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Investigation and Analysis

South Downs National Park The High Woods from above NMP

E Carpenter, F Small, K Truscoe and C Royall

Discovery, Innovation and Science in the Historic Environment



South Downs National Park
West Sussex, Chichester and east Hampshire

The High Woods from above
National Mapping Programme

Edward Carpenter, Fiona Small
Krystyna Truscoe and Carolyn Royall

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SUMMARY

The 'High Woods' area of West Sussex and eastern Hampshire is remarkable in terms of the range, extent and time depth of the archaeological earthworks preserved in the woodland. This report covers the National Mapping Programme (NMP) component of the Heritage Lottery Fund supported South Downs National Park Authority (SDNPA) project 'Secrets of the High Woods'. A key part of the project was an airborne laser scanning survey, commonly known as lidar, which provided a highly accurate 3D model of archaeological features surviving as earthworks or structures in open land and woodland. Analysis and mapping from the lidar data and aerial photographs provided an interpretation of a complex and extensive archaeological landscape suitable for use by local communities, researchers and managers of the historic environment.

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ARCHIVE LOCATION

The Historic England Archive
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DATE OF SURVEY

The analysis, mapping and recording were carried out 2014-2015.

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INTRODUCTION

The 'High Woods' area of West Sussex and eastern Hampshire is remarkable in terms of the range, extent and time depth of the archaeological earthworks preserved in the woodland. This report covers the National Mapping Programme (NMP) component of the Heritage Lottery Fund (HLF) supported South Downs National Park Authority (SDNPA) project 'Secrets of the High Woods'. The Historic England contribution included completion of part of the NMP survey, coordination of the overall NMP survey and supply of most of the aerial photographs. The Heritage Lottery Fund supported the part of the NMP survey carried out by Cornwall Archaeological Unit.

The HLF supported project provided an opportunity to survey and assess the archaeological remains within this part of the South Downs on a landscape scale. It comprised research and community engagement to explore the archaeology, local history, biodiversity and the heritage of the Wooded Estates. It covered the patchwork of woodland and downs from Arundel in the east to the Queen Elizabeth Country Park in the west (Figs 1-2).

A key part of the project was an airborne laser scanning survey, commonly known as lidar, of the whole area, carried out by Fugro BKS in March 2014 and funded by the Heritage Lottery Fund. The lidar survey provided a very accurate 3D model of archaeological features surviving as earthworks or structures in open land and woodland. The lidar data revealed the form and extent of archaeological earthworks on a scale never seen in this area. Aerial photographs taken over the last 50 or more years provided a complementary source having recorded earthworks and buried archaeological features, revealed as cropmarks, in the non-wooded areas.

Analysis and mapping from the lidar data and aerial photographs used Historic England National Mapping Programme (NMP) standards and provided an interpretation of this complex and extensive archaeological landscape suitable for use by local communities, researchers and managers of the historic environment. The NMP mapping and site descriptions were input to the High Woods project Content Management System (CMS) to enable community engagement and to inform understanding and heritage protection through the local Historic Environment Records at Chichester District, West Sussex and Hampshire.

This report describes the processes and results from the NMP survey. The aim of the report is to communicate the value and potential of the NMP results to project volunteers and heritage professionals. The report includes thematic sections that address questions raised in the Research Agenda for the Secrets of The High Woods (Thorne & Bennett 2015) and a chronological summary.

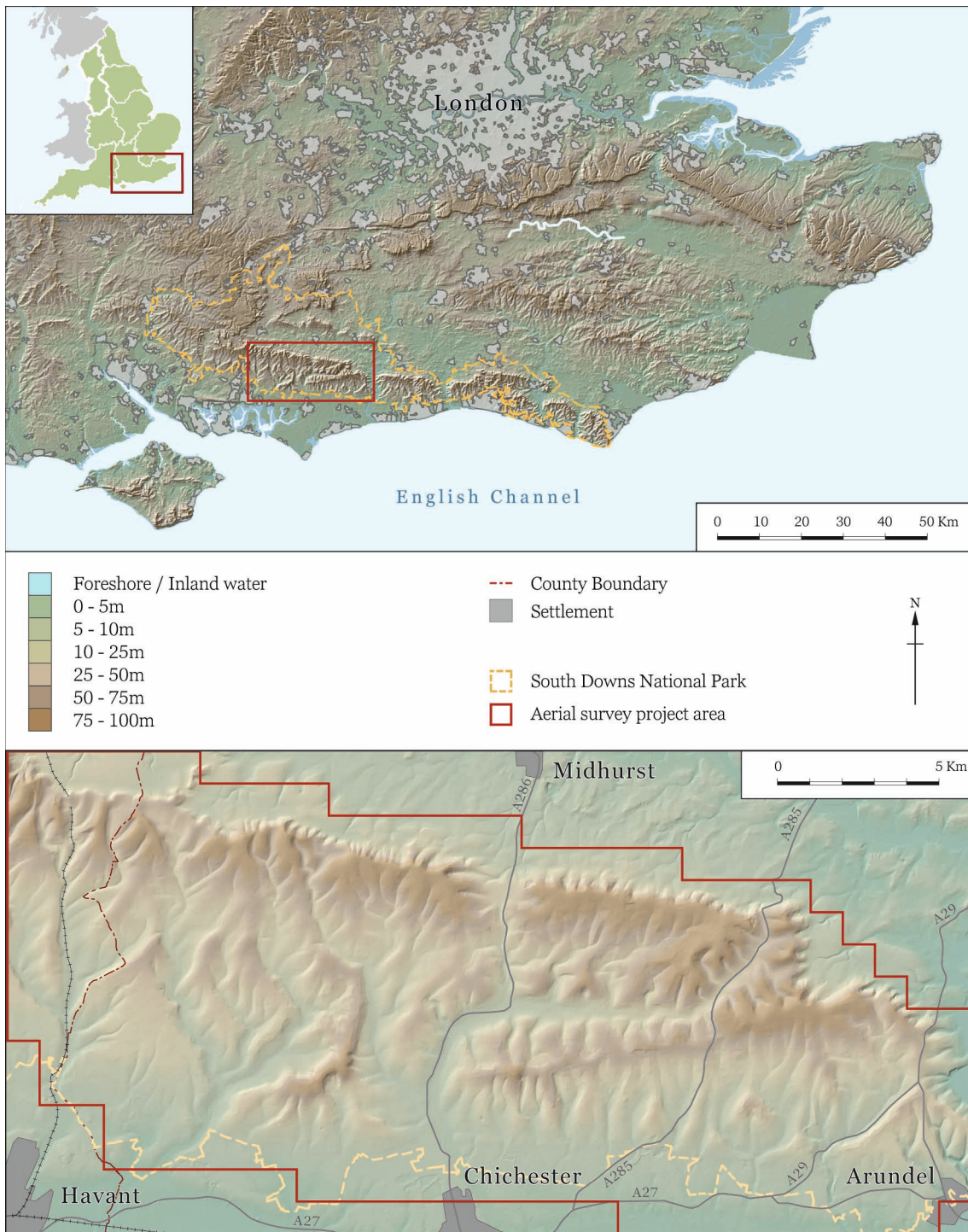


Figure 1 Location and topography of the NMP project area. Background based on lidar data © Environment Agency copyright 2013.

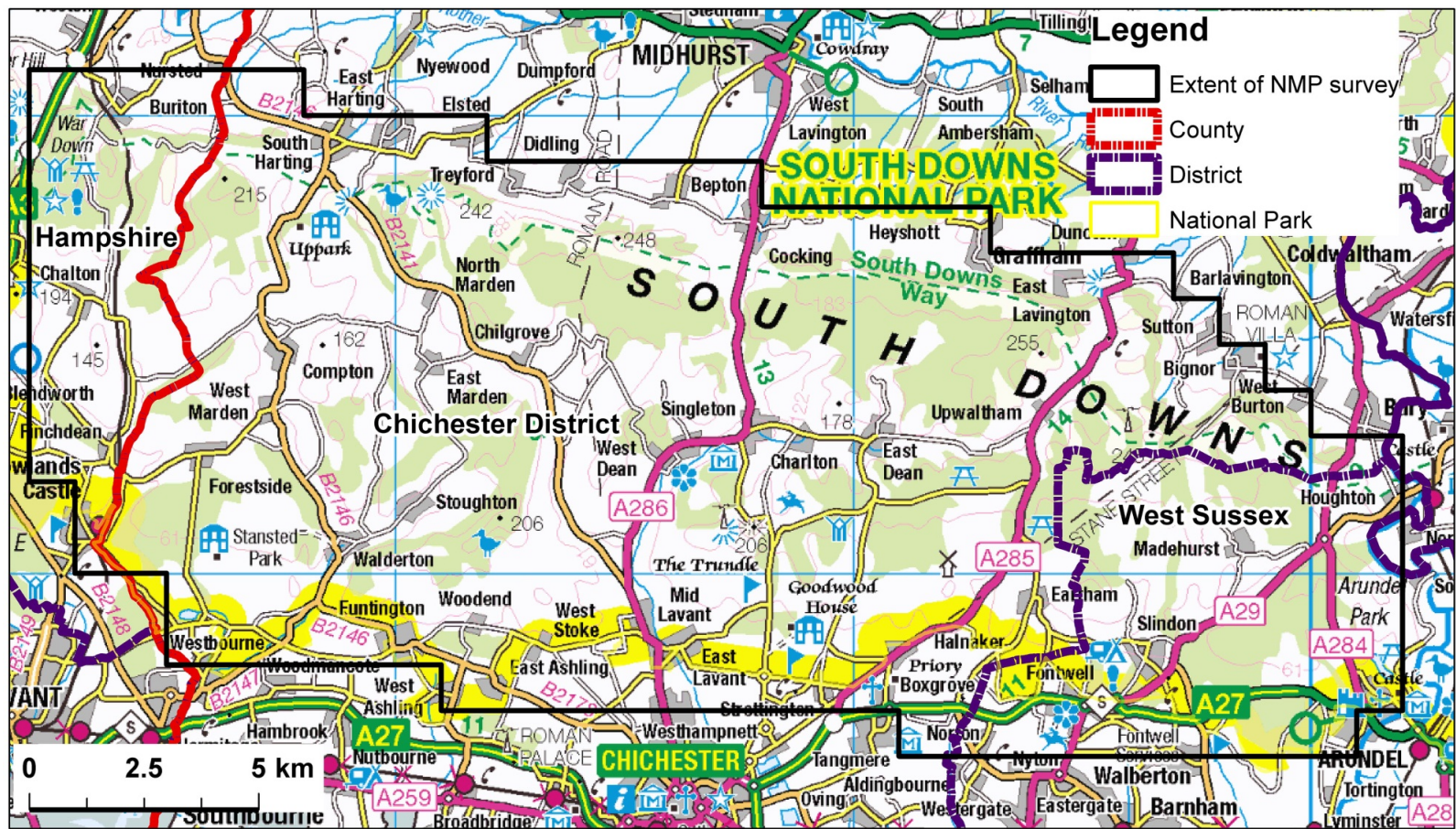


Figure 2 The NMP project area, Historic Environment Record administrative boundaries, woodland and major landmarks. Background mapping © Crown Copyright and database right 2015, all rights reserved. Ordnance Survey Licence number 100024900.

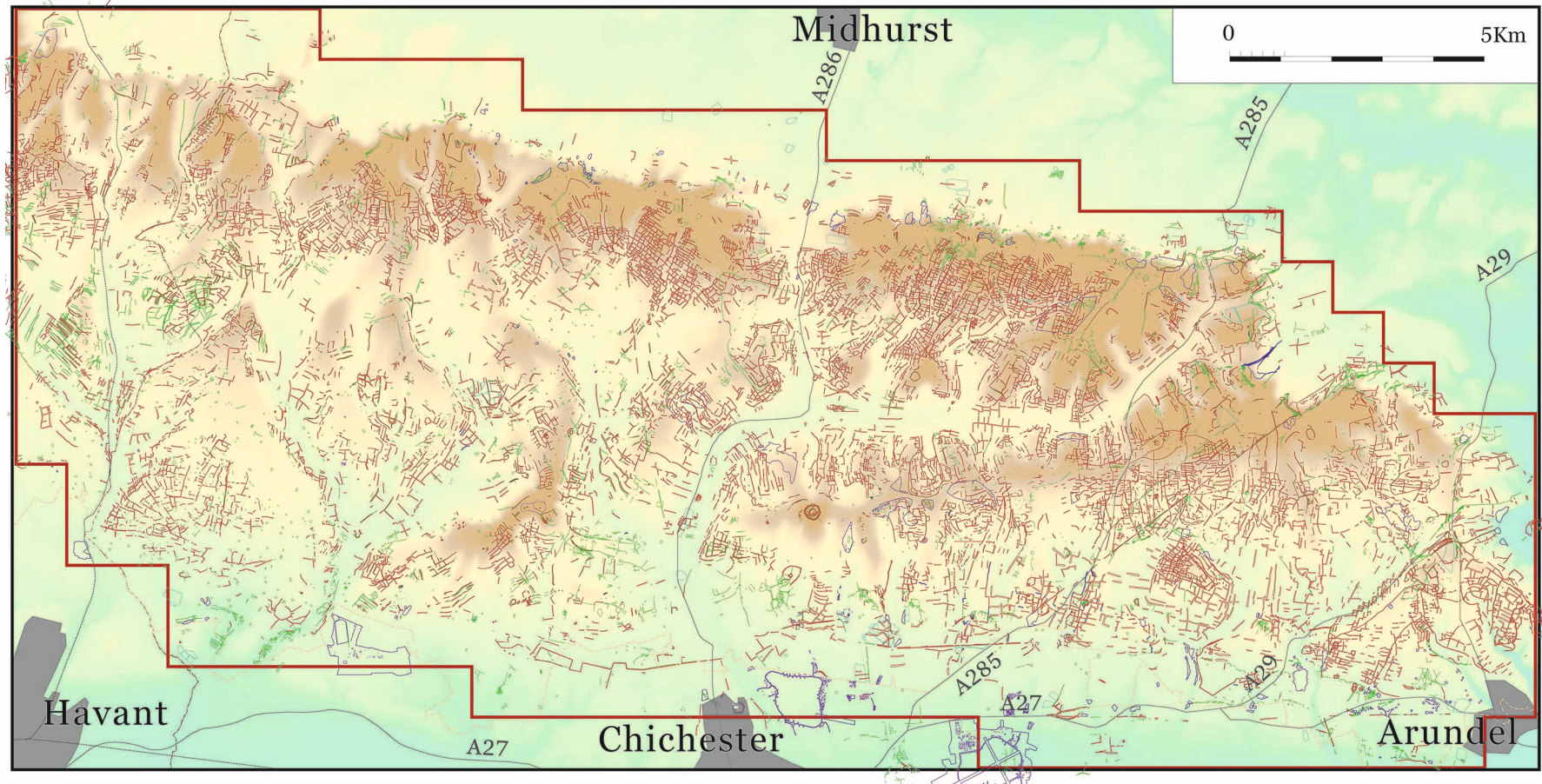


Figure 3 Overview of the archaeological features mapped from lidar and aerial photographs colour coded by form of remains. Red indicates banks, green: ditches, purple: structures, blue: extent of area and scarp, pale blue: ridge and furrow. Background based on lidar data © Environment Agency copyright 2013.

PROJECT AREA

The NMP project area extended from the Queen Elizabeth Country Park in the west to the Arun river valley in the east. It is covered by the administrative areas of the Historic Environment Records of Hampshire County Council, Chichester District and West Sussex County Council (Fig 2). The area comprised 332 Ordnance Survey kilometre squares.

The general character of High Woods project area contrasts with the rest of the chalk downs as it has as a higher proportion of woodland, much of which is classified by Natural England as Ancient Woodland (Fig 4). To the east, beyond the project area, the downs have large open arable and grassland fields with little woodland and few hedgerow boundaries creating an open landscape (ibid, 7). At the western end of the of the National Park, outside the project area, woodland and hedgerows give the appearance of a well-wooded landscape but the land use is actually mainly arable and grassland (ibid, 10).



Figure 4 View of the Downs west of Arundel with woodland interspersed with fields and small villages. 24708/16 29-AUG-2007 © Historic England

The presence of large areas of woodland in the High Woods area led to preservation of extensive archaeological earthworks (Figs 5-6). Much of the chalk downland in southern England was converted from grassland to arable since the Second World War. In these areas, some remarkable archaeological earthworks do survive, although these are generally isolated elements of once

more extensive landscapes. It is the scale and extent of the surviving earthworks in the High Woods project area that is unusual (Fig 3). A comparable area is Salisbury Plain where many archaeological earthworks were protected from ploughing as the downs are used for military training (McOmish et al 2002).



Figure 5 View of later prehistoric fields and settlement earthworks in semi-cleared woodland in Whiteways Wood. Photo: Pete Horne

The High Woods project area is part of the South Downs Natural Character Area (NCA 125) described as the ‘whale-backed’ spine of chalk stretching from the Hampshire Downs in the west to the coastal cliffs of Beachy Head in East Sussex (Natural England 2015, 3). The underlying chalk geology strongly influences the topography and soils but the area is ‘an extremely diverse and complex landscape with considerable local variation representing physical, historical and economic influences’ (ibid).

The geology, soils and topography did not have a great impact on the overall distribution of archaeological remains mapped from aerial photographs and lidar (see Fig 3 for example), but an understanding of the geology helped in the interpretation of the numerous small pits and quarries identified across the project area.

Extensive archaeological earthworks were found on all soil/geology types to varying degrees. Fewer remains were found on the northern edge of the project area on the clayey soils below the scarp edge. This may be because the lidar cover does not extend to the edge of the NMP survey area but it is more likely to be a genuine absence of archaeological remains visible from the air. A similar pattern was found further east in the Worthing-Weald transect completed for an earlier NMP project (Carpenter 2008). Areas of arable and grassland tended to have fewer, and less well preserved archaeological earthworks but here buried remains were revealed as cropmarks and parchmarks.

A significant landscape

A landscape can be defined as the land itself (both natural and humanly created features) and how this land is viewed (Johnson 2007, 4). The land is given meaning by people; a rocky outcrop is 'neither beautiful, ugly, dramatic or of any significance unless we are there to look at them' (Garner 1972). The South Downs is a well-loved landscape that continues to be celebrated through poetry, prose, music and painting and has long been considered an attractive place to visit or in which to live. The character of the area was shaped by both natural forces and the people who lived and worked there. The woodland, fields, farms and villages, archaeological remains, historic documents and stories - all are evidence of these past communities.

Ideas of landscape and perception were brought together in the European Landscape Convention (ELC) and ratified by the UK in 2007. The ELC describes landscape as 'an area, as perceived by people, whose character is the result of the action and interaction of natural and /or human factors' (Council of Europe 2000). Within the underlying philosophy of the ELC, landscape is both culturally shaped and culturally perceived, bringing together people and place, people's activities and people's thinking. It recognises that everywhere has landscape character and that within that, everywhere has historic cultural character, whether perceived as urban, suburban or rural, ordinary, degraded or special, marine, coastal or terrestrial.

The various components that make up a landscape may be considered outstanding, mundane or degraded, but together contribute to make the South Downs the place it is. All landscapes can be perceived in different ways and varied popular perceptions derive from how the land (natural and humanly made) is viewed by a range of individuals and societies over time.

Dr Samuel Johnson despaired at what he perceived as the desolation of Sussex's open downland: 'a country so truly desolate [he said], that if one had a mind to hang one's self for desperation at being obliged to live there, it would be difficult to find a tree on which to fasten the rope' (Boswell 1832, 193). In contrast, by

the early 20th century, this same open landscape was celebrated and commonly expressed opinions emphasised the idyllic remoteness from modern life that the downs were seen to provide; however, these later accounts ignored some of the realities of the agricultural depression including derelict farms and abandoned farmland.

Both these examples are concerned with the eastern downs and it is important to highlight that the western downs were highly valued. Dr Johnson 'loved the sight of fine forest-trees' (ibid) and the author Hilaire Belloc wrote movingly of the wooded downland where he made his home (Brandon 1999, 130-14).



Figure 6 View of later prehistoric fields and settlement earthworks in recently cleared woodland in Dalesdown Wood. Photo: Pete Horne

Some differences in the way a landscape is perceived reflect changes made to the landscape. The character of a place is not fixed but changes over time and these changes can derive from the loss or addition of features. An example of this (again from the eastern downs) is the landscape changes that resulted from post Second World War ploughing (see Carpenter 2008, 60-64). The introduction of arable crops changed the character of the land and the resultant ploughing was responsible for the damage or levelling of a range of archaeological sites. This was lamented in a number of articles published in *The Times* during the 1950s

including 'Despoilation of the South Downs' (Anon 1953); 'Ploughing up the Downs (Anon, 1954a, 1954b; 1954c) and 'Corn Ousts sheep on South Downs' (Anon 1957). A special correspondent wrote of 'the shock to see the extent of land that has been ploughed on the South Downs' and noted that 'It would not be surprising if many more instances of injudicious ploughing have occurred where farmers are ignorant of the archaeological treasures beneath their feet' (Anon 1954a, 5 col E).

The concern and sadness expressed at the loss of prehistoric sites during the 1940s and 1950s clearly illustrates the strong connection people can have with the past. These remains provide a tangible link back to the communities who lived in this part of the South Downs and, inspired by Belloc's line, 'He does not die that can bequeath some influence on the land he knows', our ancestors can live-on through our appreciation of archaeological traces seen as earthworks and cropmarks (Belloc 1912, 309).

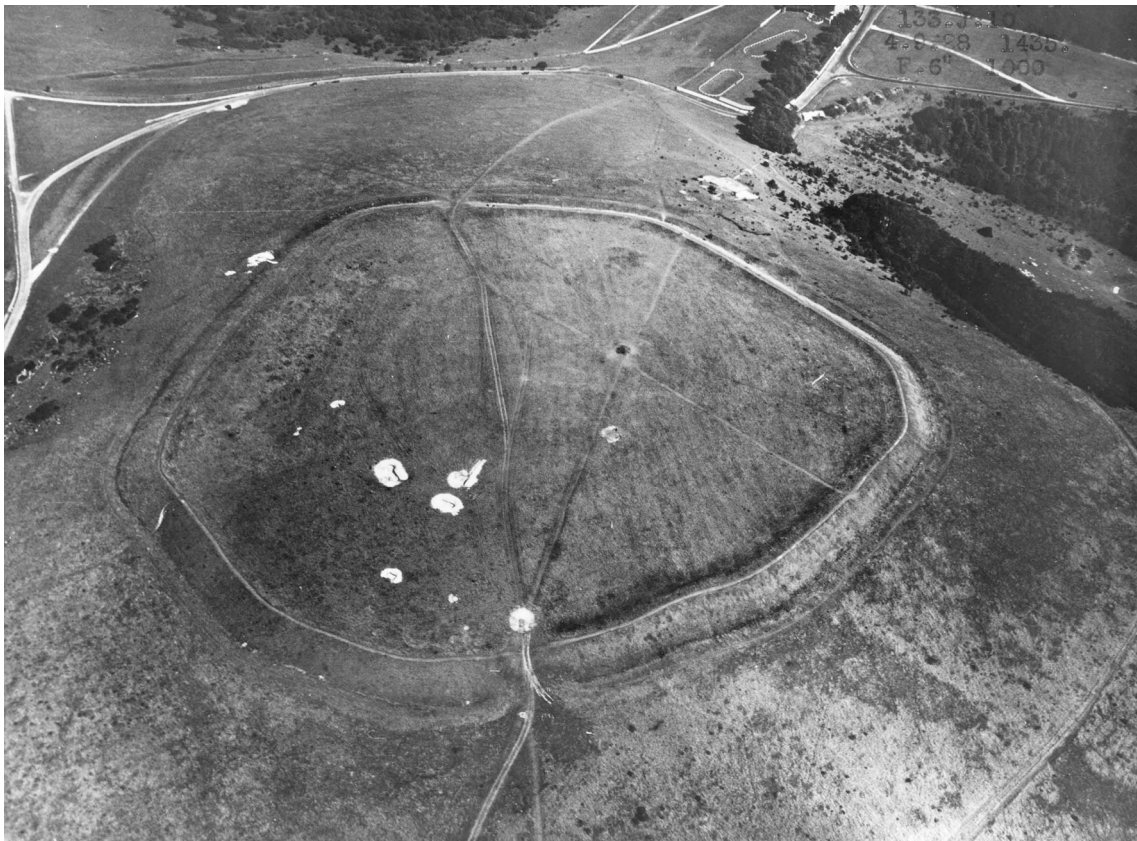


Figure 7 The Trundle, Singleton, north-west of Goodwood, in 1928. The earthworks of a Neolithic causewayed enclosure are situated within an Iron Age hillfort. The white marks are Cecil Curwen's excavation trenches (Curwen 1929a), CCC 9056 2433 4-SEP-1928 © Historic England (Crawford Collection)

AERIAL INVESTIGATION AND MAPPING

As elsewhere on the South Downs there is a long history of archaeological exploration in the High Woods area (summarised in Thorne & Bennett 2015). Many significant sites and landscapes were discovered and surveyed on the ground, often within the woodland. The Secrets of the High Woods project has brought new perspectives and for the NMP survey, this was mainly provided by the lidar data. The archaeological mapping from the lidar demonstrated what archaeologists had long thought - the known sites were part of a much wider archaeological landscape. Archaeologists have used aerial photographs in this area before, for example, the Chichester District HER has a layer with information plotted ad hoc from aerial photographs. However, there has been no systematic assessment of aerial sources for the full extent of the High Woods.

Interpretation and mapping from aerial photographs and lidar encompasses a wide range of archaeological features, with potential dates ranging from the Neolithic through to the Cold War, including earthworks and structures, or buried remains revealed as cropmarks or soilmarks. Some features from twentieth century military contexts, such as barbed wire, concrete structures and buildings, were also recorded. The project scope included archaeological features that were visible on historic aerial photographs but have since been plough-levelled or removed.

The resulting archaeological interpretations and maps, when viewed in a historic environment record, encourage a layered view of change and continuity in the landscape. Aerial evidence, and information from other sources and survey techniques, provide glimpses of the changing use of an area over potentially thousands of years. This is an important viewpoint in terms of heritage protection which considers all known aspects of the past land use in the context of managing future change.

Methods

All mapping and monument recording was carried out in the High Woods Content Management System (CMS). The High Woods CMS was developed for this project and was accessed via the internet by the NMP teams in Swindon, Wiltshire and Truro, Cornwall. This meant that new mapping and recording was shared simultaneously with all users in various locations, including the SDNPA project team, in Midhurst, West Sussex, during the mapping phase.

A key standard for NMP projects is to use all available sources including aerial photographs (in archives and online) and different visualisations of lidar data. Aerial photographs were consulted from the Historic England Archive, Cambridge University Collection of Aerial Photography (CUCAP), APGB images,

Google Earth and BING. Several visualisations of the lidar data were used. Other sources, such as historic maps, soils and geology data, published and unpublished archaeological accounts were consulted.

When required, rectified and georeferenced images were loaded into the High Woods project CMS. Other sources, crucially the various lidar visualisations, were already georeferenced and loaded.

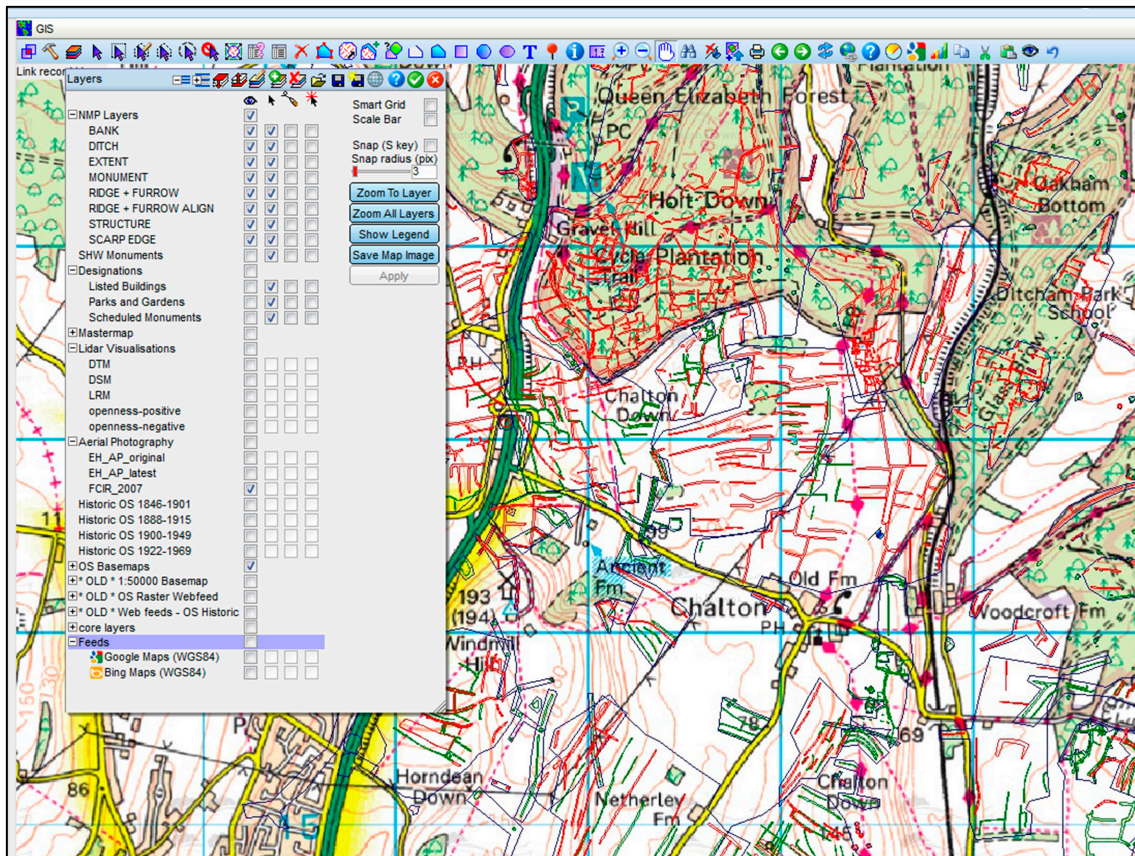


Figure 8 The NMP tab on the High Woods project CMS showing the NMP conventions. Base map © crown copyright and database right 2016. All rights reserved. Ordnance survey licence 10050083

The extents of archaeological features were traced from aerial photographs or lidar on different layers in the CMS. These layers, which corresponded to NMP Mapping standard conventions, were based on the form of remains, such as bank or ditch, and included a polygon defining the extent of the features described in the relevant monument record. A monument record was created for each archaeological site. Each item mapped was linked to the monument record that contained a description and interpretation of the archaeological site and indexed information on site type, evidence and sources. An archaeological site was usually defined as a set of features that were thought to be of the same date and function. For example, a single burial mound measuring a number of metres across, or a set of ditches and banks that formed a settlement enclosure

tens of metres across, or extensive banks defining a field system over kilometres. Details of the methods and sources for the archaeological survey from aerial photographs and lidar are in Appendix 1.

Aerial Photographs

Archaeologists have long used aerial photographs to identify sites. Aerial photographs in the national collections span a date range from the 1880s up to the present. The largest collection, the Historic England Archive, includes aerial photographs taken specifically of a range of subjects including buried sites revealed as cropmarks, illustrations of earthworks and structures, and views designed to record and inform management of archaeological and architectural sites and landscapes. The aerial photographs used for the High Woods project ranged in date from the 1920s to present. These included aerial photographs taken for non-archaeological purposes during the Second World War and throughout the latter half of the twentieth century. Aerial photography continues to be used for planning and mapping purposes and recent vertical photo mosaics such as Google Earth were consulted online.



Figure 9 A view of Halnaker Hill shows the different ways in which archaeological remains are usually seen from the air. This includes a Second World War pillbox and anti-aircraft gun emplacements, an 18th century windmill, and a Neolithic enclosure seen as earthworks and cropmarks (buried remains). 18499_12 21-MAR-2000 © Historic England

Lidar

Airborne laser scanning, or lidar (shortened from light detection and ranging), is a relatively new tool for archaeological survey (Crutchley 2010). Lidar usually involves an aircraft-mounted pulsed laser beam, which scans the ground from side to side. The laser pulses bounce off the ground, and the features on it, and the speed and intensity of the return signal is measured. ‘First return’ is the term used to describe the first beams to bounce back, whether they hit the ground, a rooftop or the tree canopy. Other beams will follow a path between the leaves and branches bouncing back from the ground within woodland (known as last return). This information is used to create a precise Digital Elevation Model (DEM) of the ground and the features on it and is a broad term that covers DSM and DTM. The different visualisations are explained below.

A Digital Surface Model (DSM) is a digital elevation model of the highest points including buildings and the tree canopy. It is generated by the first return of the laser but features are obscured by woodland and dense vegetation in the same way as on an aerial photograph.

A Digital Terrain Model (DTM) is processed using algorithms to remove first return data, to create a bare earth model based on the last return data. The Secrets of the High Woods lidar DTM data was manipulated specifically to maximise visibility of archaeological features. This included multiple visualisations and data that could be viewed interactively in a pseudo-3D environment.

The Digital Terrain Model (DTM) was provided as a hill-shaded visualisation—where the ground surface is lit from multiple directions. This was arguably the most readily understandable visualisation as it was a familiar view for those used to viewing archaeological earthworks in 3D – usually by using a stereoscope to view stereo pairs of aerial photographs, lit naturally by the sun. The realistic height representations of a DTM make them easy for the human eye to interpret – as mounds or hollows. However, a potential weakness of the hill-shaded DTM is that the apparent position of features can move slightly from their true ground position as the illumination direction is altered.

The Local Relief Model (LRM) visualisation was mainly used for mapping archaeological features. The LRM is derived from a high resolution DEM, it isolates subtle local elevation changes from the large-scale global relief and therefore enhances the visibility of small-scale, shallow topographic features irrespective of the chosen illumination angle (Hesse 2010).

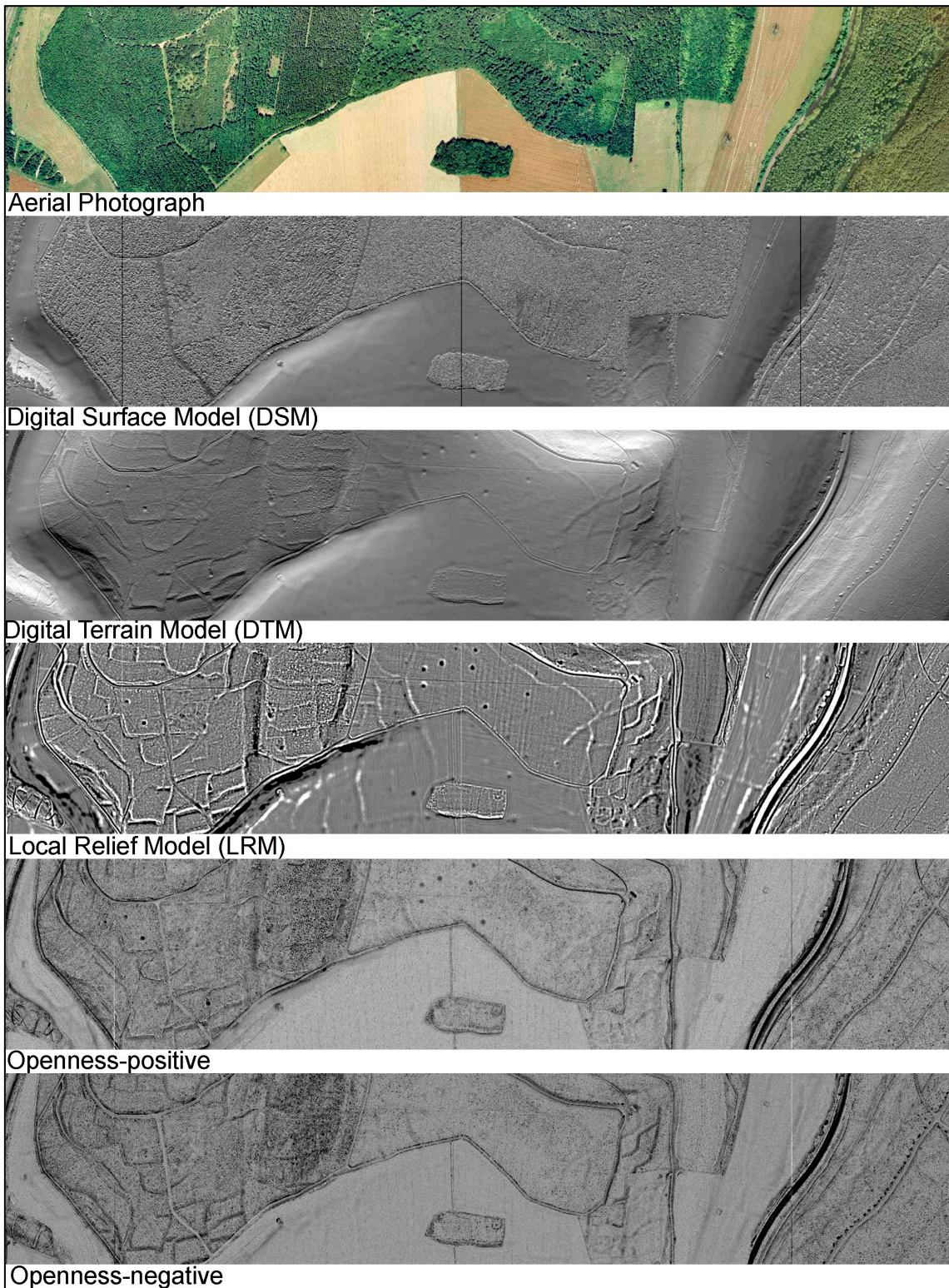


Figure 10 Aerial photograph (top) and five lidar visualisations showing the different appearance of the same area, including archaeological earthworks . It shows part of the Queen Elizabeth Country Park on the western edge of the High Woods project area. © Copyright Fugro Geospatial and South Downs National Park Authority.

The data processing involved in the LRM allowed the regular patterning of the very low earthworks banks (also very hard to see on the ground) to be visualised and therefore recognised and plotted. A major issue with the LRM was that for large-scale earthworks it tends to polarise the visualisation into white (upstanding banks) and black (negative hollows). Therefore, single-sided scarps such as terraces or quarry faces were often visualised as both black and white thus giving a false impression of the topography; - 'phantom' banks might be haloed around negative features such as extractive pits and 'phantom' ditches around positive features such as barrows. The other visualisations were therefore essential for additional clarification of the true form of the features.

Two other visualisations were provided - Openness-positive and Openness-negative. In contrast to the other various shading techniques, openness is not subject to a directional bias due to the angle of hill-shading and therefore relief features do not contain any false horizontal displacement. Additionally, it offers a distinction between archaeological relief features and the surrounding natural topography (Doneus 2013).

The openness techniques highlight both the highest and lowest parts of features and the resulting visualisations clearly accentuate positive features (within Openness negative) and negative features (within Openness-positive). Whilst the openness visualisations were ideal for mapping and outlining archaeological features with sharp edges such as extractive pits, the rendering of the digital models could make them difficult to interpret with slight earthworks obscured by the background pattern of the model.

The technical aspects of different lidar visualisation techniques are discussed elsewhere (Doneus 2013) but the key factor is to use them together to better understand the form and extent of the archaeological remains. This is particularly the case in woodland when they are the sole source of information for desk-based assessment. Aerial photographs can be compared with lidar data of non-wooded areas to inform interpretation and provide supplementary information such as evidence of buried remains, as cropmarks, or historic photographs of earthworks that are now ploughed level.

OVERVIEW OF AERIAL INVESTIGATION AND MAPPING

The following sections provide highlights of the archaeological features mapped from lidar and aerial photographs during the NMP survey. Detailed background on previous studies can be found in the Secrets of the High Woods Research Agenda (Thorne and Bennett 2015) and other published literature.

A chronological framework is important when categorising archaeological remains for use in the historic environment record or for period based research. However, what is remarkable about the High Woods project area is the overlapping and intercutting nature of archaeological features from a very wide date range over large areas. Therefore, the results are discussed thematically in subsequent chapters and these address some of the topics raised in the Secrets of the High Woods Project Research Agenda (ibid). It is hoped that further work, even if focussed on a particular period or theme, will look at the High Woods as a landscape of accumulated archaeological remains, affected by previous and subsequent activities. In particular, the wealth of earthwork remains provides an opportunity for non-invasive analysis of the relationships between features to gain a better understanding of the sequence of land use in the High Woods.

DIVIDING THE LAND, OWNERSHIP AND CONTROL

The well-preserved historic landscape of the High Woods includes many examples of how this part of the South Downs was divided up over time. This section concentrates on the earliest known monuments recorded by the survey such as causewayed enclosures, barrows, and dykes, which were partly used to demarcate the land. Many of the features mapped during this project, including settlement enclosures and the extensive ancient field systems, also reflect the desire to enclose and control areas.

The earliest evidence - Neolithic

The gradual and piecemeal clearance of the natural 'wildwood' is thought to have occurred c 4000-3000BC, and during the early part of this period the inhabitants of the South Downs began to construct monuments that left substantial enough traces to survive today as earthworks. The location and nature of settlements in the Neolithic period (c 4000–2200 BC) is not very well understood but the presence of communities on the South Downs is indicated by flint mines, causewayed enclosures and burial mounds. These are the earliest known examples in the archaeological record of markers in the landscape. Although there is no clear picture of the Mesolithic-Neolithic transition in Britain, it has been suggested that there was some continuity in terms of the

‘maintenance of landscapes with named places, crossed by paths and framed by significant points’ (Whittle 1999, 63).



Figure 11 Buried remains of a possible Neolithic long barrow indicated by cropmarks (area outlined in red) on Main Down, South Harting. OS/69002 110 06-MAR-1969. © Crown Copyright. Ordnance Survey.

Mining and quarrying appears to have been a special activity during the Neolithic period and the location of mines seems to be influenced not simply by the quality of the flint. There are significant localised concentrations of surface remains of early flint mining from the South Downs, East Anglia and Salisbury Plain (Barber et al 1999). There are issues with positive identification of Neolithic origins for some of the sites in Sussex (ibid, 14) and careful consideration of dating is required for further work (see also Whittle et al 2011, 255-6). Potential remains of prehistoric flint mining were seen on aerial photographs and lidar in Dale Park to the west of Madehurst and are discussed below in the context of other extractive industries on the downs (Flints, Clay and Cobbles – Extraction in the Woods and Coastal Plain).

Neolithic causewayed enclosures are among the oldest and rarest archaeological monument types in the British Isles, and are the earliest known instances of enclosure (Oswald et al 2001, Whittle et al 2011). They are thought to date from c 3,800BC, flourished c 3700-3600BC before use tailed off c 3,500BC, with a handful of sites used in the following centuries (Whittle et al 2011).

The earthworks of the four causewayed enclosures in the High Woods project area (Barkhale, Court Hill, Halnaker Hill and the Trundle) represent a significant group. Nationally, only a small number of causewayed enclosures survive as earthworks (15 out of around 80 reviewed in 2001 (Oswald et al 2001)) and most are known as sub-surface features recognised from the air as cropmarks (Whittle et al 2011). An enclosure on Bury Hill is defined by a continuous bank and ditch and although different from the causewayed enclosures, it is still thought to be Neolithic in date (Oswald 2001, 156). Bury Hill was identified as cropmarks on aerial photographs, but the High Woods lidar data suggests that in places the bank may also survive as a very slight earthwork.



Figure 12 The low sun picks out the banks and ditches of the multiple circuits which define the Neolithic causewayed enclosure within the later and more substantial earthworks of the Iron Age enclosure at the Trundle, by Goodwood. 23310_78 18-JAN-2004 © Historic England.

Causewayed enclosures, are the earliest known physical expression of a distinction between ‘inside’ and ‘outside’ probably reflecting ideas of access, restriction, belonging and exclusion. Their creation can be seen as a profound social and architectural development (English Heritage 2011a, 2). The considerable quantities of material culture often encountered in excavation has led to much discussion of a wide range of potential ritual and communal roles for causewayed enclosures, and provided the means for connections to be drawn with other kinds of Neolithic sites, and other regions of the British Isles.



Figure 13 Cropmarks indicate the buried mound and side ditches of a possible Neolithic long barrow – indicated by the pale elongated mark along the field edge above and to the right of the buildings near The Valdoe, Lavant. 24267_24 08-JUN-2006. © Historic England

The third major category of monuments linked to the Neolithic period comprises long mounds or long barrows (Figs 11, 13). These also represent rare and nationally significant evidence of past communities and performed a ceremonial and funerary function. An analogy to a parish church has been suggested where additions, reuse and different contexts for use develop over centuries (English Heritage 2011b, 2). The appearance of this distinctive group of monuments therefore masks complex development and use at each site. They usually comprise a large mound of material rarely more than about 50m in length and up to 25m in width. They are sometimes slightly trapezoidal or oval in form and are generally flanked by ditches from which the construction material may have been derived. This project has identified the buried remains of three possible long barrows seen as cropmarks at Main Down, Harting (Fig 11), The Valdoe, Lavant and The Warren, Harting. Other notable monuments with possible Neolithic or early Bronze Age dates include oval barrows and pit circles identified by the NMP survey near Lordington.

Bronze Age barrows

In southern England, there was a gradual increase in the construction of circular monument types, in particular round burial mounds, mainly from the late third and early second millennia BC (Field 2008, 71). Some large mounds may have late Neolithic dates but size and morphology is not a conclusive indicator of date as dimensions varied throughout the late Neolithic and Bronze Age (Bradley 2007).



Figure 14 Buried remains of the ditches associated with large mounds or enclosures, probably Neolithic or Bronze Age barrows or ceremonial monuments. Revealed as cropmarks south-east of Lordington. 15386/19 21-AUG-1995 © Historic England.

There was huge diversity of Bronze Age funerary practices, only some of which are represented in substantial burial mounds or ditched enclosures (Parker Pearson 1999: 86). Therefore, the NMP survey results will not include some forms of funerary practice with more ephemeral or less substantial remains, such as flat graves. The NMP survey recorded a substantial number of round barrows (226) representing a variety of forms in the High Woods area. These included the most common bowl barrow type, (defined simply as a mound surrounded by a ditch), and more complex morphological forms with arrangements of multiple ditches, berms and mounds. This complexity will sometimes be revealed when the mounds are ploughed level and the buried remains of ditches and pits may be seen as cropmarks. The earthwork mounds will retain far more evidence of their construction and use but this complexity is not readily visible in the external form of the mound. Seemingly isolated

barrows were occasionally seen but they were generally found in groups, sometimes in linear arrangements. Within each cemetery there may be a variety of types of barrow as seen, for example in the Devil's Jumps, Elsted and Treyford and Devil's Humps, Stoughton. The barrows were mostly positioned on higher ground along the crests of ridges and hilltops. They sometimes seem to have had possible associations with linear boundaries and cross ridge dykes (the linear boundaries and dykes generally later in date). For example, several cross dykes at Kingley Vale are positioned close to the Devil's Humps barrows, and a number of cross dykes are located adjacent to various groups of barrows along the South Downs Way; other examples of the relationship between barrows and dykes are discussed below.

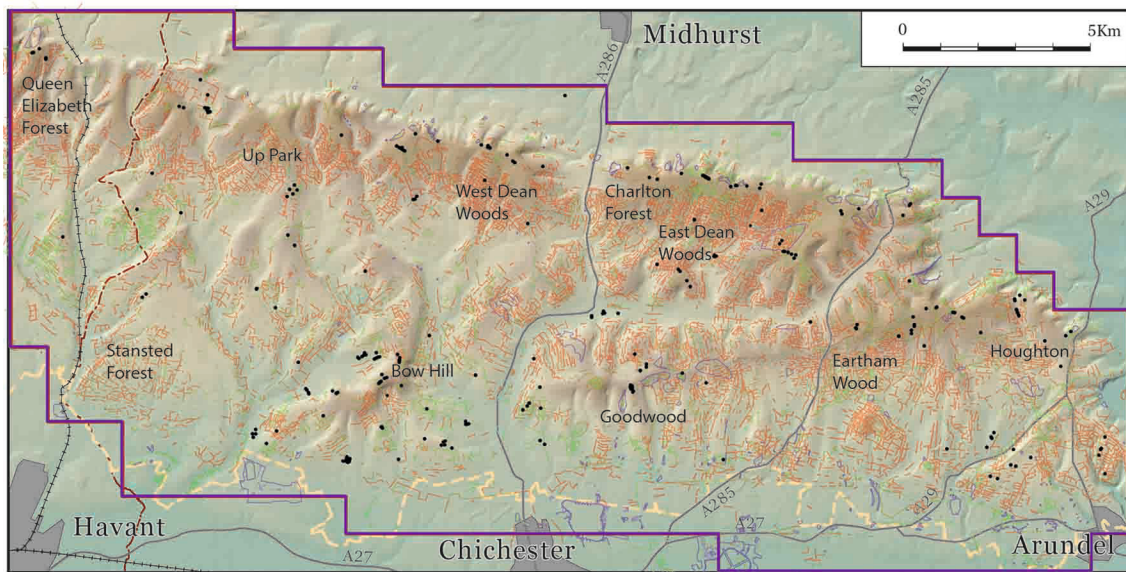


Figure 15 Distribution of round barrows with possible Bronze Age dates (black dots) other archaeological features in red, green and purple. Background based on lidar data © Environment Agency copyright 2013

Further work is required to see if any of the barrows influenced, or not, the layout of later features such as the extensive prehistoric or Roman field systems. For example, interesting relationships between barrows and fields were identified at Beachy Head (Carpenter et al 2013, 21). At Bow Hill near Stoughton in the High Woods a linear group of five small mounds were noted within a probable later prehistoric field system. Initially thought to be the remains of barrows incorporated into later fields, the size and slight sub-circular nature of the mounds may suggest these are in fact stack stands, contemporary with the fields, and possibly used for hay stacks or to store harvested crops,. (Fig 16).

