Expanding our horizons: an exploration of hominin landscape use in the Lower Palaeolithic of Britain and the question of upland home bases or lowland living sites.

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Abstract

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The majority of Lower Palaeolithic assemblages are recovered from lowland fluvial locations, and hence most interpretation is based around these. It is clear, however, that these represent only a small fraction of the hominin landscape and this bias is potentially limiting our understanding of hominin organisation to only a single facet of behaviour. While recent authors have recognised the importance of upland sites, and other non-fluvial contexts, research is currently limited to highly specific studies (such as Boxgrove), and often fail to extend the purview to incorporate the wider landscape. Consequently we are still a long way from answering basic questions such as: how and why were hominids utilising particular locations? How, if at all, does behaviour respond to landscape context? Is the same pattern seen in continental Europe?

This research applies a landscape approach to the British Palaeolithic, combining a technological, typological and chaîne opératoire methodology to determine assemblage signatures for a variety of landscape types (lowland riverine, lacustrine, grassland plains and uplands). An exploratory Geographical Information Systems (GIS) approach is applied to the upland study areas to gain a better understanding of settlement structuring and how behaviour responds to landscape context. The results are then considered in terms of behavioural variation, site choice, specialisation and provisioning across the landscape.

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CHAPTER 1 - INTRODUCTION

1.1. BACKGROUND TO THE STUDY

The Lower Palaeolithic, with its roots deep in the antiquarian era, has traditionally been approached from a site-orientated, techno-typological perspective. Whilst this has provided a wealth of information and strong knowledge base, attempts to look away from single sites and objects towards the construction of a broader landscape purview have been hindered by a variety of preservational and temporal problems (discussed below). However, a broader landscape approach serves to form an important source of evidence in a period where people were so closely linked to their environment and provides the tools to gain an understanding of hominin behaviour, choices, activities and use of that environment (e.g. Ashton 1998c).

Moreover, an apparently static pattern of assemblage characteristics throughout the Lower Palaeolithic has served to create the impression of ubiquitous behaviour across large temporal and geographic areas, leading to the observation that hominin behavioural variation was monotonous, with the same activities repeatedly taking place within similar contexts. However this repetitive signature is most likely a problem not with the hominins themselves but with the archaeological record. Essentially the majority of Lower Palaeolithic assemblages are recovered from lowland riverine contexts (Wymer 1999:15,41), which represent the same place in landscape terms, places where resources were extracted and tools produced, and where the same activities were repeatedly undertaken. Additionally, the current dataset advocates the view that Palaeolithic man was a lowland dweller, chained to water resources, with few or no forays to higher ground.

The predominance of the fluvial archive is a long-standing tradition (Pettitt and White 2012; Wymer 1999), and results from both the greater chances of preservation, and also a greater focus of industrial development in fluvial deposits (due to sand and gravel extraction) which provided opportunities for investigation and discovery. The unfortunate by-product of this is that most of our knowledge is concentrated in a very few specific areas of the palaeolandscape. Indeed the antiquarian Worthington George Smith remarked upon locating artefacts in the Chilterns:

"the discovery made in a pure chalk district, where no rivers are near, and where the smallest brooks are from one and a half to four miles off, seemed so remarkable, that I preserved the flake and made enquiries as to the origin of the gravel patch." (Smith 1894:90).

However, as Binford has suggested, "sites are not equal and vary in the organisational role within a system" (1980:4), therefore the suite of resources afforded by a site would have played a large part in the types of activities conducted there and the characteristics of the resultant signature and debris left behind. Indeed, as Pope has noted, the effect of context on assemblage composition is expected to be striking especially when characteristics of a location remain constant throughout various occupational episodes (2002:172). Consequently the resultant riverine bias is potentially limiting our understanding of hominin organisation to only a single facet of behaviour, conditioned by the suite of fluvial resources at most sites. This is what White (White and Plunkett 2004; Pettitt and White 2012) has referred to as 'normal' sites. It is clear that the river valleys represent only a small fraction of the palaeolandscape and we can currently say very little about hominins use of the landscape outside these areas. This is tantamount to reconstructing the lives of people today by only examining pubs.

One point to note is that for the purposes outlined in this research the term 'upland' is used to apply to higher level sites situated above and away from the main river valleys. Whilst the North Kent Downs and the Chiltern Hills are not deemed 'upland' in the context of many other archaeological periods, for the Lower Palaeolithic of Britain, they are considered as higher-level upland sites compared to the majority of the record.

While recent authors have recognised the importance of these upland sites (White 1997; Scott-Jackson 2000; Winton 2004), and other non-fluvial contexts, research is currently limited to highly specific studies (such as Boxgrove [Roberts and Parfitt

1999]) and often fails to extend the area to a regional or indeed continental context. Consequently we are still a long way from answering basic questions such as: how and why were hominids utilising particular locations? How, if at all, does behaviour respond to landscape context? Is the same pattern seen in continental Europe?

1.2. Neglect of upland areas

It has now been thirty-seven years since the first discovery by Gaunt, Halliwell and Parfitt of higher-level (upland) Palaeolithic material on the North Downs of Kent in the area around Dover (1977), and the corpus has been growing steadily ever since (Halliwell and Parfitt 1993; Parfitt and Halliwell 1996; Hoskins et al. 1998). However we are still no nearer to gaining answers to the crucial questions listed above. Part of the problem resides in the setting of these upland sites (see discussion in chapter 3), resulting in researchers bypassing them in favour of the wealth of data from the lowland valleys of Britain. The reasons for neglecting these areas of the record are numerous, including problems with dating, lack of environmental evidence and dominance of fieldwalked assemblages. Furthermore the sites are also perceived as having been disturbed, lacking *in-situ* contexts combined with the proliferation of grazing and pasture land thwarting the discovery of new sites. Also, uniquely in Kent, the controversy over Eoliths (Harrison 1928), may have left people with the impression that nothing genuine was actually there to find.

Britain is not unique in this respect, as similar landscape biases exist on the continent in France (Tuffreau et al. 1997:228) and Spain (Diez-Martín et al. 2008:132,133). Currently more research is underway in these areas and it is hoped that further work will develop our understanding of hominin behaviour throughout the landscape. Whilst in Britain, many of the upland sites have not been excavated, rather acquired through fieldwalking (in Kent) or 19th century industrial activity (brickmaking) in the Chilterns, they represent a very valuable resource and have the potential to tell us a huge amount about how Palaeolithic people used the landscapes they inhabited.

1.3. A LANDSCAPE APPROACH TO THE BRITISH PALAEOLITHIC

This project aims to take a landscape approach to the British Palaeolithic, and to explore whether the current corpus of sites and materials has any power to reveal behavioural flexibility across the landscape. More specifically, it seeks to explore whether hominins were utilising different sites for different activities and whether this is linked to a site's position in the landscape. In addition it is hoped that this research will advance the knowledge of these higher-level upland sites and our understanding of how they fit within the current framework and hominin settlement systems. Therefore the key research questions are:

- What are hominins doing in these upland locations, what tools are they making and using, and how are they utilising the landscape?
- Are there any differences observed between the different upland study areas?
- At a basic tool-frequency level, what activities are hominins conducting in the lowland sites?
- How, if at all, does behaviour respond to landscape context and can this be observed in the tasks carried out in the lowlands as opposed to the uplands?
- Is the same pattern seen in continental Europe?
- Is the Lower Palaeolithic record actually monotonous or purely a result of time-averaged assemblages and an inappropriate scale of analysis?

To address these questions, this thesis adopts a landscape perspective, combining artefact, ecological and inter-site analysis, to investigate behavioral variation, site choice, specialisation, organisation and provisioning across the landscape. The focus is primarily on the variation between upland and lowland areas. Two key upland zones form the core of the project: the North Downs of Kent and the Chiltern Hills, which comprise Lower Palaeolithic sites situated away from the main river valleys in solution hollow contexts. These would, in all probability, have been ponded at the time of occupation and therefore provide a contrast to the traditional record of river valley occupation provided by such sites as Barnham, Clacton and High Lodge, which form the lowland dataset. The sites have been selected for being in primary or *in-situ* context, allowing determination (in so far as this is possible) that the tools and artefacts present at these locations were deposited at that spot, thereby allowing links between the assemblage signature and the surrounding landscape character to be addressed. Using typological and technological analysis based on a chaîne opératoire approach the artefactual signatures at these sites are identified and extrapolated to aid designation of site function with a view to the examination of behavioural variation between landscape contexts (upland versus lowland; ponded against riverine, lacustrine and grassland).

Furthermore, to aid interpretation of the upland sites, which only provide artefactual information compared to the higher quality lowland record (artefactual, environmental, faunal, floral and dating evidence), an experimental Geographical Information System (hereafter termed GIS) methodology is employed, acting as an alternative method of investigation to explore the landscape settings of these sites. This is aimed at supplementing the lithic data and providing an additional line of evidence in the interpretation of site function. The GIS aspect of the project will focus on investigating the site's position within the landscape, distance from major landscape features, and their viewsheds. Whilst there are issues surrounding the use of these techniques, especially for such a remote period (see discussion in chapters 2 and 6), as the application of the technique is essentially experimental and aimed at acquiring additional lines of evidence with which to assess the activities being undertaken at these sites, the advantages undermine the negatives.

The rest of this thesis is structured as follows:

Chapter 2 will address the role of landscapes in the archaeological record and why the Palaeolithic requires a different approach from that utilised in later periods. This includes a discussion of key issues, including the use of surface scatters and open-air sites, time-averaging and palimpsests. This is followed by an overview of current models of hominin landscape use and mobility along with a selection of case studies, before discussing the approach advocated in this study, including the targeted methodology, specifically designed to look at site use. Chapter 3 introduces the British upland dataset, including a discussion of the formation of solution hollows and the dry valley network. The two study areas are then discussed (Chilterns and Kent), including their suitability, site formation processes, geology, dating and environment, before addressing the context of the individual sites. The process is repeated in Chapter 4 with the outline of the Lowland site selection.

Chapter 5 outlines the results of the artefact analysis. It begins with the Kent sites, followed by the Chilterns and lowlands, with the latter split into landscape context to aide interpretation. The Geographical Information Systems analysis of the upland sites is introduced in Chapter 6. The applicability of the methodology is discussed alongside an overview of the study areas in landscape terms, including structuring of the sites and proximity to major landforms in the area, followed by the viewshed analysis. Finally Chapter 7 brings the assemblage analysis and landscape assessment together, highlighting the main points from the previous two chapters and providing a fuller discussion of themes including landscape use and the organisation of behaviour, and drawing in comparative assemblages from the continent. Chapter 8 concludes, addressing the main questions stated above and drawing together the strands of the thesis to make inferences on wider issues such as the apparent lack of variation in the Lower Palaeolithic signature and human habitat preference.

In summary this thesis aims to explore landscape-scale behaviours, integrating traditional methods (technological and typological analysis) with a chaîne opératoire and experimental Geographical Information Systems (GIS) approach. In this way it is hoped that questions surrounding how hominin behaviour responds to landscape context will be addressed, feeding into a wider picture of hominin organisational strategies.

Chapter 2- Landscapes of Habit

The research framework for the Lower Palaeolithic is traditionally site-focused, tending to concentrate on small-scale interpretations that are integrated within the major theoretical constructs of the period. This approach encourages only a limited consideration of the wider purview, effectively isolating sites from their contextual backgrounds. However, these aspects should not be separated as sites are not isolated points but part of a wider landscape, an important consideration in a period where people were so closely linked to their environment. Regarding the preservational and contextual problems, in combination with an often limited material culture, landscapes can provide an important additional line of evidence with which to study Palaeolithic societies.

This chapter will begin by looking at how landscapes have been studied and approached in archaeology in general; in particular how landscapes continue to be treated in later prehistoric and historic periods compared to earlier prehistory. There are key differences in terms of the approaches and the manner in which problems are framed, essentially related to the large timescales and dearth of archaeological material in the Palaeolithic. These issues will be discussed below, alongside a consideration of approaches to landscape and mobility. This is followed by a selection of case studies. A critique of this then forms the baseline for further discussion and leads directly to the methodological approach advocated in this thesis.

2.1. Landscapes in the Archaeological Record

The development of regional landscape studies has its origins in work on settlement patterns in the southern United States in the 1950s (Richards 2008; Zimmerman 1978). This was followed by Binford a decade later who integrated these wide-scale studies within developing processual frameworks, thus setting the scene for the rise of landscape and regional studies as a whole in archaeology (1964). However, the current trend is moving away from discussing the idea of landscape and space in terms of resources and economic factors, towards perceiving it as a more human-ideological entity. The interpretation of landscape is now more so linked to its perception, i.e. how it is experienced and interpreted by the people inhabiting it (Knapp and Ashmore 1999).

While landscapes fundamentally represent large-scale studies, their usage is complex, with a variety of definitions depending on the focus of the study and interests of the researcher. Taken at its most basic level, landscape can be defined as the spatial relations between the environment and humans (Crumley and Marquardt 1990:73), or as a backdrop against which human actions are played out and the archaeological record is formed (Knapp and Ashmore 1999:1). While Meier argues that the term 'landscape' should be used for post-processual and phenomenological processes and 'environment' as designating the processual-scientific perspective, he also includes a third class, 'nature' which represents *"an area without human impact and [is] therefore only existent as an imagined reality"*(Meier 2006:11).

To some extent all landscapes in the Palaeolithic could be termed 'natural' based on Meier's definition, as they can easily be construed as lacking human impact. However, we are not studying 'nature' as implied by Meier; rather, we tend to focus on human behaviour as a product of its environment or landscape. But even if we assign his term 'environment' this still does not fit correctly. With the use of this term he also implies a separation of the human and natural spheres. The search for human behaviour inherent in archaeological patterns encompasses both processual and post-processual perspectives, and we should refer to these accordingly when using the term landscape.

In essence, landscapes relate to human action on this wider scale; however, there is a distinct chronological difference between applications of landscape archaeologies, with a theoretical and methodological disparity between historic and prehistoric disciplines. When looking at the literature the common view focuses on, and often describes it as, a humanly modified landscape, a purely cultural entity, which can be moulded by human action (Muir 2000; Kaelas 1978 in Ickerodt 2006:53). The overwhelming impression is that the subject is firmly rooted in disciplines related to historical time frames (Zimmerman et al. 2009); nevertheless, earlier periods do feature, although to a much lesser extent. These papers tend to go back only as far as the Neolithic (see papers in Pattison et al. 1999); indeed, the volume by Knapp and Ashmore covers a broad range of periods from post-medieval to deep prehistory. Yet the earliest period again mentioned is the Neolithic (Knapp and Ashmore 1999:5). Similarly, when looking at the types of subjects covered in the above volume, these encompass field surveys, earthworks, villages, cairns and rock carvings (Ainsworth et al. 1999; Bradley and Mathews 1999), which are all examples of modified and very much *visible* landscapes. The majority of subjects within archaeology are thus linked to the concept of landscapes as a product of human impact, creating a universal picture in terms of what humans have done to them, rather than how landscapes have molded human action.

Another difference exists in the appreciation and study of landscapes which are to some extent tangible, e.g. landscapes that we can see and experience today or that are at least comparable to present-day situations. Examples such as stone circles or historical field systems can to some extent be experienced and viewed in the landscape today. These are easily studied using approaches such as phenomenology (Tilley 2010) and Ingold's notion of Taskscapes (1993). Consequently, different concepts need to be introduced when dealing with landscapes which are 'invisible', i.e. those which have been modified and changed through a variety of processes, such as sea-level changes, glacial action and large-scale movement of features. Palaeolithic landscapes are an example of this, mostly gone but surviving in rare instances where preservation is favourable such as the Boxgrove palaeolandscapes (Roberts and Parfitt 1999; Pope 2002). This is a factor that must be considered when approaching landscapes in such an early period.

Consequently it is rare in the literature to find discussions pertaining to non-modified landscapes; however, this rather narrow viewpoint is changing. The recently published 'Handbook of Landscape Archaeology' (David and Thomas 2008) takes a much broader view, encompassing papers from more diverse and rarely considered approaches, with examples covering both early humans (Chamberlain 2008) and ecological aspects, including the use of fauna (Mainland 2008) and seeds (Fairbairn 2008).

Furthermore, broader landscape approaches form an important aspect in the Palaeolithic, where there are constraints on the lines of evidence we can pursue. Except in very rare cases (Barkai et al. 2006), this was a time when humans were living with and utilising the landscape, but were not yet playing a role in modifying it. As we have seen above, the approaches and methodologies used to investigate landscapes inevitably need to be different for later prehistory and historical periods compared to early prehistory, essentially addressing this imposed dichotomy of modified versus 'natural' landscapes.

2.2. WHY LANDSCAPES?

A landscape perspective should be a necessary part of studying the Palaeolithic because the objects and end processes of our investigations, the hominins themselves, are inherently linked to their environment, living within and adapting to it. However, problems and pitfalls (section 2.3.3) traditionally promote more site-based approaches (Villa 1991), thus effectively providing us with only a partial view of hominin interaction with the wider landscape. While informative in their own right in view of the variety of in-depth information they provide, site-based approaches have a tendency to treat behaviour as isolated pockets rather than points in a continuum of movement within the landscape (Roebroeks et al. 1992). We cannot hope to understand hominin actions at a site without considering the surrounding landscape and how it fits into regional settlement patterns (Pettitt 1995; Diez-Martín et al. 2008).

Moreover, an approach such as this allows us to address the fact that hominins are mobile participants in the landscape, rather than being tethered to one spot. With site-focused studies, we lose sight of this fact: while some activity would have been carried out on a specific spot, certain sections of the chaîne opératoire may have occurred outside the site boundaries; for example, the movement of cores into or flakes out of Area III at Barnham (Ashton 1998c) and Area AH at Beeches Pit (Hallos 2004). But even these really only tell us what may have happened meters from the excavation. We therefore have to look at the landscape in a dynamic, flexible, way and model potential complexity even if we have no way of addressing the issues at present. Whilst observing the localised site situation, other landscape features or indeed the proximity to hunting grounds further off would also have played a part in the selection of a habitable location. Consequently hominins not only reacted to local variables, their choices were influenced by the wider resource base and external influences in the surrounding environment. So, extrapolating out and constructing a landscape perspective seems the best way of getting a fuller picture of the hominin way of life.

In addition sites fulfill a specific purpose (Binford 1980) and developing a wider perspective allows us to compare activity and identify variations in behaviour which we do not get from a 'micro'- site-study. This approach also permits use of open-air and surface scatters, a category of data which is often considered to be of low interpretative value, but when used in conjunction with other lines of evidence it can be appreciated to the full (Kolen et al. 1999).

2.3. The Palaeolithic Difference

As in any area of archaeology, the locations of sites are in part determined by external factors - such as changes in resource availability in the surrounding landscape (Ashton et al. 1998) - that shape hominin choices and decision making. Gamble's formulation of the idea of the 'Landscape of Habit' aimed to encompasses not only these aspects, but also to connect social interaction with the day-to-day paths traversed in his 'Local Hominid Network'. This latter concept refers to a spatial network of intersecting routes connecting other individual hominins with each other, their competitors and resource patches (Gamble 1993:42). It also incorporates the broader subsistence and resource base, connecting individual action with the wider landscape, which combine to form a hominin's routine activity tasks (Gamble 1999:87). This idea highlights the importance of both internal factors (e.g. hominin's individual choices) and external ones (i.e. action constructed and modified by resources), both at the site level and in the wider landscape.

These 'micro' (site) and 'macro' (landscape) scales can be viewed as part of a feedback cycle. What happens in one imposes action on the individuals, influencing how they behave as well as their choices. Individual behaviour at the site level, observable in the record, influences broader practices in terms of site choice and the resources exploited in the landscape. Conversely attractive factors in the wider background influence the selection of the site and the activities undertaken there (e.g. a hunting stand). Consequently, these scales should not be discussed in isolation but should be combined to create a holistic and dynamic interpretation of the record.

As we have seen above (section 2.1), different approaches need to be utilised for landscape-scale studies in such an early period as the Lower Palaeolithic. However, this is not an easy task. We are dealing with huge time-frames and, in most cases, palimpsests of material representing many different events. Our closest methods of comparison, ethnographic parallels, can only tell us so much. Not only do they rely on pattern recognition generated from the behaviour of a different species of human, but their time-scales are insignificant compared to the large intervals represented in many Palaeolithic deposits (Heilen et al. 2008). Consequently, the patterning and build-up of deposits cannot be modelled easily. We need to identify methods to bridge the gap between the acting individual at one point in time and the larger timescales involved in site formation and deposition.

2.3.1. Why approaches should be different in the Palaeolithic versus later periods

Another point discussed above (section 2.1) is the idea that Palaeolithic landscapes lack what we term 'human impact'. Fundamentally, this refers to the fact that human action has not altered the landscape in any physical way, in contrast to that displayed in later periods (e.g. large scale tree clearance, buildings, monuments, quarrying). The only notable exception is the example of Acheulean quarrying at Revadim, Israel (Barkai et al. 2006), which is a rare and not unproblematic example. Yet, whilst Palaeolithic landscapes may be conceived as a non-modified backdrop, this does not imply that they are passive and inert, functioning purely as locations in which behaviour was enacted. Rather, they are dynamic and should be considered in terms of how these landscapes acted upon and moulded human action.

Moreover, any landscape exerts a dramatic influence on human populations and their behavioural choices. It could be argued that such effects were greater still for Lower Palaeolithic humans, for whom we cannot assume the same levels of social, cultural and material buffers that we have today, which enable us to be less reliant on our surroundings and more resilient to any environmental or climatic change, as suggested by White within the context of the Middle Palaeolithic (2006). Consequently, we require an understanding of the context of the site and surrounding resource base in order to comprehend hominin's actions, patterns of discarded debris left behind in the record, and the effect the wider environment may have had on them.

As discussed above, we are not dealing with landscapes that have parallels in the environment today. They are ecologically different and have been re-modelled over millennia until they bear little or no relationship to their past state. We cannot, therefore, go out into the field, traverse and experience them as they would have been experienced in the past; for example, by using a technique like Tilley's phenomenological approach (Tilley 2008). Therefore we have to construct our landscapes from scratch, through multiple lines of often sparse evidence.

2.3.2. A QUESTION OF SCALE

There are two aspects of scale intertwined in the study of landscapes and these need to be considered. Firstly, there is the spatial scale, encompassing the geographical size of the areas with which we are dealing. In this respect, we are looking at the size of the site, or the assemblage, whether it comprises a few tools widely scattered or a thick accumulation. Another issue linked to this is whether such accretions represent the excavation of a snapshot of activity within the site, with additional evidence beyond the limit of excavation, or whether it constitutes occupation as a whole.

Secondly, briefly mentioned above, there is the temporal scale related to timescales of discard and sedimentation. The chronological framework focuses on glacial-Interglacial cycles, with dates often quoted in Marine Isotope Stages (MIS) rather than years or millennia, as is common in later periods. Due to this temporal breadth, we cannot assume that sites or occurrences are contemporary; so, unlike in later prehistory, we cannot attribute associations between sites or indeed assume that they were part of the same settlement system (Stern 1994). Indeed, very few sites demonstrate the type of 'strict' and 'occupational' contemporaneity as discussed by Conard and Adler (1997:156-158), with most conforming to their 'geological' class, essentially being constrained within specific deposits delineated by geological events.

Consequently, our sites often span extensive time scales, therefore we need to address whether the site is part of a single occurrence or represents multiple visits over an unknown period. In addition the time taken for the material to accumulate must be considered, as well as how long the artefacts could have lain on the surface before they were covered. These are important questions which need to be considered before we can begin to develop a methodology that is tailored to Palaeolithic landscapes.

THE DICHOTOMY BETWEEN THE TWO MAIN GEOGRAPHICAL AREAS OF PALAEOLITHIC RESEARCH AND THEIR APPROACH TOWARDS LANDSCAPES

An example of how these two scales combine to help or hinder research can be seen between the two traditional centres for the study of palaeolithic archaeology (Europe and Africa). Here, there exists a dichotomy between the interpretative potential and the archaeological record itself, which is reflected both in their approach to and use of landscape archaeology as a tool.

On the one hand, African palaeolithic archaeology is constrained by marker horizons which, coupled with strong sedimentological frameworks, permitting greater chronological security for open-air sites. Consequently this allows the patches and scatters that make up hominin landscapes to be related within temporal boundaries. This facilitates the excavation of palaeo-landscapes, creating greater interpretative opportunities and insights into wider settlement systems and use of landscapes (Diez-Martín et al. 2008). Additionally, there have been fewer and less severe mechanisms of large-scale landscape remodelling in this area of the world (compared to Europe), enabling improved reconstruction and interpretation of palaeo-landscapes. However, this does create problems with sedimentation rates leading to long-term exposure of artefacts on stable land surfaces and the resultant coarse graining of assemblages (Stern 1994).

On the other hand, the record in Europe is characterised by a patchy exposure of sediments and lack of chronological anchoring. This is especially problematic for open-air and surface sites, which are key components for developing a landscape approach. Consequently, the approach in Europe has been heavily site-based (Villa 1991), taking into account the fact that we are dealing with selective glimpses of Palaeolithic land surfaces that are effectively isolated in time and space (Diez-Martin et al. 2008). The difficulty is relating these isolated occurrences to each other and the overall picture of hominin landscape use, regional settlement patterns and behavioural variation (Tuffreau et al. 1997).

The scale of the record in Europe is much smaller than that available in Africa, thus creating differing approaches between the areas. Work in Europe has to reflect these complications and develop an appropriate methodology for the scale of analysis. These constraints, and how methodologies can be constructed to deal with them, will be discussed in more detail below (section 2.3.3).

SITES VERSUS LANDSCAPES SCALE

An additional aspect related to scale is the spatial distinctions between sites and landscapes. Sites are spatial units, defined in part by the boundaries of their discovery or excavation. However, whilst being representative of the hominin behaviour that created them, sites themselves equate to only a fraction of the original archaeological record, thereby acting as spotlights on specific locales. Hence, as mentioned above, we should not treat them in isolation, rather as points in a continuum within the landscape of habit.

In essence, in order to gain an understanding of overall hominin practices and behaviour, we need to work at the scale of landscapes, as argued by Blumenschine and Masao, who suggested that focusing on smaller-scales may mask meaningful variation (1991). However, the approach advocated in this thesis takes this idea a step further, utilising a holistic approach which uses a combination of scales (both site and landscape) to build a picture of behavioural variation, tacking, as Gamble suggests, from patches to wider scatters (1999).

2.3.3. CONSTRAINTS AND COMPROMISES

Whilst approaching hominin behaviour from a landscape scale creates new perspectives and insights, there are still constraints imposed on the record. Such aspects include changing landscapes, the applicability of using surface scatters and the problems of time averaging when dealing with palimpsests of material. Consequently certain compromises may need to be made, and methodologies constructed accordingly. These factors will be discussed in more detail below.

CONSTRAINING RECORD

Firstly, one problem facing researchers in the Palaeolithic is the deficit of material evidence, compared to later periods. Our methods are constrained by the nature of the archaeological record, which foists reliance upon more traditional techniques. While other periods have good environmental evidence, including flora and fauna, which can be an important factor in determining site-use (Clarke 2001), the Lower

Palaeolithic record in Britain is challenging. The available environmental data provides general information about the surrounding environment, but rarely the specific circumstances at the site. Consequently without direct evidence such as cut marks it remains difficult to relate this to hominin occupation. The large time frames involved cause preservation issues, leaving stone tools as the key strand of evidence. Consequently, where landscape-scale approaches have been employed, this has led to a focus on raw material types and provenancing studies as proxies for investigating settlement systems and ranging zones (Byrne 2004; Feblót-Augustins 1993). Whilst this approach is relevant in Europe, it is more complicated to apply such studies in Britain due to the ubiquity of the flint deposits and lack of work on provenancing these (Ashton 2008). Therefore, approaches need to take account of this when dealing with the British record as our options are more limited.

Landscape change

Combined with this lack of material is the considerable effect of multiple and often dramatic landscape changes. Modifications created by successive glaciations, erosional processes and mass movement of sediments have left us with a landscape that is in many cases substantially different from that of the present day (Stern 2008; Van Andel and Tzedakis 1996; Diez-Martín et al. 2008). The result of this situation is that our reconstructions are hindered, making it difficult to place sites within their landscape context. As we have seen before, this also precludes site-based approaches; however, as discussed in section 2.2 this can lead to its own problems.

Key sites are open-air locations

In addition to topographic remodelling of the landscape, these formative processes can often obscure sites, burying them under metres of soil. When combined with uneven preservation of remains and incomplete exposure of palaeo land-surfaces (Blumenschine and Masao 1991) this creates considerable issues when trying to reconstruct settlement patterns. Further to this rather pocketed record of settlement use, the key sites required for a landscape approach are often open-air locations. These frequently represent the most problematic locales in terms of context and dating, making it difficult to place them within their regional context (Diez-Martín et al. 2008).

In Britain, the better researched sites are usually from secondary disturbed contexts, contained in river gravels located within the main river systems (Wymer 1996; Diez-Martin et al. 2008). However, this renders them of low value in a study such as this, due to the fact that they are not in their original location. Furthermore, these sites commonly represent repeated usage, being made up of multiple visits, as hominins return to preferred locations. Whilst this makes them more visible in the record, the collected debris of numerous gatherings can create additional problems which will be discussed in more detail below.

Surface scatters

Whilst the majority of open-air sites from this period are from excavated contexts (for example, Wood Hill [Scott-Jackson 2001] and Westcliffe [Bailiff et al. 2013] in this study) a number of occurrences are represented by surface scatters (such as Malmains 1 and 2, and the fieldwalked collection from Westcliffe). Despite considerable work being carried out on surface scatter data, they are traditionally relegated to the grade of 'spots on maps'. The information is rarely used as a proxy for human behaviour due to questions over the origin and accuracy of the data, often being accused of lacking 'context, time-depth and function' (Kinnes 1994 in Schofield 2000; Kolen et al. 1999).

However, scatters can yield more information than the simple presence/absence as advocated by Kinnes (1994 in Schofield 2000). Kolen et al. (1999) dismiss this view as too pessimistic, arguing in the case of the Middle Palaeolithic, that these scatters have their place within landscape studies and can provide valuable information on hominin behaviour and landscape use. Indeed, in later periods, surface scatters are an important resource (Schofield 1994), and even for earlier periods, Foley has argued that they form highly visible datasets and are subsequently amenable to regional studies, where buried material is not (Foley 1981; Hawkins 2004).

If we take these scatters at a landscape behavioural scale, rather than a micro-site scale, the amount of information that can be gained is increased. As Kolen et al. have commented, while these assemblages are palimpsests (see discussion below), they also represent activities conducted on relatively stable landscapes subject to much less modification than their fluvial counterparts, collecting a myriad of debris from different activity sessions (Kolen et al. 1999). Furthermore, scatters such as those from the upland sites of Wood Hill and Westcliffe (see below) can be shown through further investigations as being related to specific features within the landscape (Scott-Jackson 2000; Bailiff et al. 2013; Drinkall et al. in prep), which, while not providing us with an idea of time-depth, does give us context. So, while not constituting pristine *in situ* sites, they nevertheless contain evidence of activities conducted at those locations, helping us to gain a fuller picture of landscape use.

Thus we should avoid leaving out a subset of evidence because it does not conform to our view of the pristine highly informative record to which we aspire. Due to the nature of the archaeological record, we are already working with only a partial representation of palaeolithic life (Van Peer 2001).

PALIMPSESTS

While it can be argued that these surface scatters are contextually uncertain, forming over many years with successive activity debris covering individual signatures, the same could be said for sites which we consider to be *in-situ*. In the Palaeolithic, we are dealing with huge time frames in which surfaces and sites may have lain exposed for innumerable years. The problem is that, even with what we consider to be primary *in-situ* occupations, the surface upon which these artefacts were laid was still subject to repeat visits, each leaving behind different activity signatures, which serve to mask the individual events created at specific moments in time. These events could be separated by a couple of hundred years, months, or only a few days (Binford 1980), yet the effect is the same, the combined detritus masking the individual variability which is of most interest to us as archaeologists. This then is what is defined as a palimpsest in palaeolithic landscape archaeology. An area where repeated occupations over variable time scales, involving production and/ or discard of stone tools in the same spot has led to time-averaged assemblages.

It was long assumed that these activity areas represented a hominin 'living floor', but studies on site-formation processes and the dynamics between natural and anthropogenic agents in the 1970s and 1980s identified this as a rather simplistic appreciation of the complexities of the record (Malinsky-Buller et al. 2011). Consequently it is now recognised that the record has an unknown time depth, even within sites that have been covered relatively quickly. Furthermore, isolating individual occupations and minor events can be problematic, if not impossible (Clarke 2001), even for relatively fine-grained sites. Indeed, even in sites where artefacts seem to be related in relatively short depositional sequences (e.g. the lowland sites), it is likely that these are made up of a multitude of events, spanning as relatively short a time span as 100 years. Whilst this is 'fine-grained' in terms of our usual time-frames, this still constitutes one or two hominin lifetimes (Gamble and Porr 2005:11).

This relationship between artefact depositional patterns, time and hominin behaviour is a fundamental issue. As Heilen at al. have suggested, the key is to understand the relationship at individual sites between the archaeological pattern observed, the behaviour that created this and the time-frame within which this was conducted (2008).

For example, the sites selected in this thesis are chosen based on the *in-situ* status of their assemblages, yet both the upland and lowland datasets still represent multiple artefactual signatures of activities taking place at the same spot at different times. To deal with this inherent problem in the record, the methodology described in section 2.5 has been constructed with the aim of controlling for the effects of time-averaging. It focuses on the technological and typological components that identify activities taking place at specific points in the landscape. Therefore, even with successive visits by hominins to these foci within the landscape, we can identify 'signature' tool-types which were used within the area of the site, suggesting that certain sites may have been used for particular purposes. These fragmented records can then be pieced together to suggest site-use and infer behavioural variation in the record.

Time-averaging of events versus interpretation and visibility in the record.

The main issue, touched on above, is that variability is found and most easily seen in short-lived (fine-grained) events; however, these short-lived events are difficult to identify in the record (Clarke 2001). In his study of ethnographic societies, Binford noted that the accumulated products representing repeated visits over a year created a coarse-grained assemblage, whereas assemblages which were considered fine-grained formed over a much shorter period of time such as a few days (1980). When comparing this yearly, or indeed daily, accumulation with the archaeological record, which may span many years of re-use, we can clearly identify a variety of issues.

There are two main mechanisms that determine the resolution of assemblages. Firstly, as Binford has noted, differing rates of mobility within a settlement system can determine the likelihood of finding fine-grained sites. Therefore low-mobility societies are more likely to produce coarse-grained assemblages (Binford 1978). Secondly, a factor that is very influential is the character and stability of the depositional environment. This determines how quickly assemblages are covered, and serves to highlight major differences between ethnographic studies and the archaeological record in terms of their formation time-scales.

One particular point, which is relevant to our assessment of the archaeological record and consequently how we construct appropriate methodologies, is the amount of debris observed by Binford in his description of a short-term camp (i.e. a one or two-day stay). For example, a specific activity conducted at a location (e.g. processing or butchery) may leave behind only one or two tools (Binford 1980). In the archaeological record, short-term events such as these are easily missed due to low artefact numbers.

As discussed above, where larger sites are identified, the individual signatures are swamped through multiple visits; but when individual or small groups of artefacts are recognised they are seldom from excavated contexts, making it difficult to demonstrate *in-situ* preservation. This lack of context often leads to data from these 'spot' finds being disregarded. Therefore, it is unfortunate, as Binford points out, the more fine-grained assemblages contain greater potential for seeing behavioural variability (1980); however, these events are least likely to be seen in the record. Nevertheless, it could be argued that it is these minor occupations which provide us with the real richness that the Lower Palaeolithic record is often accused of lacking.

This is a difficult problem to address. However I would argue that spot finds and surface scatters are an essential part of any wider landscape study, conceivably representing elements of short-lived activity events scattered throughout the wider landscape. Indeed as Pope et al. found in their study of the Valdoe (2009), building on earlier work by Roebroeks et al. at Maastricht-Belvedere (1992), the wider landscape is littered with low-density scattered artefacts and debitage deposited by hominins as they traversed the landscape. Whilst these low-level occurrences are difficult to identify and place within a secure context, as discussed above, they can provide a greater idea of hominins' landscape-use as a whole. Consequently, while this type of assemblage can only give use limited information about context, they are important in terms of the wider picture, and therefore will be incorporated into the methodology discussed in section 2.5.

2.3.4. Summary

This section has focused on the issues and problems associated with utilising a wider landscape approach in the Palaeolithic. While the full patterning of the landscape will never be seen, the surviving record can provide us with useful insights and valuable information about the use of the landscape by hominins. Despite the problems and pitfalls discussed above, recently there has been a renewed interest in open-air contexts (Villa 1991). This can be seen in the work done by Roebroeks at Maastrict-Belvediere (1988) and Diez-Martín et al.'s study of the Duero River Basin in Spain (2008). These examples and others will be discussed in more detail below (section 2.4).

2.4. Models of hominin landscape use and mobility

Despite the many pitfalls associated with exploring hominin landscapes, landscape-scale studies are a relatively recent yet essential foundation to our understanding of the Palaeolithic. The question of how hominins exploited their environments is a simple and fundamental problem, linking closely with themes such as foraging patterns, mobility and the transport of tools, in addition to resource procurement. These in turn feed into interpretations of settlement systems, cognitive prowess, planning choices and industrial variation. The key aspect for this research is how hominins utilised different areas of the landscape in terms of the activities undertaken there. This chapter aims to put this into context by discussing previous models and selected case studies.

2.4.1. Basic landscape approaches

The pioneering landscape-scale studies were all developed in African contexts, likely a product of the regional record as discussed above (section 2.3). Isaac's 'scatters and patches' approach (1981), along with Foley's 'off-site' archaeology (1981) and Dunnell and Dancey's site-less survey (1983), viewed the archaeological record as a spatially continuous layer of variable artefact density, stretching across a landscape. These studies focused on the full range of archaeological material, recognising that the varying concentrations of artefacts reflected land-use and the frequency of activities on a regional scale. Therefore, single artefacts and sites are merely opposite ends of a continuum of discarded materials (Dunnell and Dancey 1983; Foley 1981) related to the enactment of activities at points within the regional record.

More recently these concepts have been taken up in Roebroeks et al.'s (1992) work at Maastricht-Belvédère, where a similar distribution of material was identified (the 'veil of stones'), and work in the Duero Basin in Spain on the distribution of artefacts across the river and associated plateaus (Diez-Martín et al. 2008). The importance of these low density occurrences has been further emphasised in Britain by research in the Boxgrove Palaeolandscape and in the Valdoe (Pope et al. 2009; Pope 2002;

Roberts et al. 1997). As discussed elsewhere, these low-level occurrences are undoubtedly more representative of time-locked hominin activities than the larger, time-averaged sites, theoretically providing the long-sought variation that the Lower Palaeolithic is seen to lack.

However, these short-lived events sometimes prove difficult to identify, often occurring as individual surface finds or isolated small groups of artefacts, usually with questionable context, which are commonly dismissed as providing limited informative value and a record of varying quality (Hosfield 1999). In response to this, Hosfield (1999) has advocated a multi-scale methodology integrating both excavated and surface data to provide a holistic dataset. Whilst there is no doubt that artefacts found in some lowland areas are in a derived state, surface finds in elevated locations may not be the product of derivation, but approximate markers of activity and use within the landscape. This enforces the integration of varying scales of data, as described in the methodology (section 2.5), underlining the importance of including all available data. This especially should include those from secondary sources and spot finds, incorporating them into regional scales, to provide greater information in terms of landscape patterning and mobility.

Mobility

Adopting a regional approach allows us to address the overall pattern of landscape use, and thereby elucidate aspects of hominin mobility (i.e. the way hominins tactically and strategically moved through and engaged with their landscape). Isaac viewed this engagement as a web of pathways along which were located *points,* indicating where small numbers of artefacts were discarded, and nodes (larger accumulations) marking places of habitation or activity spots. The locations of these points and nodes were determined by the distribution of resources and the organisation of behavioural systems (Isaac 1981).

Whilst the incidence of resources is a central aspect in the development of systems of mobility (see below), there are other factors which act upon hominins' modes of mobility and the choices inherent within this. The topography of the landscape itself can have a large impact on movement and choice of sites. One characteristic which seems to be common in both Lower and Middle Palaeolithic contexts is the proposition that river corridors acted as routes through the landscape, allowing hominins to easily follow the main prey species (Ashton et al. 2006). However, as Ashton et al. (2006) point out, the necessity for these pathways would have varied depending on the prevailing environmental regime. Lowland areas would have provided an easy route through the landscape in interglacial temperate environments, where the grazing of large herbivores would have kept the flood plains more open. However, in colder periglacial periods with less vegetation, the interfluves would have been a better location for activities, providing not only access to new resources and better views of the area, but would have been situated away from the braided river valleys (Kolen et al. 1999; Ashton et al. 2006). This differential treatment of essentially upland versus lowland areas is one of the key aspects of this thesis, along with the question of whether these areas afforded diverse suites of resources, thereby patterning behaviour between different areas of the landscape.

Distribution of resources

Concomitantly, the distribution of resources across a landscape is seen as a key factor affecting archaeological site location. Ashton et al. (1998) have suggested that land-use models centred on the premise that the distance of a site from resources formed the critical backdrop to behavioural choices and activity patterning. The relatively constant nature of some of the resources over human time-spans aids interpretation, especially when dealing with multiple occupations of differing character. For example, it has been suggested for Barnham that the two resources which were consistent (raw material and channel location) can explain some of the variations in assemblage composition. The primary manufacture of lithics in Areas I and IV (4) was facilitated by the abundant raw material nearby. However, this is contrasted by the lack of manufacture in Area V, where the lack of available raw material created a patterning of import, reduction and discard related to a dynamic system of artefact movement and use. Furthermore, the isolated discard of artefacts in Area III attests to hominins' presence but limited occupation, linked to the lack of raw material in the area (Ashton et al. 1998:264). The conclusions coming from this highlight how the variability in localised resources modified the artefactual pattern present at locations. Another example of how changing raw material availability can impact on assemblage composition is the site of Cagny-l'Epinette, France. Here the proportions of tested nodules and cortical flakes vary throughout the sequence, getting scarcer in the upper levels mirroring the availability of local raw material as sedimentation built up (Tuffreau et al. 2008).

However, not all resources are tethered to predictable points in the landscape, (e.g. game) and mobility and landscape use will vary in response to both static and mobile resources (Ashton 1998). This concept is well established and used in a number of studies e.g. Boyle's work on land-use patterns in Middle Palaeolithic France. In this example she suggests that sites may have been located preferentially to make use of immobile/ static plant resources, rather than the less predictable prey resources. Her interpretation views short-term occupation sites as linked to the exploitation strategies of mobile game resources, rather than stationary static resource procurement, with the larger sites more focused on processing of other resources (Boyle 2001:537). Ashton's static versus mobile model based on the evidence from Barnham and Elveden (Ashton et al. 1998; 2005) was used to explain the presence and absence of handaxes in the assemblages. At Barnham, the intermittent nature of the raw material source (lag gravel) was suggested as creating a signature focused on core and flake working, with limited handaxe manufacture. This contrasted to the situation at Elveden, where the raw material was available from two sources (lag gravel and chalk river bank), making it a more constant feature of the landscape, therefore creating a situation where both core and flake working and handaxe manufacture were conducted. However, this is not universally applicable (Pettitt and White 2012:187,188) indicating that a complex set of processes was in action, varying according to individual contexts.

Provisioning people and place

It is widely acknowledged that technological strategies vary in response to heterogeneous, unevenly distributed and mobile resource patches. This adaptation to the landscape is seen by Kuhn (1995) as a strategy based on the provisioning people versus the provisioning of places. His model outlines two ways of using stone raw material to negate the cost of resource procurement. When provisioning of place is the predominant strategy, raw material is moved to specific locales, forming a known cache, for example, in a stone-poor environment. This can be seen in Potts' (1994) earlier work on the use of stone caches in Early Stone Age Africa. He suggested these were used to provision areas which had little locally available raw material, and where hominins would transport carcasses to make use of the stockpiled raw material to craft tools for butchery and carcass-processing activities. Foley proposed that the transport of carcasses to these stone caches, or indeed caches of tools, actually takes less energy than carrying tools to the carcasses (Foley 1987). The opposing strategy to this is the use of portable toolkits and curated technology to provision people as they moved about the landscape. However, even when operating a provisioning of place strategy, some form of limited mobile toolkit would have been required to deal with mobile resource (hunting) scenarios. When raw material availability is unevenly or widely spread, then provisioning of the landscape may occur, where stone is moved to places in order to exploit predictable floral or faunal resources (Kuhn 1995). In their study of the foragers in Western New South Wales, Australia, Holdaway et al. (2010) identified a pattern of curation and exportation of large flakes specifically designed to minimize the risk involved when exploiting the unpredictable resources within a territory.

THE ROLE OF TECHNOLOGY AND TRANSPORT

The transportation of stone tools provides the main way of investigating landscapes in the Palaeolithic, being inherently linked to the exploitation of plant and animal resources and acting as a trace marker for mobility. A number of studies have looked at the provenance and movement of raw material and what this tells us about transport, planning, mobility and use of the landscapes (Féblot-Augustins 1993; Braun et al. 2008). Geneste's (1985, 1988, 1989a, b in Mellars 1996) work in the Perigord highlighted two key aspects of Middle Palaeolithic raw material procurement and provisioning. Firstly, the sources of raw material consisted of three categories, a local group which dominated assemblages, an intermediate set of sources from 5-20km away often collected along different axes, and a small component of 'exotic' distant materials from up to 100km away from the site. These were suggested as fitting into mobility and resource procurement strategies, with the local component collected through general subsistence activities in the immediate foraging radius of the site. The latter two categories of intermediate and distant sources were usually present in the form of blanks or finished tools, and most likely represented territorial movements or perhaps regional exchange systems.

Geneste (1985, 1988, 1989a, b in Mellars 1996) also highlighted the almost linear relationship between distance to sources and the percentages of different raw materials present on a site, with material from the most distant sources being the poorest represented, and vice versa (table 2.1). This demonstrates most likely a factor of cost-distance planning (e.g. less energy is expanded to collect the local raw materials), or that distant sources are not exploited in the day-to-day activities conducted near the site. Moreover, the more exotic pieces are usually high quality materials that have been preferentially selected and curated (Geneste 1985, 1988, 1989a,b in Mellars 1996). These patterns, certainly for the European Middle Palaeolithic, seem to be related to common patterns of technological planning and provisioning (Féblot-Augustins 1993). Similarly, there have also been links demonstrated between different artefact categories, quality and raw material sources, such as at the Caune de Arago, in the French Lower Palaeolithic, with curated stone being more readily used for producing side and convergent scrapers compared to notches and endscrapers which were most commonly made from poorer quality local sources (Byrne 2004).

This work highlights the fact that the location of stone and flint raw material would have been critical in choosing sites, especially with the established reliance on local raw materials. Indeed, technological strategies would have been tied closely to this, as demonstrated by the transportation of cores in the Developed Oldowan, as a response to distance from the raw material rich river valleys (Braun et al. 2008). The rest of the landscape would then be exploited in a pattern related to the locations of key resources needed for day-to-day survival (Wenban-Smith and Ashton 1998).

Distance of source away from site	Frequencies of occurrences at sites	Strategy of procurement	Form	Quality	Amount of pieces utilised
Local (<5km)	Up to 90%	Embedded in general subsistence activities within the foraging radius of site	All stages of chaîne opératoire present	Varying quality	<5%
Intermediate (5-20km)	Up to 20%	Collected through regional territorial movements or exchange networks along axes	Mixture of local and exotic strategies		10-20%
Distant (30-100km)	Up to 5%	Regional territorial movements or exchange networks	Blanks or finished tools (final stages of chaîne opératoire)	High quality	75-100%

TABLE 2.1 - SUMMARY OF THE RELATIONSHIP BETWEEN DISTANCE OF RAW MATERIAL SOURCE TO SITE. MODIFIED FROM (GENESTE 1985, 1988, 1989A,B IN MELLARS 1996)

2.4.2. HOMININ LANDSCAPE PREFERENCES

Traditionally, rivers have been viewed as the preferred landscape type for Lower Palaeolithic hominins, representing a rich environment that provided access to a variety of resources, and furthermore formed movement conduits, especially during wooded temperate phases when much of the wider landscape may have been densely forested (Ashton et al. 2006; 2005). Indeed, such sites, like Swanscombe, Hoxne, Barnham and Elveden are considered as favoured localities, not just for the raw materials they provided but for resources associated with their environments (Ashton et al. 2005). Whilst Gowlett (2006) agrees to some extent with this view, noting that hominins procured food and other resources in addition to tool-making on the gravel bars near raw material sources, he argues that these areas of the landscape are unlikely to have been favoured as home-bases. They would have been too exposed, especially in terms of predators, and very susceptible to flooding. He instead suggested that forested locations (such as at Beeches Pit) may have been more suitable as camp sites, supported by the evidence of fire-use, knapping, available fresh water sources and a large range of tool types (Gowlett 2006). Perhaps valleys, with or without associated rivers acted as communication links, providing access and easier passage between different ecologically varied areas of the landscape. Certainly, in the Middle Palaeolithic of France there is an increase in intensity of sites situated along tributaries, rather than the main valleys (Mellars 1996). Mellars suggests that they would have been attractive locations, providing access to resources in these smaller valleys, and easy ingress to the larger river valleys and resources therein (1996). This idea is also proposed by Wymer (1999:46,48) for the Lower Palaeolithic of Britain, suggesting that such locales would have facilitated communication and movement, and furthermore, proximity to the chalk hinterland would have provided access to a greater spread of resources and biotopes. The question here, however, is whether the difference in landscape use between the main river valleys in the Lower Palaeolithic and the extended use of a wider landscape is really a difference or merely preservational bias? We are beginning to see patterns hinted at in the Lower Palaeolithic which become more visible in the Middle Palaeolithic, especially in for example, France, with large concentrations of open-air sites located in plateau locations and smaller scatters of artefacts located more widely throughout the landscape (Mellars 1996).

It is the contention of this thesis that in order to answer these questions, we must first understand the role that plateau sites play in hominin settlement systems and landscape use? Some authors have suggested that they may have been occupied in cooler environments (Ashton et al. 2006), when there was less dense forest cover, thus allowing greater regional movement. In this type of environment, the river valleys would have been dominated by wide braided streams, perhaps providing a less hospitable environment in which to live (Kolen et al. 1999). However, it is unlikely that the broad assumption that these are merely functioning in the same way as the river valley sites, but at different points in climatic cycles, is viable. As Hosfield (2002) has pointed out, it is more likely that specific types of habitats acted as repeated foci for certain types of hominin behaviour. Consequently, what activities are represented at these upland sites, and how do these relate to activity signatures in other areas of the landscape? Are they different compared to riverine locales, or are we seeing the same pattern of resource exploitation and technological behaviour regardless of landscape position?

Therefore, in terms of the upland sites, we have to consider what the driving force was to utilise these locations. Were hominins primarily focusing on water, flint, vegetation or prey resources? Work on Early Stone Age plateau sites in Namibia by Hardaker (2011) has suggested that in this case, water was the most attractive factor, although in Britain water would have been plentiful and presumably not a limiting factor. In some cases, easily accessible raw material, eroding out of the sides of the hollows or forming lagged cobble bands, might have been the primary focus, as found at Caddington or Westcliffe. But this does not apply everywhere; at sites around doline features in the Duero Basin in Spain hominins transported quartzite from the nearby rivers, as the upland area was poor in local material (Diez-Martín et al. 2008). This then suggests that another factor may have been in play and that these upland sites afforded something else. In Duero the plateaus are adjacent to the main river valleys, providing access to several biotopes; and in addition, the locations provided good views of the neighbouring valleys, perhaps providing easy viewing of game (Diez-Martín et al. 2008). Understanding landscape use must therefore be treated in terms of the individual context and not rely on generalisations. A few case studies will be outlined below to emphasise this point.

2.4.3. Case studies

Duero River Basin, Spain

As discussed above, off-site approaches have been used to good effect within the Duero River Basin in the Castilla y Leon region of Spain. These sites have special significance for related work in Britain, as concentrations of artefacts have been found associated with karstic features, especially sinkholes, in a comparable situation to the solution hollows of the North Downs and Chiltern Hills (see discussion below). At Duero, the main focus of interest lay in the comparison of karst versus non-karst landscapes in terms of the occupation by Palaeolithic hominins. The results demonstrated that higher densities of artefacts were located around karst features, with more ephemeral scatters in the wider landscape. The artefacts collected through the survey ranged from Acheulean to Middle Palaeolithic and later, and this is corroborated by TL dates from four samples. Three collected through surface surveys gave dates of between 260,000 and 130,000BP, and one, which was from an excavated context in the brown clays of Level 3 at Valdecampana 4, gave a date of 140,000BP (Diez-Martín et al. 2008).

The excavation of one of these features, a sinkhole (Valdecampana 4), produced a series of brown clay deposits, which, in contrast to the British chalk-based dolines, was found to contain organic materials and fragments of charcoal. The excavators suggested that these deposits would have served to block the drainage conduit, effectively halting the formation of the sinkhole and creating what may have been a semi-permanent pond (*Ibid* 2008). Similar ponding mechanisms have been suggested by Catt (1986:98) and others (Jennings 1985; Ford and Williams 1989) as a common process in such active features. In addition to the organic evidence suggesting formation of vegetation around the sides of the hollow, the presence of archaeological material appears linked to the formation of the lacustrine environment. The presence of refits at Valdecampana 4 (Diez-Martín et al. 2008) also highlights the potential of these sites to preserve good records of hominin activities.

The results, in terms of landscape use, suggest that hominin behaviour may have been much more complex than previously thought. In the midst of a low frequency scatter of material over large areas of these plateaus more concentrated activity seems to have been focused on the sinkholes and karst valleys (Diez-Martín et al. 2008:129). Hominins appear to have been selecting ponded locations which provided good views and control over valleys below, representing short-term activity spots which have accumulated debris over time. However what is obvious is that the use of these locations was closely related to the valley bottoms, with hominin behavioural systems making use of both, transporting raw material up to the stone impoverished plateaus to undertake certain activities. It is likely, therefore, that in this case raw material was not a factor influencing their choice of upland location, rather hominins were taking advantage of ecologically stable systems through predictable networks of waterholes (Diez-Martín et al. 2008).

Somme Valley, France

This broad differentiation between activities in different parts of the landscape can be seen more clearly in the study by Tuffreau et al. (1997) on selected Acheulean sites in the Somme Valley. The sites are located in varying landscape settings within the valley itself, and the authors interpret the varying 'site signatures' in terms of the activities that may have been undertaken at each site. The methodology is based on the presence or absence of relevant artefact types and assessment of site location, similar to that employed here.

The first two sites – Garenne 1 and 2 - are located at the back of the flood plain, against a chalk talus slope. Cagny la Garenne 1 (MIS 12) displays a signature dominant in debitage products including handaxe manufacture flakes. Flake tools also make up a sizeable proportion of the assemblages with dominant types represented by notches and denticulates. Furthermore, indications of minimal working are present, with a number of bifaces retaining cortical edges and butts. The lack of faunal remains, despite favourable preservation has led to interpretation as a workshop, focused on the manufacture of bifaces and the production of flakes from cores, combined with activities associated with flake tools (Tuffreau et al. 2008).

Cagny la Garenne 2 has more of a focus on activities related to raw material collection with a high proportion of tested nodules and wholly cortical flakes as well as cores. Rather unusually, and in contrast to Garenne 1, core tools are more numerous than flake tools, although the dominant types of flake tools are comparable to the previous site (notches and denticulates). Similarly bifaces make up only a small proportion of the assemblages. Overall the signature is one of preliminary testing, with large numbers of artefacts from the decortication stage, and subsequent export of the debitage products (Tuffreau et al. 2008).

The later site of Cagny-l'Epinette (MIS 9) is situated in a similar position, at the edge of a channel running along a chalk talus. Tested nodules are common, as are large proportions of cortical flakes, although in contrast cores appear at lower frequencies than perhaps would be expected. Moreover, flake tools are common throughout the sequences, with the dominant types again represented by notches and denticulates.

The presence of bifaces, roughouts and products associated with handaxe manufacture confirm that these tools were produced on site. This location also contains numerous bone fragments, including human modification of a horse humorous attesting to tool use and exploitation of carcasses on the spot (Tuffreau et al. 1997; Tuffreau et al. 2008). On the evidence outlined above, this has been interpreted as a mixed strategy site, focused on tool production and use, linked to acquisition and consumption of fauna (Tuffreau et al. 2008).

The final site, La Ferme de l'Epinette, contains a smaller assemblage with a large proportion of cores. Despite this, the early stages of reduction are absent, with the cores and handaxes imported partially or fully worked. The flake tools are more prevalent than the core tools, and again demonstrate dominance of notches and denticulates with smaller numbers of scrapers and borers. Furthermore, this particular site stands out regarding its higher position in the landscape and likely function as a game viewing locale linked to hominin mobility and resource procurement (Tuffreau et al. 2008; Tuffreau et al. 1997).

The key points drawn from this are that hominins were exploiting certain areas of the landscape related to the resources they afforded, in a systematic pattern, with resources ensuring repeated visits to the same spots, producing the same activity signatures (Tuffreau et al. 1997). However, except in the case of La Ferme de l'Epinette, the site's position in the wider landscape is hardly addressed. Furthermore, the sites do not even belong to the same marine isotope stage, yet are considered as part of an integrated settlement system. Having said that, one positive aspect of this study is that it deals with sites which contain multiple occupations, indicating that these signatures persisted over time, with repeat visits producing similar activity signatures. This has led to the conclusion that topographic characteristics played a large role in the enactment of comparable activities at these sites over time (Tuffreau et al. 1997). Tying in closely with conclusions from the Duero Basin (above) the paper proposes that a lot of the characteristics identified at these sites parallels behavioural organisation usually attributed to Neanderthal populations in Europe, highlighting the question of whether behavioural variation really is different between these two periods, or whether this is just a factor of the quality of the Lower Palaeolithic record (Tuffreau et al. 1997).

SOUCY, FRANCE

The apparent close relationship between a site's functional organisation and its topographic position is further demonstrated by a series of sites in the Yonne Valley, France. Here six contemporary Acheulean settlements (Soucy 1-6), totalling nine occupation horizons, are located within the confines of an ancient river valley, dating approximately to MIS 9 (Lhomme 2007).

The results suggest that occupation on the sandy banks was brief and focused on specific activities e.g. biface shaping at Soucy 5, level II and the exclusive production and probable utilisation of notched flakes at Soucy 6. The activity located on the gravel hillocks produced a large quantity of faunal remains and artefacts from the production and utilisation of bifaces and flake tools, interpreted as activities focused on the acquisition and exploitation of animal resources. In contrast to this, the sites located on the floodplain, set back from the river (Soucy 3, level S; Soucy 4 and Soucy 5, level 0) demonstrate a very low density of faunal and lithic remains. The latter indicate short sequences of manufacture and use, with the faunal remains representing isolated bones or parts of carcasses and display no signs of human intervention (Lhomme 2007).

The technological strategies consist of the production, curation and transport of bifaces, contrasting with the *ad-hoc* expedient approach applied to the flake tools, which were manufactured on site to serve immediate needs. The differences between the assemblages and distributions of faunal and lithic material from one site to another, the methods of acquisition and exploitation of animal resources, and the complete or partial nature of the chaîne opératoire of lithic production underline the close relationship between a site's functional organisation and its position in the valley topography. This demonstrates the potential complexity of subsistence strategies and technical behaviour of hominins living during the middle phase of the Middle Pleistocene (Lhomme 2007).

Boxgrove, Sussex, UK

The scatters and patches model, discussed above, is brought into sharp focus when considered in terms of the evidence from the Lower Palaeolithic site of Boxgrove. Here the excavation of several key localities revealed a remarkably consistent technology centred on the production and use of bifaces. However, whilst sites such as Q2/A unit 4c represented primary reduction of nodules, with the resulting products transported out, other sites represent locations where the focus was more on thinning and finishing sequences e.g. Q1/A unit 4c. Whereas detailed inferences about individual occurrences can be drawn from *in situ* scatters such as those at Q1/A unit 4b, and the horse butchery site of GTP17, the real value, from a landscape perspective lies in the recognition that the Boxgrove hominins were conducting a dynamic system of artefact transport and discard, with biface production involving more than one location (Pope 2002; Roberts and Parfitt 1999).

In addition to the signatures from these high density patches, a series of test pits opened over a large survey area highlighted a low density scatter of artefacts spreading across a single land surface. In contrast to the large accumulations, the signatures from the low density scatters consisted of artefacts resulting from the thinning and resharpening of bifaces in the course of their movement across the landscape (Pope 2002; Roberts et al. 1997).

Whilst this patterning of tool movement identified at Boxgrove provides information on operational sequences and hominin mobility, Pope's (2002) analysis of land use provides more evidence of the way in which landscape locations and the presence of resources serve to shape movements and the distribution of sites across a landscape. His conclusions suggest that in the area close to the cliff line the presence of static resources (stone, water etc.) created 'favoured' locations which structured movement in the vicinity. However in the wider landscape, containing less variable resource affordances, movement was more related to the exploitation of game, creating resultant patterns of artefact curation and re-sharpening in the course of hunting. Pope takes this further, linking the discard of handaxes to group size and social interactions. Locations with limited numbers of handaxes signified the presence of small fragmented task-specific groups, which contrasts to the larger conglomerations inferring much larger group sizes centred on occupation in favoured locales which provide a varied resource base (Pope 2002).

Maastricht-Belvédère (The Netherlands)

In the Middle Palaeolithic, landscape approaches are exemplified by the work on Maastricht-Belvédère. Here a previously site based project focusing on Palaeolithic occupations in deposits of the River Maas at Belvedere, was expanded to the surrounding area to allow correlation and comparison with higher level scatters in the surrounding landscape. There are more than one hundred Middle Palaeolithic locations known from the higher landscapes (plateaus, edges and river valleys) outside the Maas valley. These proved to be very informative. Key characteristics included large numbers of retouched tools, suggesting activities were of a specialised nature. Whilst it was noted that retouched flakes and scrapers seem to be commonly present in high numbers, most sites have other dominant tool types (notches and denticulates/ handaxes and bifacial scrapers etc.), with only larger sites exhibiting 'mixed' signatures. They represent a continuum of lithic technologies from the primary procurement of nodules, through to the transportation and use of final artefacts. Also important appears to be the association of hominin landscape choices with prominent points giving good views of the surrounding landscape, especially river valleys (similar to the evidence from Duero above). Compared to the signatures from lowland valley bottoms, key differences emerged, with the percentages of tools being lower, and scrapers and backed knives forming the most common types, suggesting these sites related to occupations of short-duration primarily focused on the procurement of meat. This therefore indicates that tasks can be differentiated in the Middle Palaeolithic based on landscape location, with assemblages located in the higher zones representing different signatures, compared to the lowland areas (Kolen et al. 1999).

In summary, these case studies demonstrate a spatial segregation of activities which has more recently been recognised in the context of the Lower Palaeolithic. The evidence discussed above for the Duero Basin, the Somme sites and those at Soucy, indicate that organisation of activities, behavioural choices and locational patterning of sites does vary between landscape types. However, it is important to emphasize the variability and resultant importance of including different landscape zones in any assessment of hominin subsistence strategies and behavioural choices. The ideas discussed here and the patterns of land-use demonstrated within these different areas will now be taken forward and used to develop a methodology for the analysis of the British upland evidence.

2.5. Towards an Integrated Approach to Landscape Studies

As mentioned above, there have traditionally been problems of integrating the varying qualities of data into landscape studies. Problems such as the visibility of sites, taphonomy and biases of discovery all creating a varied record - producing more of a reliance on the richer, well excavated assemblages (Mellars 1996:246). However, as we have seen in the case studies discussed above (section 2.4), landscape methodologies have been very successful in providing informative studies on behavioural variation and hominins' use of landscapes.

It is clear from this work that a combination of different lines of evidence, such as multiple datasets, fauna, lithics and environmental context, melded with both excavated and open-air sites, provide a greater spread of data. When integrated within an intra-site and regional context as advocated by Conard (2001), they can begin to give insights into wider patterns of behaviour.

Thus, this thesis aims to develop a methodology which minimises the effects of time-averaging by focusing on the technological and typological components of selected *in situ* sites, with a view to identifying activities carried out at a variety of different landscape locations. This advocates a presence versus absence approach to key signatures related to different activities and negates the need for chronological tethering, thus moving the focus away from the traditional problems of such datasets and rather onto their potential.

This is integrated into a multi-level analysis comprising of the individual artefact, the assemblage through to its site context, coupled with an experimental GIS (Geographical Information Systems) approach to investigate the wider landscape context. It has been argued that variability in the record can be seen best in short-lived events; however, these can be difficult to identify (Clark 2001). According to work by Binford (1980), short-lived activities may represent the discard of only one or two tools, which, when found at sites comprising a number of visits, can be swamped by prior or later activities. Therefore it is likely that the real richness that the Lower Palaeolithic record is accused of lacking lies here in these short-term ephemeral events. The methodology above has been developed accordingly through the focus on tool types and segments of the chaîne opératoire, and the addition of data from spot finds, which may represent some part of the continuous artefact distribution across the landscape mentioned in work by Roebroeks et al. (1992) as the 'veil of stones' and variously as discussed above (section 2.2) by Foley (1981) and Dunnell and Dancey (1983). Indeed, the importance of low density finds, such as those found at the Valdoe by Pope et al. (2009), and the occurrence of isolated handaxes indicating transportation of tools and mobility patterns across landscapes, has been noted by many authors (Kolen et al. 1999) and provides key insights into mobility as a whole.

2.5.1. Designation of site types

As stated in section 2.3, the presence or absence of particular types and patterns of lithic discard can tell us a great deal about hominin engagements with landscapes, providing a direct link between people, the places they inhabited and the environment in which they lived (Clarkson 2008). The key idea here is that technology is intrinsically linked to resource acquisition and is created to exploit the surrounding environment, thus reflecting changes in that environment, resource exploitation and land-use strategies (Miller and Barton 2007; Binford 1980; Blumenschine 1991). Therefore, patterns in the artefactual signatures at sites should vary with landscape location as each locale affords a set of resources particular to that type of location (e.g. pond, lake, river, plateau, plains, etc.). These can be identified as signatures corresponding to different activities and thereby different types of site, which can inform us about uses of landscapes and hominin settlement systems.

INTERPRETATION

A large number of complementary and competing interpretations regarding settlement systems and organisation of behaviour, based on varying artefact signatures are available in the literature. These tend to identify broadly similar categories and a number of these will be discussed below.

For the Middle Palaeolithic of south-west France Turq (1988a; 1989a in Mellars 1996), defined four main site types reflecting a range of activities:

- *'Extraction and exploitation'*
    - Procurement and initial working of flint nodules on site from a local raw material source.
    - Key elements include the presence of flint nodules, tested nodules exhibiting one or two flake removals, and in some cases a high presence of cortical flakes, from initial decortication of cores in preparation for transport.
- *'Extraction and production'*
    - Evidence of the primary acquisition of nodules (as above) but with further working of these to produce flakes or retouched tools.
    - Key elements include high frequencies of debitage exhibiting a high percentage of cortex (over fifty percent of the flake component). Transportation of finished products out of the site. If handaxes are present they will be in roughout or broken form.
- *'Mixed strategy'*
    - Multitude of activities taking place, including procurement of flint, flaking and reduction of nodules, and the production of finished tools.
    - Key elements include all stages of flake production and tool manufacture. High numbers of retouched tools and highly reduced core forms.

- An interesting point to note is that Turq (1988a; 1989a in Mellars 1996) highlights the fact that, for the Middle Palaeolithic, these types of sites are commonly associated with higher plateaus and command excellent views over the surrounding area.

- *'Episodic'*
    - Ephemeral occupations of short-duration related to specialised short-term activities exploiting specific resources.
    - Key elements include the working of a few flint nodules or use of retouched tools.

Price (1978) earlier developed similar categories for his work on the Mesolithic settlement of the Netherlands, identifying three types of site primarily on the basis of artefact densities and presence of some diagnostic signatures. He classes 'extractive' sites as being related to the procurement of resources, thereby having specific purposes and types of activity undertaken only by small sub-sections of the population. These include hunting camps, kills, quarries, and gathering stations (Price 1978). His second category can be compared partly to Turq's 'ephemeral' sites; however, Price classes these as short-term, temporary, locations, but does not specify the types of activities that might be found. Finally, his 'base-camps' can be compared to Turq's 'mixed strategy' sites. Here, he suggests that these represent the largest accumulations with assemblage variations related to the exploitation of nearby resources. These will also contain maintenance activities (Price 1978).

To some extent, aspects of both these models have been combined in Clark's (2001) interpretation of settlement patterns in work on enclosed sites in Middle Stone Age Africa. He splits sites into two categories, with the longer occupation on habitation sites represented by larger accumulations of artefacts, and usually related to exploiting specific resources. By contrast more ephemeral site use, at places termed 'special purpose occupation sites', were identified as being small and situated in places which are often difficult to access, usually related to carcass processing or the viewing of game (Clark 2001). This is questionable, since a hunting stand should provide good views of the landscape, and (depending on the hunting strategy employed), it ought to have quick access to the relevant section of landscape that the intended prey inhabits.

In contrast to this, Binford (1978), in his ethnographic studies, suggested that observation and hunting sites could potentially contain a lot of debitage from tool making as people waited for herds. However, the extent of this would depend on the organisation of hunting groups and the tactics employed (Binford 1978). Whether this would involve waiting in one place for a while, watching out for herds, or whether a site functioned more as a viewing platform, to plan the foray and get an idea of the landscape layout and the location of herds. Agreeing in part with this, Boyle (2001) developed a variation of the mobile versus static resource approach discussed in section 2.3. She interprets short-term occupation sites as related to the procurement of mobile animal resources, equating the larger sites with the exploitation of more fixed resources (Boyle 2001: 537). Whilst this may be a valid interpretation in areas where a less mobile settlement system is in operation, with people exploiting resources around the base camps, a different pattern would perhaps be expected in more mobile land-use systems. It is also unlikely that the majority of short-term occupation sites are linked to butchery and meat processing. Indeed, Binford suggests that more ephemeral sites could also be produced through the processing and procurement of plant foods and other resources (1980). However, the sites which are most likely to stand out in the record are those which have stone working present, rather than those focused on procurement, as fewer tools will drop out of the record at these activity locales.

The methodology for interpreting the findings from the analysis will be based on a combination of the approaches described above. Whilst Turq's method (Turq 1988a; 1989a in Mellars 1996) links in with the chaîne opératoire section of the analysis, this will be combined with an identification of different activities based on typological analysis and results from the use-wear discussion below (section 2.5). This should provide a thorough grounding for an interpretation focusing on the key aims of this thesis.

2.5.2. Assemblage analysis

In this thesis informed assumptions are made about the uses of typologically distinct tools, combined with the chaîne opératoire stages. The latter provide inferences about stages of the reduction sequence and their links with specific activities. This dual approach provides two complementary methods by which to categorise sites, thus creating a robust analysis based on both qualitative and quantitative factors. This has aided the collection of data from secondary sources such as excavation reports, as the criteria for this analysis are the ones most often referred to and utilised in published material, allowing ease of comparison between datasets.

One point needs to be made regarding the choice of the lowland sites, which include a mixture of Clactonian and Acheulean industries. Whilst there have been a number of important discussions regarding the differences between these (see Pettitt and White 2012 and summary therein) this thesis is focusing mainly on typological, technological and chaîne opératoire approaches. As such it is important to put aside any pre-formed assumptions and take each site on its own merits, letting the artefacts speak for themselves. If differences are noted between the two industrial variants this will be addressed in the discussion (chapter 7).

The sites requiring primary artefact analysis were recorded and analysed by using a series of qualitative and quantitative criteria based on a combination of techniques used by Ashton in his analysis of the site of Barnham, Suffolk (Ashton 1998a,b) and that of White and Plunkett from their work on Foxhall Road, Ipswich (2004:163-169). Once, suitable criteria had been identified and selected, a recording sheet template was produced (Appendix I), putting in place a standardised recording system that was used for each site. This record sheet was created with the aim of being a combined sheet for all artefact types, e.g. cores, handaxes, flakes, flake tools etc., thus making it easier and quicker to record and input the necessary data.

The recording form was split into a number of sections: a set of generalised questions related to the identification of the artefact; and conditional questions, measurements and generalised technological analysis factors which were applicable to all artefacts analysed. The form then also contained more focused sections, such as criteria that were specifically related to flakes or tools and cores. The decision was taken not to include a specific section on core reduction strategies or handaxe analysis (e.g. Wymer 1968, and Roe 1964) as this would not advance the purpose of the thesis. However, any unusual features or points that were deemed relevant were again recorded in the general description. The criteria recorded are presented in table 2.2 and will be discussed in more detail in appendix 1.

