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Ancient Monuments Laboratory
Report 55/95

REPORT ON GEOPHYSICAL SURVEY, MARCH 1995. BASTON DROVE, THURLBY, LINCS.

M Cole

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Summary

Geophysical survey was undertaken at Baston Drove, Thurlby, Lincolnshire in response to a request from the Fenland Management Project (FMP). The aim of the survey was to assist with the interpretation of two trenches excavated by the FMP over concentrations of Romano-British material on the Fen Edge alongside the present course of the river Glen. A rectilinear pattern of enclosures was detected as well as a number of probable pits. Superimposed on these were a large number of very intense positive magnetic anomalies of a form and magnitude normally associated with thermoremanent magnetic features such as kilns or hearths. A test pit was subsequently hand-excavated over one of these anomalies and revealed that the magnetometer was apparently responding to a naturally occurring iron-rich deposit, posssibly an iron pan. The intensity of the magnetism associated with these deposits remains unexplained, however, although it is possible that a chemical remanence has been acquired during their formation. Further laboratory work is currently being undertaken to investigate the magnetic character of these deposits. The results of these endeavours will be reported upon in due course.

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BASTON DROVE, THURLBY, LINCOLNSHIRE.

Report on Geophysical Survey, March 1995.

INTRODUCTION

Geophysical survey was undertaken at Baston Drove, Thurlby, Lincolnshire in response to a request from the Fenland Management Project (FMP). The FMP was investigating a surface concentration of Romano British material found on the Fen Edge alongside the present course of the river Glen (Lane & Trimble 1995). Two separate trenches were excavated in the autumn of 1994, one over a scatter of domestic pottery and bone with some limestone fragments (trench B, see Fig 1), the other over an area which had yielded possible kiln bar fragments (trench A). Whilst trench B revealed a west-east aligned ditch, a few gullies and possible areas of burning, no structural features were found as might have been expected given the limestone rubble recovered from this area. Trench A also revealed ditches, gullies and burnt areas and additionally uncovered evidence of iron panning and tree throw disturbance. Some structural remains were recorded in this area including pits and a possible well. Unfortunately the results of the assessment of artifacts recovered from the excavation are not available at the time of writing.

The geophysical survey was intended to help broaden the interpretation of the archaeology described above and, in particular, it was hoped that kilns would be located. Unfortunately it was not possible to conduct the survey prior to the excavation. With hindsight this is regrettable as a different approach could have been taken to the location of the trial trenches.

The survey at Thurlby was centred on TF 1200 1645. The site lies on Fenland gravels overlain by a thin cover of desiccating peat.

METHOD

Magnetometry was chosen as the most suitable geophysical technique to employ given the main aim of locating kilns and also the excellent results obtained over the same geology at Hoe Hills, Dowsby 8 miles to the north (Cole 1995).

A grid of 30m x 30m squares was laid out parallel to Baston Drove and encompassing both of the FMP excavation trenches (see Fig 1). Each of these squares was then surveyed using Geoscan FM36 fluxgate magnetometers. Measurements were recorded at 0.25m intervals along traverses 1.0m apart and the data was periodically down-loaded to a micro-computer in the field. The resulting data is illustrated in this report using both greyscale and graphical trace plots (see Figs 2 & 3). An interpretation diagram of this data is presented in Figure 5.

Topsoil samples were also collected at 15m intervals along a central traverse (see Fig 1) so that their magnetic susceptibility (MS) could be measured. The measurements were made in the laboratory using a Bartington MS1 meter and MS2B bench sensor. The results are presented in Figure 4.

A return visit to the site was made in mid-August 1995 so that a small test pit could be hand-excavated over one of a number of unusual anomalies located by the magnetometer (see Fig 5). The findings of this visit are incorporated into the discussion of the magnetometer survey results (see below).

