PEMBROKE CASTLE:
GEOPHYSICAL SURVEY 2016
PART I: RESULTS
PART II: DISCUSSION

DAT Archaeological Services

Prepared by DAT Archaeological Services
For: Castle Studies Trust

REGISTERED ORGANISATION CIfA

mddiriedolaeth archaeolegol DYFED archaeological trust

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Advancing the Understanding of Castles

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PEMBROKE CASTLE: GEOPHYSICAL SURVEY 2016 PART I: RESULTS

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with Tim Fletcher
and contributions by Tim Southern and James Meek

PART II: DISCUSSION

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PEMBROKE CASTLE: GEOPHYSICAL SURVEY 2016

PART I: RESULTS

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PEMBROKE CASTLE: GEOPHYSICAL SURVEY 2016

SUMMARY (BY Neil Ludlow and James Meek)

SUMMARY

The Castle Studies Trust provided funding for a geophysical survey within Pembroke Castle, Pembrokeshire (NGR SM 9815 0165), which was undertaken by Dyfed Archaeological Trust (with Tim Fletcher and Tim Southern) during early May 2015. The castle is a Scheduled Ancient Monument (PE005; PRN 4518).

Three different forms of geophysical survey were used at the castle: magnetometry survey; resistivity survey; and Ground Penetrating Radar (GPR) survey. The magnetometry and resistivity surveys were carried out and reported upon by Dyfed Archaeological Trust (with Tim Southern) and the GPR survey was carried out and reported on by Tim Fletcher (TF Industries Ltd).

The project was developed alongside Neil Ludlow, who identified the aims and objectives of the surveys. The results of the surveys will feed into Neil's ongoing research on the castle. The general aim of the survey was to assess and characterise the surviving below-ground potential of the castle, and its layout (during its final phases, at least) when both wards show strong evidence of having a number of masonry buildings.

The surveys took place in both the inner and outer wards of the castle. The magnetometry survey covered c.3994 sq m of the outer ward and 835sq m of the inner ward; the resistivity survey covered 3344 sq m of the outer ward and a total of 794 sq m of the inner ward; the GPR survey was only undertaken within the outer ward and covered an area of around 4479 sq m. In total c.6192 sq m of the outer ward was subject to geophysical survey, covering 81.5% of its total area.

A number of below-ground features, including former buildings, had previously been recorded through aerial photography, as parchmarks/cropmarks. Most of these were also recorded through the geophysical surveys, along with a number of further features. Although it is not possible to be definitive regarding interpretations of geophysical survey results, as further archaeological investigations would be needed to characterise and date the features, the following possible interpretations of the main features of the results have been put forward by Neil Ludlow based on his existing research and comparative examples:

***Inner ward** – hints of two or possibly three buildings, none of which can be dated or characterised.*

***Outer ward** – A large, medieval rectangular building against the southwest curtain, and a possible smaller lean-to against the southern curtain; the possible site of the main castle well; a free-standing, winged mansion-house and associated building, probably from the late fifteenth century; two buildings, possibly seventeenth-century, one of them associated with a below-ground 'passage' that may be a Civil War gunpowder magazine; five buildings representing 'Hall-huts' constructed for the troops that occupied the castle during the Second World War.*

In addition were a number of more indeterminate features, some of which may be medieval and some perhaps earlier, possibly even representing prehistoric occupation of the site. All other features detected during the surveys were of uncertain nature, excepting the outline of the modern stone path running northwest-southeast right through the outer ward.

Contrary to expectations, the results indicate that the outer ward appears to have been largely empty of medieval buildings and structures. This may have been

deliberate. A change of status may have occurred under which it became progressively 'gentrified' culminating with the erection of the winged house in the late fifteenth century. Alternatively, it may have been intended to be an open space from the first, possibly – in part, at least – to house campaigning armies and/or assemblies of various kinds. It is possible that later activity has masked remains of other timber built structures such that they could not be identified through geophysical survey. Similarly no evidence was found for the infilled ditch surrounding the inner ward, although physical evidence has been recorded, indicating that the methods of resistivity and magnetometry were not suitable to identify the ditch, again due to it being masked by later activity including buildings, cables etc. Unfortunately the line of the ditch lay outside of the GPR survey area.

The GPR results also broadly concurred with the resistivity and magnetometry surveys, but allowed a greater depth into the ground to be observed. This technique also enabled a survey of the square tarmac area / former tennis court (presently painted with the map of Wales) to be surveyed.

Overall the geophysical surveys have produced very interesting results which would certainly benefit from further archaeological works to confirm their character, date, state of preservation and significance, if permissions were granted by Cadw and the Pembroke Castle Trust (and funding could be secured). Such information would not only benefit studies of Pembroke Castle and the wider study of castles in general, but also provide additional visitor attractions for Pembroke Castle, and potential opportunities for members of the public to become involved in any such investigations.

PEMBROKE CASTLE: GEOPHYSICAL SURVEY 2016
PART I: RESULTS

By Alice Day with Tim Fletcher,
and contributions by Tim Southern and James Meek

1 INTRODUCTION

1.1 Project Commission

1.1.1 Dyfed Archaeological Trust undertook a geophysical survey of the outer ward and part of the inner ward at Pembroke Castle in Pembrokeshire (NGR SM 9815 0165; **Figures 1** and **2**) through grant funding from the Castle Studies Trust.

1.1.2 The project was designed in conjunction with Neil Ludlow, who has identified the aims and objectives of the surveys, the results of which will feed into his ongoing research and future publication on the Castle.

1.1.3 The magnetometry survey was carried out by DAT Archaeological Services, the fieldwork arm of Dyfed Archaeological Trust and the resistivity survey was carried out by Tim Southern on behalf of Dyfed Archaeological Trust. A Ground Penetrating Radar (GPR) survey was also undertaken by Tim Fletcher of TF Industries Ltd (Geophysical Report Number TFI_05/2016-DAT; Appendix 1).

1.1.4 The castle is a Scheduled Ancient Monument (PE005; Dyfed Historic Environment Record reference PRN4518) and is owned and managed by the Pembroke Castle Trust. Permissions were given by Cadw and Pembroke Castle Trust prior to the surveys being undertaken.

1.2 Scope of the project

1.2.1 A Written Scheme of Investigation (WSI) for a geophysical survey was prepared by DAT Archaeological Services prior to the commencement of works and submitted to Cadw, Castle Studies Trust and Pembroke Castle Trust (Part 1, Appendix I).

1.2.2 The WSI outlined the following tasks to be completed:

- Provision of a written scheme of investigation (WSI) to outline the methodology for the archaeological work which DAT Archaeological Services will undertake;
- To identify the presence/absence of any potential archaeological deposits through gradiometer survey; and
- To produce an archive and report of any results.

1.2.3 The general aim of the survey was to assess and characterise the surviving below-ground potential of the castle, and its layout (during its final phases, at least) when both wards are thought to have shown strong evidence of having been congested with masonry buildings, most of them hitherto unsuspected.

1.2.4 One specific objective of the survey was to procure evidence to help determine whether the large building known to be in the outer ward (revealed in 2013 as parch marks on aerial photography) is, as Neil Ludlow has suggested in the past, a mid-late fifteenth-century hall-house and potential royal birthplace. The implications of a detached, high-status house from this period, separate from the main domestic accommodation, would have a significant impact on castle studies at both local and national levels.

1.2.5 The surveys may also resolve the question of the castle's water-supply, which has vexed a number of authors in the past; it will also confirm (or otherwise) the presence of an infilled defensive ditch in front of the inner curtain wall, its form and its extent. It also has the potential, at least, to reveal whether or not the outer ward was established over what had formerly been part of the earlier town of Pembroke.

1.2.6 Finally, the work very much forms part of an ongoing project being undertaken by Neil Ludlow, incorporating the results of research and field study of the castle spanning twenty years, with a fully-defined outcome – the publication of a detailed analysis of the castle, which is hoped will be a companion volume to his Carmarthen Castle book published by the University of Wales Press in 2014.

1.2.7 Three different forms of geophysical survey were used at the castle: magnetometry survey; resistivity survey; and ground penetrating radar. By using three different geophysical techniques it was hoped that the most amount of non-intrusive information could be gathered and that the chances of a feature avoiding detection would be reduced.

1.2.8 The magnetometry survey covered *c.*835.5m^2 of ground in the inner ward and 3993.8m^2 in the outer ward. The electrical resistance meter was used to survey approximately 3344m^2 in the outer ward, and an *c.*734.5m^2 in the inner ward (with an additional 59.5m^2 in the standing building known as the 'Chancery'). The GPR survey covered *c.*4479.5m^2 of the outer ward.

1.2.9 The magnetometry and resistivity surveys were not carried out over the tarmac surfaced former tennis courts area on the western side of the outer ward, or the small grassed area southeast of this. The tarmac area was not suitable for either survey type and the grass to the southeast covered too small an area for setting out survey grids. The GPR survey was carried out over an extensive strip through the outer ward, covering the tarmac covered former tennis courts and the grassed area to the southwest. Due to the survey methodology, the grid layout and time constraints it was not possible to survey the entire outer ward.

1.2.10 Additional interpretation on the results of all three surveys is included within Part II: Discussion by Neil Ludlow, where existing knowledge of the castle is used to provide potential interpretations of the features identified by the magnetometry, resistivity and GPR surveys. These interpretations are hypothetical and would require other forms of archaeological investigation to confirm them or otherwise.

1.3 Report outline

1.3.1 Part I of this report provides a summary and discussion of the results of the magnetometry, resistivity and GPR geophysical surveys (the GPR information is taken directly from Fletcher 2016).

1.3.2 Part II of this report forms a discussion of the results by Neil Ludlow, using the results of the three geophysical survey techniques, as well as cartographic and photographic materials, and his existing research into the form and development of Pembroke Castle.

1.3.3 References to cartographic and documentary evidence and published sources will be given in brackets throughout the text, with full details listed in the sources section at the rear of the report.

1.4 Abbreviations

1.4.1 All sites recorded on the regional Historic Environment Record (HER) are identified by their Primary Record Number (PRN) and located by their National Grid Reference (NGR). Scheduled Ancient Monument (SAM). Listed Building (LB). Altitude is expressed to Ordnance Datum (OD). Gradiometer readings are measured in nanoTesla (nT).

1.5 Illustrations

1.5.1 Printed map extracts are not necessarily produced to their original scale.

1.6 Timeline

1.6.1 The following timeline (Table 1) is used within this report to give date ranges for the various archaeological periods mentioned within the text.

Period	Approximate date	
Palaeolithic –	*c.*450,000 – 10,000 BC	Prehistoric
Mesolithic –	*c.* 10,000 – 4400 BC	
Neolithic –	*c.*4400 – 2300 BC	
Bronze Age –	*c.*2300 – 700 BC	
Iron Age –	*c.*700 BC – AD 43	
Roman (Romano-British) Period –	AD 43 – *c.* AD 410	Historic
Post-Roman / Early Medieval Period –	*c.* AD 410 – AD 1086	
Medieval Period –	1086 – 1536	
Post-Medieval Period[1] –	1536 – 1750	
Industrial Period –	1750 – 1899	
Modern –	20th century onwards	

Table 1: Archaeological and Historical Timeline for Wales.

1.7 Acknowledgements

1.7.1 Dyfed Archaeological Trust would like to thank the Castle Studies Trust for providing the grant to undertake the surveys; Pembroke Castle Trust and Cadw for allowing us do the work; Tim Southern for undertaking the resistivity survey and modifying the equipment to enhance the results (Part 1, Appendix II); Margaret and Ed Ferriman for assisting with the resistivity surveys; Tim Fletcher for carrying out the GPR survey, processing the enormous amount of data generated and producing the report on these results; and Neil Ludlow for developing the grant application and producing the discussion. The on-site works were undertaken by Alice Day, with assistance from James Meek, both of Dyfed Archaeological Trust.

[1] *The post-medieval and industrial periods are combined as the post-medieval period on the Regional Historic Environment Record as held by Dyfed Archaeological Trust*

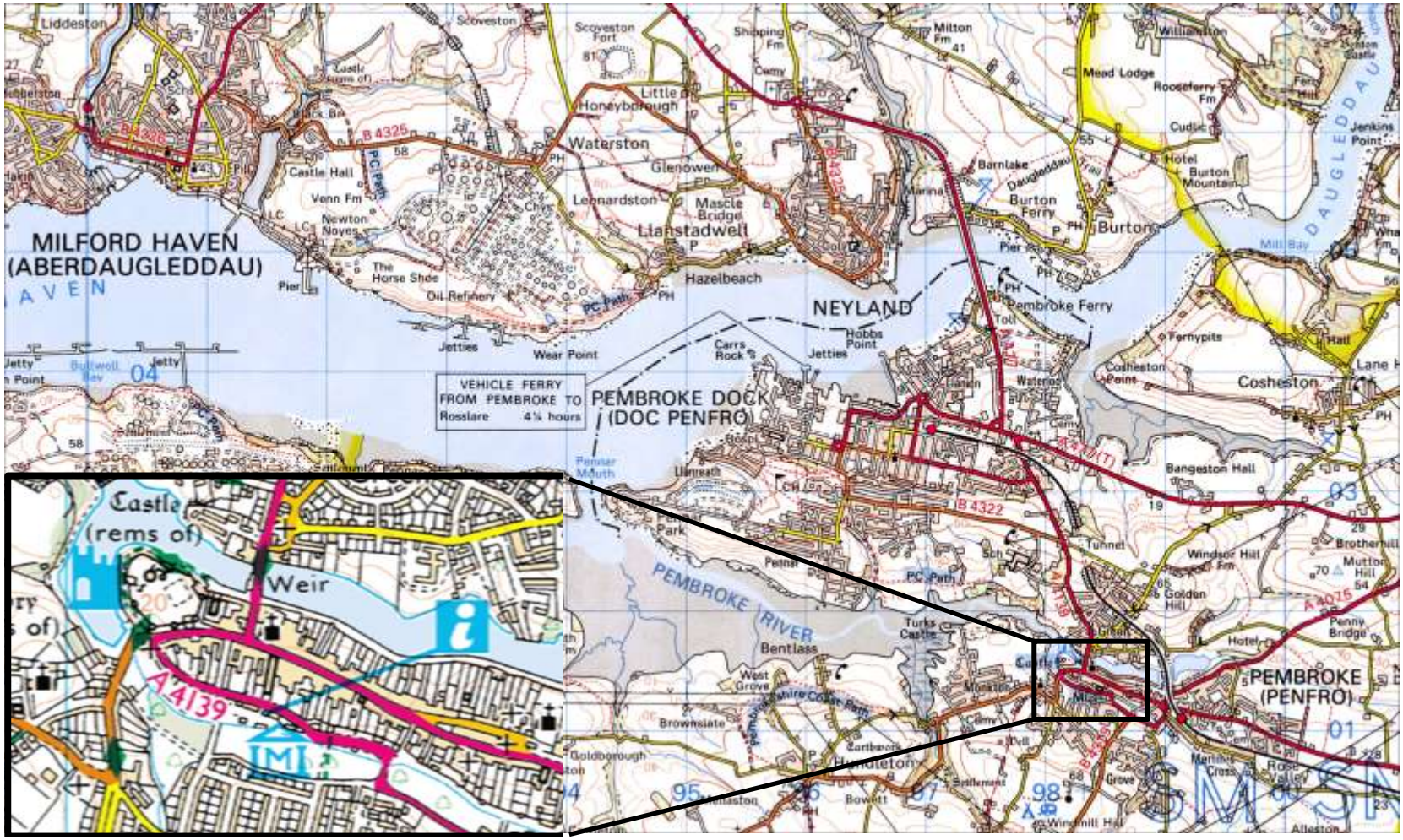

Figure 1: Map showing the location of Pembroke Castle, Pembrokeshire

2 LOCATION, TOPOGRAPHY AND GEOLOGY

2.1 Pembroke Castle is situated on the tip of a limestone peninsula that lies between two arms of Milford Haven, Pembroke River to the north and west, and Monkton Pill to the south and west (NGR SM 9815 0165; **Figure 1**). Both were tidal; Pembroke River is still wet, now controlled by a tidal barrage across the river to the west of the castle, but Monkton Pill has been mostly reclaimed and is now a low area of marshy ground known as 'The Common'. The town of Pembroke developed along the peninsula, eastwards from the castle, with later development to the south and to the north across the river. The castle lies at a height of about 20m above OD.

2.2 The bedrock beneath both castle and town comprises Carboniferous limestone and is part of the Pembroke Limestone Group (Tournaisian–Viséan stage), which runs east-west across south Pembrokeshire in three major synclines; it is the source of much of the characteristic building stone of the region, including that of Pembroke Castle itself. It lies close to the surface, outcropping in several locations within the castle and forming the steep cliffs on which it lies; where exposed during excavations in the castle, it is deeply fissured and uneven. Chemical dissolution of this limestone has also created a large cave, known as the 'Wogan', beneath the castle inner ward. A second, much smaller cave lies beneath the Barbican Tower of the outer ward; it was seen in the 1880s (Cobb 1883, 212), was re-exposed in the 1970s, and it is now sealed off. There may be others, as yet undetected. At Pembroke, and several other locations within south Pembrokeshire, fissures and cavities within the limestone can contain a pink breccia – known as 'gash breccia' – of disputed origin and date (Walsh et al. 2008, 149-50), although a recent hypothesis suggests they were derived from natural infill of these cavities during the Triassic period (Woodcock, Miller and Woodhouse 2014, 105-6). Neither rock-type is likely to cause any magnetic signals that could obscure the gradiometer survey results.

2.3 The castle was founded in the late eleventh century but, in its present form, it is largely a creation of the thirteenth century. It was extensively, but sympathetically restored in the 1930s. It comprises two large baileys and, with an overall area of roughly 1ha, it is one of Wales's larger castles (**Fig. 2;** Photo 1). The interior is largely level though the southwestern half slopes very gently to the southwest. It is largely under turf, though a square tarmac area, former tennis court, occupies the northeastern half of the outer ward, and gravel surfaces occupy about half of the inner ward, and some smaller areas of the outer ward. About a third of the inner ward is occupied by the remains of castle buildings.

2.4 In total the survey covered an area of approximately 6192.5 sq km within the outer ward of the castle, representing 81.5% of the total *c.*7600 sq m area. In total 895 sq m of the inner ward was subject to geophysical survey, representing 37.3% of the *c.*2400 sq m area of the inner ward. However, it represents about 90% of the available space not occupied by castle buildings or gravel surfaces.

2.5 Photo 1 shows it the castle from the air three years ago, when crop marks and parch marks showed very clearly the outline of buildings next to the Henry VII tower, and other features elsewhere within the castle grounds. An interpretation of this and similar photos was made by Ludlow and Driver (2014).

Figure 2: Map showing geophysical survey areas at Pembroke Castle; resistivity shaded in green and magnetometry outlined in blue

Photo 1: Aerial view of Pembroke Castle from WNW, taken in July 2013 by Toby Driver (Crown Copyright RCAHMW, AP_2013_5162).

3 METHODOLOGY

3.1 Magnetometry

3.1.1 A fluxgate gradiometer with a DL601 data logger was used to conduct the survey (Photo 2), which detects and records variations in the earth's magnetic field. A sample interval of 0.25m (four readings per metre) was used with 0.25m wide traverses across 20m x 20m grids using the zigzag traverse method of collecting data. The gradiometers sensitivity was set to detect a magnetic variation in the order of 0.1 nT.

3.1.2 A Trimble TST was used to tie the survey grid into the local Ordnance Survey grid, except for the resistivity surveys of the inner ward; these were tied in by measuring offsets to known points on the castle walls.

3.1.3 The data was processed using Terrasurveyor 3.0 and is presented with a minimum of processing. The presence of high values caused by ferrous objects, which tend to hide fine details and obscure archaeological features, have been 'clipped' to remove the extreme values, allowing the finer details to show through.

3.1.4 The processed data has been presented as a grey-scale plot, overlaid on local topographical features. The main magnetic anomalies have been identified and an interpretation of those results is also given.

3.1.5 The resulting survey results and interpretation diagrams should not be seen as a definitive model of what lies beneath the ground surface, not all buried features will provide a magnetic response that can be identified by the gradiometer. In interpreting those features that are recorded the shape is the principal diagnostic tool, along with comparison with known features from other surveys. The intensity of the magnetic response could provide further information, a strong response for example indicates burning, high ferric content or thermoremnancy in geology. The context may provide further clues but the interpretation of many of these features is still largely subjective.

3.1.6 All measurements given will be approximate as accurate measurements are difficult to determine from fluxgate gradiometer surveys. The width and length of identified features can be affected by their relative depth and magnetic strength.

Photo 2: Magnetometry survey within the outer ward of Pembroke Castle

3.2 Resistivity

3.2.1 Data was collected using a GeoScan Research Ltd. RM 15 data logger/power supply connected to a Geophysical Survey Technologies Ltd trapezoidal design SF 01 frame (Photo 3; Part 1, Appendix II).

3.2.2 The SF 01 used has a current-probe separation of 0.76m and a potential-probe spacing of 0.50m with a geometry factor (GF) of 4.07.

3.2.3 The RM 15 applies an AC voltage at a constant current (the 1mA setting was used) across the two current electrodes and measures the voltage across the two potential electrodes. This voltage is converted back to a resistance value by using the value of the constant current setting and Ohm's Law (R=V/I). A change in resistance is detected and recorded whenever either the resistance of the volume of soil being sampled changes or something else buried beneath the ground causes the current flowing to change; for example a stone would reduce current flow and an increased resistance would be measured.

3.2.4 A sample interval of 0.5m (two readings per metre) was used with 0.5m wide traverses across 20m x 20m grids using the parallel traverse method of collecting data.

Photo 3: Resistivity survey within the outer ward of Pembroke Castle

3.2.5 Data reproducibility was checked by measuring 6 readings with a 10 cm by 15 cm rectangle around each potential electrode in an area of low overall resistance. Readings had a mean of 55.8 Ohms and a standard deviation of 1.6.

3.2.6 A Trimble TST was used to tie the survey grid into the local Ordnance Survey grid.

3.2.7 The data was processed using Terrasurveyor 3.0 and is presented with a minimum of processing. The presence of extreme values caused by objects of apparent very high or low electrical resistance, such as metal objects and very wet patches of ground, which tend to hide fine details and obscure archaeological features, have been 'clipped', allowing the finer details to show through.

3.2.8 The processed data has been presented as a grey-scale plot, overlaid on local topographical features. The main anomalies have been identified and an interpretation of those results is also given.

3.2.9 The resulting survey results and interpretation diagrams should not be seen as a definitive model of what lies beneath the ground surface, not all buried features can be identified by the electrical resistance meter. In interpreting those features that are recorded the shape is the principal diagnostic tool, along with comparison with known features from other surveys. The intensity of the response could provide further information about the type of material encountered, for example, a void would give a very high resistance reading as air has such high electrical resistance. The

context may provide further clues but the interpretation of many of these features is still largely subjective.

3.3 Ground Penetrating Radar (GPR) (by Tim Fletcher)

3.3.1 The GPR survey was carried out using a GROUNDVUE 3_1 system manufactured by Utsi Electronics (Photo 4). A total of three separate survey grids were used to cover the maximum area possible within the available time. All three survey areas were carried out using a 400 MHz antenna and a 0.015m read distance. Line interval was 0.4m. Dielectric properties were estimated for the local soil type.

Photo 4: GPR survey being undertaken across the former tennis court area within the outer ward of Pembroke Castle

3.3.2 Due to the nature of GPR, it was possible to survey the large square tarmac covered former tennis court area on the eastern side of the outer ward, which was not possible to survey by either magnetometry or resistivity techniques.

3.3.3 GPR is a passive technique with equipment that pulses VHF radio waves directly into the ground from a transmitting antenna. When these electro-

magnetic waves meet discontinuities in the ground, or solid surfaces, some of this energy will be reflected back to a receiving antenna, whilst some will penetrate further and possibly be reflected back from a deeper discontinuity. This process will continue until such time that the energy of the transmitted wave has been depleted to a level that prevents further penetration.

3.3.4 By measuring the time for the reflections to return, it is possible to estimate the depth of targets along a vertical section. Multiple sections can then be processed in such a way as to provide a plan of the surveyed area at the desired depth (C-scans).

3.3.5 GPR has a number of limitations. The ability of the earth to propagate radio waves depends upon several factors, including soil conductivity, water content, soil density, porosity, temperature, the physical structure of the soil, the frequency used and the amount of salt in the ground solution. The most important factor is the electrical conductivity of the soil which determines the speed of wave propagation and the depth of penetration. Soils with high conductivity will result in a loss of signal. The soil in the area of Pembroke Castle is a shallow blend of loam and silty loam atop parent limestone, which in normal conditions would give acceptable conditions for GPR use. It is worth noting that the castle structures are built on top of a prominent outcropping of limestone so the depth of the soil is likely to be shallower than in the surrounding area.

3.4 Constraints

3.4.1 As noted above there were a number of limitations to the geophysical surveys undertaken. The main obstacle in the outer ward was the tarmac surfaced area of the former tennis courts. Such a surface is unsuitable for some forms of geophysical survey: it would obscure the results from a magnetometry survey; and prevent suitable ground contact for the electrode spikes of a resistivity meter. It was however possible to survey this area using the GPR.

3.4.2 Where possible all grassed areas of the outer and inner wards were subject to magnetometry survey, excluding smaller areas between buildings or where strips of grass were very narrow (such as to the northeast of the main entrance/south of the former tennis courts). Magnetometry survey is a relatively quick process and it was possible to cover these areas within the budgetary timescales.

3.4.3 The method of resistivity survey used at Pembroke Castle is a slower process, the instrument being pushed into the ground at every record point before a reading can be taken. It was not possible to cover as much of the area of the outer ward as was done by magnetometry within the timescales available. Additional free time was put in by Tim Southern, with volunteer assistance from Ed and Margaret Ferriman, to complete as much as possible, including areas within the inner ward. Only the area along the inside of the western curtain wall and the strip of grass northeast of the entrance remained unsurveyed.

3.4.4 The GPR survey was undertaken by Tim Fletcher of TF Industries Ltd free of charge as part of his ongoing research and to increase his own work portfolio. Tim was able to spend one weekend at the site to carry out the survey, and the maximum survey area possible was achieved within that time. It was not possible to cover the whole of the outer ward or do any works within the inner ward within the time available, but being able to survey across the tarmac covered, former tennis court area and strip of

grass meant that in total 81.5% of the *c*7600 sq m area of the outer ward was able to be geophysically surveyed.

3.4.5 Other constraints to the surveys included two tents located in the outer ward to the southwest of the entrance gateway and also on the western side of the outer ward which prevented any surveys being undertaken. Tent pegs and metal poles will have also affected the results of the magnetometry survey in the immediate areas around them. A number of floodlights were also present within both the inner and outer wards which were obstacles to the surveys and also potential areas of interference to the results of the magnetometry surveys.

3.4.6 Gravel paths around the edges of walls and around the base of staircases were avoided by the surveys as they would affect the results of both resistivity and magnetometry. This meant that it was not possible to survey directly up against the foot of the curtain walls of the castle.

3.4.7 There was no evidence that the geology of the site negatively impacted upon any of the survey results.

3.4.8 Past activity at the castle, including its initial construction over a possible prehistoric pre-cursor; rebuilding, alterations and other activity throughout the Middle Ages; potential landscaping works and remodelling in the post-medieval period; and the excavation and rebuilding in the later 19th and 20th century will have all impacted upon any earlier deposits, potentially masking them from identification by geophysical survey or even removing them completely. Thus any geophysical survey results can only be used as an indication of what might still survive below ground, it will not show everything; it is also not able to clearly demonstrate phasing of any possible archaeology identified.

3.4.9 Areas where significant disturbance is most likely to have occurred includes the following: some truncation of deposits may have occurred west of the revetment wall at the foot of the west side of the keep; it is also possible that very slight truncation has taken place along the highest part of the outer ward; and the site of the former tennis courts, built in the 1930s occupies an area made ground built up for the courts, as does the strip alongside its southeastern side. Otherwise it is thought that ground levels appear relatively unaltered.

3.4.10 Additional interpretation on the results of the resisitvity survey is included within Part II: Discussion by Neil Ludlow, where existing knowledge of the castle is used to provide potential interpretations of the features identified by the magnetometry survey. These interpretations are hypothetical and would require other forms of archaeological investigation to confirm them or otherwise.

4 SURVEY RESULTS

4.1 Magnetometry

Introduction

4.1.1 The site was surveyed over four consecutive days between the 2nd and 5th of May 2016. In total an area approximately 5111 sq m in size was surveyed of the Castle, covering all areas thought to be suitable for magnetometry. In total *c.*835.5 sq m of the inner ward was surveyed (around 34.8% of the 2400 sq m total area of the inner ward) and *c.*3993.8 sq m of the outer ward (around 52.6% of the *c.*7600 sq m total area of the outer ward. **Figures 3-6** show the survey results for the inner ward, and **Figures 7-10** show the survey results for the outer ward.

4.1.2 In the greyscale images, positive magnetic anomalies are displayed as dark grey to black, while negative magnetic anomalies are displayed as light grey to white. In the geophysical interpretation images, positive features are represented in green, and negative features appear in blue.

4.1.3 Regions of anomalously positive relative magnetic field strength may be associated with high magnetic susceptibility soil-filled structures such as pits and ditches. Regions of anomalously negative relative magnetic field strength may correspond to features of low magnetic susceptibility such as wall footings and other concentrations of sedimentary rock or voids. Paired positive-negative (dipolar) magnetic anomalies typically reflect ferrous or fired materials (including fences and service pipes) and/or fired structures such as kilns or hearths.

4.1.4 Numerous small dipolar features can be seen to cover the areas surveyed. These are likely to represent small ferrous objects such as horseshoes or nails, which are commonly found distributed across sites. Unless these features form a pattern or are part of a larger geophysical feature, they will not be discussed further.

4.1.5 Where underground cables are present, a dipolar effect can be seen where the survey encroaches near to it. This dipolar 'shadow' is visible in nearly all instances where the survey meets the cables. A number of electric cables are present within the inner and outer wards of Pembroke Castle.

4.1.6 It is possible for some archaeological features to remain undetected due to lack of variation in the magnetic susceptibility of the feature from the surrounding natural geological deposits.

4.1.7 The survey took place during hot days in spring, and it was found that the parts of the survey done in the hottest parts of each day needed extra processing to remove striping due to a change in the calibration of the instrument sensors. These parts of the greyscale images are more blurry/ stripy than others.

The Inner Ward

4.1.8 **Figure 3** shows the location of the gradiometer survey in the inner ward of the castle, and **Figure 4** shows the area enlarged in greyscale.

4.1.9 There are many dipole magnetic signals, as highlighted in **Figure 5**. These features may have interfered with signals from smaller features, rendering them unidentifiable. They also make it difficult to tell whether or not the geology of the site has contributed to the magnetic readings.

4.1.10 The largest dipole feature shown in **Figure 5**, a string of dipoles in the centre of the survey area, looks reminiscent of an electrical cable. The dipole signal in the top-right corner of the image is probably due to the

metal-cased lights there. The largest dipole features could be fired structures such as kilns or hearths.

4.1.11 **Figure 6** highlights the remainder of the features picked up by the survey. The features of positive magnetic response that are circular or sub-circular in shape are likely to represent in-filled pits, whereas those of linear shape might well be ditches. The negative-response features discovered are both sub-circular in shape, and therefore are most likely to be large deposits of stone, or voids.

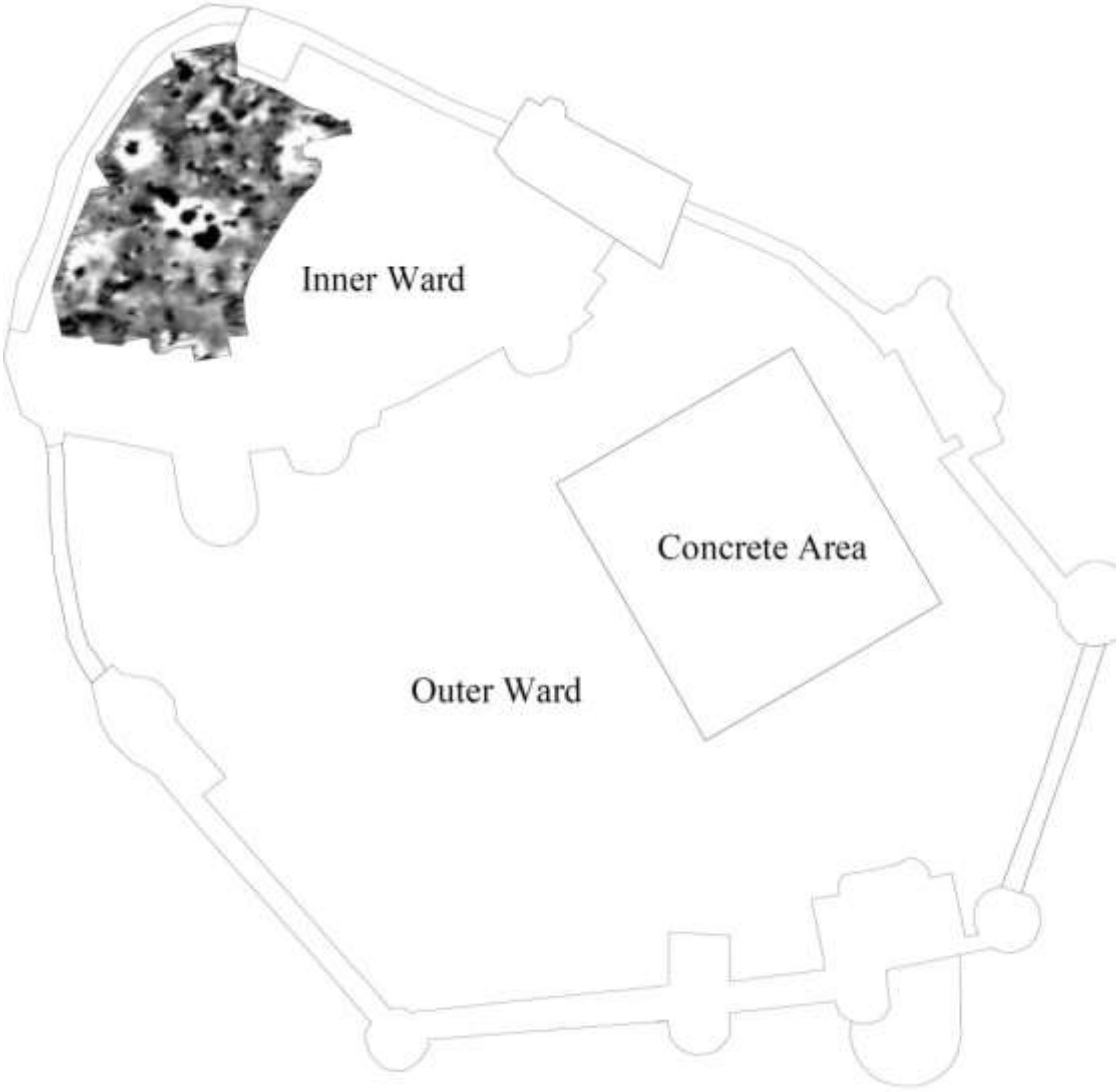

Figure 3: Location of gradiometer survey in the inner ward of Pembroke Castle (shown as greyscale plot)

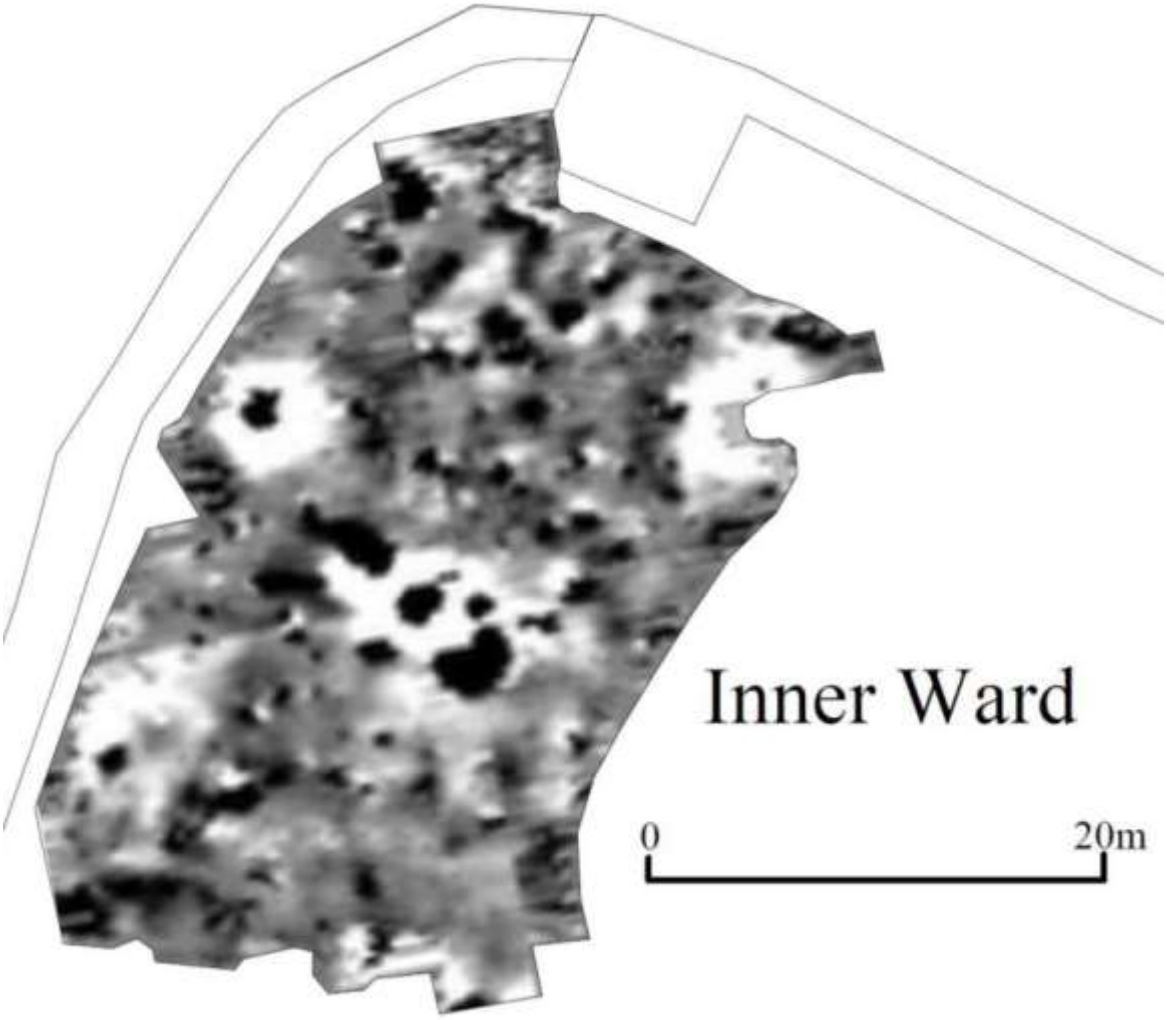

Figure 4: Processed gradiometer data for the inner ward at Pembroke Castle as a greyscale plot, overlaid on local topographical features. The results are presented over a range of ±12nT around the local average value of magnetic field strength.

