LAND TO THE SOUTH WEST OF THE EXCAVATIONS AT ELMS FARM HEYBRIDGE, ESSEX

GEOPHYSICAL SURVEY REPORT

Client: Essex County Council
NGR: Area A TL84740/07900 (centred) Area **B** TL84900/07760 (centred)
Project No: 299
Dates of Fieldwork: 10/11-4/12/1997

SUMMARY

A geophysical survey over 4 hectares of land to the south west of the Late Iron Age/Roman settlement at Elms Farm has located anomalies characteristic of archaeological features including ditches, pits, possible trackways and structures. It is clear from the survey results that the settlement extended into the survey areas and is likely to have continued beyond.

1 INTRODUCTION

The magnetometer survey was commissioned by the Elms Farm Project as part of ongoing post excavation research. Its aim was to build upon previous investigations carried out by Geophysical Surveys of Bradford (1993) by surveying a further two fields, totalling approximately 4.2 hectares, to the south west of the 1994/5 excavation site (Fig. 1). These fields represent the last remaining areas of undisturbed land within the immediate vicinity of the excavated area, and it was hoped that the survey would produce information on the nature of settlement activity further towards the River Chelmer.

2 SITE DESCRIPTION

2.1 Topography, Land Use and Suitability

Both fields were flat, level and under pasture making them generally well suited to the requirements of a magnetometer survey. The majority of perimeter fencing was

constructed of steel wire and wooden stakes to a height of around im which tended to cause intrusive magnetic interference from a distance of about 1-2 metres.

Waterlogging was a minor problem in the south west corner of the southerly of the two fields with up to 200mm of standing water present.

2.2 Geology

The underlying geological material consisted of river terrace gravels which are overlaid by alluvium towards the River Chelmer.

2.3 Archaeological Background

Two phases of excavation, undertaken by the Essex County Council Field Archaeology Group in 1993 and 1994/5, revealed extensive and complex remains of an important multi-phase site.

Evidence was found for prehistoric landscape use, the presence of an important Late Iron Age local centre and a large Roman settlement with clear signs of continuity of occupation between its precursor and a later Saxon settlement.

The main span of occupation included evidence of high status activity in the Late Iron Age, a temple complex which developed throughout the life of the settlement, and a clearly defined infrastructure of roads, surfaced open areas and plots across which zonation of activity, particularly of manufacturing, can be discerned (Atkinson & Preston 1996).

3 SURVEY AIMS

The general aim of the survey was to determine the extent and character of buried archaeological remains within the survey areas.

Specific objectives include confirming any spread of occupation activity associated with the excavated settlement, and locating the continuation of a known Roman road the path of which is projected into the northerly field.

4. TECHNICAL INFORMATION

4.1 Magnetic Surveying

Magnetometry detects anomalies in the earth's magnetic field caused by the redistribution and alteration of iron oxide particles. Such disturbances may be due to local geological variations but human activities also significantly influence the geomagnetic field.

The technique is particularly good at detecting structures and features incorporating fired clay such as kilns or hearths. In these examples the clay is de-magnetised at the Curie point (around 600-700°C) and then re-magnetised upon cooling in alignment with the Earth's magnetic field (Clark 1990). This process creates a strong positive anomaly when compared to general background readings. Features with a high brick or tile content generally produce strong mixed polarity responses due to the varying orientation of each magnetically enhanced artefact.

The detection of pits and ditches is dependant upon the existence of magnetic contrast between the backfill of a feature and the geology into which it has been cut. This contrast is usually present because the fill often consists of a proportion of topsoil which is normally more magnetically susceptible than subsoil (Tite & Mullins 1971). Again these features produce positive magnetic responses although usually weaker than those caused by fired materials.

Walls and foundations constructed of masonry are detected in a similar way although the signal is negative due to the generally low magnetic properties of these materials.

4.2 Methodology

The two fields comprising the survey were designated as areas A and B (Fig. 1). Within both areas a survey grid of 20m x 20m squares was established in alignment with the Ordnance Survey national grid. Magnetic data was collected within these squares at a sample interval of 0.5m and a traverse separation of im.

4.3 Equipment

The survey was carried Out using a Geoscan Research FM36 Fluxgate Gradiometer and ST1 Sample Trigger. The collected data was downloaded to, and processed by, the Geoscan Research Geoplot 2.01 programme installed on a Toshiba laptop and Opus Technology PC.

