Historic England

Cannock Chase, Staffordshire: The Chase Through Time, Historic England Contribution

Edward Carpenter, Dave Knight, Rebecca Pullen and Fiona Small

Discovery, Innovation and Science in the Historic Environment

THE CHASE THROUGH TIME

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Cannock Chase
Staffordshire

The Chase Through Time
Historic England Contribution

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SUMMARY

Between 2016 and 2018, The Chase Through Time project explored the rich history of Cannock Chase Area of Outstanding Natural Beauty (AONB). All across the Chase, previous generations left their mark on the land. Much is hidden in woodland and heath, including one of the best-preserved First World War landscapes in England. As part of the Great War centenary initiative: Home Front Legacy, Historic England undertook an archaeological survey in partnership with Staffordshire County Council, with support from the Heritage Lottery Fund (HLF). The HLF support included funding for high-resolution airborne laser scanning (lidar). This allowed us to see beneath the trees, revealing a range of archaeological features dating from prehistory onwards. Other sources included historic aerial photographs, which recorded archaeological remains and the changing landscape over the last 70 years. As well as the First World War, other major archaeological themes from the project included extensive medieval and later coal mining, post medieval land division associated with the early management of the Chase, and the localised concentration of prehistoric burnt mounds.

An important strand to this project was the involvement of volunteers. Historic England shared skills, provided training and promoted the use of non-invasive analytical survey techniques with people interested in exploring the history of the Chase. Archaeological records were input directly into Staffordshire County Council's Historic Environment Record (HER) ensuring they could be used immediately. Overall, 565 archaeological sites were mapped, of which 436 were new to the record. The lidar and results of the project are freely available via an online map hosted and maintained by Historic England. The project results will aid management of Cannock Chase, help to develop future projects and will contribute to a lasting legacy of archaeological investigation of this area by heritage professionals and volunteers.

CONTRIBUTORS

David Went and Helen Winton instigated and managed the Historic England contribution to the project. Edward Carpenter, Dave Knight, Cara Pearce and Fiona Small undertook the aerial investigation and mapping. Simon Crutchley provided advice to Staffordshire County Council and the HE project team on commissioning airborne laser scanning (lidar); he also developed the online ArcGIS portal enabling volunteers to view the aerial mapping results. Classroom and field survey training sessions for the volunteers were coordinated and led by staff from Historic England's Investigation and Analysis Department. Matthew Oakey, Edward Carpenter and Dave Knight delivered interactive classroom introductions on the use of lidar and aerial photographs. David Went and Rebecca Pullen planned and ran walkover and earthwork surveys, with assistance from Cara Pearce, Magnus Alexander, Olaf Bayer, Dave Knight and Daniel Hunt. Andrew Payne and Cara Pearce organised and delivered geophysical survey training with assistance from Daniel Hunt. Sharon Soutar facilitated field trialling of various HE-owned mobile recording devices. All fieldwork was assisted by The Chase Through Time project volunteers. The report was written by Edward Carpenter, Dave Knight, Rebecca Pullen and Fiona Small and edited by Helen Winton.

ACKNOWLEDGEMENTS

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We are grateful to Dr Andrew Sargent (Keele University) and his team of highly committed archival research volunteers for sharing their key documentary findings and interpretations. Lawrence Shaw (Archaeological Officer, New Forest National Park Authority) generously provided detailed insight into the volunteer recording methods they adopted, including the reasons why they chose certain systems and abandoned others. Daphne Joy Jones (daughter) and Nicolas Jones (grandson of Erskine Williams) who kindly allowed reproduction of some of Williams' contemporary sketches of life in the wartime camps. Bob Metcalfe kindly allowed the reproduction of a period image of tank training on the Chase. The 1916 plan of Brocton Camp was reproduced with kind permission of Lord Lichfield. Jake and Gill Whitehouse allowed the reproduction of the photography through the HER. Trevor Warburton, Marion Kettle, Nigel Maus, Mary Cartwright, Jim Andrews, Anne Andrews, Ned Edwards, Simon Bristow and John Maddan all usefully shared various research resources, information and ideas with us.

At Historic England, thanks to Archive staff for supply of aerial photographs, to Paul Adams for vocabulary for the buildings at RAF Hednesford, and to all those colleagues who provided archaeological advice and commented on the report, especially Chris Welch.

Field survey would not have been possible without the help of land owners and managers who granted and facilitated access to sites in their care: Mr Steve Taylor of Sheepwash Farm, Steve Barnes and Peter Scholes of Cannock Chase District Council's Countryside Service, and Jim Stewart and Doug Stanley from the local Forestry Commission team. Perhaps most importantly, the field survey teams owe an immense debt of gratitude to the hard work and impressive local knowledge of the project volunteers. They are too numerous to mention individually here, but we would like to extend our deepest thanks to all of them for their able assistance and infectious enthusiasm!

ARCHIVE LOCATION

Historic England Archive Services, The Engine House, Firefly Avenue, Swindon, SN2 2EH archive@HistoricEngland.org.uk

DATE OF SURVEY

The project began in late 2016 and completed in January 2018.

Cover: *A view over the northern half of Cannock Chase, looking east. The heathland of Brocton Field is visible in the foreground, with the plantation of Haywood Warren behind. Wolsley Park is visible beyond this, overlooking the Trent Valley to the north. 33001_066 29-NOV-2016 © Historic England Archive*

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INTRODUCTION

All across the Chase, previous generations have left their mark on the land, but many of these archaeological remains are hidden in the woods and heathland that cover this area. These remains span many centuries and are associated with a range of different activities and together they provide a rich insight into the history of Cannock Chase.

The Chase Through Time project was devised to assess the whole landscape and to explore ways of getting local communities and visitors more involved in the heritage of the Chase. The project and associated Heritage Lottery Fund (HLF) bid was developed by three bodies: Staffordshire County Council, the Cannock Chase Area of Outstanding Natural Beauty Partnership and Historic England. This report presents the results of the Historic England contribution to the Chase Through Time project, including the results of the aerial investigation and mapping and our work with volunteers. Our involvement ran from Spring 2016 until Spring 2018.

The HLF provided resources for a high-resolution airborne laser scanning survey of the Chase. More commonly known as lidar, the data was crucial in revealing the extent of archaeological earthworks that survive across the whole project area. A main aim of the Historic England contribution to the Chase Through Time project was to map and record all archaeological evidence identified on lidar and aerial photographs. This was to provide a framework for further survey, management and promotion of the historic environment. An equally important aim was to explore ways of engaging volunteers with the lidar data and the results from the aerial investigation and mapping. The HLF funded a part-time volunteer coordinator to help organise workshops and activities exploring the Chase through documentary research and archaeological survey.

During the project, thousands of aerial photographs and numerous different lidar visualisations were analysed by Historic England's aerial investigation and mapping team. The results from the analysis of the lidar significantly enhanced our understanding of the archaeology within the woods and heaths. Aerial photographs provided views of buried features and archaeological sites that were extant on earlier photographs, but subsequently demolished or levelled. For an overview of the sources and methods, see '*Working With Aerial Photographs And Lidar*' below. A total of 114,268 features were transcribed, equating to 565 archaeological sites. The large number of features reflects the nature of the archaeological remains, mainly large complex sites like the First World War camps, that each comprising thousands of features collectively covered by a single HER monument record.

Historic England provided volunteers with training in a range of analytical field survey and geophysical survey techniques. The work undertaken by the volunteers, including targeted earthwork survey, is presented in the '*Working With The Volunteers*' chapter and in relevant sections of this report. The results of the geophysical survey work carried out by the volunteers are published in two Historic England Research Reports (Payne and Pearce 2017a; 2017b). The targets for fieldwork were identified during the aerial investigation and mapping phase of

the project and Historic England was uniquely placed to present these results, share skills, provide training and promote the use of non-invasive survey techniques to engage with those involved in community projects. The extensive areas of Cannock Chase that are designated as open access land may be opportune for future targeted work involving non-invasive survey techniques. The practicalities of where work can be best undertaken on the Chase are outlined in the '*Working With The Volunteers*' chapter.

Innovative techniques were used to share our data during the lifetime of the project and beyond. Monument records describing the archaeological sites were entered directly in to the Staffordshire Historic Environment Record (HER) and some of these almost immediately contributed to management decisions being made by Staffordshire County Council. Volunteers were kept informed of highlights from the project via a blog, but a major innovation was the creation of an online map. This geographical information system (GIS) included the lidar images and was updated with our mapping and interpretations as the project progressed. The online map is being hosted and maintained by Historic England:

http://services.historicengland.org.uk/cannock-chase-map/index.html

It will provide information for management of Cannock Chase and aid and encourage future archaeological work. It is easily accessed, requires no specialist software and is one of the most important legacies of the project.

Format of report

This report is primarily the story of the Chase as understood from aerial sources. As with any archaeological survey technique, there are gaps in the narrative presented. For example, no early medieval remains were identified from aerial sources, and Cannock Chase's glassmaking sites are only known through documentary evidence and excavation (Welch 1997a). A range of sites of different periods and functions were interpreted and mapped as part of this project and four main themes emerged.

The four main archaeological themes covered in this report:

- The First World War remains of Brocton and Rugeley Camps, two major training areas, are visible across most of the Chase north of the A460. Understanding the full extent of these remains was one of the main reasons for the project, as part of the centenary commemorations of the Great War.

- Extensive medieval and post medieval coal mining remains dominate the grounds of Beaudesert Old Park, and later collieries sprung up along the southern edge of the Chase. These created previous perceptions of the industrial nature of the area.

- A significant number of medieval and post medieval earthwork boundaries associated with hunting, woodland management and intakes have been

identified across most of the upland Chase, denoting the change in land management over the centuries.

- Prehistoric Burnt Mounds form one of the more unusual class of archaeological feature identified in the country and several exist on Cannock Chase.

This report describes the processes and results of the aerial survey and a summary of the work with the project volunteers. The results presented are arranged under the four primary themes described above. The thematic approach is a way to address a range of issues. While many features identified from the air can be assigned a date in terms of period (eg Bronze Age or Medieval), it is not possible to precisely date features from aerial observation alone. Likewise, many features remained in use, or may have fallen in and out of use, over long time periods and so cannot be tightly defined to a specific date range. For example, the park pale to Haywood Park has functioned as a boundary for several centuries.

Each thematic section includes an introduction to the subject, and an overview of previous work followed by the results derived from the mapping. The final part of each section considers the more significant sites, highlights areas where further work could be undertaken or would be desirable. Each section highlights importance, the degree of survival and any potential threats. Those interested in any one theme in particular will find all relevant information in that section.

The intention is that this report will highlight the value of aerial survey to all those interested in the landscape history of Cannock Chase. In addition to discussing the results of this project, it is hoped that this document can serve as a form of research agenda and, in conjunction with the online map, will inspire further work by both volunteers and professionals. It is this continued investigation and research into the long and varied story of Cannock Chase that is the intended legacy of the project.

Where specific monuments are discussed, the relevant HER number (with MST prefix) is noted, to allow a rapid search for the detailed record through Heritage Gateway, or to search for the mapping on the online GIS (for more detail about the online GIS see chapter '*Working With The Volunteers*').

Project area

Cannock Chase is situated to the north of Birmingham, between the towns of Cannock, Stafford and the city of Lichfield. The Chase sits on an elevated plateau and is a mixture of open heathland (including heather, gorse, bilberry and bracken) and woodland (scrub, deciduous and coniferous plantation). Most of the Chase consists of Forestry Commission woodland that was established in 1919, but it also contains the most extensive area of heathland in the Midlands. This includes a unique assemblage of both northern and southern heath species as Cannock Chase coincides with the limits of their respective ranges.

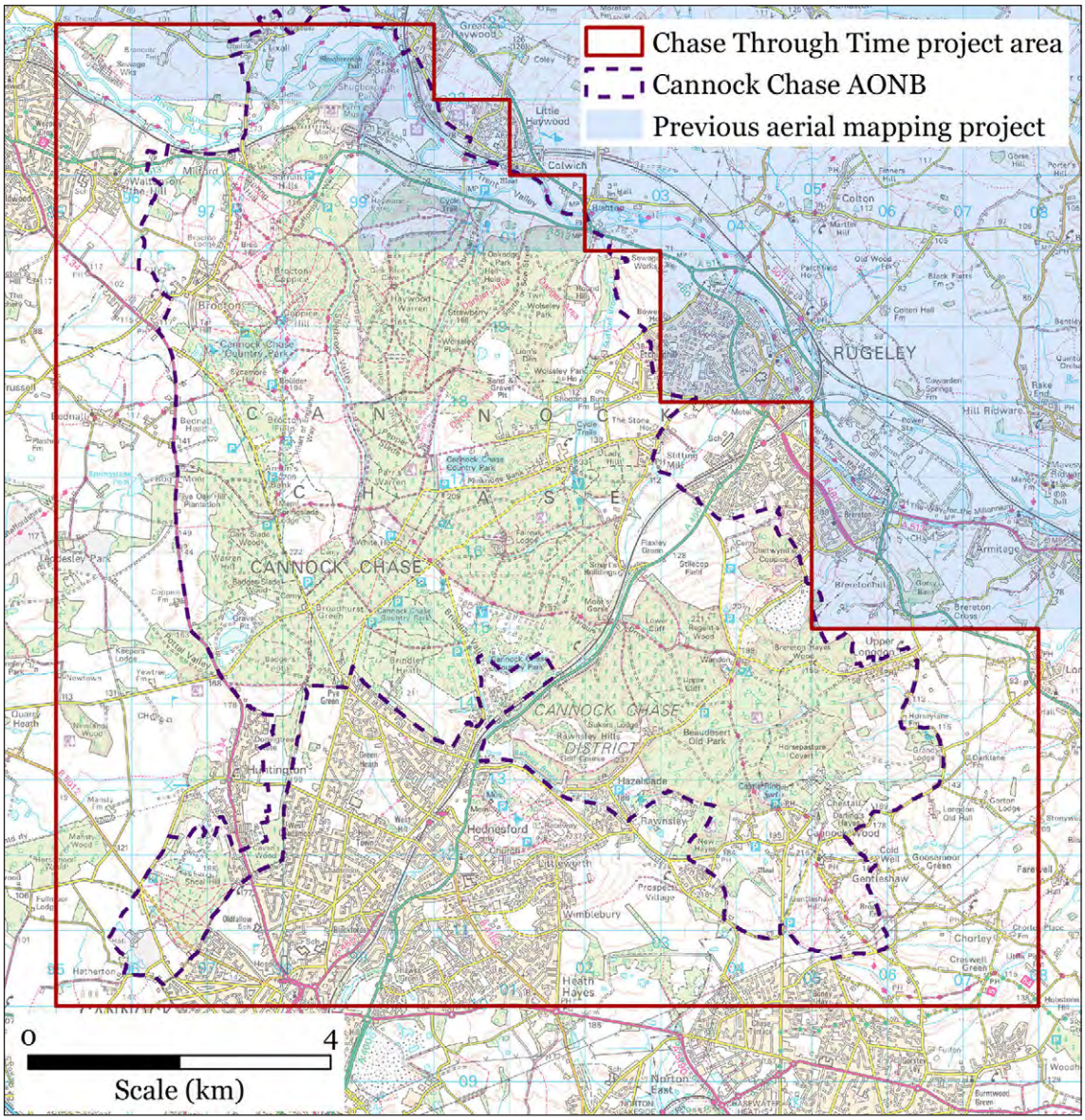

Fig 1: The Chase Through Time Historic England mapping area, denoting the area of the previous aerial investigation project and the Area of Outstanding Natural Beauty. Base map © Crown Copyright and database right 2018. All rights reserved. Ordnance Survey Licence number 100019088.

The aerial investigation and mapping covered 129 square kilometres (Fig 1) comprising the whole of the Chase and including a review of nine kilometres squares in the north-east covered by a previous aerial investigation and mapping project (Bax 2014, fig 1). Only a handful of features were added in this area.

Staffordshire is divided into three main geological regions. A mountainous northern region, a fertile central region of dairy farming watered by the River Trent and a southern region that shares many of the characteristics of the central region but is also the location of coal and ironstone (Greenslade and Stuart 1984, 13).

Cannock Chase is situated toward the south of the county. It is an area of high ground rising out of the Shropshire and Staffordshire plain to west. To the north, the Trent valley divides the Chase from the South Derbyshire claylands, and to the east there are the Trent Valley washlands (Natural England 2012). The Chase occupies a plateau defined by steep edges on all but the southern side where its slopes gradually southwards. There are a number of rises on the plateau including Castle Ring that reaches 242m. The plateau is also subdivided by valleys that carry minor tributaries that drain north and east into the Trent. This includes the valley of the Rising Brook that runs from Hednesford to Slitting Mill near Rugeley and cuts plateau in two.

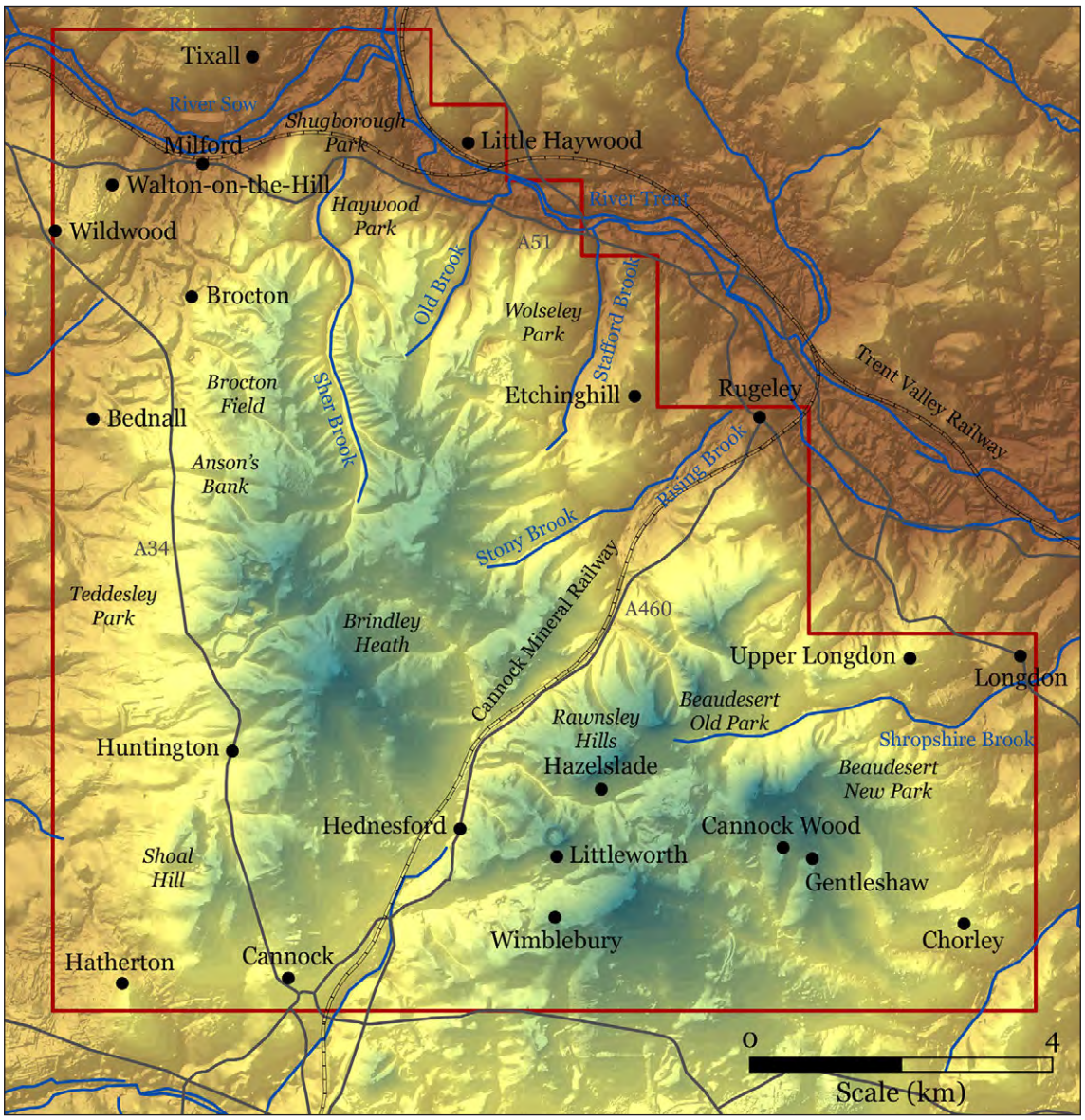

Fig 2: The primary settlements, watercourses, roads, railways, and principal names on a relief map of the project area. Relief map based on APGB height data © Bluesky International/Getmapping PLC.

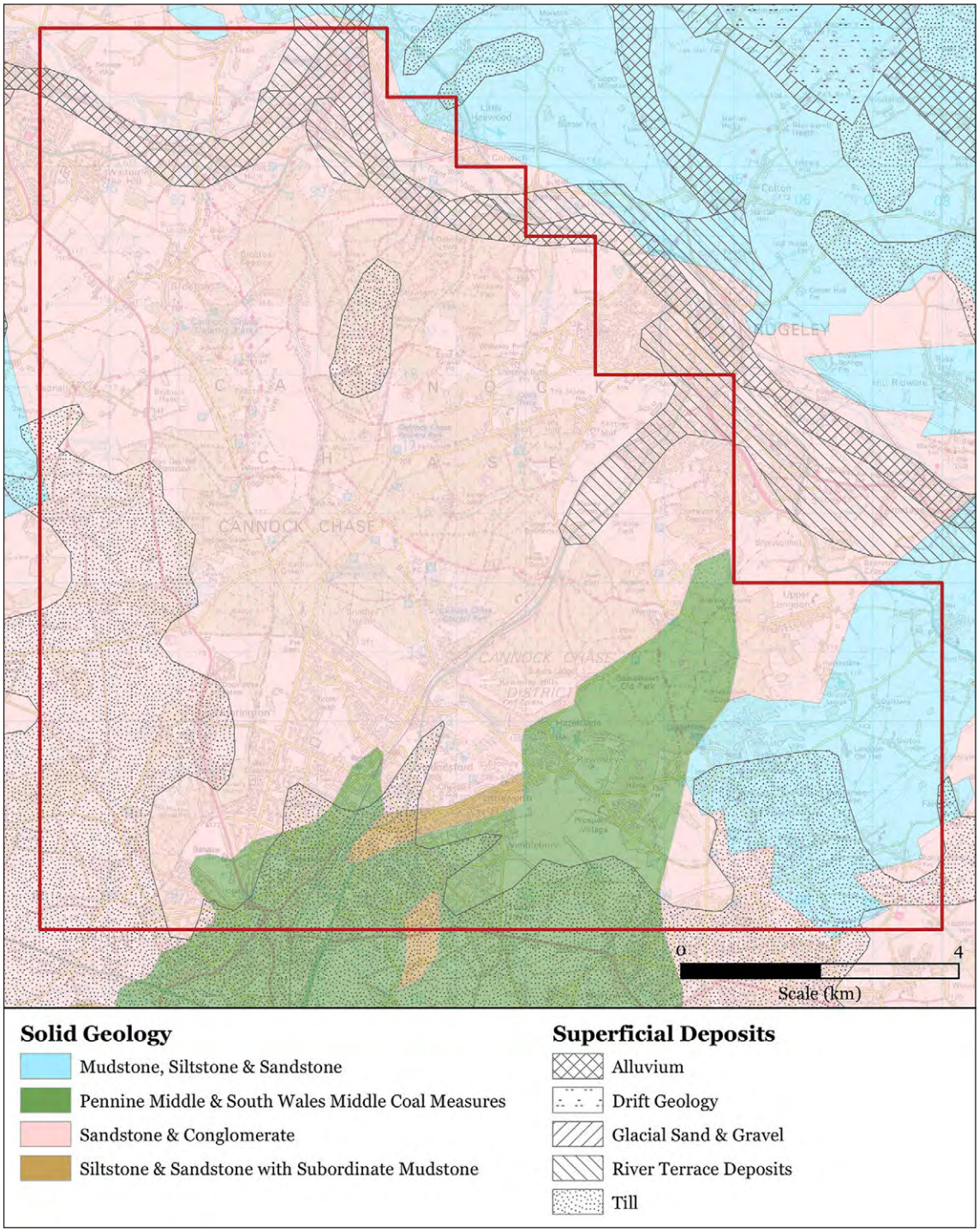

Fig 3: The solid geology and superficial deposits of the Cannock Chase Through Time project area. Base map © Crown Copyright and database right 2018. All rights reserved. Ordnance Survey Licence number 100019088. 1:625,000 Geology data reproduced with the permission of the British Geological Survey ©NERC. All rights reserved.

Cannock Chase's soil is largely thin, acid, pebbly and infertile and this supports extensive areas of heathland and coniferous plantation. The solid geology of the Chase is red sandstone interbedded with pebbles cemented together with sand and known as the Cannock Chase Formation (of the Sherwood Sandstone Group) and is 100m-150m thick.

The Cannock Chase Formation sits on the Middle coal measures, and the coal measures outcrop at the surface in the southern part of the Chase. These coal measures are a mixture of sandstones, mudstones and coal seams. They slope down to the west under pebble beds.

The area was once overlain by Helsby Sandstone Formation (red sandstone with some pebbles), and this was later buried beneath the Mercia Mudstone Group. Both these geological layers eroded completely from the higher ground but survive in lower areas to north east and west. For a more detailed description of the geology of Cannock Chase see *The Geology of Cannock Chase* (Green nd).

Cannock Chase was designated an Area of Outstanding Natural Beauty in 1958 for its landscape, wildlife and history. At the time, the history of the Chase was perhaps most obviously seen in the name, which reflects its use as a medieval hunting ground. Its best known archaeological site is Castle Ring Iron Age hillfort and this was given legal protection as a Scheduled Ancient Monument in 1925. Charles Masefield's 1910 book of Staffordshire describes Cannock Chase in terms of its topography and its role as a hunting ground, and mentions Castle Ring (Masefield 1910, 101; 104). Arthur Mee's description of Cannock Chase (first published in 1937) is brief and focuses on its role as a hunting ground and its remote wildness (Mee 1948, 58), and a similar sentiment can be seen in Phil Drabble's book of Staffordshire (1948, 17).

Within the project area, there are currently seven sites designated as of national importance with scheduled monument status. These are listed below with their National Heritage List England (NHLE) numbers:

- Castle Ring Iron Age hillfort, including medieval hunting lodge (NHLE 1014687).
- Court Banks medieval moated site and post-medieval bloomer (NHLE 1003750).
- Church Farm medieval moated site (NHLE 1007616).
- 16th-century Essex bridge on the edge of the Shugborough estate (NHLE 1006111).
- Bronze Age saucer barrow on Spring Hill (NHLE 1009312).
- First World War instructional trench system at Rugeley Camp (NHLE 1021326).
- First World War scale model of the western front trench system around Messines (NHLE 1444078).

The inclusion of lodge and moated sites in this list of scheduled sites represents the medieval landscape. The inclusion of a bloomery site (related to iron smelting) and the two First World War scheduled sites highlight two other aspects of the Chases

history: its use as a site for industry and by the armed forces. This is also reflected in the Grade II Listed Building status of the German Military Cemetery, which reflects the commemorative use of the Chase, including memorials from both World Wars. The recent addition, in 2017, of the Messines Model to the schedule of ancient monuments was partly recognition of the importance of the recent centenary of the First World War.

Charles Masefield's 1910 account highlighted the negative perceptions attributed to Staffordshire because of its industry. No mention of the First World War camps is made by Drabble in 1948. He writes fondly of the Chase but considers much of it ruined by the day-trippers, the coalmines and the general lack of broadleaf trees, which he sees as a result of overexploitation to feed the post medieval iron industry (Drabble 1948, 14-20). The earliest popular book of Staffordshire that mentions the First World War camps was published in 1974 (Bird 1974, 114). More recent archaeological work on the Chase is described in the individual chapters below.

The Chase is geographically close to the large urban areas of Birmingham, Stafford and Cannock. A current main use of the Chase is for outdoor recreation, especially by these nearby populations. The Friends of Cannock Chase are a group derived from local communities in the neighbouring towns and villages. They are a network of people concerned about the future of the area and who campaigned for AONB status in the late 1950s. They continue to promote the history of the area through guided walks and other activities. The lidar data and the results of the survey are already informing their work, and it is hoped that they will continue to use the online resources.

Cannock Chase AONB is currently recognised as a significant natural and historic landscape. The AONB Unit is supported by the Department for Environment, Food and Rural Affairs (DEFRA) and five local authorities to implement a management plan for the Chase. They also actively promote the Chase through projects and activities. The Chase Through Time project complemented this work by providing an archaeological overview of the whole Chase with information and tools to inform future management and activities to further promote the historic environment.

WORKING WITH THE VOLUNTEERS

From the outset, the Chase Through Time (CTT) project was intended as a community-focussed initiative. Alongside the provision of in-house expert mapping and interpretation of the archaeology from aerial sources, the other key Historic England (HE) contribution was to introduce local project volunteers to various types of non-intrusive archaeological landscape investigation. Workshops for volunteers were to include training in the use of lidar and aerial photographs, and a number of applied fieldwork techniques, including analytical earthwork surveys (Fig 4), walkover surveys and geophysical surveys (Went and Winton 2016). The project has succeeded in achieving most of its aims and objectives with regards to working with volunteers, although it has not been possible to achieve them all. The format and feats of our various engagements with volunteers are outlined in this section of the report and are summarised in Table 1.

Fig 4: Project volunteers engaged in analytical earthwork survey of an L-shaped military practice trench near Uppersherbrook Pool, February 2017 © Historic England.

Fieldwork training methods and locations were to be chosen on the basis of their potential to enhance understanding of certain archaeological sites within the Chase and its immediate environs, using the outcomes of the aerial investigation and mapping to identify sites that fit this brief. Historic England staff were to facilitate and steer the volunteers' work so that it could complement our own work and, ultimately, to help engage local communities with new perspectives on the historic environment. Enabling the volunteers to participate in the research process and

equipping them with practical recording skills would, it was hoped, assist their ability to continue with research beyond the lifetime of the project.

The project was publicised to existing local history groups and the wider community in and around the Chase by Staffordshire's appointed volunteer coordinator for the Chase Through Time project, Gary Ball. Individuals registered their interest with him, and were then contacted each time that opportunities to get involved arose. Gary provided our main point of contact with the volunteers throughout the project period.

Fieldwork predominantly took place through Winter/Spring 2016-2017, when vegetation was less of an obstruction. Throughout the project period, interim highlights from the aerial mapping and field teams were communicated to a wider audience through a number of short HE-authored blog posts. In June 2017, HE project staff hosted an interactive information stall at public history event which was arranged by Staffordshire County Council (SCC) to tie-in with First World War centenary commemorations, including the strong local links with the Battle of Messines (Fig 5) (Pullen 2017b).

Fig 5: Historic England's The Chase Through Time project display at the Remembering the Chase history event, June 2017 © Historic England.

As part of the wider CTT project, and running parallel to HE's project involvement, a series of weekly 2-hour archival research sessions were held at Staffordshire Record Office. These sessions were directed by Dr Andrew Sargent of Keele University, and amounted to nearly 500 hours of volunteers' time given. Local volunteers were guided in researching past life and land management on the Chase using maps and

written records within the collections held at Stafford. Thus far, the volunteers have concentrated on viewing and interpreting documents dating from the 17th, 18th and 19th centuries, with particular focus on material from the later 18th and earlier 19th centuries when change on the Chase was most apparent. The objectives and results of the Chase Through Time archival research element are reported on separately as they were undertaken outside of the scope of the Historic England contribution (Sargent 2018).

The provision of desk-based archival sessions also meant that there were valuable ways for interested individuals to engage thoroughly with the project without necessarily having to take part in the more physically-demanding field survey workshops.

At the point when the aerial mapping was nearing completion, Historic England staff and Dr Andrew Sargent co-organised a feedback seminar for project volunteers from both field survey sessions and the archival research sessions to discuss some of the patterns and puzzles that were coming out of the results. This was held at Staffordshire Record Office and it comprised presentations summarising the results of each research strand thus far, followed by time to look at some of the main historic maps and documents that had been used and a chance to view and discuss the aerial mapping results.

Overall, Historic England provided the equivalent of 11.5 days during which volunteers had the opportunity to attend expert-led training, and 13.5 days if the presence of the interactive project stall at the 2-day 'Remembering the Chase' public history event is taken into account (Table 1). Because all events were facilitated by more than one member of staff, in total about 40 person-days of direct contact between Historic England project experts and volunteers were provided in the year between November 2016 and November 2017. This does not account for the significant investment of time given by Historic England staff to liaison, logistics and preparation of materials which was required in order for each of the volunteer session to run successfully.

Events were held on a mixture of week day and weekend dates to allow volunteers with varying commitments to attend the classroom and field survey sessions. The field survey sessions all required a reasonable level of fitness to cope with long days walking and working in winter conditions. Before each HE-led session the volunteers were provided with an information sheet detailing the types of tasks they would be undertaking, the nature of the landscape they would be working in, what to bring with them and any relevant health and safety information.

Table 1. Direct engagement between Historic England staff and project volunteers

Activity / Event type	Date(s)	Duration (days)	HE staff	CTT vols	Summary
Lidar workshop 1	24-25 Nov 2016	1 (0.5 x2)	7	24	Classroom session introduction to lidar and aerial photographs, followed by instructional walkover in Oldacre Valley to familiarise the volunteers with 'reading' the lidar out in the landscape and to introduce the concept of enhancing monument records through field visits. Run twice in order to induct as many volunteers as possible: workshop 1 used a room at Cannock Library and workshop 2 used an education building at the Museum of Cannock Chase.
Lidar workshop 2	21 Jan 2017	1	3	11	
Ground Survey session 1	9-10 Feb 2017	2	3	10	A 2-day analytical earthwork survey session where volunteers were guided in a walkover over the area surrounding the site was explored to better understand its context, before learning how to produce detailed measured drawings using traditional survey methods, how to create short written descriptions and how to take record photographs. Split into two groups, the volunteers investigated a C-enclosure on Coppice hill (MST18874) and a practice trench in the First World War training landscape in the Sherbrook Valley (MST22908).
Ground Survey session 2	23-24 Feb 2017	2	3	6	The planned survey site had to be abandoned due to adverse weather conditions making access too treacherous. Instead, on the first day a detailed walkover and investigation of some of the First World War rifle ranges (MST 12296 and MST 12295) along with various nearby features was undertaken, which very usefully clarified our understanding and interpretation of the archaeology visited (Pearce 2017). On the second day volunteers completed the unfinished parts of the detailed trench survey in the Sherbrook Valley.

Activity / Event type	Date(s)	Duration (days)	HE staff	CTT vols	Summary
Ground Survey session 3	9-10 Mar 2017	2	3	6	A 2-day analytical earthwork survey session where volunteers were guided in a walkover over the area surrounding the site to better understand its context, before learning how to produce detailed measured drawings using traditional survey methods, how to create short written descriptions and how to take record photographs. Volunteers recorded the footprint of a building located at the southern end of Oldacre Valley, thought to be a field latrine block, but not marked on the 1916 plan of Brocton camp.
Geophysical training	4-6 Apr 2017	3	2	11	A 3-day field based introduction to basic geophysical survey techniques, where volunteers learned how to undertake magnetometry and earth resistance surveys. Surveys were undertaken at Sheepwash farm burnt mounds and Castle Ring hillfort interior (Payne and Pearce 2017a and 2017b).
'Remembering the Chase' public history event*	24-25 Jun 2017	2	4	n/a (>50)	A 2-day public history event held at the Marquis Drive visitor centre, arranged by SCC. Historic England staff ran a stall with detailed information and activities relating to the project and hosted a short visit from the local Young Archaeologists' Club.
Aerial/archives feedback seminar	28 Oct 2017	0.5	2	8?	A half-day seminar session in Stafford Record Office for volunteers using presentations, viewing of maps and documents held by the archive, and open discussion to compare results from HE's aerial mapping and ground recce work with the findings of Dr Sargent's documentary archival research team thus far.

*although this was not an event specifically for the CTT volunteers, many of them attended and were able to have in-depth discussions about specific sites and topics with the HE investigators, and to view and interrogate our mapping data.

Overall, working with the volunteers was a successful and very rewarding aspect of Historic England's involvement in the wider project. Workshops and fieldwork sessions were well-attended and well-received. A useful mutually-beneficial relationship was fostered between Historic England staff and local volunteers, where valuable understanding and insight was exchanged between both parties: Historic England provided broad archaeological expertise while volunteers reciprocated with detailed knowledge about the history and geography of their cherished local landscape.

Feedback derived from a questionnaire circulated by Gary Ball in January 2018, provided an overview of how overwhelmingly positive the Historic England contributions to the Chase Through Time project were received by volunteers. The feedback repeatedly referred to the beneficial aspects of working with experts, meeting other interested locals, or gaining and applying their new knowledge and skills in various ways. These aspects were felt by respondents to be the project component that they felt benefited them personally the most. The various outdoor fieldwork sessions were the most frequently chosen response when asked what element they had most enjoyed.

Introductory workshops

All registered project volunteers were given the opportunity to attend an introductory workshop looking at the best use of aerial photographs and lidar for archaeological research, mapping and survey, using examples from Cannock Chase. Our intention was that all volunteers wishing to undertake subsequent targeted fieldwork sessions with us would first have attended the introductory workshop, which was run twice in order to induct as many volunteers as possible. The sessions were well-attended (see Table 1) and well-received.

The workshops both comprised a half-day classroom session covering the history and use of aerial photographs, the technicalities and use of lidar, and the benefits of combining these sources presented through illustrated talks and interactive workbook activities using examples from the local area. An introductory presentation on the basics of field survey techniques, their development over time and how we might apply them in Cannock Chase was then followed by an instructional walkover in Oldacre Valley to familiarise the volunteers with 'reading' the lidar out in the landscape. This also introduced the concept of enhancing archaeological monument records through field visits, photography and note-taking (Fig 6).

Analytical field survey training

The ultimate aim of incorporating ground-based survey techniques was to improve the definition and understanding of archaeological sites within the study area using the aerial mapping and investigation work to identify sites which would benefit from further survey on the ground.

Fig 6: Project volunteers undertaking various activities: classroom learning through presentations and workbook exercises, using the lidar to navigate out on the Chase and look at specific features amongst the wartime camp remains, and discussing how a more detailed written and photographic record might be complied during field visits. November 2016 © Historic England.

However, for several unforeseen reasons, the field survey requirements and practical methodology adopted differed somewhat from those envisaged at Project Design stage (Went and Winton 2016). The project anticipated a series of guided walkover surveys over quite large areas to examine relatively large numbers of features in areas of poor lidar returns. However, it was soon realised that the new airborne data was of a quality that did not require such systematic verification, even in areas of significant undergrowth and vegetation. Instead, fieldwork was focussed on a small number of sites where ground investigation offered to improve overall understanding while training volunteers in analytical investigation and recording techniques.

Given the project's short timetable and the time of year when the project started, the choice of survey sites had to take place before the systematic aerial mapping exercise was fully under way. The selection was therefore largely based on preliminary examinations of the lidar by Historic England aerial and ground investigation staff and suggestions from Staffordshire County Council. Site visits were undertaken by Historic England in the weeks or days before volunteer sessions to ensure that site morphology and conditions were conducive to survey training, and that survey itself was valid in terms of demonstrating new archaeological insights.

One problem encountered at this stage was that the tremendously detailed nature of the lidar meant that features often appeared more 'visible' and robust in the

data than in reality on the ground; indeed it was rarely possible to assess the true suitability of sites until the initial site visit, and a much larger number of sites were reconnoitred than were subsequently tackled with volunteers. This process did, however, enable Historic England staff to gain greater perspective on the local topography and environment, as well as the nature of surviving archaeological earthworks across the Chase.

A number of other practical and ecological constraints impacted the final choice of survey sites. The year-round thicket of vegetation which masks large parts of the Chase can inhibit the ability to move easily through certain areas and make it difficult to undertake even basic field observations and measurements. In the more open areas of the Chase we restricted our access to footpaths only during the key season for ground-nesting birds, for example the high number of woodlarks nesting across the crest of Anson's Bank in March.

In several parts of the Chase (such as Brocton Coppice) the serious plant pathogen, *Phytophthora*, affecting Bilberry, has been identified and measures are being taken to restrict its spread. Fieldwork had to be avoided in some areas completely, and biosecurity measures taken to minimise our impact elsewhere.

Field survey methods

At the project design stage the intention was to train volunteers in the effective and systematic use of survey equipment in order to undertake surveys during and beyond the lifetime of the HLF-supported project. These ground surveys were anticipated to be generally at Level 2 (Historic England 2017) – primarily mapping and descriptive – although some more detailed (Level 3) surveys would also be undertaken where this approach would better serve to address research questions. In the event the detailed lidar results, even in areas of dense vegetation, along with ecological considerations, obviated the need for Level 2 walkover surveys. Most of the field survey work undertaken was therefore closer to Level 2/3 in nature (see Table 1), focussed on a small number of suitable targets with suitable ground conditions. However, where a specific puzzle was encountered by the aerial investigators, walkover exploration involving aerial and ground investigation staff with volunteers proved useful to enhance our understanding (for instance, of the First World War rifle ranges). Each detailed field training session covered most or all of the following steps (also see *'Case Study 1'*, below):

- Exploration of the surrounding area to gain an understanding of context;
- exploration of the target feature(s) to discuss form, function and survey method(s);
- principles of locating the site (compass readings onto fixed points; measuring with tapes to nearby fixed points; using GNSS instruments etc);
- principles of setting out baselines and triangulating perpendicular lines using basic survey equipment – long tapes, ranging rods and optical prisms;
- graphic survey techniques;
- taking spot height and creating basic profiles using simple levelling equipment (a dumpy level);

- hand-plotting measurements at scale to create a site drawing whilst in the field;
- explanation and application of hachuring to depict relative slopes and relationships;
- methods to overcome working on slopes (ie use of plumb bobs);
- basic record photography, and
- basic note-taking using the project field form.

The individual volunteer earthwork surveys served to enhance the monument records created from aerial mapping and whilst they did not warrant separate research reports, they have been ascribed unique event records in the Historic England National Record of the Historic Environment (NRHE). The final digitised earthwork survey drawings and any accompanying notes will be deposited with Staffordshire Historic Environment Record and the HE Archive (Figs 7 and 8).

Fig 7: Creating monument records: volunteers measuring and drawing earthworks thought to relate to First World War field latrines (looking north), one of the record photographs taken by the volunteers showing interior height differences between the two southernmost cells in the field latrines block (looking west), and an example completed paper monument recording form for the military practice trench recorded near Uppersherbrook Pool, March 2017 © Historic England.

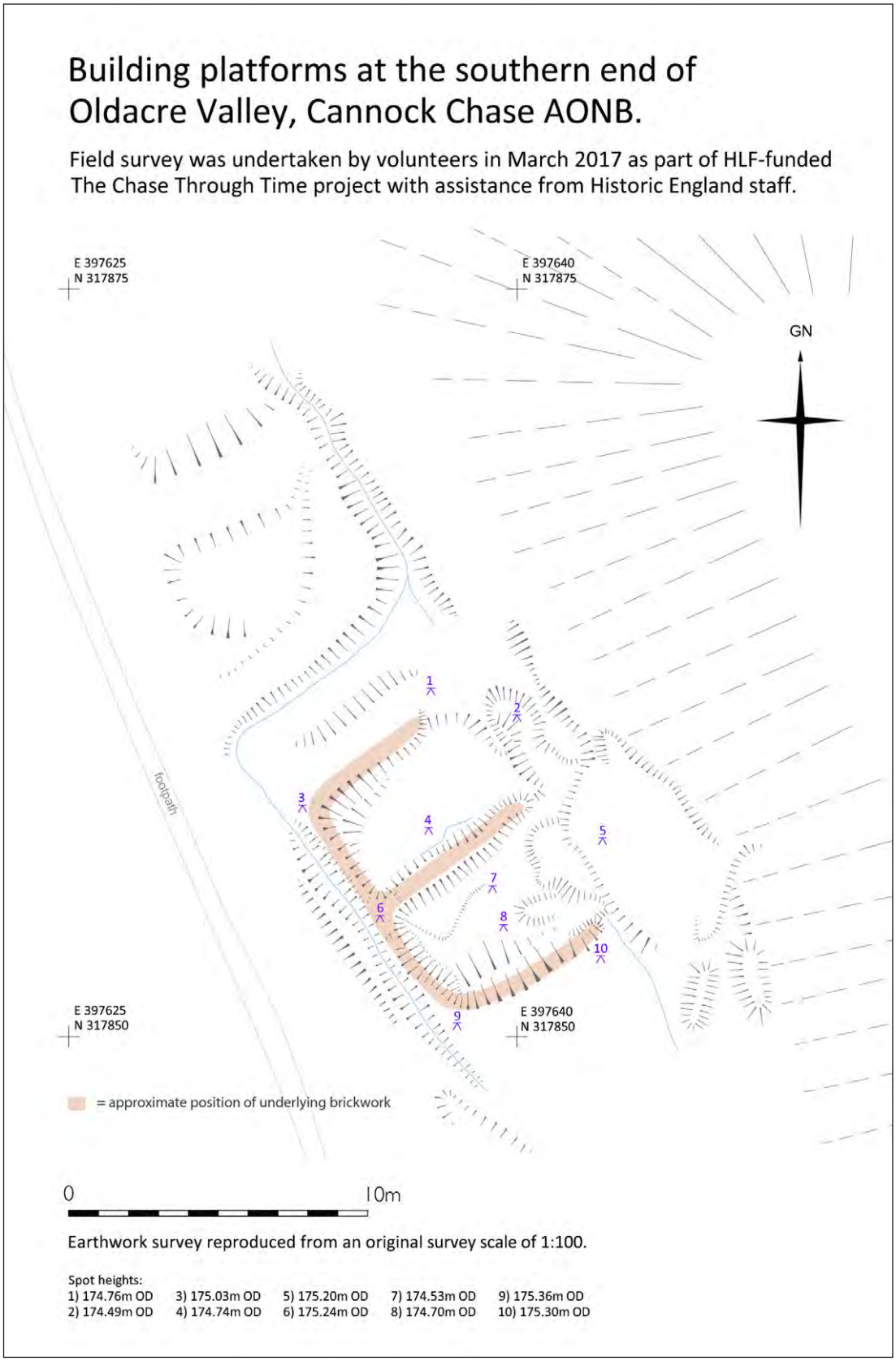

Fig 8: The completed digital earthwork survey drawing of the probable field latrine foundation at the south end of Oldacre Valley; reduced from the original survey scale of 1:100 © Historic England.

Fig 9: The Chase Through Time project draft monument recording form © Historic England.

Monument Recording Form

Field Identifier (FID):	**Monument no. (UID):**
County: Staffordshire **Parish:** _____	**District:** ☐ Stafford ☐ Cannock Chase ☐ South Staffordshire ☐ Lichfield
NGR (central): **100km square:** ☐ SJ ☐ SK	**Easting:** **Northing:**
Recorders name: **Date:**	**Organisation:** ☐ CTT volunteer team ☐ Staffordshire CC ☐ Historic England

Summary Text:

Period(s) / Probable date:	**Monument Type(s):**	**Physical Evidence:**

IDs from other numbering schemes: *List as scheme (ie NHLE), then ID no.*	**Associated monuments:** *List as scheme (ie Staffs HER), ID no., association (Child/Parent/Gen)*

Land use:

☐ pasture	☐ woodland - deciduous	☐ heath	☐ parkland
☐ cultivated	☐ woodland - mixed	☐ scrub	☐ urban
☐ rough grass	☐ coniferous plantation	☐ Other:	_____

Damage and threats: *Indicate all that are visible*

☐ burrowing	☐ root damage	☐ collapse	☐ Other:
☐ animal parching	☐ water damage	☐ decay	_____
☐ human erosion			

Condition: ☐ good ☐ average ☐ poor

Long Text:

Sources: *List by source no. (ref in long text) and title/details.*

Photo taken?	☐ Yes → Photo id no(s): _____ ☐ No → Recommended? ☐ Yes ☐ No
Sketch drawn?	☐ Yes (copy attached? ☐) ☐ No
Survey undertaken?	☐ Yes → Scale: _____ Method: _____ ☐ No → Recommended? ☐ Yes ☐ No

Event(s): *(add in office)*	**Archive/collection:** *(add in office)*

Another ambition at project design stage, related to the walkover survey approach, was that Historic England would assist Staffordshire County Council in the selection and purchase (with HLF money) of appropriate digital field recording equipment for use by volunteers (for instance handheld GNSS ('GPS') devices, smartphones or tablets). However, without the need for the envisaged walkover surveys this requirement was not realised during the active stages of the project. It also became apparent that the County Council already own a set of tablets bought for a previous project, which could potentially be configured and used by the volunteers if a future need arose. Although no final mobile recording application was selected for the project (partly because technology will likely have moved on by the time a follow on project phase occurs), a concerted effort was put into the form template that that could be used for paper-based or future digital recording in the field (Fig 9) (also, see '*Mobile Recording'*, below). This was designed to be compatible with the project requirements and data standards employed by Historic England and Staffordshire Historic Environment Record (HER).

The fields within the monument recording form template were chosen in consultation with the needs of the Staffordshire HER, and many are designed to match the required fields for monument recording to meet local authority and national recording standards (eg Period, Type and Evidence). Where possible, entries for fields were provided as tick boxes, to create a consistent data set of key terms, to reduce the problems of illegibility and avoid sections being left blank. Free text options were used to provide space for longer descriptions, interpretations and annotated sketches. Unique field identifiers (FIDs) composed of the recorders' initials and consecutive set of numbers (ie AS001, AS002, AS003 and so forth) were created for each new form because many of the features on the Chase relate to large monument record groupings – for instance most of the features relating to the Brocton training camp come under the single HER monument record MST 5865. The form has also been designed in such a way that any associated photographs can be noted and linked to the paper record, and recommendations for further survey can also be noted.

The following case study gives an overview of how Level 3 analytical earthwork survey fieldwork was undertaken:

Case study 1: Earthwork survey of a First World War practice trench

In February and March 2017 Historic England staff and volunteers investigated a group of features located near the southern end of the Sherbrook Valley (part of MST18874). These were used during the First World War to train soldiers before they were sent to the front. The site showed up well in the lidar data as an L-shaped arrangement of narrow military practice trenches cut in the classic 'Greek key' (crenelated) form alongside a pattern of circular pits surrounded by doughnut-shaped mounds, placed with some regularity close to the trench's northern edge (Fig 10).

To begin with, the area surrounding the trench system was explored to better understand its context. Then, using long tapes as baselines, volunteers were shown how to take a series of measurements at right angles from these to record the top and

bottom-line of the trenches, pits and any associated mounds of up-cast material. By carefully plotting these measurements the volunteers were able to produce accurate scale plans in the field (Fig 11). Several spot heights were also recorded across the site to give a sense of the comparative depths of the features. The pencil field survey plans were then scanned and digitally traced to create a single metrically-accurate drawing (Fig 12) and the process and results of the fieldwork were summarised in a project blog post (Pullen 2017a).

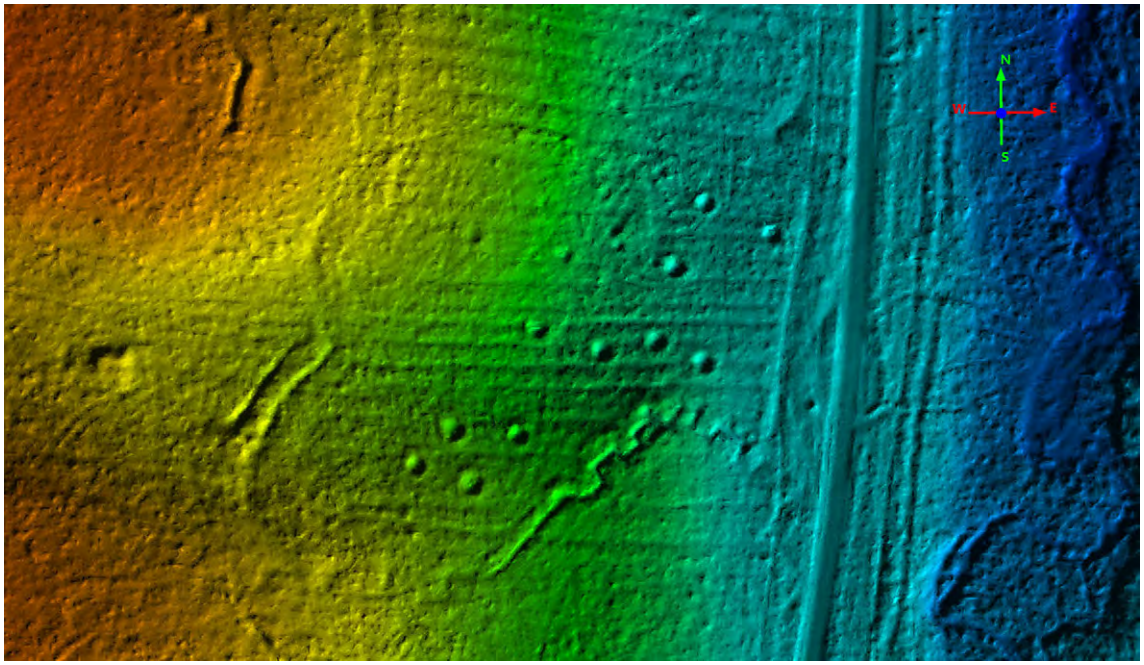

Fig 10: Digital terrain model from the new airborne lidar, showing the distinctive L-shaped length of 'Greek key' practice trench in the centre, with circular shell holes to its north and an underlying pattern of narrow parallel drainage channels. Lidar DTM 04-MAY-2016 © Historic England; source Staffordshire County Council/Fugro BV Geospatial.

Spending time recording this site in detail meant that useful observations were made. The width and depth of this practice trench (0.9m/3ft x 0.6m/2ft) suggests that it was a ⅓-scale model, easily compared with photographic evidence of a training feature of similar depth shown in a contemporary postcard (postcard in the Arthur L Lloyd collection, showing soldiers photographed posed with their rifles beside a poem entitled 'A Greeting from Cannock Chase'). Other instances of similar reduced-scale training trenches are known elsewhere on the Chase, but this is the best example we have found. Although the nearby circular pits appear as shell holes, their regularity and the uniformity of the surrounding upcast clearly demonstrated that they were hand-dug – designed to simulate battlefield conditions and to provide obstacles and positions for occupying during manoeuvres (see '*Military Presence On The Chase*', below). Close inspection of the earth bank in front of the southern trench arm revealed patterns which, remarkably, some 100 years after the event, still reflect the efforts of individual soldiers or small groups involved in its construction.

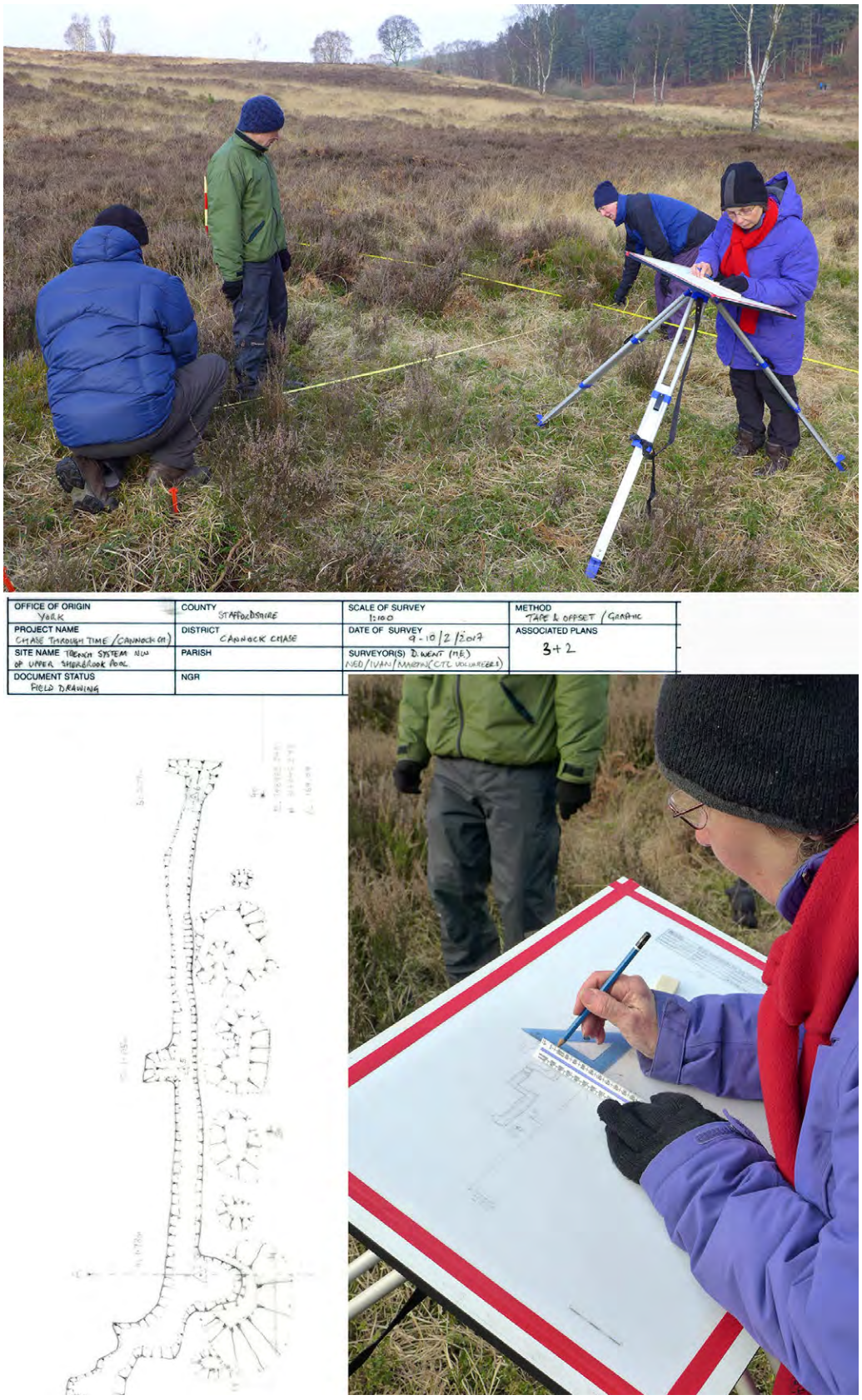

Fig 11: Measuring and drawing the earthworks of the L-shaped military practice trench near Uppersherbrook Pool, February 2017 © Historic England.

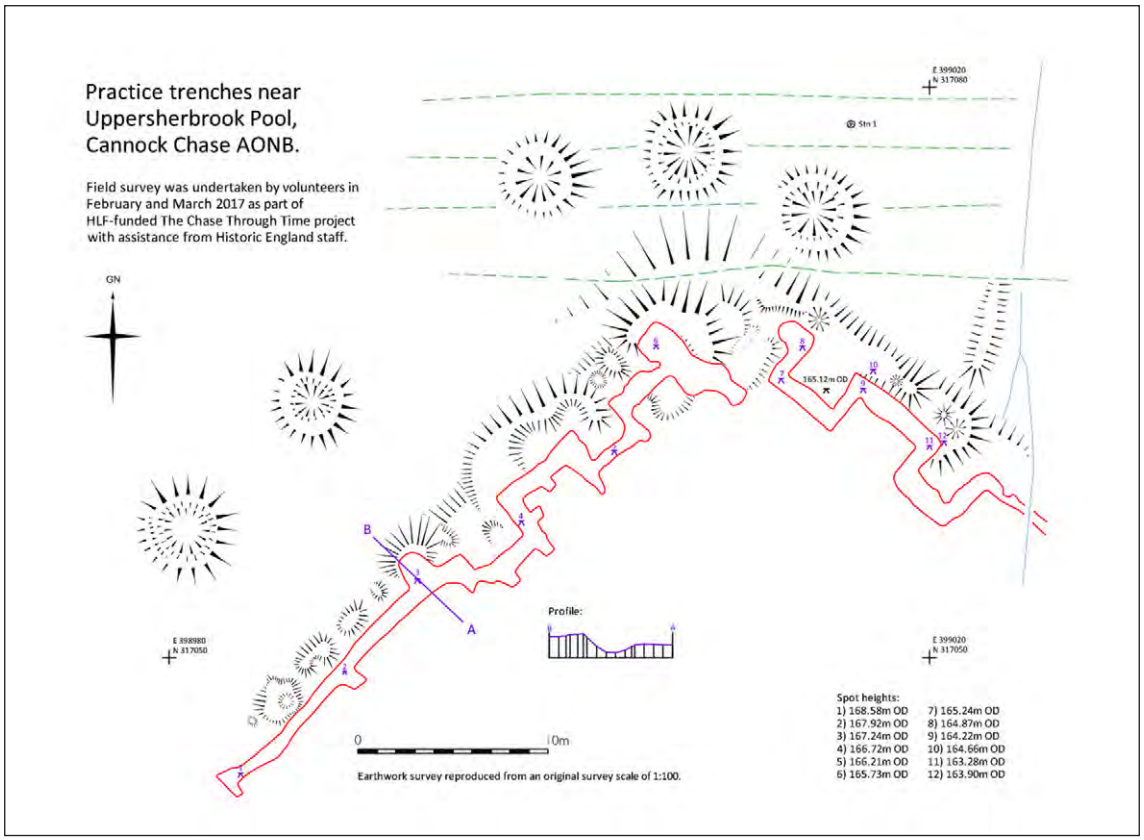

Fig 12: The completed digital earthwork survey drawing of the L-shaped military practice trench near Uppersherbrook Pool; reduced from the original survey scale of 1:100 © Historic England.

Geophysical survey training

As outlined in the project design, specialists from Historic England engaged in discussion about suitable sites and terrain for geophysical survey, and provided training and equipment for volunteers as required. The factors which limited detailed earthwork survey – forestry works, biosecurity concerns and dense heath – also negated the possibility of geophysical survey across many parts of the Chase, but a number of suitable locations were identified and reconnoitred on the basis of aerial data and existing HER records. From these, a small number were chosen for their accessibility and archaeological potential.

Across three days in April 2017, project volunteers were trained in basic techniques enabling them to carry out geophysical surveys on two archaeological sites. The location of potential prehistoric burnt mounds alongside the Rising Brook in the northern part of the Chase was surveyed (see *'Case Study 2'*, below). At Castle Ring Iron Age hillfort in the southern Chase, the foundations of a second building were discovered near those of a known medieval or post medieval hunting lodge or banqueting house located within the ramparts (RCHME 1987; 1988) (Figs 13-14). Both geophysical surveys are published in the online Historic England Research Report Series (Payne and Pearce 2017a; 2017b) and a summary blog post was uploaded (Payne 2017).

Fig 13: Volunteers using a resistivity meter at Sheepwash Farm (left) and carrying out magnetometry survey over the medieval building platform within Castle Ring hillfort (right), April 2017 © Historic England.

Of the various survey methods, geophysical survey was adopted by the volunteers with the most enthusiasm. Further refresher training and the loan of Historic England equipment for a fixed period is anticipated to allow the volunteers to carry out independent surveys of a few further sites in the first quarter of 2018, and the lessons learned through the volunteer's geophysical surveys will be of considerable value when determining which methods are best suited to future investigations on the Chase.

The following case study gives an overview of how geophysics fieldwork was undertaken:

Case study 2: Geophysical survey of a Bronze Age burnt mound site

The site of a probable burnt mound (MST999) at Sheepwash Farm on the Rising Brook, one of several burnt mounds identified across the northern part of the Chase, was chosen as a suitable target for investigation. This mound was the subject of topographical and resistivity survey in the 1980s (Hodder and Welch 1987), but modern techniques offered the possibility of combining training with new and more detailed insights into its construction and use (see '*Burnt Mounds*', below).

Burnt mounds comprise dense heaps of burnt stones often located close to a water source, and most dated examples originate in the Bronze Age (roughly 2300 to 850BC). Interpretations of their function vary, but they probably relate to the practice of creating hot water or steam by dropping hot stones from a fire into a water-filled trough. If the trough was within a closed shelter then the build-up of steam could have been used for cleansing (like a prehistoric sauna) or perhaps to make wood supple for bending. Eventually this rapid heating and cooling would crack the stones and those too small for further use were discarded and piled up, thus creating the burnt mound (Topping 2011).

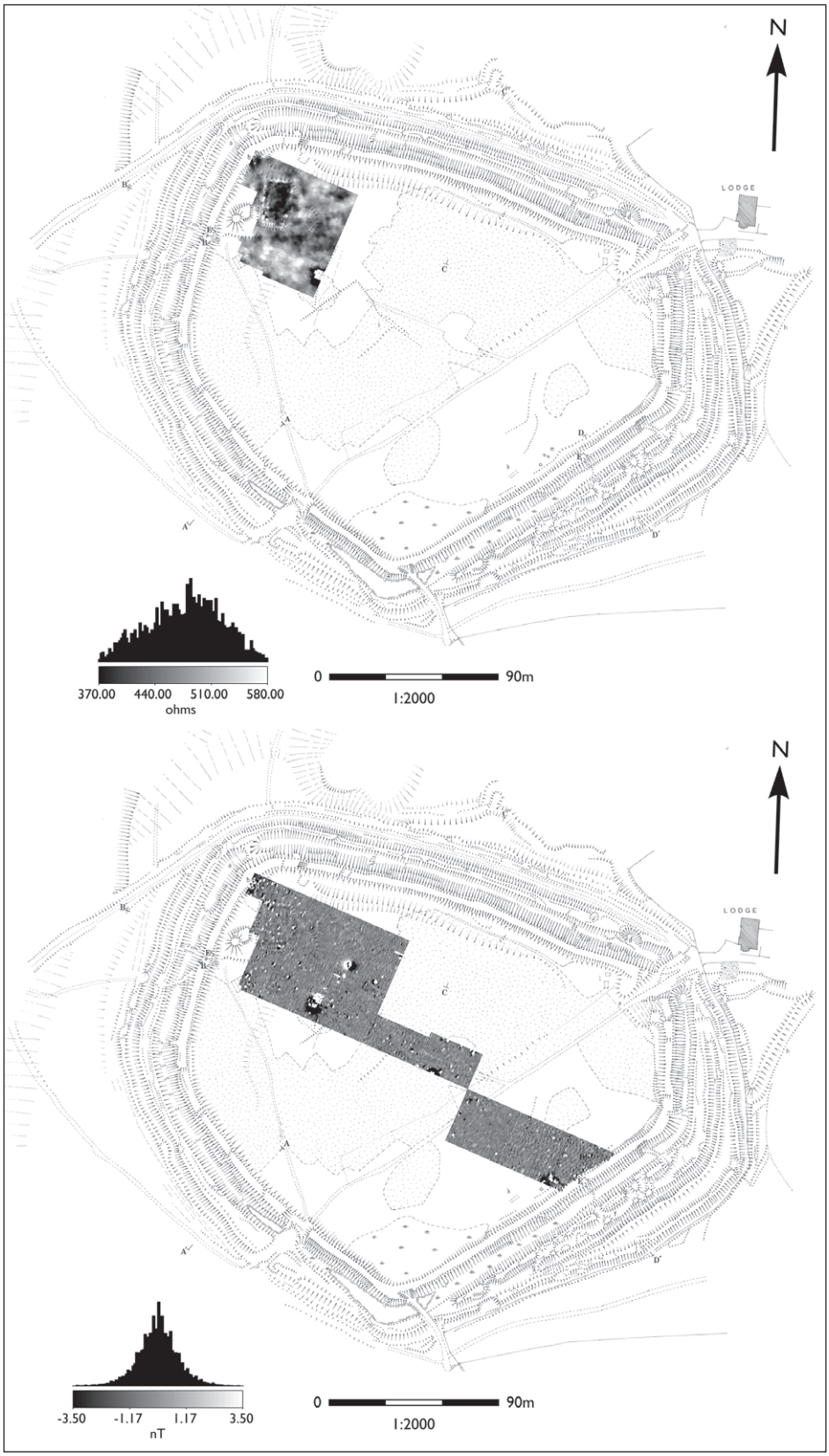

Fig 14: Castle Ring 2017 resistivity survey (top) and magnetometry survey (bottom) results, shown overlaying the RCHME's 1987 Level 3 earthwork survey drawing. Castle Ring hillfort ink survey image reference 909026 © Crown copyright. Historic England Archive.

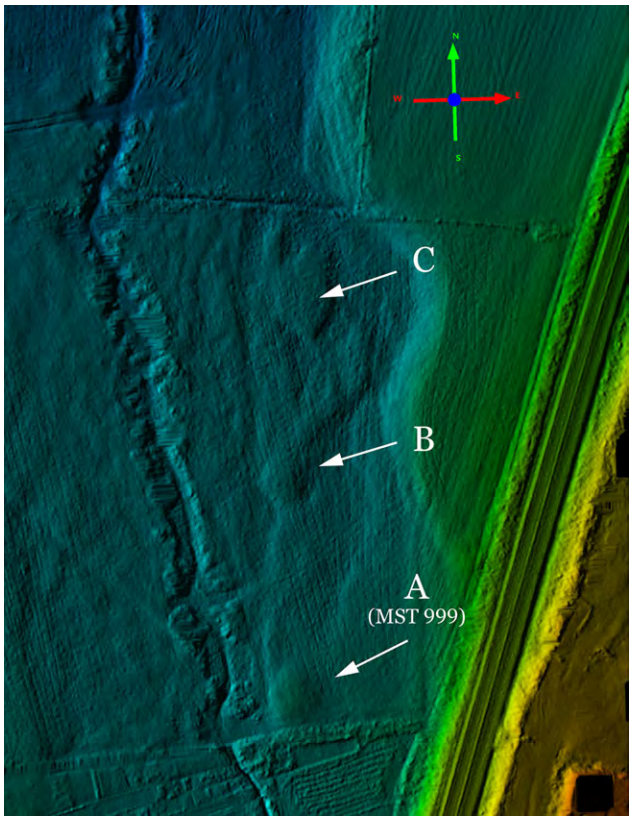

Fig 15: Digital terrain model from the new airborne lidar, showing three low domed mounds located on the east bank of the Rising Brook at Sheepwash Farm: A is burnt mound MST999 and, based on the volunteers' geophysical survey results, B and C were interpreted as natural deposits. Lidar DTM 04-MAY-2016 © Historic England; source Staffordshire County Council/ Fugro BV Geospatial.

Fig 16: The geophysical survey results, showing magnetometer data (left) and earth resistance data (right) © Historic England.

Examination of the 2016 lidar showed that the field surrounding the Sheepwash Farm burnt mound contained two other slight undulations of less certain origin (Fig 15). The volunteers deployed a magnetometer with the potential to identify burnt structures based on enhanced magnetisation after heating, and an earth resistance meter survey which can discriminate between different materials – such as compact stones and soils – based on their ability to conduct electricity.

The results affirmed the interpretation of the southern feature as a burnt mound (MST999) – its appearance modified by the meandering course of the brook (Fig 16); but that the other two mounds proved more doubtful and may represent natural deposition and scour purely created by the watercourse (Payne and Pearce 2017b). This correlates well with the informal assessment made on examination of the earthworks during the initial site recce.

Online GIS portal

It was envisaged from the outset that the Chase Through Time project that it would incorporate an accessible online element. Initially, this was seen as a means to give the volunteers access to the new airborne lidar data - something that was felt to be a key resource that should be shared as widely as possible. To begin with, volunteers were provided with instructions on how they could request specific portions of the lidar imagery and a point of contact within Historic England who would then provide this data. However, it soon became apparent that it was more efficient to give them direct access and so Historic England set up an online Geographical Information System (GIS) using ArcGIS online. Initially the map contained a mosaic of the 16 direction hillshade visualisation of the lidar data in a series of 1km^2 grid squares, each of which provided a link to the data to allow it to be downloaded. There was also a link to instructions on how to process the data to create visualisations for further use.

