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**GEOPHYSICAL SURVEY  
AT  
BOSTON ROAD  
KIRKBY LA THORPE  
LINCOLNSHIRE**

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*Phase 1*

**Work undertaken for  
Central Networks**

**April 2009**

**Report produced by  
S J Malone BSC PhD MIFA**

National Grid Reference: **TF 0907 4576**

APS Report No: **32/09**

**ARCHAEOLOGICAL  
PROJECT  
SERVICES**



**GEOPHYSICAL SURVEY AT BOSTON ROAD, KIRKBY LA THORPE**

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GEOPHYSICAL SURVEY AT BOSTON ROAD

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## GEOPHYSICAL SURVEY AT BOSTON ROAD, KIRKBY LA THORPE

### 1. SUMMARY

*Gradiometer survey was undertaken over the proposed site of a new electricity substation on the north side of Boston Road east of Sleaford, in the parish of Kirkby La Thorpe.*

*The site lies in close proximity to a pylon and overhead electric lines with an underground gas main just to the west. Although the lines were not live, the disturbance around the pylon, and from the pipeline to the west, swamp possible archaeological responses.*

*A pit and a number of possible linear features were noted, together with an area of generally higher responses on the southern edge of the survey area, but on the whole results were not clear cut owing to the influence of the modern infrastructure.*

### 2. INTRODUCTION

#### 2.1 Background

Archaeological Project Services was commissioned by Central Networks to undertake detailed gradiometer survey of land alongside Boston Road, Kirkby La Thorpe as part of proposals to construct an electricity substation at the site. The survey was undertaken on 21<sup>st</sup> April 2009.

#### 2.2 Topography and Geology

Kirkby La Thorpe lies 3km east of Sleaford in the North Kesteven District of Lincolnshire. The site lay c. 1km west of the village along the Boston Road heading into Sleaford (Fig. 1). The survey area comprised some 2500m<sup>2</sup> on the north side of the road, centred on TF 0907 4576.

The site lies on level ground at c. 10m OD.

Soils at the site are mapped as coarse and fine loamy and sandy soils of the Ruskington Association developed on glaciofluvial drift (Hodge et al. 1984, 304).

#### 2.3 Archaeological Setting

The site lies c. 1km east of the major Iron Age and Roman settlement at Sleaford. Recent archaeological investigations eastwards along Boston Road show that considerable activity extended eastwards of the town along a Roman predecessor of Boston Road (Field forthcoming; Rowe 2008). Roman remains were encountered in the near vicinity during works on an Anglian Water pipeline on the south side of Boston Road.

### 3. AIMS

The aim of the survey was to locate any features of possible archaeological significance in the proposed development area in order to contribute to the management of the potential archaeological resource of the site.

### 4. METHODS

The fieldwork was carried out on 21<sup>st</sup> April. Weather and ground conditions during the survey were dry. The ground was covered with a low cereal crop. The survey area measured 68m x 40m

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.

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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 such as pits and ditches can be seen if they contain more humic material which is normally rich in magnetic iron oxides when compared with the subsoil (but this can be variable 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*

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 basic processing carried out on all processed gradiometer data used in this report:

1. 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

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

3. Clip (excludes extreme values allowing better representation of detail in the mid range): -10 to 14nT.

## 5. RESULTS

The presentation of the data for the site involves a print-out of the raw data as greyscale and trace plots (Figure 2), together with a greyscale plot of the processed data (Figure 3). A perspective relief plot (Figure 4) is also provided. Magnetic anomalies have been identified and plotted onto the interpretative drawing

## GEOPHYSICAL SURVEY AT BOSTON ROAD, KIRKBY LA THORPE

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for the site (Figure 5) and are described below.

### *Magnetic disturbance*

The pylon produces a very large bipolar anomaly which dominates the eastern part of the survey plot (see trace plot Fig. 2 for the relative magnitude of this compared to potentially archaeological responses). Similar recent disturbances are present along the western edge of the plot due to the presence of a gas pipe line just to the west.