Bamboo canes were used to lay out the grid with the survey work itself being guided by nylon ropes.

4.4 Printed Plots

The images within this report consist of grey scale plots. With this technique the data readings are converted into varying shades of grey. The density of the shading is proportional to the difference between the reading and pre-determined maximum and minimum cut off levels. In a black and white image positive magnetic values above the maximum level will appear black and negative values below the minimum will be white with varying levels of grey in between. This produces images of considerable subtlety with a wide range of data displayed on one plot.

Minimal correction processes were carried out to produce the plots included in the report. This involved an initial clipping of the data to a minimum value of -lOnT and maximum of + lOnT to limit large data spikes. The zero mean traverse or zero mean grid functions were then applied to remove traverse and/or grid edge discontinuities (for a full explanation of these processes see Walker & Somers
1994).

No image enhancement processes were used.

5 SURVEY RESULTS

5.1 Area A (0.8 ha surveyed) (Fig. 2)

A number of well defined magnetically positive anomalies indicative of archaeological ditch and pit features were located within this area.

The majority of the ditch anomalies lie on one of two principal orientations, NW-SE and SW-NE. This reflects the general trend of alignment identified within the excavated areas and suggests that the features detected within area A are form part of the same Late Iron Age/ Roman settlement.

There is some magnetic evidence for possible improved surfaces indicating the presence of track or roadways. It is probable that some of the longer lengths of ditch within this area also delineate such features, the surfaces of which have deteriorated or are not detectable.

None of the detected anomalies can be associated with structures.

5.2 **Area B (**2.48ha surveyed) (Fig. 3)

Anomalies characteristic of archaeological features were also detected in area B. However identification and interpretation of these features is problematic due to the density of pit features and possible near surface disturbance.

A number of ditch anomalies can be discerned, some of which, particularly those evident as parallel pairs, may represent trackways although there was only limited evidence for an associated hardened surface (6).

The orientation of the majority of these ditches conform to the alignments identified in area A. A similar conclusion can therefore be drawn that these features form a continuation of the excavated settlement areas to the north.

The exception to this alignment is the linear anomaly (1). Here a well defined strip of positive data, indicative of a ditch approximately 1 .5-2m wide, borders a possible trackway or bank remnant which abuts its eastern edge. This feature appears to overlay

or cut anomalies interpreted as forming part of the settlement which would suggest a later date for its origin.

The concentration of pits identified within the area resembles spreads of similar features located during the geophysical survey of 1993 (GSB 1993) (Fig.7). During excavation these were found to contain domestic material primarily of Late Iron Age/Roman date. It is possible that the pits located within area B represent similar settlement activity.

The pit concentration discussed above, together with the detection of anomalies in general, tends to diminish towards the west of area B. This may indicate a limit of settlement however, it is probable that this low lying land has suffered from frequent inundation with the resulting sedimentary deposits masking underlying archaeological features.

Several of the ditch anomalies within area B are characteristic of more complex archaeological features.

Anomaly (2) delineates an ovoid enclosure approximately 20m across at its widest point. It comprises a ditch approximately 0.5-im wide, and a possible entrance way to its north west.

Anomalies (3) and (4) consists of two roughly rectangular enclosures around 8m wide. These may represent evidence building activity

Anomaly (5) may also indicate the presence of structural remains in the form of two narrow (approx. 0.5m) concentric circular ditches, the diameter of the outer being around 18-20m. This anomaly is similar in plan to the temple found during the earlier excavations to the north, however the outer ditch of that structure was approximately 32m in diameter.

6 CONCLUSIONS

The survey was successful in locating a number of magnetic anomalies characteristic of archaeological features and deposits which enabled the specific objectives set out in section 3 above to be achieved.

Although the feature density and disturbance within area B caused some identification difficulties, overall the magnetic anomalies detected in both areas were found to be of sufficient definition to be interpreted with reasonable confidence.

From the survey results it is clear that the settlement discovered to the north east extends fully into the two survey areas and probably beyond. There is also strong evidence for the continuation of the Roman road, also located during previous investigations, through and beyond area A.