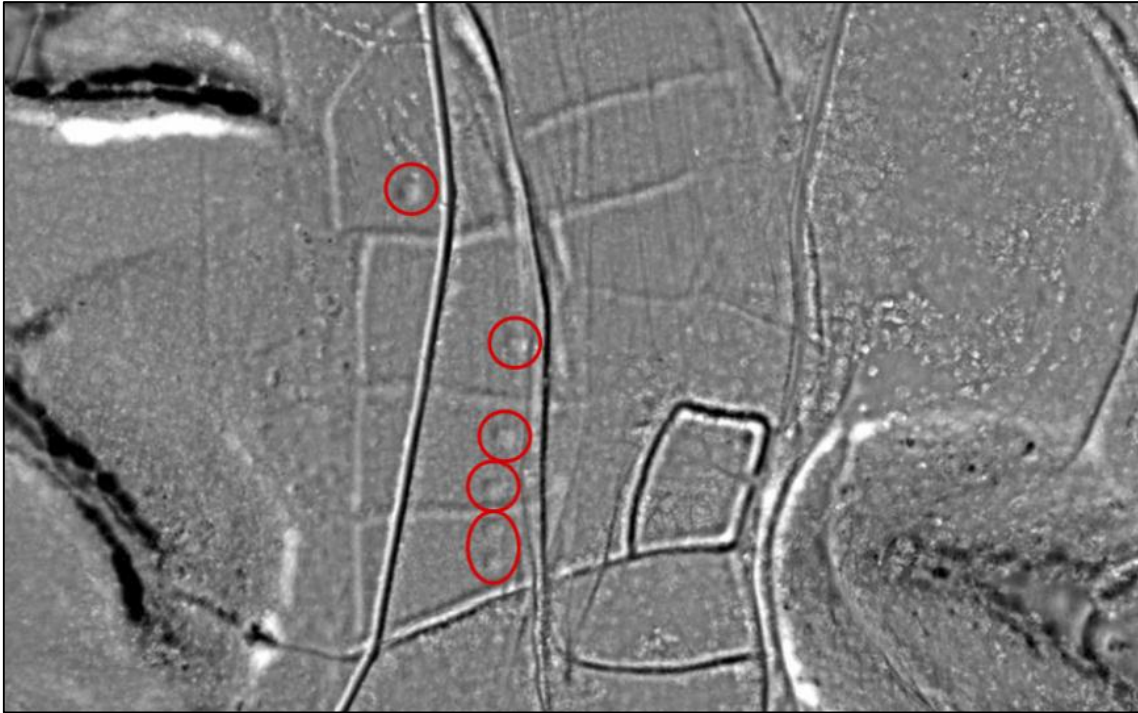


Figure 16 A group of small mounds (circled in red) within field systems at Bow Hill, Stoughton. The mounds may be a group of round barrows incorporated into a later field system or could be stack stands placed within the fields. Overlaid on lidar © Copyright Fugro Geospatial and South Downs National Park Authority

The possible relationships between Bronze Age round barrows and Neolithic enclosures do not appear consistent across this part of the South Downs. For example, no barrows were identified within 1km of the causewayed enclosures at The Trundle or Halnaker Hill. This can be contrasted with Bury Hill and Court Hill where barrows are situated within a few hundred metres of these enclosures, and at Barkhale where the closest barrow is within 20m of the enclosure. Across the country, there are varied examples of associations between Bronze Age sites and causewayed enclosure sites, including the positioning of barrows within the enclosure. However, in some examples there is some uncertainty as to whether the focus was the earlier monument or the prominent location (English Heritage 2011, 5).

The high proportion of barrows lying in easily visible upland locations may support the idea that the sites acted as territorial markers designed to be viewed from many locations in the wider landscape (Woodward 2000, 51-5). The smaller numbers positioned in more 'hidden' locations (within dry valleys and on the lower slopes) may have played a different role in the day to day lives of their Bronze Age builders and descendants, perhaps marking or guarding significant places along important traditional ceremonial route ways.

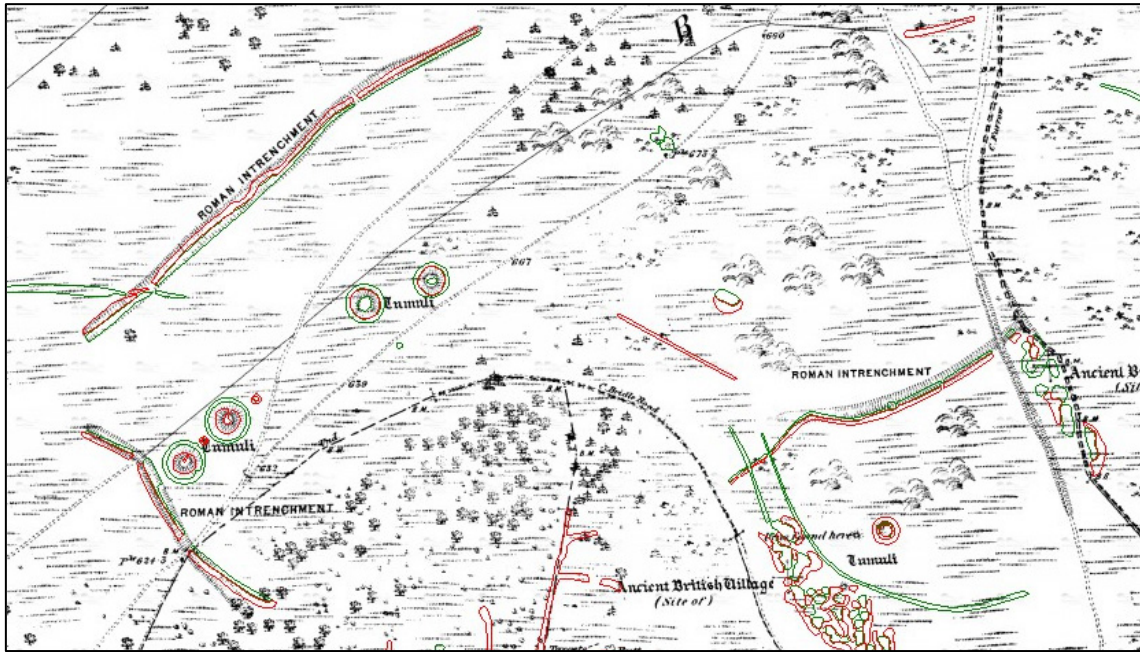


Figure 17 Linear arrangement of barrows, Devils Humps and linear cross dykes on Bow Hill, Stoughton. The 1st edition OS map notes the dykes are 'Roman' but we now know most had much earlier origins. Base map © crown copyright and database right and landmark information group ltd (all rights reserved 2016)

Late Bronze Age or Iron Age Cross dykes

Some of the earliest distinct linear forms of demarcation of the land include prehistoric earthworks known as cross dykes. Most, based on excavation or their relationship to Early Bronze Age Barrows, are thought to be later Bronze Age or Early Iron Age in origin (Bedwin 1979, 13; O'Conner 1976, 160). Cross dykes have been identified on the chalk landscapes of Berkshire, Yorkshire, Hampshire, Wiltshire, Dorset and Sussex and some early investigations of these monuments were undertaken on the South Downs by Eliot and Cecil Curwen (1918), and John Peere Williams-Freeman (1932). The remains of larger land divisions also survive in West Sussex and include the late Iron Age Chichester Entrenchments that are discussed below.

East and West Sussex have a large number of cross dykes compared to other areas and at least 80 are known in the two counties (Hamilton 2003, 77). The High Woods area coincides with what appears to be a concentration of cross dykes to the west of the River Arun (Williams-Freeman 1932).

The dykes were usually laid out across ridges or spurs extending from one steep slope to the other. There are various forms including a single bank and ditch, a ditch flanked by banks, or multiple banks and ditches. They were constructed individually or sometime in groups. The variety in form and location has led to

different interpretations (see Fowler 1964, 46). For some archaeologists, the difficulty in providing a satisfactory interpretation proved a little maddening; thirty-three years after his initial publication on cross dykes Cecil Curwen wrote ‘They seem crazy, meaningless things – monuments of apparently purposeless energy’ (Curwen 1951, 100).

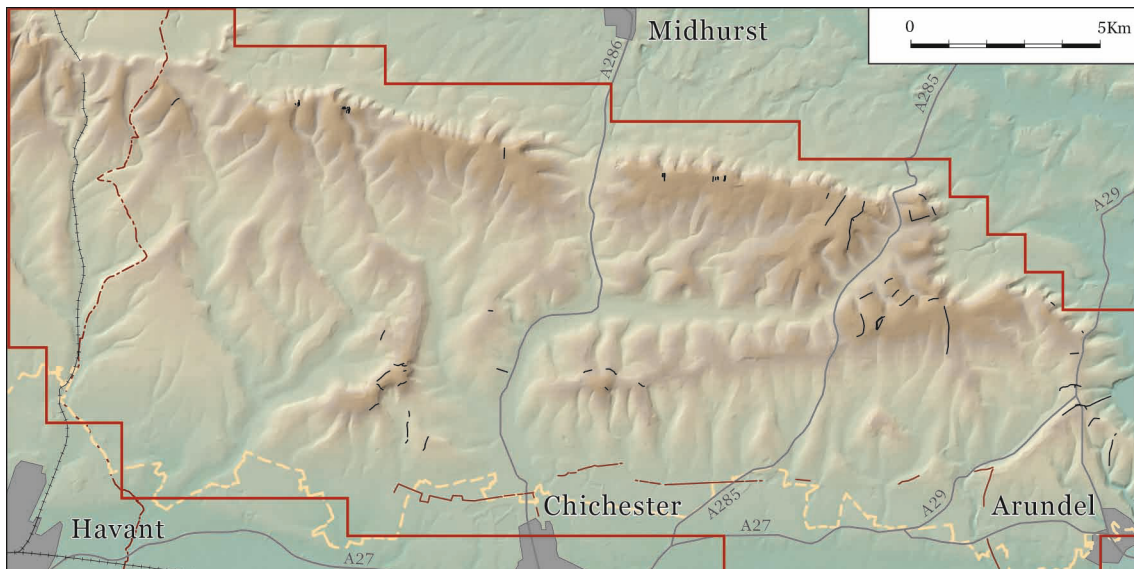


Figure 18 Distribution of late Bronze Age/early Iron Age cross dykes (in black) in relation to the later Iron Age ‘dykes’ (in brown to the north of Chichester). Background based on lidar data © Environment Agency copyright 2013

Subsequent work built on Williams-Freeman’s interpretation (1932) that the dykes were primarily land boundaries and represented a formalisation or reorganisation of land division perhaps associated with the growth of pastoralism in the Late Bronze Age (Hamilton 2003, 77). This reorganisation can be seen where the cross dykes cut through earlier field systems as on Upwaltham Hill (Fig19). Studies have highlighted regional variety of form and argued that sites must be studied individually before generalisations could be made (Fowler 1964). Peter Fowler’s comment that there was ‘much still to be learnt’ (ibid, 51) echoed the calls for further work made by Curwen (1951) and Grinsell (1958). Their number and variety in Sussex still means that they ‘clearly require further study’ (Hamilton 2003, 77).

Their construction coincides with the increased pressure on the land brought about by an expanding population (see Yates 2007). Cross dyke construction can therefore be seen as part of a wider need for formal division of land as pressures on resources and economic zones increased. It has been suggested their construction was related to an increase in animal husbandry combined with a more mixed system of agriculture overall (Champion 1999, 103) alongside the rise of powerful rulers who were able to command large workforces.

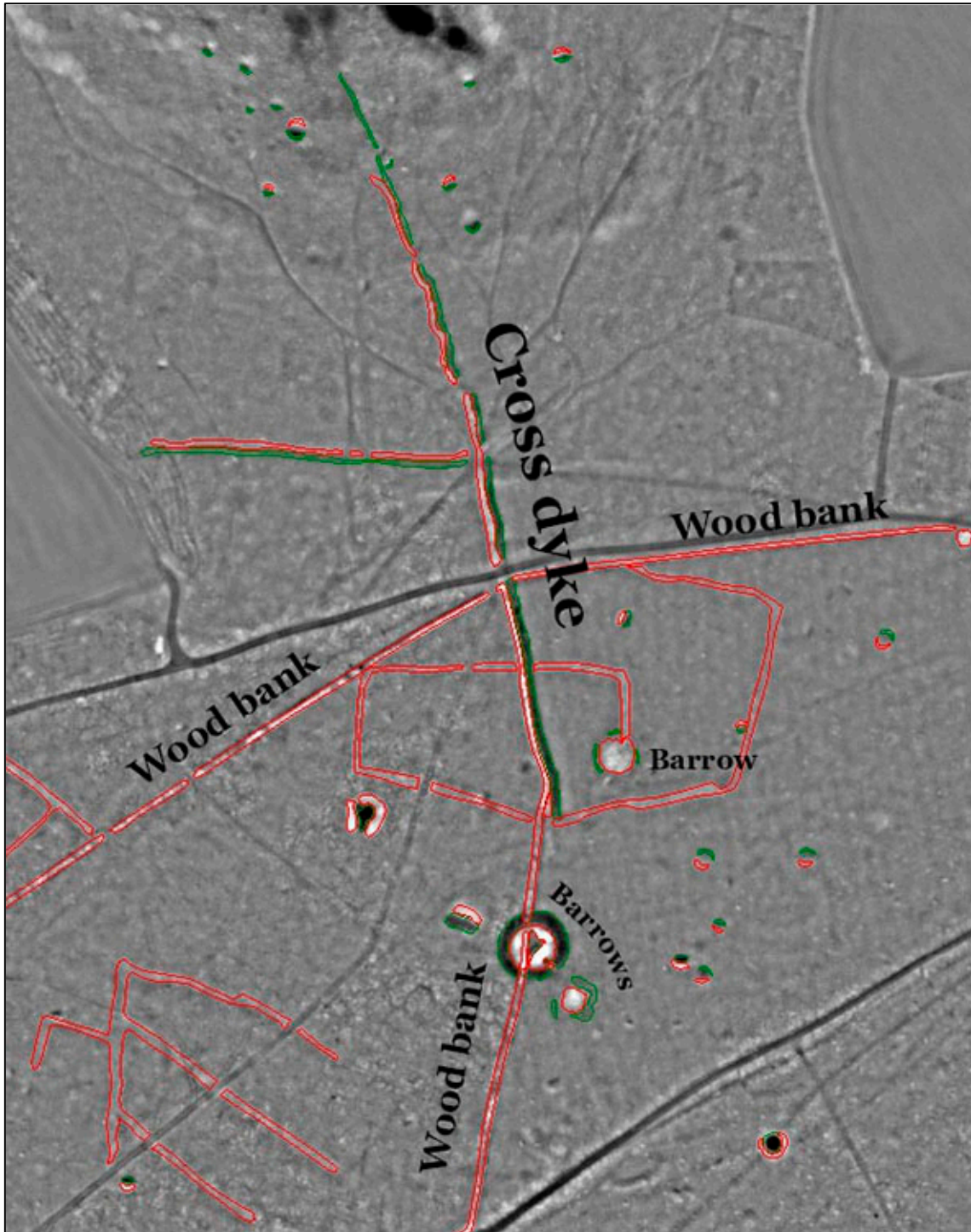


Figure 19 A cross dyke on Upwaltham Hill defined by a bank with a ditch on its eastern side. The southern end was incorporated into a wood bank that also marks a parish boundary. Lidar © Copyright Fugro Geospatial and South Downs National Park Authority

The interpretation and mapping from lidar and aerial photographs for the High Woods project provides an accurate and up to date framework for analysis of the group to the west of the Arun. Ground based work could examine details of form, relationship to other features, and topographical position. This could help

identify patterns to see if the dykes to the east of the Arun form a coherent group, or groups, of land ownership or control.

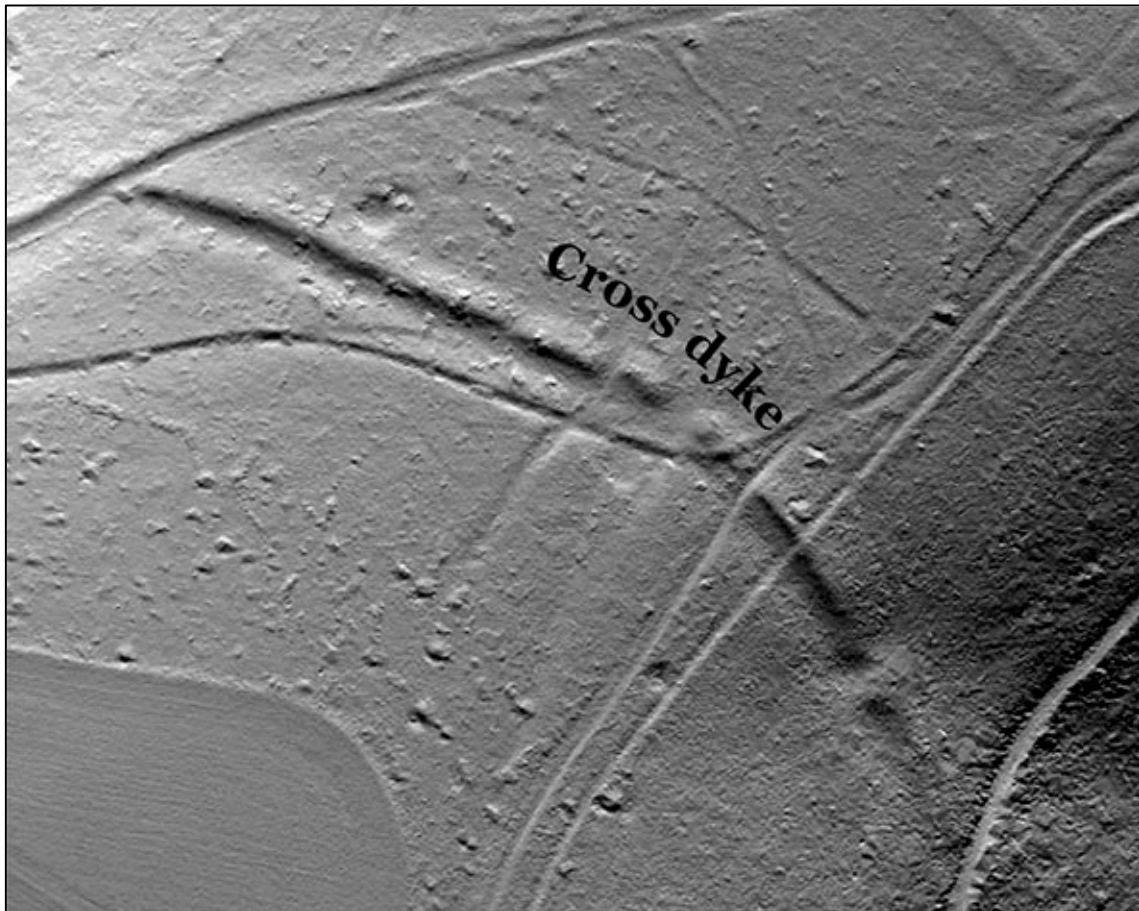


Figure 20 The lidar visualisation of a newly identified cross dyke in woodland of Duncton Hanger. It has been cut by more recent tracks Lidar © Copyright Fugro Geospatial and South Downs National Park Authority

Change and continuity of cross dykes on the South Downs

The good survival of archaeological earthworks in Sussex was commented upon in the early 1960s (Bowen 1961), but it was also noted that many of these remains were being damaged or levelled by ploughing (Drewett 1978). In some parts of the South Downs, such as to the north of Worthing, relatively few of the cross dykes remain visible as earthworks, despite being in ridge top locations where ploughing is perhaps less likely (Carpenter 2008, 22).

In the High Woods area south of Upwaltham, west of Shepherd's Copse, aerial photographs record the buried remains of a cross dyke, in open downland, which has been ploughed level. However, the lidar data revealed the ends of the dyke still survive as earthworks in the woodland to either side. Combining the

evidence from the aerial photographs and lidar means that we have an accurate map of the full extent of the dyke.

The lidar data not only revealed parts of dykes in woodland but in one case showed that a dyke previously thought to be ploughed level (as reported in the National Record of the Historic Environment Record No. 246058) survives as a slight earthwork. This was in open downland east of Linch Ball, north of Newfarm Plantation.

New discoveries

The High Woods survey revealed some of the cross dykes were longer than depicted by the Ordnance Survey. The continuations of these earthworks were often slight and located on the steeper wooded slopes. For example, three cross dykes that extend across a ridge between Littleton End and Sutton Down, south east of Upwaltham.

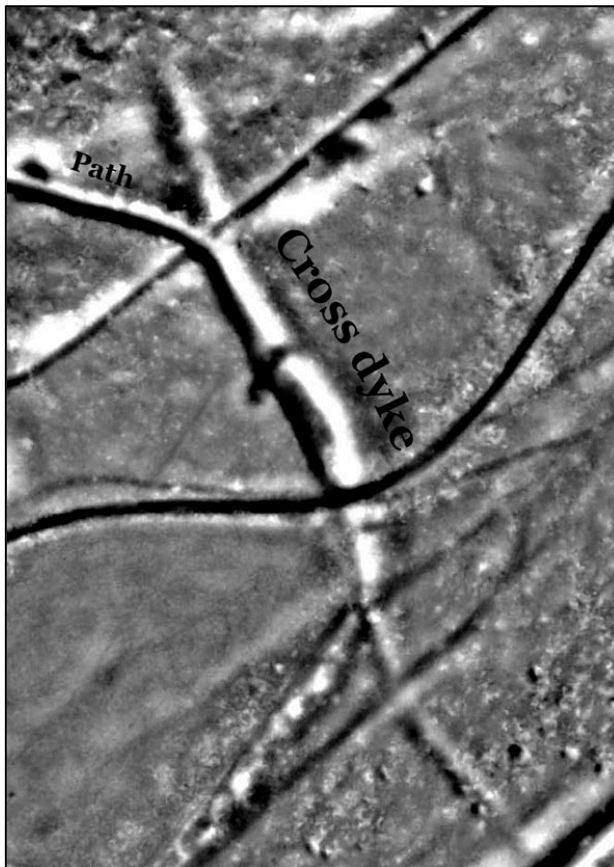


Figure 21 The lidar visualisation of a newly identified cross dyke within woodland of Barlavington Hanger. A later path joins the dyke towards its northern end. Lidar © Copyright Fugro Geospatial and South Downs National Park Authority

Previously unrecorded dykes were identified within woodland on the north-eastern scarp slope of the downs. In Duncton Hanger a dyke over 220m long crosses the spur leading up to Duncton Down (Fig 20). It comprises a bank roughly following the curve of the contour with a ditch on the upper side and a possible short length of ditch on the lower side. The dyke has been cut through in a number of places by paths and is crossed by wood banks. To the south in Barlavington Hanger a single bank and ditch crosses the spur leading up to Barlavington Down (Fig 21). It is located a little to the east of an L-shaped cross dyke but no clear association between the two has been identified.

Another newly identified dyke is situated on Upwaltham Hill and the fragmentary remains of a possible cross dyke was also seen in woodland on Westburton Hill, although this may possibly be the remains of a field system.

Later reuse

The newly identified possible cross dyke that cuts across the western spur of Upwaltham Hill also serves as an example of how earthworks may be reused. Aligned approximately north-south it is thought to have originally measured c.200-300m (Fig 19). The dyke changes direction at the southern end and is aligned on Bronze Age barrow. To the south a medieval wood bank appears to have been aligned on, and partially reused the southern end of, this dyke. This wood bank and the southern end of the dyke also mark the Slindon/Upwaltham parish boundary.

Another example of suggested re-use can be seen above Stickingspit Bottom (Fig 22). Here two cross dykes appear to be joined by what may be a later a ditch. An alternative interpretation is that all three elements may have originally formed a single linear feature. As such it would be comparable in length to another cross dyke to c 500m to west, but its position may suggest it would be better categorised as a ranch boundary, the name given to a long bank and/or ditch possible used for controlling livestock. The poor condition of the central section is comparable to part of the dyke to the north suggesting they both suffered from ploughing.

Another long boundary earthwork is situated on Glatting Down (Fig 23). Originally categorised as a cross dyke in 1918 (Curwen & Curwen 1918), it consists of a central ditch flanked by parallel banks aligned approximately north-south across the southern side of Glatting Beacon. The lidar has shown that there is a southern continuation of this earthwork for up to c 750m ending at the earthworks of a prehistoric or Roman field system. The southern c 500m consists of only a single bank and ditch (there is no trace of an eastern bank) and may represent a later addition. The line it describes later formed the

boundary between Madehurst parish and the extra parochial area known as The Gumber, and now forms parish boundary between Madehurst and Slindon.

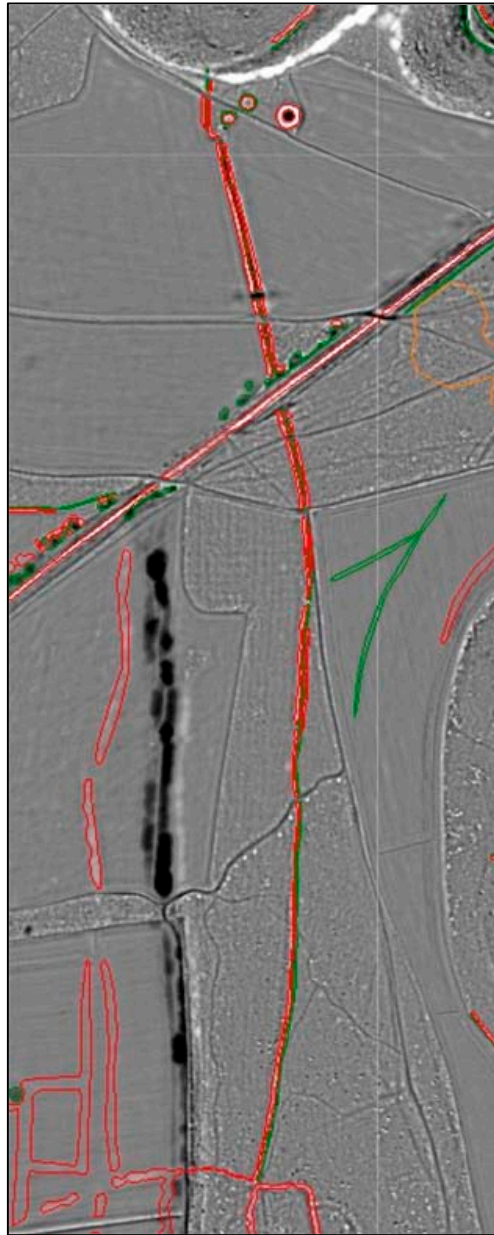


Figure 22 The northern part of this linear earthwork was identified as a cross dyke in 1918. The lidar illustrates it forms part of a much longer boundary on a north-south alignment. Lidar © Copyright Fugro Geospatial and South Downs National Park Authority

Iron Age Dykes - Chichester Entrenchments and the War Dyke

All but the most northerly elements of this system of dykes are situated to the south of the project area. By working in conjunction with natural features they have been interpreted as defining large areas of the landscape and may offer

guide in interpreting the War Dyke, the other substantial dyke within the project area. These dykes have been subjected to a number of investigations during the 20th century and the features identified during this NMP project largely match the known picture for these monuments.

The Chichester Entrenchments were investigated by Richard Bradley (Bradley 1971) and a summary of this and other work on the Entrenchments is provided by Chris Davenport (Davenport 2003). Despite difficulties in dating discontinuous earthworks, a late Iron Age date has been considered most likely with the dykes perhaps the result of three phases of development.

The earthworks mapped as part of this project are the most northerly elements of the Chichester Entrenchments and represent the earliest phase of construction (Bradley 1971, 32). These now fragmented earthworks (although they were always at least two earthworks as the line is interrupted by the River Lavant) form an approximately east-west line to the north of Chichester. They cut off the 155 sq. km of coastal plain by linking the water courses that discharge at Bosham and Bognor (ibid, 31-32). The features identified during this project match well with those previously described by Bradley.

The War Dyke was investigated by the Curwens in 1918 and Williams-Freeman in 1934 (Curwen & Curwen 1918; Williams-Freeman 1934) and the earthworks identified during this project largely match those reproduced by the Curwens (Curwen & Curwen 1918, Plate II); the main addition being the short westwards continuation of a supplementary earthwork previously depicted ending at a trackway.

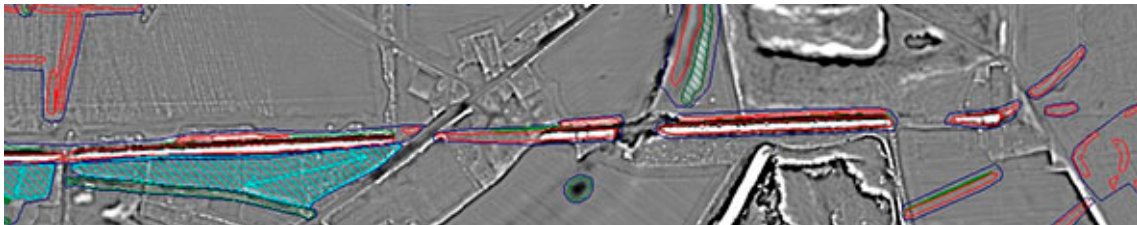


Figure 23 The eastern section of the east-west Chichester Entrenchments. Two detached earthworks at the eastern end may be the remains of a continuation of this earthwork. Lidar © Copyright Fugro Geospatial and South Downs National Park Authority

Although presented as a cross dyke by the Curwens a stronger parallel with the Chichester Entrenchments has been suggested. As with the earliest phase of the Entrenchments there is a strong relationship with a water course and the original earthwork may have reached the bank of the River Arun. Post medieval quarrying has destroyed the eastern end of the War Dyke, but the remains still extend to within 100m of the river. The course of the dyke is thought to have followed the top of the steep scarp that overlooks Fairmile Bottom and to the south-west of this the earthwork is picked-up again in Madehurst Wood, with a

second earthwork aligned north-south. This north-south earthwork is fragmentary but extends to Binsted c 2.5km to the south. The southern end of this earthwork runs parallel (between 125m-200m) to a watercourse that continues south before turning east and joins the Arun at Ford. Together these earthworks and watercourse define an area in a similar way to the Chichester Entrenchments.

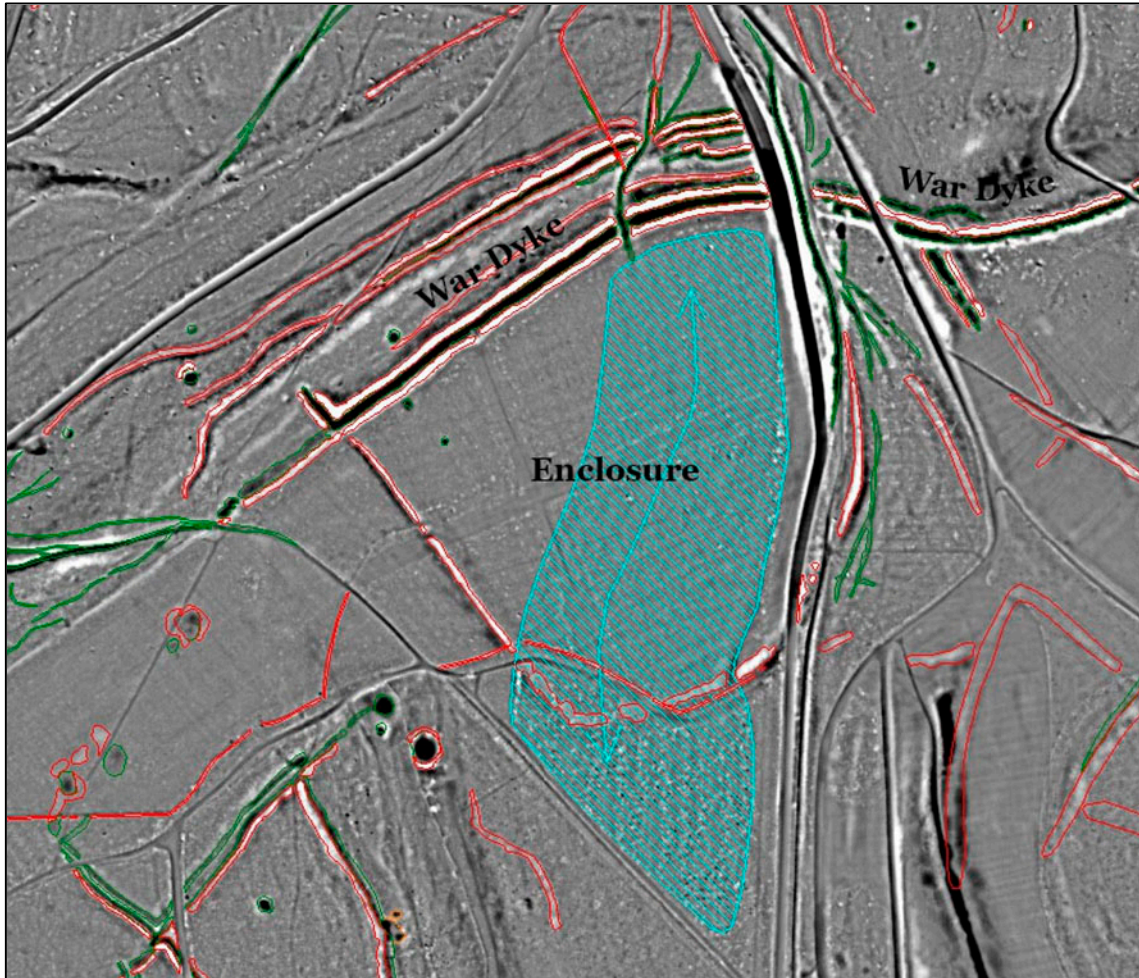


Figure 24 Part of the War Dyke with a possible large prehistoric enclosure to the south (partly covered with ridge and furrow highlighted in blue, the arrow indicates the direction of the furrows. Lidar © Copyright Fugro Geospatial and South Downs National Park Authority

Between the Chichester Dykes and the War Dyke (and apparently linking them) is the east-west Devil's Ditch linear earthwork. This is not a continuous feature and some elements are medieval in date, but may follow the line of earlier earthworks (McOmish & Hayden 2015, 25). There is a c 4km gap between the eastern end of the Devil's Ditch and the western end of the War Dyke between which are the remains of Slindon deer park pale. The northern section of the pale (which is aligned south-west - north-east) consists of two and in one place three banks that may represent the reuse of the Devil's Ditch. The possible

medieval reuse of Iron Age earthworks is also seen in Arundel Little Park (ibid, 22). Another possible association with the War Dyke is to the east on Rewell Hill (Fig 25) where part of the dyke appears to have been reused to form the northern part of an embanked circuit defining a large D-shaped enclosure in Whiteways Plantation.

Discussion

As well as identifying new cross dykes within the woods, the mapping shows them in relation to other features. Many other elements of the High Woods's historic landscape, including field boundaries, tracks and settlement boundaries could also be interpreted as expressions of ownership, tenure or control. These may have been seasonal rather than permanent and may have been communal rather than individual. While they clearly divided-up the landscape, we do not know what restrictions they placed on the population. For some periods there is scant evidence of where the people who occupied this landscape lived and little evidence can be seen from the air.

The examples of fields slighted by later cross dykes, or prehistoric features incorporated into medieval parish boundaries highlight the changing nature of ownership and control in the High Woods. The reuse of a monument may suggest continuity, but as the example of the reused cross dykes shows, some of these features may have been redundant for considerable period before being incorporated into a new network of boundaries.

The elements of the historic landscape discussed in this chapter highlight the complexity of early ownership and control in the High Woods and the variety of ways that this was visible in the landscape. The results of this project and the opportunities for further work that it has suggested will enable a better understanding of this topic. Equally the results indicate the invisibility of some boundaries in the landscape and highlight the need for communities to mark and reinforce them in other ways. This may have been through ceremonies such as beating the bounds that ensured that these divisions were fixed in the common memory. Medieval beating the bounds were concerned with parish boundaries, the limit within which people were born, lived, worked, paid their tithes and were buried, and reminds us that there may be aspects of ownership and control from earlier periods that are less easily retrieved.

FARMING AND SETTLING THE DOWNS

The evidence for past agriculture and settlement dominates the archaeological mapping from lidar and aerial photographs. The extent of these remains, suggests that through the later prehistoric period the South Downs supported a considerable number of small agricultural communities. These remains are evidence of the widespread uptake of agriculture from the Middle Bronze Age through to the Roman period. One can imagine numerous small farmsteads dispersed across the landscape amongst their fields, linked by trackways and droves from the late Bronze Age onwards (Curwen 1937, 165).



Figure 25 Lamb Lea scheduled field systems (north to bottom). 24773/05 17-OCT-2007 © Historic England

In the High Woods, the prehistoric and Roman remains indicate an ancient landscape of settlements, field systems, ritual and funerary monuments similar to that identified across the eastern downs. In contrast to elsewhere within the National Park the earthworks in the High Woods project area are extensive and survive well. Previous NMP reports have provided overviews of the archaeology of parts of Hampshire, and parts of West and East Sussex (Young 2011, Carpenter 2008; Carpenter et al 2013).

Understanding the full extent of fields - Lamb Lea

The scale of the remains revealed by the lidar survey is illustrated particularly well by an area of later prehistoric fields to the south of Lamb Lea Woods and Charlton Forest (Fig 25). This small area of fields were scheduled because they were thought to be nationally important and, presumably, because their extent and form were easily recognised in the open grassland. However, the Secrets of the High Woods lidar survey revealed that this area of fields form only a fragment of a large field system which is itself only a small part of a vast and near-continuous swathe of later prehistoric cultivation and settlement sites surviving as earthworks. The large areas of fields seen in the forested areas appear to be defined by earthworks of some considerable height. It is likely that these areas have not been cultivated since they were abandoned, probably at the end of the Roman period.

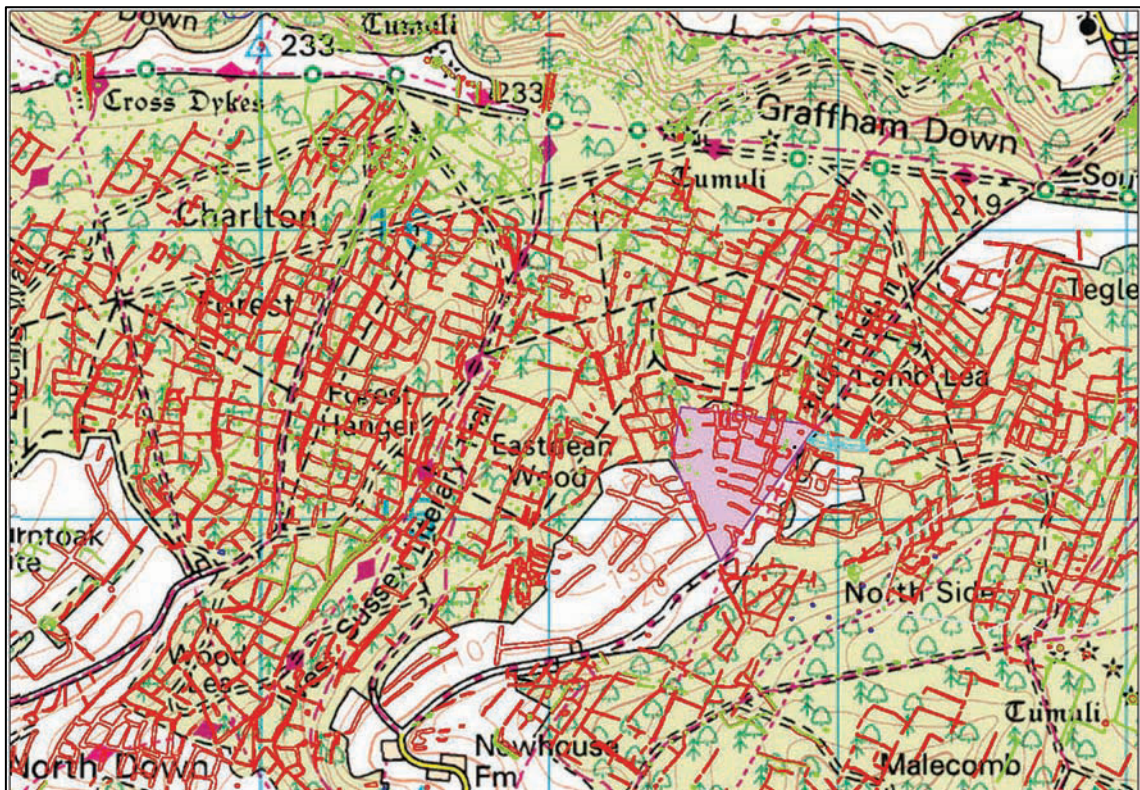


Figure 26 Map of the Lamb Lea scheduled area (shaded pink) within the full extent of the prehistoric and Roman field system (in red and green). Base Map © crown copyright and database right 2016. All rights reserved. Ordnance survey licence 10050083

The scheduled area covers a good sample of this large field system that can still be seen and understood in the grassland (Figs 26-7). However it has been ploughed at some point and the earthworks appear denuded. Although management and planting of woodland will have affected the archaeological remains to some extent, the large areas of prehistoric and Roman fields seen

within the forested areas appear to be in very good condition with earthworks of some considerable height (Fig 27).

Early work on fields and settlements

The lynchets on the South Downs were recognised as parts of field systems and documented by Reginald Blaker of Lewis at the start of the 20th century with his work on the downs at South Malling in 1902 (Yates 2007, 4). Subsequent studies by members of the Brighton and Hove Archaeology Club, particularly by Herbert Toms, a pioneer in the analysis of chalkland archaeology trained by General Pitt-Rivers, added new sites to the growing list of later prehistoric field systems and settlements on the downs (ibid). The Curwens (father and son) in the early 20th century identified and surveyed numerous sites on the Sussex downs (Curwen and Curwen 1923,) whilst at the same time OGS Crawford was working in the downs of Hampshire, Dorset and Wiltshire using aerial photographs alongside fieldwork (Crawford 1923). Between them they coined the term 'Celtic Field' to denote these widespread systems of prehistoric fields encountered across the south of England.

The work of these archaeologists formed the foundation of decades of investigation and survey and helped to shed light on the development and dating of later prehistoric field systems across the south of England. David Yates (2007) has argued that there was a widespread and sustained episode of agricultural expansion and intensification in the late Bronze Age with planned land division and established settlements of unenclosed round houses.

One of the first detailed investigations carried out on an ancient field system in the High Woods area is that of the supposed Iron Age/Roman settlement on Nore Hill near Eartham. It was identified by S E Winbolt on one of his frequent walks along Stane Street in the late 1920s to early 1930s. Armed with aerial photographs supplied by Ivan Margary (an authority on Roman roads), Winbolt surveyed the remains of these fields and settlement visible in the open field to the west of Eartham Wood (Winbolt 1931, 265-7).

Winbolt identified two dozen square embanked fields with an axial terraced way running along the contours of the slope roughly north-south, off which two further tracks extended westwards down through the fields below the terraced way (Fig 27). To the east, within the woods he found the earthworks of what he believed were dwellings and possible barrows. He also found abundant sherds of Iron Age and Roman pottery and iron slag with which he dated the site (Winbolt 1931, 265). He noted further field banks extending into the woods to the east and marked his plan 'woodland (unexplored)' (Winbolt 1931, 268).

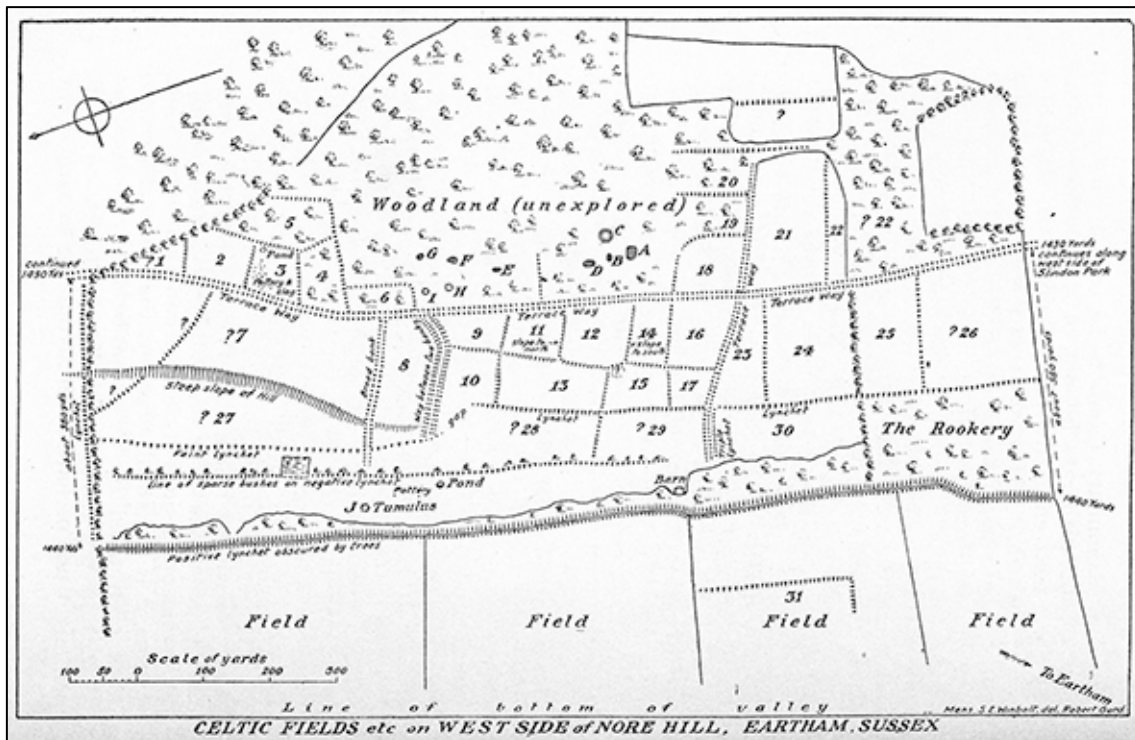


Figure 27 Winbolt's plan of 1931 on the west side of Nore Hill (north to the left) notes 'Woodland (unexplored)' in the woods to the west of the north-south terraced way (Winbolt 1931, 268; With kind permission of the Sussex Archaeological Society).

Whether the site has been revisited is unknown, but the lidar survey of Nore Hill revealed, as Winbolt suspected, the extensive remains of a field system in the woods to the east, extending across the entire hill and into the valleys on all sides (Figs 28-9). The fields on the western side, including those surveyed by Winbolt, appear smaller with evidence of a number of phases of further subdivision. The southern and eastern parts of the field systems are in open cultivated land and have been ploughed. Here, the remains are eroded and more fragmented which could be a contributory factor in the appearance of larger fields. Within what appears to be the core of the field system there is at least one D-shaped enclosure that may indicate the site of a settlement.

A later set of embanked divisions in the form of narrow post medieval woodland banks were superimposed on top of the later prehistoric field systems within Nore Wood, totally disregarding the earlier earthworks.

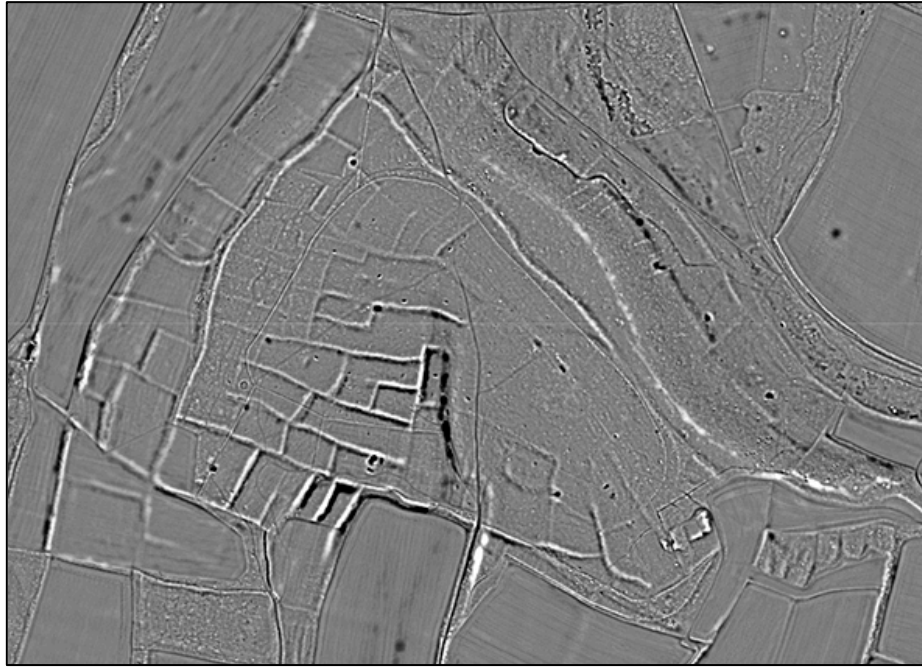


Figure 28 Lidar visualisation of the earthworks within Nore Wood seen on lidar © Copyright Fugro Geospatial and South Downs National Park Authority

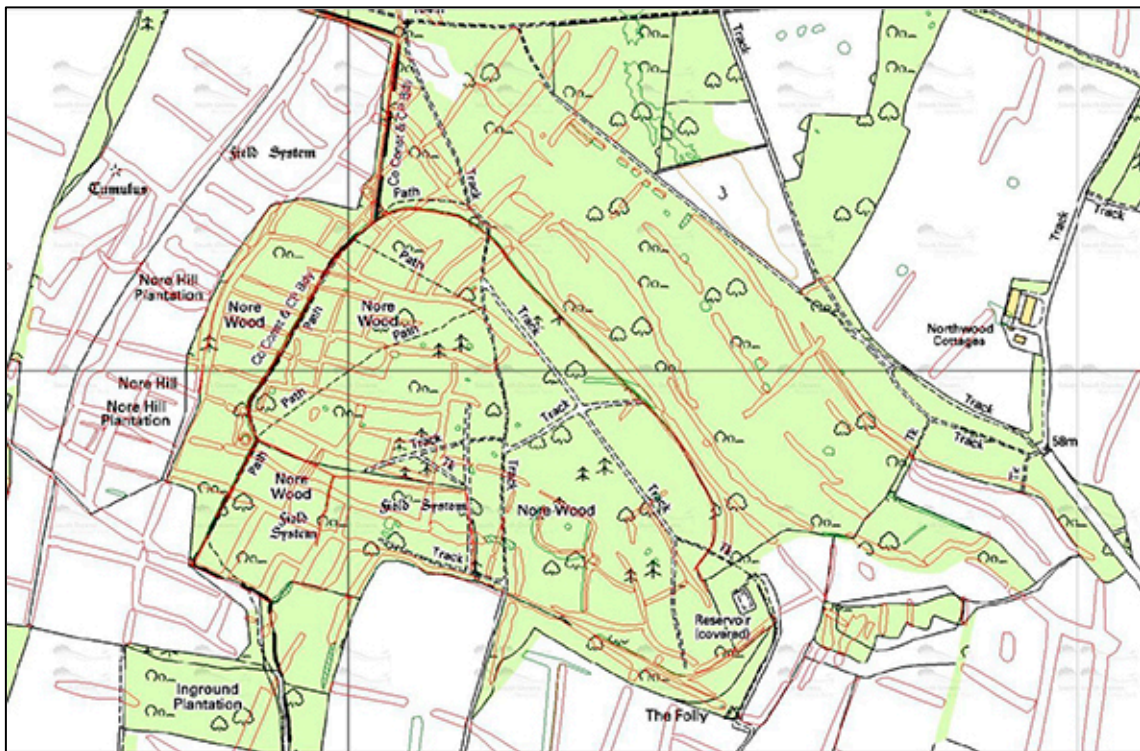


Figure 29 Map of prehistoric and Roman field systems in Nore Wood. Winbolt's survey covered the western edge beyond the woods marked as 'Nore Hill Plantation' and 'field system'. Base map © crown copyright and database right 2016. All rights reserved. Ordnance survey licence. 10050083

The nature and form of the field systems

Field systems on the South Downs have their origins in the Middle and Late Bronze Age although evidence for this is concentrated in East Sussex (Yates 2007). Within the project area, it is only the fields on the southern slope of Halnaker Hill that have been suggested to be Bronze Age in date (ibid, tb 6.3). Only a few field systems, such as those on Salisbury Plain, are thought to have survived as earthworks from the Bronze Age (McOmish et al 2002). Evidence from elsewhere in England indicates that many Bronze Age fields were abandoned but some of these were later expanded and developed in the Late Iron Age and Roman period, as seen on Bullock Down (Drewett 1982) or lost under these later field systems as seen on the Marlborough Downs (Fowler 2002).