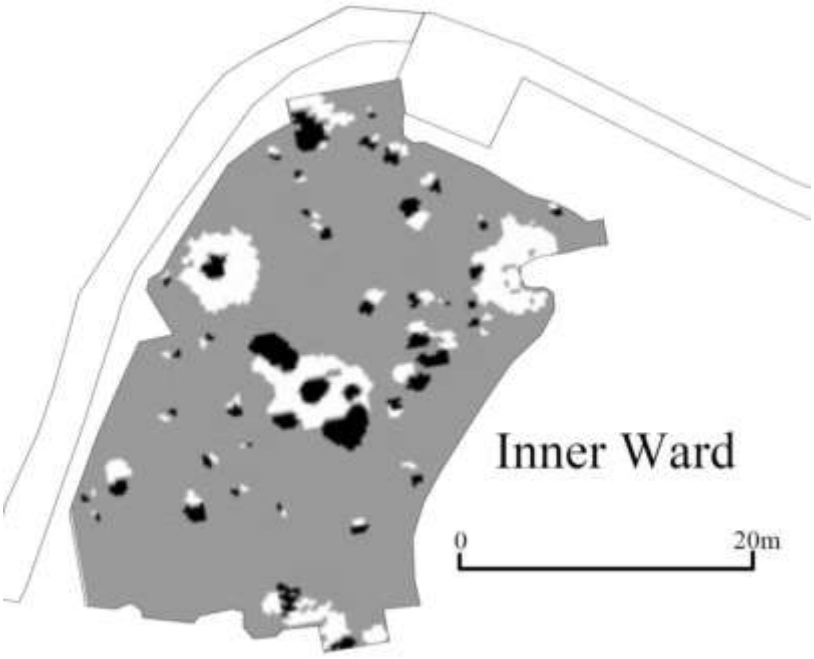

Figure 5: Dipolar features in the gradiometer survey of the inner ward of Pembroke Castle

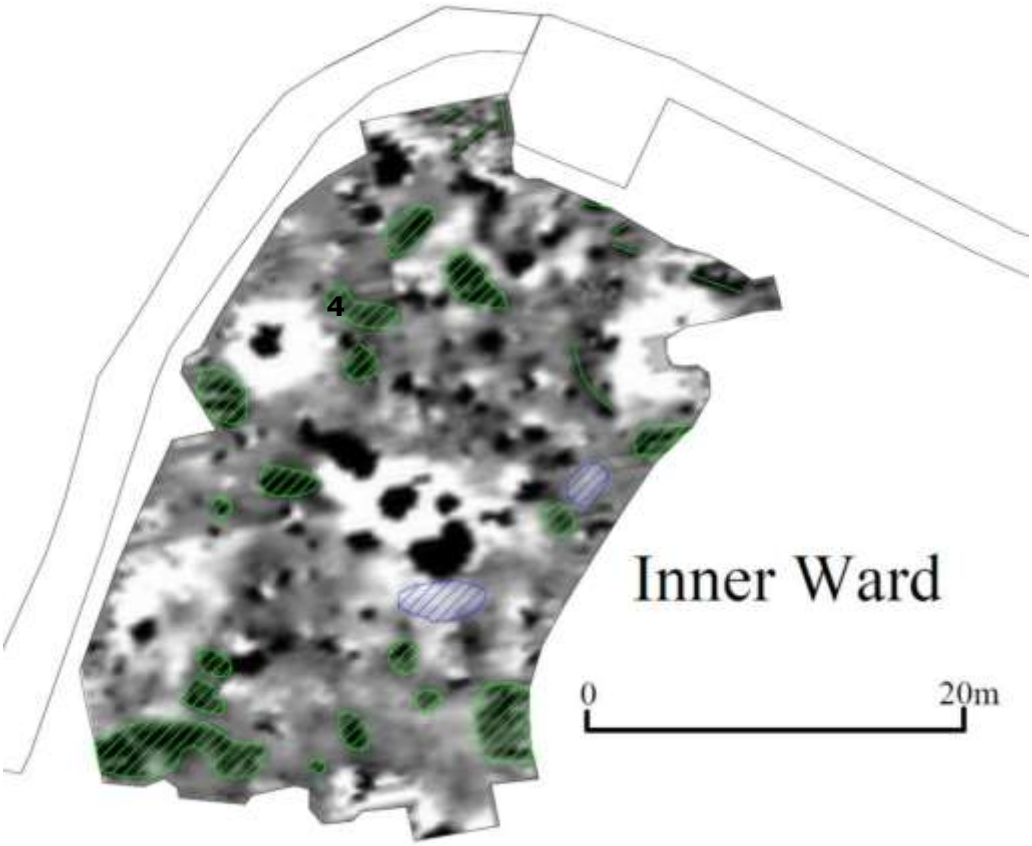

Figure 6: Interpretation plot of gradiometer survey results for the inner ward of Pembroke Castle, overlaid on the greyscale plot and local topographical features. (Positive features are represented in green and negative features appear in blue.)

The Outer Ward

4.1.12 **Figure 7** shows the location of the gradiometer survey in the outer ward of the castle, with the surveyed area show in greyscale.

4.1.13 As in the inner ward, there are many dipole magnetic signals, and these are highlighted in **Figure 8**. There are four very prominent strings of dipoles, very suggestive of electrical cables: Two of these run through the southwest corner of the survey area, one through the northwest corner, and the other approximately along the north edge of the area. The dipole features labelled **A** on **Figure 8** are also almost certainly highly magnetic cables. The linear signal in the very northeast corner is also likely to have the same type of origin.

4.1.14 It is clear that the tent that was present in the southeast corner of the survey area and the light in the north have contributed large dipole readings. Three sides of the tent near the west edge of the area have created small strings of dipole signals too. In the rest of the area, the largest of the dipole features could be fired structures such as kilns or hearths.

4.1.15 **Figure 9** shows an interpretation of the features picked up by the survey that give a negative magnetic reading compared to the average for the surveyed area. Most of them are linear and are likely to represent the remains of buried walls or wall footings. The features in the southeast corner of the survey align with the parch marks of the outline of a building seen by aerial photography (Photo 1). In the northwest corner on **Figure 8** there is a negative anomaly of roughly circular shape, which could be a large deposit of stone, or a void.

4.1.16 The features of positive magnetic response in the outer ward are shown in **Figure 10**. They are mostly circular or sub-circular in shape and are likely to represent pits, whereas those few that are of linear shape could be ditches. In the northeast corner of the image, one such feature is suggestive of a ditch around the base of the tower there. In the south of the image, near to the tent, another curvilinear feature could be the ditch at the base of a former tower associated with the building remains there, or it could alternatively be a robber trench, remaining after a stone wall had been removed.

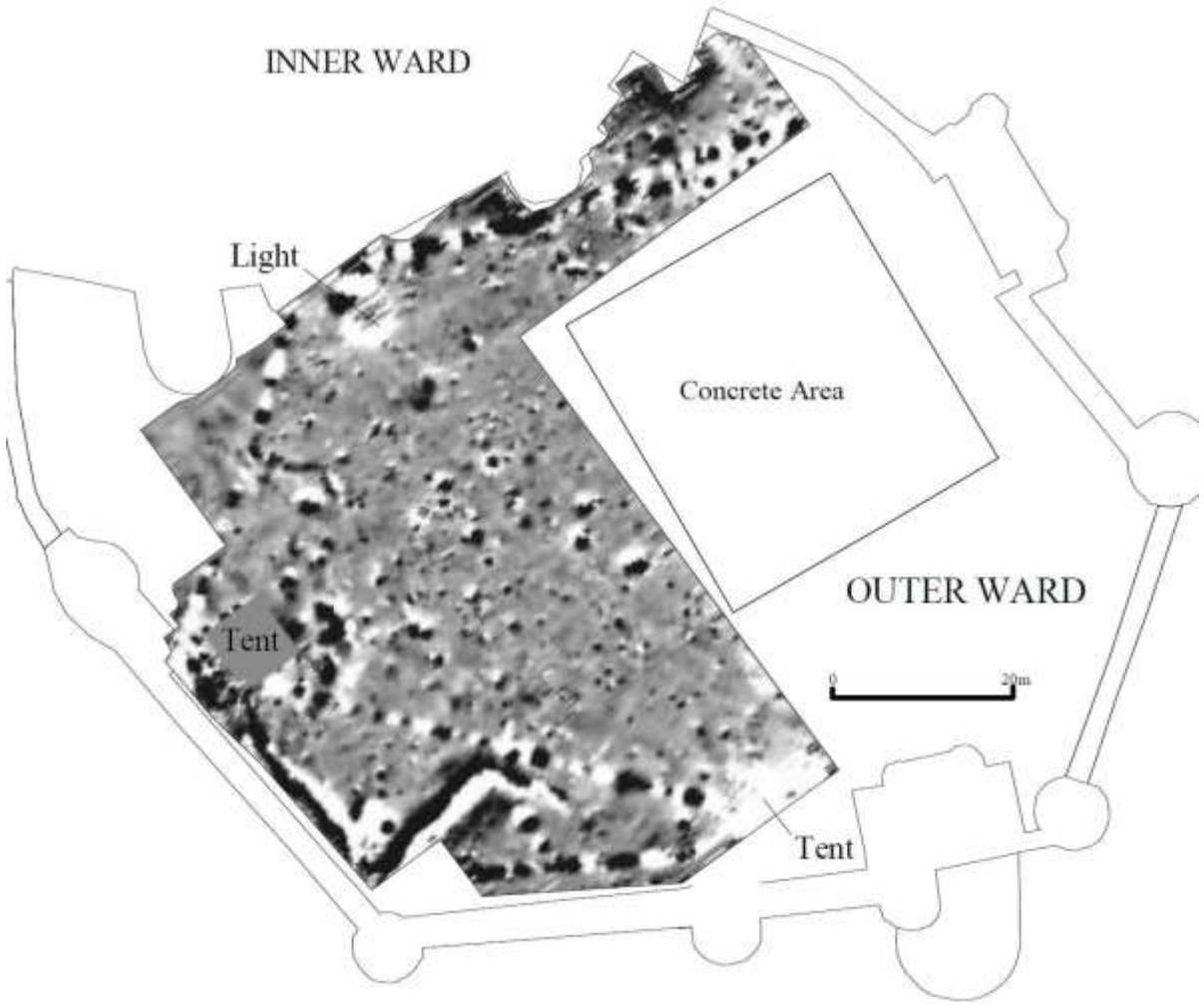

Figure 7: Processed gradiometer data for the outer ward at Pembroke Castle as a greyscale plot, overlaid on local topographical features. The results are presented over a range of ±12nT around the local average value of magnetic field strength.

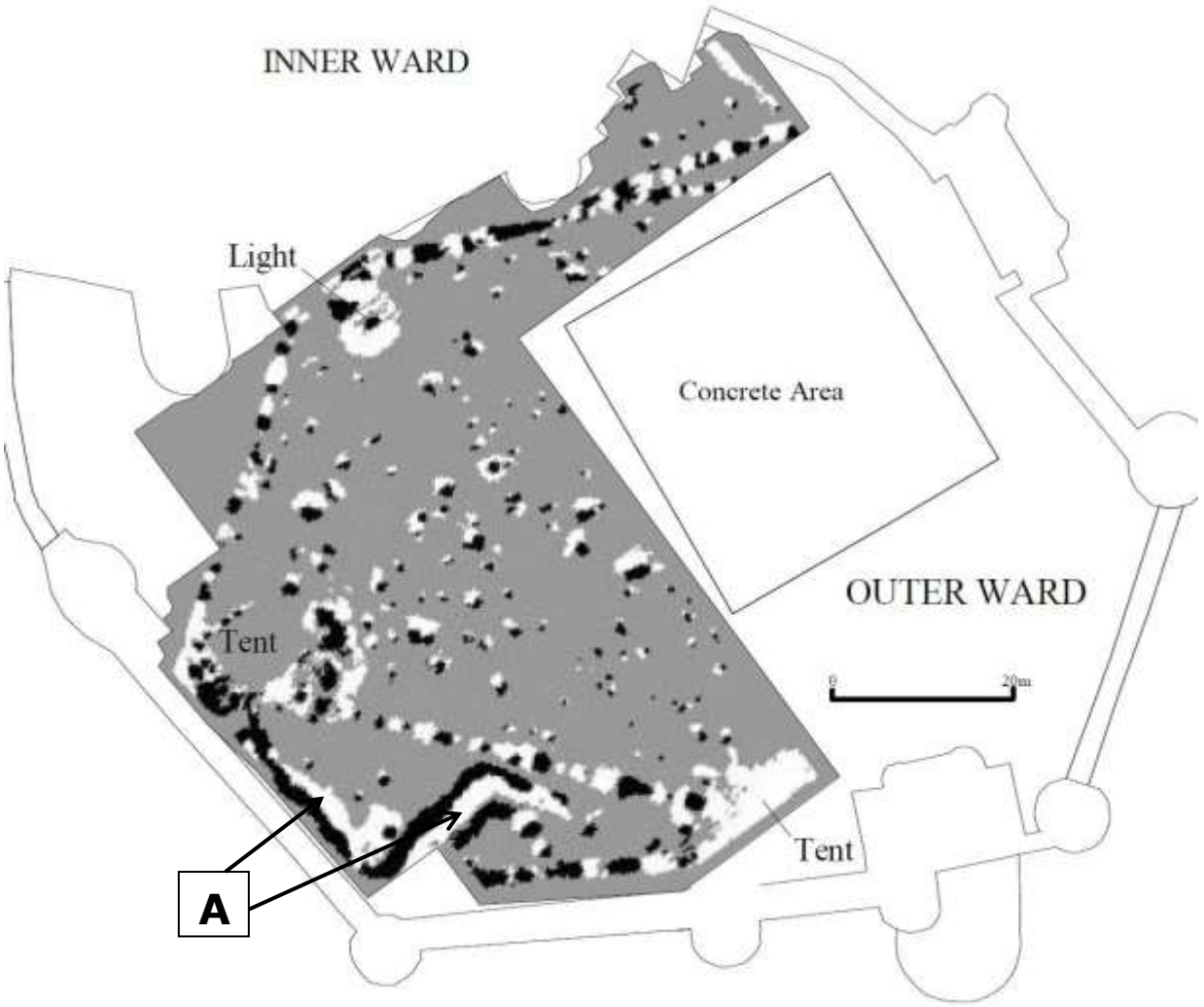

Figure 8: Dipolar features in the gradiometer survey of the outer ward of Pembroke Castle

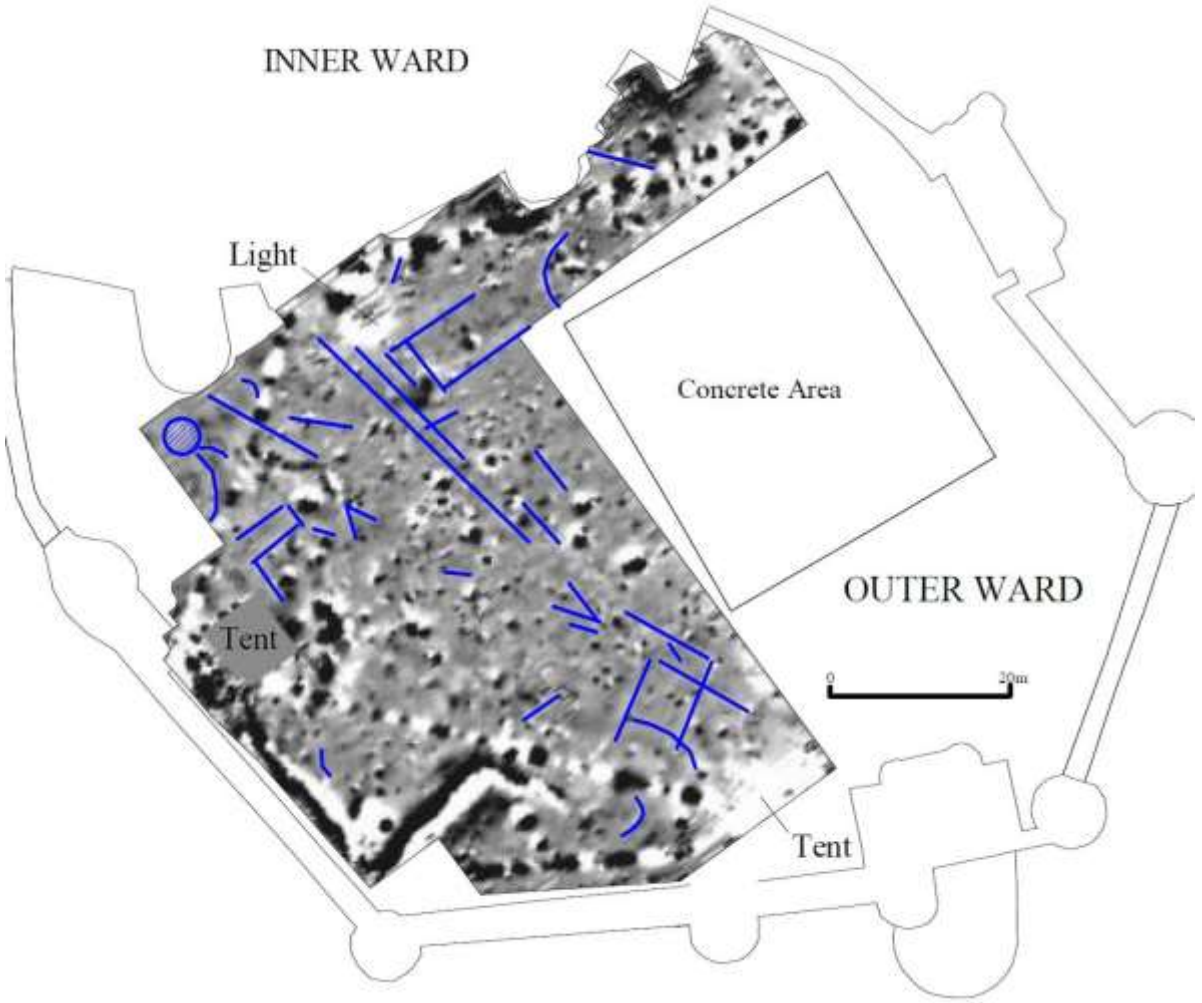

Figure 9: Interpretation plot of gradiometer survey results for the outer ward of Pembroke Castle, overlaid on the greyscale plot and local topographical features, showing negative features only, in blue

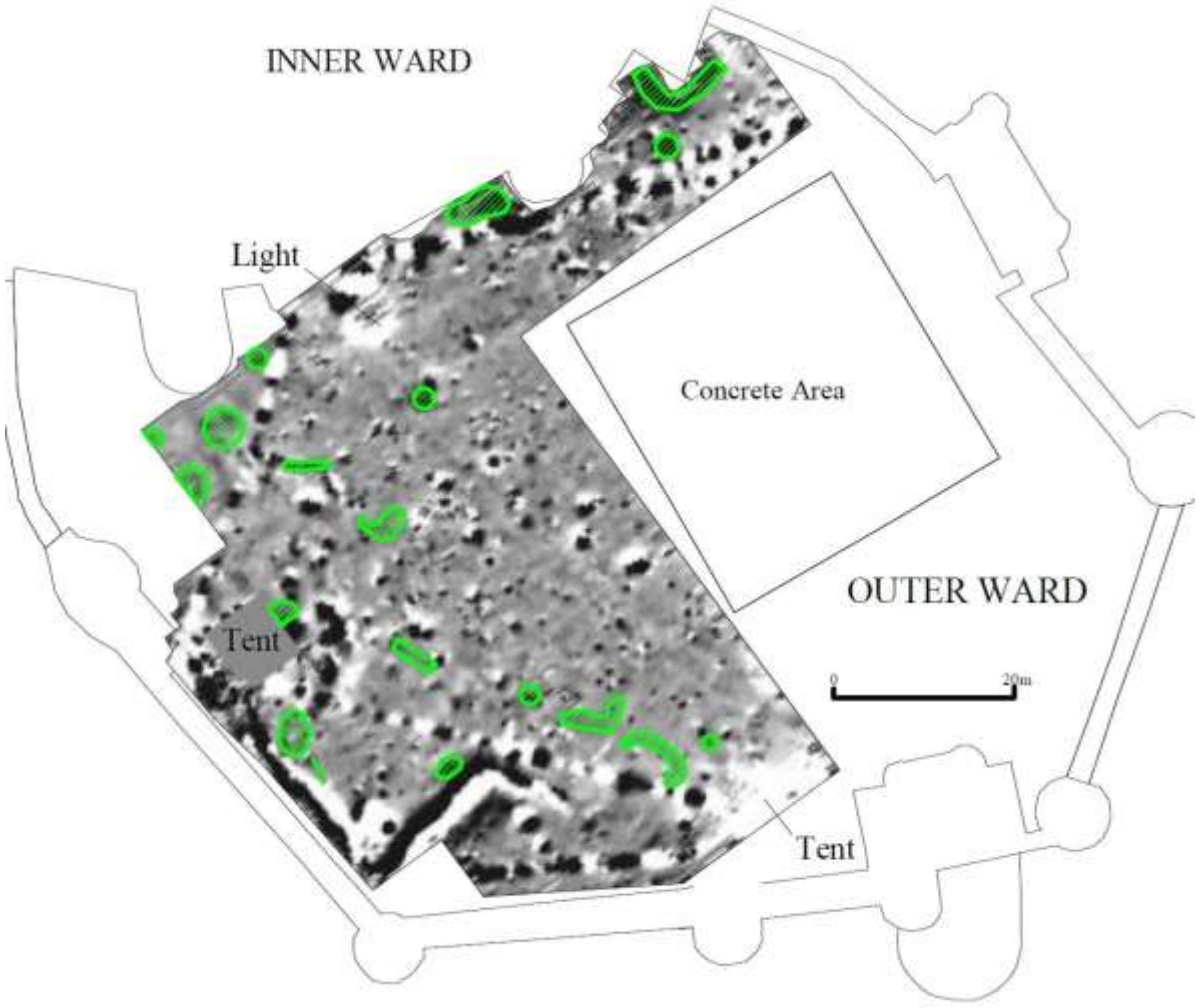

Figure 10: Interpretation plot of gradiometer survey results for the outer ward of Pembroke Castle, overlaid on the greyscale plot and local topographical features, showing positive features only, in green

4.2 Resistivity

Introduction

4.2.1 The outer ward was surveyed over four consecutive days between the 2nd and 5th of May 2016, and the inner ward was surveyed on the 10th of August. The area surveyed in the inner ward measured 734.5 sq m, with an additional area of survey undertaken within the Chancery building measuring 59.5 sq m (in total covering 33.1% of the inner ward area). In total an area approximately 3344 sq m was surveyed of the outer ward of the castle (*c*.44% of the total area of the outer ward. The surveys covered most areas thought to be suitable for survey by electrical resistance meter. **Figures 11-12** and **14-18** show the survey results, and **Figures 13** and **19** show the interpretation results of magnetometry and resistivity together, for the inner and outer wards respectively.

4.2.2 In the greyscale images, positive high-resistance anomalies are displayed as dark grey to black, while low-resistance anomalies are displayed as light grey to white. In the geophysical interpretation images, high-resistance features are represented in orange, and low-resistance features appear in purple.

4.2.3 All electrical currents are subject to some level of electrical resistance. All materials offer increased or decreased resistance to electrical current as it passes through them (or no change). Some materials give such high resistance that current will cease to flow. These changes are what are recorded by the electrical resistance meter.

4.2.4 Examples of materials with low electrical resistance are copper wire or water. Examples of materials with very high electrical resistance are air, pottery and stone. Soil contains water, so the moisture content is therefore essential to its level of electrical resistance. The current does not jump in a single direct line between the positive and negative electrodes, but fans out to form a zone between them which can be several metres in depth depending on the quantity of electrical charge.

4.2.5 Surface conditions such as concentrations of stones or uneven topography may result in poor electrical contact between the ground and one or more of the electrical resistance meter's electrodes. This can result in the recording of anomalously high or low resistance values. Unless these features form a pattern or are part of a larger geophysical feature, they will not be discussed further.

4.2.6 It is possible for some archaeological features to remain undetected due to lack of variation in the electrical resistance of the feature from the surrounding natural geological deposits.

4.2.7 The last day of the survey in May saw drier soil conditions. This decreased the average resistance value of the area surveyed such that the background in these grids (essentially everything to the north of the tarmac area) appears much lighter than on other days. The processing of the data by edge-matching was attempted in order to bring out fainter negative features but no improvement was seen so it was left as it was.

4.2.8 On this site, extremely high values are likely to be due to the fact that current is being forced though a thin layer of soil over a large non-conducting mass (e.g. a wall), thus creating a higher current density than normal, and hence higher resistance, in the vicinity of the potential electrodes.

The Inner Ward

4.2.9 The processed resistivity data for the outer ward is shown in greyscale in **Figure 11**, and **Figure 12** depicts an interpretation of the outlines of low- and high-resistance features that are likely to be archaeological in nature. As well as the grassed area survey using magnetometry, the grassed area inside the Chancery building was also surveyed (this is the relatively small region to the east of the main area).

4.2.10 Some of the small discrete sub-circular features of low and high resistance are likely to have been caused by a probe not taking a reading properly or objects near the surface of very high resistance e.g. a stone, or very low resistance e.g. a nail.

4.2.11 In the southwest corner of the main area, a set of small sub-circular high resistance features seem to form a rectangular outline (**Figure 12**), perhaps representing the buried walls of a small building. Running almost east-west through the centre of the images is a linear high resistance feature, paralleled just to the south of it by a less prominent low-resistance linear feature. These could be showing a buried wall and ditch, but bearing in mind that the magnetometry showed a linear dipolar feature here (**Figure 4-6**) they are more likely to be related to that; perhaps the wiring representing the low resistance element and a plastic/ceramic pipe the high resistance part.

4.2.12 In the main area there are two other thin high-resistance linears that could represent buried walls, both in the west of the images. All the other high-resistance anomalies in the main area are amorphous in shape save one – an almost square-shaped feature in the northeast of the area hopefully indicating a small buried stone structure. All of the other high resistance regions seem likely to represent accumulations of buried stone. None of them seem to overlap particularly well with features identified by magnetometry.

4.2.13 There are some relatively large amorphously shaped areas of low resistance in the main area shown, and three of these seem to at least partially coincide with areas of positive relative magnetism (see **Figure 13**). This confirms the likelihood that they are in-filled pits, showing up as low resistance because of the higher water content of their fill compared to their surrounding ground.

4.2.14 All of the areas of low and high resistance detected within the Chancery are either small and discrete in nature or larger and amorphously shaped, thus none gives a clear indication of its nature. It can only be reiterated that the dark features are likely to represent buried collections of stone, or voids, and the light features could be in-filled pits.

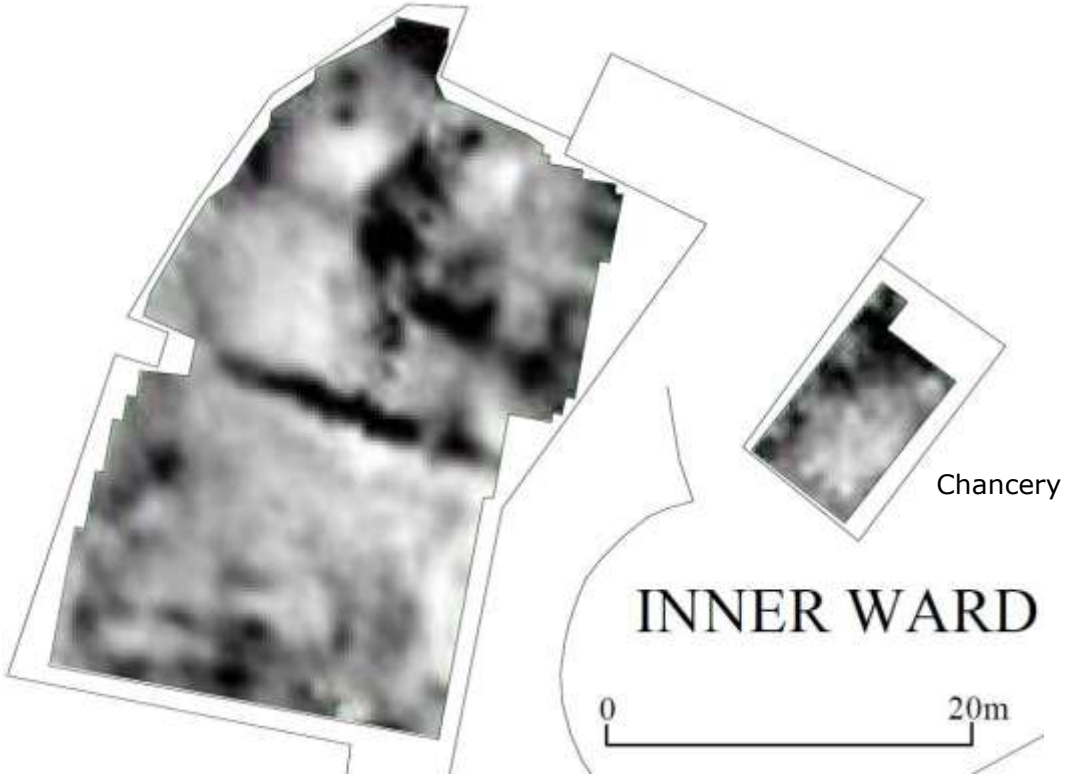

Figure 11: Processed resistivity data for the inner ward at Pembroke Castle as a greyscale plot, overlaid on local topographical features

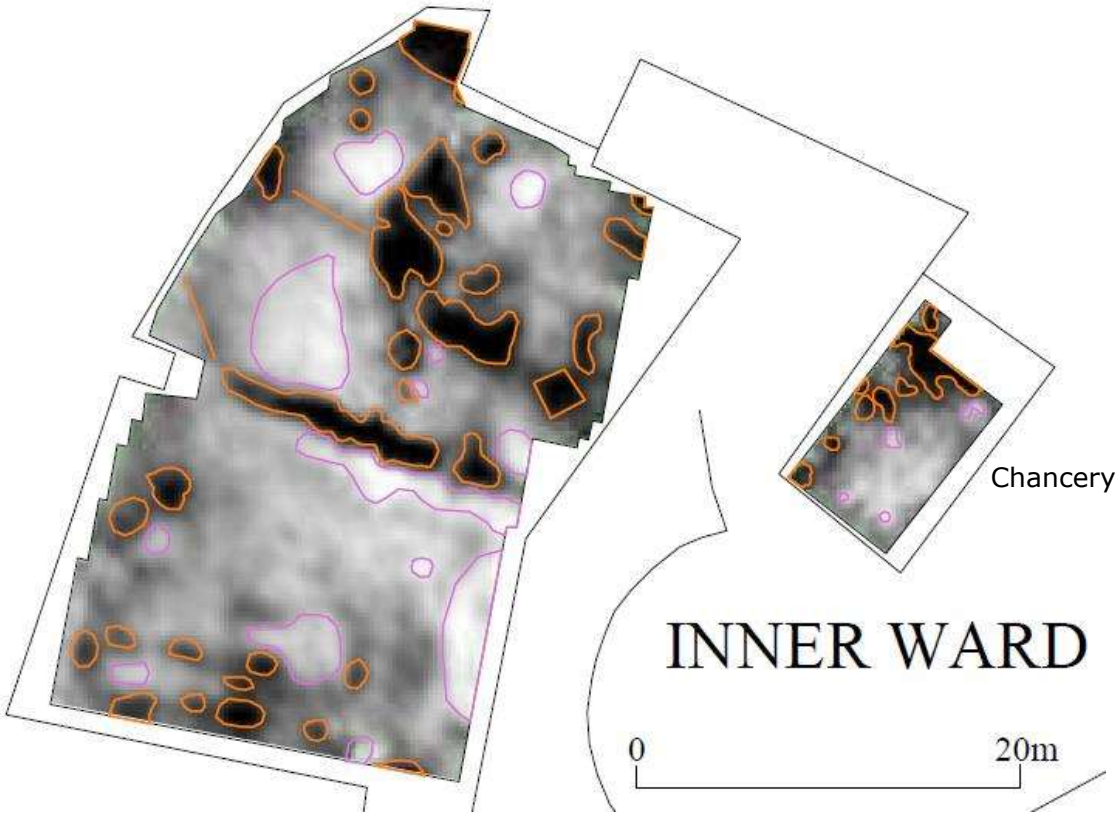

Figure 12: Interpretation plot of resistivity survey results for the inner ward of Pembroke Castle, overlaid on the greyscale plot and local topographical features, showing low resistance features (purple) and high resistance features (orange)

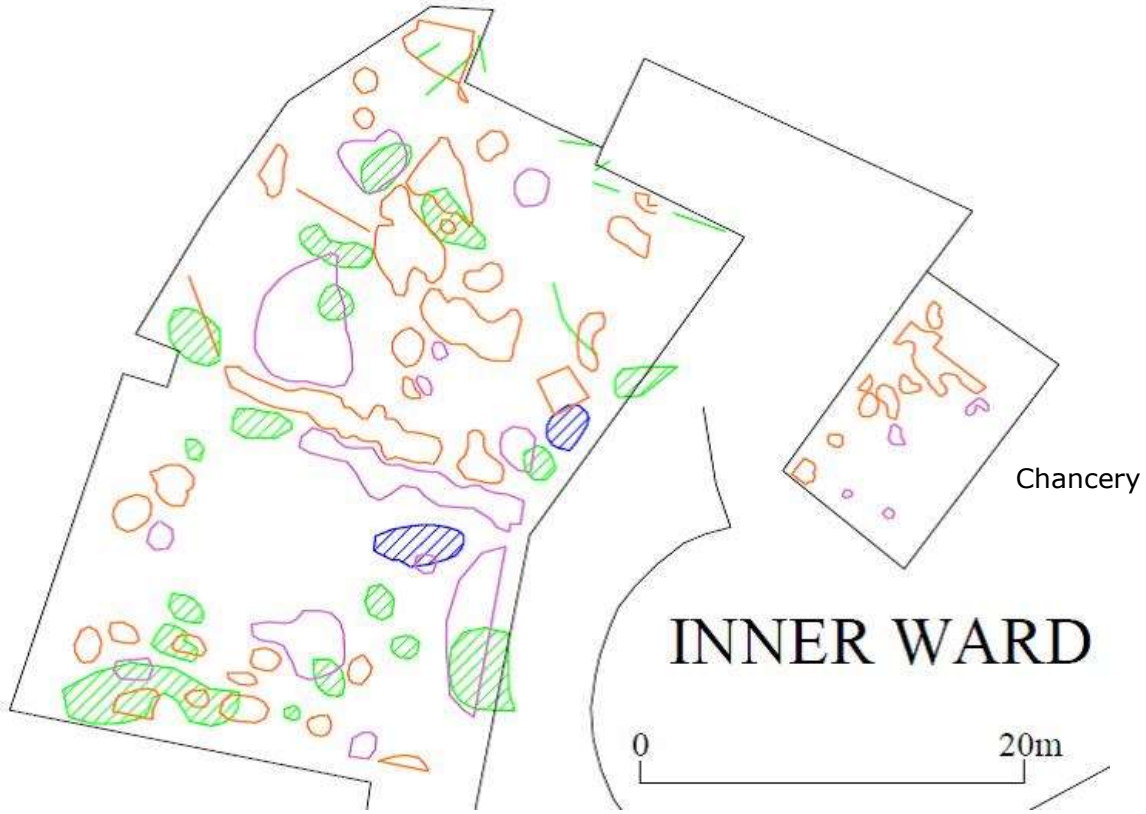

Figure 13: Interpretation plot of the magnetometry and resistivity survey results for the inner ward of Pembroke Castle, with positive magnetic anomalies in green, negative magnetic anomalies in blue, high resistance features in orange and low resistance features in purple

The Outer Ward

4.2.15 The processed resistivity data for the outer ward is shown in greyscale in **Figure 14**, and the left-hand image of **Figure 15** shows a coarser greyscale plot that shows less detail but better outlines of the most obvious features. From this coarser image, outlines of probable buildings have been plotted (shown in the right-hand image of **Figure 15**).

4.2.16 **Figure 16** depicts an interpretation of the outlines of the numerous small features that have a much lower or much higher than average resistance to electrical current. These seem to form no pattern with each other or with other features near to them, and are most likely to have been caused by a probe not taking a reading or objects near the surface of very high resistance e.g. a stone, or very low resistance e.g. a nail.

4.2.17 Many features of high electrical resistance were detected during the survey, as depicted in **Figure 17**, that are most likely to represent buried collections of stone, possibly walls. Sometimes, ditches and pits can show a higher resistance that their surroundings if their fill contains a high quantity of a high resistance material such as building rubble or if the fill has become very dry for some reason.

4.2.18 Some of the features identified as walls and ditches by the magnetometry survey show up here too, increasing the probability of their existence (**Figure 19** shows the magnetometry and resistivity results on one image). Where features are of high resistance and positive magnetic susceptibility, they are likely to be in-filled ditches, whereas when they are of high resistance and negative magnetic susceptibility they are likely to be walls or rubble-filled ditches. For example, the large linear feature running roughly northwest to southeast through the middle of the site has high resistance and negative magnetic susceptibility, so it would presumably represent a wall or rubble-filled ditch. In this case it is likely to be a stone path below the grass.

4.2.19 The most obvious features of low electrical resistance are shown in **Figure 18**. Some of the larger areas of white in the image (especially in the northeast corner as previously discussed) could definitely be the effect of drier soil in the higher areas of the site. These have not therefore been highlighted in **Figure 18**. It is of course likely that some of the patches that have been highlighted are also due to very dry soil. Alternatively, these features are most likely to represent soils that retain higher moisture content than their surroundings, such as the in-fill of some pits and ditches. Again, some of these features have already been identified as probable ditches in the magnetometry survey.

4.2.20 Alternatively, any of these and the remainder of the low-resistance features in **Figure 18** may be the result of the presence of highly conductive materials such as metal objects. A good example of this is a linear feature by the round tower in the north of the image, where magnetometry has already surmised the existence of an underground electricity cable.

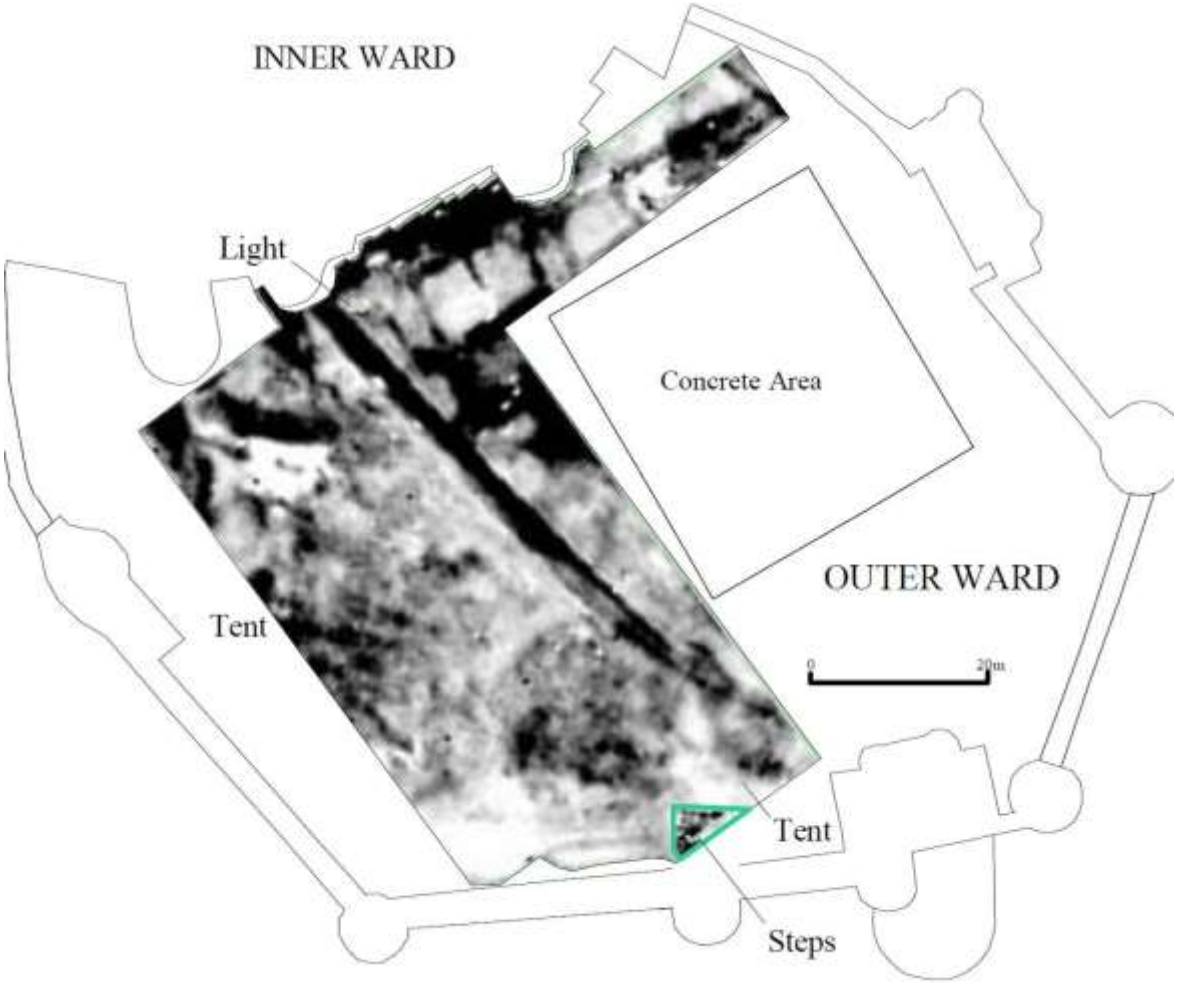

Figure 14: Processed resistivity data for the outer ward at Pembroke Castle as a greyscale plot, overlaid on local topographical features. The results are presented over a range of ±60Ω around the local average value of resistance.

