
**LAND AT
GRANTHAM ROAD, SLEAFORD,
LINCOLNSHIRE
(SLGR13)**

GEOPHYSICAL SURVEY

**Work undertaken for
Larkfleet Homes Ltd**

April 2013

**Report produced by
Andrew S. Failes BA (Hons) MA**

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**ARCHAEOLOGICAL
PROJECT
SERVICES**



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1. SUMMARY

Detailed magnetic gradiometer survey was undertaken for Larkfleet Homes Ltd on land off of Grantham Road, Sleaford, Lincolnshire. The survey area comprised two agricultural fields located to the north and south of Grantham Road and encompassed an area of c.14ha.

Magnetometer survey identified few anomalies of potential archaeological origin. A positive linear anomaly in the northern field may represent a former field boundary; three others were identified that might represent cut features. A negative linear anomaly in the northern field was also identified and may represent a drainage feature. A second linear anomaly in the same northern field signifies a water pipeline.

Magnetic disturbance is present in the northern and southern ends of the northern field, but with the exception of occasional metal items in the topsoil there is little indication of modern disturbance across the northern field as a whole. Extensive magnetic disturbance covering an area of roughly 4.5ha was recorded in the western half of the southern field and is probably associated with the construction of the adjacent Sleaford bypass (A15).

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 Ltd to undertake detailed magnetometer survey on land off of Grantham Road, Sleaford, Lincolnshire. The survey was carried out on the 4th to 12th of March 2013.

2.3 Topography and Geology

Sleaford is located 27km south of Lincoln in the administrative district of North Kesteven, Lincolnshire (Fig 1)

The investigation area lies at the western edge of the town and comprises two agricultural fields located to the north and south of Grantham Road (Fig 2).

The northern field slopes up in the southeastern corner levels out then slopes gently to the north with the angle becoming more acute towards at the northern end of the field. The southern field is on fairly level ground that slopes gently down to the northwest. The site is centred on National Grid Reference TF 0513 4488 (Fig. 2) and situated at a height of c. 20-25m OD.

The site is mapped as Aswarby Association calcareous soils developed on chalky till (Hodge *et al.* 1984, 119).

3. GEOPHYSICAL SURVEY

3.1 Methods

Location and layout of the survey area is shown in Figure 3. The investigation area

comprised two irregular shaped blocks of land approximately 14ha in total. The field had been ploughed and harrowed and was in good condition for survey.

Survey was undertaken in accordance with English Heritage (2008) and IfA (2011) guidelines and codes of conduct. The survey grid was laid out using differential GPS equipment using Ordnance Survey correction data to allowing accurate positioning and relocation where necessary.

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): -3 to 3nT.

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 4-7 & 11-14; clipped for display but otherwise unprocessed), together with greyscale plots of the processed data (Figs 8-10 & 15-17). Magnetic anomalies have been identified and plotted onto an interpretative drawing (Fig 18) and are described below.

Positive linear anomalies

A total of four positive linear anomalies were identified in the northern field. The southernmost of these is oriented on a curving northeast to southwest alignment and closely matches the 25mOD contour line recorded on the 1:25000 OS map (Fig 2) of the area. Unlike the rest of the field, the southeastern corner, which is demarcated by the positive linear anomaly had been ploughed but not harrowed. This

suggests the magnetometer is picking up this difference; however, it may be that the anomaly represents an old field boundary that respects the contour of the land rather than the magnetometer picking up just the change in the treatment of the topsoil.

The northernmost positive linear anomaly is also slightly curved and may represent a cut feature, possibly another old field boundary.

The other two positive linear anomalies are somewhat short in length and their interpretation remains unclear.

Negative linear anomalies

A negative linear anomaly was identified on a north-south alignment towards the middle of the northern field. This is on the line of a water pipeline and probably represents it. A second negative linear anomaly was located to the east of the first and was curvilinear in shape, oriented on a roughly northeast to southwest alignment. This may represent a drainage pattern or feature in the field.

Modern/magnetic disturbance

Strong bipolar responses occur in the northernmost area of the northern field where they represent a metal fence and modern disturbance, probably associated with the adjacent railway lines. There is also an area of disturbance at the southeastern end of the site near Grantham Road.

An extensive area of modern magnetic disturbance occurs in the western half of the southern field. The disturbance covers an area of c.4.5ha and is probably associated with the construction of the adjacent Sleaford bypass (A15).

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 widely scattered across the northern field. The southern field contains a good deal less of these discreet bipolar anomalies, although it records a number of strong responses indicating larger bits of debris.

4. DISCUSSION

Magnetometer survey identified few anomalies of potential archaeological origin. A number of linear positive anomalies in the northern field may represent cut features. The southernmost of these possibly represents a former field boundary. One negative linear anomaly identified in the northern field may represent drainage, however little more can be said on the basis of form alone. A second linear anomaly in the northern field represents a water pipeline.

Magnetic disturbance is present in the northern field at the northern and southern ends and is associated with modern activity, but with the exception of occasional metal items in the topsoil there is little indication of modern disturbance across the field as a whole.

The southern field has seen heavy modern disturbance. The western half of the field showed extensive magnetic disturbance covering an area of roughly 4.5ha.

5. ACKNOWLEDGEMENTS

Archaeological Project Services wishes to acknowledge the assistance of Tony Sibson who commissioned the project on behalf of Larkfleet Homes Ltd. Gary

Taylor (APS) edited the report along with Tom Lane (APS).

6. PERSONNEL

Project coordinator: Gary Taylor
 Geophysical Survey: Andrew Failes, Jonathon Smith
 Survey processing and reporting: Steve Malone, Andrew Failes

7. BIBLIOGRAPHY

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

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

APS Archaeological Project Services
 BGS British Geological Survey
 IfA Institute for Archaeologists

