BATH & COUNTIES ARCHAEOLOGICAL SOCIETY

Lansdown Environs Archaeological Project (LEAP)

Lansdown Camp

Or 'Ovate Enclosure' (west) at the Playing Field, Charlcombe Parish

Historic England Number 1002482, Somerset HER 61373

Geophysical survey

Editors: Shaun Wilson & John Richards

Abstract

Purpose of survey:

To extend the area of Lansdown covered by geophysical survey, so as to provide coverage of both halves of the scheduled monument (which is bisected by a main road) and to compare these results with historical descriptions.

Playing Field on Lansdown in Bath and North-East Somerset contains the western half of an enclosure known as ‘Lansdown Camp’ and also as the ‘Ovate Enclosure’. This report will generally use the former term as this is the title in the Historic Environment Record. The enclosure is bisected by the main road over the plateau. The eastern half in Paddock Field has already been surveyed. This document will amalgamate the two halves of the survey.

Playing Field was subject to geophysical survey by the Bath and Counties Archaeological Society in June/July 2021, using magnetometry, magnetic susceptibility, twin-probe resistance, and resistivity profiles.

The enclosure was a simple bank and ditch, with no apparent defensive properties, which had been split by the road. If the road was Roman, as seems most likely, then the enclosure was prehistoric.

Magnetic susceptibility revealed a large magnetic disturbance just to the west of the enclosure although this did not show clearly using other techniques. The survey could not determine what process had caused this disturbance.

Lansdown Environs Archaeological Project (LEAP)

Lansdown Camp

Or ‘Ovate Enclosure’ (west) at the Playing Field, Charlcombe Parish

Historic England Number 1002482, Somerset HER 61373

Geophysical survey

Authors of the Geophysical Survey John Oswin and Janet Pryke

Copyright © 2021, Bath and Counties Archaeological Society

Disclaimer

This report has been compiled with all reasonable skill, care, and diligence within the terms of the project design as specified in the written scheme of investigation and within the general terms and conditions of The Bath and Counties Archaeology Society. Whilst every effort has been made to provide detailed and accurate information, BACAS cannot be held responsible for errors or inaccuracies contained herein. No responsibility is accepted whatsoever to third parties to whom these reports or any part thereof is made known. Any such party relies upon these at their own risk.

Table of Contents

Abstract i

Table of Contents iii

List of Figures v

Preface vi

Acknowledgements vi

1 Introduction 1

1.1 Location 1

1.2 Dates 2

1.3 Personnel 2

1.4 Licence Details 2

1.5 Scope of this report 2

2 Method 4

2.1 Gridding 4

2.2 Magnetometry 4

2.3 Magnetic Susceptibility (Magsus) 4

2.4 Twin-probe Resistance 5

2.5 Resistivity Profiles 5

2.6 Software 5

3 Results 7

3.1 Magnetometer 7

3.2 Magnetic Susceptibility 8

3.3 Twin-probe Resistance 9

3.4 Resistivity Profiles 10

4 The whole of Lansdown Camp 13

4.1 Combining the Surveys 13

4.2 Previous work on Lansdown Camp 16

5 Discussion 17

5.1 Chronology from the data. 17

5.2 Conclusions 17

Bibliography 18

Appendix A Technical data 19

A1 Gridding 19

A2 Magnetometry 20

A3 Magnetic Susceptibility (magsus) 21

A4 Twin – Probe Resistance 22

A5 Resistivity profiles 24

List of Figures

Figure 1.1. General Location 1
Figure 1.2. Area covered by Scheduled Battlefield. 2
Figure 3.1. Playing Field, Magnetometer Plot. 7
Figure 3.2. Magnetic susceptibility plot for Playing Field. Note that the x and y axes are measured in the last three digits of the Ordnance Survey national grid. These numbers would be preceded by ST 72… 69… 9
Figure 3.3. Playing Field. Twin-probe resistance plot. 10
Figure 3.4. Positions of the two 31m resistivity profiles, A and B in a LiDAR image of the enclosure 11
Figure 3.5. Profile A running north to south as in Figure 3.4. 12
Figure 3.6. Profile B running west to east as in figure 3.4. 12
Figure 4.1. Combined magnetometer plot for east and west sides of Lansdown Camp. The road passes through the gap. North to top. 13
Figure 4.2. Combined resistance plot for east and west sides of Lansdown Camp. The modern road passes through the gap. North to top. 14
Figure 4.3. LiDAR DTM view of Lansdown Camp as hillshade. Contours at 1 m intervals. North to top. 15
Figure A1. Location of grid origin post. 19
Figure A2. Grid corner post GPS locations. 20
Figure A3. Gridding pattern for magnetometer survey. Arrows indicate starting position and initial direction. 21
Figure A4. Measurement points for magsus as displayed by northings and eastings. 22
Figure A5. Layout of grids downloaded from resistance meters. Arrows indicate initial direction. Data were zig-zag pattern. 23
Figure A6. Location and direction of resisitivity profiles relative to grid. Height profiles for each also shown. 24

Preface

This work was carried out as part of LEAP. This is an acronym for Lansdown Environs Archaeology Project, set up to take an overall assessment of the sites known on Lansdown, to establish a research framework to enable a greater understanding of what remains, and to identify those sites at risk. In this BACAS is also working with Bathscape, an organization which is funded to provide a higher level of understanding of the natural history and man-made heritage of the UNESCO World Heritage Site of the City of Bath and its surroundings. There is an informal agreement between BACAS and Historic England, Inspector of Monuments, Bath and North-east Somerset, to undertake surveys to provide updated archaeological information on a number of sites on Lansdown which had previously been explored over 100 years ago. Reports from this work are also provided to the local Heritage Environment Record (HER).

Bathscape has recently provided BACAS with two new twin-probe resistance devices, two new field laptop computers and a replacement magnetic susceptibility measurement probe. We are very grateful to Bathscape for this help with our work.

The work was carried out under Historic England (section 42) License Number SL00234059.

Acknowledgements

Many thanks to the landowner, Sir Henry Lawrence, and tenant Sue Bishop for allowing us on to Playing Field to undertake this survey.

We thank Bathscape for supplying us with two new Frobisher TAR3 resistance meters which we used for the first time for this work, and also for the replacement magnetic susceptibility head, which proved invaluable in this work.

In our mapping work, we acknowledge Google Earth for downloads for base images of the land. We acknowledge the Ordnance Survey for allowing us download and reproduction of maps under Crown copyright license number 100060399.

We also acknowledge the real help on the ground from our team, Robert Arkell, Terri Bell, Rick Buettner, Bob Ford, John Knapper, Elpitha Lemnos, Henry Lowe, Sharn Pepperell, Les Phillips, Wendy Russ, and Shaun Wilson.

1 Introduction

1.1 Location

Playing Field is centered on ST 721 699. It is on top of Lansdown, in the civil parish of Charlcombe, Bath and North-East Somerset. The field is at 230 to 235 m above Ordnance Datum (OD). A general location map is provided in figure 1.1.

Playing Field contains the western half of a monument known as 'Lansdown Camp' and also called the 'Ovate Enclosure'. It is the subject of National Monument Record 1002482 and Somerset (BaNES) HER 61373. It should be noted there is another monument less than 1 km away known as 'Lansdown Roman Camp' (BaNES HER 61362).

The field had just been mowed for hay and was under short grass.

Its extent was approximately 4 ha.

