GEOPHYSICAL SURVEY

Stump Cross – Boroughbridge

May, 1991.

MAP Archaeological Consultancy Ltd.

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Stump Cross Location Plan.

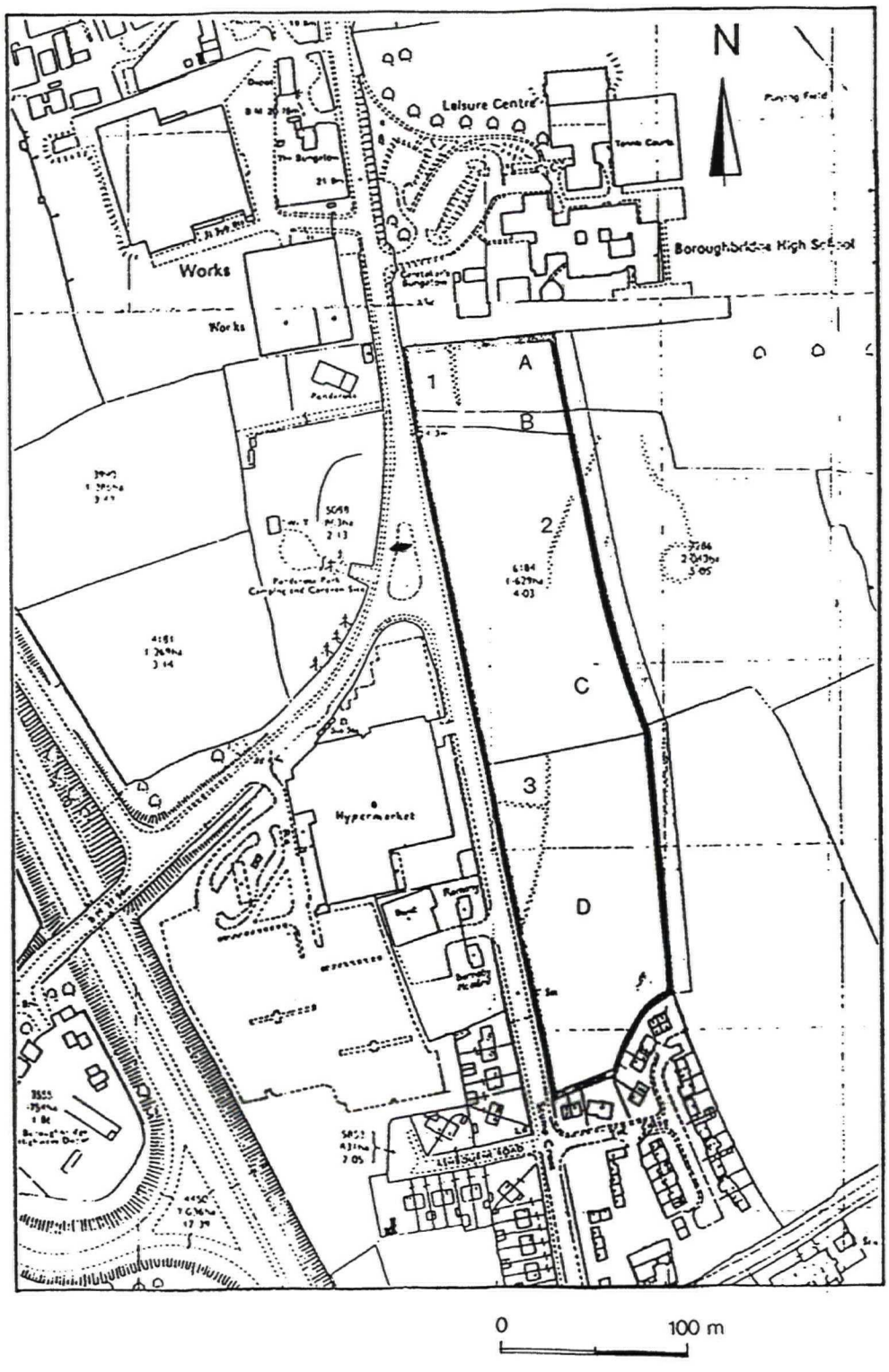
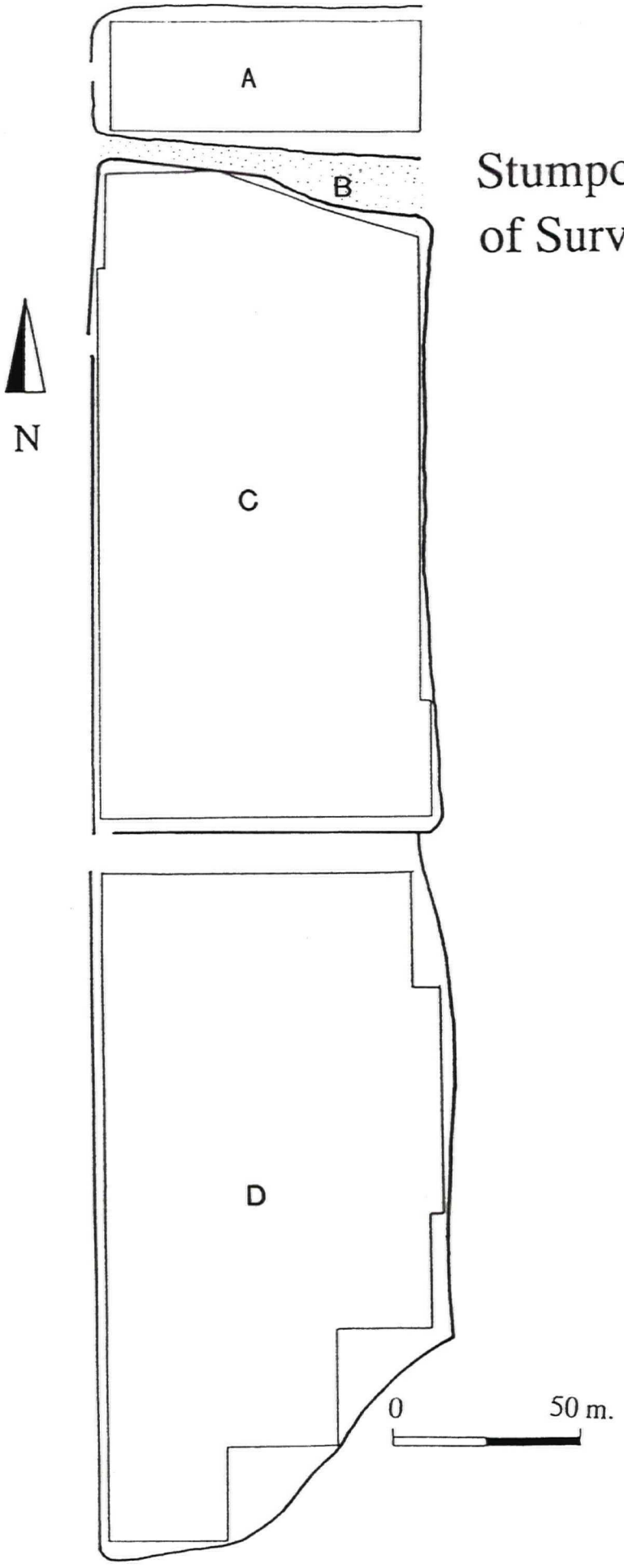


