

Magnetic Susceptibility Survey at Milton Waste Disposal Site, Milton, Cambridge

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SUMMARY

A magnetic susceptibility survey was carried out over an area of land at Milton, Cambridge which was due to be turned into a waste disposal tip. The survey area covered just over 6 hectares and consisted of 177 samples being taken on a twenty by twenty metre grid. The soil was then processed and the magnetic susceptibility reading of each sample taken. Areas of high readings were identified and located on the ground ready for additional archaeological assessments in the form of further geophysical work and a trenching evaluation. Certain areas of enhanced readings were positively identified as being the result of Iron Age/Romano-British occupation areas.

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1 INTRODUCTION

This survey was carried out by the Archaeology Field Unit of Cambridgeshire County Council in collaboration with English Heritage, as part of an archaeological evaluation of the proposed extension to the landfill site at Milton, Cambridge (NGR TL 465 625).

The site lies north of the A14, 3 km to the north of Cambridge and 1km south-west of Milton, as illustrated in Figure 1.

The aim of the magnetic susceptibility survey was to identify any areas of potential archaeological interest over several hectares in order that a more intensive survey could be located in these areas.

These took the form of further geophysical evaluation by Fluxgate Gradiometer and Earth Resistance Meter which were carried out by Geophysical Surveys of Bradford as part of the same exercise over highlighted anomalies.

An archaeological trenching evaluation immediately followed, in areas that were highlighted by the former surveys.

2 GEOLOGY, TOPOGRAPHY AND SOILS

The survey area lies on Gault Clay (h³⁻⁴) of the Cretaceous series with sporadic capping of Pleistocene gravels, silts and marls (Worssam and Taylor, 1969). This is generally covered by approximately 0.55m of mixture of clayey-silt and silty-clay soils of the Evesham 3 and Milton Soil Associations (Mackney *et al.*, 1983). Tite (1972: 231) records the potential fractional conversion of the Gault clays as 205- 460 ($\times 10^{-6}$ emu/g), and the Pleistocene gravels as 240-640 ($\times 10^{-6}$ emu/g)

The site lies on the 10m contour and is very flat and level across the area generally.

The land is presently used for arable farming with different areas of the site under cultivation. The eastern most area had already had the topsoil removed, ready for landfill excavations, when this survey was carried out. The area to the south-east is covered with existing waste pits.

3 ARCHAEOLOGICAL AND HISTORICAL BACKGROUND

Excavations carried out on other parts of the same site in 1994 revealed substantial Iron Age/Romano-British features which were interpreted as partial small settlement areas or farms (Reynolds, 1994). The present surveys would hopefully discover the extent of these sites in addition to other unknown areas of archaeological interest. The *Mere Way* Roman road which runs in a south, south-easterly/north, north-westerly direction lies approximately 300m to the north-west of the survey area.

