ARCHAEOLOGICAL ASSESSMENT AT HENDRE BACH, NEWBOROUGH

FIELD EVALUATION PART 1: GEOPHYSICAL SURVEY

G1761

Report number : 466

Prepared for

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Gwynedd Archaeological Trust

HENDRE BACH, CHURCH STREET, NEWBOROUGH

ARCHAEOLOGICAL ASSESSMENT (G1761)
FIELD EVALUATION PART 1: GEOPHYSICAL SURVEY

1. PROJECT BACKGROUND

It is proposed that a new house be built on the site of the cottage known as Hendre Bach on property lying on the south side of Church Street, Newborough.

The owner and developer, David Morgan, has asked Gwynedd Archaeological Trust to undertake an assessment of the archaeological implications of this proposed development in advance of construction. No brief has been prepared for this assessment, nevertheless the project design conforms to the guidelines specified in Standards and Guidance for Archaeological Desk-based Assessment (Institute of Field Archaeologists, 1994, rev. 1999). An initial report (GAT report 461, 2002) was prepared. This included an account of the archaeological and historic background of the area along with the results of a field investigation.

Recommendations for further assessment and mitigatory measures were made. No recommendations were proposed in respect of the ruin of Hendre Bach itself but it was concluded there is potential for the recovery of information in respect of the tenements of the bond tenants of Maerdref Rhosyr during the Middle Ages and particularly between the 13th and 14th centuries. Such evidence is extremely rare in Wales and, in the context of Llys Rhosyr and Newborough would acquire additional significance by association with the known site of the llys, within 300m of the proposed development, and in juxtaposition to the developing community at the new Medieval town of Newborough.

The recommendation was for further assessment through geophysical survey and assessment excavation. The present report consists of the results of the geophysical survey element of the assessment and makes revised recommendations for the assessment excavation phase.

The Gwynedd Archaeological Planning Service is monitoring the work on behalf of the Local Planning Authority.

2. METHODOLOGY

Fluxgate gradiometer survey provides a relatively swift and completely non-invasive method of surveying large areas. A survey at nearby Llys Rhosyr detected part of the Medieval remains in some detail. Settlement sites are well suited to this technique because significant magnetic enhancement of the soil is an inevitable result of day to day domestic activities.

Instrumentation

All geophysical work was carried out using a Geoscan FM36 Fluxgate Gradiometer. This instrument detects variations in the earth's magnetic field caused by the presence of iron in the soil. This is usually in the form of weakly magnetised iron oxides which tend to be concentrated in the topsoil. Features cut into the subsoil and backfilled or silted with topsoil therefore contain greater amounts of iron and can be detected with the gradiometer. This is a simplified description as there are other processes and materials which can produce detectable anomalies. The most obvious is the presence of pieces of iron in the soil or immediate environs which usually produce very high readings and can mask the relatively weak readings produced by variations in the soil. Strong readings are also produced by archaeological features such as hearths or kilns as fired clay acquires a permanent magnetic field upon cooling. Not all surveys can produce good results as results can be masked by large magnetic variations in the bedrock or soil and in some cases, there may be little variation between the topsoil and subsoil resulting in undetectable features.

The Geoscan FM36 is a hand held instrument and readings can be taken automatically as the operator walks at a constant speed along a series of fixed length traverses. The sensor consists of two vertically aligned fluxgates set 500mm apart. Their Mumetal cores are driven in and out of magnetic saturation

by a 1,000Hz alternating current passing through two opposing driver coils. As the cores come out of saturation, the external magnetic field can enter them producing an electrical pulse proportional to the field strength in a sensor coil. The high frequency of the detection cycle produces what is in effect a continuous output (Clark, Seeing Beneath The Soil 1990).

The gradiometer can detect anomalies down to a depth of approximately one metre. The magnetic variations are measured in nanoTeslas (nT). The earth's magnetic field strength is about 48,000 nT, typical archaeological features produce readings of below 15nT although burnt features and iron objects can result in changes of several hundred nT. The machine is capable of detecting changes as low as 0.1nT.

Data Collection

The gradiometer includes an on-board data-logger. Readings at Hendre Bach were taken along parallel traverses of one axis of a 20m x 20m grid. The traverse interval was 50cm. Readings were logged at intervals of 0.25m along each traverse giving 3200 readings per grid. This is the highest resolution suitable for area survey.

Data presentation

The data is transferred from the data-logger to a computer where it is compiled and processed using Geoplot 3.0 software. The following two display options are used in this report along with an interpretation drawing.

a) X-Y or trace plot

Each traverse is shown by a line trace. These are presented side by side allowing the full range of data and the shape of any anomalies to be seen.

b) Grey-Scale

Data values are represented by modulation of the intensity of a grey scale within a rectangular area corresponding to the data collection point within the grid. This produces a plan view of the survey and allows subtle changes in the data to be displayed.