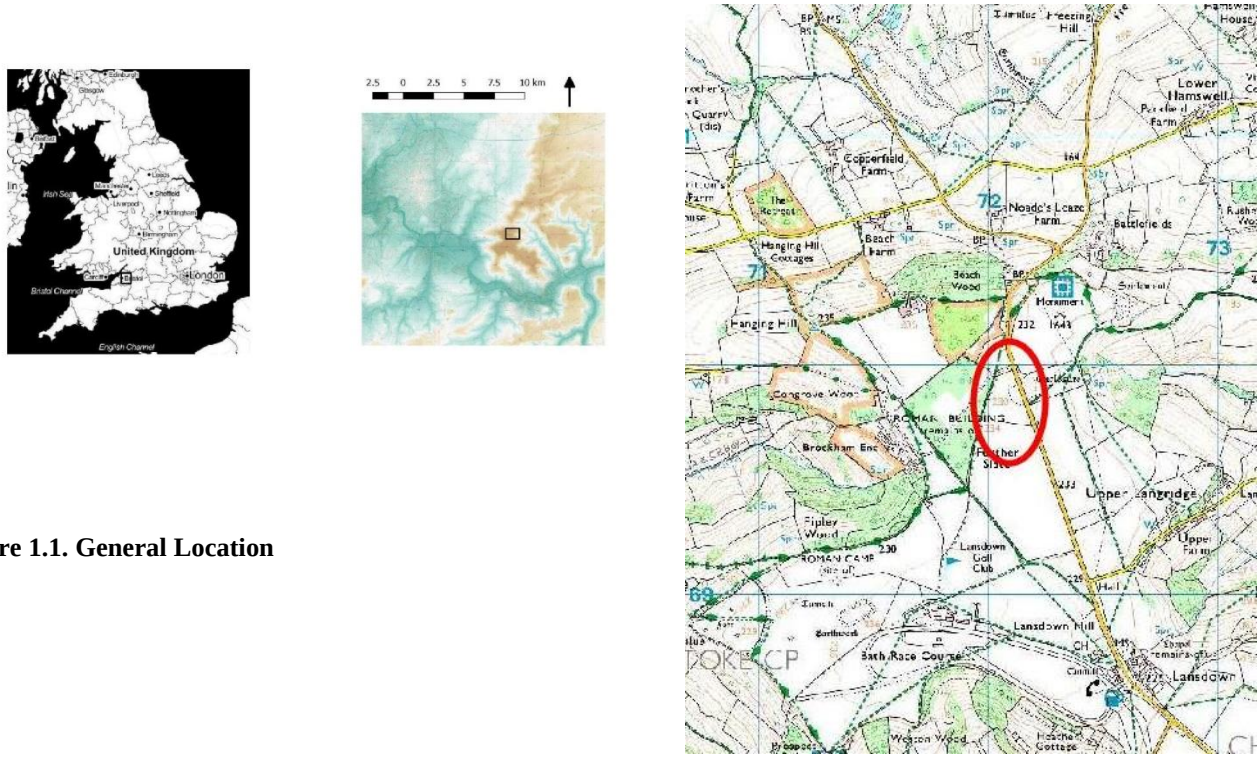

Figure 1.1. General Location

The site also falls within the Scheduled Battlefield of the Battle of Lansdown, AD 1643, but it was not expected that this survey could add detail to the battle. The area covered by the schedule is shown in figure 1.2.

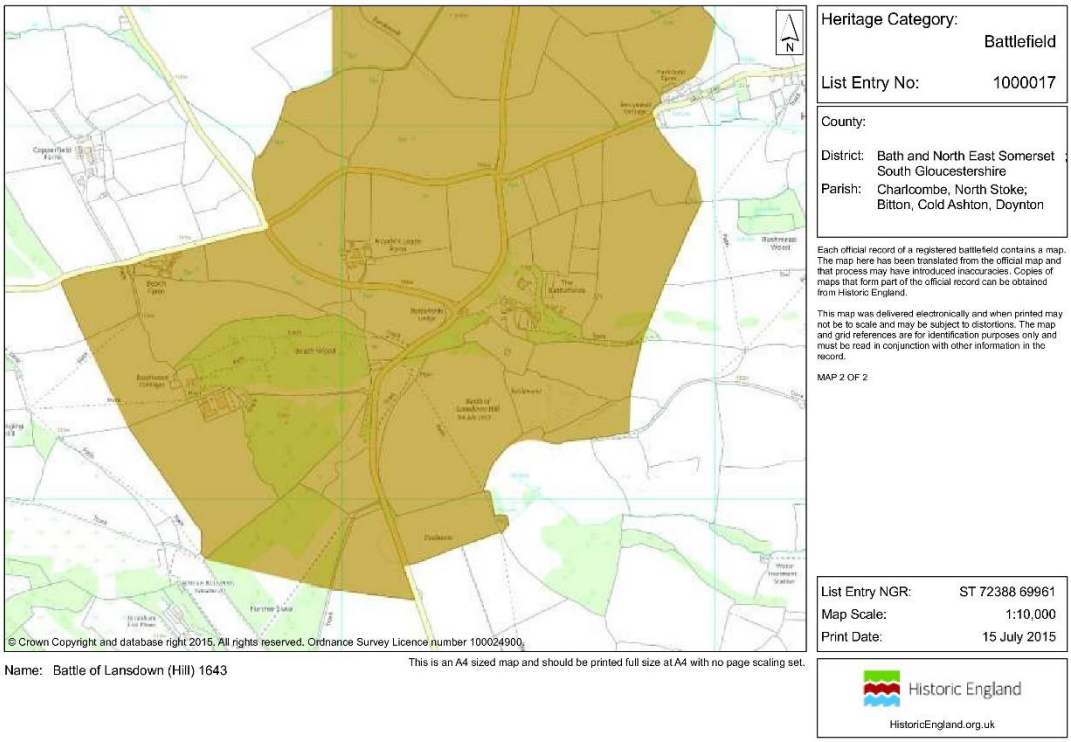

Figure 1.2. Area covered by Scheduled Battlefield.

1.2 Dates

The site was surveyed between 15th June and 2nd July 2021.

1.3 Personnel

The survey was undertaken by members of the Bath and Counties Archaeological Society (BACAS), with technical lead from John Oswin MA PhD CSci, and managed by Janet Pryke.

1.4 License Details

The license to carry out a geophysical survey on this site according to the Ancient Monuments and Archaeological Areas Act 1979 section 42 was obtained from Historic England, case no. SL00234059.

1.5 Scope of this report

This document will report on the findings of the geophysical survey of June/July 2021 It will discuss the results and will also include the newly available LiDAR data in the discussion. There will be a section in which the geophysics results from the two sides of the enclosure are

combined, using the data from 2020. Reference may also be made where relevant to earlier results obtained to the north on Lansdown in 2019 and 2018.

2 Method

2.1 Gridding

The field was laid out in 20 m grid squares, starting at the eastern gate post, and heading east along the northern wall of the field. The entire field was gridded and partial grid squares at field edges were included in the survey unless they were very small (less than a tenth of a full square).

Although there was a verge some 5 m wide between the eastern wall of Playing Field and the road, no attempt was made to survey in this area as that space close to the road was very dangerous. This means that relationship of the constructed road to the enclosure could not be observed directly.

This grid was at 20 ° to magnetic north, which currently is within 1 ° of true north. References in this section are generally to the local grid north.

Grids were laid out using tapes, with right angles constructed by Pythagorean triangle. The locations of grid corners were measured using a hand-held Elonex GPS device to a precision of five figures (1 m), but the device was only accurate to ± 2 m.

It was the practice to start each grid square in the south-west, 1 m east of the grid corner, and head north on the first traverse, finishing at the south-eastern corner.

2.2 Magnetometry

The survey was carried out using a Bartington 601-2 dual fluxgate gradiometer set to take readings at 0.25 m intervals along lines 1 m apart, giving 1600 readings per full grid square.

2.3 Magnetic Susceptibility (Magsus)

Magnetic Susceptibility was measured using a Bartington MS2 device with 200 mm diameter coil. This had no logger, so results had to be written down. The device has recently had a new search coil, which was kindly supplied by Bathscape.

Magnetic susceptibility measurements were made over the whole surface of the field, at random positions typically 10 to 15 m apart, with the spacing much decreased where large changes in value were noted. Measurement locations were noted using the Elonex hand-held GPS device detailed in section 2.1 and results transferred to spreadsheet and analysed using DPlot software. Note that the plot appeared in Ordnance Survey national coordinates, which were not directly compatible with the grid squares laid out, but the results could be overlaid.

2.4 Twin-probe Resistance

The survey was conducted using the two new Frobisher TAR-3 resistance meters kindly provided by Bathscape. The machines were operated simultaneously but kept separated by at least 60 m so as to reduce the risk of crosstalk. They were set to take 2 readings per metre along lines 1 m apart, thus giving 800 readings per full grid square. Data were downloaded as a text file and converted using spreadsheets, providing the equivalent of zig-zag data for import into INSITE analysis software.

2.5 Resistivity Profiles

Profiles were taken across the northern and western banks of Lansdown Camp using BACAS' TR/CIA resistance machine with 32 probes available.

Heights were obtained by interrogating LiDAR data using Qgis, and these were added along the length of the profiles to provide topographical data.

2.6 Software

At the time of the survey the new computers supplied by Bathscape were still being prepared, so all fieldwork here was downloaded and analysed using BACAS' Windows XP computer.

The magnetometer was downloaded using Bartington proprietary software v3.16, which rendered the data as parallel lines. The raw data was then passed through BACAS proprietary zero-median de-stripe software prior to analysis using INSITE.

Magsus data were recorded by hand and transcribed as three columns (eastings, northings, and values) on Excel spreadsheet. These were then copied into DPlot software to produce a colour band plot for the field.