### *Positive linear anomalies of probable archaeological origin*

A few possible linear anomalies are noted. None are very coherent. They may represent archaeological features but might be of agricultural origin.

### *Discrete positive anomalies*

One such was noted on the northern edge of the survey area and probably represents a pit. Other discrete positive responses are difficult to interpret owing to the generally noisy responses (compare the spiked signals in Figure 4 compared to the location of the probable pit). Quite a number of small positive responses represent no more than single readings and are unlikely to be of archaeological origin.

### *Positive area anomalies*

Locally higher readings are present in an area on the southeastern edge of the survey area. The reason for this is not clear – it lies between the pylon and the road and might merely represent further disturbance – but it is quite well defined and not of the same magnitude as the clearly modern disturbances.

### *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. These are widespread across the survey area.

## 6. DISCUSSION

Magnetic survey has had limited success on the site owing to the magnetic influence of the pylon (and its earthing?) and the gas pipeline immediately to the west.

A pit is evident on the northern edge of the survey area. Potential linear features were noted, but may be of agricultural origin. Further investigation would be necessary in order to characterise and date any of these magnetic anomalies.

## 7. ACKNOWLEDGEMENTS

Archaeological Project Services wishes to acknowledge the assistance of Alec Tuplin of Bruton Knowles and Mike Kershaw of Central Networks who commissioned the project and liaised with the landowner over access.

## 8. PERSONNEL

Project coordinator: Steve Malone  
Field survey: Steve Malone, Ross Kendal  
Survey processing and reporting: Steve Malone

## 9. BIBLIOGRAPHY

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investigations at Boston Road, Sleaford

