Centre for Archaeology Report 70/2004

Flint Farm Enclosure, Fullerton, Hampshire. Report on Geophysical Survey, February 2004

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ISSN 1473-9224

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Summary

A caesium magnetometer survey was carried out in advance of research excavation by the Danebury Environs Roman programme over the site of a large, plough-levelled, sub-rectangular enclosure of presumed Iron Age to Roman date near Flint Farm, Fullerton, Hampshire. The enclosure is periodically visible as a cropmark and although mapped by aerial photography had not previously been investigated in detail. The magnetometer survey produced exceptionally clear results that considerably improve understanding of the form and layout of the site and the activity within. The survey identifies the sub-rectangular enclosure defined by a ditch on three sides but of unknown extent to the west beyond a belt of trees and further agricultural land not included in the current survey. The western end of the enclosure is sub-divided into several smaller enclosures and other internal anomalies suggest the presence of numerous pits, quarry features and ring gullies indicative of circular dwellings.

Keywords

Geophysical Survey

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FLINT FARM ENCLOSURE, FULLERTON, HAMPSHIRE

Report on Geophysical Survey, February 2004

Introduction

A caesium magnetometer survey was undertaken by the Archaeometry Branch of the English Heritage, Centre for Archaeology in February 2004 over the site of a plough flattened, ditched enclosure of presumed Iron Age to Roman date. The enclosure lies in an arable field near Flint Farm, 3.5km south of Danebury hillfort in Hampshire at NGR SU 349403 and was surveyed in advance and support of proposed excavation by the Danebury Roman Environs Project planned to take place in August 2004. The site lies 300m to the northwest of a similar Iron Age enclosure at NGR SU 353400 (Rowbury Farm) previously surveyed using fluxgate gradiometers (Payne 2003) and subsequently partially excavated under the Danebury Environs programme.

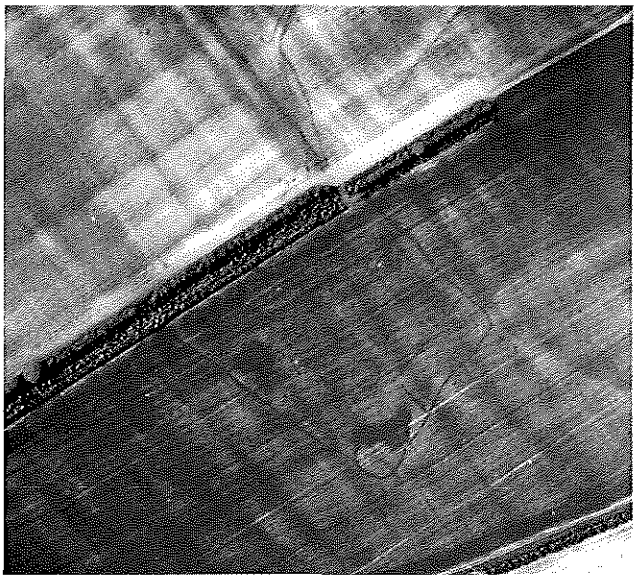

Figure 1. *Oblique aerial view taken from the southeast of the enclosure visible as cropmarks (NMR SU3440-13-85)*

The Flint Farm enclosure was first recorded by aerial photography as a series of cropmarks (see Figure 1 and Palmer 1984) and appears approximately rectangular in form with relatively straight sides, although the full extent and precise form of the enclosure are obscured to the west by a belt of woodland. Internal features visible on the aerial photographic evidence include numerous pit clusters, larger quarry pits and some circular ring-gullies. Previous magnetometer surveys of enclosed settlements undertaken in the Danebury Environs by English Heritage (see Payne 2000) have generally enhanced the information available from aerial photography alone and have also been a valuable aid to precisely positioning subsequent limited targeted excavation trenches on the ground.

The local geology consists of Cretaceous Upper Chalk overlain by shallow well-drained calcareous silty soils of the Andover 2 association (Geological Survey of Great Britain 1949, Soil Survey of England and Wales 1983).

Method

Magnetic survey has proved extremely effective in previous years at mapping the remains of later prehistoric settlement in the chalkland environment of the Danebury area. For this reason the same technique was again employed for the purpose of gaining a detailed and accurately located plan of the enclosure, including evidence of any internal features not visible from the air. Instead of the fluxgate type magnetometers previously used, a high sensitivity array of caesium sensors was employed for the survey mounted on a non-magnetic, wheeled cart. The Flint Farm enclosure provided an ideal test site to assess the effectiveness of the new caesium magnetometer system compared to the numerous fluxgate magnetometer surveys carried out on similar settlements in the Danebury area in previous years (for example Rowbury Farm (Payne 2003), New Buildings, Nettlebank Copse and Houghton Down (Payne 2000, Cunliffe 2000, Bewley 2003; Figs. 92-4)).

A survey grid was established over the site (Figure 2) using a Trimble differential Global Positioning System (GPS). Variations in the total magnetic field were recorded at ~0.1m intervals along parallel north-south traverses spaced 0.5m apart on the grid with an array of four specially modified Scintrex SM4 Smartmag caesium vapour magnetometer sensors mounted on a non-magnetic cart system.

The only corrections applied to the measured values displayed in the enclosed plots were to zero-mean each instrument traverse to remove the directional sensitivity of the instruments. Plots of the resulting data are presented as both an X-Y traceplot and a linear greytone, at a scale of 1:1000 in Figures 4 and 5 respectively. A further greytone image of the magnetometer results is also presented, superimposed on the base Ordnance Survey map data at a scale of 1:2500 (Figure 3) and an interpretation of the data superimposed on the OS map-base at a scale of 1:1250 is supplied in Figure 6.

A plan showing both the caesium magnetometer data recorded at Flint Farm in 2004 and the earlier fluxgate gradiometer data from the neighbouring Rowbury Farm enclosure is provided in Figure 7 to enable visual comparison of the two sets of results.

