Between the Caves and the Sea:

The Late Glacial occupation of the English East Midlands

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Thesis submitted for the degree of Doctor of Philosophy
Archaeology

Trinity Term 2022

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Abstract

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This thesis investigates the degree of intensity of Late Glacial human occupation of open landscapes in the English East Midlands, including evidence for chronological and regional patterns in the timing of human re-occupation and presence during the Late Glacial Interstadial (GI-1e-a; c. 14,700 to 12,900 BP; Rasmussen et al. 2014:Table 1). The regional focus is on the open, low-lying landscapes situated between known Late Upper Palaeolithic cave sites in central England and the present-day North Sea coast. Emphasis is placed on the identification of preferential site location patterns in riverine and lacustrine environments, as investigated through two site datasets comprising data from legacy site archives, Historic Environment Records, and the Portable Antiquities Scheme. Further attention has been directed towards lithic typological and technological attribute analyses of three open-air site assemblages (Farndon Fields, Nottinghamshire, Seamer Carr K, North Yorkshire, and Risby Warren, North Lincolnshire).

This thesis presents evidence that the current understanding of Late Upper Palaeolithic uplands site distribution only affords a partial view of the intensity and degree of human presence during the Late Glacial Interstadial. Based on significant new discoveries of diagnostic surface finds, lithic scatters, and open-air locales of high archaeological potential this picture is gradually beginning to change. The findings of this thesis strongly indicate that the open, lowland landscapes in the extended East Midlands research area were occupied by Late Glacial human groups to a far greater degree of intensity than posited by existing estimates and interpretations. In documenting how low-lying riverine and lacustrine environments out in the open landscapes represented particularly attractive focal points for human occupation during the Late Glacial Interstadial, my observations and results clearly provide essential evidence to better contextualise the existing information concerning human occupation of upland areas and cave sites.

Acknowledgements

Between the caves and the sea emerged out of my genuine curiosity about where, if not in caves, Late Glacial humans chose to spend their time and lives. My pursuits were funded through the following sources: the Norwegian Oxford Scholarship, Høyesterettsadvokat Per Ryghs legat, Overrettssakfører Axel Brynies, Helga Brynies og Adelheid Jordans legat, the John Wymer Bursary, the Pollard Fund, the Wyndham Fund, the ASM Bursary Fund, and the Barbinder Watson Trust Fund. Other means of support were generously provided by a number of people that I have been so fortunate as to work and correspond with over the course of this project, and I am thankful for each and every one of them.

First and foremost, I wish to thank my supervisor Nick Barton for the opportunity to pursue this project, and his guidance, support, and patience. I have greatly appreciated each journey across the East Midlands, and the many opportunities to learn along the way. For their help and advice, I am equally grateful to Daryl Garton, Lynden Cooper, Chantal Conneller, Simon Collcutt, Alison Roberts, Peter Chowne, Joshua Hogue, and Wolfgang Heuschen. A heartfelt thanks goes to Sue Cotton, David Budge, the Ice Age Journeys volunteers, and to Rose Nicholson, Kevin Leahy, and the many other consulted museum staff and heritage officers. Furthermore, I would like to thank my college advisors, particularly Peter Mitchell at St Hugh's, and Emma Cohen and Scott Blumenthal at Wadham. During the pandemic, the Museum of Cultural History and the Archaeological Library at the University of Oslo generously provided me with access to their resources - *tusen takk!*.

For their endless encouragement, emotional and practical support, I thank Will Mills, Natasha Reynolds, Sonja Grimm, and Dag Langmyhr. When life happened, time and again, I was overwhelmed by the kindness, care, and compassion shown to me by my dear friends within and beyond Beaumont Street - including, but not limited to, Penny Coombe, Katie Campbell, Karl Smith, Beth Hodgett, Erin McGowan, Jenny Dammer, Alyssa White, Lisa Briggs, Jessica Dunham, Siobhan Shinn, Jade Whitlam, Liz Stroud, Konogan Beaufay, Irmelin Axelsen, Marie Amundsen, Heidi Berg, Margrete Langmyhr, and Katrine Watz Thorsen. To Ursula Dalrymple and Paula Larsson - thank you, I could not have done this without you, nor without the support of Lars Ole Grottenberg.

For their belief and understanding throughout these years, I am indebted to my family - my mother, and my late father.

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Chapter 1

Introduction

Outline: This thesis investigates the degree of intensity of Late Glacial human occupation of open landscapes in the English East Midlands, including evidence for chronological and regional patterns in the timing of human re-occupation and presence during the Late Glacial Interstadial (GI-1e-a; c. 14,700 to 12,900 BP; Rasmussen et al. 2014a:Table 1). The regional focus will be on the open, low-lying landscapes situated between known Late Upper Palaeolithic cave sites in central England and the present-day North Sea coast. While I will refer to this research area as the English East Midlands, the focal region encompasses the East Midlands counties and Yorkshire, specifically to accommodate changes to county boundaries and to contextualise important archaeological data located in open landscapes which transgress arbitrary administrative borders. Emphasis will be placed on the identification of preferential site location patterns in riverine and lacustrine environments. Further attention will be directed towards lithic typological and technological attribute analyses of the assemblages from three open-air sites: Farndon Fields, Nottinghamshire, Seamer Carr K, North Yorkshire, and Risby Warren, North Lincolnshire.

This thesis represents an important contribution by being the first regionally specific analysis of Late Upper Palaeolithic open-air evidence in the English East Midlands. The findings of this thesis strongly indicate that the open, lowland landscapes in the extended East Midlands research area were occupied by Late Glacial human groups to a far greater degree of intensity than posited by existing estimates and interpretations. In documenting how low-lying riverine and lacustrine environments out in the open landscapes represented particularly attractive focal points for human occupation during the Late Glacial Interstadial, my observations and results clearly provide essential evidence to better contextualise the existing information concerning human occupation of upland areas and cave sites.

Background: The Late Glacial human occupation of Britain represents a re-occupation of landscapes previously rendered inhospitable during the Last Glacial Maximum (hereafter: LGM, Greenland Stadial 2/GS-2, c. 27-14,700 BP). The severity of the LGM and the extent of periglacial conditions across the entirety of Britain had led to the significant loss of viable habitats and an abandonment by human and animal groups. This nearly 15,000 year-long hiatus in human and animal presence in Britain gradually came to an end slightly prior to the sudden 14,700 BP warming event which marks the onset of the Late Glacial Interstadial (Greenland Interstadial 1e/GI-1e; Reade et al. 2020; Jacobi and Higham 2011). Concomitant changes to climate, rising mean annual temperatures, and environmental responses thus created the necessary circumstances to enable the gradual, and eventually more widespread return of human and animal groups from continental refugia. Diachronic patterns are evident in the timing of onset, scale, and extent of human re-occupation of different parts of Britain (Jacobi 1991; Barton and Roberts 1996; Jacobi and Higham 2009b; Jacobi and Higham 2011), which further provide important chronological and spatial contexts for my examination of the intensity of Late Glacial human presence in the English East Midlands.

During the Late Glacial Interstadial, the deglaciated parts of Britain occupied a peninsular location on the periphery of habitable regions of north-western Europe. Prior to the flooding of the North Sea plain, the open landscapes in eastern England extended onto the then dry-land landmass, or 'Doggerland', that constituted the physical connection between Britain and the continental mainland (Clark et al. 2012; Fitch, Gaffney and Thomson 2007; Gaffney, Thomson and Fitch 2007; Gaffney, Fitch and Smith 2009; Gaffney et al. 2020; Walker et al. 2020; Coles 1998). Since sites of comparable Late Upper Palaeolithic date and typo-technology have been documented in low-lying areas on the adjacent North European Plain, it is presumed that the human occupation of eastern England occurred via the North Sea Plain, as human and animal groups moved westwards along the major river valleys that marked the now-submerged landscapes (Barton et al. 2003; Gamble et al. 2004; Barton 2009:19; Jacobi and Higham 2011).

On this geographical basis alone, the open landscapes in eastern and northern England are clearly positioned as important arenas for human occupation. However, the current view of the British Late Upper Palaeolithic (hereafter: LUP) archaeological record is characterised by a significant bias towards cave and rock shelter sites, which over the past c. 170 years have represented the historical focus of research activities (Jacobi and Higham 2009b:Figs.11-12; Pettitt and White 2012:Figs. 8.4, 8.15; Jacobi 1991; Campbell 1977a; Wymer and Bonsall 1977; Garrod 1926). Based on isolated discoveries of surface finds (Gatty 1901; Gatty 1902; Smith 1931; Phillips 1933:115), researchers had long presumed that the open lowland landscapes had untapped archaeological potential, not least because any human occupation of these caves was necessarily reliant on the movement of human and animal groups across the adjoining open areas (Armstrong 1932:335; Phillips 1934:106; Mellars 1974:70-71; Jacobi 1980; Roe 1986:3-4; Barton 1986a:xix(b); Barton 1992). However, except for the Peak District and Creswell Crags cave sites, the East Midlands remained largely understudied from this point of view.

This thesis presents evidence that the current understanding of LUP uplands site distribution only affords a partial view of the intensity and degree of human presence during the Late Glacial Interstadial. Based on significant new discoveries of diagnostic surface finds, lithic scatters, and open-air locales of high archaeological potential this picture is gradually beginning to change. It is now possible to firmly challenge and nuance these once severely biased perspectives on Late Glacial human occupation (e.g., Barton et al. 2003; Barton 2010; Conneller and Schadla-Hall 2003; Conneller 2007; Cooper and Jacobi 2001; Cooper 2004; Cooper 2006b; Garton and Jacobi 2009; Garton et al. 2016; Harding et al. 2014; Jacobi, Garton and Brown 2001). Up until now, however, research has been based on localised site studies and there has been little opportunity to review the extensive corpus of material derived from open-air findspots. Furthermore, this material constitutes important evidence needed to address more fully the significance of riverine and lacustrine environments in the context of Late Glacial human occupation (Jacobi, Higham and Lord 2009:19-20).

Current consensus suggests that (at least) two waves of LUP development in Britain can be identified. Archaeologically, this is represented by two lithic technocomplexes that are likely successive: (1) the earliest human re-occupation and presence during the first half of the Late Glacial Interstadial (GI-1e/Bølling chronozone) is attributed to Creswellian (or earlier LUP) industries; and (2), evidence for human occupation occurring towards the end of GI-1e and during the second half of the Late Glacial Interstadial (GI-1cba/Allerød chronozone) is attributable to two *faciès* of *Federmesser-Gruppen* (or later LUP) industries (Jacobi and Higham 2009b; Jacobi and Higham 2011; Barton and Roberts 1996). The two main technocomplexes are defined by the presence of diagnostic backed blade projectile points, and can further be distinguished on additional typological and technological grounds (Jacobi 1991; Barton et al. 2003; Conneller 2007; Conneller and Ellis 2007; Conneller 2009; Barton 2010). The confirmed LUP record available for my analyses of the East Midlands comprises a limited number of primary context sources, i.e., stratified and excavated lithic assemblages, and is primarily represented by a significant wealth of material derived from secondary contexts such as unstratified surface finds and smaller lithic scatters.

Aims and hypotheses: My study builds on my central hypothesis that the open, lowland landscapes of the English East Midlands were occupied by Late Glacial human groups at a reasonably high level of intensity, i.e., that the scale, extent, and representivity of LUP-attributable open-air evidence exceeds currently available site distribution maps. Furthermore, I hypothesise that open-air sites were preferentially located on focal points in riverine and lacustrine environments, since river valleys represent "the most prominent geomorphological features of the open-landscape, and this landscape is overwhelmingly representative of the living habitat" (Mills 2020:5). Central to my analyses is the assumption that large, lowland river systems such as the Trent afforded important routes across the Late Glacial landscapes. If confirmed, the open East Midlands site data would then mirror documented site distribution patterns along major continental European river systems like the Rhine, Maas, Scheldt, and Somme (Coudret and Fagnart 1997; Fagnart and Coudret 2000; Rensink 2002; Street et al. 2006; De Bie and Van Gils 2006; Crombé et al. 2011; Crombé et al. 2013; Heinen 2016b:Fig. 1; Grimm 2019:39; Grimm et al. 2020b). Consequently, I intend that my observations will provide greater nuance to challenge the prevailing cave site-biased interpretations of LUP activities.

With respect to the typological and technological analyses carried out as part of this thesis, I expect that my observations and results will contribute towards the classification and characterisation of the East Midlands lithic artefact and assemblage record. In extension, these observations will then enable me to draw conclusions more systematically regarding chronological and regional distribution patterns. Furthermore, I anticipate that my findings will contribute towards an improved understanding of the nature of Late Glacial human occupation of the research area, with clear relevance to the subject at a Britain-wide scale.

Materials: The topical questions and hypotheses concerning the LG human re-occupation of the English East Midlands research area will be analysed through a combined review of spatial, artefactual, and written contextual evidence. Central to this study will be the systematic evaluation of LUP site data relative to physical and human geography features out in the open landscapes. Equally important will be the typological and technological attribute analyses of three of the richer open-air assemblages in the research area. Comparisons will primarily be made with the British LUP record since it displays an interesting degree of variability. Detailed comparisons with continental data fall beyond the present scope but will be included where pertinent.

The studied lithic materials are derived from primary, i.e., stratified and excavated lithic assemblages, and secondary contexts such as unstratified surface finds contained in extant collections and as reported in heritage management data records. Despite the scarcity of well-preserved and fully excavated sites the known lithic record has exceptional potential for a greater understanding of Late Glacial human activities. However, since much of the available lithic record is represented by extant finds and assemblages only, my analyses will be supported by a historiographical approach to the available contextual evidence, i.e., the complementary data derived from tertiary sources such as site archives, and both academic and 'grey' literature.

The lithic inventory from the Farndon Fields case study locale comprises both primary and secondary lithic source material. The Farndon Fields analysis (Chapter 5) includes artefact datasets comprising 310 finds and further contextual data which I was directly involved in obtaining through my involvement in the local research group Ice Age Journeys (2014 to 2018). For the Seamer Carr K case study (Chapter 6), the Vale of Pickering Research Team (notably C. Conneller, P. Lane, T. Schadla-Hall, and B. Taylor) generously granted me access to the complete lithic assemblage of 12,137 finds and unpublished site archives (Lane et al. n.d.), including the original artefact recording sheet. For the Risby Warren analysis (in Chapter 7) I carried out a series of research visits to relocate relevant artefacts across a range of British museums, whilst primarily directing my efforts towards the lithic collection and site archives at the North Lincolnshire Museum in Scunthorpe and information provided by the R. M. Jacobi archives.

All remaining LUP data is sourced from extant assemblages (held privately or by institutions) and further informed by LUP site data in major UK heritage management data repositories (Historic Environment Records and the Portable Antiquities Scheme), and the academic legacy of R. M. Jacobi (personal archives and the Palaeolithic and Mesolithic Artefact Database, PaMELA, Wessex Archaeology and Jacobi 2014). The Council for British Archaeology Gazetteer of Upper Palaeolithic and Mesolithic Sites (Wymer and Bonsall 1977) served as the essential point of departure to relocate the presumed whereabouts of relevant archaeological collections. Over the duration of this project, I estimate that I have viewed and handled c. 30,000 artefacts of partially mixed LUP and/or Early Mesolithic age from the entire research area, of which my datasets represent greatly reduced, representative samples.

Furthermore, I have consulted with several researchers, heritage officers, and other members of the wider archaeological community. In all save one instance I was granted full permission to cite our correspondence verbatim. All names and contributions are credited or obfuscated upon request.

Thesis Structure: Chapter 2 outlines the background information necessary to establish the general contextual framework for Late Glacial Britain, and the extended East Midlands research area more specifically. Contextual information will be provided regarding the chronological, palaeoenvironmental, and palaeogeographical background, and sets out in detail the relevant archaeological framework concerning the absolute chronology of human re-occupation, the classification of Creswellian and *Federmesser-Gruppen* technocomplexes, and a history of research.

The following Chapter 3, presents the methodological approach to the analyses of primary, secondary, and tertiary context materials. The presentation is tiered in order of source types, with emphasis on the typological and lithic technological attribute analysis methods used following an adapted *chaîne opératoire* theoretical framework. Further discussed is my historiographical approach to extant lithic assemblages and legacy archives, and how I examined large-scale, online heritage management data repositories.

In Chapter 4, I investigate the scale, extent, and spatial distribution of LUP site data relative to key physical and human geography features. A distinction is made between Confirmed and Certain LUP site data, i.e., Dataset 1, which comprises all sites and findspots included in my Site Catalogue A, and a second Dataset 2 of Probable and Possible LUP site data based on the information sourced from two UK heritage management datasets, i.e., Historic Environment Records and the Portable Antiquities Scheme (in Catalogue B). This second dataset is instrumental to address my hypothesis that high-potential and highly probable evidence from open-air contexts has been reported to UK heritage management data repositories, but which has not yet seen systematic consideration in the context of open-air occupation.

The subsequent four research chapters present the results of my lithic analyses of three site-specific assemblages and a smaller dataset of thirty-one LUP object records from the Portable Antiquities Scheme. The site-specific analyses are instrumental to my investigation of typological and technological differences between *Federmesser-Gruppen*-attributable assemblages. The case studies are presented in order of primary to tertiary context material and in presumed chronological order. Each chapter is dedicated to one case study each and begins with a background to the sites and artefact datasets, including previous research and previously published interpretations.

In the case study chapters, Chapter 5 examines the classification and characterisation of the lithic assemblages from the major open-air site complex at Farndon Fields, Nottinghamshire. In my analyses I investigate whether proposed typo-technological differences between material recovered from the ploughzone, and the excavated, undisturbed blade scatters can be sustained. Further addressed are questions regarding the nature of site use of the interfluve locale, and the suggested classification of the material representing an earlier *Federmesser-Gruppen faciès*.

The Seamer Carr K, North Yorkshire, case study in Chapter 6 offers enhanced potential to address specialised questions concerning preferential site location in lacustrine environments. Of further relevance to the themes pursued in this study is the evidence for preferential uses of different flint raw materials, which are highlighted in the context of the lithic scatters and key technological attributes.

Chapter 7 examines in detail the extant surface collection of *Federmesser-Gruppen*-attributable penknife points found in association with aeolian cover-sands of Loch Lomond Stadial (GS-1) age on Risby Warren, Lincolnshire. Integral to my analyses are the reconstruction of the timeline of past research developments, the relocation of the reported findspots, and an interpretation of site activities.

Presented in Chapter 8 is a small-scale pilot study using LUP-attributable finds from the research area which have been sourced from the Portable Antiquities Scheme. The purpose of this case study is to further investigate my hypothesis concerning the 'hidden' potential of heritage management records, here examined through a lithic analysis.

Chapter 9 first discusses the evidence in support of more widespread human occupation in the open, riverine, and lacustrine environments of the East Midlands, with emphasis on possible locational preferences also in a supra-regional comparative perspective. The second part of this chapter examines more closely observations regarding diachronic patterns in the spatial distribution of Creswellian- and *Federmesser*-attributable data and summarises results concerning typo-technological differences between the three site-specific case studies. This final Chapter includes my concluding remarks and recommendations for further work.

Chapter 2

A framework for LUP Britain and the English East Midlands research area

2.1 Late Glacial Britain

As outlined in the introduction, the Late Glacial human occupation of Britain, and north-western Europe in general, represented a re-occupation following the climatic, geographical, and environmental changes after the LGM (GS-2). Subsequent phases of Late Glacial human occupation are linked to broader patterns of climatic fluctuations and environmental changes that occurred over the course of the Late Glacial Interstadial (GI-1e-a). Here, I will firstly outline the chronological framework and nomenclature used in this thesis, as supported by contextual information derived from other multi-proxy archives. Following this, I will briefly describe the palaeogeography of Britain during the study period (for more detailed syntheses, see Barton 2009; Pettitt and White 2012). The archaeological framework will include a brief introduction to the history of LUP research and the location of major site concentrations in Britain. Furthermore, I will outline the established absolute chronology of Late Glacial human re-occupation and present the classification used to identify and differentiate the major archaeological groupings.

2.1.1 Chronological and environmental background

Available deep marine and long ice core records provide the necessary high-resolution evidence to reconstruct past climatic conditions and identify major changes relative to successive episodes of global interstadial warming and stadial cooling. The sequences preserved in deep stratigraphic contexts in wetlands represent essential palaeoenvironmental reference datasets. It is through multi-proxy analyses of fossil beetle faunas, coleoptera, plant macrofossils, pollen, geochemical, and stable isotope data that the climatic and environmental signals can be contextualised. Furthermore, these enable a more precise correlation between continuous records from terrestrial, marine, and ice cores (Walker, Coope and Lowe 1993; Walker et al. 1994; Blockley et al. 2006:575; Lowe et al. 1999; Walker 2001; Walker et al. 2003; Terberger, Barton and Street 2009:Tables 1-2; Walker et al. 2012).

The framework and notation used in this study follow the recommended use of the INTegration of Ice-core, Marine and Terrestrial records ('INTIMATE') event-stratigraphy scheme which is based on a series of identified events in Greenland ice-core records. Figure 1 includes the North Greenland Ice Core Project (NGRIP) curve and δ^{18}O record on the Greenland Ice Core Chronology GICC05 time scale (for a detailed overview of the evolution, methodology, and protocols of the INTIMATE event stratigraphy framework, see Rasmussen et al. 2014a:Fig. 1, Table 2 and references therein). Prior to the correlation with Greenland ice core records, a widely used nomenclature was represented by the sequence Oldest Dryas, Bølling, Older Dryas, Allerød, and Younger Dryas (Iversen 1954; Mangerud et al. 1974). This terminology was based on palynological analyses of terrestrial sequences recovered from type sites or, in the case of the Dryas, named after a cold climate indicative alpine-tundra wildflower *Dryas octopetala*. The retention of this nomenclature was rendered increasingly difficult due to observed problems in correlating sequences with calendar years and the limited applicability of local biostratigraphic archives at a greater regional or supra-regional scale beyond the Scandinavian type localities - especially because the same terms (such as *Bølling*) have been used in reference to chrono- and biozones (*sensu* Mangerud et al. 1974; Rasmussen et al. 2014a:25; Wohlfarth 1996; Björk et al. 1998; Coope et al. 1998; Litt and Stebich 1999; Litt et al. 2001; De Klerk 2004; Terberger 2004:206; Terberger, Barton and Street 2009:189-191, Tables 1-2). Although this existing archive-specific nomenclature is acknowledged to be firmly embedded in the Quaternary literature, the terminology is not synonymous with the INTIMATE event stratigraphy scheme. Therefore, Rasmussen et al. (2014:25) recommend that the Bølling–Allerød chronozone may be used synonymously as a "non-archive specific name for the generally mild climate period" between c. 14,700-12,900 cal BP[1] (in Figure 1). However, the Bølling–Allerød chronozone may not be equated with or used synonymously for Greenland Interstadial 1 (GI-1). Furthermore, the Younger Dryas chronozone which delineates the end of my study period, cannot be used as an exact equivalent of GS-1, but may be "used as a non-archive-specific synonym for the stadial period between Bølling–Allerød and the Holocene" (c. 12,900–11,700 cal BP, in Figure 1; Rasmussen et al. 2014a:25). In accordance with these recommendations, I will be referring to the first half of the LG Interstadial as 'GI-1ed/Bølling chronozone' and the second half of the LG Interstadial as 'GI-1cba/Allerød chronozone'.

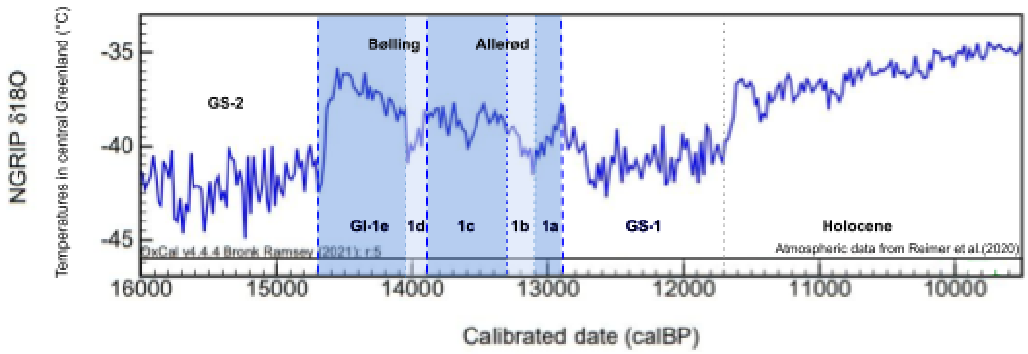


Figure 1: Late Glacial event stratigraphy scheme of climate variability with stratigraphic subdivisions for the Last Glacial Period in north-west Europe and Britain. Delineated are the end of Greenland Stadial 2 (GS-2), the Greenland (or Lateglacial) Interstadial 1 study period subdivided by warmer oscillations (blue) and colder sub-events (light blue), Greenland Stadial 1 and the Holocene (data derived from the North Greenland Ice-Core Project and δ^{18}O record on the GICC05 time scale; edited graph template sourced from OxCal v.4.4.4, atmospheric data from Reimer et al. 2020; Rasmussen et al. 2014b:fig 1)

The Windermere Interstadial or Late Glacial Interstadial (GI-1e-a) represents a significant climate transition marked by a rapid rise in global temperatures. In Europe, human and animal movements were closely linked to the overall alterations in climate and vegetation. The amelioration led directly to concomitant

[1]Whereas the INTIMATE event stratigraphy scheme for the Greenland ice cores uses b2k, i.e., years before 2000 CE (Rasmussen et al. 2014a), calibrated radiocarbon dates are conventionally stated relative to the standard year 1950 CE (van der Plicht et al. 2020:1112) and this notation is used throughout this thesis unless otherwise indicated.

changes in overall floral and faunal composition, with distinct regional variations observable in biotic and environmental responses, and enabling re-occupation of previously uninhabitable areas (Walker et al. 1994; Coope and Lemdahl 1995; Lowe et al. 1999; Walker et al. 2003; Lister and Stuart 2008; Jacobi and Higham 2009b; Brooks and Langdon 2014; Elias and Matthews 2014; Kindler et al. 2014; Binney et al. 2017; Bickerdike et al. 2018; Reade et al. 2020). The onset of the Late Glacial Interstadial itself is marked by the sharp rise in mean annual temperatures (14,700 BP warming event, in Figure 1), with an approximate duration of 1800 calendar years between c. 14,692 to 12,896 years b2k (14,700 to 12,900 BP; Rasmussen et al. 2014a:Table 1; including an approximately 3% relative or 2-δmaximum counting error, Rasmussen et al. 2006:Table 3). The Late Glacial Interstadial (GI-1; hereafter: LG Interstadial) encompasses five named sub-events that are distinct phases of oscillating warmer and colder annual temperatures labelled GI-1e-a (in Figure 1) and which may be grouped into an earlier half (GI-1ed/Bølling chronozone) and a second half (GI-1cba/Allerød chronozone).

In radiocarbon years, the first half of the Interstadial (GI-1ed/Bølling chronozone) is approximately dated to 13-12,000 ^{14}C BP (14,692 ± 4 to 14,075 years b2k, or c. 14,700 to 14,100 BP, total duration roughly 750 years) and represents the warmest phase of the LG Interstadial, with mean July temperatures rising to a maximum of 17°C and up to 20°C during the warmest phases (in Figure 1; Atkinson, Briffa and Coope 1987; Lowe et al. 1999; Barton 2009:Fig. 2.1). Analyses of coleopteran remains recovered from sequences at Llanilid in Wales and Gransmoor in East Yorkshire suggest that the onset of the interstadial warming was time transgressive and registered c. 300 radiocarbon years earlier in Britain than in the Greenland ice cores (Walker et al. 2003). However, pollen analyses suggest there was a delayed botanical response to gradually increasing temperatures (Walker, Coope and Lowe 1993; Walker et al. 2003:Fig. 18, pp. 511, 514-516; Reade et al. 2020). In very general terms, reconstructions of mean annual summer and winter temperatures indicate an overall more continental climate during the first half of the LG Interstadial than at present, and the vegetational cover is generally characterised by the gradual replacement of open-environment/steppe-tundra herbaceous taxa through the establishment of juniper scrubs (*Juniperus communis*) and scatterings of tree birch (Lowe and Walker 1986; Barton 2009:25).

The later or second half of the LG Interstadial (GI-1c-a/Allerød chronozone) is approximately equivalent to 12-11,000 ^{14}C BP (14,075 to 12,896 ± 4 years b2k or

c. 14,100 to 12,900 BP, total duration roughly 1060 years) and was characterised by slightly colder and gradually cooling climate relative to GI-1ed with mean July temperatures falling by c. 2°C (see Figure 1; Atkinson, Briffa and Coope 1987; Walker, Coope and Lowe 1993; Coope and Lemdahl 1995; Walker et al. 2003; Barton 2009:Fig. 2.1). The second half of the LG Interstadial is further characterised by increasing rates of forestation through the marked expansion of closed birch (*Betula* sp.), pine (*Pinus* sp.) and willow (*Salix* sp.) woodlands and the development of characteristic herbaceous open grassland taxa (Barton 2009:38; Coope and Pennington 1977; Lowe and Gray 1980; Walker, Coope and Lowe 1993; Coope et al. 1998). This birch-pine phase of the LG Interstadial is of great interest to questions concerning shifting loci for inhabited areas, since the archaeological record indicates more widespread and denser human occupation of especially northern Britain during this time (Jacobi 1991; Barton and Roberts 1996; Conneller 2007; Jacobi and Higham 2009b; Jacobi and Higham 2011; see Sections 4.2.5, 9.2.1, 9.3).

The LG Interstadial (GI-1) concluded with the return to fully glacial conditions in Greenland Stadial 1 (GS-1, or Loch Lomond Stadial or Younger Dryas chronozone; c. 11,000-10,000 ^{14}C BP or 12,896 ± 4 to 11,703 ± 4 years b2k, i.e., 12,900 to 11,700 BP; see Figure 1). The Loch Lomond Stadial is named after the eponymous Loch Lomond type site which was formed after the full glacial readvance around 12,900 BP when the - in geological terms - rapid return to glacial conditions abruptly altered and affected all aspects of palaeogeography, climate, and environment (Bickerdike et al. 2018). The Loch Lomond Stadial (herafter: LLS/GS-1) is generally considered to represent a renewed hiatus in human presence across the Britain due to the inhospitably cold, arid, and severely windy Stadial conditions which caused the replacement of more temperate interstadial vegetation by steppe-tundra flora (Walker et al. 2003:513). In this thesis, significant attention will be directed towards preserved sequences of aeolian coversands of LLS (GS-1) age, since these sediments provide important chronostratigraphic evidence *termini ante quem* as they often seal and preserve deposits of LUP-type (Baker et al. 2013; Bateman 1995; Bateman 1998; Garton, Barton and Bateman 2020; see Chapters 4, 5, 7).

2.1.2 Palaeogeography of the Britain after the LGM

Geomorphological processes associated with the expansion and retreat of the British-Irish Ice Sheet have had a significant impact on the creation of different

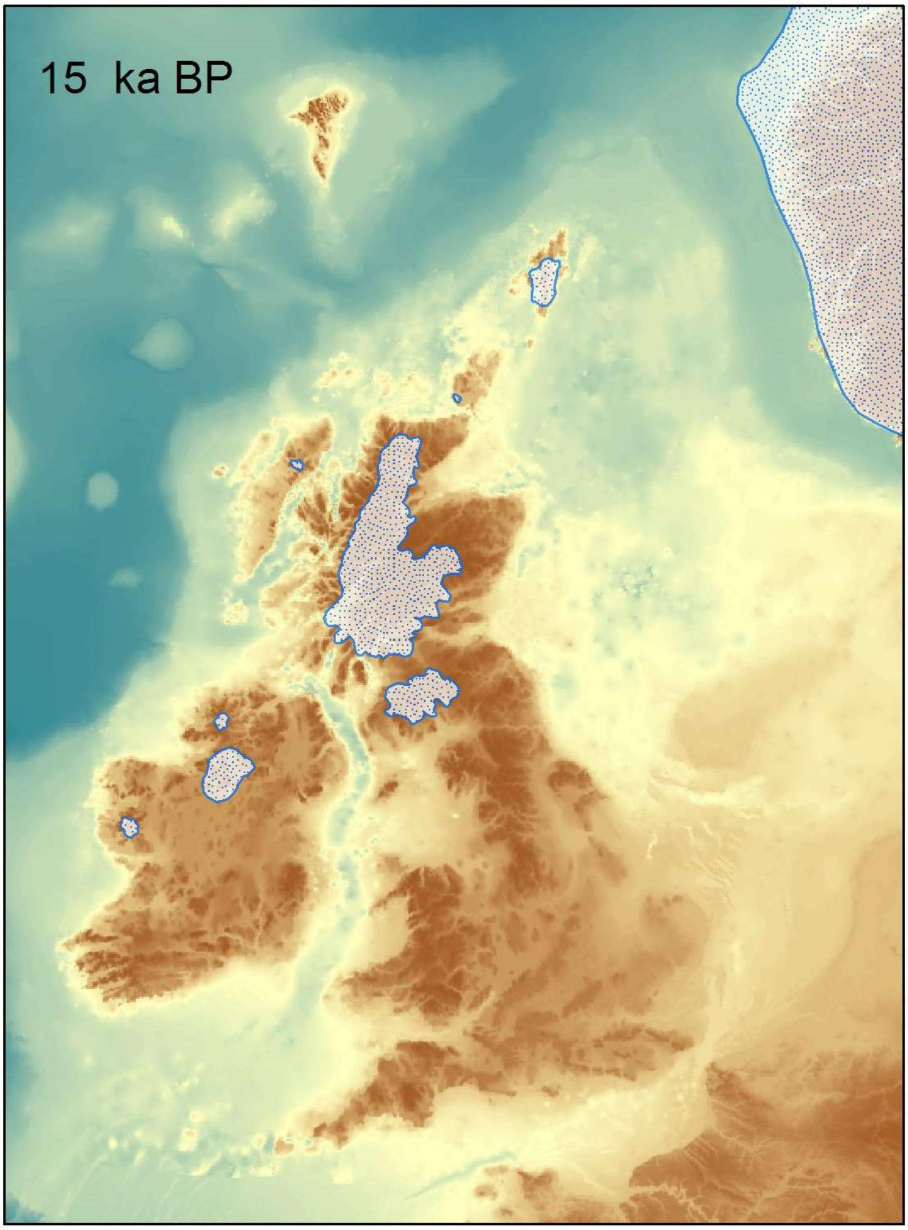


Figure 2: Reconstruction of the extent and location of the British-Irish Ice Sheet at 15 ka BP and post-LGM geography of Britain and the North Sea plain (after Clark et al. 2012:Fig. 18)

landforms, affecting the viability and timing of human and faunal presence across different parts of Britain. Britain has undergone significant changes over the past 500,000 years, moving from island to peninsula to island again several times due to major glaciations, the shifting locations of ice sheets, and the resulting changes to sea levels (e.g., Lambeck 1995; Shennan et al. 2006; Bridgland et al. 2006; Bridgland et al. 2010; White et al. 2010; Bradley et al. 2011; Bridgland et al. 2015; Sturt 2015). Since the amount of data needed to reconstruct the palaeolandscape on a British- or research area-wide scale for the length of the study period (GI-1e to onset of GS-1) could not be reliably reviewed and processed with the available means, I will be using openly available archives provided by the British Geological Survey and Ordnance Survey in this study (British Geological Survey 2019b; British Geological Survey 2019a; British Geological Survey 2020b; Ordnance Survey 2020b; Ordnance Survey 2020a; Ordnance Survey 2020c). These archives reflect present-day conditions with no corrections made for isostasy but are approximately representative of LG landforms and major river valleys and therefore ideally suited for present purposes. The base map data includes the revised chronological and geographical framework for glacial retreat and readvance dynamics proposed by the University of Sheffield's BRITICE group, which combines stratigraphic evidence from moraines, eskers, drumlins, lateral and subglacial meltwater channels, and ice-dammed lakes (in Figure 2; Clark et al. 2012:114-115; BRITICE 2017; Andersen 1981; Boulton et al. 1985; Boulton, Peacock and Sutherland 1991; Clark et al. 2004; Sejrup et al. 2005; Boulton and Hagdorn 2006; Bradwell et al. 2008; Bigg et al. 2010; Bateman et al. 2015; Hughes et al. 2016; Sejrup, Clark and Hjelstuen 2016).

The British-Irish Ice Sheet reached its maximal extent around 27,000 years ago and based on its relatively small size, its proximity to the gulf stream, and large ice stream drainage systems it is assumed that the largely marine-based ice sheet responded rapidly and dynamically to Quaternary oscillations (Clark et al. 2012:113). Accordingly, Britain represents one of the few places in the world where it is possible to study diachronic patterns in human and faunal re-occupation of peri- and postglacial environments at very high resolution (Wygal and Heidenreich 2014). Due to the severely inhospitable climatic and environmental conditions during the LGM (GS-2; Rose 1985; Bateman et al. 2011) and the widespread extent of periglacial activities even in the southern parts of Britain, evidence for human presence during these cold, stadial conditions are very scarce and likely representative of very occasional occupation (Jacobi 2004). As stated by Pettitt and White 2012(:425), "there is no evidence of human settlement for the entire Dimlington Stadial (GS-2); one is, in fact, hard pushed to find a single collared lemming, let alone an intrepid hunter-gatherer".

In very generalised terms, the patterns of ice-sheet retreat observed across all landforms following the LGM (GS-2) indicate a broadly northwards retreat away from higher grounds, which suggests that upland areas in northern Britain were deglaciated before lower-lying grounds. The various mechanisms of glacial meltwater drainage, sediment erosion, and deposition created different landforms which, even today, are visible in the landscape. This can be seen, for example, in the uplands where high-energy rivers in narrow, steep-gradient river valleys are predominant, and is reflected in the wider river valleys characterised by low-gradient floodplains of major tidal river systems such as the Trent and its many tributaries (in Figure 2; Section 2.2.2). Major sinuous river valleys also characterised the now-submerged landscapes of the North Sea Plain. Furthermore, the presence of offshore ice provides an important context for the creation and persistence of ice-dammed lakes such as Pickering/Flixton and Humber across the East Midlands and Yorkshire (Clark et al. 2012:Fig. 8; p. 118-119; Fairburn and Bateman 2016; see Section 4.2.3).

The North Sea plain, or 'Doggerland'

After the LGM and up until the Holocene flooding of the North Sea plain, Britain was connected to north-western Europe via this dry-land landmass (Lambeck 1995; Bryn et al. 2005; Shennan et al. 2006; Uehara et al. 2006; Fitch, Gaffney and Thomson 2007; Weninger et al. 2008; Gaffney, Fitch and Smith 2009; Hijma and Cohen 2010; Clark et al. 2012; Hijma and Cohen 2019). The North Sea plain represented a significant geographical feature with regards to extent (exceeding that of ice-free Britain), landscape composition, and location (see Figure 3), and the human re-occupation of Britain rests heavily on the presumption of geographical accessibility and human/animal movement across these now-submerged landscapes (Barton et al. 2003; Gamble et al. 2004; Barton 2009:19; R. Jacobi, in Pettitt and White 2012:Fig. 8.3).

Through recent collaborative analyses and large-scale integration of seismic and bathymetric data, substantial advances and refinements have been made in the landscape reconstruction of the North Sea plain which was characterised by deeply incised, major river valleys, wetlands, tunnel valleys, and lowlands (Walker et al. 2020; Gaffney et al. 2020; Pettitt and White 2012:435; Ballin 2017b; Grimm 2019:39, 353). The open landscapes and riverine environments shown in Figures 2 and 3 likely constituted focal points for human and faunal activity, and the river systems that once drained onto the North Sea plain possibly represented natural mobility corridors. In my view, any considerations of which

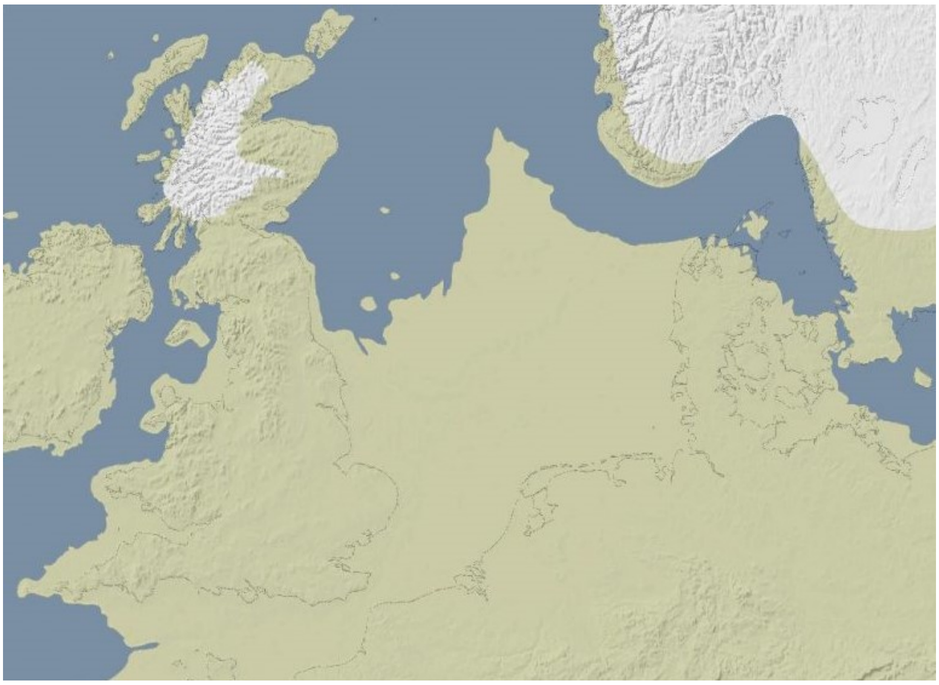


Figure 3: Map excerpt showing present-day coastlines and landform reliefs against the modelled GI-1e coastlines and landmass of Britain, the North Sea Plain, and parts of the North European Plain (after Grimm et al. 2019: Meiendorf Version 1.1., zone ETRS89/UTM 33 N, provided under a CC-BY 4.0 license)

areas LG humans occupied prior to their arrival in Britain should not focus solely on comparable open landscapes in the Low Countries but also consider the significance and viability of habitats on the North Sea plain or 'Doggerland', a term proposed in B. Coles' seminal "speculative survey" (Coles 1998). While I will limit my geographical focus to terrestrial areas, one might assume rather than speculate that the North Sea plain represented more than a mere landscape to be crossed en route towards Britain; perhaps the degree of intensity of human occupation of Doggerland even exceeded that of LG Britain? For now, however, the availability of archaeological data imposes definite limitations, as LUP-attributable archaeological evidence from the North Sea littoral and pelagic zones remains under-represented *vis-à-vis* finds from other archaeological periods (Peeters and Momber 2014; Amkreutz et al. 2018).

2.1.3 The British LUP archaeological record

Here, I will present the key archaeological framework for this thesis, firstly by outlining the main developments in the history of LUP research and by illustrating the location of major concentrations of LUP activity in Britain. Subsequently I shall describe the absolute chronological framework regarding the earliest documented timing for LG human re-occupation, which will be followed by a presentation of the classification schemes used to differentiate between the two laminar blade industries, i.e., the Creswellian and *Federmesser-Gruppen* technocomplexes.

Main developments in British LUP research and site distribution of major concentrations of LUP activity

Since this study draws extensively on lithic assemblages and related archives (see p. 4; Chapter 3), my data collection and research has benefited from a historiographical reconstruction of past timelines of events involving site discoveries, contemporary terminological classification schemes, named researchers, and key publications. In my view, there are three distinct phases in the main developments of British LUP research between the initial investigations in the mid-19th century until present-day, and which can be delineated by the publication dates of major contributions (Garrod 1926; Campbell 1977a). For each of these three phases, distinct differences can be identified with regards to shifting site counts and spatial distribution patterns, but also regarding changes and readjustments to artefact classification schemes. The key chronological and distributional developments within each of these three phases will be emphasised in greater detail in my characterisation of the history of research in the East Midlands (in Section 2.2.3).

In Britain, whereas Lower Palaeolithic evidence was first discovered in gravels and open-air sites, the emergence of Middle and Upper Palaeolithic archaeology as an academic subject can be linked to underground exploration of caves and rock shelters rather than of open landscapes. Indeed, some of the earliest published Quaternary geological and archaeological investigations in Britain identified cave sites with long Palaeolithic sequences including material of LUP-attributable age, thus effectively combining Victorian Age cave explorations with emerging Antiquarian interests in prehistory. Consequently, several LUP sites in Figure 4 were identified in areas which are naturally rich in caves, i.e., in parts of the North Pennines, the Yorkshire Dales, the Peak District, the Mendip Hills, the Wye Valley and Forest of Dean, and on the Gower Peninsula (e.g., Dawkins 1874; Dawkins

1876; Mello 1875; Mello 1876; Dawkins 1877; Garrod 1926; Campbell 1977a; Bonsall 1977b; Jenkinson 1984; Barton and Collcutt 1986; Barton and Roberts 1996; Jacobi 2004; Chamberlain 2019a; references in Catalogue A). These initial biases towards cave sites continue to be reflected in British statutory heritage records, research, and site distribution maps (in Section 4.1.1; Historic England 2019b; Historic England 2019h; Pettitt, Bahn and Ripoll 2007a; Jacobi and Higham 2009b:Figs.11-12; Jacobi and Higham 2011; Pettitt and White 2012:Figs. 8.4, 8.15, 8.17, Reade et al. 2020; Bello et al. 2021; S. Charlton, R. Dinnis, H. Reade, R. Stevens, pers. comms. 2015-2022).

However, since c. 1980 and increasingly since the introduction of the National Planning Policy Framework 16 (1990; Ministry of Housing, Communities and Local Government 2019), the investigative focus has steadily shifted beyond the karst landscapes, as new LUP discoveries have increasingly appeared out in the open landscapes (see Section 2.2.3, Chapters 4, 9). While stray lithic surface finds or smaller scatters dominate the open-air site record, important contributions in Figure 4 are represented by investigations of southern English sites including Hengistbury Head, Dorset (Barton 1992), Nea Farm (Barton et al. 2009), La Sagesse Convent (both Hampshire, Conneller and Ellis 2007), Wey Manor Farm (Jones and Cooper 2013), Guildford Fire Station (both Surrey, Roberts and Barton 2021), and Rookery Farm, Cambridgeshire (Conneller 2009). The significance of these sites rests not solely on the open landscape settings but equally concerns important observations regarding raw material behaviour, human site use, and the results emerging from detailed lithic typological and technological attribute analyses. Linked to the rising numbers of open-air site discoveries is an increasing interest in relating sites to the riverine, palaeo-lacustrine, and now-coastal environments in which they are located, with clear aims to contextualise LG human occupation within all viable habitats (see p. 4). Importantly, although the cave-centric perspectives on LUP site distribution have been greatly nuanced by now, the present understanding of LG human occupation of Britain is not fully without bias; there remain distinct site groupings relative to the focal points of LUP (cave) activities in southern, southwestern, and south-central England (in Figure 4), which constitute the background for my thematic focus on the yet under-investigated open East Midlands landscapes.

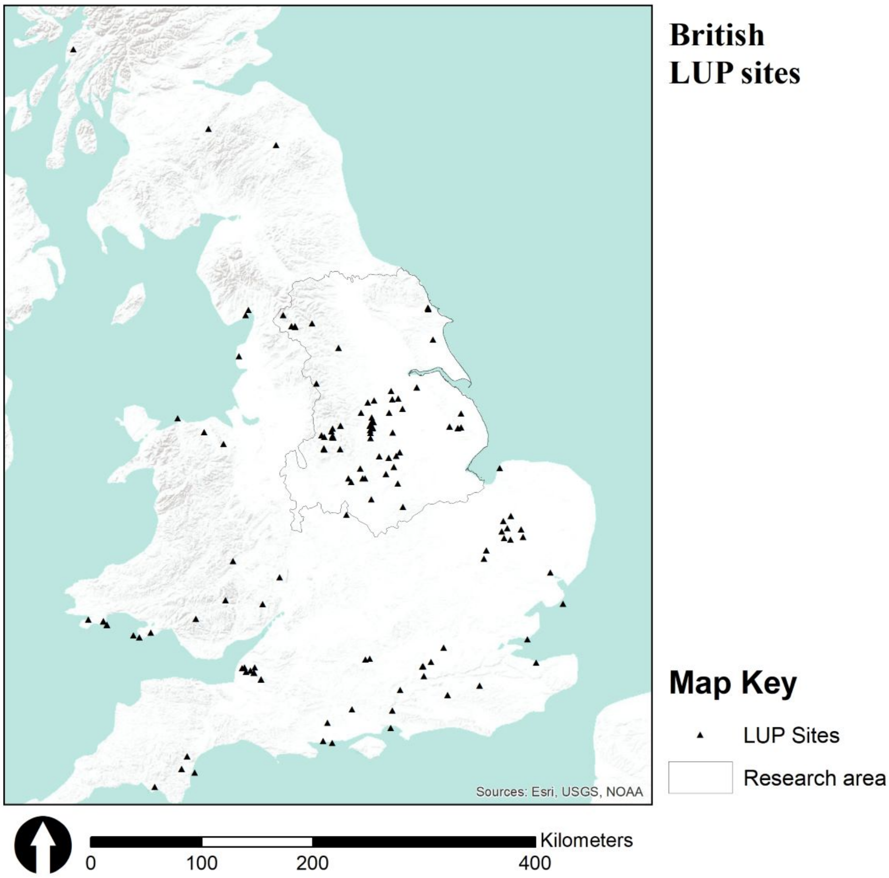


Figure 4: Distribution of major LUP sites in Britain and delineation of the extended East Midlands research area (key locales highlighted; after Jacobi and Higham 2009b:Figs.11-12; Pettitt and White 2012:Figs.8.4, 8.15, 8.17; entries in Catalogue A. Note over-plotting of adjacent findspots at scale mapped; map by J. Kotthaus and L. Grottenberg. Contains OS data, Crown copyright and database right 2021)

Absolute chronology of LG human re-occupation

Archaeological evidence for LG human re-occupation in the UK primarily consists of lithic artefacts and is on rare occasions evidenced by preserved organic faunal remains (in Figures 1, 4, 5; entries in Catalogue A). The poor state of organic preservation and low recovery rate of directly dateable remains has resulted in a comparatively modest absolute chronological framework for the British LUP in general, which to this day is near-uniquely reliant on faunal evidence from extant cave assemblages with often uncertain stratigraphic concordance and associ-

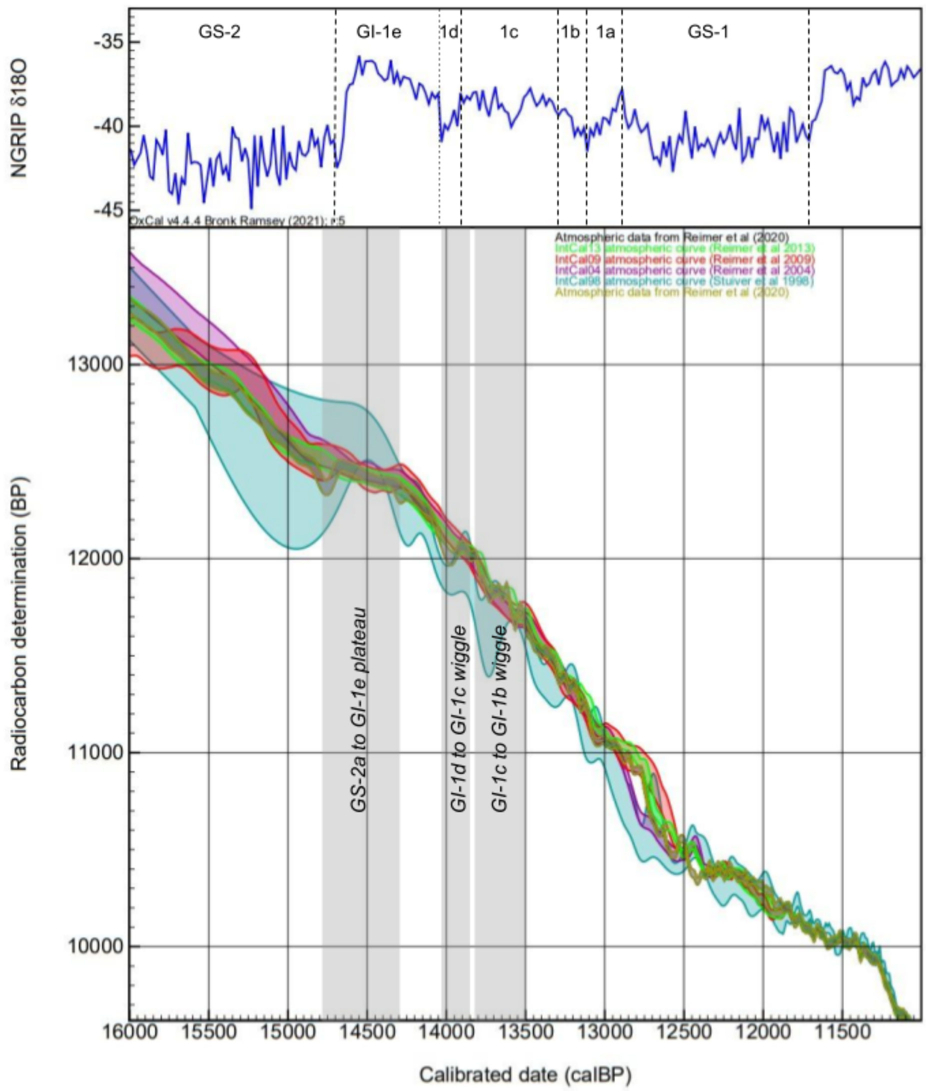


Figure 5: Comparison of all IntCal calibration curves (IntCal98-20) to illustrate the shifts and refinements achieved through progressively higher precision since IntCal98, as indicated by narrower/thinner bands. Persistent GS-2a to GI-1e plateau and location of pronounced wiggles (GI-1d to GI-1c; GI-1c to GI-1b) highlighted (data derived from the North Greenland Ice-Core Project and δ^{18}O record on the GICC05 time scale; edited graph template sourced from OxCal v.4.4.4, Bronk Ramsey 2009; atmospheric data from Reimer et al. 2020; Rasmussen et al. 2014b:fig. 1)

ation. Furthermore, the limitations posed by the natural distribution of cave sites has led to an uneven distribution of radiocarbon determinations across Britain, and significantly fewer direct dates are available for open-air sites (Jacobi 1980;

Jacobi 1991:131; Barton and Roberts 1996:251; Blockley, Donahue and Pollard 2000a:114; Housley, Gamble and Pettitt 2000:120; Jacobi and Higham 2011:242). LUP open-air sites are typically indirectly dated relative to chronostratigraphic context (Cloutman 1988b; Conneller and Ellis 2007; Lane et al. n.d.), and through measures of Optically Stimulated Luminescence (OSL; Bateman 2008), as recently employed at Guildford Fire Station, Surrey (Roberts and Barton 2021) and at my Nottinghamshire case study site Farndon Fields (Garton, Barton and Bateman 2020). Thermoluminescence dating was applied at Hengistbury Head in Dorset (Barton 1992), although there remain open questions concerning the precision of the obtained LG date ranges.

Important work on the chronology of the LG recolonisation of Britain was undertaken as part of the Ancient Human Occupation of Britain Project (Polly and Stringer 2011), specifically the program combining AMS radiocarbon dating and re-dating of LUP cave sites (Higham, Jacobi and Ramsey 2006; Jacobi, Higham and Ramsey 2006; Jacobi and Higham 2009b; Jacobi and Higham 2009a; Jacobi et al. 2009; Jacobi, Higham and Lord 2009; Jacobi and Higham 2011). Dates were determined on bone collagen collected from samples of humanly modified organic faunal remains such as bone, ivory, and antler. Samples underwent pre-treatment and ultrafiltration to remove contaminants (Bronk Ramsey et al. 2004) and the data were then modelled using Bayesian models and compared against the NGRIP record and calibrated using the IntCal04 dataset.

The onset of LG human re-occupation of Britain seems to have been delayed by about 500 calendar years relative to the main North European plain, which suggests that it was one of the last regions to have been re-occupied after the LGM (Housley et al. 1997:43; Blockley, Donahue and Pollard 2000a:114; Barton et al. 2003; Blackwell and Buck 2003; Gamble et al. 2005; Blockley et al. 2006; Barton 2009:30; Jacobi and Higham 2009a). Moreover, the timing of earliest LG human re-occupation of different parts of Britain is characterised by diachronic patterns which are directly relevant to the questions pursued in this thesis. Specifically, the earliest evidence for LG human re-occupation of Britain is represented by samples showing cut-marks and/or other human modifications on organic remains of wild horse (*Equus ferus*) and red deer (*Cervus elaphus*) found in southwestern English and Welsh cave assemblages (in Table 1). Comparable evidence from East Midlands cave assemblages, and further north, indicates incrementally delayed onsets of human re-occupation in these areas (see Section 2.2.3). Tables 1, 4 and 5 which comprise a comprehensive overview of available ultrafiltered radiocarbon age determinations from key sources (Jacobi and Higham 2011; Jacobi and

Table 1: Available AMS dates for samples from British LUP cave sites located beyond the research area. Abbreviations: KAC (King Arthur's Cave), SH (Sun Hole), GNC (Gough's New Cave), KC (Kent's Cavern), KendC (Kendrick's Cave) (data from Jacobi and Higham 2009b:Table 1; Jacobi and Higham 2011:Tables 12.4,-8, 12.12 ; Reade et al. 2020). Age is radiocarbon age. Unmodelled dates (cal BP) calibrated using OxCal v4.4.4 with the IntCal20 curve (ranges given at 95.4% certainty; Bronk Ramsey 2009; Bronk Ramsey 2017; Reimer et al. 2020)

Site	**Sample**	**Lab code**	**(^{14}C age BP)**	**Unmodelled (cal BP)**
KAC	*E. ferus* tooth (UPN-276)	OxA-V-2797-24	12,365±55	14,845-14,143
KAC	*E. ferus* tooth	OxA-V-2754-50	12,410±50	14,895-14,231
KAC	*E. ferus* tooth	OxA-19161	12,490±60	15,028-14,315
KAC	*E. ferus* tooth	OxA-19166	12,565±80	15,200-14,356
KAC	*E. ferus* tooth	OxA-17725	12,610±55	15,220-14,610
KAC	*E. ferus* tooth	OxA-X-2300-43	12,640±90	15,335-14,509
KAC	*E. ferus* tooth	OxA-X-2280-8	12,680±90	15,433-14,591
KAC	*E. ferus* tooth	OxA-X-2280-9	12,720±90	15,517-14,898
SH	*E. ferus* tooth	OxA-18705	12,490±45	15,006-14,342
SH	*E. ferus* tooth	OxA-14477	12,540±75	15,145-14,338
SH	*E. ferus* bone	OxA-14438	12,545±55	15,136-14,471
SH	*E. ferus* tooth	OxA-14476	12,610±90	15,300-14,440
SH	*E. ferus* bone	OxA-19557	12,620±50	15,234-14,833
GNC	*E. ferus* bone	OxA-17832	12,415±50	14,907-14,246
GNC	*Canis sp.* tooth	OxA-13585	12,440±55	14,951-14,285
GNC	*Lynx lynx* bone	OxA-18066	12,440±55	14,951-14,285
GNC	*Mammuthus* ivory artefact	OxA-17846	12,470±55	14,984-14,314
GNC	*H. sapiens* bone	OxA-17848	12,485±50	15,004-14,325
GNC	*E. ferus* bone	OxA-18065	12,490±55	15,020-14,321
GNC	*E. ferus* tooth	OxA-12104	12,495±50	15,021-14,335
GNC	*C. elaphus* bone	OxA-17845	12,500±50	15,035-14,341
GNC	*C. elaphus* bone	OxA-16378	12,515±50	15,089-14,360
GNC	*E. ferus* bone	OxA-18068	12,520±55	15,100-14,360
GNC	*R. tarandus* antler *bâton percé*	OxA-18064	12,535±55	15,126-14,444
GNC	*H. sapiens* bone	OxA-17847	12,565±50	15,143-14,540
GNC	*E. ferus* bone	OxA-17833	12,570±45	15,141-14,567
GNC	*E. ferus* bone	OxA-16292	12,585±55	15,178-14,556
GNC	*H. sapiens* bone	OxA-17849	12,590±50	15,175-14,584
GNC	Herbivore fragment	OxA-18035	12,600±80	15,269-14,477
KC	Hyoid bone awl	OxA-19508	12,265±50	14,804-14,051
KC	*E. ferus* bone	OxA-17723	12,315±50	14,816-14,085
KC	Bovine tooth	OxA-17544	12,425±45	14,910-14,279
KC	*Canis sp.* bone	OxA-13588	12,470±50	14,981-14,317
KC	*E. ferus* tooth	OxA-17545	12,500±60	15,056-14,323
KendC	Bovine bone	OxA-17726	12,310±50	14,815-14,082
KendC	Bovine bone	OxA-6146	12,410±100	14,984-14,123

Higham 2009b; Jacobi, Higham and Lord 2009; Reade et al. 2020).

However, an important point here concerns the recalibration of Late Glacial AMS radiocarbon dates using the IntCal20 curve, since "there is a shift to older calendar ages around 12.5 ka cal BP [and] such pronounced variations in the calibration curve will result in wide calibration age ranges for single ^{14}C dates from this period" (Reimer et al. 2020:745; van der Plicht et al. 2020:1097, 1102). The broader effects of these shifts can clearly be seen in Figure 5, comparing the overall developments since IntCal98 through to IntCal20, and in Figure 112 where refinements between the two most recent versions are highlighted (IntCal13 and IntCal20; Bronk Ramsey 2009). The shifts introduced through IntCal20 have an influence on most of the dates listed in Tables 1, 4, and 5. As illustrated by the comparisons between southern English dates using IntCal20 (in Figure 115) and IntCal13 (in Figure 116), individual shifts for pre-GI-1e dates have led to even earlier onsets (by 2-5 but up to 365 years, as seen for OxA-18067), tightening of calibrated ranges, and a break where ranges coincide with the GS-2 to GI-1e plateau around 14,700 cal BP.

Upon recalibration (see Figures 115 and 116), it can now be observed that the onsets for the earliest human re-occupation of several English and Welsh cave sites predate the 14.7 ka warming event (in Figure 1). These observations further corroborate earlier findings (Jacobi and Higham 2011:242; Walker et al. 2003:Table 5), but are in contrast with previous studies which, "at the risk of being environmentally deterministic" (Housley, Gamble and Pettitt 2000:428; Housley et al. 1997:43; Jacobi 1991; Campbell 1977a), suggested that LG human re-occupation only occurred in response to the climatic ameliorations at the onset of LG Interstadial (GI-1e/Bølling chronozone). Evidently, the recalibrated dates in Figure 115 raise important questions regarding environmental maturity and viability of habitats encountered by the earliest human and animal groups after the LGM, as explored in recent and forthcoming studies (Reade et al. 2020; Stevens et al. 2021; Charlton, Brace, Hajdinjak et al. 2022). Importantly, the fundamental premises upon which this thesis rests are still applicable, since the diachronic patterns of delayed re-occupation of central and northern England *vis-à-vis* the south-west remain unchanged, although modelled date ranges have shifted towards the older end (cf. Section 2.2.3, Tables 4, 5).

2.1.4 Lithic industries or technocomplexes present in Britain during the LG Interstadial (GI-1e-a)

In this Section, I will outline the classification used to identify and differentiate two main waves of LUP development in Britain, i.e., the Creswellian and *Federmesser-Gruppen* technocomplexes. While evidence indicates the presence of other lithic technocomplexes occurring towards the end of the Interstadial (Long Blade or Terminal Upper Palaeolithic industries, Barton 1992; Barton 1995; Barton 1998; Froom 2005; Cooper 1996; Cooper 2004; Cooper 2006b; Conneller 2007:228-232; Lewis 2011; in Catalogue Section A.5), due to the limited availability of data for the research area, only LUP or Creswellian- and *Federmesser-Gruppen*-attributable material will be considered in this thesis.

Briefly, I want to draw attention to the terminology used throughout. Firstly, in referring to the LG archaeological evidence as 'Creswellian', '*Federmesser-Gruppen*', 'lithic industries' or 'technocomplexes', I am consciously framing my terminology around named cultural taxonomic units. Importantly, I am thus utilising cultural taxonomy as a heuristic tool and lithic index fossils as etic categories to base my terminology on, whilst making no assumptions that the taxonomic units are representative of ontological 'cultures' or populations present during the LG Interstadial (Sackett 1982; Wiessner 1983; Hayden 1984; Sackett 1985; Dunnell 1986; Barton 1997a; Sauer and Riede 2019; Reynolds and Riede 2019a; Reynolds and Riede 2019b; Reynolds 2020; Reynolds 2022; N. Reynolds, pers. comm. 2017).

Secondly, in the absence of clearer diagnostic criteria, material will be labelled LUP. Where diagnostic retouched tools and characteristic technological traits are present, I will specify if the lithic evidence is Creswellian- or *Federmesser-Gruppen*-attributable. Although variations of 'Late/Final Magdalenian' in lieu of Creswellian remain in circulation (e.g., Pettitt and White 2012; Bello et al. 2021), I regard the analogous use of 'Late Magdalenian' *(sensu lato)* in reference to British earlier LUP material as flawed, since the Creswellian (*sensu* Garrod 1926:194) was initially defined to demonstrate the dissimilarity between approximately contemporary, yet geographically distinct and highly conformist/standardised Magdalenian *(sensu stricto)* assemblages and the British record (Jacobi 1991:131; Grimm 2019:70). Furthermore, while the German term *'Federmesser-Gruppen'* is pluralised to encompass the three subgroups which formed part of the first formal definition (Wehlen, Tjonger, Rissen; Schwabedissen 1954; Taute 1968), in conventional English usage the term refers to this blade industry as a singular group. The named taxonomic unit will be given preference over other terms such as ‘later LUP’ or ‘Final Palaeolithic’ (e.g., Jacobi 2014a; Conneller 2007:217; Conneller 2009).

The Creswellian technocomplex

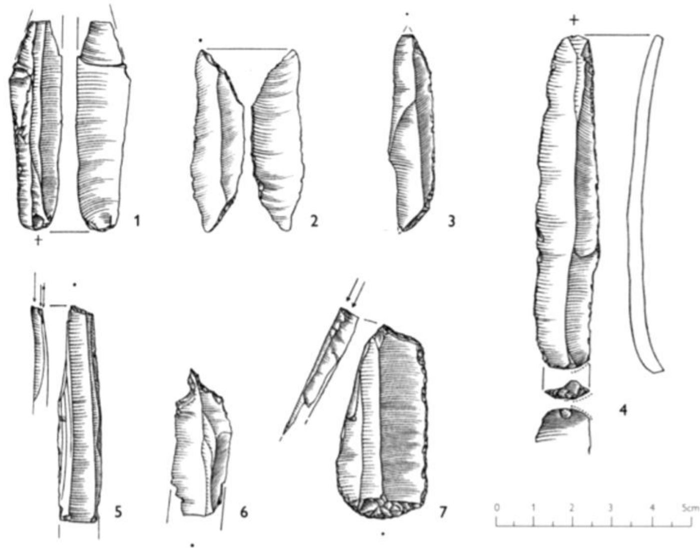


Figure 6: Creswellian-attributable artefacts: 1 ‘Creswell point’ (angle-backed blade with single oblique truncation), 2-3 ‘Cheddar points’ (bi-truncated trapezoidal backed blades), 4 distal end-scraper on blade, 5 burin on retouched truncation, 6 piercer (distal fragment), 7 proximal end-scraper and burin on retouched truncation (from Robin Hood Cave, Creswell Crags, Derbyshire; after Pettitt and Jacobi 2009; Pettitt and White 2012:Fig.8.1; drawings by H. Martingell)

The archaeological evidence associated with the earliest phase of human presence in Britain after the LGM can be attributed to the Creswellian technocomplex which, following revisions to the absolute chronological framework (Jacobi and Higham 2011:223; contra Jacobi and Higham 2009b), appear to have been present throughout most of the first half of the LG Interstadial (GI-1ed/Bølling chronozone, from 14,692 ± 4 to 13,954 years b2k) for a maximal duration of approximately 750 years. The term Creswellian was first introduced in Dorothy Garrod’s seminal volume in reference to the diagnostic ‘Creswell’ point (an angle-backed point with single oblique truncation) which is “found in greatest abundance and variety” in the eponymous LUP cave assemblages and type sites at Creswell Crags (in Figure 6; Garrod 1926:194; subsequent revisions by Bohmers 1956a; Bohmers

1956b; Campbell 1977a; Jacobi 1980; and see Jacobi 1991; Jacobi and Roberts 1992; Barton and Roberts 1996; Charles 1999; Barton et al. 2003:634; Barton 2009; Barton 2010). Creswellian-attributable sites are primarily represented by cave sites in the karst/limestone landscapes in central and southwestern Britain (in Figure 4), and open-air sites form but a small component of the presently known Creswellian site record (Jacobi and Higham 2009b:Fig. 11).

The classification used in this study is based on the grouping of distinctive typological and technological criteria outlined in Table 2 and diagnostic artefacts are illustrated in Figure 6 (Barton 2010:1-2,7-8; Jacobi and Higham 2009b:1905; Jacobi and Higham 2011:224; Barton and Roberts 1996; Jacobi and Roberts 1992; Jacobi 1997; Jacobi 1991; Jacobi 2004; Barton et al. 2003:Table 1; see Catalogue A.2). Interesting typo-technological differences *vis-à-vis* broadly contemporary continental assemblages concern the absence of small straight-backed bladelets, and, when compared directly, the British Creswellian record displays an overall lesser degree of standardisation in the lithic blade debitage (Vermeersch, Lauwers and Peer 1987; Bosselin and Djindjian 1988; Jacobi 1991; Barton and Roberts 1996; Pigeot 1990; Bodu 1993; Audouze et al. 1988).

Cut-marked and otherwise modified organic remains found in cave assemblages (in Table 1) indicate that a range of prey fauna were exploited for their meat and other resources during the first half of the LG Interstadial (GI-1e): mainly wild horse *(Equus ferus)*, red deer *(Cervus elaphus)*, and to a lesser extent wild cattle *(Bos primigenius)* which all occurred as large herds in open landscapes. Other associated species included arctic hare *(Lepus timidus)*, reindeer *(Rangifer tarandus)*, mammoth *(Mammuthus primigenius)*, Saiga antelope *(Saiga tatarica)*, brown bear *(Ursus arctos)*, lynx *(Lynx lynx)*, possibly also arctic *(Alopex lagopus)* and red fox *(Vulpes vulpes)*, although direct evidence for humanly modified bones of the latter two species has not yet been recovered (Barton 2009:33; Reade et al. 2020; Charles and Jacobi 1994; Jacobi and Higham 2011; Grimm 2019:69).

Federmesser-Gruppen industries

The second phase of LG human occupation is associated with *Federmesser-Gruppen*-attributable evidence (hereafter: FMG). Variation in the timing of appearance and typo-technological character of FMG-attributable assemblages further indicates the presence of two distinct *faciès*. Firstly, an earlier FMG *faciès* (or 'Hengistbury Head-type', Conneller 2007; Conneller 2009; Barton 1992) present towards the end of the first half of the LG Interstadial (end of

Table 2: Diagnostic characteristics of Creswellian-attributable lithic assemblages (after Campbell 1977a; Barton 1990; Jacobi 1991; Barton and Roberts 1996; Barton et al. 2003:Table 1; Barton 2009; Jacobi and Higham 2009b; Barton 2010; Jacobi and Higham 2011; Pettitt and White 2012; Grimm 2019)

Technological characteristics:
• Long-distance transfer of high-quality raw material (>30 km between source and site), indicative of high mobility • Laminar blade and bladelet debitage detached from cores with one preferred flaking direction using a soft hammer; well-made removals slightly curved in their longitudinal profiles • Careful platform preparation, frequently through faceting, occasionally represented by *talons en éperon*

Typological characteristics:
• Bi-truncated trapezoidal backed blades (Cheddar points) • Angle-backed blades with a single oblique truncation (Creswell points) • End-scrapers on long (>50 mm), straight blades (with retouched lateral edges) • Burins on truncations • Piercers and *becs/Zinken* • Blades with scalar edge modification • *Lames tronquées et usées* (blades with truncations and worn ends)

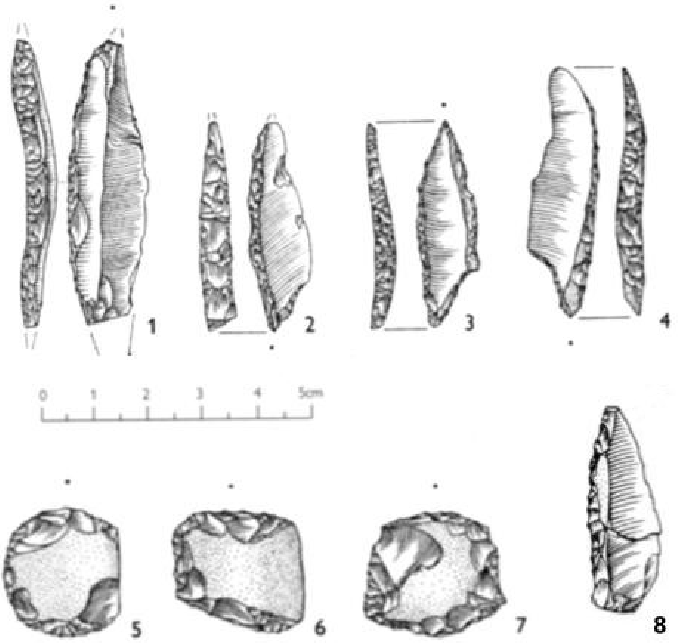


Figure 7: *Federmesser-Gruppen*-attributable artefacts: 1 Curve-backed point, 2-4 penknife points, 5-7 thumbnail scrapers (all from Mother Grundy's Parlour, Creswell Crags, Derbyshire; after Pettitt and Jacobi 2009; Pettitt and White 2012:Fig.8.18), 8 straight-backed blade, Seamer Carr K (after Conneller 2007:Fig. 6; all drawings by H. Martingell)

GI-1ed/Bølling chronozone). Secondly, a later FMG *faciès* is associated with human presence during the second half of the LG Interstadial (GI-1cba/Allerød chronozone). The maximal duration of these GRIP phases equals approximately 1060 years (from 13,954 to 12,896 ± 4 years b2k). This number is significant, as it equals a much longer timespan (by about 30%) for the presence of FMG-type industries compared to the length of the preceding Creswellian industries.

FMG industries were first defined by H. Schwabedissen (1954) based on the recognition of the namesake penknife point index fossil (German: *Federmesser*, a curve-backed *mono-pointe*; Schmidt 1912:114, in Schwabedissen 1954:8, 23, Abb. 11) in a range of unstratified surface collections and excavated assemblages across north-western Europe, which at the time were attributed to a 'Late Magdalenian culture'. In the contemporary European literature, the term now encompasses an agglomeration of Final Palaeolithic technocomplexes including the Azilian which had been defined some sixty years prior to the publication of

Schwabedissen's monograph (Piette 1889; Piette 1895; Peyrony 1936; Ikinger 1998; Grimm 2019:70, Table 2.9).

Compared with the number and spatial distribution of Creswelllian sites, the corpus of known British FMG sites indicates an increased volume of sites and shift away from caves towards the open landscapes, and a gradual expansion towards the north (in Figure 4; Chapter 4, Section 9.2.1). Interestingly, sites attributed to the earlier FMG *faciès* are comparatively rare and not currently documented beyond southern England (including Hengistbury Head, Dorset, Barton 1992; La Sagesse Convent, Conneller and Ellis 2007, and Nea Farm, Barton et al. 2009, Hampshire; likely Guildford Fire Station, Roberts and Barton 2021:Fig.1, pers. comm. and my observations in 2014; Wey Manor Farm, Jones and Cooper 2013, and Brockhill, Barton 1997b, all Surrey). In contrast, most British FMG-attributable sites are attributed to the later FMG *faciès* (present during GI-1c-a/Allerød chronozone; Jacobi and Higham 2009b:Fig. 12) based on available AMS dates or typo-technological criteria, which is consistent with comparable continental European evidence (e.g., Baales and Street 1998; Baales and Street 1996; Baales and Street 1998; Baales 2002; Fagnart and Coudret 2000; Stapert 2000; Grimm 2019).

The classification criteria used here to identify FMG-attributable evidence is based on a grouping of diagnostic typological and lithic technological traits, as outlined in Table 3 and illustrated in Figure 7 (Barton 2010; Campbell 1977a; Jacobi 1991; Barton and Roberts 1996; Coudret and Fagnart 1997; Fagnart and Coudret 2000; Jacobi and Higham 2009b; Barton et al. 2009; Jacobi and Higham 2011; Conneller 2007; Grimm 2019:Tab. 2.9; in Catalogue A.3, Table 27). In Britain, the diagnostic penknife points are defined by additional retouch near the proximal or distal end and which is oriented opposite of the backed edge (in Figure 7:2-4). Furthermore, during artefact handling of the different site assemblages I observed differences in the metric dimensions of blades, specifically an increase in mesial thickness from earlier to later FMG-attributable assemblages. Statistical tests will be used to see if these observations can be supported through quantitative evidence.

As a corollary to the climatic and environmental changes during the second half of the LG Interstadial (GI-1c-a/Allerød chronozone, cf. Section 2.1.1), the associated faunal evidence reflects changes in prey species that increasingly included elk (*Alces alces*) and giant deer (*Megalocerus giganteus*), which are found in more densely wooded habitats rather than on the open steppe grasslands. Equally evident is continued exploitation of red deer (*Cervus elaphus*), wild cattle

Table 3: Characteristics of FMG-attributable assemblages (after Barton 2010; Campbell 1977a; Jacobi 1991; Barton and Roberts 1996; Coudret and Fagnart 1997; Jacobi and Higham 2009b; Barton et al. 2009; Jacobi and Higham 2011; Conneller 2007; Grimm 2019:Tab. 2.9)

Technological characteristics:
• Increasing use of lower quality raw material found local to sites (within 10 km range) • Occasional long-distance transfer of nodules, but with core preparation undertaken on-site • Tool kit repair and replenishment using local flint sources • Transfer of ready-made retouched tools made on non-local flint types • Increasing exploitation of flint nodules' natural properties (convexities/near-right angled platforms), in combination with overall less emphasis on core and platform preparation • Preference for soft stone hammers, opportunistic use of hard stone hammers • Platform preparation occasionally through faceting; sporadic evidence for butts *en éperon* (earlier FMG *faciès*) • Platform abrasion and abraded knapping edges (later FMG *faciès*) • Laminar blade and bladelet debitage with straight longitudinal profiles • Increasing mesial thickness of blade blanks between earlier and later FMG-attributable assemblages (hypothesis, to be tested)
Typological characteristics:
• Curve-backed bi-points (earlier FMG *faciès*) • Straight-backed points (earlier FMG *faciès*) • Curve-backed penknife points, including mono-points (later FMG *faciès*) • Shouldered and angle-backed points in association with straight-backed blades/bladelets • End-scrapers on shorter (<50 mm) blades and bladelets and thumbnail scrapers (later FMG *faciès*) • *Becs*, burins on truncation, truncations

(*Bos primigenius*) and occasionally also of wild horse (*Equus ferus*; in Tables 4, 5; Barton 2009:43-44; Jacobi and Higham 2009b).

2.2 The English East Midlands research area

2.2.1 Delineation of research area

The geographical focus of this thesis is on the open landscapes situated between the Pennines and the present North Sea coastline (in Figure 4). The research area thus encompasses parts of the official English government regions of East Midlands, West Midlands, and Yorkshire and the Humber, which is equivalent to c. 24% of the total surface area of mainland England (i.e., 31,047 km² of 130,279 km²). As stated earlier, my use of the term 'East Midlands' in reference to the research area comprises geographical areas which extend beyond the administrative boundaries of the namesake government region to include the counties through which the river Trent passes (Derbyshire, Leicestershire, Lincolnshire, Nottinghamshire, Rutland, Staffordshire, South Yorkshire), as well as the East Riding of Yorkshire, North Yorkshire, and West Yorkshire. Counties beyond the Trent catchment are intentionally included to provide additional regional context for my case studies and to accommodate administrative boundary changes. Due to civil parish and county reorganisations (Local Government Acts of 1974 and 1992, UK Parliament 1972; UK Parliament 1992), database entries and finds records may now be managed by a different local planning authority (LPA) or Historic Environment Record office (HER) than at time of recording. These administrative reorganisations were for instance found to be of some significance to information relating to the Creswell Crags area on the Derbyshire, Nottinghamshire, and South Yorkshire borders. Substantial administrative reorganisation has also occurred in the areas near the Humber, affecting the material derived from North Lincolnshire, North East Lincolnshire, and the now defunct South Humberside county. External limits of the research area are bounded by present-day administrative and ceremonial county lines and the internal organisation is by civil parishes.

2.2.2 Physical geography of the East Midlands research area

This brief characterisation of the East Midlands' physical geography represents an important context for the site distribution analyses in Chapter 4 and subsequent discussions (in Chapter 9). An emphasis will be on surface water features since these are fundamental to the investigation of my hypotheses concerning LG human occupation of the riverine and lacustrine environments that characterise the open, low-lying research area. Additional emphasis will be laid on windblown or aeolian coversands of LLS (GS-1) age which are distinctive superficial deposits in Britain that are particularly abundant in the research area and therefore of great chronostratigraphic contextual relevance to my analyses (Bateman 1998; Baker et al. 2013).

Landforms and habitats

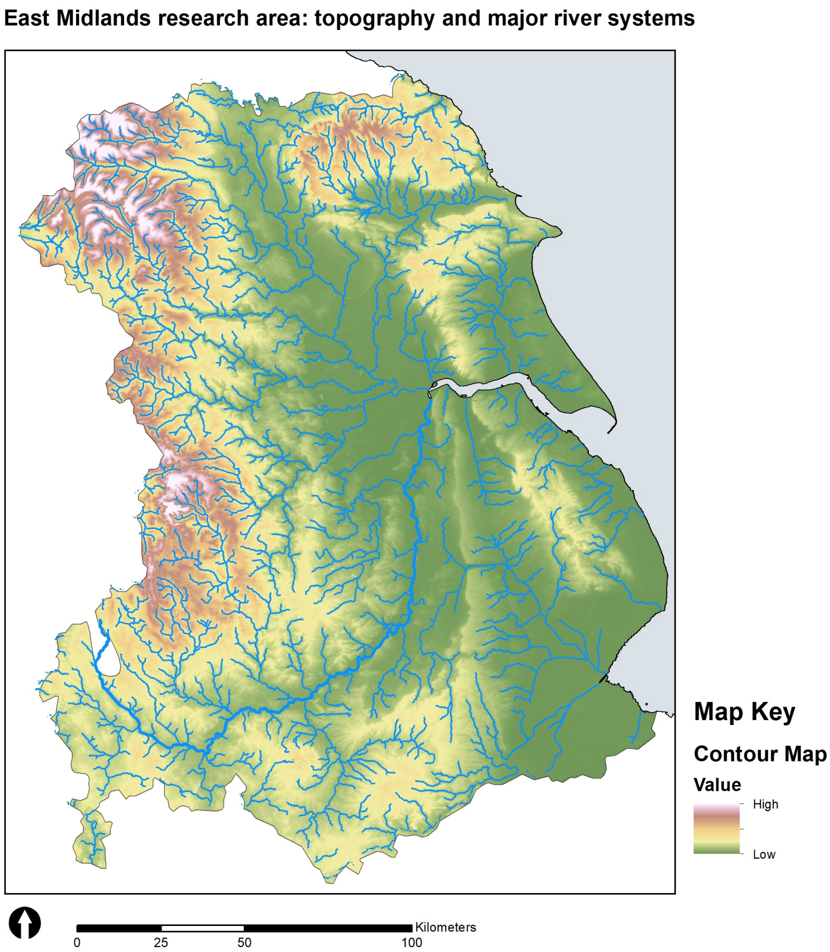


Figure 8: Topography and major river systems in the East Midlands (Contains OS data, Crown copyright and database right 2021)

The area I have chosen for research was fully deglaciated by the time of the LG Interstadial and the landforms created after the retreat of the British-Irish Ice Sheet still characterise the varied East Midlands landscapes: from low-lying floodplains and washlands, to gently undulating, low-rolling wolds, to deep valleys, upland plateaus, and high peaks (in Figure 8; Ordnance Survey 2020b; Ordnance Survey 2020a; Natural England 2014a; Billington 2016:28). The topographic profile shown in Figure 8 comprises both upland regions ($\geq$ 200 m above Ordnance Datum/AOD, with peaks up to $\geq$ 600 m AOD) and vast stretches of lowland areas (below 200 m AOD). The Pennines form a near-continuous north to south ridge along the western half of the research area, ranging from the North Pennines through to the Yorkshire Dales and to the Peak District in the south. In the north-east, the highest elevations are found in the North Yorkshire Moors. Additional locally elevated areas (ranging up to 240 m AOD) are found in the Yorkshire and Lincolnshire Wolds, which are delineated from adjacent lowlands by sharp limestone escarpments - such as the north to south-oriented Lincoln Cliff Edge (which provides scarp edges and panoramic views across otherwise mostly flat regions).

Variation can also be noted with regard to river courses; in areas with higher averages of elevation, narrower rivers such as the Colne, Don, or Derwent cut deeply through the glacially formed vales and valleys (Ordnance Survey 2020a; Natural England 2014b, Natural England 2013a), whereas the Trent and other larger rivers in low-gradient regions form wider riverbeds and open onto broad alluvial floodplains and washland (Howard et al. 2009; Ordnance Survey 2020b; Natural England 2013b; Natural England 2013c). Characteristic features of the study area are transitional stretches of lowlands and river valleys which extend onto the now-submerged North Sea plain (in Figure 2). The lowest lying regions are along the upper course of the River Trent and smaller river drainages, near the Humber estuary, the Vale of York, the Wash, and the coastal parts of Lincolnshire and East Riding of Yorkshire (in Figure 8; Ordnance Survey 2020b; Ordnance Survey 2020a; Natural England 2014a).

The present-day research area is climatically varied from very wet to semi-arid and comprises a broad range of UK-wide habitat types. It is predominantly characterised by enclosed farmlands and arable land, urban areas, semi-natural grasslands, moors, mountains, peatlands, and heathlands (see Section B.1.4; Beck, Zimmermann, McVicar et al. 2018; European Environment Agency 2017a; UK National Ecosystem Assessment 2011:Fig.1; European Environment Agency 2017b).

Bedrock and superficial geology

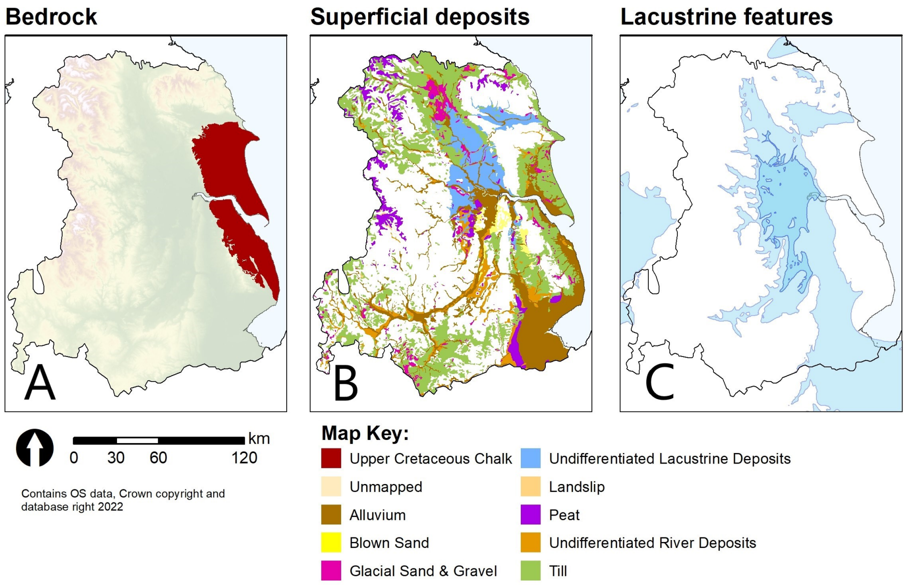


Figure 9: Geological profile of the research area (panels A-C): panel A: the distribution of bedrock/Upper Cretaceous parent Chalk deposits. Panel B: distribution of superficial deposits. The BGS' classification 'Blown sand' refers to aeolian coversand deposits (cf. British Geological Survey 2019b). Panel C: minimal and maximal modelled extent of palaeolacustrine features (BRITICE base map, Clark et al. 2018. Contains OS data, Crown copyright and database right 2021).

The main base map used for comparisons is the British Geological Survey's 1:625,000 bedrock and superficial deposits theme (British Geological Survey 2019b; classification after British Geological Survey 2020b; British Geological Survey 2020a; British Geological Survey 2019c) and my focus here is on the distribution of tabular flint sources on Upper Cretaceous Chalk deposits and on pedogenic soils or superficial deposits. Note that for most of the research area, the superficial geology is classified as 'unmapped' at the resolution, scale, and licensing available for this study (British Geological Survey 2019b; for a comprehensive overview of the geology of the Trent Valley and beyond, see e.g., Knight and Howard 1994, Howard et al. 2009, Howard et al. 2011, Ussher, Jukes-Browne and Strahan 1888, Posnansky 1963 and Bridgland et al. 2014). The distribution of caves and cave sites is naturally limited to areas with karst or limestone geology, which in the research area are concentrated in the Pennines and extending into the Derbyshire, Nottinghamshire, and South Yorkshire border (in Figures 4, 8).

With respect to the observations concerning contrasting lithic raw material behaviour (in Tables 2, 3; Barton 2010), it is interesting to note that the natural distribution of primary source flint is limited to Upper Cretaceous parent Chalk deposits in the Yorkshire and Lincolnshire Wolds (see Figure 9). Other flint theoretically suited for manufacture can be found in derived superficial deposits such as river gravels and moraine deposits, but which are too discrete to be mapped systematically (Henson 1985; Elliot et al. 2021). However, in contexts such as the Trent Valley, the river gravel flint tends to be too small to produce the type of LUP blades found at several sites which includes longer (>100 mm) laminar blade blank removals (see Chapter 5). This provides a useful starting point for discussions on raw material provenance and use in my site-specific lithic analyses (in Sections 5.2.1, 6.1.1, 9.2.2).

The research area is also characterised by different superficial geological character profiles. These deposits, distributed across much of the studied area, were predominantly formed by peri-and postglacial fluvial processes (alluvium, river terraces, glacial sand, and gravel), and aeolian (blown sands, loess) processes. Shown in Figure 9 are large stretches of lacustrine deposits which were formed under peri- and postglacial conditions beneath standing-water bodies such as freshwater lakes. The mapped deposit outlines correspond to the location of palaeolakes Pickering and Humber. Peat deposits, which are typically of Holocene date (British Geological Survey 2020b), were formed under anaerobic decomposition of organic vegetational remains and are predominantly found in the North Yorkshire Dales and Moors, the central Pennines, and south-western Lincolnshire. Till deposits (sometimes in areas of 'boulder clay'), are a heterogeneous composition of unsorted sand and coarser grains in a silt/clay matrix (diamicton) and formed under glaciers. Large-scale till deposits characterise the geology of Leicestershire and Rutland, Lincolnshire, East Riding, and North Yorkshire, with several confirmed LUP sites found on till. As might be expected, high densities of fluvial deposited alluvium of presumed Holocene age are mapped along the River Trent and smaller watercourses (in Figure 9), with the largest concentrations on the western edge of the Humber estuary, along the Lincolnshire coast, and towards the Wash in the south-east. River terrace deposits are located along the courses of the Trent and other larger river systems, whereas glacial sands and gravel are prevalent across North Lincolnshire.

Aeolian Coversands of Loch Lomond Stadial (GS-1) age

Based on the depth of subsequent Holocene sedimentation in Britain, areas with the best preserved, near-ground aeolian coversand deposits are regionally localised to the central research area south of the Humber estuary and previously unmapped smaller concentrations in the Trent Valley and Lincolnshire (see Figure 9). Aeolian (windblown) coversand deposits formed under very dry conditions of relatively low vegetation cover such as during the LLS (GS-1) which marks the end of my study period. Under these cold, stadial conditions, strong winds swept across arid, largely barren landmasses on the North Sea Plain, leading to surface erosion and subsequent aeolian deposition of substantial sand deposits (Bateman 1995, Bateman 1998, Bateman 2008). The internal structures of coversand dunes bear witness of their periglacial origins and aeolian depositional processes (Straw 1963; Straw 1969; Kolstrup 1980; Kolstrup 2002; Bateman 1998; Baker et al. 2013; Bridgland et al. 2014).

Since the apparent scarcity of archaeological evidence indicates that the severe environmental and climatic conditions during the LLS were too inhospitable to support human occupation (cf. Section 2.1.1), LLS aeolian coversands can provide chronostratigraphic *termini* for the underlying older sediments and potentially preserved LUP material. This will be particularly relevant to the case study sites of Farndon Fields, Nottinghamshire (Chapter 5; Garton, Barton and Bateman 2020; Tapete et al. 2017a) and Risby Warren, North Lincolnshire (Chapter 7; Buckland 1984). These site complexes are located in areas where coversands are stratified above archaeological LUP finds, and are probably equivalent to LUP findspots documented beneath Younger Dryas (GS-1) aeolian coversands in the Low Countries and Southern Scandinavia (e.g., Deeben and Rensink 2005; Waterbolk 2012; Vermeersch 1977).

Surface water hydrology features

As stated in the introduction, one of the main aims of this thesis is to determine whether LG humans favoured particular lowland environments over others, such as riverine and lacustrine habitats or biomes. We know for example that riverine and lacustrine freshwater features were important landscape features that are attractive for several reasons; for instance, river systems likely represented natural corridors for animal and human migration during the LG Interstadial, as illustrated by the high density of LUP findspots relative to the Rhine, Maas, and Scheldt river systems which clearly indicate river valleys and watersheds represented preferential locations on the continent (Heinen 2014; Heinen 2016a; Heinen, Schmitz and Thissen 2010; Heinen 2016b; Street 1998; Grimm 2019; Grimm et al. 2020b; Kobusiewicz 2004). Equally, the continental evidence suggests similar intensity in LG occupation of lacustrine environments (De Bie and Van Gils 2006:782, Fig. 1; De Bie and Caspar 2000; Van Gils and De Bie 2004; Rust 1958; Tromnau 1975; Riede et al. 2010). From a subsistence strategy perspective, rivers and lakes act as foci for a range of floral and faunal environmental resources in addition to the availability of freshwater itself (Grimm 2019; Lane, Schadla-Hall and Taylor 2023). Note that for present purposes it is generally presumed that post-LGM lacustrine ecosystems were sufficiently re-established to provide useful biotic resources, as implied by the Vale of Pickering site clusters (see Chapter 6; Palmer et al. 2015).

Although I refer to surface water features as natural corridors for movement, it remains unknown to what extent – or if at all – rivers and lakes were navigated by humans using boats or canoes, which would have eased the transportation of people, food, and equipment. While any direct or indirect evidence for such vessels thus far remains undocumented in the British LUP record, the potential for the use of boats has been examined and established in detail through W. Mills' study of the Channel River Network and southeastern English sites (Mills 2022). In his study, Mills (2022:345, 404-5) "considers riparian environments as catalyser, polariser, and as barrier [or conduit] to mobility for both animal populations and for associated human movements through these landscapes". Overall, firm evidence for LUP boats is sparse on the European mainland. In Northern Germany, G. Tromnau (1987:96) interpreted "some unusually worked" reindeer antlers from Stellmoor as possible structural components of a skin boat, but further work is needed to confirm Tromnau's claims. A similar claim for alleged 'boat artefacts' found at Husum has since been refuted through reinvestigation and redating (Wild et al. 2023; S. Hartz, pers. comm. 2012, S. Grimm, pers. comm. 2022, *contra* Tromnau 1987:95). Though not directly analogous to the research area, the use of boats or canoes has for instance been discussed and debated for Southern Scandinavian Early Mesolithic occupation patterns (Bjerck 2009; Wickler 2019).

The present-day mainland water catchment areas and drainage systems into the North Sea are generally representative of LG landforms (in Figure 8; UNEP 2018:Fig.2.15). Substantial river valleys also persist as submerged features beneath the North Sea where the potential for preserved archaeological evidence on Doggerland has been analysed by the Europe's Lost Frontiers project (Walker et al. 2020; Gaffney, Fitch and Smith 2009; Fitch, Gaffney and Thomson 2007). Since a detailed presentation of the palaeoenvironmental history of onshore and offshore lake and river systems is beyond the present scope of this study (but see Bridgland et al. 2014; Knight and Howard 1994; Malone et al. 2017), for my comparisons of site distribution in Chapter 4 I will focus on the significance of the River Trent network and the two palaeolakes Flixton and Humber, using the BRITICE glacial maps and Ordnance Surveys Open Rivers basemaps (BRITICE 2017; Ordnance Survey 2020b).

River Trent catchment

Since the Trent is the largest river system in the research area with a documented presence spanning half a million years, the palaeoenvironmental and geographical history of the Trent offers a unique range of contextual records. The River Trent has been a substantial feature of Great Britain since before the Last Glacial Maximum. The Trent has undergone significant changes before settling into its modern course to the Humber at the end of the LGM (Bridgland et al. 2014:333; Schreve 2016:90). Now a partially tidal river (298 km length from source to mouth), the low-gradient, wide floodplain Trent basin (10,435 km²) covers most of the lower half of the research area in Figure 8, and occupies a very large watershed from the high points of the Peak District to the lowlands of the Humber estuary. After the Anglian glaciation, the Trent formed part of the now-submerged Fen Basin fluvial network which retained a substantial presence across the North Sea plain, representing potential routes for human and animal movement across the physical connection between once-connected parts of north-western Europe (UNEP 2018). The influence of isostatic rebound on the Trent fluvial terrace gradients has not yet been investigated in full detail (Knight and Howard 2004:9), but Holocene sedimentation has significantly affected the river valleys and floodplains (Bridgland et al. 2014:332; Brown 1997; Bridgland et al. 2006; Antoine et al. 2003; Antoine et al. 2009; Howard et al. 2011; Mills 2020).

Alongside its fifteen tributaries, the Trent still represents a substantial environmental feature across the research area, as do the river systems north of the Humber estuary (Rivers Aire, Ouse, Tees, Ure, Wharf) and the Witham in Lincolnshire. Historically, the Trent has been associated with extensive seasonal flooding causing meandering and subsequent course alteration (Malone et al. 2017). Though the "climatic fluctuations of the Devensian Lateglacial are poorly represented within the Trent fluvial sequence" (Bridgland et al. 2014:332), evidence for the Trent's repeated episodes of high fluvial activity have for instance been recorded at Farndon Fields and may provide *termini* for dating purposes (M. Bateman, pers. comm. 2016).

Lacustrine environments and features

My hypotheses regarding human occupation of lacustrine environments and habitats will be analysed via two important glacio-lacustrine features, i.e., the two palaeolakes Humber and Flixton (in Figure 9). Furthermore, lacustrine deposits may provide important contexts for absolute dating, for instance by varve counting or measuring optically stimulated luminescence of sediments, whilst the shifting location of palaeo-lakefronts in response to climatic change may elucidate shifting site location patterns. The existence of other palaeolakes is presumed in areas now submerged under the North Sea but which are not considered further here (Fairburn and Bateman 2016). Parallels may be drawn with comparable continental evidence, including the high density of sites near Lake Moervart in the Scheldt estuary in north-western Belgium (Crombé, Robinson and Van Strydonck 2014; Crombe and Verbruggen 2002; Crombé and Robinson 2015).

The largest lacustrine feature in my research area is represented by Lake Humber which formed c. 17,000 years ago as ice blocked the Yorkshire Ouse-Humber system (Bridgland et al. 2014; Clark et al. 2012). As stated by Fairburn and Bateman (2016:148), "Lake Humber would appear to have existed for a maximum of 3.5 ka between c. 17–14.5 ka but probably much less". Notably, while the minimal and maximal lake extents in Figure 9 are shown as continuous and sizeable water bodies, at this supra-regional scale the modelled extents are undoubtedly an overestimation inferred from a combination of lacustrine deposit distribution and topography. Recently obtained OSL dates outline a staged terrace level model for Lake Humber, positing lake levels reached their maximal height (42 m above sea level) and surface area at around 16.6±1.2 ka (sample Shfd02012 taken at Ferribridge, Bateman et al. 2008:Table 1; Fairburn and Bateman 2016:Table 2, as adopted for use in BRITICE base map data; Bateman 2008; but see Murton 2018 and Straw 2016 for contrasting views on proposed terrace levels). According to the proposed eight-stage model, lake levels declined rapidly between (Shfd12068) 15.9±0.9 ka and (Shfd13034) 15.2±0.7 ka, and then more gradually before the lake was completely drained by (Shfd11111) 9.13±0.61 ka (Fairburn and Bateman 2016:Table 2). The modelled minimal and maximal extents of palaeolake Humber are shown in Figure 9. Note that the case study site of Farndon Fields is located at the boundary between the maximal and minimal Lake Humber extents, but which is not fully visible at the scale mapped (Garton, Barton and Bateman 2020). Fairburn and Bateman 2016's data are modelled with (near-) horizontal shorelines, suggesting that isostatic rebound did not come into effect during the regression of palaeolake Humber, possibly due to the relative speed of the lake's regression (but see Clark et al. 2018). There remain questions concerning the proposed time scale for complete drainage of Lake Humber, which I will address in the context of site distribution patterns (in Chapter 4 and Section 9.1.2).

In the Vale of Pickering, the large ice-dammed Glacial Lake Pickering had formed during the LGM and was later succeeded by the much smaller and shallower Lake Flixton located at the eastern end of the Vale, where Lake Flixton persisted into the early Holocene (Kendall 1902, in Palmer et al. 2015:51; Cloutman 1988b). Note that the modelled lake outline in Figure 9 delineates glacial Lake *Pickering*, not postglacial Lake Flixton (for more details, see Figures 39 and 40). Recent analyses of the complex bathymetry and stratigraphy of palaeolake Flixton indicate fluctuating water levels during the LG Interstadial and early Holocene which substantially affected the palaeogeography of the lacustrine environment. Lake levels declined from 24 m AOD to 23 m AOD during the LG Interstadial, and continued to decline to 20.9 m AOD during LLS, before gradually fluctuating to 23-24 m AOD during the Holocene. Changes to the lake's extent and depth are especially interesting with respect to the location of LUP and younger sites in the Vale of Pickering. To this end, Lake Flixton is of high, immediate relevance to my hypotheses concerning human occupation of fluvio-lacustrine environments, as will be analysed through the Seamer Carr K case study (Palmer et al. 2015:58-59; see Chapter 6, Section 9.1.2 and Catalogue B; Lane, Schadla-Hall and Taylor 2023; Milner, Conneller and Taylor 2018a; Milner, Conneller and Taylor 2018b).

2.2.3 The LUP archaeological record in the East Midlands

In the following paragraphs, I shall briefly outline the history of discovery of LUP sites in the East Midlands. This will simultaneously introduce the key Creswellian- and FMG-attributable sites and findspots located in the research area as well as constitute the catalogue of Confirmed/Certain LUP sites (i.e., 'Dataset 1'; for detailed site biographies, see Catalogue A). The historiographical presentation will be in tiered, chronological order of site discovery dates between c. 1870 and today, as delineated by the publication dates of key contributions to the subject (Garrod 1926; Wymer and Bonsall 1977 and Campbell 1977a).

All calendric dates referred to herein are CE (Common Era). In keeping with my thematic focus on open-air sites, comparatively more emphasis will be on the third phase of LUP research (between 1977 and until present-day) since developments over the most recent decades are marked by a significant shift towards the open landscapes.

First phase of LUP discoveries (1870s – 1926)

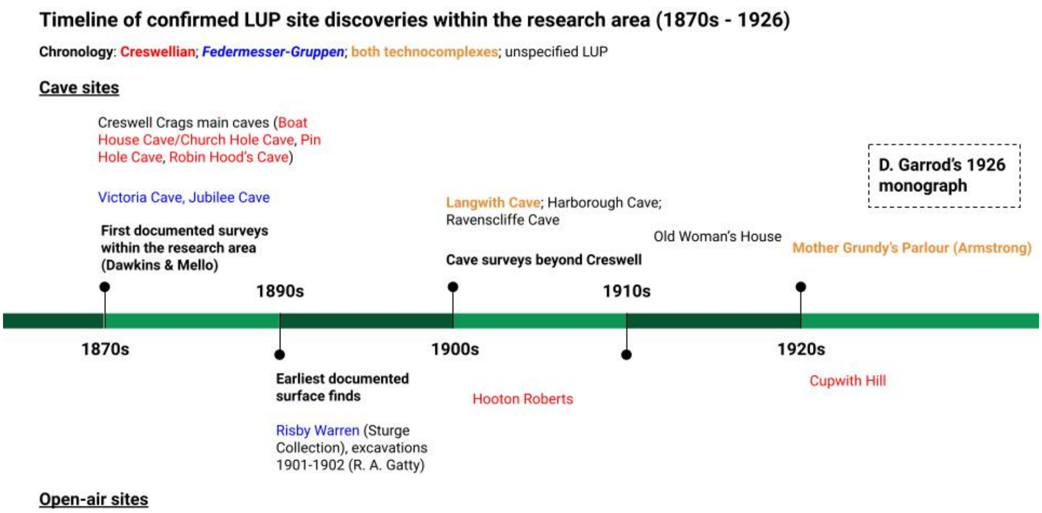


Figure 10: Timeline of confirmed LUP site discoveries between c. 1870 to 1926 (full site biographies in Catalogue A)

A first phase (c. 1870s to 1926) of LUP discoveries and interest in the East Midlands was primarily characterised by cave surveys in the Creswell Crags and Peak District. The earliest reported cave excavations within the research area took place between 1874 to 1879, when William Dawkins and J. Magens Mello began to excavate the larger caves at Creswell Crags (Church Hole Cave, Pin Hole Cave, Robin Hood's Cave), later also Victoria and Jubilee Cave in North Yorkshire (Mello 1875; Mello 1876; Mello 1877; Dawkins 1874; Dawkins 1876; Dawkins 1877). Several of the most well-known decorated, organic LUP implements in Britain were discovered during this first phase, including the 'Pin Hole Man' and 'Robin Hood Cave horse' (see Catalogue A; Trustees of the British Museum 2019b; Trustees of the British Museum 2011; Sieveking 1987). Subsequent surveys were conducted at Creswell some fifty years after Dawkins' and Mello's initial excavations (Armstrong 1925; Garrod 1926), while several other sites (in Figures 10, 4) were identified and investigated between c. 1900 and the 1920s (Harborough Cave, Langcliffe Cave, Ravenscliffe Cave, Old Woman's House Cave, Mother Grundy's Parlour; Hooton Roberts, Cupwith Hill).

Interestingly, around the beginning of the 20th century, open-air 'stations' and findspots such as Risby Warren in North Lincolnshire (see Chapter 7) had emerged as chance discoveries on industrial extraction sites, in quarries, or in railway ballast flint (Gatty 1901; Gatty 1902; W. A. Sturge Collection in Smith 1931; Phillips 1933:115; Harris, Ashton and Lewis 2019). However, as illustrated in Figure 10, the site distribution ratio was disproportionately skewed by a factor of 3:1 in favour of cave to open-air sites. The then-known Creswellian-attributable component included 4 cave and 2 open-air sites, 3 sites classified as FMG (2 cave, 1 open-air site), 2 cave sites at which both LUP industries have been identified, and 3 cave sites of unspecified LUP attribution (in Figure 4).

Second phase of LUP discoveries (1926 – 1977)

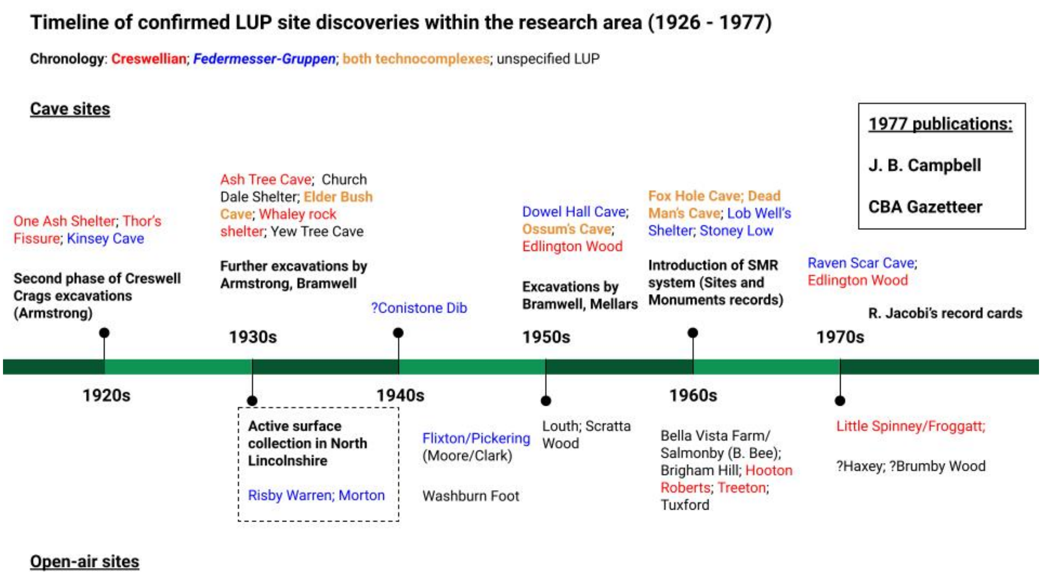


Figure 11: Timeline of confirmed LUP site discoveries between 1926 and 1977 (full site biographies in Catalogue A)

Over the course of the next five decades. i.e., the interim years between Garrod 1926 and notable 1977 publications (Wymer and Bonsall 1977; Campbell

1977a), the total number of confirmed LUP sites in the research area increased, including the number of open-air sites, all while new surveys and re-investigations targeted previously known cave sites. During this second phase of research developments in the East Midlands, 17 newly discovered cave sites are matched with a near-equal number of 14 open-air sites (in Figure 11). For instance, the high archaeological potential of the Vale of Pickering, North Yorkshire, was discovered in the late 1940s through J. Moore's and G. Clark's surveys (Moore 1950; Moore 1954; Moore 1959; Clark 1956; Clark 1972), although the case study site Seamer Carr K would not be identified until the 1980s (Lane, Schadla-Hall and Taylor 2023).

Sites discovered during this phase of research included 5 cave and 3 open-air sites classified as Creswellian, as well as 8 FMG-attributable sites, 6 of which are in caves and 2 in the open-air. At 4 of the investigated cave sites, evidence for the presence of both LUP industries was identified, whereas 11 entries in Figure 11 are of unspecified LUP classification (including 2 cave sites and 9 open-air findspots; cf. Catalogue A; Figure 4).

Third phase of LUP research (1977 to the present)

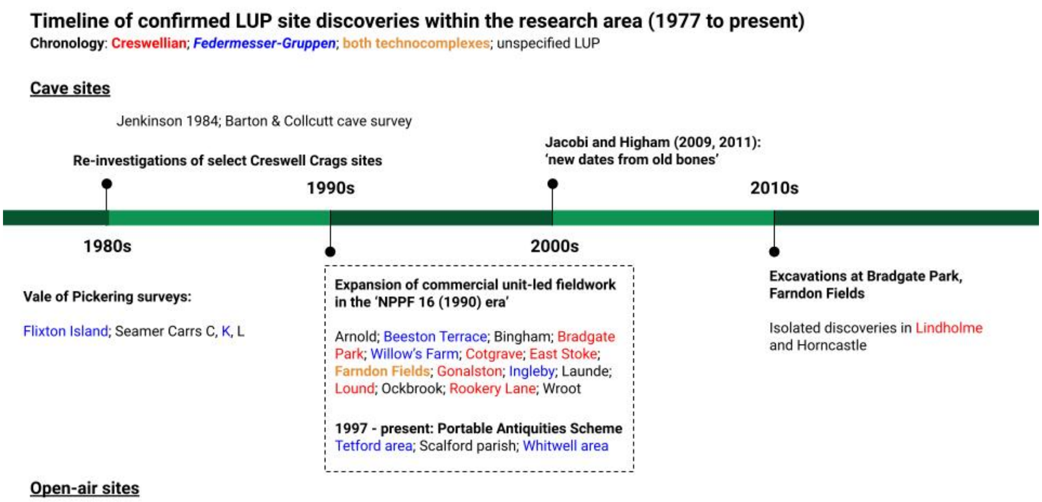


Figure 12: Timeline of confirmed LUP site discovery between 1977 and until present-day (detailed site biography entries in Catalogue A)

The increase in open-air sites discovered during this ongoing third phase of research (see Figure 12) marks a significant departure from the cave-site biased distribution patterns that had characterised the first century of LUP research. By now, the importance of the open, lowland landscapes as focal points of human LUP activities becomes firmly established largely through new fieldwork and extended surveys of previously identified open-air sites in the research area. The timeline in Figure 12 features 24 entries which are all located in open landscapes, 7 of which are Creswellian-attributable and 7 sites are classified as FMG. At Farndon Fields, Nottinghamshire (see Chapter 5), evidence possibly attributable to both technocomplexes has been recovered since 1991 (Trent and Peak Archaeology 1991; Garton and Jacobi 2009; Harding et al. 2014; Garton et al. 2016; Garton, Barton and Bateman 2020), whereas 9 open-air findspots are either unspecified LUP or Terminal Upper Palaeolithic (in Catalogue A).

