BATH & CAMERTON ARCHAEOLOGICAL SOCIETY

The lawn below the Royal Crescent Ha-ha, Bath

A report on geophysical surveys by the Bath and Camerton Archaeological Society June and October 2012

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The lawn below the Royal Crescent Ha-ha, Bath

The lawn is part of Royal Victoria Park in Bath, and this and is covered by MBN11272 “Royal Victoria Park” and DBN3598 which covers the nationally registered area (Grade II). It includes MBN30167 and MBN30168

Report on two geophysical surveys by the
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Summary

The lawn below the Royal Crescent Ha-ha in Bath was part of an archaeological investigation in 2002 for a Time Team television programme on Channel 4. In this they confirmed the route of and excavated a known Roman road down across this lawn, and also excavated nearby burials. They also revealed and excavated a Late Bronze Age ditch. This project extends the geophysics part of this work, and demonstrated that the Late Bronze Age ditch is extended to an enclosure. This work also investigated a large ditch-like formation running from NE towards the SW across the lawn, and other features including an area with pit-like chambers below the ground.

Preface

This survey was carried out by members of the Bath and Camerton Archaeological Society (BACAS), following the work done by Time Team in 2002 ("Death in a Crescent" on Channel 4), and also, as we subsequently found out, a survey carried out by Engineering Archaeological Services in 2006. The project arose from the interest of Janet Pryke in possible Roman military remains in the area. Additional geophysical description of the area was considered to be important and would also provide information for future archaeological work. BACAS agreed to support the project. John Oswin as BACAS Geophysics team leader coordinated the technical work.

Many thanks are due to John Gater who has given us permission to use the Time Team geophysics results in this report. The geophysical investigation for Time Team was carried out by GSB Prospection, and from their work we knew that resistance analysis of the area gave significant results.

The project was encouraged by Richard Sermon, B&NES Archaeological Officer, and helpful discussions have been had with him and Rod Millard, HER Officer.

We are also grateful to the B&NES Parks Department for their support and permission to undertake this work. We have also had help and advice in several areas from many departments of the Council, including Graham Evans and Simon Memory (Parks), Mike Bransgrove (Property Services) and Phil Mansfield and Mark Williams (Building Control), and the former Head of the Parks Department, Stan Hitt.

We acknowledge and appreciate the help, comments and advice that has also been given by Ian Brooks of Engineering Archaeological Services (EAS), Clare Baxter, Collections Manager of the Alnwick Castle collection, Stephen Clews and Susan Fox of the Roman Baths Museum, David Hughes of Bath Spa University and Maurice Tucker of Bath Geological Society, also the help from Colin Johnston and the Bath Record Office. Janet has appreciated the continuing encouragement of Amy Frost of Bath Preservation Trust. Through the project we have especially appreciated the support, guidance and advice from Marek Lewcun.

Special thanks are due to the group of volunteers who were pleased to take an interest in and volunteer for the geophysics work, which was all performed very efficiently and positively. It included a very early start for the June work, and there was the threat of and actual very rainy weather over both periods, in what was a very wet year. The volunteers and helpers included Adam Aust, Rick Buettner, Sandra Heward, Chris Higgs, Denise Hillier, Dawn Hodgson, Mary Huntley, Andy Kingan, John Knapper, Tim Lunt, Patrick McCarron, Di Parkin, Ian Perkins, Sue Pickering, Emma Pryke, Susan Rhodes, and Richard Wyatt.

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1 Introduction

1.1 Location

The lawn surveyed is situated in front of the Royal Crescent in Bath and is part of the Royal Victoria Park. It is also known as Three Acre Piece. Its outline is marked in Figure 1.1.

Figure 1.1 Map of the area

All satellite maps ©Google Earth with grateful acknowledgements

The Royal Crescent was built by John Wood the younger in 1767 on part of what were Upper and Middle Barton Fields as shown in a map of 1740[1]. The land down from the Ha-ha then became known as the Crescent Fields. The survey area is between the Ha-ha in front of the Crescent and the path which continues the Gravel Walk. Over to the west, on the other side of the road that runs down by the lawn, Marlborough Buildings, is the area previously known as the Commons which now makes up the major part of the Royal Victoria Park.

Down the hillside from the lawn towards the south east is Bath city centre, including the hot spring area, which is about 750m away. The Crescent and lawn are on an overall slope of about 1 in 20 down towards the River Avon, which is visible at the bottom left hand corner of Figure 1.1. This is beyond the Upper Bristol Road which is joined by Marlborough Buildings at a T junction.

1.2 Background

The lawn area was added to the public areas of Royal Victoria Park in 1846[2]. Its lower boundary was edged by a hedge, as described "to be restocked" in the drawing in John Wood's 1764 lease documents[3], above the path just north of the Barton Middle Field boundary [1]. At some time there has been apparent another Ha-ha-like length of wall below the hedge and its path, and a photograph of this from about 1860 can be examined [4]. There is no sign of this walling now and its position would be under the tree and shrub filled bank between the lawn and Royal Avenue. The lawn is part of a large area which, together with the Commons to the west, has been described over many years as "Never to be built on" as stated in the drawing in the John Wood lease documents[3].

The area of the lawn has been used for various purposes since the development of the Royal Crescent. It was the site of some of the works for the building works of the Crescent as pictured by Thomas Malton, where many types of stone workings are observed to be taking place in front of the almost-completed buildings[5]. As a field it continued to be used for grazing with the Ha-ha fulfilling its boundary role to keep the animals below the Royal Crescent. There are images of animals there through the years including up to the 1930s[6]. In 1850, there was a garden proposed for the whole area in front of the Royal Crescent[7]. This included pathways, walls, plantings and fountains. However this garden was not created and we presume that no preliminary work was done. Its area was described as park or ornamental ground in the one inch to the mile Ordnance Survey map published in 1893.

In the Second World War the lawn area was taken over for use as allotments, and aerial photography shows the arrangement of the plots[8], with their orientation at right angles to the path below the area. After the war these allotments continued to be cultivated until 1953, when they were removed. The hedge along the bottom of the area was removed at this time[9]. Following this, the area was lawned, and it is now very well used for leisure and picnicking, alongside its provision of an impressive site for special occasions.

The wider area including this lawn had been important in more historical times, and contains many features of archaeological interest through the use and settlement of this part of the city.

At earlier times there may have been standing stones visible from here. To the west, in that part of the Commons called Ring Common (after "The Ring" in Hyde Park according to John Wood the elder[10]), a group of four large stones was detected in excavations in 1985[11], buried under the level ground towards the top of the allotments behind Marlborough Buildings. Observations made at the time, included those of one pair described as "two large blocks of rough limestone set deep into the

clay and bearing marks on their surface to suggest that an original 'standing' portion of each was broken deliberately, some time in their past". The section at the south end of [grid] 11 showed that the stones pre-date the 17th century depositions." They "form an irregular curve"[11]. Nothing further is known about the date and origin of these stones. In addition, to the north up by the Lansdown road, there may also have been a view of that group of large stones known to John Wood the elder as Sols Rocks if these "three stones when erect and perfect" were as present and as visible and as obvious as he described in his "Description of Bath"[10].

