‘SEEING THROUGH THE TREES’:
THE COTSWOLD EDGE LiDAR PROJECT

THE GLOUCESTER AND DISTRICT ARCHAEOLOGICAL
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Editorial Committee
Diane Charlesworth (editor) & Les Comtesse

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FRONT COVER : Clockwise from top left, LiDAR images of Haresfield; Climperwell; Ebworth; Popes Wood (all LiDAR images c Gloucestershire County Archaeological Service)

BACK COVER: Clockwise from top left, resistivity survey Slutswell; verifying LiDAR features, ‘ground truthing’ at Standish Woods; documentary researchers at work in Gloucester Archives, (photos by John Loosely and Terri Sowerbutts); surveying earthworks at Standish Woods (photo by Mike Milward); magnetometry survey Shortwood, Haresfield; (photos, except those attributeed above, by Tony Roberts).

'SEEING THROUGH THE TREES': AN ARCHAEOLOGICAL PROJECT FOR THE COMMUNITY THE FIRST YEAR

Terry Moore-Scott

Introduction

It has always been Gloucester and District Archaeological Research Group (GADARG)'s intention to provide its members, and indeed anyone in the local community so interested, with opportunities to take part in archaeological field-work and to keep abreast of new archaeological techniques such as geophysical surveying.. For many years it has been possible to help with a major excavation of a Roman villa site at Frocester which was completed two years ago. Chances to engage in excavations continue to occur but, inevitably, with the reduction in purely research excavations and the dominance these days of professional archaeological units in developer-led excavations, we have had to focus more on field activities using a range of non-intrusive surveying techniques and analytical methods. Not only had our membership indicated that more such opportunities was something they welcomed, the recent media exposure given to archaeology by programmes such as Time Team, implied that there could also be interest among the wider public. This was the background to our 'Seeing Through the Trees' project.

The actual catalyst for the project was the arrival into the public domain of a quantity of raw LiDAR (Light Detection and Ranging) survey data covering a swathe of land along the Cotswold Edge in Gloucestershire roughly between Cheltenham and Stroud (figure 1). The survey was organised by the Cranham Local History Society and carried out in 2008 by Richard Chiles of Precision Terrain Surveys Ltd. Most of the funding for this project was provided by a grant from the Cotswold Conservation Board Sustainable Development Fund.[1]

Thanks to a grant of just under £10,000 awarded to GADARG by the National Lottery 'Awards For All' scheme, the group was able to embark on the 'Seeing Through The Trees' project. This made it more possible for local amateur archaeologists to become involved in learning about the latest LiDAR technology and exploiting its output to discover and research hitherto undetected archaeological features in the local countryside (see below for an explanation of LiDAR and its applications).

The Lottery grant itself enabled GADARG to meet the costs of producing the LiDAR imagery and of purchasing a range of surveying and other supporting equipment required for the project. It has also supported the cost of producing this report and distributing it to all GADARG members and other interested parties.

From the survey, around 400 features of possible interest were identified on the ground, although in practice far fewer than this are expected to be of significance archaeologically. This report covers the first year's work up to June 2010 and provides detailed reports on the first eight sites investigated fully (see details below). Work will continue as long as there are un-investigated sites and we expect to benefit from lessons learnt during this first phase.

LiDAR: Its techniques and application

Ever since it was first introduced by O. G. S. Crawford in the early 20th century, aerial photography has been a way of detecting archaeological features in the landscape, but its weakness has always been the inability to see what lies beneath dense woodland foliage. This has all changed with the advent of airborne laser technology called LiDAR, which uses a laser to measure and profile, with great accuracy, physical features on the ground which are normally obscured by trees and undergrowth and therefore invisible to conventional aerial photography.

The survey uses equipment carried on a light aircraft flying at a constant altitude over a pre-arranged strip of ground and firing a laser towards the earth in rapid pulses (thousands of times per second). Where the laser strikes a solid object, it is reflected back to a detector on the aircraft. The differences in the reflected signal time will directly relate to changes in the height of the ground surface and of objects on it. This produces what is known as a 'first return' ground profile. However, on the basis that some light actually penetrates the tree canopy, it is possible to derive a 'second return', i.e. with the trees removed.

There are thus three stages in the process of producing a LiDAR image: first, the aerial survey itself; secondly, initial computer processing of the resultant data and thirdly surface-modelling of that data, eventually to produce the 'second return' images. The resultant images can be enhanced further by changing the angle of the light source, thus creating

shadows. Also, by combining a number of light source angles, one can achieve a single full-relief image. Doubtless, some of the features revealed will prove to be of natural origin, or man-made and of no archaeological interest, but the technique is capable of detecting a variety of previously unknown features, such as ancient earthworks and habitation sites, burial mounds and roadways. An impressive example of the way in which LiDAR can see through the trees is reproduced as figure 2.[2]

Project aims and objectives

The Project has the following main aims and objectives:

a. The transcription, analysis and investigation of available raw LiDAR data relating to the area of Gloucestershire in question, in order to identify and record any hitherto unknown archaeological features in the landscape of that area.

b. Provision of life-enhancing opportunities and training to GADARG members, other interested local groups and the public at large, to allow them to develop their skills and gain a better understanding of leading-edge archaeological survey techniques and a range of fieldwork, analytical, documentary research and reporting activities.

c. Wide publicity of the project and its objects to inform the public and encourage their participation.

d. Formal publication of the results of the work carried out, with a view to adding to the county's Historic Environment Record (HER, formerly Sites and Monuments Record, SMR).

Methodology

The methodology adopted for this project took the form of the following sequence of activities:

a. Initial computer transcription of the raw LiDAR survey data and production of basic working data and maps (performed for the project by the Gloucestershire County Council's Archaeology Service - GCCAS).

b. Desk-based analysis of this data in association with the existing archaeological record (such as aerial photography, Ordnance Survey maps, HER entries) to eliminate known archaeological sites and features and identify new sites of potential interest.

c. Publicity about the project within GADARG, among a wide range of other local heritage groups and through the media (including regional and local radio and TV and various historical/archaeological publications) to raise public awareness of the project and recruit volunteer participants.

d. Provision of a programme of training for volunteers covering the following areas: LiDAR appreciation, earthwork surveying including the use of Geographic Positioning Systems (GPS) and Electronic Distance Measuring (EDM) systems, geophysical surveying, mainly resistivity, but also magnetometry (see technical synopsis section below for explanations of these techniques) and documentary research using the facilities of the Gloucestershire Archives.

e. With land-owner's approval, make initial field visits to reconnoitre ('ground prove') selected individual sites to evaluate their archaeological potential and prioritise those that merit further investigation.

f. Detailed investigation and recording of each such site using all available and appropriate survey techniques. Each field visit to be led by a trained and experienced GADARG member and undertaken only after having carried out an appropriate risk assessment.

g. Thorough analysis and evaluation of all subsequently available information for each site examined (including any relevant documentary evidence), and eventual publication and dissemination of a detailed report on each site.

Throughout the project, these activities have been organised and managed by a sub-committee of GADARG, working in close collaboration with the GCC Archaeology Service and the National Trust.[3]

Process and activity

Data Processing

Transcription and initial interpretation of the raw survey data was carried out for the project by the Archaeological Service of the GCC and paid for out of the Lottery grant. The principal end-product of this process was imagery of the whole terrain, surveyed in various forms depending on light angles and viewpoints selected. The images were then studied and every feature noted was checked against the HER database in order to identify whether or not it was already known. Sites meriting further study were listed with relevant back-up detail and prioritised. Around 400 sites were deemed to be of possible interest as a result of this process, and of these, approximately 80% were referred for a 'ground verification' visit. This material was made available to fieldwork leaders for their use.

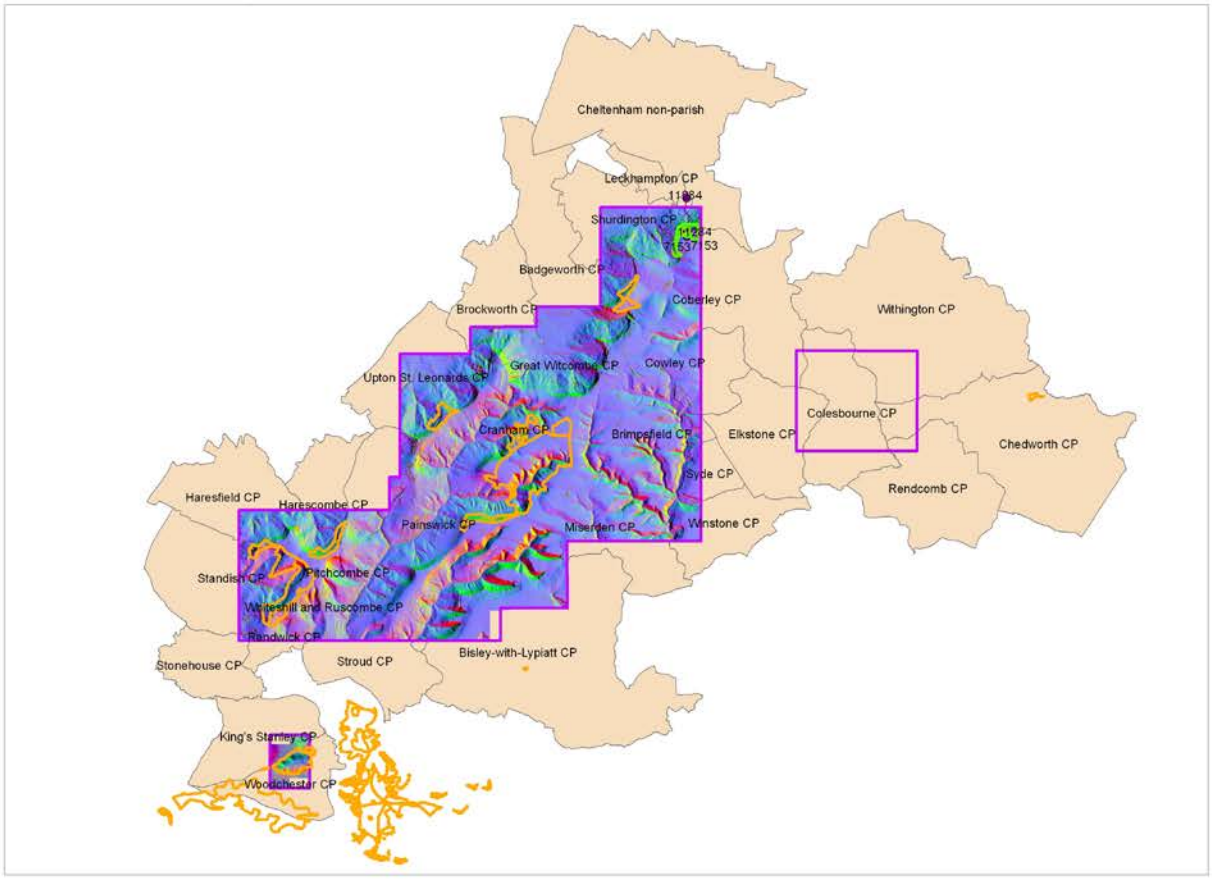

Figure 1. Coverage of LiDAR project. (© Gloucestershire County Archaeology Service).

Figure 2. Miserden Castle, Gloucestershire. The LiDAR image shows clearly the earthworks of the medieval motte and bailey castle, which are hidden beneath the trees in the conventional aerial photograph.

Finances from the Lottery grant were also used to acquire a laptop computer and appropriate software to enable raw geophysics data from any site to be processed, not only for post-fieldwork study, but also for on-site checking while work was in progress.

Publicity

Starting in May 2009, a pro-active programme of publicity was set in motion aimed at disseminating information about the project, not just to GADARG members, but also to the wider public and aimed at recruiting volunteers to participate in the project and publicising the welcome support given by the National Lottery Grants Scheme.

The following actions have taken place:

Letters have been sent to around 30 local historical and archaeological societies, museums and the National Trust operating in the area covered by the survey. Leaflets inviting volunteers were produced and widely distributed and articles and pictures appeared in the Gloucestershire Echo, Gloucester Citizen, Stroud Life and Stroud News and Journal newspapers. Two broadcast interviews were given with BBC Radio Gloucestershire at Haresfield and in the studio, contact was made with the University of Gloucestershire and a lecture given at Bristol University. A display was set up at the Autumn 2009 meeting of the Gloucestershire Local History Association and articles appeared in the January 2010 Council for British Archaeology (CBA) SW Newsletter, and the winter Newsletter of The Bristol and Gloucester Archaeological Society (BGAS). 'Seeing Through the Trees' was also briefly mentioned in the BBC's 'Countryfile' TV programme on 25 April 2010. Information on the project is also expected to appear in due course in the national 'Current Archaeology' magazine's 'Society Spotlight' feature, which profiles the work of local societies around the country. Further publicity will continue as appropriate.

Participation

Documentary research.

After publicising the need for volunteer researchers (in GADARG's newsletter and through press releases) and prior to the commencement of fieldwork, 11 people, ten of whom were GADARG members, offered to research selected sites. The eleventh responded to a local press release. Volunteers, some of whom were paired with others who had more experience, were briefed on suggested lines of research in the Gloucestershire Archives, for example, maps, documents, photographs and books and on how to list references. It was made clear that we were not looking for a formal report, but essentially a note of what had been consulted and details of anything that might shed light on the site being investigated. Initially five sites were chosen for research and allocated to seven of the volunteers. Another two sites were added after initial field investigations and updating of the HER and three more volunteers allocated to their research. The remaining volunteer will be allocated research at a later date.

Training.

Between April and August 2009, 11 dedicated training sessions were carried out, some in-doors, some out in the field, largely given by members of the GCC Archaeology Service. This was intended primarily to equip members to be able to perform as future team leaders, these sessions comprised two 'general awareness' briefings with 19 people, one on LiDAR interpretation which 7 people attended, two sessions on earthwork surveying (12 people) and 6 sessions on geophysics surveying (resistivity and magnetometry) involving 37 volunteers. The earthwork survey training included instruction on global satellite locating (using a Garmin GMAP 60 CSX), use of EDM equipment, a 'dumpy level' (for measuring horizontal levels) and plane table, on which to draw and record measurements. On-the-job training regularly took place also during site surveys.

Fieldwork.

Over the first year of the project, the overall number of persons variously involved in its activities was 69. Of this number, 36 were GADARG members, 9 were new to the group, 9 were from several different local history societies and there were a number of representatives from the National Trust and GCC Archaeology Service. Up until June 2010, 20 on-site field activities had taken place (for example, site 'recces' and geophysical surveys). These involved between 1 and 9 persons each time, averaging at 5 per visit, although on one exceptional occasion (when 24 squares of resistivity were undertaken at Slutswell on 21 March 2010) 21 persons were involved. Fieldwork at Shortwood, Haresfield on 20 November 2009 also involved school children from Haresfield Primary School. With few exceptions, the team included a leader whose role was to co-ordinate all the work on the site and produce the subsequent report.

Technical synopsis

As several sites required investigation through the use of resistivity and magnetometry it may be helpful to readers to have some understanding of how these work. Resistivity meters measure the electrical resistance of the ground, which varies according to the amount of moisture present. An electrical current is passed through the soil between two electrodes inserted into the ground and the resistance is

measured in ohms. Lower resistance readings, which appear darker on the survey plots (except for Slutswell, figures 5 and 6, which are in reverse), indicate damper areas such as ditches, whilst higher resistance appears lighter and implies the presence of solid material such as a stone feature (Bucks Head, figure 6, feature 8). The measurements are usually taken at 1m. intervals along a series of parallel traverses 1m. apart. The resistivity equipment used in the project was a twin-probe TR/CIA resistance meter (with 0.5m electrode separation).

Magnetometry is a method of measuring and mapping patterns of magnetism in the soil. Ancient activity, particularly burning, leaves magnetic traces when detected with the right equipment. Buried features, such as ditches and pits, can show up clearly from depths of between one to two metres (for example, see the Upton report figure 6). To avoid contaminating the readings, surveyors must be free of magnetic materials, so watches, rings, metal zips and the like must be kept away from the survey area. For this project, the instrument used was a gradiometer Geoscan FM256.

Site evaluations

We were aware that the ideal time to carry out site reconnoitre and surveying would be late autumn and winter, when sites could be expected to be free of concealing brush and undergrowth. In the event, the winter of 2009/2010 was exceptionally harsh, considerably limiting the opportunities for on-site work and the results in terms of numbers of sites investigated, were less than hoped-for. Even so, detailed work was carried out on eight different sites, the majority on National Trust land. These were:

Buckshead Barrow (Cranham), to obtain further information about the possible Neolithic barrow; leader Tony Roberts.

Climperwell (Cranham), to investigate two possible barrows; leader Tony Roberts.

Ebworth (Painswick), to examine an unidentified mound; leader Angela Newcombe.

Shortwood, Haresfield. To explore an unidentified mound; leader Ann Maxwell.

Pope's wood (Upton St Leonards), to investigate linear earthworks, said to be Civil War trenches; leader Martin Ecclestone.

Slutswell (Elkstone), to probe further into evidence of settlement, possibly Roman; leader Tony Roberts.

Standish Woods (Randwick), to survey a possible Bronze Age round barrow and an undated ditch and bank; leader Mike Milward.

Upton Mill (Upton St Leonards), to investigate a possible medieval watermill site, hitherto unidentified; leader Ann Maxwell.

Documentary research reports have also been received from: John Loosley on "The Old Shop" (fieldwork pending); Lynda Evans and Helen Kirkup on the Upton St Leonards mill site and Terri Sowerbutts on Witts Enclosure (fieldwork pending). John Newbury's knowledge about the Ebworth site proved useful and Valerie Hill sent a draft of her initial investigations into Witts enclosure. During the course of the research it became clear that close co-operation between the field workers and documentary researchers was necessary, rather than always via the research co-ordinator.

Conclusions

Information given here can obviously only relate to the work successfully completed during the past year on the eight sites earmarked for investigation. This has however given the group valuable experience in the general conduct of such a project and provided the basis for GADARG to continue investigating as many LiDAR derived sites as is warranted for a number of years to come.

Referring to the stated Aims and Objectives of the project, the following points can be made:

a. The transcription and initial analysis of the raw LiDAR data has been completed in full and the resultant material is now available to enable the project to continue for as long as necessary.

b. Training and on-site experience has been at the core of the project and attracted considerable attention from the start. It will be a continuing commitment as the work carries on, hopefully appealing to still more new people who are keen to be involved. But for the highly inclement winter, undoubtedly more field activities could have been carried out, but those organised to date have provided a variety of rewarding experiences to new and existing enthusiasts.

c. GADARG's initiative in LiDAR exploitation and the opportunities it offers to the community has received considerable publicity through local and regional media, as has the backing given to the project by the National Lottery and other supporting bodies. Publicity will certainly continue as work proceeds.

d. The results of work carried out to date are fully reported on in this document. All future work will be similarly written up and placed into the public domain.

The 'Seeing through the Trees' project has been very successful and has raised the profile of amateur archaeology in Gloucestershire. It will continue to offer opportunities for active participation in practical fieldwork and research. The project team has learnt a number of useful lessons over this first year, including how to work on difficult-access sites, how best to help inexperienced document researchers search for and find the relevant records and in coordinating the production of fieldwork reports. The year's experience will undoubtedly benefit future investigations and fieldwork.

Acknowledgements

Apart from thanking the National Lottery, without whose generosity this project may never have happened, GADARG have to especially thank the Gloucestershire County Council Archaeology Service, primarily Jan Wills, John Hoyle, and Tim Grubb for making available to us their expertise and active encouragement throughout the project. Thanks also to the National Trust, particularly Martin Papworth, for permitting us to work on their land and giving practical help and encouragement. Many others have also helped in making the project a success, but outstanding among these has to be Tony Roberts of GADARG and the GCC Archaeology Service whose leadership and dynamic contribution to the project must be acknowledged.

References

1 Additonal funding for the Cranham LiDAR Survey 2008 came from the following groups: Cotteswold Naturalists' Field Club, Colesbourne Estate Company, Cranham Local History Society, Crickley Hill Archaeological Trust, Gloucestershire County Council, Crickley Hill Sites Warden, Leckhampton Local History Society, The National Trust, Randwick Historical Association, Stroudend Tithing Educational Trust and Mike Rigby.

