**) is aligned on the southwest corner of the enclosure and may relate to this.

Agricultural features

Ridge and furrow is not evident on the ground but shows quite clearly within the survey on two different alignments. In the majority of the western and southern part of the field this runs roughly north-south, curving towards the west at the northern end. In the northeast of the field the alignment runs at right-angles towards the eastern boundary and continues into Area 4 (Figs 31, 32).

Strong bipolar responses

Magnetic disturbance at the southern edge of the plot (**R**) is caused by rubble at the field entrance. The very strong anomaly (**S**) towards the northeast indicates some highly magnetic buried material, perhaps infilling a former pond (these are present in most adjacent fields, but absent here).

Iron spikes (discrete bipolar anomalies)

These are fairly widely distributed across the survey area.

Area 4 (Figs 19-22)

Geological responses

Background responses owing to variations

in the underlying natural are again evident on a NW-SE trend across this area. In the northeast and northwest these variations are quite strong leading to an inversion of the usual response from the medieval furrows where the furrow fill is less responsive than the background material through which it cuts.

Positive linear anomalies

Positive linear anomaly **T** is a continuation of feature P seen to the west in Area 3 (see Figs 31, 32). Its segmented appearance is due to the ridge and furrow cutting across this line. A narrow, weak positive linear feature (**U**) can also be seen in the south of the field. This is similar to the narrow features seen in Area 3 and may be relatively recent.

Positive area anomalies – possible pits

Localised positive area anomalies (**V**) have been highlighted in the northwest of the area. These are slightly stronger than the background variations and might represent infilled pits.

Agricultural features

Ridge and furrow is not evident on the ground but shows quite clearly within the survey on three different alignments. The western edge shows a continuation of the WSW-ENE pattern from Area 3; in the centre the ridge and furrow runs N-S; in the northeastern arm of the field the pattern runs WNW-ESE, curving slightly from a headland at the western end (evident in the field as a slight broad earthwork) and truncated by the railway line to the east.

Bipolar linear anomalies

A series of narrow linear weak bipolar responses can be seen to cut across the ridge and furrow in the northeast of the area. These probably relate to post-medieval drainage.

Strong bipolar responses

Magnetic disturbance is evident adjacent to field edges and adjacent to field entrances.

Iron spikes (discrete bipolar anomalies)

These are fairly widely distributed across the survey area.

Area 5 (Figs 23-26)

Agricultural features

Ridge and furrow is no longer evident on the ground but shows strongly in the survey plot running WNW-ESE and curving slightly at the western end to the presumed headland. To the east the pattern is truncated by the railway line.

Bipolar linear anomalies

As in Area 4 a series of narrow linear bipolar responses cuts across the ridge and furrow. These probably relate to post-medieval drainage.

Iron spikes (discrete bipolar anomalies)

These are sparsely evident, mostly towards the northeast of the area. The larger localised response at **W** represents the location of a pole carrying overhead power lines.

Area 6 (Figs 27-30)

Response to the magnetometer was poor in this area. Although down to grass, coverage was patchier than areas to the north and east and its recent history may perhaps be different. The alignment of ridge and furrow (see below) unfortunately nearly coincides with the survey traverses and is hard to distinguish in the processed data although more of the pattern can be picked out in the unfiltered dataset.

Positive linear anomalies

Parallel linear anomalies (**X**, **Y**) probably represent ditched features, perhaps forming a trackway. A further discrete linear feature to the north (**Z**) may

represent a length of ditch but stands somewhat isolated.

Positive area anomalies – possible pits

Background responses are quite variable with patchy amorphous responses. A number of slightly stronger localised positive area anomalies are highlighted as possibly archaeological in origin.

Agricultural features

Although the field has been levelled, the medieval ridge and furrow is still weakly evident here, continuing the pattern seen to the north in Area 3 (see Fig. 32).

Iron spikes (discrete bipolar anomalies)

These are sparsely scattered across the survey area with broader magnetic disturbance at the field edges owing to the presence of wire fences or material dumped at the field margins.

6. DISCUSSION

Magnetic survey was generally successful with a good range of responses evident in the surveyed data and archaeological features identified in a number of areas.

Features identified in Area 1 potentially relate to the Anglo-Saxon remains identified in prior evaluation trenching (Holt and Cope-Faulkner 2008) with the form and scale of the features suggesting further sunken-featured structures.

In Area 2 a double ring ditch was identified, potentially a prehistoric ritual monument. Linear boundary features here are earlier than the medieval ridge and furrow field systems and presumably relate to some earlier division of the landscape.

In Areas 3 and 4 a linear boundary feature, at least 500m in length, and attached rectilinear enclosure with internal features

are also earlier than the medieval field system. Their form suggests a later prehistoric date. Further potentially early features are possibly present to the south in Area 6 but the responses here are not so coherent.

Medieval field systems are strongly represented with ridge and furrow patterns showing well across most of the areas.

Later disturbance is also evident including possible ponds and/or quarrying, post-medieval drainage and, in Area 2 particularly, modern services and infrastructure related to use as playing fields.

7. ACKNOWLEDGEMENTS

Archaeological Project Services wishes to acknowledge the assistance of Neil Osborne of DLP and Paul Bywater of Larkfleet Homes who commissioned the project and liaised with landowners over access. Gary Taylor edited the report.

8. PERSONNEL

Project coordinator: Steve Malone
Field survey: Steve Malone, Jonathon Smith, Matt Gault, Denise Buckley
Survey processing and reporting: Steve Malone

9. BIBLIOGRAPHY

Clark, A 1990 *Seeing Beneath The Soil*, London

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

Hodge, CAH, Burton, RGO, Corbett, WM, Evans, R, and Seale, RS, 1984 *Soils and*

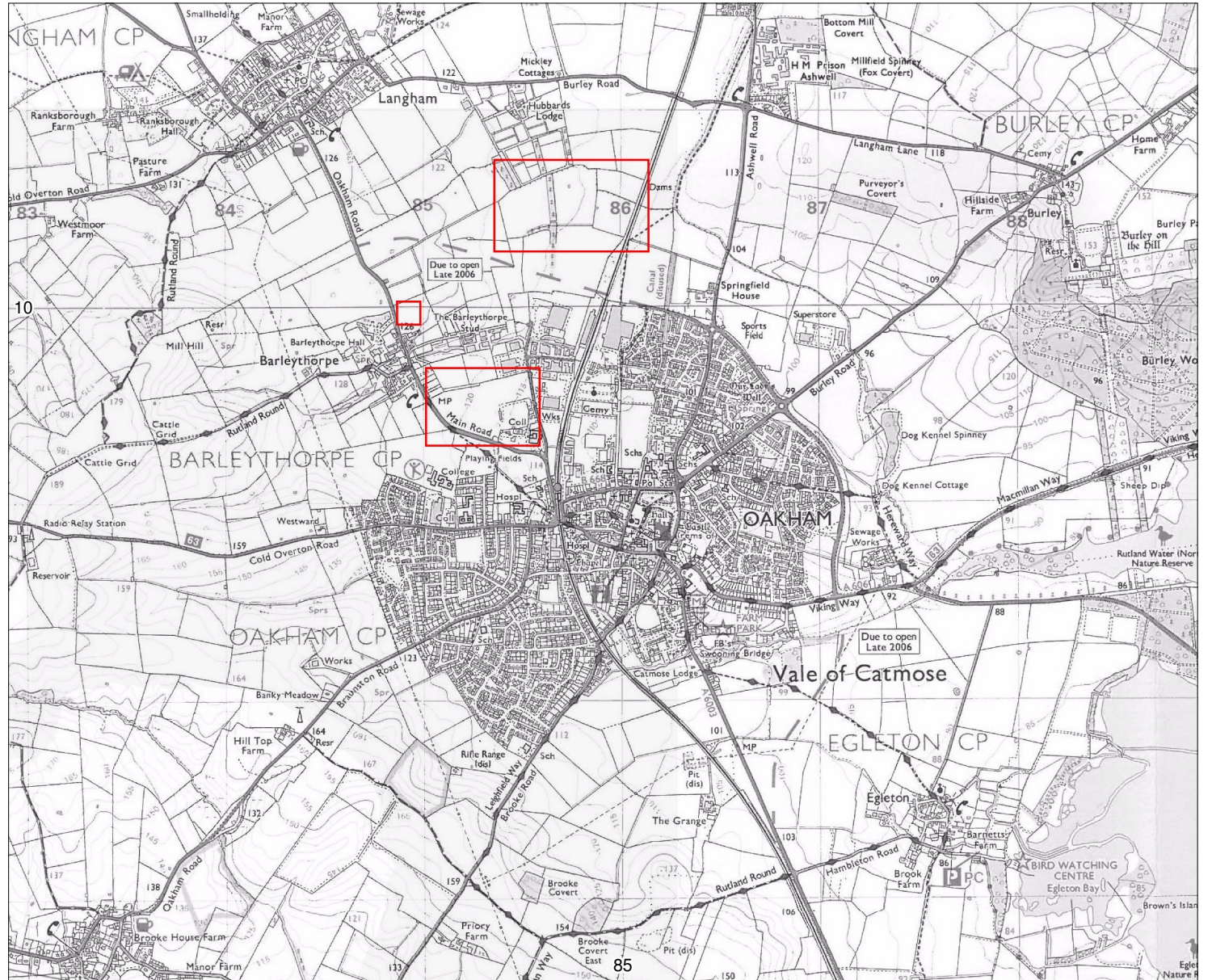
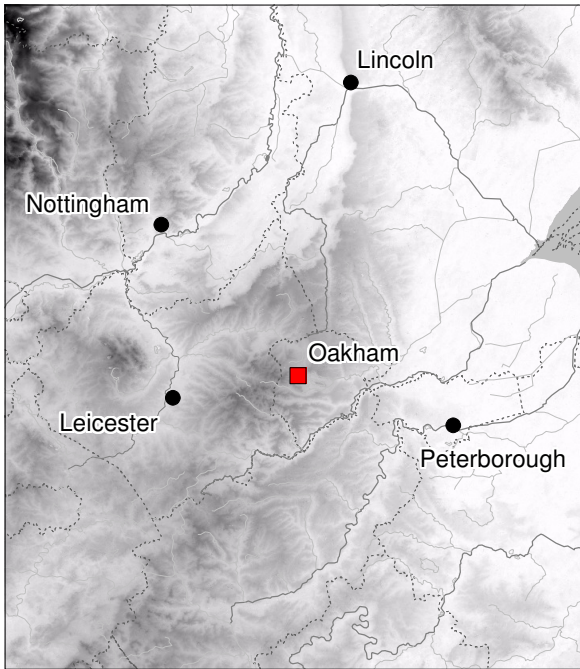
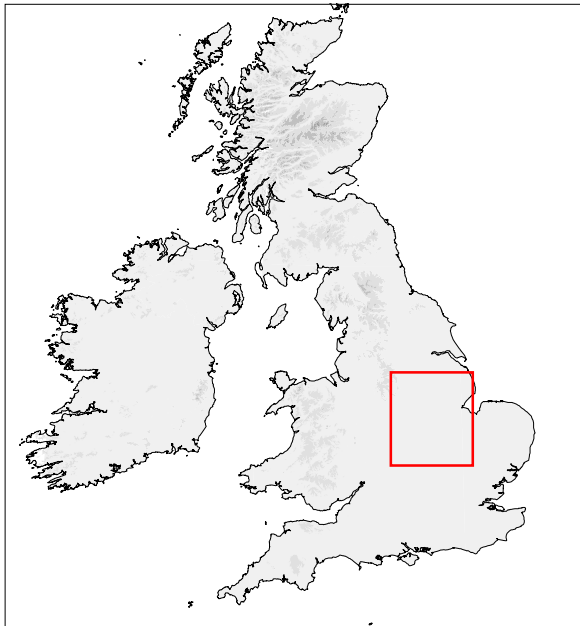
their use in Eastern England, Soil Survey of England and Wales 13

Holt, R and Cope-Faulkner, P 2008 *Archaeological Evaluation on Land off Lands End Way, Barleythorpe, Rutland*, unpublished APS Report **161/07**

IFA 2002 *The use of Geophysical Techniques in Archaeological Evaluations*, IFA Paper No. 6

10. ABBREVIATIONS

APS	Archaeological Project Services
BGS	British Geological Survey
EH	English Heritage
IFA	Institute of Field Archaeologists
OS	Ordnance Survey



Reproduced from the Ordnance Survey 1:25 000 map with the permission of The Controller of Her Majesty's Stationery Office (C) Crown Copyright. HTL Ltd Licence No. AL5041A0001


 Archaeological Project Services		
Project: Oakham Barleythorpe (OABT10)		
Scale: varies	Drawn by: SJM	Report No: 91/10