Results

The results reaffirm the effectiveness of magnetometry on the local substrates of the Danebury Environs and provide a striking image of the layout of the Iron Age settlement.

The enclosed settlement

The main boundary of the enclosure is well defined in the survey as a series of strongly resolved total field magnetic anomalies exceeding the local average of the earth's magnetic field by a range of 15-20 nanotesla (nT). The enclosure ditch has an uneven appearance suggesting it has been quarried or widened in a number of places [see for example the three anomalies marked **A** on Figure 6]. Near the north west corner of the survey area the enclosure ditch appears to widen and then split into two discrete parallel alignments [**B**]. Although roughly rectangular in shape the ditches forming the three sides of the enclosure that are visible in the survey do not run in completely straight sections and curve in and out in places, particularly along the north and east sides of the enclosure.

Further intermittent ditches [**C**], again visible as well defined linear positive magnetic anomalies, form a secondary smaller rectangular enclosure (or internal sub-division) at the north east corner of the main enclosure. A break in the ditch on the west side of this inner enclosure occurs at the location of one of the post-hole circles [**L**] described below.

A second smaller rounded-square enclosure [**D**] is present at the south east corner of the main enclosure and appears to have a distinct boundary of its own as the ditches of the larger enclosure show a pronounced change of direction where they meet [**D**]. The geophysical evidence is insufficient to determine the relationship between the two enclosure boundaries, but the rounded-square enclosure might possibly have already been in existence when the ditches of the main enclosure ditch were laid out (incorporating it into the bigger enclosure) or it may it have been constructed around the same time as the main enclosure, but for a specialized purpose set apart from the remainder of the settlement. The magnetometer has also detected a major quarried-out area on the north and west sides of the corner enclosure visible as a large amorphous area of positive magnetic disturbance of variable magnitude [**E**]. From the magnetometer data it is unclear if the quarrying cuts through the ditches of the enclosure (as would be the case if the ditches were earlier) or the enclosure ditch is dug into the fill of the zone of quarrying. The northern ditch of the corner enclosure [**D**] can be vaguely seen running through the quarried area in the magnetometer data. This might suggest that the ditch is later and therefore undisturbed by quarrying, but the magnetic data is not conclusive. It could also mean that there is a residual section of ditch surviving beneath relatively shallow quarrying.

Another interesting feature of [**D**] is that it contains a noticeable grouping of intense responses indicative of relatively near surface ferrous material [**F**] exhibiting some regularity of layout and spacing. Despite initial suggestions that these anomalies might relate to an archaeological structure, for example industrial features or graves, preliminary information from excavation (Cynthia Poole *pers. comm.*) indicates that the anomalies are unlikely to be caused by archaeological ironwork or metal-working features and are more likely due to ferrous material of recent origin such as broken agricultural machinery parts deposited in the topsoil. Apart from one piece of a modern plough, no other obvious ferrous material was evident in the area corresponding to the magnetic anomalies.

Very large and strongly magnetic pit-fills (in the region of +15 nT above background readings) are evident throughout much of the enclosure (solid red shaded anomalies on Figure 5), increasing in concentration towards the western side of the interior with a particularly dense cluster of pitting and also quarry activity [**G**] located near the south boundary of the enclosure. Another grouping of substantial pits is associated with a curvilinear internal enclosure [**H**] open to the south (where the pits are concentrated) in the north western part of the survey near the limit of the survey coverage.

Several circular gullies, probably representing the foundation or perimeter trenches of free-standing circular timber structures, have also been mapped by the magnetometer survey, the majority located in the eastern half of the enclosed space where there is a lower density of pit-type features. Most consist of single gullies - some only partially resolved as very weak positive magnetic deviations - with diameters averaging around 11m (labelled [**I**] on the interpretation). A single, tentative circular anomaly of similar

diameter is found just beyond the main enclosure ditch (marked [**I?**] on Figure 5). Immediately adjacent to and possibly associated with the concentration of pit-type anomalies at [**G**] is a slightly smaller, oval gully [**J**] 10m in diameter defined by a pair of narrow semi-circular positive magnetic anomalies. The arrangement of these anomalies suggests entrances opening to the east and west. A further more elaborate double ring ditch with suggestions of a third ring between the more strongly defined outer and inner rings has been detected at [**K**]. The more substantial outer ring of [**K**] is approximately 21m in diameter and probably represents a drainage gully surrounding a large timber-built roundhouse with vertical walls retained in the inner circular slots indicated by the magnetometer survey. The magnetic evidence indicates that the outer and inner walls are approximately 15m and 12m in diameter respectively. The more substantial outer gully of [**K**] had previously been recorded by aerial photography but the inner gullies were not apparent. The entrances of the ring-groove or gully structures, where visible in the magnetic data, invariably appear to be orientated to the west. In addition there are two further rings of the same diameter as the single ring grooves formed out of circles of small, closely spaced localised positive magnetic anomalies [**L**]. These probably represent circular arrangements of small pits for retaining upright timber posts of circular free-standing standing structures, spaced at intervals of approximately 1.0m apart or less around the circumference. Similar combinations of gully-built and post-built circular structures are also recorded at the enclosed settlement on Winnall Down, near Winchester excavated in the 1970s, in the early Iron Age phase of the site (Fasham 1994) with which the Flint Farm enclosure shares other similarities (see below).

External and modern features

A ditch has been mapped approaching the enclosure from the south as a positive linear magnetic anomaly [**M**] of slightly weaker magnitude to the anomaly generated by the main enclosure ditch, perhaps due to the greater distance from the settlement activity. It is possible that the ditch at **M** represents a linear boundary ditch that may have been utilised to form the western side of the enclosure. The area containing the expected junction of the southern ditch and the main enclosure unfortunately could not be included in the survey because of obstruction by tree-cover and therefore the precise spatial relationship remains obscure.