2 Gloucester Historic Environment Record (GHER) report 268.

3 Both for ease of access and since a good deal of the ground originally surveyed was National Trust estate land, the first phase of the project has tended to concentrate on locations on land owned by the NT. Their support to our project has been considerable and much appreciated. We are also indebted to NT's Regional Archaeologist, Martin Papworth, for approving an Archaeological Research Agreement (10.5.2010) which allowed an excavation.

STANDISH WOODS

Michael Milward

Introduction

A team led by Mike Milward, comprising Martin Ecclestone and Les Comtesse of GADARG, Allan Smith and John Wadley of the Randwick Historical Association and Richard Huxford of the National Trust (NT) carried out a physical survey of two features in Standish Woods. These had been identified as requiring further study on examination of the results of the Lidar survey of the Cotswold edge (processed Lidar images showing these two features are figures 1 and 2). The survey was conducted on 10 February 2010 on a fine but frosty day after recent snow had melted. Woodland undergrowth on both features was at a minimum at that time of year, but the ground surface was covered with a substantial depth of fallen leaves.

Location and archaeological and historical context

Site A, the mound, is located at NGR SO 82363 06786 and site B, the bank and ditch at NGR SO 83549 07917. Both sites are on a ridge composed of an outcrop of the Scottsquar Member of the Birdlip Limestone Formation within the Middle Jurassic Inferior Oolite Group. The mound is 215m above Ordnance Datum (OD). The ditch and bank feature is 235m above OD.

The mound is located approximately 200 m. SSW of the Randwick Long Barrow (GLO 10), and there are two known round barrows approximately 200m. NE of the Randwick Long Barrow.[1] The ditch and bank is located 1,250m. NE of the well-known Cross Ridge Dyke (see figure 3).[2] Both sites are at the crest of a ridge within the area of woodland known as Standish Woods or Randwick Woods, which has been forested since at least 1297,[3] and has been managed woodland in more recent times; a larch plantation was noted before 1914, but was felled for the war effort between 1914 and 1918.[4] There has been extensive quarrying throughout the woods, including in the area of both sites.

The earthwork survey

The mound was measured using tapes and a dumpy level (figure 4)on north, south, east and west axes,

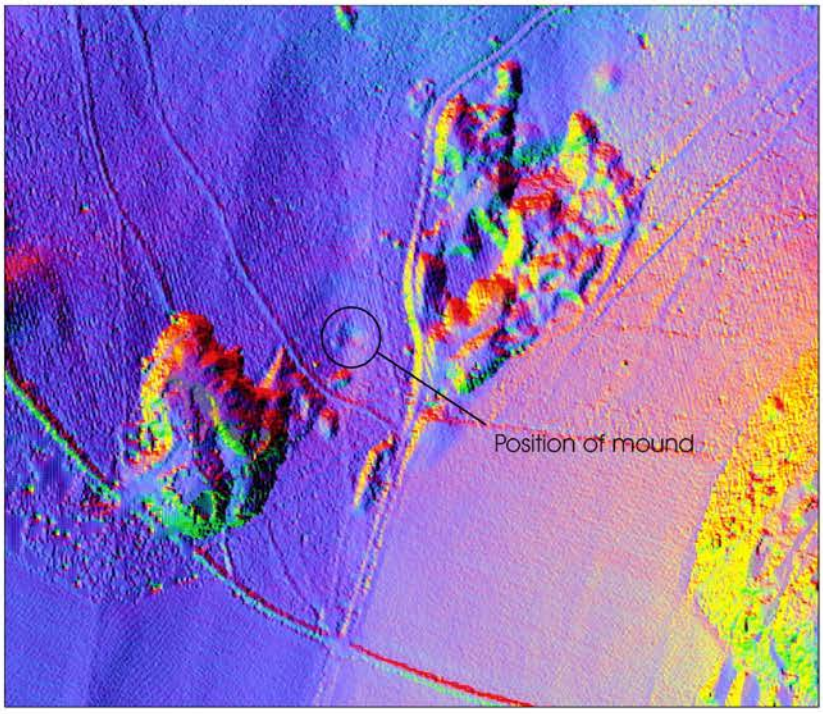

Figure 1. Lidar image of mound (© Gloucestershire County Archaeology Service).

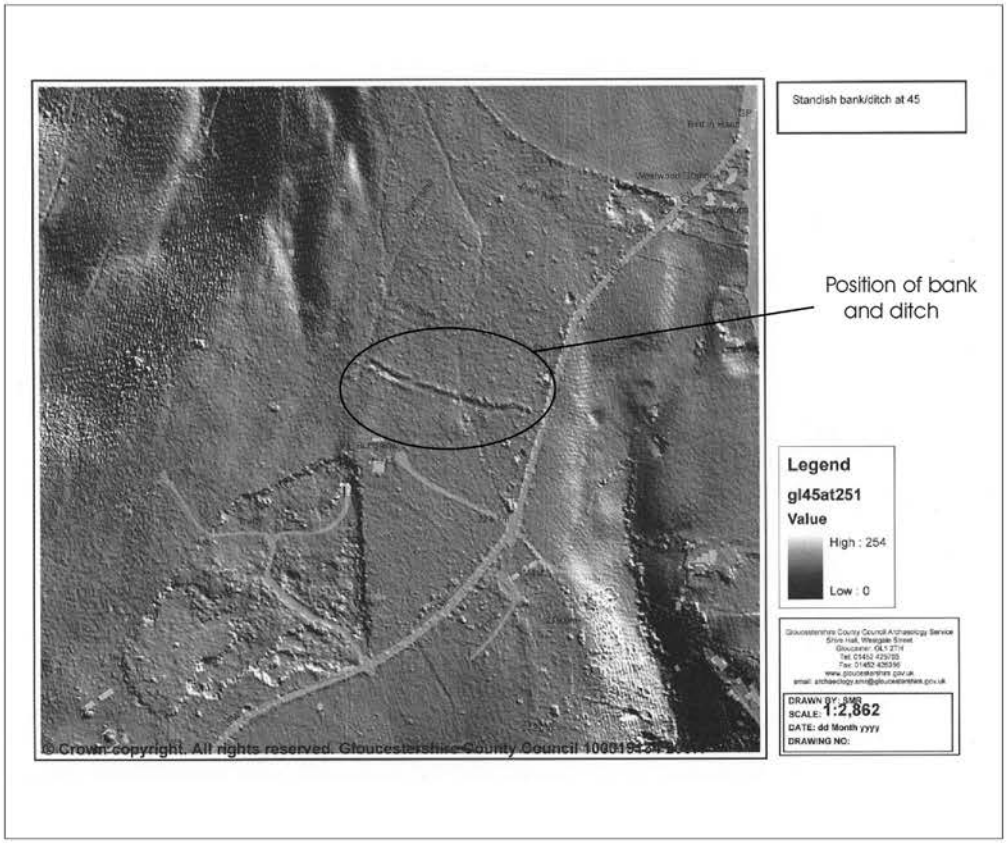

Figure 2. Lidar image of bank and ditch (© Gloucestershire County Archaeology Service).

also on other axes as vegetation allowed. This produced a profile (figure 5) showing a fairly regular circular mound, approximately 12m. in diameter with a slight depression on the south side of the summit. The ground surface drops away to the west and south of the mound; the height of the mound above the ground surface on the level ground to the east is 1m. Loose stones are visible through the covering of fallen leaves on the summit.

The bank and ditch feature (figure 6) was also measured using tapes and dumpy level to produce profiles at three places along its length. The feature extends from the road into Randwick from Edge, which here forms the parish boundary between Standish and Whiteshill and Ruscombe, westwards through woodland, across a corner of pasture and back into woodland to terminate on a current pathway. Its length is approximately 143m. The ditch, which is on the south side of the bank, is more pronounced than elsewhere at the western end of the feature, where there appears to be a bank on both sides of the ditch. The profiles (figure 7) show the bank to be consistently 3m. wide, the ditch 6m. wide and the depth variously 1m. to 1.5m. from top of bank to bottom of ditch.

Conclusions

The mound has the general appearance of a Bronze Age round barrow (figure 4) and has dimensions similar to the two barrows 400m to the NE, beyond the Neolithic Randwick Long Barrow, which are recorded by Witts as having a diameter of 32 ft (9.75 m.) and a height of 4 ft (1.2m.).[5] The proximity to other prehistoric burial monuments raises the likelihood that the mound is a round barrow, and given the extensive quarrying that has occurred in the immediate area, it is possible that there once were more that have now disappeared.[6] The trees growing on and around the mound would make geophysical survey very difficult if not impossible, and quarrying may have removed part of any surrounding ditch.

The ditch and bank bisects the same ridge as the Cross Ridge Dyke further to the south, and both features have a similar profile (figure 7). (The profile of the Cross Ridge Dyke shown in figure 7 was not measured by the GADARG survey, but derived from the RCHM publication).[7] Its accuracy is uncertain due to the very small scale of the RCHM figure. The measurements made by Witts, bank 12 ft wide 2.5 ft high, ditch 24 ft wide 2.5 ft deep, cannot easily be

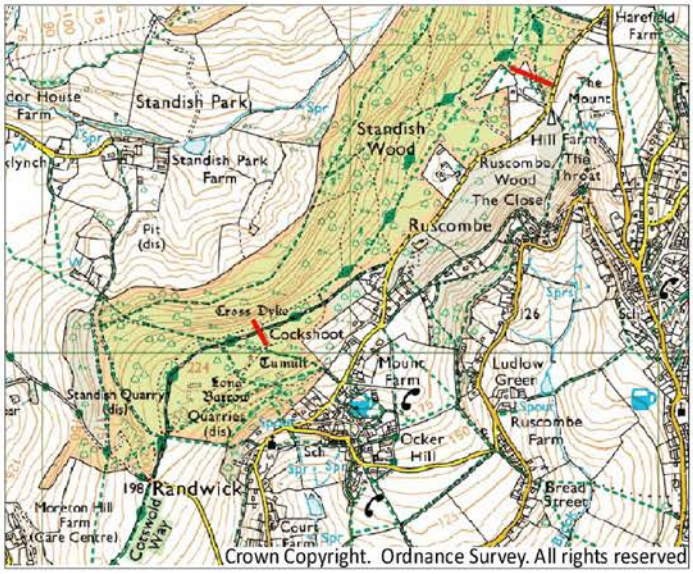

Figure 3. Map showing relationship of Cross Ridge Dyke (labelled as "Cross Dyke") and ditch and bank, both marked in red.

Figure 4. Mound seen from SE (photo by author).

Figure 6. Bank and ditch, looking east (photo by author).

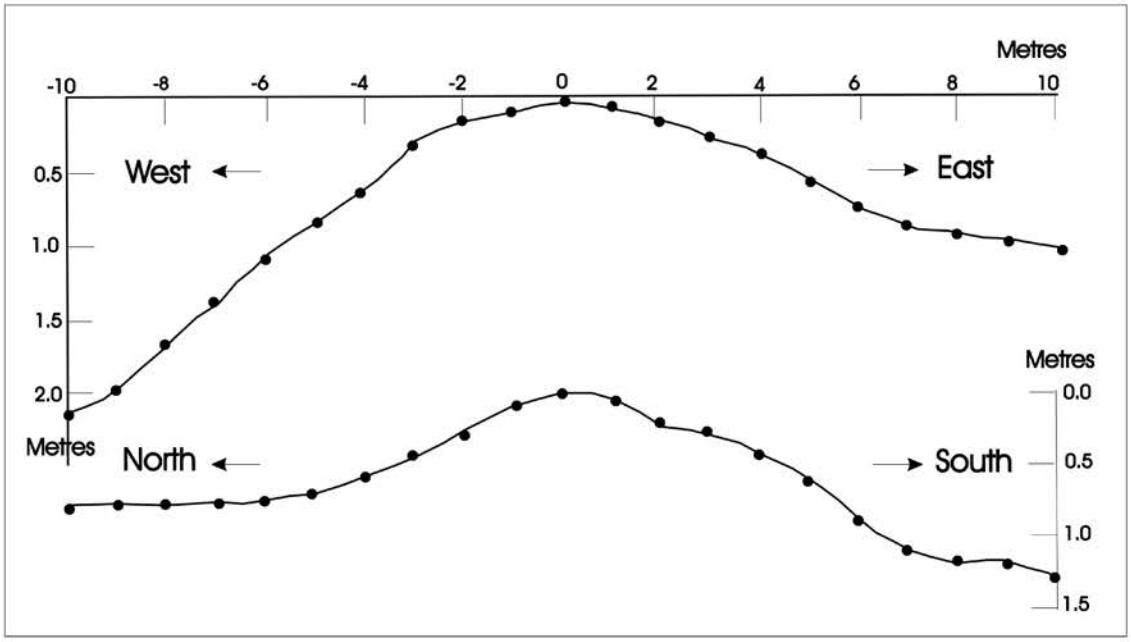

Fig 5. Possible round barrow profiles.

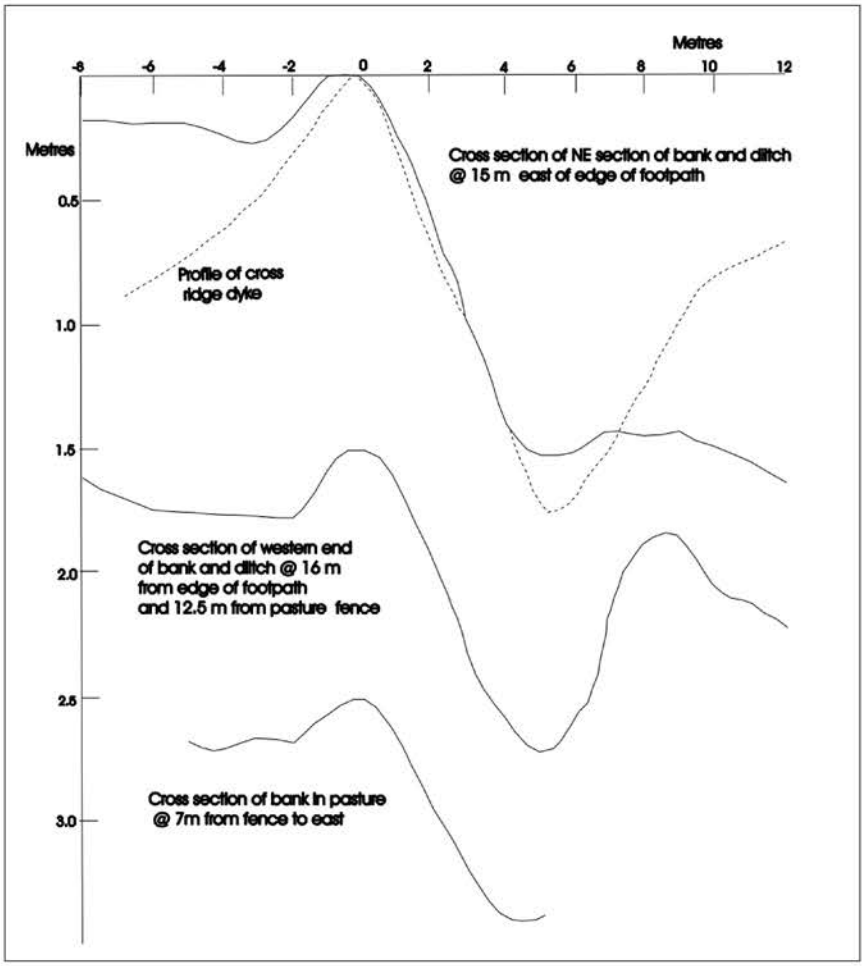

Fig. 7 Profiles of bank and ditch; from top: cross-section of NE section; cross-section of western end; and cross-section of bank in pasture. NB. profile of Cross Ridge Dyke is overlain on the NE section for comparison.[2]

compared with the profiles in figure 7, as he did not define 'width' and 'depth.[8] However whereas the Cross Ridge Dyke cuts right across the relatively flat area at the top of the ridge, running between the steep slopes to the east and west, the ditch and bank does not reach the steep slope on either side, terminating on the west side some 25m short of it. The Cross Ridge Dyke is assessed as likely to be of Iron Age date, cutting off an area of high ground in the manner of a hillfort;[9] if the ditch and bank are also prehistoric, it may be that they represent an earlier (or later) attempt to enclose the same hilltop, but much more of it. However, it should be noted that the Cross Ridge Dyke has the ditch on the north side of the bank, whereas the ditch and bank which were the subject of this survey has the ditch on the south side. It is also noteworthy that the east end of the ditch and bank is close to the start of the deep defile known as The Throat and that if the ditch and bank were to run from The Throat all the way to the west slope it would enclose the whole of the promontory.

Acknowledgements

I am grateful to Martin Papworth of the National Trust, the landowners of Standish Woods, for permission to work on National Trust land, and to National Trust tenant Jenny Hayward of The Bungalow at Randwick, for access to the part of the ditch and bank running across her pasture; also for her advice on the origin of other undulations on the same pasture. I am also grateful to Martin Ecclestone for drawing the profiles shown in figures 5 & 7.

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3 Morgan, K. Smith, B. S. 'Standish: Introduction', in Elrington, C. R., Herbert, N. M., Pugh, R. B. (Eds), *VCH (Victoria County History) Gloucestershire*, 10, (1972) 230-233.
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6 'A number of sites exist (in the Cotswolds) where round barrows are positioned in close proximity to a long barrow', Saville, A. *Archaeology in Gloucestershire* (Cheltenham: Cheltenham Art Gallery and Bristol and Gloucester Archaeological Society, 1984), 132.
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8 Witts, *Archaeological Handbook* (1883), 106.
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CLIMPERWELL BARROWS, CRANHAM

Tony Roberts

Introduction

A resistance survey of the Climperwell barrows was conducted as part of the Cotswold Edge LiDAR Project. A survey on the nearby Bucks Head barrow revealed a potential Neolithic date for its construction, therefore, it was suspected that these barrows could equally date to this earlier period. In addition, current farming practice was potentially causing damage to the surface of the monument, as larger blocks of stone were lying at the surface.

The primary objective of the survey was to use the resistance technique to identify geophysical anomalies that may be archaeological in origin, so that they may be assessed against what is already recorded about this site in the Gloucestershire Historic Environment Record (HER).

Site location and archaeological potential

Climperwell barrows are located at SO 91650 11990 (Figure 1) and survive as roughly circular earthworks. The northern barrow has a mound which measures 18m. in diameter and is 1m. high, while the southern barrow has a mound 24m. in. diameter and 1.2m. high (figure 2). The ground has a natural gentle slope to the east, the direction of the current agricultural regime and the site is regularly ploughed and planted with various cereal crops.

The Gloucestershire HER describes the barrows as bowl barrows located just below the crest of an east-facing hill.[1] One or both of the barrows is believed to have been partially excavated by a Mr Lewis during the 1930s, although there is no documentary evidence of this work.

Located on the Cotswolds the underlying geology is predominantly Birdlip Limestone Formation, with a covering of thin light lime-rich soils. There are a number of faults in the area, with the trend being aligned southeast to northwest.

Resistance Survey

The monument was surveyed on 01 October 2009. The weather was warm and dry and followed relatively heavy rainfall, so the ground was holding moisture.

Data was collected at 1m. intervals with a traverse separation of 1m. An area measuring 80m. by 40m. was separated into 20m. by 20m. grids giving 400 recorded measurements per grid. This sampling interval is very effective at locating archaeological features and is the recommended methodology for archaeological prospection.[2]

The position of the survey grids and local reference points were fixed using an Electronic Distance Measurer (EDM), and by using a Garmin Global Positioning System (GPS) for cross-referencing.

Results

The Resistance survey has identified a number of anomalies with high or low resistance characteristics, some of which can be classified as possibly archaeological in nature. Others may be the product of local geology and the effect of ploughing.
(Figures 3 and 4).

Anomalies with archaeological potential
(Figure 4):

Feature 1 High resistance details within the internal structure of the northern barrow. They have a cell like arrangement or the structure of the barrow could have been disturbed by ploughing.

