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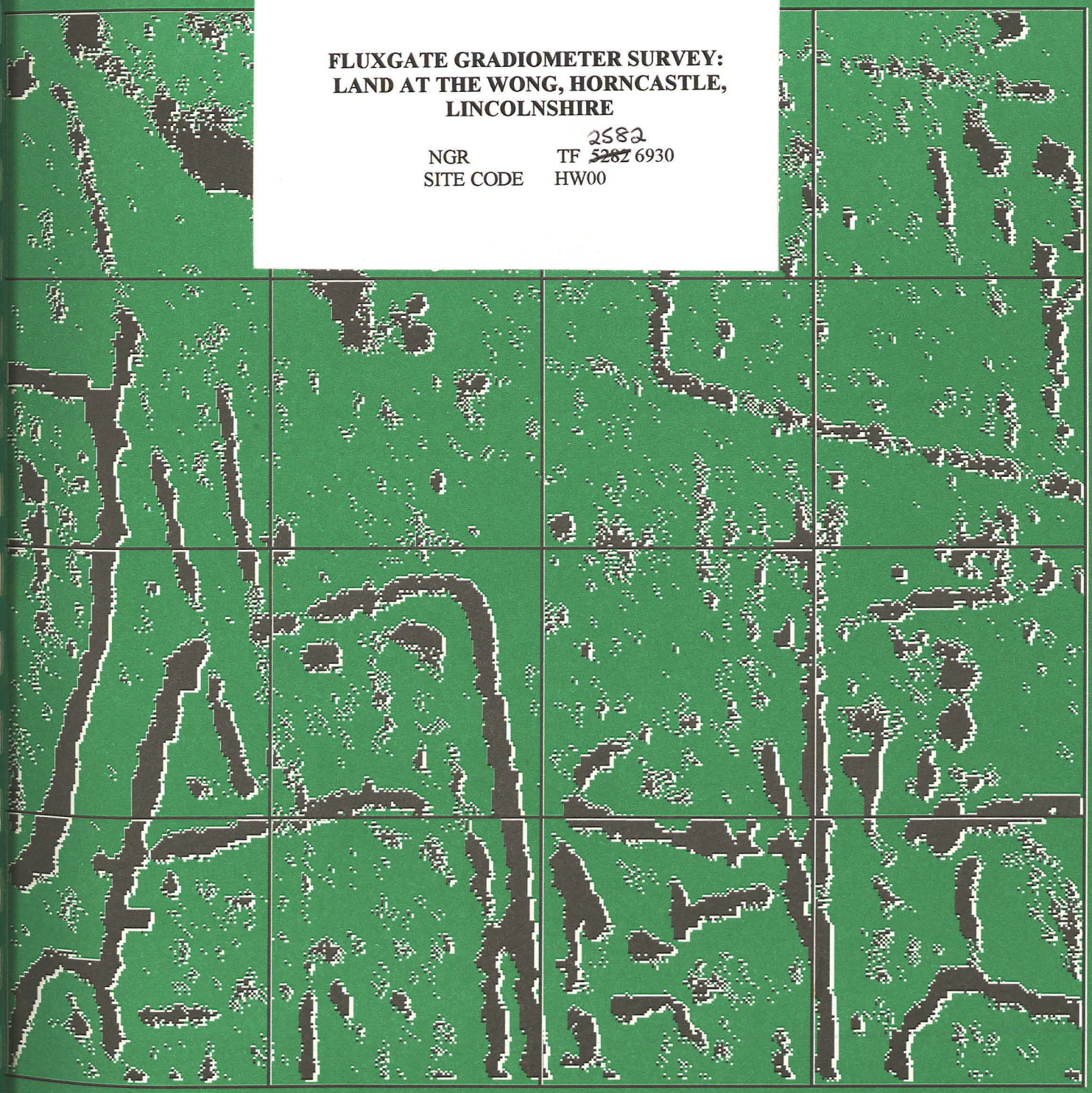
PRE-CONSTRUCT GEOPHYSICS

FLUXGATE GRADIOMETER SURVEY: LAND AT THE WONG, HORNCASTLE, LINCOLNSHIRE

NGR TF ~~5287~~ 2582 6930
SITE CODE HW00



FLUXGATE GRADIOMETER SURVEY: LAND AT THE WONG, HORNCASTLE, LINCOLNSHIRE

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Report prepared for East Lindsey Partnership Housing
by Jim Rylatt & David Bunn

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Illustrations

Summary

- *A fluxgate gradiometer survey was undertaken on 0.31 hectares of land at the Wong, Horncastle, Lincolnshire The survey identified significant magnetic variation across the site, and this variability can be resolved into a series of magnetic anomalies*

- *Most of these anomalies have been interpreted as representing features of modern origin, as they have a spatial correlation with standing structures and fences containing ferrous metals, or with areas of disturbance*

