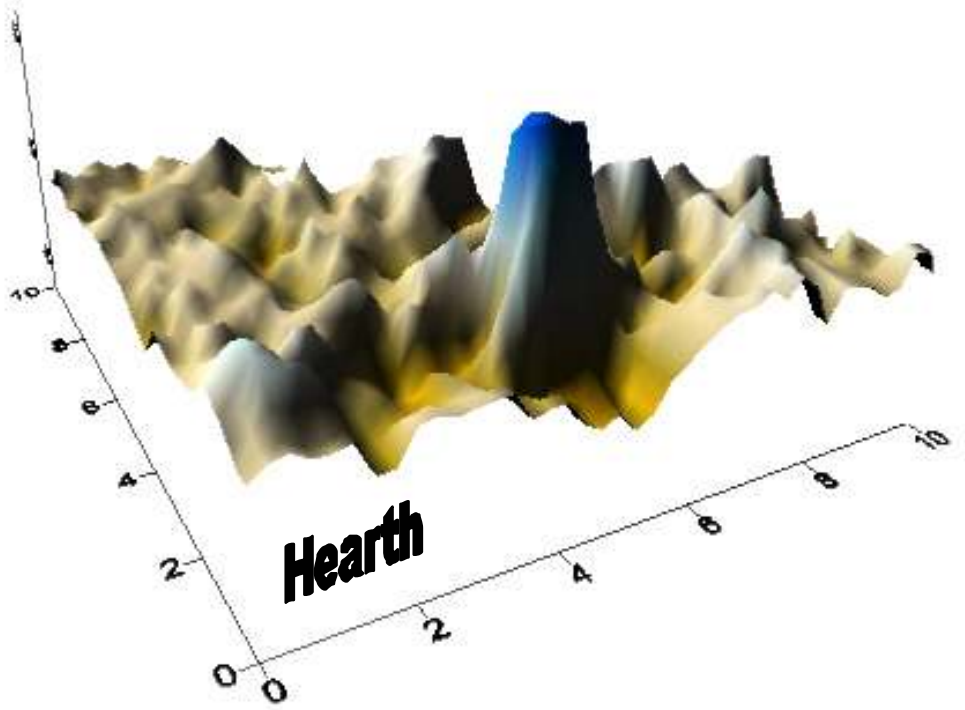
Report on Geophysical Survey Conducted at Burgi Geos

October 28-30, 2003



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Project Summary

Resistance and magnetometry surveys were conducted at Burgi Geos in order to target archaeological anomalies for further investigation. The entire surface of the Burgi was surveyed with resistance and magnetometry geophysical methods.

Methodology

Resistance Survey

Resistance survey measures the change in the resistance of the earth. The "Twin Probe" array is used in this case where a current and potential probe are paired on a roving frame that measures the variation in resistance across a grid. A second pair of current and potential probes is fixed at a certain distance from the area being surveyed. With a fixed separation distance of 0.5 m, the roving probes map an effective volume of resistance to a depth of approximately 0.75 m, measured in Ohms.

Resistance effectively looks at the saturation level of the materials in the survey area, thus is sensitive to soil compaction, soil type, geological features and objects that may be buried with in the soil. Resistance survey can map features that include pits, trenches, foundations, compacted or disturbed surfaces, and changes in soil type. (Clark 1996)

Figure 1 RM15 resistance meter with 0.5 m spaced probes.

Magnetometry:

Magnetic survey measures the variation of the magnetic fields of the earth and buried features across a site. Different soils and features can be mapped through their contrasting magnetic values. Examples of features that can be detected through this process include ferrous materials; soil affected by human occupation (rubbish pits and middens with organic materials), fired materials such as kilns and hearths, tiles, bricks, and concentrations of ceramics. Differences in soil type or soil perturbation are also detected through magnetic survey enabling identification of ditches, pits, foundations, graves and other excavated features. (Clark 1996)

Figure 2 FM256 fluxgate gradiometer.

When interpreting data for archaeological purposes we look at the gradient of the magnetic field that best reveals archaeological features. Magnetometry collects two total fields from two separate magnetometer sensors in the FM256. These sensors measure the total magnetic field at their respective distance above the earth. The gradient is calculated from the two total fields and effectively removes broader scale background noise. This background noise includes larger geological trends and diurnal effects.

Magnetometry data are collected as a series of regularly spaced points along a grid. Typical data collection for this survey is 4 – 8 points per meter with 0.5 to 1 m spaced transect lines. Data are viewed, processed and interpreted in a plan view map that represents the variation of the magnetic field values across the survey area.

