

99/22

**FLUXGATE GRADIOMETER SURVEY,
LAND AT NEWTON-ON-TRENT,
LINCOLNSHIRE**



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LAND AT NEWTON-ON-TRENT,
LINCOLNSHIRE**

Report prepared for Premier Poultry Ltd.
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Contents

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

Illustrations

- Fig.1 Location of site. 1:10000
- Fig.2 Location of survey grids. 1:2500
- Fig.3 Greyscale image. 1:1250
- Fig.4 Smoothed image. 1:1250
- Fig.5 Interpretive plan. 1:1250
- Fig.6 Trace plot of clipped image. 1:1250

Summary

- *A detailed fluxgate gradiometer survey took place to evaluate the archaeological potential of land at Newton-on-Trent, Lincolnshire.*
- *Low numbers of diffuse, linear and curvilinear anomalies of possible archaeological significance were detected.*
- *Modern land drains, a water service and miscellaneous ferrous/brick debris were recorded.*
- *The east part of the survey was characterised by mottling; probably the result of natural processes.*

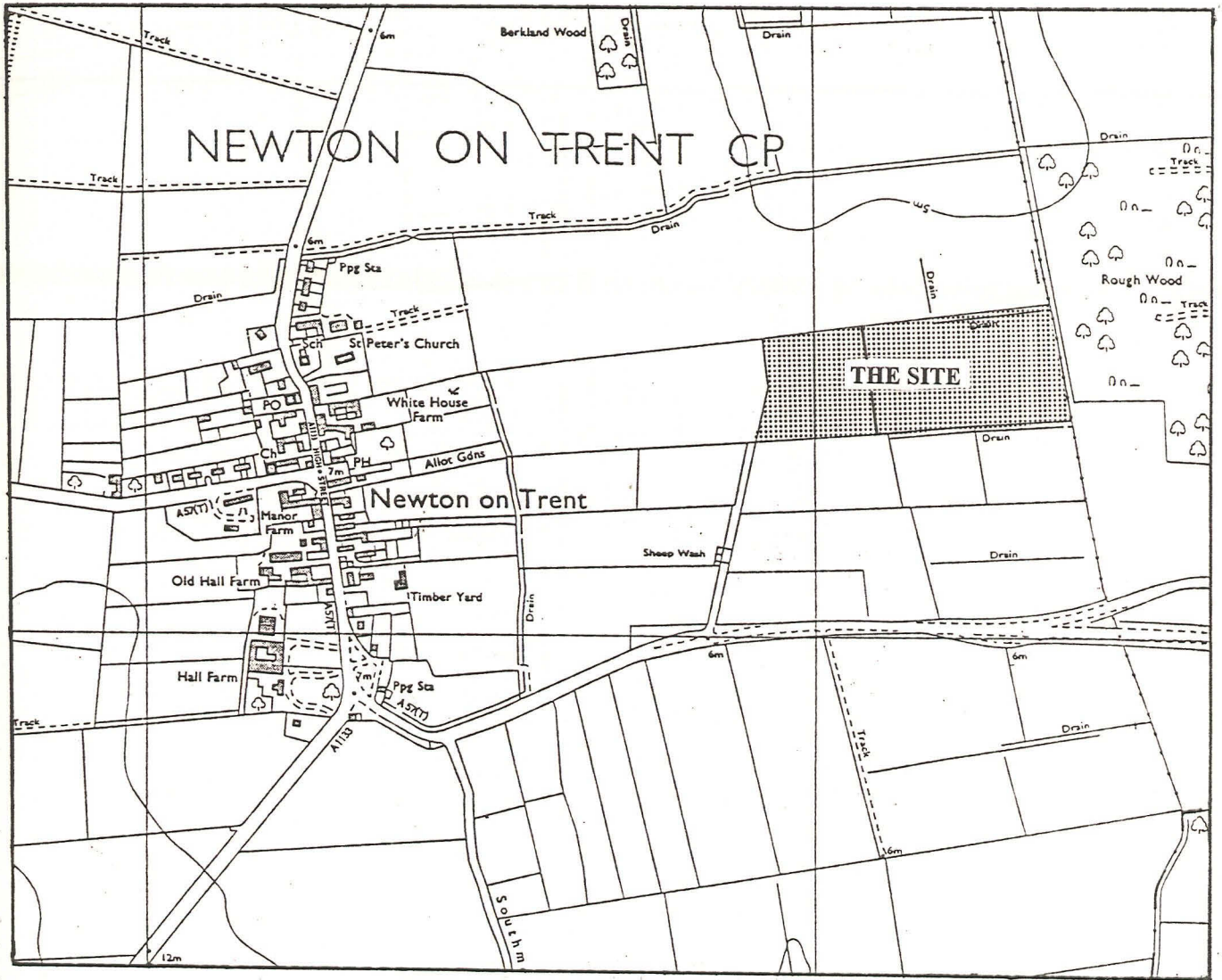


Fig.1: Location of site. 1:10000



DRAIN

DRAIN

Rough Wood

42	41	40	39	38	37	36	35	34	33	32	31	30	29
1	2	3	4	5	6	7	8	9	10	11	12	13	14
15	16	17	18	19	20	21	22	23	24	25	26	27	28
											45	44	43