When Time Team excavated the late Bronze Age ditch in the lawn they found two pieces of flint: a retouched blade and a bladelet, which were described as being "unlikely to be contemporary with the pottery and may be considered 'background noise' from the known mesolithic presence around and in Bath"[12]. There had been activity in the area at many times in the past, particularly up on the hills[13,14] which look down on the valley and the spring area with its steam and spouting hot water.

Many of the Bronze Age remains reported around Bath have been found in the burial and settlement sites up on the hills[13,14]. The sophistication of at least part of the Bronze Age civilisation in the area can be indicated by the remains of the decorated gold plated bronze sun disc found in a barrow on Lansdown, the hill which looks directly down from the west onto this area. Examples of finds such as the bronze leaf shaped sword found near the gasometer by Windsor Bridge and the bronze axe head found at Twerton, both in the Alnwick Castle collection[15] indicate the parallel importance of the lower levels including the river.

There are Iron Age settlements not far from the lawn. Over the other side of Marlborough Buildings and a little down the slope, under the Lower Common allotments, there are the remains of three Iron Age round houses, below the remains of later Roman developments[16]. Up to the northwest, up Sion Hill on the slopes of the golf course (up from the top left of Figure 1.1) geophysics has indicated the remains of a Romano-British farmstead which may have been preceded by an Iron Age dwelling[17]. This is close to the remains of the large Iron Age settlement about 650m up the hill from the lawn near the Bath Spa University site[18].

The Roman developments under the Lower Common allotments included a ditch formation on the orientation of the lower part of the Marlborough Buildings road. This was backfilled, and a Roman building complex was built which was occupied for many years[16].

There are also several Roman finds that were unearthed in the formation of Royal Victoria Park[19]. Many of these became part of the collection of the 4th Duke of Northumberland and are in the Alnwick Castle collection. These make up the group

of pottery described in the Roman section of the 1880 catalogue of the collection at the Castle[15]. Other bronze pieces, six fibulae, rings and a double fishhook "supposed to be Roman", were reported by the Museum of Worcester and Worcestershire Antiquities in 1862[19]. A fine large Roman fibula, pierced and plated with gold, was described by H.M. Scarth in 1864 to have been found in Royal Victoria Park and said to be part of the collection of the Earl of Cadogan[20]. Our enquiries from Worcester Museum and the Cadogan Estate revealed no information on what happened to these items. For all the finds from the Park there seems to be no information about the sites of their discovery. Relatively little earth movement seemed to have been completed in making the Park as it was only the areas used for the roads that were landscaped in its development[21]. No information has been found about the details of any archaeological investigations at the time, but terracing around the roads could have disturbed archaeological deposits, as could digging any foundations for gateposts or other features.

There are several Roman burials known in the area. The land behind the Royal Crescent is the site of a number of Roman burials and these with other burials in the area are listed in the HER[22]. There were Roman burials to the east of the lawn, including the group of eight sepulchral urns described by H.M. Scarth to the north east of Queen Square, including several pieces of armour, beads and a portion of a caestus (fighting glove)[20]. He also described a sword belt with a buckle found with a skeleton during gravel extraction from the Park[20]. Another Roman burial is listed to the south down towards the river below the Upper Bristol Road, and one to the west along by Gravel Walk[22]. The Time Team work excavated two more burials by the Roman road crossing the lawn[12]. A third burial marked as within this lawn area is near where Brock Street arrives at the park, and associated with that burial were a lachrymatory, two silver coins of the emperor Valens (364-378), twelve bronze coins and a silver ring[23].

This lawn area was involved in the Roman communication network as it was crossed by the Roman road that Time Team confirmed continued its direction down the hill towards the river from behind the Royal Crescent[12]. To the north, behind the Royal Crescent, the investigation by Time Team added to earlier information on known Roman habitation and activities along the area of the road there (Julian Road)[12]. There are also records of Roman occupation to the south below the Upper Bristol Road including the find of a mosaic behind Norfolk Crescent (at the bottom of Figure 1.1)[24].

In addition, examination of the resistance results from the geophysical survey over parts of the lawn made for Time Team by GSB Prospection[25] revealed hints in their image of patterns of rectilinear anomalies. These might be interpreted as showing the possible remains of features within a fortification site that had been suggested to exist in this area (Janet A Pryke, unpublished observations).

GSB Prospection did not include a magnetometry survey in their investigation of the lawn. This technique has been seen to add a great deal of additional information to resistance results, for example in the investigation made of part of the legionary fortress in Priory Field at Caerleon[26]. In June 2012 an investigation using magnetometry was carried out over this lawn to supplement the GSB Prospection study. Then following this, the area was further investigated in October 2012, including the completion of a resistance survey to cover the remainder of the lawn not covered by the Time Team project with the use of other techniques. The results of these investigations are described here together with the Time Team geophysics results, following consultation with John Gater of GSB Prospection. He has very kindly permitted us to use these results as part of this report.

After completion of this work, and during the writing of this report, it was discovered that our work repeated some geophysics that had been done by Engineering Archaeological Services[27] in 2006 for B&NES Council. It had been carried out for another purpose, and was completed for a department that no longer exists. We have been pleased to be able to take the opportunity of comparing our results with theirs, and many of the observations we give here had been previously described by them in their report.

1.3 Geology and vegetation

The city of Bath is in the valley of the River Avon. The floor of the valley is formed of lower lias clay, obscured by river gravel and alluvium. The area of the lawn is described as in an area of lower lias[12]. The lawn itself is an area of well-maintained grass.

1.4 Scope

This report describes the results of two geophysical surveys. In the introduction and in the interpretation of the results some of a range of information relating to the area has been included to give a background to these results and to indicate the significance of this area of Bath. However any interpretation is necessarily limited by the availability of and also our knowledge of the background. Any additional information and suggestions that can be added by others will be much appreciated by the authors.

2 Method

2.1 Method

The area surveyed using a range of geophysics techniques is within the lawn below the Royal Crescent Ha-ha and above the continuation of Gravel Walk, as marked in Figure 1.1.

