1311

Field Evaluation of Scheduling Proposals 2015-16

Cae Mawr, Caernarfon and St Peter's Church, Llanbedrgoch

Geophysical survey

Ymddiriedolaeth Archaeolegol Gwynedd
Gwynedd Archaeological Trust

Cadw

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Field Evaluation of Scheduling Proposals 2015-16

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Geophysical survey

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G2246 FIELD EVALUATION OF SCHEDULING PROPOSALS

CAE MAWR, CAERNARFON AND ST PETER'S CHURCH, LLANBEDRGOCH, ANGLESEY.

Location and PRN
Cae Mawr, Caernarfon, SH479623.
St Peter's church, Llanbedrgoch, SH50937985 -PRN 5354 /6944 (duplicated)

1. INTRODUCTION

Two areas of geophysical survey were carried out in response to recent discoveries with grant aid from Cadw (contingency). The two sites were Cae Mawr Caernarfon where Roman pottery had been discovered in a ploughed field and reported to the Portable Antiquities Scheme and St Peter's church Llanbedrgoch where early medieval graves had been encountered during evaluation for a proposed extension to the graveyard (Figs 1 and 2).

1.1 Copyright

2. BACKGROUND

2.1 Cae Mawr, Caernarfon

Finds of Roman pottery have been reported through PAS to GAT from the field known as Cae Mawr, Caernarfon by Caernarfon-based archaeologist Rhys Mwyn. This field is located on the west bank of the River Seiont, within a bend in the river immediately opposite the Roman walled enclosure of Hen Waliau (PRN 3090). This possible storage compound is 150m due west of Segontium Roman fort.

An account in the Morning Chronicle on Friday November 14, 1817 (London, Issue 15144) recorded that:

> As some workmen were forming a small quay a few days ago, at Carnarvon, they discovered the remains of an immense wooden bridge, formed of oak, buried several feet in the sand, and extending over the river Seint. One beam which was got up, measured upwards of 50 feet in length. This bridge appears to have formed originally a communication between Segontium and Coed-Helen summer-house, in all probability a Roman watch tower, one end of the bridge being contiguous to the old wall of Hengaer Cysteint. The entire of this bridge is supposed to have extended upwards of 400 yards.

The line of a feature named as “Helen’s Causeway”, presumably the same feature as described above, is marked with a dotted line on John Wood’s map. This runs from close to Hen Waliau to the apex of the bend in the river, half way along Cae Mawr (PRN 5564).

Thomas Pennant, writing of Hen Waliau in 1781, says ‘I was informed that in Tre’r Beblic, on the opposite shore, had been other ruins, the work of the same people’. The farmer has reported stony areas within the field from which they regularly dig up stones when ploughing. Field walking has produced sherds of Roman coarseware and at least two sherds of samian ware (Rhys Mwyn pers. comm.)

The above evidence would suggest a possibility of Roman remains lying within the field at Cae Mawr. The early accounts should, however, be treated with a degree of caution. It should be noted that there was no real evidence for the Roman origin of the bridge or even any evidence that it was a bridge. The timbers could have been associated with a different kind of structure. There were several fish traps recorded in the mouth of the Seiont (PRN 14600, Hopewell 2000, original source Jones 1889).

> Gored Aber Saint or Seiont, aka 3 weirs at Coed Helen are well documented. It was also noted that previous to the year 1799 salmon were taken in the Seiont where it touches with the Menai near the castle. Over-fishing occurred to the point that the fish were almost wiped out and fines were levied on any further depredations. Nothing is now visible of these weirs.

The fields are gently sloping to the west with a steep drop of c.10m to the river. This scarp may be a product of erosion to the river banks since the Roman Period but there must have been a steep slope due to the difference in level of the field and the river bed. This would tend to indicate that this was not an ideal crossing point unless there was previously a shelf of lower land along the river’s edge.

2.2 St Peter’s Church, Llanbedrgoch

Evaluation, by GAT for Isle of Anglesey County Council, of an area of land lying to the east of the cemetery to St Peter’s church identified a cemetery containing cist graves of Early Medieval date (report GAT forthcoming 2016). Just over fifty graves were revealed, all aligned east-west (Fig. 5). The graves lie very close to the surface, and are vulnerable to plough damage. The adjoining church is listed in the Norwich taxation of 1254, though much of the building dates from the later medieval period, and 19th century restorations. The antiquarian, Richard Fenton, recorded a ditch (fosse) around the church as well as mounds, some of which are still apparent as earthworks, though they may well be natural features. The underlying bedrock is limestone, and therefore there is survival of skeletal material. A sample sent for radiocarbon dating returned a date within the 6th century. A sub-rectangular enclosure is visible on Natural Resources Wales lidar data immediately to the south of the churchyard.