Numerous localised positive magnetic anomalies are apparent in the area around the enclosure (selectively shown on Figure 5 as anomalies with blue outlines). As well as being outside the boundary of the enclosed settlement, these anomalies are probably too weakly magnetic, irregular in form and widespread to represent archaeological features. The majority are, most likely, natural in origin caused by features such as tree-root holes, variation in topsoil depth and pockets of clay within the mainly chalk subsoil. The detection of these anomalies may in part be due to the increased sensitivity of the caesium instrument which may be more responsive than fluxgate sensors to natural soil variation. It is not possible to reject them entirely as possible archaeological features without further investigation. If they do in fact indicate further pits outside the boundary of the settlement, this has interesting implications for the tendency of archaeological investigation to focus on enclosed settlement sites defined by boundaries when the archaeological evidence of past use of the landscape may, in reality, extend far beyond the limits of the recognised enclosed space.

Boundary ditches are known in some cases to be later impositions on previously more open and perhaps more extensive areas of settlement (Nettlebank Copse being one example previously investigated by the Danebury Environs Programme; Cunliffe and Poole (2000)). The settlement history of Winnall Down near Winchester provides a useful illustration of these processes with an open settlement in the Bronze Age replaced in the early Iron Age by a D-shaped enclosure, the ditch of which was then partially filled in the middle Iron Age and an open settlement established (Fasham 1994, Cunliffe 2000). This issue has recently been discussed in Haselgrove *et al.*, (2002; p. iv) which identifies five strategic areas central to future research on the British Iron Age and significant gaps in current understanding. A number of areas where changes in archaeological practice would be beneficial are highlighted and one of the specific recommendations is the "need to look outside visible settlement boundaries which were often only part of wider inhabited zones". The close proximity of the Flint Farm and Rowbury Farm enclosures (Figure 6) and the external anomalies around both sites suggest that this may well be an example of one such inhabited wider landscape.

Patterns of former cultivation (possibly remains of ridge and furrow) have been detected as a series of weak parallel linear anomalies in the far north-east corner of the survey. Linear surface cultivation patterns are also visible throughout the entire survey area running on a SW-NE alignment approximately parallel with the western boundary of the modern field. A possible former agricultural boundary or land drain is visible as a narrow weakly positive linear magnetic anomaly [**N**] running diagonally through the survey area from the middle of the eastern side to near the north western corner.

Conclusions

The magnetometer survey has provided a detailed plan of the settlement (with the exception of the unknown limit of the enclosure to the west where it enters a densely planted belt of tree cover) and the range of internal activity. The survey results reveal an interesting internal division between the eastern part of the enclosure where circular gully and post-hole structures are prevalent and the western part which contains a high density of the more obvious larger pit-type anomalies. At the nearby unenclosed middle Iron Age settlement on Winnall Down (excavated between the late 1970s and early 1980s) there was a similar clear separation between houses and pits (Fasham 1994; p63). No obvious entrance to the Flint Farm enclosure has been identified in the geophysical data, the defining ditches appearing largely continuous around the northern, eastern and southern sides of the circuit. It is therefore probable that an entrance is present in the un-surveyed tree-covered area immediately west of the survey or in the adjoining field on the other side.

The results from Flint Farm represent a considerable improvement over previous fluxgate surveys over similar sites in the Danebury environs, including the neighbouring 'twin' enclosure at Rowbury Farm located 300m to the south east surveyed in 2003 (Payne 2003). Although successful in their own right, the earlier fluxgate results appear to be less detailed than the caesium results, possibly due to the combined sensitivity of the caesium sensors and the narrower 0.5m traverse interval compared to 1.0m at Rowbury Farm. The use of a wheeled cart may also have reduced systematic anomalies within the data due to the gait of operators carrying hand-held instruments. It is of interest to note that anomalies due to subtle ring gullies have been detected by the caesium survey at Flint Farm but were absent from the fluxgate gradiometer data

collected from Rowbury Farm, where the presence of such features (dating to the primary early Iron Age phase of the site) was subsequently proved through excavation (see Figure 8 below and Cunliffe 2003).

Figure 8.
Intercutting ring-gullies in the process of excavation at Rowbury Farm enclosure in 2003. One notable difference between these features and those at Flint Farm is that they were partially cut through and disturbed by later activity on the site.

Excavations carried out in August 2004 at the Flint Farm enclosure focussed on the largest of the suspected circular ring-gullies visible in the magnetometer survey as a series of three concentric circular weakly positive magnetic anomalies (Figure 9; anomaly [**K**] on Figure 6). The main excavation also included part of the adjacent circle of very slight positive anomalies [**L**] suspected as representing the post-sockets of a round free standing timber building. Intrusive examination of these anomalies has proved valuable for assessing the effectiveness of the caesium magnetometer array at detecting traces of relatively insubstantial former post-hole structures, one of the reasons for developing a magnetometer system which is more stable and sensitive than the previously utilised hand-held fluxgate gradiometer type magnetometers.

