SURVEY RESULTS

99 / 80 Birdoswald

1. Survey Area

1.1 The two fields surveyed in this exercise can be seen in Figure 1. Two areas were surveyed in West Field using both magnetic and resistivity techniques. Two small areas were assessed in New Field, one using fluxgate gradiometry alone and the other also using a caesium vapour instrument.

1.2 The survey grids were set out by *English Heritage* surveyors with the intention of re-establishing the original *Timescape* grid.

2. Display

2.1 The results are displayed as X-Y traces, dot density plots and grey scale images. These display formats are discussed in the *Technical Information* section at the end of the text.

3. General Considerations - Complicating factors

3.1 Conditions at the site were good. The grass was reasonably short and there were no obstacles within the survey area.

3.2 The soils at the site are seasonally waterlogged fine loamy soil over clay (SSEW 1983). It was clear from the previous work that within the area of the fort the magnetic response would be enhanced over and above natural background levels. In the non-settlement areas, however, the response was likely to be poor.

4. Results from West Field

4.1 The survey in this field was undertaken to re-establish the original *Timescape* magnetic survey and to enhance the interpretation by means of a resistivity survey. In particular it was the intention to define an elliptical area noted on the *Timescape* survey and to establish the character and nature of anomalies around this area. Both survey techniques covered ten 20x20m grids (0.4ha).

Areas A and B

Fluxgate Gradiometer Survey

4.2 The magnetic survey covered two parts of this field. The larger survey (Area A) was over the widest part of the elliptical zone, with a further area at the point where the area of magnetic low narrows (

4.3 Fringing this magnetic low area are many strong magnetic responses. The extreme positive and negative values associated with these anomalies are typical of those associated with settlement. These anomalies are largely a product of heavily magnetically altered soil that is typical of sustained anthropogenic activity. The alignment of the anomalies is roughly at right angles to the road. It is likely that a few of the negative anomalies indicate walls of low magnetic susceptibility buried within high susceptibility material. However, definite wall lines are rare and certainly not as common, or conspicuous, as those surveyed by *Timescape* either within, or to the east of, the fort.

Resistivity Survey

4.5 The resistivity results are both highly informative and yet surprisingly lacking in structural detail.

4.6 The most obvious and recurrent anomaly is the narrow and regular striping that is the result of ploughing. Two of the more obvious stripes may result from former field divisions or drains. It may be of some note that these anomalies align with the trend of the strong positive magnetic anomalies, suggesting that the ploughing was undertaken, or at least started, at a time when archaeological features were extant as earthworks. It is of note that while no evidence for ploughing can be seen in the magnetic data collected during this project, there are suggestions in the more extensive *Timescape* survey, especially in the highly magnetically enhanced soils near the fort.

4.7 Evidence for structural remains is sparse; in the western sample structural evidence is only suggested to the south of the road. Even at this position, the high resistance does not coincide with the magnetic anomalies; it must be concluded that this high resistance is more likely to be associated with the structure of the road than settlement. The settlement structures would appear to be impervious to assessment using resistance methods, at least during the summer months.

4.8 The results associated with the Military Way, however, allow different interpretations to be considered. One possible interpretation is that the resistance data indicate that the main component of the road changes between the eastern and western sample. The eastern sample, although small, clearly identifies the road as a high resistance anomaly that is the result of a material, such as stone. By comparison, in the western sample the rosad appears to be characterised by a low resistance anomaly. This suggests that soil is the main medium at this point, although the southern edge appears to be partially stone derived. This would indicate that the road changes character approximately 100m from the west gate of the fort. The remainder of the broad elliptical magnetic low could simply be soil, effectively smeared by natural and human activity, or even indicating re-construction of the road along a slightly different course. The high resistance noted at the southern edge may be an attempt to retain the road against subsidence. If the vicus were constructed after such an alteration, then the apparent excessive width of the road at this point (c.15m) could be accounted for. However, these seem unlikely scenarios; in particular the change in construction of the road to a non-metalled surface so close to the fort is difficult to comprehend.