Figure 1 Site location map

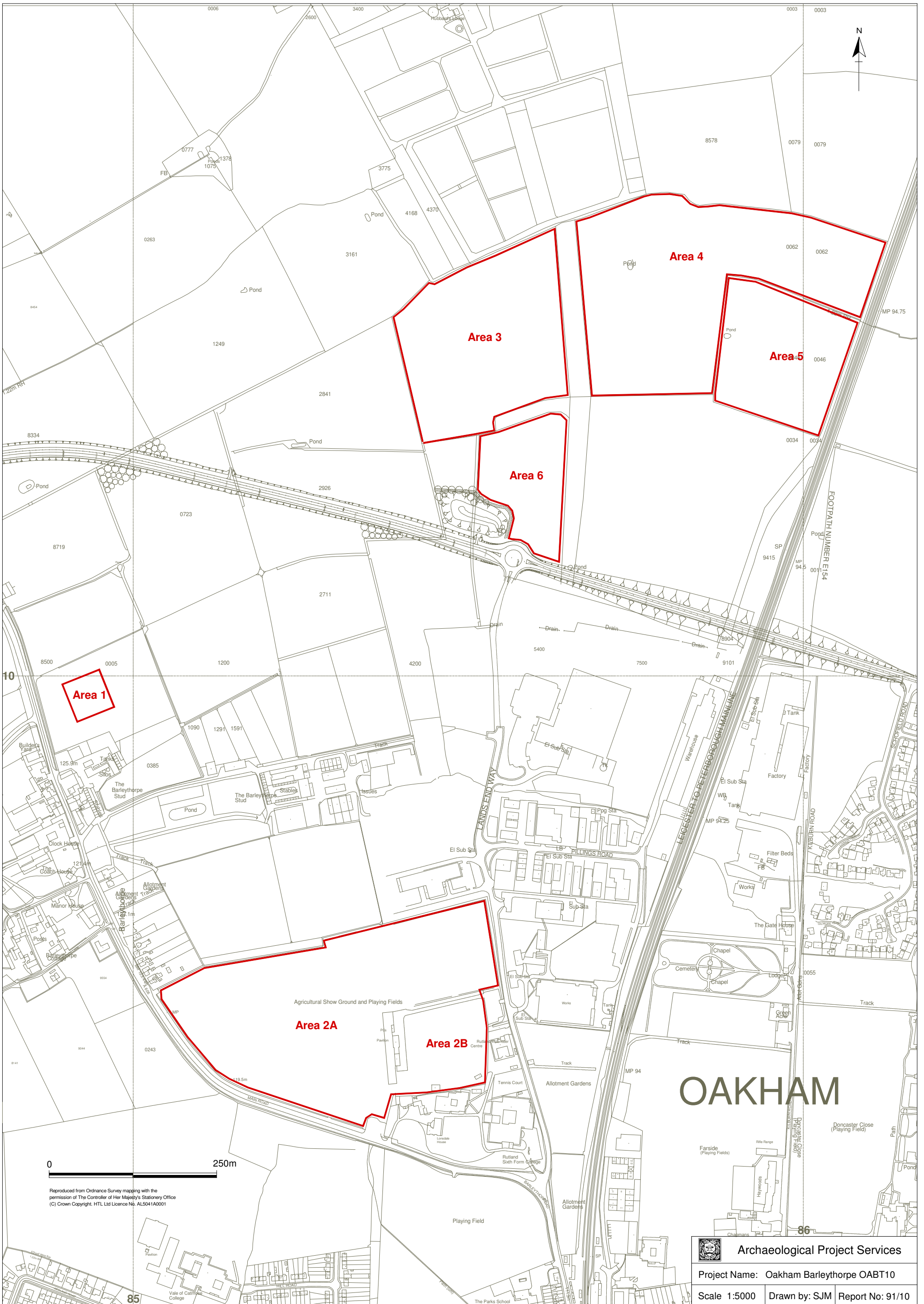
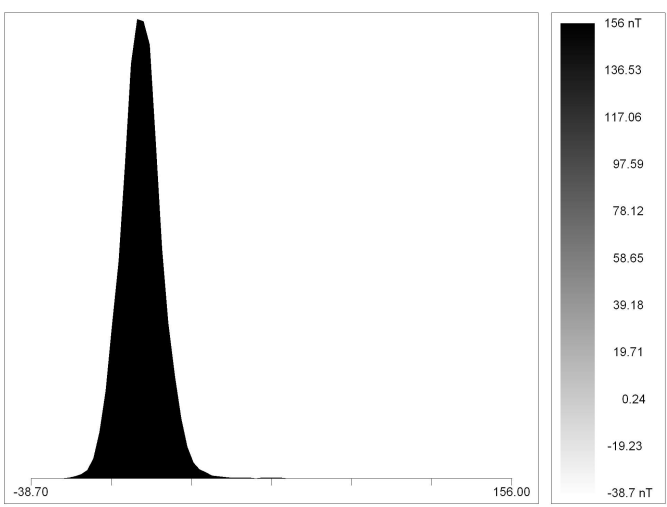
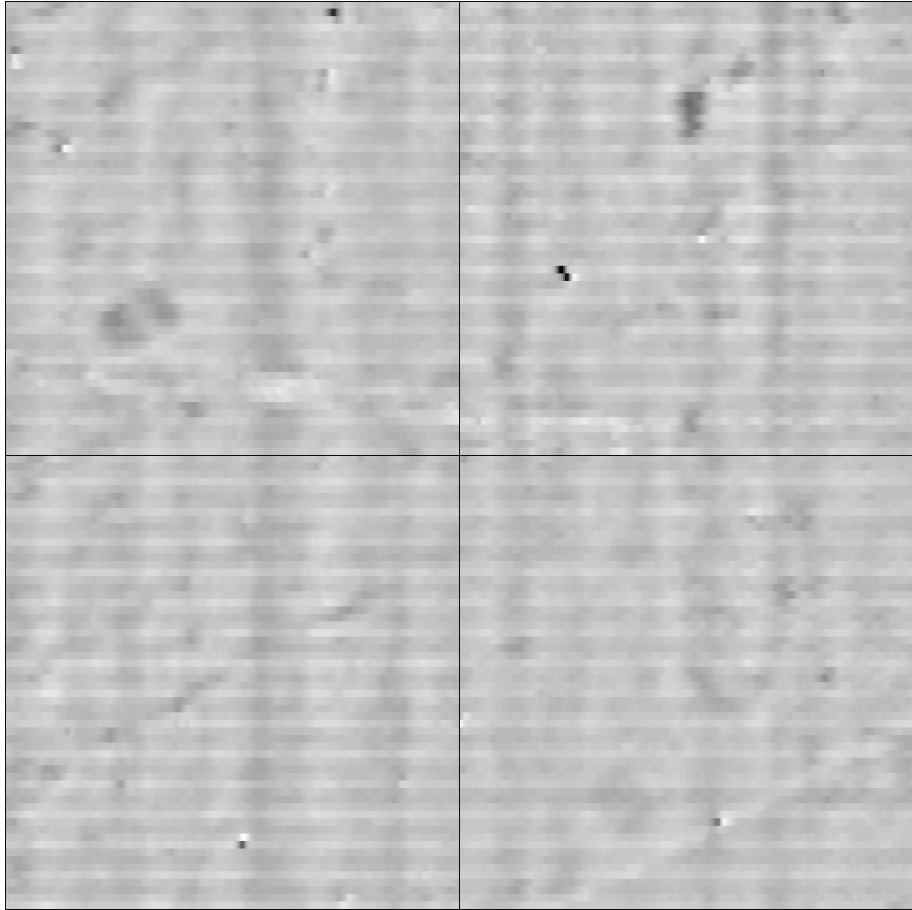


Figure 2 Site location showing survey areas




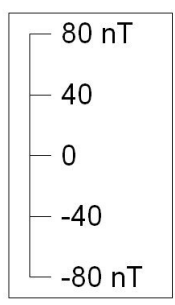
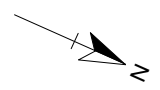
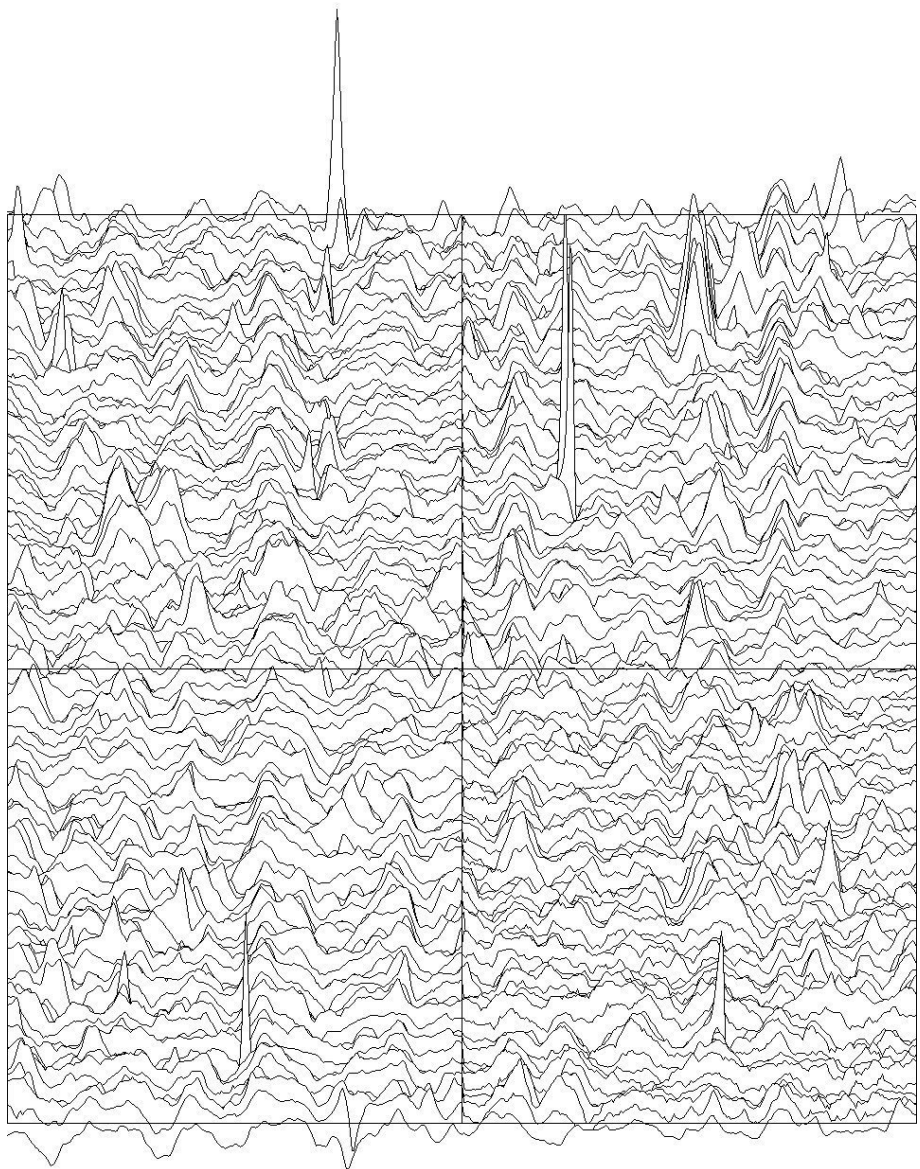
	Archaeological Project Services	
Project Name: Oakham Barleythorpe (OABT10)		
Scale 1:500	Drawn by: SJM	Report No: 91/10

Figure 3 Area 1 unprocessed data greyscale plot




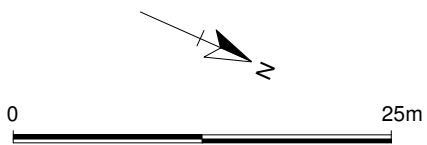
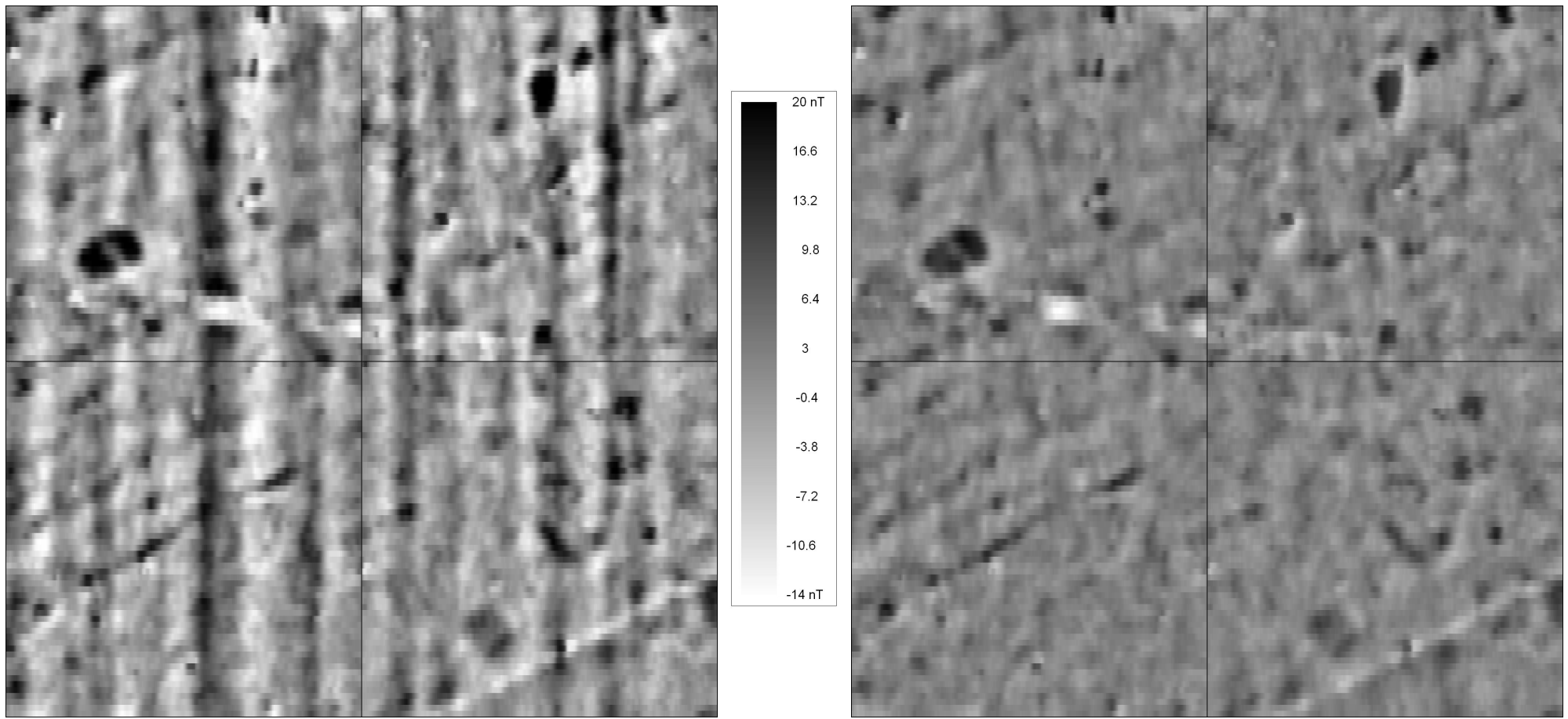
	Archaeological Project Services	
Project Name: Oakham Barleythorpe (OABT10)		
Scale 1:500	Drawn by: SJM	Report No: 91/10

Figure 4 Area 1 unprocessed data trace plot




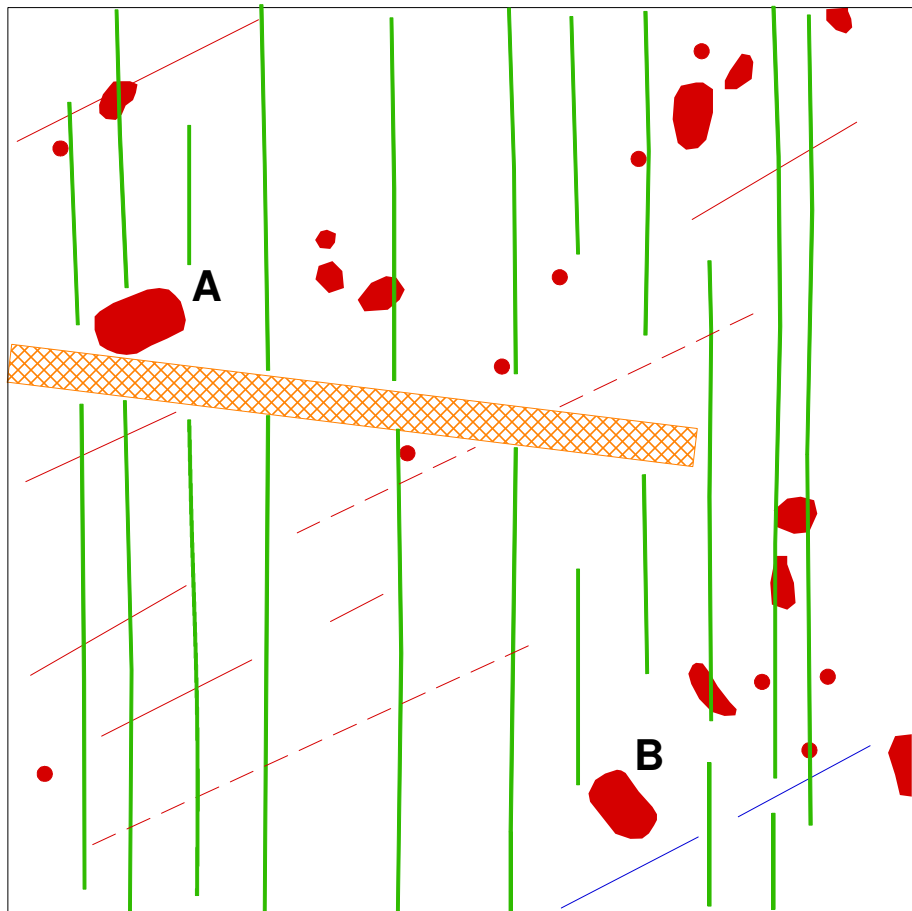
 Archaeological Project Services		
Project Name: Oakham Barleythorpe (OABT10)		
Scale 1:500	Drawn by: SJM	Report No: 91/10

