ARCHAEOLOGICAL SURVEYS

GEOPHYSICAL SURVEY REPORT

Bishop's Garden, Abergwili, Carmarthenshire

Resistivity Survey

for

Cambria Archaeology

David Sabin and Kerry Donaldson

September 2005

Ref no. 112

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Geophysical survey

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Report and fieldwork by David Sabin and Kerry Donaldson

Survey date – **13th September 2005**
Ordnance Survey Grid Reference - **SN 441 209**

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SUMMARY

Resistance survey carried out within the Bishop's Garden at the former Bishop,s Palace, Abergwili, revealed a number of high and low resistance area and linear anomalies. Several amorphous areas of high resistance and short linear anomalies cannot be interpreted with confidence, however, it is likely that these anomalies relate to ground make up or structural debris. Anomalies within the walled garden can be associated with a pathway, linear earthwork and former greenhouse. The survey is likely to have been influenced by soil moisture variation caused by mature trees and shrubs within the survey areas.

1 INTRODUCTION

1.1 Survey background

1.1.1 Archaeological Surveys was commissioned by Cambria Archaeology on behalf of Carmarthenshire Museums Service to undertake a geophysical survey of an area of land at the Bishop's Garden, Abergwili, Carmarthenshire as part of an environmental and historic landscape analysis.

1.2 Survey objective

1.2.1 The objective of the survey was to use resistivity to locate geophysical anomalies that may be archaeological in origin so that they may assessed as part of the environmental and historic landscape analysis and used to inform future proposals to develop the grounds for greater public use and enjoyment.

1.3 Site location

1.3.1 The survey was located at the Bishop's Garden, former Bishop's Palace, Abergwili, Carmarthenshire at OS reference SN 441 209.

1.4 Site description

1.4.1 The survey was conducted within three areas, Area 1 is situated to the south of the former Bishop's Palace, now the Carmarthenshire County Museum, Area 2 to the east of the museum and Area 3 within the walled garden that lies to the west of the museum within the grounds of the Bishop's residence, Llys Esgob. The total coverage of survey within these three areas was approximately 0.5ha.

Plate 1 Bishop's Palace southeast corner

1.5 Site history and archaeological potential

1.5.1 The site of the Bishop's Garden surrounds the Grade 2 listed building of the former Bishop's Palace of St David's, Abergwili, which now houses the county museum. The palace was founded as a religious house during the 13th century and became the Bishop's residence in the 16th century (Carmarthenshire Museums Service 2005).

1.6 Geology and soils

1.6.1 The underlying geology are the Llanvirn and Arenig series of the Ordovician period (BGS 2001). The overlying soils are likely to be associated with Teme and Denbigh 1 soils which are typical brown alluvial soils and typical brown earths respectively (Soil Survey of England and Wales 1983).

2 METHODOLOGY

2.1 Technical synopsis

2.1.1 The electrical resistance or resistivity of the soil depends upon the moisture content and distribution within the soil. Buried features such as walls can affect the moisture distribution and are usually more moisture resistant than other features such as the infill of a ditch. A stone wall will generally give a high resistance response and the moisture retentive content of a ditch can give a low resistance response. Resistivity should be the favoured geophysical survey where building foundations and other masonry features are suspected (English Heritage 1995).

2.2 Equipment details and configuration

2.2.1 The resistivity survey was carried out using TR Systems Ltd Resistance Meter TRCIA 1.31 using a mobile Twin Probe array.

2.2.2 Readings were taken at 1m intervals across the site giving 900 readings within a full 30m x 30m grid. This reading interval is standard and sufficient for most evaluation requirements (English Heritage 1995).

2.3 Data processing and presentation

2.3.1 Data logged by the resistance meter is downloaded and processed within ArcheoSurveyor software. Raw data is analysed and displayed within the report as well as processed data. The following processing has been carried out on data in this survey:

Image processing

- Raw resistivity data has been clipped between 60 and 250 ohms in order to improve greyscale resolution.
- Processed data has been clipped between -40 and 40 ohms to enhance any possible archaeological anomalies. Negative values are a function of the mathematical operation carried out across the data during processing.

Data processing

- Data has been "despiked" in order to remove spurious high contact responses.
- Data is passed through a high pass filter in order to enhance archaeological features. High pass filtering enhances 'high frequency' variations within resistance data which are often associated with manmade features.

2.3.2 The results of the survey are presented as a series of plots indicating the position and referencing of each survey area, greyscale raw and processed plots of the resistance data and an abstraction and interpretation plot with number coded anomalies. A summary of each anomaly highlighted in the abstraction and interpretation plot is shown below for quick reference and this is followed by a more detailed discussion of the results. A final conclusion draws together the more significant points revealed by the survey.

