

---

**LAND ADJACENT  
MORRISON'S SUPERMARKET  
HARROGATE ROAD, RIPON  
NORTH YORKSHIRE**

**GEOPHYSICAL SURVEY**

---

**Work undertaken for  
SLR Consulting**

**September 2011**

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

OASIS ID: archaeo11-110604  
National Grid Reference: **431335 469800**

APS Report No: **104/11**

**ARCHAEOLOGICAL  
PROJECT  
SERVICES**



## CONTENTS

1.	SUMMARY.....	1
2.	INTRODUCTION.....	1
2.1	DEFINITION OF AN EVALUATION.....	1
2.2	BACKGROUND.....	1
2.3	TOPOGRAPHY AND GEOLOGY.....	1
2.4	ARCHAEOLOGICAL SETTING.....	1
3.	AIMS.....	2
4.	GEOPHYSICAL SURVEY.....	2
4.1	METHODS.....	2
4.2	RESULTS.....	3
5.	DISCUSSION.....	4
6.	ACKNOWLEDGEMENTS.....	5
7.	PERSONNEL.....	5
8.	BIBLIOGRAPHY.....	5
9.	ABBREVIATIONS.....	5

Appendix 1 The Archive

### List of Figures

- Figure 1 Site location map
- Figure 2 Layout of survey area
- Figure 3 Unprocessed data greyscale plot (clip +/-50nT)
- Figure 4 Unprocessed data trace plot
- Figure 5 Processed data greyscale plot (clip +/-5nT)
- Figure 6 Processed data overlaid on base map
- Figure 7 Interpretative plot

## 1. SUMMARY

*Detailed magnetic gradiometer survey, was undertaken for SLR Consulting acting on behalf of Morrison's Supermarkets on 4ha of land adjacent to their existing store on the southern edge of Ripon, North Yorkshire.*

*The survey results suffer from considerable magnetic noise due in part to recent fly-tipping and general scatter of rubbish across the area. In the east and south of the area, however, there was little apparent at the surface and the strong magnetic effects must relate to buried material. Local knowledge suggests episodes of landfill.*

*This aside, there is little within the survey results that can be clearly interpreted as archaeological. A possible ditch in the northwest corner gives the most coherent response, but only a short length falls within the survey area. A few other possible linear and curvilinear features are tentatively highlighted, but these are only weakly expressed and given the range of background variation and degree of modern disturbance cannot be confidently interpreted.*

*Faint parallel trends in the north and west of the survey area may indicate the former presence of ridge and furrow cultivation and provide some indication of earlier field layout.*

## 2. INTRODUCTION

### 2.1 Definition of an Evaluation

Geophysical survey is a non-intrusive method of archaeological evaluation which is defined as '*a limited programme of non-intrusive and/or intrusive fieldwork which determines the presence or absence of*

*archaeological features, structures, deposits, artefacts or ecofacts within a specified area or site. If such archaeological remains are present Field Evaluation defines their character and extent, quality and preservation, and it enables an assessment of their worth in a local, regional, national or international context as appropriate'* (IFA 2008).

### 2.2 Background

Archaeological Project Services was commissioned by SLR Consulting on behalf of Wm Morrison Supermarkets plc to undertake detailed magnetometer survey on 4ha of land adjacent to their Harrogate Road Store, Ripon, North Yorkshire. The survey was carried out between the 15<sup>th</sup> and 16<sup>th</sup> September 2011.

### 2.3 Topography and Geology

Ripon is located 35km northwest of York and 16km north of Harrogate in the Harrogate District of North Yorkshire. The site lies on the southern edge of the modern town immediately north of the A61 bypass at NGR 431335 469800 (Fig. 1).

The site is situated in an undulating landscape south and east of the River Skell at c. 40m AOD rising towards the north and west away from the A61. Underlying geology is Devensian glacial till above a solid geology of late Permian Dolomitic limestone.

### 2.4 Archaeological Setting

The town of Ripon has a long history appearing as (*in*) *Hrypīs* in documents as early as 715. An Anglo-Saxon monastery was founded at Ripon in 657 AD by Alfrith, ruler of the Northumbrian province of Deira and son of the Northumbrian King called Oswy and refounded in 672

AD by St Wilfrid. A monastery *Inhrypum* is recorded by Bede in 730.

To the north and east in the Vale of Mowbray, between the central Pennines and the Hambleton Hills, lies a remarkable concentration of Neolithic monuments including the Thornborough henges. Roman remains are also known in the vicinity although the nearest major town lies 10km to the south and east at Aldborough.

### 3. AIMS

A desk based assessment has been prepared for the site as supporting documentation for the planning application at the request of the archaeological advisors to North Yorkshire County Council. The site contains cropmarks identified through aerial photography which are of unknown origin.