Figure 5 Area 1 Processed data greyscale: right - additional filtering to remove ridge and furrow



negative anomaly of probable archaeological origin	
positive anomaly of probable archaeological origin	
positive area anomaly of probable archaeological origin	
backfilled trench	
agricultural feature	



	Archaeological Project Services	
Project Name: Oakham Barleythorpe (OABT10)		
Scale 1:500	Drawn by: SJM	Report No: 91/10

Figure 6 Area 1 interpretative plan

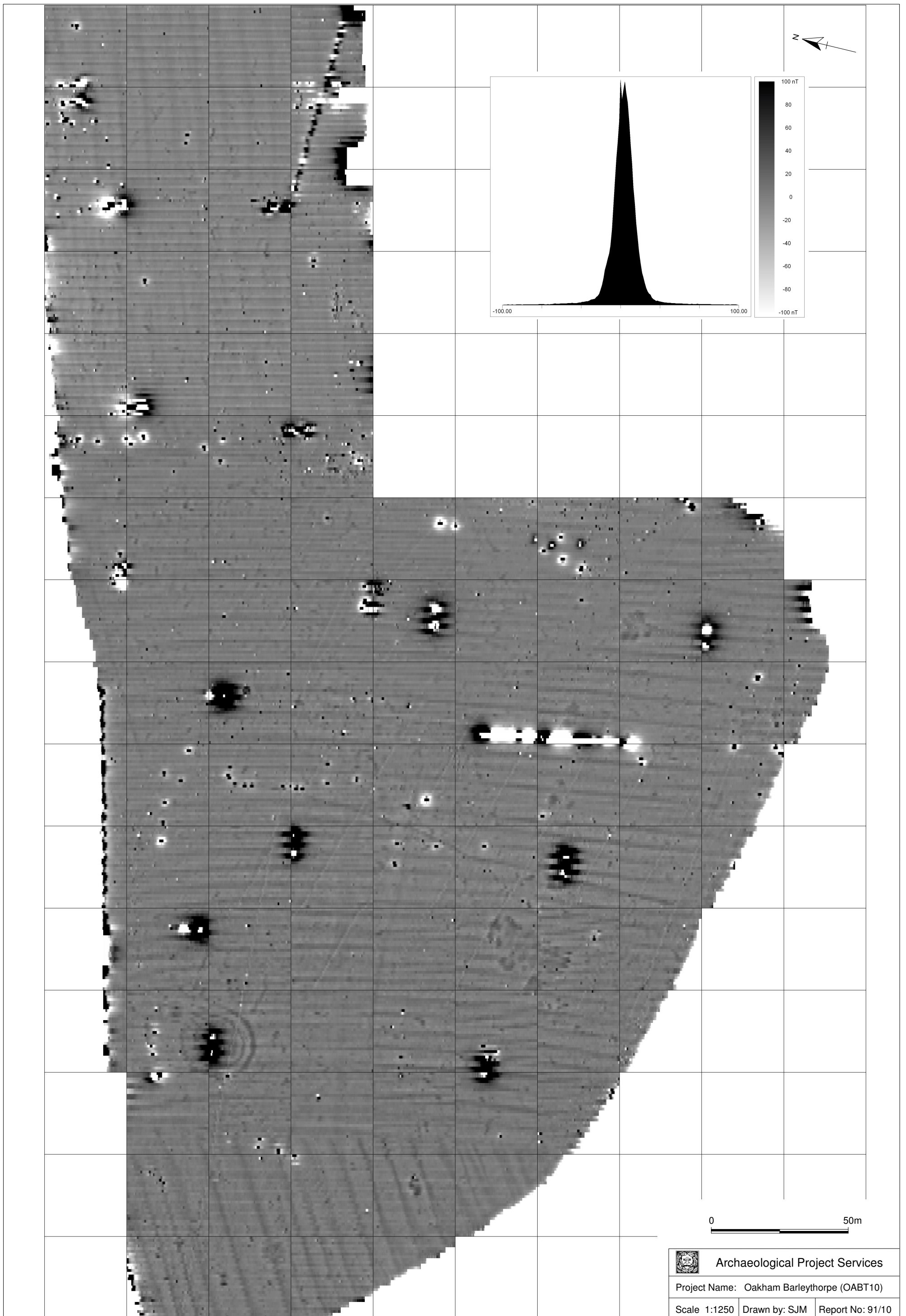


Figure 7 Area 2A - unprocessed data greyscale plot (clipped to +/-100nT for display)

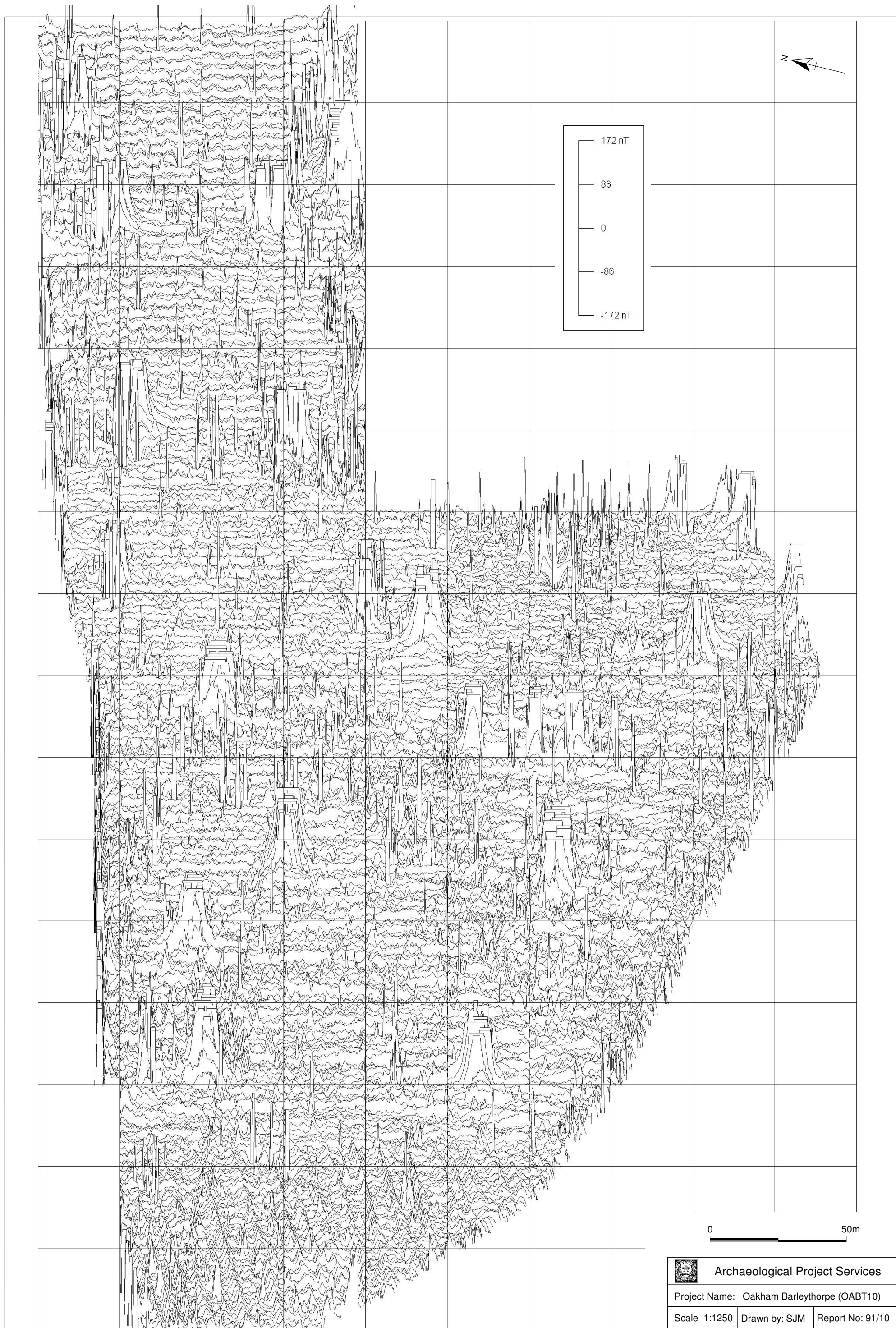


Figure 8 Area 2A - unprocessed data trace plot

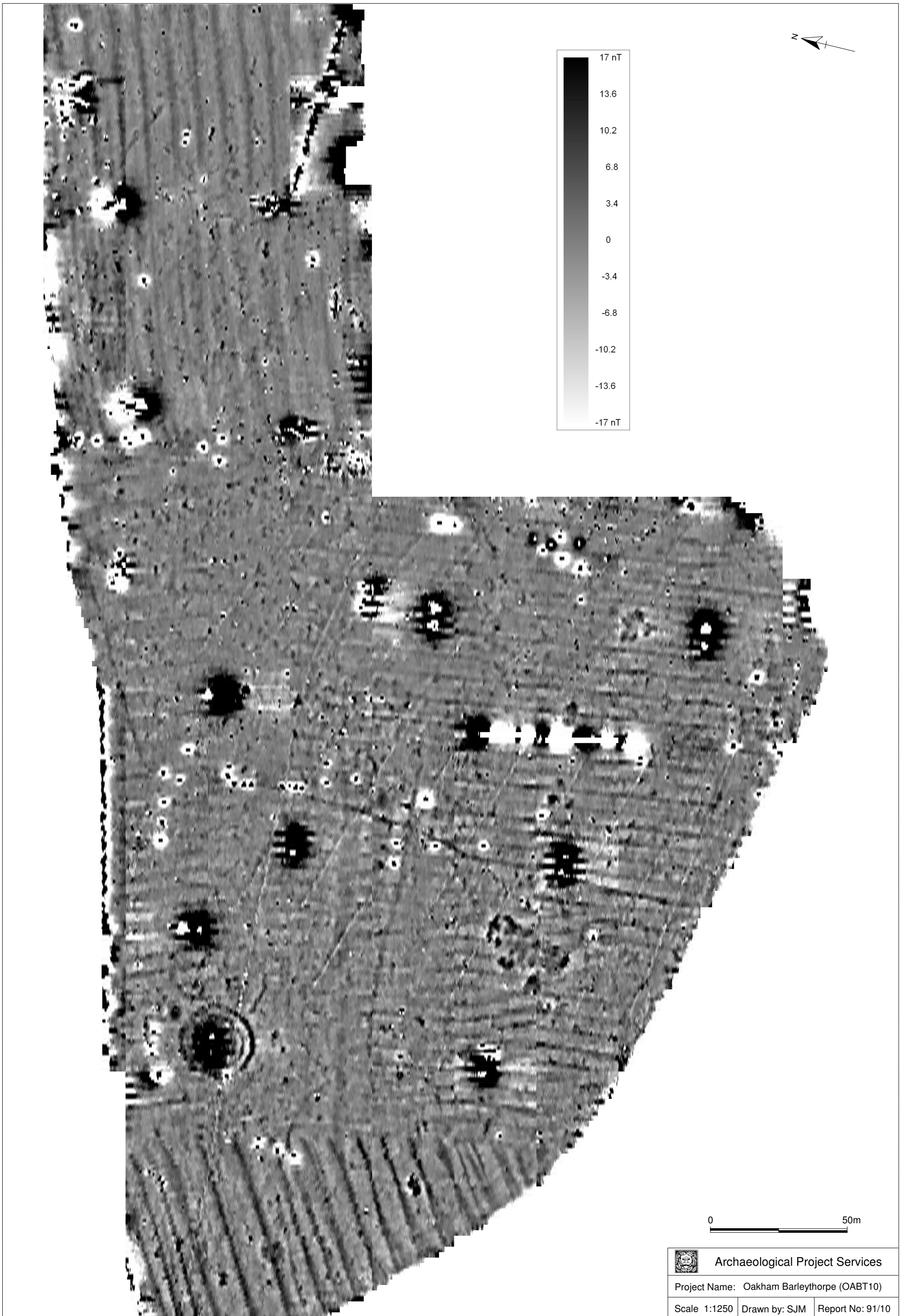
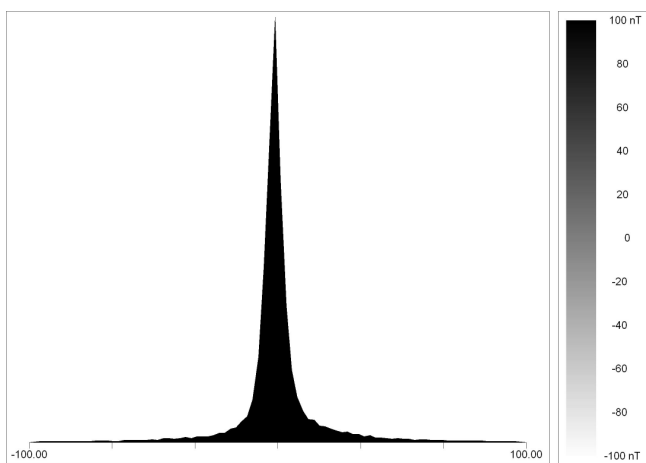
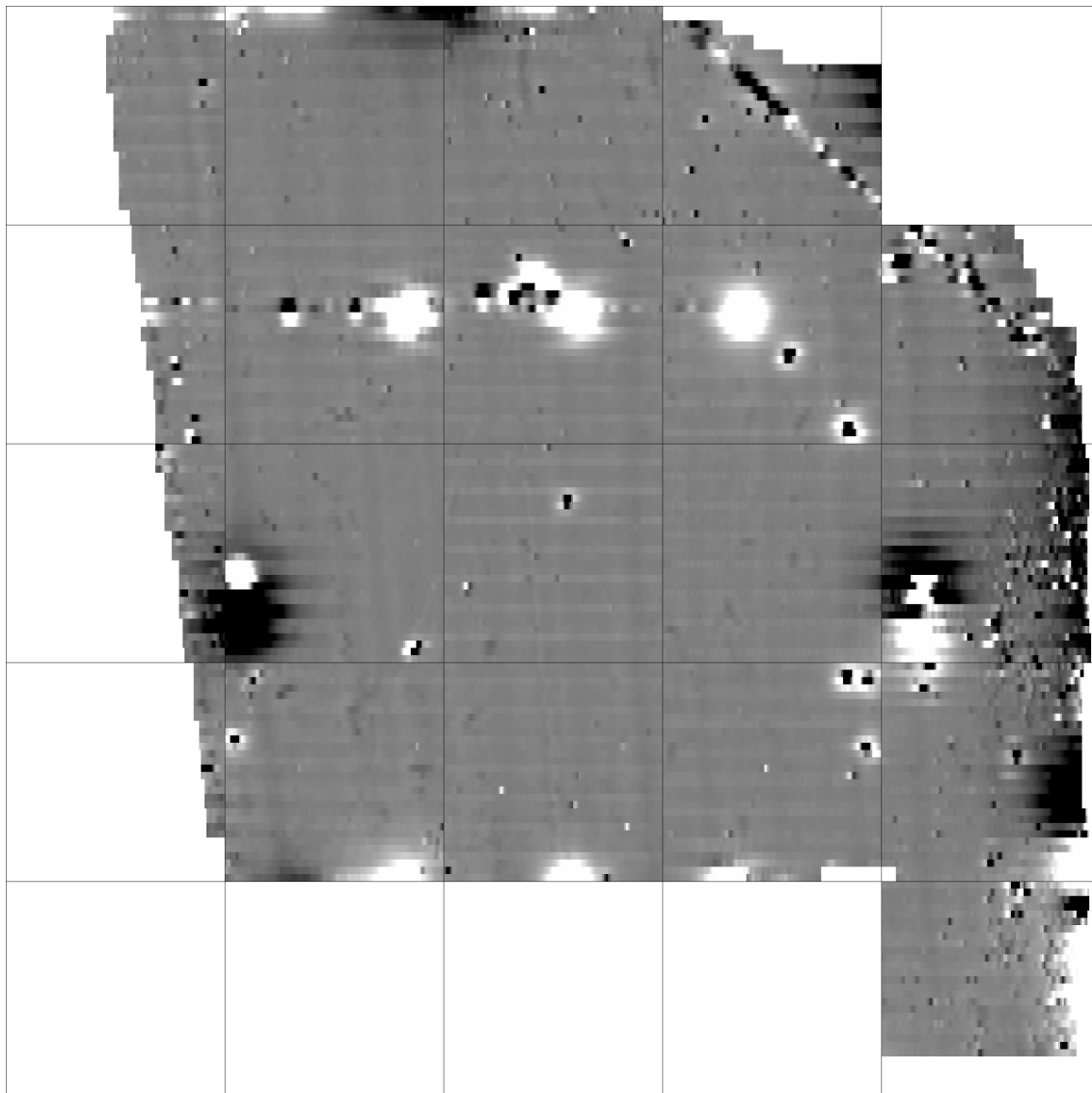