The gridding orientation and set-up was the same in all our surveys. The initial point was chosen toward the lower left hand corner of the lawn, 5m from the path, and grids laid out using triangulation of 60 x 80m triangles. The pattern was chosen to be different from that of the Time Team investigation. It was at a slight angle to that of Royal Crescent/Marlborough Buildings, and that was the line of orientation used for the Time Team survey. The standard BACAS grid is 20m square, and these were oriented parallel to the line of the path, with the lines at right angles almost magnetic northerly at 5°. The initial project was set up for magnetometry, and so a 5m-boundary set around the area additional clearances was given for metal railings and cars parked outside the park. The banks to the NW corner of the lawn were not surveyed. In the second part of the project additional areas needed to be surveyed, and the additional partial grids were added on at the southern side. The grid orientation and grid relocations are shown in Appendix A1 and A2. Because of the popularity of the area to visitors and the need to occupy as little of the lawn as possible, the readings were started for the magnetometry running from west to east, and the work was started as early as possible in the mornings.

Resistance measurements were taken at half metre intervals on lines one metre apart. The top and bottom baselines were made from coloured polypropylene 'washing' lines with markings every metre. Marked ropes were used to guide measurements. The operator walked along a role and back between ropes. The first line is 1m from the grid corner, and the last line is between the grid corners. Their first measurement is 0.5 m above the bottom baseline, and the last is on the top baseline, thus all grids fit together without overlap, as shown in Oswin (2009)[28].

For resistivity analysis two twin probe resistance meters were used, a TR/CIA and a Geoscan RM15. They were both used at 0.5m probe separation, and additionally the Geoscan RM15 was used over a limited area at 1.0m probe separation. The initial resistance survey method for Time Team had been the one carried out by GSB Prospection, and they report that the equipment they used was at 0.5m probe separation[25]. In our investigation data were downloaded via special BACAS software to match the input requirements of INSITE[29]. Our grids were labelled 1-39.

A second approach using resistivity was to use the TR/CIA résistance meter for resistance depth profiling. A 29m (or in two cases 31m) line of probes 1m apart was

set out along the line of the survey and a profile taken using probe separation measurements of 1-6m along the length. Along the area including the void a double line was set up to extend into three grids. In this case, data were downloaded and converted using TR/CIA software and processed in RES2DINV freeware.

The magnetometry survey was made over the whole lawn. For this the instrument used was a Bartington 601-2 dual fluxgate gradiometer. For this work, which was completed the first morning, the survey data were downloaded to a laptop computer using Bartington proprietary software and de-striped using bacas zero-median software and fed into INSITE version 3[29].

For magnetic susceptibility measurements a Bartington MS2 instrument was used on walkabout to precisely localise features seen in the earlier magnetometry survey for investigation by resistance profiling[28].

Areas of interest in resistance and magnetometry were further examined using ground-penetrating radar. The machine used was a MALA X3M device working at 250 MHz. Results were processed using REFLEXW. For details of the use of this instrument see Oswin et al (2011)[29].

BACAS uses INSITE version 3 as its principal software. This is now obsolete but the society has produced in-house software to download data from the instrument to a folder in the computer and then import the grids into INSITE[29].

2.1 Constraints

The project was carried out on one morning in June, and three days in October 2012. The year of 2012 was a very wet year, and so the ground continued to be often water laden. The weather was rainy in June, but fine for the morning the work was done. In October there were heavy showers during the last two days of the work.

As can be seen from the results section the magnetometry results are limited by the many very strong signals, probably due to discarded metal, in the earth in the area. This gave considerable constraints to the interpretation. Other techniques had few constraints, as the grass on the lawn was short and the area as smooth as would be expected for this excellent lawn.

3 Results

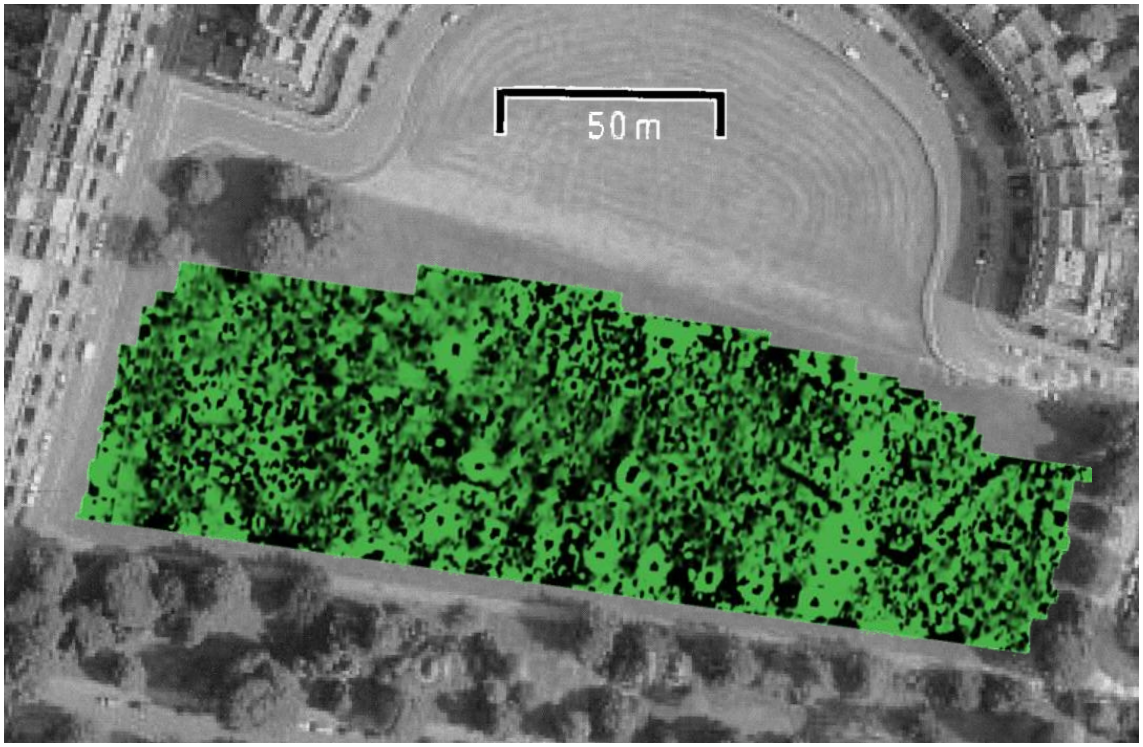
3.1 General

Figure 1.1 showed the map of the lawn with the surrounding areas with its relation to the river. The pictorial data from our surveys have been assembled and put on to part of this map. In adding images to maps the BACAS convention of using red for resistance, green for magnetometry images has been used.

3.2 Details of magnetometry survey

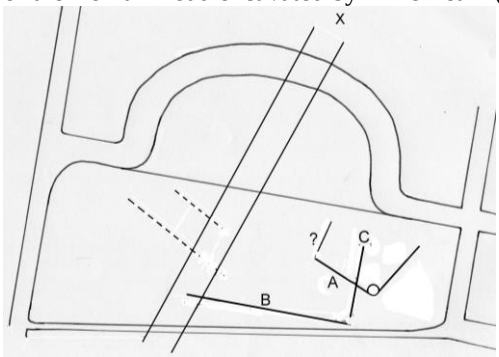
Magnetometry was carried out over the grid area.