Geophysical Survey Results

Area 1: Resistance and Magnetometry

A RM15 resistance meter was used with twin probe separation of 0.5 m. Data were collected with a sampling interval of 0.5m along 1m spaced transects. Post processing software for data analysis and interpretation included Geoplot 3.0 and Surfer 8.

The resistance survey mapped visible archaeological features around the block house, such as nearly exposed walls. Areas of low resistance are of interest because of their vicinity to the known archaeology and the fact that the two areas are distinctly separated by a band of higher resistance.

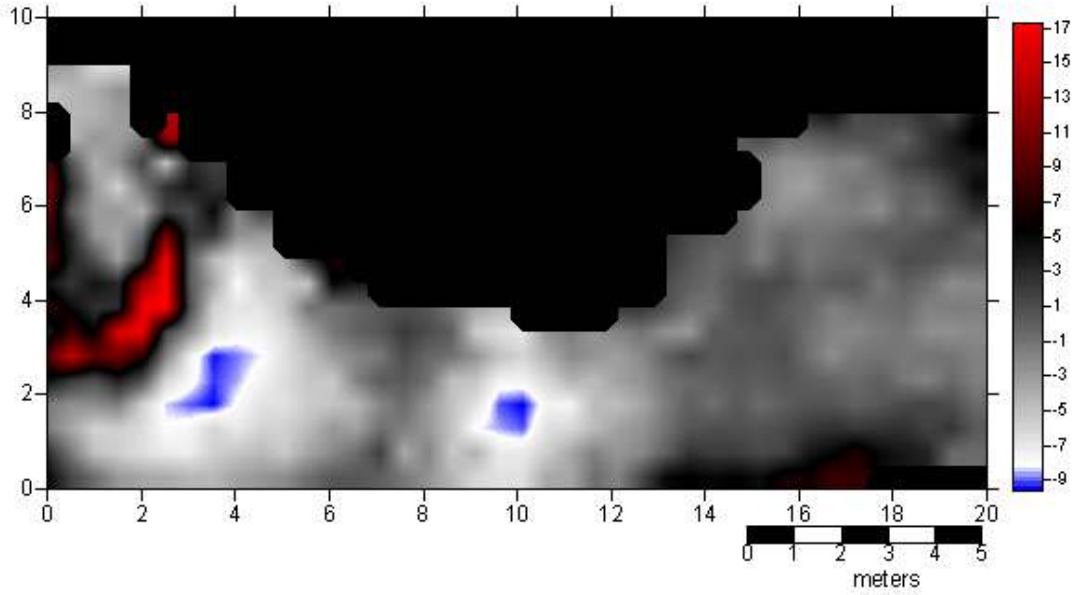

Figure 3 Resistance survey results for Burgi Geos. Areas of low resistance appear as blue.

The magnetometry survey mapped a number of interesting anomalies. Linear anomalies appear that align with the Box House walls. The most interesting magnetic anomalies that appear are the very strong magnetic areas, represented in red in the image below.

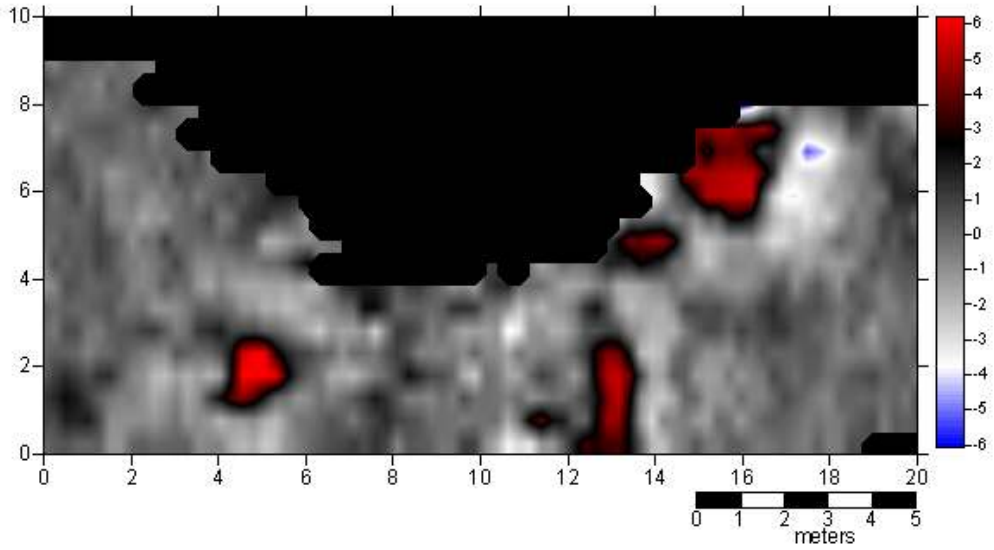

Figure 4 Resistance survey results for Burgi Geos. Areas of high magnetic value are red.