Across the country, there are recognisable regional differences in later prehistoric land division and settlement, often but not always dictated by terrain and geology as well as regional practises. For example, on Salisbury Plain swathes of ordered coaxial fields were laid out on a common north-east/south-west axis regardless of the terrain (McOmish et al 2002), whereas on the Marlborough Downs their layout is less rigid and dictated more by the terrain (Yates 2007). By mapping the remains of the field systems in the High Woods, we can see that they were not laid out in a single episode of land division and management, but represent multiple nuclei of coaxial and accreted systems of embanked small fields. The survey has shown that each system of fields has its own characteristics, apparently largely governed by the topography. The majority of fields appear to be draped across the terrain following the undulations and contours.

Overall, there is no common axis to the layout of the different groups of fields and there is no consistency in the size and shape of fields across the entire area. However, there are large swathes, particularly along the north-eastern edge of the Downs that do exhibit a strong north-east/south-west coaxial alignment with relatively uniform fields (Fig 30). They extend across 10km on the chalk dip-slope from Linchball Wood, Bepton in the west to Charlton Forest in the east. There are double-ditched tracks within a number of the field systems, on a similar alignment (Fig 30B).

Elsewhere, the land division appears accreted or agglomerated around a core of loosely coaxial fields. It is common to see field systems that appear to be a cohesive group with similar morphology, but towards the edges seem to alter in size and form with the fields at the edges appearing larger and more rectilinear. It is not clear if this is a true change in style, where fields have been added or

enlarged around the edges, because the core of the field systems often lie on ridges, where woodland cover prevails, and the peripheral fields are in open cultivated land where the remains are denuded by ploughing and fewer field banks survive as earthworks. This may give the impression of larger fields because the remains are incomplete. The use of aerial photographs and lidar to survey these peripheral areas, which may have been ploughed for some considerable time, has proved successful in detecting the slighter remains visible as cropmarks and soil marks, filling in some of the gaps, be they somewhat fragmented.

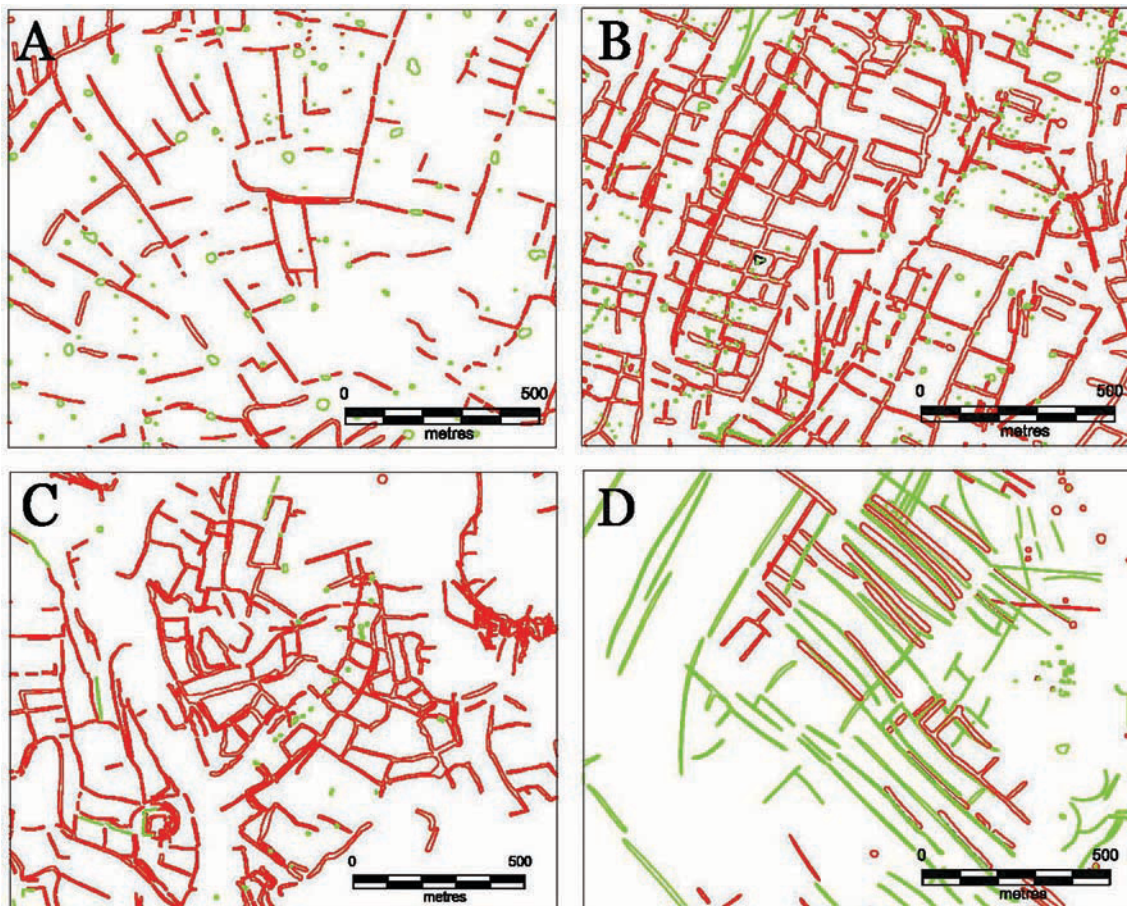


Figure 30 Examples of the varied morphology of field systems from a selection of locations across the survey area with A) radial (Stansted Forest), B) coaxial (Charlton Forest), C) agglomerated (Marden Down) and D) linear field systems (Charlton Down).

Fields can be seen extending down the sides of coombes, except where the gradient is such that only lynchets formed by contour ploughing parallel to the slope can be seen; few field boundaries were identified in the valley bottoms.

It is interesting to note that the fields on the north eastern edge of the High Woods area appear to stop short of a prehistoric cross dyke on Tegleaze Down, with further field systems visible to the east of a second cross dyke over Little

Down and Stickingspit Bottom. This has resulted in an apparent corridor of land that remained uncultivated in prehistory (between 470m – 800m wide between the two dykes in the region of Crown Tegleaze. Further work may ascertain whether this is a true absence of prehistoric fields or purely the result poor survival of field banks. The name Tegleaze is likely to be derived from *teg* a common Sussex word for a yearling sheep, and *laes* a pasture (Mawer & Stenton 1929, 21) suggesting an area cleared of woodland and under pasture for some considerable time.

Fields and Stane Street Roman road

Stane Street, the Roman military road that linked Chichester to London was probably laid out relatively soon after the invasion in the 1st Century AD (Russell 2006, 154; see also Roman Roads section below). The road followed a straight course and only deviated from this where the terrain or natural obstacles, such as the River Arun, had to be traversed.

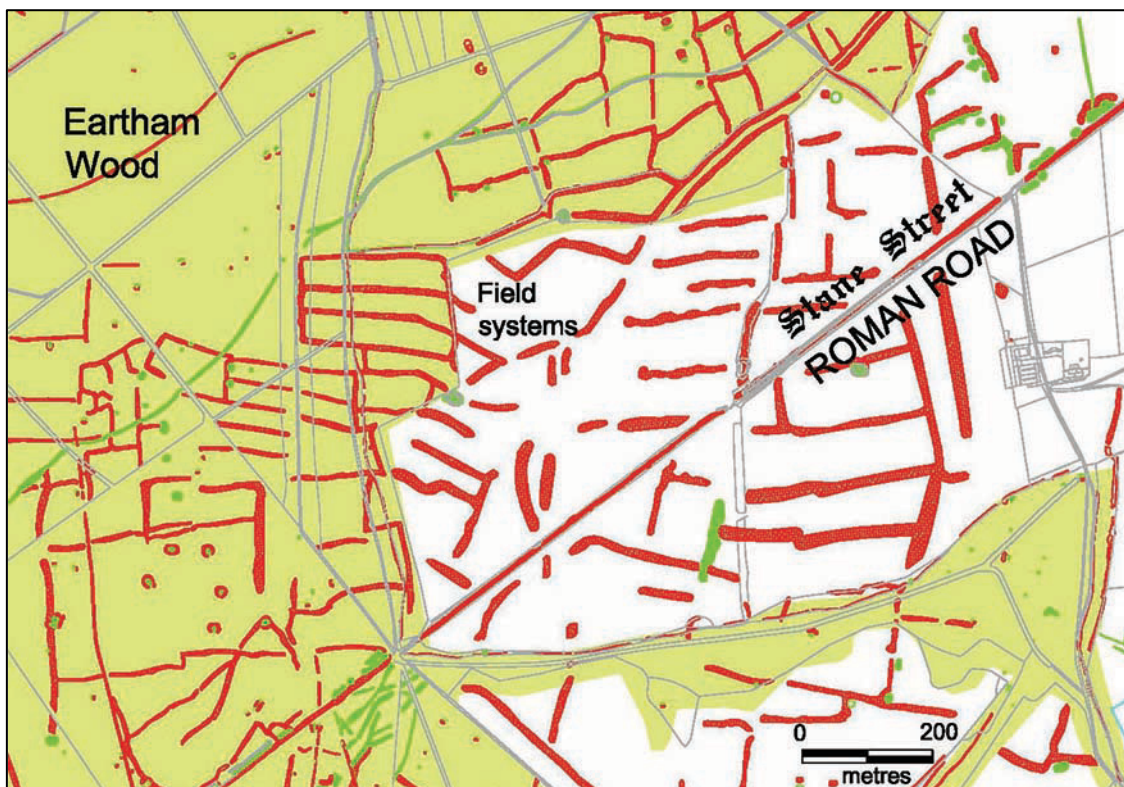


Figure 31 Map of Roman road Stane Street cutting through the later prehistoric fields in Earham Wood. Base Map © Crown Copyright and database right 2015, all rights reserved. Ordnance Survey Licence number 100024900.

The road builders did not accommodate existing land divisions they encountered on the way and the road sliced-through prehistoric field systems such as those in Earham Woods, north-east of Chichester. It is not clear if the

fields were still in use when the road was driven through, but if they were, they could have continued to be cultivated regardless of the presence of the new military road, in much the same way a modern railway or road divides parcels of farm land. The later road from Chichester to Silchester strikes out NNE through the Downs, again cutting through the existing field systems in much the same way as Stane Street.

Identifying later prehistoric or Roman settlements

Developer funded excavations on the coastal plain, south of the downs, have identified a significant number of settlements and associated fields and tracks firmly dated to the Bronze Age (Yates 2007). Most of these sites had no surface trace and frequently lay beneath or adjacent to later sites from the Iron Age and Roman period. The excavated evidence suggested another major change in land use occurred in this region during the post-Roman period. As previously mentioned, this also seems to be the case on the chalk downs to the north. However, identification of settlement sites amongst the vast swathes of earthwork field systems, and firm dates, are more difficult to establish.

Previous work in the High Woods project area has identified a number of settlement sites and there has been some excavation. However, a key to identifying and understanding the settlements and their fields on a large scale is careful analysis of the earthworks to establish relationships between phases and establish a relative chronology (see for example, McOmish et al 2002). In the High Woods, previous work and the new analysis and mapping from the lidar data and aerial photographs highlighted potential areas for this kind of further analysis.

Later prehistoric settlements

Despite the exceptional preservation of later prehistoric earthworks, and the high quality of the lidar survey, it has still proved difficult to positively identify many remains of contemporary settlement, particularly Bronze Age sites, and any trace of associated fields and integrated droves. Typically, settlements of this period comprised a single large circular domestic hut with one or two subsidiary huts or storage structures such as pits and 4-6 post structures (Ellison 1978, 35-36). The settlements without an enclosing ditch or bank are particularly difficult to identify, as the remains of the houses alone are not usually substantial enough to survive as earthworks. However, it is possible to identify earthworks of potential house platforms or scoops in the ground. Other methods, such as aerial photography (although exceptional conditions are required) and geophysical survey, can be used to identify the relatively ephemeral buried remains of round houses.

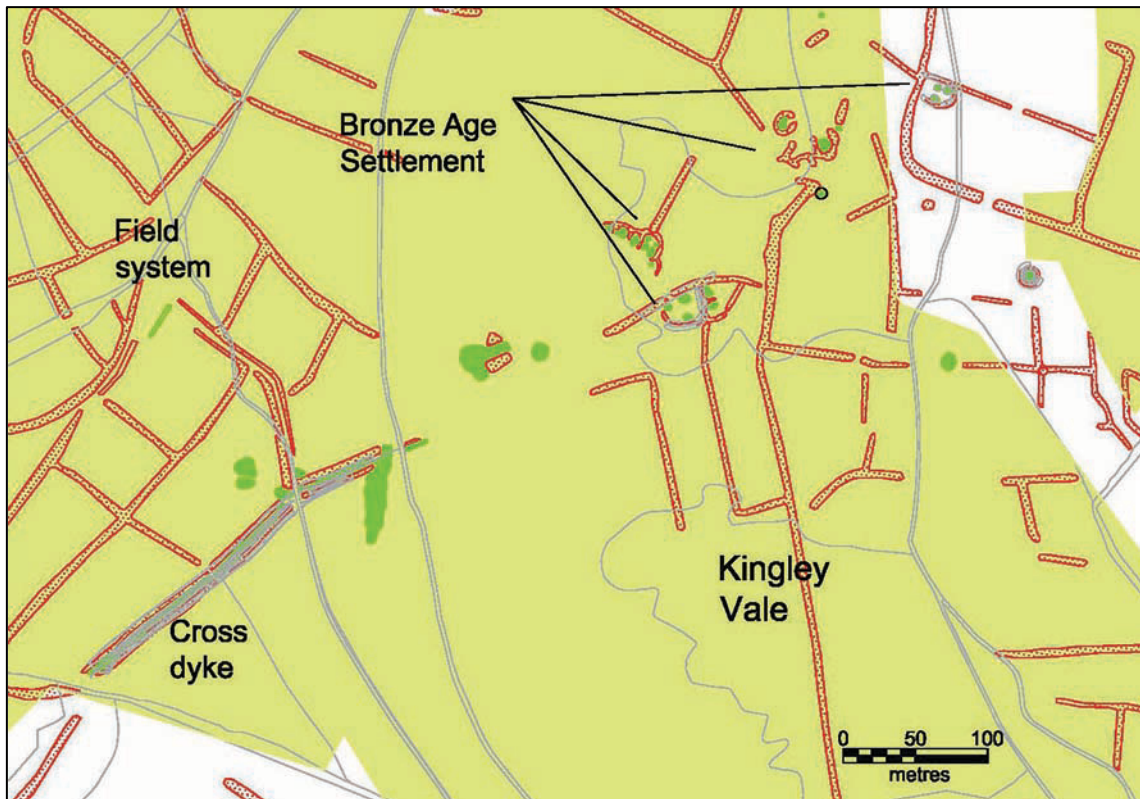


Figure 32 Map illustrating the remains of the Bronze Age settlement and surrounding field systems in Kingley Vale. Base Map ©Crown Copyright and database right 2015, all rights reserved. Ordnance Survey Licence number 100024900.

Assemblages from Bronze Age sites on the South Downs outside the project area indicate that the inhabitants were utilising resources of both a Wealden and coastal origin. These included Upper Greensand stone and clay and whetstones from the Weald, while in addition to shellfish, the coastal region also provided clay for pottery (Yates 2007, 2007, 52-55).

One of the few known Bronze Age settlements identified on the Downs within the survey area is located at Kingley Vale (Fig 32). Lying within woodland (partly ancient yew woods) the settlement comprises a cluster of five groups of small embanked enclosures set within the fragmented remains of a field system (Yates 2007). The earthwork remains of these groups of dwellings are visible on lidar images dispersed over a small area, each lying no more than 70m from the nearest neighbouring dwelling. Three have several potential hut sites in the form of scoops or depressions similar to those seen at Itford Hill, Beddingham (Ellison 1978, 35-36).

Two settlements lie in the corners of later prehistoric fields; they are each separated from the rest of the field by a curving earthwork that, combined with the straight sides of the field boundary, form D-shaped enclosures. Two other sites have linear arrangements of scoops, each hollow surrounded on two or

three sides by a bank. There is also a clear relationship between two of the sites and the field boundaries raising the possibility that at least some elements of the field system could have their origins in the Bronze Age. This settlement group is remarkably similar in form to the Bronze Age Settlement site known at Itford Hill, Beddingham that lies well outside the project area north of Newhaven (Ellison 1978, 35-36).

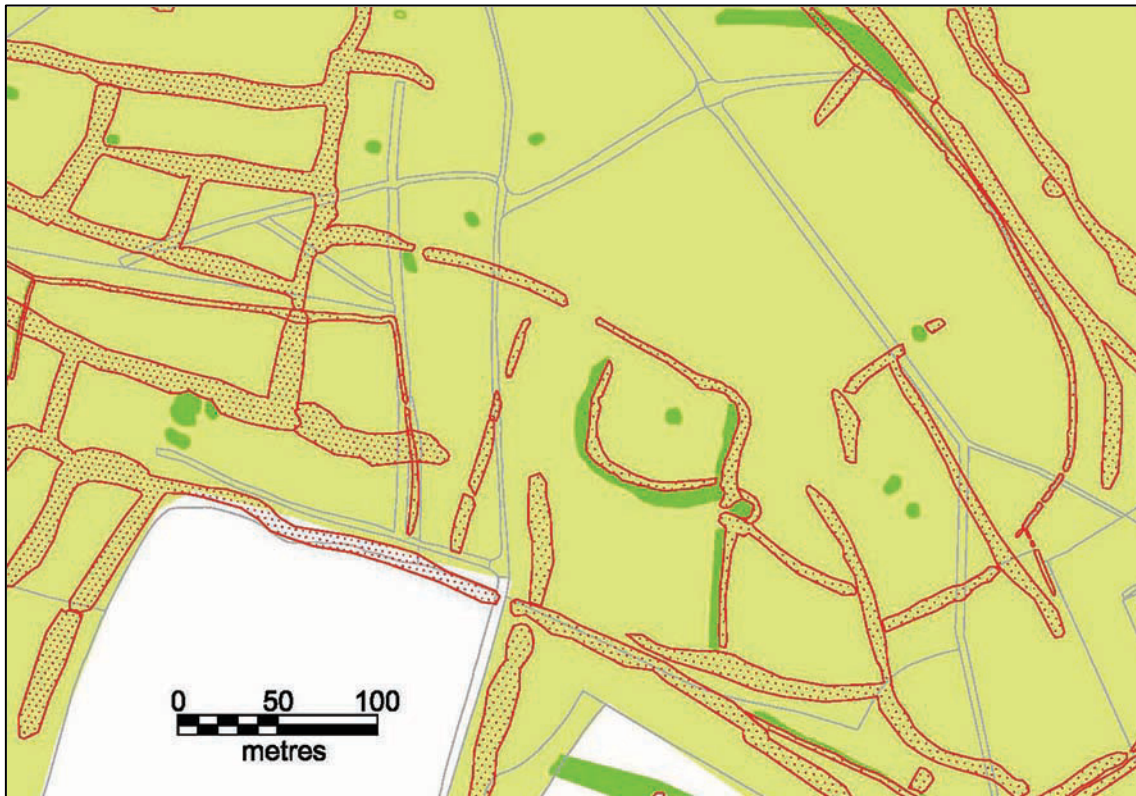


Figure 33 Map illustrating a possible settlement enclosure within Nore Wood Iron Age field systems. Base Map © Crown Copyright and database right 2015, all rights reserved. Ordnance Survey Licence number 100024900.

Potential prehistoric settlement sites, sometimes with associated tracks, were identified elsewhere across the High Woods survey area. These usually comprised small enclosures that appeared different from the surrounding fields – and an example can be seen at Nore Wood, Eartham where a single distinct sub-rectangular enclosure sits within the probable late Iron Age/Roman field system (Fig 33). Elsewhere, settlements may be indicated by clusters of enclosures defined by more curved boundaries, although these could be a different form of fields. The smaller sites were typically a curvilinear or D-shaped enclosure located in and partly defined by the field banks. As most of the field systems are believed to date from the Iron Age onwards, it is likely these were Iron Age or Roman settlements set within their fields. However, there may be Bronze Age settlements fossilized within the later Iron Age/Roman field systems.

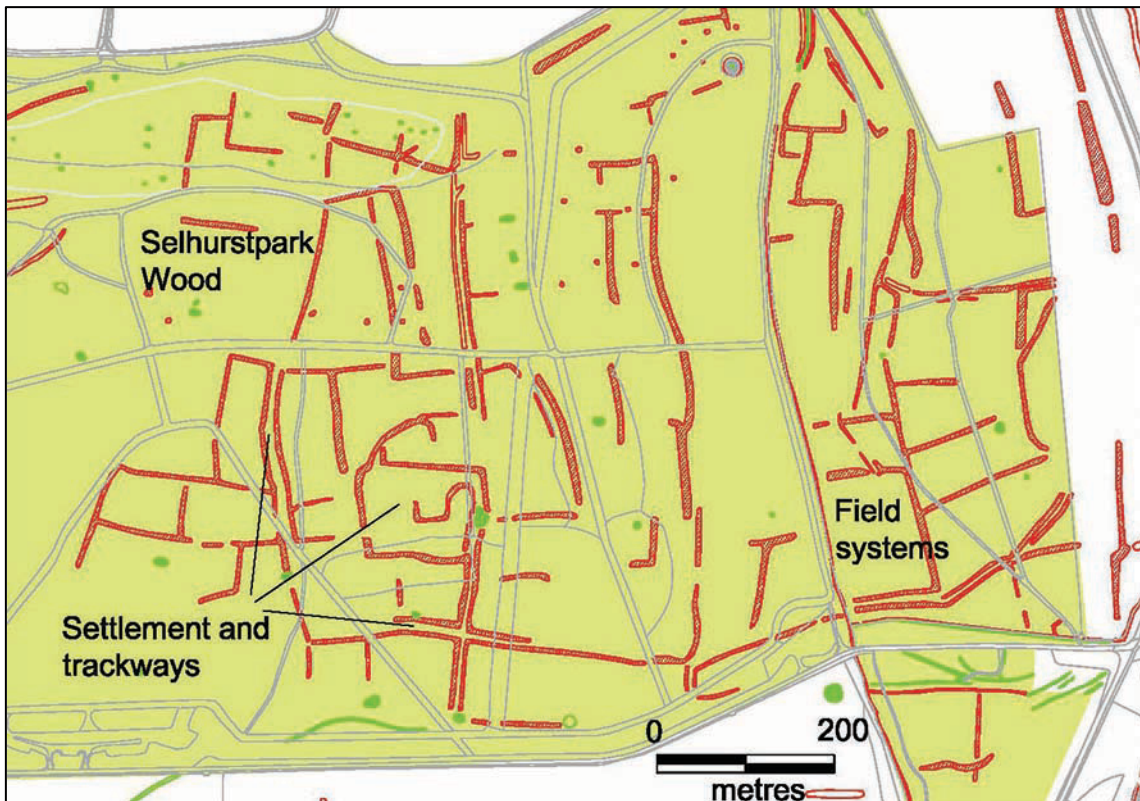


Figure 34 Map illustrating a probable Iron Age or Roman farmstead within a grid of trackways, set within an extensive fragmented field system in Selhurstpark Wood. Base Map © Crown Copyright and database right 2015, all rights reserved. Ordnance Survey Licence number 100024900.

An example of a potential substantial Iron Age/Roman settlement was identified within the woods of a former deer park at Selhurstpark Hill (Fig 34). The settlement enclosures were set amongst fields. Of note is the grid of tracks defined by parallel banks that form a crossroads and a large sub-rectangular enclosure. This may predate many of the surrounding earthworks including the track that appears to have changed direction to pass along the enclosure's eastern side. The presence of so many tracks suggests this might be more than just the meeting of ways but that they were associated with this settlement. The embanked enclosures beyond, though fragmented, are probably the remains of the fields. The tracks can be seen extending out through these fields in three directions, north towards the weald, east and south towards the coastal plain.

Case study - Dales Down, Rewell and Madehurst Woods

In the eastern end of the High Woods area, a tract of woodland is sub-divided into parcels known as Dales Down, Rewell Woods and Madehurst Wood. Here, three complexes of rectilinear enclosures were first written about by the Curwens in the 1920 (Curwen & Curwen 1920). These significant earthworks

probably represent settlement and/or stock enclosures – essentially a farm and farm yard - linked by tracks and ditches extending across the hillside (Fig 35).

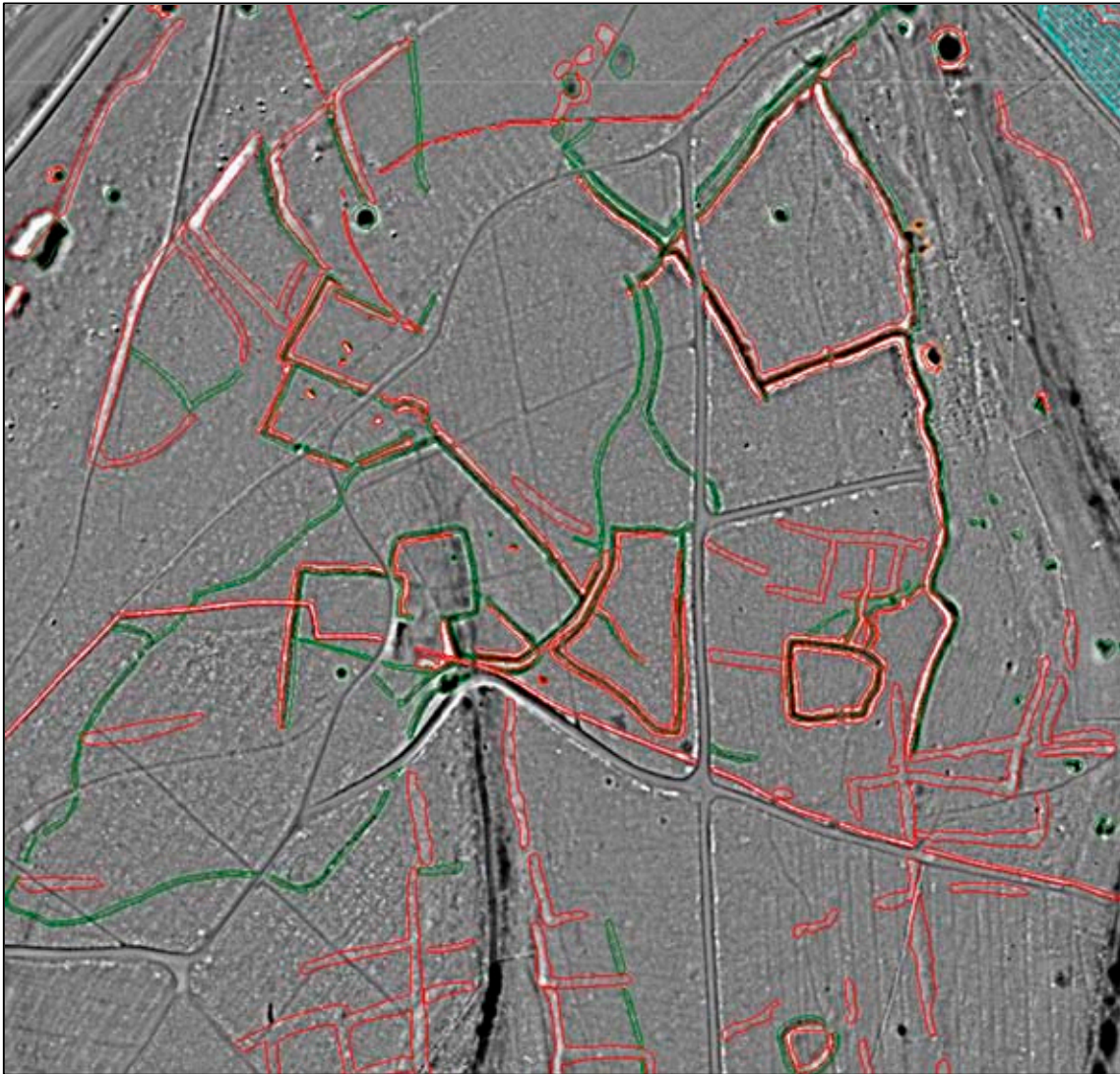


Figure 35 Map over lidar visualisation (LRM) of possible Late Iron Age/Roman settlement enclosures and trackways amongst earlier fragmented field systems at Dales Down. Lidar © Copyright Fugro Geospatial and South Downs National Park Authority

The enclosures and associated tracks were probably established in an existing field system, as they clearly overlie a number of earlier field boundaries. Whether the remaining earlier fields continued in use in this later phase is unclear, but considered likely. The Dales Down enclosures were ‘tentatively’ excavated in 1919 yielding a few sherds of early Iron Age pottery and a piece of Roman amphora thought to have come from the surface (Curwen 1929b, 138). The spread of dates from the few finds suggests longevity of occupation, possibly indicating the presence of an earlier phase of occupation obliterated by the later enclosures.

The enclosures to the south located within Rewell Wood and Goblestubbs Cope are probably of a similar age based on their morphology (Fig 36). They have been described in the past as medieval, largely on the basis of their good preservation, but recent excavation has firmly dated the Goblestubbs to c AD 20-60 at the very end of the Iron Age/beginning of the Roman period (McOmish and Hayden 2015). The function of the Goblestubbs enclosures themselves is less clear, but they may represent high status settlement enclosures with associated corrals and droves attributed to the tribal leaders around the period of the Roman conquest (ibid). Furthermore, the earlier field system overlain by these enclosures along with a scooped potential settlement enclosure described by Curwen as a 'circus' are now believed to be attributed to the mid Bronze Age (ibid).

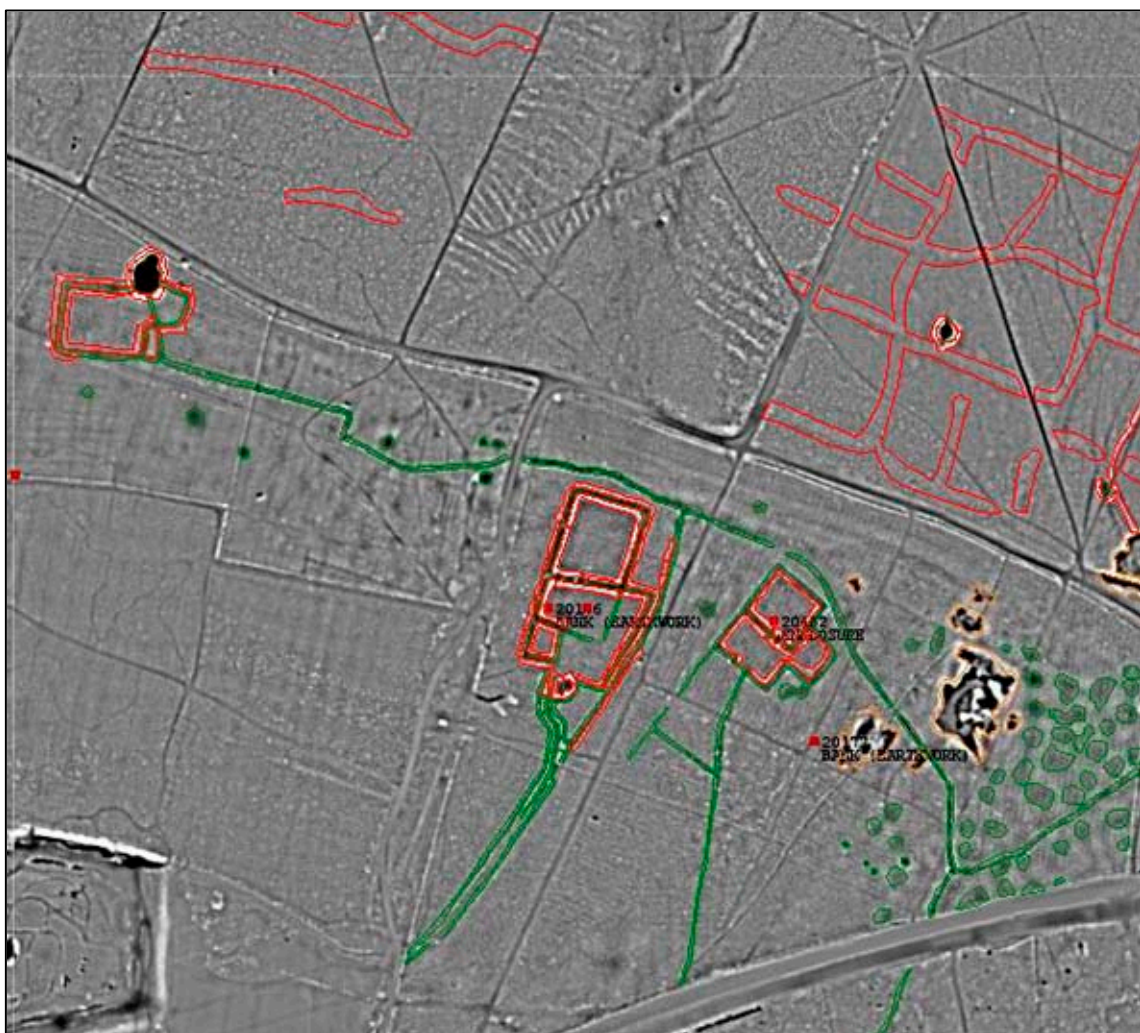


Figure 36 Map over lidar visualisation (LRM) of possible Late Iron Age/Roman settlement enclosures and trackways amongst earlier fragmented field systems at Goblestubbs. Lidar © Copyright Fugro Geospatial and South Downs National Park Authority

With this in mind, the lidar survey has identified a group of enclosures on the edge of the fields systems in Madehurst Wood, immediately to the west of the enclosures in Rewell Woods that would warrant further investigation. Their appearance and alignment differ from the adjacent field system suggesting a differing function, possibly representing the remains of another earlier settlement or farmstead associated with the fields (see enclosure B in Fig 38).

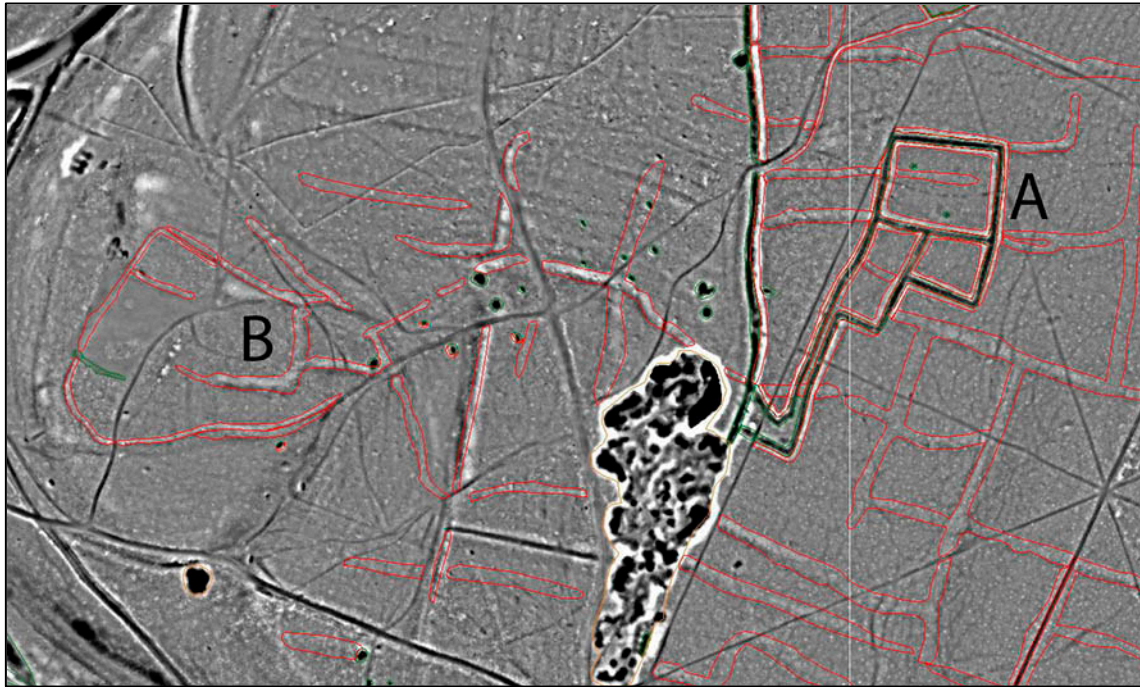


Figure 37 Map over lidar visualisation (LRM) depicting the probable Late Iron Age/Roman settlement enclosure and trackway (A) within earlier (possibly Late Bronze-Iron Age) fields and the adjacent enclosures of a possible earlier settlement enclosure (B) in Madehurst Woods. Lidar © Copyright Fugro Geospatial and South Downs National Park Authority

Case study - Arundel Park settlements

In the eastern part the High Woods survey area, there are substantial earthwork remains of a well-defined embanked track, associated settlement and fields in Arundel Park to the west of Arundel. An Iron Age/Roman settlement site is probably indicated by a D-shaped enclosure on a south-facing bluff among fields. In addition, the embanked track (of the type referred to by the Curwens as 'terraced ways') cuts north-south through the fields towards the enclosure where it enters the northern end and exits via the eastern side. The D-shaped enclosure coincided with the site of a former copse and so could be a much later feature. However, quantities of Roman pottery including amphora fragments were found in tree throws following a storm (James Kenny pers comm) which supports the idea of the plantation being placed within a much earlier existing enclosure.

At the southern end of Arundel Park, in the area known as Shepherd's Garden, the remains of a Roman building was excavated by the Littlehampton Nature and Archaeological Circle in the spring of 1931 along with a number of the surrounding features including two Bronze Age barrows (Frazer Hearne 1936). The site had occupied from c 50BC abandoned in the 3rd-4th century AD (Frazer Hearne 1936).

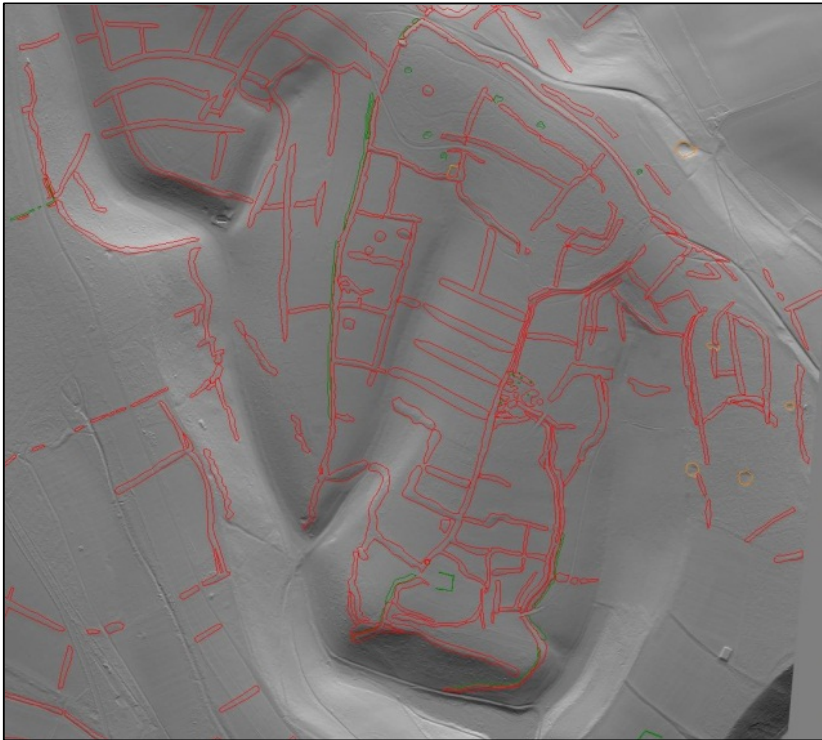


Figure 38 Map over lidar visualisation (hillshade) of settlement and fields at Shepherd's Garden, Arundel Park. Lidar © Copyright Fugro Geospatial and South Downs National Park Authority

There are distinct similarities in appearance form and location of this site to the documented settlement and field systems at Park Brow on the South Downs near Sompting in East Sussex. Work here in the early 20th century revealed a small village of Bronze Age huts, and further up the hill traces of a subsequent Iron Age settlement within an enclosure (Curwen, 1929, 89-92). This later settlement lay within fields adjacent to an incised track between two parallel banks. At the foot of the hill a Roman settlement replaced the earlier Iron Age occupation and continued to adapt the fields and trackways until the end of the Roman period when the site abandoned No remains of Bronze Age fields could be positively identified suggesting the later Iron Age field systems had obliterated all but a few lynchets (ibid).

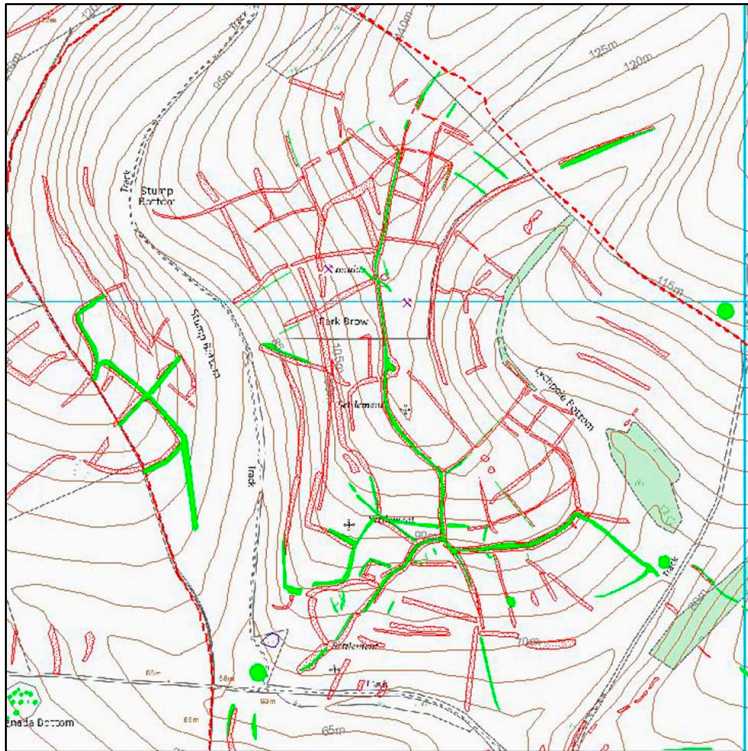


Figure 39 Extract of Worthing-Weald NMP map of Park Brow, Sompting. Base Map © Crown Copyright and database right 2015, all rights reserved. Ordnance Survey Licence number 100024900.

Case study - Middle Iron Age Farmstead at Carne's Seat, Goodwood Park

A number of potential buried later prehistoric settlement sites have been identified from cropmarks in the non-wooded areas. Some of these sites appeared in areas once covered by the earthwork traces of later prehistoric fields, and so may pre-date the fields, although this is hard to ascertain from aerial photographs alone. Some settlements appeared to comprise a single rectilinear enclosure, with or without associated ditches and tracks that may be small farmstead settlements, and others were more complex, probably multi-phase settlements. Although most of the enclosures probably indicate the sites of settlement, it is possible that some performed another function, such as stock enclosures. Few have been excavated or studied in any detail.

One interesting site is the large triple-ditched enclosure at Carne's Seat, Goodwood Park (Figs 40-41). Excavation suggested it is a middle/late Iron Age farmstead or settlement (Holgate 1986, 35). So far, it appears to be a unique site type in the High Woods area and is therefore of significance. The buried remains of the site appear particularly clearly as cropmarks in grass on aerial photographs taken in 1995. It comprises three concentric irregular rectilinear enclosures defined by ditches of variable thickness. The inner two enclosures appear to have aligned entrances towards their south-west corners. A break in

the ditch at the north-western corner of the outer enclosure may be an entrance and is possibly linked to a double-ditched track that extends to the south-west. Another probable later prehistoric or Roman settlement and field system is to the east and south-east of the enclosure, but it is not clear if there is any relationship between them.



Figure 40 Cropmarks in grass of the buried remains of the triple-ditched late Iron Age settlement enclosure at Carne's Seat, in Goodwood Park. NMR SU 8809/16 NMR 15380/36 15-AUG-1995 © Crown copyright Historic England

The large enclosures at Carne's Seat have been described as a banjo enclosure (Holgate, 1984, 48), but there is no clearly defined funnel entrance to warrant this description. However, the arrangement of the enclosures, and their entrances, suggests carefully controlled access to the inner two enclosures.

Field walking at Carne's Seat, yielded finds from the late Bronze Age to the Roman period, but the main period of occupation falls within the middle to late Iron Age when the enclosure ditches were cut (Holgate 1986, 40). The ditches themselves are substantial V-shaped ditches cut into the chalk bedrock, that of the inner enclosure measuring c.8m across and 3.5m deep. An inner shelf within the ditch was interpreted as the footings for a timber revetment. The two outer ditches, also V-shaped in profile, were less substantial. The finds analysis suggests the assemblages to be indicative of a mid-late Iron Age farmstead enclosure (Holgate, 1984, 41-48).

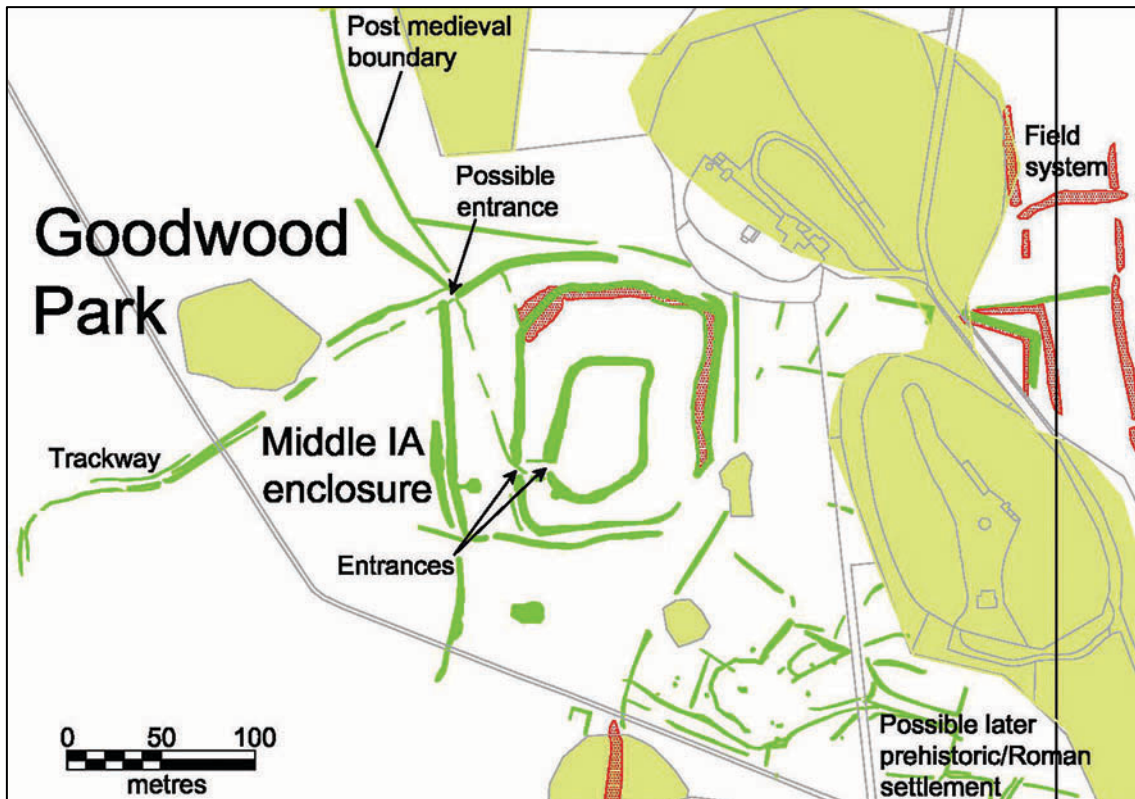


Figure 41 The transcribed remains of the middle Iron Age enclosure and surrounding features at Carne's Seat in Goodwood Park. Base Map © Crown Copyright and database right 2015, all rights reserved. Ordnance Survey Licence number 100024900.

The Excavations suggested that the site was remodelled and occupied through the Roman period. There were significant amounts of pottery from the 1st-2nd and 3rd-4th AD centuries present in the plough soil across the site and in the upper fills of the central enclosure. This may be the remains of settlement or evidence of cultivation and manuring, or perhaps a farmyard complex used for corralling stock (Holgate, 1984, 48-49).

Case Study- Chalkpit Lane and Bexley Bushes

Another site of particular interest is the Iron Age settlement at Chalkpit Lane adjacent to Bexley Bushes, in the south east of the High Woods area (Fig 42). This site appears as a cluster of sub-rectangular ditched enclosures, possibly relating to a settlement, around which are the fragmented traces of further boundaries and a number of trackways or droves. These tracks include a broad double-ditched drove or trackway extending north-south in the direction of Chalkpit Plantation, which has at least two side branches and a number of fragmented tracks leading into the site from all directions. The site has been excavated (Kenny 1993, 28) revealing the tracks and enclosures which are visible as cropmarks, as well as numerous features which could not be seen on

aerial photographs such as Neolithic and Bronze Age pits, at least 13 late Iron Age round houses, a series of medieval fields and associated trackway. This site illustrates the importance of excavation, which has repeatedly demonstrated that most sites have multiple phases, representing centuries of occupation, reuse and redevelopment. Bronze Age finds are ubiquitous across the downs, suggesting it was widely settled and farmed but actual settlement remains and conclusively dated fields are rare. The difficulty in identifying these sites may in part be due to the frequent settlement shift that is thought to have taken place during the Middle to Late Bronze Age meaning sites leave more ephemeral traces. Some settlement remains may have been destroyed following intensification of farming in the middle to late Iron Age (Kenny pers comm).

