CPAT Report No 954

Great Lawn, Powis Castle

GEOPHYSICAL SURVEY

THE CLWYD-POWYS ARCHAEOLOGICAL TRUST

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Report for National Trust

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Cover photo: Powis Castle from the air; Great Lawn in the foreground (CPAT 03-C-788)

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1 INTRODUCTION

1.1 This report details a programme of geophysical survey carried out by the Clwyd-Powys Archaeological Trust on the Great Lawn at Powis Castle, near Welshpool (SJ 216064) during October 2008. The work was funded by the National Trust, and was undertaken under the guidance of Mr J Latham, National Trust archaeologist, in an attempt to determine whether any evidence survived of the earlier garden features which are known to have once existed in this area. The survey used a fluxgate gradiometer and the methodology employed is described in Section 2, below.

1.2 The area now occupied by the Great Lawn was previously the site of a Dutch-style water garden, which is believed to have been completed by 1705 and is depicted on an engraving created by Samuel and Nathaniel Buck in 1741-2. The garden appears to have comprised four parterres aligned north-west/south-east, the central two of which were occupied by ponds of rectangular shape with semi-circular ends of smaller diameter than the pond width. Both ponds had a central statue surrounded by four small features that may have acted as fountains, although this is not certain. Statues were also placed centrally in the two outer parterres. In addition to the features depicted in 1742, it is known that a cascade ran down the slope facing the castle and emptied into a further pool, described as a 'noble Bason' by John Bridgeman in 1705 (National Trust 2000, 37).

1.3 A plan of the castle and gardens was produced by the architect T F Pritchard in 1771 (see Fig. 3), as part of his work at the castle (Ionides 1999, 186-194). The plan depicts the two ponds described above, together with the basin at the base of the cascade, although the cascade itself is not shown. It is stated that he was instructed to limit this plan to an area encompassing the castle and buildings with ground 60 yards around them (Ionides 1999, 189). The statues are also marked on the plan, but the earlier parterres are no longer evident. In the later part of the 18th century the water garden fell out of favour because of its outmoded style, and this, coupled with a number of other factors relating to the estate, led to it being dismantled and replaced by the Great Lawn at the beginning of the 19th-century.

2 METHODOLOGY

2.1 Fluxgate gradiometer survey provides a rapid, non-invasive, method of examining large areas for magnetic anomalies. Plans can then be produced which relate the anomalies to the modern topography and allow for their assessment in regard to the aims of the survey programme.

2.2 ***Instrumentation and background***

2.2.1 The geophysical work was carried out using a Geoscan FM36 fluxgate gradiometer, which detects variations in the earth's magnetic field resulting from the presence of iron minerals in the soil. These minerals are generally the weakly magnetised iron oxides that are normally found in topsoil. Features cut into the subsoil can be detected by the instrument when topsoil has formed part of their fill, whether directly or by silting.

2.2.2 There are a variety of other processes which may result in detectable anomalies, such as the presence of iron objects in the soil, which yield high readings. The potential to detect areas of burning is also of interest, as it can identify hearths and kilns where the fired clay has acquired a thermo-remnant magnetic field upon cooling.

2.2.3 Unfortunately, not all soils are conducive to the use of this method, particularly in cases where the topsoil and subsoil have similar magnetic properties. Occasionally, high or random levels of magnetic material within the soil can effectively mask the results and prevent detection of artificial features. The lack of detectable anomalies cannot be taken to mean conclusively that there is no surviving archaeology in a locality.

2.2.4 The Geoscan FM36 is a hand-held instrument which allows readings to 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, whose Mumetal cores are driven in and out of magnetic saturation by a 1,000Hz AC 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 (Clark 1990, referred to in Hopewell 2004).

2.2.5 Magnetic fields and variations are measured in nanoTeslas (nT). The earth's magnetic field is approximately 48,000nT, but archaeological features generally produce instrument readings of less than 15nT. Areas of burning and iron objects produce higher readings, perhaps up to several hundred nT. The gradiometer can detect changes as low as 0.1nT.

2.3 ***Data collection***

2.3.1 The gradiometer has an on-board data logging device which enables readings to be taken at specific time intervals. These readings are taken along parallel traverses within a grid of known size, which allows them to be correlated with geographical locations.