3. METHODOLOGY - GEOPHYSICAL SURVEY

3.1 Technical Detail

The survey was carried out in a series of 20m grids, which were tied into the Ordnance Survey grid using a Trimble high precision GPS system. The survey was conducted using a Bartington Grad 601-2 dual fluxgate gradiometer. The surveys were carried out at varying resolutions. Targeted areas were carried out at high resolution; 0.5m traverse interval by 0.25m (at Cae Mawr) or 0.125 sample interval (St Peter's). General prospection was carried out at standard resolution; 1.0 m traverse interval by 0.25m sample interval.

3.2 Instrumentation

The Bartington Grad 601-2 dual fluxgate gradiometer uses a pair of Grad-01-100 sensors. These are high stability fluxgate gradient sensors with a 1.0m separation between the sensing elements, giving a strong response to deeper anomalies. The 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 magnetized 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 therefore 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 thermo-remnant magnetic field upon cooling. This material can also get spread into the soil leading to a more generalized magnetic enhancement around settlement sites. Not all surveys can produce good results as results can be masked by large magnetic variations in the bedrock or soil or high levels of natural background "noise" (interference consisting of random signals produced by material with in the soil). In some cases, there may be little variation between the topsoil and subsoil resulting in undetectable features. The Bartington Grad 601 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 mu-metal 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. The gradiometer can detect anomalies down to a depth of approximately one meter. 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.

3.3 Data Collection

The gradiometer includes an on-board data-logger. Readings are taken along parallel traverses of one axis of a 20m x 20m grid. The traverse interval is 0.5 or1.0 meter. Readings are logged at intervals of 0.125 or 0.25m along each traverse. Marked guide ropes are used to ensure high positional accuracy during the high resolution survey. The data is transferred from the data-logger to a computer where it is compiled and processed using ArchaeoSurveyor2 software. The data is presented as a grey-scale plot where 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. This is supplemented by an interpretation diagram showing the main feature of the survey with reference numbers linking the anomalies to descriptions in the written report. It should be noted that the interpretation is based on the examination of the shape, scale and intensity of the anomaly and comparison to features found in previous surveys and excavations etc. In some cases the shape of an anomaly is sufficient to allow a definite interpretation e.g. a Roman fort. In other cases all that can be provided is the most likely interpretation. The survey will often detect several overlying phases of archaeological remains and it is not usually possible to distinguish between them. Weak and poorly defined anomalies are most 4 susceptible to misinterpretation due to the propensity of the human brain to define shapes and patterns in random background “noise”. An assessment of the confidence of the interpretation is given in the text.

3.4 Data Processing

The data is presented with a minimum of processing although corrections are made to compensate for instrument drift and other data collection inconsistencies. 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. The data on some ‘noisy’ or very complex sites can benefit from ‘smoothing’. Grey-scale plots are always somewhat pixellated due to the resolution of the survey. This at times makes it difficult to see less obvious anomalies. The readings in the plots can therefore be interpolated thus producing more but smaller pixels and a small amount of smoothing based on a low pass filter can be applied. This reduces the perceived effects of background noise thus making anomalies easier to see. Any further processing is noted in relation to the individual plot.

3.5 Geophysical Survey Results

3.5.1 Cae Mawr

Survey Conditions

The survey was carried out in very mixed weather including one day of persistent rain. The field had been used to grow sweetcorn and stubble consisting of tough, 0.2m high, stalks remained. The stalks seriously impeded the use of marked guide ropes that are used during high resolution survey. After examination of the first day’s survey results it was decided to continue the survey at standard resolution, which does not require guides.

Results (Figs 3 and 4)

The survey produced an unusually even and featureless result. Background noise was moderately high, probably as a result of weakly magnetic stones in the field. The entire field contained weak closely-spaced linear anomalies (not transcribed) that were parallel to the lines of the planted crop and were clearly a result of modern agriculture. Only two other anomalies were detected. Anomaly 1 is best interpreted as a field boundary and anomaly 2 is probably of geological origin.

