Conclusions and Recommendations

The geophysical survey of the ALSF Focus area has successfully mapped existing crop mark features as well as numerous new potential archaeological anomalies. This research has also provided a thorough assessment of basic methodologies and techniques for geophysical survey in the field. The results of the geophysical survey contain some data surprises and pose interesting questions and perhaps challenge present practices of archaeological site assessment.

An overall view of the geophysical anomalies from the ALSF Focus area illustrates the rich resource that remains buried.

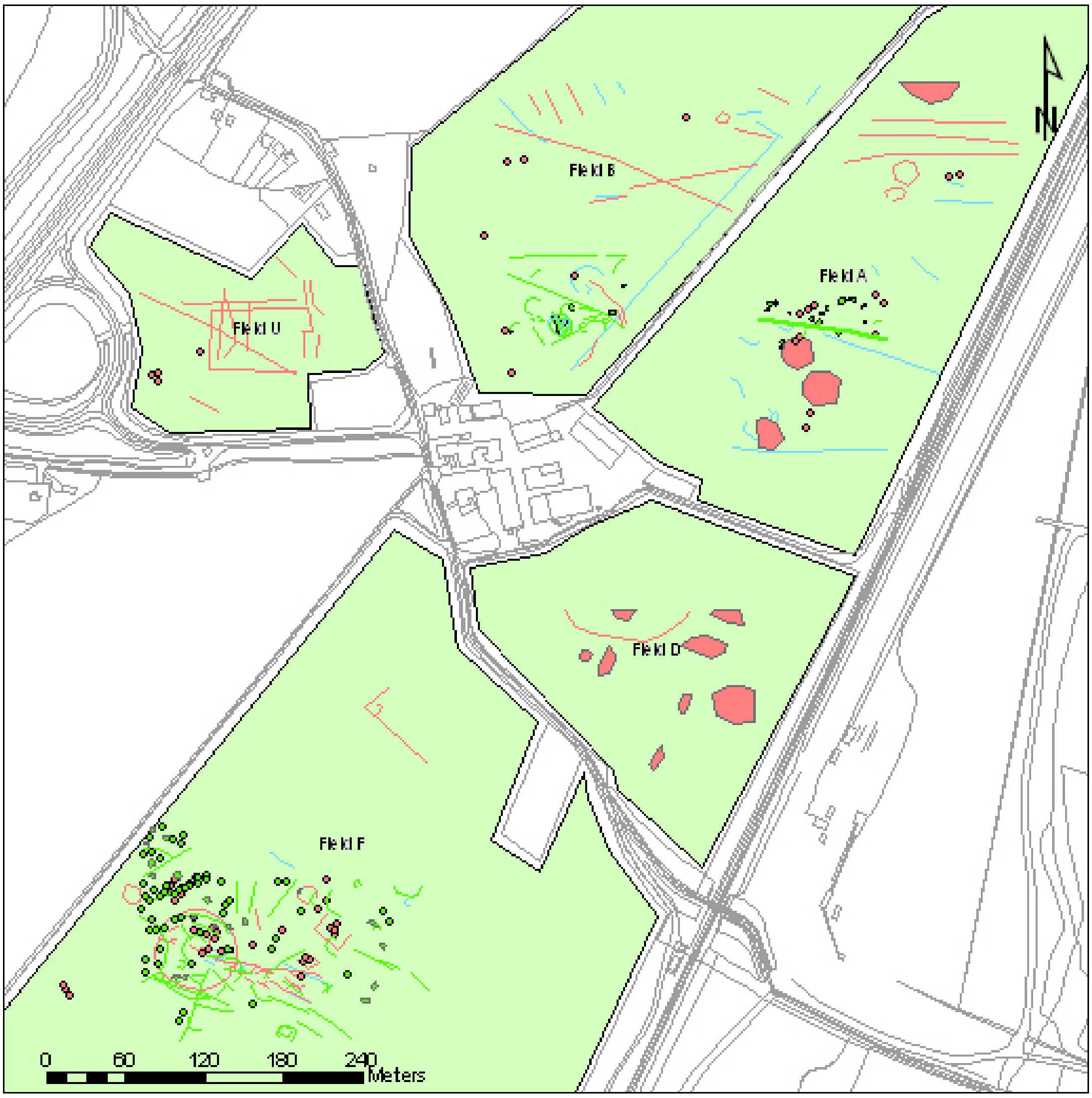

Figure 96 Overview of geophysical anomalies for the ALSF Focus area.

Specific information from the GPR survey provides hard evidence that the 'sunburst' SAM in Field B is in danger of being decimated in the near future if present land use practices continue.

