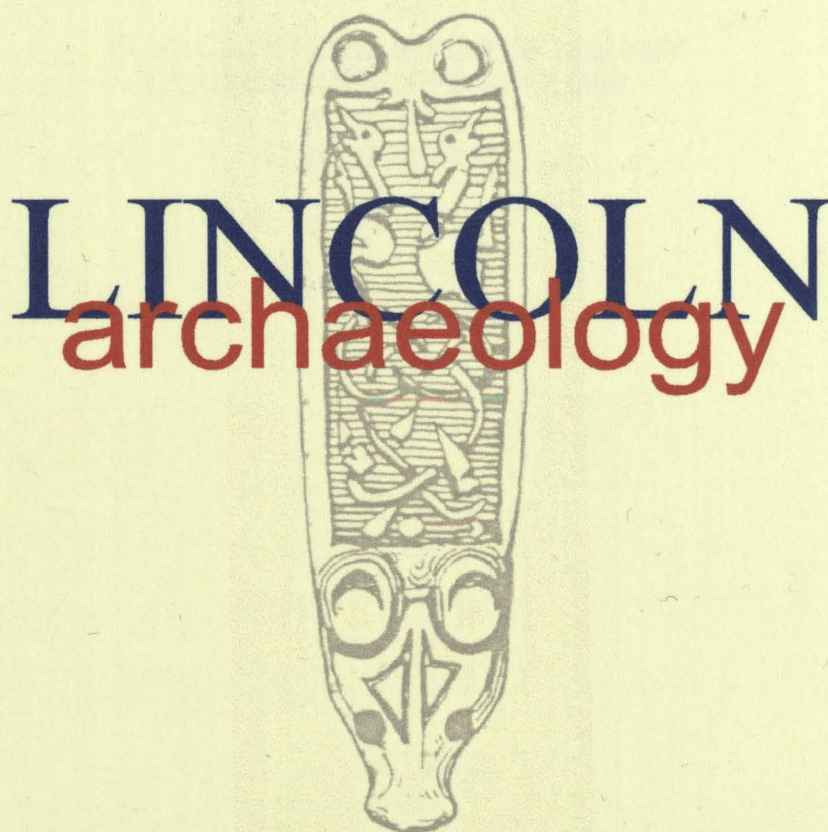


**A Report to Manton Bartle Architects  
On behalf of  
Barker & Son (Lincoln) Ltd  
January 2000**



**LAND OFF CENTURION CLOSE,  
NAVENBY, LINCOLNSHIRE**

**FLUXGATE GRADIOMETER SURVEY**

Report No.: 414

**LINCOLN**  
archaeology

Lincolnshire County Council  
Archaeology Section

24 JAN 00  
ack 24/1/00

Event LI1006  
Source LI 5712  
5714

60537

**FLUXGATE GRADIOMETER SURVEY  
LAND OFF CENTURION CLOSE  
NAVENBY  
LINCOLNSHIRE**

Contents

1	Summary	1
2.0	Introduction	2
3.0	Location of Survey Area	2
3.1	Methodology	3
4.0	Results	3
5.0	Conclusions	4
6.0	Archaeological Implications	4
7.0	Appendices	5
7.1	Bibliography	5
7.2	Summary of survey parameters	5

Illustrations

Fig.1	Location of survey area. Scale 1:10000	
Fig.2	Location of survey grids. Scale 1:1250	
Fig.3	Greyscale image. Scale 1:1000	
Fig.4	Smoothed greyscale image. Scale 1:1000	
Fig.5	Trace plot of raw data. Scale 1:1000	
Fig.6	Interpretation	
Fig.7	Greyscale image of ground plan. Scale 1:1250	

Report prepared for City of Lincoln Archaeology Unit  
by David Bunn BSc & Andrew Hardwick BSc  
January 2000

Pre-Construct Geophysics  
61 High Street  
Newton on Trent  
Lincoln  
LN1 2JP  
Tel. & Fax. 01777228129

## Contents

<i>Summary</i>	1
<b>1.0</b> Introduction	2
<b>2.0</b> Location and description	2
<b>3.0</b> Methodology	2
<b>4.0</b> Results	3
<b>5.0</b> Conclusions	4
<b>6.0</b> Acknowledgements	4
<b>7.0</b> Appendices	5
7.1 Bibliography	5
7.2 Summary of survey parameters	5

## Illustrations

- Fig.1 Location of survey area. Scale 1:10000.
- Fig.2 Location of survey grids. Scale 1:1250.
- Fig.3 Greyscale image. Scale 1:1000.
- Fig.4 Smoothed greyscale image. Scale 1:1000.
- Fig.5 Trace plot of raw data. Scale 1:1000.
- Fig.6 Interpretive greyscale image. Scale 1:1000.
- Fig.7 Greyscale image of glacial fracturing, (Navenby Heath). Scale 1:1250.