Figure 9. *Views of the sample of the interior of the Flint Farm enclosure in the process of excavation in August 2004. The outer gully (**A**) and concentric wall slots (**B**) of the large round-house (anomaly **K** on Figure 6).*

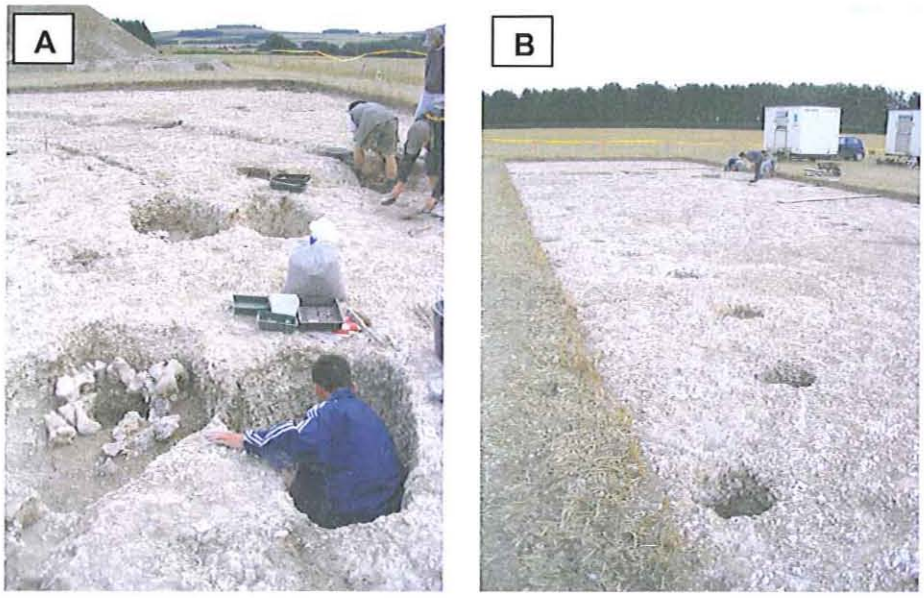

Figure 10.
A) *the door-post sockets of the west facing entrance of the large round structure.*
B) *the 30cm diameter post-sockets of the adjacent round post-built structure (anomaly* ***L*** *on Figure 6).*

Excavation demonstrated that the three concentric rings visible in the caesium magnetometer data represent an example of a particularly substantial round house of early Iron Age form similar to examples previously excavated at Cow Down, Longbridge Deverill, Wilts. and Pimperne Down, Dorset both of which were 15m in diameter and divided into a central region and peripheral space explaining the concentric wall foundation slots. The Flint Farm round house (Figures 9 and 10) is directly comparable in scale to these previously excavated examples. The Flint Farm building was encircled by an outer drainage gully 20m in diameter constructed to keep the soil, in which the vertical timbers were bedded, sufficiently drained to slow down their disintegration. The entrance to the Flint Farm building was also clearly defined in the magnetometer survey, where two larger pits on each side of the entrance gap supported the door posts of a porch-like structure (Figure 10(A)).

The adjacent arc of possible post-holes (anomaly **L** on Figure 6) was also included in the excavated area and the presence of a post-hole structure was confirmed consisting of post-holes of around 30cm diameter spaced about a metre apart with dark charcoal rich fills (Figure 10(B), Barry Cunliffe *pers. comm.*).

Surveyed by: N Linford, P Linford, L Martin, A Payne — Date of survey: 02-05/02/2004

Reported by: A Payne — Date of report: 30/9/2004

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Acknowledgements

Thanks are extended to Roger Dines who for the second year running granted access to his farmland to conduct the geophysical survey.

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FIGURE 2

FLINT FARM ENCLOSURE, FULLERTON, HAMPSHIRE Location of Caesium Magnetometer Survey, February 2004