In order to better decide on areas for excavation, the magnetic data was overlain as a contour map on the resistance greyscale map. This is a technique that is used to identify overlapping areas of interest in different data types. The primary anomaly of interest that appears in the data is the corresponding low resistance and high magnetic area (1) in Figure 5.

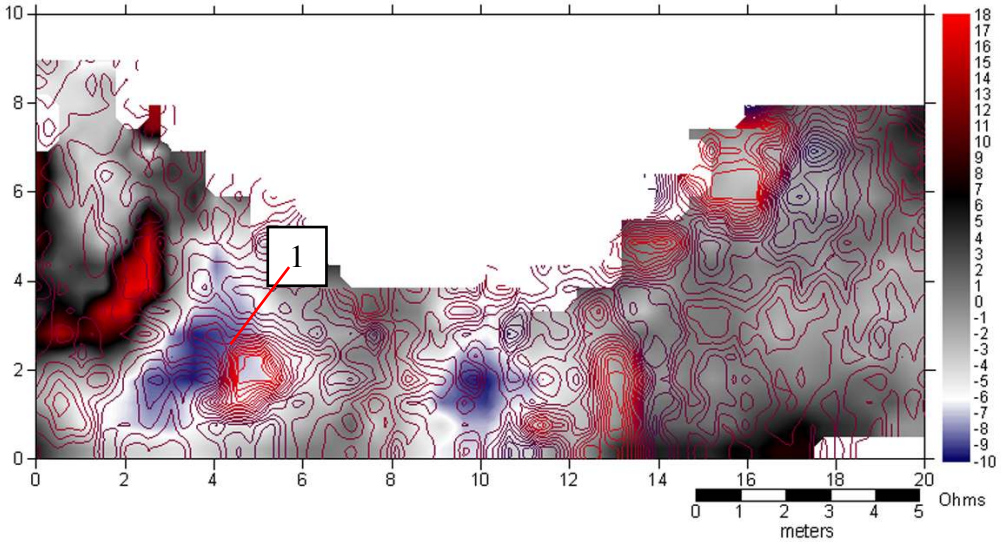

Figure 5 Primary anomaly of interest for further archaeological investigation.

The overlapping resistance and magnetic anomaly in Figure 5 (1) was selected for further investigation. Excavation identified this feature as a hearth.

A second anomaly was desired for further investigation, this required further investigation of the data. Viewing a 3D image of the magnetic data helped in the selection process for further archaeological targets.

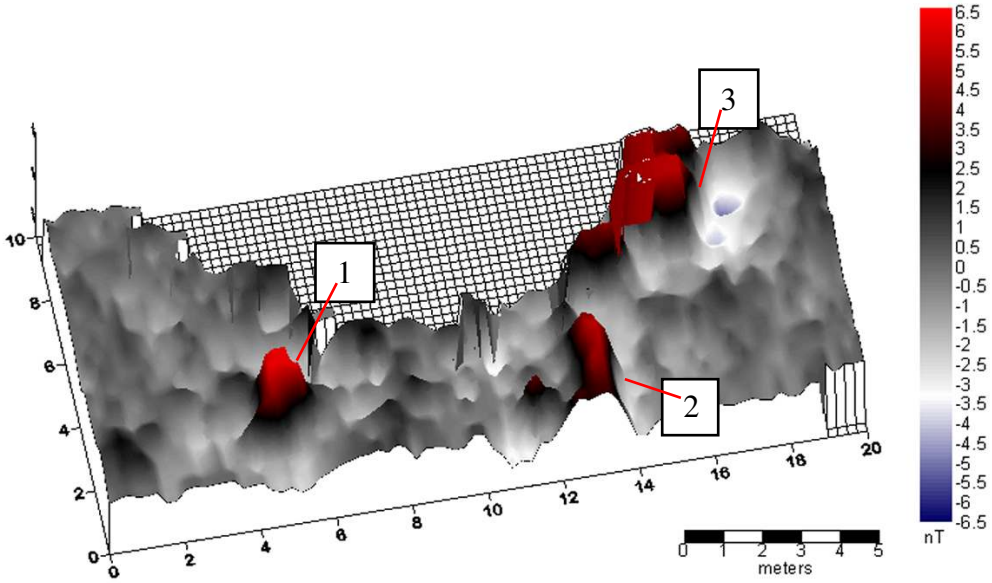

Figure 6 3D surface view of magnetic data for Burgi Geos.

Figure 6 adds an extra component for data visualization that enables additional feature recognition. Anomaly (1) is the hearth within the Block House compound. The other two high magnetic features (2) and (3) were considered for excavation. A final decision was made to excavate over anomaly (3) because of the strong dipolar nature of the anomaly.