The online GIS was also the most logical means to provide volunteers with access to the archaeological mapping created by Historic England during the project. To this end, a series of additional data layers were created: Cannock polygon data; Cannock line data; and Cannock monument extents. The standard line and polygon layers comprised the individual features, dissolved into blocks representing groups with the same layer, and monument types with additional object data (ie short attached text records) including brief information about the period, interpretation and evidence. The monument extents layer comprised polygons representing the whole of each feature, together with object data giving the name and simple description. Pop-up text boxes within the map were designed to provide this information in a structured manner (Fig 17).

Towards the end of the project an additional layer was suggested by some of the volunteers who hoped to allow access to their ground photographs and linked Site Recording Forms of certain features. In response to this, a live .kml layer file was added to the online GIS, this links to a database of images and Site Recording Forms that can be uploaded to and added to by the project volunteers.

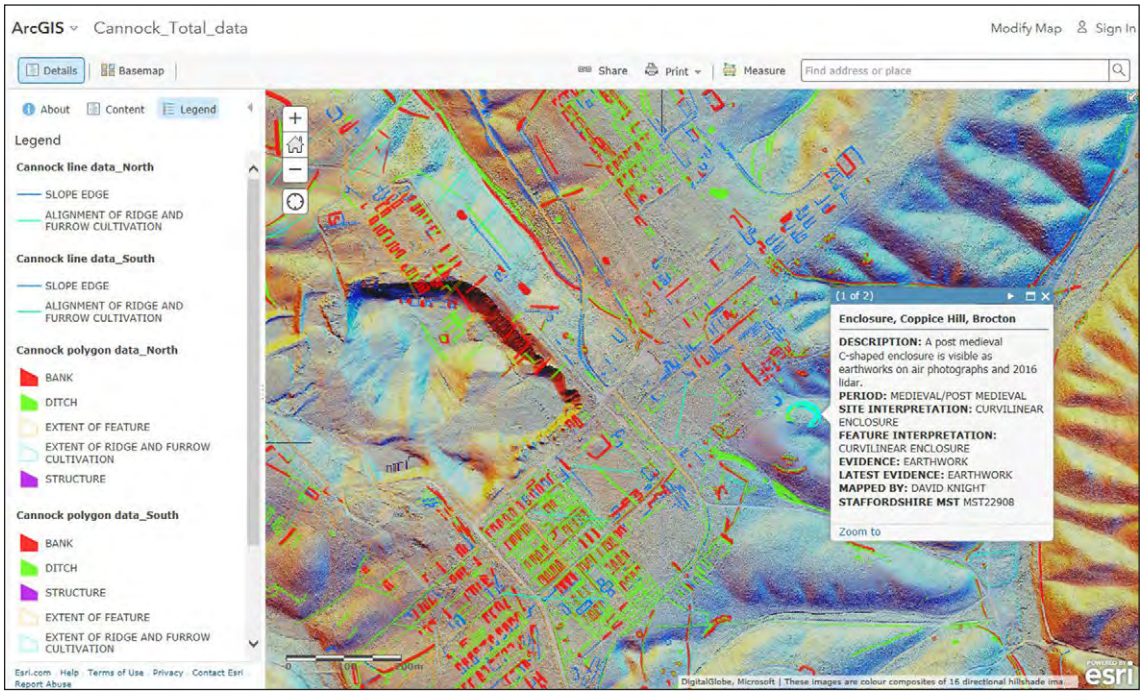

Fig 17: Example screenshot from the Chase Through Time project ArcGIS Online portal © Historic England.

For further information see '*Accessing the data*' under the '*Working with Aerial Photographs*' chapter. A link to the Online GIS is also located here and in the '*Introduction*'.

Next steps

It is hoped that volunteers will have further opportunities to carry on with walkover field survey and geophysical survey.

At the end of the HLF-project, all survey drawings and record enhancements created through the ground-based survey sessions will be made available through the Historic England Archive and Staffordshire Historic Environment Record. The standalone earthwork surveys did not warrant individual research reports, but the final digitised earthwork survey drawings and any accompanying notes will be deposited with HER and HE Archive. As part of the archiving, all stand-alone surveys will have event records created and associated monument records updated.

Encouragingly, the volunteers are already instigating their own recording activities and research strands inspired by their involvement in the project thus far, and facilitated by access to the online GIS which provides the lidar data and aerial mapping transcriptions through a web portal. One volunteer was inspired to use some of the project lidar to look at the appearance and phasing of braided track ways as a piece of coursework for an MA degree. Another volunteer recently devised a pilot method of working with other volunteers to take ground photographs of some of the surviving features in the wartime camps and geo-tag them in a project-specific layer on the community photographic recording web platform *Geograph.org.uk*. They

have subsequently envisaged a system to allow participants to also upload these photographs of features they had visited and tag or link these images to the mapped features as an additional layer in the online GIS; with the assistance of Historic England this is currently under development. A group drawn from the volunteers has arranged to borrow geophysical equipment from Historic England in order to carry out further investigation of sites on the Chase, in particular those relating to industrial activity. It is hoped that this kind of volunteer-instigated engagement will further continue and expand beyond the duration of the current HLF-supported project.

There are common elements between The New Forest Heritage Mapping Project (see below) and the Chase Through Time. The two projects share a number of similarities in terms of area, survey approaches and combinations of professional and volunteer involvement. The possibility of introducing the two equivalent volunteer teams through mutual visits to discuss archaeological discoveries and to compare recording strategies has been proposed as an interesting and desirable prospect if the Chase Through Time project is extended through a second phase in the future.

Mobile recording

In anticipation of potential future work beyond the life of this project, a number of discussions and trials were held to develop a prototype field recording form that could be used by volunteers or archaeological investigators to record field observations, either to enhance existing monument records or to create new ones. A simple form was prepared which could be printed and used in the field or filled-out digitally in the office (*see* Fig 7), and a number of avenues were explored to find a suitable mobile device and software to aid navigation and recording in the field based on this template.

Since 2010, the New Forest National Park Authority has been engaged in a 10-year programme of heritage mapping, running as part of the Verderers of the New Forest Higher Level Stewardship Scheme. The project began by commissioning detailed aerial investigation and mapping, to Historic England standards, funded by HLF (Royall 2013). This was followed by a community-focussed phase where local volunteers were trained to carry out ground-based work on the mapped archaeology, through a series of field recording sessions organised by the National Park (New Forest National Park Authority 2018). This on-going project has proved a successful model for active engagement with local volunteers and, through its active developing and trialling of different mobile field recording devices and applications, provides a useful evaluation of various equipment and software. Historic England's project staff for the Chase Through Time have gained much from discussions with the New Forest's archaeological officer for the project, Lawrence Shaw, for which we are indebted.

The essentials of monument recording can be easily achieved with paper-based recording forms: these create a physical archive, require minimal technical training and the equipment is nothing more sophisticated than a pencil and a clipboard. The disadvantages of paper-based recording, however (as quickly found by the New

Forest team), are that information can be lost or misunderstood through illegible handwriting, form fields may be left blank, and wet weather damages record sheets or renders them unusable. If the data needs to be structured and queried then there is the further issue of double-handling as hand-written sheets need to be transcribed into a database. In addition, it will be necessary to support the paper based recording methods with other survey equipment – such as navigation-grade GNSS – in order to correctly locate the position of the features which are being recorded.

A few options for digital field recording were explored. For the Chase Through Time project various devices were trialled in the field fairly informally to assess the associated issues and benefits, without committing large amounts of time to developing a system that might not be viable (Fig 18).

Fig 18: Comparing mobile recording devices with a handheld mapping-grade GNSS receiver out on the Chase, November 2016 © Historic England.

Using Historic England's handheld mapping-grade GNSS-receivers with reasonable locational accuracy (in this case a Trimble Geo7X) proved problematic because their use was restricted to open or only sparsely wooded areas, where tree coverage would not block the satellite signals. When compared to modern smartphones and tablets, mapping-grade GNSS-devices are capable of achieving more precise (repeatable) and accurate locational positioning, and have added benefits like easy upload of geo-referenced vector data, for instance shape files created from the aerial mapping results. However, they have poor screen resolution when working with imagery, and are not always particular intuitive to use for those unfamiliar with bespoke survey equipment. In addition, they are expensive to buy, often require purchase of

additional data licences and software and may need specialist upkeep, and so are not ideal for a community-based project with a limited budget.

Smartphones and tablets are more affordable and simpler to use, but one of the main issues for using such devices in Cannock Chase is signal quality. Both rely on 3G or 4G connections to dynamically track their location. The patchy (network-dependent) coverage and often poor signal strength across many parts of the Chase can make this a frustrating exercise, limiting survey to only certain areas or to those connected to the 'best' network-provider. Additionally, relying on a live 3G or 4G connection can be very data-hungry and battery-heavy.

Nevertheless, it soon became apparent that smartphones were more effective than the mapping-grade GNSS device because – where signal strength allowed – they could continue to track their location within woodland. One possible solution to the problems of poor localised mobile phone signal is addition of a mobile hot-spot and SIM card, options which certainly should be investigated further in future. Tablets and smartphones are very intuitive to use, and people are increasingly familiar with them in daily life. They also have a much better screen resolution than most survey devices and, if tablets are chosen, a larger physical screen size as well. They can also be used to cache other useful documents, resources and apps (applications) – examples from the New Forest team were inclusion of example recording guideless as crib sheets as well as access additional resources including first-aid guides, tree-identification apps or Historic England's monument thesaurus terms.

On the negative side, the positional accuracy of mobile devices is lower than that of mapping-grade GNSS devices, and any readings taken will be given in global latitude/longitude coordinates requiring subsequent conversion to the national grid (OSGB - Ordnance Survey Great Britain). This could be obviated by pairing a lightweight GNSS receiver to a mobile device using Bluetooth connectivity, as we achieved using our Trimble R1 and an Apple iPad, but that reintroduces the problems of cost and complexity mentioned above. Another key problem with the mobile devices was their restricted capacity to cache lidar and aerial images of high enough resolution and broad enough geographical coverage to be of use during one or more walkover days. In trialled examples (in the first instance using ESRI's Collector app with an Apple iPad), it is only possible to load lidar as a screen-captured image. Therefore, we could either have low-resolution for a wide area, or high-resolution zoomed-in to a particular detail. However, we could not maintain quality if we wished to pan and zoom in and out around a large area.

At the time of writing the New Forest Heritage Mapping project is using desktop and online GIS to manage their data, and is creating bespoke data selections from this to use with ESRI's Survey123 software (online and mobile app versions) as the platform for their digital field recording forms. The lidar imagery is not taken into the field on their mobile devices as a GIS layer, but as cropped raster images or even as physical printouts. The devices only have a non-editable version of the vector mapping loaded, for completing the field recording forms by tying each form to a geo-located point. All photographs are taken using a separate camera, which allows for multiple images

per feature and better image quality (frame numbers are added to the record form to maintain the link).

Mobile technology, field-based recording and navigation apps are developing and improving at a rapid rate. No final digital recording process has been fixed upon for potential future phases of the Chase Through Time project as any such system is likely to be outdated or even obsolete by the time a second phase of the volunteer project becomes active. Nevertheless, it should be a relatively simple and quick task to define and source an appropriate solution when the need arises. This should use the structure and consistency provided by the paper field forms, alongside the knowledge and hindsight gained from the discussions and trials of different mobile digital recording methods during this project.

WORKING WITH AERIAL PHOTOGRAPHS AND LIDAR

The aerial survey of Cannock Chase used both aerial photographs and lidar to build-up a picture of the archaeology of this landscape. The lidar data was captured in 2016 and the aerial photographs are a mixture of modern and historic images, the oldest taken in the 1920s. Together, they represent a fantastic resource to identify and better understand archaeological sites. Historic England's Aerial Investigation and Mapping team undertook a detailed analysis of these sources to identify archaeological sites or buildings of interest. This can be a painstaking process as both sources show a wide range of features not all of which are archaeological. Once the archaeological features are identified they are interpreted, mapped and recorded, often from more than one source. The completed archaeological map therefore collated information from a combination of modern and historic sources to provide a coherent view. The archaeological remains took many forms and included earthworks, structures and buried remains seen as cropmarks. As historic sources were used, sometimes sites were recorded that have been subsequently ploughed level, demolished, buried or built over.

Lidar

Airborne laser scanning, more commonly known as lidar (**li**ght **d**etection **a**nd **r**anging), has proved an invaluable tool for archaeological survey (Crutchley 2010; Historic England 2018). For this project, Fugro was commissioned to capture 25cm resolution lidar (where each pixel represents 25cm on the ground) for the project area. This provided Historic England with a detailed elevation model of the Chase, which became the most used mapping source for the project.

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 features on the surface, 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, tree canopy or bushes. Other beams will follow a path between the leaves and branches bouncing back from the ground (or a surface that allows no further progression), known as 'last return'. This data capture creates a 'point cloud', essentially individual points floating in space, which is then processed to create a precise Digital Elevation Model (DEM).

There are two primary forms of DEM. One is the digital surface model (DSM), which is effectively the result of the first return and reflects the highest points of the survey, i.e. tree tops, buildings etc. The digital terrain model (DTM) is what remains once the data has been processed using algorithms that classify the nature of the various returned points into those on the ground and those off ground thereby creating a bare earth model without trees or buildings. The denser the vegetation, the fewer laser pulses reach the ground, which affords less clarity to the DTM results. For example, on Cannock Chase the vegetation is very varied, and the return under coniferous and deciduous woodland canopies was very good, resulting in a well-defined DTM (*see* Fig 43). However, heather does block some of the lidar scans, and gorse is impenetrable. The result is fragmentary lidar that has holes or gaps.

The algorithm that creates the DTM can also be used to fill the gaps between known data by interpolating the values of adjacent pixels (Fig 19). This is the standard lidar product for two reasons; firstly when gaps are shown in black, the eye tends to get distracted by the strong contrast and just sees the gaps, whereas if the gaps are filled it actually focuses on the features that are defined. Secondly, some of the visualisation techniques discussed below require filled surfaces or else they generate artefacts in the data. Whilst the filled surface is more pleasing to the eye and easier to work with, it is important to be able to understand where the holes occur, because that helps to demonstrate the confidence of features recorded in those areas.

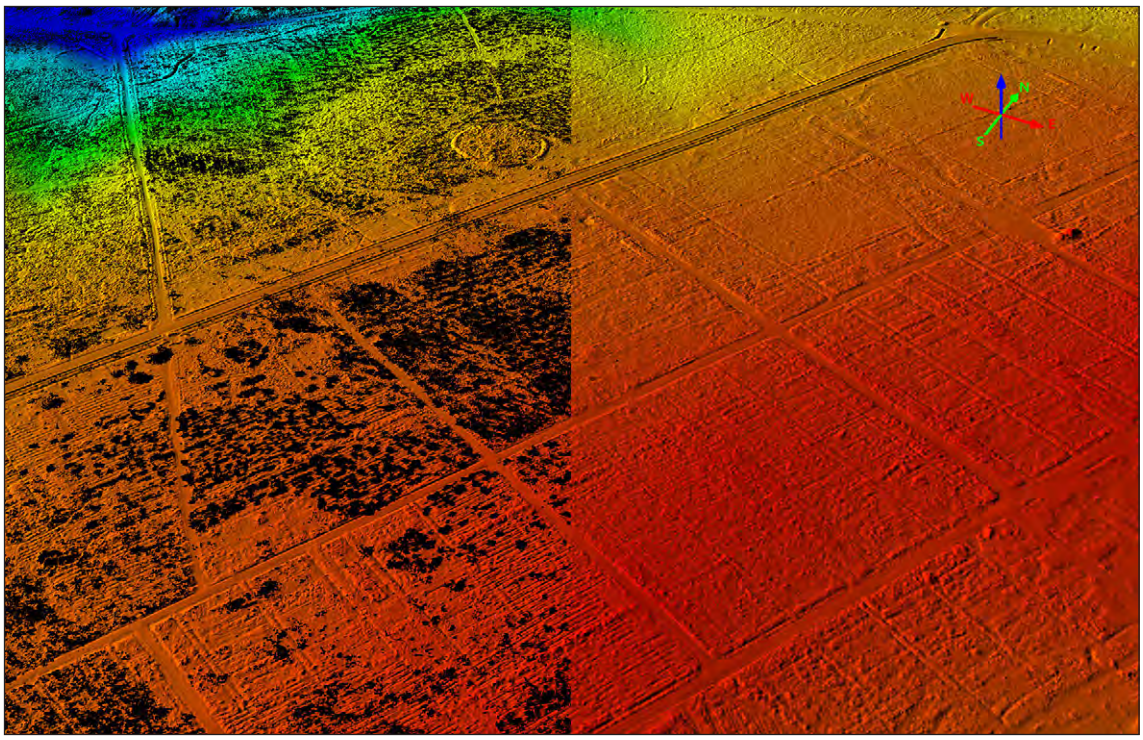

Fig 19: The denser the vegetation, the more holes were formed in the lidar (dark areas on the left image). The image on the right shows the final product, where the holes have been filled to allow a clearer view of the archaeological remains. Lidar DTM 04-MAY-2016 © Historic England; source Staffordshire County Council/Fugro BV Geospatial.

For Cannock Chase, the DTM was the primary source for mapping, as it was necessary to strip away the vegetation in order to see the archaeology beneath at its best definition.

The lidar was visualised in a number of ways. Primarily, the data was viewed live in Quick Terrain Reader, which allowed real-time manipulation of the view, false-lit sun angle and height exaggeration. Additionally, 2D visualisations of the data were produced using Relief Visualization Toolbox 1.3.[1]

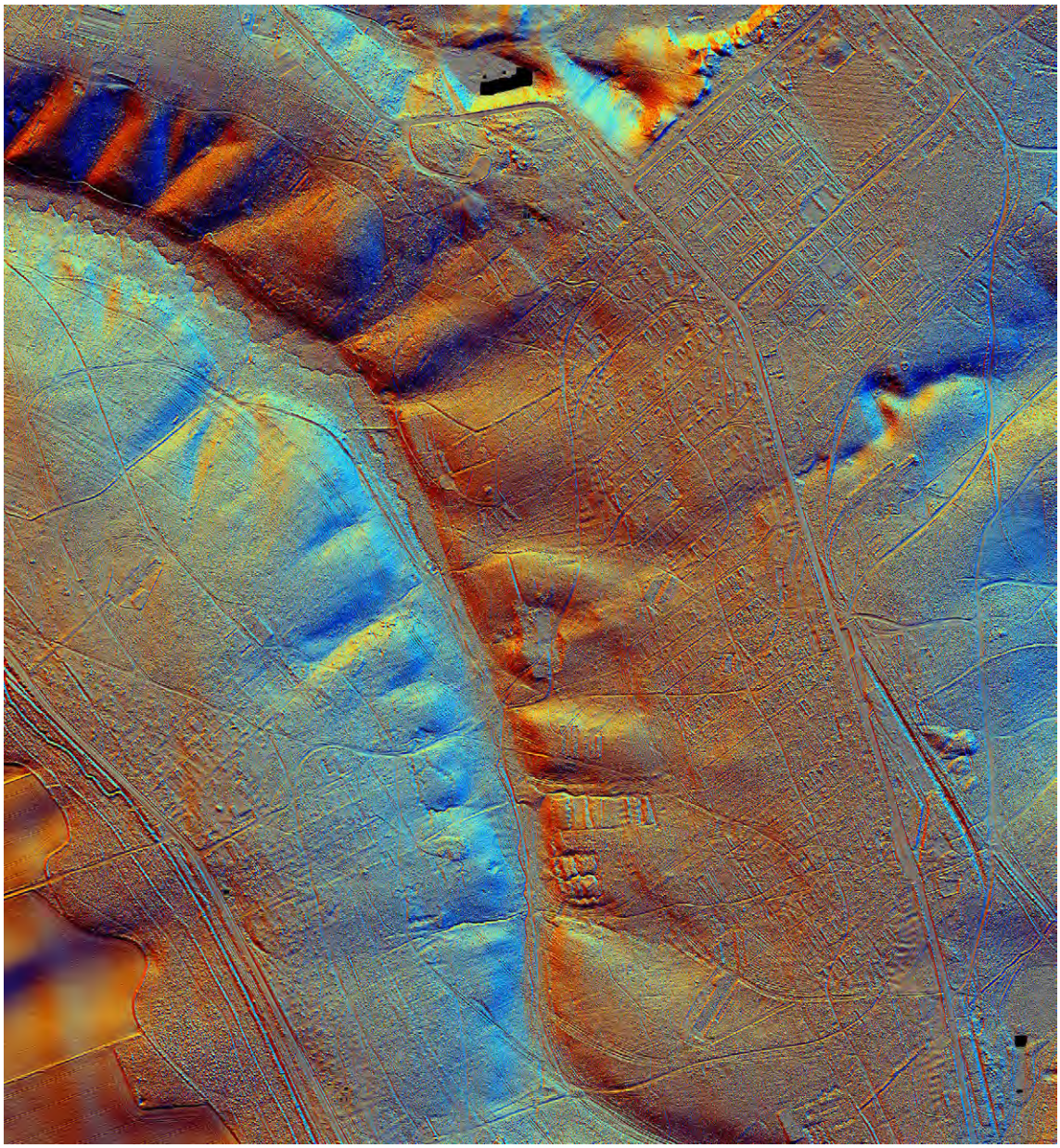

Fig 20: Oldacre Valley: 16 direction hillshade lidar. The terrain is easy to read in this visualisation, as are the subtle earthworks of archaeological features. Lidar DTM 04-MAY-2016 © Historic England; source Staffordshire County Council/Fugro BV Geospatial.

A number of visualisations were created, the most commonly used being 16-direction hillshading (Fig 20), where the data is lit from multiple directions to allow better definition of earthworks on different orientations. This visualisation is the easiest to read and interpret with the human eye, giving a more understandable representation of the landscape as features are visible as light or shade as in a photograph.

Fig 21: Brocton Camp: Simple Local Relief Model (LRM) lidar. Although more difficult to interpret on the whole, visualisations such as this display shallow cut features with more clarity. Lidar DTM 04-MAY-2016 © Historic England; source Staffordshire County Council/Fugro BV Geospatial.

A number of other forms of visualisation, including slope, openness and local relief model (Fig 21), calculated the data in a different manner, emphasising the height difference between points in the data and allowing an enhanced view of cut and large sloping features. For more information on lidar visualisations see Crutchley 2010 and Historic England 2018.

Each Aerial Investigator used their preferred combination of visualisations of the lidar to map from. Each visualisation was particularly useful for different forms of archaeology, and was used in conjunction with the available aerial photography to obtain the maximum amount of archaeological detail available (Fig 22).

Recent advances in lidar capture and data processing have significantly improved the reliability of lidar to accurately identify a range of archaeological features in woodland, and this has been established through a number of recent projects. The data also enables us to see through much of the vegetation.

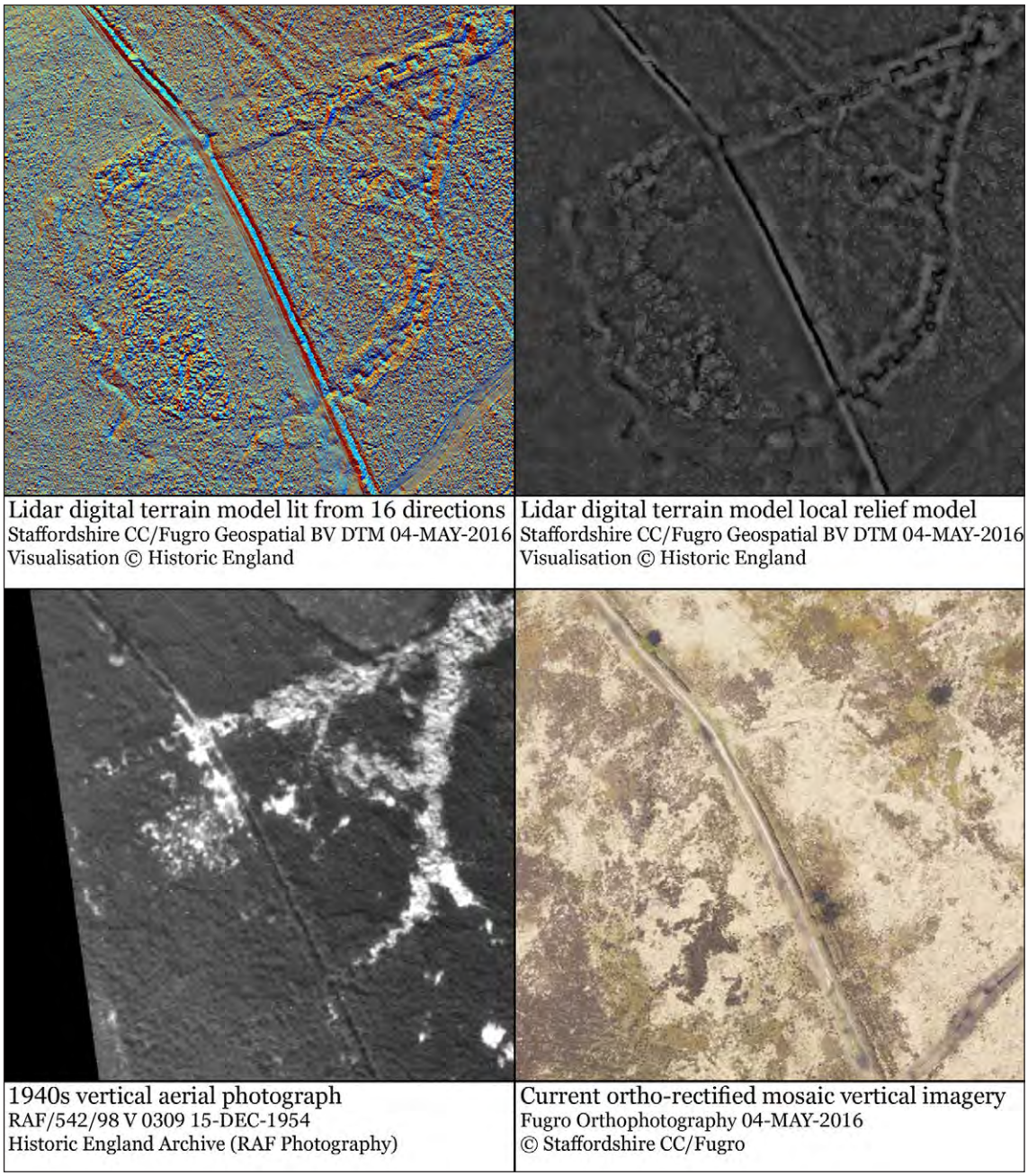

Fig 22: Different visualisations of the lidar data compared with rectified vertical photography illustrates the variance in detail that is visible on each source. Lidar DTM and orthophotograph 04-MAY-2016 © Historic England; source Staffordshire County Council/Fugro BV Geospatial; RAF/542/98 V 0309 15-DEC-1954 Historic England Archive (RAF Photography).

Aerial photographs

Most of the photographs consulted are held in the Historic England Archive. This important national collection includes historic and modern aerial photographs in either black and white or colour. They consist of negatives, prints and digital only images. Archaeologists took many of these photos, but most were taken by the Royal Air Force (RAF) and the Ordnance Survey. Irrespective of the age, format or origin

of these photographs, the collection is primarily organised by the camera angle when the photo was taken and all photographs are categorised as either being vertical or oblique.

Vertical aerial photographs

Vertical aerial photographs are taken from cameras mounted facing straight down on a single run, or sortie. The aircraft follows a set course and takes a run of photographs automatically, each frame overlapping the previous image by approximately 60%. An adjoining run will also overlap the previous one to ensure complete coverage of any given area. This overlap allows these photographs to be viewed stereoscopically, producing a 3D perspective with the aid of a stereoscope. Vertical photographs appear similar to maps but are not uniformly to scale across the entire frame. Before features can be transcribed from these images, vertical photographs are rectified.

The vertical aerial photographs used in this project consist of prints and digital images. The earliest vertical photographs of the Chase Through Time project area (in the Historic England collection) were taken by the RAF in October 1941. This sortie contains the only photographs of the Chase taken during the Second World War. However, they only cover some areas as the focus of the sortie was the River Trent and thus much of the Chase was not included. The RAF also photographed various parts of the Chase in 1945-6 and they continued to fly sorties every year between 1948 and 1961. The coverage varies year by year. For example, Historic England only holds three photographs of the Chase taken in 1961 but almost 1,000 taken in 1954. RAF sorties flown between 1945 and 1949 were undertaken as part of a national aerial survey of Britain called Operation REVUE. The Ordnance Survey used these photographs to create a series of air mosaics at a scale of 6 inches to the mile (1:10,560). These were used to revise the Ordnance Survey maps, but the mosaics were also used by those involved in town and country planning to supplement the existing maps. One of the advantages of air photo mosaics, and one particularly applicable to Cannock Chase, was their use in mining districts. As explained in an article published in 1949: 'it is possible from air mosaics to distinguish the exact form of tip-heaps and the direction in which they are extending, and to ascertain whether they are disused, old or comparatively recent' (*Illustrated London News* 1949, 182-3).

Fig 23 is a typical example of an RAF vertical photograph. It was taken on the 9th of May 1946, not long after the end of the Second World War, and it records the extensive remains of RAF Hednesford with West Cannock 5 Colliery towards the bottom of the photograph. The photograph clearly shows the layout of the camp around a central parade ground. Most of the buildings are for accommodation, dining, washing and so forth. They follow a standard pattern that is repeated across much of the site. The larger buildings towards the bottom of the camp and those above and below the parade ground linked by covered walkways are of a different layout and relate to the specialist training provided there. The roofs of the larger buildings are painted in a camouflage pattern reflecting the recent wartime threat from air attack. Lighter marks across the site are where the ground has been worn

and show areas of activity including the shortcuts taken by troops across the camp. The rounded shape of the colliery spoil heap just off the centre of the photograph is the easiest part of the mine to be seen, partly because of it lighter shade against the slope of the Rising Brook Valley. Extending to the left of this is a straight tramway that links the spoil heap to the surface buildings of the mine. A railway siding links the mine to the main railway line that runs diagonally from the bottom left of the picture. Closer to the mine buildings are the remains of older spoil heaps. For further information on these two sites, see the chapters on '*Military presence On The Chase*' and '*Industry*'.

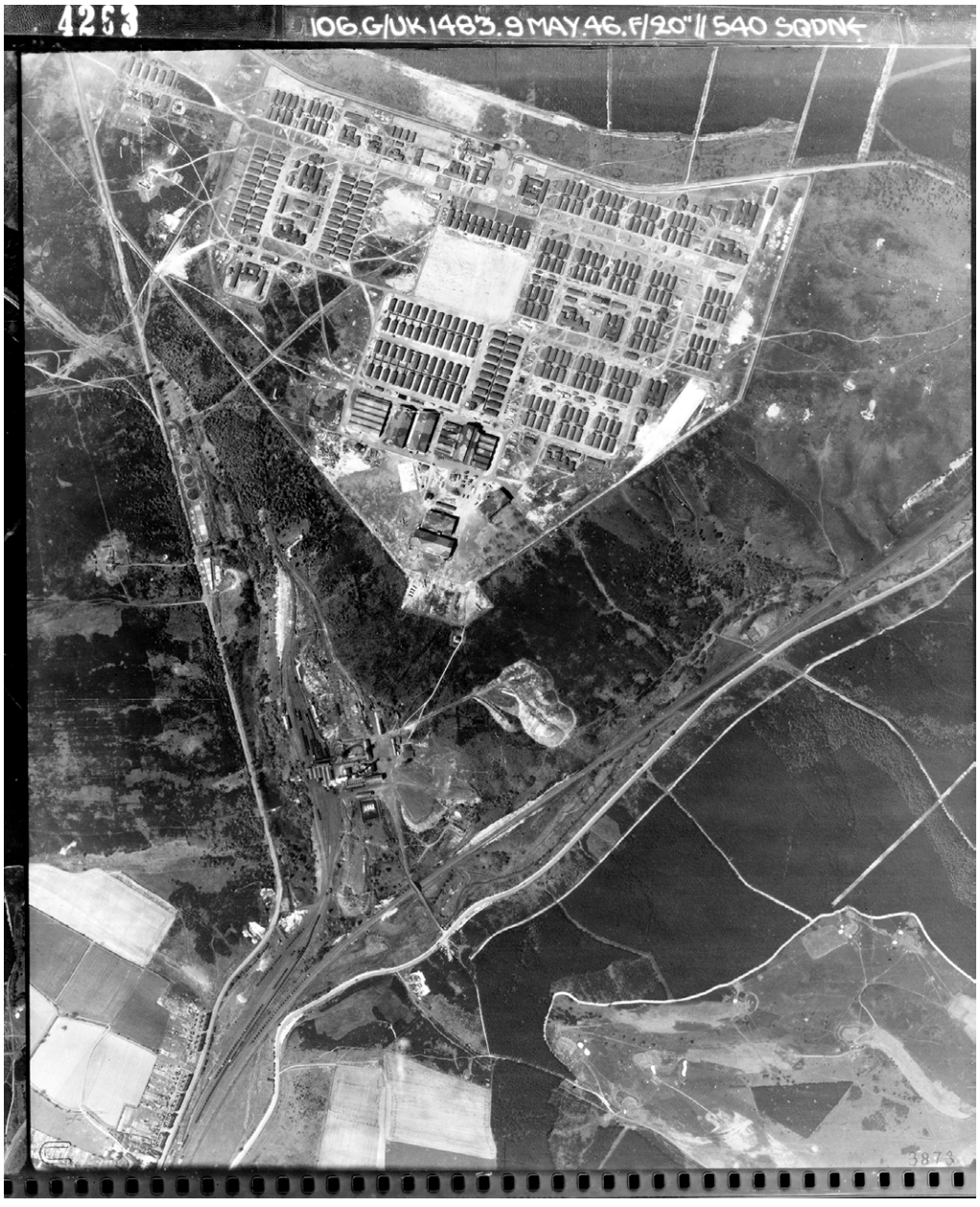

Fig 23: A 1946 RAF vertical photograph showing RAF Hednesford (top of photograph) and West Cannock 5 Colliery (Middle and lower parts of the photograph). RAF/106G/UK/1483 RS 4263 09-MAY-1946 Historic England Archive (RAF Photography).

The RAF flew its final sorties over the Chase in 1963. The Ordnance Survey (OS) continued the vertical aerial coverage of the Chase through the 1960s and beyond, and the most recent OS photographs that Historic England hold were taken in September 2000. Other companies, such as Meridian Airmaps Limited (MAL), were commissioned to take photographs of the Chase in the 1970s and the 1980s. The Meridian photographs are usually labelled with the purpose of the flight. Most are labelled Staffordshire or Staffordshire County suggesting they were part of a countywide survey.

Next Perspectives Aerial Photography for Great Britain (APGB), supplies Historic England with digital vertical photographs. Since the 1990s, a variety of companies have been commissioned to provide vertical photographic coverage of the country including Cannock Chase. Much of this output is viewable online via providers such as Google Earth.

Historic photographs show what could be termed 'lost landscapes'. They provide views of sites or structures that have since been demolished or destroyed. The clearest examples of this are the aerial photographs that show the various collieries in existence in the mid-1940s. They also provide views of since demolished Second World War sites such as RAF Hednesford (Fig 23; *see also* 64) and Flaxley Green prisoner of war camp (*see* Fig 34). Even though neither of these wartime sites have been completely destroyed, they are difficult to understand from modern aerial photographs or lidar as dense vegetation and landscaping has obscured much of their remains.

Repeated aerial surveys over the Chase during the second half of the 20th century and into the present century have recorded the changes this landscape has undergone. They show major developments such as the growth of towns and villages, but usually contain enough detail to illustrate the changes undergone at individual sites. Photographs taken between the mid-1940s and the early 1990s show the modernisation and expansion followed by the dereliction and demolition of the coalmines across this part of Staffordshire.

Historic aerial photographs will show areas that have since been built over or become overgrown and lost from view. Although not taken for archaeological purposes, some of these aerial photographs provided the only evidence of cropmarks of levelled sites.

The vertical photographs were taken at a range of scales and the smaller scale images may make it difficult to pick out detail. For the majority of vertical aerial photographs, the degree of detail is good, but they can rarely match that of some of the historic oblique aerial photographs. However relatively few oblique photographs have been taken across the Chase and even when obliques from all years are combined, coverage is poor and many areas have no photographs. In contrast, the vertical photographic coverage is extensive and exists for every decade since the 1940s.

Oblique aerial photographs

Oblique aerial photographs are taken looking across the landscape at an oblique angle. They may be taken automatically from cameras mounted in an aircraft or with a handheld camera. All the oblique images captured by the RAF were taken from fixed cameras (these are referred to by the Historic England Archive as military obliques), however there are none of Cannock Chase. The private company, Aerofilms Ltd, did photograph different parts of the Chase from the 1920s (Fig 24) onwards. These photographs were usually taken for commercial purposes and so often cover urban areas including schools, factories and other landmarks. In 2007, Historic England acquired the Aerofilms collection that covered England and these images are now routinely consulted as part of our aerial survey work. In addition, most of these aerial photographs have been scanned and are available to view online via the *Britain from Above* website.[2]

Fig 24: The earliest known aerial photograph of Cannock Chase taken in 1926. It shows West Cannock 1 colliery (foreground, closed 1958) and 4 (background, closed 1928) in Pyegreen Valley, Hednesford (Various 2006, 241, 246). Detail of AFL 60279 06-APR-1926 © Historic England Archive. Aerofilms Collection EPW015006.

Historic England, and its predecessors, carried out a programme of aerial reconnaissance photography, from the 1960s to the present (Fig 25), using handheld cameras in high-winged small aircraft. This forms the core of the Historic England oblique aerial photograph collection and includes archaeological, architectural and landscape subjects. These targeted aerial photographs were taken with a specific purpose in mind, including recording new discoveries, providing a different perspective on known sites or recording condition. These will nearly always contain

archaeological or architectural information in contrast to the surveys carried out for non-archaeological purposes (such as the vertical photographs mentioned above) which rely on serendipity to record the historic environment.

Fig 25: A recent Historic England aerial reconnaissance oblique photograph. As well as being targeted photography, the high quality modern digital imagery makes it a useful resource. This example shows Firing Range E, which was constructed during the First World War (see 'Military Presence On The Chase' chapter). 29209_036 © Historic England Archive.

The Aerofilms photography was particularly useful for the Chase Through Time project, as it records many lost landscapes in detail and unusually there were some pre-Second World War photographs. For example, the earliest aerial photographs were taken of Hednesford in 1926 and show general views of Hednesford Hills, the Green Heath Road area, part of the Cannock Mineral Railway and West Cannock Colliery Pit Number 1 (Figs 24 and 26).

Some of these photographs are also interesting for the details that can be seen when they are enlarged, such as coal wagons on a railway siding (*see* Fig 86) and views of buildings (Fig 27). In 1948 a set of photographs were taken of Kingsmead Secondary School, Hednesford. These are a fascinating set of photos, not least because they are taken at a low enough altitude to clearly show people; something of a rarity. These include a group of school staff (perhaps dinner ladies) who came out to look and wave at the plane (Fig 28), but also others walking or cycling by.

Fig 26: View over Hednesford Hills taken in 1926. Centre left is the war memorial with Cannock and Rugeley Colliery (Pool Pits) beyond. Detail of AFL 60279 APR-1926 © Historic England Archive. Aerofilms Collection EPW015007.

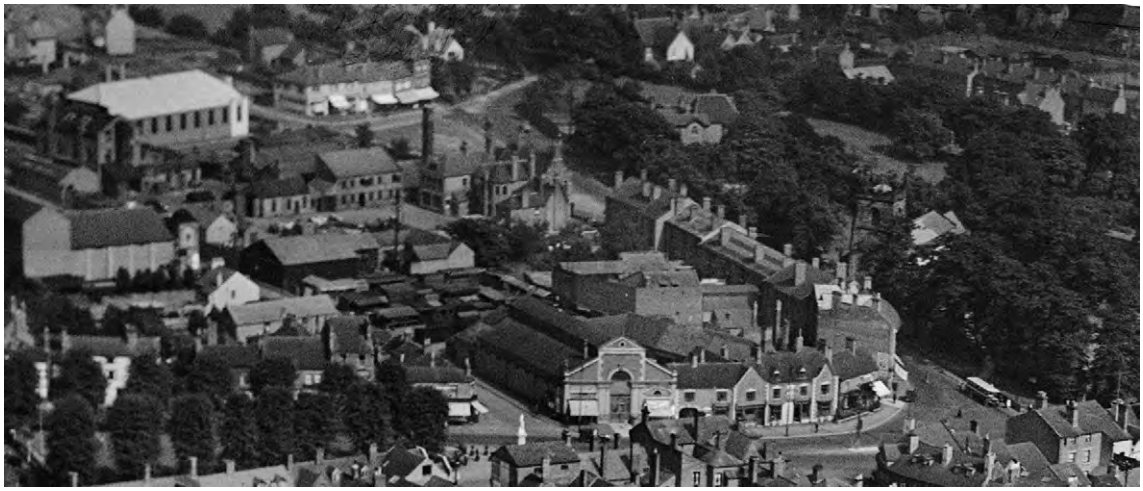

Fig 27: Market Hall, Cannock with Queens Hall top left photographed in 1930. Both buildings since demolished. Detail of AFL 60713-JUL-1930 © Historic England Archive. Aerofilms Collection EPW034059.

These photos are particularly fascinating as most also provide views of some of the many collieries in operation at that date. Most dramatic of all shows the spoil heap of East Cannock Colliery almost adjoining the school site with views of other tips on the horizon (Fig 29). Many of the oblique photographs for the Chase Through Time project were taken for archaeological purposes. Some of the earliest of these were captured in the 1950s; namely of Castle Ring Iron Age hillfort. More recent aerial photographs show the limitations of aerial photographs over woodland and heath where little archaeological detail can be seen through the vegetation. Therefore, many of the more recent oblique photographs that cover the Chase are general views rather than specific sites.

Fig 28: Waving at the plane from the grounds of Kingsmead Secondary School, Hednesford. Detail of AFL 61642 06-MAY-1948 © Historic England Archive. Aerofilms Collection EPW015390.

Fig 29: East Cannock Colliery in 1948 with the large spoil heap adjacent to the town and further tips from other collieries on the horizon. Detail of AFL 61642 06-MAY-1948 © Historic England Archive. Aerofilms Collection EAW015392.

Rectifying images

Photographic prints showing archaeological features are scanned into a computer. As these are not of uniform scale across the frame, they need to be rectified and geo-referenced to match the Ordnance Survey map. This is done using the Aerial 5.36 program. The rectification process involves matching of features on a 1:2,500 Ordnance Survey digital map (the control) with the same features on the scanned aerial photograph. This gives an overall accuracy of plotted features of 2m or less to the true ground position dependent on the accuracy of the Ordnance Survey map. More accurate control was established for most of the project area by using APGB orthophotography for the map base, which is invariably more accurate than OS maps. A digital terrain model (DTM) was incorporated into the calculation to compensate for undulating terrain. The lidar and many of the vertical photographs were already georeferenced so could be imported into our mapping software.

Mapping

Archaeological features were transcribed from rectified photographs and lidar visualisations using AutoCAD Map 3D 2015 software. These were mapped on different layers based on the original form of the feature (bank, ditch, structure etc; Fig 30). This provides a basic understanding of the form of features that is unlikely to change. Other information, such as site type, date, main sources, evidence (earthwork, cropmark, structure) is also attached to the mapped features. A monument polygon was drawn around groups of features corresponding to a single archaeological site or 'monument'. Each archaeological site was assigned a number corresponding to the monument record in the Staffordshire County Council Historic Environment Record (HER). This number had the prefix of 'MST', and is used in this report when discussing individual monuments. A total of 114,268 features were transcribed, equating to 565 archaeological sites. The large number of features transcribed reflects the nature of the archaeological remains, mainly large complex sites like the First World War camps.

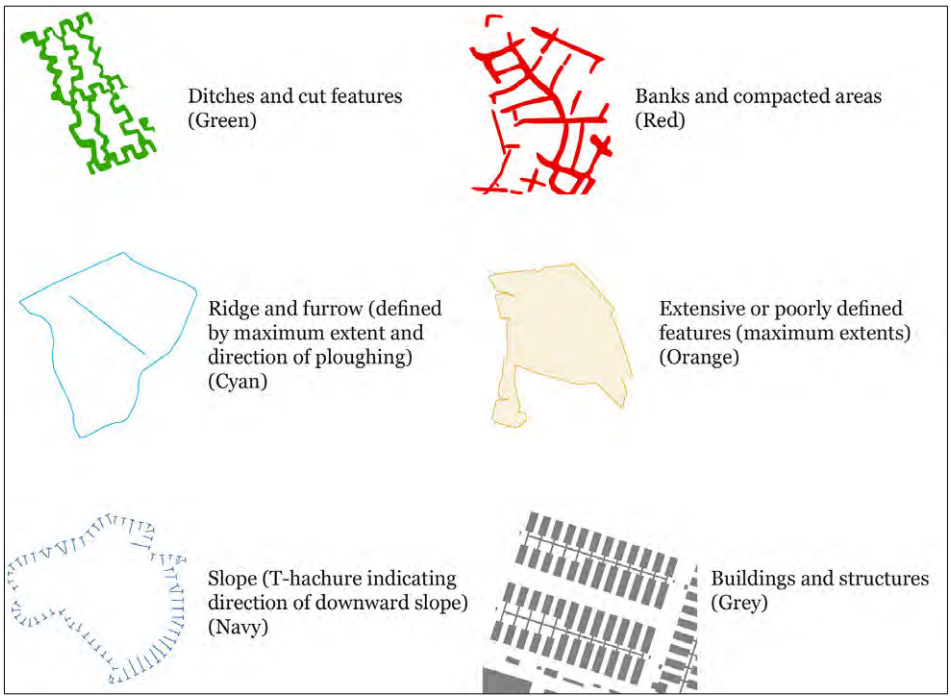

Fig 30: Mapping layers and conventions.

Recording

Each archaeological site was described in a monument record in the Staffordshire County Council Historic Environment Record (HER). 436 records were created and 129 were amended. This was carried out remotely from Historic England offices in York and Swindon using Netscaler Gateway and Citrix software. Each record consists of a description of the archaeological site and an index of its type (wood bank, mine shaft etc), its period (medieval etc) and the main evidence (earthwork, cropmark etc). Its location is also added to Staffordshire County Council's GIS map. The main sources were listed including aerial photograph, lidar, historic map or

written source where relevant. Where applicable, the record will also cross-reference with Historic England's National Record of the Historic Environment (NRHE) for the same features.

Accessing the data

Aerial photographs and digital or hard copy of the mapping is available from the Historic England Archive. All mapping and all records are also held by Staffordshire County Council. The lidar data, mapping and basic monument records are also viewable via the projects online Geographical Information System (GIS). This GIS is discussed in detail in the chapter below: '*Working with the Volunteers*' (*see* Fig 17), and can be accessed at http://services.historicengland.org.uk/cannock-chase-map/index.html.

The Staffordshire Country Council Historic Environment Record database can be accessed online via Heritage Gateway[3] or by contacting the HER directly via the Staffordshire County Council website.

Further work using aerial photographs or lidar

The archaeological mapping of the collieries reflects a single point in time, but the collection of aerial photographs shows a changing mining landscape over a period of almost 100 years. A detailed study of all aerial sources for each colliery would provide a detailed view of the surface development of each, its expansion and contraction both of buildings and spoil heaps. There is also further work to be done on the Second World War military sites using the aerial photographs to trace the development of these installations. The historic photographs also record ephemeral features. This might include worn paths that provide evidence of how people moved in and around these sites over the second half of the 20th century. Repeated aerial photographic sorties over the Chase also captured the periodic pattern of tree felling and replanting. They also highlight other changes to the landscape not mapped as part of this project. Aerial photographs taken in the 1940s show a series of linear depressions across parts of the Chase. It is not clear exactly what these represent. Some may be subsidence of old mining features but they may also be natural faults. Certainly some match geological disturbance named 'fissures' depicted on the coal authority map of the area.[4] A future study of the aerial photographs could be used to identify depressions that were filled-in and help understand how landscapes perceived to have been scarred by industry were managed in the post-Second World War period. Many historic photographs contain views of since demolished buildings or coal wagons each painted with a company name. Both may prove useful to researchers but may be overlooked as they are often not the subject of the original photographs but located in the middle or far distance of the image.

The great strength of lidar is its ability to seen through the vegetation and provide a view of the ground surface beneath the trees. However, as outlined above there are some instances where few or no laser pulses can penetrate the vegetation and the resultant image is fragmented or in places blank. There is potential for an assessment of the areas of woodland or scrubland where this occurred.

SUMMARY OF RESULTS

This section provides a summary of archaeological features mapped from lidar and aerial photographs. The summary is based on a geographic breakdown of the project area and is intended to contrast with the thematic sections under which the detailed results are presented. By doing so we hope to emphasise that the archaeological evidence on the Chase consists of the remains of a number of different periods. Our mapping shows archaeological remains of different periods and types for any given area. This allows analysis of the relationship between different features and demonstrates the multi-period nature of the landscape where archaeological remains from different periods are intermixed.

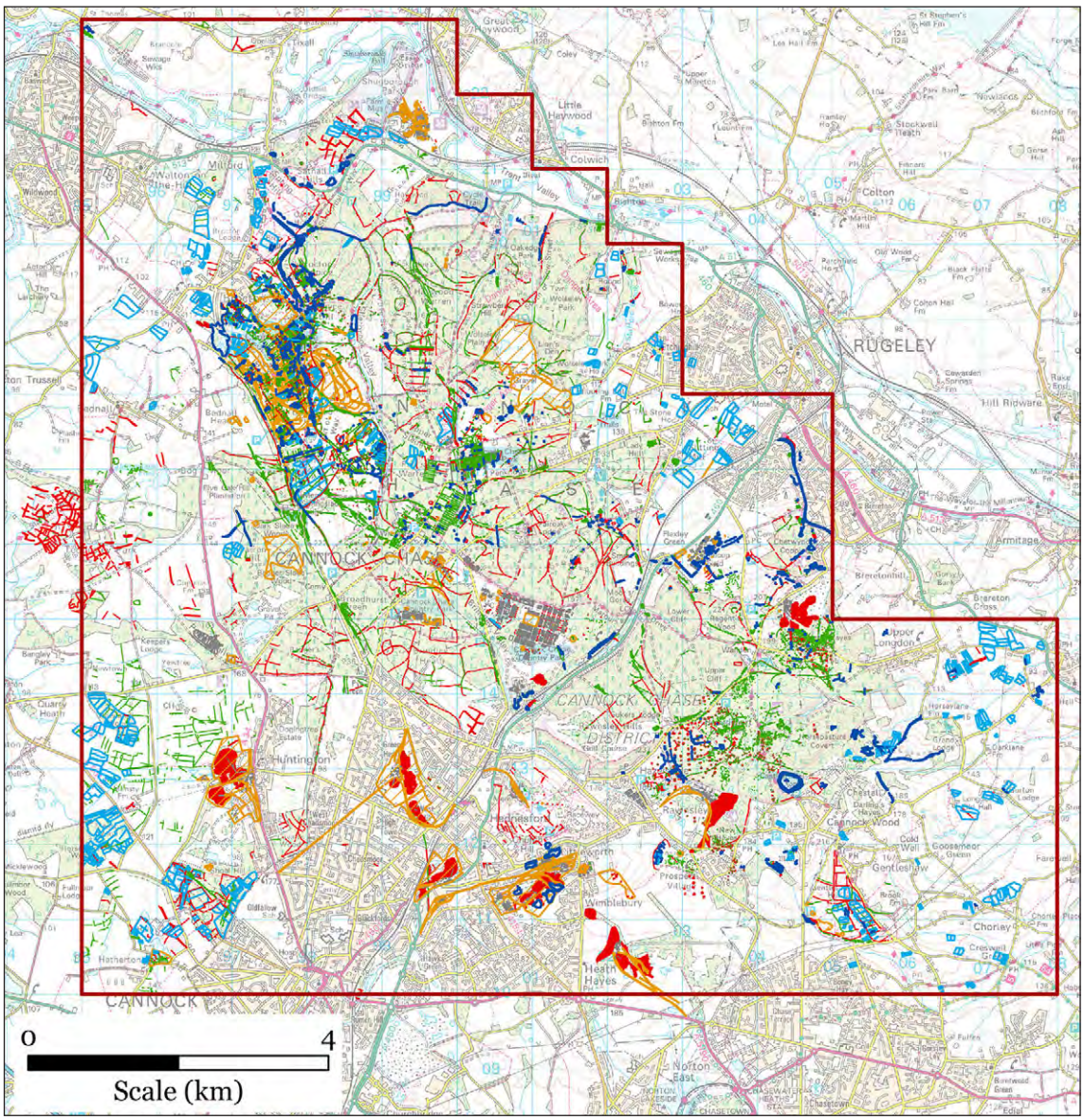

Fig 31: Overview of the mapping from aerial photographs and lidar for the Chase Through Time project. Archaeological mapping © Historic England; Base map © Crown Copyright and database right 2018. All rights reserved. Ordnance Survey Licence number 100019088.

The archaeological map of Cannock Chase produced by this project (Fig 31) was derived from a wide range of aerial sources. Most archaeological features were observed to be earthworks and were mainly recorded from the 2016 lidar data. Much reduced earthworks, a few centimetres in height and difficult to see on the ground, were identified and mapped from the lidar data. Even more substantial earthworks visible on lidar in dense woodland can be challenging to pinpoint when exploring the Chase on foot, something proved by experience with the fieldwork volunteers (see chapter '*Working with The Volunteers'*). A small number of features were seen as earthworks or as buildings on historic aerial photographs, but have since been levelled, built over or demolished. Some buried remains were revealed as cropmarks or soilmarks. Information on the evidence for each archaeological site, whether seen as earthworks, buildings, or cropmarks, is recorded in the associated monument record.

South of Rugeley Road

The core of the Chase Through Time project area covers the woodland and heathland that forms Cannock Chase AONB. The south-eastern area of woodland is located south of the Rugeley Road and is mainly within the former boundary of Beaudesert Old Park (Fig 32). The aristocratic right to keep and hunt deer in the medieval period affected large areas of this landscape, but has left relatively few remains. There are earthworks of parts of the park pale and the remains of three hunting lodges in and around Beaudesert. One of the lodges was built within the impressive remains of Castle Ring Iron Age hillfort (MST25; see *'Dividing the Landscape'*). These features are situated among the thousands of medieval and later coal pits within the woods between Hazleslade and Brereton Hayes Wood.

Beaudesert Old Park roughly coincides with the area where the coal measures come to the surface. This is the earliest mining we know about in Cannock and the area was exploited from at least the late 13th century and possibly earlier, through to the late 18th century. Therefore, the dominant historic character of this former park is industrial, albeit now subsumed into woodland. A few buried coal pits were revealed as cropmarks but most survive as earthworks. The lidar data was invaluable in identifying these remains, especially where they are difficult to see, from the air or on the ground, due to tree and shrub cover. The mapping provides an accurate and extensive record of the mining, and will form a useful framework for more detailed work looking at the early coal industry on the Chase.

A later coal mining landscape, slightly different in character, existed to the south and west of Beaudesert Old Park in a line from Huntingdon in the west, to Cannock Wood in the east. These coalmines outside the Chase were established in the second half of the 19th century and represent a move away from exploiting the shallower outcropping seams to deeper mining. Most of these coalmines continued in use for 70 years or more and were still in operation when the first aerial photographs were taken in the 1940s. By the mid-20th century, most collieries were closely integrated with the built-up areas of Cannock and Hednesford, but are now all closed and their headgear and surface structures have been cleared away. The historic aerial photographs provide a fascinating view of the development and decline of these sites.

The location of some of these mines is indicted by open areas within the towns, sometimes with residual spoil heaps particularly visible on the lidar. The majority of these collieries were located south of the Chase, but a few 19th-century pits were located to the north at Brereton and at the northern edge of Cannock (see '*Industry*' chapter for more details).

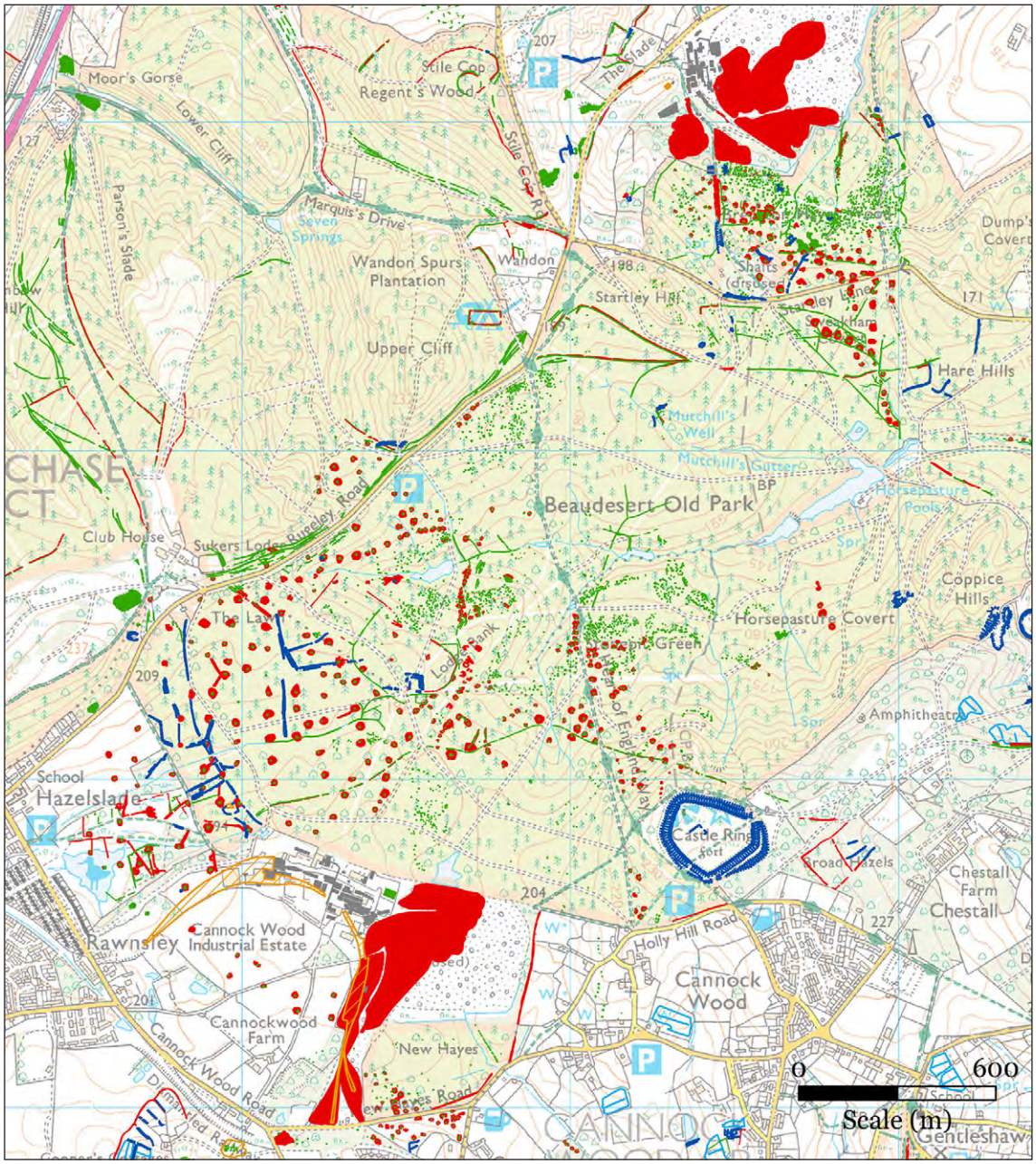

Fig 32: Beaudesert Park extended across much of the area south of Rugeley Road. There is a variety of archaeological remains in the former parkland, ranging from coal mining to hunting lodges and park pales. Archaeological mapping © Historic England; Base map © Crown Copyright and database right 2018. All rights reserved. Ordnance Survey Licence number 100019088.

South of Rising Brook

There are only a small number of coal pits to the north of Rugeley Road, and the industrial character found within Beaudesert Old Park changes quickly as you travel north-west. Relatively few archaeological earthworks were identified and mapped in this wooded area of the Chase between Rugeley Road and the Rising Brook and Hednesford Road (A460) (Fig 33).

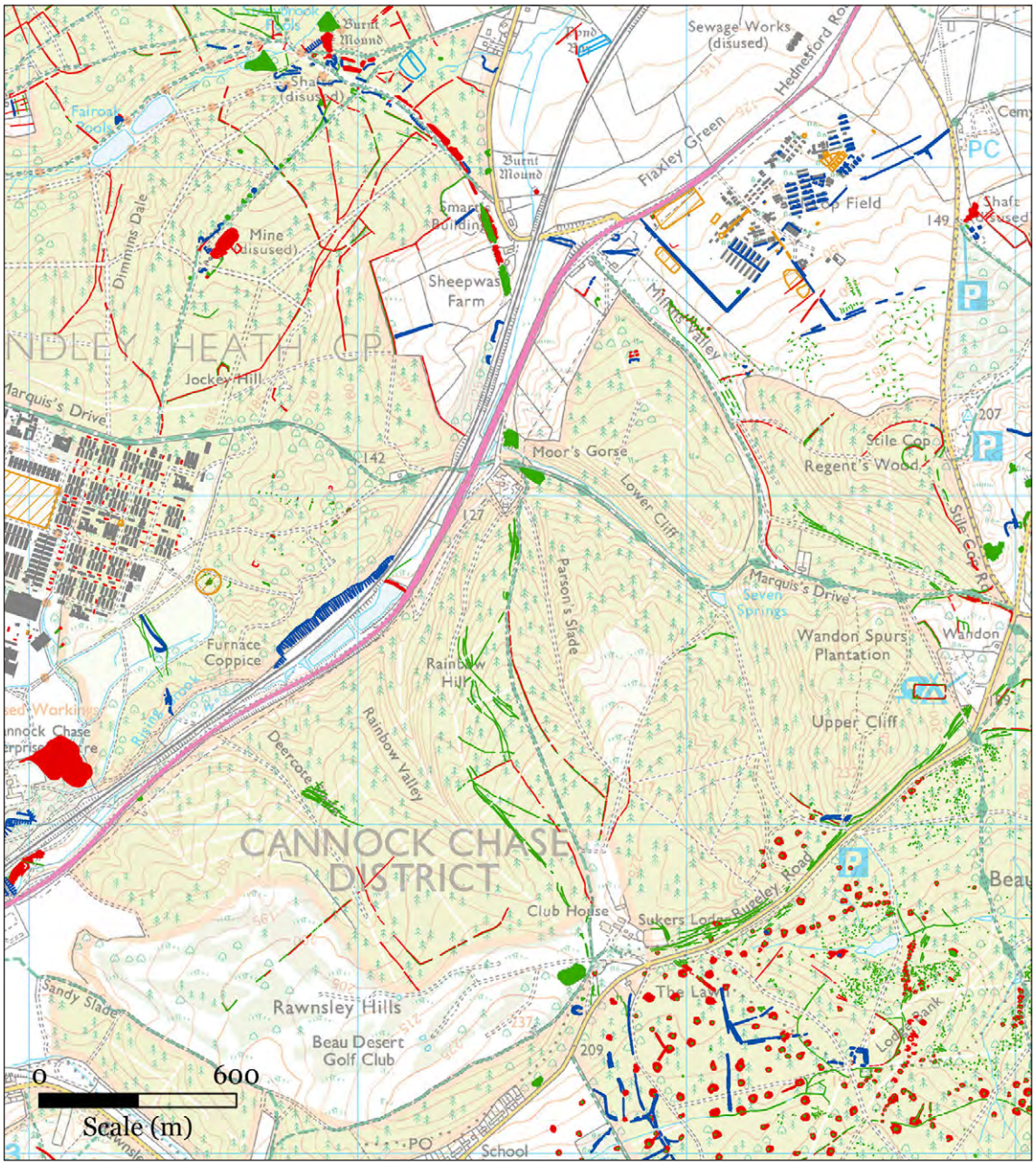

Fig 33: This area falls between Rugeley Road (the northern boundary to Beaudesert Old Park) and the Rising Brook (which extends diagonally across this image, close to the line of the railway). Archaeological mapping © Historic England; Base map © Crown Copyright and database right 2018. All rights reserved. Ordnance Survey Licence number 100019088.

The archaeological sites were mainly recorded from the lidar data and comprise a mixture of post medieval hollow ways and boundary banks. The boundaries probably relate to the coppicing of woodland for the manufacture of charcoal for the iron industry of the 16th and 17th centuries. Although the earthworks of some of these wood banks are fragmentary and incomplete, they extend for hundreds of metres. Additional wood banks were traced on Stile Cop, at the north-eastern edge of this area, which enclose a tree ring boundary; probably a remnant of the designed landscape of Beaudesert. The detailed map of these boundaries will contribute to further work looking at woodland management and the provision of fuel for the industries on the Chase. See *'Dividing the Landscape'* for more details.

At the eastern edge of the woodland, on the south bank of the Rising Brook by Smart's Buildings, are the grass covered remains of a Bronze Age burnt mound (MST999; see *'Burnt Mounds'* and *'Working with the Volunteers'* chapters for more details). The function of these enigmatic mounds is unclear. They consist of hundreds of heat-damaged stones, usually piled-up around a central trough. It is thought that hot stones were dropped into a water filled trough to create steam, perhaps for cooking, cleansing or for working with wood (Topping 2011).

Fig 34: Flaxley Green Prisoner of War Camp remained intact after the war. It was gradually demolished throughout the 1950s. RAF/CPE/UK/2469 RP 3383 09-MAR-1948 Historic England Archive (RAF Photography).

Immediately south of the Hednesford Road on Flaxley Green, there are the mostly grassed-over foundations of a Second World War Prisoner of War Camp (MST5274; Fig 34). This area, though off the upland Chase and adjacent to farmland, has been left to heathland, perhaps because of the concrete footings buried beneath. Due to the dense vegetation across the site, historic aerial photographs provided the best views of this site rather than lidar. See Second World War section of '*Military presence On The Chase*' chapter for more details.

South of Penkridge Bank

The central part of the project area extends north-east from the northern edge of Cannock to Slitting Mill on the edge of Rugeley, bounded by the A460 to the south and Penkridge Bank to the north (Fig 35).

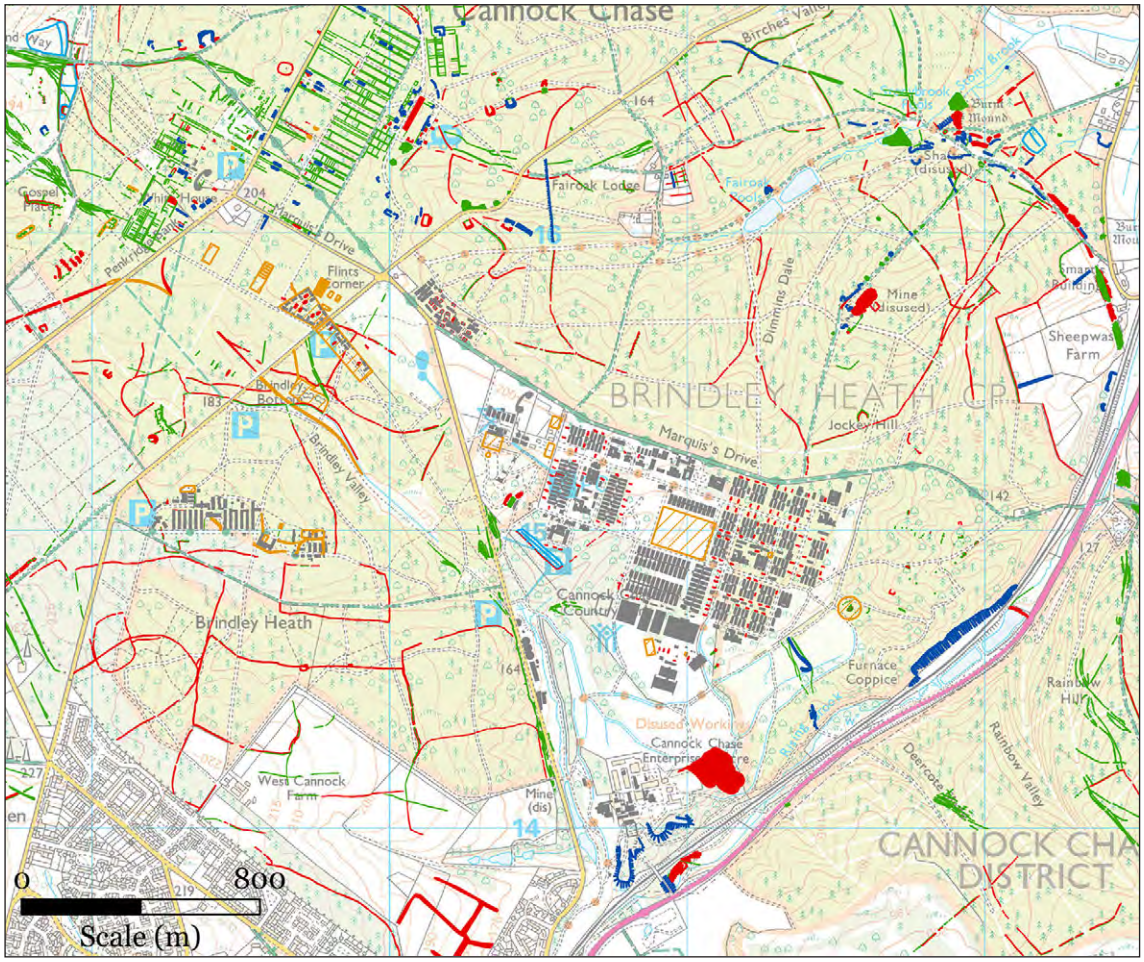

Fig 35: The central area described in this section is bounded by the A460 and railway to the south and Penkridge Bank to the north. Archaeological mapping © Historic England; Base map © Crown Copyright and database right 2018. All rights reserved. Ordnance Survey Licence number 100019088.

The archaeology here is more varied and multi-period. There are extensive post medieval wood banks and there are several near complete parcels of coppicing, enclosed by narrow boundary banks with flanking ditches. Where gaps occur in the distribution of these banks, this is due to later activity, such as mining, tracks, ponds and forestry activity. The Second World War camp at RAF Hednesford masked our view of potential archaeological earthworks across a large part of the area (MST5272) in 1939.

This RAF base undertook various roles during the Second World War and early years of the Cold War, before its closure and subsequent demolition from 1956 onwards (Whitehouse 1999) . Most of the camp foundations are now beneath deciduous plantation, or have grassed over. The military roads established for RAF Hednesford remain extant and visible from the air. As with most Second World War features, 1940s vertical photography was more beneficial for the mapping than lidar, as most of the structural elements were extant at the time.