Figure 9 Area 2A processed data greyscale plot




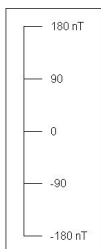
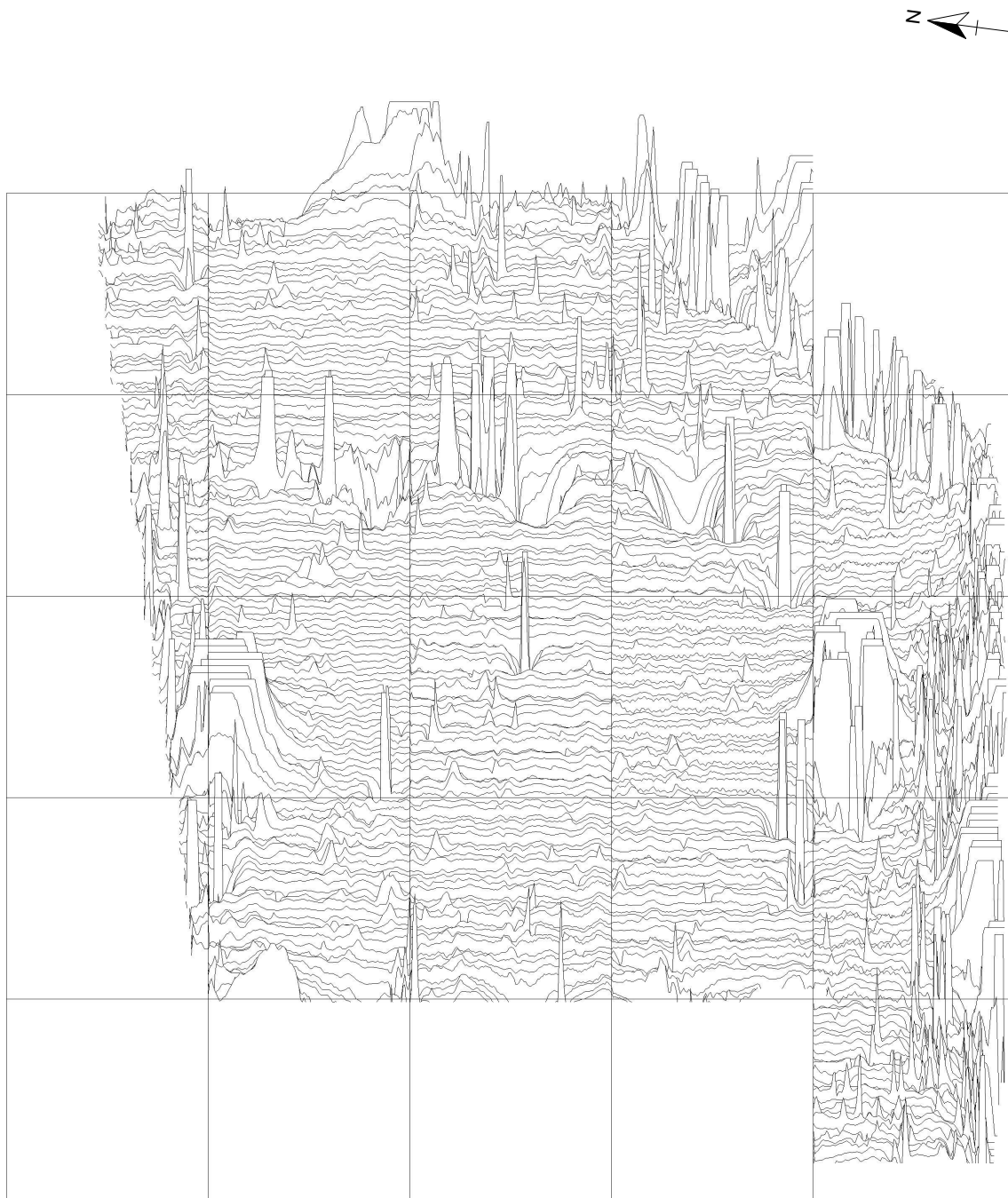
	Archaeological Project Services	
Project Name: Oakham Barleythorpe (OABT10)		
Scale 1:1000	Drawn by: SJM	Report No: 91/10

Figure 10 Area 2B unprocessed data greyscale plot




	Archaeological Project Services	
Project Name: Oakham Barleythorpe (OABT10)		
Scale 1:1000	Drawn by: SJM	Report No: 91/10