Discussion

There was enough magnetic variation to produce anomalies from minor variations in the soil such as those caused by modern ploughing so it seems likely that significant archaeological features would be detectable. This cannot be guaranteed; magnetic survey sometimes fails to detect archaeology usually because of a lack of magnetic variation between features and the subsoil or substrate. In the case of Cae Mawr, it is likely but not certain that there are no surviving archaeological features.

There are two possible explanations;

a) It is entirely possible that there was no Roman activity in this field. The presence of a Roman bridge was not proven. In addition, assuming that there was a crossing point on the line of Helen's Causeway, the steep slope down to the river makes it unlikely that a road from a crossing point would have come straight up from the river; a diagonal line running along the contour to reduce the gradient would be more likely thus taking a road or track to one of the adjacent fields. The scattered Roman pottery could have come from manuring activities, presumably from the Roman period. This could imply that there is a Roman site such as a farm or villa in the vicinity.

b) The alternative explanation is that any early archaeology has been removed by modern agriculture. The field is very stony with high levels of clay and silt in the topsoil. This could be interpreted as being a result of deep-ploughing cutting into the glacial substrate and mixing it with the topsoil. This would have removed any smaller-scale archaeology. It was noted that there were piles of rounded glacial boulders around the perimeter of the field that had presumably been pulled out by the plough. There did not appear to be any dressed building-stone in these.

The former explanation seems to be most likely; any major Roman features would have been likely to leave some magnetic trace. Occupation sites tend to cause magnetic enhancement of the soil but there were no obvious areas of increased magnetism in the very even results from this survey.

3.5.2. St Peter's Church

Survey Conditions

The survey area consisted of thin topsoil, with an increased depth at the south of the field, over fractured limestone bedrock. The limestone would be expected to contain little or no magnetic material. The principal aim of the survey was to detect additional graves beyond the previously excavated area. Graves from the early medieval period do not usually contain grave goods or coffins and associated nails. This makes them difficult to detect with magnetometer survey, the fill being magnetically identical to the surrounding soil. It was felt that there was some chance of detection in the present survey because the assessment excavation had shown that the graves were close to the surface, were cut into the bedrock and in some cases included a capping stone. This would allow the grave to fill or partially fill up with more humic soil, perhaps with some microbial magnetic enhancement, that could potentially be different to the surroundings. The survey around the church was carried out at the highest practical spatial resolution, (0.5m x 0.125m sample interval) and the excavated area was surveyed as a control in order to find out if known graves would produce recognisable anomalies. The southern half of the field was surveyed at standard resolution (1.0m x 0.25m).

The survey was carried out in variable weather after a period of heavy rain. The ground was waterlogged but this had no appreciable effect on the survey.

Results (Figs 5 and 6)

The survey detected a wide range of anomalies but failed to detect any graves. The steel-wire fence around the excavated area produced a substantial anomaly masking part of the most important area of the survey (1). The earthwork to the south of the church produced a clear anomaly (2). Its curving corner resembles that of a Roman fortlet. This interpretation is possible but unlikely; the ground falls away steeply to the east which would have constrained a fortlet to an unusually narrow plan. In addition a fortlet would be defended by a substantial ditch and no such feature was encountered in the excavation trench. An anomaly with a similar character (3) appears to join it from the south. These features are both visible on the lidar survey (Fig. 5) and they are most likely to be the remains of a former field system. This may be early; the lidar suggests that the current church boundary overlies the end of the northern field.

A series of linear anomalies at the southern end of the field (4) correspond to a former boundary and lane shown on the 1889 Ordnance Survey first edition 25 inch map. Linear anomaly 5 corresponds to a footpath that is also shown on the map.

There are several other linear and curvilinear anomalies (6-13) that are best interpreted as former field boundaries, probably indicating two previous phases of fields. Boundary 6 curves around the base of two large natural mounds in the field. A series of parallel narrow linear anomalies (19 to 21) run from north to south across the majority of the field with a few running in an east to west direction (22). These indicate that despite the shallow soil and uneven topography the field has been ploughed. The plough scars are visible in this and neighbouring fields on the lidar survey Fig. 7). The linear features run in different directions in different fields demonstrating that they are the result of ploughing as opposed a natural process such as glacial activity. The field also contains numerous small magnetic dipoles (half black and half white dots on the grey-scale printout). These are the result of small pieces of iron in the soil, often a result of domestic rubbish spread on the field during manuring. In this case they seem to be concentrated on the rocky mounds in the field (14-17) suggesting that they are fragments that have broken off plough-shares.