Figure 3.1a Magnetometry survey of lawn



The image of the results is seen in Figure 3.1a, with an interpretation in Figure 3.1b. The archaeology over the years in the area has made the image observed very noisy, so the strong signals over the whole area make the interpretation difficult.

Figure 3.1b Lawn with sites of features indicated following the investigation of the area, and the line of the Roman Road excavated by Time Team (X)[12]



However the indication that the ditch excavated by Time Team[12] belongs to an enclosure (A) is clear in the image, with the dark lines following the course of the southern and eastern ditches, together with a third possible ditch heading towards the NE from the top end with a possible entrance gap. There are also indications of a round feature in the corner of the enclosure. A further larger round feature could be indicated two thirds across the bottom of the lawn.

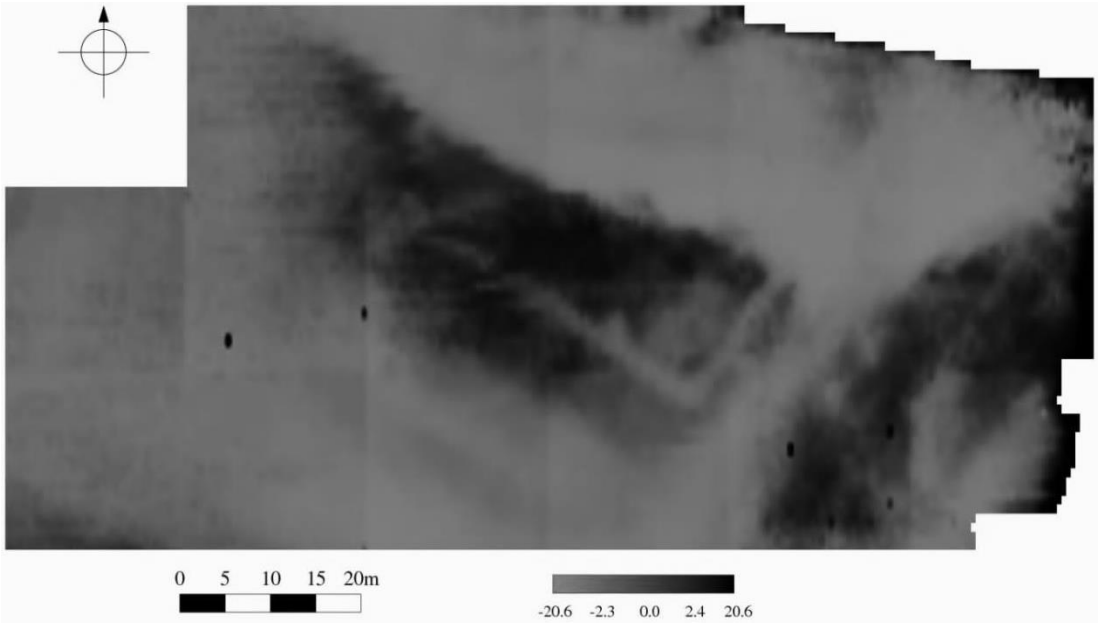
There is a strong row of features, (B) at about 12m apart with two more a little further from each end, oriented almost in parallel with the frontage of Royal Crescent but not extending symmetrically across its width. This could indicate a regular pattern of metal that was used as part of some development. A row of less regular anomalies is shown approximately at right angles to the line of this previous row (C).

Even with computer clarification and detailed examination of the results, there is little else that can be distinguished in the image. There are very slight indications in this of the course of the known Roman road across the lawn. There is also a slight indication of the large NW to SE feature running down from the bank at the top corner of the lawn.

3.3 Details of the resistance surveys

The first resistance results obtained for the site had been those of the Time Team investigations. The first part of our resistance work was to add to this with the completion of the survey over the eastern part of the lawn, as GSB Prospection had surveyed about two thirds of the area. The image for the results we obtained over the remainder of the lawn is presented in figure 3.2.

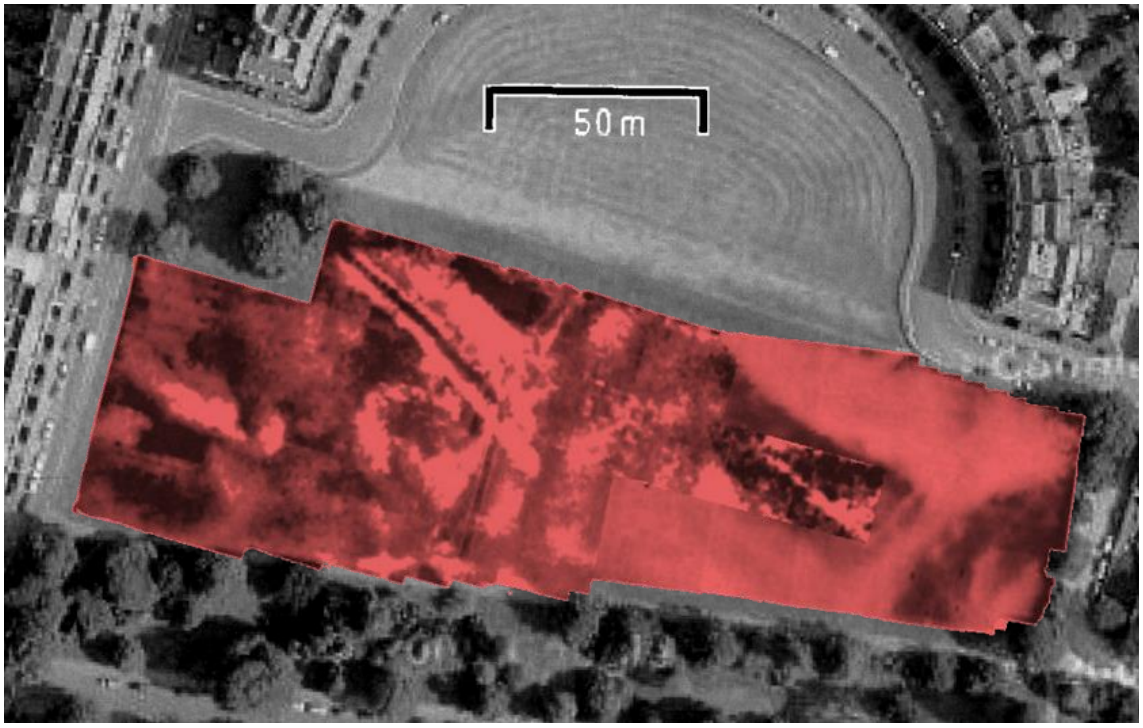
Figure 3.2 Resistance survey of eastern side of lawn (grids 22-39 excluding 24)



In this the outline of two sides of the enclosure can clearly be seen, with the ditched areas imaged with negative lines. There are also wide pronounced areas of reduced resistance, some of the boundaries and changes being parallel to the ditches of the enclosure. There is a complex area in the southeast hand corner. There is no indication of the larger circular area that was observed in the magnetometry image.