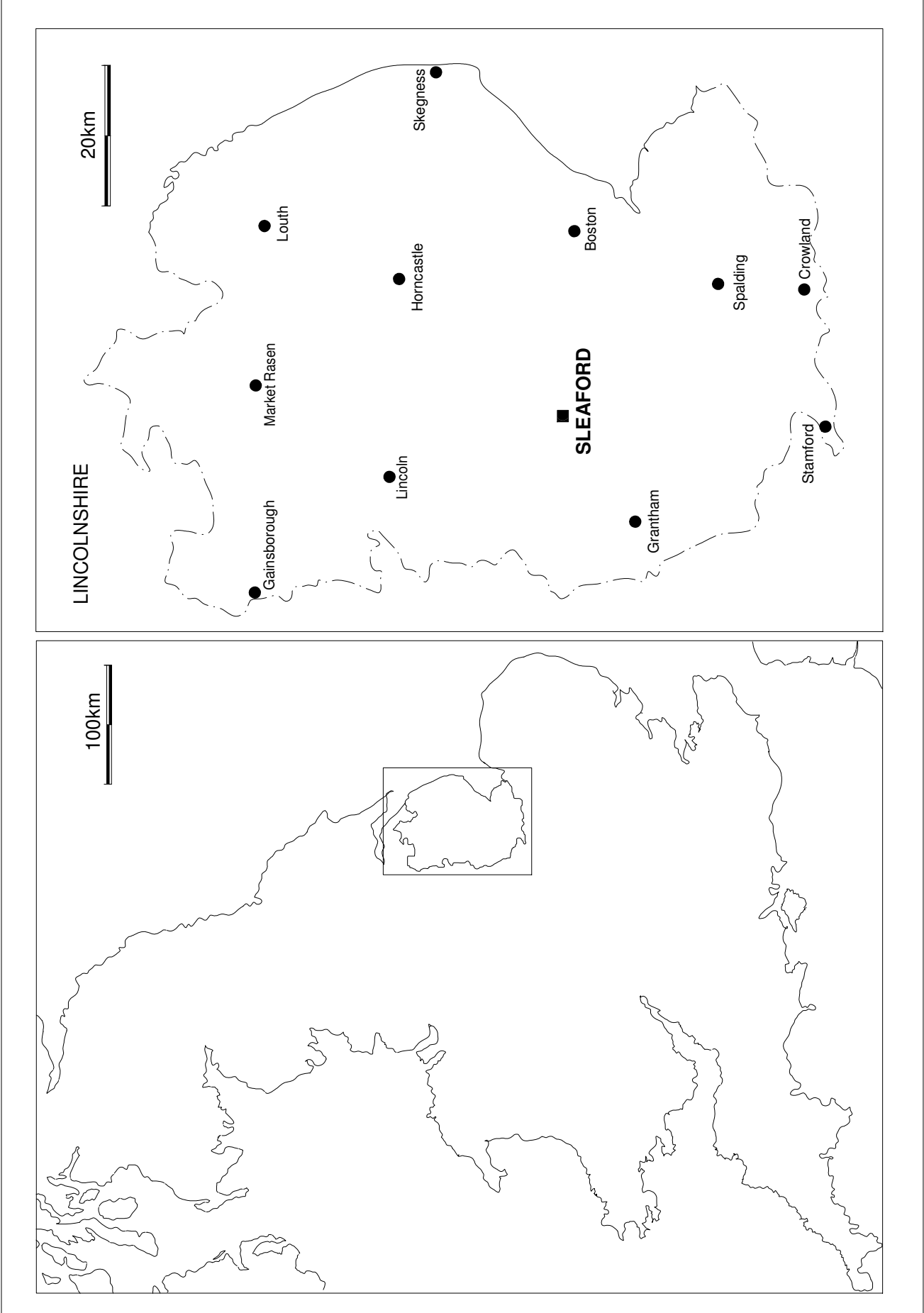


Figure 1: General Location Plan

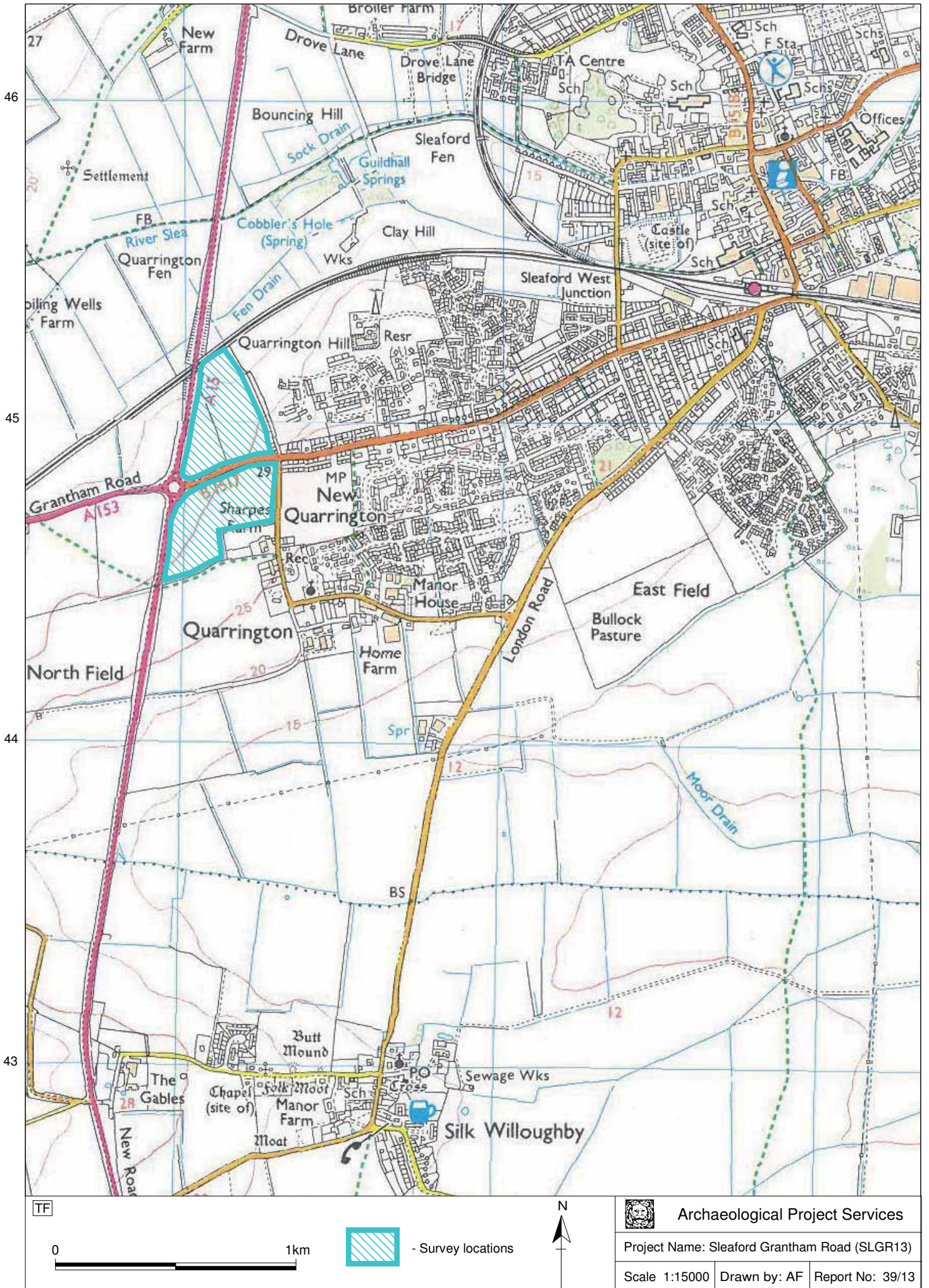


Figure 2 - Survey locations plan

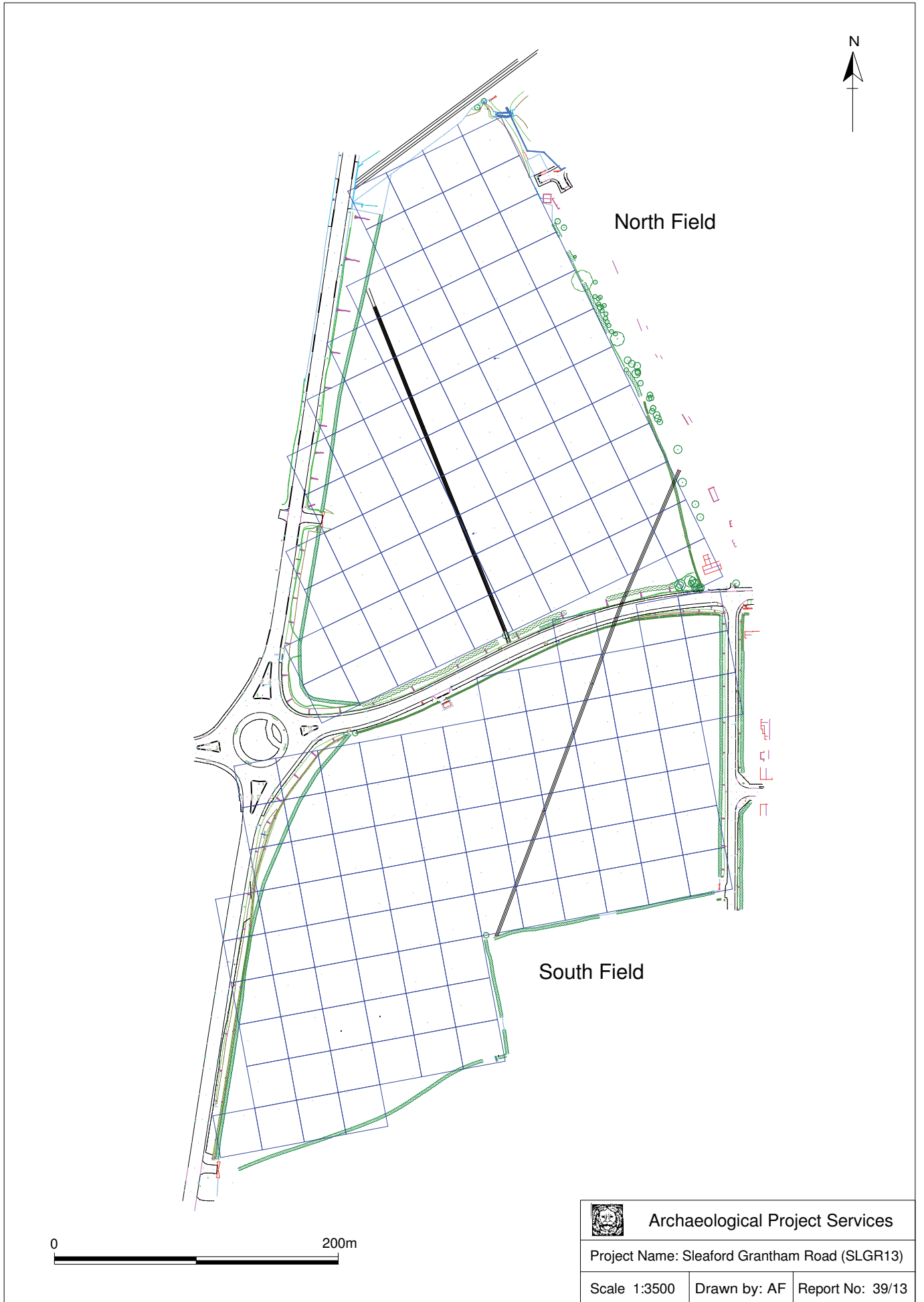
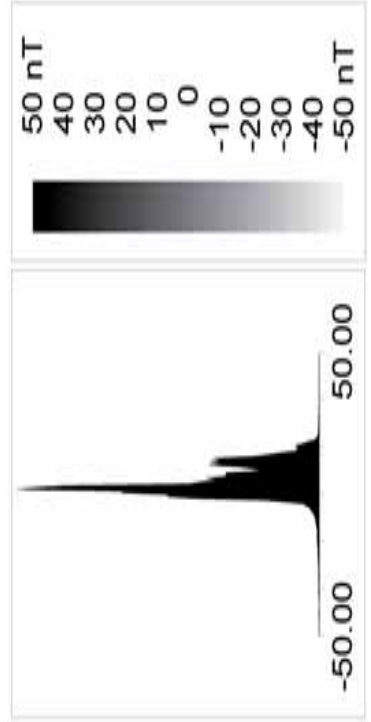
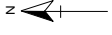
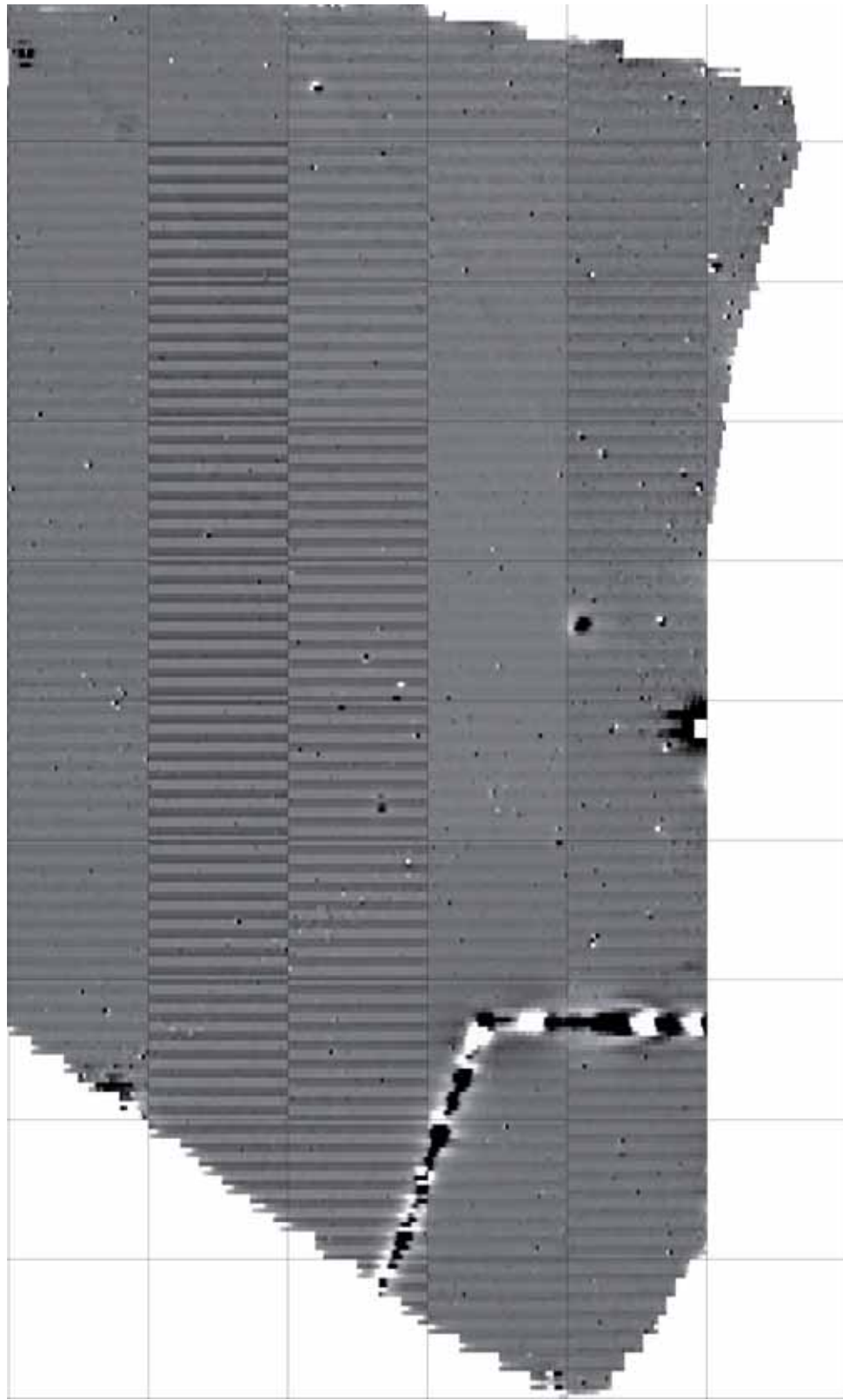