2.3.2 In the case of this survey, the grids measured 20m by 20m, with intervals between the traverses of one metre. The speed of each traverse was controlled such that readings were taken every 0.5m, thereby giving a total number of 800 readings per $400m^2$ grid.

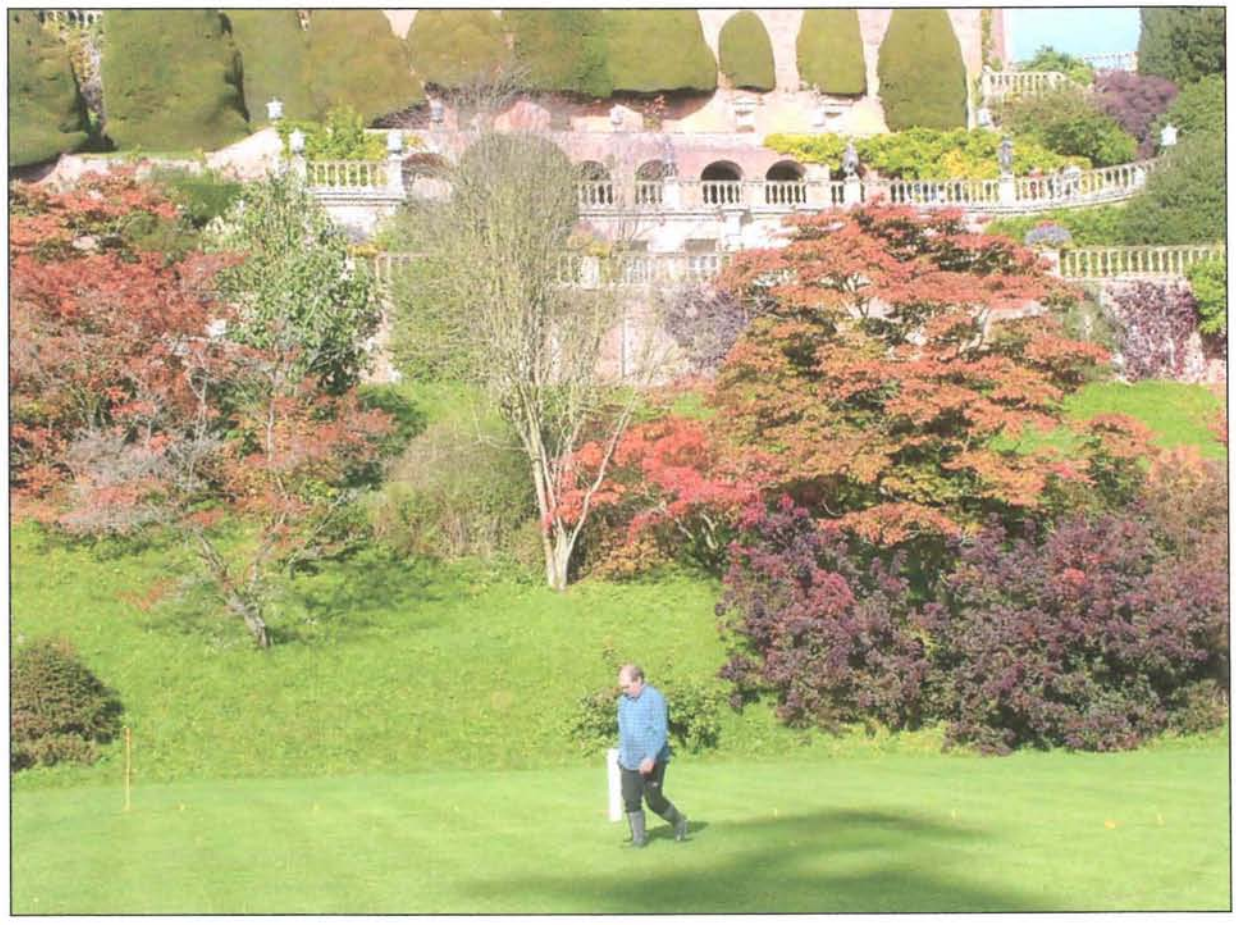

Plate 1 Surveying in progress (Photo CPAT 2667-006)

2.4 ***Data processing and presentation***

2.4.1 The data was transferred from the data logger to a computer, where it was compiled and processed using Geoplot 3.0 software. A minimum of processing was carried out, although compensations were made for instrument drift caused by gradual changes in the earth's magnetic field, and inconsistencies in data collection. Typical processing functions utilised for these ends were *Zero Mean Grid, Zero Mean Traverse, and Destagger.* The *Clip* function allowed smaller variations in the readings to become visible by reducing the impact of very low and very high readings on the plot.

