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**LAND AT  
DEEPDALE FARM,  
MOOR LANE,  
LEASINGHAM, LINCOLNSHIRE  
(LEDF14)**

**GEOPHYSICAL SURVEY**

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**Work undertaken for  
Deepdale Solar Farm Ltd.**

**August 2014**

**Report produced by  
Jonathon Smith BA (Hons), MA**

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National Grid Reference: TF 07573 49267  
The Collection, Accession No.: 2014.152**

**APS Report No: 90/14**

**ARCHAEOLOGICAL  
PROJECT  
SERVICES**

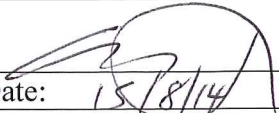





## Quality Control

### GEOPHYSICAL SURVEY DEEPDALE FARM, MOOR LANE, LEASINGHAM, LINCOLNSHIRE (LEDF14)

Project Coordinator	Gary Taylor
Site Staff	Neil Jefferson, Ryan Godbold, Mary Nugent
Survey processing and report	Jonathon Smith

Checked by Project Manager	Approved by Senior Archaeologist
 Gary Taylor	 Tom Lane
Date: 15/8/14	Date: 17-8-14



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## 1. SUMMARY

*Detailed magnetic gradiometer survey was undertaken for Deepdale Solar Farm Ltd. in connection with proposed development on land Deepdale Farm, Moor Lane, Leasingham, Lincolnshire. The survey totalled c. 11.5ha.*

*Research had identified a scatter of Roman pottery and cropmarks on the site. However, the geophysical survey only revealed two linears of probable archaeological significance. One of these linear anomalies represents a boundary ditch of probable prehistoric or Roman date, previously identified as a cropmark. The second linear feature represents a former field boundary shown on 19<sup>th</sup>-20<sup>th</sup> century maps. A number of discrete positive responses might represent isolated pit features, but these are difficult to interpret on the basis of form alone.*

## 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 Deepdale Solar Farm

Ltd. to undertake a detailed magnetometer survey totalling some 11.5ha on land at *Deepdale Farm, Moor Lane, Leasingham, Lincolnshire*. This was in advance of proposed development of the area. Roman pottery and cropmarks have been recorded in the area previously (Trimble 2014). The survey was carried out between the 11<sup>th</sup> and 13<sup>th</sup> of August 2014.

### 2.3 Topography and Geology

Leasingham is located 3km north of Sleaford, in the North Kesteven district of Lincolnshire (Fig. 1).

Deepdale Farm is 2km east of the centre of Leasingham, on Moor Lane at National Grid Reference TF 07573 49267 (Fig. 2). The proposed development area encompasses some 11.5 hectares.

Local soils at the site are of the Aswarby Series, typically brown calcareous earths (George and Robson 1978, 44). These soils are developed upon a solid geology of Jurassic Cornbrash (GSGB 1972).

## 3. GEOPHYSICAL SURVEY

### 3.1 Methods

Location and layout of the survey areas is shown in Figure 3. The west of the site was covered in stubble, the east of the site was covered in sugar beet and the south was ploughed. None of the ground conditions hampered carrying out the survey.

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 intervals along traverses 1m apart. This equates to 6400 sampling points in a full 40m x 40m 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 TerraSurveyor 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 median 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 median 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 = 2; Y radius = 2; Threshold = 3SD; Spike replacement = mean

3. Clip (excludes extreme values allowing better representation of detail in the mid range): -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 4-6; clipped for display, but otherwise unprocessed), together with greyscale plots of the processed data (Fig 4 and 7). Magnetic anomalies have been identified and plotted onto an interpretative drawing (Fig. 3) and are described below.

#### *Positive linear anomalies*

Two positive linears were identified (highlighted in red). One is weak and runs east to west across the site. The other is stronger and runs north to south. This linear is aligned on an existing field boundary and is likely to be the remains of a change in the field system.

#### *Discrete positive anomalies*

Examples of discrete positive anomalies are highlighted and possibly represent pit features. However, these are somewhat isolated and are difficult to interpret on the basis of form alone.

#### *Modern/magnetic disturbance*

There are many parallel linears running the length of the field, roughly east to west. These are almost certainly modern field drains and plough features.