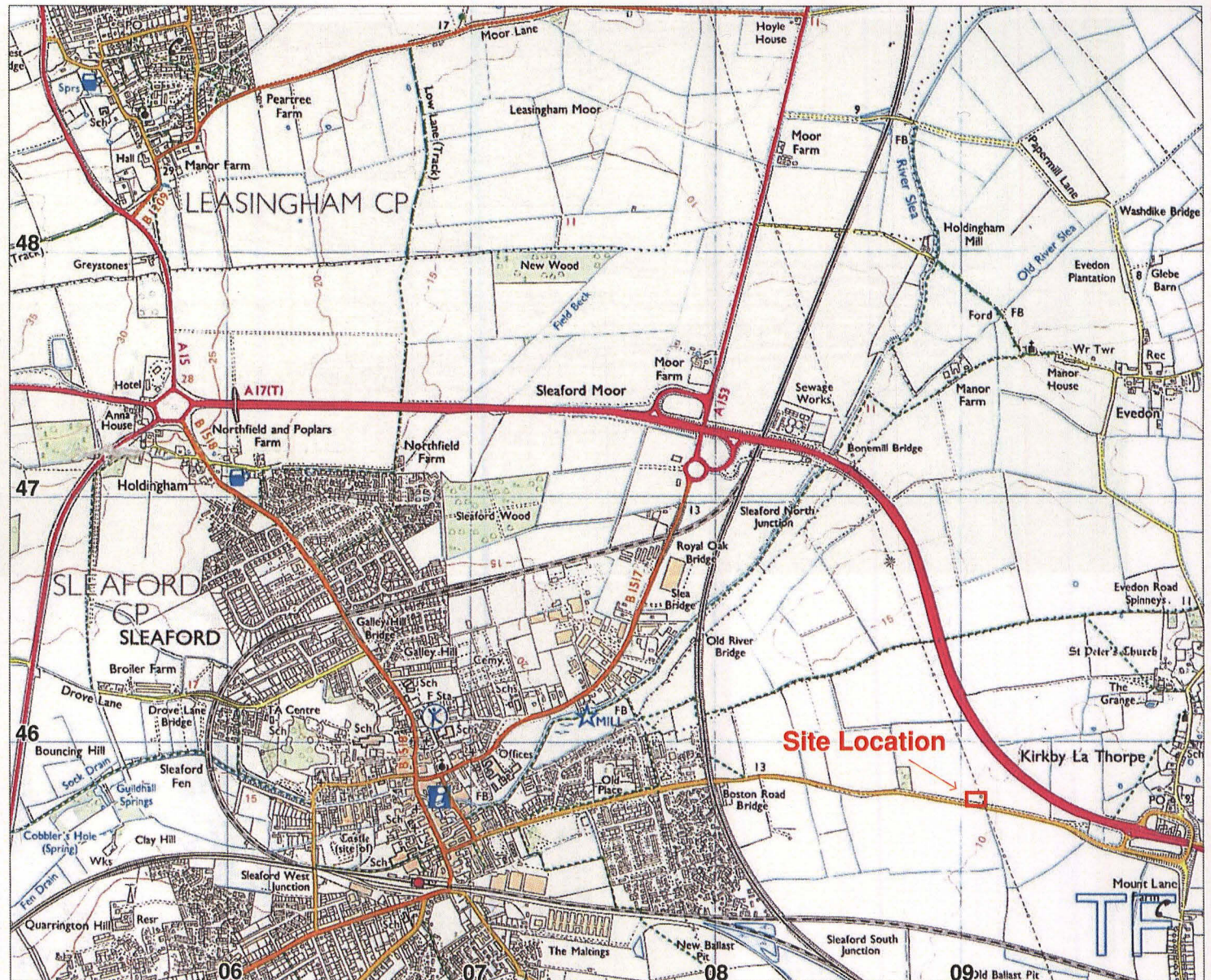
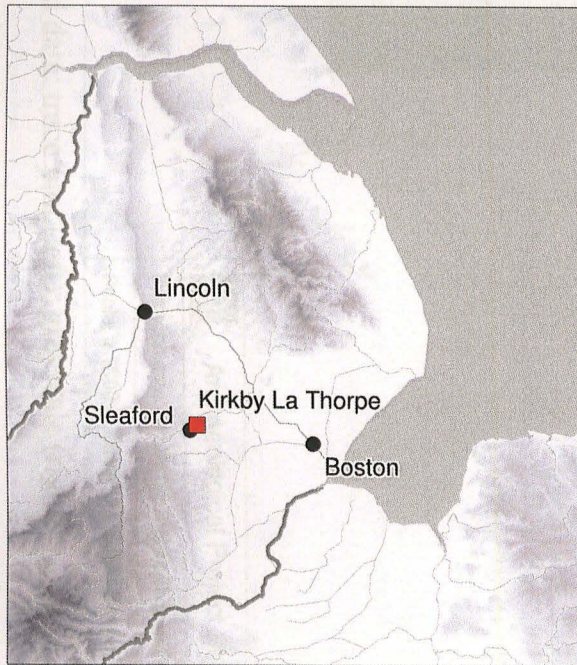
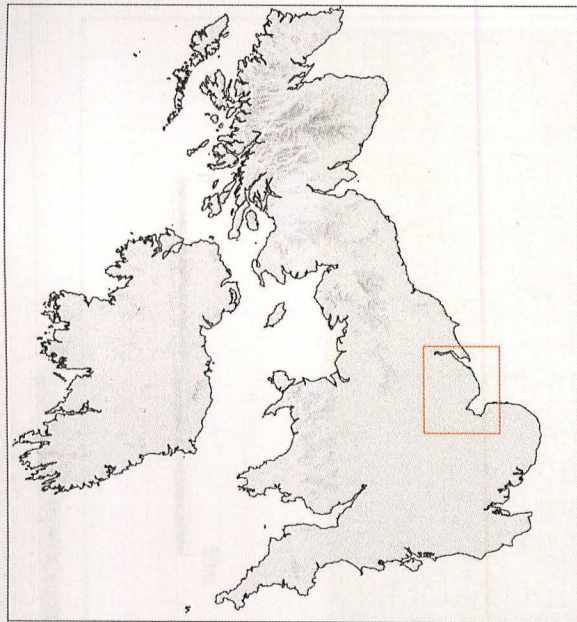
Hodge, CAH, Burton RGO, Corbett, WM, Evans, R and Seale, RS, 1984 *Soils and their Use in Eastern England*, Soil Survey of England and Wales 13