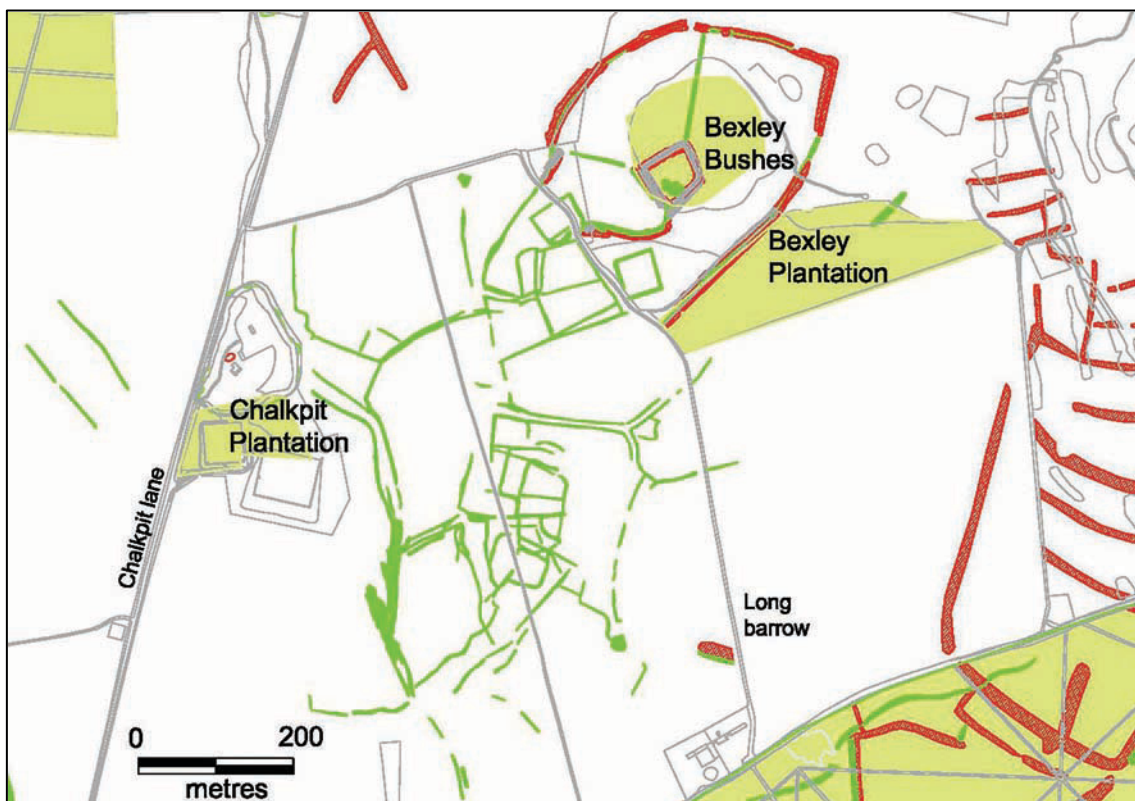


Figure 42 Map of the large multi-phase settlement at Chalkpit Lane (visible only as a cropmark) and the earthwork enclosures at Bexley Bushes, Lavant. Base Map © Crown Copyright and database right 2015, all rights reserved. Ordnance Survey Licence number 100024900.

The north-eastern end of the settlement site at Chalkpit Lane extends into the golf course at Bexley Bushes where the earthwork remains of a scheduled supposedly medieval rectilinear enclosure lies within a large sub-circular embanked enclosure (Schedule No: Sussex 42). A second square enclosure existed to the south of the central one, but this has been levelled and is now only visible as a cropmark. The surviving rectilinear enclosure is linked to the outer enclosure by three radial ditches, but it is not clear if all elements of this complex of enclosures and ditches are contemporary. The suggested medieval

date is based on this sites similarity to the earthworks of a medieval settlement at Henley Wood, Chelsham, Surrey (Allcroft 1916, 65-8). Cecil Curwen however, writing in 1929, was uncertain how to classify these 'curious' earthworks (Curwen 1929b, 139). The High Woods survey shows one of the ditches associated with the multi-phase Chalkpit Lane settlement in the adjacent field to the south-west extending into the golf course where a portion survives as an earthwork ditch with traces of an inner bank (Fig 42 A). This abuts the outer enclosing bank and ditch of the Bexley Bushes complex, but is clearly not part of the enclosure and the sequence of construction isn't obvious from the lidar and aerial photographs. It is likely that the site represents a number of phases with possible re-use and adaptation in the medieval, perhaps as a hunting lodge site. What is clear is that more is understood about the settlement site visible as cropmarks to the south-west than the adjacent extant earthwork site.

The reuse of field boundaries

The extensive archaeological earthworks in the High Woods clearly illustrate many phases of activity from the prehistoric to modern periods. This time-depth means that in addition to comparison with their contemporary landscape, field boundaries can also be related to earlier and later features in the landscape. They can also be compared with Yeakell & Gardner's Sussex map 1778-1783, which depict actual field boundaries rather than simply being a diagrammatic representation (Kingsley 1982, 92). The aerial survey has provided examples of earthwork reuse, but also highlights the large numbers that were ignored by subsequent farmers. The choices made by these men and women as to what elements were reused and what was disregarded poses questions about how this landscape was utilised at different points in time as does the survival or otherwise of these earthworks; the results from this survey are a contribution towards answering some of them.

Selective reuse

Although the prehistoric or Roman field systems across the project area are best preserved within woodland, some of these earthworks have been identified in fields such as those seen near Lamb Lea in Brockhurst Bottom (East Dean) or around Tegleaze (Graffham). These do not survive as well as those seen within the woods and cannot always be confidently identified because of their similarity with fragments of later fields, but earthworks within an area known as The Gumber (Slindon) do appear to be part of the larger ancient field system (Fig 43). One current field boundary is an example of the continued use of a prehistoric or Roman field boundary. This boundary is well established and is depicted on Yeakell & Gardner's 18th century map of the area. At the north-western corner of The Gumber what appears to be a 19th century extension to

North Wood, which uses an old field boundary as its eastern limit. The reuse of earthworks was selective and these two examples must be contrasted with the large number of old earthworks identified within The Gumber that have been ignored by modern and 18th and 19th century field boundaries. A similar selective re-use of ancient field boundaries is also seen at Lamb Lea (East Dean) and at Selhurst Park (Eartham) where the remains of three fields of possible of ridge and furrow in places are constrained by the older earthworks and elsewhere cut across these older boundaries.

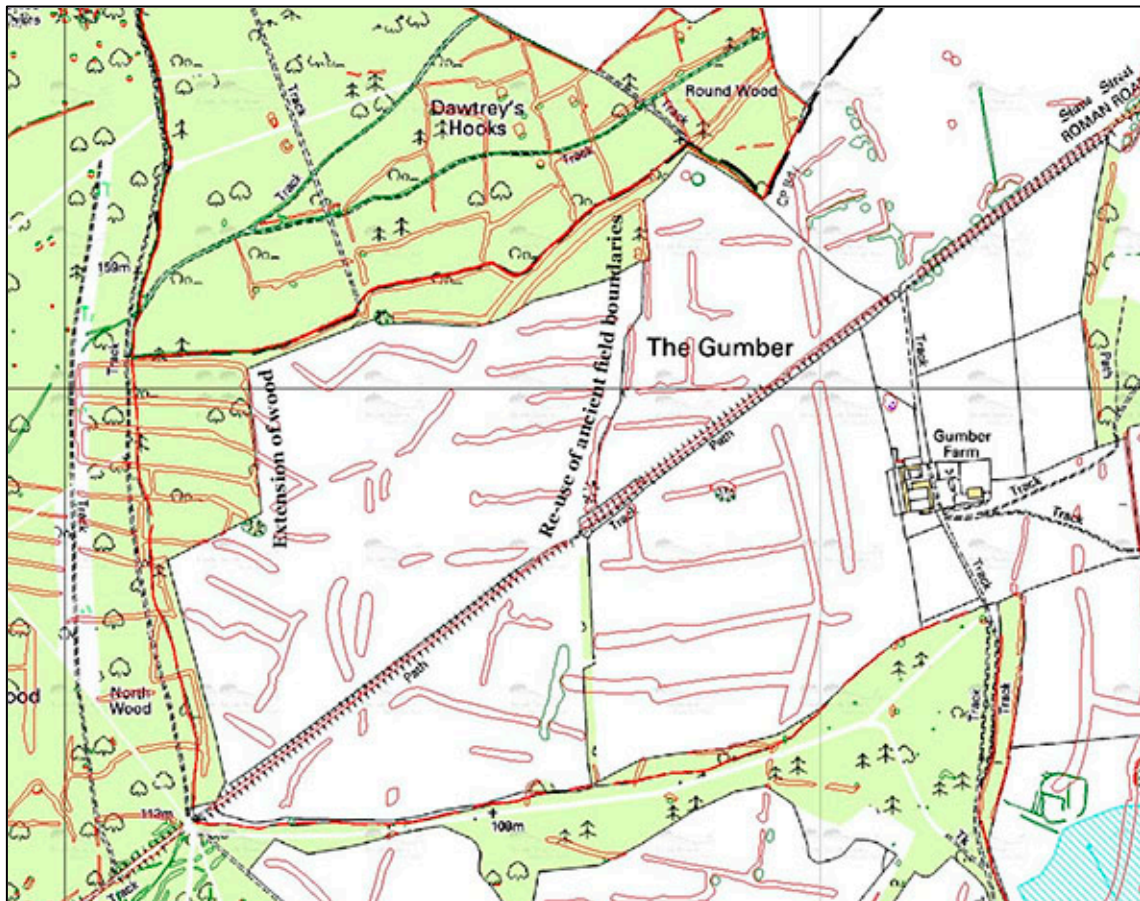


Figure 43 Current field boundaries aligned on earthworks of prehistoric or Roman field boundaries. Base map © crown copyright and database right 2016. All rights reserved. Ordnance survey licence. 10050083

Case Study - Early medieval settlement and landscape on Church Down

The extensive cropmark and earthwork remains of a field system are located to the north, south and west of Church Down (Fig 44). These largely consists of parallel banks and ditches c 40m-50m apart on a north-west/south east alignment that can be traced intermittently for almost 1km.

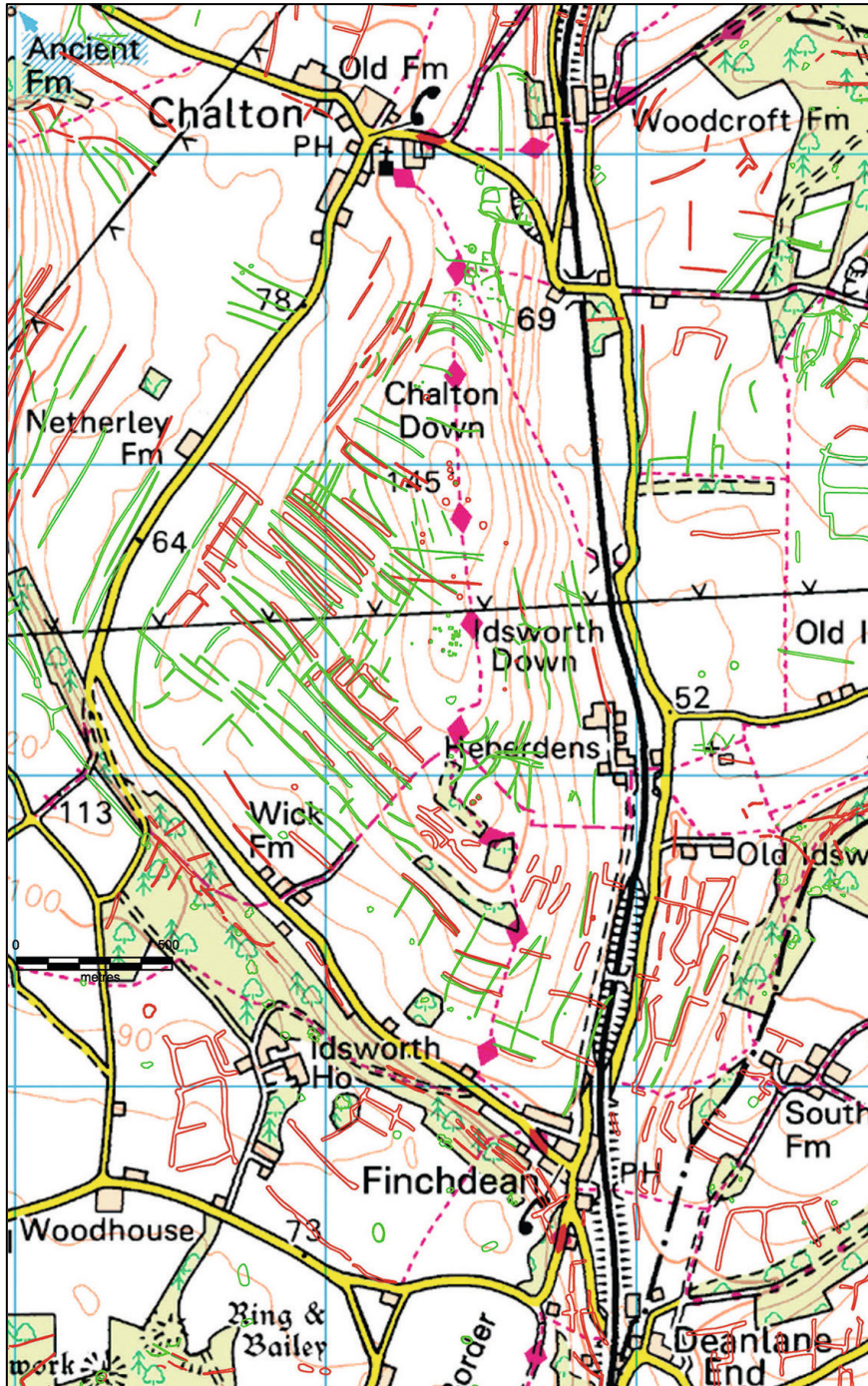


Figure 44 The site of an early medieval or Anglo-Saxon settlement on hill top to the west of Idsworth Down surrounded by the remains of prehistoric field systems. Base map © crown copyright and database right 2016. All rights reserved. Ordnance survey licence 10050083.

Some shorter banks or ditches at right angles link these features suggesting that this is a prehistoric field system in which most of the shorter boundaries have been lost or removed. Although these are nominally on the same alignment there is a slight variation and in places banks and ditches cut each other. This indicates that not all the banks and ditches are contemporary and they may

belong to at least two separate periods or phases of cultivation. Towards the centre of the field system the remains have the appearance of ridge and furrow and so may be medieval or early post medieval in date. These are concentrated within an area (now largely incorporated into one field) thought to have been brought into arable cultivation in the late medieval and early post medieval periods (Cunliffe 1972, Fig 5). These presumably overlie prehistoric or Roman fields on approximately the same axis. The remains of these earlier fields can be seen to the east and south-east either in areas of downland or in an area of waste colonised in the medieval and post medieval period (ibid).

On the crest of Church Down, south of Chalton, an early medieval settlement was identified, through collection of surface finds in ploughed fields, during field walking undertaken during the 1960s and early 1970s. This yielded abundant finds over an area of 6 hectares across the hilltop. Approximately 8% of the estimated site was excavated in 1971-72 revealing a number of timber built houses and buildings with a number of phases. The small finds suggest a 6th-7th century date for the settlement and it is suggested that the site had been abandoned by the 9th century (Addyman & Leigh 1972, 17; Cunliffe 1972, 5).

Approximately 1km to the north of Church Down settlement, and contemporary with it, is the scheduled pagan Anglo-Saxon cemetery a little to the east of Chalton.

The excavators at Church Down noted areas of disturbance across the site which appeared to be related to ploughed-out field banks visible on air photos (Addyman & Leigh 1973, 3) although no plan of these features was reproduced and no aerial photograph references given by the excavators. The relationship between these field system remains and the Anglo-Saxon settlement was far from conclusive, although where it was possible to demonstrate 'most seemed to be earlier' than the settlement (Addyman & Leigh 1973, 3).

Medieval settlement and cultivation

Deserted and shrunken medieval settlements are concentrated on the downs and the coastal plain although there are fewer known sites west of Arun (Pennington & Platt 1999 map on page 49). None are known within that part of the project area within Hampshire. A history of the study of deserted medieval settlement up to the end of the 1960s in both East and West Sussex was compiled by G Burleigh - although the focus of his own work was on East Sussex (Burleigh 1976).

A list of deserted settlement sites was compiled and eventually published in *Deserted Medieval Villages* (Beresford & Hurst 1971). These entries were based on fieldwork and also documentary research and with the result that some sites are only known through documents while a smaller number of sites identified in the field have no corresponding documentary record (ibid, 56). Some of this variety is reflected in the deserted settlement sites recorded within the project area.

During the course of the High Woods Survey the earthwork traces of a handful of known medieval settlements were identified on lidar and aerial photographs. The most extensive site is probably the earthwork remains situated in a coombe on the western edge of Monkton Wood in the parish of West Dean. These earthworks are thought to be the remains of Wenden, a settlement documented in 1348 that had been reduced to one property by 1608 (Aldsworth 1979). Fragmented earthworks of settlement shrinkage were also seen at previously identified sites of Walderton (Aldsworth & Harris 1982) and Lordington, which is one of the few Sussex sites to be assigned a period of desertion (c 1350-1450) (Holden 1962, 315).

A deserted medieval settlement identified through documentary research at Up Marden had only poor earthwork survival when visited by E Holden (Holden 1962) and a 1971 field visit could find no certain evidence of desertion. Holden placed the remains to the north-east of the church and slight earthworks identified on lidar there appear to relate to field boundaries depicted on historic maps. The lidar also revealed a series of banks to the east of Up Marden Farm. These are not well preserved but may be property boundaries. Further remains seen as cropmarks and slight earthworks to the south of the church are boundary banks defining fields or paddocks, the smallest (45m by 22m) perhaps representing the boundary of a farmstead.

A deserted medieval settlement at Duncton centred on SU 960 170 was listed by Holden based on very poor documentary evidence and perhaps not visited as no archaeological classification given (Holden 1962, 314) and no definite remains of building plots or houses were identified during subsequent field work (Haselgrove 1964, 6; NRHE 249321). A 1608 map (a detail of which is

reproduced in Yates 1982, Fig 2) depicts some buildings close to that location and further south near the since demolished church. This indicates that there has been some settlement shrinkage and this map may have been one of Holden's sources. The field work undertaken in the early 1960s noted the remains of a watermill approximately 200m to the east of Denyer's Pond (Haselgrove 1964, 6). The High Woods survey has mapped the remains of a dam from a second pond between Denyer's Pond and the site of the mill. Immediately to the south-east of this are the earthwork remains of another dam forming a third pond once fed from the pond to the west of Manor Farm. Neither of these now dry ponds is depicted on the 1608 but they appear on the 1837 tithe map.

Medieval and post medieval cultivation

This survey has identified areas of medieval and post medieval ridge and furrow, generally these form single blocks of arable but in a few cases the remains consist of a group of interlocking blocks. A good example of this can be seen to the east of the house within Goodwood Park, which may have been created in 1540 (VCH 1953). The ridge and furrow clearly cuts across even fainter earthwork banks, thought to be prehistoric or Roman field systems, and is in turn cut by drives and paths associated with the house, including Park Road that passes in front of the house and another to the south that fell out of use between 1897-1912. The northern edge of one block of ridge and furrow is crossed by the perimeter of the cricket ground. This boundary of the former arable field appears to be depicted as a line of trees on Colen Campbell's 1725 estate map (Connor 1979, Plate 2).

Ridge and furrow has also been identified within Houghton Forest and within Wildham Wood. Both Houghton Forest and Wildham Wood are considered to be ancient; that is, the area (irrespective of the age of the trees) has been wooded since at least 1600 (Hume & Grose 2010). These examples indicate that at some point during the middle ages these areas were arable, although this may represent periodic ploughing of woodland areas, and so allow some detail to be added to the understanding of land use there.

Both areas of ridge and furrow are situated at the periphery of their respective parishes, although in Houghton's case, the village's position between the river Arun and the scarp slope of the Downs means there is little suitable ploughland close to the settlement. In some cases some of the apparent ridge and furrow may be the remains of forestry work.

The potentially destructive nature of ploughing can be illustrated by an example within Whiteways Plantation. Here there are the faint remains of what may be medieval or post medieval ridge and furrow. The ridge and furrow that makes

up this single block describe the typical reverse-S pattern and overlies part of a possible prehistoric enclosure. The degree of survival of this enclosure bank is noticeably poorer where it coincides with the ridge and furrow.

The fragmented survival of 18th century field boundaries at Madehurst appears to be the result of later ploughing and particularly associated with field amalgamation. The degree of earthwork survival is more fragmentary than that in the area immediately to the west within Dale Park, created in the 1780s. The park appears to have ensured the better survival of earthworks. Similar survival is seen within other parks (e.g. Goodwood) or woodland (e.g. Houghton Forest; Wildham Wood) and suggests that most of the ploughing that levelled these earthworks was undertaken in the 19th century or later.

In other areas the fragmented earthwork remains identified on lidar can sometimes be equated with the field boundaries depicted in the 18th century. Not all of the earthworks can be confidently linked to the late 18th century field pattern but these discrepancies may represent historic field amalgamation or localised inaccuracies in the 18th century mapping. As with the example at Gumber, some of these earthworks may have a prehistoric origin. At Madehurst the coincidence of a still current field boundary bank with the parish boundary may suggest that this is an early feature. Elsewhere similar field boundary remains that appear to relate to the field pattern depicted in the late 18th century can be seen at Phylliswood, West Dean and within an area south of Nore Wood.

The majority of earthworks seen within areas of fields in Yeakell & Gardner's map appear to be those post medieval boundaries, but it is possible that elements are older. Because many of these have been ploughed in 20th century the remains are fragmented and clear associations with the better preserved prehistoric fields within woodland are difficult to make.

MOVING THROUGH AND BEYOND THE DOWNS - ROADS AND ROUTES

The results of the mapping from aerial photographic and lidar survey show that the people who lived and farmed here were not only exploiting resources on the downs but had links to the Weald to the north and the Coastal Plain to the south. The mapping provides an opportunity to explore where and when routes developed and how people moved through the downs and beyond.

Excavated evidence from Bronze Age settlements on the South Downs suggests people were exploiting resources from both the Weald and the Coastal Plain. For example, excavations on the site of a Middle Bronze Age Farm on Cock Hill, north of Worthing showed that the inhabitants were using whetstones of Horsham Wealden origin and that they were eating cockles and mussels. Therefore, they were linked to both coastal and inland communities (Yates 2007, 53) which would suggest that there must have been established lines of communication between them. Many of the main route ways through this area, both ancient and modern, extend from south to north with far fewer crossing from east to west. This probably reflects a long standing need to provide access to a range of resources for people in this area, from Bronze Age settlements, to post medieval extra parochial land connecting woodland to a parish outside its bounds.

The evidence seen on aerial photographs and lidar for movement of people and animals across the downs took a number of forms. There are numerous examples of sunken lanes or deep hollow ways that gradually formed through prolonged use. Other routes are the result of programmes of road building, for example, Stane Street Roman road, which survives as a substantial raised earthwork. There are historic designed roads such as the turnpikes constructed during the 18th and 19th centuries and many of these relatively recent roads remain in use. There is evidence of longevity of some routes (or sections of them); for example, many current footpaths follow the line of earlier hollow ways. The reuse of Roman roads in particular demonstrates their lasting effect on the landscape, where long stretches of Stane Street are designated as footpaths or bridal ways or the route of the Roman road was integrated into the modern road network, such as through Halnaker.

Through the use of the lidar and aerial photographs for mapping these routes we can start to examine change and continuity of route ways on a landscape scale. As with much of the evidence, relative chronologies can be established by looking at the relationship of routes to other features. The following discussion provides some examples of where the mapping can provide perspectives on land use on the downs. A significant discovery for the NMP phase of the project was the confirmation of the long-suspected route of the Roman road between

Chichester and Arundel. The lidar data revealed that sections survive as earthworks (see Case Study below).

Early droveways

Previous work on later prehistoric or Roman settlements and fields identified a type of track comprising a hollow way flanked by banks. This form suggested that the ground on each side was under the plough and therefore, the route ran within field systems and between settlement enclosures (Curwen 1954, 13). Recent studies suggested they were droveways linked to animal husbandry in a mixed farming regime (Yates 2007: 48) and probably connected areas of grazing land.



Figure 45 Tracks defined by double banks within field systems in Forest Hanger and Eastdean Wood. Base map © crown copyright and database right 2016. All rights reserved. Ordnance survey licence 10050083.

Comparable examples of these so called 'double-lynchet' tracks were identified within the later prehistoric field systems in the High Downs area. Numerous examples were recorded within the extensive field systems that lie to the south of the Ridgeway including within those seen Forest Hanger and Eastdean Wood (Fig 45). Other examples include a trackway identified along the eastern edge of Goodwood Park, and a trackway extending north from within Arundel Park. A Roman settlement at the southern end of Millpond Bottom, Elsted has a double-banked trackway extending from it to the north-west with field boundaries

leading off either side of it. These routes were probably used for the movement of stock between the different landscape zones to the north and south of the chalk downs.

Other routes seem to be influenced by the location of earlier features. Cross dykes, which probably date to the Late Bronze Age and Early Iron Age, are one such example. The purpose of these earthworks is unclear but many are located on the northern edge of the downs, sometimes adjacent to groups of Bronze Age barrows. The South Downs Way, following the ridgeway at the top of the Downland is a natural east-west route, but the path used today frequently cuts through groups of cross dykes. Examples can be seen, from west to east, on Linch Down, Cocking Down, Heyshott Down and Graffham Down. However, it has been suggested that the dykes were not intended as obstructions on the ridgeway and that their location does not suggest any defensive intent (Curwen 1951: 96).

The Curwens used the term 'covered way' to describe cross dykes due to the assumption that they were built as pathways that were hidden or covered by the flanking banks. There are some examples where the earthwork evidence may support this idea, for example where the cross dyke ditch appears to extend into Combe Bottom. However, it is contradicted by other examples such as the cross dyke on Linch Down East of Linch Ball. Here a path cuts across, rather than joins, the northern end of the cross dyke.

A cross dyke on Woolavington Down has a track extending from its southern end and this is a feature also noted by Curwen (*ibid*: 100). However, the track may only show the use of a pre-existing feature in the landscape and may not provide further information on the cross dyke itself. This raises the question of whether the cross dykes indicate the locations of lost routes, which can no longer be traced. They are on a similar alignment to the field systems below them but the relationship between the two is unclear. If they were connected, for example, with the movement of stock, a clear connection cannot be seen between them and the droveways that run through the field systems.

Roman Roads

Several sections of Roman roads were recorded across the High Woods project area, including Stane Street, the Chichester to Silchester road and the Chichester to Arundel road (see Case Study below).

Stane Street eventually ran from Chichester to London, but is thought to have its origins linking the Chichester Harbour (at Dell Quay) to the River Arun at Hardham (Russell 2006, 153). Excavation by the Curwens on Stane Street to the south-west of Gumber Corner revealed that the raised agger and the metalled

surface laid upon it were formed from layers of different local materials, including flint, chalk and gravel. Some Roman roads were centrally placed within a broad band of land defined by narrow ditches and these were noted by Lowther on a section of Stane Street between Chichester and Westhampnett (Lowther 1941: 112). E Cecil Curwen recorded side ditches in a section of the road surviving as an earthwork on open ground at the summit of the downs near Bignor Hill (Curwen 1954, 279).



Figure 46 The earthwork of the agger of the Roman road Stane Street looking south-west towards Chichester and the south coast. © Chichester District Council

Sections of Stane Street were recorded in the survey area from Halnaker to Bignor, cutting through later prehistoric or Roman field systems on Halnaker Hill and within Eartham and North Woods. The extant earthwork road was recorded in Selhurst Park and to the north-east of Bushy Copse as a linear bank.

As it continues to the north-east through Eartham Wood, linear ditches were visible on the ground at the summit of the Downs near Bignor Hill. (Curwen 1954, 279). It continues as a linear bank only through part of The Gumber to the north-east of the wood and then linear ditches or roadside quarries were again recorded as the road approached Bignortail Wood. These quarries were probably contemporary with the use of the road, excavated to provide materials for its repair.



Figure 47 A curving double-ditched Bronze Age track cut by the route of Stane Street Roman Road. OS 98031/276 08-MAR-1989 © Crown copyright. Ordnance Survey

There is still debate about how Roman roads were laid out over long distances (see Davies 2002, chapter 5 for a summary) and these have resulted in long straight lengths of road that in places cut-through earlier features. Examples of this in the project area have been discussed above (see above, Fields and Stane Street Roman road) but another example has been noted. Stane Street also cuts through a Bronze Age double-ditched trackway to the north of Maudlin (Fig 47). The trackway was dated during 1992 excavations on the A27 Westhampnett bypass by Wessex Archaeology.

The remains of five sections of the road connecting Chichester and Silchester were also recorded between Linchball Wood and to the north of Mid Lavant. The road runs from north to south and cuts through NW-SE aligned field systems. This is particularly clearly seen within Linchball Wood.

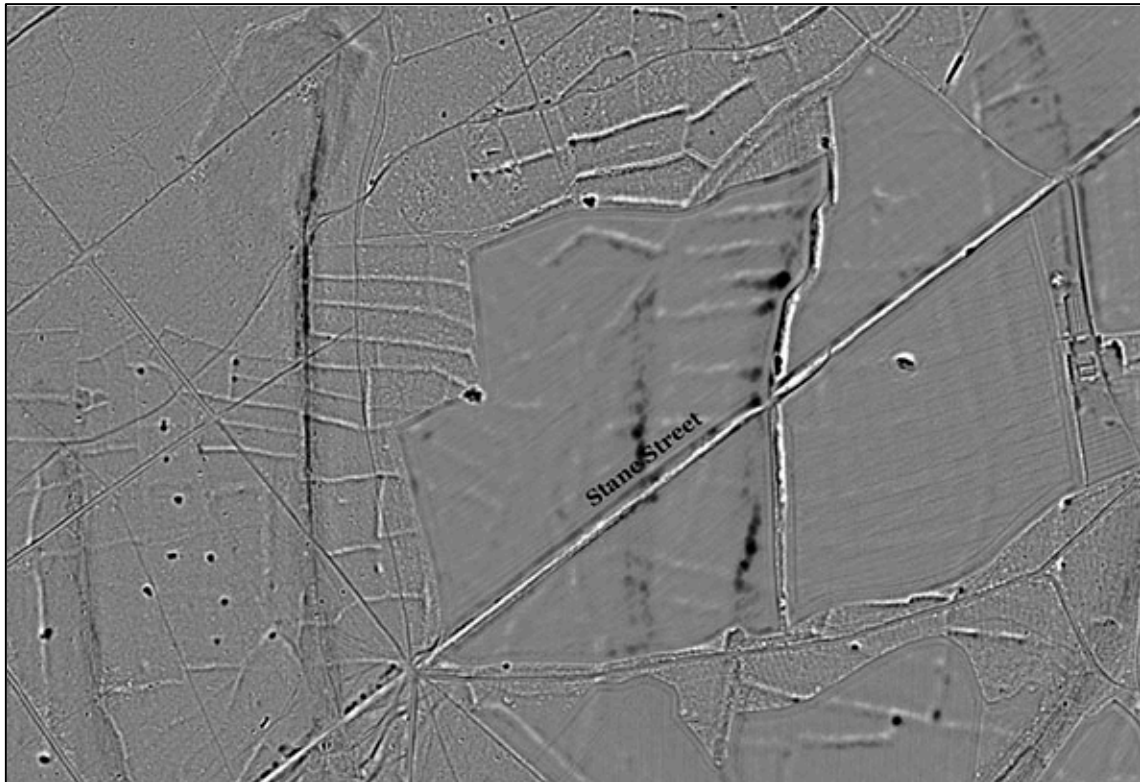


Figure 48 This lidar visualisation shows the earthwork of Stane Street cutting through the earlier field system © Copyright Fugro Geospatial and South Downs National Park Authority

Later droveways

A number of hollow ways and tracks identified during the project appear to relate to the medieval and later landscape. The examples below suggest where further work, field work and documentary research, could provide clearer chronologies and potential functions for some these routes.

Groups of hollow ways were recorded across the scarp edge of the downs near Bignor. These paths, incised in the landscape by their repeated use, may have been created during the medieval or post medieval periods. They link the settlements in the Weald to their land on the downs and among other uses would have allowed sheep to be moved from downland to arable fields. Some of these routes also formed longer distance routes and elements of these route ways are shown on the 1875 OS map, but are now largely to be out of use.

A hollow way, possibly in use from the medieval period up until the early 20th century, was recorded from photographs of 1946 at the northern edge of Halnaker Village, extending from Tinwood Lane. The ridge and furrow cultivation, also recorded from 1946 photographs, around the village of Halnaker, suggested that this route provided access to the open fields in this

area. Enclosure of farmland and the substantial change in agriculture that this brought about may have led to this part of the route going out of use.

An example of an abandoned route way and its replacement, can be seen to the west of Houghton. The road was bypassed by the Storrington to Ball's Hut, Walberton turnpike, now the B2139, by an act of 1812 (Johnson 1944, 108). The former route can be traced as an earthwork for a distance of over 1km to the west of Houghton. The turnpike road also cuts through post medieval field boundaries within Houghton parish. The tolls for this road finally expired in 1880 (ibid, 109).

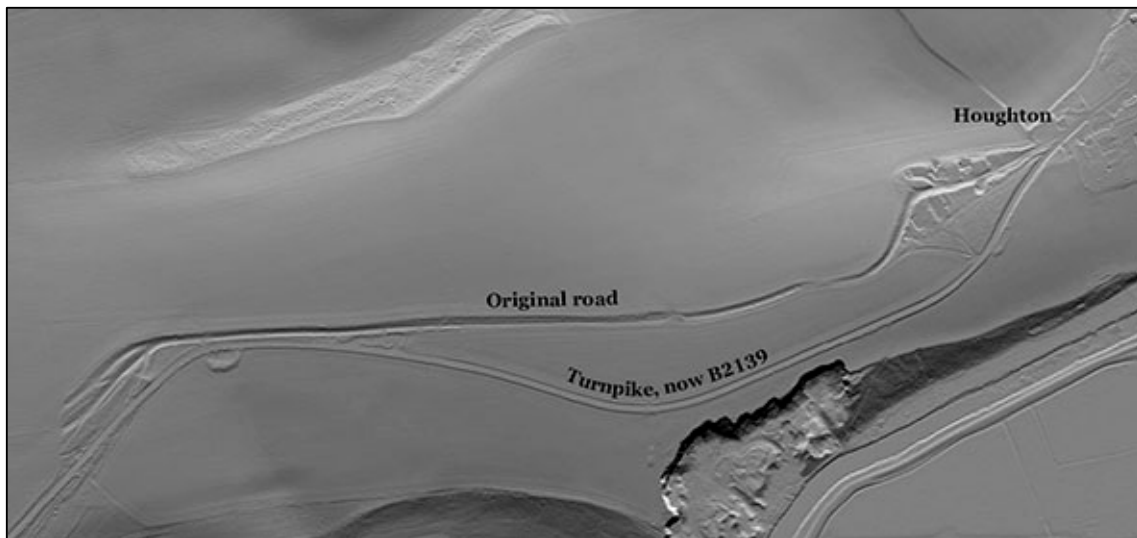


Figure 49 This lidar visualisation has removed the trees that cover much of the old road. The earthworks of the old road end abruptly at the western end (to the left) where they have been levelled by ploughing. Lidar © Copyright Fugro Geospatial and South Downs National Park Authority.

Some of the routes thought to be medieval or later in date were possibly associated with woodland management and woodland industry, such as charcoal production and chalk and clay quarrying (see *The Wooded Downs and Flints, Clay and Cobbles*).

Trackways which might have been in use from the medieval period onwards on the eastern slope of Bury Hill are truncated by a later quarry, although at least one track may have been retained as an access route. A trackway within Pond Copse to the north of Emsworth Common Road leads to a 19th century and early 20th century clay pit and may be either the access route for it, or be associated with management of the woodland.

Case Study: The Roman road from Chichester to Arundel

There is still much speculation about whether the invading Roman army landed first in Kent at Richborough or in the vicinity of Chichester in 43AD (Brandon 2006, 61). However, both locations featured as important early settlements in the Roman occupation of Britain in the decades following invasion. As Noviomagus Reginorum (Chichester) developed into an important town and port it was necessary to establish road links between other rapidly developing Roman centres.

In the first half of the 20th century, Ivan Margary set out to create a definitive catalogue of the routes of all the major and minor Roman roads throughout Britain (Margary 1955; 1957). He created a map of surviving, inferred and conjectured routes each allocated a unique number. Some were based on earthwork remains, alignments of current roads and boundaries, others purely speculative, where routes were thought likely to link major centres.

Chichester appears to have been well connected in the Roman period and several roads were constructed. Probably the most important was Stane Street (Margary 15), the military road linking the Roman towns of Noviomagus and Londinium (Manley 2002, 138). Stretches of this road remained in use with parts incorporated into the current road network. A second road (Margary 155) went northwards through the Lavant valley and up onto the Downs in the direction of Silchester town (Callewa). A third road (Margary 421) extended westwards from the town along the coastal strip in the direction Bitterne (Clausentum) the upper tidal reach of the Itchen River. The fourth route is a short spur road (Margary 156) headed due south of Chichester to the coast (Margary 1955, 30 map 1).

A fifth road has long been speculated to have run eastward from Chichester along the coastal plain (Margary 1947, 141). In the 1940s Ivan Margary investigated a number of potential routes avoiding the hills to the north and wetter ground to the south which he discussed in an article in *Sussex Notes and Queries* (ibid, 143-4). After consideration he discarded one suggested route following the Oving road eastwards out of Chichester, which though initially straight for the first couple of miles to Shopwyke, dwindled into winding footpaths.

His second and preferred route, which he numbered route 153, followed the established route of Stane Street heading NE out of the town, before branching off to the east at Westhampnett where he believed it followed the course of the former main road to Arundel, now superseded by the present A27 dual carriageway.

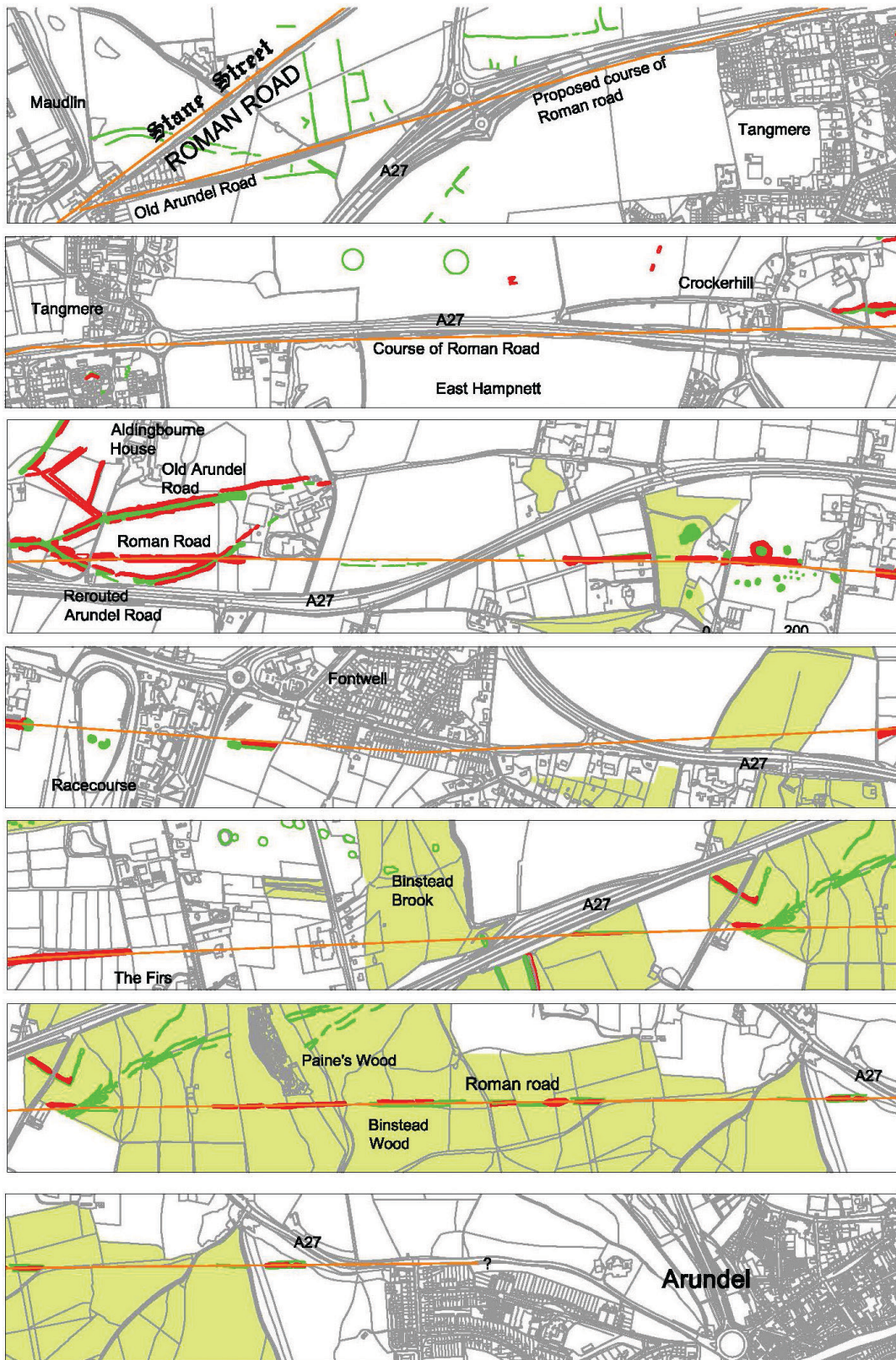


Figure 50 Sections of the Roman road (in red and green) between Chichester and Arundel seen on aerial photographs and lidar images along the proposed full route (in orange). Base Map ©Crown Copyright and database right 2015, all rights reserved. Ordnance Survey Licence number 100024900.

The old Arundel road was not entirely straight, curving gently to the north at Crocker Hill. Margary noted a line of trees crossing the park at Aldingbourne House marking the course of the old road, which had been diverted to the south of the park in the late 18th – early 19th century. His suggested Roman route proceeded via Alvisford, crossed the small, but steep sided valley of Binsted Brook at Binsted Brook Crossing before continuing on to Arundel via the old road that ran between Arundel and Torrington Common (Margary 1947, 143-4).

In the 1950s Margary published *Roman Roads in Britain*, cataloguing all known and conjectured routes of the Roman roads in two volumes (Margary 1955; 1957). He described the detailed course of Road 153 Chichester-Brighton, which essentially remained as he outlined in 1947, but with more conviction despite no solid evidence. In addition he noted details of the crossing point at Binsted Brook where he described a zigzag ascent out of the valley on the Arundel side and traces of metalling on the old road through Binsted Wood and Torrington Common (Margary 1955, 68).

The recent aerial survey for the Secrets of the High Woods project has at last identified the remains of this long speculated Roman road. Significant sections of the road's agger and side ditches were detected (as earthworks and cropmarks) for over 8km of the total 15km distance between Chichester and Arundel. No visible trace of the western section can be seen and it is suggested (and Margary suspected) that the former main road to Arundel followed the course of the Roman road to a point north of East Hampnett, west of Crocker Hill. It is also probable, from the alignment of the agger to the east that Margary was correct in his theory that the first section of the road utilised Stane Street, branching off in the vicinity of West Hampnett. Unfortunately, the new A27 sweeps in from the south-west obscuring much of the old road where it passed between Boxgrove and Tangmere. Prior to the construction of the Westhampnett bypass large areas of the site were excavated, but none of the excavated areas were near enough to the course of a Roman road to provide positive evidence.

At Crocker Hill the old road originally curved slightly to the ENE, deviating away from the straight course of the Roman road. The latter can clearly be seen crossing the park of Aldingbourne House as a linear embankment keeping the true E-W alignment between the old road and the course of the new A27. The Roman road is also cut by the later course of the old road where it was redirected around the park. After a short break just west of an old quarry, now a council depot on the eastern side of the park, the parallel side ditches of the Roman road can be traced as a cropmark in the field (now bisected by the sweeping course of the A27) east of Crockerhill. Traces of the agger are visible at the eastern end of this section, which runs along the northern property boundary of Downfields.

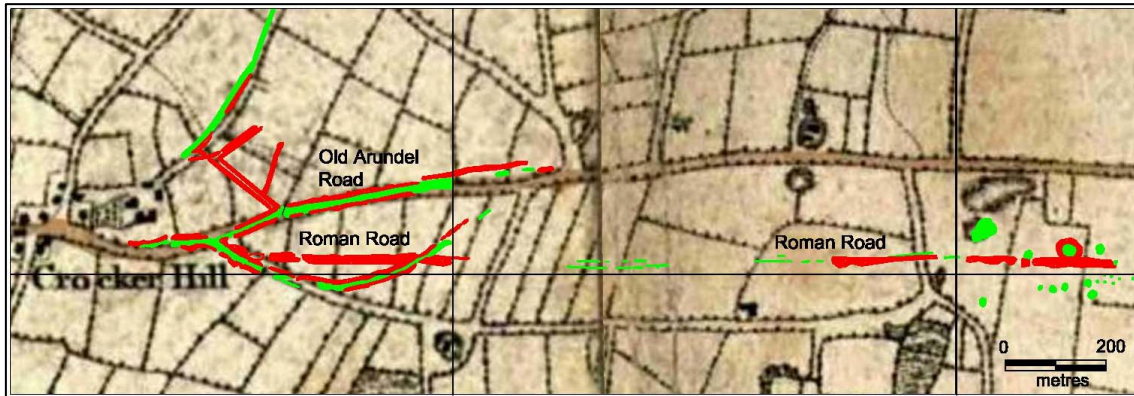


Figure 51 The course of the Roman Road east of Crocker Hill. Archaeological map from lidar overlaid on Yeakell and Gardener's 1778-83 map of Sussex. The Arundel Road was subsequently moved south in the late 18th-early 19th century when Aldingbourne House and park were established north-east of Crockerhill. Image © Dr Dominic Fontana University of Plymouth via Old Sussex Mapped website (http://www.envf.port.ac.uk/geo/research/historical/webmap/sussexmap/Yeakell_36.htm). Original held in WSCC HER.

Across the road it can be seen again in fragments in Westgate Woods, extending into the field to the west of Westgate House before disappearing beneath Westgate House close to where a late 2nd-3rd century Roman burial was unearthed in 1850 (Anon 1856, 288-9). Continuing east though the fringes of Fontwell, housing and the footprint of Fontwell racecourse have obscured a significant portion of the road, the next fragment being identified just east of the A29 south of the main road through Fontwell. From this point it is obscured beneath the centre of Fontwell and the old and new roads, but is possibly visible again as a section of agger followed by the boundary between properties to the north of the A27, immediately west of The Firs and Mill Road.

No trace of the road's crossing of Binsted Brook could be detected, possibly due to considerable disturbance from past quarrying and the cuttings for the A27. However, the remains of the road are visible again immediately east of the dual carriageway in Barns Copse. The next appearance is in Brick Kiln Wood immediately east of Binsted Lane. The longest visible stretch of the road can be seen as a distinct causeway through Paine's Wood where at its eastern end its course is picked up by a woodland track. This section of the road has been visited since the aerial survey and found to be a well-defined causeway with standing water visible in the side ditches (James Kenney pers.com). The A27 skirts the northern edge of Binsted Wood, curving to the SE and then eastwards along the course of the old Arundel Road. This last section is in direct alignment with the remains of the Roman road in the woods to the west, presumed to be a further section of the Roman alignment fossilised within the modern road network. From this point the course of the roman road into the Arundel is not clear.

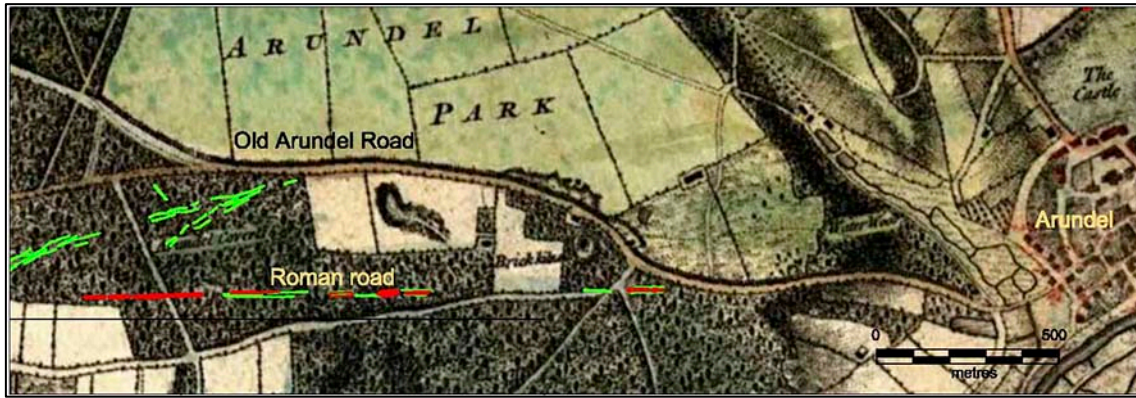


Figure 52 The course of the Roman road through Binsted Wood on the alignment of the last section of the old Arundel road. Archaeological map from lidar overlaid on the Yeakell and Gardener's 1778-83 map of Sussex. Image © Dr Dominic Fontana University of Plymouth via Old Sussex Mapped website (http://www.envf.port.ac.uk/geo/research/historical/webmap/sussexmap/Yeakell_36.htm). Original held in WSCC HER.

The course of the road appears to follow a band of marine gravel and cobbles, remnants of a Quaternary raised beach deposit. This may be a coincidental colocation of the road and a source of hardcore material, but gravels quarried from this particular marine deposit were used in the construction of Stane Street to the north, (Kenny, J pers comm) and it is likely that the Chichester to Arundel road also exploited this same source of aggregates. Extractive pits were recorded on either side of the road to the east of Crocker Hill, and it is possible that some could be contemporary quarrying associated either with the construction or later maintenance of the road surface.

The identification of this hitherto undiscovered (although speculated) section of Roman road is of considerable importance completing another portion of the region's Roman road network, it also provides context to contemporary sites including burials found adjacent to the course of the road.

Discussion

This survey has highlighted the variety of route ways across this part of the South Downs and remind us of the local and long distance journeys that people undertook. They connected people with the fields that they worked and allowed their animals to be taken to pasture. The routes connect with a wider network that allowed longer distance travel, but long distance travel is most obviously seen in the Roman roads that cross the project area such as Stane Street, which connected Chichester with London. Stane Street may have been built at the very start of the Roman period (Manley 2002, 138), but 18th century maps indicate that within the project area stretches of the now abandoned Roman road then were still in use. The long stretch from Selhurst Park that heads north-east

through North Wood and The Gumber heading towards Bignor represents a relatively recently abandoned stretch of Roman Road. A little to the south-west of that a stretch of Stane Street that passes through the village of Halnaker remains in use and forms part of the A285.

Approximate dates for the origins of some roads can be determined; the Roman roads are an obvious example of this, although accurate dating within the Roman period can be problematic. The continued use of many roads and tracks over time means that most roads cannot be said to belong to one particular period (Hindle 1993, 13). Parts of Stane Street again provide an example of this but so do the modern footpaths that follow the hollow ways that climb up and down the scarp edge of the downs. Many of these hollow ways are thought to be medieval or post medieval but may have earlier origins. Whatever their age, these routes are testament to a degree of mobility of people and goods (even if over a limited distance).