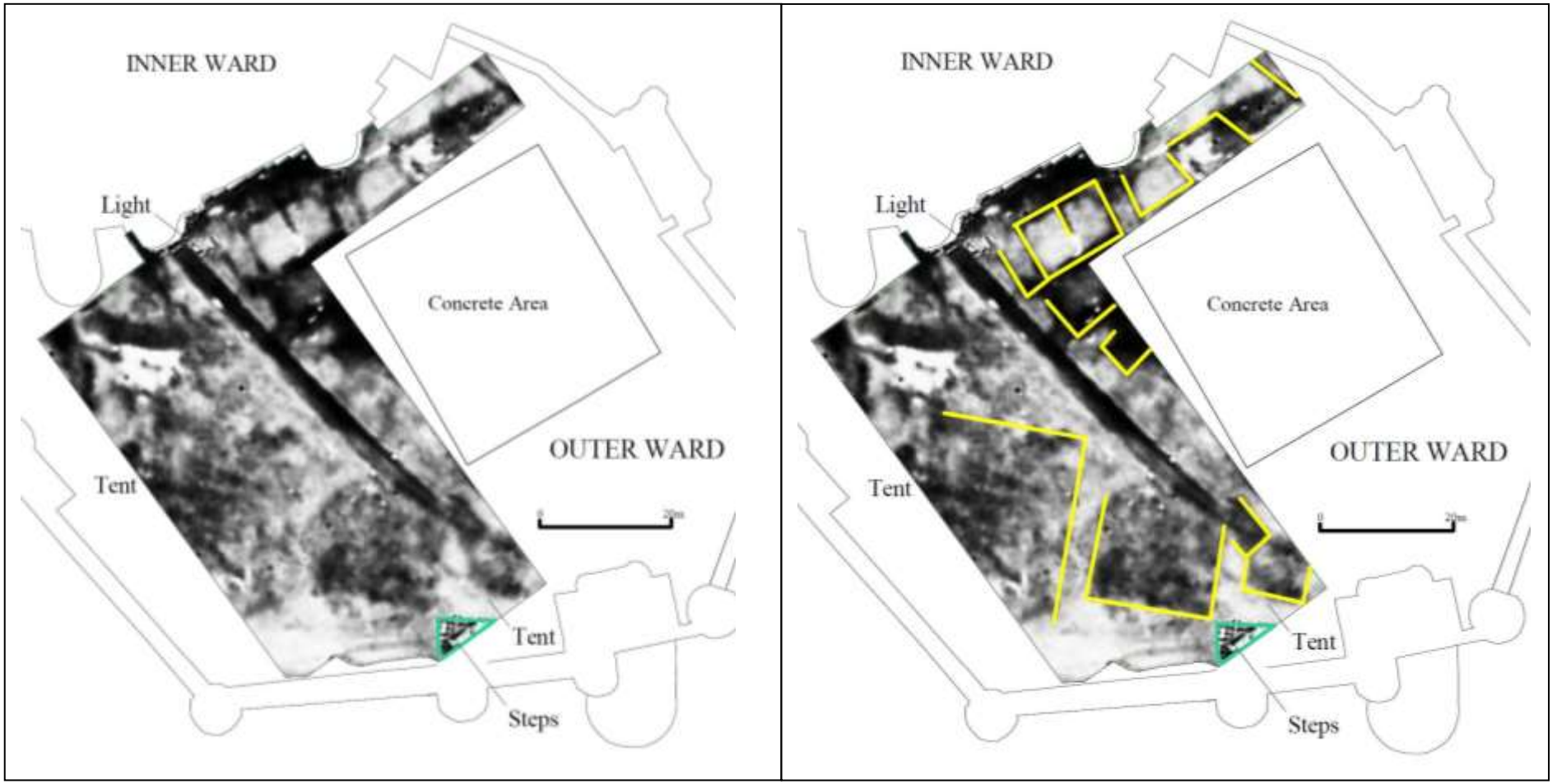

Figure 15: Processed resistivity data for the outer ward at Pembroke Castle as a greyscale plot, overlaid on local topographical features. The results are presented over a range of ±2000Ω around the local average value of resistance. The image on the right shows an initial interpretation of where building outlines/wall lines might be located, in yellow.

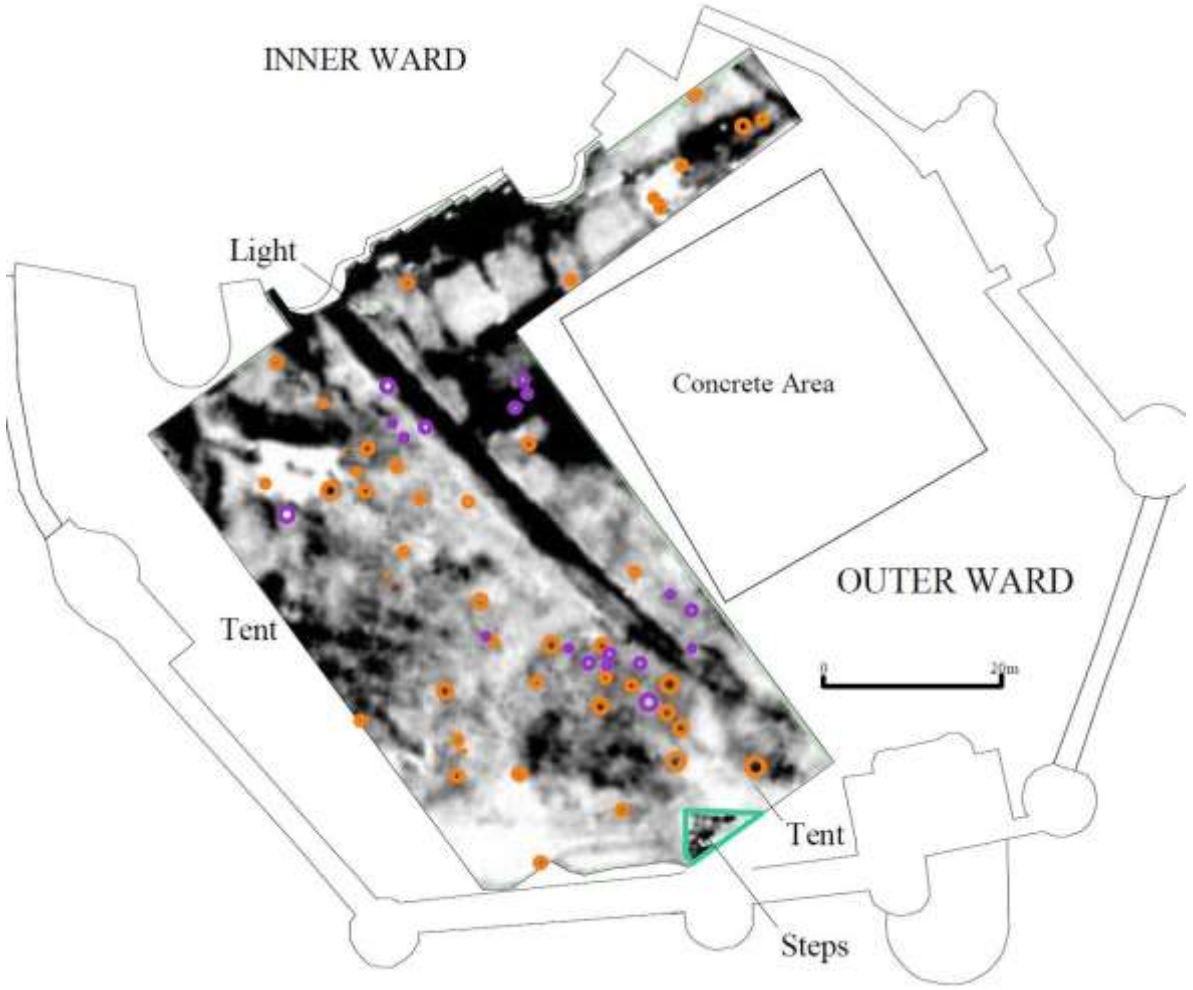

Figure 16: Interpretation plot of resistivity survey results for the outer ward of Pembroke Castle, overlaid on the greyscale plot and local topographical features, showing discrete features (high value in orange and low value in purple)

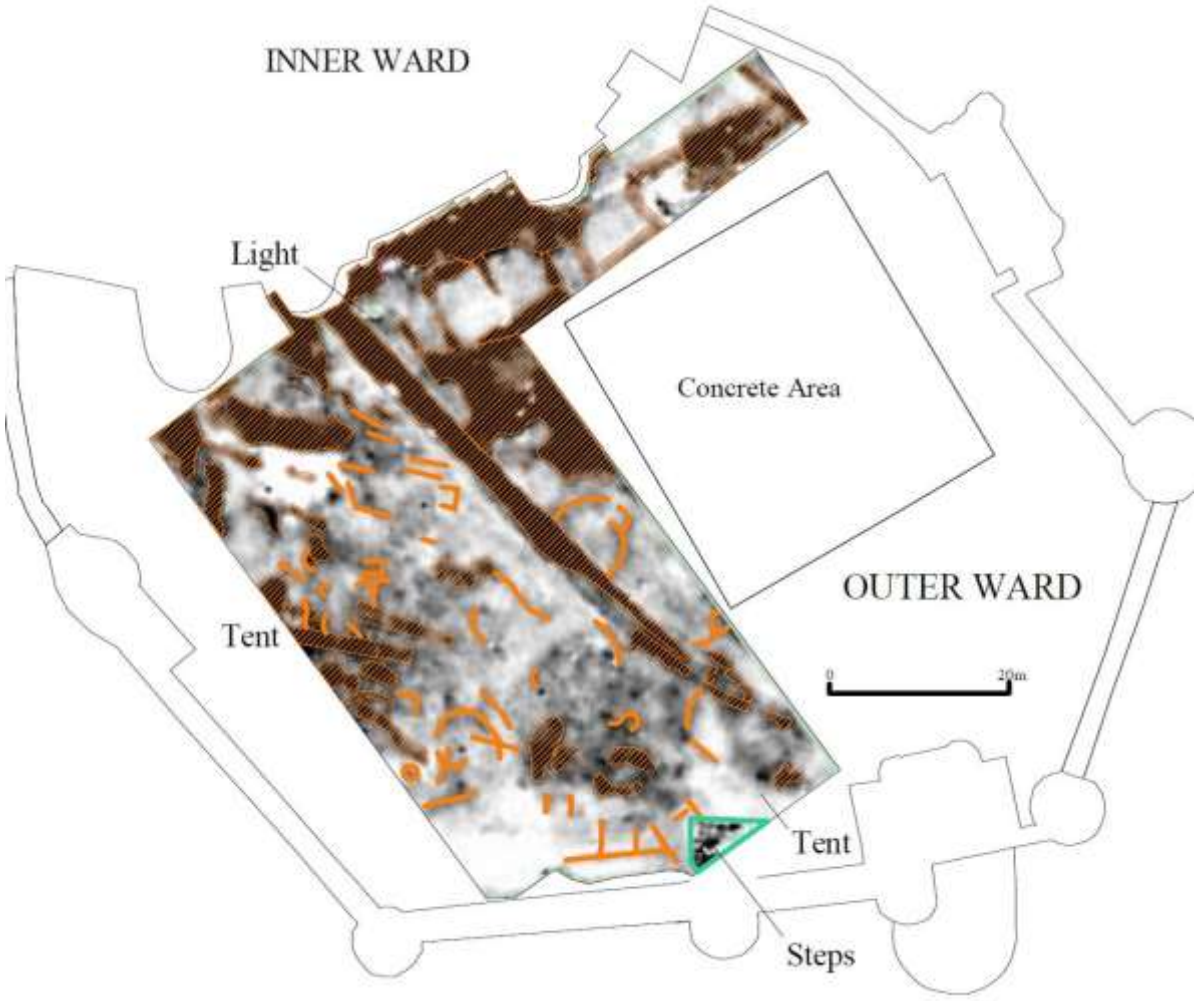

Figure 17: Interpretation plot of resistivity survey results for the outer ward of Pembroke Castle, overlaid on the greyscale plot and local topographical features, showing high resistance features only, in orange

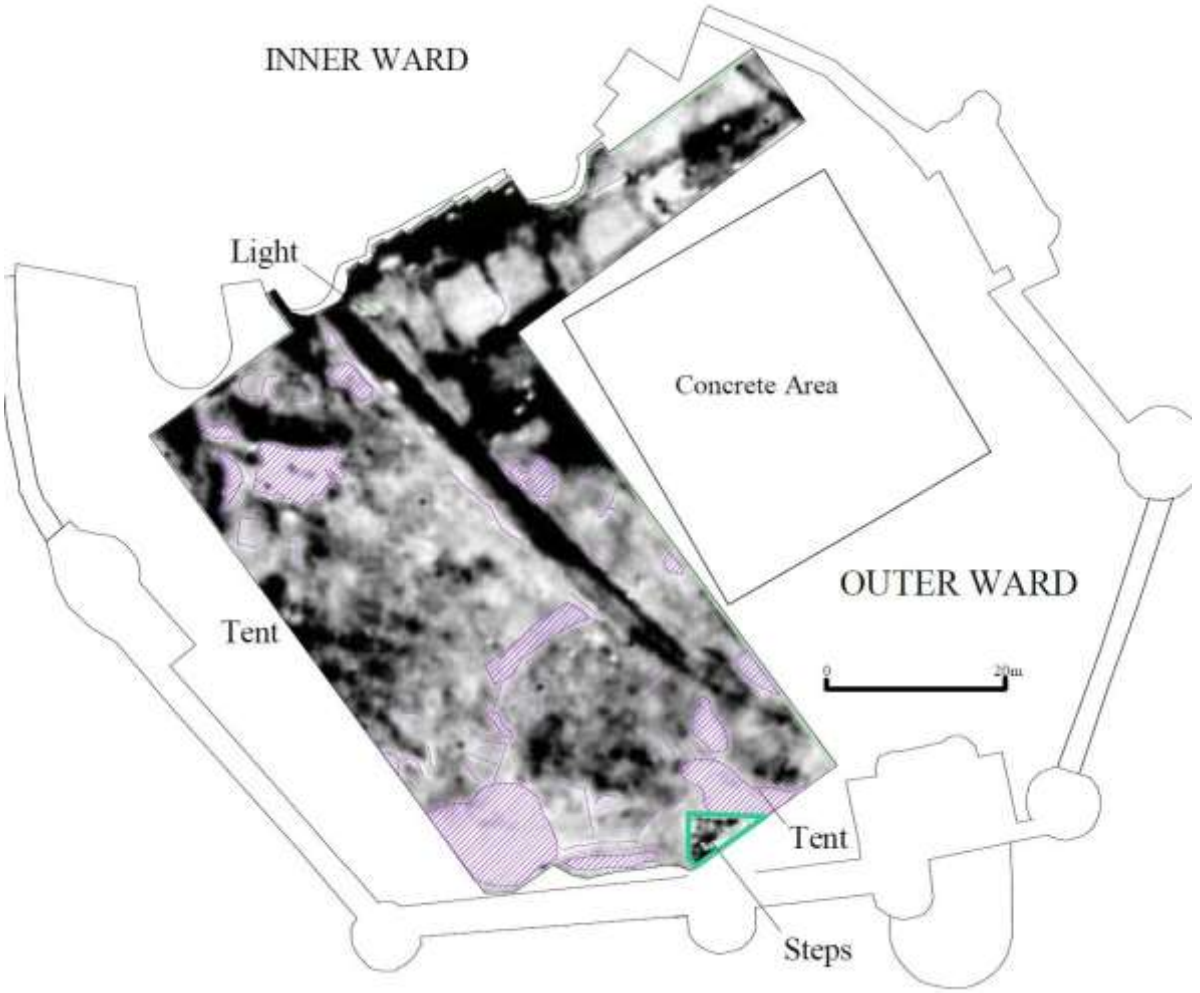

Figure 18: Interpretation plot of resistivity survey results for the outer ward of Pembroke Castle, overlaid on the greyscale plot and local topographical features, showing low resistance features only, in purple

Initial Conclusions from the Resistivity and Magnetometry Surveys

4.2.21 The magnetometry and resistivity surveys undertaken at Pembroke Castle have been successful in demonstrating the presence of buried archaeological remains (**Figure 19**). It has been possible to assess and characterise some of these remains, and evidence has been found for the large building near the Henry VII tower, known from parch marks in aerial photography (Photo 1), previous excavation and also identified by the GPR survey (Buildings G & H). Some pit like anomalies were identified by both the magnetometry and resistivity surveys, and conceivably some of these could represent a well, or wells. No evidence was found for the congestion of buildings that was theorised, or for the infilled defensive ditch in front of the inner curtain wall. This does not mean that they were never there, because the geophysics could have failed to detect them or later activity within these areas could have eradicated or covered any remains. Only excavation can ultimately answer the questions left open by these surveys.

4.2.22 The outlines of buildings, other than the ones next to the Henry VII tower (Buildings G & H), were detected using both methods, and the combination of the results of the two methods was found to be very useful for clarifying and confirming the presence of these features. The buildings were located to the north of the curtain wall, with the largest 'room' measuring about 10m long. A smaller possible building was detected by resistivity survey alone just north of the chapel wall in the inner ward. All other features detected were of uncertain nature, excepting the outline of the modern stone path running northwest-southeast right through the outer ward.

4.2.23 Part II: Discussion of this report presents Neil Ludlow's interpretations of the results. The results may also be used for to determine where areas of targeted excavation should take place in the future.

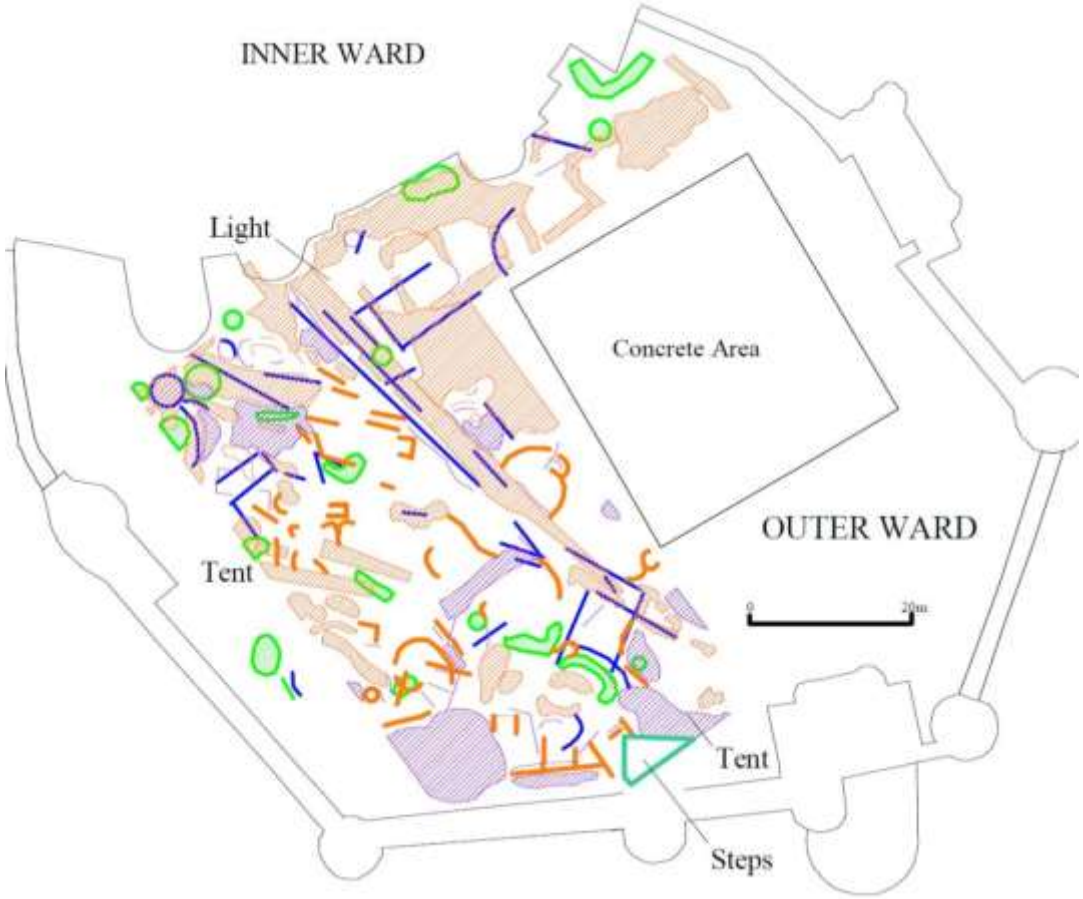

Figure 19: Interpretation plot of the magnetometry and resistivity survey results for the outer ward of Pembroke Castle, showing positive magnetic anomalies in green, negative magnetic anomalies in blue, high resistance features in orange and low resistance features in purple

4.3 GPR Results (By Tim Fletcher, taken from Fletcher 2016)

4.3.1 Interpretation of GPR surveys can be a time consuming task that involves numerous computer based techniques for processing the vast amounts of data collected. For this survey ReflexW software was used to filter and enhance the raw data. Communicating the result in a concise manner can also be a challenge as many images, or scan types, are needed to demonstrate the interpretation. As such, this section of the report will only use spliced interpolated time slices to provide the reader with a plan view that best represents the features of interest. It should be noted that a plan view at one depth (time slice) will show individual features better than they do at other depths, but that does not necessarily mean they do not exist in deeper and/or shallower time slices.

4.3.2 The boxed area in **Figure 20** shows the approximate area surveyed within the castle grounds which totalled *c.*4479.5 sq m (*c.*58.9% of the total outer ward). The modern tarmac map (former tennis court area) is to the right of the image in **Figure 20** and takes up a significant amount of the survey area.

Figure 20: Approximate area subject to GPR survey within the outer ward of Pembroke Castle (from Fletcher 2016)

4.3.3 The survey was spilt over two days with three quarters completed on the first day. The second day's survey was almost exclusively over the tarmac surfaced former tennis court area. The weather conditions were dry on both days and there had been no rainfall overnight between the two days.

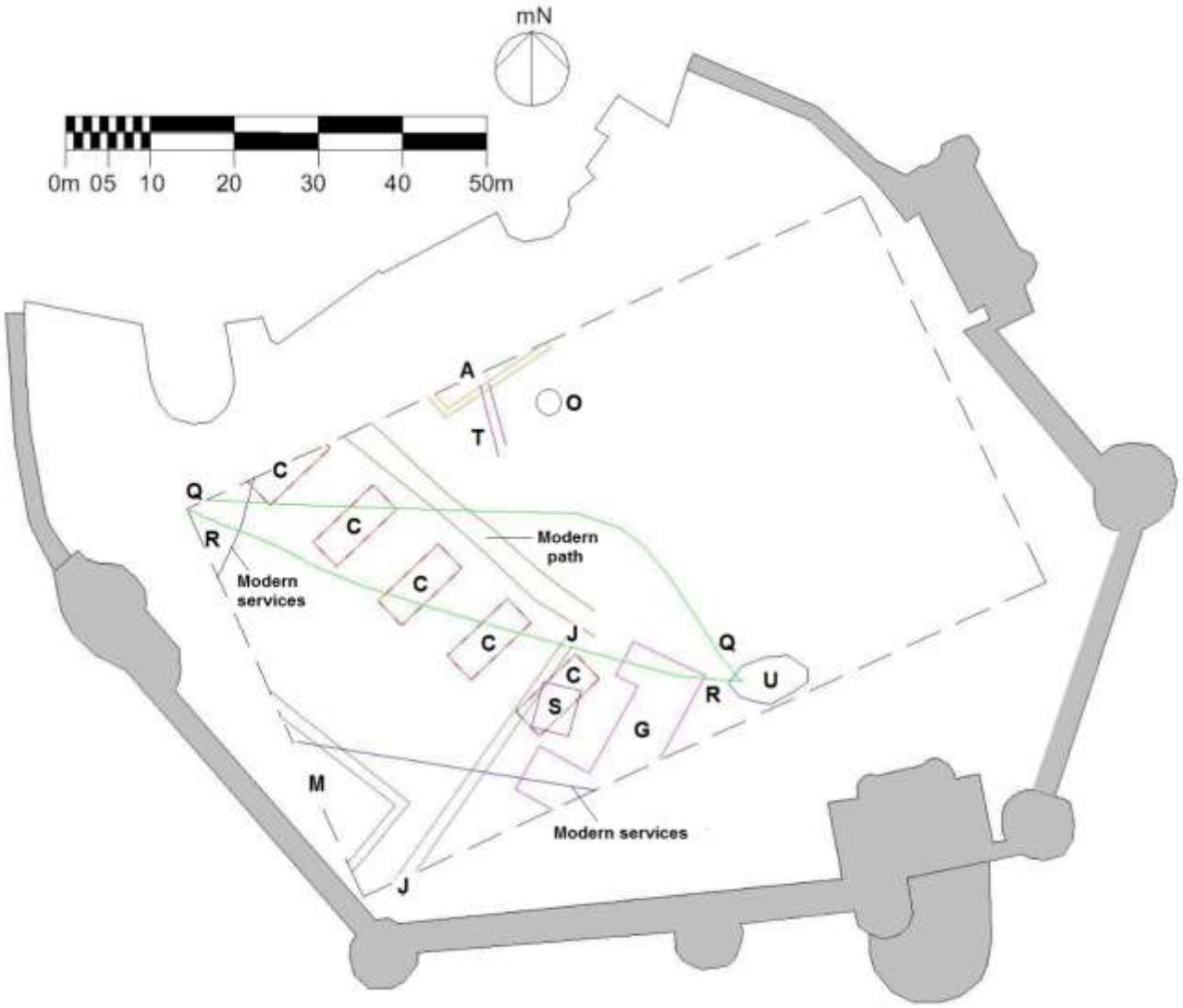

Figure 21: Identified GPR survey anomalies (from Fletcher 2016)

4.3.4 Two anomalies are considered to be modern services, based on testimony and surface indications, and are not discussed further. The following anomalies are considered to be of interest (Table 2; **Figure 21**):

Modern path (1930s). Estimated depth 0.0m-0.5m. Long linear feature also clearly visible on the ground as a trackway from the main gatehouse towards the keep. This track is not just a surface structure. It is well built, with shoulders and drainage to both sides. Sub-surface reflections suggest that it is constructed with a well consolidated material not visible at the current surface level. See **Figs. 22-31**.

Anomaly *A*. Estimated depth 0.3m-0.6m. Like ***T*** this feature also likely projects outside of the northern survey boundary. Whilst only three sides have been captured, this is assumed to be a rectilinear feature approximately 10m long on the known side. There is some evidence for possible material spill around this feature. See **Fig. 22**.

Anomalies *C*. Estimated depth 0.2m-0.3m. A series of five rectilinear features of exact same dimensions. Set out equidistantly along the line of the main track that cuts the survey area. Definition of the features reduce from North to South with the Southernmost feature almost visually lost as it overlays anomaly E1. Considering the shallow depth of the features and very ordered layout I would consider these to be relatively modern structures and I support suggestions by others that they are most likely 20th Century wartime buildings. See **Fig. 22**.

Anomaly *G*. Estimated depth 0.25m-1.2m. This anomaly is the sub-surface structure responsible for the well-defined parch marks visible in previous overhead imagery. Unfortunately it is not covered in entirety by the survey area. The GPR results are similar to the parch marks in that the most defined area of the building is to the east and with indications that there is greater disturbance or spilled masonry inclusions surrounding the structure towards the South and West elevations. The Northern edge shows the least definition, possibly from the construction of the later buildings described as anomalies ***C*** and/or ***S*** below. See **Figs. 25-27, Fig. 29**.

Anomaly *J*. Estimated depth 0.9m-1.1m. A straight, linear anomaly running NE from the SW corner of the outer ward as far as the modern path. **Figs. 27 and 31**.

Anomaly *M*. Estimated depth 1.0m-1.5m. This is a wide linear anomaly that projects out from the outer defensive wall. It appears to have a 90-degree return which continues back out of the survey area, some definition is lost along the return possibly due to significant material spill. **Figs. 27 and 31**.

Anomaly *O*. Estimated depth 0.5m-2.0m. A difficult anomaly to interpret, but the data suggests a roughly circular anomaly to the Northwest corner of the asphalt map. Visible at shallow depths, but it does not take on the circular form until deeper depths are reached. There is a significant amount of disturbance and high amplitude reflections surrounding the feature and these persist to some depth. The short diameter and significant depth of the circular feature, along with the surrounding material suggests that this is more permanent structure, as opposed to just a round pit as in anomaly U. See **Figs. 23 and 26**.

Anomaly *Q*. Estimated depth 1.0m-2.0m. Relatively deep, long linear anomaly that cuts across the survey area. Based on the vertical slices (not shown in this document) this feature is either a distinct 'drop off' in the

underlying bedrock as it falls away to the castle walls or more likely a ditch with a higher inner edge. See **Figs. 29 and 30**.

Anomaly *R*. Estimated depth 1.0m-2.0m. This anomaly is similar to ***Q***. It interacts with it to the northwest then arcs away before re-joining to the southeast. This is also a likely ditch. See **Figs. 29 and 30**.

Anomaly *S*. Estimated depth 0.8m-1.2m. This anomaly is a rectilinear feature that sits under one of buildings ***C***. It is also close to the main building (***G***) but the orientation suggests that it is not related. It is not as substantially built as other nearby structures and is only visible at around 0.4m and not much deeper. See **Figs. 24-25**.

Anomaly *T*. Estimated depth 0.2m-0.3m. This is a relatively shallow anomaly that likely projects outside the northern boundary of the survey area. It consists of two parallel high amplitude features that cuts through or sits above anomaly ***A***. See **Fig. 22**.

Anomaly *U*. Estimated depth 0.3m-1.0m. This anomaly begins at a relatively shallow depth towards the Southwestern corner of the asphalt map. With a very rough circular appearance that diminishes in size as time slices deepen. This is very characteristic of a pit. See **Fig. 24**.

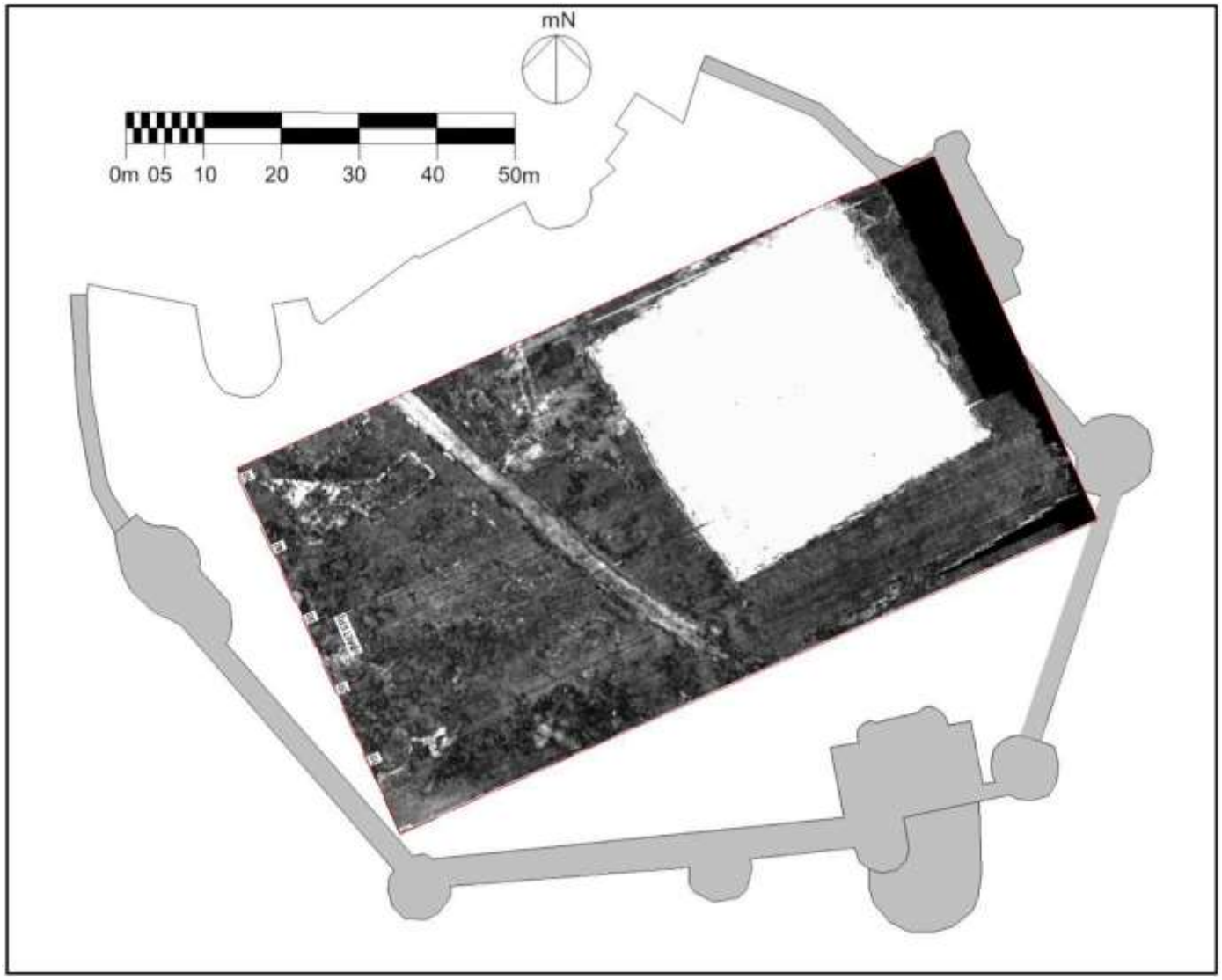

Figure 22: C-scan d= 0.25m (estimated) (from Fletcher 2016)

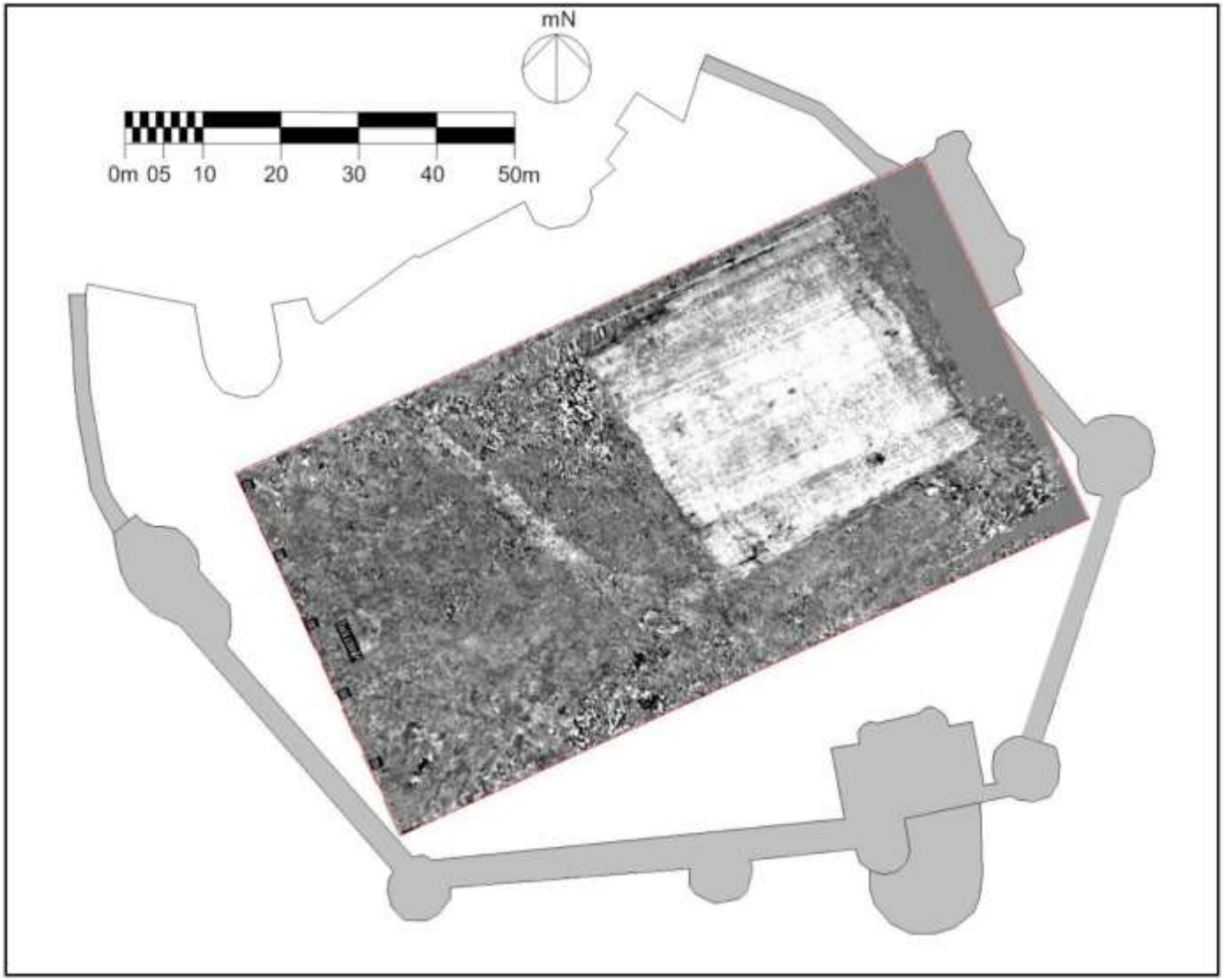

Figure 23: C-scan d= 0.5m (estimated) (from Fletcher 2016)