The increase in LUP site count and shift towards open-air locales ought to be judged together with the introduction of the National Planning Policy Framework 16 in 1990 (Ministry of Housing, Communities and Local Government 2019) which had significant effects on legislation and planning directives and has resulted in an unprecedented volume of archaeological interventions (Ralston and Hunter 2009:7-8). As a result of these legislative changes, multiple open-air LUP findspots (in Figures 12, 4) have been identified through commercial unit-led fieldwork ahead of large-scale infrastructural and industrial development schemes (including Arnold, Beeston Terrace, Bingham, Castle Donnington, Cotgrave, East Stoke, Farndon Fields, Gonalston, Launde, Lound, Rookery Lane, Leics., Wroot; see Catalogue A). These newly discovered open-air sites are significant in that they represent the first confirmed open-air LUP evidence for naturally 'cave-less' counties such as Leicestershire and Rutland which had thus far appeared as largely blank spaces in the LG landscape, whilst at the same time increasing the overall number and density of LUP sites in all of the research area's counties (Cooper 1996; Cooper 2002; Jacobi, Garton and Brown 2001). The available archaeological corpus was furthermore expanded through continued surveys of known areas of high LUP potential, for instance in the Vale of Pickering (in Chapter 6; Lane, Schadla-Hall and Taylor 2023).

Parallel to the work undertaken by archaeological units and research projects, notable discoveries and subsequent investigations have been made by East Midlands-based archaeology initiatives and collectors at Bradgate Park, Ingleby, and Ockbrook (see Catalogue A), as at my case study site of Farndon Fields (Nottinghamshire; Cooke and Mudd 2014; Garton and Jacobi 2009; Garton et al. 2016; Garton, Barton and Bateman 2020), and at Bradgate Park (Leicestershire; Cooper 2002; Cooper 2012; L. Cooper, pers. comm. 2015-2021). Other important developments include the increasing online availability of large-scale heritage management data repositories such as county-specific Historic Environment Records (Historic England 2018a; Historic England 2019a), and the Portable Antiquities Scheme which since its initial launch has amassed more than 1.5 million archaeological object records reported by members of the public (The Portable Antiquities Scheme 2017).

On the surface, the fifteen 'NPPF 16 era' sites shown in Figure 12 are a comparatively modest number. However, contrasted with Figures 10 and 11, the 1990s certainly represent the decade with the greatest increase in documented discoveries of open-air LUP sites in my research area. Combined with their context of discovery (mostly derived from commercial unit-led work) and their location (out in the open landscapes), to me this pattern is representative of an emerging trend or tendency that greatly influenced my data collection of heritage management data (see p. 4; Chapters 3, 4, 8 and Section B).

Chronology of human re-occupation of the research area: timing and spatial distribution

As already alluded to, diachronic patterns are evident in the processes of LG human re-occupation of Britain, with the earliest southwestern British evidence for the return of human groups after the LGM predating the re-occupation of the East Midlands research area by some several hundred radiocarbon years (in Tables 1, 4). As illustrated in Figure 113, up until the implementation of the newest IntCal20 calibration curves (Reimer et al. 2020), available AMS dates for Creswell Crags placed the timing of East Midlands re-occupation after the 14.7 ka warming event (Jacobi and Higham 2011:Fig.12.13). However, recalibration using the IntCal20 curve has shifted the beginning of the 95.4% probability distribution towards older calendric dates to predominantly pre-date the rapid oscillation around 14,700 cal BP (in Figure 113, Table 4). Individual shifts in the 95.4% probability distribution range between an earlier onset by 1-15 years and up to 336 years later (OxA-18349, which now falls within the end of GS-2). While this development modifies received ideas concerning the earliest onset of human re-occupation of the research area, the underlying pattern of delayed occupation compared with other parts of Britain remains valid (Sections 2.1.3, 9.2.1, 9.3).

Interestingly, whereas the most recent major re-dating programme (Jacobi and Higham 2011:240) found no substantial evidence for contemporaneity of human

Table 4: AMS dates from samples obtained at Creswell Crags cave sites: Church Hole (CH), Mother Grundy's Parlour (MGP), Pin Hole (PH), Robin Hood's Cave (RHC; data from Jacobi and Higham 2011:Table 12.9-10). Age is radiocarbon age. Unmodelled dates (cal BP) calibrated using OxCal v4.4.4 with the IntCal20 curve (ranges given at 95.4% certainty; Bronk Ramsey 2009; Bronk Ramsey 2017; Reimer et al. 2020)

Site	**Sample**	**Lab code**	**(^{14}C age BP)**	**Unmodelled (cal BP)**
CH	*L. timidus* bone	OxA-18706	12,355±50	14,837-14,124
CH	*L. timidus* bone	OxA-18704	12,395±45	14,850-14,216
MGP	*E. ferus* tooth	OxA-19507	12,280±50	14,804-14,064
MGP	*E. ferus* tooth	OxA-19503	12,315±55	14,821-14,081
MGP	*E. ferus* tooth	OxA-X-2286-54	12,450±60	14,971-14,285
MGP	*E. ferus* tooth	OxA-20193	12,455±55	14,966-14,303
MGP	*E. ferus* tooth	OxA-19505	12,545±50	15,125-14,500
PH	*L. timidus* bone	OxA-19526	11,900±50	14,004-13,601
PH	*L. timidus* bone	OxA-18348	12,175±50	14,308-13,864
PH	*L. timidus* bone	OxA-19162	12,375±55	14,847-14,165
PH	*L. timidus* bone	OxA-19163	12,430±55	14,943-14,268
RHC	*L. timidus* bone	OxA-18349	12,265±50	14,804-14,051
RHC	*L. timidus* bone	OxA-17526	12,320±50	14,818-14,089
RHC	*L. timidus* bone	OxA-17546	12,400±45	14,859-14,222
RHC	*L. timidus* bone	OxA-17542	12,445±45	14,938-14,309
RHC	*L. timidus* bone	OxA-17525	12,465±50	14,973-14,316

activities in the Cheddar Gorge, Wye Valley, and Creswell Crags, the recalibrated dates in Tables 1 and 4 indicate that there may indeed have been more overlap between regions than previously posited, which further emphasises apparent typo-technological similarities in the lithic inventories.

Further to the north, beyond an imaginary line from the Severn to Humber Estuary, the earliest onset of human presence occurred even later, as illustrated in Figure 114. With the exception of one re-calibrated sample from Victoria Cave, N. Yorkshire (OxA-15078, "a carrion carried into the cave by wolves from a human kill", Jacobi and Higham 2011:241, Table 12.11), all available dates are thus far entirely limited to within the second half of the LG Interstadial (GI-1c-a/Allerød chronozone; in Table 5). Recalibration of individual dates using the IntCal20 curve has shifted the beginning of the 95.4% probability distribution by up to 24 to 54 years later, and up to 179 years earlier (in Figure 114), This delayed arrival of human groups in the North is further supported on typo-technological grounds, since the lithic evidence is primarily indicative of a later FMG *faciès* (see Catalogue A). The recalibrated dates in Figure 114, Tables 4 and 5 indicate there may have been some degree of contemporaneity in site use between Creswell

Table 5: AMS dates from samples obtained northern English and Welsh sites. Note that Bart's Shelter, High Furlong, and Lynx Cave are beyond the East Midlands research area, but are here added for further context (data from Jacobi, Higham and Lord 2009:Table 4, 8; Jacobi and Higham 2011:Table 12.3, 12.11). Age is radiocarbon age. Unmodelled dates (cal BP) calibrated using OxCal v4.4.4 with the IntCal20 curve (ranges given at 95.4% certainty; Bronk Ramsey 2009; Bronk Ramsey 2017; Reimer et al. 2020)

Site	**Sample**	**Lab code**	**(^{14}C age BP)**	**Unmodelled (cal BP)**
Bart's Shelter	*A. alces* tooth	OxA-11646	11,600±70	13,594-13,317
Conistone Dib	indet. bone point	OxA-2847	11,210±90	13,300-12,920
High Furlong	*A. alces* bone	OxA-11151	11,660±60	13,734-13,354
High Furlong	*A. alces* bone	OxA-13075	11,715±50	13,746-13,464
Kinsey Cave	*R. tarandus* antler artefact	OxA-2456	11,270±110	13,405-12,922
Lynx Cave	*C. elaphus* bone	OxA-19206	11,640±45	13,598-13,372
Lynx Cave	*C. elaphus* bone	OxA-19207	11,680±45	13,731-13,448
Victoria Cave	*R. tarandus* antler harpoon	OxA-2607	10,810±100	13,054-12,619
Victoria Cave	barbed antler harpoon	OxA-14888	10,930±45	12,965-12,748
Victoria Cave	*R. tarandus* antler artefact	OxA-2455	11,750±120	13,994-13,344
Victoria Cave	*E. ferus* bone	OxA-15078	12,325±50	14,821-14,092

Crags and further north. The evidence from North Yorkshire indicates resource exploitation of colder climate taxa which is not documented for the Creswell Crags sites.

High-reliability LUP sites in the East Midlands research area

Emerging from the overviews in Sections 2.2.3 and 2.2.3 are the two sets of Creswellian- and FMG-attributable sites which constitute my main sources of LUP site data for the research area. Note that no firm differentiation is made between 'sites' and 'findspots'; both terms will be used interchangeably in reference to a confirmed LUP locale in the cadastral sense. I do want to acknowledge that this broad categorisation - or apparent lack thereof - of 'sites' may be regarded as rather crude, since some open-air site assemblages may consist of only a very small number of diagnostic elements, often as little as a single tool (see Figure 73 and Catalogue A). However, I would like to argue that in the regional context of the East Midlands LUP record, even a single diagnostic (surface) find is important for the purposes of this study, since such isolated discoveries may document the presence of a previously unknown open-air locale - possibly of untapped potential - or represent a 'signature' of LG presence (Mills 2022:Table 2-1). I have found this minimal, yet flexible definition to be most representative or encapsulating of the LUP evidence, and in lieu of a more rigid delineation between sites/findspots as based on quantitative (i.e., assemblage sizes), spatial, or other parameters (i.e., reference events or site use categories, Campbell 1977a:31; Evans 2013; Mills 2020). To better frame comparable data, sources will be analysed through a three-tiered classification of source types (in Chapter 3). Due to the limited availability of contextual organic data for the selected open-air sites, the seasonality of human occupation of the open landscapes will not be considered further.

Based on absolute AMS dates which place the time of site occupation within the first half of the LG Interstadial (GI-1ed/Bølling chronozone) and the presence of diagnostic typological and lithic technological traits (in Section 2.1.4), I have included 29 Creswellian-attributable locales in this study (in Figures 10, 11, 12). These site data comprise 16 cave and 13 open-air sites and include 8 sites (7 caves and 1 open site) where both Creswellian- and FMG-attributable material has been documented (for further details, see Catalogue A.2, Tables 6 and 4). The selection of 24 FMG-attributable sites is based on a small corpus of available radiocarbon determinations which place the time of human occupation into the second half of the LG Interstadial (GI-1cba/Allerød chronozone). Further site selection was undertaken on typo-technological grounds (cf. Section 2.1.4). My FMG site data are represented by 15 cave and 9 open-air sites and include 7 cave sites and 1 open-air locale where material from both Creswellian- and FMG-attributable phases of human occupation has been recovered (further details in Catalogue A.3, Tables 6, 4, 5). An earlier FMG classification has been suggested for Farndon Fields, Nottinghamshire on typo-technological grounds (Garton and Jacobi 2009:30; Garton et al. 2016), which is a question I will address in my analyses. There are distinct differences in the estimated maximal presence of Creswellian- and FMG-attributable technocomplexes that may have ramifications for the number of known sites and their geographic distribution. Compared with the c. 750 year duration of the first half of the LG Interstadial (GI-1ed), the length of GI-1cba measures c. 1060 years. The potential window of presence of FMG-type material thus exceeds the duration of Creswellian-attributable occupation by approximately 310 years (equivalent to c. 30% greater timespan). Therefore, I will need to control for the significant differences in duration. However, at this stage it is interesting to note that my site dataset includes more Creswellian- than FMG-attributable sites, and I will return to this observation and others in my analyses (in Chapter 9).

2.2.4 Summary

Through a generalised overview of LG Britain, and more detailed emphasis on the East Midlands research area, this chapter sets up the relevant chronological, geographical, and archaeological framework for this study. The subsequent two chapters will provide further contextual information by introducing the methodology (in Chapter 3), and known LUP site distribution patterns (in Chapter 4).

Table 6: High-reliability cave and open-air sites and findspots located in the East Midlands research area

Creswellian-attributable sites
• **Cave sites:** Ash Tree Cave, Boat House Cave, Church Hole Cave, Creswell Crags, Dead Man's Cave, Edlington Wood, Elder Bush Cave, Fox Hole Cave, Langwith Cave, Mother Grundy's Parlour, One Ash Shelter, Ossum's Cave, Pin Hole Cave, Robin Hood's Cave, Thor's Fissure, Whaley rock-shelter • **Open-air sites:** Bradgate Park, Cotgrave, Cupwith Hill, East Stoke, Farndon Fields, Gonalston, Hooton Roberts, Lindholme, Little Spinney/Froggatt, Lound, Rookery Lane, Salmonby area, Treeton

FMG-attributable sites
• **Cave sites:** Conistone Dib, Creswell Crags, Dead Man's Cave, Dowel Hall Cave, Elder Bush Cave, Fox Hole Cave, Jubilee Cave, Kinsey Cave, Langwith Cave, Lob Wells Shelter, Mother Grundy's Parlour, Ossum's Cave, Raven Scar Cave, Stoney Low, Victoria Cave • **Open-air sites:** Beeston Terrace, Farndon Fields, Ingleby, Messingham/Morton, Risby Warren, Seamer Carr K, Tetford area, Whitwell area, Willow's Farm

Chapter 3

Methodology

This chapter outlines the methodological approach developed for this study. Data used throughout this thesis has been classified into three categories of primary, secondary, and tertiary source types which can be further divided into different subcategories of archaeological and contextual data. The materials analysed (see p. 4) are each associated with different qualities, caveats, and differential levels of interpretive strength. Each of the site-specific case studies and datasets combine data derived from different source types, and all materials were studied through first-hand artefact handling and large-scale desk-based assessments (Chartered Institute for Archaeologists 2017). Since lithic material represents the main artefactual LUP evidence available for my study, emphasis here will be on the lithic analysis methods used in accordance with an adapted *chaîne opératoire* theoretical approach. Further outlined are general observations arising from the analyses of extant lithic assemblages, and important methodical considerations regarding data collection using UK heritage management data repositories.

The selection of site-specific assemblages for study was motivated by the intention to examine three of the richer LUP inventories found in the open East Midlands landscapes. The rationale for analysing extant collections and online heritage management data repositories was driven by three intentions: (1) to identify hitherto 'hidden' or under-reported findspots in UK heritage management datasets; and (2), to see whether existing artefact classifications of extant surface finds (Wymer and Bonsall 1977, see entries in Catalogue A) could be sustained according to contemporary lithic classification schemes (cf. Section 2.1.4); and (3), to examine the interpretive potential of extant finds with respect to specialised lithics research questions. Since this study draws extensively from the available corpus of extant surface finds and assemblages from low-to medium-reference events, all sources of contextual documentation have been source-critically reviewed and positioned within an integrated, historiographical approach.

3.1 Source types and the rationale for choosing a historiographical approach

The differential levels of resolution or interpretive strength of analysed artefact data vary categorically, yet systematically between source types. The most 'ideal' data for specialised lithics research are primary sources from high-resolution reference events (Evans 2013; Mills 2020:10-12). However, since secondary sources from medium- to low-resolution reference events in many cases constitute the only available artefact sources for large parts of the research area, this project necessarily relies on their uses. To ensure cohesion in my data collection, the lower-resolution artefact data has been approached and studied in accordance with the same lithic analysis methods within the adapted *chaîne opératoire* conceptual framework devised for higher-resolution assemblages.

Primary sources of evidence are here defined as high-resolution, single-event excavated lithic inventories with known provenance, stratigraphic concordance, and detailed contextual information. High-resolution data of this kind is rare from British LUP sites but some of the best primary source examples are from the East Midlands study area (in Catalogue A). The lithic assemblages from Farndon Fields, Nottinghamshire (in Chapter 5), and Seamer Carr K, North Yorkshire (in Chapter 6), will form the basis of testing very specific research hypotheses and questions relating to lithic typology and technology. The accompanying site documentation will form the basis of discussing the timing and nature of on-site activities (see Section 9.2.3).

Secondary sources comprise extant surface finds or smaller lithic scatters from medium- to low-resolution reference events for which contextual evidence or supplementary documentation is typically limited. The secondary sources studied in this thesis are mainly represented by extant museum and private collections and were viewed first-hand, for instance as part of the Risby Warren case study (in Chapter 7). The use of secondary sources requires stringent, systematic preparation and diligence to accommodate the variable availability of contextual information, and to mitigate the differential levels of recovery, recording, and curatorial practices. Due to the increased visibility or relatively easier identification of retouched tools during fieldwalking, extant collections may contain significantly higher percentages of retouched tools (>5%, own observations) than what is typically to be expected of a blade unit or single-context assemblage. Thus, when compared directly against primary source assemblages, secondary source assemblages may appear skewed in their proportions. Importantly, the typo-technological interpretive potential of extant surface finds may be significantly reduced due to incomplete artefact preservation, for instance where post-depositional processes have caused invasive patination or breakage to such an extent that relevant technological knapping attributes are obscured or no longer preserved, or modified tool fragments cannot be conclusively classified (Scottish Archaeological Research Framework 2012; Mallouf 1982).

To complement the artefact-centric source types, three main groups of **tertiary sources** were included in this thesis: large-scale online heritage management data repository datasets (in Chapter 4, Catalogue B), artefact recording sheets or finds databases (in Chapters 6, 7, 8), and complementary literature reviews of site and personal archives, as well as academic and 'grey' literature. The use of these resources requires grading and quality control to accommodate variations in recorded metadata, differences in dataset architecture or output, and possibly outdated or superseded terminology.

Crucially, my efforts to target the full potential of extant artefact and written sources, and to systematically evaluate the LUP potential of the East Midlands, have benefited from an explicit awareness of semantic shifts or changes in typological, terminological *corpora*, and research paradigms over time. As reflected in the timing of discovery and publication dates of several of the studied sources (see Section 2.2.3 and entries in Catalogue A), the available lithic and archival records span the past c. 170 years. It has therefore been necessary to appropriately identify, embed, and position sources within their context or *Begriffsgeschichte* through a source-critical, historiographical appraisal of relevant keywords/metadata, published works, and previous contributors. Equally, my research has drawn on a hermeneutical awareness centred on questions of 'who has seen or worked on what, and who is referring to whom?' as illustrated by R. Jacobi's lasting academic legacy and his distinctive, widely recognisable handwriting style - which to this day provides a means to quickly identify the exact finds recorded by him (Wessex Archaeology and Jacobi 2014; contributions in Ashton and Harris 2015). The recognition of such links has provided further context to the materials studied in this thesis (in Sections 7.1, E, entries in Catalogue A). In practical terms, this contextual awareness and historiographical approach has enabled me to identify or discard potentially relevant artefacts and assemblages of interest, but which are currently obscured by now-obsolete terminology or in mixed LUP and Early Mesolithic collections (e.g., "late upper Aurignacian" *sensu* Armstrong 1931b or "pigmy flints" in Gatty 1902; Piper 2022). Importantly, my comprehensive understanding of now-superseded terminology and historical research developments has equally been helpful in my data collection and dataset curation of the sizeable LUP site datasets collated using UK heritage management data repositories.

3.1.1 Nomenclature and standard definitions

The technical terms and classifications used here follow the standard terminology (Soffer et al. 1991; Inizan et al. 1999; Pelegrin 2000; Floss 2012; Ballin 2021). Where semantic discrepancies between catalogues/inventory lists and my standardised terminology were observed, the latter was given precedence for the benefit of cohesion. Measurements were taken to the nearest millimetre using a standard calliper. Knapping angles (exterior/interior) were recorded to the nearest 5°. Differences in the totals reached in the present study, compared to previously available documentation, can be explained through differences in recording and changes in terminological nomenclature - which especially applies to data from secondary or tertiary sources. In the present study, blades and bladelets are defined as "pre-planned debitage, organized in such a way as to repeatedly produce blades or bladelets from a single core" (Inizan, Roche and Tixier 1992:71). Consequently, a 'true' blade is a standardised, laminar blank removal that is straight or slightly curved in its longitudinal profile, with characteristic dorsal scars, and a $\geq$ 2:1 length to breadth or width ratio. This characterisation also includes (fragmented) blade-like flakes that are recognisable as the products of blade or shorter blade/bladelet production (Inizan, Roche and Tixier 1992:71, 130-131; Bordes 2000; Pargeter and Redondo 2015). A broader classification of removals as 'blades' is used to described debitage products within this length to width ratio, whereas a 'flake' is here understood as a removal with an identifiable ventral surface and a <2:1 length to breadth ratio (Ballin 2021:12). This broad definition of flakes encompasses a wide array of debitage products that can be classified further depending on their function and stage of removal during the *chaîne opératoire* of blade blank and tool production, such as decortication or core correction flakes (Inizan, Roche and Tixier 1992:60). Retouched tools or fragments thereof which metrically fall within that scale of reference are classified according to tool category.

3.2 Lithic analysis methods following an adapted *chaîne opératoire* conceptual framework

The choice of lithic analysis methods was driven by my intention to extract a maximal amount of information through a minimalist technological attribute analysis applicable to both primary source lithic assemblages and at the secondary context/single find level. The overarching conceptual framework is represented by the *chaîne opératoire* theoretical approach, which by now has been firmly established and found broad application across a range of (lithics) studies (e.g., Leroi-Gourhan 1965; Crabtree 1972; Tixier 1978; Cahen et al. 1980; Tixier 1980; Madsen 1983; Lemonnier 1986; Audouze et al. 1988; Auffermann et al. 1990; Pelegrin 1990; Audouze and Enloe 1991; Andrefsky Jr. 1994; Pelegrin 1995; Inizan et al. 1999; Dobres 2000b; Dobres 2000a; Bleed 2001; Andrefsky Jr. 2005; Eriksen 2000a; Eriksen 2000c; Sørensen 2008; Soressi and Geneste 2011; Kotthaus 2019; Mills 2020; Ballin 2021).

Implicit to the use and adaptation of the *chaîne opératoire* framework is an acceptance of its premises relating to cognitive and technological aspects. These aspects are recorded tangibly on the artefacts by the embeddedness of actions and decisions, technique, and their recognisable, physical expressions/manifestations following the systematic subdivision into different stages of production. One of the many benefits of this conceptual framework is this explicit focus on all operational steps - from indirect or direct raw material acquisition, to core preparation, to subsequent steps of removal, correction, tool modification, repair, and discard (Inizan, Roche and Tixier 1984:19-21; Eriksen 2000a:80-83). Each of these steps is significant and integral to understanding the lithic record and reconstructing the nature of human actions and presence. Equally, since my classification criteria for Creswellian- and FMG-attributable industries are based on a holistic grouping of diagnostic criteria (which include differences in raw material provenance and use schemata, different core preparation methods, and diagnostic retouched tools), the entirety of the *chaîne opératoire* of blade blank and tool manufacture is crucial to my analyses of these lithic technocomplexes (e.g., Soressi and Geneste 2011; Sørensen 2006c; Sørensen 2006a; Eriksen 2000c; Andrefsky Jr. 2009; Barton 2010; Weber 2012). Available technological studies for other British and continental LUP sites and lithic technocomplexes were consulted for comparison (e.g., Barton 1990; Barton 1991; Jacobi 1991; Barton 1992; Madsen 1992; Madsen 1996; Barton and Roberts 1996; Caspar and De Bie 1997; Valentin and Bodu 1997; Coudret and Fagnart 1997; De Bie 1999; Pelegrin 2000 and especially Figures 1-4 therein; Conneller 2001; Barton and Roberts 2004; Jacobi 2004; Conneller 2005; Sørensen 2006b; Conneller 2007; Conneller and Ellis 2007; Conneller 2009; Grimm, Skov Jensen and Weber 2012; Conneller et al. 2016; Ballin 2019; Grimm 2019). In the following, I will outline the rationale and process of pre-selection of finds for recording, followed by a brief description of the different lithic analysis methods used.

3.2.1 Data collection and pre-selection of finds for recording

The aim for my lithic artefact data collection was to obtain representative samples of artefact recordings and metric measurements taken on laminar blade blanks, flakes, and retouched tools. Preference was given wherever possible for artefacts with intact proximal ends and completely preserved dimensions. Additionally, descriptions of cores were collated where available. This was to examine questions relating to diagnostic technological attributes such as platform preparation methods or percussion methods and hammer types. In my data collection of the excavated Farndon Fields and Seamer Carr K assemblages, I specifically targeted the highest integrity spatial contexts (trenches or clusters; cf. Sections 5.2, 6.2). Since I had been granted permission to use the complete Seamer Carr K artefact recording sheet, I was able to include a far greater dataset than would have been possible if attribute recording had to be undertaken from scratch. The process of pre-selection of material follows the same principles for extant assemblages and artefacts but may vary greatly on a case-by-case basis, since differential levels of curatorial and recording practices influence access to and availability of material.

Firstly, I verified concordance between finds and their metadata by cross-checking site details, grid/spit/trench labels, stratigraphic concordance, artefact ID, and classification with available site documentation. Where discrepancies such as mislabelled artefacts/bags, missing spatial details, or incomplete inventories or metadata were uncovered, these observations were noted separately (in Catalogues C.1, D, E). Secondly, I sorted artefacts into type groups according to archaeological criteria to see which stages of the *chaîne opératoire* were present to then identify finds with intact preserved proximal ends and begin my lithic attribute recording.

As part of my data collection using extant assemblages, I also included a typological assessment to identify relevant finds of certain or probable LUP classification within the frequently sizeable collections of mixed chronology, or in uncategorised storage containers of stray finds (see Chapter 7). Typology describes the method of grouping artefact forms into mono- or polythetic categories based on observable similarities of physical or stylistic characteristics (Andrefsky Jr. 2005; Berg-Hansen 2017). Prior to the paradigmatic shift towards technological attribute analyses, lithic artefact typologies constituted one of the principal (lithic) analysis methods, which is further reflected in the conventional named stone tool terminologies and relative artefact chronologies (in Section 2.1.4; Sauer and Riede 2019; Grimm 2019). However, as has been pointed out in recurring criticism of typology as a method (Reynolds 2020; Reynolds and Riede 2019a; Reynolds and Riede 2019b; Shea 2014; Shea 2019; Scerri 2019; Marwick and Mackay 2011; Marwick 2019), although the typological sequences described throughout the 20th century have largely correctly identified the underlying structures in the lithic material, it should never be assumed that similar forms or types are an expression of ontological cultures. The use of typology must stay clear of an "inherent notion of types as emic units", with no assumption that types represent 'cultural' markers (Hogue 2014:44; Dunnell 1971; Dunnell 1986). Accordingly, for the intended purposes of my lithic data collection and analyses, a typological assessment has been strictly limited to serve as an efficient and productive starting point from which to evaluate the LUP potential of extant assemblages and even artefact illustrations (see Chapter 8).

Recorded lithic technological attributes

After the pre-selection of finds, the following metadata and attribute recordings were taken on a representative sample of blade and flake blanks, and on retouched tools (Andrefsky Jr. 2005:86-112; Auffermann et al. 1990; De Bie 1999; Weber 2012:39):

- contextual details including finds ID and spatial information
- raw material type and possible source of origin
- finds description and artefact category
- standardised metric measurements of proximal to distal length, perpendicular breadth/width at the midpoint of length, and mesial thickness (using a standard calliper, to nearest mm; Pargeter and Redondo 2015:6; Fig. 5)

- general condition of artefact (degree and character of breakage or patination, recorded in increments of 30%)
- degree of longitudinal curvature (for approximate placement within knapping sequence; Sørensen 2006b)
- butt/platform attributes (e.g., size, shape, preparation; Barton 1990; Barton 2010)
- bulbar scars/indication of hammer type (Pelegrin 2000)
- number and direction of negative removals on the dorsal side
- type, extent, and position of retouch (Inizan et al. 1999:130)
- refits (including number of refitting pieces, type of refit, i.e., breakage or other, refitting artefacts' ID, spatial details)

For cores, a more descriptive approach was adopted.

The preferred language and programs for data manipulation, summary statistics, and visualisations are R and R Studio (R Core Team 2017; Wickham and Francois 2015; Wickham 2009) and base Microsoft Excel. To avoid overplotting of multiple entries with the same numerical values, plots are 'jittered' by adding a small amount of random noise to the data to offset multiple points with the same values.

A frequent criticism posits that attribute analysis is frequently used uncritically, simply viewed *a priori* as an indication of a specific technique without further testing or questioning through experimental knapping or statistical analyses (Shott 1994; Darmark and Apel 2008; Högberg 2009; Damlien 2015). While some of this criticism is indeed justified, it is nevertheless argued that lithic attribute analysis is an appropriate and useful tool for the aims of this study.

Refitting

Refitting provides a means to assess the degree of complete artefact recovery, to identify which stages of the production sequence are represented, and to trace the spatial distribution of artefacts across a locale (Cahen and Keeley 1980; Cziesla 1990; Skar and Coulson 1986; Bodu, Karlin and Ploux 1990; Cziesla et al. 1990; Bodu 2007; Schurmans and De Bie 2007; Weber 2012; Conneller 2000b; Conneller and Schadla-Hall 2003; Kotthaus 2019). Due to demands on space and time, refitting has only found limited use in this thesis. Whenever possible, I endeavoured to set aside time to identify smaller refit units (such as break refits and dorsal to ventral refits) or to expand on existing refit units.

3.2.2 Further methodical considerations and observations arising from the analyses of extant lithic assemblages

The sourcing of relevant secondary sources or extant assemblages was undertaken through reviews of available literature, personal correspondences, catalogues/gazetteers, online museum collections (Wymer and Bonsall 1977; Wessex Archaeology and Jacobi 2014; Chamberlain 2019a; Ashmolean Museum 2019a; Ashmolean Museum 2019b; Trustees of the British Museum 2019a; Creswell Crags Trust 2017b; Lincolnshire County Council 2012; Museum of Anthropology and Archaeology 2019; Pitt Rivers Museum 2016; Historic England 2012a). Accordingly, several museums and named collectors were identified as having relevant collections of LUP-attributable finds from the East Midlands (see p. 4) which I then viewed first-hand through a series of research visits over the course of this project. During these visits I made several recurring observations that collectively describe the differential levels of curatorial practices or the 'taphonomy' or idiosyncrasies of extant assemblages, all which may influence the interpretative potential (Gardiner 1987; Harris, Ashton and Lewis 2019). On a practical level, the extant lithic material studied varied in its overall quantity and quality. Since several of the institutions consulted throughout this study have undergone internal re-organisation or were inaccessible during the pandemic, access to collections was at times either prevented or significantly delayed. The degree of metadata coverage and conditions of curation were highly varied, ranging from storage by finds' metric size in sometimes surprising storage containers such as biscuit tins or cigar boxes which are not unfamiliar to many archaeologists. Furthermore, I observed that some museums grouped finds either by National Grid Reference, collector, or decade of accession, or by specific artefact types, further coupled with different methods of internal storage organisation or subdivision of finds (for instance if finds are numbered or individually bagged). Occasionally, changes in curatorial or recording practices could be linked to individual staff members, allowing their paper trail to be followed-up on more closely.

The practical considerations and observations are also relevant to the study of primary context lithic assemblages for which recordings already exist (Garton and Jacobi 2009; Harding et al. 2014; Conneller 2007). Specifically, where I observed variations in recorded metadata within the same artefact dataset, I was able to link differences to the involvement of several dataset compilers and intermittent phases of recording and site archive compilation (see Sections C.1, D). From my previous work on extant assemblages I have experienced that diagnostically important retouched tools may be absent from the larger debitage assemblages because retouched tools were stored separately, whether on museum display or in the temporary possession of finds illustrators (Kotthaus 2013).

3.2.3 Methodical considerations relevant to the use of UK heritage management data repositories and observed systemic discrepancies

Central to my investigations concerning the potential of LG human occupation of the open East Midlands landscapes is the hypothesis that there exist additional open-air findspots – represented by LUP-attributable surface finds, smaller lithic scatters, or the results from unit-led archaeological interventions - that have been added to heritage management data repositories, but not yet received broader, systematic recognition (cf. Section 2.2.3; Evans 2013; Robbins 2013; Cooper and Green 2017; Huggett 2017; Russell et al. 2018; Mills 2020). At the same time, I wanted to use the same evidence to firstly investigate my hypotheses concerning the distribution of LUP site data relative to physical and human geography features, and secondly to see whether emerging areas of high LUP potential as well as lacunae in the spatial distribution could be uncovered. To this end, I collected data entries for the research area from the online versions of regional Historic Environment Records and the Portable Antiquities Scheme which then underwent subsequent dataset curation to create my 'Dataset 2 of Probable and Possible LUP sites' according to the methodical considerations outlined here. The final Dataset 2 comprises 1705 entries, of which 888 were sourced from the twelve Historic Environment Records offices (hereafter: HER) located in the East Midlands and 817 entries were gathered using the Portable Antiquities Scheme (hereafter: PAS; for further details, see Sections 4.1.2, B and Chapter 8; Historic England 2012a; Historic England 2012b; Historic England 2017a; Historic England 2017b; Historic England 2017c; Historic England 2017d; The Portable Antiquities Scheme 2017; Historic England 2018a; Derbyshire HER 2018; Leicestershire and Rutland HER 2018; Historic England 2018b; Historic England 2018c; Historic England 2018d; Historic England 2019c; Historic England 2019f; The Portable Antiquities Scheme 2019a; Tait 2020).

Here, I will briefly outline the methodical considerations and observations which informed and guided my use of heritage management data repositories, but also of other existing artefact recording sheets and databases - such as the Seamer Carr K 'superK.csv' spreadsheet (in Chapter 6) and the Palaeolithic and Mesolithic Artefacts Database ('PaMELA') which is based on R. Jacobi's extensive legacy collection of now-digitised finds records (Wessex Archaeology and Jacobi 2014; in Chapter 7 and Catalogue A). Firstly, I investigated all raw datasets to identify the different variables and columns relevant to my queries. In the next step, to ensure cohesion between datasets within my intended parameters, I streamlined variables to systematically remove errors, amend omissions or redundancies, and convert or add spatial references.

For my database queries I used an array of chronological terms to identify as many entries from the targeted 14,700-12,900 cal BP timespan, including variations of 'Late/Final Upper Palaeolithic', 'Late Pleistocene', 'Creswellian', *'Federmesser'* as well as artefact-related keywords such as 'backed blade/point' 'prehistoric knife', 'lithic scatter'. Additionally, the PAS provides an advanced search option that enables directly filtered queries for flint primary materials within an upper/lower Palaeolithic chronological boundary. Although both HERs and the PAS follow Historic England's suggested chronology and nomenclature nearly verbatim (Historic England 2015), the PAS instead recommends the use of 'Late' Palaeolithic in lieu of 'Upper' Palaeolithic (The Portable Antiquities Scheme 2019ag). Both Creswellian- (c. 14,700-13,900 cal BP) and FMG-attributable data (c. 13,900-12,900 cal BP) are within the Upper/Late Palaeolithic subphase. The overview shown in Table 7 represents the maximal chronological range of HER and PAS records returned upon my 'Upper Palaeolithic' database queries. As observed, different subphases of the Palaeolithic are not systematically differentiated in a significant proportion of HER and PAS records. The observed maximal range for heritage management records labelled as 'Upper Palaeolithic' (Historic England's Period Level 4) is equivalent to the broadest possible Prehistoric parameter, i.e., ranges from 500,000 BC up until the Roman Conquest in 43 AD. In my experience, there are several contributing causes which explain the observed chronological discrepancies at this systemic level. For instance, an overestimated chronological parameter is frequently used in reference to undiagnostic lithic artefacts of uncertain or ambiguous classification or mixed LUP/Early Mesolithic age. Alternatively, heritage management data entries may represent 'catch-all' records comprising all archaeological finds from a specific locale (e.g., Humber HER 2019a; Humber HER 2019b; West Yorkshire Archaeology Advisory Service 2012). Evidently, this chronological range is a clear overestimation of my period of interest, and effectively meant that upwards of 10,000 data entries had to be individually assessed prior to their inclusion in my Dataset 2. Ideally, based on observed discrepancies regarding chronology and certainty of classification, this

HER/PAS dataset curation would have followed the same rigorous review as for my Dataset 1 of Confirmed and Certain LUP site data (in Catalogue A, Chapter 4). However, since such a rigorous review was unattainable within the present scope, I downscaled the HER and PAS dataset curation to remove the most readily identifiable 'non-LUP' entries (cf. Sections 4.1.2; B.1, 8.1.3, 8.1.4).

Table 7: Historic England Periods list: British prehistory terminology and date ranges (excerpt verbatim from Historic England 2015). Since a significant proportion of 'Upper Palaeolithic' HER records are classified using the broader Prehistoric parameter (500,000 BC to 43 AD), I have here included the full range of prehistoric periods which fall within this chronological range.

Level 1	**Level 2**	**Level 3**	**Level 4**	**Date From**	**Date To**
Prehist.	Early Prehist.	Palaeolithic	Early Palaeolithic	500,000 BC	150,000 BC
			Middle Palaeolithic	150,000 BC	40,000 BC
			Upper Palaeolithic	**40,000 BC**	**10,000 BC**
		Mesolithic	**Early Mesolithic**	**10,000 BC**	**7000 BC**
			Late Mesolithic	7000 BC	4000 BC
	L. Prehistoric	Neolithic	Early Neolithic	4000 BC	3300 BC
			Middle Neolithic	3300 BC	2900 BC
			Late Neolithic	2900 BC	2200 BC
		Bronze Age	Early Bronze Age	2600 BC	1600 BC
			Middle Bronze Age	1600 BC	1200 BC
			Late Bronze Age	1200 BC	700 BC
		Iron Age	Early Iron Age	800 BC	300 BC
			Middle Iron Age	300 BC	100 BC
			Late Iron Age	100 BC	AD 43

In general, there are clear differences in the quality and specificity of recorded artefact metadata between individual object records, which influence the interpretive potential of the output datasets. For instance, unless the entries were written by (named) lithics specialists or revised as part of the Ancient Human Origins of Britain project (Stringer et al. 2015; Polly and Stringer 2011), I observed that HER records typically contain less detailed information regarding lithic finds than R. Jacobi's records for the same artefacts - and may even have greatly contrasting attributed dates. One such notable example is a *lame machurée* from Ockbrook, Derbyshire, which Jacobi correctly attributed to the Terminal Upper Palaeolithic (Jacobi 2014b). However, this is in stark contrast to the Derbyshire HER's proposed Later Prehistoric label (Derbyshire HER 2006; D. Budge, pers. comm. 2019). Regarding the sample of LUP objects from the PAS (see Chapter 8), variations in recorded detail or specificity may be observed (see Section 8.1.4) for instance where named specialists' comments are explicitly cited (amongst others K. Leahy, a PAS National Finds Advisor, The Portable Antiquities Scheme 2019aj, and the late Bill Bee). One of the benefits of the PAS is the inclusion of finds illustrations, which provided an additional means to assess the objects' probable chronology.

3.2.4 Summary

In this chapter, I outlined the methodology which informs this study, firstly by outlining the rationale for material selection and the three tiered source types studied through an integrated historiographical approach, followed by a description of the lithic analysis methods used within an adapted *chaîne opératoire* analytical framework. The emphasis here was on the methodical considerations and observations relevant to my analyses of secondary sources of extant artefact and written contextual data, as well as of UK heritage management data repository LUP site data.

Chapter 4

LUP site datasets and spatial distribution analyses

In this chapter, the spatial distribution of LUP sites is compared with the key geographical, geological, and palaeoenvironmental framework outlined in Section 2.2.2. The spatial analyses will be carried out at two different scales throughout this thesis, i.e., from generalised to more specific observations and by involving two datasets of LUP sites (Confirmed/Certain LUP sites in Dataset 1, and Probable/Possible LUP sites in Dataset 2; see p. 4). If distributional or chronological patterns can be identified for Confirmed/Certain LUP sites (Dataset 1), we may then test if the same patterns are borne out for Probable/Possible LUP sites in Dataset 2 (see Catalogue B). First, I will describe the sources consulted to obtain these two datasets and provide an estimate of LUP site prevalence within the study area. Then I will expand on the regional geographical and palaeoenvironmental contexts with an emphasis on the physical and human geography features with which spatial site distribution is compared. The observations from both sets of spatial analyses will be re-visited in Chapter 9. This will allow further discussion of LG human re-occupation, firstly by comparing similarities and differences between Datasets 1 and 2, and secondly by discussing diachronic patterns in the distribution of Creswellian-/FMG-attributable sites. The first dataset ('Dataset 1') consists of the 69 confirmed and certain LUP sites which were introduced in Section 2.2.3 and for which full site biographical details are collated in Catalogue A. Since this first dataset is the cumulative result of my extensive historiographical review of extant source material, including first-hand artefact examinations where possible, I consider Dataset 1 to be of utmost value to address the most specialised research questions. As such, this dataset will be given priority for the analyses in this chapter. All subsequent site-specific case studies were sourced from this pool of confirmed and certain LUP sites.

The creation of a second dataset of probable and possible LUP sites ('Dataset 2') was borne out of my observations concerning research developments since c. 1990 (see Section 2.2.3). Changes to the British archaeological sector over the past thirty years have resulted in an unprecedented volume of commercial unit-led interventions, and which have uncovered open-air sites of certain and confirmed LUP attribution (such as Farndon Fields, Notts; see Figure 12). As discussed in Section 2.2.3, I regard the increase in LUP open-air sites discovered through unit-led interventions as indicative of a significant trend. Since records management is predominantly handled by local HER offices, my observations then provided me with an impetus to systematically approach the wider potential for probable and possible LUP evidence held in heritage management data repositories (HERs and PAS; see p. 4, Section 3.2.3). As the PAS data primarily consists of individual finds made by members of the public, the inclusion of these records in my sample of heritage management data enables me to gauge and capture the potential for lithic LUP finds and findspots not widely reported elsewhere (see Chapter 8). Consequently, the value of Dataset 2 lies in its potential to use a large volume of Probable/Possible LUP heritage management records in an exploratory, yet qualified way and within the same parameters employed for the Confirmed/Certain Dataset 1.

My sample of 1705 Probable/Possible Upper Palaeolithic UK heritage management site records includes 888 HER entries and 817 PAS entries obtained through desk-based assessments of Historic England statutory data, HERs, and the PAS (Historic England 2019h; Historic England 2018a; The Portable Antiquities Scheme 2017). Data collection and dataset curation follow recommended guidelines (Chartered Institute for Archaeologists 2017) and the methodology outlined in Chapter 3. Due to observed discrepancies regarding the LUP classification of HER and PAS data that could not be fully resolved on a case-by-case basis within the scope of this study (cf. Sections 3.2.3, Catalogue B.1), my sample of heritage management data will form the separate Dataset 2 of Probable/Possible LUP sites. Note that since records for Confirmed/Certain LUP sites (i.e., my Dataset 1) are actively managed by the local HERs, there will be a small overlap of 69 site entries between Datasets 1 and 2. This overlap between datasets is warranted and necessary; to exclude the confirmed LUP Sites (Dataset 1) from my Probable/Possible HER and PAS sample would be a misrepresentation of the certifiably high reliability LUP evidence managed by HERs and the PAS (see Catalogues A, B).

4.1 Available sources and datasets mapped

4.1.1 Dataset 1: Confirmed and certain LUP sites of high reliability

This first dataset includes 69 Confirmed/Certain LUP sites (for timelines of discovery and site biographies, see Section 2.2.3 and in Catalogue A). Sites where both Creswellian- and FMG-attributable material has been recovered are counted as separate entries. Whereas evidence from cave sites long dominated the LUP discourse in the research area, for the past thirty years, new sites have predominantly been discovered in open, lowland landscapes. This shift represents a sharp contrast to the first century of LUP discoveries (1870s to c. 1977) and is of great significance to my analyses. The canonical cave sites are of continued importance and my Confirmed/Certain LUP site data thus comprises a total of 36 cave and 33 open-air sites of Creswellian, FMG, and unspecified LUP classification. Dataset 1 includes 29 Creswellian sites (16 cave and 13 open-air) and 24 FMG sites (15 cave and 9 open-air). Confirmed/certain sites of unspecified LUP classification are represented with 5 cave and 11 open-air sites (see Tables 8, 6 and in Catalogue A).

Due to administrative reorganisations of county borders (Local Government Act 1972, UK Parliament 1972), the administrative location of several Creswell Gorge cave sites on the Derbyshire, Nottinghamshire, and South Yorkshire border has shifted. Cave sites are naturally absent from counties where no natural caves are located. Sites are unevenly distributed across studied counties, ranging from 25 Derbyshire sites to only 1 in West Yorkshire (cf. Tables 8 and 6).

LUP representivity on the Schedule of Monuments

At the national level, Historic England is the highest authority on heritage and scheduling protection. Historic England maintains and publishes the Schedule of Monuments, i.e., the central register of national heritage sites also referred to as 'The List' (Historic England 2019h). At present, over 400,000 sites are listed from across all of Great Britain but of which only 53 are classified as containing Palaeolithic evidence, which is equivalent to 0.01% of all scheduled sites. Out of the 53 scheduled Palaeolithic sites in England, over 40 are caves or

Table 8: Dataset 1: tabulated overview of confirmed/certain LUP cave and open-air sites

County	Creswellian		FMG		LUP		Total
	caves	open-air	caves	open-air	caves	open-air	
Derbyshire	11	1	6	3	4	0	25
East Riding	0	0	0	0	0	1	1
Leics./Rutland	0	2	0	1	0	1	4
Lincolnshire	0	1	0	3	0	4	8
North Yorkshire	0	0	5	1	0	0	6
Nottinghamshire	0	5	0	1	1	4	11
South Yorkshire	2	3	2	0	0	1	8
Staffordshire	3	0	2	0	0	0	5
West Yorkshire	0	1	0	0	0	0	1
Total	16	13	15	9	5	11	69

rock shelters with components of LUP-attributable lithic assemblages and faunal remains. Open-air sites are substantially under-represented on the Schedule of Monuments, because open-air sites with Palaeolithic and/or Mesolithic material are typically characterised as ‘sites without structures’ and therefore less likely to be selected for scheduling (Historic England 2018e:18). During data collection, I noted discrepancies in search results between the Heritage Gateway website (Historic England 2012a) and Historic England’s interface (Historic England 2019h), indicating that although both search tools are managed and maintained by Historic England, the Heritage Gateway output data consistently returned incomplete search results. Observed discrepancies were communicated directly to Historic England during an open consultation process in 2019 (J. Last, pers. comm. 2019, Historic England 2019g). All references below are therefore sourced via Historic England 2019h. At present, the only scheduled Palaeolithic sites in the wider East Midlands research area are the sixteen following cave sites (cf. Figures 13, 10, 11, Catalogue A):

- Ash Tree Cave, Whitwell, Derbyshire (Historic England 1991a)
- Palaeolithic cave remains on the Welbeck Abbey estate, Nottinghamshire (Historic England 1986), which includes the Creswell Gorge sites: Boat House Cave, Church Hole Cave, Pin Hole Cave, Mother Grundy’s Parlour and Robin Hood’s Cave, Derbyshire and Nottinghamshire (Historic England 1979b, Historic England 1979a)
- Dead Man’s Cave, Anston, South Yorkshire (Historic England 1992)
- Dowel Cave, Hartington Middle Quarter, Derbyshire (Historic England 1991b)

- Elderbush Cave, Wetton, Staffordshire (Historic England 1949a)
- Fox Hole Cave, Hartington Middle Quarter, Derbyshire (Historic England 1991c)
- Kinsey Cave, Giggleswick, North Yorkshire (Historic England 1949c)
- Langwith Cave, Langwith, Derbyshire (Historic England 1936)
- Lob Wells Shelter, Thorpe Salvin, Rotherham, South Yorkshire (Historic England 1991d)
- Ossum's Cave, Grindon, Staffordshire (Historic England 1991e)
- Victoria Cave and Jubilee Cave, Langcliffe Scar, Langcliffe, North Yorkshire (Historic England 1949d, Historic England 1949b)

Thus, pending revisions to the scheduling selection criteria which would more easily enable the addition of nationally important open-air sites (as discussed during the open-consultation as part of Historic England 2019g and Historic England 2019d:4.1), the Schedule of Monuments upholds the historically cave-biased findspot distribution pattern (see Figure 13). Furthermore, since the scheduled cave sites were among the first LUP sites identified and surveyed in the research area, the scheduled status primarily reflects results from the first century of LUP research in Britain, i.e., excludes the significant discoveries which have been made since the 1980s and onwards (cf. Sections 2.2.3 and 2.2.3). All scheduled sites form part of the Confirmed/Certain Dataset 1, and the Probable/Possible LUP site Dataset 2.

4.1.2 Dataset 2: Probable and possible LUP sites recorded in UK heritage management data repositories

Sample of Probable/Possible LUP findspots sourced from HERs

The motivation and rationale behind the creation of Dataset 2 was addressed on pp. 4, 67 and Section 3.2.3. At the county-level, HER records provide the most comprehensive overview of documented heritage assets within their administrative boundaries, including archaeological evidence. To provide a holistic understanding of all known heritage assets and their context, data is typically compiled from a variety of sources such as archaeological surveys and excavations, site archives, grey literature, aerial photographs, and historic documents. Heritage management findspot data from the extended East Midlands research area is managed by twelve different HERs which are located at local

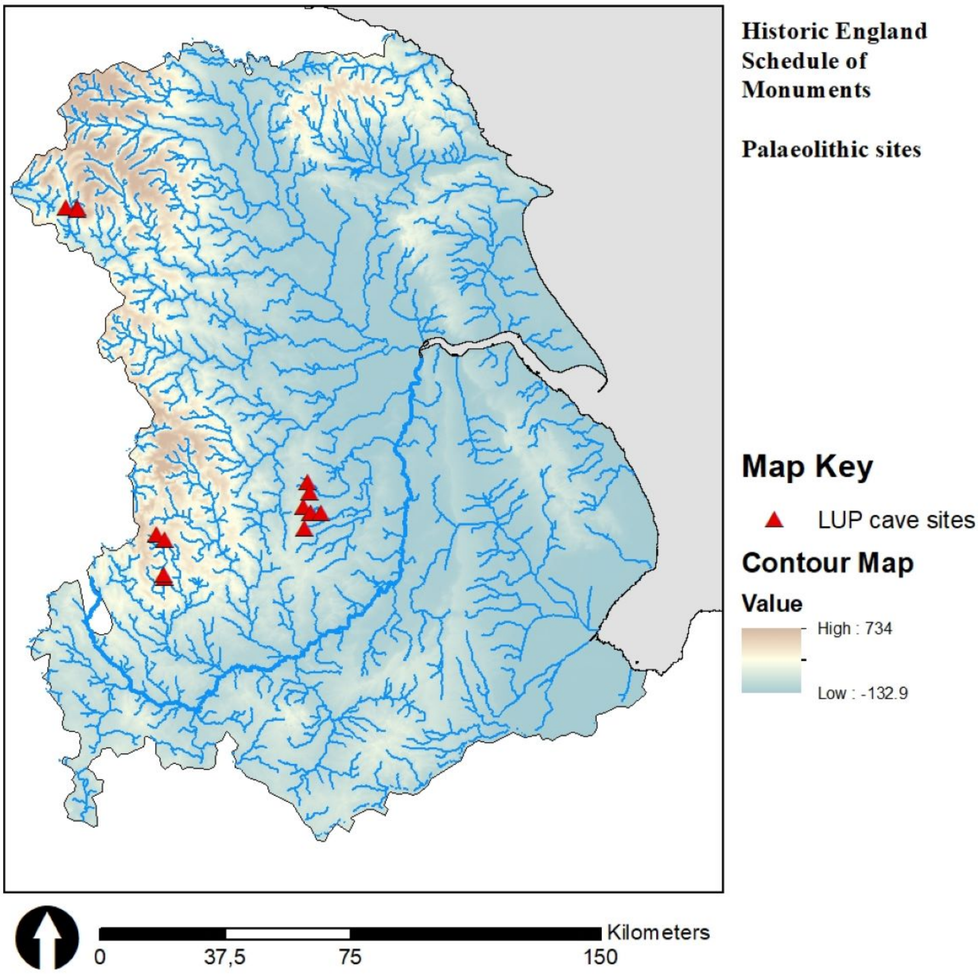


Figure 13: Distribution of Historic England's Schedule of Monuments Palaeolithic sites across the research area. All scheduled sites are LUP cave sites (Note over-plotting of neighbouring findspots in Staffordshire and Derbyshire. Contains OS data, Crown copyright and database right 2021)

planning authority and county council offices. The overall volume of site data managed by HERs has steadily risen in tandem with the increase in contract archaeology projects after the introduction of the National Planning Policy Framework 16 (Ministry of Housing, Communities and Local Government 2019:55, Annex 2: Glossary; UK Parliament 1979; Historic England 2019e; Historic England 2019d; cf. Section 2.2.3). Detailed spatial distribution analyses are presented in Catalogue B and in Chapter 9 I shall discuss emerging observations and results from comparisons between the spatial analyses of Dataset 1 (this chapter) and Dataset 2.

Table 9: Frequency and composition of Probable/Possible LUP site data in sampled HER records, tabulated per surveyed county

County	Cave entries	Open-air entries	Total
Derbyshire	39 (36.4%)	68 (63.5%)	107
East Riding of Yorkshire	1 (0.7%)	126 (99.3%)	127
Leicestershire and Rutland	0	95 (100%)	95
Lincolnshire	0	179 (100%)	179
North Yorkshire	5 (3.4%)	143 (96.6%)	148
Nottinghamshire	5 (19.2%)	21 (80.7%)	26
South Yorkshire	83 (58.8%)	58 (41.1%)	141
Staffordshire	6 (10.3%)	52 (89.7%)	58
West Yorkshire	0	7 (100%)	7
TOTAL	**139 (15.4%)**	**749 (84.6%)**	**888**

The most numerous archaeological LUP source material referenced in consulted HER records are lithic artefacts from medium- to low-resolution reference events, such as stray surface finds and ploughzone scatters as identified and recovered during commercial archaeology unit-led interventions. Finds reported from other contexts of discovery, such as chance finds made by the public, form a minor component of HER data (Wells 2019; Historic England 2019a; Historic England 2018a).

The initial Heritage Gateway-derived sample of 2846 Upper Palaeolithic HER entries (last accessed 30.10.19) underwent additional dataset curation to remove non-LUP attributable entries. Dataset curation was informed by the patterns identified for Confirmed/Certain LUP sites as well as my observations concerning records management and classification ((in Sections 4.1, 2.2.3, 3.2.3). Due to the difficulties of differentiating undiagnostic or ambiguous (unretouched) LUP and Early Mesolithic lithic artefacts found in surface or mixed ploughzone contexts, and due to variable metadata coverage, I have retained 'LUP and/or Early Mesolithic'-attributable HER entries which is in accordance with UK research framework recommendations for Late Pleistocene lithic scatters. It is worthwhile to note that this also mirrors practices on the European continental mainland (Pettitt, Gamble and Last 2008:3; Ballin 2017a; Rensink 2002; Deeben and Rensink 2005). Note that the potential presence of Early Mesolithic artefacts need not categorically exclude the findspot as a Probable/Possible LUP site, since material from both archaeological periods is frequently found at the same high reliability sites (in Catalogue A). Since it has not been possible to consistently differentiate between Creswellian- and FMG- attributable site data, the HER-derived entries will be categorised as (unspecified) LUP. To test the accuracy of my sampling method, I randomly selected two HERs for individual review (Lincolnshire; Leicestershire and Rutland HER) and found both LUP samples to be of high reliability (as ensured for Lincolnshire HER entries through the Ancient Human Occupation of Britain project; own observations and in litt.).

My curated sample of 888 HER records, of which 139 records are for cave/rock shelter sites (15.6% of HER sample) and are 749 open-air sites (84.4% of HER sample), constitutes a representative sample of documented LUP HER data from the research area. Note that one site may have more than one HER entry. Cave site records are naturally restricted to HERs whose administrative areas extend into the Pennines, Peak District, or the Creswell Gorge (Derbyshire, North Yorkshire, Nottinghamshire, South Yorkshire, Staffordshire). Interestingly, my calculations of site frequency and composition in Table 9 indicate that open-air sites represent the majority of site types in all save one of the surveyed counties (South Yorkshire). LUP sites are most frequent in Lincolnshire (county). However, since county borders and HERs' administrative boundaries differ, I have calculated LUP site prevalence for individual HERs separately. My sample indicates an LUP prevalence of 0.4% across all consulted HERs (see Table 10), which is in keeping with previously published estimates: "Exclusively Palaeolithic scatters formed less than one per cent of the sites identified in a survey of four counties undertaken in 1994-1995." (cf. Historic England 2018e:19). Most prevalent are LUP (cave and open-air) sites in the South Yorkshire SMR records. These must be interpreted in context with the county's geographical setting, including the natural over-representation of known LUP cave- and rock shelter sites, and compared with the low number of South Yorkshire SMR records in general.

Sample of Probable/Possible LUP sites sourced from the PAS

Using my researcher level access to the database (The Portable Antiquities Scheme 2019a), I collated my sample of 817 PAS entries following my methodical approach to the use and sampling of large online repositories (cf. Chapter 3). In keeping with UK framework recommendations for Late Pleistocene lithic surface artefacts and scatters (in Sections 4.1, 4.1.2; Ballin 2017a; Pettitt, Gamble and Last 2008:3), and to ensure consistency with my HER data collection, I targeted PAS entries within the reported 'Late Palaeolithic' chronological upper and lower

Table 10: Prevalence of Palaeolithic entries in consulted Historic Environment Records from the research area (*estimated total number of HER entries cf. Historic England 2012a and respective websites)

HER	**Counties**	**Palaeolithic**	**Total entries***	**Prevalence (in %)**
City of York (Historic England 2019c)	York	5	5,703	0.08
Derbyshire (Derbyshire HER 2018)	Derbs.	110	20,330	0.5
Humber (Historic England 2019f)	City of Hull & ERY	127	20,000	0.6
Leicestershire and Rutland HER 2018	Leics & Rut.	95	16,441	0.5
Lincolnshire (Historic England 2018b)	Lincs.	101	40,740	0.02
N. Lincolnshire (Historic England 2018c)	N. Lincs.	81	8,200	0.9
N. Yorkshire (Historic England 2018d)	N. Yorks ex. York	145	50,000	0.3
Nottinghamshire (Historic England 2017a)	Notts.	20	25,000	0.08
S. Yorkshire SMR (Historic England 2017b)	S. Yorks.	141	5,000	2.8
Staffordshire (Historic England 2017c)	Staffs.	58	13,000	0.4
WYAAS (Historic England 2017d)	West Yorks.	5	11,000	0.04
Total		**888**	**215,414**	**0.4**

boundaries (data collection finalised 30.10.19; recorded metadata may have been edited since by the PAS).

Since its public release in 1997, the PAS has grown to be one of the largest and most frequently updated online data repositories for British and UK archaeology (The Portable Antiquities Scheme 2017). By design, the PAS is an inclusive, free to use and open access resource which offers a platform for both hobbyists and heritage professionals. Using available recording guides (The Portable Antiquities Scheme 2019b; Robbins 2014), PAS-affiliated members of the engaged public may record and upload finds onto the database which are then given a 'public' label in lieu of institutional recording origin. The main corpus of PAS data reflects individual artefact discoveries made by members of the public, rather than reporting results from commercial archaeology units or academic surveys. Finders' personal information "remains anonymised and obfuscated unless otherwise arranged", and only in exceptional circumstances are insights into further details granted (S. Moorhead, pers. comm. 2019). Consequently, all studied PAS finds were exclusively available online.

All object records are initially quarantined to allow for review and editing prior to their release onto the PAS website. Thus, there are clear mechanisms in place which safeguard and ensure recording quality control, effectively rendering the PAS as the UK's largest peer-reviewed archaeological finds database. However, as outlined in Section 3.2.3 and as will be addressed in Sections 8.1.3, 8.2.3 and B.1, I observed discrepancies regarding the reliability of the Scheme's LUP classification. While there are formal reporting measures in place to correct such errors, relevant revisions or edits to object records may occasionally take up to several years before they are implemented or addressed (my observations and Anon., pers. comm. 2018). Due to these observed discrepancies, for the lithic analyses in Chapter 8 I have focused on the 31 PAS objects that, according to the search results, were classified as 'Late Palaeolithic' with high certainty. These 31 objects represent 14.9% of all PAS-wide object entries classified as Late Palaeolithic (as of October 2019). In 2021 I updated my catalogue of Confirmed/Certain LUP sites to include PAS-derived findspot data from the Whitwell and Scalford parishes which I regard to be of high potential for further discoveries of LUP material (see Catalogue A). These PAS entries were unavailable to my access level during data collection for the typological and technological analyses in Chapter 8 and are therefore not discussed in detail therein.

In some parts of the UK, Finds Liaisons Officers (hereafter: FLOs) are in direct cooperation with highly active collectors, for instance through joint finds rallies and roadshow events (K. Leahy, pers. comm. 2019; The Portable Antiquities Scheme 2019aj). Ideally, finds would be reported, recorded, and published on the Scheme within a reasonably short time span, which could then reveal close to real-time reporting of productive areas and findspots. However, based on recorded metadata, I have noted substantial delays at either of these workflow stages. It has also been brought to my attention that some of the observed backlogs in recording disproportionately affect non-metallic objects and flint artefacts. This may result in these artefacts being assigned lower priority due to several reasons (e.g., preference for recording metal objects which may be relatively easier to classify, or lack of specialised lithic identification expertise, or short staffing; Anon., pers. comm. 2018; 2020). This has meant that although I am aware of and have been in contact with active local collectors with an expressed interest to make their recent LUP discoveries available for recording through their local FLOs, persistent under-reporting at the Scheme's end has led to lacunae and misrepresentations in the spatial distribution patterns of parts of the research area.

All 817 sampled PAS entries in Dataset 2 are unstratified lithic surface finds made from flint and predominantly discovered as chance finds during fieldwalking or metal detecting. Interestingly, all reported findspots are situated in the open-air, and only very few entries are from areas adjacent to caves (in Section 8.1.2; The Portable Antiquities Scheme 2019g). Additionally, all objects were recorded by Finds Liaison Officers. Site frequency varies between counties (see Table 11). The largest number of entries is from Leicestershire and Rutland (244 records sampled; note that the two counties are grouped as one on the PAS), whereas only 4 records are derived from Staffordshire. It is interesting to note the comparatively modest number of entries from Derbyshire, since Derbyshire is over-represented in my Confirmed/Certain LUP Dataset 1 (see Table 8). The estimated prevalence of Late Pleistocene-attributable PAS finds is equivalent to c. 27% of all UK Late Pleistocene lithic object entries, but only equivalent to 0.08% of all PAS records. The low prevalence may be explained through the prevailing focus on metallic objects across the Scheme. The Scheme is aware of the under-representation of non-metallic finds and its revised framework strategy is planning to address the skewed representation of different primary materials and periods (cf. Section 8.2.3; The Portable Antiquities Scheme 2019al). The full spatial distribution analysis of PAS data is presented in Catalogue B.

Table 11: Frequency of sampled PAS Late Pleistocene site data per surveyed county (all from open sites)

County	Count
Derbyshire	24
East Riding of Yorkshire	172
Leicestershire and Rutland	244
Lincolnshire	89
North Yorkshire	123
Nottinghamshire	9
South Yorkshire	35
Staffordshire	4
West Yorkshire	117
TOTAL	**817**

4.2 Spatial distribution of Confirmed/Certain LUP sites (Dataset 1)

In the following, the spatial distribution of the Confirmed/Certain LUP site Dataset 1 will be compared with the key physical geography features of the East Midlands research area outlined in Section 2.2.2. Furthermore, relevant observations regarding surface water hydrology features are included, as are human geography features with which LUP site distribution is compared (in Section 4.2.4). The purpose of these analyses is to describe observed spatial distribution patterns and will intentionally be kept brief. Emerging observations concerning the degree of intensity of LG human occupation of riverine and lacustrine environments will be more fully discussed and more widely contextualised in Section 9.1. The analyses of the Probable/Possible LUP site Dataset 2 may be found in Catalogue B.

4.2.1 Distribution relative to landforms and topography

Site frequencies relative to elevation are summarised in Table 12. For Dataset 1 as a whole, a preference for lowlands is indicated by 50 sites (or 72.5%) situated below 200 m AOD, compared with 19 sites (27.5%) located in uplands (above 200 m AOD). When grouped by chronology, Table 12 points towards individual differences in the composition of Creswellian-, FMG-, and LUP-attributable data across both lowlands and uplands. Moreover, as Figure 14 illustrates, there are

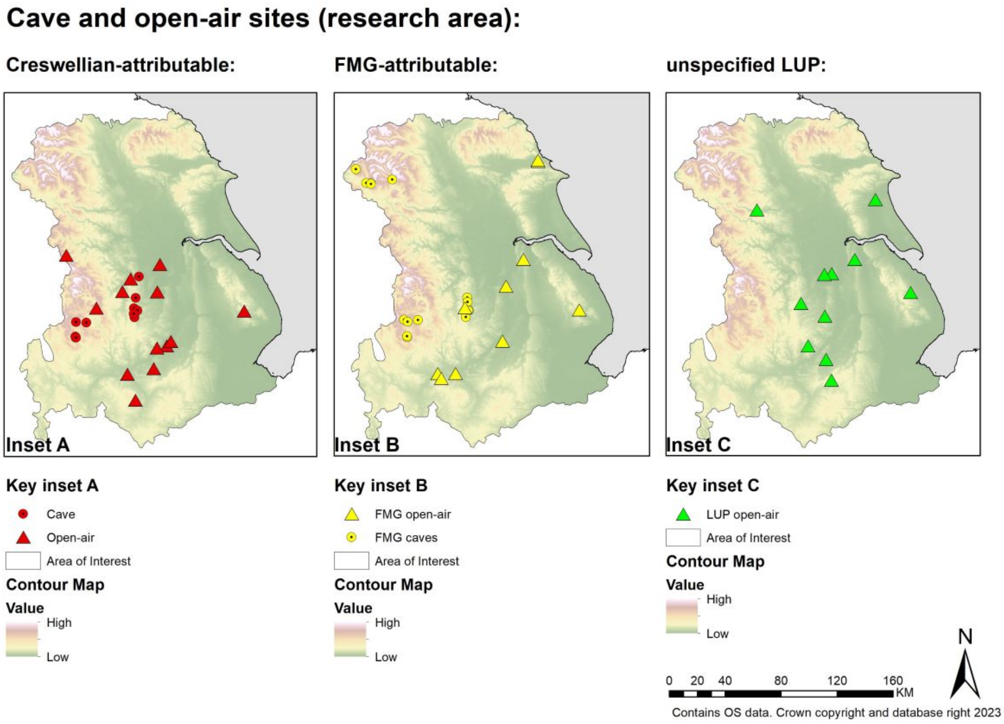


Figure 14: Distribution of Confirmed/Certain LUP open and cave sites relative to topography. Inset A: Creswellian-attributable sites, inset B: FMG-attributable sites, inset C: unspecified LUP sites (contains OS data, Crown copyright and database right 2023)

Table 12: Dataset 1: site frequency relative to elevation (in m above Ordnance Datum/m AOD, in increments of 50 m; not corrected for isostasy)

Elevation (in m AOD)	Creswellian caves	open-air	FMG caves	open-air	LUP caves	open-air	Total
0-50 m	1 (6.3%)	6 (46%)	NA	6 (66.7%)	NA	7 (64%)	20
50-100 m	7 (43.7%)	3 (23%)	4 (26.7%)	1 (11%)	NA	2 (18%)	17
100-150 m	3 (18.7%)	3 (23%)	1 (6.7%)	2 (22.2%)	1 (20%)	2 (18%)	12
150-200 m	1 (6.3%)	NA	NA	NA	NA	NA	1
>200 m	4 (24%)	1 (8%)	10 (66.7%)	NA	4 (80%)	NA	19
N (sites)	16	13	15	9	5	11	69

compelling contrasts in the geographical distribution of Creswellian- and FMG-attributable sites that drive the variations in Table 12 and tie into the discussion of diachronic patterns in LG human re-occupation more broadly. For instance, Creswellian sites are absent north of West Yorkshire where a stray Hamburgian shouldered point was found at Cupwith Hill (53.6°N, -1.9°W) and the overall low site coverage in the northern half of the research area is so far limited to the

FMG upland cave sites on the southern borders of the North Yorkshire Dales, and Seamer Carr K in the Vale of Pickering. South of the Humber estuary, site coverage increases where it can be linked to known LG cave 'hotspots' across the Peak District, near Creswell Crags, and on the higher grounds of the Lincolnshire Wolds further to the east.

Interestingly, though 20 Confirmed/Certain sites in Table 12 are situated below 50 m AOD, site frequency and coverage in Figure 16 are noticeably low across the lowest lying parts of the research area such as in the Vales of York and Mowbray, and further south towards the Wash. However, these apparent absences of LUP evidence are a result of the complex taphonomic impacts of postglacial, post-depositional processes like erosion of original palaeochannels and variable depths of Holocene sedimentation that have affected all aspects of the LG landscape. In Section 9.1, I will expand on the issues of taphonomy by drawing on recent studies of pre-LLS (GS-1) material from East Anglia (Billington 2016) and southern England (Mills 2022). Confirmed/certain sites have been identified along the lower-lying river systems of the Don, Trent, and their tributaries, and the case study locale Seamer Carr K and other Vale of Pickering sites are situated along the flat to gently undulating palaeo-lakefront of Lake Flixton (see also Section B.1.1). When viewed individually and at higher resolution, a consistent preference emerges for the open-air sites, since these appear to have been located on local raised grounds, likely to benefit from drier and more stable surfaces and better sight lines across the landscapes (cf. Sections 9.1.1, 9.2.3). Already at this stage, the distribution of Dataset 1 sites relative to topography indicates interesting patterns regarding chronological and regional differences but also with respect to landscape use. When seen in the broader context of (faunal and lithic) assemblage composition (in Catalogue A), and as exemplified by locales like Farndon Fields and the Yorkshire Dales caves, a possible pattern of specialised landscape use emerges, that combined generalised activities like blade and tool manufacture at (riverine) lowland sites with more specialised hunting/observation stations in the uplands. In Section 9.2 these arguments will be developed further.

4.2.2 Distribution relative to bedrock and superficial geology

For the present overview concerning bedrock, I have focused on site distribution relative to Upper Cretaceous parent Chalk deposits in the Lincolnshire and Yorkshire Wolds since these represent the only primary flint sources in the research area (cf. Section 2.2.2). In Figure 15, only the following Confirmed/Certain

LUP sites are located directly on the Wolds/parent Chalk: Brigham Hill (N. Yorks Wolds), Louth, Salmonby and Tetford (Lincolnshire Wolds). Sites which are located within short (up to 10 km) distance of the Chalk bedrock are the Vale of Pickering sites in North Yorkshire, and in Lincolnshire the open-air locale Risby Warren and surface findspots near Horncastle and Bella Vista Farm. For all other Confirmed/Certain LUP sites in the Trent Valley, the Creswell Crags, Peak District and beyond, the distance to the natural parent Chalk sources increases to above 70 km. Artefacts made on distinct Wolds-type flint have been identified in several of the Peak District and Creswell Crags sites which are of LUP and (Early) Mesolithic date, however, R. Jacobi (via PaMELA Database entries, in litt. undated; Wessex Archaeology and Jacobi 2014) has observed the use of Wolds-type flint only for (Early) Mesolithic, not LUP artefacts (cf. Myers 2015). Raw material provenance and provisioning strategies are discussed for each case study assemblage and in Section 9.2.2).

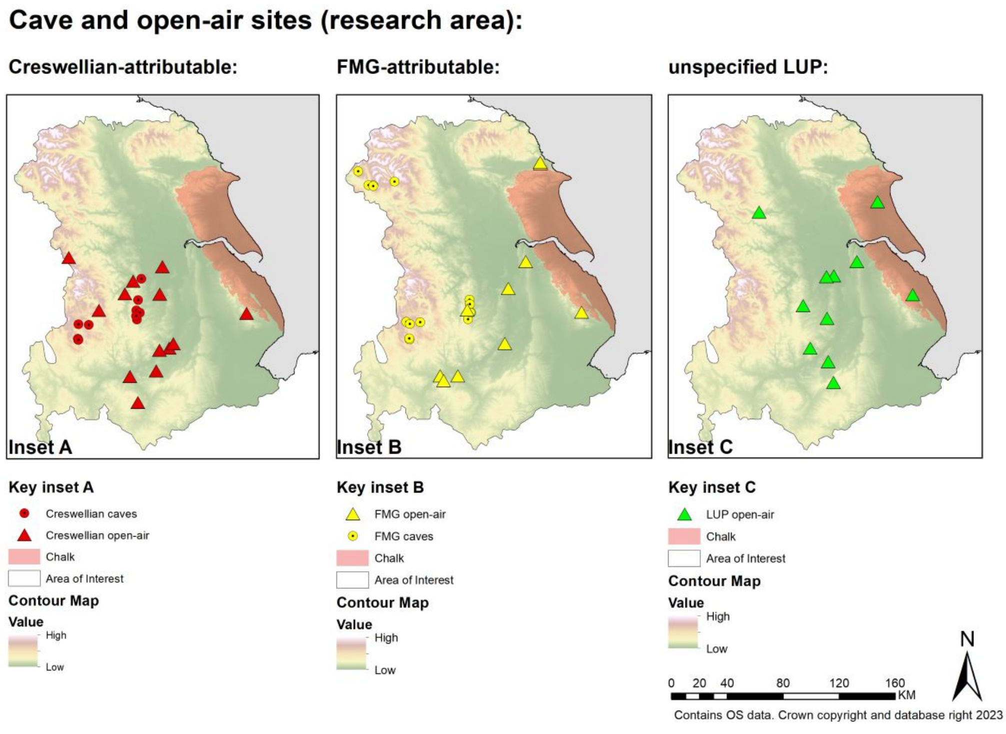


Figure 15: Distribution of Confirmed/Certain LUP open and cave sites compared with the location of primary flint sources on parent Chalk bedrock in the Lincolnshire and Yorkshire Wolds (note: the site symbology obscures Chalk deposits on the edge of the Lincolnshire Wolds. Contains British Geological Survey 2019b data and OS data, Crown copyright and database right 2023)

The research area is characterised by different superficial sedimentary profiles illustrated in Figure 16, though at the resolution available for this study, large areas are classified as 'unmapped' and further information is therefore unavailable for 80% (or 55) of Dataset 1 sites (British Geological Survey 2019b). The remaining 14 sites are distributed on alluvium (6 sites; 8.7%; Beeston Terrace, Farndon Fields, Morton, Treeton, Rookery Lane, Willow's Farm), blown sand (1 site; 1.4%; Risby Warren), glacial sand and gravel (2 sites; 2.9%; Seamer Carr K, Tetford area), peat (2 sites; 2.9%; Cupwith Hill, Lindholme), and till (3 sites; 4.3%; Cotgrave, Raven Scar Cave, Conistone Dib; and see Section B.1.2). The relevance of aeolian coversands of LLS (GS-1) age was addressed in Section 2.2.2. Note that the regional scale used for Figure 16 partially obscures very small and localised aeolian coversand deposits in the areas adjacent to the Trent, i.e., at Farndon Fields, and throughout (North) Lincolnshire, with Risby Warren representing the only Confirmed/Certain site in these blown sands contexts. During our augering and borehole surveys at Farndon Fields we were able to establish the presence of aeolian LLS (GS-1) coversands overlying Holme Pierrepoint Sand and Gravel deposits and which provided updated and comparative information for the sedimentary sequences at the Risby Warren case study locale (see Chapters 5 and 7; Figures 57, 56; Bateman 1995; Baker et al. 2013; Tapete et al. 2017b; Garton, Barton and Bateman 2020; M. Bateman, pers. comm. 2017).

4.2.3 Distribution relative to surface-water hydrology features

Table 13: Dataset 1: Confirmed/Certain LUP site frequency relative to waterways (in 500 m intervals)

Distance (in m)	All	Creswellian	FMG	LUP
0-500	32 (46.4%)	14 (49%)	13 (54%)	5 (31.3%)
500-1000	15 (21.7%)	7 (24%)	5 (21%)	3 (18.7%)
1000-1500	8 (11.6%)	3 (10%)	3 (12.5%)	2 (12.5%)
1500-2000	9 (13%)	3 (10%)	2 (8.3%)	4 (25%)
2000-2500	1 (1.4%)	NA	1 (4%)	NA
>2500	3 (4.3%)	1 (3.5%)	NA	2 (12.5%)
N (sites)	69	29	24	16

One of the key aims this study pursues is to investigate the evidence for LG human occupation of riverine and lacustrine environments. Since a full reconstruction of LG fluvial systems and watercourses was unattainable within

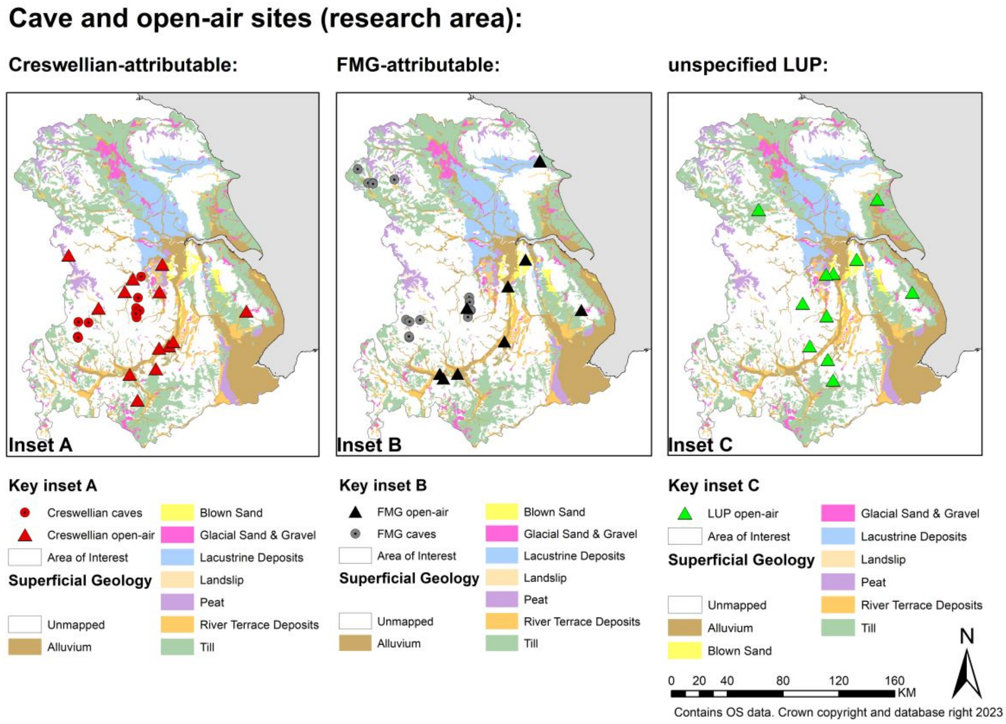


Figure 16: Distribution of Confirmed/Certain LUP open and cave sites compared with surface geology. Note that the local distribution of smaller concentrations of coversands and river terrace deposits extends beyond the scale visible in this map, for instance at Farndon Fields (contains British Geological Survey 2019b data and OS data, Crown copyright and database right 2023)

the scope of this thesis, I followed the approach modelled by L. Billington for East Anglia (2016:71-75) and used the Ordnance Survey's Open Rivers data set (Ordnance Survey 2020b) which combines modern rivers and streams and by default groups features by Strahler Order (1-6). For larger features like the Trent, the Open Rivers data set is approximately representative of the location of river networks during the LG Interstadial but further work is needed to better correlate the location of contemporary waterways with palaeo-landscapes. To define a parameter for what distance counts as being 'near' a river or stream, I used the Farndon Fields interfluve locale as an example (ArcGIS Pro calculated near-distance between centre of site and nearest waterway: 545 m) and grouped observations by ranges. This parameter also served as a buffer to offset canals and similar modern features (typically classified as Strahler Order 1-2 within the Ordnance Survey data set).

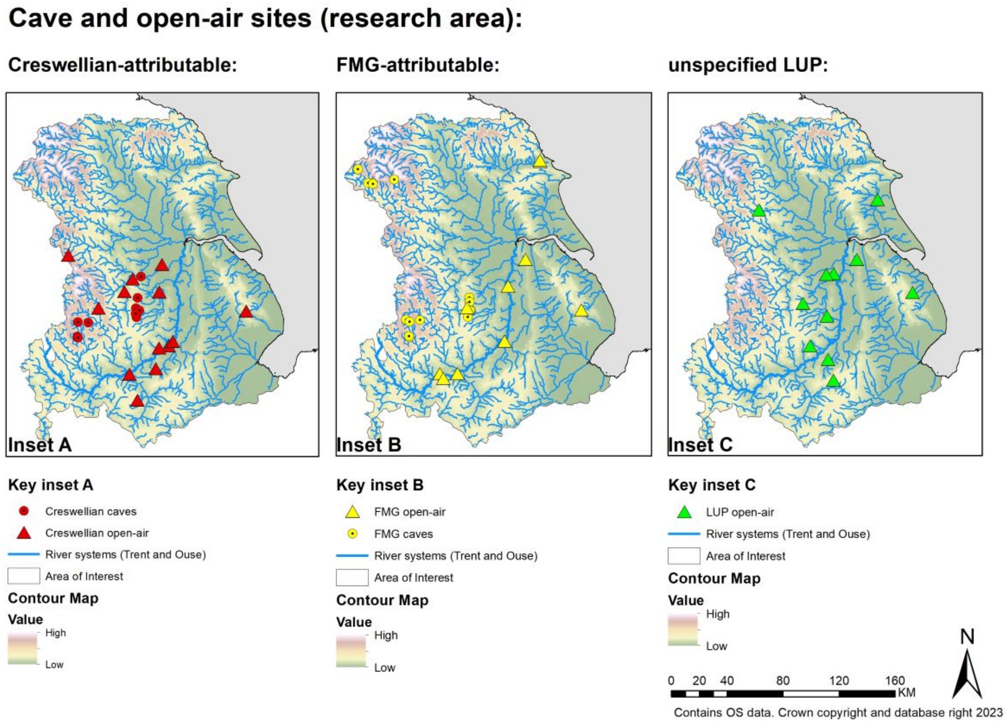


Figure 17: Distribution of Confirmed/Certain LUP open and cave sites and location of major river systems (Contains OS data, Crown copyright and database right 2023)

In Table 13, 46.4% of all Confirmed/Certain LUP sites are located within 500 m of a waterway, and proportions are even higher for the individual technocomplexes: 49% of Creswellian-attributable, and 54% of FMG sites, respectively, are within close proximity of watercourses. A comparison of site frequency relative to waterways by LUP chronology produces very Overall, the comparisons in Table 13 and Figures 18 and 17 produce similar percentages and patterns for Creswellian- and FMG-attributable data. This is influenced, in parts, by the 8 sites where evidence for both technocomplexes has been documented. Equally, these observations might reflect broader LG site location preferences since approximately 68% of sites are situated within 1000 m of a river or stream.

A qualitative comparison of Confirmed/Certain LUP site distribution with nearby waterways illustrates the importance of the River Trent system and of river confluences such as the Trent and Devon confluence at Farndon Fields, Nottinghamshire, the Trent and Don confluence at Haxey and Lindholme, Lincolnshire, the Trent and Soar confluence at Willows Farm, Leicestershire, or the Wharfe and Washburn confluence in South Yorkshire. Other important rivers

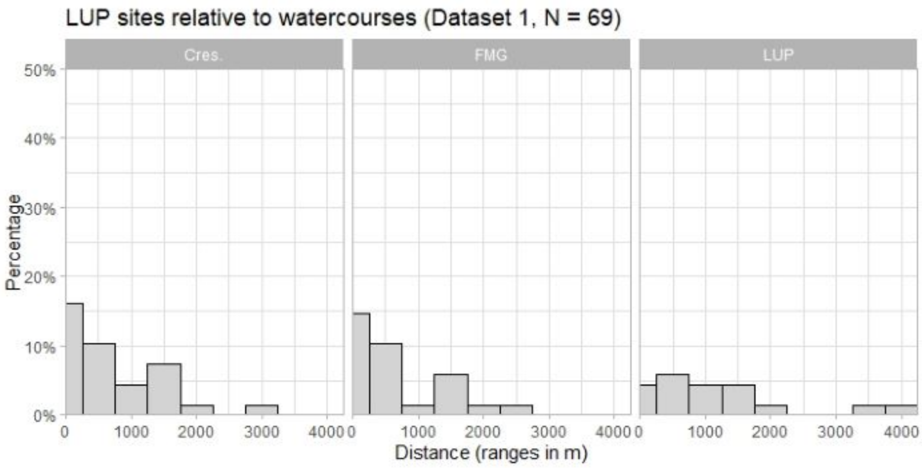


Figure 18: Dataset 1: site frequency relative to waterways summarised as a histogram and in order of LUP chronology (N = 69 sites; x-axis offset to 0; distance summarised by ranges in increments of 500 m, calculated with the Near Table Analysis tool in ArcGIS Pro; contains OS data, Crown copyright and database right 2023; Ordnance Survey 2020b)

located near (within 1000 m of) the Confirmed/Certain Peak District LUP sites are the Derbyshire Derwent, Don, Dove, Lathkill, Manifold, Poulter, Rother, and Wye. In Yorkshire, Confirmed/Certain LUP sites are located near the Colne, Yorkshire Derwent, Hertford (Vale of Pickering), and Wharfe. In the lowlands of Leicestershire and Rutland, Confirmed/Certain LUP findspots are near the Scalford stream, Lincolnshire, and near the River Lud/Louth Canal, and Rivers Bain, Beck, and Lymn (see Figure 17).

The evidence for site distribution in lacustrine environments is inferred via the location of lacustrine deposits and the modelled minimal and maximal extent of palaeolakes Humber and Pickering (cf. Section 2.2.2). Shown in Figures 16 and 19 are major accumulations of lacustrine deposits formed under peri- and postglacial conditions near the Humber estuary, extending northwards into the Vale of York, and in North Yorkshire. Smaller concentrations of palaeolake Humber lacustrine deposits are also found near the palaeolake's southern outflow through the Lincoln Gap. As addressed (in Section 2.2.2), there remain questions concerning the proposed time-scale for complete drainage of Lake Humber and, consequently, the lake's continued extent across the open East Midlands landscapes. Based on the eight-stage terrace model proposed by Fairburn and Bateman 2016, a significant gap of c. 5000 years remains during which the Stage 8 (5 m terrace) Lake Humber most likely was succeeded by a series of smaller, discontinuous lakes prior to complete drainage (i.e., between 15.9±0.9 and 9.1±0.6 ka; OSL dates reported in Fairburn and Bateman 2016:Table 2). Although Lake Humber is shown as a continuous landscape feature in Figure 19, at the scale mapped this is an overestimation of the lake's perimeter. High-resolution evidence from a series of sampling locations across the East Midlands and Yorkshire indicate that the maximal extent of Lake Humber was replaced by marshland and a series of smaller, discontinuous open water bodies comparable in size with Lake Flixton - which replaced Lake Pickering after the LGM (data accessible via BRITICE 2017; Palmer et al. 2015). Like Lake Flixton, (some of) these smaller palaeolakes may potentially have persisted into the early Holocene, either as productive lakes, open water bodies, or marshland, and such natural features could then provide a means to interpret lacustrine or riparian site distribution patterns. While the illustrated lake contours represent the best available model for Glacial Lakes Humber and Pickering, "caution is required in that the evidence is rarely complete enough to robustly define full lake extents" (Clark et al. 2018), and it is acknowledged that far more work remains to be done to establish sound chronologies on the sedimentary record (BRITICE 2017; Evans et al. 2017; Fairburn and Bateman 2016). Thus, my questions concerning this part of the chronology of the Lake Humber retreat dynamics are not adequately addressed in the subject literature and must for now remain open. However, documented archaeological LUP evidence found within the modelled extents of Lake Humber represents a possible way forward as this evidence may direct further targeted geological research into the lake's bathymetry and dynamics (see Section 9.1.2, Catalogues B and A).

The most conclusive evidence for LG human occupation of lacustrine environments in Figure 19 is provided by the Vale of Pickering site cluster (cf. Chapter 6), as well as the isolated findspots on the Isle of Axholme south-west of the Humber Estuary. Moreover, the low number Confirmed/Certain LUP sites within the modelled extents of Lake Humber (in Figure 19) must be related to the small dataset and the reduced potential for site preservation due to depositional events (e.g., blown sand cover), Holocene erosional activity, and present-day flooding of areas in the Vale of York and around the Humber Estuary - rather than be interpreted as evidence for absence of viable lacustrine habitats for human and animal occupation (see Section 9.1.2).

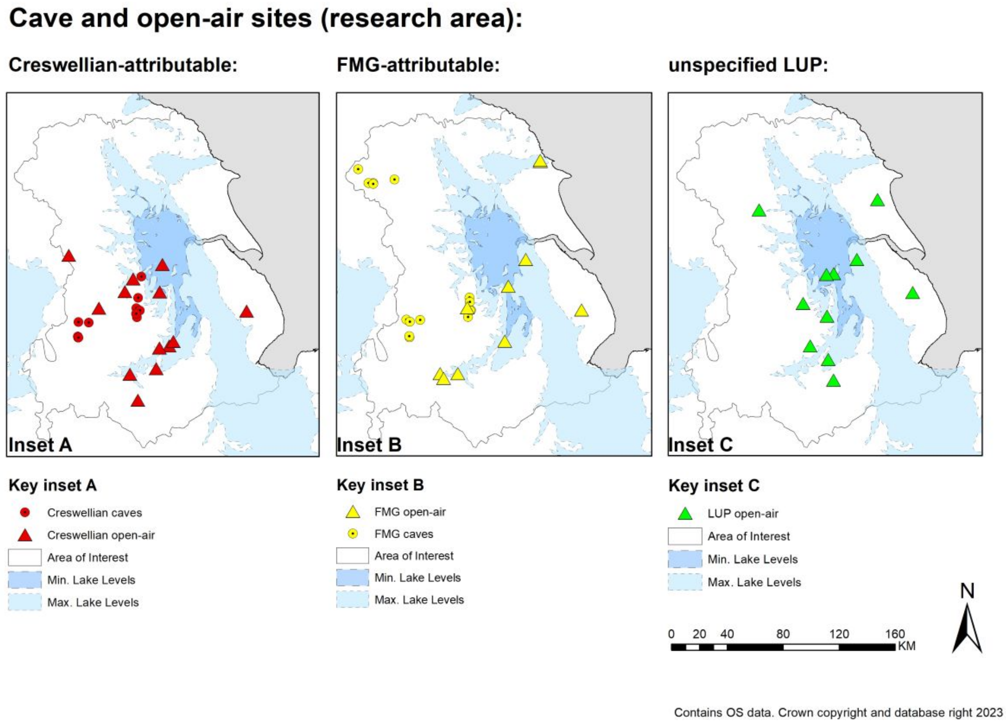


Figure 19: Distribution of Confirmed/Certain LUP open and cave sites compared with the modelled minimal and maximal extents of Glacial Lakes Pickering and Humber. Note that Farndon Fields is located at the southern boundary between maximal and minimal lake levels (contains OS data, Crown copyright and database right 2023)

4.2.4 Distribution compared with human geography features

Further to the physical geography features, human geography features and modern artificial changes to the landscape provide interesting additional context for spatial comparisons. Human land use is not static, but rather constantly changing, creating patterns which may affect and alter landscapes both gradually or rapidly depending on the methods, scale, and intensity of interventions. As addressed in Section 2.2.3 and emphasised in the site biographies in Catalogue A, several of the Confirmed/Certain LUP open-air sites were identified as discoveries of stray surface finds in the ploughzone, or during woodland clearing, or during (ground-invasive) industrial and infrastructural development schemes. These incidental open-air discoveries can be contrasted with the deliberately targeted cave surveys. As emphasised on p. 44 and illustrated by Figure 12, since the 1990s there has been a direct link between the overall increase in developer/commercial archaeology and LUP discoveries. The purpose of these comparisons is therefore to test if observed links are borne out as patterns.

Assuming all contingency factors related to deposition, preservation, and detection of archaeological remains are met (Collins 1975; Schiffer 1996; Robbins 2013), artefact survival and visibility furthermore varies in relation to cultivated soil, crop types, and environmental factors, which may introduce collection and recovery biases. Changes to ploughing intensity, such as the move from unmechanised to mechanised agricultural activity or the cultivation of lower-rooting crops, may result in near-immediate deterioration of grounds which had been left undisturbed until recently - as was, for instance, observed at Farndon Fields (Chapter 5; Tapete et al. 2017b) and at Confirmed/Certain LUP sites in the River Don Gorge (Cockrell 2016:96). Although ploughzone and surface finds contribute with important distributional information, artefacts are removed from their original stratigraphic or archaeological contexts. Consequently, analyses of ploughzone material are faced with substantial interpretive challenges (cf. Chapter 3; Haselgrove, Millett and Smith 1985; Schadla-Hall et al. 1985; Schofield 1991; Allen 1991; Bradley, Cook and Gardiner 1987; Schofield 1994; Schofield 1995a; Schofield 1995b; Schofield and Humble 1995; Schofield and Humble 1997; Bispham, Swift and Wolff 2008; Bond 2011; Hind, Jones and Spandl 2014; Robbins 2013; Billington 2016). In addition to present day land use, historic agricultural practices such as medieval ridge and furrow systems may also have a lasting negative impact on surface visibility during fieldwalking; this is particularly evident in parts of Leicester and Rutland, where Confirmed/Certain LUP sites are absent in areas with known ridge and furrow systems (H. Wells, Leicestershire HER Archaeological Officer, pers. comm. 2020).

Similarly, large-scale urbanisation is equally destructive with regards to the potential for preservation or visibility of intact archaeological material, especially since most urban centres have continuously expanded for centuries if not millennia, as illustrated for instance by the complete absence of Confirmed/Certain LUP sites in or around densely populated areas and cities such as Doncaster, Leicester, Lincoln and Nottingham (in Figure 14). Furthermore, archaeologically relevant layers are found in near-ground surfaces classified as 'artificial ground' which is not yet systematically mapped at necessary high resolution by the British Geological Survey (British Geological Survey 2019c). This is consistent with observations we made through the extensive community-led augering surveys (boreholes and test pitting) at Farndon Fields, where we found very discrete layers of aeolian coversands that were only visible at very high local resolution and not recorded by the BGS (cf. Figure 16; more details in Chapter 5; Garton et al. 2016, Tapete et al. 2017b, M. Bateman, R. Macphail and S. Collcutt, pers. comms. 2017).

In addition to agricultural or industrial land use, modern development or infrastructural schemes are a driving factor in changing land use patterns. Where there is a known precedence of archaeological remains in an area, for instance a Roman road or later prehistoric features, archaeological prospections or interventions may be mandated prior to development, and Local Planning Authorities' and HERs' research agendas are directed accordingly (Hind, Jones and Spandl 2014:4.2.1). Notably, the location of development schemes - and contract archaeology projects - is contingent on a range of geographical or societal factors, ranging from fundamental requirements or fitness for construction/development, to demand. Nevertheless, targeted unit-led surveys have in the past led to meaningful (LUP) discoveries in open-air landscapes (see Section 2.2.3, Chapters 5, 6, and Catalogue B; Lane, Schadla-Hall and Taylor 2023; Jacobi, Garton and Brown 2001; Hogue 2016).

For my comparisons in Figures 20 and 21 I selected the Roman and major UK road network base maps as proxies for construction and development schemes in general, since both sets of roads at the same time inform and direct commercial archaeology and collectors' attention. As observed at Farndon Fields, the proximity to the Roman Fosse Way running parallel along the length of the Fields and the preserved Civil War monuments in nearby Newark informed the initial planning processes, which then led to the discovery of LUP finds of national significance. While I do not intend to suggest that the location of LUP sites is directly linked to Roman roads, the location of Roman roads mirror preferential settings above the potential flood zones of rivers. Furthermore, Roman roads are firmly embedded in the British landscape, and adjacent areas are known to represent focal points for surface collection (see Catalogue B).

In Figures 20 and 21, a correlation between Confirmed/Certain LUP sites and modern and Roman roads emerges, for instance for surface findspots in the Lincolnshire Wolds and sites discovered during the A46 Fosse Way Improvement Scheme in Nottinghamshire and Lincolnshire (Cooke and Mudd 2014; in Catalogue B). Furthermore (cf. Catalogue A), an increasing number of open-air sites have been identified during other types of development schemes such as the Seamer Carr Waste Recycling Center, the River Bain flood alleviation scheme in Lincolnshire, or water pipeline constructions in Leicestershire.

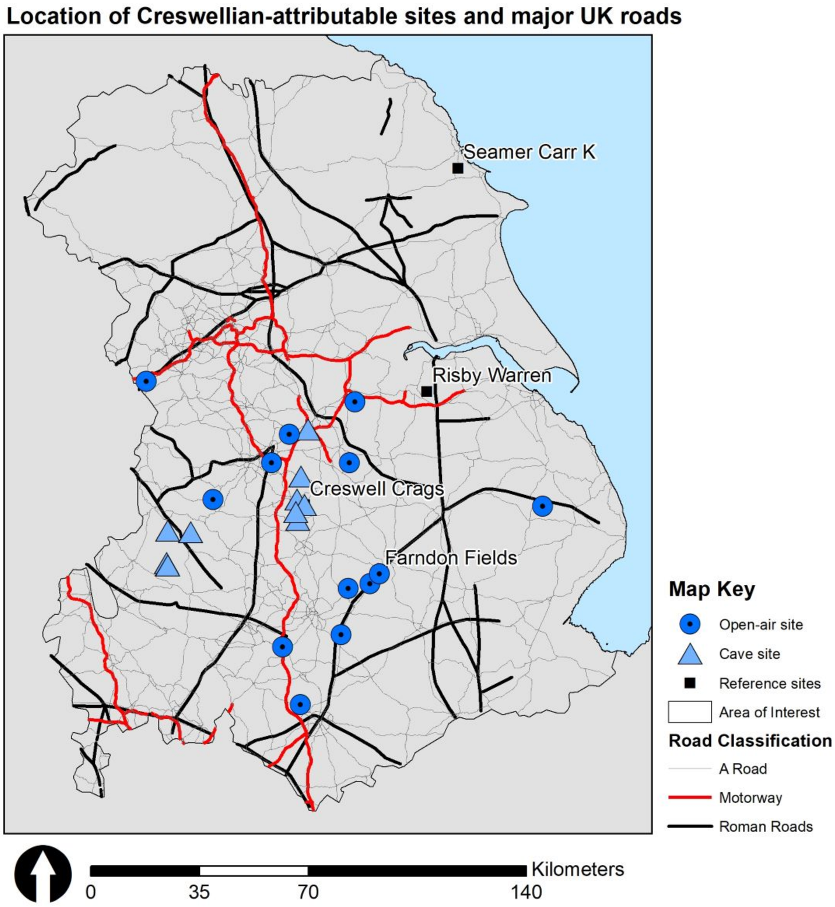


Figure 20: Distribution of Creswellian-attributable open and cave sites relative to Roman and modern roads. Note that sites in the southern Peak District and the Vale of Pickering sites overplot at this scale (contains OS data, Crown copyright and database right 2021)

4.2.5 Moving beyond cave sites: observations concerning the spatial distribution of Dataset 1 sites

In this chapter I have compared the spatial distribution of Confirmed and Certain LUP site Dataset 1 with physical and human geography features to see if any patterns emerge relative to topography, bedrock and superficial geology, surface-water hydrology and modern human geography features. Furthermore, I described the rationale and procedure to collate this first dataset, and how I obtained my Dataset 2 of Probable/Possible LUP sites in UK heritage management data repositories (HER and PAS data, see Catalogue B).

Already at this descriptive stage, and in contrast to historical site distribution

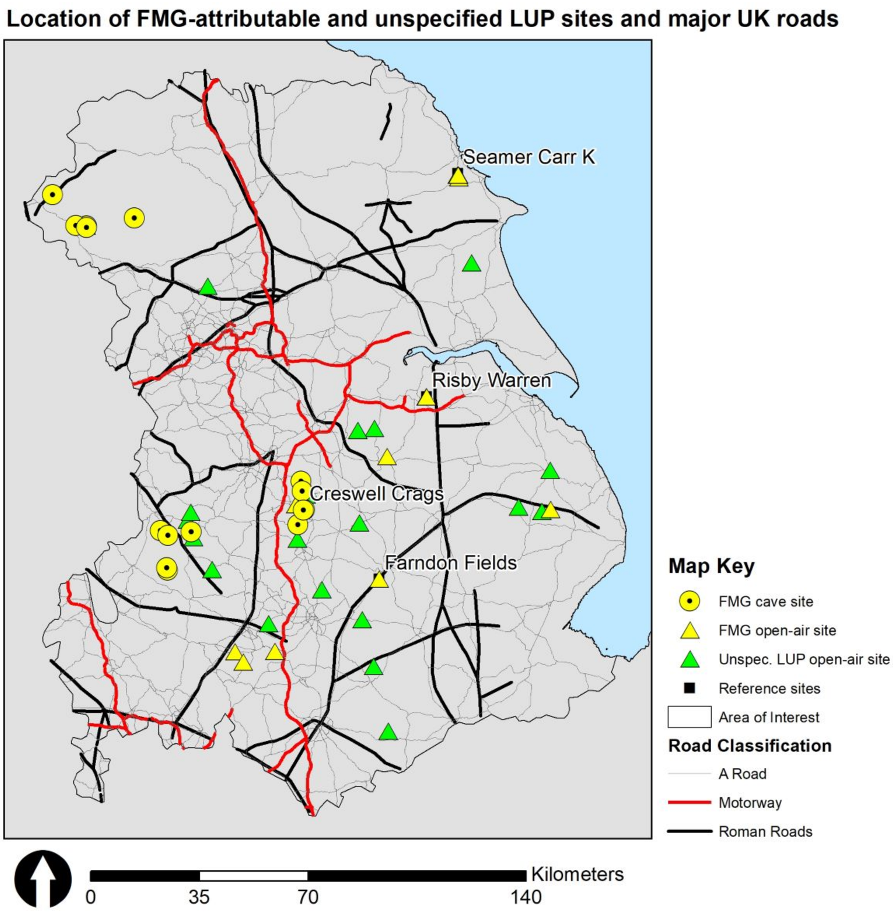


Figure 21: Distribution of FMG- and unspecified LUP-attributable open-air and cave sites relative to Roman and modern roads. Note that sites in the southern Peak District and the Vale of Pickering sites overplot at this scale (contains OS data, Crown copyright and database right 2021)

patterns (see Section 2.2.3), my LUP site datasets demonstrate that the LUP-attributable archaeological record across the East Midlands is far richer than previously posited. Moreover, the composition of my site data demonstrates that site distribution reaches beyond the confines of canonical cave sites. Emerging from my comparisons are preferential site locations on well-drained grounds at higher points in the terrain, likely chosen for their well-drained positions and good views across the surrounding landscapes, which more frequently than not are in close proximity to a river or stream.

Based on this chapter, I was able to identify three Confirmed/Certain open-air sites to use as case studies which are representative of LG human activities in either riverine, lacustrine, and open landscapes: Farndon Fields (Chapter 5), Seamer Carr K (Chapter 6), and Risby Warren (Chapter 7), of which the first two represent primary context/high-resolution reference events. Observations made in this chapter provide important regional and spatial distributional contexts for the subsequent site-specific chapters and for my hypotheses concerning LG human re-occupation of the research area. Results will be more fully discussed in Chapter 9, also with regards to diachronic patterns in the distribution of Creswellian- and FMG-attributable sites.

Chapter 5

Case study 1: Farndon Fields, Nottinghamshire

Farndon Fields, Nottinghamshire, is the largest open-air LUP site in the whole of the East Midlands. The wealth of material, and the extensive spread of documented LUP activities across an area of 18 ha, offers a unique opportunity to study the recurrent use of the locale during the LG Interstadial, with wider potential to inform discussions concerning human occupation of riverine environments. During the initial stages of fieldwork and analyses (1991-2009), a Creswellian attribution was proposed for the most diagnostic artefacts on typo-technological grounds, including the presence of diagnostic *talons en éperon*, cores with faceted platforms, and probable Creswell or Cheddar point fragments. However, isolated surface finds equally pointed towards a thin background of FMG-attributable pieces, and both technocomplexes were uncovered in two adjacent *in situ* scatters during subsequent developer-led excavations (Trent and Peak Archaeology 1991; Garton and Jacobi 2009; Harding et al. 2014; Garton et al. 2016). The purpose of this chapter is to examine the classification and characterisation of the lithic assemblages, i.e., to investigate whether proposed typo-technological differences between lithic material recovered from the ploughzone and stratified contexts can be sustained. Furthermore, I shall address the nature of human site use of the interfluve locale and the evidence in support of an earlier FMG attribution.

5.1 Site overview and phases of investigation

Farndon Fields is a large open-air site complex situated near the confluence of the rivers Devon and Trent on the south-western outskirts of Newark-on-Trent, Nottinghamshire (SK 7852). A series of both stratified clusters and surface LUP flint scatters have been identified across an area of 18 ha between the two rivers (see Figure 22). The site complex lies on the Holme Pierrepoint Sand and Gravel member (British Geological Survey 1996; Howard et al. 2011) and occupies a gentle, gradual slope dropping 1.2 m along the length of the interfluve. The gravels are overlain by a c. 150 m wide hollow described as an embayment that contains alluvial sediments interpreted as wetland margins (Harding et al. 2014:17, 69), and deposits of late glacial and Holocene age. The embayment abuts aeolian LLS (GS-1) coversands along the A46 road-line to the south of the *in situ* flint scatters (see Figure 22; Harding et al. 2014:fig. 2.3; Garton et al. 2016:108; Tapete et al. 2017a; Garton, Barton and Bateman 2020). As indicated by the contour lines in Figure 27, there are local high points at c. 11.0–11.7 m AOD and on dry ground that would have offered elevated views over the floodplains and channels. The *in situ* LUP evidence lies at c. 10.6 m AOD, and the spread of surface finds is near-exclusively concentrated to the northern/north-eastern half of the locale. In comparison, only very few artefacts have been found in the southern half of the interfluve where the low count and density of artefacts in large parts coincide with the mapped extents of the coversands (in Figure 22). The diagnostic lithic material comprises both Creswellian- and FMG-attributable artefacts. Farndon Fields has been recognised as a site of National Importance since material from these two distinct LUP traditions is rarely documented from the same open-air context in Britain (Nottinghamshire HER 2019d; Nottinghamshire HER 2019b; Nottinghamshire HER 2019c; Garton and Jacobi 2009; Garton et al. 2016). Palaeo-environmental and geological evidence obtained from Farndon provide further important contextual information for the LG Interstadial study period. Prior to the discovery of LUP artefacts at Farndon Fields in 1991, LUP evidence from Nottinghamshire was predominantly known from the Creswell Crags on the Derbyshire-Nottinghamshire border but including other cave sites in these areas and South Yorkshire. Parallel to the discoveries made at Farndon over the past c. thirty years, the corpus of known open-air findspots across the Trent Valley has gradually increased (see Section 2.2.3).

To best frame the geographical setting and particular relevance of this case study to my work on LG human re-occupation, I evoke my thesis title: *Between the*

Caves and the Sea. Farndon Fields is characterised by its open-air, riverine, and lowland features. Indeed, as Farndon Fields is equidistant from the Peak District caves in the west and the modern-day North Sea coast to the east (in Figure 4), this locale truly embodies the notion of being between the caves and the sea. Although direct links or contemporaneity of occupation between nearby LUP sites cannot be confirmed at present, Farndon nevertheless occupies a central geographical location and chronological position between other LUP sites in the East Midlands and is therefore integral to discussions regarding human re-occupation (Garton and Jacobi 2009:32-33). The maximal limit of the British and Irish ice sheet during the LGM (GS-2; Bateman et al. 2015) ran 50 km north of Farndon Fields, and the locale would have been inundated by Lake Humber during GS-2 (see Figure 19; Bateman 2008; Baker et al. 2013). Under periglacial conditions, the nearby River Trent formed a large braided and seasonally variable channel system; an effect of which was that the river alternated between exposing and covering new surfaces. Additionally, extensive parts of the surrounding landscape were highly susceptible to erosion by winds, thus resulting in newly formed aeolian coversand deposits along the Trent and into wider regions during the GS-2 and the LLS (GS-1) (Bateman 1998; Bateman, Murton and Crowe 2000; Baker et al. 2013:108–9; Tapete et al. 2017a). Results from recent OSL dating (Garton, Barton and Bateman 2020:5) provide new dates for the LUP activities at Farndon during the LG Interstadial (GI-1e-a). Samples were taken from the laminated sediments (OSL-2, Shfd15181, 14.8±1.4 ka) overlying the basal sands and gravels of Dimlington Stadial (GS-2) age and on the overlying coversands (OSL-3, Shfd15182, 11.76±0.79 ka). These date brackets are consistent with reported results from other British LUP sites (in Tables 1, 4). As mentioned, and shown in Figure 22, there is thus far an almost complete mutual exclusivity of LUP finds and aeolian coversand areas. Building on these observations, the working hypothesis for future Ice Age Journeys surveys is that targeted work in areas where coversands have buried a palaeosol may yet lead to discoveries of hitherto sealed and *in situ* LUP scatters, left undisturbed by for instance Holocene bioturbation and modern land use factors (cf. Section 9.1.2; Tapete et al. 2017a; Garton, Barton and Bateman 2020:12-13).