Figure 11 Area 2B unprocessed data trace plot

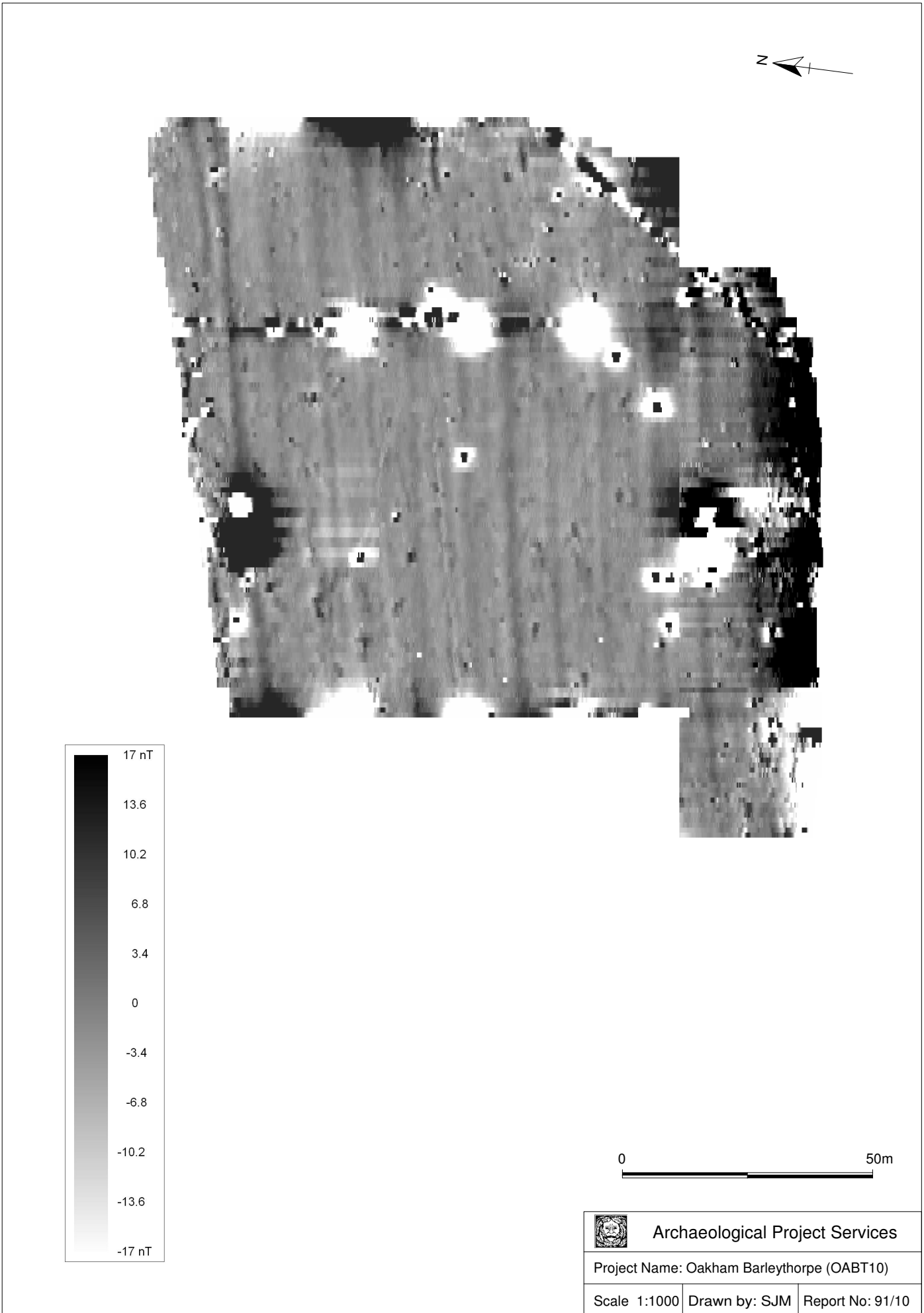


Figure 12 Area 2B processed data greyscale

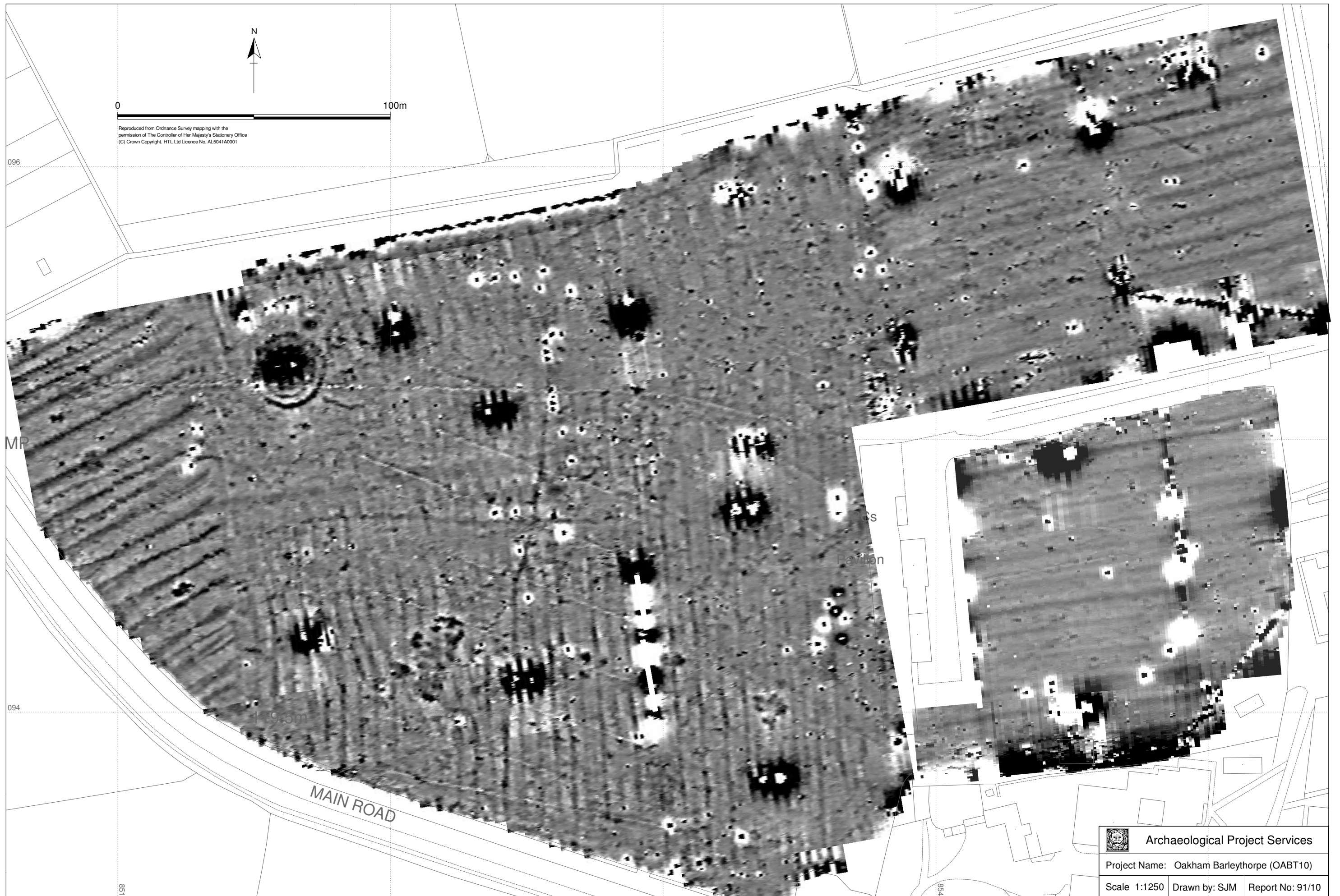


Figure 13 Area 2 Processed data overall plot



Figure 14 Area 2 overall interpretative plot

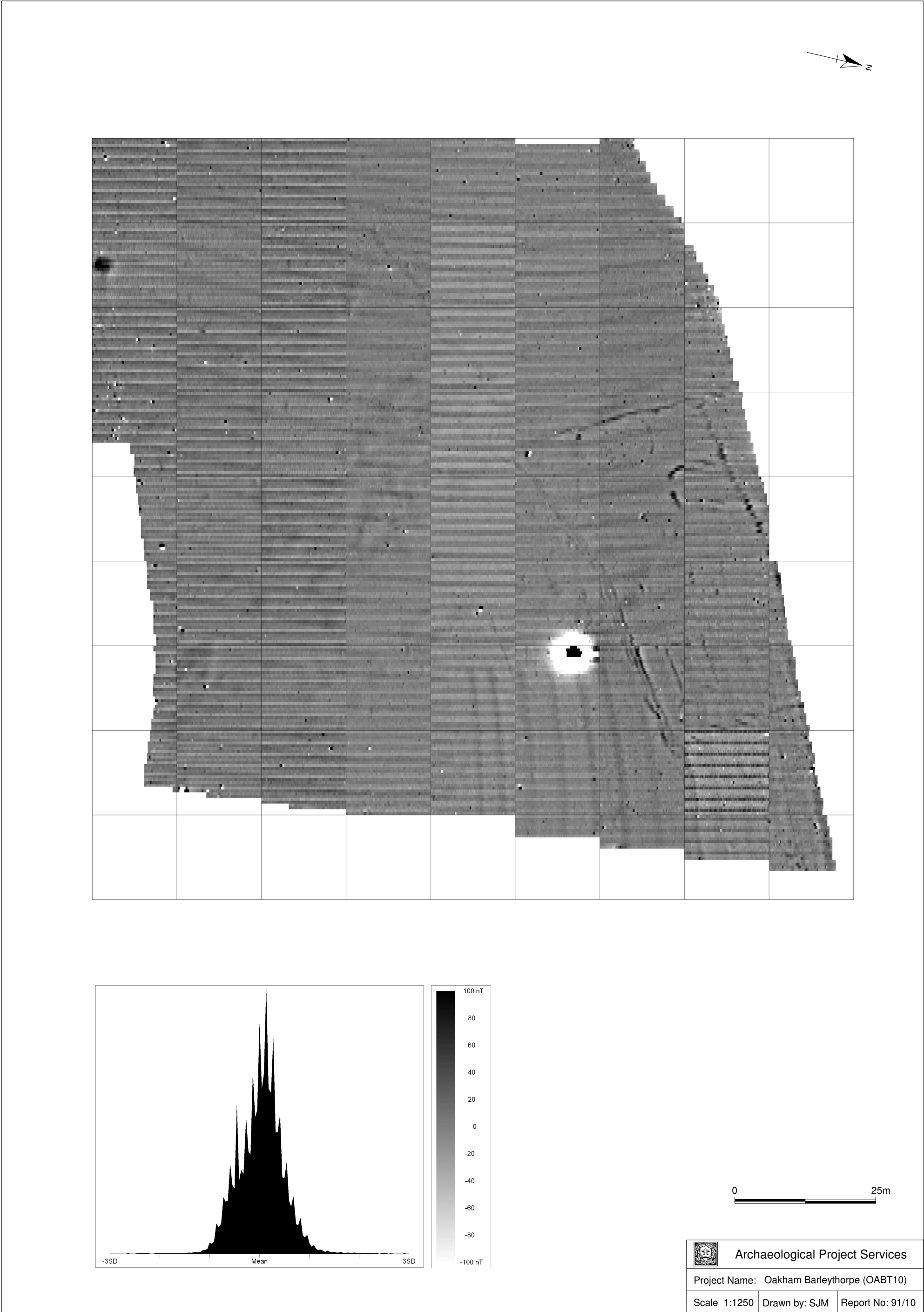
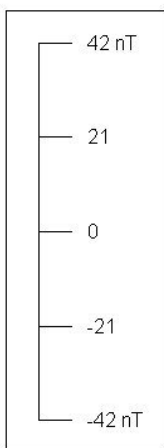
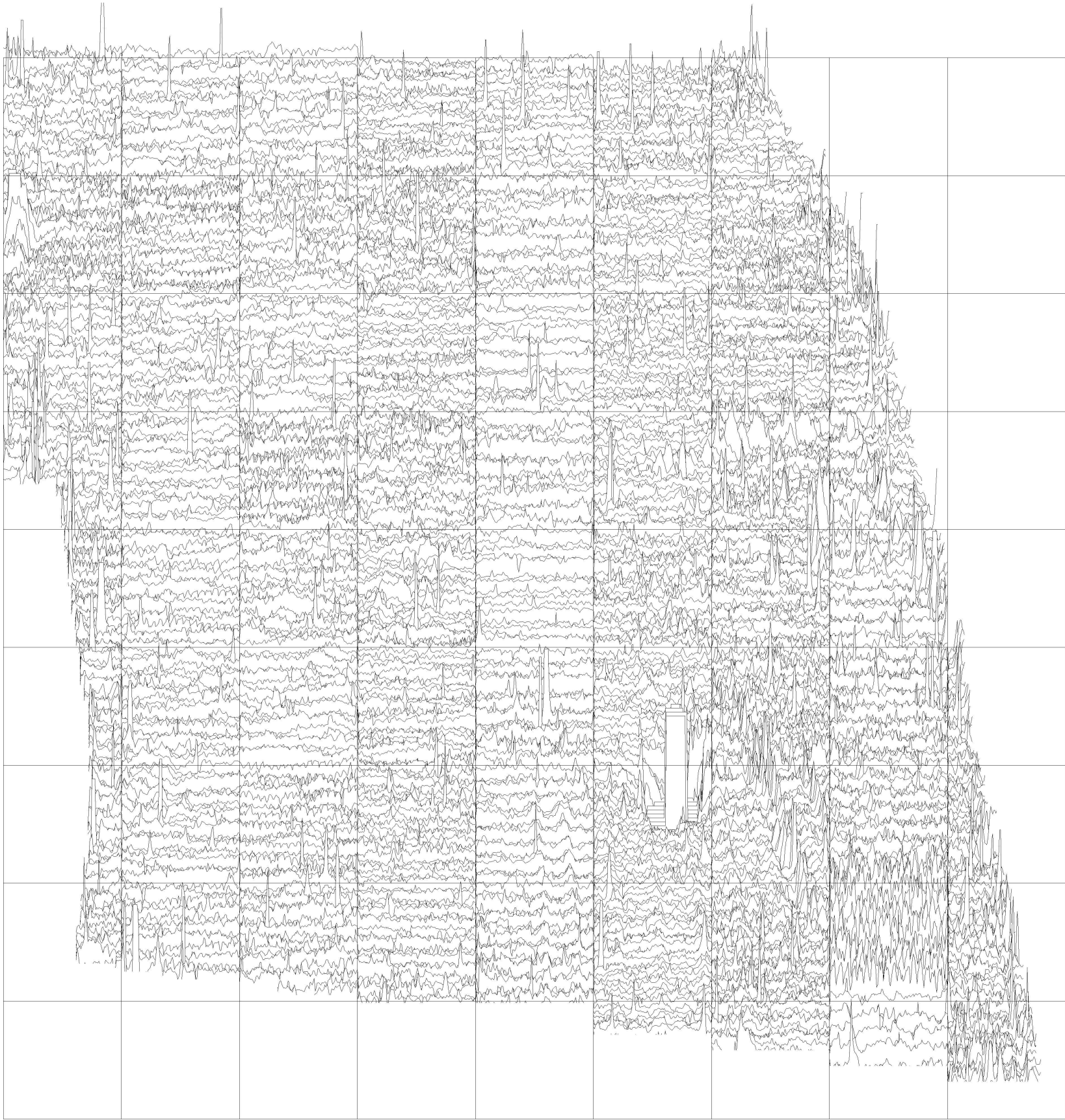


Figure 15 Area 3 unprocessed data greyscale plot (clipped +/-100nT)




	Archaeological Project Services	
Project Name: Oakham Barleythorpe (OABT10)		
Scale 1:1250	Drawn by: SJM	Report No: 91/10

Figure 16 Area 3 unprocessed data trace plot



Figure17 Area 3 processed data greyscale plot

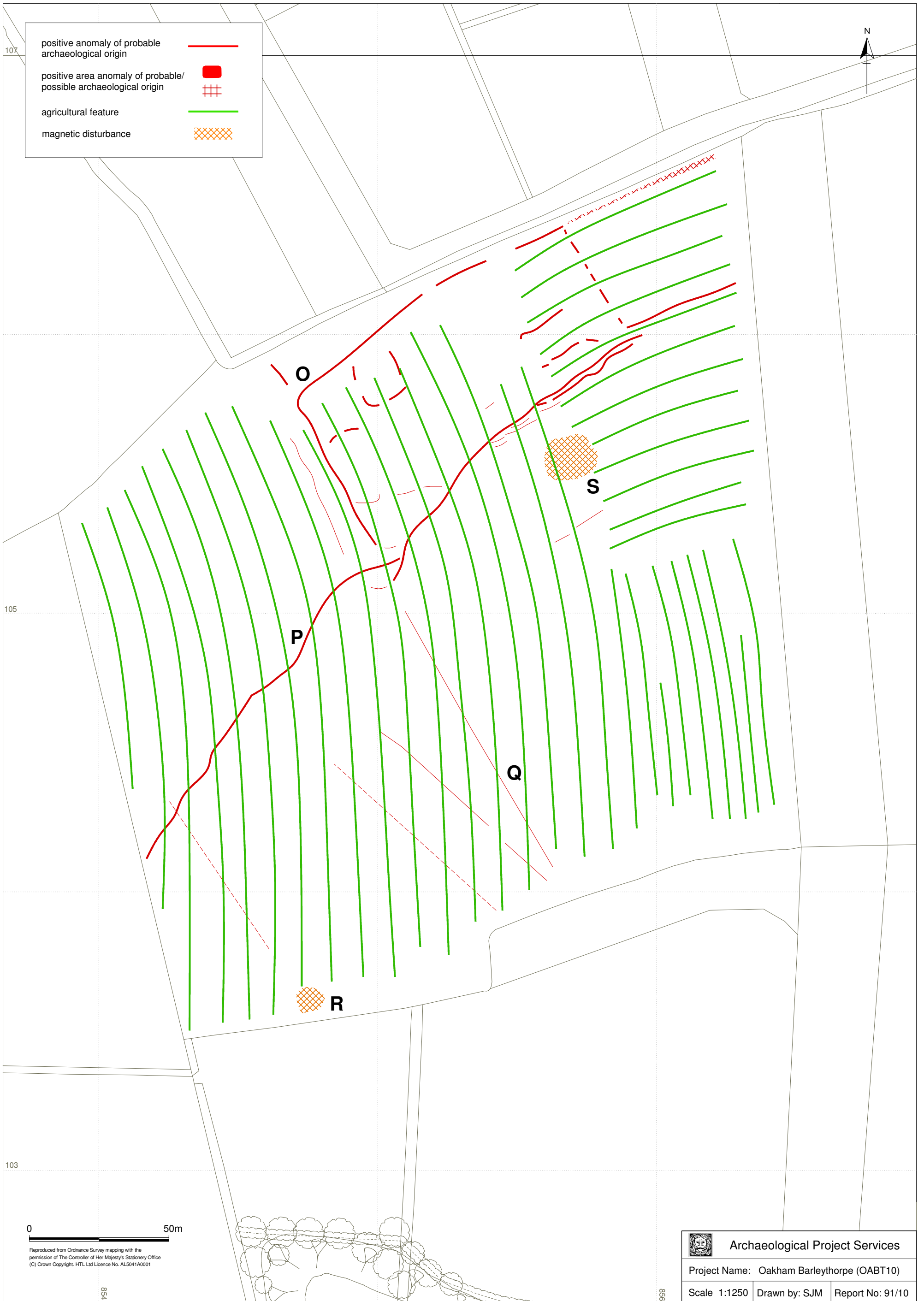


Figure 18 Area 3 interpretative plot

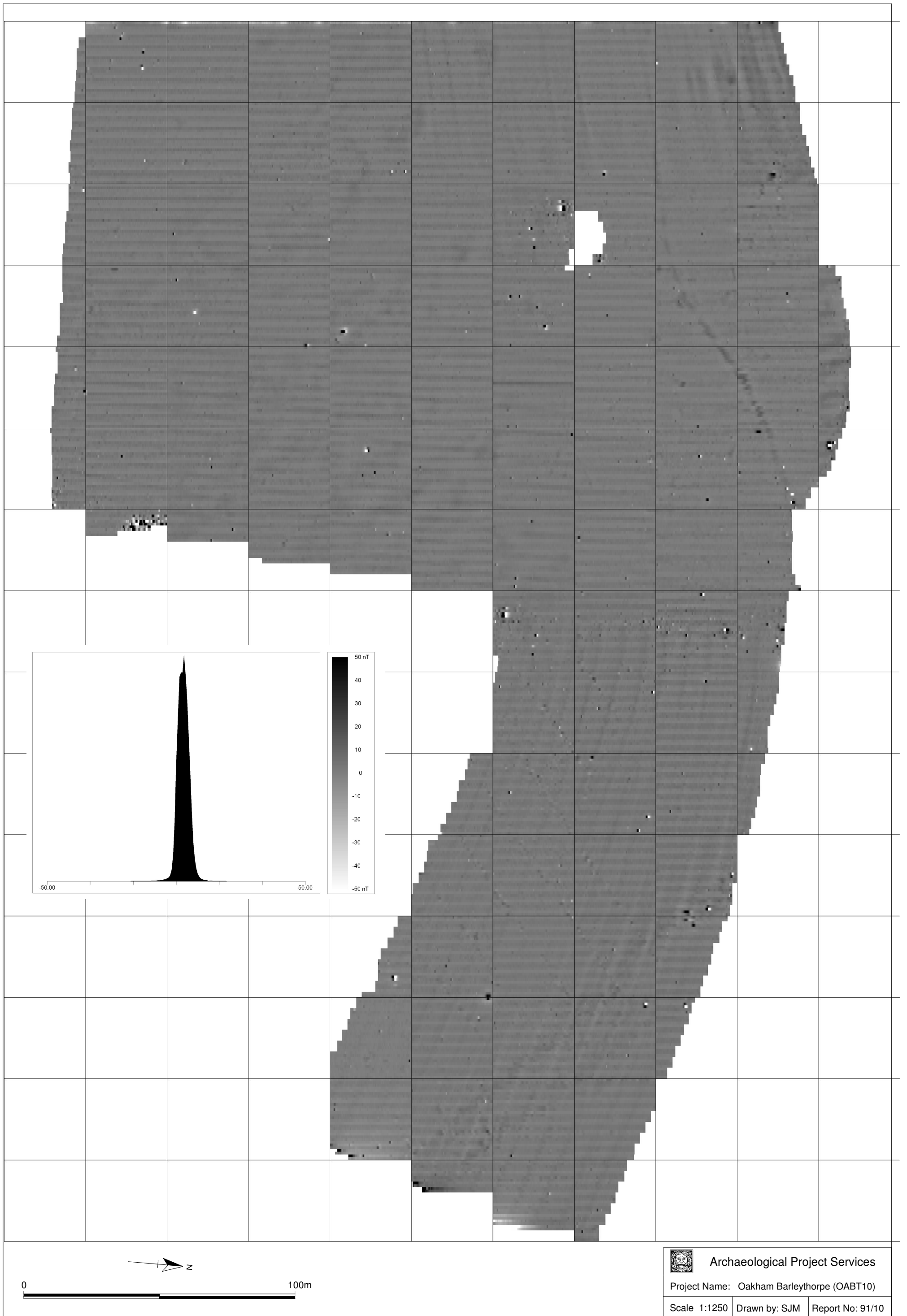


Figure 19 Area 4 unprocessed data greyscale (clipped to +/-50nT for display)