2.4.2 The results are presented in greyscale format, along with an interpretation drawing. The greyscale plot produces a plan view of the survey and allows subtle changes in the data to be displayed. Trace plots have been eschewed because they appeared to add little to the overall impression and understanding of the survey, but it would be possible to produce such plots from the archived data if these were required at any stage in the future.

2.5 ***Grid location and the plotting of the geophysical survey results***

2.5.1 Prior to the commencement of the geophysical survey, the survey grids were laid out and then located in relation to nearby boundaries and features by topographic survey using an EDM and Penmap software. The EDM survey was then related to a scan of the first edition Ordnance Survey mapping by the use of the Mapinfo program.

Plate 2 Demonstrating the results of the survey to National Trust garden staff (Photo CPAT 2667-018)

2.5.2 The greyscale plot of the geophysical survey results was produced using Geoplot 3.0 software and the plot was exported as a Windows Bitmap. This was then cleaned up and rotated to match grid north using Paint Shop Pro software, before being imported as a raster layer into GIS using

Mapinfo. A simplified version of the first edition Ordnance Survey map was used to relate the geophysical survey to the castle and garden, with the combined plan reproduced as Fig. 1. The detailed first edition map was then used as a background on which the anomalies revealed by the survey were depicted (Fig. 2).

3 GEOPHYSICAL SURVEY RESULTS

3.1 The Great Lawn measures some 160m north-east/south-west by 75m and lies at the base of the terraced garden on the south-east side of the castle. A single area totalling just over 1.0ha was examined by geophysics, comprising 27 part or whole grids, each 20m square, which encompassed the majority of the Great Lawn.

3.2 As mentioned above, the results of the survey are depicted on Fig. 1, with a further plan (Fig. 2) showing the likely interpretation of the anomalies identified. The three main anomalies (outlined in dark blue on Fig. 2) are traces of the ponds depicted by Pritchard in 1771, these being the main features of the 18th-century water-garden. Although faint, both of the ponds on the Buck engraving were visible in the results and the geophysics gives a measurement for each of approximately 21m north-west/south-east by 13m. The pond at the base of the cascade was also evident, measuring some 20m north-east/south-west, although its other dimension cannot be determined as the south-eastern part of the pond is hidden beneath later features, namely a trackway and the main drainage culvert for this part of the gardens. No evidence of the locations of any of the statuary was found, although that would not be expected with this type of survey; the locations of statues depicted on Pritchard's plan of 1771 have been added to Fig. 2 by comparing that plan with the geophysics results.

3.3 Various linear features were also revealed by the survey, but most of these (those in green on Fig. 2) were land drains placed in the later part of the 20th century. Two possible drains or water supplies were identified which could link the pond at the base of the cascade with the two ponds in the parterres, although the magnetic response was fairly faint and this theory cannot be confirmed. Likewise, a linear feature or features running along the south-east side of the lawn may represent traces of the early 18th-century parterres, or perhaps a drainage feature earlier than the modern drain which runs alongside the path.

4 DISCUSSION

4.1 The survey has been successful in identifying the main elements of the 18th-century water-garden, which appear to have survived beneath the Great Lawn. Although the results are fairly faint, this is probably a function of the nature of the remains; masonry structures do not generally respond well to magnetometer survey and the visible anomalies are likely to represent material filling the ponds and/or the foundation trenches around them. It is therefore reasonable to suppose that the ponds were simply infilled when the garden was remodelled at the beginning of the 19th century.

4.2 Similarly, the lack of clarity regarding the parterres depicted on the 1741-2 Buck engraving does not imply that these features have been entirely lost. Their presence or absence is only likely to be determined by excavation, should this ever be considered. One factor that made the identification of these features difficult was the presence of a large number of parallel drains believed to have been placed in the Great Lawn in the later part of the 20th century. These could have masked evidence of the earlier features, as they exhibit the same alignment as the sides of the parterres.