5.1.1 Phases of investigation

The growth of archaeological interest in the Farndon Fields locale is closely linked to the A46, Fosse Way, Road Improvement Scheme. Plans to re-route and expand

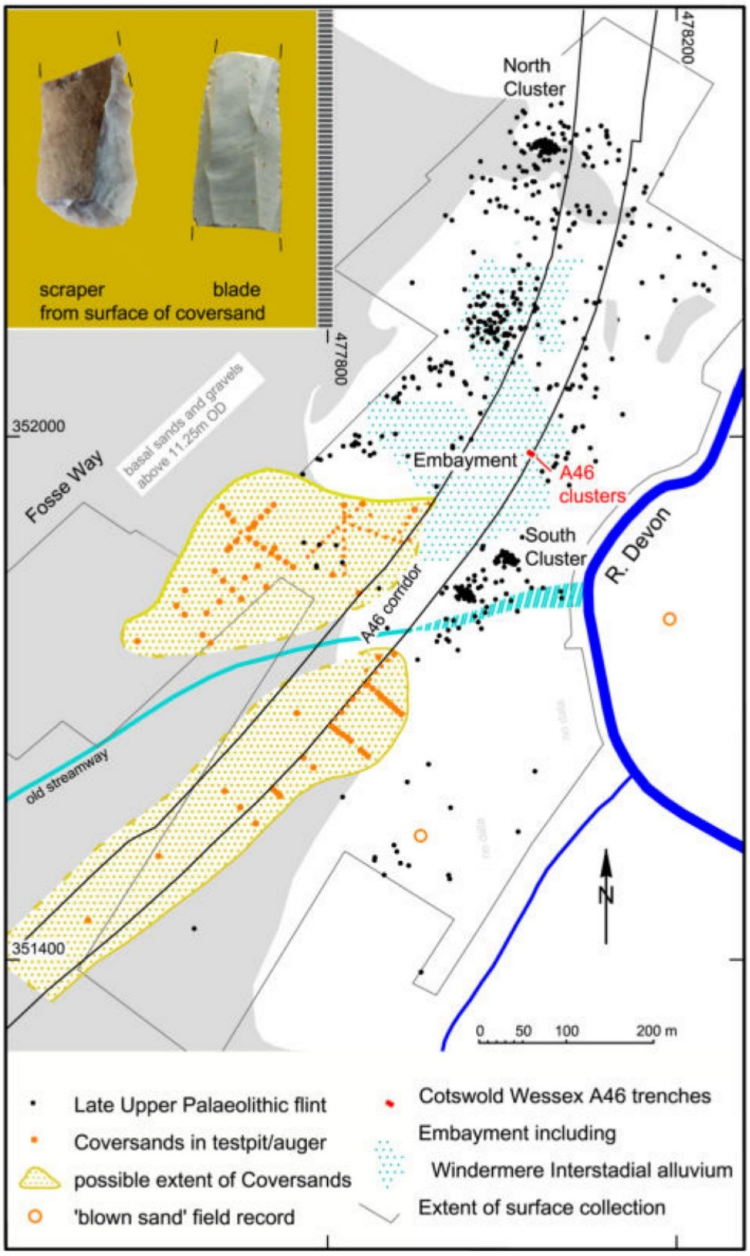


Figure 22: Site plan of Farndon Fields showing focal points of LUP activity as identified by surveys between 1991 to 2017. Image insert shows two fragmented finds which are representative for artefacts from Farndon, and that were recovered from the surface of the coversands (after Garton, Barton and Bateman 2020:Fig. 1, reproduced with authors' permission)

the capacity of the existing A46 were announced in 1991 and archaeological investigations were commenced. The investigations experienced two hiatuses, first from 1996 to 2004 and the second from 2005 to 2009 (Highways Agency 2007). Planning for the A46 upgrade was eventually restarted and construction began in mid-2009, lasting until its completion in 2012. Documented research activities at Farndon Fields can be separated into different phases of: (1) developer and commercial unit-led interventions of the interfluve terraces (site plan shown in Figure 22; full summary of preliminary investigations in Harding et al. 2014:table 2.1); and (2) subsequent surveys carried out by local volunteer archaeology groups from 2013 onwards, formalised as Ice Age Insights from 2017 onwards (registered charity number 1169575; Ice Age Insights 2019a).

First series of surveys (1991-2005)

Figure 23: Unpatinated and fragmented ploughzone finds from Farndon Fields. From left to right: combined end-scraper with piercer (at distal end), end-scraper with bended fracture near the removed proximal end, end-scraper fragment (from private collection; not recorded) and abruptly modified point indicative of typical *Federmesser-Gruppen* retouched tools (cf. Garton and Jacobi 2009:fig. 12, photograph by G. Owen for Ice Age Journeys; used with permission)

While no formal documentation exists, casual fieldwalking seems to have taken place at Farndon Fields prior to the 1990s (D. Garton, pers. comm. 2015). Since long stretches of the old A46 followed the route of the Roman Fosse Way and other archaeological finds already were documented near the Roman road, it was assumed that more archaeological remains could be discovered in the affected areas scheduled for road construction. To mitigate the risks of destroying previously undocumented and *in situ* remains, the Trent and Peak Archaeological Trust were commissioned to carry out the first series of non-invasive investigations on Farndon Fields in 1991, during which unstratified lithic surface finds were found (Garton 1993:145; Knight and Kinsley 1993; Andrews and Harding 2012). R. Jacobi, then at Nottingham University, identified diagnostic Creswellian-attributable artefacts amongst the field-walked assemblage (R. Jacobi, pers. comm. in Garton 1993:145). Subsequent unit-led investigations have systematically conducted fieldwalking, small-scale test pit excavations, and augering/borehole surveys in targeted areas (see Figure 22). Approximately three hundred lithic finds of predominantly LUP date were recovered over the course of this first phase of research activity at Farndon. Based on the discovery of both diagnostic retouched tools and technological markers, including platform preparation *en éperon* (see Figure 35; cf. Barton 1990; Jacobi 1991), finds were mainly attributed to the Creswellian (Garton 1993; Garton and Jacobi 2009:29; Barton and Roberts 1996:249-250; Jacobi 2004). Interestingly, additional tools such as curve-backed and abruptly modified points that are typically considered to be diagnostic of FMG material, were also discovered during fieldwalking at Farndon (in Figures 23; 26, 38; Garton and Jacobi 2009:29-30). The presence of both LUP industries in an open-air context is so far unique in Britain and thus central to discussions regarding LG human re-occupation patterns. Besides typo-technological differences, the chronologically older and younger artefacts have also been linked to differential levels of surface staining; a dense white patina is interpreted as a recurring feature of Creswellian-attributable finds from Farndon (see Figure 29 and Section 5.2.1) whereas FMG-attributable or otherwise undiagnostic LUP finds are more frequently unpatinated (in Figures 26 and 23). While the presence of white patina is not invariably synonymous with Creswellian-attributable artefacts, as variations in surface staining and typological characteristics do occur (see Section 5.2.1), this distinct surface staining has nevertheless become a notable secondary identifier during fieldwork and analyses.

Since most flint artefacts are ploughzone finds, crucial contextual stratigraphic or directly datable evidence is largely absent. At Farndon, the top- and some subsoil deposits that include the mostly intact laminated sediments have been substantially disturbed by ploughing and other modern land use factors throughout the past centuries. While it is difficult to infer the precise location of previously intact but now eroded scatters, all 1991-2005 survey results indicate a recurring distribution pattern of isolated finds scattered across a vast area (c. 18 ha) and higher artefact densities in two scatters ("North Cluster" in Field 374 and "South Cluster" in Field 373A; c. 11.3–11.7 m AOD, see Figure 22). Found within the North Cluster were artefacts indicative of blade production and retouched tool discard, which is mirrored in the composition of the South Cluster, albeit in smaller quantities of material (Garton and Jacobi 2009:3). In addition to fieldwalking surveys, limited (1 x 1 m and 5 x 5 m) test pit excavations have been undertaken in targeted areas selected on the basis of higher surface find densities or observations made during augering or borehole surveys. All test pits combined have only covered a minor percentage (<5%) of the maximum extent of the open landscape at Farndon Fields and during the 1994 campaign, only six artefacts were recovered from below the ploughsoil in one 5 x 5 m test pit in Field 374 (Garton and Jacobi 2009:3, 28). A more detailed presentation of the ploughzone assemblages is given in Garton and Jacobi 2009 and Section 5.2.3.

Second series of surveys: Cotswold Wessex Archaeology excavations (2009)

Work on the A46 upgrade resumed in 2009. A Cotswold Wessex Archaeology joint venture (hereafter: CWA) was commissioned for the A46 Newark to Widmerpool Improvement Scheme, which included Farndon Fields (site label FFS09) amongst seventeen other sites from younger periods (Cotswold Wessex Archaeology 2011; Harding et al. 2014). The full site archives have since been uploaded to the Archaeology Data Service and the lithic assemblage from FFS09 is now deposited with the Newark Museum (Wessex Archaeology and Cotswold Archaeology 2017).

As shown in Figure 22, the new A46 cut across Farndon Fields along a curved, south-west to north corridor. Substantial artefact concentrations had previously not been identified from within the proposed road corridor, but previous surveys had instead established a pattern of wide-spread distribution of isolated single-finds and dilated or ploughed-out clusters (North and South Clusters) across an area of at least 15 ha. Since many of the ploughzone artefacts were found to be in good condition and indicated recent integration into the ploughzone, the commercial unit-led interventions were designed with informed knowledge that stratified LUP material could be discovered *in situ*, particularly along the 11.3–11.7 m AOD contour line and in undisturbed alluvium. In response to the sizeable, potentially artefact-bearing area, CWA designed a four-tiered fieldwork stage strategy to address the project's archaeological and geological research aims and objectives. Test pits and trenches (up to 50 m long evaluation trenches;

Harding et al. 2014:Fig. 2.3) were deliberately concentrated along the new road's perimeter and examined through a combined approach of mechanical and hand excavation (including wet-sieving and 3D recording of artefacts; full summary in Harding et al. 2014:Table 2.1; p. 19-23).

All investigations prior to 2009 had recovered approximately three hundred unstratified ploughzone finds. The excavations undertaken by CWA discovered a significantly larger number of stratified artefacts (3596 worked stones and micro-debitage in total, Harding et al. 2014:43; Table 2.5 therein). Flint artefacts represent 98% of the material (3542 pieces) attributable to three different chronological periods: two LUP industries (Creswellian, FMG) and later prehistoric artefacts (Harding et al. 2014:45; 63). Diagnostic LUP finds were found in alluvium in two 4 m by 3 m trenches (TR6002 and TR6007 East and West, Harding et al. 2014:43 pp). Of central relevance to my case study are the results from trench TR6007 in which two separate lithic clusters were discovered in stratified layers (see Figures 24 and 25). To avoid further disturbance of potentially artefact-bearing alluvium and underlying sediments, the main road was built on raised ground and infill to leave any hitherto undiscovered and undisturbed LUP material preserved *in situ* underneath the dual carriageway.

The CWA lithic assemblages form an integral part of my analysis of the Farndon material, since the assemblage recovered in trench TR6007 East has been interpreted as a Creswellian blade knapping scatter on the basis of typology and technology (Harding et al. 2014:46-56; Grant and Harding 2014; Harding 2020), whereas the material found in trench TR6007 West has been classified as FMG-attributable (Harding et al. 2014:56-64). Interestingly, the CWA excavations uncovered a far greater number of FMG-attributable material which had previously only been represented by a handful of isolated surface finds (Garton and Jacobi 2009:29). Additional brown and white patinated artefacts, including blade and micro-debitage, cores, and retouched tools (burins, end-scrapers), were recovered from various other intervention trenches along the construction corridor (see Section 5.2.2; Harding et al. 2014:43-46; 56; fig. 2.26 therein). Besides typo- and technological parallels noted between the lithic material recovered by CWA and the field-walked assemblages, secondary identifying traits were also reported; specifically, the TR6007 East (Creswellian) material contained white patinated finds, whereas the TR6007 West (FMG) artefacts did not have the same surface appearance (cf. Section 5.1.1 and Section 5.2.1).

The Creswellian scatter TR6007 East

Found within the nucleated scatter shown in Figures 24 and 22 (elliptical, dense nucleus, 0.5 m long and 0.25 m wide, aligned NW-SE) in trench TR6007 East were 162 flint artefacts (in Tables 15 and 16) of which 138 pieces were found in a densely packed scatter (including 48 micro-debitage chips in alluvium spits 2 and 3). Finds were in pristine condition, with only few traces of remnant cortex preserved, predominantly patinated in the characteristic 'Farndon-white' known from the extant ploughzone assemblages, and sealed *in situ* underneath orange/brown alluvium (Harding et al. 2014:46).

While characteristic butts *en éperon* or other Creswellian index fossils such as trapezoidal backed (Cheddar) points or dihedral burins were not recovered in trenches TR6007 East or the adjacent TR6002, the excavated assemblage is nevertheless technologically consistent with the ploughzone collection previously described as Creswellian by Garton and Jacobi 2009 (cf. Section 2.1.4). Although the assemblage contained only seven blades and no diagnostic retouched tools, this scatter has been interpreted as a Creswellian blade knapping spot since the debitage and micro-debitage are indicative of carefully prepared, soft (organic) hammer reduction of a possibly prepared, single-platform core of non-local origin. The blade core was not recovered during excavation, but proximal attributes on the finds (and distinct micro-debitage) "demonstrate care and attention lavished on platform preparation" (Harding et al. 2014:53) through faceting and abrasion to produce neatly standardised blade blanks. The low number of blades left in the scatter suggests that useable blade blanks were removed from this site of manufacture.

Refitting has confirmed the spatial integrity and complete recovery of the scatter. A total of twenty-two artefacts from TR6007 East and adjacent TR6002 could be refitted into ten refit groups of break refits and dorsal to ventral refits that indicate these were struck sequentially and on site, and further shows that all steps of the blade reduction sequence's *chaîne opératoire* are represented within this assemblage (Harding et al. 2014:52).

FMG scatter TR6007 West

Shown in Figures 25 and 22 is the FMG scatter in TR6007 West (dimensions are 1.3 m north to south by 1.12 m east to west; Harding et al. 2014:56), which is less densely nucleated than the Creswellian scatter TR6007 East. A coherent grouping of 194 worked flints were found within the alluvium. As evidenced by a number of refitting finds within TR6007 West, including break refits and two

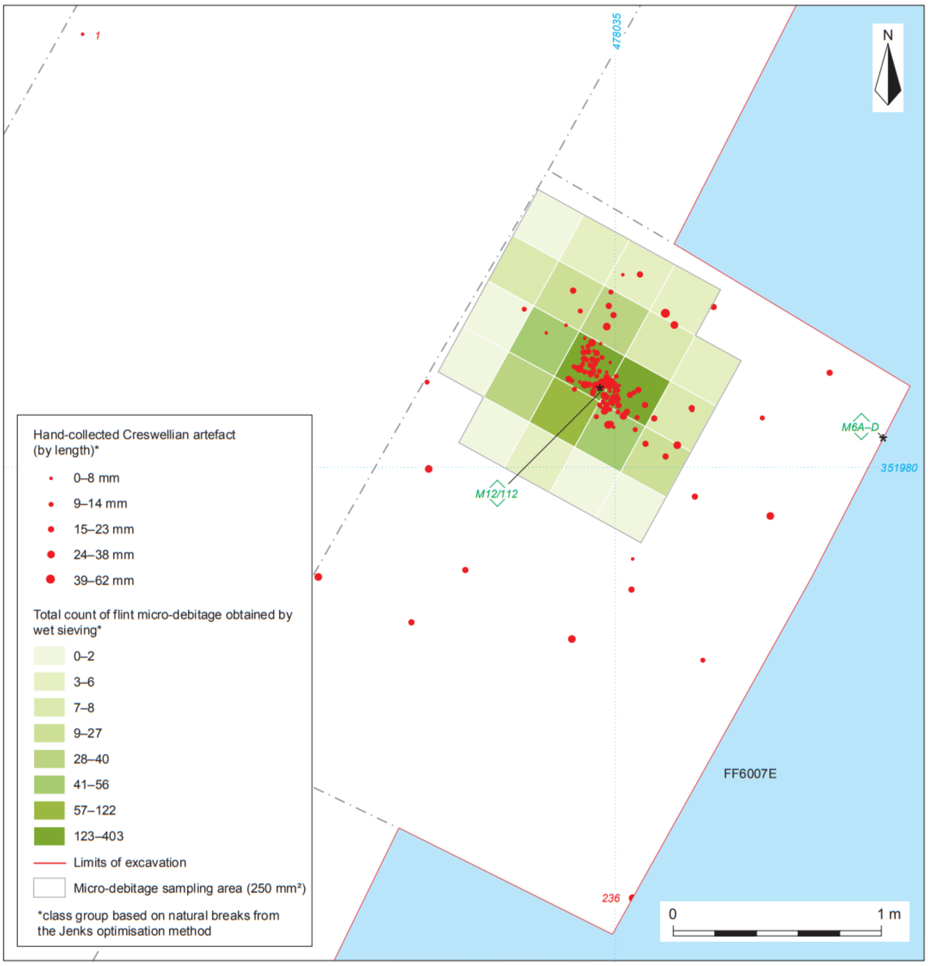


Figure 24: Trench plan and finds distribution within TR6007 East (Creswellian scatter) with location of micro-morphology samples (after Harding et al. 2014:Fig.2.26)

flakes refitting to a core found just 2 m south of the main concentration of lithics within the scatter, the assemblage was formed through on-site blade production (Harding et al. 2014:52; 56; 62). No spatial (or refitting) overlap is recorded between the scatters in TR6007 East and West. A smaller cluster of burnt artefacts at the western edge of the trench may indicate the location of a hearth, although no charcoal or structural elements were found (Harding et al. 2014:table 2.5; fig. 2.36).

The assemblage in scatter TR6007 West (in Table 15) includes micro-debitage, cores, end-scrapers, backed and retouched blades. Artefacts were mostly in pristine condition and predominantly unpatinated, with only minimal traces of iron-staining or other surface discolouration (Harding et al. 2014:60-62). According to the CWA site report, this TR6007 West assemblage "contrasts strongly with the Creswellian material" (Harding et al. 2014:60), both with regards to the use of local, poor quality river gravel flint (Harding et al. 2014:66; though see Section 5.2.1) and an absence of post-depositional surface staining. Furthermore, the material "lacked some of the refinements otherwise present in Creswellian technology", as inferred through less standardised blade blanks, less use of faceting and abrasion for platform preparation, and more prevalent use of hard hammers in lieu of soft (organic) percussion. The extent of remnant cortex preserved on finds in TR6007 West suggests all stages of core preparation were carried out on site, and negative removal patterns indicate the use of single-platform and opposed platform cores. No diagnostic retouched points were found in TR6007 West. Regarding parallels between possible FMG ploughzone finds and the material in scatter TR6007 West, the CWA lithics analyst remarked that "there is nothing to link these outlying pieces [i.e., the points shown in Figure 38] directly to the assemblage from FF6007W" (Harding et al. 2014:69). It may be open to interpretation whether this statement is mainly intended to say that these ploughzone finds were not originally part of the scatter or whether no links could be drawn between the extant field-walked material and the excavated TR6007 West scatter. During data collection I noted several more similarities between unpatinated extant ploughzone collection tools and CWA excavated retouched tools, such as the presence of scrapers made on flakes or crested blades (cf. Figure 34), and a combination tool similar to the combined end scraper and piercer in Figure 23 (no CWA object number specified for comparative tool; Harding et al. 2014:61).

According to the CWA site report, due to differences in lithic typology, technology, and post-depositional patina, there is a clear, bi-partite chronological separation between the two scatters in TR6007. And yet, in terms of whether the FMG assemblage from TR6007 West can be used as guideline or template towards unstratified (and unpatinated) LUP artefacts, the CWA lithic specialist P. Harding notes the following: "The technology, lack of patina and raw materials of the Federmesser industry were sufficiently *indistinct in isolation* to apply detailed criteria to the unstratified assemblage from the project or to material from the extant surface collection" (Harding et al. 2014:69; my emphasis). One of the objectives of my analyses of the finds is therefore to see if this stated bi-partite differentiation between scatters also emerges in this study.

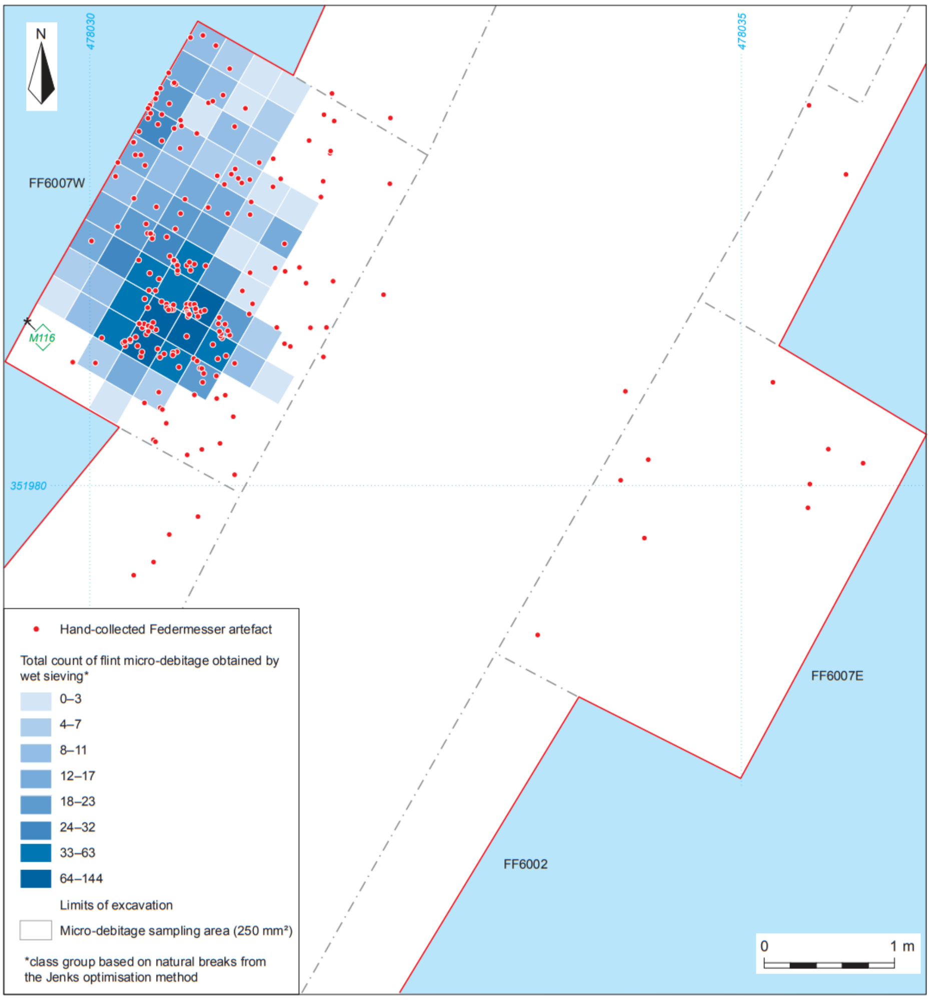


Figure 25: Trench plan and finds distribution in TR6007 West (*Federmesser-Gruppen* scatter; after Harding et al. 2014:Fig.2.36)

Third phase of activities: Ice Age Journeys-led and other surveys (2013 - ongoing)

Since completion of the finished road in 2012, fieldwork has been maintained by a local community group (now operating as Ice Age Insights, Ice Age Insights 2019a) with continued support by professional specialists and funding offered through the Heritage Lottery Fund and other grants. Building on results from previous fieldwork, the group's research aims are two-fold, with a dual emphasis on continued archaeological investigations (fieldwalking, test pit excavation) as well as geological augering and borehole surveys (mapped in Figure 22; Garton,

Figure 26: Own field photographs of a fragmented *Federmesser-Gruppen* curve-backed point (ID: GJL) made from translucent brown flint, and an opposing-platform core with multiple step-breaks (discovered during fieldwalking in 2015 and 2016; own hands for scale). The backing along the right lateral edge is clearly visible on the point, which is highly similar to a retouched blade ON 8026 found in CWA TR6007 West (cf. Harding et al. 2014:Fig.2.34.16). Blurred, but visible in the background to the left are two densely white patinated, potential Creswellian blade fragments.

Barton and Bateman 2020; Tapete et al. 2017a; Ice Age Insights 2018; Ice Age Insights 2015; Ross 2019; W. Mills, R. Macphail, S. N. Collcutt pers. comms. 2018). This phase of research activity at Farndon Fields is still ongoing, and results have thus far yielded high-resolution stratigraphic and surface topographic profiles, new OSL dates (single grain OSL measurements, reported in Garton, Barton and Bateman 2020), and recovered numerous more stray LUP finds from the ploughsoil and small quantities of finds in test pits, including diagnostic Creswellian and FMG types (D. Garton, pers. comm. 2018; Ice Age Insights 2019b). The recovery of over fifty diagnostic LUP artefacts from within the volunteer group's test pits in several of the investigated fields (in Figure 27) is especially noteworthy, since it represents the highest number of documented stratified finds outside of the commercial A46 excavations.

Based on typological and technological similarities, and observations regarding post-depositional patination, the newly discovered finds were found to correspond to the lithic material recovered between 1991 and 2009. To illustrate this continuity and correspondence between extant and recent collections, Figure 26 includes two working photographs of unpatinated FMG finds from recent fieldwalking episodes. For instance, the curve-backed point featured is nearly identical to an example discovered during the CWA excavations (object number

ON 8026 in TR6007 West; see Figure 34:16). The blade core in Figure 26, here photographed right after I found it on the field surface, is approximately 70 mm long and uncharacteristically large for the Trent Valley (cf. Section 5.2.1). Based on size and orientation of negative blade removals, percentage of remnant cortex, and the visible step breaks, this core matches previously discovered cores (Garton and Jacobi 2009:fig.5 (2,4); fig.6 (5-7); see Figure 34:2-4). Updated finds distribution patterns indicate the presence of several more focal points of LUP activity (in Figure 22), but equally highlight the invasive impact that just one season of cultivating deeper rooting crops such as potatoes may have (Garton et al. 2016:123; Garton, Barton and Bateman 2020:9; my observations). The continued state of artefact preservation at this unique open-air location is uncertain. Results from this phase of community research are described in detail elsewhere (Garton et al. 2016, Garton, Barton and Bateman 2020), and my lithic analysis sample is discussed in Section 5.2.3.

Separately to the volunteer group's work, in 2018 Allen Archaeology Ltd. were commissioned to carry out investigations as part of ongoing plans to construct a slip road off the eastern side of the A46. Survey findings mirror previous results from Farndon, as a small number of diagnostic LUP artefacts as well as Neolithic and later flints, were found during fieldwalking (J. Hogue, pers. comm. 2019; Allen Archaeology Ltd 2018).

5.2 Lithic analyses

All extant and excavated collections contain artefacts that are insufficiently diagnostic to label beyond a general LUP attribution, and the diagnostic LUP component of the lithic assemblages recovered during the first two survey phases (1991-2009) from Farndon has primarily been attributed to the Creswellian (Garton and Jacobi 2009). This is particularly true of the various ploughzone assemblages (examples shown in Figures 29 and 35) of which only a few retouched finds were diagnostic of a FMG-attribution (in Figures 26, 38, 23; Garton and Jacobi 2009:29-30). In contrast, the CWA-excavated material contains approximately equal quantities of both Creswellian *and* FMG artefacts from two spatially discrete and stratified scatters (Harding et al. 2014).

Importantly, I want to acknowledge that this case study is strongly reliant on the artefacts and assemblages first analysed and previously published by others (Garton 1993; Jacobi, Garton and Brown 2001; Garton and Jacobi 2009; Harding

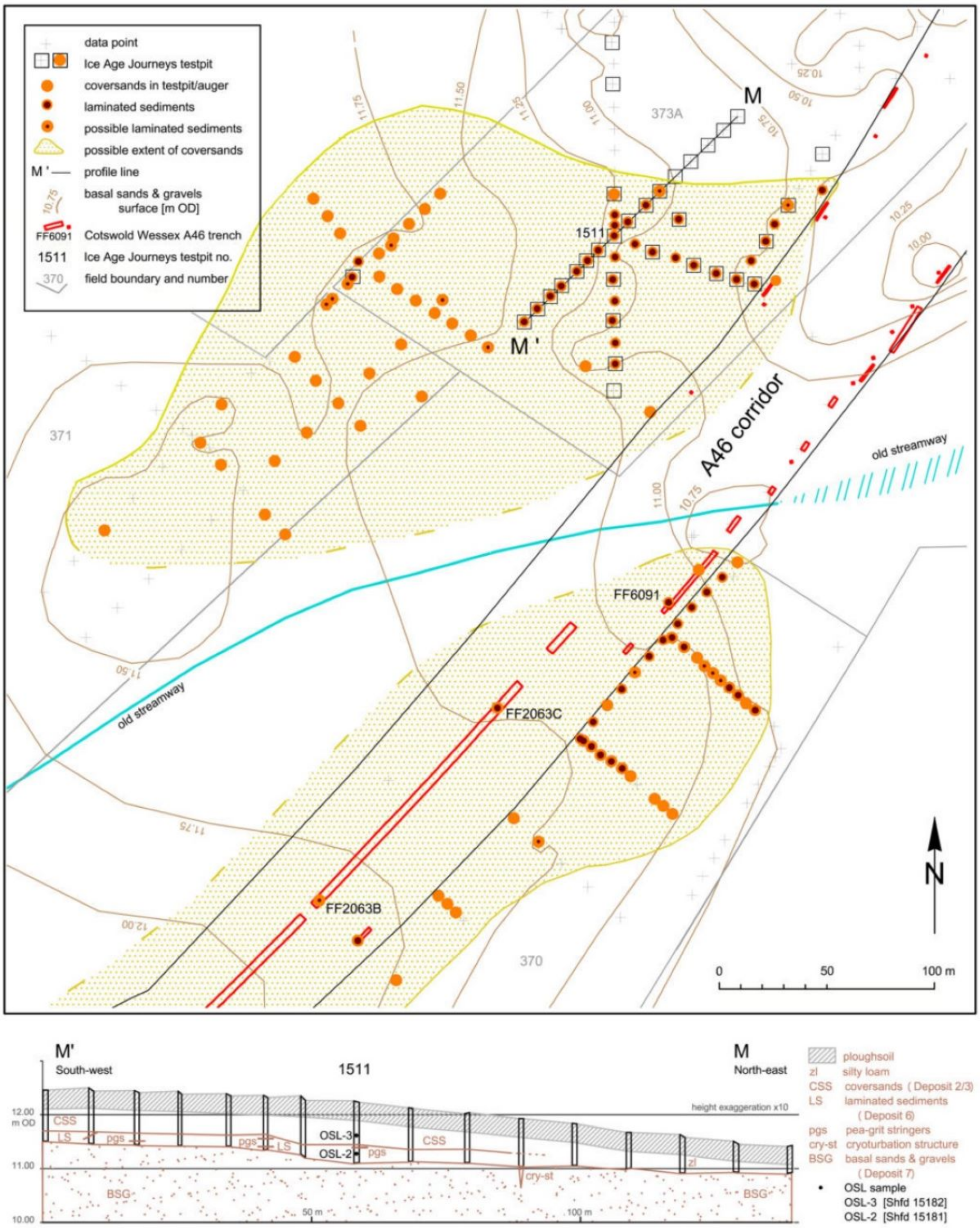


Figure 27: Location of IAJ test pits and auger-hole surveys (after Garton, Barton and Bateman 2020:fig. 3, reproduced with authors' permission)

et al. 2014; Garton et al. 2016; Garton, Barton and Bateman 2020), and perhaps rather underplays my first-hand involvement in e.g., planning and conducting surveys and other activities between 2015-2018. However, I argue that my focus on the existing site data is both warranted and necessary so to include the most diagnostic and informative data, and to further expand on their potential.

My Farndon artefact dataset (321 entries) comprises c. 50% of LUP ploughzone material collected between 1991-2013 (194 artefacts sampled; here collectively referred to by the 'FFF' find coding label), and ca. 95% of all CWA excavated finds >5 mm (127 artefacts sampled). Recognisably younger (Mesolithic or later) artefacts and undiagnostic, small knapping waste flakes and chips (ca. 3000 pieces <5 mm) were omitted from recording. Find recordings and lithic attribute analyses follow the rationale and procedures outlined in my Methodology (Chapter 3). The Farndon sample is composed of both primary (excavated, stratified) and secondary context (ploughzone) material. My data collection of the CWA material took place in April 2016 at Wessex Archaeology, Andover, and I recorded attributes on the ploughzone assemblages over the course of multiple visits to Ice Age Insights in Beeston, Nottingham (2015-2016).

My analysis is structured in order of primary (CWA) to secondary context (FFF) material. While I will present and discuss each sample subset separately, I have intentionally included both subsets in my supplementary tables for ease of comparison (see Catalogue C). Similarities or differences between subsets are discussed in Section 5.3. My CWA sample contains artefacts from the two spatially discrete and stratigraphically intact scatters in TR6007 East and West, and relevant LUP finds from other trenches excavated during the 2009 CWA campaign (Harding et al. 2014). Unless direct refits within or across trenches or test pits have been confirmed, I will not assume contemporaneity between excavated CWA finds. My ploughzone material sample (FFF) consists predominantly of unstratified surface finds, but I have also included artefacts which were found during test pit excavation (see Table 19; cf. Sections 5.1.1 and 5.1.1). Featured artefact illustrations are reusing existing expert line drawings made by H. Martingell (for Garton and Jacobi 2009) and by an unnamed illustrator (for use in Harding et al. 2014). The high quality finds photographs were made by G. Owen on commission of Ice Age Journeys, and by B. Porter, a retired photographer turned actively involved volunteer and site photographer (for use in this thesis, in Garton et al. 2016, Garton, Barton and Bateman 2020, and future Ice Age Journeys publications).

5.2.1 Flint raw materials: provenance and patina

Likely flint provenance

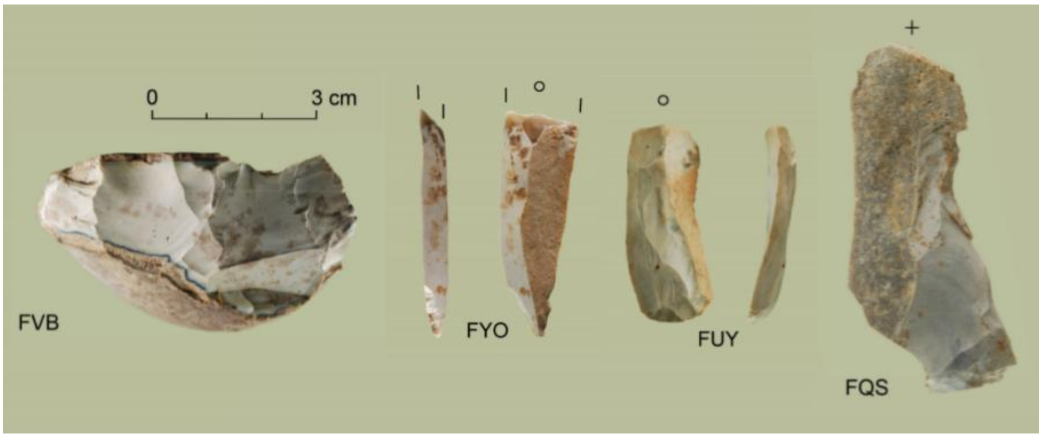


Figure 28: Representative nodular and tabular raw material examples with remnant primary cortex, illustrated through artefacts recovered in test pits in field 373B in 2014 (FVB core, FYO borer fragment, FUY end scraper, FQS flake; after Garton et al. 2016:Figs.13-14; photographs by D. Garton and B. Pointer, reproduced with permission)

At Farndon, flint was the dominant raw material for LUP manufacture. Where exposed by modern edge damage, original raw material colours range from opaque, brownish grey to translucent (light) brown and dark ox-blood red (see Figures 29, 30 and 26). The use of other raw materials such as sandstone, quartzite, or buff white-grey Wolds-type flint is thus far only documented through finds of worked later prehistoric implements (Harding et al. 2014:43). As suggested by the recovery of neat, standardised blades and retouched tools, the flint quality was generally good (Garton and Jacobi 2009:11; 31; Harding et al. 2014:Table 2.5, pp. 45-46; Garton et al. 2016:132, Tables 3-7; D. Garton, pers. comm. 2021). Variations in the size, shape, surface composition and condition (e.g., presence of primary or water-rolled cortex), and colour, indicate that a range of nodular and tabular flint sources were used (see Figures 28, 26 and 37; cf. Garton and Jacobi 2009:10-11, 31; Garton et al. 2016:132; Henson 1985; Högberg, Olausson and Hughes 2012). Such visual characteristics can provide important context with regards to whether the flint is derived from primary or secondary flint sources. Lithic attribute recordings such as metric dimensions or cortex prevalence are equally relevant to consider since these attributes may contribute additional information, i.e., these suggest if observed artefact lengths are representative of nodule sizes found within a local or non-local distance range or if cores were pre-prepared prior to use on-site.

In the Trent Valley, flint is only found in derived geological sources such as gravels, and the 'orange peel'-like preserved primary cortex on finds shown in Figure 28 indicates the modified flint was sourced from a secondary rather than a primary Chalk source. The nearest parent Chalk sources to Farndon are the Lincolnshire and Yorkshire Wolds (cf. Sections 2.2.2, 4.2.2, Figures 9, 15), and derived gravels are furthermore found in the nearby rivers Trent and Devon. While primary deposit Wolds-type flint is tabular, nodular flint can also be found in the Wolds regions. Besides qualitative assessments regarding flint provenance, the likely origin of the flint used at Farndon has been investigated through trace element analyses using the LA-ICP-MS technique (Rockman 2003; Pettitt, Rockman and Chenery 2012). M. Rockman's initial survey using a sample of nine ploughzone artefacts from Farndon suggested "a complete reliance on the south-western flint area [Pewsey/Beer Cliff, c. 200 km south of Farndon]", whereas an expanded follow-up study (thirteen Farndon finds and flint from Welton-le-Wold and North Ormsby sampled) instead pointed towards East Anglia and/or the North Lincolnshire Wolds as likely flint sources (Pettitt, Rockman and Chenery 2012). Only six of the thirteen finds analysed in the 2012 study provided stronger signals for the Lincolnshire Wolds. No specific location is suggested, since the conventional compositional grouping of 'Wolds' may extend to "include material available in the local region, or at least at distances of 30 km or more" (Pettitt, Rockman and Chenery 2012:282, Fig. 3). Pending further analyses, the parsimonious interpretation suggesting the use of nearby Lincolnshire Wolds (tabular and nodular) flint also strikes me as the most likely interpretation, not least since this flint provenance aligns with proposed least-cost pathway models in relation to the Farndon locale (Ross 2019).

Non-local (Wolds) flint provenance is furthermore strengthened through comparisons of locally observed flint nodules with recorded artefact attributes. For instance, a non-local flint source is inferred through the presence of "for this area, some largeish" cores (up to 77 mm maximum length of active face; see Figure 33; Garton and Jacobi 2009:fig. 6.7; 10; 31). This is notable because flint nodules in the Trent Valley rarely exceed 50 mm in maximum length, and as pointed out by S. Collcutt (pers. comm., 2021), "the very fact that Farndon is a significant distance from the nearest Chalk outcrops imposes certain size and particle characteristics upon any nearby river gravel", which again speaks in favour of a non-local provenance. However, suitable cobbles of river gravel flint were indeed used on occasion, as illustrated by preserved water-rolled cortex (in Figure 28) and recovered cores (e.g., Garton and Jacobi 2009:illus.5.3; ON 696 in Harding et al. 2014:Fig. 2.27.6). Nevertheless, direct comparisons between artefacts' maximal dimensions and Holme Pierrepoint Sand and Gravels (HPSG) which are scattered on the field surfaces show that nodules derived from HPSG differ in cortex (see Figure 28), and are too small and 'pebble-like' to have been selected if the knapping objective was the manufacture of long (>50 mm), standardised LUP blade blanks (cf. Figure 33; Garton et al. 2016 and own observations). A more regional flint origin is also inferred through, for instance, remnant cortex prevalence on cores and artefacts (cf. Table 32 and Figures 28, 37), since recovered cores were not always fully prepared and decorticated – and therefore lighter to transport - prior to use at Farndon. This same reasoning leads me to question Rockman's initial suggestion of a southern UK flint origin (2003), since weight would have been a significant concern during a 200+ km journey. On evaluation of observed characteristics, and in consideration of the nearby availability of suitable flint sources in the Lincolnshire and Yorkshire Wolds, I would rule out a very distant flint source.

Post-depositional condition and surface patination of artefacts

Table 14: Selection of typo-technologically diagnostic finds, sorted by proposed chronology and presence or absence of well-developed patina (in parentheses: artefact IDs cf. unpublished recording sheets and Garton and Jacobi 2009:illus.; Garton et al. 2016; object numbers ON via Harding et al. 2014)

Patinated	**Creswellian**	**FMG**
	talons en éperon (13, 15) long end scraper (UBW) proximal microburin (17) burins on truncations (FBJ, FXH) composite tool (CHQ)	thumbnail scrapers (CJV) end scraper fragment (BCT)
Unpatinated		
	bec/piercer (ON 445) long end scraper (FAB) composite tool (ANI) *bec* (UBB) *talons en éperon* (FQB, FQE)	curve-backed points (FKG, GJL) abruptly mod. point (EFQ) backed blade (FJD) small backed bladelets (ONs 426, 458)

The lithic assemblages at Farndon are characterised by different patina

Figure 29: Field-walked LUP material from Farndon Fields, Nottinghamshire. Note the distinct white-blueish patina that has become characteristic for the Creswellian flint artefacts from the Fields (image courtesy of Ice Age Journeys, used with permission).

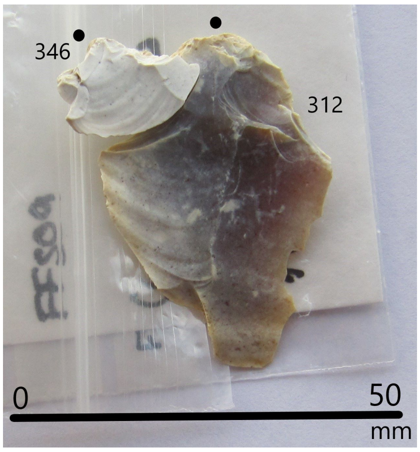


Figure 30: Working photograph of two refitting rejuvenation flakes (object numbers 312 (28 mm wide) and 346 (17 mm wide)) from the CWA FFS09 excavations of trench TR6007 East (Creswellian). Note the distinct differences and differential levels in surface staining; only flake 346 is fully stained in the dense, white patina, that has become a notable feature for Creswellian-attributable finds from Farndon (my photograph).

Year	1991	1993	1994*	2005	2009*	2012/2013	2014
Field	F373 LUP	F373B all	Area 1000 LUP	F370 LUP	F6007 East	F373 A+B fast fw LUP	F373B TP LUP
Patina: High	5 (55%)	26 (18.1%)	24 (68.5%)	2 (100%)	162 (18.6%)	15 (83.3%)	218 (96.4%)
Patina: Low		10 (7%)	11 (31.4%)			3 (16.6%)	2 (0.8%)
No patina	4 (45%)	107 (74.8%)	1 (2.8%)				6 (2.6%)
	N=9	N=143	N=35*	N=2	N=870****	N=18 (of 78)	N=226
		F373B LUP	Area 4000 LUP	F373A LUP	F6007 West	F373B intensive fw LUP	F373B TP all
Patina: High		29 (80.5%)	28 (100%)	29 (82.8%)		38 (69%)	8 (19.5%)
Patina: Low		6 (16.6%)		5 (14.3%)		7 (12.7%)	2 (4.8%)
No patina		1 (2.7%)		1 (2.8%)	194 (22.3%)	10 (18.1%)	29 (70%)
		N=36	N=28*	N=35	N=870****	N=55 (of 173)	N=41
		F374 all		F373B LUP	other fields	F373D fw LUP	
Patina: High		67 (7.1%)		20 (80%)	22 (2.5%)	40 (81.6%)	
Patina: Low		13 (3.7%)		4 (16%)		7 (14.3%)	
No patina		265 (76.8%)		1 (4%)	min. 492 (56.5	2 (4%)	
		N=345		N=25	N=870****	N=49 (of 107)	
		F374 LUP		F374 LUP		F374 fw LUP	
Patina: High		65 (83.3%)		23 (96%)		25 (89.3%)	
Patina: Low		13 (16.6%)		0		0	
No patina		0		1 (4%)		3 (10.7%)	
		N=78		N=24		N=28 (of 380)	
				Prehistoric finds		F374 test pits	
Patina: High				60 (8.4%)		40 (95.2%)	
Patina: Low						2 (4.8%)	
No patina							
				N=709		N=42 (of 75)	
Total High	5 (55%)	187 (31%)	52 (82.5%)	134 (16.8%)	184 (21.1%)	158 (15.7%)	226 (84.6%)
Total Low	0	42 (6.9%)	11 (17.4%)	9 (1.1%)		19 (1.9%)	4 (1.5%)
Total None	4 (45%)	373 (62%)	1 (1.6%)	3 (0.4%)	696 (78.8%)	15 (1.5%)	35 (13.1%)
Total	9	602	491* **	796	870****	1005	267
Total LUP	9	114 (18.9%)	64* (13%)	87 (11%)	870****	192 (19.1%)	226 (84.6%)
Total other	NA	488 (81.1%)	427** (87%)	709 (89%)	NA	813 (80.9%)	41 (15.3%)

Figure 31: Frequency of (un)patinated artefacts, divided by the three categories (high, low, none) first defined by Trent and Peak Archaeology (listed as 'H', 'L', 'N' in the original recording datasets and summarised in the grey literature, e.g., Trent and Peak Archaeology 1991; Trent and Peak Archaeological Unit 2004; Oxford Archaeology 2005; D. Garton, pers. comm. 2015). The 2009 CWA data were categorised differently (entered as Patina: True/False on the raw datasets, Wessex Archaeology and Cotswold Archaeology 2017, though with omissions viz. Harding et al. 2014 and not a complete summary here). The presentation is divided by year, field number, chronology. Differing totals compared to other publications are due to subsequent revisions to the source data (NA = not available; sources: unpublished recording datasets generously made available by D. Garton and Ice Age Journeys, pers. comm. 2015; CWA flint recording data, Wessex Archaeology and Cotswold Archaeology 2017).

types and differential levels of surface alternations caused by post-depositional processes in the ground (Rottländer 1975; Reynier 2005:129-133; Glauberman and Thorson 2012:24), ranging from entirely unpatinated, or unpatinated finds with a distinct glossy shine, or red-brown iron stained, or mottled (light) blue or white, to finds fully coated in a distinct, thick and invasive white patina. All surveys since 1991 have remarked on the presence of this 'Farndon white'

of which tools (LUP)		F373B	Area 1000	F370	F6007 West	F373 A+B fast fw	F373B TP LUP
Patina: High		2 (66.6%)	5 (62.5%)	1 (100%)		4 (100%)	9 (100%)
Patina: Low			2 (25%)				
No patina	3 (100%)	1 (33.4%)	1 (12.5%)		min. 8***		
	N=3	N=3	N=8	N=1		N=4	N=9
		F374	Area 4000	F373A	373B intensive fw		
Patina: High		9 (100%)	13 (100%)	3 (75%)		7 (100%)	
Patina: Low				1 (25%)			
No patina							
		N=9	N=13	N=4		N=7	
				F373B		F373D	
Patina: High				1 (100%)		5 (100%)	
Patina: Low							
No patina							
				N=1		N=5	
				F374		F374 fw LUP	
Patina: High				6 (100%)		3 (75%)	
Patina: Low							
No patina						1 (25%)	
				N=6		N=4	
						F374 test pits	
Patina: High						1 (100%)	
Patina: Low							
No patina							
						N=1	
Total High		11 (91.6%)	18 (85.7%)	11 (91.6%)		20 (95.2%)	9 (100%)
Total Low			2 (9.5%)	1			
Total None	3 (100%)	1 (8.3%)	1 (4.7%)	1 (8.3%)	min. 8****	1 (4.7%)	
Total tools	9	12	21	12	NA	21	9
Notes			* excl. 60 patinated LUP from sub-surface ploughsoil original recording (data NA)				
			** in report OA/TPAU				
					*** see Catalogue re missing context concordance		
					****excludes microdebitage		

Figure 32: Frequency of (un)patinated tools, divided by the three categories (high, low, none) first defined by Trent and Peak Archaeology (listed as 'H', 'L', 'N' in the original recording datasets and summarised in the grey literature, e.g., Trent and Peak Archaeology 1991; Trent and Peak Archaeological Unit 2004; Oxford Archaeology 2005; D. Garton, pers. comm. 2015). The 2009 CWA data were categorised differently (entered as Patina: True/False on the raw datasets, Wessex Archaeology and Cotswold Archaeology 2017, though with omissions viz. Harding et al. 2014 and not a complete summary here). The presentation is divided by field number and chronology. Differing totals compared to other publications are due to subsequent revisions to the source data (NA = not available; sources: unpublished recording datasets generously made available by D. Garton and Ice Age Journeys, pers. comm. 2015; CWA flint recording data, Wessex Archaeology and Cotswold Archaeology 2017).

cortication (*sensu* Garton and Jacobi 2009; Rottländer 1975; Reynier 2005:129) shown in Figures 37, 28 and 29. Artefacts with this distinct patina have been recovered from field surfaces, test pits, and *in situ* during the CWA excavations (in Trench F6007 East). In Figure 31 I have collated a comprehensive comparison of the frequency and distribution of highly, lightly, and unpatinated finds. The tabulation follows the notation used in the unpublished flint recording datasets which do not differentiate between *types* of patina, instead listing values by their *extent*, and the letter “H” (for “High”) is a useful shorthand for the distinct white patina.

In terms of ground-surface visibility, in my fieldwalking experience, the patinated white artefacts are easily visible and can introduce a pre-selection bias. This could for instance be suspected for several of the surveys listed in Figure 31 where (near) 100% of all LUP finds are highly patinated (e.g., 1993 survey of Area 4000, 2005 fieldwalking in field 374, or 2014 test-pitting in field 373B). However, as addressed by previous researchers - some of whom have been involved in Farndon since 1991 - a pre-selection due to higher levels of visibility may be tentatively ruled out (Garton and Jacobi 2009:6) since most surveys have produced broadly replicable patterns of artefact recovery regardless of surface condition. Interestingly, an LUP blade from Farndon that has been published by the PAS also conforms to this trend (see Figure 67; object ID LIN-6118B4, The Portable Antiquities Scheme 2019k). The pattern emerging from past surveys has characterised patina as a reliable visual identifier to distinguish artefacts from different periods. Initially, the ‘cortication’ criterion helped differentiate between patinated LUP finds and unpatinated flints from Mesolithic and later prehistoric periods (Garton and Jacobi 2009:10-11; Harding et al. 2014:63; analogous Belgian examples discussed by Glauberman and Thorson 2012:25). As shown in Figure 31, the link between patina and an LUP-attribution is emphasised by the contrastingly low frequency of patinated prehistoric finds. For instance, the 1993 fieldwalking survey of field 373B found that 80.5% of all 36 LUP finds were highly patinated, contrasted with 74.8% unpatinated prehistoric lithics. Since similar reversed ratios apply to other phases of investigation, the presence of white, invasive patina - or its absence - can be confirmed as highly helpful in assessing the likely age of surface and ploughsoil finds at Farndon.

There are, however, important exceptions to this broader trend: not all unpatinated finds are from later prehistoric periods, as illustrated by the excavated *in situ* flint scatter in trench F6007 West or the range of unpatinated, diagnostic LUP-attributable retouched tools in Figures 36, 26 and 23. Nevertheless, a comparison of patinated tool ratios in Figures 31 and 32 demonstrates an even more apparent trend, and the known LUP tool components are clearly biased (>86%) towards patina. While these skewed proportions are amplified by surveys with very low overall numbers of retouched tools (sometimes as low as N = 1), the broader pattern can be confirmed, regardless of survey phases, methods, or location on the interfluve.

The analyses by Garton and Jacobi (2009) showed that a further refinement of the general LUP classification is possible for the most diagnostic LUP objects and typo-technological traits. Specifically, and as compared in Table 14, a link between the presence of patina/cortication and a Creswellian-attribution was suggested (cf. Figure 37), contrasted with a pattern of unpatinated FMG tools and artefacts (in Figure 26). Most strongly expressed is this possible correlation between patina/cortication and Creswellian - or the absence thereof as an FMG indicator - in the CWA analyses of the two *in situ* flint scatters in Trench F6007 East (Creswellian, patinated) and F6007 West (FMG, unpatinated).

Although an "initial selection of pieces by [secondary] cortication shows a consistent technological [Creswellian] theme" (Garton and Jacobi 2009:29, 10; Harding et al. 2014:46), post-depositional patina is not an ideal means to differentiate between flint types used or as a chronological identifier for different LUP phases of occupation at Farndon, since secondary patina may develop very differently even under highly localised conditions. In R. Rottländer's words (1975:109-110), "patina itself provides only half the story. The other half is provided by the sediment and the micro-environment surrounding the piece of flint after its burial". Among other factors, variations in acidity levels within the same field or context, and also shifts in the vertical artefact distribution may impact originally associated flint artefacts differently (e.g., Rottländer 1975; Glauberman and Thorson 2012:24-25; S. Collcutt, pers. comm. 2021), as illustrated by examples of refitting finds found within the same trench, but with differential levels of white secondary patina (see Figure 30; equally ONs 330 and 8087 in Harding et al. 2014:58).

Indeed, while a correspondence between white patina and Creswellian-indicative types may be noted (cf. Table 14, Figure 32), exceptions are known (such as the unpatinated Creswellian end-scraper in Garton and Jacobi 2009:fig. 10.21). Equally, processes of patination are not concluded upon artefact recovery but may carry on outside of the field context, either near-instantaneously (cf. Garton et al. 2016:123) or more slowly. For instance, the abruptly modified point in Figures 23 and 38 was originally unpatinated brown-grey at time of its initial recording and photography, but has gradually changed in appearance and is now patinated in an opaque, light grey colour not dissimilar to the range of patina on Creswellian-attributable finds. Thus, "without other diagnostic features and associations, [surface condition] cannot be regarded as infallible" (Garton et al. 2016:132; Harding et al. 2014:63). Moreover, given the overall lower percentage of unpatinated LUP artefacts (in Figure 31), I would not expect to see a greater number of unpatinated tools - regardless of whichever LUP technocomplex they may be attributable to. Based on present evidence it is highly plausible that the unpatinated and patinated (i.e., secondary corticated) LUP artefacts from Farndon are of the same derived flint but have since undergone very different post-depositional and post-exhumation histories and therefore show differential levels of secondary cortication/patina (S. Collcutt, pers. comm., 2021).

At the most overarching chronological level, the patterns summarised in Figure 31 and Table 14 certainly do speak in favour of a link between patina development and chronology (LUP vs later periods). To this end, I sought to make these trends more robust by linking the lithic evidence up with site stratigraphy, i.e., to see if there are differences in the location of prehistoric activities and/or depositional histories. This is especially interesting in the broader riverine context of this thesis, since the sediment profile of the Creswellian scatter in F6007 East is interpreted as an indication of LUP occupation on soil-sediments within/near to an active stream channel (Harding et al. 2014:35).

A comparable example is for instance documented at the early Mesolithic site Thatcham III, Berkshire, where differential levels of surface alteration can be linked to different soil profiles, or the artefacts' vertical distribution within the same strata (Reynier 2005:56-57, Figs. 4.3-4.4). Moreover, Thatcham III is especially interesting because the two lithic scatters (Eastern and Western) provide an example of a patinated earlier (Star Carr type) assemblage contrasted with a subsequent, and unpatinated, later series (Deepcar type). In the Eastern scatter (Star Carr type), 90% of finds in layer 5 were patinated with a blueish hue, whereas finds in layer 4 were only very thinly or not at all patinated. Following his reanalyses, M. Reynier (2005:56) suggested that the patinated and unpatinated series could be from the same layer (4/5 as one), and differential degrees of patina are linked to that the vertical distribution within the layer. In contrast, the Deepcar type material in the Western scatter (in layer 4) is only minimally patinated (0.5% of finds from layer 4) and this scatter was also formed after the Star Carr type series had been deposited.

Since the majority of Farndon finds were found in or on the ploughsoil and contextual stratigraphic evidence is limited, I targeted the stratified scatters in F6007 East and West to see if perhaps the sedimentary contexts could provide further insight into the underlying mechanisms of patina developments. According to Harding et al. (2014:34-36, figs 2.11-2.17), the patinated *in situ* material in F6007 East was recovered from alluvium (spits 2 and 3) and the context number 607061 is described as a "moderately homogeneous, compact, massive sandy loam". The unpatinated scatter in F6007 West sits stratigraphically higher in alluvium spit 2 in context 607068, a "compact, massive sandy loam (...). Unfortunately, because of so much background pedological 'noise' (inwash of clay, both iron depletion and mottling), it is impossible to know if conditions were stable or muddy. This site seams to have become vegetated and subsequently, as the stream migrated and fine alluviation (clayey alluvium) occurred, this was washed down root holes" (Harding et al. 2014:35-36). However, due to observed metadata discrepancies between the CWA raw data and 2014 publication (see Section C.1), I was unable to link up context numbers, spits, and recorded finds, i.e., could not wholly reconstruct the stratigraphic profiles. This is unfortunate, since the importance of assessing this site complex at a high resolution is emphasised by observations during test pitting in fields 373B and 374, where different underlying topographies produced demonstrably different results (Garton et al. 2016:104, 130-131). Further raw material provenance studies of the lithic assemblages still offer high potential for future analyses, also with regards to testing if indeed different flint sources were used preferentially throughout different phases of LUP occupation, which would mirror patterns observed at Seamer Carr K in the subsequent case study (see Chapter 6). Furthermore, it will be important to investigate in more detail the extent to which sedimentary/depositional differences influence the differential levels in patina, to make the proposed typo-technological and chronological differences more robust.

5.2.2 Analysis of the CWA sample

My sample (see Table 15) includes both patinated and unpatinated finds from different trenches (from CWA fieldwork stages 1-4; see Table 16). In light of the observed discrepancies during data collection (see Appendix Section C.1), I have intentionally decided to present my CWA analysis as one aggregated sample. In practical terms this means that I have recorded fewer finds than intended from the stratified TR6007 East (Creswellian) scatter, and that my sample is skewed towards TR6007 West (FMG) and material from other trenches. Differences in sample composition will lead to differences between my results and the CWA analysis, since theirs was carried out on the full, excavated lithic assemblage (Harding et al. 2014). Nevertheless, my sample is still fully representative of the LUP artefacts recovered during excavations and suited for comparisons with the ploughzone material (in Section 5.2.3).

All recorded finds are of flint and were recovered in sediments presumed to

Table 15: Composition of CWA sample (N = 127)

Debitage product	**Count**	**(in %)**
backed bladelet	2	1.6
blade	29	22.8
burin	3	2.4
core	10	7.9
core correction blade	2	1.6
core correction flake	4	3.1
core fragment	1	0.8
core tablet	1	0.8
end scraper	5	3.9
end scraper on crested blade	1	0.8
flake	60	47.2
piercer/bec	1	0.8
retouched blade	5	3.9
scraper	1	0.8
truncated blade	2	1.6
Total	**127**	**100%**

be from beneath the aeolian coversands. The artefacts' preserved condition is generally very good and I observed only negligible signs of post-depositional (trowel) damage. During recording, I noted a wide range of patina, ranging from no discernible change (48.8%), to some mottled white and/or blue specks (12.6%), light grey or brown (3.9%) to various shades of white (34.6%), all of which correspond to colours of the ploughzone finds (in Figures 28, 29, 23 and 26).

Flakes (49.6%) and blades (29.9% $\geq$ 2:1 length to width ratio) are the largest artefact categories sampled, followed by cores (7.8%) and retouched tools (combined percentage: 9.4%). To gain a representative sample of artefacts' maximum metric dimensions (see p. 122) and lithic technological attributes, my pre-selection of finds for recording targeted both completely preserved pieces (50.4% of catalogue) and finds with intact proximal ends (N = 100, 78.7% of sample).

Cores and core reduction

A tabulation of core preparation methods is listed in Tables 33 and 34. Building on the results from the CWA campaign (see Section 5.1.1) which had identified predominant use of soft (organic) and occasionally also of hard hammers, I examined 100 preserved proximal ends for characteristic signs of core preparation.

Table 16: CWA: provenance of sampled finds (present dataset; N = 127)

Origin	Count	(in %)
NA	8	(6.29)
Eval. Trench TT1312	1	(0.78)
Test Pit 6021	1	(0.78)
Test Pit 6044E	1	(0.78)
Test Pit 6048	1	(0.78)
Test Pit 6072	1	(0.78)
Test Pit 6083	1	(0.78)
TR6002	12	(9.44)
TR6005	4	(3.14)
Trench 6007 (unspecified)	17	(13.38)
Trench 6007 East	19	(14.96)
Trench 6007 West	45	(35.43)
Trench 6013	2	(1.57)
Trench 6059	1	(0.78)
Trench 6093	1	(0.78)
Trench 7001	1	(0.78)
Trench 7003	1	(0.78)
Trench 7008	2	(1.57)
Trench 7009	1	(0.78)
Trench 7014	1	(0.78)
Trench 7017	3	(2.36)
U/S SMS2063	2	(1.57)
Total	**127**	**100%**

Abrasion (42.7%) and more extensive/heavy abrasion (35.1%) along the platform edge are the most prevalent methods and observed across all recorded trenches. Abrasion may also sporadically appear in combination with faceting (6.5%), although faceting in isolation is only reported for a small percentage of my sample (6.5%). No discernible preparation is noted for 9.8% of finds. The CWA report listed a high proportion of faceting (c. 40% for scatter F6007 East, in Harding et al. 2014:Table 2.7) which is mirrored in my sample of nineteen TR6007 East finds (42.1% faceted), contrasted with a lower proportion of faceting (27.3%) in TR6007 West. However, in comparison with the CWA data my overall CWA sample includes fewer faceted platforms (in Table 33); this discrepancy between recordings is likely caused by my overall lower sample size of TR6007 East finds (cf. Section C.1). Since I did not include micro-debitage in my catalogue, I refer back to the CWA analysis (Harding et al. 2014:Table 2.5; p. 53) which notes the presence of diagnostic faceting and core preparation chips specifically in TR6007

East (micro-debitage densities shown in Figures 24 and 25).

Regarding butt forms (Table 34), whereas 52.8% are plain, further variation may be observed; ranging from linear (25.2%) to punctiform (9.1%) and also cortical butts (8.0%). As outlined in Section 5.1.1, no unequivocal examples of characteristic platform preparation *en éperon* were observed during the CWA excavations, although I was able to record one of two platforms approaching the *en éperon* technique from TR6007 East mentioned by P. Harding (Harding et al. 2014:50).

As an indicator for which steps of the *chaîne opératoire* are present in my sample, I recorded percentages of remnant cortex on all artefacts (see Table 32). All steps from initial core preparation through to reduction are present. The extent of (continuous) patches of remnant cortex ranges none to more substantial (50-100%), as recorded on 25.1% of finds, including on seven cores (cf. Harding et al. 2014:60), which indicates that decortication took place locally. Three end-scrapers (one each from TR6007 West, TR6083, TR6021) have approximately 50% cortex coverage on the dorsal side, which suggests 'early' blanks were modified into tools. On 47.2% of finds I observed no cortex, whereas <30% of cortex remained on 27.5% of artefacts.

Knapping directionality and sequencing may be inferred through dorsal scarring patterns left by previous removals - fewer scars or negatives suggest an earlier stage of blade removals, whereas more scars indicate blanks were struck later in the sequence (see Table 35; Sørensen 2006b). All stages of the *chaîne opératoire* are present in my CWA sample, although tertiary blanks with three or more removals are most prevalent (64.4%). Since I noted cortex also in conjunction with multiple dorsal scars, this indicates that cores were not fully decorticated.

Recorded cores (N = 10; ONs 2, 3, 694, 696 all from TR6002; 983, 443, 5107, 5108, all from TR6007 West, 628 from TR7003 and one unstratified) are all mostly unpatinated save some minor surface staining. Core ON 3 shows signs of thermal crackling throughout and is also the largest core, measuring 69 mm at its longest (on active face). This is uncharacteristically large for the Trent Valley (cf. Garton and Jacobi 2009:10), and the other recovered cores are smaller (ca. 45 mm in height). All cores have knapping errors such as hinged and bulged terminations and were mainly struck uni-directionally (see Table 36). Based on crossed or opposed negative removals and recovered core correction blades/flakes, cores were re-orientated to correct knapping errors from an opposed platform (Harding et al. 2014). It is possible that cores may have been bi- or multi-directional, but with no overlap between active core faces, and therefore appear purely uni-directional or single-platform. The recovery of one "crudely crested" blade with end-scraper retouch (ON 362 from TR6007 West in Figure 34:6; Harding et al. 2014:61) indicates cresting was occasionally used to ensure longer blade removals, and cresting could account for crossed or transverse dorsal scar patterns. Only core ON 443 was exhausted fully; all remaining cores could potentially have been rejuvenated to be worked further, as illustrated by the core tablet in Figure 30.

Metric comparisons

Table 17: Comparison of measurements (width, length, mesial thickness, in mm) of all Farndon blades (N = 58, of which 29 are from the excavated CWA data, and 29 from the fieldwalked FFF dataset)

Sample	Measurement	Mean	Sd	Median	IQR
CWA	Width	13.5	3.91	14	6
FFF	Width	14.9	3.89	14	3
CWA	Length	37.7	14.5	33	24
FFF	Length	36.8	10.3	35	14
CWA	Thickness (mid.)	3.21	1.63	3	2
FFF	Thickness (mid.)	3.41	1.24	3	2

In Table 17, the measurements width, length, and mesial thickness are compared for all 58 blades in this larger Farndon dataset, including 29 CWA blades. Figure 33 is a scatter plot to illustrate the distribution of different artefact categories' widths relative to mesial thickness (measured in mm, CWA and fieldwalked FFF samples included). The 29 blades in the CWA collection are quite evenly clustered within a range of 10 to 20 mm in width (mean: 13.5 mm, sd: 3.91 mm, median: 14 mm, IQR: 6), and between 2 to 6 mm in thickness (mean: 3.21 mm, sd: 1.63 mm, median: 3 mm, IQR: 2 mm), with a fan-like gradual increase of thickness in relation to larger widths. Values for length are: 37.7 mm (mean), with a standard deviation of 14.5 mm, median: 33 and IQR: 24 mm (in Table 17, including all CWA blades regardless of degree of complete preservation).

The broadest piece in the sample measures 41 mm (ON 228 core correction flake from TR6007 East), whereas the longest recorded piece (84 mm; not illustrated in Figure) is the retouched blade ON 460 from TR6007 West, which is unusually long for a blade made from allegedly local "heavily abraded, subrounded cobbles of river gravel flint" (Harding et al. 2014:60; cf. Section 5.2.1). Notable outliers measuring 11 to 14 in mm thickness are predominantly from the FMG scatter in TR6007 West, for instance retouched blades (ON 362 on a crested blade and distal end scraper fragment ON 584, both from TR6007 West) and core correction removals (ONs 83, 8072) that are usually thicker than blade removals in order to remove knapping errors. The thickest piece (18 mm) is the core correction removal ON 187. In contrast, the thickest pieces from TR6007 East (Creswellian scatter) are markedly thinner than in the western scatter but this may be an artefact of sample size. Thinner pieces also include a core tablet in Figure 30 (ON 346 with refitting flake 312) and core correction flakes ON 228 (4 mm thick, 61 mm long and the longest blade in my TR6007 East sample) and ON 5016 (5 mm thickness, 34 mm long).

Table 18: Comparison of measurements (width, length, mesial thickness, in mm) of all sampled TR6007 blades (N = 76; includes TR6007 West, N = 40, TR6007 East, N = 19, and unspecified TR6007, N = 17)

Sample	**N**	**Measurement**	**Mean**	**Sd**	**Median**	**IQR**
TR6007	17	Width	14.6	4.44	14	4.75
TR6007 East	19	Width	18	8.28	15.5	5.75
TR6007 West	40	Width	16	6.77	14.5	8
TR6007	17	Length	19.6	6.06	19.5	4.75
TR6007 East	19	Length	25.7	12.1	25	12.2
TR6007 West	40	Length	34.1	16.3	26	19.5
TR6007	17	Thickness (mid.)	2.25	1.77	2	1.25
TR6007 East	19	Thickness (mid.)	2.22	1.31	2	2
TR6007 West	40	Thickness (mid.)	3.65	2.26	3	3

In Table 18 I have compared measurements of width, length, and mesial thickness of finds from trench TR6007 to test the stated differences between the *in situ* scatters in TR6007 East and West can be quantified. This dataset (N = 76) includes 40 artefacts from TR6007 West, 19 from TR6007 East and 17 finds for which East/West was not specified. The ratio of unpatinated and patinated finds is 50:50, with an equal divide between patinated TR6007 (East) finds and unpatinated material in TR6007 West. Measured lengths comprise both complete and fragmented artefacts and lengths are indicative rather than definite values for this sample of artefacts. The overview in Table 18 highlights interesting differences regarding the mean/median values but also between the different parts of TR6007. For instance, whereas finds in the TR6007 East group are, on average, widest (mean: 18 mm, sd: 8.28 mm, median: 15.5 mm, IQR:

5.75 mm), the material from TR6007 West is both longer (mean: 34.1 mm, sd: 16.3, median: 26 mm, IQR: 19.5 mm) and thicker (mean: 3.65 mm, sd: 2.26 mm, median: 3mm, IQR: 3 mm). Compared by width and length alone, the unspecified TR6007 material in Table 18 cannot be conclusively grouped with either of the two samples, however the similarities in mesial thickness indicate near-equal values between TR6007 East and the unspecified material.

To test if there are significant differences between the groups, I compared the results from Kruskal-Wallis rank sum tests and, where applicable, pairwise comparisons using a Wilcoxon rank sum test to compare how the different groups differ (with continuity correction and Benjamini-Hochberg/BH-adjusted P-values). There is no significant difference in the widths (result of Kruskal-Wallis rank sum test: chi-squared = 1.2325, *df* = 2, p-value = 0.54). Comparisons of lengths indicate a significant difference (Kruskal-Wallis rank sum test: chi-squared = 15.363, *df* = 2, p-value = 0.0004612). A pairwise comparison using a Wilcoxon rank sum test returns no significant difference between the West and East scatter (p-value = 0.09357), or between the unmarked 6007 and East material (p-value = 0.09537). However, the difference between TR6007 West and the unmarked 6007 group is significant (p-value <0.001). This is may be related to varying degrees of complete artefact preservation (i.e., 21 complete blades in TR6007 West but only 6 in TR6007). Comparisons of mesial thickness indicate significant differences (results of Kruskal-Wallis test comparing all three TR6007 groups: chi-squared = 11.318, *df* = 2, p-value = 0.003486), which, through pairwise comparisons state there are no significant differences between the unspecified 6007 material and East (p-value = 0.828), however the TR6007 West material differs significantly (p-value = 0.016) from TR6007 East and TR6007.

The absence of retouched artefacts from TR6007 East does not permit direct typological comparisons between scatters, but based on present evidence, the metric comparisons are in support of Harding et al.'s statements (2014) regarding the two scatters, as are the observations regarding patination as a visual, if not a chronological, distinction. This is consistent with patterns noted for ploughzone material (Garton and Jacobi 2009:29). It is interesting to see that despite the differences in sample composition between the CWA report and my sample, differences in the *in situ* material are borne out here as well.

Retouched tools (CWA)

A total of sixty-four retouched tools were recovered during the CWA campaign, which is equivalent to 1.7% of all excavated worked flint (Harding et al. 2014:Table 2.5). Retouched tools (see Table 15) were only discovered in TR6007 West and other trenches, but none were found in TR6007 East. Based on context, absence of distinct white patina, and typology, the retouched tools from TR6007 West have been interpreted as representative of FMG industries (Harding et al. 2014:61-63; see Figure 34). Although no curve-backed points or penknife points were found during excavation, the small, 25 mm long and 9 mm wide backed bladelets are diagnostic (mesial thickness: 3 mm, maximal thickness 8 mm; backing orientated along right lateral edge; ONs 426, 458, 8018 in TR6007 West; see Figure 34:13-14). This toolkit composition is representative of a later FMG *faciès* and comparable to other open-air LUP sites believed to date to GI-1cba (Allerød chronozone; cf. Section 2.1.4; Harding et al. 2014:Fig.2.39; Barton 1992; Barton 2009; Conneller and Ellis 2007). Metric dimensions are described on p. 122.

Scrapers are predominantly end-scrapers made on blade blanks and were found in trench TR6007 West (FMG scatter), but similar examples occur also in TR6002 and TR6093 (Garton, Barton and Bateman 2020; CWA ONs 329, 454, 584, 692, 703 plus two without ID). As shown in Figure 33, blanks selected for modification into scrapers are made on slightly thicker and wider blanks than unmodified blades and flakes, and the prevalence of remnant cortex suggests 'earlier' removals and in a few cases crested blades were selected. For instance scraper ON 703 (in Figure 34:9) is made on a small (25 mm W to 29 mm length) flake with a substantial amount of cortex left, and retouched along the naturally curved distal end. The scraping edge is predominantly oriented at the distal end, except for end-scrapers ON 329 and 362 (both found in TR6007 West). ON 362 was made from a crested blade and modified at the proximal end. Both scrapers have a slanted or angled tip at the opposite end of the scraping edge, reminiscent of piercers, and could have been modified further into combination tools, similar to the ploughzone end-scraper with piercer shown in Figure 23. No 'hooked' scrapers were observed, and in most respects, CWA end-scrapers are comparable to extant ploughzone examples made on blades shown in Figure 23. A direct comparison between scrapers in TR6007 West (N = 5) and scrapers in the FFF sample (N = 19) found no statistically significant differences regarding width or mesial thickness[1].

Additional retouched tools are predominantly made on straight, parallel-sided, and standardised blade blanks (see Figure 33). Two blades with straight, direct truncation were found in TR6007 West (ONs 8082, 8085; in Figure 34:11-12) and which differ from an extant ploughzone obliquely truncated fragment shown in Figure 38. All three burins I recorded in the CWA sample were made on blades (no Object Numbers given) with burin spalls removed at the distal end. One recovered piercer/*bec* (ON 445, TR6007 West) is made on a slender, long (66 mm) and narrow (9 mm) blade, which is substantially curved (in Figure 34:10). The piercer is located at the distal end, and the blade itself is slightly twisted with a small, punctiform butt. No projectile points were recovered during CWA fieldwork, which mirrors similar observations from fieldwalking (Garton and Jacobi 2009). Again, this implies little divergence in the assemblage that might be expected if there was an admixture of FMG and Creswellian tools.

5.2.3 Analysis of the FFF sample

Prior to the CWA interventions in 2009, approximately 330 finds had been recovered over the course of several episodes of unit-led surveys between 1991 to 2005, including 62 retouched tools (equivalent to 18.8% of all flint collected prior to CWA campaign; cf. Garton and Jacobi 2009:Tables 3-6); see finds distribution in Figure 22). Since 2012, subsequent work by Ice Age Journeys has thus far recovered over 900 additional finds of LUP and younger date (including 59 retouched tools, c. 6.1% of total known lithic collection), many of which were discovered after my data collection concluded and therefore not included here (Garton et al. 2016:Tables 3-7; Ice Age Insights 2019b; Ice Age Insights 2019c). All surveys followed the methodology outlined in Garton 1993, which has also been adopted for the Ice Age Journeys project after 2014 and thus ensured crucial continuity between campaigns. My own analysis is informed by D. Garton and R. Jacobi's (2009) first study of the diagnostic LUP finds recovered up until

[1]Comparison of length was omitted due to incomplete artefact preservation. Values for width are: FFF scrapers, N = 19, mean: 19.3 mm, sd: 1.97, median: 20 mm, IQR: 3 mm; TR6007W scrapers, N = 5, mean: 20.6 mm, sd: 5.59 mm, median: 21 mm, IQR: 6 mm. Results of Kruskal-Wallis rank sum test to compare both groups: Kruskal-Wallis chi-squared = 0.12889, *df* = 1, p-value = 0.7196. Mesial thickness: FFF scrapers, N = 19, mean: 5.05 mm, sd: 1.22 mm, median: 5 mm, IQR: 2mm; TR6007W scrapers: N = 5 mm, mean: 5.8 mm, sd: 2.49 mm, median: 5 mm, IQR: 2 mm; results of comparison using a Kruskal-Wallis rank sum test: chi-squared = 0.11281, *df* = 1, p-value = 0.737

2005. Compared to their analysis, which primarily discusses evidence from 'Farndon white' patinated artefacts, my own sample includes a greater number of unpatinated finds.

The composition of my FFF sample is shown in Table 20. An overview of finds provenance is in Table 19 and reflects the higher proportion of artefacts found in Field 374 where the North Cluster is located and more finds had been discovered, whereas the South Cluster is in Field 373 (see Figure 22). Based on visual characteristics, a range of nodular and tabular non-local flint types from derived geological sources were used (cf. Section 5.2.1). Using the standard blade definition ($\geq 2:1$ length to width ratio), flakes constitute the largest artefact group (63.5%), followed by blades (18.5%) and retouched tools made on blade blanks (17.5%). The recorded artefacts' longitudinal profiles are predominantly straight (74.2%). The general condition of my sample reflects its ploughzone provenance, as only 18% of finds are complete or only minimally (edge) damaged. I recorded an even larger number of medial fragments (32.6%) and specifically targeted finds with intact proximal ends (52.7%, N = 102) for attribute analyses. Virtually all sampled finds are patinated to some extent and during recording I noted a broad spectrum of patina (see Figure 29), ranging from only eight completely unpatinated finds (4.1%), to 23.7% of artefacts stained in light browns, blues or greys. Approximately 72.1% of my sample show differential levels of the distinct white patina (cf. Section 5.2.1).

Technological attributes and core reduction

To gain an overview of which steps of the *chaîne opératoire* are represented within the field-walked sample, I recorded several features, including the prevalence of preserved remnant cortex (see Table 32). By far the most common observation is no cortex at all (70.6%), followed by 14.4% of the sample containing <30% cortex. More than 50% of cortex remains intact on 14.9% of sampled finds, all save two of which are flakes with continuous flecks of cortex preserved on the dorsal side, suggesting these are early removals. One end-scraper fragment (ID: GBJ) and one burin (ID: ELT) also have <60% of cortex remaining, which indicates not all retouched tools were made on fully decorticated blanks.

Scarring patterns on the dorsal sides are additional attributes that may indicate from which step in the knapping sequence the finds originate from. Based on my overview in Table 35, 73.2% of ploughzone artefacts have three or more negative removal scars, suggesting these were removed during the later stages of core reduction. 'Earlier' blanks with fewer previous removals are also found in

Table 19: FFF: complete find distribution (present dataset; N = 183)

Field number	**Count**	**(in %)**
370	1	0.5
373	1	0.5
373A	20	10.9
373B	31	16.9
373B TP1401	1	0.5
373B TP1402	4	2.2
373B TP1406	7	3.8
373B TP1407	5	2.7
373D	12	6.6
373 TOTAL	81	44.2
374	63	34.4
374 TP1302	2	1.1
374 TP1308	5	2.7
374 TP725	1	0.5
374 TP727	19	10.4
374 TOTAL	90	49.1
n/a	11	6.0
Total	**183**	**100%**

Table 20: Composition of my sampled FFF inventory (N = 183; percentages rounded)

Debitage product	**Count**	**(in %)**
backed blade (fragment)	4	2.2
blade	29	15.8
burin	2	1.1
core	1	0.5
core correcting flake	2	1.1
crested blade	4	2.1
curve backed point	1	0.5
end scraper	13	7.1
end scraper on crested blade	1	0.5
flake	103	56.3
retouched blade	2	1.1
retouched flake	13	7.1
scraper	5	2.7
shouldered point	2	1.1
truncated blade	1	0.5
Total	**183**	**100%**

reasonable quantities (c. 25.2%).

Core reduction patterns can be inferred from the orientation of negative dorsal scars on the debitage. As shown in Table 36, blanks were predominantly struck uni-directional from single-platform cores (81%). On a smaller percentage of finds (5.6%) I recorded bi-directional scars, that may have been left following core correction removals directed from an opposed platform, as illustrated by the core in Figure 26 on which knapping errors such as hinged terminations can be seen. My sample includes only one core (ID AAR) from Field 374 which is a white-patinated core measuring approximately 55 mm wide, 45 mm long and 30 mm in thickness. It was knapped to near-complete exhaustion, as indicated by knapping errors left by failed removals, and the core was struck multi-directionally for core and platform correction purposes. Other recovered cores are discussed in Garton and Jacobi 2009 and Garton et al. 2016, and based on my observations in the field, although nodule sizes and shapes vary, reduction sequences are comparable to the core shown in Figure 26 and as discussed in Section 5.2.2. This comparison also applies to core correction removals, for instance the core tablet in Figure 30. Recovered crested blades further indicate that knapping took place on-site (see Figure 37). The presence of lips as well as other characteristic bulbar scars such as *esquillements de bulbe* are indicative of soft stone percussion, although I cannot fully exclude the use of a soft organic hammer (antler, bone) which can leave similar scars (cf. Pelegrin 2000:figs. 1-3). Like the observations made for the CWA TR6007 West scatter, hard hammer-indicative scarring is also seen on a small percentage (c. 10%) of ploughzone finds. The predominant method of platform preparation is (extensive) abrasion, which is recorded on 91% of sampled ploughzone finds (see Table 33). Abrasion is more prevalent in this sample than the CWA subset. Platform faceting (with abrasion; c. 7%) and no preparation (1.9%) are observed, but in lower percentages.

Regarding butt types, a larger variety of forms may be noted, most commonly plain platforms (49.5%), followed by linear, faceted, and fragmented in near-equal percentages (8.9-9.9%). Only one cortical butt was recorded, and punctiform platforms are comparatively rare (5.9%). Preparation using *talons en éperon* is typically associated with Creswellian industries (see Figure 35, Section 2.1.4; Garton and Jacobi 2009:17; Barton 2010), and proximal ends with this distinct spur are fairly well-represented (5.9% of sample). Similarly to the CWA assemblage, butts with preparation which approach *en éperon*-like platforms were recorded on 8.9% of the ploughzone material. Artefacts with *talons en éperon* have been found in all surveyed parts of the site, including the focal areas in the

North Cluster (field 374) and South Cluster (field 373).

Metric dimensions

While it may be difficult to identify any preferential patterns based on a sample which predominantly consists of unassociated surface finds, it is nevertheless informative to compare metric dimensions. Most of the extant field-walked finds have been damaged and fragmented after integration into the ploughzone, leaving only a small number preserved intact.

Table 17 summarises the average width, length, and thickness of all 29 blades in the FFF sample (results for width: mean: 14.9 mm, sd: 3.89 mm, median: 14, IQR: 3 mm; results for length, regardless of degree of intact preservation: mean 36.8 mm, sd: 10.3 mm, median: 35 mm, IQR: 14 mm; and mesial thickness: mean: 3.41, sd: 1.24, median: 3 mm, IQR: 2 mm). In Figure 33 the FFF data is compared by width relative to mesial thickness (in mm). To gain a broader, more exploratory overview of observed metric dimensions, I have intentionally treated my FFF sample as one combined assemblage, divided by artefact types. Furthermore, I wanted to create a visual comparison between both of my samples (excavated CWA and field-walked FFF) to highlight the range of recorded measurements and identify notable outliers. As shown in Figure 33, both blades and flakes (here defined by length to width ratio and sourced from all parts of the locale) are predominantly clustered within a range of 10 to 20 mm in width, and 2 to 4 mm in thickness, which is consistent with metric dimensions noted for the CWA assemblage and results from other LUP sites (Chapters 5, 6). A gradual, fan-like distribution is observable; as width increases, so too does thickness.

Against this broad overview of the FFF sample, some outliers can be identified in terms of width and thickness. What characterises the outliers in Figure 33 is that these are mainly core curation removals that are typically thicker so as to remove knapping errors or refresh the knapping face or platform (IDs: ABF, FFM, FQS). The thickest artefacts in this sample are 8 mm thick, including end-scraper FAB made on a crested blade (see Figure 37) and two other crested removals (IDs: CGJ, W7584-4810.1). The crested blade CGJ and core correction blade FQS are also the longest blades sampled, both measuring 65 mm in length (not illustrated). The broadest piece (flake DBV) measures 33 mm.

Retouched tools (FFF sample)

The wide variety of tools suggest that specialised tasks were carried out across the interfluve terrace. Recurrent discoveries of especially end-scrapers made on laminar blade blanks are known from all phases of investigations at Farndon, and have been found across all investigated parts of the locale with no obviously discernible spatial preference (in Figure 22). This representative sample includes burins, scrapers, points, and one truncated blade (in Table 20, p. 130). Previous publications (Garton and Jacobi 2009; Garton et al. 2016) classified the bulk of diagnostic lithic material as Creswellian-attributable, however, based on observed typo-technological traits it is equally evident that the ploughzone collection contains a number of FMG-attributable artefacts. For instance, the backed points (in Figures 26, 36 and 38) and the shouldered point (ID: ABR) in Figure 23 from near the North Cluster in Field 374 are all typologically indicative of FMG. Furthermore, the curve-backed bi-point (ID FKG in Figure 36) is highly diagnostic of an earlier FMG *faciès*. At time of collection, these FMG-attributable finds were all unpatinated, which, although it cannot be used as a definite indicator for chronology, certainly fits a recurring pattern (cf. Section 5.2.1).

Retouched tools from Farndon Fields are predominantly made on straight and parallel-sided standardised blade blanks, but occasionally also on flakes (cf. Figure 34:9). Metric dimensions of retouched tools are illustrated in Figure 33. Fine parallel or semi-abrupt retouch at either the proximal or distal end was favoured for tool modification (shown in Figures 26, 23 and 38). Occasional crushed retouch or retouch on isolated spots along the ventral side of the lateral edges is also noted which might represent use-wear, but requires further analysis. While I did not measure retouch angles, based on personal observation I would describe the edge retouch as semi-abrupt which is typical for LUP scrapers (Garton and Jacobi 2009:fig. 10). End scraper fragments shown in Figure 23 are representative of those in the collection. As indicated by the number of negative removals or cortex preserved on the dorsal sides (see Tables 32 and 35), retouched tools and especially scrapers were occasionally made on 'earlier' blanks with more remnant cortex and are slightly thicker (cf. Figure 33).

It is interesting to note the prevalence of longer end-scrapers and apparent absence of shorter scraper types in the Farndon collections (Garton and Jacobi 2009:30). In my experience this might be important since short scrapers are more common in FMG assemblages dating from the second half of the LG Interstadial (see Section 2.1.4; Schwabedissen 1954; Armstrong 1925: Jacobi 2004; Kotthaus

2019). Of the few thumb-nail-sized scrapers found at Farndon I have excluded two scrapers as probable late prehistoric examples. As first noted in Garton and Jacobi 2009, the rarity of short (FMG-attributable) scrapers may indicate human presence on the Farndon Fields locale towards the end of GI-1e (Bølling chronozone), which could explain the prevalence of Creswellian-attributable technological and typological traits (see Section 5.3).

Burins made on blades (e.g., IDs ELT, and double/proximal and distal burin FXH in Figure 37) were recovered during fieldwalking. Only one burin was found in the North Cluster in Field 374. Additional retouched finds are truncated blade fragments (such as ID AIB in field 374; Figure 38) and fragments of piercers (IDs EGV from Field 374; FYO in Test Pit 1407, Field 373B; Figures 23 and 28), all of which are indicative of LUP activity. At present, it is difficult to conclude if any of the retouched tools were modified on site or brought onto the locale ready-made. Thus far only one possible burin spall has been discovered in Test Pit 1402/03 in Field 373B (Garton et al. 2016:Tables 5-7), whereas platform preparation faceting spalls are documented from the North Cluster and Ice Age Journeys' test pits in Fields 373 and 374. Besides the one possible burin spall, no other direct evidence for *in situ* tool modification or curation has thus far been recovered. However, this apparent absence of burin spalls or retouch chips must be seen in relation to their small size and low surface visibility, and faceting spalls have only been found when test pit sediments were sieved through a fine 3mm mesh (Garton et al. 2016:131; Garton and Jacobi 2009:28). Even in the absence of recovered tool spalls and use-wear analyses, a parsimonious interpretation of the available evidence suggests that tool use and curation were carried out at Farndon.

5.3 Summary of observations and evaluation of the evidence from Farndon Fields

5.3.1 Classification of the lithic evidence

One of the questions raised in the beginning of this chapter was to what extent similar patterns or contrasts could be seen in the ploughzone and excavated CWA assemblages; for instance, whether it would be possible to differentiate Creswellian- from FMG-attributable material, and whether individual activity areas could be detected amongst the palimpsest of surface finds. In this section, I will begin by summarising my observations and results before then discussing my interpretation of the Farndon assemblages. The results must be seen against the caveats of comparing assemblages from separate source categories and recovery contexts with inherently different interpretive potentials (cf. Chapter 3), limitations caused by sample sizes, and the observed discrepancies regarding trench labelling in my CWA sample (see Section C.1). Taking all excavated and ploughzone finds into account (excluding micro-debitage <5mm), the complete lithic assemblage recovered at Farndon thus far amounts to approximately 2040 artefacts of which about 185 are retouched tools (c. 9% of combined collections). The percentage of retouched tools ranges from 1.7% in the CWA assemblage, up to c. 19% for individual fieldwalking surveys, which suggests that retouched tools are over-represented in ploughzone collections. Included in this count are finds from all documented periods, i.e., LUP, Mesolithic, and later prehistoric, of which the LUP material is the most prevalent and best studied. The Farndon assemblage sizes are highly comparable to other British LUP sites. For instance, the nearby Creswell Crags cave assemblages amount to 2-400 finds each, as do each of the two stratified CWA scatters in TR6007 (cf. Table 73; Jacobi 2004; Jacobi 2007).

Previous reporting on the ploughzone artefacts suggested that both earlier and later LUP phases could be present, though the latter phase appeared to be only represented against a thin background of fewer than ten diagnostic FMG-attributable pieces (Table 14; Garton and Jacobi 2009). In contrast, the CWA analyses pointed to a clearer bi-partite separation as of these two technocomplexes in two scatters found in TR6007 (East and West; Harding et al. 2014). My analysis of the CWA material was therefore initially based on the premise that there were marked differences between the two *in situ* scatters concerning raw material provenance, assemblage composition, and lithic technology.

Despite differences in sample composition and observed discrepancies during recording and analyses (cf. Section C.1), my comparisons between TR6007 East and West have confirmed a bi-partite typological, morphometric, or technological division *sensu* Harding et al. (2014), as illustrated by differences in preferential platform preparation methods (in Table 33), or metric dimensions (in Table 18). The absence of retouched tools in the F6007 East scatter has precluded me from drawing direct comparisons of retouched tool forms between the TR6007 East and West scatters. However, following on from my observations regarding visual characteristics and maximal dimensions of finds in TR6007 West, I disagree with the proposed local river gravel origin of the flint used in this scatter and would instead suggest that both East and West scatters were manufactured using non-local flint.

According to my re-analysis no strong heterogeneity emerges between the debitage found in the surface and CWA collections' debitage (e.g., in Table 17, Section C). Based on a comparison of visual characteristics (including size, quality, colour), it seems likely that artefacts from both FFF and CWA samples were made using highly similar raw materials, i.e., predominantly non-local tabular and nodular flint which is probably derived from the Lincolnshire Wolds. Where more pronounced individual differences between metric dimensions or recorded lithic attributes are noted, such as the apparent strong preference for platform preparation through faceting in TR6007 East (cf. Harding et al. 2014:Table 2.7), I would argue that these variations are more likely due to sample composition and the inclusion of unstratified, fragmented ploughzone material. Although there are refittable finds in the ploughzone assemblage, since the field-walked sample is composed of finds derived from different depositional events but also survey phases, its composition is more varied than the two stratified, spatially discrete, and completely excavated scatters.

On an assemblage-level, my analyses have uncovered cohesive technological and typological patterns across both excavated and field-walked debitage, with regards to preferences for unidirectional blade removals (in Table 36), platform preparation methods (in Table 33), and butt indices (in Table 34). A direct comparison between the 29 CWA blades and 29 FFF blades in Table 17 found no significant differences between blades' width (results of Kruskal-Wallis rank sum test: chi-squared = 1.6867, *df* = 1, p-value = 0.194), length (results of Kruskal-Wallis rank sum test: chi-squared = 0.10178, *df* = 1, p-value = 0.7497), or mesial thickness (results of Kruskal-Wallis rank sum test: chi-squared = 0.69932, df = 1, p-value = 0.403). Equally, a direct comparison between CWA and FFF scrapers found no significant differences in widths and thickness (in Section 5.2.2). Similarities regarding retouched tools (patinated or not, see Figure 31, Table 14) include the presence of diagnostic Creswellian markers such as blades with *talons en éperon* in the FFF surface collection (in Figure 35; cf. Section 2.1.4) and angle-backed pieces (see Figure 36; cf. Section 2.1.4). Equally indicative is the prevalence of end-scrapers on longer blades as opposed to shorter scraper types. However, through continued surveys the available corpus of FMG-attributable has expanded to include diagnostic curve-backed (bi-)points, which, when seen in context with the notable absence of shorter tool forms and the recently obtained date bracket (Garton, Barton and Bateman 2020:5), affirms previous suggestions regarding an earlier (end of GI-1e) FMG attribution (cf.

Section 2.1.4; Garton and Jacobi 2009:31). This observation is significant since sites of earlier FMG attribution are rare in Britain and their distribution thus far limited to south of the East Midlands (Barton 1992; Barton et al. 2009; Barton 2012; Conneller and Ellis 2007; Conneller 2009). In Chapter 9 I will develop this argument further, and in direct comparison with the lithic evidence from my other case studies.

5.3.2 Site use patterns

All Farndon surveys indicate a widespread distribution of LUP finds across a large 18 ha surface area, but with higher artefact densities in focal areas such as the North/South Clusters and CWA trench TR6007. Recent investigations by Ice Age Journeys have identified new foci in adjacent fields (see Figure 22; Ice Age Insights 2019b; Ice Age Insights 2019c; D. Garton, pers. comm. 2018).

Positive preservation biases notwithstanding - as the higher, drier, and reasonably stable ground likely offered an advantage for both artefact- and soil horizon formation but also offered some protection from flooding or erosion - the spread of these focal clusters on, and directly beneath (at c. 10.7 m AOD), the local high points (c. 11.3–11.7 m AOD) and in alluvium suggests that higher lying grounds in the landscape were preferentially sought-after for a range of specialised activities. These raised locations would have offered attractive dry spots overlooking the interfluve's braided river channels and may have laid alongside fording places for both humans and animal herds navigating this otherwise high energy riverine environment. Thus far, no direct evidence for structures or hearths has been discovered, although hearths may be inferred from a concentration of burnt artefacts in the excavated trench CWA TR6007 West.

Based on the near-exclusivity of LUP surface finds in areas with aeolian LLS (GS-1) age coversands deposits (in Figures 22 and 27), it may be hypothesised that additional, more sizeable finds concentrations remain undiscovered *in situ* in undisturbed LUP-artefact bearing horizons. All documented material indicates that artefact-bearing events were of limited extent in both space and time. Recovered platform preparation debitage (including faceting spalls, crested blades, laminar blade blanks, and blade cores) suggest the material from the North/South Clusters, CWA campaign, and recently identified foci is predominantly indicative of on-site blade production and tool use. Experimental recreation of the blade knapping episodes in TR6007 by P. Harding illustrates how short each stay at Farndon may have been. Harding suggests that the fan-like spread of the TR6007 East scatter was formed through on-site knapping, possibly by a left-handed knapper, and "it undoubtedly documents a single, relatively uninterrupted, moment-in-time accumulation of one, highly skilled individual" (Harding et al. 2014:68, 48; Grant and Harding 2014:fig. 2). By Harding's own estimate, it would have taken the experienced knapper 30 minutes or less to produce the assemblage (Harding 2018; Harding 2020), which emphasises the potentially short-term, transient nature of Late Glacial site use events documented at Farndon.

Additional specialised events may be inferred from recovered retouched tools. Whereas scrapers (both patinated and unpatinated) are common finds known from across all artefact-bearing parts of the locale and represented in all assemblages, the combined ploughzone and excavated Farndon collections contain notably few weapon heads or projectile points (see Figures 38, 26 and 36). Thus far, fewer than ten backed points have been discovered as chance surface finds in the ploughsoil near the North Cluster and in Field 373B, and in CWA TR6007 West, i.e., in areas that coincide with the locally higher grounds at 11-11.7 m AOD (cf. Figure 22). While taphonomic reasons may impact the preservation and recovery potential of smaller tool forms, the relative paucity of projectile points was also noted for the excavated CWA assemblages and indicates a recurring pattern. The prevalence of end-scrapers over projectile points is especially noteworthy, as their distribution across the entirety of the surveyed locale indicates that activities such as hide processing were commonly undertaken along the perimeter of the embayment, i.e., that the site was used as a processing place rather than a killing ground (Garton and Jacobi 2009:35). Similar patterns have been observed at other LUP sites (see Chapter 6), where the proximity to the river channel edges (or lakefronts) would have offered convenient access to freshwater, for instance to dispose of unwanted parts of carcasses (Harding et al. 2014; Garton et al. 2016; Mills 2022).

In my view, the Farndon locale represents a landscape of palimpsests which was occupied intermittently with significant hiatuses between each artefact-bearing site visit. Based on typo-technological observations I consider the 'consistent technological LUP theme' noted in previous publications to be most representative of an earlier FMG classification, i.e., indicative of human occupation towards the end of the first half of the LG Interstadial but against a thin background of diagnostic Creswellian- and later FMG-attributable retouched tools (cf. Sections 2.1.4 and 2.1.4).

5.3.3 Summary

Over the past 30 years, investigations at Farndon Fields have uncovered important lithic and contextual evidence dated to the LG Interstadial. Regarding typology, technology, and spatial distribution, lithic material discovered after 2012 follows previously established patterns (Garton and Jacobi 2009; Harding et al. 2014), which is further testament to the widespread extent of LUP activities across this extensive landscape complex and emphasises the continued potential for future discoveries. The observed typo-technological variation in the diagnostic lithic material can be linked with different phases of human occupation but is mainly attributable to an earlier FMG *faciès* and thus differs from the subsequent case study assemblages (in Chapters 6, 7). The Farndon Fields interfluve locale is of central importance to our improved understanding of LG human occupation of open, riverine environments, as will be developed upon in my Discussion Chapter 9.

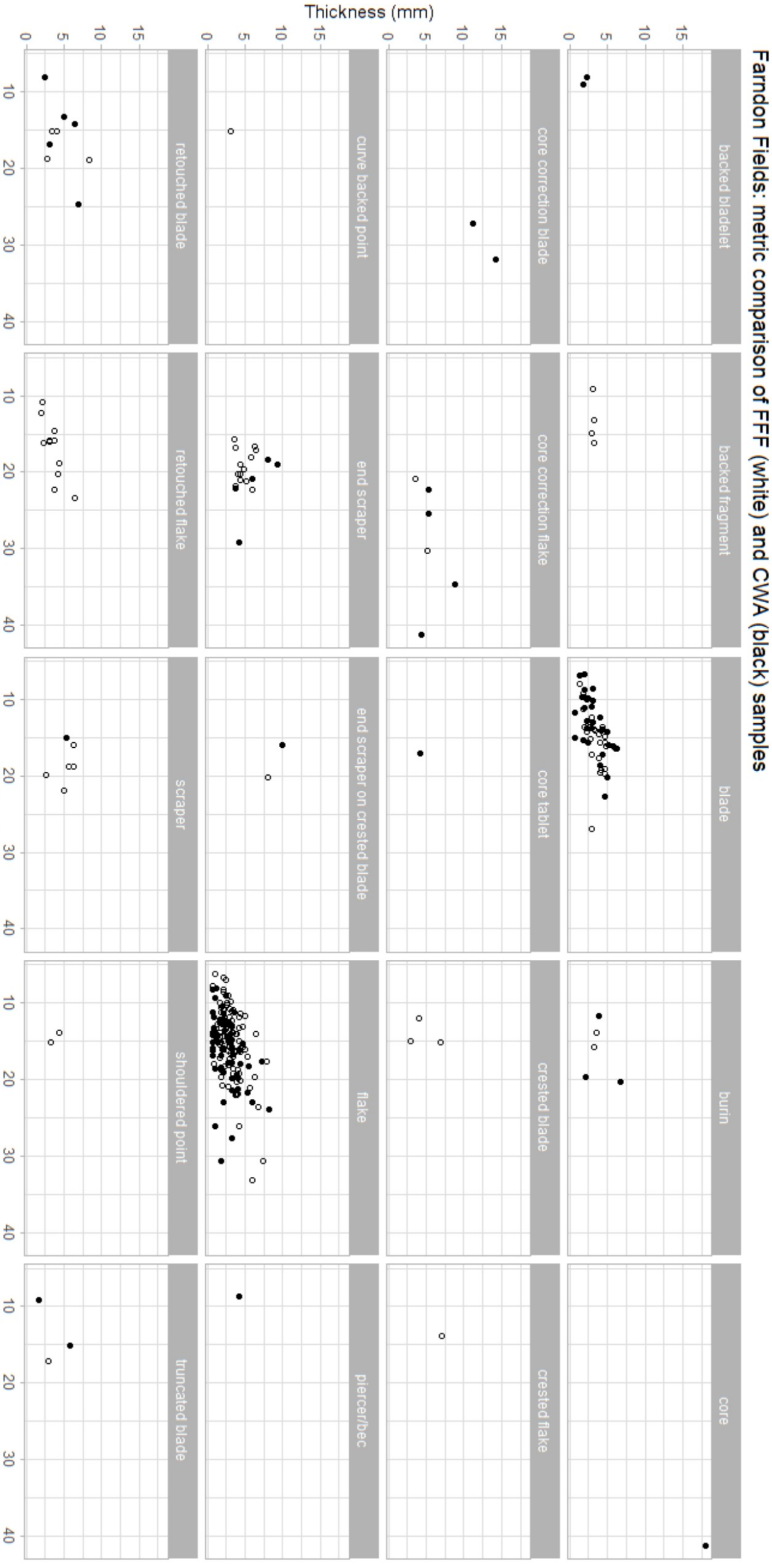


Figure 33: Metric comparison of width to thickness (measured at mid-point; all measurements in mm; CWA N = 127; FFF N = 183)

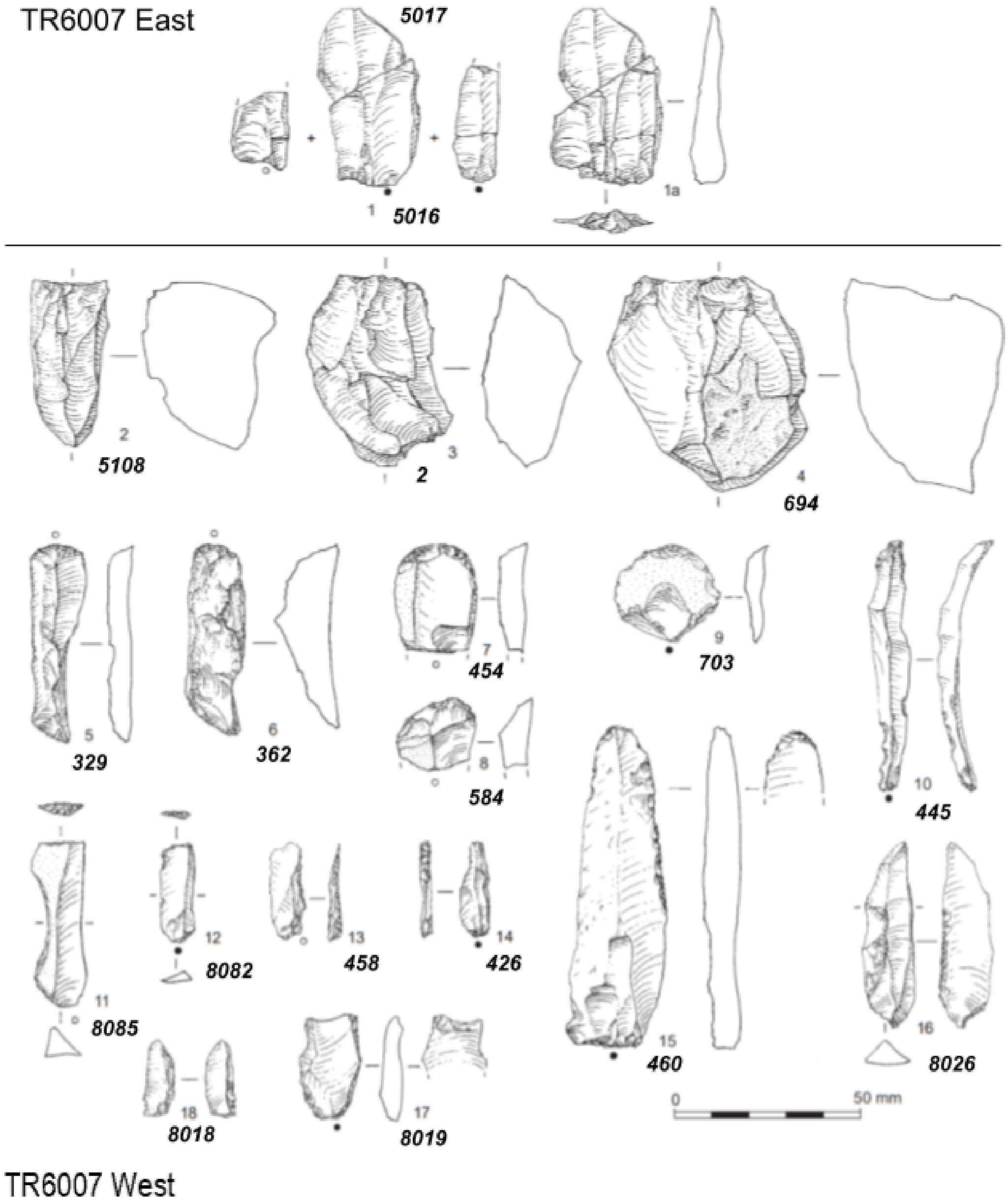


Figure 34: Top row: refitting blades from TR6007 East (incl. ONs 5016, 5017). Remaining artefacts: cores, assorted tools and retouched blades from the scatter in TR6007 West (ONs emphasised in bold; proximal ends and break lines indicated; after Harding et al. 2014:Fig.2.34; illustrator not named)

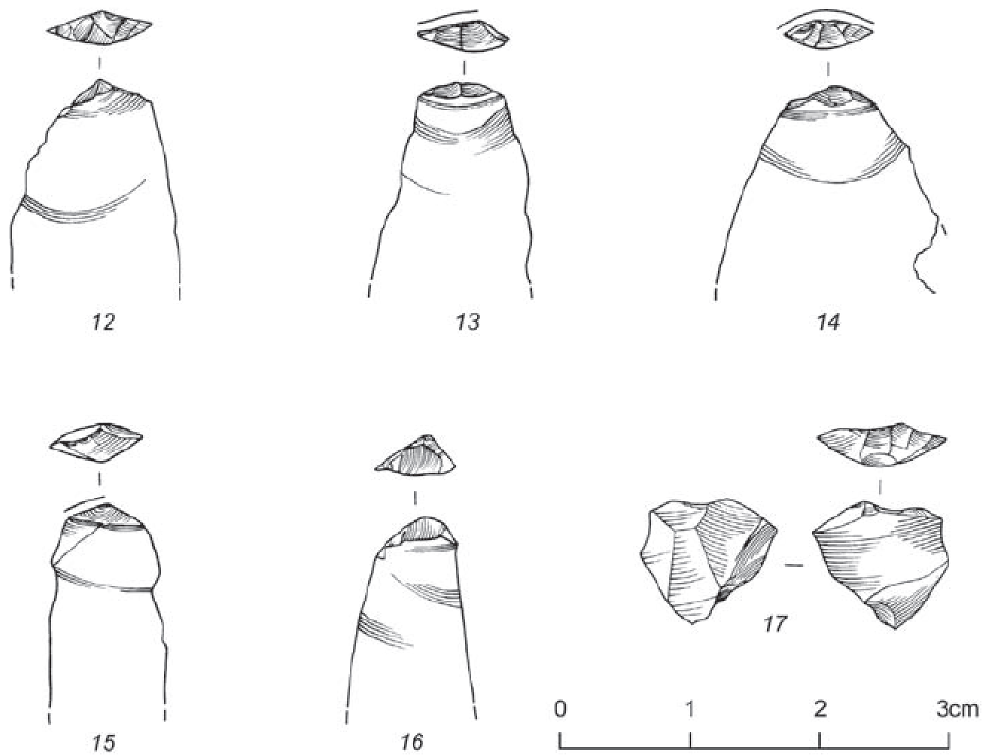


Figure 35: Illustrated proximal ends from Farndon Fields: flake (12) and blades (13-15) with *en éperon* butts. Artefact no. 17 has been compared to a proximal microburin with a faceted butt. Abrasion and rubbing is indicated by a continuous line (after Garton and Jacobi 2009:illus. 8; drawing by H. Martingell).

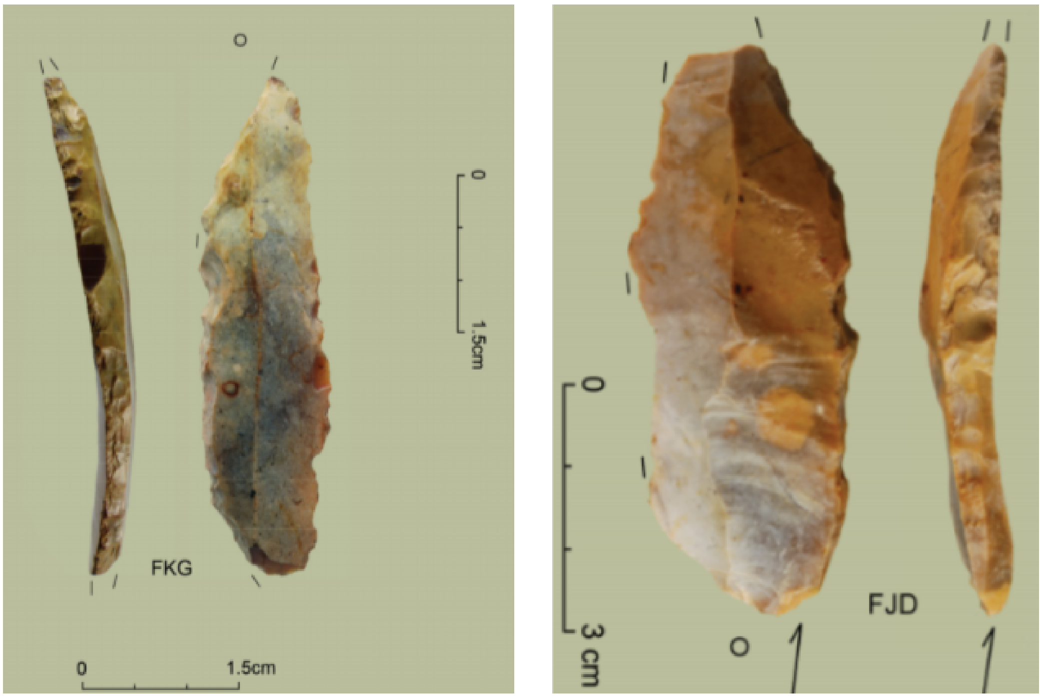


Figure 36: Curve-backed *bi-pointe* (FKG) and backed blade (FJD) from test pit 1406 in field 373B (photographs by D. Garton and B. Pointer, used with permission)

Figure 37: Assorted burins and scrapers. From left to right: burin (FXH) found in test pit 1406/field 373B; burin (ELT) and distal end scraper (EUE) both from North Cluster/field 374; distal end scraper on a crested blade (FAB; field 373D; photographs by D. Garton and B. Pointer, used with permission)

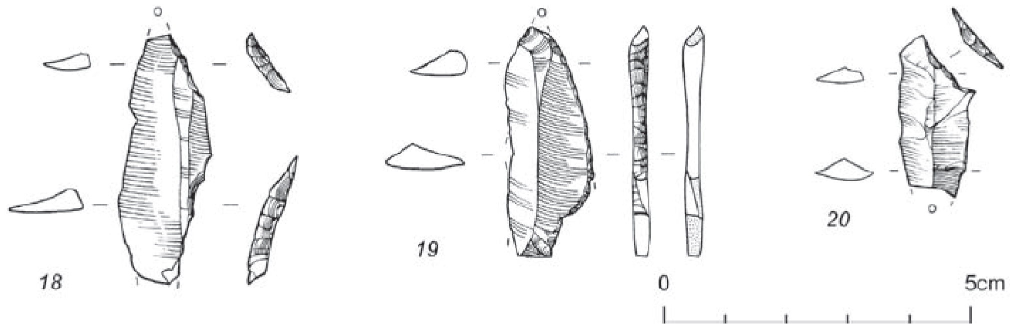


Figure 38: Abruptly modified points and oblique distal truncation from Farndon Fields. No. 19 (ID: GJL) was found in during fieldwalking in 1993 and is one of the first finds to indicate *Federmesser-Gruppen* presence at Farndon (also shown in Figure 23; after Garton and Jacobi 2009:illus. 9; Jacobi and Higham 2009b:1905-06; drawing by H. Martingell).

Chapter 6

Case study 2: Seamer Carr K, North Yorkshire

This case study will focus on Seamer Carr K (TA 033 819, Easting 503300/Northing 481900) which can best be described as a series of artefact clusters within a landscape of sites in the Vale of Pickering near Scarborough, North Yorkshire (see Figure 39). Nearby sites with Terminial Upper Palaeolithic (TUP) and early Mesolithic material are Flixton Island 1 and 2, and Seamer Carr C and L (in Figure 100 and Catalogue A; Conneller 2007). There are terminological differences between the nomenclature I have used and previously published research on Seamer Carr K which uses the term 'Final Palaeolithic' in lieu of *Federmesser-Gruppen* (analogous to the terminological and chronological structure of R. Jacobi's PaMELA database, Jacobi 2014a). To maintain consistency throughout this thesis, I have decided to retain my preferred terminology (*Federmesser-Gruppen*/FMG; cf. Section 2.1.4).