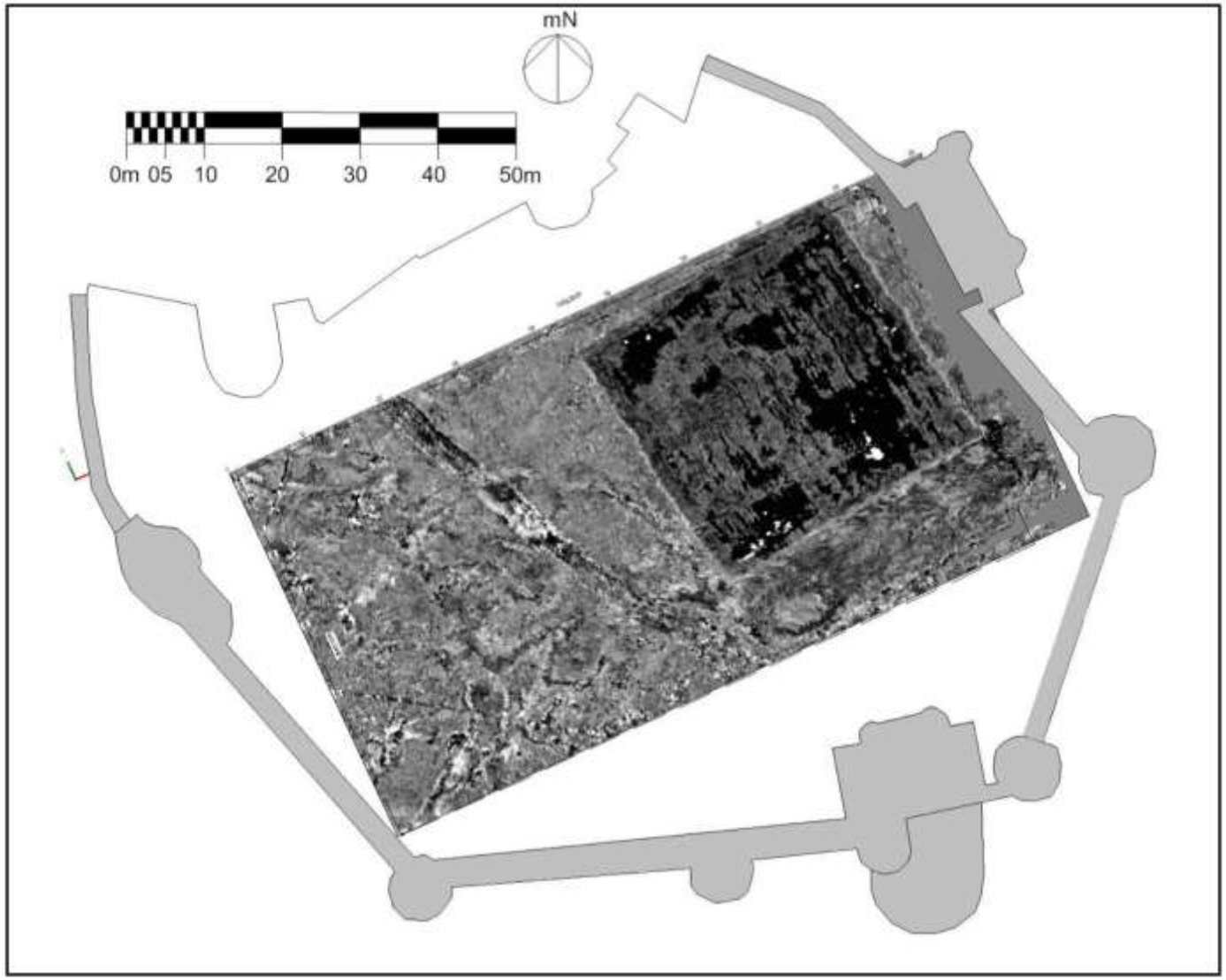

Figure 24: C-scan d= 0.3m (estimated) (from Fletcher 2016)

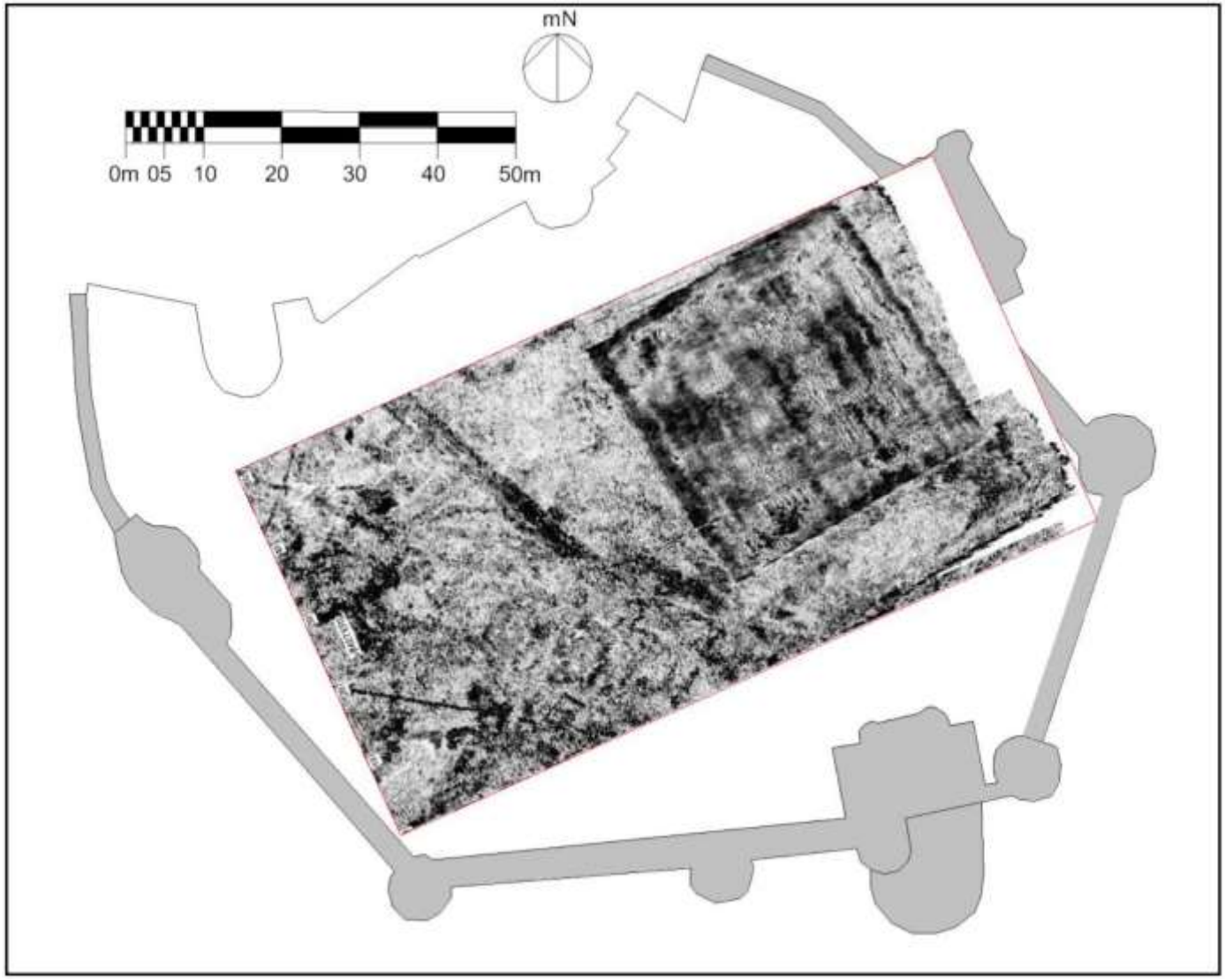

Figure 25: C-scan d= 0.35m (estimated) (from Fletcher 2016)

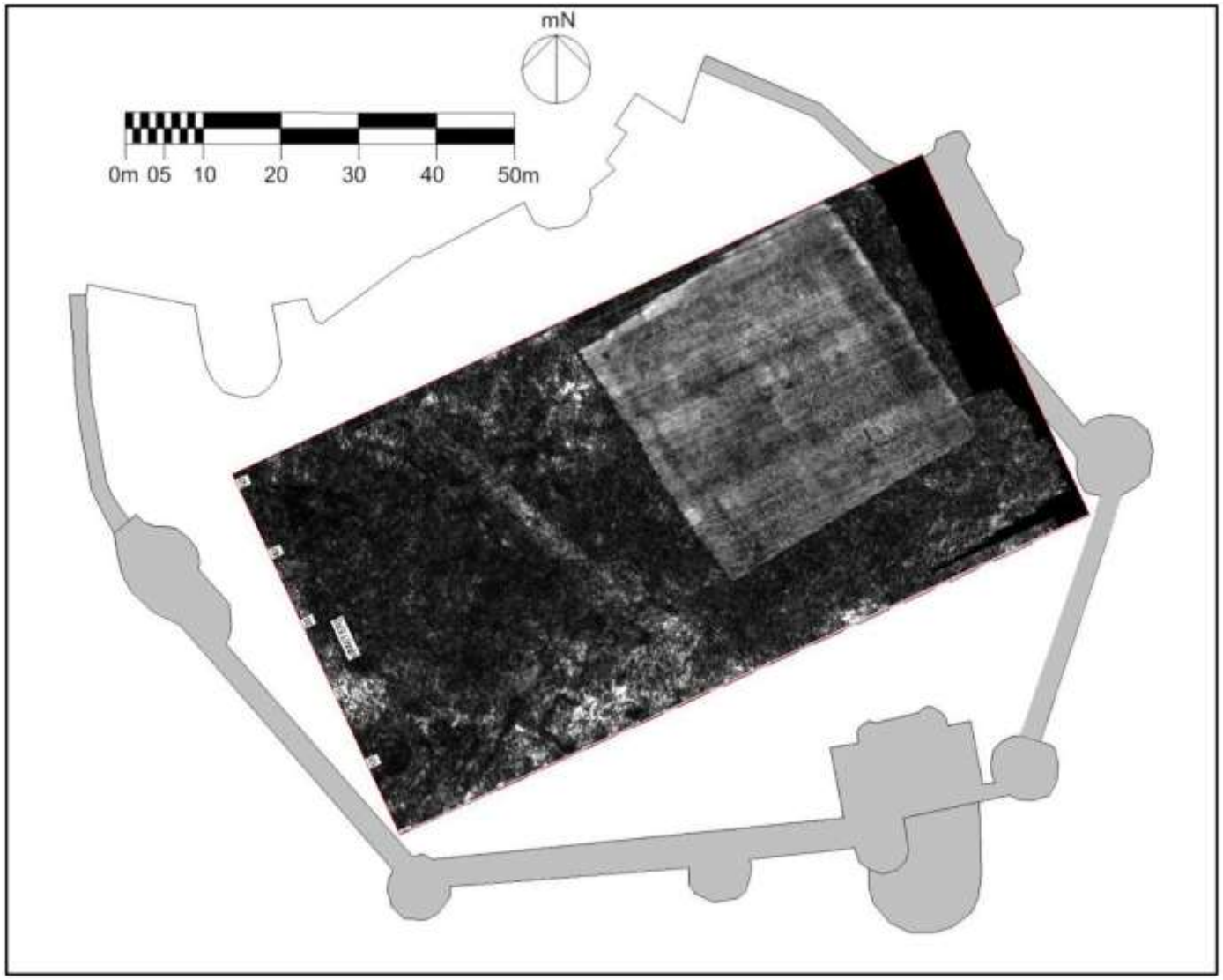

Figure 26: C-scan d= 1.0m (estimated) (from Fletcher 2016)

Figure 27: C-scan d= 1.1m (estimated) (from Fletcher 2016)

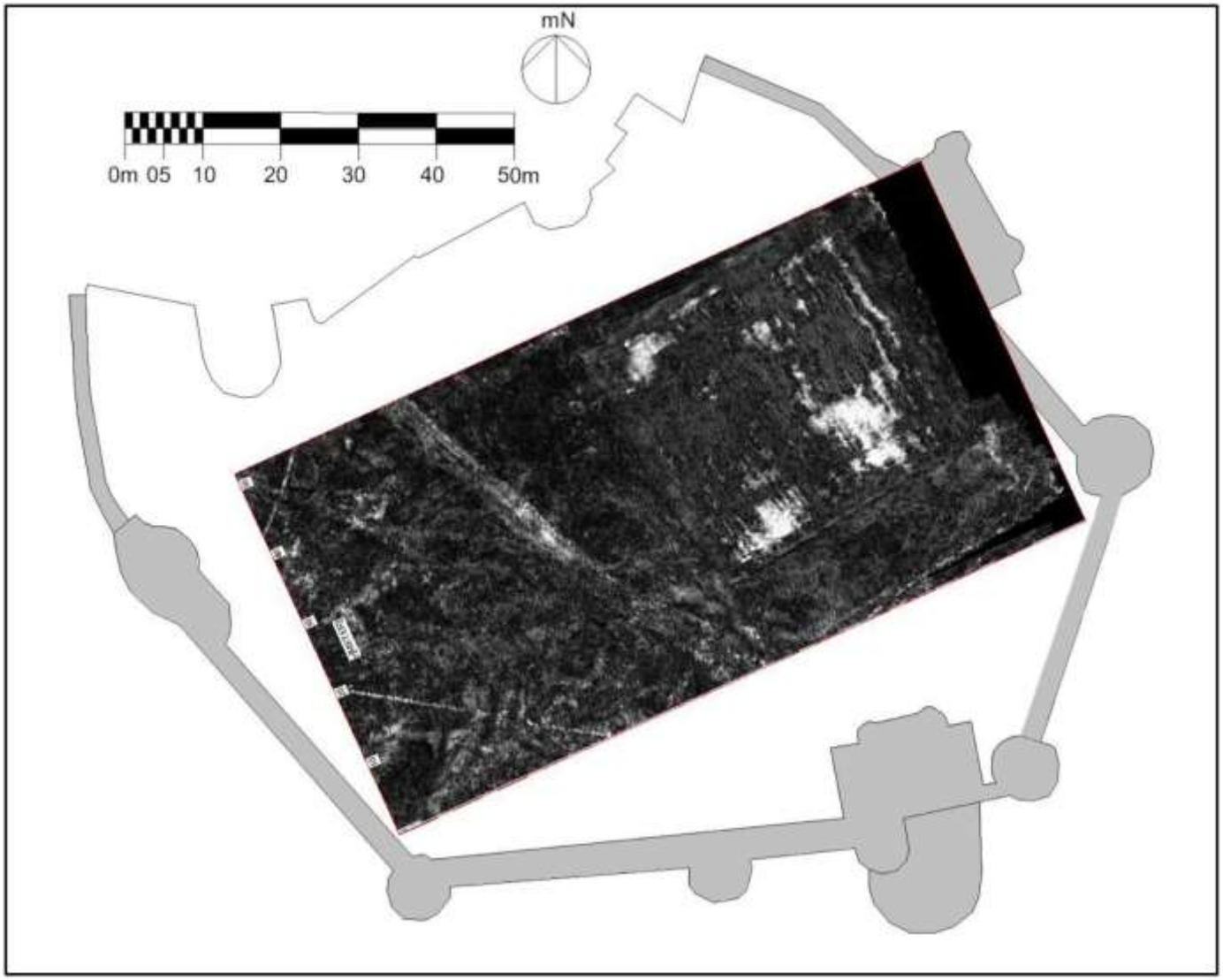

Figure 28: C-scan d= 0.4m (estimated) (from Fletcher 2016)

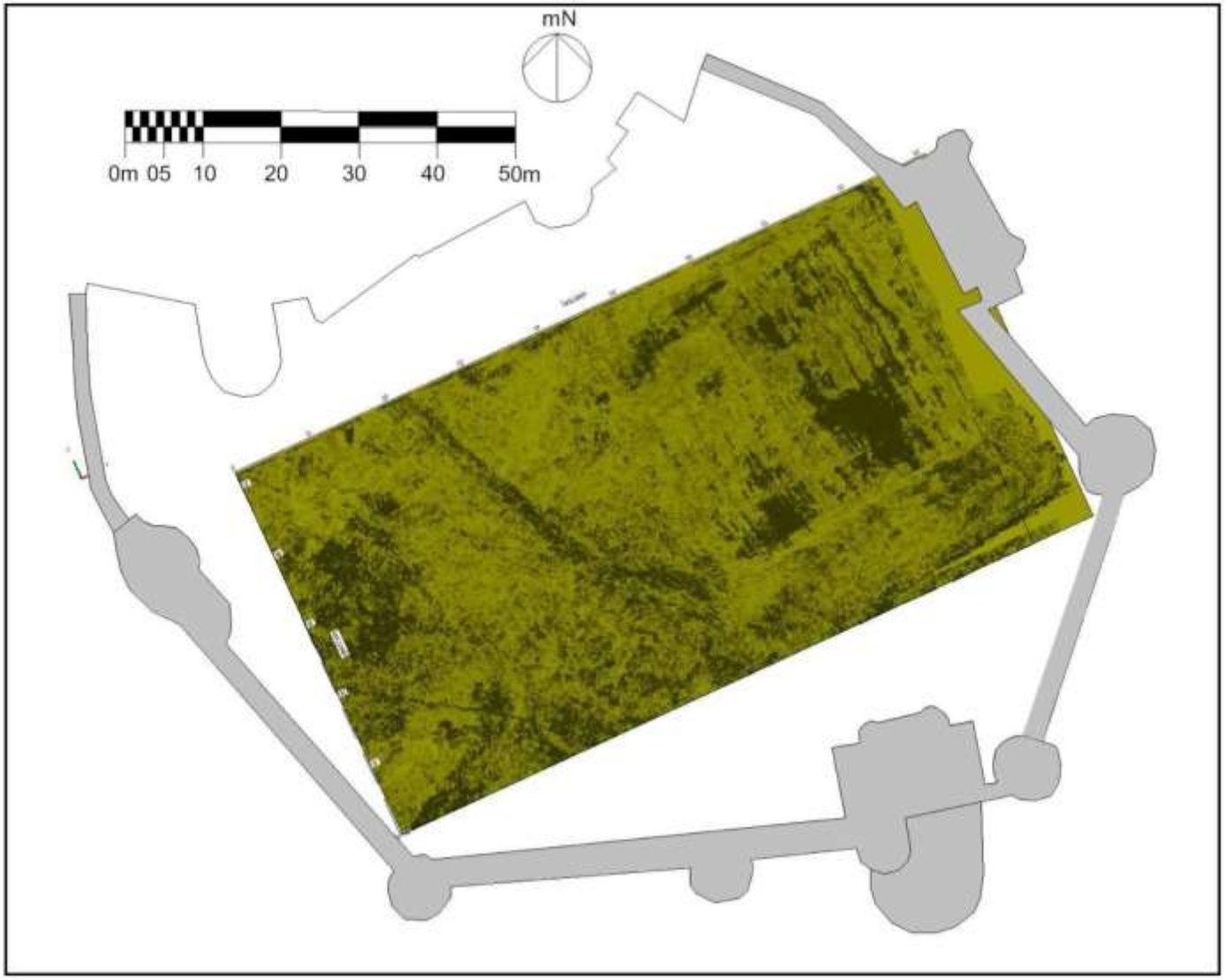

Figure 29: d= 1.05m (estimated) (from Fletcher 2016)

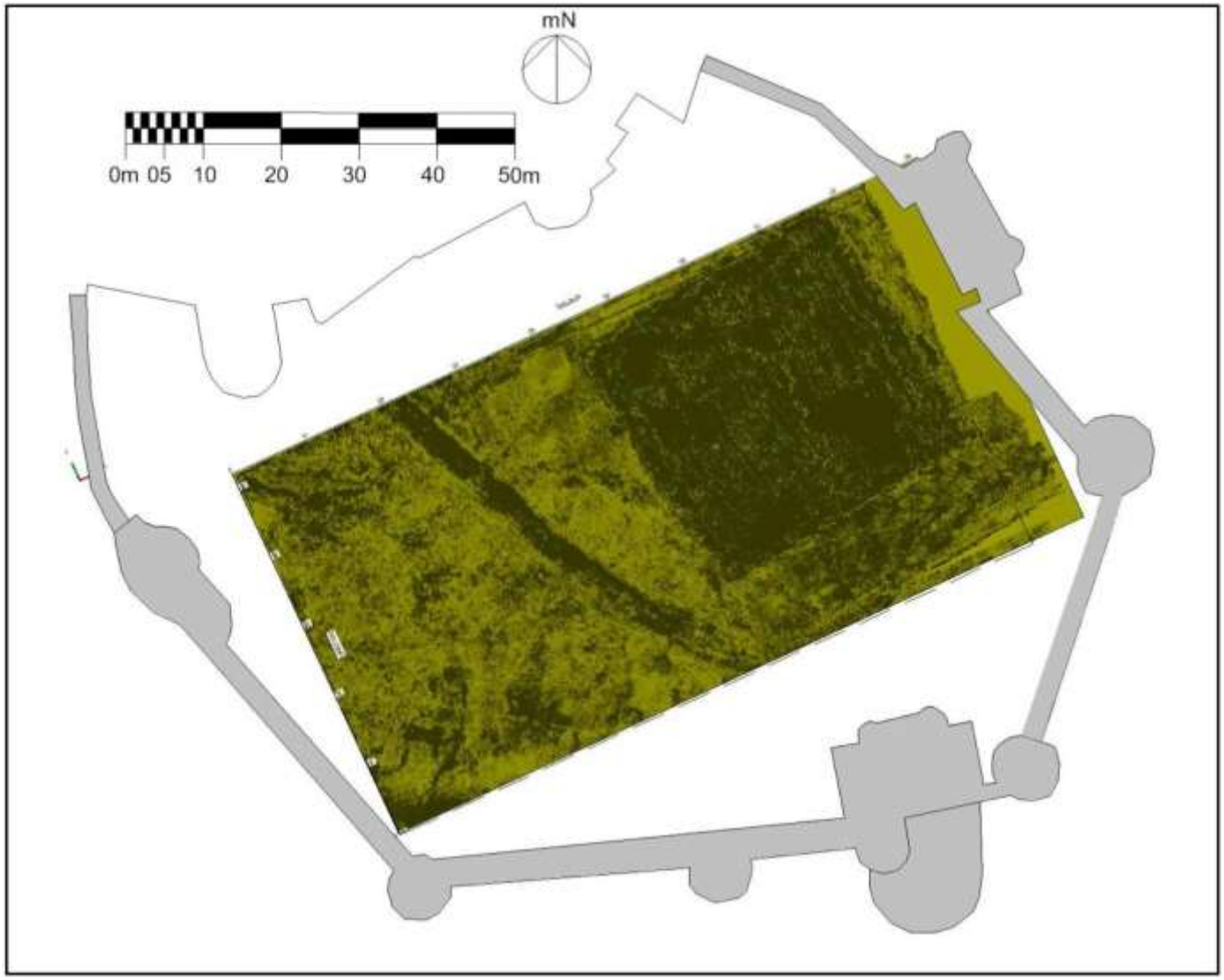

Figure 30: C-scan d= 1.5m (estimated) (from Fletcher 2016)

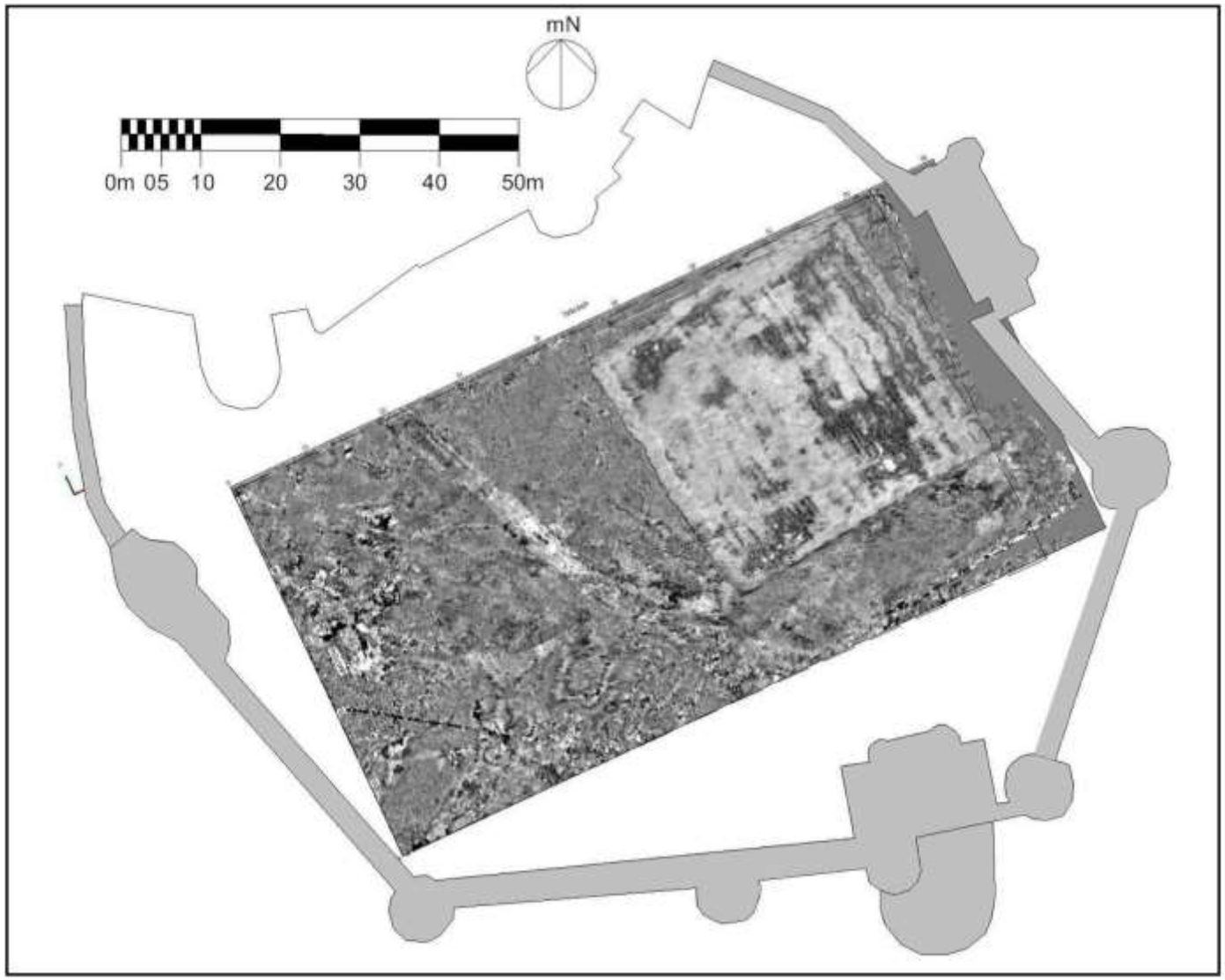

Figure 31: C-scan d= 0.95m (estimated) (from Fletcher 2016)

Summary Conclusions from GPR survey

4.3.5 The GPR survey has identified a number of anomalies of potential interest. Some of these features were already known or suspected through various sources including other geophysical techniques. It is hoped that the results confirm much of this information but also add some detail in a way that other methods cannot. Using multiple geophysical techniques at this site was a very sensible decision, if for no other reason that it is extremely busy from a sub-surface interpretation perspective.

4.3.6 It will have been noted that no anomalies of interest were identified under the tarmac surfaced former tennis court that covers a large part of the survey area. It is clear on the ground that this area of the site has been subject to extensive landscaping. This landscaping will have included both truncation to create a level surface, but also areas where the ground has been built up, as evidenced by the revetment walls along its northeastern edge adjacent to the new café and southeastern edge. Energy penetration through this material has been possible and clear construction joints of tarmac and the sub-surface strata can be seen in **Figure 29**. Unfortunately due to the very flat and consolidated layers of this area the data has been subject to 'ringing' whereby the energy is reflected multiple times between the surfaces and the antenna and this masks possible features at a greater depth.

4.3.7 The circular feature is interesting due to the current speculation of a well in the area. The feature certainly shows some characteristics that might support it being a well, not least of which the depth. The feature is visible at 2m which was the maximum depth processed as part of this survey, so it may feature at greater depths still. The significant amount of reflections in the area certainly suggests a spill of building material, and these also can be seen at some depth.

4.3.8 The two potential ditches of could benefit from some further investigation as they may form part of an earlier defensive structure.

SOURCES

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Unpublished

Fletcher, T. 2016. Pembroke Castle: Ground Penetrating Radar Survey Report. Tim Fletcher Geophysical Report Number TFI_05/2016-DAT.

Database

Dyfed Archaeological Trust Historic Environment Record, housed with Dyfed Archaeological Trust at Corner House, 6 Carmarthen Street, Llandeilo, Carmarthenshire, SA19 6AE

Photographic

Royal Commission on Ancient and Historical Monuments Wales

APPENDIX I:

PEMBROKE CASTLE, PEMBROKE, PEMBROKESHIRE:

CASTLE STUDIES TRUST GRANT FUNDED PROJECT

WRITTEN SCHEME OF INVESTIGATION FOR GEOPHYSICAL SURVEY

1. INTRODUCTION

1.1 This Written Scheme of Investigation (WSI) has been prepared by DAT Archaeological Services as part of a project funded by the Castle Studies Trust to carry out a suite of geophysical survey techniques within the outer ward of Pembroke Castle. The WSI presents a proposed methodology for a geophysical survey of the castle grounds (centred on NGR SM 98176 01609; Figure 1).

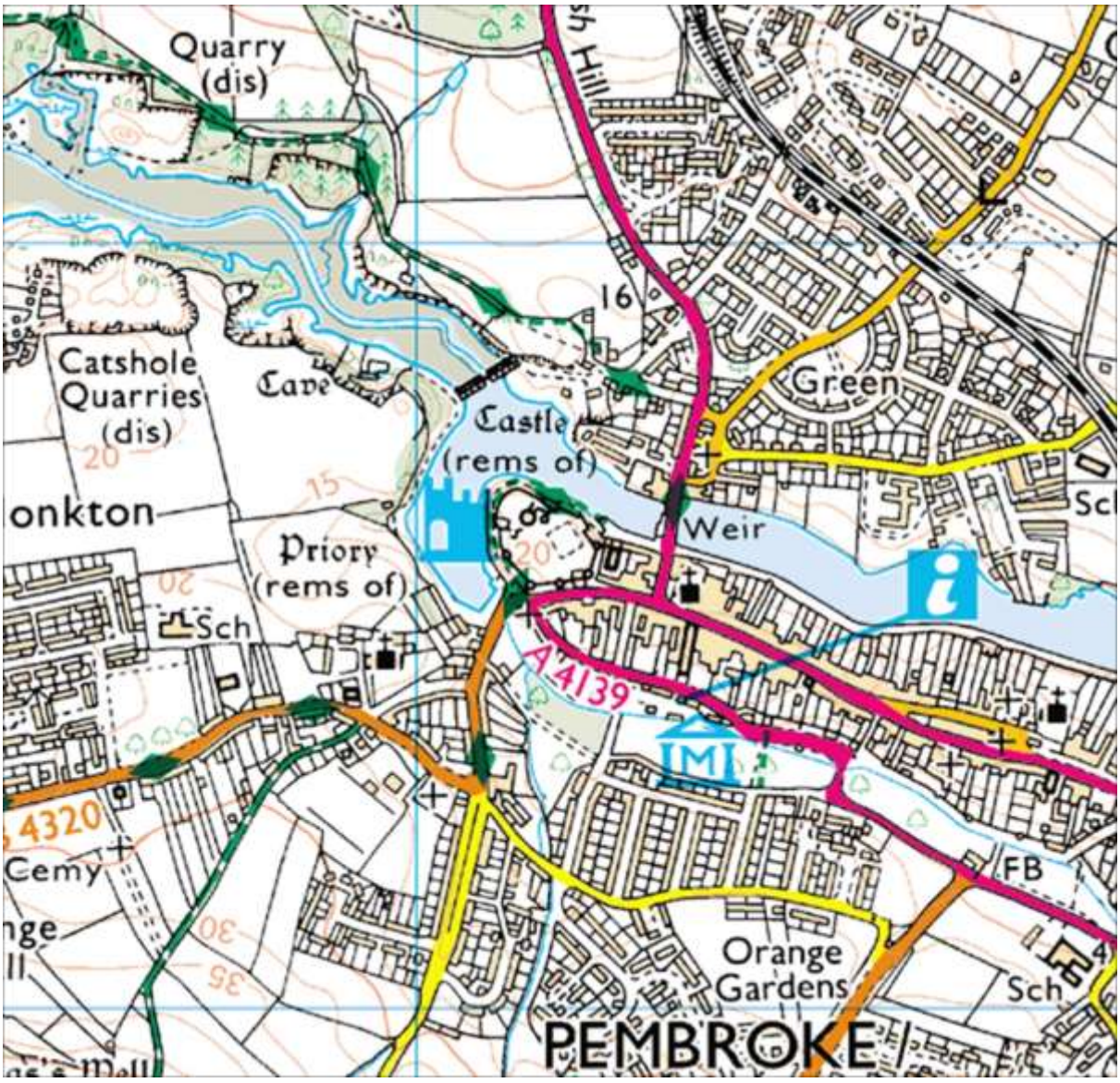


Figure 1: Pembroke Castle

1.2 A successful grant application was submitted to the Castle Studies Trust by Neil Ludlow and DAT Archaeological Services to carry out geophysical survey within the outer ward of the Castle in order to learn more about former buildings within the castle grounds. One of the specific aims to is reveal more information regarding the complex of buildings identified through aerial photography in 2013 lying in the southern part of the outer ward (Photo 1). Neil Ludlow notes that 'although not all may be medieval, they suggest the castle has, in the past, been congested with buildings – most of them hitherto unsuspected. The aim of the geophysical survey is to get a clearer idea of their nature and extent, and hopefully some clues to their date and function. One of the buildings was part-excavated, though without record, in the 1930s, and has been suggested as a mid/late 15th-century hall-house – and the potential birthplace of King Henry VII.'

1.3 Ludlow also states that 'Pembroke Castle, despite its size, prestige, and excellent preservation, is surprisingly little-understood. The documentary evidence for its construction is sparse and, though it houses an impressive range of domestic and administrative buildings, they appear in very few records. The project will provide entirely new information about the internal layout of an important castle, of which, at present, we know very little.' The proposed survey will aim to provide a detailed record of surviving subsurface remains through non-intrusive geophysical survey comprising gradiometer survey, resistivity survey and ground penetrating radar.

1.4 A report on the results of the geophysical survey will be prepared (including an archive of the results). The report will include an assessment of the findings.

1.5 The specification is in accordance with the Chartered Institute for Archaeologists Standard and Guidance for Archaeological Geophysical Survey (Chartered Institute for Archaeologists (CIfA 2014).

1.6 The Trust always operates to best professional practice. Dyfed Archaeological Trust Field Services has its own Health and Safety Policy, and all works are covered by appropriate Employer's Liability and Public Liability Insurances. Copies of all are available on request.

1.7 ***Dyfed Archaeological Trust is an CIfA Registered Archaeological Organisation.***

1.8 ***All permanent staff members of DAT Archaeological Services are CSCS[2] registered.***

[2] ***Construction Skills Certification Scheme (Health and Safety Tested)***

Photo 1: RCAHMW photograph taken by Toby Driver of Pembroke Castle in 2013

Photo 2: Detail of building parchmarks on southern side of the outer ward

2. AIMS AND OBJECTIVES

2.1 This document provides a scheme of works for:

The implementation of a scheme of non-intrusive archaeological geophysical surveys using a gradiometer, resistivity and ground penetrating radar across the outer ward of Pembroke Castle to learn more about the internal layout of former buildings within the castle walls. A report on the results will be prepared and an archive of the results will be compiled.

3. GEOPHYSICAL SURVEY METHODOLOGY

3.1 Gradiometer and Resistivity Survey (to be undertaken by DAT Archaeological Services with assistance from Mr Tim Southern)

3.1.1 A fluxgate gradiometer and an RM15 resistivity meter will be used. The gradiometer detects variations in the earth's magnetic field (full specifications are in Appendix 1) and the resistivity meter, variations in the electrical resistance of the ground. The gradiometer is carried over the ground surface to take readings. The resistivity meter requires probes to be pushed a small distance into the ground surface to take the readings. Surveys are undertaken by two people, one to lay out the grids and the other to carry the instrument to do the surveys.

3.1.2 Readings will be taken at 1m traverses wide and every 0.25m within 20m x 20m grids across the site. The area to be surveyed will be approximately 0.63ha in size. A Trimble TST will be used to tie the survey grid into the local Ordnance Survey grid. Grids are typically marked out with small canes or pegs.

3.1.3 The underlying geology and soils are considered suitable for geophysical survey.

3.1.4 The tarmac area adjacent to the Castle Café (which now has the map of Wales) will not be suitable for resistivity survey. It is possible that gradiometer survey will also not produce suitable results.

Processing, presentation and interpretation

3.1.5 Processing will be performed using *TerraSurveyor 3.0*. The data will be presented with a minimum of processing. The presence of high values caused by ferrous objects, which tend to hide fine details and obscure archaeological features, will be 'clipped' to remove the extreme values allowing the finer details to show through.

3.1.6 The processed data will be presented as grey-scale plots overlaid on local topographical features. The main magnetic anomalies will be identified and plotted onto the local topographical features as a level of interpretation.

3.2 Ground Penetrating Radar Survey (To be undertaken by Tim Fletcher)

3.2.1 The Ground Penetrating Radar (GPR) survey will involve the wheeled instrument being towed along traverse lines across the outer ward of the castle. The GPR uses pulsed radio waves that can penetrate through the ground surface and the resulting reflected wave being picked up by the instrument and time depth information can be collected. This provides information on depths of material and information on the types of material encountered.

3.2.2 This survey technique can be undertaken across the tarmac area.

3.2.3 Numerous processing techniques can be applied to the raw data collected from the site which can enable plans to be prepared for the features identified. This survey technique should clearly show any structural remains surviving below ground.

3.3 General Information on Interpretation

3.3.1 All of the resulting survey results and interpretation diagrams should not be seen as a definitive model of what lies beneath the ground surface, not all buried features will provide a magnetic, electrical or radar response that can be identified. In interpreting those features that are recorded the shape is the principal diagnostic tool, along with comparison with known features from other surveys.

3.3.2 All measurements given will be approximate as accurate measurements are difficult to determine from such surveys.

3.4 Outreach

3.4.1 Although due to the nature of the surveys it is not possible to directly involve members of the public in carrying out the survey techniques, it is intended that information will be provided to visitors to the castle. Access to survey areas will be restricted during the surveys, but this will only be around the 20m x 20m grids being surveyed at that time. The survey areas will be fenced off with bamboo canes and hazard tape. The GPR survey will be more extensive, but as long as people are not in the way of the instrument as it is being pulled across the site area, it should be fine.

3.4.2 With two members of staff on-site during the surveys, once areas have been gridded out, this will leave one member of staff available to discuss what is being done with interested parties and there will be opportunities at lunch time and at the end of the day for members of the public to see some of the results.

3.5 Reporting and Archive

3.5.1 All data recovered during the fieldwork will be collated into a site archive structured in accordance with the specifications in *Archaeological Archives: a guide to best practice in creation, compilation, transfer and curation* (Brown 2011), and the procedures recommended by the National Monuments Record, Aberystwyth. The *National Standards for Wales for Collecting and Depositing Archaeological Archives* produced by the Federation of Museums and Art Galleries of Wales will also be adhered to.

3.5.2 The basic interpretation of the results of the geophysical survey will be provided by DAT Archaeological Services (gradiometer and resistivity) and Tim Fletcher (GPR). The information will then be further analysed and interpreted by Neil Ludlow to put it into context with the development and use of the castle. The information may also be used in press releases and other publicity by The Castle Trust, DAT Archaeological Services, Tim Fletcher and Pembroke Castle Trust.

3.5.3 The report will be prepared to follow the relevant Chartered Institute for Archaeologists *Standards and Guidance* (CIfA 2014).

3.5.4 Copies of the report will be provided to The Castle Trust, Pembroke Castle Trust, Cadw, RCAHMW and the Dyfed Archaeological Trust Historic Environment Record.

4 STAFF

4.1 The project will be managed by J Meek MIFA, Head of DAT Archaeological Services.

4.2 The on-site gradiometer and resistivity surveys will be undertaken by members of DAT Archaeological Services staff, including Ed Davies and assistance from Tim Southern.