Figure 3 - Location and layout of survey areas



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Scale: 1:1000	Drawn by: AF
Report No: 39/13	

Figure 4 - Lower north field, minimally processed data greyscale plot

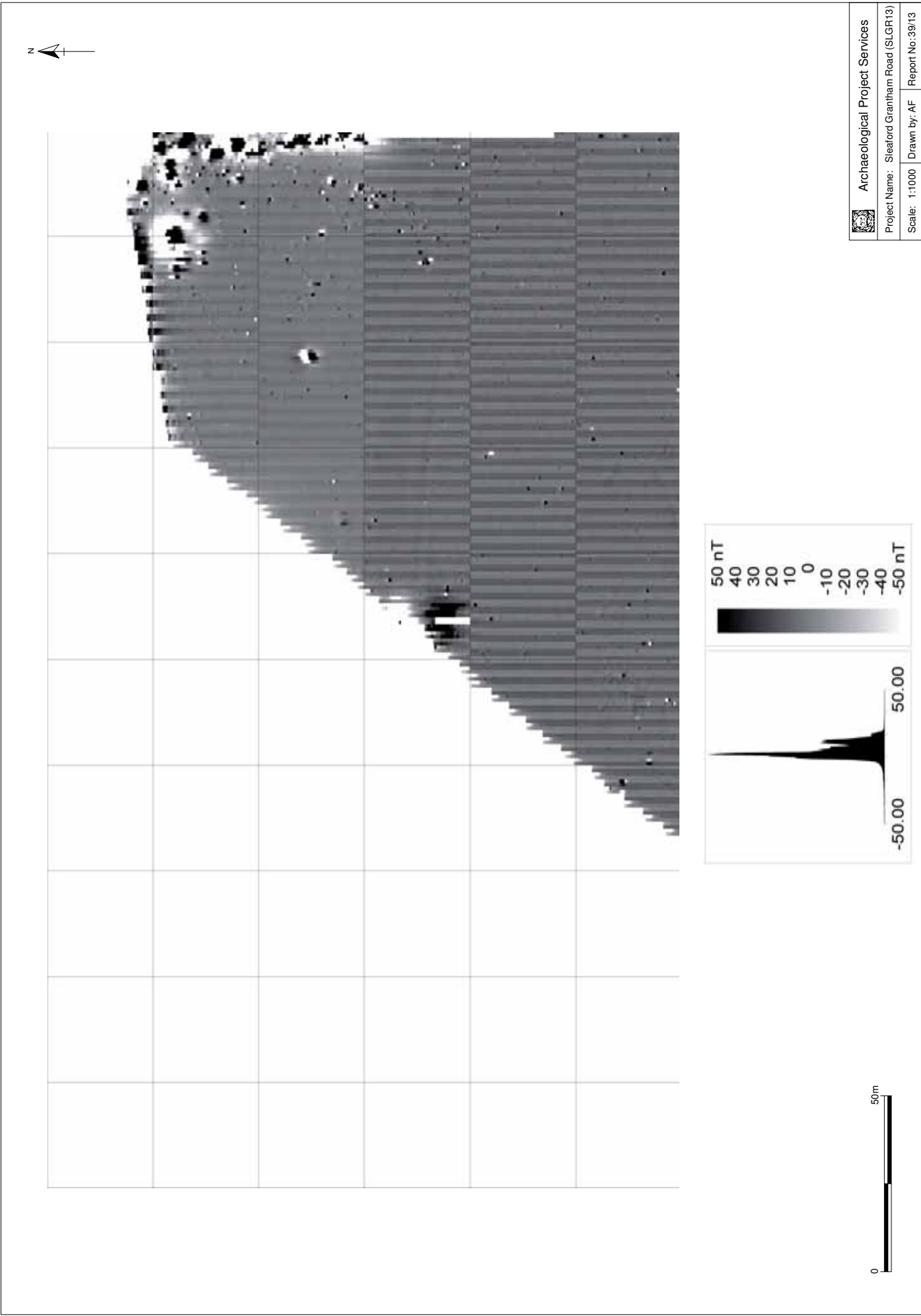
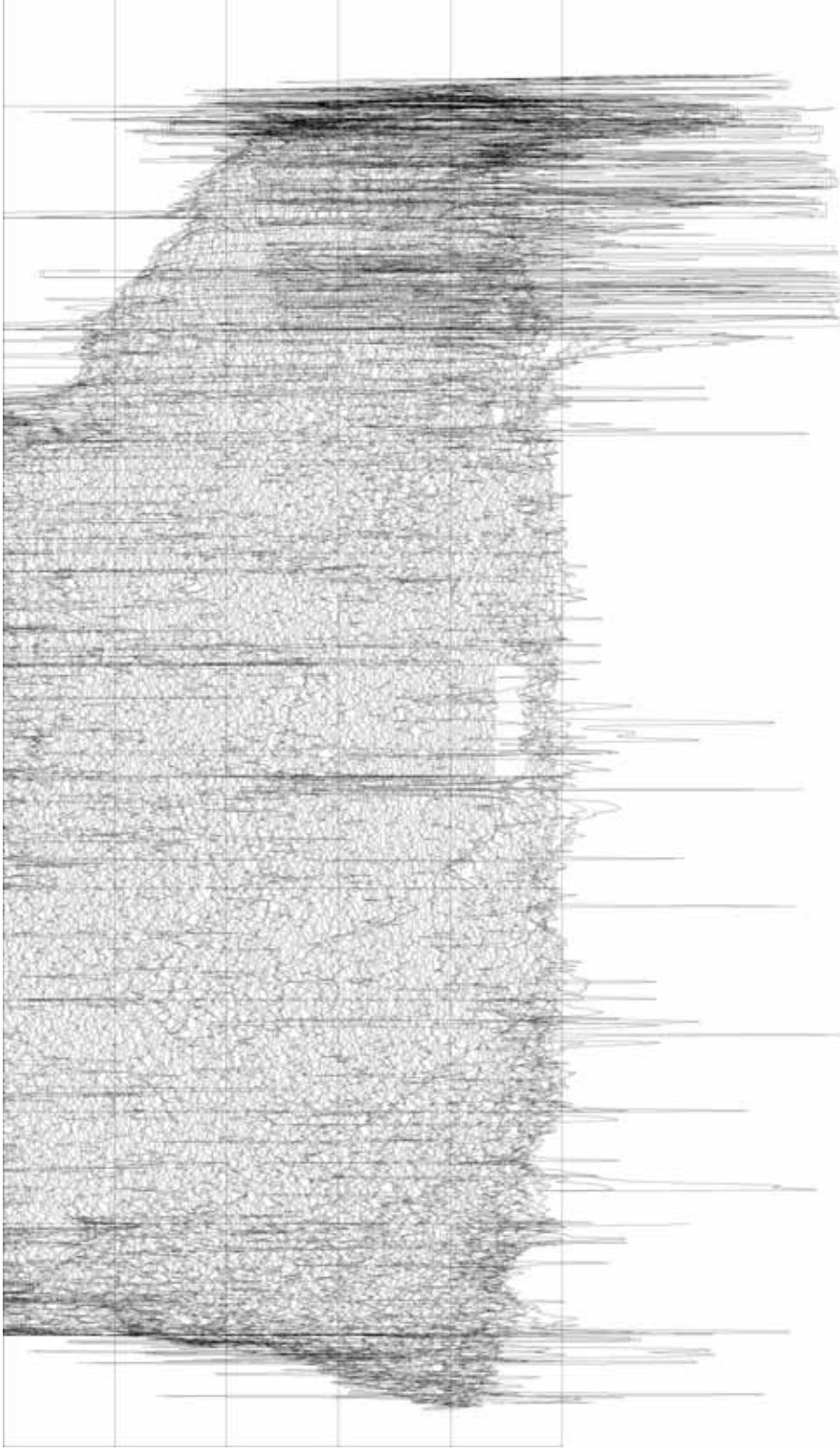
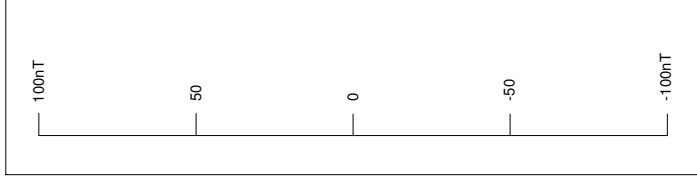
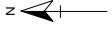
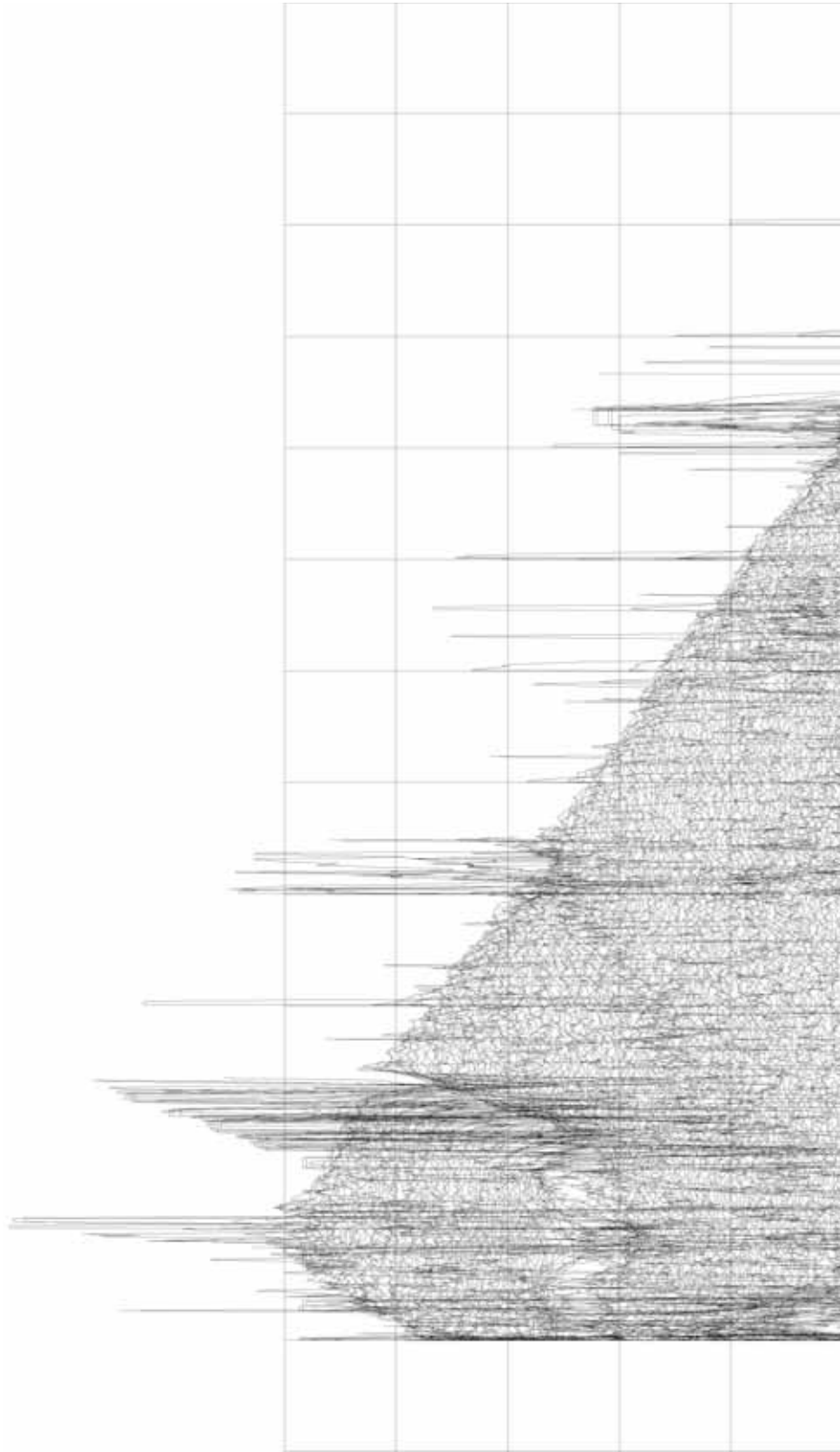
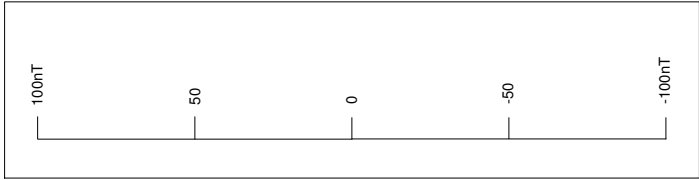
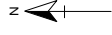