Further work may be able to make better connection between the roads, tracks and paths and the people and places they linked. In addition to the need to access arable fields and move livestock for grazing and manuring, the extensive woodlands were the source of firewood and timber. Quarrying and charcoal burning sites would have also been connected to the wooded landscape through route ways. One path within North Wood follows a NE-SW alignment but its course has not been identified beyond the bounds of the wood. It passes relatively close to the charcoal burning platforms at the northern end of the wood, but evidence of individual routes to sites such as these or the small-scale quarrying also present have not been identified. This may mean that these sites were used so infrequently that no dedicated path was formed. These limitations highlight Brian Hindle's assertion that roads should be studied as a system rather than individual routes (Hindle 1993, 13). It is hoped that the comprehensive mapping of this part of the South Downs can form the basis for a better understanding of how this landscape was connected and how earlier generations moved through this landscape.

FLINTS, CLAY AND COBBLES – EXTRACTION IN THE WOODS AND COASTAL PLAIN

The High Woods area is primarily late Cretaceous chalk overlying Gault Clay and Upper and Lower Greensands that are exposed at the northern edge of the High Woods. The geology of the coastal plain is dominated by Quaternary mixed deposits of sediments and aggregates. These mineral resources have been exploited over a long period, and the deposits including gravel, sand, clay and flints from a series of relict raised marine beaches have been valued to a lesser or greater degree through time.

Though relatively soft, chalk blocks have long been used for building and both chalk and marl used to fertilize soils. Clays have been used for ceramics from the Neolithic, and for brick and tile production probably from the Roman period to the present day. Brickmaking in particular reached its peak in the 19th century with brick pits and brick works being found in most parishes in Sussex (Beswick 1993). Gravels and sands are important aggregates that were probably quarried in quantities from the Roman period onwards for the construction of buildings and as hard-core in road construction.

Flints and Flint Mining

For over half a million years flint was probably the most important raw material to be used by hominins within the British Isles (Barber et al 1999). It is likely the first flint users simply collected flint from abundant exposed deposits at the surface. In addition to being prized for tool making, flint has been used for a number of other purposes. Abundant remains of heat crazed and fire cracked flints are found at many prehistoric sites, identified as pot boilers for heating water in low-fired pots which couldn't be placed directly in the fire. Ground-up flint was also used to temper coarse pottery. When struck, flint readily produces sparks for fire-lighting and was used as such into the 19th century but ultimately replaced by matches that were invented in 1826. Flint continued to be mined into the late 19th century for gunflints used in flint-lock guns. Little archaeological work has been done on mining and quarrying in Sussex (Barber 2003, 210) and no Sussex examples of gunflint mining are known.

The Neolithic period heralded an introduction of flint extraction, the quarries and mines resulting in some of the earliest surviving earthworks seen in the British Isles (Barber et al 1999). These mines were not simple holes in the ground, but consisted of numerous shafts dug down sometime 15 metres through the chalk to the desired seam of flint that was then followed via a network of horizontal galleries (Barber et al 1999 38). The largest and most well-known Neolithic flint mine is at Grimes Graves in Norfolk, although it is atypical in many respects, including date - it belongs mainly to the later

Neolithic, in contrast to the dated Sussex mines which clearly originate in the Early Neolithic. Documented examples from the High Woods survey area include Nore Down, Long Down (Eartham), and Stoke Down (Funtington), with further potential flint workings at Court Hill. A potential site identified at Compton Down is probably a marl pit while another possible site previously identified at Bow Hill (Curwen 1929b, 139) cuts into a post medieval trackway so is now thought to be post medieval flint extraction (Barber et al 1999, Barber pers comm 2016).

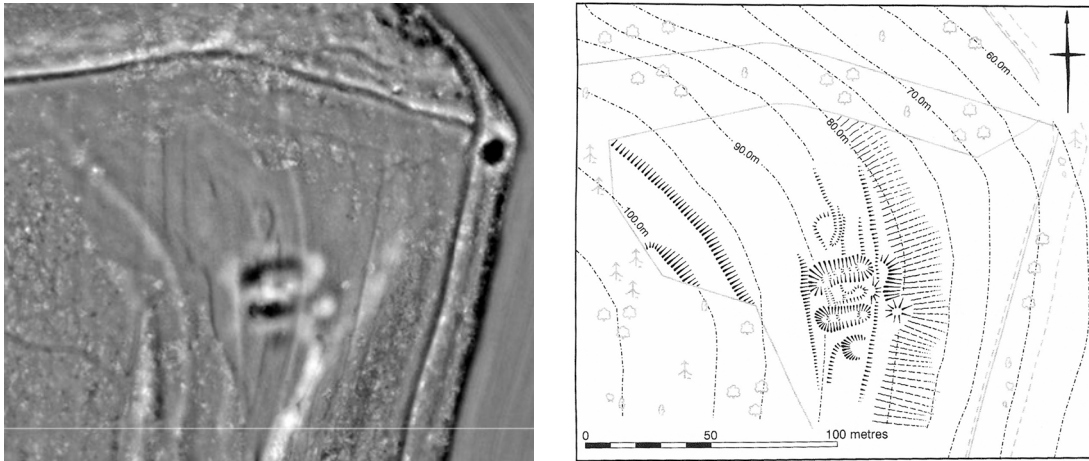


Figure 53 Nore Down Neolithic flint mine – visible on lidar LRM image on left, and as surveyed by English Heritage on the right (Lidar © Copyright Fugro Geospatial and South Downs National Park Authority; Barber et al 1999, p.41).

A handful of further potential Neolithic flint mines have been identified in the project area, but a national review in the 1990s suggested most were unlikely to be Neolithic based on a lack of conclusive evidence. One of these sites is at Fairmile Bottom where two linear excavations, similar to those seen at Nore Down, cut into the chalk. These coincide with finds of quantities of worked flints, but were considered to be later chalk pits. (Barber et al 1999).

The flint mines at Long Down and Nore Down have seen some limited excavation (ibid). At Long Down the mass of in-filled shafts were clearly visible on the lidar data and are similar to those seen on a far larger scale at Grimes Graves (Fig 54) and at Harrow Hill, which was first excavated in 1924-5. The faint traces of plough-levelled outlying craters were seen in the field to the east of the main group. At Nore Down the flint was probably extracted from two parallel cuts into the side of the hill (ibid).

Of the numerous extraction sites identified from lidar during the High Woods, a further potential later prehistoric flint extraction site was noted in Dale Park west of Madehurst. Visible as cropmarks on aerial photographs taken in June 1976, the site appears as a line of slight depressions surrounded by very slight traces of chalky upcast material, particularly on the western side. It is bounded

on the north-eastern side by a ditch or trackway. Though the site is almost entirely plough-levelled and virtually undetectable on the lidar images, slight depressions were measurable using the lidar height data.

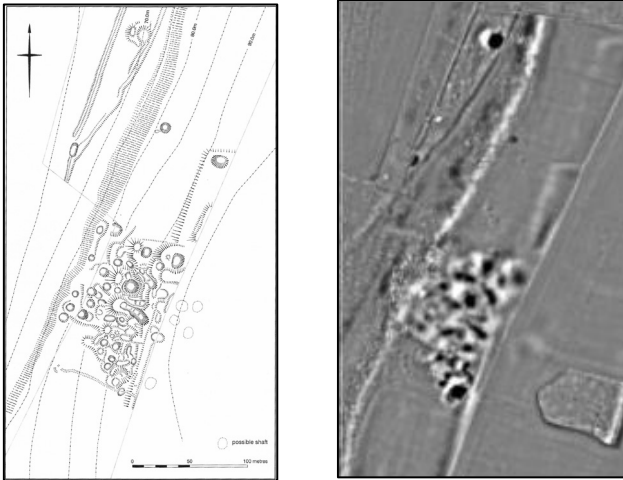


Figure 54 Long Down Neolithic flint mine – visible on lidar LRM image on left, and as surveyed by RCHME on the right (Lidar © Copyright Fugro Geospatial and South Downs National Park Authority; Barber et al 1999, 42).



Figure 55 Map of cropmarks of possible prehistoric flint extraction (outlined in green) and fragments of later prehistoric field boundaries (red) in Dale Park west of Madehurst overlain on the aerial photograph. Slight depressions were also seen on lidar data. SU9709/2 333 04-JUN-76 © Crown copyright. HE

Linear Quarries

The earthwork remains of episodes of mineral extraction are many and varied across the southern reaches of the project area where the chalk meets the coastal plain and is capped by thick Quaternary deposits consisting of inter-mixed bands and patches of differing sediments. This can be illustrated by the variety of different quarries in Slindon Common recorded on the 1st edition OS map (1846-1901). Across a distance of 3.5km the sites of four old gravel pits, two chalk pits, clay pits and a brick field (and old kiln) were recorded. Amongst these are numerous further pits of uncertain date and function, presumably predating the earliest maps. These pits appear singly, in clusters, or in linear arrangements following a particular resource.

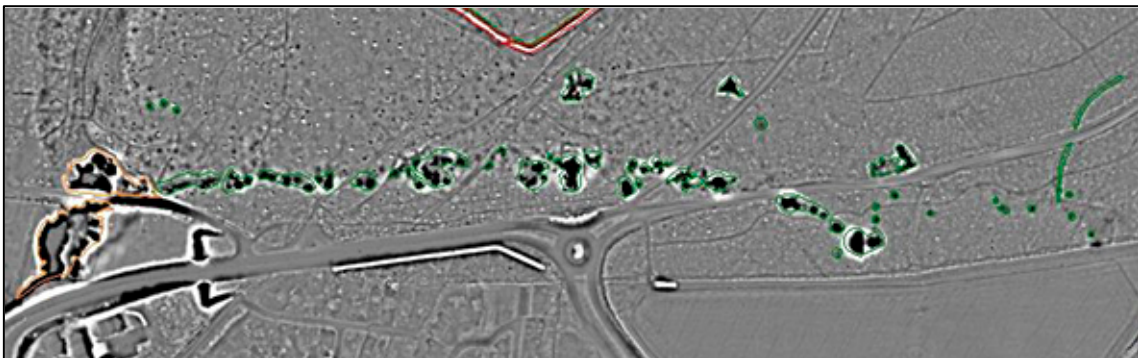


Figure 56 A linear pattern of extraction (green) visible on a lidar visualisation (LRM) within woodland on Slindon Common. Extraction of parts of the mixed quaternary deposits of clay, sand and gravel. Lidar © Copyright Fugro Geospatial and South Downs National Park Authority.

Several linear arrangements of in-filled pits extend along the southern edge of the survey area extending in two widely (c 850m apart) spaced east-west alignments following bands of 'head' – sand, silt, gravel and clay. However, it is not possible to establish from the remote survey what exactly was being quarried without field work or documentary research. The extraction appears as lines of slight pits or depressions extending in sections for a number of kilometres. The northern of the two bands of pits comprises three sections extending over 650m west through two fields from Little Heath, two sections in Slindon Park (950m long) and from southeast of Slindon village into Danes Wood (690m long). The second band to the south extends over 1km through Slindon Common, a second group 220m long extends east-west to the south-east of Slindon Common and a third alignment of 450m can be seen between Slindon Common and Danes Wood. These quarry pits pass through open fields and established wood, parkland and common land, apparently unconstrained by land boundaries seen in the post medieval landscape, presumably pre-dating it. One group in Slindon Park appears to be cut into a possible later prehistoric or

Roman lynchet so it is likely that they date from somewhere in the early medieval to early post medieval period (Fig 57). However, there is a suggestion that this broken line of banks is in fact a relict chalk cliff at the back of a fossilized raised beach and the pits are chalk pits of uncertain date (James Kenny pers comm 2016) making the dating of the pits less clear.

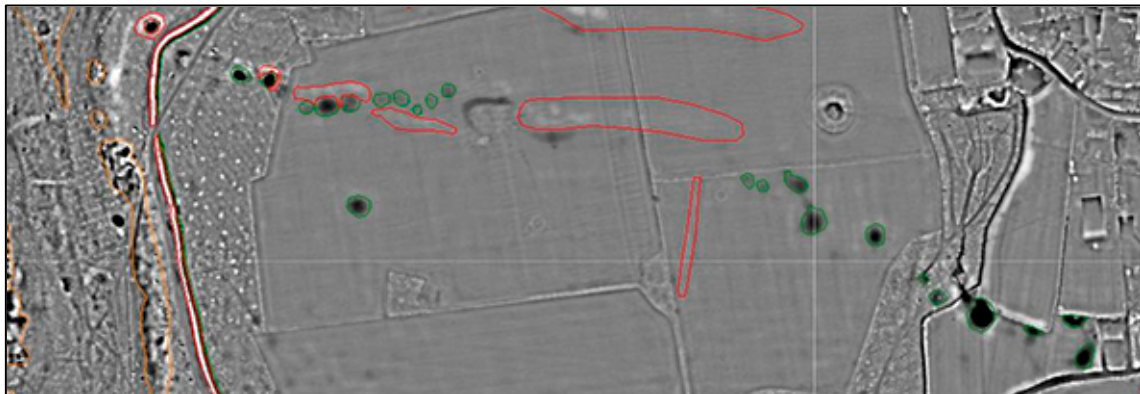


Figure 57 A linear arrangement of extractive pits (green) cut into a possible bank or scarp (red) seen on lidar (LRM) in Slindon Park. Lidar © Copyright Fugro Geospatial and South Downs National Park Authority.

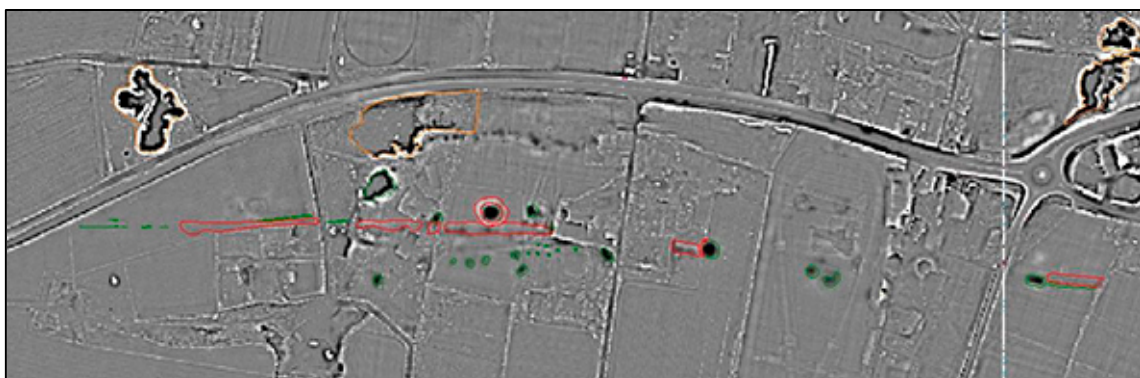


Figure 58 Quarrying in a linear pattern west of Fontwell adjacent to the course of the Chichester-Arundel Roman road that coincides with the outcrops of raised beach deposits. Lidar © Copyright Fugro Geospatial and South Downs National Park Authority.

Quarry pits identified west of Fontwell (see Fig 58) have a different appearance to the other linear groups discussed above. They are not following the same alignment and appear to be located on either side of the Roman road from Chichester to Arundel (identified from lidar and aerial photographs during this survey) and could be quarry pits for aggregates used in the construction and maintenance of the road. For much of its course the road follows a broad band of pebble and cobble deposits from a relict raised marine beach. Excavations on Stane Street's agger on Bignor Hill found a causeway built up of horizontal layers of flint rammed chalk and pebbles from the same marine beach deposits located some four miles to the south (Curwen 1937).

To the east of these linear quarries is an area of extractive pits within Goblestubbs Copse (Fig 59). Identified on lidar, this group of slight depressions covers an area 250m across. Individual pits range in size from 10-25m in diameter and are possibly of considerable antiquity, appearing to be cut by the ditches associated with an Iron Age/Roman settlement complex to the west as well as later, probably post medieval gravel pits, which are marked as such on the 1st edition OS map. Despite the remarkably similarity of these depressions to the in-filled Neolithic flint mine shafts elsewhere and that the underlying bedrock is chalk, the overlying deposits of gravel, sand and clay are probably too thick for flint deposits to be mined in this area in antiquity.

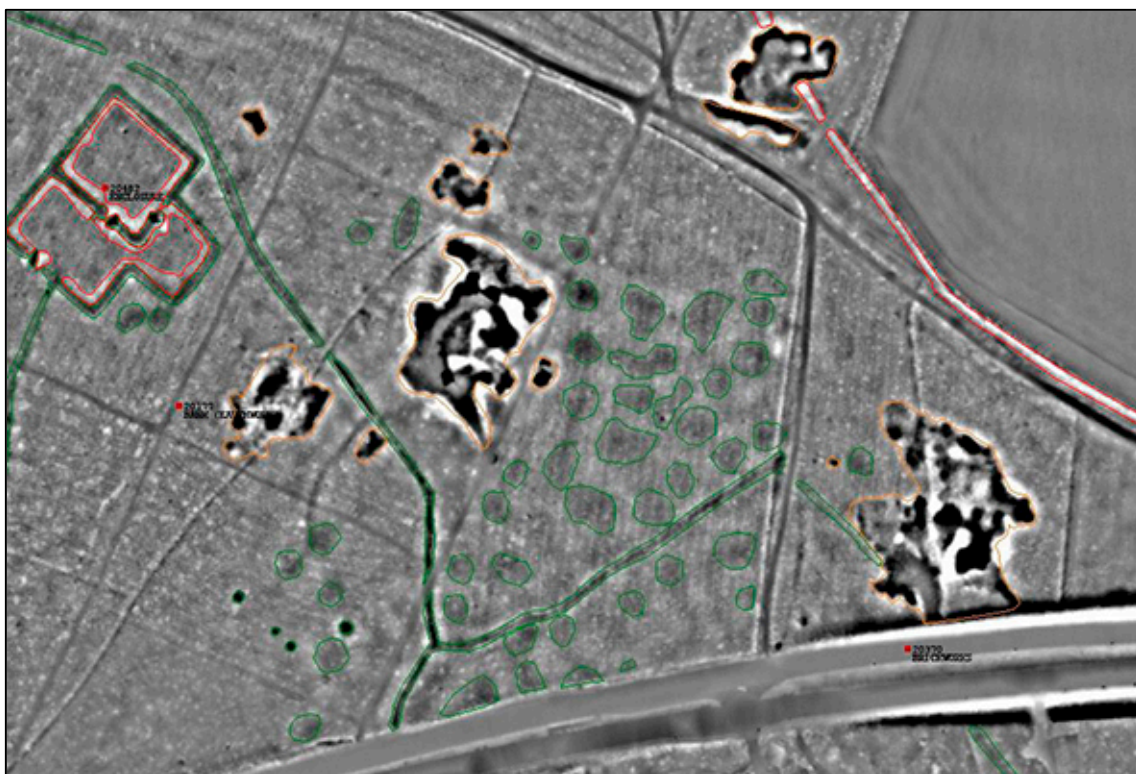


Figure 59 Map, over lidar visualisation (LRM), of extractive pits (green) in Goblestubbs Copse on the edge of Arundel Park. They appear to be cut by the ditches associated with the Iron Age settlement (top left) and post medieval gravel pits (orange). Lidar © Copyright Fugro Geospatial and South Downs National Park Authority

Sand Pits

A number of larger sand and gravel quarries were established along the coastal plain in the southern part of the survey area from the 19th century onwards. Comparisons with archaeological features marked on historic maps indicate the quarrying has removed adjacent earthworks. These include the remains of

earlier smaller quarries, a large in-filled sandpit in Rewell Wood as well as a number of significant archaeological sites such as part of the Devils Ditch at Boxgrove Common. In contrast, quarrying at Boxgrove has aided archaeological discovery (Roberts & Parfitt 1999). In one such instance aerial photographs taken in 1969 (MAL 24/69 068 02-APR-1969) recorded a probable later prehistoric track and ditches exposed during stripping of the top soil in advance of further quarrying.

Chalk pits and lime kilns

Most of the High Woods survey area is part of the Cretaceous chalk escarpment that forms the massif of the South Downs. Historically, chalk is one of the most heavily exploited mineral resources in this part of England. Used for soil dressing (to improve soil), building, lime mortars, cements and in the tanning industry, evidence of this once widespread rural industry can be seen in the numerous small, and not so small, chalk pits which pepper the landscape of the Downs (Barber 2003).



Figure 60 Small former chalk pits visible as slight earthworks in Arundel Park amongst the remains of Iron Age or Roman field systems. Archaeological map from lidar/aerial photographs is overlaid on the 1st edition OS map where two of the three pits are marked in the early 19th century as 'Old Chalk Pit'. Base map © crown copyright and database right and landmark information group ltd (all rights reserved 2016)

A large proportion of the chalk extraction was small-scale and carried out on individual farms. Small lime kilns were commonplace by the 18th century and this early lime production probably accounts for many of the small pits that dot

the chalk downland such as those seen in Arundel Park (Fig 62). Through the 19th and early 20th centuries the demand for lime drove production to industrial proportions with a number of large commercial lime works being established (Barber 2003, 211). These commercial works would have varied in size from a medium pit such as that at Chalkpit Plantation, Lavant with its on-site kiln, to truly industrial sized quarries and works.

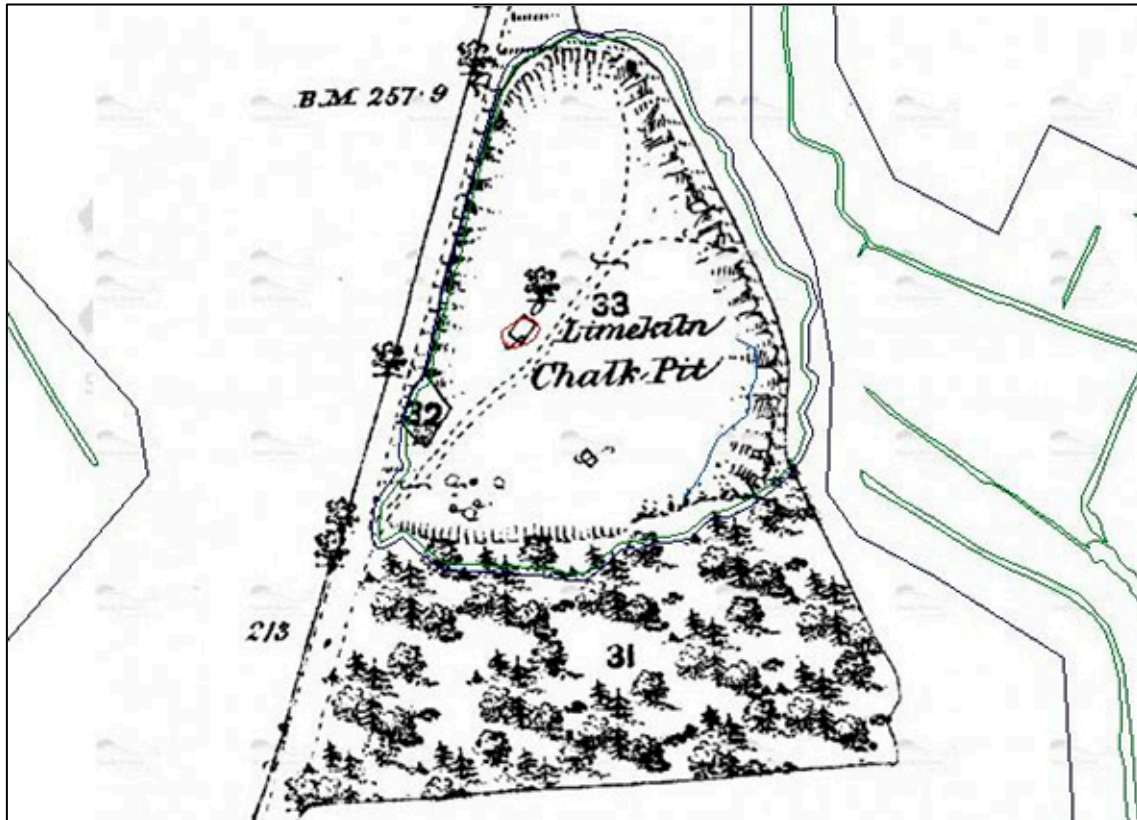


Figure 61 Chalk pit and limekiln at Chalkpit Plantation, Lavant mapped from lidar images and aerial photographs that show the quarry extending slightly east and south of its mapped extent recorded on the 19th century OS map. Base map © crown copyright and database right and landmark information group ltd (all rights reserved 2016)

One such commercial operation was Buriton Lime Works at Buriton, Hants that was established in 1859 (Fig 62). Chalk was quarried on site from three pits, two of which produced a clayey chalk that was used to make mortar, and a purer white chalk pit used for plaster. The works were served by an internal network of 3ft gauge railway lines taking chalk from the quarry to an incline down which the chalk was run by gravity and loaded into the tops of the kilns and burnt lime was raked out at the bottom. The operation expanded through the late 19th and early 20th centuries before being bought out by the British Portland Cement Company who planned to develop a cement works, but the venture failed and the site was closed in 1939 (<http://www.buriton.org.uk>).

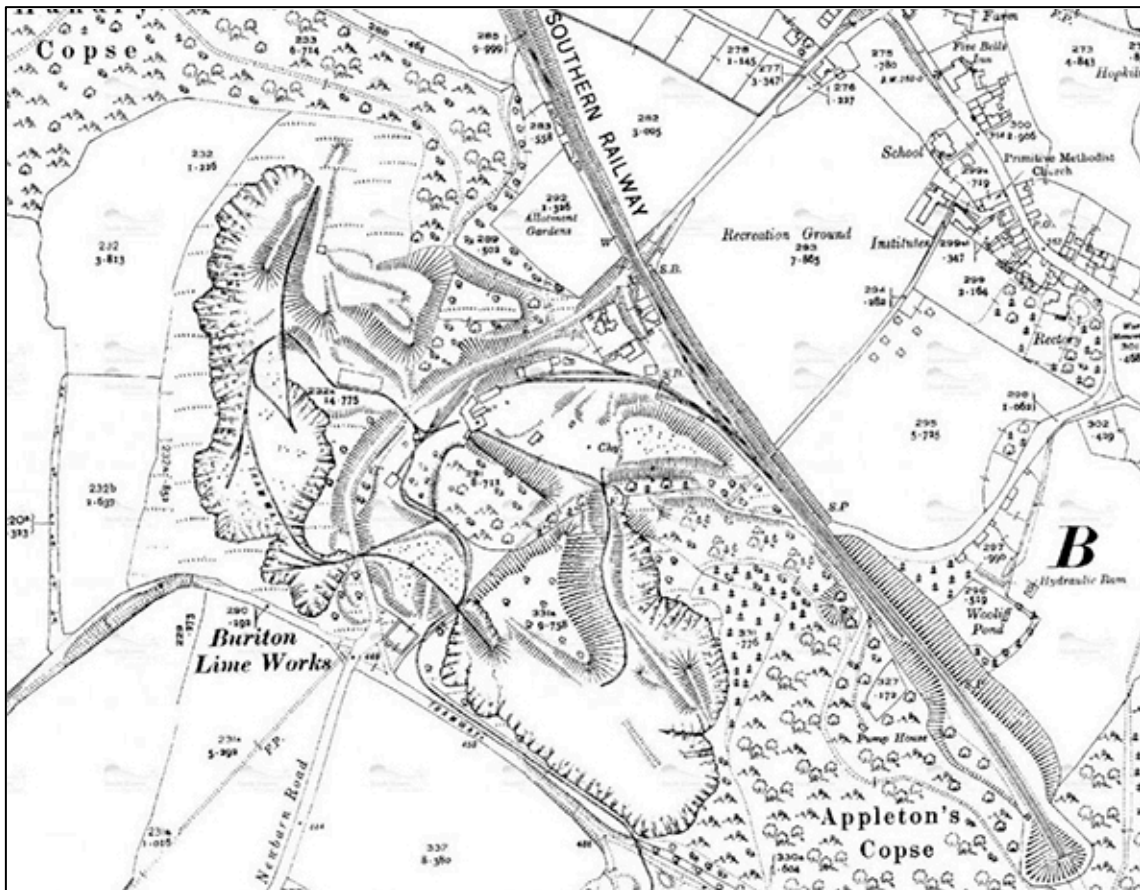


Figure 62 1st edition OS map showing the extent of the Buriton Lime Works with tramways, works railway network and branch of the main Southern Railway line. Base map © crown copyright and database right and landmark information group ltd (all rights reserved 2016)

Clay pits and Brick fields

Because of the widespread abundance of deposits of clay, sand and brick earths there has been a long history of brick and tile making in the south of England. The constituent parts of these deposits vary across the region, particularly in the percentage of sand and silt which give the clays strength and durability. Coarser brick earths with higher sand content make shrink-resistant tiles, whilst finer clays are more suited to tile and pipe production, as well as other ceramics. (Beswick 1993).

Brick and tile was first introduced to Britain by the Romans with localised production for domestic and military construction, but disappeared completely following the end of the Roman period in Britain. Tile was finally reintroduced to the country as a component in stone structures in the 10th century and production of tiles began in earnest in the 12th-13th centuries for monastic buildings. Bricks as we know them were not used until the 14th-15th century, generally imported from the continent (Flanders and the Netherlands). The first

wholly brick buildings appeared in the 1440s with a few brick houses and castles. Though still an expensive luxury, brick-built houses became more commonplace in the 16th century. Bricks were initially fired on-site using itinerant brick makers using temporary brick kilns, which were dismantled when they moved on at the end of each job. However, by the end of the 16th century, in response to increased demand the first permanent brick yards were established. These were typically sited on waste land at the edge of commons where the clay was in easy reach and there was an abundance of scrub for faggots to fuel the kilns (Beswick 1993, 25).

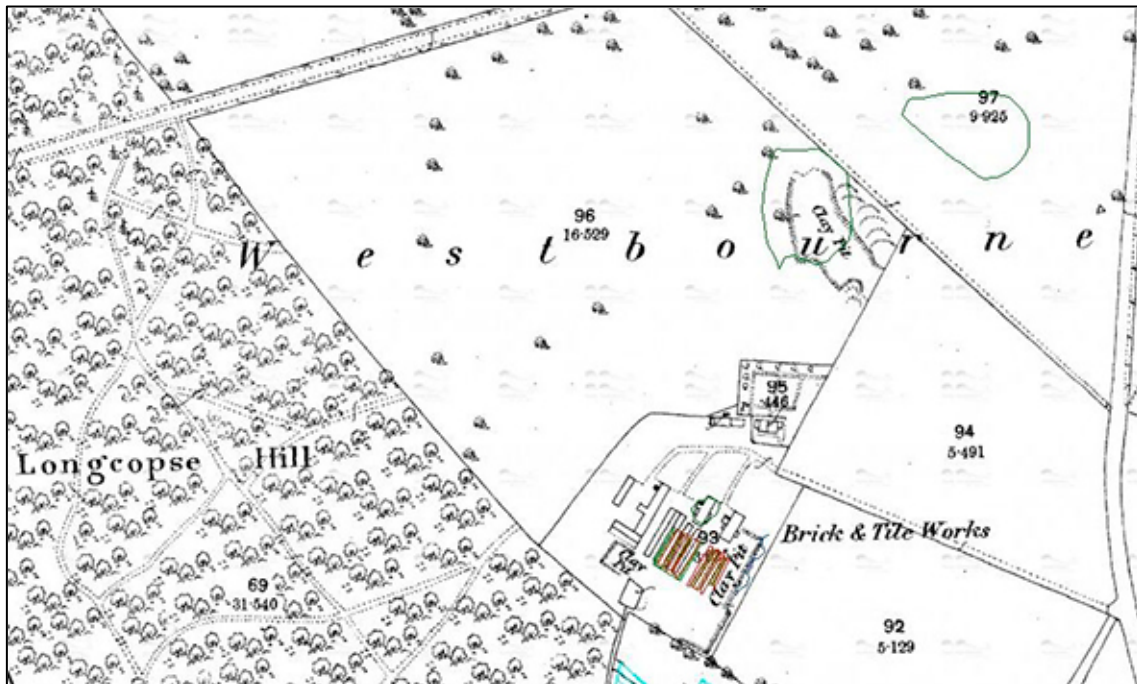


Figure 63 1st edition OS map depicting the Brick and Tile works at Longcopse Hill with adjacent clay pits. Base map © crown copyright and database right and landmark information group ltd (all rights reserved 2016)

Documentary evidence indicates an expansion in the brickmaking industry during the 18th century, many prevailing into the 19th century where they can be seen on the 1st edition OS maps marked as brick fields and clay pits (ibid 26). One such site was situated on the southern edge of Slindon Common where a number of old gravel pits are also visible. The majority of these brickworks were relatively small operations run by a handful of men, though some did develop in to large industries. All that remains of many of these sites are the abandoned clay pits amongst woodland or at the edge of fields (Beswick 1993).

Small pits in woodland

These were identified mainly from the lidar and represent a definite group or class of feature. They are typically elongated (2m x 5m) or rounded and evenly spaced through woods. These may represent the remains of small scale extraction of clay or one of the other locally outcropping deposits of sand, gravel and chalk. Some of the pits mapped may be associated with woodland management and charcoal production (see below, Woodland industries).

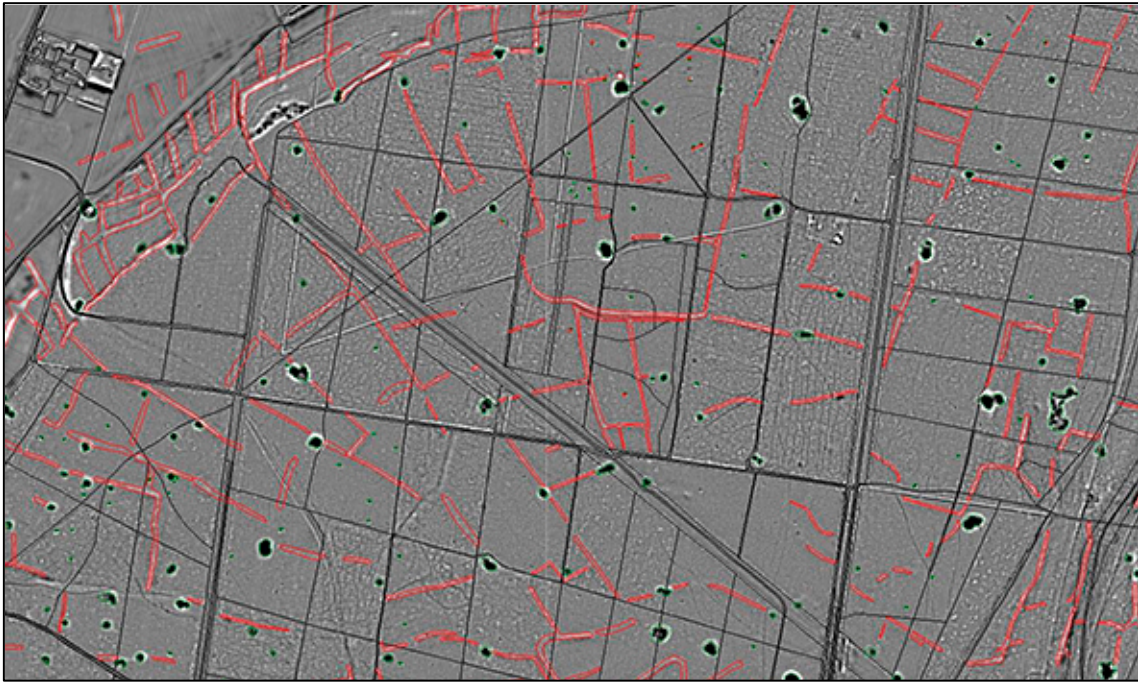


Figure 64 Map of extent of pits (green) amongst probable later prehistoric field systems (red) within Stanstead Forest overlain on a lidar visualisation (LRM). Drews Farm is located in the NW corner. Lidar © Copyright Fugro Geospatial and South Downs National Park Authority

Discussion

Although numerous, many of these pits when encountered individually in the dense woodland undergrowth are typically difficult to assess and rarely warrant investigation. The application of lidar analysis has meant that the true extent of this otherwise under-researched category of remains to be revealed across the entire region, illustrating the varied nature and long history of extractive activities across the South Downs. The pits and hollows come in all sizes and shapes and represent centuries or even millennia of extraction and exploitation of mineral resources, woodland industries and other industrial and domestic activities. Many survive as earthworks within the woodland with the slighter traces of in-filled pits and hollows visible in the open farmed areas.

THE WOODED DOWNS

As previously mentioned, the extents of the woods reflect land management decisions made in the early medieval and more recent periods. The archaeological features associated with the woods themselves range from the boundary banks that defined or subdivided woodland to the traces of industrial processes that used wood. These remains are often fragmentary and the survey from lidar and aerial photographs provides a strand of evidence that can be combined with fieldwork and documentary research to provide a better understanding of these woods.

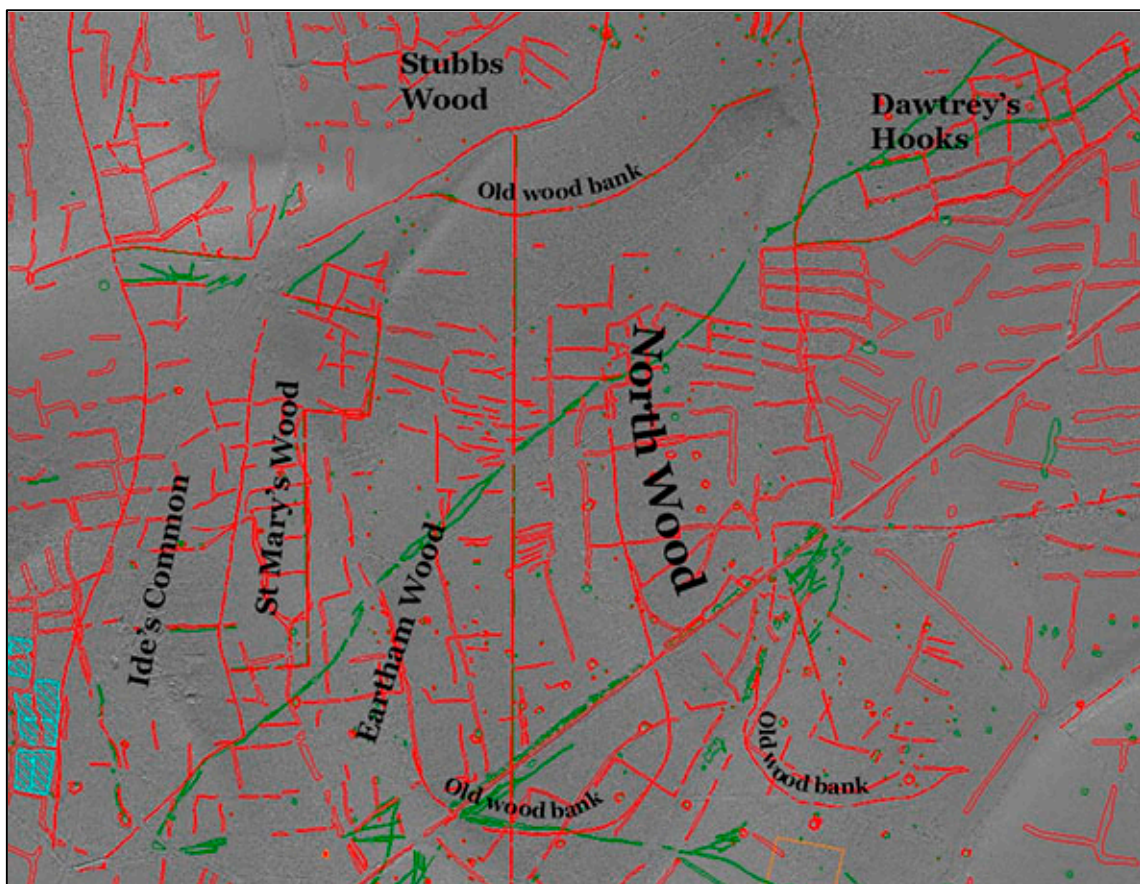


Figure 65 Long linear earthworks in woodland to the north of Slindon. Many define woods and follow the parish boundaries. Lidar © Copyright Fugro Geospatial and South Downs National Park Authority

The wooded nature of this part of Sussex can be contrasted with the creation of the open downland that characterises the eastern downs. Within the project area the presence of early medieval wooded landscape may be reflected in the concentration of isolated Saxon farms on the high downs in West Sussex (Domesday Book records seven dispersed farms are in Upwaltham) all thought to be part of a colonisation of waste by freemen (Brandon 1999, 50). Clearly the medieval development of the South Downs varied and evidence suggests that

more intensive arable farming did not return until the Middle Ages (Gardiner 2003, 152).

Both Brandon and Gardiner suggest that the soil quality in this part of the downs was poor (Brandon 1974, 30; Gardiner 1999, 38-39) but this is not reflected in soil maps (Robinson 1999, 4-5; National Soil Resources Institute, 2015). There appears to be no clear relationship between extent of tree cover and the suitability of soils and instead, the distribution of woodland reflects the choices made by those who owned and worked the land about how it was to be used. Woods do not necessarily grow on the best soil for trees but where they are allowed to develop (Rackham 1986).

Although there is evidence of prehistoric woodland management elsewhere in Britain (Rackham 1986, 73) all the evidence seen during the High Woods NMP survey is thought to be medieval and post medieval in origin. Woodland management during these periods maintained a balance between larger trees, known as standards, and coppiced trees known as underwood.

Standards were felled for timber from which were made beams and planks for buildings. Underwood provided rods and poles for fencing and wood for fuel. Inhabitants had common rights to the woodland for grazing animals and collecting fuel. An area classified as a wood does not always contain continuous dense planting and may have areas of 'wood pasture' where trees were interspersed with open areas of grassland with coppiced or pollarded trees. The woodland within deer parks was also managed would have produced underwood and timber (Rackham 1986, 126; Mileson 2009 64-66).

Different trees were grown for different purposes depending on their particular qualities, the strength of oak for building, the flexibility of ash for tool handles and shafts of vehicles, and although not exclusively, birch, beech and hornbeam for fuel. Fuel was certainly an important requirement and during the medieval and early post medieval periods underwood was the more important product and 'woods were traditionally regarded as sources of energy' (Rackham 1986, 67).

During the 18th century there was a change in the character of woodland across this part of the South Downs. These changes were largely the result of the wealthy landowners for whom trees and woodland were an important component of their great estates. Landscape parks of extensive grassland and woods were created that provided a suitable setting for the great houses at their heart, but the size, type and location of these woods was not purely determined by aesthetics. These different elements of a landscape park had many roles to play; they provided an attractive environment, had an economic role through grazing and forestry and also functioned as game reserves.

Enclosing woods

Many woods were defined or subdivided by wood banks thought to range in date from the medieval to the post medieval period. They were constructed to provide a barrier to keep livestock out, particularly important for the protection of new growth, but they also emphasise that woods were valuable property and needed to be clearly defined (Rackham 1986, 86). Many areas of continuous woodland were subdivided by wood banks into different named woods, sometimes in different parishes and presumably originally reflecting different owners. For example, the woodland north-west of Slindon (Fig 65) was subdivided into six different woods across four parishes. The straightness of the boundary between Eartham Wood and North Wood (also marking the Slindon/Eartham parish boundary) has the appearance of a relatively recent subdivision but dates to at least the 16th century and is depicted on the Arundel Map c.1590.

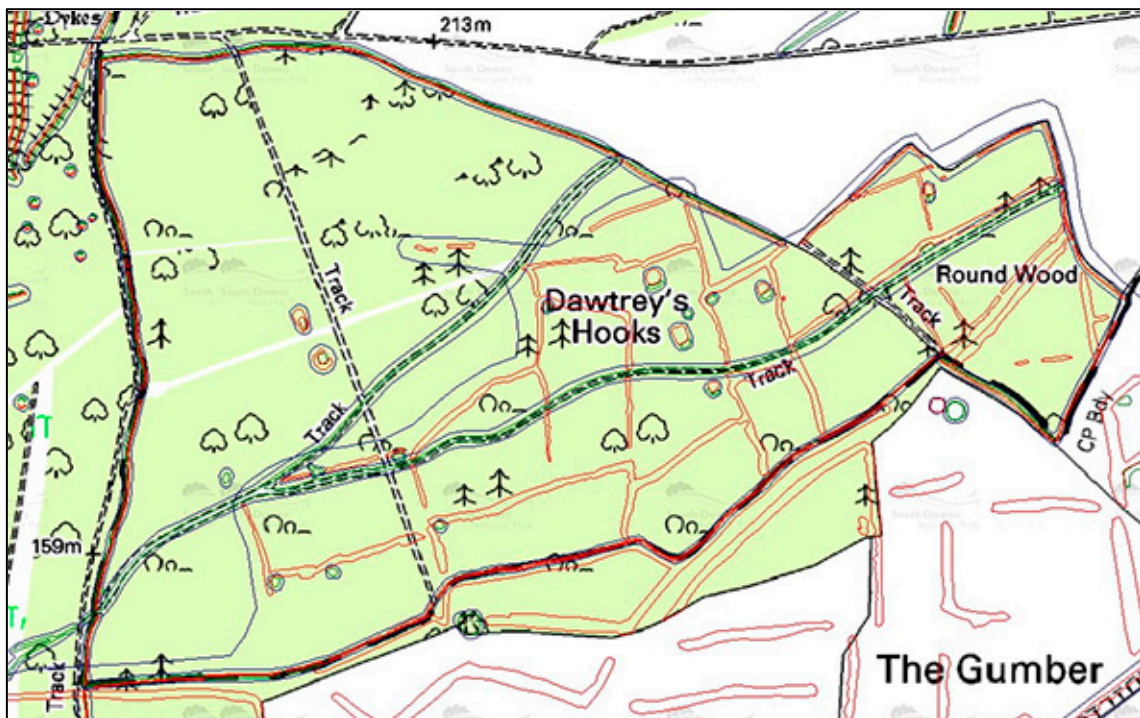


Figure 66 An earthwork bank which is aligned on, or part of, a prehistoric or Roman field system may have formed the southern extent of Dawtreys Hook wood and forms part of the parish boundary (marked CP Bdy and a dashed line on the base map). Base map © crown copyright and database right 2016. All rights reserved. Ordnance survey licence 10050083.

The woodland banks mostly appear to cut through earlier earthworks (mainly the later prehistoric or Roman field systems) but there are some exceptions. For example, what appears to be the southern line of the Dawtreys Hooks wood closely follows the 'Celtic fields' and seems to make a number of short changes in direction as a result (Fig 66). This earthwork bank once defined the boundary

between Burton parish to the north and, until 1886, an extra-parochial area called The Gumber to the south. There are some examples where shorter lengths of earlier earthworks are incorporated into woodland boundaries. For example, part of the northern boundary of North Wood follows or reuses the southern half of a prehistoric cross dyke (Fig 65). This partial reuse indicates that when these boundaries were laid out they were not greatly influenced by existing earthworks.

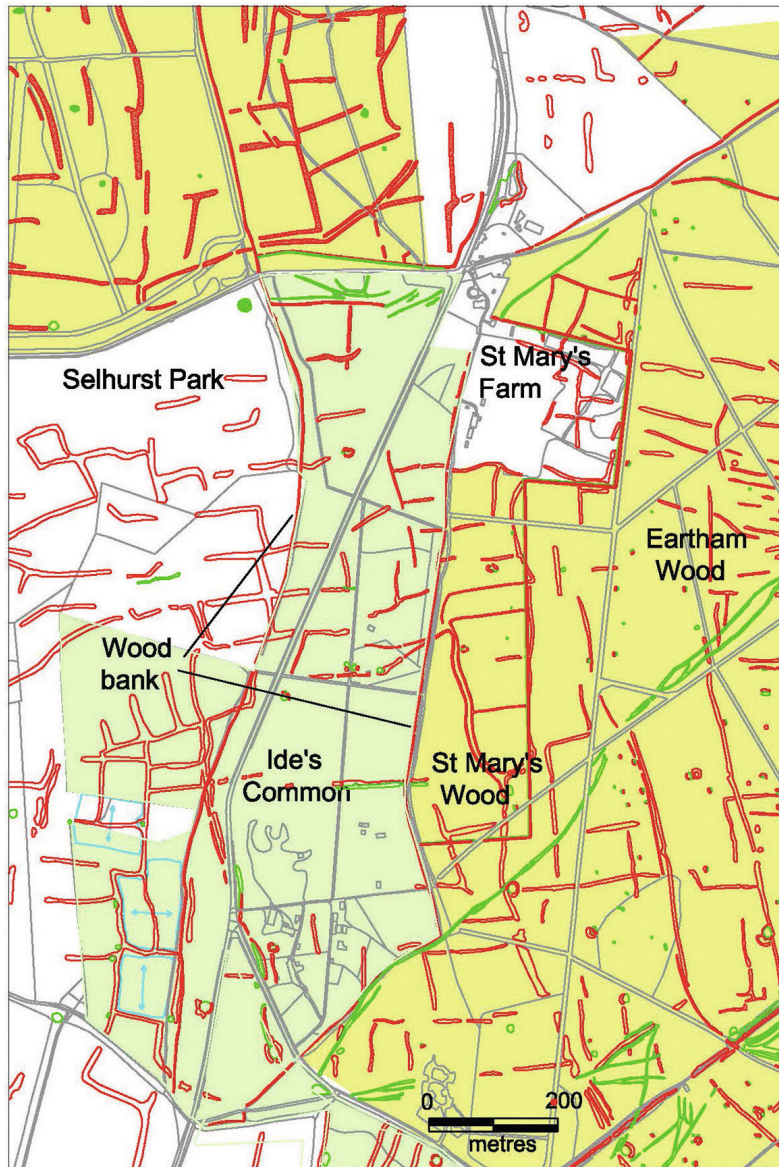


Figure 67 Ide's Common occupies a tongue of land within Upwaltham parish. Most of the boundary of the wood is defined by a bank. Largely an area of Ancient Semi-natural woodland that can be contrasted with the woodland to the north, east and west which is plantation (in different shades of green). Base map © crown copyright and database right 2016. All rights reserved. Ordnance survey licence 10050083.

Some wood banks, although no longer maintained and in places incomplete, are still followed by current boundaries. In some cases these boundaries divide ancient semi-natural woodland and more recent plantation (as identified by Hume & Grose 2010, Map 3), and Ide's Common (Fig 67) is an example of this. Elsewhere these banks separate ancient woodland from recent woodland as seen at Dalesdown Wood (Hume & Grose 2010, Map 3). Further work may be able to better understand the role woodland boundary banks or other older earthworks play in the current division between plantations and ancient semi-natural woods as identified in, for example, Rewell Wood, East Dean wood, Houghton Forest, Duncton and Barlavington (ibid).