To aid typological comparison between the different assemblages, especially between the primary recorded data and the site reports, it was decided to focus on generalised artefact categories for the analysis (see chapter 5). These were split into handaxes, roughouts, flakes, flake tools, core tools, debitage, cores and miscellaneous pieces. The distinctions between handaxes and roughouts are relatively straight forward and where these occurred in the site reports they were designated as such. However, the way different authors treated other aspects of the assemblages varied between sites, with some identifying chips, irregular knapping waste, blades, flakes etc. To make this variation manageable and quantifiable it was deemed necessary to use only general categories, therefore two main ones were used, that of flakes and debitage. Here debitage encompassed all the pieces that could not be classed as flakes (e.g. shaping chunks, chips, fragments etc.). Within the discussion itself, especially regarding the number of knapping products, chips were distinguished so as not to give false values regarding the number of pieces produced by cores or handaxes. In this instance chips are defined as any artefact with dimensions less than 20mm.

In addition, whilst handaxes can be classed as core tools, being created from nodules, a distinction was made between these and other forms of core tools (e.g. choppers, cleavers etc.) in order to isolate the butchery signature for the assemblages. Therefore anything that was produced on a source nodule but wasn’t classed as a handaxe is regarded as a core tool for the purpose of this analysis.

Furthermore, it was decided to use an experimental dataset to investigate the patterns of flake cortex present within each assemblage, using this as a proxy for the chaîne opératoires in action at the site, e.g. flake and core, handaxes or combined. The experimental dataset is based on flake cortex values split into primary, secondary and tertiary flake categories as described below (table 2.3) and seen in figure 2.1. The data is compiled from three sources. Firstly the Durham experimental assemblage is based on two of the handaxes used in Foulds' experimental dataset (Foulds 2012). Primary data was recorded by the author (Drinkall) for each of the flakes, including the cortex coverage. The handaxes were manufactured on large nodules, and all flakes above 20mm were recorded.

Typology	Typological designation of each artefact
Condition	Rolling
	Surface sheen
	Preservation
	Patination
	Colour and staining
Metrical attributes	Length (mm)
	Thickness (mm)
	Width (mm)
Technology	Raw material
	Cortex
Flake/Tool attributes	Butt type
	Flake Type
	Percussion
	Dorsal Scar Pattern (DSP)
	Flake termination
	Number dorsal removals
Cores	Number previous removals
Additional notes included in written description and drawing	
	Handaxe description and general shape e.g. Ovate, Pointed, etc.
	Retouch circumference, steepness, pattern, any other relevant features

TABLE 2.2 - LIST OF RECORDED ATTRIBUTES FOR THE PRIMARY ARTEFACT ANALYSIS

The second dataset has been taken from the data in Wenban-Smith et al. (2000), based on the knapping experiments carried out as part of the analysis of the site of Red Barns, Hampshire. These were also based on large nodules. However, a few points need to be made about this dataset. The data published in Wenban-Smith et al. (2000) provides cortex values for a variety of experimental knapping sequences, including core reduction, complete handaxe manufacture and the various individual stages (beginning, middle and end). Whilst this dataset is a useful one, the cortex categories have been split into 20% intervals, which provides data in the following categories: non-cortical; <20%; 20-40%; 40-60%; 60-80% and >80%. However, the format of the archaeological data is based on the values of primary flakes (wholly cortical + >50% cortex), secondary flakes (<50%) and tertiary flakes (non-cortical), to provide a flake type signature for each site, and these have been constructed using 50% as the separating value between the last two categories. In contrast, due to the nature of the published categories, the experimental dataset can only be split into sections using either 40% or 60% as the separator. Consequently, to investigate which would be most appropriate a comparative data-set was generated using both (i.e. none, <40% and >40% versus none, <60% and >60%). These were then compared to each archaeological sample. The results indicated that in the majority of cases comparing the archaeological signature with the 60% dataset resulted in a high proportion of matches, whereas, in contrast the 40% boundary set consistently produced no matches. From this it was deemed that 60% was the better cut-off point to use. However, the question remained as to whether this is comparable to the archaeological datasets whose results are based on a 50% cut off. Therefore, by selecting a number of sites which contained more detailed cortex data (e.g. recorded in blocks of 10%), thereby allowing groupings into both <50% and >50% and <60% and >60%, these were compared. It was found that it mattered little whether the split occurred at 50% or 60% as this resulted in negligible differences in the patterns produced for the proportions of primary, secondary and tertiary flakes. Consequently the comparison of the archaeological data and Wenban-Smith's categories, despite being in different formats, should have no impact on the overall interpretation of the data and the flake signatures. Therefore these should give reliable results for the comparison of flake cortex, with a view to identifying possible technological knapping strategies in place at the site. However only the core reduction sequence has been taken from this data as the handaxe sequence is comparable to those provided by the Durham dataset.

Percentage of flake types produced by the experimental datasets using a cortex split of 50%	**Tertiary (None)**	**Secondary <50%**	**Primary >50%**
Durham handaxe A	57%	33%	10%
Durham handaxe B	81%	12%	6%
Wenban-Smith core (60% cut off)	41%	43%	17%
Ashton core	14%	46%	40%
Ashton experimental biface	31%	45%	24%
Ashton combined (HA and core)	23%	45%	32%

TABLE 2.3 - PERCENTAGES OF FLAKE TYPES PRODUCED BY THE EXPERIMENTAL DATASETS

The final set, the Ashton sample, is taken from the Barnham report and based on experimental knapping by Wenban-Smith on material collected from the Barnham site (Wenban-Smith and Ashton 1998), utilising both core and handaxe chaîne opératoires (figure 2.1).

As figure 2.1 shows there are general patterns in the numbers of tertiary, secondary and primary flakes present from an experimental assemblage. The signatures from the experimental handaxes appear to be broadly approaching right angled triangles (steeply sloping to the right) with a much larger proportion of tertiary flakes compared to primary. The cores appear to be more commonly L-shaped in form depending on the size and extent of knapping, with a dip, then steeply sloping to the left or right. The combination signature however is evenly proportioned with regards to the primary and tertiary flakes and is similar to a bell-curve profile. These generalised shapes will be used to compare the experimental datasets to the archaeological to establish possible chaîne opératoire in operation at the sites.

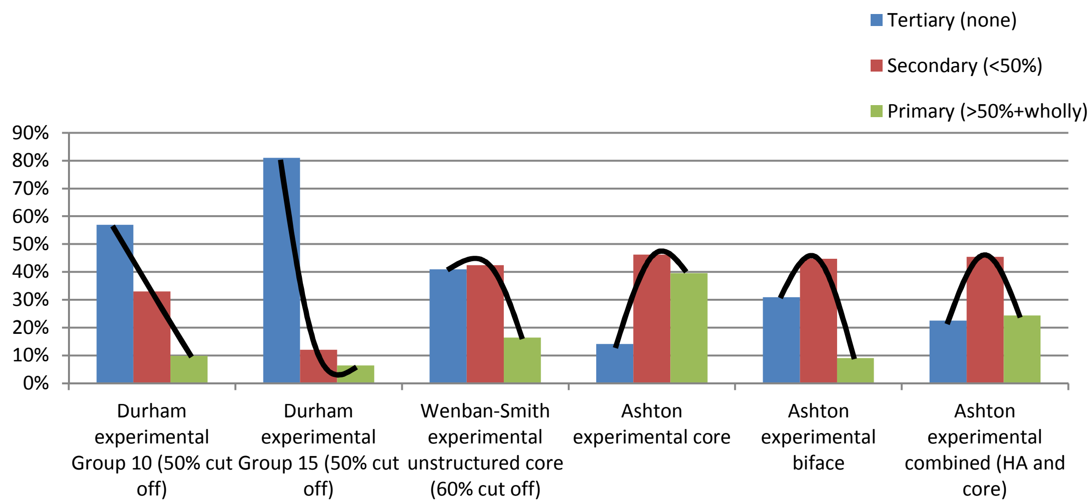


FIGURE 2.1 - EXPERIMENTAL DATASET FOR COMPARISON OF FLAKE SIGNATURE WITH THE ARCHAEOLOGICAL SAMPLES

ARTEFACT FUNCTIONS AND USE-WEAR

One of the main assumptions behind this thesis is the idea that wherever tools were used they were discarded, thereby linking the presence of particular tool types to points where different activities were conducted (Binford 1979). Whilst this assumption is often used in archaeology to make sense of settlement and behavioural patterns, in ethnographical studies, such as that by Yellen, it was noted that tools were rarely discarded at living sites or places where they were actually used (1977 in Conard 2001). This is certainly a problem, although based of course on modern human behaviour. We cannot assume that Lower Palaeolithic technological systems were the same, and indeed, one of the main aims of recent technological and chaîne opératoire based studies has been to elucidate just how Lower Palaeolithic technology was organised. It could also be argued that whilst tools may not have been used exactly on that spot, they were functioning in the surrounding landscape, thereby still linking a sites position in the landscape to activities carried out in the vicinity. So, by using a techno-typological and use-wear based approach, combined with the chaîne opératoire and, where present in the lowland sites, evidence of site usage from faunal remains, an independent picture can be constructed.

Accordingly, table 2.4 collates evidence from use-wear studies of artefacts conducted in the literature with the aim of elucidating which activities these tools were actually used for. All the sites are dated to the Lower Palaeolithic except a number of examples from Maastrict-Belvédère and Tabun Cave, Israel, however, it does appear that the activities these were used for correspond to the examples from the Lower Palaeolithic sites.

Handaxes have traditionally been seen as related to butchery activities (e.g. at Boxgrove, Sussex [Roberts and Parfitt 1999; Mitchell 1995]). Whilst this interpretation is confirmed by the use-wear data in table 2.4, there is one exception to the rule. This is a biface from Soucy in France, which has been identified as being involved in plant processing activities (Lhomme 2007); however, this may be a peculiarity of its concave edge shape. As one would perhaps expect, flakes seem to have been utilised in a variety of activities (butchery, hide processing, plant and wood related activities). This is most likely related to their ubiquity in the record, with sharp edges making them ideal for use in an *ad-hoc* capacity. The results from the scrapers again confirm the general assumption that they are associated with hide processing, although there is an example from the Upper Industry at Hoxne with wood polish (table 2.4; Keeley

1980). The use of scrapers on carcasses is also confirmed by blood and hair residue seen on tools from the Middle Palaeolithic site of Tabun Cave, Israel, although again plant evidence is also hinted at (Loy and Hardy 1992). Use-wear traces on scrapers from Level 5 at Benzú Rock shelter in North Africa also suggest this, although an apparent trend is show from Level 5 to Level 6 where the later use of scrapers in this Middle Palaeolithic context appears to be related to wood-working (Ramos et al. 2008:2215). This can also be seen at Tabun Cave with plant residues present on some of the scrapers as well (Loy and Hardy 1992).

The next category, flaked flakes, have been linked to wood-related activities (Ashton et al. 1992b; Ashton et al. 1991). Whilst there is little use-wear analysis done on flaked flakes, there are two examples where scrapers have been reworked into flaked flakes, one from Area III at Barnham and from the Golf Course site at Clacton (Keeley 1980; Ashton 1998c). Whilst retouched flakes have sometimes been seen as related to butchery activities (Roberts et al. 1997), the use-wear indicates a similar situation to the flakes with multiple activities related to bone, hide, plant and wood processing. Nevertheless, the majority of evidence presented here does point towards a stronger link with meat processing and butchery activities (table 2.4). This reflects perhaps the flexible ways in which flakes can be retouched to create a multitude of edge angles and retouch patterns, thus making them appropriate for a variety of activities. The core tools, such as choppers and chopper cores, are confirmed as related to heavy duty activities associated with bone or wood processing. On the other hand, notches present an interesting case. In the past, they have been considered as representing (along with denticulates) activities focused on wood and plant exploitation, e.g. in the Middle Palaeolithic (Rolland 1990). Interestingly, in the Lower Palaeolithic, they appear to have been used more in meat procurement activities, although there is an example from Clacton where a wood polish was identified (Keeley 1980). However, it could be argued that given their similarity in form to denticulates and flaked flakes that use on wood and plant material could be equally as likely. Finally, denticulates again have been seen as wood related, although in contrast to the notches above, this assumption has been confirmed by the use-wear results (table 2.4).

Whilst this is by no means exhaustive and relies on only a few examples of use-wear polishes identified throughout the vast span of the Lower and Middle Palaeolithic, it does provide something of a baseline from which to work. This allows us to associate certain tools types with possible activities they were used in, thereby allowing us to produce a more dynamic picture of the Lower Palaeolithic record.

2.5.3. Datasets

The data for the assemblage analysis of the upland sites (chapter 3) were collected through both primary and secondary sources, depending on the feasibility and availability of the data. There are two classes (relating to quality) of artefactual data utilised in the overall analysis of the upland study areas. The first (Category 1) is a detailed recording and analysis undertaken on the main sites in each area, as detailed in chapter 3. This includes typological and technological analysis of the artefacts from the largest sites, related to data procured from both primary and secondary sources. This forms the basis of the study, allowing detailed analysis and classification of site types at set locations in the landscape. The second level (Category 2) is that of 'smaller' find spots or sites, for which we have some detailed evidence regarding numbers and typological classification, either through primary analysis as in the case of the artefacts from Kent, or from the published reports at the time. The lowland data set (chapter 4) and comparative European assemblages (chapter 7) were also selected based on their *in situ* status and presence of good dating, faunal and environmental remains. Wider categories were employed in the analysis to mediate the discrepancies in the quality of the published data and facilitating easier comparisons between the data sets. This will be discussed in more detail in the relevant sections below.

Tool	Usewear/microwear designation	Site	Reference
Handaxe	Meat/ butchery	Lower Industry, Hoxne	Keeley 1980:143,146
		Boxgrove	Mitchell 1995
		South Woodford	Keeley 1980:161
Small biface (concave edge)	Plant processing	Soucy 1	LHomme 2007
Flake	Bone/ antler - butchery	Lower Loam and Midden, Swanscombe	Keeley 1980:121
	Hide processing	Maastrict-Belvédère	Roebroeks 1984
		Lower Industry, Hoxne	Keeley 1980:134
	Meat/ butchery	Gravel, Clacton Golf Course,	Keeley 1980:103,4,6
		Lower Industry, Hoxne	Keeley 1980:138,9
		Marl, Clacton Golf Course	Keeley 1980:93
	Plant processing	Lower Industry, Hoxne	Keeley 1980:141
	Wood processing	Lower Industry, Hoxne	Keeley 1980:129-131,143
		Gravel, Clacton Golf Course,	Keeley 1980:95-97,99
		Marl, Clacton Golf Course	Keeley 1980:87,89,90
		Lower Loam and Midden, Swanscombe	Keeley 1980:122
Scraper	Hide processing	Maastrict-Belvédère	Roebroeks 1984
		Lower Industry, Hoxne	Keeley 1980:132,3,142/143
		Upper Industry, Hoxne	Keeley 1980:150-1
		Gravel, Clacton Golf Course,	Keeley 1980:102
		Layer 5, Benzú Rock Shelter, North Africa	Ramos et al. 2008:2215
	Wood processing	Upper Industry, Hoxne	Keeley 1980:148
		Layer 6, Benzú Rock Shelter, North Africa	Ramos et al. 2008:2215
	Meat processing (residue and blood)	Tabun Cave, Israel	Loy and Hardy 1992
Scraper modified into flaked flake	Wood processing	Gravel, Clacton Golf Course,	Keeley 1980:94
		Area III, Barnham	Ashton 1998:251

Tool	Usewear/microwear designation	Site	Reference
Retouched flake	Bone processing	Lower Industry, Hoxne	Keeley 1980:140
	Hide processing	Gravel, Clacton Golf Course,	Keeley 1980:10-2
	Meat/ butchery	Lower Loam and Midden, Swanscombe	Keeley 1980:121
		Marl, Clacton Golf Course	Keeley 1980:92,93
	Meat/ butchery	Lower Industry, Hoxne	Keeley 1980:135,137-39
		Gravel, Clacton Golf Course,	Keeley 1980:106
	Plant processing	Lower Industry, Hoxne	Keeley 1980:141
	Wood processing	Gravel, Clacton Golf Course,	Keeley 1980:94,96,100
		Marl, Clacton Golf Course	Keeley 1980:88, 89
Chopper-core	Bone processing	Lower Industry, Hoxne	Keeley 1980:140,146
	Wood processing	Marl, Clacton Golf Course	Keeley 1980:90
		Gravel, Clacton Golf Course,	Keeley 1980:98
Notch	Meat/ butchery	Gravel, Clacton Golf Course,	Keeley 1980:104-5
		Lower Industry, Hoxne	Keeley 1980:135
		Marl, Clacton Golf Course	Keeley 1980:91
	Wood processing	Marl, Clacton Golf Course	Keeley 1980:89
Denticulate	Wood scraping	Gravel, Clacton Golf Course,	Keeley 1980:98

TABLE 2.4 - COLLECTION OF THE RESULTS OF USE-WEAR STUDIES IN THE LITERATURE

CHAPTER 3- THE BRITISH UPLAND DATASET

This chapter presents the British Upland assemblages that form the core dataset of this thesis. The two selected areas - the Chiltern Hills of Bedfordshire and Hertfordshire and North Downs of Kent (figure 3.1) - form banks of higher ground banding the influential Thames valley river system. During much of the Pleistocene, the North Downs were positioned between the Thames valley and the even lower lying environs of the channel river system, which would have afforded links to the continent at various points during the Pleistocene. The location of these uplands, coupled with ebb and flow of movement between Britain and the continent, therefore represent crucial settings for the understanding of behavioural variation and hominin mobility systems between these two large basins.

The two study regions contain a group of Lower Palaeolithic plateau sites, located in similar situations, relating to the formation of solution hollows - a key aspect in the preservation of these assemblages. These principle sites (category 1) will form the basis of research with additional information about the spread of hominin behaviour across the landscape provided by the smaller sites (category 2). The sites and locations will be discussed below in section 3.3 and 3.4.

3.1. BACKGROUND TO THE SOLUTION HOLLOW PHENOMENON

There are two key aspects to consider regarding the geological formation of these sites. Firstly, the role that solution played in creating these *artefact traps*, and secondly, the interplay between this and the influx of sediment into these features. This is particularly important because the combination of these factors served to collect and seal in artefacts and material from the surrounding landscape. Consequently, they are invaluable for a landscape approach, providing a glimpse of artefacts deposited in set locations. In light of this the geomorphological context of these landscape features will be discussed in some detail below.

These solution hollows (or dolines, depending on the preferred terminology) form in karstic landscapes which are characterised by underground drainage (Ford and Williams 1989). In mature karst, drainage is centripetal, flowing towards weaker points in the bedrock where water can sink underground. The porous nature of these landscapes prevents the formation of traditional river drainage networks. As a result, the dendritic linear surface systems are replaced by internally drained closed depressions (Waltham et al. 2005; Beck 1988). This is of paramount importance to these particular upland landscapes, as these are—despite the mature karst nature of the Chalk bedrock—characterised by a series of dendritic dry valleys. This raises questions, which will be discussed in more detail below (section 3.2), regarding development of these features and their co-occurrence with hominin presence.

Dolines come in a variety of shapes and sizes and appear to have very complex formation processes, relating to the properties of the underlying rock and soil. The classic profile is that of an almost circular outline over a funnel-shaped depression extending down into the bedrock. They most commonly form from a combination of solution and collapse events (Waltham et al. 2005; Ford and Williams 1989) and Waltham et al. (2005) identified six main types (figure 3.3). Whilst the more catastrophic forms are relatively rare in Chalk, small-scale collapses do occur, however, these are secondary to the main dissolution process. The periodic freeze thawing action from the development of permafrost creates a frost-shattered, brecciated top layer, weakening it and providing more opportunities for percolation and fissuring. Consequently, the bedrock becomes more susceptible to liquefaction when saturated and increased dissolution is an inevitable side effect. Therefore the English Chalk not only contains buried sinkholes such as that shown in figure 3.3, but frequent small, narrow, sub-vertical filled solution pipes, which can sometimes become so numerous that the bedrock is vertically very variable (Waltham et al. 2005; Murton 1996). The dolines present on the Chalk of the Chilterns and North Downs can most likely be classed as solution features, when considering that their form extends down through the Chalk bedrock (Ford and Williams 1989). This can be seen clearly through the borehole survey undertaken at Westcliffe in Kent (figure 3.22).

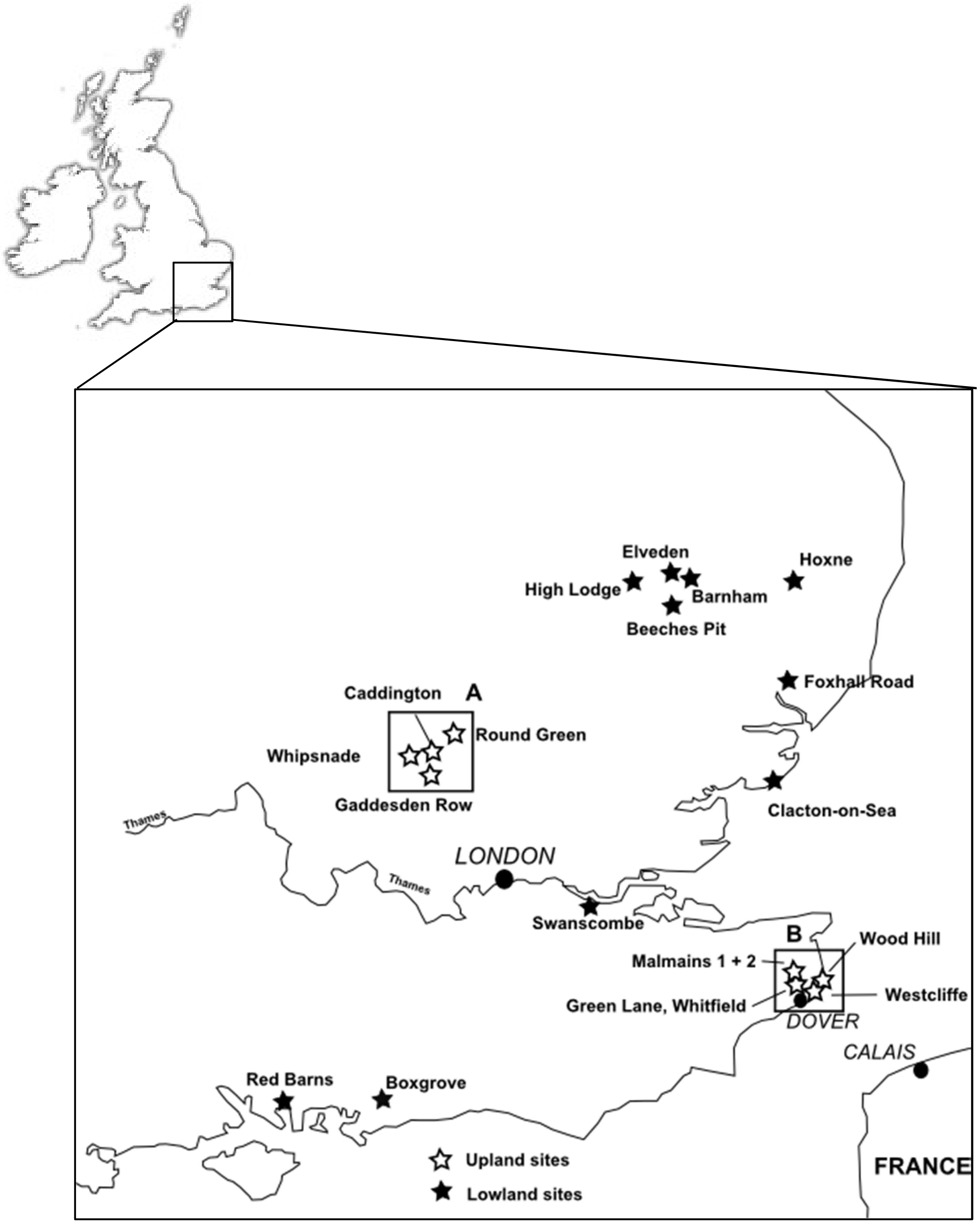


FIGURE 3.1 - LOCATION MAP FOR THE BRITISH SITES DISCUSSED IN THE TEXT. THE BOXES DENOTE THE TWO UPLAND AREAS – A – CHILTERNS, B - KENT.

The fundamental function of such features is that of transmitting ground water into the underlying aquifer (Beck 1988), which results in the development of a positive feedback mechanism. As more water drains and enlarges the shaft, soil is transported downwards and the hollow deepens and widens (figure 3.2). However, in some respects the system does become self-regulating. As a hollow becomes more capacious it collects more surface runoff and thus expands. Conversely, however, in periods of soil input the cohesive properties of clay soils infilling the basin serve to periodically block the conduit (Jennings 1985; Ford and Williams 1989; Waltham et al. 2005). Consequently, water can collect, forming ponds, which may have been viewed by the visiting hominins as a good source of water. The infilling process and constituent sediments is more fully discussed below (section 3.3.3)

Lewis has modelled these processes, correlating them with climatic cycles. He suggests that after the initial development of the doline, cooling environmental conditions caused a cessation in the solution processes acting on the Chalk. As the hollow stabilised it was subjected to infilling by loess and reworked sediments. During the subsequent warming of the climate the solution processes recommenced, serving to further enlarge and deepen the basin, incorporating material from the sides into the interior of the doline (including any archaeology) (Lewis pers. com. ; Bailiff et al. 2013). The repetition of this cycle through successive glacial-interglacial periods, coupled with the build-up of deposits above the original conduit, eventually impeding water flow would have culminated in a fully infilled basin. These are therefore more correctly correlated with buried (palaeo) dolines. Indeed the described compaction depression in figure 3.3 is comparable to that demonstrated by the surface concavity of the later solution hollow present in the Chalk at Westcliffe in Kent (see below).

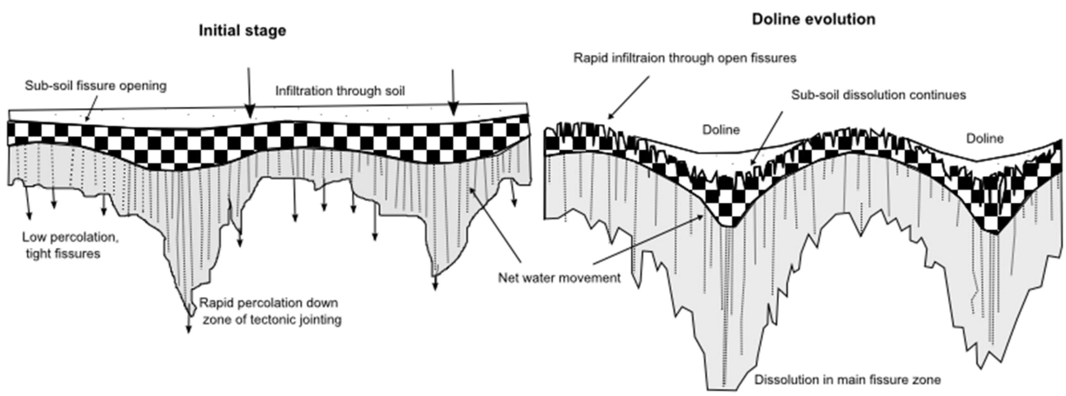
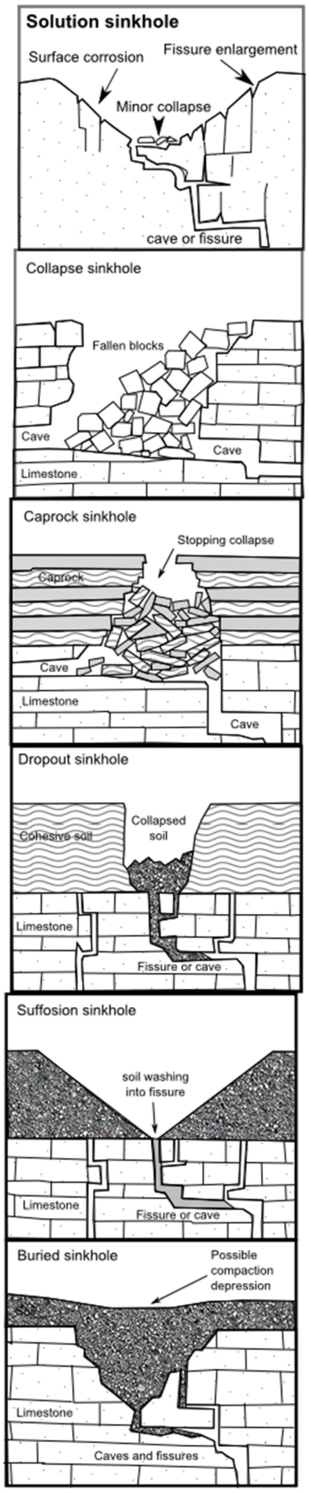


FIGURE 3.2 - FORMATION OF SOLUTION HOLLOWS THROUGH WATER PERCOLATION. REDRAWN FROM WALTHAM ET AL. 2005, FIGURE 2.2 PP. 32.



Formation process - Dissolutional lowering of surface
Host rock types - Limestone, dolomite, gypsum, salt
Formation Speed - Stable landforms evolving over > 20,000 yrs
Typical max size - Up to 1,000m across and 100m deep

Formation process - Rock roof failure into underlying cave
Host rock types - Limestone, dolomite, gypsum, basalt
Formation Speed - Extremely rare, rapid failure events, into old cave
Typical max size - Up to 300m across and 100m deep

Formation process - Failure of insoluble rock into cave in soluble rock below
Host rock types - Any rock overlying limestone, dolomite, gypsum
Formation Speed - Rare failure event, evolve over >10,000 years
Typical max size - Up to 300m across and 100m deep

Formation process - Soil collapse into soil void formed over bedrock fiissure
Host rock types - Cohesive soil overlying limestone, dolomite, gypsum
Formation Speed - In minutes, into soil void evolved over months or years
Typical max size - Up to 50m across and 10m deep

Formation process - Down-washing of soil into fisures in bedrock
Host rock types - Non-cohesive soil over limestone, dolomite, gypsum
Formation Speed - Subsiding over months or years
Typical max size - Up to 50m across and 10m deep

Formation process - Sinkhole in rock, soil-filled after environmental change
Host rock types - Rockhead depression in limestone, dolomite, gypsum
Formation Speed - Stable features of geology, evolved over > 10,000 years
Typical max size - Up to 300m across and 100m deep

FIGURE 3.3 - SOLUTION DOLINE TYPES. REDRAWN FROM WALTHAM ET AL. 2005. TABLE 2.1, PP.27

Whilst there is no doubt that the action of these features has served to catch and preserve artefacts in these upland locations, there are still questions regarding the actually extent of disturbance of these scatters. Whilst work at Caddington located knapping scatters which were considered as being subject to limited disturbance (Catt et al. 1978), recent work at Westcliffe suggests that in certain instances artefact movement may be more extensive than previously thought, with slumping and sub-surface channelling of material into active doline features (Bailiff et al. 2013; Drinkall et al in prep). Indeed work at Valdecampana 4, Spain has identified spatially and vertically separated refits (Diez-Martín et al 2008). In summary, therefore, it is likely that the degree of the preservation of spatial integrity of such artefacts will depend on the formation processes in action at each site.

3.2. The conundrum of the Dry valleys

As mentioned above, the phenomenon of dry valleys in the English Chalk raises questions about their presence during the hominin occupation of these areas. It is especially important to consider whether these were in operation as drainage systems during this time, because this has direct relevance to their landscape setting. If this proves true then we could be dealing with sites which are linked more closely to river environments than was previously envisaged. Furthermore, how did they form in such porous bedrock, when centripetal drainage is the predominant process (Waltham et al. 2005)? Unfortunately, their origin and the geomorphological processes that created them are still under discussion (Berrie 1992; Preece 1992). Previous explanations have ranged from processes related to periglacial streams, meltwater, lowering of the water table and spring-sapping (See Catt and Hodgson, 1976:188 and Preece 1992 and references therein).

Williams has pointed out that the development of dry valleys is connected to a dominance of surface flow over vertical drainage (Williams 1983). Consequently, these valleys could only have formed through a termination of the process of percolation through the chalk. In certain instances, when the water table rises, dry valleys do run during times of heavy surface run-off (e.g. the River Ver in the Chilterns). During this time, increased precipitation causes the head of the river to extend upwards, into the higher, dry valley reaches. This can create springs, which crop up across the chalk. In some instances when the ground is dry, surface run-off may create flash floods. However, this is not always the case and some dry valleys still remain as the water tables are not high enough to cause surface run off (Grapes, Bradley and Petts 2005). Whilst there is evidence of streams in some of the dry valleys during the Late Devensian and Holocene it is unlikely that their initiation and main development was accomplished in temperate conditions, regardless of the amount of rainfall (Catt and Hodgson 1979). Larue has proposed that the dry valleys present in the Pays de Thelle, which are similar to those in Britain, were caused by a higher water table with increased run off. The ravine-like incisions observed in the dry valleys are suggested as being caused by permafrost conditions in the Quaternary, providing a barrier to percolation and causing water run-off to incise the valleys. The up-stream sections of the dry valleys, which one could possibly correlate with those in Britain, contain infillings of a thin coarse alluvial sheet of periglacial origin, overlain by alluvial and colluvial sandy silt deposits, although the ages of these are debated (Larue 2005).

Catt and Hodgson (1979) also noted that the large concentrations of 'coombe' deposits (gelifluсted frost-shattered chalk [Catt 1988:72]) present in and at the reaches of the dry valleys is similar in volume to the sediment that may have been displaced from the dry valley network. Their explanation, similar to Larue's, advocates a periglacial origin. The permafrost blocked surface drainage and caused frost-shattering in the upper chalk layers, thus creating a weakened surface which was easily eroded by solifluction and torrential streams resulting from rapid summer thaws (1976). This has been further substantiated by the work of Murton and Lautridou (2003), who identify the interplay between bedrock and ice development as a key component in the rather rapid development of valleys during periglacial periods.

As a result, dry valleys are seemingly a periglacial phenomenon, but the question still remains regarding their date of origin. It is possible that they developed reasonably early and so progressively deepened through successive glacial/interglacial cycles. The large scale of the dry valleys does suggest repeated periods of erosion and incision. However, in terms of clear dating evidence, the lowest deposits tend to date to the Late Devensian/Holocene (Preece 1992:177). The problem here is that should these valleys have formed during earlier periods, the successive erosion and deepening would have removed traces of previous sediment input. Therefore the exact dating of their first development is very difficult to determine.

The outcome of this is that the dry valley network may or may not have been present at the time of hominin occupation of these uplands, with the dating evidence being so sparse. However, Wymer did consider these features to have been in place during the Middle Pleistocene (1999:48), although it is unlikely that the channels would have contained water. If they were indeed dry they would have functioned as a corridor network, facilitating access to areas of the landscape for both hominins and animals. These plateau sites therefore might have served as viewing platforms for game.

3.3. The Chiltern sites

3.3.1. Location and Nature of Discovery

The upland plateau formed by the Chiltern Hills begins in the Thames valley near Reading in the southwest, and terminates near Hitchen in the north. The sites of concern here are located at the north-eastern end of this range around Luton and Dunstable, and are positioned on interfluves between the dry valley systems of the Chalk (Smith 1894). In the nineteenth and early twentieth centuries the area was heavily exploited by the brickmaking industry. They targeted the fine-grained ‘brickearth’ deposits filling these solution features, providing an ideal opportunity for site discovery (Smith 1894). In total fourteen sites were discovered between 1886 and 1917 and were intensively monitored by the notable antiquarian Worthington George Smith. The largest and most well-known of these sites, Caddington (TL 050193), Gaddesden Row (TL 028134), Round Green (TL 102226), and Whipsnade (TL 03351763) (figure 3.1 and 3.4) all produced sizeable collections of artefacts of relevance to the present study. These will be discussed in more detail below (White et al 1999; White 1997).

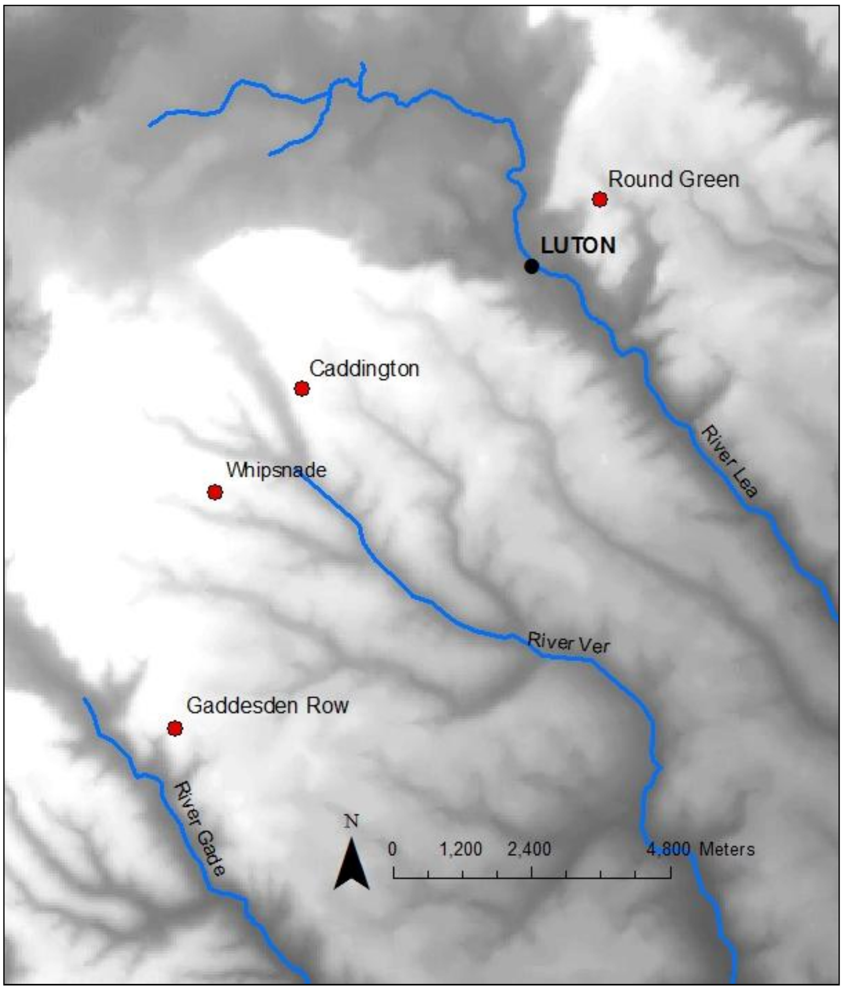


FIGURE 3.4 - LOCATION MAP, SHOWING THE MAIN CHILTERN UPLAND SITES AND LOCATION IN RELATION TO THE PRESENT DAY RIVERS

3.3.2. CHOICE OF STUDY AREA AND SITES

In view of their early discovery, these important sites could be argued as suffering from a variety of problems. However, Smith was a dedicated antiquarian, regularly visiting the brick pits in the district (sometimes even daily), until 1915 (Dyer 1978). In many ways he was ahead of his time in view of the methodologies employed. Diggers were trained in the identification of artefacts at the main locations, and unusually for the time, he also focused on recovering all aspects of the assemblages, including trimming flakes. The only exceptions are the larger cores and blocks which were noted as being too heavy for him to transport home (Smith 1894; Sampson 1978a).

Whilst these factors make for an unbiased collection in terms of the representation of artefacts, there are some inevitable problems. It was noted that the combined factors of the tenacity of the clay—frequently occurring in large lumps—and the use of shovels compared to modern excavation techniques and sieving procedures, may have obscured some artefacts, especially the smaller artefact fraction (Sampson 1978a; Smith 1894; 1916). Regardless of this fact, these assemblages do provide a good representation of the artefact types discarded at these points in the landscape – and microdebitage is not a focus for this study.

That said, it is still necessary to demonstrate that the assemblages are still in primary context, having undergone relatively little post-depositional movement. With regards to the immense earth-shifting disturbances produced by the glacial advances during the Pleistocene, it should be noted that the Chilterns represent a discrete area which was never fully glaciated (Sampson 1978a; 1978b). The ice sheets appear to have flowed around the upland area, rather than traversing it (White 1997). Nevertheless, whilst the sites escaped mass glacial disturbance and movement, the impact of periglacial conditions at the time would certainly have led to some mixing of the deposits (Murton and Lautridou 2003). Secondly, the nature of these dolines would have protected and encapsulated the artefacts close to their point of discard. Thirdly, the positioning of these sites on plateaus or very mild slopes negates the theory that artefacts could have been washed or soliflucted in from any great distance, as most likely was the case with the river valleys or sites situated below higher ground. The only exception to this is the contorted drift, which was introduced through solifluction processes (White 1997:915).

In addition to the larger and more important of Smith's sites, there are smaller localities (Category 2) such as Slip End (TL 082188), Ramridge End (TL 101229), Kensworth (TL 032190) and Mixies Hill (TL 101229) (Smith 1894; Smith 1906; Dyer 1978), which contain assemblages too small to integrate fully. However, these smaller sites will be included in the Geographical Information Systems landscape investigations, thereby adding to the larger picture of landscape use (see chapter 6).

3.3.3. Site Formation and Geology

Whilst a comprehensive discussion of the development of doline features has been included above (section 3.1), this section will discuss the specific sedimentary succession in this particular area. Avery et al.'s (1982) study of brickearth sequences in the Chilterns (including sections from Caddington and Gaddesden Row) confirmed that these sites are contained within brickearth deposits encapsulated within solution hollows. The number and types of successive overlying layers are locally variable, further highlighting the inconsistency involved in the formation processes in such features. However, the general sequence for this group of sites can be summarised as brickearth layers infilling the funnel, overlain by deposits of mottled silty clays and flint gravel, mixed with lenses of brickearth and clay.

In this area, the formation of these sediments began with the deposition of the Reading Beds over the Upper Chalk bedrock. The Reading Beds were subject to sub-aerial erosion and cryoturbation (Catt and Hodgson 1976; Catt and Hagen 1978), developing layers of mixed deposits and a thin permeable parent layer. This weathered material incorporated stones and fragments from the underlying chalk, forming superficial deposits which have been referred to variously as Plateau Drift and Clay-with-flints. There has been much confusion over the designation of these sediments. However, clay-with-flints seems to be found at a lower level, as clay washes down, mixing with fragments and flint clasts from the chalk. The plateau drift, a stonier brickearth deposit comprising larger particles, forms above (Loveday 1962;

Hodgson et al 1967). The water washing over outliers of the parent deposit would have percolated through the chalk at the weaker points, dissolving it to form cavities into which deposits slumped creating solution hollows as described above (section 3.1). Fine sheetwash sediment carried by the water during warmer periods would have been caught by the lining deposits (Clay with Flint and Plateau Drift) building up to form brickearth. This deposit was later covered by soliflucted flint gravel or brickearth from the surrounding area, and capped by Devensian loess probably introduced from the North Sea Plain (Sampson 1978; Avery et al. 1982; Catt et al. 1978).

This explanation is corroborated by the mineralogical and micromorphological analysis by Avery et al. (1982), confirming brickearth at Gaddesden Row as being derived from the local Reading Beds, with a finer clayey component introduced through percolating water. The samples from Caddington and the other non-archaeological sites in Avery et al.'s study (1982) suggest that later layers of brickearth may be of Devensian origin. Deeper deposits are derived from Anglian loess, probably blown into the dolines during colder periods, or later eroded from the landscape and carried via streams into the solution hollows, providing a *Terminus Anti Quem* for the archaeology. The layers within the features are formed through variable introduction of material, depending on the sediment load of the percolating water, with larger particles staying at the top and the clay fragment filtering further down (*Ibid* 1982).

As the clay component filtered through and built up in the bottom of the feature it would have created an impermeable layer, forming temporary ponds providing a variety of resources that would have attracted hominids (Catt et al. 1978). Artefacts would have been deposited on the margins of the ponds which over time would have moved downslope or been washed into the dolines (White 1997; White et al. 1999).

3.3.4. DATING

The dating of these sites is problematic due to the age of their discovery, compounded by poor soil conditions producing little supporting environmental and faunal evidence. The later collection of such material was prevented in many cases by the total removal of the sediment for brick making, rendering it impossible to relocate Smith's original artefact layer (Wymer 1980; Bridgland and Harding 1989).

However, some inferences can be suggested through typological considerations and analysis of the sediments. The artefactual material is Lower Palaeolithic in character, and although there is evidence of a small Levallois component, this is only present at one pit (South Site) (Bradley and Sampson 1978). On this basis the date range for the main artefactual deposits at these upland plateau sites is between MIS 13 and MIS 9.

Looking at other lines of evidence, the artefacts from Caddington and the other sites are recorded as being located within a considerable depth of brickearth, suggesting that their date is older than the Devensian (Avery et al. 1982:154). This is backed up by Avery et al.'s study (1982) of the mineralogical component of the brickearths. They suggested that brickearth deposits and lenses further up the sequence probably incorporated Devensian loess. The deeper brickearth deposits analysed at Caddington and Gaddesden Row demonstrated derivation of the loessitic component from the Reading Beds and Anglian loess (see above). This has been interpreted as being indicative of occupation by hominids during the Hoxnian (MIS 11) (Avery et al. 1982:171). However, we cannot place the sites securely within the Hoxnian, but in a bracket of MIS 11 to 9 providing a general timeframe for occupation of these environments.

3.3.5. Environment

The general discussion about the environment surrounding these sites will be based on data obtained from Caddington and the Rackley site. The dolines, as has been mentioned above, were infilled during a temperate phase. The deposition of the artefact layer is suggested to occur in the final phase of infilling, which has been argued by White (1997) to date towards the end of a temperate episode within a colder more open environment. This interpretation correlates with the pollen data and environmental information procured from the 1971 excavation of the Rackley site discussed below (Sampson 1978b).

There is no direct evidence of the environment from the Cottages site due to the age of the original excavation and acidity of the deposits. However, the nearby site of Rackley, which is only 150m from Smith's 'floor' (Campbell and Hubbard 1978), was investigated by Campbell and Sampson in 1971 and provided some inferences (1978). Layer eight from the Rackley sequence was correlated to the Cottages floor level by pollen comparisons with sediment stuck to one of the flakes (Campbell and Hubbard 1978).

The succession presented at Rackley suggests that the landscape was becoming more open with herbs, grasses and pine becoming more common as oak numbers declined (Campbell and Hubbard 1978). At the time of occupation the local surroundings are suggested as being mosaic with open grassland combined with mixed woodland with a marsh or pond nearby (Catt et al. 1978; White 1997).

In terms of fauna, Smith has described evidence of brown bone shadows which were present at most of the Chiltern sites, including Caddington (Smith 1894). These were also recorded in layer eight at Rackley where antlers indicated that deer were present around the time of hominid occupation (Campbell and Hubbard 1978). The species identified included Elephantid, Rhino and Cervids (Campbell and Hubbard 1978:56).

Whilst the evidence from Rackley does appear to correlate to the artefact layers from Caddington, recent work at Westcliffe, Kent, has served to develop a better understanding of the formation processes of these sites, and could potentially cast doubt on the reliability of pollen sequences obtained from such brickearth layers. This will be discussed more fully in the relevant section below.

3.3.6. CADDINGTON, BEDFORDSHIRE

Worthington Smith's flagship site (TL 050193; table 3.2) was located 3km to the south-west of Luton, on a plateau 162-181m OD, almost midway between the River Lea to the north-east and the River Ver to the south-west (White 1997). This is the most prolific of Smith's upland locations and has been the subject of substantial reinvestigation. The Caddington 'site' actually comprises a number of separate pits collected around the village (figure 3.5). There are two other Lower Palaeolithic locations in the immediate vicinity, Kensworth (5km) to the west and Whipsnade to the (4.5km) south-west, close to one of the dry valleys which dissect the plateau (figure 3.4).

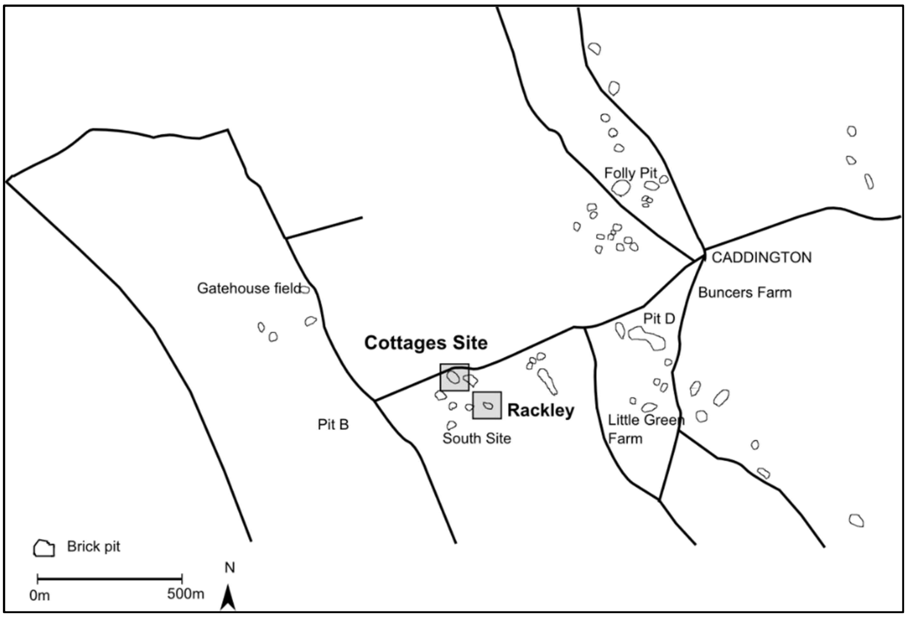


FIGURE 3.5 - LOCATION OF ALL THE CADDINGTON BRICK PITS. THE HIGHLIGHTED SECTIONS SHOWN BOTH THE LOCATION OF PIT C (THE COTTAGES SITE) AND THE LATER INVESTIGATIONS AT RACKLEY. REDRAWN FROM SAMPSON 1978A, FIGURE 1.2 P5.

The site was first identified in 1888, and seven artefact-bearing localities in and around the village of Caddington were kept under surveillance by Smith for more than twenty years (Smith 1894; Sampson 1978a; White 1997). The largest of these locations was Pit C, later incorporated into what was termed by Campbell and

Sampson as the Cottages site (figure 3.5). Here in 1890, Smith located what he termed the "floor" and closely supervised its excavation for the next two years (Campbell and Sampson 1978; Smith 1894; Sampson 1978a). Further investigations were conducted by Dyer in 1954 and by Sampson et al. in 1971 (Sampson 1978a). This latter excavation located undisturbed brickearth deposits beneath what had, at the time, been the brickworks kiln (the Rackley site). However, both these attempts failed to relocate the Palaeolithic 'floor' (Avery et al. 1982; Campbell and Sampson 1978; Sampson 1978b), and it is assumed to have been totally removed.

Site Formation and Geology

The sedimentological sequence can be seen in the sections published by Bradley and Sampson (1978) (see figures 3.6 and 3.7), and was also recorded by Avery et al. (1982). It begins with brickearth infilling the depressions in the chalk bedrock. These deposits are then overlain by sub-angular and mottled silty clays, followed by flint gravel showing evidence of cryoturbation. This is mixed with brickearth and clay deposits and the sequence is capped by a subsoil of flinty clay or silty clay. These deposits dipped towards the centre of the feature (Avery et al. 1982), demonstrating that it was still active during and after the deposition of the layers. This is similar to the dipping observed in the cobble layer at Westcliffe in Kent (see section 3.4.10).

The artefacts on the 'floor' were located within the lower brickearth deposits, on what appears to be (certainly in section 2 on figure 3.6) a horizontal, relatively stable layer, with little dipping. When coupled with the suggestion that the site contains relatively *in situ* scatters, this perhaps suggests that part of the doline either collapsed in as a single block of material, or was subject to a steady lowering of the landsurface on a relatively flat plain. This becomes especially apparent when compared to the sloping cobble layer, observed at Westcliffe (section 3.4.10; figure 3.24). It must be considered that inferences regarding the position of Smith's 'floor' are based on drawings made at the time, which show the section in strike, rather than transverse. Despite this proviso, it is likely that the degree of integrity of any archaeology contained within these hollows is variable, depending on the solution and slumping processes acting at individual sites.

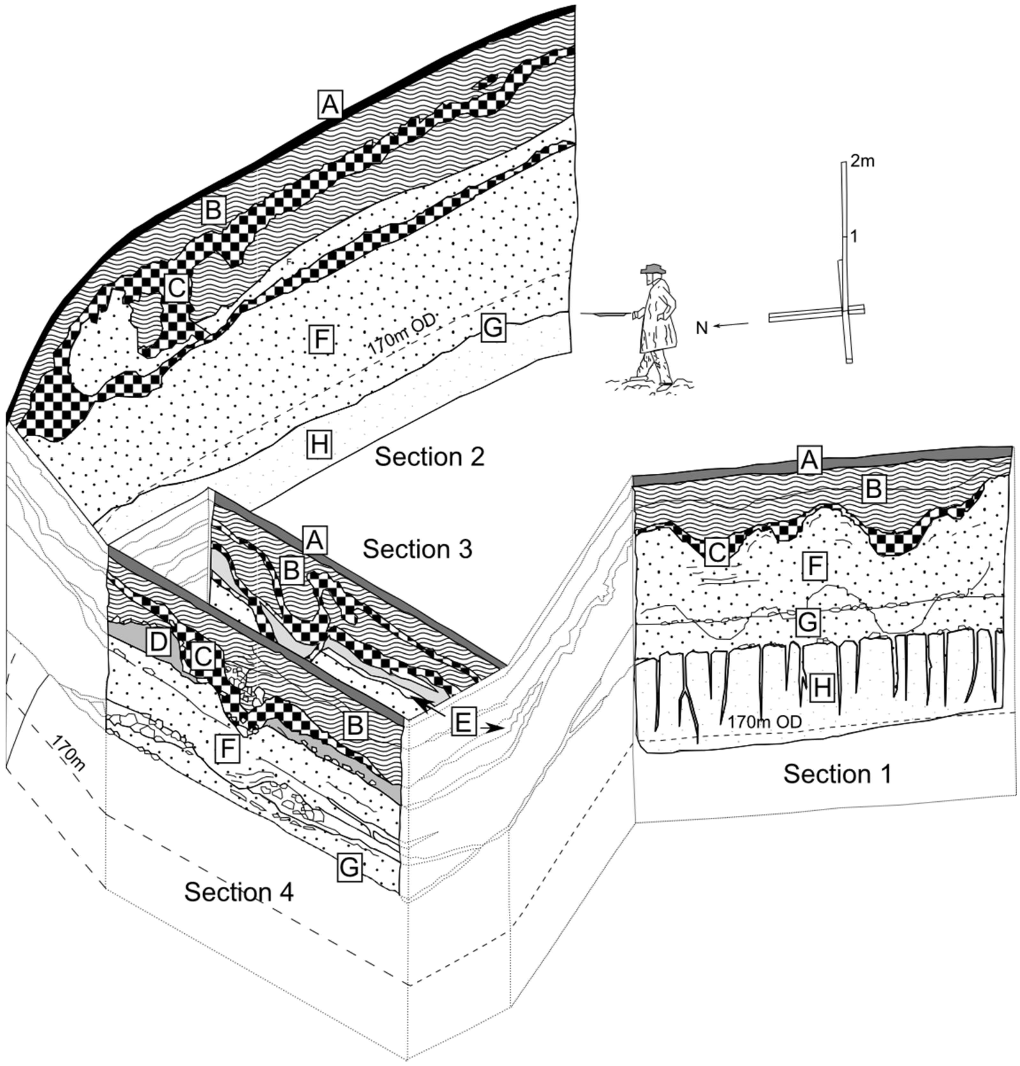


FIGURE 3.6 – ISOMETRIC DIAGRAMS SHOWING CORRELATIONS OF SECTIONS 1 TO 4 AT CADDINGTON. REDRAWN FROM CAMPBELL AND SAMPSON 1978, FIGURE 6.11 P76. DEPOSITS: A – SURFACE MATERIAL; B – RED BROWN DRIFT CLAY OR LOAM; C – CONTORTED RED BROWN GRAVELS; D – GREY WHITE CLAY; E – RED BROWN SHEET GRAVEL; F – BRICKEARTH; G – FLOOR; H – BRICKEARTH. TERMINOLOGY AFTER SMITH (1894).

ARCHAEOLOGY

The Cottages Site (Pit C) material was chosen because it is the best researched and understood of all the pits, and a large number of the artefacts can be securely related to it. We can also assume for the purposes of the study that the assemblage is representative, as Smith watched the site carefully for many years, operating an unbiased collection strategy. Although parts of the collection were handed out to museums and interested parties, the losses sustained through dispersal are, arguably insignificant (at least according to Sampson 1978a).

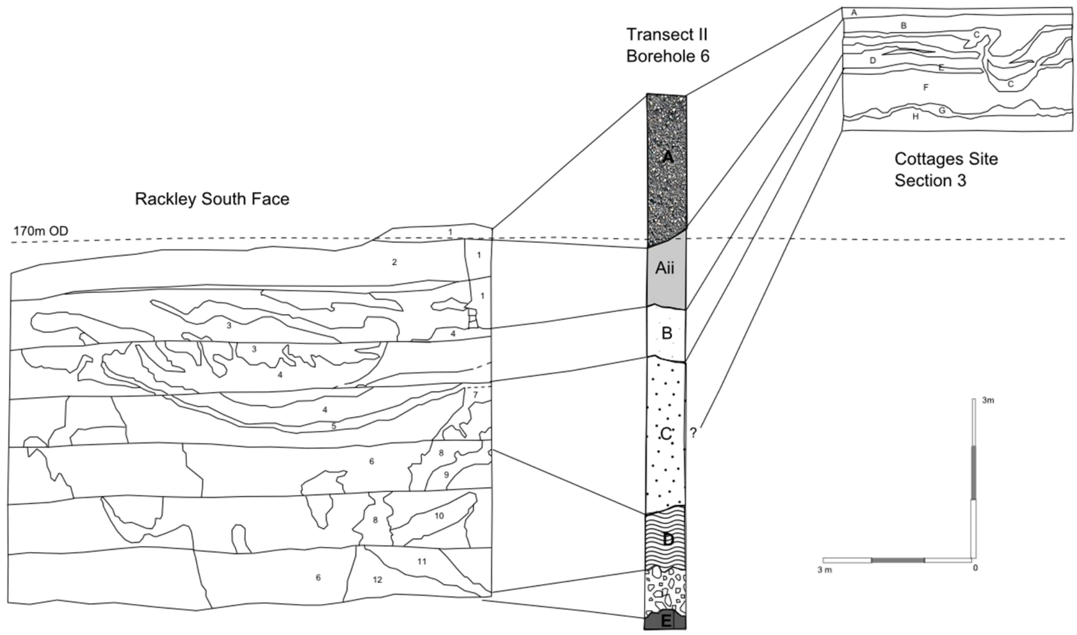


FIGURE 3.7 - TENTATIVE CORRELATION OF RACKLEY SOUTH-FACE, BOREHOLE 6 OF TRANSECT II, AND SECTION 3 OF THE COTTAGES SITE. REDRAWN FROM CAMPBELL AND SAMPSON 1978. FIGURE 6.14, P81.

Data for this site has been collected from two sources. Firstly, primary analysis was undertaken on all the tools, debitage, and refits housed in the British Museum. In addition, it includes a sample of sixteen out of the twenty-nine boxes at Luton Museum. Therefore, this should be representative of the overall typological composition of the assemblage. Furthermore, full typological counts have been published for the Cottages site by Bradley and Sampson (1978), allowing comparisons between this data and the primary analysis, in order to determine whether any typological differences occur. The published data, however, does not contain detailed cortex information, hence the preference for the primary data analysis. Whilst in general the typology between the two matches, some types are not represented in the analysed sample. Therefore, the data from Bradley and Sampson (the full typology [1978]) will form the main analysis, with cortex data taken from the sample of 368 artefacts from the primary analysis of the Cottages floor.

The presence of sharp or fresh artefacts coupled with a considerable number of refits identified by Smith (Roe 1981; Smith 1894; Sampson 1978), further emphasises the primary context of the artefacts. Many refits are spatially dispersed, though, suggesting some degree of re-working or disturbance (White 1997), as would be expected from such a depositional location. Additionally, according to Smith, flakes were found around a number of large heaps, with implements, cores, punches, and a variety of other material (Smith 1894). There is some debate as to whether the clumps of material are actually the result of Palaeolithic man's efforts, or a consequence of material movement within the matrix or pond (White 1997). However, the floor also contained a number of discrete clusters of knapping episodes, reconstructed in the later study, which further emphasises the *in situ* character of the site (Catt et al. 1978).

When viewed in context with our increased understanding of the formation process of such features through the work at Westcliffe (section 3.4.10), the evidence from Caddington does point towards the possibility of a combination of catastrophic collapses (possibly responsible for the collection of knapping scatters and apparent coherence of the 'floor') and more slow, general lowering of the sediments and gradual slippage into hollow (see discussion in section 3.1).

While we may have a deficit of cores (see above), replication experiments suggested that these may well have been rare at Caddington (Sampson 1978a). Therefore, it is debatable whether a lack of larger debris is due to collector bias or an actual deficit in the archaeological record. However, for the purposes of this study we do know from Smith's records that these blocks and tested nodules were present, which allows us to consider their significance and place within the chaîne opératoire at this site.

3.3.7. Gaddesden Row

The site of Gaddesden Row, Hertfordshire (TL039136; table 3.2), is the second of Smith's high-level brickearth sites. It is situated (10km) south-west of Luton at a height of 166m OD (White 1997), on a plateau - in what Evans termed 'table-land' on the interfluves between the River Ver and the Gade (Evans 1908). The site is the most south-westerly of the group, located only 1km from the River Gade, with the nearest site being Whipsnade, located 4km to the north (figure 3.4).

Discovered in Butterfield's Pit, Gaddesden Row (figure 3.8) around 1890, the site was observed over a period of ten years by Smith (Bridgland and Harding 1989; Dyer 1978; White 1997). Although the assemblage constitutes a primary working site, comparable in type with Caddington (above), it is by no means as prolific (Bridgland and Harding 1989). Following the re-excavation of Caddington there have been recent attempts to relocate Smith's 'floor' here. The first was by Wymer in 1975 (figure 3.8), which only located a few derived artefacts (Wymer 1980). During this work, a number of sedimentological samples were taken by Avery et al. (1982) (mentioned above), which served to further advance our understanding of the formation of the deposits. Secondly, in 1988 Bridgland and Harding opened two sections, locating the clay-with-flint walls of the solution feature, but not the 'floor'. They concluded that the original hollow and remaining brickearth deposits had been completely worked out (1989). A third and final small-scale excavation was undertaken in 1999 by White et al. This, despite identifying areas of brickearth which still existed, also failed to relocate the artefact bearing layers (White unpublished notes).

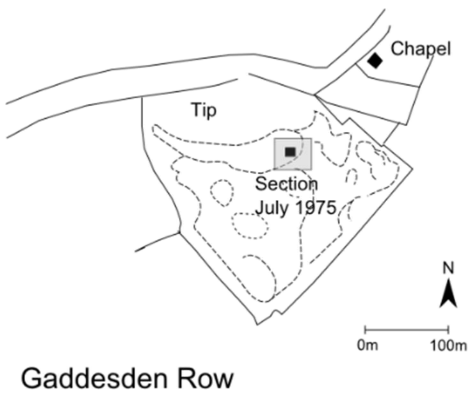


FIGURE 3.8 - LOCATION OF THE PIT AT GADDESDEN ROW AND THE 1980 SECTION AT GADDESDEN ROW. REDRAWN FROM WYMER 1980. FIGURE 1, P3.

The formation and sequence of the deposits from Gaddesden Row follow a similar structure to other sites in this area (figure 3.9). As mentioned above, the data obtained from geological investigations at Gaddesden Row during Wymer's 1975 excavation was utilised by Avery et al. (1982) to determine the formation and depositional histories for solution hollows in the area (see above). However, Wymer's (1980) published section gives specific details of the deposits and sequence at this particular site. The deposits comprised: reworked and deposited topsoil, over (1) a pale loessic-like silt with mixed flints. This sits above (2) a gravel layer in silty-loessic matrix, with (3) an ochreous, mottled silt-brickearth containing a few flints below this. This layer grades into (4) a paler sandier brickearth/silt which rests on (5) a Clay-with-flints deposit dipping into the body of the hollow (figure 3.10) (Wymer 1980).

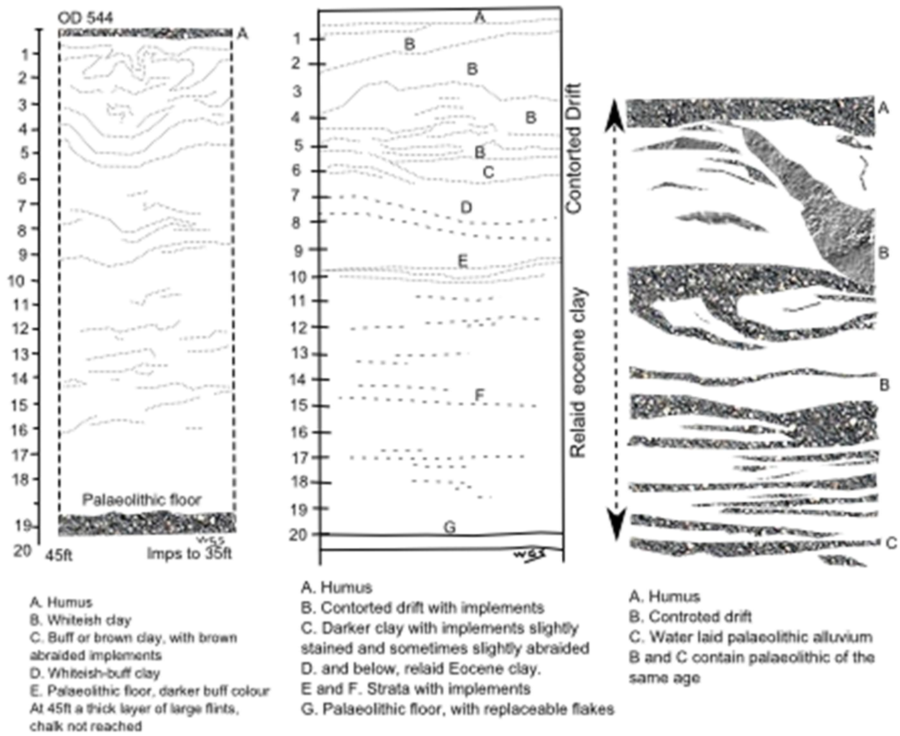


Figure 7. Worthingston Smith's published sections from Gaddesden Row (After Smith 1916).

FIGURE 3.9 - SMITH'S ORIGINAL SECTION DRAWINGS FOR GADDESDEN ROW, REDRAWN FROM WHITE 1997, FIGURE 7,P923.

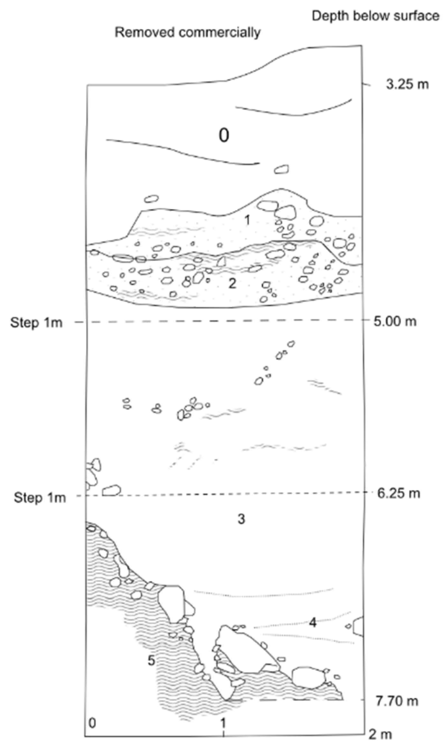


FIGURE 3.10 - SECTION DRAWING FROM THE 1975 EXCAVATION AT GADDESDEN ROW, REDRAWN FROM WYMER 1980, P3

ARCHAEOLOGY

The data collated for this study comprises 98 artefacts, representing all the objects held in St. Albans Museum and the British Museum (all that remains of the original collection (pers. comm. Mark White). As a result of unknown losses, in addition to the taphonomic and collector bias as discussed previously (section 3.3.2), the assemblage recovered from Gaddesden Row could potentially prove problematic. For instance, anecdotal evidence suggests that some of the material was stored in a shed after Smith's death, and it is not clear whether these were ever recovered (Sampson 1978). Furthermore, there appears to be a discrepancy between the totals of artefacts recorded as coming from the Palaeolithic Floor by Roe in his gazetteer (n=150) (1968:121) and the totals recorded in Smith's list of Palaeolithic Implements which counts 86 pieces. Nevertheless, it is likely that Smith's list of implements would not have included totals for flakes and debitage, only recording what he termed 'implements' (Smith unpublished; Roe 1968). Thus, whilst there have no doubt been losses over the years, Smith did bequeath many of his tools and cores to the British Museum. Consequently any loss is likely to be restricted to the debitage and a very small number of tools.

Another factor worth mentioning is that, according to Roe, Gaddesden Row has more bifaces recorded than any of Smith's other sites, but by contrast it has the fewest recorded pieces of debitage (Roe 1968; White 1997). On the one hand, this could suggest that the majority of debitage has been lost. On the other, the paucity might reflect an actual assemblage variation, suggesting that manufacture of the bifaces took place elsewhere (White 1997). These two opposing interpretations are difficult to resolve. There was likely plentiful raw material available on-site, which serves to question the latter hypothesis regarding the introduction of bifaces onto the site (White 1997). Nevertheless, it is possible that a more complex behavioural system was in place, focusing on mobility strategies and the provisioning of finished tools to certain spots in the landscape. Therefore, taking a wider landscape view might serve to elucidate this matter.

While Smith's commitment to and enthusiasm for the sites he found cannot be questioned, we need to consider the potential losses the collection sustained over time. These factors could be detrimental when using these artefacts in a detailed study. However, the methodologies employed in this research serve to mitigate this deficit by focussing on general categories and the presence or absence of artefact types, rather than detailed statistical analysis (section 2.5).

3.3.8. Round Green

The site of Round Green, Bedfordshire (TL 101226; table 3.2) is located at a height of 162m OD (White 1997) on a plateau with the River Lea 2km to the south-west. It is grouped together with two smaller upland Palaeolithic sites: Mixies Hill and Ramridge End 1km to the north-east, around the head of a dry valley which joins the River Lea to the south (figure 3.4, figure 3.11).

The site was identified when a newly dug claypit, located to exploit a hidden brickearth pocket, revealed the presence of an *in situ* knapping floor. In a comparable situation to the previous two sites (above), Smith again appears to have been vigilant, visiting the site at least once a week (Smith 1916). Furthermore, the workmen also appear to have been both willing and meticulous, according to Smith's account, showing every piece of flint to the foreman, who kept them aside until Smith's next visit (Dyer 1978).

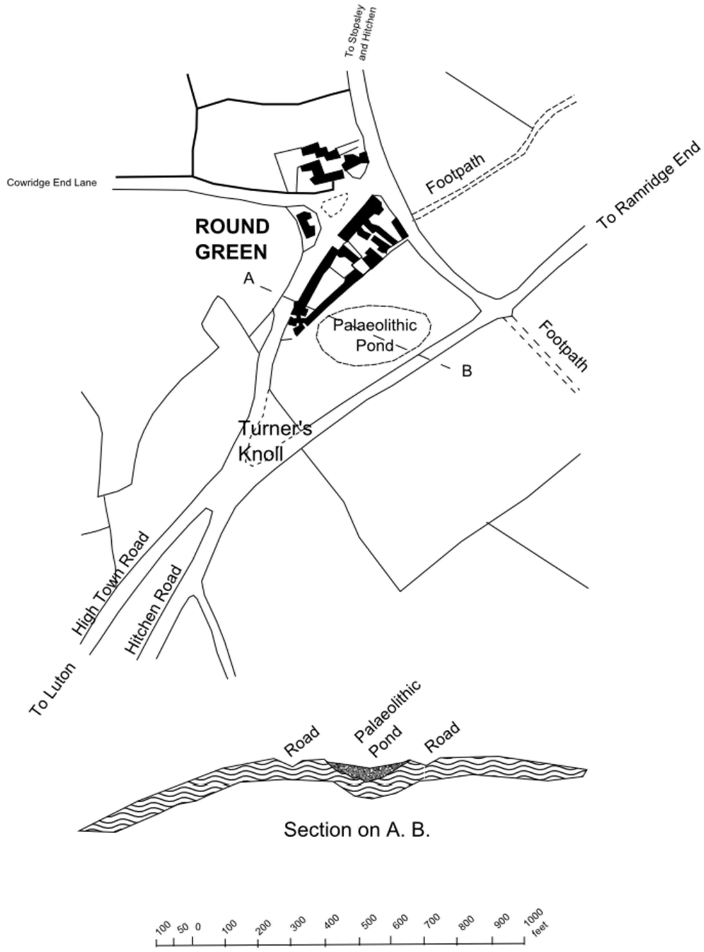


FIGURE 3.11 - LOCATION OF THE ROUND GREEN BRICKPIT AND SMITH'S EXCAVATIONS. TAKEN FROM WILLIAM AUSTIN'S HISTORY OF LUTON - MAP REDRAWN FROM BEDFORDSHIRE COUNTY COUNCIL WEBSITE – WEB 1.