The desk based assessment (SLR 2011) identified the likely presence of agricultural features within the site boundary relating to former boundaries, structures and tracks shown on historic maps dating from the 18th and 19th centuries. No cause for the cropmarks could be discerned from the available evidence.

On these grounds North Yorkshire County Council have requested a geophysical survey of the site to further investigate features of potential archaeological interest and assist in determination of the planning application.

## 4. GEOPHYSICAL SURVEY

### 4.1 Methods

Location and layout of the survey area is

shown in Figure 2. Weather and ground conditions during the survey were dry. The survey area was under grass which had just been mown leaving it in good condition for survey barring only some denser areas of vegetation at the western and eastern margins. Fly-tipping close to the eastern access precluded survey of this corner.

Survey was undertaken in accordance with English Heritage (2008) and IfA (2010) guidelines and codes of conduct.

The magnetic survey was carried out using a dual sensor Grad601-2 Magnetic Gradiometer manufactured by Bartington Instruments Ltd. Although the changes in the magnetic field resulting from differing features in the soil are usually weak, changes as small as 0.2 nanoTesla (nT) in an overall field strength of c. 49,000nT can be accurately detected using this instrumentation, although in practice instrument interference and soil noise can limit sensitivity.

The mapping of anomalies in a systematic manner allows an estimate of the type of material present beneath the surface. Strong magnetic anomalies will be generated by buried iron-based objects or by kilns or hearths. More subtle anomalies representing pits and ditches can be seen where they contain more topsoil which is normally richer in magnetic iron oxides and provides a contrast with the natural subsoil (but this can vary depending on the nature of the underlying deposits). Wall foundations can show as negative anomalies where the stone is less magnetic than the surrounding soil, or as stronger positive and negative anomalies if of brick, but are not always responsive to the technique.

Magnetometers measure changes in the Earth's magnetic field. With two sensors configured as a gradiometer the recorded

values indicate the difference between two magnetic measurements separated by a fixed distance. The Grad601-2 consists of two high stability fluxgate gradiometers suspended on a single frame with a 1m separation between the sensing elements giving a strong response to deep anomalies.

*Sampling interval and data capture*

Readings were taken at 0.25m centres along traverses 1m apart. This equates to 3600 sampling points in a full 30m x 30m grid. The Grad 601 has a typical depth of penetration of 0.5m to 1.0m although a greater range is possible where strongly magnetic objects have been buried in the site.

Readings are logged consecutively into the data logger which is downloaded daily either into a portable computer whilst on site or directly to the office computer. At the end of each job, data is transferred to the office for processing and presentation.

*Processing and presentation of results*

Processing is performed using specialist ArchaeoSurveyor software. This can emphasise various aspects contained within the data but which are often not easily seen in the raw data. Basic processing of the magnetic data involves 'flattening' the background levels with respect to adjacent traverses and adjacent grids. 'Despiking' is also performed to remove the anomalies resulting from small iron objects often found on agricultural land. Once the basic processing has flattened the background it is then possible to carry out further processing which may include low pass filtering to reduce 'noise' in the data and hence emphasise the archaeological or man-made anomalies.

The following shows the processing techniques carried out on the processed gradiometer data used in this report:

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

2. Despike (useful for display and allows further processing functions to be carried out more effectively by removing extreme data values)

Parameters: X radius = 1; Y radius = 1; Threshold = 3SD; Spike replacement = mean

3. Clip (excludes extreme values allowing better representation of detail in the mid range): -5 to 5nT.

**4.2 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; greyscale clipped to +/-50nT for display but otherwise unprocessed), together with greyscale plots of the processed data (Figs 5, 6). Magnetic anomalies have been identified and plotted onto an interpretative drawing (Fig. 7) and are described below.

*Linear positive anomalies*

Few positive linear anomalies can be clearly seen with possible examples largely weak and discontinuous. The most convincing example is **A** running across the northwest corner of the survey area and probably representing a ditched feature. Two short lengths of east-west linear **B** also stand out appearing to fall in with a pattern of regularly spaced negative anomalies of uncertain origin (see below). To the south a curvilinear response **C** perhaps relates to linear anomaly **D** but both are only weakly responsive. Further narrow anomalies **E**, **F** are much straighter and parallel to negative features lying between these two.

*Linear negative anomalies*

A number of linear negative anomalies are evident. Those at **G** are short and form a relatively regularly spaced pattern with positive anomalies **B** above. The strong, but variable, response is not immediately suggestive of ancient origin. Further short negative lines – e.g. at **H** – reflect the location of relatively recent backfilled engineering trial pits. Weaker anomalies **I**, **J** appear to form part of a pattern with **E** and **F** above. These are narrow, straight, parallel features suggestive of drainage. **K** is similar in character and perhaps also has a similar origin.