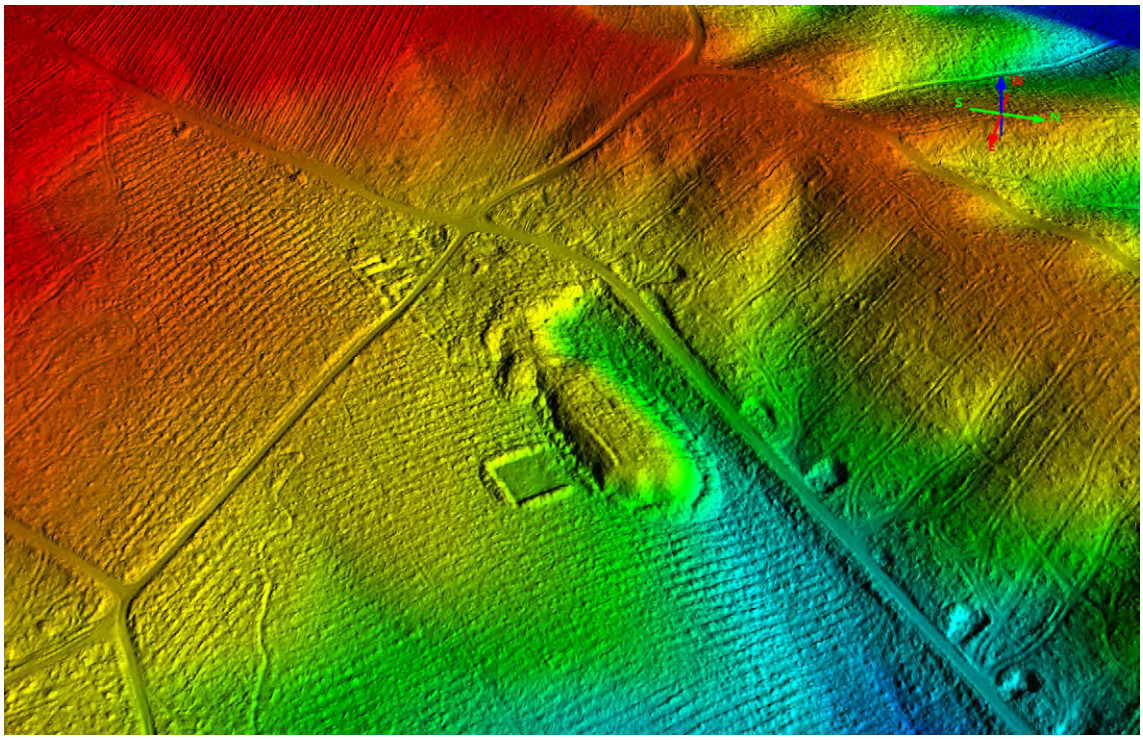

Fig 36: The spoil heap to Fairoak Colliery Pit Number 2. The remains are now surrounded by dense forestry plantation but the lidar visualisation reveals the extent of the site. Lidar DTM 04-MAY-2016 © Historic England; source Staffordshire County Council/Fugro BV Geospatial.

Although the central part of the Chase is away from the exposed coal outcrop, there were 19th- and early 20th-century coalmines intended to exploit the deeper seams of coal here. West Cannock No 5 colliery (MST5798) operated between 1914 and 1982, with modernisation in the 1950s. Unusually, most of the surface buildings remain, and this interesting group of buildings, constructed when the pit was modernised in the 1950s, now form part of the Cannock Chase Enterprise Centre. North of RAF

Hednesford are the earthwork remains of two pits called Fairoak Collieries 1 and 2 (MST2229 and MST5719 respectively). The spoil heaps to these industrial ventures survive (Fig 36), although Fairoak Colliery 1 was abandoned before reaching coal. These two pits were served by a railway siding and a tramway both of which survive in part as earthworks, and truncate earlier coppice boundary banks.

North of Penkridge Bank

The central area of the Chase also marks a transitional point. North of Penkridge Bank, there are fewer and more fragmented remains of woodland boundary banks because the First World War military activity and forestry have levelled or obscured them (Fig 37).

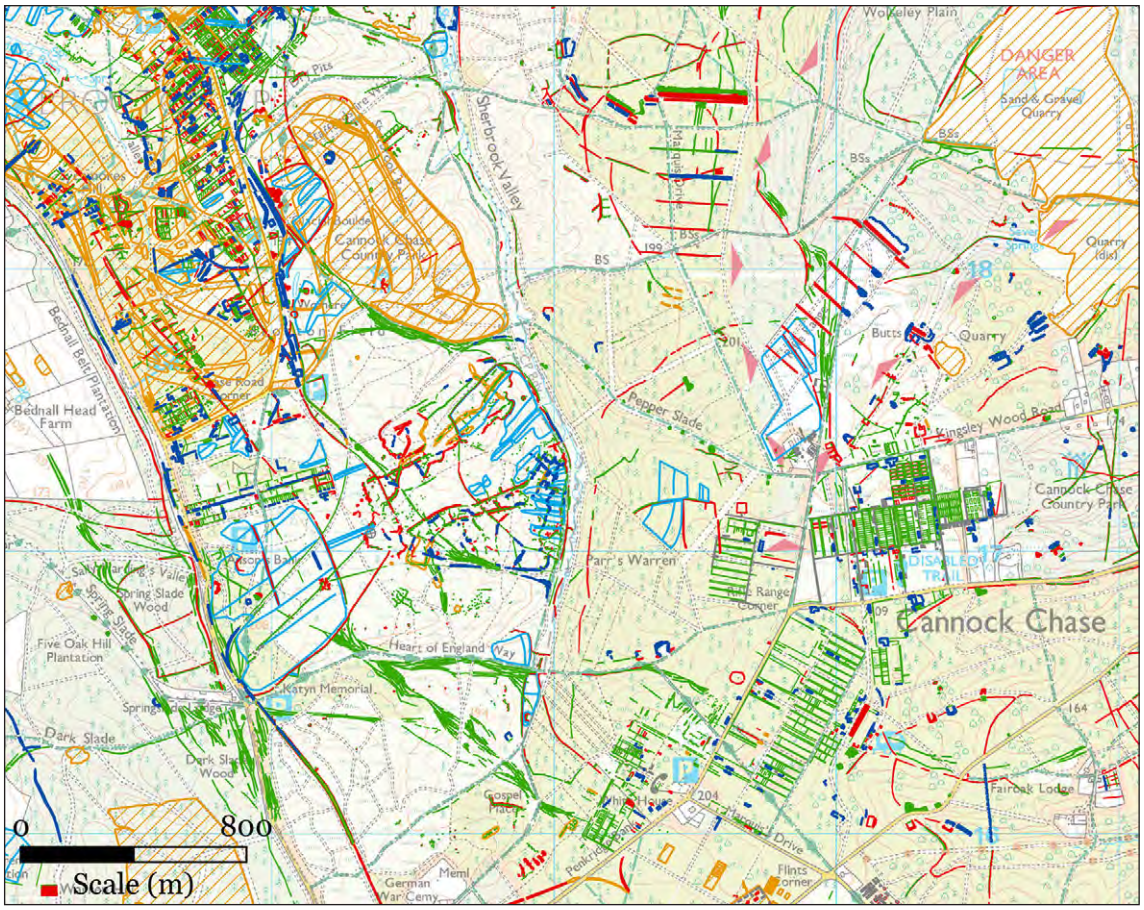

Fig 37: The area to the north of Penkridge Bank is defined mostly by plantation to the east of the Sher Brook (running south to north, through the centre of the image), and open heath and scrub woodland to the west. This area includes the First World War camps of Brocton and Rugeley. Archaeological mapping © Historic England; Base map © Crown Copyright and database right 2018. All rights reserved. Ordnance Survey Licence number 100019088.

The construction of Rugeley Camp (MST3140) began in 1914, and after seeing many tens of thousands of troops pass through it for the next four years, was dismantled after the war. The earthwork remains of the camp roads, drainage, hut foundations

and parade grounds are clearly visible on lidar. There are substantial earthworks of several firing ranges to the north of the camp, one of which remained in use until the end of the 20th century.

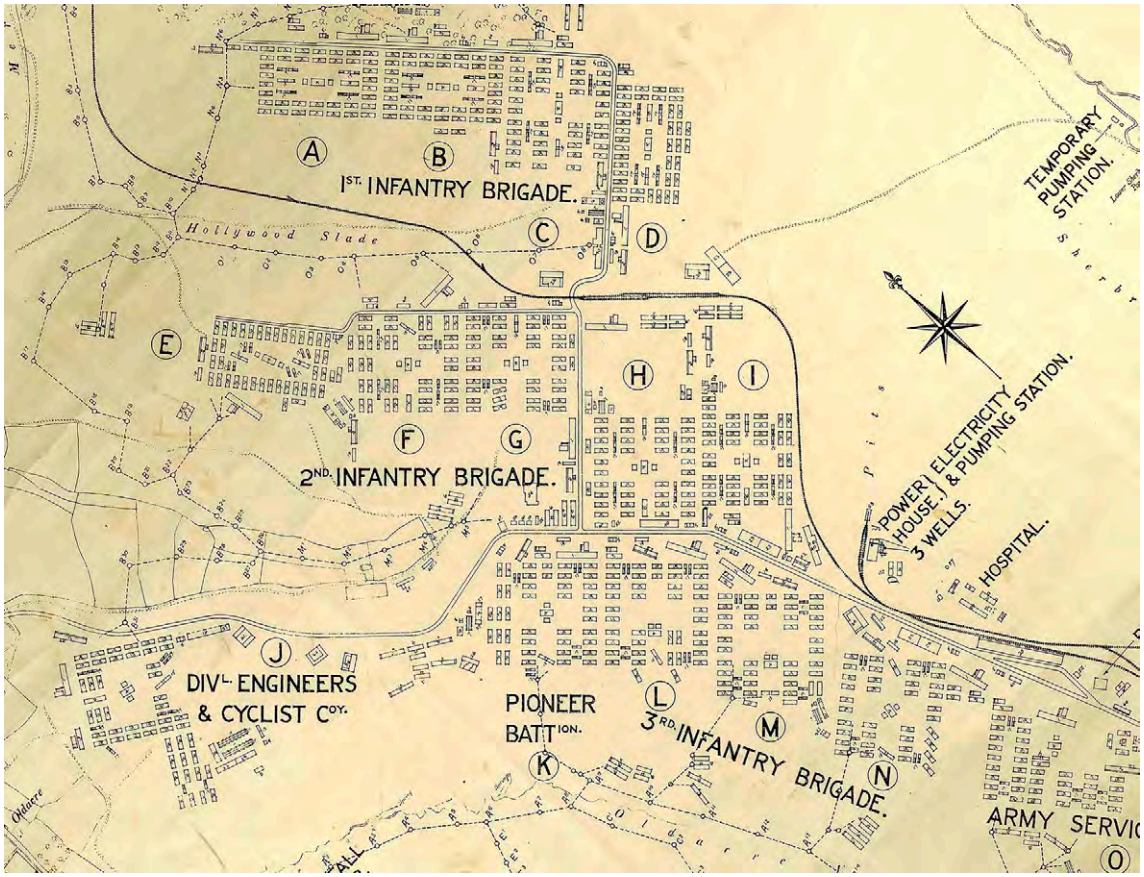

Fig 38: An extract from a 1916 dated plan of Brocton Camp and the sewage network. The camp extended over most of Brocton Field and Anson's Bank, and as far north as Brocton Coppice © Staffordshire Record Office (D615/M/6/21).

North-west of Rugeley Camp and the Sher Brook, the vegetation changes from areas of dense plantation to a mixture of scrub moorland and moorland heath called Brocton Field. Most of the archaeological earthworks here date to the First World War, and include a variety of training complexes such as trench systems and assault courses. Most of these centre on the remains of Brocton Camp (MST5865; Fig 38). This was Rugeley camp's sister site, and the surviving remains comprise hut bases and drainage channels. Historical vertical aerial photographs showed extensive Second World War armoured vehicle testing along Brocton Field (MST22879), and a small aircraft bombing range on Anson's Bank (MST22878). The northern limit of the camp fell within Brocton Coppice (MST5754), one of the surviving areas of ancient woodland on the Chase. This area of woodland contains oak estimated to be up to 600 years old and is enclosed by a single boundary bank and ditch, partly truncated by the First World War earthworks.

Taken together, the 20th-century military activity has created a complex landscape of multi-phased earthworks, intermingled with the fragmentary remains of post

medieval boundary banks. These boundary banks appear to have performed a variety of functions. Those in the west, on Brocton Field appear to have been intake enclosures, perhaps dating to the 17th and 18th centuries, when there was pressure on lowland farmland. East and north of Rugeley Camp, the boundaries relate to woodland and coppicing. A number of post medieval charcoal burning platforms were identified on the lidar here. These comprise circular levelled areas where wood was processed to make charcoal, probably for use as a fuel for the local iron industry. Numerous hollow ways, often braided in nature, were recorded in this area that probably relate to medieval and more recent routes across the area. There are also two further Bronze Age burnt mounds in this area, alongside the Stafford Brook. One is visible on lidar, the other now destroyed with the construction of a pond was identified from aerial photographs taken in 1948.

Northern edge

The northern edge of the Chase is dominated by the former parks of Haywood, Shugborough, Oakedge and Wolseley, and Haywood Warren (Fig 39).

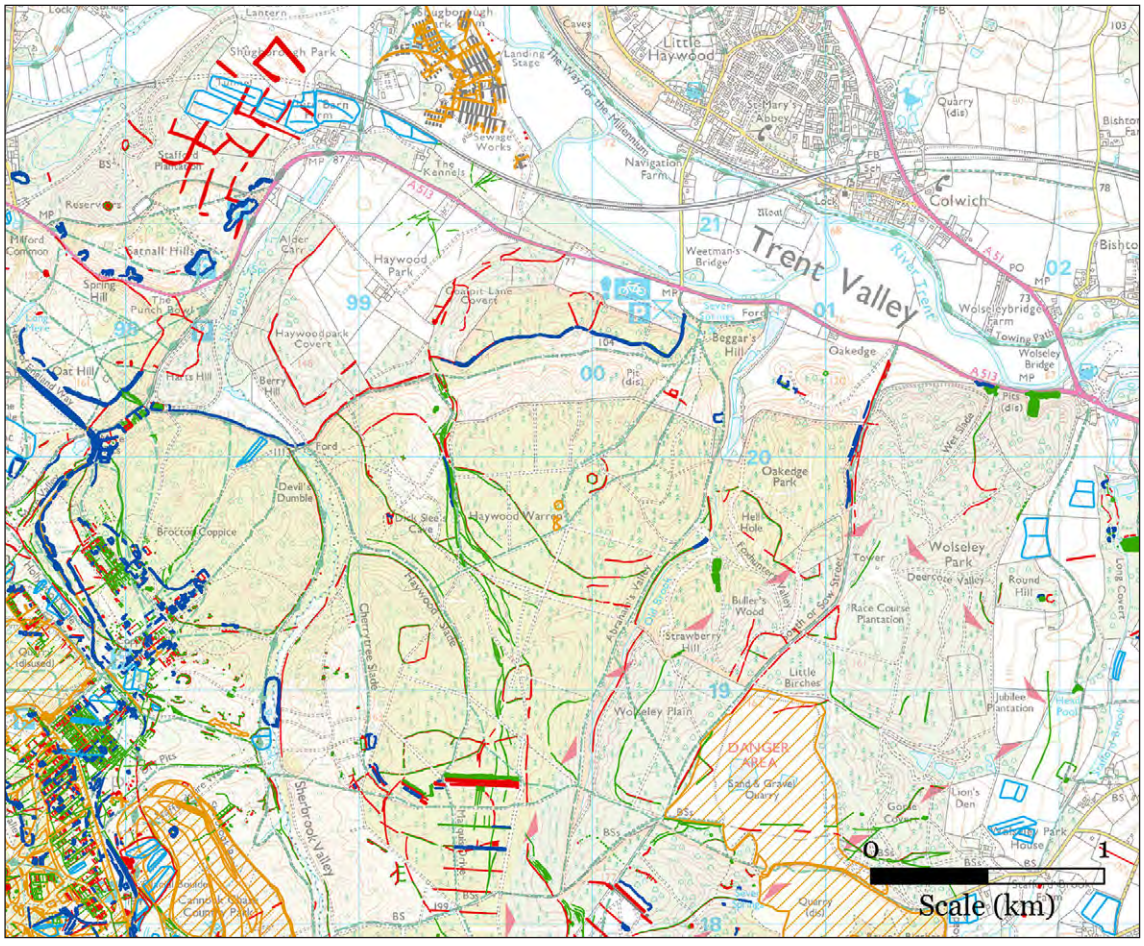

Fig 39: The parks of Haywood, Shugborough, Oakedge and Wolseley, most of which have medieval origins, form the northern edge of the project area. Archaeological mapping © Historic England; Base map © Crown Copyright and database right 2018. All rights reserved. Ordnance Survey Licence number 100019088.

Braided hollow ways extend through this area. The name of Coalpit Lane in Haywood Park denotes this to be a coal haul road, once crossing the Chase to the pits of Beaudesert. Boundary banks were identified as earthworks on the lidar throughout this area. These earthworks served a variety of purposes. Some were constructed as wood banks and others as warren boundaries, both in the post medieval period. As is the case further south on the Chase, although some of these banks can be traced on lidar for hundreds of metres, no complete circuit survives. However, the southern boundary (MST6046) to Haywood Park, which was probably constructed in the medieval period, can be traced for its full length.

In places, these boundaries were truncated by the coal road hollow ways. Elsewhere, the hollow ways avoid or respect earlier features including boundary banks and one of two large post medieval enclosures at Haywood Slade (Fig 40). Smaller earthworks within this area include the remains of the warren lodge (MST23004) in Haywood Warren and garden remains in the grounds of Oakedge Park, demolished in the late 19th century.

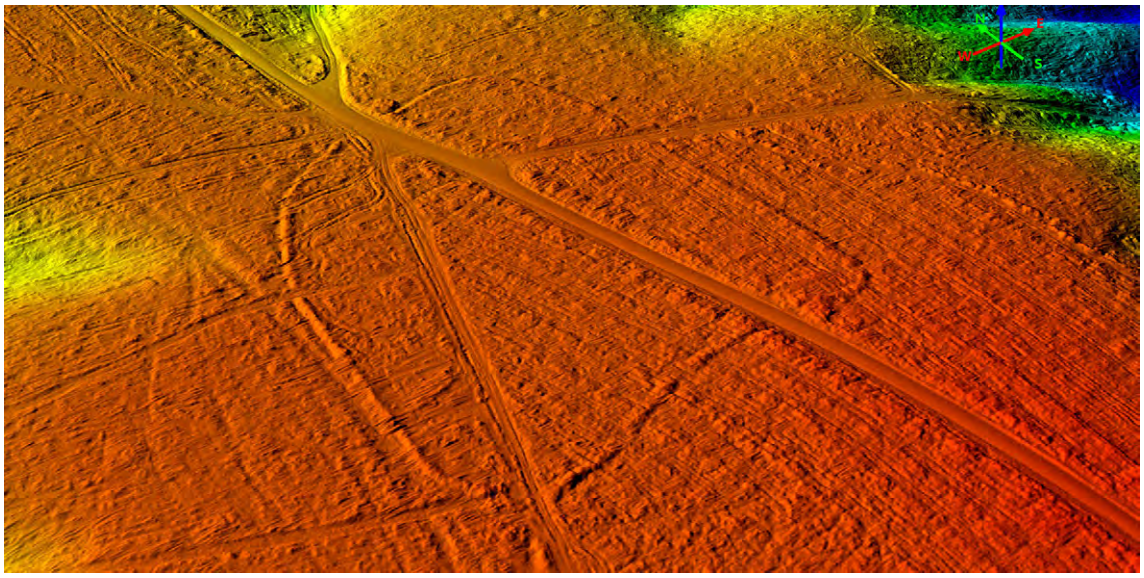

Fig 40: One of two enclosures either side of Haywood Slade, of probable early post medieval date, but unknown function. Lidar DTM 04-MAY-2016 © Historic England; source Staffordshire County Council/Fugro BV Geospatial.

The northern limit to the project area is defined by the confluence of the Rivers Trent and Sow, south of which lie the grounds of Shugborough Hall. The only feature associated with the Hall is the earthwork remains of a summerhouse platform (MST20228), seen on the lidar in the Stafford Plantation. Fragmented earthworks of a possible medieval field system (MST22999) are also visible as very low earthworks. A military hospital (MST3797) was established in the park in 1943, south-east of Shugborough Park Farm. This hospital was mapped from historic aerial photographs and has since been demolished; some of the roads being the only extant remains.

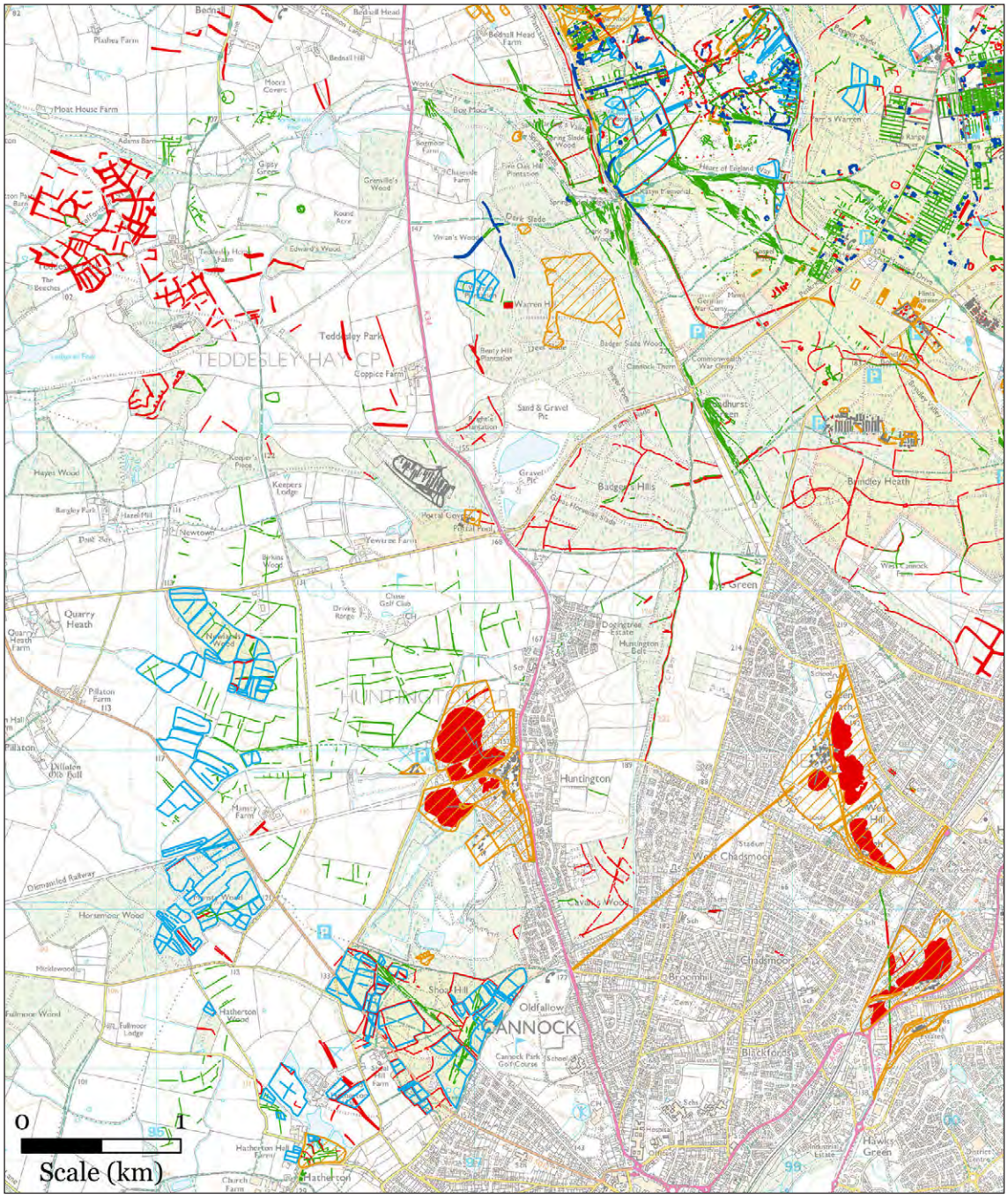

Fig 41: The western edge to the project area is defined by the lowland between the Chase and the east bank of the River Penk. Archaeological mapping © Historic England; Base map © Crown Copyright and database right 2018. All rights reserved. Ordnance Survey Licence number 100019088.

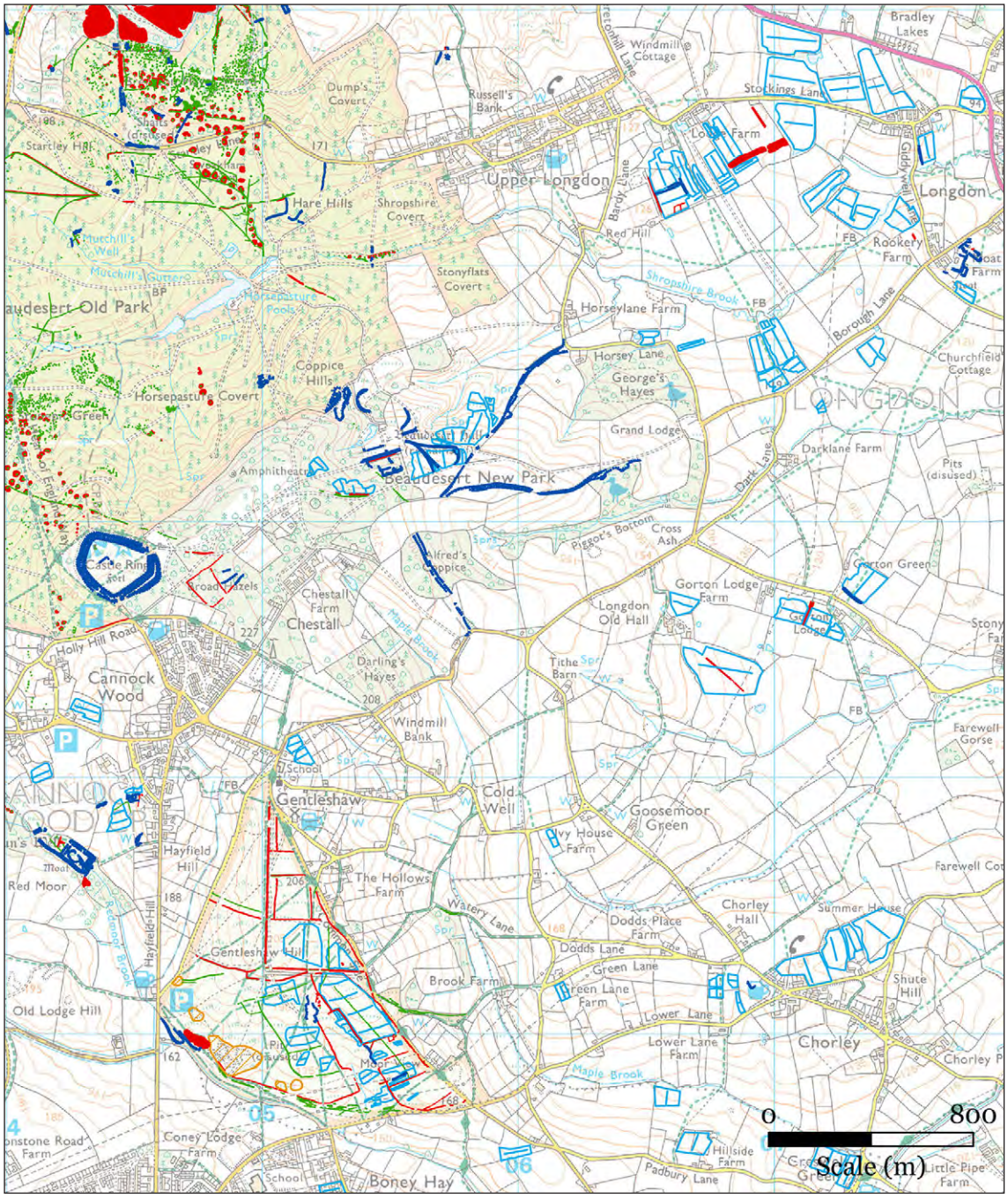

Fig 42: A mixture of arable and pastoral farming dominates the lowland in the east of the project area, between Longdon and Chorley. Archaeological mapping © Historic England; Base map © Crown Copyright and database right 2018. All rights reserved. Ordnance Survey Licence number 100019088.

Western side

The western edge of the project area, west of Brocton and the A34 (Fig 41), has a different character and disused field boundaries relating to enclosure of the area in the 19th century have been mapped. The slight earthwork remains of a possible coaxial later prehistoric or Roman field system are preserved in the pasture within Teddesley Park (MST22690). West of Huntingdon, the buried remains of an extensive area of post medieval field boundary ditches are revealed as cropmarks recorded on aerial photographs (MST22695). South of Huntingdon, on Shoal Hill, are the earthwork remains of field boundary banks and hollow ways (MST22713), probably relating to attempts to take in the land for cultivation in the later post medieval period.

The earliest features mapped in this region include three Bronze Age burial mounds usually called round barrows. The location of the buried remains of one was indicated by cropmarks west of Grenville's Wood. These comprised two concentric ditches that probably once surrounded the burial mound, and may indicate two phases of construction. (MST3742). A short distance away, to the north of Gipsy Green a cropmark indicated the buried remains of another lost burial mound, this time surrounded by a single ring ditch (MST23096). This appears to be associated with a very large circular enclosure 83m in diameter, of possible Neolithic or Bronze Age origins (MST23097). The third barrow site is indicated by cropmarks of a ring ditch south of Milford Covert (MST23095).

Eastern side

The landscape on the eastern side of the Chase resembles the area around Teddesley, in that there are numerous post medieval fields (Fig 42). However, medieval field patterns survive indicated by curving boundaries that may relate to piecemeal conversion of woodland (assarting) for settlement and farming throughout the medieval and post medieval periods. Most of the archaeological remains seen in this area relate to medieval or post medieval farming. The earthworks of small blocks of medieval cultivation, ridge and furrow, were identified on lidar, with the densest concentration around the village of Longdon. Ridge and furrow was also mapped immediately to the east of the remains of Beaudesert Hall, where some was cut by carriageways leading to the Hall. Some of Beaudesert Hall's garden earthworks were also mapped from lidar. Further evidence of the enclosure of parts of the Chase for farming was seen at the south-eastern corner of the project area on Gentleshaw Hill. Field boundaries and ridge and furrow were mapped there (MST5030) and these remains probably relate to a temporary attempt to cultivate the more marginal heathland areas of the Chase.

MILITARY PRESENCE ON THE CHASE

Introduction

As you walk along a footpath on Brocton Field, or through the quiet woods on Penkridge Bank, it is easy to be drawn to the natural environment and the peace that it offers. At first glance, it is the surrounding vegetation that draws the eye; the subtle hues of orange, brown and green of the heath and woodland. A trained eye however, might perceive unnatural shapes, rectangular embankments, a large pit or the zigzag of a ditch. As you clamber off the beaten track, you come across an area of broken brickwork, or a channel of concrete. This is all that remains of what was once the home for thousands of soldiers, training for combat before embarking on active service.

There is little else to indicate that the Chase was home to one of the largest First World War training camps in England. The more obvious reminders include the Commonwealth War Graves Commission and German War cemeteries on Penkridge Bank, the rebuilt camp hut adjacent to the Cannock Chase Visitor Centre, and the grave of the faithful mascot, Freda, on Brocton Field. Although the camp foundations are the more obvious remains to a passing rambler, a fire on the heath exposed many additional earthworks that were subsequently surveyed in 2006 by Northamptonshire Archaeology (Yates 2006).

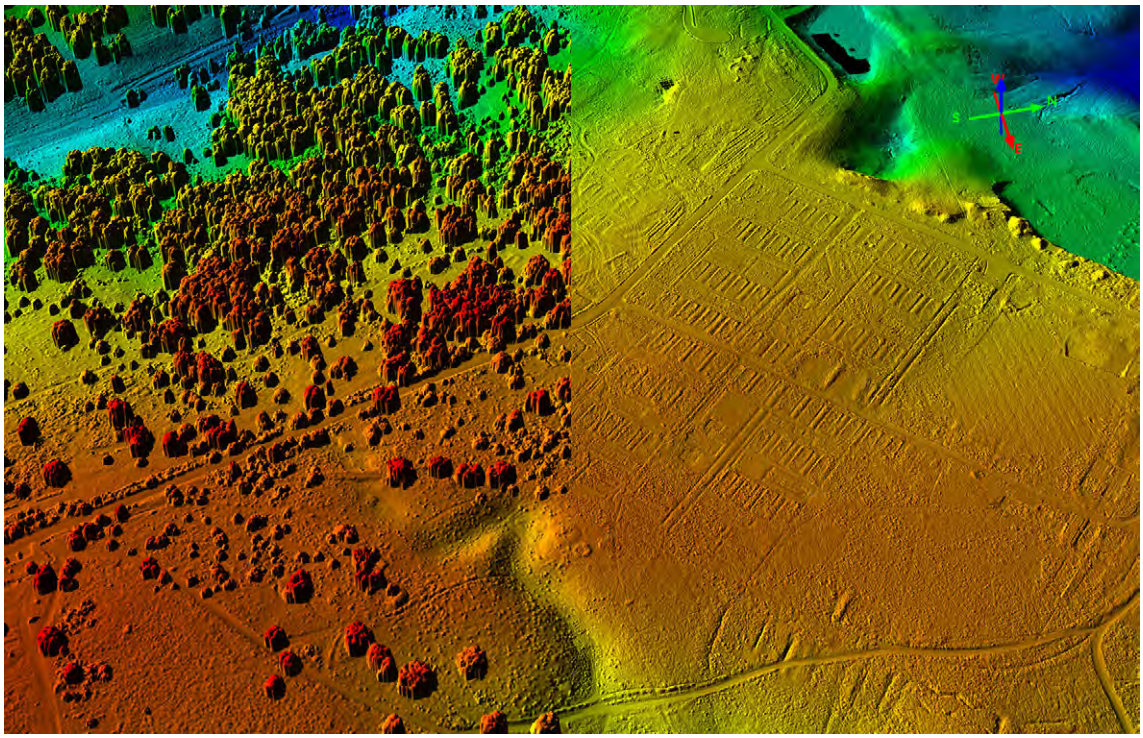

Fig 43: Brocton Camp is mostly covered by scrub woodland, reducing the visibility of the archaeology. This lidar image depicts the surface model on the left, and terrain model on the right, where the vegetation has been stripped away. Lidar DSM and DTM 04-MAY-2016 © Historic England; source Staffordshire County Council/Fugro BV Geospatial.

Prior to the Chase Through Time project, there was little large scale recording of the physical evidence of the training on the Chase. The principal innovation of this project, however, has been the use of lidar, which has allowed a unique opportunity to digitally strip away much of the vegetation, revealing military earthworks from both world wars across most of the upland Chase (Fig 43). The result has been the most detailed and extensive mapping to date of all military features in the Area of Outstanding Natural Beauty. These include the large camps of Brocton and Rugeley, which were established in the Great War, and Royal Air Force (RAF) Hednesford from the Second World War, as well as numerous other smaller installations erected across the Chase. The earlier camps were demolished and auctioned off as soon as the war ended, and by the time the first aerial photographs were taken of the area, they had largely returned to heath and woodland. When a new conflict arose in 1939, the Chase was again chosen as a base for the military, and these features were recorded on the 1940s on vertical aerial photographs that show the camps at the height of their use.

For the most part, the layout and form of the First World War camp buildings are well documented, either in period postcard photographs or on plans, but the greatest contribution of this project has been the discovery of vast areas of training trenches and other earthworks strewn across the Chase, surrounding Brocton and Rugeley Camps. These earthworks provide information and tell a side of the story that is less well recorded in documents of the period. The presence of huge networks of practice trenches, several firing ranges and numerous assault courses are a testament to the reality of the war abroad and the intensive training required for the soldiers stationed on the Chase.

Previous work

The military remains on Cannock Chase were subject to a number of archaeological surveys and historical studies over recent decades. The earliest work on the First World War camps, *A Town for Four Winters* was first published in 1978 under the title *Great War Camps on Cannock Chase*, authored by local historians, Jake and Gill Whitehouse (nee Ibbotson) (Whitehouse and Whitehouse 1996; Whitehouse 1999). This history of the camps brought together a number of historic postcard views and sketch maps of various parts of the camps, and remains the most detailed history of the camps to date. This was complemented recently with a short guide to the Great War history of the Chase (Cunliffe nd).

The most extensive work undertaken was an archaeological survey of the camps on Cannock Chase in 2006 by Northamptonshire Archaeology (Yates 2006). The assessment was the result of an uncontrolled fire that exposed archaeological remains. It comprised a walkover and condition survey of these earthworks, and a GPS survey that was output to a GIS dataset. This was the first time the earthwork remains of the training areas in and around the camps had been surveyed. The results of this survey form part of the Historic Environment Record, and was a very useful resource for the Chase Through Time mapping. A more localised walkover survey of the First World War remains adjacent to White House, Penkridge Bank, was also undertaken by Archaeological Research Services Ltd in 2015 on behalf

of the County Council, with funding from Natural England (Brown 2015). A topographical survey of the two areas of Brocton Camp earthworks was undertaken by students of the University of Birmingham, under the direction of Mark Kincey and Chris Carey in 2007, resulting in the first hillshaded models of parts of the military establishment (Teichmann and Kincey 2009).

Fig 44: The Messines model was located in 'H' Lines of Brocton Camp © Jake and Gill Whitehouse, reproduced with kind permission of Jake and Gill Whitehouse.

Targeted investigation was also conducted at a number of locations within the camps. The most notable was the Messines Model, a concrete recreation of the landscape and military positions around Messines in Flanders in 1917, constructed as a teaching aid for troops stationed on the Chase during the war (Fig 44). This remarkable and unique model was assessed by Birmingham Archaeology in 2007, undergoing a topographic survey, geophysical survey and targeted sample excavation (Brown *et al* 2007). A further evaluation using augering and trial trenching was undertaken by Northamptonshire Archaeology in 2012 to establish the western limit of the model (Simmonds 2012). This work culminated with a full open area excavation and laser scan of the model in 2013 with the support of Natural England and Staffordshire County Council, and involved over 130 volunteers as part of a wider community engagement (Brown and Nichol 2013). The model has since been covered over to protect the remains and was not mapped as part of this project. The Royal Commission on the Historical Monuments of England (RCHME) and Staffordshire County Council (Welch 1997b) investigated another 'model' of sorts, at Rugeley Camp. This monument comprises a quarter-scale model trench system constructed within a purpose-built gravel mound, and is unique. Both models are scheduled monuments (Messines Model NHLE 1444078; Rugeley Camp instructional trench system NHLE 1021326).

The Friends of Cannock Chase and volunteers promote knowledge of the role of the Chase during the war through guided walks, as do the AONB Unit volunteers who run the reconstructed First World War hut at the Marquis Drive visitor centre.

A number of First World War practice trenches have been investigated throughout the United Kingdom over recent years. Salisbury Plain, Wiltshire is the largest military training area in the country, and was intensively used during the First World War with numerous camps, ranges, railways, artillery emplacements and airfields being located there (McOmish et al 2002; Brown and Field 2007). Targeted excavations at Larkhill, one of the main garrisons on Salisbury Plain, revealed networks of practice trenches and tunnels, and a rich array of everyday items, such as tins of food and boot polish, suggesting that troops were training in the trenches for days at a time, rather than just hours (Symonds 2017).

Similar excavations have taken place at the well-preserved trenches on Otterburn Ranges in Northumberland, revealing fire-steps and duckboards at the base of the trenches. These earthworks were still being used for military training in the 1980s (Nichol and Brown nd). There is another set of trenches, equally well preserved as earthworks, a little to the south, at Rothbury. These also underwent trial excavation by Coquetdale Community Archaeology in 2008, revealing that they had originally been constructed at full scale, to a depth of 2.5m in places, and were revetted with iron sheets. A lack of finds suggested that they were not occupied for any length of time (Burgess 2008). Uniquely, these trenches can be dated to within the first few months of 1915, when they are recorded as being dug by members of the 18th (Pioneer) Battalion, Northumberland Fusiliers (1st Tyneside Pioneers) (Knight 2015, 13).

Other training areas that have undergone archaeological assessment include the practice trenches near Redmires Reservoir, which were surveyed by the University of Sheffield, and may have been constructed by the 12th (Service) (Sheffield City) Battalion, York and Lancaster Regiment (Ullathorne 2006). Another is the camp at Breary Banks, Colsterdale, which was originally built as a construction camp for navvies, but ultimately became a military training camp and then a Prisoner of War camp towards the end of the war (Finch 2013). Aerial investigation and mapping projects funded by Historic England have identified many more First World War training sites across the country, usually on a much smaller scale, and sometimes within urban environments.

More general overviews of the legacy of the First World War training facilities across the UK can be found in such publications as *The Home Front in Britain 1914-18* (Appleby *et al* 2015), *The Built Heritage of the First World War in Scotland* (Barclay 2013), *First World War Fieldworks in England* (Brown 2017), and *Legacies of the First World War* (Cocroft and Stamper forthcoming).

The military establish themselves on the Chase

The relationship between Cannock Chase and the army dates back to at least 1860, though it is quite likely that the open heathland was being used by local troops

much earlier. There was a local troop of volunteer cavalry in Teddesley as early as 1803,[5] as well as various militias throughout Staffordshire in the late 18th and 19th centuries. Lord Henry Paget, of the Beaudesert family, raised the 80th Regiment of Foot (Staffordshire Volunteers) in 1793, largely from members of the local militias, including men from the family estates,[6] and it is possible that some of these men trained on or around the Chase at times. In 1860 Henry Paget, the 2nd Marques of Anglesey, granted a rifle range for the use of the 33rd (Cannock) Company of the Staffordshire Rifle Volunteer Corps (*Staffordshire Advertiser* 1860, 4). In the same year, a proposition was put forward in the Houses of Parliament to consider creating a new central arsenal or fortress on Cannock Chase. Royal Arsenal Woolwich was considered vulnerable in the case of an invasion, so it was envisioned that there could be a centrally located military depot, and the Chase was considered by some to be suitable, both geographically and economically. However, the proposition appears to have been shelved in 1863, partly because the need for a central 'fortress' was considered to be unnecessary, and that it might also represent a 'standing menace to the people' (Hansard 1863, 681-7). Plans for using Cannock Chase as a military base did not entirely disappear, and in 1891 a scheme was drawn up for a permanent military depot and training establishment on the Chase, but again this was eventually abandoned (Dean 2013, 81).

For a number of years the Chase and its surroundings were used as training grounds for the military. Volunteer units used the area for training, especially around Teddesley Park (Belcher 2001, 116), and the Rugeley Rangers, a militia unit formed in 1879, carried out various live-firing exercises on the Chase, presumably on the firing range.[7] There were large scale manoeuvres in August 1873, where units of regular infantry, cavalry, volunteers and militia took part in extensive training and mock-battles across the Chase and into Shugborough Park. These displays were opened up to the public to watch and were extremely well received by the national papers of the time (Whitehouse and Whitehouse 1996, 2; *London Evening Standard* 1873, 3). Further manoeuvres took place in 1894, which included volunteer battalions of the King's (Liverpool) and Cheshire Regiments, a brigade of cavalry, a brigade of regular infantry and units of the Royal Artillery. The main encampment was Hagley Park, from which the units carried out training manoeuvres stretching from Pye Green to Wolseley.

There are no known physical remains of the manoeuvres of the late 19th century, as the troops would have bivouacked in tents and existing buildings, rather than purpose-built hard-standing structures as came later. The earliest military feature surviving as an earthwork, is the 'U' shaped target butt (MST18044) for the 1860 firing range (Fig 45). Located on the now heavily wooded south side of Etching Hill, the range is considerably smaller than its First World War counterparts, but was thought to be such a fine example at the time, that it was even considered as a replacement for Wimbledon as the location for the annual meeting of the National Rifle Association (*Staffordshire Chronicle* 1888, 1). The 800 and 900 yard (731m and 823m) markers remain as very low earthwork mounds, but the remainder are now under housing and a playing field. The range was already out of use by 1902, the land having been turned over to allotment gardens.

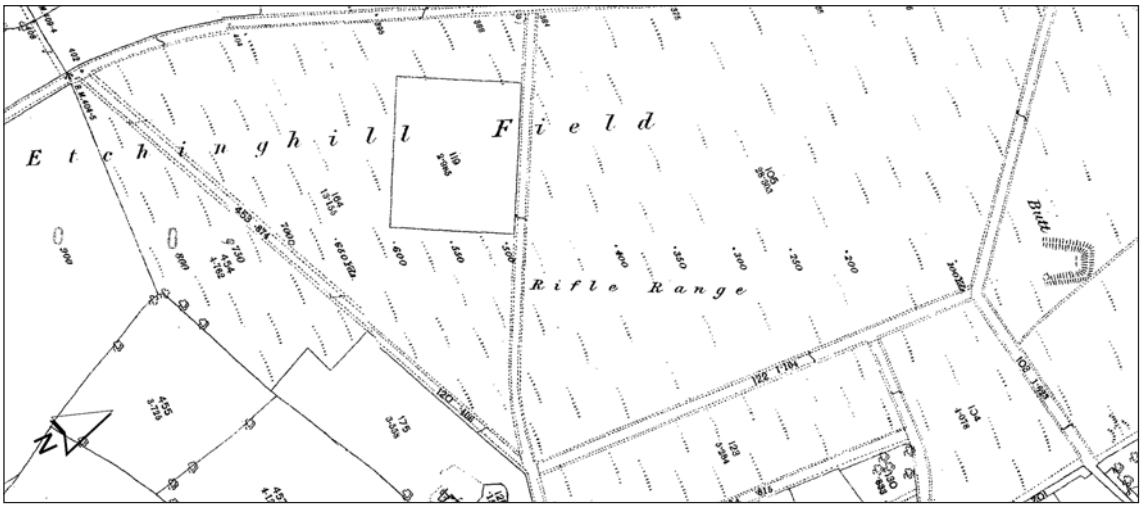

Fig 45: The firing range of 1860 was marked on the 1882 Ordnance Survey Map. Only the butt (right of frame) and 800 and 900 yard markers (centre left of frame) remain visible as earthworks. North to the top right. © and database right Crown Copyright and Landmark Information Group Ltd (All rights reserved 2018) Licence numbers 000394 and TP0024.

The Great War

A short history of the First World War on the Chase

Despite the level of interest in the 19th century, the Chase had escaped relatively unscathed, but the War Office never lost sight of its potential. The outbreak of war in 1914 put an end to this peace, and the first divisions of the British Expeditionary Force were quickly dispatched to the continent and engaged the enemy within days. With the last two divisions of regular troops shipped off at the end of October, the call for more troops came immediately, and with it the need to accommodate and train these troops effectively. Camps sprung up across the United Kingdom to take in the reservists and volunteers of Kitchener's New Army.

The construction of Rugeley Camp began in autumn 1914 to the north and south Penkridge Bank (MST3140). Brocton Camp was laid out on Brocton Field and Anson's Bank by January 1915 (MST5865; Fig 46). Upon completion, each camp was intended to house a complete infantry division (nearly 20,000 men per division), but in reality they became training camps for reserve battalions instead, the first troops arriving in the spring of 1915. Such extensive camps required a complex infrastructure. Almost immediately, the existing roads were found to be inadequate and were in need of repair and improvement. A new railway between Hednesford and Rugeley Camp was operational by early 1915, and another was constructed from Milford to Brocton Camp, the two being finally linked together later in the year (Barker 2017, 235; Whitehouse and Whitehouse 1996, 14).

Although constructed separately and to quite different plans, both Rugeley and Brocton were intended to be almost entirely self-sufficient towns. They had a bank, grocery stores, chapels, and even a theatre. The main hospital, run by the Royal

Army Medical Corps, was located on Brindley Heath, but a camp plan of 1916 indicates a small hospital south of the electricity station, though a soldier who was stationed there could not recall this. Schools of Instruction were established to include musketry, scouting, signalling, physical training, gas warfare, and many more, for training troops from both on and off camp. The schools of musketry would have made regular use of the firing ranges. The range of 1860 had long since been abandoned, so new ranges were built. The first of the ranges appears to have been built in 1915 at the head of Abraham's Valley, and by 1916 there were five. Each was between 100 and 600 yards (91m and 549m) long (Whitehouse and Whitehouse 1996, 3-5, 10, 12-14, 18-19). 'E' Range, one of the larger ranges, continued in use until around the 1990s. The effectiveness of some of the shooting was questionable, as .303 bullets have been discovered in recent years as far as Wolseley Park (Welch 1997b, 26), which was in line-of-sight of ranges 'E' and 'F'.

Fig 46: Brocton Camp under construction © Jake and Gill Whitehouse, reproduced with kind permission of Jake and Gill Whitehouse.

Much of what is known about the camps and training was taken from contemporary postcards and written accounts, with isolated pockets of earthwork practice trenches detected during walkover surveys in the 2000s. Of particular interest, are the illustrations of Erskine Williams, a bandsman in the Sherwood Foresters (Nottinghamshire and Derbyshire Regiment) who trained on the Chase. His sketches show subtle details that cannot always be gleaned from a ground photograph or from aerial imagery. For example, he illustrated bayonet practice using the straw-filled dummies to maximum effectiveness, with white patches sewn on to the dummies to represent the 'vital parts'. He also illustrated advancing and firing on the firing ranges, as well as grenade-throwing practice taking place within the traverses of

practice trenches, rather than on a specifically engineered bombing range (Jones 1992, 9-12).

The war diary of Alick Trafford may be a hand-written copy of the battalion war diary rather than a personal diary. He trained at Brocton Camp with the 5th Reserve Battalion, New Zealand Rifle Brigade in 1917 and 1918 and described in detail the various stages of a 'trench to trench' assault. Trafford even went as far as sketching sections of practice trench, and these were identified and mapped from the lidar (National Library of Zealand 2003-171-17/1). The author JRR Tolkien, trained on the Chase with the 13th (Reserve) Battalion of the Lancashire Fusiliers in 1915 and 1916, and was billeted in 'P' and 'M' Lines of Brocton Camp (Whitehouse and Robbie 2014). The huts can be identified on a camp plan dated 1916 (SRO D615/M/6/21), and the foundations remain visible on lidar (Fig 47). Other studies into personal and battalion diaries could no doubt pull out much more detail.

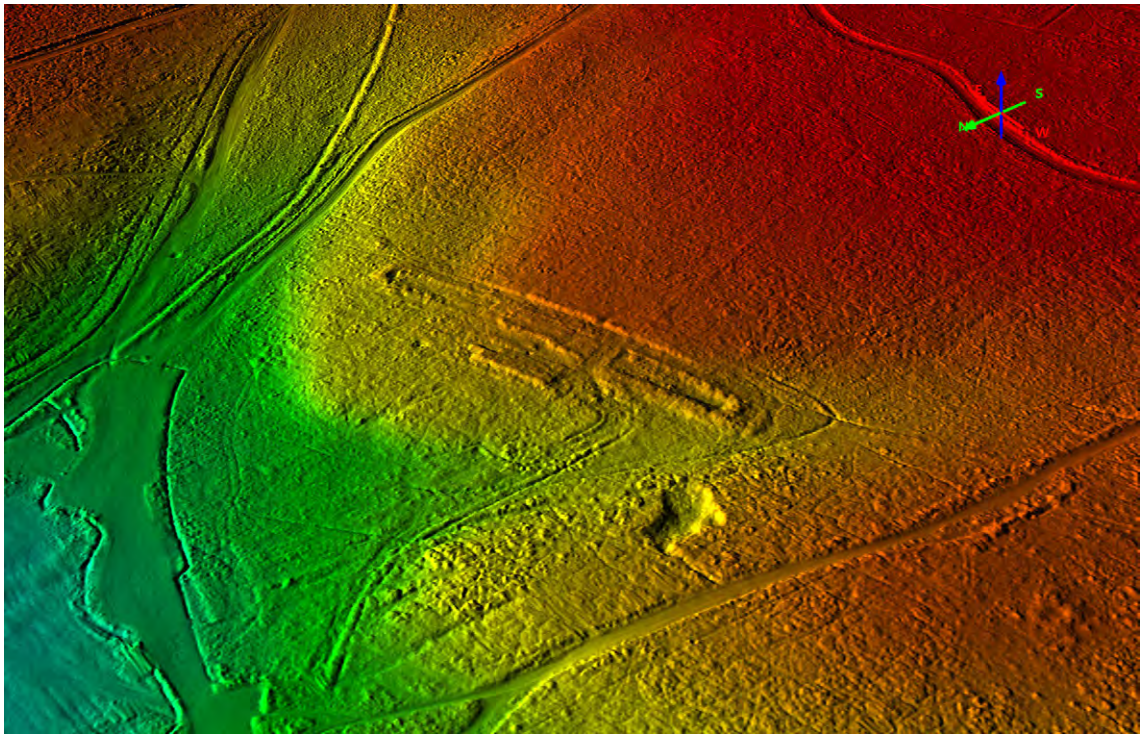

Fig 47: The foundations of the officers' huts to 'P' Lines visible in the centre, where the author JRR Tolkien was billeted between December 1915 and February 1916. Lidar DTM 04-MAY-2016 © Historic England; source Staffordshire County Council/Fugro BV Geospatial.

The camps existed for nearly four years and underwent a great deal of changes. Perhaps the most dramatic change was the conversion of 'A', 'B', 'C', 'E' and 'F' lines of Brocton Camp to a Prisoner of War Camp in 1917. Designed to house up to 6,000 prisoners, the camp was split into two halves and 'C' lines became the hospital, extending into 'B' lines by 1918 (Holt 2015, 10, 35, 37).

The archaeological legacy

The camps

The core of Brocton Camp was located on either side of Chase Road, on Brocton Field, and there were a number of satellite camps on Anson's Bank, Sycamore Hill and Tar Hill (*see* Fig 51). Most of the remains of the camp are under dense vegetation of scrub woodland, heather, bilberry and heath grassland, and were almost entirely mapped from the lidar. The earth-covered building foundations that were mapped from lidar, correspond near perfectly to a 1916 sewage disposal plan of the camp (Fig 48), with only a handful of additional earthworks that probably correspond to buildings put in place after the plan was made. This plan located the position of all the camp buildings arranged into twenty blocks named 'A' to 'T' lines, each of which would have held a battalion of men. Of nearly 1,300 buildings illustrated on the 1916 map, the aerial investigation and mapping identified surviving footings of nearly 550, though often fragmentary or incomplete. The locations of buildings were indicated by rectangular embanked footings. Some are constructed into the natural slope, with the entrance to the hut on level ground, and the hut built up on foundations to the rear to create a level platform. The general layout of the camps was seen in arrangements of a large number of concrete channels sloping downhill on each side of Chase Road. These channels were constructed on either side of rows of up to ten huts, in order to drain rain water to Oldacre Brook. The earthworks of the camp stretch from the very edge of Brocton village to Anson's Bank, denoting that much the camp plan survives intact.

Following the demolition of the camp, most of the area appears to have been left to regenerate as heathland and scrub woodland. A rapid walkover survey of the Tar Hill area, conducted as part of an introduction to lidar for the volunteers at the beginning of the project, revealed that following disuse a single tree was deliberately planted in the centre of each hut foundation, indicating that some of this woodland was the result of a replanting scheme (Fig 49). The parts of the camp constructed within the historical boundary of Brocton Coppice were also returned to deciduous woodland, alongside the last vestiges of ancient woodland that survives there.

The remainder of the camp foundations remained largely untouched until the Second World War, when Brocton Field and Sherbrook Banks became the focus for armoured vehicle tests. Vertical aerial photographs from the 1940s clearly show the extensive damage ('tank tracks') wrought by these vehicles (Fig 50). The tracks directly correspond with gaps in the camp remains, illustrating the destructive nature of the vehicle tests. Sand and gravel extraction to the south of Brocton also expanded during the war, destroying part of 'E' and most of 'F' and 'G' lines.

The northern part of Brocton Camp was turned over to a Prisoner of War camp in 1917. The camp was divided into two halves, divided by Hollywood Slade and the Milford to Brocton Camp railway. Most of the features mapped for this area were originally built for the army camp, but some of the post-1917 alterations were also identified. This includes much of the perimeter earthworks and part of the sub-divisions separating 'A', 'B' and 'C' lines as depicted on a 1917 dated plan of the eastern half of the camp ('A' to 'D' lines). There is no known plan of the western

half of the POW camp ('E' and 'F' lines), but the lidar revealed a linear ditch which probably denotes part of the line of the perimeter fence.

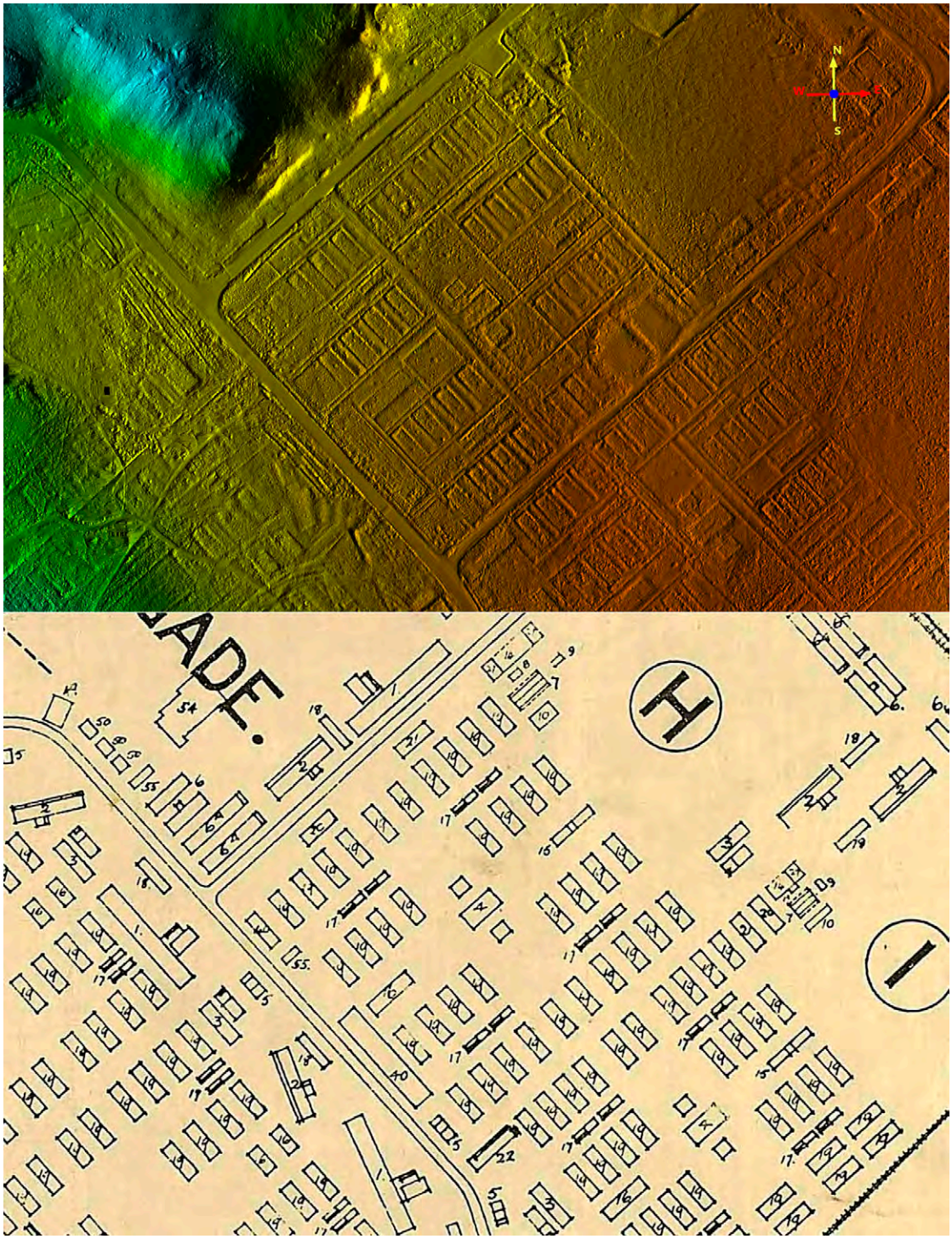

Fig 48: The footings of Brocton Camp 'H' Lines are covered with a mixture of grass, heather and scrub woodland. The lidar illustrates that the layout of the surviving foundations matches the 1916 dated plan of the camp. North is to the top of the image. Lidar DTM 04-MAY-2016 © Historic England; source Staffordshire County Council/Fugro BV Geospatial; 'Plan of Sewers and sewage disposal works at Brocton Camp' 1916 © Staffordshire Record Office (D615/M/6/21).

Fig 49: Trees were often deliberately planted within the centre of the hut foundations in order to help mask the building foundations © Historic England.

Fig 50: The destructive nature of Second World War armoured vehicle testing on the Chase is all too apparent from the period photography. Amongst the sinuous lines of the tank tracks are the linear remains of the demolished Brocton Camp. RAF/CPE/UK/2469 RS 4389 09-MAR-1948 Historic England Archive (RAF Photography).

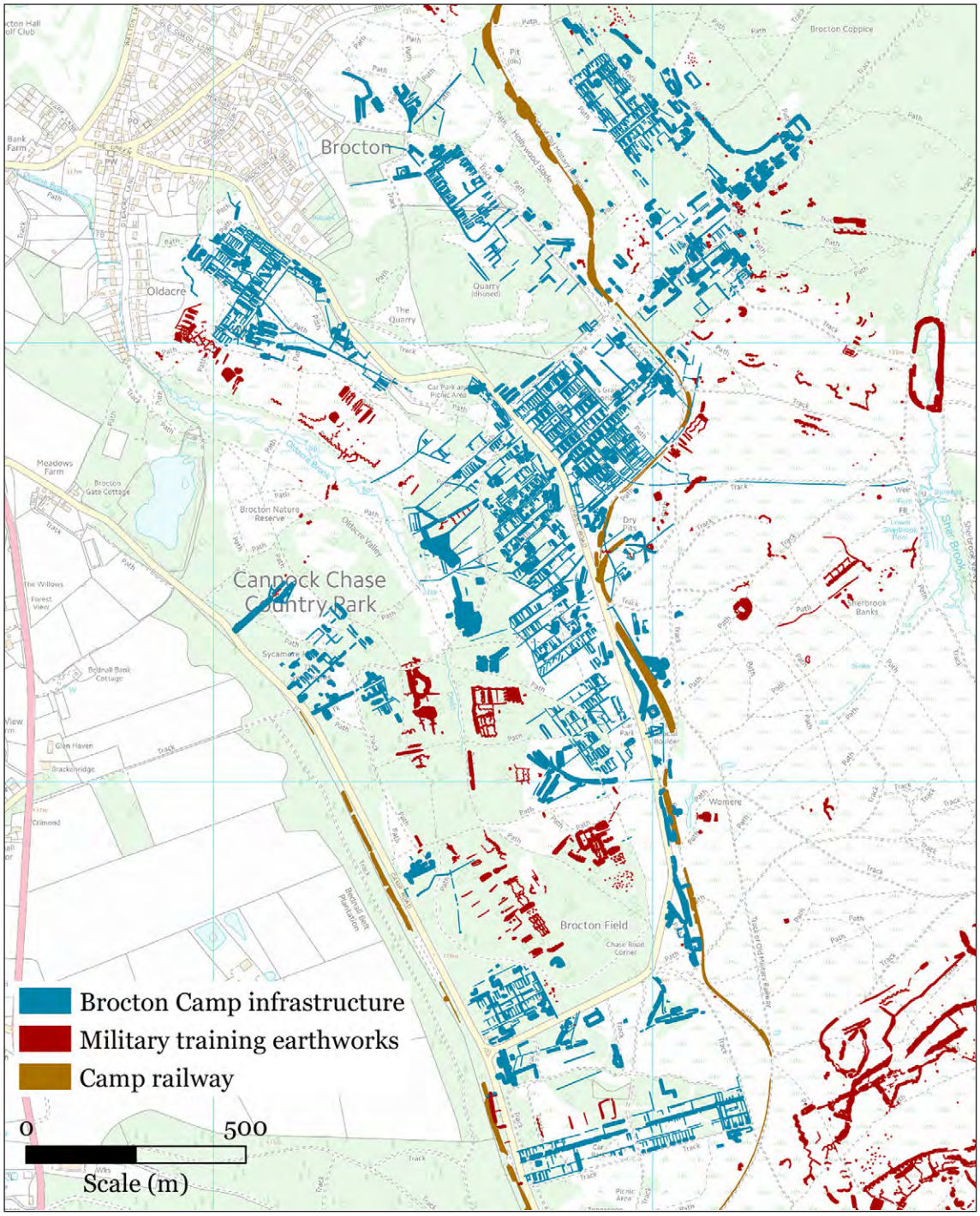

Fig 51: The remains of Brocton Camp include hut foundations, drains and roads (highlighted in blue). These are surrounded by extensive training earthworks (in red). 'A' to 'T' refer to the camp lines, as denoted on the 1916 plan. Archaeological map © Historic England; Base map © Crown Copyright and database right 2018. All rights reserved. Ordnance Survey Licence number 100019088.

Rugeley Camp was constructed over a kilometre to the south-east of Brocton, and to quite different specifications (Fig 52). A 1918 camp plan shows Rugeley as also having 20 blocks of huts, each one associated with its each own parade ground (SRO D4796/1). Most of the plan of the camp is better preserved than at Brocton, largely defined by earthwork remains of a dense network of drains dividing rows of huts. Once more, the mapped features are an accurate reflection of the 1918 plan, although there are almost no visible remains of Parade grounds 17 to 20. However, there are far fewer foundations of buildings visible at Rugeley, with only a little over 200 mapped out of over 1,100 illustrated on the 1918 plan, and almost all of these are located in the north of the camp.

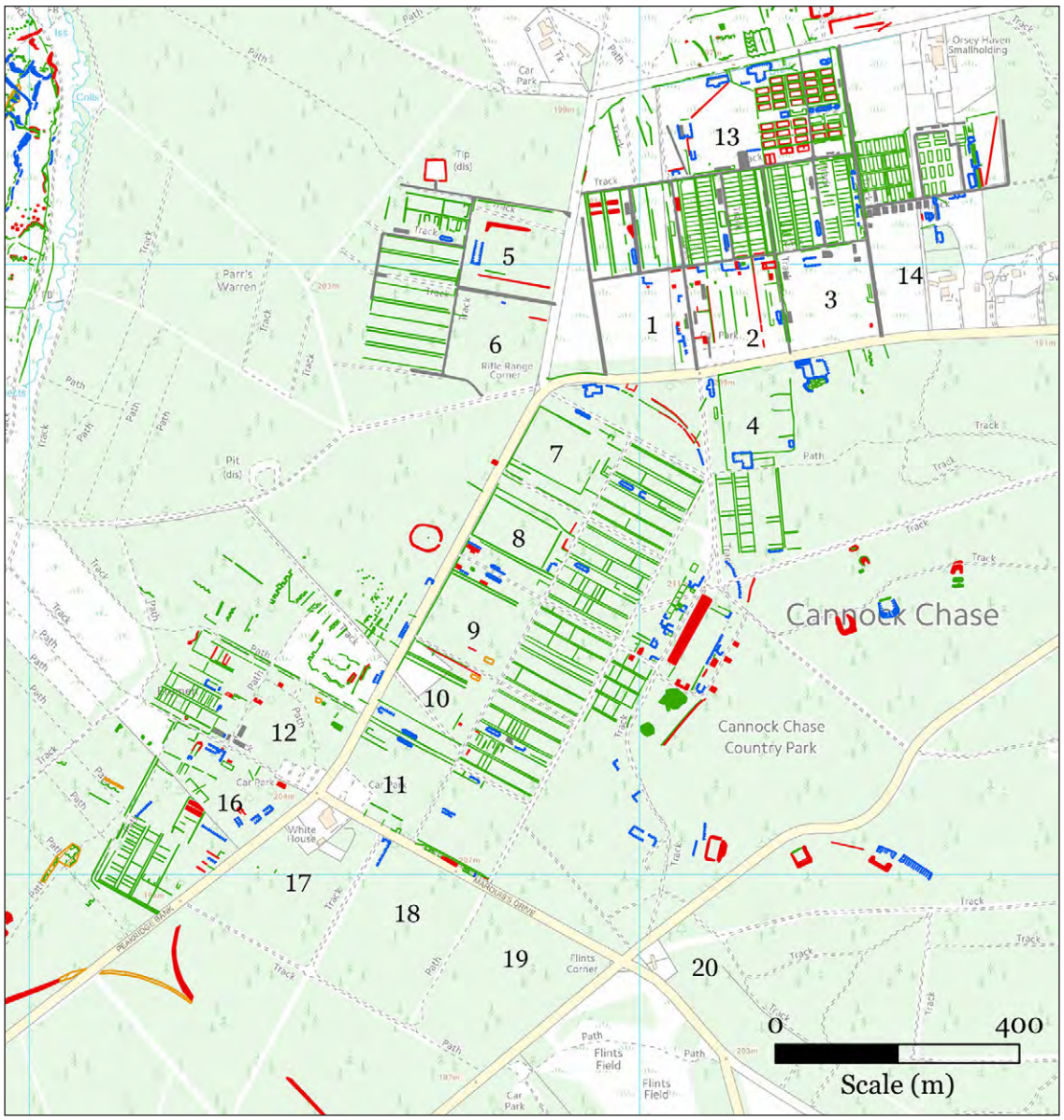

Fig 52: Rugeley Camp mostly lies beneath forestry plantation, which has had a very detrimental effect on the survival of the earthworks. The Parade ground numbers (1-20) indicate the camp divisions, equivalent to Brocton's Camp Lines. Archaeological mapping © Historic England; Base map © Crown Copyright and database right 2018. All rights reserved. Ordnance Survey Licence number 100019088.

The main reason for this difference in condition appears to be the result of tree planting regimes. This entire area was given over to the Forestry Commission in the 1920s. The preparation of ground for an evergreen plantation can be very intrusive and detrimental to archaeological remains. The remains of most of Rugeley Camp are located within densely planted evergreen forest, which resulted in the very fragmentary and sparse survival of features there. Dense plantation can also dramatically limit the return of the lidar, but in this case the lidar results were exceptionally good, suggesting that the survival of archaeological features within this woodland is truly poor. The northern part of the camp is largely under a mix of scrub, deciduous woodland and open heath, which has resulted in much better survival of archaeological earthworks (Fig 53). Similarly, the camp roads are also best defined in the north, those in the south being mutilated or reused as forestry tracks. Three of the camp 'destructors', which were effectively waste incinerators, are also visible as earthworks, defined by large curvilinear and rectilinear embanked enclosures, identified from the 1918 plan.

Fig 53: The northern part of Rugeley Camp escaped most of the forestry damage, and the foundations remained visible for decades after its initial demolition. Composite RAF/542/98 V 305-306 15-DEC-1954 Historic England Archive (RAF Photography).

The railway network that served the two camps is remarkably well preserved as earthworks (MST22944), largely because much of it has remained in use as footpaths or vehicle tracks. The remains include a 390m long and 25m-wide cutting through Broc Hill, a raised and metalled embankment extending along Hollywood Slade, and a the winding sinuous ditched defined track. The impressions left by removed railway sleepers are still visible south of the Katyn Memorial (Fig 54). The earthworks of the railway can be traced for over seven kilometres, from the edge of Milford to Brindley Heath Road, with several forks that extended to other areas within the two camps.