#### *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.

## 4. DISCUSSION

Two positive linears have been identified, one of which is very likely a recent field boundary, and its position is recorded as such on 19<sup>th</sup>-20<sup>th</sup> century maps. The other linear anomaly, extending approximately east-west through the site, represents a boundary ditch previously recorded through cropmark evidence. This boundary ditch is considered to be associated with other cropmark evidence interpreted as relating to prehistoric or Roman occupation (Trimble 2014). The geophysical survey extends the length of the boundary ditch further to the southwest than indicated by the cropmark evidence.

A number of discrete positive responses might represent isolated pit features, but these are not strong and would be difficult to interpret on the basis of form alone.

## 5. ACKNOWLEDGEMENTS

Archaeological Project Services wishes to acknowledge Deepdale Solar Farm Ltd. who commissioned the project; Gary Taylor and Tom Lane (APS) edited the report.

## 6. PERSONNEL

Project coordinator: Dale Trimble  
Geophysical Survey: Neil Jefferson, Ryan Godbold and Mary Nugent.  
Survey processing and reporting: Jonathon Smith

## **7. BIBLIOGRAPHY**

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

George, H. and Robson, J.D., 1978, *Soils in Lincolnshire II, Sheet TF04 (Sleaford)*, Soil Survey Record No. **51**

GSGB, 1972, *Grantham; Solid and Drift geology*, 1:63360 map sheet **121**

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

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

Trimble, R., 2014 *Proposed Solar Farm at Deepdale Farm, Moor Lane, Leasingham, Lincolnshire, Archaeological Desk-Based Assessment and Heritage Statement*, Witham Archaeology

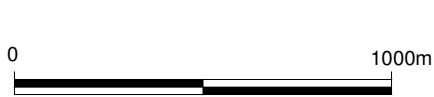
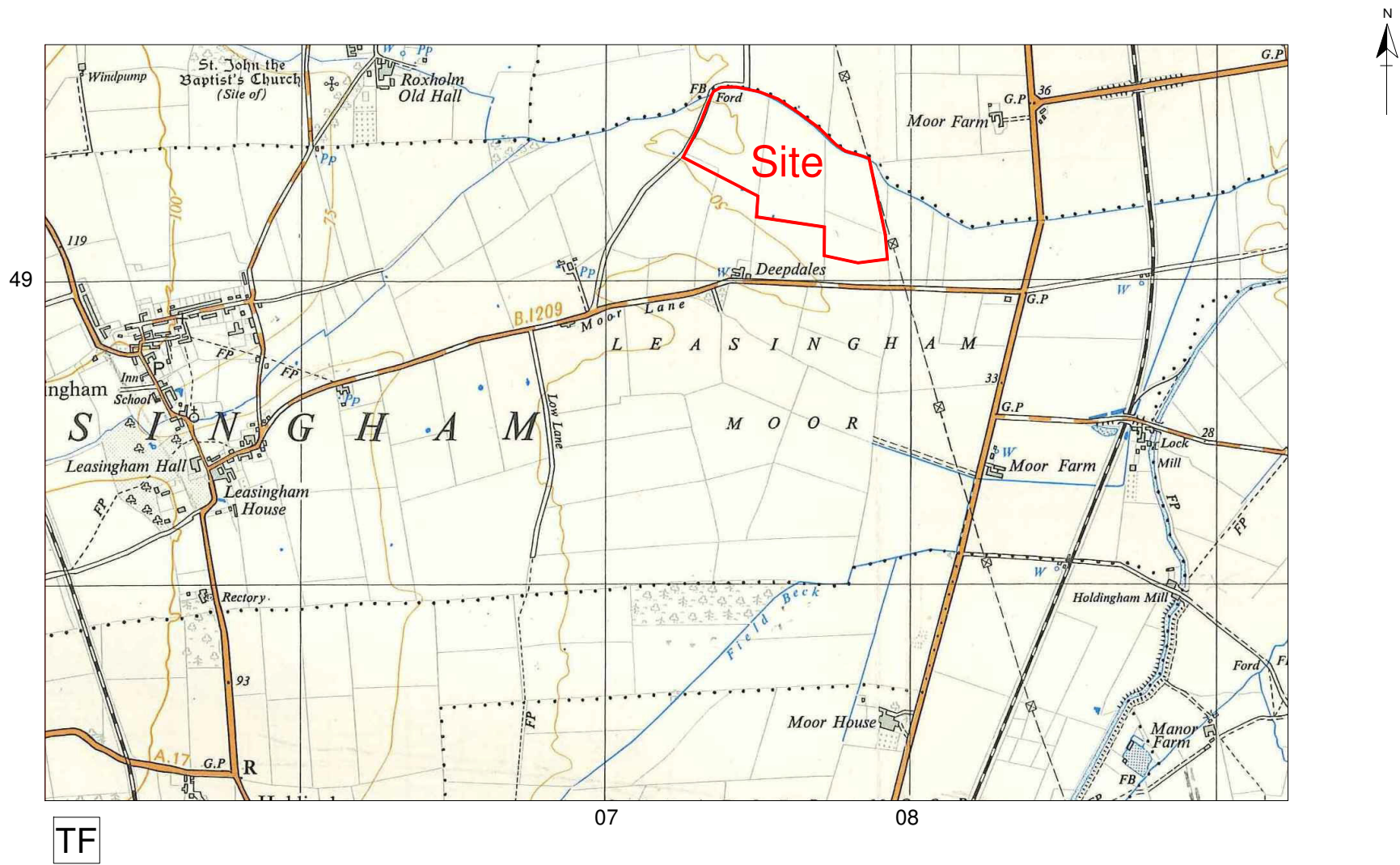
## **8. ABBREVIATIONS**