*Agricultural features*

Parallel trends visible in the northern half of the field probably reflect prior agricultural use of the land (ridge and furrow). These run roughly north-south in the northwest corner of the field and roughly east-west just to the east. These are bounded by possible former field divisions (**L**, **M**), but neither gives a very coherent response and are perhaps just suggested by the apparent limits of the ridge and furrow.

*Iron spikes (discrete bipolar anomalies)*

Iron items within the topsoil give a distinctive localised bipolar (strong negative and positive) response. Such items usually derive from relatively recent management or agricultural use of the land – broken or discarded pieces of agricultural machinery or other modern debris. These are fairly widely scattered across the survey area.

*Modern/magnetic disturbance*

Highly elevated positive and negative readings are widely evident, particularly in the eastern and southwestern corners and close to the southern boundary. These derive from a variety of sources and potentially mask subtler archaeological responses.

*Geological variation*

Background responses owing to variations in the underlying natural are visible in the northern and central part of the plot. These are evident as a rather amorphous band of elevated responses, often stronger than those given by the archaeological features. This hinders the interpretation of discrete positive anomalies – e.g. the group at **N**, potentially indicative of large pits, but actually very similar in magnitude of response to the geological anomalies along the northern margin of the field.

**5. DISCUSSION**

The survey results suffer from considerable magnetic noise with the potential to mask earlier features. Some of this can be put down to recent fly-tipping, evident at the eastern margin of the site and from the amount of rubbish generally scattered across the area. By and large, however, there was little apparent at the surface to account for the strong magnetic effects which must relate to buried material. Local knowledge suggests episodes of landfill on the site ‘Made Ground’ is shown on BGS mapping just beyond the northern boundary indicating some such activities in the vicinity.

Background variation within the glacial till is also quite large and also hinders interpretation of more subtle variations. However, there is little within the survey results that can be clearly interpreted as reflecting archaeological features. A possible ditch in the northwest corner gives the most coherent response, but only a short length falls within the survey area. A few other possible linear and curvilinear features are tentatively highlighted, but these are only weakly expressed and given the range of background variation and degree of modern disturbance cannot be confidently interpreted.

Short, regularly spaced anomalies **B**, **G** appear to reflect the location of previously identified cropmarks (SLR 2011). Their strong, but variably positive/negative responses are not immediately suggestive of ancient origin. Faint parallel trends in the north and west of the survey area may indicate the former presence of ridge and furrow cultivation and provide some indication of earlier field layout. **L** lies further east than corresponding boundaries on earlier mapping, but **M** matches the position well. A widely spaced series of straight parallel lines on an east-west alignment perhaps indicates later drainage features. However, **F** also reflects the position of an earlier boundary, as does **K**, on a different alignment, but similar in response to these features, so that these may all relate to the earlier field layout within the survey area.

*Survey in Archaeological Field Evaluation*

IfA, 2010 *Draft Standard and Guidance for Geophysical Survey*

## 9. ABBREVIATIONS

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

## 6. ACKNOWLEDGEMENTS

Archaeological Project Services wishes to acknowledge the assistance of Laurence Hayes of SLR who commissioned the project on behalf of Wm Morrison plc and arranged for vegetation to be cut. Tom Lane edited the report.

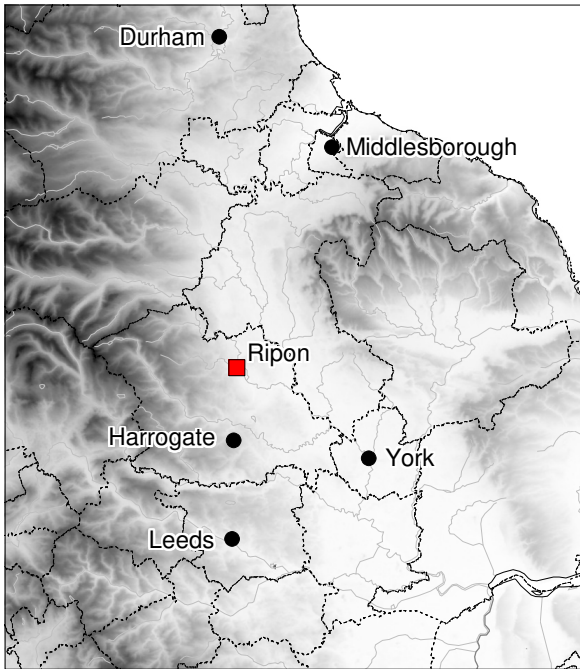
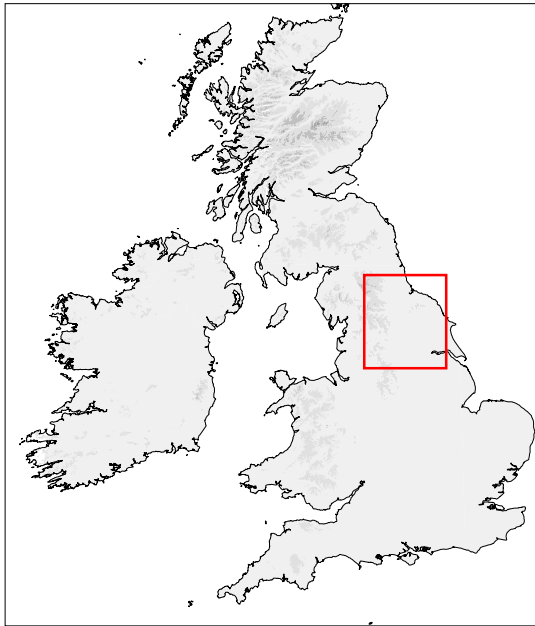
## 7. PERSONNEL