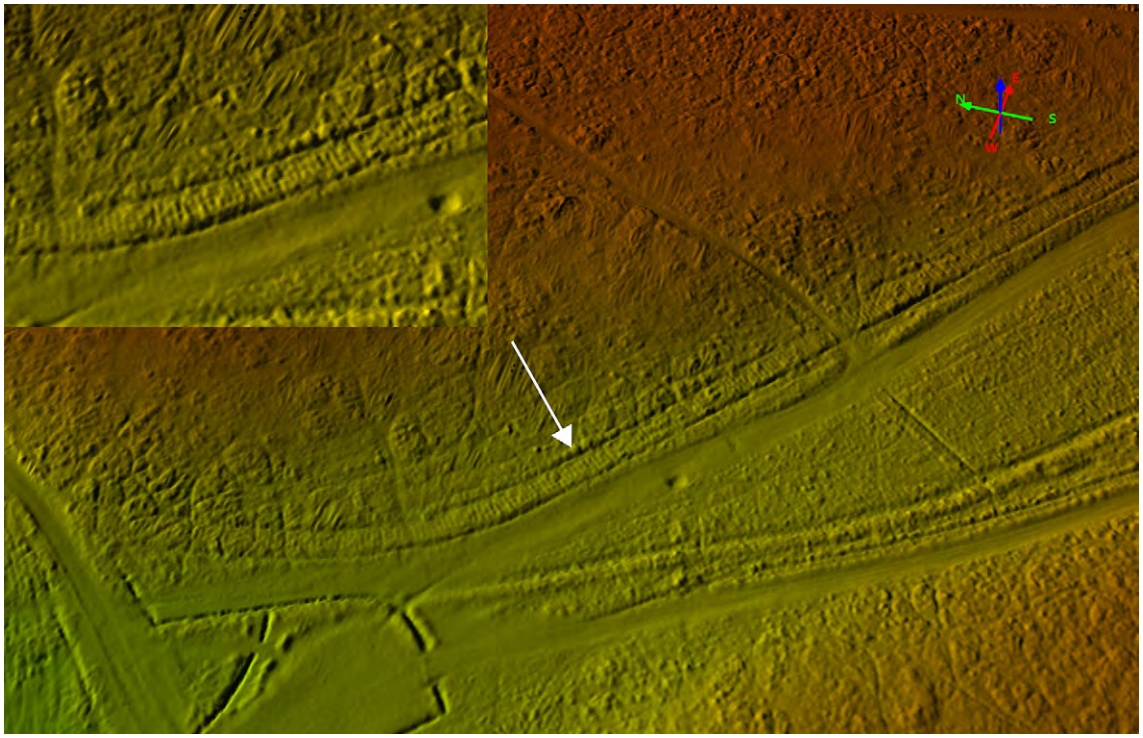

Fig 54: The indentations of the railway sleepers still survive as earthworks. Lidar DTM 04-MAY-2016 © Historic England; source Staffordshire County Council/Fugro BV Geospatial.

Firing Ranges

A number of firing ranges were identified all constructed during the First World War as part of the training facility on the Chase (Pearce 2017) (MST18878, MST12296, MST12295; Fig 55). Five of these, ranges 'B' to 'F', were designed for .303 calibre weaponry, and measured between 100 and 600 yards (91m and 549m) in length, with yard markers at every 100 yards (Whitehouse and Whitehouse 1996, 18). They are located in a cluster between Pepper Slade/Kingsley Wood Road and Wolseley Plain. Ranges 'A', 'G' and 'H' were much smaller, with the target butts cut into a natural slope, and were either '30 yard' ranges (see below) or were for small calibre arms.

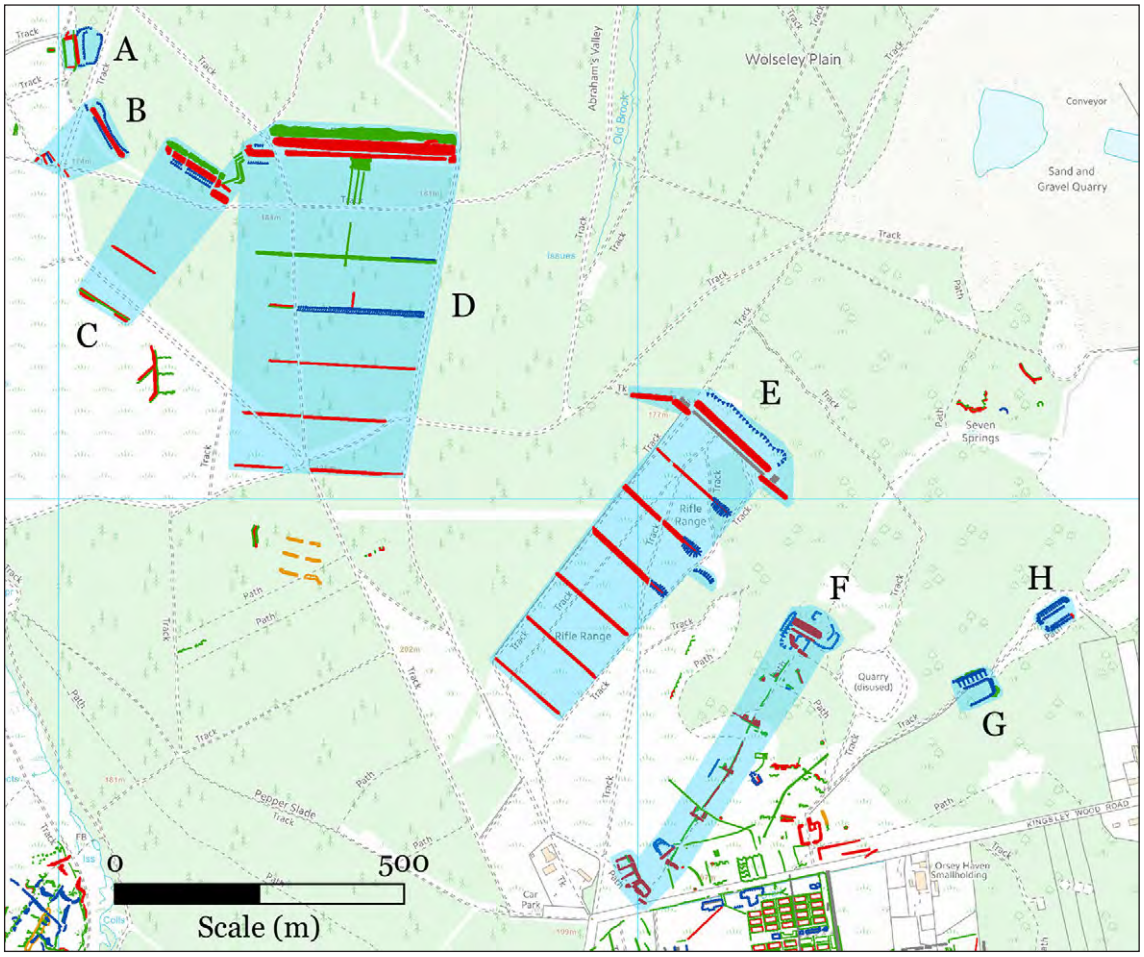

Fig 55: Firing ranges 'A' to 'H' were all located north of Rugeley Camp, but would have been used to train troops from both camps. Archaeological mapping © Historic England; Base map © Crown Copyright and database right 2018. All rights reserved. Ordnance Survey Licence number 100019088.

Overall, the firing range earthworks are remarkably intact, although most are masked by dense tree cover and are more easily seen on the lidar images. Most of the butts and yard markers comprise linear earthwork banks and ditches, and there are numerous, more ephemeral, associated earthworks. The ranges were concentrated to the north of Rugeley Camp, with the 600 yard marker of range 'F' located immediately adjacent to the camp, but would have been used by troops from both camps. They were orientated to concentrate the rifle fire north and north-east. Range 'A' was the exception, where the targets were set into the slope and firing was directed to the east. It would appear that all the ranges, bar 'F', went out of use after the war, as the butts to 'C', 'D' and 'E' ranges were all marked as 'old' on the 1923 Ordnance Survey map, but 'F' was marked as an active 'Rifle Range' and the yards markers were illustrated.

At some point shortly afterwards, probably during the Second World War, range 'E' was reinstated and 'F' went out of use, probably because 'E' was considerably wider and had the capacity for more rifles. Vertical aerial photographs taken in

1946 show that the butt for range 'E' was originally longer (Pearce 2017); it is this earlier elongated form that has been mapped by the project. It was presumably remodelled at some point after the Second World War as it continued in use into at least the 1990s. This latter phase of the butt is still marked on modern Ordnance Survey maps and remains extant as a highly visible large gravel structure. A group of buildings and probable tent bases to the immediate south of range 'E' were mapped from the 1940s photography. The buildings appear to have served the firing range, but were probably only constructed during the Second World War, as they are not marked on the 1918 Rugeley Camp plan, nor are they illustrated on the 1923 Ordnance Survey Map, when range 'F' and an associated building are shown. These buildings were extant until at least 1967 according to the Ordnance Survey, but are no longer visible.

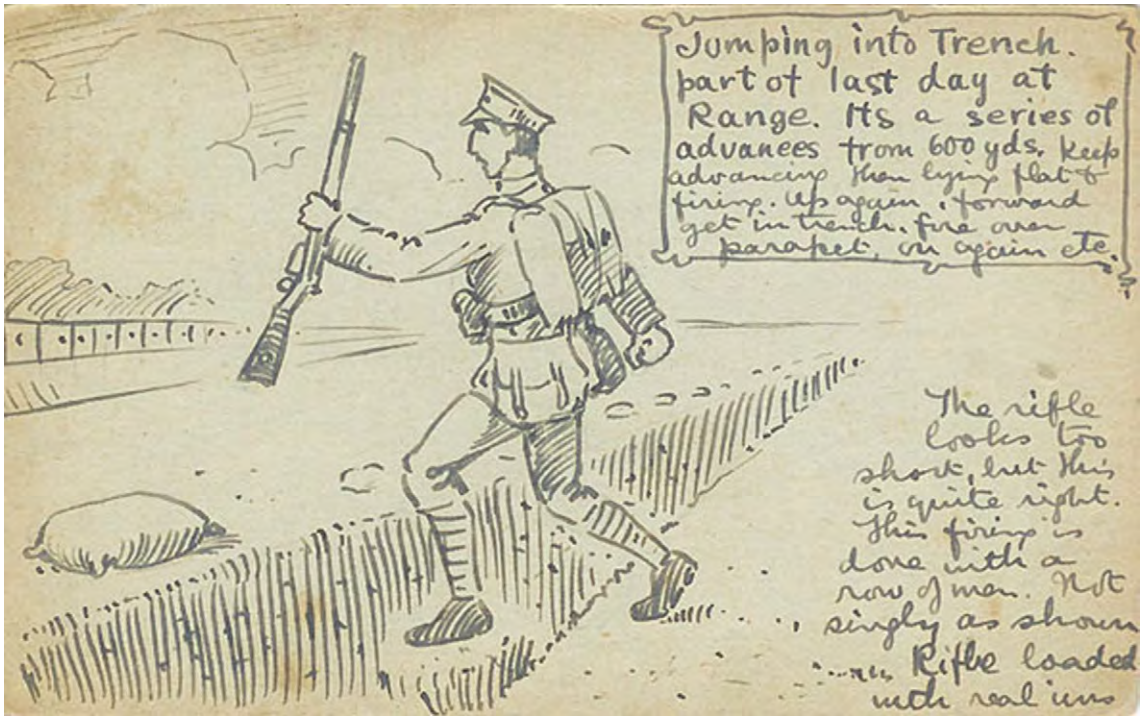

Fig 56: Erskine Williams's depiction of practice advances on one of the Cannock Chase firing ranges © Daphne Jones, reproduced by kind permission of Daphne and Nicholas Jones.

The ranges were not just used for stationary target practice; they were also used for advancing and firing exercises. Erskine Williams described how the troops would conduct a '...series of advances from 600 yds, keep advancing then lying flat and firing. Up again, forward, get in trench, Fire over parapet. Up again etc' (Jones 1992, 11) (Fig 56). Whether live-firing exercises were also conducted in the practice trenches on Cannock Chase is uncertain, though the War Office (1910, 24) suggested that live-firing could also take part on field practice ranges with the use of temporary targets.

Both camps had a series of short indoor ranges, designed for lower velocity rounds such as the .22, which were identified from the camp plans, but it is also likely

that a number of outdoor 30 yard ranges were constructed. The 1910 musketry regulations stated that such ranges 'should be constructed at all stations where there are sufficient troops to justify the expenditure', in order to train the more 'indifferent shots' (ibid, 19). A number of candidates for these ranges were identified on the lidar, including ranges 'A', 'G' and 'H' mentioned above. These ranges, and the examples discussed below, are defined by a rectangular platform cut into a natural slope, with the rear bank acting as the potential butt. A First World War postcard shows soldiers using one of these short ranges on Cannock Chase (Fig 57).

Fig 57: This 30 yard rifle range on Cannock Chase was probably one of several. © Andrew Jackson, reproduced by kind permission of Andrew Jackson and Gilbert Parkinson.[8]

Ranges 'G' and 'H' were identified by the Northamptonshire Archaeology survey (Yates 2006), though they are both marked as disused gravel pits on the 1958 Ordnance Survey map. They were assessed on the ground as part of this project, which identified spoil-heaps supporting the suggestion that they were reused for extraction.

Two rectilinear depressions to the north of a track leading west from Rifle Range Corner are also possible candidates for 30 yard ranges, though again gravel extraction has also taken place here (MST22822). A further six rectangular depressions were mapped between Rugeley Camp and Fairoak Lodge, north-east of Flints Corner, again all cut into the natural slope (MST3140). Set slightly further away and closer to Brocton Camp, another small rectangular platform was cut into a slope on Sherbrook Banks (Fig 58). The complex nature of the training that was occurring on the Chase at this time leaves the interpretation of these earthworks somewhat tentative, as they are unlikely to all be 30 yard ranges.

Fig 58: A possible 30 yard firing range on Sherbrook Banks, September 2016 © Historic England.

Training areas

The lidar was crucial in the identification of vast networks of earthworks linked to training around the two camps (*see* Fig 51). These earthworks were not included on camp plans or later maps, and only rarely appear on contemporary postcards. Fragments of practice trenches surviving as earthworks in the upper Sherbook Valley, east of Anson's Bank, were first formally identified through the walkover survey conducted by Northamptonshire Archaeology (Yates 2006). The use of lidar has allowed this project to build on this, stripping away the heather, grass and scrub woodland to reveal a vast network of earthworks stretching across the entire landscape in and around the camps. These comprise isolated practice trenches, assault courses, weapons pits and dummy craters, redoubts and an extensive 'battlefield' comprising opposing lines of full-scale trenches.

During the project, it was not possible to identify the reason and use for every set of earthworks. Many were probably dug to give instruction on the methods of trench construction, whereas others had a more active role in physical or battle training. Documentary evidence showed that some were arrayed with barbed wire and straw-filled dummies for bayonet practice, whilst others were used for manoeuvres, practising techniques in defence or attack. Many were perhaps more specialist, relating to specific units such as the engineers, machine gun squads, or artillery units. Most of these field-works are located in and around Brocton Camp. The most common type was a linear array of trenches for physical training. These consist of parallel rows of (usually small-scale) trenches, some straight, others with traverses

set at regular intervals. Some are linked with communication trenches, whilst others have hand dug 'shell-holes' to represent a miniature battlefield scenario. These assault courses would probably have included barbed wire, dummies and other obstacles. Although clearly seen on the lidar, the earthworks are very shallow when viewed on the ground, though whether they were ever constructed to a full depth or not is discussed below.

The training earthworks occur in groups, with the best preserved along Brocton Field and Oldacre Valley (incorporated in MST5865), on the downward slopes below the camp huts. Each assault course probably belonged to the adjacent section of camp, namely 'J', 'K', 'N' and 'I' lines. The courses between 'R' and 'O' lines measure up to 270 metres in length and comprise a series of slit trenches, whereas a small group immediately south of 'O' lines is only 80 metres in length and comprises a dense network of traversed trenches, parapets and shell-holes (Fig 59). This is pattern known as a 'Nursery Labyrinth'. An oval array of enclosed traversed trench, with up-cast parapet and parados (a rear parapet) to the east of 'S' lines was probably constructed as a 'closed group of fire trenches' or a 'low command redoubt' (Bull 2015, 36-38). These were a particularly strong point, and a common feature of trench warfare on the Western Front. No assault courses were identified in the northern area of Brocton Camp ('A' to 'G' lines), though there are isolated segments of practice trench along Coppice Hill, on both sides of Sher Brook, as far as Cherrywood Slade.

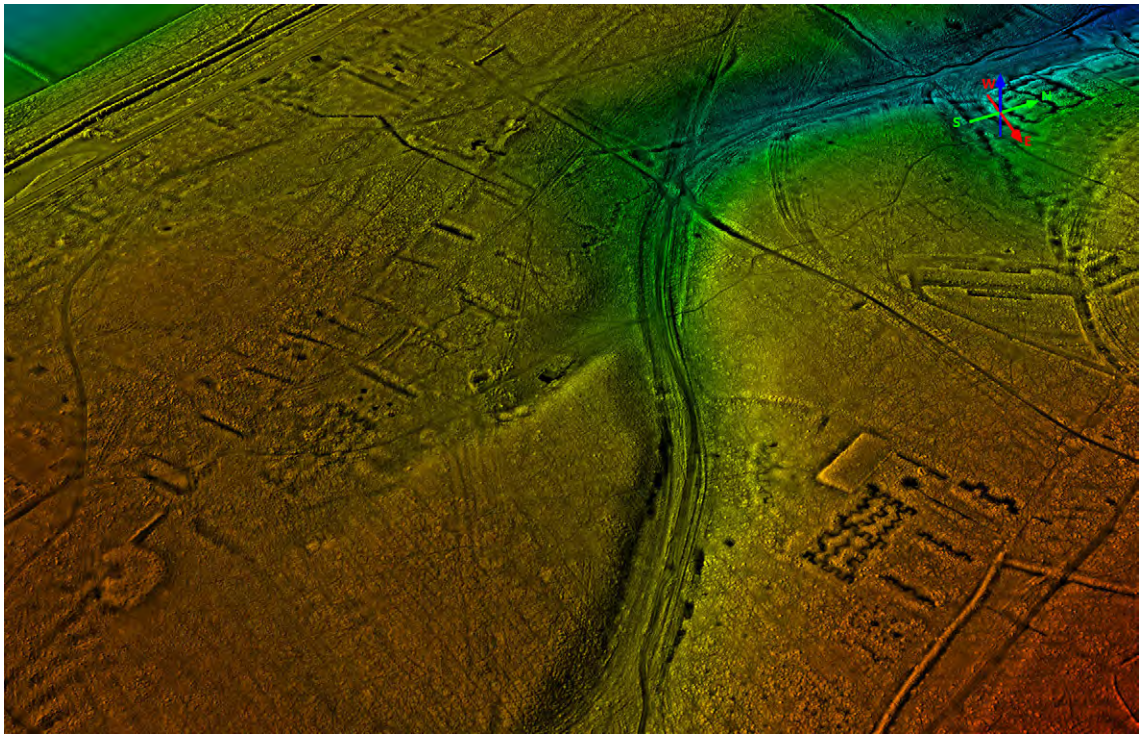

Fig 59: Assault courses adjacent to 'R' and 'O' Lines were used for bayonet practice. Dummies were moved around the courses, some on gallows, some in the trenches and others in the mock 'craters'. Lidar DTM 04-MAY-2016 © Historic England; source Staffordshire County Council/Fugro BV Geospatial.

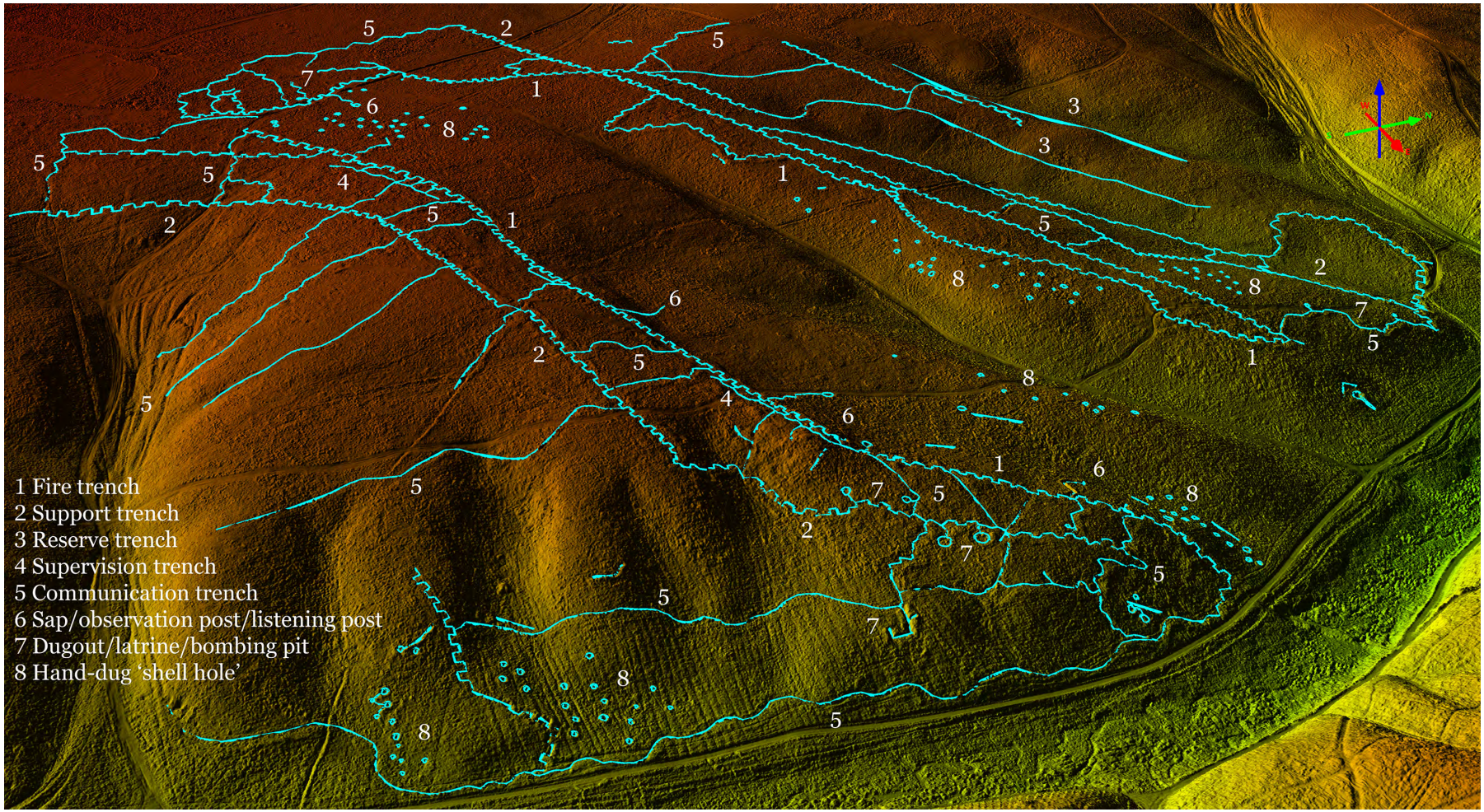

Fig 60: The battlefield scenario in the Sher Brook Valley comprised two opposing lines of trenches stretching over an area of 43 hectares. This depiction is partly schematic, in that although all the trench lines are visible as denuded earthworks, not all of the individual traverses remain visible. The digital elevation model has a height exaggeration of x2. Lidar DTM 04-MAY-2016 © Historic England; source Staffordshire County Council/Fugro BV Geospatial.

Less extensive but similar training earthworks were mapped adjacent to Rugeley Camp. These are located north of Kingsley Wood Road, adjacent to the camp area of No. 13 Parade ground, and north of the White House adjacent to 10 Parade ground and 12 Parade ground. These earthworks are far more fragmentary than those at Brocton, which is probably largely due to the damaging nature of the forestry plantation here. Other practice earthworks at Rugeley Camp include the scheduled trench model south of 3 Parade ground, and some isolated practice trenches north of Brindley Bottom.

The most extensive trench systems are in the Sherbrook Valley (MST18874; Fig 60). First identified by Northamptonshire Archaeology during their walkover survey, the use of lidar and historical vertical photography has revealed most of the network of trenches. The earthworks are located between Anson's Bank and the Sher Brook, and comprise nearly 43ha of practice trenches arranged in two opposing fronts on either side of a dry valley, the southern-most having all the recognisable elements of a 'text-book' First World trench system. This includes a front line or fire trench, comprising trenches with traverses creating fire bays set between five and eight metres apart. An earthwork parapet is cast up in front of the trench, and in places a parados. We would expect a trench like this to contain a fire step, allowing troops to fire from the trench in a defensive role, but the earthwork survival is too poor to see this level of detail. In an attack, the front line would house the first wave of advancing troops. A series of narrow and fragmentary ditches form the supervision trench immediately to the rear, which allowed troops to move effectively along the front line without interfering with the troops firing from the front line.

The support trenches are approximately 40m behind the front line, still on the crest of the slope, and comprise the same traversed-trench layout. A support trench could either act as a secondary line of defence or, in an attack, would house the second wave of troops who would advance and pass through the first wave and move on to the second objective. These two lines are connected by a series of sinuous communication trenches, designed to allow the troops to move between lines at relative speed, and to allow the passage of stretcher bearers in battlefield conditions. The network of communication trenches continues to extend to the rear, down the slope and out of the view of the enemy positions. Here they join reserve trenches, some of which have traverses and others which are effectively just broad ditches. This line would house the remainder of the companies held in reserve, who would advance to mop up the taken objectives and to relieve the attacking units.

Numerous short lengths of trench extending from the front line into 'no man's land' probably represent saps: observation or listening posts. Others extend from the communication and support trenches, and were probably dugouts for officers, medical staff, or latrines. In order to simulate the complete battlefield effect, dozens of 'shell-holes' were also dug in no man's land, visible as shallow pits on the lidar.

The scale of these trenches emphasises their importance. They would have been used for training soldiers from the camps, and perhaps for soldiers stationed off the Chase. There is some documentary evidence of their use. William Elmhirst, an officer in the 9th Battalion East Yorkshire Regiment wrote from Rugeley in February 1916 that

the '...trenches we propose spending 48 hours in, aren't half finished yet, no dugouts of any sort' (Elmhirst 2011, 110). It seems most likely that he was referring to this area of practice trenches, as they were the most extensive on the Chase, and probably the only ones constructed to such an extent they could hold a large number of troops for 48 hours. The wording of the letter suggests that another unit was preparing the trenches, though whether these were engineers, pioneers or another infantry unit is uncertain.

The diary of Alick Trafford (National Library of Zealand 2003-171-17/1), who was stationed on the Chase with the New Zealand Rifle Brigade, describes in detail in November 1917 how a trench-to-trench attack was to be carried out by a platoon, including times and objectives. The sketch he included in the diary, maps out the two opposing sets of trenches alongside a '3rd class road', with first and second objectives marked. There is little doubt that the area of trench shown in the sketch relates to the eastern area of the 'battlefield' earthworks. The road on the sketch is the track that still runs alongside the brook, as there is no other area on the Chase that contained trenches dug on such a massive scale.

It is unsurprising that these opposing sets of practice trenches were being used for full-scale battle manoeuvres. It is also possible that they were used for live firing exercises, and Erskine Williams illustrated live grenade throwing practice taking place from the front corner of a trench traverse (Jones 1992, 12). However, it is not clear if this took place within the training trench lines or at a specially constructed bombing range.

Both sets of trenches, on either side of the valley, were clearly well constructed and laid out, and can be traced as subtle earthworks using historical air photographs and lidar. However, most appear to have been back-filled, losing much of the detail and definition of the individual traverses. The survival and quality of the earthworks varies across the battlefield. The fact that full-scale attack manoeuvres were taking place and that soldiers could spend up to two days in the trenches suggests that at least part of the trench system was constructed to full-scale. Whether they were constructed to full-depth is another matter. The presence of a broad embanked parapet and parados along the front and second lines suggests that these trenches probably were quite deep, and may have billeted a platoon or more of men for two days or more. When examined on the ground, some of the best preserved trench earthworks are located in the south-east corner of the complex, probably forming the reserve line of the southern trench system. These earthworks are very crisp and display little evidence of having been back-filled, but are extremely shallow. They comprise a very shallow flat-bottomed trench with only a small parapet cast up to the north (see *'Case Study 1'* in the *'Working With The Volunteers'* section; Figs 10-12; *see also* Fig 61). Perhaps, being a reserve trench, these were never constructed to full depth.

Fig 61: The trenches in the south-east of the 'battlefield' complex are some of the best preserved, and were used for analytical survey training for some of the Chase Through Time project volunteers. March 2017 © Historic England.

Most of the trenches were presumably deliberately back-filled, either during the latter months of the war or immediately afterwards, perhaps as they were felt to pose a threat to grazing livestock on the Chase. The back-filled trenches in the north of the 'battlefield' complex have been recut by later trenches suggesting that some were filled in during the war. Erosion seems to have affected the earthworks, as the definition of the trenches on 1940s and 1950s vertical photographs, though still somewhat denuded, was clearer than they appear today on the lidar.

Practice trenches are often described as being a quarter, third or a half scale of those that were dug in the active theatre of war, but the guidelines to trench construction actually vary greatly. For example, the 1914 *Manual of Field Engineering* suggests that distances between traverses could measure between approximately 10ft (3m) and 40ft (12.2m) (Bull 2015, 30), whereas the 1916 *Notes for Infantry Officers on Trench Warfare* suggests that the length of a bay should be between 18ft (5.5m) and 30ft (9m) (War Office 1916, 21). Surviving examples from Beaumont-Hamel

on the Somme measure approximately six and seven metres between bays, whereas at the reconstructed trenches in Sanctuary Wood in the Ypres Salient the traverses can be under 4m long, and those at Vimy were up to 10m long. Of those mapped on Cannock Chase, most range between 3m and 8m in width. The narrower traverses are more common on the assault courses, which were miniaturised versions of the battlefield arrayed with obstacles for physical training. The wider traverses are found in the isolated sections of practice trench and on the battlefield scenario of the Sherbrook Valley. The latter can probably be interpreted as full-scale, at least in plan, but as discussed above, were not necessarily dug to a full-scale depth. Whether they were constructed to full-scale or not, probably depended on the training purpose of the earthwork.

The camps were set up entirely for the training of soldiers for battle readiness, and these earthworks would have formed the focus of much of this training. Alick Trafford's diary outlines the training routines the soldiers would undergo. During an eight-week course, out of 288 hours put aside for training, 42 hours would be spent in bayonet and physical training, 67 hours in musketry and 48 in field training, as well as many more hours in other specialist subjects. This, and Erskine Williams' account of his time on the Chase, emphasise the importance of these earthworks, and illustrate how the bulk of the soldier's time whilst stationed here would have been spent using them in one way or another.

The inter-war legacy

With the cessation of hostilities in 1918, the fate of the camps was sealed. The Prisoner of War camp continued in use, becoming a staging post for the repatriation of German soldiers by late 1919. The auctioning of the huts and material goods of the late POW camp continued through until 1923 (Holt 2015, 34-6). On the demolition of the camp, one surprising discovery was an escape tunnel, which remained open and viewable to passers-by for some years afterwards (Whitehouse and Whitehouse 1996, 10).

The remainder of Brocton and most of Rugeley Camp eventually succumbed to the same fate. The huts were demolished and auctioned and the foundations largely left to nature. The Forestry Commission established large areas of plantation on the site of Rugeley Camp in the 1920s, and the area of Brocton Camp was partly replanted with scrub woodland or left to return to moor and heathland. Some parts of Rugeley Camp remained in use for a short period after the war, and the huts associated with firing range 'E' were intact until the 1960s. Brindley Heath hospital (MST18877) remained in use by the Ministry of Pensions until 1924, after which much of the site was occupied by miners, becoming known as Brindley Village (Fig 62). The site was finally cleared in the 1950s (ibid, 20, 25, 27). The hospital buildings remained extant until the 1950s, and visible on 1940s vertical aerial photography, from which they were mapped.

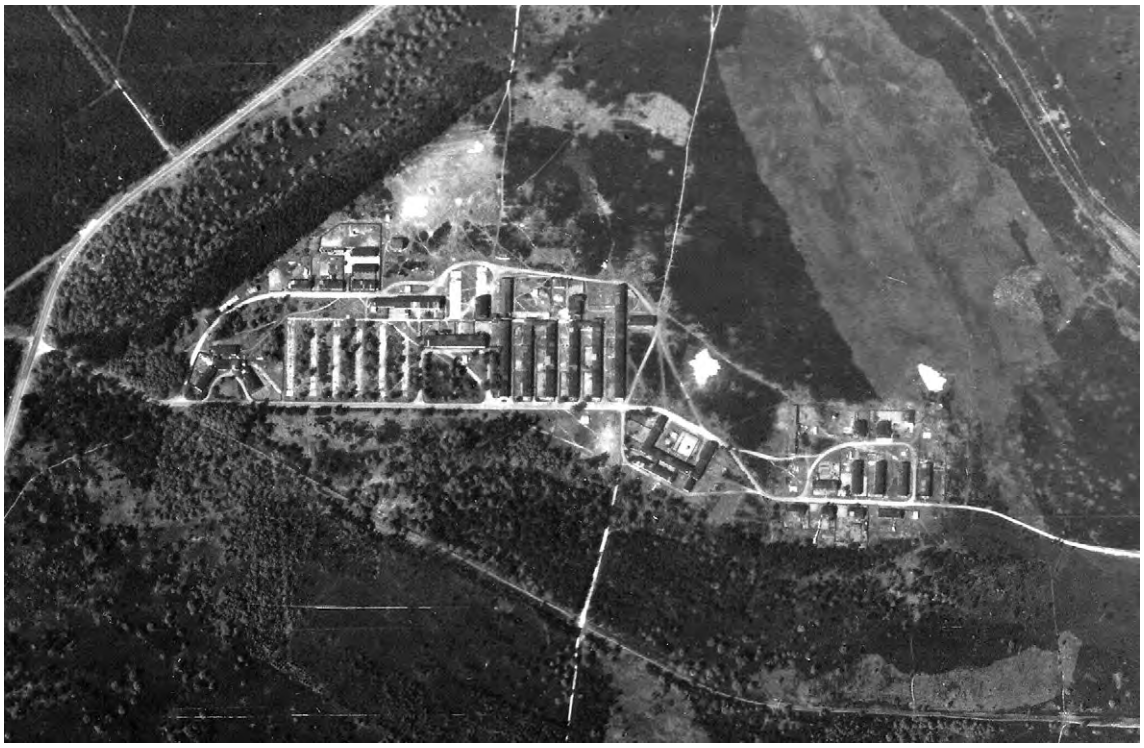

Fig 62: Brindley Heath hospital was opened in 1916, and remained in use by the Ministry of Pensions following the war, and was finally cleared in the 1950s. RAF/106G/UK/1483 RS 4265 09-MAY-1946 Historic England Archive (RAF Photography).

Rapid field investigation of several areas of the First World War landscape has established that although the demolition of the buildings was thorough, much of the basic infrastructure, such as hut foundations, drainage, sewage system and roadways were left to simply grass over. The earthwork training facilities are, for the most part, extremely shallow on the ground, often completely hidden by heather or grass. Whether these were also back-filled, as was the case in the Sherbrook Valley, is uncertain. Some earthworks however remain extant to a considerable height, such as the practice trench system west of 'O' lines.

The Second World War

The military return

Despite a twenty-year interlude, the relationship between the military and the Chase was not over, and the advent of another war in 1939 was to leave its own mark on the landscape. A number of small gravel pits that had been in existence since the 19th century were either reopened or extended in the inter-war or wartime period. The gravel that was taken from these large excavations was used to construct the runways of military airfields up and down the country (Whitehouse and Whitehouse 1996, 28).

A new camp, RAF Hednesford (MST5272), was established in 1939 (Fig 63), close to the south of Rugeley Camp, the foundations of which by then lay under forestry

plantation. The camp was sited along Marquis's Drive and was opened as No. 6 School of Technical Training. The camp also took in a large contingent of the Fleet Air Arm and included two small ancillary camps to the north-west, one of which was used to house members of the Women's Auxiliary Air Force (WAAF), and later may have held Italian Prisoners of War. As in 1914, the roads were in an appalling state, having been left to the elements after the Great War. 'Tackeroo' Road from Hednesford to the RAF camp was noted as being in a terrible state of repair in 1939, which presumably led to a concentrated effort of re-metalling and surfacing the main roads in the area that were in military use (Whitehouse 1999, 10).

A Prisoner of War camp was constructed at Flaxley Green (*see* Fig 34), which comprised one guard and six prisoner compounds (Thomas 2003, 20, 34), and another was within Teddesley Park, possibly within the house itself (Whitehouse and Whitehouse 1996, 11). A military hospital was established in Shugborough Park in 1943 for the US Army, which remained in use until 1948, again partly as a POW camp, before being returned to parkland (Fig 64). More destructive activity was also taking place. A small bombing range was established on Anson's Bank, and armoured vehicles manufactured in Stafford were tested on Brocton Field and Sherbrook Banks (Belcher 2007, 125). The Home Guard also trained on the Chase (ibid), harking back to the days of volunteer and militia training in the 19th century.

The nature of the Second World War was one of mobility. The static trench warfare of the Great War was left behind as a horrific memory. With that, the emphasis on training facilities also changed. There became less need for vast networks of trenches, and although physical training remained important, there was a shift in the use of the Chase towards more technical training. All new installations were constructed away from the footings of the First World War camps, which now had up to twenty years-worth of vegetation regrowth over them, the new training facilities were constructed elsewhere. The single largest impact was RAF Hednesford. Unlike the Great War camps that had gone before, the national coverage of vertical aerial photography from the 1940s captured the RAF station at the height of its use. The aerial photography, aided by camp plans dated 1944 and 1951 (Fig 63), clearly denotes the camp buildings, which can be separated into accommodation, dining halls and ablution blocks, by the shape of the camp buildings. The specialist buildings for technical training are also clearly visible on aerial photographs, as are the numerous embanked air-raid shelters, another sign of very different war.

Two small satellite camps are also visible, by Flint's Corner (MST5272, MST23048). The easternmost was the camp for the Women's Auxiliary Air Force (WAAF), though by 1951 this had gone out of military use and was inhabited by squatters, as denoted on the later plan of the camps. The post-war housing shortage provoked a wave of squatting across the country with squatters often occupying empty military buildings.

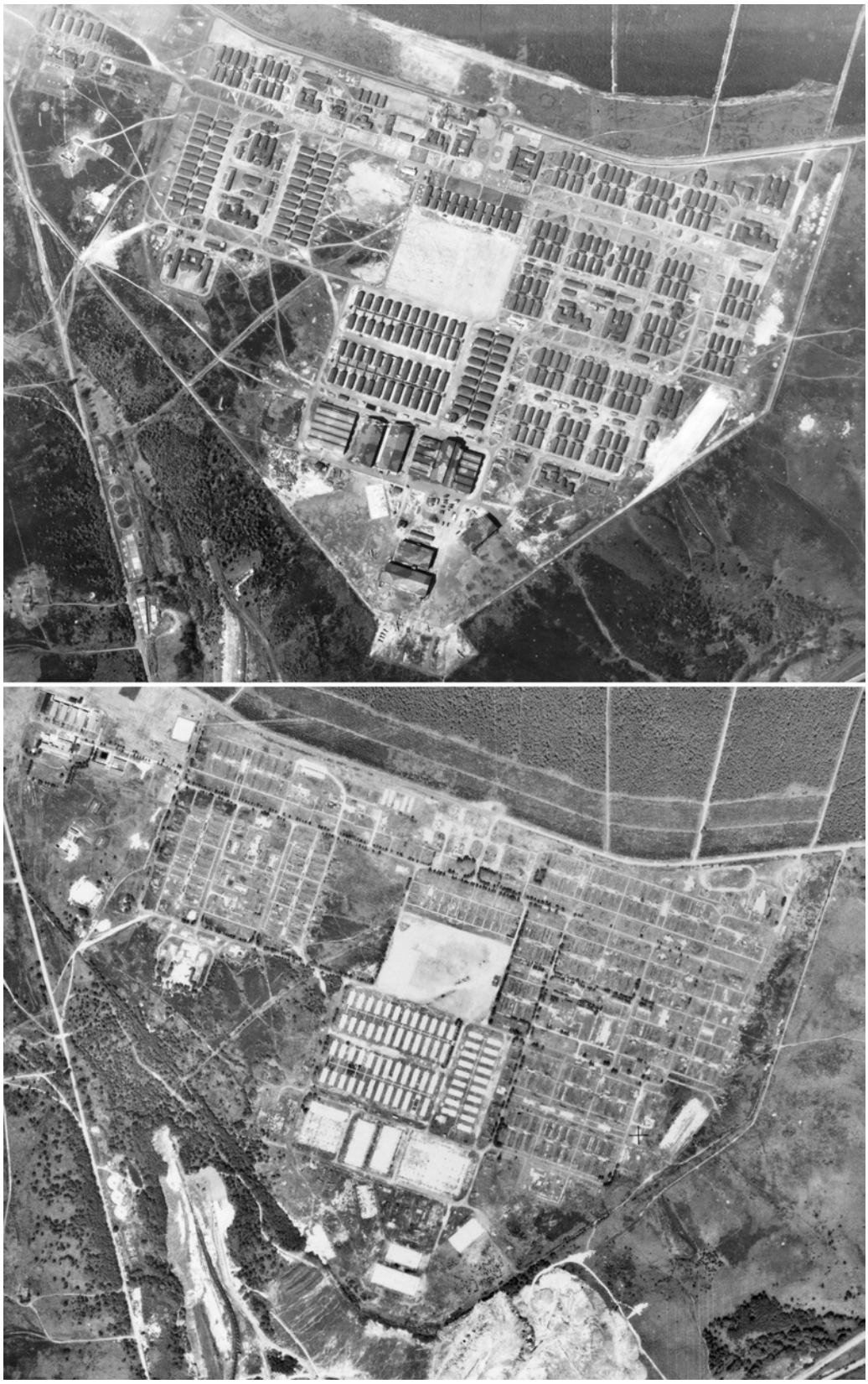

Fig 63: RAF Hednesford was established in 1939, closed in 1956 and auctioned off from 1959 onwards. By 1963 (lower photo) most of the site had been cleared. RAF/106G/UK/1483 RS 4263 09-MAY-1946; RAF/543/2336 V2 201 30-JUL-1963 Historic England Archive (RAF Photography).

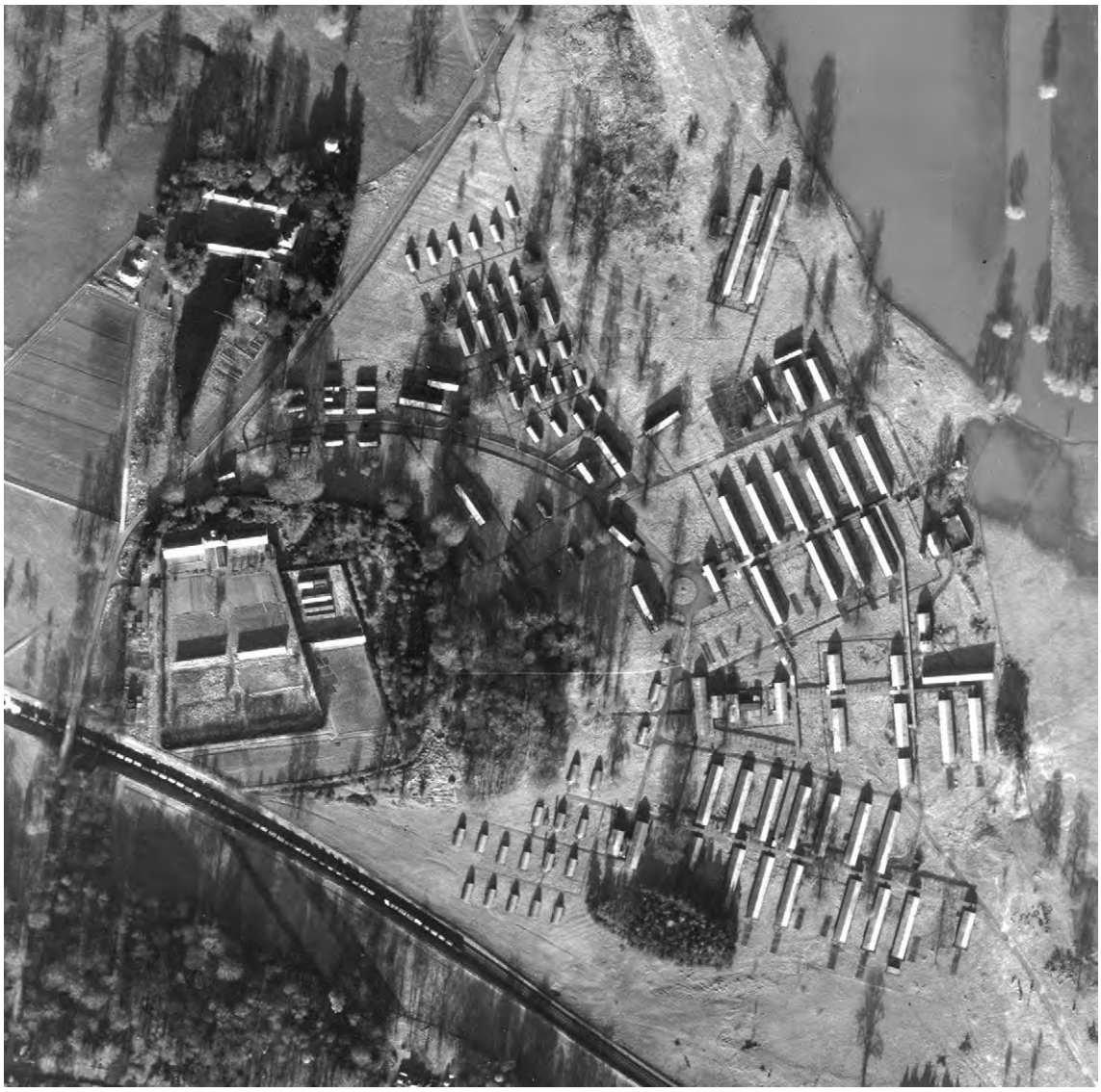

Fig 64: The military hospital in Shugborough Park. U.S. military installations of the Second World War are often distinguishable from their British counterparts by the layout. RAF/542/98 V 0168 15-DEC-1954 Historic England Archive (RAF Photography).

RAF Hednesford was converted from a Technical Training School to a basic training camp in 1950. Many conscripts to the RAF began their National Service on Cannock. Very few changes were identified on aerial photographs to reflect this change of use. The vertical photography coverage also allows a unique view of RAF Hednesford being demolished. An RAF image dated July 1963 shows only a handful of buildings remaining to the extreme west of the camp, where the Marquis Drive visitor centre is now located, the remainder having been levelled to its foundations. Following the demolition of the camp, the area was largely planted with mixed deciduous woodland, though many of the military roads remain intact today. Remarkably, the camp football pitches, which lay between the main camp and the WAAF buildings, remain distinctly visible as dark cropmarks in the grass.

The Prisoner of War camp at Flaxley Green (MST5274; *see* Fig 34) can also be clearly seen on historical vertical photography. The camp was extant on 1948 photography, and some demolition had started to take place as seen on 1953 aerial photographs. By 1963 the camp had been completely removed.

A number of pre-fabricated buildings were noted on the edge of Rawnsley on vertical and oblique aerial photography from 1946. These were not mapped as they fell outside the sphere of interest for this project, but they are worthy of mention because pre-fabrications were often erected either as a need to re-house victims of the blitz, or following the war to combat the national housing shortage. They were also often associated with the squatter movement of 1946 (Webber 2012, 129).

Fig 65: A Cromwell Tank being tested on Cannock Chase during the Second World War. BM-296 © Reproduced by kind permission of Bob Metcalfe.

Extensive tracks were mapped on Brocton Field and Sherbrook Banks. From 1939 the English Electric Company Ltd factory in Stafford began producing parts and assembling armoured vehicles. During the war, tanks such as the Covenanter, Centaur, Comet and the Cromwell were being rolled out of the factory and sent on to the Chase for testing (Fig 65).[9] This had a serious impact on the archaeological remains and this is recorded on aerial photographs. These show that the tracks left by the armoured vehicles levelled almost everything in their path (MST22879). These tracks are largely masked by vegetation now, but can still be seen in places on the lidar, some being used later as footpaths. In a number of instances the route of the tank tracks can be discerned by a rippling effect in the soft surface geology, visible along footpaths on the ground, but best defined on the lidar. This rippling was presumably caused by the rocking motion characteristic of heavy tracked-vehicles moving across uneven topography. Although the tank testing ceased at the end of the war, it nearly became a permanent feature. The Ministry of Supply requested that

the Chase become a permanent testing ground for tanks in 1947, and the War Office wanted to establish a permanent camp and small arms range there but neither were implemented (Hansard 1947b, Column 2076).

Fig 66: The remains of the bombing range target on Anson's Bank (MST22878), February 2017 © Historic England.

An RAF bombing range was located a short distance to the south of the tank training area, on Anson's Bank. This is recorded on 1940s vertical photographs and the circular target had internal cross-hairs, measuring 33m in diameter. The centre of the target is still visible on the ground (MST22878) as a bomb-damaged and weather-battered concrete and brick column (Fig 66). The outer ring, now mostly covered in vegetation, was made up of off-white broken pottery wasters, allowing the target to be seen from a great height. A bombing range arrow, located 575m to the south-west, shows the direction of the target. The arrow was visible on 1940s vertical photographs and a ground assessment revealed that the arrow appears to

now be covered by a thin layer of soil and vegetation, and was also constructed from pottery wasters. A number of small bomb craters are visible on historic photographs clustered around the target, and there is a track that extends between the arrow and the target. Much of these remain visible as shallow earthworks on the lidar. The legacy of the bombing range remains potentially poignant: in 2010 a 250 pound unexploded bomb was discovered on Anson's Bank (Express and Star 2010). The range remained in use after the war, and in 1947 a debate was raised in the House of Commons about the noise and vibration disturbance caused by the bombing. It was stated at the time that the maximum weight that could be exploded on the Chase at any was time was six pounds (Hansard 1947a, Column 288), a considerable decrease from wartime years.

Another substantial military installation was constructed in Shugborough Park in 1943. The 312th Station Hospital (MST3797) was built for the United States Army, to take 1000 beds (*see* Fig 63). It was taken over by the War Office in 1945 to become a war crimes hospital and POW camp, and was demolished in, or shortly after, 1948. As with most of the Second World War structures, the hospital was photographed from the air in the late 1940s. The camp had been mostly demolished by the 1960s, and all that remains today are some of the roads, used by the Shugborough Outdoor Education Centre.

The only other wartime features of note relate to civil defence. Numerous Second World War air-raid shelters were mapped from historic photographs, most of which were directly associated with schools. Those in the grounds of Redhill Junior School, Chadsmoor (MST22684) look like First World War practice trenches but were constructed as shelters. The shelters at West Hill School and Hill Top School in Hednesford have a 'V' plan defined by banks and ditches (MST22682). Emergency water supply tanks for fire fighting were also mapped at various locations across Cannock and Hednesford, including off Hardie Green (MST22686), Cannock Road (MST22687), Anglesey Street (MST23036), Station Road (MST23038), Hollies Park Road (MST22688) and Victoria Street (MST23037).

Post war

The end of the Second World War did not have quite the same effect as the Great War. There was no immediate rush to remove all vestiges of the military. RAF Hednesford continued in use as an RAF training school, becoming No. 11 School of Recruit Training in 1950, taking in regular and National Service recruits. The WAAF camp was occupied by squatters in the movement of 1946, a reaction to the national housing shortage, which saw ex-servicemen and their families occupy empty buildings. This was especially common on military sites that had recently gone out of use. The 'squatters' were actually paying a rent of five shillings a week, and were aided by the RAF personnel in the main camp to the south-east (Hinton 1988, 100; Hennessy 1993, 174; *Staffordshire Advertiser* 1946, 6). The main camp of Hednesford remained in operation until its closure in 1956. It was then used to house Hungarian refugees in the aftermath of the failed revolution. The War Department and County Police showed interest in purchasing parts of the site, but this came to nothing as the buildings started to be auctioned off in 1959 (Whitehouse 1999, 12,

14). In 1962, No. 81 Weekend Training Centre was established on what remained of the camp, after which it was gradually demolished.

The bombing range on Anson's Bank also remained in use. Complaints about the noise and vibration of the bombing made it as far as the House of Commons in 1947 (Hansard 1947a, Columns 287-288). A fire began on the heath surrounding the range in 1948, and took 50 fire fighters to extinguish (*Staffordshire Advertiser* 1948, 4).

Discussion and further work

Visibility on aerial sources

The visibility of features varies between lidar and aerial photographs, depending on the period of the archaeology. In the 1940s when the first aerial photographs were taken of the military areas, the First World War camps had been demolished and had returned largely back to heath or woodland. The evidence for Brocton Camp on these aerial photographs are regular pale lines of disturbed ground among the darker hues of the planted and encroaching vegetation. By the 1940s, most of Rugeley Camp was hidden from the air by a twenty-year-old tree plantation. Therefore, very little First World War activity was mapped from aerial photographs, but there were some exceptions.

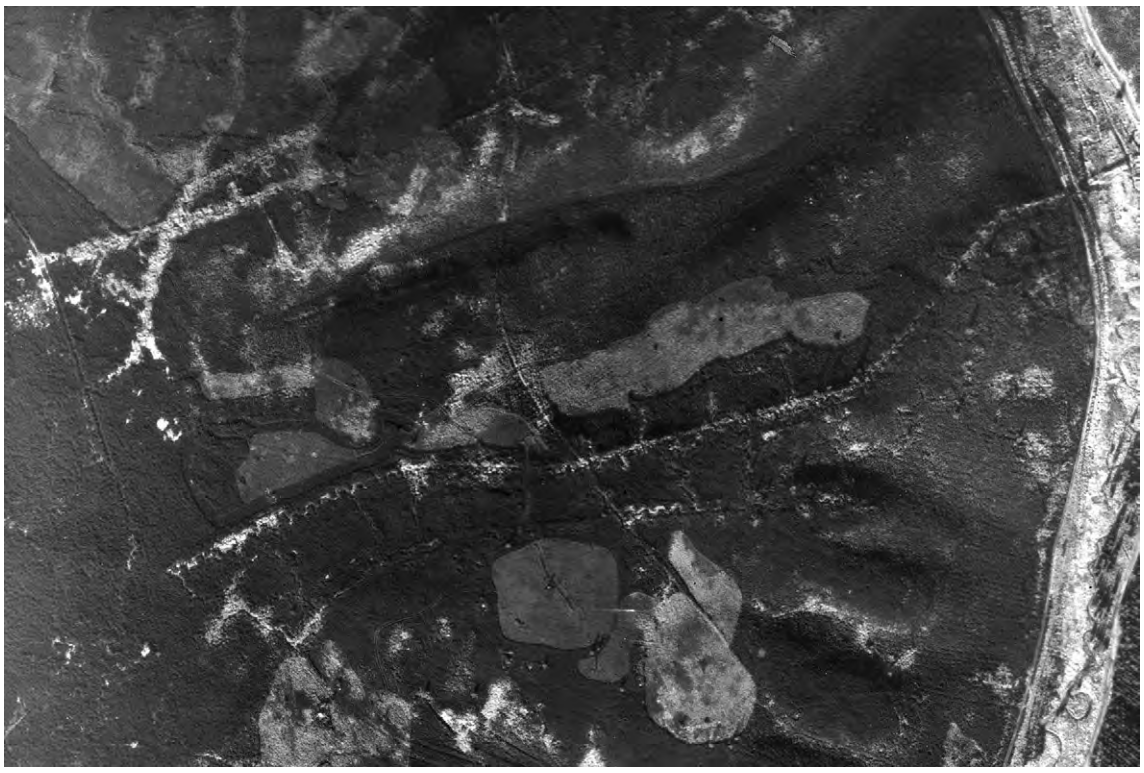

Fig 67: The 'battlefield' scenario complex of practice trenches was a lot more visible from the air in the 1950s than it is today. Most of this complex was mapped from the lidar. RAF/542/98 V 0309 15-DEC-1954 Historic England Archive (RAF Photography).

A particularly good run of low altitude vertical photography from 1954 shows good detail of the trench systems in the Sherbrook Valley (Fig 67), and recent colour oblique imagery taken by Historic England's Aerial Reconnaissance team revealed some of the grass-covered hut platforms. Generally however, most features from the First World War were mapped from the lidar data.

The 1940s photography was particularly useful for the Second World War activity, when many of the sites were still occupied and in use. A series of 1946 vertical runs captured the full extent of a range of military sites including RAF Hednesford (*see* Figs 23 and 64), and Flaxley Green Prisoner of War Camp (Fig 34). These photographs were also particularly useful in depicting the vast damage created on Brocton Field by armoured vehicle testing (Fig 68).

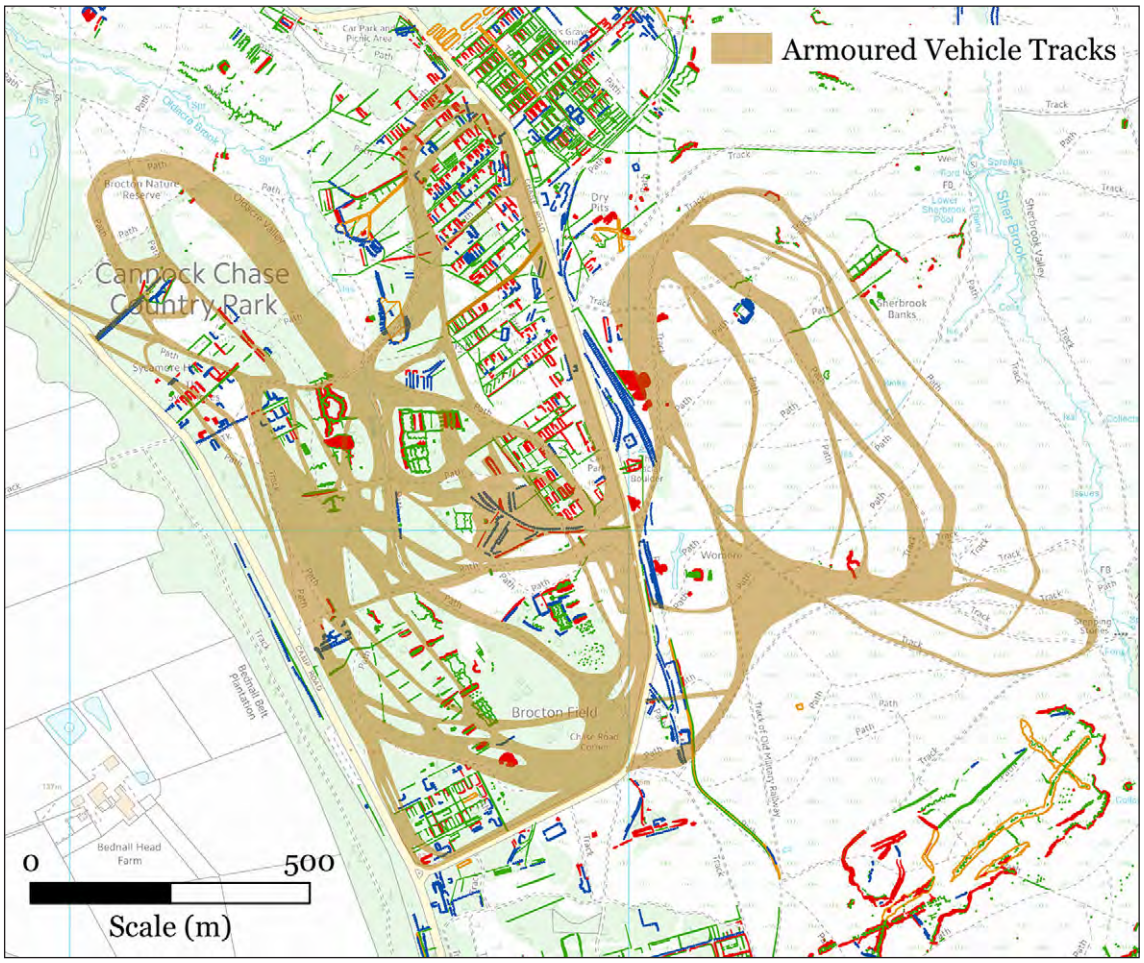

Fig 68: The mapping results clearly illustrate the impact of the Second World War tank tracks on the earthwork remains of Brocton Camp © Historic England; © Crown Copyright and database right 2018. All rights reserved. Ordnance Survey Licence number 100019088.

Importance of the military archaeology

Cannock Chase had a complex relationship with the military that spanned over a century. The training camps of the First World War were among the largest in the country, and saw many thousands of soldiers trained there before being posted abroad on active service. The archaeology on the Chase, combined with historic photographs, personal accounts and maps, allows a unique perspective into the training life of a Great War soldier. The earthworks related to First World War training are the most extensive to be surveyed in Britain outside of Salisbury Plain. The remains form one of the most coherent First World War military landscapes on the 'Home Front'. Brocton and Rugeley Camps remain unusual, in that they were almost entirely demolished immediately after the war. Most of the large military installations established during the Great War remained under military control and saw subsequent use during the Second World War and beyond. The Brocton and Rugeley huts were likely dismantled or relocated in response to national economic pressures meaning that, where possible, all reusable material from unused sites would have been salvaged; they may also have become unfit for future use due to their intensive use in the preceding years. This means that the footings represent an extensive survival of the layout of a First World War training camp.

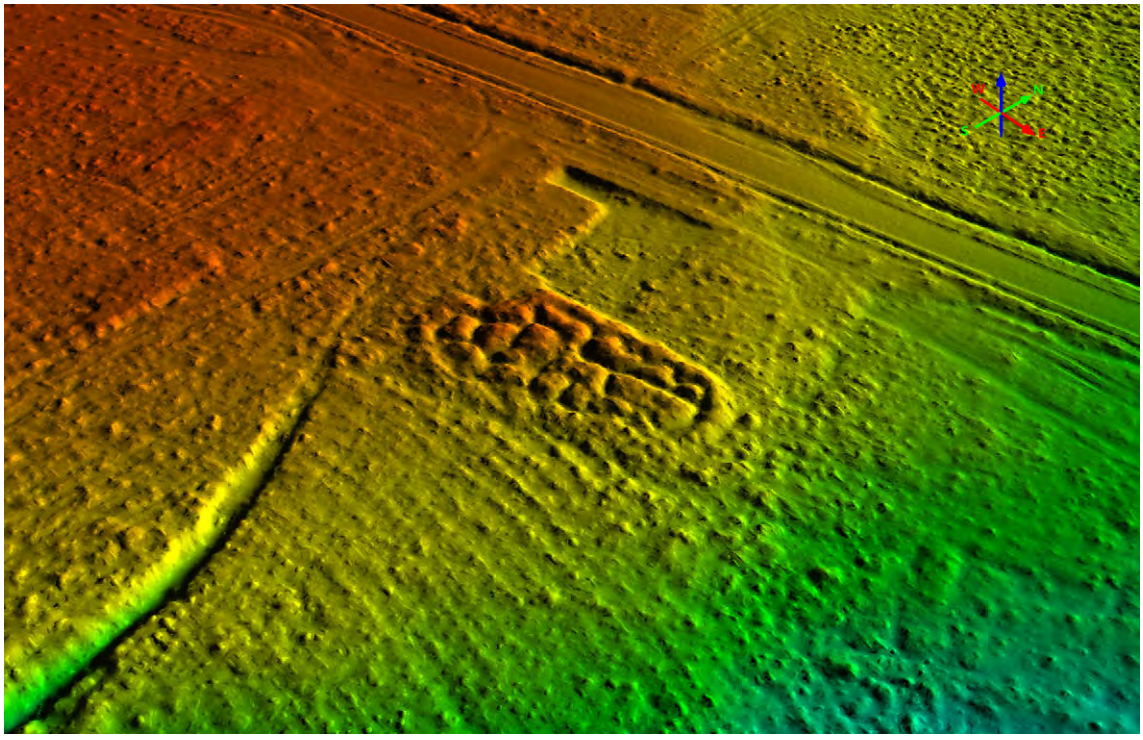

Fig 69: The 'model' trench system in Rugeley Camp was scheduled in 2004, NHLE 1021326 (MST6445). Lidar DTM 04-MAY-2016 © Historic England; source Staffordshire County Council/Fugro BV Geospatial.

The importance of the area has come to notice in recent years, with the scheduling of the instructional 'model' trench system at Rugeley Camp in 2004 (MST6445; NHLE 1021326; Fig 69) and the Messines model in 2017 (NHLE 1444078). The mapping results of this project further highlight that importance, illustrating the remarkable degree of archaeological survival of features, as well as identifying large areas of training facilities rarely seen elsewhere. Furthermore, the walkover surveys and volunteer training elements of the project have also highlighted the archaeological potential beyond aerial survey, identifying subtle features, such as the gardens in Brocton Prisoner of War Camp, or the dumps for Rugeley Camp.

The extent of the survival of the features has been revealed by the use of lidar, from which almost all the First World War features were mapped. Many of the earthworks are poorly preserved or difficult to identify on the ground through the thick heathland vegetation. The foundations of many of the huts of Brocton Camp are easier to trace on the ground, but access and visibility can be difficult in places due to dense gorse. What does remain clear, however, is that despite the levelling, back-filling and vegetation encroachment, ultimately, much of the camps and their associated training facilities do survive as earthworks.

The mapping has also illustrated that the camp plans of 1916 and 1918 accurately reflect the layout of the buildings and basic infrastructure of the military base. Furthermore, the transcriptions from lidar have enhanced our knowledge of the training facilities that were dug in and around the camps. This research has established the maximum extents of the camp, and only targeted ground assessment, survey and trial excavation, could enhance the mapped detail of the features any further.

There is continuing change on the Chase as circumstances and attitudes change. For example, during the Second World War the abandoned remains of Brocton Camp were partly levelled by the testing of armoured vehicles. More recently, forestry plantation has impacted on much of Rugeley Camp.

Future considerations

The mapping results are one of the most complete surveys of a First World War training landscape in Britain. The results have gone a long way to addressing numerous questions raised in Brown's recent report on First World War Fieldworks (2017), which asks whether any additional detail can be gleaned from the archaeology, such as date of manufacture, who constructed them and for what purpose. The results also allow us to suggest a more targeted approach towards particular themes or research questions. As has been discussed in depth above, the camp and infrastructure is moderately well understood, through either period documents, or comparable surviving sites throughout the country. The training earthworks are less-well understood, and these should form the basis for future considerations for fieldwork.

This can be broadly grouped into four main categories:

Categorize the earthworks through ground assessment, in order to ascertain additional detail of morphology and use, and establish how this relates to period manuals.

It has been established that there are a number of different forms of entrenchments constructed on the Chase. Many were simply assault or obstacle courses, which were small-scale rows of trenches designed for physical exercise, whereas others were isolated sections of trench, presumably dug for construction practice. The main area of 'battlefield' in the Sherbrook Valley is the only area where we have complete trench systems, laid out in text-book fashion. These earthworks follow the training manuals of the period almost exactly, with fire trenches and supervision trenches behind, support trenches, reserve line and communication trenches, as well as multiple dugouts and saps. The two opposing trench systems are expertly sited on either side of a dry valley, with the communication trenches and reserve lines dropping away to the rear, invisible to the enemy positions.

The assault courses form one of the most interesting feature classes within the training earthworks on Cannock Chase. They are all morphologically different, presumably constructed by different groups of soldiers, relative to the nearest barrack blocks, at different points of the war. Many were probably designed for simple physical training, whereas others, as depicted on period postcards and in the sketches of Erskine Williams, would have had a more gruesome purpose (Fig 70).

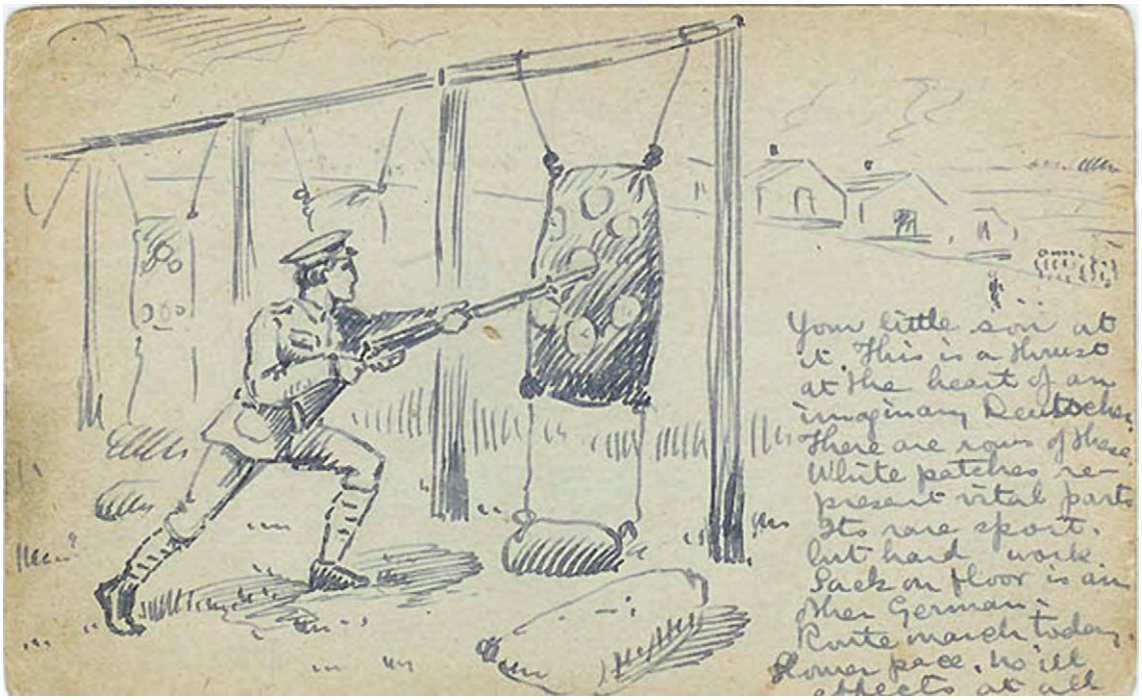

Fig 70: Erskine Williams's postcard sketch depicting bayonet practice on Cannock Chase © Daphne Jones, reproduced by kind permission of Daphne and Nicholas Jones.

A United States bayonet training manual of 1917 (Army War College 1917), which was based on the British manual, illustrates a 'Final Assault Practice Course' as having several rows of slit trenches, with gallows containing straw dummies hanging in-between. The gallows have long gone but the trenches remain visible across much of the training area on the Chase. Perhaps the most comparative example of earthwork that appears in the training manual of 1917 is the 'Nursery Labyrinth'. This contained a miniaturised section of shallow trenches, often interspersed with 'craters' throughout which straw dummies would be moved to represent the enemy, either in an advancing, retreating or crouching position (War Department 1917, 23, 27-9). Several of these courses were identified through the mapped earthworks, at 'R', 'O', 'N', 'J' and 'K' lines, and several further candidates, though more fragmentary possible examples were noted (Fig 71).