Feature 2 A low resistance linear feature surrounding the southern barrow. This is possibly a ditch that continues along the western edge of the northern barrow. It is difficult to determine if the ditches around the barrows are all one feature.

Feature 3 A higher resistance characteristic indicating a compacted outer construction of the barrow.

Feature 4 A high resistance feature possibly indicating a cist or stone lining to the centre of the barrow. It is from here that the larger stones are appearing on the surface.

Feature 5 A low resistance linear feature with a north to south trend. Possibly a ditch aligned on the southern barrow.

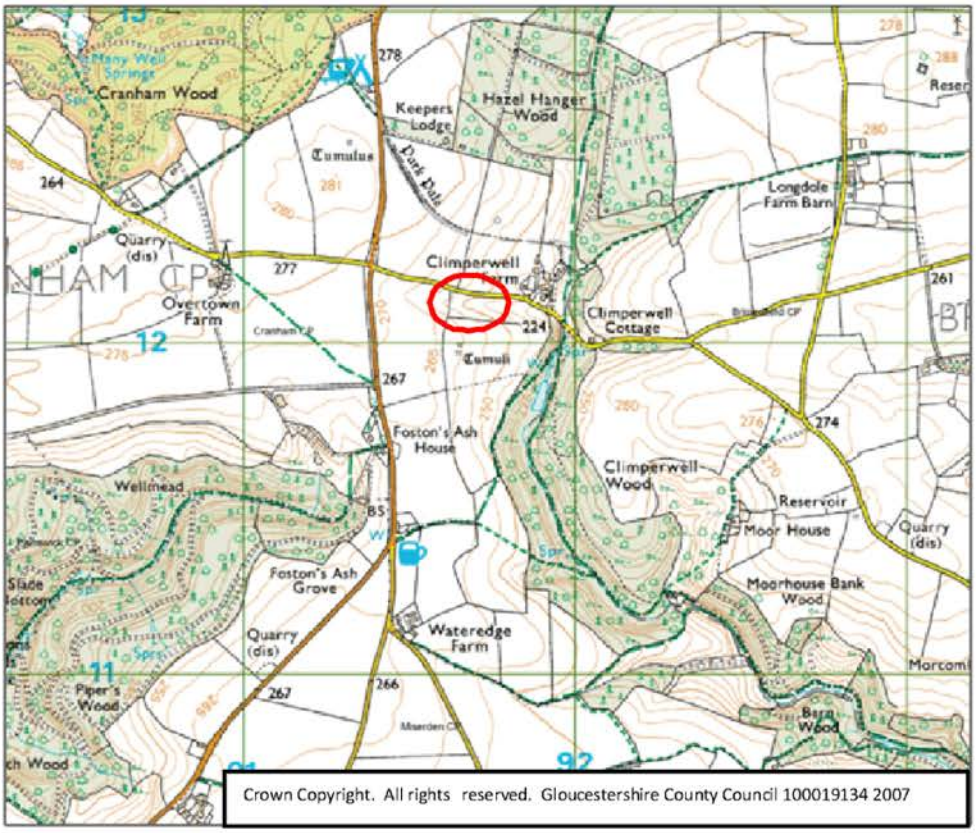

Figure 1: Location of Climperwell Barrows

Figure 2: Views of Climperwell Barrows. Left: Looking South East, Right: Looking South West.
(Photos by A. J. Roberts)

Discussion and conclusion

The survey clearly shows that, despite being reduced considerably in height by the action of ploughing, a substantial amount of archaeology still survives on this site. The southern barrow is clearly circular in construction (feature 3) with a central cist or hard-packed core (feature 4) and is surrounded by a wide ditch measuring up to 5m. in places (feature 2). Whilst the ditch appears to completely surround the southern barrow it is not so apparent around the northern one and no trace of a ditch is showing to the east of it. The northern barrow potentially cuts into the ditch of the southern one, for the junction of the two features is quite angular.

The northern barrow is not as circular in form. It appears to be more elongated in an east-west orientation. The internal features are more fragmented and high resistance anomalies (feature 1) could be indicative of a cell-like internal structure. It could also be that the action of ploughing has further destroyed this barrow.

At the southern end of the survey area a low resistance feature (feature 5), most probably a ditch, is aligned with the barrow in a north-south orientation.

It is clear that the action of the plough is bringing up stone across the top of both of the barrows. On the southern, larger barrow, bigger stones are appearing, suggesting that they are being brought from the area of high resistance (feature 4) and could be slowly destroying a potential cist chamber.

The resistance survey has produced evidence of a number of potential archaeological features. A significant amount of archaeology still survives despite the agricultural regime. Although the two barrows do not appear to be of an identical construction, how much of that can be attributed to the destructive effect of ploughing is open for debate.

It could be that we have a phasing of barrows on the site, although which came first is difficult to determine from geophysics alone. The northerly barrow appears to intrude into the ditch surrounding the southern barrow, although the ditch could have been dug to complement both. The form of the northerly barrow is different to the southern one and appears to be more elongated.

The destructive effect of the plough would seem to be potentially damaging the central area of the southern barrow. It is recommended that the management of the barrows is addressed to prevent further damage to the remaining archaeology.

References

1 Gloucestershire Historic Environment Record (GHER) report 149.

2 English Heritage, *Geophysical Survey In Archaeological Field Evaluation* (2008).

3 Roberts, A. J. *Geophysical Survey at Climperwell Barrows, Cranham, Gloucestershire* (Gloucestershire County Council, 2009), unpublished.

4 Roberts, *Geophysical Survey at Climperwell Barrows* (2009)

Figure 3. Processed results (© A. J. Roberts) superimposed on aerial photograph (© Gloucestershire County Archaeology Service).[3]

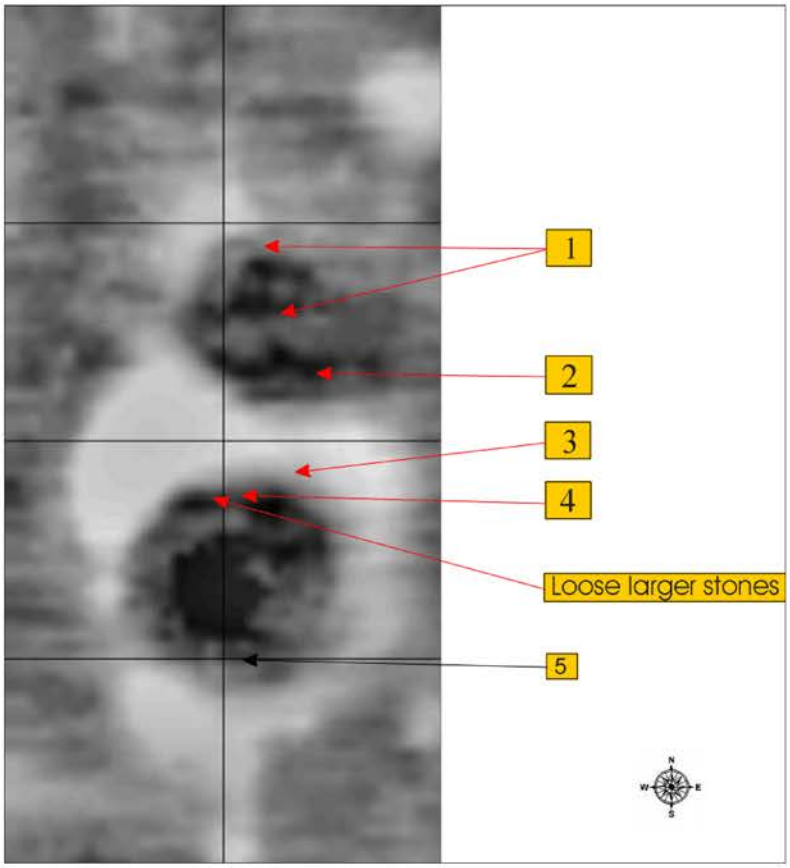

Figure 4. Resistivity anomalies. (© A. J. Roberts).[4]

BUCKS HEAD BARROW, CRANHAM

Tony Roberts

Introduction

In the spring of 2009, as part of the training programme, in anticipation of the fieldwork element, training in geophysical techniques of resistance and magnetometry was provided. The site chosen was the enigmatic round barrow at Bucks Head on the National Trust's Ebworth estate in Cranham.

Location and Archaeological Potential

Bucks Head barrow is located at SO 91317 12603, 250m south of Cranham Wood. The barrow survives as a roughly circular earthwork some 30m in diameter and about 1m high (Figure 1). The effect of ploughing has given it an artificially regular, square plan. Positioned on the 280m contour, it is on the northern slope of a small ridge commanding a good view of the surrounding Cotswold landscape. The barrow stands out well on the LiDAR imagery (Figure 2). The ground has a natural gentle slope to the north, the direction of the current agricultural regime.

The site is pasture that has been allowed to grow for hay and the grass had increased to a length of 0.3m by the last survey. Located on the Cotswold Edge, the underlying geology is predominantly Oolitic Limestone with a covering of thin light lime-rich soils. There are a number of faults in the area with the trend being aligned southeast to northwest.

The Gloucestershire SMR describes the barrow as a bowl barrow dating from the Bronze Age. Bucks Head is also known as the Hungerfield barrow,[1] which was partially excavated by J.E. Dorrington in 1880. The name Bucks Head presumably derives from the nearby farm and the close vicinity of a medieval deer park. The Tithe map for the area sheds little light on this and shows the field name as Wortley Piece.

The 1880 excavation revealed two dry stone walls recorded as being 3ft apart, which 'ran north and south to the edge of the barrow mound.'[2] In a cist, formed from a concrete-like substance between the two walls, were the primary cremations of a woman and child. Two secondary interments were also found, one a cremation and the second an inhumation. No mention is made of any accompanying grave goods.

The barrow lies in a field which is regularly ploughed. In 1959, Neolithic and Bronze Age flints were collected in the vicinity and one scraper found here was kept by Gloucester City museum.[3] In 1995, six further flints were found on the ploughed surface of the Hungerfield Barrow and are now in the Cheltenham museum. During the survey a local inhabitant showed the team some flints that had been collected from the field surface, including one well preserved flint arrowhead of Neolithic date (Figure 3).

Darvill identifies the site as one of the older monuments of the Cotswolds and assigns it a Neolithic date, describing it as a round barrow in a similar category to the Notgrove Rotunda Barrow.[4] He suggested that further examination of this monument would be worthwhile. The enigmatic origin of this barrow provided a substantial research element to the geophysical work, as well as training volunteer members.

Resistance Survey

An area covering some 12,000m^2 was surveyed over a number of occasions using a TR/CIA system resistance meter; the technical details can be found in the site report.[5] The results of the resistance survey are shown in figure 4 and a relief plot is at figure 5.

The resistance survey clearly shows that the central area of the barrow contains a complex arrangement of high resistance features that may represent a burial chamber with internal divisions (feature 7). (See Figure 6 for feature numbers). At the north-eastern end of the barrow complex is a large high resistance anomaly (feature 8), that may represent the stone lining of a cist burial. Equally, this may be the area that was subject to excavation in 1880.

The barrow appears to be flanked to the southeast and northwest by two quarry ditches (features 3 and 4). These have a linear trend being aligned southwest to northeast. They appear to not be continuous with the features (5 and 6) that flank the barrow to the northeast and southwest. This may imply that there is not a continuous ditch around the barrow but that this was constructed in phases, the earlier, deeper, phase being represented by the flanking ditches. Features 5

Figure 1: Views of Bucks Head Barrow. Left: Looking North, Right: Looking Northeast. (Author)

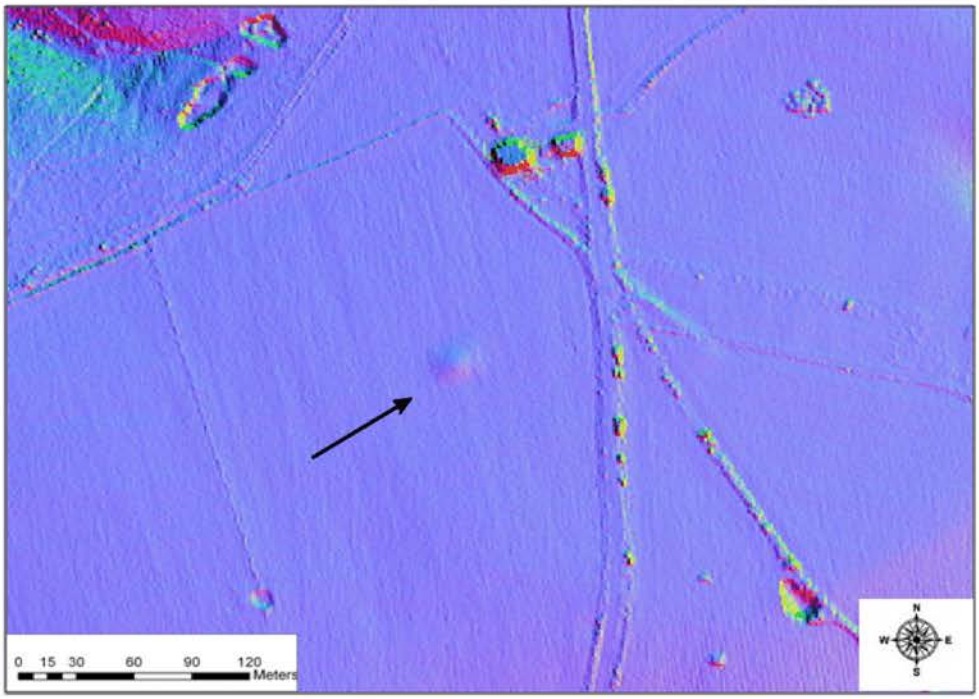

Figure 2: LIDAR Image of Bucks Head Barrow (labelled)
(© Gloucestershire County Archaeology Service)

Figure 3: Neolithic flint arrowhead found in vicinity of barrow. (Author)

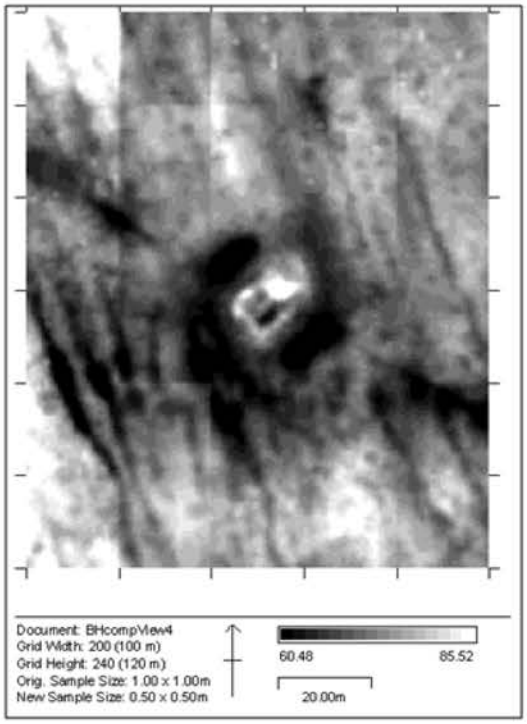

Figure 4: Resistance results for Bucks Head. (Roberts)[5]

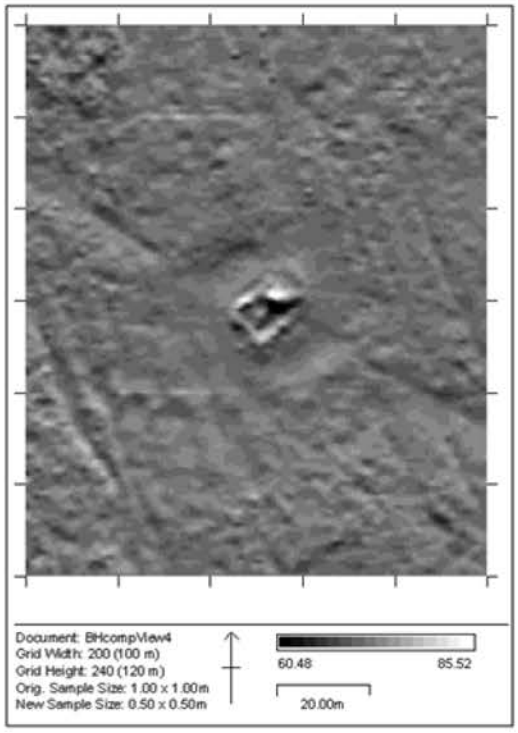

Figure 5: Relief plot of resistance results - Bucks Head. (Roberts)[5]

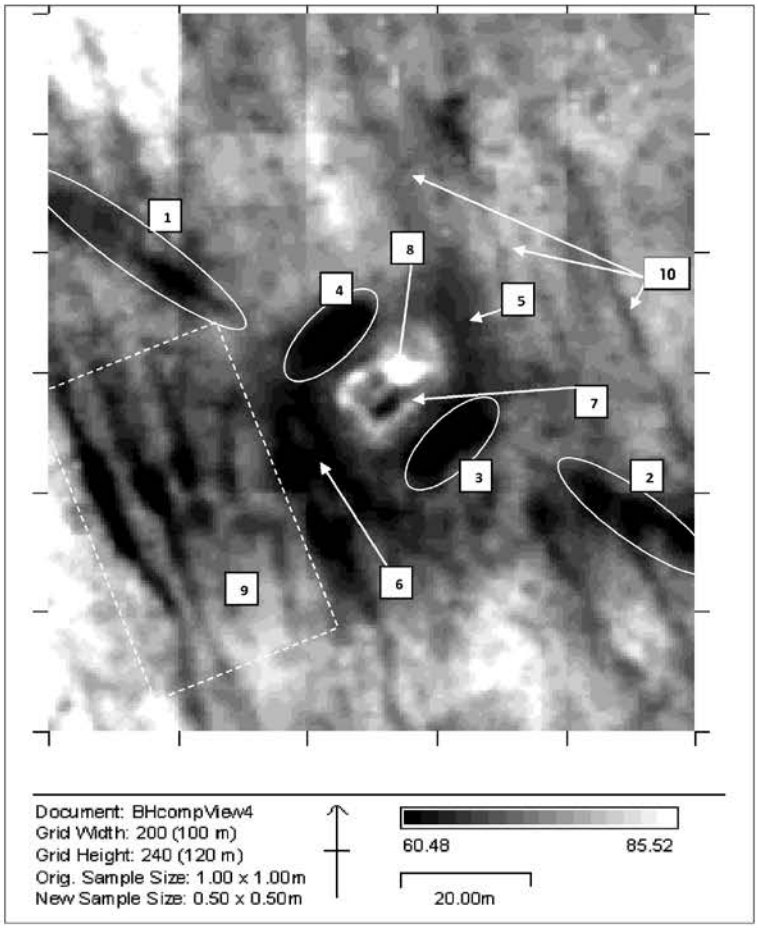

Figure 6: Resistance features at Bucks Head barrow. (Roberts)[5]

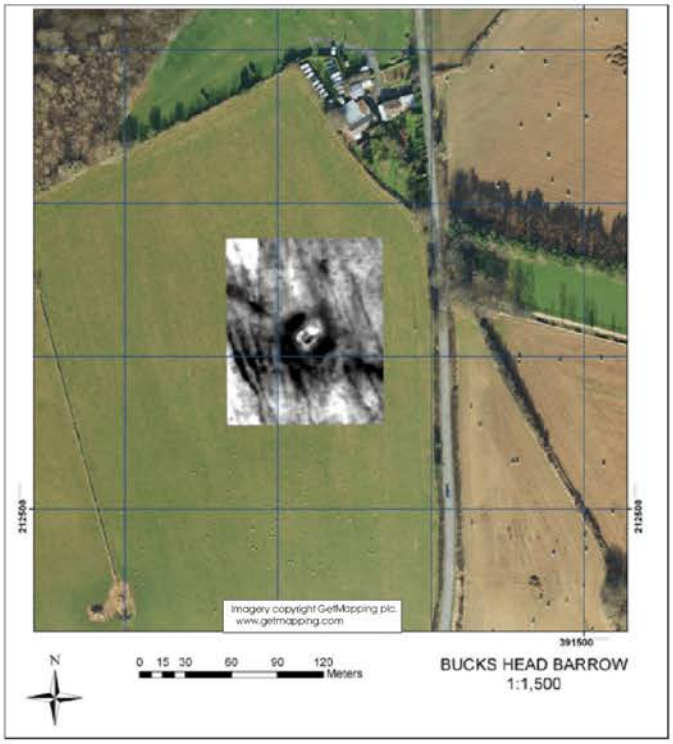

Figure 7: Bucks Head Barrow in wider landscape. (© Gloucestershire County Archaeology Service)

and 6 may represent a later attempt to continue a ditch around the barrow, but not as deep.