Discussion

The early medieval graves were not detected by the geophysical survey. The wire fence around the excavation masked part of the area around the church but there were no obvious signs of an early enclosure wall around the church. A projection of the wall to the north of the church would have extended into the survey area. The topsoil is at most 10cm to 15cm deep and directly overlies fractured bedrock so it is possible that any remains of walls in this area would have been destroyed by ploughing. The combined lidar and geophysical survey results suggest that the earthwork to the south of the church predates the current church boundary wall but is probably part of an undated field system. Elsewhere two phases of field boundaries predating or sub-dividing the present field demonstrate that this area has been cultivated for a long time despite its poor soil.

4. ACKNOWLEDGEMENTS

Thanks are due to the landowners for permission to survey; Aled Jones at Cae Mawr and Iorwerth Jones at St Peter's. Alun Jones and Rhys Mwyn brought the site at Cae Mawr to our attention and Rhys provided background information in the form of a draft report. Jess Davidson set out the geophysical survey grids and helped with the survey along with Bethan Jones.

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Fig.1 Cae Mawr geophysical survey - location map

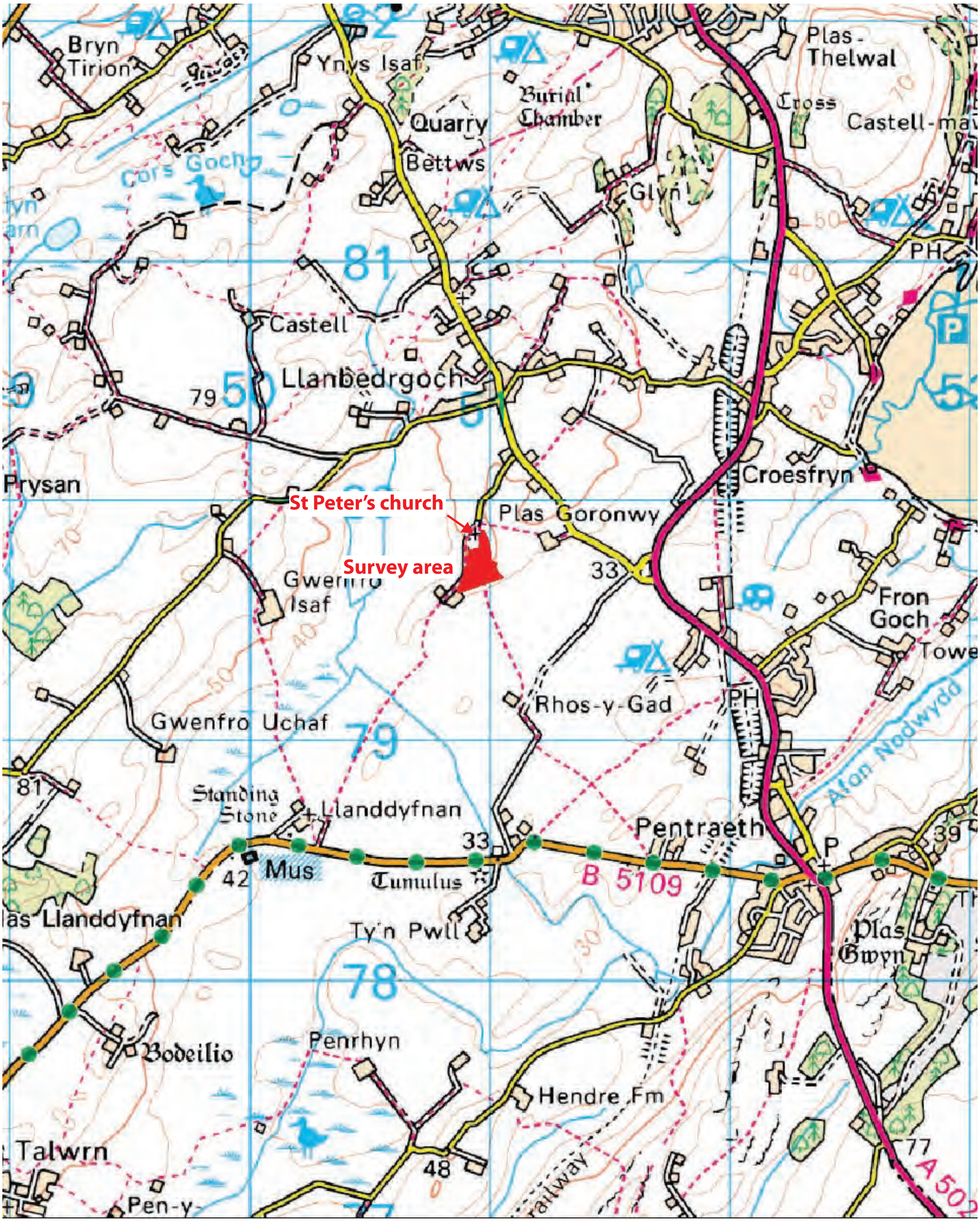

Fig. 2 St Peter's church geophysical survey - location plan

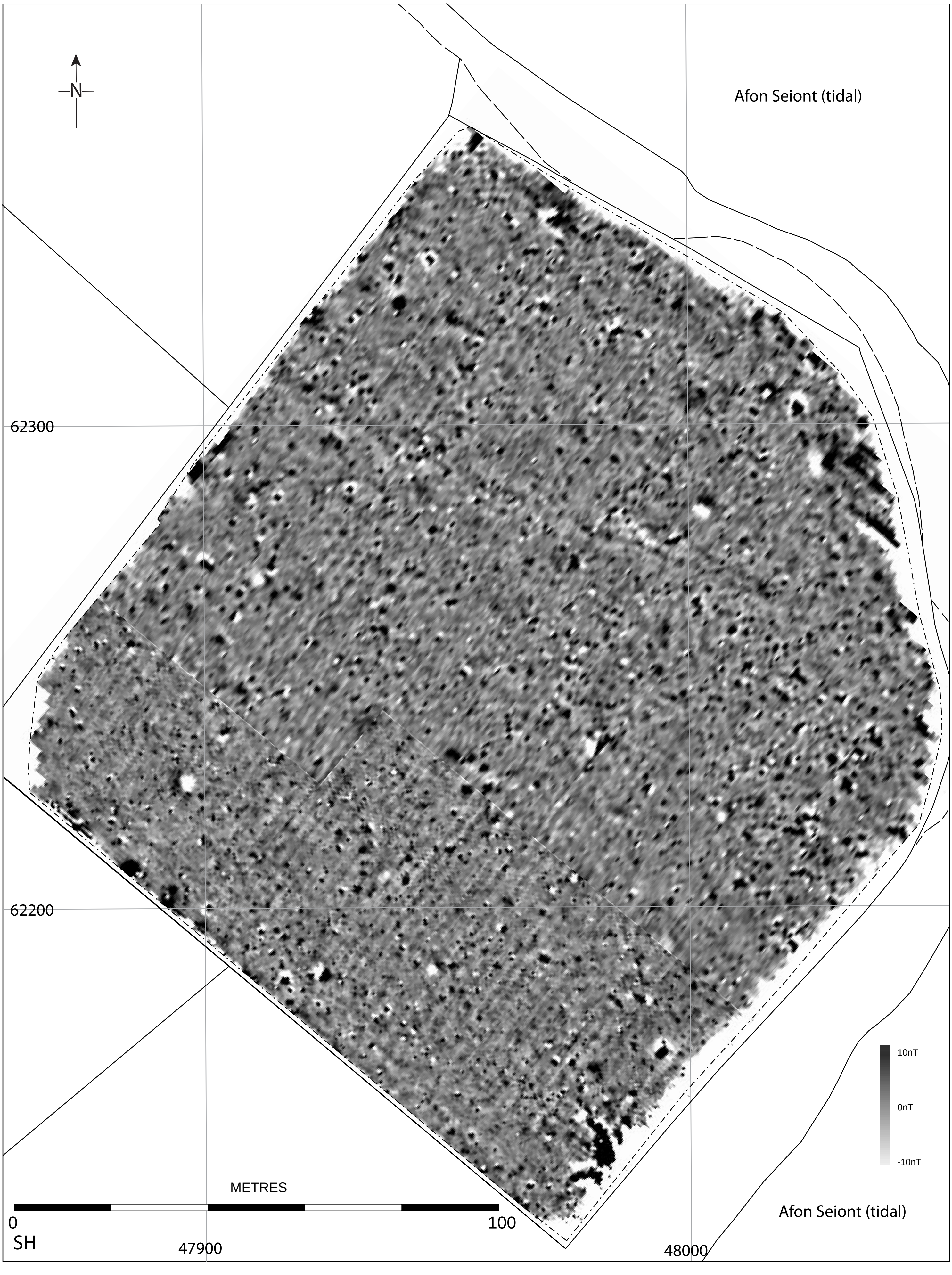

Fig. 3 Cae Mawr geophysical survey - Grey-scale plot

