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Belhus Park, Thurrock, Report on Aerial Photograph and Lidar Analysis

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Belhus Park, Thurrock Report on Aerial Photography and Lidar Analysis

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SUMMARY

Analysis and mapping of aerial photographs and lidar were undertaken at Belhus Park, Thurrock to assist with further research by local volunteers and inform the local council's conservation management plan. Belhus Park is a Registered Park and Garden in Thurrock, Essex (NHLE 1000738), and was redesigned in the 18th century by Lancelot Brown with additional later elements by Richard Woods, which incorporated the 17th- and early 18th-century features. The park was also used extensively throughout the 20th century as temporary military camps during the First and Second World Wars and later for leisure and recreation, chiefly as a golf course. Along with urban encroachment and the construction of the M25 the landscape character of the park has changed dramatically. Despite these changes, some elements of the 17th- and 18th-century gardens survive. This report summarises the results of the analysis of aerial photographs and airborne laser scanning data (lidar) images.

CONTRIBUTORS

This report was written and researched by Amanda Dickson. All aerial photographic analysis and mapping was carried out by the author.

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INTRODUCTION

Belhus Park is an 18th-century designed landscape park located in Thurrock, Essex. The park was designed by Lancelot Brown (commonly known as Capability Brown) with additional later elements by Richard Woods, which incorporated 17th-century and early 18th-century features. Early surviving elements of the Tudor/Jacobean gardens, particularly to the west of the house, as depicted in a painting of c1710 (Thurrock Museum), have recently been recorded during an Historic England archaeological survey (Bristow *et al* 2021). The park is a Registered Park and Garden (NHLE 10007380) and is on the current Heritage at Risk (HAR) register (Historic England, 2021) listed with high vulnerability. Surviving features are in poor condition and the multiple owners of Belhus Park require a shared strategy for improved management.

The aims of the aerial photograph analysis were to provide further archaeological information to enhance understanding of the park, particularly during the Second World War. This was to provide a base for future detailed research by volunteers working on the Designed Landscape project, run jointly with Land of the Fanns and the Essex Gardens Trust and which feeds into Thurrock Councils' five-year Land of the Fanns Landscape Partnership project. An assessment of land use in the 20th century also provides an invaluable resource to feed into Thurrock Council's conservation management plan and therefore help contribute to a strategy for the restoration and improved management of the Registered Park & Garden.

Belhus Park is located within a low-lying area situated on the eastern edge of London, bordering the River Thames (Fig 1). It is bounded by the settlements of Aveley (to the west) and South Ockenden (to the east) which have both expanded and encroached into the park. The M25 motorway bisects the park and has cut through the Long Pond and woodland area in the north of the park. The southern boundary has an open aspect, though mineral extraction has taken place up to the tree-lined boundary in two places. The northern boundary is more open, overlooking Belhus Woods Country Park, and largely unaltered.

The underlying bedrock of the project area is the London Clay formation, which is made up of clay, silt and sand and formed approximately 48-56 million years ago. Superficial deposits overlie this forming coarse to fine grained sand and gravel of the Lynch Hill Gravel Member and are fluvial in origin, formed up to 2 million years ago (BGS 2021). The underlying geology has formed loamy soils of the Hurst (841b) association that are mostly well draining but affected by a high-water table in places (Cranfield 2021).

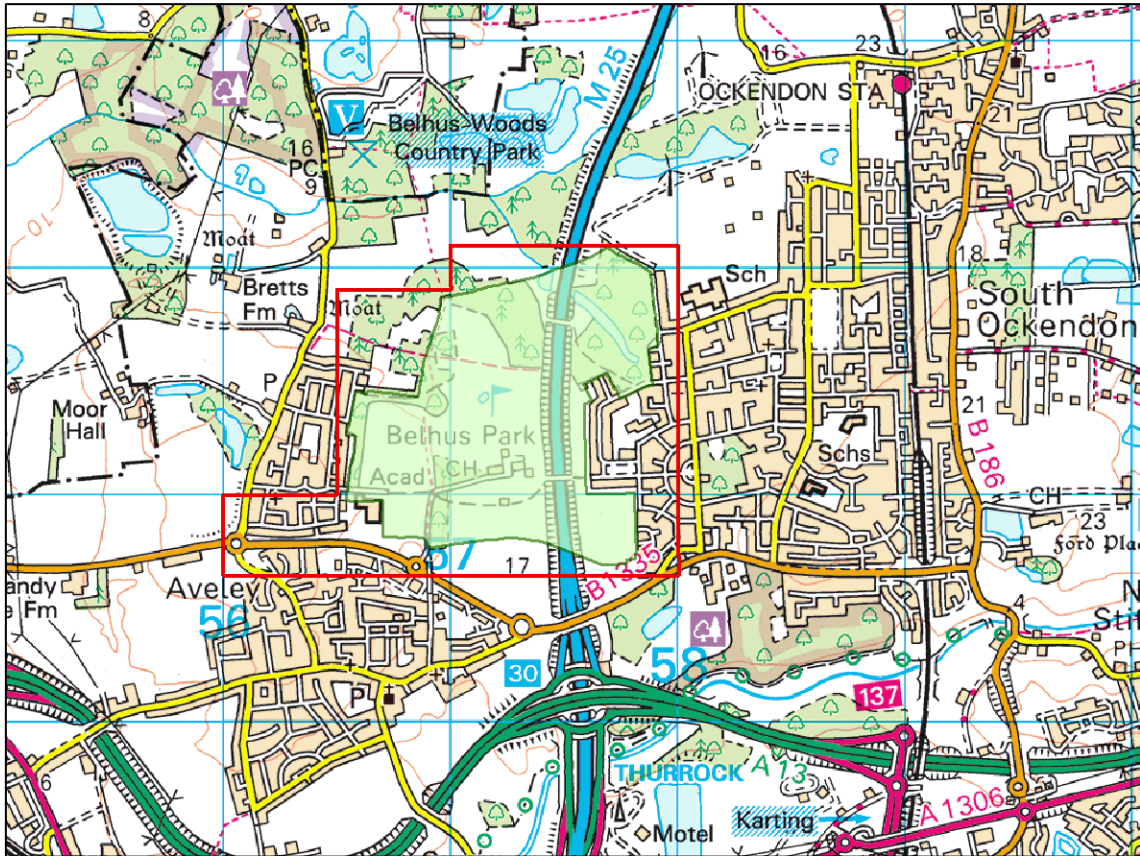


Figure 1: Location of Belhus park, showing the project area outlined in red and the registered park and garden area in green © Historic England. Basemap © Crown Copyright 2022. All rights reserved. Ordnance Survey Licence number 100019088.

LIST OF ABBREVIATIONS

HAR	Heritage at Risk
HER	Essex Historic Environment Record (record numbers are written as MEXXXXX in body of report)
NHLE	National Heritage List for England
HERR	Historic England Research Records
OS	Ordnance Survey (map scales used given in Appendix 2)

AERIAL SURVEY METHODOLOGY

All available aerial photographs held by the Historic England Archive, Environment Agency airborne laser scanning data (lidar) and online aerial photographs were assessed. A list of key photographic sources used can be found in Appendix 1. Aerial photographs consulted included vertical and oblique prints ranging in date from 1929 to the present day. Georeferenced and rectified digital images were produced from key aerial photographs using the AERIAL 5.36 rectification programme. Environment Agency 50cm lidar was processed using RVT 2.2.1 programme (Relief Visualisation Toolbox software) to generate several visualisations of the data (See Appendix 2 for further information).

The interpretation and mapping of archaeological features followed Historic England standards, which typically records archaeological features dating from the Neolithic up to the 20th century (See Appendix 3), though this project only identified features from the Iron Age/Roman period to the 20th century. The following list summarises which classes of monument are depicted and how they were recorded. See Figure 19 for all mapped archaeological features.

- Cropmarks (plough-levelled features and buried remains)

All newly-identified cropmarks and soilmarks which represent sub-surface features of archaeological origin were mapped. Cropmarks mapped as part of the Essex National Mapping Programme project (Ingle & Saunders 2003) were not re-mapped, but the available aerial photographs were assessed for any additional new features not previously recorded.

- Post-medieval field boundaries

Field boundaries pre-dating the first edition Ordnance Survey map (1867) were mapped.

- Ridge and furrow

Post-medieval ridge and furrow was recorded with furrow alignment indicated by a single line.

- Buildings and structures

Buildings and structures were not generally mapped if first edition or later Ordnance Survey maps depicted them, except where the footings or foundation walls still survive and where visible (such as Belhus House).