The other significant archaeological feature appears to be the low resistance linear anomaly (features 1 and 2) that runs southeast to northwest with an alignment through the barrow. If this is a ditch it appears to terminate either side of the barrow seemingly respecting it. The chronology of the barrow and this feature is unclear, although its position in the landscape can be appreciated in figure 7.

In the southwest corner of the survey a number of low resistance linear features run in a northwest to southeast alignment (feature 9). These are aligned with the general trend of the agricultural regime in the field and are possibly agricultural in origin. However, given the thinner soils on site they could represent fissures in the limestone geology. There is a possibility of an archaeological origin given the angular nature of the easternmost feature in this group. Equally, the linear features that are present in the northeast of the survey (feature 10) may also be agricultural in nature.

Gradiometer Survey

A gradiometer survey was conducted over the area of the barrow using a Geoscan FM256 Gradiometer.[6] The results of the survey are shown in figures 8 and 9. The survey clearly shows that the central area of the barrow contains a complex arrangement of highly magnetic features that may represent a burial chamber (feature 3 in figure 9). These anomalies coincide geographically with the resistance data; [7] the higher magnetic signature may be the result of heat at some stage.

The barrow appears to be flanked to the southeast and northwest by two quarry ditches (features 1 and 2). These have a linear trend being aligned southwest to northeast. The magnetic signature is not strong and more modern plough features that overlay them, have confused their outline. However, they do coincide with the geographical location noted in the resistance survey.[8]

The other significant archaeological features include a positive magnetic circular anomaly (feature 4) to the south-east of the survey. Although the identification of this feature is uncertain, this area has now been taken out of cultivation as a precautionary measure to preserve any potential archaeology. Measuring approximately 12m in diameter it has a couple of high magnetic 'hot-spots' within its interior. Its function is uncertain. On the north-west slope of the barrow (feature 5) is a positive magnetic anomaly that could be interpreted as a possible secondary inhumation or cremation burial.

Surrounding the barrow is a series of linear ditches that appear to be continuous around the whole monument (feature 6). These are interpreted as the result of modern ploughing activity around the barrow and are not archaeological in origin.

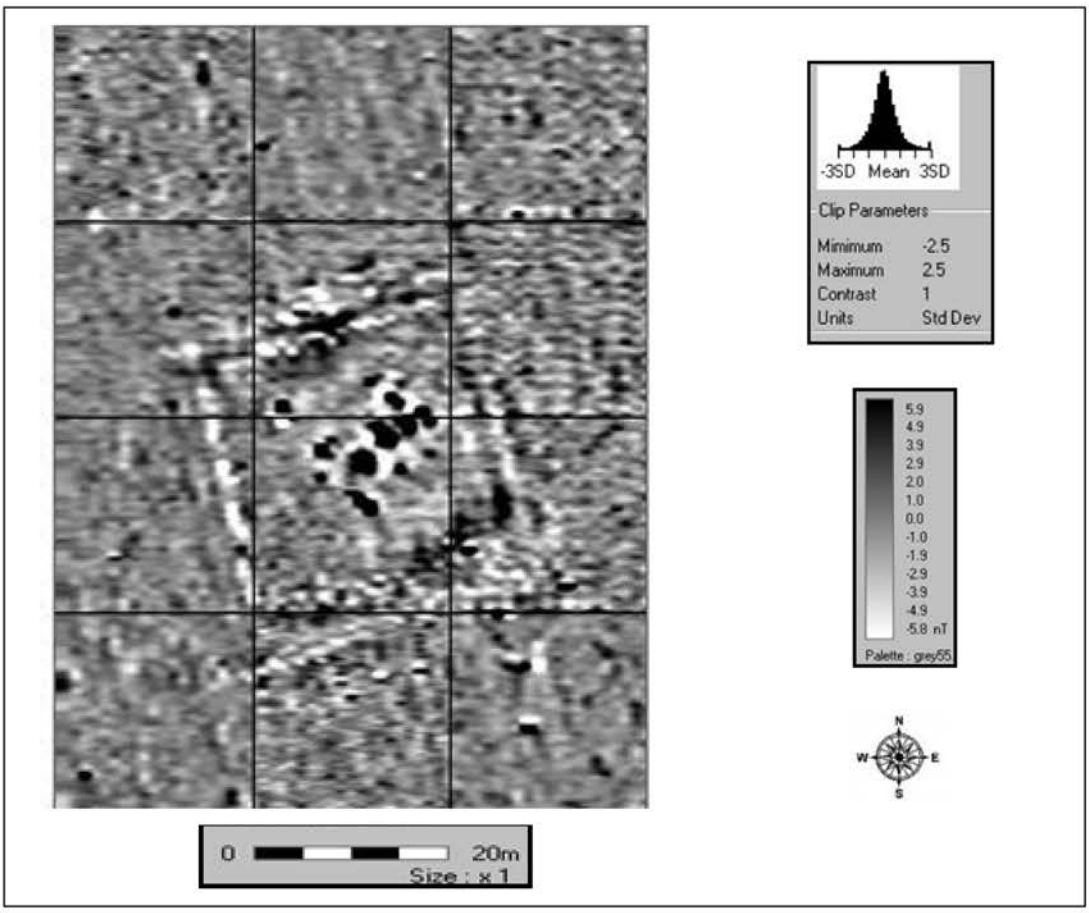

Figure 8: Gradiometer results for Bucks Head barrow. (Roberts)[6]

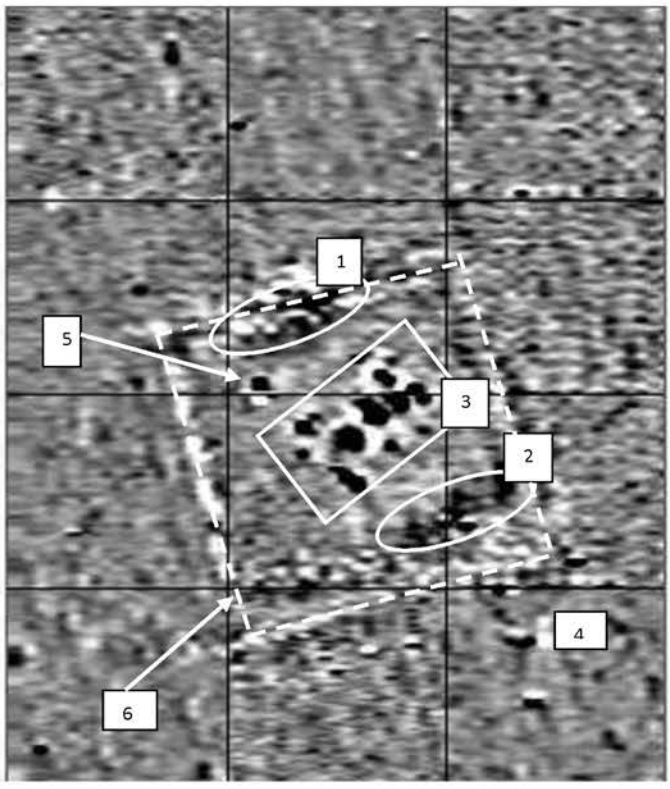

Figure 9: Interpretation of magnetic anomalies. (Roberts)[6]

Conclusions

Both the resistance and gradiometer surveys have produced evidence of a number of potential archaeological features. The significant revelation is that the survey appears to confirm the presence of a chambered structure within the barrow, that may support a Neolithic origin for the monument in accordance with Darvill's suggestion, that this could be one of the only 8 known Neolithic round barrows in the Cotswolds.[9] There does appear to be a relationship with the significant linear features that are aligned southeast to northwest and have been interpreted as ditches. The relative chronology between the barrow and the ditches is difficult to determine. Beyond this, there are few features in the immediate vicinity of the barrow that could be interpreted as archaeological. A number of low resistance features could be agricultural or geological in origin.

The geophysics appears to indicate that the structure of the barrow could be remarkably intact. Consequently, notwithstanding the interference that may have been caused by the 1880 excavation, there is the potential for the survival of in situ Neolithic material, including deposits which could clarify the date and form of the monument.

References

1 GHER (Gloucestershire Historic Environment Record), 151.

2 Dorrington, J. E. 'Remarks on a Round Barrow in Hungerfield in the parish of Cranham'. *TBGAS* 5 (1880), 55 and 133-136.

3 GHER,151.

4 Darvill, T. *Long Barrows of the Cotswolds* (Stroud: Tempus, 2004), 61.

5 GHER 33592; Roberts, A. J. *Geophysical Survey at Bucks Head Barrow, Cranham, Gloucestershire.* (Gloucestershire County Council, 2009a), unpublished.

6 Roberts, A. J. *Geophysical Survey at Bucks Head Barrow (Magnetometry*), Cranham, Gloucestershire. (Gloucestershire County Council, 2009b), unpublished.

7 GHER 33592.

8 Ibid

9 Darvill, *Long Barrows of the Cotswolds,* ***61***

SHORTWOOD, HARESFIELD

Ann Maxwell

Introduction

The investigation at Shortwood, Haresfield was led by Ann Maxwell, and involved pupils from Haresfield Primary School, Mike Milward, Les Comtesse, Angela Newcombe, Tom Evans, Neil Armitage, Sheila Hicks and Sue Phillips. When a reconnaissance was carried out in nearby woodland, the group noticed a small low mound with a central depression near the National Trust car park at Shortwood on Haresfield Hill. This feature was also visible on the LiDAR survey (fig 1) and could be the remains of a Bronze Age round barrow.

The immediate area of the site at NGR: SO 8314 0857 is fairly flat, at a height of around 240m, below the summit of Haresfield Hill, with steep slopes down to the west and south. The feature is not recorded in the Historic Environment Record, and no relevant documentary evidence was found in the Gloucestershire Archives. There are no trees shown in the location of the mound on the First Edition Ordnance Survey map of 1880, although those of 1900 and 1925 do show two trees near the feature, and the area has not been ploughed for at least 70 years.[1] The underlying geology is Lower/Middle Inferior Oolite.

The surveys

Two resistivity surveys have been carried out. The first, in November 2009, covered one 20-metre square centred over the mound and was done by pupils of Haresfield Primary School. This showed the depression in the centre as low resistance, ringed by an area of higher resistance. The results also showed an area of lower resistance curving round the mound, which could be part of a ditch (Fig.2). As the first survey did not cover the entire feature, it was decided to carry out another survey over a bigger area to see if the mound was completely surrounded by a ditch.
The second survey was carried out in May 2010 and covered an area 40 metres by 30 metres, starting one metre away from the car park fence. This survey followed a long spell of dry weather; therefore the ground was very dry (Fig. 3). The two corners nearest the car park have stones on the surface, and it was impossible to insert the probes on a small part of the eastern side. There is a large area of higher readings in the northern corner, which might indicate the presence of surplus stones or rubble from the car park area. There is a line of lower resistance curving round the west and south of the mound, but this does not appear to surround it.

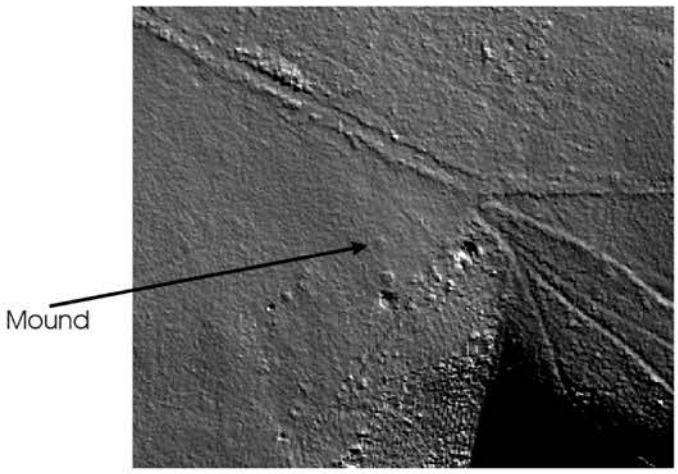

Fig.1 LiDAR image
(© Gloucestershire County Council Archaeology Service).

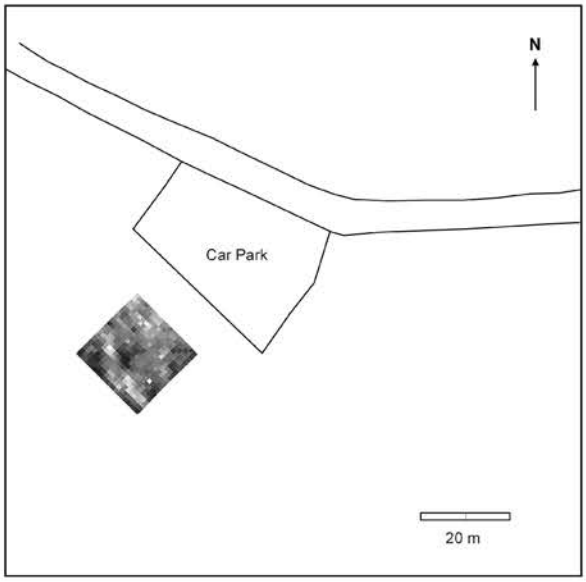

Fig.2 Results of first resistivity survey

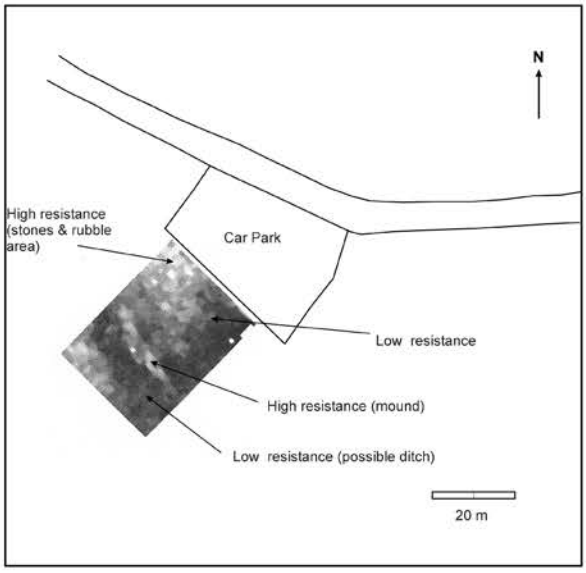

Fig.3 Results of second resistivity survey

Discussion and conclusions

The second survey has not produced a clear result showing a ditch surrounding the mound. Clearly the area may well have been disturbed and any evidence of a ditch destroyed when the car park was made and the fence erected; however the survey results make it impossible to interpret the feature with any certainty as the remnants of a Bronze Age round barrow. The remains of one or both of the trees shown on the Ordnance Survey maps of 1900 and 1925 might explain the presence of the mound. A less likely explanation of the feature is that rubble or hardcore was dumped there when the car park was created.

Acknowledgement

We are grateful to the National Trust for permission to carry out the surveys on their land.

Reference

1 Pers.comm. David Armstrong 2010

EBWORTH HOUSE, PAINSWICK

Angela Newcombe

Introduction

A team lead by Angela Newcombe and consisting of Neil Baker, Les Comtesse, Tom Evans, Martin Harris, Terry Moore Scott, Nigel Spry and Harold Wingham surveyed a 20 metre by 40 metre area containing a mound in the paddock of Ebworth House. This was adjacent to the former kennel complex. The primary objective of the survey was to discover whether the small mound was the remains of the barrow mentioned in the Gloucestershire Historic Environment Record (GHER) entry for Area 3833.[1] The secondary objectives were to teach the techniques of resistance survey to new volunteers and allow the remainder to gain further experience.

Location and survey conditions

The site is located on the Cotswold Edge with the underlying geology predominantly oolitic limestone. The pasture/orchard is on the south side of the walled kitchen garden at grid reference SO 89920 11240 and at one stage contained the kennel complex for the house. Evidence of this complex can be seen in the ruins of a structure, a number of concrete platforms and a short flight of steps, with the mound approximately 14 metres from the SW corner of the ruined building. As can be seen from the photograph at Fig. 1, it does not have the general appearance of a barrow, being smaller and more compact.

Due to the usage to which the ground has been put in the past, it is quite possible that the landscape has to some extent been levelled. There is a gentle upward slope to the west while the ground to the south beyond the area surveyed, slopes gently down before becoming a steeply wooded valley.

Site history and archaeological potential

Nicholas Kingsley states that Ebworth Park began life as a late 16th or early 17th century farmhouse, and that the mansion house was completed in 1731.[2] Eleven years later it was being rented and the tenant bought the freehold in 1756. There were subsequent sales and lettings, but by 1966 the house was derelict and the land and outbuildings now belong to the National Trust (NT). In a survey of Gloucestershire barrows carried out by Helen O'Neil and L. V. Grinsell reference is made to a mound, a barrow, excavated in 1882 that may have existed somewhere in the Ebworth area. It apparently contained Iron Age items and some bones and Grinsell observed that the first account of this given in 1929 was unconvincing.[3]

Fig 1 Mound with ruined kennel complex building in background (photo by Terry Moore-Scott).

The GHER states that Iron Age material was found in a small mound in the paddock of Ebworth House, but it was not field investigated and no mound was visible in the grass-covered paddock.[4] According to the NT the mound investigated in this survey has been in existence for at least 30 years.

The resistance survey

The area was surveyed during the morning of 31st October 2009, on a fine day that followed relatively heavy rainfall so that the ground was holding moisture. The resistance survey revealed no anomalies caused by archaeological features and the area of high resistance, showing a very clear response in the northwest corner, was due to the short flight of concrete steps that is still visible. The mound appears to be made of the same material as the immediate surroundings and there is no sign of any burial chamber (figure 2).

Conclusion

The resistance survey produced no evidence of a barrow and this, combined with its general appearance and the statement in the SMR record that no mound was visible, leads to the conclusion that while the estate may well contain a barrow, this mound is not it. The close proximity to the kennels makes it doubtful that such a structure would have survived in that location.

Acknowledgements

We are grateful to the National Trust for granting permission to investigate this feature on their land.