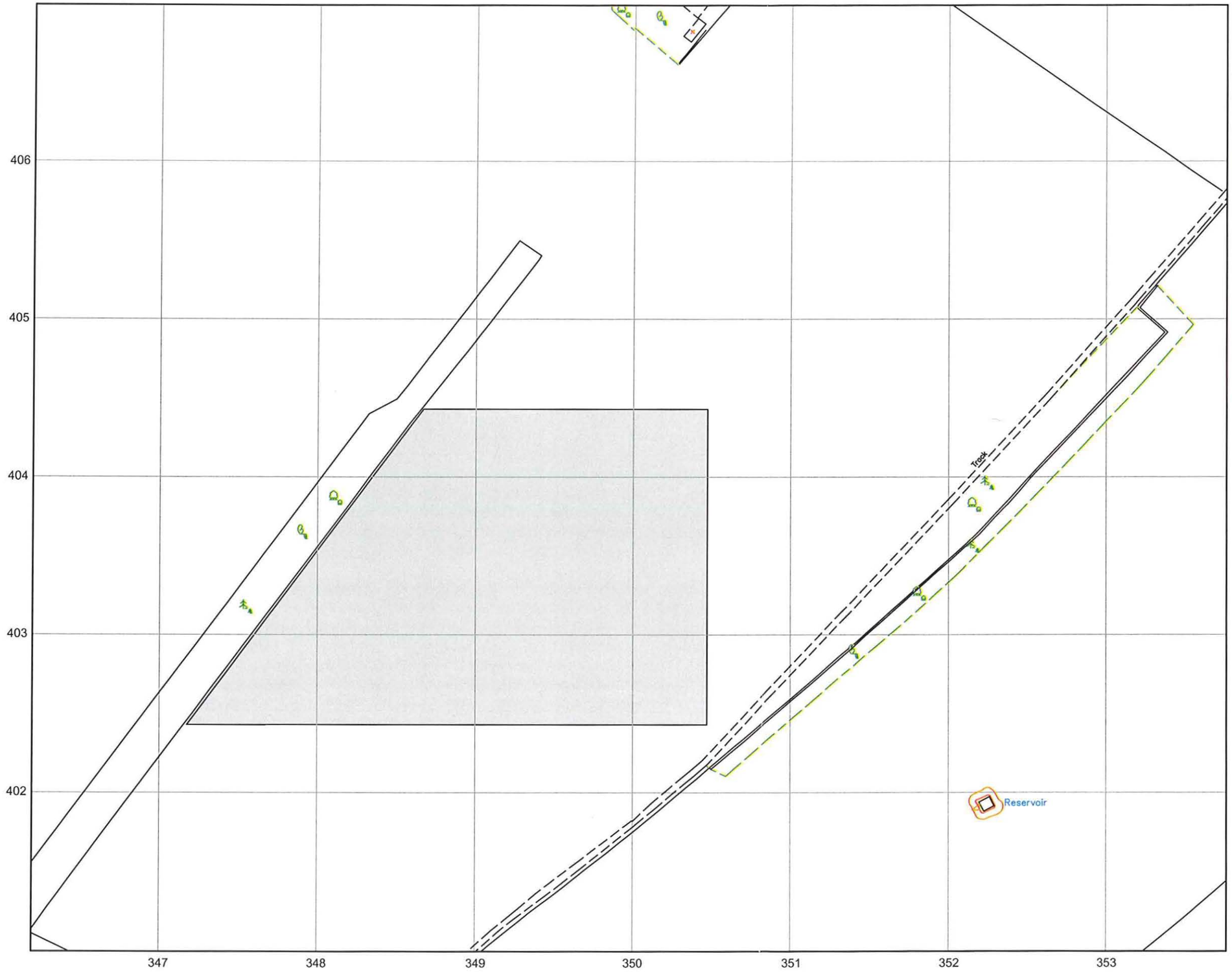

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FIGURE 3

FLINT FARM ENCLOSURE, FULLERTON, HAMPSHIRE Location of Caesium Magnetometer Survey, February 2004