- *A small number of anomalies possibly reflect the presence of sub-surface archaeological features, though these have proved difficult to resolve due to the masking effects of modern activity*

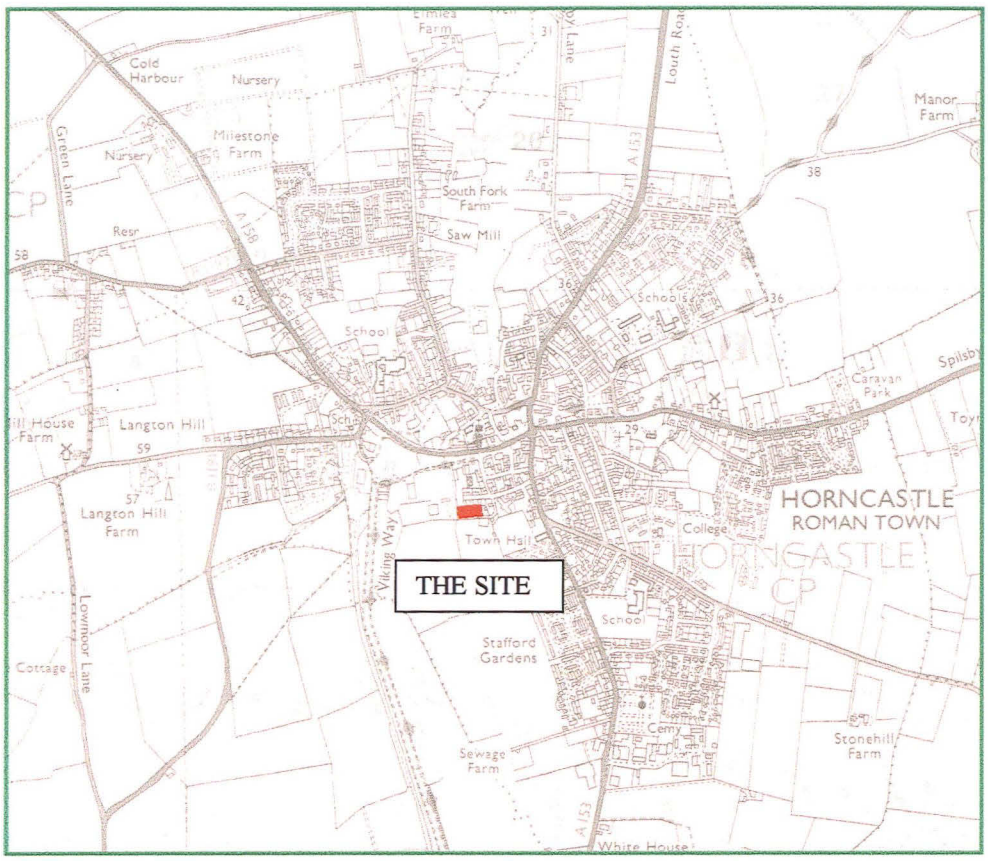


Fig. 1: Location of site 1:25000

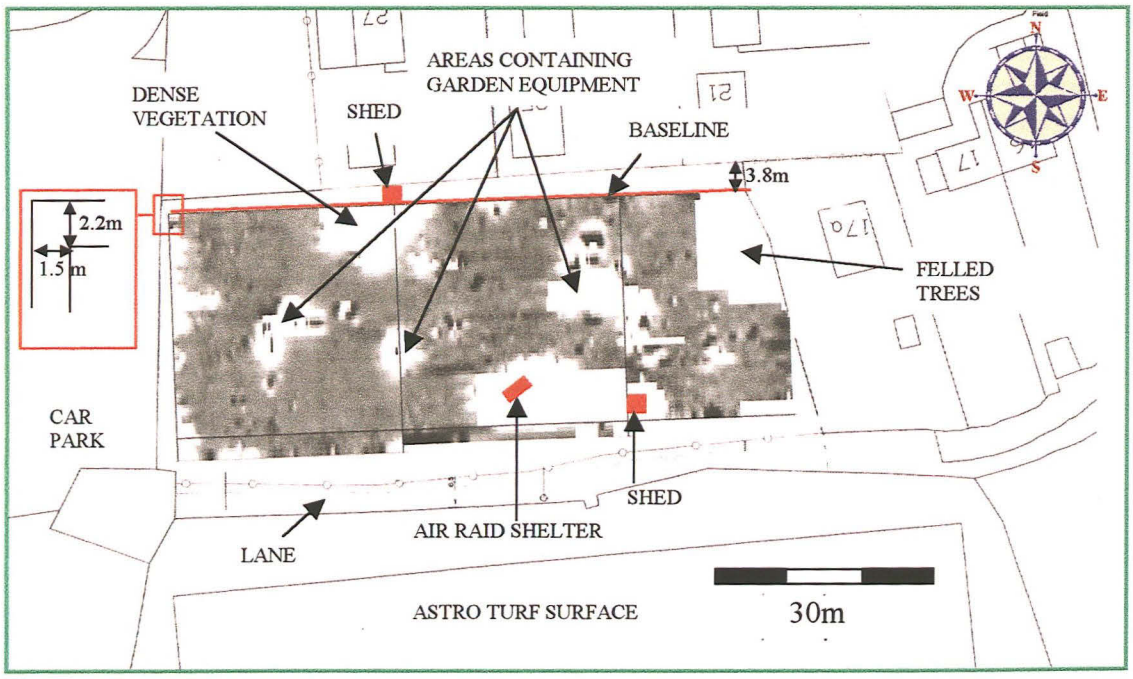


Fig. 2: Location of survey grids and above ground objects impeding the survey (superimposed upon a smoothed greyscale image). 1:1000

1.0 Introduction

East Lindsey Partnership Housing commissioned Pre-Construct Archaeology (Lincoln) to undertake an archaeological evaluation of 0.315ha of land at the Wong, Horncastle. The initial component of this evaluation was a fluxgate gradiometer survey of the site.

The survey was undertaken by Pre-Construct Geophysics, in accordance with a specification prepared by Pre-Construct Archaeology (Palmer-Brown, 2000).

The survey methodology was based upon guidelines set out in the English Heritage document *'Geophysical Survey in Archaeological Field Evaluation'* (David, 1995).

2.0 Location and description

Horncastle is situated near the south-western tip of the Lincolnshire Wolds, approximately 28km to the east of Lincoln and 30km to the west of the coast.

The site is located to the south-west of the town centre, in an area known as the Wong. It comprises a sub-rectangular unit extending to 0.315ha, and is currently used as allotment gardens (Fig. 2). Metal fences bound the site on the western and southern edges, with a wooden fence to the east, and a hedge to the north. An unmetalled footpath traverses the southern edge of the site. Houses bound the site to the north and east, with a car park to the west and sports pitches to the south. The ground surface slopes gently, declining slightly toward the west. The site was not ideally suited to this method of survey, the ease, extent and effectiveness of which was restricted by the presence of miscellaneous gardening equipment, sheds, dense vegetation, heaps of spoil, felled trees and a disused air raid shelter. These factors were taken into account during data processing and interpretation. In order to reduce the magnetic distortion imposed by these limitations, some of the movable items were cleared away from the survey area.

The site lies on the eastern flood plain of the River Bain. The latter runs from the north to south and has deposited significant quantities of silt and clay rich alluvium (B.G.S. 1995). The eastern edge of these deposits is approximately coincident with the eastern edge of the survey area, beyond which the sands and gravels of the Lower River Terrace deposits are exposed. Beneath this is a further Quaternary drift deposit, a bed of chalk rich clay till. The solid geology comprises inter-bedded grey shelly limestone and shales of the Kimmeridge Clay Formation