DRAIN

Lane

Fig. 2: Location of survey grids. 1:2500

1.0 Introduction

A detailed fluxgate gradiometer survey was commissioned by Premier Poultry Ltd. to evaluate the archaeological potential of land at Newton-on-Trent, Lincolnshire. This work was undertaken in response to a request by West Lindsey District Council that an archaeological evaluation of the site be carried out as part of a planning application to construct poultry houses.

The survey was undertaken in accordance with the guidelines set out in the Lincolnshire County Council Archaeology Section publication '*Lincolnshire Archaeological Handbook; A Manual of Archaeological Practice*', 1998, and in accordance with the guidelines set out in the English Heritage document '*Geophysical Survey in Archaeological Field Evaluation*', 1995.

2.0 Location and description

Newton-on-Trent falls within the administrative district of West Lindsey and lies approximately 10 miles west of Lincoln, at the intersection of the A57 and A1133.

The proposed development site, located to the east of the village and centred on NGR SK 8420 7435, is an irregular shaped unit of approximately 7.5 hectares. Currently supporting a grass/clover mix, the site is predominately level but falls away slightly to the east. A north-south boundary west of site centre (Fig.1) no longer exists. The site is defined by drains to the north-east, east and south-east; the remainder by hedges.

Newton-on-Trent is well known for its early Roman vexillation fortress which stands on the east bank of the River Trent approximately 1km south-west of the village. Roman remains have been recorded close to the village; in the 1980's pottery kilns were discovered during bypass construction (a gradiometer survey on land east of High Street [Johnson 1998] failed to identify any further evidence).

The proposed development lies beyond the village. However, aerial photographs of the site and neighbouring fields suggest possible settlement evidence in the vicinity of the development; cropmarks immediately north-west of the site (SMR PRN Ref. 52586) constitute possible settlement remains (linear features and enclosures of unknown date). Cropmarks south-west (SMR PRN Ref. 52587) may indicate the site of a prehistoric burial mound (a ring ditch). To the south of the site are several entries (52585, 52582, 52584) relating to medieval ridge and furrow, a possible prehistoric linear ditch system, and a further ring ditch.

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 (often discrete) 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, charcoal and pottery. These features will create detectable magnetic variability. 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 65m and 75m from the southern boundary on an east/west axis (grids 1-14, fig.2), 9m from the hedge to the west. Pegs were placed at all grid corners.

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. It 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 results were plotted as a number of greyscale images.

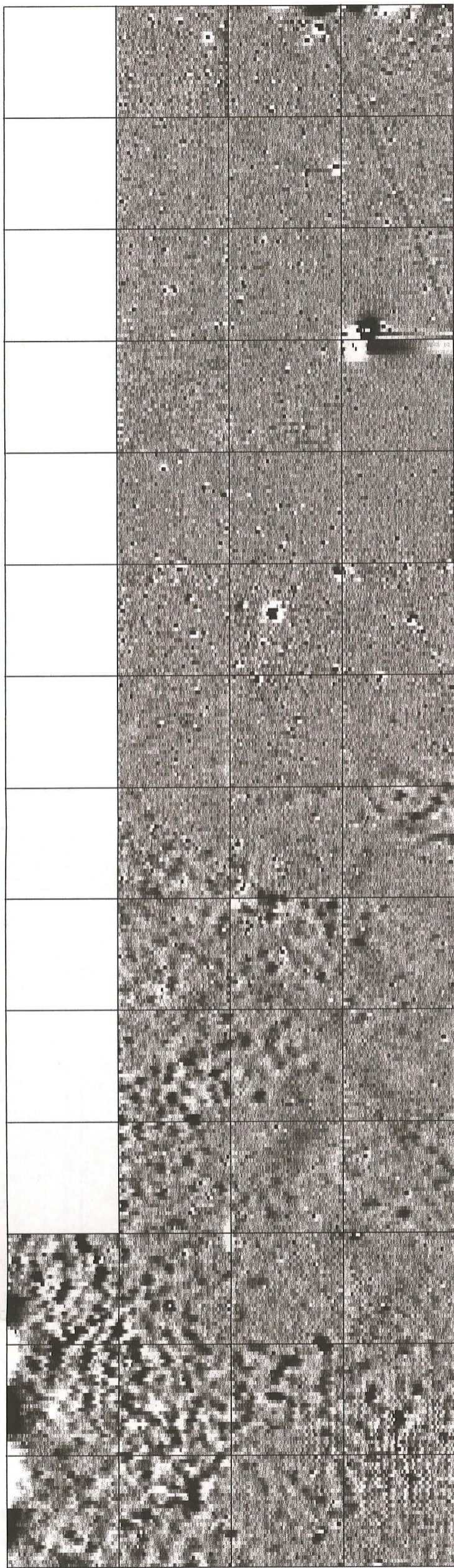
An area of 4 hectares was surveyed by James Snee and David Bunn on 8th-11th November 1999. The weather was mainly mild, calm and sunny with occasional showers.