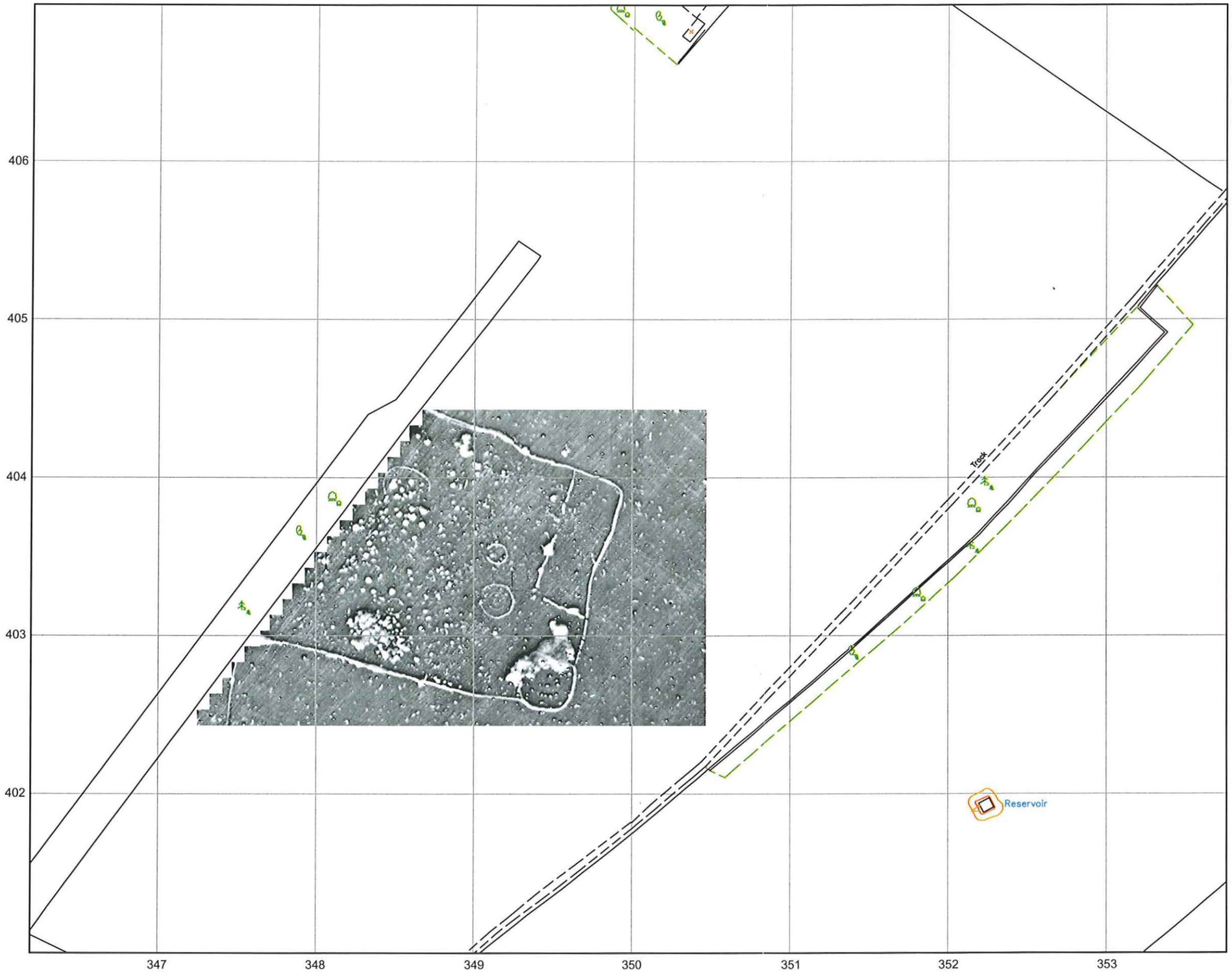

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FIGURE 4

FLINT FARM ENCLOSURE, FULLERTON, HAMPSHIRE

Caesium Magnetometer Survey, February 2004

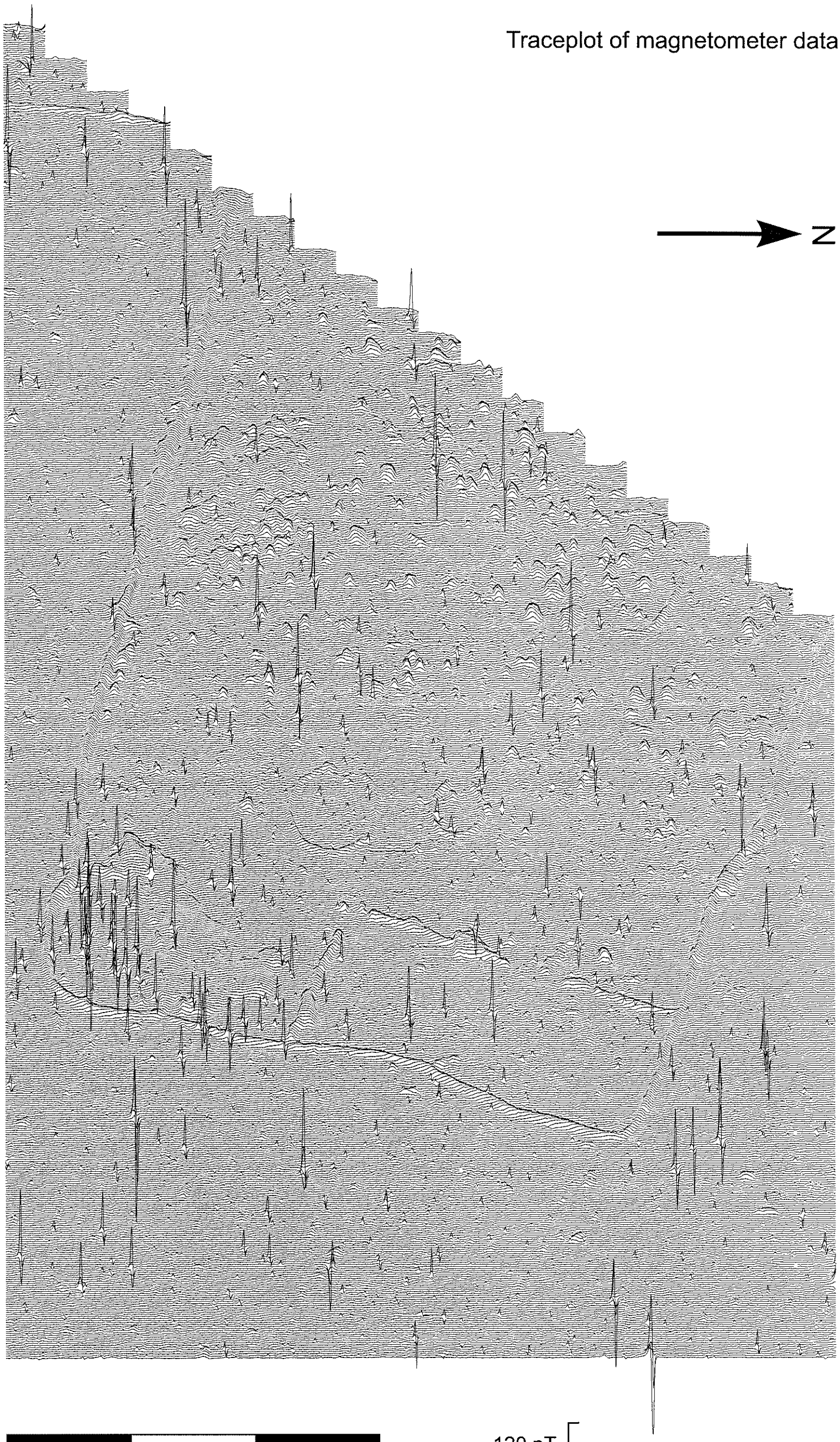

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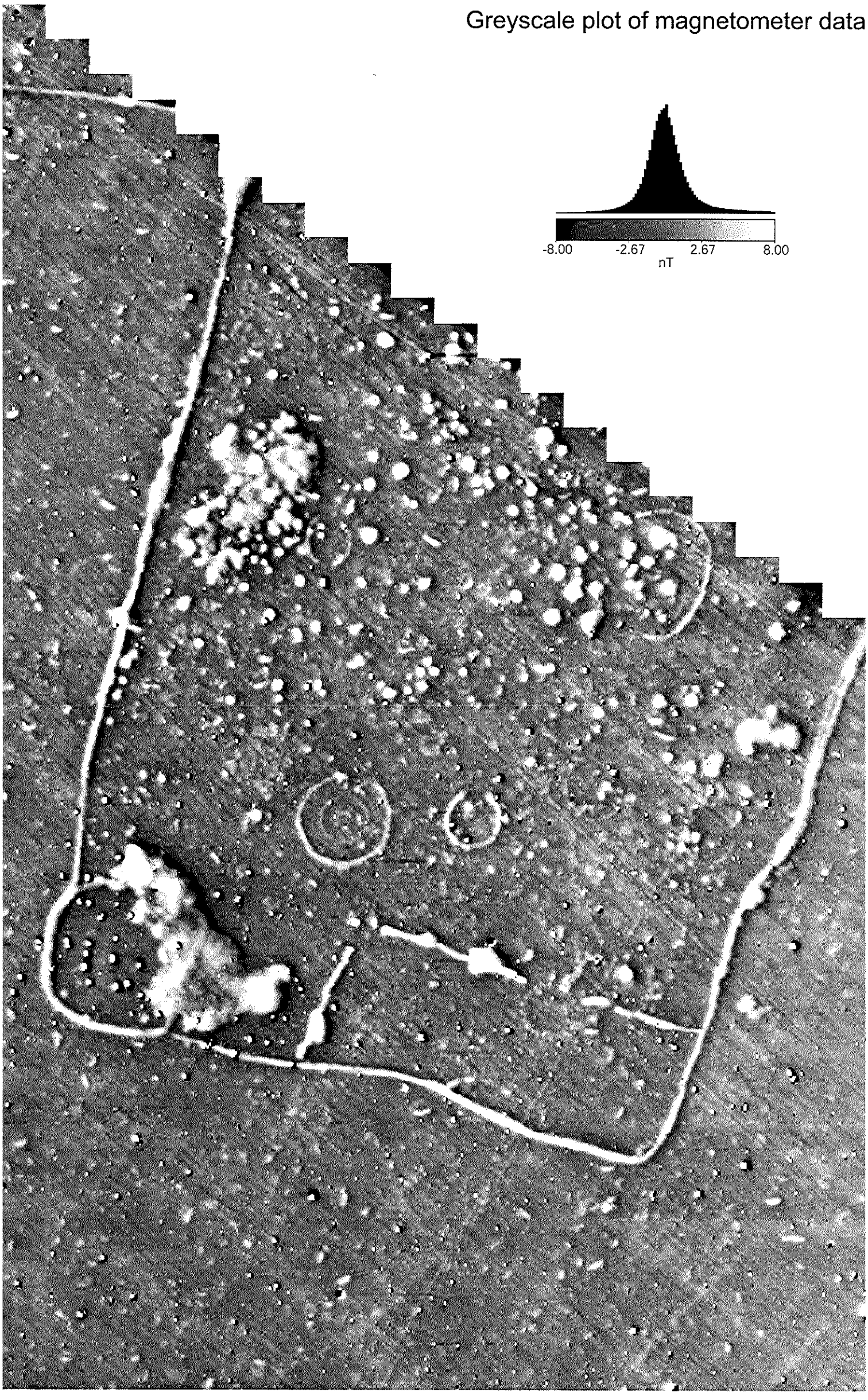
FIGURE 5