fig. 1



Stumpcross; Location of Survey.

fig. 2

Geophysical Survey at Stump Cross, Boroughbridge North Yorkshire, May 1991.

Introduction

This report covers the results obtained from a geophysical survey conducted from the 23rd to the 26th of May 1991, as part of an archaeological evaluation in advance of a residential development at the above site.

An archaeological evaluation of the site prior to the geophysical survey (Johnson 1991)indicated the presence of a series of crop marks as indicated by aerial reconnaissance of the site. Analysis of aerial photographic records of the adjacent area to the east of the site located the presence of several archaeological features datable on form alone to the pre-historic period.

The Stump Cross development site lies just south of the town of Boroughbridge and approximately 150m to the east of the A1 (SE 3970 6585; Fig. 1).

The archaeological evaluation of the site suggested the presence of three archaeologically sensitive areas (Fig. 2):

1. SE 3960 6591 – a north-south aligned linear ditch (Area A)
2. SE 3970 6585 – a north-east-south-west aligned linear ditch (Area C).
3. SE 3968 6570 – two linear ditches aligned north-south and east-west (Area D).

The site is generally level though a gentle slope down to the north is apparent in the southern part of the site; whilst in the north-west a slightly more pronounced slope to the east is evident.

Method

The area to be surveyed covered an acreage of approximately 9.6 acres. At the time of the survey Areas A and D were fallow and Area C had been recently cropped.

The survey area was divided into four distinct areas (Fig. 2). Area A measured 30m x 90m, and was divided from Area C, by a non surveyable area, Area B. Area B which formed the boundary for Area A in the south was represented by a limestone paved track, which was impossible to survey and therefore forms a negative area in terms of archaeological sensitivity. Area C to the south of Area B measured 84m by 183m; and Area D measured 80m x 177m.

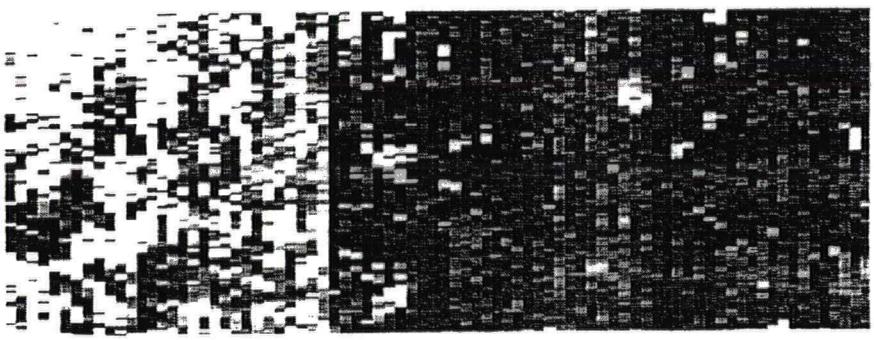
The survey was carried out using a Geoscan FM18 fluxgate magnetometer covering the whole area in 30m. square blocks with a sample interval of 25cm. x 1m, giving 3600 points for each square. Over 100,000 data points were gathered and processed using Geoimage software on a Mesh 486B microcomputer.

Results

The low range of measured signal at Stump Cross increases the relative effect of unavoidable extraneous factors influencing the readings for example, wind buffeting of the instrument, temperature variation, and striping due to bidirectional surveying. Even though extensive computer enhancement and filtration has been applied to the data, these are still apparent in the plotted results. Casually discarded metalwork gives very high readings, especially when the image is strongly computer-enhanced as it is here. It is believed that modern metal rubbish is the most likely explanation for some of the white circles in the plots.

The results of the survey indicated that there was a very low variation in the magnetic susceptibility of the surface of the site, and consequently the data obtained was very flat. Computer enhancement of the data has been employed to provide the best possible results (Figs. 3-8).

Figure 3 : Area A – Grey Scale Plot , with Band Width 6nT.



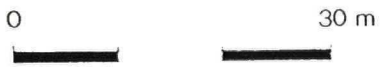
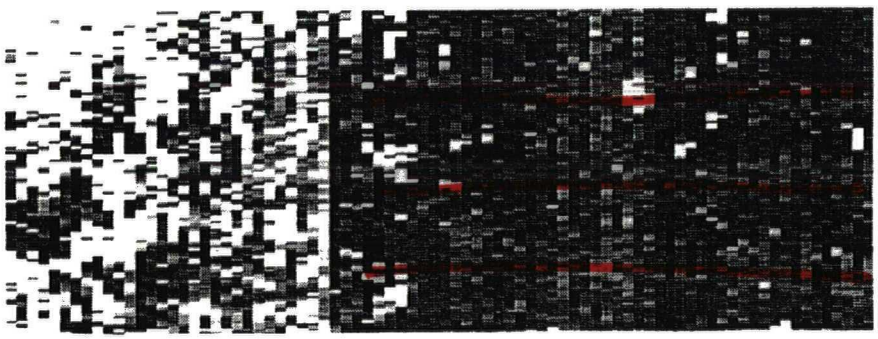


Figure 4 : Area A – Interpreted Grey Scale Plot , with Band Width 6nT.



Area A

A very high proportion of the surface area of Area A was heavily rutted, especially on the western side: this combined with the low contrast in susceptibility, and the small survey area available, means interpretation of this area in terms of locating archaeological features is extremely difficult and purely speculative.