RESULTS

Magnetometer Survey (see Figs 2, 3 & 5)

The results are dominated, particularly in the central and eastern parts of the survey, by a profusion of very intense positive anomalies many of which approach 100nT in strength. Intense responses of this type are usually associated with the presence of thermoremanent features such as kilns or hearths (see for example the magnetometer survey of an "Oxford Industry" pottery production site at Nuneham Courtenay, Oxon - Cole 1992). The large number of these anomalies is unusual and were even a minority to indeed represent kilns then it would suggest that the site of a fairly large-scale industry might have been located. Significantly, no direct corroborative evidence for the presence of such activity was afforded by the FMP excavation trenches. Confusingly, however, areas of iron panning were revealed (C French *pers comm*). When one of these anomalies was subsequently relocated and excavated by hand, an iron-rich deposit was revealed. It would appear, therefore, that some naturally-occurring process, presumably iron panning, is depositing discrete concentrations of iron-rich material which in turn produce very intense and localised magnetic responses. The intensity of the magnetism displayed by these deposits, which is comparable to that of a kiln or hearth, remains unexplained, however, although it is feasible that they have acquired a chemical remanent magnetisation[1] during their formation.

Also evident on the plots is a subtle linear pattern of rectangular enclosure ditches running roughly west-east through the survey area. These ditches clearly share the same alignment as the west-east ditch located by the eastern FMP trench as well as the crop marks of enclosures revealed in AP's of the area (R Palmer *pers comm*). The subtle response to these ditches is surprising given the generally high background MS at the site and perhaps suggests that the iron-panning (which is likely to be responsible for this high MS) post-dates the archaeological activity (see below).

The effect of ploughing at the site is demonstrated by the narrow east-west parallelism in the data, aligned with the southern field boundary (see Fig 3 & 5).

To the west of the survey area there is a zone of amorphous positive magnetic disturbance (never exceeding 4nT in strength) which, due to its shape, is unlikely to be of an archaeological origin. The latter is very similar in appearance to the response over a

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[1]For a description of how a chemical remanent magnetism is acquired see Thompson & Oldfield (1986).

former river channel at Hoe Hills and, given their proximity to the river Glen, a corresponding interpretation as accumulations of relatively high MS sediment alongside and within deposits of much lower MS is reasonable. Alternatively, a more diffuse, less concentrated form of the iron-rich deposits described above may be responsible.

Magnetic Susceptibility (see Fig 4)

The results from the topsoil MS traverse show values increasing rapidly from an average of 75 SI $x10^{-8}Kg^{-1}$ in the west to a maximum of 182 SI $x10^{-8}Kg^{-1}$ across the middle of the survey area, and remaining higher than 110 SI $x10^{-8}Kg^{-1}$ throughout the central and eastern parts. All of these values exceed those from Hoe Hills, a site exhibiting intensive occupation activity over the same substrate. Interestingly, the results appear to reflect the distribution of intense anomalies located by the magnetometer, suggesting that the iron-rich deposits have been disturbed by modern cultivation and highly magnetic material has been thereby introduced into the topsoil. Significantly, reddened material, as seen in the test pit, was plainly visible admixed with the topsoil.

CONCLUSION

As expected, the site was proven to be suited to magnetometry and a rectilinear arrangement of enclosures has been detected as well as a number of probable pits. Superimposed on these are a large number of very intense positive magnetic anomalies which are demonstrably a response to naturally-occurring deposits of iron-rich material (probably iron panning). The form and magnitude of these anomalies are comparable to those routinely attributed to the thermoremanent magnetism of kilns or hearths. However, whilst initial experimentation on recovered samples has indicated the presence of a remanent magnetism (P Linford *pers comm*) these features show no physical evidence of burning. One possible solution is that a chemical remanence has been acquired during their deposition. Further laboratory investigation into the magnetic character of these deposits is currently being undertaken in an attempt to fully explain this phenomenon. The results of these endeavours will be reported upon in due course.

Surveyed by: A Gilbert
M Cole

Dates: 31 March 1995

Reported by: M Cole

30 October 1995

Archaeometry Branch
Ancient Monuments Laboratory.

References

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Lane, T & Trimble, D 1995 Fenland Management Project, Lincolnshire. Excavations 1994, *Fenland Research 9*, forthcoming.