### *Summary*

- *A fluxgate gradiometer survey was undertaken to evaluate the archaeological potential of land north of Centurion Close, Navenby, Lincolnshire.*
- *The survey detected strong magnetic variation, the majority of which was caused by modern activity and geological formations (reticulation within the limestone bedrock).*
- *Modern debris, especially on the perimeter of the survey, may be masking weaker signals of archaeological significance, although there is little clear evidence to support this view.*

Fig 1 - Site location Scale 1:10,000

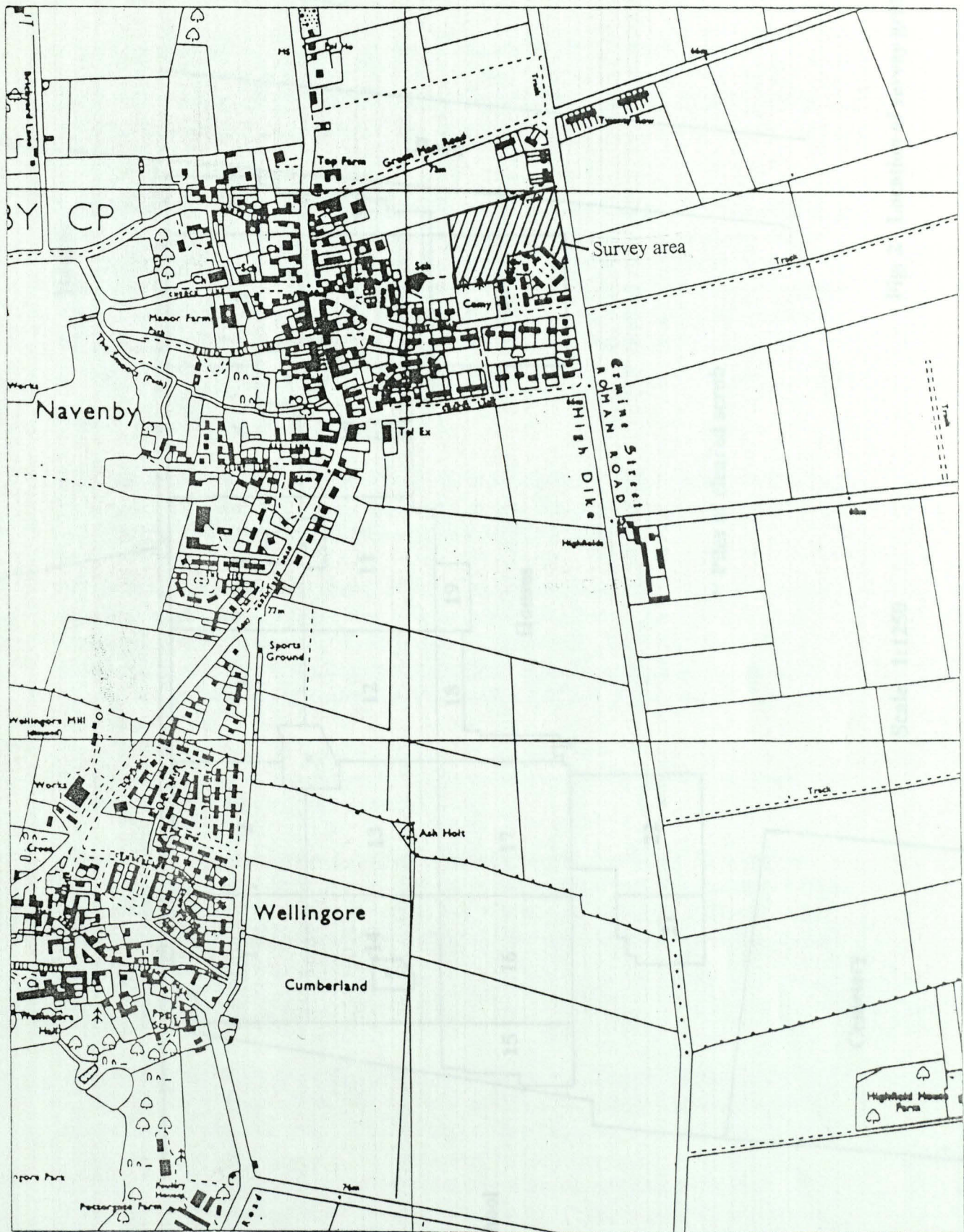
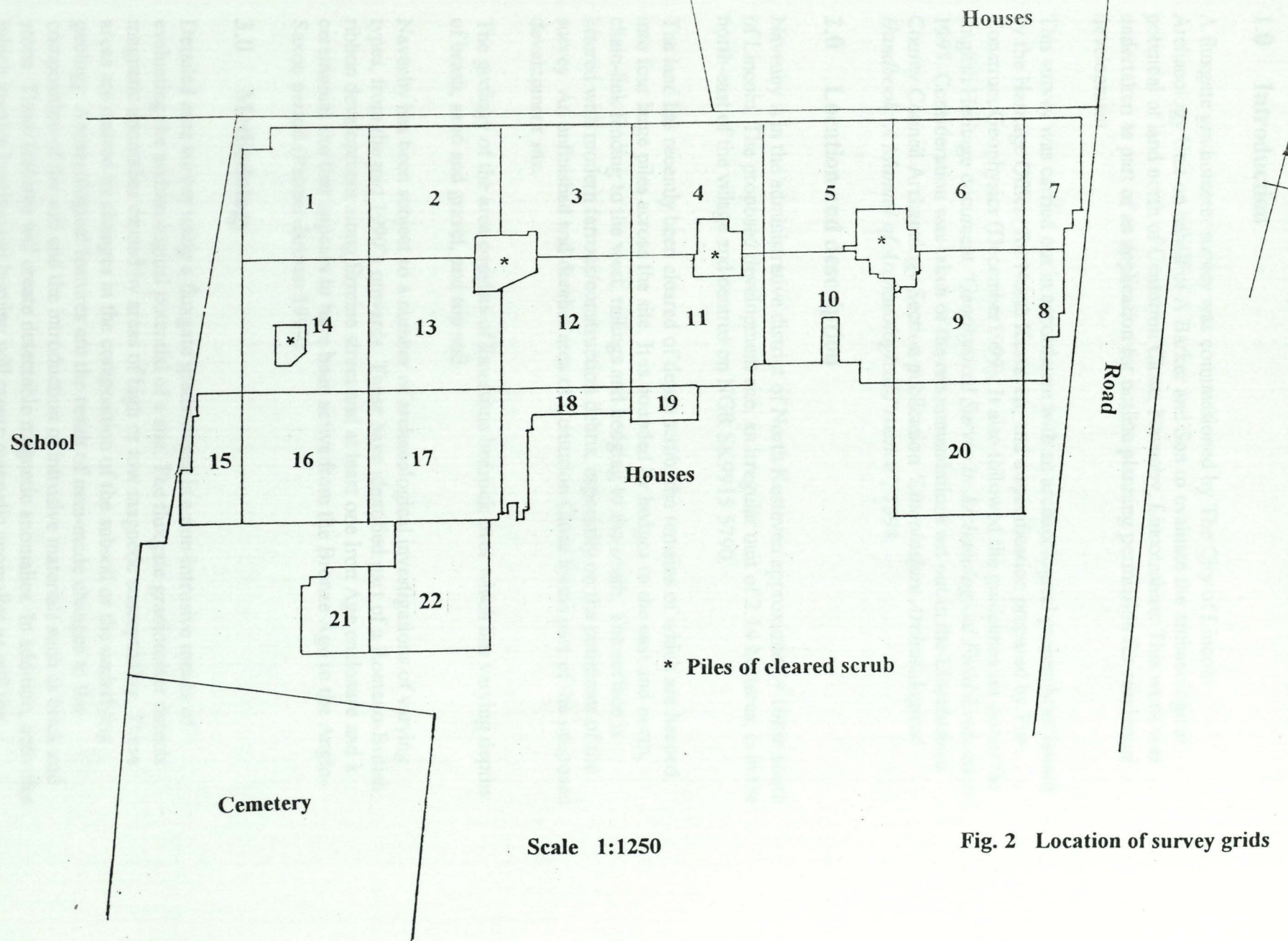