SITE FORMATION AND GEOLOGY

The sequence at Round Green again follows the standard pattern for these sites: a basal layer of Chalk, overlain by around 25 feet of brickearth and capped by contorted drift (Smith 1916; White 1997). Indeed, the section drawn by Smith (figure 3.12) denotes several layers and marks the position of the artefact bearing layers within the sequence of deposits:

A – Upper Chalk.

B – Layers of flint – b1 Clay-with-flints, b2 Chalk with flints.

C – Stratified brickearth

D – Palaeolithic floor

E – Washings of brickearth.

F – Contorted Drift

G – Humus.

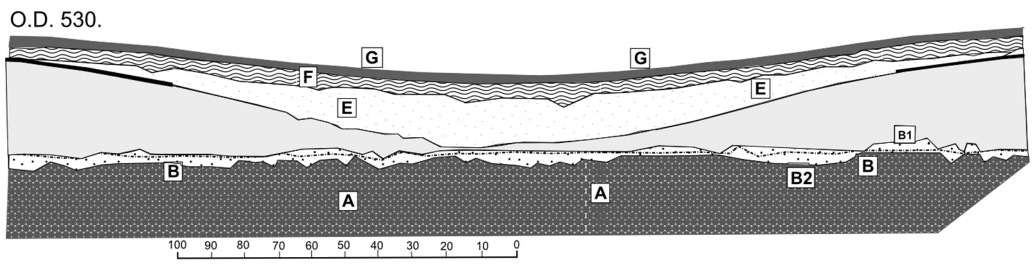


Figure 3. Smith's published section of the Round Green sequence. (After Smith 1916).
The lettered items are the original key: A - Upper Chalk; B - Layers of flints; B1 - Clay-with-flints; B2 - Chalk-with-flints; C - Stratified brick-earth; D - Palaeolithic floor; E - Washings of brick-earth; F - Contorted drift; G - Humus.

FIGURE 3.12 - SMITH'S PUBLISHED SECTION DRAWINGS OF ROUND GREEN, REDRAWN FROM WHITE 1997, FIGURE 3. P919

ARCHAEOLOGY

The assemblage from Round Green, used in this study, comprises 282 artefacts: the entire extant sample, all stored in the British Museum. However, it is likely that in the intervening years some material has been lost. Consequently, similar to the situation with Gaddesdon Row (above), there are discrepancies between the various artefact counts. Whilst Smith's List of Palaeolithic Implements mentions approximately 28 artefacts, Roe's Gazetteer denotes 342 as originating from the palaeolithic floor.

Following the previous discussion regarding this (above), Smith's number is closest to Roe's count of 21 handaxes, and is therefore unlikely to account for the debitage, cores and flakes (Smith unpublished; Roe 1968:6).

We can be reasonably sure that the majority of artefacts were recovered from the pit, because Smith mentions that at Round Green the "entire stock-in-trade of the pond-side dwellers was exposed, and as far as possible every scrap of worked flint secured" (Smith 1916:68). An additional factor is that it was common practice for the brickmakers to remove the full extent of the deposits. Consequently, the pit would only have been abandoned after all the useful deposits had been cleared (Bridgland and Harding 1989). Therefore, the assemblages presented can be assumed to be complete, or at least representative of the typological composition of the material deposited at the site.

One point to consider, however, is that the number of flake types recorded by McNabb (188 hard hammer flakes versus 71 biface thinning flakes) (McNabb 1992) has been suggested by White (1997) as representing a severe deficit in biface manufacturing debris. In addition to Smith's assurances regarding the extent of working of this pit, and his weekly visits, he described the workers as being 'most vigilant and energetic', duly reporting all artefacts to the foreman, who saved the best for Smith's next visit (Smith 1916). While this suggests that most of the tools would have been collected, the fact that the foreman saved the best for Smith's visits suggests that some of the plainer artefacts, most likely the debitage, were collected but not shown to Smith. This in turn, might explain some of the deficits regarding the handaxe manufacture mentioned earlier.

3.3.9. Whipsnade

The final site, Whipsnade, Bedfordshire (TL 03301759; table 3.2), is located at a height of 180m OD , with the River Ver 1.5km to the north-east, and the River Gade 4km to the south-west (Smith 1918; White 1997; White et al. 1999). It is grouped together with Caddington 4.5km to the north-east and the much smaller site of Kensworth 1.5km to the north, around a series of dry valleys, which feed into the valley of the River Ver (figure 3.4).

Smith first mentions the site of Whipsnade in 1896 in reference to an isolated find of a handaxe in the area. However, the present location, Mr Powdrill's Pit (figure 3.13), was not discovered by him until 1913. This was quite late in his life, when he was close to 80yrs old, so he visited the site only eight times within a two year period. Despite this, the pit still produced a large Acheulean assemblage, due to the fact that Smith had a good rapport with the workmen who saved artefacts in his absence. However, there would certainly have been some losses sustained during the collection of the material (White et al. 1999; Smith 1916). The site was published after Smith's death by Reginald Smith of the British Museum (Smith 1918). Consequently, this could be said to represent a second-hand account. However, Smith's original notes were quite detailed and we can consider this account to be accurate. Between 1992 and 1994 it was re-excavated under the direction of John McNabb, although, in a comparable situation to the later investigations at Gaddesden Row and Caddington (above), it was found that the workmen had removed all the brickearth, leaving only thin layers of the material remaining (White et al. 1999).

Site Formation and Geology

The doline feature at Whipsnade is described as being 45 metres across and at least 6 metres deep (White et al. 1999), containing a similar sequence of deposits to the other sites (above). Originally, Smith had identified eight separate artefact horizons (figure 3.14), which he interpreted as distinct occupations, vertically separated, demonstrating repeated occupation over a length of time. In contrast to this, work by White et al. suggested that these artefact horizons were a by-product of the manner in which the pits were dug, i.e. in stepped sections. Consequently, the single sloping occupation layer appeared in successive steps, giving the impression of multiple artefact horizons (White 1997; White et al. 1999) (figure 3.15).

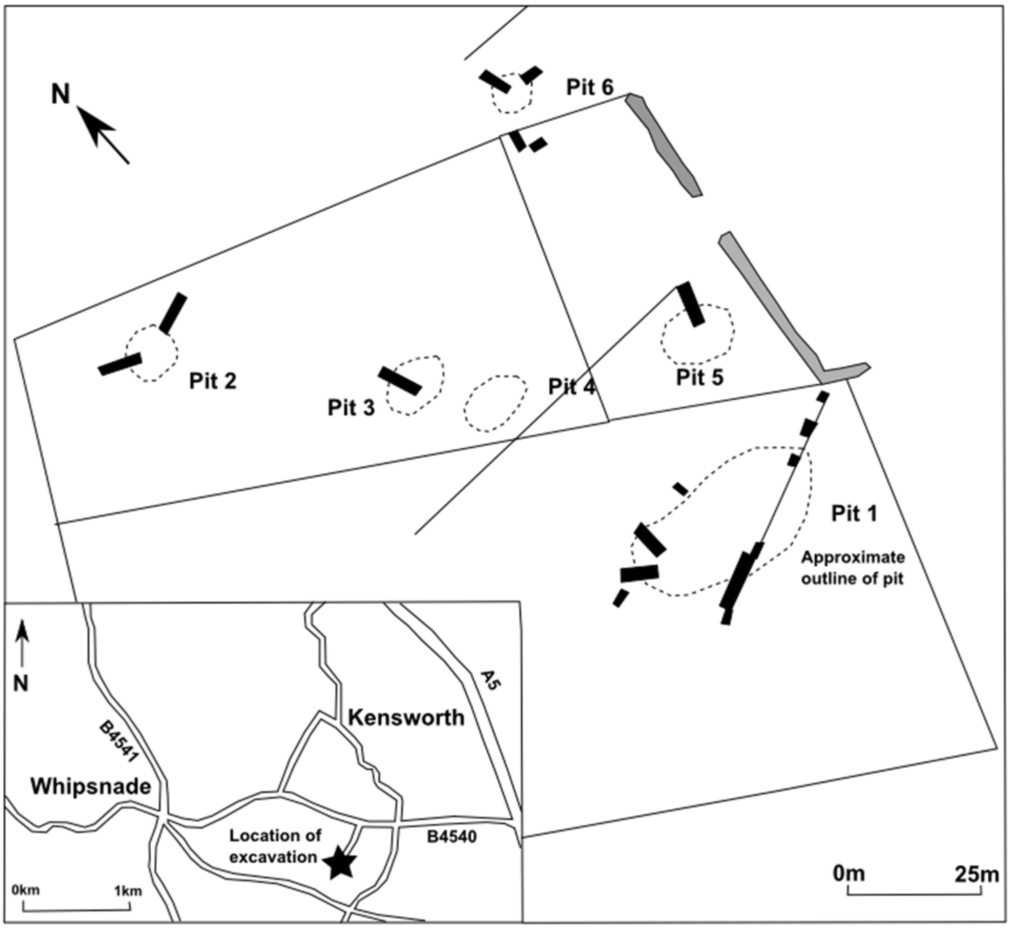


FIGURE 3.13 - MAP SHOWING THE LOCATION OF WHIPSNADE. REDRAWN FROM WHITE ET AL. 1999. FIGURE 3. PP245

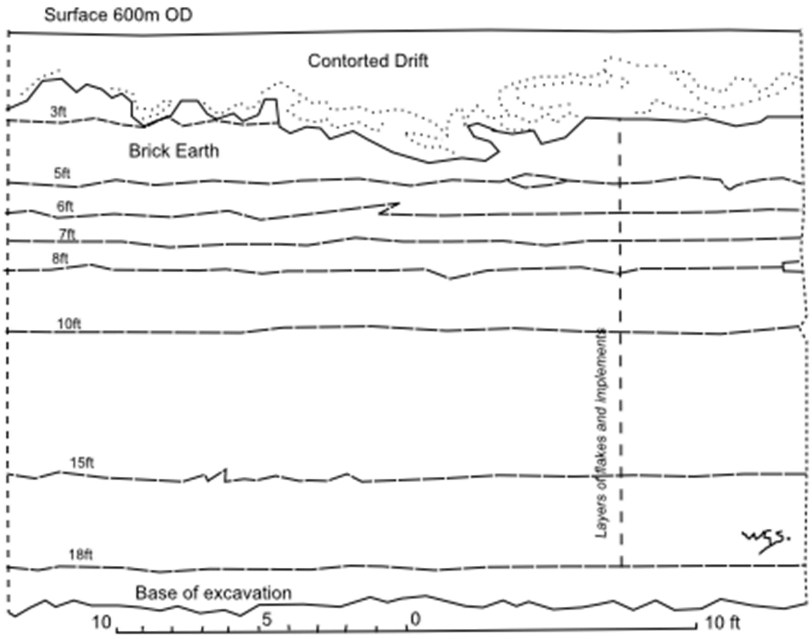


FIGURE 3.14 - SMITH'S SECTION DRAWING OF WHIPSNADE. REDRAWN FROM WHITE ET AL. 1999. FIGURE 2, P243

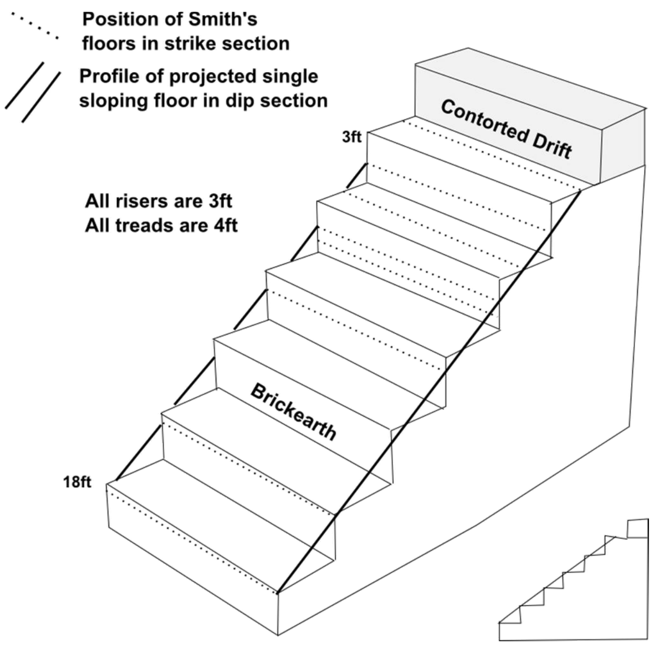


FIGURE 3.15 - DIAGRAM OF ARTEFACT LAYERS IN STEPPED SECTION. REDRAWN FROM WHITE ET AL. 1999. FIGURE 8, PP 249

ARCHAEOLOGY

The data for this site comprises all the extant artefacts relating to Whipsnade stored in Luton Museum and the British Museum. This is assumed to represent all the finds that Worthington Smith made at this site, and totals 196 artefacts. In the same way, as at the other sites, the artefacts are in fresh condition and contain refitting groups, indicating the presence of an *in situ* assemblage (White et al. 1999; Smith 1918). Despite this, it has been suggested, that the number of artefacts recovered is disproportionate, when compared to the size of the pit. This may be a result of Smith's infrequent visits, as although the majority of artefacts were collected by the workmen, it is unlikely that they would have spotted less obvious pieces, e.g. flakes, debitage and cores (Smith 1904, 1916; White et al. 1999). Nevertheless, the deficit of cores may be explained by Smith’s comment, mentioned elsewhere, that he found it difficult to transport the majority of them due to their weight (Smith 1894; White et al. 1999). We can only suppose that this was exacerbated in his later years when working at Whipsnade. On the other hand, if we attribute the small numbers solely to collector’s biases, this does not explain why there are not more handaxes present, since they are the most recognisable tools and therefore are more likely to have been kept for Smith. This is noticeable when considering that when compared to the other sites, Whipsnade contains the lowest number of handaxes, despite the fact that it was of a comparable size to the other pits.

Furthermore, White et al. mention that despite the expected lack of small elements (thinning and finishing flakes), which is most likely due to the method of extraction and clayey conditions, the rest of the flakes comprise a complete spectra of size and cortex representation. This indicates that the assemblage is fairly characteristic of a complete knapping sequence, and is interpreted as representing the remains of several biface manufacturing episodes (White et al. 1999) which took place over a short time on a single floor located towards the top of the brickearth sequence (White 1997).

3.3.10. Smaller Chiltern sites

In addition to the four main sites discovered by Worthington George Smith, there are a number of smaller locations (Category 2) that have yielded artefacts. These will be discussed below, using what little information we have about them. Whilst not contributing to the main artefact study, they are important as locations in their own right, and will be added to the Geographical Information Systems analysis. This will provide an idea of the distribution of find spots across the hills and provide as full a picture of hominin landscape use as possible.

Slip End, Bedfordshire

This site (TL 080185) is located at 153m OD on the plateau mid-way between the valleys of the Lea and the Ver, 4km south-east of the neighbouring locality of Caddington (figure 3.16). It is documented that in 1889, when Smith discovered Caddington, he visited both there and Slip End frequently (Smith 1894). Despite Smith noting that by 1893 he'd located over thirty implements and numerous flakes and cores from the pits at Caddington and Slip End (Smith 1894:95), he doesn't differentiate between these two locations. As a result, there is unfortunately only one implement (a handaxe), recorded as coming from this location in Roe's Gazetteer (Roe 1968:6), with no further artefacts attributed to the site (table 3.1).

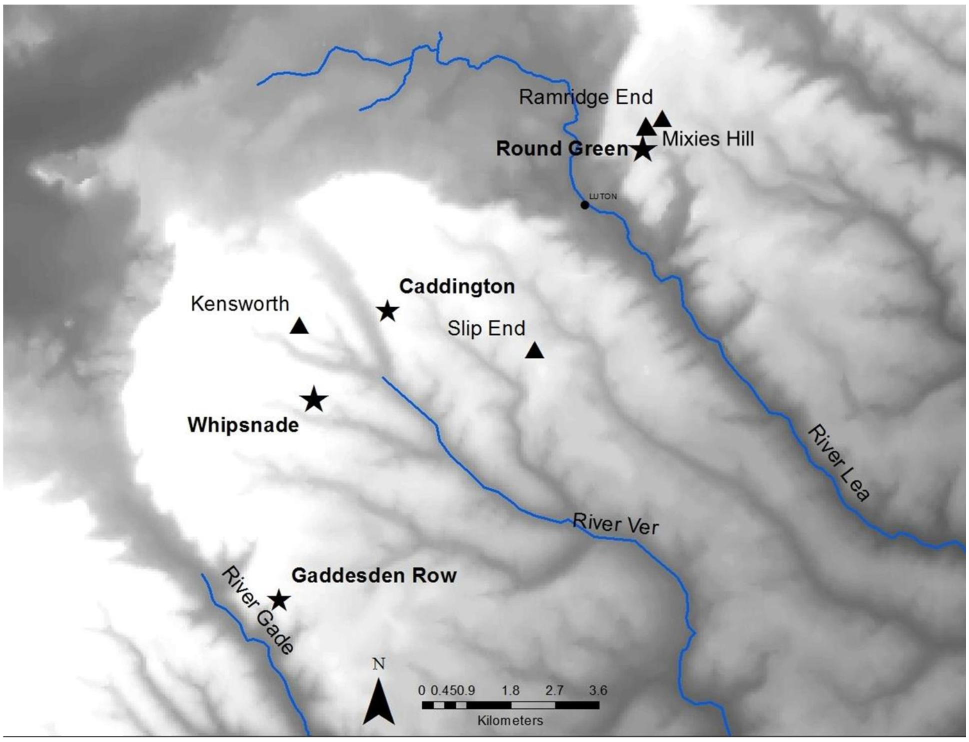


FIGURE 3.16 - LOCATION MAP SHOWING THE MAIN SITES (STARS) AND SMALLER LOCATIONS (TRIANGLES) IN THE CHILTERNS

Ramridge End, Bedfordshire

In close proximity to Round Green and Mixies Hill, is Ramridge End (TL 106232) (Roe 1968:6), located at 159m OD, with the River Lea 3km to the south-west (figure 3.16). Regarding the assemblage, Smith's list of Palaeolithic Implements records two artefacts, whereas Roe's Gazetteer notes a total of 85 originating from this location (table 3.1) (Roe 1968:6). In addition, faunal remains have been recorded at this site by Smith, including deer bones and antlers, although, as with all the faunal remains present in the dolines, they were too friable to be preserved (Smith 1906).

Mixies Hill, Bedfordshire

Mixies Hill (TL 101229) is situated close to Round Green and Ramridge End, at a height of 159m OD (figure 3.16). The only mention of artefacts here is a comment by Smith that one of the labourers working at Ramridge End helped dig out Palaeolithic artefacts at Mixies Hill, and Smith himself found flakes here in 1886 (1916). We have evidence again from Smith's accounts that animal bones were also present, including antlers of Cervus Elaphus at 12ft, and Palaeolithic flakes at 20ft. In addition to the animal bones, it was stated by a workman that a human skeleton had been found at a depth of 22ft, but that the labourers had removed it and the bones had disintegrated (Sampson 1978a; Smith 1906).

KENSWORTH, BEDFORDSHIRE

The site of Kensworth (TL 032190) is located close to Caddington and Whipsnade between the dry upper reaches of the River Ver (figure 3.16). According to Roe's Gazetteer, it is recorded as having produced 29 flakes (table 3.1), however these are spread between two potential locations: the general grid reference above and that of Mount Pleasant (TL 020198). Again Roe records this location as producing flakes but mentions no numbers (Roe 1968:5). For the purposes of this study, the presence of the 29 flakes will be added to the database and list of smaller sites, as it does demonstrate the use of the area by hominins.

Typology	Slip End	Ramridge End	Mixie's Hill	Kensworth
Handaxes	1	11		
Retouched flakes and flake implements		1		
Unretouched flakes		72	Present	29
Miscellaneous		1		
Total	**1**	**85**		**29**

TABLE 3.1 - NUMBER OF ARTEFACTS TAKEN FROM ROE 1968 PAGE 5 AND 6.

<table>
<tr><th>Site</th><th>Assemblages</th><th>Location</th><th>Date</th><th>Environment</th><th>Raw material</th><th>Additional info</th></tr>
<tr><td>Caddington
TL 050193</td><td>Cottages site</td><td>Upland pond</td><td>MIS 11-9</td><td rowspan="4">Temperate, colder more open conditions. Decreasing Oak and increasing herbs, grasses and pine. Mosaic with open grassland and mixed woodland with a marsh or pond nearby. Fauna – deer, elephantids, Rhino.</td><td rowspan="4">Available on site from the clay-with-flint deposits and the outcropping Chalk probably forming the sides of the pond</td><td rowspan="4">Brown shadows at Rackley in layer 8 suggests deer present at time Hominid occupation.
Antler and deer bones identified by Smith</td></tr>
<tr><td>Gaddesden Row
TL039136</td><td>Butterfield’s pit</td><td>Upland pond</td><td>MIS 11-9</td></tr>
<tr><td>Round Green
TL 101226</td><td></td><td>Upland pond</td><td>MIS 11-9</td></tr>
<tr><td>Whipsnade,
TL 03301759</td><td>Mr Powdrill’s Pit</td><td>Upland pond</td><td>MIS 11-9</td></tr>
</table>

TABLE 3.2 - SUMMARY OF CHILTERN SITES

3.4. The North Downs of Kent

3.4.1. Location and Nature of Discovery

The second upland study area is situated south of the Thames basin (figure 3.1). The chalk plateau forming the Kent Downs begins in the south-east near Dover, spreading north-west across the county in a line between Ashford and Canterbury in the south, to Maidstone and Rochester in the north, before curving around south-westwards and terminating at the Surrey border. The sites this study focuses on are located at the south-eastern end of the feature on the plateaus surrounding Dover and Deal. In a comparable situation to the Chiltern sites (section 3.3), these upland assemblages are positioned away from the main river valleys. Whereas in Bedfordshire, the Rivers Gade, Ver and Lea dissect the uplands, the nearest river valleys to the Kent plateau sites are the Dour to the south-east and the Little Stour, bounding the area in the north (figure 3.17).

A program of fieldwalking, set up by the Dover Archaeology Group, has been in operation since the 1980s on these chalk plateaus resulting in the discovery of a series of Lower Palaeolithic sites. The locations are comparable to Smith's famous sites in the Chilterns and have served to highlight the potential importance of such upland assemblages with relevance to hominins' organisational systems and behavioural choices. The main sites in the study area are: Wood Hill, Kingsdown (TR 371480) (Scott-Jackson 2000), Westcliffe St. Margaret's (TR 34624520), Green Lane, Whitfield (TR 29454504), Malmains 1, Eythorne (TR 29054900) and Malmains 2, Eythorne (TR 29405010) (Hoskins et al. 1998; Halliwell and Parfitt 1993; Parfitt and Halliwell 1996). Whilst these will be the focus of the discussion, special emphasis will be placed on the site of Westcliffe St. Margaret's which was recently excavated by a team from Durham University. The work carried out there has direct relevance to our understanding of the formation processes and spatial integrity of the assemblages (Bailiff et al. 2013).

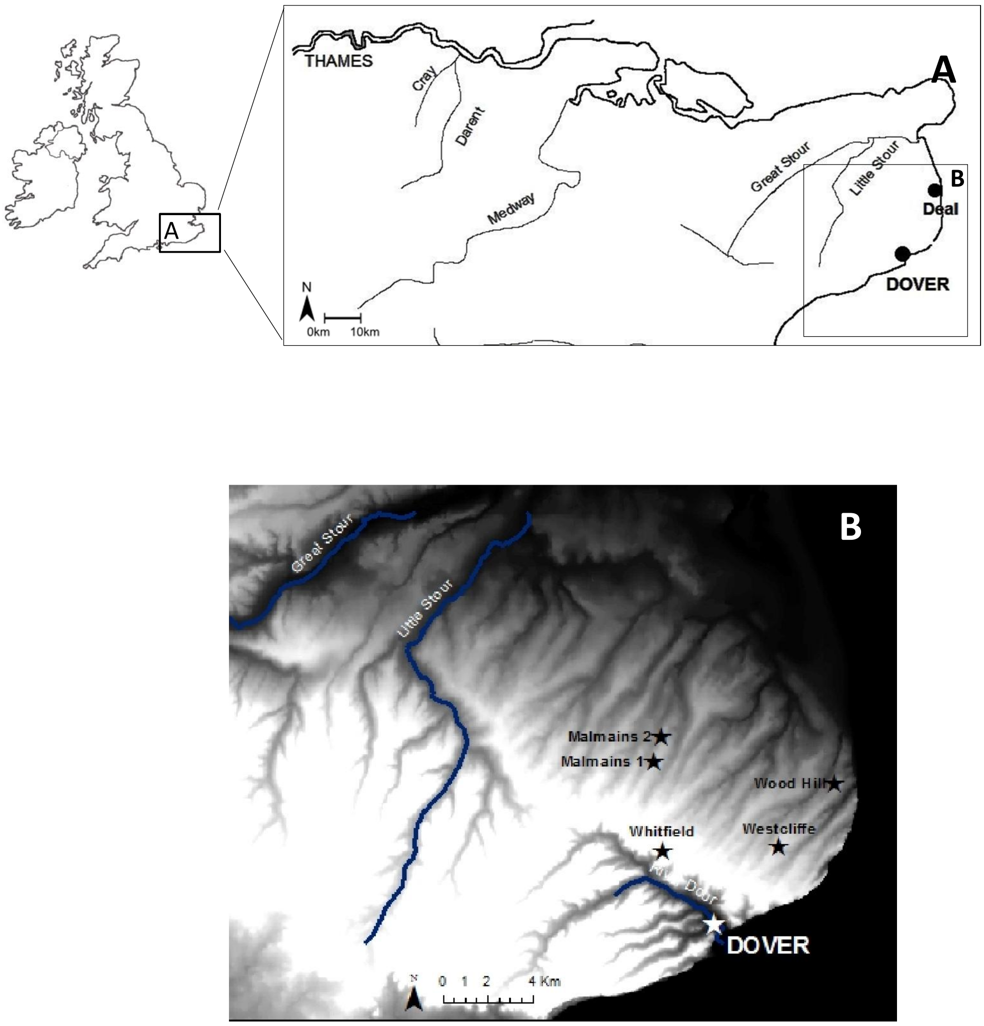


FIGURE 3.17 - LOCATION MAP FOR THE KENT DOWNS, SHOWING THE POSITION OF THE MAIN SITES DISCUSSED IN THE TEXT.

In parallel to the Chilterns, the Kent Downs also contain a number of smaller find spots comprising between one and eighteen artefacts (category 2) (section 3.4.11). These will also be incorporated into the Geographical Information Systems (GIS) (chapter 6) study to provide us with a more comprehensive view of landscape use in this area during the Palaeolithic.

3.4.2. Choice of study area and sites

The sites in Kent represent a largely unpublished dataset, consisting of large, open air, primary context assemblages, subsequently disturbed by modern ploughing. They have been chosen for inclusion in this study because the North Downs represent an un-glaciated landscape (as do the Chilterns), thereby allowing certain assumptions to be made regarding the nature and form of the landscape. It has been argued by Scott-Jackson that the landsurface has remained reasonably stable since the time of hominin occupation, and potentially from the Cromerian period. Furthermore, the downlands lie beyond the extent of the Anglian ice sheets and therefore avoided the extensive disturbance and mass movement associated with glacial action and outwash events (Scott-Jackson 2000:11). However, despite Scott-Jackson's work at Wood Hill, it is highly likely that during cold periods, there would have been some deformation and disturbance of the sediments related to periglacial processes (Murton 1996). Even though this would have disturbed the archaeological layers, the artefacts and enclosing sediments would have remained within the confines of the dolines, thereby retaining a degree of spatial integrity, i.e. they are still located at their place of discard and were not transported, as is the case with many riverine sites.

The majority of artefacts are from fieldwalked assemblages. Whilst there are some complicating issues with these, the accumulations have been collected comprehensively and unselectively since the 1980s (Halliwell pers comm. 2008). Thus, they provide a good representation of the typological composition of the sites beneath. In addition, two of the sites (Westcliffe and Wood Hill) have been subject to excavations (Scott-Jackson 2000; Drinkall et al. in prep) which have not only served to further an understanding of their formation processes and situation, but also added valuable data to the surface assemblages.

3.4.3. Site Formation and Geology

The formation processes which acted at these sites, creating the doline features, have been discussed in detail above (section 3.1). Whilst the general stratigraphy closely mirrors the sites in the Chilterns, including the development of ephemeral ponds as the soil conduit of the doline was periodically blocked, there are a couple of minor differences. Whereas the Bedfordshire sites consist of Reading Beds overlying the chalk bedrock, here the basal sediment layer is the Thanet bed which would then have eroded to form plateau drift and brickearth as described above. The basal part of this bed is formed by a layer of bullhead flint (the Bullhead bed), and this, coupled with chalk residue (in the form of flint), would have provided the main source of raw material at these sites (Scott-Jackson 2000), continuing to erode from the sides of the feature throughout its active life.

3.4.4. Dating

As has been mentioned in the previous chapter (chapter 2), these upland sites remain a challenge to date. Whilst the soil conditions preclude dating on biostratigraphical grounds, thermoluminescence methods have been employed successfully for Wood Hill. Here, burnt flint samples were tested and two yielded dates. The date from Trench 10 is regarded as the most reliable, with comparable results from both fine- and coarse- grained techniques, producing a date of 406,000-354,000BP (MIS 11/10) (Scott-Jackson 2000:149-151). However, the date from Trench 11 proved more complex, with disagreement between the two techniques introducing an unknown error. The date of 200,000 +/-33,000BP is based solely on the coarse-grain technique. However, it has been suggested that as a result of the error, this may be underestimated (Scott-Jackson 2000:151). Alternatively this could suggest several episodes of hominin occupation.

An important point to note, however, is that the material that was used to provide the older date is situated further up the stratigraphical sequence than the burnt flint from Trench 11, which produced the younger date. If taken at face value this suggests a reversal of the stratigraphy, however, the first sample came from a depth of only 24cm below the surface. This could therefore indicate disturbance by ploughing, especially since ploughsoils are usually estimated as being between 20 to 40cm deep (de Alba 1999 in Navazo and Diez 2008:325). Alternatively if similar formation processes observed at Westcliffe (Bailiff et al. 2013, Drinkall et al. in prep) were likewise in operation at Wood Hill, it is conceivable that an artefact from a later occupation was incorporated into the fill of the solution hollow, whilst an older artefact remained at a higher level, on the edge of the feature. It is also important to note that the burning events are not necessarily associated with occupation and may indeed have occurred at a later date. However in such an event it would provide a useful *terminus ante quem* for the hominin occupation of the site.

One of the aims of the excavations at Westcliffe (section 3.4.10) was to procure samples for dating. The locations of the three samples taken for analysis can be seen in section 04/04 (figure 3.24). This was undertaken at the Luminescence Research Laboratory, Durham University, and the sediment samples were analysed using Optically Stimulated Luminescence (OSL). Work on the samples was carried out using single-grain techniques, the results of which served to highlight the complexities of formation of these deposits. The first sample, 316-1, taken from below the artefact-bearing cobble layer produced multiple dose components. The oldest gave a date of 260,000 ±30,000 BP, however, this should be taken as a minimum age, due to a number of factors discussed more fully in Bailiff et al. (2013). The most recent deposition phase for the 316-1 sediment suggests an age of 136,000 +/- 15,000BP. The two other samples 316-2 and 316-3 were procured from above the cobble layer and produced similar ages of averaging around 80,000 BP (87+/-9ka and 75+/-9ka), suggesting that the assemblage layer was buried at some point between 140,000 and 90,000 BP (Bailiff et al. 2013:145).

If the artefacts had been incorporated into the hollow wholesale, within their original matrix, as previously thought, then the OSL dates would be expected to correspond to the typological date of the artefacts e.g. 300,000-400,000 BP. However, the younger results suggest there has been soil movement surrounding the artefacts, and the original depositional medium has been lost. This could be a result of the artefacts lying exposed on the plateau surface before being incorporated into the hollow at a later date, or by a later influx of sediment through pipes and percolation into the doline system, or partial bleaching of the quartz as sediment was re-worked into the hollow. Indeed the different components demonstrated by the results, do indicate several periods of influx of new material and mixing of these deposits within the doline (Bailiff et al. 2013).

These results clearly show that the mechanisms involved in the formation of these features and the archaeology contained within them are more complex than previously imagined. Consequently we are probably dating the incorporation of the artefacts into the hollow, rather than the age of hominin occupation. Despite this, dolines do form in a variety of ways as discussed above and other sites with less complex depositional matrices will likely provide more secure dating contexts. Whilst this provides a clearer picture of the formation processes of such doline features, it still remains a fact that these features act as artefact traps, serving to constrain assemblages providing evidence of human occupation in these areas of the landscape. Indeed, the presence of refitting artefacts in these situations serves to highlight the fact that despite the assemblages being subject to some degree of movement and dispersal, within the doline matrix, they do represent complete collections and therefore provide valuable datasets for the understanding of hominin behaviour in these upland landscapes.

3.4.5. Environment

Due to the acidic nature of the soils, no floral or faunal remains have been preserved, despite pollen and environmental sampling at both Wood Hill (Scott-Jackson 2000:149) and Westcliffe (unpublished report Archaeological Services Durham University 1156 2004). The only inference that can therefore be drawn is of an open, cooler environment, as suggested, firstly, through comparative work in the Chilterns (White 1997) and, secondly, by the use of local raw material from the cobble pavement and sides of the dolines, which would only have been accessible in cooler climates with limited vegetation cover. Pollen evidence from Rackley (Caddington, section 3.3.6) suggests the presence of a mosaic open environment with grasslands and trees in a slightly colder phase, probably towards the end of an interglacial (Catt et al. 1978; Campbell and Hubbard 1978; White 1997:917). However, the interpretation of these results as being directly related to the period of hominin occupation must be treated with caution. The dating work at Westcliffe has highlighted several periods of sediment influx (Bailiff et al. 2013), raising the possibility that pollen evidence could have moved through the deposits.

3.4.6. Raw material

In terms of the raw material available at these plateau sites, the clay-with-flint deposits contain both flint and bull head nodules. In addition, sources of outcropping upper chalk would not have been located far away (Winton 2004:4), as a result the raw material utilised would likely have been from a local source (Winton 2004:156).

Hominins appear to have used bullhead, tabular chalk flint and nodular chalk flint, although the latter seems to have been preferred (Scott-Jackson 2000:132; Drinkall 2005).

3.4.7. Green Lane, Whitfield

The site of Green Lane, Whitfield (TR 29454504; Table 3.4) is located at a height of 129m OD on clay-with-flints (Parfitt 2002:373; Halliwell and Parfitt 1993:85). It is positioned on a plateau overlooking the River Dour to the south-west with the town of Dover approximately 3km to the south-east (figure 3.17, figure 3.18).

Artefacts were first identified at this site with the discovery of two handaxes, as reported by Hutchinson in 1976. Following this, a program of fieldwalking in 1991 by the Dover Archaeological Group (DAG) produced a number of handaxes and flakes (Halliwell and Parfitt 1993:85). The site was excavated in 1992 by DAG, after the topsoil was removed by contractors. The investigations uncovered both Palaeolithic material and features related to later prehistoric occupation (Parfitt 2002).

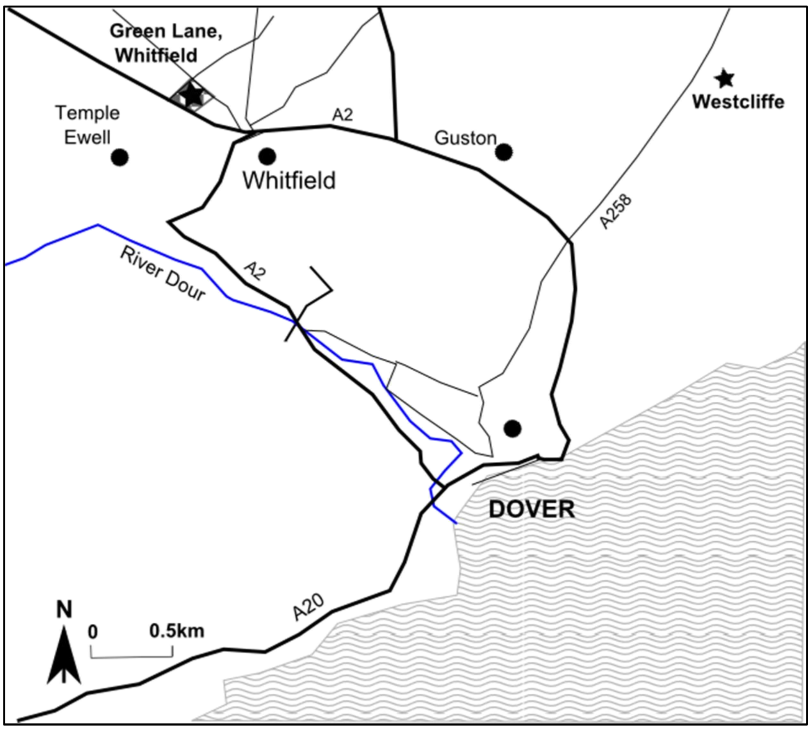


FIGURE 3.18 - LOCATION MAP FOR GREEN LANE, WHITFIELD

SITE FORMATION AND GEOLOGY

The excavations mentioned above were focused on the later Iron Age settlement and whilst they mention the Palaeolithic artefacts (many of which came from disturbed contexts related to later occupation), the section drawings produced focused on the later ditch features. Despite this, the strong similarities with the other sites mentioned in the text, in addition to the comment that artefacts were found to have come from the top of the clay-with-flint deposit (Parfitt 2002:375), does suggest an association of the artefacts with a solution hollow.

ARCHAEOLOGY

The Lower Palaeolithic evidence from this site comprises 310 artefacts. The assemblage encompasses all the material held by the Dover Archaeological Group, including both field walked and excavated artefacts. Primary analysis of the material was undertaken in Durham with the kind permission of Geoff Halliwell and DAG. Whilst a lot of the artefacts were recorded as being found *in situ*, a large quantity of material was also recovered within the later features and plough soil, suggesting a certain amount of post-depositional movement (Parfitt 2002:375).

3.4.8. MALMAINS 1 AND 2, EYTHORN

The Palaeolithic sites of Malmains 1 (TR 29054900; Table 3.4) and Malmains 2 (TR 29405010) are located on a ridge between two steep dry valleys, just to the east of the village of Eythorne in Kent (Hoskins et al. 1998). The two assemblages are situated 1km apart, with the smaller site of Malmains 2 located to the north-east of its larger counterpart, approximately 7km south-west of Deal and 8km north-west of Dover (figure 3.19).

The sites were identified through targeted fieldwalking, based on the presence of clay-with-flints deposits, by Richard Hoskins. Two concentrations of Lower Palaeolithic material were identified, separated by 1100m on the ridge, within the clay-with-flint deposit. Whilst they have been published in the Kent Archaeological Review (Hoskins et al. 1998), the collections themselves have not been studied in detail.

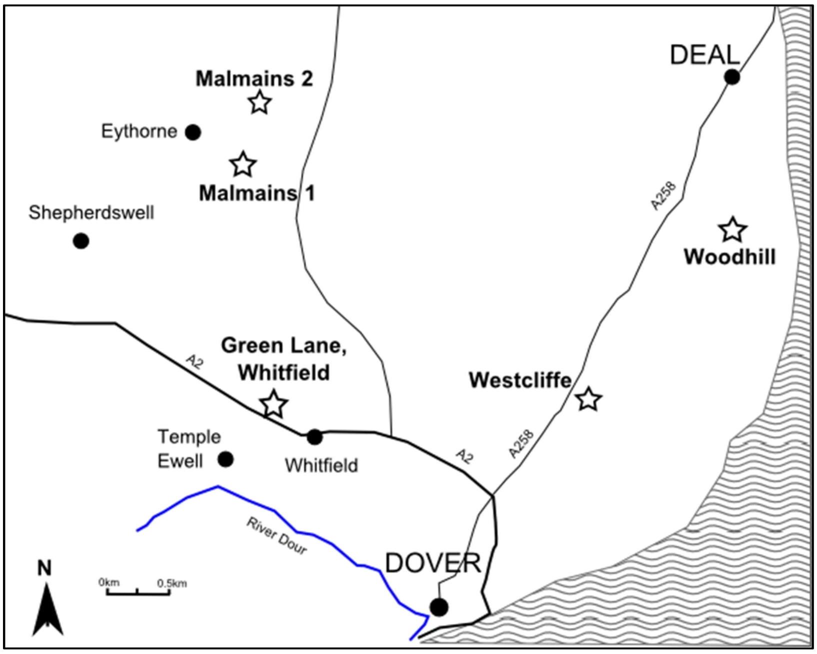


FIGURE 3.19 - LOCATION MAP FOR THE MALMAINS SITES AND OTHER SITES MENTIONED IN THE TEXT

SITE FORMATION AND GEOLOGY

As discussed above, there has been no excavation at these sites, and as such the stratigraphy has not been confirmed. However, the presence of the clay-with-flints deposit, which is similar to other sites in the area, does indicate association on the ridge with a solution hollow feature. It is likely that the deposits preserved the assemblage until ploughing removed it from its original context. The main concentration (area 1) is located in a shallow natural depression (similar to that at Westcliffe) originally thought to be 70m by 30m in the initial publication by Hoskins (Hoskins et al. 1998). Further work presented at the CKA conference in 2002 expanded this to 250m by 40m (Halliwell pers. comm. 2008).

ARCHAEOLOGY

The site has been consistently under surveillance for a number of years, as demonstrated by the size of the main assemblage (Malmains 1). However, the numbers of artefacts being recovered has decreased recently (Halliwell pers. comm. 2008), suggesting either that the majority of artefacts have already been collected or, conversely, that the pieces located in the ploughsoil and close to the surface have been depleted by modern ploughing. Although the recent cessation of deep sub-surface ploughing is perhaps more likely to be a factor, with further concentrations of artefacts still existing beneath the current plough zone, within the solution features themselves. There is also likely to be a deficit in smaller debitage due to the nature of recovery and the clay-with-flint matrix itself. Despite this, the size of the collected assemblage suggests that we have a representative sample of the typology from these locations. The assemblages analysed for this site comprises all the material collected through fieldwalking over a seven- year period (Halliwell pers. comm. 2007). The material was kindly loaned from Geoff Halliwell, Richard Hoskins and the Dover Archaeological Group for analysis in Durham.

MALMAINS 1

The assemblage recovered from this site consists of 555 artefacts and was located slightly below the crest of the ridge, at a height of 87m OD. The field had previously been utilised as an orchard and only recently been subjected to modern deep ploughing techniques resulting in the discovery of the archaeological layers (Hoskins et al. 1998).

MALMAINS 2

The assemblage recovered from the second location is considerably smaller than that from Malmains 1, totalling just 70 artefacts. When the paper was published in 1998, the site had only partly been explored, due to crops on the site. This area, in contrast to the site above, is located on the crest of the ridge at a height of about 75m OD (Hoskins et al. 1998).

3.4.9. WOOD HILL, KINGSDOWN

The site of Wood Hill, Kingsdown (TR 371480; Table 3.4), is located on a downland ridge at 65m OD (Halliwell and Parfitt 1993:82; Scott-Jackson 2000:67), 2km south of Deal and 8km north-east of Dover. The neighbouring site of Westcliffe (section 3.4.10) is 4km to the south-west on the same chalk ridge, with the two concentrations of artefacts at Malmains to the west (figure 3.19).

The site was again identified through fieldwalking by DAG, and in 1984 and 1985 they instigated a series of small-scale excavations (Parfitt and Halliwell 1996:59). These uncovered more Palaeolithic artefacts, and in 1993, a second small-scale research excavation was undertaken by Dr. Julie Scott-Jackson (2000) (figure 3.20). This was followed by auger surveying in 1994 which was primarily aimed at determining the extent and disturbance of the clay-with-flint deposit, thereby determining whether the Palaeolithic deposits were in fact *in situ* (Scott-Jackson 2000:67; 75). The site has been walked sporadically since then, adding to the material available for analysis (Halliwell and Parfitt 1993:84).

SITE FORMATION AND GEOLOGY

The stratigraphy is of a similar nature to that of Westcliffe (section 3.4.10) and the Chiltern brickearth sites, with comparable formation processes in place. However, the general sequence at the site, as recorded by the most recent excavations, begins with a layer of shattered chalk (A) overlying the bedrock. This is followed by a large deposit of brown sandy silty clay which in places overlies and contains small pockets of dark brown silty clay (B) and lenses of brown clayey silty sand (C) and yellowish brown clayey sandy silt (D). Where the hollow appears to deepen (in Section III and part of section IV), this clay deposit is covered in the deepest sections by a sandy clayey silt, varying from brown to light brown in places. This encompasses pockets of light brown sandy silty clay which also occurs above the silt deposit in the upper levels in part of Section II and III (See figures 39-42 in Scott-Jackson 2000). The relationship of these deposits is shown in figure 3.21.

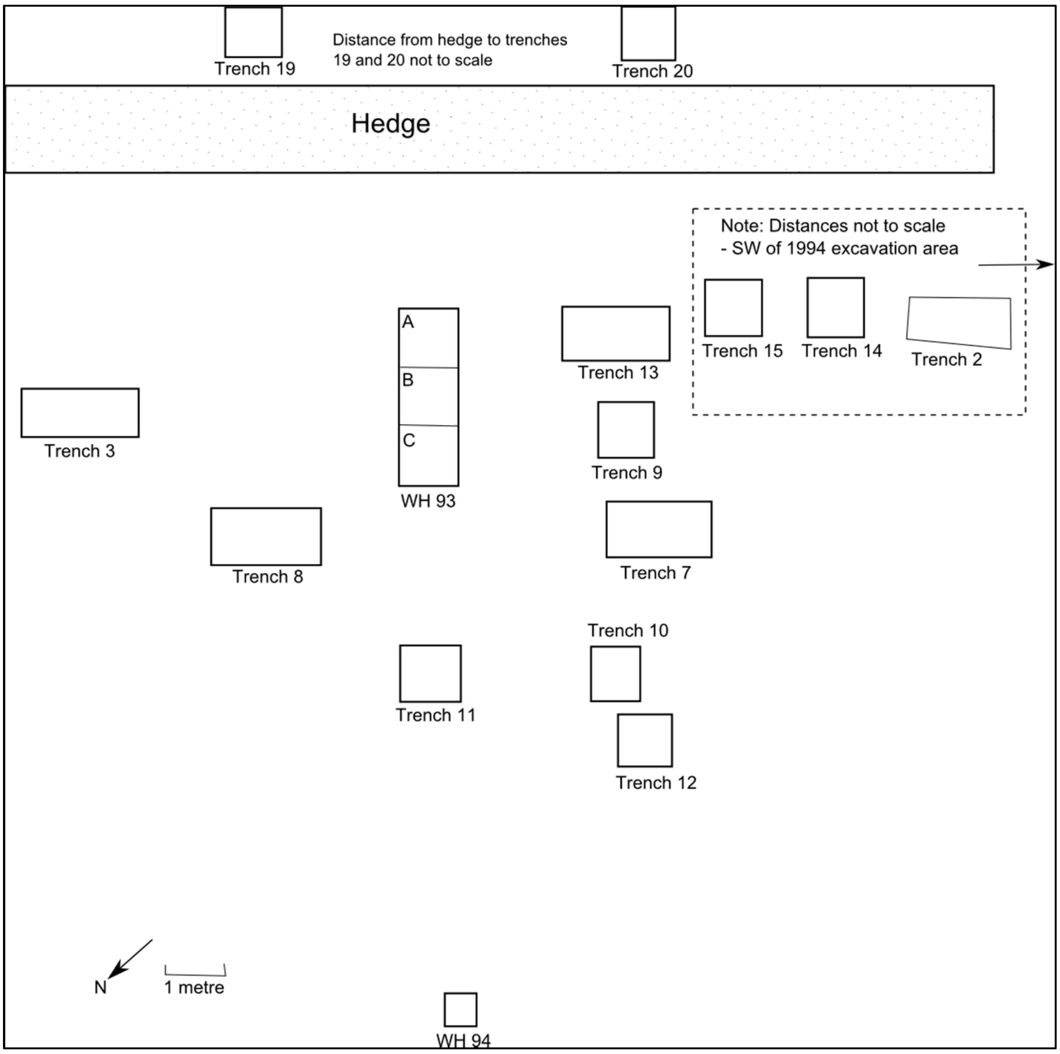


FIGURE 3.20 - POSITION OF THE TRENCHES FROM BOTH THE 1985-85 EXCAVATIONS AND THOSE OF 1993 AND 1994. REDRAWN FROM SCOTT-JACKSON 2000. FIGURE 36, P73.

ARCHAEOLOGY

Two possible explanations have been proposed for Wood Hill. The first, by Halliwell and Parfitt (1993), favours a single phase of occupation during the Lower Palaeolithic, probably around the Hoxnian. They expanded this view in their 1996 paper, stating that the assemblages from both Westcliffe and Green Lane, Whitfield, also represented short-lived single occupations (Parfitt and Halliwell 1996: 59). In contrast to this, the second scenario, as suggested by Scott-Jackson, involves multiple occupations based on the discovery of a handaxe and two flakes at a lower level to the main concentration (Winton 2004:155; Scott-Jackson 2000:141, 152). However, considering the small size of the trench from these later excavations, it is debatable whether a second occupation can be proven or not.

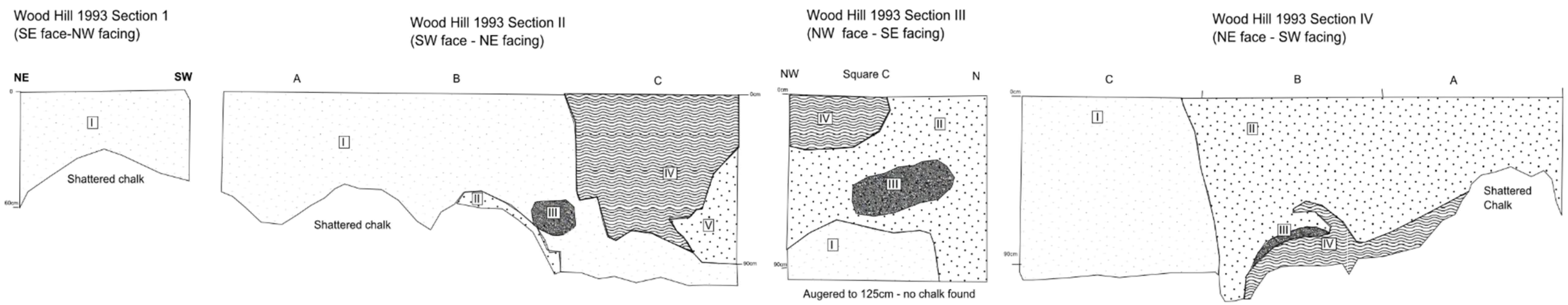


FIGURE 3.21 - SECTION DRAWINGS FROM THE WOOD HILL REPORT. REDRAWN FROM SCOTT-JACKSON 2000. FIGURES 39-42.

Whilst Scott-Jackson concludes that the sediments at Wood Hill (and therefore the artefacts) were 'subject to limited change' (2000), evidence of the effects of periglacial disturbance nearby at the Isle of Thanet (Murton 1996), coupled with a better understanding of sediment influx and movement during the formation of these dolines from work at Westcliffe (section 3.4.10, Bailiff et al. 2013) do cast doubts on the validity of this interpretation which only larger-scale investigations can resolve. The assemblage analysed for this site totals 506 artefacts, including both the fieldwalked material and the later excavated assemblage.

3.4.10. Westcliffe, St Margaret's

The site of Westcliffe, Saint Margaret's (TR 3462 4520; table 3.4) is situated in the south-east corner of Kent, 6.5km to the north-east of Dover and 5.6km south-west of Deal (Parfitt and Halliwell 1996:61). Both this site, at a height of 95m OD, and the nearby site of Wood Hill (section 3.4.9 above) are located on the same chalk ridge within a deposit of clay-with-flints (Parfitt and Halliwell 1996:61-62) (figure 3.17, figure 3.19).

Westcliffe was discovered in 1995 through a fieldwalking program conducted by the Dover Archaeological Group. Successive seasons yielded a substantial collection of Palaeolithic material which coincided with a sub-surface depression (figure 3.23). The association of a spread of artefacts, 200m across, with this concavity in the field surface suggested the presence of a solution feature or doline, comparable to Lower Palaeolithic occupations elsewhere in Kent and the Chilterns (see above) (Catt et al. 1978; White 1997.) A borehole survey conducted in 1998 confirmed that the artefacts were located around the edges of a solution hollow which had formed in the subsurface of the chalk. Additional auger work was carried out (figure 3.22, 3.23) to determine the form and depth of the depression (Parfitt and Halliwell 1996; Scott 1999).

Sediment samples were obtained during this phase of work, confirming that the infilling of the hollow contained brickearth (fine-grained silts and clay), suggesting that any surviving artefact levels may have been subject to limited disturbance. The parallels to the Chilterns sites and potential presence of an *in situ* Lower Palaeolithic locale, which could help to interpret these high level occurrences, prompted further investigation by a team from Durham University through the Dover Hinterland Project. Three seasons of work, between 2002 and 2004, were undertaken, including a program of survey, trial trenching and small scale excavation (Bailiff et al. 2013; Drinkall et al. in prep).

Site Formation and Geology

The results from the borehole survey mapped the basal surface of the chalk, and identified the location of three separate solution hollows (A-C in figure 3.22), highlighting the locally variable nature of the chalk bedrock. The excavations only uncovered Palaeolithic artefacts on the south-east side of the visible hollow (A), suggesting that this still-forming doline is of a later date. The main focus of the excavation (Area 1, figure 3.23) uncovered a sub-aerially weathered flint pavement dipping into these older hollows (B and C), and it is from this that the artefacts originated. This cobble layer comprised of large flint nodules and scattered artefacts, and the presence of plough furrows in the surface suggests that this was the origin of the field-walked finds.

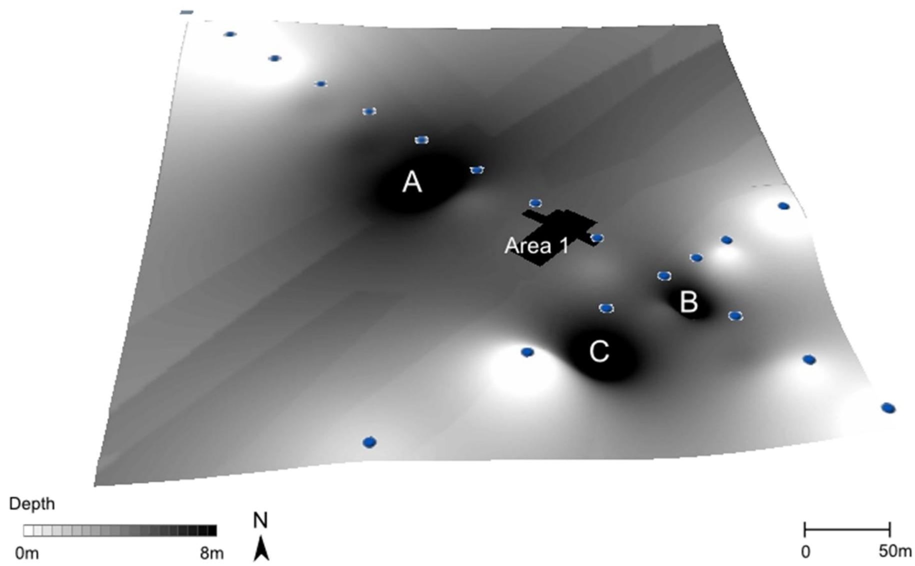


FIGURE 3.22 - 3D PLAN OF THE CHALK BEDROCK AT WESTCLIFFE COMPLIED THROUGH BOREHOLE DATA AND DISPLAYED IN ARCSCENE. THE MAIN EXCAVATION, AREA 1 IS SHOWN WITH THE THREE IDENTIFIED DOLINES A, B AND C.

The general sedimentological sequence comprises layers of modern deposits, ploughsoil and dark-brown colluvium, overlying several layers of fine-grained sediments or brickearth of varying composition and colouring. These deposits cover the clay-with-flints which rests on the chalk bedrock. A more detailed sequence of deposits relating directly to the artefact layer can be seen in section 04/04 (figure 3.24). Briefly, these comprise ploughsoil, overlying a yellowish-brown silt/clay, which formed above the cobble layer. This layer of flint clasts is contained within a brown clay matrix and overlies a brown-silt/clay with greenish mottling. Samples for OSL dating were taken from above and below the cobble layer as it dipped into the hollow (figure 3.24) in an attempt to provide a more constrained date for the archaeology. The results of these have been discussed previously (section 3.4.4).

FIGURE 3.23 - MAP SHOWING THE LOCATION OF TEST PITS, BOREHOLES AND TRENCHES FROM THE DURHAM EXCAVATIONS AT WESTCLIFFE.

As can be seen, the angle of the cobbles changes throughout the section. This may indicate that the formation processes did not involve a gradual lowering or slippage of the layer into the hollow, but in fact, as discussed above in section 3.1, may have involved multiple collapse and solution events, creating a vertically variable layer. Furthermore, the incorporation of the artefact-bearing flint pavement into the hollow appears to be much more complex when seen in a section perpendicular to that shown in figure 3.24. Figure 3.25 demonstrates that the cobble layer curves around and under the previously observed upper surface. In addition, the presence of what appears to be a pipe of material, carrying flint cobbles, pebbles and artefacts through the surrounding brickearth deposits can clearly be seen on the photograph in figure 3.26.

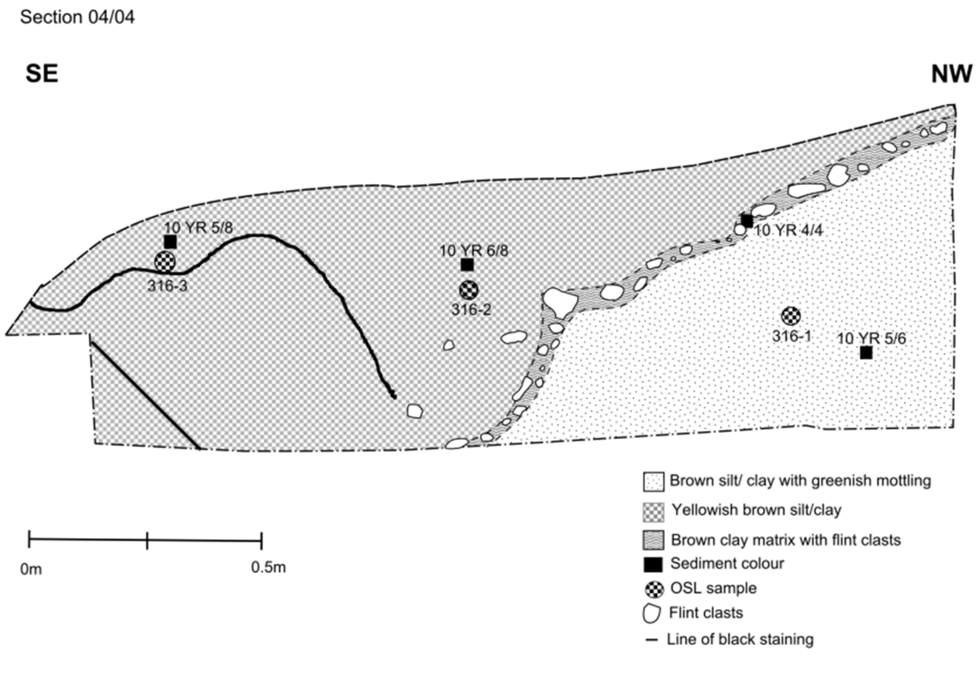


FIGURE 3.24 - SECTION 04/04 SHOWING THE COMPOSITION OF DEPOSITS SURROUNDING THE COBBLE LAYER AND THE POSITIONING OF THE OSL SAMPLES.

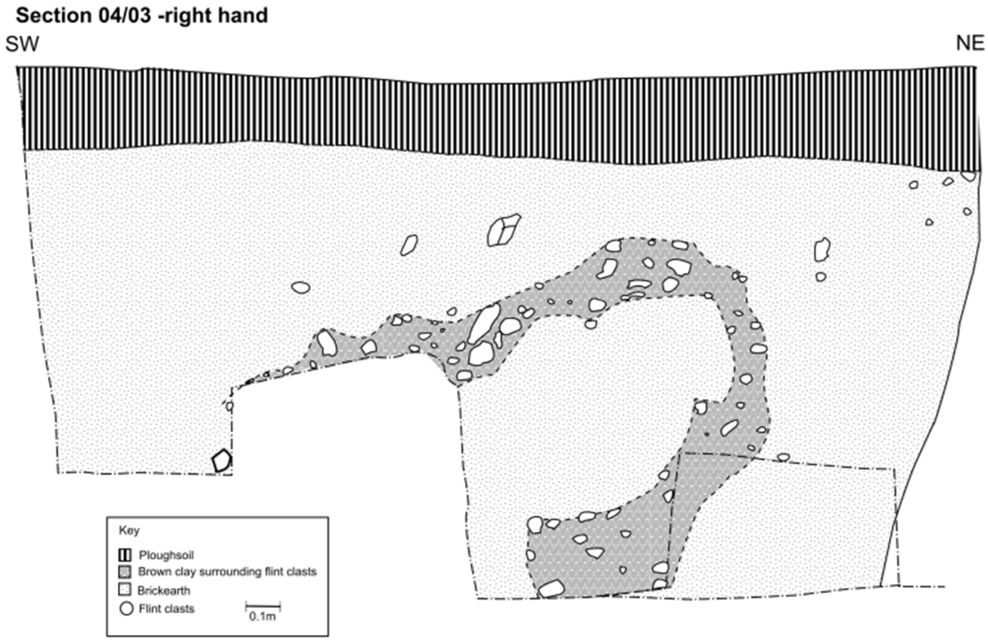


FIGURE 3.25 - SECTION 04/03 AT WESTCLIFFE SHOWING THE COBBLE LAYER CURVING UNDERNEATH THE LAYER SHOWN IN FIGURE 3.24.

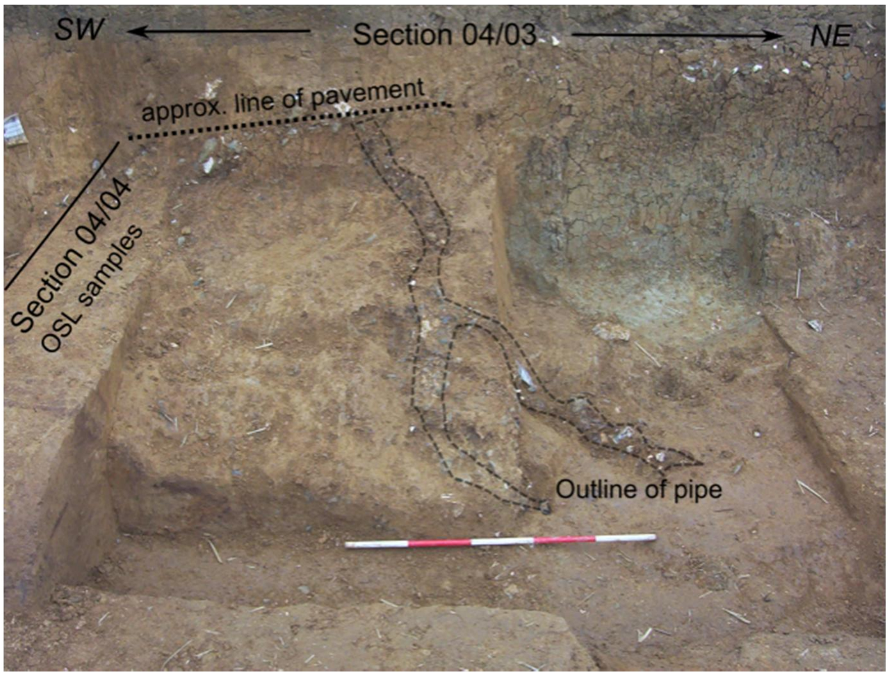


FIGURE 3.26 - PHOTOGRAPH SHOWING THE ASSOCIATION OF THE SECTIONS 04/03 AND 04/04 (ABOVE) WITH THE FLINT PAVEMENT AND OUTLINE OF THE PIPE FEATURE AT WESTCLIFFE.

ARCHAEOLOGY

Westcliffe has so far produced a substantial lithic collection, comprising both fieldwalked and excavated components. The data from this site encompasses primary analysis on all the material collected through the excavations in addition to material from field walking by the Dover Archaeological Group. Overall, the assemblage at Westcliffe comprises 1294 artefacts, the majority of which are flakes and debitage (flaking chunks, chips, fragments etc.). The presence of smaller fragments and chips indicate the presence of a primary manufacture site and attest to the integrity of the assemblage.

There are two main types of raw material utilised on site. Firstly, fresh chalk flint is available in large rounded nodules, most likely collected from the sub-aerial weathered flint pavement, and this accounts for the majority of artefacts. However, hominins also appear to have utilised bullhead flint, although in smaller quantities, and this would either have been sourced from the exposed flint pavement, or from around the sides of the hollow.

3.4.11. SMALLER KENT SITES

In addition to the larger sites above, there are a number of find spots (figure 3.27 and 3.28) which are incorporated into the GIS study to provide us with a more comprehensive view of landscape use during the Palaeolithic. The majority of these sites comprise of only one or two artefacts. Nevertheless, some do form slightly larger concentrations, with the largest, Ripple Field and Hawkshill Down, ranging up to ten artefacts. Whether these constitute single spot finds deposited as hominins traversed the landscape, or indicate further buried larger accumulations, remains to be seen; however they provide a useful insight into activity in the wider landscape. Details of the assemblages for each of the smaller sites can be found below in table 3.3, however they are discussed in more detail in chapter 6.

The smaller sites are:

- Elham (TR 193439)
- Broome Bungalows, Sutton (TR 307482)
- Freedown, Kingsdown (TR 362469)
- Hacklinge (TR 346552)
- Hawkshill Down (TR 374490)
- Knight’s Bottom (TR 368492)
- Lady Hamilton’s Seat (TR 361489)
- Ripple Field (TR 363498)
- Diamond Farm, Shepherdswell (TR 255473)
- Sutton Downs (TR 333501)
- St Rad’s Pipeline (TR 278417)
- St Margaret’s Nelson Park Road (TR 352455)
- The Lynch (TR 368493)
- Tolsford Hill (TR 155381)
- Upper Farm Sutton (TR 327492)

Site	Handaxes	Flakes	Misc	Flake tools	Core tools	IKW	Cores	Total
Elham	5	1		1				7
Broome Bungalows, Sutton		1						1
Freedown	1							1
Hacklinge	1							1
Hawkshill Down	2	6					1	9
Knight's Bottom		1						1
Lady Hamilton's Seat	1							1
Ripple Field	1	8		1				10
Diamond Farm, Shepherdswell	1	?						1+
Sutton Downs	1	2						3
St Rad's	1							1
St Margaret’s				1				1
The Lynch		2					1	3
Tolsford Hill	1							1
Upper Farm Sutton		5		1				6

TABLE 3.3 - TYPOLOGICAL FREQUENCY OF ARTEFACTS FOR THE SMALL KENT SITES

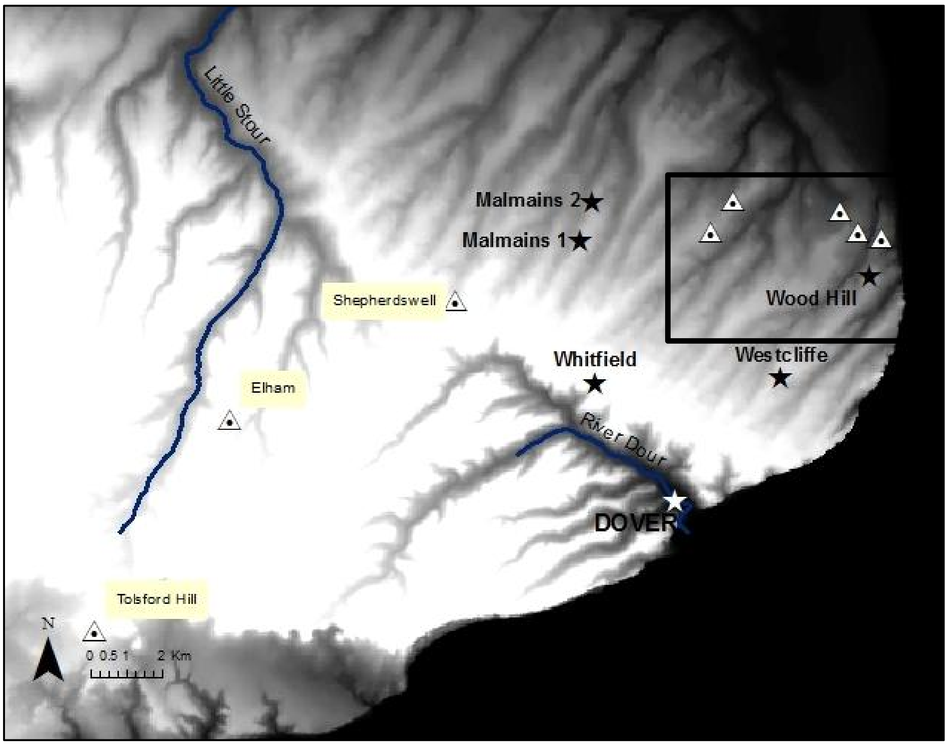


FIGURE 3.27 - LOCATION MAP OF SMALLER FINDSPOTS IN RELATION TO THE MAIN SITES IN KENT. BOX DENOTES CLOSE UP OF SITES AROUND WOOD HILL SHOWN IN FIGURE 3.28.

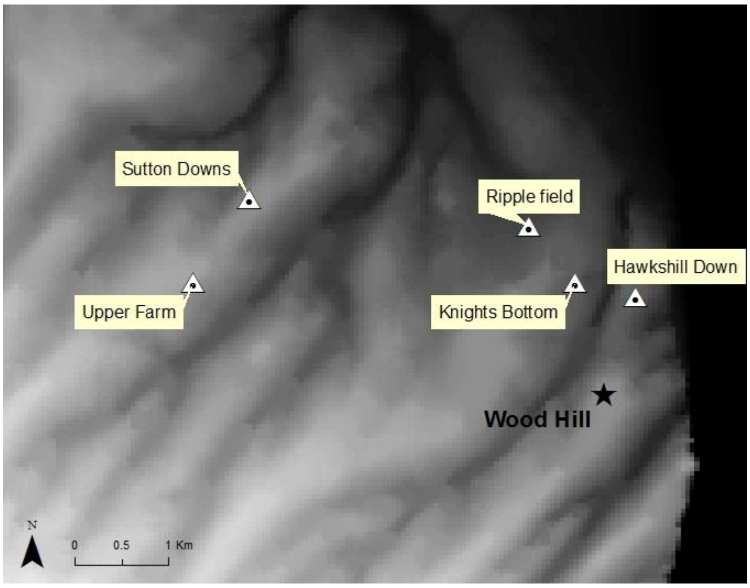


FIGURE 3.28 - CLOSE UP OF SMALL SITES LOCATED AROUND WOOD HILL.

Site	Assemblages	Location	Date	Environment	Raw material	Additional info
Green Lane, Whitfield TR 29454504	Fieldwalked and excavated	Upland pond		Unknown	Locally available, derived from Chalk or clay-with-flints providing chalk and bull head	
Malmains 1 TR 29054900	Sum total of field walked material	Upland pond		Unknown		Burnt flint, including a core
Malmains 2 TR 29405010	Sum total of field walked material	Upland pond		Unknown		
Westcliffe TR 3462 4520	Sum total of fieldwalked and excavated material	Upland pond	Archaeology incorporated between 140k and 80k BP	No pollen preserved – most		
Wood Hill TR 371480	Fieldwalked and excavated material	Upland pond	TL dating burnt flints 406k-354kBP and 200kBP	No pollen preserved		Burnt flint

TABLE 3.4 - SUMMARY OF MAIN KENT SITES

CHAPTER 4 - LOWLAND LIVING SITES?: CONTEXT AND SELECTION

The second block of sites, discussed here, represent assemblages selected from a variety of lowland contexts and will serve as comparisons for the artefactual signatures observed at the upland sites discussed in Chapter 3.