References

1 Gloucestershire Historic Environmental Record (GHER), Area 3833.
2 Kingsley, N. *The Country Houses of Gloucestershire Vol 2 1660-1830* (Stroud: The History Press Ltd, 1991), 134-135.
3 O'Neil, H & Grinsell, L V. Gloucestershire Barrows *Transactions of the Bristol and Gloucestershire Archaeological Society,* ***79,*** (1960), 111
4 GHER 3833.
5 Ordnance Survey 1883, 1st edition OS map.Gloucester Archives (GA) 42/1

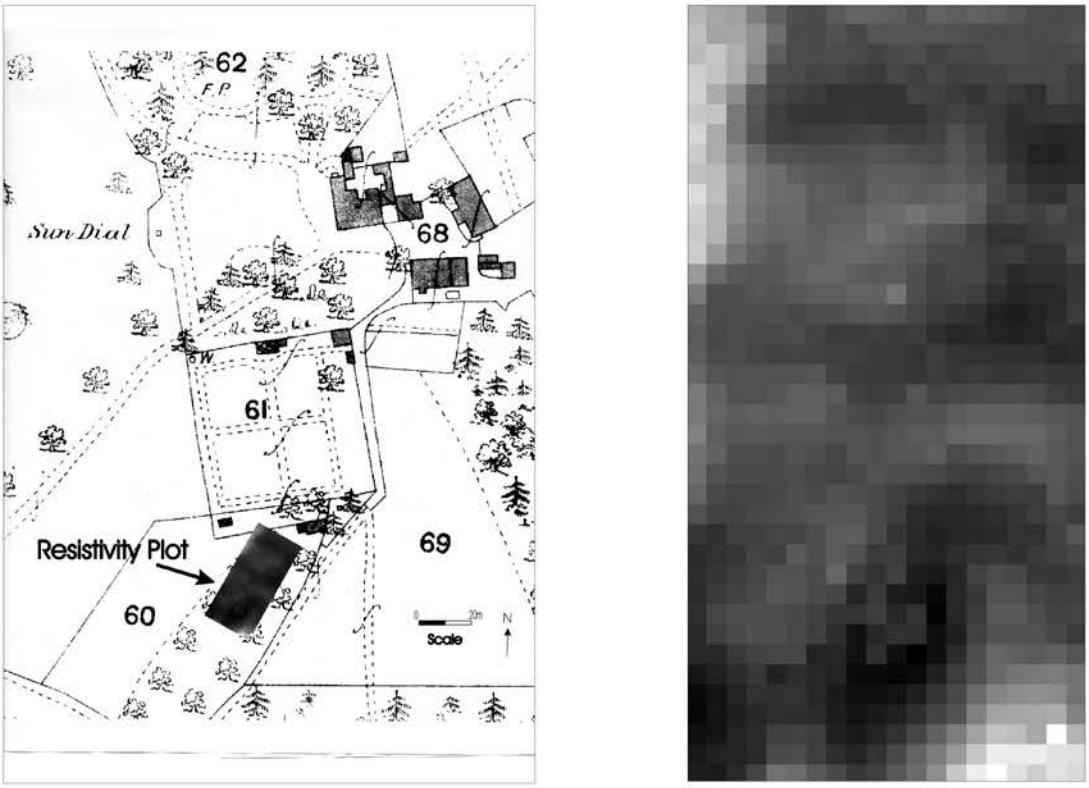

Fig 2: Location of resistivity plot (shown on right hand side) in the pasture/orchard of Ebworth House estate.[5]

SLUTSWELL FARM, ELKSTONE

Tony Roberts & Les Comtesse (historical research)

Introduction

The Cotswold Edge LIDAR Project identified a series of earthworks located in pasture north of Slutswell Farm in Elkstone (Figure 1). The earthworks had been independently recognised by the National Mapping Programme (NMP) through their analysis of aerial photographs; however, the County Historic Environment Record (HER) had a few sketchy references to some Medieval and Roman activity in the vicinity, but focussed south of the adjacent road and not in this particular field. Consequently, this presented a good opportunity to bring all of this data together to try and understand more about the context of the site. Sound starting points were a geophysical survey of the field and documentary research.

Historical background

Writing on the parish of Elkstone, the Victoria County History (VCH) remarks that '*An early outlying dwelling appears to have existed at Oldbury Close, lying in the angle of the Beechpike-Colesbourne road and the Gloucester-Rendcomb road. Adam of Oldbury, mentioned in 1327, presumably had a dwelling there and in 1537 the close was the site of the manor sheep-house. The name may derive from the Roman site which has been discovered beneath the farm buildings at Slutswell at the north-west corner of the close, but as two other closes on the north side of the Gloucester-Rendcomb road, one and probably both inclosed from the open fields, were known as Clay Oldbury and Green Oldbury there*

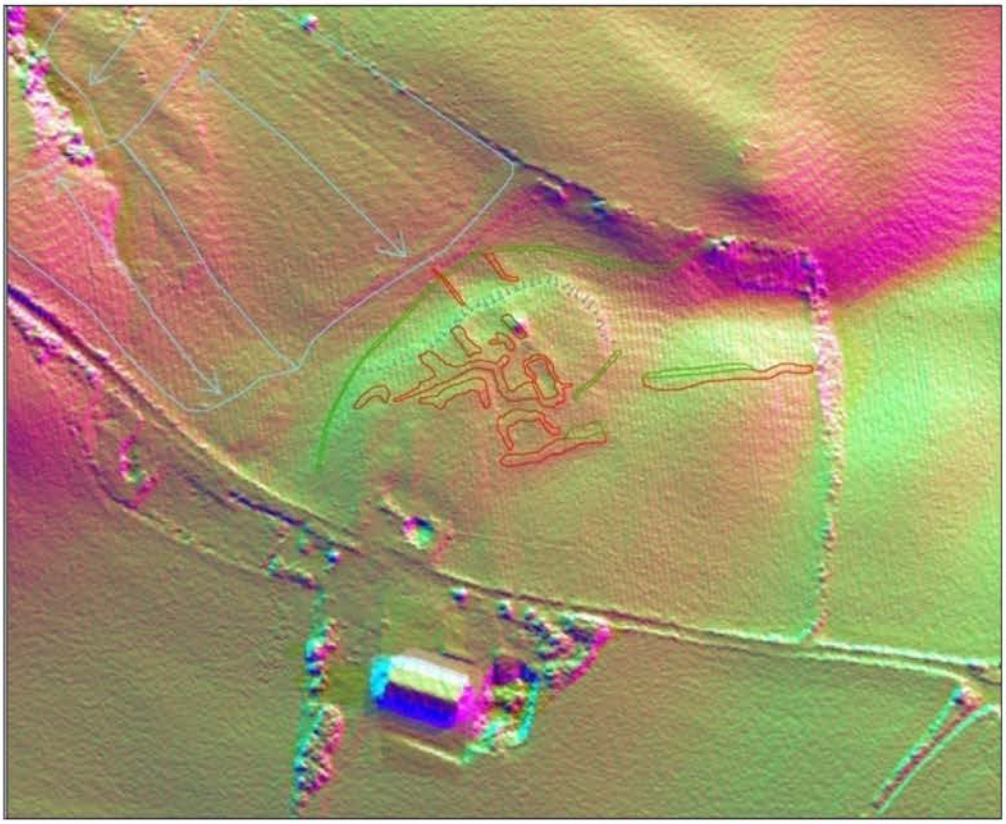

Figure 1: LIDAR image of Slutswell overlain with National Mapping Programme mapping of features (© Gloucestershire County Council Archaeology Service).

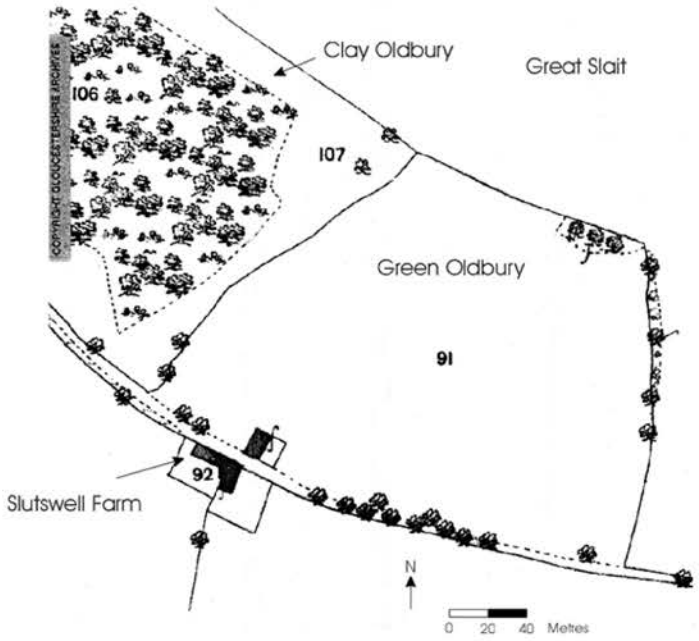

Figure 2: 1st edition OS map of 1884.

may also have been some earlier fortification which enclosed the whole of the end of the ridge.' [1]

Oldbury Close, referred to in the VCH article can be identified on the present day 1:25,000 Ordnance Survey (OS) map as the road junction with grid reference SO 98801265 (figure 3). To the north-west lies Slutswell Farm on the old Gloucester-Rendcomb road, and to the north of this lies the two fields named above as Green Oldbury and Clay Oldbury. Clay Oldbury was inclosed out of the east of the medieval north field (an open field) and was converted from arable to pasture by 1630.[2] But by 1841 the Tithe Map of the area showed that Green Oldbury was laid to pasture and Clay Oldbury was wooded.[3] The 1st edition OS map of 1884 also showed Clay Oldbury as wooded, whilst the eastern and northern boundaries of Green Oldbury were partially wooded (figure 2). A small grove of trees remains today, near the boundary of Green Oldbury and Great Slait to the north east. The latter was arable in 1630 and the eastern side formed the parish boundary with Colesbourne, as it does today.[4] The 1884 map clearly shows these fields and farm buildings with the same field boundaries as today and no other sign of habitation is shown.[5] By 1922 the situation had altered again as the 3rd edition OS map showed Clay Oldbury to be no longer wooded and Slutswell barn was visible in place of the present farm buildings.[6]

Smith, writing about the field names of Elkstone, states that the name Great Slait derives from 'slaeget' meaning a sheep pasture.[7] He also mentions that Clay and Green Oldbury in 1537 were identified as 'a sheephouse called Oldbury', which is in accord with the VCH entry. The name Oldbury he identifies as 'ald burh', a burh, or burg being an Old English (OE) name for a fortification or fortified place,[8] and 'ald' also OE, means old or long used.[9] Draper, however, writing about the importance of such enclosures in Anglo Saxon times, makes the point that although burh has its roots in the verb beorgan 'to protect, shelter', a much wider range of associations is possible, from 'ancient earthwork or encampment' to 'Roman station or camp', 'fortified house or manor' and 'market town', all of which can be shown to correlate with significant ditched, fenced, hedged or even walled enclosures on the ground.[10]

The site is recorded as Slutswell Deserted Medieval Village (DMV), Elkstone, and the DMV was listed by Aston and Viner[12]. An exploratory excavation carried out in the mid 1970s *'revealed a Roman villa site, with medieval buildings on top, which is now partly under modern farm buildings. The Roman site was occupied from the 2nd to the 4th century and possibly later. The medieval buildings are believed to be 13th century. K G Baker, Director of Fieldwork.'*[13]. The Royal Commission on the Historical Monuments of England (RCHM) also classified this site as Elkstone 1 and in 1970 they found cropmarks of buildings accompanied by building debris scattered over much of the site, with finds of medieval pottery and a few Romano-British (RB) sherds. RB finds from the south side of the road included a coin of Carausius, five clay kiln supports, a stone grinder and a polisher which were

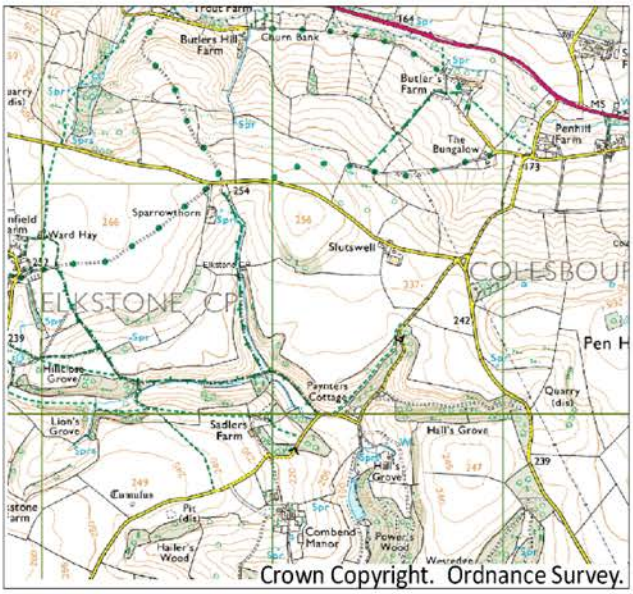

Figure 3: Location of Slutswell Farm

Figure 4: Images of the survey in progress
(photos A. J. Roberts).

Figure 5: Greyscale plot of resistance data
(geophysics results © A. J. Roberts superimposed on air photo)

deposited in Gloucester Museum.[14] On an analysis of the aerial photographs, as part of the Cotswold Hills National Mapping Project (NMP) survey, no cropmarks were found at these locations. The survey did however identify *'earthworks visible north of Slutswell farm and centred at SO 9856 1282 which may have wrongly been interpreted as cropmarks. These earthworks have been mapped and are identified as a deserted medieval settlement.'* More recent aerial photographs taken in 2006 showed the earthworks were 'not clearly defined' and 'may be partially levelled'.[15]

Clearly the archaeological potential for the site was high although it seemed unclear whether this was a Roman, medieval or multi-period site.

Geophysical survey

Given the probability of surviving stone structures it was appropriate to conduct a resistance survey of the field to the north of the road. An area measuring 11,200m^2 was surveyed over two days with the majority being completed in the warmer and sunnier conditions experienced during the second session, rather than the snow that prevailed on the first attempt! Mature undergraduate students studying Archaeology at the University of Bristol joined some GADARG members to complete the survey using three Geoscan RM-15 resistance meters; the results of which were combined at the end of the survey. Images of the survey being undertaken are at Figure 4 and on the back cover. The survey area was separated into 20m^2 grids and data was collected at 1m intervals with a traverse separation of 1m. The results of the survey are shown at Figure 5.

Interpretation

The resistivity survey revealed a significant level of potential archaeology. A number of linear high resistance characteristics were present suggestive of wall-lines and other substantial features. Figure 6 shows an interpretation of the resistance results, highlighting the significant details. The most striking is the square feature formed by the double parallel high resistance linears (marked as 1 on Figure 6). These can be interpreted as possible wall lines. Standing approximately 4m apart they are remarkably consistent and appear to form a courtyard with the high resistance feature (feature 5), a possible rubble spread, at its centre. The location of this is interesting, sitting as it does on the flat part of the spur of land projecting to the north. It is from this area that the greater concentrations of pottery that were noted on the surface during the survey were recovered, including some tesserae (Figure 7). To the east of this is a rectangular feature (feature 2) surrounded by possible high resistance linears, which could be interpreted as a courtyard and within which sit the regular forms of feature 4; they have a higher resistance signature and could be the footprints of smaller buildings. Feature 6 appears to be an outer circuit of higher resistance, again with double parallel linears approximately 7m apart. A number of apparently random areas of high resistance appear over the survey area and could be interpreted as possible areas of rubble spread, some appearing to have association with the features interpreted as wall lines. To the east of the survey area is a possible boundary feature (feature 3). It has a high resistance signature and could be the boundary marked on the NMP interpretation (Figure 1). Feature 7 is a modern service trench that carries a water pipe from the stable block to a trough further down the field.

Fieldwalking

At the same time as the geophysical survey was conducted the site was fieldwalked using the same grid pattern. Surface finds were collected from within the squares. A variety of different Roman materials were present including pottery, ceramic building material (CBM) and tesserae. Figure 7 shows the distribution of the CBM and pottery by volume. Although this analysis is coarse there does appear to be a larger concentration of both pottery and CBM in the southern part of the survey area closer to the larger square enclosure present on the geophysics. In this area a greater intensity of tesserae were present which may suggest a more substantial building in the vicinity. Further work will be conducted on the cultural material recovered from the site.

Conclusions

The presence of a large number of regular features does indicate that there is archaeology within the survey area. The regular nature of the possible wall lines, and the presence of Roman fabrics on the surface, suggests a potential roman structure. The size and shape of the larger square feature is reminiscent of Roman ritual and temple complexes, such as Hayling Island and Woodeaton, Oxfordshire, which also have a double walled element to their enclosure.[16] The composition of the pottery assemblage recovered does not appear to be extensively domestic, supporting the assertion that this may be a ritual rather than a domestic site. The earlier reported finds appear to have originated from under the farm buildings to the south of the road and an initial investigation of the fields there revealed some Roman pottery. Further work in these fields may be beneficial in providing a wider context to this site.

Figure 6 Interpretation of resistance results
(geophysics results © A. J. Roberts superimposed on air photo)

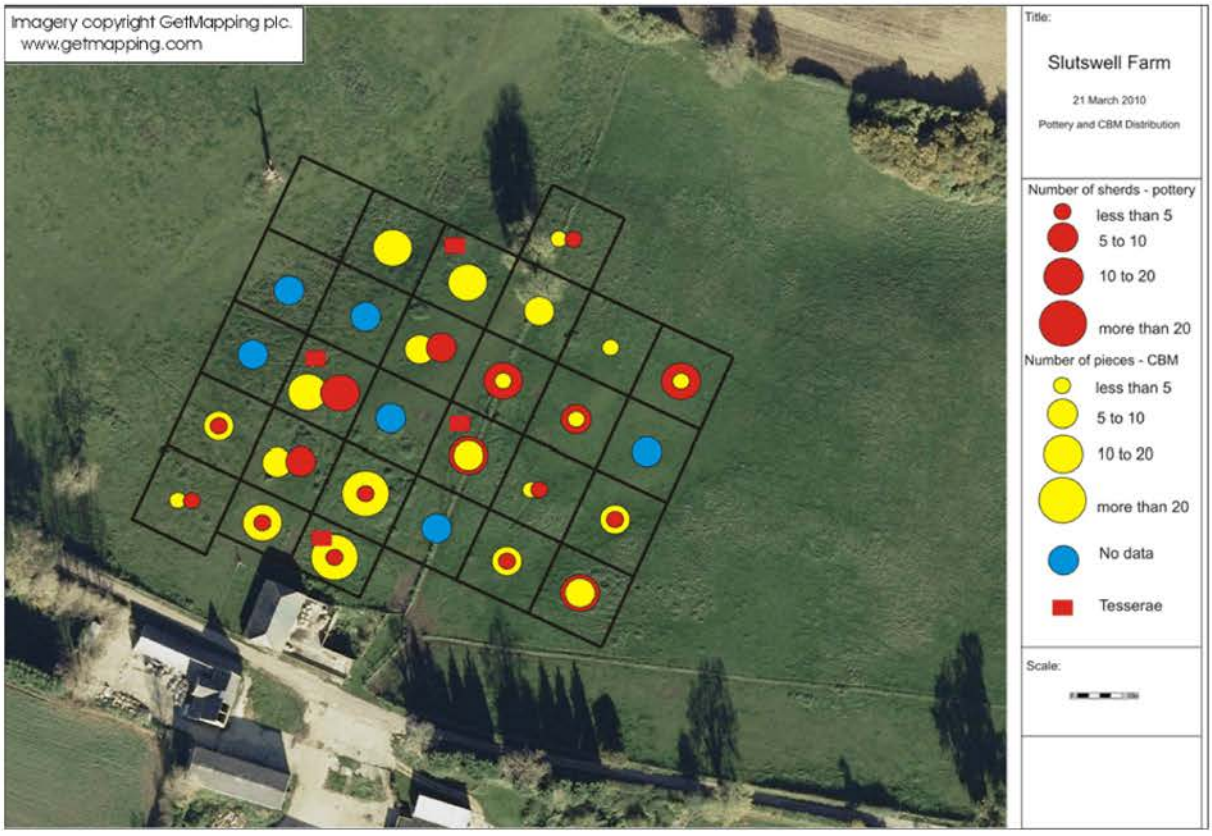

Figure 7 Distribution of ceramic building material (CBM) and pottery by volume
(geophysics results © A. J. Roberts superimposed on air photo)

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UPTON MILL, UPTON ST LEONARDS

Ann Maxwell

Introduction

The investigation of this site was led by Ann Maxwell, with the help of Martin Ecclestone, Lynda Evans, Helen Kirkup, Angela Newcombe, Tony Roberts, Les Comtesse, Louise Griffin, Lesley Harding, Ian Hollingsbee, Nigel Spry, David Brown, Ken Herbert, Jean Randall, Nick Rowles, Mike Stratford, John Barden, Rick Cavaney and David Maxwell.

The LiDAR image (Fig.1) showed a number of earthworks in a field at NGR SO 86882 14527 that had no features recorded in the Historic Environment Record. Some of the features are also visible on air photographs (Figs. 5 and 6), so the aim of the investigation was to try to identify and explain them.

The field has been unploughed and used as pasture for many years, and there is ridge and furrow in two discrete areas. The River Twyver flows through the centre of the field from south to north, and runs through a culvert for about 75 metres at its southern end. A tributary of the Twyver flows from the south east and is also culverted in the field. When the site was first visited in September 2009, the vegetation was very lush, which made the earthworks difficult to see clearly. The area immediately east of the stream was covered with Himalayan balsam. The underlying geology is lias - mainly clay.