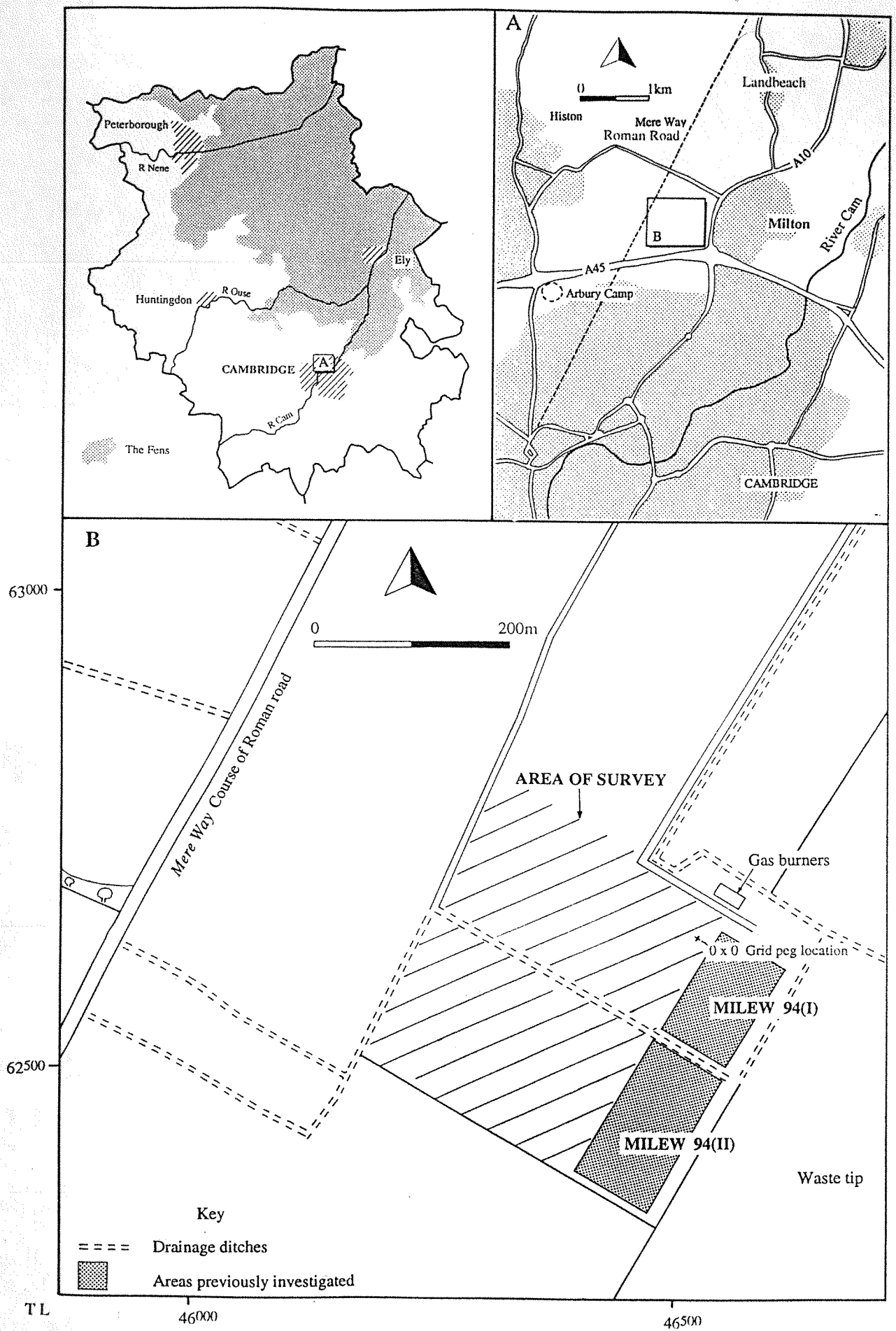


Figure 1 Location map of survey area

4 METHODOLOGY

A south-west/north-east baseline was surveyed in from point '0 x 0' (Fig 1), with the base-line perpendicular to the large field drain which divides the site in two, this drain being the only recorded major landmark close to the site which has remained unchanged. Fourteen perpendicular transects were then taken off the base-line every twenty metres and thirteen samples were taken along these at intervals of twenty metres. The western corner of the site was restricted in length by more than twenty metres and so five samples could not be taken on these grid points (Fig 2). There were therefore 177 samples taken.

An auger survey (located at 'A' Fig 2) was also carried out on one part of the site to test the magnetic susceptibility profile of the soils to use as a standard. Samples were taken from the profile at intervals of 0.10m and their magnetic susceptibility measured.

The soil samples were then taken to the laboratory, dried, sieved (600 microns), and weighed out into uniform weights (11.3 grammes). The magnetic susceptibility of each sample was then measured using a Bartington MS2 laboratory meter and located on a grid in its original position relative to the others. Each grid square therefore corresponds to the 20m square on the ground from which the sample was taken (Fig 2).

5 AUGER SURVEY RESULTS

The results of the auger survey indicate the strength and depth of the enhanced soil above the clay natural, the topsoil reflecting the average readings over the site of 21.5×10^{-8} SI / kg

Depth	Mag. Sus. value
0.00m	= 19 $\times 10^{-8}$ SI / kg
0.10m	= 20 $\times 10^{-8}$ SI / kg
0.20m	= 12 $\times 10^{-8}$ SI / kg
0.30m	= 6 $\times 10^{-8}$ SI / kg
0.40m	= 7 $\times 10^{-8}$ SI / kg
0.50m	= 6 $\times 10^{-8}$ SI / kg
0.55m	= Depth of clay natural
0.60m	= 5 $\times 10^{-8}$ SI / kg

Table 1 Auger survey results

6 AREA SURVEY RESULTS

High susceptibility readings can provide a broad indication of areas in which the magnetic properties of the soil have been modified by past human activities, and the values will usually be enhanced in the presence of past occupation or industrial activity.