3 RESULTS

3.1 Area 1, south of museum (centred on OS Ref 244101, 220939) (Figures 3 – 5)

Anomalies with an uncertain origin

(8) – Short high resistance linear anomaly possibly related to structural remains.

(9) – High resistance area extending into Area 2 may be associated with structural debris or ground make-up and has probably been enhanced by tree cover.

3.2 Area 2, east of museum (centred on OS Ref 244131, 220979) (Figures 3 – 5)

Anomalies with an uncertain origin

(9) – As above extending from Area 1

(10) – Low resistance response indicating more moisture retentive soil such as a ditch fill?

(11) – High resistance area that may be associated with structural debris or ground make-up and has probably been enhanced by a large tree within the area.

(12) – High resistance linear response possibly associated with structural remains or ground make up and may be related to high resistance (11).

(13) – Similar to (12).

(14) – High resistance linear response of uncertain origin.

Anomalies associated with nearby vegetation

(15) – High resistance area that is likely to be related to a soil moisture deficit caused by nearby mature trees.

(16) – Similar to (15)

3.3 Area 3, walled garden (centred on OS Ref 244045, 220882) (Figures 3 – 5)

Anomalies with an uncertain origin

(3) High resistance linear response that may be related to structural remains, pathway?

(4) – High resistance area that may be associated with structural debris or ground make up; natural geological/pedological variation should also be considered.

(6) – Similar to (4)

(7) – Similar to (4)

Anomalies likely to be related to structural remains

(1) – Low contrast high resistance linear anomaly associated with clearly visible earthwork suggesting former building or boundary.

(2) – Low resistance area anomaly clearly associated with remains of a greenhouse.

(5) – High resistance area with a linear trend correlates to the position of mapped garden paths.

4 DISCUSSION

4.1 Area 1

Within the survey area there are no well-defined anomalies. A short high resistance linear anomaly, (8), may be associated with former structures adjacent to the former Bishop's Palace but further interpretation is speculative. High resistance area anomaly, (9), is distinct from lower resistance response closer to the building and appears to respect the modern pathway through the area. This may well indicate that the anomaly is associated with different ground make up or soil conditions and the high resistance response may have been enhanced by moisture deficit related to trees within the area.

4.2 Area 2

There are few well-defined anomalies within the survey area although a large variation in resistance is present across the site. Anomaly (11) is an amorphous area of very high resistance which would normally be associated with unconsolidated, dry building debris or ground make up with stone. It is likely that the high resistance within this area has also been greatly enhanced by soil moisture deficit associated with nearby trees. The presence of a linear low resistance anomaly adjacent to (11) possibly indicates a former ditch holding a moisture retentive fill, however, only a short length of this anomaly is visible at the edge of the survey which prevents a confident interpretation. Short lengths of high resistance linear anomalies, (12), (13) and (14), may relate to former structural remains or garden features but again no confident interpretation is possible. Amorphous high resistance areas (15) and (16) are likely to be associated with soil moisture deficit caused by nearby mature trees and shrubs.

4.3 Area 3

Several anomalies within the survey area are associated with garden features or structural remains. Anomaly (1) is a low contrast high resistance response clearly associated with a linear earthwork; possibly a former building or boundary. A low resistance area anomaly (2) is known to have been caused by the remains of a greenhouse which exists as an overgrown low brick structure. The low resistance response is unusual and must be related to impeded drainage or highly moisture retentive soil within the structural remains. A high resistance area anomaly with a linear trend (5), shows a good correlation with mapped garden pathways. High resistance linear anomaly (3), is of uncertain origin but may be associated with a former boundary or path running across the area. Other more amorphous anomalies, (4), (6) and (7) are difficult to interpret although may relate to structural debris or ground make up; natural geological or soil variation should also be considered.

5 CONCLUSION

This survey has revealed a wide variation in ground resistance across the site although interpretation of the results has been problematic due to the poorly defined and amorphous nature of the anomalies. The timing of the survey, in late summer after a relatively dry year, would be expected to provide optimum conditions for the location of archaeological anomalies by resistance, however, the variety of vegetation surrounding the Bishop's Palace is likely to have had an unpredictable effect on soil moisture. Given the status and lengthy period of occupation at the site it is likely that many of the anomalies are related to the development of the gardens and palace over several centuries.

6 REFERENCES

British Geological Society, 1977, *Geological Survey Ten Mile Map, South Sheet, First Edition (Quaternary), Scale 1:625 000.*

British Geological Society, 2001, *Solid Geology Map, UK South Sheet, 1:625 000 scale, 4th edition.*

Carmarthenshire Museums Service 2005, *Brief for an Environmental and Historic Landscape Survey of the Bishop's Garden, Abergwili, Carmarthenshire.* Carmarthenshire County Council.