FLINT FARM ENCLOSURE, FULLERTON, HAMPSHIRE

Caesium Magnetometer Survey, February 2004

Greyscale plot of magnetometer data



0 30 60 90m

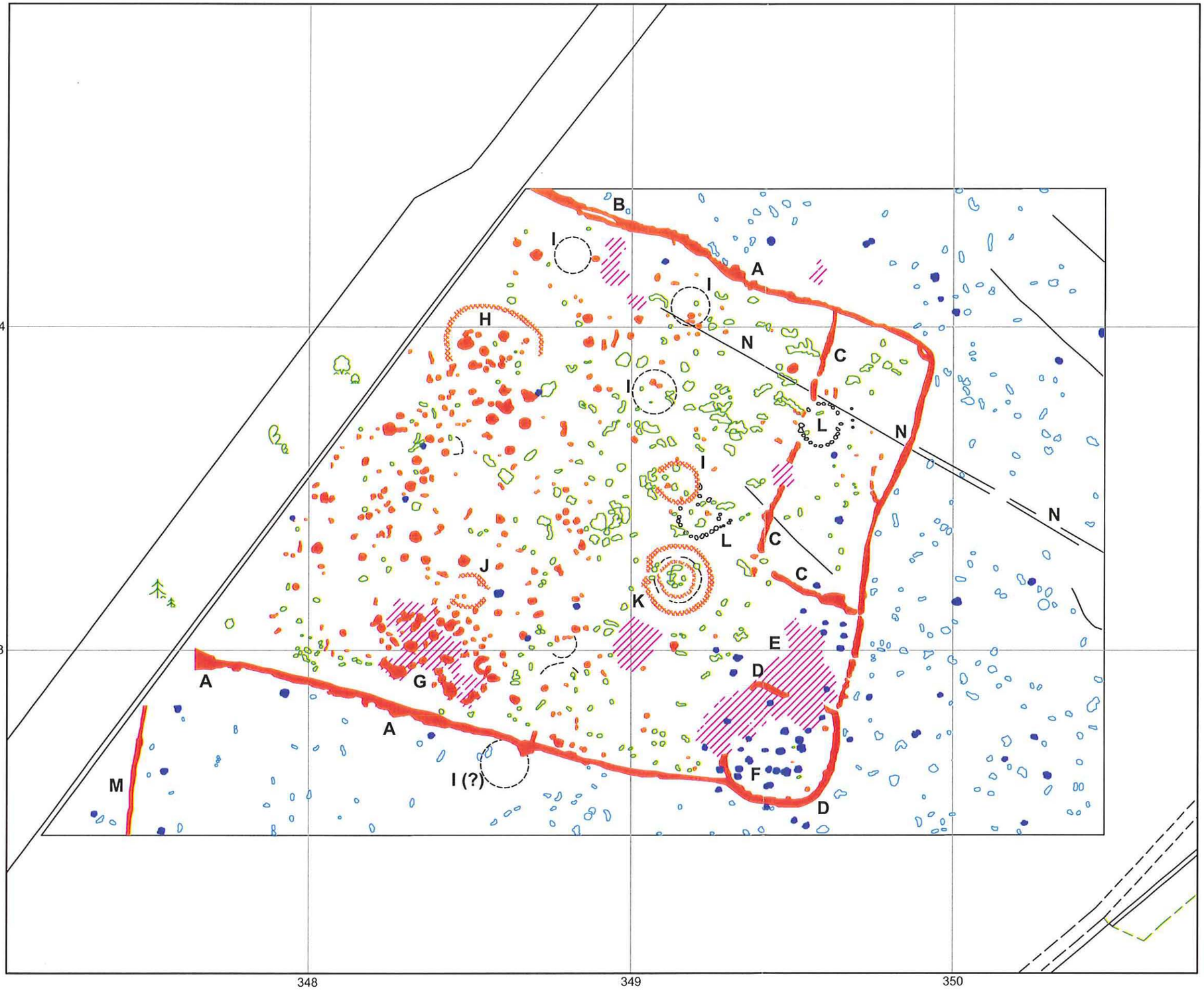
1 : 1000

N

English Heritage, Centre for Archaeology, 2004

FIGURE 6

FLINT FARM ENCLOSURE, NEAR FULLERTON, HAMPSHIRE Interpretation of Caesium Magnetometer Survey, February 2004