Where our image overlapped with the Time Team results, comparative examination of the two sets of results was done. The two showed similar patterns of responses, though with some differences in relative intensity. The results that we obtained were put together with these resistance survey done by GSB Prospection[25], and this is shown in Figure 3.3 over the map of the lawn to show the resistance analysis over the whole lawn. When after completing our work we found out that EAS had also done their resistance survey of the lawn for B&NES[27] the joint resistance result could be compared with their results. These results were comparable.

Figure 3.3 Composite of resistance results from Time Team and this investigation



Approximately parallel to the lower ditch of the enclosure there is clearly shown a large, over 15m wide, linear anomaly. It runs diagonally into the lawn as indicated in Figure 3.1b from next to the mound with the trees towards the bottom of the area. It is not strongly distinguishable towards the southern part of the image.

The image of the road that was excavated by Time Team[12] can be distinguished in the resistance patterns near the top of the image (see Figure 3.1b for line), but as also noted by in their report, its route is not clear lower down the lawn.

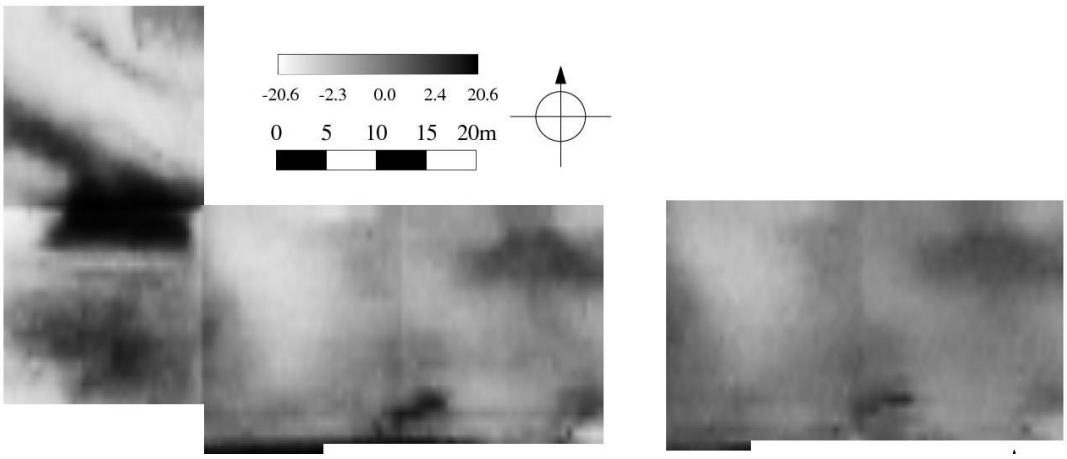
Some linear negative anomalies can also be distinguished in the Time Team image which are orientated at right angles to Marlborough Buildings and towards that side of the lawn. These continue across more than one 20m grid, so do not seem to be a grid-related error or anomaly. Among these and in the same orientation as these there is at least one large dark quasi-rectangular area in the image, about 15m across. In addition towards the middle of the lawn, there are linear anomaly areas at right angles to the above negative anomalies, and these are next to and surrounding some elongated areas.

Examining the southern border, a dark area can be seen about 70m in from the western edge, about 5m from the bottom edge. This coincided with the observed site of a hole in the ground, revealed by a lorry subsiding into it before a concert in 2003. This hole and another that appeared in the bank below the lawn were considered a health and safety matter. There was little opportunity for observation at the time, and they were filled with type 1 aggregate and topsoil[30].

Our investigations used additional resistance work to investigate the area around this hole. A dark green grassy area was visible in the lawn centred 3.5m in along the 0 line of grid 11. It extended outside our grid area, which had been originally designed to give a wide border all around the area for magnetometry, so grids 8a and 11a were instated. The resistance reproduced the same general pattern as that observed earlier and is shown in Figure 3.4a, and the area around the void at 1m-probe spacing in Figure 3.4b.

Figure 3.4 Resistance survey in south west area of lawn

a) Grids 4, 5, 8, 8a, 11, 11a using 0.5m probe separation b) Grids 8, 8a, 11, 11a using 1.0m probe separation



Complexity in the resistance pattern around the void area is indicated in these images.

In Figure 3.4a further linear anomalies can be distinguished running NW to SE at an angle down the slope approximately parallel to the course of that large linear anomaly partially crossing the lawn diagonally. The results also show the quasi-rectangular shape between the two left hand grids described earlier in the Time Team image.

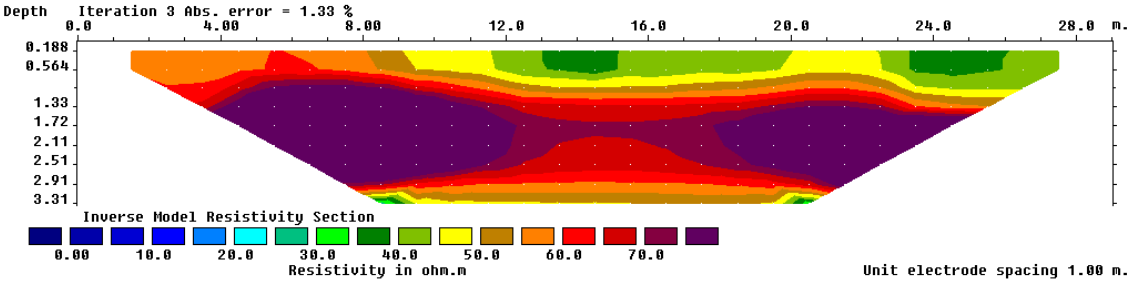
3.4 Resistivity profiling

Other resistivity techniques were used to look at parts of the area at depth, using the resistivity profiling technique. In this, resistance results are obtained from further into the earth between sequences of differently spaced probes.

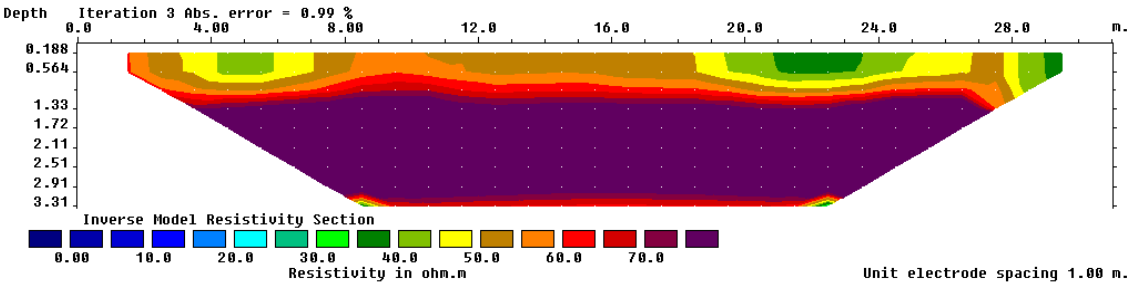
The first area to be examined by this method was the possible enclosure area. A first pair of profiles was set up across the southern corner of the area. The lower, 1m north of the corner can be seen in Figure 3.5a, and the two ditches can clearly be seen. The least resistant sections are observed to be a little over 0.5m deep, and 1.5-2.5m wide. The second profile 7.0m further north, displaced 4m further to the east to include the ditches can be seen in Figure 3.5b.