4.9 An alternative set of events can be derived from the geophysical evidence. Firstly, the assumption that the high resistance material is not shoring a soil track, but is in fact the road itself. The large low resistance anomaly to the east of this putative road surface could easily be an area of robbed out road. If this was the case then it is clear that a re-alignment of the road must happen between the two samples, perhaps at the presumed cross roads noted in the magnetic data. Support for this theory comes from the original *Timescape* survey; a ditch type anomaly apparently creates an 'opening' that would allow the road to pass through the elliptical area at its western end. If this is correct then a number of conclusions can be drawn. Firstly, the ploughing has cut into the metalled surface and has damaged it. Secondly, the road, ditch and houses would have framed the elliptical area, although for what purpose is unclear. From the geophysical evidence we can only say that the area to the north of the putative road is made up of soil derived from non-occupation deposits. It is not clear if this triangle is garden or an open area used for commercial or other purposes.

5. Results from New Field

5.1 The survey in this field was undertaken in an effort to establish the likely position of cremations and associated features. It was known from the *Timescape* survey that the magnetic response was likely to be very weak. It is also known that the form of remains found previously within this field are unlikely to produce a measurable resistivity response. In fact, burial remains are among the most difficult anthropogenic features to map using non-invasive techniques. In this case, the probability that burnt remains were present indicated that magnetic survey was still the best approach. Two methods were used to establish the variation in the magnetic response; fluxgate gradiometry and caesium vapour magnetometry. A fluxgate gradiometer was used over two 20x20m areas, while the caesium instrument was used over one of the squares.

Area C

Fluxgate Gradiometer Survey

5.2 The fluxgate survey has indicated a number of weak responses above the predicted low magnetic background. Few anomalies of clear interest have been found. The small scale 'blobs' may be individual cremations or simply noise related to variations within the soil.

Caesium Vapour Survey

5.3 The caesium vapour instrument was used over Area C only. Unfortunately, the instrument had acquired a shift from zero as well as significant 'jumps' at irregular intervals. The former is inconsequential as the measurements are relative, while the jumps were corrected by a numerical shift. Both the raw and corrected data are shown in Figure 10. The data show similar variation to the fluxgate, although there are many minor differences.

Area D

Fluxgate Gradiometer Survey

5.4 This 20m square was positioned over a large anomaly noted on the original magnetic survey. The anomaly was scanned out and the grid was set out independently of Area C. A single large anomaly was revealed. The archaeological interpretation of this anomaly was that it may be the result of a pyre site, which had significantly altered the permanent magnetic properties of the soil.

Trenching Strategy

5.5 Two trenches were positioned as a result of the magnetic surveys in Area C. The first was based on a semi-circle found only on the caesium data. It was hoped that this anomaly might indicate the location of a small ditch surrounding a cremation. However, on excavation it was decided that the physical evidence suggested that ridge and furrow is more likely to have produced the response. At the eastern end of the trench a badly plough-damaged cremation was found. The second trench was over an area where both methods had produced slight positive anomalies. In this case, a well-preserved cremation was located.

5.6 On excavation of the trench in Area D, no evidence of burning was found and the natural subsoil was reached without evidence for any archaeological features. It is assumed that the anomaly is associated with a deeply buried igneous boulder and the anomaly is, therefore, due to natural factors.

6. Conclusions

6.1 The survey in West Field verified the magnetic responses of the *Timescape* survey and characterised the majority of the anomalies as derived from settlement activity. The resistance results suggest two interpretations. Firstly there may have been a change in construction of the Military Way from a metalled surface near to the fort into a soil track some 100m from the Principal Western Gate. Secondly, the road may have been substantially robbed and plough damaged along the southern edge of the elliptical area. If the latter is true, then the elliptical area is derived from a sterile soil i.e. a non-settlement or non-industrial context, and may have been a garden or have some communal function. If the former is true, then the ditch type magnetic anomaly that frames the elliptical zone at its western edge must be a later addition.