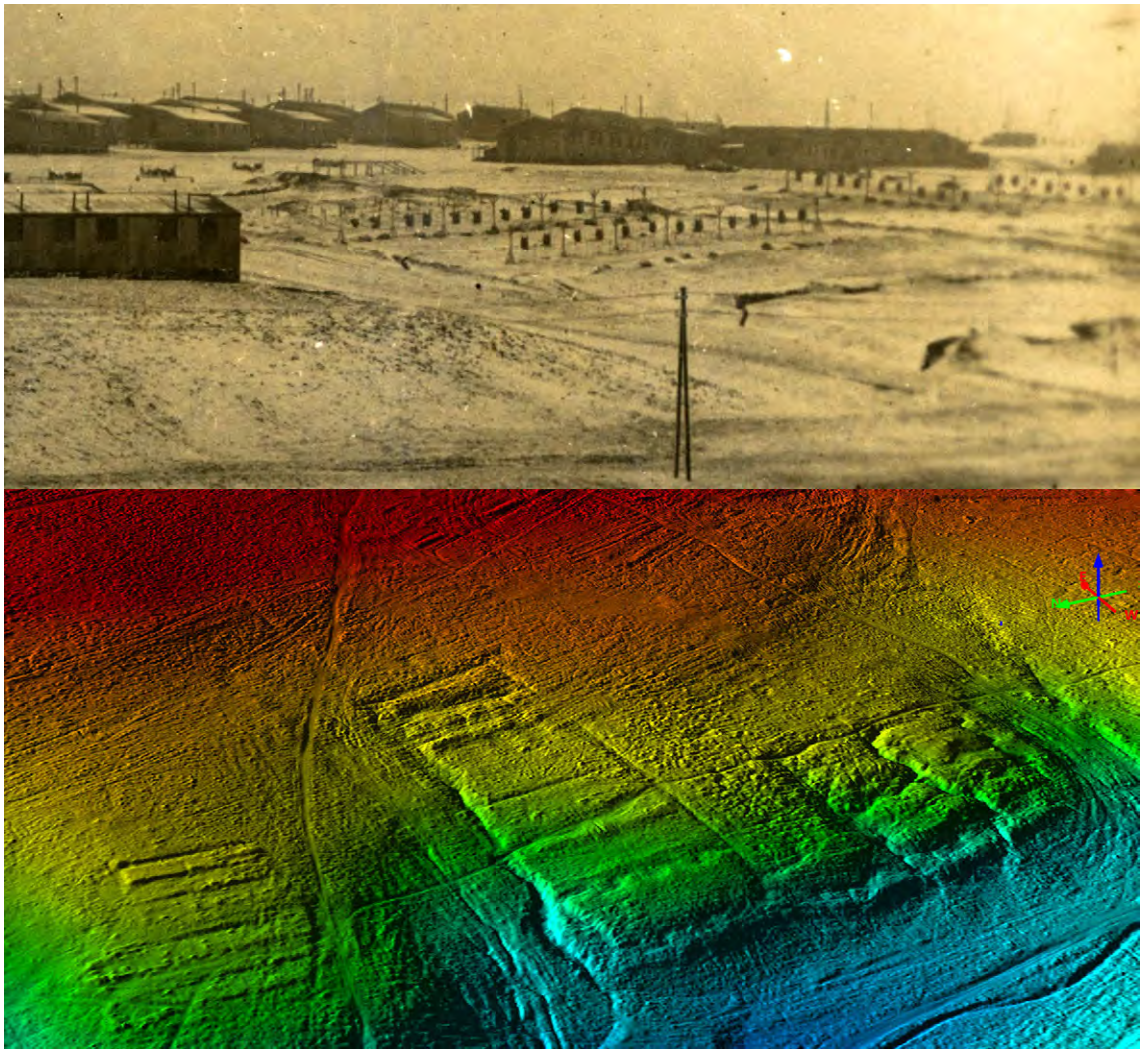

Fig 71: This postcard shows a 'final assault practice course', with sack dummies hanging from the gallows between the trenches. The lidar image illustrates the earthwork remains of the same course (centre) with a 'nursery labyrinth' to the right. The huts on the left of the photograph are visible as earthwork foundations on the left of the lidar image © Jake and Gill Whitehouse, reproduced with kind permission of Jake and Gill Whitehouse; Lidar DTM 04-MAY-2016 © Historic England; source Staffordshire County Council/Fugro BV Geospatial.

Samples of parts of these assault courses and trench systems should be considered for further survey and assessment. Further work could categorise and differentiate between the different forms of training earthworks using the mapping and the lidar data as a starting point. Trench warfare was already underway by the end of the 1914, and the camps were not fully operational until 1915, so the construction of trench systems was understandably a primary consideration for training. There are clearly different morphologies across the earthworks, and it seems likely that these might have been influenced, either by official instruction to try out new techniques, or by the personal experience of those digging them, but attributing any of the features to a particular evolution of military tactics is difficult without further study.

It is possible, to some degree, to establish the different uses of trenches based on their morphological characteristics. The scale of the Sherbrook Valley trenches, supported by documentary evidence, suggests that they were largely used for the practise of large-scale offensive and defensive manoeuvres, and for periods of occupation. The trenches were constructed on a huge scale, and perhaps establishing what unit dug them might allow a better understanding as to whether they were also dug to practice trench construction as much as for manoeuvres. The two opposing lines of trenches are quite different in plan. Those to the south display the usual characteristics of fire trench, support trench and so forth, but the system to the north is a little more ad-hoc, with lines of trenches crisscrossing one-another, some linear and some sinuous. It almost appears as though this set of trenches were either multi-phased, constructed by a different unit to those to the south, or were constructed with a slightly different purpose in mind. Some of the smaller more isolated trenches may simply have been the result of practicing trench construction techniques; others may have been used to explain the layout of a trench; whereas many were probably used for a combination of tactics.

Other than the Messines model, which has been discussed in depth elsewhere, there is no obvious evidence that any of the features were constructed to prepare for or reflect particular offensives, though it does remain probable that some may have been. For example, if the large 'battlefield' was being constructed in February 1916, the first major British offensive that would take place after this was the Somme in July. Interestingly, this battle was first devised in February and would also largely feature many of the troops who had undertaken their training on the Chase. It seems likely that once constructed, these opposing trench systems would simply have acted as a sample area of battlefront scenario for all subsequent training. These two opposing lines are quite different morphologically, one being regular and following the manuals of the period, and the other appearing more ad hoc. Whether this is indicative that one was constructed to represent the enemy lines, or that they were constructed by different troops at different times is uncertain.

There were a number of schools for specialist training at both Brocton and Rugeley, as would be expected on camps of this scale. The only evidence of some of these are detailed contemporary site plans that denote a particular use of a hut. What is less certain is how this specialist training is reflected in the earthworks. Erskine Williams sketched an intriguing cartoon showing bombing practice taking place from the forward corner of a trench traverse, the grenades being thrown over the

edge of the trench to explode downhill. Whether this was taking place in the large system of trenches in the Sherbrook Valley is uncertain, but it is the best candidate, probably comprising full-size trenches with a downward slope into 'No-Man's land'.

Additional earthworks that might signify other specialist training activities include a curvilinear alignment of pits (MST22624) to the north-east of the firing range 'E' (Fig 72). These pits were constructed to a considerable depth, each with a penannular bank or parapet around the top, serving to increase their sense of depth, broken by a narrow entry or exit channel towards the south side. They are unlike any other form of earthwork noted on the Chase, and were presumably made for a very specific function, perhaps for the training in specific weaponry because of their location in the live-firing area.

Fig 72: An alignment of deep pits (MST22624) located immediately north of firing range 'E', may have been constructed for specialist weapons training. February 2017 © Historic England.

Explore relationships between different phases of training as defined by the earthworks, and whether these phases can be attributed to different periods of the war

There is little doubt that the numerous earthworks would have been dug periodically over the successive years of the war by different units as they underwent training. A contemporary postcard depicts a rare scene of a group of soldiers digging a set of earthworks, thought to be part of the assault course adjacent to 'R' Lines (Fig 73). The earthworks, as depicted at this stage of construction, are less than waist-deep, and are revetted with sand bags. The date of the photograph is uncertain, and the

soldiers are too far away to identify the unit. When viewed on the ground, these earthworks are extremely denuded and could only be mapped using lidar.

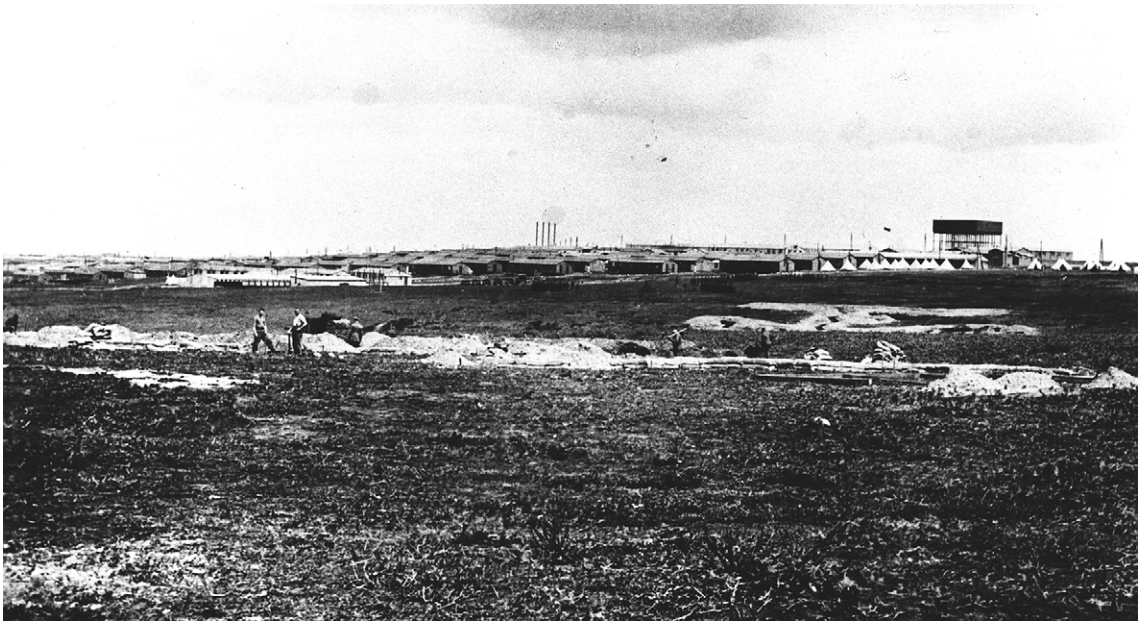

Fig 73: Soldiers constructing an assault course adjacent to 'R' Lines © Jake and Gill Whitehouse, reproduced with kind permission of Jake and Gill Whitehouse.

William Elmhirst of the East Yorkshire Regiment, wrote in February 1916 whilst training on Cannock Chase, that the trenches in which he was to spend 48 hours were not 'half finished' (2011, 110). If we are to assume this relates to the area of 'battlefield' in the Sherbrook Valley, then this may give us some approximation of the date for when, at least part of them, were being dug.

There is some evidence of phasing in the earthworks on the Sherbrook Valley. There are several instances where very crisp earthworks survive on the east side of the network of trenches, some of which appear as though they have cut the back-filled trenches of the earlier 'battlefield' scenario. Whether this signifies that the two opposing trench system had been largely back-filled prior to the end of the war, with some sporadic re-digging of elements, or whether we are witnessing post-war activity is uncertain (Fig 74).

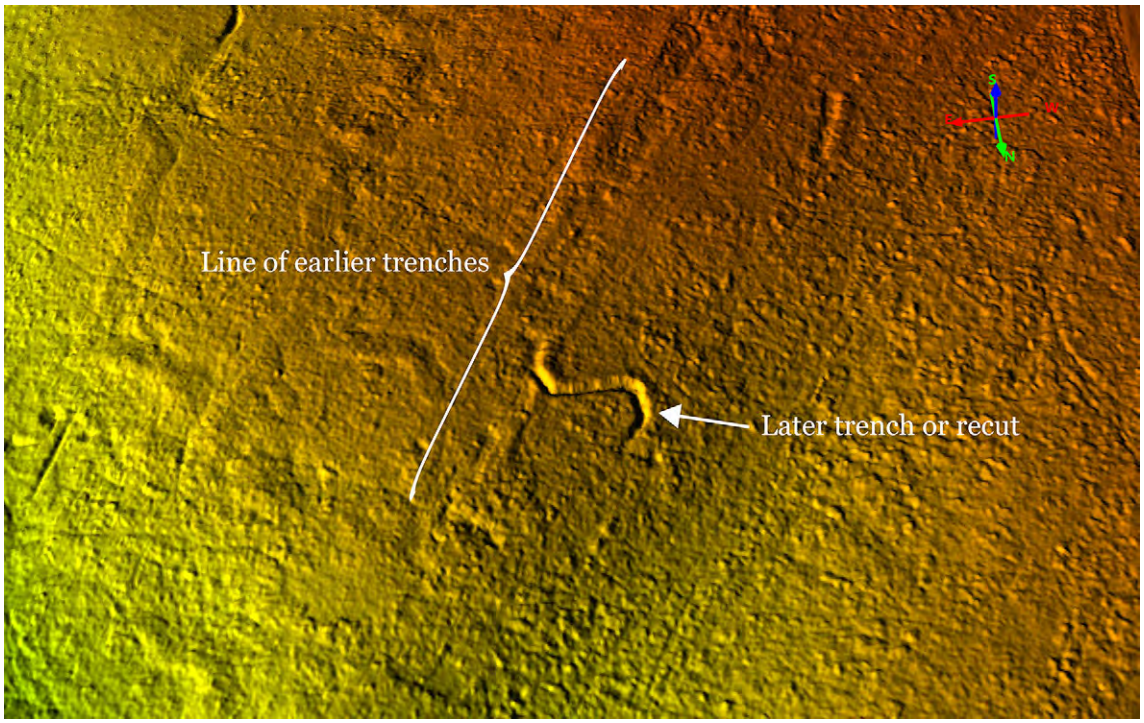

Fig 74: The lidar reveals a number of small trenches cutting through the earlier back-filled earthworks of the 'battlefield' trench system. Lidar DTM 04-MAY-2016 © Historic England; source Staffordshire County Council/Fugro BV Geospatial.

Establish how many of the training earthworks were constructed at full scale and how many were scale models

Excavations at other sites, such as Larkhill (Wiltshire), Otterburn, and Rothbury (both Northumberland), have produced a wealth of detail as to how the practice trenches were constructed, their depth, the manner of revetment, associated finds from troops training there. A similar exercise conducted on some of the 'battlefield' earthworks in the Sherbrook Valley might also lend a better understanding as to the manner in which these trenches were used. This could establish whether some of them were dug to a full depth, as is the general impression as they were designed to hold a number of men for days. The front line trenches of the Sherbrook Valley battlefield trenches are perhaps the best candidates for this, as these would be the focus of offensive and defensive training. These trenches appear to have been largely backfilled, whereas those to the south of the complex, forming the reserve trenches appear to have been only partly dug, in order to give the general impression of positions, rather than act as full-scale earthworks (*see* Figs 10-12). This may explain why some of the best surviving trenches appear so shallow. The only direct supporting evidence that at least some of the trenches were constructed to full depth is from a sketch of Erskine Williams that shows bombing practice taking place in the forward traverse of a trench that has been excavated to over the height of the man (Jones 1992, 12). It is also uncertain whether they included other typical features, such as fire-steps, drainage channels with duckboards, or whether they had covered dugouts, or what materials were used, if any, for revetting.

For the many thousands of soldiers who passed through the camps, seems fair to suggest that after its completion, many would have used the Sherbrook Valley battlefield scenario at some point or another during their training, and the potential for sub-surface survival of archaeological finds is therefore likely to be high.

The trial excavation of features associated with training activities, such as the military dumps on Cannock Chase, have already yielded results showing the form of wares and equipment used in the camp (Barker 2017). Further examination of numerous features within the camps, such as the incinerators and additional dumps, might reveal additional evidence for the less-well recorded everyday life of the serving soldier.

A review of documentary sources to see whether any of the physical remains can be attributed to particular units or periods of the war

This report has clearly demonstrated the importance of using period documentation to better understand the First World War training landscape, whether this is through manuals, photographs, maps or drawings. A next step would be to thoroughly examine all the official battalion War Diaries of those units known to have been stationed on the Chase and to attempt to link them to the physical remains there. It is in official documentation like this, that this every-day routine detail was noted, often down to the numbers of men involved and sometimes with diagrams or illustrations. A continued study of other supporting documentary sources may lead to further enhancement of the understanding of the nature of that training.

INDUSTRY

Cannock Chase has a varied history of industrial endeavour, including glassmaking, ironworking, coal mining and quarrying. These industries have left a range of remains above and below ground, but the evidence derived from this aerial survey has been overwhelmingly associated with coal mining. The following paragraphs provide a brief overview of the glass and iron industries on the Chase, with references to published works that add more detail to these topics. The bulk of this chapter is concerned with coal mining.

All these industries exploited the resources of the Chase. The iron industry mined ironstone and converted its woodland to charcoal to fuel the furnaces. Coal was mined for domestic and industrial use. The woodland also provided fuel for the glassmaking industry and many of the ingredients for making glass such as silica and potash are also available on the Chase.

To the end of the 16th century, the centre of the Staffordshire glassmaking industry was located near Abbotts Bromley, outside the project area and a smaller group within Wolseley Park, in the north of the project area. Glassworks at both locations have been excavated and a number of others identified during fieldwork, observations during land reclamation and chance finds. Most of these could not be associated with works known through documentary evidence and it was suggested that there are other sites in the area waiting to be discovered (Welch 1997a, 37).

No glassmaking sites were identified from the air as part of this project, but extensive remains of woodland management have been mapped (see *'Dividing the Landscape'* chapter) and some of these would have provided fuel for this industry. A report on glassmaking at Wolseley and a general introduction to this industry in Staffordshire can be found in the journal of *Post-Medieval Archaeology* (Welch 1997a).

A good overview of the Staffordshire iron industry is provided in the Victoria County History of Staffordshire (Greenslade and Jenkins 1967) and a detailed study of Elizabethan iron making with particular reference to the woodlands of Cannock Chase in *Staffordshire Studies* (Welch 2000). The earliest documentary reference to the iron industry is dated 1231 and concerns the establishment of forges in Cannock Forest, thought to be in the Cannock and Rugeley area (Greenslade and Jenkins 1967, 108). Documentary evidence from the late 13th to the 16th centuries includes references to iron mining (ibid, 108-9). There were few remains of the iron industry seen from the air. The Chase provided a good timber supply, iron ore and fast flowing streams for power (Sherlock 1976, 93).

The best indicator of the fuel supply for industry comes from the remains of the coppice boundary banks. These were built to enclose the coppices, the main source of wood for charcoal. These boundaries are discussed in the '*Dividing The Landscape*' chapter. Both iron ore and coal could be found in the same areas. Iron ore is the 'stone' referred to in the name Stonepit Green (C Welch, pers comm) but not all the pits there were for iron and some would have been dug for coal. This conclusion is based on ground observations and an understanding of the below ground geology

(Welch 1993, 8). It is not possible to determine from the size and shape of a pit what each was dug for.

Ironworks utilised water as a source of power and ponds are a common feature of the Chase, although not all were created for ironworks and some are quite recent in date. For example, Fairoak Pools are first depicted by the Ordnance Survey in 1982. Dams and some possible mounds of slag were identified as earthworks on aerial sources. In each case, these sites had been previously identified, often during attempts to locate ironworking sites known from documentary sources (Welch 2000, Appendix 1). The previously identified earthworks mapped as part of this project include the (modified) dam for the pond bay of the 16th-century New Furnace and earthworks at a medieval moated site Court Banks Covert that was the site of a medieval bloomery (iron working site).

While documentary evidence indicates that all three industries existed on the Chase by the 13th century, coal mining was by far the longest-lived. More coal mining sites than any other industrial features were identified from the aerial sources and significantly, most of these still survive as earthworks. The following sections of this chapter look at coal mining in and around Cannock Chase. This is not a comprehensive history, but primarily concentrates on the evidence available on the aerial photographs and lidar. It also draws on other sources including newspaper reports accessed via *The British Newspaper Archive* website[10] to help the interpretation of the Cannock coal industry in the 20th century.

Coal: 'Anywhere around Cannock you may encounter a miner'

Coalmining within the Chase Through Time project area has a long history and although we do not know the exact origins, the documentary evidence indicates that it was underway by at least the 13th century. This industry continued on the Chase for approximately 700 years, ending with the closure of the last Cannock Chase mine, Littleton colliery at Huntingdon, in 1993. Aerial photographs and lidar have enabled us to produce a detailed map of the extensive remains of this important industry, many of which still survive across the Chase.

The South Staffordshire Coalfield is divided in two by the Bentley Faults, just north of a line between Wolverhampton and Walsall and the northern part is usually referred to as the Cannock Chase Region even though it extends well beyond the area of the AONB. The belt of Bentley Faults marks the coalfield's southern boundary; the east is marked by the Eastern Boundary Fault; and the west is marked by the Littleworth and the Hazleslade Faults. The Bentley Faults throw down the coal seams on the Cannock side by up to 100m from where they dip northwest to a depth of almost 500m. As a result the presence of deeper seams of coal beneath Cannock was less easy to prove and the coal harder to mine than was the case elsewhere in Staffordshire (Sherlock 1976, 86).

King Coal

From the perspective of the 21st century, it is difficult to overstate the historical importance of coal. Britain was the world's first great coal-fuel economy, (Gould and Ayris 1995, 7) and during the 20th century coal mining was still described as Britain's 'most vital basic industry'.[11] Coal was the dominant fuel used for electricity generation, railways and steamships. It also provided domestic heating and coal gas to light and cook by. When converted to coke it fuelled heavy industry. Coal was also the source of a wide range of by-products including coal gas, coal tar, creosote and various dyes and acids (Meldola 1891).

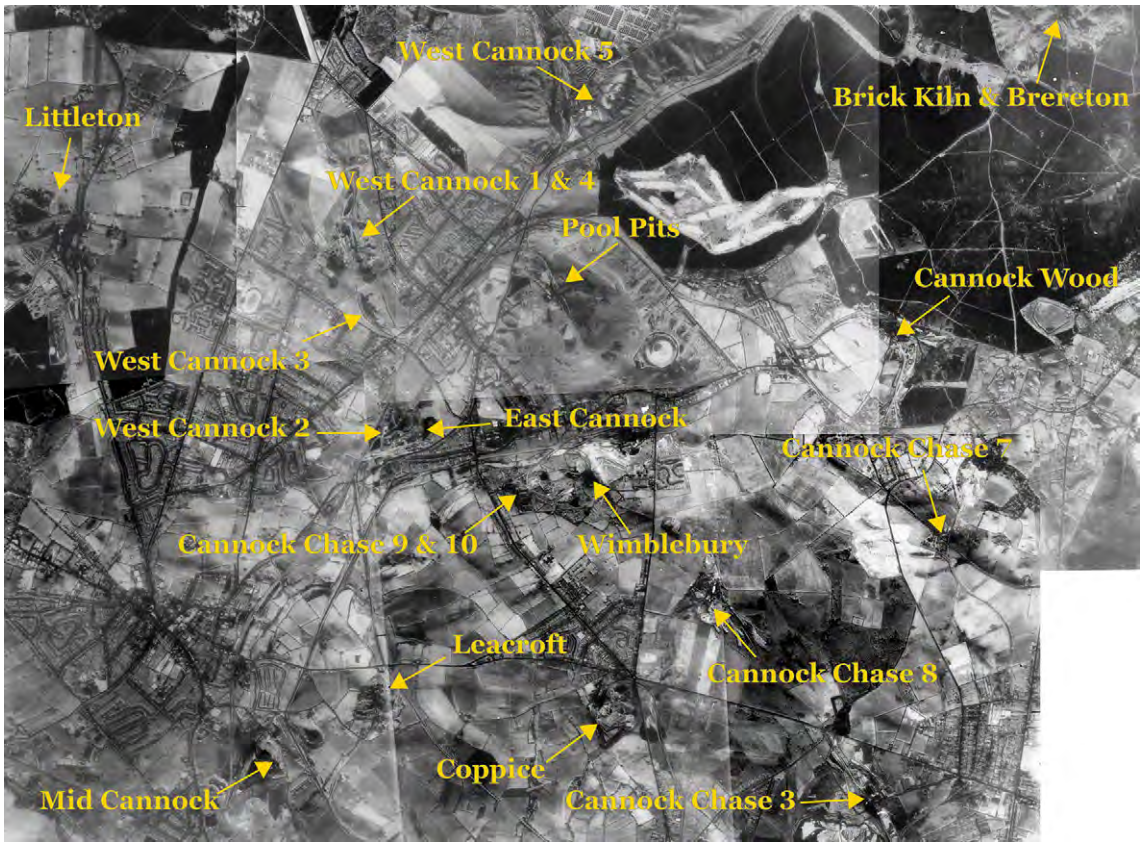

Fig 75: Collieries seen on RAF aerial photographs taken in 1959. Although visible from the air, not all were in operation at this date. Composite of seven photographs: RAF/58/2695 F21 0101, 0103, 0105, 28-JAN-1946; RAF/58/2695 F22 0100, 0103, 0104-5, 28-JAN-1946 Historic England Archive (RAF Photography).

Aerial photographs taken during the 1940s and 1950s provide a view of Cannock and the surrounding area very different from that of today (Fig 75). They show a coal mining landscape with numerous collieries, all but one of which were established in the second half of the 19th century, a period when the Cannock Chase coalfield underwent extensive development. In 1947, 22 collieries were in operation across the Cannock Chase coalfield (Hill 2012, 42) although not all of these were within the Chase Through Time project boundary. Some of these coalmines were quite closely spaced, particularly in and around Cannock.

The post-Second World War aerial view highlights how much land these collieries occupied. To give an idea of scale, over 100 houses in Hednesford occupy the area of East Cannock Colliery's spoil heaps alone, and when the area occupied by colliery buildings and railway sidings are taken into account, well over 200 houses occupy this former colliery site. The aerial photographs also show the close proximity of the pits and the towns and villages of the Chase, although places like Cannock or Rugeley were not created by or entirely dependent on the coalmining industry.

The quotation 'Anywhere around Cannock you may encounter a miner' used for the title of a section above is from a 1974 book on Staffordshire (Bird 1974, 122). It highlights that even by that date, when only three pits remained in operation, West Cannock Number 5, Littleton and Lea Hall, Cannock was still defined as a coal mining area. However, the character of Cannock and the surrounding area dramatically changed with the closure and demolition of the last of the mines during the final decades of the 20th century.

Although surface traces of these deep mines have largely been removed from the landscape, there are still extensive remains of this industry on Cannock Chase. Many are visible when walking on parts of the Chase so they are not major new discoveries. However, the lidar has allowed us to accurately plot the extensive earthworks of thousands of coal pits and some larger remains of some short-lived 19th-century collieries. Together these represent a remarkable record of all but the last 100 years of coal mining on the Chase.

Historically, men, women and children were employed in Britain's coalmines. If any Staffordshire women were employed in the mines, this had ceased by 1842; the Children's Employment Commission of that year found no evidence of women working underground in the county. Presumably, women did undertake manual work on the surface such as sorting coal. As the 20th century progressed, women continued to work in the industry in a variety of administrative and other supporting roles.

Previous work

Nationally, much of the interest in the British coal industry has focused on documentary research as opposed to the identification, survey or excavation of mining remains. The study of Staffordshire coalmines has a similar emphasis on documentary work and a good overview of Staffordshire coal mining from the Middle Ages to the 20th century is included in the second volume of the Victoria County History of Staffordshire (Greenslade and Jenkins 1967). Coalmining in Staffordshire features in county overviews such as *Industrial Archaeology of Staffordshire* (Sherlock 1976), although this is largely concerned with 19th-century mining. Staffordshire mines also feature in general works with a national overview such as *Coalmining* (Griffin 1971) and *The British Coalmining Industry* (Griffin 1977), however these texts do not always identify which of the Staffordshire coalfields is being discussed. Individual mines feature in editions of *British Mining*, the journal of the Northern Mine Research Society.[12] The Cannock Chase Mining Historical Society has produced a large body of work. The society was founded in

2002, and since its inception has researched and published their results, first in a general study (Various 2006), followed by a series of studies on individual collieries.[13]

In response to the rapid decline of the coal industry in the 1980s and 1990s, the Royal Commission for Historic Monuments England (RCHME) undertook two national surveys of coalmines. They commissioned an emergency recording programme to obtain basic aerial photographic coverage of the English coalfields in 1992 and the results were published in *Colliery Landscapes* (Gould and Ayris 1995). The RCHME also undertook a ground-based photographic survey published as *Images of Industry: Coal* (Thornes 1994) that combined targeted research with archaeological field assessments. Cannock's deep mines of the 19th and 20th centuries had all closed by the date of these surveys and Cannock Chase collieries only feature fleetingly. *Colliery Landscapes* includes West Cannock Number 5 which had closed in 1982, although many of the surface buildings were retained and reused (Gould and Ayris 1995, 37), and a view of the site of Lea Hall (outside the project area) which had been cleared by the date of photography (ibid, 32). At about the same time as these photographic surveys were undertaken, coalmining sites were the subject of a national study as part of English Heritage's Monument Protection Programme (MPP). Brief reports were prepared on the surviving colliery buildings at the site of Cannock and Rugeley pit, the site of which had become an industrial estate by the early 1990s, and three different groups of medieval or post medieval coal pits within Beaudesert Old Park (English Heritage 1993).

Some of the studies mentioned above include references to the physical remains of early coalmining in Staffordshire, although those identified are all beyond the boundaries of the Chase Through Time project. They include a note on old shafts revealed at Dibdale, Lower Gornal, during opencast mining and during the construction of the M6 motorway near Walsall. The work on the motorway uncovered wooden platforms positioned at intervals in a mineshaft, indicating the use of ladders to enter and exit the mine (Sherlock 1976, 86; Griffin 1971, 29-30). Other finds included props and twigs in old longwall workings in South Staffordshire (Griffin 1971, 50). The most detailed work on the physical remains of coal mining on Cannock Chase was a survey of medieval and post medieval coal mining remains within Beaudesert Old Park (Welch 1993). This survey produced plans of discreet groups of mineshafts and significantly, related the surface workings to known coal seams and began to build a chronology for these sites.

Finding the coal

Coal measures were laid down during the carboniferous period over 300 million years ago (Newman 2016, 88). Seams of coal, which vary in thickness, are interspersed with beds of rock, also of variable thickness. Although horizontal when laid down, almost all coal seams are inclined; and in Staffordshire this can be quite steep (Griffin 197, 9; Various 2006, 8). Coal seams occur at a range of depths, some outcrop at the surface and others will be hundreds of metres below ground. Some coal measures are located beneath more recent bedrock and are termed '*concealed*', their existence only proved through borings undertaken from the late 19th century onwards (Greenslade and Jenkins 1967, 68). Even when a seam is located, geological

faults create breaks and a change in the depth of the strata. Where a coalface meets a fault the coal will end abruptly against stone. The continuation of the coal seam beyond the fault could be higher (an upthrow fault) or lower (a downthrow fault). This difference in depth of the coal seam either side of a fault can be large, for example, the throw of the Mitre Fault, south of Cannock, is 61m (Various 2006, 8). There are a large number of faults across the Cannock coalfield with the result that relatively short distances of coal could be mined without interruption (ibid).

Coal can be found where it comes to the surface through outcropping or where it is exposed through erosion such as being cut by watercourse. The geological map of the area shows the exposed coal measures extending from Brereton to Stourbridge, although it is not continuous (C Welch, pers comm). Outcropping coal is described by Robert Plot (1640-1696) in his *Natural History of Stafford-shire* (1686). He noted that it was in the form of a crumbly black earth known as *smut* (Plot 1686, 146). Although the outcropping coal indicates where to dig, the crumbliness of the weathered coal is the result of oxidisation and it is of poor quality and cannot be used (Thomas 2002, 112). Another indicator that coal is present is what Plot termed *coal water*. This is water that drains through coal picking up a rusty coloured iron oxide sediment known locally as *car*. The rust-coloured *car* can still be seen in places along the course of the Redbrook (within Beaudesert Old Park) and it is possible that it gave the brook its name. Although not situated deep beneath later bedrock, much of the coal near Cannock is hidden beneath boulder clay. Within the project area, it is primarily around Brereton where the boulder clay has not covered outcropping seams (Greenslade and Jenkins 1967, 70), and it follows that it was here that coal was first found and dug.

Early shallow coal pits

The earthwork remains of thousands of coal pits have been mapped within the project area, and most of these are located within Beaudesert Old Park (Fig 76). These pits are the partially filled-in remains of mineshafts. Although none of these are securely dated, some sequence and approximate dates have been assigned based a number of factors, including a consideration of how far apart the pits are from each other, the presence of clearly defined spoil heaps and the position of the pit in relation to the known coal seams below.

The most northerly group of mining remains are largely within Brereton Hayes Wood, the southern part of this group extending into Sweakham Covert (Fig 77). This group consists of hundreds of closely spaced pits and a number of more widely spaced pits and spoil (MST1007). The earlier, closely spaced pits, are located where coal seams outcrop and they create a pockmarked appearance to the landscape. No individual spoil heaps associated with these pits are visible, though the general unevenness of the ground is no doubt a combination of pits and spoil. Similar pits have been mapped within Beaudesert Old Park to the south of Rugeley Road, across Lodge Bank and a group centred on Stonepit Green. The core of each of these groups were surveyed and a detailed description reported on in 1993 (Welch 1993).

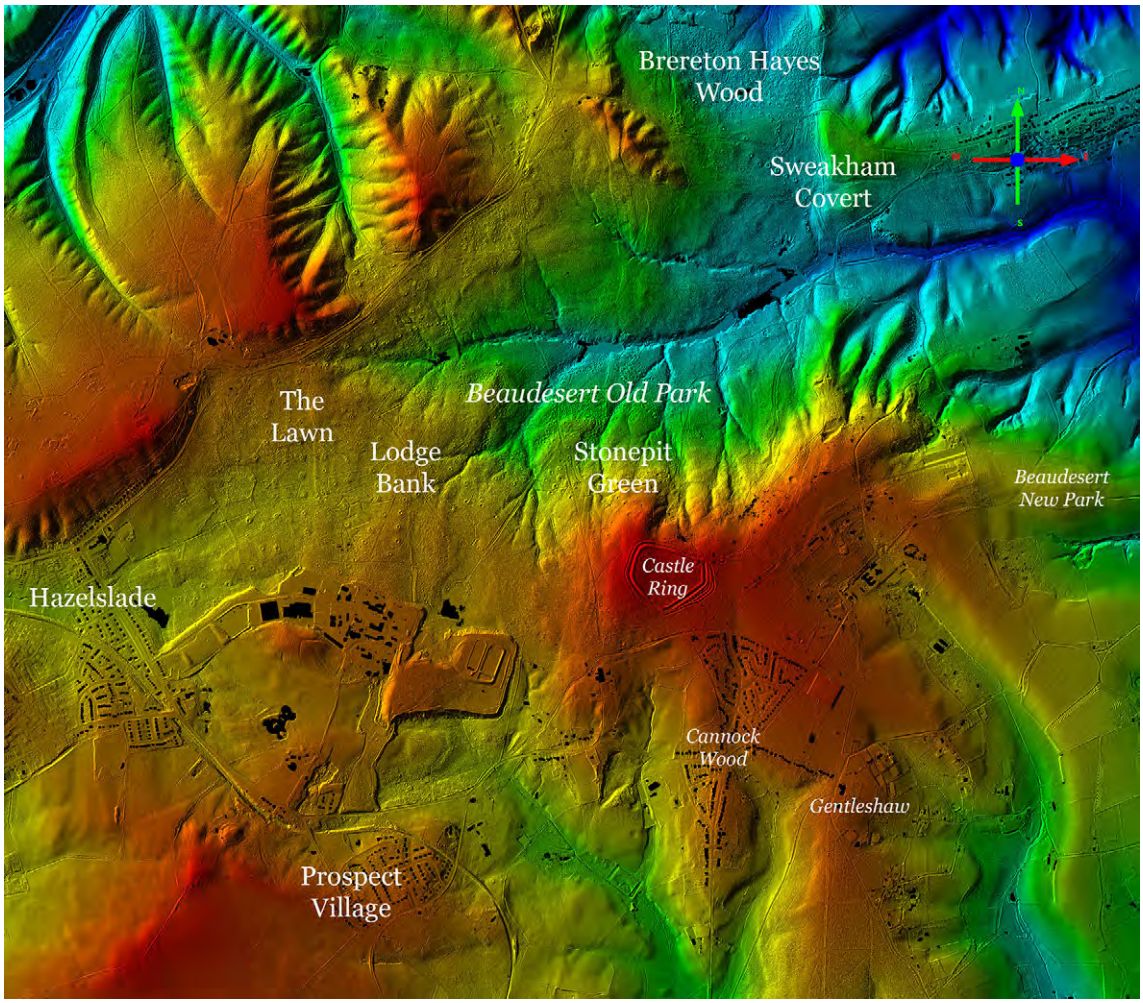

Fig 76: Map showing area of coal pits with place names used in text. Lidar DTM 04-MAY-2016 © Historic England; source Staffordshire County Council/Fugro BV Geospatial.

These pits would probably have been relatively shallow, although the depth of the coal in these areas in not accurately known and suggested depths are approximate (ibid). It is estimated that the northern band of pits at Brereton Hayes and at Lodge Bank were working coal seams no more than 2m-4m deep. However, other pits of the same shape and size at both locations may have been exploiting coal seams up to 8m deep (ibid, 6).

The date of these early shallow workings can also only be estimated. Nationally there is documentary evidence that coal was mined in Britain in the 12th century and there is archaeological evidence of its use in the Roman period (Griffin 1971, 1). Documentary evidence dates the earliest coal mining on the Chase to 1298 when coal was obtained from the Bishop of Coventry and Lichfield's manor of Cannock and in 1306 there is reference to the Bishop's leasing of 'picks' in the manor of Longdon (Greenslade and Jenkins 1967, 72). These references to coal are unlikely to mark the actual start of mining in these areas, but a medieval date is generally accepted as marking the start of coalmining on the Chase. However, the presence of

outcropping coal indicates that coal was potentially worked on Cannock Chase from the Roman period but there no evidence of this has been identified (Newman 2016, 273). It has also been suggested that a small number of pits on exposed coalfields in Britain may be late 19th- or 20th-century in date and the result of small-scale workings undertaken by striking miners (Griffin, 1971 5-6). Although, the Marquis of Anglesey (the owner of Beaudesert) found no evidence for this in 1926 (C Welch, pers comm).

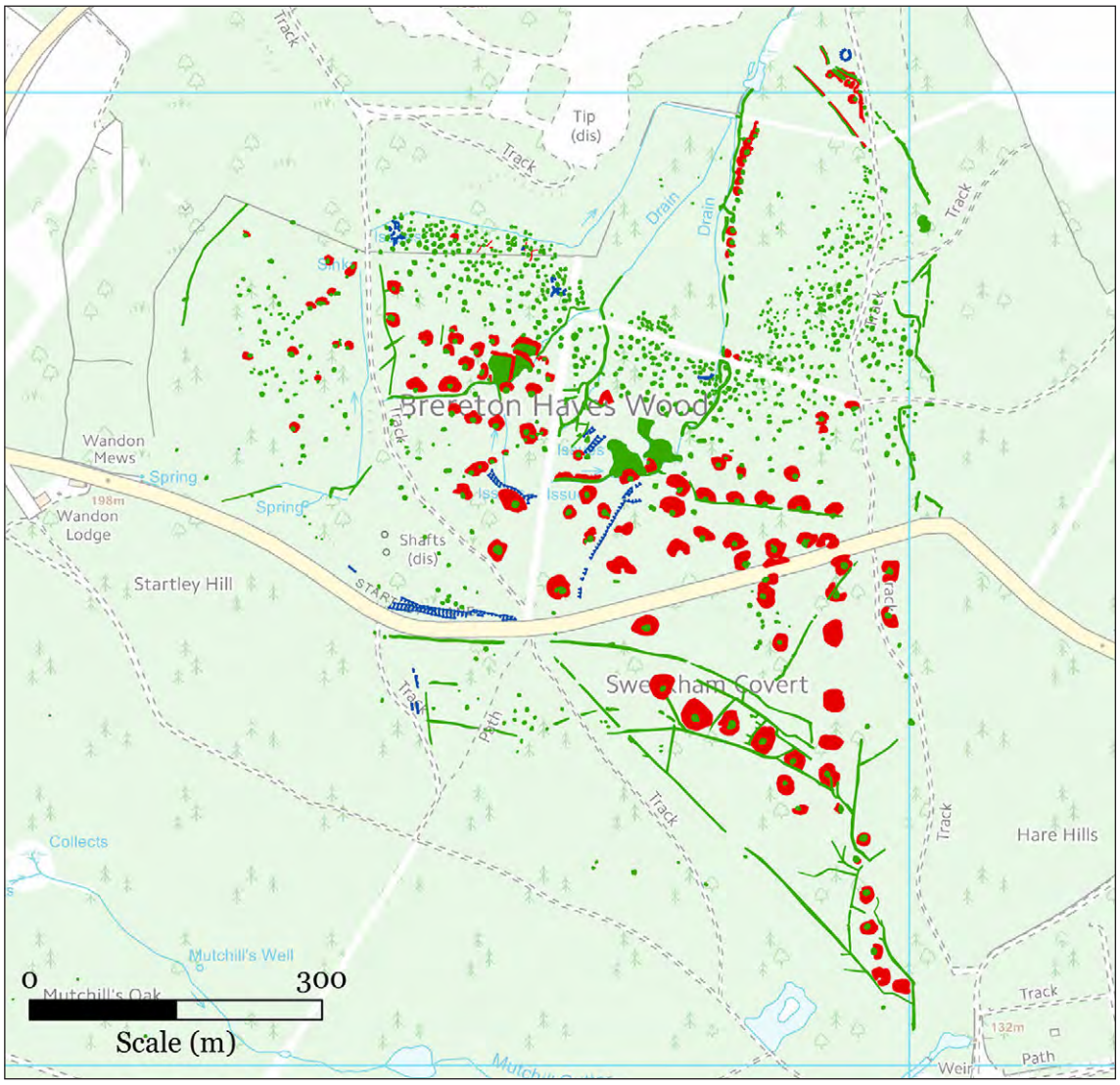

Fig 77: Earthworks of medieval and post medieval coal pits within Brereton Hayes Wood. © Historic England; Base map © Crown Copyright and database right 2018. All rights reserved. Ordnance Survey Licence number 100019088.

It has been suggested that early coal pits were sunk close together (Griffin 1971, 4). The results from the lidar show that the distant between what are presumed to be the earliest pits varies. The closest are between 1-2m apart but the gap can be up to 10m (Fig 78). This distribution of pits in part reflects the location of the coal, but also the extent of underground workings and a range of activities or obstacles

to mining that were present on the surface. Presumably, neighbouring shafts were sunk far enough away to avoid breaking into neighbouring pits and suggests that the underground area of each pit was greater than at the surface. Early coal workings are often referred to as 'bell pits' (Griffin 1971, 3; Sherlock 1976, 86). This name is derived from the assumed shape of the pit, where the shaft was sunk to the coal seam and then widened out from the base of the shaft creating a space similar in appearance to the inside of a cone or a bell. Despite the use of the term bell pit, documentary accounts and a limited review of evidence of exposed coal workings, suggest that coal was not mined this way.

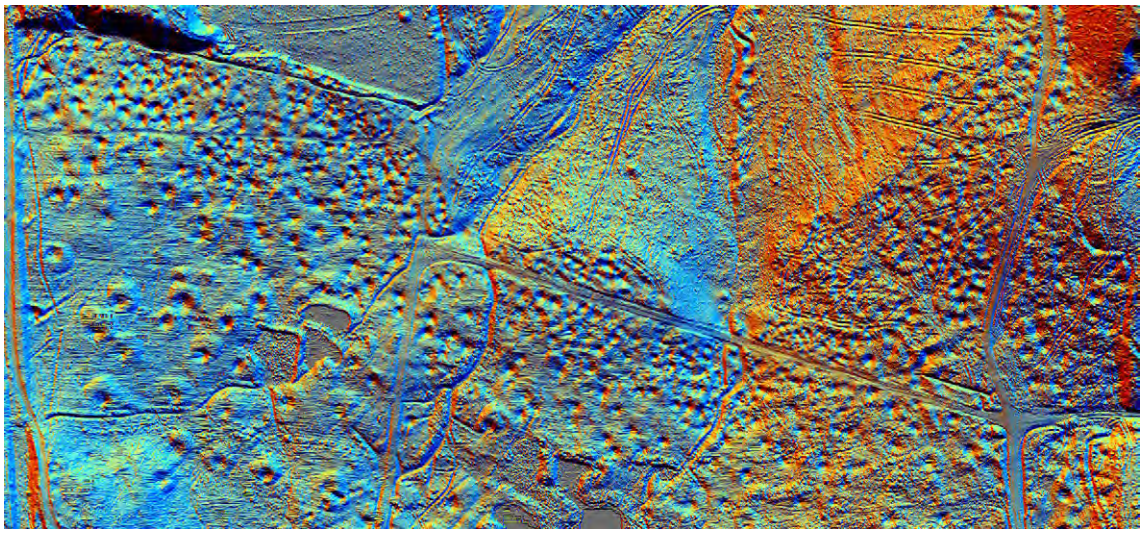

Fig 78: Lidar showing coal pits in Brereton Hayes Wood. The closely spaced pits are thought to be medieval in date. The more widely spaced pits towards the bottom of the image represent later mining (medieval or post medieval). Lidar (16 Direction hillshade) DTM 04-MAY-2016 © Historic England; source Staffordshire County Council/Fugro BV Geospatial.

Various 19th-century accounts of bell pits, a technique sometimes referred to as bell-work, are all concerned with mining for iron ore and not coal (Rees 1819, Glover 1829, 82). Evidence of pits exposed through opencast mining elsewhere in England provides some indication of the subsurface remains that may occur. Coal pits exposed at Stretton in Derbyshire in 1969 showed little evidence of belling of the sides in the coal seam (Griffin 1971, 5). Instead, it was suggested that some widening took place gradually during the process of sinking the shaft (ibid). Relatively modest increases in the width at the bases of mines shafts compared to the pit mouth have also been recorded at Dibdale, West Midlands and at Salterwood, Derbyshire (Sherlock 1976, 86; Griffin 1969, fig 1). These increases were between 0.6m and 1.4m and while it is a matter for debate whether they were sufficient to produce a bell-shaped space, it does suggest a working area slightly wider than the shaft mouth. Digging too far in to the coal seam would cause a collapse.

The distances between these early coal pits on the Chase is too varied for any conclusion to be drawn about the extent of underground workings and can only partly explain the distribution of pits (Fig 79). Activity on the surface may provide

other reasons for the spacing of pits. Some of the gaps between shafts may not be genuine and intervening pits have been filled-in and no longer visible on the surface. Other gaps between pits may indicate the location of mature trees at the time of mining or some other obstacles. It is also possible that some of these gaps between pits were deliberately left to accommodate the variety of mining activities that were undertaken on the surface. Exactly what these were, is not known and no evidence has been identified during this project, but possibly some buildings existed for those miners who remained on the surface and to store tools and other equipment. Space would have been needed to stockpile coal before it was transported from the coalfield. This raises the questions about managing the animals used to transport the coal and bring equipment and materials to the mines. If horses were kept at the coalfield for any length of time they may have needed grazing or feeding and perhaps even stabling.

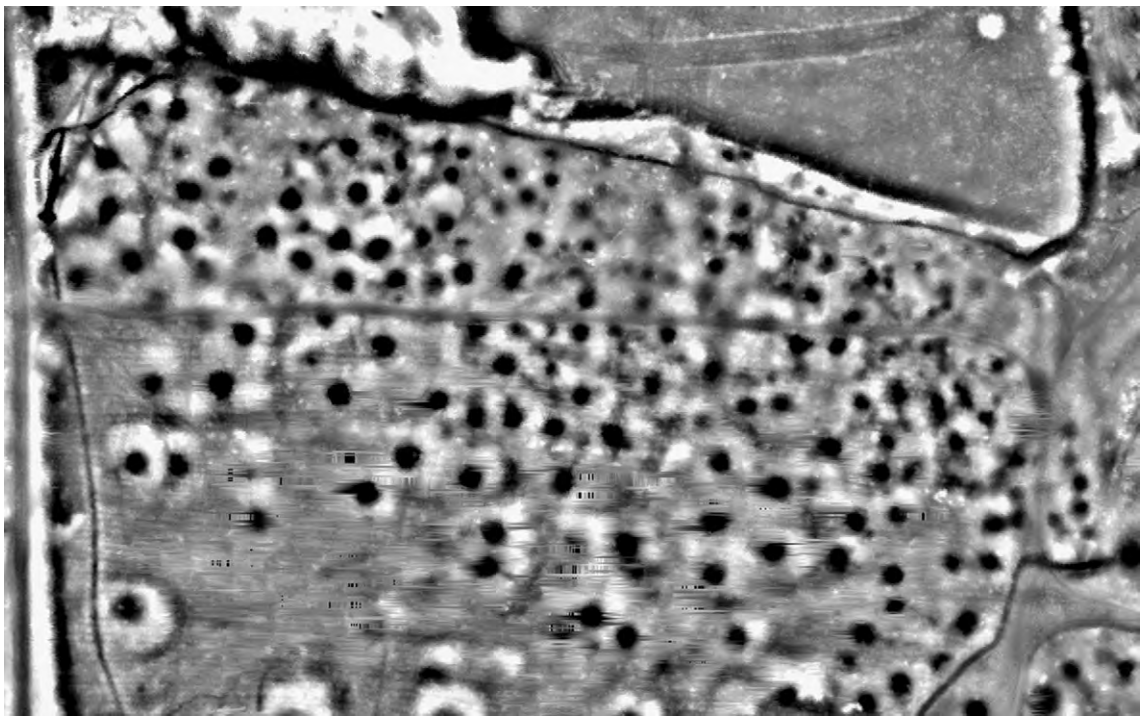

Fig 79: Detail of the earlier pits in Brereton Hayes Wood (top left in previous figure). This Simple Local Relief Model visualisation highlights the pits as black shapes. The group of pits top left appear to be connected by paths showing as dark lines. Lidar DTM 04-MAY-2016 © Historic England; source Staffordshire County Council/Fugro BV Geospatial.

In places the spacing of these pits over the shallowest seams also suggests small groups of pits may have been mined concurrently. This may have been the case for a group of pits at the north-western end of the Brereton Hayes group. These pits appear to be arranged around a central area and interconnected by a series of short tracks visible as shallow hollow ways. A similar arrangement of pits, without the paths, was identified a little to the east.

Digging deeper

Close by these early shallow pits are the earthwork remains of deeper coal pits. At Brereton Hayes these workings are visible ascending the hill to the south of the dense concentration of the earlier pits. Although these deeper pits are thought to have been dug after the shallow workings had been abandoned, they may still be medieval or post medieval in date (Fig 80). A number of features distinguish the deeper pits. They are more widely spaced than the early examples and often arranged in straight lines. At Brereton Hayes this spacing is approximately 20-30m. The spacing is significant as it suggests that, rather than individual pits, they are shafts that all connect to a single underground mine. Most of these have a ring of spoil, which reflects the greater depth each shaft was sunk to reach the coal. In some cases, the spoil surrounds the pit, elsewhere it forms a C-shape around the pit. In the latter case, the spoil was thrown down slope and left an uninterrupted approach to the pit edge from higher ground, possibly an unintentional result of working on sloping ground. A similar pattern of remains were identified around Prospect Village, Lodge Bank and Stonepit Green, but the most extensive remains are located across an area of Beaudesert Old Park called The Lawn and extending across the western boundary of the park into Hazelslade (Fig 81). In terms of size, the shafts and spoil heaps across The Lawn are similar to the other examples described above. They are however more widely spaced with individual shafts situated between 70-100m apart. Many of these shafts are aligned on each other following a north-south orientation. As at Brereton Hayes these shafts would have been linked underground and may all connect to a single mine.

Fig 80: One of many collapsed or backfilled entrances to coal mining pits in the grounds Beaudesert Old Park (MST4042), December 2017 © Historic England.

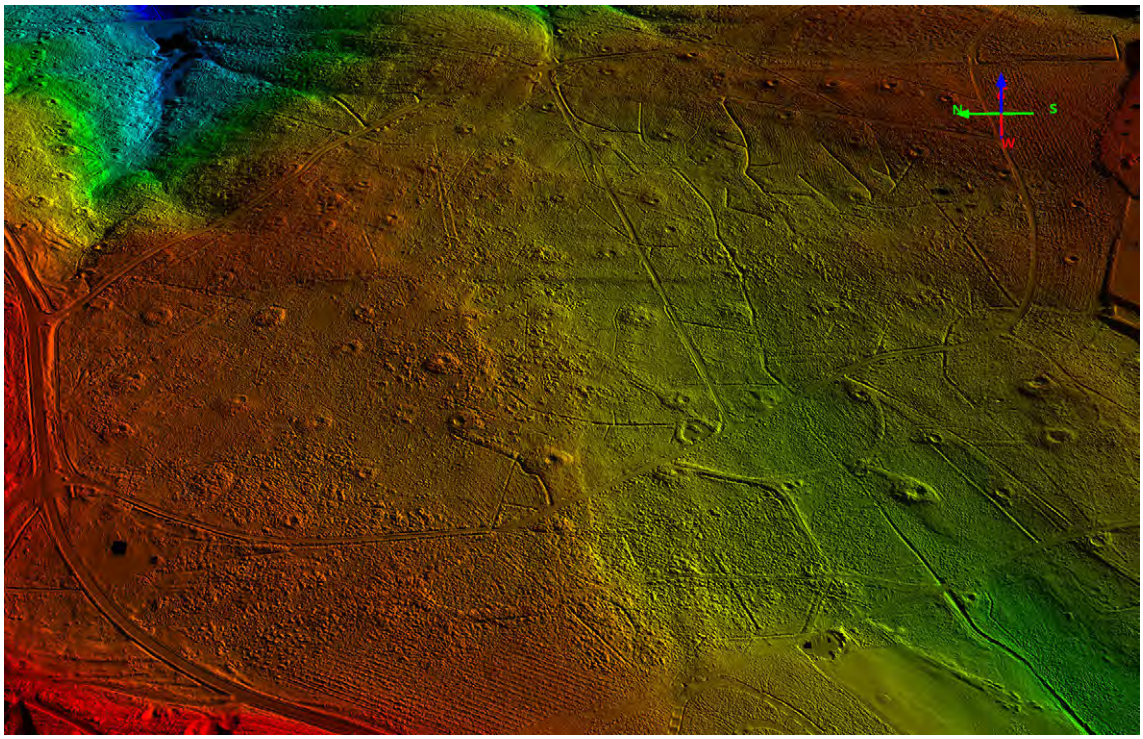

Fig 81: Lidar coal pits across The Lawn, Beaudesert Old Park. Lidar DTM 04-MAY-2016 © Historic England; source Staffordshire County Council/Fugro BV Geospatial.

Old coalmines exposed by modern opencast workings give us some idea of what the coalmine beneath The Lawn looks like. Opencast mining at Coleorton, Leicestershire uncovered a continuous series of 15th- and 16th-century pillar and stall workings and early 17th-century longwall workings; the dates based on tree-ring analysis of the timber found in the mine. Pillar and stall is the name given to a method whereby not all the coal from the mine was dug out. Instead, miners dug into the seam but left pillars of coal between these stalls to support the roof (Griffin 1971, 6). Photographs of two different patterns of pillar and stall working are illustrated from Coleorton (Hartley 1994, 93-94). Longwall working allowed more coal to be won as the entire exposed coalface was dug away and no pillars of coal left (Griffin 1971, 7).

In addition to the arrangement of the mine, the Coleorton example also hints at what else may remain below ground in some of these old workings on the Chase. At Coleorton, timber in the form of props and shaft linings was found, as were the remains of sledge-like runners for moving baskets of coal underground. Other finds included 16th- and 17th-century shoes and clothing. The dating of the Coleorton mining remains indicate that this mine was in use for hundreds of years and perhaps some of the pre-19th century mines on the Chase were in use for a similar length of time. The only evidence for the date of the later mining on The Lawn is from old maps. This area is annotated 'Coal Pits' on Yates 1775 map of Staffordshire, the same area marked 'old coal pits' on an estate map of 1819-1824.

Want of air

The Leicestershire mine at Coleorton was accessed by approximately 300 mineshafts, although no details are given of their shape size and spacing (Hartley 1994, 91). This number far exceed those seen on The Lawn, but nevertheless this mine was served by dozens of shafts which probably indicate the general extent of the underground mine workings. The main reason for so many shafts connecting to a single coalmine was the need for ventilation.

The effect of a poorly ventilated mine was described by Robert Plot in the 17th century; 'The further a man goes, into one of these coal levels, the flame of his candle will gradually grow less and less, till it goes quite out, and his difficulty of breathing greater and greater, till he cannot breath at all' (Plot 1686, 137-8). Some parts of the Staffordshire coalfield, such as the Thick Coal seam in the Black Country (south of the project area), were affected by noxious or explosive gases which went by a variety of names such as fire damp or choke damp. Even if an area was free from damps, good ventilation was still essential to ensure a flow of breathable air. Robert Plot describes his own experience of entering poorly ventilated mine. When less than 200 yards (183m) into the mine, two of the three candles he was holding had gone out and the third expiring when he was forced to turn back (ibid, 138).

Some natural ventilation of a mine will occur, as the air temperature is generally warmer than at the surface. Natural ventilation is the result of the warm air rising and the colder surface air sinking, but will fail if these temperatures are about the same (Griffin 1971, 63). Fans ventilate modern mines, but an earlier technique was to set a fire at the base of one shaft to encourage the flow of air. The first recorded use of a fire basket to ventilate a mine in Britain was at Cheadle, North Staffordshire in the mid-17th century (ibid). The adoption of fire baskets was slow and many small Midland collieries still relied on natural ventilation over a century later. This required the sinking of several shafts across the area of the mine workings, something that also minimised the cost of underground transport (ibid, 70). It is this pattern of multiple shafts linking to a single mine that is seen on the Chase. The sinking of additional shafts into the mine solved the problem of ventilation, but was not cheap. Problems in ventilation occurred when mine owners wanting to avoid additional cost and ran mines underground without sinking additional shafts (Plot 1686, 137).

Robert Plot noted that problems in a poorly ventilated mine occurred at about 180m into the mine. This distance far exceeds the widest gaps between shafts on The Lawn, which is approximately 100m. Spacing of shafts for ventilation may have varied depending on the depth of the mine but would also have been dictated by the arrangement of the pillars and stall workings and perhaps the degree of risk of damps (poisonous or flammable gases). The frequency of shafts also meant that the coal only needed to be transported relatively short distance underground before it could be brought to the surface. Frequent shafts overcame the difficulties of underground transportation of coal and this requirement to get coal to the surface close to where it was dug may partly explain the spacing of these shafts. However, it is possible that not every shaft was used for bringing coal to the surface when the expense and work involved in lining these shafts is taken in to account.

‘Laying their coals dry’

A significant obstacle to mining on the Chase was the risk of the underground workings becoming flooded. An alternative to pumping water out of a mine was to dig an underground drain called a sough to take the water from the coalfield. The following is a 17th-century explanation of the process: Miners would dig a sough ‘...when they have the advantage of fall of ground enough, which they try by the *Level*, and then either dig a trench open to the surface, like a great ditch as deep as the *coale*, or drive in a *cuniculus* [underground drain] about a yard *diameter* to the pavement (if they can) of the lowest dip of the lowest measure of *coal* to dry, toward the *Crop*, that it may be workt without difficulty’ (Plot 1686, 148).

The requirement to ventilate underground workings described in the previous section meant that a long underground drain could not be dug without shafts being sunk along its length to prevent the workers from suffocating. The necessity of this and the expense in doing so is mentioned in a 1727 paper on mining (Desagulier 1727, 355).

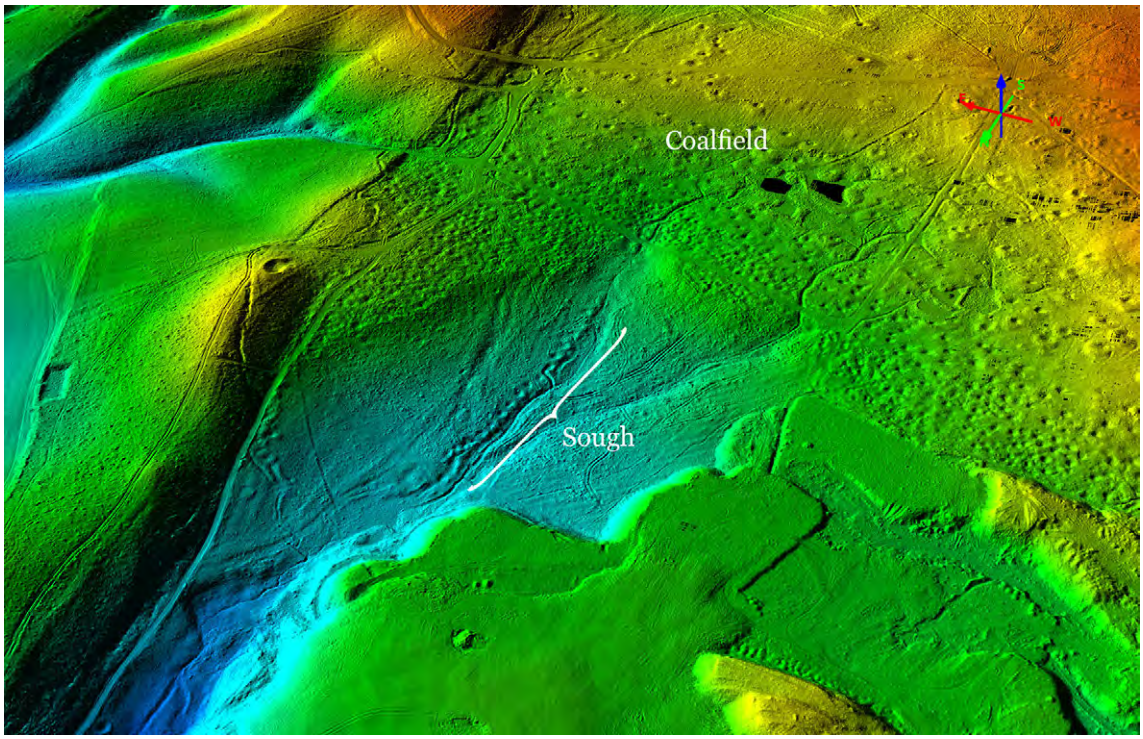

Fig 82: Lidar showing the northern group of coal pits on Brereton Hayes. A line of pits extending downslope mark the line of a sough dug to drain the coalfield. Lidar DTM 04-MAY-2016 © Historic England; source Staffordshire County Council/Fugro BV Geospatial.

These underground drains can therefore be identified on the surface by the line of shafts that ventilate the sough. These shafts are invariably surrounded by spoil and are identical in form to the shafts dug to provide access to the mine and from which the coal is raised. Two possible soughs have been identified as Brereton

Hayes (C. Welch, pers comm), one draining to the north (Fig 82) the other to the south-east (Fig 83). The sough draining to the north can be traced on the surface for approximately 160m. The earthworks here consist of a relatively straight line of shafts aligned approximately north-south. The distances between the shafts vary, but most are between 9m and 10m apart. Most of associated spoil has been thrown downslope to the west, and in places they merge together forming a continuous band of spoil. This line of pits is also noticeable for not having any other shafts in the immediate vicinity, suggesting the absence of coal at a workable depth. Water appears to be still issuing from this sough (ibid).

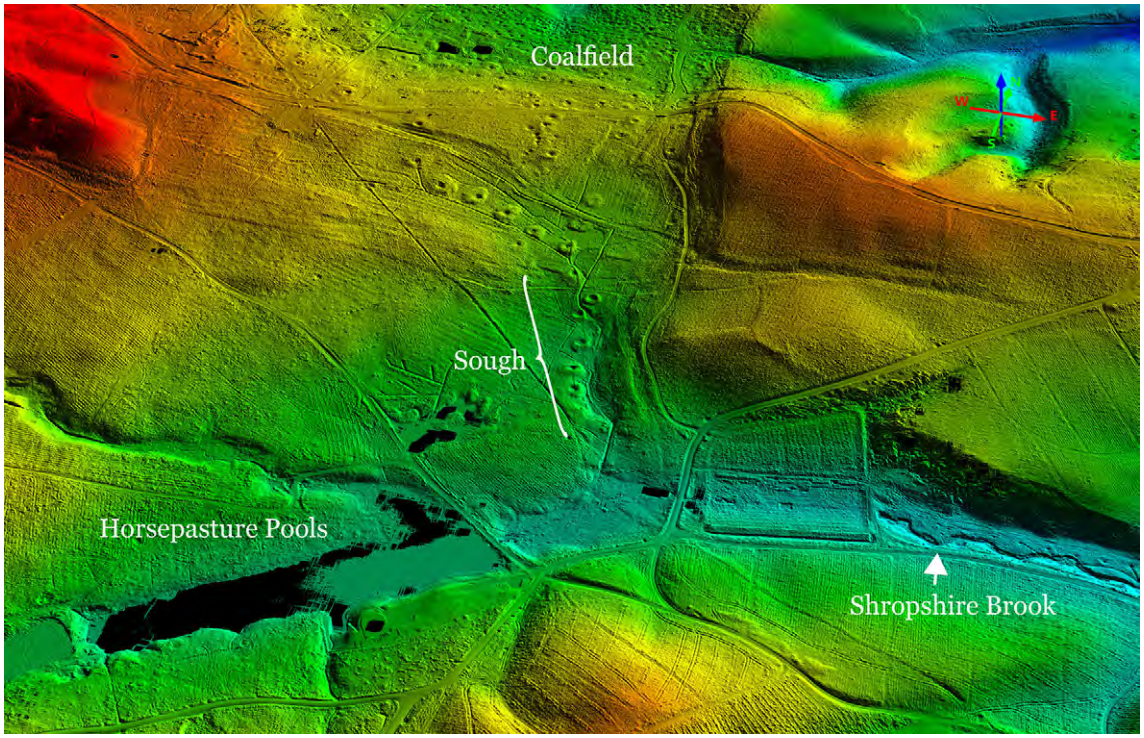

Fig 83: Lidar showing the southern group of coal pits on Brereton Hayes and line of pits possibly marking the location of a sough draining coalfield to Shropshire Brook. Lidar DTM 04-MAY-2016 © Historic England; source Staffordshire County Council/ Fugro BV Geospatial.

The other possible sough drained the coalfield to the south to the Shropshire Brook. The shafts sunk down to this southern sough have associated spoil heaps. As with the sough to the north, they extend into an area with no other evidence of mineshafts. The spacing between the shafts following the sough is approximately 10m further apart than the coal pits (a gap of c.35-45m as opposed to c.25m-35m). The sough follows the line of a coombe leading to the valley of the Shropshire Brook, beyond which no more shafts are visible. However, at this point the sough is not low enough to have drained the coalfield (ibid). The lidar revealed another line of pits about 300m to the east of the sough, located immediately alongside the Shropshire Brook. These shafts are regularly spaced (20m apart) and follow the brook for c.270m. It was initially suggested (ibid) that these may possibly represent the continuation of the southern sough but further investigation is needed.

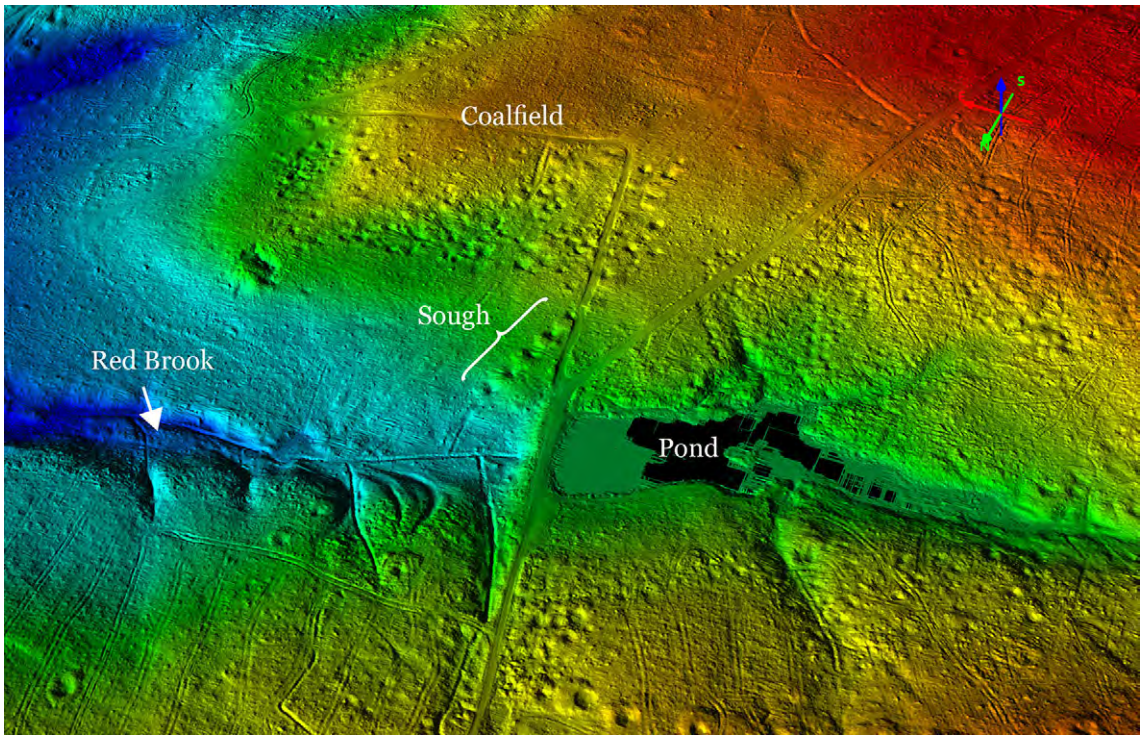

Fig 84: Lidar showing coal pits on the boundary of Lodge Bank and The Lawn within Beaudesert Old Park. A line of pits mark the possible location of a sough draining the coalfield to Red Brook. Lidar DTM 04-MAY-2016 © Historic England; source Staffordshire County Council/Fugro BV Geospatial.

Another possible sough has been identified on Lodge Bank (Fig 84). The shafts (MST1006) are aligned roughly north-south and lead down to the Shropshire Brook. A ditch running for 20m between the lowest shaft and the brook may have formed part of the sough.

Expansion of industry

In the early 19th century, coal mining on the Chase shifted north-east away from Beaudesert Old Park to the vicinity of Chetwynd's Coppice. Changes to the industry on the Chase were partly a result of the failure of the Black Country collieries to meet local demand, greater investment in deeper workings and better communications through the construction of the canal and later the railway (Greenslade and Jenkins 1967, 77-8).

Fragmentary remains of some of these collieries built in the first half of the 19th century survive (MST5768). These are largely hidden in woodland and have been mapped from lidar. Chetwynd's Coppice, near Rugeley, was the location of a number of pits sunk in the first few decades of the 19th century (Causer 1999, fig 1). This group of mines were served by a tramway (MST17358), built 1820, that linked them to the Trent and Mersey Canal at Rugeley. These pits were located along an area called The Slade and on higher ground to the north now largely occupied by Chetwynd's Coppice. Remains include the shaft and spoil of Valley Shaft and earthworks associated with the early 19th-century Hill Pit.

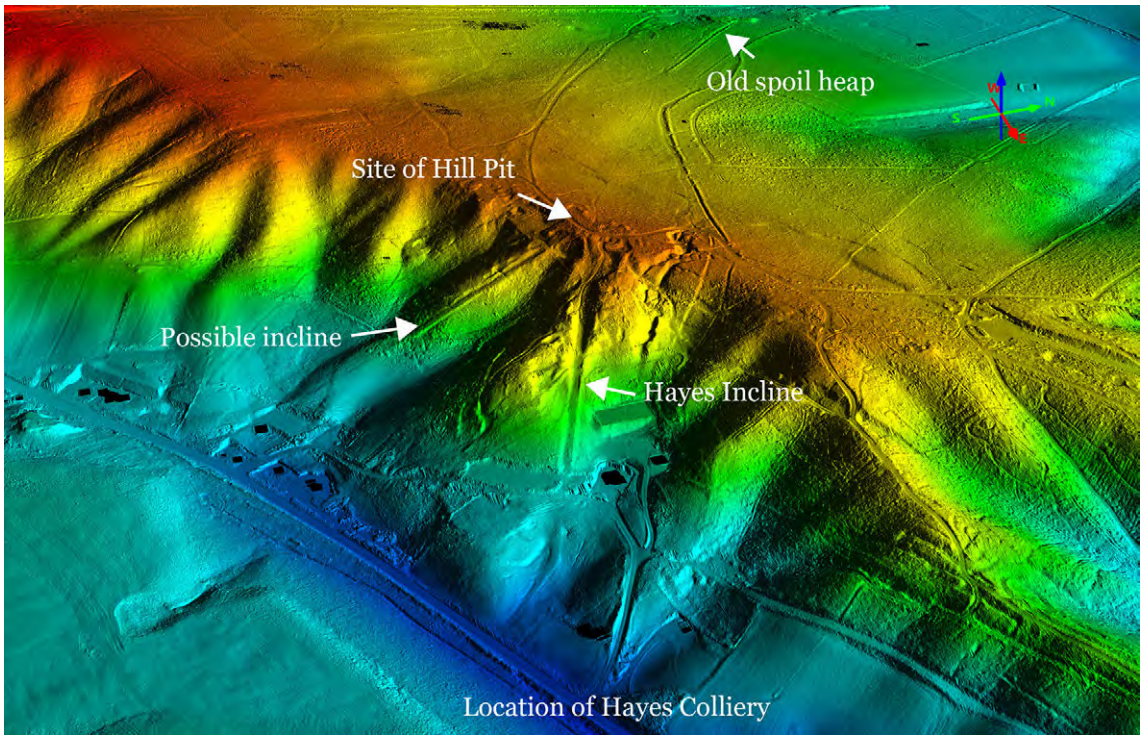

Fig 85: Lidar showing Hayes incline and the earthworks of a second possible incline on the left. Lidar DTM 04-MAY-2016 © Historic England; source Staffordshire County Council/Fugro BV Geospatial.