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ACKNOWLEDGEMENTS

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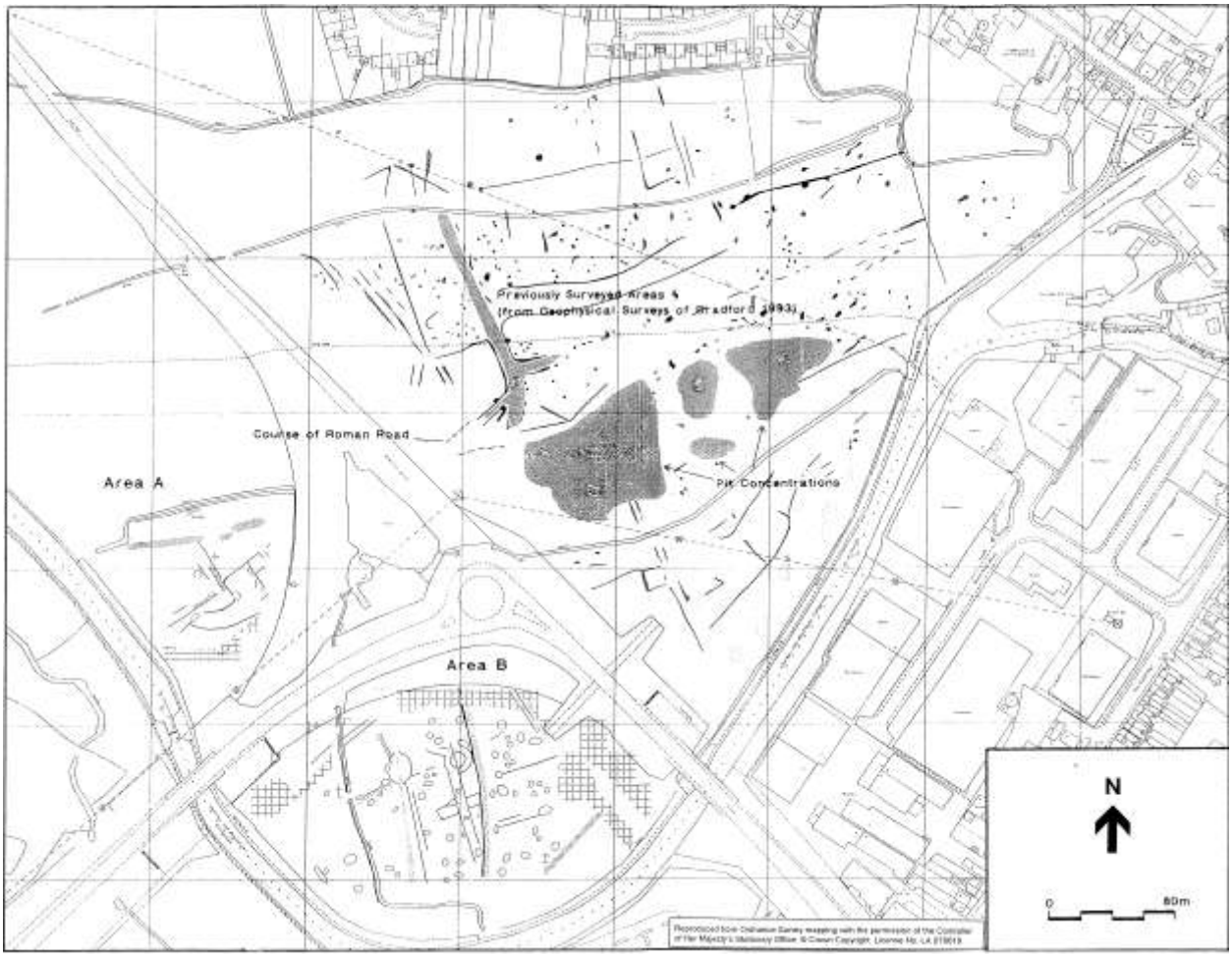
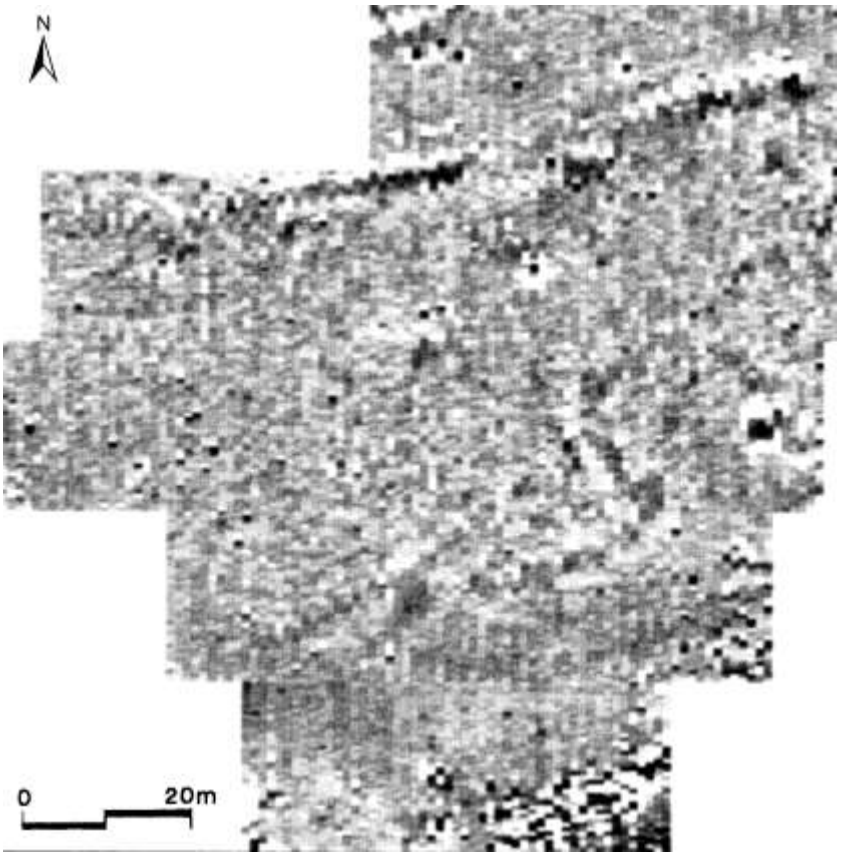