4.0 Results

The results reveal two distinct areas of magnetic variation; a relatively quiet area (approx 1.5 ha) to the west, and a mottled, busy area to the east/southeast.

Linear and curvilinear anomalies of varying magnetic response characterise the former, although only one is clearly defined (Fig.5: 1). This feature, which diagonally traverses the north-west corner of the site, bears no relationship to any existing boundary other than possible extrapolation to the northern hedge and an associated drain. It appears to reflect a cropmark highlighted by aerial photography (LSMR ARC). The linear form suggests a possible land drain, which services the field immediately west of the site and extends to the ditch on the north edge of the site. However, it could possibly represent an earlier boundary.

To the south of, and possibly butting the above, a faint linear extends on a north-east/south-west axis (Fig.5: 2) and meets a similar anomaly orientated north-west/south-east (Fig.5: 3). Further north a short broken linear extends towards anomaly 1 (Fig. ; 4). Faint curvilinear anomalies (Fig.5: 5) are also discernable, although these are more tentative. All of them may be the result of natural processes, but human activity should not be discounted, given that aerial photographs of neighbouring land show possible settlement/enclosure remains.



50m

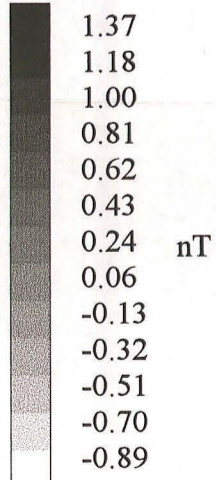
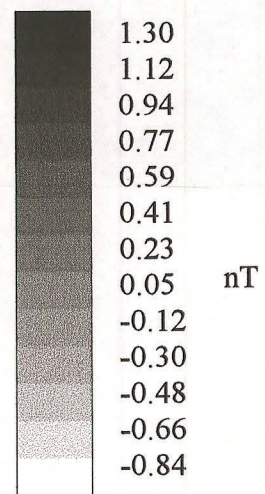
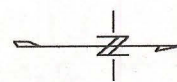
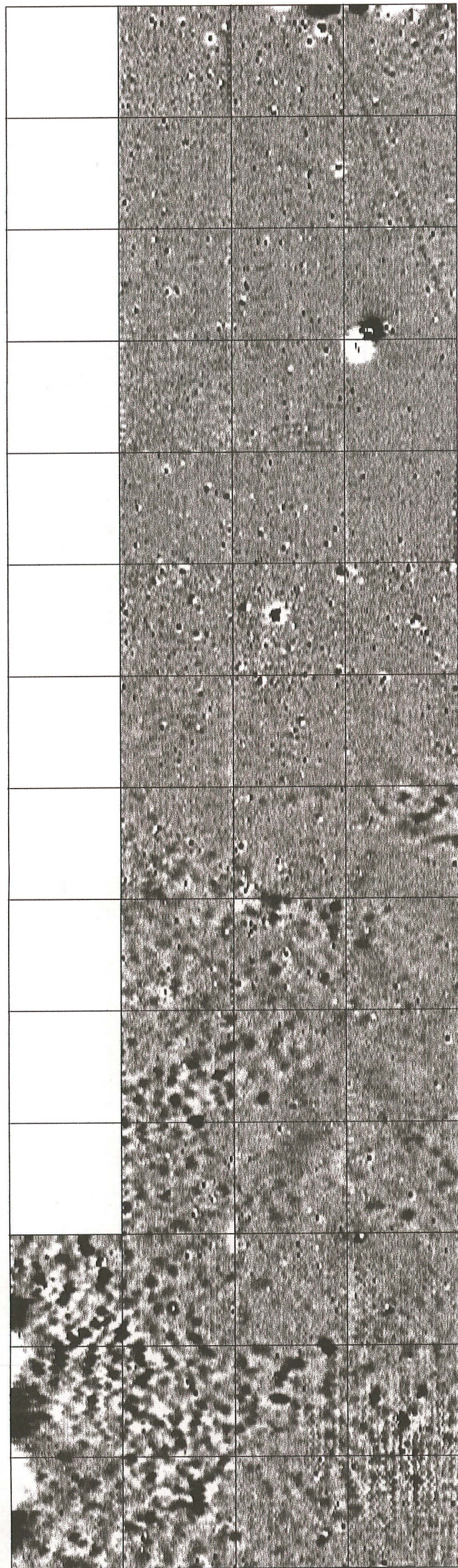