English Heritage, 1995, *Geophysical survey in archaeological field evaluation. Research and Professional Service Guideline No 1.*

Soil Survey of England and Wales, 1983, *Soils of England and Wales, Sheet 4 Eastern England.*

Geophysical Survey
Bishop's Garden, Abergwili

N
W E
S

Location map

Scale 1:50000

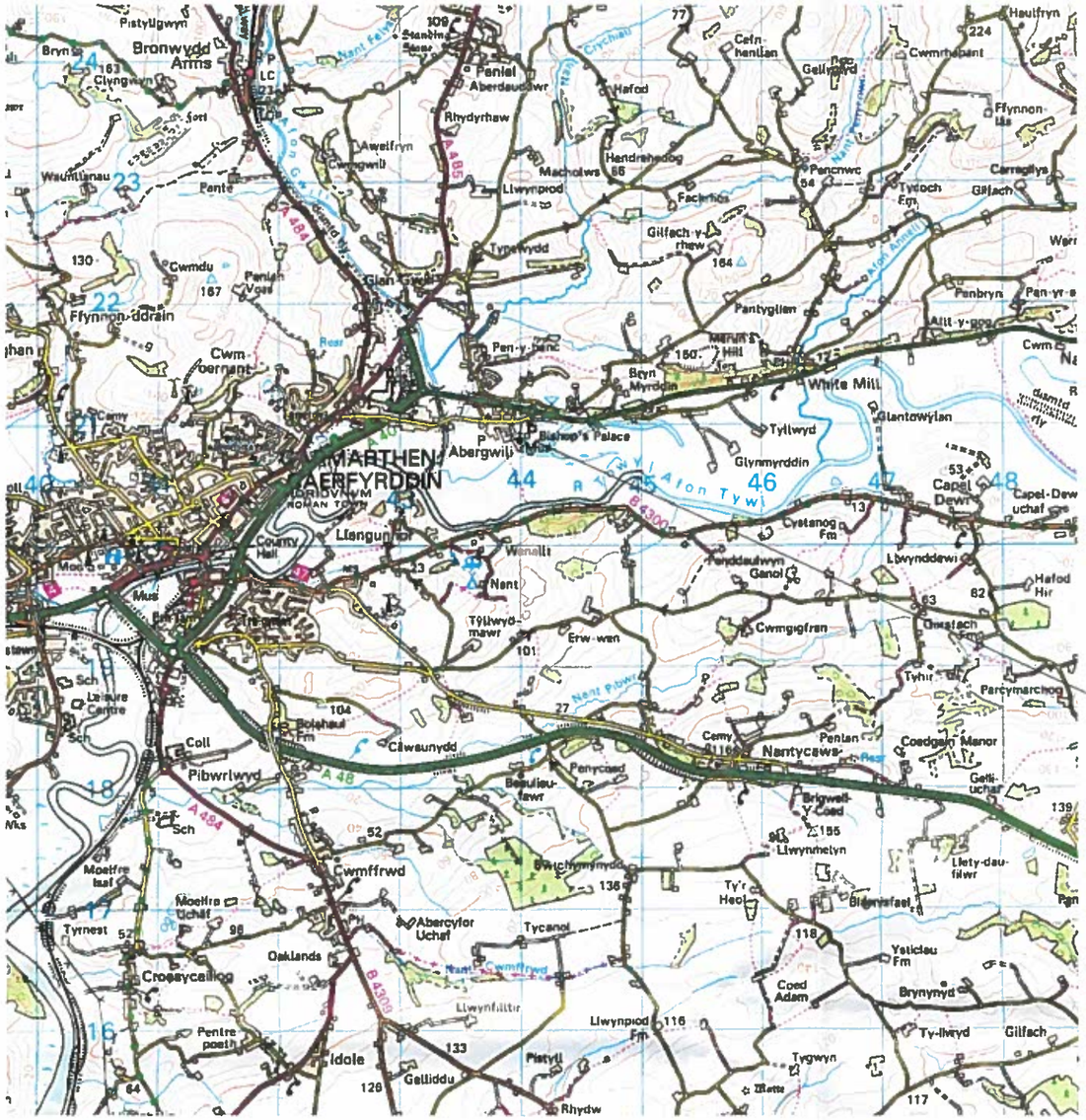


Fig01

Archaeological Surveys

Geophysical Survey
Bishop's Garden, Abergwili

Grid referencing

Scale 1:1000

ID	OSGB36_Grid_reference
A	244086.42, 220955.42
C	244118.74, 220939.43
D	244111.06, 220998.94
E	244023.45, 220886.46
F	244050.55, 220899.35
B	244090.26, 220925.67