Data Processing

The data is ideally presented with a minimum of processing. High readings caused by stray pieces of iron, fences, etc are usually modified on the grey scale plot as they have a tendency to compress the rest of the data. The data is however carefully examined before this procedure is carried out as kilns and other burnt features can produce similar readings. Corrections are also made to compensate for instrument drift and other data collection inconsistencies. In this case the geological background readings were extremely high (in excess of +- 50 nT) causing the data to be compressed to the extent that signals in the archaeological range (perhaps +- 5 to10 nT) were masked. The raw data is presented in figs 1 and 2. The very strong anomaly in the southern corner is caused by a surface outcropping of very magnetic bedrock producing readings in excess of 250 nT. As the sensitivity of the gradiometer falls off strongly below 1m, the stronger positive readings, particularly in the northern part of the field, suggest that the bedrock is close to the surface. A pronounced east-west ridge running across the centre of the field can also probably be interpreted as a natural ridge in the buried bedrock. It should be noted that the variations could also reflect magnetic changes in the geology.

These large-scale variations were lessened by processing the results using a high pass filter (Fig. 3). This, in effect, minimises the gradual, large scale variations caused by the buried geology while retaining the more sharply defined archaeological variations. This process does not, however, remove all of the effects of the geology and the data remains quite noisy.

3. RESULTS

Examination of the processed data reveals no significant archaeological features. Small anomalies scattered across the site each display a strong positive and negative element and are best interpreted as

fragments of iron in the topsoil each acting like a small magnet. These may well be derived from the demolition debris from Hendre Bach. Occasional very faint linear anomalies are probably agricultural in origin, caused by disturbance to the top of the subsoil by the action of the plough.

The data was checked for anomalies typically produced by features such as hearths and postholes that could be associated with Medieval settlement but nothing could be seen. It must be stressed however that the data produced by this survey is not of a particularly high quality due to the geological interference and that it is possible that archaeological features remain undetected.

4. RECOMMENDATIONS FOR FURTHER ASSESSMENT

The geophysical survey identified no significant archaeological features. This cannot, however, be seen as proof of absence of extant archaeology, particularly when considering the geological interference in the gradiometer results. It is therefore proposed that a detailed watching brief be carried out during topsoil stripping of the entire area affected by the development. It is recommended that the topsoil should be removed, under archaeological supervision, using a mechanical excavator, to the level that exposes undisturbed subsoil. Any archaeological features that are exposed during this process should be excavated and recorded before the development continues.

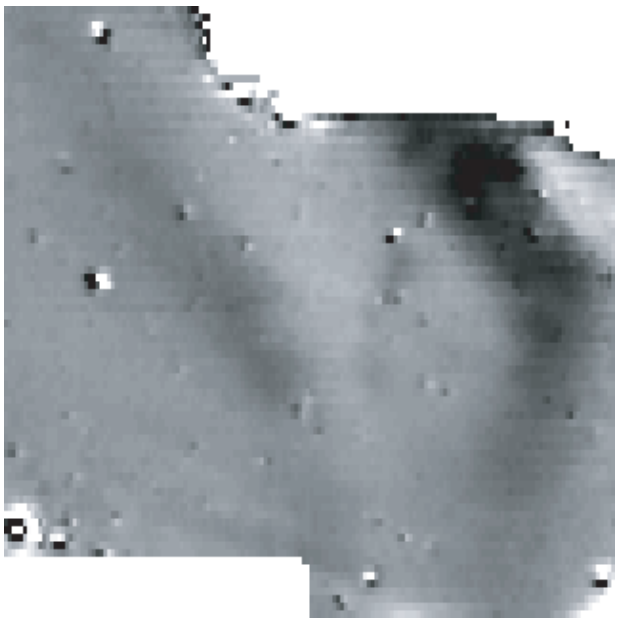


Fig. 1 Hendre Bach gradiometer survey - raw data
Grey-scale - range: +49nT to -45nT

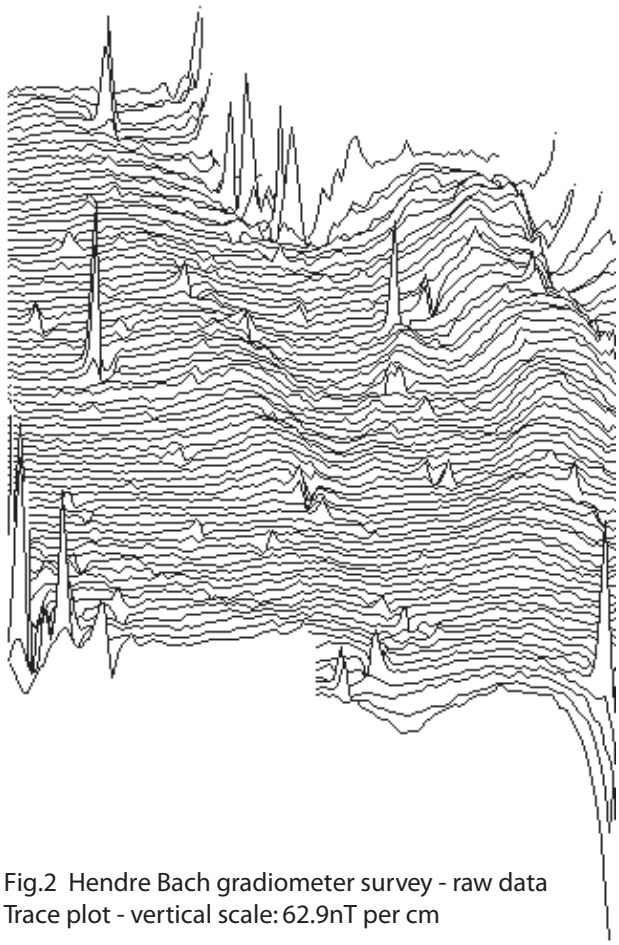
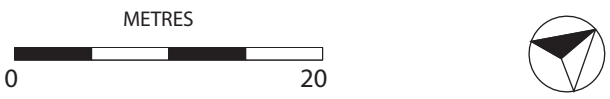