4.3 The on-site GPR survey will be carried out by Tim Fletcher.

5. MONITORING

5.1 The site work may need to be monitored by Cadw and the Project Manager. Toby Driver of RCAHMW will also be invited to monitor the works and see the results of the survey, especially in the area of the building identified from his aerial photographs (Photos 1 & 2).

PART I, APPENDIX II: PIONEERING GEOPHYSICAL TECHNIQUES

The following article was posted on the Castle Studies Trust Blog regarding the resistivity survey methodology carried out at Pembroke Castle, written in conjunction with Tim Southern.

http://castlestudiestrust.org/blog/2016/08/26/pioneering-geophysical-techniques/

Pioneering geophysical techniques

Some of the Castle Studies Trust's projects have made innovative use of cutting edge technology. Nick Tarr explains how a new survey technique was used this year at Pembroke Castle.

Geophysical Survey Technologies (GST) was formed to improve survey equipment for archaeologists to use in all environments including equipment suitable for use in woodlands. The equipment, ideally, should be within the financial reach of amateur groups.

The prototype survey frame resulted from research into voltage surveys (commonly called resistance surveys) where geology or other conditions are unfavourable for conventional methodology. The frame uses a commercially available data logger and power supply but has all four electrodes on a compact mobile frame which is collapsible to fit in boot of a car.

The prototype frame in use.
Photo ©Nick Tarr.

The metal prototype frame.
Photo © Nick Tarr.

The version used at Pembroke Castle was aimed at keeping the energy from the power supply within the archaeological layers so maximising any opportunity of detecting any archaeology present. A comparison with the conventional twin array in both parallel and zig-zag walking modes was made over a single grid which contained part of a building and a track. The existing twin array frame gave no clear signal for the building, the track was the only major feature seen.

The prototype frame gave much better results. A further test across a monastic site in west Wales has also shown improved results over the conventional twin array methodology. Development work continues.

PEMBROKE CASTLE: GEOPHYSICAL SURVEY 2016 PART II: DISCUSSION

By

Neil Ludlow

CONTENTS

FIGURES

5.1 Pembroke Castle: developmental history

5.1.1 Introduction

Pembroke was a private, baronial castle, held by the earls of Pembroke and, as such, records only survive for those brief periods when it came under Crown control. Only three published medieval accounts, from 1331, 1386 and 1481–2 (in Owen 1918, 106-7, 138-9, 172-5), name any of the castle buildings; these can largely be equated with surviving buildings in the inner ward. There are moreover no recorded gifts of building materials from the Crown, such as timber, which could help in dating periods of construction. A late fifteenth-century century manuscript source, containing a lengthy account of works carried at Pembroke Castle, is however known to exist in the Badminton MSS at the National Library of Wales (NLW Badminton 1 (Manorial 6) 1564 m. 2), but has been neither transcribed nor translated. Otherwise, there does not appear to be a great deal of unpublished source material, relating to the castle buildings, from the Middle Ages.

In addition, the tough Carboniferous limestone from which the castle is built does not allow for fine detail; surviving, dateable detail is mostly in imported Jurassic oolite and limited to three structures in the inner ward: the keep, the screen wall (with gate) across the mouth of the Wogan cavern, and the Great Hall. Nevertheless, comparisons of the standing fabric allow a broad chronology for its construction to be suggested, while functions can be assigned to some of its buildings. The sequence in the following section is based, with modifications, on Ludlow 1991, which differs significantly from that proposed by David Cathcart King in his lengthy paper on Pembroke Castle published in Archaeologia Cambrensis (King 1978). It is, however, only a brief summary. It is also an interim statement: interpretations may change in Ludlow, in prep.

Pembroke Castle was established in 1093 as an earth-and-timber castle (Thorpe 1978, 148 et al.). It comprised what is now the inner ward, which was defended by a rock-cut, defensive ditch across the limestone headland; this ditch can be clearly seen, in section, in the cliff-face on the west side of the castle. There is no evidence that a motte was ever present, and the early castle can be described as a 'partial ringwork'. The possibility exists that it was adapted from an Iron Age promontory fort like, inter alia, the nearby Carew Castle and Great Castle Head (Dale), both Pembs. (Gerrard 1990, 47; Crane et al. 1999, 133-8), and Llansteffan Castle, Carms. (Avent 1991, 170-2).

Pembroke's Main Street, which runs along the crest of the limestone peninsula on which the town is built, is a straight, axial route whose line can be projected to what is now the inner gate of the castle; it can thus be regarded as a primary feature. Monkton Priory, to the southwest of the castle, was founded in 1098 (Round 1899, 237-9), and became the parish church for Pembroke town which was established before 1130 (Walker 1989, 132). Monkton Bridge can therefore also be assumed to be an early feature. It is likely that a second route led to the castle's inner gate from Monkton Bridge; nineteenth-century maps clearly show a terrace in the cliff following this line (Ordnance Survey 1:500, 1861; now rather difficult to detect on the ground), and a deep hollow in the outer ward north of the Monkton Tower, later the site of a postern, may be associated with the suggested trackway (**Figs. 32-3**).

The castle was an administrative centre from the first, formalised under Henry I (1100-35) when it became the centre of a county with a sheriff (Hunter 1929, 136-7). The sheriff and castle constable both assisted at the county courts (Cal. Charter Rolls 1257-1300, 373; Lyte 1900, 416, 434, 511-23, 546; Owen 1897, 451-61); these were held at the castle, under the supervision of the steward of the lordship of Pembroke, on behalf of the earls of Pembroke who exercised vice-regal powers within the county and lordship (Owen 1911, 39).

These officers constituted the resident castle household. It is important to bear in mind that, throughout its history, the earls themselves were very infrequent visitors to the castle: they averaged a mere three or four visits each, normally of very short duration. Nevertheless, at this level of society, wives led separate lives from their husbands (discussed in Tabraham 2005, 37), and the countesses may have spent more time (which will have been unrecorded) at Pembroke Castle, where a separate hall may have been built for them (see section 5.1.4 below). And maintenance of status, display, and political security together meant that Pembroke Castle continued to be upgraded and extended until the mid-fourteenth century.

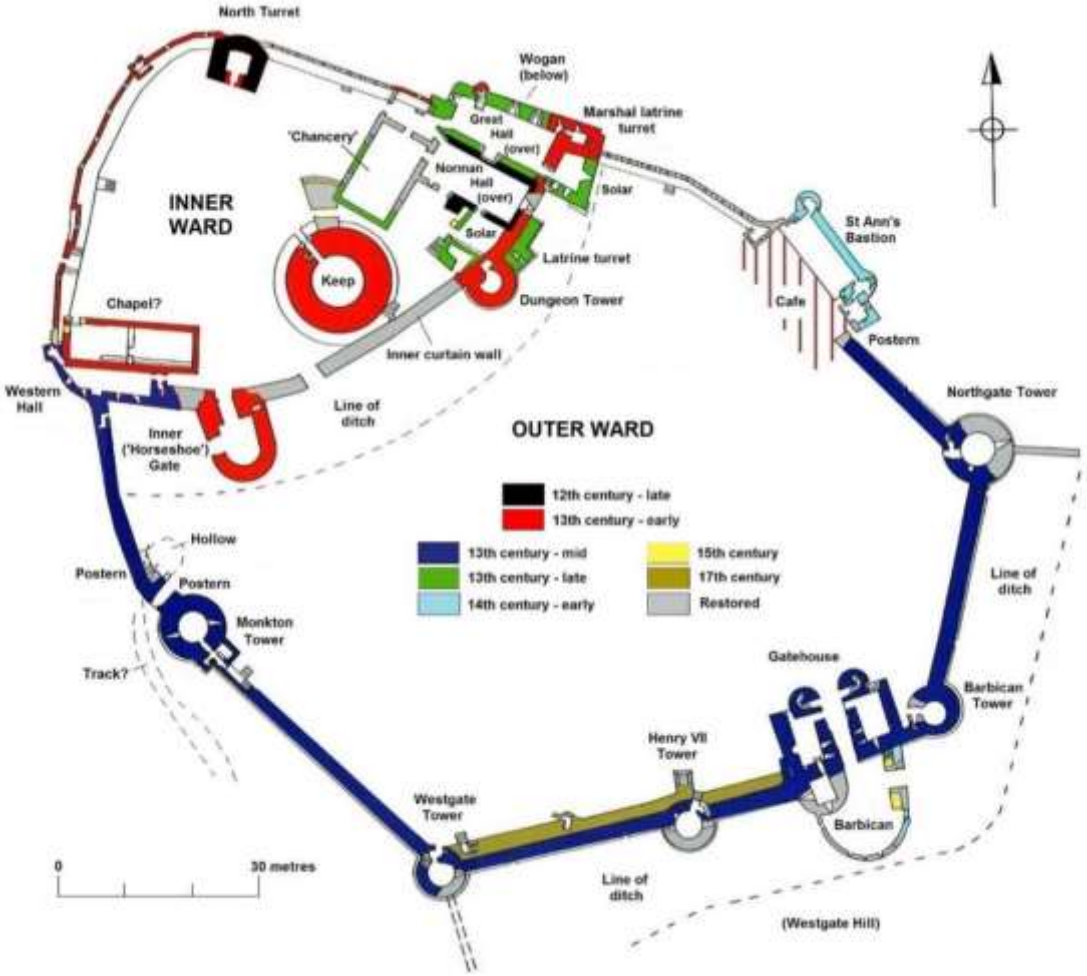


Figure 32: Ground plan of Pembroke Castle showing surviving structures, with suggested dates (modified from Ludlow 1991)

5.1.2 The first stone buildings (**Fig. 32**)

The earliest masonry may be represented by the 'Norman Hall' (or 'Old Hall'), which appears to have begun as a first-floor chamber-block, associated with a ground-floor hall (now gone), as defined by John Blair and Edward Impey at eg. Boothby Pagnell, Lincs., Burton Agnes, Yorks. and Hemingford Grey, Hunts. (see Blair 1993, 1-2); more locally, the Old Hall at Lamphey Bishop's Palace, Pembs., from *c.*1200 (Turner 2000, 12), may have similar origins. Pembroke Castle was under the control of the Crown during the latter part of the twelfth century: it was seized from earl Richard 'Strongbow' de Clare, probably in 1170 (Howlett 1884, 168; Howlett 1889, 252), and remained in royal hands until 1200 (Hardy 1837, 95; Flower 1922, 74; *Pipe Roll,* 2 John, 226, 230). It will be argued in Ludlow (in

prep.) that expenditure in 1186-8 (*Pipe Rolls*, 33 Hen. II, 143; 34 Hen. II, 165) relates to the construction of this chamber-block for Prince John as lord of Ireland, as a base for crossings to his lands there (as in 1185; Scott and Martin 1978, 227).

It is possible, in addition, that the square North Turret may have begun as a small, twelfth-century 'keep' which was later truncated and given a ground-floor entry (see **Fig. 41**). Otherwise undateable, its bowed external face is similar to that in the surviving twelfth-century keep at Haverfordwest Castle, Pembs. (**Fig. 51**), while its dimensions (8m x 7.5m) correspond with the small keeps at eg. Goodrich Castle, Herefs. (8m square; see Ashbee 2009, plan) and White Castle, Mon. (10m square; see Knight 2009, plan). Like the Haverfordwest tower, the North Turret lies at the far end of the bailey from the gatehouse. It may have been truncated when William Marshal's great keep was begun in 1200-01 (see below).

The Crown may also have been responsible for the earliest town defence at Pembroke, whose gates are mentioned in an account from 1198 (Brewer 1861, 161) which, curiously, has hitherto received no attention. The early town was probably limited to a small area east of the castle, where an undated ditch, possibly defensive, was revealed in 1994 (Lawler 2001, 176; see **Fig. 33**). The area thus defined would compare closely, in extent, with the early/mid-thirteenth-century defended areas at the royal borough of Carmarthen (James 1980, 26 and fig. 2, 27, 32-4), and baronial Haverfordwest and Kidwelly (James 2002, 434 fig. 1, 440; Kenyon 2007, 6, 40 and plan).

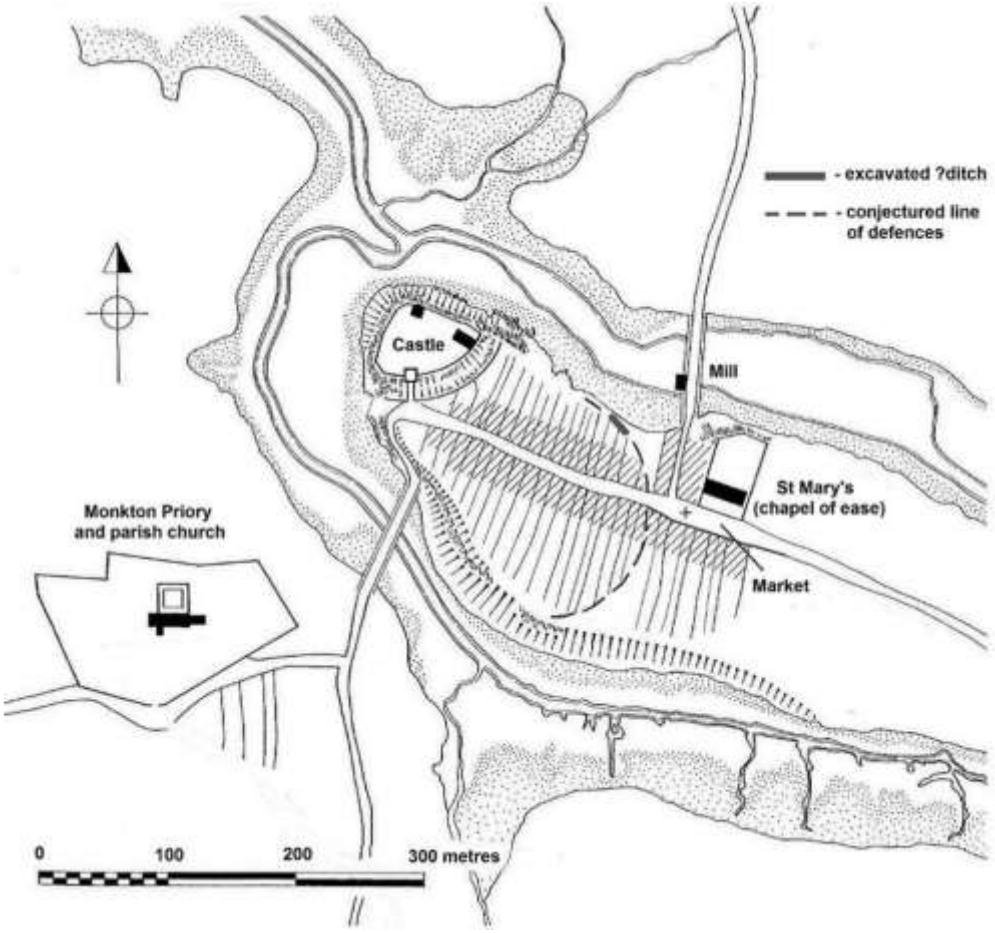


Figure 33: Pembroke: conjectured plan in *c*.1200, showing the castle (confined to the inner ward) and the possible early defended area of the town (modified from Ludlow 1991).

5.1.3 Pembroke under the Marshals (**Fig. 32**)

The bulk of the surviving masonry at Pembroke Castle however belongs to the thirteenth century. William Marshal I received the earldom of Pembroke in late autumn 1200, when he visited (Crouch 2002, 88 and n. 39) and marked his rise to the higher aristocracy, through marriage to Strongbow's heiress, by building the immense, domed, cylindrical keep. Undoubtedly celebratory and commemorative, *cf*. Aubrey de Vere III's keep at Hedingham Castle, Essex (Dixon and Marshal 1993, 22) and John de Balliol's round keep at Barnard Castle, Co. Durham (Davis 2013, 282). Pembroke's keep was influenced, in both overall form and detail, by towers in France such as Châteaudun (Eure-et-Loir), built *c*.1170-90 (Avent 2006, 89; Goodall 2011a, 162; Knight 1987, 76; also see Hulme 2014, 220, 226-7), for instance in the style of the windows, the offsets, and the hourding arrangements. Nevertheless, recent work suggests that it may be among the earliest examples of the cylindrical form, in either Britain or France; see eg. the tower at Laval (Mayenne), long considered to be from the 1180s, which has been dated through dendrochronology to 1218+ (Chollet and Gousset 2012, 261-2). Is it possible that the detail of Pembroke keep, and perhaps its battered base, were particularly influenced by the French work of the Angevin Crown eg. at Château Gaillard? (sadly, the local limestone cannot be cut into the ashlar that characterises these French towers). In turn, Pembroke's keep influenced British and Irish tower design for two generations (see Goodall 2011a, 162; Wiles 2014; *et al.*). A second-floor doorway in the keep may have led to an appearance platform, where the earl could be seen from outside the castle; it lies at an obtuse angle with, and at a considerably higher level than the inner curtain parapet, making a bridge between them unlikely, and is without drawbar-sockets.

Marshal held Pembroke until his death in 1219, with a break between 1207 and 1211 when it was seized by King John (Hardy 1835, 86 and 1844, 172-7; Painter 1933, 170; Rowlands 1996, 155); surprisingly, however, it is not mentioned at all in *L'Histoire de Guillaume le Maréchal*, the biographical poem composed in Marshal's honour (see Holden *et al*., 2002-7). It is likely, given its 'Transitional Gothic' detail like that in the keep, that the Wogan screen wall was also built 1200-1207. The inner curtain wall may have been commenced in 1204-5 following a second visit, by Marshal, that is suggested in the sources (Jones 1952, 82 and 1971, 199); it is notable for the unusual inner gate-tower (the so-called 'Horseshoe Gate') which appears to have been influenced by examples in the Middle East and eastern Mediterranean (Avent 2006, 89-90; King 1978, 107; also see Hulme 2014, 220, 226-7, 231). D-shaped, the gate-tower features two entries at right-angles, both without portcullises; it was in turn emulated by the Bohuns at Caldicot Castle (Mon.).

The siting of the present Great Hall, side-by-side with the Norman Hall, is awkward and rather unusual. I suggest it was begun by William Marshal: his keep, which occupies the highest ground in the inner ward, may have taken the place of the twelfth-century communal hall, which may then have been relocated to overlie the Wogan, using its screen-wall and the inner curtain. Its service end will have had access, via the Marshal-phase spiral stair here, to the Wogan which was probably used for storage; its high end meanwhile will have been associated with the Marshal-phase latrine turret on the inner curtain. However, little earlier masonry appears to have been incorporated into the present Great Hall.

Work on the defences may have been interrupted by King John's seizure; an implied third visit by Marshal as earl, in the crisis year of 1215 (Sweetman 1875, 86), may have been occasioned by the need to complete the work quickly'. It may also be a context for the commencement of the Dungeon Tower, which can be seen to be an addition to the inner curtain and was built to flank what was clearly still an external line of defence. This tower, however, may instead have been added by William Marshal's sons, who held Pembroke between 1219 and

1245; dressed stone is minimal, unlike the keep, while its semicircular arches and other affinities recall the Younger Marshals' work elsewhere. If so, it would imply that Pembroke Castle remained a single enclosure – the inner ward – well into the thirteenth century.

William Marshal, or more likely his sons, were however probably responsible for enlarging the defended area of Pembroke town (**Fig. 34**), with a bank and ditch defence across the narrowest part of the ishthmus, halfway along the present Main Street (Ludlow 1991, 29; also see Aston and Bond 1976, 83; King 1978, 83-4; Hindle 1979, 79).

5.1.4 Pembroke under William de Valence (**Fig. 32**)

It is now generally agreed that Pembroke's outer ward, at least in its present form, was added around the middle of the thirteenth century (Ludlow 1991, 28-9; Emery 2000, 539 n. 8; Walker 2002, 86; Lloyd *et al*. 2004, 329; Kenyon 2010, 90; Goodall 2011a, 208; *et al*.). It is stylistically very different from William Marshal I's work, and shows no dressed stone. But as it therefore lacks dateable detail there is some question as to whether it was begun by the Younger Marshals, or by William de Valence who held Pembroke between 1247 and 1296. The complexity of its defences argues against William Marshal II (1219-31) and Richard Marshal (1231-34). The same may apply to Gilbert Marshal (1234-41) whose massive expenditure at Chepstow Castle, Mon. (see Coldstream and Morris 2006, 112) – always the favoured Welsh residence of the Marshals – and at Cilgerran Castle, Pembs. (see Hilling 2000, 13, 15), and probably Carmarthen and Cardigan castles (Ludlow 2014, 184-8), may in any case rule him out. This expenditure was also compounded by a number of large cash payments made by Gilbert for the custody of southern Welsh lordships (Crouch 2015, 362-3; *Cal. Charter Rolls 1226-57,* 197). There is moreover no evidence that, as earl, he showed any interest in Pembroke (or Ireland) until the last year of his tenure.

Gilbert's brother and successor, Walter Marshal (1241-45), had an uneasy relationship with the king who placed royal constables in his Gwent castles (Crouch 2006, 49), although he seems to have had full possession in Pembrokeshire which he visited, in 1245, on his return from Ireland (Crouch 2015, 35; Williams ab Ithel 1860, 85). Contrary to most modern accounts, Pembroke does seem to have been fully-held held by Walter's successor, John de Munchensy, from July 1246 until his death in mid-1247 (TNA, Fine Rolls C 60/43-4; Owen 1911, 39; Sweetman 1875, 433; *Close Rolls 1242-47*, 443). But a probable start-date for the outer ward under Valence in late 1247 or 1248, and completion around 1254, will be argued in Ludlow (in prep.). Valence's acting steward at Pembroke, during this period, appears to have been the crown officer Robert Walerand (Ridgeway 1992, 253 n. 80; *Close Rolls 1247-1251*, 275), who was in charge of royal building works then under way at Carmarthen and Cardigan castles (Ludlow 2014, 190); as he was almost continually at court during this period (Morris 2001, 12-91), Walerand presumably functioned through deputies, but nevertheless represents a link with the 'King's Works'. No other significant drain on Valence's resources, through building work etc., has been recognised during this period.

William de Valence was half-brother to King Henry III. The outer ward towers at Pembroke show certain affinities to royal works of the mid-thirteenth century eg. the flanking 'ear'-turrets (Goodall 2011a, 208), while the complexity of the outer gatehouse, with two portcullises, two gates, twin spiral-stair turrets and two storeys of interconnected chambers above, looks towards gatehouses of the later 1250s onwards (ibid.; Guy 2016, 175). The long, mural passage in the south curtain is moreover a feature that is otherwise associated with castles of the late thirteenth century, and later. I will argue (in prep.) that the outer ward was built

under the guiding hand of a master mason from the King's Works, but using local masons who worked for the Younger Marshals at Cilgerran Castle, and also for the Barris at Manorbier Castle (Pembs.) and the Brians at Laugharne Castle (Carms.), from 1223 to *c*.1260. A distinct regional style emerged from this local 'school', which persisted into the seventeenth century in both secular and ecclesiastical contexts, and is characterised by generous use of corbel tables and jettying, squinches, barrel-vaults and domes, 'sinuous' internal angles, rounded or segmental arches and very restricted use of worked stone. The narrow arrow-loop embrasures at Pembroke may be somewhat 'archaic', but belong to this tradition, while they are also seen in contemporary work elsewhere eg. in the towers, from 1246-54, at Pevensey Castle, Sussex (Goodall 2011b, 11, 23; also see Chapman 2007, 100, 108), the lower tiers of which plunge deeply, as in Pembroke's Barbican Tower.

Antique map, print, and topographical evidence together suggest that the outer ward was never surrounded by a ditch on its vulnerable south and east sides. The walls and towers instead rise from the bedrock which was cut back to form a scarp and, to the south, was also levelled as a platform to receive them. This tends to support the other evidence that the outer ward did not exist until the stone defences were built in the thirteenth century.

The barrel-vaulted Western Hall, in Pembroke's inner ward, commands the inner gate in a manner consistent with a constable's hall, built before the outer ward was added. Yet it seems to be of one build with the outer ward curtain, and is similarly entirely without dressings. It lies on the opposite side of the inner ward from the administrative buildings; 'women's quarters were [often] situated in the most segregated parts of castles' (Gilchrist 1994, 167-8), which may suggest that it was built for Valence's wife, Countess Joan, *cf*. the similar, but earlier *camera comittisse* at Chepstow, which similarly flanks a gateway (Turner 2006, 80). The rectangular building alongside the Western Hall is later, but possibly fairly close in date; it is interpreted here as the castle chapel mentioned in 1331 and 1386 (see Owen 1918, 106, 131-2, 139; Evans 1957, 198-200); it may incorporate the remains of an earlier building.

Valence certainly did upgrade the castle's domestic accommodation, creating an integrated suite of buildings in the inner ward. The Great Hall is broadly dateable to the late 1270s-1280s, showing window-tracery which, developmentally, is on a par with that in Roger Bigod's domestic work at Chepstow Castle, from *c*.1280-84 (Turner *et al*. 2006, figs. 112 and 127), and the hall at Stokesay Castle, built 1285-94 (Summerson 2009, 8-10, 16). Valence was based at Pembroke during spring 1277 (Ridgeway 1992, 243 n. 23; *Cal. Pat. Rolls 1374-77,* 114); the hall may have been built soon afterwards, as a consequence. It was probably ceremonial, and its use restricted to Valence's infrequent visits; the Norman Hall seems to have become the main hall for the household, and may have been used for the steward's county courts (the latter function, however, has traditionally been assigned to the 'Chancery', a large building at right angles to the low end of the halls; the purpose of this building is discussed below in section 5.4.1). Both halls connected with 'solars' or withdrawing rooms, one for Valence when he visited, the other for his resident steward. The former's southeast wall is skewed from the building's main axis, presumably to follow the line of the inner ditch; the latter lies conveniently close to the Dungeon Tower, which may be the 'Prison Tower' recorded in 1331 (discussed in section 5.6.3 below). Each of these 'solars', and their respective halls, was equipped meanwhile with a latrine turret that discharged into the former inner ditch; in the case of Valence's solar, this was a pre-existing structure built by William Marshal I, which closed off the north end of the ditch. The top of the outlet for the later, steward's latrine is just visible above present ground-level in the outer ward.

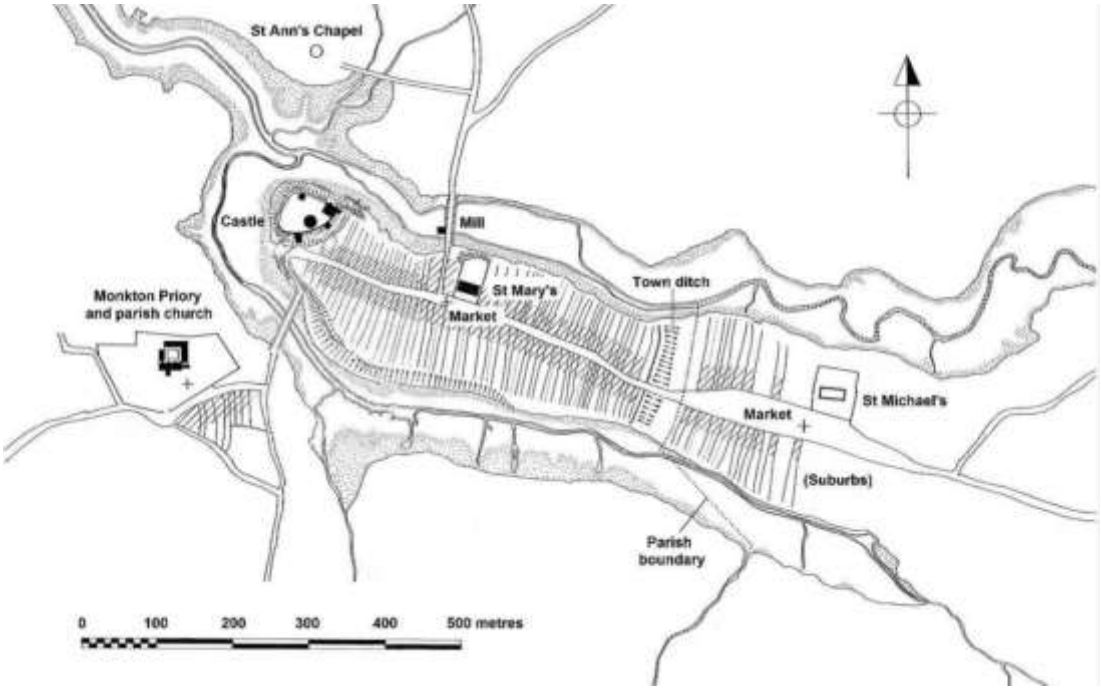


Figure 34: Pembroke: conjectured plan in *c*.1240, showing the enlarged defended area of the town, and the extra-mural suburb and church beyond (modified from Ludlow 1991).

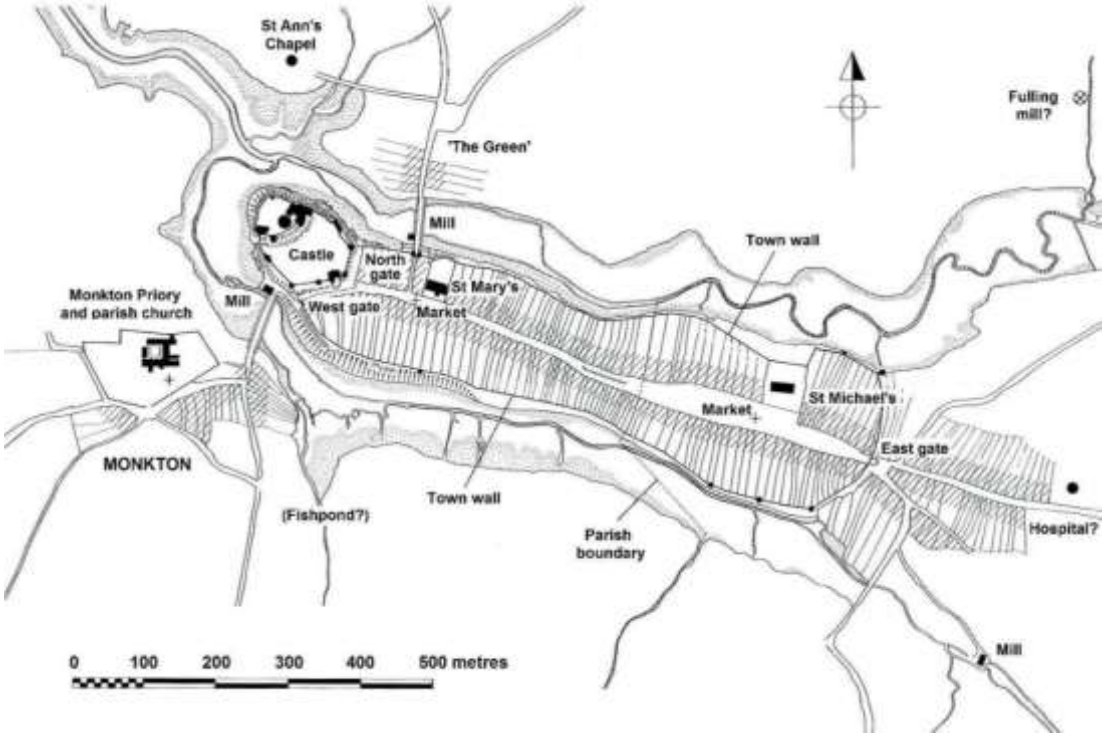


Figure 35: Pembroke: conjectured plan in the 1330s, showing the castle with the outer ward, the town walls, and extra-mural suburbs outside the east and north gates (modified from Ludlow 1991).

The eastern half of Pembroke town appears to have originated as an extra-mural suburb to the defensive line noted in section 5.1.3 above (**Fig. 34**). It was formalised, at an early date, with a market and separate parish church (St Michaels): this may have occurred under the younger Marshals – a period of growth is suggested by the assize rent total from the Manor of Pembroke in 1246

(Owen 1918, 100) – or under William de Valence, when new burgage plots were probably established in this area, in compensation for those lost when the castle outer ward was added at the expense of the town. Both areas were encircled by the surviving town walls (**Fig. 35**), which were probably also begun by Valence (Ludlow 1991, 29-30).

5.1.5 The fourteenth and fifteenth centuries (**Fig. 32**)

Valence was succeeded by his wife, who held the earldom in her own right until her death in 1307 when their son, Aymer, succeeded (1307-24). The complex structure known as St Ann's Bastion, discussed in section 5.5.3 below – which now houses the castle café – may be Aymer de Valence's work. He may also have added the semicircular barbican in front of the main, outer gatehouse; it is similar to the barbican, from *c*.1290-1300, of his castle at Goodrich, Herefs. (Ashbee 2009, 5; Shoesmith 2014, 57, 154).

Little building work can be assigned to the remainder of the fourteenth century. The castle was frequently under Crown control, during the minorities of earls Lawrence, John I and John II Hastings; towards the end of the century, in particular, its story is one of neglect rather than attention. The Great Hall, however, was clearly refurbished during the second quarter of the century: one of the external surrounds has a weakly-incised, 'ovolo'-moulded profile (King 1978, plate 12), unlike the simple chamfers seen in the rest. This fits in with the majority of earl Lawrence Hastings, from 1339 to 1348, while only minor repairs are recorded in Crown account rolls from the periods before and after his tenure (Owen 1918, *passim*).

Pembroke was without an incumbent lord during most of the latter half of the century. A survey of 1386 reveals severe neglect and decay of the castle's domestic buildings, in which it is apparent that the lead had been stripped from the Great Hall roof (Evans 1957, 198-200). Some repairs must have been undertaken, though are unrecorded, before 1399 when King Richard II spent a month at Pembroke on his way to Ireland (*Cal. Pat. Rolls 1396-99,* 577-80). Otherwise, neglect seems to have continued: Pembroke was farmed out by the Crown as a series of short-term grants, and it was not until 1403 that a lord was invested, in the person of Francis Court. The grant was both a reward for Court's service as a household knight of King Henry IV, and a military response to the Glyndŵr threat: its terms suggest that Court was to be resident in the lordship (Turvey 2002, 210; Griffiths 2002, 227-8), presumably at Pembroke Castle. But, though the castle was munitioned, at Crown expense, against Glyndŵr in 1405 and 1407 (Turvey 1990, 161; Wylie 1896, 106; Owen 1918, 46), there is no record of any refurbishment, suggesting that Court made do with what was there, though possibly financing minor works from his own pocket (see section 5.6.3 below). The southeast turret of St Ann's Bastion was, however, heightened at some point, possibly during this period of threat.

Henry V's brother Humphrey, Duke of Gloucester, was granted Pembroke in 1413 (*Cal. Pat. Rolls 1413-16,* 170), becoming earl the following year (*Cal. Pat. Rolls 1429-36,* 298-9), but was largely an absentee. It is likely, in any case, that neglect had rendered the castle's accommodation unsuitable for a person of his social rank. Jasper Tudor, earl of Pembroke from 1452-61, and again 1485-95 (Griffiths and Thomas 2005), may have found it similarly wanting: during his first period of tenure he was resident at the castle for fairly sustained periods (Roberts 2015, 50-3), and section 5.6 is a discussion of the evidence for a possible refurbishment under Jasper, including new building work.

5.1.6 The post-medieval period

The castle fell to the Crown on Jasper's death in 1495 and was henceforth occupied solely by administrative staff (Owen 1918, *passim*). The administration of Wales was reorganised through the Acts of Union of 1536-43, while the county courts moved to Haverfordwest (Owen 1903, 41), meaning that Pembroke Castle was eventually abandoned at some point during the mid-sixteenth century. It was acquired by the Pryse family of Gogerddan, Ceredigion, 1603-25 (Lewis 1833), via James I's extensive disposal of crown property. The sparing crown records from the sixteenth century, sadly, mention none of the castle buildings.

Pembroke played an active role in both Civil Wars, 1642-8. The story of the 1648 siege, and the castle's surrender to Cromwell, is well known. But the published sources yield scant information on the form and nature of the mid-seventeenth-century castle (unpublished sources for this period have still to be examined). Part of the town wall was rebuilt by the garrison commander, John Poyer, apparently from his own pocket (Lawler 2001, 173-4). The southern curtain of the outer ward was doubled in thickness at around the same time, the better to absorb cannon-shot, like the somewhat later thickening of Chepstow Castle's curtains (Geear, Priestley and Turner 2006, 235-40). It has been suggested, reasonably enough, that this was achieved at Pembroke using stone derived from the demolition of the inner curtain (King 1978, 120). Several buried structures in the outer ward may also belong to the Civil War period (see section 5.5.2 below). After the siege, Cromwell ordered the comprehensive slighting of the castle: the outer faces of the Northgate, Bygate, Henry VII and Westgate Towers were blown out with gunpowder charges (King 1978, 85-6).

There appears to have been no further building at Pembroke until the late nineteenth century. However, a couple of curious features shown on the curtain walls, by the artist Paul Sandby in the 1770s-90s (Nat. Lib. Wales P908), may represent slight, post-Civil War structures.

5.2 Restoration and rebuilding (**Fig. 32**)

The antiquarian Joseph Cobb leased the castle from the Pryses between 1880 and 1883. He undertook some minor restoration, as he also did at Manorbier Castle (Pembs.) and Caldicot Castle (Mon.), rebuilding part of the barbican (Cobb 1883, 214). He also re-opened some blocked windows and doorways.

In 1928, the castle was purchased by Major-General Sir Ivor Phillips, K.C.B., D.S.O.. He commenced restoration work on a scale not seen since Victorian work at Cardiff and Castell Coch, although a similar campaign was underway at almost exactly the same time at Caerphilly Castle, Glam. (the two are compared in Avent 2007). At Pembroke, Sir Ivor rebuilt, to varying degrees –

- The outer faces of the Northgate, Bygate, Henry VII and Westgate Towers
- Part of St Ann's Bastion
- The inner curtain, as a lower wall
- The southeast wall and southwest corner of the 'Norman Hall'
- The northeast half of the 'Chancery' building, and adjoining low walls
- The steps leading up to the keep
- Much of the present parapet around the castle walls, and the 'Flemish' chimneys
- Concrete floors were inserted in the outer ward towers and Dungeon Tower.

5.3 Previous archaeological work

The castle has been extensively excavated, rebuilt, and subject to much further intervention including drainage, plumbing, electricity supply and other groundworks. However, structured archaeological work has been limited.

Joseph Cobb exposed the foundations of the barbican's gateway before its rebuilding (Cobb 1883, 214), and part of the inner curtain wall. Excavations were deeper in the area of the inner ditch, where he uncovered the remains of the inner ('Horseshoe') gatehouse in 1881 (Cobb 1883, 198, 210). His account also implies that, somewhere along its line, the ditch was excavated to a depth of 30ft (Cobb 1883, 216), describing it as 'now filled with rubbish' (Cobb 1883, 198).

Sir Ivor Phillips, in the 1930s, seems to have removed an unknown quantity of overburden around some of the standing walling, where collapse will have obscured some door-sills etc. The tennis court had been laid out in the outer ward some time previously, and is shown in a photo of 1902 as a grass surface (Ramsden collection); collapse was also removed from the area alongside St Ann's Bastion by Sir Ivor (see **Fig. 50**), producing a slight downhill slope from south-north (reflecting the medieval topography) and necessitating the construction of a revetment wall to retain the level surface of the tennis court, which was surfaced in tarmac. Sir Ivor also laid down a rubble-based pathway between the outer gatehouse and the inner ward (see **Fig. 55**). In the inner ward, a further low wall was built along the west side of the keep (shown in **Figs. 36** and **38**), revetting ?collapse to the east against a lower area, to the west, where some truncation of deposits may have previously occurred.

In 1931, Sir Ivor also undertook the extensive excavation, though sadly without record, of a former building in the outer ward: this is described in section 5.6 below.