IfA Institute for Archaeologists

GSGB Geological Survey of Great Britain



Figure 1, General Location Plan



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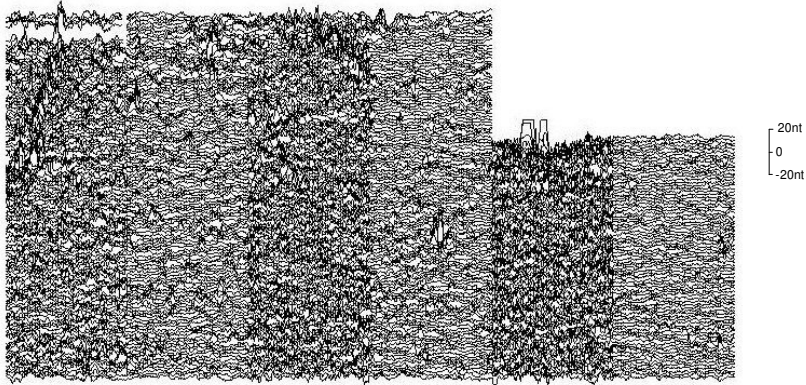
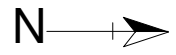
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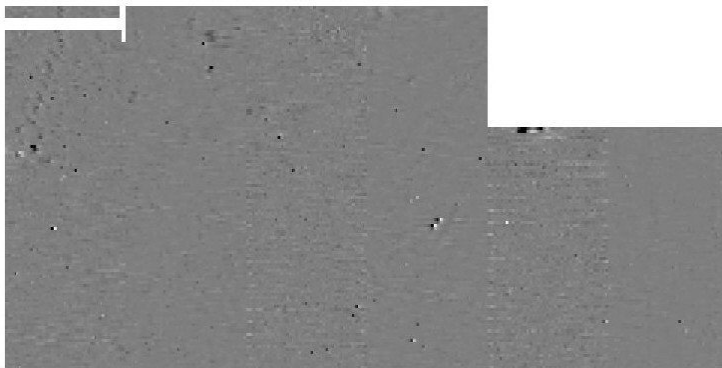
Figure 2, Site Location Map