Fig.1 Site location. Scale 1:10,000.



## 1.0 Introduction

A fluxgate gradiometer survey was commissioned by The City of Lincoln Archaeology Unit on behalf of A Barker and Son to evaluate the archaeological potential of land north of Centurion Close, Navenby, Lincolnshire. This work was undertaken as part of an application for outline planning permission for residential development.

This survey was carried out in accordance with an archaeological project brief issued by the Heritage Officer for North Kesteven, and a specification prepared by Pre-Construct Geophysics (December 1999). It also followed the guidelines set out in the English Heritage document '*Geophysical Survey in Archaeological Field Evaluation*', 1995. Consideration was taken of the recommendations set out in the Lincolnshire County Council Archaeology Section publication '*Lincolnshire Archaeological Handbook; A Manual of Archaeological Practice*', 1998.

## 2.0 Location and description

Navenby is in the administrative district of North Kesteven approximately 10km south of Lincoln. The proposed development site, an irregular unit of 2.14 hectares, is in the north-east of the village and centres on NGR SK9915 5790.

The land has recently been cleared of dense scrub, the remains of which are heaped into four large piles across the site. It is bounded by hedges to the east and north, chain-link fencing to the west, railings and hedging to the south. The surface is littered with modern ferrous/construction debris, especially on the perimeter of the survey. An unfinished and derelict area of Centurion Close forms part of the proposed development site.

The geology of the area consists of limestone bedrock over which lies varying depths of brash, sand and gravel, and top soil.

Navenby has been subject to a number of archaeological investigations of varying types, from the mid 1990's onwards. These have identified part of a Romano-British ribbon development along Ermine street and at least one Iron Age enclosure and a ceremonial site that appears to have been active from the Bronze Age to the Anglo-Saxon period (Palmer-Brown 1999).

## 3.0 Methodology

Detailed area survey using a fluxgate gradiometer is a non-intrusive means of evaluating the archaeological potential of a site. The fluxgate gradiometer detects magnetic anomalies caused by areas of high or low magnetic susceptibility. These areas are caused by changes in the composition of the subsoil or the underlying geology. Archaeological features are the result of man-made changes to the composition of the soil and the introduction of intrusive materials such as brick and stone. These features will create detectable magnetic anomalies. In addition, activities which involve heating and burning will create magnetic anomalies as will the presence of ferrous metal objects. By examining the anomalies detected by a fluxgate



gradiometer survey, geophysicists can often translate the data into archaeological interpretation.

The area survey was conducted using a *Geoscan Research* fluxgate gradiometer (model FM36) with an electronic sample trigger set to take 4 readings per metre (a sample interval of 0.25m). The zigzag traverse method of survey was used, with 1m wide traverses across 30m x 30m grids. The base line was established by measuring out from the northern and western field boundaries: 2m east, 3.5m south from the north-west corner and 3m south in the north-east corner. Pegs were left along the base line and elsewhere to facilitate grid relocation. The sensitivity of the machine was set to detect magnetic variation in the order of 0.1 nanoTesla.