Within some woods there are abandoned wood banks indicating expansion or change of woodland boundaries. For example, north-west of Slindon a continuous area of woodland is divided between Eartham Wood and North Wood. Here curving banks c.3m-5m wide may mark the boundaries of earlier woodland later subsumed into an enlarged area of woodland. The route of the wood banks appears to be dictated by the topography as they follow the contours or the lines of coombes. This close relationship to natural features can be a characteristic of older woodlands (Hume & Grose 2010, 26).

Similar but more fragmentary earthworks defining small areas of woodland that have subsequently been subsumed into larger woods were identified in Hudsons Copse, Park Copse, Wills Wood and Hazel Coombe. In Didling Hanger where some banks may represent the boundaries of small areas of woodland or perhaps subdivisions of a larger wood.

Deer Parks and the medieval importance of hunting

The forests, chases and deer parks of medieval England illustrate both the popularity of hunting and its importance to the aristocracy in demonstrating their status. The meat was equally significant and venison was eaten at feasts and was not something that could be bought or sold but only given as a gift (Rackham 1986, 125; Miles 2009, 80).

The medieval Arundel Chase was an unfenced tract of land within which the Earls of Arundel owned all the deer (though not all the land) and over which they had the right to hunt. The exact bounds of Arundel chase are not known, but it encompassed a vast area that extended from the River Arun almost to the Hampshire border and from the coast to the north side of the South Downs (VCH 1997, 51-52). Chases (more usually called Forests) were reserved for the highest ranks in medieval society with the majority owned by the king (Rackham 1986, 131).



Figure 68 Slindon deer park. The 16th century Slindon House is at the northern end of the park (marked 'College'). It was built on the site of the medieval Bishop's Palace. Base Map © crown copyright and database right 2016. All rights reserved. Ordnance survey licence 10050083.

The keeping and hunting of game has left a variety of remains in the landscape, but although there are records of hunting during the Anglo-Saxon period there is little evidence of enclosed deer parks. Instead, linear or curving earthworks called 'hays' may have been constructed to retain or trap animals during the hunt (Miles 2009, 134, n.44). Deer parks are essentially a Norman creation and about 35 are listed across the country in Domesday Book (Rackham 1980, 188). These parks were generally defined by a substantial bank and ditch to contain the deer and there was a considerable expense in their construction and maintenance. Although the cost ensured that deer parks were still only owned by the upper echelons of society they were less exclusive than forests or chases. Although some were owned by the king, deer parks were created for a wide range of owners including earls, bishops, monasteries, nunneries, minor gentry

and colleges (Rackham 1986, 125). Parks were established in every county of England including a large number in Sussex and Rackham estimated that by around 1300 there were about 3,200 deer parks in England (Cantor & Hatherley 1979, 71; Roberts 2014, 110; Rackham 1980, 191).

Deer parks are well documented through historical sources but are primarily identified on the ground through their boundaries. The clearest form of deer park boundary, known as a pale, is an earthwork bank with inner ditch. This survey has identified the pales of a number of deer parks within this part of the South Downs and the results have shown the variety of forms that the park pales took as well as highlighting deer parks known from documentary sources that could not be identified from the air.

In addition to the enclosing boundary these parks would have contained a number of other elements including a lodge for the 'parkers' who oversaw the herd and ponds to water the livestock, but they may also have included rabbit warrens and fishponds. Some early parks were some distance from the lordly residence a general trend throughout the middle ages was the bringing together of the house and deer park (Mileson 2009,86-91) .

Deer parks began to fall out of use in the later Middle Ages and especially during the 16th and 17th centuries (Rackham 1986, 126) when they reverted to woodland, became farmland, or were converted into landscape parks.

Identifying parks

A fundamental component of a deer park was woodland and the distribution of parks across England closely reflects that of woodland as recorded in the Domesday Book (Rackham 1986, 123). These parks were not entirely wooded as deer are primarily grass feeders, but the trees provided cover and forest ambience for the hunter (Stamper 1994, 141). The most important and expensive feature of a deer park would be the deer-proof pale. For most deer parks the pale consisted of a ditch with an outer bank upon which would have been a hedge or fence (Cantor & Hatherley 1979, 72; Fletcher 2011, 146). Possible park pale earthworks have been identified at the locations of all but two of the known deer parks within the project area. There is a good example at Slindon which was a manor owned by the Archbishops of Canterbury until 1542. Here the earthworks can be traced on all but the eastern side of the former park (Fig 1) and they provide the only example within the project area where the classic arrangement of an outer bank and inner ditch has been seen.

A coherent earthwork has been identified marking the boundary to Downley Park (Fig 69). This is in the form of a near continuous ditch, which can be seen

on the lidar defining all but the eastern side of the park as depicted on an early 17th century map.

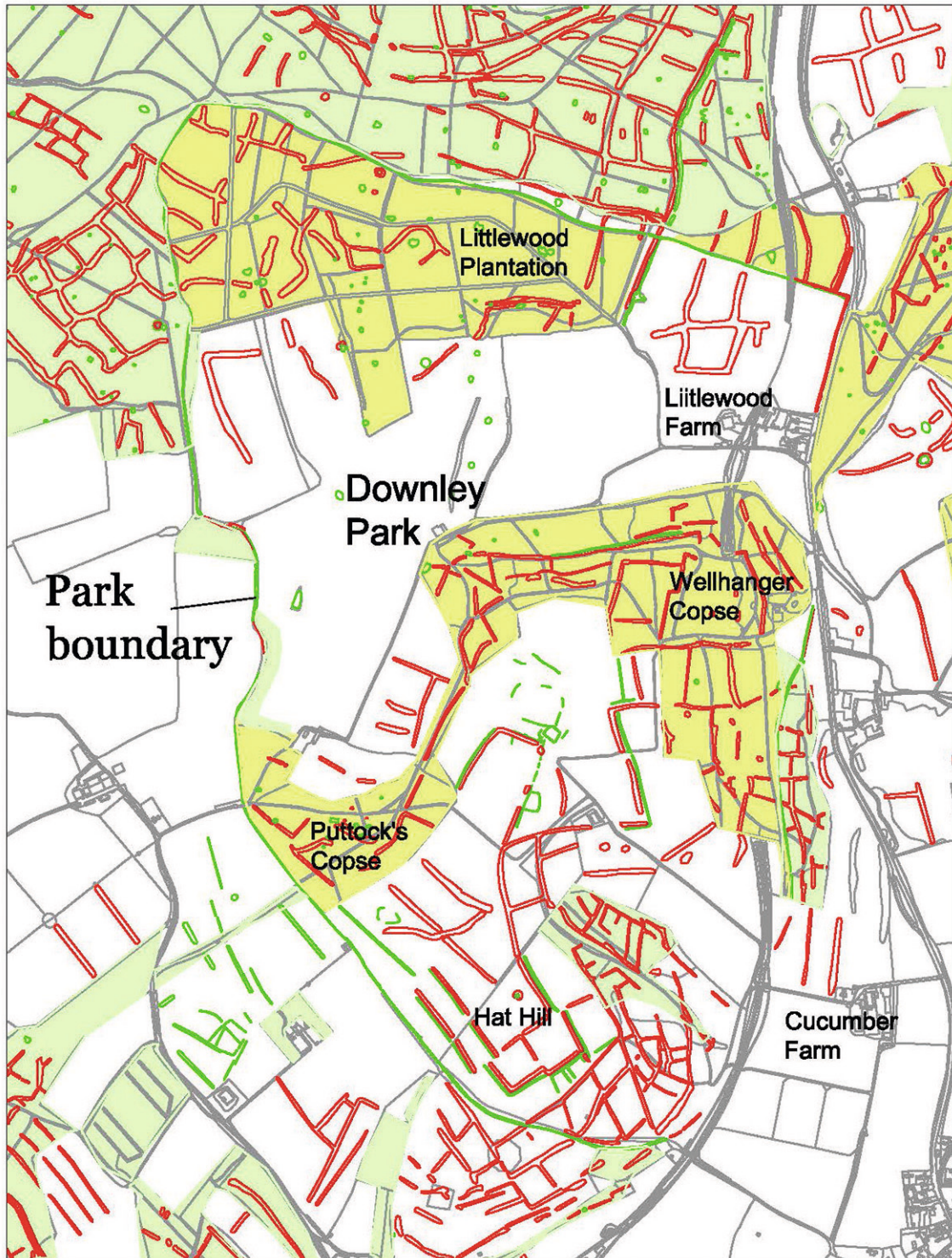


Figure 69 Downley Park Defined by a ditch on all but its eastern side. Cropmarks near the centre north of Hill Cottages are thought to be the remains of the Hunting Lodge. Base map © crown copyright and database right 2016. All rights reserved. Ordnance survey licence 10050083.

For much of its length the ditch now marks the boundaries of fields and woodland, including the northern edge of Bye's Copse where a bank flanks the ditch – although it is not clear if this is the remains of the park pale or a later wood bank. At Arundel it is a bank rather than a ditch that has been identified. The Great Park at Arundel was located in an area to the west of the current park and is now a mixture of fields and woodland. A short length of the boundary bank running alongside a track at the south-west corner of the park had previously been identified (VCH 1997, 52). The lidar shows that this earthwork continues north-east into Rewell Wood where it is largely ignored by later land divisions and assumed to predate them. However, to the east what appears to be a continuation of this bank does function as a field and woodland boundary.

At East Dean, fragmented remains of the park pale bank and ditch survive. Although the park pale does not survive in its entirety, the line of the park boundary is preserved in places through the arrangement of tracks, fields and woods. Park pale earthworks may be gradually lost through ploughing - and a number of former deer parks now contain arable – or due to a more deliberate act of levelling; parts of Arundel's park pale were removed in the early 17th century while other lengths destroyed during the English civil war (VCH 1997, 52).

The earthwork bank that follows the parish boundary between East Dean and Upwaltham and also divides woodland on Selhurstpark Hill from Benges Wood is thought to be the remains of Selhurst Park pale (J Kenny pers comm). No evidence has been identified for two parks listed by Cantor (Cantor 1983, 75-77): Stansted Park in the parish of Stoughton or Upwaltham Park that is thought to have been located within what is now Charlton Forest (VCH 1953, 174). There is good earthwork survival of later prehistoric or Roman field systems within Charlton Forest, which makes it unlikely that an earthwork park pale could have been built and removed without affecting the earlier earthworks and the park may have instead been defined by a fence. The presumed area of Selhurst Park is now largely farmland. The earliest reference to West Dean Park is 1327 (Cantor 1983, 74). It is not depicted on Saxton's 1607 map of Sussex but is presumed to have occupied the area of the current West Dean Park first recorded in 1622. General earthwork survival is not as good across the post medieval Stansted Park and it is possible that the earthwork pale was removed, perhaps when the area was landscaped in the 18th century.

The results of the Secrets of the High Woods aerial survey provide a good picture of the landscape before the parks were built. In most examples the various park boundaries are not influenced by pre-existing earthworks and they cut through the earlier field systems, something seen at the north-west corner of Downley. One possible example of the reuse of existing earthworks may be seen at Slindon where a double and at one point, triple line of banks define part of the northern side of the park pale. These may be the remains of an earlier

earthwork or be associated with the lane that passes along the northern side of the park.

Although the boundaries of deer parks appear to pay little attention to earlier earthworks some do align with parish boundaries. This can be seen at Downley where the northern boundary of the park follows the Singleton/Cocking parish boundary while its western boundary probably followed the original course of the Singleton/West Dean parish boundary (the current boundary is to the east and cuts through the area of the former park). That the park was once entirely within Singleton parish is stated in a 1570 description of the park and suggested by a 1630 map (Roberts 2014, 114; Fig 5).

There are differing views on the significance of the relationship between parish boundaries and park pales. Where they coincide it may indicate an early park where the parish boundaries were realigned to conform to the park pale (Rackham 1986, 125). Alternatively, the coincidence of pale and parish boundary may be due to the tendency to position parks on the edge of the manor (Cantor & Hatherly 1979, 724). The deer park at Slindon occupied a peripheral position in the parish but the pale does not extend to the parish boundary but runs between 200m-300m from it. Further work may be able to explain if this relationship was intended, or the result of the subsequent realignment of either boundary.

At Halnaker an approximately north-south earthwork is thought to mark the eastern boundary of the park (Fig 70-71). The northern end this earthwork appears to be aligned on an east-west earthwork bank that defines the Boxgrove/East Dean parish boundary; and the relationship suggests that it also marks the northern end of the park. The enclosing nature of this earthwork may also be seen in the wood names recorded in the 18th century, Open Winkins to the north and Inclosed Winkins to the south (Fig 4). If the park's eastern boundary is extended south it meets an east-west section of the Devil's Ditch (part of the Iron Age Chichester Dykes) which may have been appropriated as the boundary of the deer park, but which certainly appears to have formed the southern boundary of the post medieval landscape park.

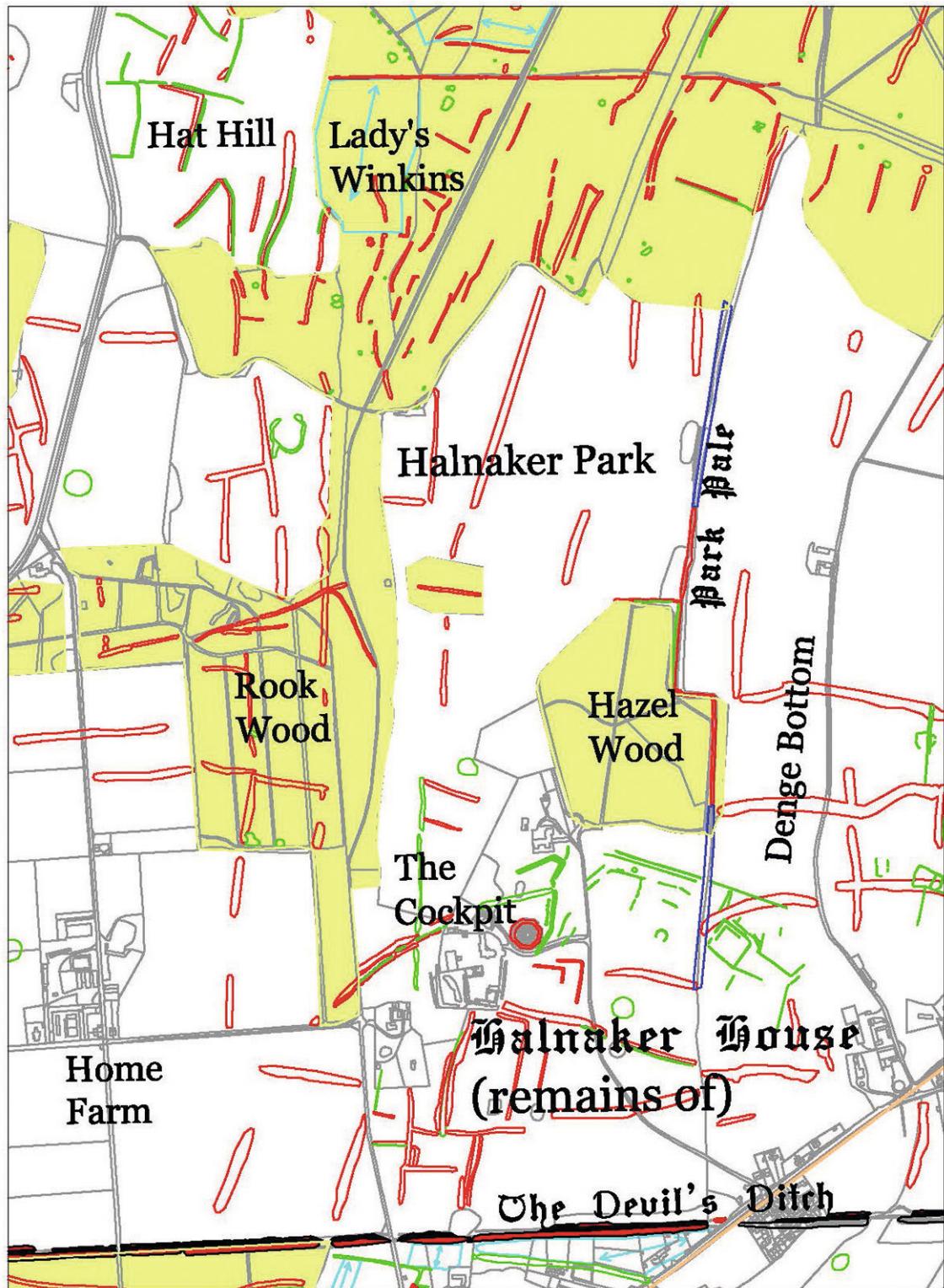


Figure 70 Halnaker park include the remains of the former deer park. Base map © crown copyright and database right 2016. All rights reserved. Ordnance survey licence 10050083.



Figure 71 Halnaker Park as depicted in the late 18th century. The woodland to the north is divided between *Open Winkins* and *Inclosed Winkins* (now called *Lady's Winkins*). Yeakell & Gardiner 1778-1783 Image © Dr Dominic Fontana University of Plymouth via Old Sussex Mapped website (http://www.envf.port.ac.uk/geo/research/historical/webmap/sussexmap/Yeakell_36.htm). Original held in WSCC HER.

Interior arrangement

Some deer parks had no internal subdivisions and the deer were free to roam; others were subdivided and included areas of coppice and areas of grazing called launds (lawns), for example as seen on the 1630 map of Downley (Fig 5). When this 17th century map is compared with the aerial survey evidence and the modern map (Fig 6) it shows that some of these interior boundaries remain in

use (e.g. Puttock's Copse or the field north east corner now occupied by Littlewood Farm). Other boundaries have been abandoned but survive as low earthworks and some appear to be part of the later prehistoric/Roman field system suggesting that although the boundary of the park ignored older earthworks, the internal arrangement was to some degree influenced by them. The parish boundary that now cuts across Downley Park also appears to follow some earlier earthworks at the southern end of the park.

Within Downley the earthwork survival in areas that were lawns is generally poor and survival is perhaps better in areas that were woodland in the 17th century, but relatively recent ploughing seems to mainly be responsible for earthwork loss (Fig 72). The better preserved earthworks survive within areas of existing woodland or the steep slopes of Hat Hill.



Figure 72 Downley Park as depicted in c.1630 (left) Add Mss 18014 Reproduced by kind permission of the West Sussex Record Office. Modern base map with NMP mapping (right) Base map © crown copyright and database right 2016. All rights reserved. Ordnance survey licence 10050083.

Although there would have been a park lodge for the parkers, some early parks were located some distance from the main residence. Over the course of the medieval period this gradually changed as houses and parks were located closer together and by the late 12th-13th centuries houses were positioned within the park. This was initially close to the boundary but from the 14th century onwards houses were occupying a more central location within parks. For existing houses and parks this change in fashion could also be achieved by the creation or extension of a park around an existing house, or the building a new house within an existing park (Milesen 2009, 86-89).

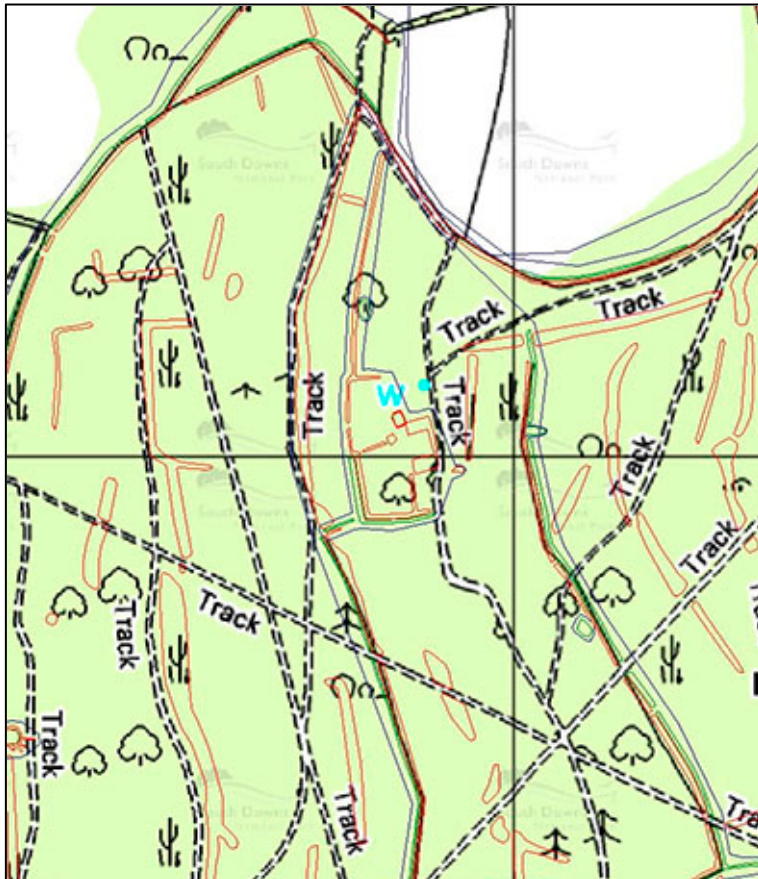


Figure 73 The site of the former East Dean Deer Park. The earthwork enclosures and buildings are at the centre of the image. Base map © crown copyright and database right 2016. All rights reserved. Ordnance survey licence 10050083.

At Halnaker , a fortified manor house was built in the 13th century (replacing a 12th century house) which may have coincided with the creation of the park in 1253 (VCH 1953, 144). In some examples hunting lodges were converted in to the main residences and in the case of Stansted the hunting lodge was replaced by a house in the late 17th century, the park landscaped in the 18th century. Centrally placed within the bounds of Downley deer park are cropmarks of enclosures and a series of boundaries that may be associated with the hunting lodge of the Earls of Arundel which was partially excavated in 2014 (Roberts

2014). Identified as a high status Tudor building it may have been developed from, or replaced a parker's lodge built when the park was created as the earliest documentary evidence to the park is from 1327.

The ruined remains of buildings are also present within a coombe a little to the east of the centre of East Dean Park. This site, known locally as King Alfred's Castle or King Alfred's Well (Fig 74) was excavated in the 1960s and surveyed in the 1990s (Kenny 1992, 30-31). Buildings and yards were identified and dated to the 14th-16th centuries. The site is scheduled as a medieval settlement (list number 1018038) but is presumably associated with the park and could possibly be categorised as a lodge. Close to the southern boundary of East Dean Park east of the original entrance and the highest part of Park Hill, are the slight earthworks of a square enclosure defined by a bank with an outer ditch. This is similar in form, although a little smaller, to the remains of hunting lodges identified in the New Forest (Smith 1999, 24). If this enclosure is the remains of a hunting lodge, it may have been contemporary with or perhaps preceded the more developed settlement to the north-east.

The positioning of a lodge building close to the park pale occurred elsewhere in the High Woods and the Bishops Palace within Slindon deer park was located close to the park's northern boundary.

Great Estates

The project area includes a number of great estates such as those of the Dukes of Richmond at Goodwood and the Dukes of Norfolk at Arundel and these parkland estates are a distinctive feature of this part of the South Downs (NCA profile: 125. The South Downs). Woodland and the planting of trees played a fundamental role in the character of estates in the 18th century. They were used to create aesthetically pleasing setting for the great houses but were also planted to define the bounds of an estate and to act as statements of land ownership (Williamson 1995, chapter 6).

In the 18th century trees were considered an essential part of a gentleman's landscape and nationally, there was a significant expansion of woodland after 1750 as aristocratic landowners planted millions of trees (Williamson 1995, 125). The already wooded nature of this part of the South Downs accounts for the apparently limited increase of woodland in the estates there when compared with those elsewhere; for example Bowood, Wiltshire where the Earl of Selbourne had planted 150,000 trees every year in the 1770s and 1780s (ibid). The Ancient Woodland Inventory (Hume & Grose 2010) indicates that most of the woodland across this part of the South Downs is categorised as Plantation on Ancient Woodland Sites and would already have been wooded circa 1600.

Despite its wooded nature trees were planted in the project area during this period. In 1742 the 2nd Duke of Richmond had planted 3.6 ha (9 acres) of 'a very bleak hill above my park' (quoted in Connor 1979, 189) and in; in 1761 the 3rd Duke of Richmond planted 1000 Cedars of Lebanon at various locations across Goodwood (Mason 1839, 161). Within Goodwood Park are a number of post-1600 woods including Kennel Slip, High Wood, Bullsdown Clump and Stonehill Clump and a number of much smaller un-named clumps relatively close to the house.

Even if this part of Sussex did not see a significant increase in the acreage of woodland these new plantations were part of a change in the character of the woodland of the great estates. The management of these woods shifted to the creation of plantations intended to largely consist of fully grown trees at the expense of coppices. The character may have also changed as different species of tree were introduced. A significant number of conifers were planted on estates across the country and further work including documentary research may provide a better understanding of what was planted on the great estates on the South Downs. The planting of Cedar of Lebanon at Goodwood indicates, some of these trees were new and exotic species for the South Downs.

Some of the changes to the extent and character of woodland are associated with the aristocratic love of hunting and in particular by the 18th century, shooting. Hunting had long been an aristocratic preserve and has left its mark in different ways. Some of the woods have been subdivided by numerous rides, some of which extend across open ground and link separate woods together. The most symmetrical arrangements of rides can be seen in The Valdoe (Goodwood Park) and Rewell Wood (Arundel estate). Straight rides such as these were laid out for shooting (VCH). This subdivision of the Valdoe in this way is depicted on Yeakell and Gardner's 1778-1783 map and although they do not depict Rewell Wood in the same way it had been laid out like this by 1772 (VCH Arundel). In both woods the rides extend out in a number of directions from circular clearings, but the designs are not identical and there are a greater number of subdivisions within the Valdoe compared to Rewell Wood.

While these examples show how a love of hunting affected the management of existing woodland, the growing interest in pheasant shooting from the second half of the 18th century was also responsible for further tree planting in the great estates. Pheasants require woodland cover, but will not venture that deeply within a wood. Some of the post-1600 woods in Goodwood Park consist of small clumps of trees or relatively narrow strips of woodland such as Kennel Strip or the planting flanking the lane to Molcombe and would have provided cover for pheasants.

Woodland industries

The survey of lidar and aerial photographs identified relatively little evidence of woodland industries or processing of timber. Saw pits can indicate areas where timber was processed and post medieval examples were excavated in Gloucestershire (Hendry et al 1984) and two were identified during the Weald and Downs Ancient Woodland Survey (Hume & Grose 2010, Appendix 2). Digging sawpits enabled two people to saw a log lengthways, one person on the log above, one in the pit below.

The saw pits in Gloucestershire were long oval depressions and excavation revealed their original form was probably typically a rectangular straight sided, flat bottomed pit 3.5m long, 1m wide and 1.5m deep. Sawn planks were laid at the bottom to provide a good footing for the woodsman (Hendry et al 1984, 51). A number of pits identified during the High Woods project may be sawpits, based on their shape. They were possibly too large to be sawpits, measuring approximately 5m by 2m, but fieldwork may provide a positive identification.

There is more evidence for the processing of underwood. This was used to make charcoal for industry (ironworks, glassworks) and for the wealthy as a domestic fuel (Stamper 1992, 139). The earthworks left by the creation of a clamp for burning charcoal usually comprised a platform or levelled area, often cut into a slope. These platforms are circular or oval (measuring up to 10m across) and built to provide a level area on which the wood stack could be assembled and burnt. Probable post medieval charcoal burning platforms were found on the slopes at the northern end of North Wood (Slindon), at North Side (East Dean), and a single example in Duncton Hanger.

Dark soilmarks seen on aerial photographs near North Side on Waltham Down, Woolavington Down and Graffham Down may be the remains of charcoal burning. However it is possible that some of these marks may be the remains of burning carried out during woodland clearance (Foard 2001, 83).

An alternative method of charcoal production was to burn the wood in pits, a technique thought to have been used in the Middle Ages. Nationally these have proved difficult to identify as earthworks (Rackham 1986, 355) although they have been identified during excavation (e.g. TBGAS 2011, 129 Andrew Simmonds Bradley Stoke), and may be the origin of the Colepit Bottom near Lamb Lea (J Kenney pers comm). As with the example of sawpits, some of the pits identified from lidar during this survey may be the remains of charcoal pits (Fig xx) and their investigation could be the focus for a programme of further work.

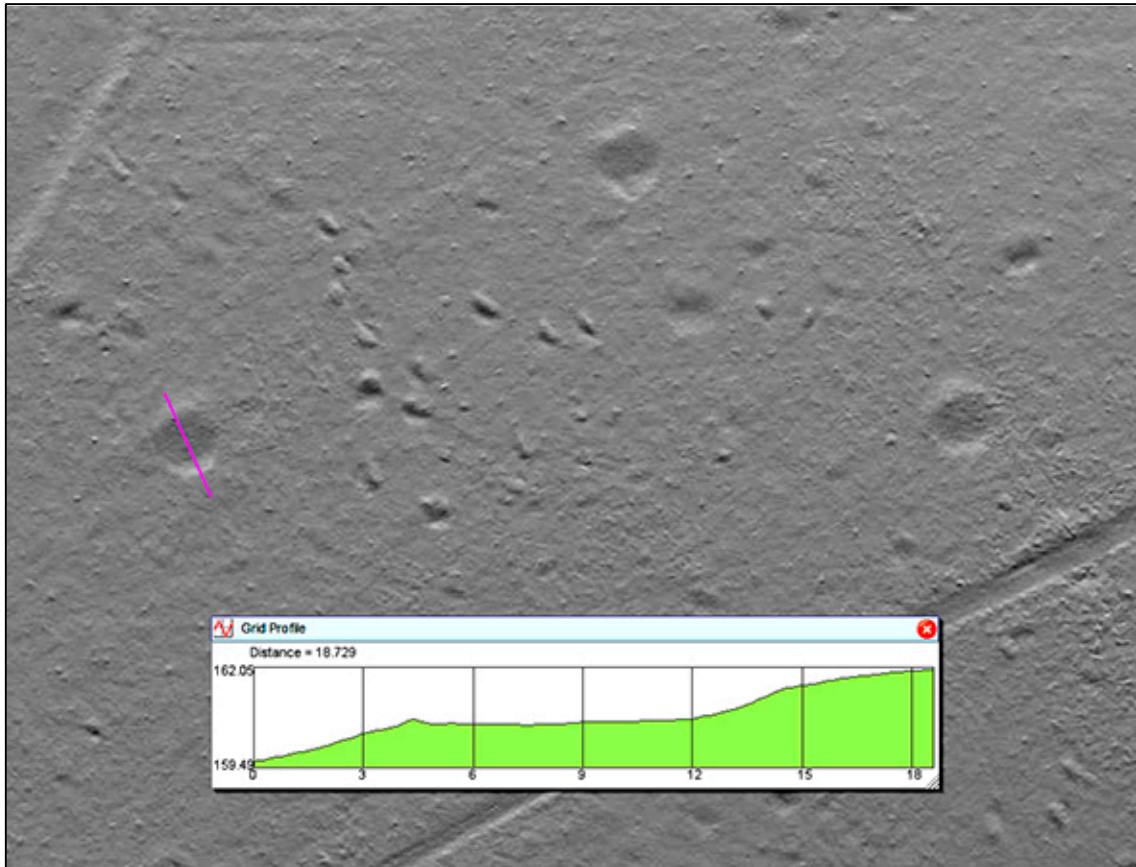


Figure 74 The lidar of some circular charcoal burning platforms in North Side wood. The western platform is also shown in profile. © Copyright Fugro Geospatial and South Downs National Park Authority

Charcoal burners and their families lived in the woods where the charcoal was made especially as they needed to closely monitor the burning, which could last a number of days. By association these charcoal burning sites highlight a dispersed element of the settlement pattern in the South Downs, although no evidence of the huts that would have housed these families have been identified. The presence of charcoal burners within otherwise empty woodland is reflected in the role (either genuine or invented) they play in medieval and later histories. The account of the death of William II (William Rufus, 1056-1100) includes the discovery of his body in the New Forest by a charcoal burner (King 1858, 251). A similar intervention is known from France when the 13 year old heir to the throne (the future Phillippe II, 1165-1223) became lost while hunting in a forest and was taken to safety by a charcoal burner (Wright 1856, 223). Whatever the truth in these stories -the early accounts of Rufus's death make no mention of a charcoal burner - (Barlow 1983, 429,) they both suggest the hidden and secret nature of woods and that this is a landscape of charcoal burners who lived physically and perhaps symbolically on the periphery of society. If the charcoal burners occupied a secretive place in society there is evidence that charcoal may have held a symbolic meaning during the early medieval period. Twelve burials

dating between the 10th-12th centuries and containing charcoal have been identified in York, Lincoln, Repton, Winchester and Chichester (Hadley 2001, 99; Biddle, 1964, 211 & 1965, 257; and Down & Rule 1971, 133-134). The reason for its inclusion is not fully understood. A sanitary measure has been suggested by Down & Rule (*ibid*) but a symbolic association of charcoal with penitential ashes has also been suggested (Hadley 2001, 99).

The friability of charcoal makes it difficult to successfully transport over long distances. Although the western Wealden industries are the most likely consumers of charcoal made in the High Woods, they are situated beyond the maximum 5-6km over which charcoal is thought to have normally been transported (Cleere & Crossley 1985, 135). The closest industrial site that would have required charcoal was a post medieval forge at Burton (c.1667-1724) c.7km from charcoal production sites in High Woods. This forge is a southern outlier of the main group of industrial sites in the western Weald and the next nearest was the iron furnace at Pallingham Farm (c.1586-1724) 15km from charcoal sites in High Woods. Although there is a 1600 record of charcoal being transported 14.5km which shows the distance could be exceeded, but no doubt with considerable wastage' (*ibid*). The actual routes that may have been taken have not been determined but they would have been longer than the estimated distances given above. However, these distances are dwarfed by that implied in the 1813 statement that most of cordwood from the Weald 'goes to London in the shape of charcoal' (Young 1808, 471); although it is also stated that 'Cordwood *for* charcoal' is 'exported in considerable quantities' (Young 1808, 420 *my italics*).

Another possible use for charcoal was as a fuel for lime burning and there are limekilns known across the county (Martin 1997) and their former presence is also indicated by place names such as Limekiln Bottom in Charlton Forest. However, an overview of limekilns and lime burning refer to either wood or coal used as a fuel but not charcoal (Williams 1989). According to Rev Andrew Young's overview of agriculture in Sussex (1808 edition) Sussex produced large quantities of charcoal and he considered it, jointly with timber and bark, as the second principle product of Sussex (Young 1808, 419); and much of this was presumably made in the Weald. Despite this huge output, only underwood is mentioned as a fuel for lime burning (Young 1808, 169, 413, 471). If these accounts are correct, it seems likely that the higher price of charcoal was a disincentive to using it for lime burning, especially as its advantage over wood of a higher burning temperature was not required in the production of quicklime.

Later charcoal consuming industries of the 18th and 19th centuries to the south in Arundel and Chichester were equally distant being over 10km away from these charcoal burning sites. Further work may be able to suggest possible routes between the downs and the Wealden industrial sites and, although the

charcoal production sites were not that close to the river Arun, explore the possibility that water transport was used in this trade.

The remoteness of the charcoal burning platforms from the known industrial sites may suggest that charcoal production in the High Woods was intended for high status domestic use or that it was an exceptional use of the underwood in response to specific circumstances. This is also suggested by the relatively small number of charcoal burning sites and possibly even by their form. These sites could only have been used periodically after an interval of years to allow for regrowth and a continuous supply of charcoal would only have been possible by a cyclical use of a number of woods. A more detailed study may be able to estimate the amount of charcoal that the High Woods could have produced but compared to the hundreds identified in Rockingham Forest (Foard 2001, 83) the evidence does not suggest intensive charcoal production. The nature of the earthworks may also indicate a short-lived industry as some cropmark and earthwork charcoal burning sites in Northamptonshire and Hampshire are thought to have spread up to 20m across as a result of repeated firings (Foard 2001, 83-84).

As a result charcoal burning here may be linked to the competition between ironworks and glass works during the second half of the 16th century, the impetus provided by the rise in charcoal prices by a factor of four between 1540-1600, eventually being eight times as expensive by the 1630s (Cleere & Crossley 1985, 163). This use of High Woods charcoal in the Wealden industries may have implications for the estimates of the amount of Wealden woodland that was exploited for industrial use. Determining the age of these sites could be a crucial step in their better understanding.

Possible bee gardens or game bird enclosures

The earthworks of two possible bee gardens were identified on Philliswood Down in the parish of Elstead and Treyford. A bee garden is an enclosure built to protect hives from grazing animals and they have been identified within the New Forest, Hampshire (Smith 1999; Royall 2013, 62-3). Similar small embanked enclosures, generally 10m across are known throughout the New Forest where they were constructed to protect hives from deer and grazing stock. The two Philliswood enclosures are square but at 12m and 17m across are larger than the New Forest examples and may instead have been used for rearing game birds as part of a pheasantry.

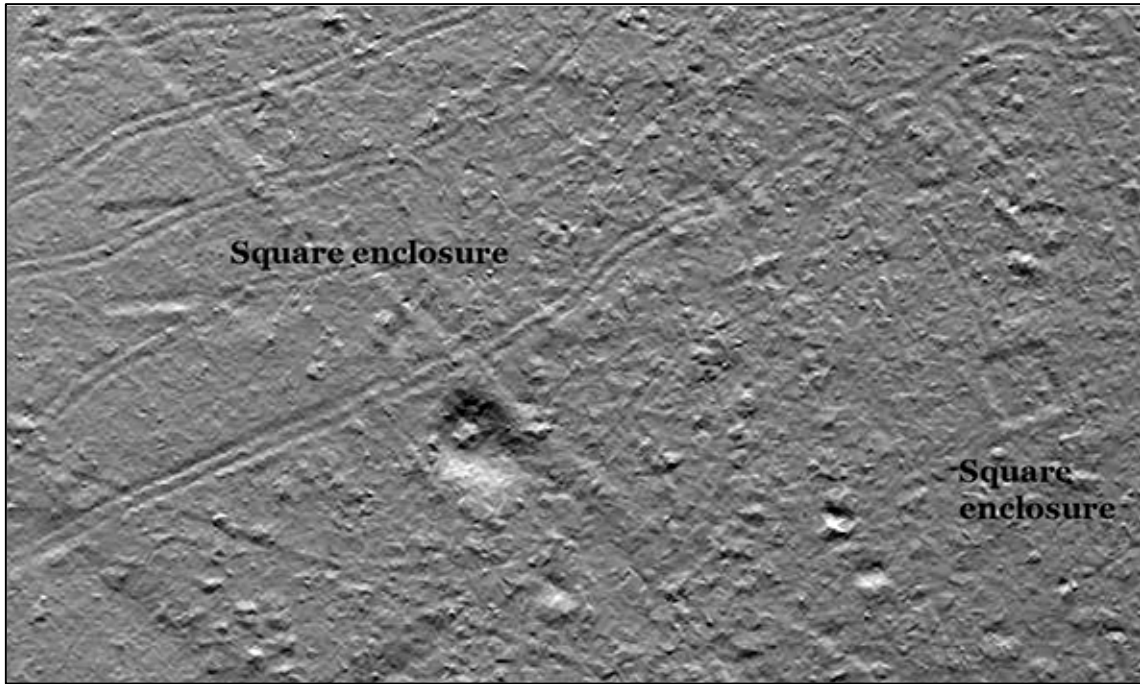


Figure 75 These two square earthworks in woods on Philliswood Down are possibly bee gardens or enclosures for game rearing, © Copyright Fugro Geospatial and South Downs National Park Authority.

Discussion

The results of the mapping from lidar and aerial photographs can contribute to programmes of further work investigating the history of woodland of this part of the South Downs but has already raised some specific points concerning the extent of pre-1600 woodland cover and the high woods contribution to industry in Sussex. The wooded nature of this part of the South Downs suggests that although the character of the woods changed during the 18th century, perhaps there was only a limited increase in the area under trees.

Although few former woodbanks have been identified outside of woods, dark soilmarks in fields, indicating charcoal production sites or burning associated with woodland clearance does highlight the existence of woodland in what is now downland or arable.

While this suggests that relatively little medieval or later woodland has been lost, historic maps do depict woods which no longer exist, for example the southern half of The Valdoe. The identification of old woodland banks within woodland has provided some evidence of woodland expansion. However if their categorisation as Ancient Woodland is correct these represent expansion of woodland that took place prior to 1600 and are not associated with an 18th century increase in tree cover.

Comparison of the distribution of the archaeological evidence and that of ancient semi-natural woodland highlights the potential for further detailed fieldwork looking at species growing in these areas. In particular, a detailed comparison of the relationship between species and the areas defined by old wood banks could be undertaken. Similar work in Leigh Woods (Somerset) highlighted how the different character of the wood reflected earlier use (Bond 2004, 91). However, what seem to be the best examples of early wood banks are within modern plantation at North Wood and Eartham Wood

CONFLICT AND DEFENCE

The story of the wartime impact on the High Woods covers a wide range of activities including troop training, defence and Prisoner Of War camps, but much of what was seen on aerial photographs and lidar is associated with war in the air from both the First and Second World Wars. A notable exception is the site of an 18th-19th century signal station that formed part of the Portsmouth Telegraph Shutter Line, an important early rapid communication network developed during the Napoleonic war. This is discussed below in the context of the use of Beacon Hill for military purposes.

As in other periods, during the World Wars the use of the High Woods area contrasted with the open downland to the east which were generally more intensively militarized zones and large areas were requisitioned for military training (Carpenter 2005, Carpenter et al 2013). However, both World Wars affected the landscape and the lives of those living in the High Woods area. The evidence from the High Woods NMP survey for the First World War is patchy due to the lack of early aerial photographs. The Second World War had a deeper impact on the landscape resulting in military installations for defence and communication, airfields, civil defences and training grounds. The RAF aerial photographs from the 1940s, particularly in the immediate post-war years of 1946-48, were a key source for many features that were rapidly removed at the end of the war.

First World War

The early 20th century heralded a new era with the invention of both submarines and flying machines. The onset of First World War fuelled their development and for the first time in military history, the conflict in mainland Europe was brought directly to the English countryside beyond the immediate coastal fringe. Now bombardment was not only restricted to the reach of naval artillery, but also to the range of a 'flying machine' bringing hitherto undisturbed areas of the south of England such as the South Downs into the range of conflict.

Aside from the matters of defence, a wide range of military and non-military establishments were set up across the country. For example, further down the coast at Seaford two large troop training camps were established in 1914-1915 for volunteers for Kitchener's Third New Army ready for embarkation from Newhaven (Skinner 2011, Carpenter et al 2013). Slindon House, under the auspices of the British Red Cross became an auxiliary military hospital for convalescing officers (<https://slindonatwarmyblog>). The woodland itself helped fuel the huge wartime demand for materials for the war effort. A Canadian logging camp was established in Slindon Woods manned by Canadian troops

and prisoners from the adjacent POW camp (<https://slindonatwarmyblog>). The woods were also used as sheltered tethering points for air ships, though no trace of these was identified on aerial photographs or lidar; both are discussed in more detail below.

War in the Air

Airships and aeroplanes were first used in conflict by the British during the First World War and though little trace of much of the activity remains today, several key sites for the early deployment of both aeroplanes and airships were located in the High Woods area and these were used to combat both enemy aircraft and submarines. At this stage of the war airships were the most effective counter-measure. Their range and ability to hover made them ideal for spotting submerged submarines, marine minefields and escorting merchant vessels.

Airfields gradually appeared across the south coast of Sussex and Kent for the development and manufacturing of British airships and planes. RNAS Polegate (Royal Naval Air Service) near Eastbourne, a subsidiary base to Portsmouth Command, was established early in the war in 1914. It housed a single SS (Submarine Scout) airship. This was replaced in 1917 by the greatly improved SS Zero which had an enclosed gondola large enough to take a crew of three men and was armed with a Lewis gun and two 65lb bombs, all suspended beneath a hydrogen-filled envelope. Operations at RNAS Polegate were expanded further west in April 1918 where two safe airship mooring sites affording protection from the wind were sought. The protected mooring sites were simply bays large enough to safely tether an airship, which cut into the woodland. One mooring-out station was found at the head of Poole Harbour, the second in a sheltered valley near Northwood Cottages at Slindon (Butler 2008). It is unlikely that any trace of the tethering mast or associated structures remain (Butler 2008).

Tangmere, located at the southern end of the project area, was selected as an aircraft landing ground during the latter phases of the First World War. The site sits on level ground on a wide strip of the coastal plain reasonably close to the coast. It was initially used as a base for No.92 Squadron in March 1918, flying continuing until 1920. After a brief period of inactivity it was re-activated in 1929 with the continued unrest in mainland Europe and continued as a military airfield into the Second World War (Birtles 1999). The airfield was further extended and eventually furnished with concrete runways and hard-standings for the aircraft of WW2, remaining in use by the RAF until 1970.



Figure 76 Airship tethered in woodland, believed to be Slindon Woods. Reproduced with kind permission of Rodney Gunner.

Slindon Estate and Eartham Woods in First World War

The Slindon Estate is a heavily wooded area at the eastern end of the High Woods project area. During the First World War this was the large base for one of the 70 or so Canadian Forestry Corps operations established in Britain following an appeal in February 1916 (<https://slindonatwarmyblog>). They were funded by the Canadian government and undertook vital forestry operations overseas – essentially in Britain and Northern France. Their roles included managing and producing timber resources for trench linings, pit props, railway sleepers and buildings as well as clearing land for airfields, constructing barracks and hospitals and farming. In 1918 at the height of fighting they also supplied men to bolster the infantry in France (<https://slindonatwarmyblog.wordpress.com>)

Despite the size of the site, little of the Slindon lumber camp remains today. Tantalising traces of the operations have been identified on aerial photographs and lidar images and on the ground by the team of South Downs park volunteers. The remains comprised earthwork ditches and banks, fragments of masonry and brick work, concrete hut platforms, pieces of metal and water pipes. At its height, the camp accommodated over 100 personnel supplemented by up to 300 German prisoners of war from a nearby prisoner of war camp (<https://slindonatwarmyblog.wordpress.com>).

The lumber was processed on site and transported to a saw mill somewhere on Stane Street via a purpose-built narrow gauge railway network and overhead cable ways (<https://slindonatwarmyblog.wordpress.com>). As well as the railway, an extensive network of water pipes was laid out across the woodland. Field visits by South Downs volunteers found the woods to be littered with metal rails, pipes and brick and concrete structures, remains of this short-lived, but industrial scaled operation (K Sloane Pers.com 2015). The High Woods NMP survey detected very little of the wartime remains but some of the numerous elongated pits throughout the woods may be saw pits created or reused for processing the timber.

There were two lumber camps, at Eartham and Slindon. Both were broken up and all saleable items sold through auction by the Disposals Board after the end of the war giving an insight into the scale of the operation. The auction for Slindon Camp took place on 26th February 1920 and included such items as rows of surplus huts, wash houses, a dynamo house, an electric lighting plant, barbed wire, lighting and electrical items. (<https://slindonatwarmyblog.wordpress.com>)

The German prisoner of war camp was located nearby. Prisoners, guarded by Canadian troops and a detachment of the Royal Sussex Regiment, worked in the Canadian lumber camps and on local farms (ibid). A comparison of historic ground photographs of the camp and aerial photographs suggests the German prisoner of war camp was on the north side of Nore Hill. Two huts and bases of further demolished huts within a roughly square area are believed to be the remains of the camp and are recorded on 1946 RAF aerial photographs just north of Nore Hill in woods known as The Plain.

Second World War and the Downs

At the outbreak of the Second World War large tracts of the South Downs were requisitioned and reclaimed by the East and West Sussex War Agricultural Executive Committee for the production of wheat, vegetables and milk. In addition, large areas (including farms and houses) were evacuated and requisitioned to provide a training ground for the troops. The largest impact in both instances was felt in the open Downs devoid of hedges and ditches in the east of the county (Brandon1999). The extensive remains from these training grounds were recorded from aerial photographs during the NMP Beachy Head Project (Carpenter et al 2013). However, in the western Downs between Horndean in the west and Arundel to the east the high proportion of woodland offered far less land for cultivation for the war effort. Some traces of Second World War ploughing has been identified on lidar images within North Wood in an area felled during the First World War.



Figure 77 1946 Aerial photograph of a Second World War defended area and tank training on Bow Hill above Kingley Vale. The barbed wire can be seen as dark grey lines. RAF 3G/TUD/UK/156 PART IV 5349-50 19-APR-1946 Historic England RAF Photography.

Though military training in this area was not on the scale seen further east on the downs, significant areas north of Chichester were used for troop training, traces of which could still be seen on RAF aerial photographs taken immediately after the war. A large area defended by barbed wire entanglements was noted on Bow Hill above Kingley Vale on aerial photographs taken in 1946 with traces of what are likely to be tank tracks visible within the enclosure and extending out into the surrounding countryside. There are a number of accounts of Canadian troops undertaking tank training here and reports of the remains of at least one tank and frequent ordnance finds in the area to support this, as do personal accounts (<https://slindonatwarmyblog.wordpress.com>). Remains of a possible troop carrier were identified within the yew woods of Kingley Vale during field work for the Secrets of the High Woods project (Fig 77).



Figure 78 Mangled remains of a vehicle, possibly a Second World War troop carrier or tank in the yew woods of Kingley Vale photographed during field work by volunteers for the Secrets of the High Woods project. © SDNPA

Elsewhere, a few practice trenches were seen on wartime aerial photographs in the grounds of Adsdean House. It was common for many large houses to be requisitioned by the army during the war, but Adsdean House was taken over by Dr Barnardos in 1940 and functioned as a mixed children's home until 1950 (www.barnardos.org.uk), receiving some evacuated children during the war (www.bbc.co.uk/history/ww2peopleswar). It is possible that the trenches were either dug by the boys at the home or perhaps by the local branch of the Home Guard.

Second World War Airfields

The coastal plain around Chichester is at its widest at around 7-9km wide. Further east the chalk escarpment angles closer and closer to the sea forming abrupt cliffs. The widening coastal plain provided vital flat ground with enough space for much needed airfields and landing grounds. A number of locations were acquired by the Air Ministry for this purpose along the south coast. The former First World War airfield at Tangmere had been reactivated in 1926 and was expanded, becoming RAF Tangmere. The runways were surfaced in

concrete and extended beyond the perimeter road and aircraft would have been parked on dispersed hard-standings or in embanked blast pens and hangars that were placed around the perimeter.