There have since been a number of smaller, but more structured archaeological projects. In April 2004, Sir Ivor's concrete floor between the second and third storeys of the Westgate Tower was removed, under archaeological supervision and accompanied by recording (Ludlow 2004).

A new café was built against St Ann's Bastion in 2008-9. Prior to the work, an evaluation was carried out by DAT (Ludlow 2006), followed by a watching brief during construction (Ramsey 2010). The results of both are discussed in section 5.5.3 below.

DAT undertook a further small evaluation in the Norman Hall in 2015, in which modern deposits directly overlay the limestone bedrock (Davies 2015). No further archaeological investigation has, to my knowledge, been undertaken in the inner ward.

Parchmarks of various structures are visible within the castle during dry summers, but until recently had not been systematically documented. They were photographed from the air, by Toby Driver of RCAHMW, during a flight on 29 July 2013 at the very end of a dry spell. The results, as rectified and mapped by Toby (see Ludlow and Driver 2014), are discussed in sections 5.4–5.6 below and compared with the evidence from the geophysics.

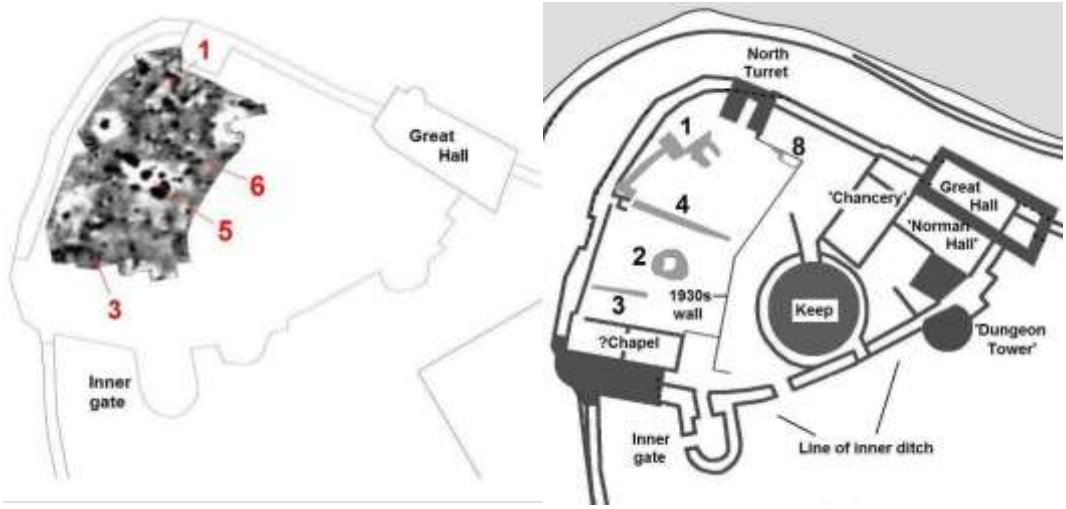
5.4 The inner ward: analysis of features (Fig. 36)

The aerial photography revealed a number of parchmarks and cropmarks in the inner ward (Ludlow and Driver 2014, 73-4). Some are also represented as geophysical anomalies. The following is a discussion, within which possible functions are suggested against the wider background of the castle buildings.

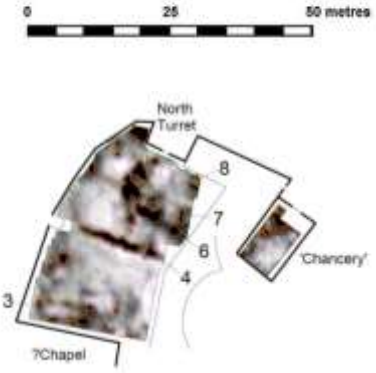
5.4.1 Kitchen and ?bakehouse

Parchmark ***1***, towards the northern apex of the inner ward may also be represented by a series of magnetometry anomalies (**Fig. 36a-b**). However, the latter are on a rather different alignment from the parchmark as mapped, while evidence from the resistivity survey is inconclusive at best (**Fig. 36c**). Nevertheless, it is considered unlikely that features in this location relate to modern activity, eg. services etc., and it remains a possibility that a rectangular building may lie somewhere here. Nevertheless, it is a very tentative suggestion (and was not mentioned in Ludlow and Driver 2014). The possible building cannot, accordingly, be assigned a function, but it is of interest that neither kitchen nor bakehouse has yet been clearly identified at the castle.

Figure 36: Inner ward: comparative plans of geophysical and parchmark surveys (parchmarks Crown Copyright RCAHMW. © Crown copyright and database rights [2014] Ordnance Survey [100022206]).



36a: Processed magnetometry data. **36b:** Parchmarks.



36c: Processed resistivity data.

A kitchen is mentioned only once in the sources, in 1386 when the 'doors and windows [were] decayed in the pantry, buttery and kitchen' (Owen 1918, 106). Cathcart King suggested that the kitchen occupied the basement beneath William de Valence's first-floor Great Hall (King 1978, 113). This, however, had just one moderately sized wall-fireplace (**Fig. 37**), and a very low, timber ceiling which would preclude the use of open hearths (and would be a fire-hazard). Bread ovens are also absent. Moreover, while the windows are of good quality, they are rather small and the room would have been both dark and poorly ventilated. Moreover, the basement room is served by the earlier thirteenth-century latrine

turret. So its attributes suggest that it may instead have been a retainers' hall, for the use of Valence's personal household should he visit. Such a use is further suggested by the 'private' communication between the room at the southeast end of the basement and Valence's solar above (see **Fig. 32**); the occupants of the basement were of sufficient status to have personal access to Valence. Retainer's halls have been suggested beneath a number of other first-floor halls including those at Ludlow Castle and Acton Burnell Castle (both Shropshire), from the 1280s (Thompson 2006, 168; Radford 1973, 5; Emery 2000, 502-4), at the closely contemporary bishop's palace at Worcester (Emery 2000, 463-6), and at Aydon Castle, Northumberland, from the 1290s (Summerson 2004, 16; Wood 1983, 180). Many of these retainer's halls had dual functions, and it is possible that the Pembroke hall basement's primary use, under normal circumstances, was as a pantry and buttery, both of which are also otherwise unknown in the castle; it has access to the Wogan cavern below, which was undoubtedly a storeroom.

Figure 37: Inner ward: the Great Hall interior, facing WNW. Nb. low, timber first floor (now gone), and ground- and first-floor fireplaces in south wall, to left.

Lying next to the Great Hall is a rectangular, gabled building known as the 'Chancery' (**Figs. 36, 38-9**). It was assigned this name and function by Joseph Cobb (Cobb 1883, 206) and his interpretation was followed by Cathcart King (King 1978, 110). It is large, single-storeyed building (15m x 9.5m), open to the roof, and has a number of other attributes which suggest that, instead, it may have been a kitchen. It, too, is normally assigned to William de Valence's tenure (King 1978, 120, et al.) although any dateable detail has gone; what remains is broadly late thirteenth century in overall character, but sufficiently unlike the Great Hall to suggest that it may belong to a separate building phase. It also lacks fireplaces, and bread ovens.

Figure 38: Inner ward: aerial photo from northwest showing, to the left, the domestic buildings – the Great Hall, Norman Hall and 'Chancery' (Crown Copyright RCAHMW, AP_2013_5162).

Figure 39: Inner ward: the domestic buildings, facing WNW, from the Dungeon Tower, with the 'Chancery' at centre.

However, the Chancery lies at the 'low' or service end of both the Great Hall and Norman Hall, with which it forms the L-shape, in plan, that is a characteristic of kitchen-hall articulation from the late thirteenth century onwards (Wood 1983, 252; Emery 2006, 159-62). More significantly, it shows strong similarities with the kitchen at Chepstow Castle (Mon.), built by Roger Bigod, earl of Norfolk, in the 1280s (Turner *et al*. 2006, 135). Like Pembroke's Chancery, this is a markedly grand structure and has only fairly recently been identified for what it was (Knight 1986, 19, 26); Patrick Faulkner's interpretation of the building as a lesser hall (Faulkner 1958, 216-8) was followed until the 1980s (eg. Perks 1967, 16-17). It too was a large gabled building (**Fig. 40**), open to the roof, with large side windows like those in the Chancery, and similarly preserved no obvious cooking facilities: though the remains of an oven have subsequently been revealed in one corner, cooking appears mainly to have been undertaken on a series of open hearths, the smoke and fumes being drawn out through an elaborate louvre in the centre of the roof (Turner *et al*. 2006, 145). The late fourteenth-century kitchen at Portchester Castle (Hants.) similarly lacks any structural evidence for either fireplaces, hearths or ovens, and was 'presumably served by a centrally-placed fire' (Goodall 2008, 12); it is, however, very small and the main cooking – and baking – was probably carried out elsewhere (Kenyon 1990, 149). Insufficient evidence remains of the surrounds at Pembroke to determine whether or not the windows were glazed, or unglazed as they would need to be for ventilation (as at Chepstow; Turner *et al*. 2006, 145); they are however set lower than the Chepstow windows and, unlike Chepstow, show window-seats in the original fabric – not a common feature of medieval kitchens but also seen in, for example, the King's Kitchen in the inner ward of Conwy Castle, Caerns. (Ashbee 2007, 41 and plan). Nevertheless, the Chancery is here suggested as the possible site of the kitchen, from the late thirteenth century onwards, and it was identified as such by Hamilton Thompson in 1912 (Thompson 1912, 181), while the kitchen was defined as a separate building from the Great Hall in Donovan's account of 1805 (Donovan 1805, 305). Though the Chancery is one of the largest buildings at Pembroke, 'the existence of a large stone kitchen . . . was an integral part of [a great lord's] philosophy' (Emery 2006, 159-62).

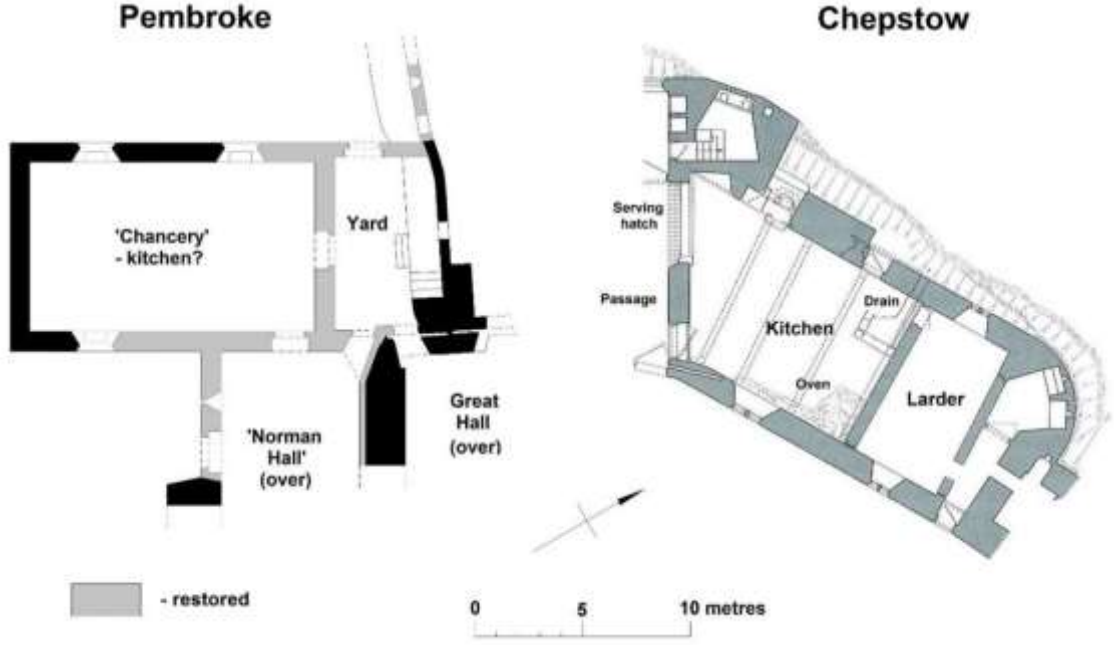


Figure 40: Comparative plans of the kitchen at Chepstow Castle, and the 'Chancery' at Pembroke (Chepstow © Crown copyright (2016) Cadw).

Resistivity survey inside the Chancery yielded no real evidence for its function (**Fig. 36c**): the interior seems to have been fairly heavily disturbed, while resistivity does not always detect areas of burning eg. from open hearths. But if the Chancery was a kitchen, might the building that is possibly suggested by features ***1*** – albeit tentatively – have been a bakehouse? The parchmarks, at least, suggest thick walls (ie. for bread ovens). The features lie some distance from the Chancery, but separate bakehouses occur at a number of other castles including Kidwelly, Carms. (Kenyon 2007, 35, 48) and Helmsley, Yorks. (Clark 2004, 8, 20), where they lay even further from the kitchen, while the close integration of these facilities was rarely a priority in manor-houses of the period (Blair 1993, 7-8, 13; Emery 2006, 159-62).

Alternatively, possible building ***1*** (**Fig. 36**) – if associated with cooking at all – may have itself been a kitchen, though somewhat small, or perhaps even a brewhouse. Its articulation with the North Turret is intriguing: whether or not the turret represents a twelfth-century keep, truncated when Marshal's keep was built, its thick walls suggest that it may have served in some kind of catering capacity (**Fig. 41**); in great houses, ancillary functions such as storage and preparation were normally carried out in other buildings near the kitchen/bakehouse, and ranges of such buildings still survive at eg. Stanton Harcourt Manor, Oxon. (Emery 2006, 159-62).

Figure 41: Inner ward: the North Turret, facing northwest, taken from the top of the keep in 1987 before the rubble was removed from the interior.

5.4.2 Other features (*Fig. 36*)

The aerial photos show a large, circular cropmark ***2*** in the middle of the inner ward, represented by an open circle of greener grass some 7-8m in diameter (**Fig. 36b**; also see **Fig. 38**). This was initially interpreted as representing a possible robbed out, free-standing limekiln (Ludlow and Driver 2014, 74): thirteenth/fourteenth century limekilns survive at a number of Welsh castles eg. Carreg Cennen, Carms., and Weobley, Glam. – where they stood within an open space like cropmark ***2*** (Lewis 2006, 2-3; Robinson 1987, 3) – and at Cilgerran,

Pembs. (Hilling 2000, 23) and Ogmore, Glam. (Kenyon and Spurgeon 2001, 39); they are normally between 4m and 8m in diameter. However, resistivity survey did not reveal any features occupying this exact location (**Fig. 36c**), while the strong concentration of dipolar readings ***5***, which dominates the magnetometry survey (**Fig. 36a**), lies some 5m to the north.

A series of resistivity anomalies ***3*** lie immediately north of the possible chapel (**Fig. 36c**), and appear to resolve as a free-standing, thin-walled rectangular building measuring 12m east-west by 4m north-south. Its north wall appears also to be represented as a linear parchmark, and may also register, faintly, in the magnetometry (**Fig. 36a-b**). On current evidence, it can be assigned neither a date nor a function. Two further groups of anomalies/parchmarks ***7*** and ***8***, in the northeast corner of the survey area, may represent further small buildings, but incompletely revealed and also of unknown date and function (**Fig. 36a-c**).

A strong linear anomaly ***4***, running WNW-ESE across the inner ward, also shows as a parchmark (**Fig. 36b-c**) and was suggested as a possible masonry division, of unknown date (Ludlow and Driver 2014, 74). However, it appears to correspond to dipolar readings ***5***, which may instead suggest that it represents modern services. The same may apply to linear anomaly ***6*** which lies just to the north of, and roughly on the same alignment as, ***4*** and ***5*** (**Figs. 36a** and **36c**).

Though a possible well has been revealed in the outer ward through GPR survey (see section 5.5.1 below) the castle was, for over a hundred years, confined to the inner ward, which would therefore have required its own water supply. However, none of the features within the inner ward appear to represent a well. John Kenyon felt that a well might be expected within Marshal's circular keep, where there is similarly no evidence for one (Kenyon 1990, 161).

5.5 The outer ward: analysis of features (Fig. 42)

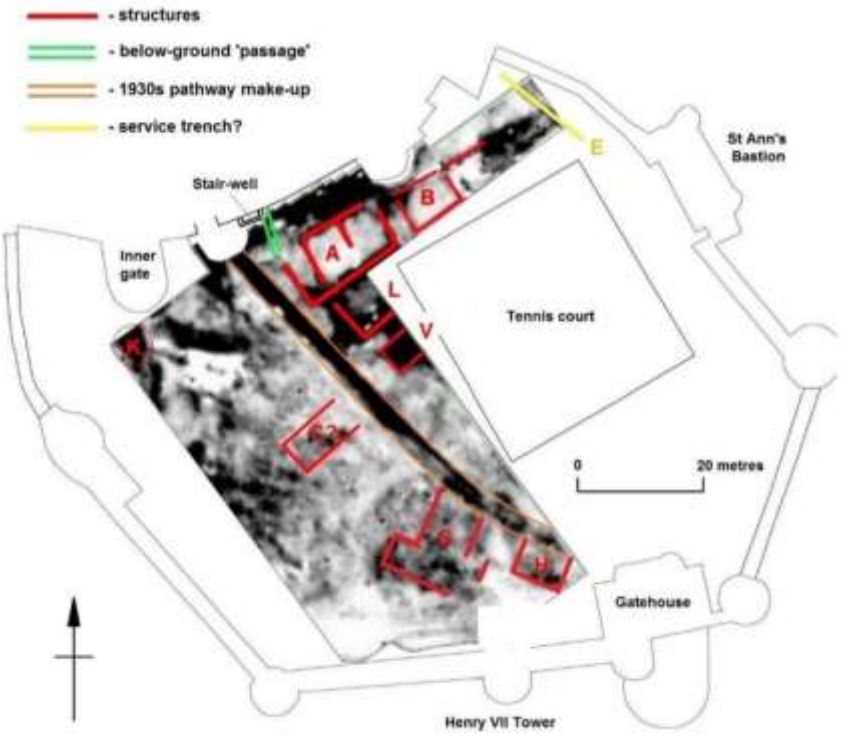
A number of buildings and other features were revealed in the outer ward, either through geophysics, aerial mapping, or both. They appear belong to several different periods, from the twentieth century to the medieval period, and perhaps even earlier. They are labelled ***A-V*** on **Fig. 42**.

Overall, however, the outer ward appears – contrary to expectations – to have been largely empty of medieval features and structures, particularly in the northeast half and including the tennis court. While a number of possible features were revealed in the southwest half by the geophysics, few form coherent arrangements (**Figs. 19** and **21**) and many of the smaller anomalies defy confident interpretation. Some may even be prehistoric. However, the nature of the geophysical process suggests that the features detected may be a fairly accurate reflection of the castle at the end of the medieval period: masonry buildings ***A, G*** and ***H***, discussed in full below, also survive as low earthworks, showing little sign of truncation, while the evidence from early twentieth-century photographs suggests that the periphery of the site, in particular, had been subject to deposition rather than truncation. The possibility nevertheless remains that some truncation may have taken place in the central, higher section of the outer ward, in a phenomenon frequent on archaeological sites; the survival below ground of Buildings ***A*** and ***B***, along with the present topography, indicate however that any such truncation has been minimal.

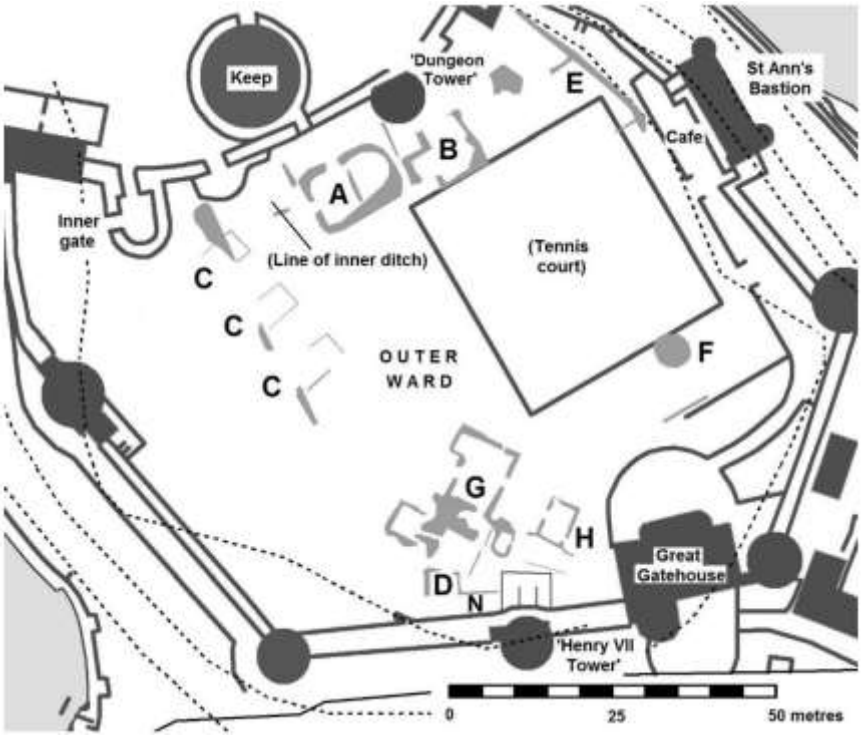
Nevertheless, the overall impression is of a predominantly empty space, and it seems likely that the outer ward was largely undeveloped until the late-medieval period. And, while any lower-status, ancillary buildings may have included ephemeral structures represented by very slight beam-slots or stakeholes, some at least would be expected to be detected through the three geophysical survey processes undertaken in the outer ward. Of those features that did show up,

many may be much later, while it is possible that others may instead pre-date the outer ward, and belong to urban development: as at Ludlow Castle, Shrops. (Renn and Shoesmith 2006, 191), and elsewhere, the outer ward was probably established at the expense of, and overlay, part of the medieval town.

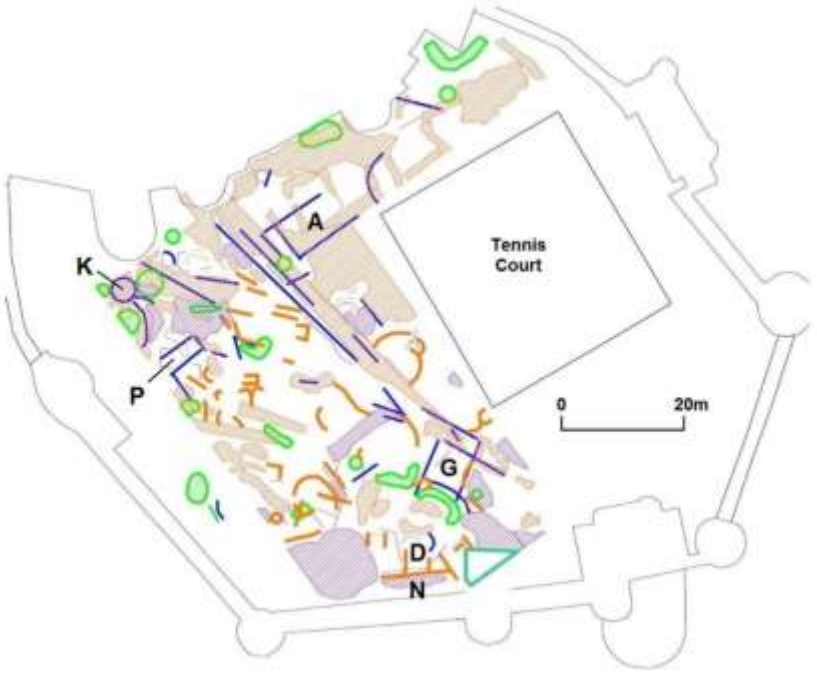
Figure 42: Outer ward: comparative plans of geophysical and parchmark surveys.



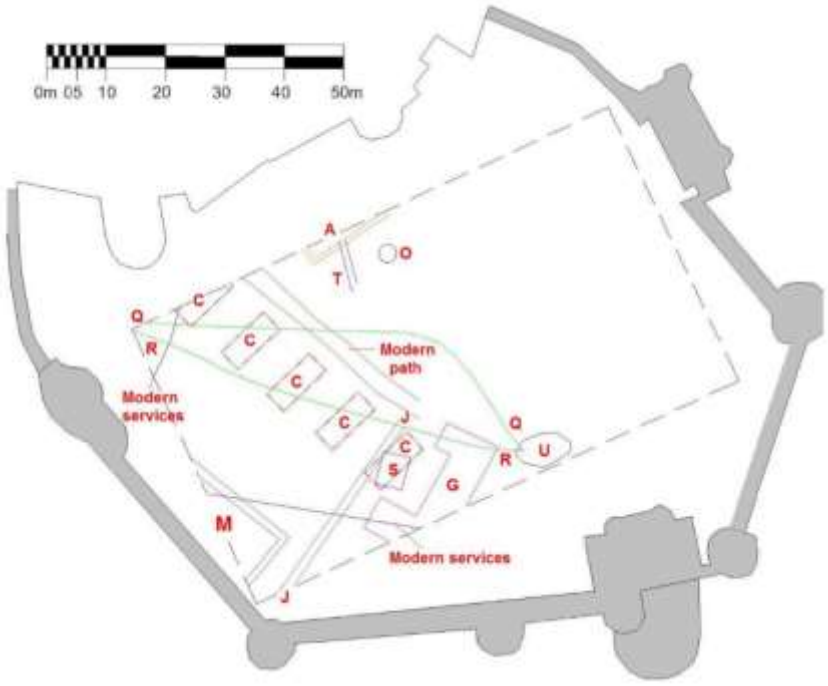
42a: An interpretation of the processed resistivity data (by Neil Ludlow).



42b: Aerial photo mapping of the parchmarks (Crown Copyright RCAHMW. © Crown copyright and database rights [2014] Ordnance Survey [100022206]).



42c: Processed magnetometry and resistivity survey data (Alice Day).



42d: Processed GPR survey data (Tim Fletcher).

The resistivity and GPR plots are dominated by the made ground beneath the present pathway (**Figs. 14, 21** and **42a-d**), which was laid down by Sir Ivor Philipps, in the early 1930s, between the gatehouse and a gap in his rebuilt inner curtain wall (see **Fig. 55**). The strongest features in the magnetometry survey plots are the modern cable trenches to the north, west and south (**Figs. 7-8**), some of which also show on the GPR plot (**Fig. 21**), while feature ***E*** appears to be another service trench, with a rubble fill, possibly a water-pipe or drain associated with the modern café and toilets in St Ann's Bastion (**Fig. 42a-b**).

5.5.1 Outer ward: earlier features

A number of curving and subcircular features were detected, as high-resistance anomalies, in the southwestern third of the outer ward (shown in brown on **Figs. 17** and **19**); they may formerly have been more extensive, but it was noted above that some minor truncation of deposits may have taken place further to the north. Iron Age occupation of the castle site is suspected (see section 5.1.1 above), and was suggested as long ago as 1811 (Fenton 1811, 368). However, this is normally regarded to have been limited to the area of the present inner ward: together with the outer ward, the area enclosed – roughly 10000 square metres (1 ha) – would place it within the largest 12% of the 60 or so coastal promontory forts in Pembrokeshire, the majority of which average between 2000 and 5000 square metres (see Murphy *et al*. 2007), though some have undergone loss to coastal erosion. The re-used forts at Carew Castle and Great Castle Head (see above) are about the same size as Pembroke's inner ward, ie. roughly 2400 square metres (0.24 ha); that at Llansteffan Castle is somewhat larger at roughly 4000 square metres (0.40 ha). Nevertheless, the circular features within Pembroke Castle's outer ward, with diameters between 8m and 9m, lie well within the size range of excavated Iron Age roundhouses in west Wales which average 6-13m in diameter. And while none form a complete circle, much like roundhouse gullies on some other Iron Age occupation sites they are confined to the upslope, where the ground rises gently to the north. However, they registered as high-resistance anomalies, which normally indicate buried stone; the fills of roundhouse gullies, in contrast, are generally fairly stone-free (although high-resistance readings are sometimes obtained if soil fills have become dried out). And Iron Age occupation of the outer ward area would tend to suggest the castle may have comprised both wards from the first, when most other evidence suggests that it didn't. Another possibility is that the circular features represent late Neolithic or Bronze Age round barrows which, through truncation etc., are often represented only by their surrounding ring-ditches. These are normally rather wider the roundhouse gullies, as seems to be the case with the Pembroke features. The Pembroke region is dense with prehistoric funerary activity, sometimes in association with later, Iron Age forts which, while not often established directly over the funerary monuments, often lie in close association. This interpretation therefore still allows for the inner ward's suggested Iron Age origins.

The circular features are confined to the lower, sloping southwest side of the outer ward, suggesting that some levelling occurred along the higher, central section when the outer ward was laid out. This may also confirm that the features are not medieval; they do not, in any case, fit happily within a medieval context (unless they somehow relate to temporary features such as tents or pavilions).

The other, more amorphous high-resistance anomalies shown in **Figs. 17, 19** and **42c** are impossible to interpret, though many follow a WNW-ESE trend at odds with the main axis of the castle (and town), and so might possibly be pre-medieval. More-or-less the same trend is followed by GPR features ***Q*** and ***R*** (**Figs. 21** and **42d**), which were interpreted by the surveyor as possible ditches (perhaps defensive), but might equally represent terracing as they appear to correspond with sharp changes in level or 'drop-offs' (see section 4.3 above). One of them, ***R***, crosses Building ***G*** without truncating it, suggesting they are earlier; moreover, they do not seem to truncate the high-resistance circular features described above. All that can be said is that they pre-date Building ***G***, and probably the circular features, but cannot be more closely dated; I would suggest they represent deliberate terracing either associated with roundhouse construction or, if the circular features are not Iron Age, medieval activity which may perhaps relate to gardens (see below, section 5.5.3).

A number of more substantial linear features were revealed through the surveys but not all can be confidently interpreted. Nevertheless at least one, feature ***J*** which was detected through GPR, may denote medieval activity (**Figs. 21** and **42d**). This feature is also visible as a parchmark in **Photo 1**, though not marked on Toby Driver's plan (**Fig. 42b**). It occupies a slightly different axis from buildings ***G***, ***H*** and ***M***, with which it is therefore probably not associated. Nevertheless it aligns not on the modern path, but on the original route between the gatehouse and the medieval inner gate, which continues the line of the town's Main Street; it is therefore not impossible that feature ***J*** might represent a pre-outer ward burgage plot boundary. Assuming that the outer ward was established over the town, then the absence of any other features relating to urban occupation suggests that – as noted above – the area was subject to levelling and truncation when the ward was laid out.

Two features, adjacent to the outer ward curtain, may represent medieval buildings. The large GPR feature ***M*** (**Figs. 21** and **42d**) appears to belong to a large, masonry building between the Monkton and Westgate Towers, aligned NW-SE, with walls around 1.5m in thickness. It was not completely revealed, but was at least 22m long and 11m wide. This section of the outer curtain is lower than those on the south and southeast sides, rather too low to support a lean-to structure. The inner wall of Building ***M***, towards the castle interior, is moreover not quite parallel with the curtain, which similarly suggests that it may have been free-standing rather than abutting the curtain; the difference is insufficient to suggest a complete absence of relationship between the two. Such a substantial building may have fulfilled a domestic function; it is equally possible, however, that it represented a storage facility such as a barn. Pembroke Castle was the centre of an extensive demesne manor from which large amounts of produce were regularly taken (see Owen 1918, 114-205) and, during times of conflict, received supplies from elsewhere as in 1277 (Owen 1918, 4).

In addition, a slighter, narrower building is suggested by a high-resistance anomaly and parchmark ***N***, parallel with the south curtain between the Henry VII and Westgate towers (**Figs. 19, 42b-c**). The anomaly runs E-W for 12m, and suggests a building some 5.5m wide, possibly a lean-to structure built against the curtain. Though its resistance suggests stone walling, the anomaly is fairly slight: it is possible that only a sill-wall is indicated and that any superstructure may have been of timber. The apparent 'annexe' ***D***, leading off at right-angles, towards the castle interior, is later (see section 5.5.2 below). Any building here was presumably disused when the adjacent curtain wall was thickened during the seventeenth century (see section 5.1.6 above), as the new masonry would overlie it; no creasing for a lean-to roof is therefore visible on the curtain wall.

A series of GPR anomalies, ***S***, appear to represent a slightly-built rectangular structure, measuring 5.5m by 4.5m (**Figs. 21** and **42d**). It lies close to Building ***G*** (see section 5.6 below), but occupies a different axis and is probably unrelated. Nevertheless, it respects the line of the medieval routeway through the outer ward and may therefore be medieval, possibly pre-dating Building ***G*** though apparently overlying linear feature ***J***. It demonstrably lay below Buildings ***C***, from the twentieth century.

Water supply at the castle is discussed in Appendix 1, wherein it is suggested that a well was always present. Cropmark ***F*** in the outer ward (**Fig. 42b**) was suggested as a possible well in Ludlow and Driver (2014, 75), but is now regarded a less likely candidate: it lies just within the area of 1930s made ground beneath the tennis court, and is therefore probably modern in origin. Instead, GPR identified a circular feature ***O***, close to the edge of the inner ditch, that the surveyor felt was a strong candidate for a well (**Figs. 21** and **42d**). It is 3m in diameter, and was traced to a depth of 2m becoming more regular with depth.

The negative magnetometer anomaly ***K*** (**Figs. 9, 42a** and **42c**), on the outer edge of the projected inner ditch, could be a large deposit of stone, or a void, or may be both. It lies more-or-less opposite the inner gate, and may therefore be the remains of a structure like a bridge abutment. These frequently took the form of an open enclosure of three walls, built against the ditch edge.

Nearby are a series of negative magnetic anomalies ***P*** (**Figs. 19** and **42c**), probably representing buried masonry, which may belong to a building lying NE-SW and measuring 7m by 3m. However, a building in this location would obscure the inner gate from view when approached from the outer gate. And while the anomalies respect the line of the southwest curtain, they do not follow the alignment of the medieval route between the two gates (and earlier road). They might be post-medieval in origin. However, it is also possible that they do not belong to a building but, instead, may represent garden features such as enclosures or terraces, perhaps associated with the later medieval 'gentrification' of the outer ward that is discussed in section 5.5.3. A further anomaly, on the same alignment, runs southward from the group.

5.5.2 Outer ward: later features

Two parchmark buildings ***A*** and ***B***, along the northwest edge of the outer ward, were also detected though geophysics (see **Fig. 42a-c**). They both overlie the infilled, medieval inner defensive ditch, while respecting the line of the (truncated?) inner curtain. Building ***A***, part of which was also picked up by GPR (**Figs. 21** and **42d**), is rectangular, is aligned ENE-WSW and measures approximately 15m x 11m. It seems to have been divided internally into two roughly equal halves, and a weaker feature to the WSW – which did not show as a parchmark – appears to represent an annexe, measuring approximately 11m x 4.5m. The building also shows as a very slight earthwork, indicating it was made of masonry; the amorphous nature of the parchmark wall lines may denote spread rubble from its walls.

Coincidentally, an underground 'passage' was discovered, in the outer ward, in May 2016. It was already known that a subterranean feature of some kind was located at the foot of the rebuilt inner curtain, marked by walls and an archway lying just below ground level, (King 1978, 106), but its form was unknown. Clearance of spoil showed that the walls enclose a stairwell, while the archway is the entry into the passage (**Fig. 43a**). This is of limestone rubble construction and averages 1m in width, with a semicircular vaulted roof approximately 0.5m beneath ground level (**Fig. 43c**). It runs southwards from the arch for 6m, narrowing considerably towards its end where it appears to terminate as a masonry wall (**Fig. 43b**). It is now largely choked with soil and debris, and very nearly inaccessible; a limited area of the original floor may, however, be visible as an apparent surface of cobbles set in clay, which would give the passage a height of approximately 1.5m. The passage had clearly been exposed during the 1930s, as part of the vault had been replaced with a concrete slab of similar form to those now flooring the outer ward towers; the entrance arch (and probably the stairwell) appear to be contemporary, but nothing seems to be known of any observations at the time. A section of the passage's eastern side wall has collapsed, exposing the loose soil fill of the inner ditch beyond (**Fig. 43b**).

Measurements showed that the passage terminates more-or-less at the floodlight base shown in **Figs. 7-8**. This is also the NW corner of Building ***A***, whose north wall may therefore be the masonry seen at the end of the passage. An association between the two is certainly implied.

It is suggested here that the 'passage' may in fact be (part of) a gunpowder magazine, from the Civil War period (1642-48), and that Building ***A*** is both

contemporary with it and associated, as a possible arms store. The passage is below-ground and vaulted, against accidental explosion, while the ditch infill may deliberately have been chosen as both a) easier to excavate than the limestone bedrock which, elsewhere in the castle, lies close to the surface; and b) for its better absorbtion of the shockwaves from accidental explosion. The crude and rather makeshift nature of the passage may relate to the circumstances under which it was excavated; construction during the siege of 1648, for example, will probably have been rushed. An association with the suggested magazine would also account for the location, otherwise somewhat inconvenient, of Building ***A***. The evidence, moreover, suggests that the building was itself thick-walled, probably with rounded corners, the better to resist the effect of blast.

Figure 43: Outer ward: the possible underground powder magazine.

43a: entry arch, facing north.

43b: side wall showing collapse (with ditch deposits beyond), and possible end wall, facing south.

43c: roof vault, and concrete replacement slab, facing north towards entry.

Building ***A*** had gone by the late eighteenth century and is not shown on the earliest detailed plan of the castle, from 1787 (Nat. Lib. Wales, Map Book 39, 93–4; see **Fig. 59**). Local tradition, recorded in 1804, placed a Civil War-period magazine in the castle though its exact location was uncertain (Donovan 1805, 311-12).

The powder magazine at Carisbrooke Castle, on the Isle of Wight, is similarly a vaulted 'tunnel' and is also 6m long (**Fig. 44**). Otherwise somewhat larger (about 1.5m wide and 2m high) and better made, it may be eighteenth century (Young 2003, 17). Gunpowder was however being made during the 1640s at Raglan Castle (Mon.), prior to the 1646 siege, and it may have been stored in one of the tower basements (John Kenyon, pers. comm).

Figure 44: The underground powder magazine at Carisbrooke Castle, Isle of Wight. It may be as late as the eighteenth century, and was later converted into an ice-house.

Lying ENE of Building ***A*** is a second association of parchmarks and resistivity anomalies which appear to resolve as another structure, Building ***B***, measuring approximately 10m x 9m (**Fig. 42a-c**). It also overlies the ditch, follows the same alignment as Building ***A*** and, like it, appears to have an annexe to the southwest. The two may therefore be contemporary, and of related function, although Building ***B*** appears to have somewhat thinner walls. Like Building ***A***, it is not shown on the 1787 plan (**Fig. 59**).

Feature ***U***, recorded through GPR, is a large pit measuring 9m by 5.5m, and around 1m deep (**Figs. 21** and **42d**). Given that it infringes upon the medieval route through the outer ward (and earlier road-line), it is unlikely to be medieval itself; it might therefore predate the outer ward or, perhaps more likely, may belong to the post-medieval period.