The data from the survey was processed using *Geoplot* version 3.0. The data was desloped (a means of compensating for sensor drift during the survey by subjecting the data to a mathematical bias sloping in the opposite direction of the bias created by sensor drift). The data was clipped to reduce the distorting effect of extremely high or low readings caused by ferrous metals on the site, and the result was plotted as a number of greyscale images.

The survey was carried out by David Bunn and Andrew Hardwick on the 5<sup>th</sup> and 6<sup>th</sup> January 2000. The weather was mild with spells of bright sunshine. The area surveyed measured approximately 1.7 hectares.

#### 4.0 Results

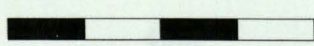
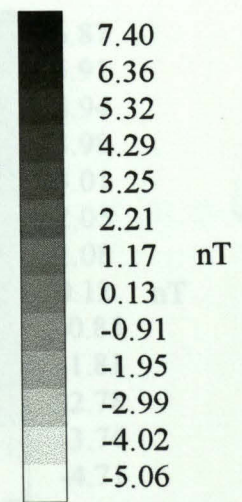
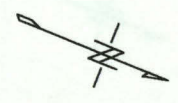
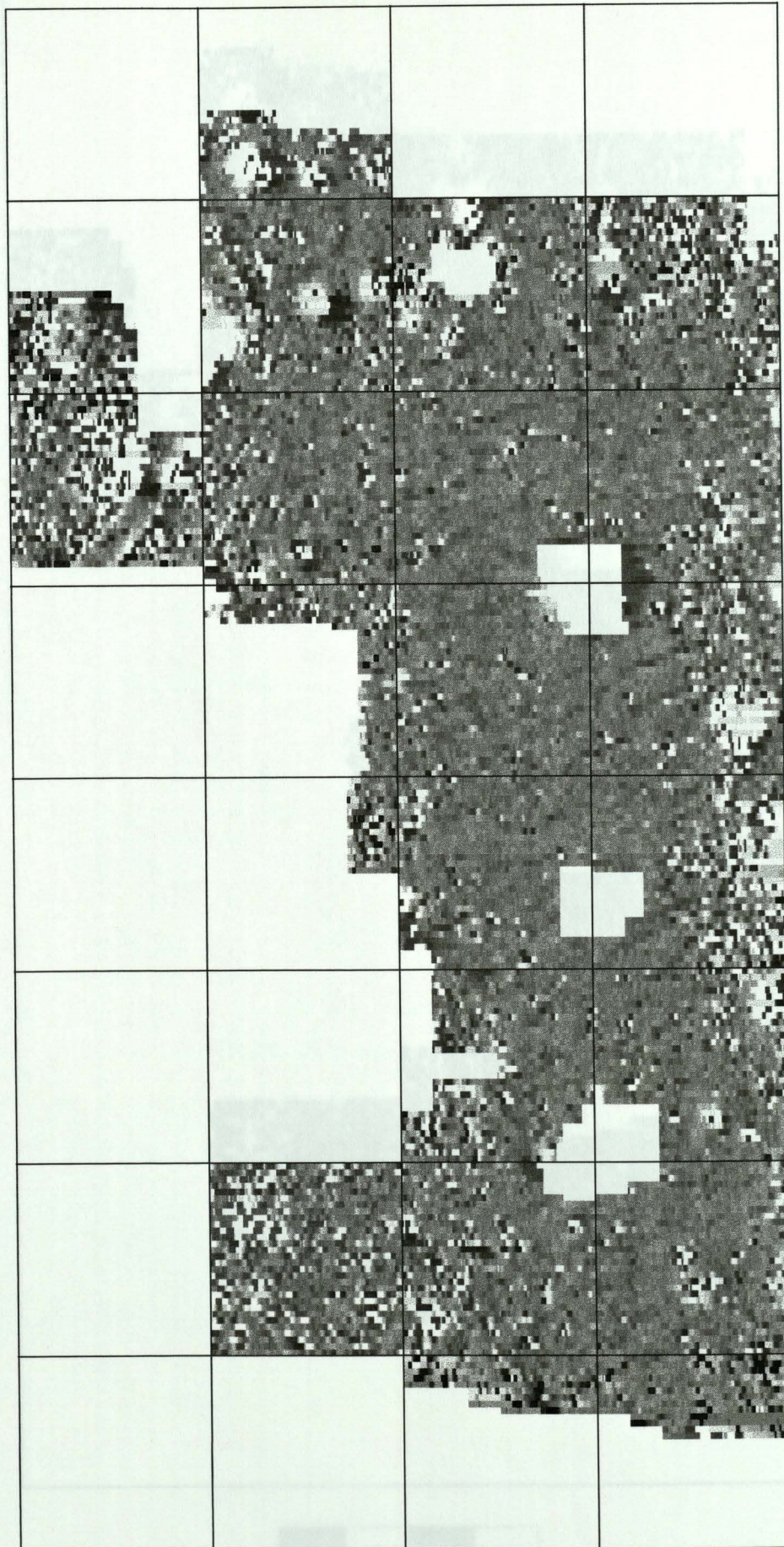
The site displayed a significant degree of magnetic variation (Figs. 3, 4 & 5). This was largely due to the presence of modern debris (Fig.6: 1) and the geology of the area (reticulation caused by natural fractures in the limestone bedrock).