The clearest remains of the tramway are of the incline plane (MST5805) that took the tramway upslope from Hayes Colliery, though the earthworks are fragmented and interrupted by later roads (Fig 85). What may be the remains of a second tramway (MST22778) on this slope is also visible on the lidar to the west of the Hayes Incline.

A more substantial spoil heap and associated earthworks (MST5772) on the edge of Stilecop Field is the remains of Style Cop Pit. The sinking of the shaft began in 1849 but was hampered by flooding. Pumping was undertaken first by horsepower and then steam-driven, but a report from September 1851 stated the works were completely flooded (Causer 1999, 63). It is not clear how much of this spoil is associated with this phase of work. The Ordnance Survey mark this pit as 'old' only in 1884 and 1902. By 1923, it appears to have been back in use, and the Ordnance Survey map depicts a spoil heap that corresponds with that mapped from the lidar. The early 20th-century use of this mine is further corroborated by the spoil heap extending over a boundary that is shown on earlier map editions.

The iron and steel boom of the early 1870s (Greenslade and Jenkins 1967, 81) meant demand for coal was high at the start of the decade. Existing Cannock companies extended their workings and new companies leased large areas of Chase mineral rights. Close to the centre of Cannock Chase, south of Stonybrook Pools, are the remains of a spoil heap from Fair Oak Colliery No. 1 (MST2229). This pit was sunk in the early 1870s but progress was problematic, and with no coal found after reaching a depth of 250yds the pit was closed. A second pit, Fair Oak

number 2 (MST5719), did reach coal and remained in use until the early 1880s. Other earthworks identified on the lidar include the remains of Fair Oak railway sidings (MST5717) that linked No1 pit with the London and North West Railway (LandNWR) Cannock Mineral Branch, and remains of the tramway that linked pit No 2 to the siding. Both collieries, tramway and railway sidings are shown on the 1884 25-inch OS map but the company closed in that same year. The *Railway Times* of 1884 reports on the liquidation of the company and sale of machinery (*Railway Times* 1884, 1444). Other collieries established in the 1860s and 1870s were more successful. They continued in use for decades, some for over a hundred years, and so formed part of the 20th-century landscape of Cannock Chase.

British coal petrol

The pattern of collieries seen on the 1940s vertical aerial photographs had largely been established by the late 19th century, but the intervening period had been fraught with problems including the collapse of Britain's coal exports in 1920-1, the great depression of the 1930s and increasing competition from oil (Griffin 1977, 170-171). It was during the interwar years that an efficient technique to produce motor spirit from coal was developed at Cannock. Although not the only process developed to distil coal, the *Cannock Process*, as it became known, was capable of producing significant quantities of motor spirit from coal and the only one to go into commercial production (*Birmingham Gazette* 1936, 35). One ton(ne) of coal and 18 gallons (81.8 litres) of creosote (a derivative of coal) produced 15cwt of smokeless fuels and 15 gallons (68 litres) of petrol (*Staffordshire Advertiser* 1934, 7).

The development of the Cannock Process was partly inspired by the falling fortunes of the coal industry, and partly to answer concerns of Britain's growing dependence on foreign fuel supplies in the form of oil. The venture was presented as a new hope for the coal industry by meeting the competition from oil. For some, the gradual switch from domestic coal to foreign oil to fuel the Royal Navy's ships had grave implications for the nation's defence. One of the stated aims of this work was to re-establish the coal industry and make the country self-sufficient in oil supplies; 'from the standpoint of defence alone, this is an advantage of incalculable value' (ibid).

Two retorts (in which the coal was distilled) were constructed at Leacroft Colliery, Cannock. The Cannock Process was developed and launched by WB Mitford and EW Brocklebank, and implemented by the National Coke and Oil Company Ltd. Waste coal in the form of slack and dust was pulverised and dispersed in creosote and then distilled (*Birmingham Gazette* 1936, 35; *Illustrated London News* 1935, 528-9). This distilling plant went into commercial production in 1934 and the petrol, properly referred to as a motor spirit, was sold under the trade name Napet. A by-product of the manufacturing process was a semi-coke breeze that was made into briquettes. This smokeless fuel was marketed under the name Naco or Naco Ovoids. Presumably, both names were based on the first two letters of National (NA) combined with PET for petrol or CO for coal.

A number of events marked the launch. Earl Howe drove a racing car fuelled with Napet from London to Birmingham, presumably at breakneck speed as he asked the

press not to make a note of his speed! Another famous motorist Whitney Straight (later Air Commodore Straight), claimed the fuel was the equal if not better to any fuel he had previously used. While the pilot Captain E W Percival tested the fuel by flying from London to Birmingham and later to Cannock, where he gave an aerial acrobatics display over the plant (*Staffordshire Advertiser* 1934, 7; *Birmingham Daily Gazette* 1934, 10).

Initial newspaper reports suggest a successful start to this venture. In October 1934 it was reported that the entire output of the Cannock plant had been sold for the coming year (*Staffordshire Advertiser* 1934, 7). There were also ambitious plans for expansion and in 1935, the *Illustrated London News* reported on plans to open five plants across the country. This was under an impressive double-page illustration of these plants that included a cut-away of the one at Tipton showing the processes involved in distilling the coal. The five plants were to have been at Tipton (Birmingham), Erith (Greater London), Manchester, Edinburgh and Glasgow (*Illustrated London News* 1935, 528-9). In the event, plants were only constructed at Erith and Tipton. At the same time the plant at Cannock was closed and its two retorts dismantled and re-erected at Tipton (Anon 1935, 562).

Two years later problems with the process were reported and for unspecified reasons the Tipton plant had to be shut down for the greater part of 1937 with only Erith in production (Anon 1937, 431). Napet and Naco appear in various adverts in the national and local press during the late 1930s. The latest reference found is in an advert dated August 1938 for a Worthing (West Sussex) filling station. This advertised Napet as 'British Coal Petrol' at 1/6 a gallon. This was a few pence more expensive than petrol which the same garage sold at 1/3 halfpenny per gallon. Manufacturing problems and a slightly more expensive retail price presumably contributed to the ultimate failure of coal petrol.

Fig 86: Coal wagons at Hednesford photographed from the air in 1938. See chapter 'Working With Aerial Photographs'. Detail of AFL 61187 26-NOV-1938 © Historic England Archive. Aerofilms Collection EPW060289.

More coal!

As part of the post-Second World War aerial survey of the country, the RAF flew sorties over Cannock Chase from 1946 onwards. Although these do not represent the earliest aerial photographs of coal mines on the Chase (*see* Fig 24), this was the first of a number of comprehensive aerial surveys carried out throughout the 1940s and 1950s. These and the aerial photographs taken by Aerofilms provide a fascinating view of coalmining on the Chase. All but one of these pits had opened between the mid-1850s and the early 1870s.

It could be argued that the aerial photographs of the 1940s show a high point in mining on Cannock with such a large number of collieries in operation, but the reality of the immediate post-war period was a coal industry in crisis. During the Second World War national coal output had dropped from 231.3 million tons (1939) to 174.7 million tons (1945). There were a number of causes for this including the inefficiencies of old pits and a shortage of mineworkers (Griffin 1977, 173). These problems continued into the post-war period and during 1946 there were numerous newspaper reports of the problems caused by the shortage of coal. Low coal stocks at factories, power stations and gas works were reported (*Gloucester Citizen* 1946, 2). Some steel works were forced to close due to the lack of coal (*The Scotsman* 1946, 3) and a number railway engines had been converted to burn oil (*Western Morning News* 1946, 3). These problems were exacerbated by other post-war shortages including a reduced number of railway coal wagons (*Yorkshire Post and Leeds Intelligencer* 1947, 3).

The coal industry was nationalised on 1st January 1947 and the prime minster Clement Atlee highlighted the problems facing the industry. In a speech marking the transfer to state ownership he said that the coal board was a fine team but was 'going out to bat on a distinctly sticky wicket', 'nevertheless' he added, 'I am sure it will score a great many sixes' (*Illustrated London News* 1947, 35). Problems were made worse by the heavy snowfalls and a prolonged cold period that lasted from late January to mid-March 1947. The bad weather compounded the problem of limited coal supplies with the difficulty in transporting coal across the country. Cannock miners rose to the challenge by working a Sunday shift as part of a national push to win more coal and get coal stocks moving from pit to power stations and factories (*Nottingham Evening Post* 1947, 1). Cannock miners were keen to repeat the Sunday shift the following week, but the chairman of the Midland Division of the Coal Board did not consider it possible to prepare the mines in time, although he was favourable to this happening on future Sundays. If this was the case, it does not appear to have been reported in the press (*Belfast News-Letter* 1947, 5; *Western Morning News* 1947, 3).

It was during this period that work was undertaken on what became known as the *Plan for Coal*, which was published in November 1950. The plan was for a large investment in the coal industry, estimated at £635 million, to produce more and cheaper coal and better conditions for miners. The intention was that by 1965 36 million tons more of coal could be won by 80,000 fewer miners working in fewer

pits. This was to be achieved by the reconstruction of more than 250 collieries and the closure of older pits.

Aerial photographs show evidence of modernisation on the surface of West Cannock No 5 (MST5798). The earliest aerial photograph taken in 1946 (Fig 87) shows the original arrangement of buildings prior to this rebuilding programme, while those taken in September 1954 show the subsequent building work at the colliery in progress (Fig 88). New buildings included offices, baths, medical centre, time office, control room complex lamproom, rescue room, workshop and stores. There was also the creation of a new approach road. By 1963 the works appear completed and show some landscaping and tree planting as well as additional structures associated with the coal loading buildings on the railway siding.

Fig 87: A 1946 aerial photograph showing the surface arrangement of buildings at West Cannock 5 colliery. RAF/106G/UK 1483 RS 4395 09-MAY-1946 Historic England Archive (RAF Photography).

Other changes took place beneath the surface, including the linking of collieries below ground. West Cannock 2 (MST22565) and West Cannock 5 were linked in Feb 1955 by a 1.5-mile (2.4 km) long tunnel. From that date all coal from both mines was raised at No 5 pit and the surface works at No 2 colliery were closed (Anon 1955, 26).

The spoil heaps offer some indication of the underground operations. Aerial photographs taken in the second half of the 20th century show the gradual expansion of the tips. The earliest photos of West Cannock 5 show a discrete spoil heap that grows gradually until at least 1948. After this, the development of the

spoil heap differs from many of the other tips in and around the chase. Rather than building the heap up, photographs show the spoil spread along the side of Rising Brook valley, gradually changing the profile of the land (Fig 89). Spoil was also spread across part of the abandoned RAF Hednesford and this is discernible as a broad low mound on lidar.

The surface evidence can be misleading. The abandonment of spoil heaps at Littleton Colliery (MST5762) is clearly seen on aerial photographs taken in August 1954. The bridge, which took the spoil from the pit had been demolished and the spoil heaps were becoming overgrown. The disused status of the spoil heaps is confirmed by the 1954 OS map which labelled the tip as disused. However, the colliery was still in operation until 1993, but from the mid-1950s the spoil was disposed of elsewhere (Various 2006, 327).

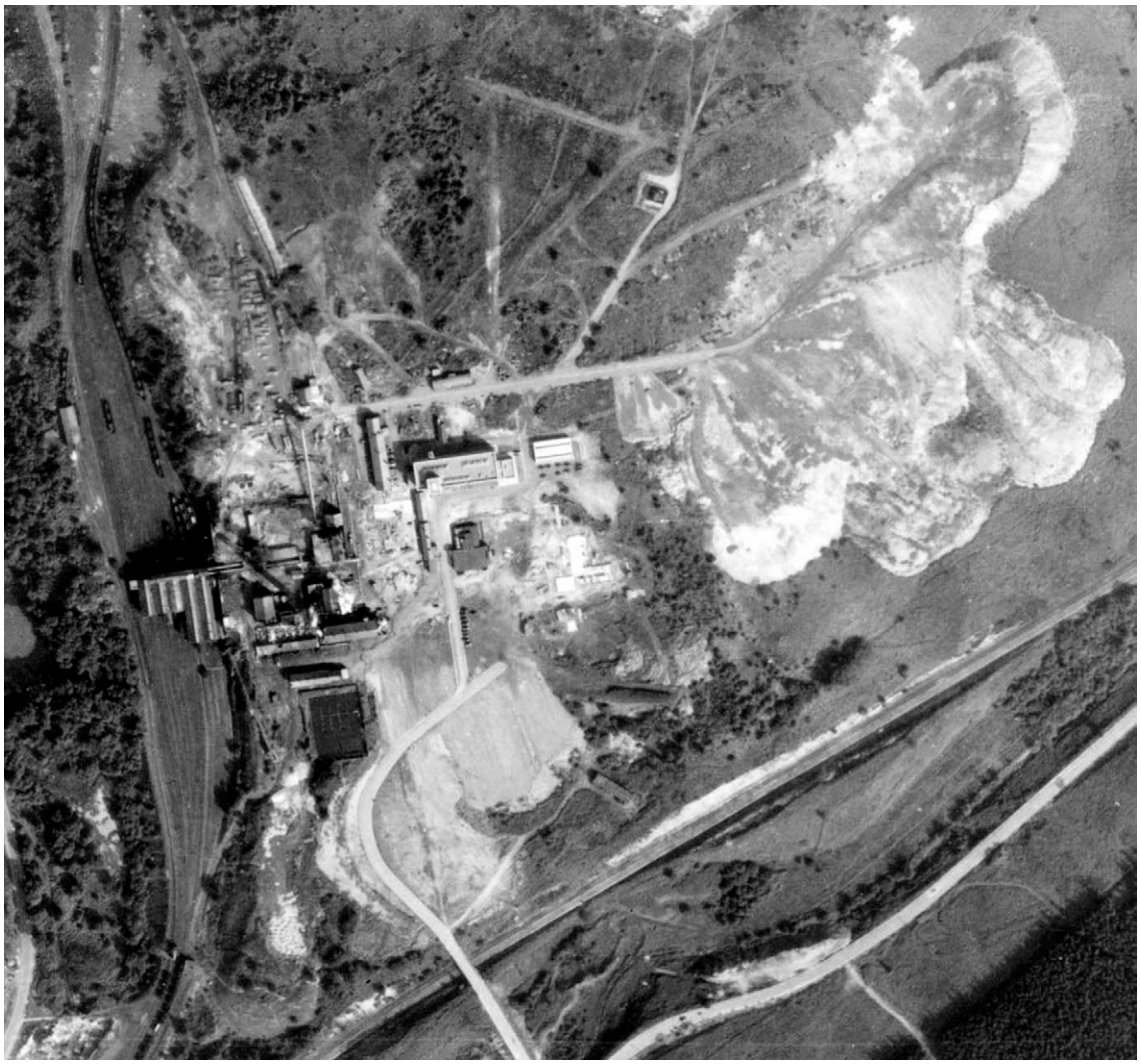

Fig 88: West Cannock 5 colliery in 1954 showing new buildings under construction. RAF/58/1553 0065 15-SEP-1954 Historic England Archive (RAF Photography).

Fig 89: This Ordnance Survey photograph taken in 1978 shows the spoil from West Cannock 5 spread to the right along the side of the Rising Brook valley and toward the top of the picture across the site of RAF Hednesford camp. Compare with Figs 87 and 88. OS/78158 V 0243 22-SEP-1978 © Crown copyright. Ordnance Survey.

Housing

A study of housing is not within scope of the Chase Through Time project, but a proportion of the houses and other buildings in the area were built for mineworkers. The First World War Brindley Heath hospital (MST18877) was converted to house miners and became known as Brindley village (see *'Military Presence On The Chase'* chapter). A physical link between a mine and housing once existed at the northern end of Cannock, and a footbridge was constructed linking a housing estate to the colliery (Fig 90). This was demolished with the closure of the pit. Although the site of the colliery continued to provide jobs in the form of an enterprise centre, the demolition of the footbridge may indicate that the site was by then drawing on a more distant workforce.

Fig 90: A 1963 aerial photograph showing the footbridge (since demolished) that linked West Cannock Colliery 5 to housing at northern end of Cannock. RAF/543/2336 0201 30-JUL-1963 Historic England Archive (RAF Photography).

Fig 91: Wimblebury colliery with barrack-like accommodation on the right. RAF/82/988 F22 0016 14-AUG-1954 Historic England Archive (RAF Photography).

Aerial photographs taken in the 1940s and 1950s show a group of barrack-like buildings at Wimblebury (MST5792) (Fig 91). These were presumably erected during the Second World War, but their location next to an unfinished pre-war housing development suggests that were not associated with the armed forces. They possibly provided wartime accommodation for those conscripted into the mining industry rather than the armed forces; workers known as Bevan Boys. These buildings were demolished by 1968 and new houses eventually built on this site.

The third example of housing for miners is in Rugeley. Here the Pear Tree Estate consists of 800 homes built by the Coal Industry Housing Association and were once almost exclusively occupied by miners. Street names include Attlee Crescent, named after the Labour Prime Minister, Clement Attlee. Other streets are named after those associated with the industry. These include the trade unionist Keir Hardie, the author of the 1842 Mines and Collieries Act Lord Shaftsbury and inventor of the safety lamp Humphrey Davy (Bird 1974, 118).

Dereliction

Over the course of the 20th century, coal was gradually losing its pre-eminent position. Coal's main competitor was oil, both as a fuel and in the form of its many by-products, but coal also lost out to natural gas, nuclear energy and renewable forms of power generation. Other factors affected the industry, including the importation of foreign coal and changing attitudes to the environmental impact of burning fossil fuels. As a result, the industry declined over little more than 100 years. In 1913, Britain's mines produced more coal than they had before or since, when over one million miners from more than 3,000 pits won 287 million tons of coal. Just over 100 years later in 2015, Britain's last deep mine closed.

As part of the 1950 *Plan for Coal* Cannock Chase was one of the areas predicted to see a significant number of pit closures (*Northern Whig* 1950, 1). By 1955 it was reported that the intended closures on Cannock Chase had been scaled-back (*Birmingham Daily Post* 1955, 8). Nevertheless, Cannock saw a considerable number of pit closures during this post-war period and 12 pits closed between 1947 and 1960 (*Birmingham Daily Post* 1960, 29). Nationally, colliery closures averaged 34 pits per year between 1958 and 1973 (Thornes 1994, 1).

Aerial photographs show the effect of the closures on the Chase. The first post-war pit closure was West Cannock 3 (MST5787) (Fig 92) at Hednesford in 1949. Aerial photographs taken in 1952 show the pit buildings and headgear still in place although some buildings appear derelict. Two years later the buildings had been demolished but the spoil heap remained (Fig 93). The aerial photographs show a similar pattern of limited demolition and clearance at the four pits closed during the 1950s. In the following decade only two pits closed. The first was Brereton colliery in 1960, which had been in operation for an impressive 105 years. Two years later Wimblebury Colliery closed after 90 years. The aerial photographs taken during this decade (mainly by the Ordnance Survey) show a marked change in the industrial landscape of the Chase. Not only were their spoil heaps quickly removed after pit

closure, but the aerial photographs also show spoil heaps in the process of being removed at collieries that had closed in the 1930s, 40s and 50s.

The evidence from the aerial photographs suggests a programme of work aimed at addressing the problem of derelict industrial sites on and around the Chase. Some of this dereliction was long-term, abandoned tips at West Cannock Colliery 2 had been left for over 20 years. Even the spoil heaps from the first post-war closure had remained in place for over a decade.

Fig 92: West Cannock 3 working in 1946 RAF/106G/UK 1483 RP 3257 09-MAY-1946 Historic England Archive (RAF Photography).

Fig 93: West Cannock 3 in 1954, five years after closure. The spoil heap remains but the buildings have been demolished. Compare with Fig 92. RAF/82/988 F22 0047 14-AUG-1954 Historic England Archive (RAF Photography).

A less tolerant attitude to dereliction was evident during the 1960s and the problems associated with disused industrial sites was outlined in John Barr's 1969 book *Derelict Britain* (Barr 1969). By 1964 Staffordshire had almost 9,000 acres of derelict land that justified treatment based on the criteria of the time; over a third of which was spoil (ibid, 43). Aerial photographs taken in 1964 show new housing built next to sites being cleared (Fig 94). This highlights the problem of dereliction and abandonment for a community and may indicate that the derelict land was cleared partly in response to construction of these new buildings.

Fig 94: This photograph taken in 1964 shows the spoil heap of West Cannock 3 finally being removed. Immediately next to the site is a group of new houses. OS/64033 V 0018 17-MAY-1964 Historic England (OS Photography).

Fig 95: Housing being built in 1978 over site of East Cannock Colliery. OS/78158 V 0331 22-SEP-1978 © Crown copyright. Ordnance Survey.

Little remains of these 20th-century coalmines and most colliery sites appear to have been cleared completely. This is certainly the case for the site of East Cannock Colliery (MST23100), which is now occupied by housing (Fig 95). Other colliery sites were not redeveloped and lidar indicates that although the heaps were flattened and largely removed, some trace of them does remain. These are either under woodland or grass and invariably survive as broad flat heaps difficult to identify as old spoil tips, although small grass-covered mounds at the site of East Cannock/ West Cannock 2 are the remains of the spoil heap after most of the waste had been removed. Some spoil heaps appear relatively unaltered, as is the case to the south-east of Wimblebury where the remaining Cannock Chase 8 (MST5794) spoil tips can be clearly seen on lidar. Other sites of significance to Cannock's mining industry have also been lost. Figure 96 shows the building used as the mines rescue station, which has since been demolished and is now the site of a supermarket.

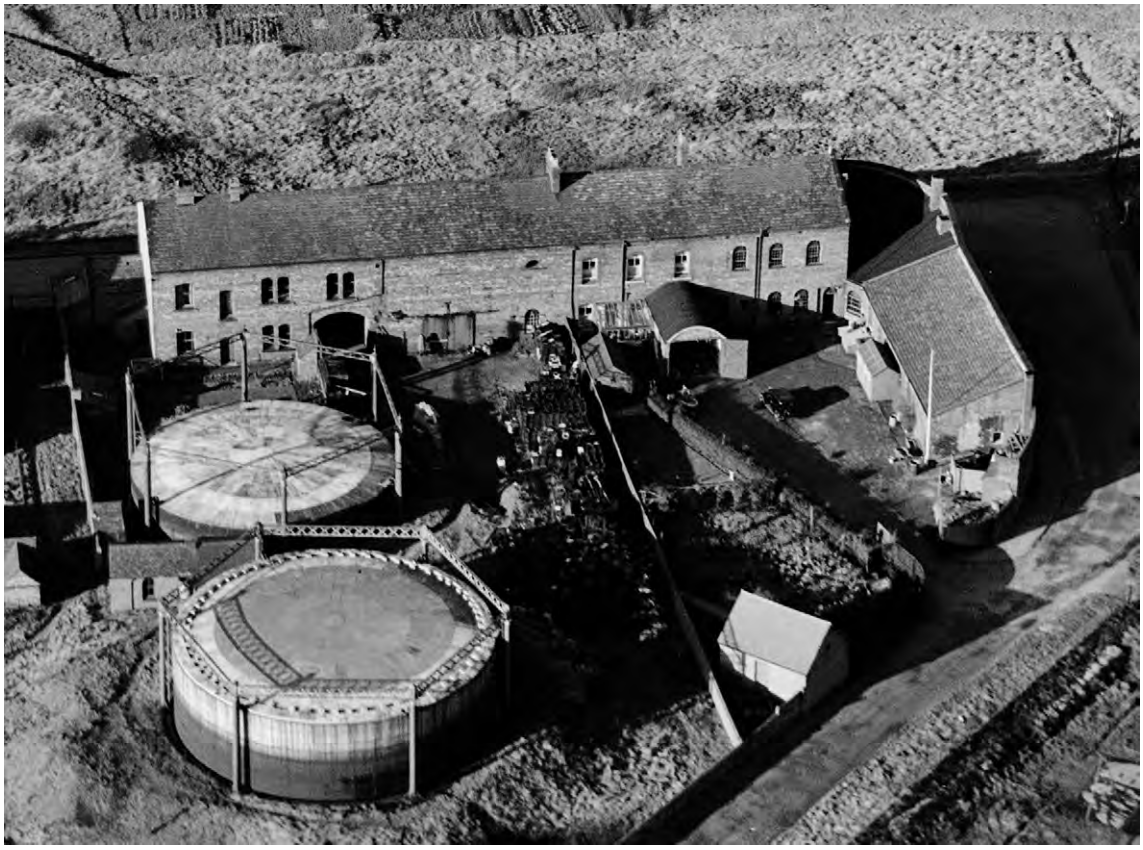

Fig 96: Mines rescues station to right of the town gasworks photographed in 1938. The small building bottom right was a mortuary. Detail of AFL 61187 26-NOV-1938 © Historic England Archive. Aerofilms Collection EPW060289.

The best survival is at West Cannock Pit 5 (closed 1982) where most of the surface buildings were retained and now form the Enterprise Centre (Fig 97). A 19th-century mine building also survives from Cannock Wood colliery and now forms part of the industrial estate on the site.

Fig 97: Cannock Enterprise Centre largely consisting of buildings once part of West Cannock Colliery 5 colliery. These were built as part of the 1950s modernisation of the pit and replaced those seen in Fig 87. CCX 14378/14 28-OCT-1992 © Historic England (taken by Chris Cox).

Conclusion and further work

The earthwork remains of mining extend over a large area of the Chase, but despite the fact that some of these earthworks are substantial, they are somewhat lost in the landscape, partly obscured by woodland and often hidden from view of those visiting the Chase. This project has demonstrated the value of aerial survey in the study of the coalmining industry and has resulted in the production of a detailed map of coal mining on Cannock Chase. The value of aerial survey in the identification of coal mining remains has a long history and the National Coal Board commissioned an aerial survey during the 1960s to help identify spoil heaps in Durham and Northumberland (Barr 1969, 48).

A number of early coal pits survive in England but the apparent invisibility of old coal mining remains in part explains Griffin's comment that 'it is rarely possible to see old bell pits on the surface' (Griffin 1971, 4). However, his comment also partly reflects that many of these earlier pits had been levelled or built over by the later 20th century. Of course, all buried features may produce cropmarks and coal pits are no different. It is possible that coal-mining cropmarks were overlooked or dismissed in early aerial archaeological work. An account of the identification (in 1955) of the

cropmarks of Nottinghamshire coal pits was published in *Colliery Engineering* rather than an archaeological journal (Henson and Smith 1955, 256-258).

For this project, historic aerial photographs have provided views of since demolished collieries and shown aspects of their development during their working life and the stages of decline after their abandonment. They have also enabled the identification of medieval or post medieval coal pits that were levelled since the 1940s and undetectable on the lidar, and of the cropmarks of early coal pits levelled before the earliest aerial photographs were taken (Fig 98). The lidar has proved crucial in the understanding of coal mining on Cannock Chase, as the vast majority of coal mining remains are within woodland and cannot be seen on historic aerial photographs.

Fig 98: This 1948 photograph shows New Hayes Road running left to right (east-west). Coal pits can be seen either side of the road. Those towards the top are earthworks, but those toward the bottom of the picture have been levelled and show as cropmarks. RAF/CPE/UK/2469 RP 3353 09-MAR-1948 Historic England Archive (RAF Photography).

Woodland is not only a hindrance to aerial photography, but also to field survey and traditionally wooded areas are poorly investigated. However, the presence of trees may also inadvertently ensure better survival of archaeological features. The field survey of the coal pits in the early 1990s (Welch 1993) showed what can be achieved on the ground, but also highlights that access to certain areas can be restricted by the density of vegetation. Equally, access to some areas may be restricted for other reasons.

The remarkable survival of extensive coal mining remains across the Chase represents hundreds of years of coal mining and illustrates a range of medieval and post medieval mining features. This good survival is a combination of a number of factors. Most of these pits are located within Beaudesert Old Park, with the larger scale mining taking place outside the park by the early 19th century. Unlike many other coalfields whose surface features only survive on the periphery of the coalfield (Newman 2016, 274), Cannock's are largely unaffected by later development and so more accurately reflect the development of the entire coalfield. The location of these early mines within an Area of Outstanding Natural Beauty has also ensured protection from major developments, including 20th-century opencast mining.

The aerial survey has highlighted the remarkable survival of earthworks representing hundreds of years of coal mining on the Chase. Identification is the first step in a better understanding of Cannock's coal industry and further work will enable a more nuanced categorisation of these mining remains. The next step is to consider what work needs to be done to better understand the history of coal mining on the Chase and how these remains can help to answer some of the questions as formulated in the research aims published in the National Association of Mining History Organisations (NOMHO) Research Framework (Newman 2016).

The results of this survey indicate that Cannock Chase has enormous potential to answer questions about early coal production. Nationally, very little archaeological exploration has been undertaken of shallow coal working to establish true underground nature, origins and techniques used. This survey answers the first step in this aim, by identifying the extent, pattern and form of shallow workings on the Chase to provide a framework to target further work.

Fieldwork may be able to distinguish different phases of coalmining that made up this 700 or so year history. Further work could potentially identify evidence of pre-medieval coal mining or the remains of any shallow pits that may have been dug by 19th- and 20th-century striking miners. Part of this work could involve relating these surface features to known coal seams, their angle of incline and the location of faults. Any aspect of this further work should contribute to a better understanding of regional coal working technique.

This important group of coal mining remains has great local significance, but its survival has significance regionally and nationally. Despite the long history of coal mining in Staffordshire, the survival of remains for this county appear to be poor and only one group of coal pits in the West Midlands has been identified as nationally important and scheduled: Saltwells Wood, Dudley (NHLE 1020539). A thorough comparison of all known coal-mining areas, some of which are designated as being of national importance, will allow Cannock to be put in its proper context.

Most coal pits mapped are on land once owned by the Paget family (later Marquis of Anglesey and Earl of Uxbridge) and potential estate documents may survive that can further our understanding of coal mining on the Chase. Archive work to identify documentary evidence for this coalfield could lead to in-depth research of the management of this resource and perhaps answer questions relating to when and by

whom were certain pits dug, their maintenance, what quantities of coal were raised, what price it sold for and its ultimate destination?

Based on evidence from medieval and post medieval coalmines exposed through opencast workings elsewhere in the country, we can be confident that beneath the Chase there are the physical remains of a range of mining techniques and also a rich array of artefacts including tools and perhaps clothing. Remains of this type offer a more personal history; something that would also be achieved through an oral history project to record different aspects of the industry from the last generation to have mined coal from this part of Staffordshire.

The demolition of colliery buildings and the removal of spoil heaps, which together formed a familiar part of this landscape, marked a dramatic change in the character of this part of the Chase. The unattractiveness of colliery landscapes has been commented upon by a number of authors, including George Orwell in *The Road to Wigan Pier* and JB Priestly in *English Journey* (see summary in Barr 1969, 47-8). The clearance of derelict industrial sites was partly a response to their unattractiveness and their damaging effects on the landscape, but must also be seen in the context of the 1966 Aberfan disaster in which a spoil heap collapsed and engulfed a school, killing 145 children and adults.

With the near wholesale demolition and clearance of the collieries that closed in the 20th century, this important industry is now represented by the earlier coal pits on the Chase and they form a significant group of monuments for an area with a long story of coal mining. While the clearance of most of Cannock's 20th-century collieries was probably a response to environmental and safety factors, it has meant the removal of those parts of the landscape that may have acted as memorials to the role this region played in the story of coal mining. Perhaps as a result of this absence, a number of memorials to the mining industry and to those who worked in the pits have been built in towns around the Chase in recent years. It is hoped that the surviving coalmining remains highlighted by this survey will in part compensate for the absence in the landscape of more recent coalmines and provide a connection with the generations of miners who for over 700 years won coal from Cannock Chase.

DIVIDING THE LANDSCAPE

Introduction

The use of lidar on the higher ground, and a combination of aerial photography and lidar on the surrounding lowlands helped reveal aspects of land division potentially dating back to the later prehistoric period. Whether defined by field boundaries, park pales, wood banks or intakes, these boundaries reflect patterns of the changing physical landscape, and the social relationships between the ruling classes and commoners.

This chapter aims to draw the historical and archaeological evidence together, providing a summary of features, and how they link to documented history and other sites in the region. A brief overview of previous archaeological work is provided, with a concise history of the management of the Chase from the medieval period onwards. The archaeological results from the project are then described in the context of previous research to better define our understanding of how physical and social divisions in the landscape are preserved in the archaeological record.

Previous work

Evidence of pre-medieval land management is lacking on Cannock Chase, though recent studies have begun to expand our knowledge of the wider area. In terms of aerial survey, Historic England funded aerial investigation and mapping projects (to NMP standards) in Staffordshire, have helped to increase our knowledge of the later prehistoric landscape, but only in isolated pockets (Bax 2014; Bax 2015). These projects surveyed and recorded a number of areas in the county from aerial photographs and Environment Agency lidar, and partly overlapped with the northern area of the Chase Through Time project, around Shugborough Park. A little to the north of the project area, at Brancote Lodge and north-west of Great Haywood, pockets of field boundaries were mapped from cropmarks, indicative of buried features. Considered to be of probable Iron Age or Roman date, these boundaries comprise linear ditches, enclosures and pit alignments, and although fragmentary, appear to show elements of early field systems (Bax 2014, 25-27). Most of these cropmarks are visible on the rich alluvial sand and gravel river deposits of the River Trent, which passes through the north of the Chase Through Time project area.

The Trent Valley is a well-studied landscape, with a rich diversity of prehistoric activity visible as cropmarks stretching along most of its length. Other notable field systems have been mapped or excavated along the River Trent in Staffordshire, again usually defined by ditches and pit alignments, at Kings Bromley and Fisherwick (Knight and Howard 2004, 97, 102). One of the most intensely utilised areas is indicated by cropmarks at the confluence of the Rivers Trent and Tame, a little to the east of the project area. Here, prehistoric and Roman field systems, routeways and settlement are visible as cropmarks, notably at Whitemoor Haye, as well as the prehistoric ceremonial complexes at Woodhenge (Buteux and Chapman 2009, 12, 31). Most of the more extensive later prehistoric landscapes known from cropmarks

along the Trent, lie a little further afield, in Derbyshire and Nottinghamshire. Further areas of prehistoric land management were recorded from aerial photographs in the north of the county, bordering on the Peak District, where cropmarks revealed buried prehistoric land division defined by pit alignments (Bax 2014, 25-27).

In the medieval period the project area was dominated by its use as a forest and chase; a hunting ground. Most of Cannock Chase Area of Outstanding Natural Beauty lies within the bounds of a historical royal forest, named Cank or Cannock Forest, that stretched between the Rivers Penk, Sow, Tame and Trent, and as far south as Wolverhampton. In the late 13th century, a large portion of the forest was granted to the Bishop of Coventry and Lichfield as his private Chase, much of which was within the current AONB. The subsequent centuries saw the area divided into small manors and deer parks. Leonard Cantor wrote extensively on the medieval deer parks of England, but also authored a number of papers that reveal the history of Cannock Chase in some detail. The studies and transcriptions of other authors, especially Welch (2000) and Harrison (1974), open a fascinating window into the 16th century, allowing a rare opportunity to see how this upland landscape was being utilised as part of an early 'industrial revolution' (see '*Industry*' chapter).

The wider subject of forests, chases, parks and woodland have been extensively researched by a number of authors, notably including Rackham (1993) and Grant (1991). Their studies allow for a better understanding of the wider picture of how, where and why boundaries were created, which is of great importance when interpreting the archaeological features surveyed by this project.

Despite this, physical survey of the pre-military archaeology of the Chase is somewhat limited. A number of walkover surveys have been undertaken, most notably Scruby's (published in 2000) on behalf of the Forest Enterprise, which produced a number of notebooks and field drawings, now deposited in the Staffordshire HER. Most of the additional surveys were localised and specifically focussed on particular periods of history. Numerous assessments, surveys and archaeological evaluation excavations have taken place in the grounds of Shugborough Park from the 1980s onwards, and in Beaudesert Park. The latter included an analytical earthwork survey of Castle Ring hillfort (RCHME 1987; Taylor and Dean 2015, 44, 57, 110). Excavation and subsequent research of the glassworks in Wolseley Park yielded fascinating results, suggesting that one glassworks was in operation from at least the 14th century, and documents record that glass manufactured in Cannock Chase made its way as far as York Minster (Welch 1997a, 1-2). The link between industry on the Chase and land division will become more evident below.

Archaeological survey and evaluation was undertaken on a small enclosure in Badger Slade, the site of an 'old encampment' marked on 18th-century maps of Teddesley Warren (SRO D260/M/E/353a). The enclosure, which was probably a stock enclosure, was subsequently destroyed by mineral extraction (Jones 1997; Scruby 2000, 5). Pottal Pool and Rugeley quarries have been subjected to a number of archaeological assessments as they have expanded (Taylor and Dean 2015, 68, 74, 79-80).

As a final note, Brocton Coppice has seen a number of archaeological and environmental surveys by both the County Council and Northamptonshire Archaeology (ibid, 62), primarily due to its status and importance as ancient woodland.

A brief history of Cank Forest and Cannock Chase

In order to better understand the results of the mapping, it is necessary to understand its documented history. The archaeological and natural landscape of the area is the result of a complex history dating back to the early medieval period. The subsequent centuries of parcelling up the land into various manors, changing land ownership, relations between lords and their tenants, and the management (and lack thereof) of the woodland, were all responsible in creating the heathland that existed at the outbreak of the First World War.

Norman lordship

In Domesday Book of 1086, Cannock is described as having woodland '6 leagues long and 4 leagues broad'. This is the single largest area of woodland recorded in the entire survey (Welch 2000, 19), though Sargent (2018) argues that this is reference to the size of the manor rather than the actual woodland. The manor of Rugeley was also densely wooded, being '3 leagues long and 2 broad'. Brocton and Bednall are both described as waste (Williams and Martin 2003, 673-5). The Domesday Book often describes woodland as for pasture (*silva pastilis*) or for coppice (*silva minuta*), but that in the manors of Cannock and Rugeley was *silva*, or plain woodland (Jones 1993, 33).

Following the Norman Conquest, most of the manors in the area were passed directly to the Crown, and it may have been shortly afterwards that the area was designated a royal forest, and the term Cank or Cannock Forest was applied. Unlike the modern sense of a forest, a royal forest was more of a game preserve, and comprised areas of woodland and waste alike, that were set aside as a hunting ground for the monarch. It fell under forest laws, which were set in place to protect the habitat for the game, though over time, as you will read below, these often gave way to timber rights. Cank Forest was far larger than the current Area of Outstanding Natural Beauty, stretching as far east as Tamworth, south to Wolverhampton and west to Penkridge. The manors of Cannock and Rugeley belonged to the Crown, whereas, in continuation of pre-Conquest arrangements, Baswich (including Brocton), Haywood and Lichfield remained held by the Bishop of Lichfield. The bishop eventually became the biggest landholder within the forest, with additional estates granted to them as tenants-in-chief by Henry II and Richard I in the 12th century. These included the manors of Cannock and Rugeley which, along with Haywood, form the core of the modern AONB (Fig 99).

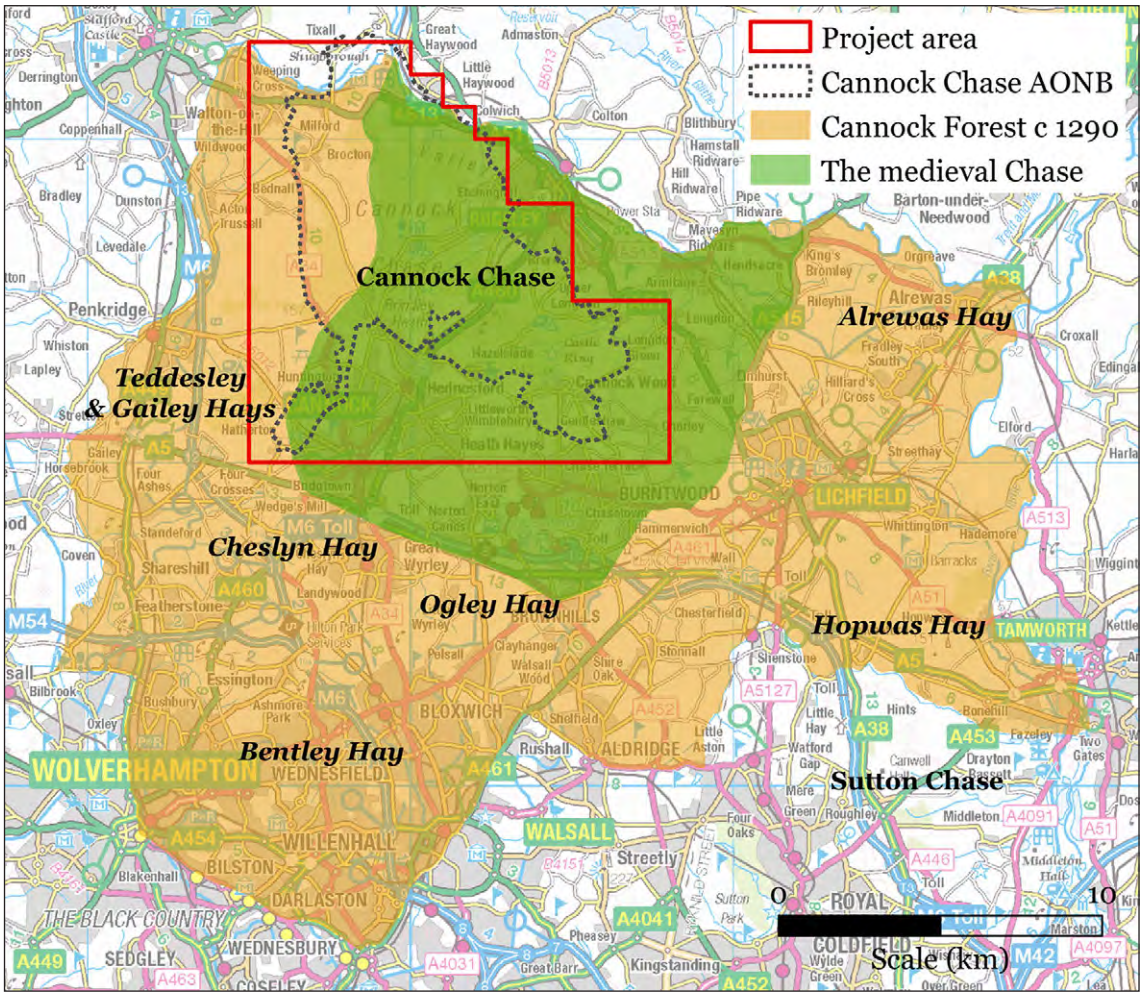

Fig 99: Cannock Forest, and subsequently also the Chase, were originally much larger than the present Area of Outstanding Natural Beauty. These boundaries are based on the forest pleas of 1286 and a perambulation of 1300, described in detail by James (1990, 97) © Crown Copyright and database right 2018. All rights reserved. Ordnance Survey Licence number 100019088.

Reducing the royal forest

Throughout the medieval period, commoners had grazing rights for cattle, sheep, and even pigs that were fattened on acorns in the autumn. Documentary evidence mentions that there was a fishpond in the forest in 1162 and two dairy farms in 1130 (Cantor 1968, 42-3). When the lords of the forest manors tried to take away these rights by enclosing land in later centuries, the commoners rose up in arms (Welch 2000, 33).

However, it was not long before the royal forest began to shrink. The first reduction took place in 1125, when the area between the Bourne Brook and the River Tame were granted as Sutton Chase to the Earl of Warwick. In 1153, land around Lichfield was granted to the Bishop, and this was ordered by Richard I to be disafforested in 1189, which effectively removed the area from the protection of the forest laws. There was encroachment into a number of England's royal forests around the time

of the Baron's War, and in 1227 Henry III ordered the boundaries to be revised and forests restored to their original size from before the conflict (Cantor 1968, 43-4). Edward I also attempted to restore the forest boundaries to their original positions, and perambulations were conducted (Hooke 2006, 77). However, disafforestation continued into the late 14th century (Cantor 1968, 46).

The first descriptions of the forest date to the reign of Edward I, with the forest pleas of 1286 and a perambulation of 1300. The latter described the maximum perimeter of the forest, defined by seven hays (and the Bishops Chase: see below). The hays were named as Alrewas, Bentley, Cheslyn, Gailey, Hopwas, Ogley and Teddesley (ibid, 45; James 1990, 97-98; Grant 1991, 158) (*see* Fig 99). A 'hay' can be an enclosed area, often of woodland, but in the case of Cannock, appears to have simply referred to several large areas of managed woodland forming the forest bounds. The areas of settlement in-between these hays were not considered part of the forest and were outside of forest laws (Cantor 1968, 40; Grant 1991, 30).

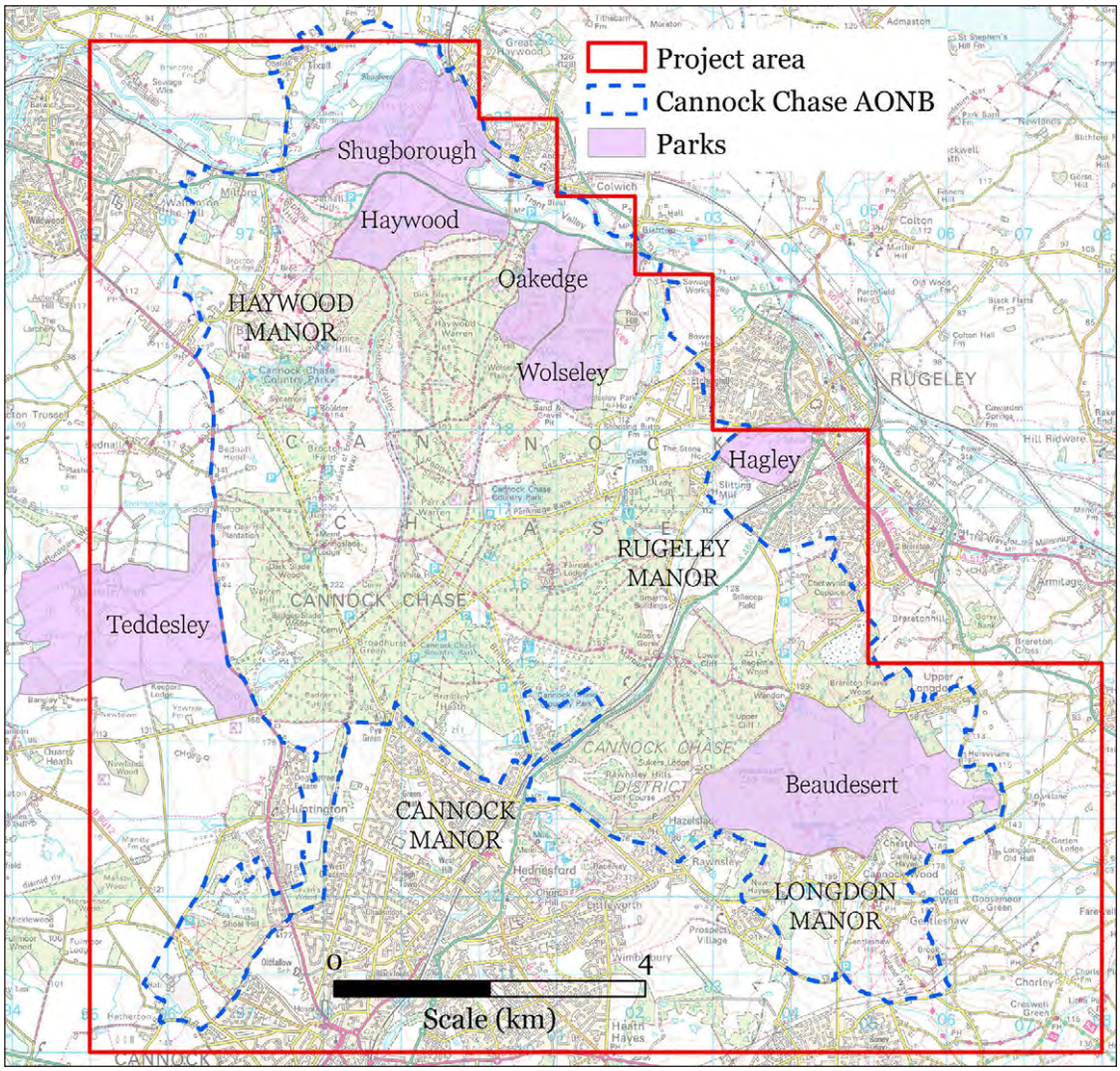

Fig 100: The principal manors, parks and family seats of Cannock Chase in the medieval and post medieval periods © Crown Copyright and database right 2018. All rights reserved. Ordnance Survey Licence number 100019088.

In 1290, Edward I granted about a quarter of the forest, including the manors of Cannock and Rugeley, to the Bishop of Coventry and Lichfield to be made into his private 'Chase' (Cantor 1968, 44, 46; James 1990, 97). A Chase was the nobility equivalent of the royal forest, bestowing the same hunting rights on the owner, as the monarch had previously held. Again, a Chase was not necessarily entirely wooded, but still fell under forest laws, and the owner was expected to see to the welfare and habitat of the animals to be hunted therein. Cannock Chase stretched as far north as the River Trent, and bordered on Lichfield to the east, and Brownhills and Cheslyn Hay to the south. The western boundary to the Chase bordered on the manors of Teddesley and Haywood. By this period, the manors of Brocton and Bednall also became part of the manor of Haywood, as did Baswich by 1473 (Taylor and Dean 2015, 18), and thus the bishops owned almost all the current area of Cannock Chase.

The bishop held the Chase until the Reformation, when in 1546 Ralph Baines, the current Bishop, was ordered to surrender his manors of Beaudesert, Longdon, Haywood, Cannock and Rugeley. The houses, parks and Chase once again reverted briefly to the Crown, though soon passing to Sir William Paget, a favourite of Henry VIII (Harrison 1974, 6). A number of small estates, such as Wolseley and Hagley were privately owned. Part of Brocton manor went to the Bishop's nephew, Brian Fowler (this was sold to the Anson family of Shugborough in 1785). The remainder of Brocton parish was in the Pagets domain until 1893, when the last remaining unenclosed elements of the Chase were also transferred to the Ansons, who continued to hold the estates until 1950 (Taylor and Dean 2015, 18).

Dividing the Chase

One of the most important factors relating to the land management of the Chase in the medieval period, were the enclosures resulting from emparkment. There were several parks within the project area, the earliest of which were deer parks (Fig 100). These were enclosed by local lords and tenants-in-chief by royal warrant, in order to stock and farm the deer. Deer parks were usually enclosed by an earthen bank on which stood a pale (a fence, hedge or wall) and an internal ditch, collectively designed to prevent the deer from leaping out of the park. Arable farming and wood-cutting were not permitted in the parks, but they often contained pasture for livestock (Cantor 1965, 72; Cantor 1968, 40).

The oldest park within the Chase is Beaudesert. The name is first recorded as early as the 13th century as part of the manor of Longdon. The Bishop of Coventry and Lichfield was given a licence to crenellate the house in 1306 (Taylor and Dean 2015, 19) and the estate was emparked by 1337 (Cantor 1965, 7). It became the principal seat of the Paget family, who became the Barons of Beaudesert in 1549, and the medieval manor house was remodelled into a mansion in the 1570s and 1580s. The house succumbed to fire in 1909, but was restored before being abandoned by 1920. It was put up for sale in 1924, and eventually demolished in 1935 (Harrison 1974, 12; Colvin 1985, 107-9, 120-1).

The manor of Haywood was extensive and formed much of the north-west of the project area. Its origins are thought to be pre-13th century but the history and

extents of the park are a little obscure. Despite being held by the Bishops of Lichfield under a fee, Haywood Park remained outside the Chase (Cantor 1968, 47; Harrison 1974, 2). As a result it fared differently over the centuries, and this is reflected in the archaeological remains found there. Haywood was emparked by 1286, and soon afterwards the Bishop was fined for illegally constructing two deer-leaps, which encouraged deer to enter the park from the Chase which was still a game preserve under forest law (Cantor 1965, 2; Gould 1967, 36). The park was briefly transferred to the Stanley family in 1501, but ended up in the hands of the Paget family following the Reformation (Cantor 1965, 4). It remained with that family until the late 19th century when it was passed to the Ansons' of Shugborough (Taylor and Dean 2015, 20).

Teddesley Park also lies outside the Chase and, as mentioned above, the manor formed one of the seven hays of Cannock Forest in 1300. Although there is no evidence to suggest that the 'hays' of Cannock were enclosed, it was possible some were emparked, even if only temporarily. Teddesley Hay may have been one of these, and was formally emparked by the Littleton family in 1588 (Cantor 1965, 3). The family remained there until 1953 (Midgley 1959, 182-4).

Although most of the Chase was in the hands of the Bishops of Coventry and Lichfield and then the Pagets, there were a number of smaller estates established within the parent manors over the centuries. Shugborough was a settlement by the 14th century, and fell within Haywood manor until the 1500s. At some point in the late 16th or early 17th century, the house and grounds passed to the Whitby family, and went through several hands before passing to the Anson family in 1624. The park was landscaped in the 18th century and the village gradually demolished (Taylor and Dean 2015, 19). The house and park now belong to the National Trust.

Wolseley was also originally part of Haywood manor, held separately by the Wolseley family from at least the 12th century (Buteux *et al* 1989, 16). After illegally enclosing a part of the Chase in 1465, Ralph Wolseley was granted a licence to empark in 1469 (Palliser 1976, 90; Buteux *et al* 1989, 32), and the hall remained the seat of the family until 1969 when the house was demolished (Taylor and Dean 2015, 20). Oakedge Park, which bounds Wolseley Park to the west, can be traced back to the 17th century, and could relate to Wolseley's illegal encroachment on to the Chase in 1465. The Anson family of Shugborough are thought to have lived there for a time, and by the 18th century the park was owned by the Whitby family of Great Haywood, before being purchased by the Ansons in 1768. The house was abandoned by around 1817 and demolished (Taylor and Dean 2015, 21), but some garden features are visible as earthworks (MST22825).

Hagley was a sub-manor of Rugeley, first described as a manor in 1513 when under the Mutton family, and had its own court by 1571 under Richard Weston, and was therefore one of the few estates not under the direct ownership of the Paget family at this time. Similarly, Brereton was a sub-manor held by the Chetwynds, and remained out of Paget jurisdiction. Hagley passed to the Curzon family in the 18th century, at which point the park was landscaped, and eventually passed into the

hands of the Pagets in the late 19th century, who broke up the estate (Harrison 1974, 10; Taylor and Dean 2015, 23-4).

Documents mention an unnamed deer park at Cannock, which was in existence in 1274 and enlarged in the early 14th century, and a park in Rugeley, which existed around 1320 (Cantor 1965, 2, 5, 8). These may refer to parks mentioned above, but this remains uncertain.

Stripping the woods

The woodland of Cannock Chase was described by John Leland in the 1540s as being 'in many places so cut downe that no token is that ever any were there' (Cantor 1968, 49). When Sir William Paget was granted the estates in 1546, he was given rights to both the main wood (oak, birch, ash etc) and underwood (holly etc) (Harrison 1974, 6, 92). He established the first iron furnaces and forges on the Chase shortly afterwards. Whatever remained of the woodland on Cannock Chase became the source for charcoal-making as fuel for Paget's iron works (Welch 2000, 30).

The manner of harvesting the wood varied. Trees were felled, cropped or pollarded, but it was coppicing that would leave the strongest archaeological legacy. A survey in 1554 identified 40 separate woodland parcels: 25 in Rugeley; and 14 in Cannock; excluding the 860 acres (348ha) of Beaudesert Park. The descriptions given are incredibly important, suggesting that there was predominantly one large tract of woodland, bounded on the west by heathland, and farmland to the east, though only two of the woods were specifically called coppices, not all were necessarily enclosed (Welch 2000, 31, 36).

Once a tree was felled, in order to protect the new coppiced shoots from grazing animals, some form of fence would enclose the woodland parcel (ibid, 39). As a result, commoners lost their grazing rights, and routeways and access to waterways were blocked, leading to many disputes. The 1544 Act for the preservation of woods tried to address this by stating that coppice woodland could only be fenced for a maximum of seven years (nine years from 1571), but then must be thrown open for grazing. However, the commoners reacted badly. They accused Paget of erecting 60 new enclosures and 50 new cottages on the Chase, and so from 1580 to 1581 there were a series of riots leading to the burning or destruction of various coppice fences and hedges, mostly bordering Rugeley (Harrison 1974, 158, 167, 175). This was not a new experience on the Chase. Wolseley had angered the locals by illegally enclosing 1,000 acres of the Chase in 1465, and enclosing a coppice in the 1480s in order to make charcoal for his glassmaking industry and these actions led to the coppice boundary being destroyed (Welch 1997a, 30; Welch 2000, 40).

As discussed in more detail below, the archaeological mapping has allowed us to identify a number of these woodland boundaries on the Chase, most of which probably relate to coppicing. Dating them more precisely is difficult. The 'Old Coppice', mentioned in the survey of 1554, contained only hollies and waste and was probably no longer a coppice. One or two of the other parcels of woodland might also have been earlier coppices, though how many pre-date the iron working in the area

is uncertain (Welch 2000, 42-3). Furthermore, excavation evidence suggests that there was a glassmaking site in Wolseley Park as early as the 14th century, so there is likely to have been some form of woodland management for charcoal production from at least this time (Welch 1997a, 1).

Whether there was simply not enough wood on the Chase, or whether Paget was trying to allow some of his woodland to regenerate, he ended up purchasing wood from neighbouring manors. He bought the rights to wood in Teddesley Hay from Edward Littleton in 1577, initially felling the trees, but then cropping. Part of this agreement was to create two coppices, one of which appears to have become Teddesley Park, and the other is mentioned as a coppice by 1610 and illustrated on numerous estate maps of the 18th century. There was an attempt to open the coppice in the 17th century, but it remained intact until the Enclosure Acts of the 19th century, which saw it broken open and incorporated within the landscaped park (Welch 2000, 44, 46). All that remains now are the names of Coppice Farm and Coppice Lodge.

Thomas Paget, William's son, fled to France in 1583 as a Roman Catholic plotter against the Crown, and his lands were forfeit. They were leased to Fulke Greville, by which time the trees were said to have suffered so greatly from cropping and pollarding that, even if not felled, they would die anyway. Thomas's son, William, was restored to the family seat in 1602 and kept Greville's lease on until it expired in 1614 (ibid, 20-1, 38). Whatever damage Paget had started, Greville was to complete. An enquiry in 1595 relates that Greville was felling holly, an important source of winter fodder, against the terms of his lease. He had also felled wood for non-iron-making purposes, and had failed to coppice. There were even reports of his men felling ash saplings in Haywood Park, which lay outside of his timber rights, but despite all this, he remained in tenancy (Harrison 1974, 98). By the end of his lease, stump wood appears to have become the main source of fuel, which may say something about the survival of the woodland (Jones 1993, 41; Welch 2000, 52-3).

In 1606, a custumal was issued dictating, for the first time, the rights of the tenants on the Chase, concerning Paget's manors of Cannock, Rugeley, Haywood and Longdon. This stipulated that Paget would not enclose any new coppices as long as the boundaries to the old ones were not disputed: a right that was maintained until the 19th century. The copyholders, their farmers and their tenants had the right to free commons for their livestock on all wasteland, including Cannock Heath and Cannock Wood, except where a coppice had been enclosed (which could not exceed a duration of nine years). The commoners were not permitted to plough up waste. Even Paget noted that the distinct loss of woodland had seen an increase in the number of sheep on the Chase (Harrison 1974, 18, 29; Welch 2000, 42).

By the 1680s, the Chase was mostly devoid of trees, limited to a handful of coppices on higher ground, but the iron industry survived for another century. The only fragment of woodland to survive, outside the historical bounds of the Chase but within our project area, is Brocton Coppice. This woodland fell within the manor of Baswich, and was leased out to Brian Fowler, the bishop's nephew, from 1539 for a

period of 99 years, effectively removing it from the control of the Pagets and Greville (Harrison 1974, 89; Potter and Welch 1998, 40; Taylor and Dean 2015, 29).

Yates's map of 1775 shows only a handful of coppices remaining, including Brocton Coppice on the west of the Chase, and several on the east side, between Beaudesert and Rugeley. It also shows the distinct oval enclosure of Teddesley Coppice as being thinly wooded. However, a map of the Paget lands on the Chase, surveyed between 1819 and 1824, shows Brocton Coppice as sparsely wooded when compared with the coppices on the east of the Chase, and it is not even depicted on the 1830s original series Ordnance Survey map. Subsequent Ordnance Survey maps also show less tree cover than now. The dense woodland that exists today is largely the result of reseeding and planting of birch following fires in the 1970s. Despite this, Brocton Coppice has about 600 mature sessile oak trees, with evidence of pollarding and coppicing, and some are estimated to be over 600 years old (Taylor and Dean 2015, 61; Potter and Welch 1998, 38) (Fig 101).

Fig 101: Brocton Coppice hosts a number of mature oak trees, some of which are estimated to date back to the 15th century, August 2016 © Historic England.

The coppices were not the only boundaries found on the Chase. In 1570, Osborne the forester was granted permission to rebuild his lodge and enclose ten acres of waste around it (Harrison 1974, 79, 141). Cantor suggested that the Chase itself was defined by a boundary bank, with element of this surviving as an earthwork at Badger Hills (1968, 49), but the Chase Through Time survey found no evidence for this, there or elsewhere. Common lands and chases in South Yorkshire were often unfenced, so this could have been the case at Cannock (Jones 1993, 43-4).

By 1682, there are records of tenants in most of the Chase manors creating temporary enclosures, mostly for growing corn (Midgley 1959, 49-63; Harrison 1974, 101). Vegetation in the land parcels was burned, and then ploughed for several years using bracken as a fertiliser. If used for tillage the area would be enclosed for up to five years before reverting to common (Palliser 1976, 103-4). This went against the 1606 custumal, which dictated that the waste was not to be ploughed. However, times were changing and some of the enclosures perhaps relate to increased pressure on farmland, partly due to population increases, that led to marginal areas being taken into cultivation.

As well as being industrial entrepreneurs, the landed gentry sought other ways to exploit the Chase. There was a warren within Wolseley Manor in 1342, and the Pagets were creating warrens in the 17th and 18th centuries. These required areas to be enclosed and this led to further riots (Welch 2000, 63; Taylor and Dean 2015, 33). 'The right of A Free Warren', where granted by royal license, allowed the lord to hunt smaller game, such as fox, hare, wild cat and game-birds, and was not necessarily just for farming rabbits as became the norm in later centuries (Cantor 1965, 2).

Fig 102: Castle Ring hillfort is located on the southern edge of Beaudesert Old Park. It commands an impressive view across Cannock Chase to the north and north-east. 20829_49 09-OCT-2008 © Historic England Archive.

The Pagets' maintained deer on the Chase until the 1850s (Sargent 2018), but by the 19th century the hunting of deer was less fashionable, and shooting game-birds had become popular. Marquis's Drive, which originally extended nearly six kilometres from the north of Beaudesert Park to the open heathland of Anson's Bank, was constructed by the Marquis of Anglesey (a title bestowed upon the Paget family in 1815) to 'facilitate his shooting expeditions' (Whitehouse 1999, 12). Shooting Butts

Farm, west of Etchinghill, depicted on the 1830s original series Ordnance Survey, was probably another shooting area on the Chase.

The former deer parks became ornamental gardens and parkland. The parks were largely returned to woodland, with the aesthetic planting of largely non-native trees throughout. Older features were recognised as landmarks, such as the Iron Age hillfort of Castle Ring, which formed a prominent feature within Beaudesert Park (Fig 102). The ramparts of the fort were levelled off for a walkway, and footpaths were created crossing the interior (RCHME 1987; Frost 2005, 9). Outside the parks, the Chase had largely become heathland.

Enclosure

The Enclosure Acts, as elsewhere, had a major impact on the area of Cannock Chase, though mostly on the lower lying farmland. As early as 1570 most of the manor of Cannock was enclosed, with fields ditched, fenced or hedged. The fields were rotated using the three-field system, and Cannock had six common fields, with Rugeley having seven (Harrison 1974, 72-5). However, it was the Enclosure Acts of the 19th century that created the landscape surrounding the Chase that we see today. The earliest systematic enclosure took place in 1827 in the western manors of the project area, including Teddesley Hay and Berkswich; enclosure of Cannock and Rugeley followed in 1868 and 1885 respectively (Brown 1994, 108; Belcher 2001, 83; Sargent 2018). Enclosure appears to have removed some of the commoners' grazing rights on the Chase, limiting public access, and turning the heath into a private shooting ground. This access was not fully rescinded until the 1950s, when Lord Lichfield granted Shugborough to the National Trust and the remainder of his estate, which included most of the upland Chase, to Staffordshire County Council. The Beaudesert estate was sold to the Forestry Commission in the 1920s (Taylor and Dean 2015, 40).

Following the Great War and the return of the Chase to heathland and woodland, the last vestiges of what was once a royal hunting forest were all but gone, largely only recorded as woodland place-names, for instance the Monks Hollies, Bevin's Birches, Fair Oak, New Coppice Pool and the Sycamores. Even the traces of the aristocracy are now remarkably scarce, again visible in such names as Marquis's Drive or Haywood and Parr's Warrens.

Mapping results

The history described above provides a framework for some of the archaeological features described below. Although a handful of boundaries and enclosures had been picked up on the Chase by previous surveys, the full extent of these archaeological remains was mainly unknown and uncharted. The archaeological survey provides a physical record of parts of the long and complex history of the Chase.

Pre-medieval land division

The most extensive evidence of early land division is in Teddesley parish and comprises the earthworks of a close-knit network of rectilinear embanked enclosures

covering an area of over 1.5km in length (MST22690; Fig 103). This field system is comparable to coaxial systems elsewhere across the midlands, and is broadly considered later prehistoric or Roman in date. The earthworks are within the grounds of Teddesley Park and it is possible that the field system was preserved because the area was not ploughed during the medieval period.

Teddesley formed one of the Hays of Cank Forest before being emparked in 1588 (Cantor 1965, 3; Welch 2000, 46); however, much of the manor was enclosed by Sir Edward Littleton in 1558 (Midgley 1959, 182-4), so an early modern origin for the boundaries should not be entirely dismissed. One enclosure within the field system is called King Dick's Encampment (MST1884), and has been suggested to be a fortification dating to the English Civil War. This enclosure appears to form part of the field system, but is unusual in that it has an outer ditch, and may have been adapted from earlier boundaries.

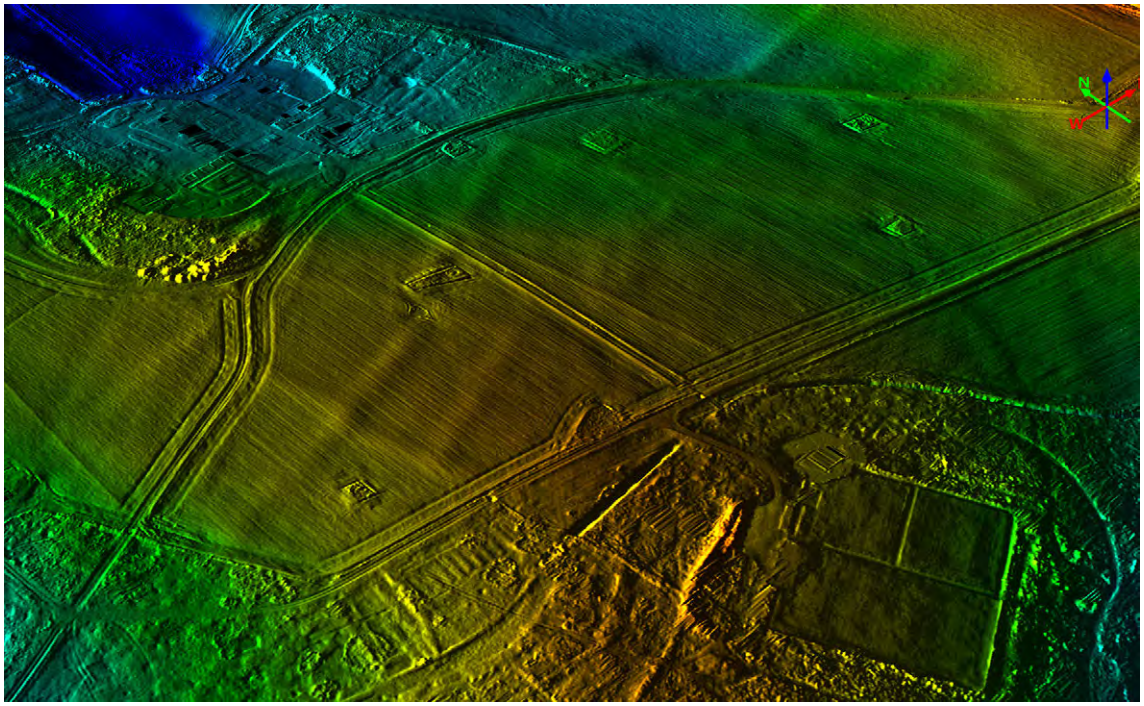

Fig 103: The field boundaries in Teddesley Park are defined by very low banks highlighted on a lidar visualisation (MST22690). This image has a height exaggeration of x2. Lidar DTM 04-MAY-2016 © Historic England; source Staffordshire County Council/Fugro BV Geospatial.

Another field system is located in Shugborough Park (MST22999). It is less extensive and is mainly defined by now buried banks revealed as cropmarks, though some boundaries survive as shallow earthworks. The field system is a network of small rectilinear enclosures, of similar dimensions to those mapped at Teddesley; however, the date of the field system in Shugborough Park is more questionable. Some of the embanked enclosures appear to be respected by medieval ridge and furrow and a settlement existed in the vicinity between the 14th and 18th centuries (Taylor and Dean 2015, 19). It is therefore possible that these boundaries are part of the farmland

associated with this settlement, though the morphology of the earthworks suggests that an earlier origin should not be dismissed.

A possible field system is located on Cockpit Hill, north of Littleworth, in the south of the project area (MST23034; Fig 104). These boundaries are much more fragmentary than those described above. They comprise shallow parallel rows of earthwork banks, with some perpendicular banks suggesting they may have formed a coaxial system. The earthworks are bisected by Reservoir Road, which appears to have existed from at least the 1830s, and therefore pre-date the Cannock Enclosure Act. Located on a slight upland spur, the morphology of this field system does not correspond with the post medieval wood banks or intake boundaries of the surrounding area. It is possible they could relate to medieval land division, perhaps associated with Littleworth, or they could be the remains of later prehistoric or Roman field system. Many of the longer banks are lynchet-like in appearance, occurring in parallel rows on natural slopes, which could suggest a medieval date, especially in this midland region (Robinson *et al* 1969, 93).