Central National Grid Reference TF 2582 6930.

3.0 Archaeological and historical background

Evidence has been recovered from the town relating to activity throughout much of the prehistoric period. This includes the recovery of Mesolithic and Neolithic worked flints from 27 High Street and a perforated basalt axe-hammer of Bronze Age date from the Wong. A quantity of Iron Age pottery has been found on the southern side of

the town and one assemblage relating to a possible Late Iron Age settlement in the Mareham Road area.

Horncastle continued to be a focus of settlement following the Roman invasion and developed into an important small town (Field and Hurst, 1983). The earliest Roman artefactual material dates to the 1st and 2nd centuries AD and, as with the Iron Age material, was recovered from the southern side of the modern town. Numerous finds of pottery, building remains and burials have been made, indicating that settlement in this part of the town continued throughout the Roman period.

At some point in the later 3rd century AD, a sub-rectangular walled enclosure was constructed between the rivers Bain and Waring, around the area now occupied by the Market Place. Sections of this wall are still standing and others have been examined during excavations. It is hypothesised that this enclosure was some form of military installation analogous to a Saxon shore fort (*ibid*). The name Horncastle is thought to mean `Roman station or fortification on a horn-shaped piece of land' (Mills, 1993).

The site lies outside and to the south of the walled area of town. Aerial photographs show extensive cropmarks to the south and west of the area surveyed. These have been interpreted as enclosures or trackways, but remain undated, but are presumed to represent elements of the Iron Age and Romano-British settlement. Roman building remains have been recovered from the Boston Road area and burials are recorded to the north of Southfield Place, with a further cremation and inhumation discovered in Churchill Avenue, all to the south-east of the site.

A number of Saxon finds have been made in the town. These include part of a small 6th century long brooch and a 9th century strap end and hairpin from excavations in the High Street (*ibid.*). Horncastle is recorded in the Domesday Survey of 1086 as belonging to King William, prior to which it had belonged to Queen Edith (Morris, 1986).