Figure 5 - Upper north field, minimally processed data greyscale plot



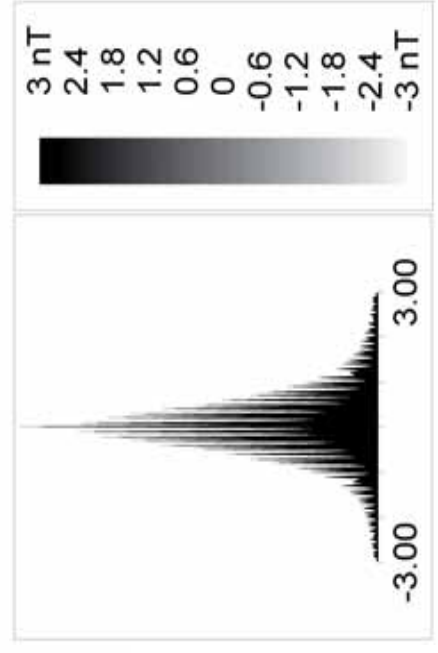
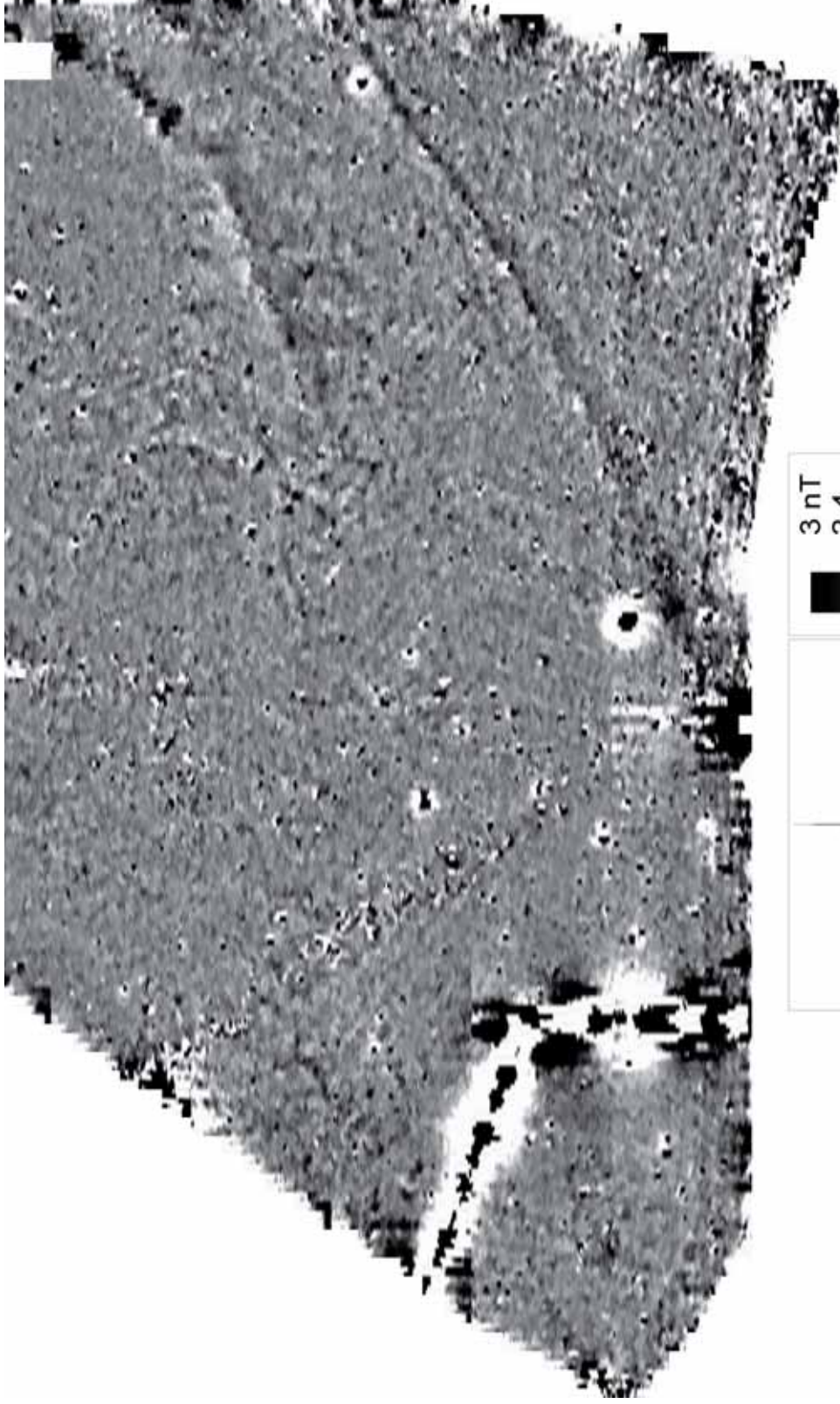
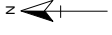
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Figure 6 - Lower north field, minimally processed data trace plot



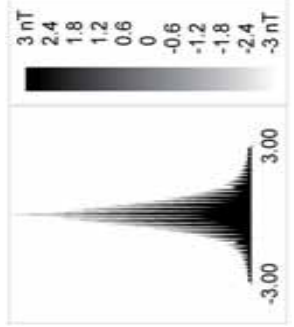
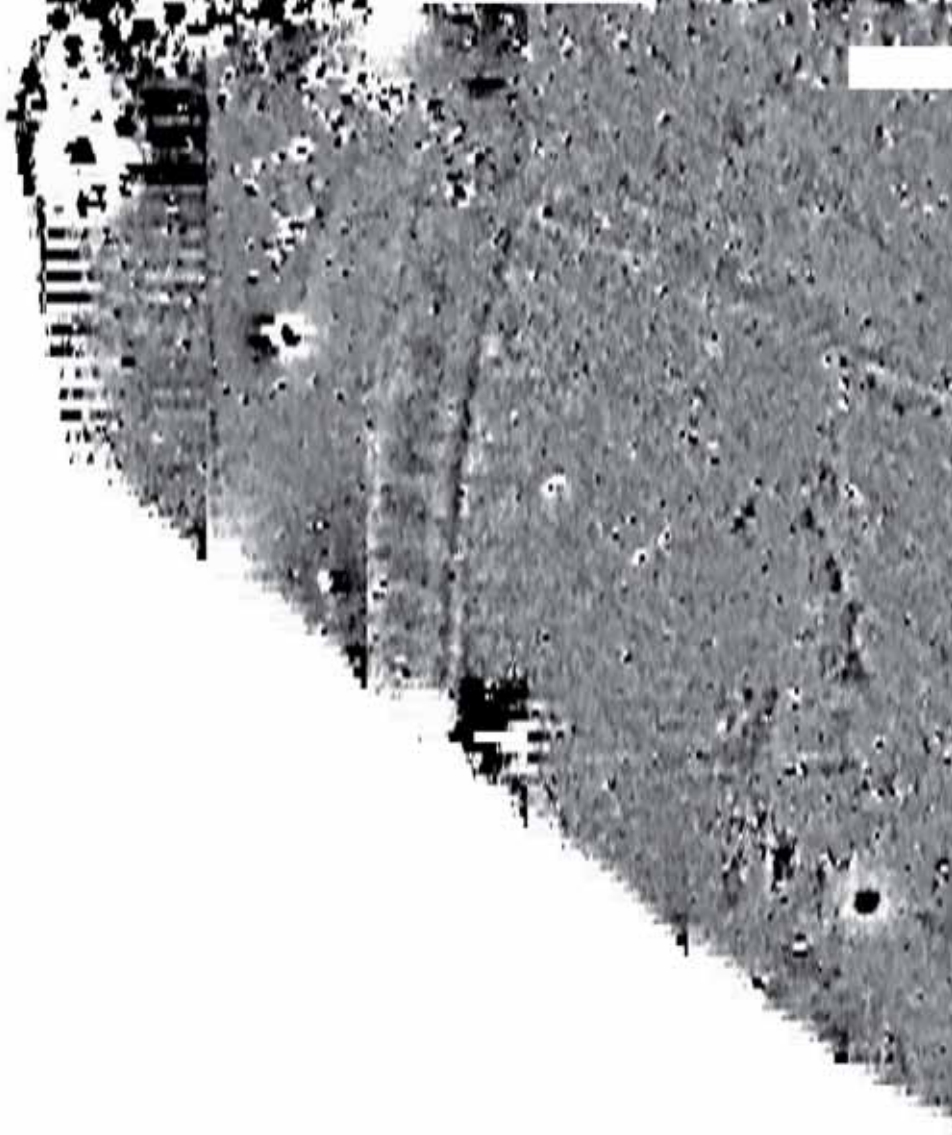
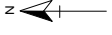
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Figure 7 - Upper north field, minimally processed data trace plot



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Figure 8 - Lower north field, processed data greyscale plot



0 50m

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Figure 9 - Upper north field, processed data greyscale plot