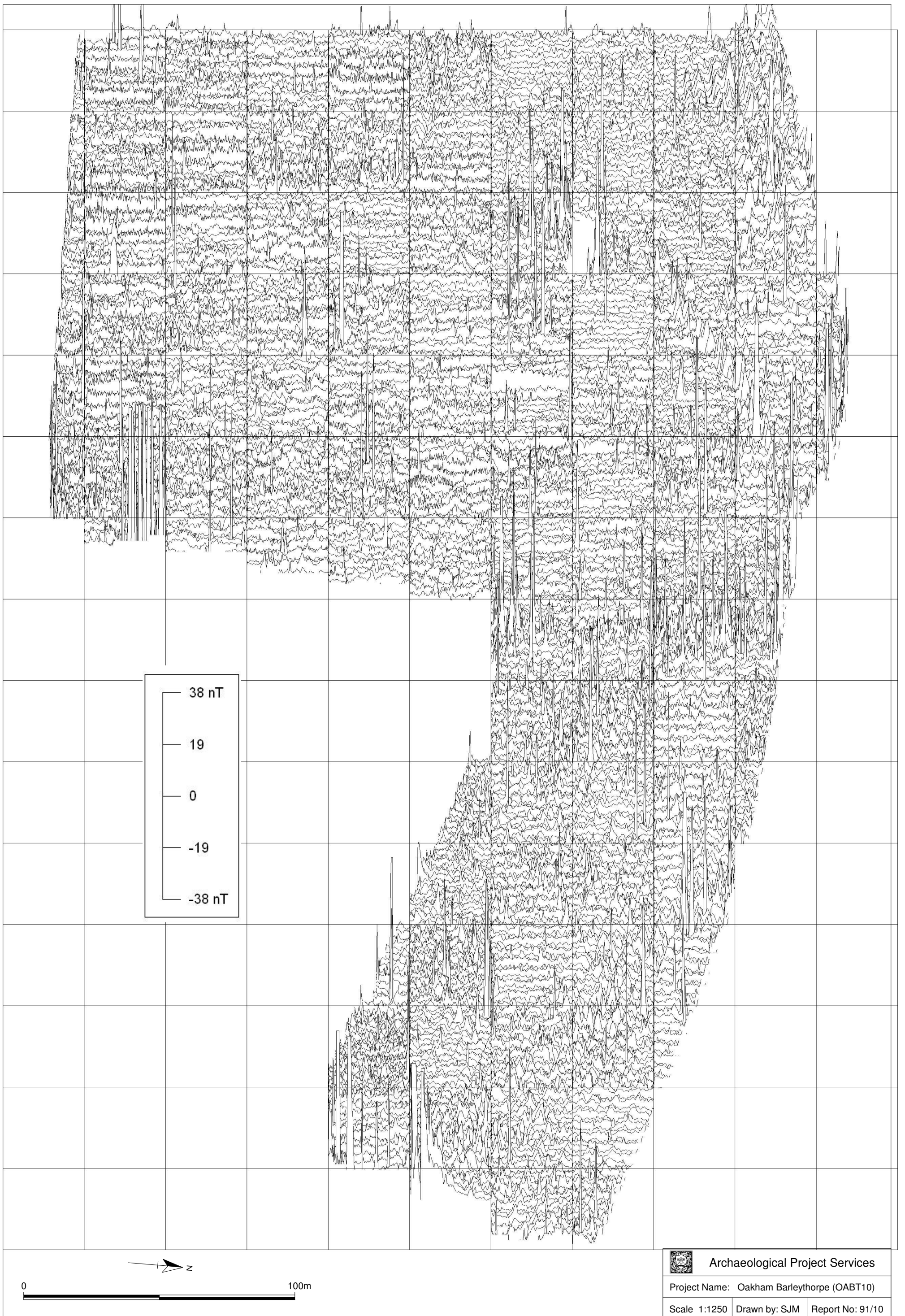


Figure 20 Area 4 unprocessed data trace plot

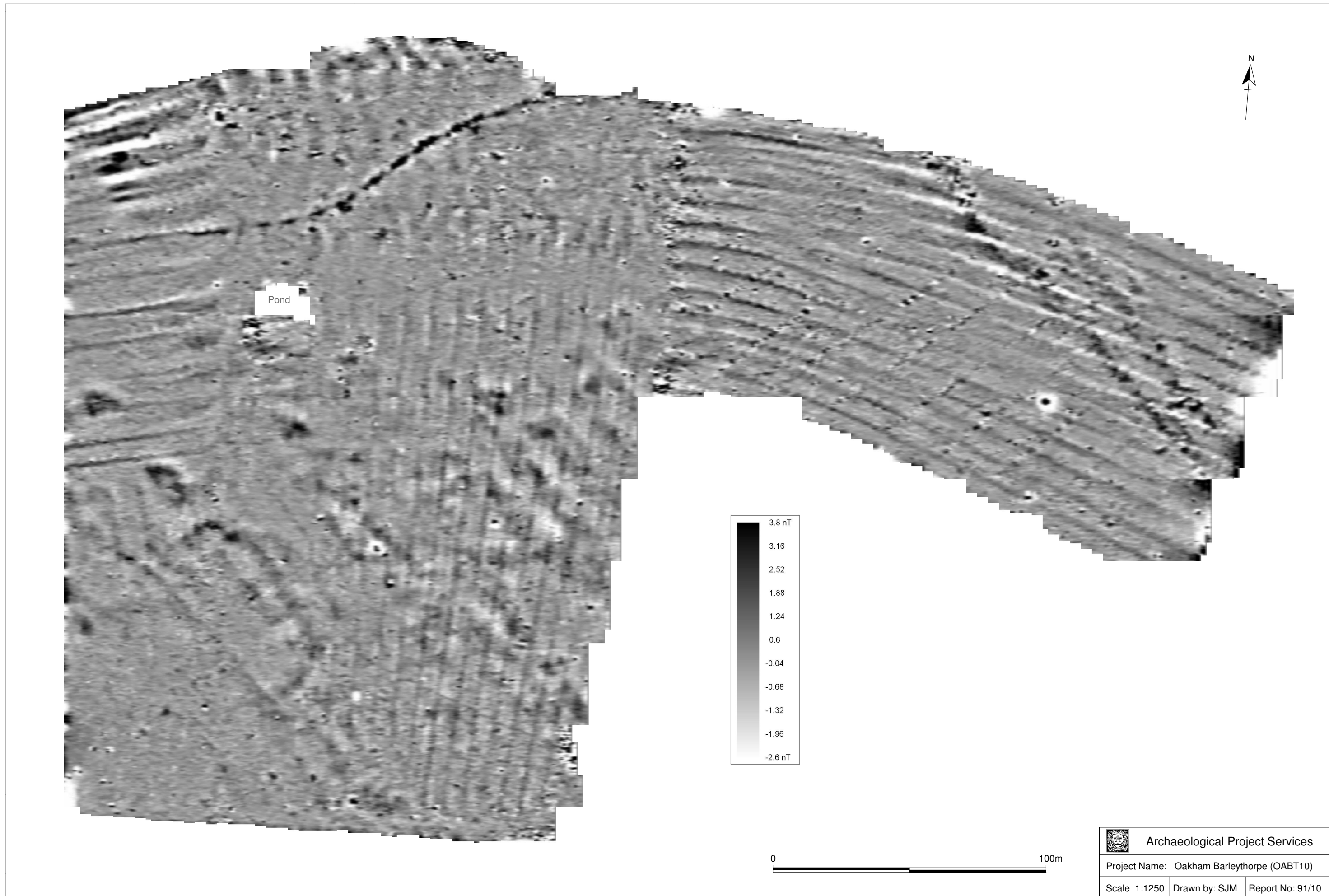
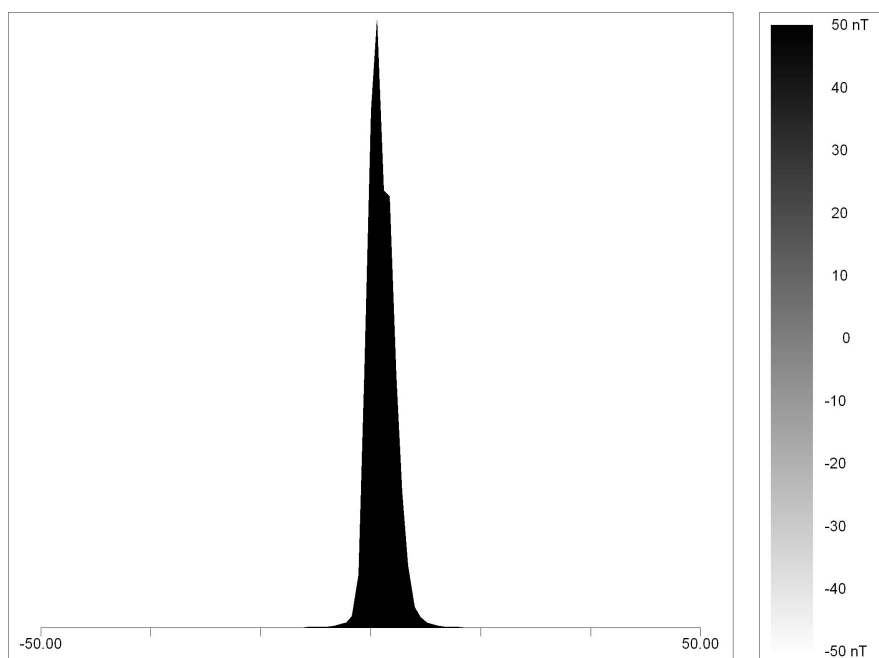
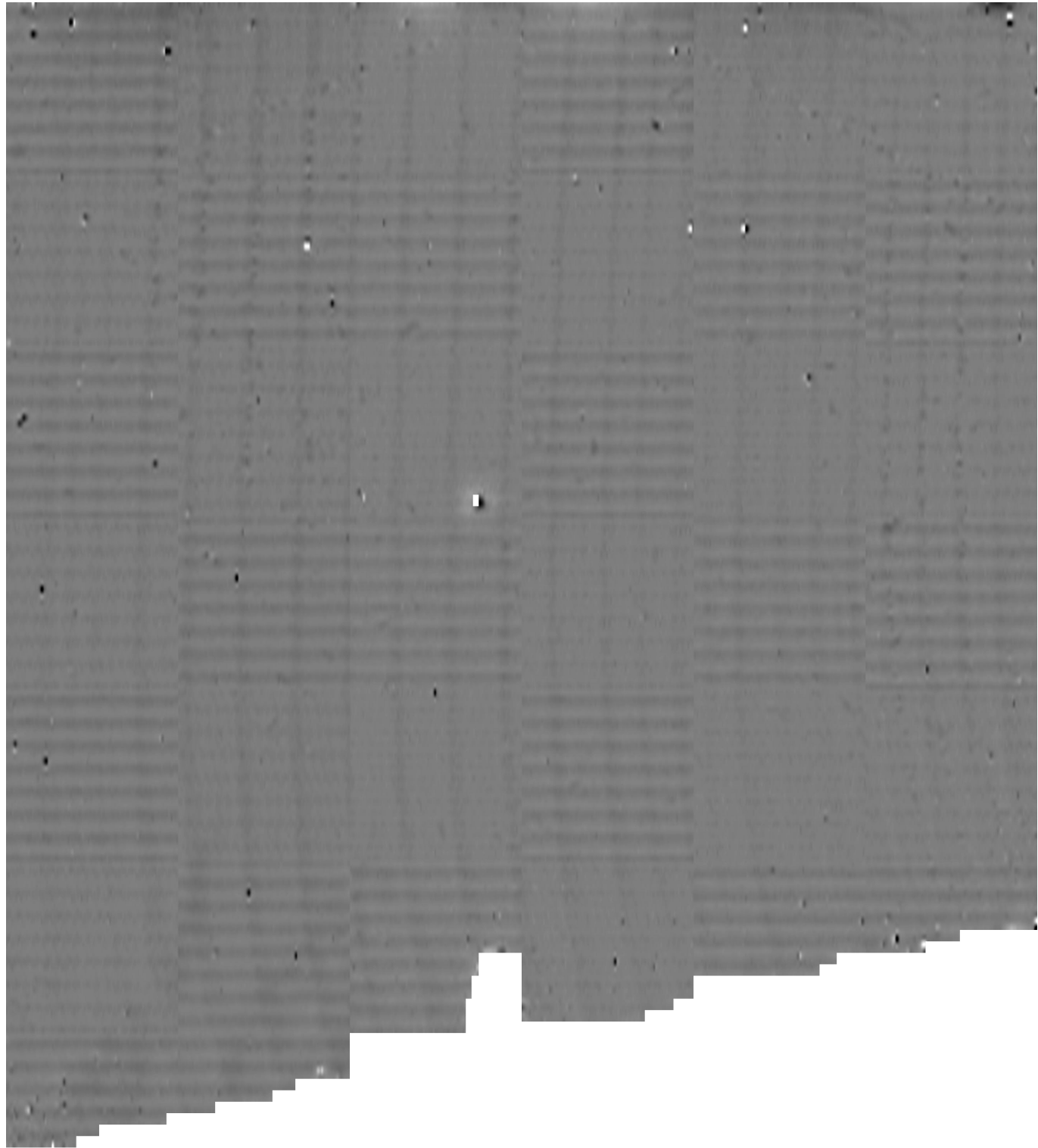