4.3 There are slight suggestions of a possible water supply or drain between the three ponds, although it is likely that the pipes would have been of lead and these would not show directly; the response may have come from the backfill of the trenches in which they were laid.

5 ACKNOWLEDGEMENTS

5.1 The writer would like to thank his colleague Eleri Farley for her assistance with the survey, also Mr John Latham and other members of National Trust staff for their help with logistics and to the Gwynedd Archaeological Trust for the use of their geophysics equipment.

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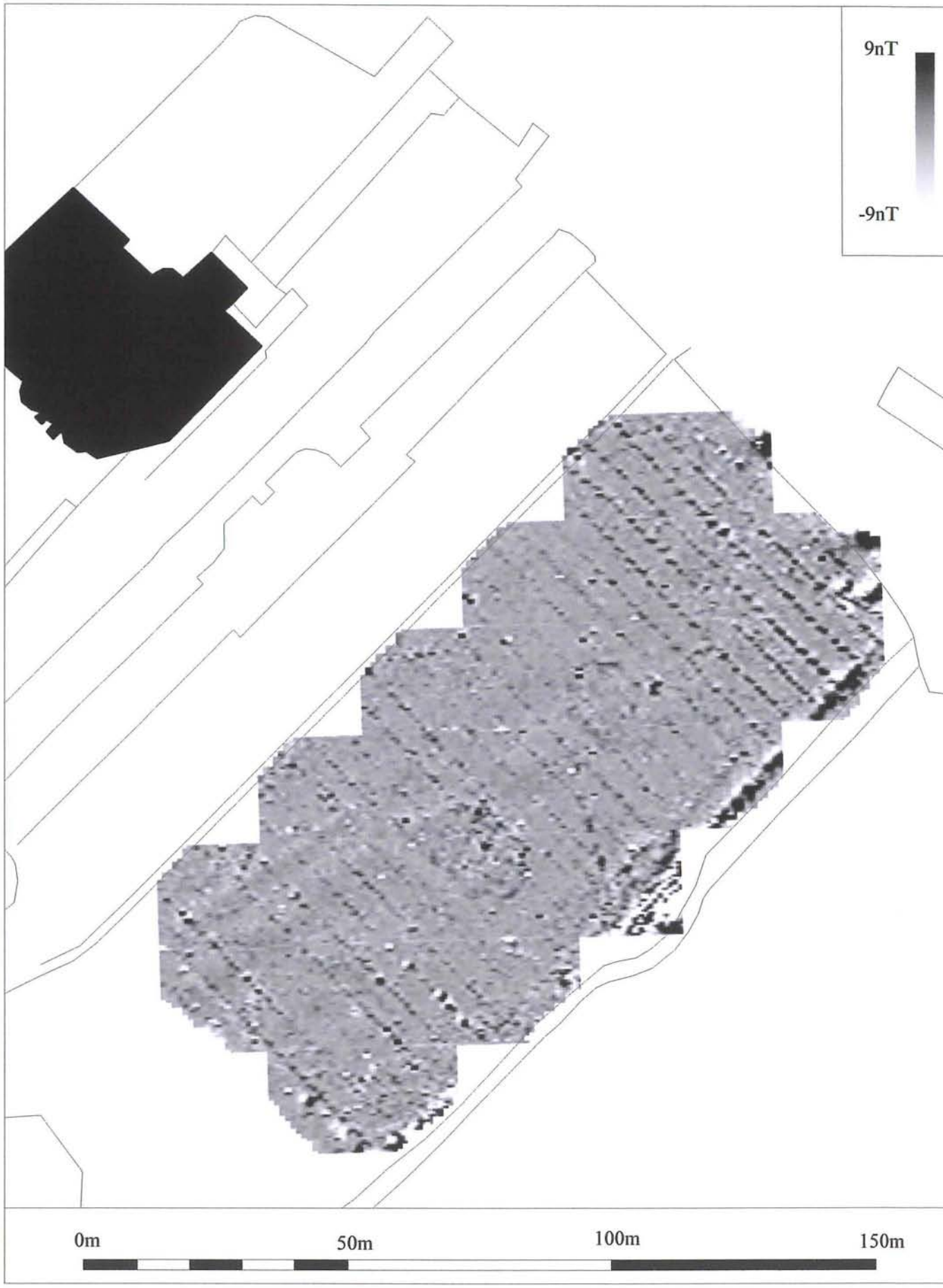