Fig.3 Greyscale image.



50m

Fig.4: Smoothed greyscale image

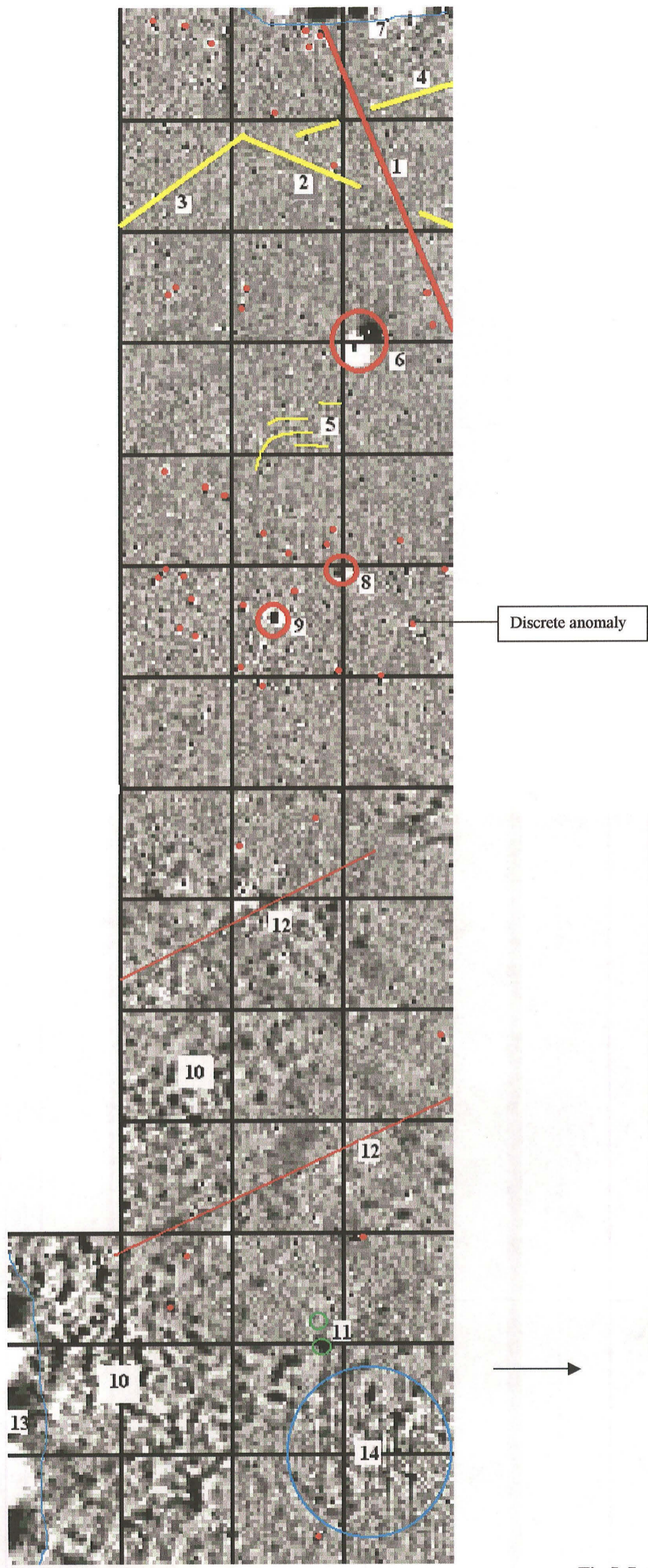
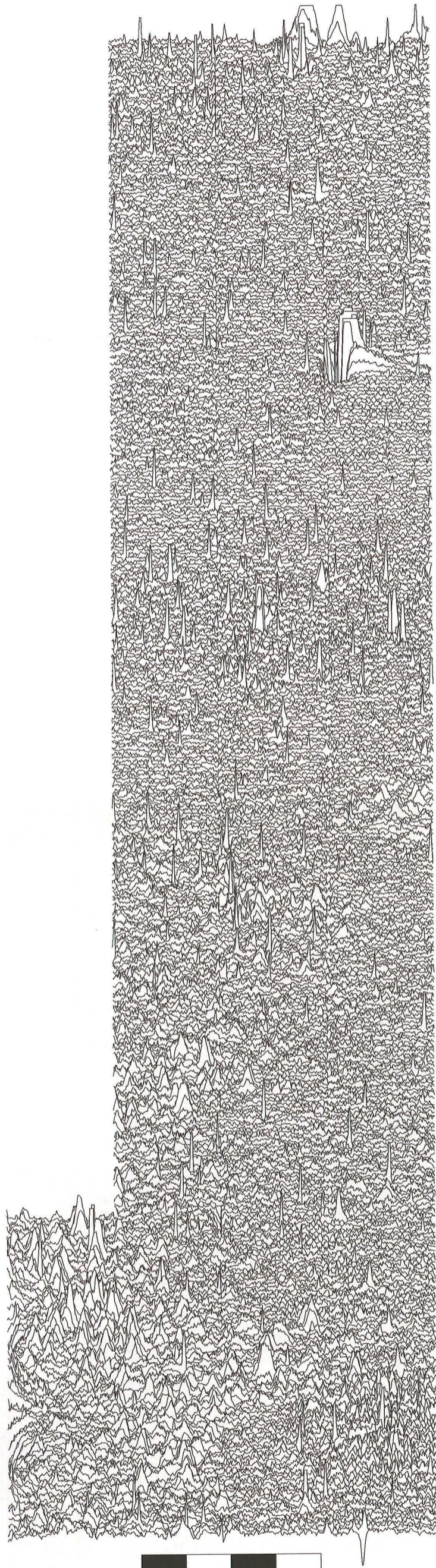
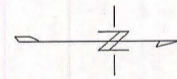