Figure 21 Area 4 Processed data greyscale



Figure 22 Area 4 interpretative plot



0 50m

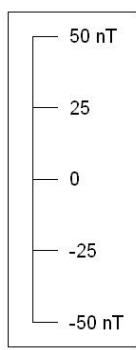
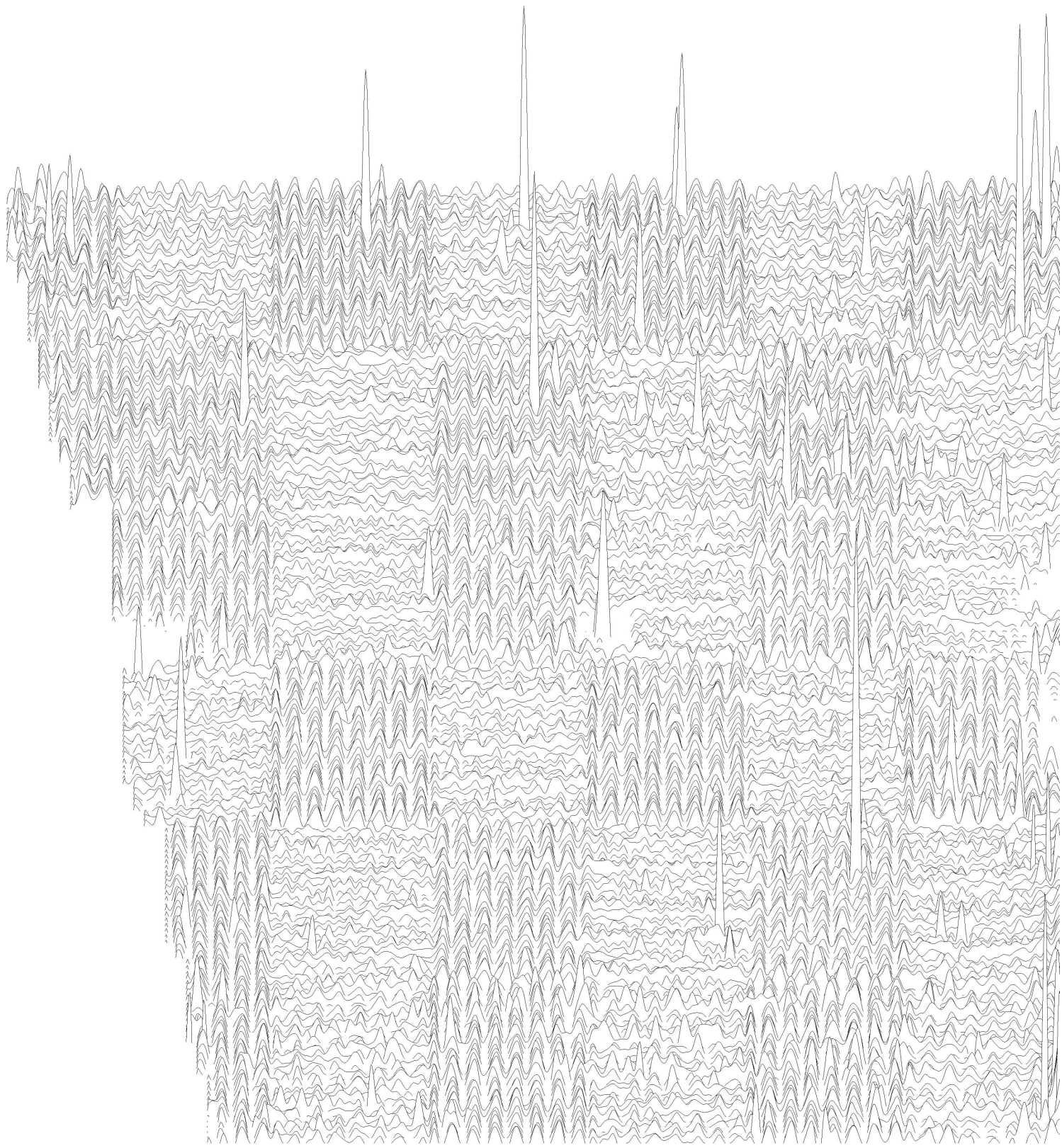


Archaeological Project Services

Project Name: Oakham Barleythorpe (OABT10)

Scale 1:1000 Drawn by: SJM Report No: 91/10

Figure 23 Area 5 unprocessed data greyscale plot (clipped +/-50nT for display)




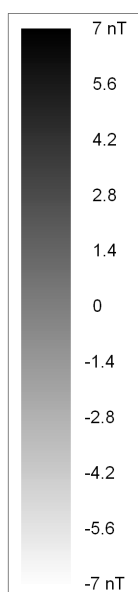
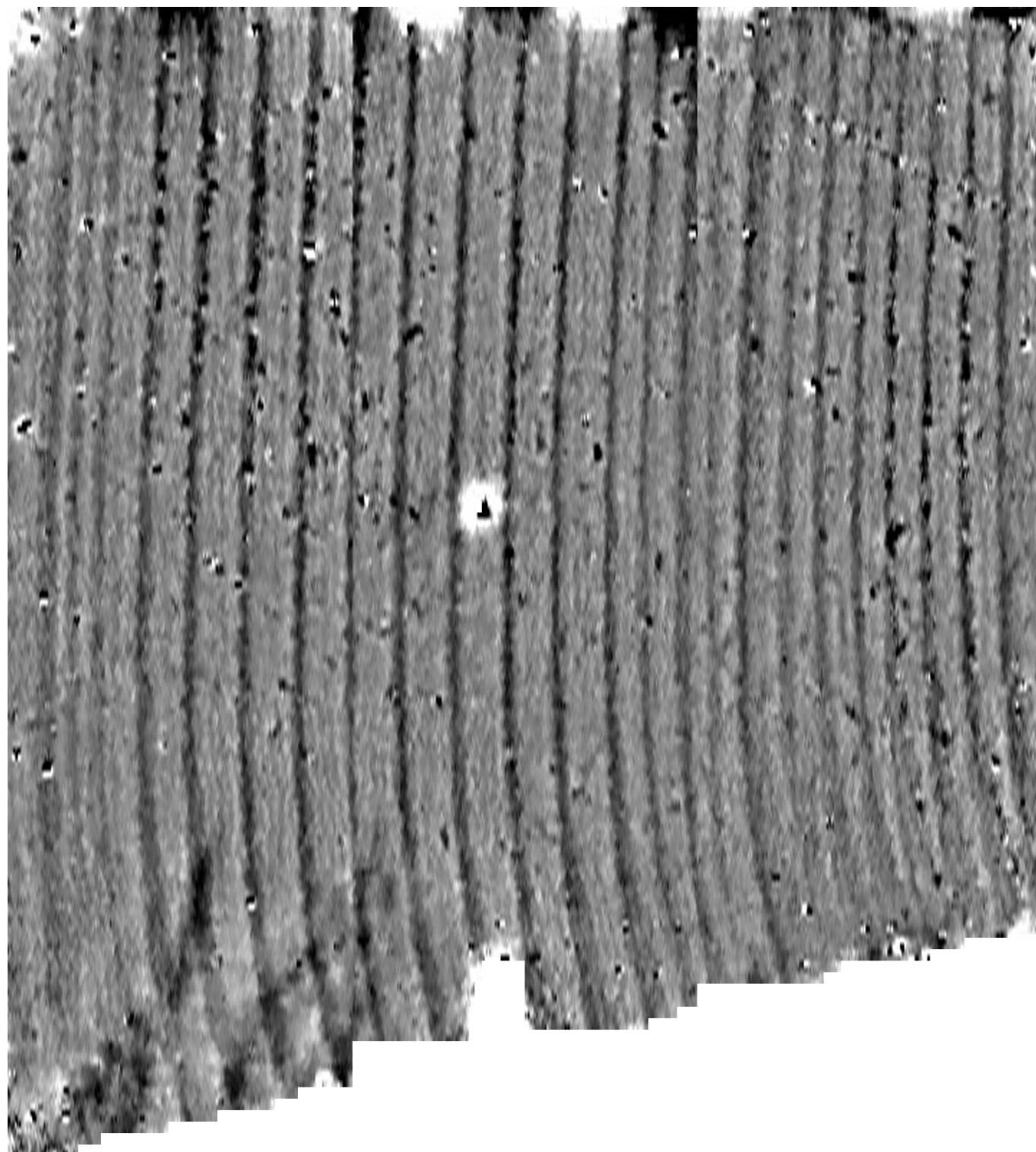
	Archaeological Project Services	
Project Name: Oakham Barleythorpe (OABT10)		
Scale 1:1000	Drawn by: SJM	Report No: 91/10

Figure 24 Area 5 unprocessed data trace plot



0 50m


	Archaeological Project Services	
Project Name: Oakham Barleythorpe (OABT10)		
Scale 1:1000	Drawn by: SJM	Report No: 91/10

Figure 25 Area 5 processed data greyscale plot



Figure 26 Area 5 interpretative plot

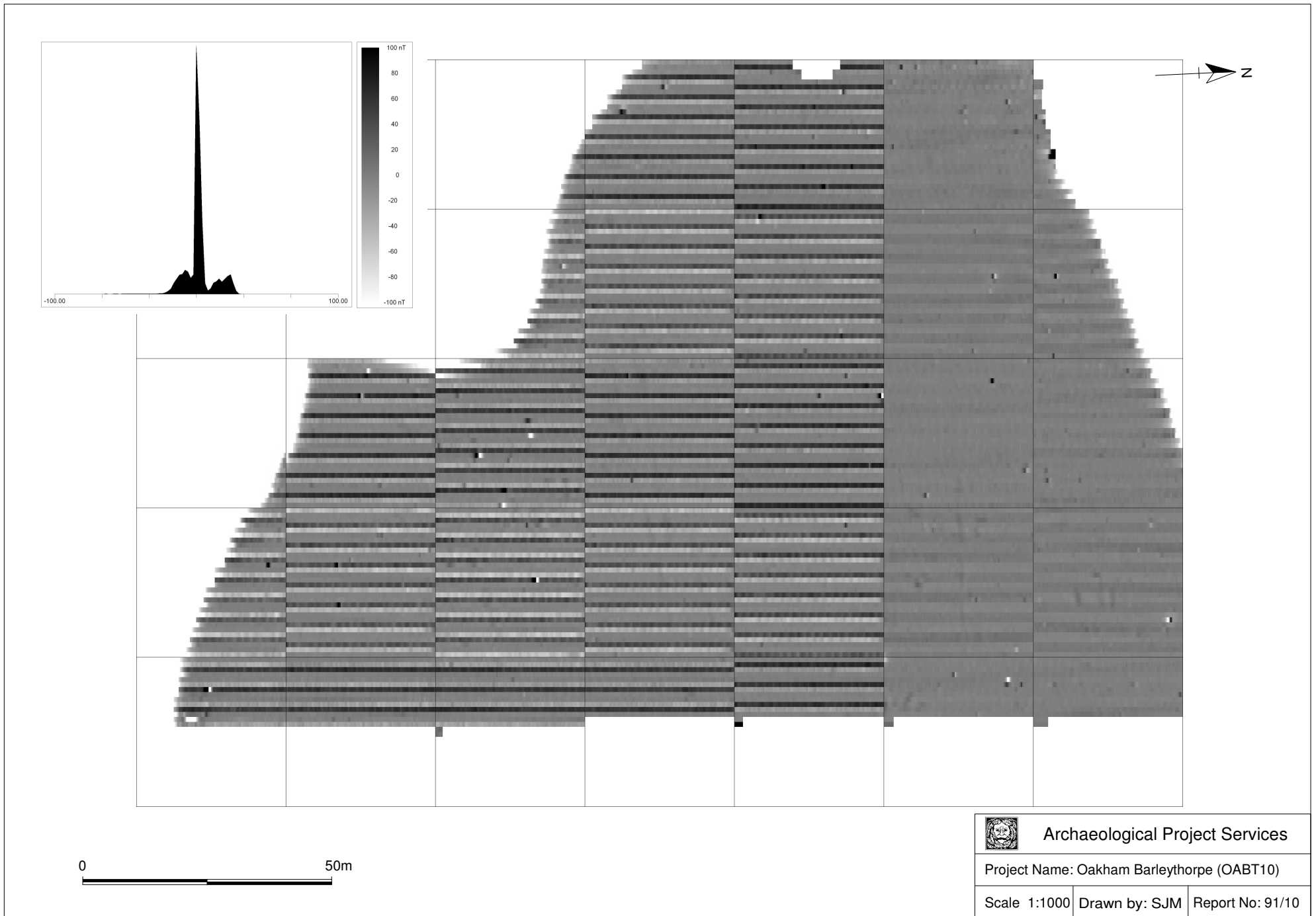


Figure 26 Area 6 unprocessed data greyscale plot

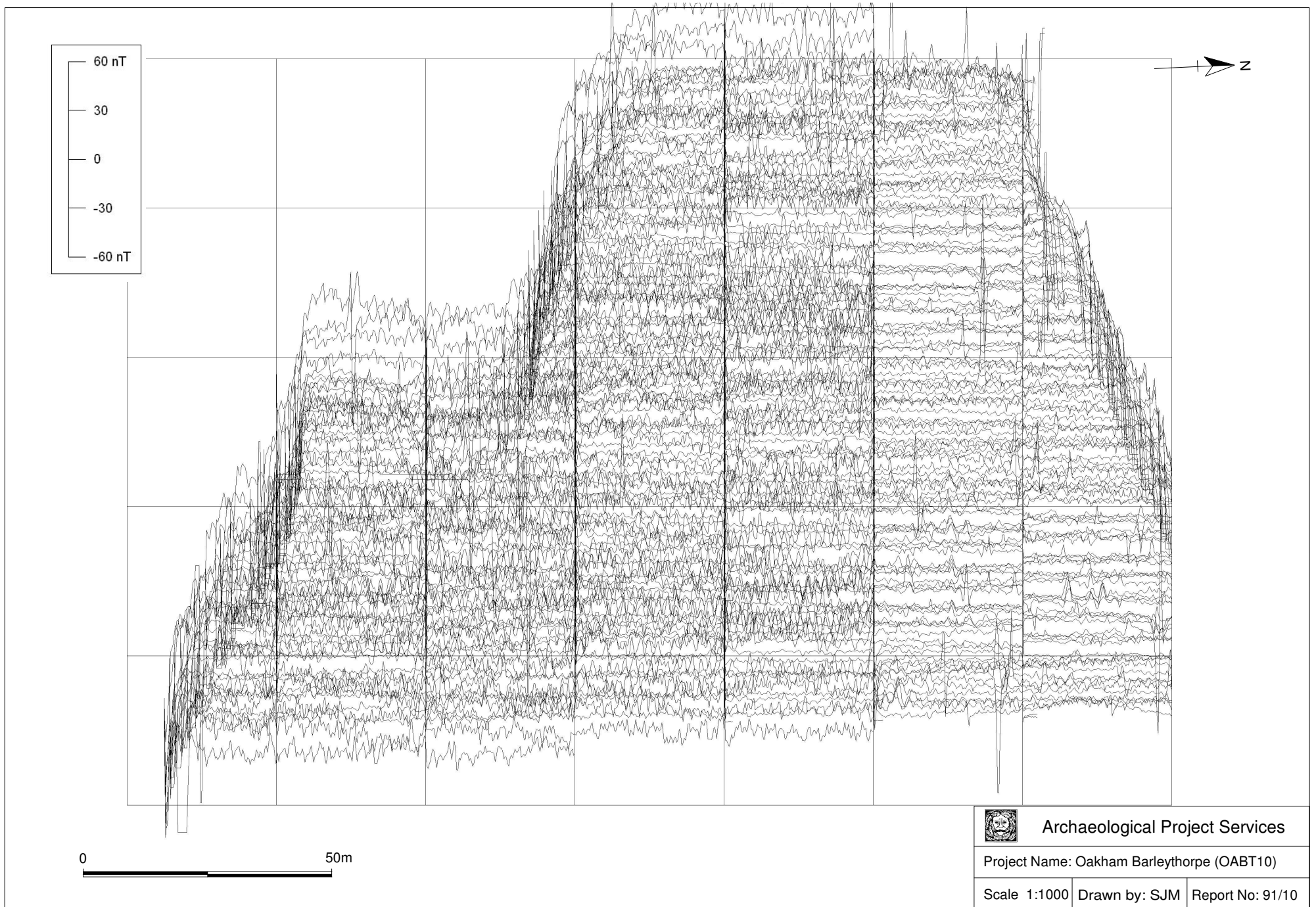
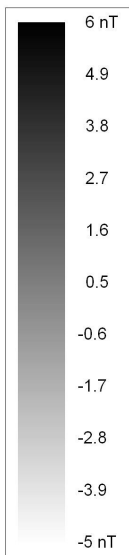
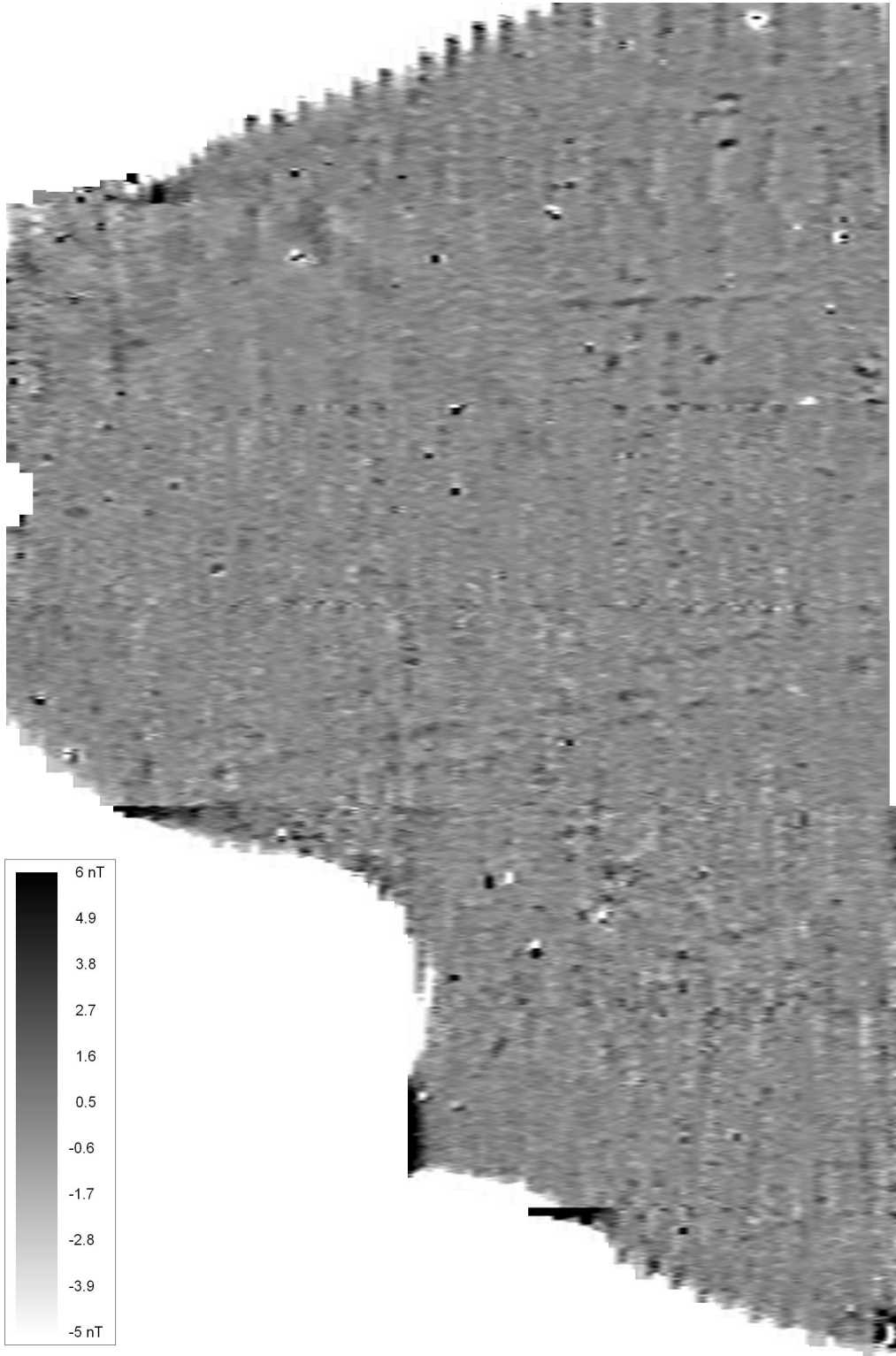