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Plans Enclosed

Figure 1 Location plan of survey showing FMP trenches (1:2500)

Figure 2 Greyscale plot of magnetometer survey overlain on location plan (1:2500)

Figure 3 Greyscale and traceplot of magnetometer survey (1:1000)

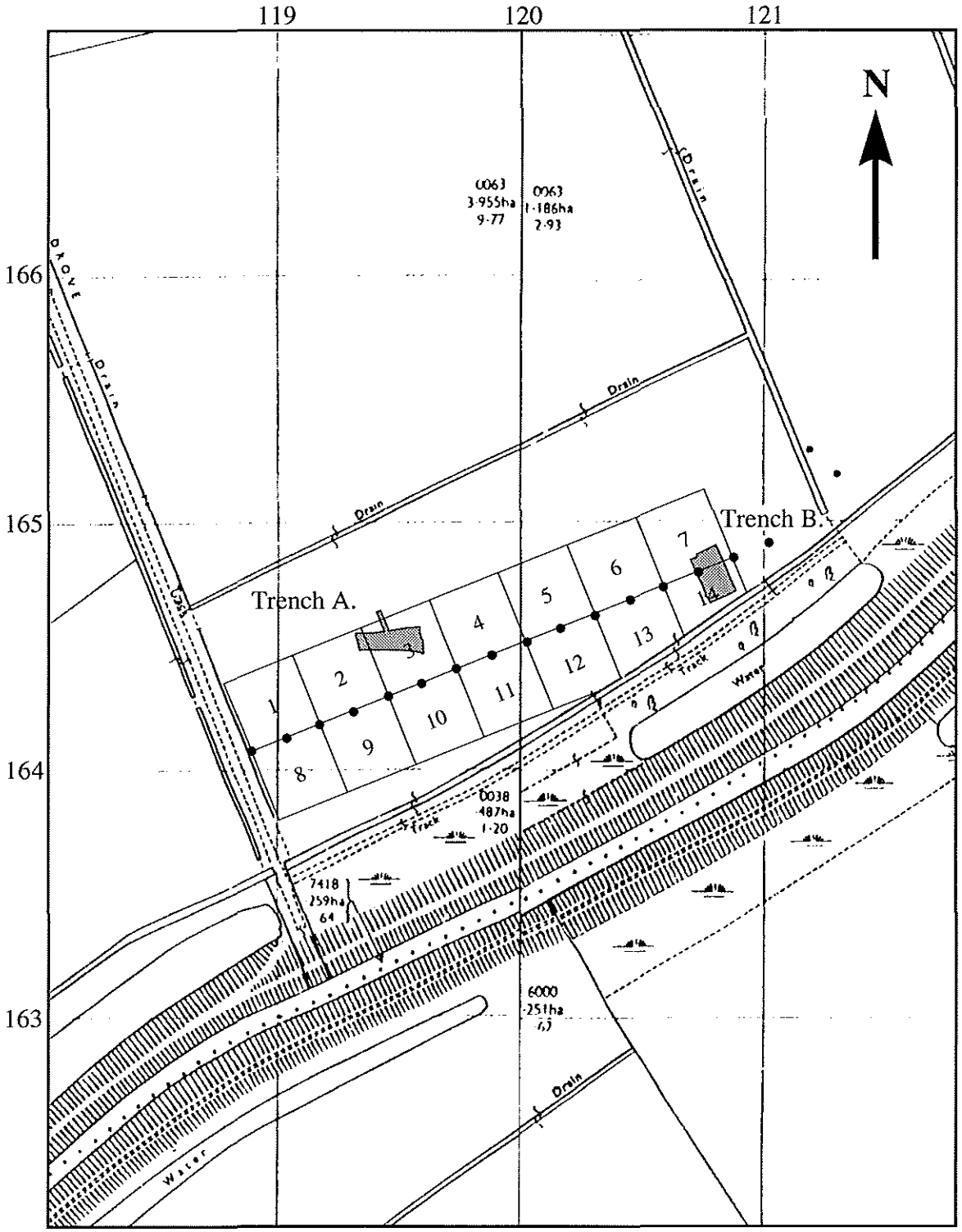
Figure 4 Plot of magnetic susceptibility results

Figure 5 Interpretation of magnetometer survey.

FIGURE 1.

Baston Drove, Thurlby, Lincs.
Location plan of geophyiscal survey.

TF 1116 & 1216.



• • • Topsoil MS traverse.