A market was granted in 1234 and the town remained prosperous throughout the medieval period. After a period of decline in the 17th century, the town regained its importance with the opening of the Horncastle Navigation Canal in 1802, which linked it to Lincoln and Boston, followed by the arrival of the railway in 1855 (Pevsner and Harris, 1995).

4.0 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 result from man-made changes to the composition of the soil and the introduction of intrusive materials such as brick and stone. These features create detectable magnetic anomalies. In addition, activities that involve heating and burning will create magnetic anomalies, as will the presence of ferrous metal objects. The anomalies detected by a fluxgate gradiometer survey can often be resolved into entities sharing morphological characteristics with features of known

archaeological provenance. This enables the formulation of an informed, but subjective interpretation.

Magnetic variation between archaeological or naturally produced features and the natural background level can result from:

- different depth or density of fill, with respect to the depth or density of surrounding soils magnetically similar to the fill
- the magnetic properties of materials introduced as a result of human activity (e.g. rubble, stone, brick/tile, ferrous metal etc.) in contrast to those within surrounding natural deposits
- the magnetic susceptibility of areas of burning, as opposed to unburnt areas
- the magnetic properties of localised, naturally deposited minerals, such as occur in the fill of palaeo-channels, in contrast to those of the surrounding soils.

The area survey was conducted using a *Geoscan Research* fluxgate gradiometer (model FM36) with an electronic sample trigger set to take four 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 sensitivity of the machine was set to detect magnetic variation in the order of 0.1 nanoTesla. The base line was established along the southern edge of the survey area (Fig.2).

The data from the survey was processed using *Geoplot* (*v. 3.0*). It was desloped (a means of compensating for sensor drift during the survey) and clipped to reduce the distorting effect of extremely high or low readings caused by discrete pieces of ferrous metal. The results are plotted as greyscale and trace images.

The area survey was carried out by David Bunn on the 7th of November 2000.

Instrument	Geoscan Research fluxgate gradiometer FM36 Sample trigger ST1
Grid size	30m x 30m
Sample interval	0.25m
Traverse interval	1.0m
Traverse method	Zigzag
Sensitivity	0.1nT
Processing software	Geoplot (*v. 3.0*)
Weather conditions	07/11/99 Cool, overcast, showery
Area surveyed	c. 0.23ha

Table 1: Summary of survey parameters

5.0 Results, interpretation and discussion

The survey detected areas magnetic variation consistent with the effects of close proximity to ferrous objects. These are presented in figure 3 as coloured anomalies. Although some of these features were not visible on the surface, it is reasonable to assume, given the recent history of the site, that most, or all of these anomalies are the result of modern activity. This interpretation is supported by examination of the trace plot of the raw data (fig. 4).

The strong anomalies on the perimeter of the survey area, particularly those along the western and southern edges, are probably caused by the proximity of the metal fences. Away from the boundary, many of the extreme readings correspond with objects that were noted at the time of the survey. These include cold frames, metal supports for climbing plants, and miscellaneous debris.