Previous publications have made the case that there are good stratigraphic, technological, and typological grounds to identify several separate FMG- and Early Mesolithic-attributable scatters in the same area, for example at Seamer Carr K. This has been further supported by results from a comprehensive refitting program (Conneller and Schadla-Hall 2003; Conneller 2007), and is based on observations regarding the preferential use of different lithic raw materials for making artefacts. For this case study, I will re-examine some of this evidence in more detail with the aim of further clarifying differences between the nature of the scatters and aspects of the tools found with them.

Seamer Carr K has enhanced potential for answering specialised questions because it falls in the category of a primary context site. As one of the largest excavated open-air sites with a substantial amount of stratified LUP archaeological and environmental evidence from north of the Humber, Seamer Carr K is thus ideally positioned to inform the general themes and questions regarding LG human re-occupation investigated in this thesis. Moreover, since Seamer Carr K is located in a lowland lacustrine setting, the site provides an interesting additional environmental perspective to complement my other single site-specific case studies that are set in riverine (Farndon Fields, Notts., Chapter 5) and entirely open, sandy landscapes (Risby Warren, Chapter 7). Of further interest is the documented co-occurrence of stratified FMG and Early Mesolithic material, which provides links with more broadly observed spatial distribution and assemblage composition patterns (in Catalogue A; Pettitt, Gamble and Last 2008).

My approach to the Seamer Carr K data follows the methodology and procedures outlined in Chapter 3. This case study is structured to first establish the relevant background context, followed by a re-appraisal of the lithic FMG-attributable assemblage based on the information contained in the original artefact recording sheet, which was kindly made available to me by the Vale of Pickering Research Trust team, and that provided the data for all spatial distribution maps, other supporting tables, and figures included here. In the interest of full transparency, I want to clearly acknowledge the extent to which this case study relies on the work (unpublished and in press) of C. Conneller and the Research Trust Team; their generosity in entrusting me with their data is sadly not matched by an equal quality and care in my recording and reporting. It was my intention to fully examine this collection and to build on the existing raw data by recording additional lithic attributes on material from the FMG and mixed scatters. To most effectively carry out this ambitious first-hand examination despite frequent disruptions caused by personal circumstances (2018-2019), I structured my data collection into distinct workflow stages (e.g., sorting finds, controlling metadata, selecting finds for recording, and recording; see Section D). I was able to finish the first two workflow stages before my situation changed again and I needed to make decisions regarding my continued studies of Seamer K and LG human re-occupation more broadly. At that time, I regarded the information available (in the grey literature, raw data, my notes) to be sufficient until I could return to finish examining the physical collections. My plans were ultimately unattainable due to the pandemic and related measures. Since the LUP evidence from Seamer is of such vital importance to my analyses, I nevertheless decided to retain this case study, albeit with a far greater reliance on legacy data than intended. Moreover, and to paraphrase C.W. Philips (1934:115), 'there remains the satisfaction of knowing that this most important site preserves its secrets intact for future scientific investigation', with more attention to details than my efforts afforded it.

An additional emphasis throughout my analyses will be on the two predominant raw material sources that were recovered at Seamer Carr K, i.e., Wolds- and glacial drift or till-type flint, since preferential raw material use patterns are a defining feature of the chronologically separate lithic assemblages, as highlighted by previous publications (for the Early Mesolithic assemblages, see Conneller and Schadla-Hall 2003; for the FMG component, see Conneller 2007). While my focus is on the evidence classified as FMG, I will include the Early Mesolithic and mixed lithic scatters for reference and context where relevant.

In working with these valuable databases, I will be reporting some of my own original observations that I hope will add to the overall corpus of work accumulated at Seamer Carr since 1976. In doing so I have not had access to field notebooks, so my work is based largely on the original databases themselves with some additions of my own based on the artefacts that I have been able to examine. The purpose of this chapter is thus to provide some further details to complement the existing records and to compare with my other study sites (in Chapter 9).

6.1 Lake Flixton surveys and fieldwork stages

Bounded by the North York Moors to the north and the plateau of the Yorkshire Wolds in the south, the Vale of Pickering is a wide, flat bottomed valley southwest of Scarborough in North Yorkshire (in Figure 39). Towards the end of the earliest post-glacial period, Lake Flixton (in Figure 40; cf. Section 4.2.3, Figure 19) had formed on the eastern end of the Vale. Subsequently, throughout the Mesolithic the lake gradually dried up, decreased in size and by the end of the 8th millennium BP the surrounding landscape had shifted to wetland marsh and smaller watercourses which would come to dominate the Vale until drainage measures were carried out from the 18th century AD onwards (Cloutman 1988b:15; Milner et al. 2013:43-58; Palmer et al. 2015; Figure 16). Peat formation and the extent of waterlogged soils in the Vale have been crucial to the high degree of organic preservation and archaeological potential of the area, such as at Star Carr (Moore 1950; Moore 1954; Moore 1959; Clarke 1954; Clark et al. 1949;

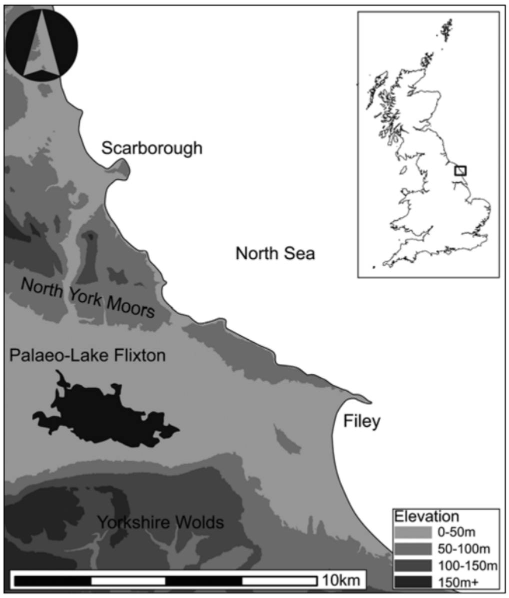


Figure 39: Location of palaeolake Flixton in the Vale of Pickering (after Milner et al. 2011:Fig. 1)

Clark et al. 1950; Milner, Conneller and Taylor 2018a, Milner, Conneller and Taylor 2018b; The Star Carr Archaeology Project 2019).

Following earlier work at Star Carr in the 1950s, a new archaeological and palaeoenvironmental survey scheme was initiated in the mid-1970s (The Seamer Carr project; Milner et al. 2011). Two kilometres of the Lake Flixton shoreline, as well as adjacent areas and palaeo-islands in the lake, were systematically mapped and recorded throughout the 1980s through a tiered methodical approach that combined geological auger/borehole surveys with archaeological interventions and the survey grid was laid out along the palaeo-lake Flixton shoreline (25 m AOD subsurface contour; Schadla-Hall and Cloutman 1985; Cloutman 1988b; Cloutman 1988a; Cloutman and Smith 1988). In all, at least 50,000 lithic artefacts were recovered from twenty-five named findspot locations shown in Figure 40, dating from the Late Palaeolithic through to the Iron Age (Milner et al. 2011). A latest phase of research-focused fieldwork resumed in 2004, and excavations have since continued at other sites in the Vale (see Figure 40; Milner et al. 2013; Lane, Schadla-Hall and Taylor 2023).

Following the rationale first laid out in Lane 1998, 'sites' are here defined as "the larger excavated areas, and also groups of smaller excavation units [...]; however, this does not imply these are concrete entities representing a discrete habitation area or single occupation. It is more appropriate to consider the Vale of Pickering lithic material as representing the debris of various acts of manufacture and deposition", not 'sites' *per se* (Conneller and Schadla-Hall 2003:88; Lane 1998; Conneller 2000b:99). This definition of sites sets an important baseline for understanding the nature, appearance, and composition of the findspots and assemblages, and it also mirrors my own impressions from working with the material from Seamer K. Furthermore, while the number of named locations dated to roughly the same periods may give an impression of a deeply connected network of sites (i.e., entities), only a small number of these findspots can be demonstrated to be coeval with each other (Lane et al. n.d.; Milner et al. 2013; Lane and Schadla-Hall 2004).

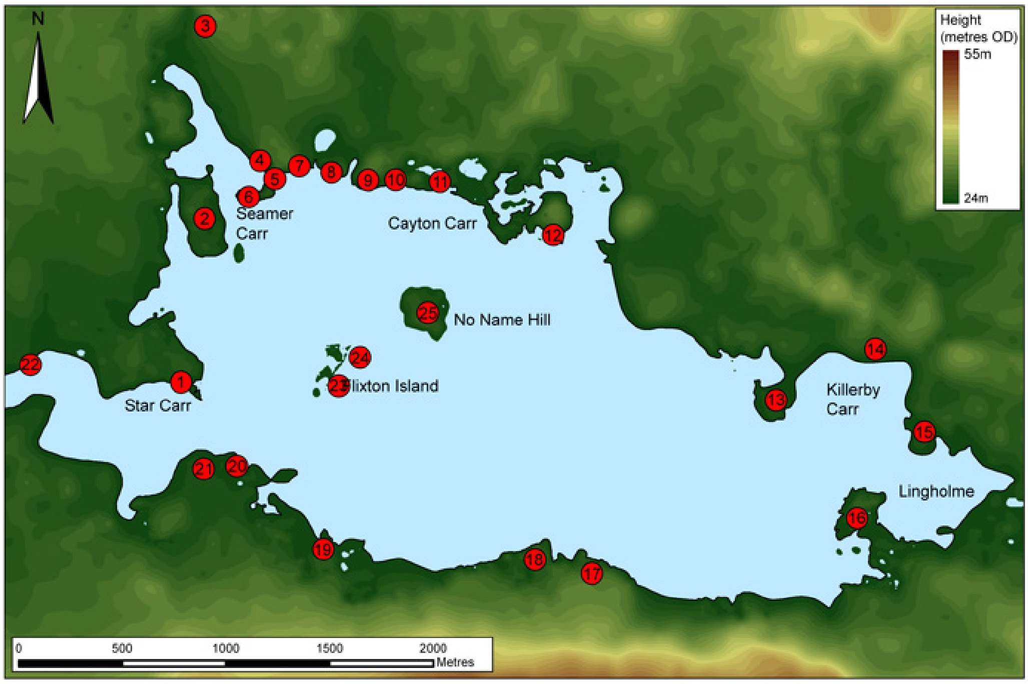


Figure 40: Site distribution in the Vale of Pickering shown relative to Lake Flixton (Seamer Carr K is site number 5; after Milner et al. 2013:fig. 4.7, CC BY-NC 4.0)

6.1.1 Site description of Seamer Carr K

Seamer Carr K is one of seven sites referred to by a Seamer name (other sites: Seamer Carr B (Rabbit Hill), C, D, F, K, L and N; see Figure 40) and was first identified during the Vale of Pickering Research Trust surveys. Seamer Carr K

Figure 41: Field photograph of the 1985 excavations at Seamer Carr K showing the series of parallel trowelling lanes and dark organic horizons, with white flags indicating *in situ* flint finds (unspecified orientation; unpublished image, courtesy of Carter 2013)

(hereafter: Seamer K) is located on a gentle slope on the southern side of a narrow kame formation (see Figures 43 and 41), overlooking Lake Flixton in a lagoon-like setting referred to as the West Embayment (in Figure 100; Lane et al. n.d.). Most of the initial test pits were concentrated along the former lake edge itself and produced evidence mostly of Early Mesolithic type. Subsequent expansion of test pits onto the higher lying surfaces of the kame produced further Early Mesolithic artefacts, but also FMG-attributable finds and a smaller cluster of Late Mesolithic artefacts (David 1998).

The investigated area covered 2,300 m² and the complete excavated assemblage comprises 12,137 lithic artefacts and 79 bone and antler fragments derived from approximately 16 separate knapping scatters. The lithic material can be attributed to the FMG and Early Mesolithic on the basis of typological, technological, and stratigraphic evidence (Conneller 2007:223). Seven of these scatters (3, 4, 6, 13, 14, 15, 27; comprising 2350 artefacts) were found to be predominantly FMG and four scatters (2, 7, 21a, 30; total of 1744 finds) are predominantly Early Mesolithic (Conneller and Schadla-Hall 2003:93-94). Two mixed clusters (5, 25; N = 1734 artefacts) containing material from both periods were also identified as well as several lower resolution artefact concentrations that are more difficult to attribute or interpret (Conneller and Schadla-Hall 2003:89). The site plan in Figure 42 shows the original subdivision of the site into forty-five smaller analytical area units (A. David pers. comm. undated, in Conneller 2000b:154). Notably, these forty-five areas are not standardised in size, grid layout, or orientation, but

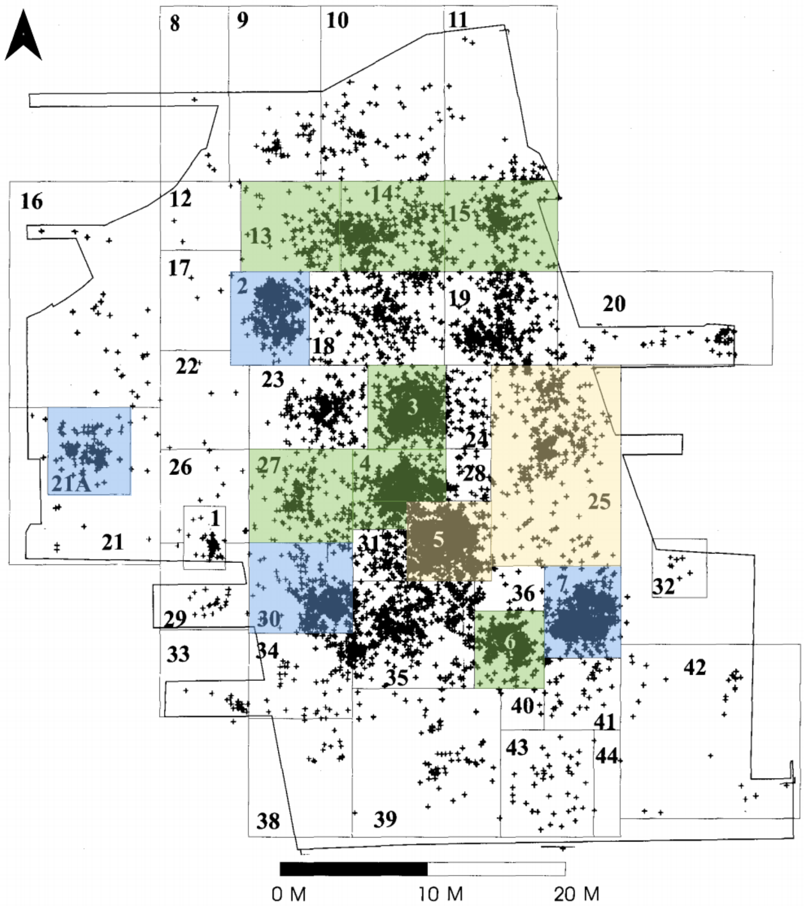


Figure 42: Artefact densities, distribution and analytical area subdivision at Seamer Carr K, shaded by proposed chronology (*Federmesser* in green, Early Mesolithic in blue, mixed in yellow; adapted from Conneller and Schadla-Hall 2003:fig. 9)

instead encompass and delineate both scatters and smaller artefact concentrations. Finds frequencies between scatters and analytical areas vary, ranging from fewer than 50 recorded object entries for twenty-five of the Seamer K areas, and up to 1666 entries in scatter 5 (see Figure 101).

Regarding my own analyses of the FMG-attributable components of the sample, I will first present a brief overview of contextual evidence including site stratigraphy, followed by key results from the refitting programme and observations regarding preferential raw material use patterns. This contextual preface is necessary due to the degree of post-depositional admixture of FMG and Early Mesolithic artefacts which has complicated the interpretation of several of the scatters (Lane, Schadla-Hall and Taylor 2023). A comparison of retouched

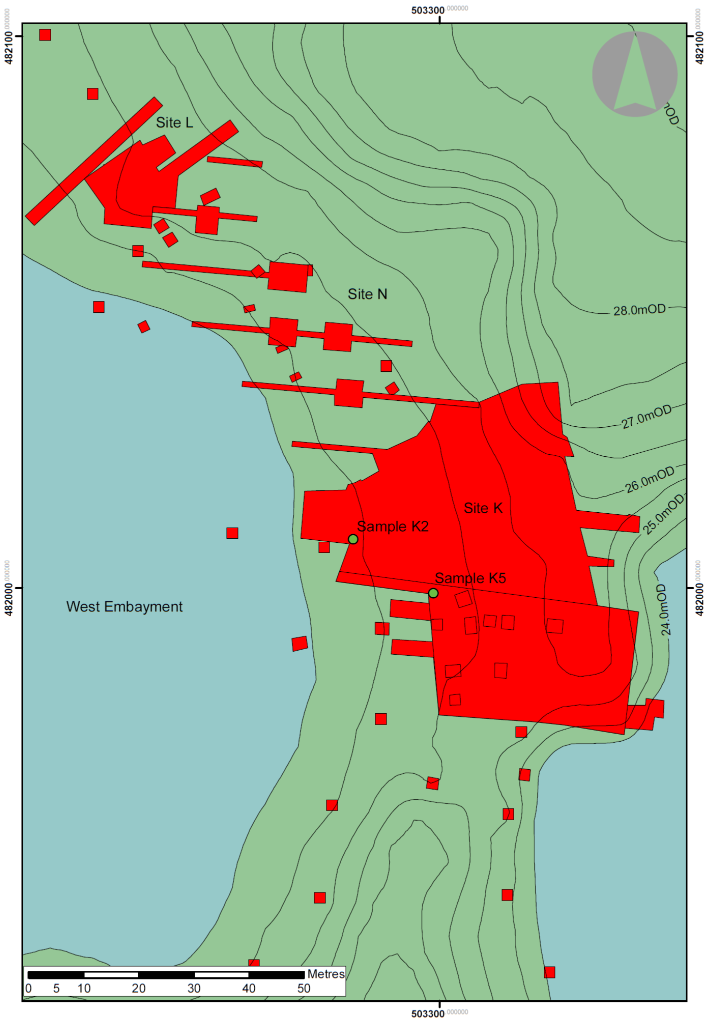


Figure 43: Site plan showing excavated areas at Seamer Carrs K, L, and N and pollen sampling points (used with authors' permission, after: Lane et al. n.d.:fig. 7.1; Cloutman 1988a)

tool types, their frequencies, and raw material prevalence, as well as evidence from refitting have identified the separate phases of site use at Seamer K, for instance as illustrated by period-indicative knapping of backed blades and microlith manufacture. Intra-site refits have also illustrated a range of additional activities including tool kit curation and preparation of nodules, and the spatial distribution of refitting finds indicates that different steps of the *chaîne opératoire* were carried out across a larger surface (see Section 6.1.1). As the full site archives for the Vale of Pickering Research Trust surveys are currently unavailable due to internal review processes and preparation for forthcoming publication to the Archaeology Data Services (P. Lane, pers. comm. 2021), I have sourced additional contextual information for my use of the artefact recording spreadsheet from previously published works (cf. Section D.1).

Recorded stratigraphic contexts and dating

A Late Glacial organic detritus [5085/5069] provided the oldest stratigraphic context for samples for radiocarbon dating, and was found sealed beneath an almost sterile layer of medium-coarse grey sand (Lane et al. n.d.; Cloutman 1988b; Conneller and Schadla-Hall 2003:93). Of the five dates modelled in Figure 44, four of the oldest assays were taken on the base and top of the peaty organic detritus layer [5085/5069], which return the following results (recalibrated in OxCal v.4.4.4 with the IntCal20 curve at 95.4% confidence):

- base (CAR-842): 12,010 ± 130 ^{14}C BP (14,212 - 13,519 cal BP),
- top (HAR-5242): 11,000 ± 130 ^{14}C BP (13,156 - 12,737 cal BP),
- top (CAR-841): 10,960 ± 110 ^{14}C BP (13,088 - 12,745 cal BP) and
- beneath the overlying sand (HAR-5787): 10,040 ± 130 ^{14}C BP, (12,040 - 11,204 cal BP).

The base (CAR-842) was formed during GI-1e whereas the dates for the top two dates (HAR-5242, CAR-841) fall within GI-1ba/the Allerød chronozone. The fourth date (HAR-5787) taken on the same Late Glacial organic detritus context [5085/5069] appears too young for the LG Interstadial but may indicate that sedimentation continued into the early Holocene. Results for the fifth date in Figure 44 indicate activity around 10,600 cal BP (e.g. Early Mesolithic charcoal sample from the main Mesolithic occupation surface [5012] HAR-5794, 9590 ± 120 ^{14}C BP, 11,217-10,583 cal BP; regarding recent re-dating of Mesolithic samples, see Conneller and Higham 2015:Table 1, 161). Dates are modelled

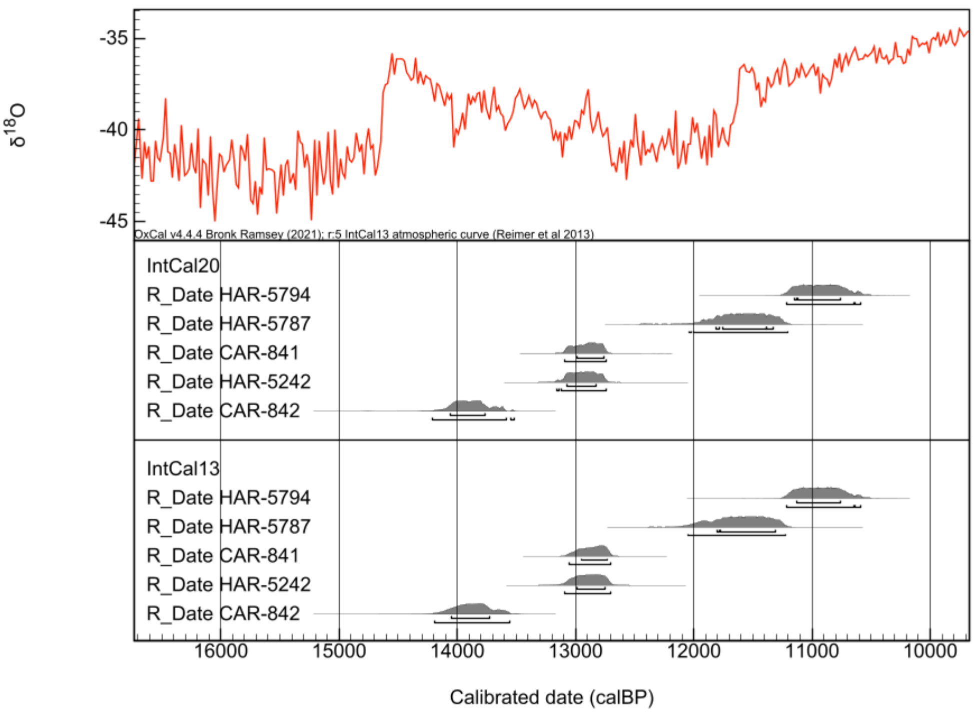


Figure 44: Radiocarbon dates from Seamer Carr K: comparison of dates with IntCal20 (top) and IntCal13 (bottom). Simple multiplot; dates shown against the NGRIP GICC05 ice core record; calibrated in OxCal v.4.4.4, bars and brackets indicate 68.3% and 95.4% confidence ranges (Bronk Ramsey 2009; Reimer et al. 2020. Data from Cloutman 1988b; Lane et al. n.d.; Conneller and Schadla-Hall 2003).

in Figure 44 (at 68.3% and 95.4% confidence) wherein recalibrated dates with IntCal20 are compared with IntCal13. Recalibration using the IntCal20 curve has shifted the beginning of the 95.4% probability distribution of CAR-842 and CAR-841 later by about 20 and 30 years, while HAR-5242 now begins c. 60 years earlier. The ranges for HAR-5785 and HAR-5794 are unchanged. The full results from palynological and environmental surveys are reported in detail elsewhere (Cloutman 1988b; Cloutman 1988a; Cloutman and Smith 1988; Lane et al. n.d.:Table 7.6; and see Schulting and Richards 2002; Schulting and Richards 2009 for an overview of the debates concerning classifications of (Early Mesolithic) fauna, seasonality, and diets).

A fuller presentation of the stratigraphy at Seamer Carr K has recently been authored by the original Seamer Carr Project team for forthcoming publication (Lane et al. n.d., including Harris matrices, section drawings, and context concordances). To avoid overlap with Lane et al.'s (forthcoming) detailed account, I have instead focused on a tabulated overview of recorded finds frequencies per geological context in the FMG and mixed scatters (see Figure 102). Of particular relevance are the Late Glacial sandy gravel basal layers [5015] and interstadial peat horizons [5091/5085] (presumed layer visible in Figure 41), but also the loose, sandy context [5014] and the main Mesolithic occupation horizon [5012] (for a complete list of context numbers and descriptions, see Lane et al. forthcoming).

While the majority of finds in the FMG scatters 14 and 27 were recovered from the corresponding Late Glacial horizon [5091], I have equally observed that the early Holocene land surface [5012], a medium-coarse grey sand, is also recorded as the context from which a significant proportion of finds were recovered across all FMG scatters (see Figure 102). This illustrates the documented admixture of geological horizons within scatters and mixing of finds also between adjacent lithic scatters caused by post-depositional processes. Only a small number of clusters are fully stratigraphically intact; while varying levels of disturbance and admixture of material are recorded for all FMG scatters, the highest degree of stratigraphic integrity is documented for the spatially discrete Early Mesolithic microlith manufacture assemblage in scatter 21a and the Late Mesolithic microliths in the easternmost extension of area 20. Admixture was also observed for artefacts of Early Mesolithic technology recovered from stratigraphically older contexts originally underlying the early Holocene layers. Natural as well as anthropogenic features associated with the Early Mesolithic occupation layers have further disturbed the spatial integrity of once intact and undisturbed scatters, and overall complicated the interpretation of the site. A detailed presentation of spatial and stratigraphic finds distribution is forthcoming (in Lane et al.); as emphasised therein and in previous publications on Seamer K, the chronological attribution of the lithic scatters is thus based on an integrated appraisal of multiple lines of evidence, including, but not limited to, stratigraphy.

Evidence from refitting

Figure 45: Working photograph of an extensive core refit unit comprising Wolds-type flint debitage found in scatter 27 (complete width: 17 cm; my hand for scale)

The main importance of the refitting studies at Seamer K has been to show the high rate of recovery of finds and refitting has allowed any post-depositional effects of displacement to be fully documented. This has been useful in demonstrating the spatial integrity of the scatters but it has not been possible to reconcile all artefacts unequivocally. In parts this is due to the sheer size of the assemblages and time constraints, but also because the range of tasks reflected in the most artefact bearing scatters are more varied and less specialised than at the nearby Seamer Carr C, which was investigated during the same refitting program. Results from refitting are reported more fully elsewhere (Lane, Schadla-Hall and Taylor 2023; Conneller 2000b; Conneller 2005; Conneller and Schadla-Hall 2003). Here, I have focused on understanding the broader patterns of scatter formation and composition as elucidated by refitting, since the results obtained by the original Seamer Carr Survey team are integral to our understanding of the mixed scatters. Central to my own analyses are the observations from refitting regarding preferential raw material use patterns observed across the FMG and

Early Mesolithic components of the assemblage.

Of immediate relevance to my analyses is the Wolds flint refit sequence from scatter 25 to which a backed blade could be refitted (shown in Figure 49), as it illustrates *in situ* knapping and tool production during the FMG phase of human presence (see Section 6.2.1). Reported refits between retouched tools such as scrapers and burins, and (resharpening) spalls in several scatters, indicate toolkit repair and curation as other examples of *in situ* activities during the Late Glacial occupation phase. The absence of suitable blade blanks from refitted sequences has been interpreted as intentional removal of individual blades from site, for instance to "gear up" to meet immediate or future tool needs (Conneller 2007:227). The same pattern of removing usable blade blanks was also observed to apply for cohesive clusters of debitage and debris that likely originate from the same knapping episode but which were not completely refitted (Conneller 2007:226; Myers 2015).

As shown in Figure 46, most refits are typically represented by smaller refit groups comprising two to five artefacts or break refits within the same scatter (own observations). Shown in Figure 45 is an extensive core refit unit comprising over 20 removals from scatter 27. Where refits are documented across more than one analytical area at Seamer K, these are most common between two or more adjacent scatters, although refit units are also reconstructed using finds which are located much further apart (note the 20 m site map scale in Figure 42). The nearer refits may show gradual dilation of *in situ* scatters (Lane et al. n.d.), whereas the longer distance refits could reasonably represent anthropogenic movements of artefacts across the site (Conneller and Schadla-Hall 2003; Conneller 2007). Higher concentrations of non-refitting finds in certain areas such as scatters 2 and 30 in Figure 42 have been interpreted as containing discarded and dumped material.

Evidence for preferential raw material use patterns

Two distinct flint types found at different sources are represented in the lithic assemblage recovered at Seamer K. The first is local flint that was sourced from the nearby Yorkshire Wolds in the southern part of the Vale of Pickering (c. 10 km distance between site and source, cf. Figure 15). Wolds flint is tabular, derived from horizontal deposits, and opaque white/grey (see Figures 48, 45). The second flint type was not locally sourced and is characterised as translucent brown drift- (or till-type) flint (in Figure 48). Even though the second type of flint

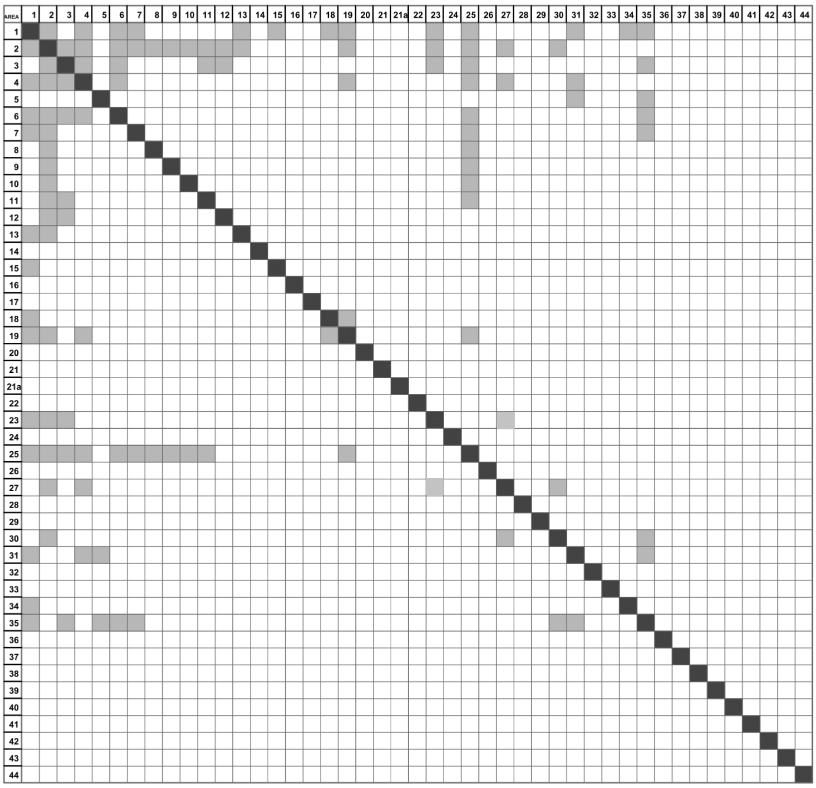


Figure 46: Refit matrix of documented refits across all excavated Seamer Carr K areas (includes all refit units and conjoined fragmented pieces; data sourced from superK-spreadsheet and own observations)

could have come from beach pebbles in its raw state, drift flint is of higher quality and possibly originates from the modern coast or the now submerged North Sea Plain (10 to 20 km to the east of the Vale; Lane, Schadla-Hall and Taylor 2023; Henson 1982; Henson 1985; Conneller and Schadla-Hall 2003:93-94, 100-101; Conneller 2007:227; 232-3). Compared to other site assemblages in the Vale, local Wolds flint is overrepresented at Seamer K (Lane, Schadla-Hall and Taylor 2023; A. David pers. comm. undated, in Conneller 2000b:155). These two flint types were used preferentially during the FMG and Mesolithic phases at Seamer K, and the same patterns could also be mapped at a high resolution at several of the other Seamer Carr sites (Lane, Schadla-Hall and Taylor 2023; Conneller 2000a; Conneller 2001; Conneller and Schadla-Hall 2003; Conneller 2007). The evidence for preferential preparation, provisioning, and use of local and non-local flint types at Seamer K has informed the broader discussion of chronological and regional patterns in lithic raw material behaviour in British LUP assemblages (see

Section 2.1.4; Barton 2010; Jacobi and Higham 2011:227). Thus, Seamer K is of crucial relevance to my comparisons between case study assemblages (in Section 9.2.2).

In Figure 47, recovered artefact types and their prevalence vary recognisably across the excavated scatters. Furthermore, types also vary identifiably in relation to specialised use of local vs non-local flint, as evidenced by a comparison of flint types used throughout the various stages of the *chaîne opératoire*: procurement, preparation, tool manufacture and use, as well as toolkit curation and disposal. Results from refitting have revealed broader patterns regarding the two flint types recovered from site (Wolds and drift-type flint); for instance, higher percentages of knapping waste and blanks on local Wolds material in the FMG-attributable scatters indicate that this was the preferred manufacturing material (see Figure 45). Found within the same scatters are pre-prepared blanks and ready-made tools from imported drift flint, including diagnostic curve-backed blades and rounded end-scrapers on blades. In contrast, no FMG-attributable prepared cores or nodules appear to have been made from drift flint. These observations imply that although immediate tool needs could be met by exploiting local resources, tool kits were also curated in an anticipatory manner using non-local flint (Conneller 2007:227; Barton 2010:8). However, higher percentages of prepared cores and nodules of non-local drift-type flint are observed in the Early Mesolithic scatters, with only isolated examples of cores made on local Wolds flint (tested on site but abandoned during early stages of reduction).

As tabulated in Figure 47, the prevalence of local Wolds flint relative to non-local drift-type flint - and vice versa - may be used as a valid and reliable chronological proxy or indicator for the focal areas of interest on Seamer K. Most pronounced are these patterns in the FMG-attributable area/scatter 3 and the Early Mesolithic area 30, where more than 90% of recovered finds are from the respective period-indicative raw material, i.e., correspond to *in situ* manufacture using local Wolds flint as the dominant raw material during the older phases of occupation, contrasted with an emphasis on non-local drift-type flint in the Early Mesolithic.

Figure 47 shows how this identifiable pattern applies to all of the designated areas, although at slightly lower ratios than in areas 3 and 30. The only notable exception is scatter 15, where the proportions are reversed (55% drift to 45% Wolds). Since most finds were recovered from the Late Glacial sediments [5091], scatter 15 can be attributed to the FMG, even if the raw material prevalence is more balanced than in the other FMG scatters (Conneller 2007:225). A similar situation applies to the mixed scatter 25, where, based on raw material representation and composition of the recovered sample, a clear delineation between FMG-attributable and subsequent Mesolithic activities is more complicated. However, as demonstrated by the refitted backed blade in Figure 49, area 25 clearly contains identifiably FMG elements. The interpretation of the mixed scatter 5 is based on the results from refitting, as at least one of the refitting sequences from "very fresh" drift-flint is evidence for microlith manufacture, and the refitting units from patinated Wolds flint also contain backed pieces (Conneller 2007:226).

Regarding raw material identification, in one instance I noted a discrepancy on the dataset regarding raw materials, as one of the smaller refit sections apparently consists of both Wolds but also two drift-type flint removals. The refit unit (SK13:14) in question is composed of 6 refitted flakes (IDs 18164, 20762, 20077, 21108, 21280, 21341) and 1 burin spall (ID 20804) derived from the Late Glacial context [5091] in adjacent scatters 13 and 14, plus single finds from scatters 5 and 35. This discrepancy is especially noteworthy since the burin spall and flake from scatter 5 (ID 18164) are recorded as drift flint. As tabular Wolds nodules cannot contain traces of drift flint, the most likely explanation for this discrepancy is human error during recording, i.e., the wrong artefact ID number was noted for this refitting spall. This observation is unfortunate, but has not been of immediate consequence to my analyses.

While a preference is shown for the use of different flint types for different periods at Seamer K, the observable patterns are more nuanced than equating one flint source with one period (cf. Section 2.1.4), as illustrated by wider, contrasting considerations of retouched tool prevalence and on-site manufacture. Regarding the FMG component of the assemblage, the recovery of for instance backed blades made from Wolds flint suggests skilled use and exploitation of local raw materials, whereas the recovery of ready-made backed blades and other retouched tools made from imported drift-type flint suggests a curated approach. This flexibility between *ad hoc* and curated use of raw materials is also mirrored in the Early Mesolithic scatters, as indicated by microliths and microlithic manufacture debris from both types of flint. These raw material use patterns are also of wider relevance to this thesis as similar patterns were observed elsewhere in my immediate research area (see Section 9.2.2) and elsewhere in Britain (including at Rookery Farm, Cambridgeshire, Conneller 2009; La Sagesse Convent, Hampshire, Conneller and Ellis 2007).

6.2 The FMG-attributable assemblages

A total of 12,137 finds were excavated over the course of fieldwork at Seamer K and recorded across 8959 separate records in the original artefact spreadsheet. My approach follows the methodology outlined in Chapter 3, and further particulars are outlined in Section D.1. The general condition of the finds is good, and from the refitting, artefact recovery was thorough. Finds densities and spatial distribution at Seamer K are shown in Figure 42. Seven scatters (3, 4, 6, 13, 14, 15, 27) were classified as FMG-attributable through a combined evaluation of stratigraphic, typological, and technological evidence, and these seven scatters are the focal interest to this case study (Conneller 2007:223-6). Additional FMG elements are also documented from the mixed scatters 5 and 25. I have intentionally included the Early Mesolithic (hereafter: EM) scatters 2, 7, 21a, and 30 to provide additional context for comparison (Conneller and Schadla-Hall 2003:93-94), i.e., to amplify the significance of raw material sources or retouched tool prevalence between chronologically older and younger scatters. Key information concerning the focal scatters is summarised in Figure 47, sorted by artefact types and raw material sources. Even this tabulated overview clearly captures the observable differences between scatters relative to flint type prevalence.

As addressed in the introduction to this case study and in Section D, due to changing personal circumstances I was unable to complete my first-hand examination of the Seamer material. For the sake of coherence, these analyses are primarily based on the raw data included in the superK-spreadsheet and supported by my additions (e.g., observations, measurements) where available. Comparisons and analyses are carried out on the common denominators that are consistently recorded for most entries, for instance artefact types and raw material source. Existing recordings of measurements in the superK-spreadsheet are used for a morphometric comparison of blades, bladelets, and backed blades (in Section 6.2.1). The excavated test pits and trenches at Seamer K were assigned their own labels that are separate from the numbers shown in Figure 42. All finds (save unstratified spoil heap finds) were recorded three-dimensionally. Since trench labels are not listed for most of the spreadsheet records, I have retained the site subdivision by scatters and analytical units (Areas 1-44; see Figure 42; Lane, Schadla-Hall and Taylor 2023; Conneller and Schadla-Hall 2003; Conneller 2007).

6.2.1 Overview and composition of sample

Building on the foundation regarding raw material prevalence outlined above, I was able to identify which components of the dataset should be included in my own sample. One of the things I considered as an indicator of on-site activities, such as core preparation, was the presence of cortex on artefacts. Approximately 80% of artefacts from the focal FMG, mixed, and EM scatters are fully decorticated, and larger quantities of remnant cortex are only preserved on a smaller quantity of finds (<5%). The overall degree of recorded cortex coverage is consistent with the types of on-site activities identified from the lithic assemblages (decortication, core reduction with smaller quantities of cortex remaining, tool manufacture on tertiary blade/bladelet blanks, and toolkit curation). However, since the locally available Wolds flint is tabulated, these nodules naturally contain fewer corticated surfaces than for instance nodules directly derived from till and beach pebble till flint. Consequently, the overall amount of cortex on Wolds-type (primary) debitage and cores will be lower (Henson 1985). Conversely, higher counts of primary and secondary cortical pieces from Wolds flint indicate on-site decortication and core preparation. In line with reported higher frequencies for prepared (decorticated) cores and ready-made tools on non-local drift-type flint, 'no cortex' is marginally more prevalent in the drift-component of my sample. However, given the overall composition of the sample, this difference can be observed, but not confidently quantified at present.

Regarding post-depositional patina, C. Conneller aptly noted that since "till [drift] microliths and refit sequences are only ever fresh in condition and backed points only ever slightly patinated, it is presumed that patination of till material can be used to distinguish the two occupations" (Conneller 2007:225). Although only colour, not 'freshness' of patination is recorded, I concur with Conneller's observations. The presence and locations of hearths is inferred via burnt artefacts found near scatters 5, 7, 15, 19 and south of scatter 1 (my observations and Conneller 2007; Conneller 2000b:159-165).

20 cores (out of 69 cores total) were recovered in the FMG scatters, whereas the remaining 49 cores are from EM, mixed or unspecified scatters, including the refuse areas 2 and 30. 15 of these cores were recovered from the early Holocene context [5012], 3 from context [5014], and 2 from the Late Glacial context [5091]. Single-platform cores are the most prevalent (N = 9, from scatters 3, 4, 6, 15) and 4 are two platform cores (orientation unspecified in dataset; from scatters 3, 14, 27). 4 are polyhedral cores (scatters 4, 6), and 3 cores are unspecified

(scatters 3, 15). Only a small number of diagnostic FMG tools could be refitted to cores (like the backed blade in Figure 49; Lane et al. n.d.). There are slight differences between products made from Wolds and drift-type flint (see Figure 47). In the FMG scatters, tabular Wolds flint is the dominating raw material used to produce scrapers and the preferred flint type for blade manufacture (including cores, flakes, debitage, and fragments). All microliths and most microburins found in EM scatters are made from drift-type flint, which was also favoured for bladelet manufacture.

Regarding core preparation, the tabulated Wolds flint naturally offers a suitable surface for use as a platform, and detached blanks found within the FMG scatters show thicker butts and fewer traces of abrasion (Conneller 2000b:156). Similar patterns of skilled, highly adaptive use of the flint types' natural properties are for instance known for later (Allerød chronozone) FMG-assemblages in northern France where natural convexities of nodules or, as at Seamer K, naturally level and right-angled platforms were fully exploited (Coudret and Fagnart 1997; cf. Section 2.1.4). Consequently, platform and knapping edge preparation by (extensive) abrasion is more frequently observed on finds made from nodular drift-type flint and corresponding butts (and blanks overall) are smaller and thinner (my observations and calculations below; Conneller 2000b:156). Figure 47 shows the frequencies of core preparation removals, which are more frequently recorded from drift flint. 'Core preparation flake' is used as an umbrella term on the recording spreadsheet to collectively refer to crested blades and flakes, core tablets and plunging blades/flakes, amongst which crested blades occur most frequently.

Figure 50 shows the prevalence of hammer types, sorted by raw material source and main analytical areas of interest. Hammer types appear to have been systematically recorded for almost all measured objects ('NA', i.e., not assessed finds, include fragmented artefacts) and I regard the dataset as largely complete. 'Soft' could refer to soft stone or organic hammers which both can produce similar scarring patterns even though these will change how the knapper interacts with the material (Pelegrin 2000). Furthermore, different hammer types could have been used during the same knapping process, and if so, such information would remain undifferentiated within the sample. Hammer types categorised as 'uncertain' effectively reduces the counts for both hard and soft hammers in Figure 50, thereby creating a misrepresentation in the data.

Blade debitage and backed blades

During post-excavation work in the late 1980s, measurements for length, width, and thickness were taken on a comprehensive sample of completely preserved blades and bladelets. In addition, the same measurements were taken on a representative quantity of intact flakes with preserved proximal ends. On average, 16.6% of recovered finds from Seamer K were measured, and up to as many as 25-30% in individual scatters (Areas 13, 14, 25). I regard the sample as generally representative and the available measurements for blades, bladelets, and flakes provide a representative image of what blank types were selected for further modification into tools. Finds frequencies are summarised in Figure 47. Regarding the classification of flakes, bladelets, and blades, I presume the standard blade definition (i.e., $\geq$ 2:1 length to width ratio) applies here, whereas I have not been able to determine the underlying parameters for bladelets (or flakes vs. debitage). The prevalence of bladelets also in the designated FMG scatters indicates that small blades were the likely knapping objective, rather than 'bladelets' in the strict sense. Artefact types which were not measured post-excavation include general (micro-) debitage, fragments, and a significant number of retouched tools. Due to aforementioned difficulties during data collection I was unable to add additional recordings to the existing records, which has hampered direct comparisons between the morphology of retouched tools and blade/bladelet debitage.

The distribution of blades, bladelets, and backed blades relative to mesial width and thickness is illustrated as a scatterplot in Figure 51. Removals made on either Wolds- or drift-flint type are more densely clustered in the ranges of 3-15 mm for width and 2-5 mm for thickness. The distribution of Wolds-type finds is more fan-shaped, with one core preparation blade as the most notable outlier (45 mm width/39 mm thickness). As indicated in Figure 51 and tabulated for more direct comparison in Table 21, blanks made on drift-type flint are generally thinner than comparable blanks made on Wolds-type flint. I regard these observations to be indicative of different methods and variable intensity of core preparation but also to reflect different knapping objectives (Wolds: blades; drift: bladelets[1]). While the refit unit from scatter 27 in Figure 45 clearly illustrates the sometimes

[1]The differences between flint types relative to thickness are mirrored in the Early Mesolithic (EM) material as well. Values (in mm) are: EM Wolds blades (N = 6) mean 5.8, sd 2.5, median 5.5, IQR 2.5; EM Wolds bladelets (N = 47): mean 3.8, sd 2.6, median 3, IQR 3. EM drift blades (N = 21): mean 6.5, sd 3.9, median 6, IQR 2; EM drift bladelets (N = 187): mean 2.8, sd 2, median 2, IQR 1

Table 21: Comparisons of width and mesial thickness of FMG-attributable backed blades, blades, and bladelets, grouped by measurement, raw material source, sorted by descriptive values (all values in millimetres; N = 191, data sourced from 'superK' recording spreadsheet, excluding 10 entries for which no measurements were recorded)

Measurement	FMG Material	Flint type	N	Mean	SD	Median	IQR
Width	backed blades	drift	19	11.3	3.53	11	3
Width	blades	drift	5	14.4	4.98	15	7
Width	bladelets	drift	30	11.8	4.86	11	6
Width	backed blades	Wolds	3	11	3.61	10	3.5
Width	blades	Wolds	28	19.7	5.06	20.5	6
Width	bladelets	Wolds	109	10.4	4.05	10	5
Thickness	backed blades	drift	19	3.37	1.86	3	2
Thickness	blades	drift	5	4.8	3.70	4	3
Thickness	bladelets	drift	30	3	2.29	3	1.5
Thickness	backed blades	Wolds	3	5.33	4.04	3	3.5
Thickness	blades	Wolds	28	8.82	4.72	8	4.25
Thickness	bladelets	Wolds	109	3.38	2.33	3	2

very thick Wolds-type flint removals, the mean thickness of Wolds blades seems extraordinarily high (8.82 mm). This is likely driven by the modest sample size (N = 28) and skewed by the inclusion of thicker outliers (in Figure 51).

As mentioned and illustrated in Figures 52 and 49, the recovery of twenty-nine backed blades is an important typological marker for the FMG occupation of Seamer K. Regarding the spatial distribution of these backed blades, one half of the sample originates from the scatters within the designated FMG and mixed areas (see Figure 47). The remaining backed blades were recovered from analytical areas (18, 19, 24, 34, 35, 41 and 45, all regarded as mixed clusters) adjacent to the FMG scatters. The stratigraphic distribution of backed blades is equally split between the interstadial peat deposits [5091, 5014, 5084] (15 finds) and the main early Holocene horizon [5012] (14 counts). This is consistent with the general stratigraphic distribution at Seamer K (in Figure 102).

Seven of the recorded backed blades were made from local Wolds flint (found in areas 3, 4, 5, 19, 27, 35), whereas the remaining twenty-two were made using non-local drift-type flint. Evidence for on-site knapping and fabrication of backed blades using Wolds flint is documented, whereas the prevalence of backed blades on drift-flint is consistent with the import of ready-made retouched tools and blanks made on non-local sources (Section 6.1.1). Soft hammer use is only specified for two backed blades and hammer types are otherwise recorded as unspecified. Based on the superK-recording sheet, only half of the backed blades are preserved intact, whereas the remaining half are recorded as fragmented, but it is not determinable if this means that proximal and/or distal ends were removed through retouch, or if the artefacts are more substantially fragmented. Cortex is entirely removed from all save four backed blades (find IDs 14095, 16389, 20800, 21855).

Measurements were recorded for three of the backed Wolds blades, and nineteen of the drift-type backed blades. In Table 21, measurements are summarised and in Figure 51, backed blades are compared relative to width and thickness by raw material type, and compared against unretouched blades and bladelets from the FMG-attributable scatters. As can be seen in Figure 51, the width and thickness of backed blades corresponds to small blades or bladelets (recorded width up to 21 mm, median thickness c. 3.1 mm). This is equally applicable to drift and Wolds-flint, albeit with the caveat that the greater number of backed blades made from drift-type flint enables a more direct comparison. There are two backed blade outliers that measure 10 mm in thickness, one each from drift (find complete; ID 18618, width 9.1 mm, scatter 14) and Wolds flint (fragmented; find ID 16634, 15 mm width, scatter 4). Other outliers in Figure 51 include the 39 mm thick blade made on Wolds flint from area 1 which is also one of the longest recorded finds, measuring 99 mm in length. Overall, the illustrated metric dimensions confirm the general tendency for thickness <5 mm, but this also includes blade and bladelets removals during the earlier stages of knapping, which are typically thicker. Additional comparisons between the backed blades/blades and bladelets found no significant differences regarding width or thickness illustrated in Figure 51[2]. Further clarification of morphological details would benefit from measurements taken on larger knapping sequences; however, this was not pursued as part of this case study. The extent, orientation, and placement of retouch is not recorded, but the illustrations in Figures 52 and 49 suggest that backing/retouch was concentrated mostly along the length of the (left) lateral edge. Fine-parallel, but also more invasive and irregular, retouch types seem to have been used, as suggested by the illustrated larger penknife point in Figure 52. No retouch *sur enclume* is recorded.

[2]Results for Kruskal-Wallis rank sum test comparing widths: Kruskal-Wallis chi-squared = 0.27096, df = 3, p-value = 0.9654, i.e., no significant difference between groups. Results for Kruskal-Wallis rank sum test comparing thickness: Kruskal-Wallis chi-squared = 4.1118, df = 3, p-value = 0.2496, i.e., no significant difference between groups.

Retouched tools

Two retouched tool types are particularly indicative of the older and younger phases of occupation of the Seamer K locale. Whereas backed blades and penknife points (in Figures 49 and 49) are diagnostic of a later FMG *faciès* (cf. Section 2.1.4), recovered microliths and microburins are equally diagnostic for EM assemblages. These differences in type fossils are mirrored in the overview in Figure 47, and higher concentrations of certain artefact categories reflect the range of identified on-site activities (see Section 6.1.1; Conneller and Schadla-Hall 2003; Conneller 2007). Notably, the presence of one or two type fossils in the 'wrong' area do not render the chronological interpretations of the respective scatters as invalid, because their attribution to the older or younger phases of occupation is based on a holistic evaluation of several lines of supporting evidence.

Figure 52 shows a selection of curve-backed points and backed blades from Seamer K, and I was able to relocate two of the illustrated finds' ID numbers during my brief artefact handling. However, I discovered that neither ID 22546 nor ID 22544 are recorded on the spreadsheet, which has limited my abilities to place these illustrated finds into the wider site context. Based on the drawings in Figure 52, the variation in appearance of the penknife points mirrors my observations from other British FMG-attributable assemblages (in Section 2.1.4, see Chapter 7).

In addition to backed blades and penknife points, the retouched tool component at Seamer K is scraper-dominated (89 scrapers recorded, i.e., c. 51% of retouched tools, approximately equivalent to 1.5% of entire assemblage, in Conneller 2000b:Table 4.11), which is especially evident in scatters 3, 4, and 5 (in Figure 47). Other retouched tools such as burins, borers, piercers, scrapers, and combination tools were also excavated at Seamer K, as well as microburins/tool spalls and resharpening flakes (see Figure 47; Conneller 2000b:Figs. 4.26-27). As illustrated in Figure 52, retouched tools were mainly made on fully decorticated removals, and in some cases, scrapers were made on smaller, but thicker and sturdier 'early' blade blanks or core correction removals. Such shorter scraper types are diagnostic of the later FMG *faciès* (see Section 2.1.4). A more in-depth analysis of the retouched tools was not possible for this case study due to the relative scarcity of recorded measurements and lithic technological attributes.

6.2.2 Nature of site occupation

The spatial site organisation and nature of human site use of the Seamer K locale has been inferred through the location and prevalence of retouched tools. The size, spatial distribution, and composition of the FMG lithic assemblages is indicative of several shorter, but partially interconnected stays on the site to undertake retooling, knapping, toolkit curation, discard, and dumping. Several of these activities may have taken place in isolation, and with much time in-between each occupation phase since the detailed scatter formation processes have been difficult to delineate in detail due to the degree of stratigraphic admixture of finds and overall prevalence of finds recovered from the early Holocene horizons (in Figure 102; Lane et al. n.d.). Interestingly, the recovery of cutting and scraping tools from along the modelled lake edge suggests that 'messier' tasks such as plant, meat, or hide processing were carried out close to the water, which reveals interesting insights into task organisation within this lacustrine habitat (see Section 9.2.3).

Moreover, and as will be more fully discussed in Section 9.1.2, the location of the Seamer K scatters and the wider cluster of sites in the Vale of Pickering enables an interesting perspective on human occupation in lacustrine environments during the LG Interstadial and into the early Holocene (Conneller and Schadla-Hall 2003:100). For instance, the general landscape setting of Seamer K confirms spatial patterns observed more broadly for open-air sites (cf. Chapter 4), since the kame location combines the immediate benefits of settling on relatively level, well-drained grounds within the proximity of the freshwater lakefront. As shown in Figures 40 and 43, this preferential pattern relative to the gradually receding Lake Flixton appears to be borne out for human occupation throughout subsequent centuries or millennia and is further evocative of comparable patterns observed in the Low Countries (Crombé et al. 2013; De Bie and Van Gils 2006).

6.2.3 Summary

Seamer K represents one of the largest FMG open-air sites in my extended East Midlands research area and, with respect to LG human occupation of lacustrine environments and typo-technological traits of later (Allerød chronozone) FMG-attributable assemblages, this case study is ideally suited to inform the wider themes discussed in this thesis.

The reassessment presented in this Chapter builds on the site archives and artefact recording data from Seamer K in the Vale of Pickering. The emphasis of this case study has been on exploring the data held in the original finds recording spreadsheet since it offered interesting opportunities to expand on results from previous research through additional data analysis and visualisations (Conneller and Schadla-Hall 2003; Conneller 2007; Lane, Schadla-Hall and Taylor 2023). Despite omissions in the dataset, it has been possible to extract more information specifically relating to the FMG assemblage's condition and composition. The results from my analyses were here framed in the context of the two raw material sources, and I further highlighted technological details and included metric comparisons of blade/bladelet dimensions. My analyses have enabled me to present more information on the backed blade component recovered at Seamer K, which future work may expand on through targeted recording of complete refit sequences and retouched tools. In Chapter 9 I shall revisit the results and observations arising from this case study and discuss their wider significance.

SCK FINAL PALAEOLITHIC	Scatter 3		Scatter 4		Scatter 6		Scatter 13		Scatter 14		Scatter 15		Scatter 27	
Type	Drift	Wolds	Drift	Wolds	Drift	Wolds	Drift	Wolds	Drift	Wolds	Drift	Wolds	Drift	Wolds
Awl			1											
Axe flake														
Backed	1	1	1	1					2					
Blade		7		2		7	1	4	2	4	1		1	4
Bladelet		37	8	13	2	18	1	15	6	12	7	2	6	12
Borer														
Burin (incl. possibles)	1	7	6	2		2	1		4	2	3		1	2
Burin spalls (incl. possibles)		24	4	19	4	5	5	4	5	6	3	4		3
Core (incl. fragments)		5	3	5	1	5		3		2	3	1		1
CPF (core prep. flake?)		2	1	2	1	4		3		2	2	1	1	1
*Debitage**	8	83	10	53	1	4	7	28	3	21	4	9	9	7
Flake	5	441	37	302	12	150	12	63	12	65	36	46	6	66
Fragments		84	19	54	15	68	9	49	14	34	29	13	7	32
Microburin	1			1										
Microlith	2	1	1				2						1	
Scraper (incl combination)	3	25	4	7	1	5	4	2			7	4		1
TR (truncation?)		1	1	1		2					1			
Total	21	718	96	462	37	270	42	171	48	148	96	80	32	129
Total (in %)	2,8	97,1	17,2	82,7	12,1	87,9	19,7	80,3	24,5	75,5	54,5	45,5	19,8	80,1

SCK EARLY MESOLITHIC	Scatter 2		Scatter 7		Scatter 21a		Scatter 30		Scatter 5 (mix)		Scatter 25 (mix)	
Type	Drift	Wolds	Drift	Wolds	Drift	Wolds	Drift	Wolds	Drift	Wolds	Drift	Wolds
Awl	1								1			
Axe flake	1											
Backed	1								1	2	5	
Blade	11	1	4	1	1		4		1	4	2	
Bladelet	56	15	42	7	11		50		28	25	28	7
Borer										1		
Burin (incl. possibles)	1		1	3					6	6	3	
Burin spalls (incl. possibles)	1		4	3					20	14	8	4
Core (incl. fragments)	9	3	7		1	1	4		5	1	5	2
CPF (core prep. flake?)	9	1	7	1	3		15		5	7	4	5
*Debitage**	1		139	17	26	4	42	1	23	47	16	15
Flake	152	60	173	111	42	3	174	12	215	701	51	88
Fragments	92	29	116	29	32		121	4	97	160	35	32
Microburin	3	1	2	1	2		25	1	10	1	1	
Microlith	2		10		1		19		11		4	
Scraper (incl combination)	7		1	1	4				13	10	2	1
TR (truncation?)			2				2			1		
Total	347	110	508	174	123	8	456	18	436	980	164	154
Total (in %)	75,9	24,1	74,5	25,5	93,9	6,1	96,2	3,8	30,7	69,2	51,6	48,4

*excludes aggregated entries

Figure 47: Overview of *Federmesser-Gruppen* scatters, arranged by main artefact types and raw material source. Main mixed scatters 5 and 25 shown for comparative purposes (Aggregated or mixed entries excluded; data derived from unpublished main superK.csv-spreadsheet)

Figure 48: Working photograph illustrating the different flint types represented in scatter 25 (left and right: patinated drift-type flint removals, centre: Wolds-type flint)

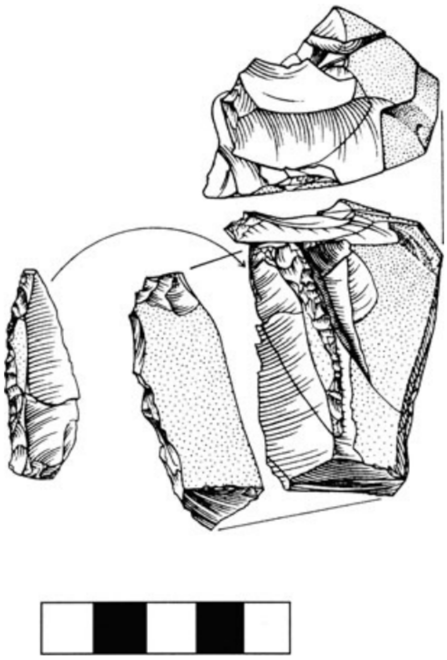


Figure 49: A refit unit from Seamer Carr K (scatter 25) with a refitting backed blade (after Conneller 2007:fig. 6, drawing by H. Martingell)

Source	Drift					Wolds					TOTAL
Hammer type	hard	soft	uncertain	NA	Sum	hard	soft	uncertain	NA	Sum	SCATTER
Area 3	1	1	12	8	22	15	70	556	91	732	754
Area 4	6	4	75	10	95	4	9	400	52	465	560
Area 6	0	1	34	2	37	5	3	260	3	271	308
Area 13	1	1	33	7	42	4	11	118	35	168	210
Area 14	0	2	43	3	48	0	4	125	19	148	196
Area 15	2	1	86	8	97	1	1	69	11	82	179
Area 27	0	1	22	9	32	4	2	117	7	130	162
Area 5 (mixed)	9	29	369	30	437	10	26	895	56	987	1424
Area 25 (mixed)	0	7	137	20	164	1	0	135	19	155	319
Area 2	24	26	300	9	359	0	3	109	0	112	471
Area 7	15	20	325	149	509	7	2	147	18	174	683
Area 21a	0	3	92	30	95	0	0	5	3	8	133
Area 30	22	17	380	49	468	0	0	17	1	18	468
Total	80	113	1908	334	2405	51	131	2953	315	3450	5867
Total (in %)	3,3	4,6	79,2	13,7	~100	1,5	3,8	85,6	9,1	100	

Figure 50: Prevalence of hammer types, by raw material sources and analytical areas (*Federmesser-Gruppen* areas shaded in yellow, mixed areas in green, and Early Mesolithic in blue; absolute numbers)

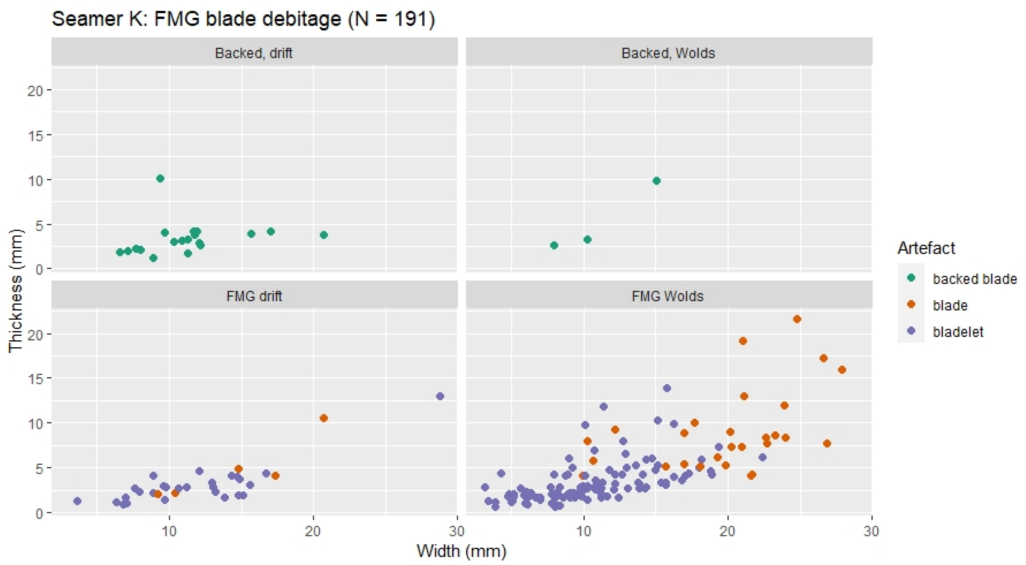


Figure 51: Comparison of width and thickness of all recorded backed blades, blades and bladelets from the FMG scatters at Seamer Carr K, separated by raw material source (N = 191 entries, points have been 'jittered' to offset overlap; data taken from superK-spreadsheet, entries without recorded measurements have been removed)

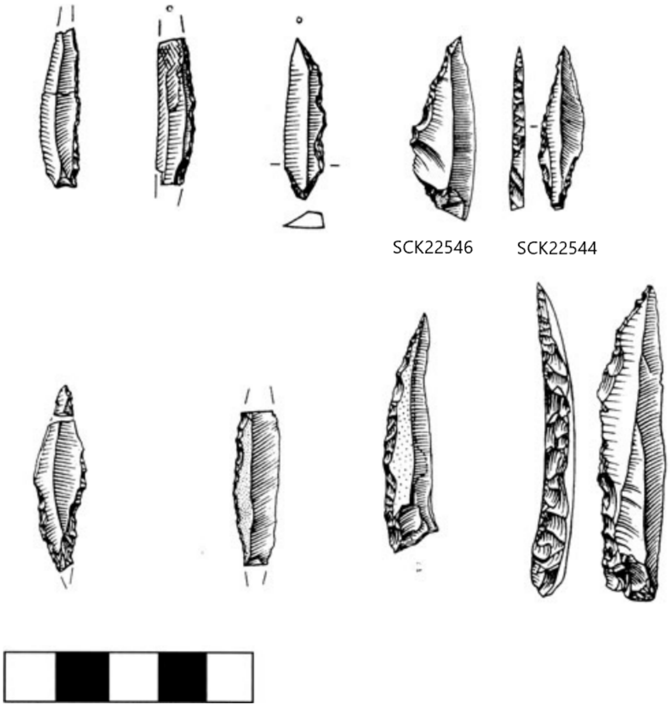


Figure 52: Assorted curve-backed and penknife points from Seamer Carr K (after Conneller 2007:Fig. 5, drawing by H. Martingell)

Chapter 7

Case study 3: Risby Warren, North Lincolnshire

One of the key observations for the Scunthorpe area was summarised by Charles W. Philips, whose work on Lincolnshire during the early 1930s helped bring to the forefront the rich archaeological record of the county. At the time, Lincolnshire was considered to represent "the bane of archaeologists [...] because it has interposed a long, nearly featureless bulk between important areas of ancient culture" (Phillips 1934:106). As Phillips noted,

> *"It is a nearly invariable rule that any exposure of sand will be found to carry traces of human occupation, especially when it is near good natural hunting grounds. There are two areas in Lincolnshire where this phenomenon has been investigated with some care - [i.a.] the Scunthorpe district. [...] While the great majority of the sites are on the summit and upper slopes of the Cliff they also occur in the valley to the west, where they are revealed by iron workings, and it seems that the determining factor in their distribution is not height but the occurrence of sand."* (Phillips 1934:116)

Areas with known deposits of aeolian LLS (GS-1) coversands in the UK have long attracted substantial scientific and archaeological interest, not least due to a series of lithic discoveries which were reported from the Lincolnshire Cliff in North East Lincolnshire as early as the late 19th century (Sturge Collection, see Smith 1931; Ussher, Jukes-Browne and Strahan 1888; Ussher 1890; Gatty 1901; Gatty 1902; Garrod 1926:188; Wymer and Bonsall 1977:177-79; 427). The Lincolnshire Cliff findspots shown in Figure 53 form a landscape of documented open-air sites at the northern outskirts of the greater Scunthorpe area. These findspots are scattered along a north-south axis parallel to the modern course of the River Trent (6 km to the west), and adjacent to the nearby Roman Ermine Street to the east, just a short, 10 km distance south of the modern Humber Estuary's southern shores. The highest density of known findspots is in Risby-cum-Roxby parish, most prominently on the so-called Risby Warren which will be the central focus of this case study. At their time of discovery in the early 20th century, the coinciding discoveries of diagnostic penknife and curve-backed points (see Figures 61, 60 and 59) reportedly found *in situ* beneath the LLS (GS-1) coversands helped challenge the hitherto prevailing distributional bias towards cave sites (cf. Sections 2.1.3, 2.2.3) and represented essential contributions towards the gradually more nuanced understanding of LG human re-occupation patterns, upon which this thesis ultimately expands.

Today, Risby Warren is a large, managed wasteland situated on the outcrops of aeolian sand on the edge of a heavily industrialised area. Its characteristic sandy dune landscape, a notable natural feature apparently reminiscent of "Egypt and Arabia", was first noted in 1695 (Pryme 1870:58), and parts thereof have since been recognised as a Site of Special Scientific Interest and placed under protection (Natural England 1986). At its highest point (Flagstaff Hill, 69.5 m AOD), the Warren provides an important vantage spot with views east across the Vale of Ancholme, towards the Lincolnshire Wolds, the Humber Estuary, and the Yorkshire Wolds; to the west can be seen the Lower Lias plain as far as the Trent Valley (Dudley 1949).

The Risby Warren locale effectively occupies several interesting, intersecting research interests. From a quaternary geological and archaeological standpoint, this area is ideally situated only a relatively short distance away from the modern North Sea coast (40 km eastwards), and equidistant *'en route'* to other well-known LUP sites from the research area (ca. 60 km to Farndon Fields in the south and the same distance to Creswell Crags in the south-west). Furthermore, this area is one of the few places in the UK where aeolian LLS (GS-1) coversands deposits are openly exposed or easily accessible beneath thinner Holocene sediments (cf. Chapter 4), which mirrors the geology of adjacent continental areas where artefacts of similar lithic typology and technology have long been reported from beneath the same types of sandy horizons (Crombe and Verbruggen 2002; Vermeersch 1977).

From an archival or research historical perspective, the Lincolnshire Cliff and Greater Scunthorpe area findspots are a particularly interesting subject for specialised research. This is due to a century of documented interest which has resulted in numerous archaeological finds and other source materials located across different legacy and museum collections. These not only reflect various historical stages of changing research methods and paradigms, but also reveal the shifts in investigative and curatorial practices over time (see Section E.1). Although most of the archaeological artefacts are typically from low-resolution (surface and disturbed topsoil) contexts, many of these extant finds and other source materials can nevertheless be relocated in different museum institutions across the UK, thus offering inherent potential for further work.

The early timings of lithic discoveries on Risby Warren and environs - and their then-unique status as open-air sites – meant that these locations were frequently mentioned in the LUP and Mesolithic literature and syntheses (Garrod 1926:188; Armstrong 1932; Clark 1932; Phillips 1934:114-5; Dudley 1949; Armstrong 1956; May 1976; Wymer and Bonsall 1977:177-79; 427; Campbell 1977a:fig. 141.6-7; Jacobi 1978a; see Figure 12). However, there is little direct information about the lithic assemblages, and the low number of site-specific publications does not accurately reflect the high levels of collecting activities or numbers of discoveries that have taken place in the wider area over time (see Figure 54). Although some results were published (Armstrong 1931a; Riley 1957, Riley 1978; Buckland 1984), most research was only reported after a substantial delay of up to several decades, and then mainly focused on material from later prehistoric periods.

Despite the ideal geographical settings and previously high levels of interest in the area, Risby Warren has attracted only very limited academic attention in recent decades. This is in stark contrast to the otherwise incremental increase in open-air findspot investigations over that same period, and contrasts even more strongly with the increasing interest in the topical debate concerning LG human re-occupation (cf. Sections 2.1.3, 2.2.3). However, there remains an active interest within the academic community to resolve open questions regarding the presumed stratified LUP evidence discovered on Risby Warren.

Thus, the main focus of this chapter will be on the small, yet highly important collection of LUP penknife points that were first discussed by A. Leslie Armstrong (Armstrong 1931a). Through my analyses I will further address the following questions:

1. Can A. Leslie Armstrong's claims concerning the stratigraphic integrity of the penknife points be substantiated?

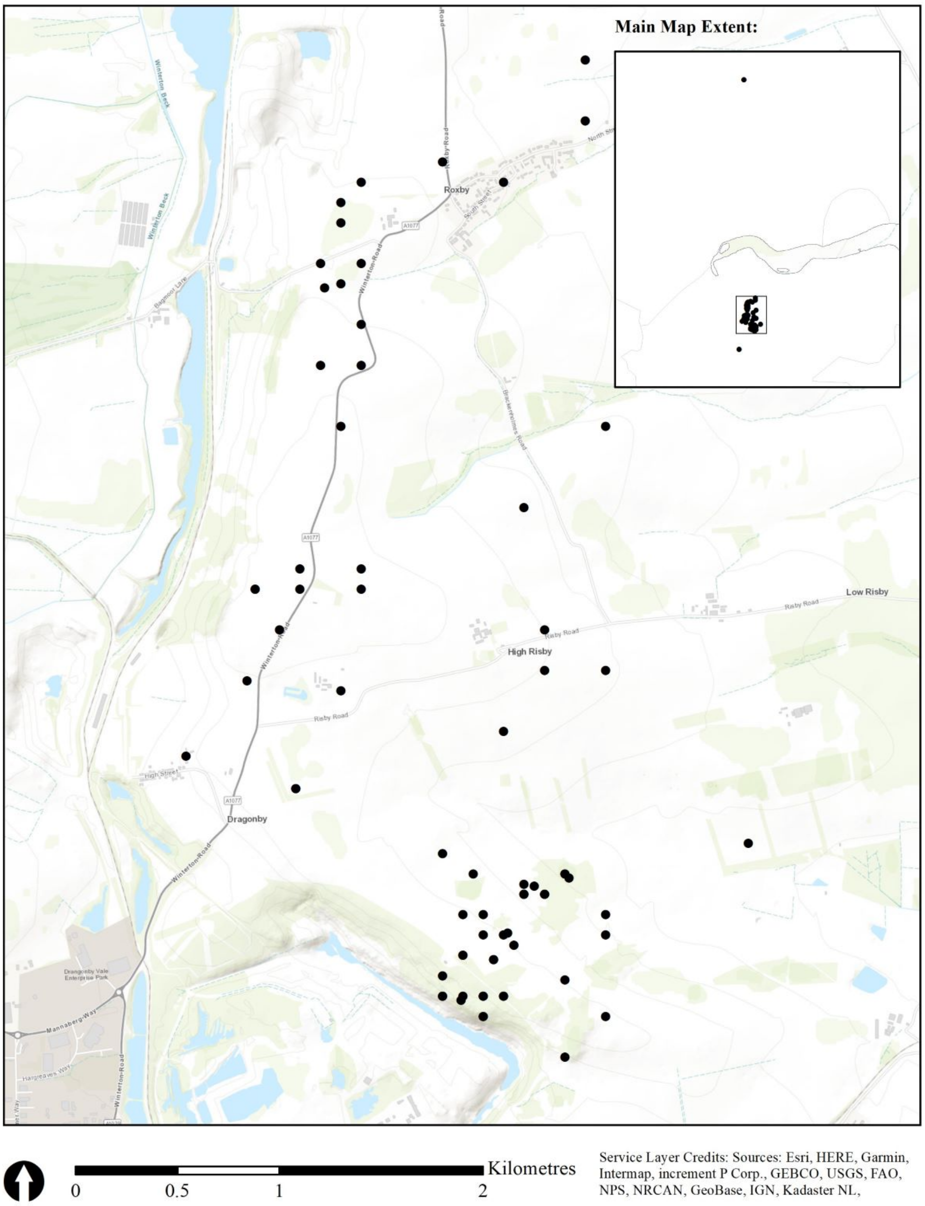


Figure 53: Regional overview of recorded findspots from the Greater Scunthorpe area in relation to the Humber Estuary. Markers denote the approximate National Grid location of findspots for which LUP and later finds are recorded and currently held at the North Lincolnshire Museum (Note: spatial precision varies from two to eight digits, with some overlap).

2. Can the reported LUP findspots be relocated?
3. What is the current archaeological research potential of the Risby Warren

locale, and have any subsequent discoveries of LUP artefacts been made?

4. What is the most arguably-sound interpretation of site activities?

In Chapter 9 I will revisit the question of how the FMG-attributable evidence from Risby Warren relates to the topical subject of LG human re-occupation of the research area and the lithic assemblages from Farndon Fields and Seamer K. Furthermore, I shall address possible similarities in typology with the penknife points from Seamer K.

7.1 Reconstructing Late Glacial Risby Warren

Due to the complexities of access for fieldwork and doubts over some of the locations, and survival of the sites, I decided it would be most profitable to focus on the extensive and under-investigated archival and museum material. Central to my analyses has been the small group of FMG penknife points which were first discussed by A. L. Armstrong (Armstrong 1931a), since these finds represent the strongest typo-technological evidence for human presence on the Warren during the second half of the LG Interstadial.

Found in Section E.1 is my extensive reconstruction of the timeline of research interest and archaeological discoveries on Risby Warren. This detailed site biography lists the main stages of previous research activities, primary collectors, associated academics, and their respective involvements (summarised in Figure 54). The most comprehensive archives of information about the Lincolnshire Cliff sites are held at the North Lincolnshire Museum, Scunthorpe. By far the most targeted - but ultimately unpublished - research on the LUP and Early Mesolithic evidence from the area was carried out by R. M. Jacobi between the years c. 1970 to 1993, when the Scunthorpe-based aerial archaeology pioneer D. N. Riley, with whom Jacobi had corresponded since the 1970s, passed away. Since there is overlap between the finds analysed by Jacobi and myself, I have collated an overview of Jacobi's Risby Warren data in Section E.3. Where available, I have included dates for the references *in litteris*. Based on these site archives, I have managed for the first time to collate the disparate LUP finds and findspots from Risby Warren (though see Section E.2.2). This is crucial to better understand the changing landscape, survival of Palaeolithic activity, and to better contextualise the existing evidence in its local and regional context.

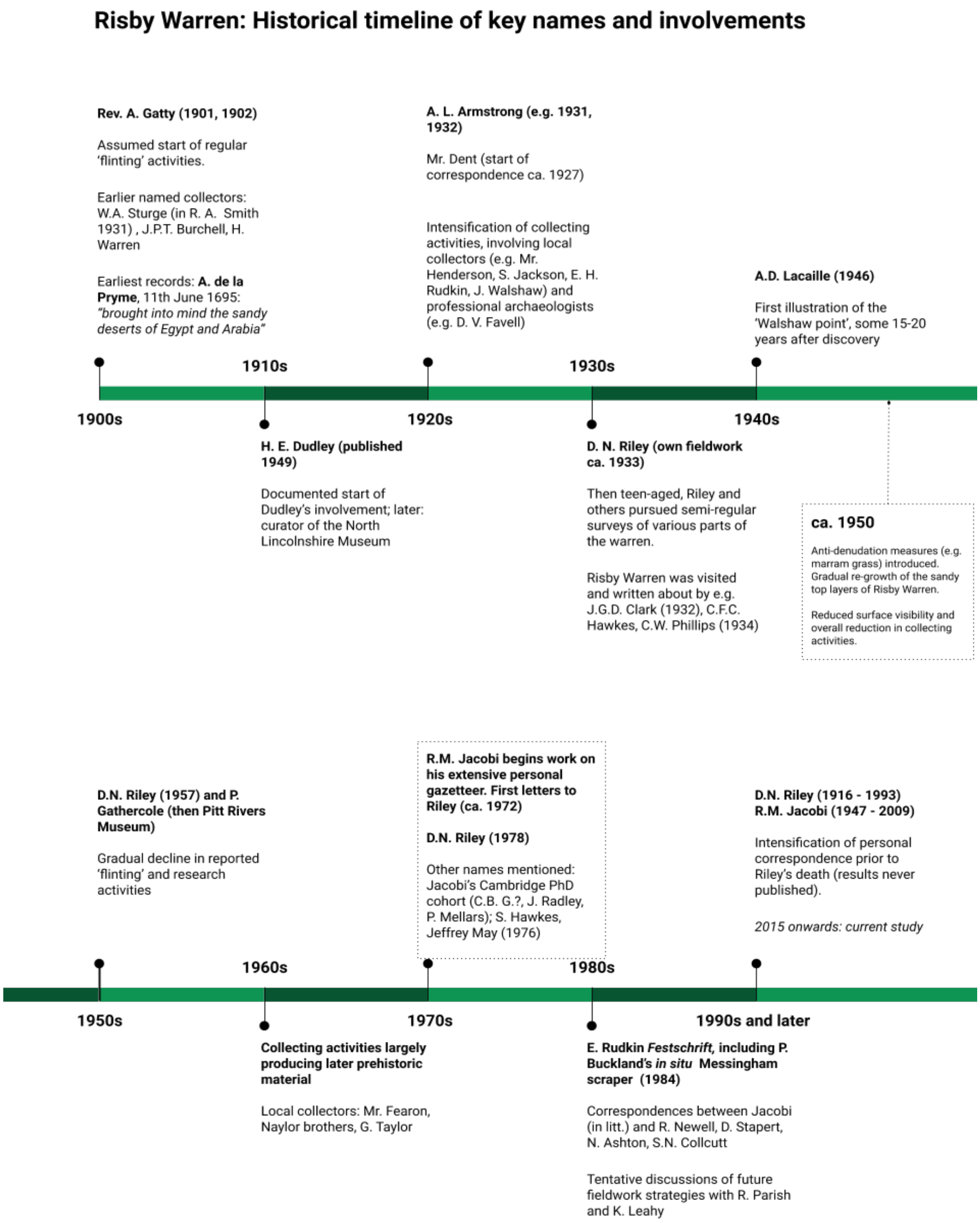


Figure 54: Historical timeline of key names and involvements, reconstructed on the basis of published and archival information

7.1.1 Known lithic inventories from Risby Warren

Artefacts found by numerous collectors on the Risby Warren are now stored across a range of institutions (see Tables 37 and 22; Wymer and Bonsall 1977:177-79; 427). Key discoveries of LUP artefacts occurred between 1920 to 1950 and were brought to a wider academic audience by A. Leslie Armstrong (see Figure 54 and Section E.1.2). Prior to my data collection, Jacobi and previous researchers had identified c. fifty LUP finds from across Risby Warren, of which 31 are diagnostic FMG-attributable penknife and curve-backed points that form the main sample of artefacts analysed in this study. Following my artefact handling visits to Scunthorpe (NLM), Lincoln (Collections), Cambridge (formerly CAEM, now MAA), Oxford (Ashmolean and Pitt Rivers), and the British Museum, I can conclude that although Scunthorpe holds the largest inventory of Lincolnshire Cliff sites lithic material, the majority of diagnostic LUP artefacts are stored at Franks House, British Museum, London (Armstrong Collection).

Despite warranted expectations based on previous observations of LUP finds, the vast majority of the Risby collections are of Mesolithic and later date and therefore outside of the scope of this thesis. In Section E.4 I have summarised my observations and lithic attribute recordings taken on a sample of predominantly Early Mesolithic artefacts that I recorded during my extended research visits. I examined upwards of ten thousand finds in the North Lincolnshire Museum inventory alone, which for the most part includes substantial quantities of largely undiagnostic flint debris and debitage (>5000 finds), but also smaller quantities (up to hundreds) of different diagnostic retouched tools such as scrapers and arrowheads from later periods. My estimate of total flints viewed is based on my own counts and scaled using the numbers/proportions of previous site reports (Clark 1932; Dudley 1949; Riley 1957; Riley 1978; R. Jacobi, *in litt.* and Section E.1). For instance, Riley (1978:11) suggested that H. Dudley's (1949) tabulations of c. 550 retouched tools "should be multiplied by a factor of ten to obtain the numbers of flints removed by known collectors". This projected estimate of 5500 finds and its composition - averaged out to contain 10% broad blades, 40% narrow blades, 7% arrowhead types, 37% scraper types, 7% knives, from all Mesolithic and later periods - is an accurate representation of the Risby collections. Moreover, at the parish level, a comparison with lithic PAS objects reflects a similar assemblage composition. The Risby-cum-Roxby finds (N = 166, PAS data collected in October 2019) are mainly retouched tools. Only one entry is classified as possibly Lower Palaeolithic, whereas there is a prevalence of

44% Neolithic (diagnostics: arrowheads, scrapers), 42% Mesolithic (diagnostics: scrapers and microliths), 10% Bronze Age finds (including scrapers and one arrowhead), and single finds of unspecified prehistoric and post medieval date (gun flints). To these numbers I would add thousands of (undiagnostic) blades, bladelets, or fragments, debitage, and waste flakes. The extent of this latter category of flints expanded significantly in 2016 after the sizeable donation of the late H. Dudley's remaining personal collection of Risby Warren surface finds. Overall, more than 3000 of the Scunthorpe Museum inventory artefacts were identifiably Mesolithic and included typical examples of obliquely blunted points and microliths on thin, delicate bladelets that fulfil the standard metric definition ($\geq$ 2:1 length to width ratio). The time of discovery of these minute Mesolithic finds corresponds well with G. Clark's description of Risby Warren as the "happy hunting-ground of collectors of 'pigmy' flints" (1932:35; Piper 2022; see Section E.1).

Based on my survey of the collections, the overall volume of diagnostic LUP finds is low and I estimate there might be around twenty additional LUP finds (mainly laminar blade debitage), but which were not sufficiently typo-technologically diagnostic and of uncertain provenance. While I cannot entirely rule out the possibility that additional LUP finds remain 'hidden' within these large inventories, in the absence of clearly diagnostic attributes these pieces could also be tentatively classified as Early Mesolithic, which is a commonly observed problem for undiagnostic surface finds from poorly stratified contexts (Pettitt, Gamble and Last 2008; Ballin 2017a). From the outset, the LUP evidence from Risby Warren indicates a markedly different assemblage composition than the Farndon and Seamer case studies; specifically, the prevalence of projectile points reflects specialised use of the locale. Reassessment is thus needed to join up areas of Palaeolithic research (i.e., discussions regarding LG re-occupation, in Section 7.2.1) and investigate whether low artefact numbers imply a collection bias or reflect other factors.

7.1.2 Site geology

The site geology and site formation processes at Risby Warren and North East Lincolnshire are highly unusual in a British context (for a detailed overview of the geology of Lincolnshire, see e.g. Straw 1963; Straw 1969; Buckland and Dolby 1973; Buckland 1984; Hayes 1994; Baker et al. 2013; Bridgland et al. 2014). Since this is one of few areas in Britain characterised by large

Table 22: Overview of institutions with Risby Warren collections. Stated counts are not an accurate estimate of total finds inventoried, but reflect the number of recorded PaMELA database entries (Wessex Archaeology and Jacobi 2014).

Institution	**Entry Counts**
NA	17
Ashmolean museum	1
Bristol City Museum	1
British Museum	29
C.A.E.M.	1
Field Museum, Chicago U.S.A	1
Grantham Museum	2
Institute of Archaeology	3
Lincoln Museum	4
Pitt Rivers museum	2
Reading museum	1
Rotherham Museum	16
Scunthorpe museum	156
Sheffield City Museum	21
Ulster Museum	1
TOTAL	**256**

concentrations of aeolian coversands of LLS (GS-1) age beneath comparatively shallow Holocene sediments, the *sédiments directeurs* aeolian coversands are highly relevant *termini ante quem* for the age and context of LUP finds (see Figure 57; R. Parish, K. Leahy, R. Jacobi, in litt. 1990). However, most artefacts from Risby were recovered from poorly stratified contexts. Only very few LUP finds were recovered *in situ*, but which includes a small diagnostic assemblage of penknife points (Armstrong 1931a). More details concerning Armstrong's reported stratigraphic concordance are provided in Section E.2.1.

The general stratigraphy for the area is outlined in Bateman (1998:318 and fig. 2 therein, shown in Figure 56), and shows successive strata of sands above thinner layers of peat, overlying windblown sands. The peat formation is indicative of the presence of substantial braided rivers and waterlogging during the Holocene, causing periodic or seasonal reworking of initially aeolian deposits. As a result, the thin base layer overlying the limestone bedrock is not original, and due to the highly mobile nature of the sands, the overall depths of deposits on Risby Warren can vary by up to one or more meters (Dr. V. Wilson in Lacaille 1946:180; Riley 1978:5; Buckland 1984:11, 14-16).

The age of the aeolian coversands is established through reference to the

Figure 55: A group of penknife points and fragments collected from Flagstaff Hill, Risby Warren, by E. Rudkin and presumably G. Dent (upper row, translucent middle items; location: Franks House, British Museum); “[t]hese are part of a group of ‘penknife points’ found in the ‘base clay’ below Late Glacial coversands on the summit of Flagstaff Hill, Risby Warren, Flagstaff Hill (S.324 B)” (Jacobi in litt./British Museum inventory box). The image on the right side shows the assorted contents of one of the Risby Warren boxes at the North Lincolnshire Museum, included to illustrate the typical range of flint types, colours and patination (own field photograph).

regional sandsheet geometry and pollen and coleoptera deposits, indicating a LLS (GS-1) age (Baker et al. 2013:115, fig. 1; Straw 1963; Straw 1969; Kolstrup 2002; Bridgland et al. 2014). The most recently (in 1972) documented *in situ* find is an end-scraper, discovered in a band of peat beneath over two meters of blown sands at a nearby Messingham quarry ca. 6 km south of Scunthorpe. This peat layer may correspond to the bands of peat noted at Risby Warren (Buckland 1984:11, radiocarbon assays taken on the peat bed returned a date (BIRM-349) of 10,280 ± 120 ^{14}C BP, 12,608-11,410 cal BP, and BIRM-707 from the ‘peaty lens within sands’ is dated to 10,550 ± 250 ^{14}C BP, 13,067-11,621 cal BP; with 95.4% confidence, calibrated in OxCal v.4.4.3 with the IntCal20 curve; Bronk Ramsey 2009; Reimer et al. 2020).

Prior to the introduction of stable vegetations in the 1950s, post-depositional

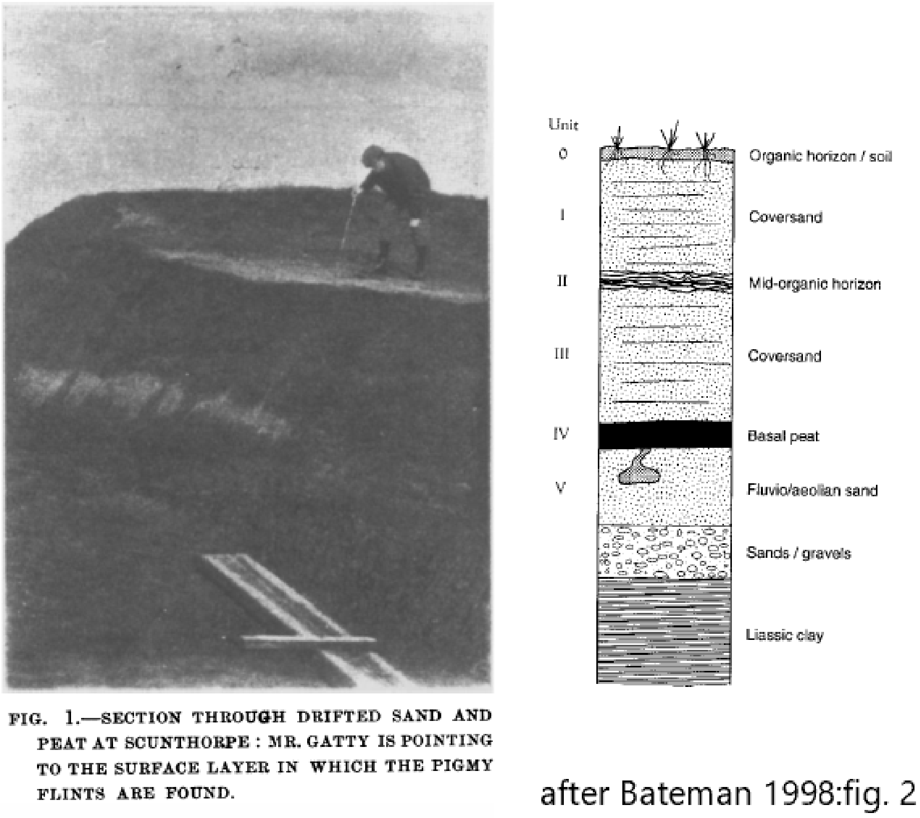


Figure 56: Contemporary site photograph documenting the earliest published fieldwork activities on Risby Warren (Gatty 1902:fig. 1), shown alongside the generalised stratigraphy for coversands areas in North Lincolnshire (Bateman 1998:fig. 2). While Gatty's finds were collected from the sandy surface, his excavated section cut through mobile layers of Coversand, which superimpose a layer of peat on top of the ironstone (Gatty 1902:18).

erosion and recurrent aeolian reactivation of the surfaces and deposits led to the admixture of archaeological material from different periods (Armstrong 1931a; Clark 1932; Lacaille 1946:180; Dudley 1949:32; Posnansky 1963; Straw 1963; Straw 1969; Buckland and Dolby 1973; May 1976:36; Riley 1978; Buckland 1984:11; Bateman 1998; Gathercole, in litt. 1970, S. Collcutt, in litt. 1988, Jacobi, in litt. 1992). Upon review of the source materials I noted several discrepancies regarding stratigraphic concordance which I have tried to resolve (in Section E.2.1). Nevertheless, as Jacobi (in litt. 1992) concluded: "It seems clear that Late Upper Palaeolithic 'penknife points' have been recovered from beneath the coversands. None are reported from a more recent context". Thus, Armstrong's

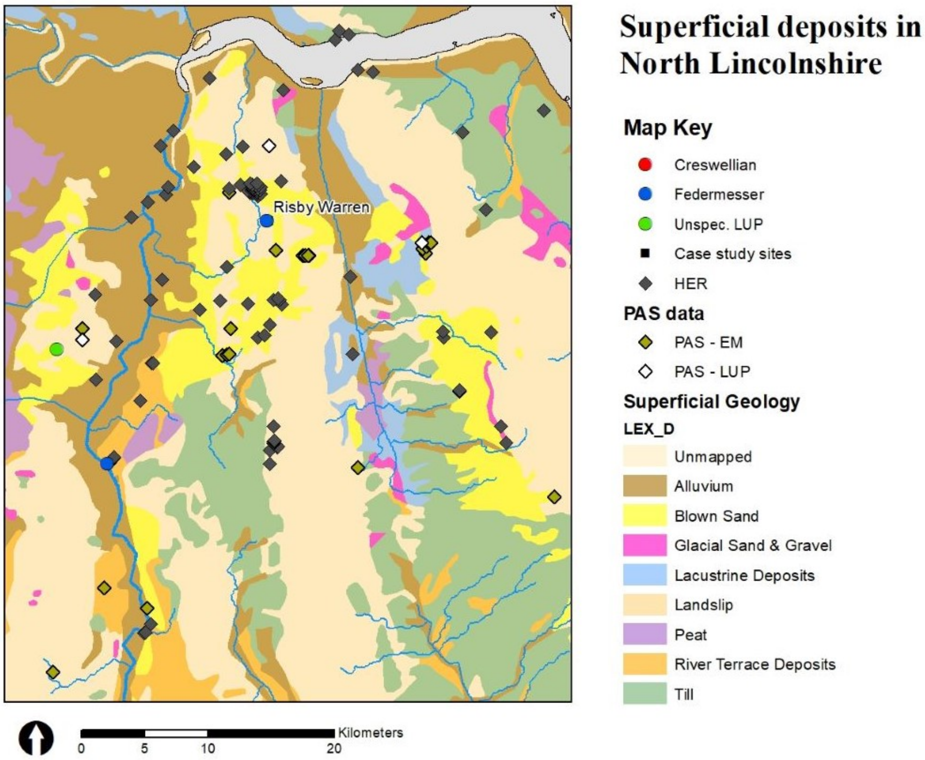


Figure 57: Site distribution of Confirmed/Certain and Probable/Possible LUP sites relative to superficial deposits (contains OS data, Crown copyright and database right 2021)

central claims with regards to the recovery of diagnostic LUP artefacts from the clay beneath the aeolian LLS (GS-1) coversands is still valid (Riley 1978:5).

7.1.3 Relocation of reported LUP findspots and present-day conditions on the Warren

At Risby Warren as elsewhere in the UK, many of the 'hotspots' or geographical foci for collecting activities coincided with areas of extraction quarrying for materials such as clays, gravels, ores or sands, or ironstone, as at Risby (Harris, Ashton and Lewis 2019:5-6). Although opencast quarries are highly damaging to original deposits and preserved finds, such extraction methods nevertheless led to increased levels of visibility of artefacts and exposure of relevant geological horizons. An additional contributing factor to Risby Warren's high archaeological potential were the prominent mobile sand dunes and frequent reworking of field surfaces due to strong winds (see Section E.1). As shown in Figures 53 and

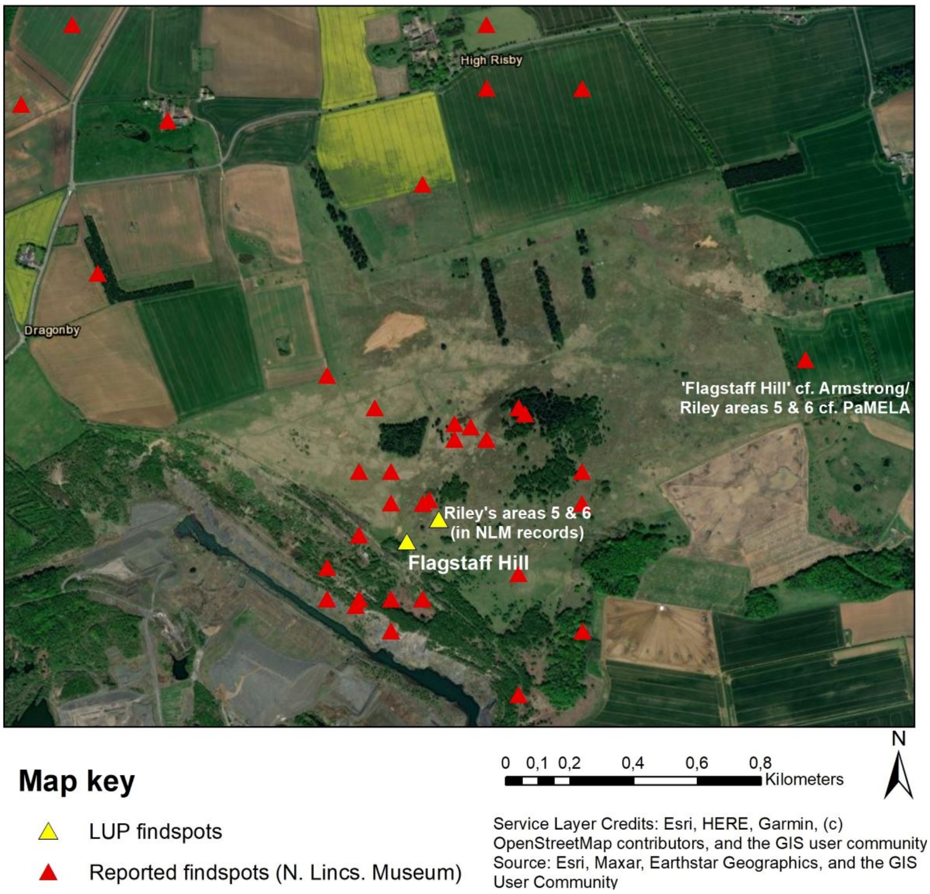


Figure 58: Location of Risby Warren main sites, highlighting LUP findspots, and the two separate reported locations for Flagstaff Hill, and Riley's areas 5 & 6, respectively. The basin in the bottom-left half of the image is a modern water reservoir connected to the steelworks (Contains OS data, Crown copyright and database right 2023)

103, Risby Warren represents a quarry-adjacent landscape of numerous findspots, as is mirrored in the PaMELA database sample of 132 separate site names, some of which overlap with the North Lincolnshire Museum's catalogue (63 site labels). No complete map exists of all local collectors' personal site plans, but based on Jacobi's previous work and the inclusion of coordinates provided by the North Lincolnshire Museum, I have been able to re-establish a clearer idea of the locations of Late and Final Upper Palaeolithic findspots (see Figure 58). The highest concentrations of reported findspots are located in the southern parts of the Warren, particularly in the areas surrounding the highest point of Flagstaff Hill which Armstrong also referred to as the diagnostic penknives' point of provenance (Armstrong 1931a). While there are discrepancies regarding the exact findspot locations across catalogues and published records (see Section E.2.2), it seems most likely that an accumulation of material occurred on and near this naturally advantageous highpoint on the Warren. This distribution pattern indicates that prehistoric activities were concentrated on Flagstaff Hill, but also reflects a collecting bias towards areas with known potential for artefacts. In the regional context of the low-lying landscapes around Scunthorpe, Flagstaff Hill (69.5 m AOD) provides a natural vantage point with clear sight lines across a large distance, thus the location would have been an obvious choice for LG humans visiting the area. Interestingly, and in contrast to Farndon Fields and Seamer K, the Risby Warren locale appears to have been a 'dry' spot as there are no known palaeo-riverine or lacustrine features or sediments preserved. Risby Warren abuts two river catchments (Trent and Ancholme), which in their modern courses lie upwards of 5 km away from the site. However, the extent of alluvial deposits relative to the Risby locale (in Figure 57) indicates that the now-managed Trent, Ancholme, and Humber once ran closer to site, perhaps on a seasonal basis due to flooding. Note that the small lake-like feature and watercourse shown in Figures 53 and 58 is a 20th century reservoir/basin and intake (via the New River Ancholme) that supplies the steelworks with water for e.g., equipment cooling, material processing, waste treatment and therefore not of bearing to human activities during the LG Interstadial.

The archaeological potential of Risby Warren remained high up until the 1950s when anti-denudation measures were introduced to prevent "the sandstorms, which shut down traffic in the area as recently as 1947" (Dudley 1949; see Section E.1). Consequently, the introduction of marram grass and other types of vegetation not only limited the movement of the sands, but also significantly decreased the overall surface visibility on Risby Warren, which is evocative of the Dutch 'Golden Age' of surface discoveries in the decades after land reforms up until re-nudation (c. earlier half of 20th century, Waterbolk 2012:322).

Another factor in the preservation of the LG landscapes is the destruction caused by subsequent expansions of the Scunthorpe Steelworks and their supply networks in the latter half of the past century that have drastically altered the local landscape in the immediate vicinity to Risby Warren. Many of the 'original' (pre-1950s) findspots on the southern parts of Risby Warren have since been lost, damaged, encompassed by the steelworks, or subsumed, as indicated by my reconstruction of likely findspot location and cross-comparisons with satellite imagery (see Figure 103; R. Nicholson, pers. comm. 2016; Riley/Jacobi, in litt., undated). Furthermore, the parts of Risby Warren between the steelworks and public area have now been placed under access restrictions due to the risks and public hazards of mining subsidence, with clear ramifications for future non-invasive surveys or targeted fieldwalking in these previously high potential areas (Natural England 2015a; Natural England 2020b; Natural England 2020a).

The present-day conditions at Risby Warren have led to a decrease in surface collecting in this southern area of the warren, as illustrated by distribution pattern of more recently discovered PAS finds which are concentrated in the northern parts of Roxby parish (The Portable Antiquities Scheme 2019ai; P. Chowne, pers. comm. 2016; K. Leahy, pers. comm. 2019). Following on from conversations with the responsible Finds Liaisons Officer (M. Foreman, pers. comm. 2016), this relative paucity of new discoveries is indeed caused by the cumulative effects of overall reduction in surface visibility, leading to less public interest in fieldwalking the area, as well as a scarcity of more invasive surveys or fieldwork - rather than being the consequence of significant under-reporting.

7.2 The FMG-attributable assemblage

For this study I have focused on the small assemblage of 31 typo-technologically diagnostic LUP retouched tools that are primarily held in the Armstrong Collection, British Museum, and on display at the North Lincolnshire Museum (see Figure 60). Further information was sourced through the Jacobi archive (in Section E.3). Interestingly, Jacobi was able to correctly identify two refitting fragments of a fragmented penknife point held across two separate museum collections (Scunthorpe and London; Jacobi 2014c). As mentioned in Section E.2.2, there are unresolved questions regarding findspot location, but more important is the finds' reported stratigraphic context below the (aeolian LLS/GS-1) coversands - although this too must be seen relative to the observed discrepancies (see Section E.2.1).

As illustrated by Figures 61, 55 and 59, the varied range of (primarily fragmented) retouched tool types includes diagnostic penknife points, curve-backed points, straight-backed points, and (obliquely truncated) shouldered points, which are typo-technologically consistent with British FMG-attributable assemblages dated to the second half of the LG Interstadial (cf. Section 2.1.4). Due to incomplete artefact preservation, some of the retouched tool type classifications are ambiguous. A generalised tabulation suggests an equal divide between penknife and (curve)-backed points, and (obliquely truncated) shouldered points. In the Jacobi Archive, the penknife points are primarily classified as tanged blades, in reference to the pronounced (basal) double-sided modification that mimics a tang or stem (see Section E.3).

The studied Risby Warren assemblages share a consistent technological theme with field-walked and excavated collections I have reviewed from elsewhere in the research area (in Chapter 8 and Catalogue A). The varied state of complete artefact preservation caused by post-depositional breakage and surface-invasive patina precludes detailed lithic technological attribute analyses (cf. Chapter 3), and the interpretive potential is furthermore lowered due to the intentional removal of proximal ends for tool modification. Since it is a surface collection of intermittently collected finds, contemporaneity of use and deposition cannot be conclusively demonstrated.

The composition of the Risby Warren FMG assemblage indicates a prevalence (20 finds or 65%) of characteristic grey-buff (Lincolnshire) Wolds-type flint (in Figures 55, 59). A smaller proportion (11 finds/35%) are made on good quality, translucent, derived glacial till- or drift-type flint. Good sources of both till- and Wolds-type flint are found within a 10 km range east of Risby Warren (in Figures 57 and 15) and it is plausible that nodules or cobbles suitable for knapping were readily available nearer to, or on the Warren itself during the Interstadial (Myers 2015:173). The absence of confirmed FMG-attributable cores, blade debitage, and micro-debitage - that are typically indicative of on-site manufacture - preclude a more qualified statement concerning possible preferences for which flint types were knapped on site - if at all, or whether tools were brought onto Risby exclusively as ready-made tools. Likewise it hinders whether differences can be observed relative to the subsequent phases of human presence (*vide* Chapter 6; Conneller 2007; Conneller and Schadla-Hall 2003). However, different lithic raw material behaviour is indicated by the higher proportion of translucent flint in the FMG data *vis-à-vis* the near-complete dominance of Wolds flint in the Early Mesolithic assemblages (90% Wolds flint in the Risby Warren site 1 assemblage, Myers 1986; Myers 2015:Table 1; PaMELA data in Table 39) which is also applicable to my RWAA dataset of non-LUP attributable surface finds (84% preference of Wolds flint, see Section E.4).

Blade blanks chosen for modification are primarily thick (mean 5.48 mm, sd 1.6 mm, median 6 mm, IQR 2 mm), as illustrated by the lateral view of the 'Walshaw' point in Figure 60, and notably thicker than the delicately (1-2 mm) thin diagnostic Early Mesolithic finds found on the Warren (see Sections E.3, E.4). Small preserved amounts of cortex are visible (in Figures 55 and 61) which suggests that retouched tools were made on sturdy, suitable blanks independently of the cortical condition of the dorsal surface, as exemplified by the relative thickness of backed blades (mean 6.06 mm, sd 1.61 mm, median 6 mm, IQR 2 mm; N = 15).

Several of the modified blanks have a feathered end, i.e., a naturally thin lateral half with a delicately thin and sharp edge that was left unretouched. The longest preserved lengths in Figure 61 are up to 60 mm. The longitudinal profiles are primarily straight to gently curved. Dorsal scarring patterns left by previous removals shows blades were mainly struck uni-directionally, possibly from single-platform cores, but the use of an opposed-platform core was remarked on by Jacobi for PaMELA ID 633 (Jacobi 2014i). The use of a soft (stone or organic) hammer is indicated by the presence of light ripples on the ventral sides (as on PaMELA ID 635, Jacobi 2014j), through the scarcity of bulbar 'lips', and the presence of plain butts (one recorded example of a linear butt, Jacobi 2014g). All of the diagnostic finds are extensively retouched, typically through backing along the length of one lateral (straight or slightly convex) edge, with additional modification that created oblique truncations or a shoulder mainly oriented at the proximal end (in Figure 61). Retouch in general is (semi or light) abrupt and direct, but occasionally observed are pieces with concave and convex retouch. According to Jacobi, the backing on at least ten points was made on anvil *(sur enclume)*, which is a sound LUP typo-technological indicator (e.g., Jacobi 2014o; Jacobi 2014q).

Finds were not analysed for traces of use-wear in detail. However, on a partially backed and obliquely truncated shouldered point (Jacobi 2014n), Jacobi noted the following: "Damage at tip could be due to prising rather than impact", for which the "closest parallel for damage is 1.4/322 from Gough's Cave (illustration Parry (1929), pl.xvii, no.67/14.)". It is possible that several of the artefacts were damaged prior to discard or loss, but this cannot be conclusively differentiated from post-depositional breakage except where the intensity of post-depositional patination varies. Based on my observations it seems possible that some degree of toolkit curation and modification (i.e., resharpening) took place on site, but which cannot be confidently ascertained due to the absence of indicative micro-debitage.

Caveats concerning artefact preservation or recovery biases notwithstanding, the prevalence of projectile points at Risby is highly interesting; following my first-hand review of over 12,000 finds from Risby Warren (in Section E.4, Catalogue E), I feel confident in my assertion that no scrapers, burins, or other retouched tools can conclusively be classified as unspecified LUP or FMG. In this regard, the assemblage composition mirrors parts of the assemblages from Aveline's Hole (Jacobi 2005:274), although the Aveline's Hole penknives "are more gracile" (N. Barton, pers. comm. 2022). Interestingly, Jacobi 2005(:277) draws two direct parallels between Aveline's Hole and Risby Warren by commenting on the similarities between two 'typical' penknives (Jacobi 2005:Fig. 3.4; and see Garrod 1926:Fig. 14.13; *vide* penknives from Mother Grundy's Parlour ex. Armstrong Collection, and Barton and Roberts 1996:Fig. 8.7). Furthermore, Jacobi remarked on the presence of an interesting stepped, burin-like facet from a transverse break on the proximal fragment of a penknife at both Risby, and Aveline's Hole (Jacobi 2005:272; Garrod 1926:Fig. 14.21). To these cross-comparisons of Risby Warren with other British FMG-attributable sites I would now add Seamer K, due to typo-technological parallels between the short and thicker penknives and (curve-)backed points (see Chapter 6).

7.2.1 Evaluation of site use

Risby Warren occupies an important vantage point near the confluence of the Rivers Humber and Trent, close to a number of other LUP sites in the research area (see Chapter 4). Given this special location, it would certainly be reasonable to assume that there is a high potential for identifying further sites and LUP finds; I will therefore openly admit that I found the low number of LUP finds from Risby to be surprising, especially when compared directly with the wealth of material from the Mesolithic and later periods. There are several contributing factors that most likely contribute to this observed situation, ranging from overall low population density in this area during the second half of the LG Interstadial, or a small number of 'site visitors' carrying out highly specialised task over a small or isolated surface area. Equally, post-depositional factors have certainly limited the visibility of finds and introduced recovery and collection biases, but this certainly was not the case in the 1930s when it was widely regarded by archaeologist as "a happy hunting ground" (Clark 1932:35). However, the low artefact count may indicate different spatial preferences for LG human land use and site location - perhaps mobile groups preferred the nearby river valleys, despite the availability of "nice, dry-spots up on the cliffs" (Anon., pers. comm. 2020)?

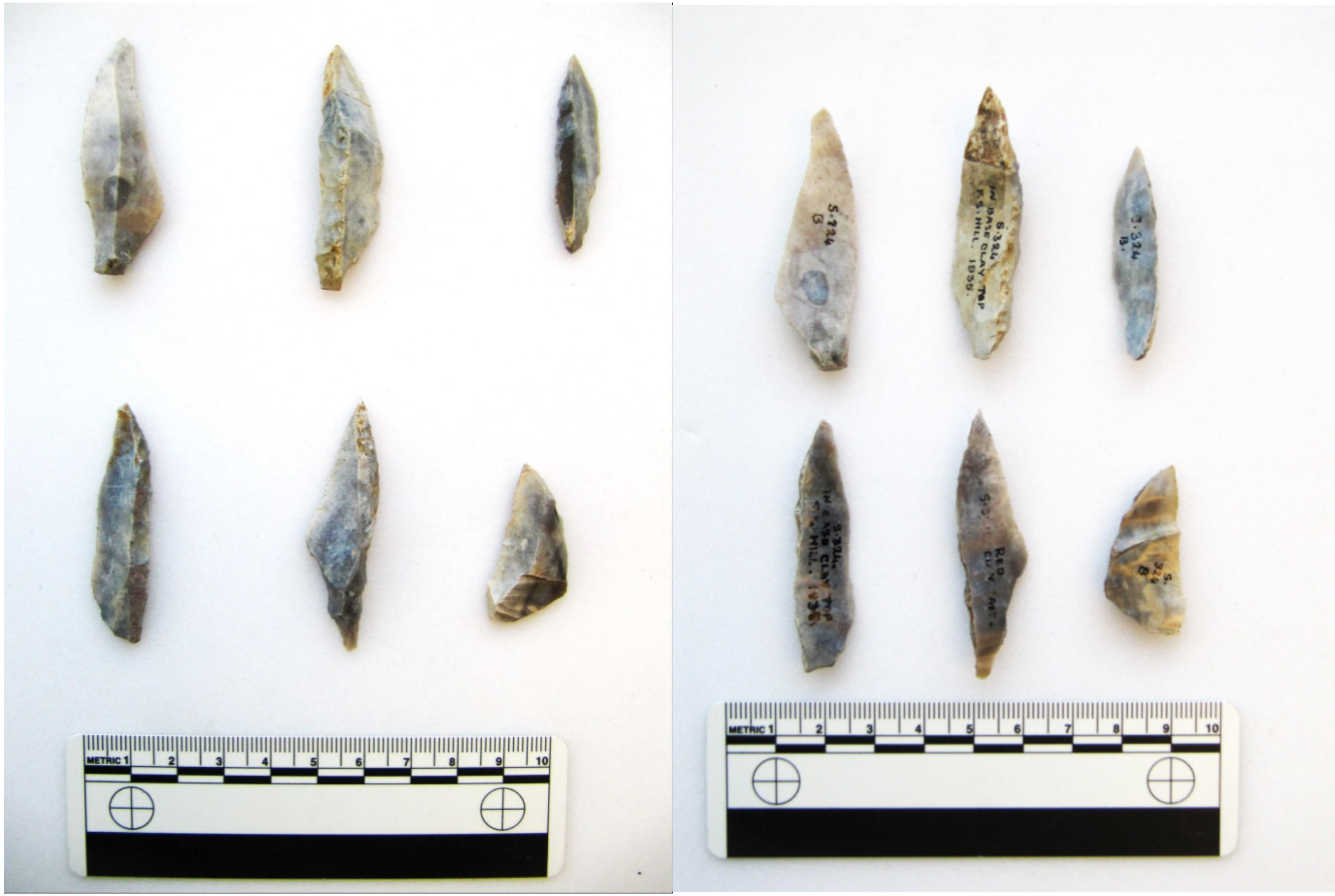
In my view, and interpretive caveats notwithstanding, the relative scarcity of LUP finds primarily indicates limited and specialised short-term human occupation. The assemblage composition, i.e., the prevalence of projectile points, strongly suggests Risby Warren represents a hunting location where curation of brought-in tools took place, which is further strengthened by the patterns of pre-depositional breakage, modification, and curation of tools. No conclusive evidence has been recovered to suggest blade manufacture or core preparation/reduction took place on-site during the LUP phase(s) of occupation. Since it is not possible to conclusively demonstrate if the typo-technological artefacts or hunting activities are coeval, it is possible that Risby Warren was occupied more than once during the LG Interstadial.