Figure 3.5 Resistivity profiles near the corner of the enclosure
← W

a) across grids 29, 32 and 35, 1m up from 0 line



b) across grids 29, 32 and 35 7.5m up from 0 line



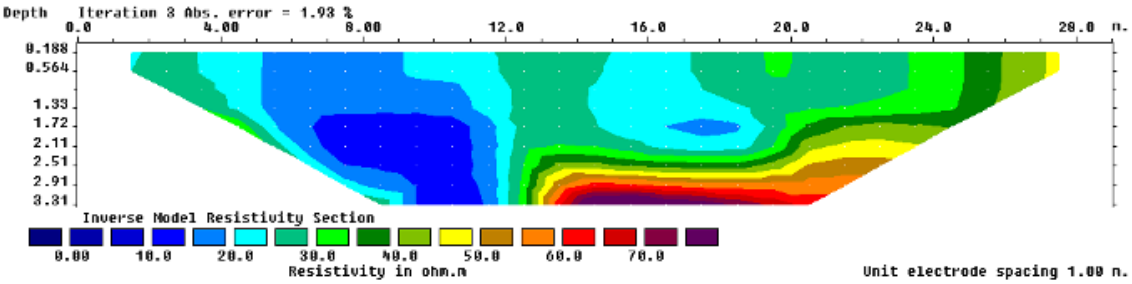
The ditches are clear in both these images, and a possible parallel ditch area to the east side is indicated. This cannot be distinguished in the generally pale area in seen in Figure 3.1. It can be noted that the area between the ditches shows different resistance patterns between the two profiles, but this resistivity profiling provides no evidence for an internal ring ditch.

Another area to be investigated was the large linear feature that is seen in Figure 3.3 towards the top of the lawn, heading southeast, but not detected on the lower areas of the lawn. Two profiles were set up along the course of this to see if it does run diagonally across the lawn. The first was on a grid to the top of the area, diagonally to our gridding pattern. This is shown in Figure 3.6a. It indicates a strong 4.5m wide ditch area, the deepest part coincident with the dark line seen in Figure 3.2, which could be a feature of the resistance response to a deep area. The other features in the profile fit with the image in Figure 3.3. A profile was taken across the projected linear course of this ditch, across the bottom of our gridding pattern, shown in Figure 3.6b. There is a wide ditch pattern revealed in this position so it seems to cross the lawn. Neither of these profiles shows the bottom of the feature.

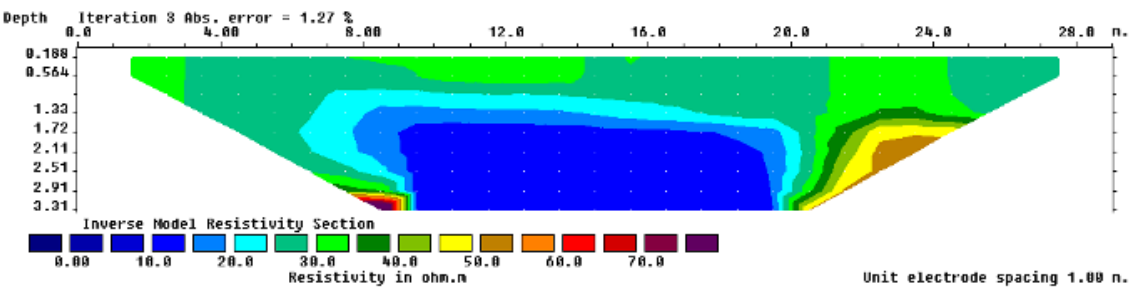
Figure 3.6 Resistivity profiles over linear anomaly running NW to SW over lawn

a) Diagonal SW to NE across grid 13

←
SW

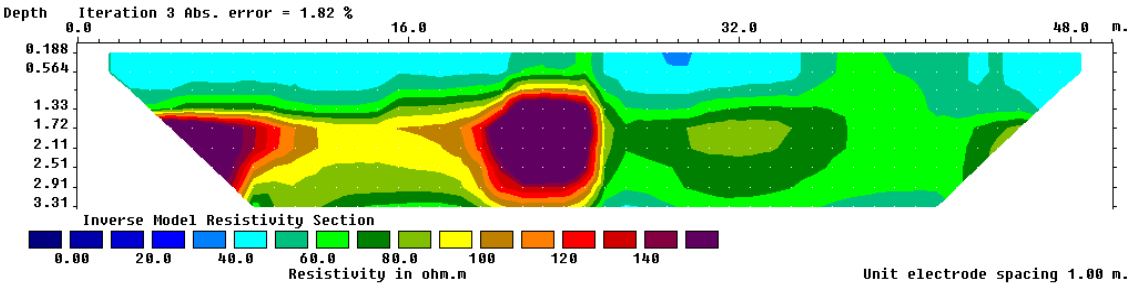


b) Diagonal SW to NE across grid 27



A third extended profile investigation was run across the area in which there was suggested to be a void as investigated further in Figure 3.4. This is shown in Figure 3.7.

Figure 3.7 Linked double profile over suggested site of void (across grids 8, 11, 15)



The void can clearly be seen towards the middle of the profile with apparent dimensions are 2.9m deep with a cross section of 4m. Along with this there could be a similar looking cross-section to the west, and there are also underground feature(s) to the east.

Other profiles were taken as part of our project, one N/S across the hints of negative linear features seen in Figure 3.3. A second was taken across the southern area over a row of strong signals that we observed into magnetometry. These profiles revealed no information to add to our results.