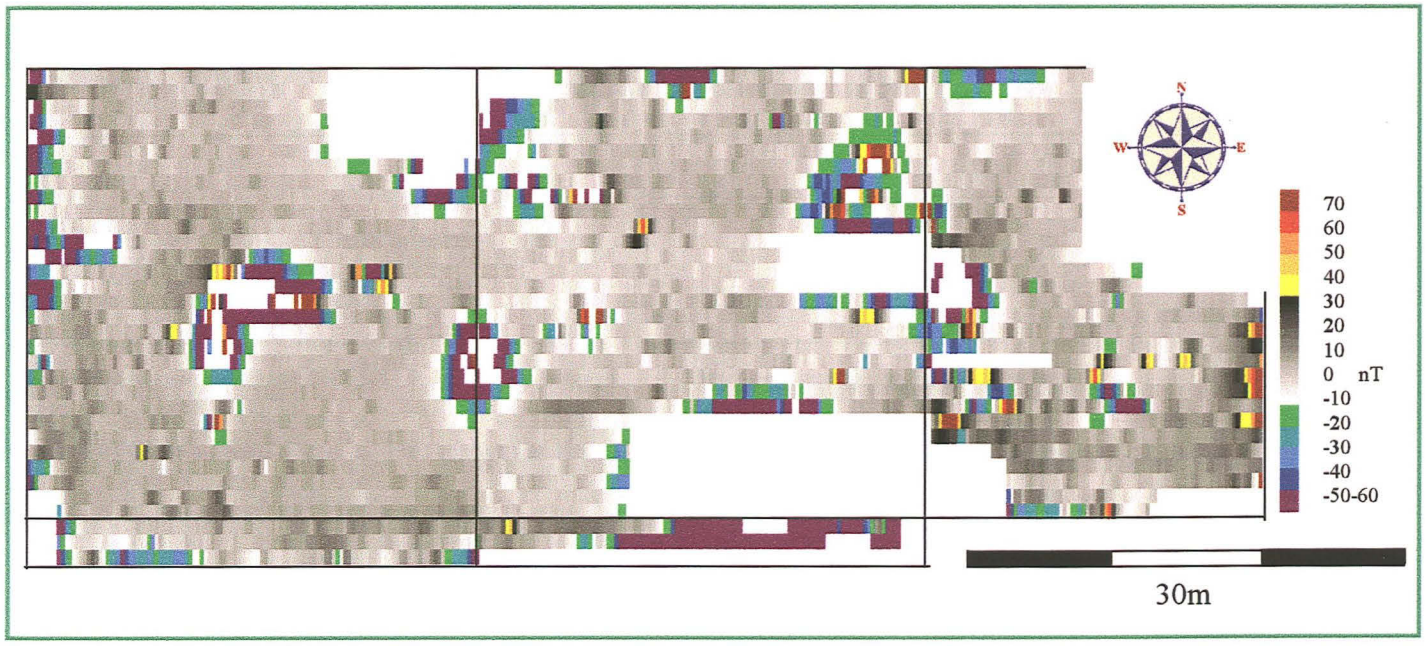


Fig. 3: Greyscale image of raw data with anomalies of definite and probable modern origin shown coloured. Scale 1:500.