The sites all date between MIS 12 and MIS 9 and have been selected because they satisfy a number of criteria; they demonstrate little evidence of disturbance, are *in situ* or primary context locations, and on the whole provide good environmental information and secure dating evidence. They are therefore considered to provide a reliable dataset with which to investigate the type of activities that were being carried out at certain points in the landscape and thereby hominins' utilisation of these environments.

The sites are mostly located in the lowland areas positioned banding the two upland zones (the Chiltern Hills and Kent Downs). An overview of the sites, assemblages chosen and source of data can be found in table 4.1. More detailed discussions of each site and dataset follows below.

4.1. BARNHAM, SUFFOLK

The site of East Farm, Barnham (TL 875787), is positioned within the valley of the Little Ouse River, four kilometres south of Thetford. The site lies in a deep channel at the head of a small dry valley at 38mOD. Chalk bedrock rises to the south, forming a watershed with the Lark valley, with the Black Bourn, a tributary of the Little Ouse lying to the east (Lewis 1998; Ashton et al. 1998) (figure 4.1). The site is part of a group of four Lower Palaeolithic locations, clustered together in this part of Suffolk (figure 3.1), along with High Lodge, Elveden, and Beeches Pit.

Site	Assemblages selected	Source
Barnham	Area 1 Unit 4	Ashton et al. 1998,
	Area III Unit 5c	Ashton 1998a, Ashton 1998b
	Area IV (4) Unit 4	
	Area V Unit 5d	
Beeches Pit	Area AH	Hallos 2001
Boxgrove	Quarry 1 Area A unit 4c	Roberts and Parfitt 1999
	Quarry 1 Area B Unit 4c	Roberts et al. 1997
	GTP17 Unit 4b	Pope 2002
Clacton-on-Sea	Lion Point	McNabb 1996
	Jaywick	McNabb 1996
	Golf Course - Gravel	Singer et al. 1993
Elveden	Area I Bed 5	Ashton et al. 2005
	Area III Bed 4	
Foxhall Road	Grey Clay	White and Plunkett 2004
	Red Gravel	
High Lodge	Bed C2, Bed D, Bed E	Ashton et al. 1992
	Bed C1	Ashton 1992
Hoxne	Upper Industry	Singer et al. 1993
	Lower Industry	
Red Barns	Grey Loam	Wenban-Smith et al. 2000
Swanscombe	Lower Gravel	Wymer 1968
	Lower Loam Knapping Floor	Ovey et al. 1964
	Lower Middle Gravel	

TABLE 4.1 - DETAILS OF THE SELECTED ASSEMBLAGES AND SOURCE DOCUMENTS UTILISED IN THE MAIN DATA ANALYSIS.

Barnham has long been recognised as a significant site. The first excavations were undertaken by Paterson between 1933-1936, with work on the geological succession following in 1979 by Wymer and Rose (Wymer 1985). This uncovered refitting artefacts, indicating an *in situ* assemblage, prompting a final series of excavations (figure 4.2), undertaken by the British Museum which ran from 1989 to 1994 (Ashton et al. 1998; McNabb 1998).

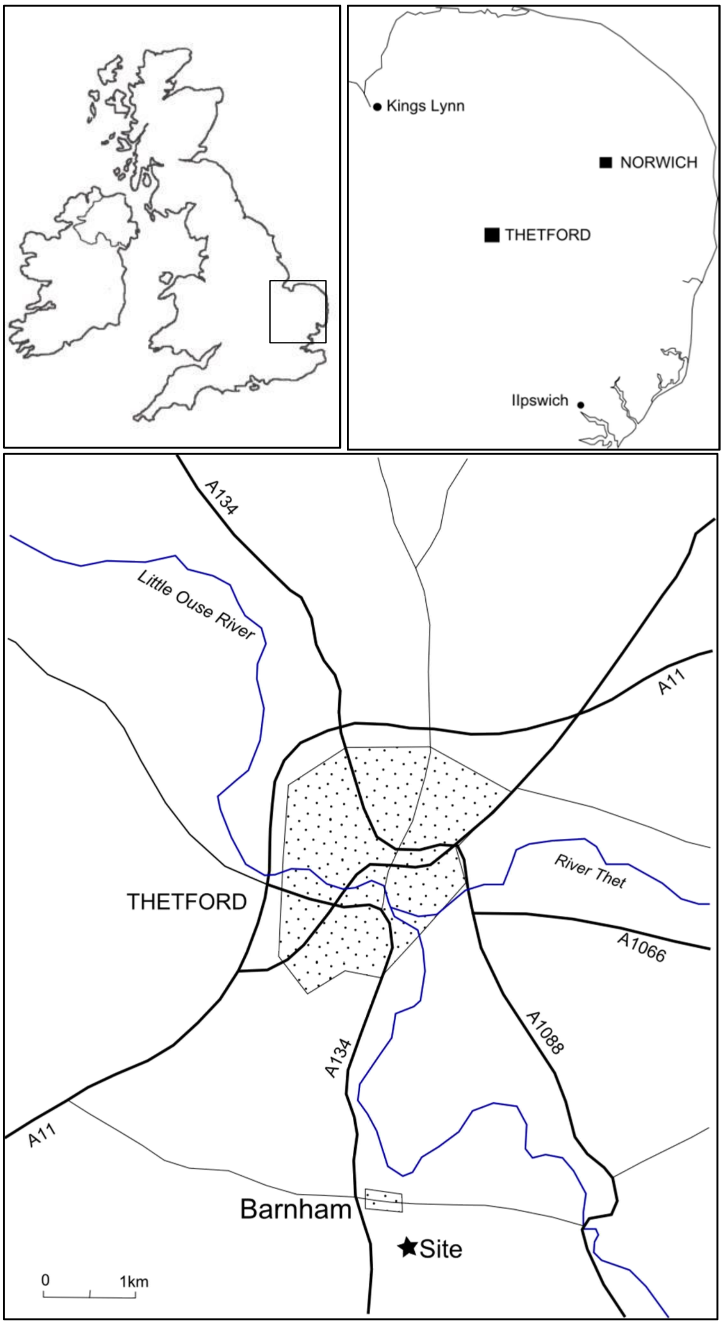


FIGURE 0.1 - LOCATION MAP FOR BARNHAM, REDRAWN FROM ASHTON 1998D. FIGURE 1.1. P2.

4.1.1. Site Formation and Geology

The geological sequence at the site, as established by the British Museum excavations, is summarised in table 4.2 and figure 4.3. The basal layer comprises Upper Chalk, into which a steep channel was eroded, with archaeology located in layers 4, 5c and 5d. Dating evidence on material from Unit 5c using Amino

Stratigraphy and Amino Acid Geochronology produced a date correlating to the Hoxnian Interglacial (MIS 11 - 364-427k BP) (Bowen 1998). Whist there have been contradictory age estimates, this corroborates the results produced from the mammalian fauna, including comparisons between species present in the Lower Gravel and Lower Loam at Swanscombe (section 4.10) and Beeches Pit in Suffolk (section 4.2) (Ashton et al. 1998). Consequently, the occupation at the site has been assigned to an early temperate phase of the Hoxnian.

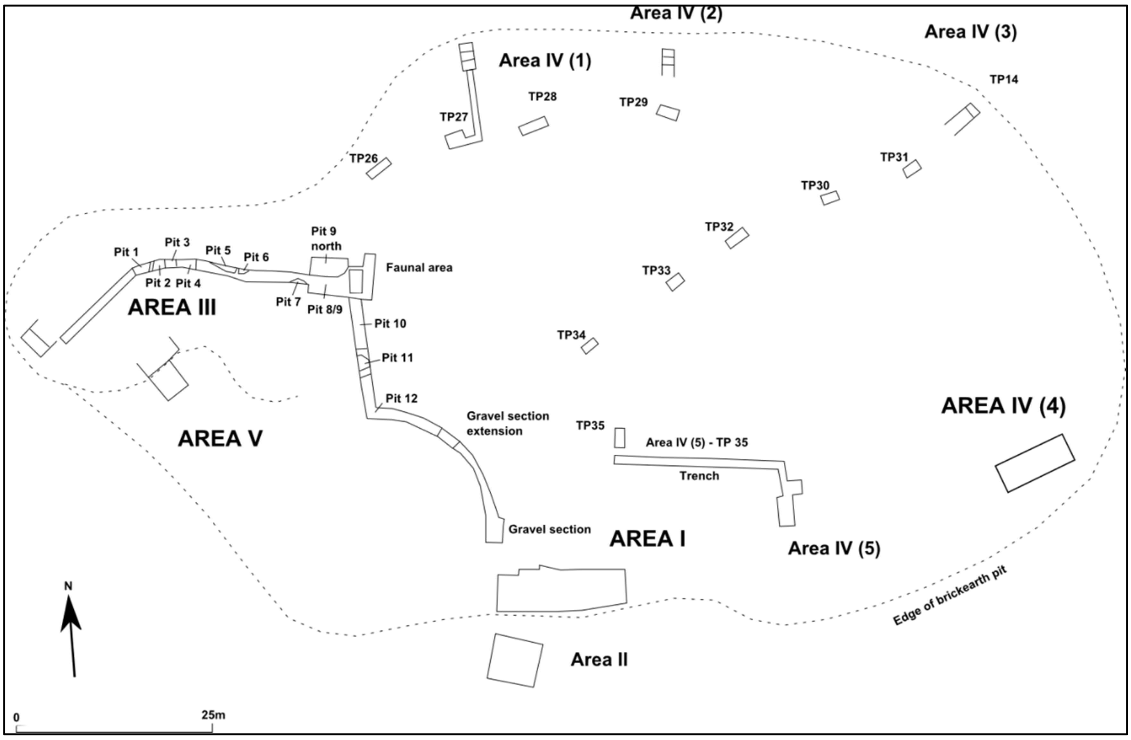


FIGURE 4.2 - MAP DENOTING THE AREAS OF EXCAVATION AT EAST FARM, BARNHAM. REDRAWN FROM ASHTON 1998E. FIGURE 3.1. P14

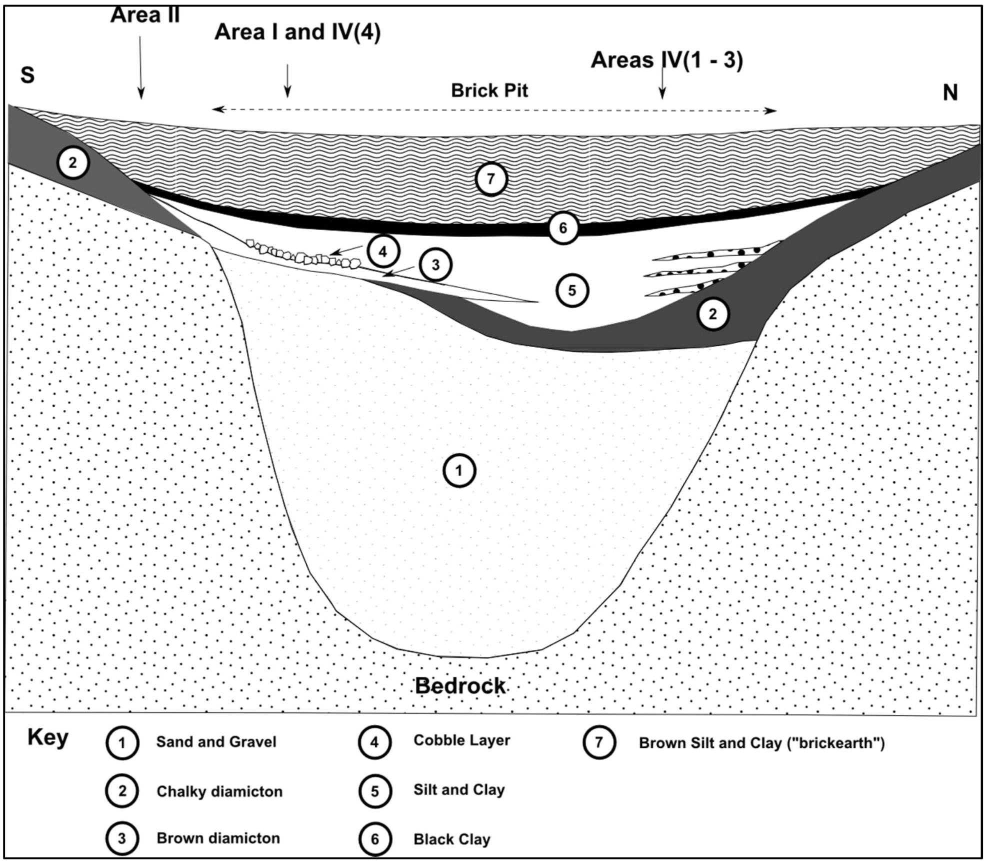


FIGURE 4.3 - SCHEMATIC SECTION THROUGH THE BARNHAM DEPOSITS, IDENTIFYING THE GENERAL SEQUENCE PRESENT AT THE SITE. REDRAWN FROM LEWIS 1998, FIGURE 4.32. P68.

4.1.2. Archaeology

A number of areas were excavated by the British Museum between 1989 and 1994, with the majority of them incorporating both rolled and fresh artefacts (Area I, IV (4) and V). Whilst Ashton regards the fresh and rolled groups for the most part as being part of the same assemblage, there are suggestions that hominins undertook repeated visits. As a result, the rolled elements may represent manufacture over a longer time period than that which created the fresh assemblage (Ashton et al. 1998; Ashton 1998a, b). Consequently, to make the data as reliable as possible, only the fresh component will be incorporated into this analysis, as this more closely resembles an *in situ* set of artefacts (table 4.11).

Unit	Description	Faunal area	Description
7	Brown silt and clay 'brickearth'		Sedimentation and surface formation over Unit 6
6	Black clay		Formation of soil layer across whole site after infilling drying out of channel with various layers of Unit 5, and process of drying out
5e	Yellow silty sand		Overlies unit 4. Low-energy fluvial deposit
5d	Grey/brown stony clay*		Low-energy fluvial deposit
5c	Grey silt and clay*	Gritty clay Shelly clay Black Clay Brown-grey clay Laminated shelly clay Basal silt	Deposited during slow-flowing/ still water sedimentation
5b	Grey chalky clay		Slow-flowing/ still water sedimentation
5a	Brown silt and clay		Overlies unit 3, unevenly distributed across the site - Slow-flowing/ still water sedimentation
4	Cobble layer*		Winnowing of Unit 1 in channel margins removing fine sediments creating a lag-gravel
3	Brown diamicton		Solifluction deposit infilling second channel
Channel cut into surface of unit 2 after retreat of glacier			
2	Chalky diamicton		Deposited by overlying ice-sheet
1	Sand and gravel		Glaciofluvial deposit infilling channel cut into Chalk
Steep channel cut into chalk bedrock			
0	Chalk		

TABLE 0.1 - SUMMARY OF THE STRATIGRAPHICAL SUCCESSION AT BARNHAM, BASED ON TABLE 3.1 IN ASHTON 1998E:13. WITH ADDITIONAL INFORMATION ADDED FROM LEWIS 1998 AND ASHTON ET AL. 1998, TABLE 24.1. P260-261. * DENOTES PRESENCE OF ARTEFACTS.

The assemblages selected for analysis are listed below. All are located on the channel margin, except Area III, which is situated in the middle of the channel feature (Ashton et al. 1998). Although the archaeology is argued as being broadly contemporary by Lewis on geological grounds as the assemblages occur within equivalent deposits within each of the activity areas (1998), this has been disputed by White (2000) and Wenban-Smith (1996). Despite this, the assemblages should still provide a good assessment of the types of activities that were taking place in this area of the landscape.

The raw material has been identified as originating from the cobble layer (Unit 4) or lag gravel on the edge of the channel (Ashton et al. 1998). Whilst for Areas I and IV (4) which were situated directly on the cobble layer, the raw material for Areas III and V appear to come not from an immediate source, but from somewhere outside the area of excavation. However, it is likely that the material is from a local source, perhaps even no more than a few metres (Ashton 1998b).

Area I (fresh) – primary artefacts discarded in unit 4 (cobble layer)

The assemblage from Area I is located on and within the cobble layer (unit 4) (exposed on the edges of the channel) and later reworked into the overlying yellow silty sand (unit 5e) (Lewis 1998). The fresh group totals 504 artefacts, comprising flakes, cores and flake tools. The full chaîne opératoire is represented, with a focus on tool production and resharpening. The presence of refits (Ashton 1998b) highlights the assemblages' integrity and limited post-depositional movement.

Area III (fresh) – *in situ* artefacts in unit 5c (grey silt and clay)

Area III is situated close to the middle of the channel and the 16 artefacts are associated with faunal remains, within a fine-grained context (unit 5c) (Ashton et al. 1998; Lewis 1998). The assemblage is similar in typological composition to that of Area I, representing flakes, cores and a flake tool. The lack of debitage suggests that this is a use location with tools being imported into the area then tossed into the channel. A dearth of disturbance is demonstrated by the presence of the only true *in situ* artefact scatter identified by the authors (Ashton 1998b).

Area IV (4) (fresh) – in unit 4 (cobble layer)

Similar to the assemblage from Area I, the artefacts from this location also lie on and within the cobble layer (unit 4) and in the overlying yellow silty sand (unit 5e) (Lewis 1998). The assemblage totals 379 artefacts, including flakes, flake tools, cores and core tools in the form of bifaces (Ashton 1998b). Two groups of artefacts are represented with hard hammer core and flake working, coupled with occasional biface manufacture (Ashton et al. 1998b).

Area V (fresh) – in unit 5d (grey/brown stony clay)

The fresh component (79 artefacts) of the archaeology in Area V rests on the surface of the grey/brown stony clay (unit 5d), which, as in Area IV (4), includes core and flake working with some biface manufacture (Ashton et al. 1998). Whilst refitting is present and the site is in primary context, some post-depositional disturbance has occurred (Ashton 1998b).

4.1.3. Environment

The site was located next to a river providing hominins with a diverse range of flora and fauna species, in addition to fresh water and a local raw material source in the form of reworked lag gravel (unit 4) present on the margins of the channel (Ashton 1998). The surrounding area has been classified as a mosaic of deciduous oak woodland and open-forest-edge communities. Over time, the slow-flowing river silted up and the environment became drier (Holman 1998; Seddon 1998; Ashton et al. 1998; Parfitt 1998).

4.2. Beeches Pit, Suffolk

Beeches Pit, Suffolk (TL 798719), is located in a disused brick pit on a slope above the River Lark. The site lies close to a series of other Palaeolithic locales (figure 3.1) including High Lodge (section 4.7), Elveden (section 4.5) and Barnham (section 4.1) (Preece et al. 2006). The first work at the site was conducted Skertchly in the 1870s, followed by Sieveking in 1967. Kerney, and more recent excavations between 1990 and 1991, aimed at clarifying the stratigraphy, followed by an extensive program of excavations by Liverpool University from 1992 to 1999 (figure 4.4) (Preece et al. 1991; Preece et al. 2006; Hallos 2001).

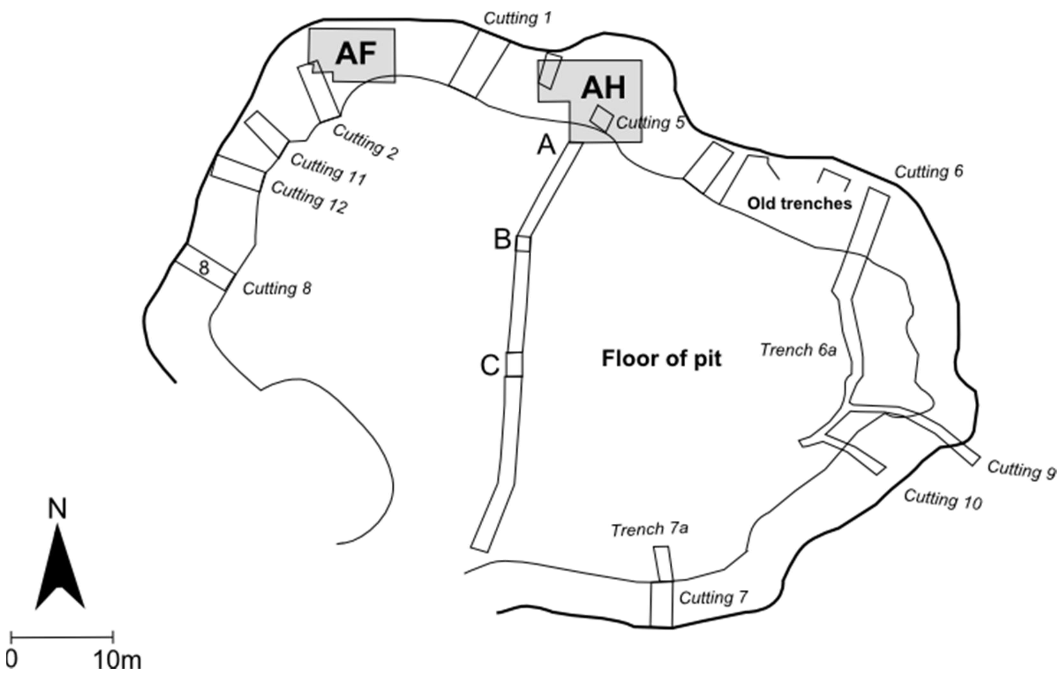


FIGURE 4.4 - MAP OF THE BRICKPIT AT BEECHES PIT, WITH EXCAVATION AREAS SHADED. REDRAWN FROM PREECE ET AL. 2006. FIGURE 2. P 487.

4.2.1. Site Formation and Geology

The Pleistocene deposits at Beeches Pit are situated in a sub-glacial channel, cut through the underlying chalk. The full stratigraphic succession can be seen in figure 4.5, along with the positioning of the assemblages recovered and the prevailing environment at the time (figure 4.6). Archaeological deposits are located in five layers, the first of which, layer 3b, comprises a brown silty clay, formed in a warm period close to a stagnant pool, in a scrub grassland environment. Layer 4 is made up of tufaceous silts and clays, associated with springs within a fully temperate forested environment. The overlying layer 5 comprises grey/brown silts and clays, linked to slope activity. The remaining two archaeological deposits, a black organic clay and 'bone bed' (layer 6) and sandy clay (layer 7) are associated with the development of slow-moving water conditions (Preece et al. 2006).

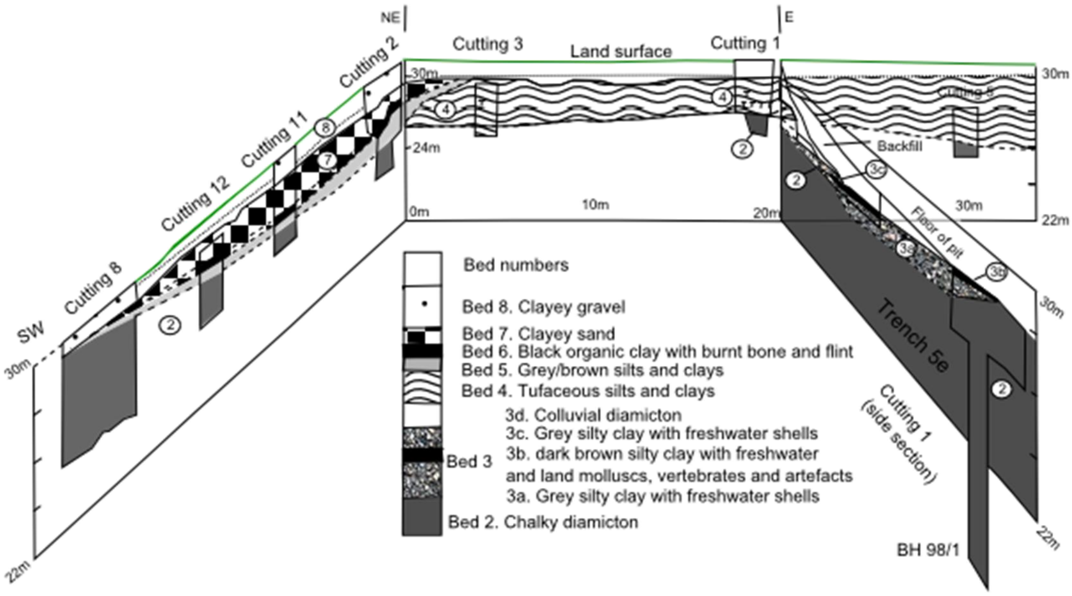


FIGURE 4.5 - ISOMETRIC VIEW OF THE EXPOSURES AND STRATIGRAPHICAL RELATIONS IN THE NORTH-WESTERN PART OF BEECHES PIT. REDRAWN FROM PREECE ET AL. 2007. FIGURE 4, P1242.

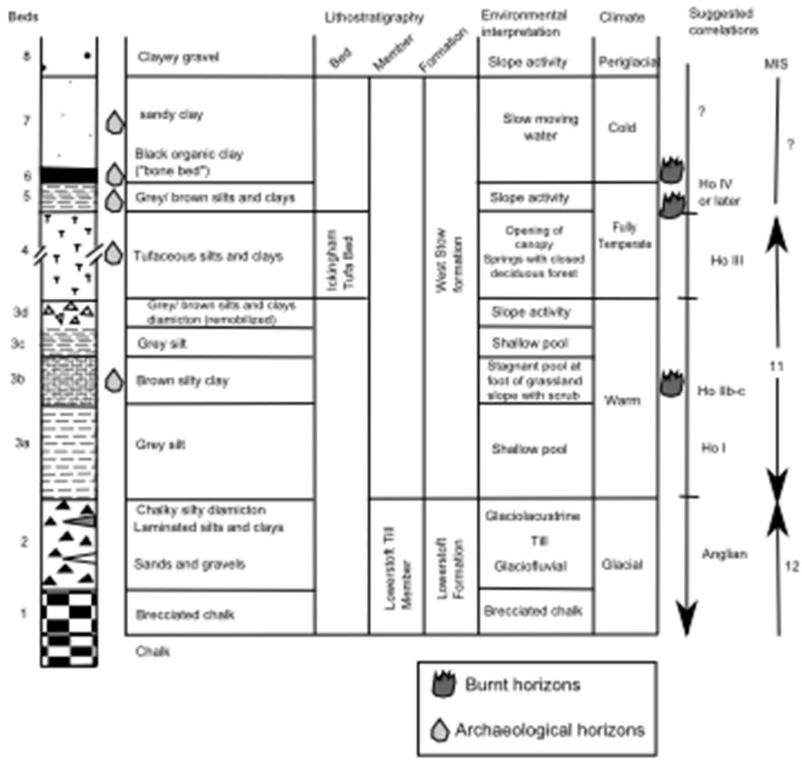


FIGURE 4.6 - SUMMARY OF STRATIGRAPHICAL SUCCESSION AND ENVIRONMENTAL CORRELATIONS AT BEECHES PIT. REDRAWN FROM PREECE ET AL. 2006. FIGURE 3, P488.

4.2.2. Archaeology

Excavations by the University of Liverpool identified two main areas-AF and AH-within the brick pit (Gowlett et al. 2005) (figure 4.5). The investigation at area AH produced a large collection of artefacts in a primary context, the majority of which come from bed 3b. The fresh condition of the artefacts and presence of refitting pieces confirm the primary context nature of the material (Hallos 2001). There is very little detailed information published about the assemblages, however, a detailed analysis and lists of artefact numbers for the Area AH assemblage is given in Hallos' thesis (2001), and this data will be utilised here (table 4.11). The assemblage from AH has been interpreted as representing the knapping of locally procured material, focused on producing handaxes on site, and refitting evidence indicates the presence of an *in situ* knapping site. Other evidence suggests that hominins were importing tools and exporting partly-reduced cores from the area (Hallos 2004; Preece et al. 2006).

In terms of the raw material, it was procured from nearby, either from glacial deposits or from the Upper Chalk outcrops further up the slope, which contain bands of good quality flint (Preece et al. 2006). Regarding the date of the site, biostratigraphical evidence from beds 3-5 demonstrates a Hoxnian faunal suite (MIS 11). In addition, the molluscan remains in bed 4 share affinities with the Middle Gravel at Barnfield Pit, Swanscombe, which is thought to be Hoxnian (Kerney 1971 in Preece et al. 1991; Preece et al. 1991; Schreve 2001). This, coupled with absolute dating methods (Uranium Series, Thermoluminescence and Amino Acid dating), serves to confirm the MIS 11 date for the site (Ashton et al. 1998; Preece et al. 2006).

In addition an important point to note is the association of the archaeology with the presence of burning events and burnt flint. This link with fire and the situation of the assemblages in forested environments (albeit of varying density) has led to the suggestion that the site represents a Lower Palaeolithic home base (Preece et al. 2006:492).

4.2.3. ENVIRONMENT

The earliest evidence for occupation, which includes the majority of artefacts from Area AH, bed 3b, is linked with an open environment at the edge of a small pool surrounded by marsh, with drier areas of calcareous grassland and patches of open woodland nearby. The next period of archaeological activity (beds 4 and 5) was located close to a tufa-forming spring, with areas of deeper, more permanent water in the form of pools nearby, as suggested by the aquatic molluscs. The molluscan fauna associated with artefacts from the base of the tufa demonstrates occupation at the height of an interglacial in an environment dominated by closed deciduous woodland, with similar conditions prevailing in bed 5. In the overlying deposits of bed 6, a change to more open country is suggested, with a shallow near-stagnant water-body during a colder climatic episode. Bed 7 is also a cold unit with cold-loving ostracods and lemming (Preece et al. 2006; Preece et al. 1991). Therefore, there is unambiguous evidence of human occupation of a relatively open landscape during an area of temperate climate (bed 3b) and within a fully interglacial closed forest environment (beds 4 and 5). Refitting flint clusters and evidence of fire use attests to *in situ* occupation during these periods. In addition, flint artefacts and burnt bone, recovered from overlying cold-climate deposits (bed 6 and 7), imply human persistence at the site under these dramatically different conditions (Preece et al. 2006).

4.3. BOXGROVE, SUSSEX

The site of Boxgrove, Sussex, is located in Eartham Quarry (SU 918087-SU924085), 12 km from the modern coastline and 7 km east of Chichester (Roberts and Parfitt 1999). The site comprises a series of Pleistocene land surfaces, forming part of the West Sussex coastal plain and abutting the steep dip slope of the South Downs (Roberts 1986; Roberts and Parfitt 1999) (figure 4.7).

Located in a quarry used for gravel, sand and chalk extraction, the site was first investigated in the 1970s by the British Geological Survey. The archaeological material uncovered was subsequently examined by Woodcock (Roberts 1986; Woodcock 1981), who highlighted the possibility that an extensive occupation layer existed at the site. Consequently, it was re-investigated in 1983 as part of a rescue excavation prior to further quarrying (figure 4.8). This work revealed *in situ* knapping scatters demonstrating the importance of the location. Further extensive work was conducted by the Boxgrove Lower Palaeolithic Project, run by the Institute of Archaeology at University College London (Roberts 1986).

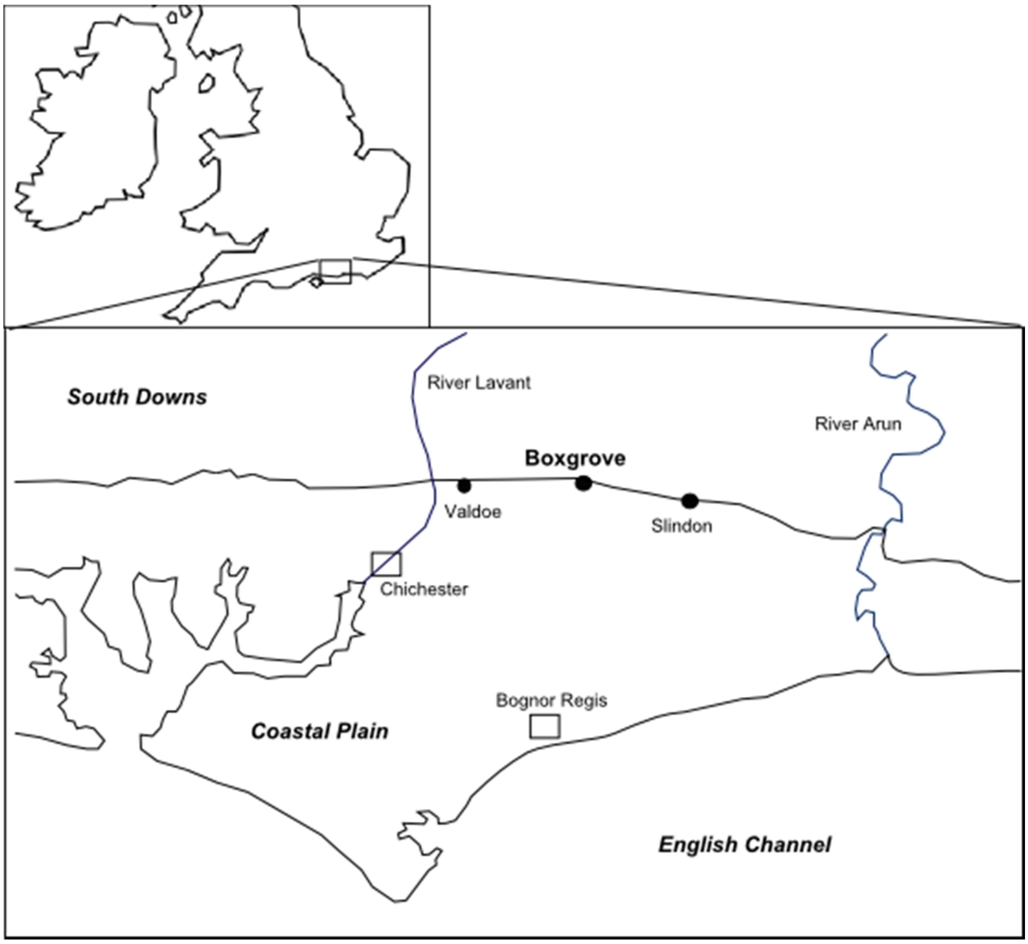


FIGURE 4.7 - MAP SHOWING LOCATION OF BOXGROVE ON THE SUSSEX COASTAL PLAIN. MODIFIED AND REDRAWN FROM POPE 2002. FIGURE 3.1, P83.

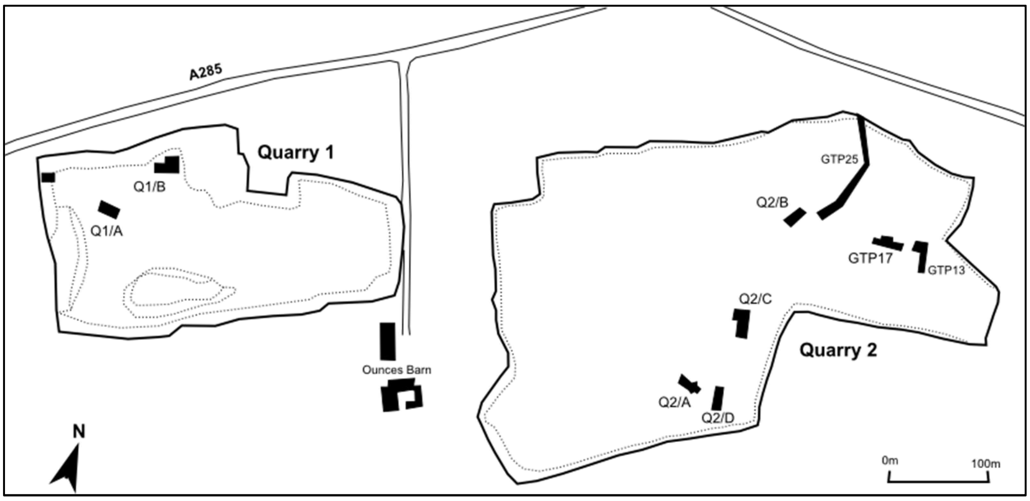


FIGURE 4.8 - LOCATION OF BOXGROVE QUARRIES AND EXCAVATION AREAS. REDRAWN FROM POPE 2002.FIGURE 3.7. P103.

4.3.1. Site Formation and Geology

The geology of the site comprises two major groupings of sediments. The basal material is chalk, overlain by a series of temperate deposits classified as the Slindon Formation. These are capped by sediments formed during the cooler, final part of an interglacial, the Eartham Formation (Roberts 1999).

The stratigraphic succession is laterally variable across the site, with some deposits only located in close proximity to the cliff line whilst others are located some distance from it. The general succession of deposits is shown in figure 4.9 with additional localised units included in table 4.3. The deposits of interest to this study belong to Unit 4, which contains primary context archaeology. The assemblages would have been discarded during low tide events on a major land surface which formed for a short time in front of the cliff (figure 4.10). After a period of inundation, a second land surface developed (Unit 4c). This developed into a grassy plain, upon which the main artefact scatters were deposited (Roberts 1999:152,153).

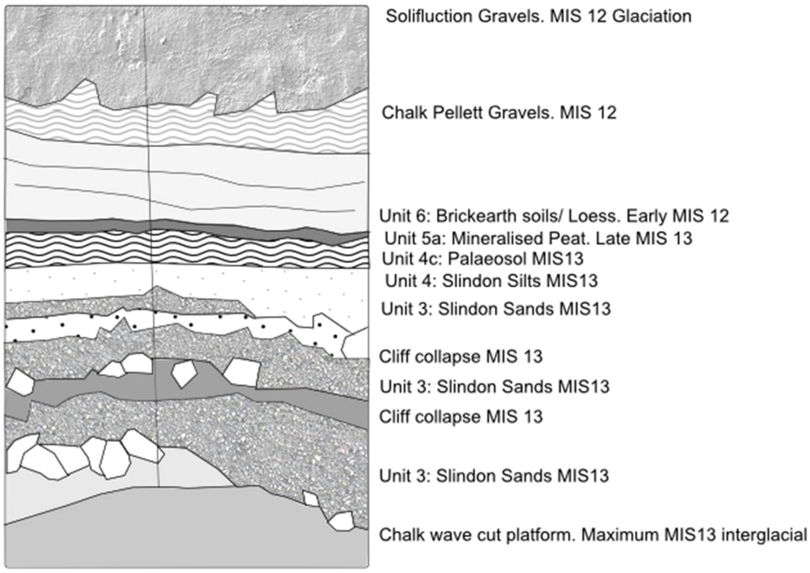


FIGURE 0.2 - SUMMARY OF STRATIGRAPHIC SUCCESSION AT BOXGROVE. REDRAWN FROM POPE 2002. FIGURE 3.2. P86.

Unit	**Description**	**Origin**	
10, 11	Head Gravels		
9	Fan bed gravels		
8	Angular chalk beds and silty clays	Derived from scree of cliff	Eartham Formation
7	Angular chalk beds	Formed from erosion of cliff	
6	Eartham Upper Gravel Member Brickearth solifluction Loess	Formed through soil movement in cooler conditions from downland block	
5a	Marshy mire deposit	Marking transition to colder climate	
4c	Palaeosol	Development of land surface – grassy plain	Slindon Formation
4	Slindon Silts	Deposited in lagoon conditions	
Formation of intertidal mudflat as lagoon feature developed			
3	Slindon Sands	Deposited at the end of the Cromerian by a high sea-level event.	Slindon Formation
1	Bedrock	Chalk	

TABLE 0.2 - SUMMARY OF STRATIGRAPHIC SUCCESSION AT BOXGROVE, COMPILED FROM ROBERTS 1999.

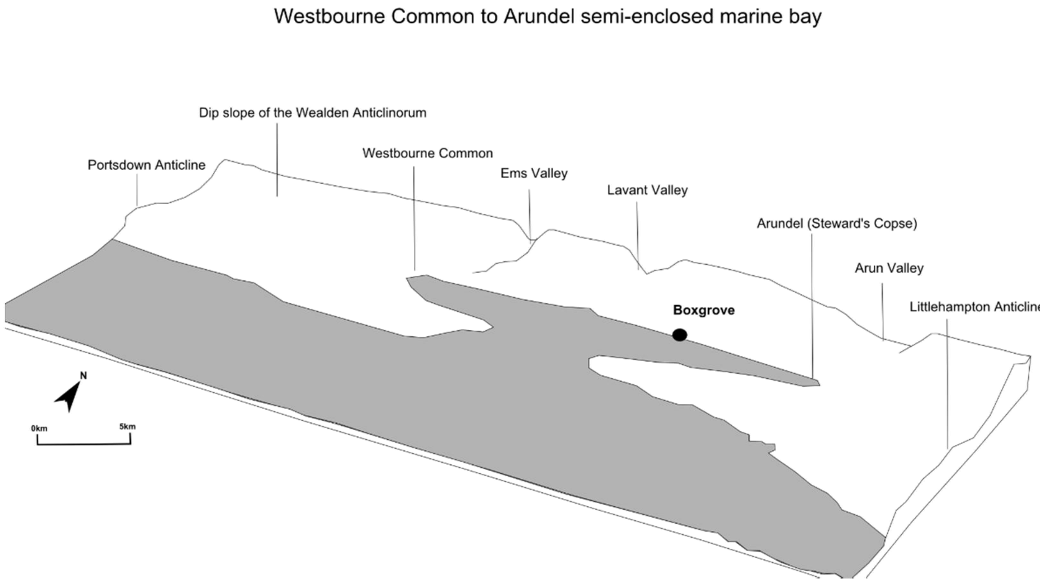


FIGURE 0.3 - RECONSTRUCTION OF THE SEMI-MARINE BAY AT BOXGROVE. REDRAWN FROM ROBERTS AND POPE 2008. HANDOUT. LITHICS STUDIES SOCIETY EXCURSION TO BOXGROVE FIGURE 6.

4.3.2. Assemblage

The site has so far only been partly published; consequently, the analysis is limited to material included in the first report (Roberts and Parfitt 1999) and the data contained within Pope’s 2002 thesis. The main archaeological bearing layers are Units 4c and 4b (Austin et al. 1999), and the present analysis will concentrate on these (table 4.11).

Quarry 1 Area A – Unit 4c

Quarry 1 Area A (Q1/A) was discovered 100m south of the buried cliff line. The main archaeology comes from Unit 4c and is in fresh condition, with a small amount of associated butchered bone. Refits are present within the flake debitage, with all stages of biface production represented. However, the assemblage is focused more towards the final stages of biface reduction, with a predominance of thinning and finishing flakes, suggesting tools were imported partially knapped and finished in the area (Pope 2002; Austin et al. 1999).

Quarry 1 Area B (Q1/B)

This area is located between Q1/A and the relict cliff line 60m south of this feature. The geology is similar to Q1/A, but with the addition of a silt (unit 4d) deposited as the product of a spring originating from the chalk cliff. The archaeology is only present in this area from unit 4c and 4d and, judging from the artefacts, similar activities seem to have been taking place. The material is fresh, except for six rolled pieces, probably incorporated from an earlier deposit. The presence of refits again shows that this assemblage and the deposits have some degree of integrity (Austin et al. 1999).

Quarry 2 GTP 17 – Unit 4b

General Test Pit 17 (GTP 17) is located in Quarry 2, at the north-west end of the excavations, and is only 40m south of the buried cliff line. Unit 4c contained a number of handaxes and flakes, all in fresh condition, associated with evidence of butchery and faunal material including deer, rhino and bison. In addition, an archaeological horizon is present within the unit 4b silts, similar again to deposits in Quarry 1, Area A; and over 1800 pieces, including refits, were procured and linked to a single episode of horse butchery. Hominins imported nodules to knap in the vicinity of a carcass located on an exposed mudflat. All phases of butchery appear to have taken place at this location, including killing, skinning, disarticulation, butchering and marrow extraction (Austin et al. 1999).

Two types of raw material were immediately available at Boxgrove in the form of tabular and nodular flint varieties. The tabular flint consists of coarse bands, so would have been less easy to work. Consequently, the hominins seem to have utilised the nodular flint preferentially, despite its variable quality. The material would have been collected as it eroded out of the cliff face, or picked out from the scree deposits at the base of the cliff (Austin et al. 1999; White 1998).

The dating of the site has been to some extent problematic, as different techniques have produced different date ranges. However, the consensus from the faunal component of the site record, including mammalian and molluscan evidence, suggests a date of MIS 13 for the temperate deposits (Slindon Formation) and MIS 12 for the cold bearing deposits (Eartham Formation), thus providing a date range of 524-420kBP (Roberts and Parfitt 1999).

4.3.3. Environment

The landscape surrounding the site is described as mosaic, with areas of open grassland, shrub and bush vegetation, which acted as a corridor for herds of ungulates traversing the coastal plain. There would have been small pools littering the landscape and forested vegetation on the downland block above the site (Roberts and Parfitt 1999; Roberts 1999; Roberts et al. 1997).

4.4. Clacton-On-Sea, Essex

The site of Clacton-on-Sea is located on the east coast of Essex, 26km south-east of Colchester. It comprises three main localities situated around a series of braided palaeochannels: Jaywick Sands (TM 154135), Lion Point (TM 148128) and the Golf Course site (TM 157134) (figure 4.11) (McNabb 1992; Singer et al. 1973). Clacton has been an important location for Pleistocene fauna since the nineteenth century, and a key site for Palaeolithic artefacts since the early twentieth century.

The main collection of artefacts – from the Lion Point foreshore - was amassed by Warren between 1910 and 1950. Brief investigations were also made in this area by Oakley and Leakey (1937), and later sediment sampling was undertaken by Bridgland (1994) (McNabb 1992). The first real excavations were conducted by Oakley and Leakey at Jaywick Sands, one kilometre north-east of the original location (Oakley and Leakey 1937). This locality produced a sequence of deposits including fluviatile marls, sands and gravels, which represented the remains of a number of small palaeochannels, confirming Warren's previous observations. The site contains fresh artefacts, suggesting the presence of a primary knapping floor. A second excavation was carried out at the Golf Course site (figure 4.11) by Wymer and Singer between 1969 and 1970. In a comparable situation to the archaeology at Jaywick, the site yielded an assemblage in fresh condition. The small numbers of rolled pieces were interpreted as being linked with occupation on the bank of one of the channels (Singer et al. 1973).

4.4.1. Site Formation and Geology

The deposits at Clacton-on-Sea represent a complex sequence, comprising a series of Pleistocene channels, related to the diversion of the Thames into the Medway's channel during the Anglian Glaciation (McNabb 1992). The stratigraphy is locally variable across the area, and has consequently produced diverse interpretations of the depositional succession (e.g. Singer et al. 1973 and McNabb 1992.) Nevertheless, a generalised sequence has been developed by Bridgland (1994) (figure 4.12) and further clarification of the stratigraphy was published in 1999 (Bridgland et al. 1999), as summarised in table 4.4.

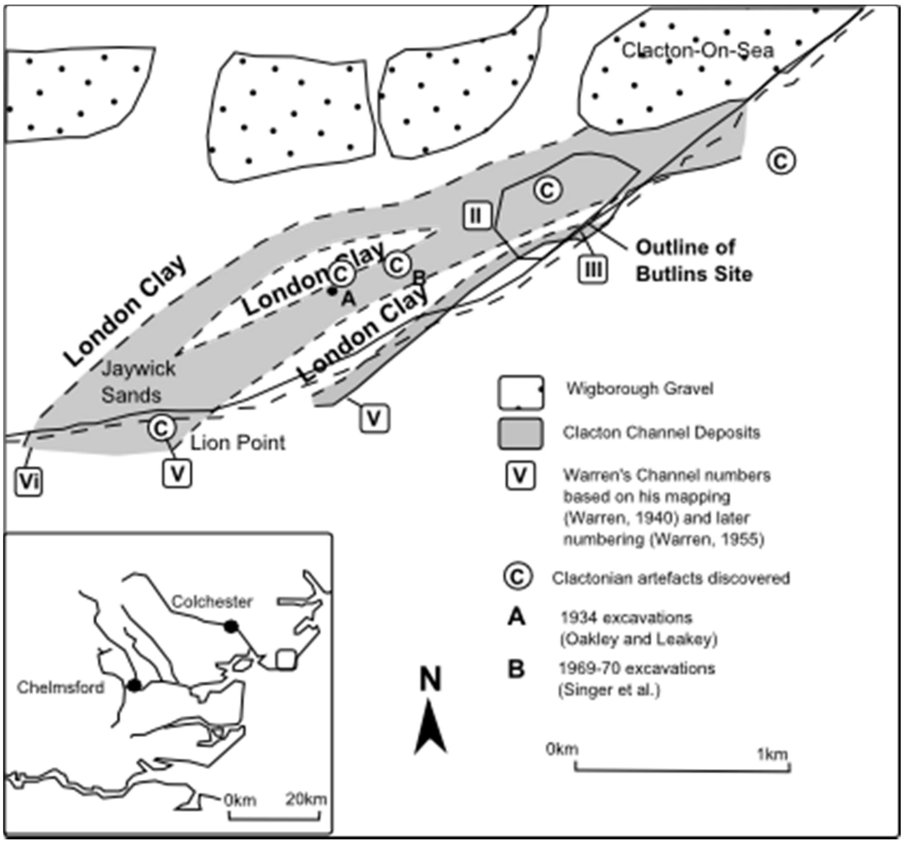


FIGURE 4.11 - LOCATION MAP FOR THE CLACTON LOCALITIES. REDRAWN FROM BRIDGLAND ET AL. 1999. FIGURE 1, P111

Hominin presence is attested in both the Upper and Lower Freshwater Beds, but not the Estuarine Beds. The fauna, pollen and molluscan evidence, indicate that these two units fall within the early and late temperate zones of the Hoxnian interglacial (MIS 11). Correlations are also indicated with the Lower Gravel at Swanscombe (see below), suggesting a similar age for the two sites (McNabb 1992; Roe et al. 2009; Bridgland 1994).

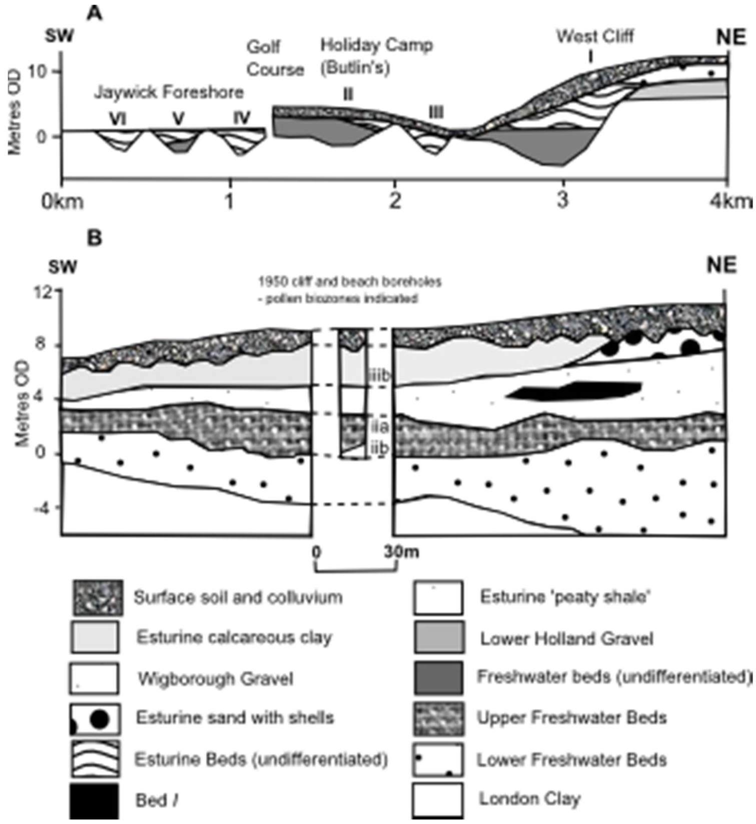


FIGURE 4.12 - SECTION SHOWING THE CLACTON CHANNEL OCCURRENCES AND SECTION THROUGH DEPOSITS. A – IDEALISED SECTION THROUGH THE SIX CHANNELS IDENTIFIED BY WARREN. B – DETAILS OF THE WEST CLIFF SECTION. REDRAWN FROM BRIDGLAND ET AL. 1999 (SEE FOR MORE DETAILED DESCRIPTION)

Unit	Description	Description
9	Surface soil and colluvium	
8	Upper bedded gravel	
7	Calcareous clay, passes laterally into 6	Clacton Estuarine Beds
6	Estuarine sands and shells	Clacton Estuarine Beds
5	Laminated clay	Clacton Estuarine Beds
4	Erosion creating channelling within 3	
3	Loamy sands and clays	Upper Freshwater Beds*
2	Clayey gravel and sands	Lower Freshwater Beds*
1	London clay / lower Holland gravels	

TABLE 4.4 - GENERALISED STRATIGRAPHIC SUCCESSION - DEVELOPED FROM: BRIDGLAND 1994:333.* LOCATION OF ARTEFACT LAYERS.

4.4.2. ARCHAEOLOGY

The database for Clacton includes the assemblages from the three main locations mentioned above (table 4.11). The majority of raw material used appears to be local in origin, most likely sourced as cobbles from the river gravels (Singer et al. 1973; McNabb 1992). There are a small number of non-flint pieces in the form of quartzite. However, these came from earlier excavations and no other examples were found during the later analyses (Singer et al. 1973).

LION POINT

The assemblage contains the material collected by Warren from the Lion Point foreshore, housed in the Warren Collection in the British Museum (Warren 1951, NcNabb 1992). Details of the 1342 artefacts have been obtained from McNabb's doctoral thesis (1992) and represent a collected assemblage subject to recovery biases, such as the lack of small débitage. Evidently this might be the result of modern coastal processes, or due to the fact that Warren may have overlooked them, although McNabb (1992) attributed it to winnowing action shortly after deposition. This locality has previously been classed as a non-biface assemblage, however it does contain two rolled handaxes. These implements have similar degrees of rolling to other flakes present in the assemblage and could conceivably be related to the other artefacts, or may be related to an entirely separate period of occupation.

Jaywick

Oakley and Leakey excavated at Jaywick Sands ahead of development work, in a location where the channel deposits were considered to be closer to the surface. The assemblage utilised in this study comprises data on 200 artefacts labelled as Jaywick from the British Museum and McNabb has suggested that they represent sweepings off the side of the channel from occupation surfaces nearby (McNabb 1992).

Golf Course

The final collection is that from the Golf Course site and the excavations of Wymer and Singer. There is available data from both McNabb's thesis and the published report (McNabb 1992; Singer et al. 1973), although despite the fact that McNabb's work represents the most recent analysis, here the artefacts from both the marl and gravel were combined, due to perceived similarities in technology (McNabb 1992). However, this is not ideal as they may represent two separate assemblages or occupations, thereby corresponding to the enactment of different activities. Therefore, the dataset for this location is taken from the published report by Singer et al. (1973). An additional advantage to this is that the analysis can be restricted to only those artefacts which the excavators regarded as mint or sharp condition (Singer et al. 1973). Consequently, the 736 artefacts that make up this assemblage will be used for the analysis. The original excavators regarded the archaeology from the upper part of the gravel as representing an *in situ* occupation, based on the refits and fresh condition of the artefacts. In contrast to this, McNabb argues that damage on these pieces is consistent with fluvial transport, although the fresher pieces are likely to be derived from a nearby location. Whilst a number of scenarios could be imagined, McNabb's favoured hypothesis is that of hominin occupation of the stream bank, from which artefacts were washed in and reworked into the gravel bed or bar. This theory is consolidated by refits linking artefacts that remained on the bank with those in the channel, thereby confirming the limited lateral disturbance of the assemblage.

Furthermore, it explains why the rolled material identified by McNabb does not demonstrate signs of extensive travelling and damage (McNabb 1992).

4.4.3. Environment

The environment at the time of the deposition of the Freshwater Beds, which includes the artefact-rich marl and gravel, would have been temperate. The presence of nearby deciduous woodland is attested to by oak and alder pollen, coupled with faunal evidence, including boar and fallow deer. Furthermore, the presence of horses indicates nearby areas of more open grassland. This mixture of environments would have provided hominins with a variety of resources to exploit, and when viewed in context with other Lower Palaeolithic sites, suggests a strong preference for the occupation of mosaic habitats (Bridgland 1994).

4.5. Elveden, Suffolk

The site of Elveden, Suffolk (TL 809804), is situated in a disused brick pit 3.5km west-south-west of Thetford (figure 4.13). The initial excavations were undertaken in 1937 by Paterson and Fagg, followed in 1967 by Sieveking and Turner, building on earlier work and adding to the assemblage totals. The similarities between the stratigraphical sequence at Elveden and the neighbouring site of Barnham raised questions about the relationships between the assemblages at these two sites, and this provided the focus for the most recent excavations by the British Museum between 1995 and 1999 (Ashton et al. 2005).

4.5.1. Site Formation and Geology

The British Museum recovered artefacts from five main areas (figure 4.14), representing hominin occupation next to a river. Table 4.5 summarises the stratigraphy at Elveden, with the artefact bearing deposits situated in units 3-5. Whilst the gravel (unit 3) contains the majority of the artefacts, the overlying black clay (unit

4) produced an assemblage in fresh condition, especially in Area III. The uppermost layer associated with hominin occupation is a brickearth (unit 5) and this produced artefacts in both Area I and III (Ashton et al. 2005). The two areas which produced the assemblages chosen for this study (see below) are Areas I and III, and more detailed stratigraphy and section drawings for these areas can been seen in figure 4.15 (Area I) and figure 4.16 (Area III).

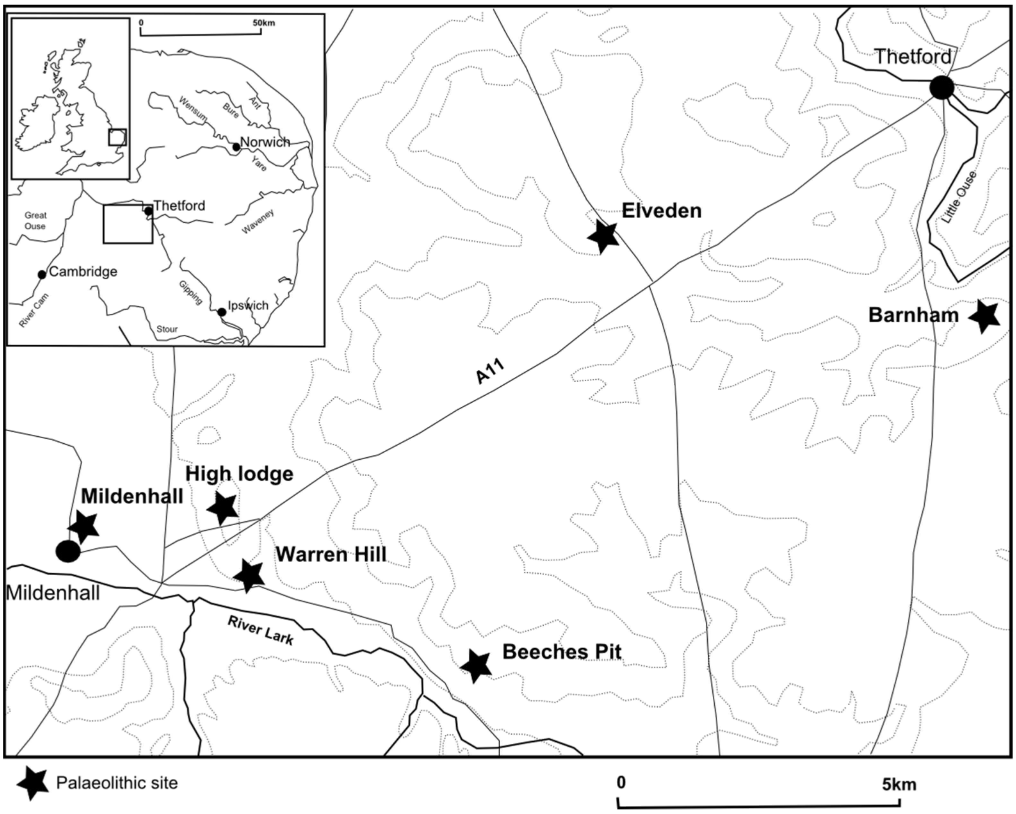


FIGURE 4.13 - MAP SHOWING THE LOCATION OF ELVEDEN. REDRAWN FROM ASHTON ET AL. 2005. FIGURE 1. PAGE 2

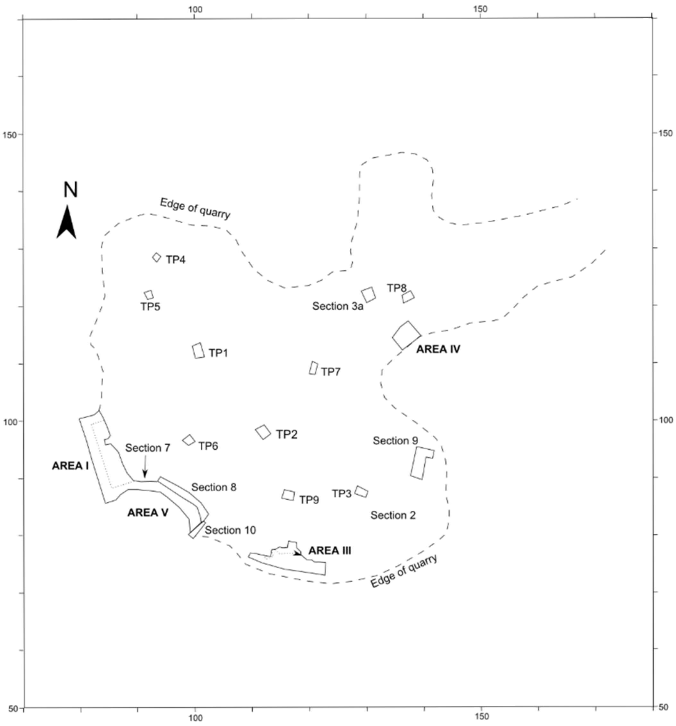


FIGURE 4.14 - MAP OF EXCAVATIONS AND LOCATION OF SPECIFIC AREAS AT ELVEDEN. REDRAWN FROM ASHTON ET AL. 2005. FIGURE 2. PAGE 3.

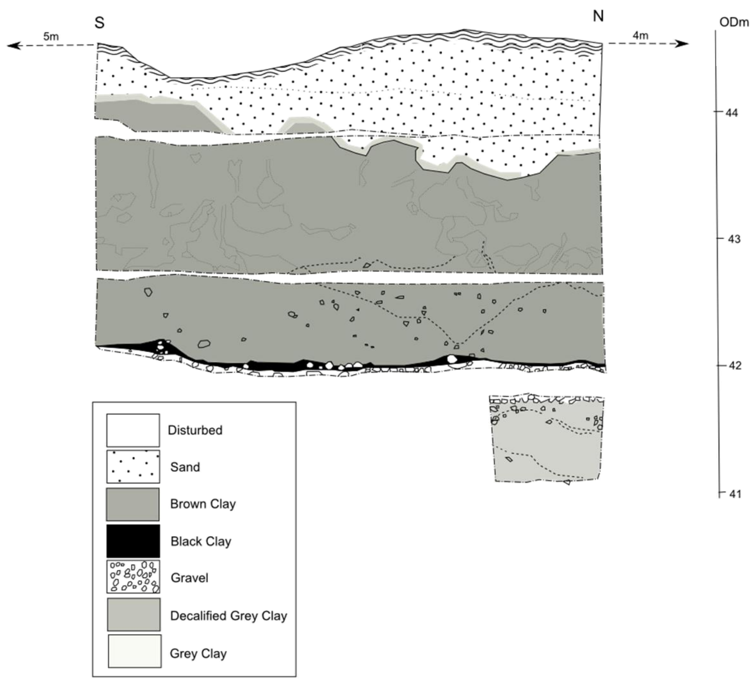


Fig 11.Area I section. Full section extends 5m to the south and 4m to the north.

FIGURE 4.15 - SECTION DRAWING FROM AREA I. REDRAWN FROM ASHTON ET AL. 2005. FIGURE 11. PAGE 13

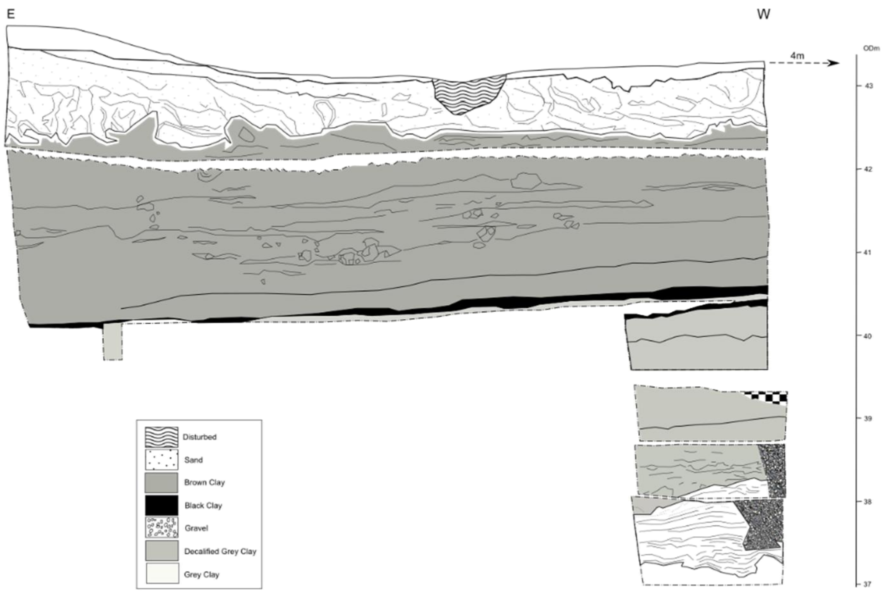


Fig 12. Area III section. Full section extends 4m to the west.

FIGURE 4.16 - SECTION DRAWING FROM AREA III. REDRAWN FROM ASHTON ET AL. 2005. FIGURE 12. PAGE 14

Bed	Description	Date	Description
6	Coversand		Laid down by the last cold stage.
5	Brown silt and clay (brickearth)*	MIS 11	Laid down by colluvial processes, with the presence of sand indicating occasional high energy flows.
4	Black clay*	MIS 11	Located around the depression margins – development of margins at the edge of the water body as the basin dried out.
3	Gravel*	MIS 11	Lag deposit focused around the margins of the depression, sloping towards the centre.
2	Grey silt/clay	MIS 11	Deposited by a still or slow flowing water body - organic sediment and lamination indicates lacustrine conditions for part of the sedimentation.
	Depression formed in chalky diamicton, infilled by bed 2		
1	Chalky diamicton	MIS 12	Lowersoft Till Member
Depression forming in chalk bedrock, infilled by bed 1			
Chalk Bedrock			

TABLE 4.5 - SUMMARY OF DEPOSITS AT ELVEDEN. INFORMATION TAKEN FROM ASHTON ET AL. 2005. * DENOTES ARTEFACT-BEARING LAYERS.

4.5.2. ARCHAEOLOGY

The most recent excavations produced a total of eight assemblages. However, only those from Areas I and III are large and fresh enough to warrant inclusion here. Area I produced two assemblages, one from the gravel (bed 3) and one from the overlying brickearth (bed 5) (table 4.11).

Ashton et al. suggested two hypotheses regarding their deposition. Firstly, they could represent two separate assemblages, with the artefacts from the gravel modified to some extent through post-depositional movement, resulting in the loss of the smaller component. The second hypothesis is that they constitute the same assemblage, but with artefact movement vertically from the gravel into the brickearth (Ashton et al. 2005). Regardless, the artefacts from the brickearth represent the more *in situ* assemblage, appearing fresher, with more of the smaller component present. Therefore, this assemblage will be included in the analysis, as it should be representative of the activities taking place at this location.

In the same way, there are two artefact-bearing deposits from Area III, the black clay (bed 4) and the overlying brickearth (bed 5). The black clay deposit (bed 4) contains *in situ* artefacts in fresh or slightly abraded condition and includes some refits. This coupled with the size distribution of the artefacts is indicative of minimal post-depositional movement. In contrast, the overlying brickearth incorporates a much smaller assemblage that suffers more from post-depositional movement (Ashton et al. 2005). Therefore, the *in-situ* assemblage from the black clay is selected for analysis.

Regarding the date of the hominin occupation, the deposits forming beds 2 to 4 occupy a depression in the chalky till formed by a water body, within which sediment was deposited during a warm phase after the Anglian Glaciation (MIS 12). Amino Acid Racemization, faunal evidence and organic palynological remains from bed 2 and bed 3 all indicate an MIS 11 age**.** It is likely that the assemblages present at the site are broadly contemporary, in a similar situation to that at Barnham; however, this cannot be directly demonstrated (Ashton et al. 2005).

The raw material at Elveden is most likely of local origin with two sources of flint suggested, both linked to the development of the river. The first, the lag gravel, is present in Areas I, II, IV and V and comprises small to medium pebbles and occasional larger cobbles. The second, less common example is large nodules from the chalk coupled with occasional clasts present in the brickearth, which are in fresh condition and were probably eroded from the chalk by the river (Ashton et al. 2005).

Area I – Brickearth (Bed 5)

The brickearth is formed through colluvial processes, with thinly developed soils present at various levels within the sediment. The assemblage from this deposit, which totals 2163 artefacts, is in fresher condition than that from the gravel. Furthermore, a comparative analysis conducted by Ashton et al. using Schick's 1986 experimental work suggests that the majority of knapping debitage is present, including the chips (Ashton et al. 2005). This coupled with the fresh condition of the artefacts indicates that this is an *in situ* assemblage, highly suitable for this study.

Area III – Black Clay (Bed 4)

The artefacts within the black clay in Area III are in primary context, with a large number of refits suggesting very little post depositional movement. The black clay represents the formation of a palaeosol, with the artefacts deposited prior to full soil development. The number of refits coupled with the fresh or only slightly abraded condition and size distribution further suggests that limited movement has occurred (Ashton et al. 2005). The assemblage from the black clay in Area III comprises 1465 artefacts.

4.5.3. Environment

The pollen evidence from the sediment sequence prior to hominin occupation indicates cool conditions and an environment consisting of open vegetation at the edge of a water body. As the basin steadily infilled, lacustrine conditions were replaced by a stream environment. With the warming of the climate, the stream developed into a moderate-sized river, situated within a wooded, temperate environment, as suggested by faunal and molluscan remains from bed 2 (grey silt/clay). The riverine conditions provided an attractive habitat for hominins, providing fresh water and a raw material supply in the form of the lag gravel (Ashton et al. 2005).

4.6. FOXHALL ROAD, SUFFOLK

The site of Foxhall Road, Suffolk (TM 187439), is situated on a gravel plateau above the town of Ipswich at 40m (135ft) OD (figure 4.17). Recent work has re-constructed the original 1900s excavations and identified eight assemblages, including two in primary context (White and Plunkett 2004).

The site was discovered during clay extraction in 1902, resulting in three separate excavations in the early twentieth century. The original investigations were conducted by Nina Layard between 1903 and 1905, followed in 1914 by a joint collaboration between Layard and Reginald Smith, the aim of which was to clarify the geological sequence at the site. A third excavation was carried out by James Reed Moir in 1921. Work by Wymer, aimed at relocating surviving Pleistocene deposits proved to be unfruitful (White and Plunkett 2004). The most recent work at the site, facilitated by the demolition of a factory and engineering work, allowed Allen and White (unpublished) to confirm the position of the original trenches, and tie up some remaining doubts about the stratigraphy.

4.6.1. SITE FORMATION AND GEOLOGY

The site is situated in a linear channel feature - part of the valley of the Mill River - that originally formed as a sub-glacial drainage line. This channel is interspersed with three deep depressions, created by sub-glacial scouring and filled with fine-grained sediments (brickearth). At the time of occupation, in the Hoxnian Interglacial (MIS 11), these would have formed a series of small lakes or ponds connected via a small stream. The site excavated by Layard, Smith and Moir is situated in one of these deeper sections (White and Plunkett 2004), with occupation surfaces forming on the red gravel and clays as water levels fluctuated (Allen and White 2004). The sequence of deposits is summarised in table 4.6 and in figure 4.18.

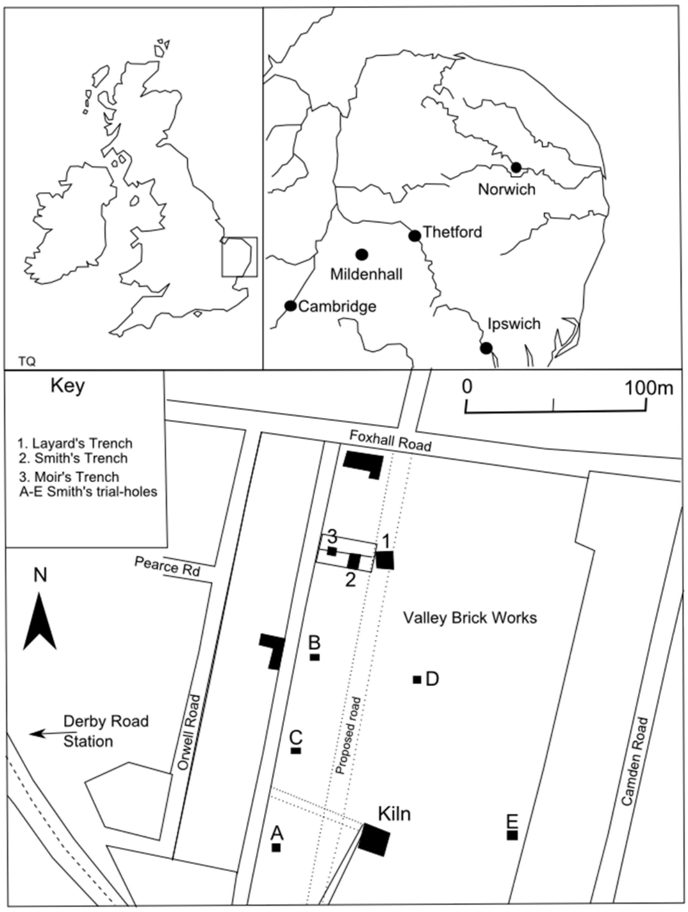


FIGURE 4.17 - MAP SHOWING THE LOCATION OF FOXHALL ROAD. REDRAWN FROM WHITE AND PLUNKETT 2004. FIGURE 1.1, P1.