However in the eastern sector of Area A three equadistantly spaced and east–west aligned anomalies are likely to represent part of a medieval ridge and furrow field system.

Area D

The survey of the northern sector of Area D displays a random picture which breaks up, this sometimes happens at the edges of fields as iron waste, like broken plough–shares, are often thrown to the edges.

Despite the low variation in the magnetic susceptibility of the site, the survey does indicate a number of possible archaeological features.

Interpretation

The survey results are presented in their original form and also with an interpretation of the readings obtained. The archaeological features located fall into two categories, ring features and curvilinear features.

Visible in the results are a number of circles that may relate to ring ditches, Anomalies E, F, and G are distinct, whereas Anomalies H, I, and J are more tentative and harder to isolate in the data (Figs. 3–8). The diameters of the anomalies are : Anomaly E – 18m; F – 15m; G – 12m; H – 20m; I – 15m; and J – .
12m.

Anomalies M and N appear to represent a pair of linear features extending over c.65m south–east to north–west in Area C (Figs. 5 & 6). The general form of the features suggest that they may be interpreted as boundary ditches on either side of a trackway.The indistinctness of the plot suggests that these ditches may be multi–phase.

Anomalies O and P aligned north–east to south–west and continuous for approximately 55m in Area C (Figs. 5 & 6) also appear to represent boundary ditches on either side of a trackway. The relationship of Anomalies M and N to Anomalies O and P is unclear.

The relationship of Anomaly Q to Anomalies M/N and O/P is also unclear, it may represent a semi–circular enclosure or possibly be related to Anomaly M. It is impossible to establish this relationship without archaeological excavation.

Anomaly R in Area D (Figs. 7 & 8) represents a linear feature which runs south for a distance of 150m from the broken up data near the hedge dividing Areas C and D, and then curves east towards the road. Its alignment in Area C cannot be traced with any confidence. Anomaly S runs for approximately 40m south–west from the road to meet Anomaly R. It is possible that Anomaly R equates in some form with AP3.

Anomaly T extends for approximately 70m north–west from the road, crossing Anomalies S and then R, before curving southwards, and butting Anomaly V.

Anomaly U is a linear feature measuring approximately 70m, aligned north–east to south–west which appears to butt R.

Anomaly V represents a linear feature aligned north–south and which is continuous for approximately 70m before it is no longer distinguishable near the hedge in the northern sector of Area D.

Conclusion

Magnetic prospecting at the Stump Cross site did not produce clear–cut data, the results are therefore most difficult to read. The plots provided, and particularly the interpretive ones, should be seen as plots of potential rather than of fact. If, as seems most likely, the slight variations highlighted in the interpretive plots are indicative of the archaeology below, then there are widespread features pertaining to prehistoric activity on the site.

Figure 5 : Area C – Grey Scale Plot , with Band Width 6nT.