Fig.2 Hendre Bach gradiometer survey - raw data
Trace plot - vertical scale: 62.9nT per cm



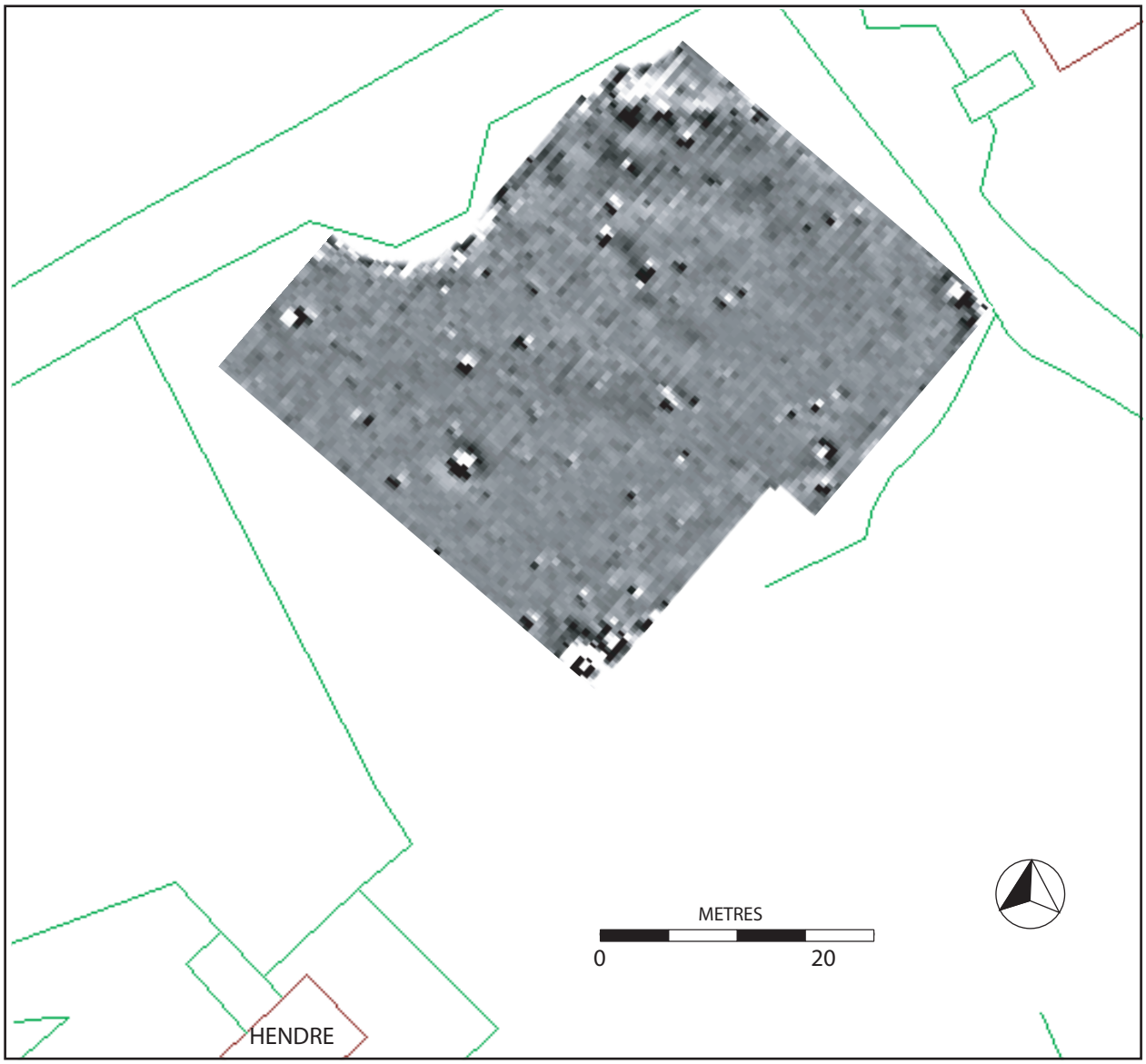


Fig. 3 Hendre Bach gradiometer survey - Processed data

Fig. 4 Hendre Bach gradiometer survey - Interpretation

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