Sediment	Environment	Description
Upper sand and gravel	Fluvial	Final layer of riverine deposition.
Gravelly clay*	Fluvial	Horizontally laid riverine deposit – sparse artefacts.
Development of riverine conditions		
Red and grey clay*	Lacustrine	Sloping deposit of water-lain sandy clay, occasional pebbles and artefacts.
White gravelly clay*	Lacustrine	Lens of flint gravel, containing abraded artefacts.
Red gravel*	Lacustrine	Sloping deposit, with varying gravel sizes – abundant fresh artefacts.
White sandy gravel*	Lacustrine	Localised lens - sloping into hollow – sparse artefacts
Grey clay*	Lacustrine	Sloping deposit infilling hollow – sparse, fresh artefacts.
Bone bed		Angled deposits comprising of sands, gravels and shingles – glacial outwash.
Formation of deeper sections resulting from sub-glacial scouring – forming ponds		
Formation of linear channel feature as part of a sub-glacial drainage line		
Boulder clay		

TABLE 4.6 - SUMMARY OF THE STRATIGRAPHIC SUCCESSION AT FOXHALL ROAD (COMPILED FROM WHITE AND PLUNKETT 2004; ALLEN AND WHITE 2004, TABLE 6.2 P59)

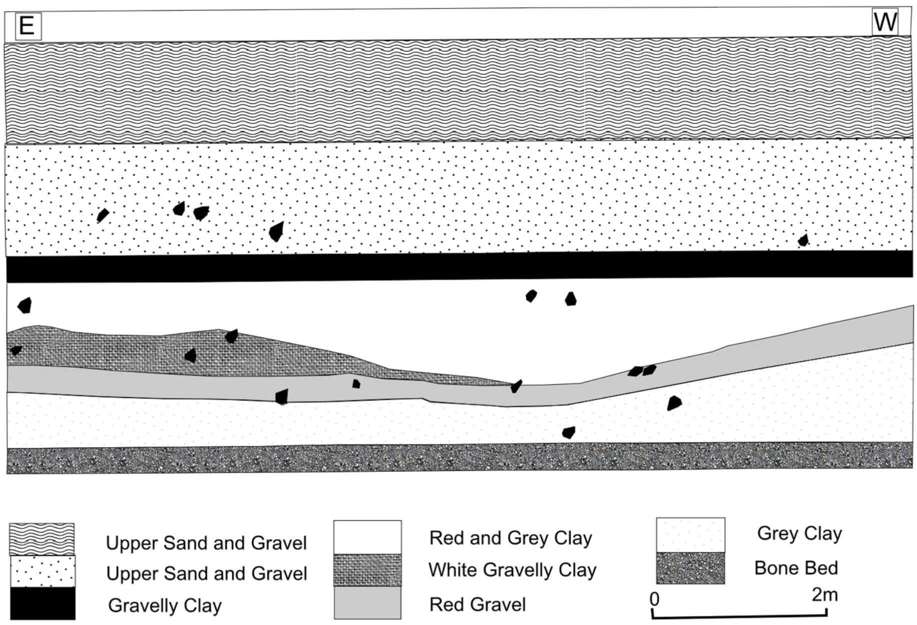


FIGURE 4.18 - SECTION DRAWING FOR FOXHALL ROAD SUMMARISING THE SUCCESSION OF DEPOSITS. TAKEN FROM WHITE AND PLUNKETT 2004. FIGURE 6.2, P60

4.6.2. ARCHAEOLOGY

Unfortunately the quality of data is highly variable. First, while Layard's excavation was detailed and well recorded in many ways, the precise number of artefacts that were uncovered is unknown. For example, despite the fact that every worked flint was kept, the exact numbers of flakes collected in the first season was not recorded (White and Plunkett 2004). An estimate by White and Plunkett suggests approximately four to five hundred artefacts were discovered, from the eight separate assemblages (2004). Secondly, the artefacts from Smith's investigations proved difficult to assign to individual layers, with many of the artefacts derived from secondary contexts in the upper deposits. In the same way Reed Moir's excavations also proved problematic with regard to the location of artefacts, coupled with many artefact losses which occurred over the intervening years. Nevertheless, there are artefacts which clearly relate to what he termed 'bed 7' which equates to Miss Layard's Red Gravel (White and Plunkett 2004), providing additional information about this context.

In addition to potential excavation losses, smaller artefacts may be under represented, especially from within the gravel layers. This could suggest a bias towards the larger more easily identifiable flakes and tools. Nevertheless, whilst there is a bias in the flake component, both hard hammer and soft hammer flakes are present, with debitage from different stages of the, *chaîne opératoire* at the site.

These issues could be considered problematic; however the methodology employed in this research (section 2.5) focusing on presence/ absence of artefacts and *chaîne opératoire* stages should limit these factors in the analysis. Furthermore, the *in situ* nature of the two assemblages, coupled with the presence of hominin occupation during lacustrine conditions, contrasts with many British Lower Palaeolithic sites, where occupation is linked to the arrival of fluvial conditions (Ashton et al. 2006). Consequently, Foxhall Road is an important site for this study, as it serves as an example of lakeside occupation.

As both the red gravel and grey clay artefacts are considered to be in primary context (White and Plunkett 2004), both of these have been selected for inclusion here (table 4.11). These deposits are interglacial in character and attributed to the early to middle Hoxnian (MIS 11), with the archaeology located at the top of this sequence consequently placing it directly within MIS 11 (Allen and White 2004).

The flint raw material comprises three types: bullhead, Cameropitichium aperta (*C. aperta)* flint and sponge flint. Overall the majority of the material (80%) has a worn cortex, suggesting procurement from nearby gravel sources, with the remainder identified as chalk flint. The artefacts manufactured on the red gravel utilise material from directly within this deposit. In contrast to this, the material from the grey clay appears to be larger and was probably imported into the site, although it is likely to have come from a relatively local source (White and Plunkett 2004).

Grey Clay

The majority of artefacts from this deposit are in mint or fresh condition which, when coupled with the presence of fairly large artefacts within a very low energy environment suggests these are the product of hominin discard, rather than the result of fluvial action. This *in situ* assemblage comprises three discrete clusters of artefacts, one of which Layard found around a burnt area (hearth feature) in a rough arc. Whilst the artefacts only total 29, they represent a small group of undisturbed activities, potentially giving us a clearer picture of behaviour at this location, related to a relatively short-lived lakeside occupation (White and Plunkett 2004).

Red Gravel

The assemblage from the red gravel contains artefacts that are mainly fresh or slightly rolled (90%), with the remaining 10% more heavily abraded and likely derived from elsewhere when the gravel was emplaced. The majority of the artefacts, however, were deposited on the surface of the gravel when the lake receded, and it is this deposit which provided the raw material. There is evidence of some disturbance probably caused by winnowing of the sediment at the water's edge (Allen and White 2004). Despite this, Layard does mention the presence of a refitting piece which, if correct, suggests that this post depositional movement was limited. Unfortunately, this refit has been lost during the intervening years and cannot be verified (White and Plunkett 2004).

Nevertheless, the comparison of the artefacts from the red gravel to Schick's experimental sample (1987), conducted by White and Plunkett, concluded that, provided the excavation bias is taken into account, the assemblage from the red gravel mirrors the experimental data, thereby suggesting the presence of a fairly complete original scatter (2004). The assemblage from the red gravel chosen for this analysis therefore combines data from both Layard's excavation (n=142) and that of Reid Moir (n=112) (see discussion above) comprising a total of 256 artefacts.

4.6.3. Environment

Due to the antiquity of the excavations, we have limited evidence for the local environment at the site. The only environmental evidence comes from the 'Bone Bed', located below the grey clay, and includes a few fragmented faunal remains: a tusk fragment from an elephant, tooth fragments from a rhinoceros, aurochs/bison, and deer, plus an antler tip (White and Plunkett 2004). Whilst this evidence cannot directly be related to hominin presence at the site, it can suggest the types of animals that may have been present.

4.7. High Lodge, Suffolk

The site of High Lodge (TL 739754) was discovered in a brick pit in the 1860s. It is located in the Breckland region of Suffolk lying on a hill between two valleys, with the River Lark to the south of the site and the Little Ouse River 12km to the north (figure 4.19) (Ashton et al. 1992a; Rose 1992). As with a number of other early Lower Palaeolithic discoveries, the site has been exposed to the work of many antiquarian collectors over the years (Ashton 1992a). The first formal excavations were by R. Smith and the geologist Marr (Marr 1921 and Smith 1921 in Ashton 1992a), which were followed by the main series of excavations conducted between 1962 and 1968 by Sieveking for the British Museum. However, the stratigraphy proved complex, and a further investigation was undertaken by Cook in 1988 in order to reconcile the inconsistencies (Ashton 1992a).

4.7.1. Site Formation and Geology

The artefacts were deposited on the floodplain of a pre-Anglian river, which originated in the Midlands. The deposits, which likely date to MIS 13 (500,000 BP), were transported as a raft of sediments by the ice sheets of the Anglian Glaciation and laid down in their present location on the surface of the Mildenhall Lower Diamicton (Bed A) (Rose 1992; Ashton et al. 1992a). The Diamicton is overlain by sands (Bed B1), upon which is laid down the High Lodge Clayey Silts, encompassing artefacts deposited on the floodplain of a river. Multiple channels then developed on this surface after the retreat of the ice and were infilled and covered by the Mildenhall upper sands and gravels containing artefacts in beds D and E (figure 4.20). A full summary of the stratigraphic sequence is given in table 4.7 below.

4.7.2. Archaeology

There are three main groups of artefacts from High Lodge: firstly, a set collected between 1870 and the 1920s, secondly, assemblages from the British Museum excavations of 1962-68 and lastly, those from the 1988 investigations. Of these three, the earlier collected material is cherry picked and biased towards the finer, larger implements. The 1988 excavations produced only a few pieces, with the majority coming from section cleaning or unstratified deposits (Ashton 1992b). In contrast, the 1960's excavations uncovered a large assemblage which has been well published (Ashton et al. 1992a), and consequently this group will be used for the analysis (table 4.11).

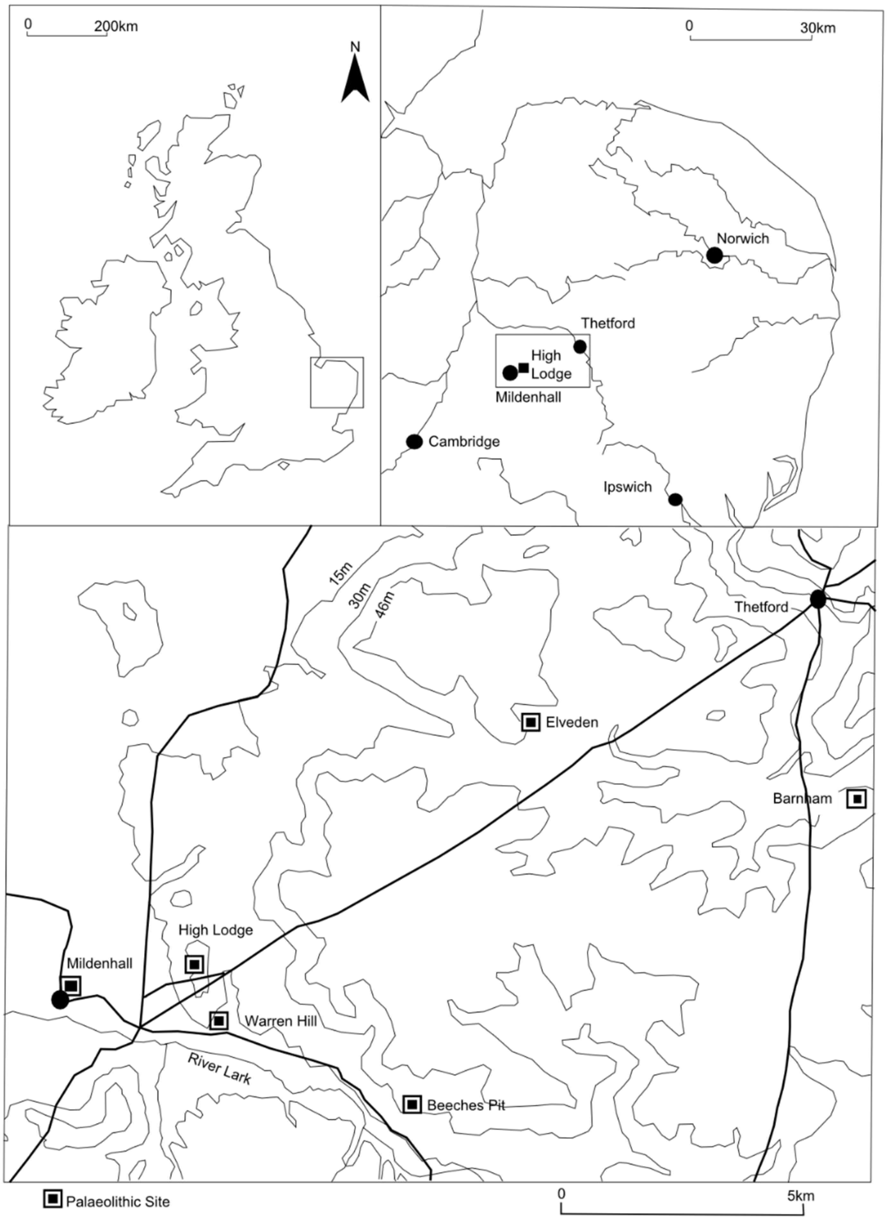


FIGURE 4.19 - LOCATION MAP OF HIGH LODGE, REDRAWN FROM ROSE 1992, FIGURE 1.1. P14.

The 1960's collection contains fresh artefacts, knapping scatters and refits demonstrating limited post-depositional movement (Ashton 1992a). Despite the fact that the artefact-bearing deposits were re-deposited from their original location (Rose 1992) they appear to have been moved in a complete wedge. Thus they still represent a primary context site, previously located within a riverine situation.

Bed	Deposit	Stratigraphy	Archaeology
K	Coversand	Overlying bed E and capping the sequence – Devensian Aeolian deposit	
J	Mildenhall upper diamicton	Reworking of the lower diamicton forming over the sands and gravels	
G+H	Sands	Mildenhall upper sands and gravels - Deposited in channel systems with variable fluvial flow conditions likely associated with melt water	
F	Sands and Gravels		
E	Contorted sands*		Artefacts
D	Silty sands and lag gravels.*		Artefacts
	Development of multiple channels in clayey silts after ice retreat		
C2	Upper brown clayey silt*	High lodge clayey silts - Deposited overlying bed B in a low energy environment, likely an overbank floodplain	Artefacts deposited by hominins on overbank floodplain.
C1	Grey clayey-silt*		
B2	Lower brown clayey silt with interbedded sands*		
B1	Mildenhall lower sands	Glaciofluvial deposit, overlying the diamicton	
A	Mildenhall lower diamicton	Infilling chalk basin through glacial action, correlated with Lowestoft till (MIS 12)	
Chalk Bedrock forming an enclosed basin			

TABLE 4.7 - SUMMARY OF STRATIGRAPHIC SUCCESSION, MODIFIED FROM LEWIS 1992; ASHTON 1992A:39; ROSE 1992: 23. *INDICATES PRESENCE OF ARTEFACTS

Artefacts are present within five main deposits: bed B2 (lower brown clayey-silt), C1 (grey clayey-silt), C2 (upper brown clayey-silt), D (silty-sands) and bed E (contorted sands) (Ashton 1992b). Furthermore there are two types of industries represented: a flake, flake tool and core assemblage represented in each of these layers, in addition to a derived biface industry located within bed E (Ashton and McNabb 1992).

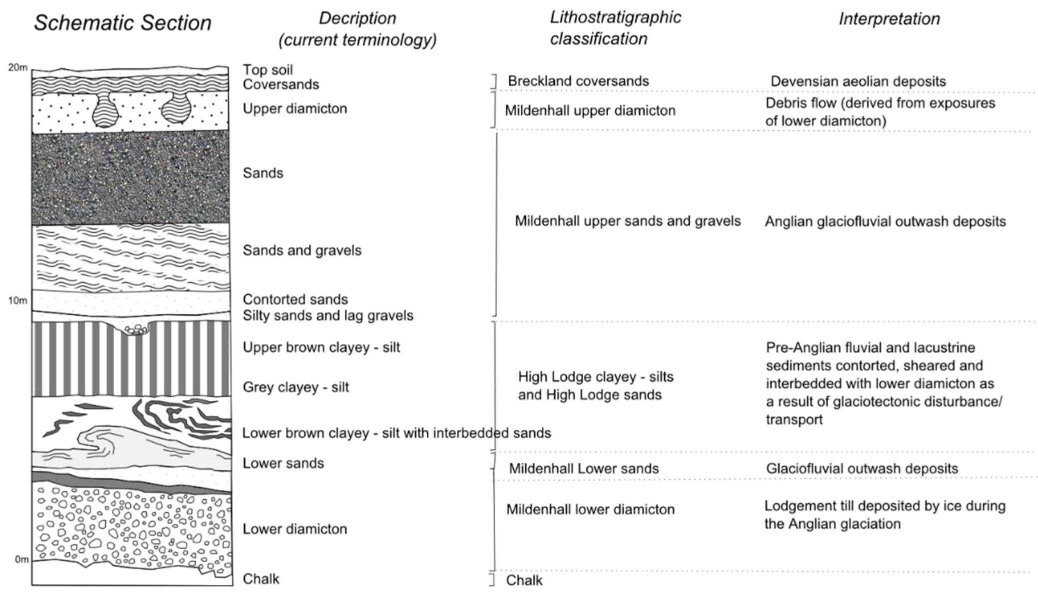


Fig 3.1 Schematic section through deposits at High Lodge, with the field description, lithostratigraphic classification and interpretation of the units

FIGURE 4.20 - SECTION DRAWING AND SUMMARY OF THE SEDIMENT SEQUENCE FROM HIGH LODGE. REDRAWN FROM ASHTON 1992A – FIGURE 3.1.

The authors make a distinction between the artefacts from beds B and C1, and those encompassing the main concentration, in beds C2, D and E. They propose that a separate occupation is represented in the lower two layers, backed up by the lack of refits between these and the overlying C2 deposit (Ashton 1992a,b). This demonstrates at least two occupation phases, with hominins present on the floodplain and the surface of the river bank (Ashton et al. 1992a).

The presence of refits between artefacts from bed C2 and those of D and E demonstrate limited vertical movement, in addition to similarities in staining and condition of the artefacts, which suggests that they are all part of the same assemblage. The silt channels and overlying sediments of D and E likely eroded the top of C2, thus incorporating part of the assemblage. Furthermore, the original context in C2 includes two knapping scatters and a large amount of refitting pieces, further emphasising its *in situ* status and likely source of origin for the artefacts from D and E. (Ashton 1992b).

In summary, the main occupation is represented by artefacts within bed C2 (n=1097), which have partly eroded into beds D (n=308) and E (n=462), therefore the artefacts from these three deposits will be combined to represent a single assemblage. The additional occupation level, as represented by artefacts from C1 (n=81), will also be included, as this has been demonstrated to represent a separate occupation from that present in C2. As mentioned above, the biface industry present in bed E is a separate assemblage with the majority of artefacts exhibiting more abrasion compared to the core and flake group, suggesting derivation from a location nearby (Ashton 1992a) and will therefore not be included in the analysis (table 4.11).

Regarding the age of the site, the artefact bearing clayey-silts have been interpreted as being re-deposited by the Anglian ice sheets (MIS 12). Furthermore, the environmental remains are temperate in character, with the presence of Stepanorhinus etruscus (Stuart 1992) suggesting correlation with a pre-Anglian interglacial, indicating discard at a similar time to the Boxgrove sediments in MIS 13 (500,000BP) (Lewis 1992).

The raw material is of local East Anglian origin, with the majority represented by chalk flint, probably derived from eroding deposits from the valley sides. The presence of pieces exhibiting thinner cortex does suggest occasional use of secondary material, most likely procured from the river gravels (Ashton et al. 1992a; White 1998).

4.7.3. Environment

Evidence for the environmental context of the site comes from insect and macroscopic plant remains from bed C1 (Ashton 1992a), coupled with faunal and pollen evidence from the clayey-silts and contorted sands (Stuart 1992). This indicates that the pre-Anglian river had a broad floodplain which would have provided a wide variety of plants and wildlife, with marshy reed swamps, aquatic tubers, fish and game-birds. The river valley would have acted as both a water source and corridor through the landscape, attracting both hominins and herbivores including herds of horses and elephants. Wooded slopes positioned away from the floodplain were covered in spruce and pine and would doubtless have held deer (Ashton et al. 1992a; Coope 1992; Hunt 1992).

4.8. HOXNE, SUFFOLK

Hoxne has been made famous for Frere's discoveries on the antiquity of man and by the association of a rich environmental corpus with extensive archaeological assemblages. The brick pits containing the archaeology (TM 175766) are positioned on an interfluve at a height of 36mOD on the East Anglian till plain, between the Rivers Dove and Goldbrook (figure 4.21) (Gladfelter 1993).

Like many of the 'classic' British Palaeolithic sites, Hoxne has a long history of research. Investigations by Evans and Prestwich in the 1850's were followed in 1895 by the first formal excavations, conducted by Reid for the British Association. Following these two further campaigns conducted by Moir (1920 - 1934) and McBurney (1951 - 1954) were succeeded by the final investigations which ran between 1972 and 1974 and 1978 by Wymer and Singer (Wymer and Singer 1993a).

4.8.1. SITE FORMATION AND GEOLOGY

The complexities with the stratigraphy are likely due to the variety of classification systems used during Hoxne's long period of research. However, a recent re-analysis of the succession by Ashton et al. (2008) cleared up some of the issues. The basal layer comprises Chalky Boulder Clay, overlain by a sequence of deposits associated with a lacustrine environment (clays, sands and silts - stratum C to F). The development of riverine conditions heralded the arrival of hominins in the area, with chalky sandy gravel, overlain by a sequence of sands, silts and clays encompassing the Lower and Upper Industries. The temperate environment was replaced with cooler conditions towards the top of the sequence highlighted by periglacial sediment structures. The stratigraphic association and major events in the development of the site are summarised in table 4.8.

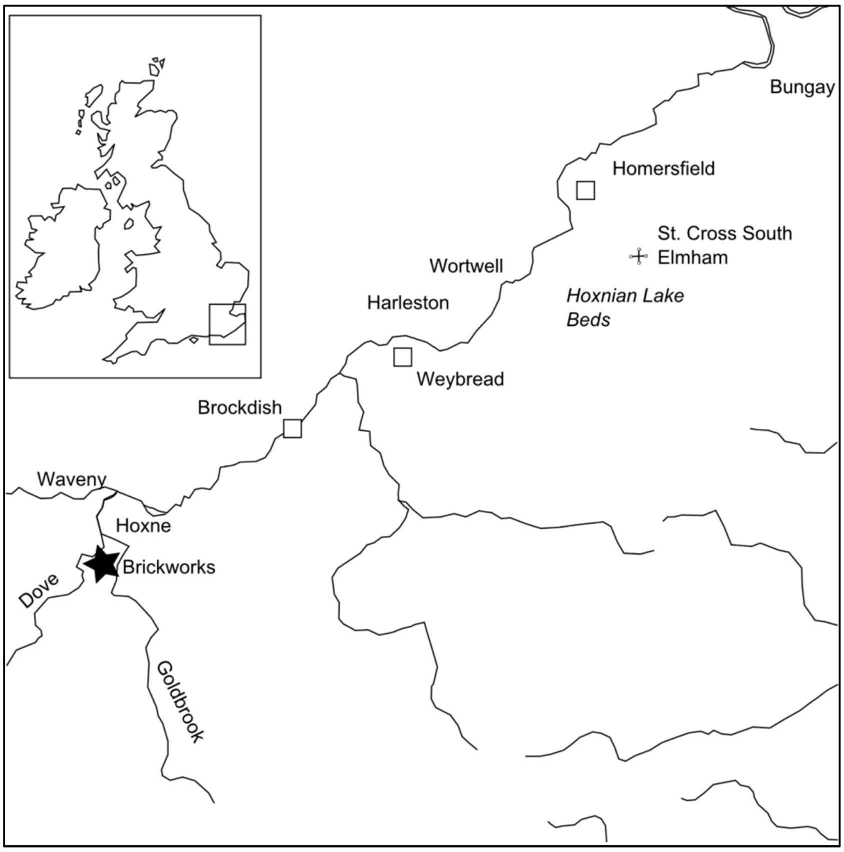


FIGURE 4.21 - MAP SHOWING THE LOCATION OF HOXNE, REDRAWN FROM WYMER AND SINGER 1993, FIGURE 1.1. P2

4.8.2. Archaeology

The locality contains two distinct industries, the earlier Lower Industry situated within the sands, silts and clays of bed B1 and the stratigraphically higher Upper Industry located within the sandy clay of A2(iii) (Gladfelter 1993). Although there has been suggestion of a Middle Industry, there are, however, disagreements over whether this represents a variant of the Upper Industry or a separate occupation (Wymer and Singer 1993a). The stratigraphic interpretation has been re-evaluated in the recent work by Ashton et al. (2008) and these correlations are the ones used below. For the purposes of this research both the Upper and Lower Industries (table 4.11) will be included in the analysis (Singer at al. 1993) (table 4.11).

Stratum	Description	Description	Archaeology
A1	Coversand	Final layer, deposited during cold climate conditions shown by periglacial structures in sediment.	
A2(i)	Sand and gravel	Cryoturbated deposit, ice wedges indicating permafrost conditions.	
A2(ii)	Solifluction gravel	Deposited during colder phase.	Derived artefacts from the Upper Industry.
A2(iii)	Sandy clay	Alluvial floodplain slope deposited by the river.	Upper Industry – suggested as occupation on floodplain next to a major river (Wymer and Singer 1993:119).
B1	Sands, silts and clays	Deposits infilling a channel feature which developed in the surface of B2.	Lower industry and faunal remains deposited next to channel.
B2	Chalky sandy gravel	Laid down by the newly introduced fluvial regime.	
Hydrological change resulting from the development of the lake into a river			
C	Laminated sands and silts	Lacustrine deposit formed as the environment cooled.	
D	Peat	Laid down as water level in basin receded, correlated with the encroachment of alder carr at the waters edge.	
E	Brown-green lacustrine clay	Overlying stratum F and comprising main deposit filling lake basin.	
F	Grey lacustrine clay	Primary deposit in centre of a post-glacial lake basin which formed in the till after the retreat of the ice.	
G	Chalky Boulder clay	Glacial till deposit, part of the Lowersoft till, deposited by the Anglian ice sheet during MIS 12.	

TABLE 4.8 - SUMMARY OF STRATIGRAPHICAL SUCCESSION AT HOXNE, MODIFIED FROM WYMER AND SINGER 1993A:9; TABLE 1, ASHTON ET AL. 2008: TABLE 1,657, 658.

Hoxne has previously been dated to between 298,000 +/- 10,000 BP and 330,000 +/- 27,000BP (MIS 9) by Thermoluminescence (burnt flint), Uranium-series and Electron Spin Resonance (both tooth enamel). Although there were issues with the determination of the environmental dose-rate used to calibrate the results (Gladfelter et al. 1993). Furthermore additional data from the biostratigraphy, presence of the Hoxnian Type X pollen and a reassessment of the Electron Spin Resonance dates, advocated an MIS 11 date for Strata B1 and B2 (Stuart et al. 1993; Mullenders 1993). A later analysis by Ashton et al. (2008), which included Amino Acid Racemisation, biostratigraphical and palynological correlations with sequences from elsewhere in Europe suggests that Stratum B lies within a later interstadial in MIS 11, most likely 11a.

The raw material utilised for the Lower Industry is a black, high quality flint likely derived from the chalk; however, the source of this is unknown. There are outcroppings of chalk related to the banks of the River Waveney 3km or more to the north and 12km to the east of the site; however, sources may have been closer in the Palaeolithic (Wymer and Singer 1993a; White 1998). It has been suggested by White (1998) that hominins procured material from outside the local area, bringing it onto site and caching it as demonstrated by the stone clusters noted by Wymer (Wymer 1985). The material from the Upper Industry was procured from immediately available river gravel within the nearby channel, when this was of a suitable size and quality for profitable use (Wymer and Singer 1993b).

The Lower Industry

The Lower Industry is located within the fluvial sand, silt and clays of stratum B1 (Ashton et al. 2008) and comprises a fresh assemblage of 925 artefacts. Whilst some post-depositional movement has taken place the fresh condition of the artefacts (Gladfelter 1993), and presence of two refits (Woor 1997) suggests that the disturbance may have been limited and that the assemblage has not moved far from its original position (Gladfelter 1993). Occupation was on the edge of a fluvial channel (Ashton et al. 2005; Ashton et al. 2008), with the artefacts discarded in association with mammalian bones and teeth, which display evidence of cut marks, demonstrating that butchery was carried out on site (Gladfelter 1993).

The Upper Industry

The Upper Industry (n=479) originates from Stratum A2 (iii) (Ashton et al. 2008) and represents occupation close to a major river. The artefacts are located within overbank sediments in a floodplain context. The sporadic inundation events led to the incorporation of a small number of derived artefacts mixed within the scatter of primary material (Wymer and Singer 1993a; Gladfelter 1993).

4.8.3. Environment

The presence of the Lower Industry coincides with an increase in water flow and the development of fluvial conditions at the site coupled with a warmer climate. The faunal remains indicate a mixture of mosaic environments, including open grassland suggested by the presence of horse, and forested areas containing fallow deer, beaver and macaque (Ashton et al. 2008). At the time the Upper Industry was deposited occupation was on the banks of a major river in an open, temperate environment, with nearby trees suggested on the basis of faunal evidence (Wymer and Singer 1993a; Stuart et al. 1993).

4.9. Red Barns, Hampshire

The site of Red Barns (SU 608063) is situated at 30m OD on the side of a dry valley which runs down the side of Ports Down Hill, near Portsmouth, with the Hampshire Downs dip-slope lying 7km to the north (figure 4.22) (Wenban-Smith et al. 2000). Artefacts were first discovered by Draper in 1973, as a result of monitoring work prior to the development of a housing estate. Further test pitting in 1974, this time in collaboration with Woodcock, located artefacts in mint condition, including chips and spalls. This discovery of *in situ* flint work prompted a joint rescue excavation in 1975 by the University of Southampton and the South Hampshire Archaeological Rescue Group (Wenban-Smith et al. 2000).

4.9.1. Site Formation and Geology

The site represents an extensive sequence of deposits (figure 4.23), which are summarised in table 4.9. The archaeology is found in two layers, firstly from the lower grey loam, which overlies the brecciated chalky bedrock. This deposit is covered by further variable lenses of brecciated chalk, which is then overlain by a cemented

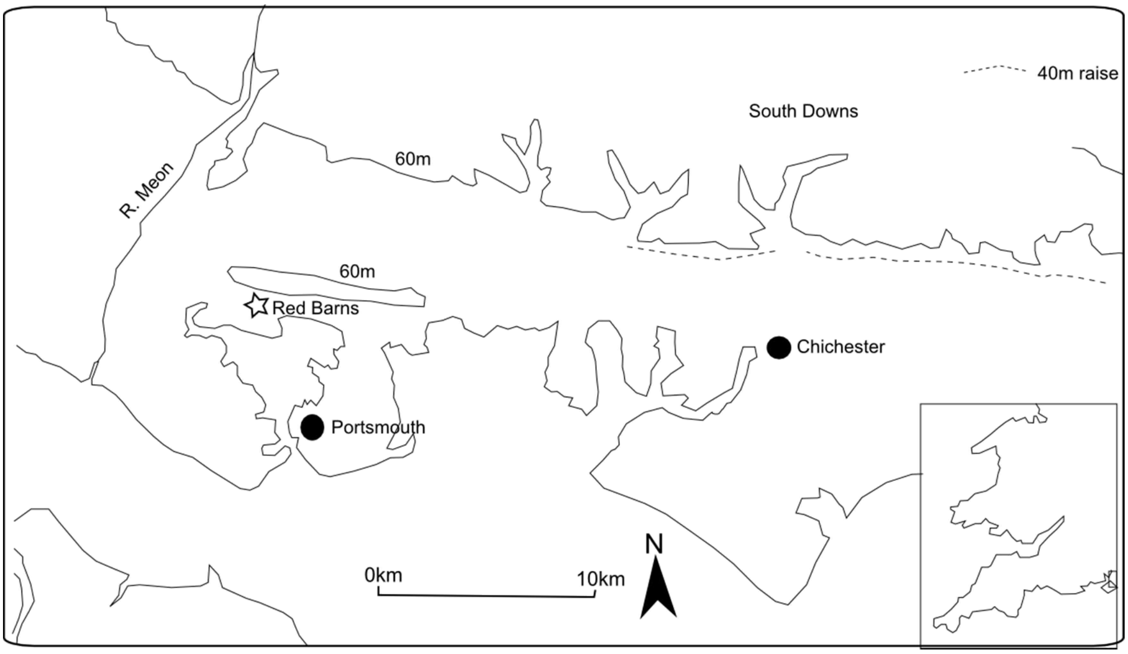
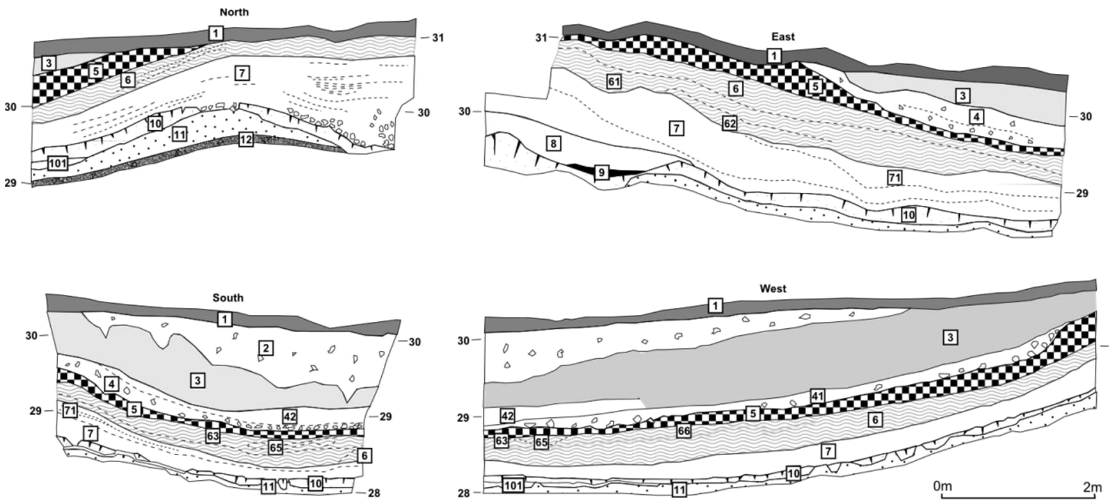


FIGURE 4.22 - LOCATION MAP FOR RED BARNS, REDRAWN FROM WENBAN-SMITH ET AL. 2000.

Sediment	Description
Top soil	
Brown flinty clay	Overlying chalky mud in the north-western corner
Chalky mud	Evidence of colder climate, contains frost-fractured flints
Red brown silty loam	
Brown clayey loam	Discontinuous patches throughout red-brown loam
Red-brown loam	Spread over whole site
Yellow-brown loam	
Brown gritty mud	
Brown silt	
White chalk gravel	Overlying grey loam in south corner of site
Grey loam	Incorporated flints
Pale grit	
Clayey loam	
Laminated sandy loam	
Angular flint gravel	Overlying brown clay in north-east section of site
Brown clay	Occurring in lenses
Cemented breccias*	Occasional artefacts, spread over whole site
Chalky breccias	Variably present lenses
Grey loam*	Solifluction or colluvial deposit, containing molluscs and artefacts
Chalky rubble	Brecciated upper layer of chalk, resulting from frost action
Chalk	Bedrock

TABLE 4.9 - SUMMARY OF THE STRATIGRAPHIC SUCCESSION AT RED BARNS, TAKEN FROM WENBAN-SMITH ET AL. 2000:215-218,239. * SIGNIFIES THE PRESENCE OF ARTEFACTS.

breccia containing sporadic artefacts distributed across the site. Whilst both these layers contain assemblages the grey loam is the larger and better preserved of the two, so will be incorporated into this analysis. The remainder of the deposits are made up of a large number of deposits some of which are spatially variable, but essentially comprise a sequence of clays, gravels and loams. At the top of the sequence a chalky mud heralds a period of colder climatic activity with the incorporation of frost-fractured flints. This is overlain by brown flinty clay across part of the site, capped by top soil.



1. Top soil/ made ground, 2. Brown flinty clay, 3. Chalky mud, 4 & 41. Dark red-brown silty loam, 42. Brown clayey loam, 5 & 51. Brown/ red-brown loam, 6 & 63. Pale yellow_brown loam, 61. Ochre-brown gritty mud, 62. Brown silt with chalk flecks, 64. Chalk gravel, 65. Grey loam with flints, 66. Pale grit, 7. Red-brown clayey loam, 71. Yellow/brown laminated sandy loams, 8. Angular flint gravel, 9. Brown clay, 10. Cemented breccia, 11. Chalky breccia, 11. Grey loam, 12. Chalk rubble.

FIGURE 4.23 -SECTIONS DRAWINGS FOR RED BARNS, REDRAWN FROM WENBAN-SMITH ET AL. 2000, FIGURE 8.

4.9.2. ASSEMBLAGE

A peculiar factor of this assemblage is the use of frost-fractured flint. This causes difficulties in distinguishing humanly manufactured specimens from natural debris. The re-assessment of the site, undertaken in 2000, utilised detailed criteria aimed at dealing with this issue. Consequently, the potential loss of pieces due to difficulties in identification is minimal. In addition it has been suggested that some artefacts may have been misplaced in the intervening years between the original excavation and re-analysis, but this is loss estimated as being minimal. Furthermore, the use of sieving at the site allowed the recovery of the smaller fragments of debitage, resulting in a high-quality dataset (Wenban-Smith et al. 2000).

Regarding the condition of the artefacts, the majority of pieces from the grey loam are in mint or fresh condition, and the slight amount of damage exhibited is considered by Wenban-Smith et al. (2000) as probably occurring *in situ*. Furthermore, analysis of the size sorting also suggests that the grey clay deposit has not been distorted, and the distribution of pieces is further evidence of its minimally disturbed context. In contrast, the smaller assemblage recovered from the overlying cemented breccias, demonstrates greater damage, suggesting the assemblage was probably transported downslope from another location (Wenban-Smith et al. 2000). As a result, the assemblage from the grey loam, numbering 6632 artefacts has been selected for analysis (table 4.11).

The site is situated on a chalk outcrop, providing a plentiful supply of raw material from the dry valley immediately to the west, or alternatively from the remnant of the Goodwood-Boxgrove-Slindon beach that would doubtless have been exposed above the site. However, the material is badly affected by frost-fracturing (as noted above), resulting in a surplus of debitage as the material fractures unpredictably when knapped (Wenban-Smith et al. 2000; Ashton 2008).

The site has been dated by Amino Acid Geochronology on molluscan remains from within the brown clayey loam and grey loam. However, due to the lack of comparative data in this area of southern Britain, the results can only be grouped into an age bracket of MIS 11 to MIS 9 (425,000-300,000BP) (Wenban-Smith et al. 2000).

4.9.3. Environment

The faunal and molluscan remains noted in the grey loam include a horse calcaneum and astragalus which rearticulate. Unfortunately, these are not well preserved, so any cut marks or features indicative of hominin modification have been obscured. This combined with the molluscan evidence suggests a temperate environment with dry open calcareous grassland (Wenban-Smith et al. 2000).

4.10. Swanscombe, Kent

The site of Barnfield Pit, Swanscombe (TQ 598743), is located within a quarry on the southern side of the Lower Thames Basin (Conway et al. 1996; Wymer 1968) (figure 4.24). The site is important both archaeologically and geologically and has been subject to many excavations. It was identified during gravel and sand extraction (Conway 1996), with the first recorded handaxe being found in 1885. The original excavation by Smith and Dewey took place between 1912 and 1913 at both Barnfield and the neighbouring Colyer's pit. They identified a number of assemblages including a Clactonian industry within the Lower Gravel, an Acheulean assemblage associated with the Middle Gravels and a smaller number of implements from the Upper Loam (Wymer 1968). The discovery of skull fragments within the Middle Gravels in 1935 and 1936 prompted an additional period of excavation in 1937, initiated by the Swanscombe committee. This was followed by the Wymer's excavation (1955 to 1960) which focused on the Upper Middle Gravels (Sutcliffe 1964) and Waetcher's (1968-1972) which concentrated on the lower units, primarily the Lower Loam and upper part of the Lower Gravel, with additional work carried out on the Lower Middle Gravel (Conway 1996; Wymer 1968; Currant 1996).

4.10.1. Site Formation and Geology

The stratigraphical succession at Barnfield pit is long and complex, involving a number of down-cutting channel features which is summarised in table 4.10. Figure 4.25 shows a cross-section through the site, giving an idea of the complexity and number of layers involved. The basal layer at the site is Thanet sand, into which a channel was incised at the end of the Anglian (MIS 12). The Lower Gravel containing the oldest assemblage was laid down in this channel. A new channel system formed in the surface of this deposit, within which the Lower Loam formed, including the next

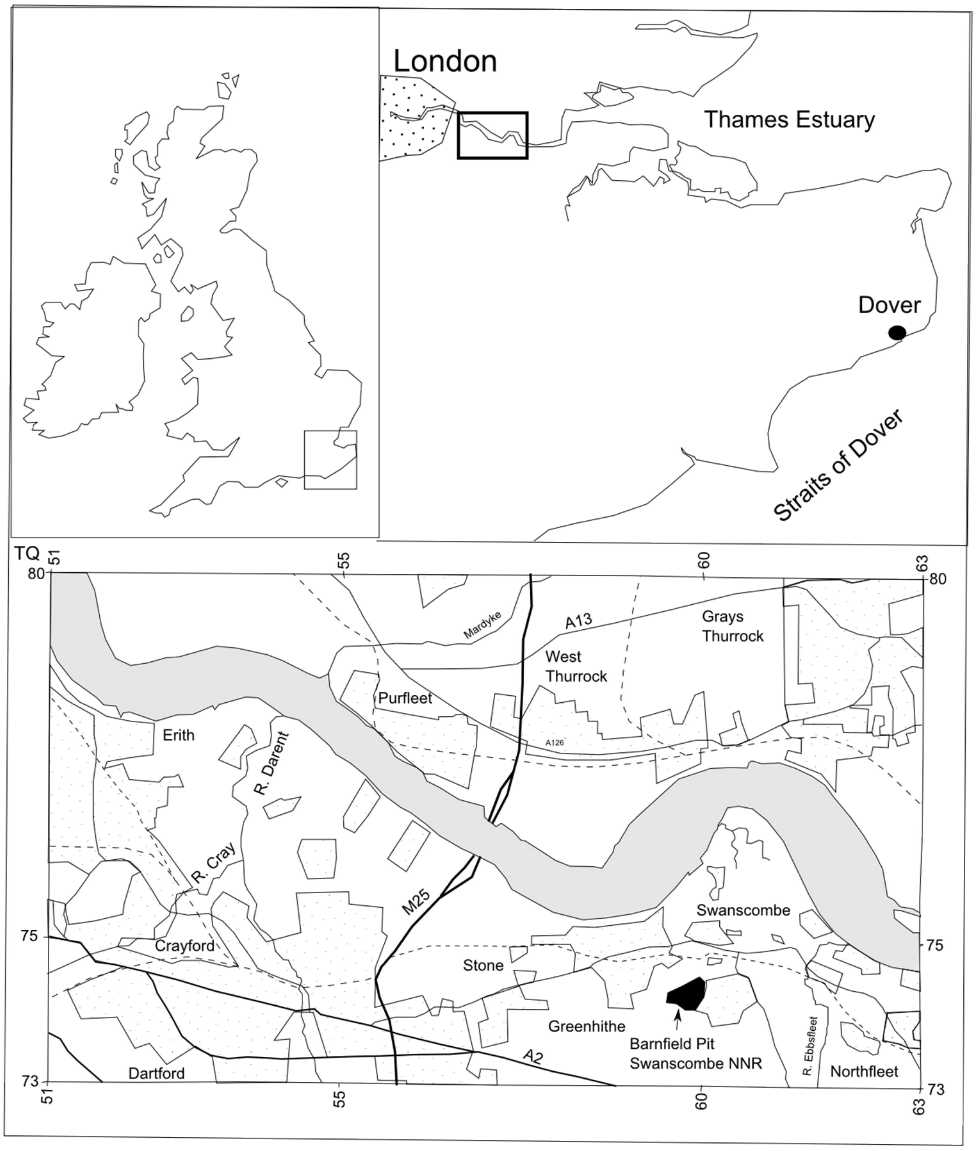


FIGURE 4.24 - LOCATION MAP OF THE SWANSCOMBE AREA– REDRAWN FROM CONWAY ET AL. 1996. FIGURE 1.1, P2.

period of hominin occupation. A period of fluvial activity then followed, preceded by the deposits of the Lower Middle Gravel (including artefacts). Another channel eroded steeply into the two underlying deposits and it is into this one that the Upper Middle Gravel formed including hominin occupation on a series of temporary beaches, followed by the development of a land surface onto which another industry was discarded. A further channel formed cutting into these deposits, which was then infilled by a sequence of cold climate deposits incorporating the Upper Sand, Upper Loam, Upper Gravel with the Higher Loam capping the sequence.

4.10.2. Assemblage

There are five main layers which contain Lower Palaeolithic artefacts: the Lower Gravel, Lower Loam, Lower Middle Gravel, Upper Middle Gravel and Upper Loam (Wymer 1964). There are two chief industries represented: a Clactonian core and flake industry (Lower Gravel and Lower Loam) and an Acheulean industry (Middle Gravels and Upper Loam) (Ashton and McNabb 1996). As has been discussed elsewhere (section 2.5), these industrial designations will be treated, for the purpose of this thesis, as representing in essence, variants of the same overall industry, being analysed purely in terms of the typology and chaîne opératoire.

An important point to consider, however, is that Waetcher's excavation, which included the Lower Gravel, Lower Loam and Lower Middle Gravel, was fully published only after his death, and it is possible that a small amount of information was lost (Conway et al. 1996). In addition, sieving was not common practice in his excavation (Currant 1996); and it is possible that the smaller component of the assemblage is under-represented. Nevertheless, the volume of material is such that the assemblage provides a good representation of the typological signatures present at the site. Despite this only three assemblages have been chosen (Lower Gravel, Lower Loam, Lower Middle Gravel), being considered as of sufficient quality and contextual security to be utilised in such research (table 4.11).

Lower Gravel

The oldest industry is contained within the Lower Gravel and comprises a core and flake technology, the majority of which is sharp or slightly rolled (Wymer 1968; Conway et al. 1996). Whilst this deposit was investigated by both Smith and Dewey and Waetcher, it is the data from the latter which will be included in this analysis as this contains more comprehensive information on the assemblage.

Stratum	Description	Archaeology
Higher Loam	Capping deposit	
Upper Gravel	Solifluction deposit	Artefacts probably derived from Upper Loam.
Upper Loam	Resting on below deposit, ice wedge features on surface (cool climate – periglacial).	Scatter of biface thinning flakes near the top - deposited on temporary beaches.
Upper Sand	Fluvial deposit resting in channel feature, evidence of ice wedges (cool climate).	
Development of channel cutting into land surface		
	Development of land surface, disturbance by solifluction and cryoturbation (cooler climate).	Acheulean industry with a single Levallois core.
Upper Middle Gravel	Fluvial sandy gravel filling steep narrow channel below – formation of temporary beaches.	Acheulean artefacts deposited on beaches.
Steep narrow channel feature, partly eroding Lower Middle Gravel and cutting through deposits below to basal level and Thanet Sands.		
Lower Middle Gravel	Gravel with larger flint cobbles from lag deposit at base.	Acheulean industry
Fluvial activity truncating top of Lower Loam		
Lower Loam	Infilling channel cut into lower gravel, low energy deposition. Re-cutting phases and temporary land surfaces interspersed.	*In situ* artefacts deposited on temp land surfaces
The Middle [midden?] level	Infilling of muddy hollow within channel system.	
Channel system formed in Lower gravel		
Lower Gravel	Fluviatile lag deposit of flint cobbles, infilling channel.	Clactonian industry
River channel incised at the end of the Anglian (MIS 12)		
Thanet sand and chalk	Basal level	

TABLE 4.10 - SUMMARY OF STRATIGRAPHIC SUCCESSION AT SWANSCOMBE, MODIFIED FROM ASHTON AND MCNABB 1996; CONWAY 1996; CONWAY ET AL. 1996; WYMER 1968).

Lower Loam

The Lower Loam is a water-lain deposit (Hubbard 1982) with artefacts and faunal remains throughout, however within the deposit are a series of artefacts deposited in primary context on a 'knapping floor' and this is what is used in the analysis. The integrity of the deposits is also indicated by the presence of refits (Ashton and McNabb 1996; Conway 1996). The 'knapping floor' represents an uneven surface which dips to the south, and represents a series of flaking episodes adjacent to a small stream. The skull and antlers of a Clacton Fallow Deer were unearthed from this horizon, although the rest of the animal is not present. This has been suggested as indicating removal of the carcass by hominins (Ashton and McNabb 1996), although this cannot conclusively be proven. The data for this assemblage has been taken, as for the Lower Gravel, from the excavations conducted by Waetcher as these provide more detailed artefact analysis.

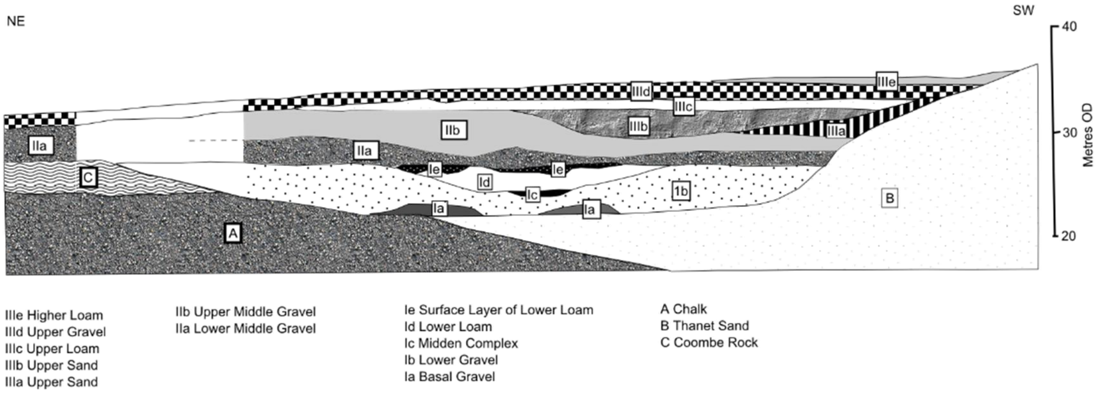


FIGURE ERROR! NO TEXT OF SPECIFIED STYLE IN DOCUMENT.**4.25 - GEOLOGICAL CROSS-SECTION THROUGH THE DEPOSITS AT SWANSCOMBE, REDRAWN FROM CONWAY 1996. FIGURE 8.1. P118**

LOWER MIDDLE GRAVEL

The third assemblage is located within the Lower Middle Gravel, a deposit created by strong currents. Despite this, the artefacts are only moderately abraded, suggesting that the majority date to a time after the initial cutting of the channel (Wymer 1964; Ashton and McNabb 1996). However the action of the currents has resulted in the winnowing of a lot of the smaller debitage, producing a size bias in the recovered artefacts (Conway 1996). Despite the layer featuring in the excavations by both Smith and Dewey and Waetcher, again the former will be used.

Regarding the raw material source, the artefacts are mostly knapped on chalk flint, likely derived from secondary deposits within the fluvial gravels, as suggested by the worn nature of the cortex. The Lower Gravel and Lower Middle Gravel assemblages were made at the site, possibly on a gravel bar at the edge of the river, which would have provided a good source of raw material (Ashton and McNabb 1996).

4.10.3. Environment

The deposits from the Lower Gravel through to the Upper Middle Gravel were laid down during interglacial conditions as suggested by faunal, molluscan and pollen evidence. These, combined with the presence of the Type X pollen, which is only found in the Hoxnian Interglacial, date the assemblage to MIS 11, and this is corroborated by Amino Acid Racemization (Conway 1996; Conway et al. 1996; Bowen 1998; Hubbard 1996).

At the time of deposition of the Lower Gravel the fauna, molluscan and pollen remains suggest a wooded temperate interglacial environment with mixed oak, pine and a small amount of alder close to water (Sutcliffe 1964; Schreve 1996; Conway 1996; Hubbard 1996). With the introduction of the overlying Lower Loam, the fauna and ostracods suggest the presence of an abandoned meander channel or oxbow lake, with a slow-flowing water body nearby. Open areas of grassland on the floodplains give way to a temperate mixed deciduous wooded environment (Robinson 1996; Schreve 1996; Hubbard 1982).

The proceeding layer, the Lower Middle Gravel, was laid down in fast-flowing water, in a more wooded environment than the overlying Upper Middle Gravel, whilst the pollen remains are comparable to those of the Lower Gravel and indicative of open, grassy environment with trees and shrubs (Hubbard 1996; Conway et al. 1996). Furthermore, molluscs present particularly in Lower Middle Gravel include ‘southern species,’ implying a warmer climate and development of a link between the Thames and Rhine. The evidence from the overlying Upper Loam again suggests that a temperate mixed-oak forest was prevalent (Hubbard 1996).

Site	Assemblages	Location	Date	Environment	Raw material	Additional info
Barnham **TTL 875787**	Area I Unit 4 Area III unit 5c Area IV(4) unit 4 Area V unit 5d	River bank Middle of channel River bank River bank	MIS 11	Mosaic deciduous woodland and open-forest-edge communities, with slow flowing river silting up over time	Local on site – from cobble layer/ lag gravel. Area III no obvious source but likely from gravel on edge channel	Unit 5c - Associated faunal remains
Beeches Pit **TL 798719**	Area AH unit 3b Area AH unit 4 and 5	Pool Beside spring and pools	MIS 11	3b - Open environment at edge small pool surrounded by marsh, with drier areas of calcareous grassland and patches open woodland nearby 4 and 5 – Spring with nearby pools in closed deciduous woodland	Local from the glacial deposits of outcrops of Upper Chalk	Presence fire
Boxgrove **SU918087-** **SU924085**	Q1/A unit 4c Q1/A unit 4b Q1/B unit 4c Q2/A unit 4c	Coastal plain 100m from cliff. 60m from cliff 200m from cliff	MIS 13	Mosaic, areas open grassland, shrub and bush vegetation. Small pools and forested vegetation on downs.	Locally procured from cliff	Butchered bone Associated with fauna, cut marks.
Clacton-On-Sea **Jaywick** **TM 154135**	Jaywick – material from the British Museum	Riverbank	MIS 11		Small flint cobbles from the river gravels	
Clacton-on-Sea **Golf Course** **(TM 157134)**	Golf Course Gravel layer	Riverbank	MIS 11		Most likely local material from the river gravels and cobbles.	
Clacton-on-Sea **Lion Point** **(TM 148128)**	Lion Point Warren Collection	Riverbank	MIS 11		Most likely local material from the river gravels and cobbles.	

Site	Assemblages	Location	Date	Environment	Raw material	Additional info
Elveden **TL 809804**	Area I bed 5 Area III bed 4	River bank	MIS 11	Interglacial wooded environment beside river	On site from lag gravel and rarer examples chalk eroded from river banks	
Foxhall Road **TM 187439**	Red Gravel Grey Clay	Lakeside	MIS 11	?	Local majority from gravel and rest from chalk flint nearby	Hearth feature?
High Lodge **TL 739754**	HL bed C2 HL bed D HL bed E	River bank	MIS 13	Interglacial environment with pine and spruce forest, juniper scrub and grassland with swampy ground on floodplain. Fauna include Horse, elephant and rhino.	Local mostly from chalk but also river gravels used	
Hoxne **TM 175766**	Lower Industry – Stratum B1 Upper Industry – Stratum A2(iii)	River bank River bank/ floodplain	MIS 11	LI – calm water, cooler climate, more open landscape. Open grassland areas and temperate deciduous forests with horse and deer, beaver, lion, fish, birds. Mixture environments mosaic. UI – temperate open environment, trees close to river or lake.	LI – Chalk flint, not locally available, brought in. UI – locally available flint from river gravels on site.	LI – cut marks
Red Barns **SU 608063**	Grey Loam	Hillside	MIS 11-9	Dry open calcareous grassland in temperate conditions - horse	Immediately available on site – Chalk outcrop.	
Swanscombe **TQ 598743**	Lower Gravel Lower Loam (knapping floor) Lower Middle Gravel	River bank Temporary land surfaces at side of river River bank	MIS 11	LG - Wooded temperate interglacial environment with mixed oak, pine and alder. LL - Development of oxbow lake and open grassland on floodplain giving way to mixed deciduous environment. LMG – fast flowing water in open, grassy environment with trees and shrubs.	Raw material collected from lag deposit or gravel bars beside the river.	

TABLE 4.11 - SUMMARY OF LOWLAND ASSEMBLAGES

Chapter 5 – Site Analysis

The main question explored in this research is whether the archaeological signatures from sites in a variety of landscape contexts (riverine, pond, grassland, lacustrine, etc.) differ with regard to technological and subsistence behaviours. This section presents the results of the two datasets (uplands and lowlands). The latter sites are grouped into their relevant landscape contexts to facilitate the analysis and further the aims and objectives outlined in chapter 1. The sites are considered on an individual basis, looking at the assemblage typology, chaîne opératoire, technological strategies and flake signatures, as outlined in section 2.5 and appendix I. Once the assemblage signatures are identified the landscape context of the upland sites will be explored through a Geographical Information Systems approach outlined and discussed further in chapter 6. The main points, patterns and outcomes of the results will be discussed further in chapter 7.

5.1. Kent Plateau sites

5.1.1. Westcliffe St. Margaret's

The largest of the Kent sites, Westcliffe St. Margaret's, comprises 1294 artefacts, the majority of which are knapping waste (flakes [n=904, 70%] and debitage [n=291, 22%]) making up 92% of the total (Appendix II; figure 5.1). The remainder is split between cores (n=41, 3%), handaxes (n=24, 2%), flake tools (n=19, 1%), roughouts (n=7, 1%), core tools (n=4, <1%) and miscellaneous pieces (n=4, <1%). The somewhat low proportion of flakes is counterbalanced by the higher proportion of debitage related to the nature of working and manufacturing focus.

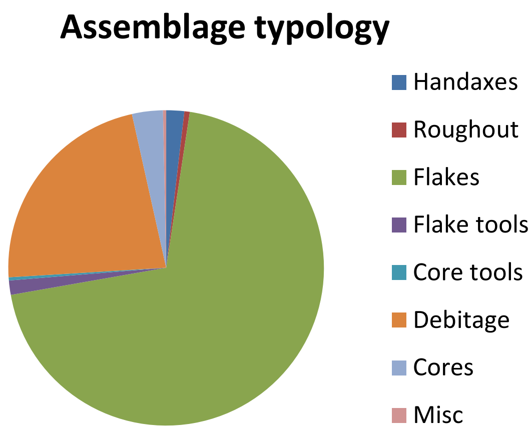


FIGURE 5.1 - TYPOLOGICAL COMPOSITION OF THE ASSEMBLAGE FROM WESTCLIFFE, ST. MARGARET'S, KENT

The chaîne opératoire contains stages from both handaxe manufacture and core and flake working, from preliminary working (cores, cortical flakes and tested pieces) to further reduction (partially and non-cortical, hard and soft hammer flakes, debitage, chips), including on-site handaxe manufacture (roughout, shaping and thinning flakes), and the production, presumed use and discard of the final tools (handaxes, flake and core tools) (table 5.1). Interestingly the flake tools only represent 1% of the total assemblage, which is a comparatively small amount for such an upland site, and is also the smallest proportion of the Kent sites (although Wood Hill comes close). The number of handaxes outnumbers the flake tools, signifying that the latter represent a by-product of other activities, perhaps associated with butchery and the procurement of meat resources, as suggested by the handaxes. Furthermore, whilst the proportion of cores in the assemblage is small (only 3%), the actual numbers (n=41) indicate a strong focus on flint working, indicating that this may have been the predominant activity at the site.

At Westcliffe 1214 artefacts can be classed as knapping products (flakes, debitage, flake tools), although 138 of these are chips (<20mm) so can be removed leaving 1076. Assuming these came from the 41 cores, this provides a mean of 26 flakes per core, indicating an over-representation of knapping products. Nevertheless, if the handaxes are factored in (estimated 50 flakes per handaxes, 10 per roughout) this provides 1270 products which is not far from the total artefacts found at Westcliffe and certainly more than the number of knapping products on site. Therefore, handaxes were likely imported into the excavation area, or alternatively some degree of post-depositional movement occurred obscuring the missing flakes.

Residual cortex patterns on the flakes (Appendix II; figure 5.2) further demonstrate that all stages of reduction are present. The largest component is represented by non-cortical flakes (n=98, 40%), followed by <50% (n=80, 33%), >50% cortex (n=41, 17%) and wholly cortical flakes (n=25, 10%). Interestingly the site exhibits a greater proportion of flakes with no or <50% cortex compared to the other Kent assemblages, although again Wood Hill demonstrates a similar pattern (see 5.1.2 below). Whilst this could be linked to the apparent focus on manufacture and raw material working, it could also be a factor of preservation, with these two assemblages being the only ones with a sizeable portion originating from excavated contexts. Furthermore, the cortical flakes suggest a greater presence of primary reduction stages, yet compared to the number of cores (n=41), there are only half the expected numbers. This could be explained in a number of ways. Firstly, cores or handaxes were decorticated off site and brought in partially worked. Secondly the larger cortical flakes may have been selected to be removed as blanks for other tools, thirdly the nodules were decorticated elsewhere on the site, out of the immediate excavation area, or alternatively incorporated deeper into the hollow out of the reach of the excavation.

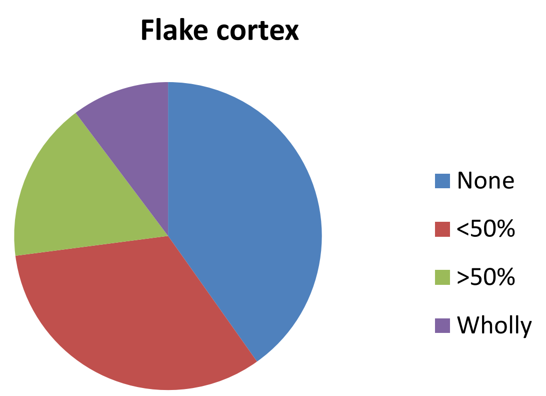


FIGURE 5.2 - COMPARISON OF THE AMOUNTS OF CORTEX PRESENT ON FLAKES AT WESTCLIFFE, ST. MARGARET'S, KENT

Moreover, when the primary, secondary and tertiary flake data (section 2.5) is compared to the experimental assemblages (table 5.2), the archaeological sample produces a shallow triangular form with a peak in tertiary flakes, followed by secondary then primary. The pattern matches a less pronounced version of Durham Handaxe A (figure 5.3). As a result the signature is suggested as being predominantly handaxe related, however compared to the signature for Durham Handaxe A, Westcliffe contains more primary flakes, and less tertiary, demonstrating a predominance of early stage working. This could potentially be explained by small nodule size. The majority of material at Westcliffe is in the form of chalk flint, which comes in reasonably large-sized nodules. However hominins have made use of bull head flint, which is smaller and therefore would produce less tertiary flakes and more primary. It could also perhaps be explained by a smaller component of core and flake working, although with the primary stages emphasised more. Therefore both strategies were being employed, although with a slant towards handaxe manufacture and neither element was solely imported.

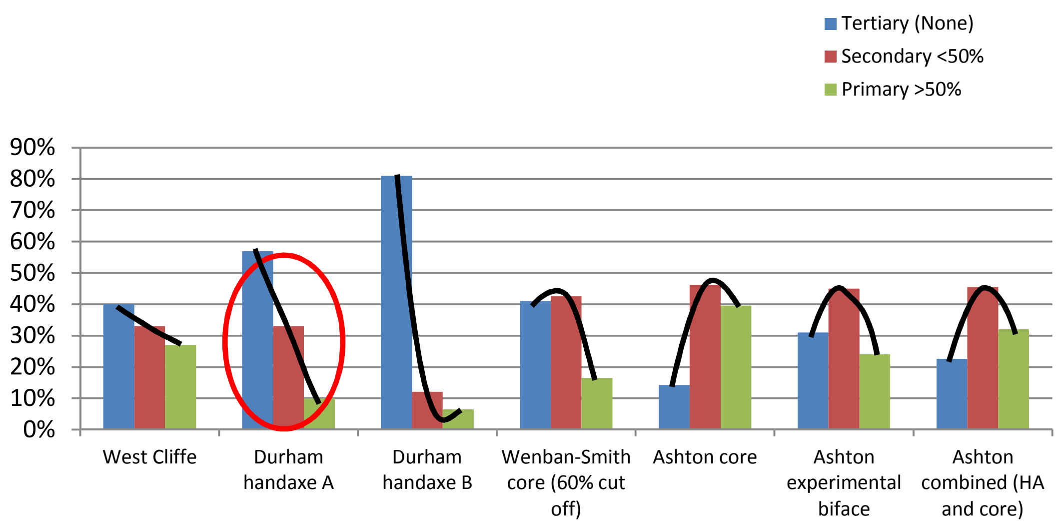


FIGURE 5.3 - COMPARISON OF FLAKE SIGNATURE FROM WESTCLIFFE, ST. MARGARET'S WITH THE EXPERIMENTAL DATASET

A diverse range of tool-types are represented (Appendix II; figure 5.4), although the comparatively low overall percentage of this category suggests that activities associated with these were of secondary importance. The most prevalent are scraper-related activities, although only comprising a third of the flake tool category (n=8, 33%). This is followed by activities associated with notches (n=5, 21%), core tools (n=4, 17%), retouched flakes (n=3, 13%), flaked flakes (n=3, 13%) and a single denticulate (4%). This mixed typological signature has parallels with sites such as the Lower Industry at Hoxne (section 5.3.5) and the Golf Course at Clacton-on-Sea (section 5.3.2). If the interpretations made in the use-wear discussion are considered (section 2.5), scraper-based activities are often associated with hide processing, notches with wood or plant-based activities, retouched flakes with carcass or meat-related products and flaked flakes and denticulates can be linked to wood-based activities. Consequently it could be inferred that carcass or animal related processing activities are more frequent than wood-related. However the signature is essentially mixed, indicating a general spread of subsistence activities with no strong focus. The presence of handaxes links to the suggested function for scrapers. Interestingly, core tools are represented here, suggesting a heavier component of processing activities, something which doesn't appear in the lowland sites (see comments in chapter 7).

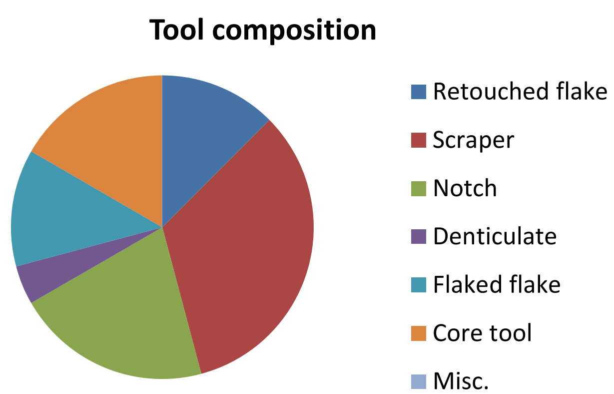


FIGURE 5.4 – TOOL COMPOSITION OF THE ASSEMBLAGE AT WESTCLIFFE, ST. MARGARET'S

Chaîne opératoire stage	Present/ absent	Westcliffe	Wood Hill	Green Lane	Malmains 1	Malmains 2
Raw material procurement	Cores	Yes	Yes	Yes	Yes	Yes
	Cortical flakes	Yes	Yes	Yes	Yes	Yes
	Test Pieces	Yes	No	Yes	No	Yes
Debitage	Partially cortical flakes	Yes	Yes	Yes	Yes	Yes
	Non-cortical flakes	Yes	Yes	Yes	Yes	Yes
	Debitage	Yes	Yes	Yes	Yes	Yes
	Chips	Yes	Yes	Yes	Yes	Yes
	Hard hammer flakes	Yes	Yes	Yes	Yes	Yes
	Soft hammer flakes	Yes	Yes	Yes	Yes	No
Tool manufacture	Shaping flakes	Yes	No	Yes	No	No
	Roughout	Yes	No	No	No	No
	Thinning flakes	Yes	Yes	Yes	Yes	Yes
	Flake tool spall	No	No	No	No	No
Finished tools	Handaxe	Yes	Yes	Yes	Yes	Yes
	Flake tools	Yes	Yes	Yes	Yes	Yes
	Core tool	Yes	Yes (one)	Yes	Yes	Yes
	Misc.	No	Yes	Yes	Yes	No
Other indicators	Cut marks	Yes	No	No	No	No
	Use-wear	Yes	No	No	No	No

TABLE 5.1 – SUMMARY OF CHAÎNE OPÉRATOIRE STAGES FOR THE KENT STUDY AREA

Percentage of flake types produced by the experimental datasets using a cortex split of 50%	Tertiary (None)	Secondary <50%	Primary >50%
Durham handaxe A	57%	33%	10%
Durham handaxe B	81%	12%	6%
Wenban-Smith core (60% cut off)	41%	43%	17%
Ashton core	14%	46%	40%
Ashton experimental biface	31%	45%	24%
Ashton combined (HA and core)	23%	45%	32%
Westcliffe	40%	33%	27%
Wood Hill	37%	37%	22%
Green Lane	28%	47%	24%
Malmains 1	27%	49%	23%
Malmains 2	12%	64%	24%
Whipsnade	34%	58%	9%

TABLE 5.2 - COMPARISON OF THE PROPORTIONS OF FLAKE TYPES PRODUCED BY THE EXPERIMENTAL DATASETS COMPARED TO THAT FROM THE KENT SITES

In summary, the signature from Westcliffe indicates a focus on primary manufacture, using locally available raw material, with at least part of the manufacture waste associated with the production of handaxes. Whilst it is suggested that some of the cores and handaxes were brought in, manufacture was a large part of the activities undertaken at Westcliffe. Furthermore the number of discarded handaxes coupled with the predominant tool type (scrapers) does suggest a butchery component, although the overall tool signature is mixed. Moreover, the percentage of flake tools is low compared to many of the other upland sites, and this is further emphasized by the greater numbers of handaxes present, signifying that the flake tool activities were a secondary consideration resulting from day-to-day subsistence, compared to the activities associated with the handaxes. To conclude, Westcliffe represents a similar signature to Turq's 'mixed strategy site' (in Mellars 1996) or Price's 'base camp' (1978), with multiple activities represented although the limited number of flake tools suggests activities conducted within day-to-day subsistence routines.

5.1.2. WOOD HILL

The neighbouring site of Wood Hill is situated on the same ridge as Westcliffe and has produced an assemblage totalling 506 artefacts (Appendix II). The majority are represented by flakes (n=443, 88%), followed by cores (n=16, 13%), debitage (n=14, 3%), miscellaneous artefacts (n=13, 3%), flake tools (n=11, 2%) and handaxes (n=8, 2%), with a single core tool also present (<1%) (figure 5.5).