6.2 The resistance data has provided fresh evidence on West Field. It is likely that a more extensive survey would be highly beneficial to the investigation of the elliptical zone and its association with the Military Way. In particular, a larger resistance survey may reveal evidence for the ditch associated with the Turf Wall, which in turn may be connected with the low resistance of the elliptical space. It would be also of great interest to conduct measurements at depth; the 0.5m Twin-Probe used in this survey evidently measured inhomogeneities at the near surface c.f. the evidence for ploughing. Pseudo-section methods would allow a greater understanding of the construction of the road and elliptical zone.

6.3 The magnetic surveys in New Field have produced the expected problematic response. Neither fluxgate gradiometer nor caesium vapour instruments gave definitive statements on the presence of cremations, but used in conjunction some of the features may be identified.

Project Co-ordinators: Dr C F Gaffney and J Gater,
Project Assistants: L Harvey and A Shields

Date of Survey: 27th- 29th June 1999
Date of Report: 19th November 1999

References:

Biggins, J.A., J. Robinson and D. J. A. Taylor 1999 *Report on a Geophysical Survey of the Settlement and Cemetery at Birdoswald Roman Fort, Gilsland, Cumbria.* Unpublished.

SSEW 1983. *Soils of England and Wales. Sheet 1, Northern England.* Soil Survey of England and Wales.

Time Team 1999 *Evaluation of the cremation cemetery and the western extramural area of Birdoswald Fort, Cumbria: Project Design.* Unpublished.

The authors would like to thank Julia Robinson of Timescape Archaeological Surveys for allowing access to an unpublished report and data from the extensive survey at Birdoswald. Thanks are also due to Tony Wilmott who has supplied us with many insights concerning the archaeology of the area. Finally, we gratefully acknowledge the support of Bruce Bennison and his staff at the fort who made us feel most welcome during our brief stay.

SITE SUMMARY SHEET

99 / 80 Birdoswald

NGR: NY 616 663

Location, topography and geology

Birdoswald Roman Fort lies 3 km east of the village of Gilsland, Cumbria. The fort is the eleventh from the eastern end of Hadrian's Wall and is part of the World Heritage Site. The geophysical investigation at the site was limited to a flat grassed area ('West Field') directly west of the fort and a piece of elevated land approximately 400m further west ('New Field').

Archaeology

The land to the west of the fort is largely devoid of earthworks, although it was known that extramural settlement would exist. An earlier geophysical survey by *Timescape* (Biggins *et al,* 1999) indicated considerable activity both to the east and west of the fort. An interim report on the findings of the survey concluded that an unusual arrangement is seen in the western area where an apparently open, elliptical space was noted on the line of the Military Way. While conventional survey in New Field has revealed little, ploughing has produced evidence for cremated bone.

Aims of Survey

The aim of the surveys at Birdoswald can be divided into two:-
1. West Field. Both resistivity and fluxgate magnetometer survey were undertaken to further the interpretation of the elliptical space. It was believed that some of the geophysical anomalies at the edge of the elliptical open space may indicate cremation burials (Biggins *et al*) or mausolea (Time Team, 1999) rather than settlement - the geophysical work was designed to establish the nature of the archaeology in West Field.
2. New Field. High sensitivity and high sample density magnetic measurements were undertaken over part of the cemetery. It was hoped that such a strategy, involving both fluxgate and caesium vapour instruments, would help identify both individual graves and the extent of the cemetery.
The work was undertaken as part of a wider evaluation by *Time Team* for a TV documentary to be screened by Channel 4.

Summary of Results *

The geophysical work in West Field has clearly identified many anomalies of archaeological significance. It was believed that the results were most likely to indicate settlement rather than cemetery and this was proved by excavation. The alignment of the Military Way through the elliptical space has been interpreted in two ways. However, the most likely scenario is that the road follows the southern edge of the elliptical space, exiting the western edge through a gap between ditched features. The elliptical space appears to be comprised of magnetically unmodified soil, suggesting neither settlement nor industrial activity.

In New Field the interpretation of the geophysical evidence is more ambiguous. While a cremation was identified and excavated, it is believed that the magnetic contrasts are, on the whole, too weak to be distinguished from the background response from the soil.

*** It is essential that this summary is read in conjunction with the detailed results of the survey.**

List of Figures