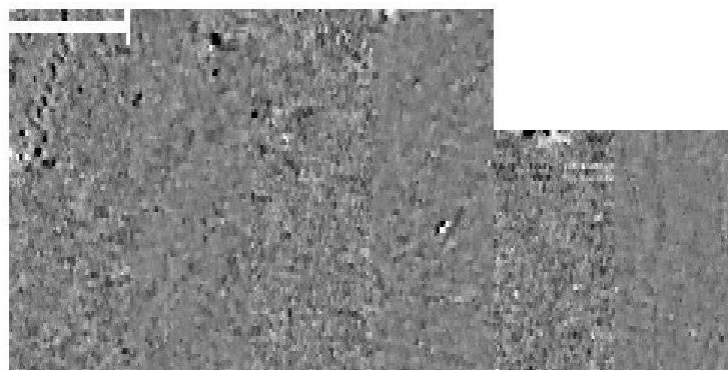
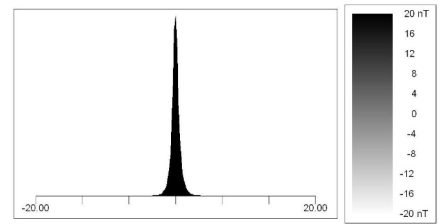
Figure 3, Site Layout with Interpretation