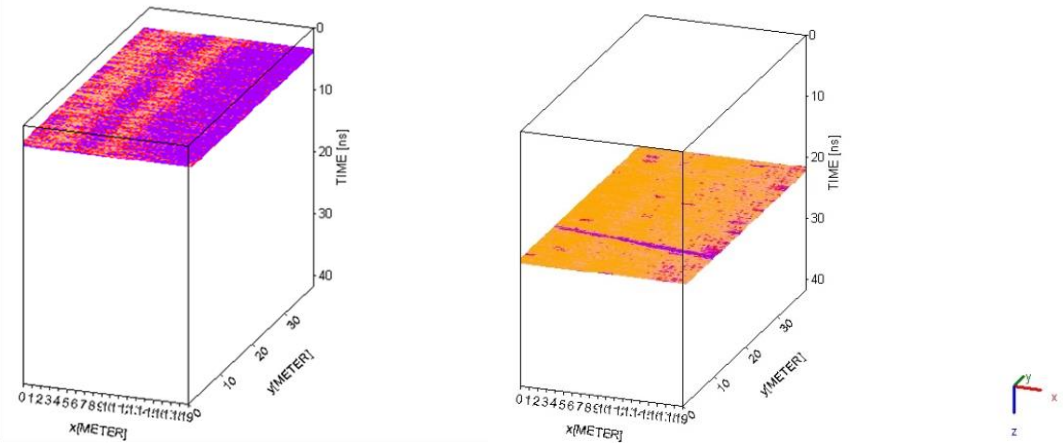
3.5 Ground penetrating radar

This technique was first of all used to examine the area of the lawn in which the enclosure was found, but nothing of interest to the features indicated following magnetometry or resistance analysis could be seen in sections or slices.

A second area investigated was two 20 by 20 meter grids, to cover the area of the strong line of regular signals distinguished in Figure 3.1a, shown in Figure 3.8.

Figure 3.8 Ground penetrating radar over area including row of strong magnetometry signals (shown as B in Figure 1) grids 23 and 27

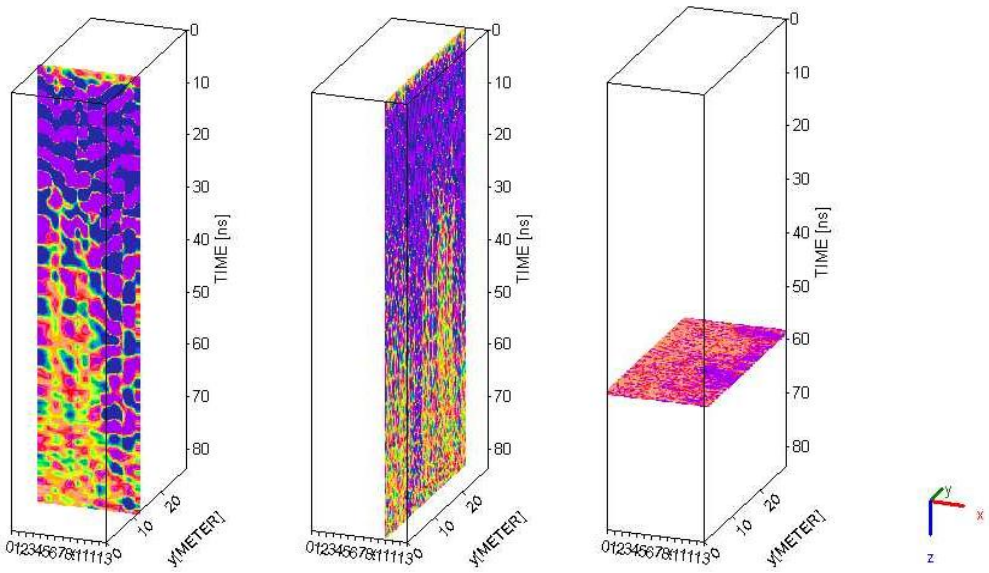
← N



Some banding is seen across the area, as shown in the first section. A section further down reveals a line that is not seen in any of the other investigations. It had been already noted in the surveying work in June that there was a damp area towards the top of the lawn about 40m further up the slope from this area, but any association is not known. There is no cable known that runs down the lawn as the electric supply is from its edges[30]. There is an indication of a line in the grass in this area in an enlargement of the map in Figure 1.1, but no further information on the reason for this image is known.

A third area investigated with ground penetrating radar was around the void area, and selected slices and a level area are shown in Figure 3.9.

Figure 3.9 Ground penetrating radar over void area 30mx15m across grids 8, 8a, 11, 11a
← N



The void that had been reported is clear in these images, but again the area around appears to be complex with some further indications of similar deep areas below the ground.

4 Interpretation

There is a range of information we have been able to take from the results of the geophysical investigations we have done over this lawn. In this section we will put together the points and their interpretation that have seemed most apparent to us related to the different features we have considered.

4.1 The large ditch-like formation across the lawn

Having seen the clear indications of this at the top of the lawn in the Time Team resistance image, we examined the cross section of this both towards the top of the lawn, and lower down in the resistance image using resistivity profiling. Our results indicate that it is a large ditch type feature that ran across the area at some time, and that appears to have been infilled in some way.

Mud (Mad/Muddle) Brook used to run down the west side of the lawn on the Marlborough Buildings line down to the river[10,31]. It came down the slope from several springs including St Winifred's Well. When the Royal Crescent was built there was a large ditch running down by the side of the buildings[32]. The Brook now runs culverted down behind Marlborough Buildings. If the ditch-like feature we located running across the lawn continued on a straight line to the north west it would have cut Mud Brook about level with the top of Royal Crescent. There exist the possibilities that once this feature could have been a branch of this brook, or even an original course, from which it was rerouted. It could alternatively have been some other natural or man-made feature. Very large linear earthworks are known from Bronze Age to Iron Age, and can run for kilometres[33] or be part of a complex dyke system such as around Camulodunum[34]. It can be noted that the orientation of this and other parallel features in the geophysics is in the general direction of a line up the hill towards the approach golf course up Sion Hill and down towards the hot springs area.

The possible continued course of this feature down the hill towards the river could be further investigated by further geophysical investigation, and its nature clarified with future excavation.

4.2. The enclosure

This work has clearly shown that the Late Bronze Age ditch revealed in the Time Team[12] excavation is a component of an enclosure, with two continuous sides meeting at a corner with a possible third side with a gap which may have been a NW gateway. The width of the bottom boundary of this enclosure is about 40m. The

magnetometry results also indicate a possible ring feature in the corner. This is not indicated in the resistance results, though the profiling results do show some different activity across the area between the ditches near the corner of the enclosure.

The finds from the ditch excavated by Time Team[12] were described to include Late Bronze Age pottery of the plain ware tradition c900-800BC. Fragments of bone were found, including *bos sp.* and sheep, with evidence of butchery and cookery and the darker material of organic material. It was stated that these finds indicated a possible occupation site nearby. We believe that these results confirm the existence of this occupation site with the demonstration of this enclosure.

The appearance of the enclosure is similar to those from other Bronze Age enclosed areas[33]. However there is no evidence here of whether this is a single-family settlement or part of a larger enclosure complex. The enclosure image is surrounded by other parallel lines and knowing that over time ditches could be recut, such a more complex pattern might be expected if there were continued use of the site over a time.

Besides the finds by the river as well as those on the hills, this information on the existence of this settlement down the hill and closer to the hot springs is a significant extension to our picture of Late Bronze Age settlement in the area, and adds to our knowledge of the continued civilisation of this area of Bath.