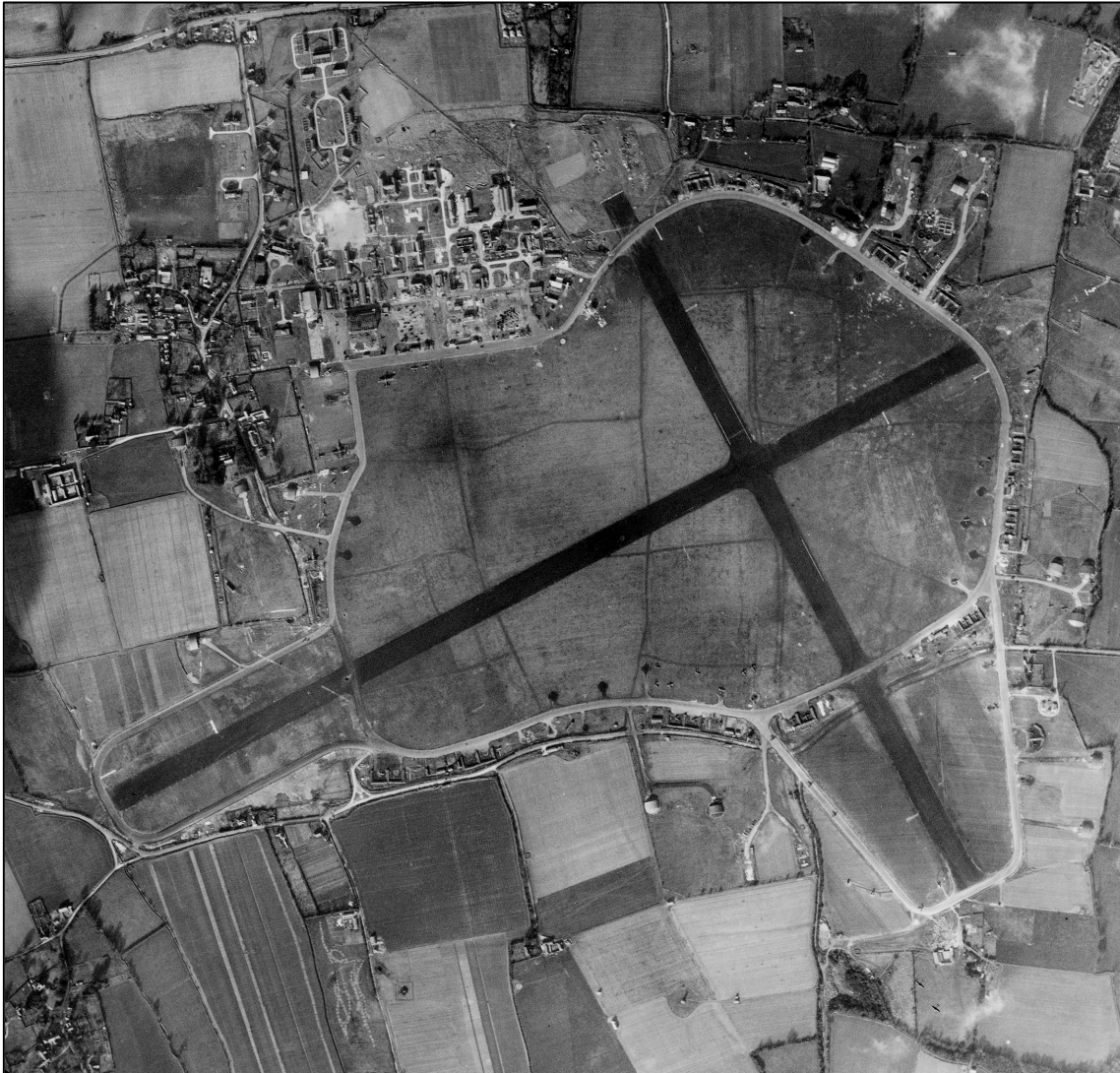


Figure 79 Extract of USAAF aerial photograph showing the extent of RAF Tangmere in February 1944. US7PH GPLOC/178 5021 10-FEB-1944 Historic England USAAF Photography

United States Army Air Force aerial photographs taken in February 1944 show the site at the height of its wartime development (Fig 79). The main airfield buildings, administration and accommodation buildings were located in the north-western corner of the airfield. In addition, a number of auxiliary satellite sites including the sick quarters and women's accommodation were located outside the perimeter to the north-east.

At the start of the Second World War it became a fighter airfield, home to Hurricanes of No. 1. No.43 and No.605 Squadrons until August 1944. Hunter

Jets replaced the Hurricanes in 1945 and were based here until 1958. The airfield was active until 1963, finally closing in 1970 (Birtles 1999, 134).

A radar station, presumably serving RAF Tangmere was located 2km east of the airfield between Norton and Fontwell. RAF photographs taken in 1946 show a triangular fenced compound containing four masts with three separate station buildings, two within a compound, the third with a blast wall. These buildings would have housed the transmitter (Tx) block, receiver (Rx) block, administration and guard huts and the transform kiosk (Lowery 1996).

A satellite Emergency Landing Ground was laid out in 1940 on land, to the north-west of Tangmere, requisitioned prior to the war at Westhampnett on the Goodwood Estate. Known as RAF Westhampnett, it only had grass runways, and RAF photographs taken in 1946 show its perimeter road with 'frying pan' aircraft dispersals and dispersed accommodation, operations site and sick quarters to the north and north-east of the site.

The airfield became home to Hurricanes of No. 145 Squadron, followed by a number of other British and American fighter units. In July 1942 the USAAF 31st FG arrived with Spitfires until the return of the RAF in October of the same year, staying until September 1944 when it was handed over to the Fleet Air Arm until November 1945. The station was finally closed in May 1946 (Birtles 1999).

The site reopened in 1958 as a civil aviation airfield, now Goodwood Civil Aerodrome. Few of its wartime features are evident though a few surviving buildings, including a hangar at Valdoe Yard and the concrete roads from one of the dispersed accommodation camps survive in the fields around Westerton Cottages and can be seen on aerial photographs. The footprint of the sick quarters to the west is also fossilized in the outline of the housing development around Richmond Road.

Further to the west, some 6km from Westhampnett an Advanced Landing Ground was established at Funtington in 1943 in advance of D-Day to support the Normandy landings (Birtles 1999). The nature of the site, with its two runways of rolled steel mesh and tented accommodation suggests it was laid out quickly and closed as soon as the operation was completed in December 1944. In the build-up to D-Day it was home to Squadrons 19, 65 and 122 with Mustangs, Typhoons and Spitfires. The site was returned to agricultural use after the war and little trace can be seen (Birtles 1999).

Decoy sites

In response to threats from aerial bombardment a national programme of homeland defences was established in the early months of the Second World War. This included the construction of decoy and dummy sites to draw enemy attack away from towns, airfields, factories and depots (Dobinson 1996). In 1940 a dummy airfield or 'K' decoy site (No. 51a) was established at Gumber Farm near Slindon (Butler, C 2008). This was to act as a decoy for RAF Tangmere 8km to the south-west and was equipped with dummy aircraft including Hurricanes – typically these would have been made of painted wood and moved around the dummy landing ground to give the impression of an active airfield (Butler 2008). The ephemeral nature of such decoy sites leaves little trace and no obvious remains were identified during the NMP project on aerial photographs of the site taken immediately post-war in 1946.



Figure 80 Gumber Farm decoy control bunker and generator remains photographed in January 2016 © SDNPA

However, at a later date the Gumber Farm decoy was developed into a Q decoy site furnished with controlled lights designed to simulate the night-time operations at RAF Tangmere. With this came a suite of buildings and structures including a semi-sunken control shelter and air raid shelter, both of which still survive. The personnel were billeted at the farm where a second air raid shelter was built in the garden of the cottages. (Butler 2008) The remains of the control shelter can be seen on aerial photographs to the north of the farm - the blast walls to the entrance and the emergency exit are clearly visible cut into the built up mound over the sunken structure. It is not certain where the actual decoy was and no trace of the decoy lights remain. It has been suggested (Butler 2008)

that the embanked line of Roman Stane Street to the west of Gumber Farm could have been used to lay out the lights. This long straight bank would have been ideal to place lights to simulate runway lights. However, the existence of the decoy appears to have been no great secret, being found to be marked as such on German wartime maps. (Butler 2008).

Civil and military defence

During the Second World War much of the coastal zone of the south of England was given over to both passive and active anti-invasion and aerial defences. The area of the High Woods NMP project lies inland of this zone but a few defensive sites were recorded. This included part of the anti-invasion defences around Chichester. An anti-tank ditch was constructed between natural obstacles such as the River Lavant and the Chichester Canal and its route partly falls within the High Woods area.

The remains of a possible anti-aircraft landing obstacle were seen on Great Down to the west of Stammers Wood on aerial photographs taken in 1946. This obstacle consisted of seven pits with spoil heaps on their southern sides obstructing a long reasonably flat field between woodland. It is likely to have been dug during the 1940 invasion scare. These pits have since been levelled and no earthworks traces can be seen on lidar imagery.

On Halnaker Hill within the remains of a Neolithic causewayed enclosure is the site of a Second World War radio direction-finding installation (and an 18th century windmill). The radio station was sited there because of the elevated location to fix the position of advancing aircraft triangulated from three radio locators housed on three of the four octagonal brick towers. The three locator towers had a concrete base upon which a 2.6m high wall was constructed around a central holdfast. Each was topped by a wooden structure housing the radio location equipment. A fourth tower with a large adjacent oil tank and several smaller structures were the site's ancillary buildings. The windmill, which was built in 1750 for the Goodwood Estates, was re-used during the war as an observation post for the Home Guard. (Butler 2008, 64-65).

The remains of a radar station were seen on 1946 RAF photographs, located on Beacon Hill on the northern edge of the Downs overlooking Harting. Like the radio location station on Halnaker Hill (see Figs 81-82) the site on Beacon Hill also lies within a later prehistoric site –in this case the remains of a Bronze Age enclosure. The wartime site consists of a number of buildings, two of which appear to have blast walls and may be gun emplacements, but no radio masts are visible



Figure 81 Extract of RAF 1946 aerial photograph showing the remains of the Second World War radar station on Beacon Hill above Harting located within a large Bronze Age enclosure. RAF 3G/TUD/UK/155 5284 16-APR-1946 Historic England RAF Photography.

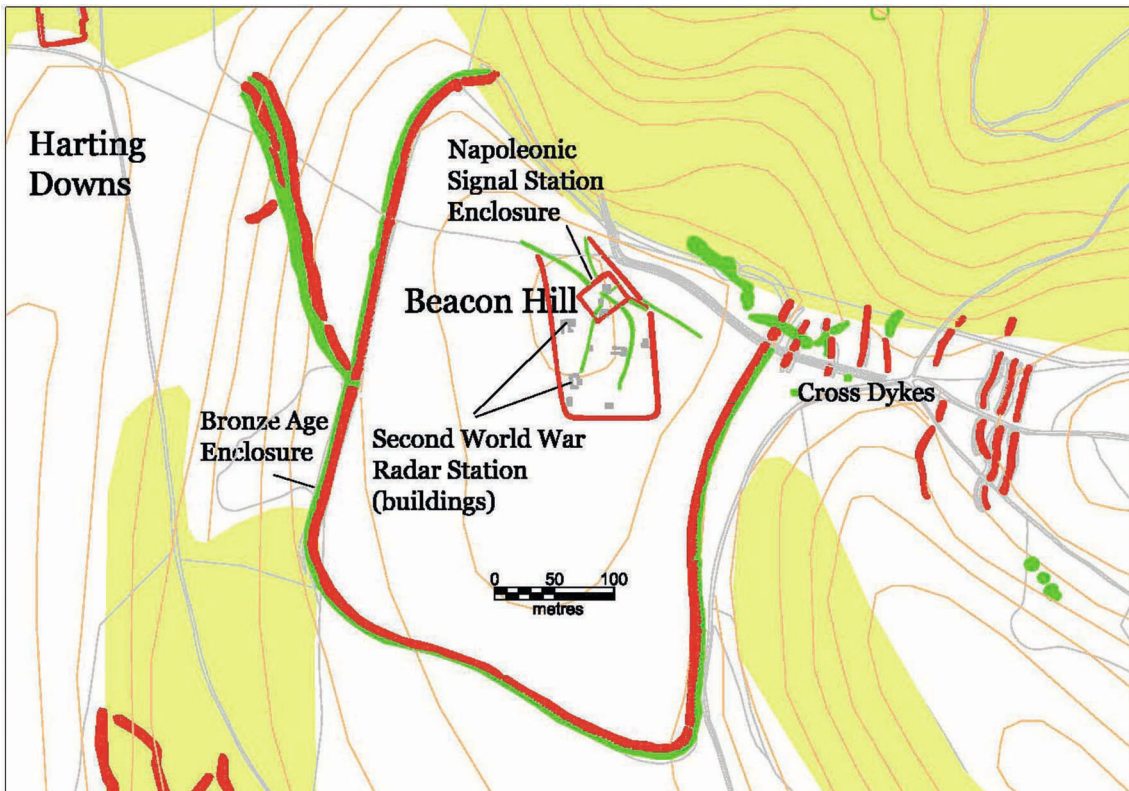


Figure 82 Map of features from multiple periods at Beacon Hill. Base Map ©Crown Copyright and database right 2015, all rights reserved. Ordnance Survey Licence number 100024900.

Two of the buildings or structures are located within a small rectangular embanked enclosure, measuring 29m x 33m, which is marked on the 1846-1901 OS map. This enclosure is all that remains of the site of an 18th-19th century signal station which formed part of the Portsmouth Telegraph Shutter Line, an important early rapid communication network developed during the Napoleonic war.

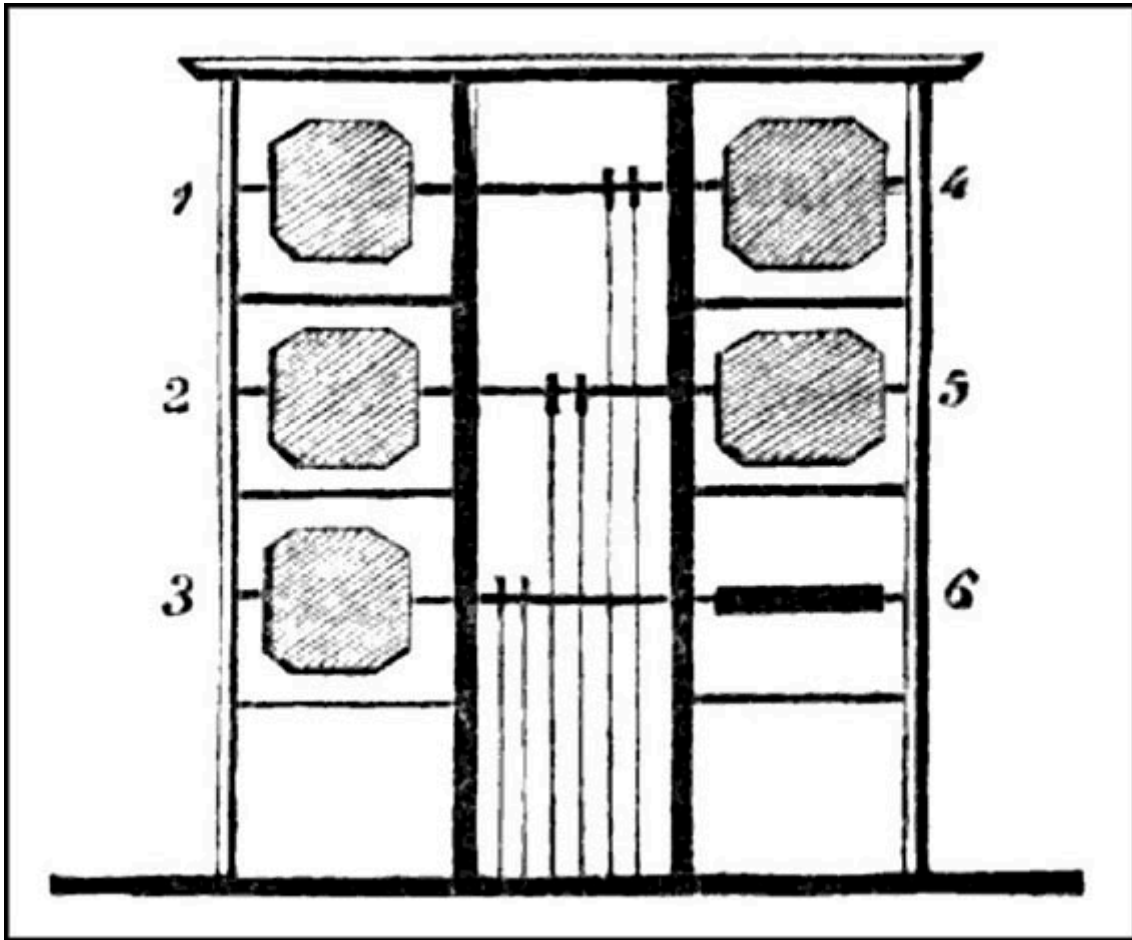


Figure 83 Diagram of the Murray six-shutter semaphore system (shutter 6 positioned horizontally) used for the Portsmouth Telegraph Shutter Line, one station located on Harting Beacon (https://en.wikipedia.org/wiki/Semaphore_line).

The French had already developed a means of long distance communications using signals, and following capture of a French soldier, secret signal plans and an alphabet were recovered. The British, namely Rev. John Gamble and Rev. Lord George Murray (working independently on the same problem) developed improved versions of the French towers. The result (designed by Murray) was a tower with six square paddles that could signal 63 combinations. A line of signal towers were set up in 1795 initially linking London to Chatham with a branch to Sheerness. A second line of ten towers or shutters was started in March 1796 from the roof of the Admiralty in London to Portsmouth. The Beacon Hill

(South Harting) Shutter was the 8th tower in this sequence (Holmes 1983). Messages could be passed from London to its destination in a matter of minutes.

Discussion

Conflict and the threat of invasion have impacted the landscape of the South Downs both directly and indirectly and the remains of a wide range of military and civilian activities have been recorded across the High Woods project area. The majority of sites recorded date from the Second World War, but traces of sites associated with the First World War and even the Napoleonic wars have also been recorded. The First World War saw the first aerial bombardment of coastal towns and industrial sites, but nothing to match the scale of threat seen in the Second World War. Though little trace remains, hints of the conflict still survive in the woods.

As one might expect, the remains of the Second World War are most in evidence being the most recent and most far-reaching of the major conflicts. The Secrets of the High Woods survey benefitted from numerous RAF aerial photographs taken at or immediately after the war recording military and civilian wartime structures, which had yet to be removed at the end of the war. The combined sources of aerial photographs and lidar have helped to piece together a picture of this part of Britain playing its part in both defence and troop preparations. Though not on the scale of adjacent areas of the South Downs where there was wide-scale requisitioning of land, the High Woods nevertheless played a key role as military training ground and essential location for airfields and emergency landing grounds for the RAF.

A WELL PRESERVED ARCHAEOLOGICAL LANDSCAPE

The results of this aerial survey project highlighted a broad range of archaeological sites within the High Woods project area, belonging to a long period of activity for prehistory to the Second World War. What is remarkable about this landscape is that much of the evidence of past activity survives as well-preserved earthworks. Their survival is largely due to the protection - particularly from the damaging effects of ploughing - provided by the extensive woodland across this part of Sussex and Hampshire.

The use of the word 'secrets' in the project title highlights the hidden nature of this archaeological landscape but also indicates an understanding that earthworks do survive (are hidden) within the South Downs woodland. This report has highlighted some examples where earthworks within woodland have been noted in the past, and some woodland sites such as the prehistoric enclosures in Rewell Wood have been the subject of survey. Despite these examples, the archaeologist SE Winbolt's annotation on his 1931 plan of Nore Hill: 'woodland (unexplored)', is a suitable summary in terms of archaeological investigation for much of the woodland in this area.

The use of lidar has made this detailed survey of the woodland possible by highlighting those features that survive, but not all the archaeological sites identified can be seen by lidar. Some of the archaeological earthworks have been levelled and only survive below the ground surface. Aerial photographs taken when conditions were favourable have allowed these sites to be revealed by the cropmarks created by these buried remains. Evidence of the two World Wars has largely been on buildings and structures, but the wartime landscape was short-lived and survives in a fragmentary state, something that is particularly true for the First World War).

The mapping undertaken during this project has produced a complex picture extending back into prehistory. The detail achieved reveals the relationships between monuments of the same age and with older features. The re-use or continued use of some features, such as field boundaries or trackways highlights this complexity making it difficult to accurately break the historic landscape down into different periods, something reflected in the thematic approach followed in his report.

All aspects of the High Woods area of the South Downs have historic character. Some features may be assessed as being special and will have protection that acknowledges their national importance (through scheduling) and will benefit from careful consideration of their futures, but value also resides in the more typical and commonplace. If we value the past it can enrich our future and Historic England's *Conservation Principles* (2008) defines group of four values

that can be used to describe and understand the significance of a place. These are:

Evidential value: the potential of a place to yield evidence about the past.

Historical value: the ways in which past people, events and aspects of life can be connected through a place to the present.

Aesthetic value: the ways in which people draw sensory and intellectual stimulation from a place.

Communal value: the meanings of a place for the people who relate to it, or for whom it figures in their collective experience or memory.

The High Woods landscape has clear Evidential value that covers a large area and concerned with a period of time that extends back to the Neolithic. The excellent preservation of archaeological earthworks in the High Woods area establishes the potential of this place to yield evidence of the past. The evidential value of the earthworks can help us understand this part of the downs, the wider South Downs and similar landscapes across England. The more that is lost the more difficult they can be to understand.

These monuments also provide a link with the early archaeologists who undertook pioneering work on the South Downs and are important to the history of early of archaeological work in Britain. The whole of the South Downs were the focus of a number of early 20th century archaeological investigations that helped either identify or establish new interpretations of a number of different types of monument. Early work on the identification and understanding of field systems, cross dykes, Bronze Age settlements, Neolithic flints mines was undertaken in Sussex (e.g. H Toms 1911; Curwens 1918; E C Curwen 1923, Holleyman1935).

The Historical value of the High Woods is the landscape's ability to link past people or events to the present. There are two types of Historical values and the surviving visible monuments are considered to have Illustrative value. A visible monument provides a tangible link between present and past communities and the excellent earthwork preservation across this part of the South Downs means that many links can be made to a wide range of activities across a number of different periods. Illustration depends on visibility and significant buried sites do not have this Illustrative value. This may also be true for some of the earthwork remains within woodland that although not impossible to see may not be readily visible or recognised.

These remains provide a tangible link to the communities who lived in this part of the South Downs. They are represented by features relating to a wide range of

periods, functions and social scales. They include prehistoric settlements, field systems; post medieval charcoal burning sites lived and worked in by itinerant labour, medieval deer parks that were the scenes of hunts and the provision of meat for the tables of the aristocracy.

Historical value is also has Associative value and these remains can provide a link to notable people or events. Perhaps the most obvious examples are the few remains that illustrate the role that the High Woods played in the two World Wars.

Aesthetic value enhances people's attachment to the High Woods and the satisfaction they gain from being associated with this landscape. As this report has shown this landscape is the result of natural and human interventions over many generations. This has created what has been considered 'a national icon of a landscape considered quintessentially English' (Brandon 1999, xv) and has been eulogised by authors such as Kipling and Belloc. These authors' descriptions of the landscape did include references to ancient sites and serve to emphasise how the past has helped make this a landscape that is greatly valued both aesthetically and because of the connections they provide across generations.

Historic and Aesthetic values are closely bound-up with Communal value. These parts of the landscape provide meanings of a place for those who draw part of their identity from it, or have emotional links to it. The strong community involvement in this HLF funded Secrets of the High Woods project will ensure that their views as to what is significant to them and what elements of the landscape are bound up with these different values will be heard.

The NMP component of the High Woods project has been able to contribute to the identification of those historic parts of the landscape, whether surviving or buried, that contribute to the character and heritage value of the South Downs. As emphasised, all these elements have value but a series of questions can be asked to try and determine the relative contribution they make to the overall value of the place; what is its significance?

Some of the sites identified are relatively small well defined monuments that are considered to be of national importance. The cropmarks of the two Neolithic long barrows are good examples of this for the evidential value they possess. More extensive but relatively well-defined sites with a national significance include the fragmented remains of the Chichester -Arundel Roman Road. This is a road that has long been speculated to have existed since at least the 1940s (Margary) but for which evidence has only been identified during this project. These remains have evidential value but their survival as earthworks allows them to function as a visible link with the past connecting communities with Roman Britain.

Historical and illustrative value also resides in the earthwork remains of the medieval deer park pale at Slindon. The earthworks of this park, owned by Archbishops of Canterbury, are the only example within the project area of the classic arrangement of bank with inner ditch. Although the circuit is no longer complete, what remains appears to consist of substantial earthworks.

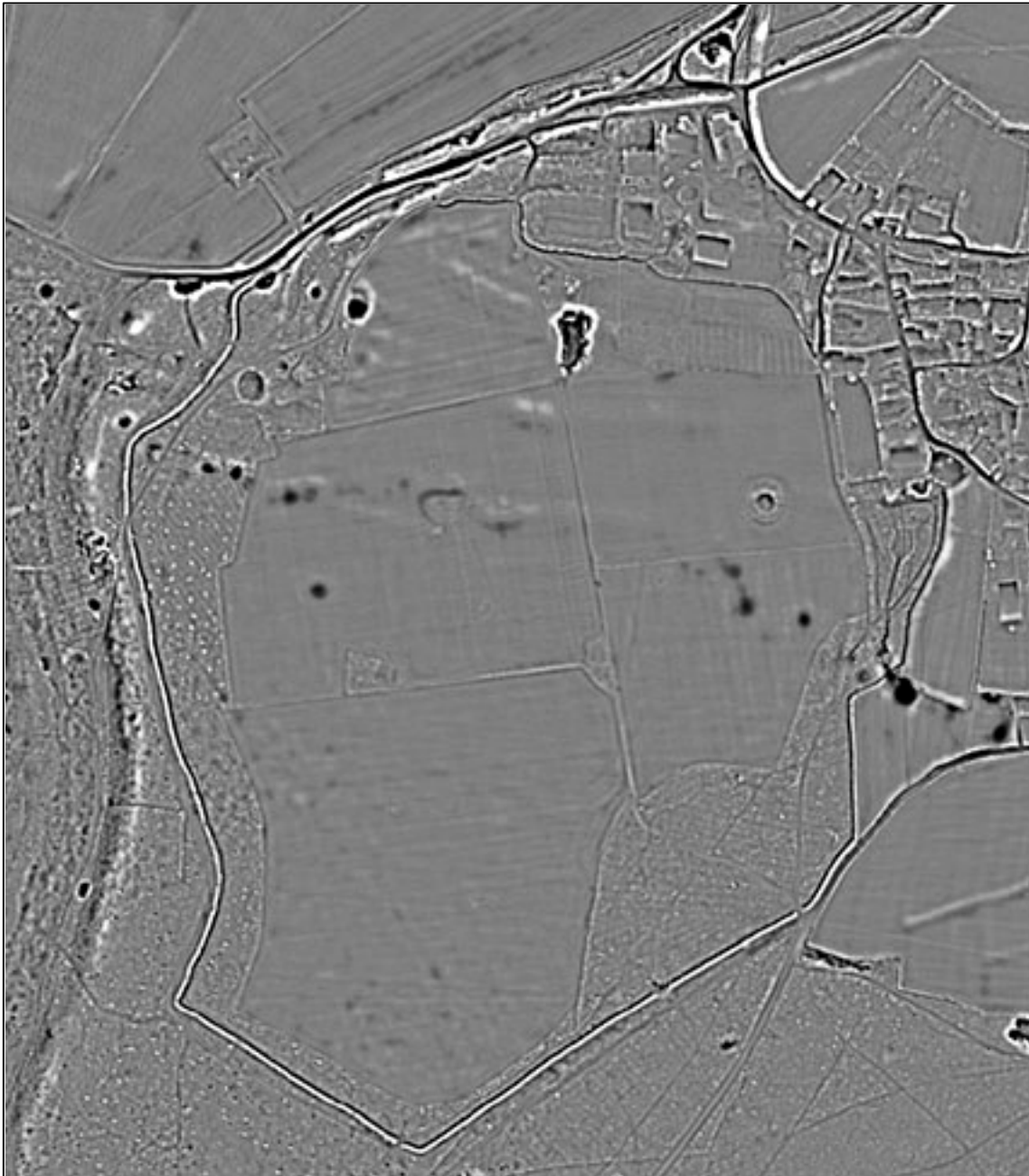


Figure 84 A lidar visualisation of Slindon deer park pale © Copyright Fugro Geospatial and South Downs National Park Authority

The NMP survey has provided a landscape context for sites such as those discussed above but the large scale survey has also indicated how extensive some archaeological remains are. These extensive remains may have significance, but there may be problems in deciding on their boundaries and achieving protection. The visibility of prehistoric or Roman field systems in a field near Lamb Lea in the parish of East Dean was one of the factors in their protection through scheduling. The lidar survey shows that these lynchets form part of a much larger field system that are located within the woodland that extends along the northern edge of the South Downs. Despite the extensive remains of ancient fields across the High Woods they also represent a rare example of protection being given to this aspect of the historic landscape. This is in part because their true extent was not understood until this part of the project was completed but also because remains that extend over a large area pose their own set of problems (see Brightman et al 2015).

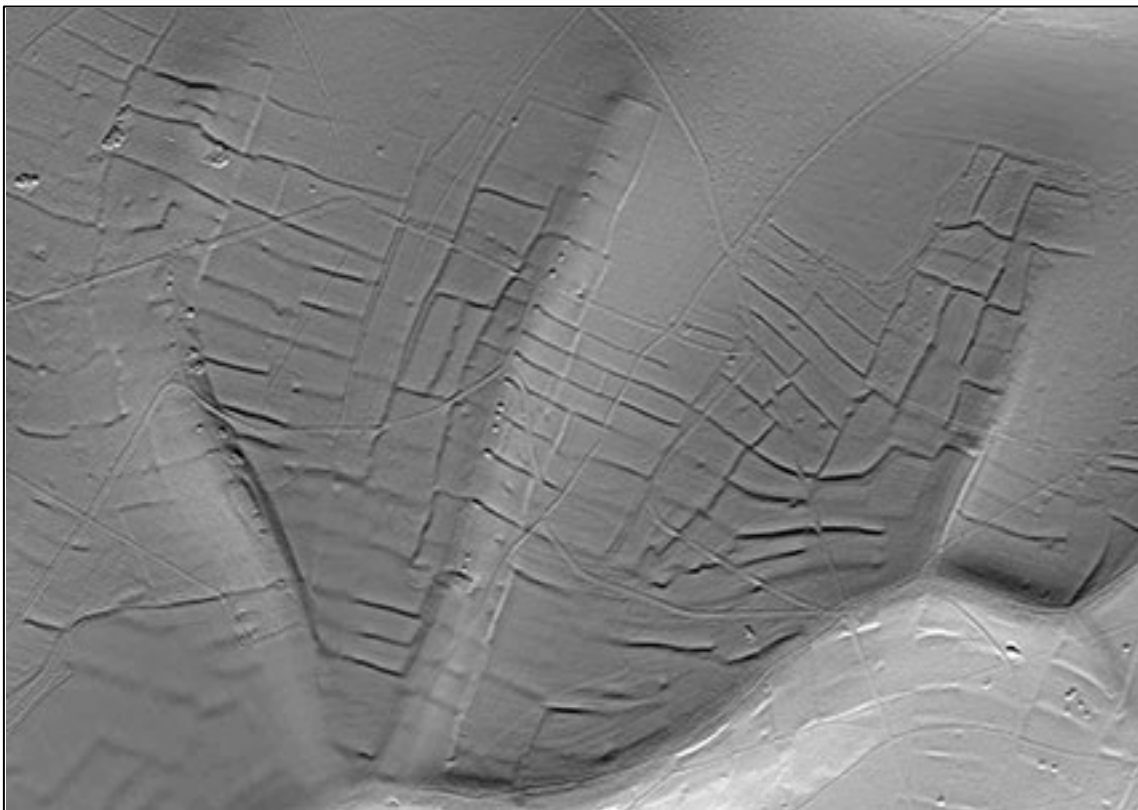


Figure 85 A lidar visualisation of prehistoric or Roman fields at Lamb Lea © Copyright Fugro Geospatial and South Downs National Park Authority

The national importance of the settlement earthworks at Dalesdown and Goblestubbs has been recognised through protection. Their close association with the earlier field systems illustrate the way many of these sites are interconnected. These connections may be intended or incidental but they reflect the complexity of monuments across the High Woods and highlight the difficulty in delimiting sites for protection.

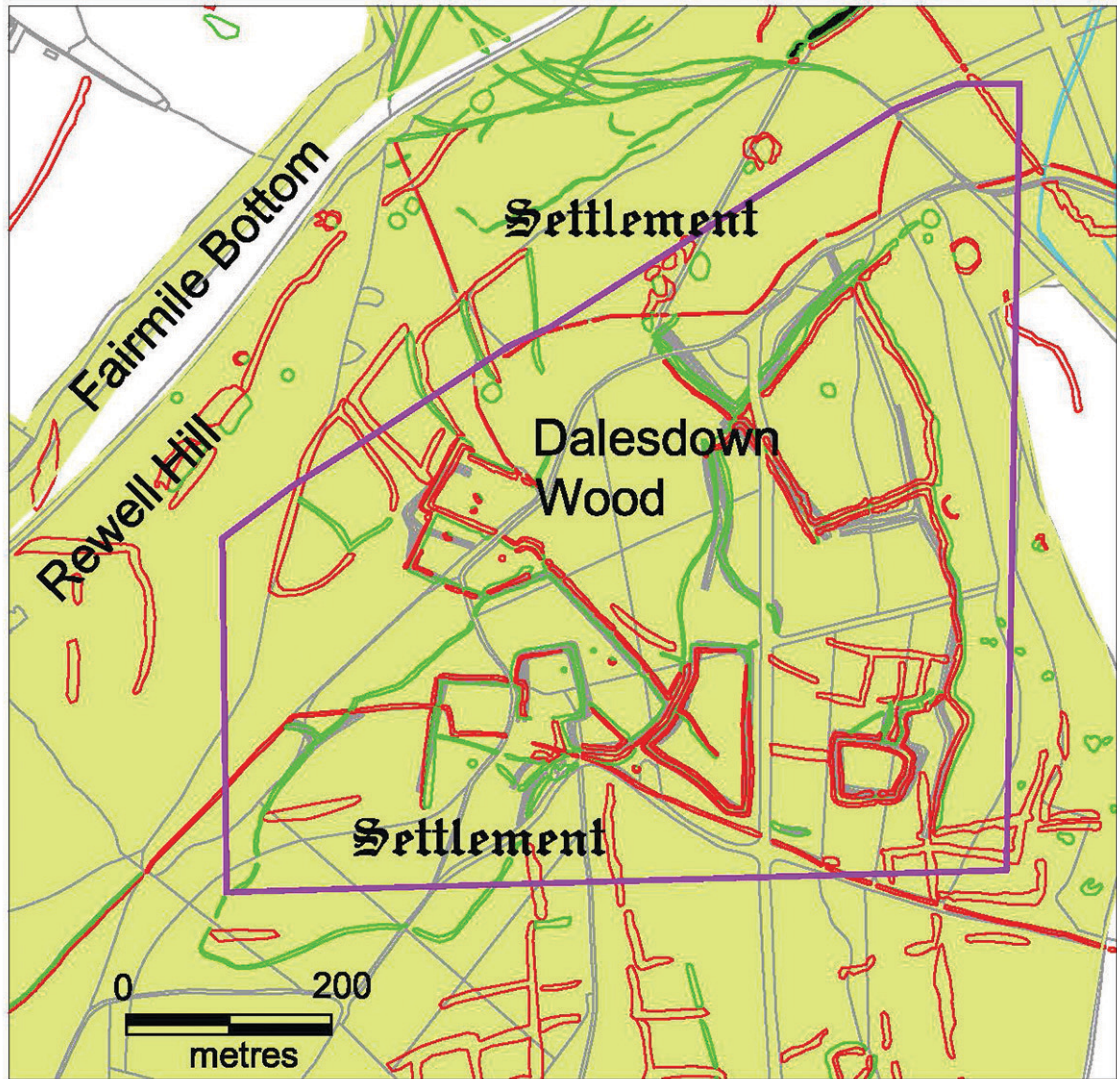


Figure 86 Earthworks in Dalesdown Wood. Scheduled area outlined in purple. Base map © crown copyright and database right 2016. All rights reserved. Ordnance survey licence 10050083.

Management and designations

The NMP survey, from lidar and aerial photographs, for the High Woods project was designed for use in the local authority historic environment records. It will provide a significantly enhanced level of information on the extent, form and interpretation of archaeological features, especially in the woodland. Combined with the other data in the HERs it will inform future planning and management decisions. The mapping can also be used to demonstrate the extent of archaeological remains to land managers and provides an important framework for management focussed on the historic environment.

Some of the sites discussed above are designated of national importance (scheduled) and further work in the High Woods may lead to the protection designation of other sites. However, protection and management may take a number of different forms. A high proportion of the High Woods project area falls within Land Management Schemes and these may be one of the most applicable ways of providing long-term conservation of landscape-scale archaeological sites. This approach, Entry Level plus Higher Level Environmental Stewardship Agreement, is based on parcels of land that reflect modern management concerns. However, land across the High Woods within stewardship agreements is a mixture of woodland and open land, but generally does not include the larger blocks of woodland found along the northern edge of the downs or the central part of the project area. Discreet areas of these woods are included in Higher Level Environmental Stewardship Agreements. Small areas of woodland have been designated Sites of Special Scientific Interest. As in the previous example the boundaries of these areas are unlikely to coincide with archaeological features. Whatever unintended benefits they may offer the archaeology, heritage is not the primary focus for protection. The archaeological mapping from aerial photographs and lidar provides a further level of information to demonstrate the extent of archaeological remains to land managers and provides an important framework for management focussed on the historic environment.

Some sites may be assessed as of special importance and be protected accordingly but undesignated sites can still possess considerable historical or archaeological significance. It is hoped that the better understanding that has been gained from this project will ensure that the historic landscape will continue to play an important role in the future of the High Woods.

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APPENDIX 1 – METHODS

Sources

Images

- SDNPA lidar visualisations
 - Hill shade
 - Local relief model
 - Openness negative
 - Openness positive
- Historic England (formerly English Heritage) Archive vertical aerial photographs
- Historic England (formerly English Heritage) Archive oblique aerial photographs (prints and digital)
- The Cambridge University Collection of Aerial Photography (CUCAP)
- 25cm orthophotography supplied through the Pan Government Agreement (PGA)
- Google Earth and Bing online sources

Monument datasets

- West Sussex, Chichester District and Hampshire Historic Environment Record (as collated in the project CMS)
- National Record of the Historic Environment (NRHE) database (AMIE)
- National Heritage List for England (scheduled monument data)

Other sources

- Ordnance Survey modern and historical mapping
- NSRI soilscapes and BGS geological information
- Administrative boundaries
- Existing field surveys
- Published and internal reports
- Yeakell & Gardner's 18th century map of Sussex

Archaeological Scope

Cropmarks, parchmarks, soilmarks

All sub-surface archaeological remains visible as cropmarks, parchmarks or soilmarks were mapped and recorded.

Earthworks

All archaeological earthworks were mapped and recorded. This includes features visible as earthworks on early aerial photographs, which have since been levelled.

Buildings and structures

Standing roofed or unroofed buildings are not normally be mapped except where they relate to historic industrial and military complexes not already mapped by the Ordnance Survey.

Other features

Medieval and post medieval ridge and furrow were mapped and recorded.

Post medieval field boundaries that are depicted on OS first edition or later mapping are not usually mapped except where they form part of a wider field system that is not depicted by the OS.

Historic or disused elements of parkland, landscape parks and gardens were mapped and recorded.

Extraction for local use such as quarries or marl pits is not always mapped for NMP projects. However, given the archaeological importance of extraction in the High Woods project area, all pits were mapped.

Transport features depicted on the OS mapping (tracks, roads, canals and main railway lines) are not usually be mapped, unless of archaeological relevance.

Military features up to and including the Cold War were mapped and recorded. This includes any roofed or unroofed structures.

Natural features

Natural features that are geological or geomorphological in origin will not be mapped. If there is risk of confusion in contexts with other archaeological features, then the natural features were mentioned in the text record.

Mapping and recording

The project Content Management System (CMS) was used to depict the form and extent of each archaeological feature identified on aerial photographs or lidar. Each archaeological site was described in a 'monument record' linked to the mapping. The monument records included an interpretation of the site type,

the period(s), the form of the remains, and the main sources. They also described associations between monuments.

A combination of aerial photographs and lidar were used to map archaeological features and interpretations were based on morphological comparison to well know site types, topographical location and other published evidence.

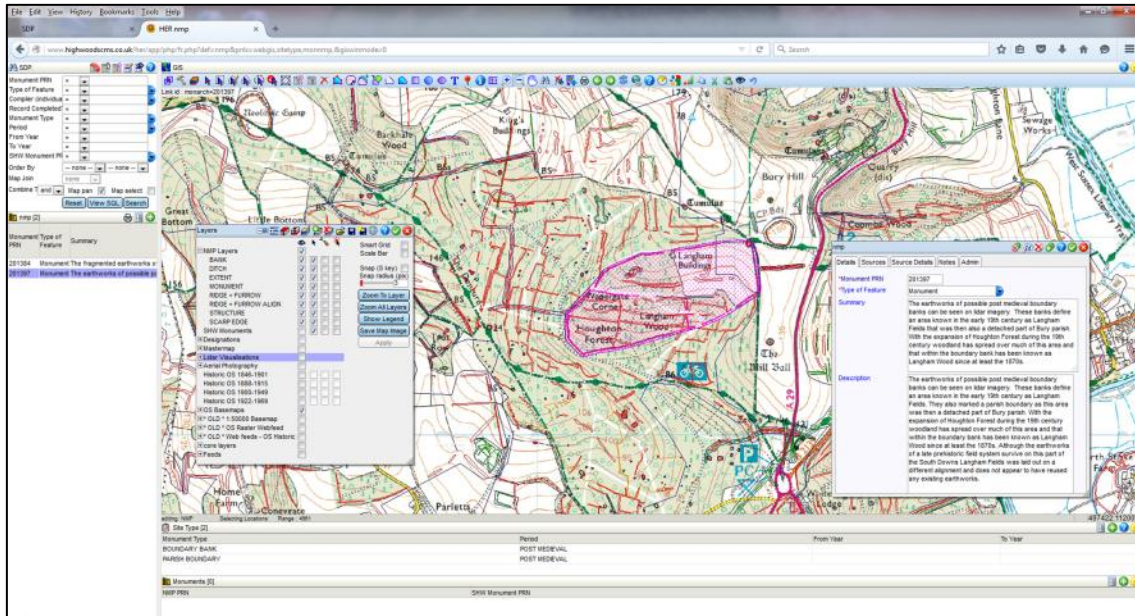


Figure 87 The project CMS showing the monument recording panels © SDNPA; Base map © crown copyright and database right 2016. All rights reserved. Ordnance survey licence. 10050083

Photo rectification and georeferencing

When required, oblique or vertical photographs were scanned and then rectified using AERIAL 5.29 software. Control was derived from either the 25cm resolution PGA orthophotography or Ordnance Survey 1:2,500 scale MasterMap® vector data. Digital terrain models derived from 5m interval contour data supplied by Next Perspectives were used to improve the accuracy of the rectification. The geo-referenced and rectified aerial photographs were imported to the project CMS. Other sources, such as the lidar data and PGA aerial photographs were already georeferenced and loaded into the High Woods project CMS.

Mapping

Archaeological features were traced off geo-referenced and rectified aerial photographs or lidar visualisations using the CMS. The CMS was specially adapted to allow NMP standard mapping and recording. Features were mapped depending on the form of remains, such as bank, ditch etc. The drawing tools

were also adapted and developed to enable mapping of complex shapes and polygons.

The web-based platform meant that mapping tools and navigation were slower than in stand-alone drawing packages, such as AutoCAD, but it was comparable in speed to networked GIS. This was offset by a much faster and efficient monument recording system.

LAYER NAME	COLOUR	DESCRIPTION
BANK	Red	Used to outline banks, platforms, mounds and spoil heaps
DITCH	Green	Used to outline cut features such as ditches, ponds, pits or hollow ways.
EXTENT	Orange	Used to depict the extent of large area features such as airfields, military camps, or major extraction.
MONUMENT	White	Used to indicate the extent of the monument record as defined in the NRHE or HER database.
RIDGE+FURROW	Cyan	Used to outline a block of ridge and furrow.
RIDGE+FURROW ALIGN	Cyan	Line or arrow(s) (hand drawn not a symbol) depicting the direction of the rigs in a block of ridge and furrow.
STRUCTURE	Purple	Used to outline structures including stone, concrete, metal and timber constructions e.g. buildings, Nissen huts, tents, radio masts, camouflaged airfields, wrecks, fish traps, etc.
SCARP EDGE	Blue	The top of the “T” indicates the top of slope and the body indicates the length and direction of the slope. Used to depict scarps, edges of platforms and other large earthworks.

Table 1 NMP standard layers used in the project

Recording

The project CMS was adapted to allow the core fields for NMP to be quickly recorded. In NMP projects, the archaeological nature of the site determines the unit of record. Different monument records describe distinct sites of clearly different periods. Where overlapping phases cannot be clearly dated, as is common with sites seen as cropmarks, a single record describes the possible phases. A single monument record may describe a site comprising dispersed, but clearly grouped, elements, such as a medieval settlement. The monument record describes the full extent of the site, not just those parts mapped for the NMP project, for example, where there is evidence from other sources.

DATABASE FIELD		DESCRIPTION
Unique identifier		Monument number
Summary text		A brief description or “site map”
Long Text		Incremental text added as knowledge of the monument grows. May provide more detailed interpretive and location information.
Sources	Title	Use to distinguish type of source e.g. oblique photograph, vertical photograph, website etc
	Source Number	Number which relates the source(s) to the relevant parts of the Long Text.
	Comments	Free text field with all references sited in long text (including air photos etc)
Period		EH/ALGAO compliant terms to be used
Type		Use the Historic England thesaurus terms or equivalent.
Evidence		Latest known physical evidence of the site e.g. earthwork, cropmark, levelled earthwork
County/District/Parish		
NGR		One central NGR per monument.
	100km square	e.g. SU
	easting	
	northing	
Other numbering schemes		NRHE and/or HER numbers, SAM numbers etc
	Identity Method	e.g. SMR Number (Hampshire)
	Value	Monument UID
Links to other monuments	Monument number	
	Type of relationship	Parent/Child or general association etc
Roles	Name	
	Date	
	Organisation	
Event		NMP project event number attached to records created or amended.
Collection/archive		NRHE database only

Table 2 NMP standard database fields

APPENDIX 2 DISTRIBUTIONS OF MONUMENT RECORDS FROM THE NMP SURVEY

Overview

For the purposes of this report, reference to new sites refers to those not previously recorded in the local authority Historic Environment Records (HERs) or the Historic England National Record of the Historic Environment (NRHE). During the Secrets of the High Woods project, 2298 monument records were input to the CMS database. 1646 were for new sites and 652 were for sites already recorded in existing databases. In terms of overall distribution, sites were plotted right across the study area. The percentage of new sites across the project area as a whole was 72 %.

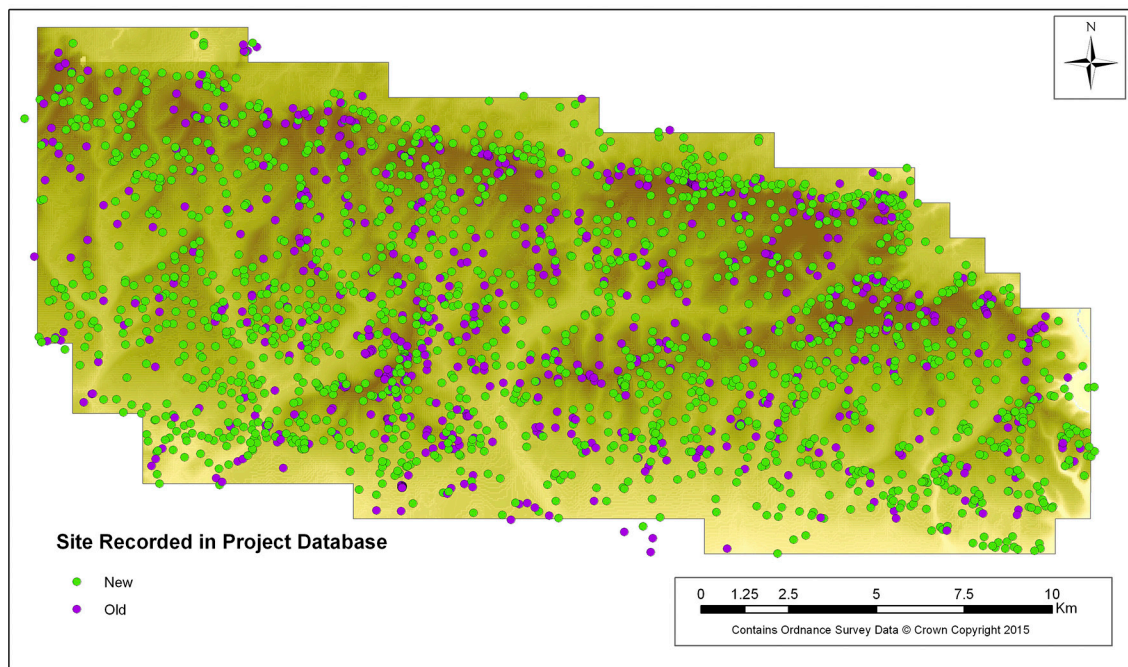


Figure 88 Centre points of all records created from the NMP phase of the project

The numbers of sites recorded by period are listed in Table 1 below. The date ranges used in this report are those used in the High Woods project database and are intended for use in the local authority HERs. Archaeological sites were recorded for all periods from the Neolithic to the mid-20th century.

The nature of lidar and aerial photographic evidence means that generally sites have been assigned dates based on the evidence of the form of the monument and its relationship to other monuments and features in the landscape. There may also be additional evidence from fieldwork, artefact scatters or excavation. Some generalisations have however been made; for example, round barrows

(and ring ditches which were considered to be funerary-related) have been assigned to the Bronze Age despite their potential for being of late Neolithic/Early Bronze Age origin.

Period	Updated Sites	New Sites	Total
Neolithic	16	6	22
Bronze Age	197	79	276
Iron Age	9	0	9
Prehistoric/Roman	125	108	233
Iron Age/Roman	13	6	19
Roman	15	0	15
Early medieval	1	0	11
Medieval	19	32	50
Historic	28	171	200
Post Medieval/20th Century	173	895	1068
Modern	16	57	73
Undated	41	292	333
Total	652	1646	2299

Table 3 Numbers of sites recorded from the NMP survey by archaeological period.

Form of remains

The form of remains of each site was recorded in the project database. This was based on the latest evidence (e.g. as visible on the latest Google Earth images or on lidar imagery) and how it was seen on earlier sources. For example, if a site was visible as an earthwork on early RAF 1940s photographs but was later plough-levelled and consequently only visible as cropmarks on the latest photography, then the site was recorded in the database as a cropmark but the description records the change to the site. Similarly, if a site was not visible at all (neither as earthworks nor cropmarks) on the latest imagery but had been plotted as an earthwork from early photographs, it would be recorded in the database as Levelled Earthwork.