The chaîne opératoire indicates the presence of at least some early stage manufacture, with cores and cortical flakes represented, however there are no nodules that could be classed as test pieces. Later stages are well represented with partially and non-cortical, debitage, chips and hard and soft hammer flakes. In terms of the handaxe production sequence there are no roughouts, suggesting that the initial stages are missing, although flakes relating to handaxe manufacture are present (thinning and trimming). Some of the finished tools were certainly discarded on site, although whilst handaxes actually represent 2% of the total assemblage, only three of these are complete. This indicates that hominins actively discarded damaged tools or those with limited use-life remaining. However the three complete implements do suggest some form of butchery was undertaken in the vicinity of the site. Other finished articles are also present in the form of flake tools and a core tool, although again in a similar situation to Westcliffe, the flake tools represent only a small proportion of the assemblage.

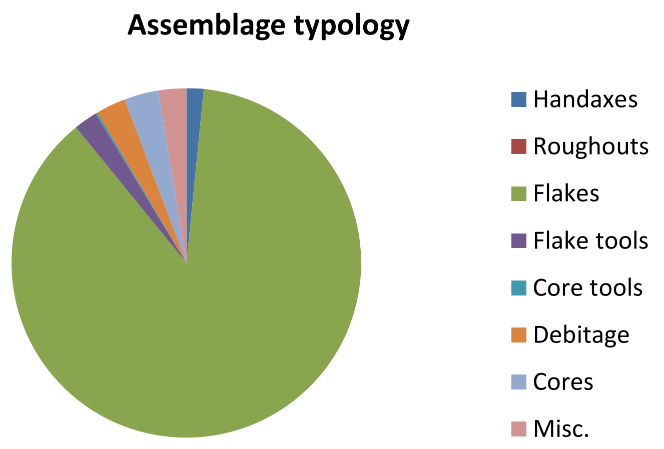


FIGURE 5.5 - TYPOLOGICAL COMPOSITION OF THE WOOD HILL ASSEMBLAGE

Looking at the actual artefact numbers, the flakes, flake tools and debitage provide 468 products, which if assumed to come from the 16 cores gives 29 flakes per core, a comparable value although slightly higher than that estimated for Westcliffe (26 flakes). However Winton has suggested that the cores present at Wood Hill are only minimally worked (2004) indicating that the signature may be based around a handaxe technological system rather than core and flake working. Alternatively, if the assumption is made that all handaxe fragments were knapped (in their complete state) on site, using an estimated value of 50 flakes, this produces 400 products, much closer to the number of actual flakes present (n=443). Therefore, in this scenario the remaining flakes split between the cores gives an average of 3 flakes per core, indicating that working of the extant cores and handaxes could account for all the material at the site.

Moving on to consider the flake cortex results, it is clear that all stages of the reduction sequence are represented. Unusually equal portions of the flakes are represented by both non-cortical (n=164, 37%) and those with <50% cortical surface (n=166, 37%), with the remainder made up of >50% cortex (n=73, 16%) and wholly cortical flakes (n=23, 5%). This unusual pattern could suggest that the technological strategies in operation at the site may be more complex than those in operation, for example, at Westcliffe. Indeed, the relative paucity of primary flakes needs explaining. Winton has suggested that manufacture at Wood Hill was based on the production of pointed, plano-convex handaxes on large flake blanks, and that these were produced and exported for use in the wider landscape (2004). Consequently this would explain why there are no biface roughouts present, with only the later stages represented by trimming flakes. Conversely, if handaxes were manufactured with a view to export, we would expect a clear over-representation of flakes, compared to the handaxes and cores, and this doesn't appear to be the case. The three complete handaxes demonstrate a combination of 204 visible scars, which accounts for nearly half of the flakes at the site. Nevertheless, it is possible that Wood Hill was part of a wider network of transport, with hominins both exporting and importing handaxes. However, an additional point to make is that the excavations carried out encompass only a small area of the overall site (Winton 2004), and more artefacts could be present outside these areas.

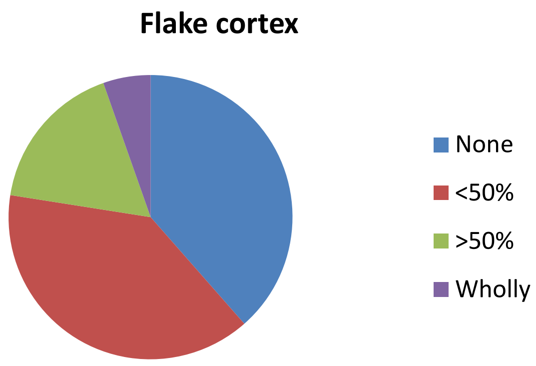


FIGURE 5.6 - COMPARISON OF FLAKE CORTEX FOR WOOD HILL, KENT

As noted previously, Wood Hill demonstrates an unusual pattern of flake cortex and when the resultant flake signature is compared with the experimental data (Appendix II; figure 5.7, table 5.2) the secondary and tertiary categories are the largest, followed by primary flakes, creating a right handed L-shape pattern. The closest comparable signature from the experimental dataset is that of Wenban-Smith's core, although the archaeological sample has more primary flakes and fewer tertiary and secondary. This is unusual since the manufacture of handaxes by debitage rather than façonnage, as suggested by Winton (2004:86) would likely result in more tertiary flakes being produced in a purely handaxe scenario. Therefore this indicates that a more complex technological system was in operation at the site.

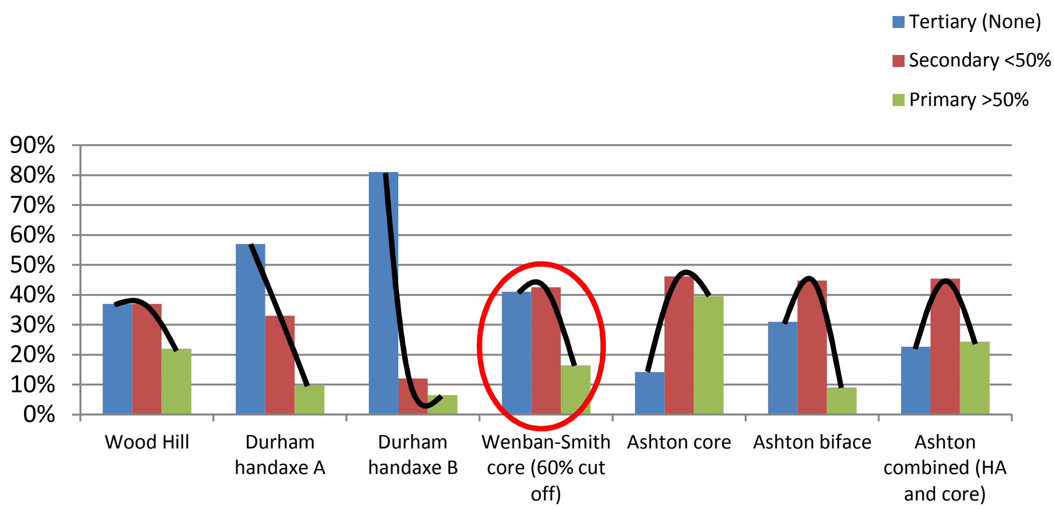


FIGURE 5.7 - COMPARISON OF THE FLAKE SIGNATURE FROM WOOD HILL WITH THE EXPERIMENTAL DATASET

As noted above, flake tools are three times more common than complete handaxes. Furthermore, the emphasis appears to be on retouched flake activities (n=6, 50%), followed by scraper-based events (n=2, 17%), with a further two miscellaneous pieces (17%) and a single core tool and notch (8% each) (Appendix II; figure 5.8). If these are interpreted in light of the use-wear discussion (section 2.5) it could be suggested that retouched flakes and scrapers are primarily associated with the processing of carcasses (hide and meat), compared to the single notch (linked to wood working, and some bone processing). Therefore despite there being a variety of flake tools, it could be argued that the predominant focus may have been on activities related to retouched flakes and scrapers (e.g. carcass processing). Again it is interesting to note that a core tool is also present, again as at Westcliffe, suggesting that some form of heavier processing was being undertaken in the vicinity. Overall the low number of tools makes it likely that these relate to general subsistence activities carried out during raw material procurement and knapping, rather than representing a specific activity-related focus. An additional point to note is that a number of the cores exhibit retouched edges related to possible use as scrapers (Winton 2004). This suggests that certainly during one or more occupations the production and use of scrapers (and indeed cores) was in a more *ad-hoc* capacity, with hominins making use of available edges where needed to accomplish the immediate (scraper-related) task in hand.

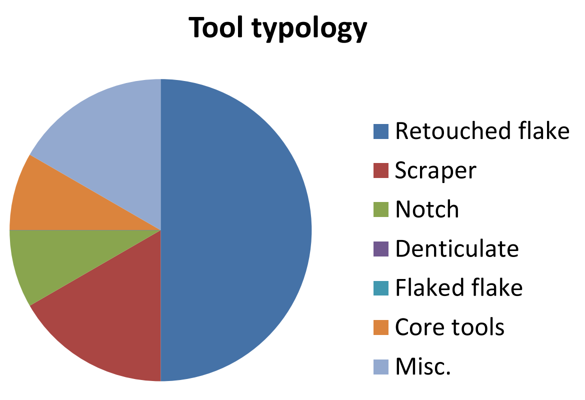


FIGURE 5.8 - TYPOLOGICAL COMPOSITION OF THE TOOLS AT WOOD HILL

In summary, the site of Wood Hill appears to be focused on raw material procurement and the production of handaxes, with a tool component centred on carcass activities with very limited evidence for wood processing. Although as at Westcliffe the actual number of tools indicates generalised subsistence-based activities rather than specialised resource procurement. This pattern fits with Turq's 'mixed strategy' occupation (Turq in Mellars 1996).

5.1.3. Green Lane, Whitfield

The assemblage from Green Lane comprises 310 artefacts from fieldwalked and excavated contexts. Unusually the flakes provide only 64% of the total (n=199), a much smaller percentage than usually found. The rest is made up of debitage (n=34, 11%), flake tools (n=34, 11%), handaxes (n=23, 7%), cores (n=12, 4%), miscellaneous pieces (n=6, 2%) and two core tools (1%). Coupled with the proportion of flakes at the site, the percentage of flake tools is very high, much higher than any of the other Kent sites, suggesting that this site has a different focus from those in the rest of the area (Appendix II; figure 5.9). This bias is likely deliberate as there are no major taphanomic issues with any of the upland sites, and certainly these sites in Kent have all been observed over a number of years by local archaeology groups, ensuring that a representative sample has been procured for study. Additionally the assemblage demonstrates the highest proportion of handaxes (n=23, 7%) when compared to the rest of the Kent sites. However there are no roughouts recorded, demonstrating that handaxes were not produced from scratch on site.

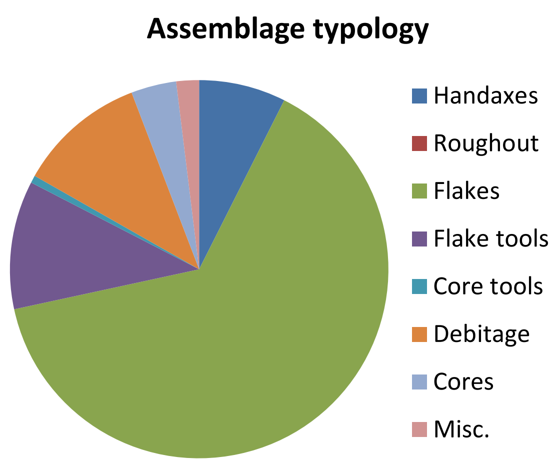


FIGURE 5.9 - ASSEMBLAGE COMPOSITION FOR GREEN LANE, WHITFIELD, KENT

In terms of the chaîne opératoire, all stages of core and flake working are represented from selection of raw material and primary manufacture (cores, cortical flakes, tested pieces) to the secondary stages of reduction (partially and non-cortical flakes, debitage, chips, hard and soft hammer). There are also some later stages of handaxe manufacture (shaping and thinning flakes) as well as discard of the finished articles (handaxes, flake tools, core tools). Due to the lack of faunal remains it cannot be confirmed whether these tools were used on site, however they do indicate activities undertaken in the nearby environment (table 5.1).

Green Lane contains 267 artefacts that can be classed as knapping products (flakes, flake tools, debitage). Firstly if these are assumed to originate from the extant cores (n=12), this provides an estimate of 23 flakes per core. Furthermore, if the handaxes (n=23) are factored in (estimate of 50 flakes per handaxe) this yields a total of 1150 products, four times as many flakes as are present. Therefore, depending on the extent of reduction of the handaxes, many were likely brought in at least partially worked. Nevertheless, there are a small number of handaxe manufacture flakes demonstrating that some manufacture was taking place on site.

Despite this deficit in the number of extant flakes the cortex analysis indicates that in fact all stages are represented. Nearly half of the results are represented by <50% cortex (n=85, 47%), followed by non-cortical (n=51, 28%), >50% cortex (n=33, 18%) and wholly cortical flakes (n=11, 6%) (figure 5.10). Moreover, the observed flake deficit can also be seen in the number of primary flakes compared to cores. There are only 11 wholly cortical flakes compared to 12 cores, demonstrating that cores are likely to have been brought in partially worked, with limited decortication occurring on site. Conversely, cortical flakes may have been present but were moved out elsewhere in the landscape. However, the former is the most likely scenario.

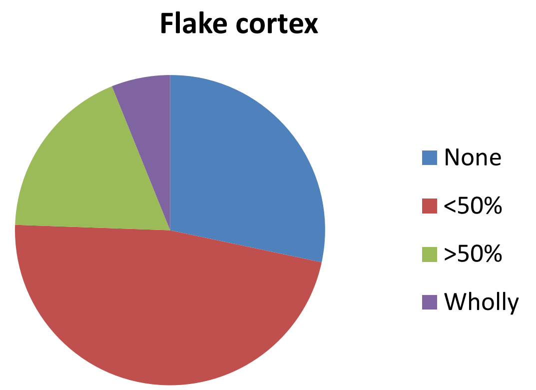


FIGURE 5.10 – PROPORTIONS OF FLAKE CORTEX FOR GREEN LANE, WHITFIELD

Comparing the proportions of primary, secondary and tertiary flakes to the flake signatures from the experimental dataset (table 5.2), it can be seen that the largest proportion is found in the secondary category, followed by tertiary and primary, creating a bell-curved profile (figure 5.11). This matches the signature for Ashton's combined handaxe and core chaîne opératoire indicating that both sequences were in operation at Green Lane.

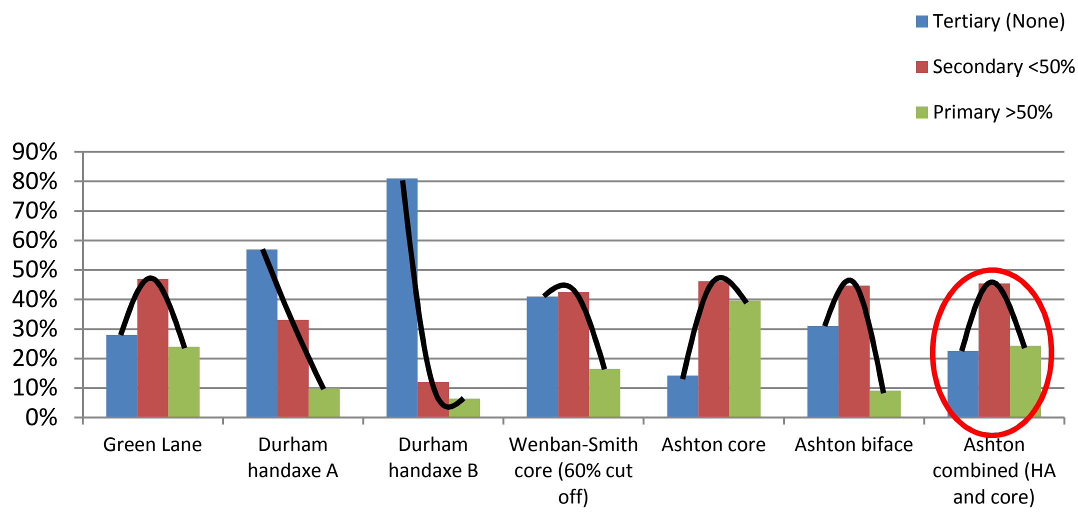


FIGURE 5.11 - COMPARISON OF THE FLAKE SIGNATURE FROM GREEN LANE WITH THE EXPERIMENTAL DATASET

The assemblage contains a high proportion of flake tools, more than double that shown by any of the other sites. Nearly 50% of these represent retouched flake-related activities (n=16, 44%), followed by scrapers (n=11, 31%), with a smaller proportion of notch-related tasks (n= 4, 11%), miscellaneous pieces (n=3, 8%) and two core tools (6%) (Appendix II; figure 5.12). In terms of the types of occupations that may have been undertaken here the site is very much focused on activities related to scrapers and retouched flakes, which can be linked to carcass and hide processing (section 2.5), linking in with the high proportion of handaxes present. Notch-related tasks are correlated with wood or bone working (section 2.5) and the low numbers infer that this was by-product of the main activities represented. Furthermore, as with the other Kent sites, Green Lane also contains a limited number of core tools suggesting some form of heavier processing. It is also important to note that the majority of handaxes on site are actually broken, suggesting that useable implements were removed and used in the wider landscape. Moreover the flake tools comprise a greater proportion of the assemblage than the handaxes. Whilst it could be argued that this is related to collection bias, the expectation would be that more handaxes would be identified during fieldwalking, thus biasing the assemblage accordingly. As a result, this suggests that the processing activities represented by the flake tools hold greater importance than the handaxes, and that this bias is valid.

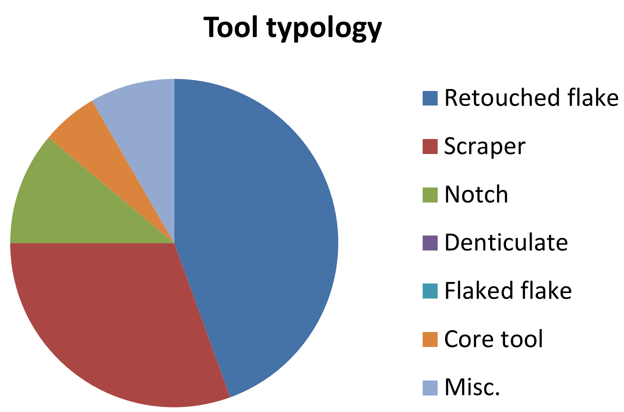


FIGURE 5.12 - TOOL TYPOLOGY FOR GREEN LANE, WHITFIELD

In summary, the site exhibits high numbers of handaxes and flake tools, and smaller proportions of debitage and flakes compared to the other Kent sites. This pattern coupled with the predominance of tools linked to carcass processing and hide working suggests that meat procurement was the overwhelming focus of the site. Whilst there is evidence of wood working however this is in a secondary capacity.

Overall this site likely functioned as a locale to which game was brought back from the wider landscape to be processed, with some handaxe manufacture or repair being carried out, along with general day to day subsistence activities. In terms of the type of site signature, this could be seen as a mix between Turq's 'mixed strategy' and 'episodic' locales, encompassing both manufacture, tools use and processing activities but skewed towards the procurement of a particular resource (Turq in Mellars 1996). The signature, however, perhaps more closely matches that of Price's 'extractive' site (1978).

5.1.4. Malmains 1, Eythorne

The site of Malmains 1 is situated on a ridge near the smaller, neighbouring site of Malmains 2. The assemblage totals 555 artefacts with the majority represented by flakes (n=412, 74%). The remainder comprises debitage (n=65, 12%), flake tools (n=30, 5%), cores (n=24, 4%) and handaxes (n=19, 3%), with smaller numbers of miscellaneous artefacts (n=4, 1%) and a single core tool (<1%) (Appendix II; figure 5.13). In a comparable situation to Green Lane, the flake tools are more prevalent here than the handaxes suggesting a stronger focus on processing events.

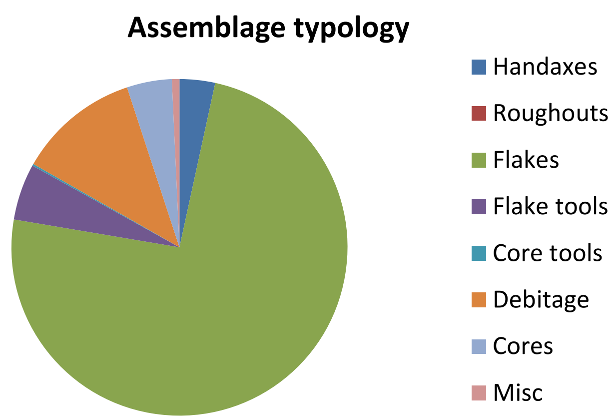


FIGURE 5.13 - ASSEMBLAGE TYPOLOGY FOR MALMAINS 1, KENT

All stages of the chaîne opératoire are represented from primary selection and reduction (cores, cortical flakes, tested nodules) through to further working (partially and non-cortical flakes, debitage, chips, hard and soft hammer flaking), as well as later stages of handaxe reduction (shaping and thinning flakes). The finished implements are also present (handaxes, flake tools, core tool) demonstrating likely use and discard on site. There are also a couple of nodules which were used as hammerstones, further emphasizing *in situ* manufacture at the site (table 5.1).

Concerning the actual number of flakes, flake tools and debitage totals 507, which if assumed to have come only from the extant cores provides a high average of 21 flakes per core. Conversely the handaxes (50 flakes each) are estimated to have produced 950 flakes, nearly double that of the knapping products identified. Therefore in a similar situation to Green Lane, there is a deficit of flakes compared to the estimated numbers of products. This therefore is most likely to be related to the import of handaxes onto the site.

Regarding the flake cortex, all stages are present, with just under half represented by flakes with <50% cortex (n=203, 49%), followed by non-cortical (n=113, 27%), >50% (n=71, 17%) and finally wholly cortical flakes (n=25, 6%) (figure 5.14). This pattern matches that observed in the previous two sites regarding the proportion of cortical flakes to cores. Although at Malmains 1 the assemblage contains one more cortical flake than core, signifying that the early stages of reduction were likely carried out elsewhere or indeed in a section of the site outside the fieldwalked area.

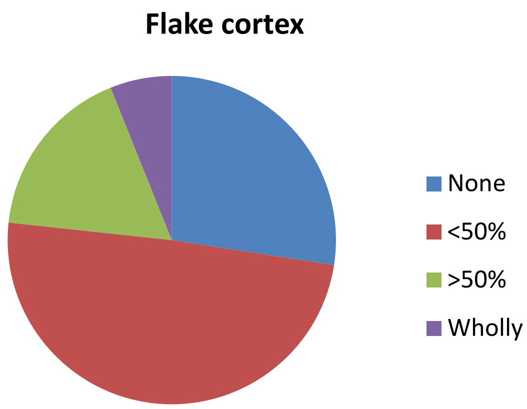


FIGURE 5.14 – PROPORTIONS OF FLAKE CORTEX FROM MALMAINS 1

Moreover, when the flake signature is compared to the experimental data (table 5.2) the resultant pattern is that of a bell-curve, with the highest proportion represented by secondary flakes, followed by tertiary and primary (figure 5.15). This matches almost exactly that of Green Lane (above, figure 5.11) and Ashton's combined signature, although with slightly less tertiary and more secondary than the latter. The parallels with Green Lane infer that similar manufacture strategies were being undertaken.

Concerning the tool component, the majority is represented by scraper-based activities (n=13, 43%), with a further 23% linked to tasks involving notches (n=7). The remainder includes retouched flakes (n=5, 17%), denticulates (n=4, 13%) and a single core tool (<1%). Although the numbers are small, the focus is on scraper-related events, suggested as linked to hide processing (section 2.5). The remainder are evenly spread in terms of numbers with notches and denticulates associated with wood-working, with the single core tool indicating more heavy-duty processing activities.

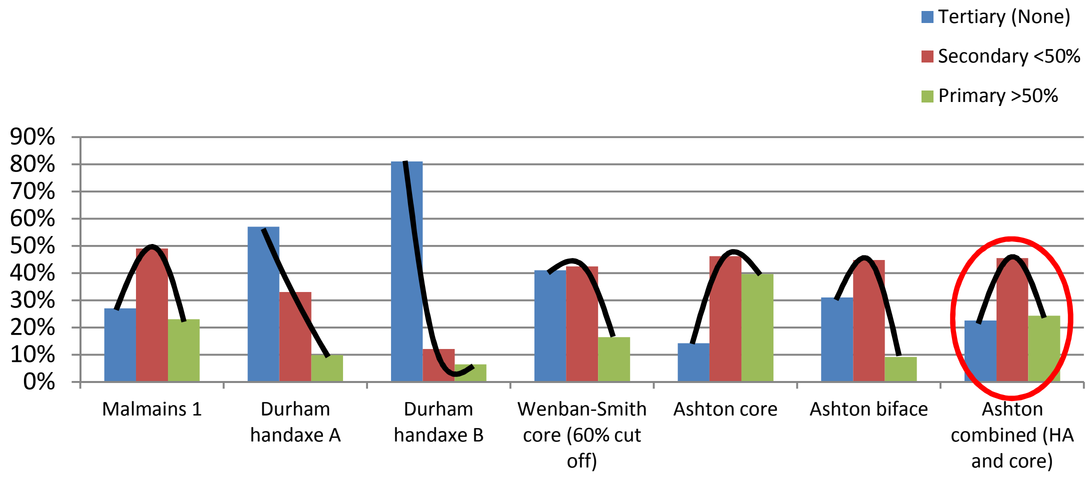


FIGURE 5.15 - COMPARISON OF THE FLAKE SIGNATURE FROM MALMAINS 1 WITH THE EXPERIMENTAL DATASET

In summary, the signature for Malmains 1 represents a mixed strategy site, where manufacture was based around core and flake working, likely aimed at the production of tools. Some handaxe manufacture is indicated, however it is likely that the majority were imported for use on site. The tools suggest a strong focus on hide working and activities associated with carcass processing, with a secondary smaller component linked to wood processing. In conclusion the signature shares similarities with that of Green Lane, with carcasses being processed on site, although the activities are generally of a more mixed nature identifying with Turq's 'mixed strategy' signature (Turq in Mellars 1996).

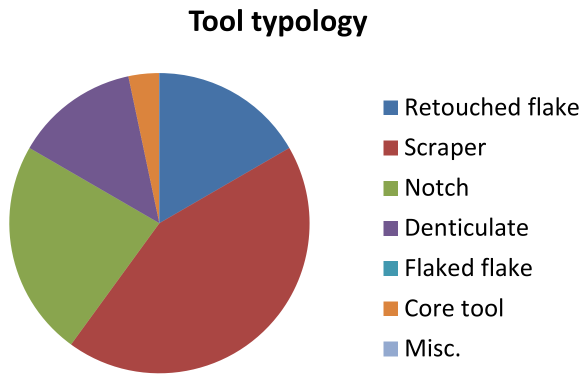


FIGURE 5.16 – BREAKDOWN OF TOOL TYPOLOGY FROM MALMAINS 1

5.1.5. Malmains 2, Eythorne.

The assemblage from Malmains 2 is smaller than the other Kent sites, containing only 70 artefacts. This dearth may be related to intensity of investigation (limited fieldwalking) although equally the site may simply not have been a favoured spot for hominin occupation, serving instead as a short-term stop. The majority of the assemblage is made up of flakes (n=50, 71%), followed by debitage (n=9, 13%), handaxes (n=3, 4%), cores (n=3, 4%), flake tools (n=2, 3%), miscellaneous (n=2, 3%) and core tools (n=1, 1%) (Appendix II; figure 5.17).

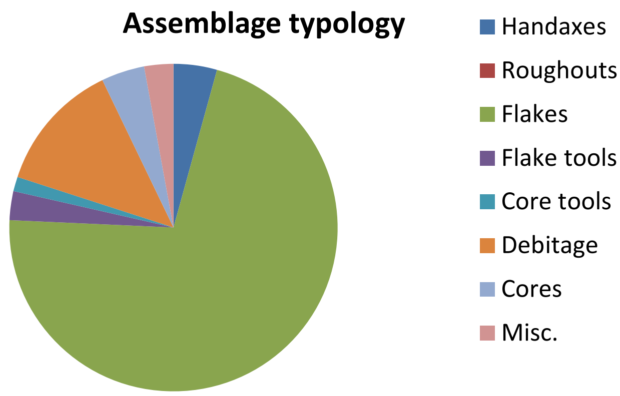


FIGURE 5.17 - ASSEMBLAGE TYPOLOGY FROM MALMAINS 2, KENT

In terms of the chaîne opératoire, despite the site being small, the primary stages of core and flake working are represented (cores, cortical flakes, tested pieces), along with later reduction (partial and non-cortical, debitage, chips, hard hammer flakes). The presence of one flake related to handaxe manufacture does again suggest some re-working or repair, although the early stages are absent signifying that artefacts were brought in fully or partially worked. The site also contains discarded tools (flake tools, handaxes, core tool), although of the three handaxes, two are broken, suggesting discard on site. A limited number of artefacts also demonstrate evidence of fire, although it cannot be proven that this is anthropogenic. In summary, the core and flake chaîne opératoire appears to be mostly complete, compared to the later stage/ modification of handaxes imported into the site (table 5.1).

In terms of the actual numbers of artefacts present, they are limited suggesting an ephemeral occupation. Nevertheless, if extant flakes, flake tools and debitage (n= 61), are considered to have originated from the three cores this provides an average of 20 flakes per core. Conversely if the manufacture of the three handaxes should have produced in total 150 flakes (50 flakes each) then this indicates a flake deficit, suggesting that the handaxes for the most part were imported fully worked.

Regarding the percentages of flake cortex, whilst all stages are represented there does appear to be an unusual distribution, with the greatest percentage made up of <50% (n=32, 64%), followed by >50% cortex (n=10, 20%), then non-cortical flakes (n=6, 12%) and finally wholly cortical surfaces (n=2, 4%) (figure 5.18). The low proportion of flakes with no cortex exhibits limited evidence of later stage manufacture, with more of a focus on the middle stages of the chaîne opératoire. Furthermore, there are only two wholly cortical flakes compared to the three cores, which again follows a similar pattern at the other Kent sites, with a deficit in the beginning stages of working. This suggests that either the cores were brought in partially worked and then discarded, that the cores were decorticated out of the immediate area, or alternatively the cortical flakes were removed for use elsewhere or as a basis for tool production.

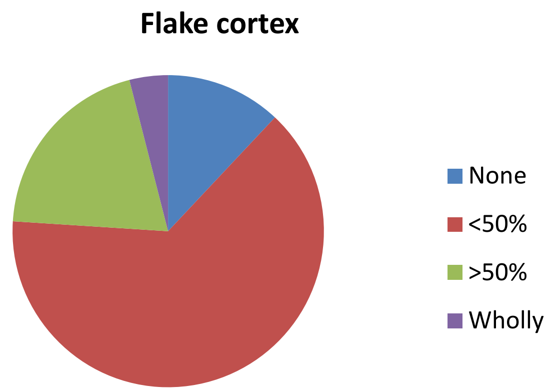


FIGURE 5.18 – PROPORTIONS OF FLAKE CORTEX AT MALMAINS 2, KENT

Subsequent to the pattern demonstrated in the flake cortex, the flake signature forms an extended bell-curve with a large proportion of secondary flakes, followed by primary then tertiary (figure 5.19, table 5.2). The closest match in terms of the overall profile is that of Ashton's combined signature, although the proportion of secondary flakes is much higher in the archaeological sample, and the tertiary flakes lower. It suggests that perhaps nodules were brought onto site partially knapped, a few flakes were then removed before exported.

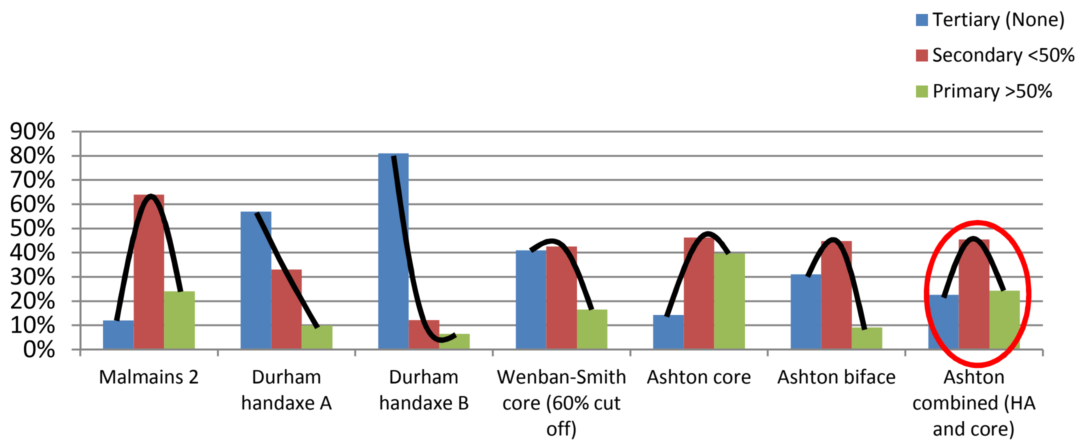


FIGURE 5.19 - COMPARISON OF THE FLAKE SIGNATURE FROM MALMAINS 2 WITH THE EXPERIMENTAL DATASET.

The restricted number of tools represented suggests that processing activities were undertaken in a minimal fashion, as part of general subsistence activities. The tools are a retouched flake, scraper and core tool (figure 5.20), which furthers the idea that this represents limited occupation, with minimal mixed processing tasks being undertaken. However, according to the use-wear analysis (section 2.5) the retouched flake and scraper might be linked to carcass processing, which would tie in with the presence of handaxes on site. Again the core tools infer a link between these upland sites and some form of heavier processing activities.

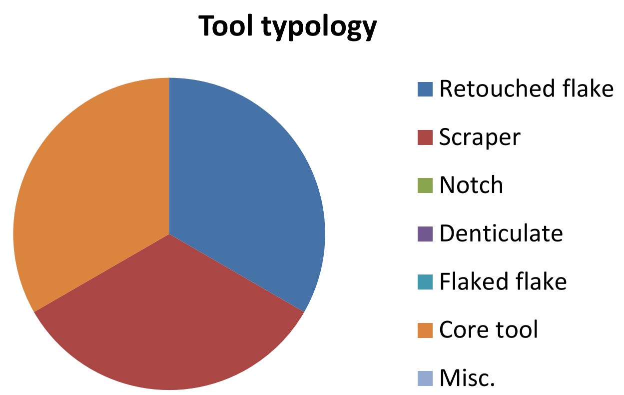


FIGURE 5.20 - TOOL TYPOLOGY FOR MALMAINS 2

In summary, the signature displayed is unusual due to the limited evidence and varied technological composition. The assemblage is small, which could be linked to taphanomic factors and limited collection of artefacts. However the extensive assemblage obtained from Malmains 1, which was fieldwalked over a similar time-scale does indicate that we may be dealing with a different occupation signature. Furthermore the site doesn't appear focused on any particular activity, and a lack of evidence for major raw material procurement is indicated, serving to differentiate this locale from the others in Kent. There is a slight emphasis on carcass-related activities with the flake tools and handaxes, however this is in a limited capacity and likely representative of a short stay ephemeral site, where general maintenance activities took place over a short period of time, in accordance with Turq's 'episodic' site (Turq in Mellars 1996).

5.2. Chiltern Plateau sites

5.2.1. Cottages Floor, Caddington

The published report (Sampson 1978) gives the assemblage size as 1431, with 87% of these represented by flakes (n=1249). The rest comprises flake tools (n=63, 4%), miscellaneous artefacts (n=58, 4%), debitage (n=24, 2%), handaxes (n=13, 1%), roughouts (n=11, 1%), core tools (n=9, 1%) and cores (n=4, <1%) (Appendix II; figure 5.21). One point to note is that the flake tools are five times more common than handaxes, indicating a likely focus on processing activities. Whilst the very small number of cores (only four) is probably a result of Smith's transportation issues (see discussion in section 3.3).

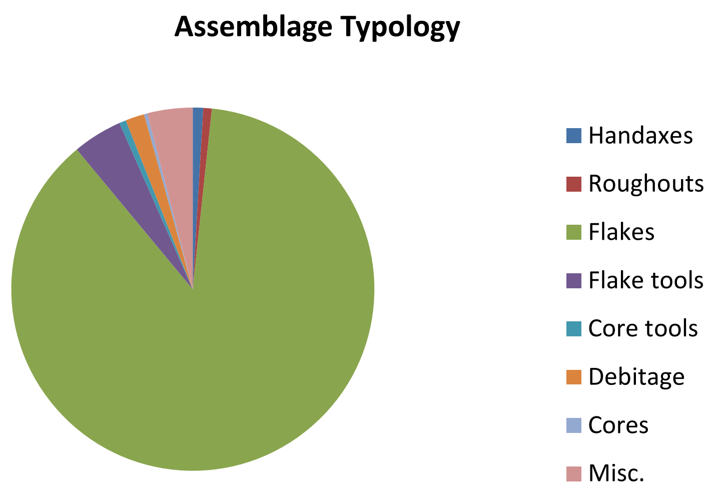


FIGURE 5.21 - ASSEMBLAGE TYPOLOGY FOR THE COTTAGES SITE, CADDINGTON

All stages of the chaîne opératoire are represented, from primary acquisition and decortication of raw material (cores, cortical flakes) through to the secondary stages (partial and non-cortical, debitage, chips, hard and soft hammer), and the manufacture of handaxes (roughouts, shaping, thinning and tranchet flakes), and presumed use and discard of the finished artefacts (handaxes, flake and core tools) (table 5.3). Again there appears to be a pattern of core tool presence associated with the majority of these upland sites.

The low numbers of extant cores, as noted above, makes a reconstruction of the knapping sequences obsolete, however estimations can be made based on the handaxes to give an idea of possible numbers. Consequently, using an estimate of 50 flakes per handaxe and 10 flakes per roughout, this provides 760 artefacts, leaving 576 needing to be accounted for. Therefore it is likely that the missing cores account for at least part of the flakes, with others likely produced from handaxe manufacture with the resultant finished products exported.

The flake cortex results were not published in the original report (Bradley and Sampson 1978) so the values used here will be taken from unpublished data collected by White. This is based on the analysis of 327 flakes and used as a proxy for the remaining assemblage. The results demonstrate that nearly half of the flake component is made up of pieces exhibiting <50% cortex on their dorsal surfaces (n=158, 48%), followed by a further 29% represented by non-cortical flakes (n=95). The remaining pieces are split into >50% (n=45, 14%) and wholly cortical flakes (n=29, 9%) (Appendix II; figure 5.22).

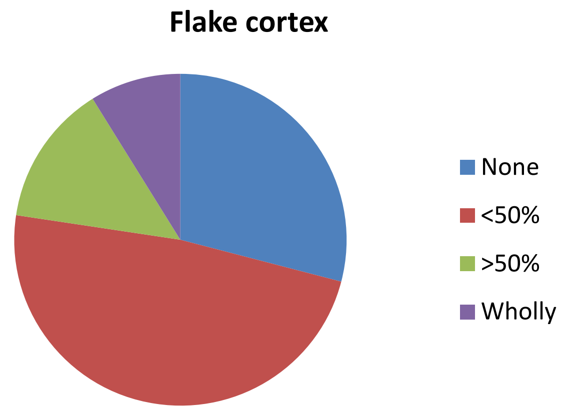


FIGURE 5.22 - FLAKE CORTEX BREAKDOWN FOR THE COTTAGES FLOOR, CADDINGTON

Chaîne opératoire stage	Present/ absent	Caddington	Gaddesden Row	Round Green	Whipsnade
Raw material procurement	Cores	Yes	Yes	Yes	No
	Cortical flakes	Yes	Limited	Yes	Yes
	Test Pieces	No	No	Limited	No
Debitage	Partially cortical flakes	Yes	Yes	Yes	Yes
	Non-cortical flakes	Yes	Yes	Yes	Yes
	Debitage	Yes	Yes	Yes	Yes
	Chips	Yes	No	No	Yes
	Hard hammer flakes	Yes	Yes	Yes	Yes
	Soft hammer flakes	Yes	Yes	Yes	Yes
Tool manufacture	Shaping flakes	Yes	Yes	Yes	Yes
	Roughout	Yes	Yes	Yes	Yes
	Thinning flakes	Yes	Yes	Yes	Yes
	Flake tool spall	No	No	Yes	Yes
Finished tools	Handaxe	Yes	Yes	Yes	Yes
	Flake tools	Yes	Yes	Yes	Yes
	Core tool	Yes	No	Limited	No
	Misc.	Yes	No	Yes	No
Other indicators	Cut marks	No	No	No	No
	Use-wear	No	No	No	No

TABLE 5.3 - SUMMARY OF THE CHAINE OPERATOIRE STAGES FOR THE CHILTERN SITES

Percentage of flake types produced by the experimental datasets using a cortex split of 50%	Tertiary (None)	Secondary <50%	Primary >50%
Durham handaxe A	57%	33%	10%
Durham handaxe B	81%	12%	6%
Wenban-Smith core (60% cut off)	41%	43%	17%
Ashton core	14%	46%	40%
Ashton experimental biface	31%	45%	24%
Ashton combined (HA and core)	23%	45%	32%
Caddington	29%	48%	22%
Gaddesden Row	53%	35%	12%
Round Green	24%	58%	19%
Whipsnade	34%	58%	9%

TABLE 5.4 - COMPARISON OF THE PROPORTIONS OF FLAKE TYPES PRODUCED BY THE EXPERIMENTAL DATASTS COMPARED TO THAT FROM THE CHILTERN SITES

Furthermore, the flake signature demonstrates a predominance of secondary flakes, followed by tertiary and primary, creating a right-slanted bell-curved profile. This matches with the signature observed from Ashton's biface, but could equally, depending on losses from the original assemblage, fit the combined core and handaxe manufacture profile (figure 5.23, table 5.4). Judging by the evidence from the chaîne opératoire, it is more likely the latter, although perhaps with a slant towards handaxes. This pattern closely mirrors that found at both Green Lane (section 5.1.3, figure 5.11) and Malmains 1, Kent (section 5.1.4, figure 5.15), suggesting parallel technological strategies.

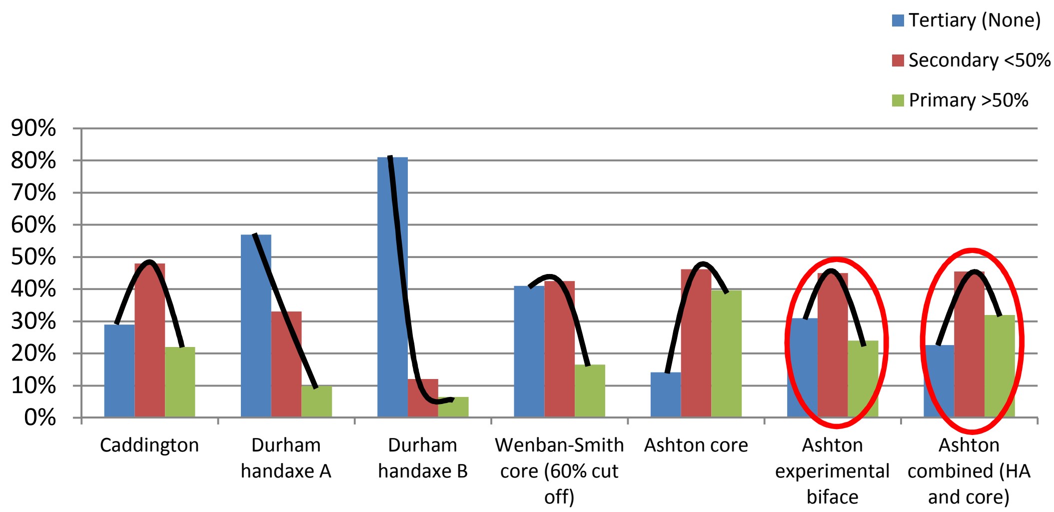


FIGURE 5.23 - COMPARISON OF THE CADDINGTON FLAKE SIGNATURE WITH THE EXPERIMENTAL DATA

The tool component demonstrates a rather mixed pattern. The most common activity appears to be related to the use of notches (n=22, 31%), followed by scraper-related activities (n=15, 21%), denticulates (n=13, 18%), retouched flakes (n=9, 13%) and core tools (n=9, 13%), with a further four tools classed as miscellaneous (6%) (Appendix II; figure 5.24). The mixed nature of the assemblage is confirmed when the use-wear results are considered. Notches are suggested as being linked for the most part to wood processing, although bone working has also been demonstrated on a limited basis. Likewise scrapers are most often associated with hide working, denticulates with wood working and retouched flakes are more often linked to carcass processing (section 2.5). Consequently it is interesting to note that in contrast to many of the upland plateau sites, whilst Caddington is essentially mixed, the focus does appear skewed towards wood processing, rather than hide and carcass working if the assumptions developed on the use-wear hold true.

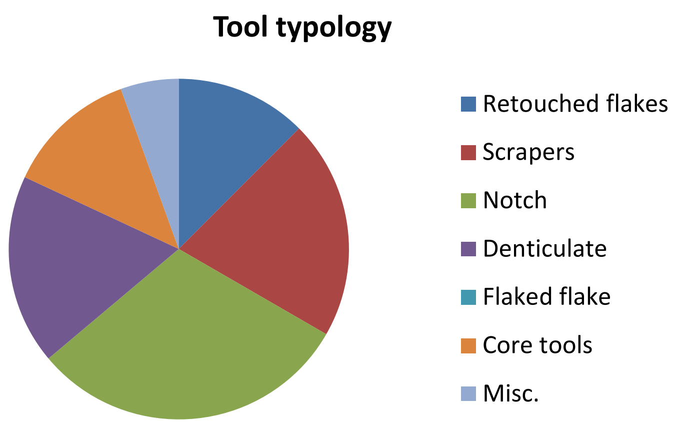


FIGURE 5.24 - TOOL COMPOSITION FOR THE COTTAGES FLOOR, CADDINGTON TAKEN FROM SAMPSON (1978)

In summary, the assemblage signature at the Cottages site at Caddington is a mixed one. Primary manufacture was taking place, along with the use of handaxes (butchery activities) and flake tools. The mixed signature in the tool component, although slanted towards wood-related activities, is reminiscent of a pattern related to broader occupation type sites such as the Golf Course at Clacton (section 5.3.2) and the Lower Industry at Hoxne (section 5.3.5). This pattern fits with what Turq has termed a 'mixed strategy' site (Turq in Mellars 1996), or similar to Price's 'base-camps'(1978) displaying flake tools, full range of manufacture debris and evidence of procurement and maintenance activities.

5.2.2. Gaddesden Row

The composition of the assemblage from Gaddesden Row stands out, with the total extant artefacts only comprising 89, and of these nearly half are handaxes (45%, n=44). Furthermore, flake tools make up a greater proportion (except in the case of Green Lane, section 5.1.3) than usually seen (n=11, 11%). The remainder is made up of flakes (n=34, 35%), cores (n=4, 4%) and debitage (n=1, 1%). Whilst this pattern clearly relates to losses following Smith's death (section 3.3), where much of the debitage was lost, inferences can still be made concerning the tools and these will be discussed below.

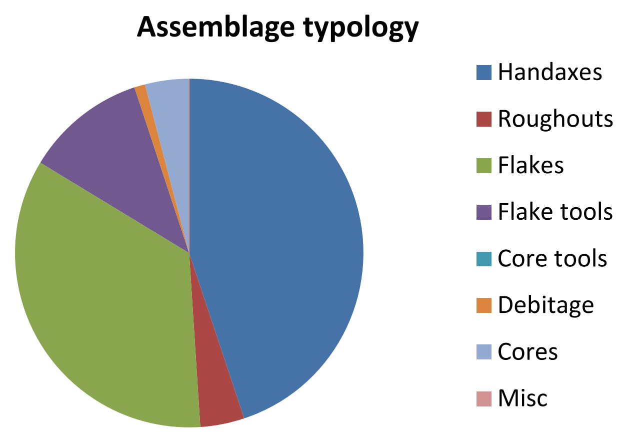


Figure 5.25 - Assemblage typology for Gaddesden Row

Despite problems with the assemblage (section 3.3), certain observations can be made regarding the chaîne opératoire. All stages of handaxe manufacture are present from initial roughing out to the final stages of reduction (shaping, thinning) and discard of the finished handaxes. Furthermore a reasonably complete core and flake sequence is also present, from initial selection and reduction (cores, one cortical flake), to further working (partially and non-cortical flakes, debitage, hard and soft hammer) and the production of finished tools (handaxes, flake tools). There are no tested nodules or chips present, however this most likely relates to the biases discussed above and in section 3.3. This may also apply to the lack of core tools, although this cannot be demonstrated. In terms of the types of activities that were conducted, the large numbers of handaxes (figure 5.25) may not wholly be related to biases in the remaining collection. Indeed in terms of the actual numbers, Gaddesden Row contains nearly four times as many as Caddington, which is overall a much larger assemblage, being more extensively worked and sampled. This suggests a different focus for the site, with the numbers indicating a strong focus on butchery-related activities (table 5.3).

Due to the absence of many of the original flakes and cores an estimation of the artefact numbers cannot be made. However, cortex data derived from the remaining flakes establishes that all stages are represented in some form. Over half demonstrate non-cortical dorsal surfaces (n=18, 53%), followed by <50% (n=12, 35%), >50% (n=3, 9%) and a single cortical flake (3%) (Appendix II; figure 5.26). Taken at face value the single cortical flake compared to the four cores suggests a deficit in the early stages of manufacture, however in reality, cortical flakes would have been easily overlooked by the brick pit workers (section 3.3).

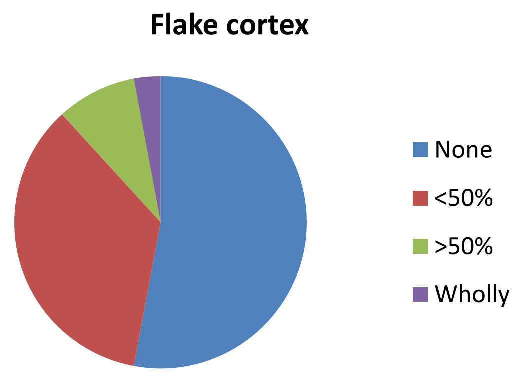


FIGURE 5.26 – PROPORTION OF FLAKE CORTEX FROM GADDESDEN ROW

Bearing in mind the comments above, whilst the low number of extant flakes makes it difficult to make too many inferences, it is interesting to note that the available data regarding the flake signatures produces a triangular shape with a predominance of tertiary, followed by secondary and primary flakes (figure 5.27, table 5.4).

Consequently the form matches the pattern for Durham handaxe A, which despite the low artefact numbers, ties in with the assemblage bias towards handaxes.

Moreover, the butchery signature suggested by the handaxes is further strengthened by the flake tools, all of which are scrapers. Following the discussion over use-wear (section 2.5), scrapers are predominantly associated with hide-based activities, therefore evidence from the flake tools corroborates the inferences made concerning the handaxes, demonstrating a focus on butchery and hide processing at the site.

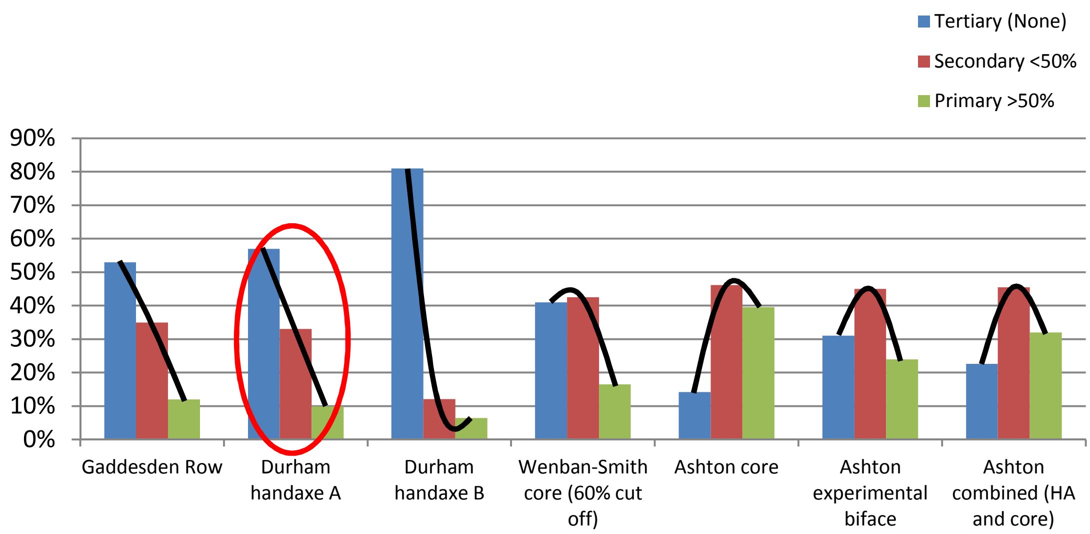


FIGURE 5.27 - COMPARISON OF THE FLAKE SIGNATURES FROM GADDESDEN ROW WITH THE EXPERIMENTAL DATASET

In summary, the site signature indicates a concentration on butchery, carcass and hide-related activities, with primary manufacture appearing, despite the reservations discussed above, to be predominantly associated with the manufacture of handaxes. However if these were manufactured on site it would have created a huge amount of debitage (estimated over 2000 flakes), so it is more likely that a number were imported fully worked during the course of activities undertaken in the surrounding landscape. In terms of the type of site, if the post-deposition losses were actually minimal, the site would demonstrates a correlation with Turq's 'episodic' occupation, with low artefact numbers and specialised procurement activities (Turq in Mellars

1996), or with Price's 'extractive' site focused on specific resource procurement (Price 1978).

5.2.3. Round Green

The assemblage from this site totals 282 with over three quarters of the artefacts represented by flakes (n=221, 78%). The remaining categories comprise handaxes (n=25, 9%), flake tools (n=15, 5%), cores (n=11, 4%), roughouts (n=7, 2%), a single core tool (<1%) and two miscellaneous pieces (1%) (Appendix II; figure 5.28).

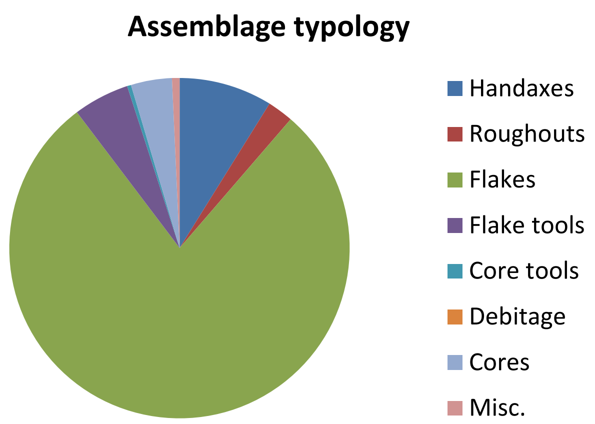


FIGURE 5.28 - ASSEMBLAGE TYPOLOGY FOR ROUND GREEN

Both handaxe and core and flake chaîne opératoires are in operation at the site. The manufacture stages range from primary selection and decortication of raw material (cores, cortical flakes, test pieces) to secondary working (hard and soft hammer, partially and non-cortical flakes) and handaxe reduction (roughout, shaping, thinning, finishing and tranchet flakes), through to the use and discard of the final artefacts (handaxes, flake tools and a core tool). Evidence of *in situ* tool production is also demonstrated by the presence of a flaked flake spall. The quantity of both roughouts and handaxes is large, especially since fourteen of the finished tools are complete, suggesting both manufacture and use in the vicinity of the site. Furthermore, handaxes outnumber the flake tools, signifying the importance of butchery-related tasks (table 5.3).

The incidence of flakes and flake tools, if assumed to originate from the eleven cores, gives an estimated value of twenty-one flakes per core. On the other hand, if the handaxes and roughouts are included (50 flakes per handaxe, 10 per roughout) then the extant pieces produce an estimated 1320 flakes. Accordingly, this deficit of flakes infers that handaxes, or indeed cores, may have been brought into the site partially or fully worked. However, the point discussed above regarding collection biases also applies to Round Green (section 3.3), so these inferences cannot be taken too far.

The cortex present on the extant flakes indicates that all stages were present, with over half of these demonstrating <50% cortex (n=127, 58%), followed by non-cortical (n=52, 24%), >50% (n=29, 13%) and wholly cortical (n=12, 5%) (Appendix II; figure 5.29). The numbers of cortical flakes compared to cores suggests a deficit in the early stages of production, with cores perhaps being decorticated outside the immediate area, or imported into the recovery zone from their area of manufacture. This links in with the point made above about the frequency of handaxes and cores versus the flakes and flake tools.

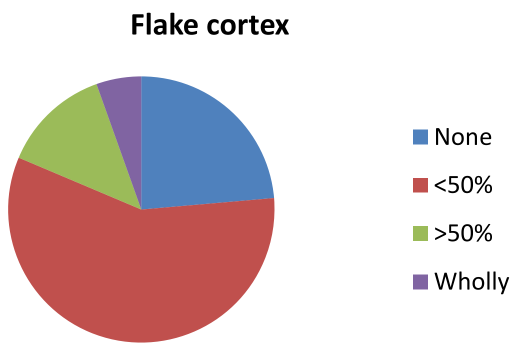


FIGURE 5.29 – PROPORTIONS OF FLAKE CORTEX ON THE ASSEMBLAGE FROM ROUND GREEN

The resultant flake signature demonstrates an extended bell-curve form, with a large proportion of secondary flakes followed by tertiary and primary (figure 5.30, table 5.4). The pattern is reminiscent of that of Ashton's mixed core and handaxe signature, although with considerably more secondary and less primary stages represented. It is likely therefore that the signature is a mixed one, indicating that nodules were brought in partially worked, as supported by the deficit in cortical flakes. Conversely it could be explained by recovery bias, with wholly cortical and the smaller non-cortical fractions being missed. However, for reasons discussed above this is unlikely to account for all the absent pieces.

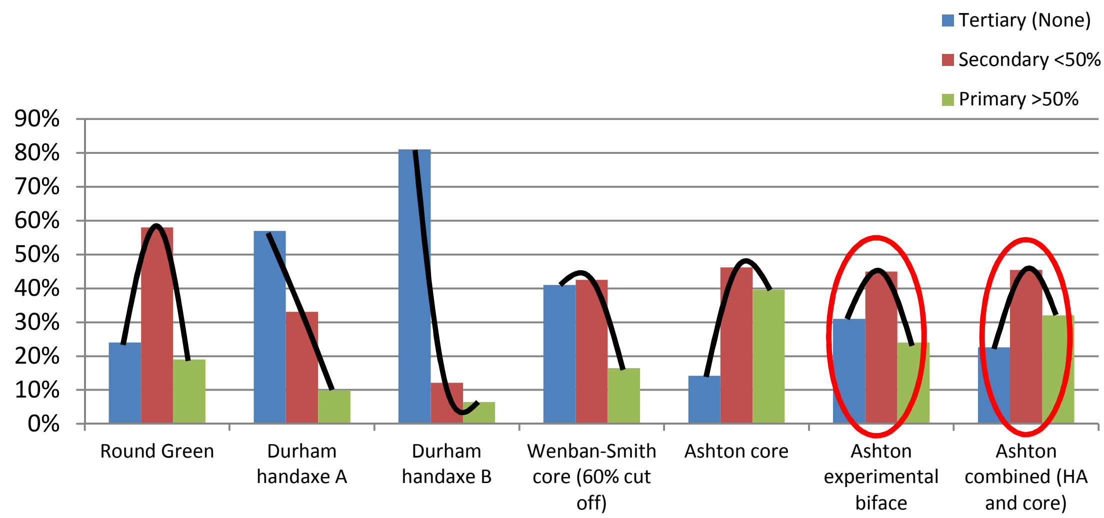


FIGURE 5.30 - COMPARISON OF THE FLAKE SIGNATURE FROM ROUND GREEN WITH THE EXPERIMENTAL DATASET

Over half of the flake tools are linked to scraper-based tasks (n=10, 63%) with the remaining proportion represented by flaked flakes (n=4, 25%), a single denticulate (6%) and a core tool (n=1, 6%) (Appendix II; figure 5.31). The types of processing events implicated by these tools (use-wear discussion - section 2.5) are hide working (scrapers) and the procurement and processing of wood and plant material (flaked flakes, denticulates). Consequently the dominance of scrapers ties in with the presence of handaxes and implied butchery activities. However, the presence of the other tools suggest more of a mixed focus. Furthermore, as seen with the other upland sites, a core tool is present, indicating that heavier processing was undertaken, although whether this is related to the carcass or wood events can't be determined.

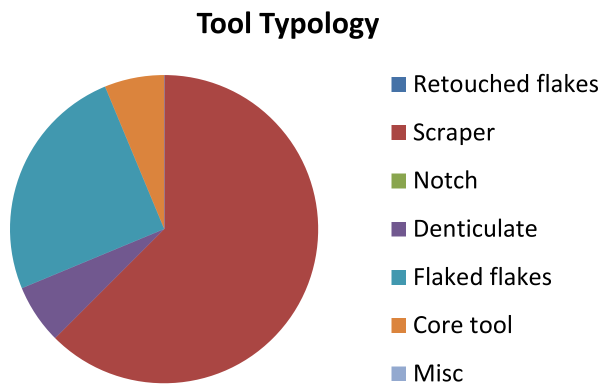


FIGURE 5.31 – TOOL TYPES PRESENT IN THE ROUND GREEN ASSEMBLAGE

In summary, the signature from Round Green demonstrates *in situ* working of both handaxes and flake tools, with some handaxes and cores imported into the site partly worked. Indeed, based on McNabb's assessment of the flake types (188 hard hammer flakes versus 71 biface thinning flakes) (1992), White has maintained that the assemblage contains a severe deficit in biface manufacturing debris (1997), a view which is backed up by the evidence presented here. Additionally, the assemblage focus is on butchery and scraper-related activities (hides), with a secondary more mixed signature represented by the rest of the flake tools. Overall the signature is closest to Turq's 'mixed strategy' site (in Mellars 1996) with both primary working and resource procurement represented.

5.2.4. Whipsnade

The assemblage from Whipsnade totals 196 artefacts, of which 170 are flakes (87%). The rest is accounted for by handaxes (n=8, 4%), flake tools (n=8, 4%), miscellaneous pieces (n=6, 3%), roughouts (n=2, 1%) and two pieces of debitage (1%) (Appendix II; figure 5.32). The site contains the smallest number of handaxes from the Chilterns group, and even taking into account the recovery biases, one would perhaps expect a larger number, considering that these are the most easily recognisable artefacts for the brick pit workers. However, the size of the pond feature at Whipsnade might indicate that it was more of an ephemeral occupation compared to the others.

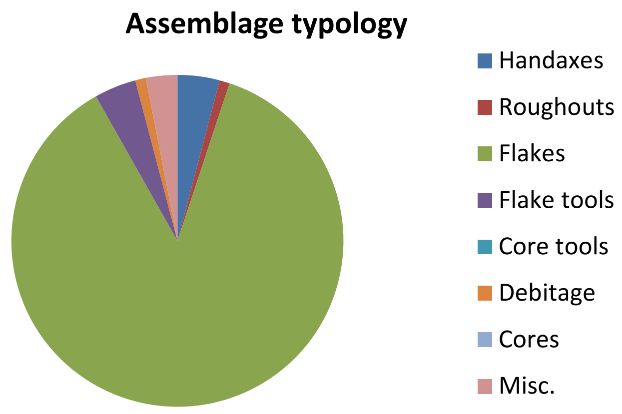


FIGURE 5.32 - ASSEMBLAGE TYPOLOGY FOR WHIPSNADE

The handaxe chaîne opératoire seems to be fairly complete, with initial working (roughout, shaping flakes) through to thinning (thinning and finishing flakes) and final reduction and discard of the end products (handaxes). In contrast the core and flake sequence appears incomplete, with no cores or tested pieces, and very few cortical flakes. There are however limited instances of debitage and chips and both hard and soft hammer flakes, with all stages of cortical surfaces represented. Furthermore, manufacture of flake tools did take place on site with identification of the resultant spalls. Interestingly soft hammer flakes are more prevalent than hard hammer ones, suggesting that later stages of manufacture were more represented (table 5.3).

The lack of cores and cortical flakes is expected to relate to previous discussions regarding recovery biases applied to the other sites (e.g. Round Green, section 3.3). However, an alternative argument could be made, regarding the fact that there are only three wholly cortical flakes present. It is entirely possible that they came from a single core, which was subsequently exported out of the site, however this interpretation must be approached with caution. Furthermore, the fact remains that Whipsnade contains only eight bifaces which make up 5% of the assemblage, much less than at the other sites. This number could be expected to be greater if the relative proportions of artefacts at this site were solely the result of the collection strategy.

Whilst no inferences on artefact numbers can be made with the lack of cores and possible collection biases, some inferences can be made based on the handaxes. If fifty flakes were produced in the manufacture of each handaxe, with ten for each roughout, then the eight handaxes and two roughouts could have produced around 420 flakes. It is debatable as to whether such a difference in the remaining flakes versus the perceived flake counts is solely related to recovery, suggesting that there was likely an original deficit in flake numbers. The thinning flakes that do occur on site may have been generated through repair and resharpening.

Moving on, the results from the flake cortex again indicate that all stages are represented, although they suggest an under-representation of cortical flakes (n=3, 2%), related to either collection bias or more likely import of partially worked nodules and handaxes. Working with the data available suggests an emphasis on the later stages of manufacture, with <50% making up 58% (n=98), followed by non-cortical (n=57, 34%), and >50% (n=12, 7%) (Appendix II; figure 5.33), an inference which ties into the point above regarding the observed frequency of soft hammer flakes.

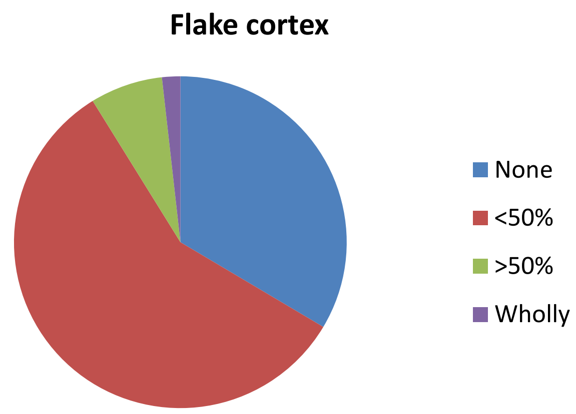


FIGURE 5.33 – PROPORTIONS OF FLAKE CORTEX FOR WHIPSNADE

There are a number of hypotheses that can be presented to explain the flake signature at Whipsnade. The large number of secondary flakes, followed by tertiary and primary creates a right-slanted bell-curve, the shape of which fits closest to Ashton's biface (figure 5.34, table 5.4), although the archaeological sample has a lot more secondary and fewer primary flakes. Again this agrees with the previous comments regarding a perceived focus on the later stages of manufacture. Alternatively it could be argued that the relative proportions of primary and tertiary flakes could be argued as being related to the pattern displayed by the Durham handaxe examples. Therefore if the import of artefacts and further reduction increased the secondary flake proportions it could equally be related to the more classic handaxe signature. However there is evidence of at least part of the core and flake working sequence, which could explain the high levels of secondary flakes compared to the rest.

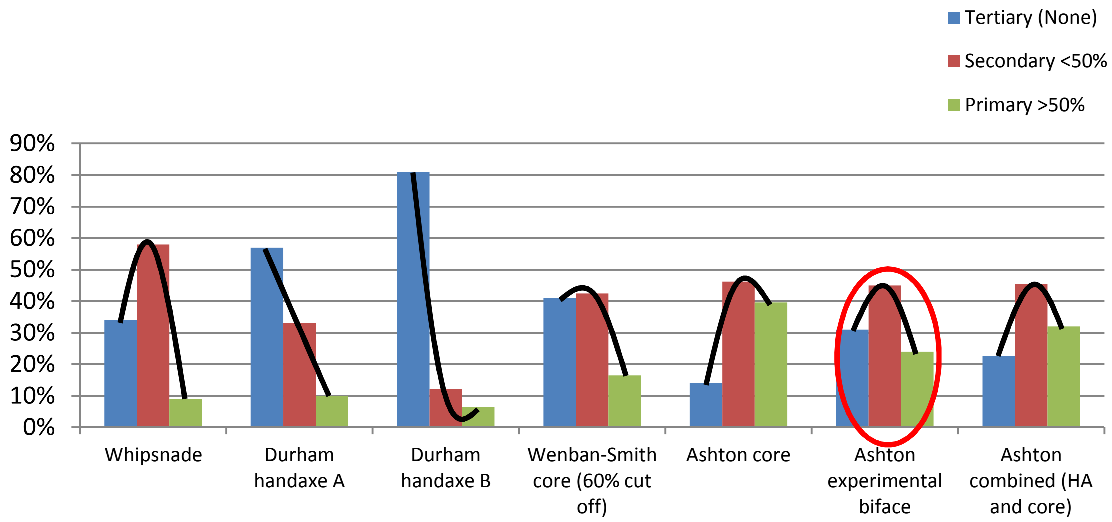


FIGURE 5.34 - COMPARISON OF THE FLAKE SIGNATURE FROM WHIPSNADE WITH THE EXPERIMENTAL DATASET

Another point to note is the similarity in the frequency of the handaxes and flake tools, suggesting that there is no particular distinction between butchery and other processing activities. Furthermore, this is backed up by the results of the flake tools, which are made up in the majority of flaked flakes (n=5, 63%) indicating a bias towards wood working activities (see use-wear discussion, section 2.5). The remainder are represented by scrapers (n=3, 38%) (Appendix II; figure 5.35) indicating that a carcass processing component was present, in-line with the existence of handaxes on-site. Moreover, the identification of flaked flake spalls suggests that these tools were produced on-site, however the low numbers may indicate use within a subsistence context rather than specific and focused resource procurement.

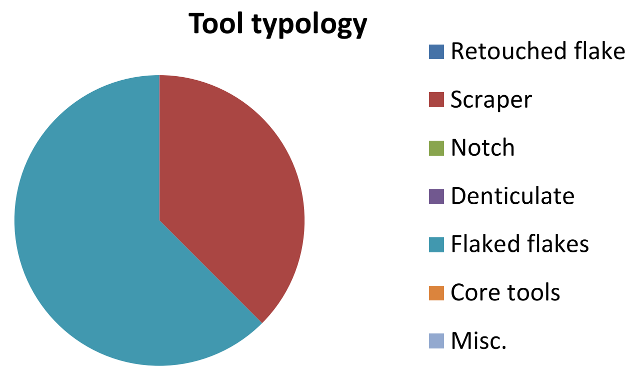


FIGURE 5.35 - TOOL TYPOLOGY FOR WHIPSNADE

In summary, Whipsnade represents a mixed signature, with both manufacture and tool use occurring on site. The predominant manufacture appears to be handaxe related, with a focus on the later stages. Although flake tools are being produced on site this does not appear to be reflected much in the flake signature. In terms of the activity focus, handaxes and scrapers link to butchery and hide processing, whilst the main focus of the tools is on flaked flake activities (wood processing). Overall the site fits closest to that of Turq's 'mixed strategy' signature, with both manufacture and tool use occurring (Turq in Mellars 1996).

5.3. Riverine sites

5.3.1. Barnham

Area I

The assemblage from Area I at Barnham totals 504 and mostly consists of flakes (n=443, 88%) and cores (n=29, 6%) encompassing 94% of the total artefacts. The remainder is made up of flake tools (n=32, 6%) (Appendix II; figure 5.36), indicating that manufacturing and processing activities were conducted on site.

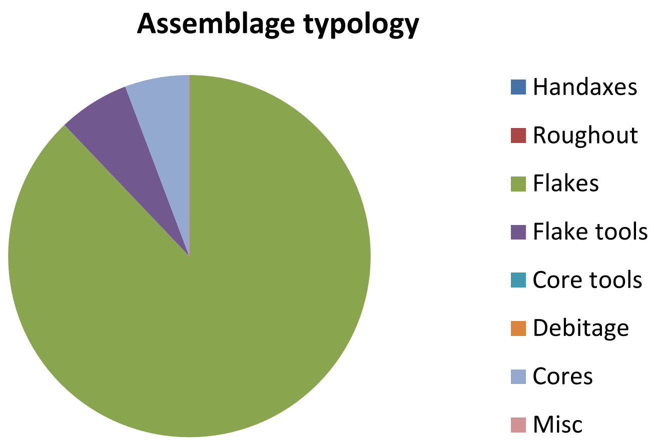


FIGURE 5.36 - ASSEMBLAGE TYPOLOGY FOR BARNHAM, AREA I

The chaîne opératoire (table 5.5), is focused on core and flake working. All stages are represented from raw material acquisition (cores, cortical flakes) through to secondary working (partially and non-cortical hard hammer flakes, chips) and production of the final products (flake tools, flake tool spall). There is no evidence of handaxe manufacture or soft hammer flakes. Therefore manufacture is centred on core and flake working and the production of flake tools to meet processing and procurement needs in the surrounding environment.