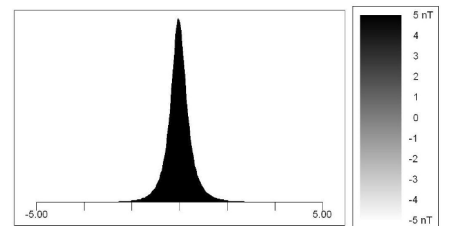
Area A, minimally processed trace plot



Area A, minimally processed greyscale plot



Area A, processed greyscale plot



Archaeological Project Services

Project Name: Deepdale Farm, Leasingham

Scale 1:2500

Drawn by: JS

Report No: 90/14

Figure 4, Area A trace and greyscale plots

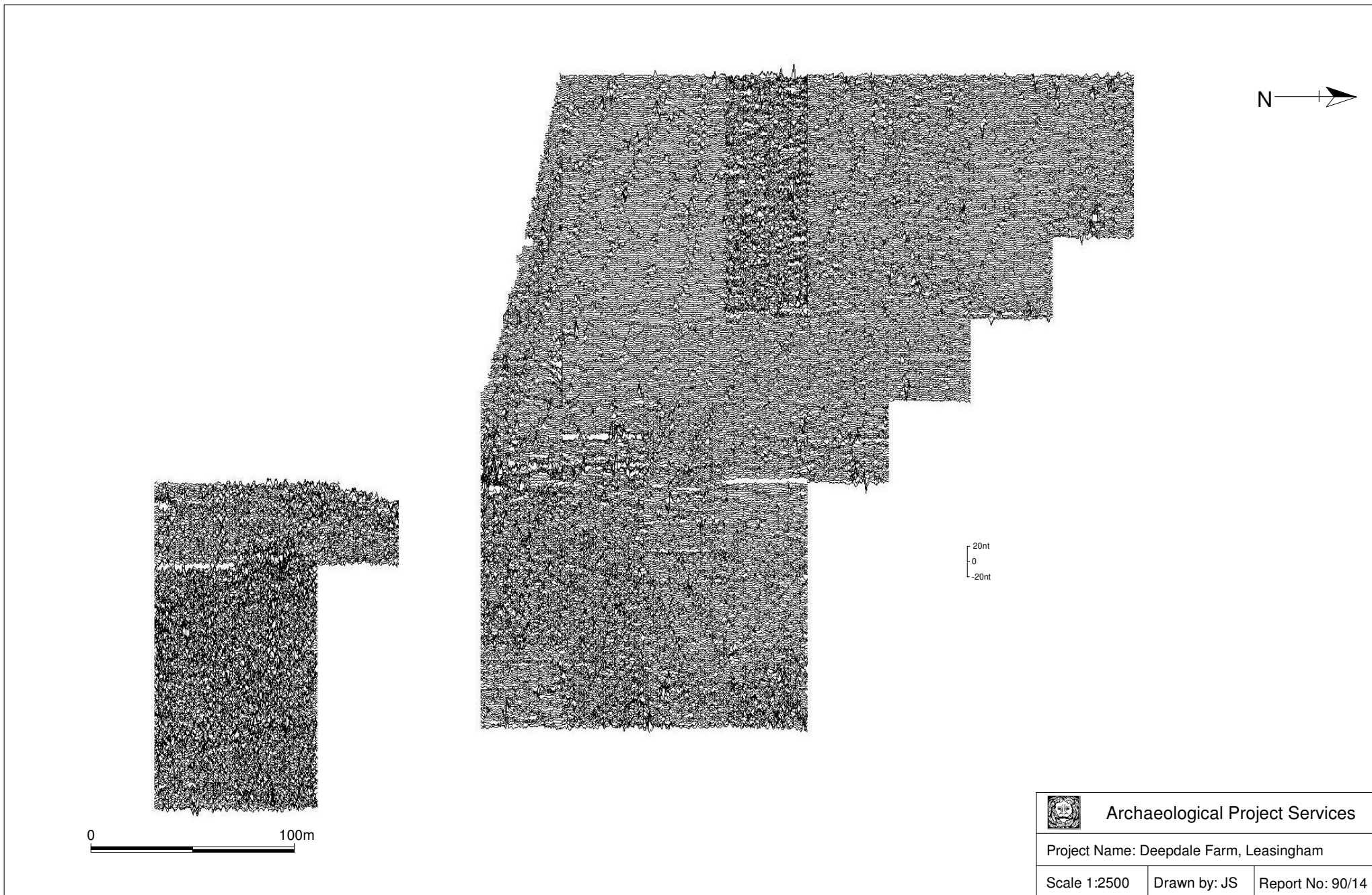



Figure 5, Area B minimally processed trace plot

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Project Name: Deepdale Farm, Leasingham		
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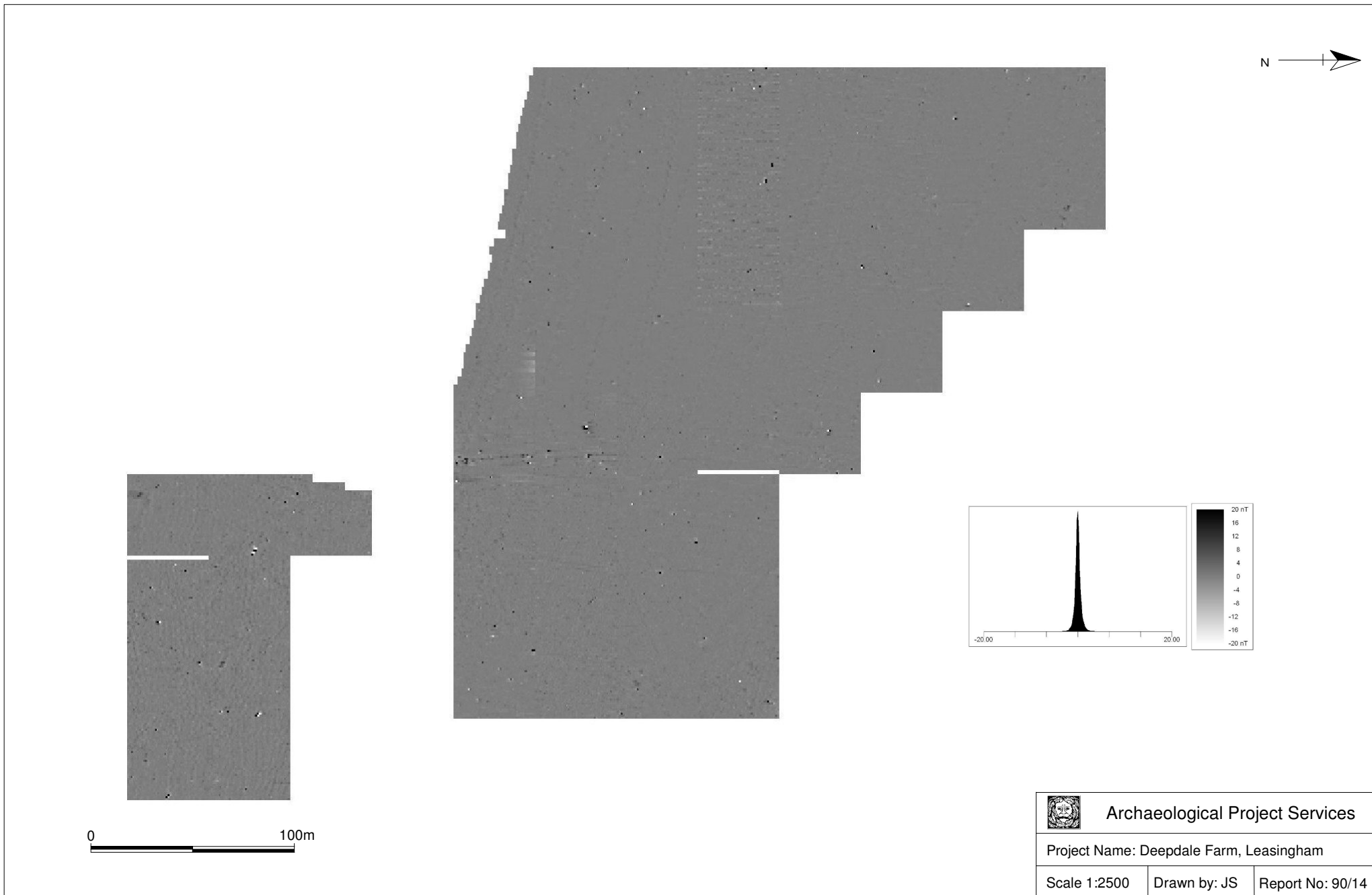