Regarding the low number of Late or Final Upper Palaeolithic finds, since periodic occupation is documented for large parts of Risby Warren - especially near Flagstaff Hill, I cannot fully rule out the possibility that LUP artefacts were reworked during later periods, which is also known from other parts of the research area (D. Garton, pers. comm. 2015). If so, then the LG human presence on the locale could be classified as a palimpsest site(s) and the overall potential for intact preserved LUP finds is lowered further. Based on the extent to which Risby Warren has been field-walked over the course of several decades, it seems likely that more archaeological LUP evidence from lower-lying areas would have been discovered, if indeed any activities had taken place in these areas in the first place. It also seems plausible that the wider Risby Warren landscape was at least seasonally inaccessible, perhaps due to flooding, braided river systems, or soggy grounds after thawing periods, which would have greatly limited the potential for more extensive site use in antiquity.

7.2.2 Summary

By way of combining a site biography, a source-critical reappraisal of existing evidence, and lithic analyses, this case study represents the most updated synthesis of past research activities and extant archaeological evidence from Risby Warren. This site represents one of several nationally renowned open-air findspots in the Greater Scunthorpe/Lincolnshire Cliff area and, from which, artefacts of probable FMG attribution have been known to researchers for more than a century. While this area occupies an interesting position at the intersections of ideal (quaternary) environmental, geographical, and geological settings, and vast extant assemblages of surface finds of relevant chronology and some previous publications exist, only very little was ever systematically published. As a result, the area has received modest academic interest in the most recent decades.

In summary, there exists an abundant record of thousands of lithic surface finds from the entire Risby Warren area, and I viewed a substantial proportion of these artefacts during my data collection. Based on my reconstruction of likely findspot location and stratigraphy, most of the lithic artefacts were recovered from the disturbed and mixed upper layers of the topsoil either as stray finds or from mixed surface scatters. Most artefacts can be classified as Early Mesolithic or later prehistoric. The confirmed LUP component of the complete inventories amounts to fewer than fifty artefacts, amongst which diagnostic FMG-attributable penknife points and curve-backed points are overrepresented. Although the poor state of artefact preservation precluded more detailed technological attribute analyses, and observed discrepancies concerning the diagnostic finds' stratigraphic concordance (presumed *in situ* beneath aeolian coversands of LLS/GS-1 age) drew into question some of the original site documentation, the small assemblage of FMG-attributable from Risby Warren nevertheless provides important contextual information for human presence and likely site activities during the second half of the LG Interstadial.



(a) Dorsal view

(b) Ventral view (note location labels)

Figure 59: Field photograph showing a selection of Armstrong Collection (*via* G. Dent) penknife points attributed to Flagstaff Hill, Risby Warren (location: Franks House, British Museum)

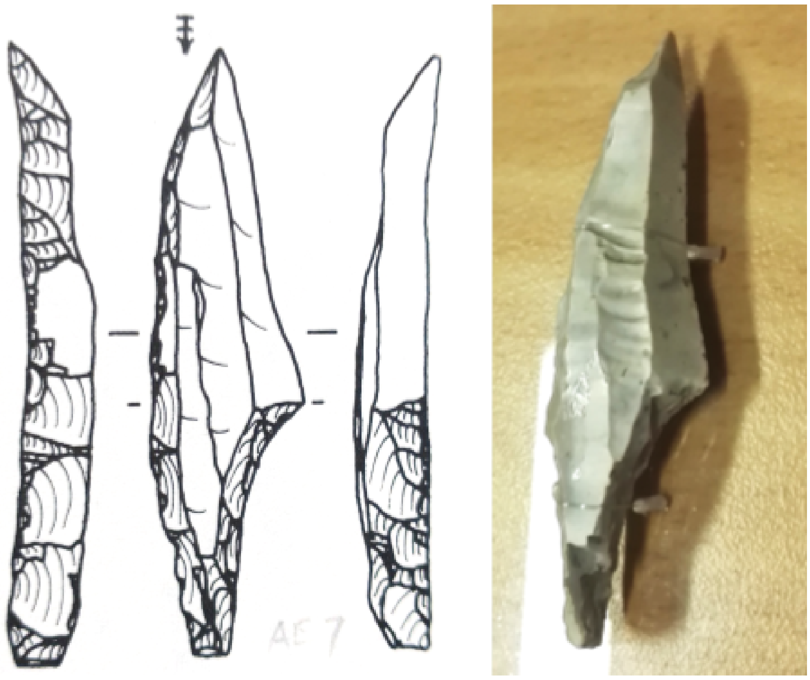


Figure 60: The ‘Walshaw point’ (total length 5.6 cm), which is mounted in a display case at the North Lincolnshire Museum (own field photograph; drawing in Campbell 1977b:fig. 141.7; also published in Lacaille 1946:fig. 3, Dudley 1949:fig. 13; May 1976:fig. 14.6, whose pencil annotations are faintly visible)

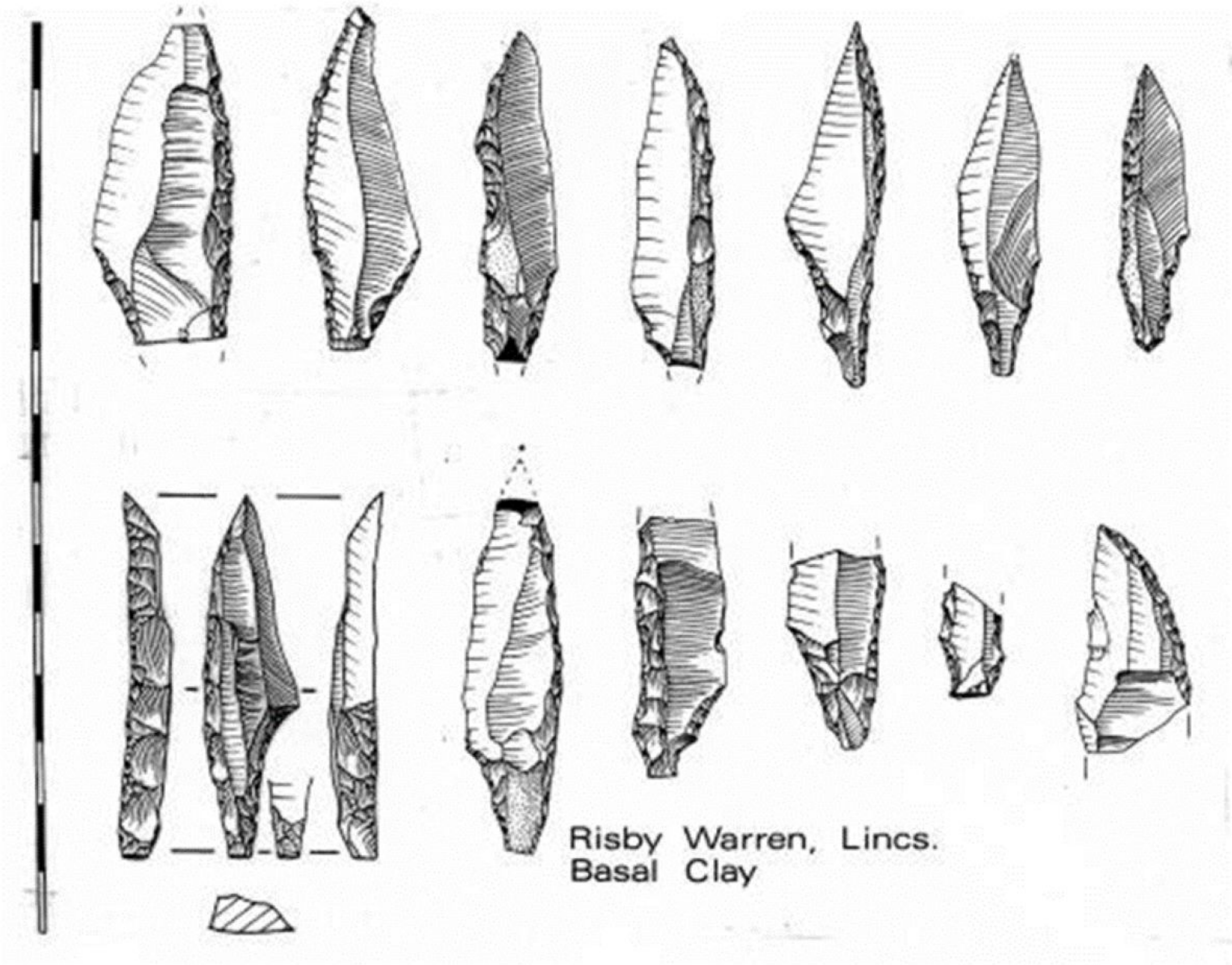


Figure 61: Assorted penknife and curve-backed points from Risby Warren (found in or beneath the basal clay). My comparisons indicate that these finds are mostly derived from the E. Rudkin collection (Unpublished and undated drawing by R. Jacobi; in litt.; original held at Franks House, British Museum)

Chapter 8

Case study 4: LUP dataset of Portable Antiquities Scheme records

The present sample of PAS artefact data comprises 31 lithic object records from the East Midlands research area, and this sample comprises the artefacts which were returned upon my database search using 'Late Palaeolithic' (sic.) as keywords for my query. This classification reflects the objects' mean chronological boundary as it is registered as on the PAS database. At time of final dataset compilation (last accessed 30.10.19), a total of 207 LUP objects had been published on the PAS for the whole of the UK and the present sample constitutes 14.9% of the national LUP total. This sample of 31 LUP object entries was also included in the larger Dataset 2 of Probable/Possible LUP sites in heritage management data repositories (cf. Chapter 4, Catalogue B).

The general background and structure of the PAS was outlined in the Introduction and Section 4.1.2. Since the Scheme was launched to the public in 1997, it has attracted more than 1.5 million objects from virtually all archaeological periods, primary materials, and geographical areas of the UK (The Portable Antiquities Scheme 2017; Worrell et al. 2010). The PAS is perhaps mostly associated with metal detecting finds from more historically recent periods, although the database includes thousands of non-metallic objects (including flint artefacts) that constitute a disproportionately small and largely understudied component of the Scheme. Whereas other heritage management data repositories such as regional HERs are routinely consulted during research, British Palaeolithic research has been relatively slow to adopt the systematic use of lithic PAS records for study, especially when compared with a growing record of research projects that target other archaeological periods or study metallic objects

(The Portable Antiquities Scheme 2019ah). The PAS has recently proposed a PhD research idea on the potential of PAS (Palaeolithic) lithics data with the goals of addressing this skewed use of PAS data, exploring the full investigative potential of lithic PAS records in general, and improving the overall research visibility and recording practices of non-metallic finds records (The Portable Antiquities Scheme 2019ak). The analyses presented here and in Catalogue B constitute a first point of departure analogous to the Scheme's own PhD topic proposal (The Portable Antiquities Scheme 2019ah).

Further to my aims to explore the possibly 'hidden' potential of heritage management data, and in response to the PAS' own research proposal, I have compiled a small-scale lithic technological analysis on this available online corpus of extant surface finds (cf. p. 4, Section 3.2.3). The approach taken here differs from previous analyses of PAS' lithics data in that I specifically wanted to address the individual finds rather than target lithic scatters and their distribution more broadly (Bond 2010; Bond 2011; Billington 2016). In my view, there remained scope for an artefact or object records-centred perspective, not least since the PAS database remained accessible while the pandemic restricted access to other archaeological collections. Furthermore, in specifically targeting object records classified as 'Late Palaeolithic', as based on the keyword search, I wanted to see whether any 'hotspot' areas of high LUP potential emerge, but which have not yet received wider recognition beyond the PAS-level (cf. Sections 9.1.1, 9.3.2).

8.1 Analysis of the LUP dataset of PAS records

As addressed (in Sections 3.2.3, 4.1.2, B.1), during data collection and dataset curation I observed two discrepancies: (1) there are clear caveats regarding the reliability of the LUP classification; and (2), the selected finds' potential for lithic technological attribute analysis are reduced due to incomplete metadata and the variable degree of complete artefact preservation. In my experience from fieldwalking across the East Midlands, incomplete artefact preservation is an inherent characteristic of unstratified lithic surface finds like those included in this PAS sample, since stray surface finds more frequently than not show signs of breakage caused by post-depositional processes such as trampling and plough damage (cf. Section 3.1; Scottish Archaeological Research Framework 2012; Mallouf 1982). Depending on the orientation and extent of the post-depositional breakage, important typo-technologically diagnostic traits may be obscured or entirely absent so that the recognition, identification, and classification of the find are made more difficult. Similar challenges apply to heavily patinated surface finds such as the lithic implement NLM-DFBE07 (The Portable Antiquities Scheme 2019c). Although the object record mentions shaping formed by distinct backing and classifies the find as very likely LUP-attributable, these typo-technologically important characteristics are difficult to identify due to post-depositional damage (breakage, patina) and the fine details are hard to see in the object photograph.

Consequently, already at the outset these systemic observations pose definite limitations to the interpretive strength of the lithic PAS records and their suitability for specialised LUP research. In response, the subsequent artefact analyses are limited to diagnostic LUP categories like backed blades, blades, and retouched points, and are of a more descriptive character than the lithic technological attribute analyses in Chapters 4-6. This presentation follows the same internal structure as the other case studies, from dataset composition, spatial distribution, chronology, through to presentation by artefact categories. Visualisations of metric dimensions and summary statistics were done in R Studio (R Core Team 2017; Wickham 2009).

As per common PAS practice, all artefacts have been returned to their finders after recording by the Finds Liaisons Officers. The analyses herein are therefore based on the object records and their metadata as published at time of final dataset compilation (31.10.2019). Since the finders' identities remain obfuscated for my research level access, I was unable to pursue first-hand artefact handling as part of this case study. Finds will be referred to by their individual PAS object ID and where applicable, I will draw from past conversations with named East Midlands-based colleagues and collectors to address emerging observations. Further details may be found in Catalogue F.

8.1.1 Dataset composition and context of origin

The 31 objects included in this sample (see Table 23) represent stray surface finds from all stages of production. Retouched tools account for approximately half of the sample since these are "quite frankly, more likely to be picked up" (D. Budge, pers. comm. 2016), which is a common observation across extant surface find collections from the East Midlands. The artefacts were predominantly discovered through fieldwalking (21 finds), metal detecting (1 object) or as chance finds during metal detecting (5 objects), and during agricultural or drainage work (4 objects). The time of discovery is specified for 13 objects which were found between 2006 and 2017. All object entries were compiled by named Finds Liaisons Officers (FLOs).

Table 23: LUP dataset composition (present PAS LUP sample)

Object type	**Count**
Backed blade	2
Blade	3
Core	4
Debitage	2
End scraper	2
Flake	3
Lithic implement	5
Point	4
Retouched flake	1
Scraper	4
Side scraper	1
Sum	**31**

8.1.2 Provenance and spatial distribution

Further to the spatial distribution patterns of the wider sample of Late Pleistocene PAS data (in Catalogue B and Chapter 9), the provenance and origins of the present sample are shown in Figure 62 and Table 24. All sampled objects were discovered by members of the public at open-air findspots. The findspots in Figure 63 are exclusively located in the low-lying (<200 m AOD) southern half of the East Midlands research area. In Figure 64 the majority of findspots (22, or 71%) are within a 500 m and up to 1000 m distance of waterways, including the three objects that I classify as LUP-attributable with a high degree of certainty (DENO-8C977B from Tetford, 79 m from watercourse; LIN-6118B4 from Farndon, 580 m distance; DENO-4D9D06 from Whitwell, 679 m distance). All save one object are within 2000 m of a river or stream. The outlier (2695 m distance to watercourse) is a lithic implement NLM-DFBE07 from Haxey at the South Yorkshire/North Lincolnshire border (The Portable Antiquities Scheme 2019c). This object can nevertheless be related directly to an important surface water feature, namely Lake Humber and the palaeo-lacustrine environment on the Isle of Axholme (in Figure 19; see Section 9.1.2).

Figure 62: Provenance and object types of PAS records (present sample)

County	District	Parish	Object type	Count
Derbyshire				5
	Bolsover (4 total)	Elmton	Blade	1
		Whitwell (2 total)	Backed blade	2
			Scraper (tool)	1
	South Derbyshire	Ticknall	Core	1
Leicestershire				18
	Melton (17 total)	Eaton (4 total)	Core	1
			End scraper	2
			Point	1
		Hoby with Rotherby	Lithic implement	1
		Scalford (12 total)	Blade	2
			Core	2
			Flake	2
			Lithic implement	1
			Point	2
			Scraper (tool)	3
			Side scraper	1
Lincolnshire				2
	South Kesteven	Burton Coggles	Lithic implement	1
	East Lindsey	Tetford	Point	1
North East Lincolnshire				1
	North East Lincolnshire	Great Coates	Debitage	1
North Lincolnshire				4
	North Lincolnshire	Barnetby Le Wold	Debitage	1
			Retouched flake	1
		Haxey	Lithic implement	1
		Risby cum Roxby	Lithic implement	1
Nottinghamshire				1
	Newark and Sherwood	Farndon	Flake	1
Total				31

Table 24: Grid source origin

Source	**Count**
NA	19
Centred on field	1
From a paper map	1
From finder	5
Generated from computer mapping software	4
GPS (from the finder)	1
Total	**31**

Interesting observations emerge regarding the prevalence and distribution of LUP entries across surveyed counties, which I will briefly contextualise through my local knowledge and research. Notable differences concern the low prevalence of PAS finds in counties like Derbyshire, South Yorkshire, and Staffordshire with an otherwise rich LUP record (see Tables 6, 8, Section 4.1.1, Catalogue

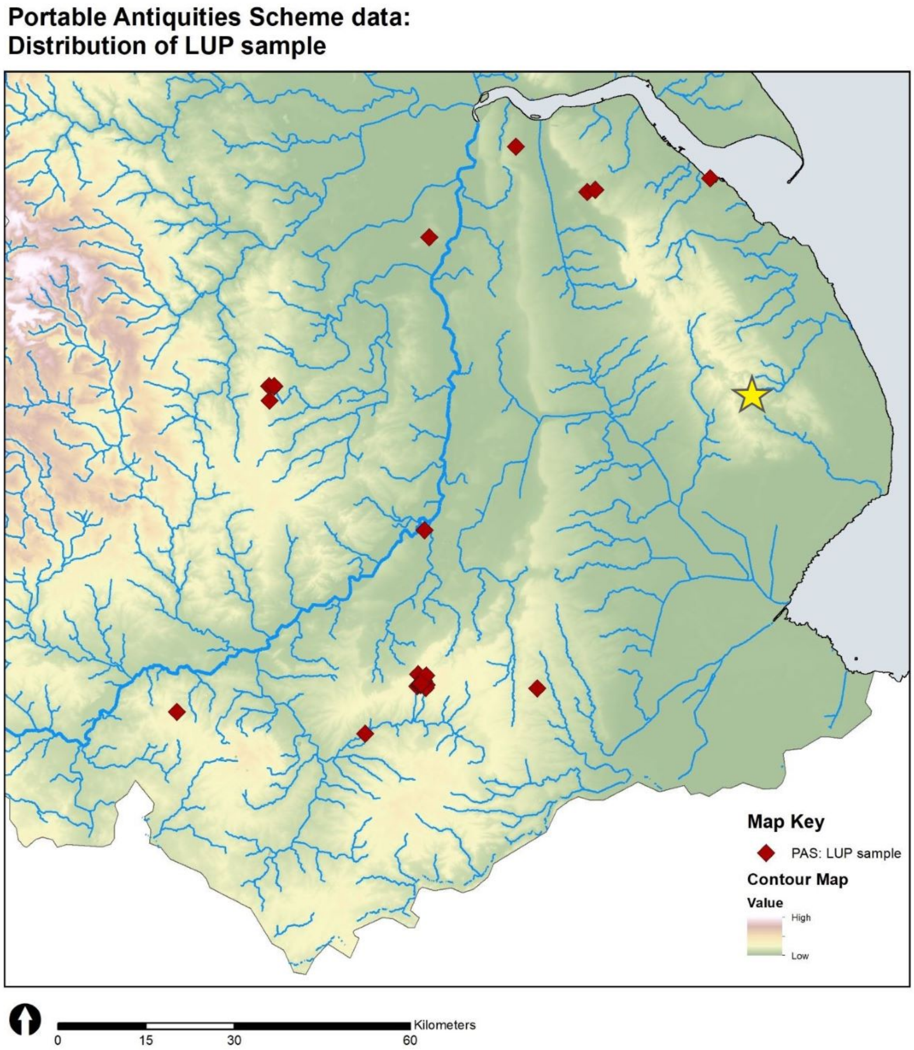


Figure 63: Spatial distribution of sampled LUP finds (present PAS sample; findspot location of the shouldered point DENO-8C977B highlighted. Contains OS data, Crown copyright and database right 2021)

A). The overview in Table 62 is clearly skewed towards 'cave-less' counties and open landscapes rather than areas adjacent to karst limestone caves. For instance, Leicestershire and specifically the district of Melton are overrepresented (17 entries), including 12 finds from the same Scalford parish-based collector (in Figure 65; L. Cooper, H. Wells, pers. comms. 2020). Based on my wider analyses (cf. Figure 92, Sections 4.1.2, 9.1.1, 9.3.2), there is an interesting cluster of more than 100 surface finds of mixed LUP and prehistoric date across Scalford

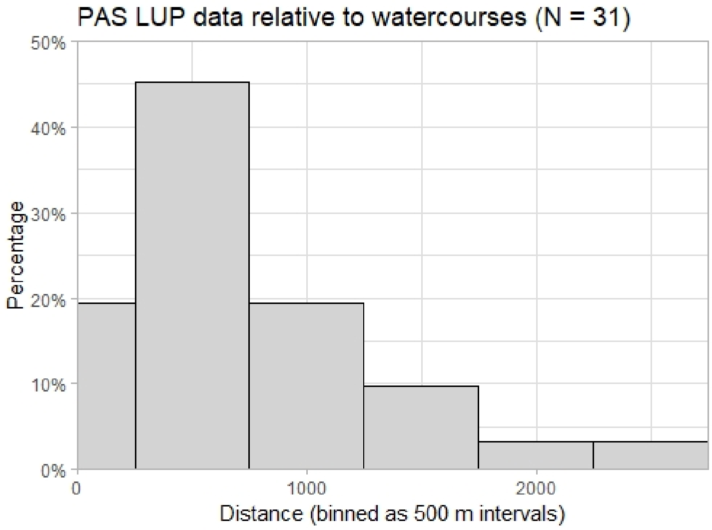


Figure 64: Frequency of LUP finds (present PAS sample, N = 31) relative to watercourses (500 m intervals)

and the adjacent Wycomb parish, and the wider Melton Mowbray area clearly represents an interesting hotspot for further study. In contrast, no finds have yet been recorded for the Leicestershire parish Newton Linford which, based on the recently excavated LUP open-air site and additional nearby open-air findspots in Bradgate Park, is of known high LUP potential as the Bradgate Park LUP site was itself a chance discovery during fieldwalking (in Catalogue A; Leicestershire and Rutland HER 2014; Leicestershire and Rutland HER 2000; Cooper 2012).

Interestingly, the present sample in Table 62 suggest a continuity in artefact discoveries near known LUP locales, for instance in Tetford parish in the Lincolnshire Wolds where one of the best preserved and most diagnostic LUP artefacts across the entirety of the PAS was found (The Portable Antiquities Scheme 2019k). The Tetford area is likely under-represented in this dataset, as the area's high LUP potential has been confirmed through the late B. Bee's expansive surface collection (see Catalogue A). Furthermore, the reported artefact found at Farndon, Nottinghamshire, mirrors the lithic assemblages discussed in Chapter 5 and the lithic implement from Haxey, N. Lincolnshire, is interesting in the context of LUP occupation within the perimeters of Lake Humber (in Sections 4.2.3, 9.1.2).

Given the otherwise impressive record of lithic surface finds from Roxby-cum-Risby parish (see Chapter 7) and considering that community archaeology activities have taken place in the Greater Scunthorpe area in the recent decade (K.

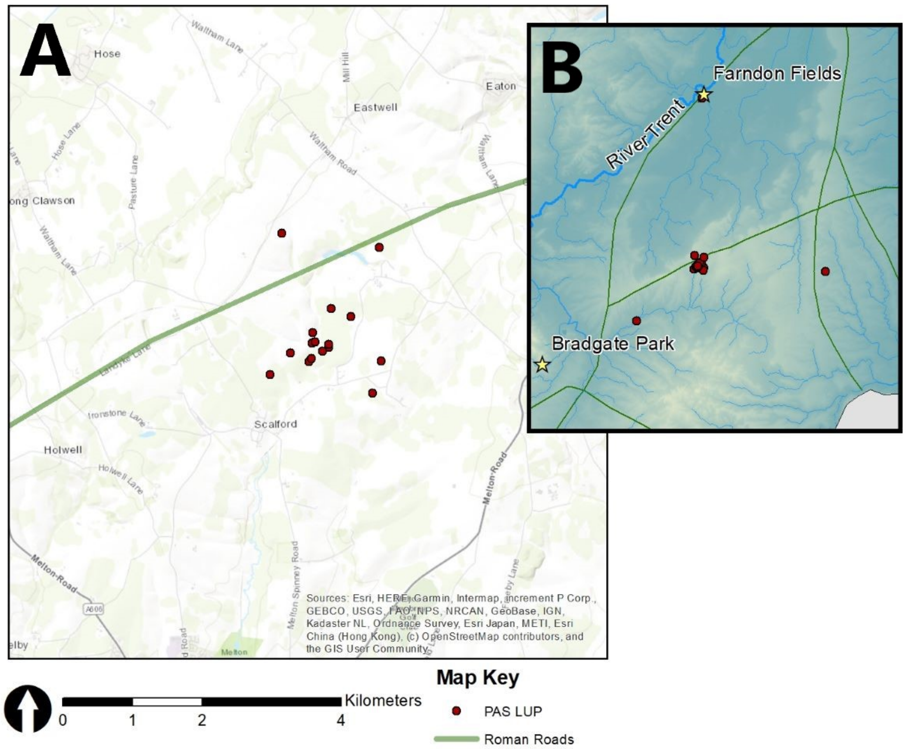


Figure 65: Inset A: Detailed view on the high density of PAS-reported LUP findspots in Scalford parish, Leicestershire (findspot cluster shown relative to the Roman road network). Inset B: location of Scalford cluster in the regional context of major LUP sites and the River Trent. Contains OS data, Crown copyright and database right 2021)

Leahy, pers. comm. 2019), it may seem surprising to only see one find listed in Table 62. However, I would argue that this low number is due to continued public access restrictions on Risby Warren and the overall lower surface visibility of finds on the now-stabilised sand dunes (see Sections 7.1.3, 9.1.2; The Portable Antiquities Scheme 2019ai; Natural England 2015a; Natural England 2015b)

Compared with established patterns of LUP discoveries in the East Midlands (in Section 2.2.3), it is striking to note the near-complete absence of cave site-adjacent LUP finds in Figure 63. The overview in Table 62 indicates four artefacts have been found in the Creswell Crags-adjacent parishes of Elmton and Whitwell in Derbyshire. The Whitwell finds (a small group of backed blades and one scraper) originate from the private collection of a local landowner who over the past thirty years has been gathering "interesting" flints whilst ploughing near the Ash Tree Cave Scheduled Monuments site (The Portable Antiquities

Scheme 2019g; HE list number 1017583; Derbyshire HER 1939; Armstrong 1957; Campbell 1977a; see Catalogue A). Thus far, the landowner “has only offered the most distinctive/interesting flint for recording but he does have many more flakes etc.” (The Portable Antiquities Scheme 2019g), which suggests the number of known LUP finds may increase in the future.

8.1.3 Chronology of sampled finds

				LOWEST BOUNDARY Palaeolithic			UPPER BOUNDARY Palaeolithic		Mesolithic		Neolithic		Bronze Age	
PAS url ID	Object ID	Mean boundary		Early	Middle	Late	Early	Late	Early	Late	Early	Late	Early	Late
430444	DENO-4D9510	PALAEOLITHIC	Late											
430445	DENO-4D95E1	PALAEOLITHIC	Late											
430448	DENO-4D9D06	PALAEOLITHIC	Late											
430453	DENO-4DA237	PALAEOLITHIC	Late											
631746	DENO-8C977B	PALAEOLITHIC	Late											
858956	LEIC-053019	PALAEOLITHIC	Late											
858959	LEIC-054916	PALAEOLITHIC	Late											
858984	LEIC-05D151	PALAEOLITHIC	Late											
859053	LEIC-07049A	PALAEOLITHIC	Late											
859056	LEIC-0710BE	PALAEOLITHIC	Late											
900738	LEIC-16854E	PALAEOLITHIC	Late											
267067	LEIC-3B7624	PALAEOLITHIC	Late											
969832	LEIC-3DF246	PALAEOLITHIC	Late											
909715	LEIC-4C6172	PALAEOLITHIC	Late											
909721	LEIC-4C7AE3	PALAEOLITHIC	Late											
943699	LEIC-514F4B	PALAEOLITHIC	Late											
945959	LEIC-6572D3	PALAEOLITHIC	Late											
900150	LEIC-87C098	PALAEOLITHIC	Late											
970386	LEIC-921119	PALAEOLITHIC	Late											
912119	LEIC-987CB6	PALAEOLITHIC	Late											
912122	LEIC-98A64E	PALAEOLITHIC	Late											
942506	LEIC-BEF6D6	PALAEOLITHIC	Late											
967697	LEIC-C2E345	PALAEOLITHIC	Late											
944748	LEIC-D03BF4	PALAEOLITHIC	Late											
879260	LEIC-E6CO50	PALAEOLITHIC	Late											
61364	LIN-6118B4	PALAEOLITHIC	Late											
872099	NLM-327DC4	PALAEOLITHIC	Late											
585878	NLM-358F94	PALAEOLITHIC	Late											
877424	NLM-D69A09	PALAEOLITHIC	Late											
158038	NLM-DFBE07	PALAEOLITHIC	Late											
201595	NLM-E89633	PALAEOLITHIC	Late											

Figure 66: Date ranges of sampled PAS records from the research area (in alphabetical order by county)

The full chronological range of the sampled LUP objects is shown in Figure 66. Although all sampled object entries were on the results list of my ‘Late Palaeolithic’ keyword query, these finds span a wide chronological range between the recorded lowest and upper boundaries. For instance, find LEIC-16854E is described as a “flake, could be any date” [sic.], The Portable Antiquities Scheme 2019u, whereas object LEIC-4C6172 is labelled as an ambiguous “Palaeolithic Bronze Age core” (The Portable Antiquities Scheme 2019v). At the other end of the diagnostic scale, finds NLM-DFBE07 (“lithic implement/backed knife”, The Portable Antiquities Scheme 2019c) and DENO-4D9D06 (“Backed Blade from Derbyshire”, The Portable Antiquities Scheme 2019h) have very narrow chronological bands that delineate the finds as LUP-attributable. Of the remaining finds, approximately half are defined as most probably Palaeolithic, or possibly Late Mesolithic or later.

As addressed in Sections 3.2.3 and B.1, the wide date ranges may be due to the absence of diagnostic typo-technological traits or the FLO's unfamiliarity with the recording of lithic objects (Anon., pers. comm. 2017). For the present analysis I decided to concentrate on the most diagnostic LUP finds and respective artefact categories (backed blades, blades, and retouched points; all further object descriptions may be found in Catalogue F). This selection reduced the sample size from 31 to 10 artefacts which is equivalent to 32% of the sample. However, upon individual review of these 10 finds, I found the LUP-attributable component to be far lower, as I only regard 3 of the artefacts discussed in this chapter to be reliably classified as LUP: the straight-backed blade DENO-4D9D06 (The Portable Antiquities Scheme 2019h), the shouldered point DENO-8C977B (The Portable Antiquities Scheme 2019k), and the blade LIN-6118B4 (The Portable Antiquities Scheme 2019k). Consequently, only 3 of originally 31 sampled object entries, i.e., 9.6% of my initial PAS 'Late Palaeolithic' sample, passed this review. In Sections 8.2.3 and B.1.5 I will address implications regarding the reliability of lithics PAS data.

8.1.4 Caveats concerning recording quality

As a preface to the analysis, there are some caveats regarding the quality of recording and some recurrent problems that I want to briefly address. The Scheme is aware of these metadata issues and the PAS is taking measures to improve on through their ongoing work to review and revise practices and guidelines for recording common non-metallic finds (The Portable Antiquities Scheme 2019al:4). Most importantly, I want to acknowledge that the irony of commenting on recording quality is by no means lost on me, as these observed issues are entirely applicable to the data and supplementary information that I have provided - or neglected to include - throughout this thesis. Documentation standards do matter; mistakes and omissions at either stage between recovery, recording, research, reproducibility, and publication cannot always be easily amended, and have clear consequences for the quality of presentation.

The PAS objects are only available for study online; they cannot be picked up, turned around, viewed at scrutiny, or otherwise be handled in person, which reduces the overall analytical potential. Accordingly, both the descriptive and

Figure 67: Recorded objects DENO-4D9D06 (The Portable Antiquities Scheme 2019h) and LIN-6118B4 (The Portable Antiquities Scheme 2019k). While the left image is a good example of a multi-view photograph which clearly shows the retouch on the find, the right image file is corrupted (the right half of the uploaded image file is missing).

illustrative parts of the documentation should therefore include the relevant metadata needed for (lithics) research. A form for the documentation of such metadata must be drafted together with researchers, field-archaeologists, FLOs, and database-managers so that the system is more streamlined and facilitates the ease of attributing the appropriate data where it should be. However, the observed standard of object documentation included in this alleged LUP dataset varies, which partly reflects that most FLOs are not lithics specialists and omissions may thereby occur in the text descriptions (Anon., pers. comm. 2017). Object illustrations ought to follow the standards for lithic finds photography to best enable a view of the object's relevant features, ideally from several angles, and using lighting which highlights directions of negative removals or other technological details, especially on retouched tools and cores. Ideally, all uploaded illustrations should include a scale, so that the overall size and dimensions can be considered. For most finds recorded in this PAS sample, only the dorsal side is photographed from directly above, which excludes a view of platform-specific knapping attributes.

To illustrate the observed variation in object records documentation I have included two examples in Figure 67 which highlight the proverbial good and the bad. The find (DENO-4D9D06, The Portable Antiquities Scheme 2019h) shown in the leftmost part of Figure 67 is a good example, since the find is shown to scale and from the dorsal, ventral, and both lateral sides. While the photograph may not be of publishable quality, the retouched edges are clearly visible and reflect the information provided in the object description. In contrast, the rightmost artefact image in Figure 67 (a flake found at Farndon, Notts., LIN-6118B4, The Portable Antiquities Scheme 2019k) does not include a scale, and the image file itself seems to be corrupted, so that half of the depicted object is missing.

8.2 The present LUP sample

Based on recorded artefact type prevalence, flint types used, preserved condition, and post-depositional patina, the present LUP dataset is representative of other surface finds collections from the East Midlands (see Chapters 4-6; entries in Catalogue A). The artefacts' preserved condition, i.e., fragmentation/plough damage, invasive surface patination, or missing metadata has limited the opportunities to analyse lithic technological attributes in detail. Where visible, several of the recorded objects show signs of soft (unspecified type, e.g., stone or organic) hammer percussion and the orientation of negative removals is mainly indicative of unidirectional knapping. Specialised methods of preparation in the shape of distinct *talons en éperon* were not encountered (cf. Section 2.1.4).

In Figure 106 width and thickness are compared by artefact category for the present sample of 10 objects. The three most likely LUP-attributable finds are oriented towards the narrower/thinner scale.

8.2.1 Blades (4) and backed blades (2)

This sample includes three blades, two backed blades, and a flake that I would classify as a blade instead (LIN-6118B4, The Portable Antiquities Scheme 2019k; see Table 23, Figures 67, 69). A comparison of metric dimensions is shown in Figure 68. Blade DENO-4DA237 (in Figure 69:C; The Portable Antiquities Scheme 2019i) is poorly preserved with heavy white patina. Post-depositional breakage reveals the original translucent mid-brown flint. Dimension are 60.5 mm (length), 22.6 mm (width), 13.55 mm (thickness) and both the proximal and distal ends are missing, and only the right lateral edge has been retouched. No further indications regarding technological attributes are recorded, and it is uncertain whether this blade should be classified as LUP.

Blade LEIC-E6C050 (The Portable Antiquities Scheme 2019s, in Figure 69:D) is comparatively much less patinated and made on fine translucent flint. It is 35 mm long, 13 mm wide and 3 mm thin, straight in profile, and has finely

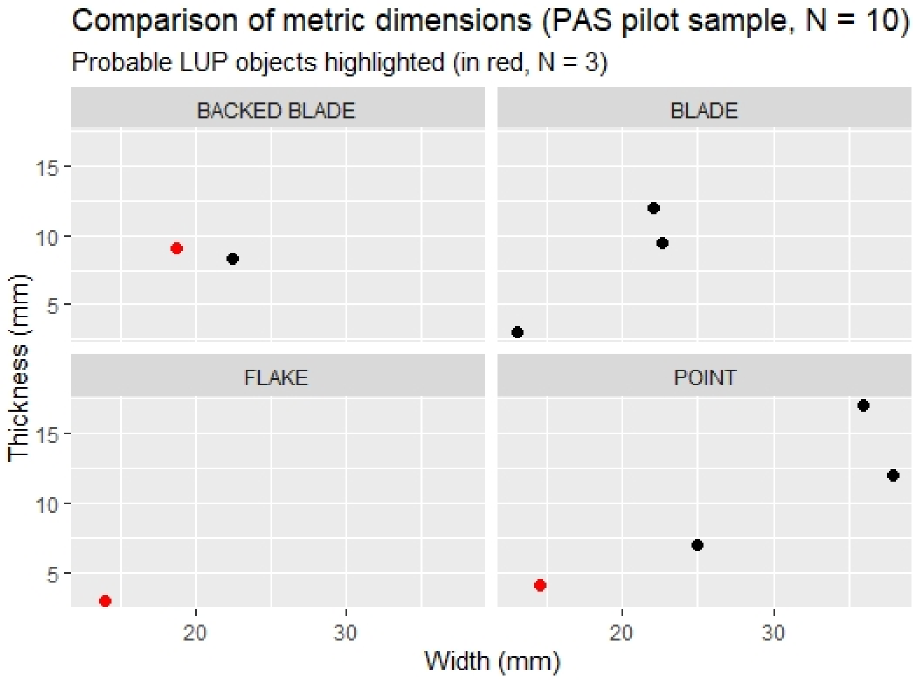


Figure 68: Metric comparison of width to thickness (in mm, data sourced from PAS records; not specified if measurements were taken at mid-point or widest/thickest point). Direct comparison of edited PAS LUP sample (N = 10) with the three objects that are most consistent with an LUP-attribution.

Figure 69: A selection of blades included in present sample (A: LEIC-D03BF4, The Portable Antiquities Scheme 2019ab; B: DENO-4D95E1, The Portable Antiquities Scheme 2019g; C: DENO-4DA237, The Portable Antiquities Scheme 2019i; D: LEIC-E6C050, The Portable Antiquities Scheme 2019s)

serrated or small parallel retouch along both lateral edges tapering towards the broken off distal end. The proximal end is also absent, although the recording officer suggests this blade was made using soft hammer percussion.

In contrast, the completely preserved object LEIC-D03BF4 (Figure 69:A; The Portable Antiquities Scheme 2019ab) shows evidence of hard hammer percussion. Dimensions are 65 mm (length), 22 mm (width), 12 mm (thickness) and a small amount of cortex is intact at the distal end. The distal half of this straight-backed blade is lightly patinated (light blue opaque patina), while the lower unpatinated half reveals a light brown flint with darker inclusions. The left lateral edge is unretouched, and semi-abrupt scalar retouch extends along the whole of the right edge, including the distal end.

The two objects categorised as backed blades were found by the same landowner near Ash Tree Cave, Derbyshire. Both blades are made on mid-grey, banded flint, but are now substantially patinated, as can be seen on the straight-backed blade DENO-4D9D06 (The Portable Antiquities Scheme 2019h) in Figure 67:A. Although the patina and breakage obscure technological attributes, based on appearance, size (L: 71.1, W: 18.7, T: 9.1 mm), and orientation of retouch, this object shares a resemblance with other backed blades which I have seen from the research area, and does indeed appear to best classified as LUP. The second backed blade DENO-4D95E1 (in Figure 69:B; measurements: L: 60.5, W: 22.4, T: 8.3 mm, The Portable Antiquities Scheme 2019g) is crescent-shaped with semi-abrupt sub-parallel retouch along the straight and concave edges. It is tentatively described as a "possibly later fabricator or awl/burin", as is reflected by its wide chronological range (see Figure 66), and should not be classified as LUP. The object LIN-6118B4 (Farndon parish, The Portable Antiquities Scheme 2019k) in Figure 67 is described as a flake. Although the image quality is substantially compromised, this object should instead be classified as an LUP blade based on metric criteria (dimensions: L: 42, W: 14, T: 3 mm) and the clear parallels with other white patinated blades found at Farndon (see Chapter 5).

8.2.2 Points (4)

It is debatable whether or not the three points shown in Figure 70 indeed should be classified as Palaeolithic, since there are apparent typo-technological discrepancies despite the Middle Palaeolithic to LUP chronological range shown in Figure 66. I have nevertheless intentionally included these in this sample to specifically illustrate the variation of typological or chronological certainty of PAS entries. All three recorded points are substantially white/cream patinated with some traces of iron-staining. Metric dimensions are illustrated in Figure 68. All points lie flat against the ventral side. The shape of these points

Figure 70: Points classified as falling within a possible LUP date range, although the accuracy of classification may be questioned (present sample; A: LEIC-3DF246, The Portable Antiquities Scheme 2019ae; B: LEIC-6572D3 The Portable Antiquities Scheme 2019ac; C: LEIC-921119, The Portable Antiquities Scheme 2019af)

varies: (1) an irregularly shaped, near-triangular point with a long, offset tang (LEIC-6572D3, dimensions: L: 64, W: 38, T: 12 mm, see Figure 70:B; The Portable Antiquities Scheme 2019ac); (2), a more narrow, but lightly curved tanged point with evidence for substantial reworking in later periods (LEIC-921119, measurements: L: 66, W: 36, L: 17 mm; in Figure 70:C; The Portable Antiquities Scheme 2019af); and finally (3), a straight backed point with basal retouch (possibly for hafting, LEIC-3DF246, measurements: L: 54, W: 25, T: 7 mm, see Figure 70:A; The Portable Antiquities Scheme 2019ae). This latter object has a shouldered edge along the right lateral edge, which is damaged by what appears to be a step-fracture. Since the patina overlays this fracture, the damage may be regarded as having occurred contemporaneously with production and "is not a post-depositional damage" (The Portable Antiquities Scheme 2019ae). The available documentation suggests objects LEIC-3DF246 (Fig. 70:A; The Portable Antiquities Scheme 2019ae) and LEIC-921119 (Fig. 70:C; The Portable Antiquities Scheme 2019af) were made using soft (stone) percussion, as small *esquillements de bulbe* can be seen just below the butt (cf. Pelegrin 2000).

In contrast, one of the best Scheme-wide LUP examples is the shouldered point DENO-8C977B from Tetford, Lincolnshire (see Figure 71, measurements: L: 68.7, W: 14.5, T: 4.1 mm, The Portable Antiquities Scheme 2019k). Although patination has dulled the original shine and smaller residues of iron-staining are visible on the artefact, the thin, slender, and slightly curved blade is made from

Figure 71: The Late Glacial shouldered point DENO-8C977B, a find of noted national importance (The Portable Antiquities Scheme 2019k)

warm, amber-coloured translucent flint. Based on the available information it is unclear if the shoulder was formed at the proximal or distal end, since the photographs are slightly ambiguous (Figure 71). Two different types of retouch are clearly visible: short, semi-abrupt retouch along the shoulder and tip, as well as more invasive and irregular scalar retouch along parts of one of the lateral edges. While no further information regarding lithic technology may be drawn from the object description, the find appears to share the typical technological LUP signatures of soft hammer-struck blades from regular blade cores found elsewhere in the Tetford/Lincolnshire Wolds area. This shouldered point is of high LUP diagnostic value and is one of currently only eight Palaeolithic artefacts to which the PAS has assigned nationally important find status. Although the absence of contextual information precludes further information, it is plausible that this isolated shouldered point represents an accidental hunting loss.

8.2.3 Summary

This analysis of a dataset of 31 alleged LUP records sourced from the PAS represents a pilot study to further explore the 'hidden' LUP potential of heritage management data records and to evaluate the suitability of lithic PAS records for specialised LUP research (cf. pp. 4, 4, The Portable Antiquities Scheme 2019ak). Data selection was based on the objects' reported mean chronological boundary ('Late Palaeolithic') and dataset curation followed the methodology outlined in Chapter 3). Overall, the sampled artefacts are representative of other stray surface finds from the East Midlands. Due to observed discrepancies regarding the reliability of the stated LUP attribution (in Sections 3.2.3, 4.1.2, 8.1.3, 8.1.4, B.1), for this analysis I focused on presenting a general overview of the dataset and limited further descriptions to the most diagnostic LUP finds and respective artefact categories. Notably, the challenges identified throughout this analysis can be related to ongoing discussions at the Scheme's end, as the PAS is currently working to revise and update its recording practices and guidelines for non-metallic objects (e.g., K. Leahy, pers. comm. 2019; The Portable Antiquities Scheme 2019al). A previous version of this chapter included a list of wider policy-related recommendations and proposed practical modifications to the present format of the data entry fields and my professional feedback concerning the Scheme's handling of non-metallic flints. Since I compiled my feedback prior to the publication of the most recent PAS Strategy documents, I intentionally excluded those sections to avoid overlap with the Scheme's official, and now published, documents.

Based on the present dataset, it is evident that there are clear caveats concerning the recording quality and structure of PAS lithics records and specifically regarding the reliability of (Late) Palaeolithic artefact classifications (in Figure 66, Sections 8.1.3, 8.1.4, Catalogue F). Upon my review, only 3 (or 9.6%) of the 31 sampled 'Late Palaeolithic' object entries were found to be likely LUP-attributable. Such a high error rate is disconcerting and has ramifications for the overall reliability of heritage management (Palaeo-)lithics data. Since I consider this to be a pilot study, I deliberately chose to present all data collection, dataset curation, and evaluation stages instead of just including the few finds which passed my review to better set this case study up as an example, and exemplify why and where I am critical of the finds' classifications. Observed discrepancies in the reliability of artefact classification may partially be explained through the absence of typo-technologically diagnostic traits or the differential levels of lithics expertise at the recording Officer's end, which mirrors similar observations made during the analyses of HER data (in Sections 4.1.2, B.1). These caveats need to be explicitly addressed and resolved by the Scheme if the lithic PAS records are to be used for specialised lithics research to a greater degree than at present (The Portable Antiquities Scheme 2019ak; in Sections 8.1.4, 9.3.2). In my view, the sometimes "fanciful recordings" (Anon., pers. comm. 2020) may be to the detriment of the few artefacts of certifiably high reliability LUP evidence found on the PAS, and which are of great significance to my analyses of LG human occupation of open landscapes (cf. Catalogue B, Section 9.1). Separately to this, as I have been informed of through East Midlands-based colleagues and collectors themselves, there remains a consistent problem of under-reporting since, for a number of reasons (cf. Robbins 2013), a number of active field-walkers in the studied counties have not yet made their LUP discoveries available for recording. It is hoped that through local initiatives like finds rallies, the available corpus of LUP PAS records may increase in the future. Additional systemic recommendations concerning (Palaeo)lithic heritage management records may be found in Section 9.3.2.

Chapter 9

Discussion and concluding remarks

9.1 Assessing the evidence for LG human re-occupation of the open landscapes between the caves and the Sea

In the preceding chapters I have presented my analyses of Confirmed/Certain LUP sites (Dataset 1, in Chapter 4 and Catalogue A) and Probable/Possible LUP site data (Dataset 2, in Chapters 4, 8, Catalogue B). I then supplemented these through lithic technological analyses of three representative case study locales (in Chapters 5, 6, 7), accompanied by comprehensive historiographical and source-critical reviews of site archives and available sources. In this chapter, I will return to my original research questions (on p. 4) and discuss my observations and results regarding the degree of intensity of evidence for LG human (re-) occupation of open landscapes, and whether there is any clear chronological or spatial patterning in this evidence.

The evidence indicates that the landscape features contained within the research area were relevant to the theoretical potential for open-air occupation, as well as the sites' survivability, visibility, recovery, and recording. Though caveats of poor organic preservation out in the open landscapes necessarily lead to a reliance on dating faunal remains from cave sites, dates obtained on cut-marked faunal remains are testament to the resources afforded by the wider landscapes as well as an ever-earlier onset of human presence in this part of Britain as well (see Figures 113, 114). Likewise is the differential landscape composition of large, low-lying riverine and (palaeo-)lacustrine areas, bounded to the north-west and west by uplands, an attractive environmental arena, combining environments favoured by different principal prey species like wild horse (*Equus ferus*), likely a persistent resource throughout the LG Interstadial, and reindeer (*Rangifer tarandus*), and elk during the Allerød (*Alces alces*; Jacobi, Higham and Lord 2009; Jacobi and Higham 2009b; Jacobi and Higham 2011; Reade et al. 2020). With respect to the survivability of LG evidence, the presently known site/findspot distributions are likely an underestimation, caveated by the spatially and temporally variable effects and impacts of taphonomic processes on the landscapes. As exemplified by the low frequency of LUP finds or higher resolution scatters in active river valleys (in Figures 17, 96), or the low density of findspots in areas coinciding with palaeolake Humber (in Figures 19, 95), or the variable preservation of LG horizons and artefacts across the arable lands, geomorphological and modern processes have altered and continue to affect the research area. Such processes can have a preserving effect on the Palaeolithic landscape, for instance where aeolian coversands (LLS age) blanket LG horizons, but more commonly the taphonomic processes are erosive, or lead to the formation of new, thicker soils and deposits. Taphonomic processes are not a monolith; rather, as demonstrated by L. Billington's (2016) work in East Anglia, just to the south of the research area, landscapes' environmental and taphonomic histories must be studied at high local and regional resolution. In the event that all contingencies related to the survivability of archaeological evidence in the ground are met (Robbins 2013), further caveats are introduced through variations in survey or recovery methods (Billington 2016), and recording (see Section B).

Bearing these important caveats in mind, I shall address what my analyses have uncovered regarding preferred site locations and emerging hotspots of LUP activity, but also observed lacunae, across the East Midlands and Yorkshire. Furthermore, I will present evidence in support of chronological and regional patterns by comparing the spatial distribution of Creswellian- and FMG-attributable findspots and sites, followed by a comparison of observations arising from my lithic technological and typological analyses of the site-specific assemblages. Finally, I will present my conclusions on this study and recommendations for future work.

9.1.1 Emerging importance of open landscapes

This thesis began with the hypothesis that the intensity of and potential for LG human re-occupation of open, lowland landscapes most likely exceeded existing estimates and interpretations. These emerged from a strongly cave site-biased tradition that characterised the first century of LUP research. Furthermore, I posed the question whether any chronological and spatial patterns could be detected in the open-air evidence, and subsequently, what the significance of this evidence is in the wider context of the LG re-occupation of Britain.

In addressing my hypotheses, my research clearly shows that the open landscapes of the East Midlands and Yorkshire were an important subsistence arena during the LG human re-occupation of England. Indeed, the significance of the open landscapes cannot be underestimated, since most reliably identified LUP sites and highly probable LUP findspots included in my datasets are open-air locales. My analyses clearly document the greater degree to which LG humans exploited the open landscapes beyond the karst and limestone cave landscapes; the evidence compellingly indicates that especially river valleys and lakefronts were highly attractive focal points for human occupation. The combined evidence for occupation of open-air sites and the repeated re-occupation of certain Peak District and Creswell Crags caves and rock shelters during the LG Interstadial clearly demonstrates the variety and interest of the archaeological record across the wider East Midlands research area (in Figures 14 and 92; see Catalogues A and B). Likewise are the differences in assemblages sizes and composition indicative of possible patterns of landscape use, combining generalised lowland sites near watercourses and lakes with more specialised hunting stations near gorges and in the uplands along the Pennines and North Yorkshire. These classifications of site functions are not a new interpretation of upland sites (*vide* Campbell 1977a; Jacobi 1980; Jacobi 1991, entries in Catalogue A); however, the contrasting site functions are becoming more clear through the gradually increasing number and volume of open-air assemblages that provide higher resolution insights into human activities than stray surface finds that long dominated the lithic open-air LUP record.

Moreover, differential landscape composition aside, strong parallels emerge between LUP site distribution in the research area and on the adjacent continental mainland. The location preferences for LG human occupation are well-documented in the open Low Countries as well as the Central and Lower Rhineland landscapes. It is my impression that these same preferences are strongly evident in the English record as well - including within the research area that I have focused on. To see established continental open-air site distribution patterns be borne out of the East Midlands record represents an interesting opportunity to better contextualise the present site evidence, with ample potential to inform future site-specific or supra-regional comparisons (in Section 9.3.2).

In Section 2.2.3 (cf. Figure 12; Jacobi 1991:129; Jacobi and Higham 2009b:Figs. 11, 12) I highlighted how a significant shift from caves to open sites has been emerging in archaeological surveys since c. 1990. This development is emphasised by a strong prevalence of open sites in UK heritage management data repositories (84.4% open-air to 15.6% cave sites; see Sections 4.1.2, 4.1.2, Catalogue B). In recent decades, LUP discoveries of national importance have predominantly been made in lowland riverine and palaeo-lacustrine settings (Conneller and Schadla-Hall 2003; Conneller 2007; Lane, Schadla-Hall and Taylor 2023), for instance in the open landscapes of Nottinghamshire, Leicestershire, and Rutland which had previously appeared largely devoid of any LUP evidence (Garrod 1926; Campbell 1977a; Wymer and Bonsall 1977; Jacobi, Garton and Brown 2001; Cooper and Jacobi 2001; Garton and Jacobi 2009). New cave sites are only rarely discovered which may partly be explained by a reluctance to survey fresh locations in favour of returning to known cave sites which by now are virtually emptied of LUP remains.

The spatial distribution patterns emerging from my analyses highlight preferential site location on locally raised and well-drained sites situated near river valleys and palaeolakes. My site data thus addresses a pre-existing "serious gap in our understanding of LUP Britain" (Jacobi, Higham and Lord 2009:19-20) since the impression gained from my analyses is that the principal factor for predicting site location is close proximity to active watercourses and palaeo-lakefronts, as seen in the Vale of Pickering (in Figures 17, 96 and 94). Approximately 46% of catalogued sites are positioned within 500 m of rivers (Strahler stream order 1-6 considered, see Tables 13, 30), and all sampled site datasets combined indicate c. 56.5% of sites are located within 1000 m of modern waterways. During the LG Interstadial, several LUP sites were likely to be positioned much closer to freshwater features because their position in the modern landscape must consider the now hidden palaeochannels, palaeomeanders, oxbows, and seasonally braided river channels. This is for instance illustrated by Farndon Fields, now located c. 500 m equidistant to both the modern courses of the river Trent and its tributary Devon, but which formed an interfluve at the site during the LUP phases of occupation. Risby Warren seemingly represents an important exception to this generalised pattern. The case study locale is situated at the boundary of the Ancholme and Trent river catchment areas, roughly 10 km south of the Humber, but the modern river courses lie between 5 and 10 km away from Risby Warren. At Risby, the seemingly 'dry' location can be nuanced through comparison with the more extensive alluvial deposits along the courses of the Trent and Ancholme (in

Figure 57). In addition, attention must also be paid to the effects of modern land drainage and canalisation measures, since, for instance, the Ancholme and the landscapes it drains throughout Lincolnshire have been actively managed since the Middle Ages.

Moreover, the East Midlands' lowland evidence is highly comparable to continental open-air site distribution patterns and close parallels may be found across virtually 'all' of the adjacent north-western European riverine record. While direct comparisons between site densities are skewed viz. the overall far greater number of LUP sites on the continent, my observations regarding preferential site location within close proximity to watercourses mirror sites situated on the alluvial plains between the rivers Rhine, Maas, and Scheldt (Heinen 2016b:150-151, 155, Fig. 1; Grimm 2019:39). To name but a few examples, in Sandy Flanders, Belgium, the average distance between sites and surface water features is 173 m (Crombe and Verbruggen 2002:Fig. 7), whereas in the Belgian Campine region, the high-resolution site Rekem is situated on the left bank of the river Maas which in its modern course is found 1 km further northeast (Verheyleweghen 1956; De Bie and Caspar 2000; Van Gils and De Bie 2004; De Bie and Van Gils 2006:782, Fig. 1; De Bie, Van Gils and Deforce 2009:80, 85, Fig. 5). In the adjacent southern Netherlands, distances between findspots found on (palaeo)river terraces and near meander scars can reach up to 4 km relative to the modern course of the Maas (Arts 1988; Deeben 1988; Rensink 2002:184; Deeben and Rensink 2005:186-7).

The preference for site locations near surface water features is unsurprising, since rivers and freshwater lakes are natural mobility corridors, landscape markers and provide rich environmental resources for human groups and large herds of prey animals such as wild horse (*Equus ferus*) that rely on access to fresh drinking water (cf. Sections 4.2.3 and B.1.3; Reade et al. 2020). Despite the rare preservation of direct organic evidence, sometimes only represented by a matter of single vertebrae, the rich and varied faunal records from the well-documented central Rhineland sites Andernach-Martinsberg, Gönnersdorf, Kettig and Niederbieber demonstrate that a range of aquatic resources like salmon (*Salmo salar*), northern pike (*Esox lucius*), daces (*Leuciscus cephalus*) were exploited (Street et al. 2001:762-3, Tabl.1-2; Grimm 2019:Tab. 2.16). Likewise have burnt animal remains including fish bones been documented for Dutch FMG sites along the Oude Ijssel and Regge (Lauwerier and Deeben 2011). A fragmented fishhook excavated at the (late Alleröd/early Younger Dryas) FMG site Klein Lieskow 120 in the river Spree valley (Lower Lusitania, Germany) has been interpreted as evidence for fishing using a line and hook, possibly in the nearby river (Neubeck 2019:210, 224, Fig. 15; Pasda 2001:399p). Additional indices for the use of marine/aquatic resources are the figurative engravings on Magdalenian *art mobilier* plaques (Cleyet-Merle 1987, Cziesla 2004; Terberger, Barton and Street 2009:192-3; Gramsch et al. 2013; Langley and Street 2013; W. Heuschen, pers. comm. 2016). That marine mammals like seals were part of the diet is confirmed through stable isotope analysis of human remains from Kendrick's Cave, Wales (Richards et al. 2005; Bocherens and Drucker 2006; Pickard and Bonsall 2020; Charlton, Brace, Hajdinjak et al. 2022).

An additional factor in site selection is the emphasis on locally higher grounds such as interfluves, escarpments and ridges representing natural vantage points with advantageous sight lines over surrounding landscapes (cf. Sections 4.2.1, B.1.1, 9.2.3 and Figures 83, 84). To explore potentially strategic landscape locations, recent analyses by W. Mills (2022:Figure 6.7) modelled the location and intersections of interfluves along the Channel River Network. Since this includes the entirety of my research area and the nearest continent, it is possible to compare the model with my site data. Upon comparison, the areas where multiple elevated ridges come together to form high-potential/strategic junctions (in Mills 2022:Fig. 6.7) coincide with the location of confirmed LUP evidence at Farndon Fields, in the Vale of Pickering, in the areas between the rivers Trent, Idle and Don west of the Humber Estuary. The overlap between modelled strategic locations and two of the largest open-air LUP sites is both a confirmation of Mills' model (2022:Figure 6.7) and of the sites' attractive settings. Moreover, the model identifies a stand-out area among the otherwise low frequency/density of LUP-attributable data at the centre of the research area (cf. Figures 19, 95). Although direct evidence for human occupation of the Isle of Axholme is thus far limited to stray finds of uncertain classification (from Haxey, Lindholme and Wroot, see Sections 9.1.2, A.4), not least due to the complex superficial geology of the area that imposes caveats to more wide-spread preservation of LG evidence, the strategic elevated location is of heightened future potential. Upon broader regional comparison, these topographic choices directly evoke comparable continental open-air site locations on the edges of plateaus or flanks overlooking river valleys, on dry terraces, and sandy ridges above streams and silted-up channels (e.g., Leroi-Gourhan and Brézillon 1972; Alix et al. 1993; Coudret and Fagnart 1997; Heinen and Kopecky 1999; De Bie and Van Gils 2006; De Bie, Van Gils and Deforce 2009:85; Crombé et al. 2011:460; Crombé et al. 2013; Heinen 2014; Heinen 2016b; Peeters and Rensink 2019:44; Weber, Valentin and Bodu 2019:95; Grimm

2019; B. Eriksen, S. Grimm, W. Heuschen, M. Niekus, M.-J. Weber, pers. comms. 2012-21).

Although there are distinct regional variations in topography and natural character profiles, the characteristics of preferred riparian site location can be observed for both wider, low-gradient river valley edges in gently undulating landscapes and for high energy rivers with steep channel gradients. Certainly, to an extent these observations are influenced by the immovable location of confirmed LUP cave upland sites that form an integral part of my site dataset. Equally, the present evidence may be an artefact of my analytical approach (i.e., the direct comparison with the OS Open Rivers data, rather than through reconstruction of palaeoenvironments); and yet, these results are in accordance with spatial patterns documented for lithic scatters in East Anglia, where evidence is overrepresented relative to the overall proportion of the landscapes within the set distances to watercourses, and on vantage points (Billington 2016:71-2, figures 2.17, 2.18; 330pp). Furthermore, my observations indicate that sites are deliberately oriented relative to the direction in which rivers drain. For instance, where rivers trend west to east, such as in the Northern Pennines, sites are preferentially located on south-facing hillsides. In the Lincolnshire Wolds, however, west-facing findspots are found nearer the flattish base of the rolling hills (in Figures 14, 83, 17 and 96). Site orientation is less readily identifiable in low-gradient, active river valleys because catchments have been undergoing substantial changes and course alterations over the past millennia. Using Farndon Fields as an example, activity foci were concentrated on slightly higher ground and along the edges of an embayment, which mirrors the settings of the Seamer Carr sites (see Figures 27, 22, 42; Lane, Schadla-Hall and Taylor 2023). The overall patterns indicate that locales were deliberately chosen for their good views over surrounding landscapes, shelter from wind and away from river, tidal, and surface water flooding (cf. Section 9.2.3).

Emerging areas of high potential for future targeted studies, and persistent lacunae

Although the inclusion of Probable/Possible LUP site data (in Dataset 2) increased the overall number of mapped findspots, the resulting site distribution maps are by no means densely populated, and my comparisons show that LUP site data is unevenly distributed across the East Midlands and Yorkshire (in Table 28). There are apparent clusters or hotspots of LUP activity, for instance in areas adjacent to confirmed LUP cave sites in the Peak District and Creswell Crags. However, equally evident are persistent lacunae in the overall landscape where LUP evidence is only sparsely scattered or altogether absent, most notably in the lowest lying central parts of the research area around the Vale of York in North Yorkshire (in Section B.1.5 and Figure 92). My data indicates that the variation in site coverage and density reflects genuine locational preferences of LG humans but it is also indicative of some survey and collection biases. Equally relevant to consider, also with regards to different chronological and regional patterns of human re-occupation, is the significance of different palaeogeographical features which likely imposed limitations to the landscapes' fitness for human occupation as well as the sites' post-depositional survivability and visibility (see Sections 9.1.2 and 9.2.1).

Much information already exists regarding locational preferences in upland/lowland margins (Garrod 1926; Campbell 1977a; Barton et al. 2003:639; Jacobi, Higham and Lord 2009; Jacobi and Higham 2009b; Jacobi and Higham 2011; Pettitt and White 2012; Parker and Knight 2013). Probable/Possible LUP site coverage is generally good near Confirmed/Certain cave sites such as Hooton Roberts and Edlington Wood in the River Don Valley; near Dead Man's Cave and along the Anston Brook; and near Thor's, Ossum's and Elder Bush Cave along the River Manifold (in Figure 92). It is likely that survey biases have contributed to a higher findspot density near well-established cave and rock shelter focal points (see Section 8.1.2), since from the record we know that spoil heap investigations and exterior maintenance interventions near scheduled cave sites have recovered additional LUP finds (Jenkinson 1984; Jenkinson et al. 1986; Pettitt, Bahn and Ripoll 2007a; Davies 2015; Jenkinson 2023b; R. Dinnis, pers. comm. 2016, 2020). Due to time constraints and the availability of data, I prioritised my case study sites located further afield of the caves, but it would be interesting to analyse the caves and nearby open-air evidence in more detail to see if the recovered material suggests contemporaneity between cave and open activity foci, which could elucidate the possible relationships between cave and open-air sites in the same landscapes.

Beyond the immediate periphery of Confirmed/Certain LUP sites, other emerging areas of high potential are especially prominent in the southern half of the research area, for instance in the Leicestershire and Nottinghamshire Wolds (in Figure 92). My dataset of UK heritage management records suggests the presence of Probable/Possible LUP clusters, as illustrated by a concentration of more than one hundred PAS-derived records north of Melton Mowbray (Scalford and Wycomb parishes, Leicestershire) and an interesting cluster of HER-derived, high reliability LUP surface findspots near Uppingham in Rutland. Interestingly, both clusters are demonstrably the result of collector biases and good local rapports with heritage recording officers which have resulted in higher levels of finds reporting than what is typically the case (M. Foreman and Anon., pers. comms. 2016, 2018; comment in The Portable Antiquities Scheme 2019g and Section 8.1.2). While I do not want to exclude the possibility that hotspots are linked to natural landscape features such as (ancient) water bodies (cf. Section 9.1.1), my research suggests that higher concentrations of especially PAS-derived findspots are primarily indicative of locally higher interests in fieldwalking (my observations and personal correspondences). This bodes particularly well for other under-explored or thus far under-reported parts of the research area. Among the reported PAS finds from the Melton Mowbray area are Cheddar points and blades with diagnostic *talons en éperon* (PAS object records LEIC-35D973, LEIC-8C1D36 and LEIC-19140C, see Catalogue A). However, there are known classification issues concerning the wider sample of surface finds from this area that require further assessment (own observations and Anon., pers. comm. 2022). The Uppingham finds were all made by a named local fieldwalking enthusiast, and lithic specialists at the Leicestershire and Rutland HER have corroborated the finds' classification as LUP (H. Wells and L. Cooper, pers. comms. 2020; Leicestershire and Rutland HER 2018: entry MLE21110). Thus far, no systematic surveys have investigated these two interesting areas, which therefore lend themselves to future prospection, for instance by adopting a collaborative approach as we employed at Farndon Fields.

9.1.2 Important natural landscape features relevant to the potential for open-air occupation

More refined preferences for site location across the landscapes, by LG humans, may be presumed - however these preferences are currently difficult to confirm at higher resolution and within the research area. This is partly due to the aforementioned challenges represented by the taphonomic histories of landscapes (cf. Billington 2016), yet also related to the persistent scarcity of attributable sites or findspots that, at the scale used for present analyses, have led me to draw generalised observations rather than fully reconstruct the palaeoenvironments of each natural character area that would have allowed me to better contextualise the lithic record relative to the (fluvial/riverine) environments. Equally challenging is the uncertain stratigraphic provenance of most sampled diagnostic artefacts which represent stray surface finds and scatters, i.e., are derived from medium to low resolution reference events. Since most of the studied areas' superficial deposits are presently classified as 'unmapped' by the British Geological Society at the resolution and scale available for my analyses, more detailed sedimentary information is presently unavailable for c. 60% of my LUP site data. Where available (see Table 29), my tabulations indicate a strong preference for site location on well-drained soils and substrates such as till, alluvium, (blown) sands and gravel, which mirrors results from recent analyses in East Anglia (Billington 2016:71, 76) and on the nearby continental mainland (Coudret and Fagnart 1997; De Bie and Caspar 2000; Deeben et al. 2005; De Bie and Van Gils 2006; Crombé et al. 2011:Fig 9).

Overall, high frequencies of LUP finds found in glaciofluvial deposits such as till and on fluvially deposited alluvium, or on meltwater-deposited glacial sand and gravel demonstrate good preservation of peri- and postglacial sediments. Finds and sites concentrations on alluvium, river terrace, and lacustrine deposits (in Table 29 and Section 9.1.2) are important proxies for preferential site location near ancient surface water features. Conversely, low site coverage on certain superficial deposits may indicate unfavourable conditions during the LG Interstadial and the impact of the landscapes' post-depositional histories (Barton et al. 2003:638). As seen, site coverage is low on alluvial deposits along the northern and western riverfronts of the Trent and near the Humber Estuary, along the Lincolnshire coast, and towards the Wash. There are extensive stretches of till and lacustrine deposits in the Vale of York where site coverage is low (in Figures 16 and 92). Stronger correlation between site location on alluvial and river terrace deposits may be presumed but is difficult to confirm due to the greater degree of vulnerability of open-air locations as to the erosional history of active river systems (Jacobi 1991; Jacobi, Higham and Lord 2009; Historic England 2019d:Section 5).

In the following, I will briefly touch upon my observations regarding site location relative to aeolian coversands of LLS (GS-1) age and glacial lakes Humber and Flixton, which I regard to be of great chronostratigraphic relevance and prospection potential for future studies of the East Midlands.

The chronostratigraphic relevance and prospection potential of surfaces beneath aeolian coversands of LLS (GS-1) age

Aeolian coversands deposited during the LLS (GS-1) are highly regionalised and comparatively rare superficial deposits in Britain. Within the research area, however, they are abundant and coincide with LUP findspots such as the focal locales of Farndon Fields and Risby Warren (in Section 2.2.2, Figures 16, 92, 22, 57; Bateman 1998; Bateman, Murton and Crowe 2000; Baker et al. 2013:108–9). Aeolian coversands of LLS age (GS-1) are of great chronostratigraphic significance since these sediments postdate and bury older horizons - thereby preserving context relevant to the LUP activities and providing *termini* for chronostratigraphic and OSL dating at both Farndon Fields and Risby Warren. This is not a rare phenomenon in eastern Britain, but is more commonly associated with LUP sites in the Low Countries where aeolian (Younger Dryas/GS-1) coversand deposition is believed to be partly contemporary with that of the East Midlands (cf. Sections 5.1, 7.1.2, E.2.1; Garton, Barton and Bateman 2020; Tapete et al. 2017a; e.g., De Bie and Caspar 2000; Deeben and Rensink 2005; Waterbolk 2012). Besides the chronostratigraphic dating potential, the confirmed presence of aeolian LLS (GS-1) age coversands at two case study locales highlights the impact of survey biases, the need for more high-resolution mapping, and future survey potential.

As addressed in Section 7.1.2, the reported discoveries of penknife points beneath aeolian coversands of LLS (GS-1) age at Risby Warren has been of key relevance to the locale's once elevated status in British LUP research (Gatty 1902; Armstrong 1923; Clark 1932:35; Riley 1978; May 1976; Bateman 1998). Since the earliest LUP discoveries in the wider Scunthorpe area in the late 19th century, the importance and archaeological potential of open-air site complexes such as Risby Warren has been intertwined with their geological context, or, in C. W. Phillips' words, "the determining factor in their distribution is [...] the occurrence of sand" (Phillips 1934:116; see Figures 56, 57, 54, and Section 7.1.3). Certainly, the sands referred to by Phillips are primarily the mobile and wind-activated Holocene sand dunes which long characterised the scenic outskirts of Scunthorpe. Up until the introduction of stable vegetation in the 1950s which reduced surface visibility during fieldwalking, discoveries had continuously been made where artefacts were buried less deeply beneath the aeolian LLS (GS-1) coversands or eroded onto the sandy surfaces. This observation has been confirmed by K. Leahy (pers. comm. 2019, my edits), a National Finds Officer (PAS and North

Lincolnshire Museum; The Portable Antiquities Scheme 2019aj):

> *"In Lincolnshire the honey-pot sites are on the sandy warrens where flints are easily discovered. Was Prehistoric [and earlier] activity concentrated on these sandy sites or are flints (and pottery) just easier to find? My feeling, using our experience on other soil types, is that activity was concentrated on the sand. If there were sites of similar density elsewhere, we would have got some indications of their presence."*

In my view, Leahy's statements capture the dual importance of aeolian LLS age coversands. The good coverage of LUP finds from Risby Warren and environs cannot be divorced from collector biases when and where ground-surface visibility is high due to erosion and reactivation of sand dunes (Clark 1932:35). In this regard, the Lincolnshire Cliff sites mirror similar discoveries of thousands of Mesolithic surface finds on the once sandy rabbit warrens Wangford Warren and Lakenheath in East Anglia (Clark 1932:34; Billington 2016:175-177), and these examples evoke LUP discoveries in the Dutch province of North Brabant where surface collection reached its peak prior to the introduction of anti-denudation measures (Deeben and Rensink 2005:187; Waterbolk 2012:32; Vermeersch 1977).

At the same time, the aeolian LLS (GS-1) age coversand deposits are an important factor in the preservation of LG horizons and LUP artefacts, in that coversands may seal and protect the underlying records. In the field, however, potentially preserved horizons may still translate to an apparent absence of finds, likewise the extent of preserved aeolian LLS (GS-1) coversand deposits is likely underestimated in existing base maps of the research area, viz. the prevalence of presently 'unmapped' superficial deposits and variable depth of Holocene sedimentation (Baker et al. 2013; Bateman, Murton and Crowe 2000; Bateman 1998). Although well-dated sections have been recorded at Girton quarry (though without any associated LUP artefacts so far, Baker et al. 2013), and at Messingham quarry, where a blade end-scraper was recovered *in situ* (Buckland 1984:11), the presence of aeolian LLS coversands at Farndon Fields was only recognised during the high resolution CWA excavations ahead of the A46 Improvement Scheme (Harding et al. 2014:17) and our subsequent auger surveys showed that the aeolian LLS (GS-1) age coversands extend more widely across the locale (see Section 5.1; Garton, Barton and Bateman 2020; and see Billington 2016:Fig.4.21, pp. 178-9 for comparable observations to the south of the research area). A comparable situation may apply to a greater number of open East Midlands sites where fine-grained sedimentary profiles are not yet available. Equally, as shown in the Farndon site plan in Figures 22 and 27, there remains a near-complete exclusivity of LUP finds in the southern half of the locale where the ploughsoil overlies aeolian LLS (GS-1) age coversands, in marked contrast to the finds distribution and frequency between the northern half of the locale (with the GI-1 alluvium embayment). At Farndon, we have interpreted these contrasting find distribution patterns to indicate heightened potential for *in situ* scatters sealed beneath the coversands, and beyond reach of the modern ploughs that have worked LUP artefacts into and onto the ploughsoil. Through continued targeted, and more ground-invasive surveys the role of coversands in - potentially - preserving LG material may be better understood, for the Farndon locale specifically, and with broader applicability to comparable locations across eastern England.

Site location relative to palaeolakes Humber and Flixton

As mentioned (in Sections 4.2.3 and B.1.3), along with other surface water classes, open freshwater water bodies such as lakes are important natural landscape features and preferential settings for LUP site location. Indeed, the importance of lacustrine features cannot be understated with respect to access to permanent freshwater, the theoretical possibility of using watercraft for transport of goods and group members, and the ecological richness supported by productive lacustrine habitats. Provided eutrophic levels had sufficiently stabilised after the LGM, lakes would have provided rich aquatic habitats for food and other vital resources. The location of palaeolake edges may explain site densities but the lakes themselves may also represent lacunae and help interpret gaps where evidence of LUP human occupation is absent. Glacial lake level dynamics may furthermore provide a means to contextualise diachronic shifts in human occupation patterns, for instance if lowering lake water tables negatively affected a lake's ecological diversity (Bos, Bohncke and Janssen 2006; Crombé et al. 2011; Crombé et al. 2013:172, 174-175; Crombé, Robinson and Van Strydonck 2014).

In the research area (cf. Sections 4.2.3 and B.1.3), there remains uncertainty concerning the modelled extents and retreat dynamics of Glacial Lake Humber which formed c. 15,000 years ago when ice impounded the Yorkshire Ouse-Humber system. An eight-stage model for the lake's terrace levels and minimal/maximal extent was proposed by Fairburn and Bateman (2016) and Clark et al. (2018; as implemented by BRITICE 2017), although the chronology and patterning of gradual lake level retreat of Lake Humber is presently known at reconnaissance level only. It is likely that over the course of c. 5000 years between the lowest modelled (Stage 8) lake level (5 m terrace, Shfd13036 OSL dated to <15.5±0.8 ka) and proposed complete drainage (OSL Shfd11111 dated to 9.1±0.6 ka; Fairburn and Bateman 2016:Table 2), Lake Humber was gradually succeeded by fens, marshland, and many smaller discontinuous lakes comparable in size with Lake Flixton in Yorkshire. The extent of Lake Humber may have ramifications for understanding site location over the course of the Interstadial but also resource-rich lake margins with significant potential for preserved LUP evidence (Loughlin and Miller 1979; Tappin et al. 2011; Natural England 2012; Bateman et al. 2015; Palmer et al. 2015; Fairburn and Bateman 2016; Straw 2016; Evans et al. 2017; BRITICE 2017; Clark et al. 2018; Murton 2018).

Emerging from my comparisons of LUP site data with the modelled glacial lake's contours (in Figure 19) and superficial deposits (in Figure 16) is an overall low, yet markedly different site distribution within the minimal and maximal extents of Lake Humber. My site data currently suggests the presence of a 'Vale of York'-shaped dearth in LUP findspots to the west of the Humber Estuary which coincides with areas which were likely flooded for the longest time up until complete drainage around 9.1±0.6 ka (Fairburn and Bateman 2016:Table 2). No LUP sites have thus far been discovered within the northern periphery of the Humber Estuary where superficial deposits are characterised by lacustrine deposits, indicating that large areas were submerged beneath open water for longer, which has undoubted implications for LUP site location. Other possible explanations for the apparent absence of finds in such deposits are poor survivability, low surface visibility, and lack of fieldwalking. However, at a chronological and regional scale (cf. Section 9.2.1), the scarcity of LUP evidence is likely contingent on geographical factors. In contrast, the superficial geology to the south of the Humber Estuary is more varied. There are confirmed LUP findspots at Haxey, Lindholme, and Wroot on the Isle of Axholme, and are located within the maximal extents of palaeolake Humber. These findspots indicate that these parts of the landscapes were, at the time of occupation, relatively dry and accessible, possibly because these areas were islands and therefore inhabitable by human groups (in Section B.1.3 and Figure 95). A more detailed study of the palaeolake contours of Lake Humber may yet yield important data on chronological and regional patterns in LG human presence in relation to the former lake(s), analogous to evidence from the Low Countries (De Bie and Van Gils 2006; Crombé et al. 2013). But for the present, the low site coverage prevents more definitive statements from being made (see Section 9.2.1).

The best evidence for LUP human occupation of lacustrine environments in the research area is represented by the high density of sites on the lakefronts of palaeolake Flixton in the Vale of Pickering, which provide compelling examples with broader applicability to the East Midlands (see Figures 39 and 40, Section 6.1.1). Striking parallels can be found at several locations in north-western Europe, for instance relative to palaeolake Moervart in Sandy Flanders, Belgium, where FMG sites are clustered tightly and near-continuously along 10-15 km of the lakefront and "site density is at least five times higher compared to other areas within Sandy Flanders" during the Allerød (Crombé et al. 2013:162; Crombé et al. 2011:Fig. 11, 461-462). Similar site densities are noted near (within 300 m of) smaller palaeolakes in the Belgian and Dutch Campine regions (De Bie and Van Gils 2006:782, Fig. 1; De Bie and Caspar 2000; Van Gils and De Bie 2004; Deeben 1988; De Bie, Van Gils and Deforce 2009:80, 85, Fig. 5; Verheyleweghen 1956). Other highly prominent examples are the LG palaeolake sites in the Ahrensburgian Tunnel Valley in Germany (Rust 1935; Rust 1943; Schwabedissen 1954; Rust 1958; Schütrumpf 1958; Tromnau 1975; Riede et al. 2010) as well as in Denmark (Holm and Rieck 1992; Pedersen 2009; Riede, Laursen and Hertz 2011; Riede, Weber, Westen et al. 2019:21-22, Fig. 5).

Importantly, site complexes like Seamer clearly illustrate the significance and research potential of studying the evolution of lacustrine landscapes. Analyses targeting a variety of sources can provide the chronostratigraphic proxy data needed to reconstruct ecological niches and the animal-human landscape at a greater detail. These sources include lake level bathymetry, sedimentary records, preserved organic remains, and environmental archives comprised of microfossils and phytoliths. Examples for the use of such sources are plentiful and are readily illustrated by high-resolution studies conducted on the continental mainland (Clark 1972; Foley 1981; Cloutman 1988b; Cloutman 1988a; Cloutman and Smith 1988; Schulting and Richards 2002; Dark 2003; Bos, Bohncke and Janssen 2006; Schulting and Richards 2009; Crombé, Robinson and Van Strydonck 2014; Palmer et al. 2015; Crombé and Robinson 2017; Taylor et al. 2018; Bos et al. 2018; Innes et al. 2021). Although none of the other Vale of Pickering sites could match the Mesolithic Star Carr with regards to the scale, extent, and quality of preservation of organic material, one should not exclude the theoretical possibility that organic LUP remains could be preserved at hitherto undiscovered wetland locations.

Overall, I regard an improved understanding of the palaeolacustrine landscape composition as one of the most interesting avenues for future research (in Section 9.3.2). Once more information about environmental records is available at higher local resolution (i.e., through improved lake bathymetry models, mapping of lacustrine sediments, and archaeological surveys), it will be increasingly important to look at the potential for preserved archaeological evidence and palaeoenvironmental deposits within and along the retreating boundaries of palaeolakes (cf. Section B.1.3). Based on the established precedents in the Vale of Pickering and in the Low Countries, I argue that we should expect to find LG evidence situated on raised grounds. Specifically, these locations should be away from flood zones (as on the Isle of Axholme), but near shallow lakefronts (such as in kames or lagoon-like settings). These sites most likely lay beneath peat deposits, and possibly overlay glacial sands and gravel deposits. Perhaps there may be a 'new' Seamer complex awaiting discovery?

9.2 Evidence for chronological and regional patterns in the LG human re-occupation of the English East Midlands

Clearly emerging from my analyses is the demonstrable potential for studying English landscapes away from karst and limestone caves, and my observations represent evidence for greater intensity of LG human occupation of the East Midlands. Moreover, shared similarities emerge between the distribution of open-air sites in the research area and on the continent with regards to locational preferences for well-drained grounds and good views in riverine and lacustrine settings.

Here, I shall now address what I have uncovered in support of chronological and regional patterns through my analyses of Creswellian- and FMG-attributable sites and material. The classifications are mainly based on lithic typo-technological criteria but supported by an increasing corpus of available radiocarbon determinations (cf. Section 2.1.4, Catalogue A, in Figures 4, 5). To avoid overlap with preceding chapters, I will concentrate on key differences between Creswellian- and FMG-site distribution, to then focus on observations and results from my lithic technological analyses of the three case studies.

9.2.1 Contrasting spatial distribution patterns of Creswellian- and FMG-attributable sites and their significance for the timing of human re-occupation and presence

As addressed (on p. 1, Sections 2.1.4 and 2.1.4), previous studies observed chronological and regional patterns in the LG re-occupation of Britain, highlighting differences in site counts between periods and the geographical distribution of Creswellian- and FMG-attributable sites (Jacobi 1980; Jacobi 1991:Figs. 13.3-4; Barton and Roberts 1996:259-260; Jacobi and Higham 2009b; Jacobi and Higham 2011). Here, I wish to briefly discuss whether these observations are borne out by my data and address the wider significance to the matter in question.

It has been stated (Jacobi 1991; Jacobi and Higham 2009b:1908-1909) that "despite worsening climatic conditions" (Conneller 2009:180) there are more FMG- than Creswellian-attributable sites in Britain. Besides environmental factors, this observation must take into account the differences in duration of the two halves of the LG Interstadial, and control for the near 30% shorter duration of the Creswellian (GI-1ed, c. 750 years compared with GI-1cba, c. 1060 years). However, my site data comprises roughly equal numbers of Creswellian (N = 29, 16 cave/13 open) and FMG sites (N = 24, 15 cave/9 open; see Sections A.2 and A.3). The prevalence of Creswellian sites is even more pronounced if I exclude the eight sites where material from both technocomplexes has been found, since several caves were repeatedly occupied over the course of the LG Interstadial (in Table 6). This Creswellian prevalence in my catalogue is not only in marked contrast to my case studies which are skewed towards FMG assemblages, but also interesting upon consideration of the overall shorter time span of GI-1ed.

Elsewhere in northern and central Europe, open-air locales appear to have been increasingly favoured over cave sites during the second half of the Interstadial (Jacobi and Higham 2009b:1908-1910; Gamble et al. 2005:203-205). However, as seen in my LUP site data (Section A.3), this shift in site locations is not replicated in the British FMG evidence. Instead, Jacobi and Higham 2011(:1910; Figs. 11-12) stated that "more caves were used" during the FMG-attributable phase of human presence, which is not applicable for the research area if seen in isolation, but evident for Britain as a whole. The distribution of FMG cave sites in my catalogue reaches as far north as the Yorkshire caves, i.e., extends further north in England than Creswellian-attributable evidence (see below). Furthermore, these FMG cave assemblage sizes support existing interpretations of more fleeting use or occupation (Jacobi and Higham 2011:1910; Campbell 1977a:168-9; Lord

2013; Lord and Howard 2013; see entries and references in Section A.3).

Concerning observations (Jacobi and Higham 2011:1910) that the geographical distribution of sites expanded after the first half of the LG Interstadial, I can confirm that my data reflects this. Indeed, significant differences emerge regarding the maximal northern and southern distribution of Creswellian and FMG sites, respectively (cf. Chapter 4 and Figures therein). In my site data, Creswellian-attributable sites and assemblages dated to the first half of the LG Interstadial are mainly concentrated to the southern half of the research area, i.e., primarily found below an imaginary Severn to Humber Estuary line. Moreover, this apparent scarcity of Creswellian-attributable (or datable to GI-1e/Bølling chronozone) material at more northerly latitudes is significant in the broader context of delayed timings for the earliest documented evidence for LG human presence in different parts of Britain. As addressed (in Sections 9.1.1 and 9.1.2; and see Barton et al. 2003:637-639; Jacobi 1991:138; Stevens et al. 2021), it is possible that the apparent paucity of Creswellian evidence in northern Britain may point towards geographically and environmentally limiting factors such as lower maturity levels of landscapes and more limited resource availability. Survey biases may also need to be factored in, as well as population factors - perhaps group sizes were too low to allow an expansion of territories northwards without putting existing social networks at risk against the apparent thin background of human presence during the Interstadial (cf. p. 1 and Section 9.3). However, beyond the northern boundary of the study area, isolated discoveries of stray surface finds attributable to the first half of the LG Interstadial on typo-technological grounds have been made - for instance at Fairnington near Kelso in the Borders (Saville 2004:fig. 10.23), Howburn, South Lanarkshire, and possibly also at Dunragit Site 19, Dumfries and Galloway, Scotland (Bjarke Ballin et al. 2010; Ballin et al. 2018:Plates 1, 4, 5, 9-11, 13-16; Ballin 2021). Certainly, the discoveries in Scotland are important evidence for a Scottish Palaeolithic and a potentially earlier onset of LG human presence in the North. Equally, though these sites challenge my observations, the presence of exceptions need not negate a trend, since my analyses confirm earlier observations concerning the near-absence of archaeological material associated with this first phase (during GI-1e/Bølling chronozone) of human re-occupation north of Derbyshire and South Yorkshire (Jacobi 1991; Jacobi and Higham 2009b:Fig. 11).

Of great significance to the timing of human re-occupation of the northern parts of Britain is the contrasting maximal site distribution of my FMG data, which reaches to beyond 54°N in the Yorkshire caves and the Vale of Pickering.

Based on available dates and diagnostic artefacts (in Tables 4, 5 and Section A.3), evidence for human re-occupation in these areas is limited to the second half of the Interstadial (GI-1cba/Allerød chronozone). My observations thus confirm existing models regarding the delayed onset of human presence in different parts of Britain (cf. p. 1 and Section 9.3; e.g., Jacobi 1991; Jacobi and Higham 2011; Jacobi and Higham 2009b; Conneller 2007; Pettitt and White 2012). Similar absolute and relative chronological patterns are documented for other parts of peripheral northern Europe (e.g., Eriksen 1996; Eriksen 2002; Grimm and Weber 2008; Riede et al. 2010; Fischer et al. 2013; Grimm et al. 2021; contributions in Terberger and Eriksen 2004; Eriksen and Bratlund 2002; Eriksen, Rensink and Harris 2019;Grimm et al. 2020a). However, the FMG site coverage in the northern half of the research area is low and unevenly distributed, with a noticeable gap occurring across the central parts of North Yorkshire (in Figures 16; Jacobi and Higham 2009b:Fig.12). This skewed distribution in North Yorkshire has been apparent for some time (Coggins, Laurie and Young 1989), and continues to persist despite isolated LUP discoveries in the Vale of Mowbray (in Figures 92; Dickson 2011; Waddington et al. 2020). Located beyond the research area's northern boundaries are other FMG-attributable findspots at Kirkhead Cave, Lindale Low Cave, and Netherhall Road, Maryport, Cumbria (Salisbury 1988; Barton 2009; Jacobi and Higham 2009b; Smith, Wilkinson and O'Regan 2013:Fig. 1; Clarke et al. 2022), Howburn, South Lanarkshire, and Kilmelfort Cave, Argyll (Saville and Ballin 2009:Illus. 5; Bjarke Ballin et al. 2010; Ballin et al. 2018:Plate 7; Ballin 2017b; Ballin 2021). The relative clustering of FMG cave sites in Cumbria and Yorkshire suggests that occupation levels could have been slightly denser, possibly due to the prolonged period during which FMG groups were present in Britain compared with the shorter time span recorded for Creswellian evidence (cf. Section 2.1.4).

Differences also emerge between the distribution of my catalogue sites in the southern East Midlands counties where a greater Creswellian representation is contrasted with a scarcity of FMG sites south of the Trent Valley (in Figure 16; Jacobi and Higham 2009b:Figs. 11, 12). This apparent absence of FMG sites in the southern half of the research area is interesting, and warrants further investigation (see Section 9.3.2). Upon consideration of likely East England access routes from the now submerged North Sea Plain, I had expected to find more FMG-attributable evidence in these parts of the Midlands - not least because FMG-attributable evidence has been found beyond the research area's southern boundary in, for instance, Cambridgeshire (Conneller 2009), Surrey (Barton

1997b; Jones and Cooper 2013; Roberts and Barton 2021), Hampshire (Conneller and Ellis 2007, and Dorset (Barton 1992; Barton et al. 2009; Jacobi and Higham 2009b:Fig. 12).

Apart from the differences in maximal northern and southern distribution, the distribution patterns of Creswellian and FMG sites are comparable, at times even directly overlapping – whether in the Peak District and Creswell Crags caves or in the open in lowlands along the river Trent and its first- and second-order tributaries and the southern Lincolnshire Wolds (cf. Table 6; Figures in Chapter 4; Jacobi and Higham 2009b:Figs. 11, 12). However, different chronological and spatial patterns emerge relative to the river Don system and across north-eastern South Yorkshire (see Section 9.1.2), where so far only Creswellian-attributable material has been identified – not FMG. As stated above, this situation is however entirely reversed in the northern half of the research area. This patterning has persisted with only minimal changes over the past few decades (*vide* Jacobi 1991; Wymer and Bonsall 1977; Campbell 1977a). This begs the question whether one should expect to find archaeological (Creswellian-attributable) evidence for human presence during the first half of the Interstadial (GI-1e/Bølling chronozone) beyond the imaginary line from the Severn to the Humber Estuary. Perhaps we have been looking in the wrong places? For now, this shall remain an open question with ample potential for future studies (see Section 9.3.2).

9.2.2 Evidence from lithic technological attribute analyses of case study assemblages

Since many open-air LUP findspots in the East Midlands, and Britain more generally, only include single or very small numbers of finds (see Table 73, Catalogues A and B), I concentrated on three of the richer open-air assemblages in my research area. While my LUP catalogue comprises slightly more Creswellian- than FMG-attributable sites, my lithic case studies primarily contain FMG-attributable material which proved most useful for direct typo-technological comparisons. Based on my observations (in Chapters 4-6), I was able to establish shared similarities, but also aspects in which these FMG assemblages not only differ - but differ convincingly. This lead me to propose separate chronological classifications for Farndon Fields, which I classify as primarily representative of an earlier phase of FMG compared to Seamer K and Risby Warren, which I instead attribute to the later phase of FMG (cf. Section 2.1.4, Table 27). Key diagnostic typological differences include curve-backed bi-points found at Farndon Fields, whereas the most diagnostic artefacts from Seamer K and Risby include penknife points. In the following, I will present and discuss the evidence in support of my interpretation and compare lithic raw material behaviour and the nature of human site use of the various locales.

Lithic raw material behaviour

In Section 2.1.4, I outlined observed chronological and regional patterns in the lithic raw material behaviour of Creswellian- and FMG-attributable assemblages (Barton 2010). Since the preferential use of local Wolds-type flint in the Vale of Pickering contributed towards the characterisation of FMG-classifiable patterns (Conneller and Schadla-Hall 2003; Conneller 2007; Jacobi and Higham 2011:227), here I compare the evidence from Farndon Fields and Risby Warren with Seamer K. There are interesting aspects in which my case study assemblages differ, which may be due to the sites' distances to the Upper Cretaceous parent Chalk deposits but also probably chronology.

Farndon Fields is located the farthest away from the primary flint sources (c. 50 km distance to the Lincolnshire Wolds). The river gravel flint in the Trent Valley imposes certain limitations on the intended manufacture of longer (>60 mm), standardised blade blanks which were knapped and recovered at Farndon. From the outset Garton and Jacobi's (2009:10) comments regarding the "exceptionally large [cores] for Trent Valley artefacts" pointed towards other flint types/sources. Previous analyses first indicated a distant source in the south of England (200 km distance, in Rockman 2003), which through re-analyses was revised to a more regional origin (Chalk deposits in East Anglia/North Lincolnshire, Pettitt, Rockman and Chenery 2012). The prevailing interpretation of the flint represented in the ploughzone assemblages and in the excavated 'Creswellian' blade scatter (TR6007 East) thus primarily points towards transfer of (partially) prepared cores and artefacts from a non-local source in the Lincolnshire Wolds to ensure adequate provisioning of high quality, nodular flint of desired dimensions (cf. Section 5.2.1; Garton et al. 2016:127; Harding et al. 2014:46, 66; Garton and Jacobi 2009; S. Collcutt, pers. comm. 2021; contra Rockman 2003, as revised in Pettitt, Rockman and Chenery 2012). Due to the low recovery rate of diagnostic micro-debitage ($\geq$ 5 mm), such as knapping or retouch chips in the ploughzone assemblage it is difficult to conclude to what extent prepared blade blanks were transferred to Farndon for tool modification on site, or whether tools were (occasionally) brought onto site in a ready-made form, as documented at Seamer K. In contrast to Seamer K and Risby Warren (see Sections 6.1.1 and 7.2), the use of tabular, buff-grey Wolds-type flint has been excluded for the LUP-attributable artefacts at Farndon (Garton et al. 2016; D. Garton, pers. comm. 2015, 2021; own observations). This is consistent with observations elsewhere across the Trent Valley and East Midlands, where artefacts made from tabular Wolds-type flint are primarily associated with Early Mesolithic assemblages (Jacobi, in litt., undated and Myers 2015; D. Garton, pers. comm. 2016, 2021; own observations).

Although only very few recovered artefacts and core fragments in the Farndon ploughzone assemblage are consistent in size, shape, and cortex with the use of lower quality (river) gravel flint from a derived source, a previous study suggested that this flint type was present in the excavated 'FMG' blade scatter in trench TR6007 West (Harding et al. 2014:66; see Section 5.2.1 and Figures 28, 29, 23). While it is true that river gravel cobbles were occasionally used to produce artefacts that have been recovered on the interfluve locale (e.g., cores in Garton and Jacobi 2009:illus.5.3; ON 696 in Harding et al. 2014:Fig. 2.27.6, p.60), based on my comparisons of recovered artefacts' preserved metric dimensions with nodular flint found in the Trent Valley and by disregarding the distinct, yet not diagnostically infallible, 'Farndon white' secondary patina as a proxy for flint types (see Sections 5.2.1 and 5.3), I conclude that nodular, non-local flint sourced in the Lincolnshire Wolds was knapped to produce both blade scatters (TR6007 East and West). Consequently, my evaluation of the likely flint sources is in disagreement with the separate flint types and sources proposed by Harding et al. 2014(:66). Following my reassessment of the Farndon assemblages I suggest that the artefacts represented in the ploughzone *and* excavated inventories were predominantly made using flint from non-local sources, which further emphasises observed typo-technological parallels between assemblages (in Chapter 5).

Based on my holistic reappraisal of other chronological identity markers of the Farndon assemblages, and upon consideration of evidence from other British sites with a proposed earlier FMG-attribution, I would classify the raw material behaviour observed at Farndon as displaying certain 'Creswellian-like' traits - such as the observed long distance transfer of non-local, high-quality flint nodules, cores, and blade blanks - whilst proposing an earlier FMG-attribution on typo-technological grounds (in Section 5.3). The raw material behaviour patterns indicated at Farndon thus suggest a high degree of mobility to obtain good quality flint from better flint sources located some distance away from the site (here: >50 km; cf. Section 2.1.4; Kuhn 1991:99-101; Arts and Deeben 1987). These sourcing schemata may be characterised through "a sophisticated degree of forward-planning" (Barton 2010:8) to ensure adequate provisioning, at times combined with a more flexible approach to the use of locally available flint.

The emphasis on non-locally obtained flint, variably prepared at source or on site at Farndon, contrasts with the flint types represent at the later (dated to the Allerød chronozone) FMG assemblage at Seamer K (and likely also Risby Warren). During the FMG phase of human occupation of the Seamer K locale, Wolds-type flint found locally (within 10 km distance to site) was the predominant flint type exploited for *in situ* blade/bladelet manufacture (in Section 6.1.1). Finds made from a non-local flint type, i.e., the drift-type flint that was possibly derived from a now-submerged source beneath the North Sea to the east, are only represented by ready-made retouched tools. This contrasts with Farndon where non-local flint is also represented by nodules and prepared cores. The evidence from Seamer K has been interpreted as characteristic of later FMG assemblages (see Section 2.1.4), since the provisioning scheme combines the skilled use of locally available raw materials of suitable quality with a curated 'travelling stock' of finished tools instead of blade blanks (see Section 6.1.1; Barton 2010:7-8; Conneller 2007). Since the blade blanks knapped at Seamer are overall smaller (i.e., shorter but thicker) than at Farndon, the use of lower quality Wolds-type flint may nevertheless have met the knappers' needs.

Regarding Risby Warren, the composition and state of artefact preservation of the surface assemblages precludes a conclusive characterisation of the lithic raw material behaviour. The locale is equidistant within 10 km to sources of drift- and Wolds-type flint (in Figures 57 and 15) and retouched tools made from both flint types are represented in approximately equal measures in the FMG assemblage, with a slightly higher prevalence of drift-type flint artefacts. It is possible that artefacts were knapped using nodules found immediately local to site; however, the current conditions on the Warren limited my field assessment of locally available raw materials (in Section 7.2). On balance, I would nevertheless propose that the lithic assemblage from Risby Warren corresponds to the pattern observed at Seamer K and other later (Allerød chronozone) FMG-attributable assemblages.

The observations from my case studies are broadly consistent with the existing framework regarding regional and chronological differences in lithic procurement, provisioning, and use schemata, mirroring observations from LUP sites in southern England and the continental mainland (Arts and Deeben 1987;

Jacobi 1991; Barton 1992; Barton and Roberts 1996; Coudret and Fagnart 1997; Barton et al. 2003; Conneller and Ellis 2007; Barton 2009; Barton et al. 2009; Conneller 2009; Barton 2010; Kotthaus 2019).

9.2.3 Nature of site use and length of occupation

The nature and duration of human presence at my case study sites is inferred through a combined assessment of the extent, composition, and spatial distribution of artefacts, and compared with the operational steps present in the material. While higher artefact densities may reflect the methods of site survey and sampling intensity, the location of activity foci at well-sampled sites such as Farndon Fields and Seamer K indicate human site use was concentrated on specific parts of the locales. Specifically, activities were undertaken on relatively level, well-drained, and locally higher surfaces, for instance to avoid seasonal flooding of the Trent's braided river channels or at some metres' distance away from the Flixton lakefront (see Figure 22, Section 5.3; Section 6.1.1 and Figure 40). At Risby Warren, activity was concentrated on the flanks of the local vantage point of Flagstaff Hill (69.5 m AOD) - a landscape feature that provided far-reaching, panoramic views in all directions (in Figure 53) and was a naturally dry sandy location. After evaluating the lithic assemblages, and in consideration of the evidence from refitting as well as the absence of hearths or other substantial site features, I interpret the evidence from all case study sites to primarily indicate short, task-specific episodes. At Farndon, the distribution of different activity foci across an area of 18 ha certainly suggests repeat or intermittent phases of human occupation of the interfluve locale. At Seamer K, refitting has confirmed the integrity of artefact recovery and scatter formation processes, but these scatters do not necessarily indicate the contemporaneity of activities. It is possible that the Seamer K scatters represent localised foci, i.e., are equivalent to one of the artefact clusters identified at Farndon (in Figure 22). A variety of tasks were undertaken *in situ* during phases of human site use (see Sections 5.3 and 6.2.2). Blade blank manufacture is documented at both Farndon Fields and Seamer K, as represented by the full *chaînes opératoires* of blade reduction sequences: from preparation and maintenance of cores, to sequential blade removal, curation, and repair. A parsimonious interpretation of the Farndon assemblage suggests retouched tool modification took place on-site, but this is difficult to conclusively confirm due to the low recovery rate of diagnostic spalls and microdebitage ($\geq$ 5 mm). Exhausted cores and lithic knapping waste were discarded at both sites. Though not yet formally assessed through microwear analyses, on-site tool use can be inferred through breakage, spalling, and use-wear patterns (Garton and Jacobi 2009:Table 6, Illus. 11.30, 32-33, for Risby, see Jacobi 2014n; Jacobi in litt., undated; Conneller 2000b:160; personal observations). Further evidence from Farndon and Seamer K documents toolkit replenishing and the removal of not fully exhausted cores and suitable blade blanks (cf. Sections 5.1.1 and 6.1.1). Interestingly, the prevalence of projectile points and complete absence of other retouched tool types at Risby Warren suggests a different site use pattern, indicating that this site most likely represents a brief hunting camp (in Section 7.2.1).

Concerning the duration of human presence at each of the sites, I have characterised the evidence from the artefact-producing events as brief and task-specific, as modelled after my own knapping experiences and more compellingly illustrated by P. Harding's experimental '30 minutes or less' re-creation of the Farndon blade scatter (in Section 5.3; Harding 2018; Harding 2020). Admittedly, this characterisation may be too reductionist; time spent knapping does not equate 1:1 to time lived, since each of the steps involved in blade production are events within a chaîne opératoire, and only one aspect of human activities. And yet, when measured against the lithic record, the documented extent, composition, and evidence for LG human occupation of my case study sites corresponds with what I consider to be a recurring characteristic trait for British LUP cave and open-air sites, namely usually very short and specialised occupations (see Sections 2.1.4 and 9.3).

9.2.4 The worked flint assemblages

As outlined in Chapters 4-6, there are a number of important parallels between assemblages, as well as notable differences between these examples of earlier, and later FMG-attributable assemblages, respectively.

Technological attributes

At both Farndon Fields and Seamer K, the main objective was the manufacture of standardised, parallel-sided blade blanks, as evidenced by the recovery of pieces from the operational stages of blade core reduction. At both locales, this was achieved through direct percussion using soft hammers (stone, rarely organic). Only sporadically do more pronounced bulbs or striations suggest the use of a hard stone hammer (in Tables 50, Pelegrin 2000:Figs. 1-3; Naudinot et al. 2019).

The orientation of negative dorsal scarring patterns (in Table 35, Section 6.2) and longitudinal curvature indicate they were primarily struck from one preferred core platform (in Figure 26, Table 36). Transverse dorsal scars and recovered crested blades (occasionally with continuous patches of remnant cortex) show that crests were formed to guide removals or to correct knapping errors. I have interpreted removal patterns as mainly indicative of opposed-platform cores with repeated removals from one platform so that the blades created are near-indistinguishable from those made on single-platform cores. Besides re-orientation, other corrective and maintenance measures include core rejuvenation tablets (in Figure 30) and 'chunkier' core correction blades/flakes.

Technological differences between Farndon Fields and Seamer K reflect adaptations to flint types used, as suggested by different preferences for and intensity of core preparation. Such adaptive patterns have for instance been observed in later FMG assemblages (dated to GI-1cba/Allerød chronozone) in the Somme Valley, France (Coudret and Fagnart 1997; cf. Section 2.1.4). The nodular flint used at Farndon necessitated preparation, commonly represented by faceting of platforms (Garton and Jacobi 2009:Figs. 5-6), and abrasion mainly along the knapping edge. Examples of the distinctive faceting method *en éperon* are very uncommon at Farndon Fields and only known from the ploughzone assemblage (see Figure 35 and Tables 33, 34; Garton and Jacobi 2009:Illus. 5-6, p. 29; Harding et al. 2014:Fig.2.30, p. 48-50, 55, where there is a marked absence of *talons en éperon* in the lists). In contrast, blade removals detached from Wolds-type flint at Seamer K display fewer traces of platform preparation by abrasion and seemingly no use of faceting since the natural properties of the tabular Wolds-type flint with natural (near right-angled) platforms were exploited. Accordingly, Wolds-type butts and blades are thicker than those made on nodular drift-type flint (see below), which also exhibit more traces of abrasion along the knapping edges and platforms (Conneller 2000b:156). Faceted platforms/butts or *talons en éperon* are not represented in the FMG assemblage from Seamer, nor were these types found at Risby Warren.

Blade morphology and blanks selected for modification and retouch types

To gain a more comprehensive overview of the blade and bladelet morphology represented in the site assemblages, I here summarise my observations. In Figure 72 and Table 25 I have compared the dimensions (width, length, mesial thickness) of complete blades from Farndon (CWA, FFF) with the Seamer K FMG blade/bladelets (both drift and Wolds-type flint) and summarised jointly with the retouched tools in the Risby Warren LUP dataset. In Table 26 I have furthermore summarised the results from pairwise comparisons of these site/artefact groupings to test if, and where, differences are significant. While I have selected for complete blades/bladelets, the incomplete artefact preservation in the Risby LUP data hinders more direct comparisons.

For these comparisons I grouped the Seamer blades and bladelets as one sample, which has changed values *vis-à-vis* the data in Table 21. Here, I compare blade/bladelets by drift- and Wolds flint since I consider the metric dimensions of the Seamer material to be linked to inherent differences in raw material properties of the two flint types used, and the results summarised in Table 26 suggest there is a significant difference between drift- and Wolds-type removals relative to width, and mesial thickness. Interestingly, width-wise both of the Seamer FMG samples in Table 26 differ from the fieldwalked FFF-sample from Farndon, whereas no similarly strong differences emerge in comparison to the excavated CWA blade assemblage. Overall, as Figures 72 highlight, there are similarities in the width (and length) of compared finds. Present comparisons of the Farndon blades are in agreement with my other statements regarding typo-technological parallels between the ploughzone and excavated assemblages (in 5).

In Section 2.1.4 I presented an observation regarding differences in the mesial thickness of blades/blade blanks in the case study assemblages, more specifically that later FMG material appears to be thicker than blade removals in earlier FMG-attributable assemblages. Initially, this observation emerged out of my examination of the LUP finds from Risby Warren, which then prompted me to directly compare the case study assemblages. As is evident in Figure 72, and in Tables 25 and 26, the Risby LUP tools differ significantly with regards to mesial thickness. In Section E.4 and Figure 105 I further compared the Risby LUP data with samples of Early Mesolithic material to emphasise the metric, and chronological differences between surface finds. The enhanced median thickness of Seamer K Wolds-type blades is likely exaggerated due to a pre-selection bias at time of their recording (in Figure 51, see Catalogue D). I would also argue that the thicker removals resulted from the exploitation of the naturally near right-angled platforms of tabular Wolds-type flint and less additional core preparation. I regard this as a characteristic technological schema for later FMG assemblages and contend that this carries greater indicative strength than descriptive values alone (Coudret and Fagnart 1997, see Section 2.1.4).