Fig02

Geophysical Survey
Bishop's Garden, Abergwili

Raw resistance data

Scale 1:1000

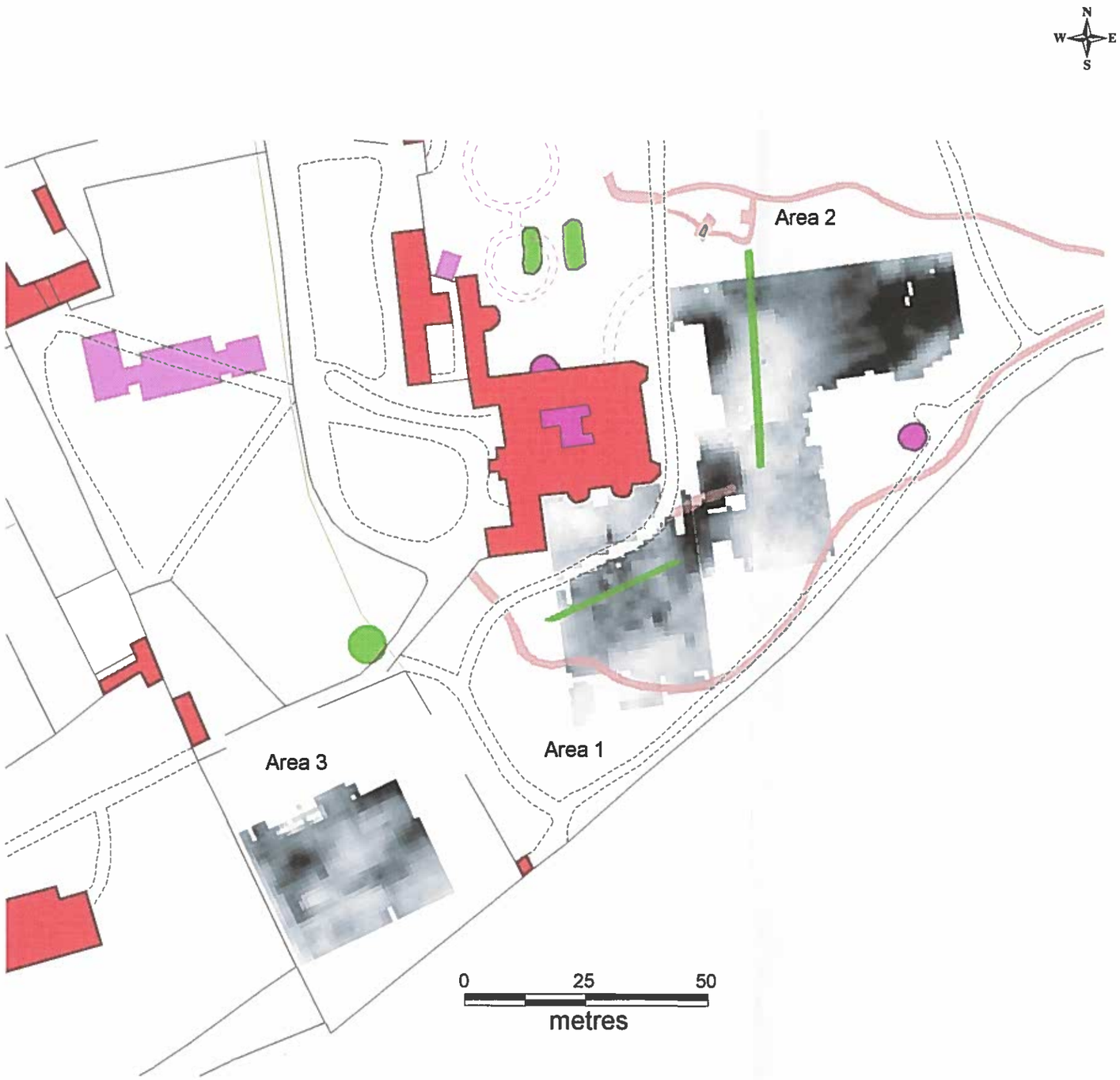


Fig03

Archaeological Surveys

Geophysical Survey
Bishop's Garden, Abergwili

Processed resistance data

Scale 1:1000

40 ohms

-40 ohms

Fig04

Archaeological Surveys

Geophysical Survey
Bishop's Garden, Abergwili

Abstraction and interpretation of resistance data

Scale 1:1000

Key

- High resistance linear - possible sructural remains
- Low resistance linear - possible former ditch/drain
- High resistance area - possible debris and moisture uptake by trees
- High resistance area - probably related to nearby trees
- Low resistance area - part of greenhouse remains - partly visible brick
- High resistance area - possible structural debris/ground make up
- High resistance area - probable former pathway