▨ FMP trenches.

0 ——— 90m

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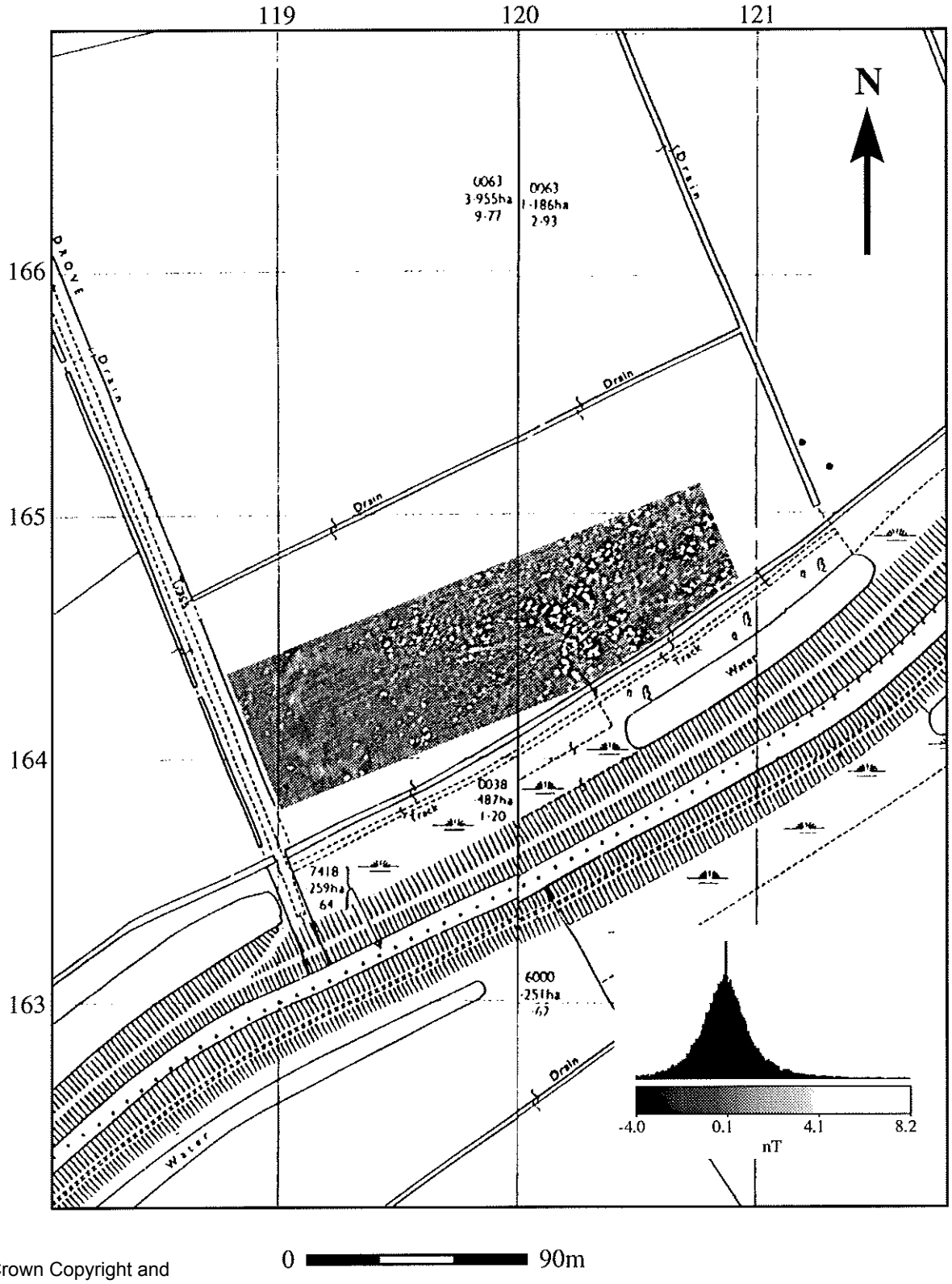
FIGURE 2.

Baston Drove, Thurlby, Lincs.
Location of magnetometer survey.

TF 1116 & 1216.



