

A topographic map of North West England, showing the region's terrain with brown and green hues. The map is centered on the region, with the surrounding sea to the west and south. The text is overlaid on a white rectangular background in the upper portion of the map.

Evaluating Aggregate in North West England

The Effectiveness of Geophysical Survey

Summary and Conclusions

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Introduction

We have half a century of evidence that archaeological geophysics “works”. Thousands of surveys, carried out all over the world and in a vast range of conditions, have mapped buried remains and helped archaeologists pursue research and conservation. The wide use of geophysics in some cut-throat commercial environments, where technical efficiency is vital, shows that some archaeologists think it provides what they need against tough competition from other methods of survey. Yet others remain sceptical. It is striking that professional opinions about such objective matters can differ so much yet it is a symptom both of the complexity of the issues and of the persistent lack of objective measures which the project reported here tries to address, at least locally, to address.

This paper is the result of a study of archaeological geophysics in the North West of England. It was prompted by the concerns of some professional archaeologists - curators and consultants - that geophysics did not give them what they need. As a result some had doubts about whether it should be used at all. Concerns over the effectiveness of geophysical survey in the North West are particularly significant since there are often no good alternatives. The project therefore set out to identify all of the surveys which had been carried out in the NW, concentrating on commercial projects since 1990, and to analyse those with sufficient evidence to see how effective they had been. In addition, discussions were held with almost all of the surveyors, curators and consultants working in the region to find out what they thought could be done to make geophysics a more effective tool. On the understanding of anonymity some strong views were expressed and it became clear that very few are comfortable with some key aspects of the professional practice of geophysics in England.

This document distils both the study of survey outcomes and the subsequent discussions to reach conclusions concerning the narrow question of whether archaeological geophysics is doing its job and the wider question of how it might be better used.

It is accompanied by three other documents:

- 1 The original project design, which gives the project background and provides a framework for understanding its conclusions
- 2 The full report, which describes the project and its outcome in detail
- 3 An academic paper which condense the project report and places it in a wider context

The first two are available as PDF files online at:

www.terranovaltd.co.uk

The third is in press and will be available as an online version once published

Summary, Conclusions and Recommendations

- 1 Geophysical survey in the North West of England usually produces results which meet the needs of those who commission it. It deserves a key role in archaeological site evaluation and deserves to be applied more often and more widely. Geophysics appears to be (perhaps surprisingly) reliable, not only in identifying where there are buried remains but also in identifying where they are absent.
- 2 Only about 10% of surveys fail entirely to meet the need for which they were commissioned, for example by failing to detect substantial remains.
- 3 We might expect that the reasons why surveys fail will be complex but this does not appear to be so. In the North West, at least, surveys only fail where the archaeological remains are unusually deeply buried, are masked by other (usually modern building debris or metal) anomalies or in the unusual circumstance that there is too little geophysical contrast between remains and their surroundings. The causes and effects of these problems are already well understood. They are cumulative: Deep burial, interfering anomalies or weak contrast alone may not make remains undetectable, but any combination of these is much more likely to do so.
- 4 Most sites where standard survey may not be successful can probably be identified in advance by some simple map and field research, and thus survey can either be avoided or adapted. This kind of preliminary study would cost very little and should be made routine.
- 5 Although there are plenty of commercial surveys in progress, archaeological geophysics is, nationally, suffering from a lack of research. There is a real prospect that research could improve the

techniques and application of geophysics in the NW, as elsewhere, and the abundance of surveys and excavations present abundant opportunities. These are being missed because of the restrictive structure of commercial archaeology – which to some extent discourages research - and the lack of central funds. Research needs to be promoted at the national level and built into the normal fabric of archaeological projects if it is to have the necessary scope. A small investment here could bring significant rewards in more effective, more precisely tailored survey.