No magnetic anomalies of obvious archaeological significance were apparent. This may be due to:

- (a) Absence of features,
- (b) The masking effects of modern/natural anomalies,
- (c) Lack of magnetically susceptible archaeological remains.

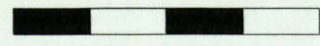
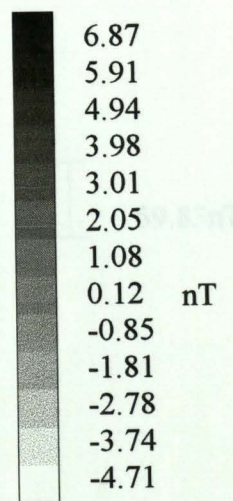
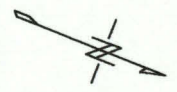
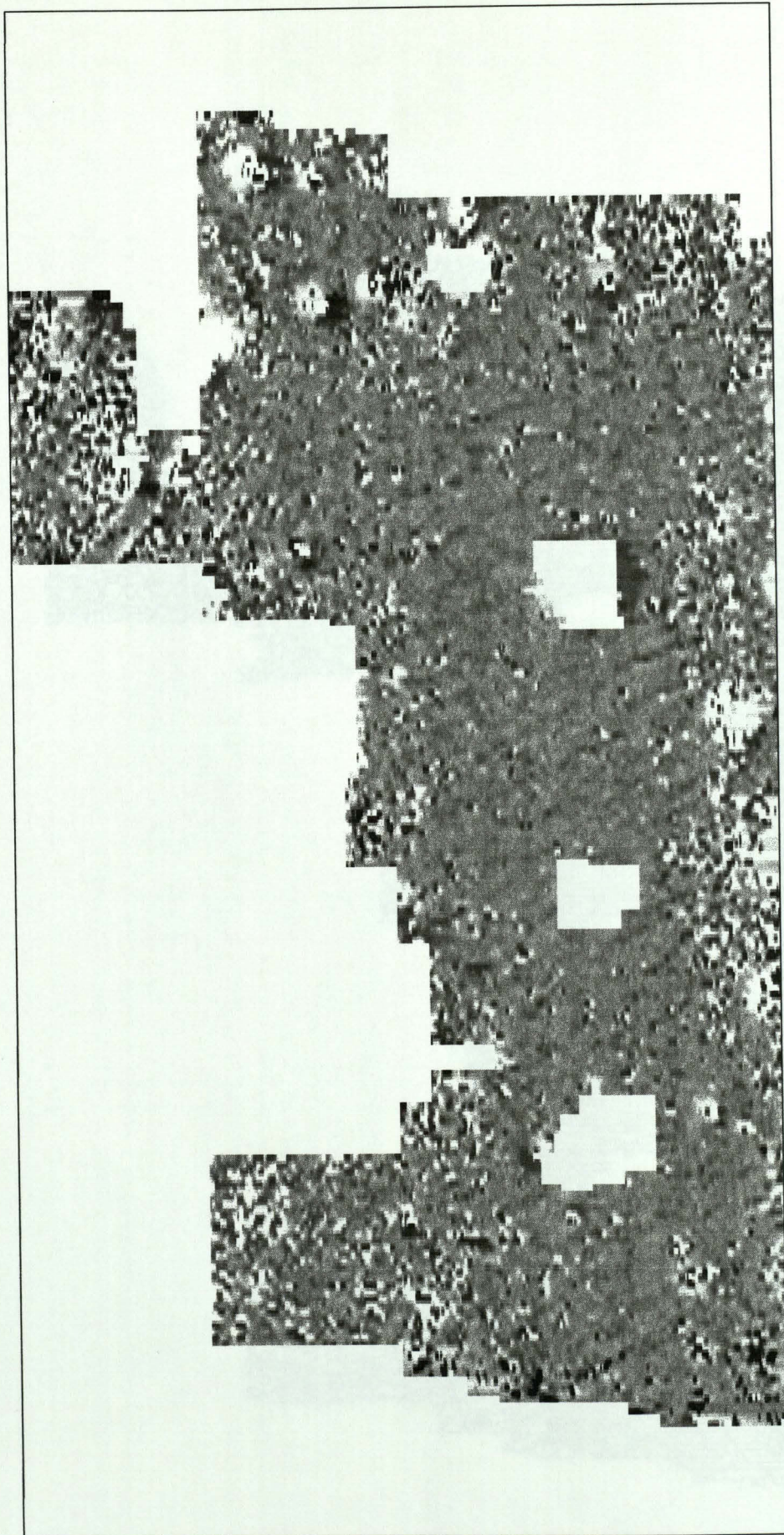
Weak random anomalies characterise the quieter central area of the survey. Interpretation of these features is difficult, although similar effects have been recorded elsewhere at Navenby (Llyall 1996, Snee and Bunn 1999). These anomalies may represent the geological phenomenon known as 'ice-wedging'. Fig.7 shows glacial fracturing of the bedrock on land to the south (Snee and Bunn 1999), later confirmed by excavation, (Palmer-Brown and Rylatt 1999).

Widespread dipolar readings on the edges of the site (Fig.6, 1) are probably modern: large concentrations of ferric/rubble debris (noted on the surface) reflect the lack of agricultural activity in recent years and the construction of houses on land to the immediate south. The remnants of an incomplete access road (Fig.6, 3) dominate the south-west corner of the site.