Project coordinator: Steve Malone  
 Geophysical Survey: Steve Malone, Bryn Leadbetter  
 Survey processing and reporting: Steve Malone

## 8. BIBLIOGRAPHY

Clark, A., 1996 *Seeing Beneath the Soil*, London, 2<sup>nd</sup> edn

English Heritage, 2008 *Geophysical*



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


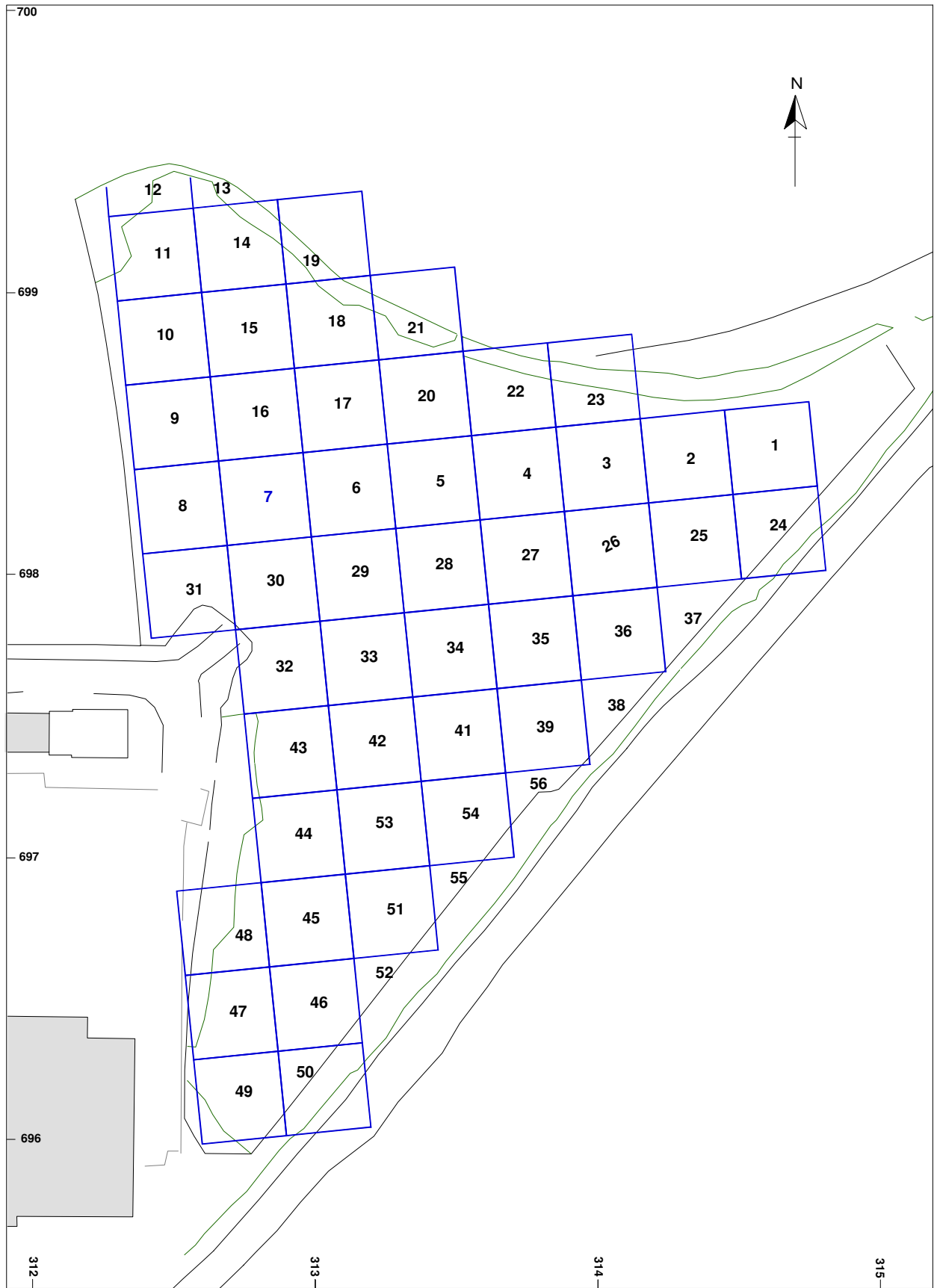
 <b>Archaeological Project Services</b>		
Project: Ripon Morrison's (RIPG11)		
Scale: varies	Drawn by: SJM	Report No: 104/11