Fig. 1 Location of geophysical surveys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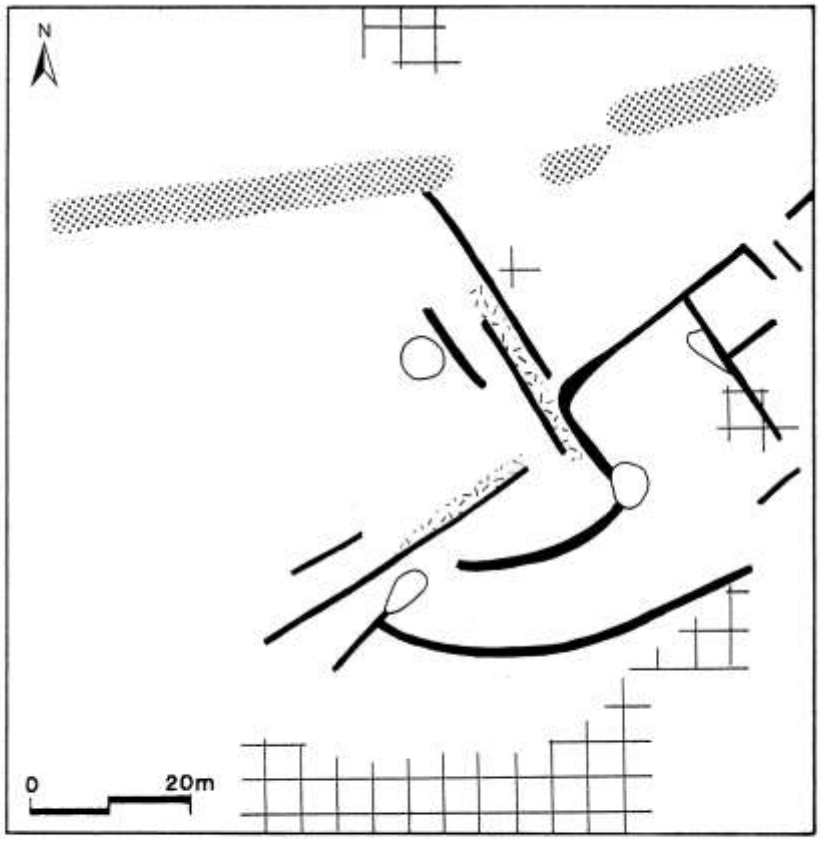