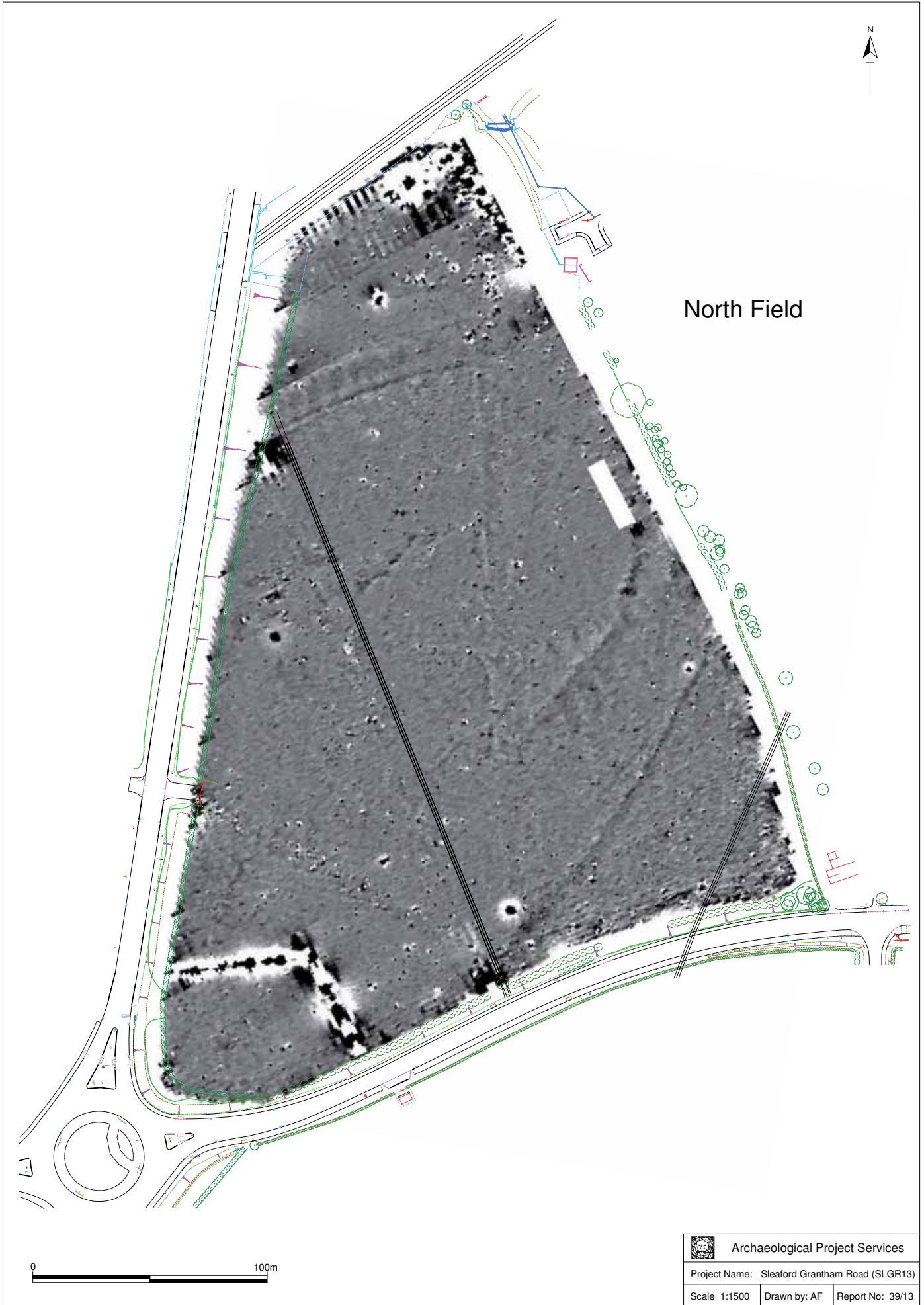


Figure 10 - Processed data greyscale plot overlain on basemap

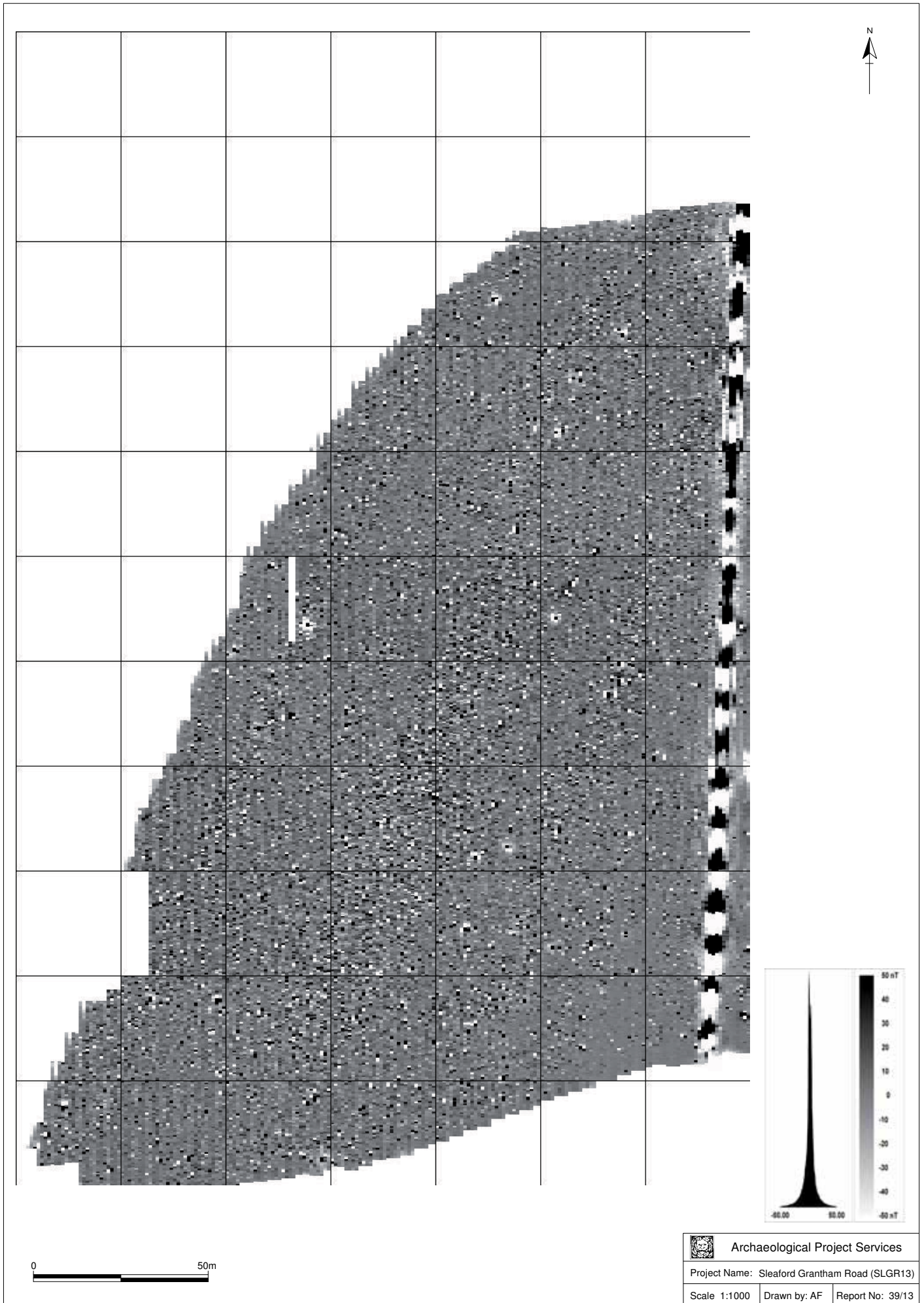


Figure 11 - Western half of southern field, minimally processed data greyscale plot