A row of features ***C***, revealed both as parchmarks and in the geophysics, derive from Second World War military huts. They are represented by rectangular arrangements of slight anomalies, running along the southwest side of, and at right-angles to, the pathway laid through the outer ward in the 1930s. Five were detected through GPR survey, each measuring 6m by 4m and standing 7m apart from one another (**Figs. 21** and **42d**); three of them are visible as parchmarks (**Figs. 42b** and **45**) and, arguably, one shows up in the resistivity plot (**Figs. 14** and **42a**). They represent the narrow brick or stone bases for small 'Hall Huts' of a type commonly used during the war and which were normally raised from the ground, either on low brick carrier walls, or on pads/posts of timber, brick, blocks, or concrete (Roger Thomas, pers. comm). They do not belong to Nissen huts, which had solid concrete bases. The huts are shown on an undated wartime aerial photo (**Fig. 46**), which confirms that they were five in number and were

raised on both carrier walls and two internal rows of pads. The Royal Fusiliers (12 Battalion) were stationed in Pembroke Castle from 21 July until 19 November 1940 (Imperial War Museum, Documents 20540; TNA WO 166/4537). They were succeeded by 7 Queen's Own Royal West Kent Regiment, who stayed until August 1941 (TNA WO 166/4642), and then 17/31 Battalion of the Welch Regiment, who were there during late 1941-early 1942 (TNA WO 166/4724). Later in 1942, 1 Tyneside Scottish Regiment were stationed in Pembroke (TNA WO 166/9000). The 110th Infantry Battalion of the US Army have been reported as using the castle for accommodation from about April 1943 until late summer 1944 (Adrian T. A. James, pers. comm.). Lastly, 5 Somerset Light Infantry were at Pembroke (and elsewhere in the county) from late 1944 until VE Day, and the huts in the 'Castle Yard' are described as billets in their official War Diary (TNA WO 166/17203).

Figure 45: Outer ward, facing southwest from the top of the Dungeon Tower, in August 1989. Three parchmarks *C* lie in a row just beyond the path. In the bottom left-hand corner, larger and thicker-walled structure *L* can also be seen as a parchmark, also apparently aligned on the path.

Wartime aerial photos also show two much longer, camouflaged Hall Huts, similarly raised on pads or posts, north of the 1930s pathway (**Figs. 46-7**). The first runs NW-SE parallel with the path, the second lies WSW-ENE in front of the inner curtain wall. A further rectangular feature ***L***, recorded through resistivity, appears to correspond with the southeast end of the first hut (**Fig. 42c**). However, this feature also appears as a parchmark in **Fig. 45** (but not recorded through aerial photography, see **Photo 1**), of a nature that suggests a building with fairly substantial, masonry walls and a width of approximately 8.5m; the possibility remains that it is unconnected with the Second World War huts. Both aerial photos seem to have been taken late in the war; in **Fig. 46**, Huts ***C*** seem to be being dismantled, while **Fig. 47** appears to show discrete areas of turf corresponding with the hut sites. The photos were probably taken in late 1944-early 1945.

The two long Hall Huts otherwise lie in an area subject to very strong signals from earlier buildings ***A*** and ***B***, which may have masked evidence for later buildings. Further, smaller buildings are shown to the northeast in **Figs. 46-7**, but evidence for them may similarly have been masked by interference from service trenches etc. here. Wartime diaries mention the 'parade-ground' within the castle (TNA WO 166/4642) but, curiously, Sir Ivor Philipps's tarmac tennis court appears turfed

over in **Figs. 46-7**. An air-raid siren was installed on St Ann's Bastion at some point during the war (Ivor Ramsden, castle owner, pers. comm).

Figure 46: Undated aerial photo of Pembroke Castle during WWII, facing north, showing two long Hall Huts, and the five other huts now represented by features ***C***. (from the collection of Adrian T. A. James)

Figure 47: Undated aerial photo of Pembroke Castle during WWII, facing northwest, showing the long Hall Huts, and possible turfed areas over huts ***C***. (from Pembroke Dock Heritage Centre archive)

A shallow, linear feature ***T***, recorded through GPR, appeared to overlie or cut through Building ***A*** and runs through, or beneath, Building ***L*** (**Figs**. **21** and **42d**). Its precise nature is unknown; it appeared in no other surveys and appears not to relate to Building ***L***. A further feature ***V*** may show, in the resistivity plot, on the northeast side of the path (**Fig. 42a**). It appears to represent another rectangular

building, of a similar size to huts ***C*** and, like them, at right-angles to the path. However, the feature is weak, rather doubtful and otherwise unknown.

Feature ***D***, which partly overlies building ***N*** (**Fig. 42b-c**), belongs to a modern building which is shown on a plan published in 1926 (Oman 1926, 204), but is not suggested on any of the detailed Ordnance Survey maps of the nineteenth century.

The possible ditch noted in Part I (paragraph 4.1.15), around the base of the Dungeon Tower (**Figs. 7** and **42c**), may represent excavation in the inner ditch fill by Joseph Cobb; is this where his excavation reached down to 30ft? Other potential wall-lines are shown in **Figs. 9** and **19**.

5.5.3 A context for the outer ward

It was suggested in section 5.1.4 above that the outer ward was established 1247-54, under William de Valence. It was surmised, prior to the geophysics, to have contained extensive ranges of ancillary buildings such as stables, barns, storehouses, workshops etc.. However, sections 5.5.1 and 5.5.2 above show that this does not seem to be the case, and the outer ward seems to have been largely undeveloped until the late-medieval period. Although it was not possible within the constraints of the project to survey directly up against the foot of the southeast curtain of the outer ward, there is no evidence for roof-creasing against this wall, while no parchmarks have been observed here.

But it is possible that such outer ward buildings were neither as universal nor as extensive as convention might have it. Few castle outer wards have been comprehensively investigated, so no 'standard' degree of development has been established with any certainty: as John Kenyon noted, in 1990, 'archaeological excavation in castles has tended to concentrate on areas other than the outer bailey' (Kenyon 1990, 156), and in general this still holds true. Investigations at eg. Barnard Castle, Co. Durham, and White Castle, Mon., have revealed fairly crowded outer wards (Kenyon 1999, 5, 8-9, also see Austin 2007; Knight 2009, 39). Nor was Pembroke's outer ward necessarily entirely empty in the thirteenth and fourteenth centuries – the possible medieval barn ***M*** and lean-to ***N*** are described in section 5.5.1 above. However, they are not intrusive, but may show that there was some storage aspect to the bailey's functions while leaving the greater part as an open space. And where investigation has taken place elsewhere, significant medieval development has not always been identified eg. Portchester Castle's outer ward (Goodall 2008, 19-23; Munby 1990, 20-1; the large barn here is sixteenth-century). Moreover, the widespread use of the term 'green' for outer wards, albeit often in early post-medieval records (discussed in Ludlow 2014, 230), may suggest that they were not always perceived primarily as developed spaces.

Comparisons may also be furnished by concentric castles like Harlech and Beaumaris in north Wales, whose narrow outer wards contained little room for ancillary buildings, buildings which would, in any case, defeat the objective: these wards were intended as open spaces. They could however be occupied by gardens, as at Harlech (Peers 1923, 73, 82), which is suggestive of high-status rather than artisan identity.

Activity at Harlech Castle – which was instrumental in Edward I's conquest of north Wales – seems largely to have been confined to its inner ward, which is somewhat smaller (roughly 2000 square metres) than Pembroke's inner ward (roughly 2400 square metres); many other major castles were no larger. I had previously speculated that Pembroke's outer ward may at first have been laid out in timber (Ludlow 1991, 28), sometime after the addition of the Dungeon Tower. But this was perhaps an unnecessary assumption, as its lack of development

would suggest an absence of any pressing demand for space for additional buildings.

Pembroke's outer ward shows instead possible evidence for use, from an early date, as a high-status, landscaped area. The inner ditch was clearly infilled during the active life of the castle: a latrine in the outer curtain, near its junction with the Western Hall (**Fig. 32**), was deliberately kept clear, the infill sloping steeply down towards its entry. The infilling of the ditch may have occurred in the early fourteenth century, when St Ann's Bastion was built or, more likely perhaps, during the fifteenth century when it may have been associated with further building activity (Buildings ***G*** and ***H***; see section 5.6 below).

Figure 48: Outer ward: St Ann's Bastion, external façade from ESE.

Figure 49: Outer ward: St Ann's Bastion, interior from top of keep, facing east (with the café built in 2009).

St Ann's Bastion projects out from the northeast side of the outer ward as a low-walled, rectangular platform between two turrets (**Figs. 48-9, 51**). The latter are circular and narrow, showing corbelled parapets and plain cruciform arrow-loops, recalling early/mid-fourteenth-century towers eg. in the gatehouses at Carisbrooke Castle, Isle of Wight, and Lewes Castle, Sussex (Goodall 2011a, 270-1), while the whole is clearly secondary to William de Valence's outer curtain. Cruciform loops returned to fashion during the first decades of the fourteenth century, when they were usually given four terminal oillets; however, the latter are absent, as in St Ann's Bastion, at eg. Prudhoe Castle (Northumberland) in work from 1330-40 (West 2006, 10-11). But, while the upper stages of the bastion's southeast turret are jettied out – superficially in the fashion of northern castles of the later fourteenth century eg. the Prince's Tower at Middleham Castle, dated to *c*.1400 (Kenyon 2015, 16, 19-20, 35), and the contemporary Doune Castle, Perthshire (Scott 2013) – this seems to be an illusion caused by the later-medieval heightening of the turret above what was originally a corbelled parapet, the blocked embrasures from which can just be discerned in **Fig. 48**.

The bastion is a complex structure and, were it merely intended to be defensive, a mural tower might have been more appropriate. For this reason, and following both Cobb (1883, 209) and King (1978, 97), I originally thought that it may have housed a high-status building, perhaps something along the lines of a 'Gloriette' like those at Chepstow Castle and Leeds Castle, Kent (see Turner *et al*. 2006, 141). However, DAT's evaluation for the café in 2006, followed by a watching brief in 2009, revealed nothing conclusive (Ludlow 2006; Ramsey 2010); the entire area had been disturbed by groundworks during the 1930s (**Fig. 51**), earlier deposits had mostly been lost and, as in the Norman Hall, modern deposits directly overlay the limestone bedrock. Archaeological features were limited to two short lengths of walling, neither of which may be medieval, and a possible oven or kiln, also undated (Ramsey 2010, 17); the latter may relate to late medieval/early post-medieval use of the castle as administrative and garrison centre, rather than as seignurial residence. Furthermore, there is no evidence of a roof-crease or tabling against the flanking turret.

Figure 50: Outer ward: St Ann's Bastion in 1902, facing southeast from its northwest turret. Restoration work, and new build in the bastion, have yet to take place (© Pembroke Castle Trust).

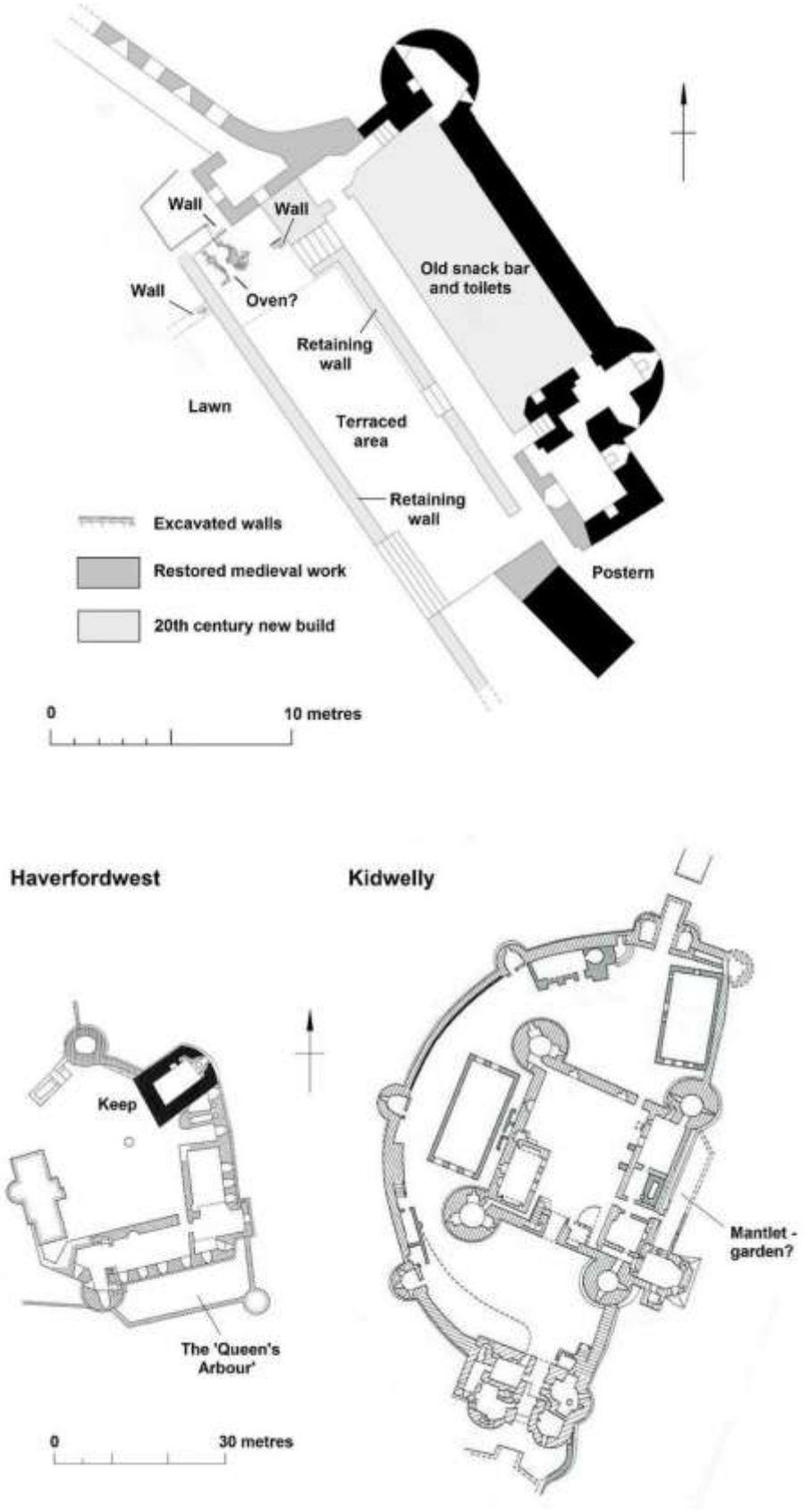


Figure 51: Comparative plans of St Ann's Bastion at Pembroke Castle, and walled terraces at Kidwelly Castle and Haverfordwest Castle (Pembroke modified from Ramsey 2010).

Nevertheless, with its prestige character, and 'show' frontage on the riverside, the bastion may be associated with some other high-status feature, and one which would take advantage of the views across the water. It occupies a sheltered spot, exposed to the sun. Might it have contained a pleasure garden? A number are known from other castles during the late thirteenth/early fourteenth centuries, and in their form and siting show similarities to the bastion. A garden had been laid out in the east barbican at Conwy Castle, Caerns. – which similarly projects over a waterfront – by 1316 (Emery 2000, 691). With its low walls and riverside location, moreover, the Pembroke bastion is not unlike the outer ward at Goodrich Castle, Herefs., within which gardens have been suggested (Shoesmith 2014, 54, 65, 189-91); this is normally assigned to William, Joan or Aymer de Valence, *c*.1290-*c*.1320 (Radford 1958, 5; Ashbee 2009, 24; Emery 2000, 537; Shoesmith's date of *c*.1500 is not favoured here, see Shoesmith 2014, 57, 189-91), and its corner turrets are not dissimilar in general form and size to those in St Ann's Bastion. But perhaps the closest parallel might be the enclosure at the foot of the inner curtain on the south side of Haverfordwest Castle, Pembs.. It overlooks the town, rather than the river, but comprises a level, terraced platform with a narrow, circular turret in one corner. It is undated, but adjoins a range of domestic buildings that are normally attributed to Queen Eleanor, wife of Edward I, who held the castle in 1289-90 (King 1983, 393). It too was, by 1577 at least, the site of a 'green walk' or garden styled the 'Queen's Arbour' (Owen 1903, 40), and its attributes suggest it may have been established as one.

Haverfordwest Castle was granted to Aymer de Valence in 1308 (*Cal. Pat. Rolls 1307-13,* 145) and, given the brief duration of Eleanor's tenure, he may have completed some of its more peripheral features: in west Wales, these suggested garden enclosures may have been a feature of Valence tenure, and may reflect their personal tastes. A very similar terraced platform survives on the south side of Kidwelly Castle, Carms., again commanding views over the river and, like the Haverfordwest platform, lies outside the main curtain wall. It is attributed to William de Valence (Kenyon 2007, plan), who held the castle from 1283 to 1296 but, this time, no turret is present. No function is normally assigned to the feature, though it was earlier writers regarded as a defensive 'mantlet' (eg. Radford 1952, 8). A garden was recorded at Kidwelly Castle at various times (Kenyon 2007, 48), so might the mantlet represent an early stage in the development of what might be termed the 'turreted garden enclosure'?

Aymer de Valence almost certainly visited Pembrokeshire in May 1308 (*Cal. Pat. Rolls 1330-34*, 67-8), shortly after inheriting the earldom, and may have stayed for some time; he is next recorded in November, near London (Phillips 1972, 323). Given its architectural attributes, he is a likely candidate for the construction of St Ann's Bastion and the suggested garden, and it is possible that the work (along with the barbican, mentioned above in section 5.1.5) may have been initiated during this stay. He will have had little idea that he would spend so little time at Pembroke; only one other visit is known (Phillips 1972, 334-5) but his wife may have stayed more frequently. He is also suggested to have made additions to Tenby's town wall (Thomas 1993, 20; Walker 1970, 9), and may have completed Pembroke's town wall which shares certain features with that at Tenby.

A garden was certainly present in Pembroke Castle by 1481, when it was described as 'the outer garden' with a hedge of 'thorns' (Owen 1918, 172), which appears to place it in the outer ward; we cannot know however if St Ann's Bastion is meant. Nor do we know its extent. But, taken along with the openness of the outer ward, the presence of a high-status feature like St Ann's Bastion, fifty years or so after it was laid out, suggests two main possibilities.

The first is that the outer ward was never intended for significant artisan use. It may have been intended for more 'polite' use from the first, or as an assembly

point for campaigning armies – or perhaps both. The 1240s-50s, when the outer ward was added, were a period of deteriorating relationships between the Crown and marcher lords, and the Welsh; raids were made deep into Pembrokeshire during 1257-60 (*Close Rolls 1259-61*, 184, 267-8; Jones 1952, 111; Luard 1880, 676-7; Williams ab Ithel 1860, 93-4, 97-8), soon after the suggested completion of Pembroke's outer defences. William de Valence, their builder, was a trusted lieutenant of the Crown and was later to lead the royal armies in west Wales (Lewis 1939, 76; *Chancery Rolls 1277-1326*, 229); anticipation of such a role may lie behind the creation of a large open space for musters. Militating against such a suggestion, however, is the fact that he had to wait until the 1270s before this first appointment as commander, long after the outer ward was completed, and that his own personal retinue was comparatively small (Ridgeway 1992, 245-6, 249). Nor is there any direct record of musters at Pembroke Castle; when earl Lawrence Hastings raised a local levy for the French campaign of May 1345, for example, he assembled them at Tenby (Walker 2002, 106). Nevertheless, Pembroke's outer ward has echoes in the immense bailey at Bampton Castle, Oxon., which may have been laid out *c.*1315 by William de Valence's son Aymer (Blair 1988, 1 and Fig. 7; *Cal. Pat. Rolls 1313-17*, 278; architectural detail suggests the present remains may be a little later), which suggested to one author that both may have intended for military assemblies (Emery 2006, 57). And it may be inferred from the sources, though it is not directly stated, that a field army gathered at Pembroke Castle, under King Henry III's son Edmund and William de Valence, during spring 1277 (see Ridgeway 1992, 243 n. 23; *Cal. Pat. Rolls 1272-81*, 194-5).

And while the outer ward may look like a huge investment merely to enclose an empty space, it did represent a considerable strengthening of the castle, as well as a show of prestige: it is a major piece of fortification and was clearly meant as both a deterrent, and for serious defence. It may be significant, too, that castle-guard obligation already existed within the lordship, possibly since Henry I's tenure in 1100-35 (Rowlands 1980, 152), so the necessary infrastructure for manning the outer ward defences was already in place; at Richmond Castle, Yorks., and Dover Castle, Kent, for example, each castle-guard fee was allotted a tower for defence (Pounds 1990, 47-9; Goodall 2001, 18). Nevertheless, castle-guard at Pembroke had been commuted to a cash-payment by 1307 (Owen 1918, 82).

More pertinently, perhaps, Pembroke Castle had been used as a base for crossings to Ireland since Earl Richard Strongbow's Leinster campaign of 1170. William de Valence seems to have visited his lands in Co. Wexford, albeit fleetingly, in spring 1270 (*Cal. Pat. Rolls 1266-72,* 413; Sweetman 1877, 141; Ridgeway 1992, 243 n. 23). As Pembroke was the sole port for embarkation that was under his personal jurisdiction, it is safe to assume he assembled his entourage at the castle. Valence is known to have supplemented his retinue with considerable numbers for long-distance travel (Ridgeway 1992, 245), while his wife Joan travelled with a very large entourage of 200 or more people (TNA E101/505/26). These entourages would need a large compound while awaiting favourable winds, and the very large outer bailey at Portchester Castle, for example, was used as just such an encampment by royal forces assembling for travel to France (Goodall 2008, 33). Further Irish visits were planned by Valence for May 1268 (Sweetman 1877, 136) and August 1295 (Sweetman 1881, 62-3); his widow intended travelling in December 1296 (Sweetman 1881, 84-5), as did Aymer de Valence in February 1303 (Sweetman and Handcock 1886, 64-5). It is probable that none of these crossings was undertaken, but the respective retinues may have begun assembling at Pembroke in anticipation of the journey.

The open space of the outer ward may instead – or in addition – have been intended, from the first, for more leisurely gatherings, within a context of

pageantry and other forms of prestigious display. The equally large outer enclosure at Bampton Castle has been suggested to have contained gardens and orchards, but was regarded as housing a tiltyard in 1848 (Blair 1988, 6 and Fig. 7). The causeway at Kenilworth Castle was referred to as a tiltyard in the sixteenth century (Morris 2010, 5) but is physically associated with a large outer enclosure, 'The Brays', which may have been functionally related, as well; like so many of these enclosures, it needs 'further research' (ibid.). It must be borne in mind that the tournament *per se* was illegal during much of the thirteenth century. Nevertheless, many of the very large outer wards at other castles, eg. Framlingham, Scarborough and Pevensey, may have been the setting for other forms of display and pageantry. The circular geophysical anomalies in Pembroke's outer ward, discussed in section 5.5.1 above, may be of interest in this connection, although their high resistance may not be consistent with the sites of tents or pavilions. Moreover, the prolonged comital absences from Pembroke have to be taken into account.

But gatherings may not always have been of high status. Might Pembroke's outer ward have been a place of assembly in socio-judicial terms? To reinforce lord/tenant bonds and relationships? At least something along these lines was formalised in the open-air 'Courts of the Castle Gate', as held at Pembroke, Haverfordwest and elsewhere, presumably within the castle curtilage where the stewards had jurisdiction. These courts were first recorded at Pembroke in 1307 (Owen 1918, 81-2) but may be earlier still. In 1358, they heard pleas of obligation and fresh force within the county (Owen 1918, 95-6), respectively dealing with crown debts and land disputes (see Griffiths 1972, 25). At Haverfordwest, which also has a large outer ward, three courts of the castle gate were recorded in 1577, two of them still operational; within them the freeholders of the lordship performed suit for their lands, fines were levied and various actions were tried (Owen 1903, 42). An element of the confirmation of social bonds is implicit, particularly in the latter case. Might, for example, the northern bailey at Kidwelly Castle have originated as a similar assembly-place? Such open-air courts were by no means unusual, *cf*. the hundred courts etc., but some at least may have earlier origins and may even perpetuate long-standing traditions: the open-air manorial courts of the lordship of Manorbier (Pembs.) were held in Longstone Field, Lydstep, around a Bronze Age standing stone (Ludlow 1996, 9-10; also see Walker 1992, 135). While continuity of overall tradition does not necessarily mean continuity at any given site, the importance of these assembly-sites is increasingly being recognised in early medieval studies (eg. UCL, 'Assembly Sites of Wales' pilot project); it may also be a potential area for further research regarding the later medieval period.

The second main possibility is that St Ann's Bastion (and possible garden) were the first stage of a progressive 'gentrification' of the outer ward, culminating in the erection of the winged mansion (Buildings ***G*** and ***H***, described below in section 5.6) and possibly, at the same time, the infilling of the inner ditch to create an appropriate setting for the new house – and an open space suitable for the staging of pageantry, etc. as described above. And, at Pembroke, the court of the castle gate may have been a factor behind the construction of the large barbican: progressive gentrification of the outer ward under Aymer, its probable builder, may have been incompatible with the gathering of freeholders and tenants, prompting the relocation of these courts to the barbican. The related barbican enclosure at Goodrich Castle was equipped with benching and a latrine, suggesting similar use for assembly (Shoesmith 2014, 151-2). Similarly, gentrification of the outer ward may have been associated with the increasing administrative and penal use of the inner ward (see section 5.6.3 below). It can be assumed that the outer ward, at the very least, became increasingly 'zoned' according to status like, for example, the inner ward at Carmarthen Castle (Ludlow 2014, 208).

But if gentrification was a secondary process, then evidence for earlier buildings, if present, might still be expected. Any such process will moreover have been interrupted by the long period of absentee earls, intermittent crown control and temporary custody which lasted from 1324 until the mid-fifteenth century. The castle had no resident lord, while the castle officials, and their offices, were located in the inner ward (see sections 5.1.5 and 5.6.3). Taken along with the absence of buildings, this implies that the space within the outer ward was not greatly used during this period.

5.6 Outer ward Buildings *G* and *H*: a fifteenth-century mansion house?

A complex of masonry walls, representing two buildings, lie close to the surface in the southern half of the outer ward. They are represented by parchmarks ***G*** and ***H***, which are strong enough to be seen on the ground as both parchmarks and very faint earthworks (**Figs. 52-3**).

These features did not, however, register particularly strongly as geophysical anomalies, though elements are visible in all three surveys, while the GPR and resistivity plots show Building ***G*** in general outline. This is far from being unusual, and there are a number of possible reasons why –

Magnetometry – the magnetism of the masonry walls might be very similar to the bedrock; the interiors may be filled with rubble of similar magnetism to the walls; interference by magnetic signals from the electricity cables in this area; magnetic interference from debris in the topsoil.

Resistivity – interference by the strong magnetic signal from the 1930s pathway, which partially overlies the buildings.

Both – the depth of the topsoil which, although averaging 0.25m, may be deeper in areas where the walls are lower, whether through truncation or the natural slope here. GPR showed that Building ***G***'s walling can go down as far as 1.2m.

The following account is adapted from Ludlow and Driver (2014), with updates and amendments; without further investigation of the buildings, it can only be a working hypothesis and must be treated as such.

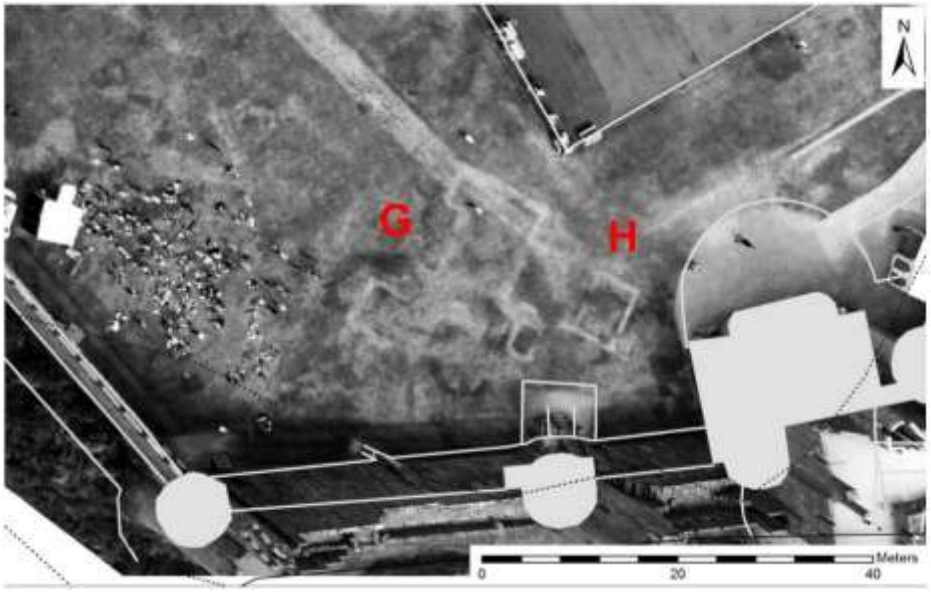


Figure 52: Outer ward: enlarged section of rectified aerial photograph showing Parchmarks ***G*** and ***H***, with Ordnance Survey mapping overlying modern built detail in grey (Crown Copyright RCAHMW.

Figure 53: Outer ward: Parchmarks ***G*** and ***H***, facing WNW from the top of the gatehouse, summer 2015 (© Pembroke Castle Trust).

Figure 54: The outer ward in 1929, before excavation of Buildings ***G*** and ***H***, facing southeast from the top of the keep. The northern wing of Building ***G*** is visible as a parchmark; the rest of the building lies beneath overburden (© Pembroke Castle Trust).

Figure 55: Outer ward: Building ***G*** under excavation in March 1931, facing WNW with the keep in the background. The large, deep chamber in the foreground is probably the cesspit mentioned in 1931. The make-up for the modern path can be seen beyond (© Pembroke Castle Trust).

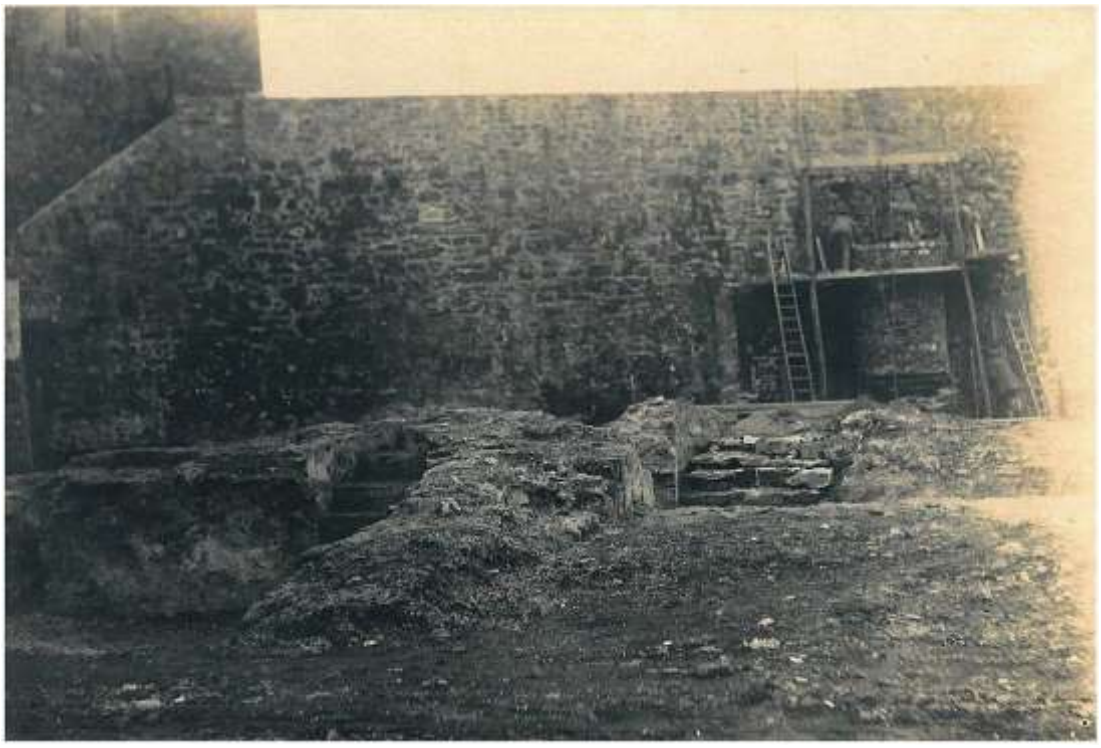


Figure 56: Outer ward: Building ***G*** under excavation in March 1931, facing due south with the Henry VII tower, recently restored, to the left. The base of a stair, probably in the south wall of the southern wing, can be seen, with a further stair to the right? (© Pembroke Castle Trust).

Figure 57: Aerial photo of Pembroke Castle facing east, dated 1938, showing that the excavation of Building ***G*** in the outer ward has been completed and backfilled (Pembroke Dock Heritage Centre archive)

5.6.1 Description

Buildings have been known to exist here for some time, if not always fully understood. Cathcart King noted their presence and showed some wall-lines on his plan, but dismissed them as 'some kind of rustic occupation of the castle after its slighting' (King 1978, 121). Perhaps he was unaware that they had been excavated in 1930–1 by Sir Ivor Philipps. The excavation revealed the 'foundations of walls and buildings, showing chambers with doorways, a cobble pavement, two spiral staircases, and a latrine with its cesspit' (Anon. 1931, 177–9).

Unfortunately Sir Ivor left no plan of the excavation, but we do have two photographs showing a complex of substantial walls and surfaces (Ramsden collection; **Figs. 55-6**). Recorded finds were limited to just one item. 'Amongst the refuse from the cesspit' was found a zoomorphic bronze fitting, 'gilt and enamelled in three colours, dating from the thirteenth century, coming from Limoges or the Meuse district . . . It seems to be part of the decoration of a casket or shrine' (Anon. 1931, 179); the object is now in the possession of the Pembroke Castle Trust (**Fig. 58**). At least four other examples of enamelled bronze-work are known to be connected with the earls of Pembroke: a casket, a pendant, a cup-lid and an entire tomb, all commissioned by the Valence earls, and all possibly Limoges work from between *c*.1290 and 1324 (Alexander and Binski 1987, 259, 357-8). So it may be that the fitting from the outer ward building was also from an item belonging to the Valences. If so, its damage, loss and deposition in the latrine-pit could have occurred at any time after the early fourteenth century.

Figure 58: The zoomorphic, enamelled bronze object, of thirteenth-century date, retrieved from the cess-pit of Building ***G*** in in 1931 (© Pembroke Castle Trust).

Buildings ***G*** and ***H*** are aligned NNE-SSW, respecting the line of the medieval route from the great gatehouse to the inner gate, suggesting that the inner curtain and gate were still standing when it was built. A lease of the 'outer green in the precinct of the castle' was recorded in the 1560s (Lewis and Davies 1954, 476), but the phrasing used does not necessarily imply that they had gone – we saw in section 5.5 above that the outer ward may have been primarily an open (and possibly green) space, while the baileys at Monmouth and York castles were similarly called 'greens' during a period of at least partial use (discussed in Ludlow 2014, 230). The buildings may have been demolished during the Civil War of 1642–8, as one source for the stone used for thickening the south curtain wall, or soon afterwards when the castle was comprehensively slighted. Only vestiges remained in 1787, when a map depicted, and labelled, two of their walls in fragmentary form (Nat. Lib. Wales, Map Book 39, 93–4; see **Fig. 59**); a ruinous doorway belonging to one of the buildings is also shown in a drawing of 1802 (reproduced in Thompson 1983, 219; see **Fig. 60**).

I had already suggested elsewhere that the buildings may represent a late-medieval 'mansion house' (Ludlow 1999, 22; Ludlow 2001, 15, 20). The geophysical survey and aerial mapping appear to confirm this interpretation, and allow the form and dimensions of the buildings to be more fully appreciated. The main block, Building ***G***, appears to be a U- or H-plan house, a form which appeared in the fourteenth century (Wood 1983, 55) and persisted into the seventeenth century (Smith 1988, *passim*). In these houses a central hall, open to the roof, is flanked at each end by a storeyed wing containing, at one end, the services, and a solar at the other. Building ***G*** is *c*.20m long overall with an average width of *c*.7m; the wings project to a maximum east-west dimension of *c*.15m in the south wing (**Figs. 52** and **61**). The relative narrowness of its walls suggests that the building rose no higher than two storeys and, taken along with the building's total destruction, also suggests that it didn't carry the stone vaults that were so characteristic of buildings in south Pembrokeshire during the late medieval and early post-medieval periods (Owen 1892, 76–7; Lloyd, Orbach and Scourfield 2004, 51; Parkinson 2002, 550; *et al*.); it may therefore have been of a style more 'cosmopolitan' than regional or vernacular. The double-winged U- or H-plan was moreover not frequently adopted in southwest Wales, where the end-hall with a single wing is for more widespread (Lloyd, Orbach and Scourfield 2004, *passim*, *et al*.), and its use at Pembroke may by itself indicate origins

within the upper strata of society. And where it does occur in Wales, mainly in the north and east, the double-winged plan is generally rather late and doesn't become prevalent until the mid-fifteenth century (Smith 1988, *passim*).

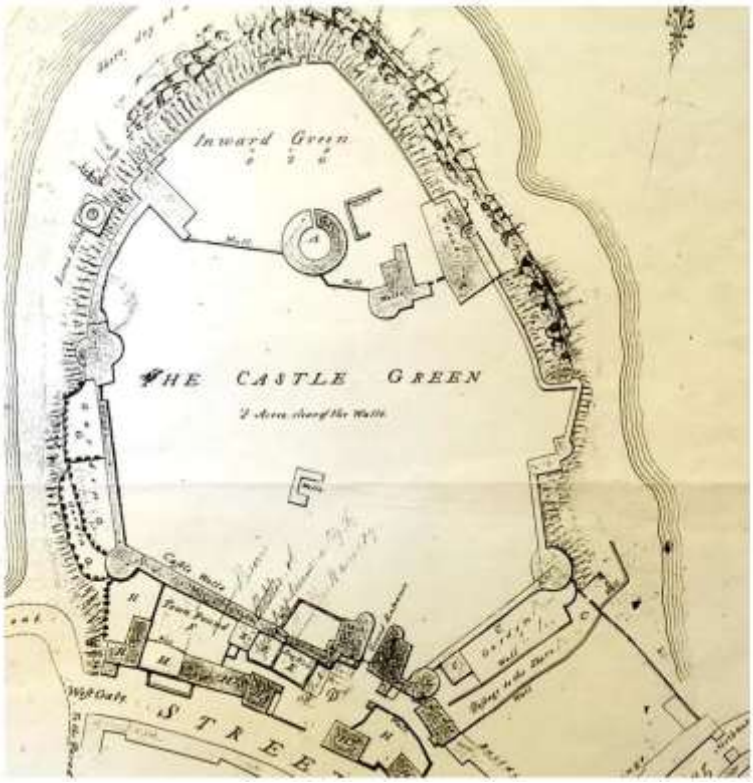


Figure 59: Detail from plan of Pembroke Castle in 1787. Note the 'walls' marked and labelled in the centre of the outer ward: the west end of Building ***G***'s north wing appears to be represented (Nat. Lib. Wales, Map Book Vol. 39, 93).

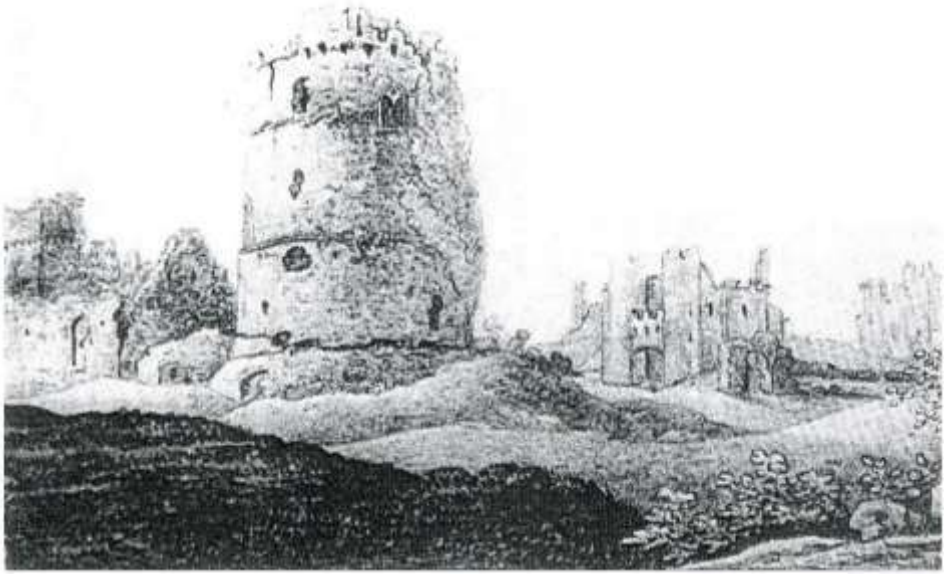


Figure 60: View of the interior of Pembroke Castle in 1802, by Sir Richard Colt Hoare, facing southeast towards the gatehouse with the keep on the left; Henry VII Tower to far right. The ruined doorway standing in front of the gatehouse must belong to Building ***G***.