The twin-probe devices were downloaded to a folder and then the text file was used to extract each grid in turn, taking just the final column and copying this to a text file and converting it to dat file ready for use in INSITE as a zig-zag file.

The profiler data were downloaded using TR/CIA proprietary software, which also converted the data to resistivity values and locations prior to processing in Geotomo RES2DINV 32-bit software v 3.71.112 full version for analysis. Relative height data were added to provide topographic as well as electrical profiling.

Plots could be overlaid using Photoshop and these could also be overlaid on Google Earth images to show location. These fits were approximate as GPS data were only accurate to ± 2m and projections to a flat plane did not necessarily match.

LiDAR data from the 2020 set came in 5 km squares. Digital Terrain Modelling (DTM) was used to provide ground surface details rather than vegetation. These were 1 m resolution. Six such squares were combined to cover an area from Bath to Tog Hill north of Lansdown. Analysis, principally by single direction hillshade and by contour used Qgis v 2.18. Other techniques, such as multiple direction hillshade were tried, but did not add significantly to understanding the landscape.

3 Results

3.1 Magnetometer

The magnetometer plot is shown in figure 3.1.

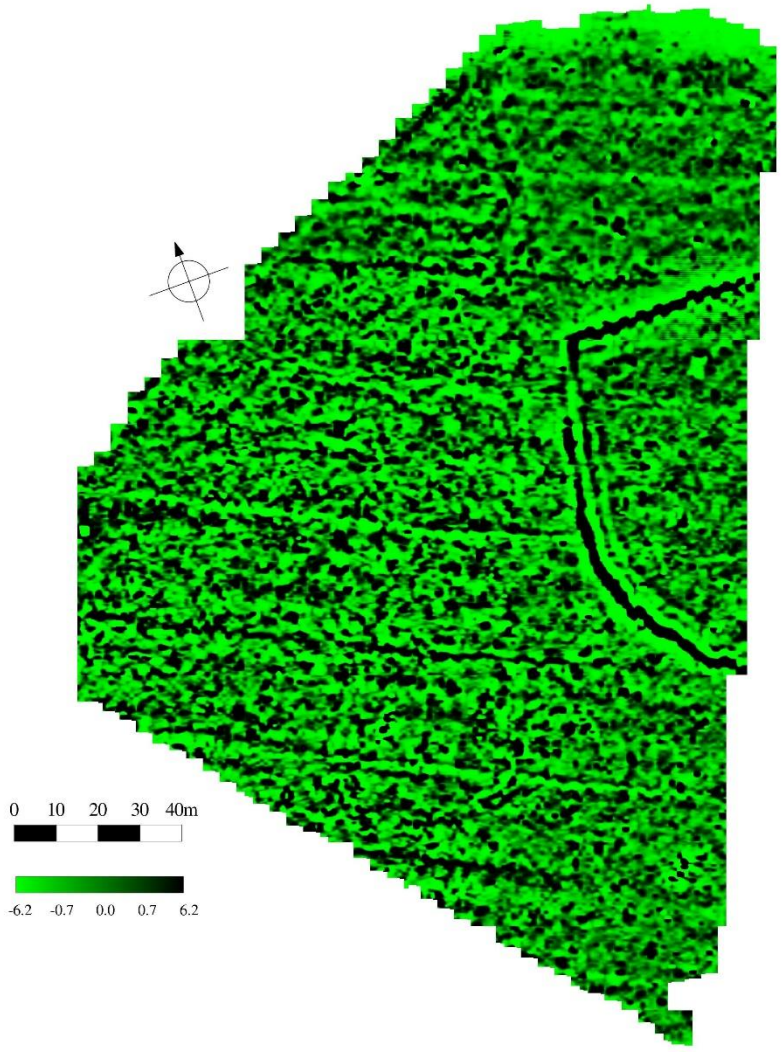

Figure 3.1. Playing Field, Magnetometer Plot.

The western half of the enclosure is clearly shown by the magnetometer. Note how the south curves into the west side (with possible sign of an earlier cut) but the north cuts across abruptly. The slight 'zig-zag' effect of the north is due to poor operator control.

Note that the western line continues faintly beyond the north bound and there is a faint sign of another possible northern bound just below the top of the plot.

There are faint signs of irregular earthworks to the west of the enclosure and to its south-west.

There are possible post holes within the enclosure, but these are not clearly defined.

The most obvious magnetometry is 'noise.' The east-west regularly spaced lines are most likely modern drainage cuts, but generally, magnetic response is high across the field, although possibly a little lower in the north-east corner, beyond the linear northward extension of the enclosure. It is understood that the field has been kept as pasture in recent times.

3.2 Magnetic Susceptibility

The possible cause of the noisy magnetic response is shown in figure 3.2, the magnetic susceptibility plot. Note that this shows very high levels to the south and south-west of the enclosure. Levels across the field are generally high, with lower levels only seen within the enclosure and to its north. The gradiometer only measures changes in magnetic anomaly and this is further reduced by a zero-median adjustment. Removing the zero-median did not appear to show any overall bias in magnetic levels. Perhaps an absolute magnetic method might give more understanding of the cause of this magnetic enhancement.

Note that the coordinates of the plot are based on the final three figures of the Ordnance Survey grid readings, so the plot is not quite compatible with the magnetometry. However, the general areas of high response can be made out and equated between the two plots.

It was noted through the field that the soil was darker than that of the neighbouring field to its south, and in particular had very dark patches within it. It is possible that some industrial process or high burning had taken place here, and the residue subsequently spread about the field by ploughing in ancient times. This spreading does not seem to have included the enclosure or the area to its north, suggesting that these were separated significantly from the western portion of the field.

Perhaps soil samples need to be collected and analysed or sampled by pXRF testing. That might also provide clues to the nature of the industrial processes happening in this field. However, that is beyond the scope of this study.

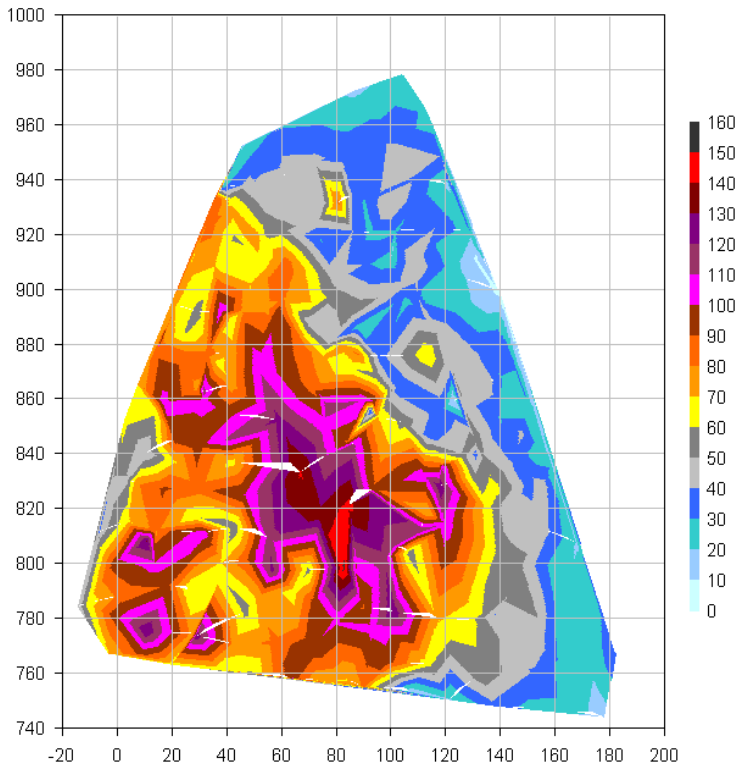

Figure 3.2. Magnetic susceptibility plot for Playing Field. Note that the x and y axes are measured in the last three digits of the Ordnance Survey national grid. These numbers would be preceded by ST 72… 69…

3.3 Twin-probe Resistance

The resistance plot is shown in figure 3.3. This adds a complementary picture to the magnetometer plot of figure 3.1. The ditch lines of the enclosure stand out well, but as low resistance (lighter) features. There are some signs of a stony bank on the south-west curve, but the northern bank looks earthen. There are no signs of re-cutting of ditches in this plot, but this method may not have detected such fine detail.

There are no obvious signs of stone structures within the enclosure.

The area to the west and south-west is masked by rock close under the surface, but this also shows some interesting, mainly negative, features. At one point, the enclosure just impinges on the rocky area, and there are a few signs of natural stone within the enclosure. However, it is noticeable that the strong stone signals do not extend into the enclosure or into the area to the north of it. The soil levels are slightly raised inside the enclosure.