Regarding the blank/bladelet selection for further modification, evidence from

Table 25: Summarised values for width (W), length (L) and mesial thickness (T) of FMG-attributable backed blades, blades, and bladelets, grouped by measurement, site/sample name, sorted by descriptive values (all values in millimetres; N = 261)

Measure.	Debitage	Sample	N	Mean	SD	Median	IQR
W	blades	CWA	29	13.5	3.91	14	6
W	blades	FFF	29	14.9	3.89	14	3
W	blades/bladelets	Seamer drift	35	12.2	4.90	11.5	6
W	blades/bladelets	Seamer Wolds	137	12.3	5.68	11	8
W	tools	Risby LUP	31	14	2.62	14	2.5
L	blades	CWA	29	37.7	14.5	33	24
L	blades	FFF	29	36.8	10.3	35	14
L	blade/lets	Seamer drift	35	31.2	15.8	34	23.5
L	blade/lets	Seamer Wolds	137	35.7	16.5	32	22
L	tools	Risby LUP	31	41.5	11.9	42	18
T	blades	CWA	29	3.21	1.63	3	2
T	blades	FFF	29	3.41	1.24	3	2
T	blade/lets	Seamer drift	35	3	2.62	3	2
T	blade/lets	Seamer Wolds	137	4.49	3.7	3	3
T	tools	Risby LUP	31	5.48	1.63	6	2

Table 26: Pairwise comparisons between artefact groupings using Wilcoxon rank sum test with continuity correction (P-values indicated, p-value adjustment method BH)

Width	CWA	FFF	Seamer FMG drift	Seamer FMG Wolds
FFF	0.281	-	-	-
Seamer FMG drift	0.103	0.017	-	-
Seamer FMG Wolds	0.145	0.017	0.527	-
Risby LUP	0.527	0.430	0.026	0.026
Length	CWA	FFF	Seamer FMG drift	Seamer FMG Wolds
FFF	0.756	-	-	-
Seamer FMG drift	0.370	0.370	-	-
Seamer FMG Wolds	0.455	0.375	0.455	-
Risby LUP	0.370	0.355	0.077	0.077
Mid. thickness	CWA	FFF	Seamer FMG drift	Seamer FMG Wolds
FFF	0.45279	-	-	-
Seamer FMG drift	0.35727	0.06695	-	-
Seamer FMG Wolds	0.25783	0.70401	0.02397	-
Risby LUP	<0.0001	<0.0001	<0.0001	0.00081

all site assemblages indicate the preferred use of secondary, tertiary, and shorter blade blanks. Scrapers and combination tools were frequently made using sturdier blade blanks, flakes, and occasionally crested blades and/or core correction removals (regarding Farndon, see Figures 23, 34; for Seamer, see Sections 6.2.1 and 6.2.1, Figures 52 and 49). Differences between values of remnant cortex are likely a reflection of different flint raw materials knapped on-site rather than a preferential pattern, since the tabular Wolds-type flint represented at Seamer K naturally has fewer cortical surfaces than the nodular flint knapped in the Farndon material. Having been imported in a ready-made state, the drift-type tools from Seamer K are also all nearly entirely decorticated, in which they differ from comparable examples at Farndon Fields (see Table 32). At both Farndon Fields and Seamer K, the most prevalent retouch types are fine-parallel or semi-abrupt and oriented at the distal end and one lateral edge, with only occasional examples displaying more invasive and irregular retouch (example in Figure 52). Blades with highly invasive, scalar retouch *(retouche 'rasante')* were not recovered at any of the sites (cf. Section 2.1.4). Like the Seamer K assemblage, the Risby Warren inventory indicates preferences for sturdy blade blanks with minimal remnant cortex, often with a much thinner lateral half which was left unretouched. Where preserved, several of the Risby penknife points have a pronounced tang produced through double-sided modification mainly at the proximal end (see Sections 7.2 and E.3, in Figures 61, 55, 59, 60). Here, a variety of retouch types are represented, ranging from semi-abrupt and direct to backing of one lateral edge *sur enclume* on at least ten points (R. Jacobi, in litt. undated, see Jacobi 2014o; Jacobi 2014q).

9.2.5 Retouched tool inventories and concluding observations regarding the presence and case-study based distinctions between earlier and later FMG *faciès*

As addressed in Section 9.2.3, variations in retouched tool inventories reflect different onsite activities. Further variation is evident in the typological variation of tools, which is a characteristic shared with other British LUP assemblages (cf. Section 2.1.4 and Catalogue A). Important differences emerge from the composition and typology of the retouched tool inventories, most significantly regarding the backed blade components. I attribute these variations to chronological differences, indicating the presence of an earlier and a later *faciès* of FMG material. Key characteristics for each site are summarised in Table 27.

Notably, for the Farndon Fields ploughzone assemblage, the presence of additional diagnostic Creswellian and later FMG artefacts (*sensu strictu*, in

Figures 35, no. 18 in 38, 37, shouldered point ID: ABR in Figure 23, small backed bladelets in Figure 34:13-14; Garton and Jacobi 2009; Harding et al. 2014) cannot be disputed. However, and in support of my hypothesis, I regard the material studied in Chapter 4 as primarily representative of earlier FMG (see Table 27). In doing so, I am basing my interpretation on a holistic appraisal of available contextual data (geochronological/technological) and existing studies (e.g., Coudret and Fagnart 1997; Valentin and Bodu 1997; Barton et al. 2003; Conneller 2007; Barton 2010; Jacobi and Higham 2011:226; Roberts and Barton 2021:499).

As a result of our work at Farndon, new OSL dates provide a date bracket for the laminated sands which places the likely time of occupation between 14.8±1.4 ka (OSL-2, Shfd15181) and 11.76±0.79 ka (OSL-3, Shfd15182), i.e., towards the end of the first half of the Interstadial (Garton, Barton and Bateman 2020). The arguments that speak in favour of an earlier FMG classification for Farndon are the presence of 'Creswellian-like traits' regarding raw material behaviour, morphometric preferences for longer and thinner blade blanks, and including distinct platform preparation *en éperon* (in Figure 35, Table 14). Highly important ploughzone finds diagnostic of an earlier FMG classification are gracile curve-backed points, which, although fragmented, most probably took the form of bi-points (find ID FKG in Figure 36, no. 19 in 38, 26) as opposed to curve-backed mono-points, including penknife points which are absent from the Farndon locale (cf. Section 2.1.4; Jacobi and Higham 2011:226; Valentin and Bodu 1997; Roberts and Barton 2021:499). Another significant diagnostic trait are end-scrapers made on longer blades which are well-represented in the Farndon assemblages; shorter scraper types, which are typically associated with FMG assemblages attributable to the second half of the Interstadial have remained absent since fieldwalking of the locale began c. thirty years ago (see Sections 5.2.2 and 5.2.3; Garton and Jacobi 2009:30; Harding et al. 2014; Garton et al. 2016).

Regarding the evidence in favour of a later FMG classification for the two other case studies, based on (chrono)-stratigraphical and typo-technological grounds, the timing of human occupation can clearly be placed within the Allerød chronozone. As opposed to the curve-backed bi-points found at Farndon, the backed component of the Seamer K assemblages includes penknife points which are diagnostic of a later FMG *faciès*, as are the recovered short scrapers (see Figures 52 and 49, Table 27). Their diagnostic quality is furthermore strengthened through site stratigraphy and the absolute AMS dates. The dates shown in Figure 44 form a bracket for the timing of human site occupation; whereas the formation of the Late Glacial organic detritus (CAR-842, 12,010 ± 130 ^{14}C BP, 14,212 - 13,519 cal BP) occurred during GI-1e, the dates taken on top of the (HAR-5242, 11,000 ± 130 ^{14}C BP, 13,156 - 12,737 cal BP; and CAR-841, 10,960 ± 110 ^{14}C BP, 13,088 - 12,745 cal BP) fall within GI-1ba/the Allerød chronozone (dates recalibrated using IntCal20, 95.4% certainty; see Section 6.1.1; Cloutman 1988b; Lane et al. n.d.; Conneller 2007; Conneller and Schadla-Hall 2003).

The analysed Risby Warren material represents a severely imbalanced assemblage that is in marked contrast to the more generalised activities documented at Farndon and Seamer, since the Risby LUP finds are wholly biased towards points and backed blades (cf. Sections 7.2 and E.3). From a typological perspective the exclusive bias towards different types of backed blades is an advantage; diagnostic penknife points, curve-backed mono-points and straight-backed points are shown in Figures 61, 55, 59 and 60. Evidence for other retouched, LUP- or FMG-attributable tools such as scrapers or burins is entirely absent, not only from the selected material, but the wider Risby locale at large. While the classification of the LUP finds from Risby Warren has been subject to debate (in Sections 7.2.2 and E.3), the reported chronostratigraphic position of the tools beneath the LLS (GS-1) age coversands (in Sections 7.1.2, E.2.1, Figure 56), the presence of penknife points and additional technological and typological identifying features agree with a later FMG classification (see Table 27).

Table 27: Characteristics of analysed earlier and later FMG assemblages. Note that the interpretive potential of the Risby Warren surface finds is reduced to incomplete artefact preservation (after Barton et al. 2003:Table 1; Grimm 2019:Tab. 2.9; criteria outlined in Section 2.1.4)

FMG comparison			
Characteristics	**Farndon (earlier FMG)**	**Seamer K (later FMG)**	**Risby (likely later FMG)**
Human occupation during GI-1e/Bølling chronozone	X		
Human occupation during GI-1cba/Allerød chronozone		X	X
Transfer of high-quality flint nodules/cores from non-local source	X		NA
Transfer of ready-made retouched tools made on non-local flint types		X	NA
Increasing use of locally available flint of lower quality		X	NA
Exploitation of flint nodules' natural properties		X	NA
Evidence for platform faceting and *en éperon* technique	X		
Blades as preferred blanks	X		
Bladelets as preferred blanks		X	X
Curve-backed bi-points	X		
Common presence of penknife points		X	X
End-scrapers on long (>50 mm) blades	X		
End-scrapers on shorter (<50 mm) blades		X	NA

9.3 Concluding remarks and recommendations for future work

9.3.1 Conclusion

This study has investigated the topical question of the extent and intensity of Late Glacial human re-occupation in the English East Midlands by targeting evidence found in the open landscapes situated between the canonical cave sites in central England and the modern North Sea coast. This study represents the first regionally specific synthesis on the LUP in this area and my work has elucidated a range of aspects regarding this previously under-explored area of Britain. My analyses provide strong evidence to confirm my hypothesis that LG human groups re-occupied the open, low-lying landscapes of eastern England on a far greater scale than previously posited. Throughout the LG Interstadial, the location of open-air evidence is directly linked to well-drained, slightly raised grounds in riverine and lacustrine environments with good views across surrounding landscapes, i.e., preferentially found in landscape settings which characterise large parts of the East Midlands. Moreover, my analyses have found that these observed locational preferences clearly mirror established open-air site distribution patterns on the continental mainland. Indeed, although the density and number of sites on the Continent far compasses the evidence for Britain, compelling links may be drawn between the material studied herein and the established north-western European LUP record.

For instance, throughout the research area site locations are preferentially within close proximity (up to 1000 m) of modern watercourses, and local raised grounds, embayments/kames, or adjacent promontories were preferential places for settlement. Other clear parallels emerge with regards to the frequent re-occupation of cave sites and diachronic shifts in site density over the course of the LG Interstadial (Schwabedissen 1954; Rust 1958; Taute 1968; Holm 1972; Vermeersch 1977; Rozoy 1978; Baales and Street 1996; Bratlund 1996; Coudret and Fagnart 1997; Fagnart and Coudret 2000; Cauwe, Hauzeur and Van Berg 2001; Deeben and Rensink 2005; Bos, Bohncke and Janssen 2006; De Bie and Van Gils 2006; Richter 2006; Street et al. 2006; Valentin 2007; Vanmontfort et al. 2010; Gelhausen 2011; Riede, Laursen and Hertz 2011; Richter and Bos 2012; Crombé et al. 2011; Crombé et al. 2013; Heinen 2016b; Grimm 2019).

Furthermore, my findings support the existing consensus regarding chronological and regional patterns in human occupation since the composition and distribution of studied LUP site datasets emphasise different timings *vis-à-vis* the southern and south-western parts of Britain (Barton and Roberts 1996; Barton et al. 2003; Jacobi 2004; Conneller 2007; Jacobi, Higham and Lord 2009; Jacobi and Higham 2011; Pettitt and White 2012; Stevens et al. 2021; Charlton, Brace, Hajdinjak et al. 2022). Specifically, my analyses affirm the near-complete absence of LUP-attributable evidence during first half of the LG Interstadial (GI-e/Bølling chronozone) beyond South Yorkshire and further north. This confirmed pattern is an important observation in the broader context of climatic and environmental conditions, and likely also regarding social/socioeconomic factors since the overall implication is that human occupation only gradually expanded northwards during the second half of the LG Interstadial (GI-1cba/Allerød chronozone).

Interestingly, and in response to one of my hypotheses, the timing for human occupation of the case study locale Farndon Fields can now be confirmed as occurring towards the end of the first half of the LG Interstadial. It is true that several Creswellian *(sensu stricto)* traits are displayed in the Farndon assemblage, such as the distinct platform preparation *en éperon*, the presence of characteristic end-scrapers made on blades, and evidence for long-distance transfer of good quality lithic raw material. In previous publications these characteristics were brought forward to propose a Creswellian classification for the most diagnostic artefacts represented in the Farndon inventories (Garton and Jacobi 2009; Harding et al. 2014). At the same time, the presence of diagnostic curve-backed bi-points and typo-technological parallels with comparable English sites, are compelling arguments in support of classifying the Farndon material as primarily representative of an earlier FMG *faciès* (see Section 2.1.4). Confirmed assemblages of earlier FMG classification are exceptionally rare in Britain and have thus far only been found south of the research area (at Hengistbury Head, Dorset, Barton 1992; La Sagesse, Conneller and Ellis 2007 and Nea Farm, Barton et al. 2009, Hampshire; likely Guildford Fire Station, Roberts and Barton 2021:Fig.1, pers. comm. and my observations in 2014, Wey Manor Farm, Jones and Cooper 2013, and Brockhill, Barton 1997b, all Surrey). The recognition of this variant in the East Midlands represents one of the most notable contributions this study can make.

However (cf. Section 5.3), Creswellian- and earlier FMG attributable traits need not be mutually exclusive. Analogous to S. Grimm's (2019:67) positioning of the continental Final Magdalenian *(sensu lato)*, perhaps the Creswellian technocomplex is representative of an Azilianisation process in Britain, and should therefore be included amongst the Federmesser groups? Personally, I remain open to the possibility of expanding FMG attributions to encompass chronologically older backed blade assemblages. Nevertheless, since a detailed examination of such terminological questions undoubtedly exceeds the scope of this thesis, I shall leave them as open questions for a future occasion; and I remain in eager anticipation of the publication of currently ongoing analyses of other Creswellian- and early FMG-attributable English sites that will provide an improved basis to reassess existing interpretive frameworks on (L. Cooper, N. Barton, W. Mills, pers. comms. 2014-2022 and my observations).

Regarding the nature of LG human presence, clear caveats concerning survey, preservation, and recovery biases contribute to the persistent scarcity of LUP evidence in quantities surpassing the single finds- and small scatter-levels in the

East Midlands and Britain. In theory, open-air sites, or site clusters comparable in assemblage size and extent with their continental counterparts in the Somme Valley, Paris Basin, or Rhineland could have existed in Britain. However, only limited evidence of such kind has thus far been discovered since the earliest LUP cave site surveys in the 19th century. Although "generalising at this stage may be unwise" (Conneller 2009:182), the continued absence may represent sufficiently compelling evidence to characterise the nature of LG human presence as a gradual accumulation of material across a large geographical area by an overall low number of humans who only sporadically ventured towards the north-westernmost inhabitable periphery of LG Europe. If the potential human presence in the research area then only ever was represented against a thin background of intermittent visits over the course of the Interstadial, it would certainly help explain why most larger assemblages and sites may "represent no more than the result of brief stop-overs" (Garton and Jacobi 2009:33) as groups of LG humans moved through the East Midlands. Importantly, it is not my intention to purport a reductionistic equation of lithic assemblage sizes and their composition with the LG humans who left behind these artefacts; I acknowledge that my characterisation of the nature of human presence as 'short-term' relies on an imprecise measurement, and I appreciate that 'small' is an insufficient metric to characterise past residents of the research area. My interpretation rests on the fundamental premise that the humans who lived in these open landscapes were children and adults of all possible ages, sexes, genders, and abilities, and I believe that these people formed and were part of social groups, family units, task collectives and social networks more broadly. Perhaps, whilst living in the East Midlands landscapes, these human groups were moving along riverine corridors, possibly along and around glacial lakefronts, whilst advancing towards upland gorges and cave sites. As my site distribution patterns show, certain caves were repeatedly occupied during the Interstadial, whereas gradually, human presence extended further northwards to previously uninhabited landscapes, possibly due to ameliorating climatic and environmental conditions, changed subsistence patterns, or gradually expanding social networks. However, whether the hitherto known LUP record represents sufficient evidence to identify directions taken during phases of human presence, or, more generally, whether it is possible to identify the mode and speed of human movement (Jochim 1991; Housley et al. 1997:38, 45; Housley, Gamble and Pettitt 2000; Blockley, Donahue and Pollard 2000b; Barton et al. 2003; Gamble et al. 2004; Blockley et al. 2006; Conneller 2007; Terberger, Barton and Street 2009; Davies, Gamble and Housley 2021), or whether the British LUP record instead bears witness of “highly mobile groups practising forms of mobility for which there are no recent analogues” (Conneller 2007:217; Davies 2001:206), shall remain an open question for now, with continued relevance to inspire future investigations. To this end, I consider this improved knowledge concerning LUP occupation of the open landscapes to be of utmost relevance to further investigate questions concerning hunter-gatherers’ lives, their movement, and mobility (Binford 1980; Kelly 1983; Anthony 1990; Jochim 1991; Ingold 2008; Ingold 2011; Leary 2014; Sobkowiak-Tabaka and Diachenko 2022), from a more comprehensive perspective of the ‘lived’ environments rather than the sole study of lithic artefacts.

9.3.2 Recommendations for future work

Concerning future directions for research, the following are but a few of many possible suggested recommendations. At the most overarching level, what are needed are more investigations of and comparisons with the wider British and adjacent continental LUP record, for instance approached through the following three questions: *Firstly, what lies between the Thames and the Trent?* My analyses have shown the demonstratively greater scale and representivity of LUP evidence in the East Midlands open landscapes - yet there remain significant gaps in the distribution of open-air sites between the Trent Valley and the definite site groupings in eastern England, south-central and southwestern Britain. I believe that the most profitable way forward will be to target specific areas with good, yet under-explored, Probable/Possible LUP findspot coverage rather than to approach continuously blank spots on our distribution maps. Investigations of these lacunae should follow once palaeogeographical landscape features are better understood at higher levels of local resolution (cf. Section 9.1.2). To this end, I recommend others to ‘dig into’ the emerging high potential of especially Leicestershire, Lincolnshire, and Rutland. I regard these open landscapes near the geographical centre of England as ideally situated to approach currently under-investigated areas elsewhere in the Midlands and eastern England, for instance by looking beneath important marker horizons such as the extensive spread of aeolian coversands of LLS (GS-1) age that occur all over Lincolnshire, into Yorkshire, and even East Anglia.

Secondly, what is the overall potential and likely chronology of LUP evidence within and beyond North Yorkshire? Although important site and artefact discoveries that on typo-technological grounds have been dated to the first half of the LG Interstadial have been made north and west of Yorkshire and beyond Hadrian's Wall, at sites like Fairnington near Kelso in the Borders, Howburn, and Kilmelfort Cave (Salisbury 1988; Saville 2004; Saville 2005; Saville and Ballin 2009; Bjarke Ballin et al. 2010; Dickson 2011; Smith, Wilkinson and O'Regan 2013:Fig. 1; Ballin et al. 2018; Ballin 2019; Waddington et al. 2020; Ballin 2021), the apparent scarcity of Creswellian-attributable evidence north of the Humber Estuary suggests that human presence in more northern latitudes may primarily fall within the second half of the Interstadial. Nevertheless, more work remains to be done to link up existing evidence more systematically and to investigate the theoretical potential for LG human occupation in these northern to northernmost, marginal environments.

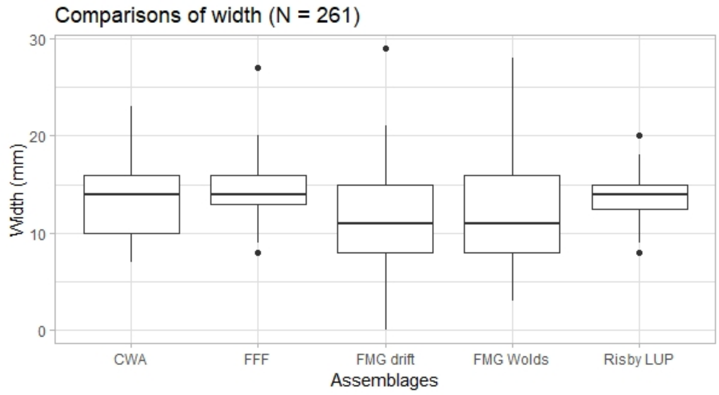
Thirdly, what is the relationship between sites at either end of the now-submerged North Sea Plain, and where were the likely entry points into the East Midlands? Based on the many striking parallels in locational preferences shared by LG human groups in the studied English and adjacent continental record, the increasing corpus of confirmed open-air sites on the British shores constitutes an interesting subject for further chronological, spatial, and typo-technological comparisons with open sites in the Low Countries and further east, also with a view towards genomic studies (Posth et al. 2016; Fu, Posth, Hajdinjak et al. 2016; Posth, Yu, Ghalichi et al. 2023). With regards to the North Sea littoral and Plain itself, LUP evidence is notably under-represented compared with other archaeological periods, which invites further investigations (Coles 1998; Gaffney, Thomson and Fitch 2007; Gaffney, Fitch and Smith 2009; Peeters and Momber 2014; Amkreutz et al. 2018; Walker et al. 2020; van der Plicht and Kuitems 2022).

In working towards these broader themes, more refined local and regional characterisations and comparisons of site distribution would be useful, ideally within the parameters of natural character profiles rather than artificial, administrative boundaries. Promising complementary approaches are more detailed (flint) raw material characterisations, and more in-depth geomorphological and palaeoenvironmental analyses to better contextualise chronological and regional patterns in human presence (Prendergast et al. 2018; Reade et al. 2020; Davies, Gamble and Housley 2021; Stevens et al. 2021; Conneller 2022b; Charlton, Brace, Hajdinjak et al. 2022). Perhaps predictive site location modelling might prove a feasible approach ahead of targeted area studies? Based on the apparent absence of archaeological material attributable to the first half of the Interstadial beyond the Humber Estuary and the Vale of York, I would be very interested in a more detailed understanding of the landscape evolution related lacustrine features such as Lake Humber.

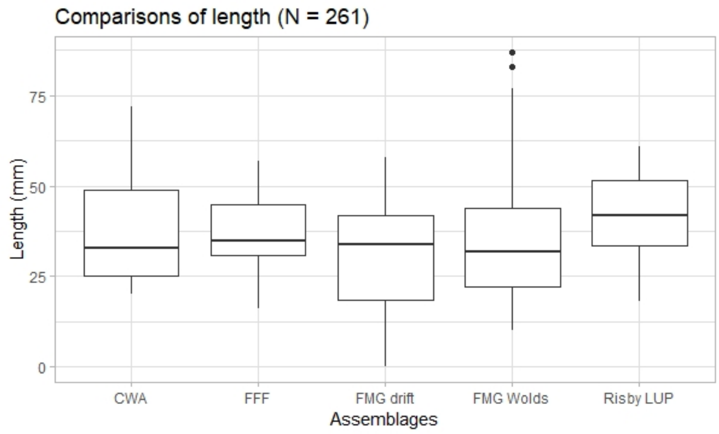
Furthermore, I would be remiss not to remark on how my experiences in working with UK heritage management data records indicate a significant need for HER and PAS enhancement schemes to address classification issues and metadata discrepancies, and to revise existing recording frameworks for non-metallic objects. There needs to be a framework developed by all interested parties, and it would be beneficial to strive towards more homogeneous recording and publication practices across counties, and to aim for better cross-integration of records between stakeholders - not least to enable easier comparisons between the spatial distribution of HER- and PAS-derived data.

I certainly hope that others may yet find fresh impetus to pursue these recommendations further – possibly with a view towards the upcoming 100-year anniversary of the publication of D. Garrod's (1926) monograph. To me, this represents an excellent incentive to discuss and assess the present state of knowledge, a century after Garrod, by bringing together the many ongoing analyses and recently concluded studies awaiting publication, promising interesting points for further comparisons and contributions to future debates (e.g., N. Barton, S. Charlton, L. Cooper, W. Mills, pers. comms. 2020-2022).

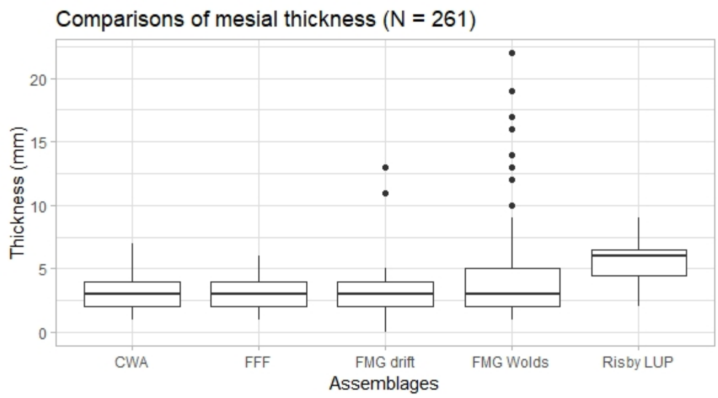
In turning my attention towards the open landscapes, I sincerely hope to have brought some fresh perspectives to the ongoing, ever-evolving debate concerning LG human re-occupation. As always, more evidence may lie but a modern field or two away, where no-one has yet looked.



(a) Comparisons of width (in mm)



(b) Comparisons of length (in mm)



(c) Comparisons of mesial thickness (in mm)

Figure 72: Comparison of width, length, and mesial thickness (in mm; LUP blade and bladelet debitage from Farndon Fields/CWA and FFF data, Seamer Carr FMG material, and Risby Warren retouched LUP tools, N = 261)

Catalogue A

Catalogue of Confirmed and Certain Late Upper Palaeolithic sites

Presented here is a catalogue of the certain and confirmed LUP sites located in the extended East Midlands research area. Included herein are all locales introduced in Sections 2.1.3 and 2.2.3 which constitute the main Creswellian-, FMG- and unspecified LUP-attributable site 'Dataset 1' used for the spatial analyses in Chapter 4. Documented assemblage sizes vary significantly between sites and findspots, as the diagnostic lithic record mainly comprises single finds or smaller scatters. Only very rarely do assemblage sizes exceed 100 recovered lithic artefacts (see Figure 73). The sites analysed as case studies in Chapters 5, 6, 7 were sourced from this dataset of certain/confirmed LUP sites.

The tiered, chronological presentation of the research history and state of knowledge, and specifically the discussion of developments and discoveries since 1977 enabled me to identify a range of probable and possible LUP sites contained within UK heritage management data repositories (Historic Environment Records, the Portable Antiquities Scheme). Based on this evidence, I created a representative sample referred to as 'Dataset 2' (in Chapters 3, 4 and Catalogue B). Hitherto under-reported HER and PAS sites and locales for which I was able to establish a high degree of LUP certainty, were included in Section 2.1.3 and this catalogue. These following locales are comparatively 'new' discoveries which have not yet been reported widely elsewhere:

- Identified via the PAS data: Whitwell area, Derbyshire; Scalford area (with neighbouring parishes of Melton and Wycomb; Leicestershire)
- From personal correspondence and own artefact handling: Ingleby and

Ockbrook (Derbyshire; D. Budge pers. comm. 2015, 2019); Horncastle, Lincolnshire (Hogue 2016 and pers. comm. 2015).

The presentation below is in alphabetical order of surveyed counties and sites are classified based on AMS dates and/or the presence of diagnostic index types (cf. Section 2.1.4; Barton and Roberts 1996; Barton 1990; Barton 2010; Jacobi and Higham 2011:243):

- Classified as **Creswellian-attributable:** lithic assemblages or single finds which have either been contextually dated to the earlier half of the Late Glacial Interstadial (GI-1e/Bølling chronozone), and/or contain diagnostic typo-technological markers such as (bi-)truncated trapezoidal backed blades ('Cheddar' or 'Creswell' points), and/or butts with the distinctive preparation *en éperon* (in Section A.2, Figure 75; cf. Section 2.1.4).
- Classified as ***Federmesser-Gruppen*/FMG-attributable:** lithic assemblages or single finds which have either been contextually dated towards the end of the first half of the interstadial (GI-1e/d), and/or contain characteristic curve-backed points and retouched tools made on longer blade blanks (earlier FMG *faciès*). Material dated to the latter half of the interstadial (GI-1cba/Allerød chronozone), and/or containing diagnostic penknife points, straight-backed bladelets, and shorter scraper types will be classified as the later FMG *faciès* (in Section A.3, Figure 79 cf. Section 2.1.4).
- Classified as **'unspecified LUP'** are finds and assemblages for which no radiocarbon determinations are available and which are insufficiently typo-technologically diagnostic to fulfil the aforementioned criteria (see Section A.5, Figure 80).

Notable Long Blade/Terminal Upper Palaeolithic sites are here purely reported for context (in Section A.5 and Figure 81) and do not form part of my site corpus. Where entries are repeated, this is due to the discovery and recognition of more than one lithic LUP industry at the same site. Recovered and documented evidence from later (Mesolithic to modern) periods is briefly mentioned to provide additional context. Decorated organic implements and site features of note are highlighted. Available radiocarbon dates are included as uncalibrated ages (^{14}C BP) and calibrated date ranges (in cal BP at 95.4% confidence; calibrated using the most recent version OxCal v4.4.4, plotted against the IntCal20 curve; Bronk Ramsey 2009; Bronk Ramsey 2017; Reimer et al. 2020).

< 10 artefacts	< 50 artefacts	< 100 artefacts	< 500 artefacts	> 500 artefacts
Arnold	Ash Tree Cave	Bella Vista Farm	Edlington Wood	Bradgate Park
Beeston Terrace	Boat House/Church Hole Cave	Flixton	Mother Grundy's Parlour	Farndon Fields
Bingham	Cupwith Hill	Langwith Cave	Robin Hood's Cave	Launde (TUP)
Brigham Hill	Dead Man's Cave	Pin Hole Cave	Seamer Carr C, L	Seamer Carr K
Brumby Wood	Dowell Hall Cave	Risby Warren		
Church Dale Shelter	Elder Bush Cave	Salmonby		
Conistone Dib	Fox Hole Cave			
Cotgrave	Hooton Roberts			
East Stoke	Little Spinney/Froggatt			
Gonalston	Lob Wells Shelter			
Harborough Cave	One Ash Shelter			
Haxey	Ossum's Cave			
Horncastle	Rookery Farm			
Ingleby	Scalford			
Jubilee Cave	Thor's Fissure			
Kinsey Cave	Whaley Rock Shelter			
Lindholme				
Lound				
Louth				
Morton				
Ockbrook				
Old Woman's House Cave				
Raven Scar Cave				
Ravenscliffe Cave				
Scratta Wood				
Stoney Low				
Tetford				
Treeton				
Tuxford West Farm				
Victoria Cave				
Washburn Foot				
Whitwell Area				
Willows Farm				
Wroot				
Yew Tree Cave				

Figure 73: Overview of assemblage sizes for confirmed LUP catalogue entries

A.1 Consulted sources

Data was primarily sourced from the mainstream archaeological literature (including Garrod 1926; Campbell 1977a; Wymer and Bonsall 1977; Jacobi and Higham 2009b:Figs. 11-12; Pettitt and White 2012:Figs. 8.4, 8.15, 8.17; see 4, Sections 2.1.3, 2.2.3). The Jacobi Archive (PaMELA Database, Wessex Archaeology and Jacobi 2014 and personal archives) provided additional information. Further data was predominantly sourced from national and regional research frameworks (e.g., Membery 2000; Pettitt, Gamble and Last 2008; Historic England 2018e; Knight et al. 2021), statutory data such as Historic England's Schedule of Monuments (see Section 4.1.1; Historic England 2019h), and Historic Environment Records (Historic England 2019c; Derbyshire HER 2018; Historic England 2019f; Historic England 2017a; Leicestershire and Rutland HER 2018; Historic England 2018b; Historic England 2018d; Historic

England 2017d; Historic England 2017b; Historic England 2017c). Other published sources were consulted (papers in Barton, Roberts and Roe 1991; Barton and Roberts 1996; Barton et al. 2003; Barton and Roberts 2004; Jacobi 2004; Reynier 2005; Conneller 2007; Terberger, Barton and Street 2009; Barton 2010; Jacobi and Higham 2011; Pettitt and White 2012) and The Portable Antiquities Scheme (The Portable Antiquities Scheme 2017). Planning policy and research frameworks, as well as published guidance documents have furthermore informed this study (UK Parliament 1979; Pettitt, Gamble and Last 2008; Department for Communities and Local Government 2012; Hind, Jones and Spandl 2014; Historic England 2015; Ballin 2017a; Historic England 2018a; Historic England 2018e; Historic England 2019b; Historic England 2019a; Historic England 2019h; Ministry of Housing, Communities and Local Government 2019; Knight et al. 2021).

The Council for British Archaeology's Gazetteers of Mesolithic and Upper Palaeolithic sites in England and Wales served as a key resource to identify grid references, relevant primary literature, and presumed whereabouts of cited lithic collections (Wymer and Bonsall 1977). The Upper Palaeolithic volume of the Gazetteer (Bonsall 1977b) was largely informed by and collated based on John B. Campbell's and Roger M. Jacobi's doctoral research (Campbell 1971, reproduced verbatim in Campbell 1977a; Jacobi 1976; Wessex Archaeology and Jacobi 2014) and significant contributions made by other researchers. Indeed, particularly Jacobi's work on the Mesolithic entries to the first half of the Gazetteer (Bonsall 1977a) provided the foundation for the National Monuments Records (1984). Notably, the 31 LUP findspots from the extended East Midlands research area mentioned in the Gazetteer are predominantly cave sites or records of finds in the downwash from caves or rock shelters (23 entries; Bonsall 1977b). The Upper Palaeolithic Gazetteer therefore gives a rather one-sided view of prehistoric activity patterns, in stark contrast to the vast records of open-air Mesolithic sites listed in part one of the volume (Wymer 1977; cf. p. 1). Although it is a gazetteer, and its contributors acknowledged that uncertainties regarding precise chronological classification remained, this Gazetteer still constitutes an important reference for Late Glacial archaeology in the UK due to the inclusion of Ordnance Survey National Grid findspot locations, collections' composition and whereabouts, collector's names and key references. All of the cited works within the Upper Palaeolithic Gazetteer were consulted first-hand (see Figure 74), as were all yearbooks and reports published from the main research area between 1977-2021 to cover any potential site reports or artefact discoveries made after the publication of the Gazetteer in 1977 (e.g., The Antiquaries Journal, Proceedings of the Prehistoric Society, Derbyshire Archaeological Journal, Rutland Record, Transactions of the Leicestershire Archaeological and Historical Society, Transactions of the Thoroton Society).

The main resource used for information regarding individual artefacts is the Palaeolithic and Mesolithic Lithic Artefact Database (hereafter: PaMELA) which is the digitised, open-access online version of R. Jacobi's extensive record cards archive (accessible via the Archaeology Data Services, Wessex Archaeology and Jacobi 2014). All PaMELA ID numbers cited herein refer to the unique record card identifier which can be queried directly through the online search interface. For his recordings, Jacobi primarily targeted extant finds held in museums and private collections and relevant material from contract archaeology unit-led surveys or excavations is generally under-represented on the database (Jacobi 2014a). Cross-comparisons have not been possible for archaeological material discovered after Jacobi's death in 2009, but findspot classifications have been verified using other sources. Where possible, I have consulted the relevant site assemblages, archives, and individual finds in person.

Furthermore, I have viewed approximately 1200 artefacts from the following cave assemblages first-hand: Gough's Cave (Cheddar Gorge Museum), Symonds Yat and Pixie's Hole (from the collection of S. N. Collcutt and R. N. E. Barton), Paviland (Ashmolean Museum), Wookey Hole and Mother Grundy's Parlour (Burkitt/McBurney collections, Museum of Anthropology and Archaeology, Cambridge). Although several of these viewed assemblages are not from the research area, this broader approach to British LUP material enabled me to better contextualise the eastern England evidence.

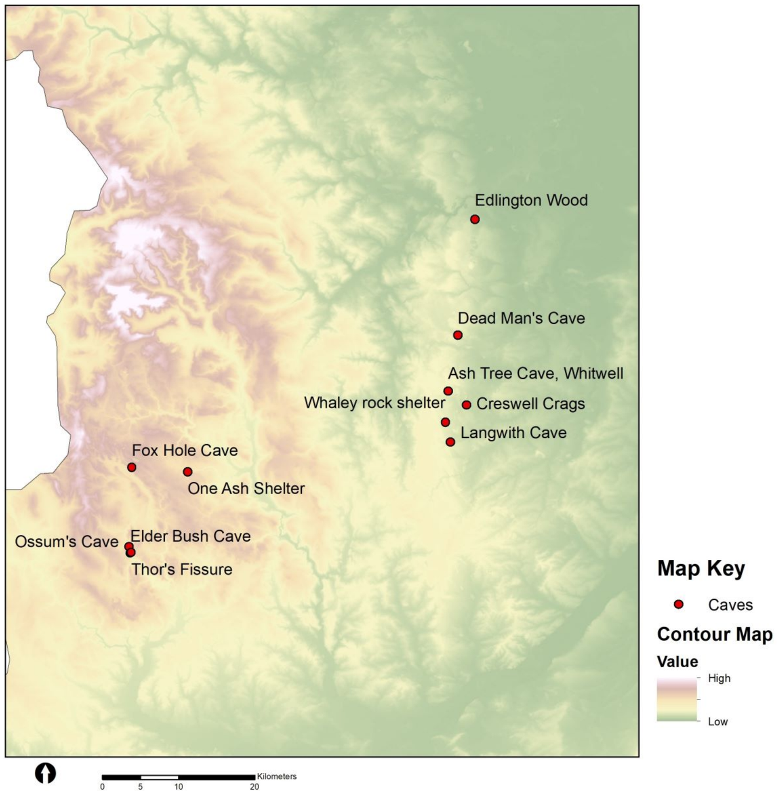
Other consulted open-air assemblages include the late Bill Bee's private collection of surface finds from Tetford and Salmonby parishes in the Lincolnshire Wolds (c. 300 artefacts, including finds displayed at the Collections Museum, Lincoln) and c. 50 stray surface finds from Derbyshire and Lincolnshire (as made available to me by D. Budge, P. Chowne, and J. Hogue). Furthermore, I have viewed the entirety of the lithic assemblage from Sheffield's Hill held at Scunthorpe, and Seamer Carr C (with thanks to C. Conneller). Lynden Cooper is thanked for providing me access to view parts of the Bradgate Park LUP assemblage 'fresh' in the field. From beyond the research area, I was able to view, but not record, the lithic assemblages from Guildford Fire Station (at Oxford Archaeology) and La Sagesse Convent, Hampshire (at Wessex Archaeology). Where accessible, online collections were also consulted ahead of research

Figure 74: Reviewing all bibliographical entries in Wymer and Bonsall 1977 (own edited photograph, taken on location at Duke Humphrey's Library, Old Bodleian, June 2016)

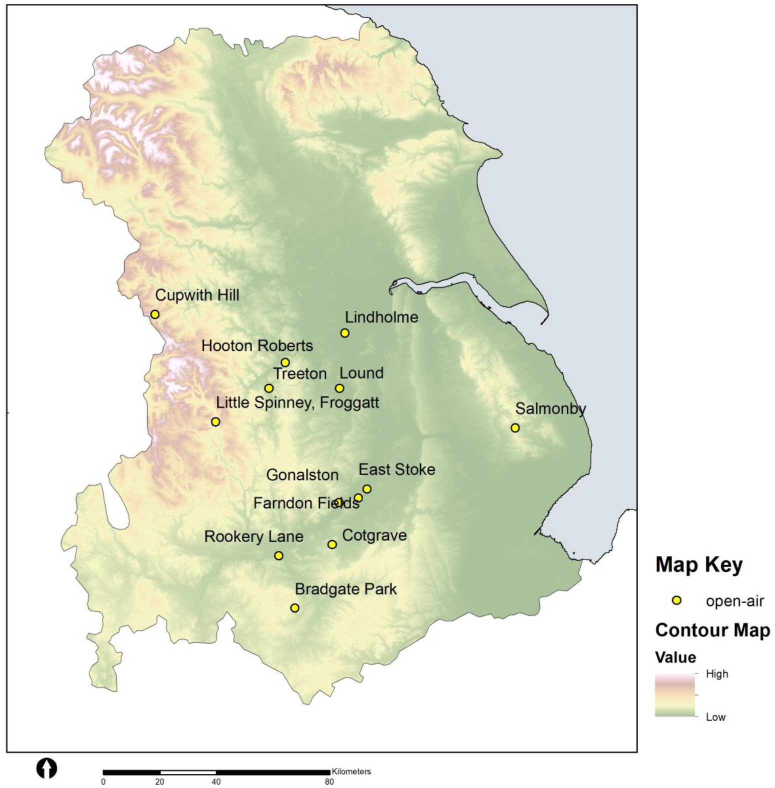
visits to a number of museums, including the Ashmolean (Ashmolean Museum 2019b; Ashmolean Museum 2019a), Pitt Rivers (Pitt Rivers Museum 2016; Roberts 2013), British Museum (Trustees of the British Museum 2019a), Creswell Crags Visitors Centre (Creswell Crags Trust 2017b), Museum of Anthropology and Archaeology (Museum of Anthropology and Archaeology 2019) and The Collections Museum in Lincoln (Lincolnshire County Council 2012). Access to online databases has varied greatly over the course of this study due to internal database reorganisations and online collections temporarily going offline.

A.2 Sites classified as Creswellian

Sites listed below and shown in Figure 75 represent the key Creswellian-attributable locales and assemblages (cf. Section 2.1.4). Note that terminology may vary between consulted sources (i.e., 'Late(r) Upper Palaeolithic' and 'Late Magdalenian' in lieu of my preferred Creswellian attribution). Assemblages containing Hamburgian shouldered points are included in this GI-1ed/Creswellian-attributable grouping based on dates from comparable continental sites (Weber 2012; Grimm and Weber 2008; Bjarke Ballin et al. 2010; Grimm, Skov Jensen and Weber 2012; Pettitt and White 2012:Fig. 8.15).



(a) Cave sites



(b) Open-air sites

Figure 75: Catalogued Creswellian-attributable sites (map by J. Kotthaus and L. Grottenberg. Contains OS data, Crown copyright and database right 2021)

A.2.1 Derbyshire

Ash Tree Cave, Whitwell (SK 51485 76144, E: 451485, N: 376144)
Alternative name: Whitwell Cave. Scheduled cave site (Wymer and Bonsall 1977:54, 418; Armstrong 1957; Historic England 1991a; Derbyshire HER 15123, Derbyshire HER 1939). Excavations by A. L. Armstrong who appears to have been the first to suggest a Creswellian-attribution (Armstrong 1939). Later excavations by Prof. C. McBurney of Cambridge (results unpublished). Material reportedly deposited at Sheffield City Museum and the Museum of Archaeology and Anthropology, Cambridge (MAA Z31279.1-9, Z31280.1-6), although I was unable to relocate the physical artefacts during a research visit to Cambridge in 2016.

Evidence for Mid-, Early- and Later Upper Palaeolithic site occupation, as documented by unmodified faunal remains ("Reindeer, Fox, White Rhino", and Jacobi noted the presence of modern bird bone and snail shells mixed with the older contexts; PaMELA ID 5010). Armstrong recorded admixture of Mousterian and LUP material (Armstrong 1956:62). There are 87 entries on Wessex Archaeology and Jacobi 2014 in which Jacobi recorded artefacts made from a range of different primary materials (inorganic: flint, chert, quartzite; organic: bone, teeth), derived from different excavations and archaeological periods. Jacobi's records draw several cross-comparisons with artefacts from Pin Hole Cave and Mother Grundy's Parlour. Based on accession numbers I believe there is overlap between finds recorded by Jacobi and the artefacts I was unable to relocate at Cambridge. Only a small number of entries can be related to the LUP phase of cave occupation, such as PaMELA ID 4939, a tang fragment of a penknife point cf. Armstrong, and the burin (ID 4994) which Jacobi regarded as 'clearly LUP' with signs of use wear from twisting/boring.

Boat House Cave and Church Hole Cave, Worksop (SK 53544 74219, E: 453544, N: 374219)
Both cave sites appear on the same Schedule of Monuments entry (see Figure 76; Historic England 1979b; Derbyshire HER 34806, Nottinghamshire HER M4373; excavated by J. Magens Mello and W.B. Dawkins, later by A.L. Armstrong; Mello 1875; Mello 1876; Mello 1877; Dawkins 1876; Dawkins 1877; Garrod 1926; Derbyshire HER 1875; Jenkinson 2023b). Information regarding archaeological material from Boat House Cave is sparse, beyond the Creswell Crags Visitor Centre's reporting that A.L. Armstrong resorted to explosives to reach the

concreted cave floor (Creswell Crags Trust 2017a). Site use during the Holocene is documented by extensive records of Roman to early medieval finds.

Palaeolithic occupation of Church Hole can be dated from the Mousterian up to the LUP (Wymer and Bonsall 1977:428; collections held at the British Museum, Natural History Museum London, Bolton, Derby, Manchester, Sheffield City Museum). There are 142 entries for Church Hole Cave on PaMELA, of which the LUP component forms but a small part. Of note are PaMELA ID 1894, a backed and obliquely truncated blade cf. Gough's Cave, a proximal fragment (ID 1918) with preparation similar to a *talon en éperon*, which is also present on IDs 1885, 1964, 1978, 1979, 1994, 2019, 2046 (Jacobi in litt., undated). Two cut marked arctic hare *(Lepus timidus)* bone fragments have returned the following dates: OxA-18704 12,395 ± 45 ^{14}C BP (14,850-14,216 cal BP, accession number MANCH LL 7431/P2218) and OxA-18706 12,355 ± 50 ^{14}C BP (14,837-14,124 cal BP, accession number MANCH P 2120; Jacobi and Higham 2011:Table 12.9). More details can be found in Jacobi 2007, also regarding the antler rods found at Church Hole, which have been dated to (OxA-3718) 12,250 ± 90 ^{14}C BP (14,835-13,872 cal BP) and 12,020 ± 100 ^{14}C BP (14,105-13,607 cal BP, OxA-3717; Hedges et al. 1994:339; Pettitt and White 2012:475 and Text Box 8.4; Hedges et al. 1989:214).

Church Hole Cave is furthermore home to the UK's only verified example of parietal cave art, interpreted to represent bison, reindeer and birds, as well as other abstract motifs (Bahn, Pettitt and Ripoll 2003; Ripoll et al. 2004; Bahn 2007; Pettitt, Bahn and Ripoll 2007b). Additional reports mention the discovery of possible sewing tools such as a line spindle and eyed needles made on bone (Jacobi 2007).

Creswell Crags, Elmton/Holbeck/Worksop (centred on SK 53894 74352, E: 453894, N: 374352)

See also Church Hole Cave, Mother Grundy's Parlour, Pin Hole, and Robin Hood's Cave. Some of the most well-known LUP sites in Britain are located in the Creswell Gorge on the Derbyshire/Nottinghamshire border (see Figure 76; Pettitt and White 2012:Fig. 8.4, Fig. 8.15), and any attempts at a comprehensive summary of surveys and results would far exceed the present scope. What makes the Creswell Crags unique in a British setting is the sheer number of sites with material records which span from the Middle Palaeolithic to medieval times, the high degree of preservation of organic remains, and discoveries of both parietal cave art and *art mobilier*. Most of the Creswell Crags Scheduled Monument boundary is in the ownership of the Welbeck Estates (Historic England 1986).

Due to the length of documented research interest and investigations from c. 1870 onwards and wealth of sites and findspots, material from Creswell Crags may be found across figuratively 'all' British museums and in the private collections of notable 19th and 20th century archaeologists. The widespread distribution of artefacts which cannot always be provenanced beyond a generalised 'Creswell Crags' site label in lieu of more location-specific IDs has made it difficult to fully establish the current whereabouts of all artefacts of interest, or of all site archives. Artefacts previously held at the British Museum are now deposited as long-term loans to the Creswell Crags Visitors Centre (Wymer and Bonsall 1977:51, 418, 423, 428; Creswell Crags Trust 2017b; Historic England 1979b; Derbyshire HER 1984; Nottinghamshire HER 2019a; Historic England 1979a; Jenkinson 2023b). There are at least 155 entries on the PaMELA Database in addition to the site-specific records and numerous cross-record references (Jacobi in litt., undated). In general, assemblage sizes for each phase of site occupancy are small (<200 artefacts). Based on assemblage size and composition, site use at Creswell Crags has been interpreted as representing brief episodes of site occupation in the gorge which may be linked to seasonal patterns of animal migration (Pettitt 2008; Pettitt and White 2012:445). The assemblages reflect evidence for on-site production of laminar blade blanks and subsequent tool modification.

Whereas the LUP assemblage at Gough's Cave, Somerset, still represents the single largest LUP assemblage in Britain (Jacobi 2004), the Creswell Crags are the index type location for both the eponymous Creswell point (an angle backed point with a single oblique truncation) as well as the namesake term 'Creswellian' to classify finds of earlier LUP date (Garrod 1926:194; cf. Section 2.1.4 and p. 42).

Fox Hole Cave, Earl Sterndale, Hartington Middle Quarter (SK 09975 66179, E: 409975, N: 366179)

Scheduled cave site with exceptional views from the cave entrance, excavated in 1962-5 by D. Bramwell (i.a. personal collection; Bramwell 1962; Bramwell 1971; Bramwell 1977:8, Fig. 51.5; Campbell 1971; Campbell 1977a; Wymer and Bonsall 1977:424; Derbyshire HER 1928; Historic England 1991c; Pettitt and White 2012:475, Figs. 8.4-6, Figs. 8.15-16). Jacobi (in litt., undated) reports LUP shouldered points (PaMELA IDs 3874, 3890), backed blades (ID 3906), and several Early, Middle and Late Mesolithic microliths.

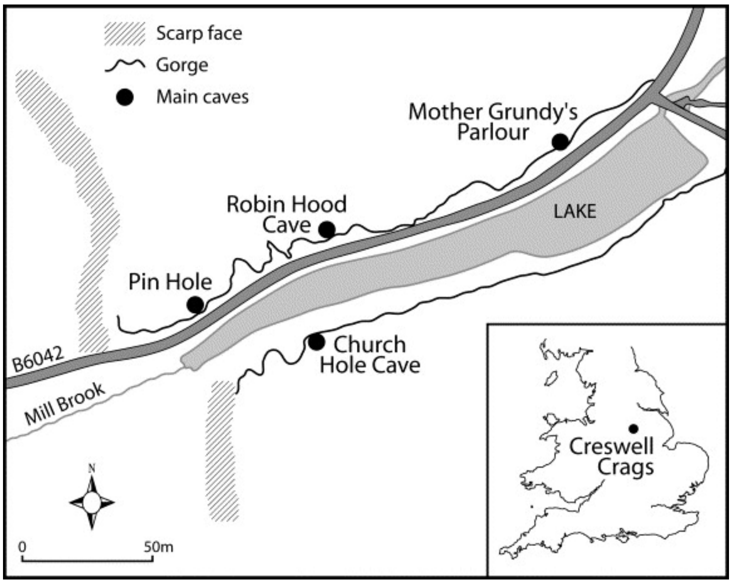


Figure 76: Overview of main Creswell Crags LUP sites (after Pike et al. 2005:Fig. 1)

Langwith Cave, Nether Langwith, Scarcliffe (SK 51799 69497, E: 451799, N: 369497)

Scheduled cave site (Historic England 1936; Pettitt and White 2012:Fig. 8.4), excavated between 1903-12 and in 1927 (finds held at Derby and Oxford University Museum; Mullins 1913; Garrod 1926; Garrod 1927; Wymer and Bonsall 1977:424). A small collection of lithic 'Creswell' finds which I viewed in Cambridge are from D. Garrod's excavations at Langwith (Museum of Archaeology and Anthropology accession numbers: 1952.31.1, 1952.31.2, 1952.32.1, 1952.33.1, 1952.34.1). Additional finds from Langwith at Cambridge (IDs 1976.455.1-2) could not be conclusively verified as deriving from Langwith (but are presumed to derive from one of the Creswell Crags sites; own observations).

There are 47 entries on the PaMELA Database predominantly based on Garrod's collection. LUP artefacts for instance include an awl (PaMELA ID 2796, compared to a find from Robin Hood's Cave), Creswellian-indicative backed blades (IDs 2792, 2801, 2803, 2810), the 'atypical' shouldered point classified as PaMELA ID 2814 (Pettitt and White 2012:Fig. 8.17), a *Zinken* (ID 2743), and evidence for the use of a soft stone hammer (Jacobi in litt., undated). Mullins 1913 reports discoveries of unmodified reindeer remains.

Little Spinney, Froggatt (open-air findspot, SK 2447 7602, E: 424470, N: 376020)

Open-air findspot situated on a slope overlooking the River Derwent, where a small collection of lithic artefacts were discovered beneath a large boulder during levelling of a private garden in 1960 (Derbyshire HER entry 5902; Wymer and Bonsall 1977:424; Pettitt and White 2012:Fig. 8.4). Finds are held in the A. H. Henderson Collection (Henderson 1973). The findspot's setting has been described as occupying an ideal hunting location where animals could be disadvantaged and intercepted, comparable to Bradgate Park, Leicestershire (Pettitt and White 2012:451). One of the recovered proximal ends shows preparation using a *talon en éperon* (PaMELA ID 655; Barton et al. 2003:636), but besides a crested blade (ID 662) the small assemblage is lacking in other typical Creswellian technological traits, possibly due to admixture or the uncertain relationship between finds found during different episodes of fieldwalking at Little Spinney. PaMELA ID 664 is a fragmented blade with semi-abrupt retouch, reminiscent of an unspecified find from Gough's Cave (Jacobi in litt, undated) and ID 661 is a long end scraper on a laminar blade blank. The angle burin (ID 656) is compared to a burin found at Spa Farm, Treeton (coordinates or PaMELA ID unspecified).

Mother Grundy's Parlour, Elmton (SK 535 742, E: 453500, N: 374200)

This scheduled cave site with an enigmatic name has an equally enigmatic anecdote surrounding the presumed earliest explorations. According to the Creswell Crags Visitors Centre (Creswell Crags Trust 2017a), in the mid-19th century a local man undertook unsystematic excavations at the site for the purpose of 'finding treasure', as had been foretold in his wife's dream. According to this legend, he discovered a hippopotamus tooth that he then sold. Subsequent surveys have thankfully adopted an entirely different and more measured investigative approach to this important site.

Mother Grundy's Parlour (hereafter: MGP; Derbyshire HER entry MDR6568) has been investigated several times: in 1924 (A.L. Armstrong), 1959-60 (C. McBurney), 1969 (J. Campbell), 1975 (S. Collcutt). The material is deposited at the British Museum*, Museum of Archaeology and Anthropology, the Pitt Rivers and Worksop* (*reportedly moved to Creswell Crags Visitors Centre cf. Derbyshire HER, in litt.; reported in Armstrong 1925; Garrod 1926; Campbell 1970; Campbell 1971; Campbell 1977a; Wymer and Bonsall 1977:51, 423; Jenkinson 1984; Jenkinson 2023b). Recent investigations of downwash/scree in front of the cave entrance were undertaken by R. Dinnis, P. Pettitt and M. White (results unpublished; pers. comms. 2015-2016). The complete lithic assemblages from MGP comprise evidence for multiple phases of occupation during the Middle and Later Upper Palaeolithic (estimated 2-400 LUP artefacts, including c. 60 backed pieces). Evidence for repeated site use during the Mesolithic, and from Roman to medieval times. There are 400 entries on the PaMELA Database. Dates taken on humanly modified horse have returned the following dates: OxA-20192, 12,470 ± 55 ^{14}C BP, 14,984-14,314 cal BP, and OxA-19507, 12,180 ± 50 ^{14}C BP, 14,309-13,869 cal BP (Jacobi and Higham 2011).

MGP is of central interest to British LUP studies due to the disproportionately large number of recovered backed pieces in relation to other retouched artefacts. The lithic material from MGP has been interpreted as representing evidence for a transitional Creswellian/*Federmesser-Gruppen* phase, in addition to containing separate Creswellian and *Federmesser-Gruppen* assemblages (Pettitt and White 2012:Fig. 8.18). As such, MGP represents a highly interesting site with the potential to further investigate the topical question of Late Glacial human re-occupation of the East Midlands. Although I began to collect data with the intention to include MGP as a case study, an in-depth re-analysis of this site was only reluctantly omitted from this thesis for several reasons, including the availability and whereabouts of data and known difficulties concerning the stratigraphic concordance of artefacts, and my overall decision to focus on analysing lithic assemblages from open-air sites in this study. However, a full re-investigation of the MGP material should be of high priority for any future UK LUP research projects.

Penknife and backed points have been found in far higher frequencies at MGP than at any other British LUP site (Campbell 1977a:171-3, "layers LB and SB"; Armstrong 1925: "base and lower middle zones"; McBurney 1959: "layer B"). During my data collection I initially sought to identify and relocate the artefacts which Armstrong refers to as comparable to finds from Risby Warren and Sheffield's Hill, Lincolnshire (see Chapter 7; penknives found in base and lower spits, in Armstrong 1931a; Armstrong 1925:Figs.10.7-10; Jacobi 2004:72; Armstrong 1932; Armstrong 1942; Armstrong 1956; Clark 1932; Jacobi in litt., undated). As there remains some uncertainty regarding the current whereabouts of Armstrong's MGP collection, my cross-comparisons were primarily based on artefact illustrations which indicate a typological variation in penknife and backed points and include pieces which I would classify as partially backed points rather than penknife points *sensu* Garrod (Campbell 1977a:Figs. 144:2-3, 146:10-14).

High frequencies of penknife points persist in the higher "transitional" layers producing "Mesolithic/LUP" assemblages at MGP, i.e., Armstrong's "middle spit or middle zone", McBurney's Interface C/B and Campbell's Interface C/B, and are furthermore accompanied by increasing numbers of Early Mesolithic obliquely blunted points within the same interface (Campbell 1977a:173). Based on my data collection of a representative sample of Early Mesolithic artefacts found on Risby Warren, Lincolnshire, there are several typological and technological parallels between the two assemblages.

Armstrong's collection of MGP artefacts is reportedly stored at the British Museum. However, the collection catalogue entries and acquisition dates (including 37 records of unknown discovery date acquired as recently as 2011; Trustees of the British Museum 2019a accession number 2011,8050.21) do not match the entire known extent of Armstrong's excavated assemblage. Moreover, the overview on Trustees of the British Museum 2019a lists only four penknife points, none of which appear to match previously published artefact drawings (Campbell 1977a:Figs. 144-150). The more recently acquired artefacts are classified as 'Upper Palaeolithic/Mesolithic' and may be the aforementioned material from Armstrong's "middle zone" (i.e., Earlier Mesolithic), although definite certainty is pending further investigations. Furthermore, during a visit to the Museum of Archaeology and Anthropology in Cambridge in 2016 I was unable to relocate or access substantial parts of McBurney's excavated lithic material due to internal reorganisations of the online and physical collections (requested material: Boxes/ID 1983.184, 1980.1014-1016; I. Gunn, pers. comm. 2016). The new online collections resource was relaunched in August 2020. The material I initially queried appears to have been relocated, but due to Covid measures, closures and restrictions it has not been possible to pursue this line of enquiry further.

The third major collection (ex J. Campbell; Wymer and Bonsall 1977:423) of MGP finds was on loan to the Pitt Rivers Museum, however, as A. J. Roberts was able to establish, this material had since been returned to J. Campbell and may be the collection donated to the Creswell Crags Museum in 2007 (Roberts 2013:170; in Derbyshire HER record MDR6568). Additional MGP finds were also stored at Worksop and Bassetlaw museums and have likely been integrated into the Creswell Crags Trust collections. Despite these leads with regards to the collections' whereabouts, more work remains to be done to relocate all artefacts of interest, especially concerning those derived from the 'transitional' excavated layers (Campbell 1977a:173).

One Ash Shelter, Lathkill Dale, Monyash (SK 173 656, E: 417300, N: 365600)

Only very little is known about this reported cave site (Derbyshire HER: MDR1271). One Ash Shelter was excavated in 1927 or 1928 by T. A. Harris whose discoveries included a small number of LUP finds (a backed point, a core, 21 flint flakes associated with unmodified reindeer bones), as well as a Neolithic circular knife and leaf-shaped arrowhead (in T. A. Harris Collection, Wymer and Bonsall 1977:424; Bramwell 1962; Campbell 1971; Campbell 1977a). There are no associated entries for this site on the PaMELA Database.

Pin Hole Cave, Creswell Crags, Elmton (SK 533 741, E: 453300, N: 374100)

Scheduled cave site in the Creswell Crags (alternative spelling in older records is 'Pinhole Cave', Historic England 1979a, Derbyshire HER number MDR6578; excavated in 1874 and between 1924-38, later by S. Collcutt in 1974, and R.D.S. Jenkinson; material held at British Museum and Manchester Museum). First reported in Mello 1875, subsequent surveys by: Armstrong 1925; Garrod 1926; Armstrong 1928; Armstrong 1931c; Kitching 1963; Wymer and Bonsall 1977:51, 418, 423; Jenkinson 1984; Jacobi 2007(:Table 7.9). Post viva, R.D.S. Jenkinson's final publication on Pin Hole Cave was published posthumously, including the extensive Creswell Heritage Area Digital Archive (1874-2018) dataset. Both of these resources are of great potential for future research into the "epicentre of Quaternary evidence within the Creswell Gorge" (Jenkinson 2023a; Jenkinson 2023b).

There are 390 entries on the PaMELA Database which report on lithic artefacts and organic material (Wessex Archaeology and Jacobi 2014; post-LGM faunal assemblage includes humanly modified arctic hare and reindeer). Documented evidence for site use during the Middle and Later Upper Palaeolithic, up to Roman and medieval times. The lithic assemblage contains 17-23 backed points and is classified as Creswellian, and *Federmesser-Gruppen*-attributable finds are represented by curve-backed points of which some show possible signs of impact damage (e.g. PaMELA ID 5847). Jacobi has recorded traces of percussion using soft stone on PaMELA ID 6064, and ID 6092 is described as a double piercer made on a trapezoidal backed blade, comparable to a similar find from Langwith Cave. Direct radiocarbon dates taken on humanly modified arctic hare (awls made on tibiae) returned dates between (OxA-3404) 12,510 ± 110 ^{14}C BP, 15,160-14,225 cal BP and (OxA-1467) 12,350 ± 120 ^{14}C BP, 14,965-14,060 cal

BP (Jacobi 2004; Jacobi 2007; Jacobi and Higham 2011). While these dates evidence LUP occupation and meat processing at Pin Hole, due to unclear internal stratigraphy between artefacts found in the Upper Cave earth, these dates are indicative of Creswellian activity, but not directly associated with it.

One of the most notable LUP finds from Pin Hole is an anthropogenic figure known as 'Pin Hole Man' engraved on a fragmented rib of woolly rhinoceros (*Coelodonta antiquitatis*; BM object Palart.854, Trustees of the British Museum 2019b; Sieveking 1987). This rare British example of LUP *art mobilier* was discovered during A. L. Armstrong's 1926 excavation. The object's authenticity has been subject to some scrutiny, not least since woolly rhinoceros became extinct in Britain after the Last Glacial Maximum, which raised some questions regarding Armstrong's interpretation of the artefact as LUP. Analyses undertaken in 2004 at the British Museum Scientific Research Laboratory have since been able to establish that the rib was most likely "deposited in the cave before 20,000 years ago, then found and used as the support for the drawing around 13,000 years ago", and incorporating already existing post-depositional lines on the bone's surface (Trustees of the British Museum 2019b). Other discoveries of humanly modified bone/antler include a costa/rib-bone decorated with cross-hatched pattern and an engraved mammoth ivory *sagaie* (Campbell 1977a:148; Pettitt and Bahn 2007:20; Pettitt 2008; Pettitt and White 2012:Fig. 8.8; Jenkinson 2023a).

Robin Hood's Cave, Elmton (SK 53544 74219, E: 453544, N: 374219)

Part of the Scheduled Creswell Crags sites, located at the northern end of the ravine (Historic England 1979a, Derbyshire HER entry MDR6573). Dubbed "a popular home for people during the ice age" due to the discovery of artefacts from the Mousterian through to LUP, and later deposition of Roman to medieval artefacts (Creswell Crags Trust 2017a; Creswell Crags Trust 2017b). Excavated several times, first between 1874-6 (W. Boyd Dawkins, Magens Mello, with T. Heath of Derby Museum whose contributions were largely under-reported during his lifetime) and in 1969 (J. Campbell), later by R. Jenkinson (Jenkinson 1984; Jenkinson et al. 1986; material held at the British and Natural History Museum, Bolton, Doncaster, Manchester, Preston (HM), Sheffield City Museum; Mello 1875; Mello 1876; Mello 1877; Dawkins 1876; Dawkins 1877; Garrod 1926; Campbell 1969; Campbell 1970; Campbell 1977a:171-74, 185; Jenkinson 2023b). The assemblage from Robin Hood's Cave represents one of fewer than ten "totally unmixed collections of Creswellian artefacts" (Barton et al. 2003:634-35; Table

1). Material excavated during J. Campbell's 1969 season (Wymer and Bonsall 1977:418) has since been returned from the Pitt Rivers Museum to its legal owners (Roberts 2013:170; presumed donated to Creswell Crags Trust by J. Campbell in 2007, cf. Derbyshire HER entry MDR6573, in litt., undated). The most recent archaeological interventions took place in 2015 and were undertaken in conjunction with repairs of the wooden steps outside the cave entrance, which uncovered a small number of mixed Middle, LUP and modern artefacts (Davies 2015).

There are 770 related entries on the PaMELA Database for finds from all documented Palaeolithic periods. The extant assemblage from Robin Hood's Cave comprises 2-400 lithic artefacts and c. 40 backed points, which makes it one of the largest Creswell Crags assemblages. The diagnostic LUP component includes Creswellian index types such as angle-backed points with a single or two truncations, shouldered points, endscrapers on long, slender laminar blades, burins, piercers and combination tools (Jacobi in litt., undated; Garrod 1926:Fig. 29, 31; Campbell 1969:Fig. 7.9; Campbell 1977a:Figs. 152-153; Jacobi and Higham 2011:Fig. 12.10). The recovered faunal remains include reindeer and humanly modified arctic hare which have been dated from 12,465 ± 60 ^{14}C BP, 14,986-14,300 cal BP (OxA-17525) to 12,265 ± 50 ^{14}C BP, 14,804-14,051 cal BP (OxA-18349; Jacobi and Higham 2011:Table 12.9; Charles and Jacobi 1994). An awl made from arctic hare tibia was found by J. Campbell in a 19th century spoil heap and returned a date of 12,580 ± 110 ^{14}C BP, 15,271-14,315 cal BP (OxA-3416).

Although its authenticity and origin have been contested since its discovery by Mello, the most notable find from Robin Hood's Cave is the UK's only documented example of decorated bone with a faunal motif - an engraved rib fragment showing a lateral view of an anatomically correct horse head overlain with striated lines (Trustees of the British Museum 2011; Sieveking 1987; Pettitt and White 2012:cover image).

Whaley rock shelter, Bolsover (SK 51130 72120, E: 451130, N: 372120)

Group of rock shelters excavated by A. L. Armstrong in 1937 and later by J. Radley (Derbyshire HER entry 11232; Radley 1967). There are 19 entries on the PaMELA Database and the recordings were predominantly taken on J. Radley's finds, although Jacobi also cites the Armstrong Collection. Faunal remains (shed reindeer antlers) dated to the Middle Palaeolithic (OxA-4433, OxA-4434, Hedges et al. 1996). Small assemblage of LUP finds and Early to Late

Mesolithic microliths. Diagnostic LUP retouched tools include backed point fragments ('Creswell' points with a single oblique truncation, PaMELA IDs 4031, 4013), penknife points (IDs 4002, 4032), a *Federmesser*/penknife point (ID 4001), backed blades (ID 4021, derived from a scatter of Romano-British pottery), and an angle-burin on a fragmented blade (ID 4010). Another comparable angle-burin (ID 7675) was discovered in a nearby turnip field during fieldwalking.

A.2.2 Leicestershire

Discoveries made in Leicestershire over the past three decades have been instrumental towards the improved understanding of human re-occupation of open-air, lowland landscapes. This is illustrated for instance by findspots and sites identified during fieldwalking or commercial unit-led interventions which all post-date the publication of the CBA Gazetteer (Wymer and Bonsall 1977). See also Chapter 8 for a review of LUP finds reported to the Portable Antiquities Scheme where finds from Leicestershire are overrepresented in my sample.

As summarised by L. Cooper 2006a: "Indeed the cluster of findspots within the East Midlands is one of the densest in the country (Jacobi 2004; Barton et al. 2003) and supports the theory that the Trent acted as a corridor for movement." Furthermore, there is great potential for the preservation of palaeochannels and intact preserved scatters overlying gravel and beneath alluvial deposits along the Trent.

Bradgate Park, Newton Linford (open-air site; SK 5248 1007, E: 452480, N: 310070)

Initially recognised c. 1990 on the basis of diagnostic LUP surface finds by a lovely married couple with a keen interest in fieldwalking (personal conversation with the Coombs, February 2016). The site's location is in a 'picture-book perfect' setting for an LUP hunting camp (my observation; PaMELA ID 730; Leicestershire and Rutland HER 2014; Leicestershire and Rutland HER 2000; Cooper and Jacobi 2001; Cooper 2002; Cooper 2004:19; Cooper 2012; Pettitt and White 2012:Fig. 8.4). Excavations were undertaken 2015-2016 (see Figure 77, publications forthcoming, L. Cooper, pers. comm. 2015-2020).

Rookery Lane, Lockington-Hemington (open-air findspot; SK 468 286, E: 446800, N: 328600)

Stray surface finds reported by K. Challis of Trent and Peak Archaeological Unit,

Figure 77: Will Mills (left) and Nick Barton (right) approaching the excavation site on the last day of the LUP dig at Bradgate Park. Visible in the centre-right background are the ruins of Bradgate House/Grey Manor, where a large LUP blade was discovered during the field school excavations in 2015 (own photograph, view towards the South, February 2016)

discovered during a watching brief prior to the construction of the A564 Derby Southern Bypass (Challis 1995; Wessex Archaeology and Jacobi 2014). Small assemblage of a diagnostic Creswellian bi-truncated backed blade (PaMELA ID 732, compared to a fragmented surface find found at Gonalston, ID 789), three possibly contemporary unretouched blades, and a flint core (ID 7288; site marked as Lockington-Hemington on Pettitt and White 2012:Fig. 8.4; Cooper and Jacobi 2001).

A.2.3 Lincolnshire

Salmonby (open-air findspots; TF 30384 73857, E: 530384, N: 373857)
See also Bella Vista Farm; isolated surface finds of Early to Later Upper Palaeolithic and Early to Late Mesolithic date (i.a. G. V. Taylor Collection; Lincolnshire HER 2019; Pettitt and White 2012:Fig. 8.15). Figure 78 shows a panoramic view overlooking the River Lymn and the rolling hills landscape surrounding Salmonby. Jacobi recorded a Hamburgian shouldered point (PaMELA ID 769), a blade core (ID 176, Lincolnshire HER entry MLI43457; B. Bee Collection, Bee 1999) and a small number of backed blades (PaMELA ID 770, Cheddar point, IDs 771, 13419) found at Wallow Camp

Figure 78: Own panoramic photograph overlooking Salmonby in the Lincolnshire Wolds (July 2016)

Farmhouse, where B. Bee was a tenant farmer.

A.2.4 Nottinghamshire

There are only three reported LUP sites for Nottinghamshire in Bonsall 1977b, i.e., Peak District cave sites. However, a significant increase in the discovery of open-air sites and findspots may be noted from c. 1990 onwards, several of which were confirmed by R. M. Jacobi whilst he was still at Nottingham University.

Cotgrave, Rushcliffe (open-air findspot; SK 656326, E: 465600, N: 332600)
Reported discovery of a penknife point found during fieldwalking (Cooper and Jacobi 2001:119; note: classified as Creswellian in Jacobi, Garton and Brown 2001:17-19; Garton and Jacobi 2009:31). The artefact appears not to have been recorded as part of the PaMELA Database or by the Nottinghamshire HER, but in Jacobi, Garton and Brown 2001(:20) the penknife point is described as having a large, offset tang, made on orange semi-translucent flint.

East Stoke, Syerston (open-air findspot; SK 749 490, E: 474900, N: 349000)

During unit-led fieldwalking as part of the Fosse Way Project/later A46 Newark to Widmerpool Improvement Scheme, Trent and Peak Archaeology discovered stray finds of a bi-truncated trapezoidal point (PaMELA ID 785), a fragmented blade (ID 5654), crested bladelets and a bladelet core (ID 5648), in addition to miscellaneous Mesolithic, Neolithic and later Prehistoric lithic artefacts (Nottinghamshire HER entries L1642, L1643; Trent and Peak Archaeology 1992; Jacobi, Garton and Brown 2001:17; Pettitt and White 2012:Fig. 8.4; Jacobi in litt., undated).

Farndon Fields, Newark-on-Trent (open-air locale; SK 77922 52134, E: 477922, N: 352134)

Nationally important open-air locale discovered during unit-led fieldwalking in 1991, which is described and analysed in more detail in Chapter 5 (Nottinghamshire HER 2019d; e.g. Trent and Peak Archaeology 1991; Trent and Peak Archaeology 1992; Garton 1993; Garton 2005; Garton and Jacobi 2009; Pettitt and White 2012:Fig. 8.4, Fig. 8.15). First discoveries of diagnostic Creswellian-attributable lithic artefacts were made during commercial unit-led fieldwalking in 1991, which were later complemented by *Federmesser-Gruppen* finds (PaMELA IDs 786, 4432, 5756). Subsequent surveys as part of the A46 Improvement Scheme and ongoing local archaeology initiatives have since identified stratified clusters and unstratified surface LUP flint scatters across an area of 18 ha on gentle sloping ground on the interfluve terraces between the two rivers Trent and Devon (Cooke and Mudd 2014; Grant and Harding 2014; Ice Age Insights 2019a; Ice Age Insights 2015; Ice Age Insights 2019c; Garton et al. 2016 Garton, Barton and Bateman 2020). Results from recent OSL dating are reported in Garton, Barton and Bateman 2020(:5) and provide new dates for the LUP activities at Farndon, placing the time of occupation into the Windermere Interstadial (GI-I; 14,700–12,900 cal BP; Rasmussen et al. 2014a). Excluding micro-debitage (<5 mm), the complete lithic assemblage from Farndon Fields consists of 2040 artefacts which are predominantly of LUP age (retouched tool prevalence c. 8%), with smaller components of Mesolithic and later prehistoric finds.

Gonalston, Hoveringham (open-air site; SK 67933 47438, E: 467933, N: 347438)

The site is located in the lowlands Trent Valley and was discovered beneath sub-alluvial gravel deposits during industrial gravel extraction (Elliott and Knight 1996). During survey and excavation of an Iron Age and Romano-British settlement, residual or redeposited lithic artefacts were found of both LUP and (Late) Mesolithic age. There are four entries recorded under Hoveringham as PaMELA IDs 5690-5691 (misc. Mesolithic artefacts), of which the fragmented angle backed or trapezoidal backed point (Creswell or Cheddar point, PaMELA ID 789) is most diagnostic. PaMELA ID 246 is a burin on the distal end of a fragmented blade, which based on observed dimensions may be the first documented find of Terminal Upper Palaeolithic age in Nottinghamshire (c. 106 mm length, 38 mm width; Jacobi, Garton and Brown 2001:17-19; D. Garton, pers. comm. to R. Jacobi, in litt., undated).

Lound, Bassetlaw (open-air findspot; SK 68200 87800, E: 468200, N: 387800)

A single trapezoidal backed/Cheddar point was discovered during fieldwalking in the 1990s (Jacobi, Garton and Brown 2001:19-20; Pettitt and White 2012:Fig. 8.4). As noted by R. Jacobi (PaMELA ID 791), the "piece appears best interpreted as a blade with pair of divergent oblique truncations partially linked by slight concave inverse backing. This appears re-cycled into 'piece with worn end and clockwise marginal spalling'. This re-cycling [is] visible at both extremities". The artefact is unusual because of "extreme" rounding of distal tip, which is not uncommon for Creswellian-attributable points, but "nowhere else is it present on a Cheddar point", according to Jacobi (Jacobi, Garton and Brown 2001:19).

A.2.5 South Yorkshire

Note that due to administrative reorganisations of the Derbyshire, Nottinghamshire, South Yorkshire county borders, some of the cave sites listed below may be recorded by more than one HER (pre/post 1972 Local Government Act; UK Parliament 1972). The Palaeolithic and Mesolithic records were recently reviewed by the West Yorkshire Archaeological Advisory Services (Grassam and Weston 2015), reporting a doubling in recorded (Mesolithic) findspots and 'highlighting the importance of cave sites, upland locations and wetland environments'.

Dead Man's Cave, North Anston (SK 52762 83530, E: 452762, N: 383530)
Scheduled cave site, excavated by George Gwynne-Griffiths between 1967-8 (material deposited at the Creswell Crags Visitor Centre; reports in Historic England 1992; Mellars 1969; White 1970; Campbell 1971; Campbell 1977a; Wymer and Bonsall 1977:432; Pettitt and White 2012:Fig. 8.15, 8.17). The archaeological assemblage includes Middle and Late Upper Palaeolithic lithic artefacts, later Prehistoric pottery sherds, and unmodified faunal remains (e.g., reindeer, *Rangifer tarandus*, Mellars 1969).

There are 31 entries on the PaMELA Database which can be attributed to both the earlier and later half of the Lateglacial Interstadial. Relevant entries include a shouldered point (PaMELA ID 3734), several points with one oblique truncation (Creswell points; IDs 3717, 3747, 3741, 3744), and abruptly modified (straight) backed blades (IDs 3719, 3746, 3718, 3720, 3735, 3715). An unmodified reindeer phalange has been dated (OxA-5804, 10,020 ± 80 ^{14}C BP, 11,814-11,263 cal BP; Hedges et al. 1996).

Edlington Wood, Edlington (reported rock shelter; SK 550 987, E: 455000, N: 398700)

Excavated in 1958 by M. Dolby and in 1971 by P. Mellars (Mellars 1973; Barton and Collcutt Barton and Collcutt 1986 and pers. comms. 2014) who discovered a small lithic assemblage during trial trenching (recorded depths 0-60 cm below surface). The extent and location of M. Dolby's excavation are unknown, as is the precise location of the presumed cave or rock shelter (Wymer and Bonsall 1977:384, 432; Campbell 1971; Pettitt and White 2012:Fig. 8.4). Though the finds were discovered from an open area, the material was probably derived from a locale situated below the line of limestone crags to the south of Mellars' excavations. It is as of yet unclear if the material originated from downwash from a former cave or rock shelter (Wymer and Bonsall 1977:384; 432). The locale is now littered with burnt out cars but the wider landscape has recently been analysed using LiDAR (Buckland, Buckland and Prosser 2020; P. Buckland, pers. comm. 2014).

According to P. Buckland (pers. comm. 2014; and see Barton et al. 2003:636), amongst the artefacts found at Edlington Wood are straight and curve-backed pieces prepared with *talons en éperon* and a piercer/bec (PaMELA ID 879; Buckland 1977:Fig. 31). The entire assemblage (137 artefacts including 12 retouched tools) is mixed with other periods and cannot consistently be classified as Creswellian. Additionally R. Jacobi has recorded a backed blade (PaMELA ID 880, donated to Doncaster Museum by D. S. Cameron together with Bronze Age and later prehistoric finds which differ in material from the Dolby and Mellars material).

Hooton Roberts, Conisborough (open-air site; SK 490 970, E: 449000, N: 397000)

Possible Later Upper Palaeolithic findspot in the River Don Gorge near Hooton Cliff where the Magnesian Limestone is exposed in a scarp edge; exact location and cave/open-air context of recovery is uncertain. First reported by R. A. Gatty and later classified as Creswellian by T. Manby (Gatty 1901; Radley 1964; Manby 1966; Wymer and Bonsall 1977:432; Cockrell 2016:Table 7.3, Early to Late Mesolithic finds). There are eight entries on Wessex Archaeology and Jacobi 2014 of which the shouldered point and an angled backed fragment recorded as PaMELA ID 881 (ex Gatty Collection) are most diagnostic.

Lindholme (open-air findspot; approximate location SE 700074, E: 470064, N: 407463)
A chance find of a fragmented, yet substantial blade with lateral retouch (Accession No. DONMG 2016.7.1; 79 mm long, 20 mm in maximal breadth, 10 mm in maximal thickness; fully patinated to a very pale yellow-brown) was discovered in a River Don palaeochannel during R. Friend's research fieldwork on the last glaciation in the Vale of York. In his unpublished MSc dissertation, Friend initially classified the artefact as a burin, however, P. Pettitt states "but [it] is actually a Cheddar Point of Creswellian attribution" (Pettitt 2018). A third account offers a different classification. Finds of this nature are rare in South Yorkshire, and in Saville and Buckland 2016 the late A. Saville discusses his rationale for proposing an LUP attribution as most probable. The artefact features oblique, unilateral retouch at the distal end, and macroscopic signs of use-wear underneath the dense patina suggest this tool could be classified as a piercer or *bec*, which is also my interpretation.

Treeton, Rotherham (open-air findspots, SK 43193 87841; E: 443193, N: 387841)
Three findspots are recorded on the PaMELA Database from this village in the Don Valley outside Rotherham. At Bole Hill (SK 438 869; E: 443800, N: 386900), surface collection by P. Mellars and J. Radley in 1963 (Radley 1964:45; Campbell 1971; Cockrell 2016:Table 7.3, Early Meso. trough to Prehistoric finds) discovered a *Zinken*, which Radley attributes to the Hamburgian period. Other finds reported from Treeton are two backed blades ID 886 (Hail Mary Hill, E: 443800, N: 386900, Sheffield City Museum, Radley/Mellars Coll.) alongside Early to Late Meso microliths made on Wolds-type white/grey flint. Jacobi reports a flint core (ID 13768, Rotherham Museum) from Treeton Wood, classification or flint raw material unspecified.

A.2.6 Staffordshire

Elder Bush Cave, Wetton (SK 09774 54906, E: 409774, N: 354906)
Scheduled cave site in the Manifold Valley (alternative spelling: Elderbush), excavated between 1935-52 (Historic England 1949a; Pastscape 305632, HER DST5877 and NMR SK05SE2; Buxton Museum; Bramwell 1964; Campbell 1971; Campbell 1977a:175; Wymer and Bonsall 1977:430). Note that there is a different cave site named Elderbush Cave in Derbyshire where red deer bones

and Early Mesolithic bladelets have been recovered (PaMELA IDs 3833, 3834, 3839, 3841-3845; Pettitt and White 2012:491).

Bramwell (1964) reports an apparently intentional burial of the thorax of a young reindeer *(Rangifer tarandus)*, which Campbell (1977:175) refers to as evidence for "cult" practices. The small lithic LUP assemblage comprises patinated blades, however, the PaMELA Database reports only one Early Mesolithic microlith (PaMELA ID 7326). The cave was re-occupied at various times between the Upper Palaeolithic to the Roman period (Historic England 1949a).

Ossum's Cave, Grindon (SK 09587 55753, E: 409587, N: 355753)

Scheduled fissure cave site in the Manifold Valley, excavated between 1954-6 by D. Bramwell and S. Gee, later analysed by J. Campbell (Historic England 1991e; alternative spelling: Ossom's Cave; Bramwell 1955; Manby 1966; Campbell 1971; Wymer and Bonsall 1977:430; Jacobi 1980; Scott 1986; Jacobi 1987). Recovery of Palaeolithic and Romano-British remains, including flint artefacts, animals bones and pottery sherds (Staffordshire HER entry 305557). There has been some uncertainty concerning the stratigraphic association between reindeer bones and flint artefacts. As described in the Staffordshire HER entry, "the associated animal remains place the flints at not later than Late Palaeolithic - but the flints are nearer Mesolithic in form" (Manby 1966; Early Mesolithic microliths recorded as PaMELA ID 7331). The HER entry furthermore describes the Palaeolithic material as comprising a backed blade, scraper, a bone point and reindeer bones, none of which were recorded by Jacobi under either alternative spelling of the site's name.

The reindeer bones were recently re-analysed for traces of human modification and redated (Jacobi and Higham 2009b; O'Connor and Jacobi 2015:131). As the authors observed, the cave deer "were the prey of wolves rather than people", which indicates that no direct association can be drawn between the Late Glacial faunal remains and stylistically classified LUP artefacts.

Thor's Fissure, Wetton (SK 099 550, E: 409900, N: 355000)

Cave site excavated between 1927-35 by Rev. G.H. Wilson and later investigated by J. Campbell (finds deposited at Buxton Museum; Wilson 1934; Wilson 1937; Campbell 1971; Wymer and Bonsall 1977:430). Mesolithic material is discussed in Manby 1966. Of note in this context are a crested blade (PaMELA ID 3991), the shouldered and obliquely truncated blade with abrupt and direct retouch along the lateral edges (PaMELA ID 3986) and PaMELA ID 3972, a shouldered blade of trapezoidal outline. Jacobi reports this "piece is trimmed to a narrow 'bec' at the upper end" (in litt., undated; see also Pettitt and White 2012:Fig. 8.15).

A.2.7 West Yorkshire

Cupwith Hill, Colne Valley (open-air findspot; SE 03300 14100; E: 403000, N: 414000)
Findspot in the Colne Valley predominantly associated with Early to Late Mesolithic artefacts which were collected in the 1920s (Petch 1924, Buckley 1924 in Wymer and Bonsall 1977:377). Of note is a stray find of a Hamburgian shouldered point (PaMELA ID 876; donated by F. Buckley to Tolson Memorial Museum; also mentioned in Pettitt and White 2012:Fig. 8.15).

A.3 Sites classified as *Federmesser-Gruppen*

See also Section 2.1.4 where the terminology, typological and technological characteristics of the *Federmesser-Gruppen* are outlined. Sites are illustrated in Figure 79.

A.3.1 Derbyshire

Beeston Terrace, Potlock, Twyford and Stenson (open-air findspot; SK 316 288, E: 431600, N: 328800)
Reported discovery of a stray penknife/*Federmesser*-type point found during fieldwalking led by Trent and Peak Archaeological Unit (Jacobi, Garton and Brown 2001:20; Knight and Howard 2004). Jacobi recorded the find as made on unpatinated reddish flint found at a multi-period findspot at Potlock's House Farm (PaMELA ID 669; D. Garton, pers. comm. undated in Cooper and Jacobi 2001:119).

Creswell Crags, Elmton/Holbeck/Worksop (centred on SK 53894 74352, E: 453894, N: 374352)
See entry on p. 263 for a general overview of the LUP evidence from the Creswell Crags sites (Campbell 1977a:171-175; Pettitt and White 2012:Fig. 8.17).

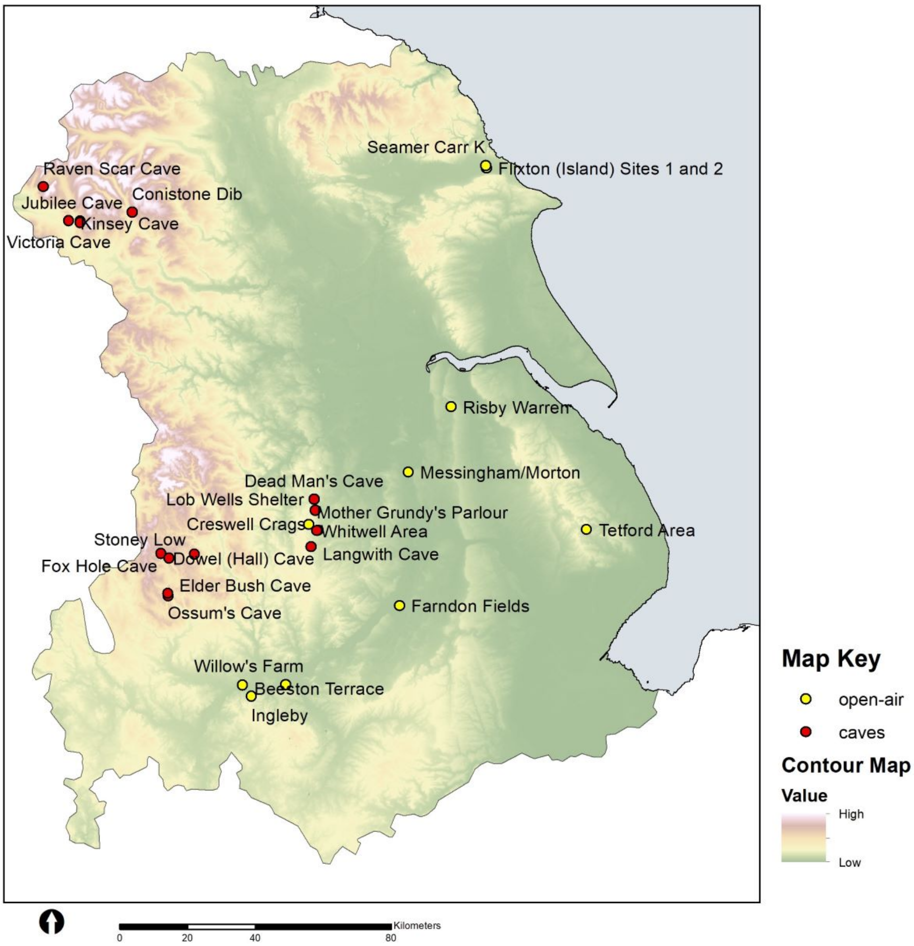


Figure 79: Catalogued FMG-attributable sites (map by J. Kotthaus and L. Grottenberg. Contains OS data, Crown copyright and database right 2021)

Dowel (Hall) Cave, Earl Sterndale, Hartington Middle Quarter (SK 07559 67595, E: 407559, N: 367595)

Scheduled cave site (Historic England 1991b; Derbyshire HER entry 6807). Excavated by the Peakland Archaeological Society between 1958-9 (S. Gee Collection; Bramwell 1959; Campbell 1971; Wymer and Bonsall 1977:424; Hedges et al. 1989; Pettitt and White 2012:454, Fig. 8.17). Three recorded PaMELA entries on finds held at Stockport Museum, including a Final Upper Palaeolithic backed blade and penknife point (PaMELA ID 3824), a proximal portion of an artefact made on worked antler (PaMELA ID 3832; primary material verified by A. P. Currant, in litt. 1986), and two backed blades (PaMELA ID 3831). The worked antler fragment had originally been interpreted as Mesolithic by D. Bramwell, which has since been refuted by a directly taken radiocarbon date (OxA-1463, 11,200 ± 120 ^{14}C BP, 13,317-12,838 cal BP; Hedges et al. 1989:214; PaMELA ID 3832).

Fox Hole Cave (SK 09975 66179, E: 409975, N: 366179)
Scheduled LUP cave site (see description on p.264; Historic England 1991c; Derbyshire HER 1928; Pettitt and White 2012:Fig. 8.17). Due to the small size of the LUP assemblage, Fox Hole has been interpreted as a site of short-term hunting excursion or weapon losses/discard. Important finds include PaMELA ID 3846, a fragmented worked antler rod/*sagaie* that Jacobi described as "overall very reminiscent of ID 8172 from Church Hole" and highly similar to worked javelin foreshafts found in the Hamburgian horizon at Stellmoor in the Ahrensburgian Tunnel Valley, Germany (reindeer or red deer, previously erroneously classified as worked bone, Rust 1935). The rod has been dated to the second half of the LG Interstadial: OxA-1494, 12,000 ± 120 ^{14}C BP, 14,145-13,530 cal BP. This is also applicable to the second modified rod found at the site, which is PaMELA ID 3897: OxA-1493, 11,970 ± 120 ^{14}C BP, 14,096-13,521 cal BP (Hedges et al. 1989:214; Jacobi in litt., undated).

Ingleby (open-air findspot; SK 342 255, E: 434200, N: 325500)
A potentially highly interesting multi-phase, open-air site where two straight backed bladelets were discovered by D. Budge who was in the lead of a fieldwalking survey for the Derbyshire Archaeological Society in the late 1990s to early 2000s (PaMELA ID 666, Derbyshire HER 21709). The findspot is in a prominent position overlooking the Trent Valley. Reportedly highly promising potential for further fieldwalking around Heath Wood, which has not yet been realised. D. Budge has very kindly shown me the LUP finds and given me permission to summarise and reproduce his currently unpublished observations. Other finds, all in insufficient quantities or concentrations "to suggest anything more than the occasional visit and casual loss" (D. Budge, pers. comm. 2015, 2019) include Star Carr-type obliquely blunted points, broad blade microliths, and narrow blade geometric microliths, Mesolithic debitage, Neolithic, Middle and Late Bronze Age and Iron Age pottery and two very corroded fragments of a Bronze Age dagger/knife blade (fieldwalking reported in Richards 2004).

Langwith Cave, Nether Langwith, Scarcliffe (SK 51799 69497, E: 451799, N: 369497)

Scheduled cave site further described in entry on p. 265 (Historic England 1936). FMG-indicative finds include PaMELA ID 2805, a backed blade fragment, as well as penknife points (IDs 2760, 2811; Jacobi in litt., undated).

Mother Grundy's Parlour, Elmton (SK 535 742, E: 453500, N: 374200)
Scheduled cave site with significant evidence for LUP occupation, as outlined in more detail on p. 266 (Derbyshire HER 1877).

Stoney Low, Ashford in the Water (near reported cave findspot; SK 175 673, E: 417500, N: 367300)
According to Pettitt and White 2012(:Fig. 8.17), this cave site in the vicinity of Fox Hole and Dowel Hall Cave can be classified as FMG based on at least one reported curve-backed point, but no further information or references are included therein. The only HER records available (through Historic England 2012a) are for an entirely different Stony Low (note the spelling), i.e., a location in Madeley, Staffordshire. The PaMELA database reports four finds from this location, of which only PaMELA ID 670 may be of possible LUP date - the others are Early to Late Mesolithic. This backed blade was found in a "field next to Stoney Low", and the grid references place this findspot in the civil parish of Ashford in the Water, not Sheldon (SK 174674A), which is the reported parish for Mesolithic material found at Stoney Low (in Wymer and Bonsall 1977:54; T. Goodwin collection reported by Radley 1968).

Whitwell Area, Bolsover/Elmton (surface finds; SK 511 760; E: 451100, N: 376000)
A small number of surface finds have been reported to the Portable Antiquities Scheme from the vicinity of Ash Tree Cave where a farmer has gathered surface finds over the past 30 years (see Chapter 8). These are slowly being made available for recording and include artefacts such as the straight backed blade with dense white patina found near Ash Tree Cave (DENO-4D9D06, The Portable Antiquities Scheme 2019h) and the fragmented backed blade DENO-4DA237 (The Portable Antiquities Scheme 2019i; reportedly found near SK512735).

A.3.2 Leicestershire

Willows Farm, Castle Donington (open-air findspot; SK 4437 2892, E: 444370, N: 328920)

A diagnostic stray find made on light grey/brown translucent flint is reported from the confluence of the rivers Trent and Soar where unit-led investigations took place at the nearby Hemington Quarry. Cooper and Jacobi 2001(:118) describe the blade with convex backing as "a distal fragment of a *Federmesser* or Azilian point [...]. The backed edge has steep abrupt retouch while the leading edge has been slightly remodified at a later date". The pattern of these deliberate modifications indicate that the artefact was tentatively reshaped into a plano-convex knife, representing an example of reworking of Palaeolithic flint artefacts during later prehistoric periods, which is not uncommon in the Trent Valley (D. Garton, pers. comm. 2015).

A.3.3 Lincolnshire

Morton, Messingham (open-air findspot; SK 80500 91500, E: 480500, N: 391500)

This findspot is only rarely referenced and of uncertain LUP or Mesolithic classification (Lincolnshire HER entries MLI98452, MLI98523; Wymer and Bonsall 1977:177; Pettitt and White 2012:Fig. 8.17). PaMELA ID 740 (E. Rudkin Collection) is an angular backed blade fragment of ambiguous classification, possibly attributable to the *Federmesser-Gruppen* and described as comparable to a piece found at Scratta Wood. The reddish brown flint used to make the blade with PaMELA ID 15341 is compared to material found at Louth, Lincolnshire. Notably, this blade was found in an area of coversands, "5ft down in yellow sand during construction work for new houses in Orchard Close off Mill Lane" (Jacobi in litt, undated). An end-scraper found at the nearby Messigham Quarry is discussed in Chapter 7 (Buckland 1984).

Risby Warren, Roxby-cum-Risby, Scunthorpe (open-air locale; centred on SE 931 107, E: 493100, N: 410700)

See also Chapter 7 and Catalogue E for a comprehensive site presentation. The landscape and stratigraphy of the area are unique in a UK context, as the aeolian sand dunes are more reminiscent of coastal Southern Scandinavia or the Low Countries. Alongside other Lincolnshire Cliff sites, Risby Warren emerged as an area of geological and archaeological interest in the late 19th century and was once described as "the happy hunting-ground of collectors" (Clark 1932:35; Ussher, Jukes-Browne and Strahan 1888; Ussher 1890; W. A. Sturge Collection, in Smith 1931; Gatty 1901; Gatty 1902; Garrod 1926). While there are no direct dates available from Risby Warren, the closest site with reference dates are from nearby Messingham which shares the same stratigraphic succession of aeolian sands, peat beds and peaty lenses (radiocarbon dates: peat bed, BIRM-349 10,280 ± 120 ^{14}C BP, 12,608-11,410 cal BP; peaty lens within sands, BIRM-707 10,550 ± 250 ^{14}C BP, 13,067-11,621 cal BP; in Buckland 1984).

The combined lithic assemblage is sizeable - the North Lincolnshire Museum in Scunthorpe alone houses more than ten thousand lithic artefacts from Risby Warren, and a recent private donation of c. 3000 lithic finds to the museum increased that number further. Notably, all consulted museum collections of Risby Warren finds (viewed at the Ashmolean, British Museum, Pitt Rivers, MAA and NLM) predominantly contain Early Mesolithic and later prehistoric lithic artefacts which far outnumber the LUP component (see Chapter 7). During data collection I viewed >13,000 finds first-hand to relocate diagnostic artefacts and collections referenced previously (R. Jacobi Archive, in litt. c. 1970-1993; Lacaille 1946; Wymer and Bonsall 1977; Riley 1978) and explored the extant assemblages for any previously unreported LUP finds. I specifically targeted typologically diagnostic retouched tools and LUP-attributable laminar blade blanks and debitage from the collections of A. L. Armstrong, H. E. Dudley, D. N. Riley and E. Rudkin since these collections reportedly contained finds from stratified contexts beneath the aeolian Loch Lomond Stadial (GS-1) coversands (Armstrong 1931a; Armstrong 1932).

Frequently mentioned in the same context and located nearby is Sheffield's Hill (SE 098160(A)), which is a comparable locale comprising several open-air findspots of possible LUP age. Following my first-hand review of the entire lithic assemblages from Roxby-cum-Risby parish held at the North Lincolnshire Museum, I would place the typology and chronology of Sheffield's Hill primarily into the Early Mesolithic. Similar to my observations made during the analyses of the Risby Warren assemblages, only a handful (<10) of lithic artefacts from Sheffield's Hill could be classified as LUP (*contra* Armstrong 1931a; Lacaille 1946; Dudley 1949; Reynier 2005; Pettitt and White 2012:Fig. 8.17). Due to the limited availability of data, Sheffield's Hill was not considered further for this thesis but appears to be highly comparable with Risby Warren in all respects.

Tetford Area (open-air findspot; TF 33055 74560; E: 533055, N: 374560)

One of the most notable surface finds featured in my small sample of LUP entries sourced from the PAS is a shouldered point found during fieldwalking in the Tetford area (DENO-8C977B; see Chapter 8 and Figure 71 therein; The Portable

Antiquities Scheme 2019k). The point was made on a thin, slender, and slightly curved blade and the raw material is warm amber-coloured translucent flint. Post-depositional patination has dulled the original shine and smaller residues of iron-staining are visible on the artefact. The orientation of retouch (distal or proximal end) is unclear from the artefact pictures and description, but both short, semi-abrupt retouch along the shoulder and more invasive and irregular scalar retouch along parts of one of the lateral edges are visible. Based on the featured images the artefact seems to share the same technological attributes as other LUP finds from the same region (likely soft hammer-struck blades from regular blade cores). This shouldered point is of high LUP diagnostic value and has been assigned nationally important find status by the PAS.

A.3.4 North Yorkshire

Three of the North Yorkshire cave sites (Kinsey Cave, Raven Scar Cave, Victoria Cave) listed here have several archaeological characteristics in common. For instance, the earliest cave explorations and excavations were undertaken as early as the 1870s, and revealed lithic and faunal evidence from the Upper Palaeolithic to later prehistoric times (cf. Section 2.2.3). The classification of recovered material - especially of the modified bone artefacts - has been the subject of debate, but which has seen clarity through recent AMS-dating of the artefacts in question (Campbell 1977a:169 *contra* Breuil 1922; Jacobi and Higham 2011; Lord 2013). Notably, there are only very few LUP artefacts documented from each of the caves. As stated by Lord and Howard 2013(:241), "[e]ven including pieces with uncertain find histories, there are at most two [stone tools] from Raven Scar Cave, two from Kinsey Cave, and one from Victoria Cave", which are curve-backed blades and points attributable to the second part of the LG Interstadial (GI-1cba). Due to uncertain stratigraphical concordance of old excavations, direct association between stone tools and dated organic artefacts can be inferred but not be fully established.

Conistone Dib, Wharfedale (cave site; SD 991 681, E: 399100, N: 468100)
A fragmented bone point made from the anterior side of metacarpal of elk *(Alces alces)* was recovered during cave excavations at Coniston(e) Dib. This find is recorded as PaMELA ID 1024 and may have been made on a splinter. According to R. Jacobi (in litt., c. 1994), both ends of the bone point are gently tapered, and some post-depositional damage from root-marking and gnawing are visible.

The overall dimensions are 262 x 10.6 x 10.8mm. The bone point has been dated to 11,210 ± 90 ^{14}C BP, 13,300-12,920 cal BP (OxA-2847) which places it into the later half of the LG Interstadial (GI-1cba; Hedges et al. 1992:142; Rockman 2003:204; Jacobi, Higham and Lord 2009; Currant and Jacobi 2011:176; Lord and Howard 2013:240). This find is in all respects identical to a find from Lynx Cave, Denbighshire (OxA-8164 11,700 ± 90 ^{14}C BP, 13,769-13,357 cal BP; Stevens et al. 2021:Tab. 1; Lord and Howard 2013:240).

Jubilee Cave, Langcliffe Scar (SD 83759 65525; E: 383759, N: 465525)
Scheduled cave site surveyed by the Settle Cave Exploration Committee in 1871, then by T. Lord and T. L. Frankland between 1935-38 (Historic England 1949b; Campbell 1977a:168-169; Wymer and Bonsall 1977:390; Chamberlain 2019b). Cave assemblage comprises Neolithic burials, later prehistoric artefacts, and a small lithic assemblage predominantly of Mesolithic age (two microliths recorded on PaMELA). As at Victoria Cave, Campbell's re-analysis of the lithic artefacts identified "some LUP material" (1977:168), and Campbell (1977:169) interprets the Settle caves' location as "very useful for summer exploitation of the western Yorkshire Pennines when reindeer should have been quite abundant there".

Kinsey Cave, Giggleswick Scar (SD 80384 65668, E: 380384, N: 465668)
Scheduled cave site where excavations took place between 1925 and 1932 which uncovered LUP artefacts as well as Bronze age and Roman material. Other unpublished surveys between the 1880s and the earlier 20th century recovered animal and bear bones. In 2005 the site was excavated once more to mitigate damages caused by nesting badgers, and by metal detectorists (Historic England 1949c; Pettitt and White 2012:Fig. 8.17; Jackson and Mattinson 1932; Campbell 1971; Campbell 1977a:Fig 137, p. 168-69; Wymer and Bonsall 1977:432; Cave Archaeology Group, in. litt. 2005; Lord 2013; Lord and Howard 2013).

The finds comprise tools and waste flakes of flint and chert, an antler point, and fragmentary human remains cf Historic England 1949c. There are six entries on the PaMELA database (including Mesolithic and Bronze Age artefacts), of which Jacobi classifies ID 1027 (mesial blade fragment with opposed dorsal scars) and ID 1033 (proximal end of a broken blade) as possibly LUP (see Campbell 1977a:Fig. 137:1-4). PaMELA ID 1032 is part of a broken reindeer antler 'rod' which was dated to 11,270 ± 110 ^{14}C BP, 13,405-12,922 cal BP (OxA-2456; Hedges et al. 1992:142), for which Jacobi (in litt., undated) notes parallels with PaMELA ID 3832 from Dowel Hall Cave.

Raven Scar Cave, Ingleton (SD 729 756, E: 372900, N: 475600)
Cave site predominantly known for Late Neolithic human burials, Bronze Age pottery, and later prehistoric faunal remains (cf. North Yorkshire HER entry YD 3688; Chamberlain 2019c). Investigations by Gilkes in the 1970s revealed isolated finds of broken backed blades, which are PaMELA IDs 1061, 1062 (see also Lord and Howard 2013:241, Fig. 16.7). Three additional entries on the PaMELA Database are Mesolithic microliths and flake blades.

Seamer Carr K, Flixton (open-air site; TA 033 819, E: 503300, N: 481900)
Seamer Carr K is a fully excavated and delineated open-air locale situated on a gentle slope on the southern side of a narrow kame formation adjacent to palaeolake Flixton and was excavated between 1982 to 1985 (see Chapter 6 for a comprehensive site biography and technological analysis of the lithic LUP evidence; North Yorkshire HER 2013; Lane, Schadla-Hall and Taylor 2023; Conneller 2007; Conneller and Schadla-Hall 2003; PaMELA ID 14067). Sealed beneath an almost sterile layer of aeolian Younger Dryas sand was a Late Glacial organic detritus [5085/5069] which provided the stratigraphic context for samples for radiocarbon dating (base of detritus: CAR-842 12,010 ± 130 ^{14}C BP, 14,212-13,519 cal BP; two dates taken on top of the detritus layer, CAR-841 10,960 ± 110 ^{14}C BP, 13,088-12,745 cal BP, and HAR-5242 11,000 ± 130 ^{14}C BP, 13,156-12,737 cal BP (Lane et al. n.d.:Table 7.6; Cloutman 1988b; Conneller and Schadla-Hall 2003:93)).

The complete excavated assemblage from Seamer Carr K contains 12,137 lithic artefacts plus 79 bone and antler fragments derived from approximately 16 separate knapping scatters which can be attributed to the Final Palaeolithic (2350 finds, c. 19.3%) and Early Mesolithic (9787 artefacts, c. 80.7% of assemblage) on the basis of typological, technological and stratigraphic evidence (Conneller 2007:223). The assemblage documents evidence for Late Palaeolithic and Early Mesolithic *in situ* laminar blade blank manufacture, tool modification, and use.

Victoria Cave, Settle (SD 83828 65038, E:383828, N: 465038)
Scheduled cave site (Historic England 1949d). First excavations between 1840-1860 by J. Jackson, later by the Settle Cave Exploration Committee between 1870-1878, then by T. Lord, 1937-39 (Chamberlain 2019d). Wymer and Bonsall 1977:432 lists slightly different dates than the Bristol Speleological Society, stating that excavations began with W. Dawkins between 1870-8, later by D. Garrod (material held at Settle museum; reporting in Dawkins 1874; Breuil 1922;

Garrod 1926; Jackson 1945; Campbell 1977a:168-69 and Fig. 137; Wymer and Bonsall 1977:390, 432; Hedges et al. 1992; Jacobi and Higham 2011; Pettitt and White 2012:Figs. 8.4, 8.20; Lord 2013; Lord and Howard 2013).

There are 10 entries on the PaMELA database for finds from different primary materials and periods. The notable organic *Federmesser*-attributable finds are fragmented points made from reindeer antler (PaMELA ID 1069, OxA 2453 10,220 ± 110 ^{14}C BP, 12,471-11,403 cal BP) and ID 1071 (OxA 2455, 11,750 ± 120 ^{14}C BP, 13,994-13,344 cal BP; Garrod 1926:Fig. 18; Breuil 1922). PaMELA ID 1074 is a backed blade with a modified, *'bec'*-like distal end (Jacobi in litt., undated), and in entry ID 1065 Jacobi describes the bilaterally barbed antler harpoon which was found by J. Jackson in 1870. Dawkins (1874) first proposed a Neolithic date, which Abbé Breuil (1922) suggested be changed to a Magdalenian date (cf. finds from Mas d'Azil, France), whereas Jacobi and J. Campbell (1977:169) both initially classified this artefact as Late Mesolithic. The find has been dated: OxA-14888 10,930 ± 45 ^{14}C BP, 12,965-12,748 cal BP (Lord and Howard 2013:Table 16.1, Fig. 16.4).

A.3.5 Nottinghamshire

Farndon Fields, Newark-on-Trent (SK 77922 52134, E: 477922, N: 352134)

See entry on p. 275 and Chapter 5 for an extensive site presentation and full technological analyses of the lithic assemblage (Nottinghamshire HER 2019d; Pettitt and White 2012:Fig. 8.17).

A.3.6 South Yorkshire

Dead Man's Cave, Anston (SK 52762 83530, E: 452762, N: 383530)

Scheduled cave site containing FMG-attributable abruptly modified straight-backed blades (in Pettitt and White 2012:Fig. 8.15; catalogued by R. Jacobi as PaMELA IDs 3719, 3746, 3718, 3720, 3735, 3715) (site description in entry on p. 276; Historic England 1992).

Lob Wells Shelter, Thorpe Salvin, Rotherham (SK 531 803, E: 453100, N: 380300)

Scheduled rock shelter in the Bondhay Valley which forms part of the Creswell Crags heritage area (Historic England 1991d). The site was excavated between

1966-7 which uncovered a small number of FMG-attributable artefacts, though predominantly Early Mesolithic to later Prehistoric finds. The site has been scheduled due to the quantity of surviving deposits. The recovered material was previously held at Worksop Museum and is now presumed relocated to the Creswell Crags Visitors Centre (Campbell 1971; Wymer and Bonsall 1977:432; Pettitt and White 2012:Fig. 8.17; Cockrell 2016:Table 7.3, Early Meso. through to Prehistoric finds). There are five entries of presumed LUP blade fragments on the PaMELA database (note: county erroneously listed as Northamptonshire). ID 3782 is classified as a penknife point with "smooth, convex chipping" along the left lateral edge, and with cortex comparable to Mother Grundy's Parlour (comparative pieces unspecified; Jacobi in litt., undated).

A.3.7 Staffordshire

Elder Bush Cave, Wetton (SK 09774 54906, E: 409774, N: 354906)
Scheduled cave site containing a small LUP lithic assemblage, including FMG-indicative curve-backed points (cf. Pettitt and White 2012:Fig. 8.17). Further site details in entry on p. 278 (Historic England 1949a; Wymer and Bonsall 1977:252, 430; Campbell 1977a:175).

Ossum's Cave, Grindon (SK 09587 55753, E: 409587, N: 355753)
Scheduled cave site as described in entry on p. 279 (Historic England 1991e; Wymer and Bonsall 1977:251, 430). The small lithic assemblage is mostly undiagnostic, but reportedly contains one *Federmesser-Gruppen* attributable curve-backed point (Jacobi 1980; Jacobi 1987; Pettitt and White 2012:Fig. 8.17, 480).

A.4 Unspecified LUP-attributable sites

A.4.1 Derbyshire

Church Dale Shelter, Youlgrave (SK 183 655, E: 418300, N: 365500)
Cave site predominantly associated with Neolithic remains but containing a small number of LUP artefacts (alternative spelling Churchdale; Derbyshire MDR1274). Sections of the shelter were excavated by Major Harris and A. L. Armstrong between 1936-9 (cf. Derbyshire MDR1274 in litt.; other reports in Bramwell 1962; Campbell 1971; Campbell 1977a:116; Wymer and Bonsall

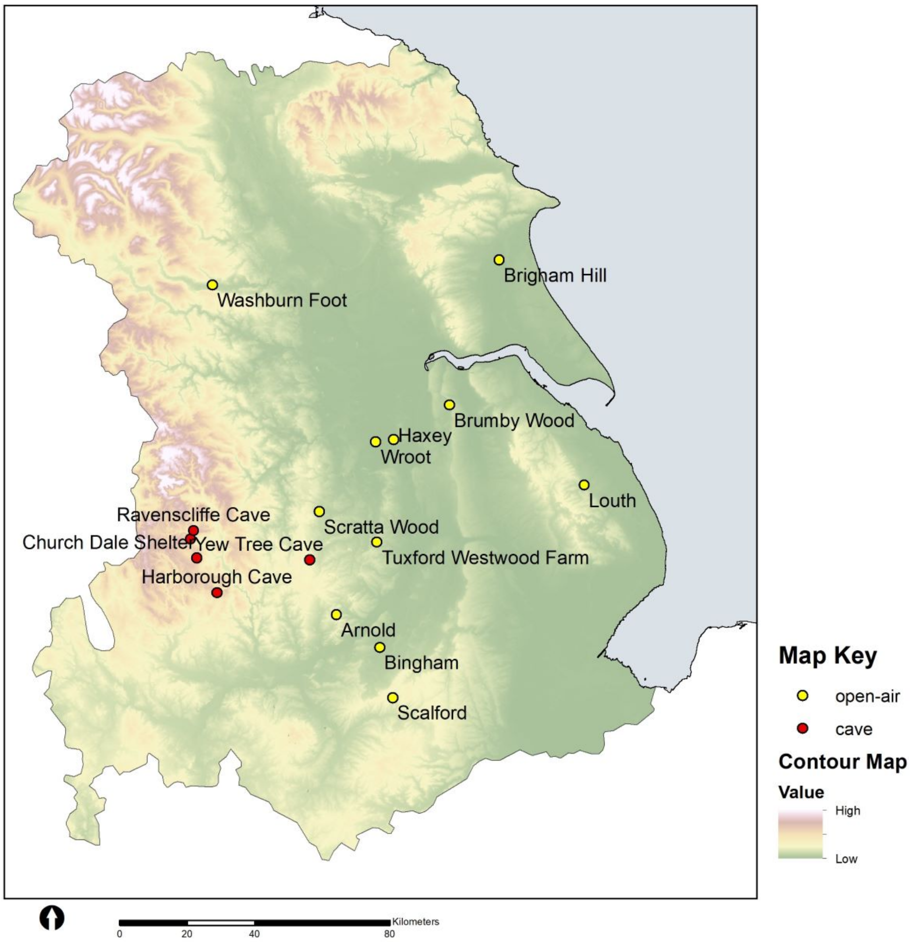


Figure 80: Catalogued LUP-attributable sites (map by J. Kotthaus and L. Grottenberg. Contains OS data, Crown copyright and database right 2021)

1977:424). There are two tertiary blade removals and one flake recorded on Wessex Archaeology and Jacobi 2014, PaMELA IDs 3816, 3820, 3822 (all "from hearth with red deer and horse", Jacobi in litt., undated).