- Military remains

Military buildings and structures (including temporary features such as tents) from the Second World War were recorded and mapped according to the form and extent of the remains on the photographs taken in 1944 and 1946 to reflect the change in function and layout.

- Industrial archaeology

Extraction areas were mapped and recorded where visible.

- Parks and gardens

All vestigial earthwork (above ground) features pre-dating the first edition Ordnance Survey map (1867) were mapped, including the remnants of the tree avenue. The extent of the parkland drives were also mapped, due to their survival on recent aerial photographs and lidar imagery.

AERIAL SURVEY RESULTS

The prehistoric and Roman landscape

The Essex National Mapping Programme project (Ingle & Saunders 2003) identified a number of archaeological cropmarks around the perimeter of the park and some features within it (Figure 19). Those mapped within the park (MEX17620) were excavated prior to the building of the M25 and revealed Iron Age and Roman settlement evidence. Similarly, linear ditches and pits were visible as cropmarks (MEX39869), within the grounds of Ockenden School and later excavations revealed a Middle Iron Age occupation site there.

The features identified during the Essex National Mapping Programme project (*ibid*) were not re-mapped as part of this project. However, more recent aerial photographs were viewed in case additional archaeological detail could be added but none was identified.

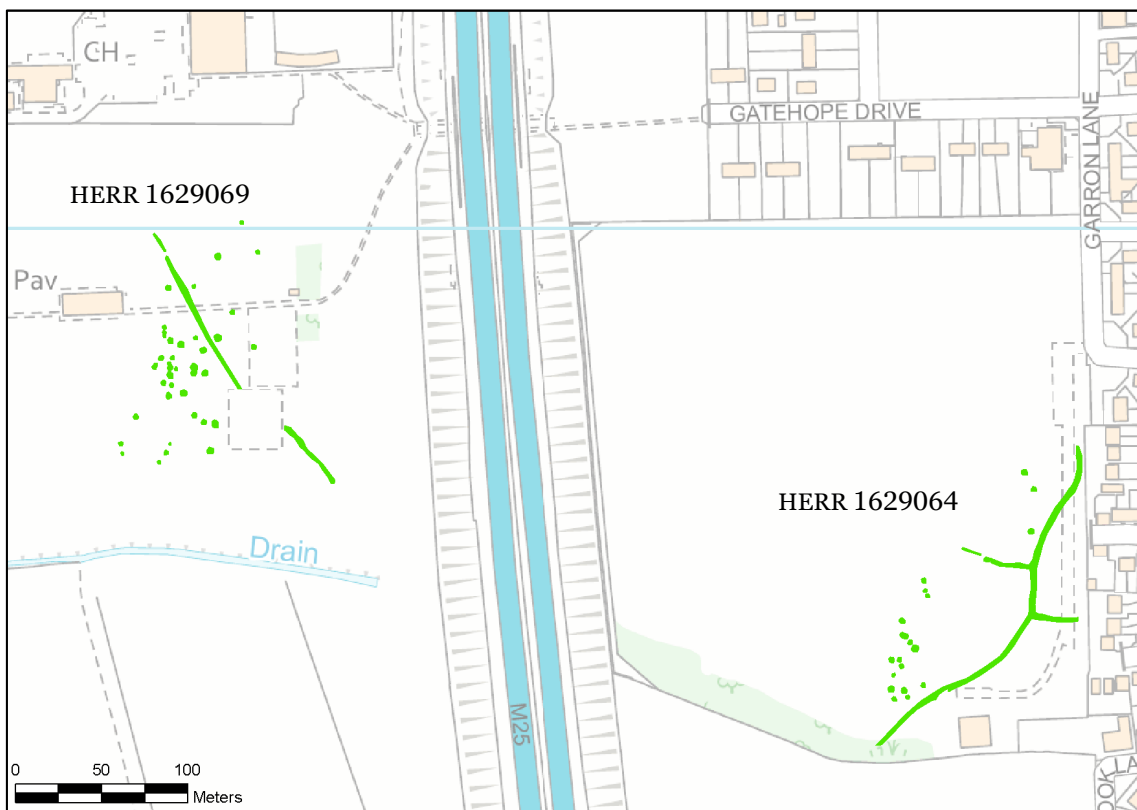


Figure 2: Extract of mapping showing the possible Iron Age and/or Roman cropmarks in green. © Historic England. Basemap © Crown Copyright 2022. All rights reserved. Ordnance Survey Licence number 100019088.

Despite the underlying soils being conducive to cropmark formation, the only new cropmark sites visible on aerial photographs were in the south of the park (Fig 2). In the south-east corner of the park a curving linear ditch, possibly forming an enclosure, and pits (HERR 1629064) were visible on aerial photographs taken in 1976, 1991 and 2014. These have been tentatively dated to the Iron Age and/or Roman periods based on the nearby excavated evidence (Wilkinson 1988; Ennis

2008) and could be further evidence of settlement and an associated field system. Similarly, further to the west is a linear ditch with possibly associated pits of varying sizes (HERR 1629069). Both these features may be further evidence of the wider later prehistoric and Roman landscape of Thurrock. Though it is always possible that they could be geological in nature.

Parkland and pleasure gardens

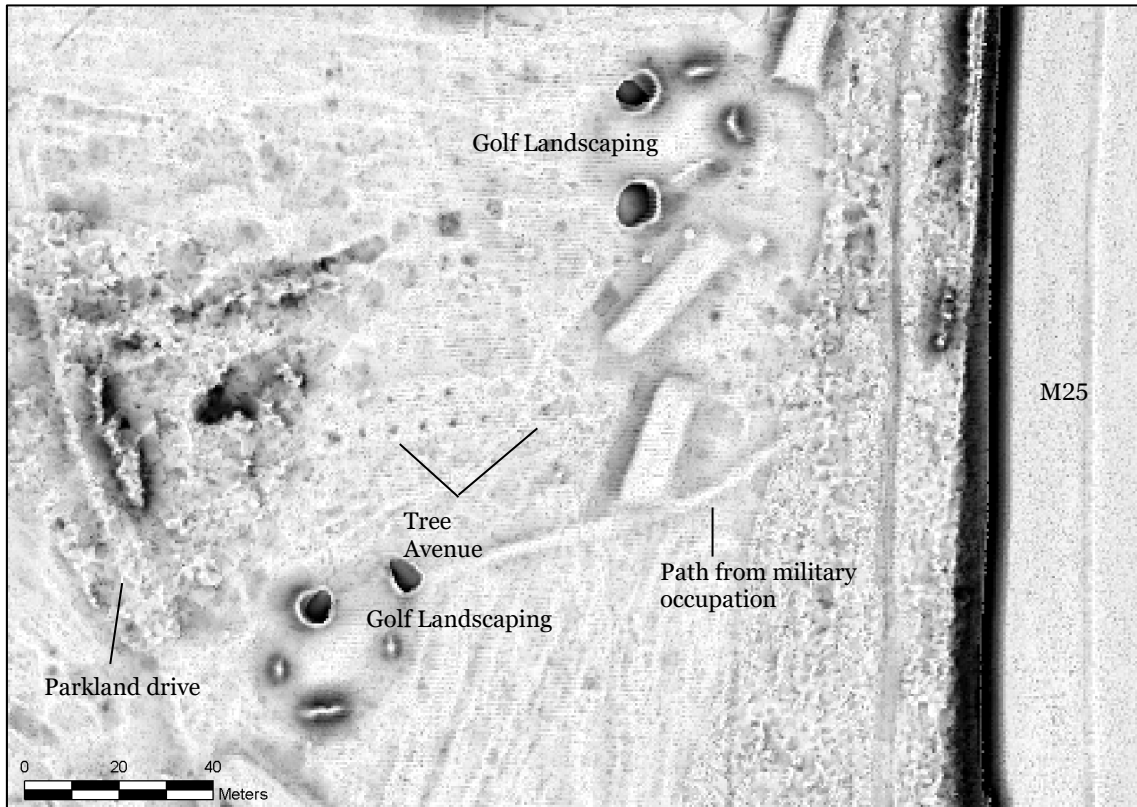


Figure 3: Extract of processed lidar taken in 2017 showing the remnants of a tree avenue in Belhus Park. LIDAR Environment Agency DTM 2017 © Historic England; source Environment Agency.

Lidar proved the most useful in identifying earthworks within the park and though most visible earthworks related to the current golf course, several potential garden features were mapped and recorded. These features were recorded within HERR 618055 unless otherwise stated.