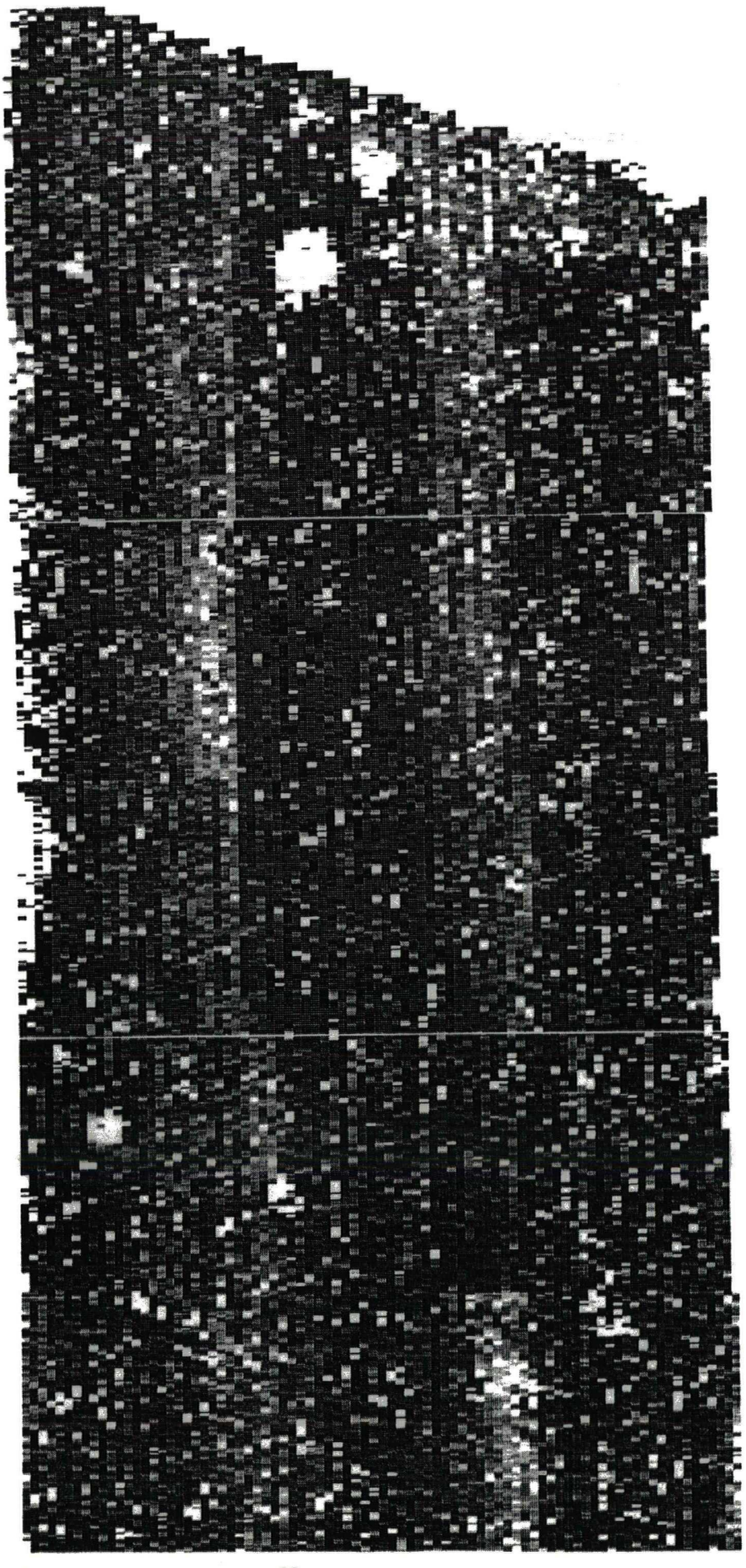


Figure 6 : Area C – Interpreted Grey Scale Plot , with Band Width 6nT.