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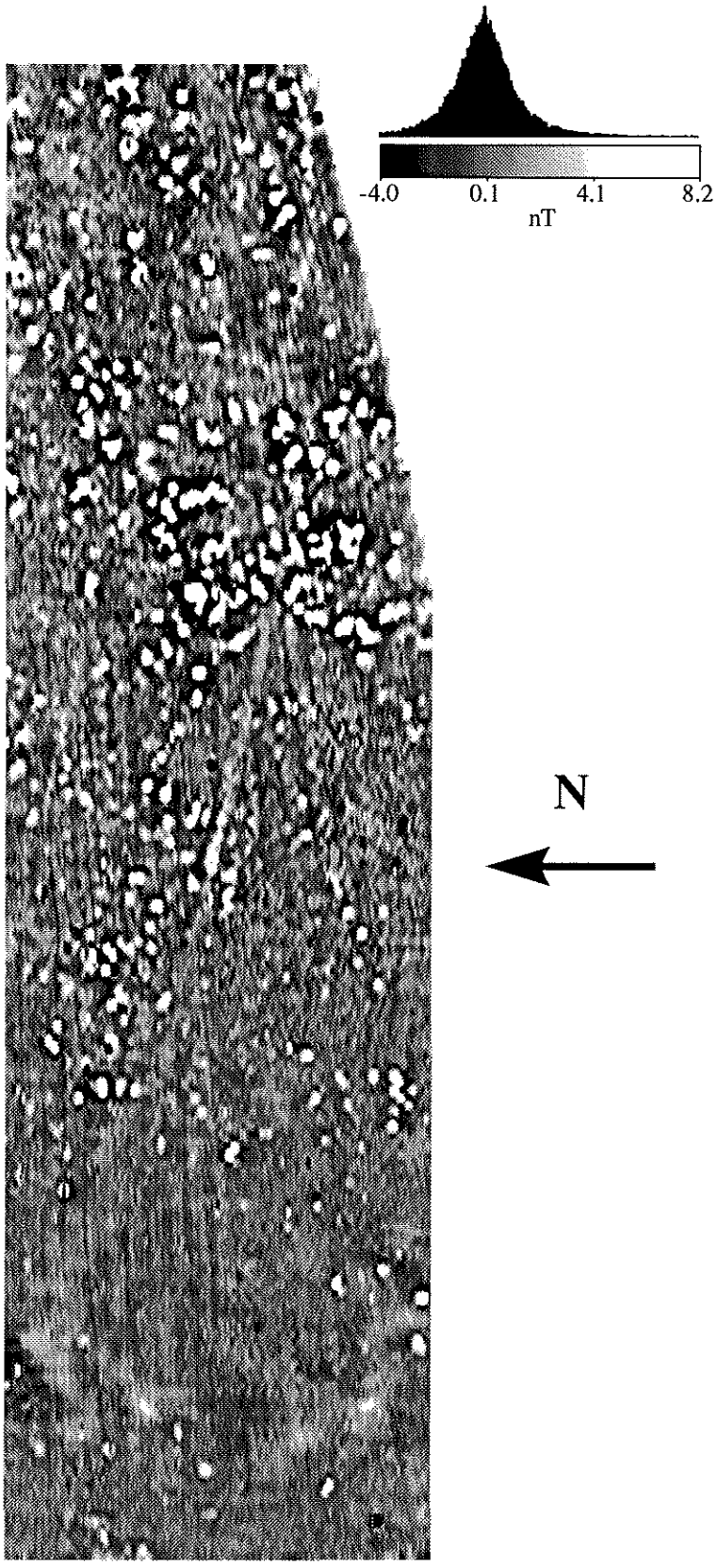