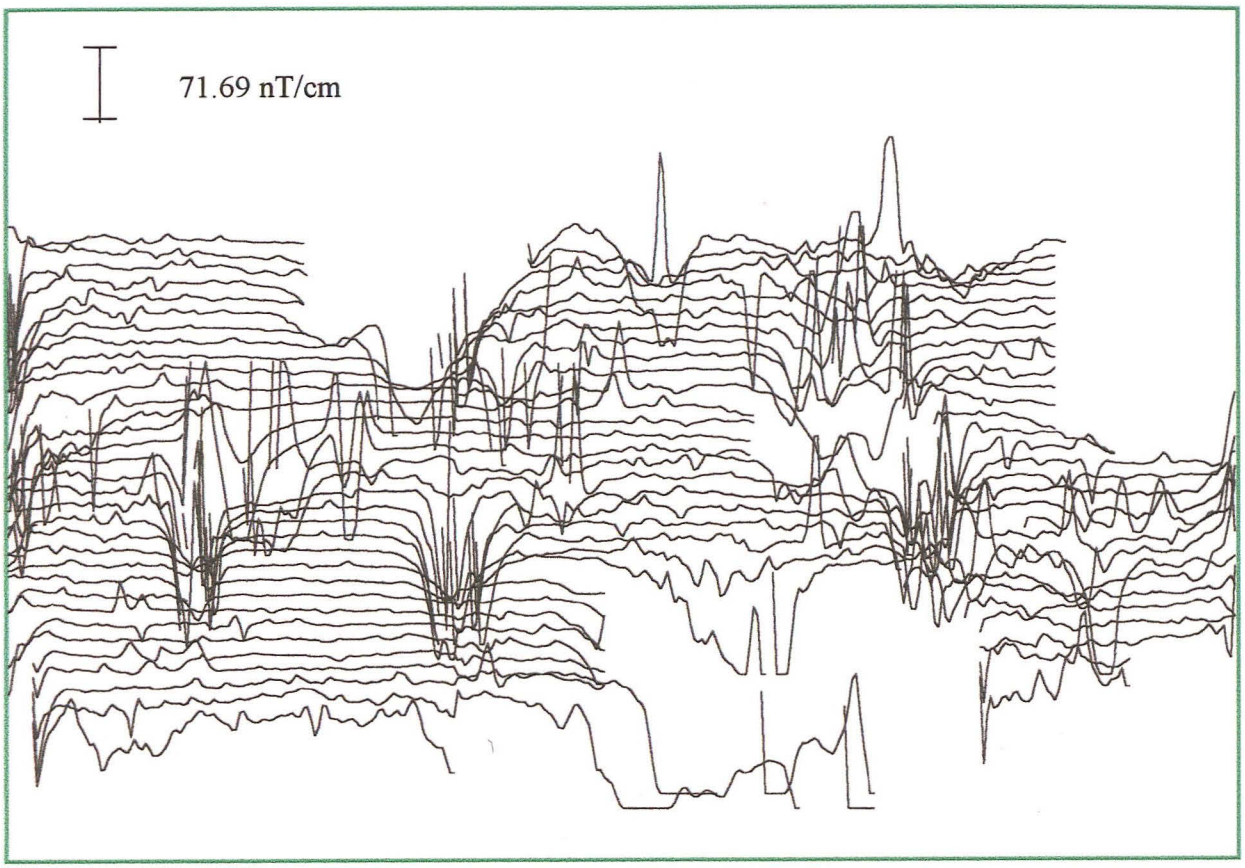


Fig.4: Trace plot of raw data Scale 1:500

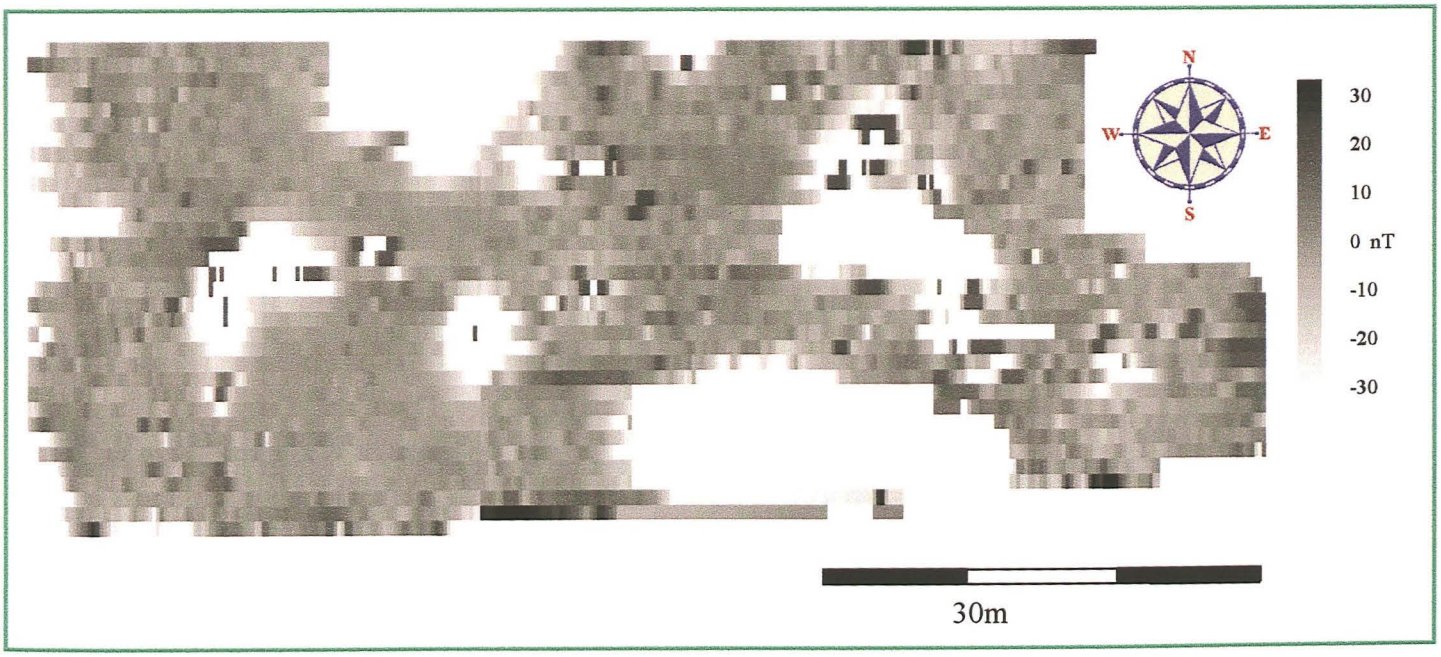


Fig. 5: Clipped greyscale image. Scale 1:500

An improvement in the clarity of the greyscale image can be achieved by reducing the scale to 1:1000 (compare fig.5 with figs. 6 and 7). The survey area was already considered relatively small for the purposes of interpretation, but although this reduces the image size further, it partially eliminates the distorting effects of single readings.

A further, though possibly misleading, enhancement is achieved by the smoothing, or blending, of the individual readings with those that they conjoin (Fig. 7).