4.3. The hole in the ground

This was first discovered as had been stated before by a vehicle subsiding into it in 2003. Another was revealed further along and down the slope in the tree-lined area above Royal Avenue. Observations at that time showed the hole to be 3-4m deep with multiple tunnels from the base (four tunnels in one), indicating a possible pit-like nature[35]. However this appearance of chambers could be caused by their natural geology. Examination of the evidence from the time of the collapse of the top indicates that these appear to be cut or formed through brown clay[35]. They may have been caused following collapse and erosion by a subterranean stream or spring[36]. Although neither of these is known in the precise area there are many springs and streams in on these slopes[31]. However the similarity of the form of these chambers to those known to exist for prehistoric mining[37] may also merit further investigation. If they were made for this purpose, they are not of a size for any large scale mining, but would be more to indicate the removal of pockets of something in the earth[38]. In relation to this it can be noted that flints have been observed in the clay in the Lower Common excavation[35].

Our results indicate the complexity of the area of this possible group of holes in the ground which may indicate a cluster of pit-like features. The origin of these is not known, and would reward further investigation.

4.4 Other observations

The survey completed by us and GSB Prospection shown in Figure 3.3 also contains some possible linear and rectangular indications in the images and also at least one large dark rectangular area towards the western side of the lawn. We have no direct evidence of what could be a cause of these anomalies or any of the other linear indications that may be distinguished in Figure 3.2. One possible exception in this may be that for the line of signals across the bottom of the lawn seen in magnetometry. A very similar series of signals about 5-20m apart can be observed in a magnetometry survey done at Caistor Roman town[39]. In that case the observed long rows of signals, which cross some building blocks in the town, have been described as possible responses to iron collars joining wooden pipes. If these signals are similar to ours, this could add to the list of hints of the existence of a rectangular block indicating building over the right hand side of the middle of the lawn.

This lawn, along with the Commons to the west, was known as "never to be built on". The 1886 Ordnance Survey map does shows a small building on the west side of the lawn but it is only about 3m wide and further up the lawn than the dark right-angled image in Figures 3.3 and 3.4. Any proposal that this and other anomalies could relate to the remains of buildings or other developments provides the great problem in that they are mostly only slightly hinted at by the geophysics results and have not been shown by any excavations in the area[12,35]. So there may well still be further questions that need to be formulated and answered.

5 Comment

This work has now completed the resistance survey over the lawn area commenced by the Time Team investigation[25] and has been compared with the survey subsequently carried out by EAS[27]. The confirmation that the late Bronze Age ditch is a component of a settlement enclosure adds to our consideration of the importance of this area in the Bronze Age. The complexity of the site around this is indicated with the large infilled ditch-like formation running down the lawn approximately parallel to the southern ditch of the enclosure. The area's use at other times may be indicated by a possible cluster of pits along the south edge of the lawn, if they are not shown as a natural feature. There are other geophysical indications which may possibly be other archaeological features and for these too we at present have no further information.

Further planned geophysics both on the band stand lawn below this area and other lawn areas will give us additional information to add to these results and will continue to add to the description of the area.

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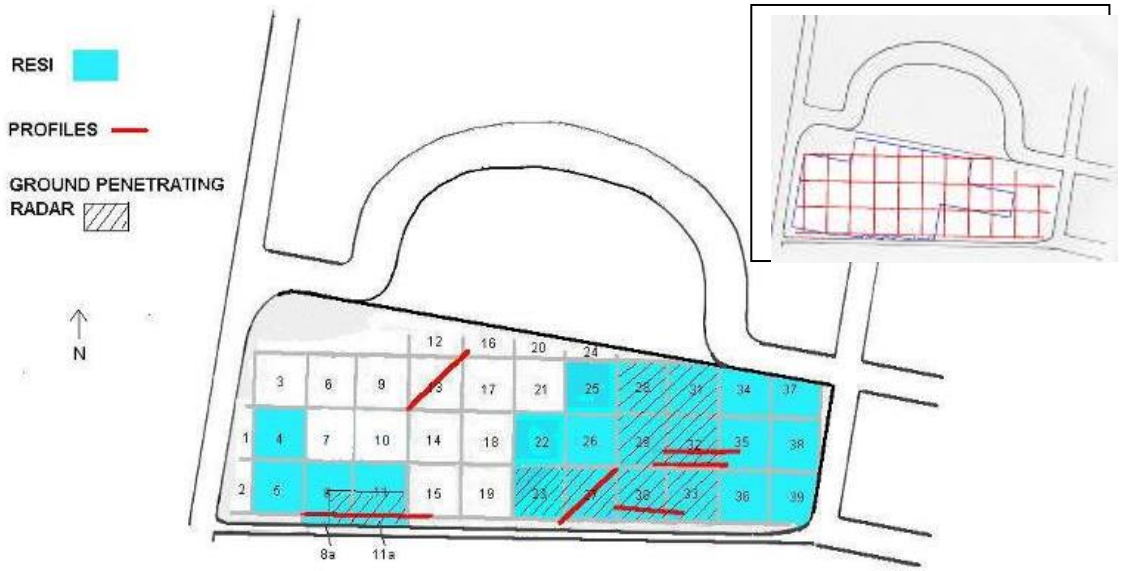
Appendix A1

Figure showing the pattern of the investigations described in this project.
Inset is the Time Team geophysics area (blue) over this 20m grid pattern (red).



The arrangement of the grids was set up parallel to the path, with the first post at the western end 15.25m from the gatepost and 5.00m from the path. These were also measured from the lampposts along the front of the lawn, and the distances of the posts from the 7 lampposts starting from the SW corner are as follows:

a (grids 2/5) 5.00m from the path, 15.25m from the gatepost, 13.00m from lamppost 1
b (grids 5/8) 9.03m from lamppost 1, 19.65m from lamppost 1
c (grids 8/11) 4.67m from lamppost 2, 31.15m from lamppost 3
d (grids 11/15) 21.90m from lamppost 2, 11.9m from lamppost 3
e (grids 15/19) 10.00m from lamppost 3, 22.82m from lamppost 4
f (grids 19/23) 29.40m from lamppost 3, 5.00m from lamppost 4
g (grids 23/27) 18.12m from lamppost 4, 14.75m from lamppost 5
h (grids 27/30) 6.98m from lamppost 5, 26.15m from lamppost 6
i (grids 30/33) 26.14m from lamppost 5, 7.15m from lamppost 6
j (grids 33/36) 14.40m from lamppost 6, 10.75m from lamppost 7
k (grids 36/39) 11.25m from lamppost 7, 20.00m from (j)

Any grids can be set up from these using e.g. 100, 80, 60m triangulation.

Appendix A2

The results of the original data are stored as INSITE backup file, and also as individual .dat files. Those prefixed ‘r’ are resistance, those prefixed ‘d’ are de-striped magnetometer files. Grid maps can also be supplied to indicate arrangement of the grids in case of the need for future reference.