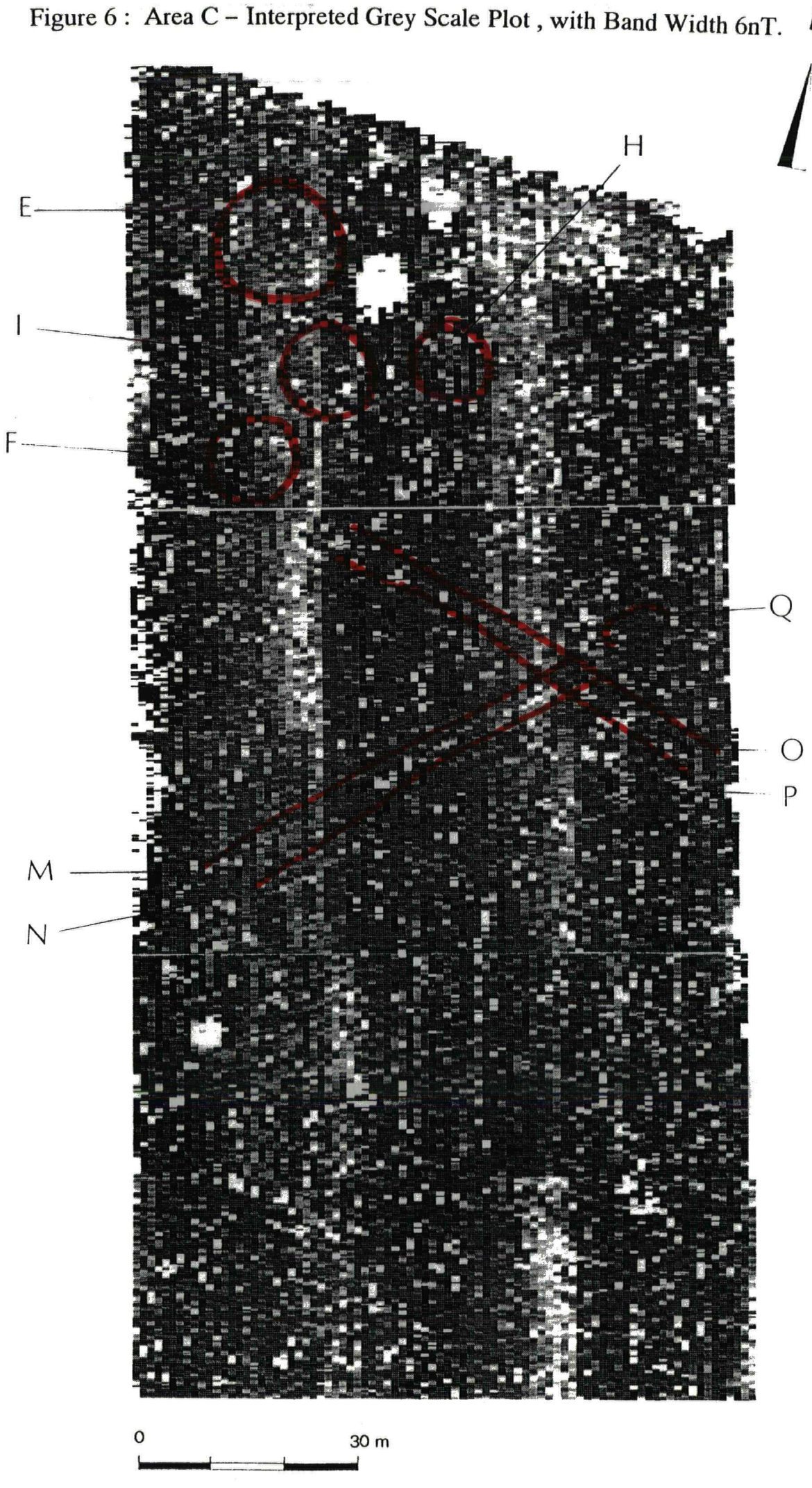


Figure 7 : Area D – Grey Scale Plot , with Band Width 6nT.