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

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### 10. ABBREVIATIONS

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



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Figure 1 Site location map



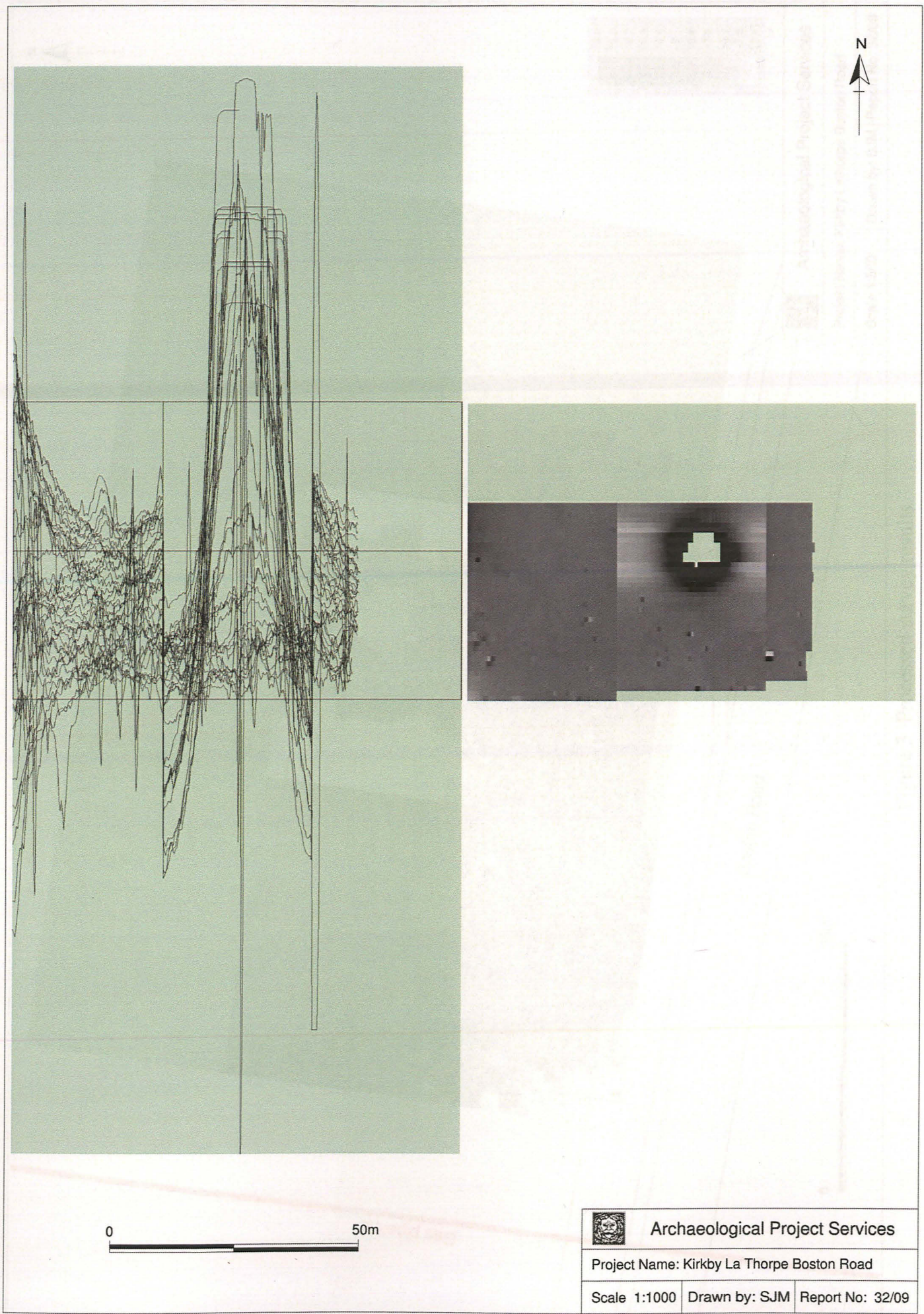


Figure 2 Unprocessed data: trace plot (left); greyscale (right)