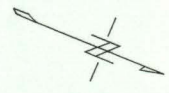
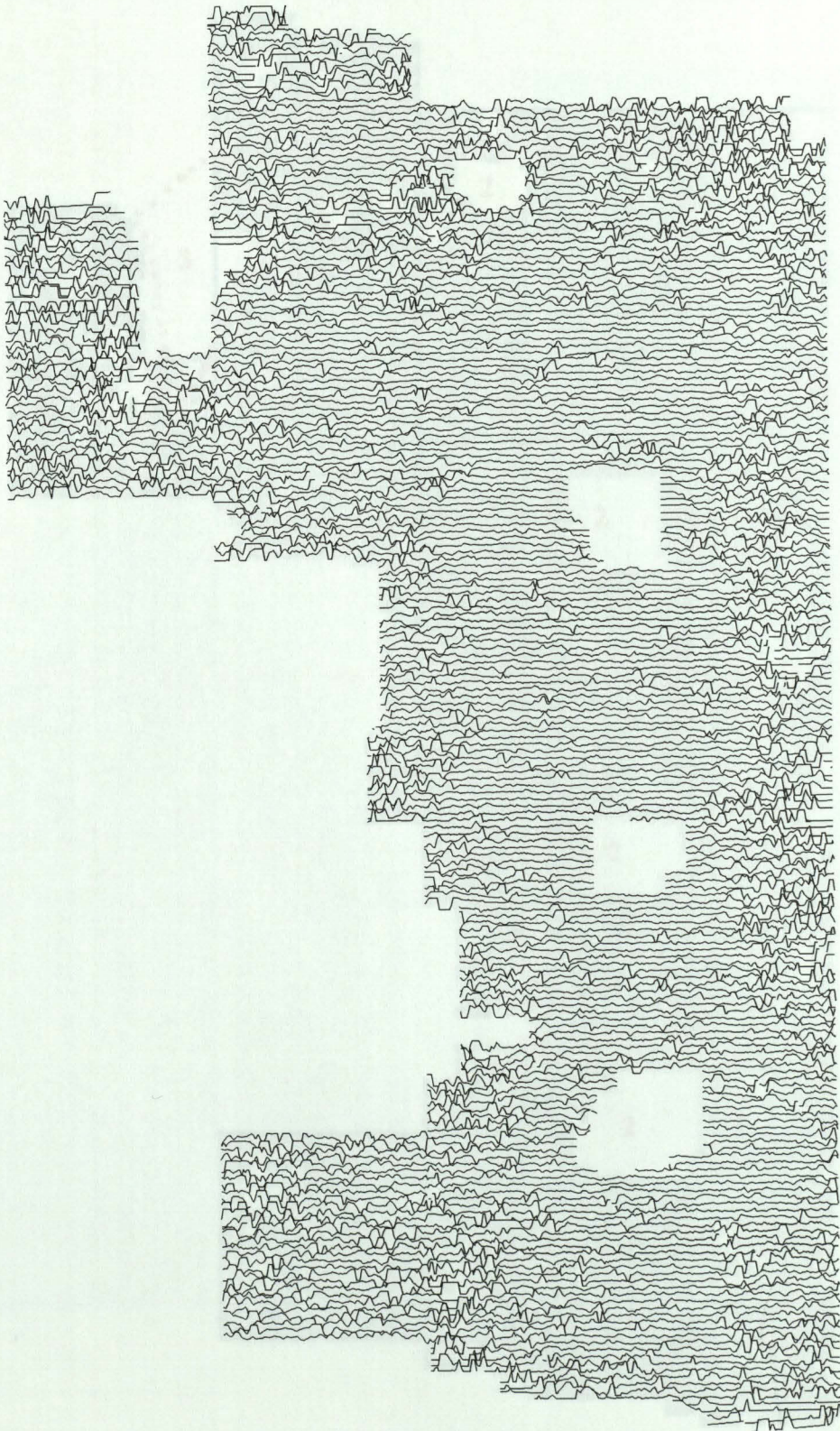
40m