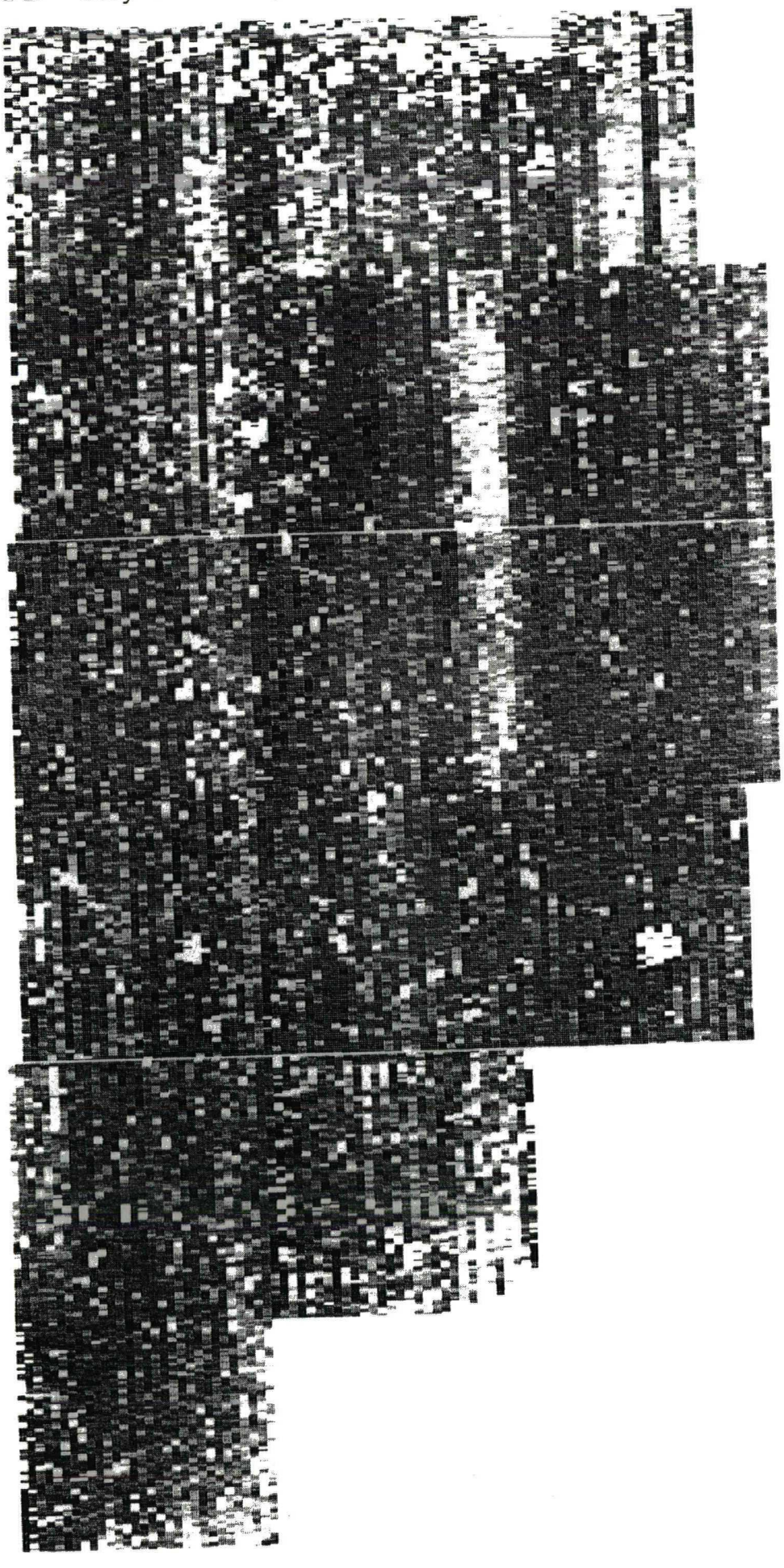