Ashton (1998b:207) notes that the average number of flake scars for the cores is 7.6, with a maximum estimate of 20. Therefore using this estimate, the 29 cores would provide 220 flakes, and using the maximum number of flake scars yields a figure of 580. When these values are compared to the number of extant flakes and flake tools (n=443 and n=32) the combination of these values lies within the predicted range for the assemblage, indicating the likelihood that there was minimal net import or export of either debitage or cores.

When considering the flake cortex, it is clear that all stages are represented, from the acquisition and primary working of cores to the final stages of tool production. The greatest number of flakes fall within the <50% cortex category (n=183, 41%), followed by non-cortical pieces (n=143, 30%), >50% (n=84, 19%) with the remaining category comprising wholly cortical flakes (n=42, 9%) (figure 5.37).

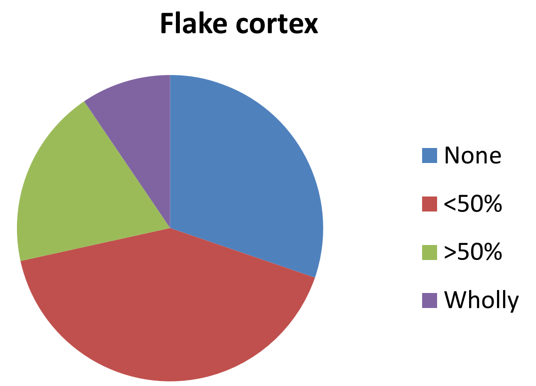


FIGURE 5.37 - FLAKE CORTEX FOR AREA I, BARNHAM

Furthermore, the proportions of primary, secondary and tertiary flakes forms a bell-curved signature, with a predominance of secondary, and close proportions of primary and tertiary (figure 5.38, table 5.11). This shape shares affinities with the signatures for Ashton's experimental biface and his combined signature of both handaxe and core working. It is interesting to note that the form suggests some form of handaxe manufacture on site, however the chaîne opératoire is purely a core and flake one. This could perhaps be explained by the working of the raw material. If the average flake removal for the cores is seven then the cores may be minimally worked, creating an over-representation of pieces with cortex present. However this could also be linked to the production of flaked flakes, in a similar situation to High Lodge. In this instance the removal of the flaked flake spalls creates an increase in the non-cortical category, in which case the signature could be suggested as being close to Ashton's core, rather than Wenban-Smith's.

In contrast to the other locations at Barnham, Area I has a larger number of tool types, with over 50% linked to flaked flake tasks (n=19, 59%), followed by activities associated with scrapers (n=10, 31%), denticulates (n=2, 6%) and retouched flakes (n=1, 3%) (figure 5.39). As discussed in section 2.5, use-wear suggests that flaked flakes and denticulates are linked to wood-based procurement or modification. Scrapers have affinities with hide processing, and whilst the uses of retouched flakes appear mixed, they most often associate with carcass processing. Using these assumptions it could be argued that the flake tool component is centred on wood-related activities, with a secondary component of hide or carcass processing tasks. Furthermore, the presence of a number of flaked flake spalls indicates that tools were manufactured on site for immediate use. This would tie in with the environmental evidence which suggests the surrounding area was oak woodland, providing easy access to wood resources (Holman 1998; Seddon 1998; Ashton et al. 1998a; Parfitt 1998).

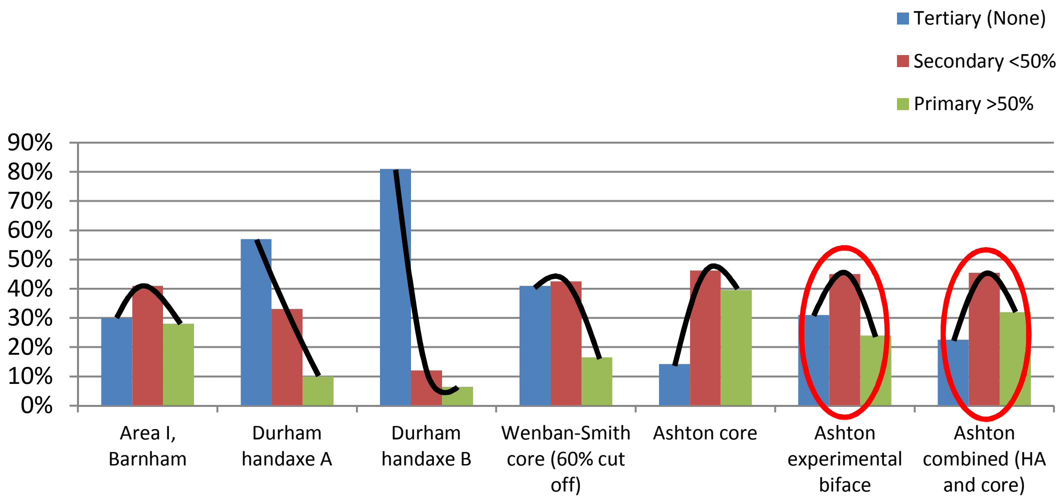


FIGURE 5.38 - COMPARISON OF THE FLAKE SIGNATURE FOR AREA I, BARNHAM WITH THE EXPERIMENTAL DATASET

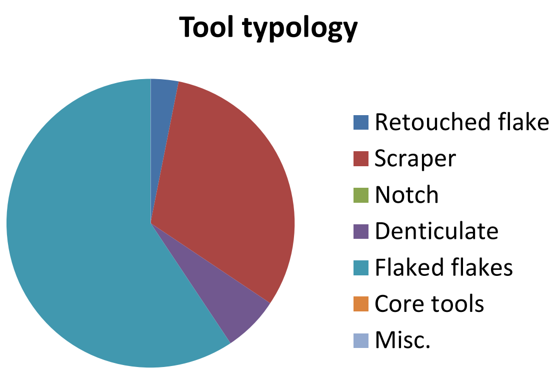


FIGURE 5.39 - TOOL TYPOLOGY, AREA I, BARNHAM

In summary, the assemblage signature from Area I suggests a focus on raw material procurement and the manufacture and use of tools, with subsistence activities mostly focused on flaked flake wood-related tasks. There appears to be a secondary component associated with carcass processing (scrapers and retouched flakes) linked to general subsistence activities. If this assemblage has accrued over time, as is likely, it advocates that a lot of activities in this location were centred around wood procurement and processing. The signature shares similarities with Turq's 'mixed strategy' locations with manufacture, production and use of flake tools (Turq 1988a; 1989a in Mellars 1996).

Area III

The assemblage from Area III is small, only consisting of sixteen artefacts, with flakes (n=12, 75%) and cores (n=3, 19%) making up almost all of the artefacts. The remaining implement began life as a scraper (Appendix II; figure 5.40), but was modified at some point into a flaked flake (see discussion below). The assemblage appears to consist of artefacts which have been tossed into the channel (Ashton 1998a), however they can still be used to infer activity in the vicinity of the site.

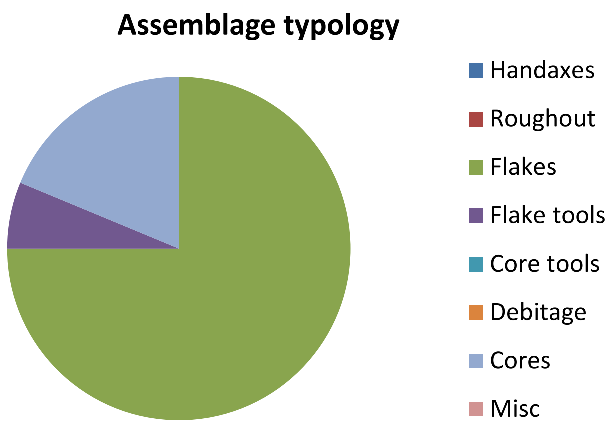


FIGURE 5.40 - ASSEMBLAGE TYPOLOGY FOR AREA III, BARNHAM

Chaîne opératoire stage	Present/ absent	Area I	Area III	Area IV(4)	Area V
Raw material procurement	Cores	Yes	Yes	Yes	Yes
	Cortical flakes	Yes	N/A	Yes	Yes
	Test Pieces	No	No	No	No
Debitage	Partially cortical flakes	Yes	N/A	Yes	Yes
	Non-cortical flakes	Yes	N/A	Yes	Yes
	Debitage	No	No	No	No
	Chips	Yes	Yes	Yes	Yes
	Hard hammer flakes	Yes	Yes	Yes	Yes
	Soft hammer flakes	No	No	Yes	Yes
Tool manufacture	Shaping flakes	No	No	No	No
	Roughout	No	No	Yes	No
	Thinning flakes	No	No	No	No
	Flake tool spall	Yes	No	No	Yes
Finished tools	Handaxe	No	No	Yes	No
	Flake tools	Yes	Yes	Yes	No
	Core tool	No	No	No	No
	Misc.	No	No	No	No
Other indicators	Cut marks	No	Yes	No	No
	Use-wear	No	No	No	No

TABLE 5.5 – SUMMARY OF CHAINE OPERATOIRE STAGES FOR THE FOUR MAIN AREAS AT BARNHAM

The group represents a core and flake technology, although as these are likely individual implements brought in and discarded at the spot, operational sequences cannot be reconstructed for the locale. However a number of observations can be made (table 5.5). Firstly, cores and chips are present suggesting manufacture was undertaken in the area surrounding the channel. Secondly, some form of processing was also carried out nearby as the flake tool attests. Finally, there are cut marks present on some of the faunal remains. Whilst Ashton et al. (1998a:264) cautions that these cannot be assumed to be associated with the bones, they do indicate that butchery was one of the activities that was conducted in this riverine setting.

The data for the flake cortex from Area III has not been published in detail as the number of flakes is so small. In addition the likelihood that these represent individual tools as discussed above (Ashton 1998a:264), means that any comparison of cortex would produce little useful information. This is further emphasised by the variation between the lack of cortex on the flakes compared to the cores (Ashton 1998a).

In terms of the flake tool, its original usage was for scraper-based activities, suggested by use-wear results (section 2.5) as being related to hide working. However it was reworked at some point into a flaked flake, signifying an *ad-hoc*, flexible approach to manufacture, with re-working for immediate use. It is therefore interesting to note that the use-wear results (section 2.5) indicated that flaked flakes were connected to wood working, indicating a change of use for the tool and indeed activities carried out at the site.

To conclude, the small number of tools present at this location suggests that this is a short-stay ephemeral site, where hominins introduced tools and conducted limited activities probably related to day-to-day subsistence (wood processing and hide working). However, if as Ashton et al. suggest (1998a:264) these tools were brought in as isolated artefacts over time, then it demonstrates a continued use of the site as a favoured locale, albeit for short-term activities, such as an opportunistic butchery locale. Consequently, this site would fall within Turq's 'ephemeral/ episodic' occupation, with limited, short-term events being conducted over time at the same spot (Turq in Mellars 1996).

Area IV (4)

The assemblage from Area IV (4) is larger than that from Area III with 379 artefacts, 90% of which comprises flakes (n=362, 96%), along with a relatively high number of cores (n=13, 3%). Two flake tools (1%), one handaxe (<1%) and a roughout (<1%) are also present. The latter two pieces indicate the presence of at least a partial handaxe chaine opératoire, making it likely that hominins were conducting butchery activities, as supported by cutmarks on fauna from Area III (Appendix II; figure 5.41).

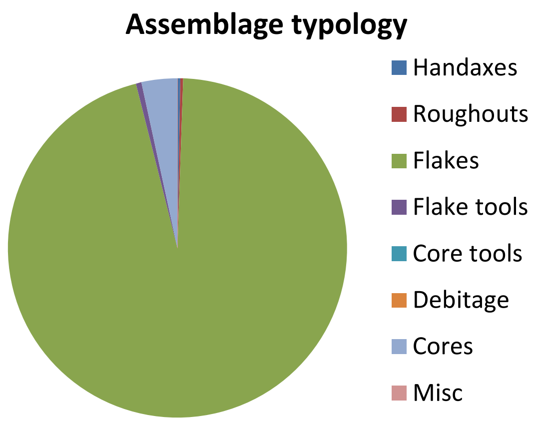


FIGURE 5.41 - ASSEMBLAGE TYPOLOGY FOR BARNHAM AREA IV (4)

As mentioned above, in contrast to the other areas at Barnham, this location demonstrates not only a core and flake chaîne opératoire (cores, cortical flakes, partially and non-cortical flakes, chips, hard hammer), but also evidence of a handaxe production sequence with the primary stages (roughout), soft hammer flakes and finished end product (handaxe) present. There are also a small number of flake tools suggesting limited processing activities at the site (table 5.5).

However, there appears to be a flake deficit as demonstrated by the mean scar count for the 13 cores (5.6) (Ashton 1998:207), giving a projected estimate of 73 flakes. If this was based solely on a core and flake chaîne opératoire, then taking the maximum number of removals (11) only produces 143 flakes, still resulting in a deficit of cores compared to flakes. However, it must be remembered that the number of flake scars only reflects the last removals and not the total number. Assuming that the handaxe (50 flakes) and roughout (10 flakes) were also manufactured here, this only provides a further 60 flakes, giving a total of 203, which is much lower than the 362 flakes recovered. Therefore this demonstrates a deficit of source pieces (cores, handaxes, roughouts) compared to the remaining artefacts.

In terms of the flake cortex, all stages of the chaîne opératoire are represented with the most prevalent being flakes exhibiting <50% cortical dorsal surfaces (n=147; 41%). This is followed by those with no cortex (n=138; 38%), >50% (n=45; 12%) and wholly cortical flakes (n=32; 9%) (Appendix II; figure 5.42).

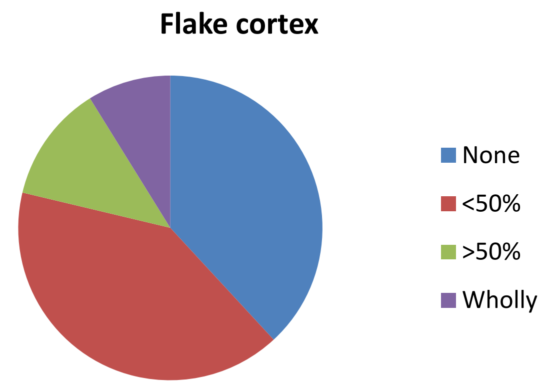


FIGURE 5.42 - FLAKE CORTEX FOR AREA IV(4), BARNHAM

If this pattern is split into primary, secondary and tertiary flakes, the resultant signature produces a left-handed L-shape, with the greatest proportion in the secondary category, closely followed by the tertiary flakes, then primary (figure 5.43, table 5.11). This most closely resembles Wenban-Smith's core signature, suggesting that the majority of the artefacts from Area IV(4) are the result of core and flake manufacture, and that handaxe manufacture likely played a minimal role in the accumulation of artefacts at the site.

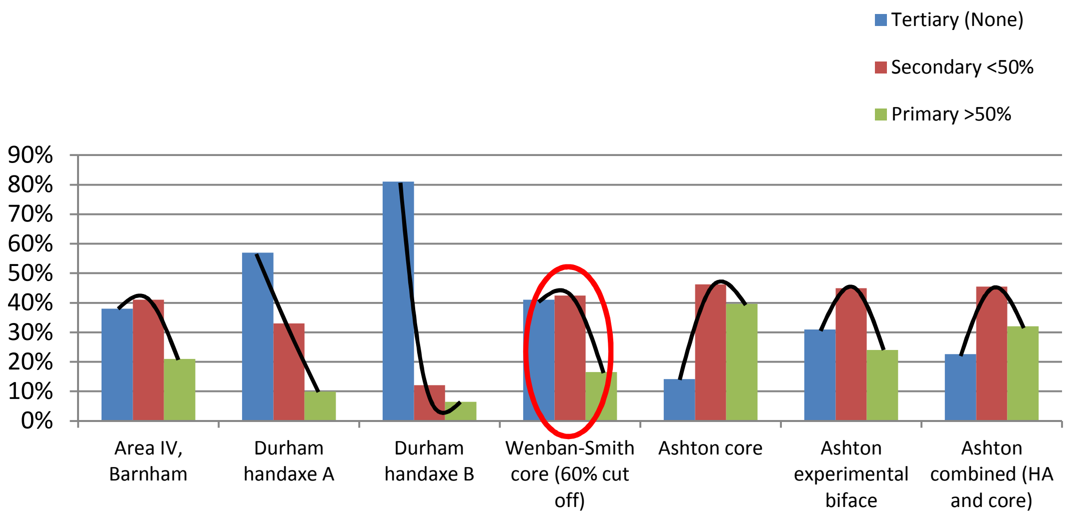


FIGURE 5.43 - COMPARISON OF THE FLAKE DATA FROM AREA IV (4), BARNHAM WITH THE EXPERIMENTAL DATASET

The limited evidence from the handaxe chaîne opératoire arguably corresponds to the evidence from the flake tools, both of which are scrapers. The results from the use-wear discussion suggest that scrapers are most commonly associated with hide working (section 2.5), suggesting that butchery and carcass processing were present in the vicinity of the site, although in a limited fashion.

In summary, the assemblage from Area IV (4) at Barnham represents a manufacture location where raw material was procured and worked, possibly related to a butchery event, involving the production of bifaces and scrapers, and subsequent export of artefacts. In terms of the site signature, this reflects a combination of Turq's 'extraction and production' with pieces being exported, and his 'mixed site' signature with both extraction, manufacture and tool use taking place (Turq in Mellars 1996).

AREA V

The assemblage from Area V is closer in size to that of Area III. It is comprised completely of flakes (n=75, 95%) and cores (n=4, 5%) giving a total of 79 (Appendix II; figure 5.44). The typological composition suggests that the main activity was centred on the working of flint. This was likely related to the production of tools and the exportation of these out of the immediate area as attested to by the presence of a flaked flake spall.

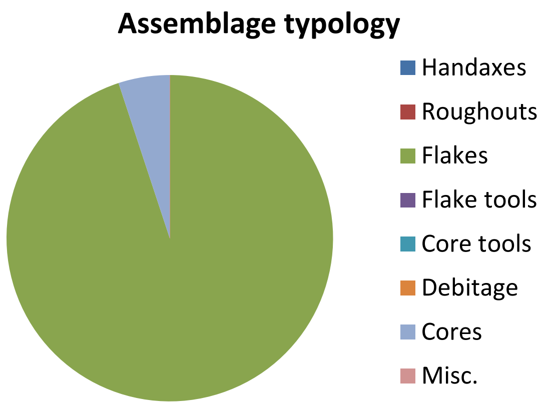


FIGURE 5.44 - ASSEMBLAGE TYPOLOGY FOR AREA V, BARNHAM

The chaîne opératoire is based on core and flake working, from the beginning stages (cores, cortical flakes), through to further working (non and partially cortical, hard and soft hammer, chips) and the production of flake tools (flaked flake spall) (table 5.5). However, whilst wholly cortical flakes are present, their presence is minimal (see below), suggesting that the chaîne opératoire is biased towards the later stages of reduction.

Area V appears to be a location away from the cobble band, to which objects were moved to fulfil a particular purpose. The four cores present could have produced between 12 and 20 flakes, but only 75 are present. So flakes were either brought into the site or cores were worked on site and then exported. Furthermore, whilst all stages of reduction are represented in the flake cortex there is an obvious bias in the pattern. Non-cortical flakes make up over half (n=47; 63%), followed by those with <50% (n=21; 28%), then >50% (n=5; 7%) and finally those with wholly cortical dorsal surfaces (n=2; 3%) (figure 5.45). Consequently, there is a notable deficit in wholly cortical flakes compared to the number of cores. This makes it likely that hominins were importing partially worked cores, exploiting them on site, before exporting them to other locations in the landscape.

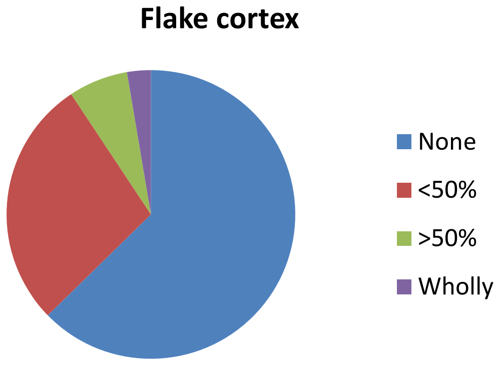


FIGURE 5.45 - FLAKE CORTEX FOR AREA V, BARNHAM

This bias is further demonstrated by the flake signature, with a predominance of tertiary flakes, followed by secondary, then primary (figure 5.46, table 5.11). The resultant pattern forms a triangle and is closest to that of Durham handaxe A, however apart from the single soft hammer flake, there is no evidence of handaxe manufacture at the site. Therefore, coupled with the minimal working of the cores, it suggests that hominins imported previously worked cores. These were then reduced to produce flakes for the immediate activity being undertaken, then exported for use elsewhere. Such a scenario would produce a signature like the one shown for Area V, if the decortication of the cores had taken place elsewhere.

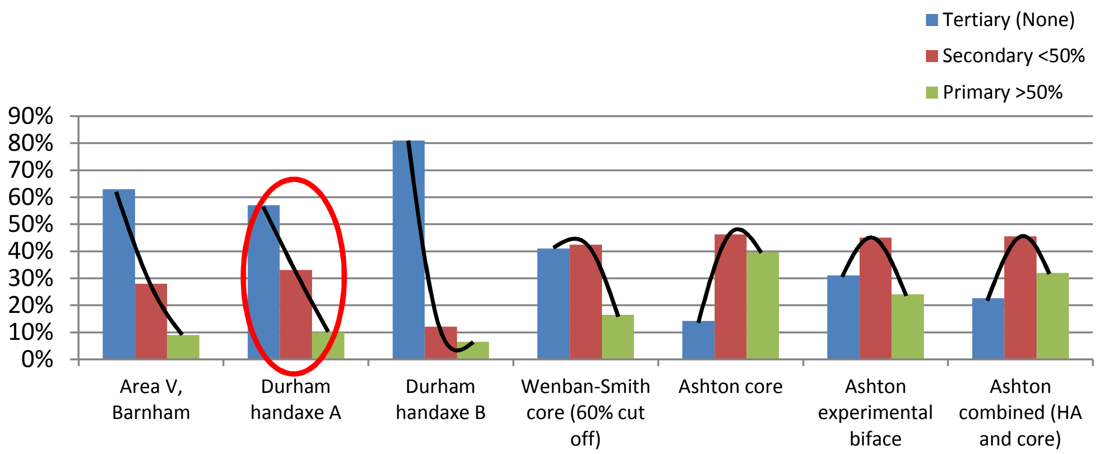


FIGURE 5.46 - COMPARISON OF FLAKE TYPES FROM AREA V, BARNHAM WITH THE EXPERIMENTAL DATA

In summary this signature appears to be that of an ephemeral occupation, perhaps a short stay locale where raw material which had been carried onto the site was reduced to produce at least one expedient flake tool (flaked flake spall), which along with the cores, was removed elsewhere for use. The absent flaked flake, if the results from the use-wear (section 2.5) are correct, suggests that processing of wood was being carried out in the surrounding environment. In this case the 'episodic' signature is more appropriate with the limited numbers and import and export strategy indicating that the site was geared to the short-term exploitation of a resource (Turq in Mellars 1996).

5.3.2. Clacton-on-Sea

Golf Course Site

The Golf Course site is the most recently excavated assemblage from Clacton and as such will form the base for the discussion of this locality. The artefacts total 736, with the majority of the assemblage made up of flakes (n=529, 72%), followed by cores (n=95, 13%), which, when combined with the debitage (n=39, 5%) accounts for 90% of the total. The remainder is made up of flake tools (n=65, 9%), and in contrast to many of the lowland sites, core tools (n=9, 1%) (Appendix II, figure 5.47). Also the sheer number of cores from the site (n=95) suggests that manufacture was a large part of the activities that were undertaken in this area.

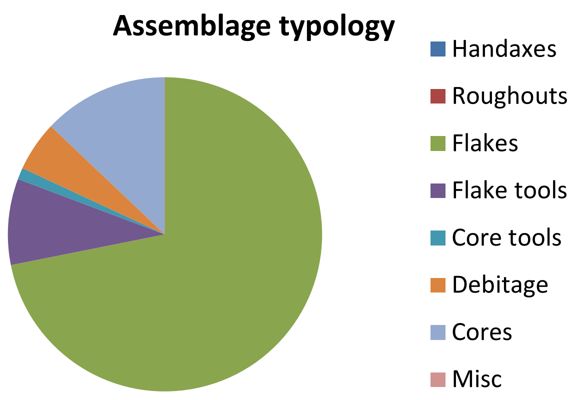


FIGURE 5.47 - ASSEMBLAGE TYPOLOGY, GOLF COURSE, CLACTON

In terms of the chaîne opératoire, all stages of core and flake working are represented from initial selection and roughing out (cores, trial and test pieces, cortical flakes), further reduction (partial and non-cortical flakes, hard hammer, debitage) to manufacture (flaked flake spall) and discard of the final artefacts (core tools, flake tools) (table 5.6).

Making the assumption that all artefacts found were produced on site, the total number of products (flakes, flake tools, debitage) compared to the number of source nodules (cores, core tools) provides an estimation of six flake removals per core or core tool. This low number could either relate to minimal working of the raw material, or alternatively a more complex technological provisioning system with movement of artefacts into and out of the area. Furthermore, if the data in the site report contained within table 5 (Singer et al. 1973:34) is taken into account, the 40 cores mentioned provide 318 observable scars, accounting for over half the extant flakes in the assemblage. Whilst this does suggest that the cores were indeed minimally worked, over half exhibit eight or more scars, leading to the conclusion that these extant cores do not account for the large number of flakes originating from the primary stages of manufacture.

The published data for the flake cortex combines both >50% and wholly cortical flakes and therefore doesn't provide numbers of wholly cortical flakes. However it is in a format which matches the categories used for flake signatures defined here, so some assessment can take place. As can be seen the results display an interesting pattern. Unusually the most common category is that of >50% and wholly cortical flakes (n=209, 40%) compared to flakes with <50% cortex (n=197, 37%) and non-cortical pieces (n=123, 23%) (Appendix II; figure 5.48). This signature could be explained either by minimal working of the cores or, as mentioned above, the testing and decortication of cores prior to exportation.

Furthermore, when the flake signature for the archaeological assemblage is compared to the experimental dataset, it demonstrates a shallow left-slanted L-shape, with a peak in primary flakes followed by secondary, then tertiary (figure 5.49, table 5.11). The closest match to this appears to be Ashton's core, but with fewer secondary and more tertiary flakes demonstrated in the archaeological signature from the Golf Course location. This advocates that primary manufacture and decortication were more common at this location, with later stages being conducted elsewhere.

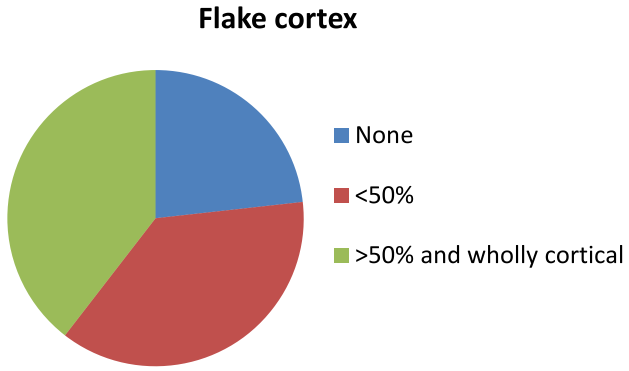


FIGURE 5.48 - FLAKE CORTEX, GOLF COURSE SITE

FIGURE 5.49 - COMPARISON OF THE FLAKE TYPES FROM THE GOLF COURSE SITE, CLACTON, WITH THE EXPERIMENTAL DATASET

Regarding the number of tools, the Golf Course site stands out with a wider variety of types compared to many of the lowland sites. This large range suggests an extensive history of visits and of a variety of activities undertaken in the surrounding landscape. Flaked flake-related activities are the most common (n=25, 34%), followed by events associated with retouched flakes (n=11, 15%), core tools (n=9, 12%), endscrapers (n=6, 8%), scrapers (n=4, 5%) and denticulates (n=3, 4%). In addition there is also a large number of tools classed as miscellaneous (n=16, 22%), suggesting a more fluid *ad-hoc* approach to tool form (Appendix II; figure 5.50). In terms of the activities represented, the use-wear results in section 2.5 suggest that wood processing (flaked flakes, denticulates) was most common. Retouched flakes are generally considered to be related to carcass processing (along with endscrapers and scrapers), but their usage can be mixed. The site also contains a number of core tools, a type that is rarely seen in lowland settings in this research and appears to be more common in the upland areas. This perhaps suggests a similar type of heavy duty activity was conducted here as at the upland sites.

The tool types suggest that although the focus appears to be skewed towards wood working, this represents more of a mixed processing site. Indeed the evidence from the use-wear produced by Keeley (1980, see table 2.3) also corroborates this interpretation of mixed tasks. The percentage of flake tools is again high and similar to that from Lion Point, indicating that processing activities formed an important aspect of occupation at this site.

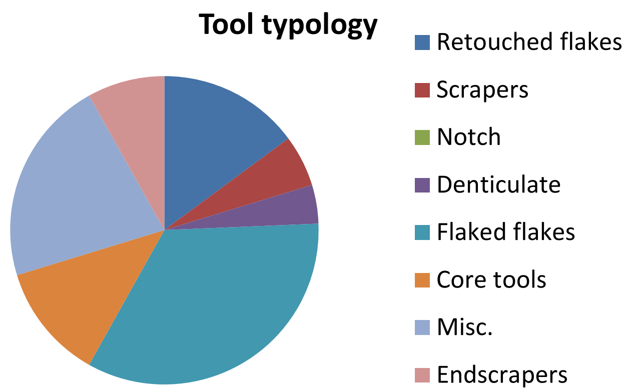


FIGURE 5.50 - TOOL TYPOLOGY FOR GOLF COURSE, CLACTON

In summary, the signature for the Golf Course assemblage represents a manufacture location, but with a focus on the earlier stages of reduction, with the movement of cores out of the site, similar to Turq's designation of 'extraction and exploitation' site. The presence of flaked flake spalls (McNabb 1992) indicates tool production on site. However this is coupled with a mixed signature for a variety of processing activities, more closely linked to a 'mixed strategy' site with longer term occupation and processing activities (Turq in Mellars 1996). Moreover whilst the decortication of nodules and export of cores matches the expected pattern for a primary workshop site, it does not fit with the large number of discarded cores. One hypothesis that might explain this is that cores were decorticated and transported out of the site for further reduction elsewhere before being either re-introduced or other partially reduced cores imported and discarded.

Jaywick Sands

The locality of Jaywick Sands was excavated in the 1930s and the assemblage comprises 181 artefacts made up mostly of flakes (n=153, 85%) and cores (n=21, 12%) with a single piece of debitage (1%). This manufacturing waste accounts for 97% of the total assemblage. The remaining 3% is represented by a small number of flake tools (n=6) (Appendix II, figure 5.51).

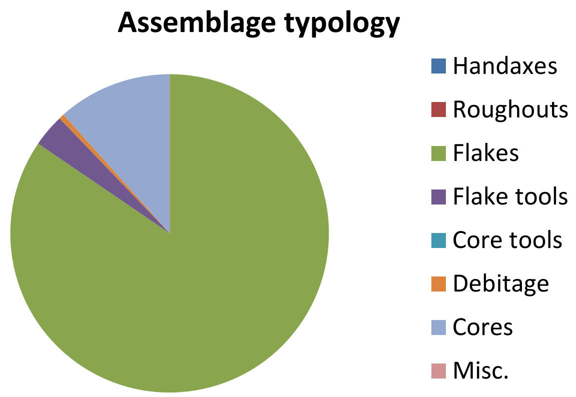


FIGURE 5.51 - ASSEMBLAGE TYPOLOGY FOR JAYWICK, CLACTON

The chaîne opératoire, as above, is based on core and flake technology and is fully represented from selection and working of raw material (cores, cortical flakes) to further reduction (partially and non-cortical flakes, hard hammer and debitage) including on-site manufacture of flake tools (flaked flake spall), to the use and abandonment of the finished products (flake tools) (table 5.6).

In terms of artefact numbers, assuming all remaining artefacts were produced on site, the number of flakes, debitage and flake tools totals 160. If these originated from the 21 cores it gives an average of eight flakes per core. Therefore, it is possible that the cores account for all the flakes present on site.

Chaîne opératoire stage	Present/ absent	Golf Course	Jaywick	Lion Point
Raw material procurement	Cores	Yes	Yes	Yes
	Cortical flakes	Yes	Yes	Yes
	Test Pieces	Yes	No	No
Debitage	Partially cortical flakes	Yes	Yes	Yes
	Non-cortical flakes	Yes	Yes	Yes
	Debitage	Yes	Yes	Yes
	Chips	No	No	No
	Hard hammer flakes	Yes	Yes	Yes
	Soft hammer flakes	No	No	No
Tool manufacture	Shaping flakes	No	No	No
	Roughout	No	No	No
	Thinning flakes	No	No	No
	Flake tool spall	Yes	Yes (1)	Yes
Finished tools	Handaxe	No	No	Yes
	Flake tools	Yes	Yes	Yes
	Core tool	Yes	No	No
	Misc.	Yes	No	No
Other indicators	Cut marks	No	No	No
	Use-wear	Yes	No	No

TABLE 5.6 - SUMMARY OF THE CHAÎNE OPÉRATOIRE STAGES FOR THE CLACTON-ON-SEA LOCATIONS

However a clearer picture is shown in the results for the flake cortex. Whilst McNabb splits the flake cortex categories into non-cortical, wholly cortical and partly cortical (thereby combining flakes with both <50% and >50% cortical surfaces) (figure 5.52), which doesn't lend itself to the methodology employed here, it does provide important information regarding the number of cortical flakes. Consequently there are very few wholly cortical flakes (n=6) compared to the number of cores (n=21), indicating a considerable deficit in the initial stages of reduction. This suggests that either the cores were decorticated outside the area of excavation, or that partially worked cores were imported into the site. It is important to note that this is the opposite pattern to that shown for the Golf Course site (above), where cortical flakes are over-represented and the suggested solution was the export of decorticated partially worked cores.

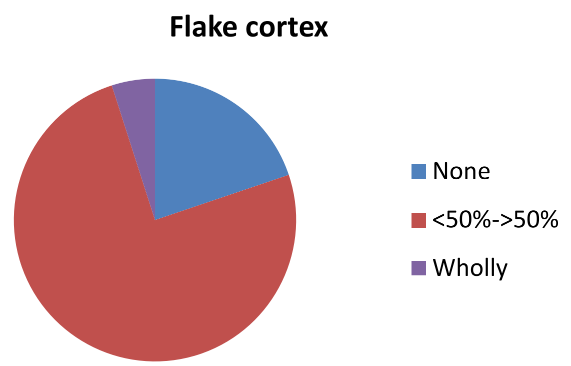


FIGURE 5.52 - FLAKE CORTEX FROM JAYWICK, CLACTON

Furthermore, the flake tool component is made up in its entirety by flaked flakes (n=6). This indicates that the predominant processing activity was associated with the working of wood (use-wear section 2.5), and also mirrors the dominant tool type at the Golf Course (above), suggesting a similar focus.

In summary, the signature at Jaywick Sands, although representing a small assemblage, suggests that partially worked cores were imported and further reduced on site, likely related to the production of flaked flakes and their subsequent use. The pattern shares affinities with Turq's 'Episodic' site (Turq in Mellars 1996) with a short-term occupation focused on the production of tools to procure certain resources, in this case wood or plant-related activities.

Lion Point

The assemblage from the Lion Point foreshore has been collected over a number of years and as such represents a time-averaged as well as cherry-picked group of artefacts. However, despite being a palimpsest, where complete chaîne opératoires (table 5.6) cannot be constructed, the various sections can give us information on the types of activities that took place on the foreshore. The assemblage totals 1326 artefacts, made up of flakes (n=725, 55%), cores (n=454, 34%) flake tools (n=118, 9%) and debitage (n=27, 2%) (Appendix II; figure 5.53). In addition there are two handaxes present, and whilst it is unlikely that they are associated with the main assemblage it does indicate that some form of butchery activity was undertaken in the surrounding landscape at some point during the Lower Palaeolithic.

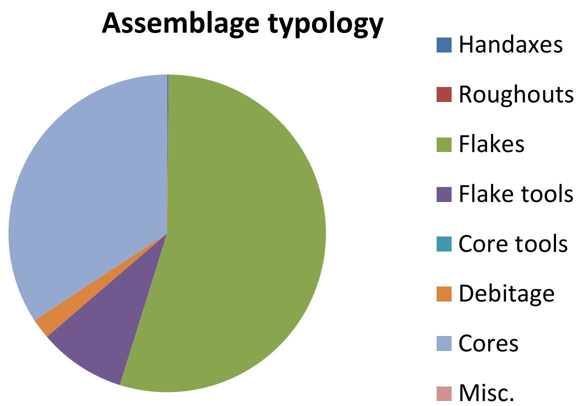


FIGURE 5.53 - ASSEMBLAGE TYPOLOGY FOR LION POINT, CLACTON

The vast number of cores (n=454) attests to the longevity of the location in terms of repeated visits, highlighting it as a favoured locality, with certain resources acting as strong attractive factors for the hominins who frequented the spot. Furthermore, there is an over representation of cores, assuming that all flakes, flake tools and debitage were produced on site. A total of 870 products split between 454 cores generate a figure of only two flakes per core. Indeed, this does equate to the number of scars on the cores and whilst the assemblage is subject to large collection and taphonomic biases with the smaller flakes under-represented, the frequency of cores is still unprecedented. This gives rise to the possibility of transport mechanisms where cores were introduced to the site, or flakes removed from it.

As noted above the flake cortex as analysed by McNabb (1992) splits the categories into non-cortical, wholly cortical and partly cortical, thereby combining flakes with both <50% and >50% cortical surfaces (figure 5.54). Whilst not fitting with the methodology advocated here, certain inferences can be made regarding the cortical flakes, of which there is a severe deficit. This could be related to the collection bias, because although cortical flakes tend to be reasonably large in size and therefore easier to spot, differentiating them from pebbles would have depended on which way they lay on the beach. Indeed, there are only eight cortical flakes compared to 454 cores. So even if only one cortical flake was produced per core – a ludicrously small number- there is still a large discrepancy, raising the possibility that the cores may have been brought in partially worked, or were decorticated in an area away from the main exposures watched by Warren. In this regard the pattern here shares similarities with that observed from Jaywick Sands and is the opposite of the flake cortex results from the Golf Course site (see above). The question must be asked, therefore, as to whether these three sites were part of the same settlement system, with cores moved down-river from the interior to the foreshore.

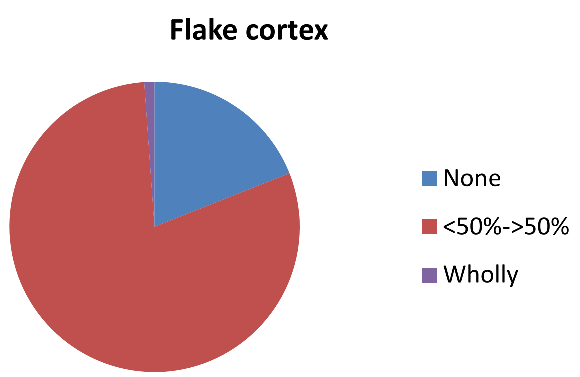


FIGURE 5.54 - FLAKE CORTEX FOR LION POINT, CLACTON

In a similar pattern to the cores, the flake tools make up a sizeable proportion of the assemblage, 9%, which is greater than the majority of assemblages considered here.

What is more significant however is the considerably high proportion represented by flaked flake activities (n=110) amounting to a colossal 93% of the total tool component. This is followed by comparatively miniscule numbers of denticulates (n=4, 3%), scrapers (n=3, 3%) and a single notch (1%) (figure 5.55). It is fair to say, therefore, that the overwhelming focus, based on the use-wear recommendations (section 2.5), is on tasks related to the processing and procurement of wood resources. This is an important aspect when viewed in light of the discovery of the Clacton yew spear point (Warren 1951). Consequently it could be argued that the foreshore was an important locale for the production of such implements.

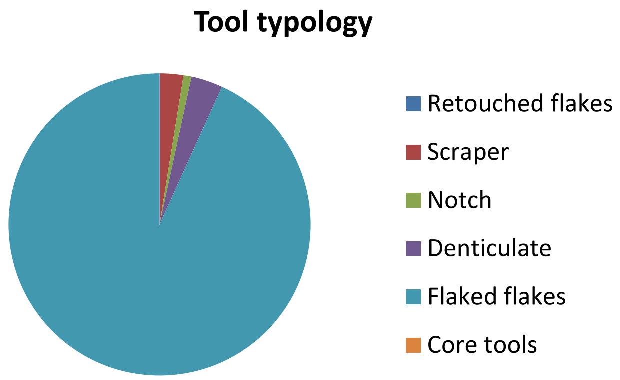


FIGURE 5.55 - TOOL TYPOLOGY FOR LION POINT, CLACTON

In summary, the signature from the Lion Point foreshore, despite being the subject of collection and taphonomic biases, indicates a manufacture and procurement location of long duration. The evidence suggests that cores were imported, with a view to manufacturing tools for use in wood procurement tasks, perhaps linked to the production of the Clacton spears. This could therefore, if one wanted to be contentious, be tentatively classed as a workshop location.

It is also interesting to note that although Jaywick is an excavated assemblage and considerably smaller than Lion Point, it demonstrates a similar predilection towards flaked flakes and their associated activities. Furthermore the perceived deficit in cortical flakes is also apparent here compared with the foreshore, a pattern which contradicts that found further up the coast at the Golf Course site. It could therefore be implied that a system of artefact movement was in practice, with artefacts being transported from the interior upstream for use, with utilised nodules moving back as the hominins returned. However, this pattern will be discussed in more detail in chapter 7.

5.3.3. ELVEDEN

AREA I

The assemblage from Area I totals 2163 artefacts with debitage (n=1631, 75%) and flakes (n=515, 24%) making up nearly 100% of the assemblage. The remainder is split between cores (n=14, 1%) and flake tools (n=3, <1%) (Appendix II, figure 5.56).

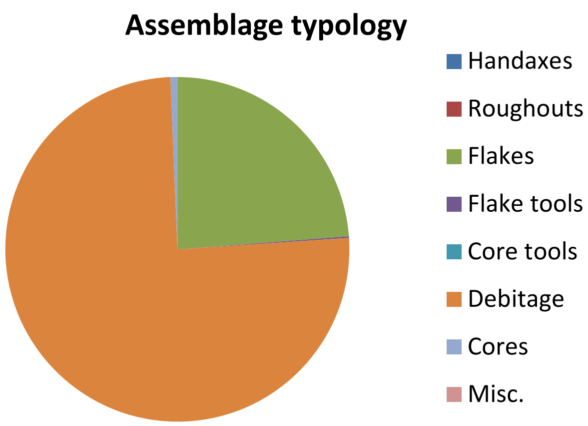


FIGURE 5.56 - ASSEMBLAGE TYPOLOGY FROM AREA I, ELVEDEN

Despite the lack of cores, all stages of production (chaîne opératoire) are present, from raw material acquisition and testing (cores, cortical flakes and tested pieces) to non-cortical, partially cortical, hard and soft hammer flakes, chips and debitage (table 5.7). In contrast to Area III (below), despite there being numerous soft hammer flakes, no roughouts or finished handaxes have been recovered. This indicates that material was selected, tested and exported, with further roughing out done elsewhere. The presence of only three flake tools suggests that the activities associated with these were a by-product of the main tasks undertaken at the site, with hominins manufacturing tools in an *ad-hoc* fashion to address immediate needs.

Chaîne opératoire stage	Present/ absent	Area I Brickearth	Area III Black Clay
Raw material procurement	Cores	Yes	Yes
	Cortical flakes	Yes	Yes
	Test Pieces	Yes	Yes
Debitage	Partially cortical flakes	Yes	Yes
	Non-cortical flakes	Yes	Yes
	Debitage	Yes	Yes
	Chips	Yes	Yes
	Hard hammer flakes	Yes	Yes
	Soft hammer flakes	Yes	Yes
Tool manufacture	Shaping flakes	No	No
	Roughout	No	Yes
	Thinning flakes	No	No
	Flake tool spall	No	No
Finished tools	Handaxe	No	No
	Flake tools	Yes	Yes
	Core tool	No	No
	Misc	No	No
Other indicators	Cut marks	No	No
	Use-wear	No	No

TABLE 5.7 – SUMMARY OF CHAÎNE OPÉRATOIRE STAGES FOR AREA I AND AREA III, ELVEDEN. (TESTED NODULES ARE HERE TAKEN AS THOSE WHICH HAVE ONLY ONE OR TWO REMOVALS).

In this assemblage there are 2146 pieces that can be classed as knapping products, of which 1576 are chips. When these are removed from the calculations it leaves 570 knapping pieces of a size greater than 20mm. If the assumption is made that these were produced from the 14 extant cores, this would require an average of 41 removals per core – far more than any of these cores could have feasibly yielded. Therefore, one scenario is that cores were knapped on site and exported from the cobble band to other areas of the site (i.e. Area II and III), leaving an over-representation of flakes in this area. Alternatively handaxes may have been the products produced in Area I, leading to an over-representation of knapping pieces as they were exported out.

The data for the flake cortex in the excavation report includes fresh hard and soft hammer flakes from both the gravel and brickearth. Whilst the focus in this analysis is upon the fresh material from the brickearth, these combined values do not affect the interpretation because 515 of the 538 flakes for which we have cortical data originate from the brickearth. Therefore using these values the largest proportion of flakes falls within the <50% cortex category (39%, n=210), followed by non-cortical flakes (n=170, 32%). Finally the >50% and wholly cortical flake components make up similar sections of the assemblage, with 15% (n=83) and 14% (n=75) respectively (figure 5.57).

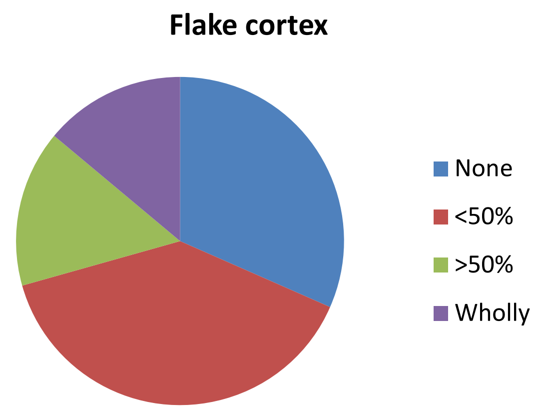


FIGURE 5.57 – PROPORTION OF FLAKE CORTEX FOR THE FRESH ASSEMBLAGE FROM AREA I, ELVEDEN (GRAVEL AND BRICKEARTH)

When the flake signatures for Area I are compared to the experimental data a shallow bell-curve profile is produced with the greatest proportion seen in the secondary flakes, followed by tertiary, then primary (figure 5.58, table 5.11). This is similar in form to that produced by the combined signatures of handaxe and core manufacture as recorded by Ashton, although with a less pronounced spike in the secondary flake bracket. Furthermore, this agrees with the chaîne opératoire data, indicating that although there are no roughouts or finished handaxes, the later stages of manufacture were conducted on site. Indeed the fact that the proportions of all three categories are relatively similar suggests that the archaeological sample has more tertiary (related to the later stages of handaxe reduction indicated on site) and primary flakes (testing of raw material on site) than the experimental signature (figure 5.9).

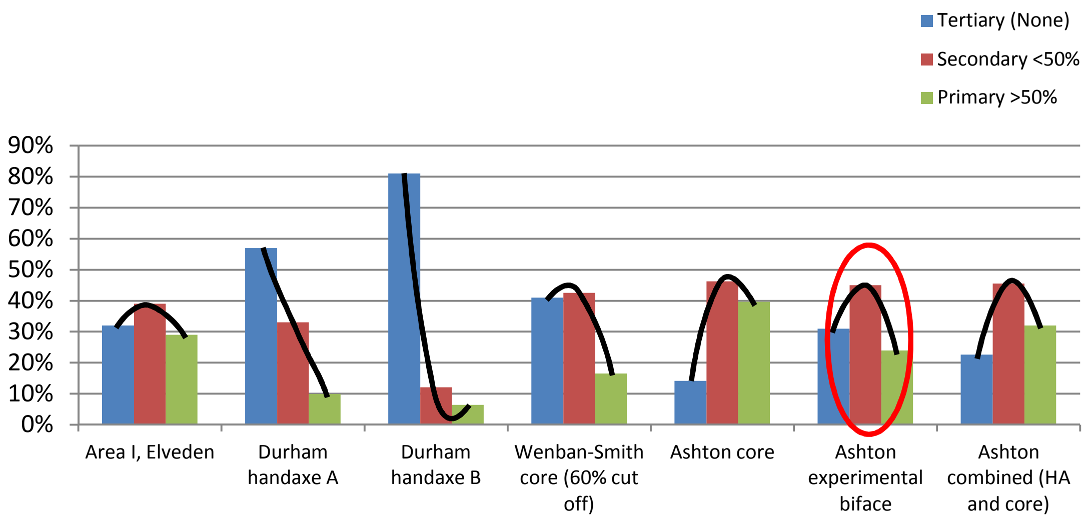


FIGURE 5.58 – COMPARISON OF THE ARCHAEOLOGICAL FLAKE SIGNATURE FROM AREA I, ELVEDEN WITH THE EXPERIMENTAL DATASET.

The low numbers of flake tools likely indicate use within a day-to-day context. The excavation report states that three come from the brickearth in Area I, in contrast, four (three scrapers and a notch) are noted as originating from Area I (figure 5.60; Appendix II). Therefore only one piece was derived from the gravel, although the published report does not identify which. Despite this these tools directly represent activities undertaken in the vicinity of the site so will be considered in the context of this study as a whole group. Seventy-five percent reflect scraper-related tasks (figure 5.59), with the remaining piece a notch. Consequently, the undesignated tool from the gravel does not affect the overall focus of the tool component to any great extent. It can therefore be concluded that the overall focus is towards scraper-based activities, with minimal notch-related events. It could be inferred, on the basis of the use-wear discussion in section 2.5, that this represents an emphasis on hide-working.

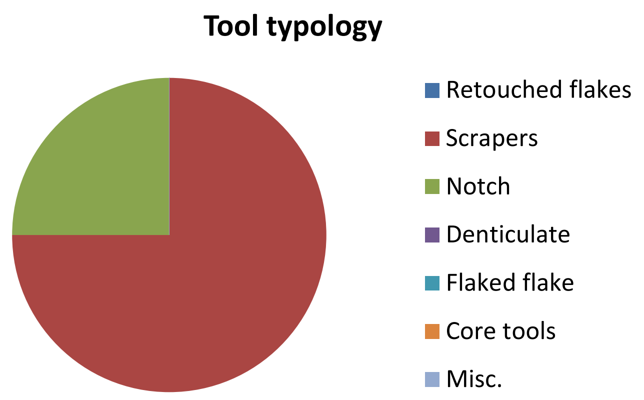


FIGURE 5.59 - TOOL TYPOLOGY FROM AREA 1 BRICKEARTH AND GRAVEL

In summary, the signature from Area I, Elveden is based on raw material procurement from locally available flint sources, coupled with the manufacture of handaxes and reduction of cores. The paucity of any actual implements suggests that the desired end-products were exported. The flake tool constituent is likely a product of general subsistence-based activities carried out on a day to day basis, centred on scraper-related tasks with a limited notch component. In terms of the type of site, Area I displays similarities with Turq's 'extraction and production' locales, with raw material procured on site, decorticated and worked down before being exported. However the assemblage displays a greater proportion of later stage reduction than is suggested in Turq's model (Turq in Mellars 1996) and it is likely that a combination of practices was in operation.

AREA III

The assemblage from the black clay in Area III, Elveden totals 1465 artefacts, with the debitage (n=787, 54%) and flakes (n=646, 44%) accounting for nearly 100%. The remainder is split between cores (n=22, 2%), flake tools (n=6, <1%) and handaxe roughouts (n=4, <1%) (Appendix II; figure 5.60).

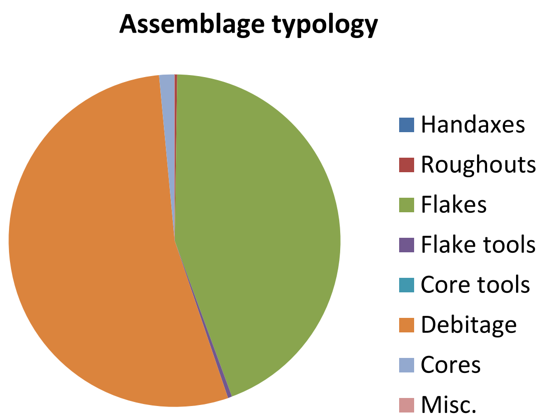


FIGURE 5.60 - ASSEMBLAGE TYPOLOGY FOR AREA III, ELVEDEN

The chaîne opératoire for Area III mirrors that from Area I in a number of ways. All stages are represented from raw material acquisition (cores, cortical flakes and tested pieces) to partial and non-cortical flakes, hard and soft hammer, chips and debitage (table 5.7). However, in Area III, in addition to the soft hammer component, indicating the later stages of handaxe manufacture, there are also four roughouts, representing a complete handaxe chaîne opératoire. The flake tools also parallel those from Area III, with low numbers (n=6) indicating occasional *ad-hoc* processing tasks (Ashton et al. 2005:44,45). It is interesting to note that whilst Area I is located in proximity to a raw material source, the flint worked in Area III was introduced from 30 metres away, indicating a specific choice of location by the hominins involved perhaps linked to the exploitation of particular resources.

Of the 787 pieces of debitage present, 774 of these are chips, which leaves 13 pieces greater than 20mm in dimension. Combining this with the flakes (n=646) provides a total of 659 pieces of knapping waste. Assuming these originated from the remaining cores (n=22) this gives a rather large estimate of 30 flakes per nodule. However, taking into account the four roughouts (estimated ten flakes each) this only decreases the average flakes produced by two for each core. The observed over-representation points to the fact that cores or handaxes were exported by the hominins who occupied the site.

However, results from the flake cortex demonstrate that all stages of working are indeed present. The most common category is that of <50% cortical surfaces (n=164, 43%), followed by non-cortical (n=92, 24%), with the remainder made up of >50% (n=73, 19%) and wholly cortical flakes (n=53, 14%) (figure 5.61).

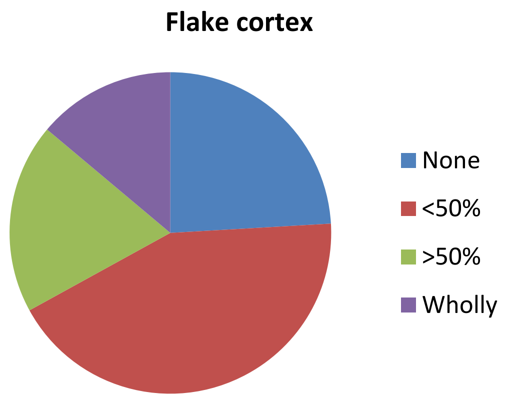


FIGURE 5.61 - FLAKE CORTEX CATEGORIES FOR AREA III, ELVEDEN

The flake signature for Area III shows a predominance of secondary flakes, followed by primary, then tertiary (table 5.11). The overall shape of the graph is a left slanted bell-curve and almost exactly matches that for the combined handaxe and core manufacture sequences (figure 5.62), tying in with the evidence from the chaîne opératoire demonstrating both handaxe and core and flake working.

In contrast to the flake-tool signature from Area I, the focus in Area III is on notch-related tasks (n=5, 83%), with only a single scraper (17%) present (figure 5.63). Whilst the limited numbers again suggest that these artefacts were produced to meet an immediate need related to day-to-day subsistence, it is clear that the activities address a different purpose from those in Area I, with a reversal of the pattern shown above. Using the results from the use-wear studies, it can be inferred that these were related most likely to wood working, although bone working has also been suggested for these tool functions (section 2.5).

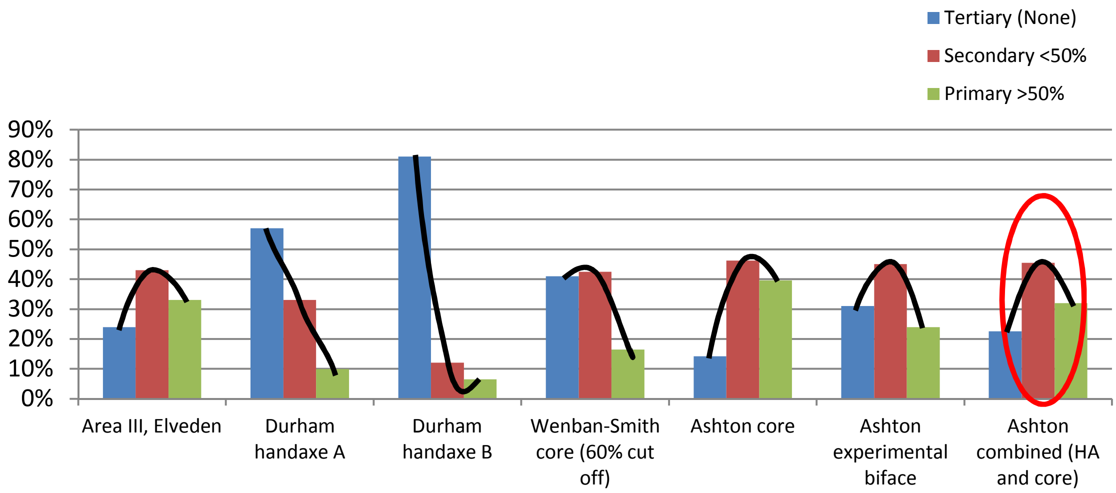


FIGURE 5.62 – FLAKE SIGNATURE FOR AREA III, ELVEDEN COMPARED TO THE EXPERIMENTAL SAMPLES.

Whilst this assemblage represents a small sample and therefore the interpretation cannot be taken too far, it does suggest that the site served a different function (especially in light of the movement of raw material into the area) from that being undertaken at Area I.

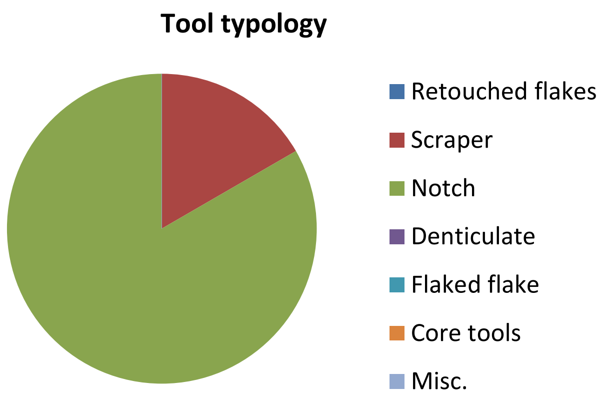


FIGURE 5.63 - TOOL TYPOLOGY FOR AREA III, ELVEDEN

In summary, the archaeological signature from Area III, Elveden embodies a raw material procurement and manufacture locale, focused on the production of both flake tools and handaxes, with the exploitation of partially or fully knapped handaxes into the wider landscape. The tool component links to general subsistence activities undertaken in an *ad-hoc* fashion, manufactured to meet immediate limited short-term needs. This follows the pattern observed for Area I in that it shares similarities with Turq's 'extraction and production' site, with raw material being worked, then finished and partially finished artefacts removed for use elsewhere (Turq in Mellars 1996).

5.3.4. High Lodge

Bed C2,D,E

The artefacts from Bed C2, D and E are grouped together as they originate from Bed C2 and comprise a single core and flake-based assemblage. Whilst a small quantity of bifaces and thinning flakes come from Bed E, these are regarded as being derived and from a separate occurrence to the rest of the artefacts (Ashton 1992). The main assemblage is almost entirely made up of flakes (85%, n=1538) and debitage (n=152, 8%), which together account for 92% of the total. A further 2% is represented by cores (n=32), and the remainder includes a sizeable number of flake tools (n=91, 5%), suggesting that processing activities were central to the choice of this locale (Appendix II, figure 5.64).

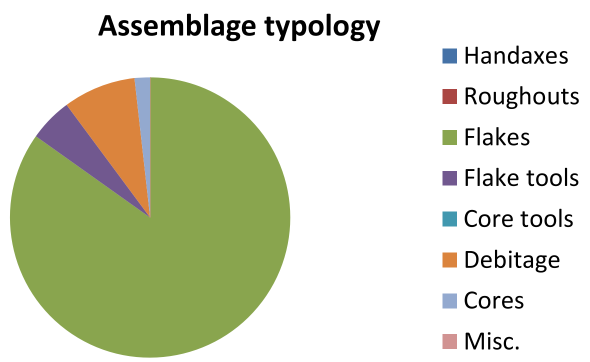


FIGURE 5.64 - ASSEMBLAGE TYPOLOGY FOR BEDS C2, D & E FROM HIGH LODGE

The chaîne opératoire (table 5.8) provides evidence of all phases of core and flake working beginning with tested nodules (exhibiting only one or two removals). Further knapping is indicated by debitage and the presence of chips, and hard hammer flakes as well as a hammerstone from Bed D. There is no evidence of any handaxe manufacture or soft hammer flakes, however we do have flake tool manufacture in the form of refitting flaked flake spalls and knapping scatters from Bed C2, which include notches and a retouched piece (Ashton 1992:139). Consequently the production of tools carried out on site was aimed at resource acquisition and processing tasks.

Chaîne opératoire stage	Present/ absent	Bed C1	Beds C2, D, E
Raw material procurement	Cores	Yes	Yes
	Cortical flakes	Yes	Yes
	Test Pieces	Yes	Yes
Debitage	Partially cortical flakes	Yes	Yes
	Non-cortical flakes	Yes	Yes
	Debitage	Yes	Yes
	Chips	No	Yes
	Hard hammer flakes	Yes	Yes
	Soft hammer flakes	No	No
Tool manufacture	Shaping flakes	No	No
	Roughout	No	No
	Thinning flakes	No	No
	Flake tool spall	No	Yes
Finished tools	Handaxe	No	No
	Flake tools	Yes	Yes
	Core tool	No	No
	Misc.	No	Yes
Other indicators	Cut marks	No	No
	Use-wear	No	No

TABLE 5.8 - SUMMARY OF CHAÎNE OPÉRATOIRE FOR BED C1 AND BEDS C2, D AND E, HIGH LODGE. (TESTED NODULES ARE HERE TAKEN AS THOSE WHICH HAVE ONLY ONE OR TWO REMOVALS). NB. BIFACES AND THINNING FLAKES ARE FOUND IN BED E BUT THESE ARE REGARDED AS BEING DERIVED (ASHTON 1992:129)

In this assemblage combining the numbers of flakes and debitage (n = 1538; n = 152) provides 1690 artefacts resulting from 32 cores. This gives an average value of 53 flakes per core, suggesting that the extant cores do not account for all the debitage present at the site. This is especially true when considering that the cores do not appear to be worked out and usually retain some cortex (Ashton 1992:137). The implication of this is that either the cores were exported or that this deficit is a product of the collection bias, with cores being collected less frequently or less easily spotted than the flakes.

Whilst cortex data is discussed in the High Lodge report (Ashton 1992) it is not in a format suitable for incorporation in this study, 200 flakes were analysed by White (pers comm.) and the data is used here as a representative sample, the results of which are shown in figure 5.65. The greatest proportion is made up of flakes with <50% cortical surface (n=96, 48%). This is followed by non-cortical (n=62, 31%), >50% (n=32, 16%) and wholly cortical flakes (n=10, 5%).

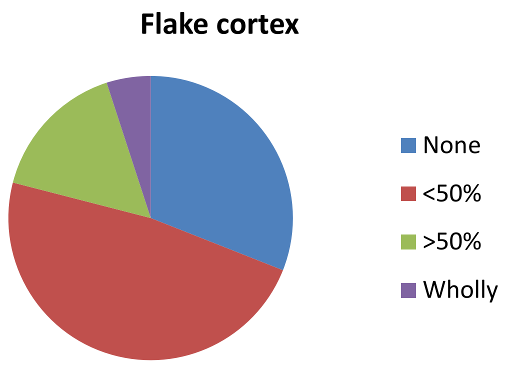


FIGURE 5.65 - FLAKE CORTEX PROPORTIONS FOR HIGH LODGE, BEDS C2, D AND E

When comparing the flake signature for the archaeological assemblage with the experimental dataset it can be seen that the majority of flakes lie in the secondary category, followed by tertiary, then primary, forming a right-slanted bell-curve (figure 5.66, (table 5.11). The closest signature appears to be that from Ashton's biface, however the site exhibits no evidence of handaxe manufacture. Two alternative options are available. Firstly it could be argued that the sample may be missing some of the tertiary group, with later working conducted elsewhere, modifying it from a form similar to Wenban-Smith's core. Secondly the a-typical signature might be the result of the production of flaked flakes, with the spalls producing an apparent over-representation of later stages. Interestingly a similar pattern can be seen in the Lower Loam at Swanscombe (section 5.3.6), where there is also a high proportion of flaked flakes in the tool component (figure 5.86) and a flake signature matching a combined technological strategy, but again no evidence of handaxe manufacture. A similar situation also arises at Whipsnade in the Chilterns (section 5.2.4) which also contains a large proportion of flaked flakes which has resulted in a handaxe flake signature.

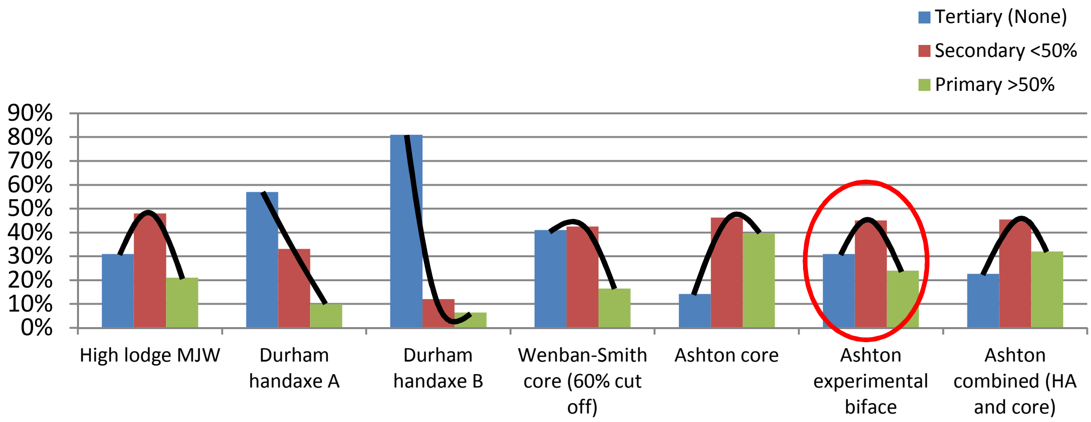


FIGURE 5.66 - COMPARISON OF THE HIGH LODGE FLAKE SIGNATURE WITH THAT OF THE EXPERIMENTAL DATASET

The variety of tool types at High Lodge is greater than many of the other sites, denoting a location at which multi-functional activities were undertaken. Regarding the tool breakdown, just over 50% is represented by flaked flakes (55%, n=53), followed by scrapers (n=22, 23%), notches (n=10, 10%) and denticulates (n=5, 5%), along with six tools classed as miscellaneous (6%) (figure 5.67). Hence the emphasis is on tasks involving the use of flaked flakes. This is further emphasised by the presence of a number of scrapers that have been re-worked to form flaked flakes or notches (Ashton 1992:146), demonstrating not only a typological bias but also a more flexible, expedient approach to the manufacture of these tools. Applying the use-wear results (section 2.5) it could be inferred that the flaked flake element represents a wood-related activity focus, coupled with the denticulates. Furthermore this links in with the environmental evidence suggesting that wooded slopes (spruce and pine) banded the river valley (Ashton et al. 1992; Coope 1992; Hunt 1992) providing access to wood and plant-based resources. Whilst scrapers are less common, their presence does indicate that hide working is also likely to have been undertaken at the site. The notches represent a mixed category being associated mostly with the working of wood, but also bone (use-wear discussion, section 2.5). Therefore, it can be concluded that tasks linked to wood and plant processing were predominant, with a smaller scraper component. Moreover, in terms of the proportions of the main tool types similarities can be drawn with Area I at Barnham (section 5.3.1), indicating parallels between the types of activities carried out.

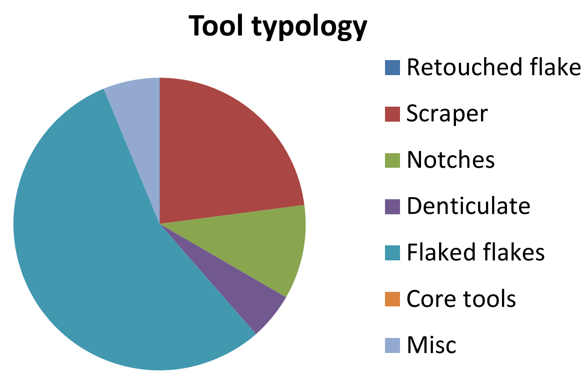


FIGURE 5.67 - TOOL TYPOLOGY FOR BEDS C2, D &E FROM HIGH LODGE

In summary, the assemblage signature from Beds C2, D and E at High Lodge represents a raw material procurement and manufacture area, with tested nodules and core and flake working, along with the production of flake tools for use on site. The tool component is mixed but with an emphasis on flaked flakes, likely related to wood or plant processing and procurement. The number of tools (n=91) suggests repeated visits possibly linked to the exploitation of resources. The signature follows the pattern for Turq's 'mixed' occupation site with a variety of activities being conducted (Turq in Mellars 1996).

Bed C1

In contrast to the assemblage discussed above, the artefacts from Bed C1 favour a different interpretation. The group is much smaller, with only 81 artefacts in total. Again flakes (73%, n=59) and debitage (n=8, 10%) account for the majority of pieces (83%), with a further seven cores (9%) and seven flake tools (9%) making up the remainder of the assemblage (Appendix II; figure 5.68).

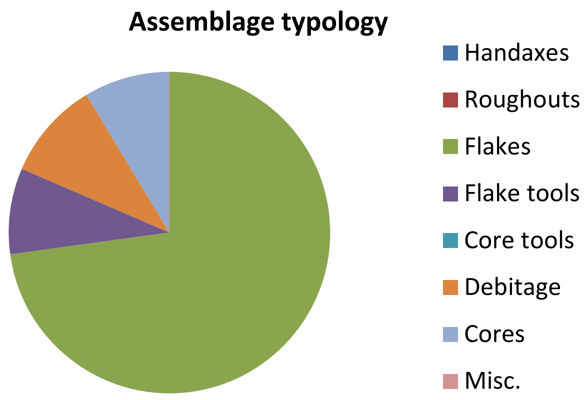


FIGURE 5.68 - ASSEMBLAGE TYPOLOGY FOR BED C1, HIGH LODGE

In terms of the chaîne opératoire (table 5.8) there is minimal detailed evidence available from the High Lodge report as the focus was on the larger assemblage from Beds C2, D and E (Ashton 1992). However, knapping fragments and debitage are present alongside cores suggesting the reduction of nodules on site. In parallel with the assemblage above, the absence of handaxes, roughouts and soft hammer flakes indicate a technology based solely on core and flake working.

As noted above, whilst cortex data is discussed in the High Lodge report this focuses on the artefacts from Bed C2, D and E, with little data available for the flake cortex from Bed C1 (Ashton 1992). However, if we make the assumption that the 59 flakes, seven flake tools and eight pieces of debitage were produced from the seven extant cores, this gives an estimate of 10.5 flakes per core. Therefore it is feasible that all artefacts were knapped on site from local raw material, when taking into account the likely collection biases.

The flake tools show a predominance of scrapers, making up 80% of the total component (n=4), representing a primary focus on scraper-related events. A single denticulate (20%) is also present (figure 5.69), alluding to the fact that other forms of processing activities were also conducted, although in a more limited fashion. The results from the use-wear (section 2.5) indicate that these events could have been focused on hide-working, with wood proposed for the denticulate-related activity. However, the limited number involved makes it likely that these were activities conducted as part of ephemeral general subsistence events. However, it is interesting to note that the task-specific focus appears to have changed from that observed in Beds C2, D and E, perhaps suggesting a change of use of the site.

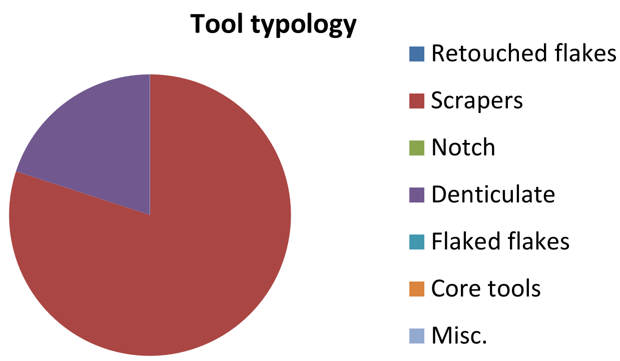


FIGURE 5.691 - TOOL TYPOLOGY FOR BED C1, HIGH LODGE

Overall, the small size of the assemblage and composition suggests an ephemeral site, centred on the procurement and manufacture of raw material for a core and flake-based assemblage. The tool component is focused on scraper-related activities likely conducted as part of general subsistence-based situations. The small assemblage suggests links with Turq's 'ephemeral' site (Turq in Mellars 1996), in which limited manufacture and processing activities were carried out in the context of a short stay.