One of the most striking was the remnant of the tree avenue (Fig 3) which extended west of the Walled Garden (NHLE 1337122) and is marked on the 1867 OS Map. It is visible on the lidar as a two parallel lines of pits caused by the complete removal of the tree boles or trunks; most of the trees were removed during later landscaping of the golf course between 1970 and . Some of the trees, which once made up this avenue appear to still survive on recent aerial photographs taken in 2018, either side of the M25.

Two banks, annotated as Parkland Features on Fig 4, are visible on lidar and have a possible association with lines of trees marked on the 1867 OS map. Though it is not clear which period of landscaping they relate to, the bank visible to the north of the demolished Belhus House was identified by Historic England staff in 2021 (Bristow *et al* 2021, 7) and interpreted as the possible remains of the western of two canalised ponds, flanking the northern 17th-century gardens.

Also noted during the archaeological survey (*ibid* 7-8) was the circular garden feature relating to the earlier 17th-century formal gardens to the west of the house. It was clearly visible and mapped from lidar imagery, but no additional details of this feature were identified by the current project. However, it was visible as a slight parchmark on the historical photographs taken in 1944 (see Figure 6), as well as recent Google Earth imagery from 2019 and 2020.

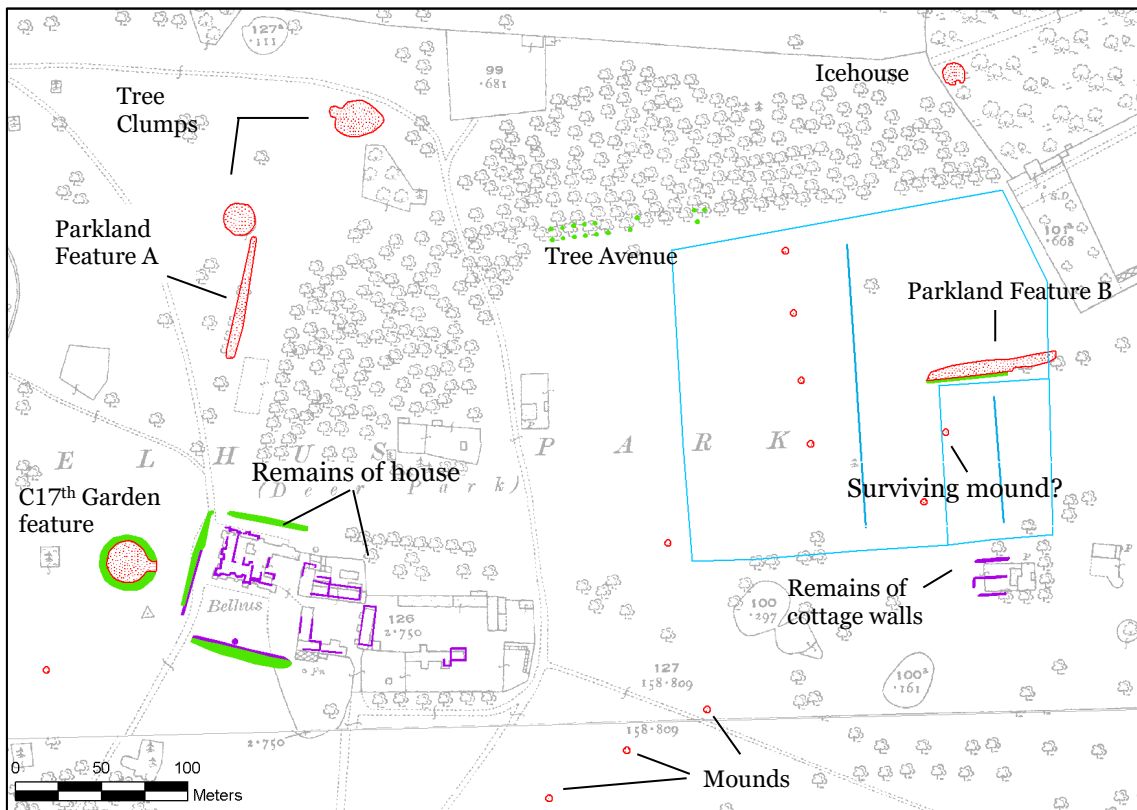


Figure 4: Extract of mapping showing possible 17th Century or 18th Century landscaped banks and other Post Medieval landscape features overlying 1920 Ordnance Survey map (1:2500). Earthworks are Red, Ditches Green, Ridge and Furrow in Blue © Historic England. BaseMap © Crown Copyright 2022. All rights reserved. Ordnance Survey Licence number 100019088.

Two mounds are located in the north of the park and were visible as substantial mounds on lidar (Fig 4) and have been interpreted as tree clumps. These and another two, located nearby, are recorded as bowl barrows in the monument record (HERR 411409). The first mention within the HERR record is from a letter sent by an individual in 1947. An archaeological field surveyor later comments in 1953 that they are of unknown date and all surmounted by trees. He notes that they may be barrows, but that they are not mentioned in either the Royal Commission on the

Historical Monuments of England's, Inventory of Historical Monuments of Essex (published 1916) or within The Victoria County History Essex. 1 (published 1903). The 1867 OS map shows three of the mounds clearly marked but are not given a label of antiquity, with the fourth only marked on the 1959 OS map. The lack of archaeological evidence and the tentative description by the field surveyor in 1953 makes the interpretation of the mounds as tree clumps, created during the 18th-century landscaping, plausible.

The paths or drives through the park, which are depicted on the 1867 OS map, were mapped (see Figure 19) from aerial photographs taken in 1944 and despite later landscaping, are still clearly visible for most of their lengths as cropmarks on the 2015 aerial photographs and slight earthworks on lidar imagery. The east-west trending path was metalled or concreted and used by the military during the park's occupation during the Second World War, only small sections survive (HERR 1629051) (see Fig 11).



Figure 5: A cropped Aerofilms photograph taken in 1929 of Belhus House as it was before the Second World War, showing the possible garden fountain or water feature. ALF EPW026628 01-MAY-1929 Historic England Archive.

The Aerofilms oblique taken in 1929 (Figure 5) clearly shows the house, as it was before the Second World War. The Listing (NHLE 1000738), notes state “During the Second World War Belhus was damaged by bombing and by military occupation and it was demolished in 1957”. It's worth noting that it's difficult to see any clear damage to the roof or the external structure of the house from the photographs taken during the war as seen in Figure 6, which shows a comparison

of Belhus house during the military occupation in 1944 and it's condition in 1951, not long before its demolition in 1957.



Figure 6: Extract of RAF vertical photographs from 1944 (left) and 1951 (right) showing Belhus House before its demolition in 1957. No obvious bomb damage can be seen. RAF/106G/LA F20 3026 04-AUG-1944 and RAF/58/715 VP3 5016 04-JUN-1951 Historic England Archive RAF photography



Figure 7: Extract of APGB vertical photographs from 2018 showing the buried remains of Belhus House. Next Perspectives APGB Imagery 01-SEP-2018 ©Bluesky international/Getmapping PLC

The recent vertical photographs also clearly show what remains of the former country house (Fig 7). The foundational remains of the house and some of the outbuildings to the southeast are clearly visible as parchmarks on recent aerial photographs taken in 2014 and 2018 and on recent lidar imagery. The parchmarks show the external walls and even some internal walls within Belhus House.

The wall enclosing the house and garden to the south were also visible on lidar (see Figure 4). The external ditch surrounding the wall, could be an earlier garden boundary but it likely a ha-ha, preventing cattle straying into the grounds. A small garden feature (HERR 411412), situated 34m south of the house, which appears to be a small pond or fountain, was visible and mapped from 1946 aerial photographs, and is seen more clearly on an oblique aerial photograph taken in 1929 (see Figure 5). It is also visible on lidar as a raised area suggesting that buried structural remains survive. Possible structural remains of walls surrounding the garden cottage to the east of the house were also visible on lidar and mapped (see Figure 4). The cottage was still visible in 1955 but demolished prior to 1961.