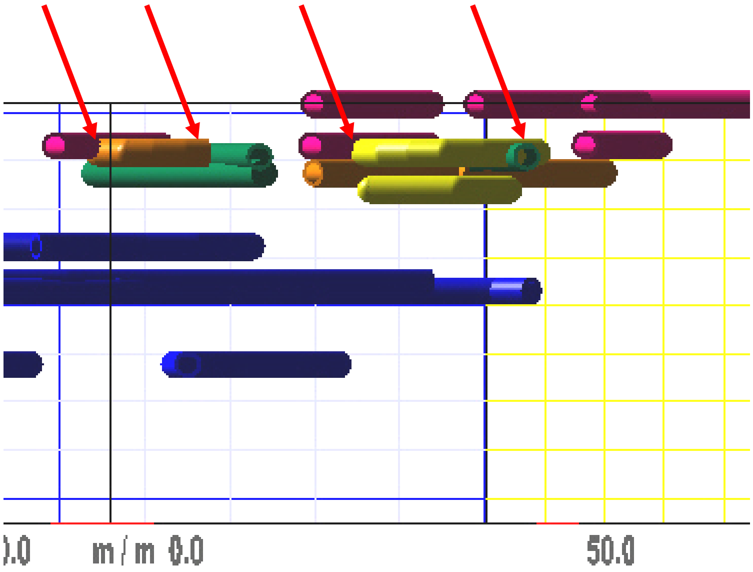

Figure 97 Example of modern land use practices intruding into archaeological features.

The failure to map possible anomalies that correlate to the 'woodhenge' feature in Field A is alarming. Though GPR and resistance provide a few possible anomalies, these are by no means regarded with high confidence as evidence the 'woodhenge' monument still exists below field A. The lack of conclusive mapping of the SAM can have 2 explanations:

1. Physical properties: The features of the 'woodhenge' may be too small to have been mapped with the sampling rates of different techniques utilised in this survey. Perhaps the properties of the 'woodhenge' monument are not detectable by the techniques employed. Additional geophysical survey over this area with increased sampling rates will hopefully prove this statement correct, or incorrect.
2. The features have been ploughed out. As demonstrated with the GPR results in Fields B and F, the monument in Field B is presently being impacted by ploughing and the monument in Field F is not yet being effected by ploughing.

Survey, data collection, and integrating results

Mapped geophysical anomalies prove that a significant offset (10 – 20 m) exists between the actual position of the archaeological features in the earth and the current crop mark maps used in archaeological investigations.