There is also slightly less dense rock in the areas where the magsus shows highest response and magnetometry indicates indeterminate features.

The rock has also been scratched by thin lines, assumed to be early ploughing. These are generally north-south in direction. In the southern portion, there are lines in other directions, including south-west. This may possibly be a continuation of a ditch of a Roman road discovered in 2020 on the eastern side of the main road (Oswin and Pryke, 2020), but there is no sign of a matching ditch or any road surface, so this survey can provide no conclusive evidence of a south-westward continuation of this road.

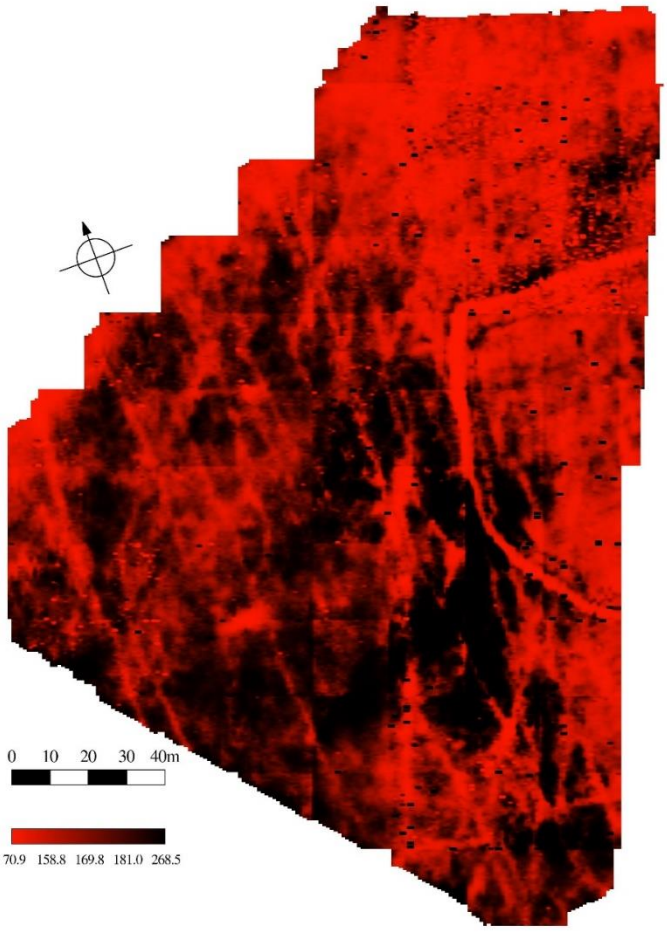

Figure 3.3. Playing Field. Twin-probe resistance plot.

3.4 Resistivity Profiles

Two resistivity profiles were set up to measure the ground resistivity across the bank and ditch edges of the enclosure in two positions. The first was set up across the northern bank boundary

(A) and the second across the western one both directed from the outside to the inside of the enclosure as shown in Figure 3.4.

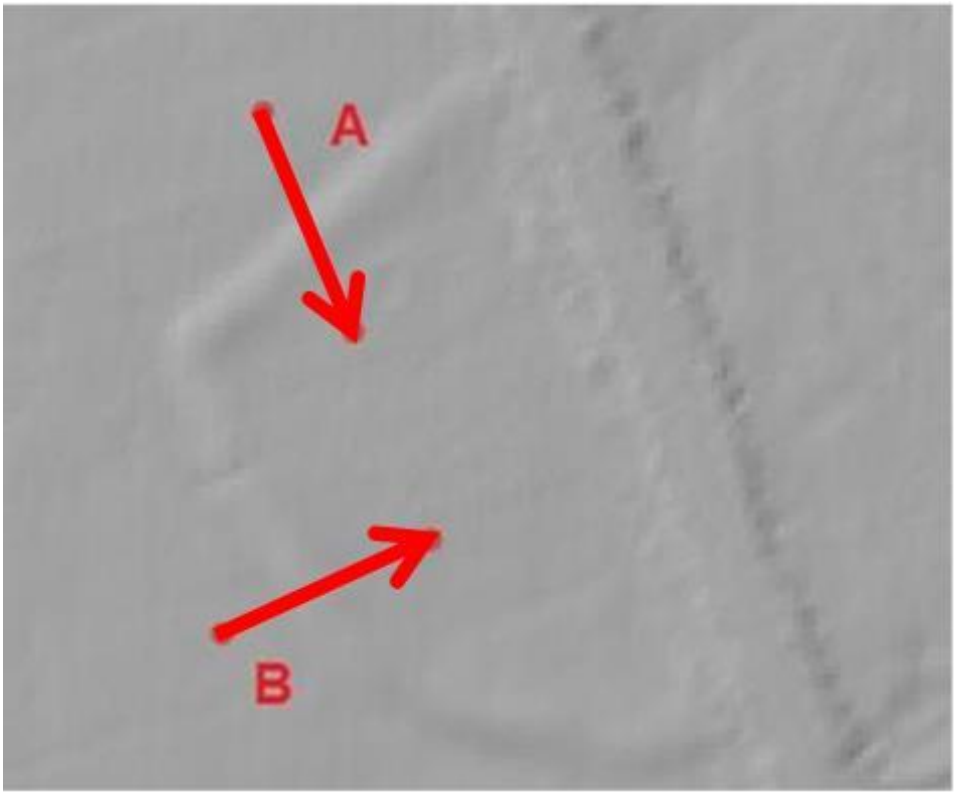

Figure 3.4. Positions of the two 31m resistivity profiles, A and B in a LiDAR image of the enclosure

The grid locations of profiles A and B are shown in the appendix, section A5.

Figure 3.5 shows the resistivity values across profile A. In this profile, the ditch position can be seen as a low resistivity volume at 14-16m near the surface with the highest bank point at 18-19m. Bush made a short report from the 1908 excavation across this bank. That trench was to the east of profile A at 10 ft. from the road wall. He described a 2ft. 3in. deep ditch, of width about 5ft. The bank was 14 in. high and was made up of rubbly stones below 6 in. of soil with a base width of 7 ft. No clear bank material differentiation can be seen in profile A.

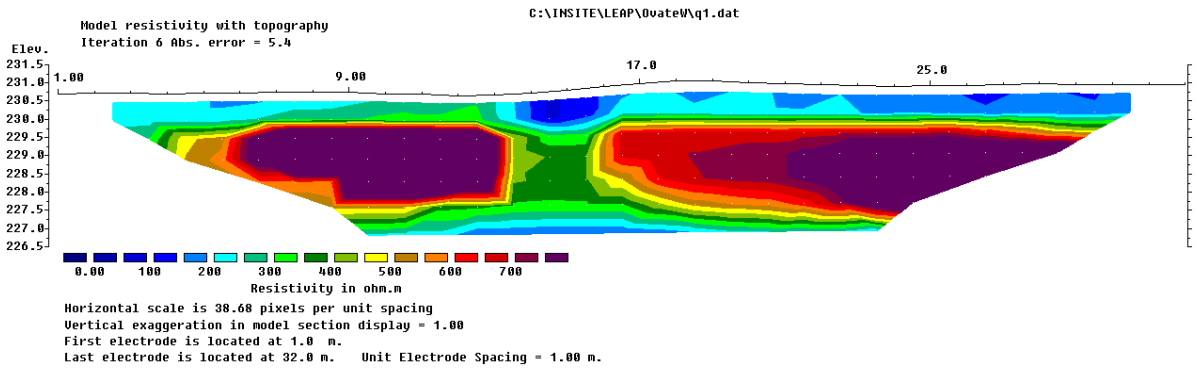

Figure 3.5. Profile A running north to south as in Figure 3.4.

Across the length of the profile there is less than about 1m depth of topsoil over the underlying rock. However, the interior of the enclosure appears shows a slightly deeper soil layer and also lower resistivity levels than that outside. It is slightly raised over the outside. There is some variation in resistivity near the surface along the survey length that might indicate the possible successive ditch positions noted from the previous surveys.