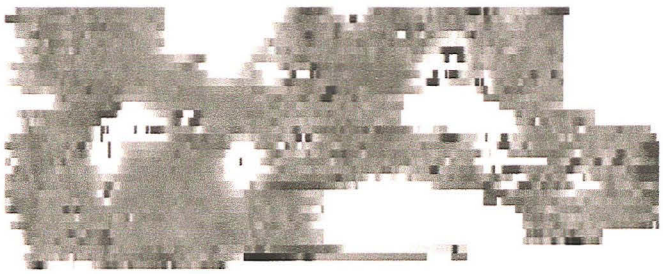


Fig. 6: Clipped data Scale 1:1000

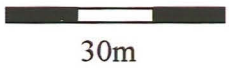


Fig. 7: Clipped and smoothed data Scale 1:1000

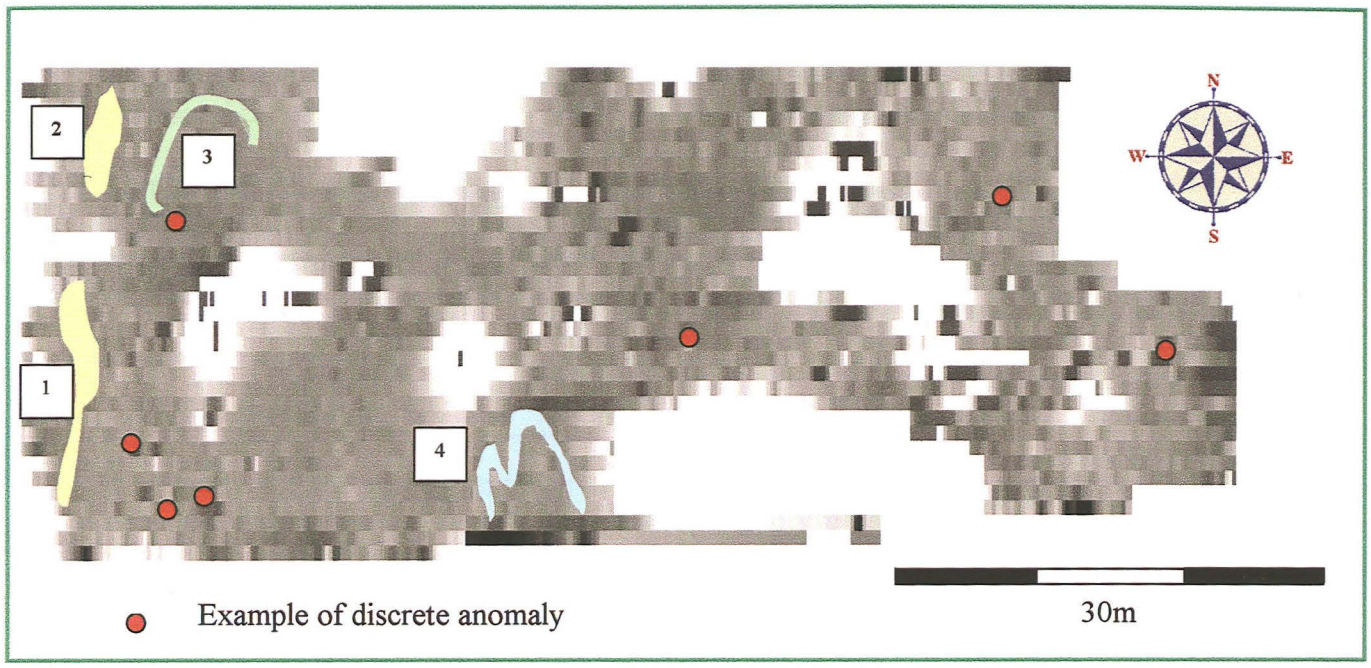


Fig. 8: Interpretive plan showing anomalies of potential archaeological significance. Scale 1:500

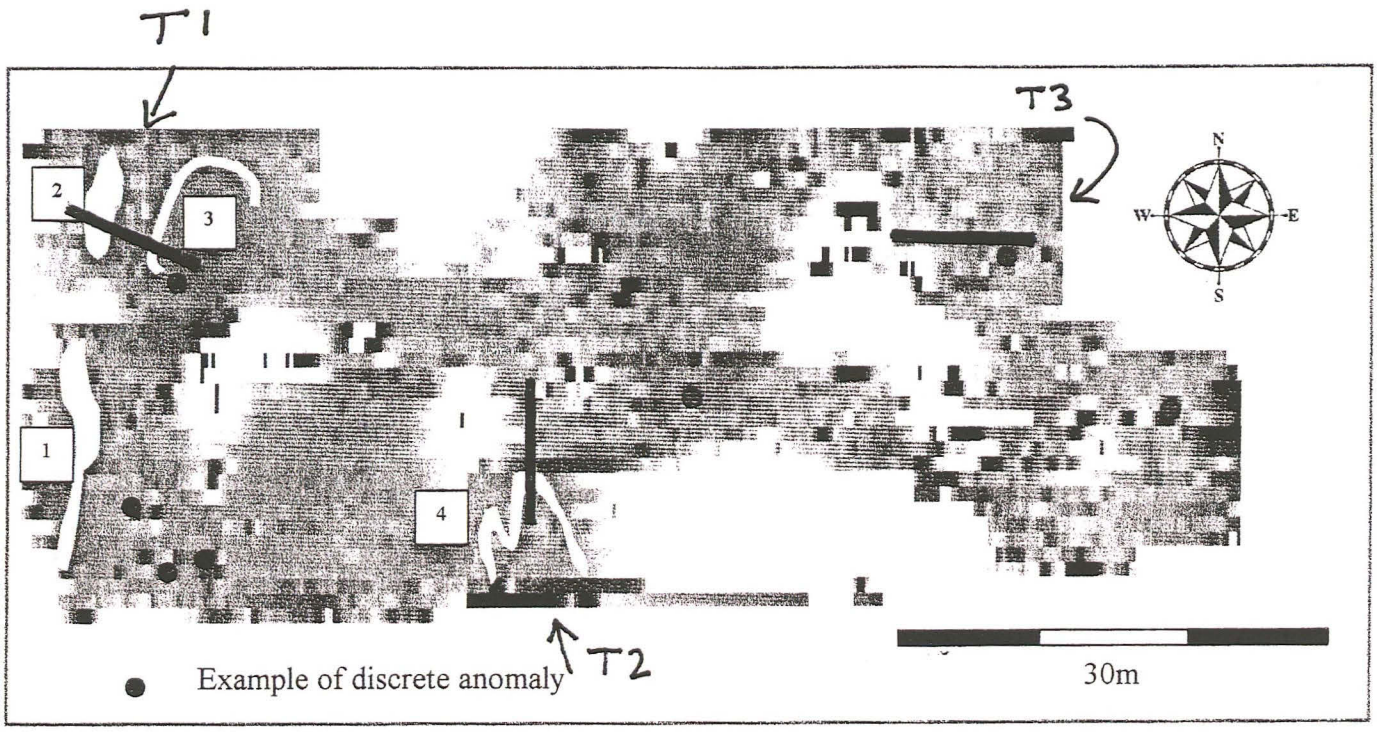
The clipped greyscale image reveals a series of diffuse anomalies that may reflect the presence of sub-surface archaeological remains.