- 6 The planning system fails sufficiently to distinguish and reward skilled survey and basic data standards need to be set to reverse what conscientious surveyors see as a race to the bottom. The national bodies (EH, IFA, CBA, ALGAO ...) and local authorities need to ensure that contractors reach adequate standards and receive rewards which recognise their skill. Curators need to assess survey quality needs more fully and require work of higher quality, inevitably at greater cost, where it is likely to be useful. There will be some cases where cheaper, simpler survey can also be identified as appropriate but standard survey data density (1x0.5m for magnetometry, for example) is already rather sparse for detecting many kinds of remains, in more complex geophysical environments, and the norm should be set a bit higher. New technologies will make this easier.
- 7 The skills of expert surveyors are being wasted, and surveys inadequately designed, because briefs are formulaic and guidelines, intended as minimum standards, have become a very restrictive norm. Instead briefs should only define the aims of a survey and the quality of data required to meet them, explicitly stating the purposes of a survey, and thus the targets (eg the size of buried ditches) that must be detectable by it. Briefs should not, however, define the methods to be used to achieve this and surveyors should be given

discretion to decide how to carry out a survey, but should be required to justify their design in the light of its purpose.

- 8 Surveys would be more effective if surveyors had greater freedom to adapt, expand or increase the density of data gathering – or to change the method in use - following an initial phase of survey. A more explicit examination of survey designs, in relation to their purpose, should result in a wider variety of approaches and survey densities – and this would be welcome if it means that surveys more closely fit their purpose. Many surveys would, as stated in point 6 above, benefit from closer survey data spacings in areas of particular complexity or interest, and this could be defined by an initial survey.
- 9 There is likely to be considerable benefit in the wider use of alternative techniques – Electrical Resistance Tomography, Magnetic Susceptibility, Ground Penetrating Radar and Electromagnetic Conductivity methods, for example. Projects may also benefit from the use of geophysics in mapping things other than simply buried archaeological remains – sources of palaeoenvironmental evidence such as former river courses for example. Geophysics might also have a key role in monitoring physical and chemical changes taking place within sites in response to climate change.
- 10 Much of the forgoing requires that we develop a new and more subtle way of using geophysics and of designing survey briefs - more informed, more flexible and more diverse. This, then, requires that Consultants bring in expert geophysical surveyors as paid consultants at an early stage of projects and this should be a routine stipulation of briefs issued by curatorial teams.
- 11 Survey contractors need some standards for the interchange of data at the beginning and end of projects. At the beginning they should

receive sufficient information about the geology, soils, topography, landuse and history of a site to make rational decisions about survey strategies (to get away from the formulaic approach we have now). This should be derived from two sources – a standard series of map searches carried out through the BGS under a national Service agreement and a walk-over survey, carried out with a standard checklist, by the curatorial team or the archaeological consultant. At the end of the project the survey contractor should return a minimum package of data to the their client who is obliged to pass this, and related excavation data, back to BGS to enhance our national soil and geology maps. This symbiotic relationship could be an effective way to enhance the work of all concerned at negligible cost. It should prove very attractive to BGS, in particular, since archaeologists and geophysical surveyors generate data and have access to Quaternary geological exposures of a range and spatial distribution of which most geologists can only dream.

- 12 Similarly, it is important that surveyor contractors receive copies of excavation reports and plans, as a matter of course, so that they can assess how well their survey represented the buried remains and learn about how to survey more effectively. This should be a standard stipulation of excavation briefs, as a part of the normal archiving process.
- 13 Curators, consultants and survey contractors all need better independent technical support from experts in archaeological survey. The English Heritage Geophysics team could fill this role but needs to be better funded and to be given a wider remit to do so. This would, however, be a very worthwhile investment because their considerable expertise and decades of experience are currently being underused. A new post might therefore be established, within this team, with

specific responsibility to provide advice and advance research in routine commercial projects.

- 14 Nobody really believes that magnetic scanning (unrecorded magnetometer survey) is reliable. It should stop. Some surveyors, however, feel that they can't challenge briefs which require it because they will then be excluded from future invitations to tender. This is, in itself, a significant criticism of the current system by which surveys are commissioned.
- 15 Geophysical survey is too often commissioned at very short notice, which causes contractors endless problems in providing staff – and thus puts them under pressure to lower standards, just to get the job done under senseless commercial conditions. Briefs need explicitly to give surveyors time to carry out work designed and performed to professional standards, and this needs to be written into briefs.
- 16 Survey results are often difficult to access, as this project found, and the digital archiving of original data, processed data and survey reports should be a routine requirement of survey briefs. The cost of this, on the other hand, should be borne by survey clients and not the surveyors themselves.

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