Fig.3 Greyscale image



40m

Fig.4 Smoothed image



59.83nT/cm



40m

Fig.5 Trace plot

Fig.6 Interpretive plan 1:1000

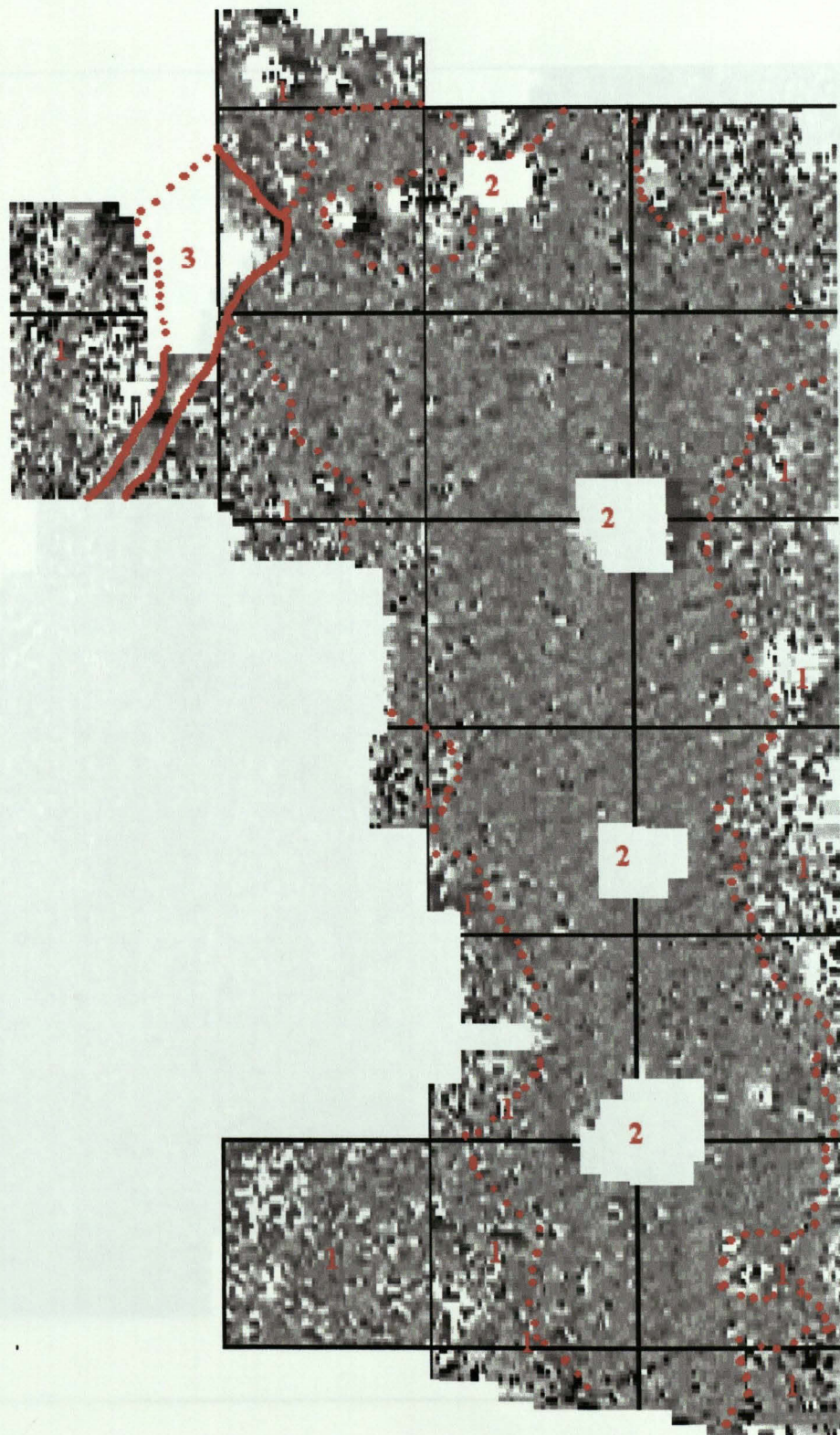


Fig.6 Interpretive plan 1:1000

Fig.7 Ground Geomorphology at Navvayy Head

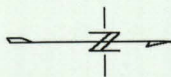
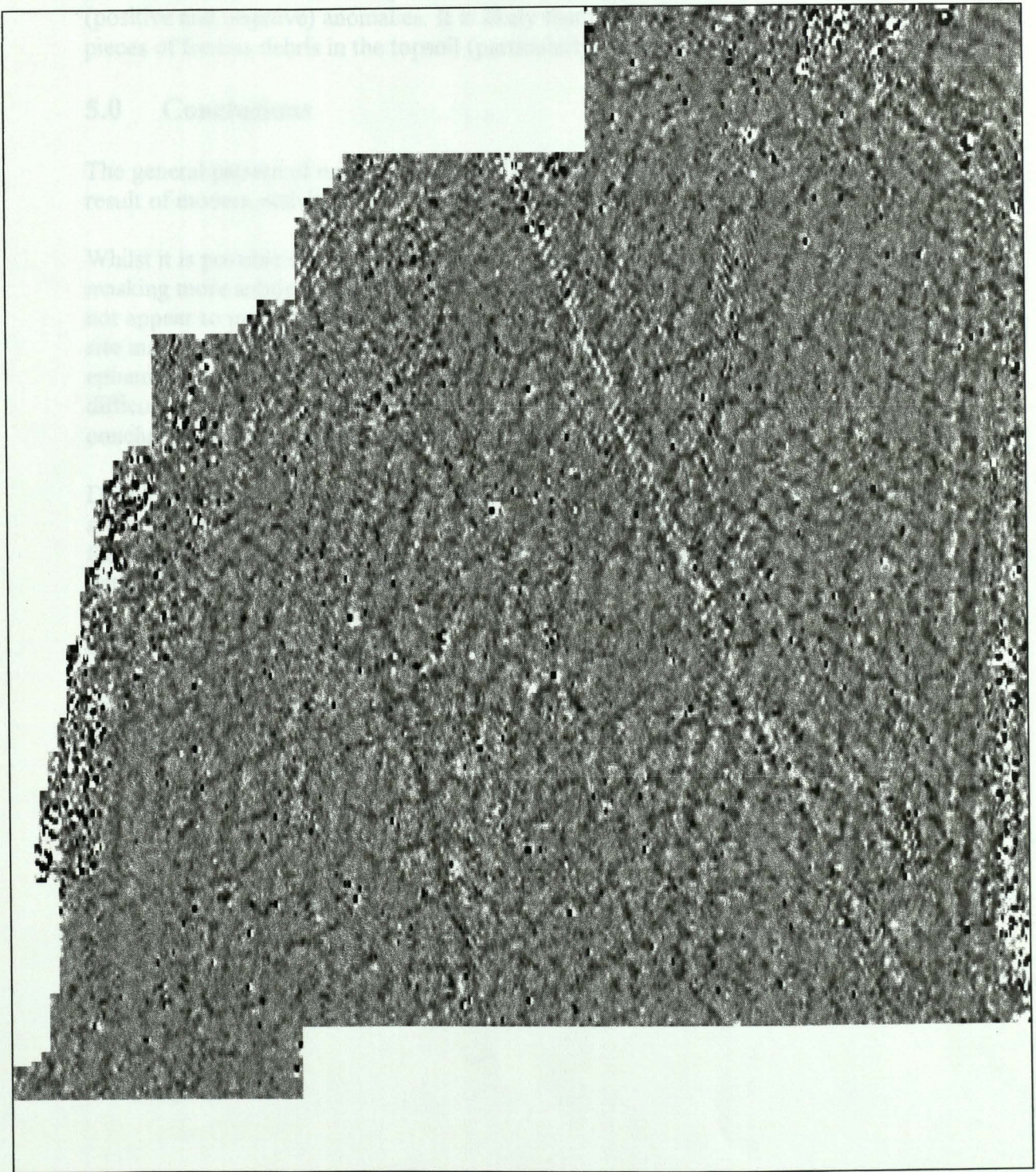
Four large pieces of cleared trees and roots (Fig. 6) did not assist the survey, and it was not possible to assess these areas.