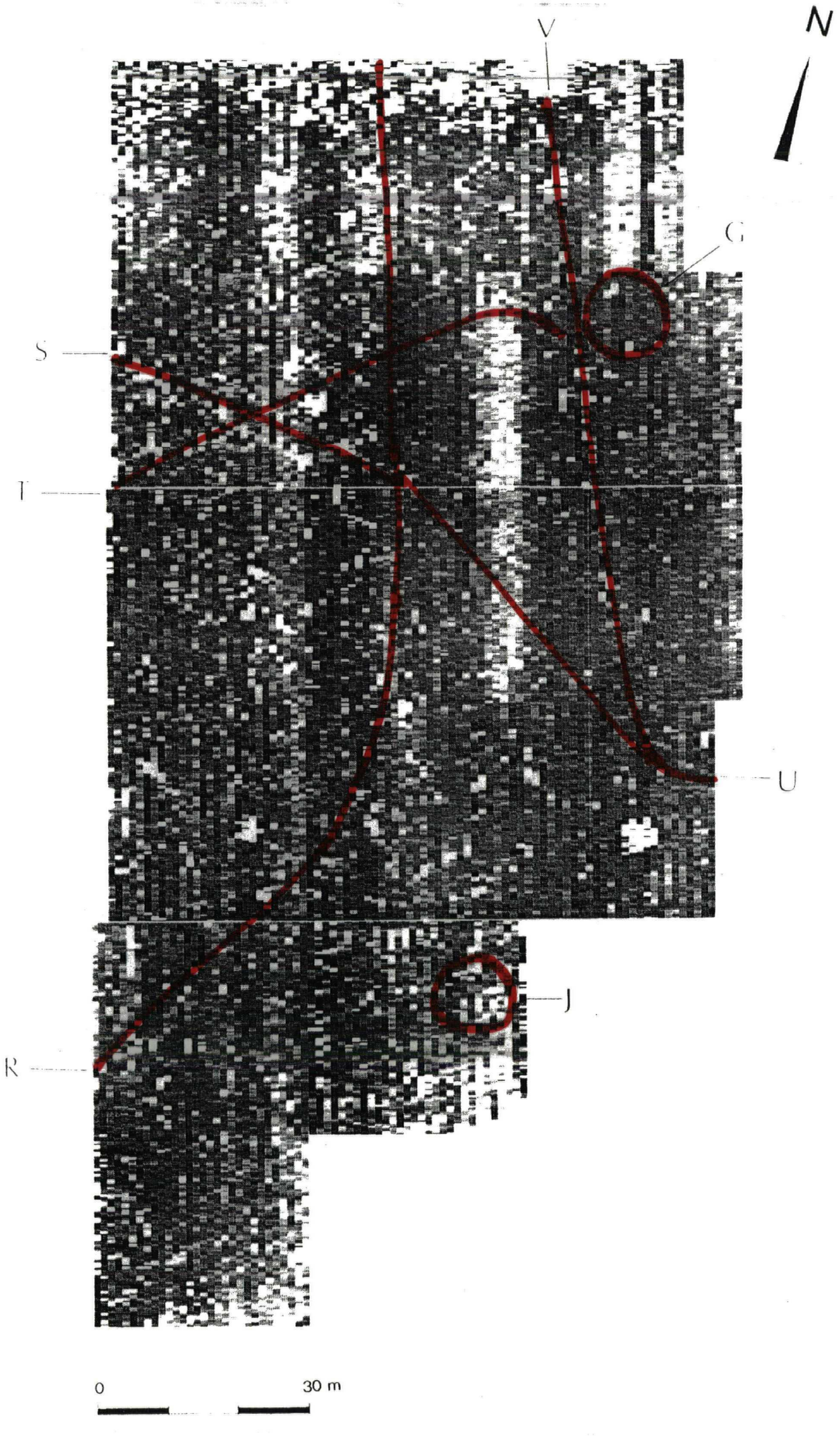