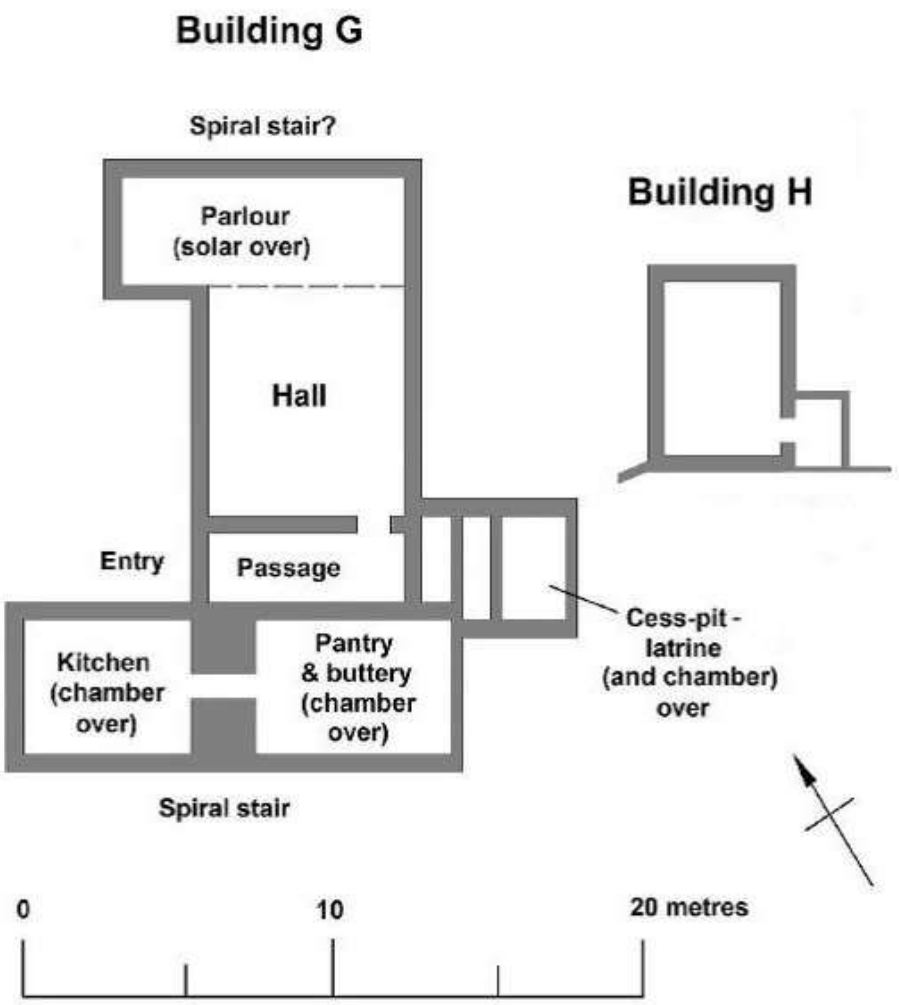


Figure 61: Possible layout of Buildings ***G*** and ***H***, based on Cothay Manor, Somerset, and others.

It is instructive to compare Building ***G*** with a well preserved example of the type like Cothay Manor, Somerset, an H-plan house with which it is similar in plan, if not in scale (**Fig. 62**). Dateable to 1485-90, Cothay comprised a central hall with transverse wings at either end (Pevsner 1958, 133; Pevsner 1968, 155; Pevsner and Orbach 2014, 224-7; Emery 2006, 460, 529-33). The upper wing contained a solar, overlying a parlour, while the lower wing housed the services – kitchen, pantry and buttery – with three chambers above. Perhaps the thicker walls suggested in the southern wing of Building ***G*** at Pembroke represent fireplaces or ovens, partly within a north-south division, which would imply a similar functional arrangement to the rooms at Cothay, and may indicate the 'high' and 'low' ends of the building; the parchmarks do appear to show evidence for a screens passage at this end of the hall. The upper floors in the wings at Cothay were accessed from spiral stairs at each end of the building, the one in the kitchen wing subsequently altered (Emery 2006, 532; Pevsner and Orbach 2014, 226); a photograph taken during Sir Ivor's excavation in March 1931 (**Fig. 56**) shows what appears to be a stair in the southern wing, while 'two spiral staircases' were recorded (Anon. 1931, 177–9), so the arrangement of stairs may also have been similar to that at Cothay.

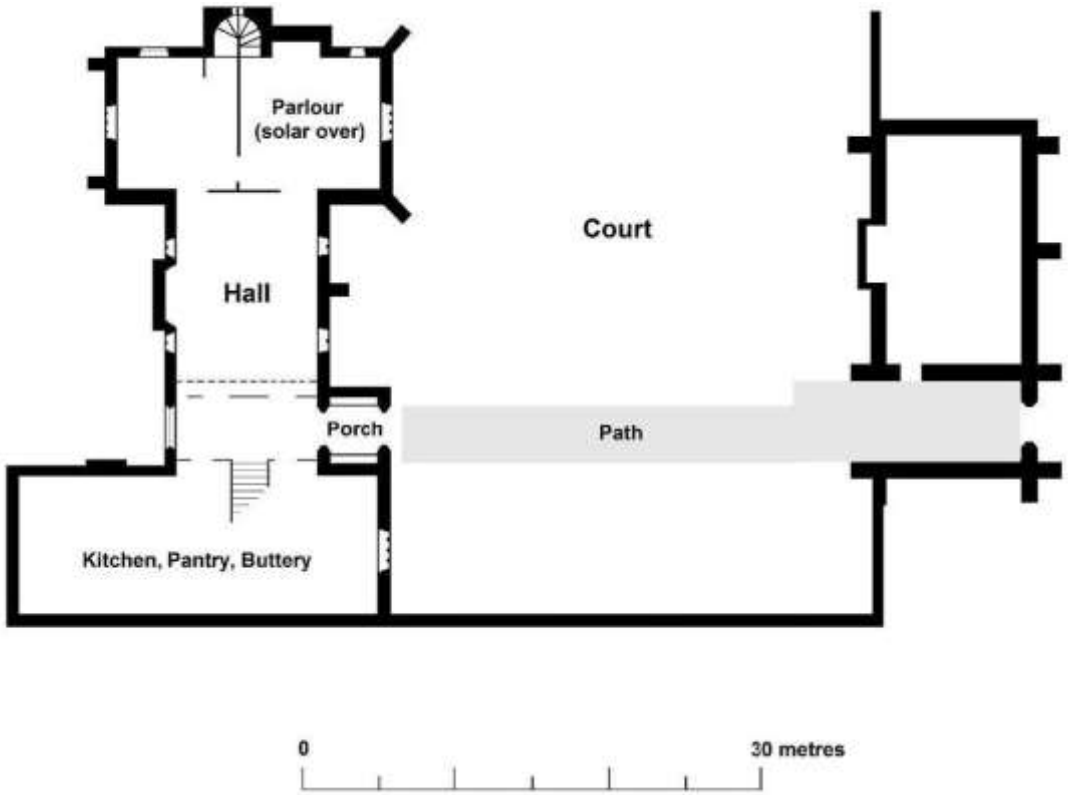


Figure 62: Plan of Cothay Manor, Somerset, before the addition of the seventeenth-century dining room (redrawn from Pevsner 1968 and Emery 2006).

Where the two plans differ is in the 'latrine with its cesspit' which was recorded at Pembroke in 1931 (Anon. 1931, 177–9). It is clearly the structure in the foreground of the other excavation photograph (**Fig. 55**, also taken in March 1931). This was taken from the SSW, with the keep just visible in the background, indicating that the cesspit can be equated with the annexe represented by the strong, rectangular parchmark feature projecting some 6 metres from the east wall of the central hall. The latrine block that appears to be indicated lies at the suggested low end of the hall, but the 1931 photograph makes it clear that an alternative interpretation – that the feature may represent a porch onto the screens passage – is less likely (see Ludlow and Driver 2014, 77).

Geographically, the nearest parallel to the Pembroke mansion may be the ruinous U-plan house at Penallt, near Kidwelly, Carms. (**Fig. 63**). On the same scale as Building ***G***, its wings projected from the entrance façade while a latrine projected from the rear wall of the hall (Davis 1989, 27-33). Unlike Pembroke, however, Penallt follows local tradition in having the accommodation on the first floor, above a series of vaulted chambers. Penallt was possibly built by the Dwnns, a prominent Yorkist family, in the mid-fifteenth century, though it could be as late as *c*.1500 (Davis 1989, 28-9).

The latrine block is the key to understanding Building ***G***. It probably occupied the rear wall, as at Penallt, suggesting that Building ***G*** faced west, with the flanking wings mainly projecting to the front again like Penallt. The latrine itself will, if it followed the standard arrangements of the period, have lain at first-floor level, with the cesspit below. It will therefore have served a room on the first floor, presumably a private chamber in the southern wing, which the latrine block partly adjoins. The latrine block is very large, but it may have incorporated a first-floor

bedchamber, wardrobe or dressing-room. This arrangement is seen in a large number of late-medieval houses, eg. at East Meon, Hants. (Roberts 1992, 463, 466), and is suggested during the fifteenth century at the Western Hall, Lamphey Palace (Turner 2000, 18).

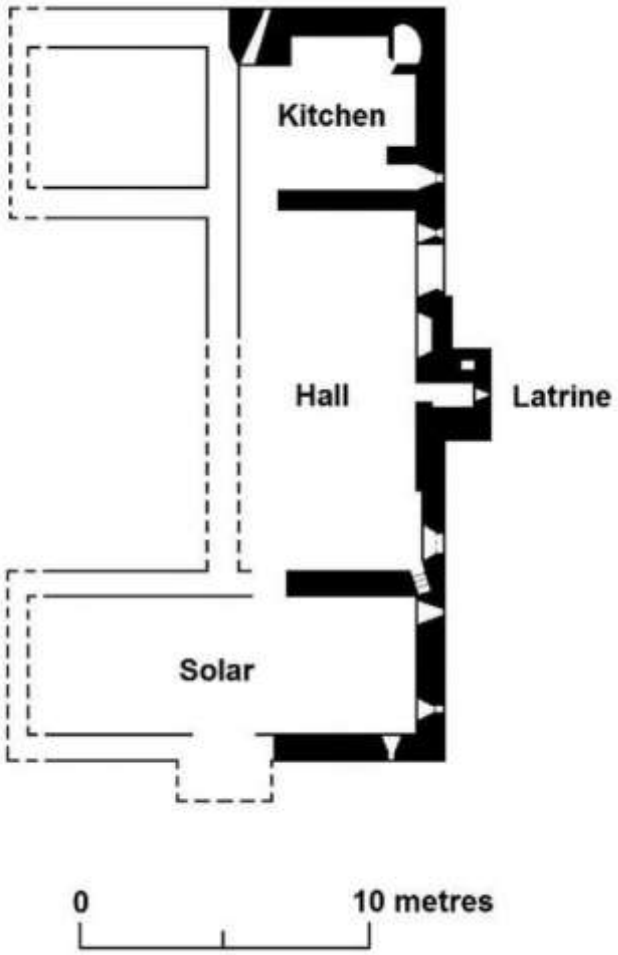


Figure 63: Plan of Penallt, Carms., at first floor level (redrawn from Davis 1989).

However, the latrine at Penallt appears to serve the hall, rather than a chamber. This is somewhat unusual while, in any case, the hall occupied the first floor unlike the ground-floor hall suggested at Pembroke. The possibility that the Pembroke block housed a battery of latrines at ground-floor level, entered from the screens passage, is considered unlikely; parallels are hard to find. The projecting block at eg. Middleham Castle, Yorks., from 1397-*c*.1410, contains ground-floor latrines but these, too, served chambers rather than a hall (Kenyon 2015, 21-2, 35).

There is a further possibility – that Building ***G*** featured a room over the hall. The late fifteenth century witnessed a development in domestic planning, in which the hall became downgraded in favour of an overlying chamber. It begun in Somerset during the 1450s-60s at eg. Blackmoor Manor, Congresbury Vicarage and Gothelney Hall, but was slow to reach other regions (Emery 2006, 50-3, 460, 568, 629; Wood 1983, 196) and it must remain the most slender of possibilities at Pembroke; see section 5.6.2 below.

Some 4m to the east of Building ***G*** is a separate rectangular block measuring 5m x 7m (parchmark ***H***), of unknown function but following the alignment of, and clearly associated with the house, to which it appears to be connected by a wall

(**Figs. 52** and **61**). It too has an annexe against its east wall (visible in **Fig. 52** but not shown on the aerial photo mapping, **Fig. 42b**), also of unknown function.

5.6.2 Dating the buildings

Free-standing domestic buildings are not a common feature of castle baileys, where buildings normally lay against the curtain walls; they are more characteristic of late-medieval fortified manor houses, moated sites and episcopal palaces. Where they do occur in castles it is usually because the curtains occupied steep banks, as at Bristol, Lincoln, Castle Acre (Norfolk), Launceston (Cornwall) and Oakham (Rutland). However, free-standing suites of domestic apartments were built within baileys that, like Pembroke, were without banks at Tattershall Castle, Lincs., during the 1420s-30s (Goodall 2011a, 354) and at Fotheringhay Castle, Northants., in 1463-9 (Emery 2000, 239-40).

More significant to us may be the free-standing building in the outer ward at Kidwelly Castle, Carms., which has been interpreted as a lodging built by Sir Rhys ap Thomas between 1485 and 1525 'to accommodate his almost vice-regal household' (Emery 2000, 640 n. 84); it suggests that the accommodation in the inner ward was no longer adequate for residential purposes (Kenyon 2007, 22). These examples by themselves argue for a later, rather than earlier date for the Pembroke mansion, whose coherent plan suggests it was an entirely new building rather than an adaptation of an existing structure.

But who commissioned it, and when? The building's attributes limit the number of likely candidates to two: Humphrey Duke of Gloucester (1413-47) and Jasper Tudor (1452-95). Duke Humphrey built up a strong network of local alliances in Pembrokeshire (Griffiths 2002, 232-3), and was Justiciar of southwest Wales 1440-43 (Griffiths 1972, 150). He had also been granted, in 1414, the manor, vill and dissolved alien priory of Monkton, across the river from Pembroke (*Cal. Pat. Rolls 1429-36,* 298-9). It will be argued in Ludlow (in prep.) that Humphrey built the late-medieval building, known as Monkton Old Hall, as a courthouse and residence for his steward there; an additional wing, gone by the nineteenth century (see Cobb 1880, 249; Thomas 1962, 345; Lloyd *et al*. 2004, 300), may have been built for his own use should he choose to visit. His loss of this accommodation in 1443, when he granted Monkton to St Albans Abbey (Riley 1872, 47-50), allows for the possibility that he may have built the Pembroke Castle mansion as a replacement; stylistically, this represents the earliest plausible date for Building ***G***. It was noted in section 5.1.5 above that the castle had suffered severe neglect in the late fourteenth century, which may not have been fully remedied. So it is likely that no earl would wish to stay in the existing accommodation. There is no direct evidence that Duke Humphrey was ever at Pembroke (Vickers 1907, *passim*) and, although an unrecorded visit is probable in 1440-43 (Roger Turvey, pers. comm.) it is, given the context of his tenure, unlikely to have been lengthy. Duke Humphrey was essentially an absentee, who 'used his resources for capital projects elsewhere' (Emery 2000, 627) including palaces at Greenwich, Penshurst in Kent and Baynards Castle, London (Goodall 2011a, 351, 360; Emery 2006, 186, 242, 248-9, 392). Nevertheless, after his effective fall from power, in 1442-3, he may have viewed Pembroke as a possible long-term residence, far from the court and his rival factions (Roger Turvey, pers. comm.).

But Jasper Tudor is a better candidate. He was created earl of Pembroke on 23 November 1452 (Thomas 1971, 32), receiving Pembroke and its castle in March 1453 (Thomas 1971, 35). There is no firm evidence that he was at Pembroke until November 1456, and this visit was mainly prompted by the need to deal with political difficulties there (Roberts 2015, 50). Nevertheless, given the nature of the existing accommodation, he may have commissioned building work at the castle in 1453 in anticipation of possible visits, and to announce his arrival among

the leading aristocracy. In response to the escalating violence between Lancaster and York, between 1456 and 1461, Jasper used Pembroke Castle 'a secure base for his own, as well as the House of Lancaster's, power in southern Wales' (Griffiths 2002, 240), and his stays there were occasionally lengthy (Roberts 2015, 50-3). He took an active interest in the region, commissioning and part-financing the strengthening of Tenby's town wall in the late 1450s (discussed in Walker 1970). A fine oriel window in the steward's solar at Pembroke Castle, in the Perpendicular style, may also be Jasper's work (Emery 2000, 636 and n. 85). The flight of steps leading up to the keep is from the 1930s, but the base of what may have been a predecessor is shown on earlier maps and photos and it, too may belong to this general period.

Jasper's income during this period has been calculated at £925 per annum (Thomas 1971, 137) which, though substantial, did not place him among the wealthier echelons of the aristocracy – perhaps accounting for the mansion's somewhat modest nature. Though his income rose dramatically after his restoration in 1485, drawn from his increased lands, construction at Pembroke during this second period of tenure is unlikely: he appears not to have visited the castle during this period, spending most of his time in the west country, chiefly at Sudeley and Thornbury castles, in Gloucs., which he held through his wife, and Minster Lovell Hall, Oxon. (Roberts 2015, 109-10, 118), though he occasionally held the sessions at Carmarthen and Cardigan (eg. in 1491 and 1492; he was also in Carmarthen in 1487, see Roberts 2015, 106, 112). It was at Thornbury that he died, in 1495, and he was buried at Keynsham Abbey, Somerset, to which his (very) modest endowments were more-or-less limited (Weaver 1901, 327-9). In view of Jasper's principal association with the West Country after 1485, the suggestion that Building ***G*** featured a chamber over the hall may assume a greater interest (see section 5.6.1 above). However, all other evidence suggests that he showed little interest in Wales during the expansion of this house plan from its West Country heartland, so the possibility can perhaps be discounted. And the Pembroke mansion is not likely to have been built following his death, after which the castle was never again a seignurial residence.

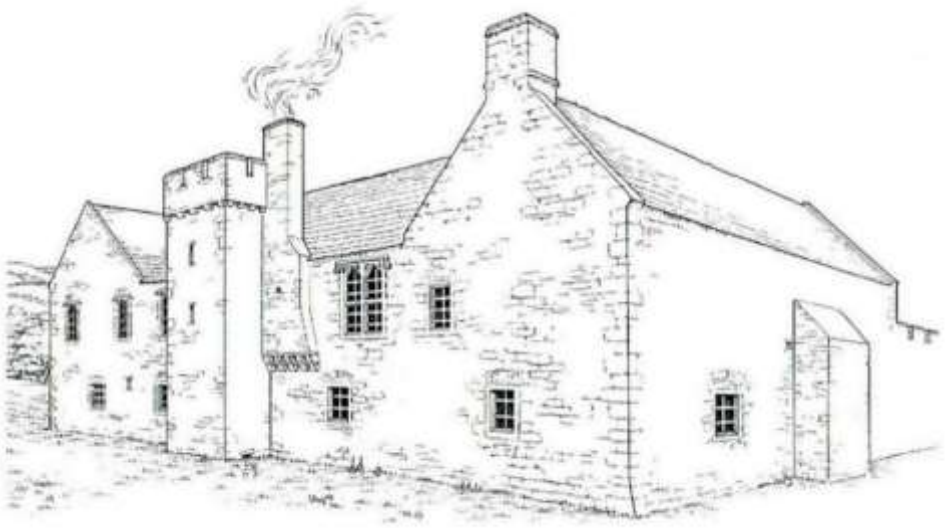


Figure 64: Reconstruction of Penallt, Carms., from the southwest, by Paul R. Davis. It may give a flavour of the appearance of Building **G** (from Davis 1989).

It has been said of Jasper Tudor that he was not a great builder (Emery 2000, 636). However, he seems to have undertaken work on at least two other castles. The now-vanished guest range at Thornbury Castle was referred to as the 'Earl of Bedford's lodging' in a survey of 1583 (Emery 2006, 184), suggesting that it was

built by Jasper after he received the earldom of Bedford in October 1485. He is also thought to have converted the gatehouse at Llansteffan Castle, Carms., into a dwelling (Humphries 2006, 2). In addition, as constable of royal castles in west Wales 1457-60, Jasper ordered the 'strengthening' of Carreg Cennen Castle in spring 1459 (Roberts 2015, 54) and a gun-port, inserted in one of its towers, may belong to this period (Lewis 2006, 1); Kidwelly Castle was apparently strengthened at the same time, but no work there has been firmly attributed to Jasper (see Kenyon 2007, 22). And it has been suggested – albeit very tentatively – that the ornate great chamber block at Sudeley Castle, normally attributed to Richard of York, might instead be Jasper's work (Goodall 2011a, 385; Emery 2007, 175 n. 18); as noted, the castle was one of his favourite residences. This work is of the highest quality and cannot be used to assess the form or decoration of the Pembroke house, which may have been more in the spirit of **Fig. 64**.

There remains the possibility however that the Pembroke house was built during the Yorkist supremacy of 1461-85, when Jasper was in exile. Pembroke was held, between 1460 and 1469, by the Yorkist lord of Raglan William Herbert I (Owen 1911, 30 et al.). His massive expenditure on Raglan Castle (Mon.) probably militates against any extensive building campaigns elsewhere (as implied in Goodall 2011a, 368), and he was otherwise heavily engaged in Yorkist service, but works at Pembroke Castle are recorded in the untranslated account mentioned in section 5.1.1 above (NLW Badminton 1 (Manorial 6) 1564 m. 2); Herbert is also known to have carried out 'repairs' to Haverfordwest Castle in 1462-63 (Griffiths 2002, 244). The tenure of his son, William Herbert II (1471-79), was in contrast notable for instability and lawlessness at Pembroke Castle (Griffiths 1972, 186, 252-3, 328, 342), rather than investment. It led, ultimately, to Pembroke's exchange, for other lands, with Edward Prince of Wales in 1479; between 1479 and 1485, therefore, expenditure at Pembroke was entered in the Crown accounts – but only minor works are recorded (in Owen 1918, 172-5).

5.6.3 A context for the buildings

New building, as at Sudeley, Thornbury and Fotheringhay, was undertaken at numerous castles – mostly baronial – into the sixteenth century. The period also saw extensive campaigns to upgrade and update existing castle buildings, and west Wales was no exception; in addition to his possible work at Kidwelly, Sir Rhys ap Thomas commissioned new work, between 1485 and 1525, on the existing buildings at Carew Castle (Goodall 2011a, 384), Narberth Castle (Ludlow 2003, 18) and Carmarthen Castle (Ludlow 2014, 205).

But though the domestic buildings in the inner ward at Pembroke Castle continued to be used until the mid-sixteenth century, there is no architectural evidence – apart from the oriel mentioned above – for any refurbishment after the early fourteenth century. It is even possible that the Great Hall itself – primarily ceremonial, only occasionally used and so probably not prioritised during any repair campaigns – had become unusable. Maintenance under Francis Court, assuming he was resident at the castle 1403-13 (see section 5.1.5 above), may have been limited to the adjoining solar which will presumably have been made habitable. A record from 1406 mentions the considerable expense he'd incurred on the 'safe custody' of Pembroke Castle, along with those at Tenby and Cilgerran (Owen 1918, 47), which may have included expenditure on its fabric. The solar appears to be the 'small apartment' within which 'wainscotting' – perhaps consistent with a fifteenth-century date – apparently survived into the mid-eighteenth century (Donovan 1805, 305), but there is no evidence for any structural work or, for instance, the provision of a fireplace in the solar: it continued to be heated by an open hearth or brazier. Nor does any physical

evidence for wainscotting survive. There are, however, impressions in the wall-plaster on the south wall of the Great Hall, next to the solar entry, which appear to be from a lobby that was intended, perhaps, to seal the solar off from the hall (**Fig. 65**); unless the roof leadwork had been replaced the hall would, at best, not be weatherproof (see section 5.1.5 above). This work might have been undertaken by Francis Court, but could belong to Richard II's visit in 1399, or perhaps to the residency of Jasper Tudor.

Otherwise, the inner ward domestic buildings seem to have been given over entirely to use by the castle's administrative staff. Evidence that the inner ditch was infilled and the outer ward enhanced as an open space was discussed in section 5.5 above, and this work may have been contemporary with the construction of Building ***G*** which was clearly intended for aristocratic use. The 'normal' relationship between inner and outer ward had, at some time, become reversed: the outer ward had become the high-status zone within the castle.

Figure 65: Pembroke Castle Great Hall: impressions, possibly belonging to a lobby, in the wall-plaster of the south wall; doorway to solar on left (the stair is modern).

This may be associated with the increased administrative and penal machinery at Pembroke. Five courts were operational by the 1480s (Owen 1918, 159), probably held in the Norman Hall in the inner ward which, it was suggested above, had become the steward's hall. In addition, prisoners of varying status were held at the castle, sometimes for lengthy periods, and it is possible that the Dungeon Tower in the inner ward was a 'pit prison' for convicted felons of lower status (see Appendix 1). Executions, moreover, were also carried out at Pembroke Castle (Owen 1897, 452). Increased activity of this nature, and its neglected buildings, may have combined to make the inner ward uninviting as a place to live. Michael Thompson has observed that similar demands on other county-town castles during the late medieval period were forcing their owners out, and into other residences nearby (Thompson 1987, 12); few were still in use as seignurial residences by the later fifteenth century, and even the heads of

administrative households could find themselves crowded out, as at the Tower of London (Thompson 1987, 12).

The same process could also occur at castles which were not primarily administrative, a celebrated example being Tretower (Brecs.) which was ultimately abandoned in favour of the courtyard house begun by Roger Vaughan, 200m to the east, in the 1450s (Robinson 2010, 3). Interestingly, by the sixteenth century, Tretower's manorial courts were held in the open space between the two (ibid., 5).

The return to Pembroke after nearly 150 years of a resident earl, in the person of Jasper Tudor, may have been made possible by a compromise solution in which Buildings ***G*** and ***H*** were erected in the quieter (and enhanced?) outer ward for Jasper's personal use. A similar process occurred somewhat later in another county-town castle, at Montgomery, where a mansion house was built in the outer ('middle') ward in 1537-40 (Knight 1993, 147-71), and rebuilt in 1622-5 (ibid., Lewis 1968, 127-41); unlike the Pembroke house, both phases were built against the curtain wall, in traditional fashion, and no free-standing structures were present. The possibility remains however that the Pembroke house, when commissioned, was primarily intended as a guest lodging, for prestigious visitors: its builder, Jasper or otherwise, may not have anticipated a protracted personal stay.

5.6.4 A royal birthplace?

Lady Margaret Beaufort, several months pregnant and already a widow, was brought to Pembroke in November 1456 by Jasper Tudor, her brother-in-law and guardian. The castle represented a secure environment, in a country at war, for the birth of her child – the future King Henry VII – early the following year. John Leland visited Pembroke Castle in the 1530s, reporting that: 'In the outer ward I saw the chamber where Henry VII was born, in knowledge whereof a chimney is new made with [his] arms and badges' (Smith 1906, 115–16). By the eighteenth century, the outer ward was empty of buildings and antiquarians searched in vain for this 'chamber'. Most opted for one of the domestic buildings in the inner ward (eg. Donovan 1805, 304; Fenton 1811, 364) – in defiance of Leland, who was writing during a period when the castle was still in use. The attribution of the event to the first-floor chamber of a tower in the outer ward, now called the 'Henry VII Tower', is more recent. It was first suggested, rather tentatively, by Joseph Cobb (Cobb 1883, 208, 217); he nevertheless continued to employ the term 'central tower', and the present name was not generally used until the 1930s. Interestingly, the chronicle of Elis Gruffudd, completed in 1552 (Nat. Lib. Wales MS 3054D, *ff*. 324r-324v), locates the birth 'in the tower which is named the Boar's Tower within Pembroke Castle', but the suspicion that this may merely be a literary device is heightened by the fact that Richard III's personal badge was the boar. The chamber in the tower is primarily a guardroom – a public space, which also links two mural passages within the outer curtain. And the castle was almost certainly garrisoned during this active phase of the Wars of the Roses, making it a busy space as well. Doubts that a high-status relative of the resident earl was delivered of her first child in such an unlikely setting have been expressed by, *inter alia*, Cathcart King (King 1978, 93). But we have seen above that the inner ward buildings were crowded with officials, while the earl's Great Hall and solar were possibly disused. Together, the evidence suggests that the above interpretations may be correct, namely that Building ***G*** had already been built, and represents the strongest candidate for the chamber within which Henry VII was born.

6 CONCLUSIONS

6.1 The inner ward

Geophysics and parchmark evidence together demonstrated the presence of a number of below-ground features. However, most were indeterminate and impossible to characterise with confidence. There remains, nevertheless, the possibility that three undated buildings were indicated; this prompted wider speculation about cooking and food-preparation at the castle.

Other, linear features may represent modern services.

6.2 The outer ward

Contrary to expectations, the outer ward appears to have always been largely empty of medieval buildings and structures. This may have been deliberate. A change of status may have occurred with the establishment of a garden in the early fourteenth century, under which the outer ward became progressively 'gentrified' culminating, after a long period of near-disuse, with the infill of the inner ditch and erection of a mansion-house in the late fifteenth century. Alternatively, it may have been intended to be an open space from the first, when it was initially laid out in the mid-thirteenth century, possibly – in part, at least – to house campaigning armies and/or assemblies of various kinds.

However, a number of features were recorded through geophysics and/or as parchmark evidence. They comprised –

- Possible early terracing of the outer ward area (***Q*** and ***R***) – prehistoric?
- A number of high-resistance, circular features, of unknown date and form; there is a possibility that they may relate to Iron Age occupation.
- A linear feature ***J***, which may represent the boundary of a burgage plot established before the outer ward was laid out over part of the town.
- A void/stone deposit ***K***, on the edge of the inner ditch, which may be the remains of a medieval bridge abutment.
- A large building ***M*** against the southwest curtain wall, probably medieval and possibly for storage.
- A possible medieval lean-to building ***N*** against the south curtain.
- A circular feature ***O*** probably representing a medieval well.
- The free-standing, winged mansion-house ***G***, and associated building ***H***, probably from the late fifteenth century.
- A slight, undated building ***S***, possibly medieval but perhaps later.
- A complex of enclosures or terraces ***P***, perhaps representing later medieval garden features.
- Two buildings ***A*** and ***B***, possibly seventeenth-century, one of them associated with a below-ground 'passage' that may be a Civil War gunpowder magazine.
- Further undated features including a pit ***U*** and a possible building ***V***.
- An early twentieth-century building ***D***, of unknown purpose.
- Five buildings ***C***, representing 'Hall-huts' constructed for the troops that occupied the castle during the Second World War.
- An undated building ***L***, which may be associated with ***C***.
- Some other minor features of indeterminate form and date.

While building/rebuilding of domestic accommodation in castles was not unusual during the late medieval period, Buildings ***G*** and ***H*** – if they do represent a free-

standing, double-winged gentry house – are in many ways quite exceptional; I know of no close parallels in British castles. And we are by no means certain when it was built, why, or by whom. Some of these questions might be answered by excavation. A turf-strip to reveal the plan of Building ***G***, followed by targeted evaluation, might provide a high return of information with minimal disturbance to the remaining archaeology. The building has been excavated once before, and much may have been lost. It is possible, however, that some deposits may survive in the cess-pit, with the potential to yield priceless information regarding the date of the building and the nature of its use, and status, in addition to diet and health, parasitology, contact and trade, and the vegetational environment of the castle. The excavation of the cesspit at the nearby Tudor Merchant's House, in Tenby, has shown just how much can be revealed (Murphy 1989).

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APPENDIX 1 – Water supply, and prisoners, at Pembroke Castle

Water supply

No well is mentioned in any of the sparing medieval accounts for Pembroke Castle. Nor does a well survive (see above, section 5.4.2). This has led to a great deal of speculation about the castle's water supply, and the development of a mythology. The latter began unwittingly with the Elizabethan antiquarian George Owen, who produced a pamphlet on the defence of Milford Haven in 1597. In it, he stated that 'within Pembroke Castle is a great cave called the Wogan, and in the same is a well of fresh water of great depth, for the use of the people within the castle' (Owen 1897, 558). This has traditionally been taken to mean that the well was in the Wogan. But is this what Owen meant? My reading is that, by 'in the same', Owen meant that the well lay in the *castle*, ie. in one of the baileys.

The absence of physical evidence for a well in the Wogan, and indeed its unlikelihood, led subsequent authors to twist Owen's words, replacing 'well' with 'spring' (Fenton 1811, 366, 370; Lewis 1833; *et al*.). But the Wogan's geology argues against a spring and, again, there's no physical evidence that a water-source ever rose there.

Owen's pamphlet was widely published. During the siege of the castle, in 1648, Oliver Cromwell wrote to the Commons that he could deprive the garrison of their water by 'beating down a staircase which goes to a cellar where he has a well' (Phillips 1874, 315-18): clearly he meant aiming his cannon on the stair turret that leads down from the Great Hall basement to the Wogan. This implies that he knew of Owen's pamphlet, and that he too had misunderstood it. But the stair turret still survives, indicating that it wasn't bombarded and suggesting that Cromwell subsequently found out the truth. A number of captives were taken during the siege, and there were also some deserters, who yielded information of various kinds (Mathias 1987, 207; Leach 1937, 199) which perhaps included the real location of the well.

Later on, another local 'tradition' developed – that water was piped to the castle, across Pembroke River, from Monkton to the south. It seems first to have appeared in print in 1805, when the traveller Edward Donovan was told that that lead pipes, carried through Monkton Bridge, were destroyed by Cromwell (Donovan 1805, 310). But Cromwell himself, in all his extensive correspondence from Pembroke (mostly published in Phillips 1874), mentioned no such incident, while there is no evidence that water-supply played any part in the garrison's surrender (Leach 1937, 203, 235). The tradition had nevertheless become both firmly entrenched and embroidered by the time Joseph Cobb was writing in 1883, while the pipes had become ceramic and 'laid in cement' (Cobb 1883, 210). The antiquarian Edward Laws went a stage further in 1888 with an entirely spurious, but dramatic account in which a traitor, one 'Edmunds', revealed the pipes to Cromwell (Laws 1888, 344). It all seemed to have been confirmed when some earthenware pipes were exposed, in a field near Monkton, in the 1930s (*Western Telegraph*, n. d.); it had probably passed from memory that 'pipelines, up to half a mile long, from seven public conduits' had been laid down by the borough corporation, to supply Pembroke with water, during the 1820s (Lewis 1833).

The story was very effectively debunked in 1937 (Leach 1937, 232-6), but traditions die hard; Pembroke's water-pipes appeared, with caveats, in a paper on castle water supply published during the 1990s (Ruckley 1990, 17). However, the suggestion of an external, piped supply by the seventeenth century is not, in itself, implausible: it existed elsewhere, usually as a later feature, but was present during the fourteenth century at Restormel Castle, Cornwall (Molyneux 2003, 16), and appears to be recorded at nearby Carew Castle, Pembs., in the sixteenth and seventeenth centuries (King and Perks 1962, 274). Nevertheless, a piped supply could only realistically enter Pembroke castle from the east, where

none is recorded. Any pipelines from the other three sides would have to cross the river before rising more than 10 metres, very steeply, to the castle – an improbable feat for water-supply systems of the seventeenth century.

The castle prison(s)

Prisoners at the castle are first mentioned in the 1270s (Rees 1975, 104) but, as the head of a marcher lordship and county, will have been held there from the twelfth century. They were held both after sentencing – sometimes for lengthy periods – and on remand (ibid.; Owen 1918, 51): felons arrested in subordinate lordships were sent to Pembroke to await trial (Owen 1897, 451-61). A 'Prison Tower' is mentioned in an account from 1331 (Owen 1918, 138-9), whose terms imply a spatial association with the steward's solar; it is possible, therefore, that the so-called Dungeon Tower in the inner ward is meant. The basement of this tower is accessible only via a trapdoor from the first floor and is lit by a single, very narrow slit-light with an upwards-plunging embrasure. The first-floor entry features a lobby, closed off by drawbars at both ends, in the 'airlock' arrangement seen in other castle prisons (Nevell 2015, 209), but from which the spiral stair to the upper floor is accessed. However, there is no latrine in the tower and it may be that the basement, instead, represents a strong-room like those increasingly being recognised, eg. at Kidwelly Castle where the narrow, plunging slit was intended to shed light down onto a desk or lectern (Kenyon 2007, 27). But, while latrines were present in most castle prisons, they were not universal (Nevell 2015, 212); the towers normally identified as gaols at Pevensey Castle, for example, also lack latrines, though one has a urinal (Chapman 2007, 110). Following Richard Nevell's distinction between the various classes of inmate held in castles (as opposed to aristocratic prisoners), and the arrangements made for them (Nevell 2015, 211-12), the Dungeon Tower basement may represent a 'serf's prison' much like the Scottish 'pit-prison'; the lack of any latrines however suggests that, unlike many of the latter, the chamber above is unlikely to have housed middling-status prisoners.

Nevertheless, it has been conjectured that two gaols (at least) were present at Pembroke, for differing classes of prisoners and perhaps for those awaiting trial (Walker 2002, 176). One of the chambers in the Monkton Tower, in the outer ward, shows a double-doored 'airlock' lobby flanked by a latrine and possible gaoler's lodging (Neil Guy pers. comm.). The chamber itself is lit by two very narrow lights and may therefore represent a prison for inmates of middling status, or those on remand. The chamber above also features a small annexe, possibly a bedchamber; might it represent the lodging of the sheriff of Pembrokeshire? (though it lacks a latrine). Such usage, combined with a freeman's prison, might fit in with the suggested 'gentrified' status of the outer ward.

PEMBROKE CASTLE: GEOPHYSICAL SURVEY PART I: RESULTS

RHIF YR ADRODDIAD / REPORT NO. 2016/27
RHIF Y DIGWYLLIAD / EVENT RECORD NO. 109358

Paratowyd yr adroddiad hwn gan / This report has been prepared by

Alice Day

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Mae'r adroddiad hwn wedi ei gael yn gywir a derbyn sêl bendith / This report has been checked and approved by

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Swydd / Position: **Head of DAT Archaeological Services**

Llofnod / Signature  Dyddiad / Date: 05/Sep/2016

Yn unol â'n nôd i roddi gwasanaeth o ansawdd uchel, croesawn unrhyw sylwadau sydd gennych ar gynnwys neu strwythur yr adroddiad hwn

As part of our desire to provide a quality service we would welcome any comments you may have on the content or presentation of this report

PEMBROKE CASTLE: GEOPHYSICAL SURVEY PART II: DISCUSSION

RHIF YR ADRODDIAD / REPORT NO. 2016/27

RHIF Y DIGWYLLIAD / EVENT RECORD NO. 109358

PART II: DISCUSSION

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