Figure 1 Site location map






 <b>Archaeological Project Services</b>		
Project Name: Ripon Morrison's (RIPG11)		
Scale 1:2000	Drawn by: SJM	Report No: 104/11

Figure 2 Survey area layout

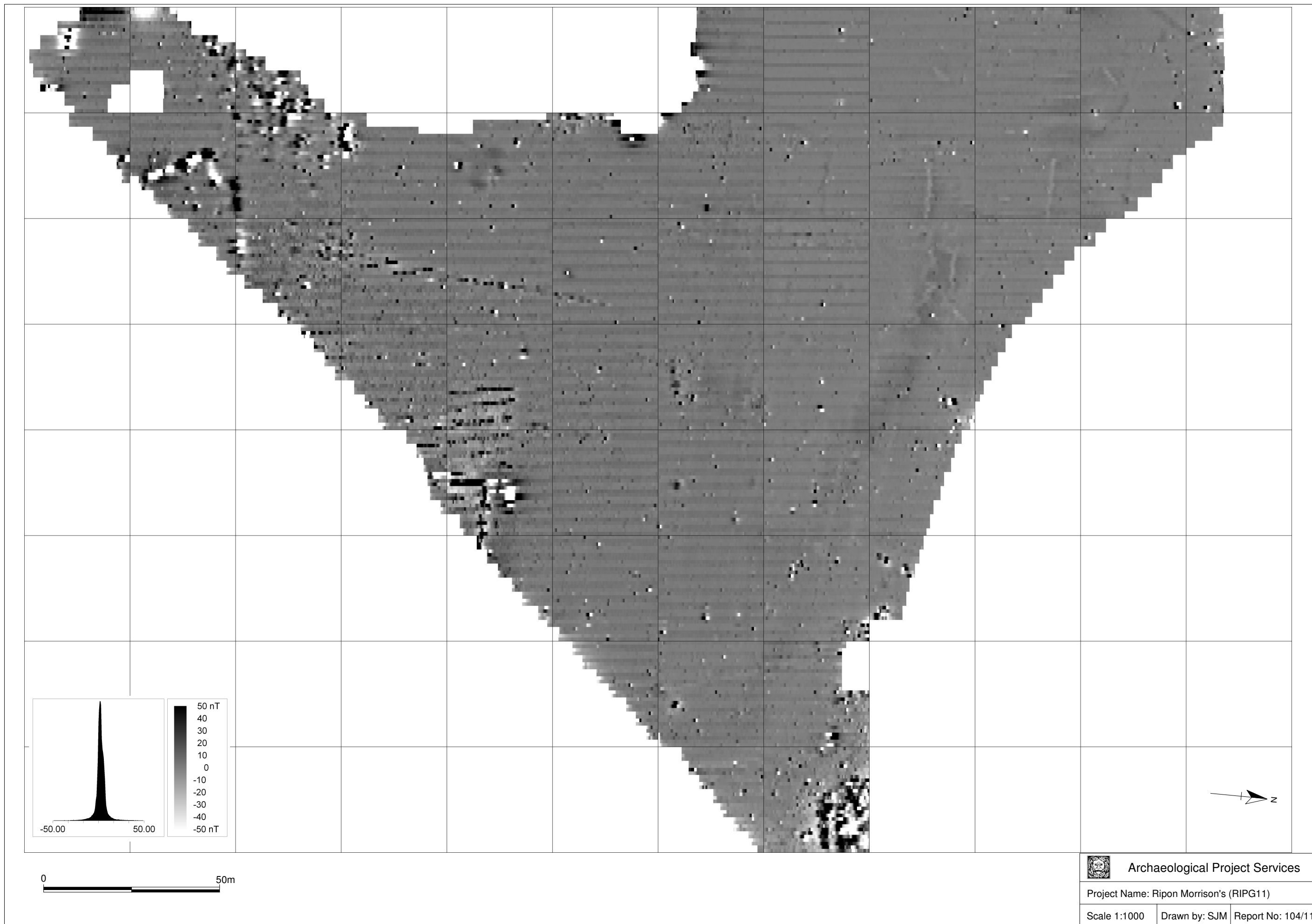


Figure 3 Unprocessed data greyscale - clip +/-50nT

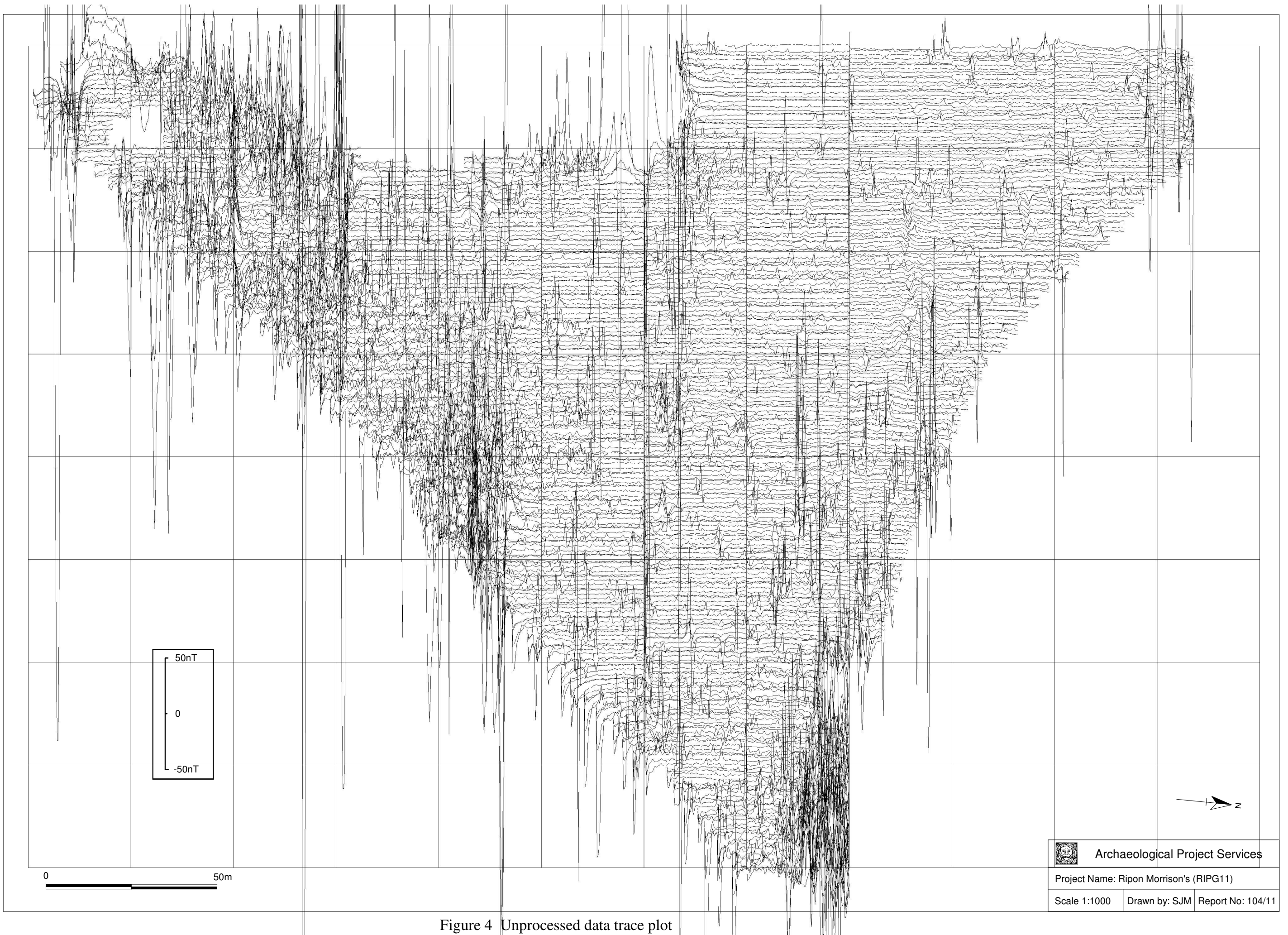


Figure 4 Unprocessed data trace plot

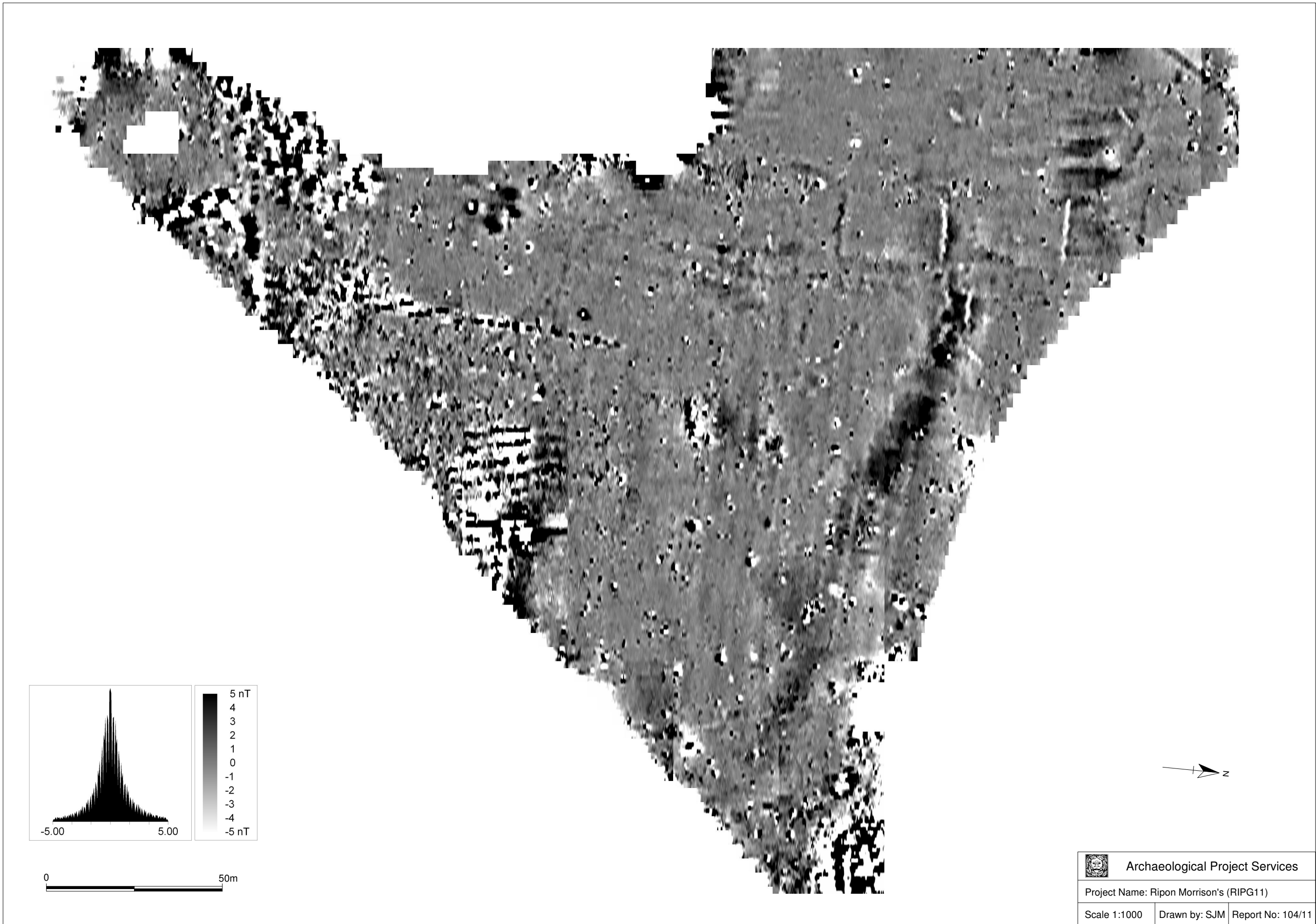


Figure 5 Processed data greyscale - clip +/-5nT

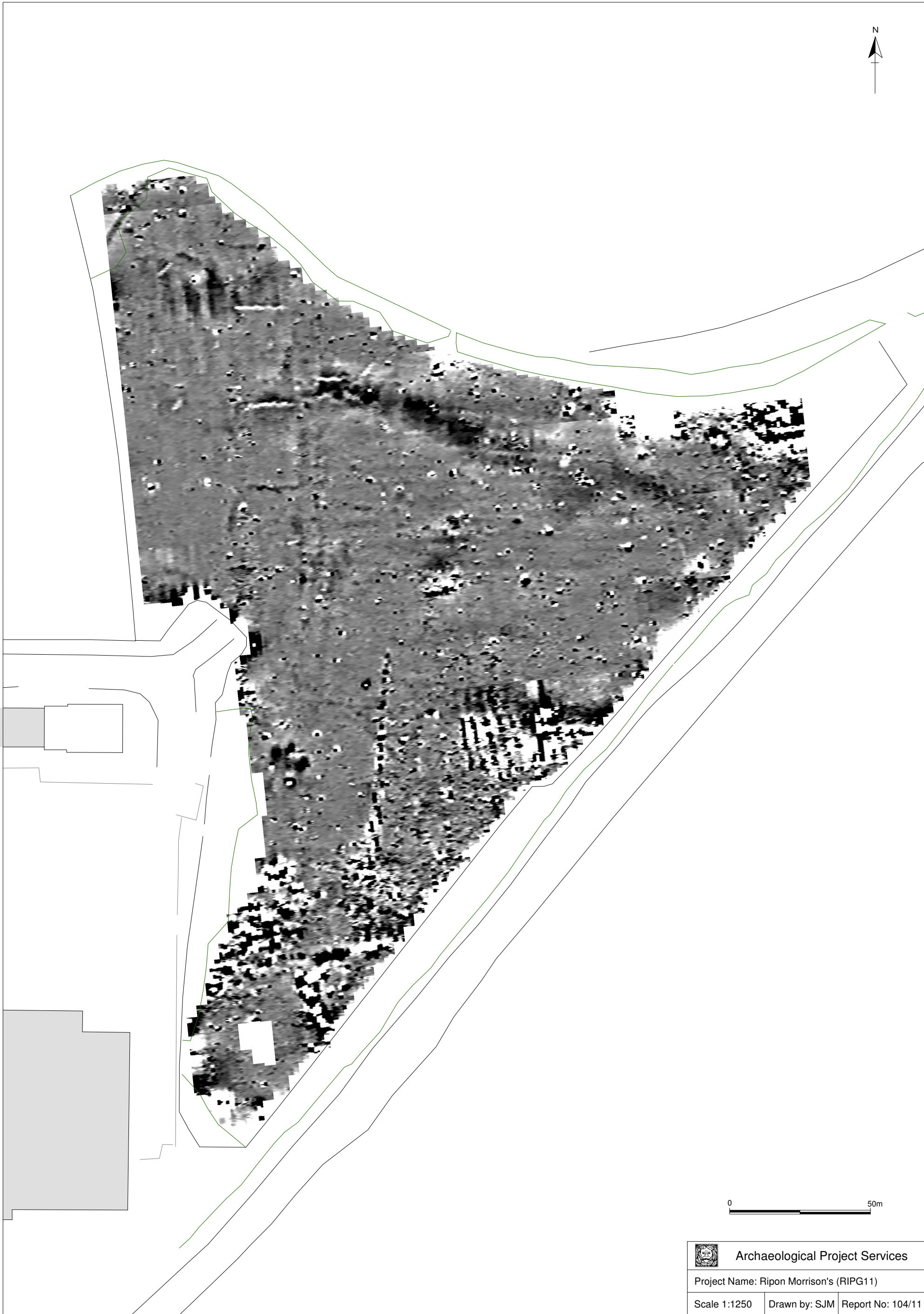


Figure 6 Processed data overlaid on base map



Figure 7 Interpretative plot