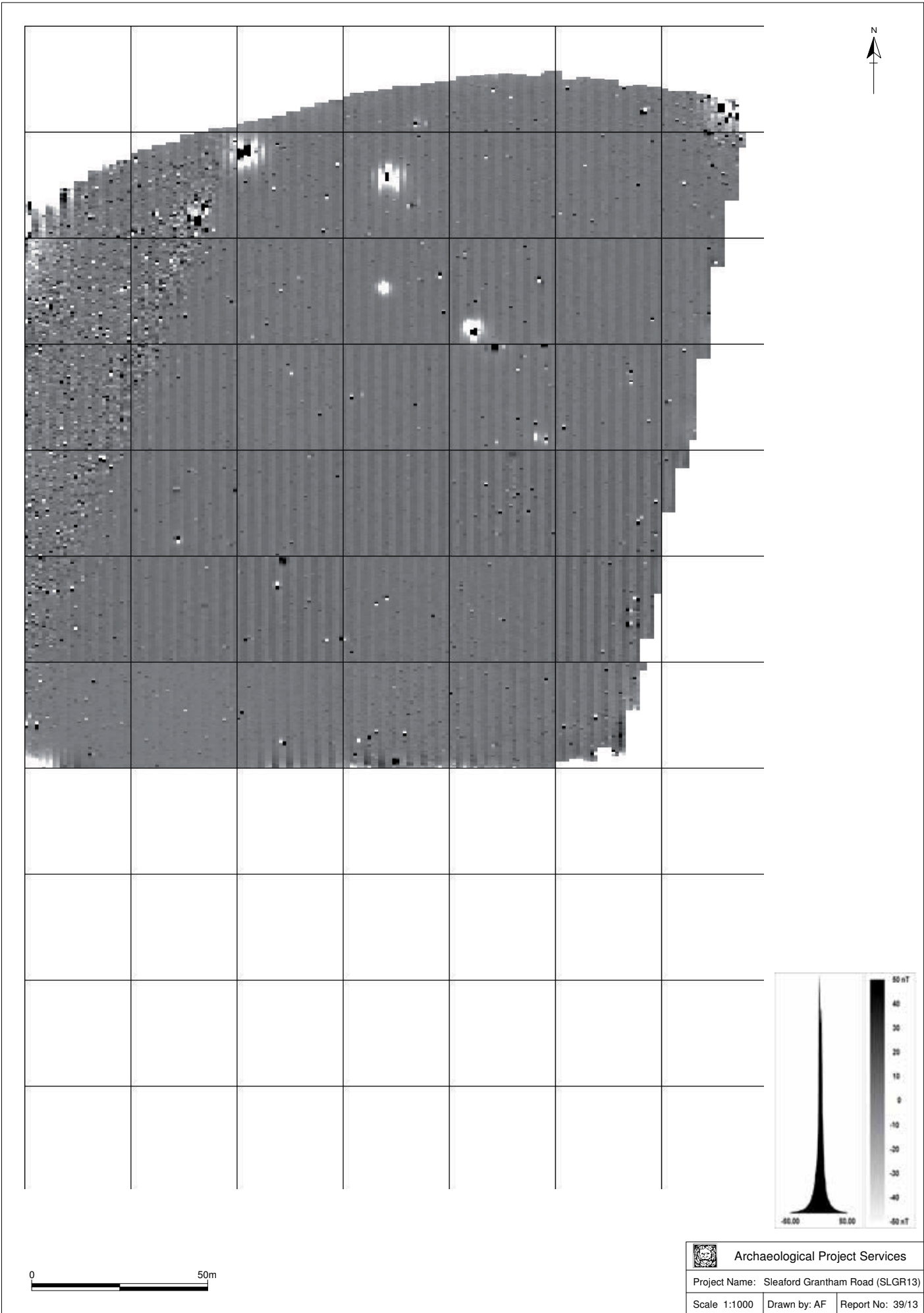
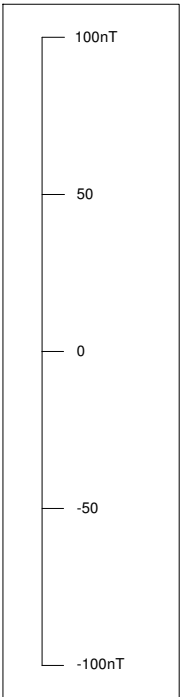
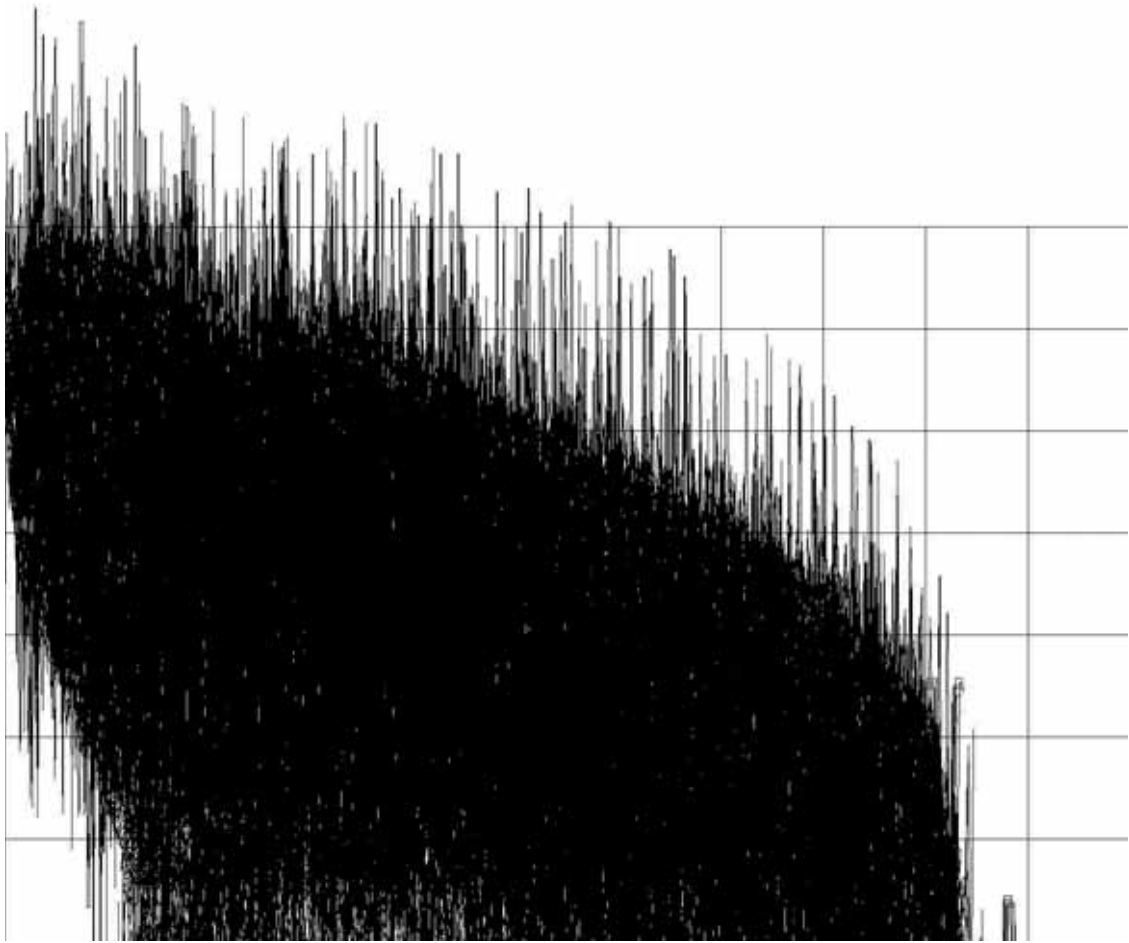
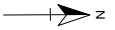


Figure 12 - Eastern half of south field, minimally processed data greyscale plot




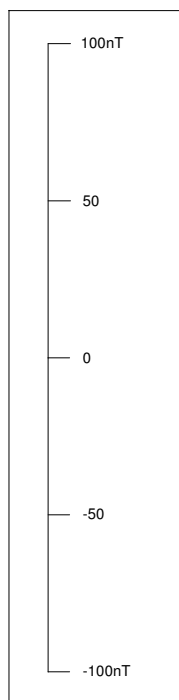
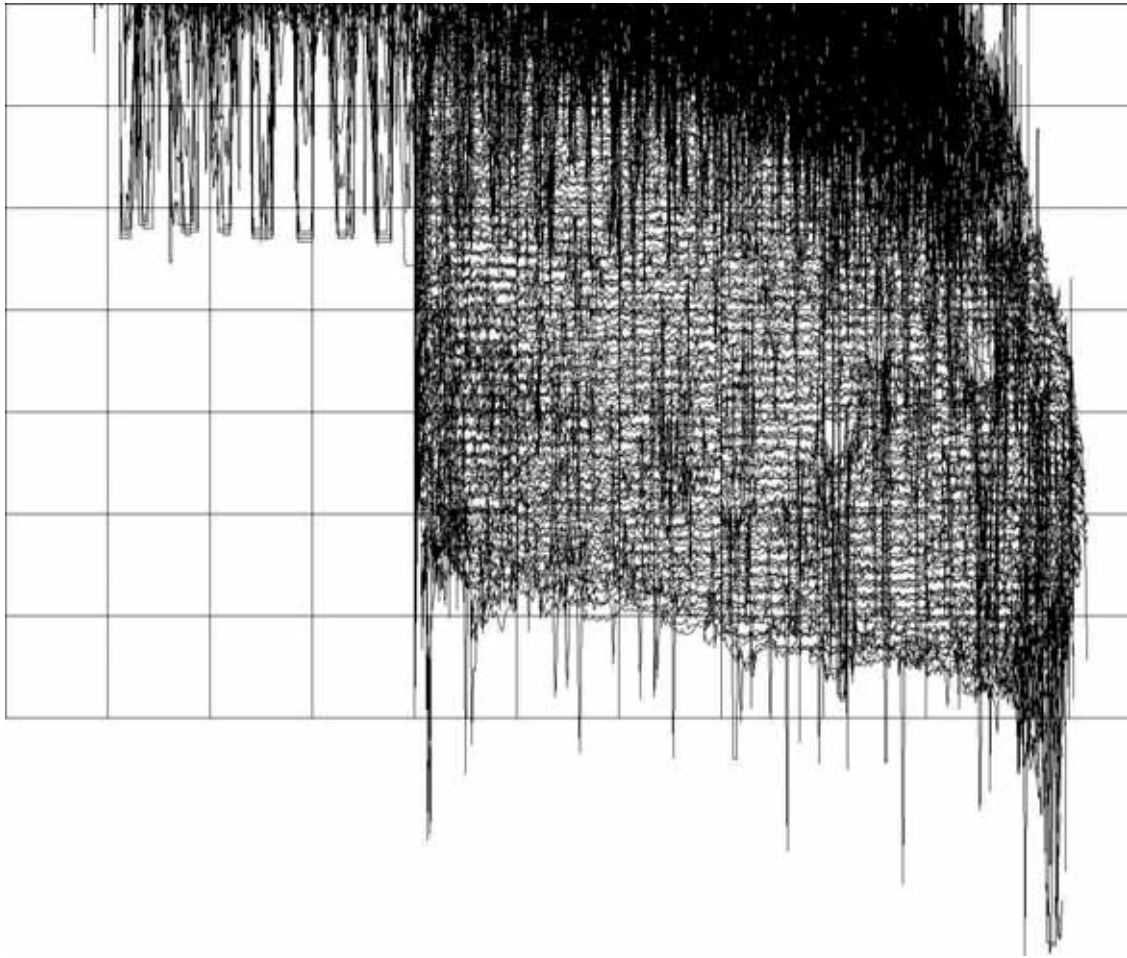
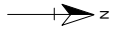
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Figure 13 - Western half of southern field, minimally processed data trace plot




	Archaeological Project Services		
Project Name: Sleaford Grantham Road (SLGR13)			
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Figure 14 - Eastern half of southern field, minimally processed data trace plot