Figure 28 Area 6 unprocessed data trace plot




	Archaeological Project Services	
Project Name: Oakham Barleythorpe (OABT10)		
Scale 1:1000	Drawn by: SJM	Report No: 91/10

Figure 29 Area 6 processed data greyscale plot

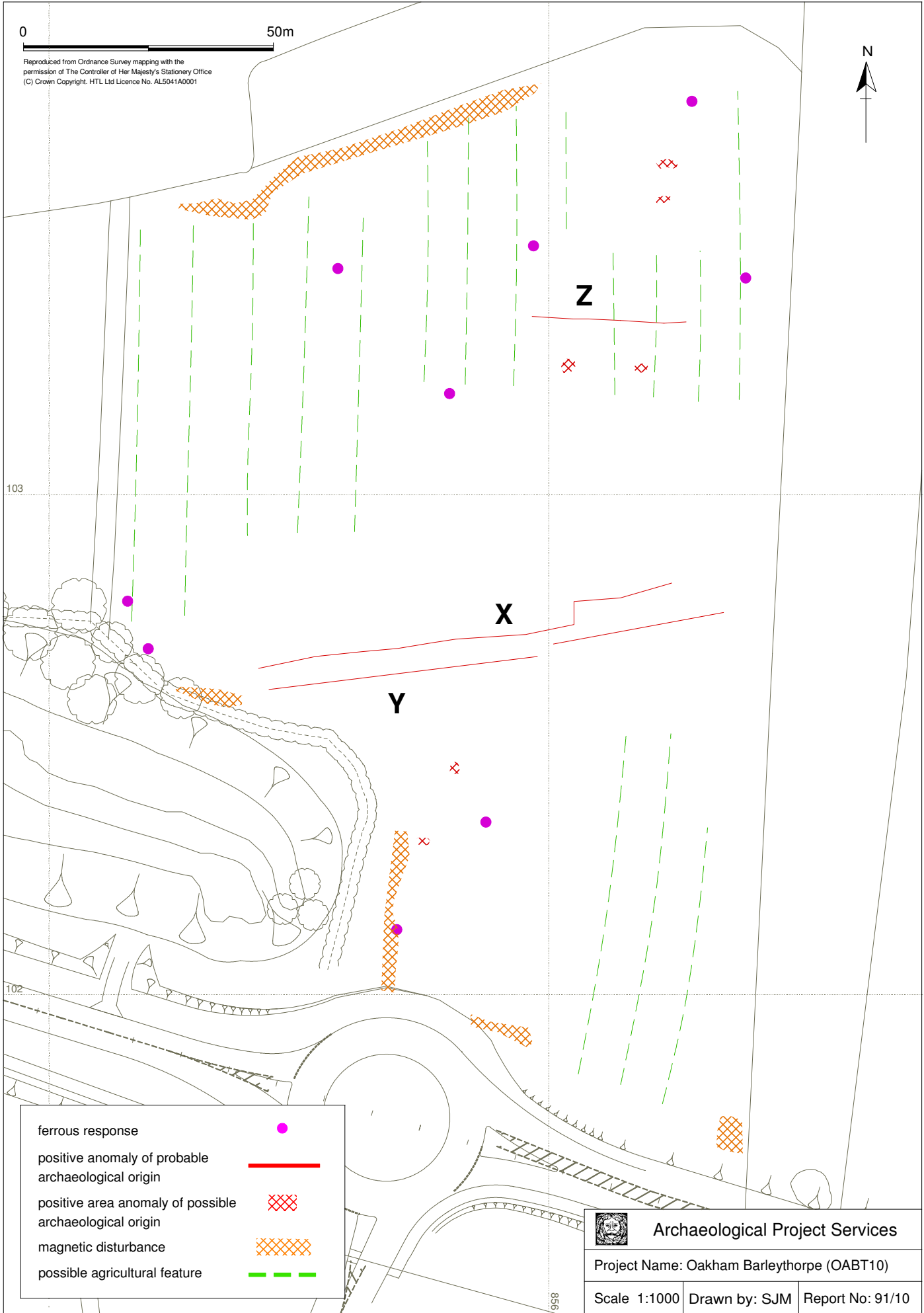


Figure 30 Area 6 interpretative plot

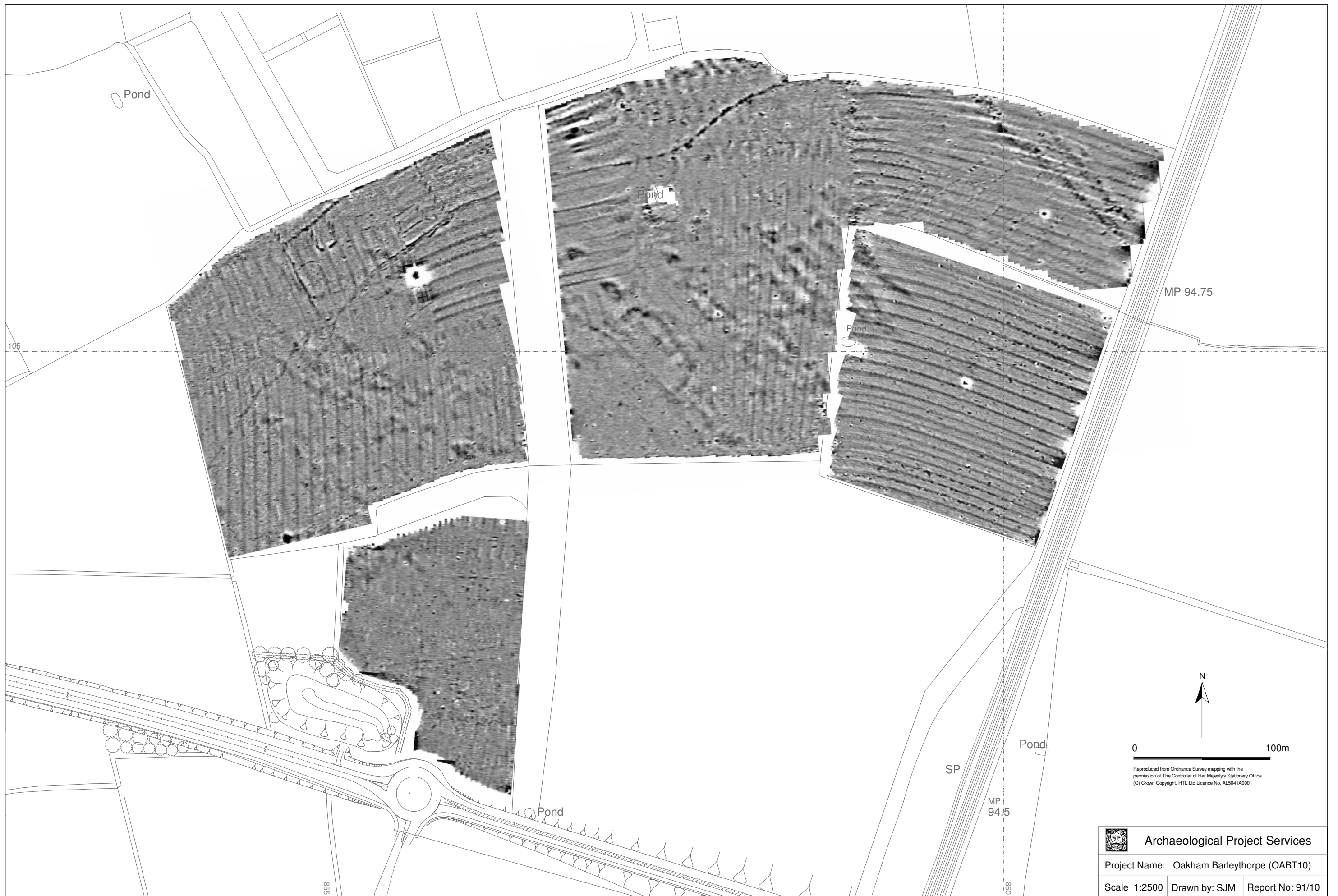


Figure 31 Areas 3-6 combined plot processed data greyscale

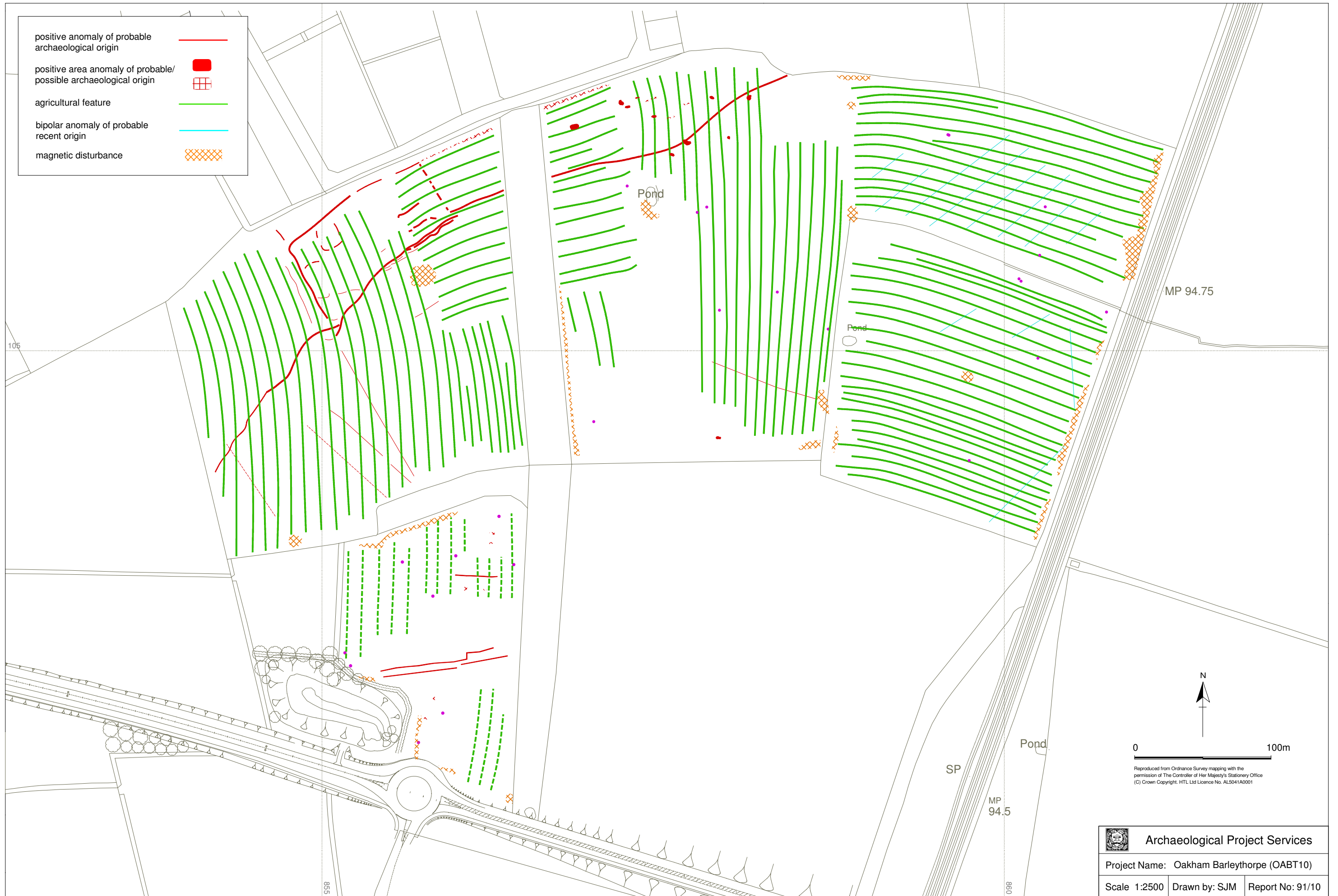


Figure 32 Areas 3-6 combined plot interpretative