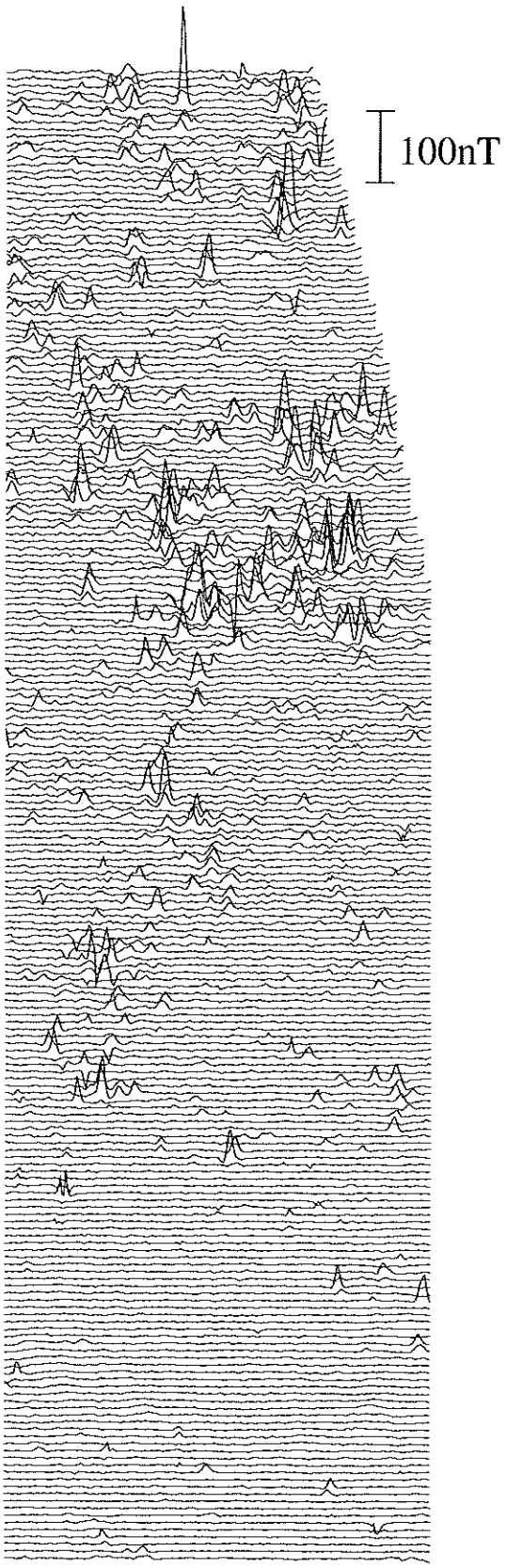
Baston Drove, Thurlby, Lincs.
Magnetometer Survey March 1995.