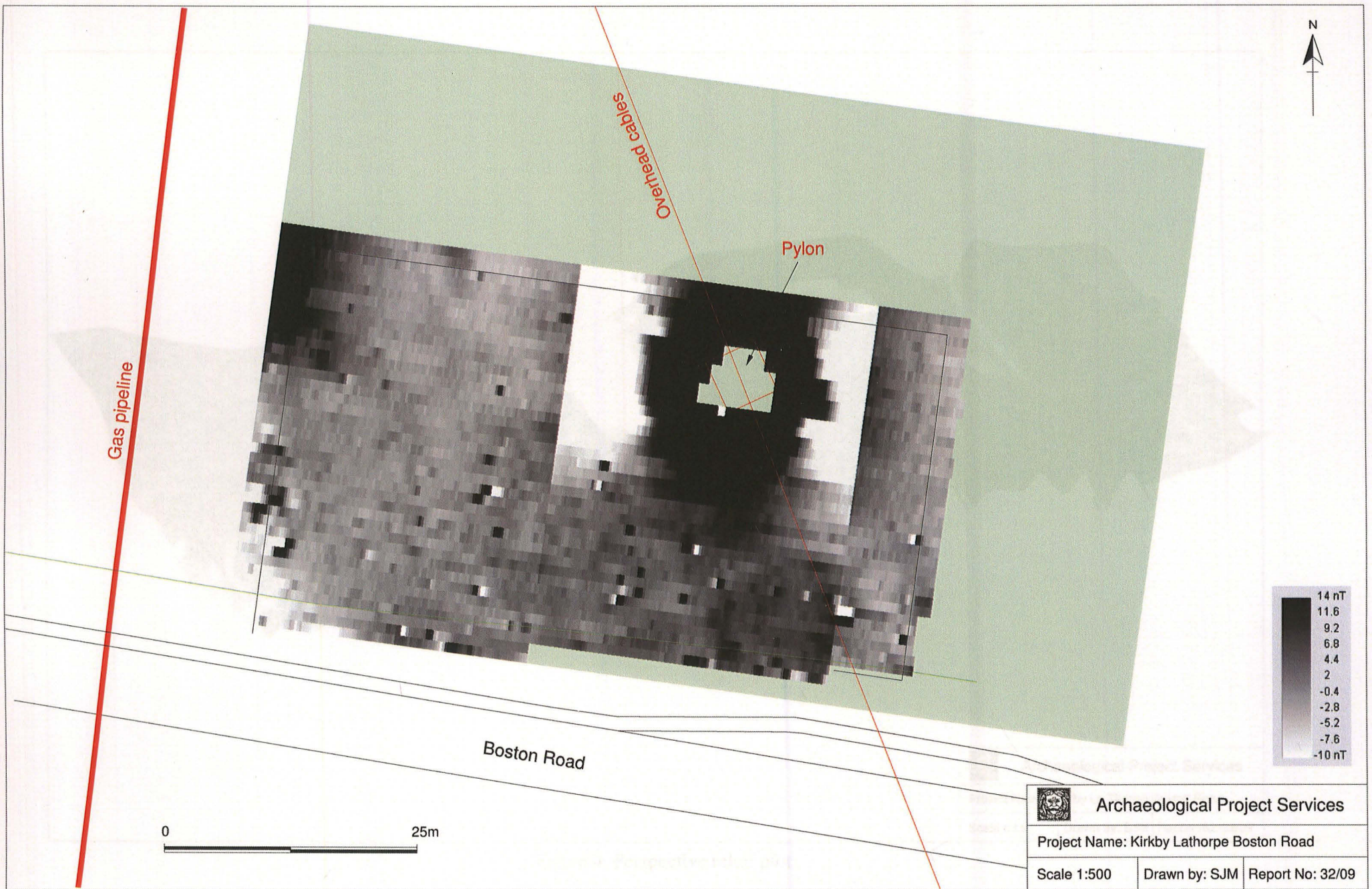
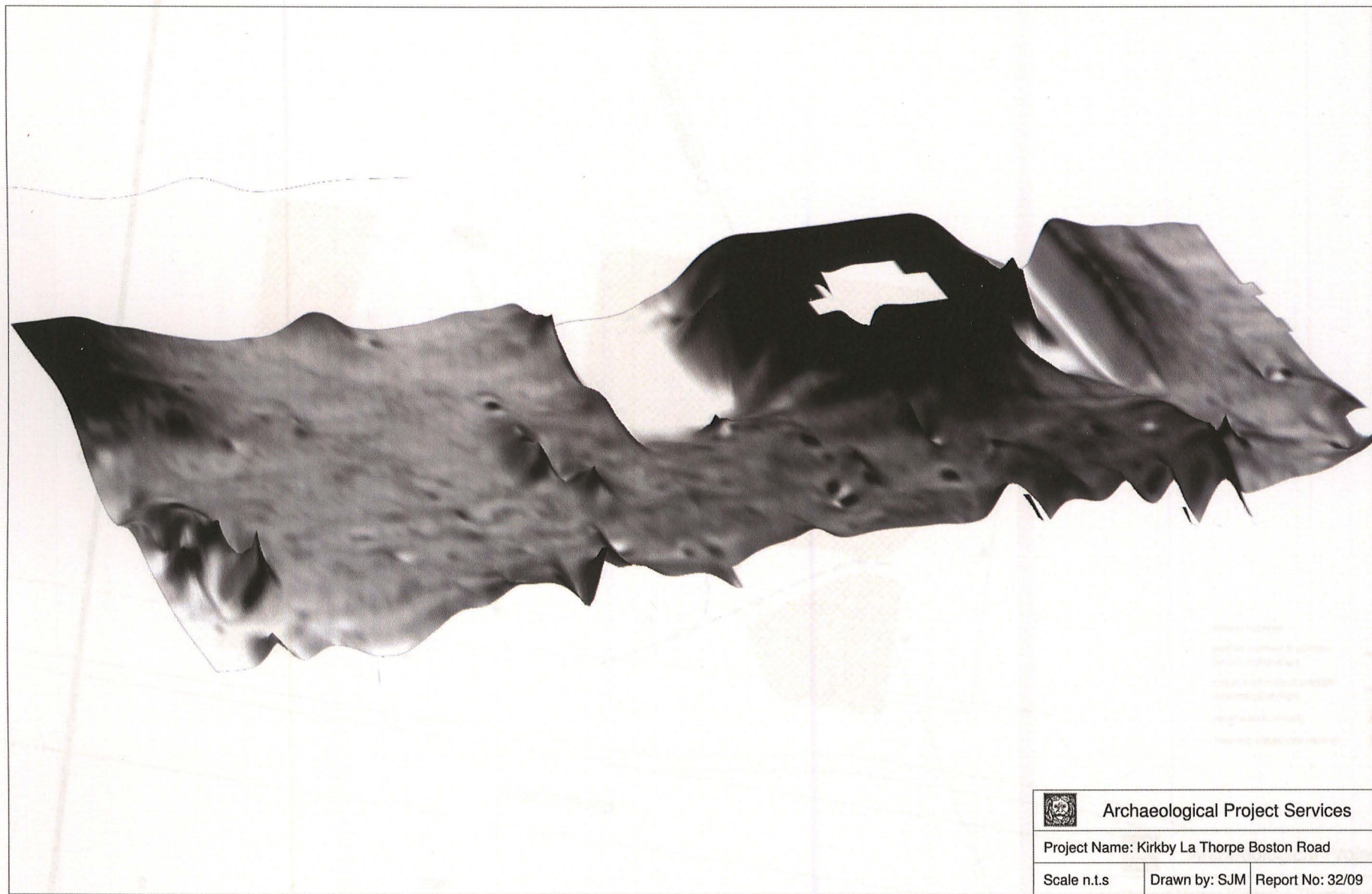


Figure 3 Processed survey results




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Figure 4 Perspective relief plot

Figure 5 Geophysical survey interpretation




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Figure 5 Geophysical survey interpretation