Fig. 1 Geophysics results in relation to the castle and terraces, as depicted on the 1887 Ordnance Survey map (Scale 1:1,000)

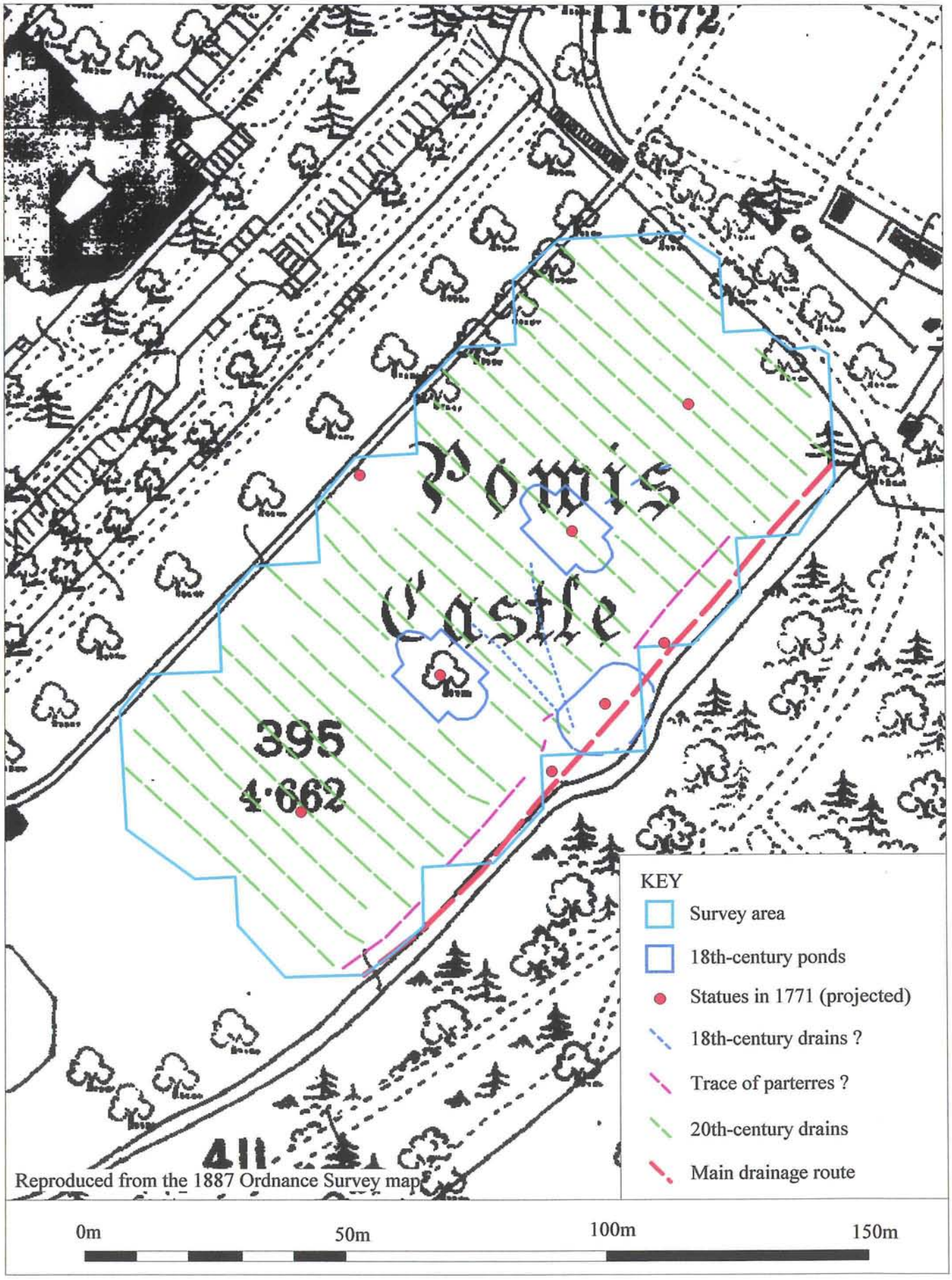

Fig. 2 Interpretation plan of the geophysics results also showing the likely locations of statues depicted by Pritchard in 1771 (Scale 1:1,000)