The survey produced several areas of concentrated high readings, one between 24 and 46 x 10⁻⁸ SI / kg) in the west of the site (Area I, Fig 2), which contains the second highest value recorded, 46 x 10⁻⁸ SI / kg.

The highest and third highest readings (51 and 36 x 10⁻⁸ SI / kg), lie next to each other in the south-east area of the site, close to the previously recorded archaeological features mentioned above (Area C, Fig 2).

Other areas of high readings (Areas D - K) are illustrated in Figure 2 .

Metres from 0 x 0 grid peg in east of site (Fig 1).

	Location of field drain ditch														
	0	20	40	60	80	100	120	140	160	180	200	220	240	260	
0	18	20	<u>28</u> B	16	18	<u>51</u> C	A 19	20	21	24	22	<u>27</u> G	23	25	
20	18	20	<u>26</u>	11	22	<u>36</u>	20	20	21	18	22	23	<u>32</u>	19	
40	22	20	25	18	20	20	<u>26</u>	18	19	20	20	25	22	22	
60	22	21	22	17	22	21	19	20	22	21	24	20	23	22	
80	19	15	22	18	14	18	22	18	<u>28</u> K	20	22	18	20	<u>26</u> H	
100	15	24	17	15	15	20	21	18	20	18	20	22	19	<u>33</u>	
120	16	15	<u>30</u> D	14	14	17	19	23	22	22	20	22	24	20	
140	15	<u>30</u>	17	13	13	18	19	19	18	<u>29</u>	25	24	25	22	
160	20	18	18	16	15	<u>26</u> E	21	19	22	21	<u>28</u> I	<u>46</u>	<u>27</u>	<u>28</u>	
180	20	20	21	17	19	22	<u>29</u>	19	23	21	<u>35</u>	23	25	<u>27</u>	
200	25	25	19	21	19	20	17	18	16	20	25	22	24	24	
220	19	23	20	22	22	<u>30</u> F	20	19	18	23	23	<u>32</u> J	<u>29</u>	21	
240	20	21	20	22	25	<u>40</u>	<u>31</u>	18	22	0	0	0	0	0	

The average reading is 21.5 x 10⁻⁸ SI / kg.

Display range 11 x 10⁻⁸ SI to 51 x 10⁻⁸ SI/Kg.

Range highlighted over 25 x 10⁻⁸ SI/Kg.

Sample interval 20m, traverse interval 20m

Figure 2 Magnetic susceptibility survey results.

7 CONCLUSIONS

As the auger survey indicates, the site is generally covered with approximately 0.5m of clay soil with enhanced topsoil magnetic susceptibility levels of 19 and 20×10^{-8} SI / kg which is similar to that of the site average. This is over four times that of the clay natural and would therefore be expected to produce reasonable survey results.

It is therefore important to note the relatively high readings in at least three different areas of the site (B, C and I, Fig 2), which may be the result of areas of archaeological interest.

Anomalies in the south-east of the site, marked B ($25-28 \times 10^{-8}$ SI / kg, Fig 2) and C ($36-51 \times 10^{-8}$ SI / kg in, Fig 2) may be extensions of features found in the adjacent, previously recorded area (MILEW 94 I, Fig 1). If these are archaeological features then those in Areas D-K (Fig 2) may be seen as comparable in strength and so also of archaeological interest. A large area of high readings in Area I suggest some form of human activity in this area.

The low readings on the site appear to show the natural clay, or deviations in the depth of the underlying geology (see auger survey results).

8 ACKNOWLEDGEMENTS

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APPENDIX 1

Post-Magnetic Susceptibility survey work.

A Fluxgate Gradiometer survey of the south-eastern area of the site revealed linear anomalies in Areas B and C, which could be interpreted as evidence of ditches. An earth resistance survey also revealed anomalies which were potentially of archaeological significance in Area C. Trenching carried out by Cambridgeshire County Council Archaeology Field Unit revealed a concentration of ditch cuts in the south-eastern part of the site (Areas B and C) which compare favourably with those found in MILEW 94 (I) (Fig 1). Trenches opened in the south-west of the site however, revealed very few substantial sub-surface features other than ditches cut to receive ceramic field drainage pipes. However these fills contained large amounts of carbonised material, flecks of fired clay and pottery, and brick fragments suggesting a Post-Medieval date for their deposition. These remains could help to explain the enhanced magnetic susceptibility readings found in this area.



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