Historical research

The First Edition Ordnance Survey map, surveyed in 1883 (Fig.2), shows field boundaries very similar to the modern map, but with the addition of a rectangular area extending into the adjacent field on the east.[1] This area is called *Tyning* on the Tithe Award map of 1840 (Fig, 3), and a long narrow field called *Langet* stretches into the southwest corner of the modern field, bounded by the Twyver and its tributary from the southeast.[2] As the watercourses were still above ground at this date, the creation of the culvert can be dated to the period between 1840 and 1883. The Tithe map also shows that the field was at that period divided into four smaller fields called *Lower Mill Ground, Millpond Close, Upper Mill Ground and Orchard*, fieldnames indicating the presence of a water mill.

A manorial survey written in 1589 for Lord Cobham (which was copied in 1718, and this copy is held in the Gloucestershire Archives) lists five water mills.[3] One of these was occupied by Margery Littleler and is described as

'a dwelling house cont. 3 bays with a millhouse and a water mill in ye one end of ye said house, in the other end a kitchen and a butt end, 2 rooms of ye said dwelling house being lofted, and a barne a stable adjoining 3 bay, with a hey curtilage, mill hey,

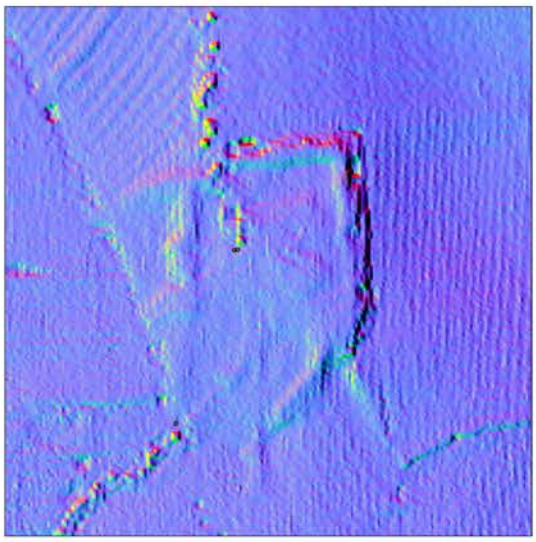

Figure 1: LiDAR image (© Gloucestershire County Council Archaeology Service).

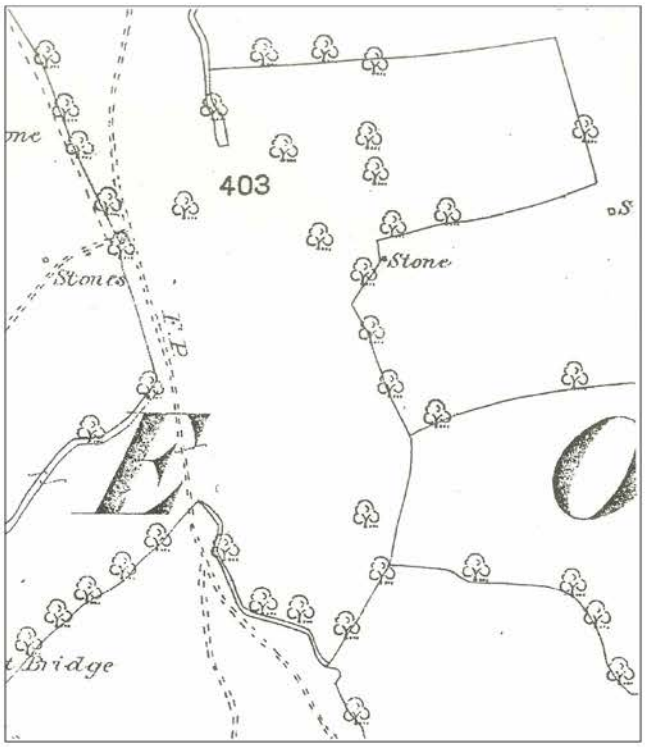

Figure 2: First Edition Ordnance Survey, 1883.

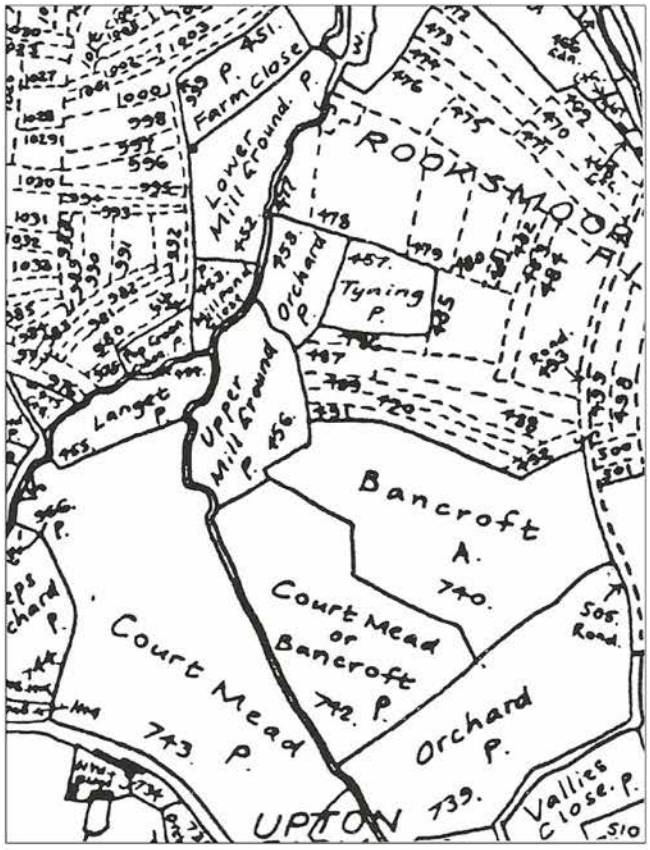

Figure 3: Tithe Award map, 1840 (drawn by G Gwatkin).

orchard and garden adjoining cont. pasture estimated 1¼ acre. Also several closes of meadow adjoining to ye said millhey cont. pasture estimated 1¼ acre, the end south east of one called ye hale abutteth on pasture of Mr Barnard called Bandcrafte, and ye other called ye home in the south end abutteth on a meade of Mr Barnard called Courtmeade.'

It is clear from this that the mill and its closes of meadow were contiguous, so the fact that the land with the mill adjoins *Bandcrafte* (*Bancroft* on the Tithe map) and *Courtmeade* means that it can be securely identified as the site being researched. The 1718 copy also indicated that Margery Littleler's mill was by then Mr Sadler's mill, with Alderman Rodway and others, so it would seem that the mill was in use for over a century.

The will of Anthony Lyttler 'alias Lyttleton' of Cranham dated March 1585 refers to his mill in Upton, which he wishes his wife Margery to have the use and occupation of during her life.[4] The will also mentions Anthony Lyttler's son-in-law, James Sadler. The Court Rolls for 1592 state that in May that year James Sadler and his daughter Mary were granted a water mill, a house and land at an annual rent of 90s. In July 1592 a further entry stated that *'Margery Lytler, widow, customary tenant of a watermill, has died since the last court...; the said messuage and mill and its appurtenances are granted to Walter Lytler, James Sadler and others'.*[5] This probably explains why the mill was known as Mr Sadler's in 1718.

This mill would have been the highest on the river Twyver, approximately half a kilometre above Upton Mill, which still stands. Apparently work done on an old sluice behind Upton Mill some years ago revealed that the river could have been more than 5 metres wide.[6]

Earthwork survey

Most of this survey (Figs. 4 and 5) was done in early April 2010, after the winter floods had dried and before the grass grew high. The presence of three inquisitive horses in the field meant that the survey had to be done quickly, so the southernmost area was not planned. To the east of the river, at the north end of the field, there is an obvious rectangular platform bounded by a linear depression running along its northern and eastern edges. There is no clear change in level on its south side, but the area to its south is lower lying and holds water during wet winters. A tree

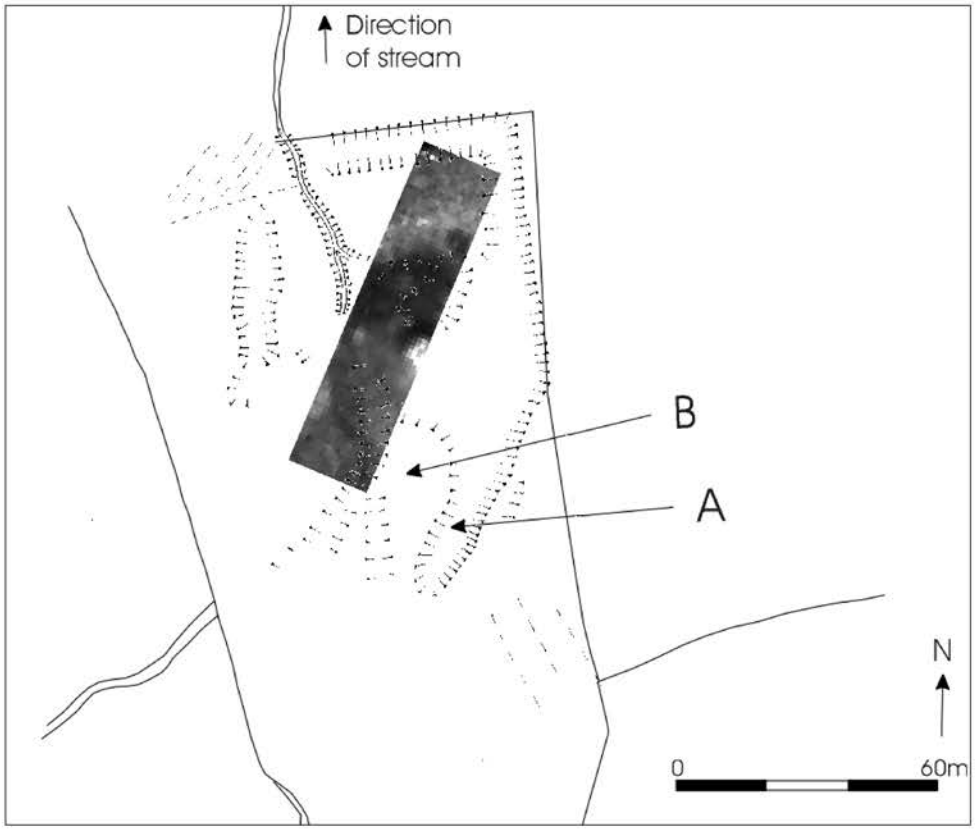

Figure 4: First resistivity survey with earthworks plan
feature A - depression; feature B - possible location of mill.

was shown there on the First Edition Ordnance Survey map (Fig.2), which may partly explain the depression. This is now the lowest point in the field. There is a short channel into the river there, which was draining the standing water into it in February 2010. There is also a line of cobbling about 2 metres wide across the Twyver, linking a trackway just south of the ridge and furrow on the west with the platform, but not with the linear depression.

Some of the ditches or holloways in the southern section of the field appear to match the field boundaries and the courses of the Twyver and its tributary stream that are shown on the Tithe map (Fig.3). On the February 2010 visit it was observed that water was flowing in channels down the field from the southern end, probably following the original watercourses and ditches. The lowest point of the most eastern linear depression (marked 'A' on Fig.4) is approximately 1.7m below its eastern bank. The linear depression curving down to the western side of the Twyver might be an earlier line of the river or just a geological feature.

Resistivity surveys

The areas and positioning of the surveys were largely dictated by the state of the vegetation in the field. The first survey was carried out in September 2009 over a line of four 20-metre squares running obliquely down the field from the northern 'platform' to the east of the Twyver (Fig.4). The ground adjacent to the stream was inaccessible because of the thicket of Himalayan balsam. The results showed higher resistance on the platform and to the south of the area that holds standing water.

A second resistivity survey was carried out in March 2010, when all the previous year's vegetation had died down, so it was possible to survey the platform up to the fence next to the stream. The result appears to show part of a rectilinear area of high resistance on the western end of the platform, aligned with the stream but cut through obliquely by the northern holloway (Fig.5). If this feature was a building, then the holloway must have been dug out at a later date. The cobbling in the stream might be associated with this.

Gradiometer survey

This survey was carried out in June 2010. The results (Fig. 6) show that the culvert is completely straight (feature C). The tributary stream is culverted into the Twyver before it enters the field. The depression west of the Twyver appears to be natural. There are a number of highly magnetic anomalies (feature D) in the deep linear depression on the eastern side of the field. The crossed lines (feature E) may indicate former field boundaries.

Discussion and conclusions

The Manorial Survey of 1589 listing the names of Margery Littleler's fields adjacent to her mill with abutments matching fieldnames on the Tithe map proves that her mill was located somewhere in the large modern field. The acreage given for her holding in the Survey is only a quarter of an acre less than that listed in the Tithe Apportionment for *Upper Mill Ground* and *Orchard* (Fig.3), which implies that her mill was within the eastern section of the modern field. The magnetometer survey suggests that the linear depression west of the Twyver is a geological feature, which supports this theory. It is possible that Margery Littleler's orchard was where *Orchard* is shown on the Tithe map. No trees are shown there on the First Edition Ordnance Survey map, so the fieldname may refer to a much earlier use of the land.

The right-angled holloway in the northeast corner is unlikely to have any connection with the water mill. The angle would not permit water from the mill to return swiftly to the river. No water or even dampness was observed in this depression on any of the site visits. The digging of it might have created the platform in that part of the field, and the resistivity survey results suggest that there was an earlier building next to the stream. Perhaps it was merely a boundary ditch.

Clearly there have been many changes in the landscape since the manorial survey of 1589, including the removal of old field boundaries and the construction of the culvert. None of the fieldwork has enabled the precise location of the mill to be identified. As the buildings were probably timber structures, this is not entirely surprising. It is possible that the deep linear depression (feature A, Fig.4) is what survives of either the mill leat or pond, and that this became a field boundary at a later date. If this was part of the water system of the mill, it is not clear how it was fed. There is no surviving evidence for a stream leading into it. However, if this was the mill leat or pond, it is possible that the mill and adjoining house were situated on the higher ground immediately to the west of it (feature B, Figs.4 and 6). Perhaps another resistivity survey in the future might provide the answer.

Acknowledgement
GADARG is grateful to the landowner for permission to carry out the fieldwork.

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Figure 5: Second resistivity survey with earthworks plan and air photograph.

Figure 6: Gradiometer survey over air photograph
feature B - possible location of mill; feature C - line of culvert; feature D - magnetic anomalies in depression; feature E - possible former field boundaries.

POPES WOOD, UPTON ST LEONARDS

Martin Ecclestone

Introduction

Among the numerous features in the central Cotswolds that have been located by careful processing of the images produced by the LiDAR survey and considered to be worth closer examination on site, are earthworks at the northern end of Popes Wood in Upton St Leonards, now owned by the National Trust (figure1). These earthworks have been given the name of the 'Civil War trenches', though the origin of this attribution is unknown, other than historical evidence that the Royalists, including the King, were in the area in 1643. The County's HER record simply records this attribution.[1] Figures 2 and 3 are LiDAR images of the area at the north end of figure1, with 'lighting' from the north-west and north-east respectively; the two principal earthworks are shown best by figure 2, and figure 3 suggests that there is a minor earthwork nearer the Portway. Figure 4 is an interpretation of these images in terms of the major features, such as the ancient Portway road, the principal tracks through the wood, and the three distinct earthworks, referred to here as Upper Lower and Portway. The first serious examination of the site by the GADARG LiDAR Project was on 10 July 2009, and was attended by members of the Upton St Leonards Historical Society and Mark Bowden of English Heritage. The more detailed subsequent surveys were led by the author.

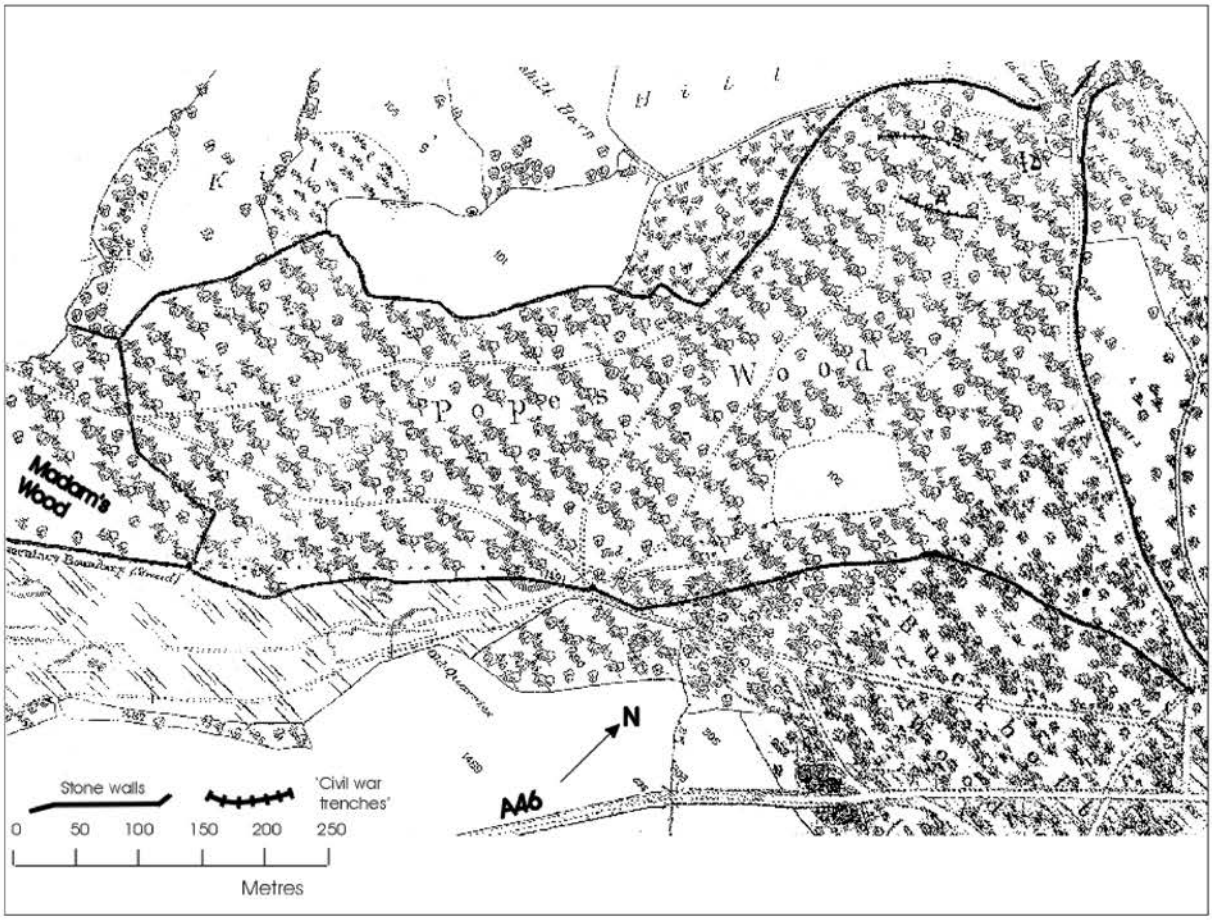

Fig 1. Reduced copy of the first edition (1884) of the OS 25 inch map of the Popes Wood area.