Fig.5: Interpretive plan. Scale 1:1250



50m



9.46nT/cm

Fig.6 Trace plot.

Probable modern features in this zone (Fig.5: 6,7) are represented by strong magnetic readings along the west boundary (ferrous debris in the hedge) and a dipolar anomaly further east (agricultural discard).

Scatters of discrete positive/dipolar anomalies across the site may also have modern agricultural association. A concentration of these occurs to the east of anomaly 6 and coincide with an earlier field hedge which was removed in the 1970's (J Stimpson pers com.). A large positive anomaly (Fig.5: 8) may be the result of topsoil backfill of a large tree (the root of which lies on the boundary immediately north). The strong dipolar anomaly (Fig.5: 9) may be of modern origin.

The extensive spread of mottled anomalies further east are probably the result of natural processes (Fig.5: 10). This effect bears similarities to results obtained elsewhere by gradiometry (Llyall 1995, Snee & Bunn 1999). It was conjectured that the 'leopard spot' characteristics were caused by uneven iron deposition during episodic flooding. On this site, the mottling occurs primarily in the low and wetter areas. Two small sample holes were dug by the survey team in order to determine any soil/stratigraphic differences between areas of different magnetic response (Fig.5: 11). Depth of topsoil remained constant in both examples, but the natural, underlying sand was darker where magnetic strengths were higher. Increased iron concentration may be the cause, but this interpretation can only be substantiated by trenching.

Diffuse linear anomalies were also detected in this area (Fig.5: 12). The easterly section of the site is known to have been drained within living memory. Although faint, these anomalies are probably traces of modern clay pipes; the weak response due to the masking effect of the natural sub-soil.

Strong magnetic signals to the extreme south-east were caused by the presence of a water main, which crosses the drain in the south-east corner (Fig.5: 13). Light grey (negative) striations (Fig.5: 14) in the north-east corner were caused by wheel ruts (noted on the surface).

5.0 Conclusions

It is concluded, on the basis of evidence obtained by this survey, that the site probably has limited archaeological potential. The faint linear anomalies to the west of the site may be significant, but most features are probably the result of natural processes or recent human activity.

Fluxgate gradiometry is one of many techniques used to evaluate the archaeological potential of a site and will only reveal features displaying anomalous magnetic characteristics.

6.0 Acknowledgements

Pre-Construct Geophysics would like to thank Premier Poultry Ltd. for this commission.