N

INTERPRETATION OF MAGNETIC ANOMALIES

- linear positive magnetic anomalies representing ditches
- pronounced localised positive magnetic anomalies representing large pits
- moderate localised positive magnetic anomalies representing possible pits or shallow scrapes
- extensive positive magnetic anomalies of varying magnitude representing large quarry pits/quarried areas or concentrations of pits
- circular or oval gullies/narrow ditches - well defined
- possible circular gullies - marginally defined
- circular post-hole structures
- intense magnetic anomalies indicative of ferrous material
- selective minor positive anomalies outside the enclosed area - the majority of these probably relate to natural disturbances in the subsoil such as tree-root holes or clay pockets but some may be archaeological
- weak linear positive magnetic anomalies - former agricultural boundaries or cultivation patterns

1 : 1250

0 30 60 90m

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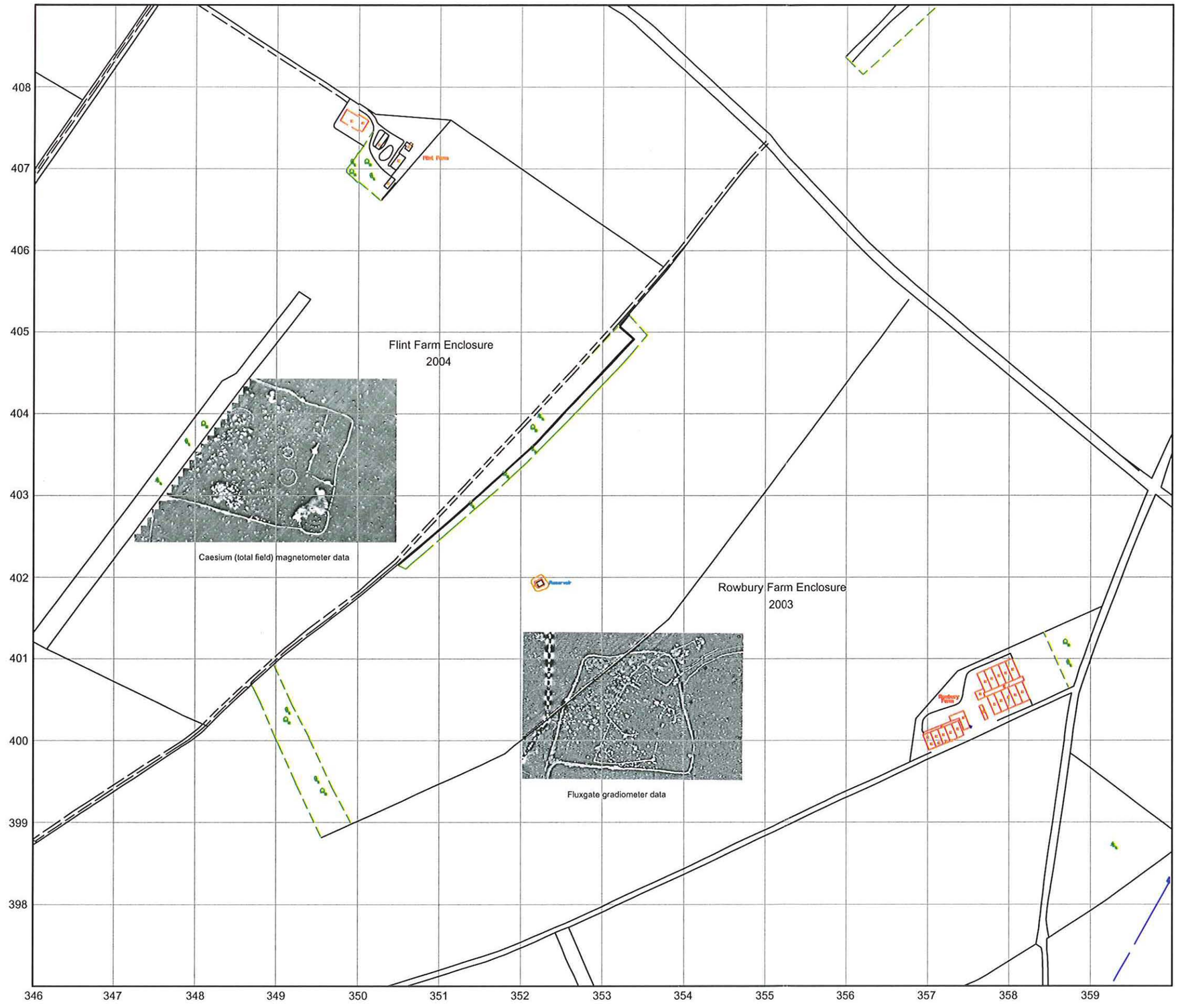
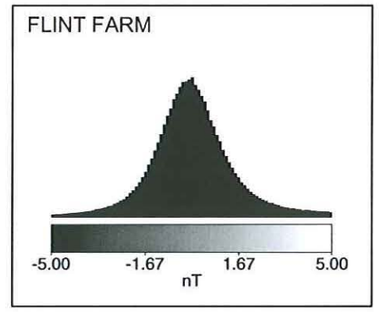
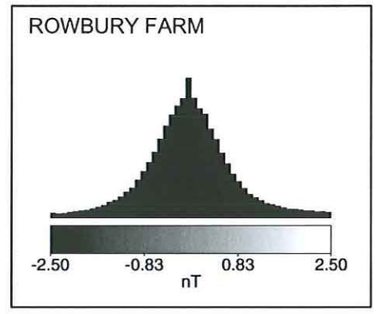
FIGURE 7

FLINT FARM AND ROWBURY FARM ENCLOSURES, NEAR FULLERTON, HAMPSHIRE

Location of Magnetometer Surveys 2003 & 2004







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