Magnetic Anomalies

Natural

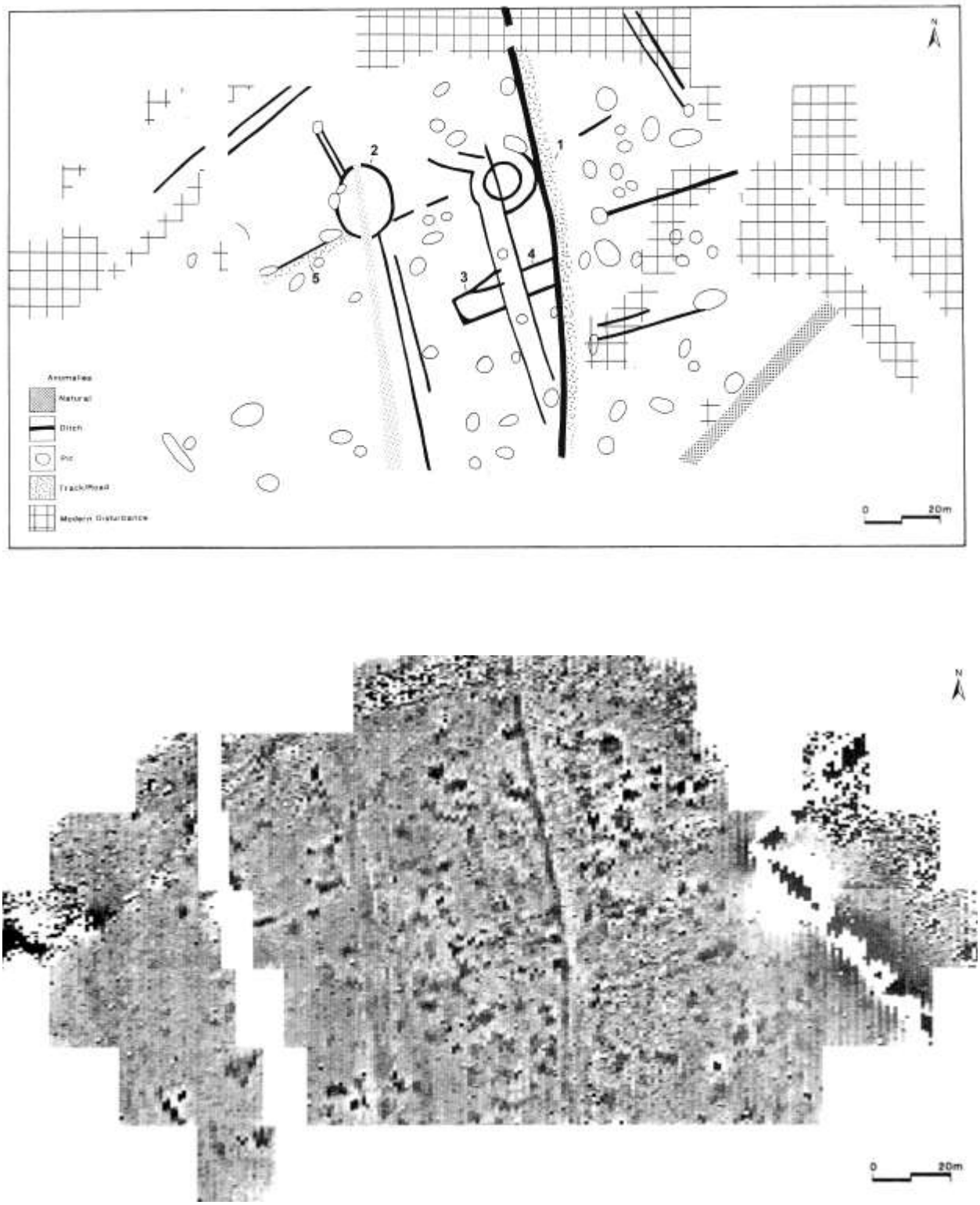
Ditch

Pit

Track/Road

Modern Disturbance

Fig. 2 Area A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Anomalies
Natural
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Modern Disturbance
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Fig. 3 Area B