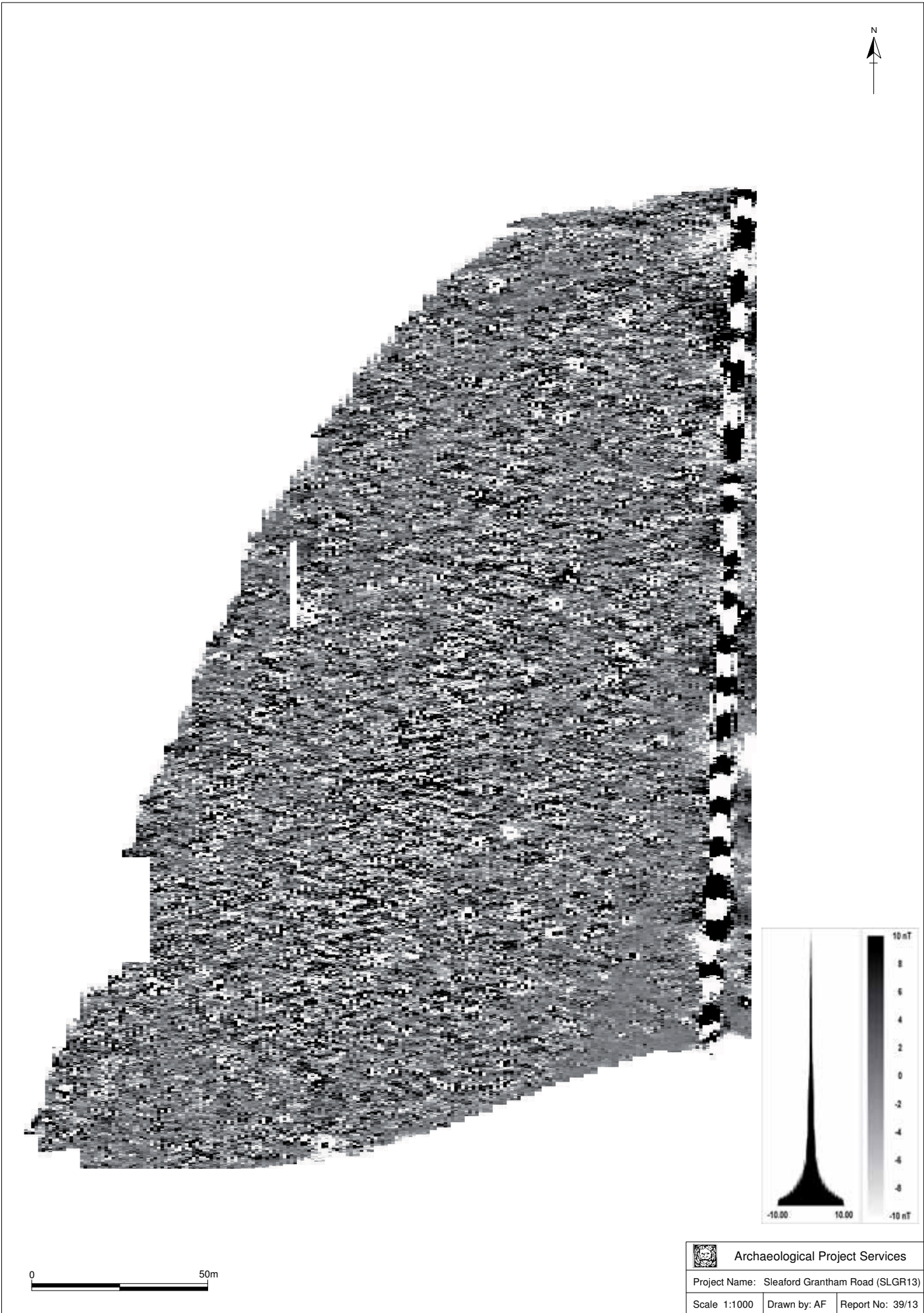


Figure 15 - Western half of southern field, processed data greyscale plot

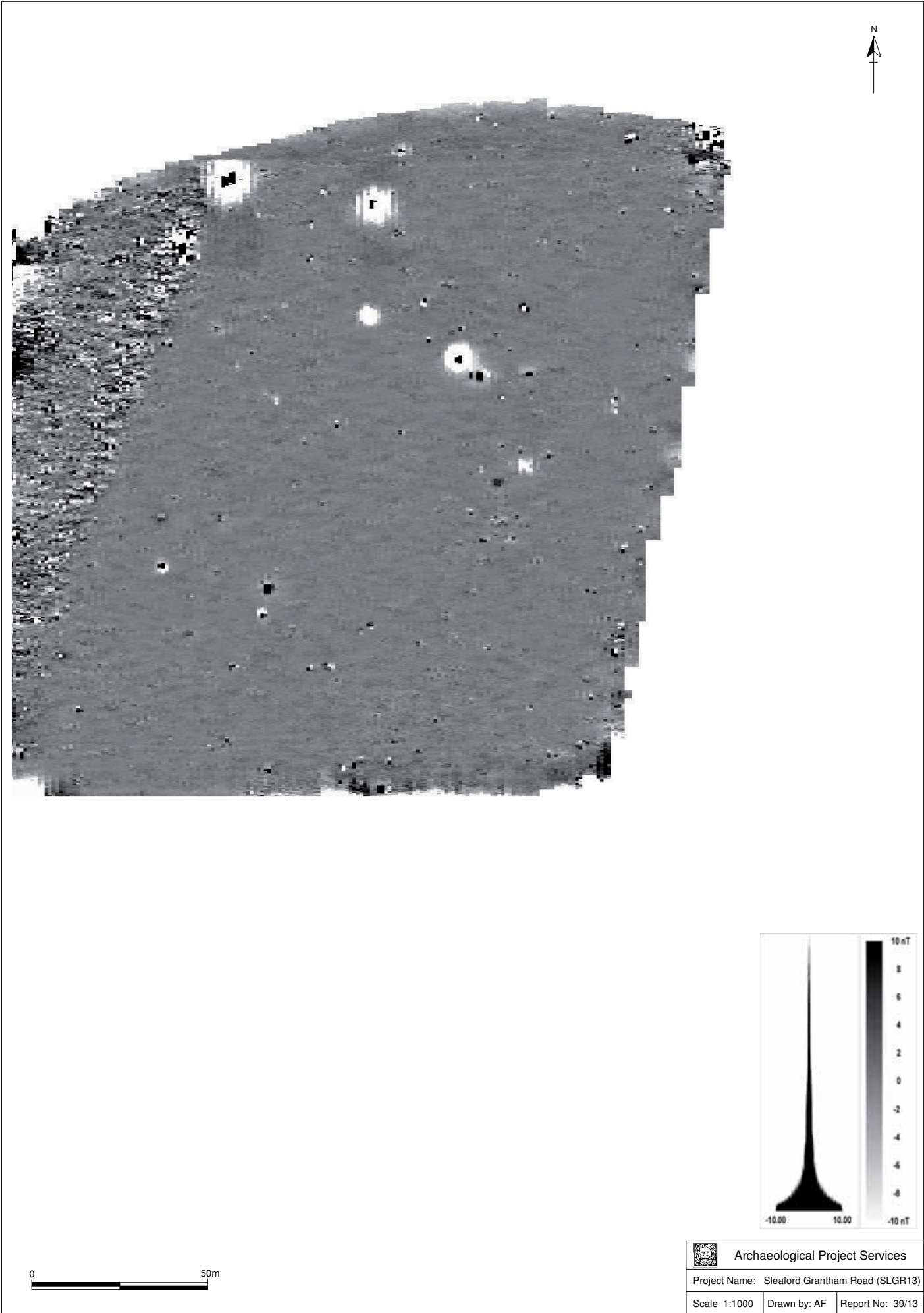


Figure 16 - Eastern half of south field, processed data greyscale plot



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Figure 17 - South field, processed data greyscale plot overlaid on base map

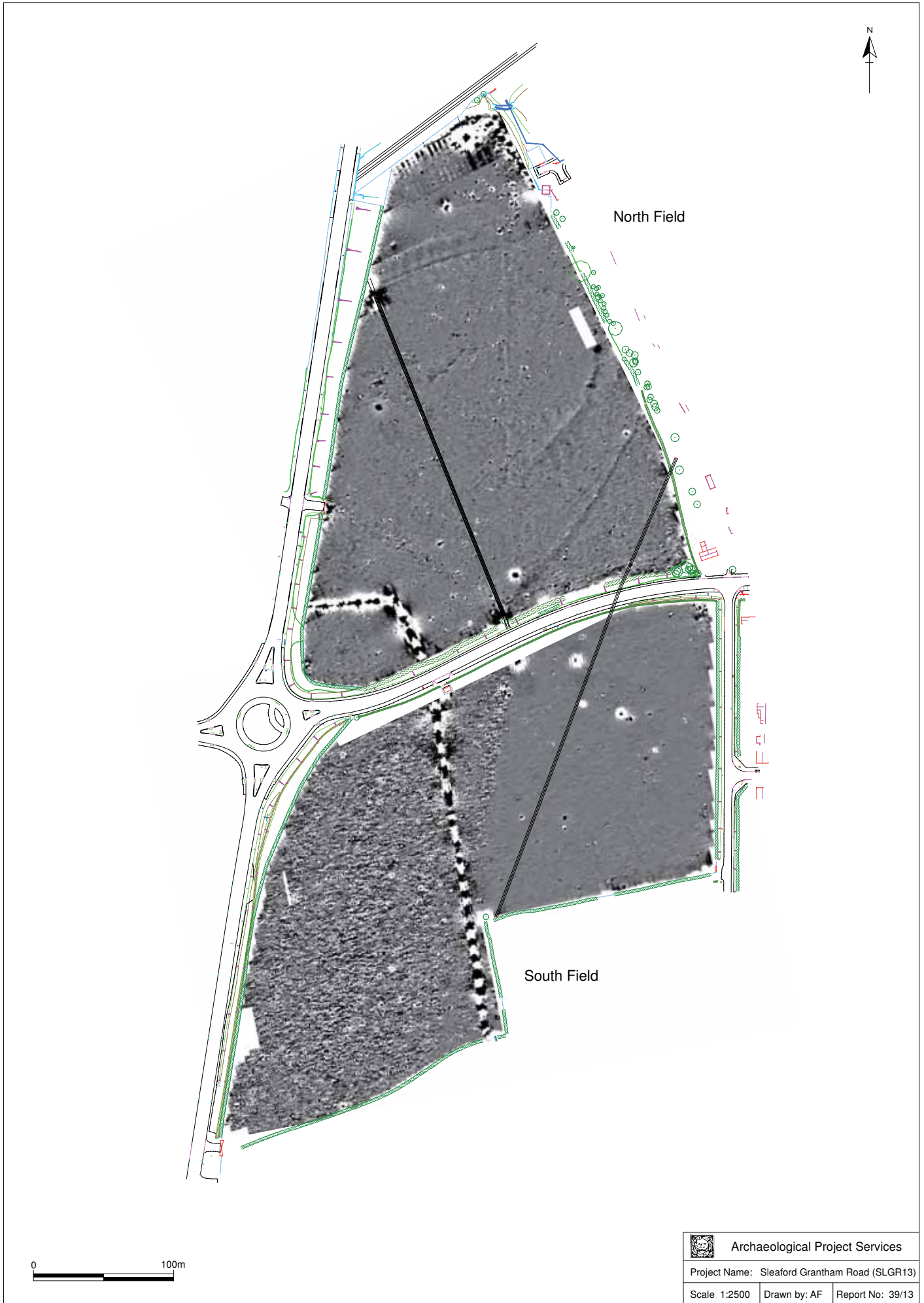


Figure 18 - North and south fields, processed data greyscale plot overlain on base map