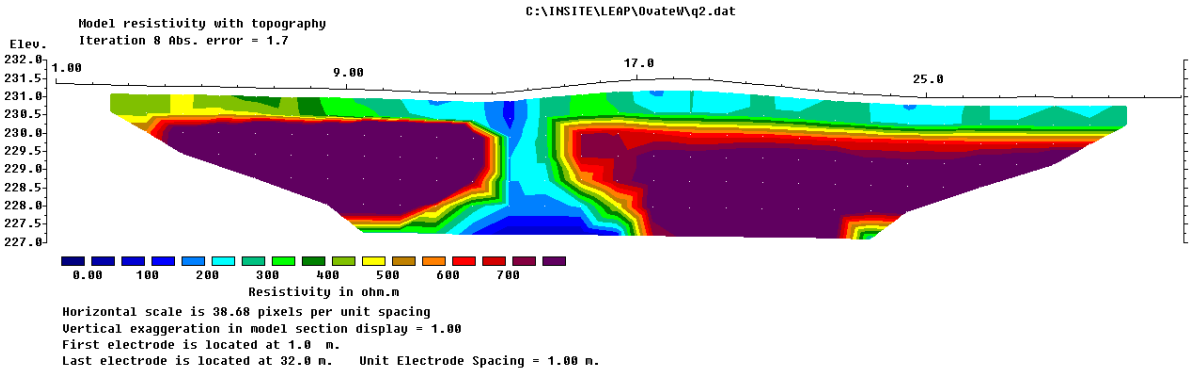

Figure 3.6. Profile B running west to east as in figure 3.4.

Figure 3.6 shows profile B across the western bound. In this profile the bank peaks at 17m with a narrower ditch position around 12-13m. A slightly higher resistivity volume appears approximately to coincide with the bank position. Again, the enclosure interior shows as a lower resistivity area than the exterior. The low resistivity under the ditch position in both these profiles is likely to be the result of water from it soaking downward.

4 The whole of Lansdown Camp

4.1 Combining the Surveys

It is possible to put the geophysics of the two sides of the enclosure together, although with limited accuracy. Note that GPS readings were no better than ± 2 m, and location of the plots over the grid corners is not higher accuracy, so it is best to consider that there may be an error of up to ± 5 m in comparing the two sides. Note that such errors may occur even with higher precision methods where plotting systems use differing projections. It is nonetheless possible to compare feature locations in both halves of the plot.

Figure 4.1 shows the magnetometer plots combined. Each half has been adjusted individually for best observation of features. The two halves have not been matched for magnetic scales.

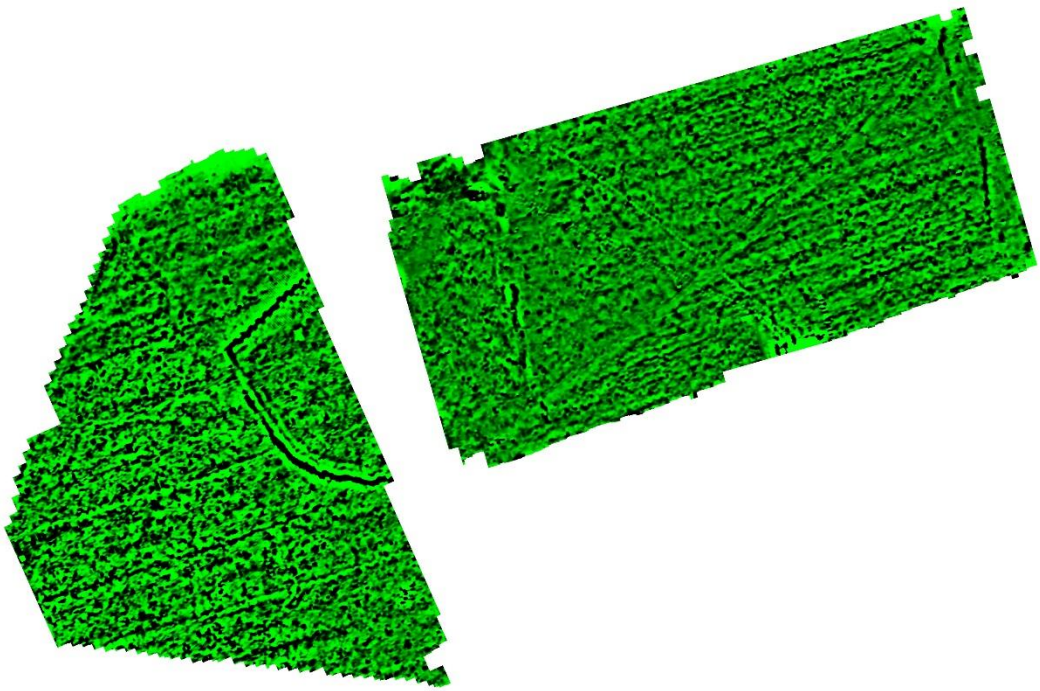

Figure 4.1. Combined magnetometer plot for east and west sides of Lansdown Camp. The road passes through the gap. North to top.

The eastern side can be seen to be badly degraded in magnetic signature compared to the western side, although it was noted in Section 3 that the western side (Playing Field) had much enhanced magnetic properties over all the field.

There does just appear to be one bound on the eastern side, although there is a second slight earthwork some 20 – 30 m further to the east.

The portion of the northern bound on the east side appears to have been heavily affected by quarrying, which is still visible. There is a possible modified course joining north to east bounds which just cuts off the corner. The southern bound is barely visible on the east. The line of the road to Settlement Field can be seen crossing the field diagonally.

In the western field, the bounds are clearly visible as a curve from south to west cut by a straight northern bound. There is a possible northern continuation of the western bound.

Figure 4.2 shows the resistance plots combined.

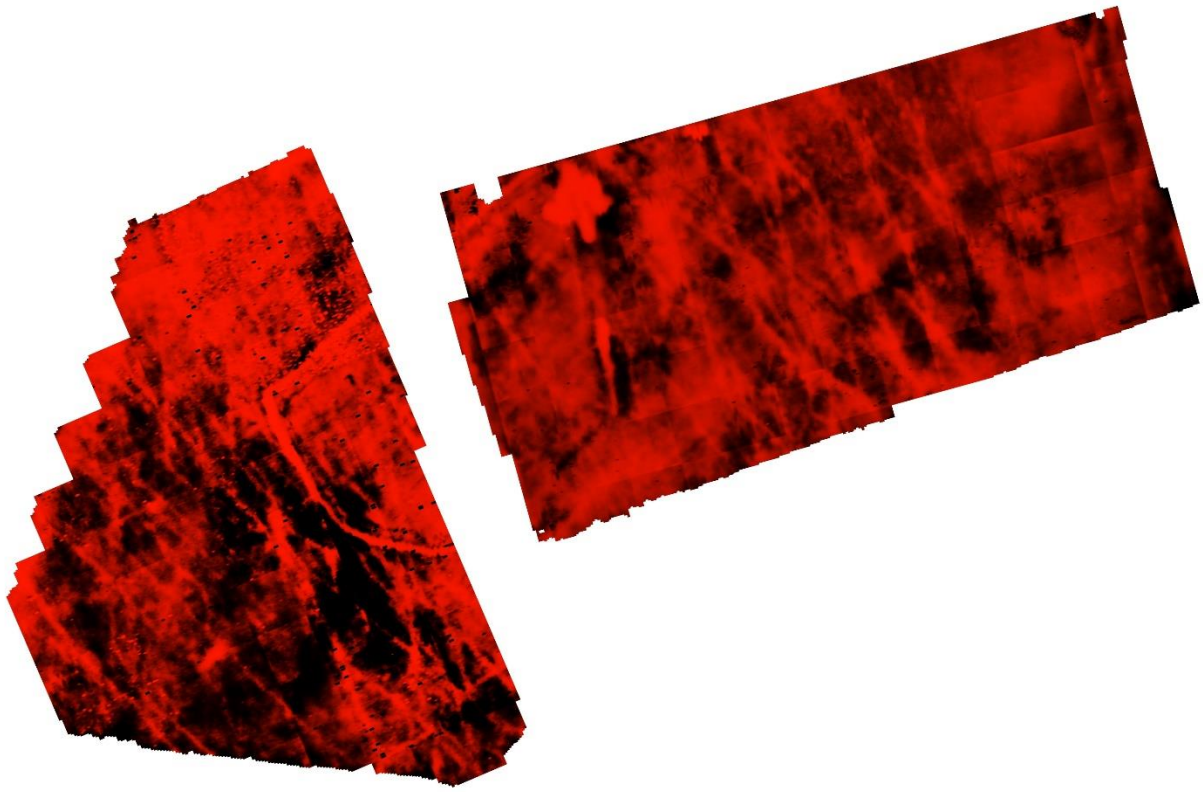

Figure 4.2. Combined resistance plot for east and west sides of Lansdown Camp. The modern road passes through the gap. North to top.