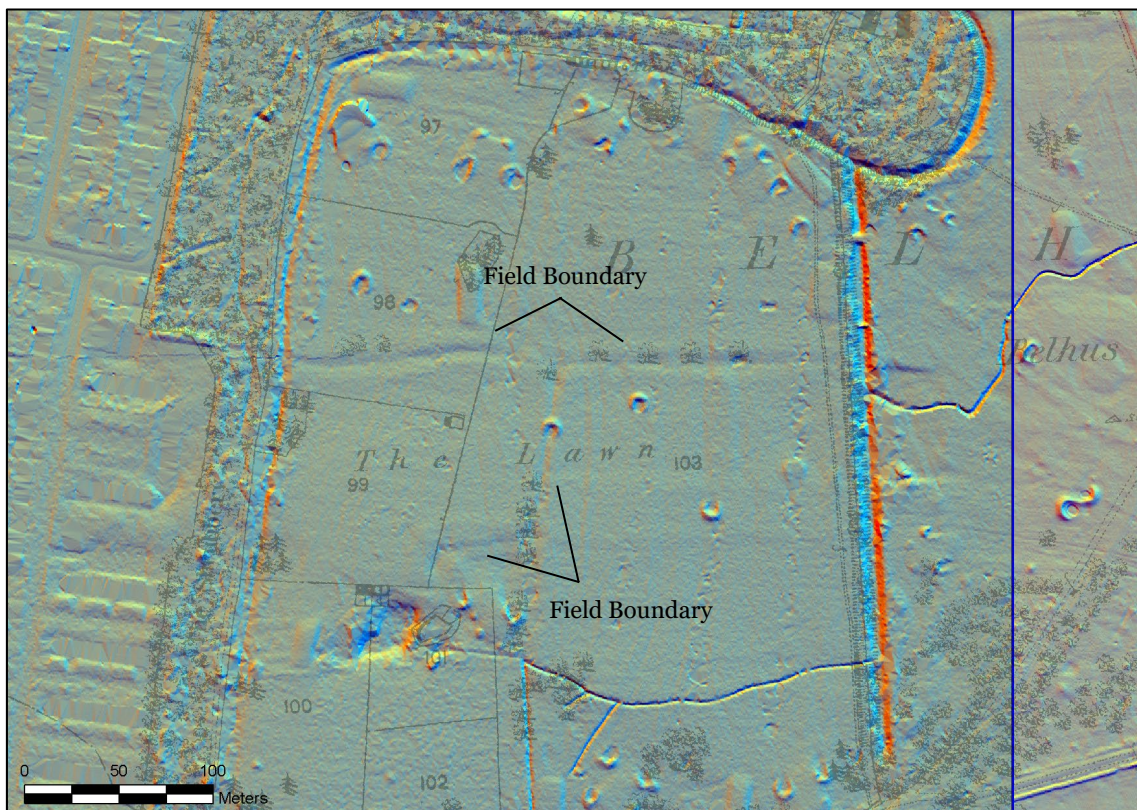


Figure 8: Extract of processed lidar data showing the field boundaries visible as ditches flanked by low banks overlain by the 1867 Ordnance Survey map. LIDAR Environment Agency DTM 2017 © Historic England; source Environment Agency Map © Crown Copyright 2021. All rights reserved. Ordnance Survey Licence number 100019088.

To the west of the park, in an area known as The Lawn on the 1867 OS map, field boundaries of a post medieval or earlier date were visible on lidar taken in 2017 (HERR 1629062). They do not match with the field boundaries as they appear on the 1867 map, but they do appear to roughly line up with the line of trees depicted

on the map (Fig 8). They may have formed part of the original parkland layout or even pre-date the landscape park at Belhus.

Surprise features were initially recorded south of The Lawn from aerial photographs taken in 1953. The aerial survey identified 19 small mounds (NRHE 1629062) each measuring about 3m to 3.5m in diameter and surrounded by a ditch (Fig 6). Some of these mounds also appear slightly triangular. On further review of the 1944 aerial photography 26 more of these mounds are also located in the rest of the park to the south and east of Belhus House. They were more difficult to identify but were recorded as being of the same type of feature. It is not clear what the date or function of these mounds were, but one idea is they could be evidence of agricultural use in this area of the park, possibly feeding stations. The park was being used for grazing cattle which are visible on the aerial photographs taken in 1929 and in 1953. However, the mounds are regularly spaced which may suggest another explanation is necessary. The mounds were not visible on any later aerial photographs, except for the mound located at TQ 57521 81323 (See Figure 4). Aerial photographs taken in 2019 and lidar imagery both show a triangular shaped ditch at this location, possibly indicating the levelled remains of the mound.

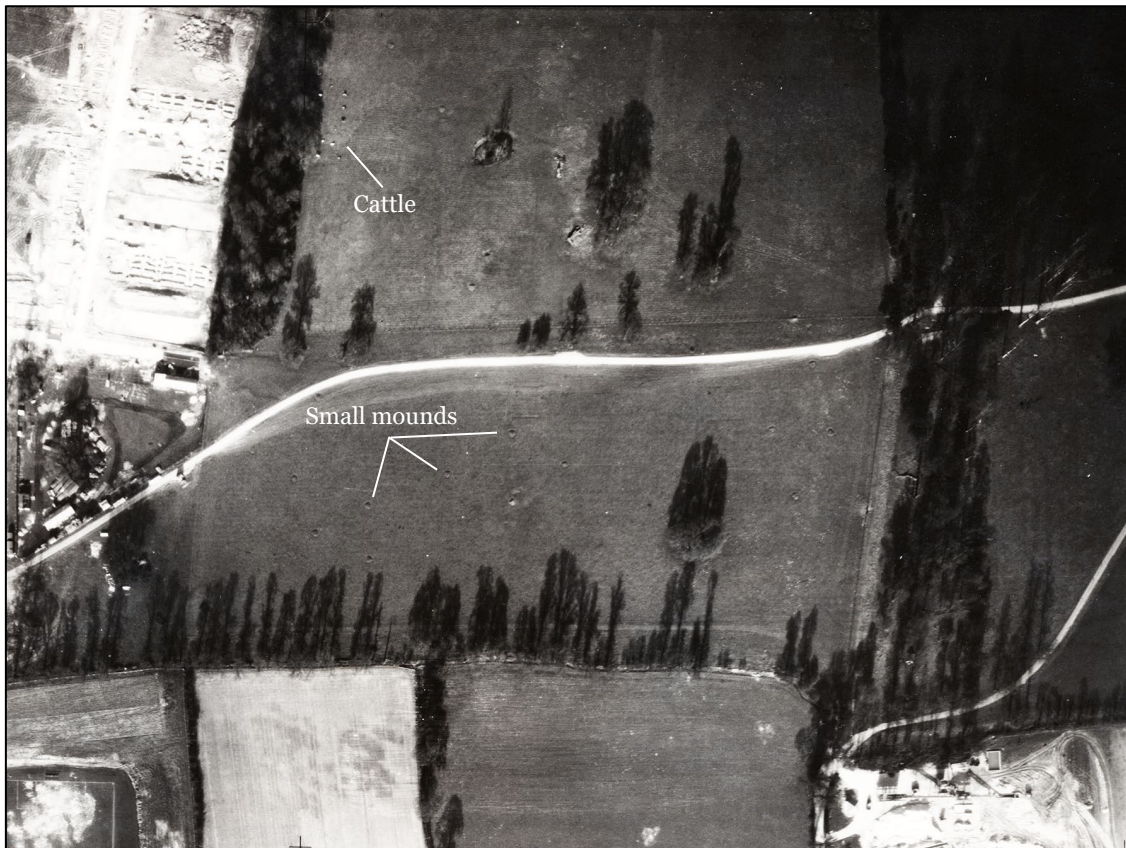


Figure 9: Extract of RAF vertical photograph showing the circular mounds in the south-east of the park. Three have been annotated. RAF/58/1017 V 0096 06-FEB-1953 Historic England Archive RAF photography.

Faint traces of ridge and furrow ploughing were visible on 1955 aerial photographs to the west and south of the walled garden (see Figure 4). Their narrow appearance suggests later post medieval steam ploughing, and this may have been drainage for

grassland improvement rather than arable cultivation. The furrows cross the linear bank (see Figure 4, annotated as parkland feature B), suggesting a later date for the ridge and furrow. Despite their faint appearance on the aerial photograph, a section of the ridge and furrow survive as earthworks. Linear earthworks which have the same orientation as the ridges and furrows and have the same narrow form are visible on the lidar imagery, centred at TQ 575 813.

The Second World War military occupation

The earliest vertical photographs were taken by the RAF in 1944, a year before the end of the war and show the military camp located in Belhus Park (HERR 1629051). There are three sorties, flown in April, July and August 1944 that cover Belhus Park. The April 1944 date is significant as in June of the same year thousands of British and allied troops landed on the coast of Normandy. There is also a sortie taken in May 1946, a year after the cessation of hostilities. The range of photographs over a short period of time can enable phasing of the camp activities as seen in Figure 18.



Figure 10: Extract of RAF vertical photograph showing the main part of the Second World War military camp as it was in April 1944. RAF/106G/LA/2 F20 3001 25-APR-1944 Historic England Archive RAF photography.