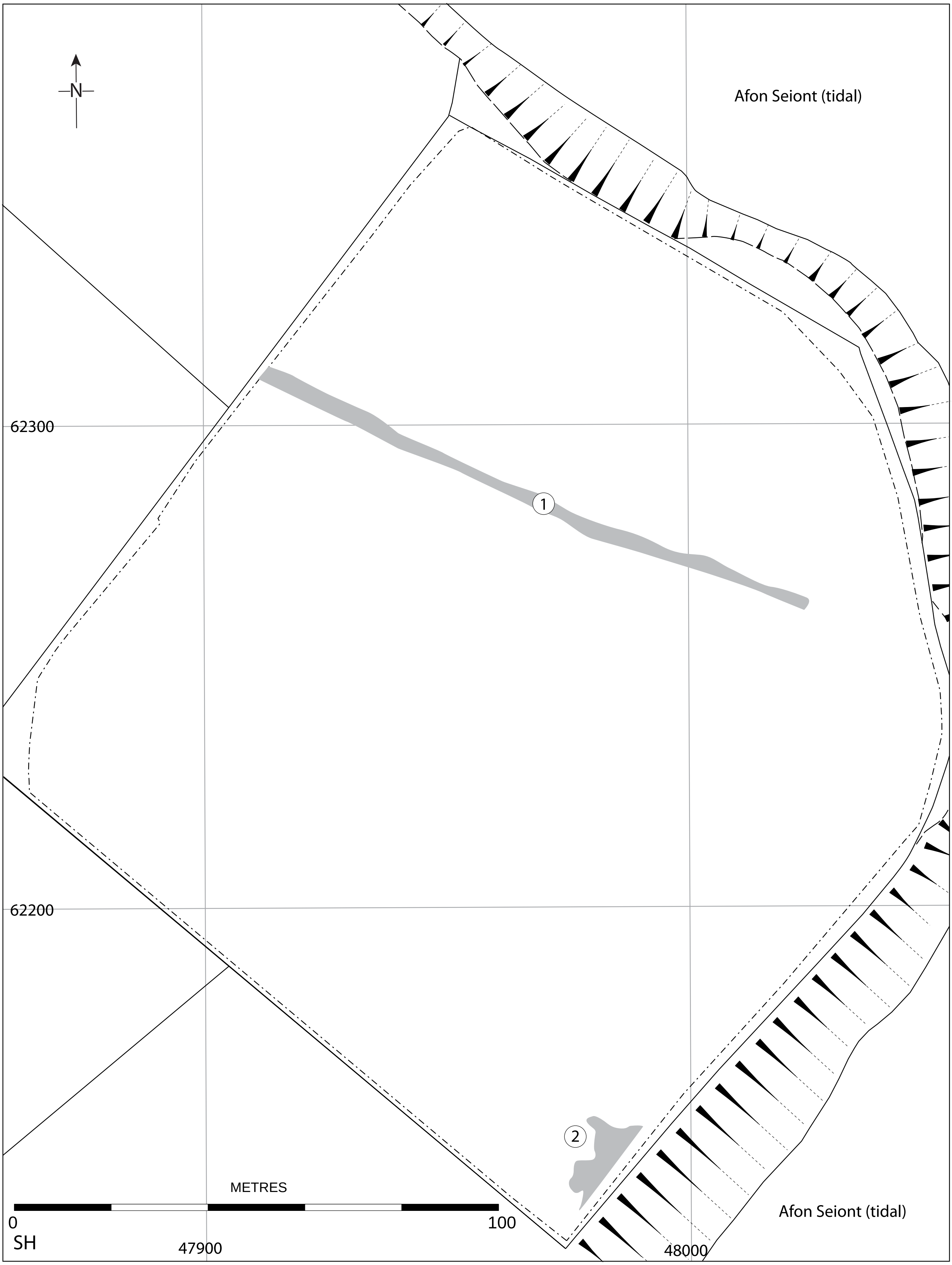

Fig. 4 Cae Mawr geophysical survey - Interpretation

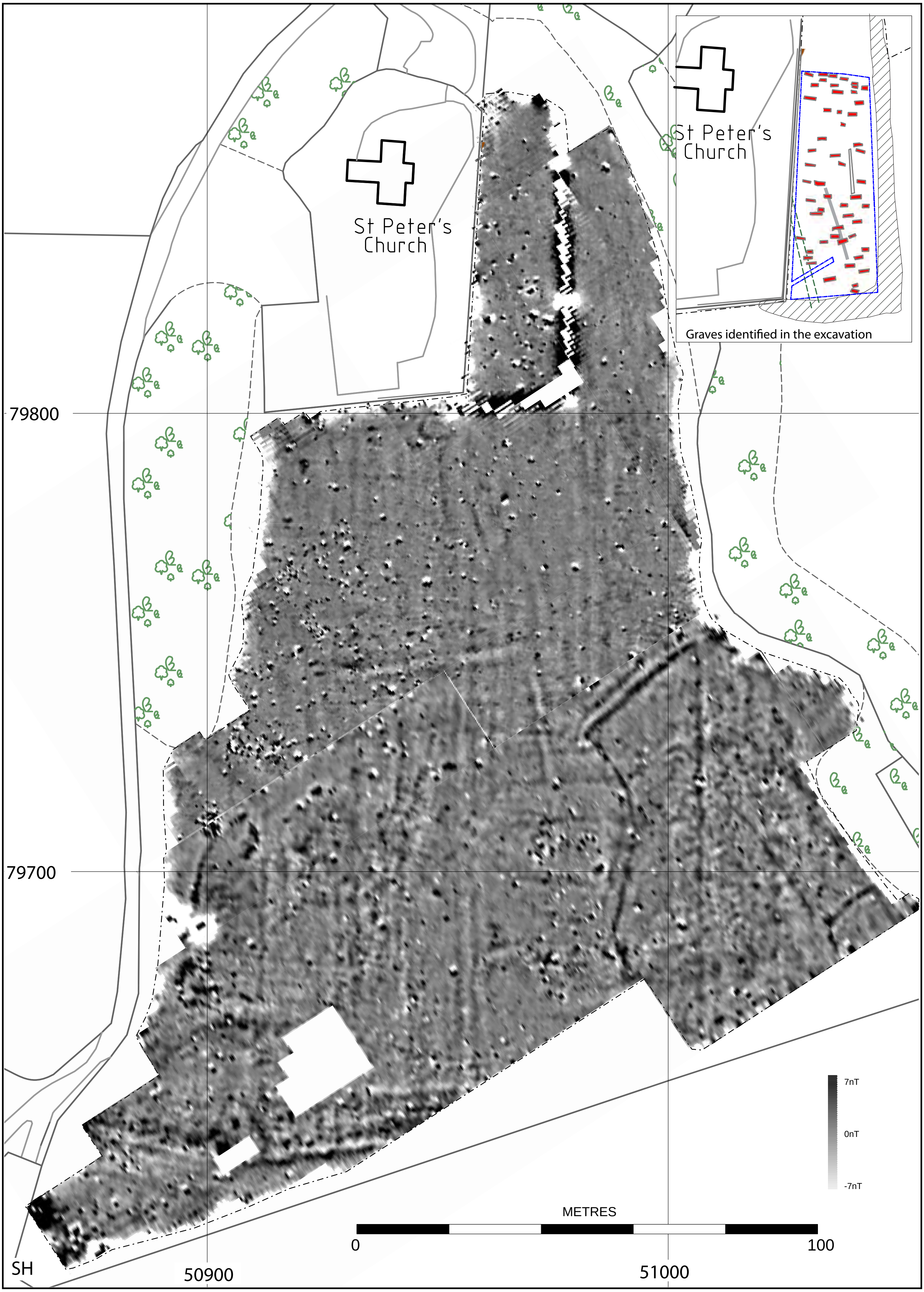

Fig. 5 St Peter's church geophysical survey - grey-scale plot

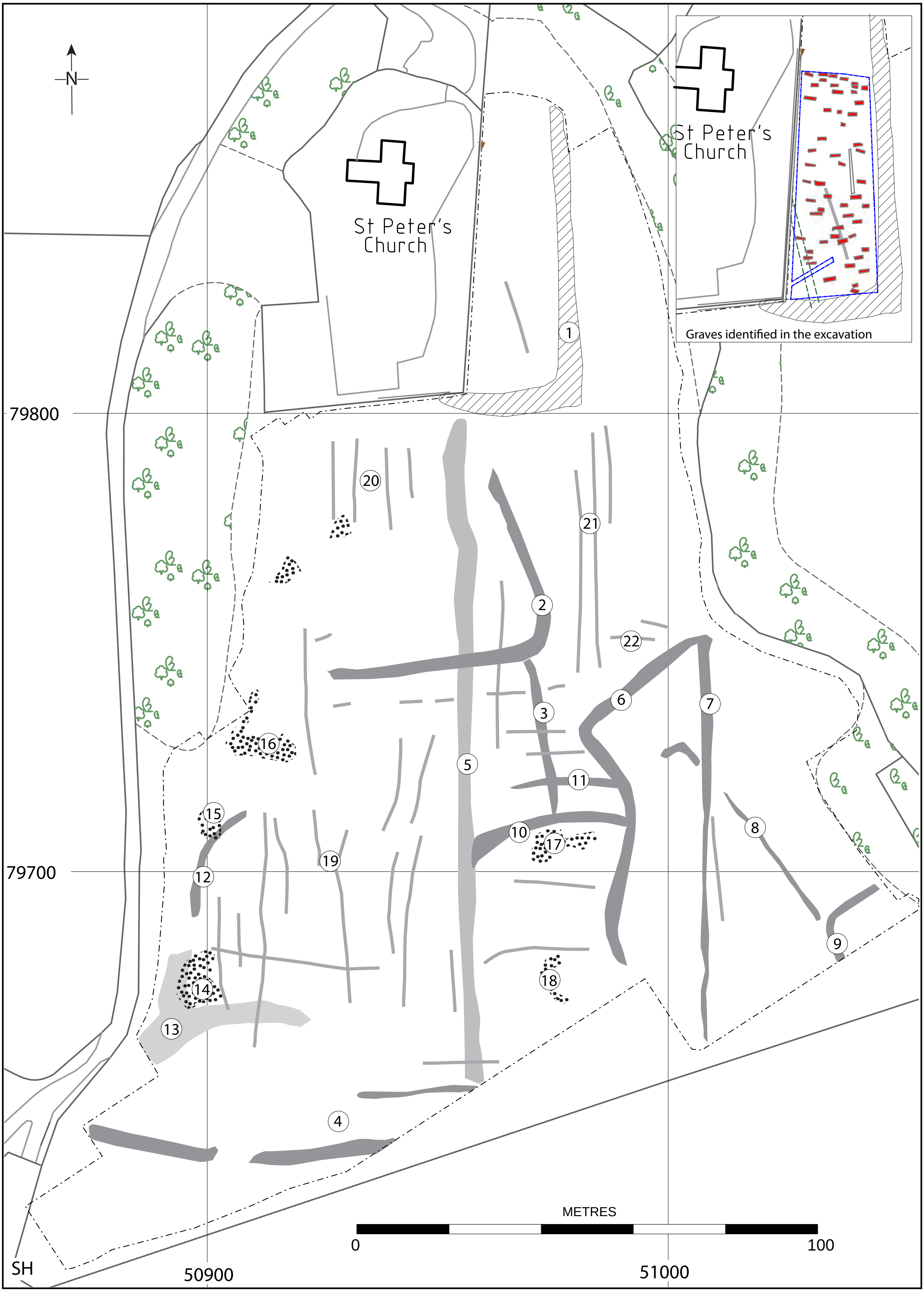

Fig. 6 St Peter's church geophysical survey - interpretation

Fig. 7 St Peter's church - Lidar

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