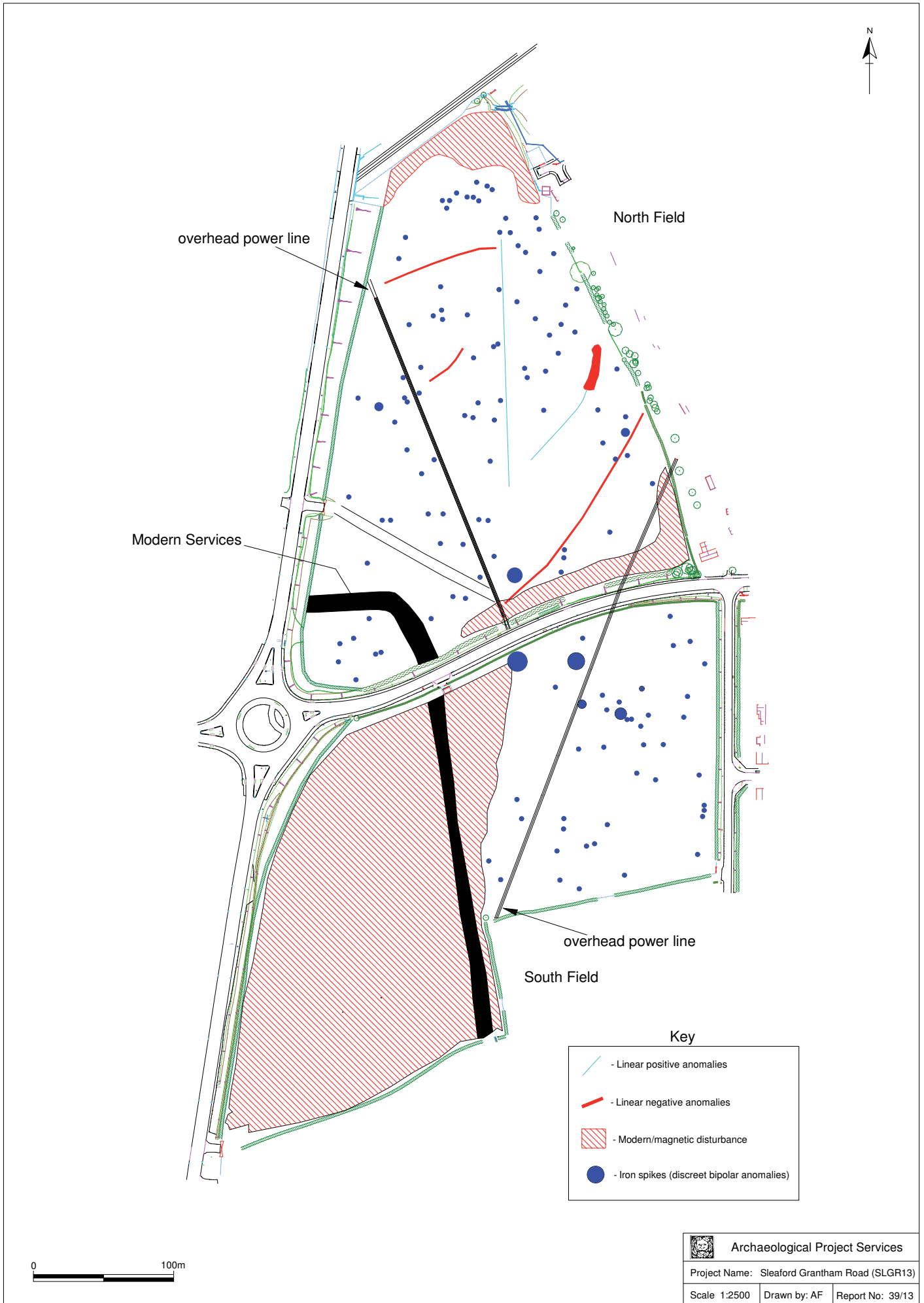


Figure 19 - Overall interpretative plot

Appendix 1 THE ARCHIVE

The archive consists of:

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

File names	slgr13-01.xgd slgr13-02.xgd slgr13-03.xgd slgr13-04.xgd slgr13-05.xgd slgr13-06.xgd slgr13-07.xgd slgr13-08.xgd slgr13-09.xgd slgr13-10.xgd slgr13-11.xgd slgr13-12.xgd slgr13-13.xgd slgr13-14.xgd slgr13-15.xgd slgr13-16.xgd slgr13-17.xgd slgr13-18.xgd slgr13-19.xgd slgr13-20.xgd slgr13-21.xgd slgr13-22.xgd slgr13-23.xgd slgr13-24.xgd slgr13-25.xgd slgr13-26.xgd slgr13-27.xgd slgr13-28.xgd slgr13-29.xgd slgr13-30.xgd slgr13-31.xgd slgr13-32.xgd slgr13-33.xgd slgr13-34.xgd slgr13-35.xgd slgr13-36.xgd slgr13-37.xgd slgr13-38.xgd slgr13-39.xgd slgr13-40.xgd slgr13-41.xgd slgr13-42.xgd slgr13-43.xgd slgr13-44.xgd slgr13-45.xgd slgr13-46.xgd slgr13-47.xgd slgr13-48.xgd slgr13-49.xgd slgr13-50.xgd slgr13-51.xgd slgr13-52.xgd slgr13-53.xgd slgr13-54.xgd slgr13-55.xgd slgr13-56.xgd slgr13-57.xgd	slgr13-71.xgd slgr13-72.xgd slgr13-73.xgd slgr13-74.xgd slgr13-75.xgd slgr13-76.xgd slgr13-77.xgd slgr13-78.xgd slgr13-79.xgd slgr13-80.xgd slgr13-81.xgd slgr13-82.xgd slgr13-83.xgd slgr13-84.xgd slgr13-85.xgd slgr13-86.xgd slgr13-87.xgd slgr13-88.xgd slgr13-89.xgd slgr13-90.xgd slgr13-91.xgd slgr13-92.xgd slgr13-93.xgd slgr13-94.xgd slgr13-95.xgd slgr13-96.xgd slgr13-97.xgd slgr13-98.xgd slgr13-99.xgd slgr13-100.xgd slgr13-101.xgd slgr13-102.xgd slgr13-103.xgd slgr13-104.xgd slgr13-105.xgd slgr13-106.xgd slgr13-107.xgd slgr13-108.xgd slgr13-109.xgd slgr13-110.xgd slgr13-111.xgd slgr13-112.xgd slgr13-113.xgd slgr13-114.xgd slgr13-115.xgd slgr13-116.xgd slgr13-117.xgd slgr13-118.xgd slgr13-119.xgd slgr13-120.xgd slgr13-121.xgd slgr13-122.xgd slgr13-123.xgd slgr13-124.xgd slgr13-125.xgd slgr13-126.xgd slgr13-127.xgd	slgr13-141.xgd slgr13-142.xgd slgr13-143.xgd slgr13-144.xgd slgr13-145.xgd slgr13-146.xgd slgr13-147.xgd slgr13-148.xgd slgr13-149.xgd slgr13-150.xgd slgr13-151.xgd slgr13-152.xgd slgr13-153.xgd slgr13-154.xgd slgr13-155.xgd slgr13-156.xgd slgr13-157.xgd slgr13-158.xgd slgr13-159.xgd slgr13-160.xgd slgr13-161.xgd slgr13-162.xgd slgr13-163.xgd slgr13-164.xgd slgr13-165.xgd slgr13-166.xgd slgr13-167.xgd slgr13-168.xgd slgr13-169.xgd slgr13-170.xgd slgr13-171.xgd slgr13-172.xgd slgr13-173.xgd slgr13-174.xgd slgr13-175.xgd slgr13-176.xgd slgr13-177.xgd slgr13-178.xgd slgr13-179.xgd slgr13-180.xgd slgr13-181.xgd slgr13-182.xgd slgr13-183.xgd slgr13-184.xgd slgr13-185.xgd slgr13-186.xgd slgr13-187.xgd slgr13-188.xgd slgr13-189.xgd slgr13-190.xgd slgr13-192.xgd slgr13-193.xgd slgr13-194.xgd slgr13-195.xgd slgr13-196.xgd slgr13-197.xgd slgr13-198.xgd
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	slgr13-58.xgd slgr13-59.xgd slgr13-60.xgd slgr13-61.xgd slgr13-62.xgd slgr13-63.xgd slgr13-64.xgd slgr13-65.xgd slgr13-66.xgd slgr13-67.xgd slgr13-68.xgd slgr13-69.xgd slgr13-70.xgd	slgr13-128.xgd slgr13-129.xgd slgr13-130.xgd slgr13-131.xgd slgr13-132.xgd slgr13-133.xgd slgr13-134.xgd slgr13-135.xgd slgr13-136.xgd slgr13-137.xgd slgr13-138.xgd slgr13-139.xgd slgr13-140.xgd	slgr13-199.xgd slgr13-200.xgd slgr13-t1.xcp slgr13-t2.xcp slgr13-t3.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 7		
Date of last modification	01/03/13		
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

Accession Number:

LCNCC: 2013.32

Archaeological Project Services Site Code:

SLGR13

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OASIS ID: archaeol1-148692

Project details

Project name	Land at Grantham Road, Sleaford, Lincolnshire Geophysical Survey
Short description of the project	Detailed magnetic gradiometer survey was undertaken for Larkfleet Homes Ltd on land off of Grantham Road, Sleaford, Lincolnshire. The survey area comprised two agricultural fields located to the north and south of Grantham Road and encompassed an area of c.14ha. Magnetometer survey identified few anomalies of potential archaeological origin. A positive linear anomaly in the northern field may represent a former field boundary; three others were identified that might represent cut features. Two negative linear anomalies in the northern field were also identified. One may represent a drainage feature; the other was produced by a water pipeline. Magnetic disturbance is present in the northern and southern ends of the northern field, but with the exception of occasional metal items in the topsoil there is little indication of modern disturbance across the northern field as a whole. Extensive magnetic disturbance covering an area of roughly 4.5ha was recorded in the western half of the southern field and is probably associated with the construction of the adjacent Sleaford bypass (A15).
Project dates	Start: 04-03-2013 End: 12-03-2013
Previous/future work	No / Not known
Any associated project reference codes	SLGR13 - Sitecode
Type of project	Field evaluation
Site status	None
Current Land use	Cultivated Land 2 - Operations to a depth less than 0.25m
Monument type	FIELD BOUNDARIES Uncertain
Monument type	DRAINAGE FEATURES Uncertain
Significant Finds	NONE None
Methods & techniques	"Geophysical Survey"
Development type	Housing estate
Prompt	Planning condition
Position in the planning process	Not known / Not recorded
Solid geology	CORNBRASH

Solid geology (other)	LIMESTONE
Drift geology (other)	Aswarby Association calcareous soils developed on chalky till
Techniques	Magnetometry

Project location

Country	England
Site location	LINCOLNSHIRE NORTH KESTEVEN SLEAFORD land off Grantham Road
Study area	14.00 Hectares
Site coordinates	TF 0513 4488 52.9906067868 -0.433611035811 52 59 26 N 000 26 01 W Point

Project creators

Name of Organisation	Archaeological Project Services
Project brief originator	None
Project design originator	Gary Taylor
Project director/manager	Gary Taylor
Project supervisor	Andrew Failes
Type of sponsor/funding body	Developer

Project archives

Physical Archive Exists?	No
Digital Archive recipient	The Collection
Digital Archive ID	2013.32
Digital Contents	"Survey"
Digital Media available	"Geophysics", "Images vector"
Paper Archive recipient	The Collection
Paper Archive ID	2013.32
Paper Contents	"Survey"
Paper Media available	"Correspondence", "Map", "Miscellaneous Material", "Plan", "Report", "Survey "

Project bibliography 1

Publication type	Grey literature (unpublished document/manuscript)
Title	Land at Grantham Road, Sleaford, Lincolnshire Geophysical Survey

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Other bibliographic details 39/13
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