April 1944

The photographs taken in April show the military camp at Belhus with troops preparing and waiting for the invasion order (Fig 10). The camp is spread out

throughout the park, consisting of dispersed military tents and temporary buildings. The headquarters of the camp would have been based in Belhus House with the soldiers' accommodation in the small (circa 4m diameter) bell tents, which are strategically located underneath the canopies of the parkland's trees. There were at least 267 of these tents visible within the park, but the number is likely more as some were obscured by the trees. There are also oblong shaped tents and buildings which form small groupings. It is likely these small hubs consisted of ablution blocks and mess tents providing washing and food facilities but possibly also sergeants quarters, perhaps grouped by platoons or companies.

The east-west path that connected Belhus House to the edge of the parkland, visible on the first edition Ordnance Survey map (1897, 1:2500) appears to have largely been hardened and upgraded, presumably to support the volume of military vehicles entering and exiting the park. It is not known if the park was already used as a training camp prior to 1944 or how long some of the troops had already been based at Belhus, but clear evidence of some downtime can be seen west and north of the house, where a football pitch and another smaller sports pitch (34m by 24m), possibly for basketball to the north (Fig 10).



Figure 11: Extract of RAF vertical photograph showing a part of the Second World War military camp as it was in July 1944. RAF/106G/LA/214 RS 4132 04-JUL-1944 Historic England Archive RAF photography.

A document held in the Essex Record Office (ERO, 2014) dated 25th May 1944, shows Belhus Park as Marshalling Area S4, with a Sub area HQ and four sub camps

so it is likely that the activity visible in April 1944 relates to the increased preparations for D-Day and was in use at that point as a Marshalling Camp.

July 1944

The July 1944 photographs show that more of the small bell tents have been erected, as well as some new buildings and oblong tents. Though some of the tents are located out in the open, they tend to stick to the same location of tents as two months previous. There is also a lot more vehicle activity, with a long convoy of trucks entering the park (Fig 11) from the east, (their movement can be seen on the stereopairs of the 1944 prints). Presumably the park is still in use mobilising new troops heading to the Front. Also, of note are the small ditches located near the tents. Their purpose is unclear, but they could be small trenches, or weapons pits, used as blast shelters from bombing raids. In addition, three areas have also been surrounded by barbed wire entanglements, which suggests a high level of security to the buildings within. It is possible these enclosed areas provided weapons or ordnance storage. The layout of the camp (Fig 12) changes little from July to August 1944, but has the addition of new tents, though some of these are likely to have been erected in July 1944 but were obscured by the park trees on the aerial photographs.

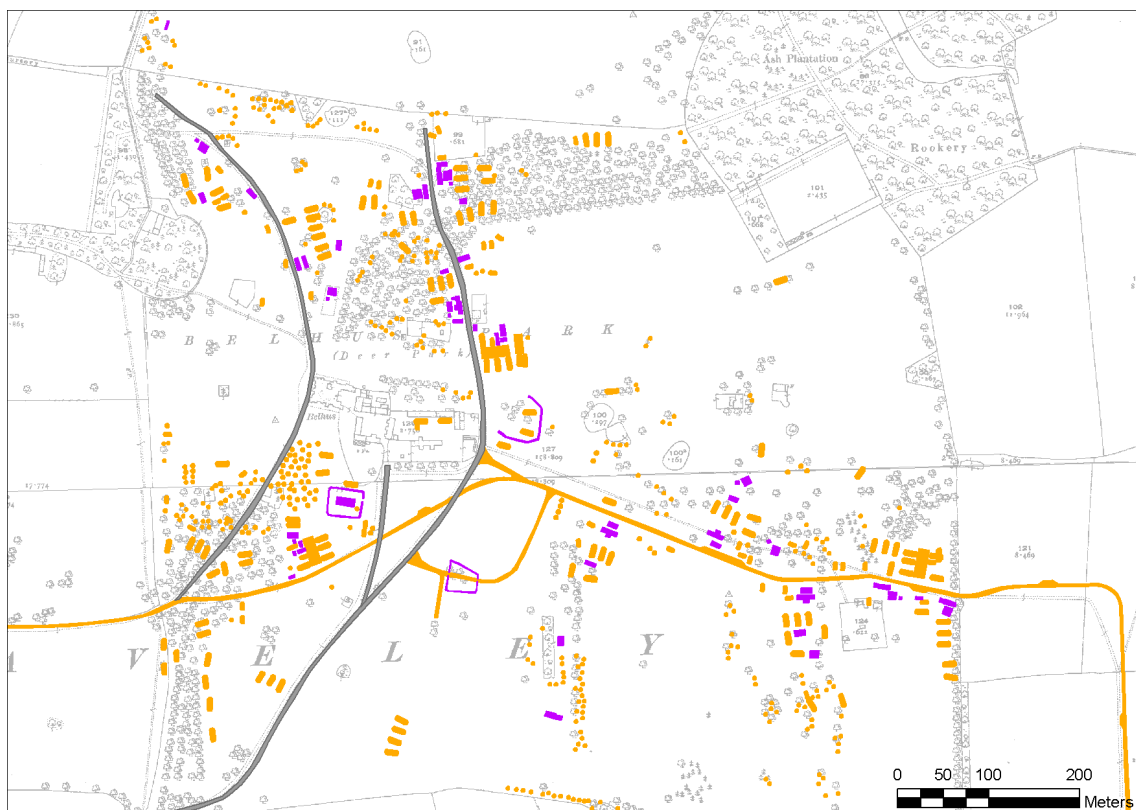


Figure 12: Extract of mapping showing the layout of Second World War military features recorded from aerial photographs taken in 1944. Buildings are in purple, tents and military road in orange. The two parkland drives are shown in grey for clarity © Historic England. Basemap © Crown Copyright 2021. All rights reserved. Ordnance Survey Licence number 100019088.

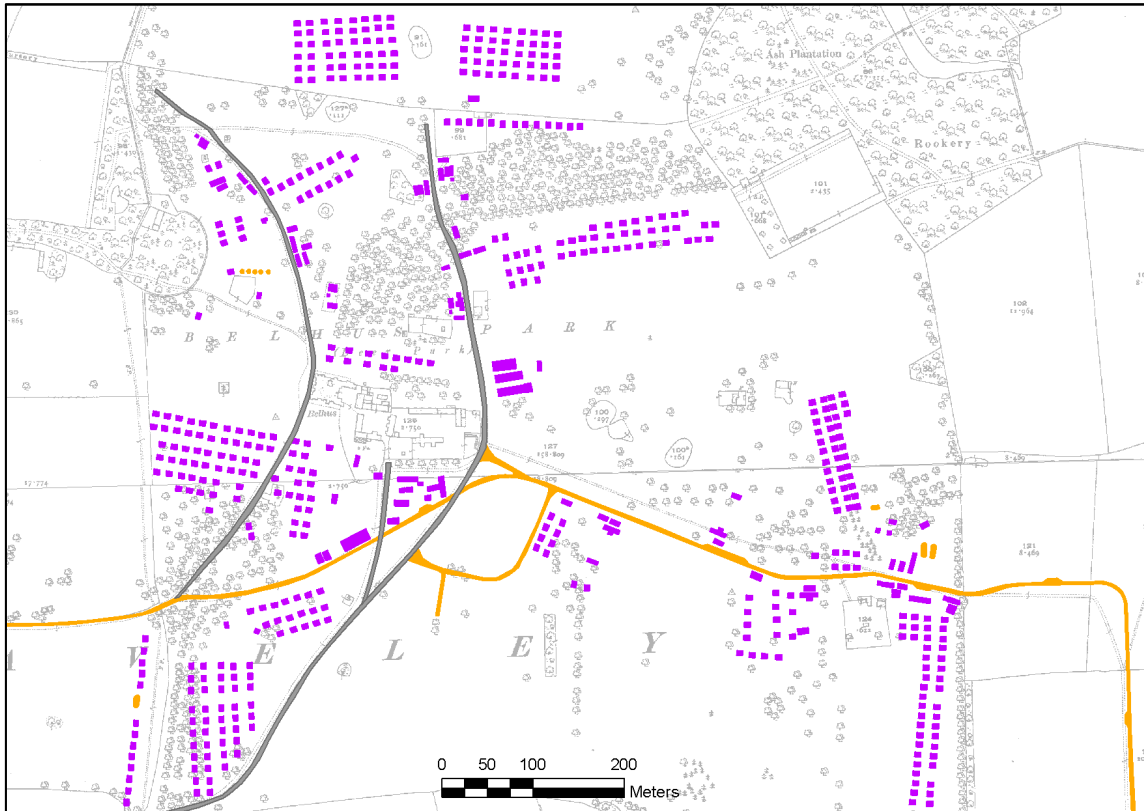


Figure 13: Extract of mapping showing the Second World War military features recorded from aerial photographs taken in May 1946. Buildings and square tents are in purple, other tents and the military road are in orange. The two parkland drives are shown in grey for clarity © Historic England. Basemap © Crown Copyright 2021. All rights reserved. Ordnance Survey Licence number 100019088.