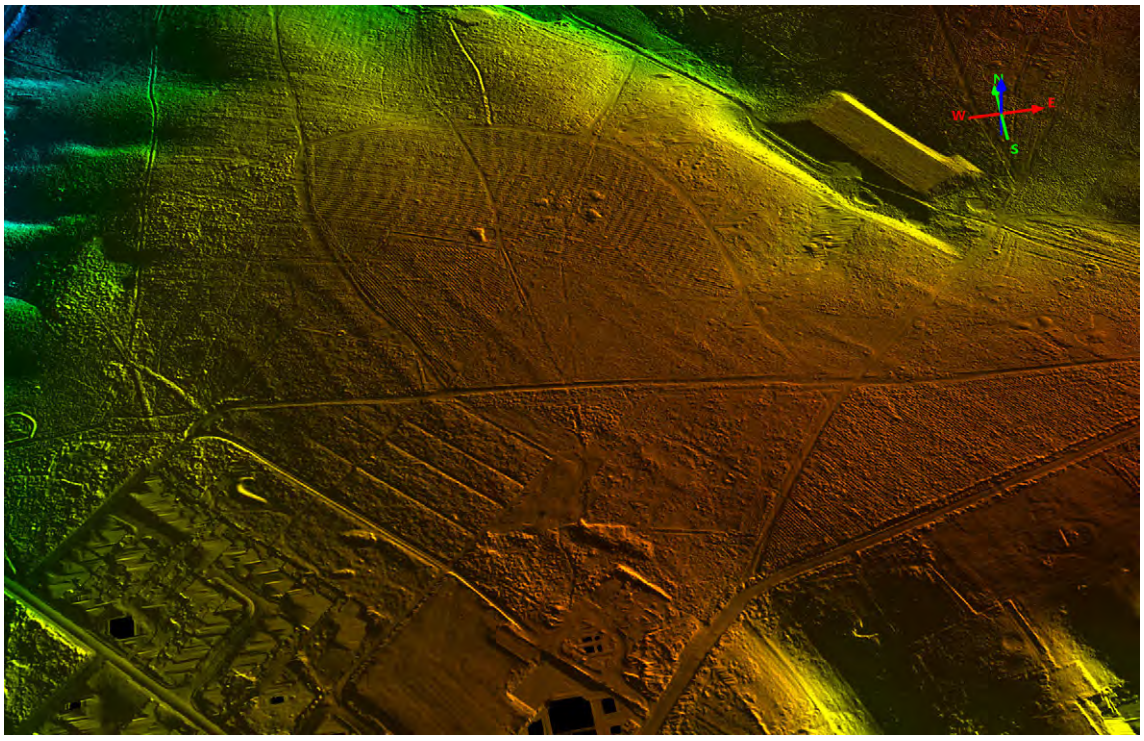

Fig 104: The embanked boundaries on Cockpit Hill are very fragmentary and denuded, but could potentially relate to later prehistoric or medieval cultivation (MST23034). Lidar DTM 04-MAY-2016 © Historic England; source Staffordshire County Council/Fugro BV Geospatial.

No prehistoric or Roman coaxial field systems have been recorded as extant earthworks in this central area of Staffordshire. There are, however, a number of coaxial field systems across the midlands, sometimes erroneously called 'Celtic' fields. These include Long Mynd in Shropshire (Hooke 2006, 29), and examples identified on the northern edge of Staffordshire, around Ilam (Palliser 1976, 37), and

in the Derbyshire Dales at Cowlow and Staden Low (Bacilieri and Knight 2010, 23), not to mention several others throughout the Peak District.

A small C-shaped enclosure (MST22863), identified through lidar at the summit of Round Hill, adjacent to Wolseley Park, may have a prehistoric date. It is situated on a knoll, away from the central upland of the Chase, where it overlooks the Stafford Brook valley from a position just east of the hill's crest. The enclosure measures about 35.5m across at its widest point and is defined by a denuded earthwork bank. The site was reconnoitred in January 2017. From the ground, the bank has a definite sense of being a complete circuit, albeit much less appreciable on the eastern side where the natural topography drops off more steeply, and possibly with unseen entrance breaks. Slight traces of an outer ditch were also observed around the south and west side of the bank (Fig 105).

Fig 105: The southern perimeter bank and ditch to the enclosure identified on Round Hill (MST22863) is clearly visible where the tree shadows raise up and 'bend over' the bank, dropping down into the ditch behind, January 2017 © Historic England.

Another enclosure is situated on the summit of natural knoll, in Milford Covert. This oval ditched enclosure with hints of an internal bank is visible on the lidar. The enclosures on Round Hill and at Milford Covert appear different to more confidently dated medieval or post medieval enclosures in the area, suggesting they could have earlier origins. Nevertheless, a medieval or post medieval date should not be ruled out and their different form perhaps relates to different functions.

Most other features relating to the Iron Age or Roman periods were seen as buried features revealed as cropmarks. The most extensive of these occur a little to the north of Teddesley Park, at Gypsey Green. The cropmarks indicate a probable small settlement (MST22921) defined by a cluster of adjoining ditched rectilinear enclosures, from which a number of ditches radiate outwards, probably forming part

of a wider field system. Further groups of ditched enclosures and linear boundaries were mapped from cropmarks to the west (MST22929), around Lord's Wood, and south (MST22922), as far as Teddesley Home Farm. None of these appear to relate to the current alignment of field boundaries, suggesting they have earlier origins, possibly in the later prehistoric or Roman period. There are no obvious associations between this ditched field system and the embanked coaxial field system in Teddesley Park, and morphologically the two are quite different, suggesting they are of different date or function. A ditched rectilinear enclosure is visible as cropmarks inside what was the western edge of Teddesley Coppice (MST22691). The enclosure measures 63m by 86m and the shape suggests a probable later prehistoric or Roman date, though an association with the medieval coppice or other features linked to Teddesley Park should not be completely dismissed.

Fig 106: A large circular enclosure north of Gypsy Green could potentially have Neolithic or Bronze Age origins (MST23097). 17483/01 17-JUL-2000 © Historic England Archive.

One of the more curious features of this landscape is a very large enclosure (MST23097) visible as a cropmark between Gypsy Green and Moors Covert Farm (Fig 106). The enclosure is almost perfectly circular, with a diameter of 83m. It does not appear to relate to the surrounding field system, but is sited together with a ring ditch thought to be that of an enclosing ditch to a Bronze Age round barrow. The barrow is located on the western edge of the enclosure, and it seems likely that one was deliberately placed on the site of the other; what is less certain is which one came first. The enclosure is too large to be a ring ditch relating to a barrow, but does

not appear to conform to the later field system either. Perhaps it may be an outer enclosure around the barrow, contemporary with it, forming an enclosed cemetery. Another suggestion, based on its scale and the narrow nature of the ditch, is that it is a palisaded enclosure, which could push the potential date of origin back to the Neolithic period.

Fig 107: A possible Iron Age or Roman multiple ditched boundary (MST22795) is visible as faint cropmarks on recent oblique aerial photography. 28424_043 11-JUL-2013 © Historic England Archive.

Cropmarks visible on aerial photographs to the east of the Chase, between Slitting Mill and Rugeley show the buried remains of fragmentary linear ditches, presumably field boundaries, considered Iron Age or Roman in date. A triple-ditched linear feature is visible in the old grounds of Hagley Park that may be another track or a multiple ditch boundary (MST22795; Fig 107). It is only visible for a length of 200m and does not appear to correspond with any current alignments, and is suggested to be Iron Age and/or Roman in date. A double-ditched rectangular enclosure was mapped a short distance to the west, between Slitting Mill and Etchinghill (MST22783). It measures 99m by 103m and its regular shape could be taken to indicate Roman date, but it may have earlier origins. Another smaller enclosure was mapped to the north of Etchinghill, adjacent to the Stafford Brook (MST3943). This rectilinear enclosure is also ditched in form, measuring 59m by 76m, and is probably of Iron Age or Roman date. The only other mapped boundary of significance is a pit alignment (MST22947), visible as cropmarks to the west of Brocton Park Farm.

The cropmarks indicate the presence of later prehistoric and roman communities living around the edges of the Chase. Analogies can be taken from excavated features at the confluence of the Rivers Tame and Trent. Here, settlement enclosures were

revealed to be Iron Age, as were pit alignments, though there is some argument that some of these could date back to the Neolithic (Buteux and Chapman 2009, 105-18). Many of the boundaries and enclosures found during the Chase Through Time project are probably linked to settlements and represent the remnants of wider field systems. The modern arable use of this land enables us to see these buried remains, and their distribution is likely to relate more to the available evidence than the actual extents of early activity in the area.

Boundaries on the Chase

The only known evidence we have for early medieval activity in the project area are the place-names, and the records of previous land owners mentioned in Domesday Book in 1068. Significantly, the manor of Cannock contained the largest woodland in the entire survey, and most of the area of the current Area of Outstanding Natural Beauty continued to be used as royal forest for the first few centuries following the Conquest in 1066. The archaeological record on the Chase mainly relates to the medieval and later periods.

It is in the more remote upland, largely untouched by cultivation or the enclosure acts of the 19th century, that we see the clearest earthwork survival within the project area. Excluding the military features of the 20th century the single most extensive archaeological monument that survives as earthworks are the boundaries, largely hidden under vegetation but identified using lidar (Fig 108).

'Boundary' is a broad term to describe these features. They clearly had a number of uses: some appear to have been park pales; others probably marked out areas of intake for cultivation or land improvement; but most are thought have been woodland or coppice boundaries. Most of them are embanked, often with an external flanking ditch. Where complete, they enclose areas ranging between 2ha and 79ha, and can be irregular, curvilinear or rectilinear in plan. The boundary banks are all morphologically similar, with uniform profiles, similar width, and possessing excavation or drainage ditches, usually on the outside of the enclosed area. The detailed documentary evidence, partly discussed in the introduction to this section was an important framework for understanding the sequence and function of boundaries on the Chase.

Most of the boundaries are to the north of the A460, and although fragmentary, they extend across much of the upland area of the AONB, from Brindley Heath towards Brocton Field and Brocton, and along Birches Valley as far north as Wolseley Plain. These boundaries can be roughly grouped based on their morphological characteristics and geographical locations.

Those on Brindley Heath form a dense network of rectilinear enclosures (MST22731), adjacent to the housing estates of Green Heath, and stretching as far west as Badger's Hills and north to Flints Corner. The boundaries are defined by well-made banks varying in width between approximately 1m and 4m. They form comparatively small, rectilinear enclosures, ranging from 150m to 500m in length. There are only a handful of instances where ditches flank the banks, but there is no

regular pattern of these inside or outside the enclosed parcels of land. The boundaries abut one-another, forming a cohesive unit of enclosures of varying sizes. One of the enclosures forms the boundary of Brindley Coppice and is depicted on the 1833-1838 Ordnance Survey map (Fig 109). This suggests the adjoining enclosures, not marked on the maps, had fallen out of use by the early 19th century. There were woodland parcels in this area in 1554 named Little Borneley, Great Borneley and South Borneley, from which the name 'Brindley' is probably derived. It is not possible to confidently link these to the archaeological evidence but it may be that some of the boundaries relate to these 16th century woodland parcels. A small square embanked rectangular enclosure, immediately east of Brindley Coppice, abuts one of the boundary banks. It measures 7.5m by 14m, and with a central partition, appears to be the probable foundations of a building. Its location in relation to boundary suggests it to be contemporary in date, though the function is uncertain.

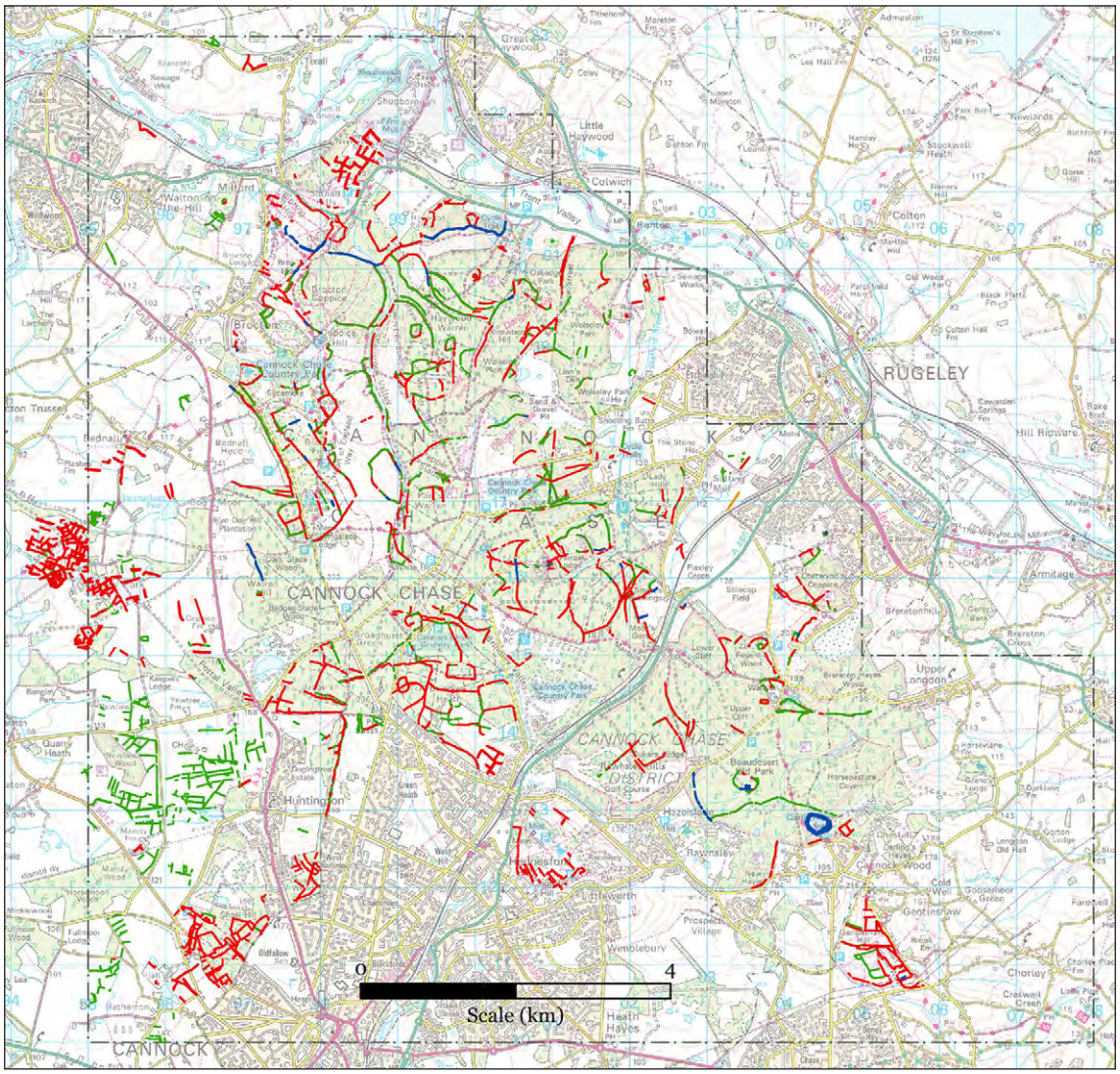

Fig 108: A plot of the boundaries, park pales, wood banks, field systems and enclosures mapped for the project. Archaeological mapping © Historic England; Base map © Crown Copyright and database right 2018. All rights reserved. Ordnance Survey Licence number 100019088.

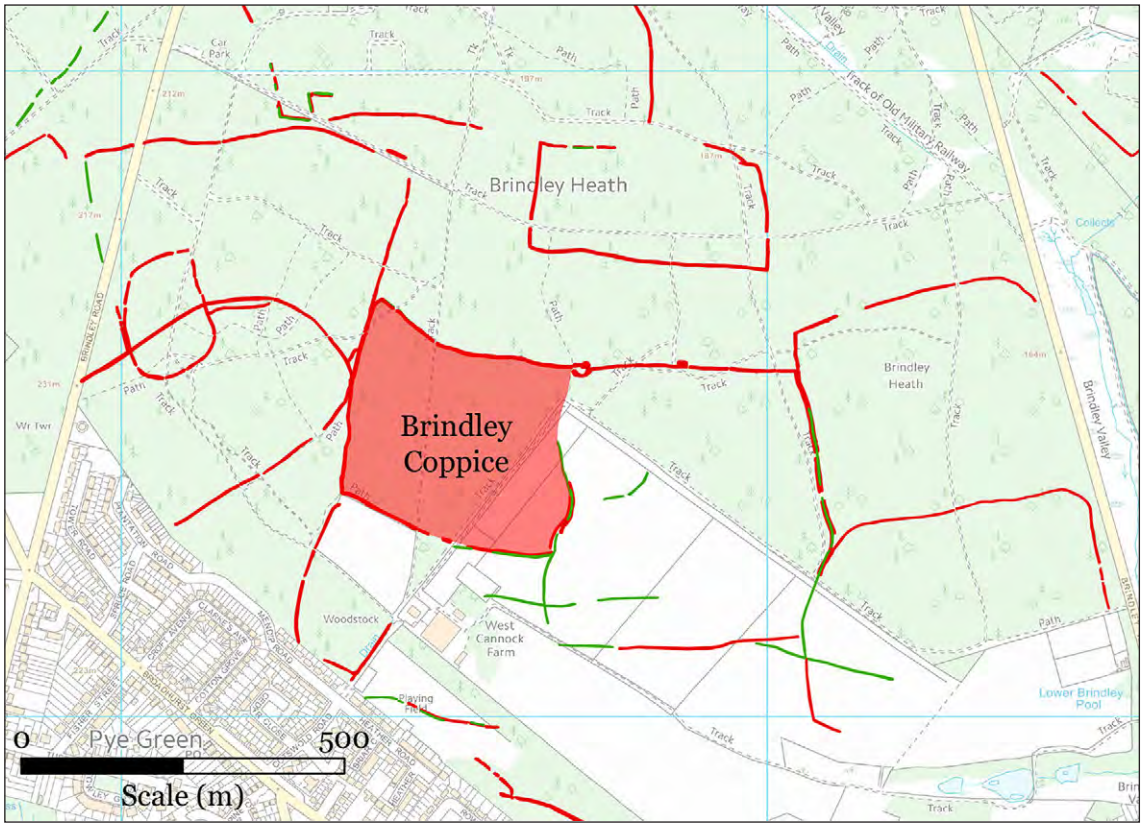

Fig 109: Wood banks surviving as earthworks on Brindley Heath © Historic England; © Crown Copyright and database right 2018. All rights reserved. Ordnance Survey Licence number 100019088.

To the north-east of Marquis's Drive, as far north to the A513, is a dense concentration of boundaries forming large curvilinear enclosures with multiple internal divisions. The most complete of these are three large enclosures centred along Birches Valley, centred on Fairoak Lodge (MST22868, MST22875, MST22876). The boundaries are defined by narrow banks between approximately one and a half and three metres in width, with ditches to the side. Multiple internal divisions and fragmentary sections of bank suggest reuse and reshaping of the enclosures over time. The ditches are generally located on the outside of the enclosures, and in some instances where only fragments of an enclosure can be seen, the presence of a ditch to one side indicates which side was likely to have been within the enclosure. These boundaries were probably created to protect coppice, allowing the regrowth of the trees, free from grazing animals. A fence or a hedge would top the boundary bank, and the outer ditch would provide an additional barrier and add height to the exterior of the boundary bank to prevent livestock or deer from entering the enclosure (Rotherham 2013, 13).

Most of these boundaries probably correspond to 16th-century coppicing. Chris Welch's study of the 1554 survey went to great lengths to tease out the descriptive detail of where the various woodland parcels were located, and this area, located adjacent to the Rising and Stafford Brooks would have related to the woods of Tymberwoode, the Bircheshawridges, and the Ryders Herber and Roughe Hillis (Welch 2000). Timberwood is of particular importance, as the name reappears in

the Chase accounts of the 1577 to 1585, whereas most of the 1554 woodland names are not mentioned again. In *c* 1573 and 1583, Timberwood enclosed an area of 180 acres, using the 16th-century definition of an acre (ibid, 36). The enclosure centred on Fairoak Lodge may relate, at least in part, to Timberwood.

The apparent disuse of woodland names between 1554 and 1585 suggests that new coppices were created between these dates. By law, they would only have a nine-year lifespan before reverting to common use. It is possible that the new coppices did not follow pre-existing woodland boundaries. The complex and multi-phase nature of the boundaries mapped from the lidar appears to substantiate this. For example, a boundary (MST22877) to the west of the Fairoak lodge enclosure suggests it was probably extended westward at some point, and would have enclosed an area of approximately 186 acres (75ha).

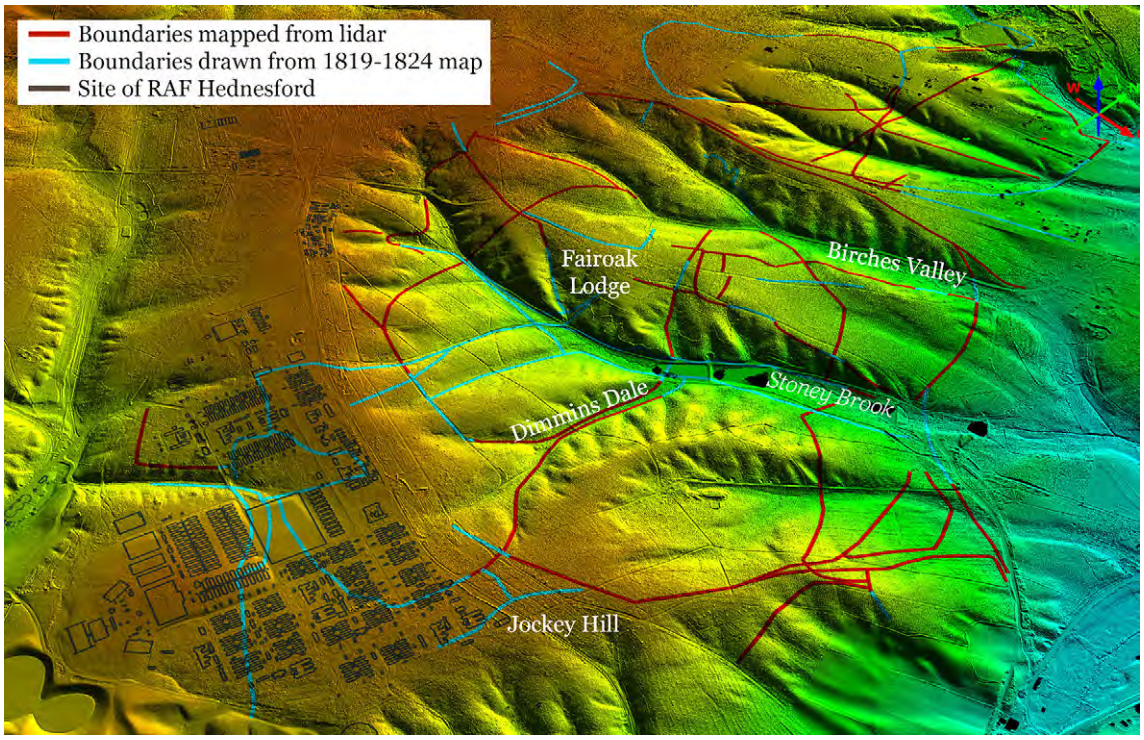

Fig 110: Many of the coppice boundaries probably made in the late 16th century remain intact as earthworks. Many others can be traced from an 1819-1824 estate map. This image has a height exaggeration of x2. Lidar DTM 04-MAY-2016 © Historic England; source Staffordshire County Council/Fugro BV Geospatial.

Crucially however, the boundaries that are visible as earthworks on lidar now represent only a small proportion of the boundaries that existed here originally. The estate of the Marquis of Anglesey (the Paget family) was surveyed between 1819 and 1824 and published as one map in 1863 (SRO D260/M/E/353a). This shows a great many more boundaries than those visible now. It would appear that the cartographers were mapping prominent land divisions in the landscape, but the parcels of land are all located on the heathland, they are not numbered, the lines are dotted and often incomplete, and so were almost certainly out of use at this time.

A combination of the lidar mapping and the Paget estate map, allow an insight into the post medieval land division of the Chase and the management of woodland (Fig 110). The estate map illustrates a large enclosure overlapping or underlying the Fairoak coppice enclosure discussed above. This enclosure, based on the 1554 description, is another likely candidate for at least one phase of the coppice of Timberwood, measuring 135 acres (55ha). Unfortunately, most of this enclosure was built over for RAF Hednesford during the Second World War.

The boundaries continue northwards, becoming more fragmentary on either side of Kinglsey Wood Road and Pepper Slade. Although it is possible to trace determine their original extents, many were built over during construction of Rugeley Camp in the First World War. They are illustrated on the 1819-1824 estate map and for the most part they seem to be coppice boundaries of the mid-to-late-16th century. A little further to the west, boundaries on Parr's Warren may relate to 17th- or 18th-century enclosure of the warren (MST22855, MST22686). A rectilinear earthwork enclosure is sited centrally within the warren (MST22845). Though partly removed by recent forestry activity, the enclosure is illustrated on the 1830s Ordnance Survey map, and appears to have been the site of the warren lodge marked on Yates 1775 map.

There are more boundaries recorded on the lidar to the north, on Haywood Warren and within and adjacent to Wolseley and Oakedge parks. This area is a little more complex historically, with Haywood manor being subdivided a number of times throughout the medieval period, and although many of the boundaries again probably relate to coppicing associated with the iron or glass industries, others may relate to other land uses. Haywood Warren may have been one of those enclosed by Paget in the 17th century, leading to riots. There are multiple sinuous boundary banks (MST22811) along the southern edge of the warren, all with ditches to the south, presumably enclosing the warren. A number of parallel boundaries might represent the movement or expansion of the enclosure over time. A hexagonal enclosure is located within the warren, set within an incomplete and fragmentary outer curvilinear enclosure (MST1013). Unusually, the bank is on the outside and ditch on the inside, perhaps suggesting that it may have been constructed to keep animals in. Perhaps it was designed to pen livestock, such as the 'deer house' marked on the 1819-1824 map on the Rawnsley Hills, or maybe it was a feature of the warren. The only rabbit warren mounds mapped by the project were located on the west of Haywood Warren, some 700 metres west of the enclosure. They are defined by broad linear embankments in the plan of a 'V' (MST22813) and 'X' (MST22812), with associated drainage ditches. The 'embanked cross' form of warren is less common than a linear pillow mound, but does occur throughout the country, with examples in North and East Yorkshire, Somerset, Shropshire and Wales (Williamson 2006, 39; Evans *et al* 2012, 28).

A small enclosure immediately west of and adjacent to the warren boundaries, overlooking the confluence of the Sher Brook and Haywood Slade, is called Dick Slee's Cave (MST5801). Originally marked as 'Adullams Cave' on early 19th-century maps, the site is described in local folklore as the dwelling place of a hermit. Stories tell that, before becoming a hermit, constructing a hut here on the Chase and living here with his pet hare, the man was originally a labourer for the Anson's of

Shugborough.[14] The enclosure measures 21m by 47m and appears to have been disturbed at the north end. Its location on a slope makes it unlikely to have been a dwelling, but perhaps it may have acted as a stock enclosure, or a feature related to the warren.

Within Shugborough Park, there is a raised circular platform (MST20228) in the Stafford Plantation; according to historic maps this was the former location of a summer house. The platform was recorded from lidar data and measures 23m by 28m. A mound to the north (MST20253), on the edge of the plantation, was previously interpreted by the HER as a prospect mound, designed to offer a view over the garden. Viewed on the lidar this appeared to be a natural feature, with some probable artificial enhancement in the form of a ride around the base of the mound. It does not look over the estate towards the house, but over the Sow Valley to the north, and so if it was used as a prospect mound it was for looking out from the park.

The boundary banks and ditches on the edge of Wolseley Park and within Oakedge Park are very fragmentary in nature, and therefore are difficult to interpret. They lie outside the Paget lands surveyed between 1819 and 1824 and so there is no map evidence to illustrate their full extent. Most are probably either associated with Wolseley's illegal enclosing of Chase in the 15th and 16th centuries, or with coppicing relating to the glass and iron industries. There was also a warren within Wolseley Manor in 1342, but the location of this is uncertain, and it may not have been enclosed.

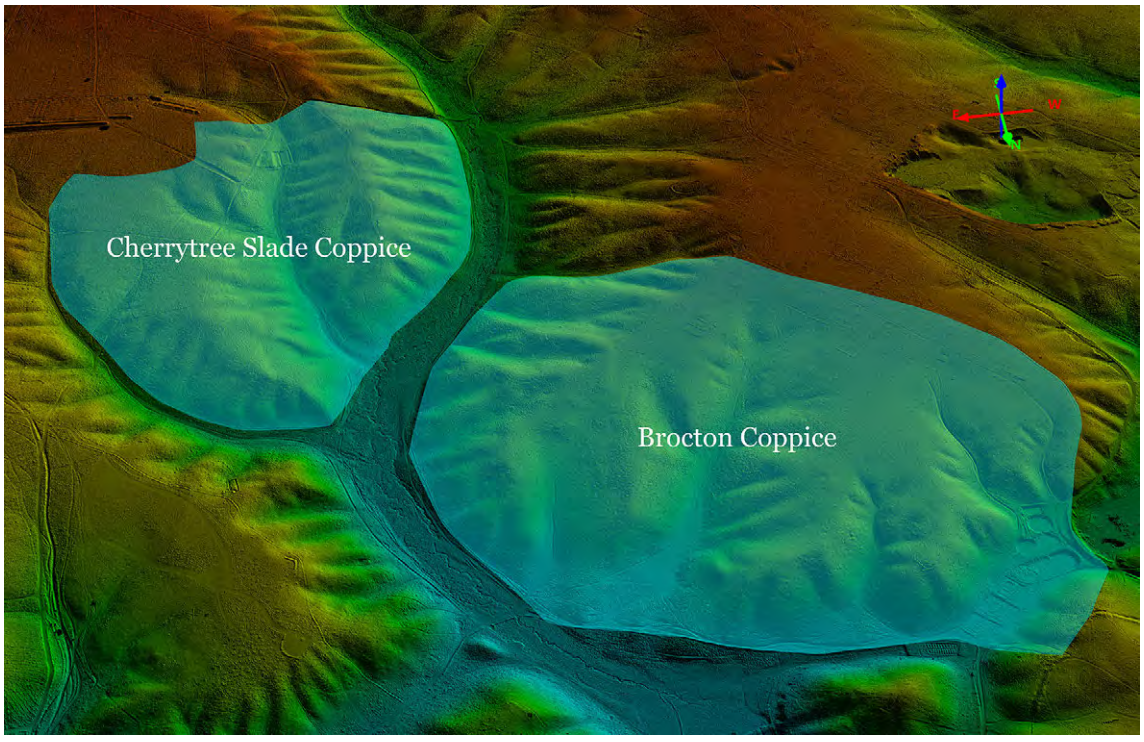

Fig 111: Extents of Brocton and Cherrytree Slade Coppices. Lidar DTM 04-MAY-2016 © Historic England; source Staffordshire County Council/Fugro BV Geospatial.

One of the largest upland enclosures on the Chase is immediately to the south-west of Haywood Warren, centred on Cherrytree Slade (MST22815). The boundary extends along Haywood Slade and along the east bank of the Sher Brook. The southern boundary is only intermittently visible, but presumably roughly followed a line eastwards from Lower Sherbrook Pool. Exceeded only by Brocton Coppice in size, these boundaries enclose an area of roughly 60ha, and are again defined by an internal bank and external ditch (Fig 111). This is probably a coppice boundary. It is shown on historic maps as having more tree cover than Brocton Coppice between 1819 and 1824. As it lay in Haywood manor, it was outside the survey of 1554. The two coppices face one another on either side of the Sher Brook, and may be contemporary.

Brocton Coppice is the largest and one of the best preserved enclosures on the Chase. The coppice boundary is defined by a single, though now somewhat fragmentary, boundary bank with external ditch (MST5754). The northern boundary is shared with the park pale to Haywood Park (see below). To the east, the boundary hugs the bottom of the slope, adjacent to the Sher Brook, and on the west the boundary follows the Mere Valley. There are gaps in the southern boundary earthworks where Brocton Camp was built over it. Where these earthworks have been levelled, the line of the boundary can be reconstructed from the 1819-1824 map of the Chase. The enclosure covered an area of 77ha. The earliest reference to the coppice is in 1626, and it may that the boundary was put in place shortly before this. The lack of sub-divisions is in contrast to the complexity of the coppice boundaries in Rugeley manor. This could mean that the wood underwent simpler management, but there is evidence of pollarding and coppicing. It is one of the few examples of ancient woodland surviving on the Chase, boasting trees estimated to be up to 600 years old (Potter and Welch 1998, 38).

There is an unusual C-shaped enclosure to the south of Brocton Coppice, on Coppice Hill (MST22908; Fig 112). It is defined by a deep ditch with a significant external bank, enclosing an area measuring 40m by 60m. It is sited on a slope at the head of a shallow dry valley, once a tributary of the Sher Brook. The site was investigated on the ground with project volunteers in January 2017. On the lidar, the enclosure also appears to have a slight inner bank, though this is more difficult to discern on the ground due to the dense heather. There is a 28m-gap along the southern up-slope edge of the enclosure opens onto the fairly flat top of the plateau. The enclosure does not appear to ever have been a complete circuit as there is no clear sign of disturbance along this southern edge. A small causewayed entrance to the north-west appears to be relatively recent, and examination on the ground suggested it to be made up of waste material, probably from nearby Brocton Camp.

It is not clear whether the enclosure dates to the medieval or post medieval period, or if it has earlier origins. The earthworks have a different character to the nearby practice trenches and post medieval boundary banks, suggesting it does not relate to 20th-century military activity or coppicing. The enclosure is not obviously defensive and it seems most likely that it was associated with the management of livestock, perhaps a deer house, like the one on the Rawnsley Hills, illustrated on the 1819-1824 map. However, the enclosure may have been enhanced and reused during

training in the First World War; indeed, 1940s vertical photography shows an area of disturbance at the western edge of the enclosure, similar in appearance to the disturbed ground of Brocton camp.

Fig 112: DTM lidar with orthophotograph overlay depicting the C-shaped enclosure on Coppice Hill. Lidar DTM and orthophotograph 04-MAY-2016 © Historic England; source Staffordshire County Council/Fugro BV Geospatial.

The northern limit to the upland Chase lies within Haywood Park, beyond which extend Shugborough and the Trent Valley. The park boundary, marked on maps of 1775 and 1819-1824, is still defined as a field boundary on modern maps. Today, the line is marked by a wire fence but the earlier park pale survives as an earthwork beneath this (MST6046). Parts of this boundary may relate to the emparkment of 1286. The boundary changes form along its length. From the base of Harts Hill to the Sher Brook there is no sign of any bank, but a ground assessment demonstrated that a natural downward slope to the north appears to have been enhanced to act as a natural obstacle, preventing the deer from exiting the park. If there was a bank along the top edge of this slope, to the south, this may have been removed by the construction of the current track. A hedge or fenced pale probably extended along this rise. To the east of the brook, as far as Coalpit Lane Covert, the boundary resembles a more typical pale embankment. Again, there is no indication of a ditch to the north, so presumably the natural drop-off to the north provided additional height to the boundary.

Haywood Park continued east to Old Brook, and the southern boundary is visible as earthworks as far as Weetman's Bridge. This eastern length of the park boundary is very different in appearance to those described above. The boundary defines the

southern edge of a high ridge known in the 1830s as Black Hill, which was bounded by the River Trent to the north. It comprises a very broad ditch, with some up-cast bank material to the north, though this is intermittent, possibly as the result of levelling by forestry. This is unusual for a park pale as the ditch appears to be on the outside of the park, which goes against the basic principles of a deer park where the ditch would be on the inside to prevent deer from escaping. There is little doubt that this is the boundary to the park however, as it is illustrated on numerous maps. These differences may relate to the topography, or could suggest multi-phased construction.

Fig 113: The height of the Oat Hill earthwork (MST23011) exceeds 2m in places, November 2017 © Historic England.

A line of substantial earthworks was mapped on Oat Hill, immediately west of Haywood Park (MST23011; Figs 113-114). This boundary is defined by a broad and deep ditch extending around the southern edge of the plateau, terminating at each end on the edge of two shallow dry valleys cutting into the plateau from the east and west. As with the Black Hill boundary, there is an up-cast bank on the upward side of the slope, to the north. The earthworks are up to 15m broad, but in places the ditch and bank have been heavily truncated and levelled. The height of the earthwork, from the base of the ditch to the top of the bank, varies, but in places exceeds 2m.

The date and origin of the earthwork remains unclear. The lidar shows that extensive land improvement has taken place on the plateau, which is probably responsible for some of the truncating and levelling of the boundary earthworks, but this

activity probably took place within the last two centuries. Two narrow woodland banks overlie the boundary on the east side. They are clearly later in date and the earthworks are not as weathered, but they also appear to re-use part of the dyke as a boundary. The southernmost of these wood banks is probably associated with Brocton Coppice and dates from at least the early 17th century.

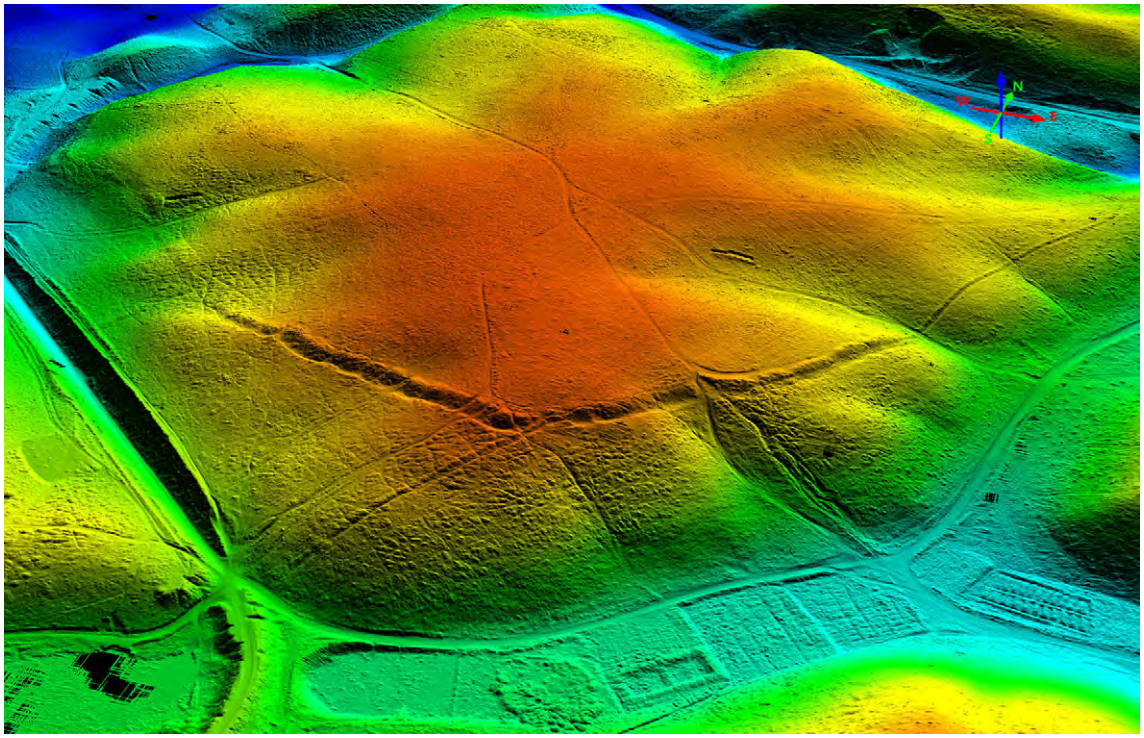

Fig 114: The boundary ditch and up-cast bank along the scarp edge of Oat Hill are extensive earthworks (MST23011). They are overlain and reused by wood banks that probably date to the 17th century (MST23016). Lidar DTM 04-MAY-2016 © Historic England; source Staffordshire County Council/Fugro BV Geospatial.

A prehistoric date is possible for such a massive earthwork; there are no comparative examples known in the region, but there are examples of similar boundaries, with a potential date range from the Bronze Age to the early medieval period, elsewhere in the country. The Oat Hill boundary does not appear to have been defensive, as it only circles part of the hill, and nor is it likely to be a head-dyke separating the marginal upland grazing from the low-lying farmland as there is no neighbouring farmland. Although considerably broader, the Oat Hill boundary resembles the eastern boundary to Haywood Park, with a southern ditch on the downslope and bank cast up to the north. They are also both in similar topographical locations, defining the southern limit of hilltops. The dyke also follows the approximate line of the southern boundary to the park.

Although it is not a typical park pale, and is outside the post medieval boundary of the park, it seems most likely that the Oat Hill boundary formed part of a medieval park boundary. Oat Hill was probably subsequently taken out of the park-bounds as the manor of Haywood was gradually broken up in the later medieval period.

The broad outer ditch may suggest that these boundaries were put in place to keep grazing animals off the hill tops. Perhaps the boundaries were defining specific areas within the park put aside for a different purpose. It is worth noting that medieval wood banks are often considered to be very large earthworks when compared to the typical narrow post medieval boundaries described above (Rackham 1993, 114-5).

Further boundary banks extend to the west of Brocton Coppice, along Mere Valley and Hollywood Slade; these appear to have joined the Brocton Coppice enclosure in the vicinity of Mere Pits. The orientation of the boundary extending along Hollywood Slade is parallel to that of the coppice. In this case the boundary ditch lies to the east of the bank, suggesting that it would have enclosed the area of heath to the west. This boundary can be traced on the 1819-1824 map, arcing westwards and terminating at Oldacre Brook to enclose Tar Hill. However, most of the boundary appears to have been levelled during construction of Brocton Camp.

The Tar Hill boundary comprises straight sections, in contrast to many of the coppice boundaries which are sinuous or curvilinear in form. South of Tar Hill, the boundaries have more straight sections. These extend along Sherbrook Banks, Brocton Field and Anson's Bank, as far as the Katyn Memorial, covering large strips of heathland (MST13409). There are a number of smaller enclosures, most notably in Brocton Nature Reserve (MST22904), north of Womere (MST22896), and on the west side of the Sherbrook Valley (MST22884) opposite to Parr's Warren. These boundaries are defined by narrow banks with outer ditches. Along Brocton Field the enclosures open up into two long adjoining strips of land, extending parallel to Camp Road for up to 2.3km, and enclosing an area over 780m broad. Some of these boundaries are illustrated on the 1819-1824 map, filling in a number of the gaps where the earthworks have since been levelled by construction of Brocton Camp.

There are numerous associations between these enclosures and 'furrows'. Where the furrows occur they appear to be contemporary with the boundaries that they clearly abut, and morphologically they appear to be ridge and furrow cultivation (Fig 115); nevertheless, this interpretation should be treated with caution. In an upland landscape a more common reason for parallel furrows is land improvement in order to turn and drain the land to create better grazing pasture. Another reason for a 'ridge and furrow' effect in the uplands is tree planting, most commonly associated with plantation, but these features clearly pre-date the 20th-century forestry on the Chase. The form of the enclosures, with an internal bank and outer ditch is reminiscent of the coppice enclosures to the east and north, where the ditch and a hedge or fence atop a bank were designed to stop livestock from entering the enclosed area. However, it seems unlikely that these boundaries ever related to coppice and there is no evidence to suggest that Brocton Field or Anson's Bank were wooded in recent history. The most plausible suggestion is that these enclosures are areas of intake, possibly relating to the temporary enclosures that sprung up across the Chase in the 17th century, and that the ridge and furrow represents a brief attempt to cultivate the land. This is partly supported by a statement dated 1794, which indicated that the best soils on Cannock Chase for growing crops (especially barley and turnip) and grazing sheep was on the west and north sides, and around Hednesford (Midgley 1959, 49-63). The boundaries would have kept livestock away

from the crop, after which the fence would be removed and the land thrown back open to common.

The western-most of the probable intake boundaries (MST22894) extends the full length of the Bednall Belt Plantation, skirting westwards at the southern end, through Spring Slade Wood. This bank encloses much of the current farmland surrounding Bednall Head Farm further supporting the idea that it was originally an intake from the heath. This area was shown as open heath on Yates 1775 map, and probably formed the area known as Bednall Head Common which was enclosed in 1814 (ibid, 11-17). The boundary here is defined by a bank and external ditch, and almost certainly pre-dates the 1814 enclosure, as it extends through the centre of, and is overlain by, the plantation, which was put in place as a result of the act. As with the boundaries along Brocton Field to the east, which are parallel and on a similar scale, it is most likely to represent an earlier attempt to take in the land for cultivation. After a few years it probably reverted to common land, as was denoted on the 1775 map, before being enclosed permanently in 1814, when the current boundaries of Bednall Belt Plantation and Spring Slade Wood were established.

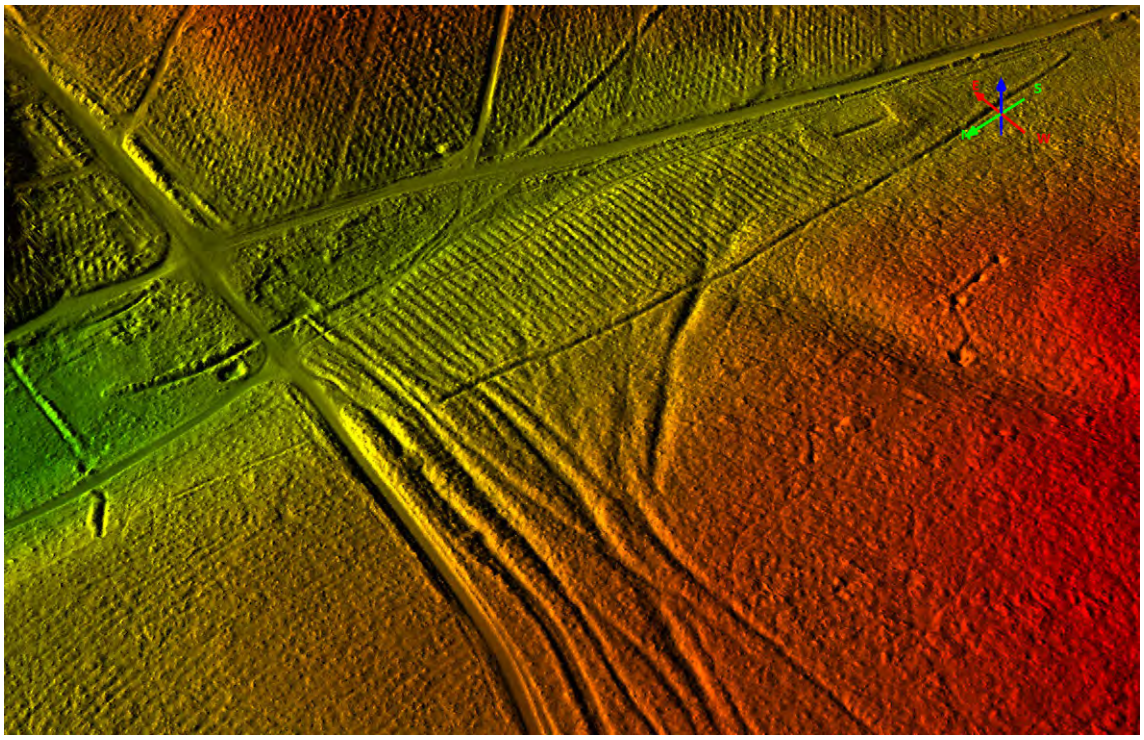

Fig 115: Ploughing evidence (narrow ridges in the bottom left and in the triangular area below the road) along Brocton Field and Anson's Bank may be indicative of the 17th-century temporary intakes. Lidar DTM 04-MAY-2016 © Historic England; source Staffordshire County Council/Fugro BV Geospatial.

A small embanked enclosure lies within Spring Slade Wood where bank and external ditch enclose an area measuring over nine hectares (MST22893). This area was called Acton and Bednall Common, now bordering Camp Road to the north of Springslade Lodge. The enclosure has more curved boundaries than those at Bednall

Belt and Brocton Field. It is not clear if it relates to coppicing, cultivation intakes or a warren. This area lies outside the estate of the Pagets and the Littletons and was not included on maps dating to 1819-1824 and 1754 (SRO D260/M/E/353a).

The woods to the south of here were all originally within Teddesley Warren, but there is no evidence of a surviving boundary for this estate land. The enclosure in which Warren House stood is however visible as a shallow earthwork (MST5009). Much of the area was excavated to form the extensive Pottal Pool sand and gravel pit (MST22883). This destroyed a curious earthwork marked as the 'old encampment' on the 1754 map. The Staffordshire Historic Environment Record has records for a series of linear banks within this woodland extending across Warren Hill, Deer Slade and Dark Slade Wood; however lidar interpretation and subsequent ground assessment confirmed these to be lines of forestry brash.

South of the A460, there are far fewer boundaries. There are a handful of fragmented banks and ditches on the Rawnsley Hills, which largely correspond to those marked on the 1819-1824 map. The map also shows that a deer house existed here, but no trace of this was found. The landscape was largely remodelled during the construction of a golf course and has undergone extensive rally vehicle damage in recent years. A little further east, the boundaries of Regent's Wood are well preserved as narrow wood banks, most of which match the woodland boundary shown on the 1820s map (MST22655, MST22666). The knoll of Stile Cop forms the summit of this woodland, which accounts for a sudden northerly bulge in the boundary.

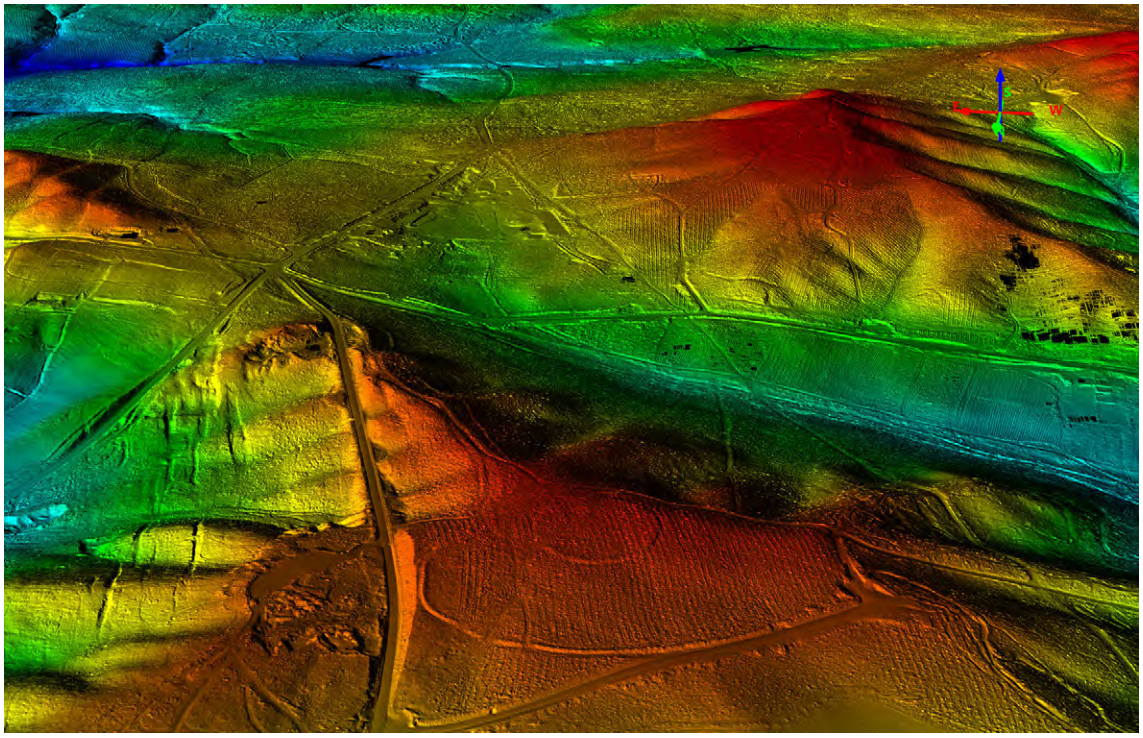

Fig 116: The probable circular tree ring (centre foreground) enclosure on Stile Cop (MST22654), which overlooks the estate of Beaudesert to the south. The overlying ridges relate to modern tree planting. Lidar DTM 04-MAY-2016 © Historic England; source Staffordshire County Council/Fugro BV Geospatial.

There is a perfectly circular ditched enclosure with a diameter of 73m and hints of an internal bank on Stile Cop (MST22654). There are no other equivalent examples in the area and, as it overlooks the estate of Beaudesert to the south, it was probably originally an enclosure around a small cluster of trees, a tree-ring, designed to be visible from the house (Fig 116). It may be associated with the landscaping of the park in the 18th century. Yates's 1775 map shows a small cluster of trees on the Cop, which may well relate to this feature. A number of fragmentary banks were also mapped in Chetwynd's Coppice, though areas of the woodland have been truncated by gravel and coal extraction.

Beaudesert

The estate of Beaudesert has a complex history. It was one of the earliest deer parks in the region, being emparked in 1337, and was located at the heart of the historic Chase owned by the Bishop of Coventry and Lichfield. It later became the seat of the Baron Paget of Beaudesert, who also held the titles of Marquis of Anglesey and Earl of Uxbridge. The park was initially established for keeping and hunting deer but was also exploited for ironstone and coal before being landscaped in the 18th century. Although elements of landscaping still exist, the current land use is mainly forestry in the Old Park to the west and pastoral farming in the New Park to the east.

Based on historical map evidence, Beaudesert Park extended as far east as Horsey Lane, south to Cannock Wood, west to Hazelslade and north to Startley Lane, at its maximum extent. The coal mining and later landscaping of the park make it difficult to trace the medieval park. The possible western boundary (MST22746) of the deer park is visible as shallow earthworks, defined by a mutilated ditch arcing northwards from Cannock Wood Industrial Estate, over Bentley Brook, and disappearing alongside Forestry House. The boundary probably originally continued along the line of Rugeley Road, but no earthworks remain visible.

Described in 1554 as covering 860 acres (348ha), the deer park formed the core of the later 'Old Park', which covered approximately 453ha. The woodland parcel of Stereclyffe in the 1554 survey is described as bounding Beaudesert Park. Chris Welch has interpreted this as being Startley Hill, which is depicted on maps as being within the park by at least 1757 (C Welch, pers comm). The boundaries to the south of Startley Hill are complex and difficult to discern amongst the extensive coal mining earthworks, but two boundaries may be the remnants of a park pale, perhaps the original boundary to the park (MST22838). These are low and fragmented earthworks but they have a ditch to the south, on the inside of the park, and in places a slight bank to the north. There are at least two phases visible, the northern one perhaps being slightly later in date, indicating an encroachment of the park into the Chase (Fig 117).

A more complete boundary is visible a short distance to the south, still within the Old Park (MST22747). This sinuous ditch, with a bank to the south, extends eastwards from near Cannock Wood Industrial Estate for over 1.7km (Fig 117). The boundary is cut through by roads and drainage, but is well-defined. There is no evidence to suggest that it relates to the post medieval landscaping of Beaudesert. It

has been truncated by the coal mining in places, so it is most likely a feature of the original deer park, perhaps the original southern pale. Interestingly, it passes to the north of Castle Ring, which may suggest that this prehistoric hillfort originally lay outside the park. The area called Broad Hazels, immediately adjacent to the hillfort, is shown as being outside the park on a sketch map of 1757, but by 1775, Castle Ring is illustrated as being within the park, as are the Broad Hazels on early 19th-century maps. One suggestion is that this entire southern area was only taken into the park bounds during the late 18th century.

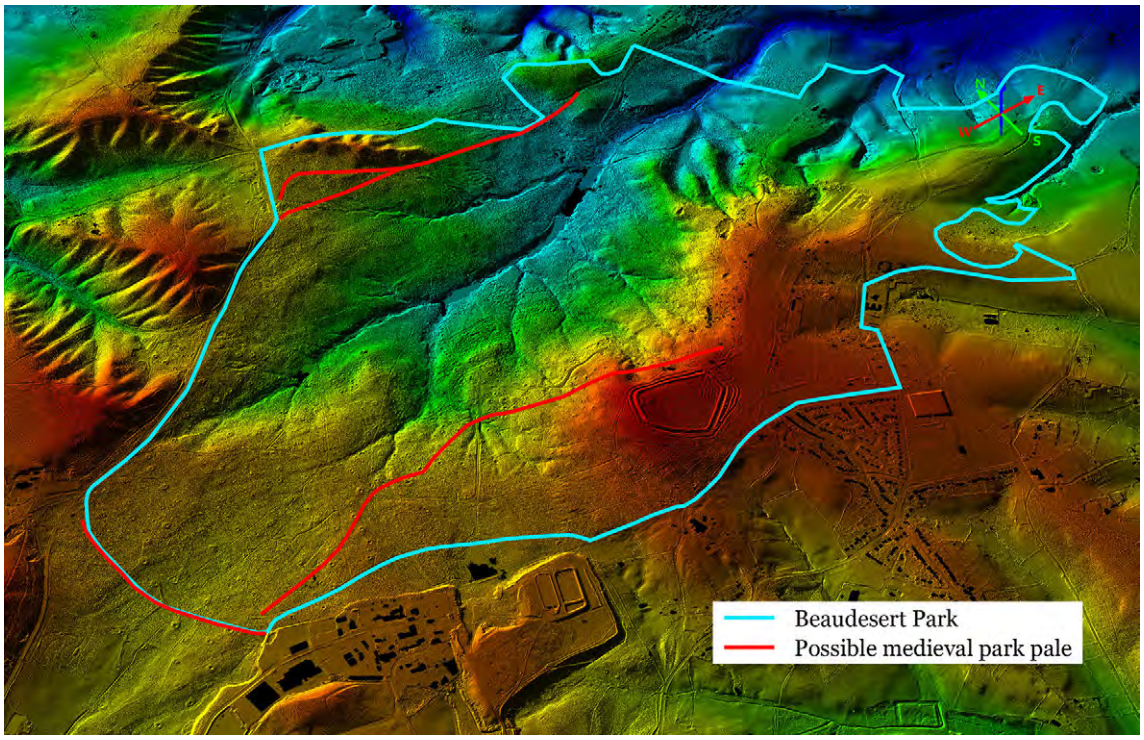

Fig 117: A number of linear earthworks within the grounds of Beaudesert Park might relate to the medieval deer park. Lidar DTM 04-MAY-2016 © Historic England; source Staffordshire County Council/Fugro BV Geospatial.

The lodges of Cannock Chase

Beaudesert Park had nine gate lodges around the perimeter in the 19th century, but these were very different to the medieval lodges of the Chase, of which at least one was located inside the park. The site of one of these lodges is marked on the map of 1819-1824 as three small rectangular enclosures, two of which have buildings inside, the westernmost being called 'Lodge Barn'. By 1884 all that was depicted was a line of trees marking the location of the easternmost enclosure. This enclosure is the only one of the three known from map evidence that survives as earthworks visible on the lidar (MST22758). Although affected by later forestry activity, this enclosure is still a considerable earthwork. The surviving north-eastern part encloses an area measuring 46m by 48m, and comprises an external bank and outer ditch, with a possible second bank and narrow ditch on the inside (Fig 118). The enclosure boundary is about 14m wide, suggesting a site of some scale and importance, but

there is no clear sign of the building within it. Parts of the probable footings of Lodge Barn are located 60m to the west.

It is reasonable to suggest that the enclosure was the site of the original lodge. It is not possible to ascertain an exact date however, but a medieval or early post medieval origin is possible, and its size suggests it probably served as the main lodge for the deer park. The lodge appears to be contained within an outer enclosure (MST20537), defined by a ditch on the outside and an internal bank (Fig 118). The area to the immediate west of the lodge site is still called The Lawn, which may have derived from 'launds', an area of open heath or grassland within a medieval park (Rotherham 2013, 19).

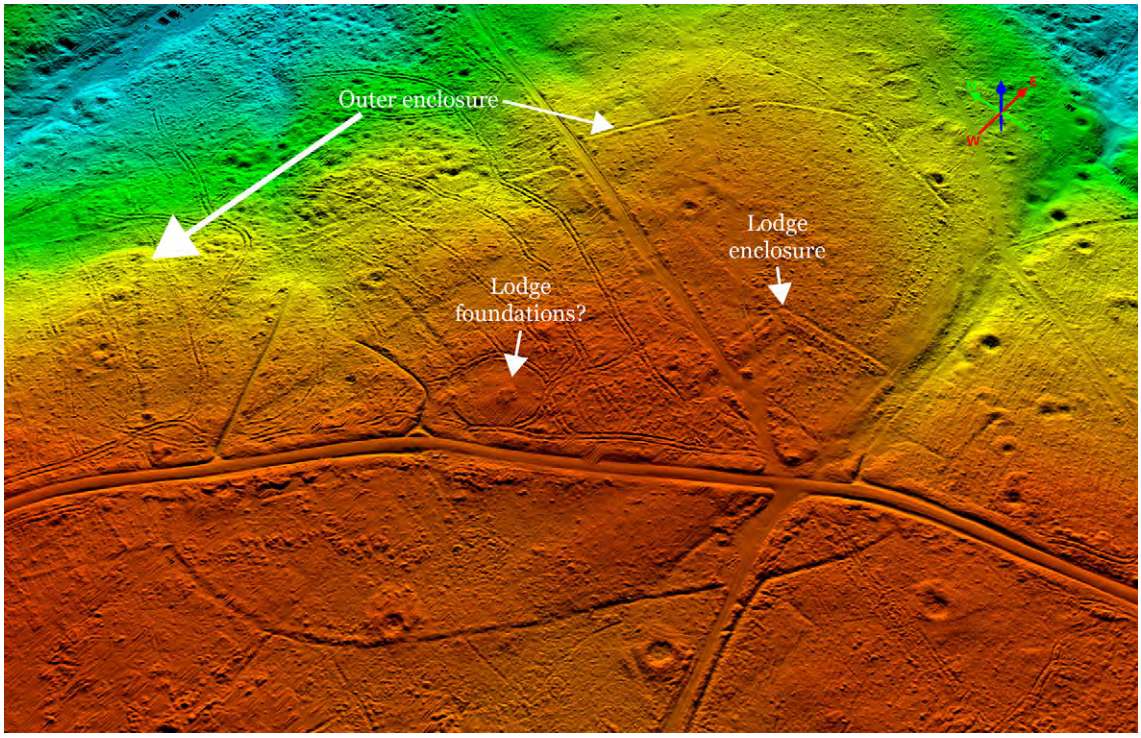

Fig 118: The lodge in Beaudesert may have medieval origins (MST22758). The surrounding curvilinear enclosure is of the same form as the supposed medieval park pales (MST20537). Lidar DTM 04-MAY-2016 © Historic England; source Staffordshire County Council/Fugro BV Geospatial.

There is another possible lodge within Castle Ring hillfort (MST25). The site was excavated in the 19th century to reveal a building and numerous finds of pottery and stag horn, and was encompassed within the analytical earthwork survey of the hillfort in 1987 by the RCHME, and subject to geophysical surveys in 1987 and in 2017 as part of the Chase Through Time project (RCHME 1988; Strain 1987; Payne and Pearce 2017a). The stone building footings are rectangular in plan, measuring approximately 12.5m by 24m with internal divisions, and are clearly visible on the ground. The 2017 geophysical survey also noted responses adjacent to the building that could represent additional structures. Tentatively dated to the 14th century, the building is thought to be a lodge or banqueting house associated with Beaudesert

Park. The location of the building, in the north-west corner, the highest point in the hillfort's interior, would have afforded a very good view over the park. However, as argued above, it is possible that Castle Ring lay outside the bounds of the park until the late 18th century, in which case, perhaps this could have been a lodge associated with the Chase as a whole. Castle Ring is located almost centrally within the area designated as the Bishop's Chase in 1290.

A moated site (MST221) in Courtbanks Covert, Red Moor, less than a kilometre to the south of the hillfort, is considered to be the site of a Cistercian priory founded on land granted by the Crown in the 12th century. The monks were granted certain rights to tillage and pasture in the area, but after trouble with the foresters, they were moved to Stoneleigh. Henry I took back the ownership of the site, converting it into a hunting lodge in about 1157-1159 to replace an earlier lodge at Cannock (Brown *et al* 1963, 907; Gould 1967, 30-1). This lodge was located centrally within the royal Cank Forest that existed at that time, but whether it was maintained after the Chase was granted to the Bishops of Lichfield and Coventry in the late 13th century is uncertain. The earthworks are considerable, comprising a large rectangular moat with ditches up to 12m wide, enclosing an area of 60m by 90m.

Yates's 1775 map of Staffordshire shows no less than nine additional lodges across the Chase (Fig 119). Two of these fall outside the project area, Coopers Lodge no longer exists, and three are still roofed buildings and so fell out of the scope of the survey. The lodges include Fair Oak Lodge, which was called Dukin's Lodge on the map, Sukars Lodge, called Sugars Lodge on the maps of 1775 and 1819-1824 and Coney Lodge on the edge of Boney Hay. The Teddesley lodge of 1775 appears to correspond with what later became Warren House (MST5009), and may well have been constructed in the 17th or 18th century for the keeper of the warren. The site is still visible on the edge of Warren Plantation, as a much-denuded rectilinear enclosure measuring 38m by 57m. Elements of the boundaries that originally enclosed Parr's Warren lodge are also visible as earthwork banks (MST22845). This enclosure corresponds with the location of one of Yates's lodges, and was marked on the 1819-1824 map, though no buildings internal buildings were illustrated. When examined on the ground by Scruby (2000, 5), it was noted that felling and limited ploughing had taken place, and 17th- to 19th-century pottery and glass were discovered. The 1775 map also denotes a lodge immediately south of Haywood Park, west of Old Brook. This location matches a small embanked enclosure mapped from the lidar, in the north-east corner of Haywood Warren (MST23004). Measuring 24m by 38m, this is marked as the 'Site of Warren House' on the 1819-1824 map of the Chase, and presumably relates to Paget's warrens of the 17th and 18th centuries.

One of the earliest documented lodges was that of Osborne, Paget's forester for the Chase in the late 16th century. In 1570 he was permitted to rebuild his lodge and enclose an area around it. The site of this lodge has not been found. The warren lodges were probably only constructed in the 17th or 18th centuries, although they may have had earlier origins. The strongest candidate for Osborne's lodge is at Lodge Bank within Beaudesert Old Park. This is the only lodge that shows evidence of being enclosed by a boundary of probable medieval or early post medieval date. This lodge was also located at the heart of the Bishop's Chase and less than 2km

west of Beaudesert Hall. Another candidate is Fairoak Lodge, the site of which remains occupied. This is in the centre of the area covered by the coppice enclosures of the late 16th century, and was probably sited within or on the boundary of Tymberwoode and the Ryders Herber and Roughe Hillis. There is also the moated site at Red Moor, which was the site of the king's lodge to the royal forest, but there is no documentary use of this site following the establishment of the Chase. Additional candidates for Osborne's lodge include some to the south of the project area and so it was not possible to consider the physical evidence for these.

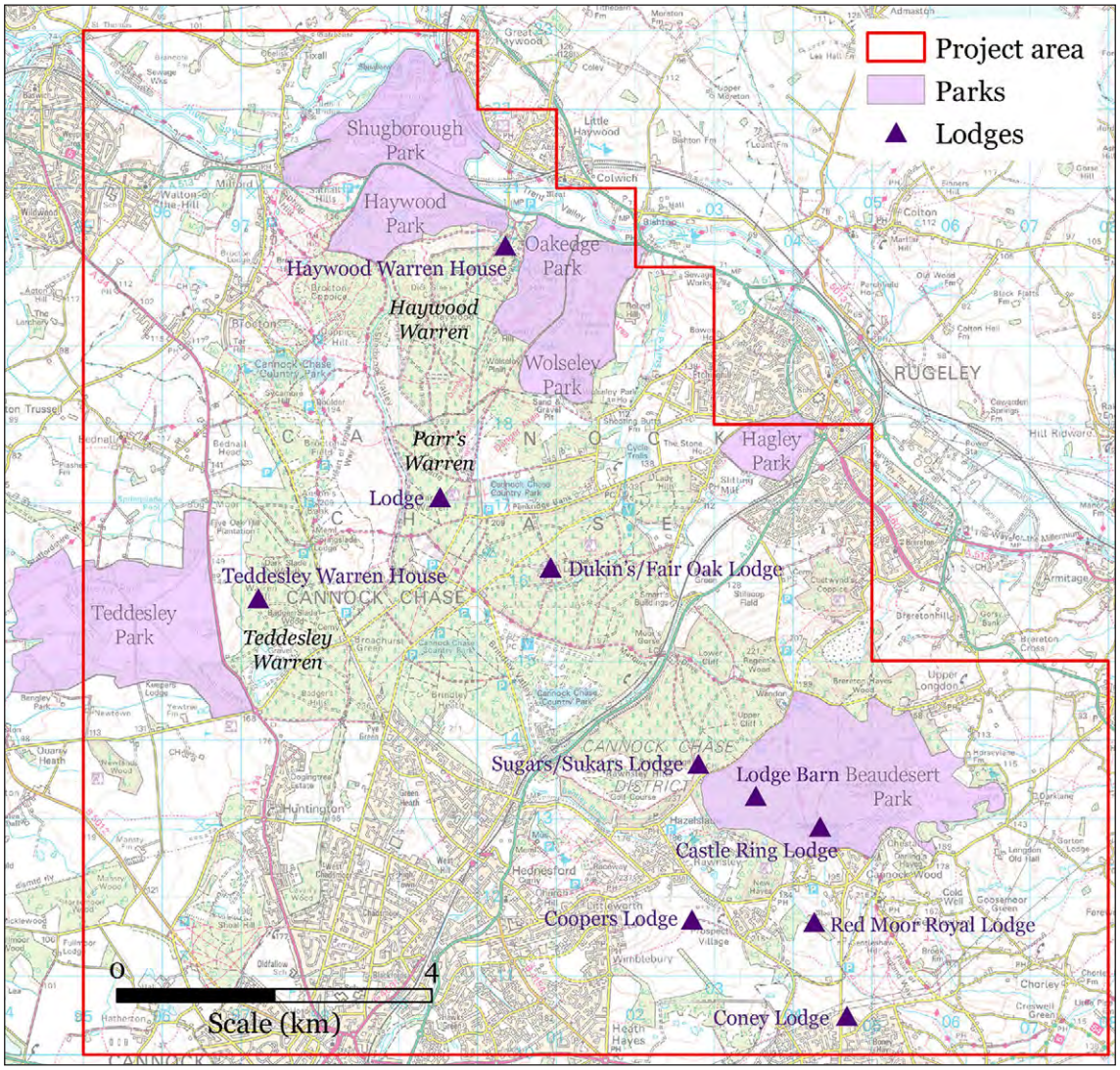

Fig 119: The medieval and post medieval lodges of Cannock Chase. The lodges or lodge enclosures of Haywood and Teddesley Warren Houses, Parr's Warren Lodge, Red Moor royal lodge, Castle Ring lodge and Lodge Barn are all visible as earthworks on the lidar © Crown Copyright and database right 2018. All rights reserved. Ordnance Survey Licence number 100019088.

There are a number of other small enclosures across the Chase similar in plan although smaller than the outer enclosure at Lodge Barn. They are all broadly curvilinear and defined by internal banks and external ditches, but none show any visible evidence of having internal structures or additional earthworks. Two are located on either side of Hollywood Slade (MST22671, MST22636) in the north of the Chase, and one on Brindley Heath (MST22731). Whether these enclosures were associated with lodges is uncertain. Another suggestion is that they were for penning livestock, but the position of the ditch on the outside of the enclosure suggests this was not the case. Perhaps they were simply small coppice boundaries. The Brindley Heath example displays no association with the other rectilinear wood banks there, though which came first is not clear in the evidence visible on lidar.

Breaking the boundaries

There were riots from at least the 15th century in Wolseley manor, through to possibly as late as the 18th century in response to Paget enclosing warrens on other parts of the Chase (Taylor and Dean 2015, 33). The main reasons behind these riots were the denial of commoners' grazing rights and their access to water and routeways. The rioters broke down hedges and burned fences, but the landowners simply had the boundaries reinstated. Although the hedges and fences were burned, the banks on which they were constructed endured.