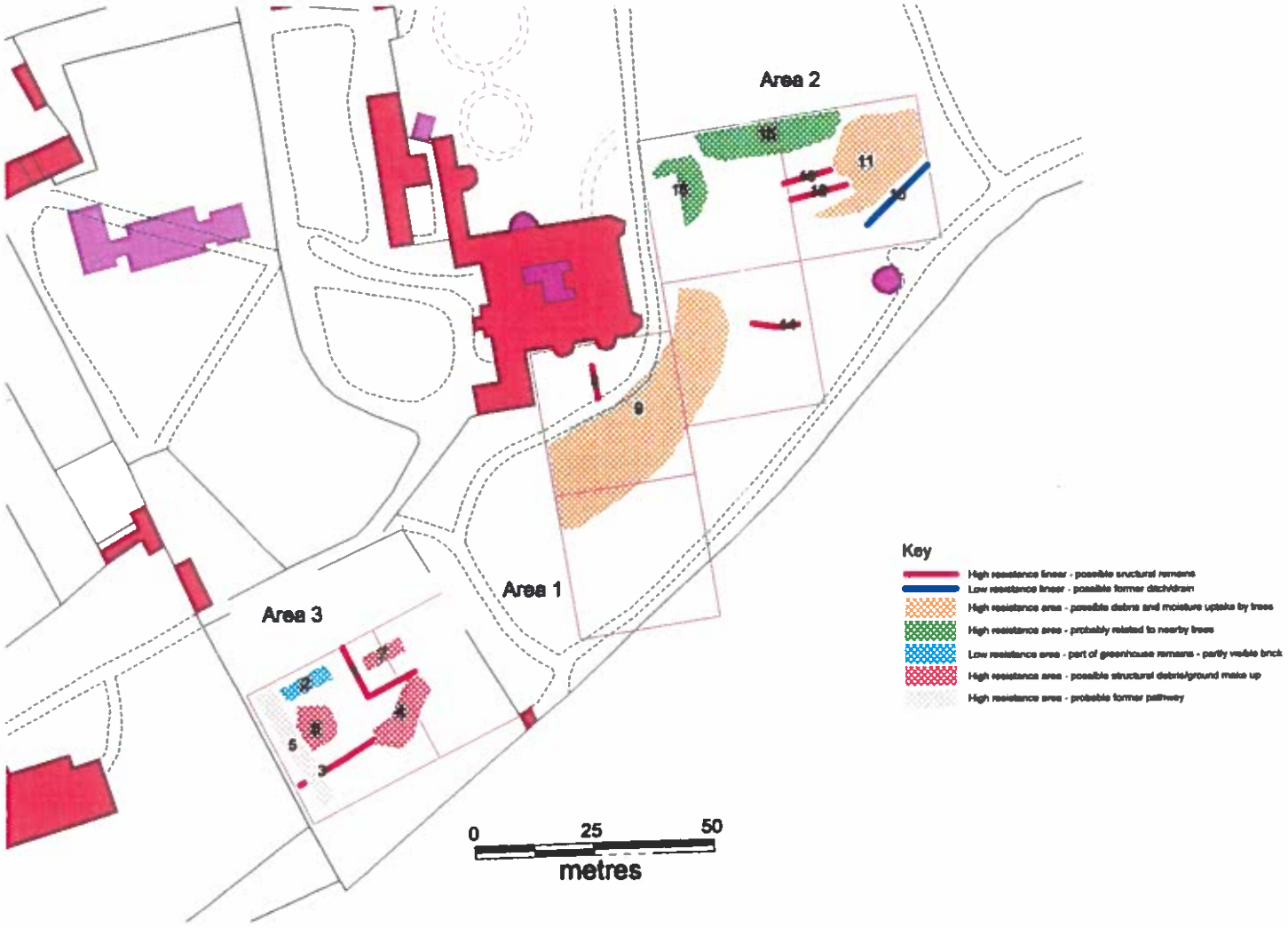
Fig05

Archaeological Surveys

Geophysical Survey
Bishop's Garden, Abergwili

Abstraction and interpretation of resistance data

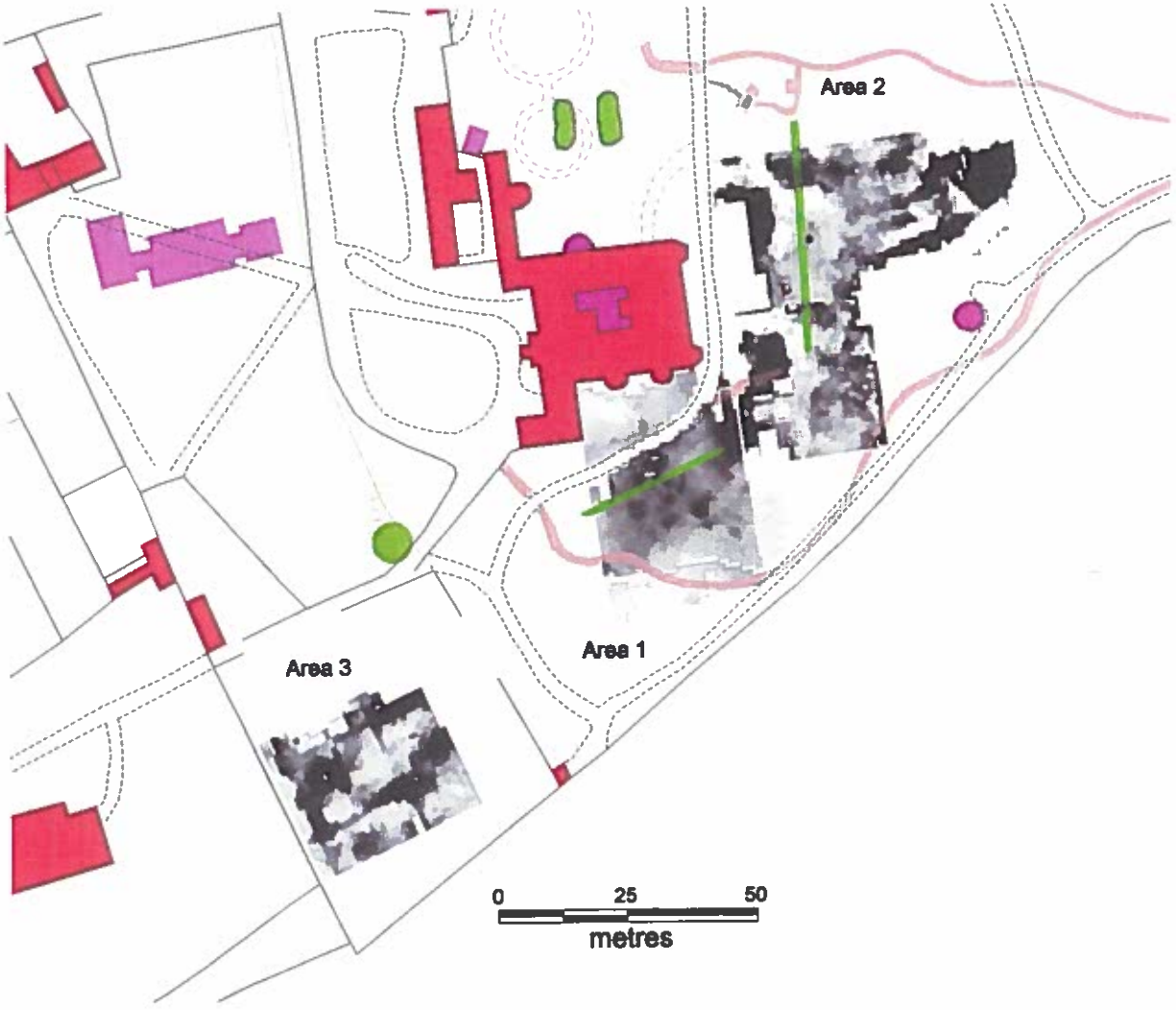
Scale 1:1000



Geophysical Survey
Bishop's Garden, Abergwili

Processed resistance data

Scale 1:1000

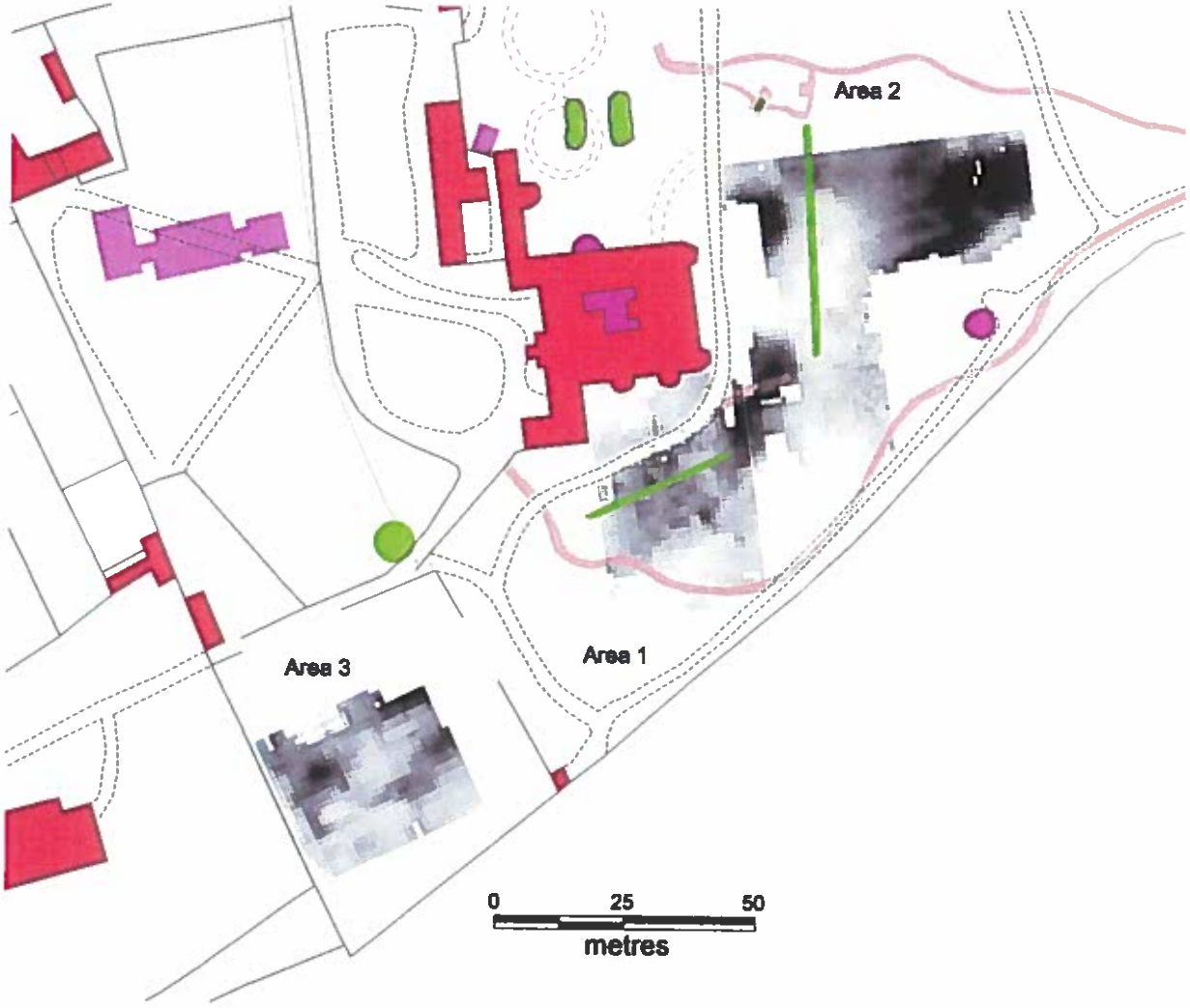


40 ohms

-40 ohms

Archaeological Surveys

Geophysical Survey
Bishop's Garden, Abergwili



Raw resistance data

Scale 1:1000

250 ohms

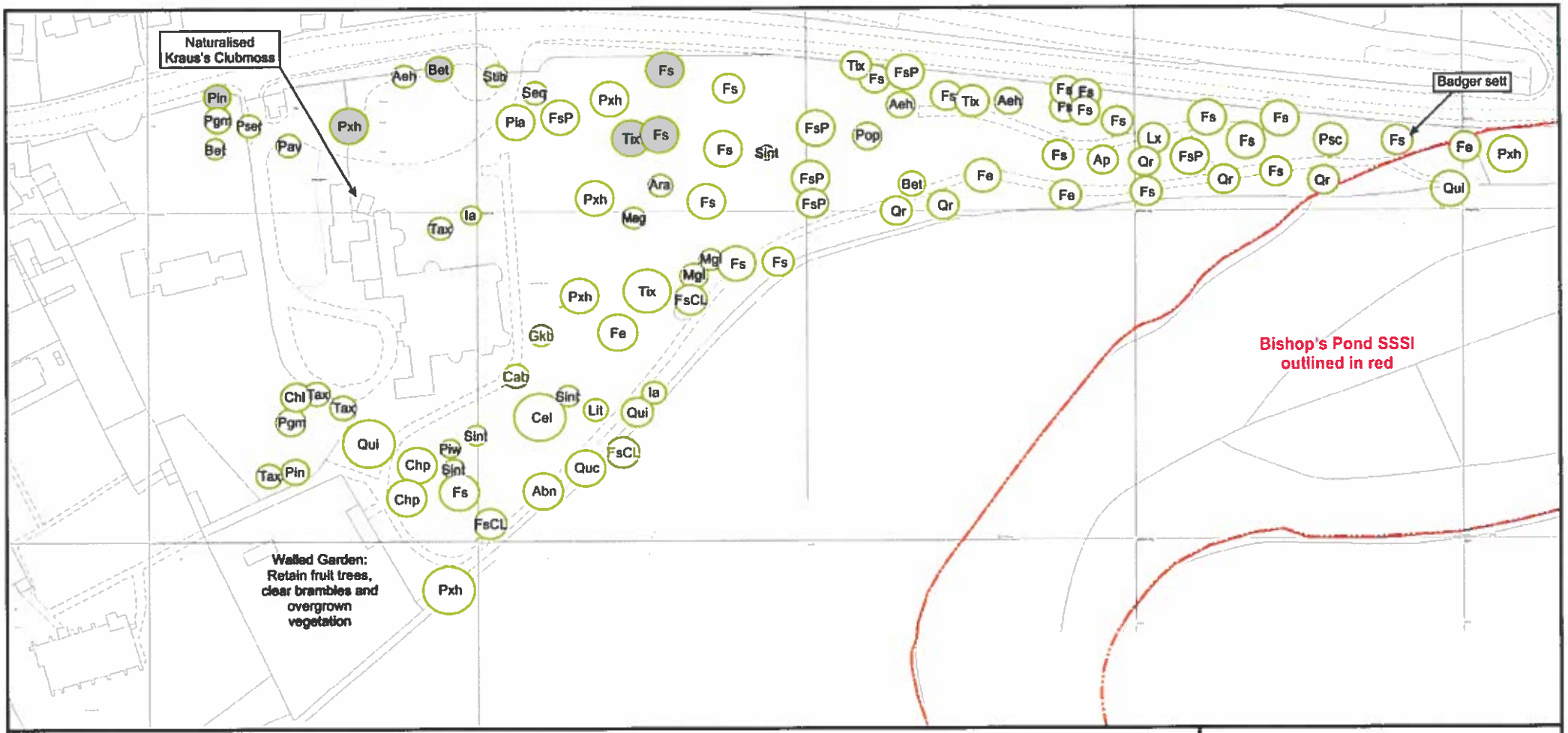
60 ohms

Geophysical Survey
Bishop's Garden, Abergwili