May 1946

On aerial photographs taken in 1946, the layout of military activity has completely changed (Fig 13). The numerous small and oblong tents have been removed to be replaced by another large camp layout. The regimented layout of tents in rows are grouped and spread throughout the parkland. They are largely visible as rectangular parchmarks suggesting around 464 tents were erected within the park, with 92 of those tents still standing when the 1946 photograph was taken (Fig 14). New buildings can also be seen to the east and south of Belhus House. The purpose of this camp is not known. It is possible it could have been used to house soldiers awaiting demobilisation or used as a displaced persons camp, or even as an overspill Prisoner of War camp. There was a Prisoner of War camp located further south at Beacon Hill, Purfleet (Jackson 2010).

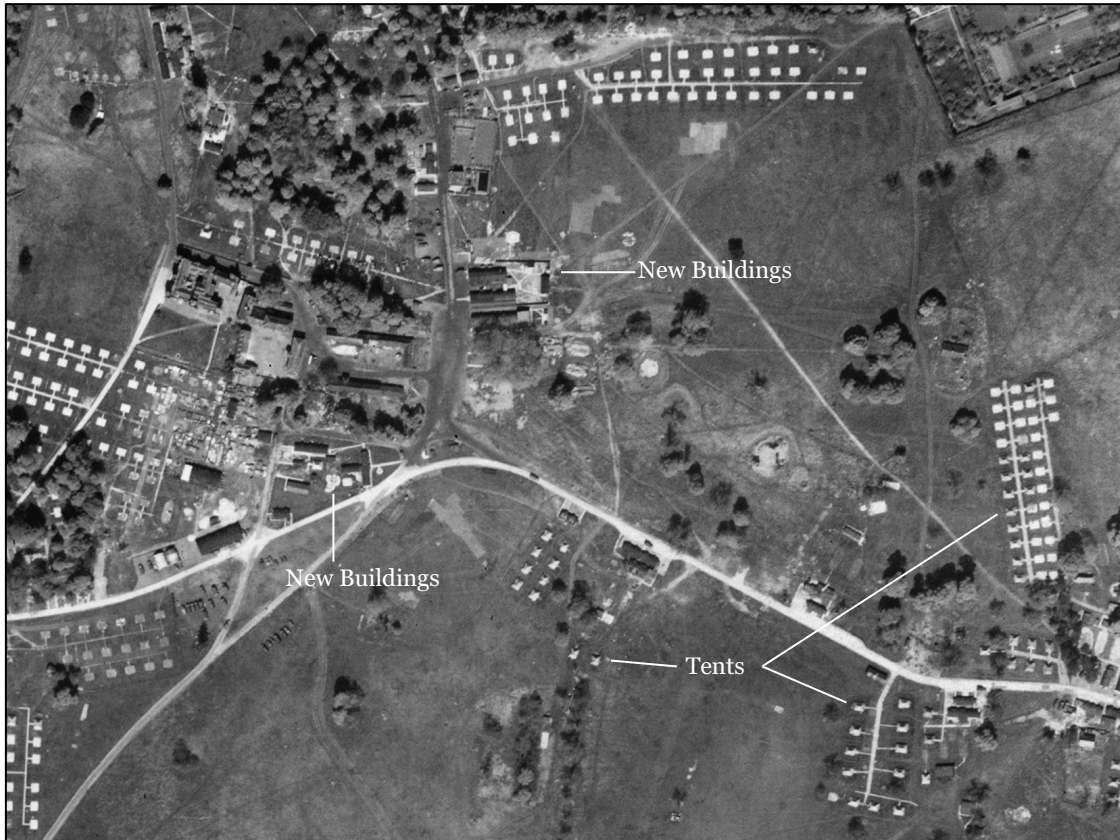


Figure 14: Extract of RAF vertical photograph showing the Second World War military camp as it was in May 1946. RAF/106G/UK/1447 RV 6102 01-MAY-1946 Historic England Archive RAF photography.

Post-1946

The removal of military buildings was not complete until after the end of the war with some buildings remaining in the park in 1955, though they were all gone by 1961 (see Figure 17C). The concrete road that was constructed during the war has largely been built over, but there are two small sections, where the base of the road is still visible, along with three buildings visible on oblique aerial photographs taken in 2015 (Fig 15).

As stated on Page 8, the nature of the bomb damage that occurred to Belhus House as stated in the NHLE Listing notes (1000738) is unclear. The park was certainly affected by bomb damage and a number of bomb craters were visible on aerial photographs and mapped (HERR 1629059).



Figure 15: Extract of Historic England photograph taken in 2015 showing the foundation remains of Second World War buildings and concreted road. HEA 29647/6 27-MAY-2015. © Historic England Archive.

ASSESSMENT OF LANDUSE

The following assessment refers to extracts of aerial photographs as shown in Figure 17: A-F unless otherwise stated.

Belhus Park was used as a temporary training camp during the First World War, though no features relating to his period were recorded and it is not known what, if any, changes occurred during military occupation at that time. Due to the available historical aerial photographs from 1944 (see Figure 18) onwards we can see that after the Second World War the character of the park began to change, with residential housing being built on the east and west sides and sportsgrounds to the south, though the rest of the park changed little from its pre-1945 days.

The aerial photographs show that from 1951 (A) the residential encroachment began on the east side of the park, with the construction of houses south of and within the walled garden and the demolition of the kennels. By 1955 (B) residential housing was also built within the southwest of the park. The south of the park, the parkland became a public recreation area, with cricket pitches, a running track and rounders pitches all visible on the aerial photographs. The sportsground is also shown on the 1959 Ordnance Survey map with its small pavilion and tennis courts.

Belhus Hall and associated buildings were demolished in 1957, this further altered the park, though the overall form of the 18th-century designed landscape would still have been recognisable, as seen on aerial photographs taken in 1961 (C).

The arrangement of recreational activities became more formalised with the creation of the golf course in the 1970s (D) and the leisure centre facilities first seen on aerial photographs in 1981 (E). The leisure centre created an urbanised link between the newer estates of Aveley and South Ockenden and remains in use today. To the north and west of the now demolished house, several trees were removed as part of the expansion and landscaping of the golf course. This gave the park a more open appearance. Cropmarks on aerial photographs taken in 2014 (Fig 16) highlight the parkland's years of use as a sportsground (on both sides of the M25) providing space for cricket, football and rugby pitches. The cropmarks show the multiple layering of pitches which were drawn and redrawn on the same site. The repetitive white painting of the pitch outlines can change the condition of the soil underneath, producing a moisture differentiation in the grass in dry summers.

It is arguably the construction of the M25 motorway (E and F) which has altered the park the most by bisecting it and isolating some of its surviving features from each other and changing its appearance irrevocably. The Long Pond situated within the woodland to the north has been cut in half and can no longer be appreciated in its entirety (F). The woodlands of Ash Plantation and Oak Wood are now dislocated from the parkland but appears to have remained untouched by modern development, with the M25 just skirting its southwestern boundary. The lidar imagery shows that the network of paths within the woodland remains largely intact.

New woodland has been created however, as seen on recent Google Earth images taken in 2021, which abuts Ash Plantation and Oak Wood to the north. More trees as part of Belhus Woods Country Park were also planted on the west side of the M25 motorway in 1999, which from an aerial perspective gives the appearance of bringing the woodland back into the park. This can be seen well on Historic England obliques taken in 2015 (see Front Cover).



Figure 16: Extract of APGB mosaic aerial photograph taken in 2014 showing several years of football pitches in the southeast of Belhus Park. Next Perspectives APGB Imagery 31-JUL-2014 ©Bluesky International/Getmapping.



Figure 17: Vertical photographs which show the sequence of changes to Belhus Park between 1951 and 2005.