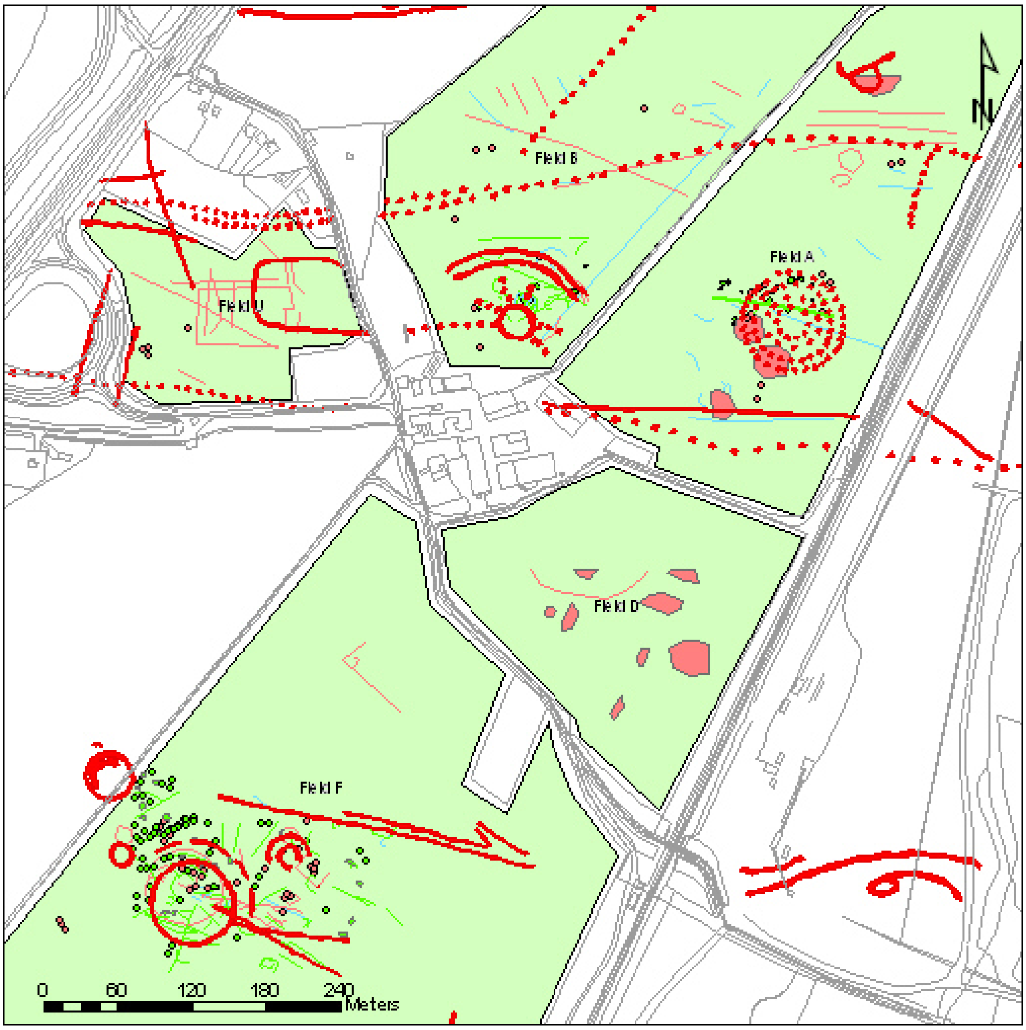

Figure 98 Overview of geophysical anomalies with mapped crop marks for the ALSF Focus area.

Archaeological site investigations rely heavily upon crop mark features mapped from aerial photographs. The crop mark data used in this project is an existing compilation of aerial photograph interpretations available from the Staffordshire Sites and Monuments Record (SMR). Past archaeological investigations of this area and the beginning of the ALSF Focus area geophysical survey are based on crop mark features in this data set. As the ALSF project progressed, further aerial photography investigation was pursued. Field F provides a perfect example of the human error involved in map-making and challenges our assumptions when regarding existing data.

Figure 99 1981 aerial photographic mosaic of the ALSF Focus area.

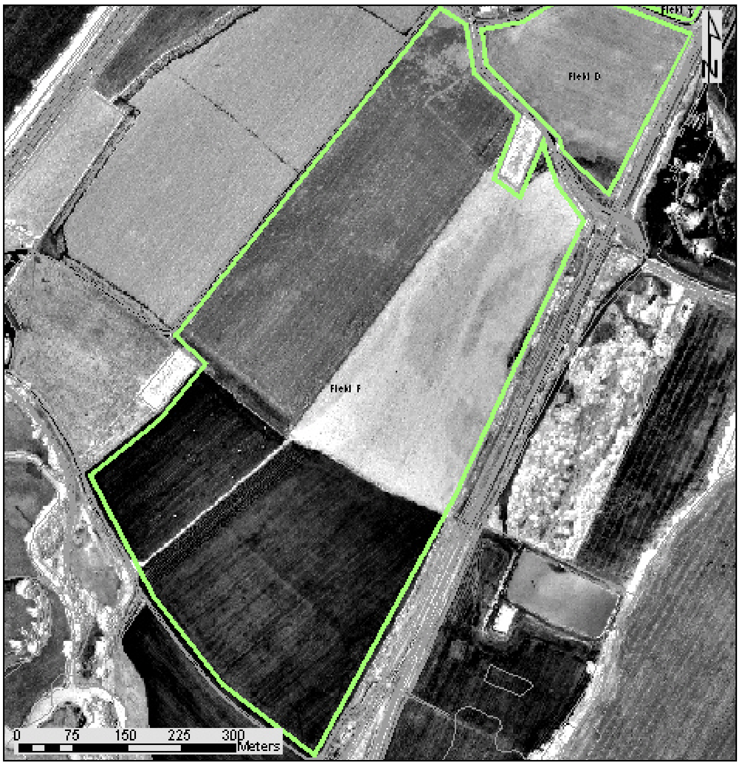

Figure 100 1981 aerial photograph of Field F.

A close-up of the 1981 aerial photograph reveals features in field F. The main circular crop mark feature with two extending lines shows up clearly in this photograph as does the previously un-mapped field enclosure that appeared in the resistance data.

Figure 101 1981 aerial photograph of Field F with newly mapped crop marks.

Though this is the same main feature from the previous crop mark data file, a clear offset between the features in the two maps measures between 13-20 m.

Figure 102 1981 Aerial photograph crop mark map overlay.