Grid referencing

Scale 1:1000

ID	OSGB36 Grid reference
A	244086.42, 220855.42
C	244118.74, 220839.43
D	244111.06, 220888.94
E	244023.45, 220886.46
F	244050.55, 220899.35
B	244090.26, 220825.67



Abn	Caucasian Fir *Abies nordmanniana*	Pav	Wild Cherry *Prunus avium*
Aeh	Horse Chestnut *Aesculus hippocastanum*	Pgm	Douglas Fir *Pseudotsuga mensiesii*
Ap	Sycamore *Acer pseudoplatanus*	Pia	Norway Spruce *Picea abies*
ApP	Sycamore Purple leaved varieties	Pin	Corsican Pine *Pinus nigra* ssp. *laricio*
Ara	Monkey Puzzle *Araucaria araucanal*	Pis	Sitka Spruce *Picea sitchensis*
Bet	Silver Birch *Betula pendula*	Piw	Bhutan Pine *Pinus wallichiana*
Cab	Hornbeam *Carpinus betulus*	Pop	Italian Black-poplar *Populus* x *canadensis*
Chl	Lawson's Cypress *Chamaecyparis lawsoniana*	Psc	Scots Pine *Pinus sylvestris*
Chp	Sawara Cypress *Chamaecyparis pisifera* 'Squarrosa'	Pser	Japanese Cherry *Prunus serrulata*
Fe	Ash *Fraxinus excelsior*	Pxh	London Plane *Platanus* x *hispanicus*
Fs	Beech *Fagus sylvatica*	Qr	Pedunculate Oak *Quercus robur*
FsCL	Cut-leaved Beech *Fagus sylvatica* 'Heterophylla'	Quc	Turkey Oak *Qercus cerris*
FsP	Copper Beech *Fagus sylvatica* 'Purpurea'	Qui	Evergreen Oak *Quercus ilex*
Gkb	Maidenhair-tree *Ginkgo biloba*	Seq	Coastal Redwood *Sequoia sempervirens*
Ia	Holly *Ilex aquifolium*	Sint	Swedish Whitebeam *Sorbus intermedia*
Lit	Tulip Tree *Liriodendron tulipifera*	Stib	Mitchell's Whitebeam *Sorbus thibetica*
Lx	Hybrid Larch *Larix* x *marschlinsii*	Tax	Yew *Taxus baccata*
Mag	magnolia *Magnolia* sp.	Tix	Common Lime *Tilia* x *europaea*
Mgl	Dawn Redwood *Metasequoia glyptostroboides*		

N

Bishop's Palace Garden,
Abergwili, Carmarthen

MATURE TREES and TREES WHICH SHOULD BE CONSIDERED FOR RETENTION

SCALE
0 METRES 50

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