Harborough Cave, Brassington (SK 2423 5522, E: 424230, N: 355220)
Possible LUP cave site (Campbell 1977a:116; Derbyshire HER entry 2445). The cave was first investigated in 1907 by W. Storrs Fox and R. A. Smith (Fox and Smith 1907), then in 1922 by A. L. Armstrong (with better documentation; Armstrong 1923). The cave assemblage is of mixed possible Upper Palaeolithic to Bronze Age and Romano-British age. Assemblage includes lithic debitage, one scraper and bone points which Armstrong describes as 'marrow scoops'

(taxa unspecified; Armstrong 1923:408, Fig. 5; Wymer and Bonsall 1977:423; materials deposited at Buxton Museum). There is only one entry recorded by Wessex Archaeology and Jacobi 2014:PaMELA ID 3944, which only refers to a text file that I have not consulted in person.

Old Woman's House Cave, Taddington (SK 164 711, E: 416400, N: 371100)

Now located c. 40 m west of the A6. J. Campbell has recorded three lithic blades or flakes from this possible LUP cave site, which was excavated in 1910 by W. S. Fox (Fox 1911; Wymer and Bonsall 1977:424; note that the grid reference SK 165 708 is wrong, cf. Derbyshire HER entry 13503). As indicated by Fox's report titled "Derbyshire cave-men of the Roman period" and reflected by the Derbyshire HER's Early Bronze Age to Roman period classification, the best documented site use post-dates the Palaeolithic. Further information regarding the LUP component is sparse; the site is not referenced by Wessex Archaeology and Jacobi 2014 or Campbell 1977a, nor have I been able to establish any more recent information.

Ravenscliffe Cave, Great Longstone (SK 17390 73560, E: 417390, N: 373560)

In the CBA Gazetteer, this cave site is recorded as a possible Earlier Upper Palaeolithic site based on J. Campbell's classification of one reported scraper (presumably PaMELA ID 3809). Excavations under the auspices of W. S. Fox took place between 1902-10 (Derbyshire HER entry 6406; material held at Buxton and British Museum; Fox 1910; Jackson 1962; Wymer and Bonsall 1977:418). All of the search results on Trustees of the British Museum 2019a suggest a Neolithic to Bronze Age date.

However, there may be one LUP-attributable find from this cave: a proximal fragment of an obliquely truncated and shouldered point from this site (PaMELA ID 3803; British Museum accession number 1907.2-14.46). Other artefacts recorded by Jacobi are PaMELA IDs 3801 and 3802, distal fragments of an antler, modified into a point on which "longitudinal tool-marks are clearly preserved within groove and on its margins cf. Church Hole Cave", (Jacobi in litt., undated; British Museum accession number: 1907.2-14.21. Basement 108: box 3B37). PaMELA ID 3797, distal fragment of presumed reindeer antler, comparable to a find from Dowel Hall Cave (British Museum accession number: 1907.2-14.17; Jacobi in litt., undated).

A.4.2 East Riding of Yorkshire

Brigham Hill, North Frodingham, Foston (open-air site; TA 078 537, E: 507800, N: 453700)

Open-air findspot with "undoubted Mesolithic forms" and possible Later Upper Palaeolithic artefacts, identified through surface collection between 1962-63 (finds held in the C. and E. Grantham Coll., reported by Manby 1966; Campbell 1971; Wymer and Bonsall 1977:432; Wessex Archaeology and Jacobi 2014:PaMELA ID 13545). According to T. Manby (1966:221), the site's location on the edge of a low hill with commanding views over the Holderness lowlands would have served as a natural vantage spot during hunting. Furthermore, "[t]he dominance of the obliquely blunted point/truncated blade and backed points at Brigham resembles that at the industries of Mother Grundy's Parlour and the Dutch site of Neer II [...] but shows dominance of end-worked points over backed points and a more limited graver assemblage" (Manby 1966:221). A selection of lithic artefacts are illustrated in Campbell 1977a:Figs. 138-140. However, regarding the classification of the assemblage, I here refer to J. Campbell (1977:170) whose first-hand artefact handling of the entire Brigham Hill material leads him to refute the LUP classification of the assemblage, instead proposing an Earlier Mesolithic age. There are only three pieces (i.e., 'atypical' shouldered and penknife points) which Campbell (and myself, I should add) would "rather unwillingly accept as LUP, as this is a surface collection", especially since "penknife points occur widely in the LUP and the Mesolithic (see Campbell 1977b; and Clark 1932) and may therefore be either/or in an uncertain context" (Campbell 1977a:170).

A.4.3 Leicestershire

Scalford parish, Melton (surface finds; centred on village, SK 762 241, E: 476282, N: 324100)

In 2019, H. Wells, the Leicestershire and Rutland HER officer informed me about the active collective of avid field-walkers and metal detectorists who regularly survey this parish (Melton Fieldwalk Group and others). Similar groups or individual collectors who to a variable degree make their artefact discoveries available for recording, are active in other parts of Leicestershire and Rutland. This is for instance evident on the PAS where closer to 200 artefacts of Middle to Late Upper Palaeolithic and (Early to Late) Mesolithic surface finds are recorded from Scalford parish. Several of these artefacts are discussed in Chapter 8 since

Scalford parish is overrepresented in my PAS sample. Relevant finds include backed blades (finds numbers LEIC-D03BF4, LEIC-3DF246, LEIC-6F49F5, LEIC-E6C050), and a scraper which I would classify as a retouched blade fragment (LEIC-514F4B). Furthermore there are a number of interesting finds which appear to have been made available to my PAS research access level after I completed my data collection, and which are therefore not discussed in detail in Chapter 8, but have been included in my sample of PAS data used for Chapter 4. Notable finds include retouched blades (LEIC-6F6DA5 and LEIC-523F04), a piercer/awl (LEIC-6ED3A9), blades with possible *talons en éperon* (LEIC-35D973, LEIC-8C1D36 and LEIC-19140C) and a burin (LEIC-3465DB). As discussed in Chapter 4 there are clusters of PAS-derived findspots reported from Scalford, Melton Mowbray and nearby Wycomb parish, which may be contrasted with an overall lower representation on the Leicestershire and Rutland HER (e.g. entries MLE4028, MLE4026 which are of Mesolithic and younger date). Together with H. Wells and L. Cooper (pers. comm. 2019) I have discussed the promising potential of the wider Scalford area and Leicestershire/Rutland in general, and, pending access permission to the many finders' personal information, it is hoped that more work can be done in person 'on the ground' once pandemic-related restrictions have eased in the future.

A.4.4 Lincolnshire

Brumby Wood (open-air findspot on Risby Warren; SE 931 107, E: 493100, N: 410700)

Reported find of a Hamburgian shouldered point (Pettitt, Rockman and Chenery 2012:Fig. 8.15), but could alternatively be the same artefact classified as a tanged Bromme point (Historic England 2018c:ID 1493, R. M. Jacobi therein). Further information is sparse; the site name is not referenced in the Jacobi Archive, nor are any references cited in Pettitt and White 2012, nor was I able to relocate any additional evidence during my prolonged stays in Scunthorpe. It is possible that there are two points of different LUP classification and age, or that there is one Bromme point which has been misclassified as a Hamburgian shouldered point, or vice versa. Due to these uncertainties, I have decided to classify this findspot as broadly LUP-attributable; however, either classification would represent a notable addition to the regional record.

Haxey (open-air findspots, approximate location SE 765 005, E: 476500, N: 400500)

The findspots are located at the watershed between Rivers Don and Trent on the Isle of Axholme and situated on Humberhead Levels in a landscape which has been studied in the context of the most recent glaciations. There are several isolated findspots recorded from Haxey, predominantly of Mesolithic to Prehistoric date (e.g. PaMELA ID 15330 found at Haxey Cove Farm; Wymer and Bonsall 1977:176; Cockrell 2016:313, Table 7.3). In Chapter 8 I have included the PAS object NLM-DFBE07, (The Portable Antiquities Scheme 2019c) which was also found at Haxey. During my research stay at the North Lincolnshire Museum in Scunthorpe, I came across a crested blade found at Coney Garth, Haxey, in the museum display case. The blade is completely preserved, parallel-sided with a sharp, feathered distal end, minimal longitudinal curvature, approximately 120 mm long and c. 20 mm wide. It is patinated white-greyish with a 'chalky' touch, with crested removals running perpendicular to the length of the dorsal side. This blade is most likely included in the group of finds recorded as PaMELA entry ID 15329 (Acc.no.8.5.84/84, HX HC 1, donated by E.H. Rudkin).

Louth, East Lindsey, Lincolnshire (open-air findspot; TF 330 870, E: 533000, N: 387000)

Isolated discovery of an opposed platform blade core fragment made on "yellowish-red-black" flint (PaMELA ID 13485; PaMELA ID 15341 from Morton is of comparable flint colour), which was possibly recovered together with a small collection of Mesolithic finds "found 11 ft below surface, ex. Mr Baldock and G. F. Lawrence", as recorded by R. Jacobi and J. Walshaw (in Wymer and Bonsall 1977:176).

Wroot (open-air findspot; SK 712 999, E: 471200, N: 399900)

The locale is located on raised Humberhead Levels overlying the Magnesian Limestone in the Don Valley. According to information from Doncaster Museum referenced in Jacobi, Garton and Brown 2001(:17-19), LUP material has been found "from an old course of the River Idle". The find(s) are not described in any further detail, but other recorded features are Mesolithic flint scatters and Holocene palaeochannels within 1 km of the grid reference (North Lincolnshire HER entries 19562, 21138; Cockrell 2016:Table 7.3 listing Late Mesolithic and later Prehistoric finds). The only artefacts from Wroot recorded on the PaMELA Database are a Mesolithic microlith and debitage listed under PaMELA ID 15360 (found by J. Gaunt, Leeds Geological Survey, at SE711037, c. 4 km north of the location reported in Jacobi, Garton and Brown 2001).

A.4.5 Nottinghamshire

Arnold, Holbeck, Nottinghamshire (open-air findspot; SK 596 487, E: 459600, N: 348700)
A brief note on an LUP surface find found at Arnold is reported in Jacobi, Garton and Brown (2001:17-19; C. Turner, pers. comm. undated therein; Nottingham University Museum accession number DKH691). This artefact appears not to have been recorded in detail by R. Jacobi, nor has it yet been recorded by the Nottinghamshire HER. The closest reported finds on the PaMELA Database are from nearby Arnold Red Hill New Farm (SK579462, c. 3 km south west of the LUP find), which are PaMELA IDs 5548 and 5550 of Early Mesolithic to Later Prehistoric date and made on Wolds-type flint.

Bingham (open-air findspot; near SK 725 390, E: 472500, N: 339000)
An LUP surface find is reported from near Bingham (Nottingham University Museum BI.69.11/BNR 68; in Jacobi, Garton and Brown 2001:17-19). This artefact was most likely found during the initial Fosse Way Project stages (Trent and Peak Archaeology 1991; possibly PaMELA ID 5758), but there is very little available information on the Nottinghamshire HER and the Jacobi Archive. Five entries on the PaMELA database which are also surface finds from near Bingham are either unclassified or Early Mesolithic microliths and blade fragments.

Scratta Wood (open-air findspot; SK 545 792, E: 454500, N: 379200)
Scratta Wood is located on Magnesian Limestone near Creswell Crags on the Nottinghamshire/South Yorkshire border. The locale is broadly near, but not immediately adjacent to waterways which feed into the River Idle system. During ploughing and woodland clearance in 1959 an Iron Age site and residual lithic artefacts were discovered (White 1966, Dolby 2008, in Cockrell 2016:193, Table 7.3). Information on a small Mesolithic assemblage was compiled by J. Radley and T. Manby (Wymer and Bonsall 1977:54; finds held at Worksop Museum).

There are 41 entries on the Jacobi Archive which are all from the G. Gwynne-Griffiths Collection, and predominantly of Early to Late Mesolithic age. Of LUP interest is the angular backed blade fragment with PaMELA ID 792 (G. Gwynne-

Griffiths catalogue K 7, in litt., undated) which was also reported in Jacobi, Garton and Brown (2001:17-19).

Tuxford Westwood Farm (open-air findspot; SK 716 701, E: 471600, N: 370100)
Mesolithic surface finds from a ploughed field at Tuxford Westwood Farm have been reported by J. Radley and T. Manby (Manby 1963; Newark and Nottingham Museum; Wymer and Bonsall 1977:222). In Jacobi, Garton and Brown's 2001 summary of LUP surface finds from Nottinghamshire the same findspot is listed as a possible LUP site (referencing a find held by Newark Museum, with accession number 88/1.49). There are two records on Jacobi's Archive and the artefact drawing included in record PaMELA ID 5918 features another probable LUP artefact. Based on the information therein, these finds were first discovered or reported by M. Posnansky ("scattered across 18 fields", in Posnansky's unpublished PhD dissertation; Wessex Archaeology and Jacobi 2014:ID 5918 in litt, undated). Jacobi's notes on a proximal section of a fragmented blade state the following: "from robusticity [sic.] could this be LUP; translucent patinated dense speckled glossy blue as Farndon and RHC [Robin Hood's Cave]".

Yew Tree Cave/Shelter, Mansfield (SK 517 649, E: 451700, N: 364900)
Scheduled cave site in the Creswell Crags area (Derbyshire HER 1936). Reported as a possible LUP site and excavated by A. L. Armstrong in 1937-8 (Armstrong 1939). Material was originally held at Manchester, but J. Campbell reports that "artefacts are now lost" (in Wymer and Bonsall 1977:428). A partially crested blade made on comparable flint as Mother Grundy's Parlour material is recorded as PaMELA ID 4074, and a burnt crested blade fragment is ID 4060 (both Armstrong Collection; Jacobi in litt., undated) The status of this site as verifiably LUP is less certain. Other recovered archaeological lithic remains date to the Late Middle Palaeolithic and Mesolithic, and there are also assorted faunal remains of *Bos*, *Equus*, *Meles meles*, *Rangifer* which appear to not yet have been analysed further (cf. PaMELA IDs 4090, 4082; Pettitt and White 2012:342 and Fig. 6.10; Creswell Crags Trust 2017b).

A.4.6 South Yorkshire

Washburn Foot, Farnley (open-air site; SE 229 463; E: 422900, N: 446300)
Open-air findspot at the confluence of Rivers Wharfe and Washburn, lithic

assemblage of Mesolithic and Later Upper Palaeolithic date, collected in 1943 (finds stored in Otley (MIM); Mesolithic finds discussed in Cowling 1946; Manby 1966; Wymer and Bonsall 1977:393; LUP component mentioned in Campbell 1971; Wymer and Bonsall 1977:393).

A.5 Additionally noteworthy findspots of later chronology (Terminal Upper Palaeolithic/Long Blade industries)

Although the sites listed below are of slightly later chronology than the main research period, I have intentionally included this brief overview to provide additional information regarding an under-represented phase of human open-air occupation of the research area. Sites are illustrated in Figure 81.

Ockbrook, Derbyshire (open-air findspot; SK 425 378, E: 442500, N: 337800)

In 2015 David Budge (Mercian Archaeological Services CIC and Ice Age Journeys volunteer) showed me a *lame machurée* which had been discovered in the early 1990s during fieldwalking in connection with the excavation of a Romano-British aisled building at Little Hay Grange Farm, Ockbrook (project run by the Ockbrook and Borrowash Historical Society, the Ilkeston Historical Society and the Derbyshire Archaeological Society; Wilson 1998; Palfreyman 2001). The site itself is a prime lookout spot, located on the edge of the Trent Valley with extensive views across and into the valley.

Only the Romano-British structures and Samian pottery finds have been published, whereas the flint artefact was recorded by R. Jacobi (PaMELA ID 3758) and the Derbyshire HER (entry number 23876). Although intended, further fieldwalking was variously impeded by "politics" (Anon., pers. comm. 2019) and ground nesting birds. The HER's classification of this clearly identifiable *lâme machurée* as dating to the Roman period is rather unfortunate.

Launde Park Wood, Leicestershire (open-air; SK 809 032, E: 480900; N: 303200)
Chance discovery of a localised lithic scatter discovered just beneath the plough soil during the Wing to Whatborough water pipeline construction (Leicestershire

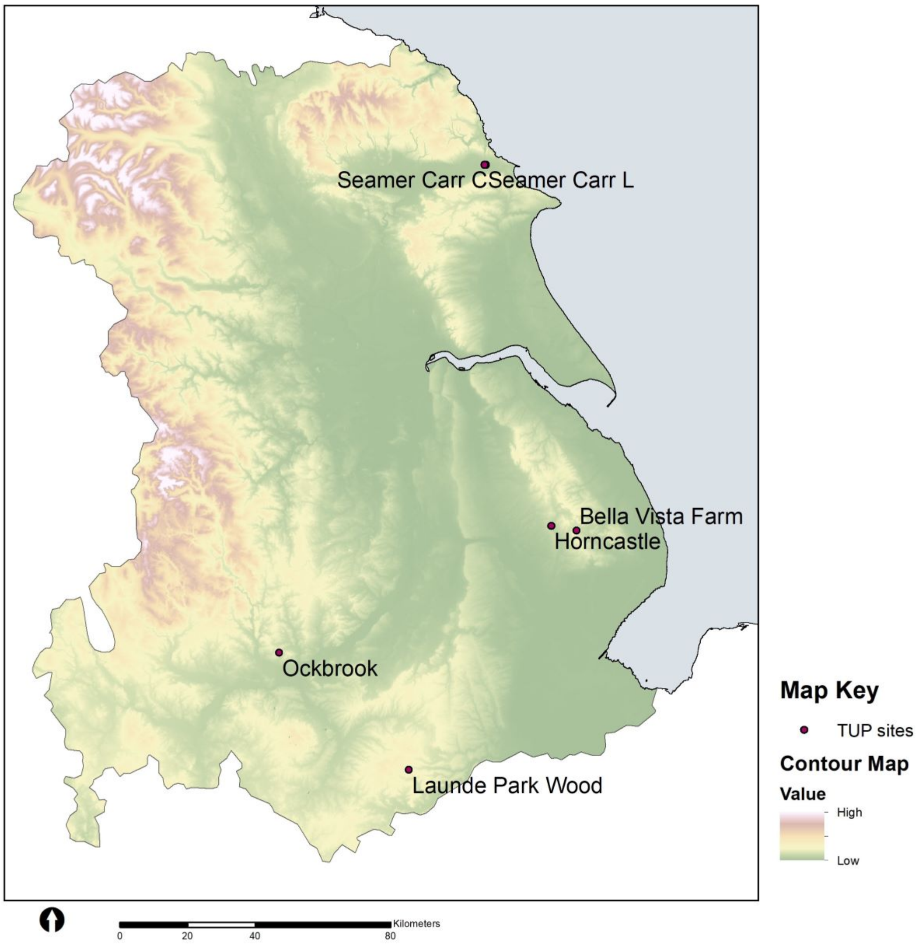


Figure 81: Catalogued TUP/LB-attributable sites (map by J. Kotthaus and L. Grottenberg. Contains OS data, Crown copyright and database right 2021)

and Rutland HER 1997; Leicestershire and Rutland HER 2019; Cooper 1996; Cooper 2004; Cooper 2006b). The site is located on a hilltop with good sight lines and panoramic views across the valley. Approximately 3000 flint artefacts were recovered, most of which were patinated in a dense, white patina also identified at Farndon Fields, Notts. The assemblage consists predominantly of lithic blade debitage (maximal length 146mm; straight and slender blade blanks; plain and faceted butts), shorter blades/bladelets, crested blades, miscellaneous flakes and blade cores (both unifacial and prismatic, several with opposed platforms). The retouched tool component is disproportionately low (0.006% of hand excavated material, c. 2% after conclusion of analyses; Cooper 1996:92), and consists of three obliquely truncated points, a Corbiac burin, five endscrapers, two microburins, one of which is classified as a Krukowski microburin, and projectile points, including period-indicative Zonhoven points (Cooper 2004:Fig. 8). The classification of the material found at Launde raised some initial questions; Jacobi noted that the "collection [is] very different from 'standard' early Meso[lithic] with plain/linear butts and abundant core tablets and plain platform cores" (Wessex Archaeology and Jacobi 2014:PaMELA ID 175, my edits). Jacobi recorded the presence of long blades, *Riesen-* and *Großklingen* (Taute 1968) and compared the Mesolithic microlith with artefact ID 253 to microliths found at Uxbridge and Manton Site 10 (near Scunthorpe).

Results of a *chaîne opératoire* technological analysis of the lithic assemblage and detailed site plans are reported in Cooper (2004:Figs. 7-9). The location of a hearth is inferred via higher proportions of burnt artefacts around the centre of the site plans, but the presumed hearth structure may have been undercut by the first evaluation trench which was dug straight across the scatter. Based on assemblage composition, Launde has been interpreted as a blade knapping spot where only minimal tool modification took place. Based on typological and technological characterisation, Launde is classified as a Long Blade/Terminal Upper Palaeolithic site and compared to Three Ways Wharf, Uxbridge (Lewis 2011; Lewis 1991).

Long Blade finds near Bella Vista Farm, Lincolnshire (open-air findspots; TF 30384 73857, E: 530384, N: 373857)

A landscape of Terminal Upper Palaeolithic/Long Blade findspots located on the fields surrounding Bella Vista Farm, which I have - in private - referred to as 'Bill Bee's happy hunting grounds in the Salmonby/Tetford/Belchford triangle', and from where a number of Middle Palaeolithic to Prehistoric lithic surface finds are derived (Wymer and Bonsall 1977:170-182, information mainly R. M. Jacobi in litt., undated). Located near the rivers Beck and Lymn in the centre of the Lincolnshire Wolds. Partially recorded by the Lincolnshire HER (those entries are included in my HER dataset and mapped in Chapter 4). Further work to relocate Mr Bee's approximate findspots and record all finds is currently ongoing (P. Chowne, pers. comm. 2015-2017).

The late Bill Bee was a tenant farmer who developed a keen interest in surface collecting whilst farming. His collection is estimated to include c. 300 artefacts. Mr Bee became a familiar figure to many in the wider Palaeolithic community thanks to his involvement in the Lithic Studies Society, his contributions as a local advisor to the PAS, own and collaborative publications (e.g. Bee 1999; Bee 2005), knapping, teaching and local outreach (S. Gorst, a farmer in nearby

Figure 82: Working photograph at Bill Bee's home to view his private collection of Lincolnshire Wolds finds (Mr Bee and myself pictured; photograph kindly taken by P. Chowne, 2016, to whom I remain grateful for facilitating the visit)

Oxcombe, pers. comm. 2018). Parts of his private collection were acquired by the Collections Museum in Lincoln during his lifetime where they have since been displayed. Following some time of uncertainty as to the fate of the remainder of Bee's collection, which I actively communicated to the UK Palaeolithic community, it is now assumed that all finds have since been deposited at the museum in Lincoln (J. Hogue, pers. comm. 2019).

On a rather personal note, I want to thank Bill and his lovely wife Pearl for their hospitality during my visit, making it one of the most delightful field days during my research (see Figure 82), and I was deeply saddened to learn about their passing shortly thereafter.

Horncastle, Lincolnshire (open-air findspot; TF 229 753; E: 522900, N: 375300)

An isolated chance discovery of a small blade and a bruised blade was reported by J. Hogue 2016. The artefacts were discovered at the interface between alluvial silts and the underlying river gravels during excavations in advance of the River Bain flood alleviation works. Bruised blades, or *lâmes machurées*, are characteristic index types for Terminal Upper Palaeolithic or Long Blade industries, which thus far are only rarely documented in the East Midlands - the nearest parallels being known from Launde, Leicestershire, and Sproughton, Suffolk (Cooper 2006b; Barton 1986b). Both artefacts are completely preserved. The bruised blade was made on a straight and parallel-sided blade blank (c. 85 mm length to 28 mm maximal width; widening towards the distal end), with a small, diffuse butt and traces of faceting visible on the dorsal side of the proximal end. The blade has undergone post-depositional grey-black patination, and intermittent retouch is visible along the ventral and dorsal sides of the lateral edges (Hogue 2016:Fig. 2; own observations and J. Hogue, pers. comm. 2015).

Flixton (Island) Site 1, Flixton (open-air site; TA 035 811, E: 503500, N: 481100)

Open-air site located in the middle of palaeolake Flixton in the Vale of Pickering. First excavated in 1948 by J. Moore who identified two sites: Flixton 1 (Long Blade) and Flixton 2 (early Mesolithic; Moore 1954; Wymer and Bonsall 1977:432; see also North Yorkshire HER entries MNY12611 and MNY12646). Later investigated by the Vale of Pickering Research Trust between 1986-7 and in 1993 (Lane, Schadla-Hall and Taylor 2023). Archaeological assemblage from stratified excavation comprises lithic artefacts and remains of *Equus ferus* (at Flixton site 2: 38 mostly incomplete bones and 4 molars found in layer H, a fine detritus mud layer). The context of deposition was aptly described by J. Campbell as “the result of the pursuit of the horses [...] into a Late Glacial muddy bog” (Campbell 1977a:169 and Fig. 141.5).

Due to humic contamination, dates reported by Cloutman 1988b yielded results for Flixton Site 2 which are ‘too young’ for the Upper Palaeolithic archaeological and palaeoenvironmental age estimates (soil around bone: CAR-1016 9850 ± 80 ^{14}C BP, 11,684-11,110 cal BP; mud Q-66 sample on top of layer: 9270 ± 210 ^{14}C BP, 11,175-9,912 cal BP). A horse astragalus (find No. 2713) was recently redated following a different method of pretreatment (X-2395-14, 10,155 ± 55 ^{14}C BP, 11,970-11,405 cal BP) which represents a better match for the associated contexts and estimates (Marom et al. 2013:703, Table 3).

Seamer Carr C and L, Flixton, North Yorkshire (open-air site; TA 035 820, E: 503500, N: 482000)

Seamer Carr C and L (TA 032 820; North Yorkshire HER entry MNY 38207) are located in the Vale of Pickering and two of more than twenty sites which have been discovered within and along the perimeter of palaeolake Flixton. The sites were excavated under the auspices of the Vale of Pickering Research Trust in the 1980s. The lithic and faunal assemblages found at site C can predominantly be attributed to the Terminal Upper Palaeolithic and Early Mesolithic (North Yorkshire HER 2017; Wessex Archaeology and Jacobi 2014:PaMELA ID 14064; diagnostic Final Upper Palaeolithic component at Seamer C are 11 curve-backed and penknife points). The raw material provenance patterns for the two phases of occupation at Seamer C are for instance discussed by Conneller and Schadla-Hall 2003; Conneller 2007 and Lane, Schadla-Hall and Taylor 2023. At Seamer L, a small lithic assemblage containing long blades was found in amongst faunal remains (*Equus ferus* bones; OxA-19511 10,025 ± 45 ^{14}C BP, 11,748-11,311 cal BP; Conneller and Higham 2015:160; Conneller 2007; Conneller 2000b; Conneller and Schadla-Hall 2003; Lane, Schadla-Hall and Taylor 2023).

Catalogue B

Supplementary information for Chapter 3

This supplementary information details the observations and results obtained from the spatial analyses of the Probable/Possible LUP site data sourced from two major UK heritage management data repositories (Historic Environment Records and the Portable Antiquities Scheme, i.e., Dataset 2; data collection finalised in October 2019). The purpose of these desk-based assessments was to assess the prevalence, scale, and representivity of Probable/Possible LUP-attributable evidence within the research area in order to investigate if the same distributional patterns identified for Confirmed/Certain LUP sites (i.e., Dataset 1) were borne out for this larger Dataset 2. A tabulation of analysed HER and PAS records can be found in Table 28.

My analysis is the first to combine and approach both HER- and PAS-derived LUP findspot data at this regional scale. All comparisons were carried out using the same parameters for data collection and dataset curation and compared with the same physical and human geographical features as Dataset 1. My comparisons of Datasets 1 and 2 are separate, yet parallel analyses, which will necessarily bring repetitive elements to this text.

B.1 Probable/Possible LUP site distribution (Dataset 2 of HER and PAS site data)

The impetus to explore heritage management data repositories was given by developments in LUP research since c. 1990 (see p. 44 and Figure 12) indicating an overall increase in LUP open-air site discoveries through commercial unit-led interventions, which then are reported to and managed by local HER offices. Equally interesting to consider was the inherent potential of largely under-studied lithic PAS data (cf. Chapter 8). In Section 4.1.2 I outlined the rationale and methodology for data collection and dataset curation.

A separation between Datasets 1 and 2 was necessary due to discrepancies regarding the classification of LUP data in heritage management data repositories (see Sections 3.2.3, 4). These classification issues and discrepancies regarding metadata coverage led me to group the Probable/Possible LUP sites as one dataset of LUP-attributable data (or 'Late Pleistocene' data, Pettitt, Gamble and Last 2008:3-4) with no additional distinction made between earlier/later LUP technocomplexes. The reason why I decided to refer to this Dataset 2 as 'Probable/Possible LUP data' is because the collation of my Confirmed/Certain LUP site Dataset 1 for Catalogue A had illustrated how important it is to critically review all available information to account for changes in site classification. Because the same rigorous review of all sampled HER and PAS data was unattainable within the present scope, some issues could not be fully resolved but were mitigated by the creation of two LUP site datasets.

Dataset 2 contains 1705 probable/possible LUP site entries (HER N = 888 and PAS N = 817; see Table 28). Whereas the HER sample comprises 139 cave/rock shelter sites (15.6%) and 749 open-air sites (84.4%), all sampled PAS records are from open-air sites. Notably, the Confirmed/Certain LUP sites (Dataset 1, in Sections 2.2.3, 4.1, and Catalogue A) and all 17 LUP Schedule of Monuments sites are included in the HER and PAS samples discussed here. These 69 sites represent c. 4% of the 1705 Dataset 2 sites. And while this inclusion does create a minimal overlap between Datasets 1 and 2, an exclusion of the confirmed LUP sites from this larger Dataset 2 would have been an omission of verifiably high reliability evidence managed by HERs and a misrepresentation of documented site data. The PAS sample also includes the PAS LUP records analysed for the pilot study (N = 31, in Chapter 8).

The HER and PAS site data are subset throughout this analysis for two important reasons; (1) to heed observed discrepancies regarding the reliability of the LUP classification; and (2) to compare the HER and PAS samples with each other. As stated (in Sections 4.1.2 and 3.2.3), my initial data mining of the HERs and PAS returned larger datasets that I then curated. Using a sample of c. 400 HER entries (comprising the Dataset 1 sites and two randomly selected counties) for individual review, I was satisfied with the LUP classification of at least 45% of the HER sample and continued dataset curation according to the same parameters.

In contrast, in my PAS pilot case study (in Chapter 8) I found that out of a sample of 31 object entries that made up the results of my 'Late Palaeolithic' keyword search, only 3 entries (or 9.6%) were consistent with the stated LUP-attribution (see Sections 4.1.2 and 8.1.3 in Chapter 8). This high fail rate (c. 90%) far surpasses the proportion of potentially wrongly classified HER entries, and has wider implications for the accuracy of lithic PAS records in general (see Sections 8.2.3 and B.1.5). Nevertheless, since the Scheme undoubtedly contains records of high LUP reliability with promising potential for the study of LG human occupation, I regard my use of Late Pleistocene PAS data as justified - albeit with clear caveats - whilst keeping a graded approach to their interpretation.

The motivation to further compare the HER and PAS site data is driven by (1) an interest to heed the differences in data origin contexts, data sources, and scope; (2) to see if there are similarities or differences in the output site data and their composition and distribution. The HER and PAS samples are comprehensive, yet not impartial datasets, as these datasets are both representative of documented human presence during the LGI but equally also represent different contingencies for preservation and collection of prehistoric data (Collins 1975; Schiffer 1996:9; Robbins 2013:55pp). Due to various taphonomic factors including sedimentary biases (e.g., depth of Holocene sedimentation, erosion) or low ground-surface visibility, or few to no targeted surveys in an area due to the landscapes' poor fitness for construction (cf. Section 9.1.2; Robbins 2013; Billington 2016; Mills 2022:485pp), each heritage management dataset will necessarily be affected by preservation and collection biases. These biases impact datasets differently, and a combination of both heritage management data repositories holds the potential to recreate a more comprehensive and complementary overview of documented LUP evidence.

There are distinct differences between HER and PAS records regarding types of managed heritage assets, or object entries' origin context, data sources, and scope: whereas most of the HER data is derived from the professional heritage sector, the PAS is focused on public reporting of individual finds. As such, there is a risk that the spatial distribution of HER entries are a direct replication of the location of unit-led interventions, i.e., reflect survey biases rather than provide an overview of documented prehistoric activities. Since fieldwalkers and metal detectorists are more at liberty to set their preferred search areas (Robbins 2013; Axelsen 2021), the inclusion of PAS data may thus provide additional information found beyond firmly delineated survey boundaries, and therefore provide a means to nuance and complement the HER site data.

Interesting differences between the HER and PAS components are addressed to identify if the differences in data origin (HER/PAS) and context of discovery (professional heritage sector/members of the public) influence the volume and spatial distribution of LUP finds. If both datasets produce very similar results, these will indicate the presence of patterns independent of data source. If there are differences between the HER and PAS datasets, such as emerging areas of high LUP potential as identified through casual fieldwalking or attentive metal detectorists, these examples could provide additional information to better direct future LUP surveys.

In addition to informing questions concerning the degree of intensity of LG human re-occupation of the East Midlands, further analyses of emerging differences between the HER and PAS components of Dataset 2 could provide an interesting avenue for future research. Results outlined here can serve as a reference for how predictive models could weight different geographical features, which is part of an essential methodological evaluation in prediction model design (see Section 9.3.2). Note that cave and open-air sites have been grouped under the same symbology throughout all maps, and that nearby sites overplot at the scale mapped.

Table 28: Comparison of LUP open and cave site frequency per surveyed county and consulted sources ('catalogue' is synonymous with Confirmed/Certain LUP sites in Dataset 1, cf. Catalogue A)

County	Catalogue	HER sample	PAS sample
Derbyshire	25	107	24
East Riding	1	127	172
Leicestershire/Rutland	4	95	244
Lincolnshire	8	179	89
North Yorkshire	6	148	123
Nottinghamshire	11	26	9
South Yorkshire	8	141	35
Staffordshire	5	58	4
West Yorkshire	1	7	117
Total	69	888	817

B.1.1 Distribution of Dataset 2 site data compared with landforms and topography

The distribution of Probable/Possible LUP sites was compared with elevation above Ordnance Datum (m AOD). Notably, and in contrast to previous views regarding spatial findspot distribution patterns (cf. Section 2.1.3), Dataset 2 suggests there is ample evidence to support far greater LUP presence across lowland open-air areas, as tabulated in Figure 84 (elevation range: 0 m to >500 m AOD). As calculated, most Probable/Possible sites are located below 150 m AOD, and predominantly between 50 to 100 m AOD with a skewed right distribution for both HER and PAS site data. Interestingly, twice as many PAS sites viz HER entries are recorded at 100 to 150 m AOD. Whereas the frequency of HER sites gradually decreases as elevation increases, the PAS data is less evenly distributed and increases with higher elevation. Thrice as many PAS viz HER records are located between 350 to 400 m AOD. The differences between HER and PAS site distribution in Figure 84 may be linked to differential contexts of artefact or site discovery, as for instance fewer development schemes and therefore fewer unit-led archaeological interventions are planned in upland areas. In contrast, most PAS finds are discovered by members of the public who may survey surfaces at any level of elevation, and in national parks or otherwise protected lands. A notable exception are HER records for contract archaeology projects related to the Angram, Scar House, and Gouthwaite reservoirs (Nidderdale AONB, N. Yorks., see Figure 90).

As Figure 83 illustrates, Probable/Possible LUP sites are found across most of the lowlands. Site coverage is higher near Confirmed/Certain LUP sites such as Creswell Crags, Risby Warren and environs (Lincolnshire; see Chapter 7), and the Vale of Pickering (N. Yorkshire). In contrast, there are lacunae around large urban centra such as Nottingham, Lincoln, Leicester, York, Bradfield, between Sheffield and Leeds, where modern developments obscure access to any potential underlying archaeological remains. Findspot coverage is notably low in the Vale of York and in the south-eastern lowlands of the research area towards the Wash where relevant LG sediments are too deeply buried underneath Holocene sediments, or where Holocene erosional activity has disturbed the surfaces. To complement Figure 83 and to illustrate patterns relative to elevation, I have compared distribution in more detailed increments of 50 m AOD (highlighting Confirmed/Certain LUP sites for reference, see Figures 85, 86, 87, 88 and 89).

Figures 83 and 85 furthermore reveal high site density along the present-day North Sea coast. These findspots would have been inland sites due to the differences in coastline location between now and the LG Interstadial, when the research area extended into now submerged areas beneath the North Sea. My comparisons indicate higher frequencies of (present-day) coastal findspots north of the Humber Estuary, which are a notable contrast to the southern half of the research area: for the entirety of the southern (Lincolnshire) coastline, only one entry is recorded (Upper Palaeolithic blade core from Skegness, Historic England 2018b: entry MLI98526). The stark contrast between densities of northern/southern coastal findspots is certainly worth investigating further, not least since I regard Lincolnshire's overall LUP potential as high, and because I observed several classification issues in the 'coastal' Humber HER entries which require further clarification. For future research I consider it to be important to pursue the potential for more LUP discoveries along the coast and the littoral zone, as begun by the Europe's Lost Frontiers ERC-funded project (e.g., Fitch, Gaffney and Thomson 2007; Walker et al. 2020).

As shown in Figures 86 and 87, at increasing elevation sites cluster thus (from north to south): near Ripon, along the southern boundary of the North Yorkshire Moors National Park, on the central parts of the Howardian Hills (all North Yorkshire), on the Spur of England and in the Yorkshire Wolds. In the centre of the research area, sites are located along the north to south axis of the Lincolnshire Cliff limestone escarpment, in the central and southern parts of the Lincolnshire Wolds (mainly west-facing flanks), and along a north-south ridge in the Don Valley between Doncaster, Worksop, and Mansfield, where site density is high near known cave sites at Creswell Crags. In Figure 85, there are additional areas with higher site coverage at the Nottinghamshire/Leicestershire border, and along the southern boundary of the research area. Most of the central Lincolnshire Wolds findspots can be traced back to the late Bill Bee who was a local tenant farmer and who collected surface finds along the River Lymn in the Belchford-Salmonby-Tetford triangle (Bee 1999; Bee 2005; Lincolnshire County Council 2012; P. Chowne and B. Bee pers. comm. 2016 and own observations; see Catalogue A).

Between 100 and 150 m AOD (see Figure 87), the overall site coverage decreases, but notably higher densities of Probable/Possible LUP sites are mainly located on south facing 'beauty spots', for instance in the North Yorkshire Dales. These lithic artefact discoveries may be incidental finds near known sites from later prehistoric periods in Yorkshire (Pouncett 2019). The near-linear distribution of HER findspots in the Nidderdale AONB (more detailed view in Figure 90) is the result of different contract archaeology unit-led surveys along the Nidd. Also shown in Figure 87 is a small cluster in the eastern Peak District, and a prominent near-linear distribution along the north-south axis between Doncaster to Worksop. In the southern reaches of the research area, the distribution pattern observed for sites between 50-100 m AOD continues along the southern boundaries and reveals interesting clusters in the Vale of Belvoir and near Uppingham on the Leicestershire/Rutland border.

Above 150 m AOD (see Figure 88), site distribution is more limited and mainly concentrated to the south-eastern parts of the North Yorkshire Dales and North Yorkshire Moors. Isolated findspots are found on the higher lying ground of the Wolds, then near Mansfield, and the southern reaches of the Peak District. In the south, site clusters are limited to locally higher points and ridges in the Vale of Belvoir and on the outskirts of Uppingham. Since the location of upland areas (elevation greater than 200 m AOD) is limited by natural factors, site distribution is mostly concentrated on the Pennines (see Figure 89), but with two outlier locations in the North Yorkshire Moors, and near Uppingham in Rutland.

B.1.2 Comparisons with geology

Distribution of Dataset 2 sites relative to Upper Cretaceous Chalk bedrock

In Figure 91 I have compared Probable/Possible LUP site distribution relative to the location of Upper Cretaceous parent Chalk deposits. Although geographical distance – or proximity – to source is not a reliable indicator for preferential patterns regarding raw material provenance and provisioning schemata, it is nevertheless informative to compare site coverage near the natural primary sources in the Lincolnshire and Yorkshire Wolds (Barton 2010). Additional nodular flint theoretically suitable for blade manufacture can be found in superficial/derived sources (river gravels, moraine deposits) across the landscapes. However, comparisons between hand specimen characteristics such as nodule size and maximal length of laminar blade artefacts represented in studied assemblages suggest that locally available, nodular flint from a derived source was not necessarily the preferred material knapped, likely due to inherent raw material properties (e.g., maximal attainable lengths of blade removals, or more variable quality). Chronological and regional patterns in lithic raw material behaviour are more fully discussed in each case study and in Section 9.2.2. There are definite site clusters on the Lincolnshire Wolds and especially north-eastern and northern half of the Yorkshire Wolds, and a parsimonious interpretation would suggest that local Wolds-type flint can be found in the respective assemblages (cf. observations for the Vale of Pickering sites in Chapter 5). However, essentially none of the HER or PAS metadata specify flint type or origin, although all sampled data entries cite ‘flint’ as the primary material. A more detailed interpretation of flint provenance would thus be contingent on a case-by-case evaluation, but which fell beyond the present scope.

Distribution of Dataset 2 site data relative to superficial geology

Probable/Possible LUP site distribution was compared with superficial deposits, using the 1:625,000 BGS data for Figures 92 and 93. K. Smith (School of Archaeology, Oxon., pers. comm. 2019) kindly made his (higher resolution BGS 1:10,000 superficial deposits theme) licence available for the tabulated comparison of HER and PAS samples’ frequency in Table 29. The majority of HER (59.4%) and PAS (66.3%) sites are located on deposits currently classified as ‘unmapped’ (cf. Section 4.2.2). In general, the location of Probable/Possible LUP sites follows the broad regional characterisations of differences in surface geology composition, and observations and site frequency vary significantly between all parts of the research area. For instance, lacustrine deposits are predominantly concentrated to the upper half of the research area and north-west of the Humber, whereas the highest concentrations of alluvium are found in counties south of the Humber estuary, which is reflected in regionally different site distribution patterns (see Figures 16, 92 and 93). Sites along the modern-day North Sea coast in East Riding of Yorkshire and North Yorkshire are found on till, which is the predominant surface deposit there, whereas south of the estuary and towards the Wash in the south, alluvium is the most prevalent deposit, albeit with notably fewer documented sites (in Table 29).

In chapters 4 and 9 I have described my observations in more detail. Here, I shall refer to Table 29, and highlight a notable observation where my analysed HER and PAS site data differs. Interestingly, whereas alluvial deposits are far more frequently reported for HER (7.4%) viz PAS entries (1.6%), comparatively more PAS finds are recorded from peat (5.5% viz 1.3% for HER data), which may be linked to fewer large-scale developments schemes planned in ‘peaty’ areas. A notable exception are the Vale of Pickering findspots on the North Yorkshire HER (see Chapter 5), which were discovered prior to the construction of the namesake Seamer Carr household waste recycling centre (*carr*, from Middle English: peat-accumulating wetland).

Table 29: Frequency of Probable/Possible LUP sites relative to superficial deposits (*undifferentiated; calculated in ArcMap using BGS 1:10,000 superficial geology basemap; British Geological Survey 2019a)

Geology	HER sample (in %)	PAS sample (in %)
Alluvium	66 (7.4%)	13 (1.6%)
Blown sand	53 (6%)	28 (3.4%)
Glacial sand & gravel	58 (6.6%)	72 (8.8%)
Lacustrine deposits*	34 (3.8%)	17 (2%)
Peat	11 (1.3%)	45 (5.5%)
River terrace deposits*	22 (2.5%)	10 (1.2%)
Till	116 (13.1%)	90 (11%)
Unmapped deposits	528 (59.4%)	541 (66.3%)
TOTAL	**888**	**817**

B.1.3 Distribution of Dataset 2 site data compared with surface water hydrology features

The distribution of Probable/Possible LUP data was compared with surface water hydrology features, specifically river systems and palaeolakes Flixton and Humber (see Section 4.2.3). Rivers and lakes are highly interesting landscape features, for instance from a perspective of subsistence strategies as freshwater features provide access to environmental resources. Whereas lakes may be natural barriers, lakes may also be regarded as natural communication corridors for human groups using boats or canoes. While there is currently no documented evidence for the existence of such vessels during the LG Interstadial in Britain, boats or canoes would theoretically have facilitated the transport of humans, food, and other equipment across the landscape (Mills 2022).

Table 30: Frequency of Dataset 2 (Probable/Possible LUP) sites relative to waterways (in 500 m intervals; calculated using OS data, Crown copyright and database right 2023)

Distance (in m)	Dataset 2	HER sample	PAS sample
0-500	622 (36.5%)	310 (35%)	290 (35.5%)
500-1000	342 (20%)	160 (18%)	170 (20.8%)
1000-1500	233 (13.6%)	126 (14.2%)	93 (11.4%)
1500-2000	174 (10.2%)	69 (7.8%)	93 (11.4%)
2000-2500	228 (13.4%)	92 (10.4%)	124 (15.1%)
>2500	193 (11.3%)	131 (14.7%)	47 (5.7%)
N	1705	888	817

Using the same approach as described in Section 4.2.3, near distances between Dataset 2 sites and watercourses were calculated in ArcMap Pro, using the Ordnance Survey Open Rivers data set (Ordnance Survey 2020b; Billington 2016:71-74). As summarised in Figure 94 and Table 30, site densities are high (36.5%) in the proximity of waterways, as 35% of HER and 35.5% of PAS sites are within 500 m of waterways. The proportions of HER and PAS sites are overall very similar up to a distance range of 1000 m, but frequencies differ within 1000-1500 m where there are more HER (14.2%) than PAS sites (11.4%). PAS sites are more prevalent than HER sites between 1500 to 2500 m distance to waterways, though as distances increase beyond 2500 m, HER site frequency increases (14.7% HER vs 5.7% PAS sample; in Table 30, Figure 94). This latter observation is interesting and requires further assessment, for instance to see whether these locations are truly 'dry' sites or whether the sedimentary record is indicative of past fluvial activities closer to the locales.

The collation of Catalogue A pointed towards a relationship between sites and the Rivers Ouse, Aire, Lymn, Wharf, Don, Nidd, as well as the Trent and its tributaries. However, the density of Dataset 2 sites relative to the Trent in Figure 96 is low, and warrants further investigations at the local and regional level, for instance to map the nature and extent of geomorphological and taphonomic processes that have impacted fluvial landscapes since the LG Interstadial (cf. Section 9.1).

In general, Figures 83 and 95 illustrate that the distribution of Probable/Possible LUP sites trace palaeochannels of the Trent and other rivers, and that sites are located within and along the modelled perimeters of palaeolakes Humber and Flixton (cf. Table 29). A good example is the density of sites along and within the Lake Flixton lake shores, which includes the well-documented Vale of Pickering sites (see Chapter 5; Lane, Schadla-Hall and Taylor 2023; Lane 1998; Clarke 1954; Milner, Conneller and Taylor 2018a; Milner, Conneller and Taylor 2018b). Interestingly, and tying in with my comments in Section 4.2.3, in Figure 95 there are comparatively fewer recorded sites within the former boundaries of palaeolake Humber, especially west of the Humber estuary and in Vale of York, and towards the south-eastern maximal extent of Lake Humber (see also Section 9.1.2). Except for my case study site Risby Warren, LUP sites are scarce near the Humber Estuary. In Figure 96 I have counted only ten findspots along the shores of the estuary. Half of these are on opposite shores of the Humber Bridge between Hessle/North Ferriby and Barton-upon-Humber, and only the North Ferriby findspots are on the northern side of the Estuary.

B.1.4 Distribution of Dataset 2 site data compared with human geography features

As outlined in Section 4.2.4, modern land use patterns such as construction work, quarrying, industrial extraction, or cultivation are ground-invasive and damaging to the integrity and survival of underlying deposits. Paradoxically, such activities are at the same time a means through which the visibility and recovery of artefacts or findspots may be increased. Indeed, several of my case study sites were identified based on artefact discoveries through fieldwalking of the ploughzone, which is also the context of discovery for a significant proportion of the HER and especially PAS site data analysed in this appendix.

Since results from contract archaeology interventions are the largest contributor of new data recorded by HERs, the survey location of development schemes or unit-led interventions may have a quantifiable, possibly directional effect on archaeological findspot distribution patterns (cf. Sections 2.2.3, 4.1.2; Historic England 2019a; Wells 2019). In contrast to commercial developer archaeology, surface collectors or metal detectorists may target wholly different search areas, and which might otherwise not be investigated commercially. Since finds made by members of the public and especially casual collectors or metal detectorists represent the majority of lithic finds on the PAS (see Section 4.1.2), the Scheme's data can be used to see if different findspot patterns emerge viz HER data. As identified in recent analyses (Robbins 2013; Brindle 2010; Axelsen 2021), although a small number of PAS finds truly are 'chance finds', the majority of PAS objects are incidental discoveries in deliberately targeted locations. Contributing factors to collectors' search area selection range from geographical accessibility and surface visibility, to access permission rights, the collectors' 'home range', known 'hotspots' for discoveries, and preferential landscape types for collection (Robbins 2013:58-60).

To investigate the relationship between LUP findspot distribution and human geography features in a systematic way, I have compared Probable/Possible LUP site data with UK land cover base maps (see Section B.1.4). Note that land 'use' and land 'cover' are highly related, though not synonymous terms, as land use cannot always be inferred via land cover. However, for the intended purposes here, land cover provides a valid base map for analyses (Rowland et al. 2015). Due to constraints on time and funding, further analyses of changing land *use* patterns were omitted, but which promise interesting avenues for future studies (see Section 9.3.2). The base maps used for comparisons here provide a 'snapshot' of 2015 land cover classifications (in lieu of land use; Rowland et al. 2015), which on a local scale may since have been superseded.

Distribution relative to UK Land cover classes

Table 31: Frequency of HER and PAS Late Pleistocene findspots site data compared with land cover classes (contains data from Rowland et al. 2015)

Land cover type	**HER sample**	**PAS sample**
NA	7 (0.8%)	2 (0.2%)
Broadleaved woodland	122 (13.7%)	11 (1.3%)
Coniferous woodland	8 (0.9%)	15 (1.8%)
Arable/horticulture	356 (40.1%)	589 (72%)
All grasslands	257 (28.9%)	92 (11.2%)
Heather	20 (2.3%)	21 (2.5%)
Heather grassland	16 (1.8%)	6 (0.7%)
Bog	6 (0.7%)	9 (1.1%)
Inland rock	2 (0.2%)	NA
Freshwater	17 (1.9%)	61 (7.4%)
Littoral sediment	3 (0.3%)	3 (0.3%)
Urban	16 (1.8%)	5 (0.6%)
Suburban	58 (6.6%)	3 (0.3%)
TOTAL	**888**	**817**

Shown in Table 31 is a simple analysis of comparing the frequencies of Probable/Possible LUP data relative to land cover (Rowland et al. 2015), with no corrections for the overall proportions of land cover classes within the research area. As outlined in Section B.1, the purpose of these comparisons is to see whether the different site data origins and contexts (i.e., contract-led interventions contrasted with casual collecting) are expressed as different proportions across land cover types. There are both parallels but also notable differences between the HER and PAS components. Most of HER and PAS findspots are located on arable or horticultural land (classification includes perennial crops, orchards, and freshly ploughed land), which is ubiquitous across the entire research area. Notably, the prevalence of PAS finds from arable land (72%) is greater than for HER data (40.1%), indicating that such land cover types are preferentially targeted for fieldwalking, likely because actively managed/ploughed fields can have good ground visibility and an overall high potential for surface find discoveries (Ammerman 1985; Robbins 2013:57; Bond 2010; Mills 2022:490-1, Fig. 7.2; see Section 8.1.2 and own observations).

The second largest proportion of Probable/Possible LUP sites are found on grasslands (prevalence 28.9% HER viz 11.2% PAS for grasslands, see Table 31), which includes areas used for grazing but also actively managed grasslands for silage, hay, and pasture. Surface visibility is generally lower on densely vegetated grasslands but may change between seasons. Broadleaved woodlands make up only 2.5% of Britain's total land surface (Woodland Trust 2019), yet this is the land cover type with the third highest HER prevalence (13.7%). This proportion is also far higher than for the PAS sample (1.3% PAS sites, see Table 31). These differences could be linked to poor ground surface visibility and reduced potential to identify surface finds within Broadleaved woodlands, contrasted with more beneficial conditions for artefact discovery during unit-led interventions. Comparatively fewer HER findspots (0.9%) are found in coniferous woodlands, from which more (1.8%) PAS findspots are recorded. The third highest frequency of PAS data (7.4%) is found near freshwater features, i.e., canals, standing open water, small (<50 m wide) rivers and streams. In comparison only 1.9% of HER findspots are derived from near freshwater features. Note that the sites are located near, but not in freshwater itself (see Figures 96 and 94), as the 25 m raster dataset used here overextends the boundaries of mapped features (Rowland et al. 2015).

An interesting difference between the datasets concerns site data from urban and suburban land cover classes, from which 8.5% HER viz 0.9% PAS entries are recorded (see Table 31). This indicates that commercial archaeological interventions related to (sub)urban features such as car parks (e.g., in Leicester) and industrial development schemes return Probable/Possible LUP HER records. However, and in contrast to observations made by Mills (2022:492, Fig. 7.3) and others (e.g., Cooper 2013; Cooper and Green 2017) who highlighted the positive bias between cities and larger concentrations of surface finds, the low proportion of (sub)urban PAS-derived records in my dataset suggests a different pattern applies to the East Midlands which merits further analyses at a future occasion.

Distribution relative to the modern road network

Probable and possible LUP site data was compared with the Ordnance Survey's Open Roads base map (Ordnance Survey 2020c), specifically focusing on modern main A and M-roads and the Roman road network (see below). The frequency of Dataset 2 findspots in relation to modern roads is shown in Figure 98. The maximum distance between findspots and any modern road is c. 1800 m, and site frequencies are highest within 200-400 m of road features. There are differences between the individual HER/PAS components. The skewed right distribution of sampled HER data emphasises site concentrations within short (up to 200 m, 400 m) distances of modern roads. Beyond 400 m the frequency of HER sites drops gradually, then declining further at distances >600 m. Outliers (equivalent to ten sites) may be observed >1000 m distance range. The spread of Probable/Possible LUP PAS sites mirrors the overall pattern for Dataset 2. The PAS sample is also skewed right in Figure 98, but differs from the HER sample in that PAS sites are most frequent within the 200-400 m range, rather than within 200 m. PAS site frequencies remain high as distances increase (up to 600 m) before declining sharply past the 800 m range.

The calculated results are consistent with the hypothesis stated in Section 4.2.4 and observations in Section 2.2.3, i.e., that the context of artefact discovery and recovery through commercial archaeology unit-led interventions ahead of infrastructural development schemes may be reflected in the distribution pattern of Probable/Possible LUP HER site data. Looking more closely at Figure 97, clear patterns emerge along the A5 and A444 (Staffordshire and Leicestershire/Coventry border), along the A631 (Lincolnshire Wolds), M1, M69, the A1 Wetherby bypass (Motorway Archive Special Interest Group 2009) and A1/M1 extension north of Leeds, as well as near the A46 and A156. In contrast, the sampled LUP PAS data is less strongly correlated to modern road proximity, and the distribution curve for PAS data in Figure 98 is more heterogeneous.

Frequency in relation to the Roman road network

Prompted by the discovery of case study site Farndon in fields adjacent to the Roman Fosse Way (Cooke and Mudd 2014) and the high potential lithic surface scatter near Scalford (in 8), the distribution of Probable/Possible LUP data was mapped relative to the Roman road network to see if site locations correlate to proximity. Such links have been noted in previous studies of PAS material (Robbins 2013:Fig. 4; Bolton 2010:85; Brindle 2010:123; Collins 2010:135, 141; Harrington and Welsh 2010:176; Worrell 2010; Robbins 2014:31; Brindle 2014), however, further work is needed to quantify observations and to identify appropriate parameters for proximity. The maximal distance for this Dataset 2 to any Roman road is 35,000 m. In Figure 97, site clusters can be seen near the Fosse Way, Dere, Ermine and Icknield Street, Via Devana and Cade's Road, as well as near unnamed parts of the Roman road network which overlap with modern roads

(Ordnance Survey 2020c; Ordnance Survey 2017).

For the simplified overview in Figure 99, intervals have been set to 5000 m but and components of Dataset 2 (HER and PAS samples) are skewed right, but with notably different modalities. The distribution of sampled HER data is quite uniform, predominantly found within the 5000 to 10,000 m range. Peaks beyond 20,000 m merely illustrate the maximal observed distance between site and Roman feature, rather than indicate a meaningful relationship.

In contrast, the frequency of PAS LUP sites located near Roman roads is more pronounced within the 0-5000 m interval (see Figure 99) before percentages gradually decrease as distances increase. While more work is needed to make this simple analysis more robust, compared to the Probable/Possible LUP HER component, the sampled PAS data appears more strongly linked to Roman road proximity, which ties in with an emerging pattern for PAS objects in general, and it is interesting to see this trend emerge for LUP records as well.

B.1.5 Summary of observations concerning similarities and differences between Datasets 1 and 2

Here, I will present a brief summary of observations, highlighting similarities but also differences between Datasets 1 and 2. In Chapter 9 I shall address the general evidence pertaining to the intensity of LG human re-occupation of the open landscapes, and briefly discuss other observations concerning notable landscape features, and chronological and regional patterns.

Detailed summaries for each surveyed county are only reluctantly omitted from present scope, as are detailed comparisons between sampled HER and PAS data. There are, for instance, areas where PAS site coverage is greater than for HER-derived data (and vice versa), and my analyses of Dataset 2 indicate interesting differences in the modalities of correlation/distribution of HER and PAS sites relative to physical and human geography features. In my view, these observations are likely an expression of quantifiable differences in discovery context (unit-led interventions vs casual collection), survey location/search area selection, and fieldwork methodologies, which offer interesting avenues for future research (see Section 9.3.2).

Overall, there are clearly identifiable trends and tendencies in open-air site location patterns which are borne out for both Datasets 1 and 2, and which lead me to conclude that there is likely a significantly under-explored corpus of LUP site data in heritage management data repositories such as the HERs and PAS (see p.

1). The most notable difference concerns dataset sample sizes - 69 sites in Dataset 1 are here contrasted with a much larger Dataset 2 of 1705 Probable/Possible sites. On this basis alone, my Dataset 2 is a strong indication that once we go beyond the cave sites, then there is ample evidence to suggest a far greater potential for LUP presence. Based on my data collection and dataset curation of UK heritage management data repositories, there could be as many as 1636 additional, predominantly (84.5%) open-air sites/findspots compared with the 69 (slightly cave-biased) Dataset 1 sites, which is quite the break with tradition – but neither speculative nor an unfounded observation, since I have arrived at this conclusion through a systematic review of available sources. Firstly, I approached the corpus of 69 Confirmed/Certain LUP sites to establish the broader characteristics of documented LUP evidence in the research area (cf. Section 2.2.3, Chapter 4 and Catalogue A), to then systematically approach the recorded Probable/Possible LUP site data in UK heritage management data repositories (on p. 67, Sections 4.1.2, 4.1.2).

However, I envision that the proposed scale of my Dataset 2 may be a source of contention, not least upon consideration of the recurring classification issues which I have repeatedly addressed (in Sections 3.2.3, p. 67, 4.1.2, 4.1.2), and that are particularly pressing in the detailed analysis of 31 'Late Palaeolithic' PAS finds - of which I would only regard 3 (or 9.6%) as reliably classified as LUP (see Chapter 8, especially Sections 8.1.3, 8.1.4; strong criticism in Sections 8.2.3 and B.1). I would be remiss not to acknowledge observed discrepancies in recording since these clearly negatively impact the interpretive strength of the available data, which in itself is predominantly derived from medium to low resolution reference events and thus of inherently lower interpretive strength than primary context, stratified data. Through random sampling, testing, dataset curation, revision, and in naming this Dataset 2 'Probable/Possible LUP site data', I have sought to mitigate the classification issues and to ensure the validity of my data collection of HER and PAS entries.

At present, it is difficult to provide an accurate estimate for the number of 'real' LUP sites within this Dataset 2; on the one hand, there is certainty regarding the 69 Dataset 1 sites and the good agreement between overall LUP prevalence in HER records and the reliable classification of the proportion (c. 80%) of HER records I reviewed first-hand (Table 9; Historic England 2018e:19). Using these values to project the number of sites in the total (N = 1705), suggest that 710 or 41% of Dataset 2 sites are LUP sites. However, this does not yet include the sampled PAS records that on present grounds appear to often be deficient in their classification (in Chapter 8). If the fail rate for the sample of 31 records is applicable to the larger sample of 817 PAS entries, then the projected number would increase by 78 counts and suggest that 788 or c. 46% of Dataset 2 sites are 'real' LUP sites.

While this Dataset 2 will require additional revisions which were unattainable within the present scope, I am excited at its potential - and by no means deterred by the prospect that sample sizes will change. Rather, I welcome any future revisions, since these will improve the overall quality and accuracy of recording, and, in turn, provide an informed basis for future study of the topical subject of LG human reoccupation (see Section 9.3.2).

Regardless of observed caveats, interesting parallels emerge *vis-à-vis* Dataset 1's composition and spatial distribution patterns. Overall, the calculated county-wide prevalence and site frequencies (see Tables 28, 8, 10, 9 and 11) are in line with previously published estimates for LUP representivity in HERs (<1% of surveyed counties' HER records; Hind, Jones and Spandl 2014 and in Table 10). Although the extent of my Dataset 2 (N = 1705 records) far exceeds previous estimates of LUP site representivity, the overall prevalence of LUP-attributable evidence is generally low, and the period is notably under-represented in UK statutory records (in Section 4.1.1).

Out in the open landscapes, especially pronounced are preferences for site locations on well-drained soils and substrates, situated on locally raised ground away from the floodplains or possible lakefronts, and which likely provided good views and sight lines across surrounding areas. The emphasis on proximity (up to 500 m) of modern rivers and streams is particularly interesting (in Figure 96), since it underlines my hypothesis that higher site density should be expected relative to freshwater systems (see p. 1, Sections 9.1 and 9.3). LUP sites are unevenly distributed across surveyed counties but also across surveyed sources, which may indicate differential levels of organised surveys and general interest in surface collection (see Tables 28, 6, 9 and 11). For instance, whereas Leicestershire, Rutland, and West Yorkshire are notably under-represented in my catalogue data, these counties boast far greater HER- and especially PAS-derived records, which I have been told is to the credit of the avid fieldwalking community and their good working relationship with HER/PAS recording officers (especially in Leicestershire and Rutland, H. Wells, pers. comm. 2020). In contrast, whereas sites from Derbyshire are over-represented in my catalogue and with good coverage in the HER sample, the PAS sample for Derbyshire is notably lower. In my view, these individual differences at the county-level may be useful to identify areas for future targeted studies, especially where Possible/Potential site coverage contrasts markedly between sources.

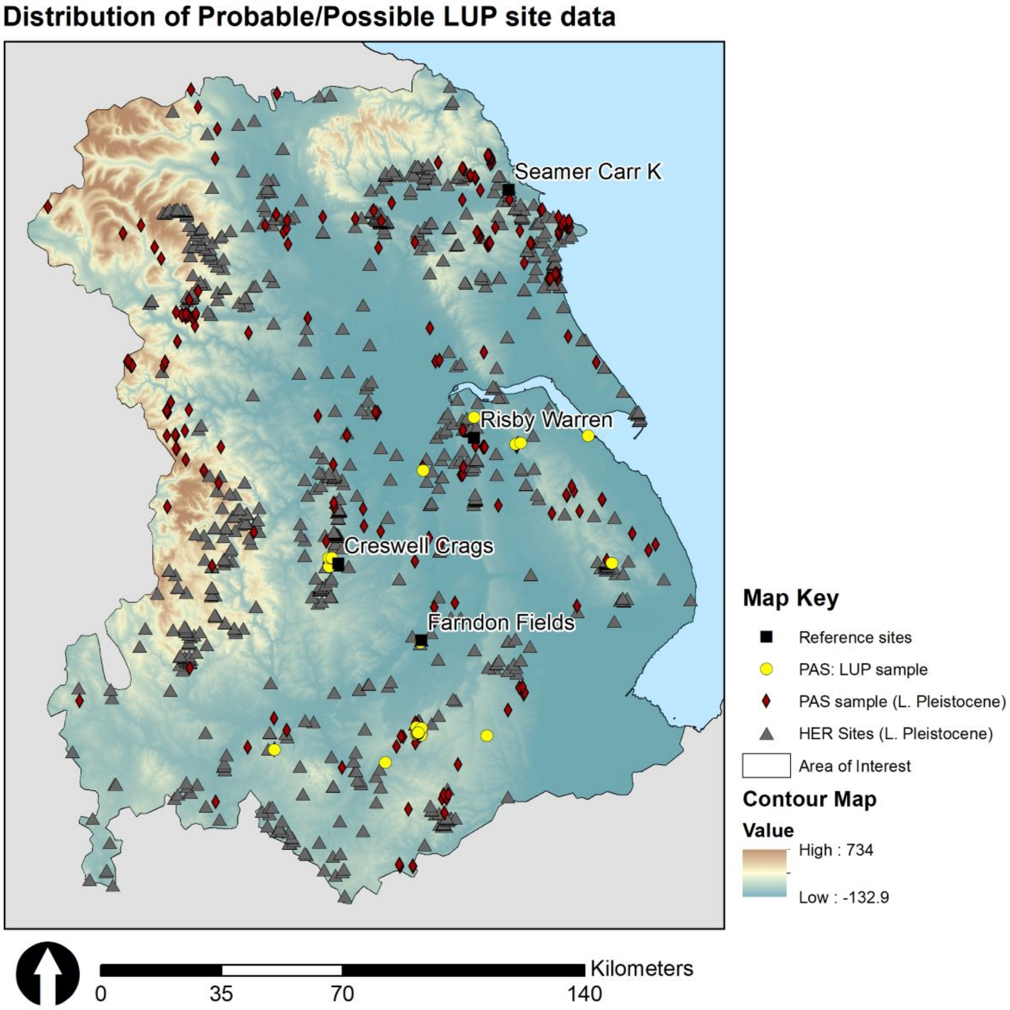


Figure 83: Distribution of Probable/Possible LUP site data sourced from UK heritage management data repositories relative to topography (Historic Environment Records/HER, and the Portable Antiquities Scheme/PAS. Contains OS data, Crown copyright and database right 2023)

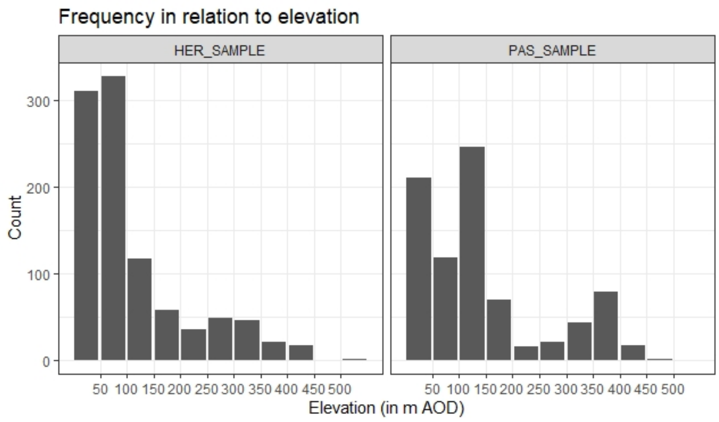


Figure 84: Frequency of Probable/Possible LUP site data sourced from UK heritage management data repositories (Historic Environment Records/HER, and the Portable Antiquities Scheme/PAS) relative to elevation (in m AOD; calculated using OS data, Crown copyright and database right 2021)

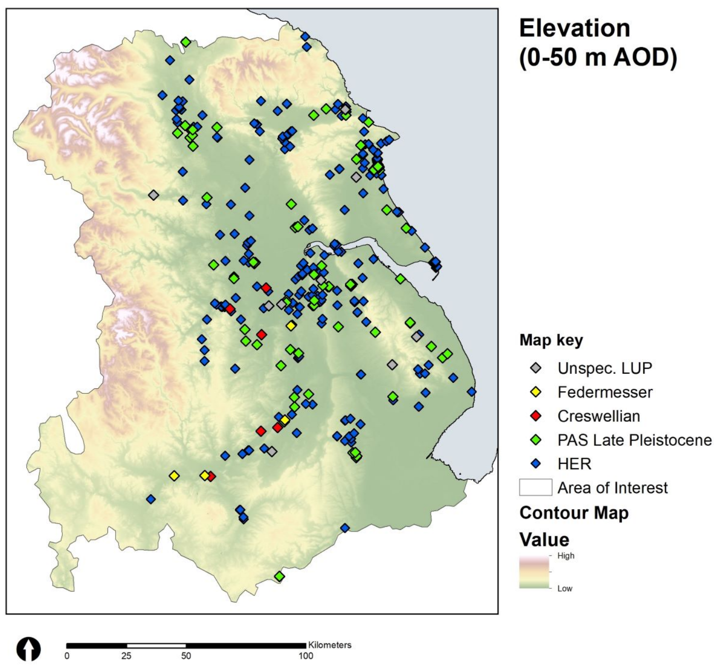


Figure 85: Site distribution at 0 to 50 m AOD (contains OS data, Crown copyright and database right 2021)

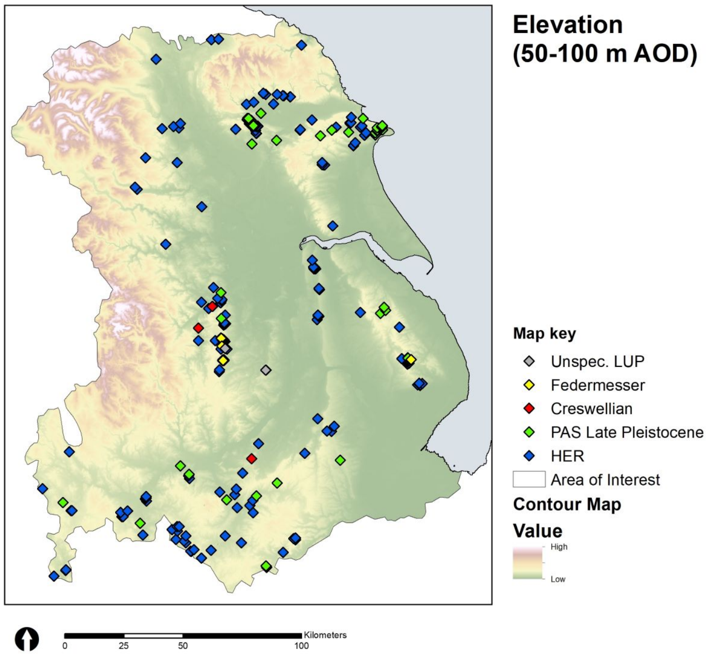


Figure 86: Site distribution at 50 to 100 m AOD (contains OS data, Crown copyright and database right 2021)

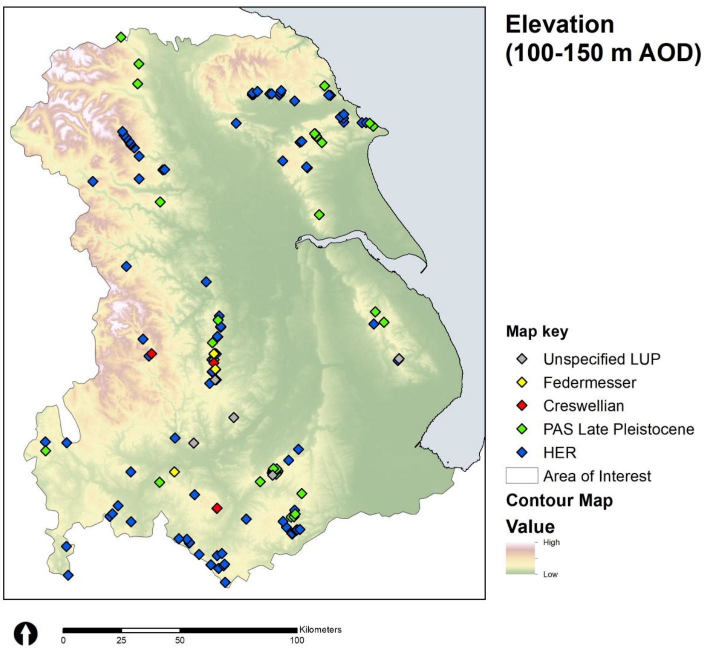


Figure 87: Site distribution at 100 to 150 m AOD (contains OS data, Crown copyright and database right 2021)

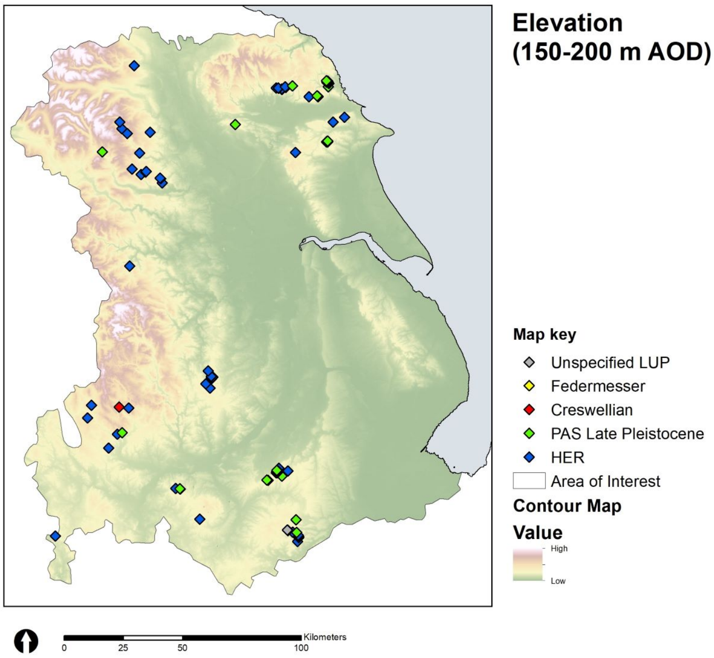


Figure 88: Site distribution at 150 to 200 m AOD (No records for *Federmesser-Gruppen* or Unspecified LUP sites; contains OS data, Crown copyright and database right 2021)

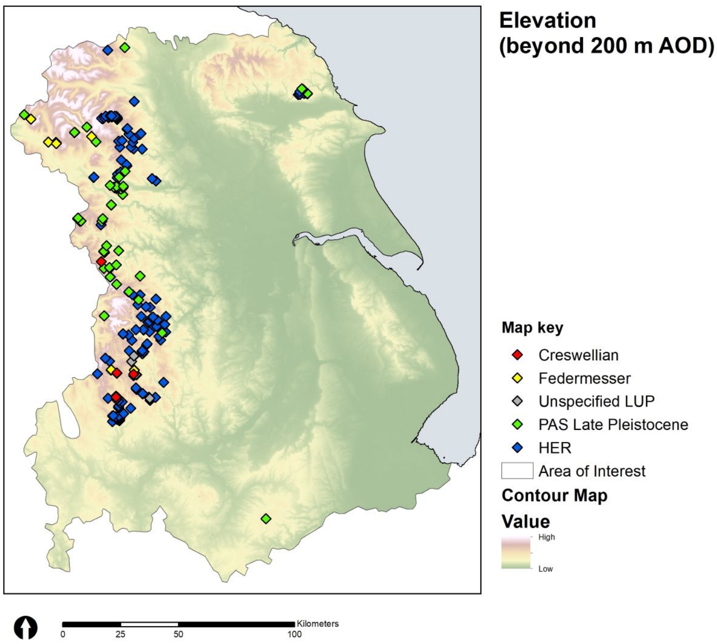


Figure 89: Site distribution beyond 200 m AOD (map by J. Kotthaus and L. Grottenberg. Contains OS data, Crown copyright and database right 2021)

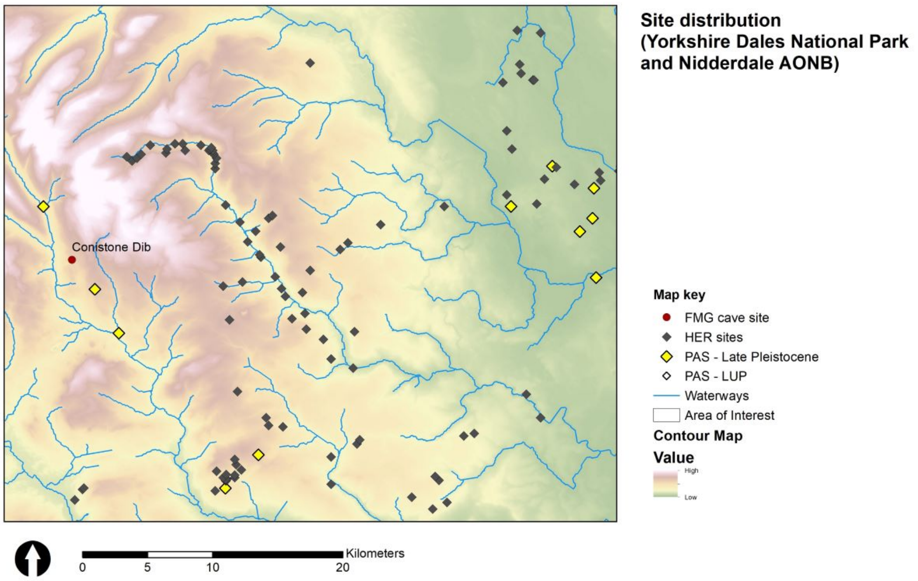


Figure 90: Dataset 2: detailed view of site distribution in the North Yorkshire Dales and Nidderdale AONB (contains OS data, Crown copyright and database right 2021)

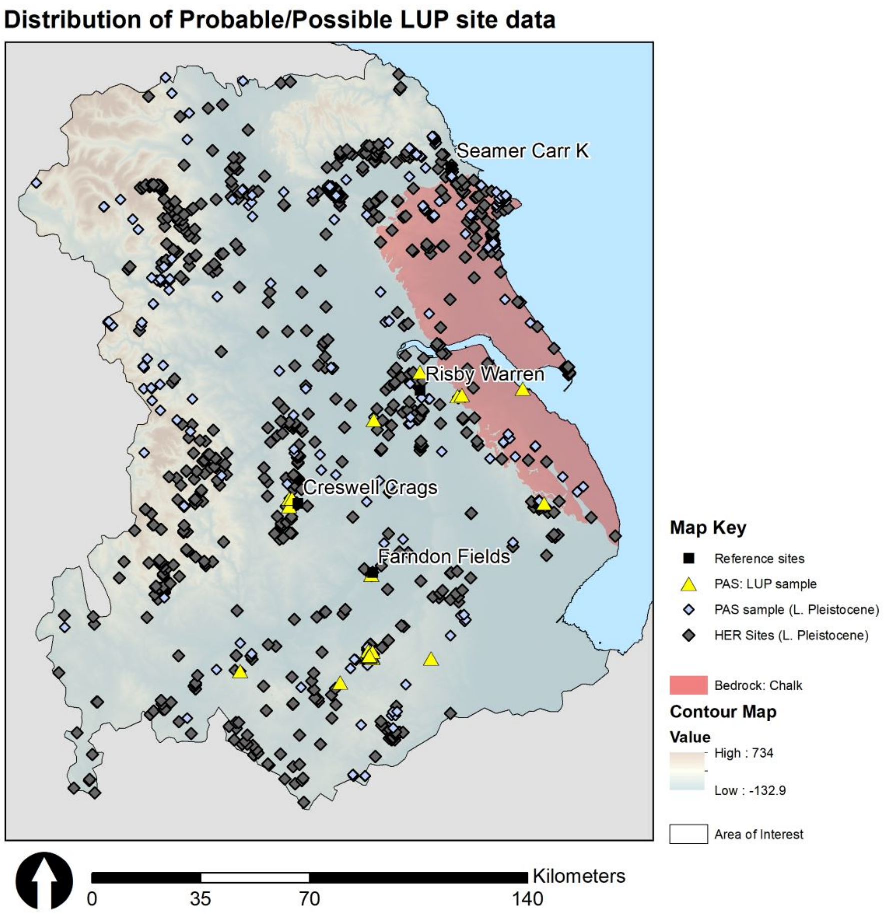


Figure 91: Distribution of Probable/Possible LUP site data sourced from UK heritage management data repositories (Historic Environment Records/HER, and the Portable Antiquities Scheme/PAS) relative to primary flint sources on Upper Cretaceous parent Chalk bedrock in the Lincolnshire and Yorkshire Wolds (Contains British Geological Survey 2019b data and OS data, Crown copyright and database right 2023)

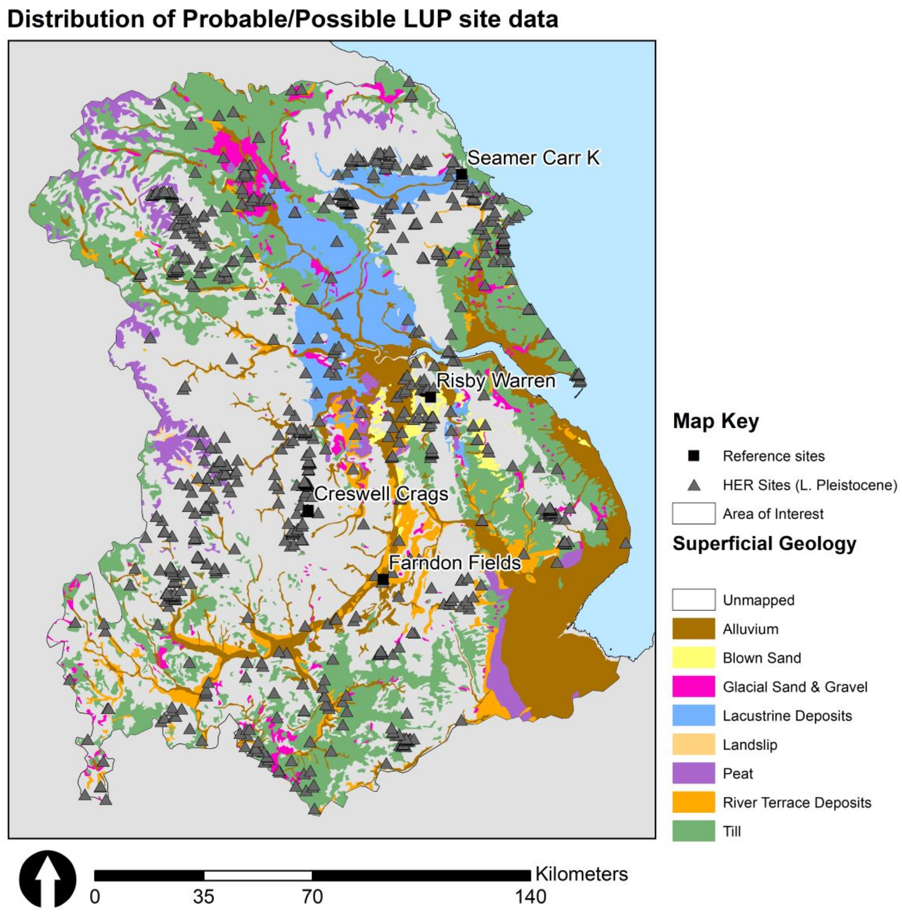


Figure 92: Distribution of Probable/Possible LUP site data (HER sample) relative to surface geology. Note that the local distribution of smaller concentrations of coversands extends beyond the scale visible in this map (contains British Geological Survey 2019b data and OS data, Crown copyright and database right 2023)

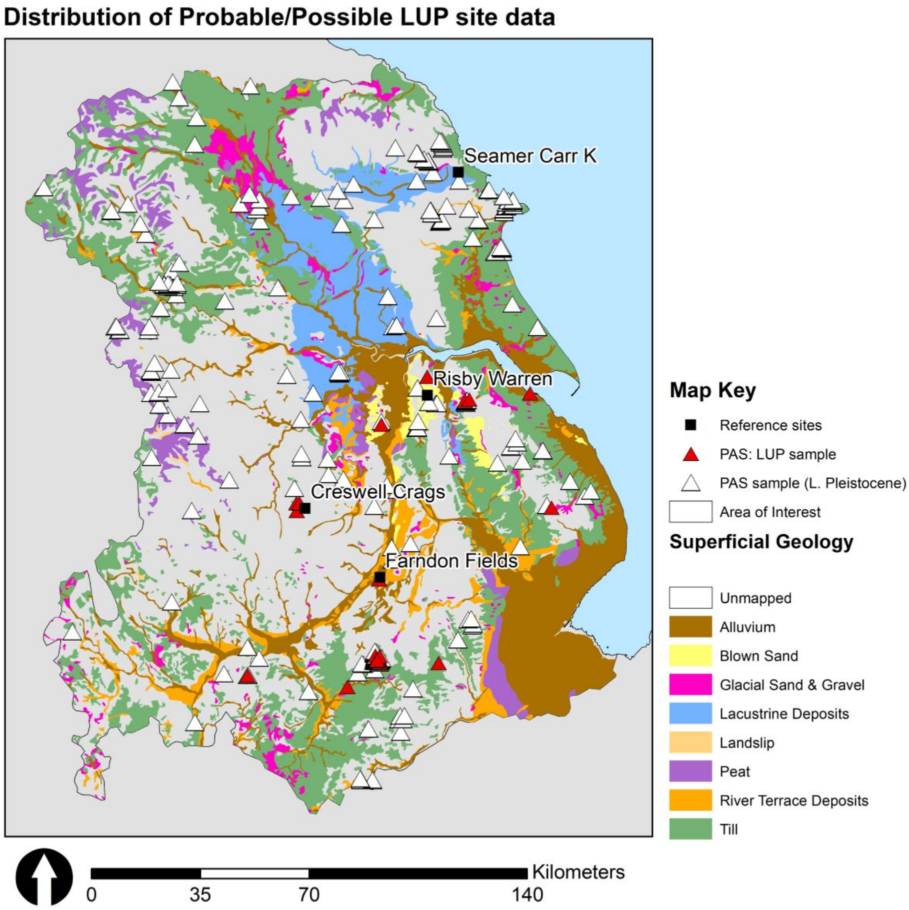
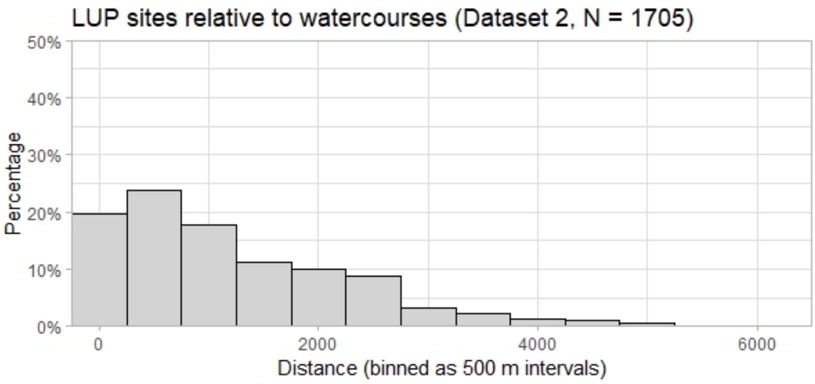
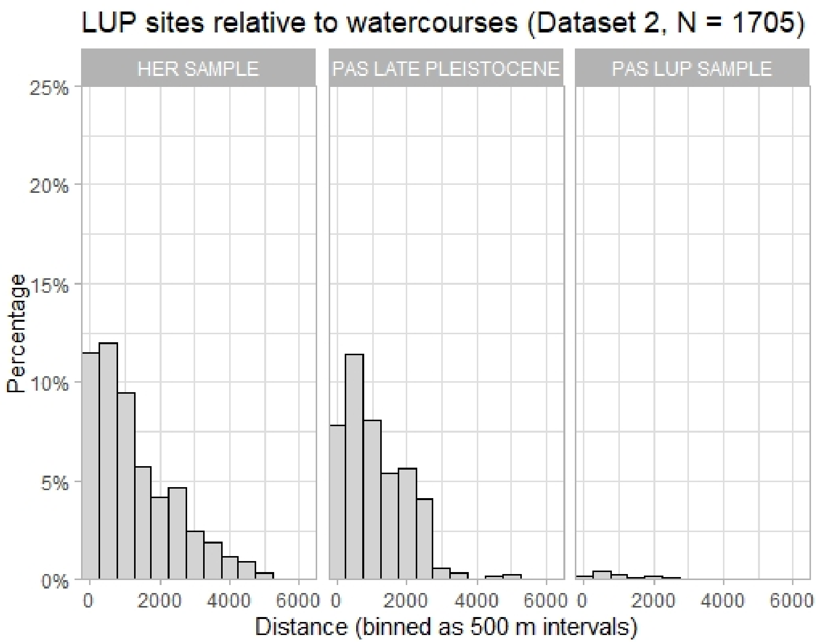


Figure 93: Distribution of Probable/Possible LUP site data (PAS sample) relative to surface geology. Note that the local distribution of smaller concentrations of coversands extends beyond the scale visible in this map (contains British Geological Survey 2019b data and OS data, Crown copyright and database right 2023)



(a) Dataset 2 (all)



(b) Grouped by source

Figure 94: Frequency of Dataset 2 (Probable/Possible LUP) sites relative to waterways (in 500 m intervals). Data sourced from UK heritage management data repositories (Historic Environment Records/HER, and the Portable Antiquities Scheme/PAS; calculated using OS data, Crown copyright and database right 2023)

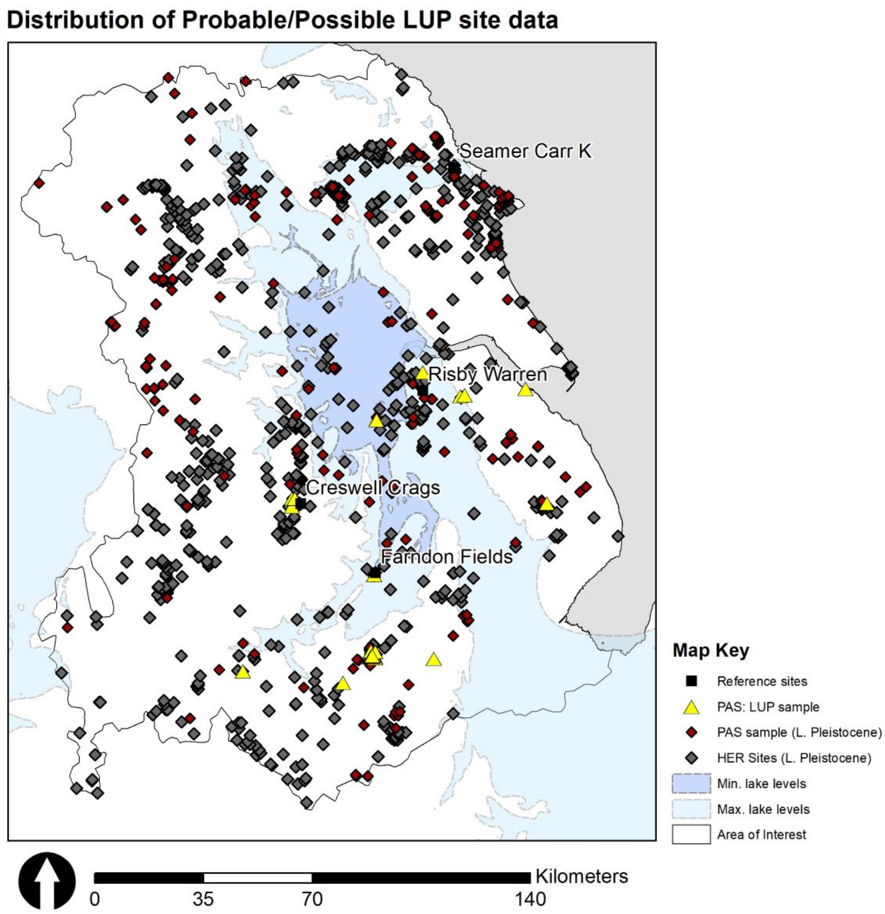


Figure 95: Distribution of Probable/Possible LUP site data sourced from UK heritage management data repositories (Historic Environment Records/HER, and the Portable Antiquities Scheme/PAS) compared with the limits of palaeolakes Flixton and Humber plotted. Note that Farndon Fields is located at the southern boundary between maximal and minimal lake levels (contains OS data, Crown copyright and database right 2023).

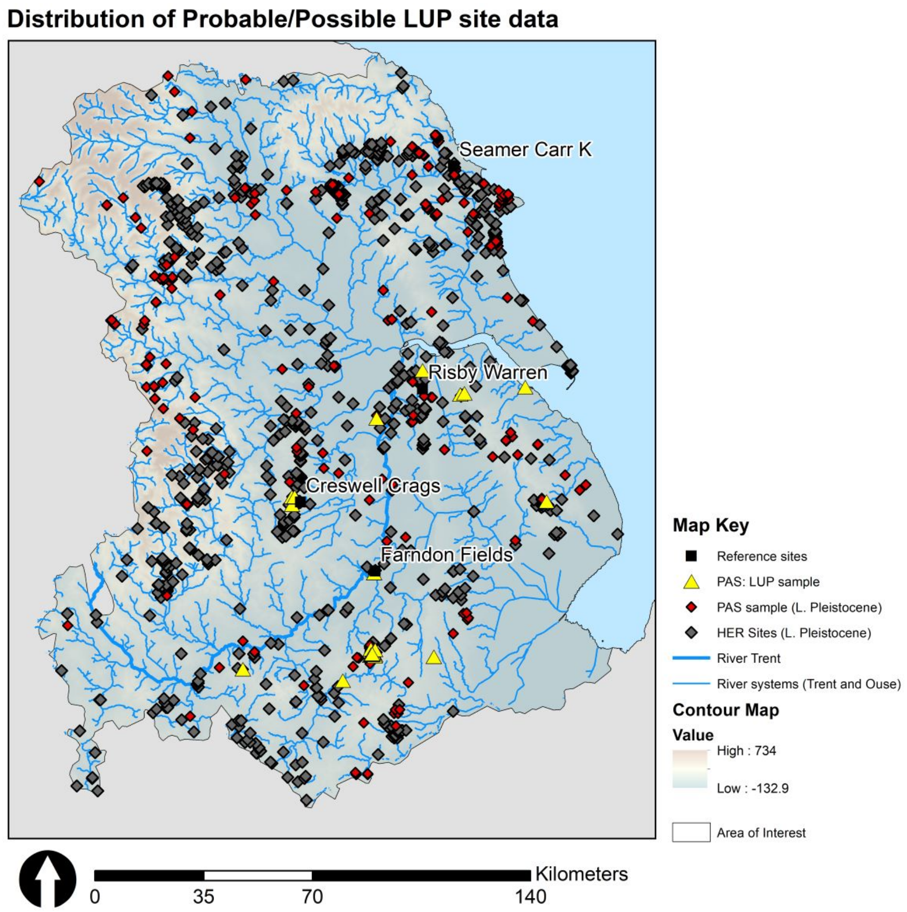


Figure 96: Distribution of Probable/Possible LUP sites data sourced from UK heritage management data repositories (Historic Environment Records/HER, and the Portable Antiquities Scheme/PAS) relative to major river systems (contains OS data, Crown copyright and database right 2023).

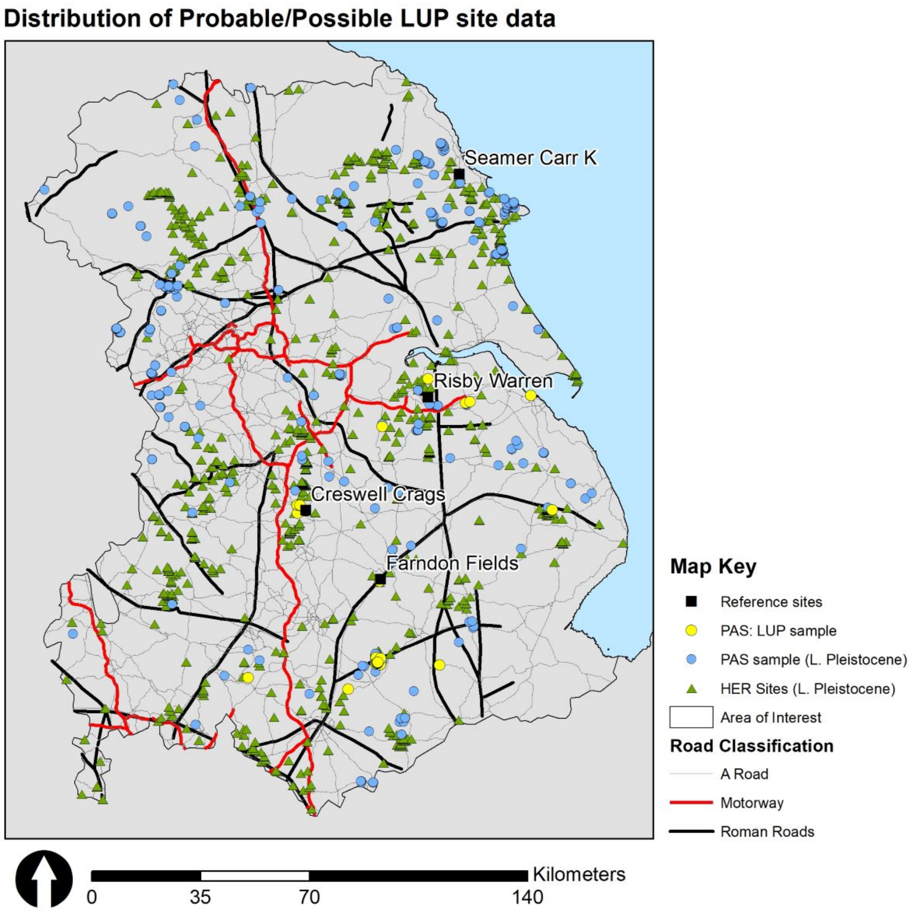
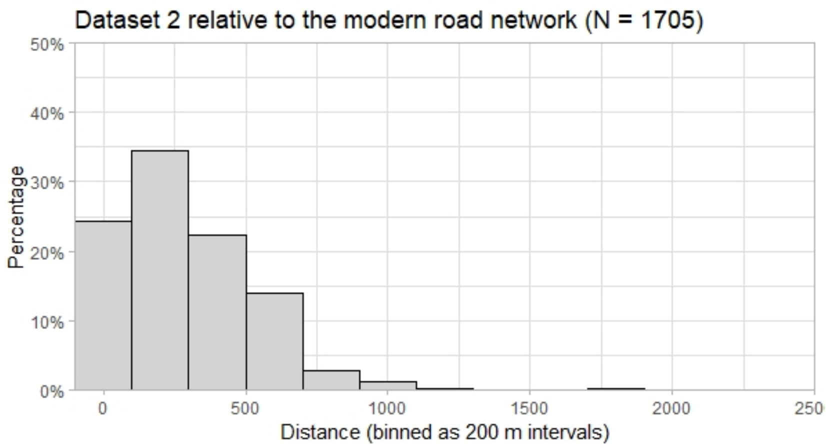
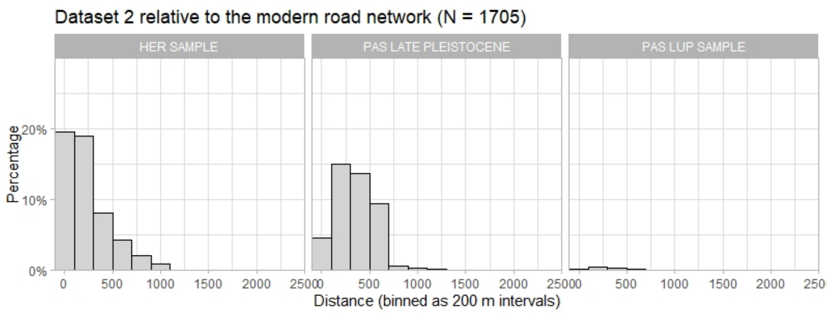


Figure 97: Distribution of Probable/Possible LUP site data sourced from UK heritage management data repositories (Historic Environment Records/HER, and the Portable Antiquities Scheme/PAS) relative to Roman and modern roads (contains OS data, Crown copyright and database right 2023)

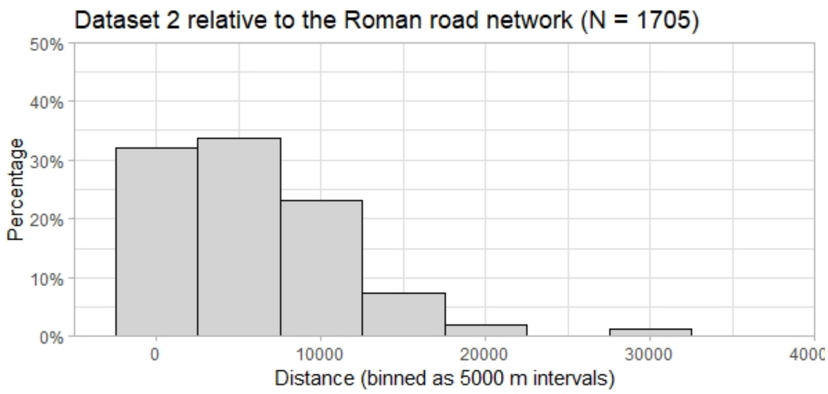


(a) Dataset 2 (all)

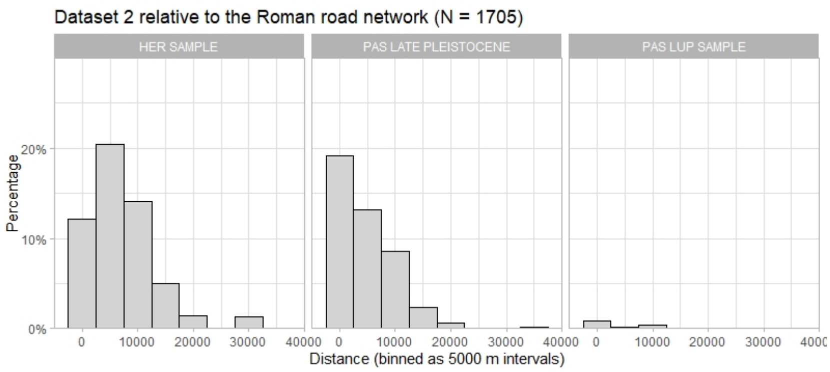


(b) Grouped by source

Figure 98: Frequency of Dataset 2 sites relative to the modern road network (in 200 m intervals. Data sourced from UK heritage management data repositories, Historic Environment Records/HER, and the Portable Antiquities Scheme/PAS; calculated using OS data, Crown copyright and database right 2021)



(a) Dataset 2 (all)



(b) Grouped by source

Figure 99: Frequency of Dataset 2 sites relative to Roman roads (in 5000 m intervals; calculated using OS data, Crown copyright and database right 2022)

Catalogue C

Supplementary information for Chapter 4

C.1 Caveat regarding CWA trench and context number concordance

As outlined in Section 5.1.1 and based on the CWA A46 report (Harding et al. 2014), there is a clear-cut distinction between the eastern and western part of Trench TR6007: the lithic material in TR6007 East contains exclusively Creswellian-type finds, whereas TR6007 West is attributed to the FMG. As such, the exact trench label (east or west) provides essential spatial and interpretive context. During my data collection at Andover, I intended to record a representative and equally sized sample from the two stratified scatters in TR6007. However, I observed that finds bags were not consistently labelled with trench IDs or object numbers, whereas stratigraphic context numbers were consistently inked on all finds. At the time, this meant that I was unable to fully re-establish the provenance for a part of my sample, and the site archives were still undergoing internal preparations for publication and therefore not available to me. I expected to be able to resolve the remaining discrepancies by cross-referencing my recorded sample, using context numbers and the full site archives once these were made available online (Wessex Archaeology and Cotswold Archaeology 2017).

Upon review of the site archives and raw data files, which include the lithic artefact recordings and separate GIS layers, I noted that the lithic finds lists (see Wessex Archaeology and Cotswold Archaeology 2017) use the same Object

Numbers (ONs) I had written down during data collection and that are referred to by Harding et al. (2014). There is, however, no concordance between Object Numbers on the CWA flint finds lists and the separate series of object IDs listed on their GIS data. Since I was unable to match finds entries across the raw datasets, I cross-referenced stratigraphic context numbers with trench labels (e.g., objects found in trenches FF6007 generally correspond to context numbers starting with 6070XX). However, this workaround does have its limitations, since the context numbers listed in the CWA flint finds lists do not match the contexts described in Harding et al. (2014), and there is, to my knowledge, no separate context concordance metadata available to link the published report with the raw dataset.

Using flint object numbers (in Figure 34 and Harding et al. 2014) and recorded patination as a way to locate entries in the CWA flint finds list, I was able to identify ranges of context numbers (in the CWA raw data) that contain some material from the *in situ* scatters. According to Harding et al. (2014:35), the FF6007 East/Creswellian scatter was recovered from a compact sandy loam Context F607071 (alluvium spit 2 and 3). In the CWA flint finds list, this number does not exist, so it is necessary to filter entries by ranges of context numbers (607000 - 607030, N = 132, and 607500 - 607600, N = 89) to identify objects found in the F6007 East scatter. This workaround will need to refined further since it returns more objects than the 162 mentioned in Harding et al. (2014:Table 2.5).

With regards to the FMG scatter in FF6007 West (in alluvium spit 2, Context 607078, a compact, massive sandy loam, cf. Harding et al. 2014), the same discrepancy applies. Using the same workaround and excluding patinated finds to relocate context numbers in the CWA spreadsheet suggests that 607030 - 607080 (N = 195) is the approximate range within which the FMG artefact-bearing context numbers (*sensu* CWA raw flint data) are listed. At face value, these could represent the 194 unpatinated FF6007 West finds listed in Harding et al. (2014:Table 2.5). However, more details are needed to refine this selection, since there is a separate excavated trench FF6078 for which context numbers need to be identified to avoid confusion.

It is unfortunate that significant components of the CWA raw data (i.e., lithic recording data and 3D records, context numbers in the raw data and the publication) cannot be linked with each other. This situation has three limitations for my own study; (1), that my sample contains material which I was unable to specify beyond the general trench label (TR6007) and identify as either Creswellian or FMG *sensu* the CWA analysis. The provenance of some my

Table 32: Cortex prevalence (CWA N = 127; FFF = 183)

Cortex	**CWA (in %)**	**FFF (in %)**
none	47.2	70.6
<30%	27.5	14.4
<60%	16.5	10.8
>60%	8.6	4.1
Total	**127**	**183**

Table 33: Platform preparation methods (CWA N = 91; FFF N = 102)

Platform preparation	**CWA (in %)**	**FFF (in %)**
abrasion	42.7	74.4
extensive/heavy abrasion	35.1	16.6
faceting on platform	6.5	4.9
faceting on platform; abrasion	5.5	1.9
none	9.8	1.9
Total	**(100%)**	**(100%)**

sampled finds shifted (see Table 16), specifically by reducing the number of finds from TR6007 East, and increasing the number of 'unspecified if East or West' because the same context numbers were used in both parts of Trench 6007. Thus, 13.38% of my CWA catalogue cannot be more precisely located within TR6007 and 6.29% of sampled finds are from unknown trenches or test pits. (2), this has meant that I can only replicate the general spatial distribution patterns within the CWA trenches, but not accurately map the precise finds I have analysed; and (3) that it has not been possible to fully relate the stratified lithic evidence with the sedimentary contexts, for instance with a view to critically examine claims (mine and theirs) regarding the patinated and unpatinated lithic material, i.e., by testing if the differential levels of surface patina developed in the same or different contexts (cf. Reynier 2005:56-57, Figs. 4.3-4.4; Glauberman and Thorson 2012:22; for Farndon-examples of how the vertical distribution of refitting flints can cause differential degrees of patina, see Harding et al. 2014:58 and Figure 30).

Given the national importance of the Farndon LUP collections and openly accessible site archives (Wessex Archaeology and Cotswold Archaeology 2017), which may be used for additional desk-based computational analyses of the lithic material, I recommend that future work addresses and resolves the observed discrepancies in the raw data. I have contacted Wessex Archaeology to discuss further steps.

Table 34: Butt indices (*"non *éperon*" refers to a prepared platform which is highly similar to, but not fully identical to the characteristic spur; CWA N = 87; FFF N = 101; cf. Jacobi 2004:table 8; Tixier 1980; Inizan, Roche and Tixier 1992)

Mode	**CWA**	**(in %)**	**FFF**	**(in %)**
cortical	7	(8.0)	1	(0.9)
en éperon	NA	NA	6	(5.9)
faceted	3	(3.4)	10	(9.9)
fragmented	NA	NA	9	(8.9)
linear	22	(25.2)	10	(9.9)
*"non éperon"**	1	(1.1)	9	(8.9)
plain	46	(52.8)	50	(49.5)
punctiform	8	(9.1)	6	(5.9)
Total	**87**	**(100%)**	**101**	**(100%)**

Table 35: Frequency of dorsal scars (simplified; not including scar orientation; CWA = 127; FFF = 183)

Type/scar count	**CWA (in %)**	**FFF (in %)**
NA	9.4	1
cortex	1.5	0.5
1-2	9.4	13.4
1-2; cortex	15	11.8
3 dorsal scars	12.6	27.7
3 dorsal scars; cortex	7	6.1
>3	34.6	30.2
>3; cortex	10.2	9.2
Total	**127**	**183**

Table 36: Dorsal scar pattern (CWA N = 127; FFF = 183)

Direction	**CWA (in %)**	**FFF (in %)**
NA	9.4	1
bi-dir	4	5.6
multi-dir.	3.1	NA
cortical	1.6	0.5
crossed	2.4	3.5
uni-dir.	73.2	81
uni-dir. crossed	5.5	7
uni-dir. opposed	0.8	1
Total	**127**	**183**

Catalogue D

Supplementary information for Chapter 5

D.1 Preparing the analyses: the ‘superK’-spreadsheet and raw data

The full dataset and site archives will be made openly available via the Archaeology Data Service as part of the forthcoming publication of the Vale of Pickering Surveys monograph (P. Lane, pers. comm. 2021). The complete lithic assemblage was given to me as a long-term material loan; however, due to changes in personal circumstances and prolonged physical access restrictions to the lithic assemblage during the COVID pandemic, this reappraisal of the Seamer Carr K material is mainly supported through the complete spreadsheet of artefact recordings, which includes 12,126 artefacts across 8959 separate entries. My copy of the ‘superK.csv’-spreadsheet is an unpublished, compiled dataset of the original floppy disk files, and was made available to me by C. Conneller. This is by far the largest site-specific dataset included in this thesis, and already includes metric measurements of 1488 recorded objects from all excavated areas, which is equivalent to 16.6% of all database entries. Whereas measurements were mostly taken on all completely preserved blades or bladelets and a selection of retouched tools, as well as on numerous complete flakes, the majority of (micro-)debitage is not recorded in such detail. Overall, the measured artefacts were found to constitute a fully representative and well-sized sample. All data manipulation for this case study was carried out in Excel and R Studio, using different packages and following the procedures outlined earlier in Chapter 3 (R Core Team 2017;

Wickham and Francois 2015; Wickham 2009).