The pale band demarking the course of the road to Settlement Field is visible across the eastern side but does not appear to line up with any equivalent feature on the western side. It therefore must be assumed that this road branches off the course of the modern road, so the modern road must follow the course of a contemporary (Roman) road. The suggestion that the diagonal track crossed the line of the modern road (Oswin and Pryke, 2020) must therefore be discounted, and it joins the road in the direction of Bath.

The black ‘smudges’ on either side are taken to be areas where the underlying rock is shallower, and the pale streaks through these are taken to be plough marks. There are two alignments of

these in either field and these appear to relate to each other, so it is likely that any ploughing took place on a single territory.

The bounds of the enclosure can be seen in the resistance plots but no more clearly than shown by the magnetometer plots. There does appear to be a large irregular excavation through the eastern bound at its northern end indicated by pale, low resistance. This must be a modern quarry or pond.

Neither geophysical method shows strong, reliable evidence of any structure within Lansdown Camp. The stone patterns are too amorphous to be indicative.

Figure 4.3 shows the 1 m resolution LiDAR DTM of Lansdown Camp.

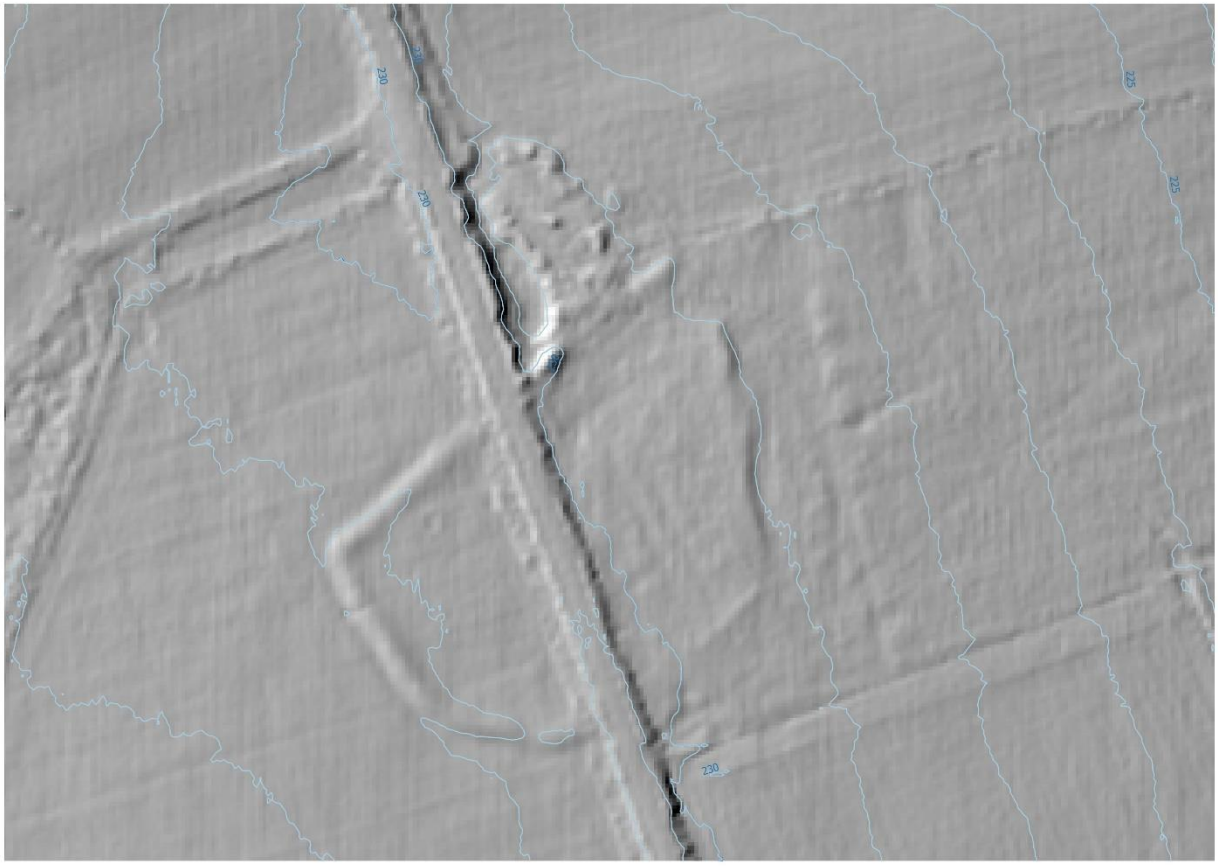

Figure 4.3. LiDAR DTM view of Lansdown Camp as hillshade. Contours at 1 m intervals. North to top.

Small dips in the western half of the enclosure appear on the ground to be earlier excavations. The bank, strong on the western side and much weaker on the eastern side can be made out. It appears here to be an irregular semi-circle with a straight northern side forming a join. Figures 4.1 and 4.2 suggested that the gap in the north-east is more likely to be due to damage than intended as an entrance. There is a slight gap in the south-west, but there is no evidence that this was an entrance originally. Possible gaps in the south-east may also just show damage.

The slight earthwork to the east of the enclosure is visible, and there appears to be a small enclosure at its northern end too. These do not appear to be related to the enclosure and may be modern.

Most noticeable is that the modern road breaks straight through the earthwork on its own alignment, which does not align with any banks.

4.2 Summary of previous work on Lansdown Camp

Previous work in Playing Field is covered only by a short report written by Thomas Bush following the excavation in 1908 of the western part of this enclosure as part of their series of excavations over Lansdown. Bush described the three banks forming an irregular enclosure possibly crossing the road "with a bank connecting the ends forming the E. side of [the] camp, but as present there is not any evidence of it on the surface." No dateable finds were recorded on this excavation. There are signs of a cut trench at one point on the western bank and one inside the enclosure. These do not seem to coincide with Bush's intervention. No report of them has been noted.

Playing Field is the southernmost on the western side of the road within the scheduled battlefield of the Battle of Lansdown, AD 1643 (see Figure 1.2) and may been involved in the activity at the time.

The beech copse in the north-west corner of the Paddock is sunken up to 2 m below the surrounding field surface, and is assumed to be in a quarry, probably for road or wall stone.

On the eastern side of the enclosure, earthworks are very slight and are not scheduled. Indeed, the eastern side is not shown on many nineteenth century maps, while the western side is clearly marked. However, the Crocker map of 1808 shows earthworks both sides of the road and refers to 'ancient intrenchment' at this point. Greenwood's map of 1821 only shows the western earthworks. Thorpe's 1774 map does not show earthworks here. These are relatively small-scale maps. Large scale Ordnance Survey maps, 1:2500, show western earthworks only up to the 1919 revision. The eastern ones only become evident on the 1930 revision.

An earthwork survey was carried out as a Bristol University MA student project in 1993. This covered both sides of the road. The earthwork survey shown there suggests alignment of the bank in the north but misalignment of the southern banks of the enclosure.

Paddock Field was subject to geophysical survey by BACAS (Oswin and Pryke, 2020) and that work has been reported to Historic England and Heritage Environment already.

5 Discussion

5.1 Summary of Geophysical Survey

The BACAS survey program has confirmed the visual evidence of the earthworks which can be seen on the ground and with LiDAR. The survey has unfortunately found no evidence of structures within the earthworks or its function.

The survey has given no further clues to the age of the monument.

The survey has shown the field which the western half of the monument sits may have been the site of some industrial process or high burning, but there was no evidence of this inside the earthwork.

5.2 Conclusions

As with previous investigations, the geophysical program has given no indication of dates for the earthworks or its function.

It appears that Lansdown Camp was cut through by a Roman road (now the modern road) as it was directly in its path. The differing state of the eastern side could be due to the western half being subject to a second or subsequent rebuilding phase or they are two earthworks of different construction dates. It may be simply that the eastern half poor remains are a result of later ploughing and quarrying,

The very high magnetic susceptibility immediately to its west seems to be a result of some industrial process, as signs of habitation are minimal. It may help to take soil samples for analysis, but this would require separate consent of landowner and tenant. It would also go beyond BACAS' capability and brief.

The area of survey reported here is relatively small, no more than 4 ha, but it makes an important contribution to the LEAP survey so far in that it has added contiguously to an area of some 17 Ha already surveyed. All these surveys have used complementary multiple instrumentation. In due course, this will lead to a better understanding of the whole area.

Bibliography

Bush, T. S. 1909. *Roman camp, September 11, 1908*. Proceedings of the Somerset Archaeological and Natural History Society (Bath branch), 1904-1908, p213

Bush, T.S. 1913. *Summary of the Lansdown Explorations 1905 - 1912*. Proceedings of the Somerset Archaeological and Natural History Society (Bath branch) 1909-1913, 246 – 252

Davenport, P, 2021. Roman Bath. Stroud: The History Press

English Heritage battlefield report. Battle of Lansdown, 1643.