Excavations over anomaly (3) revealed a large area of burning, but was not classified as a formal hearth.

Area 2: Resistance and Magnetometry

Additional geophysical survey was conducted with resistance and magnetometry over a 20 m grid adjacent to the walkway out to the Burgi. The purpose of this survey was to see if the geophysical methods would record traces of human activity in this area that may relate to the occupation and use of the Burgi.

Results from the resistance survey did not reveal any areas of interest. Note the red area in the upper right corner of the grid, this reflects the thinning of soil over the bedrock at the cliff edge.

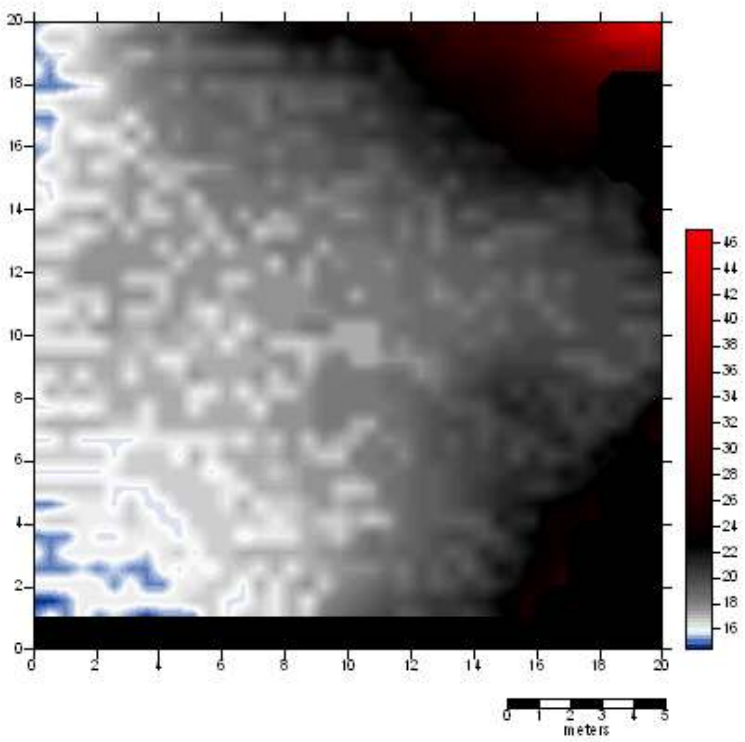

Figure 7 Resistance results for Area 2 survey at Burgi Geos.

Review of the magnetic data shows two areas of high magnetic values. Area (2) was targeted for excavation based on its position relative to the walkway onto the Burgi.

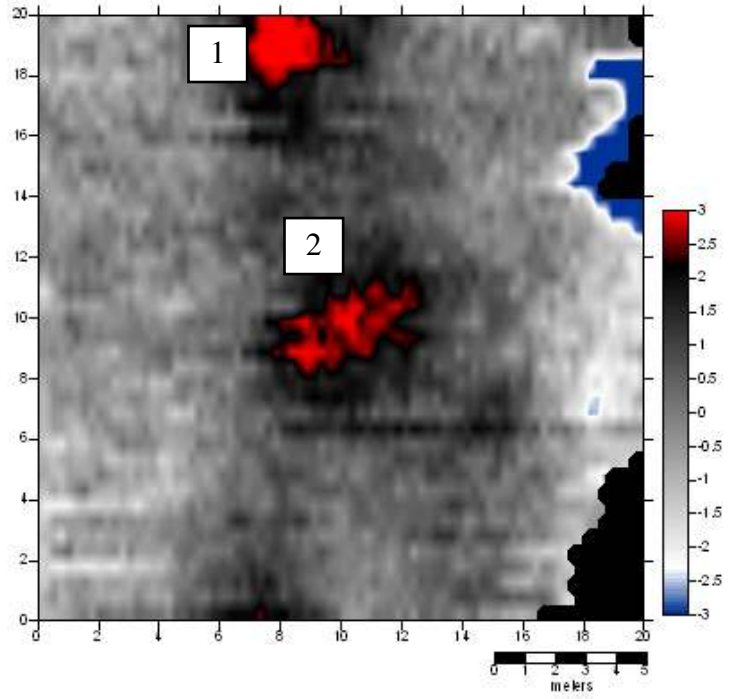

Figure 8 Magnetic survey results for Area 2 survey at Burgi Geos. Area (2) was targeted for excavation.

Excavations over area (2) did not identify anything conclusively archaeological.

Conclusions

Geophysical survey at Burgi Geos successfully identified areas of interest that led archaeological excavation. Results from these excavations identified archaeological and non archaeological characteristics of the site.

Bibliography

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