It is a quite complex dataset with 49 variables; in some cases, values appear to have moved columns, and upon review it seems likely that these observed errors occurred during data transfer from the original storage medium to Excel. As far as I have been able to establish the degree of reliability and integrity of the data, the most relevant recordings still appear to be in correct order. While the spreadsheet contained no key or explanation of abbreviated terms, it was nevertheless possible to decipher most information. In addition to the measurements, other important recorded categories are, among others: quantity, artefact type, trench numbers, and coordinates, as well as contextual information concerning for instance stratigraphic context or horizon, raw material source, degree of cortex coverage, or signs of damage (post-depositional or other).

While the spreadsheet does not include any explicit chronological separators or labels, I was able to use other variables as proxies for chronology, as based on written documentation (Lane et al. n.d., Conneller and Schadla-Hall 2003, Conneller 2007). Specifically, I have structured my queries and created my data samples using the seven designated separated FMG scatters (i.e., excavated areas 3, 4, 6, 13, 14, 15, 27 on database; areas 5 and 25 are mixed FMG and Early Mesolithic, Conneller 2007:223-226). Regarding dataset variables but also values, I have made some deliberate choices to create my own sample from the raw data. For practical purposes, I have excluded aggregated entries from my sample. This pre-selection has not affected my specific queries, as the excluded records mostly contain counts of unretouched debitage and fragments, which I presume were not considered sufficiently period-diagnostic or relevant to be recorded separately.

One of the observed difficulties relates to how refits are recorded; for instance, most of the finds which refit are classified as 'fragments' on the database, and therefore appear to not have been systematically measured - or their dimensions recorded in this dataset - prior to refitting. With regards to detailed lithic technological analyses, important attribute recordings were left out of the spreadsheet. These omissions in recording are unfortunate, since our understanding of the technological variations between FMG and Early Mesolithic components of the Seamer Carr K sample could be enhanced even further through inclusion of technological attributes in general, and measurements taken on comprehensive refit sequences. Without disassembling the refit units, it has not been possible to examine the refitted pieces for basic morphometric and technological information, such as proximal attributes, core preparation, and reduction sequences.

D.2 Supplementary figures and tables

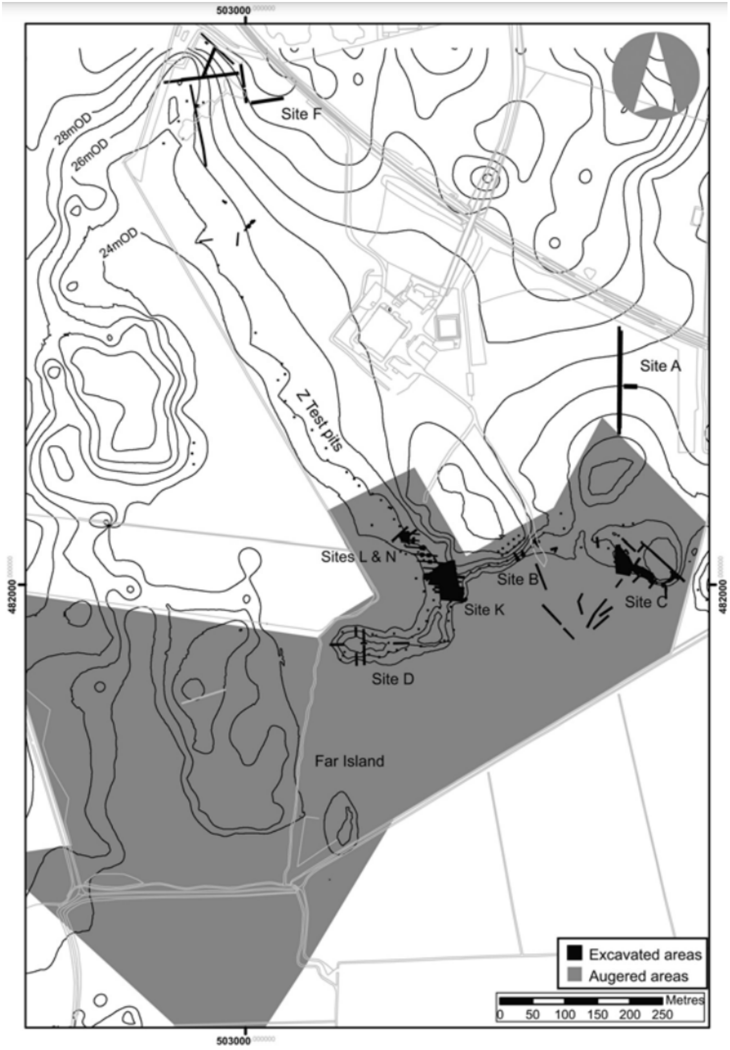


Figure 100: Seamer Carr sites and survey plan (after Milner et al. 2011:Fig. 4)

Figure 101 provides a detailed overview of recorded object entries per survey season, arranged in order of analytical areas. Based on the comparison of areas and finds frequencies, it transpires that the largest proportions of finds were made in 1983 (32,1% of finds total), which coincides with the excavation of the disproportionately artefact-rich Areas 5 (mixed) and 7 (mainly Early Mesolithic), and in 1984 (41,9% of finds total), with finds frequencies more evenly spread across a larger surface. While there are denser concentrations of finds, most analytical areas contain fewer than 200 artefacts, and 25 out of 45 <50 finds. The range of density is related to types of on-site activities, but the interpretation of several areas is made difficult by the presence of dumped material, as in Area 2 (Conneller and Schadla-Hall 2003:93).

Seamer Carr K:	*Years of discovery*				
Area	1982	1983	1984	1985	Total
NA	7	49	84	27	167
1		101	2	1	104
2	3	1	534	1	539
3		1	787		788
4		296	333	1	630
5		1003	663		1666
6		338			338
7	260	757	1	29	1047
8			3	1	4
9			49	2	51
10				4	4
11				10	10
12			10	2	12
13			103	132	235
14			79	132	211
15			5	196	201
16			19	4	23
17			4	1	5
18			197	51	248
19			82	255	337
20		16	2	21	39
21		3	7		10
21a			143		143
22			6		6
23	1	1	199		201
24			19	9	28
25		51	159	129	339
26		3	8		11
27	1	19	159	1	180
28		14	11		25
29		3		21	24
30	16	28	9	472	525
31		44	12		56
32		7			7
33				27	27
34	1	12		184	197
35	45	71	54	211	381
36	3	10			13
37				35	35
38	8		1		9
39		5	1	5	11
40	1	1			2
41	7	22		1	30
42		17		2	19
43				20	20
44				1	1
Sum entries	**353 (3,9%)**	**2873 (32,1%)**	**3745 (41,9%)**	**1988 (22,1%)**	**8959**

Figure 101: Frequency table of recorded objects, sorted by area and year of discovery. Highlighted are FMG clusters (green) and mixed (yellow) and Early Mesolithic scatters (blue; note: summary is by superK-dataset object entries, not individual artefact count).

Seamer Carr K

Context	Scatter 3	Scatter 4	Scatter 6	Scatter 13	Scatter 14	Scatter 15	Scatter 27	Scatter 5	Scatter 25
5003						1			2
5005	6	1		2		2		3	
5012	704	351	327	106	50	38	30	1003	146
5013	1						1		1
5014	9	29	10	25	37	64	12	133	12
5015								1	1
5018								2	
5041								1	
5083	1	34			5		14	46	1
5084	9	1		5	3	1	4		5
5085			1				2	8	
5088	6								
5091	18	214		97	114	95	115	467	114
5093							1		
5095								1	
5096								1	
5098							1		
5103					1				3
5114					1				46
5115									8
	754	630	338	235	211	201	180	1666	339

Basal Late Glacial/L-G origin
L-G Interstadial dep.
Main Early Meso horizon

Figure 102: Finds frequency table for all recorded stratigraphic contexts from designated FMG and mixed scatters (data sourced from superK-spreadsheet, descriptions cf. Lane et al. n.d.)

Catalogue E

Supplementary information for Chapter 6

Presented here is supplementary and contextual documentation to the Risby Warren case study (see Chapter 7). In Section E.1 I outline the detailed site biography of past research activity, followed by my conclusive reconstruction of likely findspot location, artefact provenance, and the investigation of Armstrong's claims concerning stratified finds beneath the aeolian LLS (GS-1) coversands (see Section E.2). Further included is an overview of the sample of Risby Warren finds recorded by R. Jacobi (see Section E.3).

E.1 History of research and fieldwork around Risby Warren

E.1.1 Earliest known 'flinting' activities (pre 1900 to ca. 1930)

The unique natural landscape around Scunthorpe was mentioned as early as 1695 (Pryme 1870). In an effort to provide a more concise overview of recurring names and the timings of their involvement, I have reconstructed the historical timeline of events in Figure 54. Since the private collections of some of the key antiquarian figures in the late 19th/early 20th century (J.P.T Burchell, Reid Moir, Hazzledine Warren and W.A. Sturge) contain Scunthorpe area finds (Burchell 1931; Burchell and Moir 1935; Smith 1931), it may be presumed that the earliest reported 'flinting' took place on and near Risby Warren around the turn of the past century. Chronologically, this closely follows the history of the development of archaeology as a discipline in the post John Evans era, and is consistent with observations from elsewhere in the UK, where incidental discoveries of archaeological finds made on industrial extraction sites attracted increasing levels of antiquarian interests (e.g. Harris, Ashton and Lewis 2019). Following first reports of "very minute flint implements" exposed on the surface of the highly mobile sands on the Warren, the earliest systematic fieldwork was carried out by the local Reverend A. Gatty (Gatty 1901; Gatty 1902), whose excavations are documented in Figure 56, and which uncovered "Pygmy flints" [sic.]. Gatty's collection is now stored at the Pitt Rivers Museum, Oxford (in Table 22, accession numbers 1904.16.1-19). Although apparently no LUP artefacts were discovered during this earliest phase of activity, some commonly observed patterns in subsequent fieldwork and collecting were first outlined in Gatty's work, for instance the prevalence of geometric Mesolithic microliths, as well as "an absence of large tools" (Gatty 1901:100). Gatty furthermore hypothesised the large quantities of microliths and micro-debitage were indicative of on-site knapping and toolkit curation, and suggests Trent River gravels and Wolds flint as most likely raw material sources - an early observation regarding flint provenance which would since be confirmed and repeated by other researchers, and this statement still retains its validity for lithic assemblages from this geographical area (Gatty 1902:19; Henson 1985; see also previous Chapter 5).

Besides Gatty's fieldwork and his own passing references to other collectors, very little is documented from collecting activities prior to the late 1920/early 1930s. Through my further queries, I have not been successful in narrowing down the locations on which these earliest discoveries were made, beyond the general four figure grid reference for Risby Warren (SE9213), but Gatty reports his finds were exclusively made on the surface of the sands that superimpose layers of peat (Gatty 1902:19; see also notes on stratigraphy in Figure 56). In 1919 Harold E. Dudley was appointed curator at the local museum in Scunthorpe, marking his official, long-lasting involvement in local archaeological research, which eventually culminated in his monograph on the prehistory of the county (Dudley 1949).

E.1.2 Second wave of interest: 1930s and onwards

The perhaps most active phase of discoveries at Risby Warren seems to have begun in the early 1930s (although possibly as early as the 1920s; see Figure 54), when several local collectors were regularly visiting and adding to their personal collections, some of which were shared or gifted to more established researchers like A. Leslie Armstrong. One of these key collectors is D. N. Riley (Riley 1978), with whom R. Jacobi would later correspond for some twenty years, through which much of the information included herein has been sourced. It is during this second wave of interest that the crucial discoveries of penknife points and other LUP material took place, which marked not only the beginning of Armstrong's involvement in the area, but also the start of more systematic research into the archaeological remains on the Lincolnshire Cliff sites surrounding Scunthorpe. By the mid-1920s, Armstrong was already widely involved in excavations at several of the nearby foundational Creswell cave sites (Armstrong 1925; Armstrong 1928; Armstrong 1931c) in addition to his fieldwork in Norfolk (Armstrong 1926). Armstrong's first on-site visits appear to have taken place in or after 1927, following correspondence with the Scunthorpe local Mr Dent (Armstrong 1931a:337).

In terms of research historical developments, the state of knowledge regarding Late Glacial activities in Britain was rapidly developing, and largely directionally driven by the continued interest into the cave sites (Garrod 1926; Garrod 1927; Armstrong 1923; see Section 2.1.3). Overall, the intensity of collecting appears to have quietened down gradually in the years prior to and during the Second World War, and the previous levels of interest in the area seem never to have been reached again, nor are any substantial LUP discoveries reported. Two contributing factors besides the Wartime efforts may be the overall decrease in surface visibility on the warren after vegetation was introduced to limit the sands' movement (see also Section 7.1.3), and Dudley's retirement from the position of museum curator in 1956, who, at the ripe age of 75, perhaps also retired from his informal function of *primus motor* in local 'flinting'.

One of the key finds, the 'Walshaw point', was published during this phase of activity (see Figure 60). This "flint implement of special interest" had been discovered by J.H. Walshaw in December 1933, "embedded in the basal [clayey sand] deposit forming the floor of the hollow dunes" (Lacaille 1946:180). Dudley saw this shouldered point as an "[outstanding] relic close to the northern limits of Palaeolithic human migrations" (Dudley 1949:34; fig. 13). This artefact, which is now mounted in the Palaeolithic display case at the North Lincolnshire Museum, drew some academic interest, and the drawing has since been reproduced several times (May 1976: fig. 14; Buckland 1984:11). I believe this Walshaw point is recorded as PaMELA ID 741 (Jacobi 2014k), placing the findspot at "Risby Warren from G R Walshaw's section above Medieval house", i.e., the same grid reference from where several of Riley's Late and Final Upper Palaeolithic finds derive (SE 92300 13100, see also Figure 58).

It is worth noting that while 'flinting' may have flourished during the 1930s, with the exception of a few references to the Lincolnshire Cliff sites (Phillips 1934; Armstrong 1942; Lacaille 1946; Dudley 1949), only relatively little was ever systematically published, and frequently only after a substantial hiatus in time. This too was commented on by subsequent researchers (May 1976:36), who would otherwise have been in a better position to follow up on some of the original contributors during their lifetime. Furthermore it is interesting to observe that, for example, J. Campbell only made passing reference to the open-air finds from the Scunthorpe area in his otherwise fairly comprehensive synthesis, despite drawing quite extensively on Armstrong's published works on other sites (Campbell 1977c:184). This is also in contrast to the fact that Campbell is named as the compiler of the Risby Warren LUP Gazetteer entries (Wymer and Bonsall 1977:427), whereas these records are otherwise only known from Jacobi's cards. Coincidentally, my personal copy of Campbell's two-volume publication is an antiquarian purchase *ex libris* J. May, who annotated the two illustrated Risby Warren finds therein (Campbell 1977b:4-5; fig. 141.6-7; "backed blade with oblique truncation, AC23" and "shouldered penknife point, AE7"), and later went on to publish the same finds (then illustrated by Jacobi) in his own summary of Late Glacial finds from Risby Warren (May 1976:fig. 14.6-7). The repeated use and reference to the same few artefacts, i.e., the 'Walshaw point' especially, emphasise the special character and rarity of these finds in a regional context.

As mentioned, only very little is known or documented with regards to collecting activities during the 1950s or 1960s (see Figure 54). Based on the archives at the North Lincolnshire Museum and information in the E. Rudkin *Festschrift* (Field and White 1984), it is clear that some local involvement continued throughout these decades, although it appears no additional Late Glacial material was discovered. According to correspondence between R. Jacobi and Peter Gathercole, then of the Pitt Rivers Museum, Oxford, only limited, small-scale excavations were undertaken on the Warren in 1957 and 1958 by Gathercole and D. N. Riley. Gathercole's "[impression was of] a very disturbed and confusing site which would require specialized and very extensive field research to make any sense" (in litt., 1970). It is likely that the majority of finds were "from the grey sands" (in litt.), and were mostly Neolithic or Bronze Age (Riley 1957).

Referring back to the above-mentioned penknife points, Mr. Dent's finds are now included in the Armstrong collection stored at Franks House (in Table

22), together with a number of other penknife points which had been discovered separately and by different collectors between the years 1933-1935 (J.H. Walshaw, H. E. Dudley, E. Rudkin, S. Jackson; Figure 54). Unfortunately, the archival sources are inconclusive with regards to finds totals, and similar discoveries may also have been made by other members of the large local group of collectors who were active in the area at the time, but which may not have been communicated to a wider audience (cf. Table 37; Jacobi in litt. undated; Dudley 1949). Common for all finds reports are frequent mentions of geometric and 'Tardenoisian influences' (Armstrong 1939), but according to Jacobi, "all [finders] suspected a greater age" for their respective finds of penknife points (Jacobi in litt. undated), a selection of which are shown in Figures 59 and 55.

In addition to these specific penknife points, other discoveries of presumed pre-Mesolithic stray finds had sporadically been made in the decades up until ca. 1950 (Riley 1978 and in litt.). However, while it has been possible to refine the spatial precision of findspot locations (see Figures 53, 58 and 103), little further contextual evidence is reported - most artefacts are surface finds, although Dudley reports that 'the oldest artefacts yet found on the Warren [derive from] the basal implement-bearing deposits consisting variously of clayey sand, loess clay or weathered Oolite rock' (Dudley 1949:18; Figure 56).

As is illustrated by the comparison of Jacobi's PaMELA entries in Table 37, the reported sample of Late and Final Upper Palaeolithic artefacts is evidently low (12.5% of entries), and has continuously remained low throughout the course of a full century of collecting and research. When seen in direct contrast with the wealth of archaeological material from the Early Mesolithic and later periods, discoveries of which continue to this present day (The Portable Antiquities Scheme 2019ai), the documented extent of Late Glacial human occupation of Risby Warren is low, and limited to a few isolated discoveries of finds. Furthermore, upon a close review of the existing archival and published sources, it is apparent that the various penknife points provide the strongest arguments and supporting evidence in favour of Armstrong's claims regarding a definite presence of *stratified* Late Glacial finds from Risby Warren (Armstrong 1931a:337-9; Armstrong 1932:130; Armstrong 1942:55; Armstrong 1956:97; Phillips 1934:114). Any re-investigations of the Late Glacial material from Risby Warren ought therefore to focus particularly on these isolated discoveries of important finds, and previous researchers' and my own efforts have been directed accordingly (see Section E.2).

E.1.3 Research activity since 1970

The third phase of activity started in 1970 when Roger Jacobi, then a PhD student at Cambridge, first contacted Riley early that year to enquire about his work in the 1930s (see Figure 54). Both remained in correspondence until the latter's death in 1993, and the complete records of their communications are stored in Jacobi's Archive at Franks House, British Museum, containing all letters, drawings, and map tracings. Jacobi also corresponded with other collectors, institutions and researchers to locate the lithic material that had been discovered around Scunthorpe (as summarised in Table 22), and was able to reconstruct the approximate findspot locations and areas where fieldwalking had taken place. Some of this information also went into Jacobi's personal record cards archive (Wessex Archaeology and Jacobi 2014), and the 1977 CBA Gazetteer (Wymer and Bonsall 1977:177-79; 427), on the basis of which large parts of my personal research was structured.

In general, research into Risby Warren post 1970 appears to largely have been driven by Jacobi's personal interest in the site, which in itself may be split into two phases; the first phase coinciding with his doctoral research in the 1970s; and the second phase taking place during the mid-1980s up until the early 1990s and which included discussions about new fieldwork (see Figure 54; N. Ashton, in litt. 1987; S. Collcutt, in litt. 1988). This observation is supported by the record cards/PaMELA database incremental numbering (earliest Risby Warren records starting at ID number 625, Jacobi 2014c, whereas the second series begins at ID number 15019). D. Riley would eventually publish his results some forty-five years after he had 'lived on Risby Warren' (Riley 1978). Other notable contributions were also made with regards to the geology of the area (see Figure 56; Bateman 1998; Hayes 1994; Bridgland et al. 2014), especially P. Buckland's 1984 article in which he discusses evidence for climatic conditions and dates for Late Glacial Lincolnshire, as well as presenting one of the only *in situ* lithic artefacts from a securely stratified context in the entire Scunthorpe area: an LUP end-scraper found by Mrs. Buckland at the nearby site of Messingham (Buckland 1984).

Only very little is known in terms of survey or collecting activities in the past twenty-five to thirty years, but I have been able to obtain some information about more recent developments. K. Leahy (previously North Lincolnshire Museum, now a National Finds advisor to the Portable Antiquities Scheme; hereafter: PAS) has informed me that some local finds rallies have been held, although these were concentrated on areas which have produced much younger finds (pers. comm. 2019). This slight shift in focus area is also evident in the records held for Risby-cum-Roxby parish on the PAS (The Portable Antiquities Scheme 2019ai), which at present reports 167 flint objects for the whole of the parish discovered through fieldwalking and metal detecting. Spatial details are recorded for 86 of these objects and show concentrations of finds along the roads framing the northern half of Risby Warren, i.e., Winterton Road, Risby Road, and North Street, with additional finds scattered across this area. However, amongst the flint objects currently published on the Scheme, only one is recorded as Palaeolithic. This object has been struck by hard hammer, has patina that is densely creamy-white in colour, and is described as quite "chunky" in terms of lithic implements (NLM-D69A09, SE 93140 16705, The Portable Antiquities Scheme 2019r; see Chapter 8). Although this object has been assigned an LUP date with high confidence (i.e., narrow chronological range), I would conservatively place it into the Neolithic. The remaining PAS sample contains Mesolithic (70 entries), Neolithic (73 entries) and later periods, and based on the recorded information online, these reported finds are representative of previous finds made in the area.

The recorded metadata for these 'new' Roxby lithics reveals that 72 of these were discovered in 1976, whereas the remaining finds have been collected every year since 2002. Furthermore, the spatial focus has shifted north of the previously known concentrations of findspots in the southern half of Risby Warren, closer to Flagstaff Hill and the Steelworks. The PAS sample highlights some degree of continuity in local collecting activities, even during the decades for which few other research activities are reported. Whereas other geographical parts of the research area are faced with the problems of substantial under-reporting of lithic surface finds, these object entries are evidence that finds are regularly made available to the local Finds Liaisons Officers at the nearby North Lincolnshire Museum.

Given the overall representativeness of the PAS sample compared with existing Risby Warren collections regarding assigned chronology, flint types, context of discovery and patination, the absence of any clear, diagnostic Late Glacial finds is indicative of a true absence of such finds (at least in the more northern parts of Roxby parish). Moreover, the apparent absence of newly discovered finds from these previously productive southern parts of Risby Warren is notable since this is in contrast with past patterns of discoveries from all periods. Although this discrepancy certainly warrants further enquiry, this has intentionally been left for a future occasion due to the reportedly low potential for LUP finds.

One likely contributing factor may be the present-day conditions on the warren, as discussed in Section 7.1.3.

The most substantial addition to the archaeological record in terms of quantities of finds, occurred during my series of research visits to Scunthorpe, when H. Dudley's granddaughter donated the remainder of his personal collection of field-walked finds to the North Lincolnshire Museum in 2017 (R. Nicholson pers. comm. 2017). I was kindly granted permission to view this vast amount of 'new' material (ca. 10,000 lithic artefacts), which Dudley collected all over Risby Warren or Roxby parish over the course of many years, if not decades. Although a more thorough analysis will have to wait until this collection has been properly inventoried by the museum, at first glance it appears that Dudley's finds are very similar to the other Risby Warren assemblages with regards to the flint types used, patina/condition, and lithic technology, and Dudley's collection is highly representative of other such surface-finds collections from the wider area (see Figure 55). Dudley stored his finds by metric length (and in otherwise unmarked plastic freezer bags or biscuit tins), but during my brief viewings of the material I was unable to regroup finds into original knapping units or blade sequences. Whilst at the museum, I attempted to casually refit some of the blade blanks made from the same flint type but was ultimately unsuccessful during the short time span set aside for this; nor was I able to discover any clearly diagnostic LUP artefacts within Dudley's collection. Thus, at present there is unfortunately little evidence to suggest that Dudley's collection contains any unambiguous, diagnostic Late Glacial artefacts, and until more detailed attribute analyses are possible, I would place most of these finds which include microliths, retouched points, soft hammer struck blades, and bladelets into the Early Mesolithic and later periods.

As I remarked previously in Section E.1.2, the same recurring pattern can be observed across all known collections or catalogue entries - regardless of time, location, or method of discovery, and therefore the documented assemblages containing Late or Final Upper Palaeolithic artefacts remain rare, isolated occurrences. It is likely that there are several factors which have contributed to this situation, ranging from past environmental conditions (that may have restricted access to the area in antiquity), to a decrease in surface visibility, or low survivability of Late Glacial activity zones. As expanded upon in Sections E.2 and 7.2.1, the types of artefacts recovered further support the interpretation of short-time - possibly hunting task-specific - uses of Risby Warren, which typically result in fewer discarded finds than for instance *in situ* blade production.

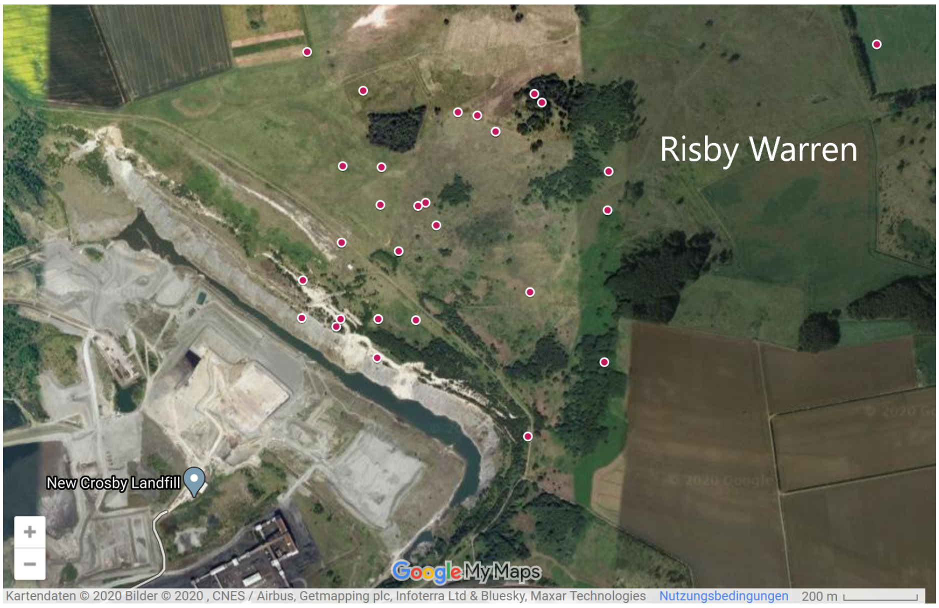


Figure 103: Distribution of known findspots across the southern parts of Risby Warren which border the Scunthorpe Steelworks near the highest point of elevation at Flagstaff Hill (site data obtained from the North Lincolnshire Museum; spatial precision varies from four to eight National Grid digits. Satellite image taken from Google Maps.)

E.2 The Armstrong Collection 'penknife points from Flagstaff Hill': observations from a re-appraisal of source material

As with any review of substantial, existing extant collections and site archives, it is to be expected that previous interpretations may require revision, for instance to accommodate interpretive changes in lithic typology and chronology over time, and which may alter the contemporary classification of finds (Kotthaus 2019; Harris, Ashton and Lewis 2019). This too was found to apply to the lithic debitage assemblages from Risby Warren, which I now classify as predominantly (Early) Mesolithic. Regarding artefact classification, Armstrong's preferred terminology has been superseded in recent decades and contemporary relative chronologies now shift much of his evidence into the early post-glacial and Holocene (Clark 1932; Buckland 1984:11; Buckland and Dolby 1973; Jacobi 1978a). Crucially, Armstrong's observations regarding observed proportions of retouched tools across the recovered assemblages are still relevant and mirrored by more recent research elsewhere in the area (Campbell 1977a:170, 173), showing an increasing prevalence of thinner, geometric microliths and overall reduction in quantities of larger tool forms (Clark 1932:35; Clark 1936:190-2; Jacobi in litt. undated; my observations). Armstrong saw typological similarities to the lithic inventories from the nearby Lincolnshire Cliff site Sheffield's Hill, "[t]hough the blades reveal a tendency towards the microlithic, this is not pronounced, and true microliths are extremely rare" (Armstrong 1932:131). This observation still applies to much of the material from Risby Warren, as I was able to confirm over the course of my extensive first-hand review of all Risby Warren, Sheffield's Hill, and Roxby parish assemblages. Subsequently collected artefacts confirm the general patterning as initially noted by Gatty (1902), then Armstrong, later as documented by Jacobi, and then in my own observations during data collection; all of which emphasise that similar to other surface finds assemblages from the East Midlands, the Risby Warren lithics are predominantly attributable to the Early Mesolithic and later prehistoric periods (Reynier 2005).

E.2.1 Armstrong *ad fontes* - stratigraphic context and location of finds

Central to my research interest in Risby Warren are the reports that Armstrong and collaborating collectors discovered diagnostically FMG-attributable penknife points from the base clay layer *beneath* aeolian LLS (GS-1) coversands (see Figure 56). If Armstrong's claims can be substantiated, the coversands would represent a reliable chronological proxy for the artefacts' age. Throughout my research, I have found that although Armstrong frequently referred to Risby Warren, these references are lacking in detail, and are typically included to establish relative chronologies of artefacts between his other excavated sites, and in relation to Risby Warren. For instance, when discussing the evidence from nearby Sheffield's Hill, Armstrong describes the presence of 'considerable depths of wind-borne sands' and dune formation, "burying early living sites" underneath, but which following extensive recurrent sand movements, become available again for re-occupation. Thus, "valuable evidence in the form of successive stratification of cultures has been obtained by the writer on Risby Warren". However, no exact findspot location is specified (Armstrong 1931a:337). Armstrong again refers to Risby Warren to strengthen his argument regarding the age of the Sheffield's Hill finds, by establishing a relative chronology based on the stratigraphic context he observed there: "This [free from Tardenois influences] assumption has been proved beyond doubt by stratigraphical evidence obtained on Risby Warren, where *the series of tools collected in the clay which forms the base level of the dunes*, and is therefore the oldest of the stratified levels, are found to be the same industry as that of the Cliff site." (Armstrong 1931a:339; my emphasis). Although no precise location is given for where these stratified tools were gathered on Risby Warren, nor any additional information is provided regarding the artefacts, collectors, or time of discovery, this statement nevertheless stands out as one of the few, clearest indicators for a stratified origin on the clay, *below* aeolian coversands. The archival literature also states that the 'Walshaw point' in Figure 60 was discovered *in the clay overlying the bedrock*, which emphasises the proposed Late Glacial date for this artefact (Dudley 1949:34; Lacaille 1946:180; Riley 1978:8).

The British Museum assemblage of penknife points (in Figures 59, 55 and 61) are reportedly "from the base clay" on or near the Flagstaff Hill summit, as confirmed by their collectors (E. Rudkin, H. Dudley, S. Jackson, J. Walshaw; Riley 1978:8). Armstrong's descriptions however also suggest the finds' context to be on the 'base (B)', which, when left unspecified, is ambiguous because Armstrong uses the same 'base (B)'-label for artefacts found "on the surface of a solifluxion layer at the base of the site", as reported for the twenty-five pieces collected by Dent in 1946 (now Armstrong Collection, Franks House) - a statement which Armstrong repeated time and again (in Armstrong 1939:83; Armstrong 1942:55; Armstrong 1956:97). As Jacobi was able to establish, these Dent collection finds were however "discovered at the entrance to a fox earth" (Henderson pers. comm., in Jacobi in litt. undated), which is suggestive of substantial post-depositional disturbances, and thus directly refutes Armstrong's central claims regarding their stratified origin. Furthermore, Early Mesolithic obliquely blunted and partially backed points of Wolds-type flint, i.e., items like the Dent Collection finds, are associated with podsoil developed upon the coversands, rather than the 'base' of the site *sensu* Armstrong (Jacobi in litt. 1992; Riley 1978:7). Jacobi and Riley (in litt. 1974, 1984) also argue that Armstrong may have misinterpreted a layer of rubble as a "solifluxion" [sic.] layer, since several local collectors noted finds from this side of the slope below Flagstaff Hill as exposed by erosion of rubble immediately above the limestone bedrock, or from recently exposed higher-up surfaces.

Additional sites which "link up with the series of stratified deposits at Risby Warren" are Hardwick Hill ("implements enclosed in a clay boulder and raised beach", Armstrong 1932:130) and Willoughton (also discovered by E. Rudkin). The open-air site at Willoughton is interesting in this context since the dimensions, stratigraphy, and extent of the excavation are reported. Below the humus topsoil was an equally deep "relic bed of yellow sandy clay and stones, [...] resting upon a [six inches deep] basement bed of limestone slabs and boulder clay", and the archaeological evidence suggests periodic, not continuous, settlement (Armstrong 1932:133; also Dudley 1949:32).

While establishing Risby Warren and the areas surrounding it as focal points of interest and of high potential for Late Glacial research, it is regrettable that Armstrong's own writings leave out crucial details regarding the stratigraphic contexts at Risby Warren. Many of his sequence descriptions instead rather refer to a relative chronology of artefacts, with proposed links to respective strata, across cave and open-air site excavations that he himself directed (in particular at Mother Grundy's Parlour). Nevertheless, there are clear, indisputable discrepancies with regards to Armstrong's claims, which have not been entirely possible to eliminate. Indeed, even during his lifetime and shortly afterwards, other researchers were similarly unsuccessful in re-locating necessary or more refined documentation, since Armstrong 'gave no detailed stratigraphic data' (Preston 1953:168; Riley 1978:9; May 1976:28; Jacobi in litt. undated). The omissions of more precise spatial and stratigraphic details are frustrating, as are the observed discrepancies or errors, all of which emphasise the already difficult to interpret the nature of the site. I have intentionally sought to address and mitigate these various challenges by including as much other information as possible throughout this chapter, and which will ultimately be of value for future studies of Risby Warren.

E.2.2 Flagstaff Hill - LUP findspot precision and observed spatial discrepancies

Figure 58 shows the 3 specified findspot locations for all reported Late or Final Upper Palaeolithic artefacts (Wessex Archaeology and Jacobi 2014). 6 entries are listed for the central location near Flagstaff Hill (Easting 492300/Northing 413100), and 1 is located to the west (Easting 490900/Northing 413600). For one particular tool (a slightly asymmetrical tanged point from a flint scatter; Jacobi 2014h), some more stratigraphic information is noted: "Exposed and eroded solifluction layer. Found with a cache of obliquely backed points". Most Late and Final Upper Palaeolithic artefacts (i.e., twenty-five of the PaMELA database entries), are however assigned to the isolated north-eastern findspot near Risby Farm (Easting 493500/Northing 413500), and for which two separate spatial details are recorded on the same cards: "Flagstaff Hill (S.324 B)" cf. Armstrong

- but also ‘D.N. Riley Areas 5 & 6’ (Jacobi/Riley in litt.; PaMELA IDs 749-762). Concerning stratigraphic concordance, some descriptive variations of “S.324 (red) base clay” are listed, and only PaMELA ID 764 is specified as originating “from below cover sands (artefact sealed by sand horizon)” (Jacobi 2014r). However, the British Museum’s details for a (1927?) Armstrong donation which included material marked ‘S.324’ were marked by Ch. Hawkes (formerly Assistant Keeper) as deriving from the “site on Sheffield’s Hill” - and *not* Risby Warren (Jacobi in litt. 1987). If this is true, then these Armstrong-finds predate any of the other collectors’ documented discoveries of penknife points by several years. Of critical importance is the possibility that Hawkes’ comment uncovered a fundamental recording error in Armstrong’s own documentation, and which could call the accuracy of all subsequent uses of the ‘S.324, Risby Warren’-label into question.

If the archival documentation however is correct, i.e., if “S.324” indeed refers to Risby Warren, then Armstrong’s ‘Flagstaff Hill (S.324 B)’ corresponds to ‘Riley’s Areas 5 & 6’ - however, as an added complicating factor, the North Lincolnshire Museum records place ‘Riley’s Areas 5 & 6’ closer to the central concentration of findspots near the natural position of Flagstaff Hill (SE 920 133, E: 492000/N: 413300; R. Nicholson, pers. comm. 2016), and not at the north-eastern location where the PaMELA entries were reportedly collected. Given the proportionally high number of database entries linked to Riley’s Areas 5 & 6, I have intentionally highlighted this observed discrepancy in Figure 58. Upon further comparisons, a similar pattern was uncovered for the following PaMELA entries:

1. PaMELA ID 626 recorded location (E: 493500/N: 413500) vs NLM coordinates SE 922 135 (i.e., E: 492200/N: 413500; R. Nicholson pers. comm. 2016; Jacobi 2014d)
2. IDs 627 and 628 recorded location (E: 493500/N: 413500) vs NLM coordinates SE 917 130 (i.e,. E: 491700/N: 413000; R. Nicholson pers. comm. 2016; Jacobi 2014e, Jacobi 2014f)
3. IDs 743 and 744 recorded location (E: 493500/N: 413500) vs NLM coordinates SE 919 133 (i.e., E: 491900/N: 413300; R. Nicholson pers. comm. 2016; Jacobi 2014l, Jacobi 2014m)

Based on the spatial details provided by the North Lincolnshire Museum, these five listed entries, as well as the museum’s coordinates for Riley’s Areas 5 & 6, are located at entirely separate locations some 1.2-1.5 km west of their respective PaMELA records’ stated grid reference (Easting: 493500/Northing: 413500).

One explanation could be that several database entries have been aggregated under that grid reference, whereas these should indeed be recorded as separate findspots (cf. NLM coordinates and R. Nicholson, pers. comm. 2016). Due to the overall low number of Late and Final Upper Palaeolithic finds from Risby Warren, these spatial discrepancies are not without consequence, because this effectively changes the finds distribution pattern for a large part of the Final Upper Palaeolithic sample - if Easting 493500/Northing 413500 is the correct location, then the artefacts were recovered from an area measuring 30 m AOD, whereas the Flagstaff Hill summit height is 69.5 m. Since it is the highest point of elevation on Risby Warren, Flagstaff Hill is a natural, known local landmark, and its location cannot be disputed.

Therefore, the observed discrepancies between the two reported Flagstaff Hills, especially the physical distance between the actual Flagstaff Hill and Armstrong's findspot 'Flagstaff Hill (S.324 B)', is problematic - not least since the lower-lying setting of Riley's Areas 5 & 6 changes the existing interpretations regarding site-use patterns. Based on all available documentation (Riley 1978; Riley and Jacobi in litt.; see Figure 54), and as mentioned, there is little to no evidence to doubt the locational accuracy of Riley's findspots, and it appears that either Armstrong's use of the 'Flagstaff Hill'-label, or the reported coordinates for those finds, is wrong. While I was unable to relocate any truly location-specific contemporary photographs of this relatively uniform landscape during my research, I believe the steelwork's exhaust fumes are visible in the background of some of the (undated) negatives. This would then indicate proximity to the Flagstaff Hill area and is further supported by map tracings held at the North Lincolnshire Museum. Based on the amount of documentation which specifically references the Flagstaff Hill-adjacent areas, I believe it is justifiable to assume this location is also the most likely provenance of the Late Glacial material, but nevertheless remain aware of the observed discrepancies in the available written documentation.

E.3 Risby Warren data on the PaMELA database

The Risby Warren case study was informed by Roger Jacobi's academic legacy which represents an invaluable resource for British Palaeolithic and Mesolithic archaeology in general, both in terms of its scope and attention to "detail, refinement, and insight which Jacobi imparted to its compilation" (Jacobi 2014a).

However, as a personal database largely developed through the study of museum collections, the Archive is acknowledged to be 'incomplete' and it reflects Jacobi's changing research interests over the course of his professional life (ibid.). In practical terms, these idiosyncrasies may be evident from variations in geographical representation or Jacobi's occasional subsequent revisions or edits.

Regarding the practical aspects of working with the database, one of the structural problems of the online PaMELA datasets is that not all of the data entries on the full, downloadable comma-separated values (csv) archive files contain any of Jacobi's period-specific qualifiers as listed variables (e.g., 'Creswellian', 'Terminal Upper Palaeolithic', Jacobi 2014a). As such, any specialised search targeting all period-specific entries must be done through the ADS interface, and exports of period-specific results lists must then be merged manually. Individual finds are best accessed and cited via their unique record card ID. A separate Colonisation of Britain dataset has been published which includes period labels where specified (also available via Wessex Archaeology and Jacobi 2014), however, this was found to not apply to Jacobi's sample of Risby Warren data and I therefore merged data manually. As ever when data manipulation requires substantial manual editing, there is an inherent potential for accidental omissions of entries or other data collection errors, and mistakes may have occurred despite my best efforts to avoid them. Additionally, and to the best of my knowledge, no shortcut exists for decoding Jacobi's Chronology labels, even where these are included in the database (Jacobi 2014a). Many of the classifications are linked to lithic typology and are thus obvious to those with a specialist knowledge of the subject (i.e., shibboleths), but given the decades over which Jacobi composed the record cards, even Jacobi's classifications may have been subject to the changes and readjustments in typology and terminology, especially with regards to the Early Mesolithic. In this chapter (and thesis), all references to finds recorded by Jacobi are by their individual 'PaMELA ID'.

The Risby Warren/Greater Scunthorpe area was found to be exceptionally well-covered and studied in the combined Jacobi Archives. Since the record cards are sequentially numbered by PaMELA ID, which is the label assigned by Wessex Archaeology during the digitisation process, the Risby Warren sample also illustrates how it is possible to trace the timeline of Jacobi's recordings. There are two series of Risby Warren-entries on the PaMELA database, reflective of Jacobi's stages of personal research involvement. Jacobi's initial phase of interest in Risby Warren appears to have been aimed at the chronologically earliest reported finds, i.e., Late and Final Upper Palaeolithic artefacts, starting at PaMELA ID number 625 (Jacobi 2014c). Decades later, Jacobi added a series of Mesolithic finds to his records (PaMELA ID numbers 15019 and upwards). Only one Early Mesolithic find is included in this earlier series of PaMELA entries (Jacobi 2014p). The full dataset of Risby Warren finds recorded by Jacobi includes 1336 objects across 256 records cards IDs (including entries with multiple cards; see Table 37). Most of the PaMELA entries in this sample are for one individual artefact, but several of the Mesolithic entries include more than one and up to as many as 325 finds (PaMELA ID 15242, Mesolithic "Favell collection debitage held at the British Museum"). Jacobi did not consistently assign a chronological label to all entries (Jacobi 2014a), and the aggregated Mesolithic component of the sample heavily outweighs the 37 recorded LUP finds (83.6% viz. 16.4% Late and Final Upper Palaeolithic).

Regardless of the inherent biases or disparities with regards to representation of chronology, collectors, museums (see Table 37), or for instance specific findspots on Risby Warren, Jacobi's data are the most systematic starting point for a specialised analysis of legacy finds from this area, and have thus provided quintessential information for my 'reconstruction of LG Risby Warren'. Since there is overlap between finds viewed by me and Jacobi, I have collated the following overview of his sample of recorded finds.

The listed site types or finds contexts are either flint scatters or stray finds, and the recorded artefacts were collected by a number of local collectors (ibid.) across three specified parts of Risby Warren, as shown in Figure 58. These database entries were compiled by Jacobi in the 1970s, and the general details are also included in the CBA Gazetteer (Wymer and Bonsall 1977). As shown in the overview of recorded artefact types in Table 38, Jacobi set the type categories quite widely - e.g., not refined beyond the broadest parameters and instead opted to include more detailed free text descriptions. To illustrate the prevalence of data for the Mesolithic finds relative to the low number of LUP finds at Risby Warren, I have included entries from both periods in my Figures and Tables as well. Retouched tools or retouched debitage constitute nearly 90% of all database entries across all chronologies. This confirms anecdotal reports and observations that these artefact types are generally over-represented in extant museum collections, as they are more likely to be recognised and picked up by collectors, and which is consistent with observations from other (field-walked) assemblages containing a disproportionally high percentage of retouched finds (see Chapter 7).

The classification of the lithic LUP artefacts from Risby Warren has been subject to some debate over the past century. Changes to chronological and terminological frameworks notwithstanding, previous reports (see Section E.1 and in litt.), and most notably A. L. Armstrong suggested there are typological similarities between Creswellian assemblages and parts of the Risby Warren inventory. Jacobi classified only one entry as 'LUP', which could be the single Creswellian-attributable find from Scunthorpe mentioned by Knight et al. 2021 (no further details specified). In contrast, Jacobi classified thirty-one entries as 'Final Upper Palaeolithic', including the most diagnostic examples illustrated in Figure 61. The only explicit reference Jacobi's recordings make to any 'cultural' or index type/periodic label are for PaMELA ID 631, on which "left-hand modification at platform kicks out slightly cf. 'Ahrensburgian points'" (Jacobi 2014i). The separate archive containing Jacobi's personal correspondence and other written Risby documentation includes a brief exchange discussing potential 'groups' or cultural affinities. Unfortunately, I have been unsuccessful in relocating the exact artefacts in the relevant illustration, and none of this external assessment seems to have been identifiably included in the PaMELA database. Throughout a series of letters dated to 1984, Jacobi and his Low Countries-based colleagues D. Stapert and R. Newell discuss possible typological date ranges for a selection of twenty-four Risby Warren artefacts, as drawn by Jacobi, and presumably stored at the British Museum. To Stapert at least, two of the retouched points do apparently look "Creswellian-like", i.e., typologically like artefacts found at the Dutch Creswellian site Siegerswoude, whereas R. Newell describes one of them as an "atypical Ahrensburgian point" (in litt. 1984). However, both Newell and Stapert also mention the similarities to "Basal" or Early Mesolithic artefacts, but reserve further judgment based on the assessment of such a curated and illustrated-only sample. In Barton 1991(:237), two flint toolkits (found below and above the coversands) are mentioned, of which the "upper assemblage [includes] diminutive tanged forms typologically identical to north-west European 'Ahrensburgian points'" (May 1976; Jacobi 1980; Jacobi pers. comm. to N. Barton, undated). Unfortunately, I have been unable to re-establish the composition of these two toolkits and cannot comment further on the validity of proposed typological affinities. In general, I have not seen any material that would confirm a Creswellian attribution (cf. Section 2.1.4), nor would I propose an Ahrensburgian classification (*sensu* Taute 1968). Based on my evaluation, I would classify the entire assemblage as *Federmesser-Gruppen*-attributable (cf. Section 2.1.4), but have intentionally retained Jacobi's PaMELA classification throughout my tables here.

For comparisons with the LUP penknife points and my own recordings (RWAA dataset, in Section E.4), I collated a separate dataset with all Early Mesolithic PaMELA records (N = 86). This dataset (labelled 'Risby PaMELA EM') exclusively comprises different microlith types (including Jacobi's types 1a-1ac, 1b-1bp, 2b, in Figure 104), chiefly among which are (fragments of) obliquely blunted points (56 entries or 65% of records), triangular microliths (2 isosceles and 7 large scalenes), curve- or partially backed points (5 entries), as well as 8 fragments with retouch. All microliths were made on thin, parallel-sided bladelets with a preference for orienting retouch at the proximal end.

The information concerning raw materials is summarised in Table 39. Unfortunately, the raw material sources are not specified for the entire sample, and it is likely that the number of finds made from (glacial) drift- or till-type flint is an underestimation. Except for one find made from drift derived material, only Wolds-type flint is further specified as a raw material source, although it is unclear which Wolds-origin Jacobi proposes, as multiple nearby sources are possible (Lincolnshire or Yorkshire Wolds). The comparison in Table 39 demonstrates that Wolds-type flint is the predominant flint type for Mesolithic finds from Risby Warren, which was further corroborated for a wider selection of Early Mesolithic sites between through A. Myers' doctoral studies that R. Jacobi supervised (up to 90% prevalence of Wolds flint, Myers 1986; Myers 2015). Jacobi's descriptions of colour ranges and shades of patina mirror my personal observations (see also Figure 55), and are representative of the other surface finds assemblages discussed throughout this thesis. Tonally, the flint ranges from translucent to more opaque shades of greys and (honey) browns, and post-depositional patination altering the natural surface colours in a range of blues, to cream, to fully white, occasionally smoothing the exposed surfaces further. The second image in this Figure 55 also shows a field photograph of unsorted contents in one of the Risby Warren boxes at the North Lincolnshire Museum, and which illustrates the wide range of observable flint types and patination. On some pieces, traces of iron staining and exposure to sand are noted (e.g. 'desert gloss' or 'pitted by sand grains'; see Figure 109). The artefacts shown in Figure 59 are made on a translucent grey-brownish flint with differential levels of light blue to white mottled patina. The E. Rudkin finds in Figure 55 are less uniform in both shape, preserved condition, and appearance, ranging from a fully-white and glossy patinated fragment, to cream-coloured, patinated flint with a matte finish. The visual contrast between these two groups of finds is emphasised upon direct comparison, as illustrated by the juxtaposition of finds in the upper row of Figure 55.

The relative prevalence of Wolds type flint is in accordance with observations from similar assemblages in the research area (Section 6.1.1; Henson 1985). This also supports the discussions regarding technical economies in the Vale of Pickering in the previous Chapter 6 where a distinct preference for knapping local materials during the Final Palaeolithic was observed, although it is important to note that Wolds-flint is the raw material local to Seamer Carr K. Consequently, what may be regarded as a distantly sourced raw material to one site, may indeed be the local source to another location, necessitating careful differentiation during analyses.

E.4 The RWAA Risby Warren sample

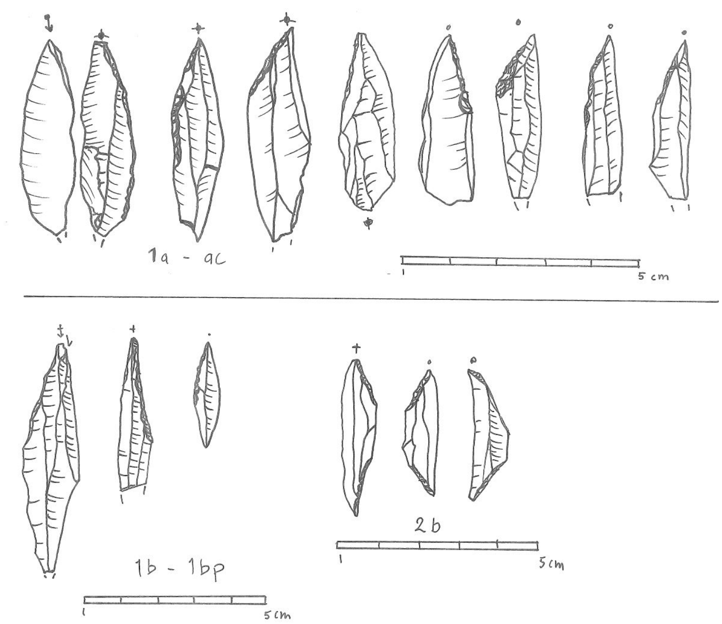


Figure 104: Representative selection of microlith types from Risby Warren. Top row: types 1a-ac. Lower row (left): type 1b-bp, (lower right) type 2b (based on my sketches and redrawn after R. Jacobi, *in litt.*)

As outlined in Section 7.1.1, contrary to my warranted expectations to build on the existing corpus of diagnostic LUP finds from Risby Warren, the lithic collections are primarily of Early Mesolithic and later date. During my research visits where I handled upwards of 10,000 surface finds from the locale, I began to record lithic attributes on a number of finds (N = 213, in Table 42) for the purpose of comparing these with the 31 LUP finds, and also the Early Mesolithic PaMELA records (N = 86). The sampling criteria follow the methodology outlined in Section 3.2.1. All artefacts are stray surface finds found across the Risby Warren (SE 9213) over the past century, and the North Lincolnshire Museum site label 'RWAA' is used to name this dataset. The obtained sample comprises mainly Early Mesolithic artefacts that I would classify as Deepcar type (cf. Reynier 2005; Conneller 2022a:Box 1.3), and the RWAA dataset also includes undiagnostic blade/flake removals and fragments that I recorded as general references. To avoid overlap with finds recorded by R. Jacobi, I selected comparable finds without his distinct handwriting on the labels. The summary here shall provide a 'raw' overview of the data I recorded; in future analyses I intend to focus on specific artefact categories and/or a selection of finds within this larger sample.

The composition of the RWAA dataset is summarised by collector in Table 41, and by artefact types in Table 42. Compared to the other site datasets in this thesis, the RWAA data is biased (53.5%) towards retouched tools. Different microlith types form the largest artefact category, including curve-backed, obliquely blunted, and backed points. Unretouched blades, flakes, and by-products of blade/bladelet manufacture constitute 46.5% of recorded finds. The presence of crested blades and core correction removals is seemingly in contradiction to my statements in Section 7.2.1 where I argued that there is no conclusive evidence for blade manufacture on the Risby Warren. Since the crested blades, core preparation pieces and single core fragment in Table 42 are not diagnostically LUP-attributable, and could be Mesolithic or Neolithic, my initial assessment remains valid.

A representative selection of microlith types is illustrated in Figure 104 and a cursory summary of microlith types (cf. Jacobi) is listed in Table 43. Since this was my first hands-on experience recording British Early Mesolithic material, I must add a caveat to the microlith type classifications in Table 43 which may require revision to amend mistakes, not least to include further information regarding preferences for lateralisation of retouch on obliquely blunted points since this can be of typo-chronological importance (cf. Reynier 2005:24, Figs. 2.8-2.11). Among the obliquely blunted points are penknife points that, at first glance, are very similar to LUP penknife points with respect to the outline, shape, and orientation of retouch. This observation is not unique to Risby (Clark 1932:xxxi), but represents an interesting angle for comparisons between these microliths and the LUP-attributable penknife points from the same locale (in Section 7.2).

All sampled RWAA finds are made from opaque Upper Cretaceous (Lincolnshire/East Yorkshire) Wolds flint or translucent flint from secondary sources. In his analyses of the mobility patterns of Deepcar-type groups, A. Myers (1986) included the Risby Warren 1 site assemblage with a c. 90% preference of Wolds-type over 10% translucent flint (Myers 1986; Myers 2015:173, Table 1; Conneller 2022a:81-82). In the RWAA sample I recorded a slightly lower proportion (84%, 178 entries) of Wolds flint compared with 16% translucent flint (35 entries). The difference between mine, Myers' and Jacobi's (in Table 39) flint type frequencies are likely due to differences in site/assemblage selection, since this present RWAA sample comprises stray finds derived from the entire Risby Warren locale (SE 9213, i.e., a total surface area of 1 km²) rather than one delineated site like Risby Warren 1 (in Myers 1986). Interestingly, this near-complete dominance of Wolds-type flint is in contrast with the LUP material discussed in Section 7.2 which is more balanced with regards to flint types. While further analyses are needed to make these comparisons more robust for the LUP-attributable material from Risby and ideally by including more LUP finds from other findspots across the North Lincolnshire Cliff, present evidence indicates chronological differences in the lithic raw material behaviour during different phases of human occupation of the Risby locale.

The post-depositional patina of sampled RWAA finds is equivalent to other Risby assemblages (in Sections 7.2, E.3), and varies between minimal changes (e.g., 'desert gloss' or slight opacity but no substantial changes to the colour of the external surfaces), to the development of fully invasive white-/cream-/toffee-coloured patina (in Figure 55). Like at Farndon Fields, links have been drawn between the presence - or absence - of patina as an indicator of chronology. Rather than commenting on the likely provenance of the flint used to manufacture the Risby Warren finds, G. Clark (1932:36) remarked on their appearance, stating that "(...) whereas flints of theses latter periods (Beaker and Bronze Age) are almost invariably unpatinated in this [North Lincolnshire Cliff] region, the majority of the Tardenois flints are patinated a creamy white colour. This is a fact which has been noticed by many investigators, and points to the difference in age between the two groups which we should expect".

As I recollect (and see Riley 1978), the unpatinated appearance of flint artefacts from the more recent (Late Neolithic/Bronze Age) phases of human occupation is still a valid observation that remains largely unchanged over the past century (since Clark 1932). However, and as discussed in relation to the evidence at Farndon Fields (in Section 5.2.1), post-depositional patina is not a reliable criterion to classify or distinguish different phases of human occupation (Rottländer 1975; Reynier 2005; Glauberman and Thorson 2012). Future analyses of the surface assemblages should instead utilise the differential levels of surface patination as an indicator of different depositional histories across the Risby Warren landscape, since these may indicate different preferences in site location throughout the Holocene.

In Table 44 I have summarised the degree of artefact preservation. Proximal ends were preserved on 139 (65.2%) of sampled finds. Preserved bulbar scars and features on the ventral side of the artefact (like cones, lips, Wallner lines) in combination with a visual comparison (using Pelegrin 2000:Figs. 1-3 as a reference) indicate that the majority (78 or 56.1%) of finds were struck using a soft stone hammer. Evidence for soft organic (42 finds or 30.2%) and hard hammer percussion (13.6%, 19 finds) was also visible, though to a lesser extent.

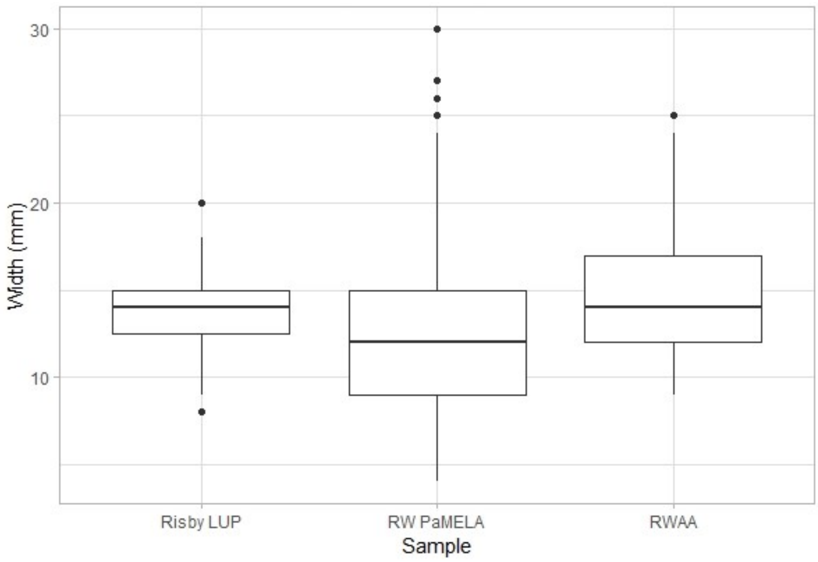
Finds are mainly straight in longitudinal profile (131 finds or 61.5%), with some 82 (38.5%) artefacts that are curved or slightly twisted. Sampled RWAA finds are primarily fully de-corticated (no cortex on 146 finds, 68.5%). Where preserved, the original cortex makes up a continuous patch on up to a third of the dorsal surface (usually concentrated on one of the lateral edges) on 53 or c. 25% of finds. Cortex covers up to 50% of dorsal surface in two counts (0.9%), and covers more than 50% of the dorsal surface of 12 (or 5.6%) finds. Platform preparation methods are summarised in Table 46 and a c. 82% preference for abrasion, or abrasion with faceting, is evident, whereas faceting only was recorded on 25 (or 18%) of finds. Knapping directionality can be inferred through dorsal scar patterns, which I recorded by type and orientation relative to the artefact's ventral side (i.e., same or opposite or transverse to the direction it was struck from), presence of cortex, and number of previous removals. Since this was my first experience recording a British Early Mesolithic/Deepcar-type assemblage, I was unfamiliar with some of the preferred terminology (like Y-type or T-type removal patterns noted by Reynier 2005) and the simplified overview in Table 45 may misrepresent removal patterns. For the most part (80.8%, 172 entries), previous removals were struck from the same as the current direction, though the scarring pattern also indicates re-orientation to either a platform at the opposite end or perpendicular to the current knapping direction.

Comparisons of lengths were omitted due to the variable degree of complete artefact preservation. To test if there are differences between the various Risby Warren artefact datasets, and more specifically to compare whether there are differences between the LUP component and the Early Mesolithic data (in the

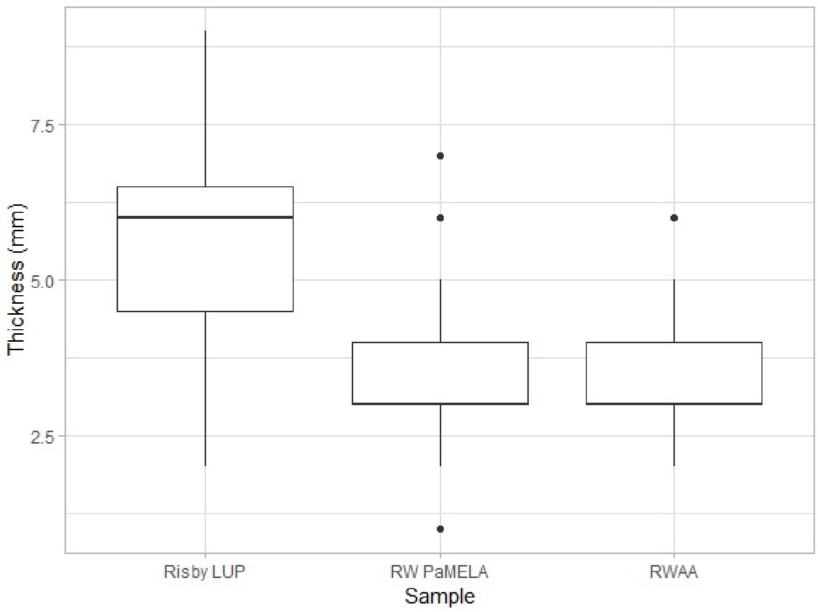
RWAA, and Jacobi's RW PaMELA samples), I have collated the following information. Since all entries in the Risby Warren LUP dataset are retouched tools (including LUP penknife and curve-backed points, N = 31), for the comparisons of Risby samples in Figure 105 and Table 40 I chose to exclude any unretouched blade/bladelets in the RWAA (N = 72) and the RW PaMELA (N = 172) samples to instead compare similar artefact categories. For the present comparison, samples have not been subset by flint types.

In Figure 105, samples are compared by width and indicate there is overlap between the Risby LUP data and RWAA sample (no significant difference, p-value = 0.8764; calculated using a Wilcoxon rank sum rest with continuity correction, p-value adjustment method BH). Both of these samples are also different to the RW PaMELA. Regarding differences between the RWAA and Jacobi's RW PaMELA data, I consider this to be a result of artefact selection since the RWAA dataset includes a number of broader Early Mesolithic penknives that I initially, and in error, had confused with possible LUP artefacts.

Figure 105 compares retouched tools thickness and indicates that the Risby LUP artefacts are thicker than the predominantly Early Mesolithic samples (labelled as RWAA and RW PaMELA). A Kruskal-Wallis rank sum test (data: Thickness by Site, Kruskal-Wallis chi-squared = 46.395, *df* = 2, p-value <0.0001) confirms there is a significant difference in the mesial thickness of sampled finds. A pairwise comparison using a Wilcoxon rank sum test (with continuity correction, p-value adjustment method: BH) confirms a statistically significant difference (p-value <0.0001) between the Risby LUP data and the two other samples. In contrast, thickness-wise there is no significant difference between the RWAA data and the Risby PaMELA sample (p-value = 0.9). Though further analyses are needed to better identify how observed differences between artefacts are linked to factors like differential raw material composition of LUP/Early Mesolithic samples, or differences in knapping techniques used to create the blanks used, the morphological and technological patterns evident in the Risby assemblages reflect the comparable evidence and intra-assemblage/site differences documented at Seamer K (in Chapter 6).



(a) Comparison of width (in mm)



(b) Comparison of thickness (in mm)

Figure 105: Comparisons of width and thickness (Risby Warren datasets: Risby LUP, N = 31; RW PaMELA, N = 172; RWAA, N = 72; n = 275)

Table 37: Summary of Risby Warren-related record cards collated by R. Jacobi for the PaMELA database, in order of collector and proposed chronology (Jacobi 2014a)

Source	**LUP**	**Final Upper Pal.**	**Early Meso.**	**Early Meso., Meso.**	**Early, Late Meso.**	**Early, Late, Meso.**	**Meso.**	**Late Meso.**	**NA**	**Count**
NA		4	38	4	8		14	48	14	130
Armstrong		16	1						1	18
Brown		1	2							3
Chant		1								1
Dent								1		1
Dudley			2		1		2			5
Favell							9			9
Henderson			6		3	2	1	2		14
IoA UCL							1	2		3
Jackson	1	6								7
Riley		1	13		1		13	14	1	43
Riley & Walshaw						2		2	1	5
Rudkin			2		1					3
Sturge								1		1
Walshaw		3	4				2	4		13
Total	**1**	**31**	**69**	**4**	**14**	**4**	**42**	**74**	**17**	**256**
Total (in %)	**0.39**	**12.1**	**26.9**	**1.5**	**5.4**	**1.5**	**16.4**	**28.9**	**6.6**	**100**

Table 38: Overview of recorded artefact types from Risby Warren, in order of proposed chronology (Wessex Archaeology and Jacobi 2014)

Artefact types	**LUP**	**Final Upper Pal.**	**Early Meso.**	**Early Meso., Meso.**	**Early, Late Meso.**	**Early, Late, Meso.**	**Meso.**	**Late Meso.**	**NA**	**Count**
Core				1					3	4
Debitage			2	1	2		1		7	13
Flint		1								1
Other		1	3	1		1	2			8
Retouched Tool	1	29	63	33	72	1	11	2	7	219
Retouched Tool Debitage			1	6		2		2		11
Total	1	31	69	42	74	4	14	4	17	256
Total (in %)	0.4	12.1	26.9	16.4	28.9	1.4	5.4	1.4	6.6	100

Table 39: Raw material sources (cf. present PaMELA sample entries; Wolds origin not further specified; chronological labels abbreviated)

Source	**LUP**	**Final Upper Pal.**	**Early Meso.**	**Early Meso., Meso.**	**Early, Late Meso.**	**Early, Late, Meso.**	**Meso.**	**Late Meso.**	**NA**	**Count**
Drift		1								1
Wolds	0	9	36	2	5	4	8	13	11	88

Table 40: Comparisons of width and mesial thickness in the Risby Warren datasets (Risby LUP, N = 31; RW PaMELA, N = 172; RWAA, N = 72), grouped by measurement, sample name, sorted by descriptive values (all values in millimetres; n = 275)

Measurement	**Sample**	**N**	**Mean**	**SD**	**Median**	**IQR**
Width	Risby LUP	31	14	2.62	14	2.5
Width	RW PaMELA	172	12.6	4.75	12	6
Width	RWAA	72	14.2	3.56	14	5
Thickness	Risby LUP	31	5.48	1.63	6	2
Thickness	RW PaMELA	172	3.29	1.01	3	1
Thickness	RWAA	72	3.33	1.03	3	1

Table 41: Frequency of finds in RWAA sample, in order of collector

Collection	**Count**
Brown	20
Chant	23
Day	3
Dudley	58
Fearon	36
Fowler	5
Jackson	10
Riley	35
Walshaw	19
Total	**213**

Table 42: Simplified summary of knapping direction, as inferred through the type and number of dorsal scars and their orientation relative to the artefact's ventral side (RWAA sample)

Artefact type	**Count**
awl	3
backed point	1
blade	26
blade fragment	38
blade fragment with retouch	11
blade with retouch	10
(obliquely) blunted point (obp)	40
(obliquely) blunted point fragment	2
core correction blade	20
core correction flake	8
core tablet	2
core fragment	1
crested blade	7
curve-backed obp	4
end scraper	6
flake	19
flake with retouch	4
knife	2
LG backed point	1
point fragment	1
scraper	3
scraper fragment	1
side and end scraper	2
tanged point	1
Total	213

Table 43: Summary of microlith types represented in RWAA sample (after Jacobi 1978b and Conneller 2022a:Figure 1.6.)

Category	**Count**
NA	190
1 obliquely blunted point	12
1 obp tip	1
1 or 4	4
2 triangle	1
4 curve backed	2
partially backed	3
Total	23

Table 44: Simplified summary of knapping direction, as inferred through the type and number of dorsal scars and their orientation relative to the artefact's ventral side (RWAA sample)

Degree of preservation	**Count**
complete	98
distal end absent	36
distal end fragment	17
medial fragment	42
proximal end absent	13
proximal end fragment	7
Total	213

Table 45: Simplified summary of knapping direction, as inferred through the type and number of dorsal scars and their orientation relative to the artefact's ventral side (RWAA sample)

Type/scar count and orientation	**Count**
only cortex	1 (0.5%)
>3 all directions	22 (10.3%)
3 opposite	4 (1.8%)
same, and opposite	8 (3.7%)
same, and transverse	4 (1.8%)
same direction	172 (80.8%)
transverse	2 (0.9%)
Total	213

Table 46: Platform preparation methods (RWAA sample; 'NA' includes finds without intact proximal ends and no recorded data)

Type	**Count**
NA	77
abrasion	56
abrasion; faceting	5
faceting	25
heavy abrasion	44
heavy abrasion; faceting	6
Total	213

Catalogue F

Supplementary information for Chapter 7

F.1 Catalogue of LUP dataset of PAS records

This catalogue contains an overview of the PAS object records included in Chapter 8. Entries are grouped by object types, including measurements of length/width/thickness (not specified in database if measured at mesial or maximal point), with ID keys and find descriptions cited verbatim.

1. Cores (4)

   - LEIC-4C6172 (The Portable Antiquities Scheme 2019v): Palaeolithic Bronze Age flint core (sic.)
   - LEIC-4C7AE3 (The Portable Antiquities Scheme 2019w): Palaeolithic (Lower) to Neolithic (Later) core
   - LEIC-BEF6D6 (The Portable Antiquities Scheme 2019z): Later Palaeolithic flint core.
   - LEIC-C2E345 (The Portable Antiquities Scheme 2019ad): Palaeolithic flint core.

2. Blades (3)

   - DENO-4DA237 (The Portable Antiquities Scheme 2019i): Flint blade (L: 60.5, W: 22.6, T: 13.55 mm), probable Final Late Upper Palaeolithic straight backed blade (c.13,000BC-8,300BC); possibly Neolithic blade (4,500BC-2,100BC)

- LEIC-E6C050 (The Portable Antiquities Scheme 2019s): Palaeolithic (Upper) to Neolithic (Early) retouched blade (L: 35, W: 13, T: 3 mm)
- LEIC-D03BF4 (The Portable Antiquities Scheme 2019ab): Later Palaeolithic flint backed blade (L: 65, W: 22, T: 12 mm)

3. Debitage, flakes, lithic implements (11)

   - LIN-6118B4 (The Portable Antiquities Scheme 2019k): Possible Upper Palaeolithic blade, categorised as flake (L: 42, W: 14, T: 3 mm). This object is shown in Figure 67. Note that the actual PAS image file appears to be corrupted.
   - NLM-DFBE07 (The Portable Antiquities Scheme 2019c): Probably a Late Palaeolithic naturally backed knife (L: 53.1, W: 23.2, T: 5.7 mm)
   - NLM-E89833 (The Portable Antiquities Scheme 2019d): Probably a Upper Palaeolithic flint blade (L: 62, W: 25.4, T: 7.6 mm)
   - LEIC-3B7624 (The Portable Antiquities Scheme 2019e): Prehistoric flint flake (L: 25, W: 22, T: 19 mm)
   - LEIC-987CB6 (The Portable Antiquities Scheme 2019x): core correction fragment (L: 52, W: 28, T: 13 mm)
   - NLM-358F94 (The Portable Antiquities Scheme 2019j): (debitage) Toffee coloured clouded and opaque flint. Knife. Narrow rod-shaped blade (L: 42.4, W: 8.2, T: 5 mm).
   - NLM-327DC4 (The Portable Antiquities Scheme 2019q): (debitage) Grey flint with cortex debitage (L: 49, W: 30, T: 12.4 mm)
   - NLM-D69A09 (The Portable Antiquities Scheme 2019r): (lithic implement) Flint possible edge-polished fragment (L: 41.3, height: 67, T: 26 mm)
   - LEIC-87C098 (The Portable Antiquities Scheme 2019t): Palaeolithic (Lower) - Neolithic (Early) flake (L: 41, W: 22, T: 11 mm)
   - LEIC-16854E (The Portable Antiquities Scheme 2019u): Palaeolithic (Later) - Bronze Age (Later) flint flake with retouch (L: 92, W: 48, T: 20 mm)
   - LEIC-98A64E (The Portable Antiquities Scheme 2019y): Palaeolithic (Upper) to Neolithic (Later) fabricator (L: 75, W: 24, T: 27 mm)

4. Backed blades (2)

   - DENO-4D95E1 (The Portable Antiquities Scheme 2019g): Possible

Final Late Upper Palaeolithic curve-backed blade (L: 60.5, W: 22.4, T: 8.3 mm)

- DENO-4D9D06 (The Portable Antiquities Scheme 2019h): Probable Final Late Upper Palaeolithic straight backed blade (L: 71.1, W: 18.7, T: 9.1 mm)

5. Points (4)

   - DENO-8C977B (The Portable Antiquities Scheme 2019k): Late Upper Palaeolithic shouldered point (L: 68.7, W: 14.5, T: 4.1 mm)
   - LEIC-6572D3 (The Portable Antiquities Scheme 2019ac): Upper Palaeolithic flint tanged point (L: 64, W: 38, T: 12 mm)
   - LEIC-3DF246 (The Portable Antiquities Scheme 2019ae): Palaeolithic flint backed point (L: 54, W: 25, T: 7 mm).
   - LEIC-921119 (The Portable Antiquities Scheme 2019af): Palaeolithic flint tanged point (L: 66, W: 36, L: 17 mm).

6. Scrapers (7, all categories combined)

   - DENO-4D9510 (The Portable Antiquities Scheme 2019f): (scraper/tool) Flint implement; possible Final Upper Palaeolithic backed blade or later side scraper made on a secondary flake (L: 59.5, W: 23.1, T: 8.1 mm).
   - LEIC-053019 (The Portable Antiquities Scheme 2019l): (end scraper) Palaeolithic (Upper) to Bronze Age (early) end scraper (L: 33, W: 20, T: 9 mm)
   - LEIC-054916 (The Portable Antiquities Scheme 2019m): (scraper/tool) Palaeolithic (Upper) core/carinated scraper (L: 39, W: 25, T: 17 mm)
   - LEIC-05D151 (The Portable Antiquities Scheme 2019n): (side scraper) Palaeolithic (Upper) to Neolithic (early) side-scraper (L: 44, W: 28, T: 12 mm)
   - LEIC-07049A (The Portable Antiquities Scheme 2019o): (scraper/tool) Palaeolithic (Upper) to Neolithic (Late) keeled/core scraper (L: 42, W: 36, T: 27 mm)
   - LEIC-0710BE (The Portable Antiquities Scheme 2019p): (end scraper) Palaeolithic (Upper) to Neolithic (Late) end scraper on broken flake (L: 26, W: 32, T: 12 mm)
   - LEIC-514F4B (The Portable Antiquities Scheme 2019aa): (end

scraper) Later Palaeolithic flint scraper (L: 27, W: 16, T: 4 mm).

F.2 Further PAS lithic object descriptions

The subsequent artefact catalogue contains the remainder of the LUP dataset of PAS records discussed in Chapter 8. As addressed, although the stated mean chronological boundary of all sampled artefacts was specified as 'Late Palaeolithic', upon individual review the artefacts were found to be too undiagnostic or of later prehistoric date, and therefore not included in the chapter. The purpose of this separate catalogue is to illustrate the observed discrepancies, since these represent systemic issues to the use of lithic PAS data for specialised LUP or lithics research and therefore are of immediate relevance to the PAS' prospective PhD idea on this very topic (The Portable Antiquities Scheme 2019ak). In previous methodological discussions about the frequently undiagnostic nature of surface finds - and the resulting difficulties in determining precise date ranges (see Sections 3.2.3, 4.1.2, B.1, 8.1.4), analyses of single finds may be further complicated if these cannot be viewed in person and interpretations have to rely exclusively on second- or third-hand information. As noted under 'Subsequent Action' on each PAS object record, all finds have been returned to their respective finder and privacy restrictions prevented further opportunities to consult this material first-hand. All observations presented throughout this Catalogue are therefore derived directly through the published descriptions and images included in each PAS finds record. In Figure 106 I have compared the width relative to thickness (in mm) for this entire dataset (N = 31), with the most likely LUP-attributable finds highlighted. The measurements are derived from the object records, however it is not specified if measurements were taken at mid-point or the widest or thickest part of the object. Compared with the other finds, the LUP-attributable finds are consistently at the thinner and narrower end of the scale.

Cores (4)

Three of the sampled cores are shown in Figure 107. The illustrated examples are heavily patinated (dark blueish to white/cream in colour) and the cortex is almost entirely removed. Where visible, the original raw materials are dark grey or brown opaque flint with some inclusions of chert. All cores are presumed blade cores that were discarded at various stages of knapping - ranging from

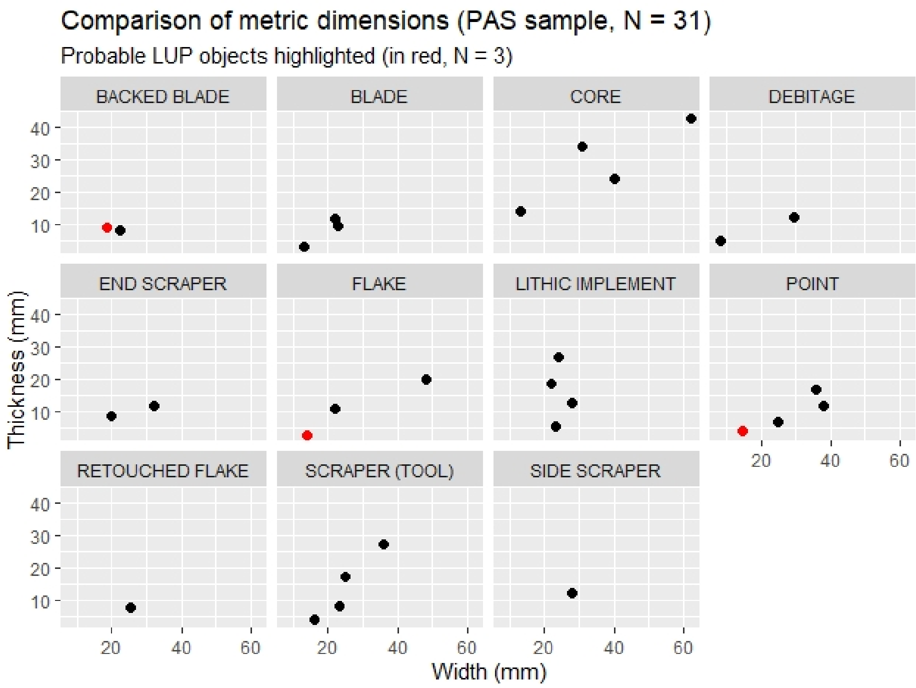


Figure 106: Metric comparison of width to thickness (in mm, data sourced from PAS records; not specified if measurements were taken at mid-point or widest/thickest point). Direct comparison of PAS LUP sample (N = 31) with the three objects that are most consistent with an LUP-attribution.

only a few removals, to worked, and almost entirely exhausted (especially core LEIC-4C6172, Figure 107:B; The Portable Antiquities Scheme 2019v). Step fractures, which likely led to discard, are recorded and visible on objects LEIC-BEF6D6 (small, rectangular fragment, Fig. 107:D; The Portable Antiquities Scheme 2019z) and LEIC-C2E345 (pyramidal core, Fig. 107:C; The Portable Antiquities Scheme 2019ad). Core LEIC-4C7AE3 is reportedly of poor quality (see Figure 107:A) and only a few large, unidirectional removals were struck prior to discard (The Portable Antiquities Scheme 2019w). A better example is object LEIC-4C6172 (Fig. 107:B, The Portable Antiquities Scheme 2019v), for which multiple core faces and uni- and bidirectional removals are noted. Although only a small section of the substantially patinated knapping edge is visible in the photograph, this edge does appear to have been abraded or similarly modified. This core is somewhat anachronistically described as a “Palaeolithic Bronze Age flint core”, although it is uncertain whether this is an expression of its potentially wide chronological range or intended to indicate that a Palaeolithic core was

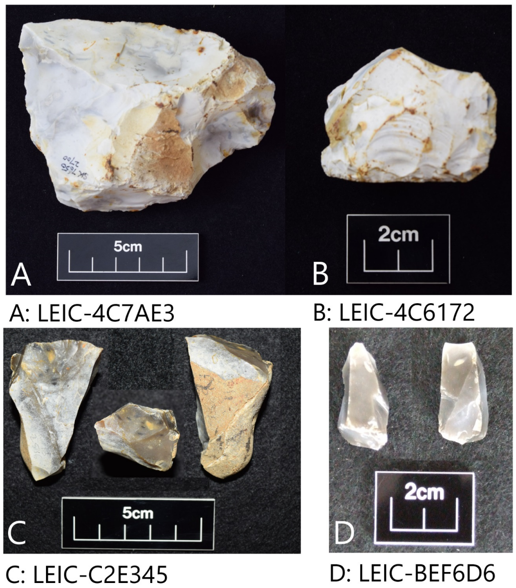


Figure 107: Four LUP-attributed cores recorded in present PAS sample (Core A: LEIC-4C7AE3, The Portable Antiquities Scheme 2019w; Core B: LEIC-4C6172, The Portable Antiquities Scheme 2019v; Core C: LEIC-C2E345, The Portable Antiquities Scheme 2019ad; Core D: LEIC-BEF6D6, The Portable Antiquities Scheme 2019z)

reworked at a later, prehistoric date.

Non-blade debitage, flakes and lithic implements (11)

A great deal of variation in terms of probable chronology, function, and features may be observed on the assorted flakes (3 objects), lithic debitage (2 objects) and lithic implements (3 objects; see Table 23) which are included in the present sample. Flakes LEIC-3B7624 (The Portable Antiquities Scheme 2019e), LEIC-87C098 (The Portable Antiquities Scheme 2019t) and LEIC-16854E (The Portable Antiquities Scheme 2019u) are undiagnostic, or, in the recording officer's own words describing the latter find, "could be any date".

A minor discrepancy between classification and documentation must be noted for object NLM-E89833 (Fig. 108:B; The Portable Antiquities Scheme 2019d), which is recorded as a "retouched blade (...) likely representing a late glacial industry", whereas the description and finds illustration specify that no retouch is present. Included in Figure 109:A is flake NLM-327DC4 (The Portable Antiquities Scheme 2019q) which is quite 'chunky' and showing signs of hard hammer percussion. This flake is chronologically ambiguous, and covered with a

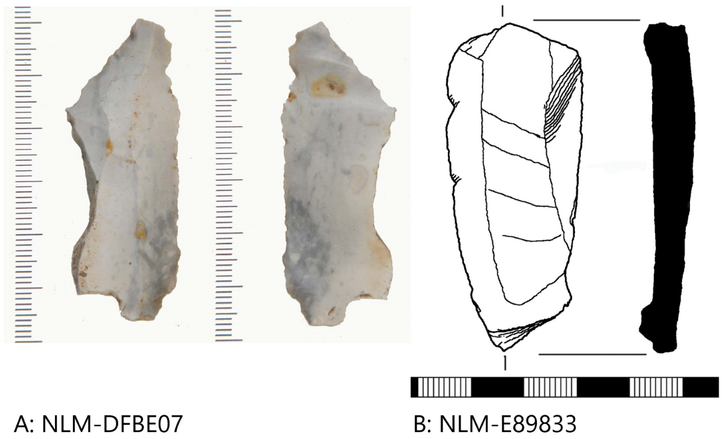


Figure 108: Further lithic implements included in present PAS sample (A: NLM-DFBE07, The Portable Antiquities Scheme 2019c; B: NLM-E89833, The Portable Antiquities Scheme 2019d)

dense, light brown to cream-coloured and high-shine patina which is described as “desert gloss”. This high-shine gloss is also reported from the otherwise unpatinated object NLM-358F94 which was discovered on inter-tidal coastal land (see Figure 109:B; The Portable Antiquities Scheme 2019j). Post-depositional impact of waves or movement through beach sand may explain the ‘smoothed’ appearance of this toffee coloured, lightly clouded, and opaque flint implement. Parallel retouch extends along the length of the right lateral edge and the tapered proximal end gives this blade the appearance of a naturally formed tang. Based on K. Leahy’s suggestion, this object “is a find of note and has been designated: County/local importance”.

Object NLM-D69A09 (The Portable Antiquities Scheme 2019r) is best described as quite ‘chunky’ and a large, pronounced cone extends from the platform onto the proximal ventral side. Other preserved scars of hard hammer percussion are still visible despite the thick, white patina, and iron staining which is characteristic for Palaeolithic or Mesolithic surface finds from the Greater Scunthorpe area. There is a slight discrepancy between the stated object category and the description: “the edge-polished axe head form is held to be characteristic of the later Neolithic. Dr. Kevin Leahy kindly suggests the object may have been bifacially worked” (The Portable Antiquities Scheme 2019r). A similarly chunky piece is a white patinated object (The Portable Antiquities Scheme 2019y). Although it is tentatively described as a fabricator, the orientation and type of removals along the centre of the dorsal side give it the impression of being a core-

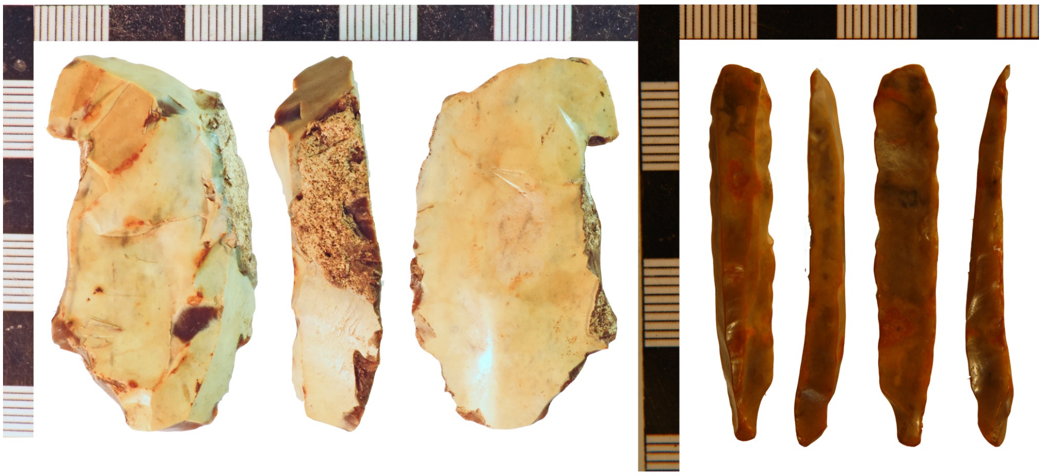
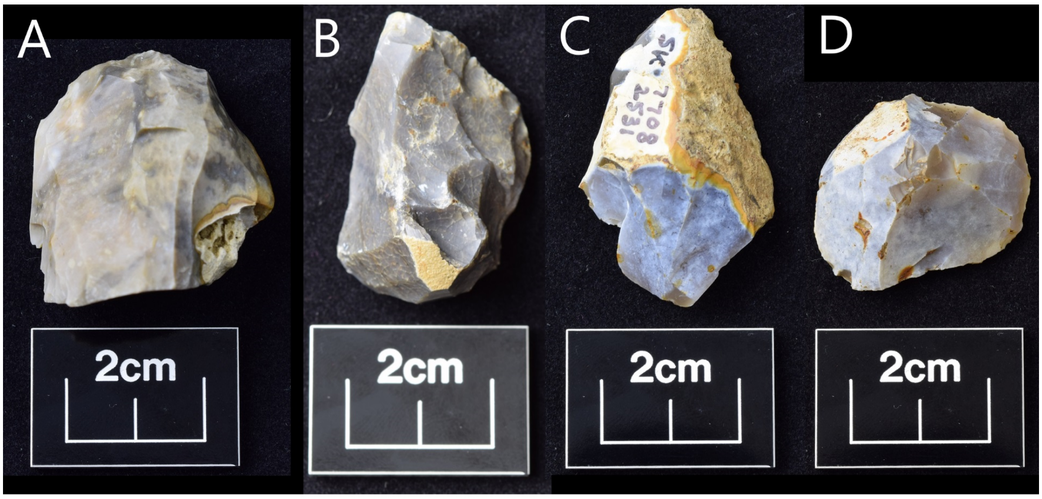


Figure 109: Lithic implements with recorded “desert gloss” patination (A: NLM-327DC4; The Portable Antiquities Scheme 2019q; B: NLM-358F94, The Portable Antiquities Scheme 2019j)

correction removal or potentially a crested flake.

Bidirectional knapping is recorded for a different core-correction fragment LEIC-987CB6 (The Portable Antiquities Scheme 2019x), which is coloured chalky grey/white through invasive patination and given a Middle Palaeolithic to Neolithic date range. As is noted specifically in the published record, the artefact is “giving the impression it is an end scraper” due to the ‘wrong’ orientation of the object photograph.

For object NLM-DFBE07 from Haxey, N. Lincs. (Fig. 108:A; The Portable Antiquities Scheme 2019c), the late B. Bee is explicitly named as a secondary identifier. Although classified as a lithic implement, it is described as a “naturally backed knife” of LUP age. This find is substantially creamy white patinated with darker grey spots and similar to other artefacts I have seen from Haxey parish. Based on the small bulb and soft ripples, soft hammer percussion seems likely, and abrupt retouch along the left distal end has produced an oblique truncation. Short abrupt retouch at the proximal end was used to create an off-centred tang. Based on the extensive post-depositional changes (breakage, patina) it is difficult to clearly classify this find from the published photograph and confirmation of the LUP-classification would be contingent on first-hand artefact handling.



A: LEIC-07049A B: LEIC-054916 C: LEIC-05D151 D: LEIC-0710BE

Figure 110: A selection of scrapers from Leicestershire (present sample; A: keeled core scraper LEIC-07049A, The Portable Antiquities Scheme 2019o; B: scraper/carinated core LEIC-054916, The Portable Antiquities Scheme 2019m; C: scraper LEIC-05D151, The Portable Antiquities Scheme 2019n; D: scraper LEIC-0710BE, The Portable Antiquities Scheme 2019p)

Scrapers (7 all combined)

The scrapers included in this sample vary greatly with regards to technological attributes and preserved condition and represent a wide range of chronological certainty. An LUP-date is indicated with a higher degree of confidence for several of these objects (in Figure 66).

As stated earlier, since I do not have access to the physical artefacts, I am hesitant to question the FLOs' object classifications based on the information currently available to me. Therefore, I have intentionally decided to keep the object type descriptions as they are recorded on the PAS at present. However, at least in one case it could be argued that the visible retouch is intended to form a backing, not a scraping edge (e.g., DENO-4D9510 in Figure 111:A, and see below; The Portable Antiquities Scheme 2019f). Furthermore I would suggest that two of these scrapers could be better described as combination tools, an example of which is the scraper/carinated core LEIC-054916 (Figure 110:B; The Portable Antiquities Scheme 2019m). Although this object is heat damaged, the high number of removals on the dorsal face and extensive retouch are still visible. A similar combination tool example is the "keeled core scraper" LEIC-

07049A (Figure 110:A; The Portable Antiquities Scheme 2019o), which has been truncated at right angles to create the keeled shape and shaped into a distal end scraper through abrupt retouch. Multiple negative removals are present on the dorsal side, but no further technological attributes are recorded.

Several of the other recorded scrapers seem to have been modified or reworked at a much later point in time, as is evident where the retouch has removed the patination (e.g. LEIC-053019, see Figure 111:B, The Portable Antiquities Scheme 2019l and LEIC-05D151, Figure 110:C, The Portable Antiquities Scheme 2019n). This suggests that older artefacts were curated and modified for other purposes at a later point in prehistoric time, an observation which is consistent with documented surface finds from elsewhere in the research area, for instance from my own experiences during fieldwalking at Farndon Fields, Notts. (also D. Garton, pers. comm. 2015).

Object LEIC-0710BE (Figure 110:D; The Portable Antiquities Scheme 2019p) is a small, nearly thumb-sized end scraper, and the original translucent mid-brown flint is covered in light-blue opaque patina with some signs of iron-staining and post-depositional damage. The scraper edge is rounded to shape by “long retouch which radiates to the centre of the dorsal face” and the object’s presumed age is set from Upper Palaeolithic to Late Neolithic.

A: DENO-4D9510 B: LEIC-053019 C: LEIC-514F4B

Figure 111: Further objects that were recorded as ‘scrapers’ in the present sample (A: DENO-4D9510, The Portable Antiquities Scheme 2019f; B: LEIC-053019, The Portable Antiquities Scheme 2019l; C: LEIC-514F4B, The Portable Antiquities Scheme 2019aa)

As indicated in Figure 66, object LEIC-514F4B (see Figure 111:C; The Portable Antiquities Scheme 2019aa) is assigned an LUP date with high certainty, and the find has been categorised as a side scraper due to the short, semi-abrupt retouch along the right lateral edge. The distal end is missing and based on the available documentation it cannot be determined if the breakage is intentional. Light blue semi-translucent patina and small traces of iron-staining cover this otherwise light brown to grey slightly opaque flint. The small, irregular platform may have been abraded, and soft hammer percussion seems most likely given the small, diffuse bulb. Based on present appearances it is unclear whether this is indeed a scraper or perhaps better described as a retouched blade.

Object DENO-4D9510 (Figure 111:A; The Portable Antiquities Scheme 2019f) is part of the group of Whitwell parish finds from the same landowner, and shares the same thick, cream-coloured patina overlaying the original mid-brown translucent flint with small remnants of slightly grainy cortex and smaller inclusions still visible on the dorsal side. The small platform and bulb and diffuse scarring are indicative of soft hammer percussion. Although tentatively classified as a side scraper, this object is described as a probable LUP straight backed blade, with semi-abrupt retouch or backing running the full length of the left lateral edge. The right edge extends perpendicular to the axis, and tapers in towards the distal end, giving the object a distinctly triangular shape. The retouch along the right lateral edge is more recent, as indicated by the removal of patina, and indicates this object was later reworked.

Catalogue G

Supporting figures: recalibrated radiocarbon dates

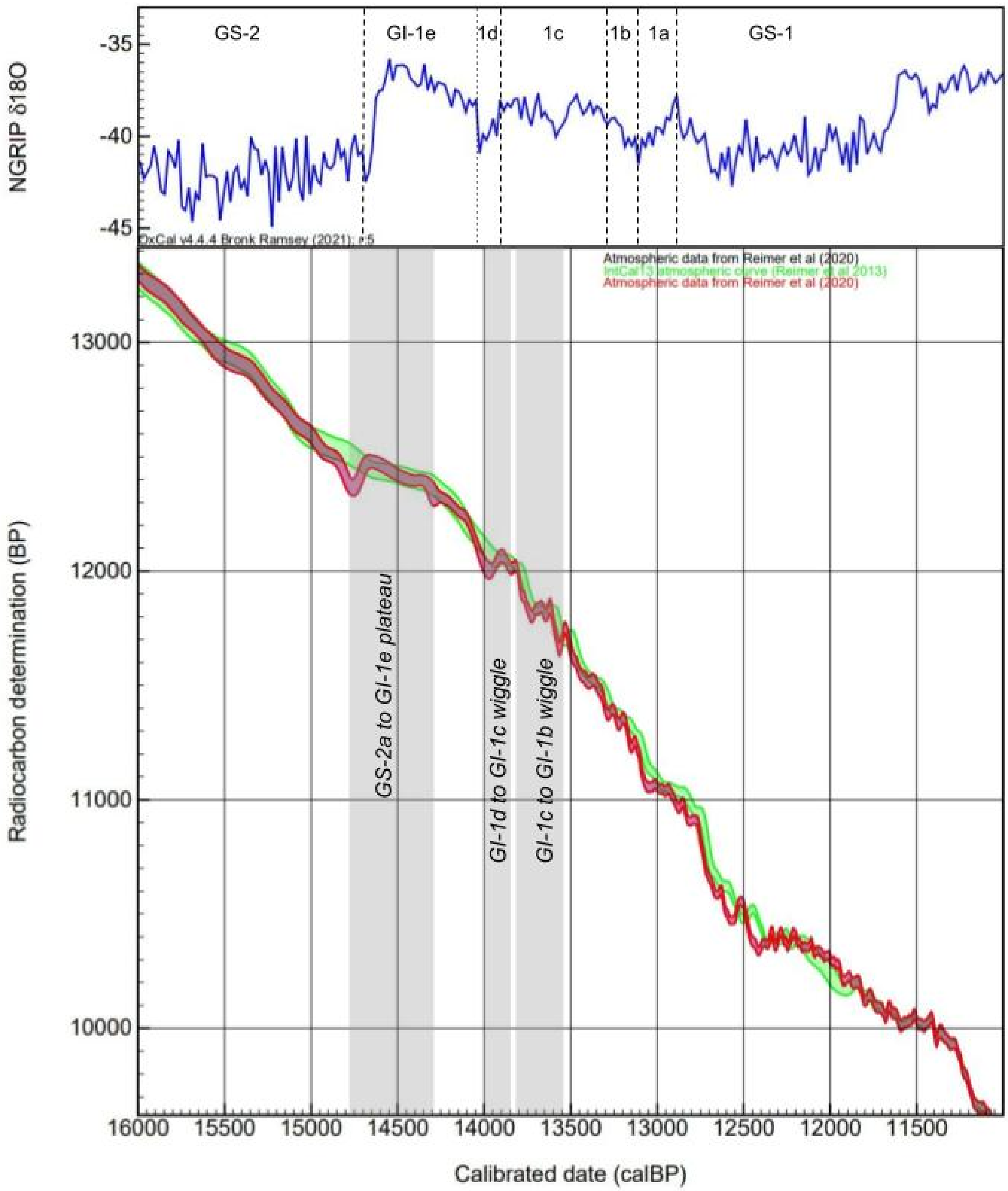


Figure 112: Comparison of the two most recent IntCal calibration curves, IntCal20 (in red) and IntCal13 (in green). IntCal20 overall provides slightly earlier dates (pre-GI-1e), but with a shift towards older dates (after c. 12,500 cal BP). Persistent GS-2a to GI-1e plateau and pronounced wiggles (GI-1d to GI-1c; GI-1c to GI-1b) highlighted. Around 11,900 cal BP, a harmonisation of curves occurs (data derived from the North Greenland Ice-Core Project and δ^{18}O record on the GICC05 time scale; edited graph template sourced from OxCal v.4.4.4, Bronk Ramsey 2009; atmospheric data from Reimer et al. 2020; Rasmussen et al. 2014b:fig. 1)

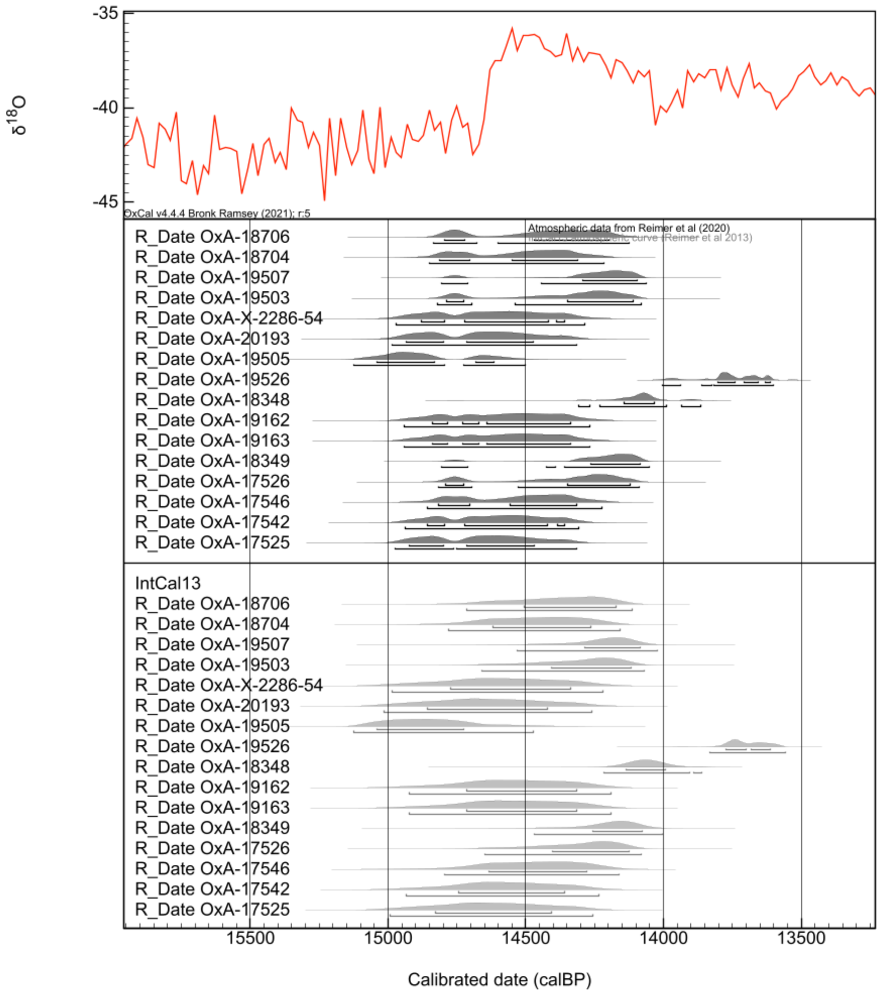


Figure 113: Radiocarbon dates from Creswell Crags cave sites: comparison of dates calibrated with IntCal20 (top) and IntCal13 (bottom). Dates obtained at Church Hole Cave (OxA-18706; OxA-18704), Mother Grundy's Parlour (OxA-19507, OxA-19503, OxA-X-2286-54, OxA-20193, OxA-19505), Pin Hole Cave (OxA-19526, OxA-18348, OxA-19162, OxA-19163), and Robin Hood's Cave (OxA-18349, OxA-17526, OxA-17546, OxA-17542, OxA-17525; data from Jacobi and Higham 2011: Table 12.9-10). Simple multiplot; dates shown against the NGRIP GICC05 ice core record; calibrated in OxCal v.4.4.4, bars and brackets indicate 68.3% and 95.4% confidence ranges; Bronk Ramsey 2009; Reimer et al. 2013; Reimer et al. 2020

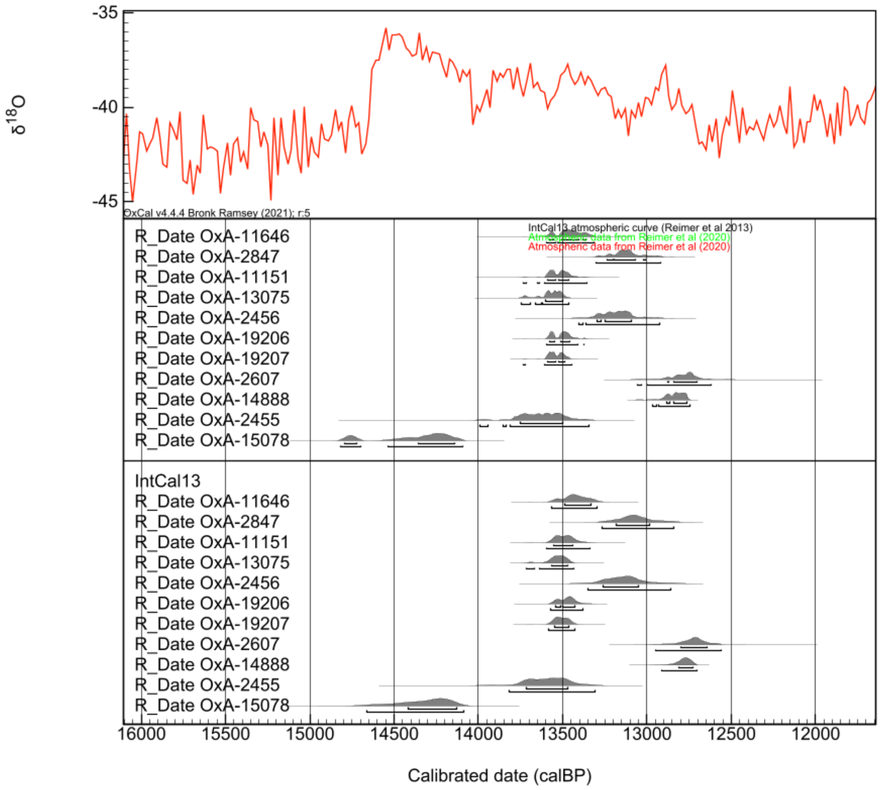


Figure 114: Radiocarbon dates from northern English and Welsh cave sites: comparison of dates calibrated with IntCal20 (top) and IntCal13 (bottom). Dates obtained at Bart's Shelter (OxA-11646), Conistone Dib (OxA-2847), High Furlong (OxA-11151, OxA-13075), Kinsey Cave (OxA-2456), Lynx Cave (OxA-19206, OxA-19207) and Victoria Cave (OxA-2607, OxA-14888, OxA-2455, OxA-15078; data from Jacobi, Higham and Lord 2009: Table 4, 8; Jacobi and Higham 2011: Table 12.3, 12.11). Simple multiplot; dates shown against the NGRIP GICC05 ice core record; calibrated in OxCal v.4.4.4, bars and brackets indicate 68.3% and 95.4% confidence ranges; Bronk Ramsey 2009; Reimer et al. 2013; Reimer et al. 2020

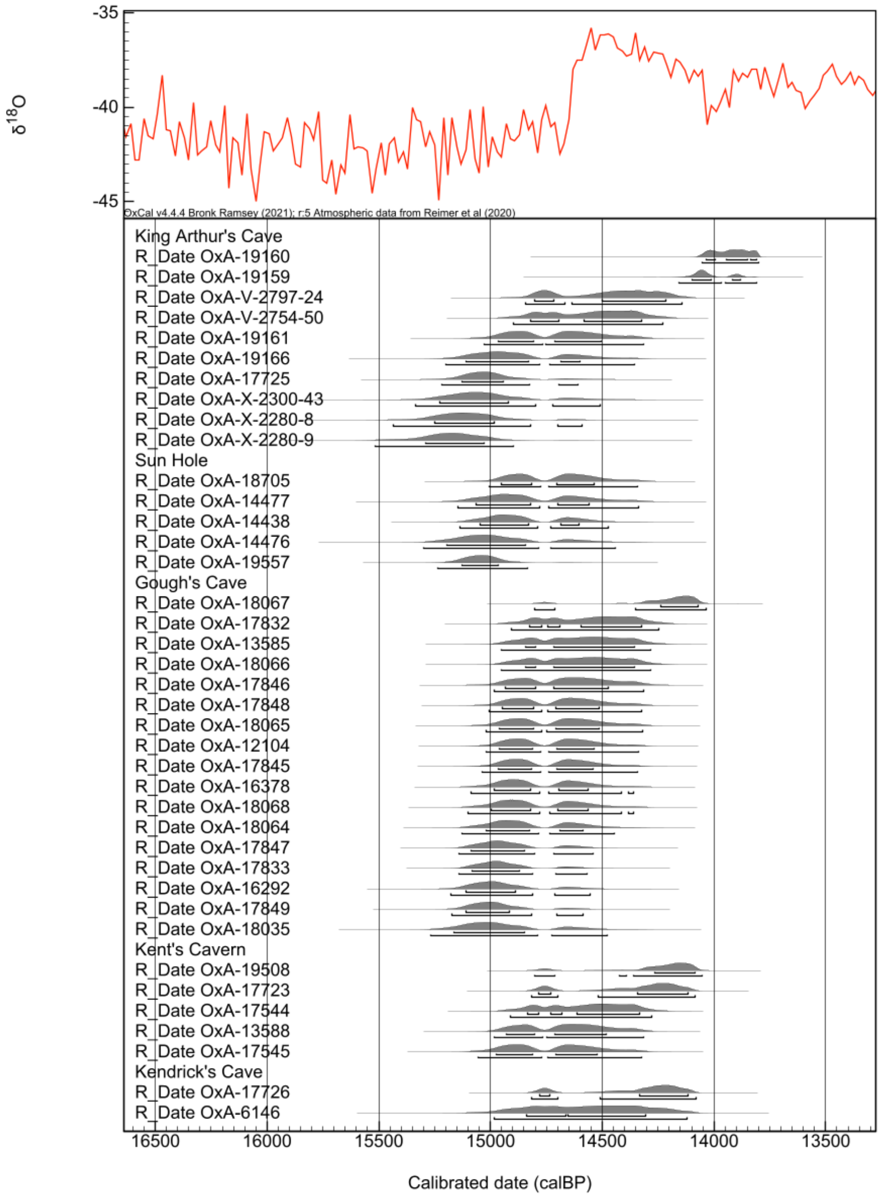


Figure 115: Radiocarbon dates from major British LUP cave sites in the South of England calibrated with IntCal20 (data from Jacobi and Higham 2009b: Table 1; Jacobi and Higham 2011: Tables 12.4,-8, 12.12; Reade et al. 2020). Simple multiplot; dates shown against the NGRIP GICC05 ice core record; calibrated in OxCal v.4.4.4, bars and brackets indicate 68.3% and 95.4% confidence ranges; Bronk Ramsey 2009; Reimer et al. 2020

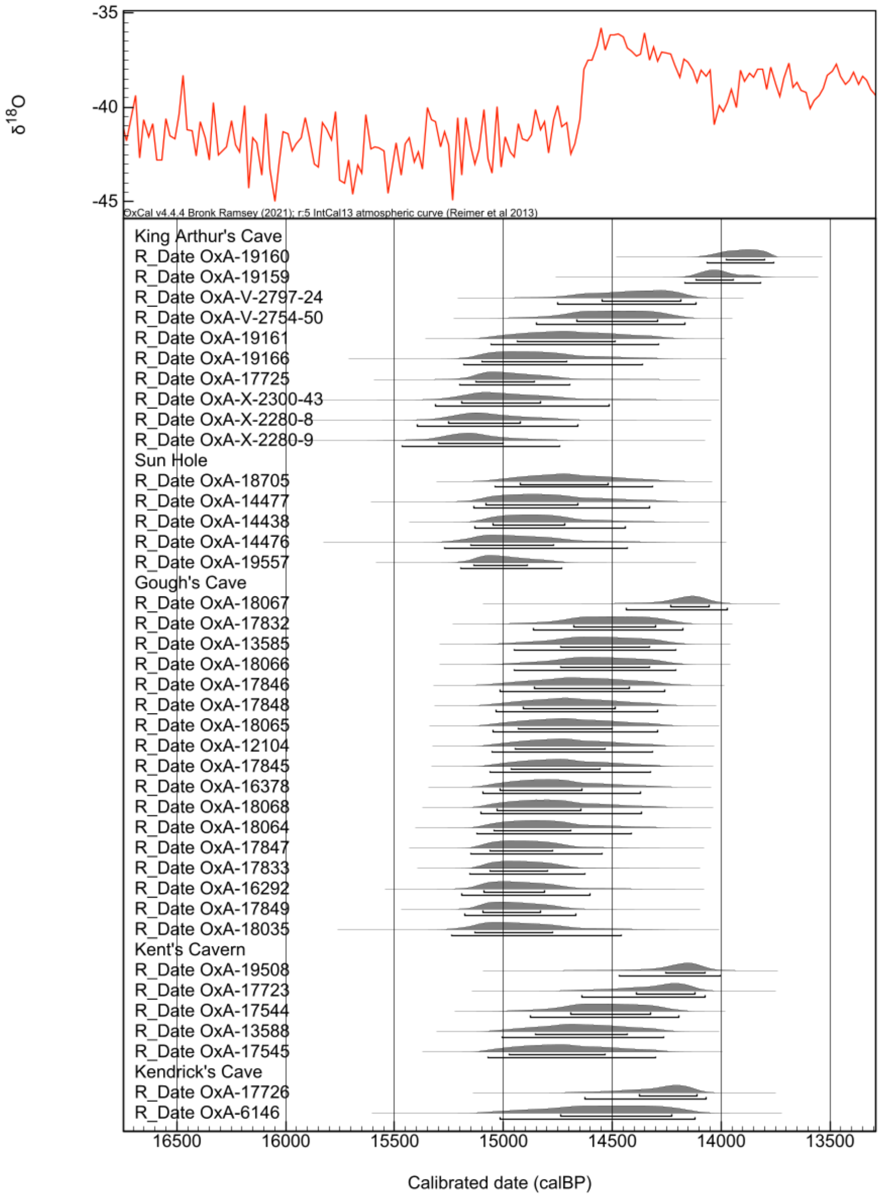


Figure 116: Radiocarbon dates from major British LUP cave sites in the South of England calibrated with IntCal13 (data from Jacobi and Higham 2009b: Table 1; Jacobi and Higham 2011: Tables 12.4,-8, 12.12; Reade et al. 2020). Simple multiplot; dates shown against the NGRIP GICC05 ice core record; calibrated in OxCal v.4.4.4, bars and brackets indicate 68.3% and 95.4% confidence ranges; Bronk Ramsey 2009; Reimer et al. 2013

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