Holley, R (ed.), 2018, Little Down Field, Upper Farm, Upper Langridge, Bath.
Bath and Counties Archaeological Society.

Oswin, J and Pryke, J. 2019. Lansdown Environs Archaeological Project (LEAP). Season 2, 2019. Monument Field. Bath: Bath and Counties Archaeological Society.

Oswin, J and Pryke, J, 2020. Lansdown Environs Archaeological Project (LEAP). Season 3, 2020. Paddock Field. Bath: Bath and Counties Archaeological Society.

Ross, C, 1996. Lansdown Camp survey project. Unpublished Master's Dissertation. University of Bristol.

Appendix A Technical data

A1 Gridding

The origin of the grid was set on the inner corner of the north wall immediately next to the eastern gatepost of the field entrance. The grid was then continued along the inner face of the northern wall at 20 m intervals. The grid origin post is shown in figure A1.

Figure A1. Location of grid origin post.

The grid posts were measured into the Ordnance Survey grid using a hand-held Elonex meter. Note that this only claimed accuracy to ± 2 m, so the pattern presented in figure A2, which maps these points is not quite regular.

The grid was constructed using tapes to measure out 20 m intervals and using Pythagorean triangles to obtain right angles.

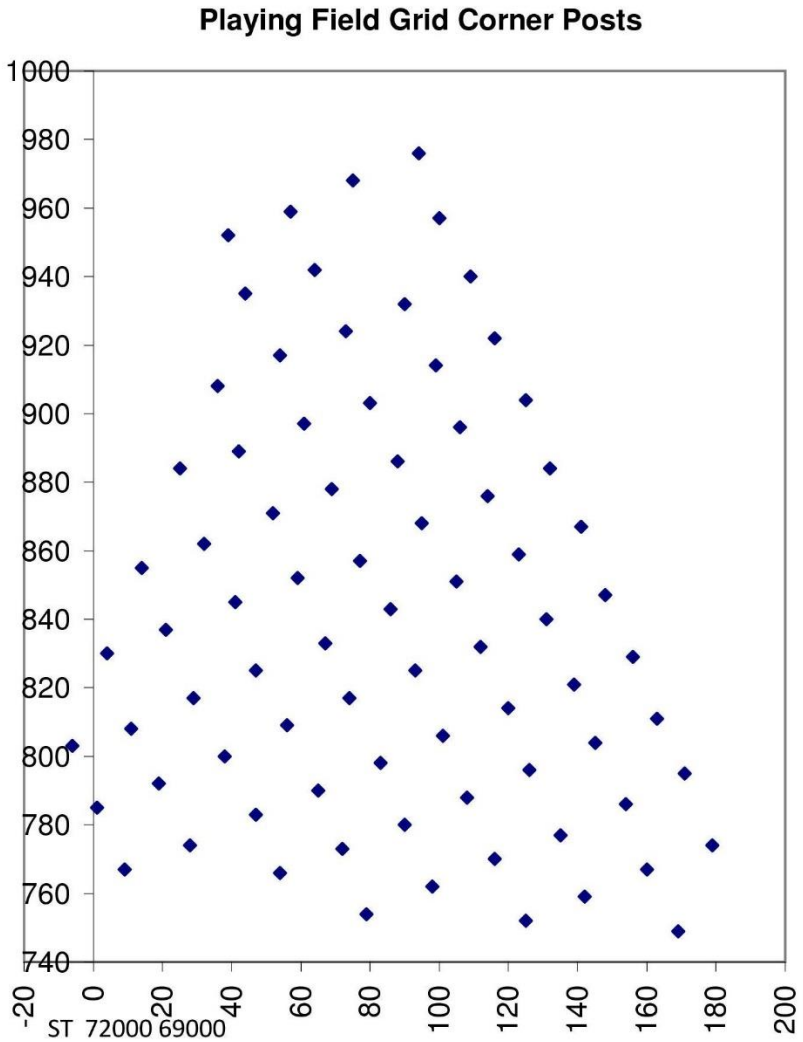

Figure A2. Grid corner post GPS locations.

A2 Magnetometry

The magnetometer was a Bartington 601-2. It took readings at 0.25 m along lines 1 m apart (2 lines per traverse). This gave 1600 points per complete 20 m grid square. Grids were started in the SW corner, 1 m east from the corner, 0.25 m north of base line, heading north initially and finishing 0.25 m north of SE corner.

A zig-zag pattern was walked, but the data were converted to parallel lines by the Bartington download software. The data were de-striped using BACAS proprietary software and given the prefix D…, ready for import into INSITE.

Figure A3 shows the order in which the grids were surveyed.

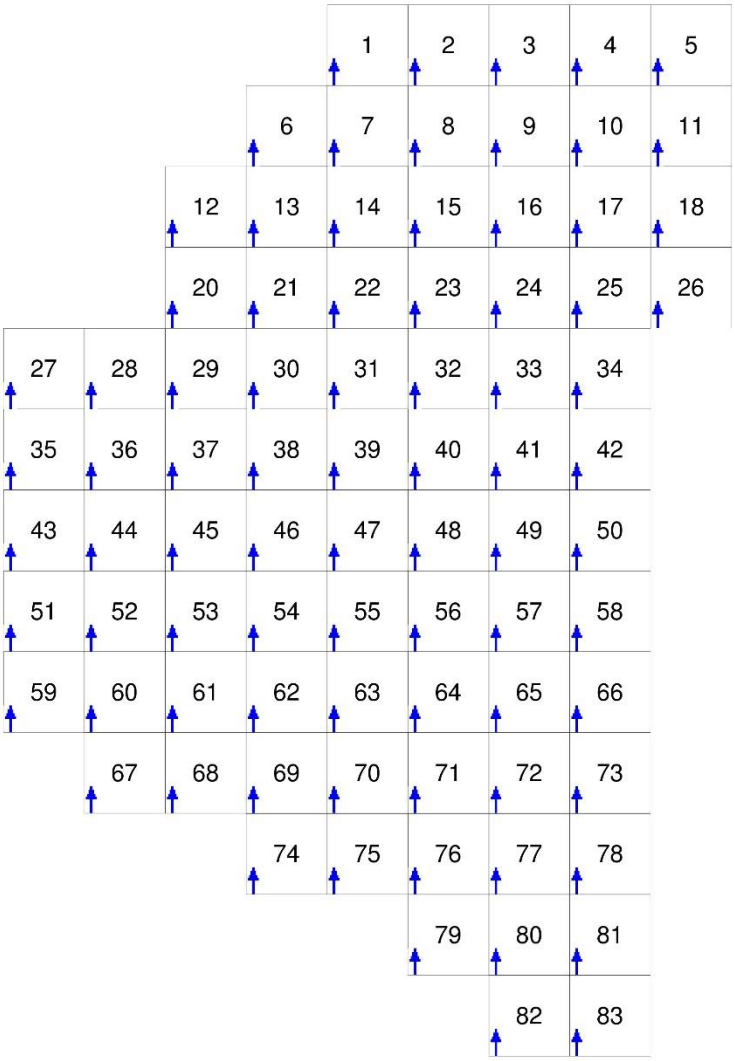

Figure A3. Gridding pattern for magnetometer survey. Arrows indicate starting position and initial direction.

A3 Magnetic Susceptibility (magsus)

The magsus was without data logger, so readings were logged by hand and later transcribed to column C of a spreadsheet. Columns A and B were used to record the eastings and northings of the measurement spot, as recorded on a Elonex hand-held GPS meter. This was only accurate to ± 2 m, but that is as accurate as can be located on a map. Readings were initially taken every 10 – 12 paces while walking ever-decreasing circles round the field. Where significant changes in reading were noted, the spacing was dropped to 2 – 3 paces.

The coverage provided is shown in figure A4. This generally worked well, but there are some larger spaces towards the southern end of the field. Readings were taken at grid corner posts that were laid out initially, but not in the southern portion of the field, which was gridded out only after this survey was complete.

Zero was re-set on the meter typically every 12 readings.