Results from the resistance and GPR surveys confirm the accurate location of the crop mark coincides with the aerial photograph interpretation conducted as part of the geophysical ALSF Focus area study.

Figure 103 1981 aerial photograph crop mark map with geophysical survey anomalies.

The approach to data in the ALSF Focus area has been as spatially accurate as possible. Series of aerial photographs were rectified to the OS base in GIS, geophysical survey grids were positioned with highly accurate GPS and total station survey. Data were collected as accurately as possible along marked ropes and were processed as responsibly as possible. Rectification of geophysical survey results in the GIS were accurate and data interpretations digitised as clearly as possible. Figure 103 demonstrates the results of these efforts. If further archaeological investigations are to continue with additional geophysical survey and excavation, areas of interest can be positioned with the GIS and then re-located in the field with very high spatial accuracy. These efforts enable a highly efficient use of resources.

Geophysical Techniques

All three geophysical techniques employed in the ALSF Focus survey produced accurate and useful data. The only restrictions encountered in the field were soil saturation and the crop rotation schedule.

Resistance Survey

The best resistance results are in Field F. These data were collected during and after a rainstorm when the soil had a high level of water saturation. The nature of the soils at Catholme is well-drained with a high sandy gravel content. Despite these conditions, resistance survey performed well across the site.

Though resistance survey is slow, it is effective. The resistance survey conducted for the ALSF Focus area doubled the typical commercial data sampling along transects. This was done in order to achieve as robust a data sample as possible. Further analysis of the data can determine the effectiveness of decreasing sampling intervals.

Magnetic Gradient Survey

The magnetic gradient survey produced results beyond expectations. A review of the grey literature suggests magnetic survey in this type of area is not effective. This follows assumptions for cultivated fields in general when looking for more ephemeral archaeological features. (Other sites such as iron age forts or Roman villas would not necessarily have the same assumption in cultivated fields because of the properties of archaeological targets.)

Data were sampled at as high a rate as possible for the scope of the project. Though most of the anomalies in the magnetic data across the site can be attributed to *noise* (iron debris, plough furrows, etc.) some anomalies are clearly archaeological in nature, and others, pending further investigation, may also be assigned such a classification.

Ground Penetrating Radar Survey

The ground penetrating radar survey provided a definitive third dimension for the geophysical survey of the ALSF Focus area. This technique successfully identified 2 (the 'sunburst', Field B and the large circle with extending linear features in Field F) out of the 3 mapped crop marks in the survey area and provided the best information for further investigations into the third crop mark (the 'woodhenge', Field A).

In addition to mapping the crop marks, the GPR survey provided a geophysical sub-section of the ALSF Focus area. This third dimension enabled an analysis of the effects of modern and past land use on the archaeological features of interest. GPR survey has provided information that suggests the 'sunburst' SAM in Field B is being directly effected by modern land use, and was probably impacted by Medieval land use as evidenced by the position of remnants of ridge and furrow features.

The same analysis in Field F provides information that present and past land use have not directly impacted the buried archaeological features of interest.

GPR survey is nearly as fast as magnetometry survey and is a tool that should be used on most archaeological sites, depending on the type of information desired.

Recommendations

The research conducted on the ALSF Focus area provides conclusive evidence in support of a specific methodology for non-invasive site investigation. As discussed in the methodology review above, GIS has been the managing and enabling tool for this project. Aerial photography rectification and analysis, geophysical grid creation and transfer to GPS for on-site mapping, integration of geophysical results for interpretation are only a few of the materials at work in the GIS (see Volume 3, Chapter 3 of this report.) As a result, this project has a high confidence in the spatial accuracy of all data presented.

The point of pursuing this path is not only to utilise the most advanced technology available, but also to apply the proper tool to the job. Considering the geophysical tools employed, each technique proved useful, but GPR and resistance survey proved the most effective and thorough out of the three. GPR enables passing beyond simple plan views of data to accurately mapping different stratigraphies, calculating the depth to features, the shape and volume of features and the overlap or intrusion of buried features.

Of course, geophysics can be sold as painting a clear picture of what exists and does not exist beneath the earth's surface. But it is only with ground-truthing that the actual nature of buried features and unknown anomalies can be identified and recorded. Taking this next step into excavation is most important in the final assessment on the success of the geophysical research that has been completed in the ALSF Focus area.

The results from this geophysical survey and additional higher-resolution geophysical research on selected areas will provide detailed information for creating an excavation strategy. Excavation over selected features and control areas will provide the feedback needed to fully understand the geophysical survey results and help guide future developments for site management and planning.