A: RAF/58/715 VP3 5016 04-JUN-1951 Historic England Archive RAF photography. B: RAF/582/1230 F22 44 06-JUL-1955 Historic England Archive RAF photography. C: RAF/58/4646 F44 299 28-AUG-1961 Historic England Archive RAF photography. D: MAL/70085 V 205 13-NOV-1970 Historic England Archive. E: MAL/81004 V 105 28-MAR-1981 © Essex County Council. F: EARTH.GOOGLE.COM 12-2005 ACCESSED 16-DEC-2021 (Image © 2021 Getmapping PLC)

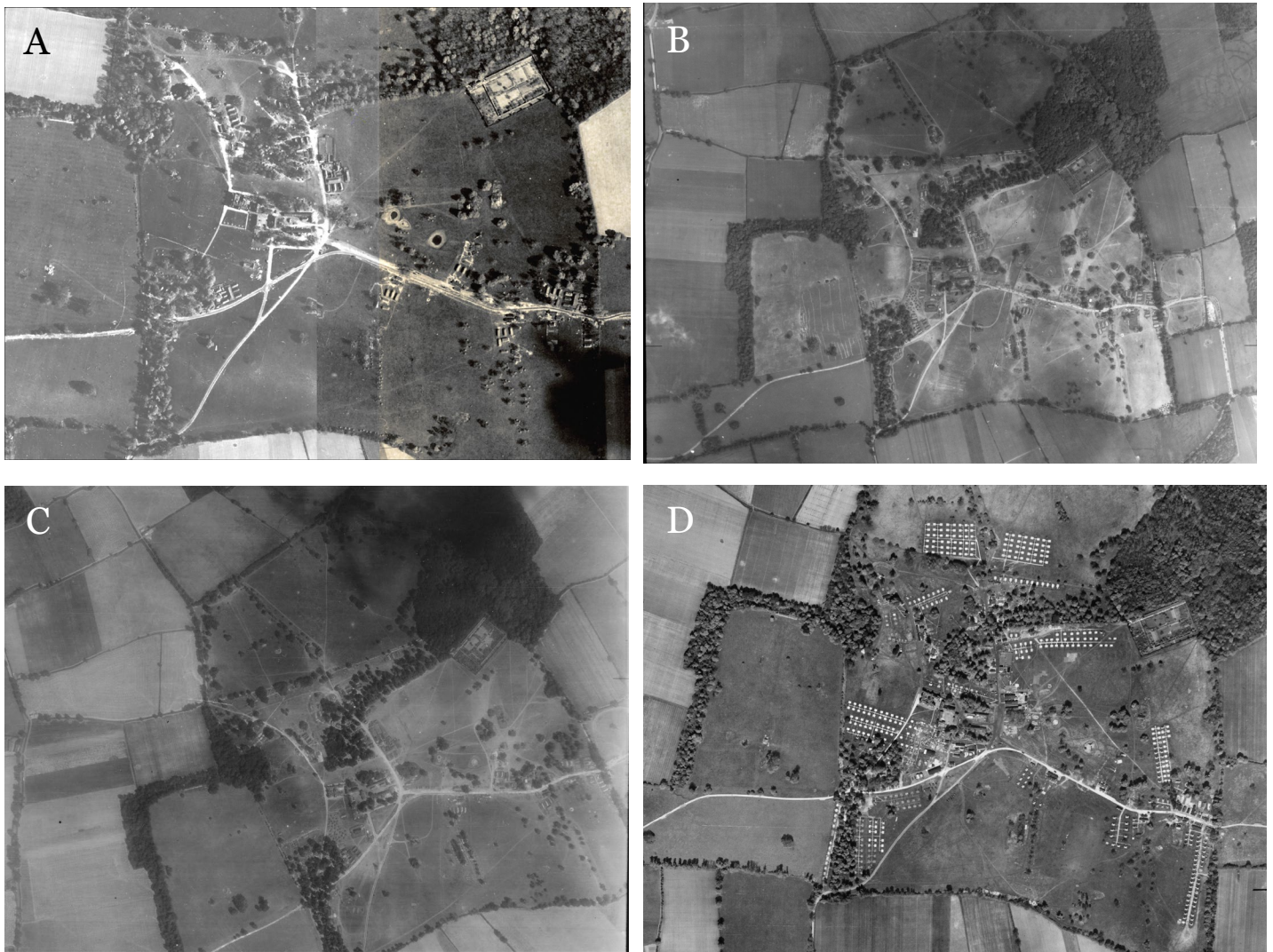


Figure 18: RAF vertical photographs which show the sequence of changes to the Second World War military camp between 1944 and 1946.

A: is a mosaic of three photographs taken in April 1944 RAF/106G/LA/2 RP 3001 25-APR-1944, RAF/106G/LA/2 RS 4001 25-APR-1944 and RAF/106G/LA/2 RP 3033 25-APR-1944. B: RAF/106G/LA/214 RS 4132 04-JUL-1944. C: RAF/106G/LA/26 RP 3025 04-AUG-1944. D: RAF/106G/UK/1447 RV 6102 01-MAY-1946. All are Historic England Archive RAF photography.

FURTHER RESEARCH

Detailed archaeological and historical research were outwith the scope of this report, but a number of useful avenues for further historical and archaeological research were identified. The historical aerial photographs are an invaluable part of the story providing a stunning snapshot, but they do not provide all the answers. Further research bringing together documentary evidence and local community knowledge will be of considerable interest and may answer those questions.

Parkland Features

Though Belhus Park has been much landscaped by the golf course, garden features such as the early Tudor/Jacobean garden feature, the tree clumps, and the boundary banks identified during this survey remain visible as above ground features. Further archaeological research by additional GPR survey or targeted excavations, particularly to the north of the house, may reveal buried remains, which due to tree cover and modern landscaping, could not be seen on aerial photographs or lidar. The possible below ground survival of one of the unknown mounds, tentatively dated to the Post Medieval period, recorded to the east of the M25, also suggests further targeted excavation may be beneficial, to understand these puzzling mounds.

Military Features

There is good quality photographic evidence for military activity in the park, but little is known within the archaeological records of the Battalion or Regiments that were stationed here. We know the Park was used as a marshalling camp, housing troops on the build up to D-Day on the 6th June. However, it is not clear what military activity was taking place after D-Day between August 1944 and May 1946, when the layout of the camp changes. Who was stationed and living in the tents prior to the photograph in May 1946?

The above ground survival of some of the military buildings and a section of road recorded in the east of the Park hint at the possibility of other features or structures relating to Second World War activity being identified through targeted field survey or excavation.

There are also references to the condition of the house and park after the war. The Listing notes state “During the Second World War Belhus was damaged by bombing and by military occupation and it was demolished in 1957”. However, the available aerial photographs do not necessarily show this. The park was certainly affected by bomb strikes, but it does not appear that any landed on the house itself. Lost Heritage (2021) notes that “the troops stationed there had used some of the fine panelling and the oak floorboards for firewood. Estimates to repair the damage were in the region of £35,000 - equivalent to around £1m today.”, which led to the eventual demolition of the house. Many country houses suffered a similar fate, but it would be interesting to see if there was any further evidence to corroborate the potential bomb damage.

CONCLUSION

The wealth of good quality historical aerial photographs held in the Historic England Archive which covered a range of dates, provided a useful visual record of the changes in land-use in the 20th century within the park. The lidar imagery proved to be extremely useful in identifying garden features visible as low earthworks which pre-dated the golf course and indicated where structural remains are present underneath dense vegetation, such as the walls of the garden cottage. The mapping, of Belhus Park will provide good visual baseline data for further research and for informing future management plans.

Of particular interest are the historical aerial photographs which show military preparations in full swing on the build-up to D-Day and the rate of change in activity over a short period of time. Bringing together a range of documentary sources and local knowledge would be useful in researching this period of the park's history to enrich the archaeological record.

The survival of garden features visible on lidar imagery hints that other buried archaeological features may survive where the landscaping of the golf course has levelled above-ground remains, particularly to the north of the Belhus House. Lidar and recent aerial photographs also show the potential archaeological survival of features recorded east of the M25 and west of Umber Avenue, Ockenden, which would also benefit from targeted excavations. This strip of former parkland is uniquely placed as not only being outside the current Golf Course, but also having features recorded from different periods of the park's history, including a post medieval mound (one of many) of unknown function.