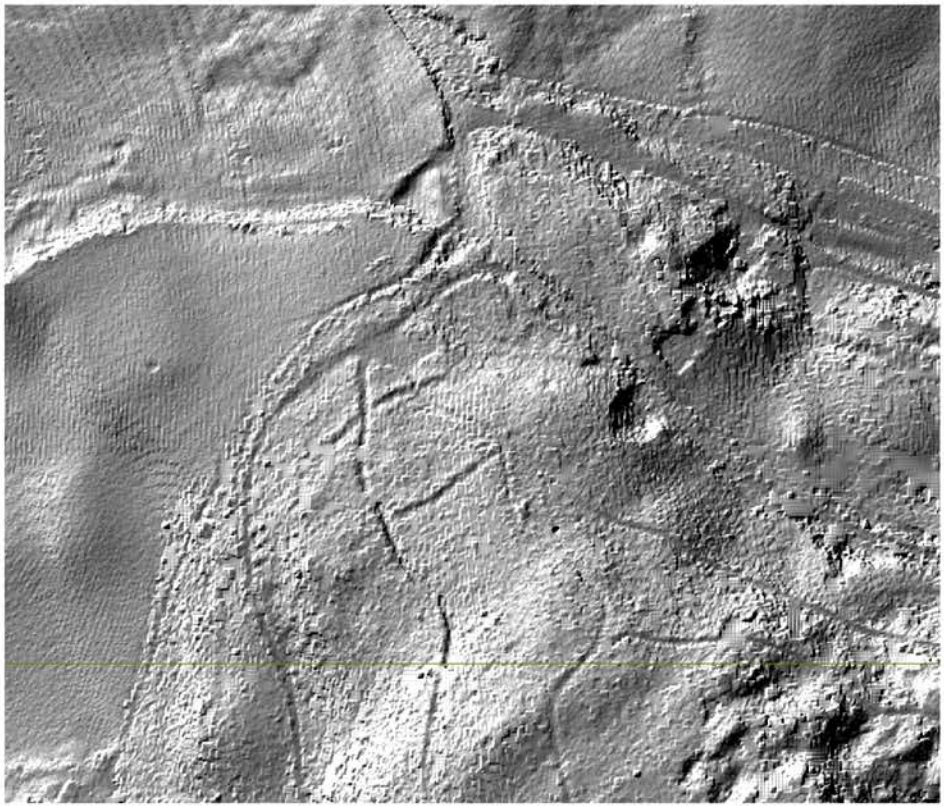

Fig 2: Lidar image of the north end of Popes Wood, with 'lighting' from the north-west.
(© Gloucestershire County Council Archaeology Service).

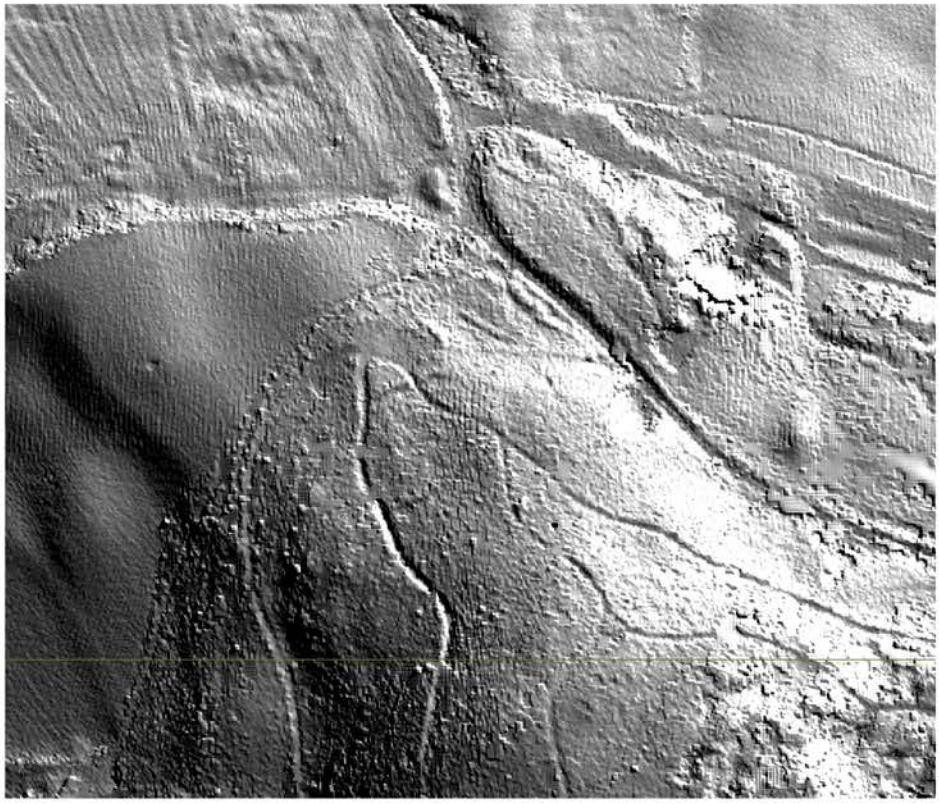

Fig 3: Lidar image of the same area as figure 2, with 'lighting' from the north-east.
(© Gloucestershire County Council Archaeology Service).

Description of the earthworks

There are two separate but similar linear earthworks near NGR SO 8752 1312, each of which is roughly parallel to Popes Wood's northern boundary that is near the foot of the wooded Cotswold escarpment that rises south of Upton St Leonards (figures 1, 4 and 6). Each earthwork has a ditch or 'trench' running more or less along a contour for a distance of 80 to 100m., with a continuous mound or 'rampart' on its downhill side. The lower earthwork is 60m. south of the boundary of the wood and is cut into three parts by two woodland tracks, while the upper earthwork is a further 60m uphill and 11m. higher, and is terminated by the same two tracks. A cross-section of the hillside (figure 5) between the lower and upper earthworks along the line between B2 and A3 (see figure 6) shows that the undisturbed ground between the two earthworks rises at 1 in 6 or 7, while the downhill side of the mounds is steeper, at 1 in 3 or 4.

The third linear earthwork near NGR SO 8758 1318 runs north-west, more or less parallel to the Portway road, 30 to 40m. away, where the north-east hillside has been quarried. Only 20m. of mound and ditch of this 'Portway' earthwork are visible. This earthwork differs from the upper and lower earthworks by not following a contour, for it ascends at 1 in 10 to the south-east. It is terminated at its upper end by a footpath.

The present state of these earthworks is complicated by the stumps of felled trees and the large hollows and mounds left by trees that were probably uprooted by a severe gale in 1992, and any surveying is hampered by the numerous ash saplings. On the whole, each earthwork is fairly consistent along its length, with the exception of the western 20m. of the lower earthwork, where the ditch or trench is very shallow, though the accompanying mound is still visible.

Figure 6 is a reasonably accurate plan of the earthworks, focussing on the position of the ramparts, whose summits can be located more certainly than the lowest points of the accompanying ditches, while the break of slope above the ditch is even less

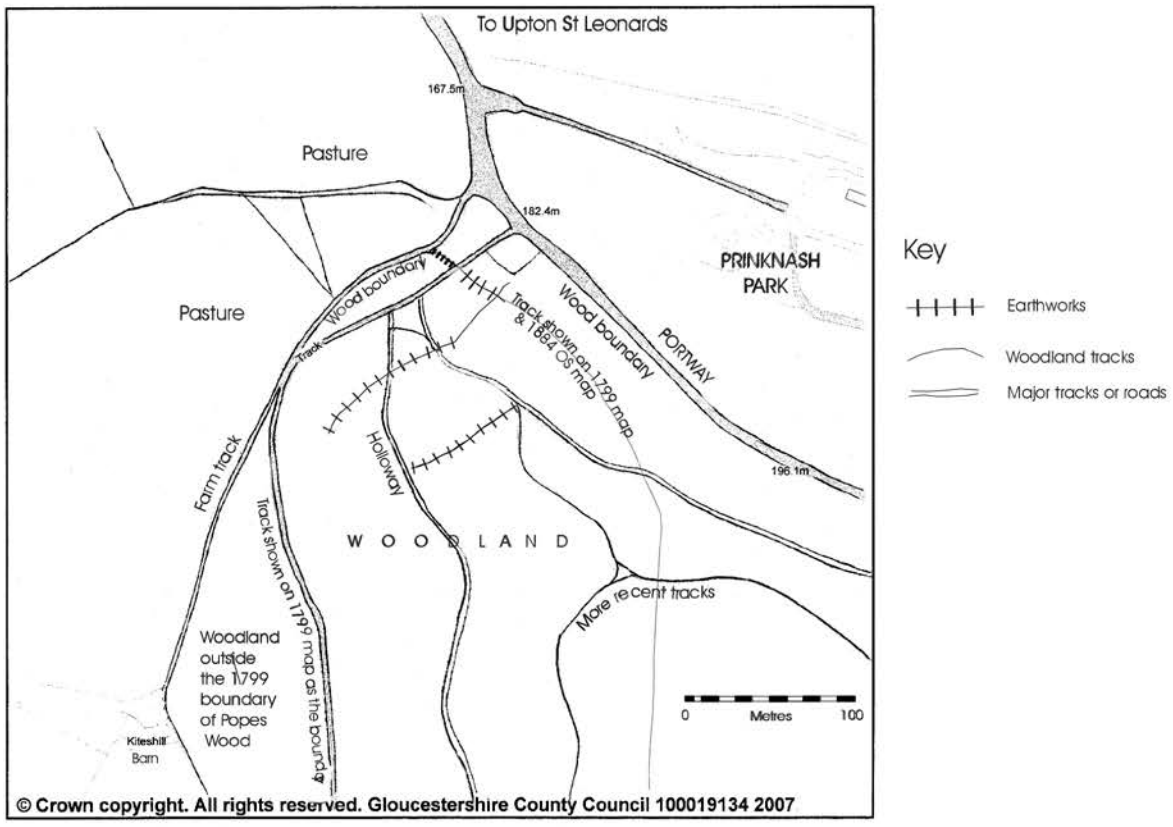

Fig 4: Interpretation of the major features of figs 2 and 3.

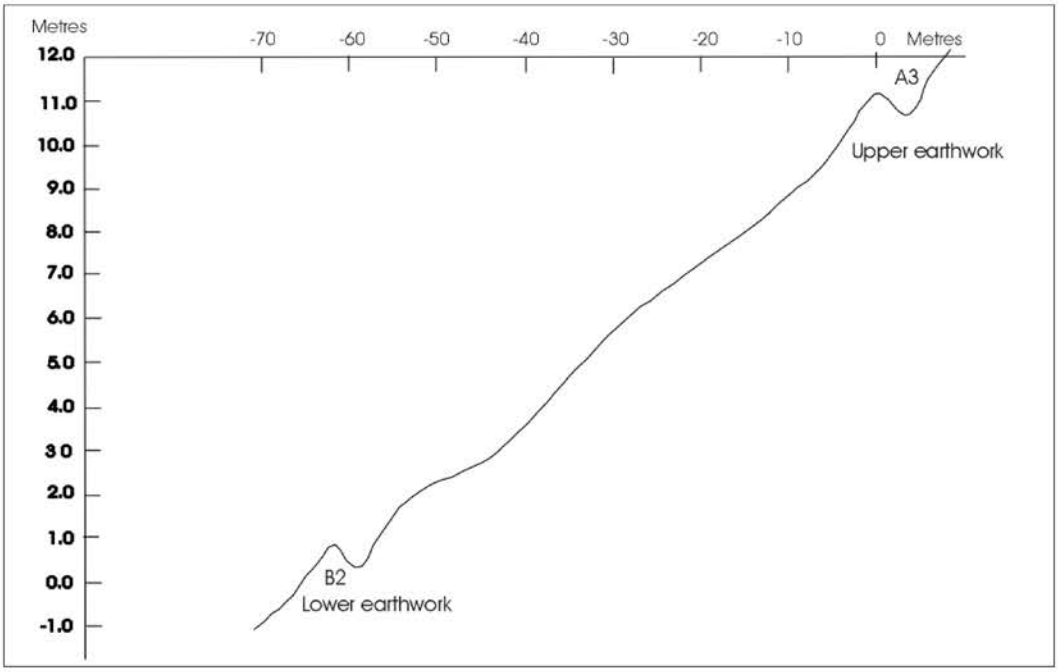

Fig 5: Cross-section of the hillside joining points A3 and B2.

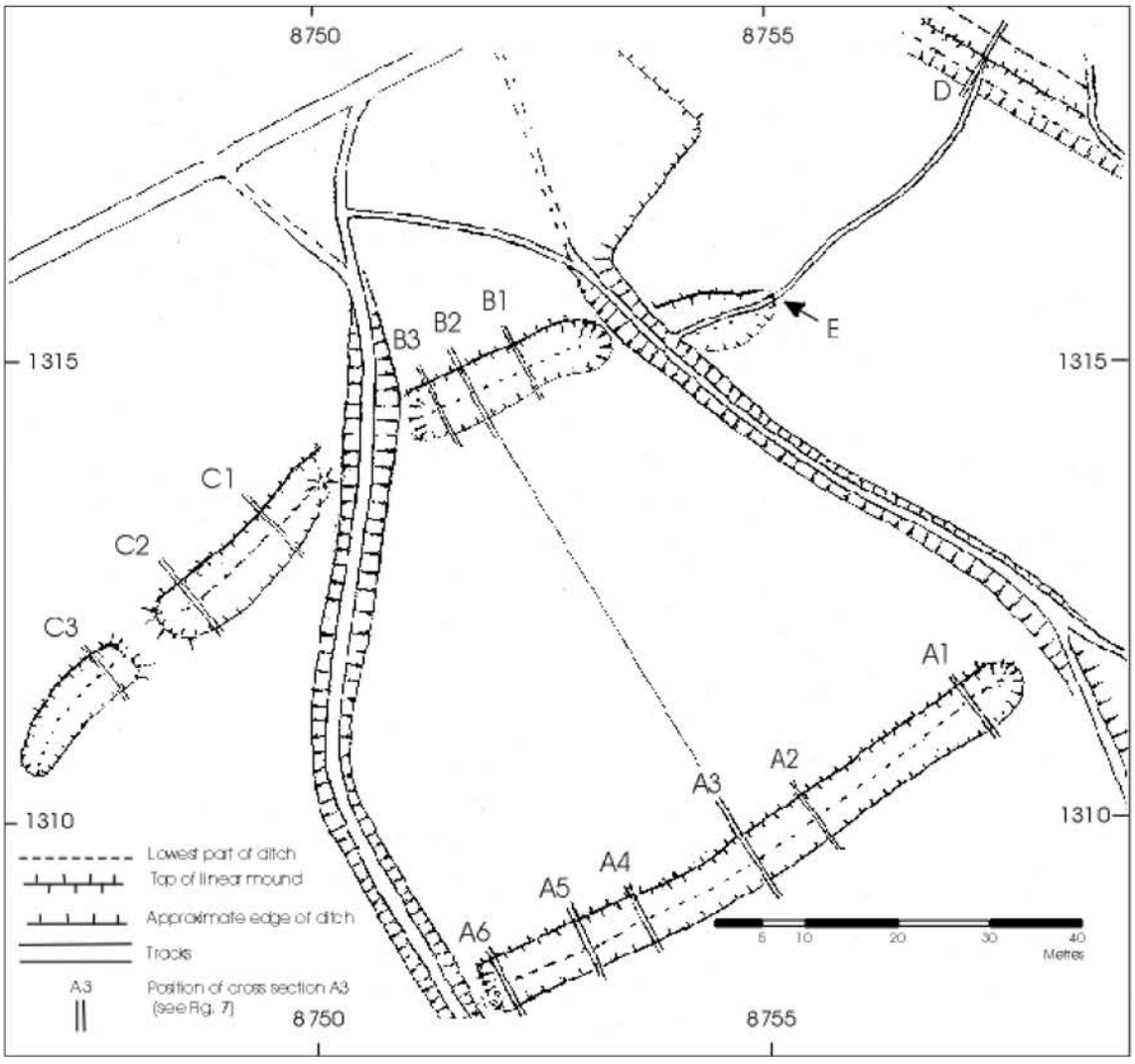

Fig 6: Plan of the earthworks. 'E' (at c.200m.) is the reference point for heights in fig.8.

recognisable. For these reasons the shape of the earthworks is best illustrated by cross-sections measured at selected positions along their length (figure 7). Figure 8 shows the height of the mounds along their length, relative to a single reference point ('E' on figure 6, at the east end of the lower earthwork, which is approximately 200m. above sea level). For the sake of clarity figures 7 and 8 employ vertical scales that are respectively four and five times the horizontal scale. All height measurements were made using a dumpy level kindly loaned by Gloucester City's Historic Environment Team.

The cross-sections shown in figure 7 can best be characterised by three measurements, H, W and M. H is the vertical height from the lowest point of the ditch to the highest point of the mound or 'rampart', for a particular cross-section. W is the distance from the highest point of the rampart to the far side of the ditch, measured horizontally. M is the distance from the lowest point of the ditch to the far side of the rampart, also measured horizontally. Figure 9 tabulates H, W and M for all the measured cross-sections, identified on figure 6 as A1 to A6 on the upper earthwork, B1 to B3 on the middle part of the

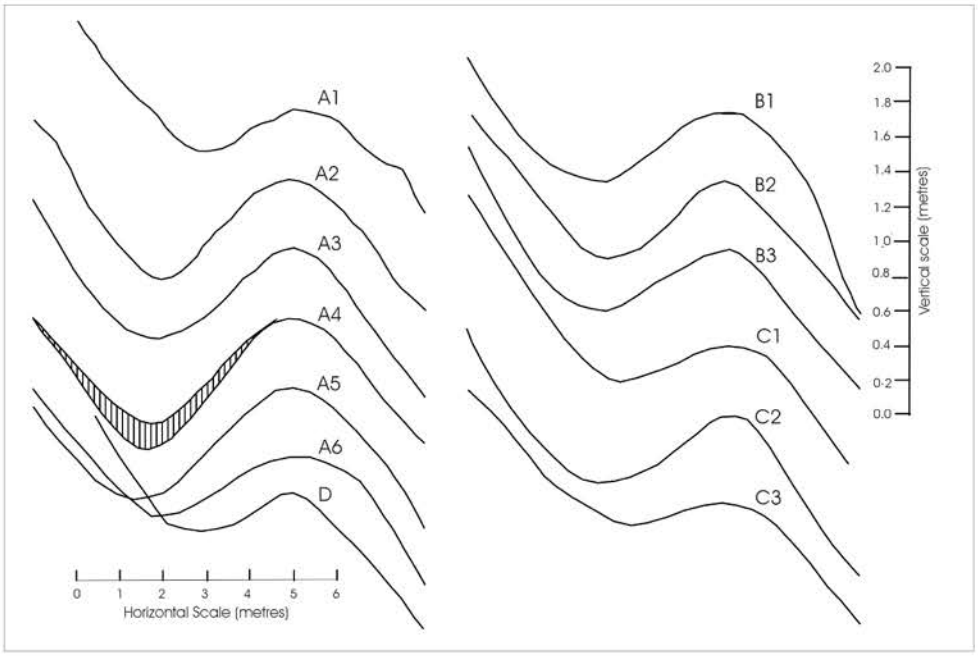

Fig 7: Cross-sections of the earthworks at selected points.
The hatched area of A4 is the fill as measured by excavation.

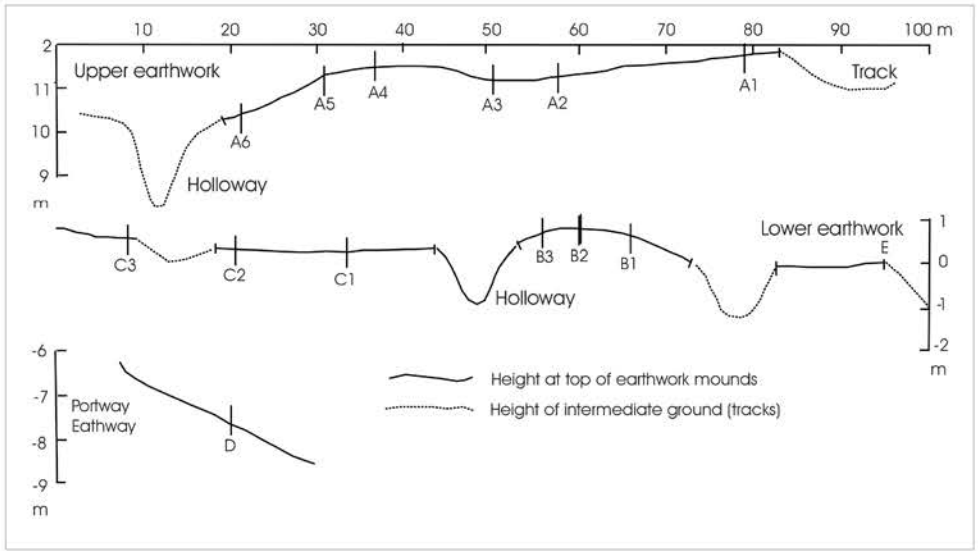

Fig 8: Heights along the upper, lower and 'Portway' earthworks, relative to point E.