It remains uncertain for how long the boundaries remained in use. Coppices were supposed to be enclosed for periods of up to nine years before reverting to common. It is unclear how often coppiced areas were reused or what form they took when used as unenclosed commons. It is also uncertain how many coppices might be enclosed at any one time. The survey of 1554 suggests that much of the Chase, stretching from Wolseley Park to south of Beaudesert was covered in parcels of woodland, but it is not clear how many of these were enclosed.

The Chase is thought to have been almost devoid of trees by the early 17th century, but the iron industry in the area endured, and so perhaps did the coppice industry to some degree. The furnaces are thought to have been out of use by the early 18th century, and by time of the 1775 map the only areas of woodland depicted are Brocton Coppice, Furnace Coppice, New Coppice, Chetwynds Coppice and Brereton Hays. Although most of the boundaries seemed to be out of use by the 17th or 18th centuries, they were still illustrated on the 1819-1824 map. The construction of the camps of the First World War and RAF Hednesford during the Second World War did the greatest damage to the boundaries across the Chase. The boundaries that remained on Brocton Field were damaged further as a result of armoured vehicle testing during the Second World War, and forestry planting is still prevalent across most of Brindley Heath today. Scruby noted during his walkover survey, that considerable damage had been caused to the boundaries by footpath erosion and car rallying, in places removing any traces of relationships between the banks (2000, 6). However, the evidence from the Chase Through Time survey demonstrates that a significant number of boundaries survive and provide considerable opportunities for further survey and research.

Charcoal burning

Most of the boundaries mentioned above were probably to enclose coppice woodland to make charcoal for the iron and glass industries. However, despite the extensive coverage of woodland across the Chase in the earlier centuries, and the intensive coppicing industry, there are few surface remains relating to the manufacture of charcoal. Eleven probable charcoal burning platforms were identified from the lidar (MST22823; Fig 120). These were seen as roughly circular level platforms measuring between 9m and 11m across, cut into the wooded slopes of the predominantly dry valley of the Stafford Brook. Located on the east side of the Chase, they lie on the margin of Paget's lands, almost bordering on Wolseley manor to the north. This area, based on Welch's suggested locations of woodland parcels in 1554 (2000, 32), would probably have fallen within, or between the Old Coppice (Tholde Copice) and the New Coppice (Newe Copice). The platforms are located a little over 1.5km north-west of one of Paget's forges on the Rising Brook, and a few kilometres north of the furnaces. The friability of charcoal can make it difficult to transport over long distances (Carpenter *et al* 2016, 102), so local use is most likely. This is further substantiated by a report of 1591 that stated that the fuel was at risk of bursting into flames, as it was transported fresh from the charcoal burning site to the furnace. We know of other areas of charcoal burning. For example, Henry Gotyar, a collier, rented 20 acres (8.1ha) of land near Stoney Brook in 1570 (Welch 2000, 24).

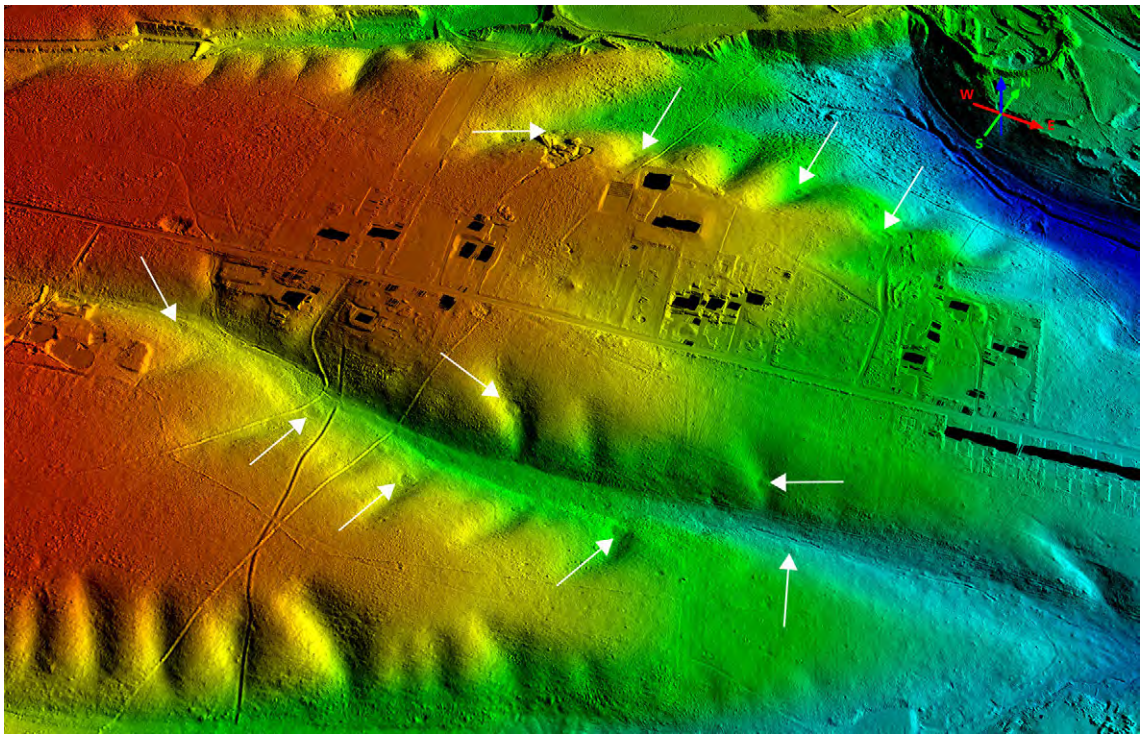

Fig 120: The location of eleven charcoal burning platforms located along the slopes of the Stafford Brook. Lidar DTM 04-MAY-2016 © Historic England; source Staffordshire County Council/Fugro BV Geospatial.

The most likely explanation for the limited archaeological evidence for charcoal burning is poor survival. Charcoal-making sites were carefully chosen, frequently cut into slopes protected from prevailing winds (Kelley 1986, 5); they are often represented in the archaeological record by slight earthworks in the form of an oval or circular level area with a front 'apron' scarp of material immediately downslope. As already demonstrated, much of the upland Chase around the areas of the coppicing and iron industries saw extensive change in the 20th century, which perhaps removed the vestigial remnants of the burning sites. Perhaps the method of burning may also have varied. Charcoal production can also take place in pits, though these are difficult to positively identify from the air (Rackham 1980, 355). The colliers of Cannock Chase make reference to a 'pitt', though Welch argues that the charcoal was still being manufactured in earth-covered kilns (2000, 24). Another possibility is that there were relatively few burning sites, and that after being dried on site, the harvested timber was transported to a handful of charcoal burning platforms in the shallow dry valleys on the east side of the Chase. Burning sites were often reused as the ground became conditioned (Kelley 1986, 5). However, considering the sheer quantity of charcoal being manufactured for the furnaces and forges of Cannock and Teddesley Hay between 1577 and 1585 (Welch 2000, 26), it seems likely that there were a great deal more burning sites operating than have currently been identified in the archaeological record.

Land division off the Chase

The parcelling of land was more prevalent in the lowlands than in the upland Chase. Much of the field pattern was established during enclosure in the 19th century. A small number of field boundaries of this date were mapped from aerial photographs if they were not depicted on Ordnance Survey maps.

A number of areas of more extensive field system also survive as earthworks. These include fields on Gentleshaw Common, where a close network of abutting rectilinear enclosures are clearly post medieval in date (MST22713; Fig 121). This field system is illustrated on the 1819-1824 map of the Chase, but appears to have been out of use by this time. Associated ridge and furrow indicates that the area was ploughed, suggesting that Gentleshaw Common was one of the areas of marginal land taken-in during the 17th or 18th centuries.

There is a similar arrangement of boundaries and ridge and furrow on Shoal Hill (MST5030). The field system is visible to either side of New Penkridge Road, therefore predating that road which was constructed at some date between 1775 and the 1820s. Now an area of common and plantation, this was still part of the Chase heathland in 1775, and probably another area of temporary intake. Fragmentary earthwork banks to the north-east in Cavan's Wood may have a similar origin, also in an area of heathland in the 18th century.

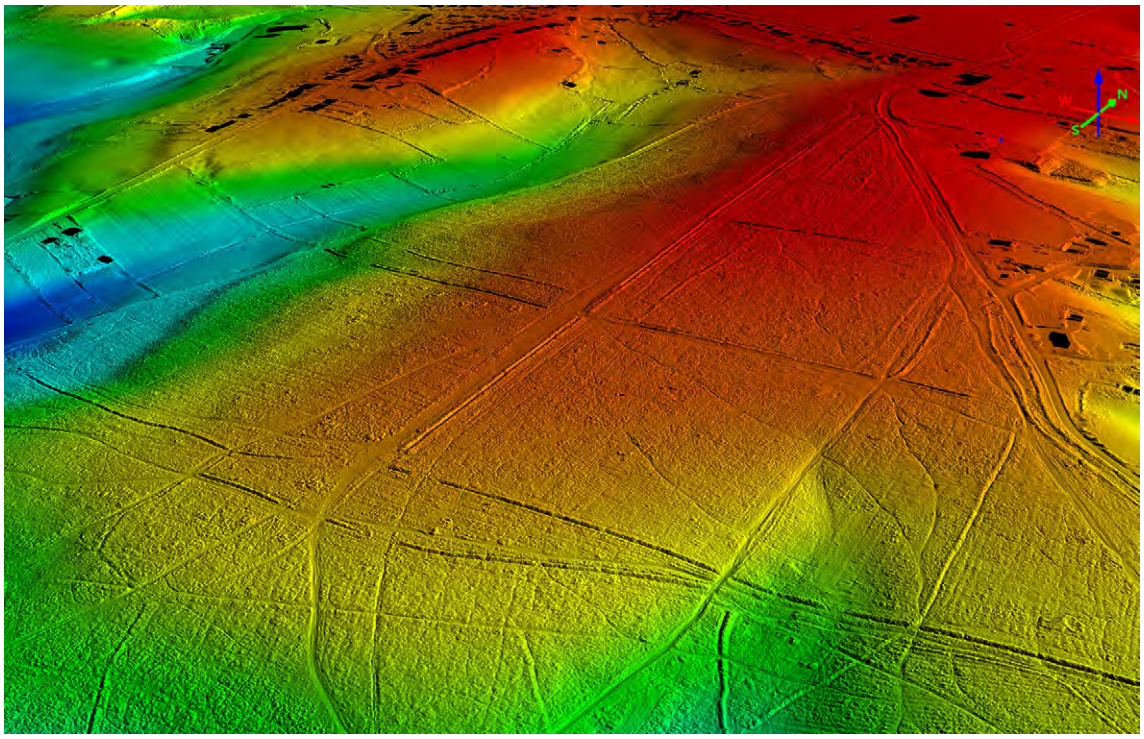

Fig 121: The field system on Gentleshaw Common is rectilinear in form and clearly post medieval in date (MST22713). Lidar DTM 04-MAY-2016 © Historic England; source Staffordshire County Council/Fugro BV Geospatial.

The nature of land division changes to the west of Huntington. Here the remains of post medieval enclosure are defined by buried ditched field boundaries (MST22695) visible as cropmarks, some of which are marked on the 1884 edition Ordnance Survey map. The boundaries were removed to allow for the more intensive farming practices of the late 20th century. There are patches of ridge and furrow cultivation visible as both earthworks and cropmarks associated with this field system.

At Newlands Wood, there is the earthwork survival of medieval cultivation in the form of 'S-bend' ridge and furrow and associated headland banks, a rare occurrence within the project area (Fig 122). The curve of the furrows is the result of using an ox-drawn plough. This isolated patch of earthworks appears to have survived due to tree cover, although it is uncertain when the wood was established. The earthworks of a broad-ditched D-shaped enclosure are situated on the edge of Newlands wood and the eastern end, outside of the wood, is now buried beneath the plough soil and is visible as cropmarks (MST22692). In terms of size and shape it is similar to later prehistoric or Roman enclosures, however, it seems most likely that it is a medieval moat as it appears to be respected by ridge and furrow. The ditch is very broad, over ten metres in places, and encloses and area measuring 90m by 120m.

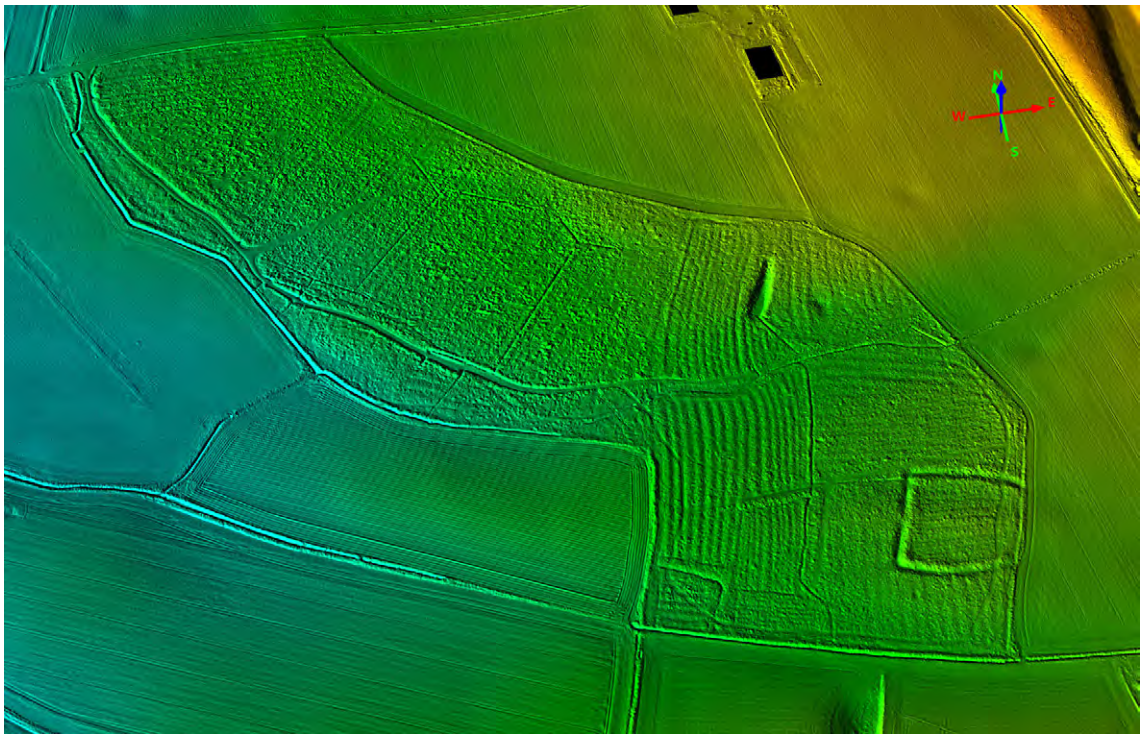

Fig 122: Newlands Wood has protected medieval earthworks from plough levelling. Lidar DTM 04-MAY-2016 © Historic England; source Staffordshire County Council/ Fugro BV Geospatial.

Traversing the Chase

The various rights to the chase, for nobility and commoners alike, would have influenced their access and movement across it. There are numerous earthworks marking these routes, some ephemeral tracks and others extensive networks of braided hollow ways that extend for kilometres. These are an often-neglected site type in archaeological survey and the lidar data allowed the Chase Through Time project to produce an extensive map of the network of routes across the area.

The most extensive braided hollow ways are visible along Brocton Field and Anson's Bank. There are several dominant routes here, mostly orientated roughly north-west to south-east. The longest is over 3.7km and, although fragmentary, can be traced as a single route between Fairoak Lodge and Spring Slade Wood (MST22881, MST5820, MST22866). A section of hollow ways fork from this main route on Anson's Bank, towards the south-east, but cannot be traced any further south than Penkridge Bank (MST5823, MST5824; Fig 123). It is possible that the continuation of this route east from Fairoak Lodge is marked by the present footpath that leads to Stony Brook Pools. To the west, the hollow ways turn more to the north-west, and probably once extended towards Common Lane, Bednall. The entrance to the heathland from the end of Common Lane in 1775 was called Bednall Gate, one of a number of 'gates' on to the Chase, and it seems likely that this was a route between Bednell and Rugeley. Establishing a date of origin is difficult. Parts of the route were still in use between 1819 and 1824, but the earthwork remains are more extensive and deviate at several locations from the course shown on old maps. The presence

of braided and deeply incised hollow ways suggests that they were possibly used as droving routes for livestock, and could have origins stretching as far back as the medieval period.

The importance to commoners in maintaining their rights of access on the Chase are well documented, and it was the obstruction of this access, with the construction of boundaries for coppices and warrens, that led to many of the riots. Where the Bednall-to-Rugeley hollow ways pass to the south of the source of the Sher Brook, there is a small area of well-preserved boundaries enclosing an area of ridge and furrow (MST22854). The hollow ways described above pass through this enclosure at the northern end. The lidar evidence suggests that some of the hollow ways run under the boundary, whilst others truncate it. This multi-phasing suggests a period of reuse of the route, though it is likely that the enclosure, which may relate to a 17th- or 18th-century intake, was probably only in use for a short period of time. Further to the east, near Fairoak Lodge, the fragmentary relationship between the hollow ways and the coppice boundaries is less clear, though they do appear to be parallel to one-another, showing some level of contemporaneity. This could potentially push back the date of some of the hollow ways to the 16th century, when the coppice enclosures were being constructed.

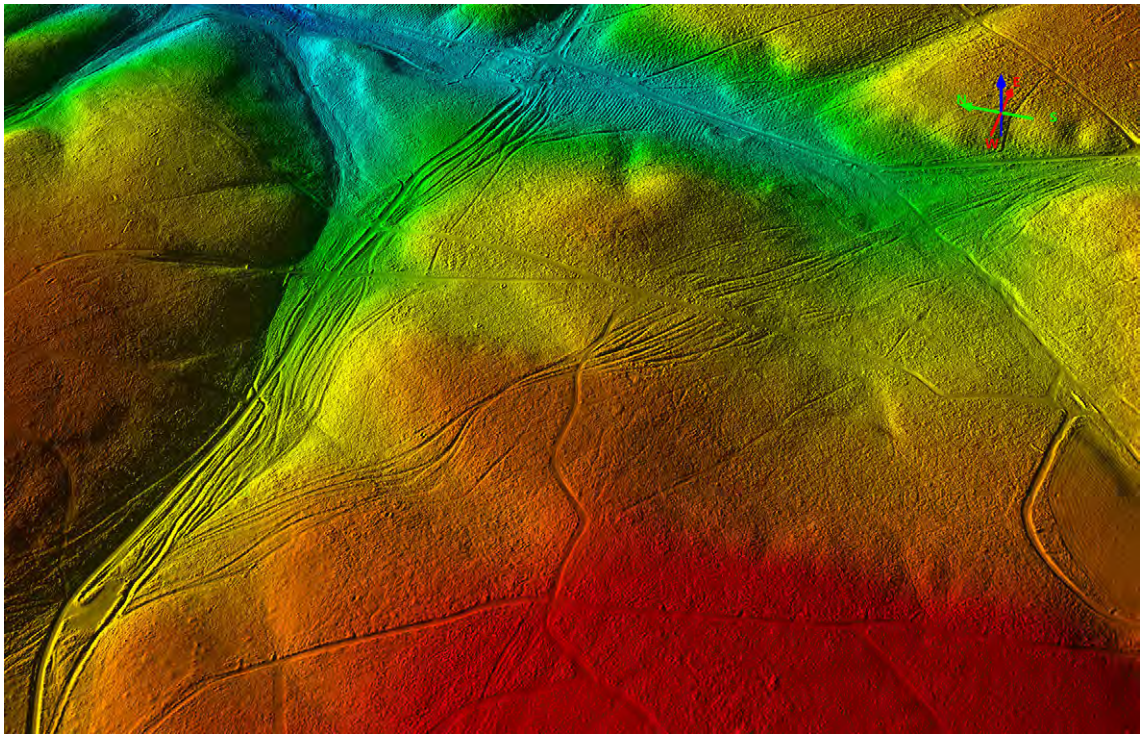

Fig 123: Hollow Ways diverge and intersect on Anson's Bank to the east and south-east. Lidar DTM 04-MAY-2016 © Historic England; source Staffordshire County Council/Fugro BV Geospatial.

We see a similar relationship on Brocton Field, near the Glacial Boulder. A series of complex braided hollow ways (MST22897) that extend north-west from a fording point of the Sher Brook, appear to follow or align on an enclosure boundary bank. The exact relationship between the two remains uncertain however, due to extensive levelling and disturbance by Brocton Camp.

Further hollow ways (MST22882) extend alongside part of Camp Road, adjacent to the Katyn Memorial, and along Spring Slade towards Bednall Head Farm. Camp Road appears to have been constructed by the military during the First World War, and there is no route marked here on Yates's map of 1775. The earliest alignments that correspond with the hollow ways are a thin belt of trees called Bednall Hills Wood and the road through Spring Slade on the 1830s Ordnance Survey map. Both of these were probably established following the enclosure of Bednall Head Common in 1814. However, the tree-line appears to have followed the historical boundary between the manors of Teddesley in the west, and Haywood and Cannock in the east, so the routeways could be earlier in origin.

The origin of another major route of importance is a little easier to establish. A set of braided hollow ways (MST5817, MST22647, MST5819) extend south from Coalpit Lane Covert for 3.5km. This route, as the name suggests, was a haul road for the coal, presumably that being extracted in Beaudesert Park. Though no longer used for coal, the various winding coal roads were still marked on the 1819-1824 estate map. The roads possibly went out of use with the construction of the Trent and Mersey Canal in the 1770s (Scruby 2000, 5).

We are clearly only seeing fragments of the routeways across the Chase. Many have probably been removed by 20th-century military activity, or plantation, and others were incorporated into later tracks, still used today as footpaths. One retains the name of Marquis's Drive, which was constructed between Beaudesert and Penkridge Bank to bring shooting parties from the estate to the Butts (MST22880) on Anson's Bank. Fourteen shooting stands were identified on the lidar, defined by central pit surrounded by a circular bank, arranged in two rows on either side of a dry valley.

Conclusion and suggestions for further work

The nature and history of these land divisions is a complex and interesting one. The boundaries had a variety of forms and uses, and potentially range in date from the Iron Age to the 19th century. Extensive studies on the iron working on the Chase by Welch (2000) and Harrison (1974) have paved the way for further research into the coppice boundaries, and the results of this aerial survey has helped further that understanding. The results demonstrate good earthwork survival of many of the boundaries, but have also highlighted that where there is little evidence, it is due to 20th-century military and forestry activity. Additional research has established that many of the levelled boundaries were mapped between 1819 and 1824. Rectifying this map and transcribing the additional boundaries would allow us to fill in many of the gaps. Piecing this together with the aerial mapping data, and Welch's (2000) work on the woodland parcels, would further understanding of the 16th- and 17th-century land division on the Chase.

The use of documentation and historical maps has enabled the dating of most of the upland boundaries with a degree of confidence to between the 16th and 18th centuries. In some cases we are able to suggest a possible use for the enclosures, but the relationships and phasing within and between them is less certain. The association between the networks of braided hollow ways and the boundaries is even less certain, though there is the suggestion of contemporaneity for some. Analytical earthwork survey may be able to clarify some of these relationships. One target for further work could be the boundaries surrounding Fairoak Lodge, most of which probably relate to woodland and coppice boundaries of the 16th or 17th centuries, but which also appear to be multi-phased and very complex in nature. It also appears as though the Bednall-to-Rugeley route of hollow ways might have passed through a number of these boundaries.

It is presumed that most of the mapped coppice boundaries relate to the iron industry of the mid-to-late-16th century, but is it possible to establish whether any are earlier? Welch (2000, 42) suggests that perhaps a couple of the woodland parcels mentioned in the 1554 survey were earlier in date, such as The Old Coppice. Did these exist prior to the iron industry, and if so, were they also for fuel production, or was the wood being managed for other purposes? If the boundary of this coppice could be identified from the mapping, it may be possible to target a surviving section of boundary for more detailed study, in order to ascertain a possible date for construction.

A number of possible park boundaries were mapped, but how they all functioned is not certain. A walkover established that part of the southern pale to Haywood Park was not embanked, as it had appeared on the lidar, but was using the natural slope to act as a deer trap, the false 'bank' being the result of dense vegetation that had grown up around the modern wire fence. The eastern boundary to the park (MST6046) is anomalous, as the ditch appears to be on the outside of the park. Similarly, a rapid ground assessment of the large boundary earthworks on Oat Hill (MST23011) came up with similar results. If these earthworks were boundaries to Haywood Park, they appear to have performed in a different manner, keeping livestock out rather than in. Additional study of documentary records might offer further insight into the medieval park and how it was being managed.

The boundaries along Brocton Field are morphologically quite different to the woodland boundaries east of the Sher Brook, being more rectilinear in form, and associated with cultivation or land improvement (Fig 124). As described above, they are considered most likely to relate to short periods of intake, due to the relationship with what appears to be cultivation or land improvement. Once again, greater interrogation of documentary sources might reveal more clues about when these parcels of land were first enclosed, and for what purpose.

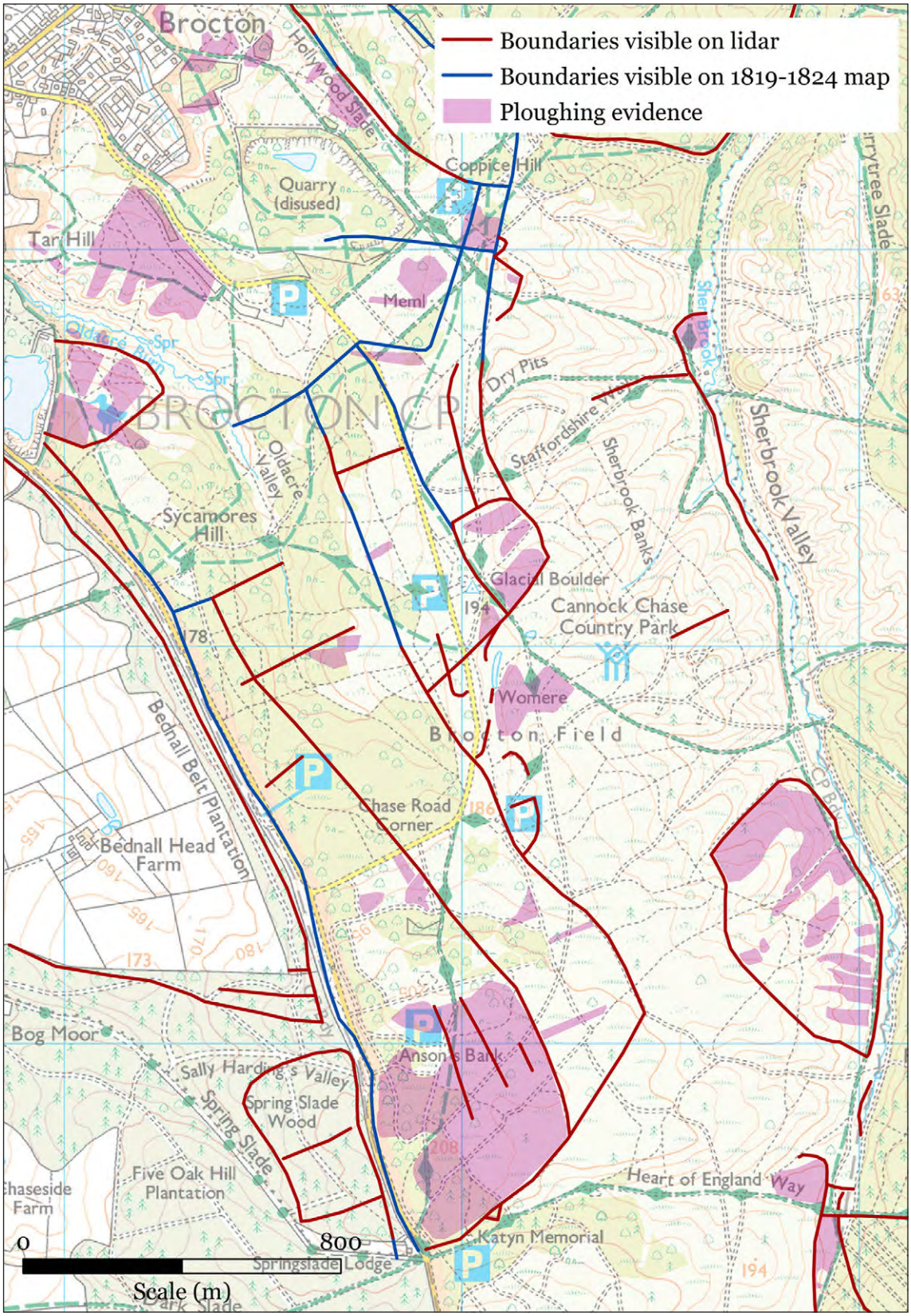

Fig 124: Most of the boundaries on Brocton field remain extant as earthworks. Where they have been levelled by military activity, they can be traced from the 1819-1824 estate map © Historic England; © Crown Copyright and database right 2018. All rights reserved. Ordnance Survey Licence number 100019088.

Other suggested sites for further research include the small curvilinear enclosures at Hollywood Slade (MST22636; MST22671; *see* Fig 40) and on Brindley Heath (MST22731; *see* Fig 109). The latter example appears to pre- or post-date the wood banks on the Heath, though the phasing is not clear on the lidar. The form of these enclosures is the same as many boundaries across the Chase, but whether they are related to lodges, stock management or coppicing is uncertain. The building mapped within the complex of woodland enclosures on Brindley Heath is also unusual and would benefit from further assessment. Any building foundations that pre-date the First World War are rare on the Chase, and the association of this building with the wood banks makes it potentially important, perhaps even a lodge site.

Further study of some of the better candidates for early lodges, such as the moated site at Redmoor (MST221), the building on Lodge Bank in Beaudesert (MST22758; *see* Fig 118), or Fairoak lodge, may lead to a better understanding of the management of the Chase during the medieval and early post medieval period. Similarly, a thorough examination of additional Paget estate documents might be able to confirm the location of Osborne's Lodge of 1570; Osborne acted as the head forester during the riots of that period. The lodge is also described as a 'rebuild', so it would be interesting to establish if this was the location of an earlier lodge, and to determine a date for its construction.

Although only a small number of charcoal burning platforms were identified, it would be useful to examine these further, perhaps using a similar approach to the analysis of the platforms in Barbon Park, Cumbria (Hazell *et al* 2017). Coring could help confirm them as definite burning sites, and further analysis, such as identifying the species and dating the burning episodes could help better understand when they were in use. This could also determine whether they relate to the iron industry, and whether underwood or hardwood was being processed. It may be possible, using a combination of Chris Welch's calculations of the number of 'loads' being supplied to the furnaces and forges, and with comparisons to other areas of burning throughout the country such as the Forest of Dean, to estimate a minimum number of charcoal burning sites on the Chase.

As has been clearly demonstrated, the entire heathland area has undergone great change over the previous five centuries, but this project has highlighted just how much of this change is preserved in the archaeological landscape. Despite the protection afforded by AONB status, there are potential threats to the archaeology, including forestry establishment and management. However, the greatest impact on the pre-20th-century archaeology of the area was the wartime military activity, although this is itself is now an important part of the heritage of the Chase. The Chase is also a popular haunt for walkers and off-road cyclists, and Scruby in 2000 noted how modern tracks can remove evidence of relationships between boundaries.

Most of the archaeological evidence in the lowland area surrounding the Chase was seen as buried remains revealed as cropmarks on aerial photographs. The exceptions are the earthworks of the coaxial field systems discussed above. A potentially significant site is the large circular enclosure north of Gypsy Green (MST23097; *see* Fig 106). The tentative interpretation of this enclosure being palisaded, suggests a

possible Neolithic date, and so it is perhaps the earliest feature mapped. Geophysical survey would be best suited to survey this enclosure and would hopefully add more detail to our knowledge of the sub-surface remains.

Significance

The use of lidar has redefined our understanding of the form and extent of the archaeology of the Chase. The mapping has revealed the remains of fossilised landscapes across Brindley Heath, Wolseley Plain and Brocton Field, broadly spanning the 16th to 18th centuries. The scale of coppicing and woodland management directly associated with industry that was occurring on the upland Chase has, to date, not been identified anywhere else in England. Similar regional studies, such as the Forest of Dean (Small and Stoertz 2006) and the New Forest (Royall 2013), as well as localised studies into many upland regions, illustrate how the management of these upland and wooded environments differ across the country, each one retaining its own unique characteristics. The uniqueness of Cannock Chase's archaeology is the survival of intact coppice boundaries that can be directly linked to this brief industrial revolution of the late 16th and 17th centuries. The archaeological remains testify to the fluctuating nature of the land use. In an area that was rapidly becoming denuded of tree cover, the woodland boundaries were being established to try to preserve areas of woodland as a source of fuel. Once a use for that fuel had diminished, there was no longer a need for the woodland, the result being the moorland heath that existed through until the 20th century. The extent of their survival, though somewhat fragmentary, testifies to the enduring nature of even the slightest of earthworks in an upland environment, and how modern technology can be used to reveal them.

BURNT MOUNDS

In the UK and Ireland, a class of enigmatic, mostly Bronze Age, sites known as burnt mounds have been recorded in a range of landscape settings. A significant number are located within the West Midlands, including a number within Cannock Chase. Lidar survey has proved a useful tool for identification and prospection of slight earthworks, both in woodland and open areas. Within Cannock Chase, a number of the known burnt mound sites, along with a handful of potential new sites, were seen on both lidar and aerial photographs, and investigated through field visits and geophysical survey for the Chase Through Time project.

Most burnt mounds are Bronze Age in date (roughly 2300-850BC), although there are a few earlier examples, such as a mound at Willington in Derbyshire, associated with impressed Neolithic wares and flints (Beamish and Ripper 2000).

Burnt mounds typically comprise low mounds of heat-shattered pebbles and charcoal often found adjacent to a stream. Many sites have a surviving low mound, but more usually they are identified from thick deposits of burnt stones exposed in the banks of a stream or exposed during excavation. They can occur singly or in groups along watercourses and are typically kidney-shaped, though can be oval, round, crescent-shaped or teardrop-shaped and a variety of forms can occur within a single cluster. The mounds themselves range in size from 3.5m to 15m in diameter and can measure up to just over a metre in height. Excavations have shown that the mounds often lie adjacent to, or overlie, a water trough fed by a natural water source. A hearth for heating stones is sometimes found close-by (Topping 2011). In a few rare cases, the trough survives. Excavation of a mound in Willington, Derbyshire uncovered a substantial rectangular timber-lined trough of split birch or alder logs, and another mound at Birstall, Leicestershire had a circular wooden trough lined with split oak planks and wattle side supports (Beamish and Ripper 2000).

Burnt mounds are occasionally discovered amongst settlements in the Northern Isles and Ireland, but in England they rarely have this association, although they have been found in close proximity to possible Bronze Age round barrows at two sites in the East Midlands (Beamish and Ripper 2000).

Since the first sites were identified in the early 20th century, numerous examples have been found across the British Isles through a combination of chance discovery and targeted survey. However, generally they have tended to be simply noted, but then overlooked in favour of more well-understood sites, and so remain largely understudied (Hodder 2004). Where studies and excavations have taken place, the lack of any associated material has been noted.

Theories on the purpose of burnt mounds

Their purpose remains obscure, but current opinion is divided between three possible purposes. Firstly, that these sites represent cooking sites with hot stones placed in the water-filled trough to boil food, probably meat, but in practice very few

sites have yielded animal bones and there is no evidence of food preparation, cooking or consumption (ibid).

Secondly, they may represent saunas or sweat lodge sites. The use of saunas is long established in many parts of the world as an effective method of bathing in cooler climates before the adoption of tub bathing and the invention of plumbing. Water is poured on hot stones to make steam within a hut or tented structure. In many cultures, there was also a ritual or religious component to the sweat bath or sauna linked to physical and spiritual purification. A number of reconstructions to test this interpretation include an experiment in 1998, based on a site at Cob Lane, Birmingham. It was inspired by a visit by a New Age sweat lodge user to a burnt mound in Moseley Bog, Birmingham (ibid) (scheduled in 2002, NHLE 1020542). This reconstruction demonstrated how the elements of a burnt mound site may have worked. There was a hearth for heating the stones with an adjacent pit to scoop out heated stones and a crescent-shaped accumulation of heat-shattered stone behind the hearth. The actual sweat lodge structure was located up to 10m from the hearth. It comprised a tent of animal hide stretched over a simple frame of bent branches constructed over a central hollow for the water trough fed by a small clay-lined cistern. There was also a third area for discarded fire-shattered stones, which could no longer be re-used. With continued use, modern sweat lodge sites become muddy so it is necessary to move the lodge site a short distance away. This could explain the occurrence of adjacent burnt mounds (ibid).

The third suggestion, is that burnt mounds functioned as industrial sites for a variety of activities, such as dying, felting, leatherworking and woodworking using steam to bend wood, all employing 'hot stone technology' and requiring quantities of hot water and steam (ibid).

It is possible that burnt mounds are a result of one or a combination of all three suggested activities. Sites with clusters of mounds, with a range of mound sizes and forms, could be the result of mixed use at one stream-side location or indicate use over a long period of time.

Burnt mounds in Cannock Chase

Previous work

Burnt mounds were first identified in the South Staffordshire Coalfield in 1910, when T C Cantrill (1913) identified 15 sites during geological survey work. Over the intervening years, steps have been taken to locate and confirm the existence and physical remains of these first sites, and to identify further unrecorded burnt mounds. Following the work of Cantrill, in the first half of the 20th century, a further 15 potential burnt mounds were located in south Staffordshire, two of which have been excavated: Sutton Park (Bullows 1927); and Syrescote (Gould 1976). In later years, only eight of the potential 15 mounds could be located, possibly due to their destruction or subsequent development of the land. A further three new sites were identified at Sutton Coldfield between 1979 and 1982 (Hodder 1988), and three new sites were located through a programme of intensive field survey along a stream edge

and ploughed fields in Sandwell between 1982 and 1986, one of which was excavated (Hewitt and Hodder, 1988). Between 1983 and 1987, Mike Hodder and Chris Welch revisited all the sites in South Staffordshire recorded before 1930, and identified a further two sites in Rugeley.

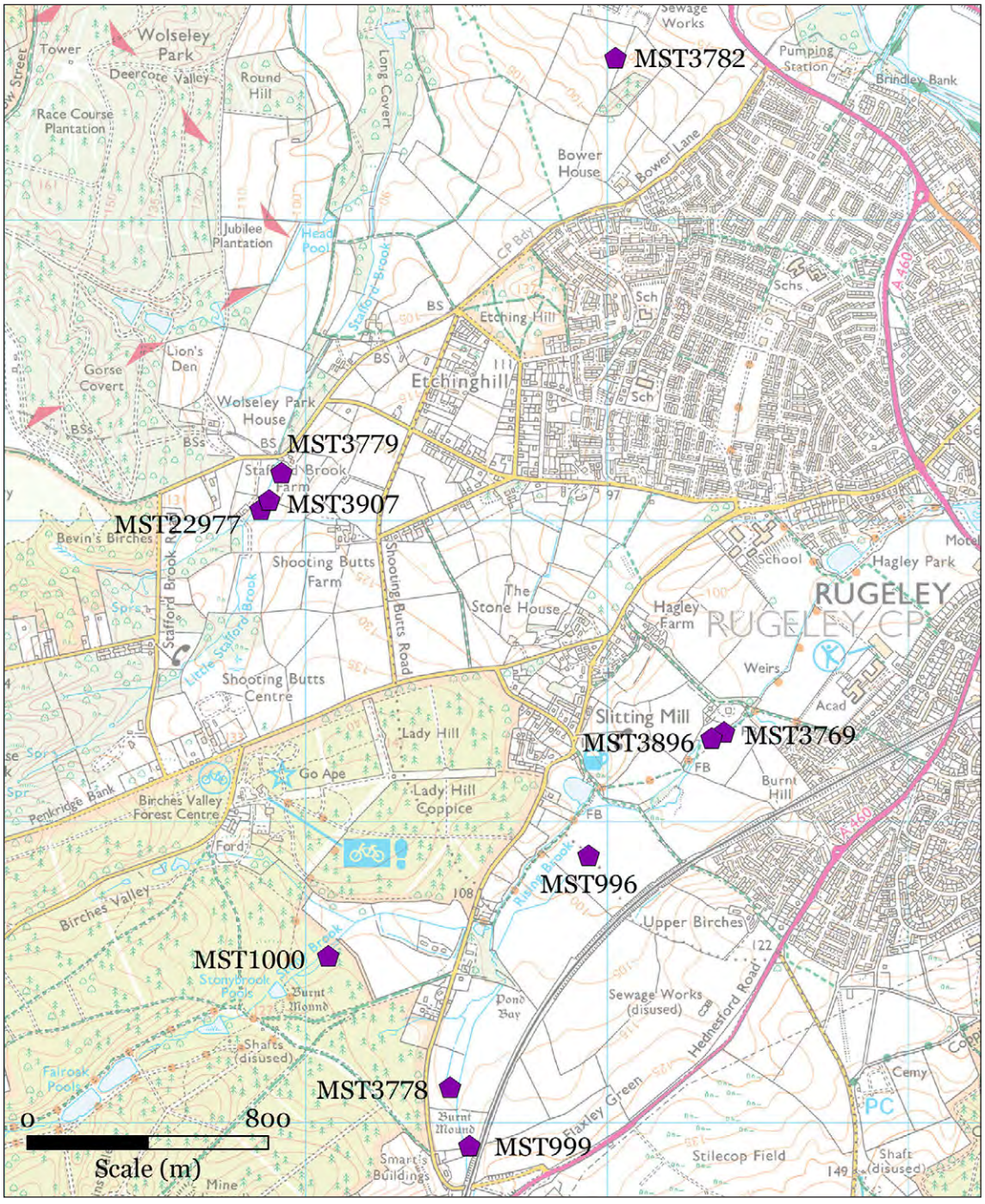

Fig 125: Distribution of burnt mounds within the project area © Crown Copyright and database right 2018. All rights reserved. Ordnance Survey Licence number 100019088.

Of the sites recorded within south Staffordshire, a number lie within the extents of Cannock Chase AONB. Some were visited as part of Hodder and Welch's burnt mound review in the 1980s, (Hodder and Welch 1987) and additional sites were reported in 1990 by Chris Welch, two at Slitting Mill on the Rising Brook and another near the Stoney Brook (Welch 1990). Within the area covered by the Chase Through Time project the catalogue of known sites of burnt mounds included:

- Three mounds on the Rising Brook;
- two at Slitting Mill (MST996, MST3896);
- two mounds close to Smarts Building recorded as Smarts Building 1 and 2 (MST999 and MST3778);
- a mound on the Stoney Brook (MST1000);
- another close to the Stafford Brook, at Stafford Brook Farm (MST3779);
- two in the Birches Valley on a tributary of the Stoney Brook, a scatter of heat-shattered pebbles close to Bose's Well (MST3780);
- a burnt stone scatter Bower Farm (MST3782) (Hodder and Welch 1987).

Prospection and survey

Because of their distinctive composition of accumulated heat-shattered pebbles and charcoal, burnt mounds can be identified with reasonable confidence through non-invasive survey methods such as field observation or assessment of aerial sources. The deposits of pebbles are usually well-drained, and provide good electrical resistance. As a result, mound sites can often be identified by resistivity surveys, and the presence of large quantities of burnt material within the mound give enhanced magnetic signatures that can readily be detected using a Fluxgate Gradiometer (Payne and Pearce 2017b). As they are often adjacent to water courses, potential for waterlogged deposits preserving organic materials and environmental evidence is fairly good. Potential abundance of charcoal provides dateable material.

Using the combined resources of aerial investigation, field survey and geophysical survey for the Chase Through Time project, it was hoped to confirm the continued survival of these sites last recorded in the 1980s. Understandably, using remote survey techniques on such slight mounds within a landscape littered with the remains of coal mining is problematic, but it was hoped that further potential sites might come to light.

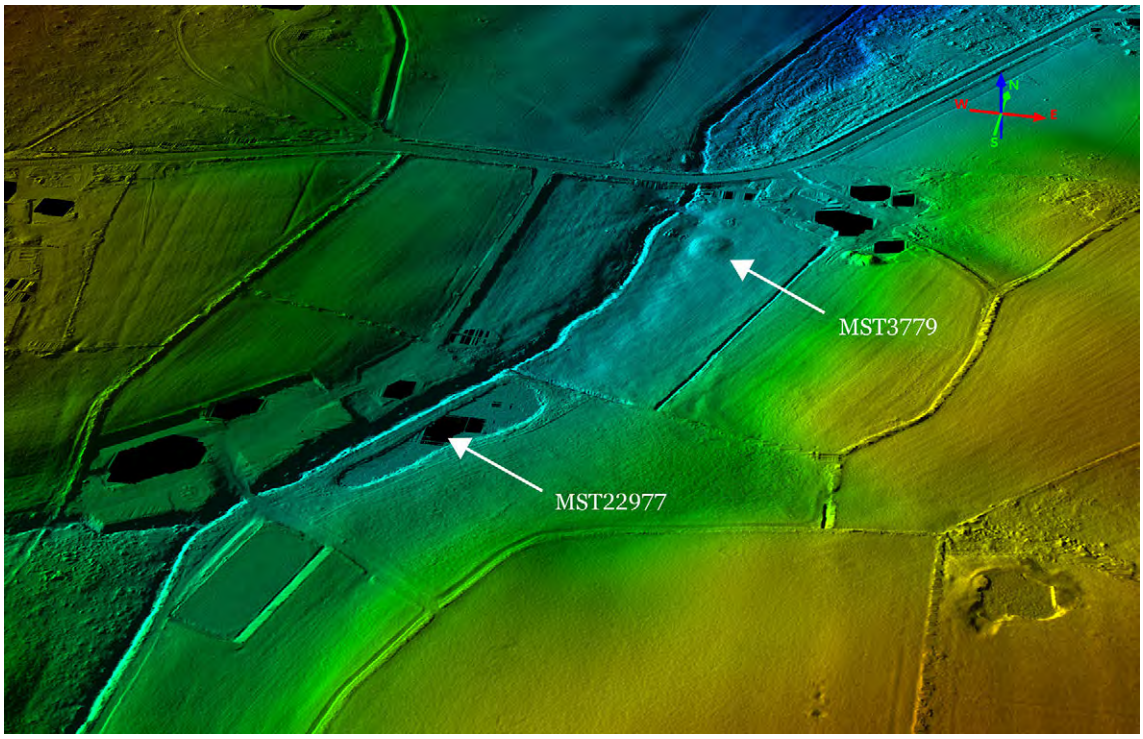

Fig 126: Stafford Brook Farm burnt mound with traces of a second possible mound to the south-west. Lidar DTM 04-MAY-2016 © Historic England; source Staffordshire County Council/Fugro BV Geospatial.

The burnt mound sites investigated during the Chase Through Time project were as follows:

MST3779 (NRHE 1147034)

This possible burnt mound was identified by Chris Welch. He noted a low mound 16m in diameter and *c* 1.5m high (Hodder and Welch 1987). The site was recorded from lidar images as a large oblong mound, measuring 14m by 19m and located 17m east of the Stafford Brook (Fig 126).

MST3907

A large quantity of heat-cracked stone was observed in a drainage ditch in 1989 (Welch 1990) at SK 0188 1807 adjacent to the Stafford Brook. The site lies at the southern end of the field that contains another burnt mound (MST3779). More material was seen in another ditch a few metres away, but it was not clear whether this represented one wide low mound or two small ones. No remains of a raised earthwork mound could be seen on lidar images or aerial photographs at this location.

MST22977

A possible mound measuring18m by 19m was seen on a 1946 RAF vertical photograph situated adjacent to the Stafford Brook, 125m to the south-west of MST3779 (above) and approximately 50m south-west of the possible mound noted

above (MST3907). The site appears to have been at least partially destroyed by a later pond; however, traces of any burnt material may still survive at the edges of the pond.

MST1000 (NRHE 304680)

This site is another of Cantrill's Rugeley burnt mounds. Reassessment by Hodder and Welch (1987) located a mound within Forestry Commission plantation, but it contained no trace of heat-shattered pebbles to classify the site as a burnt mound.

The lidar revealed a single low rounded mound with a diameter of 7m approximately 15m south-east of the Stoney Brook, and 5m north-north-west of the given location (Fig 127). It is probable that these are the same mounds.

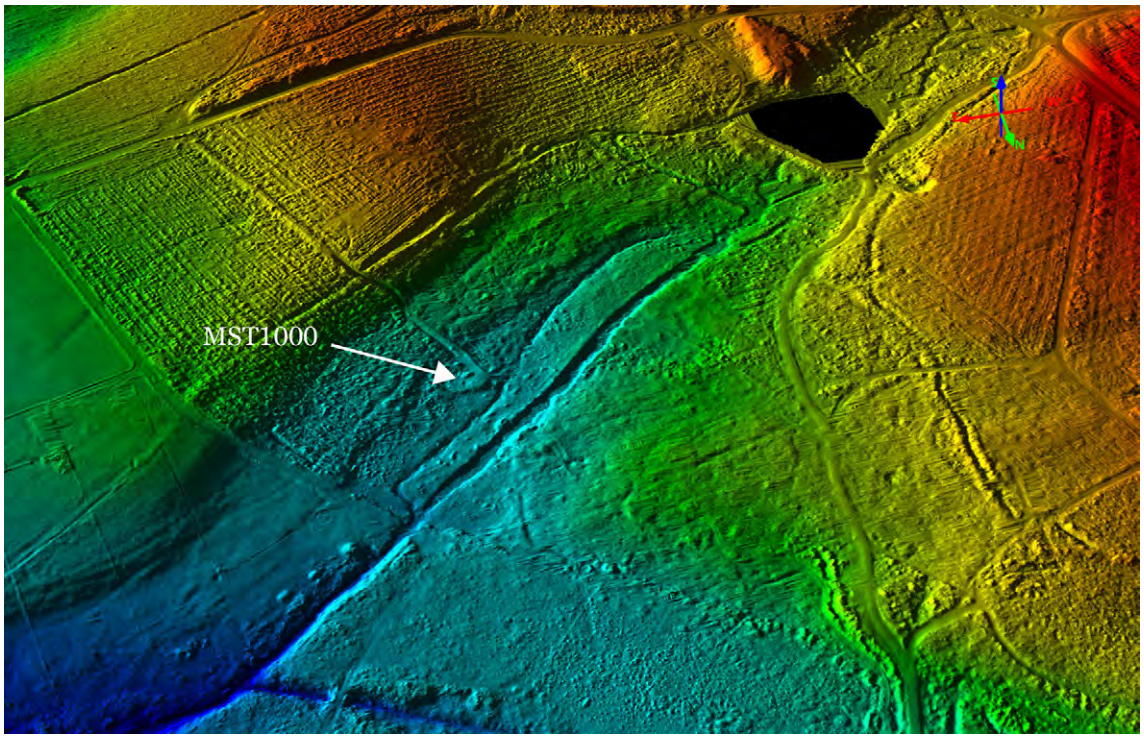

Fig 127: Location of the possible burnt mound MST1000 within a Forestry Commission plantation at Stoney Brook, which was mapped from lidar. Lidar DTM 04-MAY-2016 © Historic England; source Staffordshire County Council/Fugro BV Geospatial.

The site was visited in January 2017. Located on a slightly raised shelf above the south-east bank of the Stony Brook, it is a well-formed low mound with a pronounced front apron scarp on the stream-ward side. Its south-west edge has been slightly worn away by the course of an off-road cycling trail and it is within an area of young mixed plantation, with several pine and silver birch trees growing out of the mound (Fig 128).

Fig 128: Earthwork remains of burnt mound MST 1000, January 2017 © Historic England.

MST999 (NRHE 304675)

This site is thought to be another of those identified by Cantrill in the 1930s at Rugeley on the eastern bank of the Rising Brook on land at Sheepwash Farm. It was first recorded as a mound 45ft (13.5m) in diameter. When reassessed in the 1980s, the field had been subject to improvement-ploughing, but a heart-shaped mound of heat-shattered stone with a slight central depression could still be clearly seen (Hodder and Welch 1987). An earth resistance survey undertaken at the time revealed a significant resistance anomaly over the site of the mound.

The Chase Through Time lidar identified three mounds in fields along the east side the Rising Brook (Fig 15). The southern-most of these was the site of the above mentioned burnt mound, which appeared as a single low rounded mound c.14m in diameter visible as a slight earthwork. It was located just over 3m from the current course of the Rising Brook. The site was visited on the ground in January 2017 (Fig 129).

As part of this project, a magnetometer survey was carried out on all three mounds, but the latter (MST999) was the only site to produce readings suggesting the presence of burnt material (see '*Working with the Volunteers*' chapter). The middle mound recorded a more diffuse magnetic response, which could indicate a disturbed burnt mound, or alternatively a modern dumping of magnetic material. The northern-most of the three mounds gave no magnetic response, but appeared to be composed of higher resistance stone material (Payne and Pearce 2017b) (see '*Case Study 2*', in '*Working with the Volunteers*').

Fig 129: The well-formed dome of burnt mound MST999 on the eastern bank of the Rising Brook at Sheepwash Farm, January 2017 © Historic England.

MST3778

Located some 200m northwest of mound MST999, and on the opposite side of the brook and much further from the present watercourse, this site was initially recorded as a low spread mound of heat-shattered pebbles exposed by shallow ploughing (Hodder and Welch 1987). A contour survey and resistivity survey undertaken at that time (ibid) showed an area of slightly higher ground (0.3m) corresponding with an anomaly of higher resistance than the surrounding ground.

The site was not detected on the Chase Through Time lidar, or on historic aerial photographs. Traces of a faint, low swelling were observed during our ground visit in January 2017 but this was not convincing as a burnt mound (Fig 130). However, it is possible that the mound observed in the 1980s has been almost levelled through subsequent pasture-improvement ploughing. Indeed, magnetometer survey undertaken with project volunteers in April 2017 produced a strong response suggesting industrial activity or intense burning which could be indicative of a burnt mound (Payne and Pearce 2017b).

Fig 130: The slight swelling of possible burnt mound MST3778, a short distance from the western bank of the Rising Brook at Sheepwash Farm, January 2017 © Historic England.

MST996: 'Slitting Mill'

The burnt mound at Slitting Mill was one of the sites identified by Cantrill in the 1930s. He recorded it as located 'near Rugeley', but it could not be located during the 1980s evaluation or on aerial photographs and lidar as part of this project at the given location (SK 0294 1689). It may have been plough-levelled since its identification. However, the recorded location for the mound is 110m south-east of the Stafford Brook, considerably further from the watercourse than is typical for a burnt mound and may have been recorded incorrectly.

MST3896 and MST3769

Two further burnt mound sites were found by Chris Welch in 1989, located beside the southeast bank of Rising Brook, close to the site of the former slitting mill (for slitting iron into rods) and pumping station, south-east of Hagely Wood. One site was recorded as a well-preserved mound immediately beside the stream course, slightly eroded by the footpath and quite overgrown (MST3896). A second was described as a spread of heat-cracked stone and charcoal (MST3769). Perhaps related, the area to the south-west of the mounds, now developed as a suburb of Rugeley, is named 'Burnt Hill' on Ordnance Survey maps from the first through to the present edition.

Fig 131: The site matching descriptions of MST3896, truncated by the modern footpath and with exposed surface fragments of fire-cracked stone and charcoal (right), January 2017 © Historic England.

In January 2017, this area was reconnoitred on the ground. A site matching the description of MST3896 was located, albeit closer to the grid reference recorded for MST3769; here a small number of heat-shattered stone fragments were noted on the surface of a slightly raised area of ground between the footpath and the stream (Fig 131). The site of the second mound was not confidentially identified, but it looks likely that any slight upstanding earthwork in the field immediately south of the footpath would have been mostly or entirely levelled by improvement ploughing. Neither site was visible in the aerial sources.

MST378

Recorded as a scatter of heat-shattered stone seen in the soil below the spring known as Bose's Well in Cannock Wood was first reported in 1916-17 (Cantrill 1913) and observed 1985 (Hodder and Welch 1987) in the upcast of a drainage ditch on the west side of a field 200m north of the spring, possibly representing the same site. No trace could be seen on lidar or aerial photographs.

MST3905 and MST3906

These are two possible burnt mounds located in the Birches Valley on a tributary of the Stoney Brook (Welch 1990). Neither could be seen on lidar or aerial photographs.

MST1832

This site was recorded as a 'hearth' feature seen in Edward's Wood Teddesley Hay in the 1920s (NRHE 77088), but no trace of this site has been found during subsequent fieldwork or through aerial survey.

MST3782: Bower Farm cave shelter

A further possible burnt mound site within the project area was noted by Cane and Cane (1986) as a scatter of heat fractured pebbles and patches of blackened sand found in association with a late Mesolithic flint assemblage and human remains in a small cave shelter at Bower Farm (SK 030 195). As expected, neither aerial photographs nor lidar images were suited for surveying such a site, but its location at a cliff base, some distance from running water is inconsistent with the pattern seen with other sites classified as burnt mounds.

Conclusion

The survey as a whole has demonstrated the value of using aerial remote sensing methods to identify earthworks in both wooded and open landscapes, but it remains difficult to differentiate potential burnt mound sites from the numerous mounds of other archaeological or natural origin. This was demonstrated at Sheepwash Farm, where in addition to the previously known burnt mound site (MST999), two further potential mounds were identified on lidar images, but subsequently dismissed after geophysical survey failed to find any evidence of burnt material (see '*Case Study 2*', in '*Working with The Volunteers*', above). Therefore, it is essential that any potential new burnt mound site has a follow-up ground visit to verify the presence of tell-tale burnt stone and charcoal deposits, or geophysical survey to identify magnetic anomalies.

CANNOCK CHASE – A SIGNIFICANT LANDSCAPE

The Cannock Chase landscape can be defined as the land itself (a combination of natural and artificial features) and how this land is viewed. Landscape is given meaning by people, and individual features are '...neither beautiful, ugly, dramatic or of any significance unless we are there to look at them' (Garner 1972). This section will briefly look at ideas about landscape, before considering the historic character of the Chase and the significance of the archaeological features mapped during the project.

Landscape and perception

Ideas of landscape and perception were brought together in the European Landscape Convention (ELC), and ratified by the United Kingdom 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 philosophy of the ELC, landscape is both culturally shaped and culturally perceived, bringing together people and place. 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 the Chase may be considered outstanding, mundane or degraded, but together contribute to make Cannock Chase the place it is. All landscapes can be perceived in different ways and varied popular perceptions derive from how it is viewed by a range of individuals and societies over time. The character of a place is not fixed but changes over time and these changes can derive from the loss or addition of features. Some differences in the way a landscape is perceived reflect these changes made to the landscape.

Significance of Place

All aspects of Cannock Chase have historic character. Some features have been assessed as being special and have protection that acknowledges their national importance through scheduling. Scheduled monuments within the project area include Castle Ring Iron Age hillfort, a medieval moated lodge site at Red Moor, and two First World War instructional models, one in miniature, used for the training of troops before they embarked on Active Service. These 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) defined four values that can be used to describe and understand the significance of place. These are:

Evidential value: the potential of Cannock Chase to yield evidence about the past.

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

Aesthetic value: the ways in which people draw sensory and intellectual stimulation from Cannock Chase.

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

The good survival of archaeological sites across the Chase Through Time project area means that the Chase holds a great store of **evidential value** about the past. The remains identified by aerial survey span a broad period of time, extending back into prehistory, but the evidential value of the Chase also includes those archaeological sites that we know to exist from other forms of investigation that are not visible from the air. The results of the aerial investigation and mapping fall into three dominant themes.

One of the main drivers for this project was the survival of extensive remains of two First World War camps and their associated training areas. These remains can help us to understand the approaches taken in training large numbers of troops during the First World War. In particular, the extensive remains of practice trenches offer a good opportunity to build on our knowledge of the development of trench design and the training of troops in trench warfare. The military association with the Chase did not end with the dismantling of the Great War camps. Work began on a large RAF camp immediately prior to the outbreak of the Second World War and a variety of other camps and training areas were established in and around the Chase during that conflict. Together they represent a wealth of evidence of Britain's role in major 20th-century conflicts.

Another theme concerns the ways in which the Chase was divided over the centuries. Evidence of this division in the form of earthwork boundary banks and ditches can help us to understand how this area was managed and utilised by past communities. The boundaries were constructed for a variety of purposes including the control of deer and the management of woodland. Some of these historic boundaries remain in use today and their survival contributes the distinctive character of the Chase.

The third main theme from the results is coal mining. Extensive remains of mining extending as far back as the medieval period, if not earlier, survive well on the Chase. These remains are the most noticeable survival of a range of medieval and early post medieval industrial activities on the Chase. The sheer number and range of coal mining remains suggests an enormous potential to provide evidence about the establishment and development of this industry.

The **historical value** of the Chase is its ability to link past people or events to the present. As with evidential value, some sites may only survive beneath the ground, but when they survive as visible monuments they are also considered to have illustrative value. The survival of earthworks on the Chase is good, in part due to the designation of the Chase as an Area of Outstanding Natural Beauty in 1958. The surviving earthworks, even where obscured by dense woodland, relate to a range of periods, functions and social scale, and provide a tangible link between present and

past communities. The military sites discussed above clearly link the Chase to the two largest conflicts of the 20th century (and the Cold War). This association varied in nature, but resulted in the influx of thousands of troops to these camps. They came from across the globe, and not just Britain, most notably from New Zealand. Prisoners of War were also held in camps on the Chase. In the immediate post-Second World War period National Servicemen were posted to RAF Hednesford. Part of the camp was also used to accommodate Hungarian refugees as well as squatters. Brindley Heath hospital was similarly turned into temporary housing for coal miners, earning the name Brindley Village. The industrial remains on the Chase link it to the national story of industrialisation; in particular, the demand for iron and coal. Other monuments are associated with hunting and provide direct links to the medieval royal forest from which the Chase was carved out for the Bishops of Lichfield.

Aesthetic value enhances people's attachment to Cannock Chase and the satisfaction they gain from being associated with this landscape. An appreciation of the Chase can be seen in the inter-war concerns that it would be ruined by further development, in particular the expansion of coal mining. These concerns led to campaigns for the Chase to be made into a National Park, which ultimately led to its designation as an Area of Outstanding Natural Beauty in June 1958 under the National Parks and Access to the Countryside Act.

Historic and aesthetic values are closely bound-up with **Communal** value. This is the ability of the Chase to provide meaning for those who draw part of their identity from it or have emotional links to it. The Chase has provided a recreational area, not just for those living close by, but for many living in the West Midlands and beyond. While many may enjoy the rural pleasures of an AONB, others find value in the association with its history and the monuments there that give focus to this appreciation. That some of these features are relatively recent in date (such as the 20th-century military sites and coalmines) may mean that some families or individuals relate to the Chase on a personal level. The volunteer involvement in this project will hopefully ensure that the views of the community about what is significant to them will be heard.

Although only a select number of archaeological sites are referred to in the above paragraphs, all of the thousands of features mapped as part of this project will have one or more of these evidential, historical, aesthetic and communal values, even if perhaps considered to be ordinary or in poor condition. Whatever their status and condition they contribute to the character of Cannock Chase.

Management and designations

The mapping and monument descriptions created during the survey will be used in the Staffordshire County Council's Historic Environment Record (HER). The results of the project provide a significantly enhanced level of information of the extent, form and interpretation of archaeological features across the whole of the Chase and environs. Combined with the other data in the HER, this will help to inform future planning and management decisions. The mapping demonstrates the

extent of archaeological remains as currently understood for use by land managers, and provides an important framework for management focused on the historic environment.

Some of the archaeological sites discussed on the Chase are designated as being of national importance, and further work may lead to the protection of other sites. Protection and management may take a number of different forms. Cannock Chase Area of Outstanding Natural Beauty (AONB) forms the core of the Chase Through Time project area. Other areas, largely but not entirely beyond the boundaries of the AONB, are subject to Environmental Stewardship Agreements. The Chase also includes discrete areas of Ancient Woodland and more extensive areas are designated Sites of Special Scientific Interest (SSSI). Whatever the benefits these designations may offer the archaeology of the Chase, heritage is not the primary focus for protection. However, they may be one of the most applicable ways of providing long-term conservation of landscape-scale archaeological sites.

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 derived from this project and any future fieldwork and research it may encourage, will ensure that the historic landscape will continue to play an important role in the future of Cannock Chase.

HISTORIC ENGLAND'S WORK ON CANNOCK CHASE

Historic England has mapped archaeological sites across Cannock Chase. Many of these are earthworks located within woodland or heathland, and although many of these are relatively large features, they can be difficult to see in this vegetation when visited on the ground. These earthworks are sometimes also invisible on aerial photographs, but lidar has greatly enhanced our understanding of the archaeology of Cannock Chase. The results from the interpretation of the lidar and aerial photographs have enabled Historic England to produce a remarkable map of past activity on the Chase, which although largely dated to the medieval and post medieval periods, does extend back to prehistory in places. The identification of archaeological sites, whether as earthworks or buried remains seen as cropmarks, is the first step in better understanding the story of Cannock Chase.

Importantly, Historic England has made the aerial investigation and mapping results widely available to volunteers and professionals via an online GIS. Historic England teams have also provided the volunteers with training in the use of aerial photographs and lidar, as well as in field recording and geophysical survey (see '*Working With The Volunteers*' chapter). This combination of the archaeological map and targeted training marks a unique contribution seldom used in other community projects. One of the main aims of this project is to inspire others to carry out and continue archaeological investigation of the Chase. The online GIS project map, training of volunteers and this report are all intended to engage, support and enthuse others to do so.

Further work

Each of the preceding chapters have suggested further work that could be undertaken on the archaeological sites of Cannock Chase mapped as part of the Chase Through Time project. This section summarises some of these suggestions, and is intended to act as an overview of the general potential for further work. It is loosely arranged by technique, such as earthwork survey, geophysical survey and so forth, and with the relevant chapter indicated in the text. A fuller overview of further work by theme is available in the relevant chapters. The following is not intended to be a definitive list and other areas of research may suggest themselves to the readers of this report or after a study of the mapping and monument records. In turn, it is hoped that any further work undertaken on the Chase will suggest new areas of study.

Using and enhancing the mapping

The number of volunteers who have already been inspired to carry out their own research and survey work reflects the value of the results of this project. The work carried out by a volunteer on braided tracks is an example of using the aerial mapping as a tool, and can be used in this way for a variety of archaeological monuments. Another project hopes to enhance the mapping by enabling ground photographs of archaeological sites to be uploaded to a layer in the online GIS

and linked to the mapping of the same feature (see '*Working With The Volunteers*' chapter).

Further work to enhance the mapping could help provide a better picture of the boundaries that subdivided the Chase (see '*Dividing The Landscape*' chapter). Transcribing the boundaries depicted on the 1819 and 1824 estate map (SRO D260/M/E/353a) not already depicted on the project map would fill a number of gaps in the pattern of boundaries. This would provide a more complete picture and could be analysed in conjunction with documentary research on the post medieval management of woodland (Welch 2000).

Any further work looking at the physical remains on the Chase should use the aerial investigation and mapping results as a framework to identify key areas. This could include further work on the archaeological features mapped or work to address the physical or conceptual gaps in the results. Further work inspired by the aerial investigation and mapping results should consider updating the Staffordshire Historic Environment Record – this will ensure that interpretations are up to date and inform future management decisions.

Geophysical survey

The geophysical survey carried out by volunteers on the potential burnt mound sites and within Castle Ring hillfort has already demonstrated the value of this technique (see *'Working With The Volunteers'* chapter). A group of volunteers have already discussed a continued programme of geophysical work (using Historic England equipment) to survey some industrial sites. Geophysical survey may prove useful on many sites across the Chase, and it is likely that new targets will be identified during further work. A potential target site is the cropmark of a large circular enclosure north of Gypsy Green, Acton Trussell and Bednall parish. Further examination of a number of the lodge sites, such as the moated site at Redmoor, Lodge Bank (Beaudesert Old Park) and Fairoak lodge, may lead to a better understanding of the management of parkland (see '*Dividing The Landscape*' chapter). Geophysical survey within some of the coalfields may help to locate sub-surface traces of some of the surface activity, in particular buildings that are now buried.

Field survey

The training in analytical field recording techniques will allow work to be carried out on a range of sites including the military camps, boundaries and coal mines. Despite the detail derived from the high-resolution lidar, the composition and condition of individual sites, and the relationship between different earthworks, is often better understood from ground assessment. One area of particular complexity is the group of boundaries surrounding Fairoak Lodge (see '*Dividing The Landscape*' chapter). Field assessment of these boundaries would work well in conjunction with suggested enhancement of the mapping, in order to better understand associations between boundaries, the lodge and routeways.

From the air, the extensive areas of early coal pits within Beaudesert Old Park have been loosely grouped together, geographically and by form (see *'Industry'* chapter). Phasing of some of the closely spaced coal pits may be possible by undertaking a field investigation looking at the relationship between these earthworks. Fieldwork on the coalmines would also be beneficial if undertaken in conjunction with documentary research. A closer study of the earthwork remains of these early coal pits, considering phasing and condition of the earthworks may identify very early evidence of coal mining.

Documentary research

Most of the archaeological remains identified across the Chase are thought to be medieval or post medieval in date and further consideration of documentary evidence is suggested for a number of sites. The coal mining evidence from this project is the surface expression of a range of underground workings. Geological maps of the coal seams beneath the Chase show the depth of the coal seams and the location of faults, and relating the earthworks to the coal seams maps would be a valuable piece of research (see *'Industry'* chapter). It would identify which coal seams were mined from which pits, and ascertain to what depth the shafts were sunk. Much of the early coal mining was carried out on land owned by the Paget family. Study of the family papers could initially determine the potential of this archive in relation to the coal mining industry. Based on the results of documentary work on coal mining on the Chatsworth estate, Derbyshire (Barnatt and Williamson 2005; Barnatt and Banister 2009) archive material relating to Beaudesert may provide a great deal of information about coal mining on the Chase.

The Paget family papers may also prove useful in better understanding some of the boundaries and lodges seen across the Chase. In particular, they may help in determining the location of the 16th-century Osborne's Lodge. Other documentary research should enhance our understanding of the management of deer parks, small areas of intake on the Chase and the date of some coppice boundaries (see '*Dividing The Landscape'* chapter).

Documentary research may also help in answering questions about woodland management and charcoal burning. Further research, in combination with the mapping of hollow ways, may be able to indicate where Cannock's industrial output (such as coal and ironwork) was destined.

Excavation

Although the emphasis on further work is on non-invasive techniques, excavation and coring has been suggested for some sites. The coring of charcoal burning sites could allow the sites to be dated and identify the species of wood being burnt (see '*Dividing The Landscape'* chapter). Excavation could show if the First World War trenches in Sherbrook Valley were originally dug to a full depth, and provide a set of results that would allow comparison of this site with other excavated British practice trenches (see '*Military Presence On The Chase'* chapter).

Oral History

The recording of personal recollections will only be applicable to some sites within the Chase. The value of oral history in recording different aspects of forestry in West Sussex was demonstrated in the Secrets of the High Woods project (Edom 2016, 28), and a similar approach could be employed for Cannock Chase. Oral history need not be restricted to those involved with woodland management, and many other aspects of the Chase could benefit. In particular, an oral history of the coal mining industry would provide a wealth of information about a now lost industry. This could include personal testimony, terminology and technical aspects of mining in this part of Staffordshire. Indeed, our understanding of the use of the military firing ranges, including the continued use of range 'E' into the later 20th century, was greatly enhanced through on-site discussion with one of the project volunteers who had experienced using some of these facilities.

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ENDNOTES

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2 https://britainfromabove.org.uk

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10 www.britishnewspaperarchive.co.uk

11 *Big Job* 1965 National Coal Board film

12 for an index of articles concerning Staffordshire see www.nmrs.org.uk/mines-map/coal-mining-in-the-british-isles/staffordshire/coalindexstafford

13 www.ccmhs.co.uk/ccmhs_publications.htm

14 https://brownhillsbob.com/2014/06/26/hare-and-gone

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