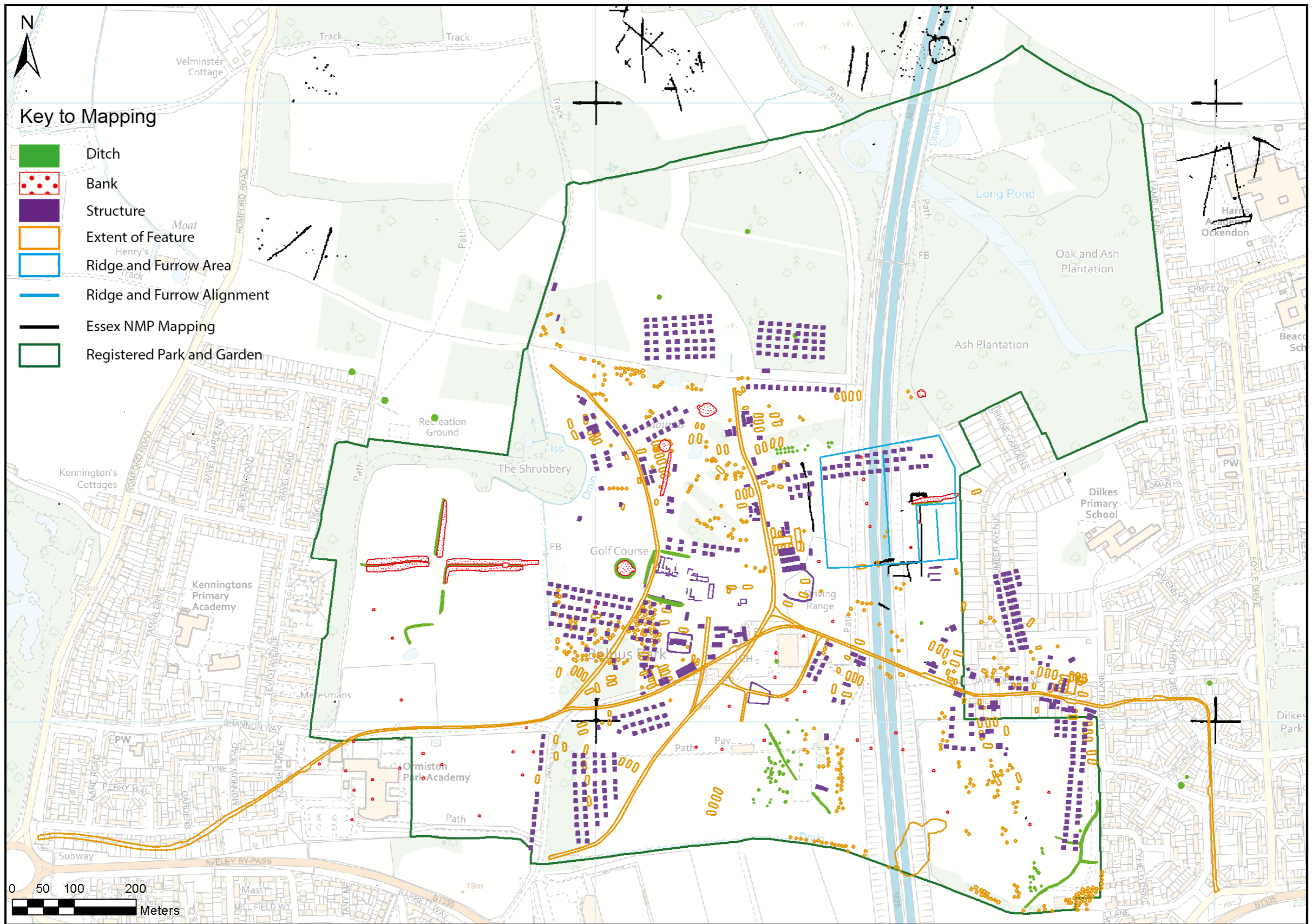


Figure 19: All archaeological mapping from the project area. © Historic England. BaseMap © Crown Copyright 2021. All rights reserved. Ordnance Survey Licence number 100019088.

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APPENDIX 1. AERIAL SOURCES

Historic England Archive

The project photograph loan (dated 14-Jun-2021) from the archive contained 502 aerial photographs with about 300 of those covering the Belhus Park and its surrounds and therefore viewed as part of the aerial survey. Below are the key aerial photographs used for mapping, during the report and which show significant information.

Key Historic England Archive vertical aerial photographs

Sortie	Library No.	Camera Position	Frame	Date
RAF/106G/LA/2	8301	RP	3001	25-Apr-44
RAF/106G/LA/2	8301	RS	4001	25-Apr-44
RAF/106G/LA/2	8301	RP	3033	25-Apr-44
RAF/106G/LA/21	8309	RS	4132-4135	04-Jul-44
RAF/106G/LA/23	8316	RP	4146-4148	06-Jul-44
RAF/106G/LA/26	8312	RP	3024-3025	04-Aug-44
RAF/106G/LA/31	8316	RP	3020-3021	09-Aug-44
RAF/106G/UK/1447	334	RV	6101-6102	01-May-46
RAF/58/715	3426	VP3	5015-5017	04-Jun-51
RAF/58/1017	1342	V	95-96	06-Feb-53
RAF/582/1230	1667	F22	43-44	06-Jul-55
RAF/58/4646	2204	F44	298-300	28-Aug-61
MAL/70040	5632	V	195-196	30-May-70
MAL/70085	5659	V	204-206	13-Nov-70
MAL/71096	5925	V	55-57	03-Jun-71
MAL/81004	7697	V	105	28-Mar-81
OS/91023	13796	V	189-190	11-Apr-91
EA/AF/95C/208	40084	V	9542-9544,9550-9553	01-Mar-95

Key Historic England Archive oblique aerial photographs

Source	Film No.	Frame No.	Date Flown
ALF	60579	EPW026629	Apr-29
NMR	953	7	07-Jun-1976
HEA	29647	1	27-May-15

Air Photography for Great Britain (APGB)

The APGB Mapshop is a web portal managed and operated by Bluesky International Limited.

12.5cm vertical aerial photographs 01-SEP-2018 and 31-JUL-2014

50cm infra-red vertical aerial photographs 01-SEP-2018 and 24-AUG-2014;

12.5cm legacy vertical aerial photographs 03-NOV-2006
25cm legacy vertical aerial photographs 27-JUN-2010, 21-AUG-2007, 03-NOV-2006 and 12-JUL-2003.

5m digital surface model 01-09-2018

Google Earth

Earth.Google.Com 01-JAN-2005 (date may not be accurate), 11-APR-2019, 03-JUN-2020, and 30-MAR-2021. All were last accessed 16-DEC-2021

APPENDIX 2. OTHER SOURCES

Historic England Archive GIS (historic maps and other information)

Ordnance Survey Maps from 1867 (Epoch 1, 1:2,500), 1920 (Epoch 3, 1:2,500) and 1959 (Epoch a5 1:1,250)

Essex Historic Environment Records

Information available from online from Heritage Gateway

<https://www.heritagegateway.org.uk/gateway/>

Historic England Research Records

Information available from online from Heritage Gateway

<https://www.heritagegateway.org.uk/gateway/>

Relief Visualisation Toolbox software

Information available via the following references:

Kokalj, Ž., Somrak, M., 2019. Why Not a Single Image? Combining Visualizations to Facilitate Fieldwork and On-Screen Mapping. *Remote Sensing* 11(7): 747.

Zakšek, K., Oštir, K., Kokalj, Ž., 2011. Sky-View Factor as a Relief Visualization Technique. *Remote Sensing* 3(2): 398-415

APPENDIX 3. HISTORIC ENGLAND ARCHAEOLOGICAL SCOPE

Earthworks, plough-levelled features and buried remains

All cropmarks and soil marks which represent sub-surface features of archaeological origin have been recorded. Some earthworks, for example field boundaries, have not been mapped where they are clearly marked on the first edition Ordnance Survey maps unless they are associated with other mapped features. In this case this will be clearly stated in any monument records. Features which have an uncertain date, or which are thought to be possible geological marks have been recorded (though not necessarily mapped) where they are associated with or may be confused with other archaeological features.

Post-medieval field boundaries

These have not been mapped, except where they are part of larger field systems and are not depicted by the Ordnance Survey. They may be mapped where they have been considered to be regionally or nationally archaeologically significant.

Military remains

Military buildings and structures from the Second World War (pre-1945) were recorded and mapped according to the form and extent of the remains, except in some cases where they were marked on Ordnance Survey maps. In this case, this was clearly stated in any monument records.

Ridge and furrow

Medieval and/or post-medieval ridge and furrow was also recorded. Levelled and extant fields of ridge and furrow were depicted using different conventions and furrow directions were indicated by arrows.

Industrial archaeology

Areas of industrial archaeology have been recorded where the features can be recognised to predate 1945 and where their industrial buildings are no longer extant or not clearly marked on the first edition Ordnance Survey maps. Small local extractive sites were not mapped, except where they formed part of a significant, i.e. particularly extensive, area of extraction.

Buildings and structures

Buildings and structures were not generally mapped if first edition or later Ordnance Survey maps depict them. However, in specific contexts (e.g. industrial and military complexes, or country houses) and when in association with other features, they were sometimes mapped.

Transport

Major transport features (e.g. canals and railways) have not been mapped except where they are considered to be archaeologically significant.

Parks and gardens

Only vestigial features, not botanical features, were mapped. In urban areas only significant parks and gardens were recorded. 20th century features were not mapped



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