Fig 9: Dimensions of selected cross-sections of the earthworks (see fig.6 for their locations)

Cross-section	H	W	M
A1	0.25	3.6	3.5
A2	0.58	5.1	5.5
A3	0.51	5.4	5.2
A4	0.60	5.9	5.8
A5	0.63	6.0	6.4
A6	0.32	4.7	5.6
Mean A1-6	**0.48**	**5.1**	**5.3**
B1	0.42	5.3	4.7
B2	0.46	4.7	4.7
B3	0.37	4.7	4.5
Mean B1-3	**0.42**	**4.9**	**4.6**
C1	0.23	3.7	3.8
C2	0.40	4.9	4.3
Mean C1-2	**0.32**	**4.3**	**4.0**
C3	0.14	3.5	3.3
D	0.22	3.5	3.3
Excavated A4	**0.75**	**5.9**	**5.8**

COLUMN HEADINGS:

H: the vertical height (in m.) from the lowest point of the ditch to the highest point of the mound,
W: the horizontal distance (in m.) from the top of the mound to the far side of the ditch,
M: the horizontal distance (in m.) from the lowest point of the ditch to the far side of the mound.

lower earthwork, C1 to C3 on the west end of the lower earthwork, and D on the Portway earthwork. The mean values of H, W and M suggest that earthworks A and B are quite similar, while the continuation of the lower earthwork west of the holloway (C) is progressively on a smaller scale. The reference in figure 9 to 'Excavated A4' and the cross-section of A4 in figure 7 are explained below under the heading 'Comparison with known Civil War Earthworks'.

Documentary evidence

In 1799 Popes Wood contained 23 ha. of mixed woodland and old stone quarries that are now in the parish of Upton St Leonards, though it was a detached part of the parish of Matson until the end of the 19th century. In the medieval period it also belonged to the manor of Matson, and the Priors of Llanthony had quarrying rights in its demesne land at Popewood, as it was spelt until the 19th century.[2] In the 17th century the estate of William Selwyn of Matson included 94 ha. of copses and woods, called Popewood and Saltridge[3] (now in Painswick); the Bridgeman family of Prinknash next owned the wood until the 1770s, when it was acquired by the Howell family.[4] Following the 1796 Inclosure Act for Gloucester (that included Matson), a map of Matson parish was produced in 1799 that included Popes Wood,[5] as shown in figure 10. Though rather inaccurate, this plan confirms that the wood's boundary has not changed significantly since 1799. The first edition (1884) OS 25 inch map is the oldest detailed plan of Popes Wood, but it gives no indication of the earthworks, which have been added to figure 1. The wood remained part of the Prinknash estate until it was sold to the Workman family in 1923,[6] and was given in 1989 to the National Trust by John Workman.[7]

The manorial boundary of Popes Wood in 1799 was defined by a stone wall, except along the Portway, which divided the wood from Prinknash Park. The boundary of the detached part of Matson parish coincided with the wall on the west and south sides of the wood, but along the scarp edge to the south-east it was up to 20m. north-west of the manorial boundary wall, while the Prinknash Park wall formed the parish boundary along the Portway as shown in figure 10. In preparation for the first edition of the 25 inch map, the Ordnance Survey had to determine the boundary between Matson and Cranham parishes, which was undefined on the ground within Popes Wood, as it still is today.[8] The stone wall around Popes Wood is now dilapidated, and hardly visible in some parts, but it clearly coincides with the 'woodwall' shown as a solid line in figure 10 (other than along the Portway), as comparison with figure 1 shows. A number of old

beech trees, whose trunks exceed 2m. in circumference, still grow close to the north-western part of the wall, inside the wood, while the modern wire fences are outside the wall. Unfortunately the age of this wall cannot be determined. The best maintained parts are on the south-east side, in Painswick and Cranham parishes; the latter part is shown on a 1750 map of Gloucester Cathedral's land in Cranham, as far east as its junction with the Portway.[9] The wood on the south-west side of Popes Wood, called Madams Wood, was divided from Painswick manor on its south side by a wall built soon after 1614, to protect its trees from damage by straying Painswick livestock,[10] and it is plausible that Popes Wood was similarly protected by a continuation of this wall north-eastwards, if it were not already there. This part is first recorded in 1787, as 'Mr Howell's wall', when the manorial boundary of Upton St Leonard was perambulated; an earlier recorded perambulation (in 1589), almost certainly along the same boundary, simply calls it 'the edge of Pope Wood'.[11]

Prinknash Park, on the east side of the Portway, was the Abbot of St Peters 'summer house' until the Dissolution, when it became the property of Lord Chandos of Sudeley Castle. When the siege of Gloucester began in 1643, the King was staying at Matson House, while one of his officers (probably Robert Tayloe of Upton) was at Prinknash.[12] The Parliamentary commander Massey carried out several recorded raids south and east of Gloucester in 1644, including Painswick and Huddinknoll Hill (NGR SO 847108).[13] These facts and the probable military importance of the Portway suggest that skirmishes may have been expected near Popes Wood, but there is no documentary evidence that would confirm a military interpretation of the earthworks.

Discussion

The minor 'Portway' earthwork could be interpreted as breastworks for musketeers covering part of the Portway, only 30 to 40m. away and roughly 5m. lower. However, the height of its mound above the ditch (H = 0.22m) would provide quite inadequate protection. It seems more likely that the ditch was part of a track from the Portway at the north end of the wood, leading south to the top of Popes Wood, possibly the track shown in figure 10 in 1799. If that were the case, the low mound on the Portway side might be the result of the track deepening naturally through use while traversing the hillside, rather than a deliberate construction. A track seems the most probable interpretation, especially as the earthwork rises steadily (see figure 8), until it terminates where it meets an existing footpath up the hill.

The more significant upper and lower earthworks cannot be explained so easily, and like many other

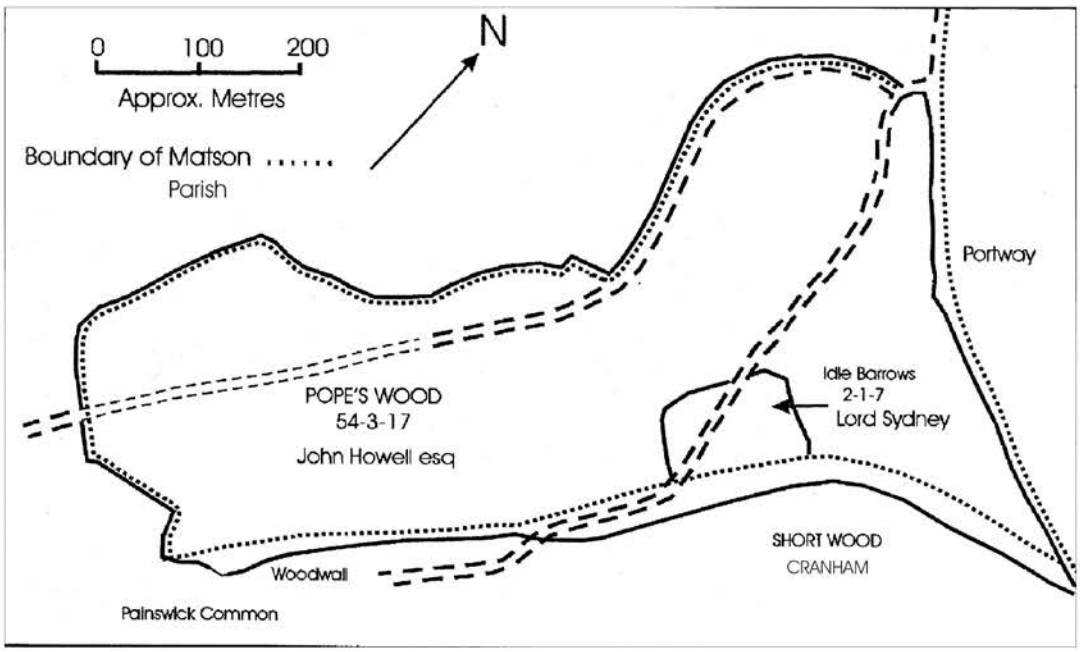

Fig 10: 1799 plan of Popes Wood.[22]

earthworks with no recorded history or obvious purpose, the Civil War provides a convenient escape. As the distinguished landscape historian Christopher Taylor has said, 'England is littered with sites that are said to be of the Civil War, most of which are spurious'.[14] What is clear is that the similarity of the two earthworks, as indicated by the measurements in figure 9, implies they were created for the same purpose and probably at the same time. The relationship of these earthworks to two north-south tracks through the wood (figures 4 and 6) raises the obvious question: which came first, earthwork or track?

While the eastern track appears to be quite recent, the western track is a well-defined holloway that might be centuries old. If the holloway is younger than the earthworks, it deliberately avoided the upper earthwork, but cut through the lower earthwork, which extends further west. As the holloway deepened with time, its eastern bank would have revealed a cross-section of the earthwork's ditch. At cross-section B3 the lowest point of the ditch is 1.2m. above the present level of the holloway's track, perhaps less than 1 m. if the ditch's accumulated fill were subtracted. The top of the east bank of the holloway might therefore be expected to dip significantly where the ditch meets the track, but in fact it is almost level; the west bank of the holloway is similar, though lower. Unfortunately, the National Trust regularly removes accumulated debris from the holloway and dumps it nearby, so any evidence of the expected dip could have been obscured. An alternative approach to the relative age question is to look at the terminals of the earthwork's bank or mound. A rounded terminal would imply that the earthwork deliberately stopped near the existing holloway, whereas a terminal that is 'chiselled' parallel to the track would imply that the track cut through the earthwork. Mark Bowden from his own observation thinks that the bank's terminals are 'chiselled', but acknowledges that the evidence is rather ambiguous.[15] In any case, the holloway cannot confidently be dated, so without excavation or the discovery of relevant records for the earthworks, their age must remain uncertain. What should be discussed and tested against evidence is their purpose.

First, are they tracks which happen to traverse the hillside? If they were used long enough, the tracks would deepen, but it is unlikely that the linear mounds on their downhill side were not made from the spoil from a deliberately excavated ditch. Unlike downhill tracks, which are eroded by rainwater flow as well as traffic, a level track would deepen more slowly, if at all. Nor would such tracks be easily accessible from the holloway, which today is 1.8m. lower than the ditch at A6 and 1.2m. lower than the ditch at B3. The only tracks in Popes Wood that are more or less level are those near the wood's boundary; elsewhere there are numerous downhill tracks, old and new. The older tracks were almost certainly used to transport timber or underwood, and it was only common sense to go downhill until the Portway was reached. It is difficult therefore to see what purpose there might be for tracks traversing the hillside for less than 100m., and there is no visible evidence that they once extended further than at present. The one exception might be the west end of the lower earthwork, which disappears gradually; this may suggest that whatever its purpose, its construction was abandoned.

If the earthworks are not the relics of tracks, were they intended to define a boundary, generally known as a woodbank? Popes Wood certainly dates from the medieval period, as are other woods on the steep western scarp of the Cotswolds, which was otherwise of little use, other than for quarrying. The absence of funnel shaped entrances, or 'horns', implies that it was unlikely to be a wood-pasture, that provided common pasture, at certain times of the year. As a demesne wood of Matson manor, the full extent of its boundary would have been clearly defined by a woodbank or a wall, though today's boundary may have extended (or withdrawn) from its medieval position. Such a woodbank would nearly always consist of a ditch on the outside of the wood and a bank on the inside; the Popes Wood earthworks are quite the opposite, as was typical of deer park boundaries, which had a wooden pale along the outer bank to prevent deer escaping from the park.[16] There is no evidence that Matson manor ever had a deer park, though the nearby Prinknash Park kept at least 40 deer; its wooden pales were replaced by a stone wall in the 18th century.[17] The boundary of Popes Wood is defined by a stone wall (see figure 1), and there is no clear evidence, such as a ditch on its outer side, that the wall replaced an earlier bank. In practice, walls were used instead of earthworks whenever stone was readily available, as it was on the western scarp of the Cotswolds.[18]

Finally, if the earthworks were defensive, the Civil War provides a possible cause, since Royalists were certainly in the area in 1643. Having two separate trenches with breastworks would not be surprising, though it is not obvious why they both cover the fields north-west of the wood; perhaps the enemy was expected to avoid the Portway, as a too obvious route which could be easily blocked. If they were Civil War defences used by musketeers, their dimensions need to be compared with those of other, better attested examples.

Comparison with known Civil War earthworks

Most of the published archaeological surveys have been concerned with major works associated with sieges, such as at Gloucester or Newark. Peter Harrington has written a number of comprehensive books, including 'English Civil War Archaeology', but this has little to say about the minor earthworks that gave infantry musketeers some protection, apart from 'Breastworks take the form of crude barricades, frequently taking advantage of natural features and local building material'.[19] Like the known military breastworks, the Popes Wood earthworks appear to have an excavated trench protected by a rampart on the side most likely to face the enemy, and their elevation above possible targets would be an advantage. Elsewhere, the usual height of Civil War ramparts above the floor of the trench was one to 1½ metres, so that a standing musketeer could shoot above the rampart, protected up to his breast level against return fire. Since their construction, such trenches have slowly filled with hill wash and decayed vegetation, while the ramparts may have eroded, so that by now the height difference must have lessened.

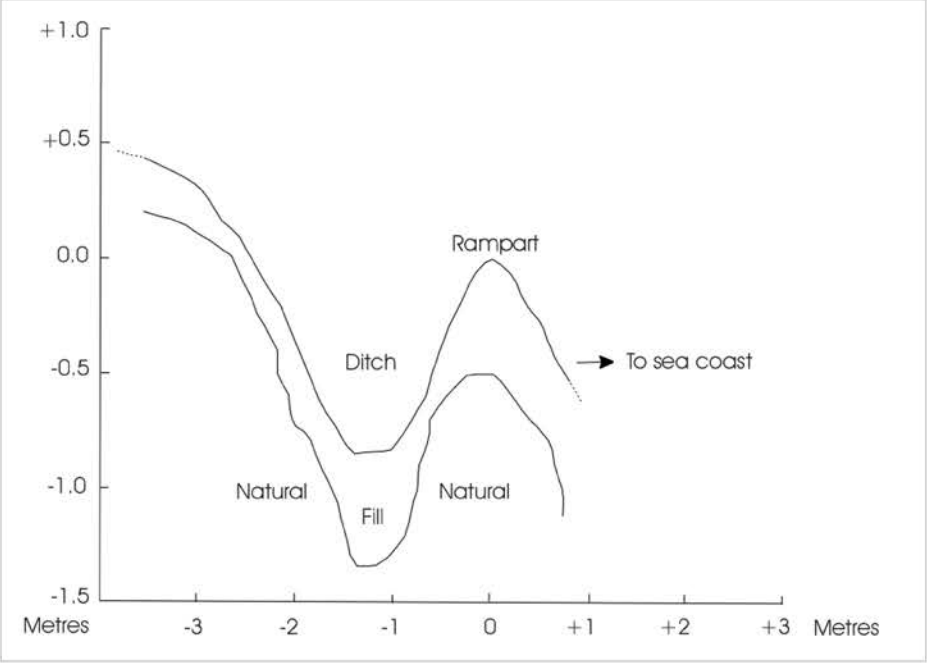

Fig 11: Simplified cross-section of the breastworks of Trench 3 at The Garrison, St Mary's, Isles of Scilly, investigated by English Heritage in 2009.

A good example of a Civil War breastwork, on St Mary's in the Isles of Scilly, has recently been excavated and surveyed by English Heritage;[20] figure 11 shows a simplified cross-section. Its rampart faces the sea, and its internal height above the floor of the trench would have been 1.35m., though fill has reduced this by 0.5m. since its construction. The present width of the trench, measured horizontally from the top of the rampart to the landward hillside is 2.4m.; the original width may have been around 3m. The present width of the rampart, measured horizontally from the lowest point in the trench to the seaward face of the rampart, is about 2.4 m. also. Compared with the measured cross-sections of the Popes Wood earthworks (figure 9), the present depth of the St Mary's ditch (0.85m.) well exceeds the deepest Popes Wood ditch (A5, 0.63m.) and is twice the mean depth (0.4m.), while its present width (2.4m.) is less than the narrowest Popes Wood ditch (C3, 3.5m.) and is only half the mean width (5.0m.). Mark Bowden considers that these ditches are too wide to be breastworks, but not wide enough for artillery positions. [21]

The Popes Wood earthworks clearly have a very different profile from the Scilly example. However, the measured depth of the Popes Wood ditches relative to the height of the adjacent rampart, as discussed so far, has not taken into account the difference between the lowest point of the ditch when it was made, and the lowest point as seen today. This difference can only be measured by removing the fill that has accumulated since the earthworks were constructed. Permission to excavate a trench across the ditch at A4 was therefore obtained from the National Trust, and the necessary work was carried

out on 24 May 2010. The cross-section for A4 in figure 7 includes a hatched area that represents the depth of the fill across the ditch; its maximum depth was 14.5cm. The fill was made up of decayed leaves, plants, earth and some small stones. The next 10cm below this fill consisted mostly of larger stones and less soil, which were probably on or below the original surface of the ditch. Although this single excavation may not be typical, it seems unlikely that the ditches of earthworks A and B, when constructed, could be as much as one metre deep, relative to the top of the original rampart, even allowing for some erosion. This is much less than the St Mary's breastwork depth of 1.35m, so that a Civil War origin for the Popes Wood earthworks appears unlikely. The small depth of the fill at A4 also suggests that these earthworks are not very old.

Conclusions

1. Figure 9 shows that the upper and lower earthworks are quite similar, probably contemporary, and intended for the same purpose. It is possible that they are only part of an unfinished project, though their duplication makes this less likely.

2. The north-south holloway (which may be medieval) appears to determine the western terminal of the upper earthwork, which would therefore post-date the holloway. For the lower earthwork, which intersects the holloway, the evidence is ambiguous, as discussed above, and does not help to date the earthworks. The excavation at A4 found that the ditch fill was quite shallow (15cm), which suggests that the earthworks are unlikely to be even a century old.

3. Neither earthwork is likely to be a trackway, since they go nowhere, and the mound on their downhill side implies that the ditches were excavated for some other purpose. The earthwork near the Portway may well be part of an old trackway.

4. They are not woodbanks. First, because the ditch would be on the outside of the bank (unless it completely enclosed a deerpark, when there would be a single continuous woodbank). Secondly, because the ancient boundary of Popes Wood is a stone wall (of unknown date and in some places vestigial), and the wood has no evidence of internal subdivisions.

5. The possibility that the upper and lower earthworks were intended to be breastworks that Civil War musketeers could use to attack an enemy force coming from the north-west is unlikely, since the ditch behind the rampart was too shallow to provide the necessary protection, taking into account the small depth of the accumulated 'fill' found by the excavation at A4.

6. In conclusion, the earthworks' purpose remains uncertain, though they are almost certainly quite recent.

Acknowledgments

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GLOUCESTER AND DISTRICT ARCHAEOLOGICAL RESEARCH GROUP (GADARG)

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Gloucester and District Archaeological Research Group was established in 1967. Currently it has a membership of some 150 independant amateur and full time archaeologists and local historians. Archaeological and historical evidence is investigated through the study of aerial photographs and documentary research and by undertaking activities, such as field-walking, resistivity, landscape and standing building surveys. For many years Group members have supported local excavations, particularly at Frocester. Sometimes GADARG is asked to undertake archaeological evaluations and watching briefs. Members are also encouraged to conduct their own projects, for which help is often needed. If local history is your interest, the Group can offer support to get you started, as well as provide contacts in Gloucester archives, where GADARG volunteers often help with Archive projects. Other activities include setting up information displays at relevant public events.

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