## Appendix 1 THE ARCHIVE

The archive consists of:

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

File names	rip11-01.xgd rip11-02.xgd rip11-03.xgd rip11-04.xgd rip11-05.xgd rip11-06.xgd rip11-07.xgd rip11-08.xgd rip11-09.xgd rip11-10.xgd rip11-11.xgd rip11-12.xgd rip11-13.xgd rip11-14.xgd rip11-15.xgd rip11-16.xgd rip11-17.xgd rip11-18.xgd rip11-19.xgd rip11-20.xgd	rip11-21.xgd rip11-22.xgd rip11-23.xgd rip11-24.xgd rip11-25.xgd rip11-26.xgd rip11-27.xgd rip11-28.xgd rip11-29.xgd rip11-30.xgd rip11-31.xgd rip11-32.xgd rip11-33.xgd rip11-34.xgd rip11-35.xgd rip11-36.xgd rip11-37.xgd rip11-38.xgd rip11-39.xgd rip11-40.xgd	rip11-41.xgd rip11-42.xgd rip11-43.xgd rip11-44.xgd rip11-45.xgd rip11-46.xgd rip11-47.xgd rip11-48.xgd rip11-49.xgd rip11-50.xgd rip11-51.xgd rip11-52.xgd rip11-53.xgd rip11-54.xgd rip11-55.xgd rip11-56.xgd  rip11-c1.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	ArchaeoSurveyor 2.5.11 running under Windows XP Service Pack 3		
Date of last modification	22/09/11		
Indications of known areas of weakness in data	None		

All primary records are currently kept at:

Archaeological Project Services  
The Old School  
Cameron Street  
Heckington  
Lincolnshire  
NG34 9RW

The ultimate destination of the project archive is:

Archaeological Project Services Site Code: RIPG11

Archaeological Project Services shall retain full copyright of any commissioned reports under the *Copyright, Designs and Patents Act 1988* with all rights reserved; excepting that it hereby provides an exclusive licence to the client for the use of such documents by the client in all matters directly relating to the project as described in the Project Specification.