Anomalies **1** and **2** are located at the western edge of the survey area. Their spatial relationship suggests that they represent the magnetic traces of a single linear feature, which is being partially masked by strong magnetic signals emanating from the metal fence defining the western perimeter of the site. These anomalies possibly indicate the location of a ditch defining an earlier alignment of this boundary.

Anomaly **3** lies to the east of anomaly **2**. The readings produced by **3** did not contrast significantly with the background, resulting in the relatively diffuse appearance in the greyscale image; this constrains interpretation. The data appears to indicate the presence of a north-north-east to south-south-west aligned ditch or gully, which turns through c. 80 degrees at its northern end. There is also evidence of a corresponding southern return. Consequently, anomaly **3** may define three sides of some form of enclosure, c. 10m long x 5m wide.

Anomaly **4** lies close the southern edge of the site, and appears to be as irregular, curvilinear feature. Strong magnetic disturbance around the air raid shelter may be masking an eastward continuation of this anomaly. Additionally, the construction of the latter may have resulted in the destruction of archaeological remains in this part of the site. Taphonomic processes may account for the lack of definition of this anomaly, but its morphological characteristics suggest that it is a naturally produced feature, such as a paleochannel.

PROPOSED TRENCHING SCHEME, THE WONG, HORNCASTLE.



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Other, discrete, anomalies were detected by the survey (examples shown as red, fig.8). These anomalies are typical of sites that have been subject to human activity and are often the result of agriculture (eg midden spreading, thrown horseshoes, etc), or in this instance, horticulture.

Further magnetically enhanced deposits of archaeological potential may exist within the site boundaries. However, modern activity has produced a concentration of magnetically strong anomalies, which has overwhelmed and masked any signal they produce.

6.0 Conclusions

The results of the survey largely reflect the concentrated human activity that has occurred on the site in the recent past. The majority of anomalies almost certainly result from the recent use of the site as allotment gardens. However, traces of earlier activity may have been detected, in the form of a boundary and two relatively diffuse features of indeterminate form. Given the close proximity of the site to recorded archaeological features, it remains possible that some of the latter are of archaeological significance.

7.0 Acknowledgements

Pre-Construct Geophysics would like to extend thanks to East Lindsey Partnership Housing for all the help and assistance given during this survey.

8.0 References

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Dr B Lott
Built Environment Team
Lincolnshire County Council
Highways & Planning Directorate
3rd Floor
City Hall
Lincoln

7th November, 2000

Dear Beryl,

ARCHAEOLOGICAL INVESTIGATIONS: THE WONG, HORNCASTLE, LINCS.

Please find attached one copy of the gradiometer survey report for the above.

As expected, there is a considerable amount of background magnetic noise that has masked potential archaeological anomalies. This has resulted from ferrous litter in the soil, as well as modern features that tend to characterise allotment areas.

Despite this, a few subtle anomalies have been identified in one or two areas, and these may be archaeological.

I attach the trenching scheme that I am proposing. This has been designed to a) reflect your own requirements, b) cover as much of the site as possible, c) traverse anomalies of potential archaeological significance.

I have advised ELPH that we would wish to undertake the trenching as soon as possible, and I would like to propose ~~Monday~~ Wed, 20th November; all subject to your approval of course.

Let me know what you think.

Best regards,

Colin Palmer-Brown.