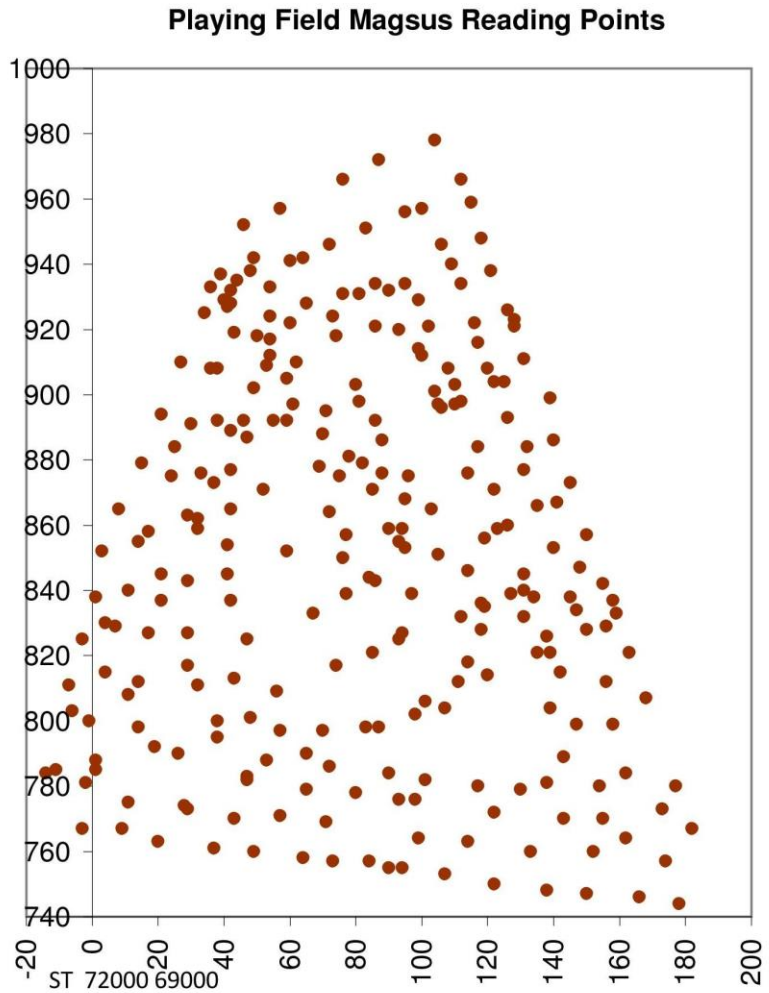

Figure A4. Measurement points for magsus as displayed by northings and eastings.

A4 Twin – Probe Resistance

The resistance survey only used the two new Frobisher TAR3 meters kindly supplied by Bathscape. These had half – metre probe spacing. The two meters were kept separated by 60 m or more (including remote probes) so that there was no cross-talk between them.

The data were downloaded as a single text file separated into blocks for each grid. Readings had been taken at 0.5 m intervals along lines spaced at 1 m, giving 800 readings per complete grid. Grids started at the SW, 1 m east of the corner post, 0.5 m north of the base line, initially heading north and finished 0.5 m north of the SE corner post.

The downloaded text file was opened as a spreadsheet, and for each grid square, the fourth column, the resistance readings, were extracted on to a separate spreadsheet, which was converted first to a text file and then to a .dat file for use in INSITE. Dummy readings (registered in download as '100') were converted to 'NUL' for use in INSITE. The readings followed the pattern walked, so made a zig-zag file. The layout of the grid squares as downloaded is shown in figure A5.

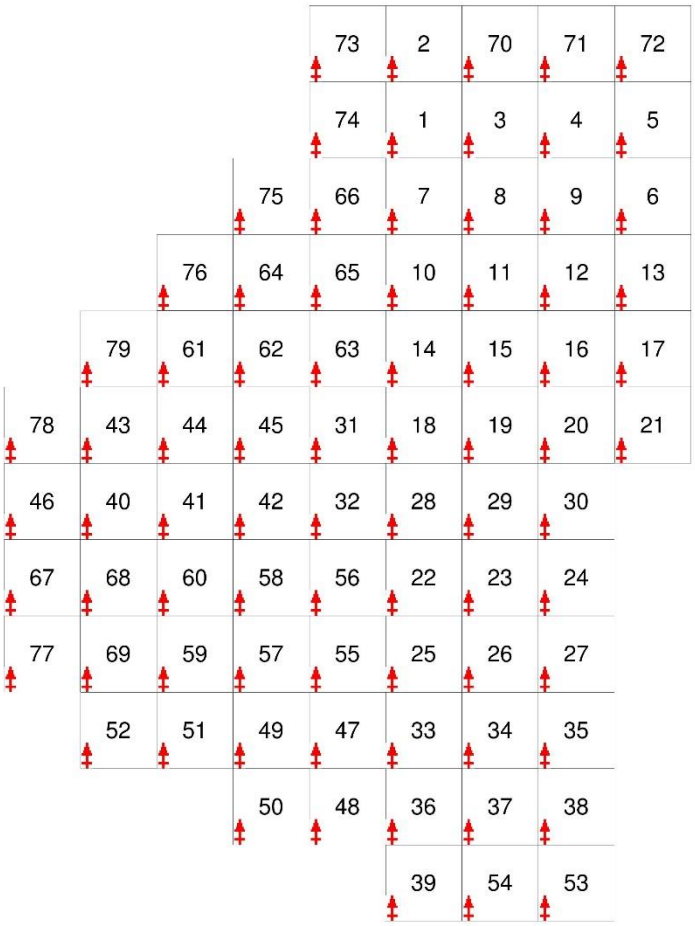

Figure A5. Layout of grids downloaded from resistance meters. Arrows indicate initial direction. Data were zig-zag pattern.

A5 Resistivity profiles

Figure A6 shows the locations of the resistivity profiles relative to the twin-probe resistance grid, and also shows the vertical profiles measured along the profiles. Each profile used 32 probes at one metre spacing, giving a 31 m length.

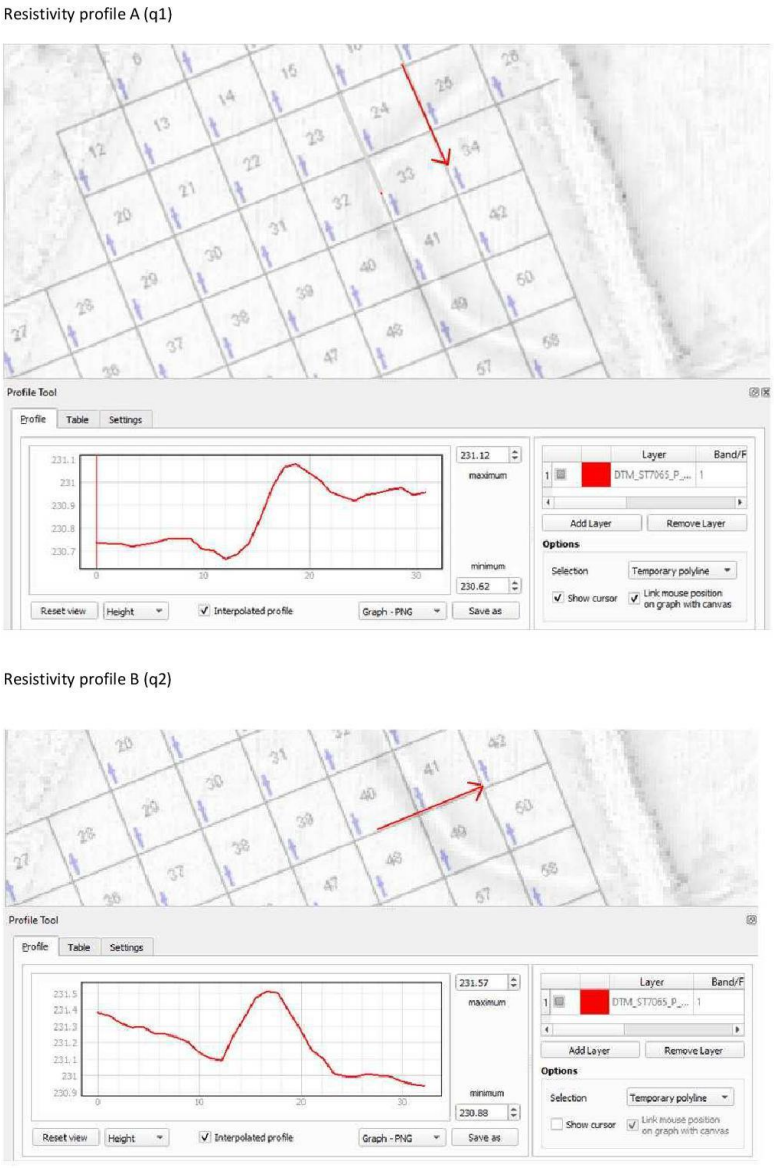

Figure A6. Location and direction of resistivity profiles relative to grid. Height profiles for each also shown.