Of the 2298 records for the project area, 1834 (80%) are earthworks. A further five records (0.2%) were extant or partially extant structures and nine (0.4%) were structures that had been completely levelled or demolished. Of the total number of sites, 420 (18%) were buried remains visible or partially visible as cropmarks or soilmarks on the aerial photographs; of these 85 were also partially surviving as earthworks.

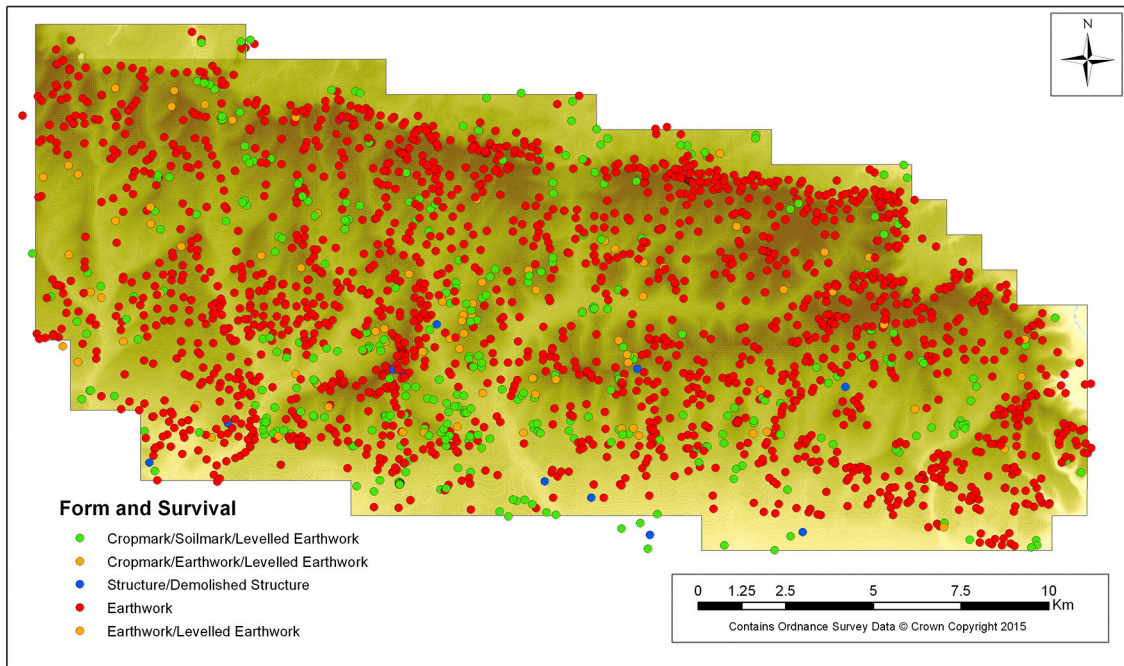


Figure 89 Centre points of all records created for the NMP phase of the project based on form of remains.

Form	No: Sites	% of total
Cropmark/soilmark	335	14.6
Cropmark and earthwork	85	3.7
Earthwork/ Partially levelled earthwork	1834	79.8
Levelled earthwork	30	1.3
Structure	5	0.2
Demolished structure	9	0.4
Total	2298	

Table 4 Numbers of sites recorded from the NMP survey grouped by form of remains.

As expected, most of the sites recorded were seen as earthworks because of the remarkable survival of archaeological remains in the area and because lidar was the main source for the project. The levelled earthworks were mainly recorded from older aerial photographs in the open land between the woods. Structures and demolished structures mainly relate to twentieth century military remains, still in situ (as far as can be told from latest aerial sources) or removed in the post war period.

Distribution of monument records by period

The following section illustrates the distribution of monument records created during the NMP phase of the project based on period. It is possible that some sites will appear in more than one distribution given the potential date ranges of certain features. For example, the extensive fields and settlements found across the High Woods area (discussed above in Farming the Land) have a potential date range from the Bronze Age through to the Roman period, or burial mounds/round barrows potentially date from the later Neolithic to the Bronze Age and, sometimes, to the Roman or early medieval periods. The distributions provide an indication of location and range of types of records and mapping that can be accessed through the High Woods project database and the HERs.

Neolithic (c4300BC-2200BC)

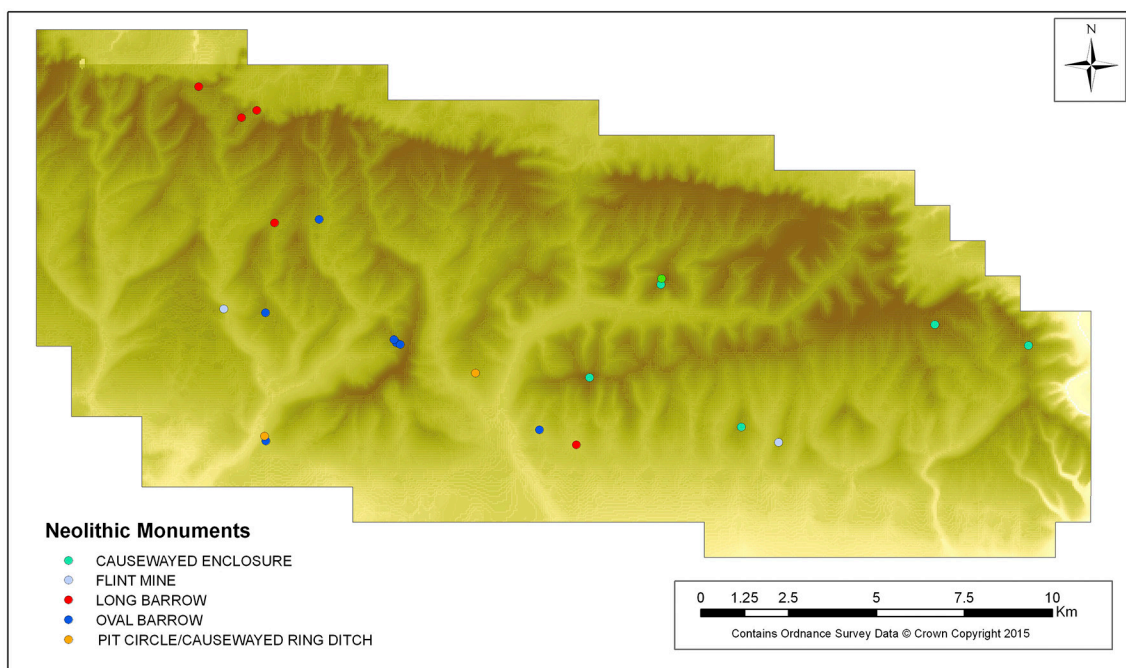


Figure 90 Centre points of all records created for the NMP phase of the project assigned a Neolithic date.

Most of the sites assigned a Neolithic date were already known and had entries in the HERs or the NRHE. In all, 22 Neolithic monuments were recorded, over half of which (55%) were funerary-related (long barrows and oval barrows) and about a fifth of which were causewayed enclosures. Five sites were new to the record including three long barrows, an oval barrow and a pit circle. Two flint mines were also recorded. Just fewer than half the sites were recorded as earthworks, mainly seen on lidar data, and the remainder were buried remains revealed as cropmarks recorded on aerial photographs.

Site Type	No: Sites
Bank (Earthwork)	1
Causewayed Enclosure	5
Causewayed Ring Ditch	1
Flint Mine	2
Long Barrow	5
Oval Barrow	7
Pit Circle	1
Total	22

Table 5 Numbers of Neolithic sites recorded from the NMP survey grouped by monument type.

Bronze Age (2200BC-800BC)

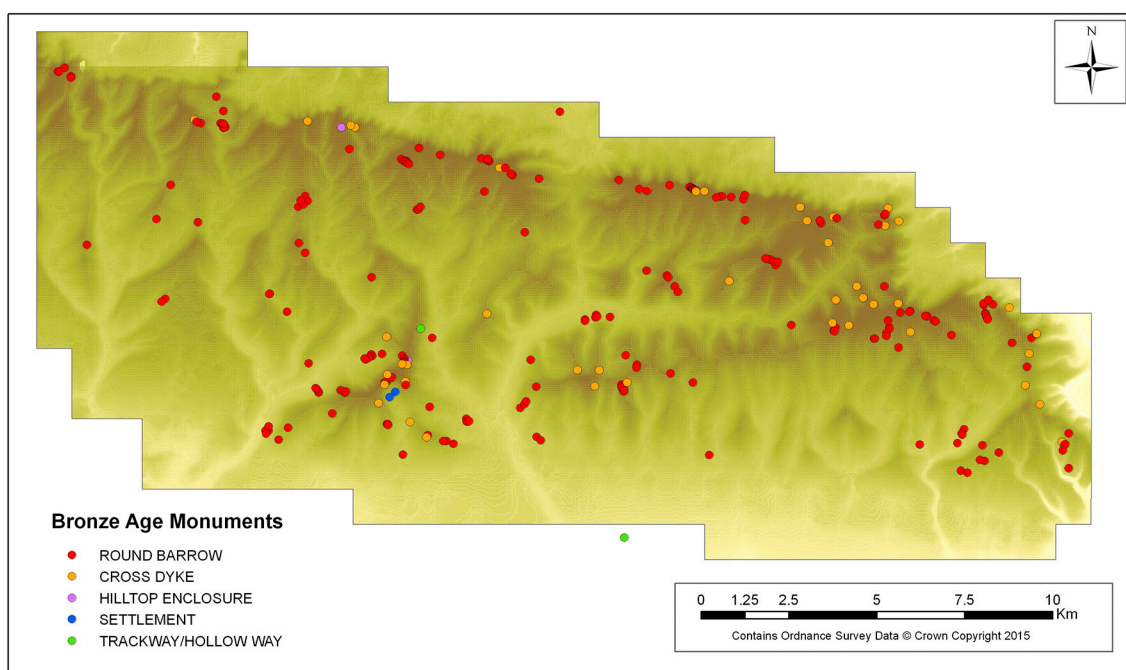


Figure 91 Centre points of all records created for the NMP phase of the project assigned a Bronze Age date.

276 monuments were assigned to the Bronze Age. However, there may be many other long-lived sites such as field systems that had their origins in this period, but have been allocated a more general Prehistoric to Roman date and are therefore described elsewhere. Most monuments were specifically assigned to the Bronze Age are funerary-related including 226 barrows. Another significant category of site is the linear boundary known as a cross dyke, or cross ridge dyke, for which 43 were recorded in the project area. Less common was evidence of settlement; only two settlements were assigned to the Bronze Age and two hilltop enclosures. Of the total 276 Bronze Age sites, 79 (29%) were newly recorded during the project. All but 87 sites were still surviving as upstanding earthworks.

Site Type	No: Sites
Bell Barrow	13
Bowl Barrow	83
Disc Barrow	2
Platform Barrow	2
Pond Barrow	3
Saucer Barrow	1
Round Barrow	122
Cross Dyke (also indexed at Iron Age)	43
Hilltop Enclosure	2
Settlement	2
Trackway/Hollow Way	3
Total	276

Table 6 Numbers of Bronze Age sites recorded from the NMP survey.

Later prehistoric or Roman (2200BC-410AD)

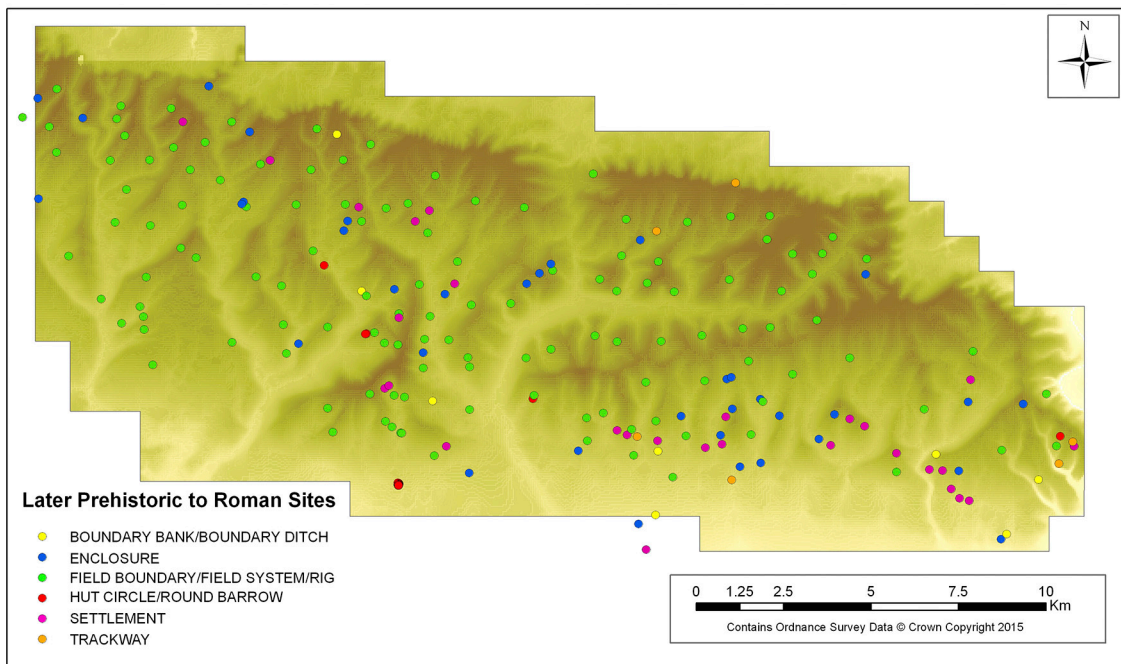


Figure 92 Centre points of all records created for the NMP phase of the project assigned a later prehistoric or Roman date.

As discussed in the main text above many of the archaeological sites recorded from the NMP survey were assigned a broad date range, such as settlements and field systems, from the later prehistoric through to the Roman period. Certain site types, such as funerary or ceremonial monuments, were sometime assigned a general later prehistoric date but are likely to be Neolithic and/or Bronze Age. 79 sites were allocated a Later Prehistoric date – mainly enclosures, tracks or field systems felt to be of an earlier phase than the widespread Iron Age/Roman

fields. An oval mound seen on lidar was tentatively assigned a prehistoric date. 154 sites were assigned a potential Prehistoric or Roman date - mainly enclosures, tracks and field systems. The hut circle/barrow interpretation refers to a ring-ditch seen as cropmarks which, based on size could be the buried remains of the drip gully (formed when rain runs off the roof) or foundation trenches of hut circles, or the ditch encircling small burial mounds, or ceremonial features.

Site Type	No: Sites
Barrow/Oval Barrow	2
Round Barrow	24
Boundary Bank/Ditch	6
Field System	106
Enclosure	34
Settlement	28
Field Boundary	24
Hut Circle/Round Barrow	1
Trackway	6
Total	232

Table 7 Numbers of later prehistoric and/or Roman sites recorded from the NMP survey

Iron Age (800BC – AD 43) and Iron Age/Roman (800BC-410AD)

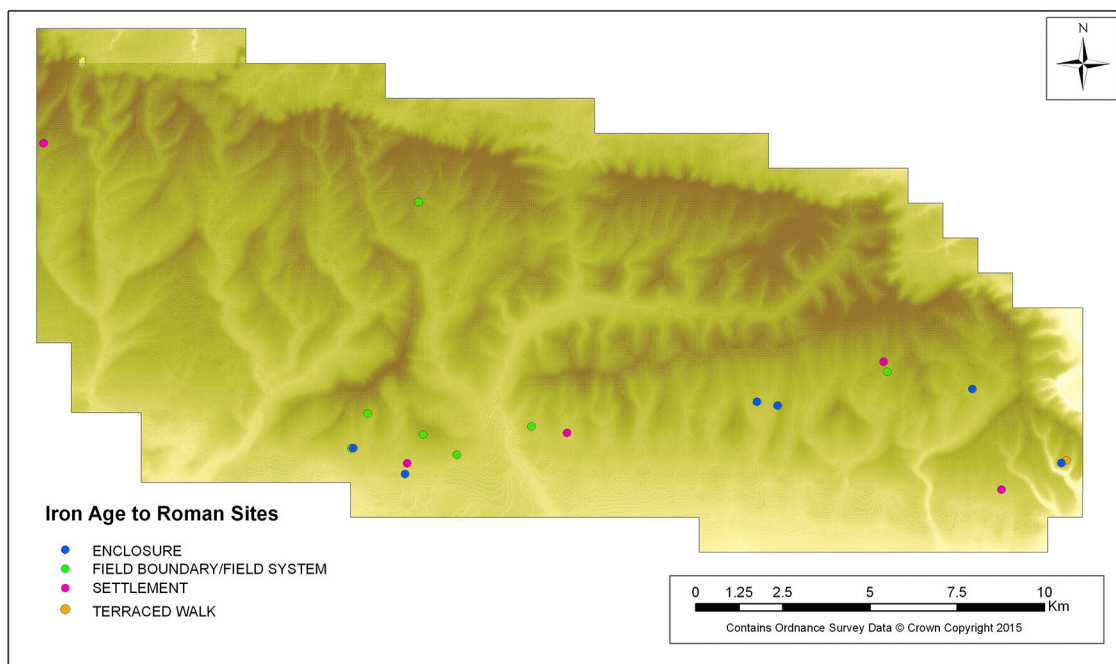


Figure 93 Centre points of all records created for the NMP phase of the project assigned an Iron Age date or an Iron Age/Roman

Site Type	No: Sites
Dyke (defence)	3
Hillfort/Rampart	4
Enclosure/Settlement	2
Total	9
Site Type	No: Sites
Enclosed Settlement	1
Field Boundary/Trackway	1
Field System	6
Rectilinear Enclosure	6
Settlement	4
Terraced Walk	1
Total	19

Table 8 Numbers of Iron Age sites recorded from the NMP survey grouped by monument type.

Nine sites were attributed a definite Iron Age date based on the site type or other information. These included parts of the Chichester dykes, War Dyke, and hillforts. A further 19 were assigned a probably broad Iron Age/Roman date – these mainly comprised field systems, enclosures and tracks.

Roman (AD 43-AD 410)

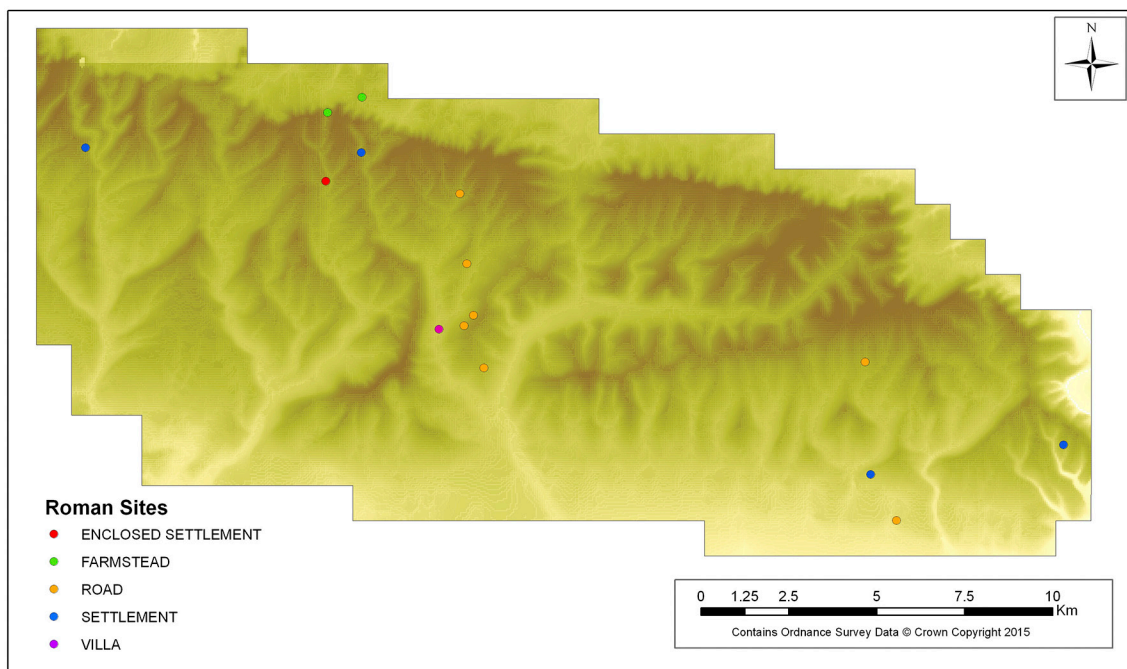


Figure 94 Centre points of records created for the NMP phase of the project assigned a Roman date.

15 sites were assigned a definite Roman date based on the site type or other information. As mentioned before there are many more sites which have a potential later prehistoric or Roman date.

Site Type	No: Sites
Enclosed Settlement	1
Settlement	4
Farmstead	2
Road	7
Villa	1
Total	15

Table 9 Numbers of Roman sites recorded from the NMP survey grouped by monument type.

Post Roman-early medieval (AD410-1066)

Identification of post Roman/early medieval sites Surveys using non-intrusive methods is usually limited to distinct morphological site types, such a sunken featured buildings or timber halls. The early medieval period is therefore often underrepresented in surveys from aerial photographs and lidar. Although there is archaeological evidence from this period in the High Down area, for example as discussed above at Chalton, no new sites mapped were assigned an early medieval date.

Medieval (AD1066 – AD1540)

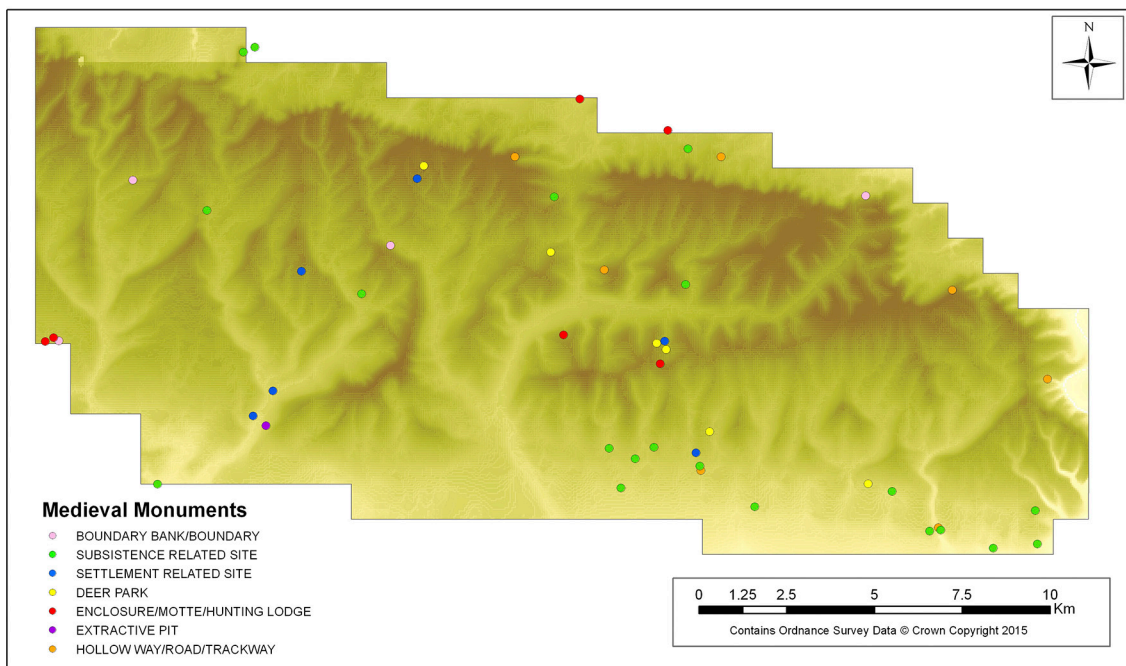


Figure 95 Centre points of records created for the NMP phase of the project assigned a medieval date

There were also relatively few features recorded from the medieval period and these included deer park boundaries, a motte, a ring work and bailey, moats and

a possible hunting lodge. A few traces of medieval or post medieval ridge and furrow cultivation were also found. This distribution, or relative lack of sites identified on lidar and aerial photographs, probably reflects the land use in the High Woods area during the medieval period. As mentioned previously the woodland was established and managed from the medieval period and this created a very different pattern of land use and settlement. The apparent continuity of this pattern into the modern period partly accounts for the relatively few medieval earthworks, and other features, identified. However, this is just compared to the wealth of evidence from other periods. There are still key sites and themes to be explored on the ground, especially where we can see continuity and change in boundaries, fields and settlement locations.

Site Type	No: Sites
Bank (Earthwork)	1
Boundary Bank/Parish Boundary	2
Deer Park/Park Pale	6
Drainage Ditch	1
Extractive Pit	1
Field Boundary/Lynchet/Strip lynchet	3
Field System	1
Fish Pond	1
Hollow Way/Road/Trackway	7
House	1
Enclosure/Hunting Lodge/Moat	4
Ridge and Furrow	15
Ringwork and Bailey/Motte	2
Settlement	5
Total	50

Table 10 Numbers of Medieval sites recorded from the NMP survey grouped by monument type.

Post medieval sites (AD1540 - AD1945)

There were relatively large numbers of sites assigned a general post medieval or later date. Many of these related to extraction – the numerous pits described in the thematic section above. Possible post-medieval site types are listed in the tables below. These features are grouped together here but where there was evidence for more precise dates, these are recorded and described in the project database.

Several rarer categories of sites were recorded including possible bee gardens on Philliswood Down, Elstead and Treyford. These were based on similar sites seen in the New Forest (Royall 2013, 62-3) but may be related to game rearing. A rifle butt on the northern end of Target Bottom, Lavant Down and three possible targets in a rifle range in Kingley Vale. The site of a 19th century signal station was recorded as an earthwork on Beacon Hill.

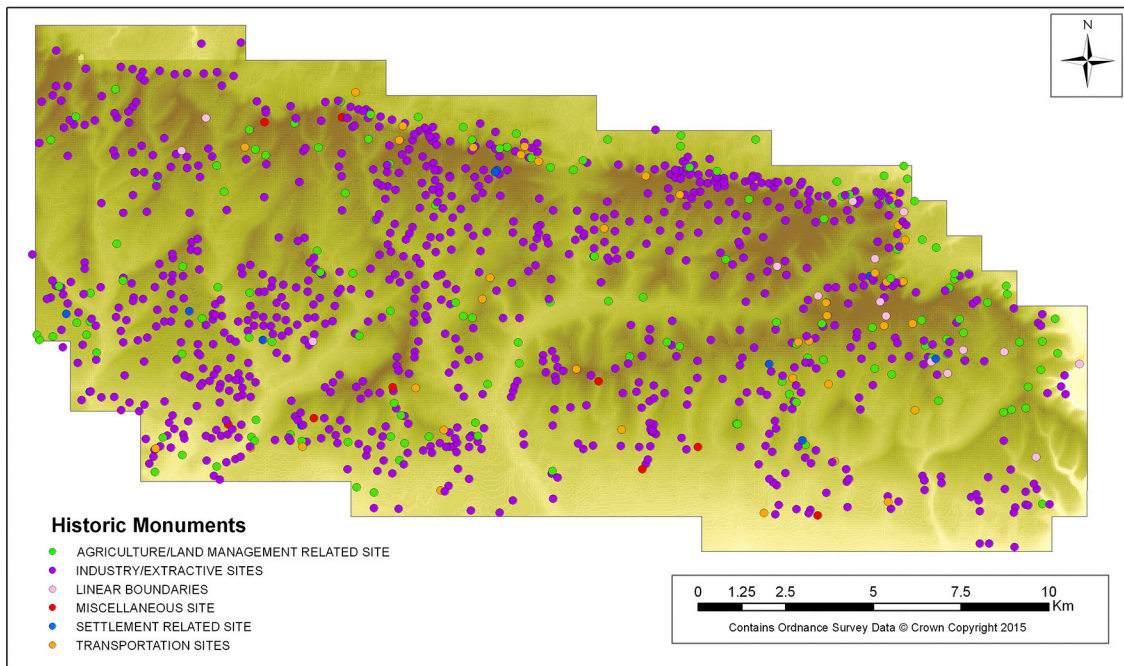


Figure 96 Centre points of records created for the NMP phase of the project assigned a post medieval date colour coded thematically.

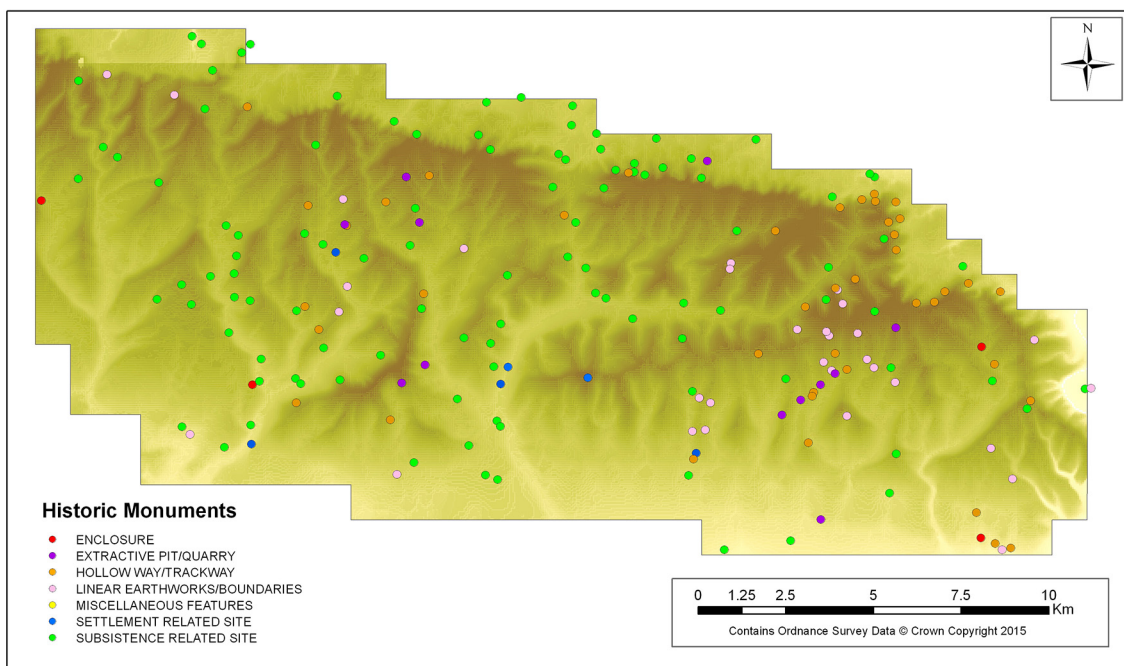


Figure 97 Centre points of records created for the NMP phase of the project assigned a post medieval date colour coded by site type.

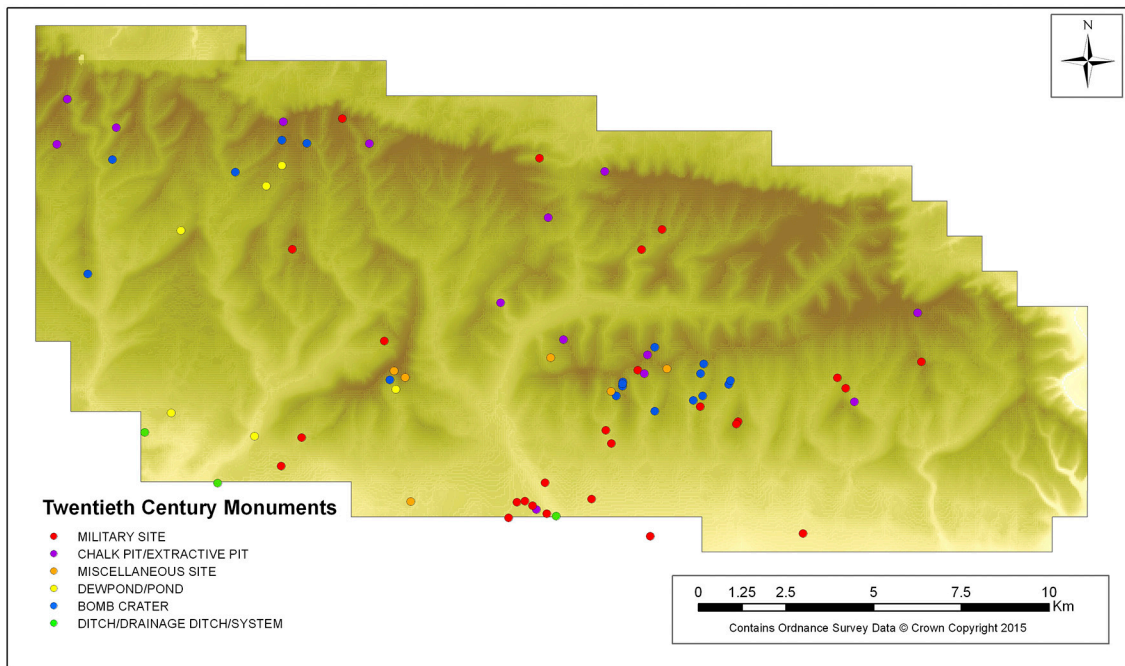


Figure 98 Centre points of records created for the NMP phase of the project assigned a twentieth century date colour coded by site type.

Site Type (post medieval-20th century)	No: Sites
Assart/Charcoal Burners Site/Charcoal Burning Platform	9
Bank (earthwork)	1
Bee Garden/game enclosure	1
Boundary/Boundary Bank/Boundary Ditch/Parish Boundary	15
Brickworks/Tile Works	1
Chalk Pit/Clay Pit/Extractive Pit/Gravel Pit/Quarry/Sand Pit	827
Cockpit	2
Cultivation Marks	5
Dewpond/Pond	26
Ditch/Drainage Ditch/Drainage System	11
Enclosure	2
Farm/Farmstead/Outfarm	5
Field Boundary/Lynchet	48
Field System	2
Firing Range/Rifle Butts	2
Folly	2
Garden/Formal Garden/Garden Feature/Terraced Ground	4
Ha Ha	1
Hollow Way/Path/Trackway/Road/Bridleway	39
Ice House	1
Pillow Mound	1
Pit	2
Signal Station	1
Spoil Heap/Mound	4
Tree Enclosure Ring	4
Windmill/Windmill Mound	3
Wood Bank	47

Total	1068
Site Type (assigned a 'historic' date)	No: Sites
Bank (earthwork)	1
Boundary/Boundary Bank/Parish Boundary	14
Cultivation Marks/Ridge and Furrow	23
Enclosure	4
Extractive Pit/Quarry	12
Field Boundary	54
Field System	14
Garden	1
Hollow Way/Trackway	42
Leat	1
Mill Pond/Pond	2
Pillow Mound	3
Settlement/Deserted Settlement	3
Strip Lynchet/Terraced Ground	6
Windmill Mound	3
Wood Bank	17
Total	200
Site Type (20th century)	No: Sites
Advanced Landing Ground	1
Anti-Landing Obstacle	1
Anti-Tank Ditch	5
Assart	1
Bomb Crater	18
Building Platform	1
Chalk Pit/Extractive Pit	10
Dew Pond/Pond	6
Ditch	1
Drainage Ditch/Drainage System	2
Earthwork	1
Emergency Landing Ground	1
Enclosure	3
Horse Exercise Ring	1
Military Airfield	1
Military Camp/Military Installation	5
Parterre	1
Pit	4
Practice Trench/Slit Trench	5
Prisoner of War Camp	1
Radar Station	1
Royal Observer Corps Site	1
Searchlight Battery	1
Target Range	1
Total	73

Table 11 Numbers of post medieval and modern records from the NMP survey grouped by monument type.

Undated

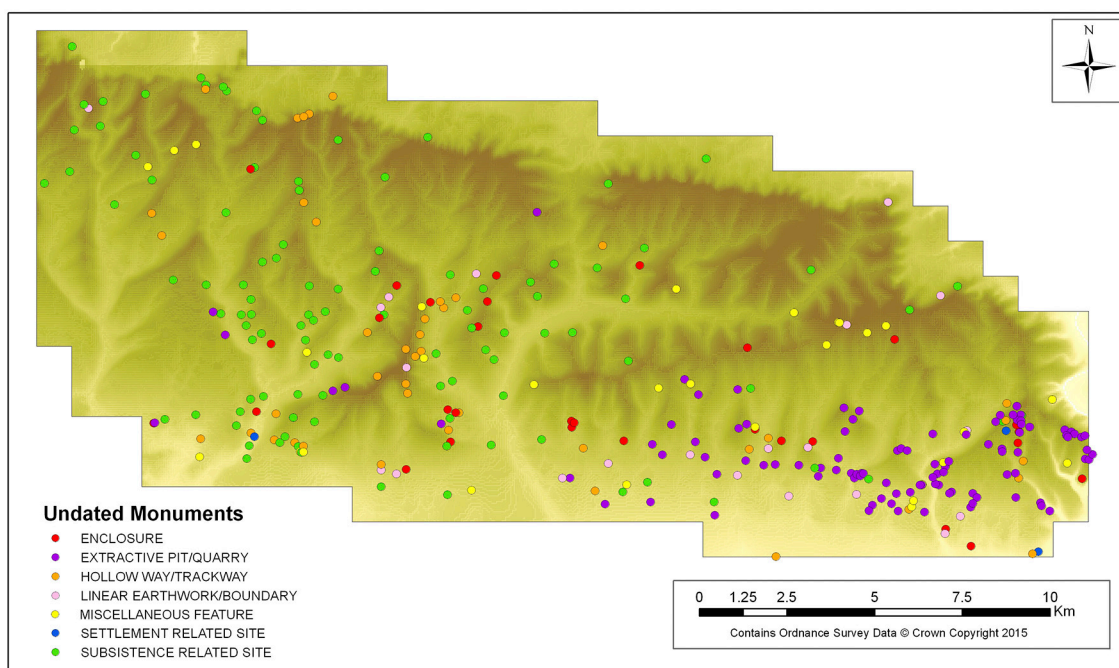


Figure 99 Centre points of records created for the NMP phase of the project assigned an uncertain date.

333 sites were recorded as undated. These are sites to which a more specific prehistoric or historic date could not be assigned with confidence. They include sites of ambiguous function such as mounds and ditches as well as site types that could range in date from the prehistoric through to the historic periods such as field boundaries and field systems, extractive pits, trackways and enclosures.

Site Type	No: Sites
Bank (earthwork)	5
Boundary Bank/Ditch	13
Building	1
Chalk Pit/Extractive Pit/Pit/Marl Pit/Flint Mine/Quarry	98
Cross Dyke/Parish Boundary	2
Dewpond/Pond	4
Ditch/Drainage Ditch	9
Earthwork	1
Enclosure /D Shaped Enclosure/Rectilinear Enclosure/Stock Enclosure	36
Field Boundary/Lynchet/Strip Lynchet	73
Field System	18
Hollow Way/Road/Trackway	42
Mound	21
Natural Feature	3
Pit	1
Platform	1

Settlement	3
Wood Bank	2
Total	333

Table 12 Numbers of undated records from the NMP survey grouped by monument type.

APPENDIX 3 SITES SUGGESTED FOR FURTHER WORK

Feature	Place	SHW number	NGR	Description/recommendation
Pit circle	Lordington, Stoughton	200087	SU 7847 0944	The cropmark indicates the subsurface remains of a possible Neolithic or Bronze Age pit circle. This feature consists of six oval pits. There are 60 timber or pit circles recorded in England, but they remain little understood and excavation could determine if these pits ever held posts.
Long barrow	The Valdoe, Lavant	200027	SU 8735 0920	The cropmark indicates the subsurface remains of a probable Neolithic long barrow measuring c.45m by 15m. The eastern end of the barrow ends abruptly against a field boundary and presumably extended further east (though presumably not by much as long barrows rarely exceed 50m in length). Part of the southern ditch is also visible as a cropmark. Due to their comparative rarity, considerable age and longevity of use, all long barrows can be considered nationally important.
Long barrow/ pillow mound	The Warren, Harting	201043	SU 7826 1870	The cropmark indicates the subsurface remains of an earthwork bank 37m by 5m. Any eastern extension lost in woodland. Uncertain if this represents the remains of a long barrow or a pillow mound. Due to their comparative rarity, considerable age and longevity of use, all long barrows can be considered nationally important.
Long barrow	Main Down, Harting	200804	SU 7783 1849	The cropmark indicates the subsurface remains of a possible Neolithic long barrow. The cropmark of the mound is 24m long, flanked by ditch but the monument is truncated at its western end by a field boundary. Only a fragment of the northern ditch can be seen to the west of this boundary, suggesting a total length of c.52m. Due to their comparative rarity, considerable age and longevity of use, all long barrows can be considered nationally important.

Neolithic/Early Bronze Age oval barrow	Lordington, Stoughton	200083	SU 7852 0930	The cropmark indicates the subsurface remains of a possible Neolithic oval barrow. Feature is an oval ditched enclosure measuring 35m by 21m. Oval barrows are rare and there are less than 50 recorded examples in England and are considered nationally important. Although no upstanding earthworks survive, the cropmarks indicate that there is sub-surface survival that will have archaeological potential for the recovery of evidence of its date, manner of construction, use and environment.
Bronze Age barrow cemetery	Bow Hill, Stoughton	201789-90, 201793-6	SU 8239 1179 SU 8245 1170 SU 8244 1165 SU 8244 1162 SU 8244 1160 SU 8243 1158	The earthworks of six Bronze Age round barrows on the northern end of Bow Hill, five of which are arranged in a north-south line. Close to Bow Hill settlement and cross dyke (scheduled 1012319) the barrows are previously unknown must be considered with the linear arrangement of six barrows called the Devil's Humps 500m away on south-western side of Bow Hill (Scheduled 1008371, 1008372). Unlike the Devil's Humps, there is no obvious trace of these barrows having been excavated. These form part of the generally well preserved and closely associated Bronze Age and Iron Age monuments on Bow Hill. Round barrows are a major historic element in the modern landscape and their considerable variation of form and longevity as a monument type provide important information on the diversity of beliefs and social organisations amongst early prehistoric communities. They are particularly representative of their period and a substantial proportion of surviving examples are considered worthy of protection.
Bronze Age barrow cemetery	Singleton	202384-90	SU 8759 1282 SU 8759 1278 SU 8789 1288 SU 8791	Loose grouping of six round barrows all seen as cropmarks although one mound (SHW 202384) survives as a very slight earthwork. Round barrows are a major historic element in the modern landscape and their considerable variation of form and

			1295 SU 8794 1290 SU 8830 1289	longevity as a monument type provide important information on the diversity of beliefs and social organisations amongst early prehistoric communities. They are particularly representative of their period and a substantial proportion of surviving examples are considered worthy of protection.
Bronze Age barrow cemetery	Mitchamer Cottage, Singleton	201095, 201099-201101	SU 7993 1087 SU 7996 1084 SU 8000 1077 SU 8001 1073	A line of four barrows aligned NW-SE. All seen as cropmarks one barrow survives as a slight earthwork (SHW 201095). Round barrows are a major historic element in the modern landscape and their considerable variation of form and longevity as a monument type provide important information on the diversity of beliefs and social organisations amongst early prehistoric communities. They are particularly representative of their period and a substantial proportion of surviving examples are considered worthy of protection.
Later prehistoric/ Bronze Age cross dyke	Within Goodwood Park, Charlton Down, Singleton	202481	SU 8880 1100	The low earthworks of a cross dyke consisting of a central ditch flanked by a bank on both sides. It will contain archaeological and environmental information relating to their construction, original purpose, and the landscape in which it was built. It is also part of a group of similar linear earthworks across the South Downs.
LBA/EIA cross dyke	Dunton Hanger	201013	SU 9625 1600	The earthworks of a cross dyke across the tree-covered ridge between Dunton Hanger and Barlavington Hanger. It will contain archaeological and environmental information relating to its construction, original purpose, and the landscape in which it was built. It is also part of a group of similar linear earthworks across the South Downs.
LBA/EIA cross dyke	Barlavington Hanger	201015	SU 9653 1561	The earthworks of a cross dyke on the tree-covered ride in Barlavington Hanger. It will contain archaeological and environmental information relating to its construction, original purpose, and wider landscape.
Possible	Upwaltham	200937	SU 9465	The earthworks of a possible cross

LBA/EIA cross dyke.	Hill		1272	dyke across the southwestern spur of Upwaltham Hill. It has been partially re-used as a parish boundary. If a cross dyke this would have been part of a group of contemporary monuments that together could provide evidence for the relationship between land division and funerary practises.
Possible LBA/EIA cross dyke/ Medieval boundary bank?	Upwaltham Hill	200126	SU 9510 1261	The earthworks of a cross dyke across the eastern spur of Upwaltham Hill. If a cross dyke this would have been part of a group of contemporary monuments that together could provide evidence for the relationship between land division and funerary practices.
LBA/EIA cross dyke	Upwaltham Hill	200125	SU 9475 1339	The cropmark indicates the subsurface remains of the central section of this cross dyke. Part of a group of contemporary monuments that together could provide evidence for the relationship between land division and funerary practises. The dyke survives as an earthwork at either end and these are scheduled (List entry number 1018060). Should the scheduled area be extended to cover the central section?
Iron Age/Roman rectilinear enclosure	Bushy Copse, Eartham	201023	SU 9326 1019	The cropmark indicates the subsurface remains of a subdivided enclosure, possible trackway and field boundary ditches. The subsurface survival has archaeological potential for the recovery of evidence of its date, manner of construction, use and environment.
Later prehistoric field system	Glass Brow, Buriton	201627	SU 7416 1723	Earthworks of field system damaged in places by post medieval quarrying. A number of pillow mounds also present across site. The field system will contain archaeological information and environmental evidence relating to the field system and the landscape in which it was constructed.
Later prehistoric field system	Grevitts Copse, Compton	201262		The earthworks and to southeast beyond wood some cropmarks of a field system. The field system will contain archaeological information and environmental evidence relating to the field system and the landscape

				in which it was constructed.
Later prehistoric enclosure	Red Copes, Halnaker Park, East Dean	202678	SU 9197 1098	The incomplete earthwork remains of a curvilinear enclosure. Further work could determine the level of survival; well-preserved examples are likely to be identified as nationally important.
Later prehistoric enclosure	Red Copes, Halnaker Park, East Dean	202681	SU 9173 1092	The incomplete earthwork remains of a rectilinear enclosure. Further work could determine the level of survival; well-preserved examples are likely to be identified as nationally important.
Later prehistoric /Roman settlement	Eartham Thicket, Slindon	200121	SU 9277 0855	This settlement consists of the earthworks of a group of joined enclosures. Earthworks to the south-west may be the remains of fields. Further work could determine the level of survival; well-preserved examples are likely to be identified as nationally important.
Later prehistoric enclosures/s settlement	Parletts Farm, Madehurst	200236	SU 9873 1090	The cropmark indicates the subsurface remains of later prehistoric enclosures and associated boundary ditches including those of a possible trackway. The buried remains have the archaeological potential for the recovery of evidence of its date, manner of construction, use and environment.
Roman Road	Chichester to Brighton	201025	SU 2959 0703 to TQ 0033 0708	The earthworks and some cropmarks of the Roman Road from Chichester to Brighton. A road along this route had been speculated upon since the 1940s. It survives as agger, side ditches or a hollow way depending on terrain. The cropmarks indicate the subsurface remains of double ditches. These roads are highly representative of Roman administration; provide evidence of engineering skills and pattern of conquest and settlement.
Deer park pale	Slindon	201149	SU 9534 0807	Well preserved, though incomplete medieval park pale defining Slindon deer park, owed by the Archbishops of Canterbury. This well-preserved earthwork will contain archaeological and environmental information relating to the monument and the landscape in which it was constructed.
Possible medieval rectangular	Singleton Plantation, West Dean	202524	SU 8703 1224	The earthwork of a square enclosure within West Dean Park. Possibly the remains of a hunting lodge, its banks,

enclosure				ditches and buried walls will contain information relating to its use.
Possible medieval rectangular enclosure	Counters Gate, East Dena Park, East Dean	202503	SU 8979 1143	The earthworks of a square enclosure within East Dean Park. Possibly the remains of a hunting lodge, its banks, ditches and buried walls will contain information relating to its use.
Possible medieval/post medieval pillow mounds	Glass Brow, Buriton	201629	SU 7430 1735	The earthworks of a group of possible pillow mounds. They will contain information relating to the exploitation of rabbits. Further work will establish the degree of survival; all well-preserved warrens are considered worthy of protection.
Medieval/post medieval strip lynchets	Heyshott Down, Heyshott	202068	SU 8854 1695	The earthworks of strip lynchets within woodland on Heyshot Down. They will provide an important insight into medieval farming practices and environmental evidence relating the monument to the wider landscape.
Post medieval charcoal burning platforms	Upwaltham Hill, Upwaltham	200221	SU 9492 1244	The earthworks of post medieval charcoal burning platforms on Upwaltham Hill. These have the archaeological potential for the recovery of evidence of its date, use and environment.
Post medieval charcoal burning platforms	North Side	202778	SU 4907 1467	The earthworks of post medieval charcoal burning platforms at North Side. These have the archaeological potential for the recovery of evidence of its date, use and environment.
Post medieval charcoal burning platforms	Eartham Wood	200240, 200249	SU 9427 1121 SU 9425 1208	The earthworks of post medieval charcoal burning platforms in Eartham Wood. These have the archaeological potential for the recovery of evidence of its date, use and environment.
Post medieval charcoal burning platform	Duncton Hanger	201168	SU 9637 1614	The earthworks of post medieval charcoal burning platforms in Duncton Hanger. These have the archaeological potential for the recovery of evidence of its date, use and environment.
Post medieval enclosures (bee	Philliswood Down, Elstead and Treyford	200961	SU 8203 1706 SU 8216 1704	The earthworks of two square banked enclosures. These may be 'bee gardens', built to protect hives from grazing livestock or associated with

gardens?)				the rearing of game birds. Further work may be able to determine the date and use of these earthworks.
Undated rectangular enclosure	Selhurstpark Hill, East Dean	202722	SU 9227 1195	The earthworks of a rectilinear enclosure consisting of a bank and outer ditch. Centrally placed within it are the earthworks of a curvilinear banked enclosure. Further work may be able to determine the date and use of these earthworks.
Undated enclosures	Bexley Bushes, Lavant	200029 & 200071	SU 8729 0981	The earthworks of a large sub-rectangular enclosure of later prehistoric, Roman or medieval date. Ditches extending from this link with a large incomplete oval enclosure (SHW 200030). Close association but uncertain relationship with cropmark complex (SHW 200028). Further work may be able to determine the date and use of these earthworks.
Undated boundary ditch	Slate Barn, Lavant	202173	SU 8344 1030 to SU 8463 0999	A long linear boundary or trackway of uncertain origin is visible as cropmarks on aerial photographs. The cropmark indicates the subsurface remains of this ditch that runs for over 1200m from Langford Farm west and then WNW. Further work may be able to determine the date and use of this feature.
Anglo-Saxon settlement	Charlton Down	37754	SU 7341 1443	The cropmark indicates the subsurface remains of a Saxon settlement at Charlton Down. These will have the archaeological potential for the recovery of evidence of its date, manner of construction, use and environment.



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