FIGURE 3.

1. Greyscale of raw magnetometer data.

2. Traceplot of raw magnetometer data.





0 60m

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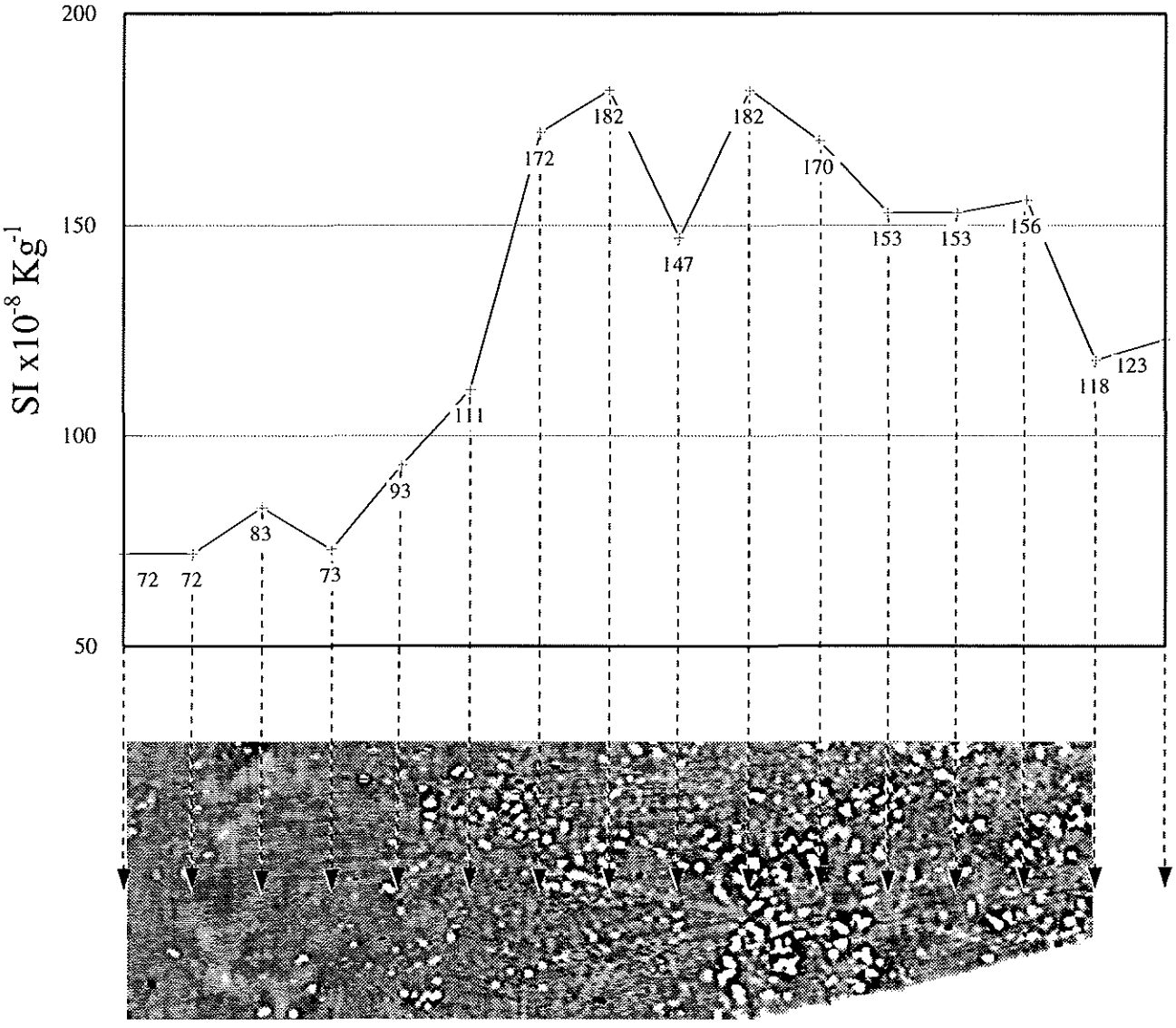
FIGURE 4.

Baston Drove, Thurlby, Lincs.
Magnetic Susceptibility Survey March 1995.



Topsoil samples retrieved at 15m intervals along a transect through the centre of the magnetometer survey.

N

0 60m

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FIGURE 5.

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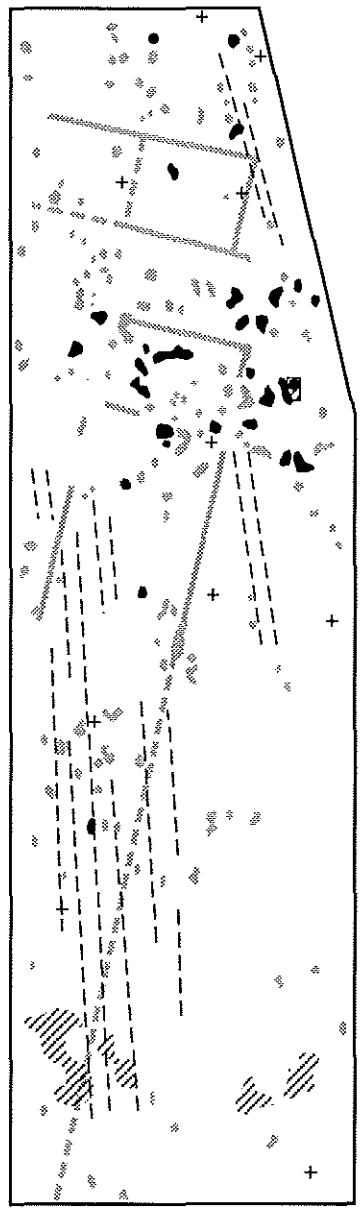
Interpretation of magnetic anomalies.



N

Key

- Positive anomalies (> 50nT)
- Positive anomalies (< 50nT)
- Negative linear anomaly (ploughing)
- Zone of anomalous magnetic disturbance
- \+ Response to ferrous material
- Location of test pit

0 60m

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