Across the width of the survey were a number of small pits and depressions, some positive and negative anomalies, at a scale of 10m. These were probably the result of small-scale details in the topsoil (quaternary).

### 5.0 Conclusions

The general pattern of the survey was the result of massive-scale glacial fracturing.

Whilst it is possible to make more detailed maps of the area, the survey was not intended to do this. The survey was intended to provide a general overview of the area.



50m

**Fig.7** Glacial fracturing at Navenby Heath

Four large piles of cleared trees and roots (Fig.6, 2) did not assist the survey, and it was not possible to assess these areas.

Across the centre of the survey were a number of small discrete positive or dipolar (positive and negative) anomalies. It is likely that the majority of these are caused by pieces of ferrous debris in the topsoil (particularly the dipolar anomalies).

## 5.0 Conclusions

The general pattern of magnetic variation detected in this survey is predominately the result of modern activity and/or of natural reticulation in the bedrock.

Whilst it is possible that the high levels of disturbance over much of the site may be masking more subtle underlying archaeological remains, the clearer areas that exist do not appear to incorporate archaeological anomalies. It is tentatively suggested that the site may lie beyond the primary areas of Roman activity. However, if, for example, ephemeral prehistoric remains lie in the vicinity of the site, then such features may be difficult to detect by gradiometry. To this end, it may be desirable to test the conclusions of this report by some form of trial excavation.

Detailed survey by fluxgate magnetometer is only capable of detecting features that alter the magnetic susceptibility of soils or are magnetically different to the soils or features around them. It remains a possibility that there are archaeological features within the survey area that are not detectable.

## 6.0 Acknowledgements

Pre-Construct Geophysics would like to thank City of Lincoln Archaeology Unit for this commission.

## 7.0 Appendices

### 7.1 References

- Clark, A J                                      1990    '*Seeing beneath the soil.*'
- David, A                                         1995    *Research & Professional Services Guidelines No 1; 'Geophysical Survey in Archaeological Field Evaluation.'*
- Gaffney, C, Gater, J &  
Ovenden, S                                    1991    *IFA Technical Paper No 9; 'The use of Geophysical techniques in archaeological evaluations.'*
- Llyall, J                                         1996    *Fluxgate gradiometry survey at Navenby*
- Palmer-Brown, C P H &  
Rylatt, J                                        1999    *Archaeological Field Evaluation Report, Land at Chapel Heath, Navenby*
- Palmer-Brown, C P H                        1999    *Chapel Lane, Navenby; Archaeological Watching Brief.*
- Snee, J & Bunn, D B                        1999    *Fluxgate Gradiometry Survey, Land South of Winton Road: Phase D, Chapel Heath, Navenby.*

### 7.2 Summary of survey parameters

Instrument:	Geoscan Research Fluxgate Gradiometer FM 36 with Sample Trigger ST1.
Resolution:	0.1 nT
Grid size:	30m x 30m
Sample interval:	0.25m
Traverse interval:	1m
Traverse method:	Zigzag



## **LHA NOTE & ARCHIVE DETAILS**

### **LHA NOTE DETAILS**

CLAU CODE: NED00

CLAU REPORT No.: 414

PLANNING APPLICATION NO.: N/A ?

FIELD OFFICER: Michael Jarvis

NGR: SK 9915 5790

CIVIL PARISH: Navenby

SMR No.: -

DATE OF INTERVENTION: 5<sup>th</sup>-6<sup>th</sup> January 2000

TYPE OF INTERVENTION: Geophysical Survey

UNDERTAKEN FOR: Manton Bartle Architects on behalf of Barker & Sons (Lincoln) Ltd

### **ARCHIVE DETAILS**

PRESENT LOCATION: City of Lincoln Archaeology Unit, Charlotte House, The Lawn, Union Road, Lincoln, LN1 3BL.

FINAL LOCATION: The City and County Museum, Friars Lane, Lincoln.

MUSEUM ACCESSION No.: 1.2000

ACCESSION DATE: -