Figure 8 : Area D – Interpreted Grey Scale Plot , with Band Width 6nT.



Appendix:
MAGNETOMETER SURVEY

Buried archaeological remains such as pits, ditches, banks and walls may, depending on the material filling them or used in their construction, cause small localised variations in the Earths magnetic field. Although very small, too slight to be noticed by a compass, these changes can be measured by more sensitive magnetic instruments. By collecting a large number of measurements over an area the variations can be plotted and a 'picture' of buried features built up.

Essentially the technique detects contrasts between the natural sub soil and intrusive elements. For example, a ditch cutting deep into the sub soil and filled over time by topsoil and rubbish will appear slightly more magnetic than the surrounding natural. This is because the material filling the ditch has a higher magnetic susceptibility than the natural, a result of chemical differences between the two. Under normal conditions a wall would appear less magnetic than its surroundings, and thus give a low reading. However, results are dependant on the magnetic properties of the area and the outline given could be reversed in certain conditions.

Pieces of iron, and fired clay such as hearths and ovens have a much more marked effect. In some instances this can be used to detect specific features, pottery kilns or metal working areas. A kiln produces a magnetic signal many hundred times that of a ditch or pit and a piece of iron can produce one several thousand times greater. Unfortunately pieces of iron are quite common in the soil and if present in too great a quantity can mask the more subtle archaeological features.

The equipment used, a Geoscan FM18 fluxgate magnetometer, is a light rigid aluminium tube 50 centimetres long, with a fluxgate sensor mounted at either end. A data logger (a small computer), the power supply, and the controls are also mounted on the carrying handle to make the instrument fully portable. In use the two sensors are aligned, balanced, and zeroed and the instrument is then carried vertically alongside the operators body. The upper sensor is less influenced by the ground and so provides a reference to the background magnetic field of the Earth. Subtracting the lower sensors' reading from the upper sensors' reading the magnetometer can detect the presence of buried anomalies. By walking in a grid pattern and taking readings at regular intervals it is possible to cover an area both quickly and accurately measurements being stored in the data logger. The data collected is periodically transferred or dumped to a portable computer in the field. Using appropriate software the grids can be reconstructed and data presented in a pictorial form. As the instrument is highly sensitive and the magnetic variations very slight substantial computer processing is required to enhance the signal due to buried anomalies and suppress "noise" in the readings.