Figure 6, Area B minimally processed greyscale plot

	Archaeological Project Services	
Project Name: Deepdale Farm, Leasingham		
Scale 1:2500	Drawn by: JS	Report No: 90/14



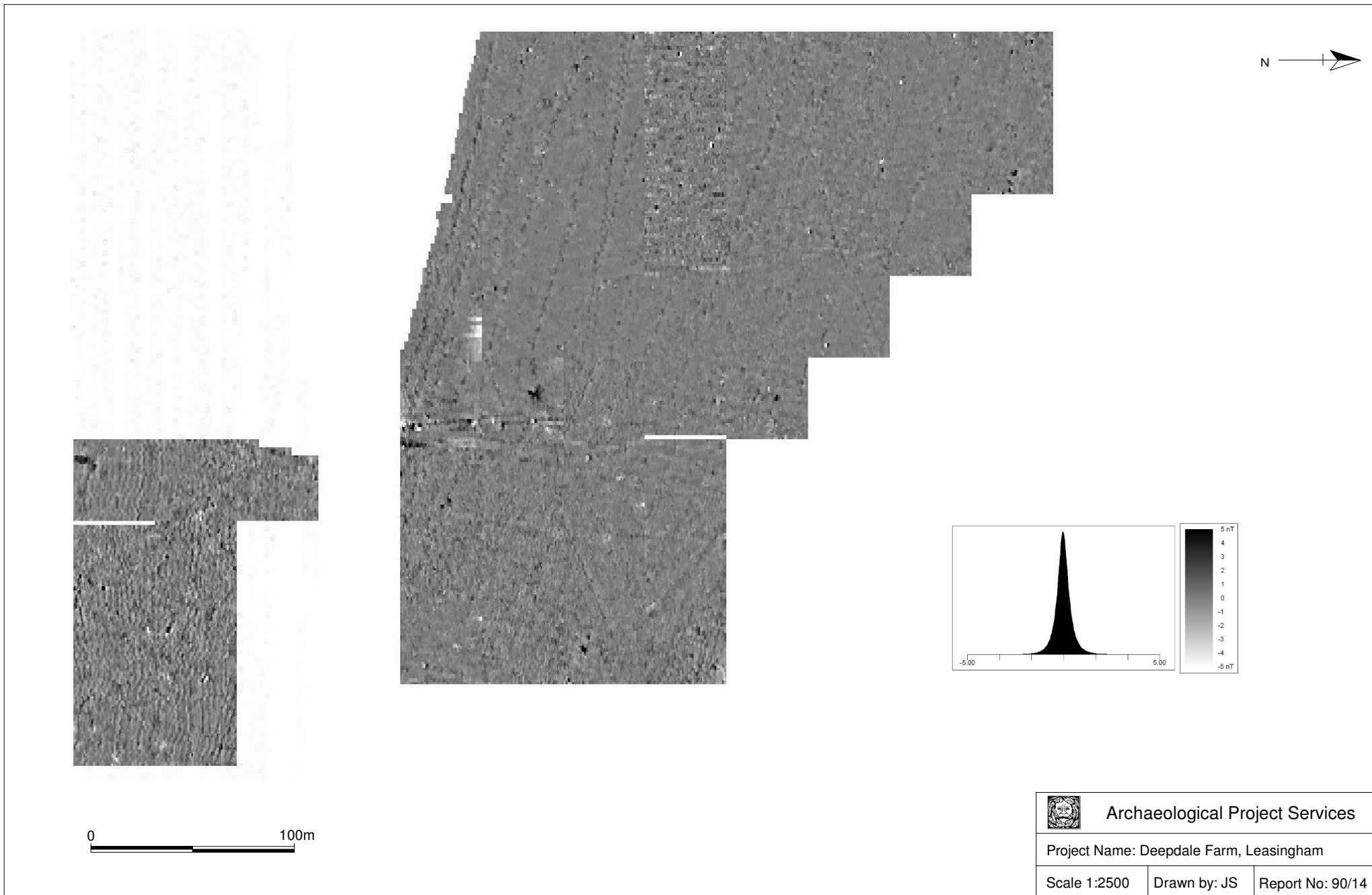



Figure 7, Area B processed greyscale plot

	Archaeological Project Services	
Project Name: Deepdale Farm, Leasingham		
Scale 1:2500	Drawn by: JS	Report No: 90/14

## Appendix 1 THE ARCHIVE

The archive consists of:

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

File names	LEDF14 White01.xgd to LEDF14 White49.xgd LEDF14 Yellow01.xgd to LEDF14 Yellow17.xgd LEDF14_11-8-14.xcp LEDF14_13-8-14.xcp LEDF14_14-8-14.xcp
Explanation of codes used in file names	xgd files are magnetometer grids, named with site code and number in the order surveyed. 'White' and 'Yellow' are the names of the two machines used to carry out the survey. 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	TerraSurveyor 3.0.25.1 running under Windows 7
Date of last modification	14/08/2014
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:

The Collection  
Art and Archaeology in Lincolnshire  
Danes Terrace  
Lincoln  
LN2 1LP

Site Code:	LEDF14
The Collection, Accession Number:	2014.152
OASIS project code:	archaeo11-187594

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## Printable version

**OASIS ID: archaeol1-187594**

### Project details

Project name	Deepdale Farm, Moor Lane, Leasingham, Lincolnshire
Short description of the project	A geophysical survey at Deepdale farm, east of Leasingham, Lincolnshire, was undertaken as Roman pottery and cropmarks have been recorded in the area previously. A linear ditch-type anomaly and some isolated pit-type features were recorded. Additionally, another linear anomaly, in line with an extant boundary and probably marking a former continuation of it, was also recorded.
Project dates	Start: 11-08-2014 End: 13-08-2014
Previous/future work	No / Not known
Any associated project reference codes	LCNCC:2014.152 - Museum accession ID
Any associated project reference codes	LEDF14 - Sitecode
Type of project	Field evaluation
Site status	None
Current Land use	Cultivated Land 4 - Character Undetermined
Monument type	NONE None
Significant Finds	NONE None
Methods & techniques	"Geophysical Survey"
Development type	SOLAR FARM
Prompt	National Planning Policy Framework - NPPF
Position in the planning process	Not known / Not recorded
Solid geology	CORNBRASH
Drift geology	Unknown
Techniques	Magnetometry

## Project location

Country	England
Site location	LINCOLNSHIRE NORTH KESTEVEN LEASINGHAM Deepdale Farm, Moor Lane
Postcode	NG34 8SH
Study area	11.50 Hectares
Site coordinates	TF 07573 49267 53.0295456229 -0.395765264948 53 01 46 N 000 23 44 W Point

## Project creators

Name of Organisation	Archaeological Project Services
Project brief originator	None
Project design originator	Dale Trimble
Project director/manager	Dale Trimble
Project supervisor	Neil Jefferson
Type of sponsor/funding body	Developer
Name of sponsor/funding body	Deepdale Solar Farm Ltd

## Project archives

Physical Archive Exists?	No
Digital Archive recipient	The Collection
Digital Archive ID	2014.152
Digital Contents	"Survey"
Digital Media available	"Geophysics","Survey"
Paper Archive recipient	The Collection
Paper Archive ID	2014.152
Paper Contents	"Survey"
Paper Media available	"Correspondence","Map","Miscellaneous Material","Plan","Report"

## Project bibliography 1

Publication type	Grey literature (unpublished document/manuscript)
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