5.3.5. Hoxne

Lower Industry

The Lower Industry at Hoxne comprises 925 artefacts, made up in the majority of flakes (n=719, 78%) and debitage pieces (n=131, 14%) which account for 92% of the assemblage. The remainder is split between cores (n=17, 2%), handaxes (n=11, 1%), roughouts (n=2, <1%), flake tools (n=30, 3%) and miscellaneous artefacts (n=15, 2%) (Appendix II, figure 5.70).

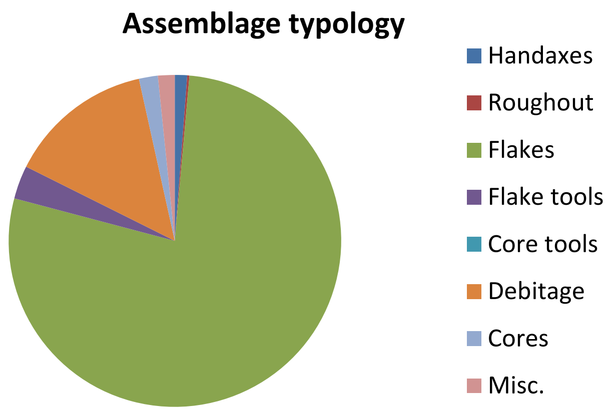


FIGURE 5.70 - ASSEMBLAGE TYPOLOGY FOR THE LOWER INDUSTRY, HOXNE

Both core and flake and handaxe chaîne opératoires are represented, with all stages from raw material acquisition and testing (cores, trial pieces, cortical flakes, roughout) through to final working (chips, non-cortical, partially-cortical, hard and soft hammer flakes, spalls, debitage, tranchet flake), and the use (cut marks) and discard of the final artefacts (flake tools, handaxes) (table 5.9). Nevertheless, despite having a full handaxe chaîne opératoire, not all artefacts produced were discarded on site. This is demonstrated by the lack of fit between the tranchet flake and the remaining handaxes, suggesting that its source was modified on site and exported out of the immediate area (Wymer and Singer 1993b:80). An additional point to note is that the majority of the handaxes are well worked and finely finished, contrasting with those from the Upper Industry, signifying that the assemblages may have been linked to different activities and needs (e.g. more expedient nature of the Upper Industry handaxes) (below). As a result of the greater extent of working, the former industry has more finishing flakes, resulting in a lower overall proportion of cortex. The focus therefore appears to be on the manufacture of at least some finely worked handaxes, supported by the more *ad-hoc*, less standardised nature of the flake tools (Wymer and Singer 1993b:90,91). However it can be seen that the flake tool component, although accounting for only a small fraction of the assemblage, is nearly three times as numerous as the handaxes. It could be suggested, therefore, that the handaxes were part of a mobile technology, moving in and out of the site, in contrast to the flake tools which were manufactured and used *in situ,* being left to accrue over time.

In this way it mirrors to some extent the evidence at Boxgrove, where handaxes were transported around the landscape (Pope 2002).

The assemblage contains 883 artefacts classed as knapping products (flakes, debitage, flake tools), which, if originating from the 17 extant cores, gives a resultant average of 52 flakes per core, thereby indicating a considerable over-representation of flakes. Moreover, if the handaxes are included (estimated 50 flakes each), this contributes 650 flakes, leaving 233 flakes resulting from the cores, and a modified estimate of twelve flakes per core, which is more feasible. Therefore, whilst it could be argued that there is no overall net import or export, the evidence from the handaxes does indicate some movement of finished products out of the site. In contrast, the flake tools are more likely manufactured to serve an immediate need.

When considering the flake cortex, the site report (Wymer and Singer 1993b) groups these into non-cortical, <50% and >50%. Whilst wholly cortical flakes cannot be distinguished, these categories match the methodology outlined for the comparison of primary, secondary and tertiary flakes (section 2.5). Despite this, it can be seen that over half the flakes exhibit non-cortical surfaces (n=402, 56%), followed by <50% cortex (n=201, 28%) and finally 16% (n=112) exhibit surface with over 50% cortex (figure 5.71). This pattern suggests that the later stages of flake reduction are more common, although this is likely a result, as has been mentioned above, of the fine working of the handaxes (Wymer and Singer 1993b:90).

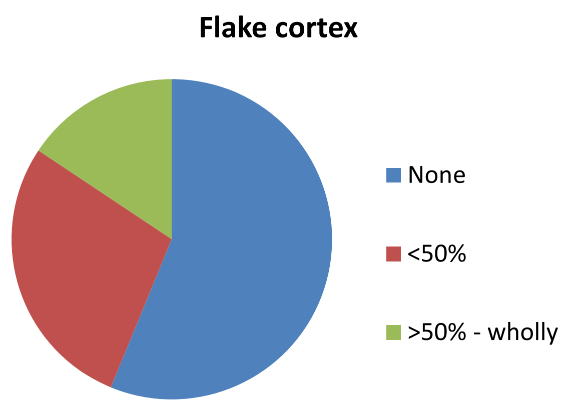


FIGURE 5.71 - FLAKE CORTEX FOR THE LOWER INDUSTRY, HOXNE

		Hoxne	
Chaîne opératoire stage	**Present/ absent**	**Lower Industry**	**Upper Industry**
Raw material procurement	Cores	Yes	Yes
	Cortical flakes	Yes	Yes
	Test Pieces	Yes	Yes
Debitage	Partially cortical flakes	Yes	Yes
	Non-cortical flakes	Yes	Yes
	Debitage	Yes	No
	Chips	Yes	Yes
	Hard hammer flakes	Yes	Yes
	Soft hammer flakes	Yes	Yes
Tool manufacture	Shaping flakes	Yes	Yes
	Roughout	Yes	Yes
	Thinning flakes	Yes	Yes
	Flake tool spall	Yes	Yes
Finished tools	Handaxe	Yes	Yes
	Flake tools	Yes	Yes
	Core tool	No	No
	Miscellaneous	Yes	Yes
Other indicators	Cut marks	Yes	No
	Use-wear/ microwear	Yes	Yes

TABLE 5.9 – SUMMARY OF THE CHAÎNE OPÉRATOIRE FOR THE LOWER AND UPPER INDUSTRIES FROM HOXNE (TESTED NODULED ARE HERE TAKEN AS THOSE WICH HAVE ONLY ONE OR TWO REMOVALS).

The flake signature displays a triangular form demonstrating a predominance of tertiary flakes, followed by secondary then primary (table 5.11). This slanted form matches the pattern exhibited by Durham Handaxe A (figure 5.72), indicating that the majority of the debitage in the assemblage is likely related to handaxe manufacture. This signature ties in with the presence of the full handaxe chaîne opératoire observed, and the extensive working of the handaxes, paralleling that of the Durham examples.

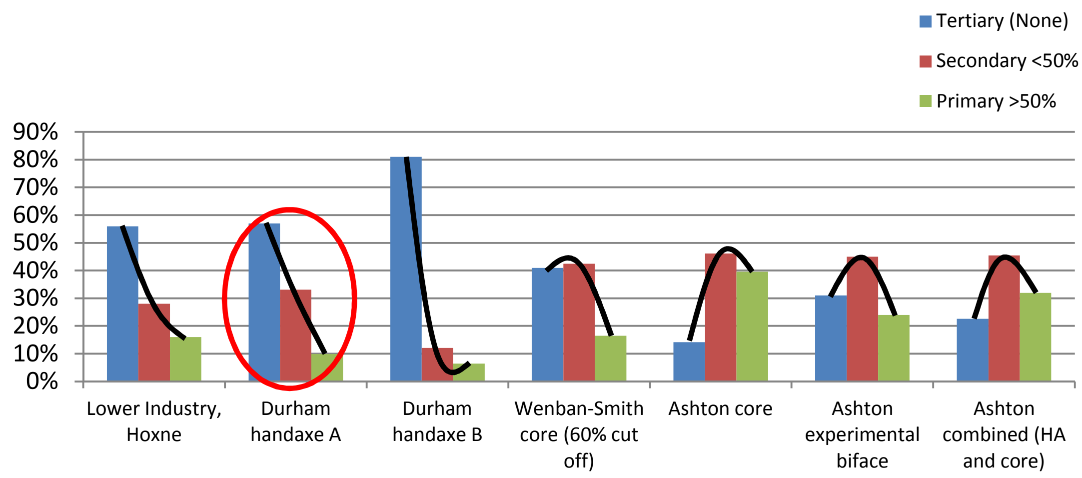


FIGURE 5.72 - COMPARISON OF ARCHAEOLOGICAL FLAKE SIGNATURE FROM THE LOWER INDUSTRY, HOXNE WITH THE EXPERIMENTAL DATASET.

In a comparable situation to the Golf Course at Clacton-on-Sea (section 5.3.2) the Lower Industry contains a large variety of tool types. The most prevalent representing close to a third of the category, are scrapers (n=9, 30%), followed by retouched flakes (n=8, 27%). In addition, endscrapers (n=4, 13%) and miscellaneous tools (n=7, 23%) are also present, along with one notch (3%) and a denticulate (3%) (figure 5.73). However, unlike Clacton the numbers are small and the focus appears to have been on scraper-based tasks as well as those associated with the use of retouched flakes. Consequently it could be inferred, using data from the use-wear discussion (section 2.5), that scrapers are commonly associated with hide working, and with meat-related tasks linked to retouched flakes. Furthermore, the low presence of notches and denticulates (wood-processing) suggests that activities undertaken with these tools were a lot less prevalent.

In conclusion, the signature for the Lower Industry at Hoxne indicates raw material procurement and manufacture centred on the production of handaxes and the *ad-hoc* manufacture of flake tools to meet an immediate need. Moreover, combined with the discard of handaxes, faunal remains, including cut marks on horse (*Equus*) and deer (*Cervus elaphus*) bones, coupled with the skew towards scraper-related activities and retouched flakes, links the use of the site to the processing of meat and carcasses. The number and variety of tool-types also suggests affinities with what Turq (Turq in Mellars 1996) termed 'mixed strategy' sites or Price's (1978) 'base-camps'. Indeed, the use-wear results (section 2.5) corroborate the multi-functional interpretation of the site, with meat, wood, plant and hide polish being identified on a variety of tools (Wymer and Singer 1993b:77,80).

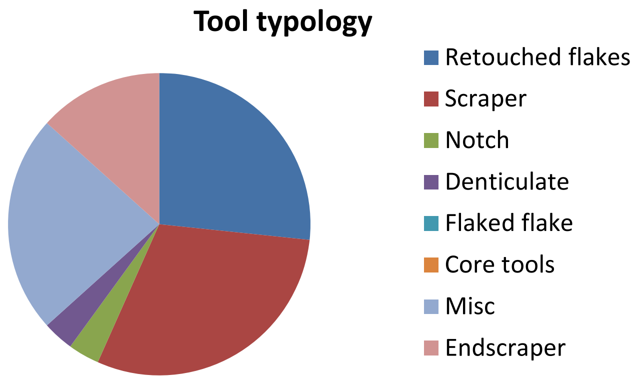


FIGURE 5.73 - TOOL TYPOLOGY FOR THE LOWER INDUSTRY, HOXNE

The durability of this location is attested to by the faunal species recovered during the excavation. The presence of deer, macaque, giant deer, horse, lion, otter, beaver and fish indicates that this may have been a prime location for meat-based subsistence activities. Indeed, it is interesting to note that the two most common species in the faunal assemblage (horse and deer) mirror the pattern of cut marks (Wymer and Singer 1993b:119). Furthermore, the majority of the material utilised for the Lower Industry is good quality black flint. There is no immediate source identified for this indicating that it was imported. This is in direct contrast to the Upper Industry where hominins procured coarse gravel from the river (Wymer and Singer 1993b:124), feasibly signifying a more *ad-hoc*, expedient occupation approach in the latter assemblage. Whilst this could be accounted for by changes in availability of the different raw material sources, it could also suggest that better quality raw material was utilised on the more enduring site.

Upper Industry

In contrast, a different assemblage composition is seen in the Upper Industry. The assemblage totals 479 artefacts, with the majority represented by flakes (71%, n=341). However the flake tools represent an unusually large proportion (n=95, 20%), something that is rarely seen in such settings. The remainder comprises cores (n=27, 6%), handaxes (n=8, 2%), a roughout (n=1, <1%) and miscellaneous pieces (n=7, 1%) (Appendix II, figure 5.74).

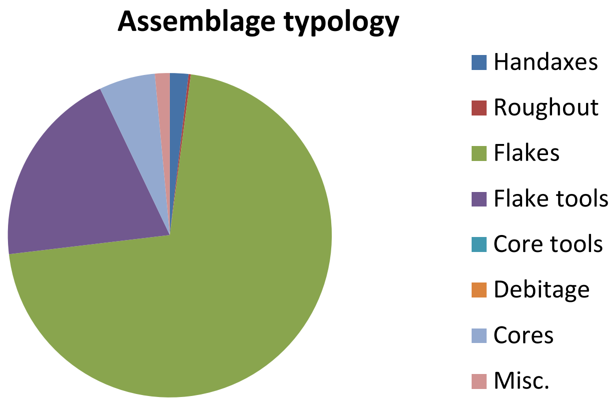


FIGURE 5.74 - ASSEMBLAGE TYPOLOGY FOR THE UPPER INDUSTRY, HOXNE

The chaîne opératoire essentially mirrors that of the Lower Industry with all stages represented from raw material acquisition (cores, trial pieces), initial working (cortical flakes, roughout, hard hammer flakes), through to finishing (chips, non-cortical, partially-cortical, soft hammer flakes, spalls, finishing flakes), and the presumed use (no identified cut marks) and discard of the final artefacts (flake tools, handaxes) (table 5.9). Consequently, all stages of handaxe production are represented, coupled with a core and flake chaîne opératoire. However, there are differences, especially in the degree of working and amount of flake tools which hint at an incongruent focus to the lower assemblage.

Firstly, only one handaxe roughout is present, and given the apparent lower quality raw material in use (mostly river cobbles [Wymer and Singer 1993b]) a higher incidence of discarded roughouts could perhaps be expected. Consequently the beginning stages appear to be less well represented. However, another explanation relates to the limited working of the handaxes, compared to the finely made examples in the Lower Industry (Wymer and Singer 1993b:96).

Secondly, the cores likewise exhibit minimal working, leading to a predominance of hard hammer flakes, and interestingly show failed attempts at flake removal, which could be related to issues with the raw material. Moreover, the flake tools are standardised in form with greater numbers of what the authors term 'microflakes' (chips), which are suggested as relating to secondary working of these implements (Wymer and Singer 1993b:90,102).

The debitage products for the Upper Industry comprise 341 flakes and 95 flake tools, which, if assumed to derive from the 27 extant cores, give an average of 16 removals per core. However, the site report indicates that the cores were minimally worked (Wymer and Singer 1993b:102), thereby suggesting an over-representation of flakes. Likewise, if we estimate that the eight handaxes and roughout produced on average 50 flakes each (10 for the roughout) this gives a value of 410. When viewed in light of the minimal working it indicates that at least some handaxes were imported for use on site and then discarded. Furthermore, the raw material was procured from the coarse gravel in the river (Wymer and Singer 1993b), implying an *ad-hoc* usage compared with that from the Lower Industry (above).

When considering the flake cortex data the same discussion applies above regarding the category breakdown in the published report. However, all cortex stages are represented and the majority of flakes exhibit <50% cortical surfaces (n=160, 40%), followed by non-cortical (n=139, 34%), and >50% cortical flakes (n=106, 26%) (figure 5.75) providing an even spread across the categories.

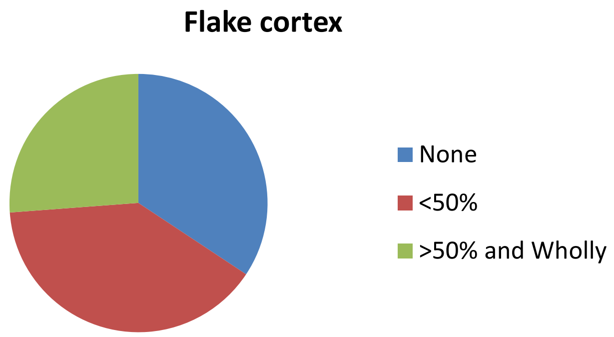


FIGURE 5.75 - FLAKE CORTEX FROM THE UPPER INDUSTRY, HOXNE

Again the flake signature from the Upper is different from the Lower Industry, demonstrating a peak in secondary flakes, followed by tertiary then primary (table 5.11). The bell-curved pattern shares similarities with both Ashton's handaxe and his combined signature, although the right-handed slant on the bell curve suggests more of an affinity with the minimally worked biface signature (figure 5.76). What can be said is that unlike the Lower Industry, the pattern does not show a classic, strong handaxe signature. Therefore if the minimal working of the cores is taken into account, which would provide a slant towards the earlier stages of manufacture, this combined with the handaxe signature would produce a signature similar to that for the Upper Industry, suggesting this is in fact a combined strategy site.

Although this assemblage demonstrates certain differences in the tool component compared to its counterpart (above), in terms of the actual breakdown they are very similar. The focus again appears to be on scraper-related tasks (n=55, 58%), followed by retouched flakes (n=20, 21%), endscrapers (n=17, 18%), and denticulates (n=3, 3%) (figure 5.77). Similarly, the typological variability is greater than seen in many sites, however the number and proportion of flake tools in this assemblage is much larger, suggesting that activities associated with their use were more prominent than in the Lower Industry. The results from the use-wear discussion (section 2.5) suggest that scraper and retouched flake-related activities are linked to carcass processing. Furthermore, the small numbers suggest that denticulate-related tasks (indicated through use-wear as related to wood-based processing) were undertaken intermittently.

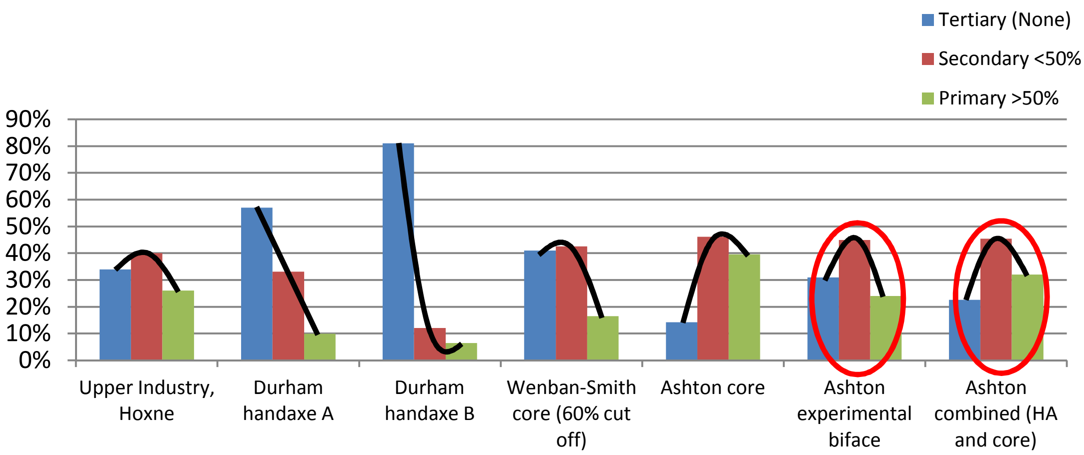


FIGURE 5.76 - COMPARISON OF THE FLAKE SIGNATURE FOR THE UPPER INDUSTRY, HOXNE WITH THE EXPERIMENTAL DATASET.

Moreover, the results from the use-wear (section 2.5) indicate that a variety of activities were undertaken, linked to hide, wood, bone, plant and meat (Wymer and Singer 1993b: 96,98,121). The suite of animals represented by the faunal component is also similar (*Ibid* 1993b: 119). Despite the lack of cut marks there are clusters of smashed bones, including one identified as a rhino skull, indicating that carcass processing tasks were likely undertaken on the spot (Wymer and Singer 1993b:128).

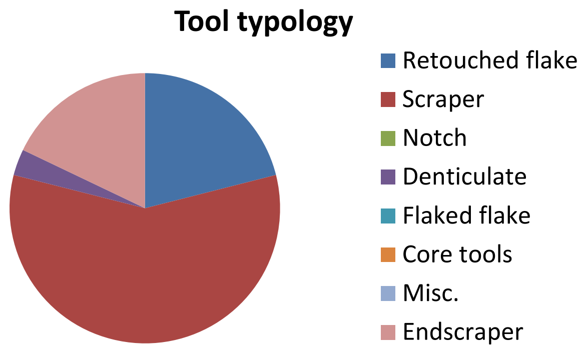


FIGURE 5.77 - TOOL TYPOLOGY FOR THE UPPER INDUSTRY, HOXNE

In summary, the archaeological signature in the Upper Industry represents a cross between Turq's 'mixed strategy site', with a large percentage of flake tools, and his 'extraction and production' sites with manufacture of the finished articles (Turq in Mellars 1996). Whilst manufacture was taking place, the cores are minimally worked and some of the handaxes may have been imported partially worked and further reduced on site. The high percentage of flake tools suggests a focus on processing activities, associated mainly with scraper and retouched flake-based activities, which combined with the handaxes suggest an emphasis on butchery and carcass related activities.

5.3.6. Swanscombe

Lower Gravel

The assemblage from the Lower Gravel totals 1105 with 84% represented by flakes (n=932). The remainder is split between cores (n=85, 8%), flake tools (n=70, 6%), debitage (n=17, 2%) and a handaxe (<1%) (Appendix II; figure 5.78).

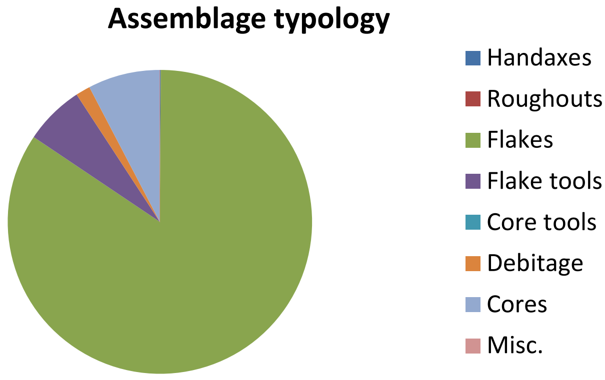


FIGURE 5.78 - ASSEMBLAGE TYPOLOGY FOR THE LOWER GRAVEL, SWANSCOMBE

The chaîne opératoire is based on core and flake manufacture, with raw material sourced and knapped locally on site from river gravel (cores, cortical flakes) (Ashton and McNabb 1996:217). All subsequent stages of production are present (partially cortical, non-cortical flakes, debitage, chips, hard hammer flakes), including manufacture and discard of the final products (flake tools) (table 5.10). Despite the presence of the handaxe, there is no evidence that this was knapped on site, instead it was probably imported during an occupation event.

When considering the actual artefact numbers there are 1019 pieces that can be classed as knapping products (flakes, debitage and flake tools). Of these, seven are chips which can be removed from the calculations, leaving 1012. Therefore, assuming these were produced from the extant cores (n=85), this delivers an estimate of 12 flakes per core. Nevertheless, there are core episode estimates detailed in the report (Table 16.14 in Ashton and McNabb 1996:212) resulting in an estimation of 1.7 core episodes, with a mean of 2.8 removals per episode. Consequently, based on these figures it suggests that on average 5 flakes were removed from each core, so the 85 cores would have produced an estimated number of 405 flakes, much lower than the value above. Whilst these flake scars represent only the last sequence of removals, these figures do suggest an over-representation of knapping products, meaning that cores were likely knapped on the spot and exported to another location.

Ordinarily we would therefore expect a predominance of cortical flakes if this partial knapping and export of raw material was taking place. However, all stages of the continuum are represented, and the flake cortex actually demonstrates a deficit in cortical flakes. Here the number of wholly cortical flakes is marginally lower than the number of extant cores (85 cores to 84 wholly cortical flakes). However, this pattern might be created if each core produced only one cortical flake, and knapping was then based on the previous flake scar. However, given the apparently limited working of the cores, we would expect more cortical flakes to be evident. Moreover, this does not agree with the previous hypothesis that cores were partially worked on the spot and transported. Therefore, another scenario could be proposed, involving the import, reduction and export of cores into and out of the area. Alternatively it is possible that the larger, more cortical flakes could have been selected and removed from the site, although the former scenario is more likely. In summary, the largest proportion of flakes comes within the <50% range (n=442, 47%), followed by >50% (n=216, 23%), non-cortical (n=190, 20%) and wholly cortical flakes (n=84, 9%) (figure 5.79).

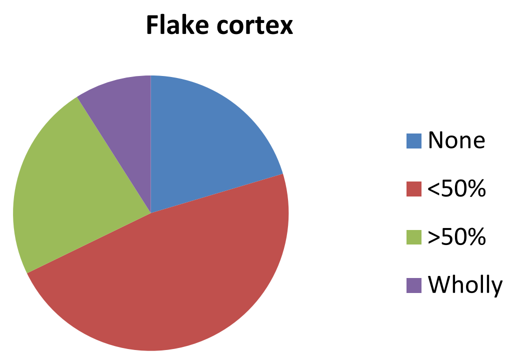


FIGURE 5.79 - FLAKE CORTEX FOR THE LOWER GRAVEL, SWANSCOMBE

Furthermore, when the primary, secondary and tertiary flake data for the archaeological sample is compared to the experimental signatures (table 5.11), the graph demonstrates a peak in the middle with a predominance of secondary flakes, followed by primary, then tertiary, creating a left-handed bell-curve (figure 5.80). The closest signature appears to be either Ashton's combined signature or his core. Since there is no evidence of handaxe manufacture on site the combined signature is unlikely. Therefore, when compared to the core signature, the archaeological sample contains fewer primary and marginally more tertiary flakes, suggesting that it represents a smaller proportion of early-stage reduction and marginally more later-stage. Indeed, this pattern backs up the second hypothesis above, suggesting that a portion of the cores were brought in partially reduced, knapped on site, then removed.

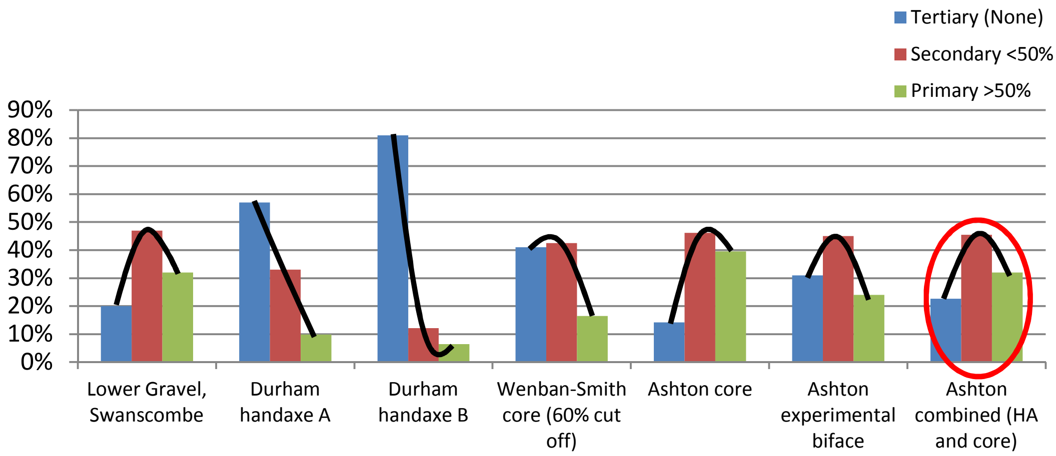


FIGURE 5.801 - COMPARISON OF THE ARCHAEOLOGICAL FLAKE SIGNATURE FROM THE LOWER GRAVEL, SWANSCOMBE WITH THE EXPERIMENTAL DATASET.

As noted above, the assemblage contains a high number of flake tools (n=70), suggesting that processing activities played a large part in the tasks undertaken at this locale. Furthermore, the main focus (representing 92% of the flake tool component) is on flaked-flake related activities (n=66), with the remainder represented by retouched flakes (n=2, 3%), scrapers (n=2, 3%) and notches (n=2, 3%). Extrapolating this using the use-wear results from section 2.5, it indicates a predominance of wood-based processing (flaked flakes), with the smaller proportion of retouched flakes and scrapers linked to carcass-related jobs. Indeed, this apparent partiality is further suggested by the lack of handaxes, signifying that butchery had a limited influence in the events conducted at the site. Moreover, the high incidence of flaked flake tools is reminiscent of the pattern found in the assemblage from the Lion Point foreshore at Clacton-On-Sea (section 5.3.2), suggesting that similar activities were being undertaken in both these locations. Extrapolating further, it could be suggested to represent some form of wood processing station, even potentially linking in with the production of wooden spears as at Clacton (Warren 1951).

		Swanscombe		
Chaîne opératoire stage	**Present/ absent**	**Lower Gravel**	**Lower Loam**	**Lower Middle Gravel**
Raw material procurement	Cores	Yes	No	Yes
	Cortical flakes	Yes	Yes	Yes
	Test Pieces	No	No	No
Debitage	Partially cortical flakes	Yes	Yes	Yes
	Non-cortical flakes	Yes	Yes	Yes
	Debitage	Yes	No	No
	Chips	Yes	Yes	Yes
	Hard hammer flakes	Yes	Yes	Yes
	Soft hammer flakes	No	No	Limited
Tool manufacture	Shaping flakes	No	No	No
	Roughout	No	No	No
	Thinning flakes	No	No	No
	Flake tool spall	No	Yes	No
Finished tools	Handaxe	Yes	No	Yes
	Flake tools	Yes	Yes	Yes
	Core tool	No	No	No
	Misc.	No	No	No
Other indicators	Cut marks	No	No	No
	Use-wear/ microwear	No	No	No

TABLE 5.10 – SUMMARY OF THE CHAÎNE OPÉRATOIRE STAGES FOR THE LOWER GRAVEL, LOWER LOAM AND LOWER MIDDLE GRAVEL AT SWANSCOMBE.

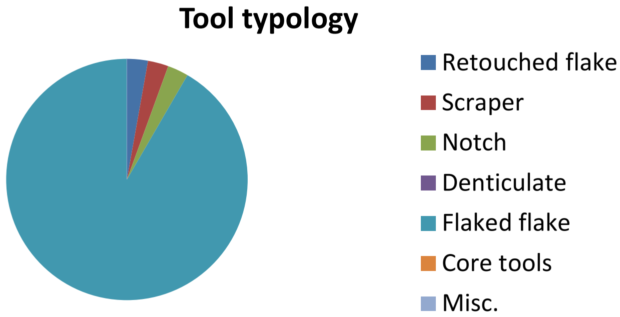


FIGURE 5.81 - TOOL TYPOLOGY FROM THE LOWER GRAVEL, SWANSCOMBE

In summary, the signature from the Lower Gravel represents a core and flaked based industry focused on primary manufacture coupled with the import and export of partially worked nodules. The flake tools probably played a large part of the activities at the site and were centred on the use of flaked flakes, likely associated with wood-working in the temperate wooded environment which was present at the time of occupation. The signature therefore has links with Price's 'extractive site' as a resource processing station (1978) or Turq's episodic site, although with a longer duration of occupation and repeat visits (Turq in Mellars 1996).

Lower Loam

The assemblage from the knapping floor situated on the Lower Loam contains 254 artefacts, mostly comprising debitage (n=176, 70%) and flakes (n=72, 29%) which accounts for 97% of the total assemblage. The remainder is made up of flake tools (n=4, 2%) (Appendix II, table 5.82). No handaxes or cores are present, suggesting that the source of the manufacturing waste was exported out of the site for use elsewhere once its immediate purpose had been exhausted.

The knapping floor chaîne opératoire contrasts with that for the Lower Gravel (above) in that for the most part the primary stages of reduction are lacking (e.g. cores, tested pieces) (table 5.10). However, the presence of wholly cortical flakes suggests that raw material was brought in (no locally available flint [Ashton and McNabb 1996]) and worked on the spot (refitting flakes), with nodules then exported out of the immediate area. Hard hammer partial and non-cortical flakes are present along with chips but no other forms of debitage (e.g. shatter pieces, chunks). The manufacture is based on core and flake working, with no evidence of soft hammer flakes or handaxes. Flake tools, however, are present including a retouched flake, denticulate and flaked flake spall from the refitting groups, clearly demonstrating manufacture of tools for use on site (Ashton and McNabb 1996:225,231). Given the lack of raw material at this location, and the fact that hominins seem to have imported what they needed (*Ibid* 1996:217), the flake tools appear to be the focus of manufacture in this area.

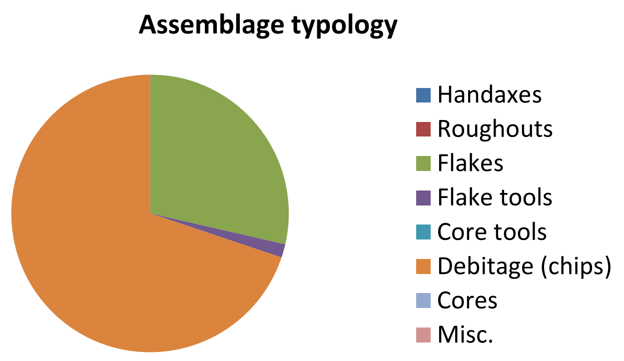


FIGURE 5.82- ASSEMBLAGE TYPOLOGY FROM THE LOWER LOAM KNAPPING FLOOR, SWANSCOMBE

The remains of a fallow deer skull and antlers suggest that butchery may have been one reason for the choice of location for this site, although if handaxes were used they were removed when the hominins vacated the area. The absence of any other bones has led the authors to suggest that the animal was butchered on the spot, with the rest of the carcass removed in an articulated state for consumption elsewhere, although there are no cut marks to indicate definite human alteration. Furthermore, refitting flakes have been found in close proximity to the carcass (Ashton and McNabb 1996: 229, 232-233), suggesting a link between the knapping event and the faunal remains. Indeed this occupation represents a more constrained time frame than the other two, seen through the movement of raw material between refitting contexts (*Ibid* 1996:230).

There are no cores present in the knapping floor, however those associated with the general Lower Loam assemblage can be used as a proxy for the extent of working of the missing knapping floor cores. The estimates based on these artefacts give a mean of 2.7 removals per core episode and 2.2 episodes per core (Figure 16.14 in Ashton and McNabb 1996:212) providing an estimation of six flakes per core. Therefore if the flakes (n=72) and flake tools (n=4) give 76 knapping products associated with the floor, using the proxy of six flakes would suggest that approximately twelve cores were used in the manufacture of the flake tools and flakes at the site. Although it must be remembered that this is an estimate and it is likely that the number would be lower, especially considering the cores were introduced and were likely to be reduced more to make the best use of the material. Conversely however, they must still have had some use-life left, otherwise they would have been discarded in this location.

The results from the flake cortex demonstrate that all stages are in fact represented, with the largest category being flakes with <50% cortex (n=27, 38%). This is followed by non-cortical flakes (n=24, 33%), those with >50% cortex (n=15, 21%) and wholly cortical flakes (n=6, 8%) (figure 5.83).

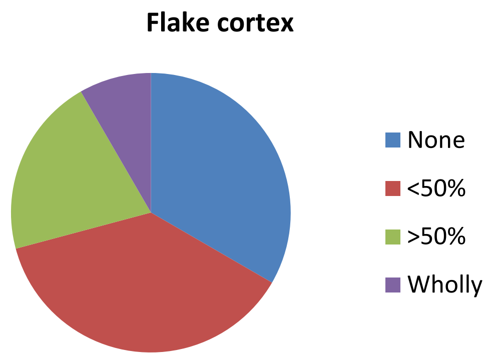


FIGURE 5.83 - FLAKE CORTEX FROM THE LOWER LOAM KNAPPING FLOOR, SWANSCOMBE

Moreover, the flake signature displays a shallow bell-curve profile with a predominance of secondary flakes, followed closely by tertiary and primary (figure 5.84, table 5.11). However, this does not match with any from the experimental datasets. The closest in overall pattern would be the combined signature from Ashton, but there is no evidence of handaxe manufacture on site. If the two core signatures are compared, for the archaeological sample there would have to be either an over-representation of tertiary or primary flakes to match either. The authors have argued that the assemblage from the knapping floor represents the final stages of reduction, based on minimally reduced nodules being imported. This would tie in with the low numbers of wholly cortical flakes (n=6), and a lower overall proportion of cortex (Ashton and McNabb 1996:205,217,230), when compared to the signature from the Lower Gravel and Lower Middle Gravel (above and below).

Whilst there are only four flake tools present, half of them are linked to flaked flake activities (n=2), followed by a retouched flake (n=1, 25%) and denticulate (n=1, 25%) (figure 5.85). Despite the small assemblage size, it could be suggested, based on the use-wear discussion in section 2.5, as being primarily linked to activities related to the working of wood (suggested function for denticulates and flaked flakes). The presence of flaked flake spalls and the association of the tools with refitting scatters demonstrate *in situ* manufacture likely aimed at meeting expedient immediate needs. There is a suggestion by the authors that flaked flakes were manufactured on site and exported (Ashton and McNabb 1996:232), which would perhaps explain the relatively larger number of cores estimated to have produced the flakes. Moreover, if this was the case it might explain the flake signatures' affinities with the combination pattern if the production of flaked flakes as seen at High Lodge (section 5.3.4) artificially increasing the proportion of tertiary flakes.

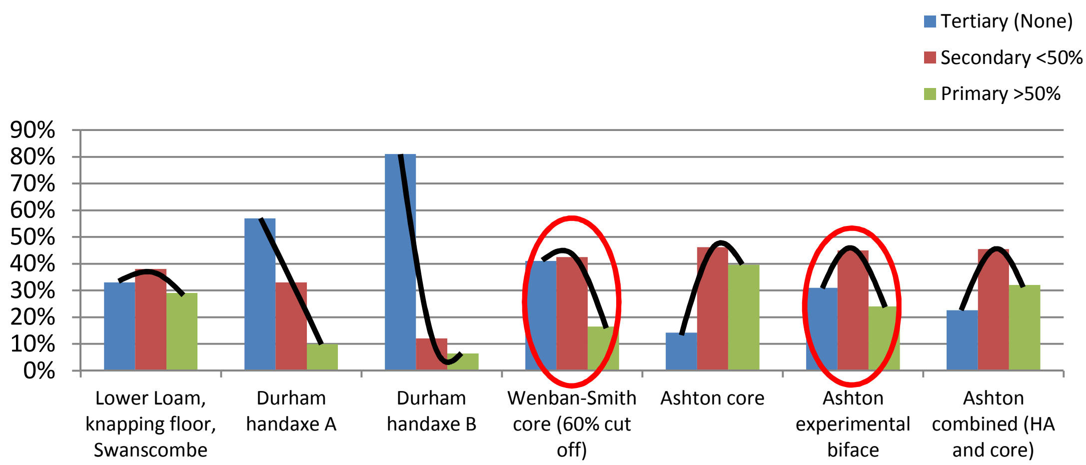


FIGURE 5.84 - COMPARISON OF THE FLAKE SIGNATURE FROM THE LOWER LOAM KNAPPING FLOOR, SWANSCOMBE AND THE EXPERIMENTAL DATASET

In summary, the signature from the Lower Loam knapping floor appears to represent an ephemeral occupation linked to processing activities and opportunistic butchery. Cores and nodules were brought into the area and knapped producing tools for immediate use and which were then removed for use elsewhere. The signature shares similarities with Turq's 'episodic' site (Turq in Mellars 1996) and with both the 'extractive' and 'transitory' patterns from Price's model (1978)

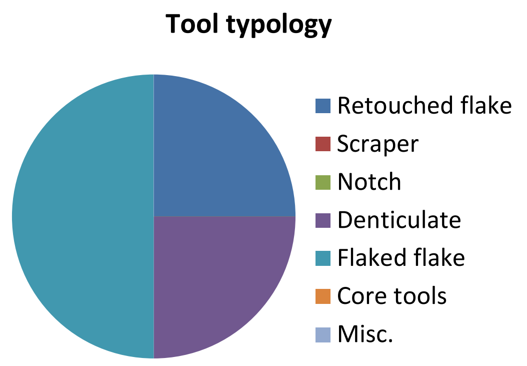


FIGURE 5.85 - TOOL COMPOSITION FOR THE LOWER LOAM KNAPPING FLOOR, SWANSCOMBE

LOWER MIDDLE GRAVEL

The assemblage from the Lower Middle Gravel is comparatively small, with only 151 artefacts, mostly made up of flakes (n=122, 81%), followed by cores (n=13, 9%), flake tools (n=7, 5%), debitage (chips, n=6, 4%), and handaxes (n=3, 2%) (Appendix II, figure 5.86).

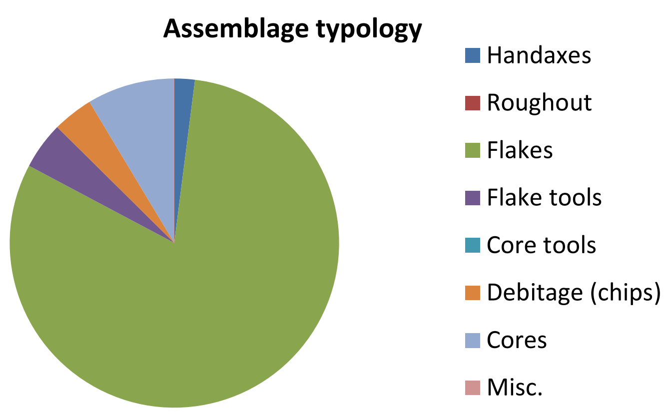


FIGURE 5.86 - ASSEMBLAGE TYPOLOGY FOR THE LOWER MIDDLE GRAVEL, SWANSCOMBE

The chaîne opératoire (table 5.10) mirrors that found in the Lower Gravel, with one small difference, there is a restricted number of soft hammer flakes present (Ashton and McNabb 1996:207), hinting at limited later stage working of handaxes. Otherwise, all stages are represented, from raw material acquisition and primary working (cores, cortical flakes) to further reduction (partial and non-cortical hard hammer flakes, chips) and the discard of finished articles (handaxes, flake tools). The handaxes are minimally worked, perhaps expediently produced for an immediate need, and the lack of evidence of a full handaxe chaîne opératoire suggests these were imported (*Ibid* 1996:217).

There are 122 flakes and seven flake tools which can be classed as knapping products. The six pieces of debitage mentioned are chips so are exempt from the calculations. The handaxes are regarded as being imported, so this leaves the 13 extant cores as the source nodules, providing a mean number of removals per core of ten. However, the excavation report (Table 16.14 in Ashton and McNabb 1996:212) gives the mean number of removals per core episode as 2.5, and the mean number of episodes per core as 1.8, providing a value of 59 removals. This value is much lower than the remaining flakes (n=122), and even if this only represents the last phases of reduction, it still leaves a large number of flakes unaccounted for, thereby suggesting that cores may have been removed from the locality for use elsewhere.

Regarding the flake cortex, all stages are represented, with the greatest proportion, nearly 50%, falling within the <50% cortex category (n=55, 45%). This is followed by non-cortical (n=30, 25%), those with >50% cortex (n=24, 20%), and wholly cortical flakes (n=13, 11%) (figure 5.87). It is interesting to note that the number of wholly cortical flakes matches exactly the number of cores present in the assemblage, which, unless each flake was detached from the previous flake scar, hints at a deficit of cortical flakes, adding to the idea that cores were part of a technological strategy centred around fluid movement of artefacts with active import and export occurring within the course of successive occupations.

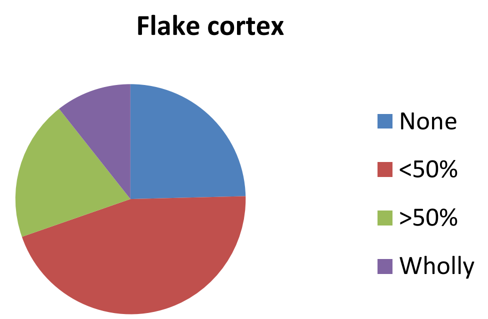


FIGURE 5.87 - FLAKE CORTEX FROM THE LOWER MIDDLE GRAVEL, SWANSCOMBE

Furthermore, when the flake signature is compared with the experimental dataset (table 5.11), it displays a similar pattern to the one found in the Lower Gravel, with a peak in the secondary flakes, followed by primary, then tertiary, creating a left-slanted bell curve profile (figure 5.88). This is comparable to that from the Lower Gravel, and could be argued to be closest to Ashton's combined signature. However the question here is whether the manufacture on-site of flaked flakes is biasing the sample towards an increase in tertiary flakes. One alternative explanation is that the cores were introduced partially worked, utilised, then removed. This would create an increase in the number of tertiary and secondary flakes compared to perhaps Ashton's core signature, especially if, as has been discussed above, the Ashton core is created on smaller more restricted materials similar to the river gravel nodules in use here.

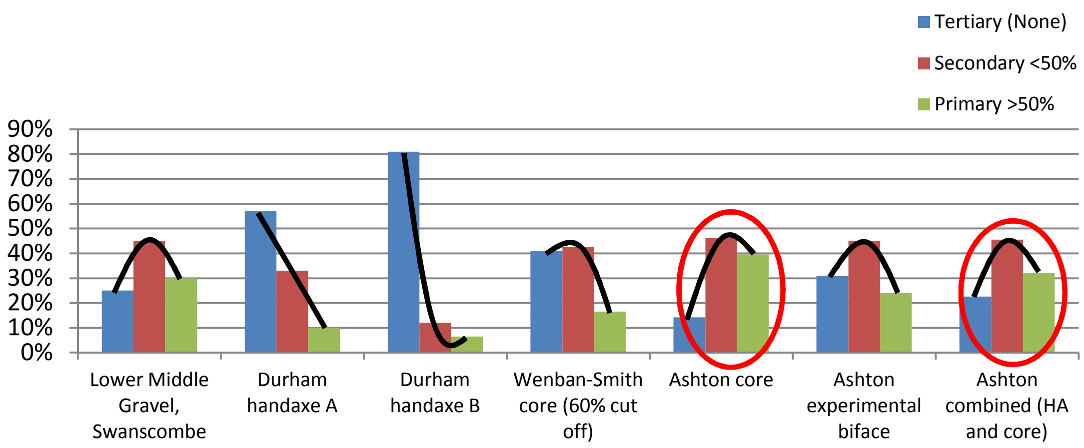


FIGURE 5.88 - COMPARISON OF THE FLAKE SIGNATURE FROM THE LOWER MIDDLE GRAVEL, SWANSCOMBE WITH THE EXPERIMENTAL DATA.

Following on from the previous two assemblages, although limited in number, the focus of the tool component here is also strongly related to activities associated with flaked flakes (n=6, 86%), with a single notch providing the remaining 14% (figure 5.89). Furthermore, based on the use-wear (section 2.5), as with the other Swanscombe assemblages, activities are related to wood-based procurement. However, in contrast to the Lower Gravel, the actual numbers of flake tools are low, suggesting perhaps *ad-hoc*, expedient use for immediate needs based on day-to-day subsistence tasks.

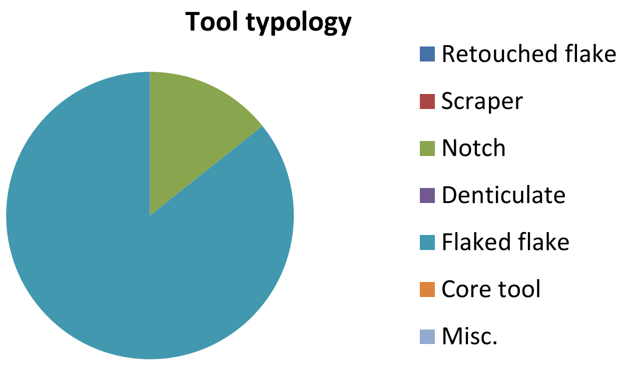


FIGURE 5.89 - TOOL COMPOSITION FOR THE ASSEMBLAGE FROM THE LOWER MIDDLE GRAVEL, SWANSCOMBE

In summary, the signature from the Lower Middle Gravel suggests a relatively small-scale ephemeral occupation, with primary manufacture of nodules on site. Additional cores were also imported partially worked, as well as finishing or re-sharpening of handaxes. This is in addition to butchery and limited processing of wood, likely related to day-to-day subsistence activities. In this sense the signature matches Turq's categorisation of an 'episodic' site (Turq in Mellars 1996), with the production of tools to meet an *ad-hoc* immediate need.

Percentage of flake types produced by the experimental datasets using a cortex split of 50%	**Tertiary (None)**	**Secondary <50%**	**Primary >50%**
Durham handaxe A	57%	33%	10%
Durham handaxe B	81%	12%	6%
Wenban-Smith core (60% cut off)	41%	43%	17%
Ashton core	14%	46%	40%
Ashton experimental biface	31%	45%	24%
Ashton combined (HA and core)	23%	45%	32%
Area I, Barnham	30%	41%	28%
Area IV, Barnham	38%	41%	21%
Area V, Barnham	63%	28%	9%
Golf Course, Clacton	23%	37%	40%
High Lodge	31%	48%	21%
Area I, Elveden	32%	39%	29%
Area III, Elveden	24%	43%	33%
Lower Industry, Hoxne	56%	28%	16%
Upper Industry, Hoxne	34%	40%	26%
Lower Gravel, Swanscombe	20%	47%	32%
Lower Loam, Knapping Floor, Swanscombe	33%	38%	29%
Lower Middle Gravel, Swanscombe	25%	45%	30%

TABLE 5.11 - COMPARISON OF THE PROPORTIONS OF FLAKE TYPES PRODUCED BY THE EXPERIMENTAL DATASETS COMPARED TO THAT FROM THE LOWLAND RIVERINE SITES

5.4. Lowland Pond/lake sites (lacustrine)

5.4.1. Beeches Pit

Area AH

The assemblage from Area AH contains 1812 artefacts comprised mostly of manufacture waste, making up 98% of the assemblage. This is divided between flakes (n=1724, 95%) and cores (n=53, 3%), with the remaining 2% made up of handaxes (n=7, <1%), flake tools (n=22, 1%) and miscellaneous artefacts (n=6, <1%) (Appendix II; figure 5.90).

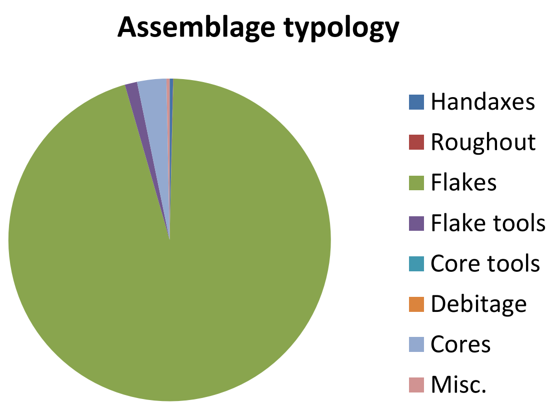


Figure 5.90 - Assemblage typology for Area AH, Beeches Pit

As with many of the other sites in this study, both core and flake working and a handaxe chaîne opératoire are present, although not all stages are represented to the same extent. In terms of core and flake working the primary stages of decortication and the testing of nodules are well represented (cortical flakes, cores, tested nodules), with further reduction (hard hammer, partially and non-cortical flakes, debitage, chips), and modification of flake blanks into tools. In contrast the handaxe chaîne opératoire appears disjointed. Whilst initial roughing out is identified (refitting flakes, roughout [Hallos 2001:174]), along with soft hammer and thinning flakes, artefacts from the shaping stages appear limited, suggesting a gap in the manufacture sequence (table 5.12). Indeed, Hallos suggests that the thinning flakes are a result of re-sharpening rather than part of a full sequence (2001:165). She proposes a spatially broken knapping chain, with initial roughing out and reduction carried out on site, with finished articles exported for use in the wider landscape. Both handaxes and flake tools are discarded on site, indicating processing and butchery tasks. The proportion of flake tools, whilst greater than the handaxes, still only represents a small proportion of the assemblage (1%). Parallels can perhaps be drawn with Westcliffe (section 5.1.1) and Wood Hill (section 5.1.2) which demonstrate a similarly low proportion of flake tools and dominant focus on knapping and manufacture. The presence of hammerstones also emphasises the manufacturing nature of the assemblage.

Of the 53 cores, 23 of these are tested nodules, providing an estimated two removals each (46), so if the debitage products (flakes, flake tools; n=1746) are assumed to have come from the cores this provides an average of 56 flakes per core. Conversely, if the handaxes (50 flakes) and roughout (10 flakes) are included this gives 310 flakes, leaving 1436 which could be attributed to the cores. Split between the cores this gives an average of 46 flakes per core, indicating a substantial deficit in the original number of handaxes and cores. This agrees with Hallo's interpretation that cores were knapped on site and exported, or discarded at another location (Hallos 2001:178), and it's likely that some handaxes were partially reduced on site and exported.

If the hypothesis discussed above hold true this should be observed in the pattern of flake cortex. Whilst all stages are represented, unusually the proportions of flakes with <50% (n=213) and non-cortical (n=256) surfaces make up equal proportions, 31% and 37% of the flakes respectively (figure 5.91). A similarly close pattern can be seen in the flakes at the upland site of Wood Hill in Kent (section 5.1.2). This was interpreted by Winton as being the result of handaxe manufacture on large flake blanks (Winton 2004:86), and may be a significant point when considering that one of the technological strategies suggested for Area AH involves the production of large flakes for use as biface blanks (Gowlett et al. 2005:17; Hallos 2001:138). Finally,

Chaîne opératoire stage	Present/ absent	Beeches Pit Area AH	Foxhall Road Red Gravel	Grey Clay
Raw material procurement	Cores	Yes	Yes	Yes
	Cortical flakes	Yes	Yes	?
	Test Pieces	Yes	No	No
Debitage	Partially cortical flakes	Yes	Yes	?
	Non-cortical flakes	Yes	Yes	?
	Debitage	Yes	No	No
	Chips	Yes	No	No
	Hard hammer flakes	Yes	Yes	Yes
	Soft hammer flakes	Yes	Yes	Yes
Tool manufacture	Shaping flakes	Limited	No	No
	Roughout	Yes	Yes	No
	Thinning flakes	Yes	Yes	Limited
	Flake tool spall	No	No	No
Finished tools	Handaxe	Yes	Yes	Yes
	Flake tools	Yes	Yes	Yes
	Core tool	No	Yes	Yes
	Misc.	Yes	Yes	No
Other indicators	Cut marks	No	No	No
	Use-wear	No	No	No

TABLE 5.12 – SUMMARY OF CHAÎNE OPÉRATOIRE STAGES FOR BOTH BEECHES PIT AND FOXHALL ROAD.

wholly cortical flakes demonstrate the smallest percentage (12%, n=85), with >50% making up the remaining 20% (n=138) (figure 5.91).

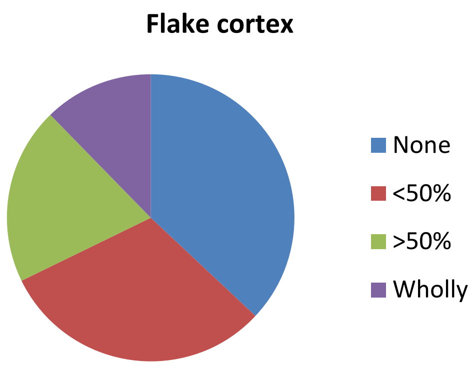


FIGURE 5.91 - FLAKE CORTEX FROM AREA AH, BEECHES PIT

Furthermore, if the cortex results are split into primary, secondary and tertiary categories the pattern above shows clearly, with similar values for each category (table 5.13). The dominance of tertiary flakes closely followed by primary, then secondary produces a shallow concave profile unlike any displayed by the experimental dataset (figure 5.93). This overrepresentation of flakes associated with the primary stages of reduction could be related to knapping strategy (i.e. light use of the material, although Gowlett et al. (2005) argue against this scenario), or the decortication of cores at this location and their subsequent export for use in the wider landscape. Thus, the pattern suggests manufacture at the site was complex, perhaps involving multiple partial and complete production sequences.

A variety of tools types is represented in Area AH, the most prevalent of which are denticulates (n=7, 32%), followed by notches (n=6, 27%), flaked flakes (n=5, 23%), scrapers (n=3, 14%) and a single item classed as miscellaneous (5%) (figure 5.93). Although denticulate-related activities are the most common, similar proportions are also represented by activities associated with notches and flaked flakes. Applying the use-wear results (section 2.5) denticulates, notches and flaked flakes are more commonly associated with wood-based procurement and working, suggesting that the site was focused on tasks linked to the procurement of such resources. Furthermore, hide-working (represented by the scrapers) comprises a much smaller component. Indeed, the nominal number of scrapers could be argued to tie in with the low frequency of handaxes within the assemblage.

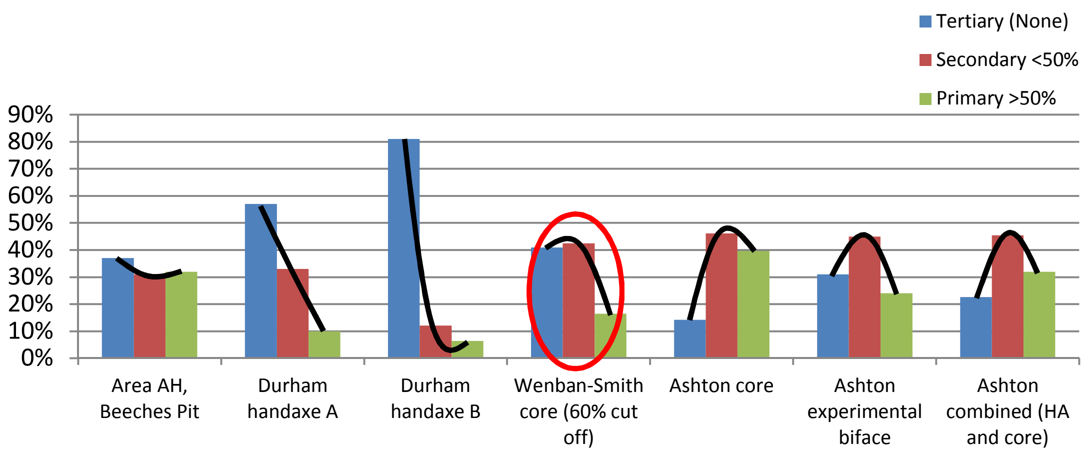


FIGURE 5.92 - COMPARISON OF FLAKE SIGNATURE FROM AREA AH, BEECHES PIT WITH THE EXPERIMENTAL DATASET

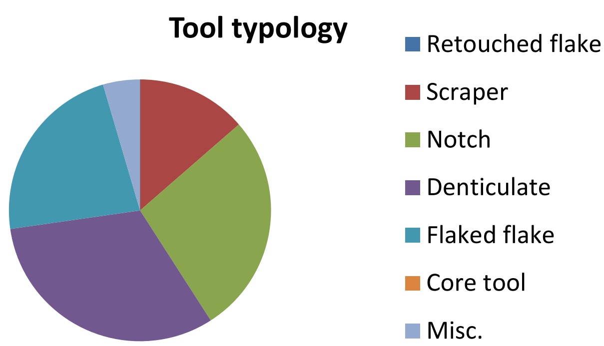


FIGURE 5.93 - COMPOSITION OF THE TOOL COMPONENT FROM AREA AH, BEECHES PIT

In addition there is evidence of fire-use with a hearth and burnt flakes which refit to the roughout, indicating that the burning event is contemporary with hominin occupation (Hallos 2001:176).

In summary, the signature from Area AH at Beeches Pit represents a manufacturing locale with considerable flint working (both core reduction and biface manufacture) being conducted with exportation of partially worked pieces for further reduction and use in the wider landscape. This is coupled with a focus on wood processing activities demonstrated by the data from the flake tools, tied with occasional hide working and butchery, although these are in the context of day-to-day subsistence activities. The site appears to function as a raw material procurement locale, with decortication and early stage reduction for both chaîne opératoires, with pieces then exported out for further reduction elsewhere. Coupled with this movement of pieces away from the site, artefacts are also being introduced, for example handaxes, and re-sharpened or reworked in the course of these activities.

When compared to Turq's site types, Beeches Pit can be correlated with his 'extraction and production' locale (Turq in Mellars 1996), with raw material worked on site and pieces exported for further reduction elsewhere. However other activities are also taking place, including some general subsistence related processing as indicated by the small numbers of flake tools, coupled with the introduction and re-sharpening of handaxes, indicating again that butchery activities were carried out on site.

5.4.2. Foxhall Road

Red Gravel

The assemblage from the Red Gravel at Foxhall Road totals 254 artefacts. However, when compared to other sites, it contains a relatively low proportion of flakes, accounting for only 70% of the artefacts (n=179). The remainder comprises handaxes (n=27, 11%), cores (n=20, 8%), flake tools (n=10, 4%), miscellaneous artefacts (n=8, 3%), core tools (n=7, 3%) and handaxe roughouts (n=3, 1%) (Appendix II, figure 5.94). The large quantity and resultant proportion of bifaces in the assemblage is likely the result of excavation bias, nevertheless when compared to the other sites in this study, there is only Gaddesden Row in the Chilterns, which contains a greater actual number of handaxes (n=42), despite many sites containing substantial numbers of artefacts.

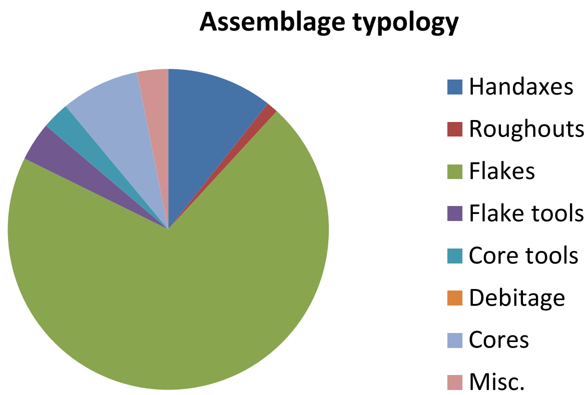


FIGURE 5.94 - ASSEMBLAGE TYPOLOGY FOR THE ASSEMBLAGE FROM THE RED GRAVEL, FOXHALL ROAD

In terms of the chaîne opératoire (table 5.12), both core and flake working and handaxe manufacture sequences are present. Initial working is represented (cores, cortical flakes, roughouts), although there are no tested nodules evident, probably as a result of the small size of the nodules worked. Whilst no debitage or chips are present (resulting from the excavation methods and age of the assemblage), further working is represented in the form of partially, non-cortical, soft and hard hammer flakes. Regarding the handaxe chaîne opératoire thinning flakes have been recovered, indicating that manufacture was taking place on site. Furthermore, finished artefacts were also discarded with handaxes, and both flake and core tools inferring the existence of processing tasks.

The flakes and flake tools from the Red Gravel amount to 189, which if originating from the existing cores gives an average number of 9 flakes per core. However, if the handaxes (50 flakes) and roughout (10 flakes) are assumed to have been manufactured on site this produces an estimated figure of 1350. Therefore, even with the collection bias favouring the larger tool and core component, it could be argued that it is unlikely that the excavators would have missed so many flakes. This scenario proposes that the handaxes were imported and discarded at this location. However the authors (White and Plunkett 2004) point out that both the handaxes and cores are minimally worked. To test this, if the estimates are modified to a very conservative 5 flakes per core and handaxe, this would provide a total of 250 flakes, which still leaves a deficit, albeit a much smaller one.

All stages of flake cortex are represented with the largest proportion made up of <50% cortex (n=81, 45%), followed by those with no cortex (n=47, 26%), >50% (n=34, 19%) and wholly cortical flakes (n=17, 9.5%) (figure 5.95). Following on from the discussion above, there is a deficit in wholly cortical flakes (n=17) compared to the number of cores recovered (n=20). Whilst this again could arguably be correlated with the collection biases in operation at the site, the shortfall is especially notable as the authors indicate that the cores are small and minimally worked, retaining a sizeable proportion of cortex (White and Plunkett 2004:100). This would suggest that some cores were introduced partially worked.

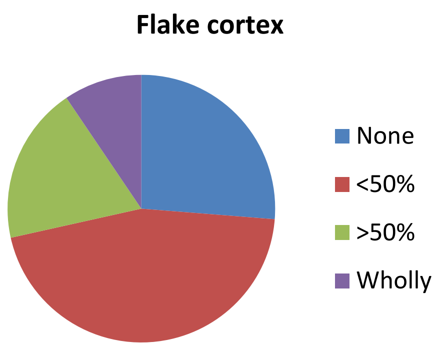


FIGURE 5.95 - FLAKE CORTEX FOR THE RED GRAVEL AT FOXHALL ROAD

Furthermore, when the flake signature is compared to the experimental data the greatest proportion lies in the secondary flakes, followed by primary, then tertiary, creating a bell-curve profile (figure 5.96, table 5.13). This shares similarities with Ashton's combined signature although with slightly more tertiary and less primary in the archaeological sample. This could potentially be explained by the presence of larger flake blanks, which were likely imported and reduced on site (White and Plunkett 2004:119).

Core tools (n=7, 3%) are almost as common as the flake tool component, indicating that activities related to heavier processing tasks were important. Within the tool category, after core tools, flaked flake-related activities are the most numerous (n=4, 24%), followed by scrapers (n=3, 18%), miscellaneous pieces (n=2, 12%), and a single denticulate (6%) (figure 5.97). Using the results from the use-wear discussion (section 2.5) it advocates that flaked flakes, along with denticulates, are connected to wood-related tasks, with scrapers associated with hide working. Therefore although the slant appears to be towards wood procurement, the signature is better classed as mixed with a number of activities represented.

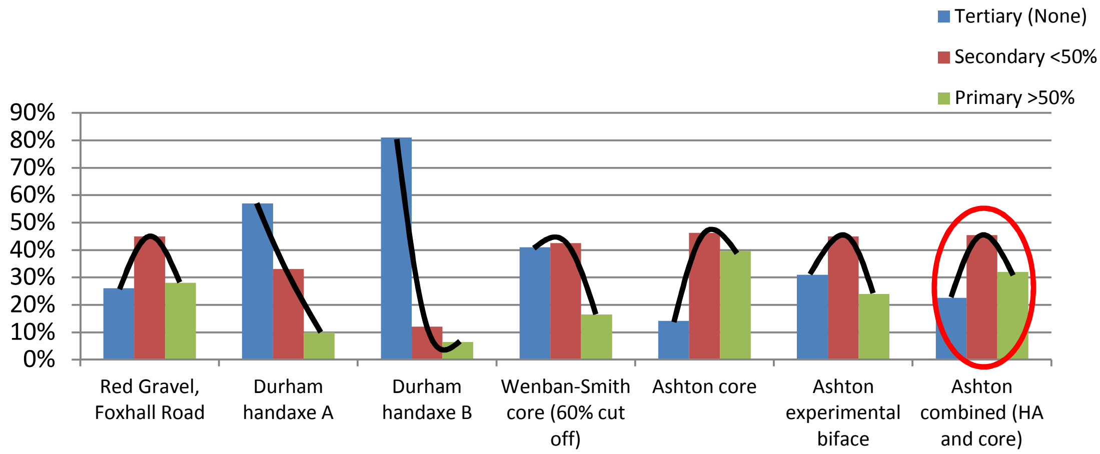


FIGURE 5.96 - COMPARISON OF THE FLAKE SIGNATURE FROM THE RED GRAVEL, FOXHALL ROAD WITH THE EXPERIMENTAL DATASET

A number of other points should be raised when considering the signature for this assemblage. White and Plunkett have suggested that a fluid adaptive strategy was in place, with some artefacts bridging typological distinctions (2004:101). Furthermore there are two types of raw material being utilised for manufacture on site, the local gravel, and a number of large flake blanks which were either imported as ready-made blanks or introduced as nodules, knapped and removed, before turning the blanks into handaxes (2004:100, 119).

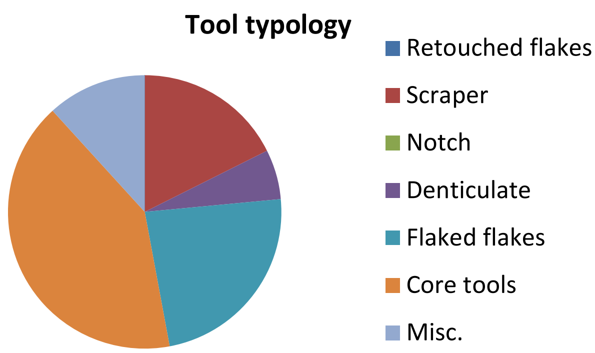


FIGURE 5.97 - TOOL TYPOLOGY FOR THE RED GRAVEL, FOXHALL ROAD

In summary, the assemblage from the Red Gravel at Foxhall Road, whilst containing elements of manufacture for both core and flake and handaxe sequences, appears to be linked to butchery combined with some evidence of heavy duty processing, perhaps of carcasses or wood. In addition, wood and hide-based activities are also indicated in the flake tools (section 2.5) giving a resultant signature which can be compared to Turq's 'mixed strategy' site (Turq in Mellars 1996), but with more focus on activities being undertaken compared to manufacture.

Grey Clay

The assemblage from the Grey Clay is small, made up of only 29 artefacts, however it does represent an *in situ* occupation of short duration and as such the small numbers of artefacts are likely representative of the original activities undertaken here. Unusually, handaxes represent over half of the assemblage (n=19, 66%), with the remainder made up of flakes (n=16, 21%), cores (n=2, 7%), a flake tool (3%) and core tool (3%) (Appendix II; figure 5.98).

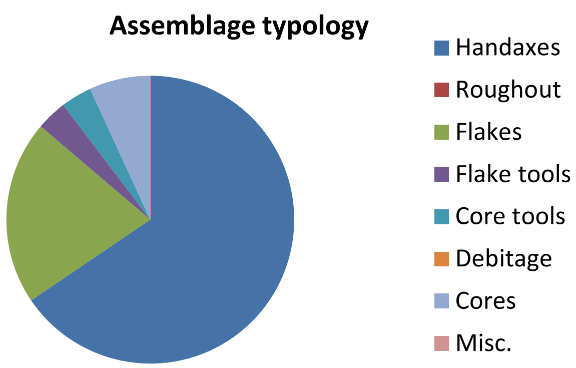


FIGURE 5.98 - ASSEMBLAGE TYPOLOGY FOR THE GREY CLAY AT FOXHALL ROAD

In terms of the chaîne opératoire (table 5.12), some primary manufacture is indicated (cores), with additional hard and soft hammer flaking. However the grey clay lacks evidence of handaxe manufacture, with only a single thinning flake present likely related to later modification, signifying that the handaxes were imported for a specific use. The number of flakes suggest limited working on site, with the finished products (handaxes, flake tool, core tools) representing use in processing or butchery activities.

The overwhelming presence of whole handaxes (there are only two classed as broken) further emphasizes this.

Unfortunately the flake sample size is too small for an assessment of the cortex coverage, and, therefore, no comparison with the experimental dataset has been conducted. Regarding the recovery bias, the Grey Clay was excavated by Layard using the same techniques as the Red Gravel, and given that the clay is a finer burial medium the low artefact numbers seem accurate. Accordingly the six flakes compared to the cores and the large number of handaxes suggests that artefacts were brought into the area as complete tools with the flakes possibly originating from the two cores, linked to the manufacture of the core and flake tool. This is more likely when we consider that the pebble cores are minimally worked (White and Plunkett 2004:101).Furthermore the artefacts are arranged in clusters (*Ibid* 2004:47,93) additionally emphasizing the *in-situ* nature of the assemblage and their relation to specific processing events.

In summary, this assemblage appears to be an ephemeral occupation with fully worked artefacts imported for a specific purpose, linked to butchery and carcass processing, with minimal *in-situ* manufacture. Another interesting point to note is the presence of a hearth or campfire feature (White and Plunkett 2004), which when coupled with the small number of tools suggests a short-stay occupation locale. The signature therefore matches that of Turq's 'episodic' site (Turq in Mellars 1996), with low artefact numbers and specific activities represented.

Percentage of flake types produced by the experimental datasets using a cortex split of 50%	**Tertiary (None)**	**Secondary <50%**	**Primary >50%**
Durham handaxe A	57%	33%	10%
Durham handaxe B	81%	12%	6%
Wenban-Smith core (60% cut off)	41%	43%	17%
Ashton core	14%	46%	40%
Ashton experimental biface	31%	45%	24%
Ashton combined (HA and core)	23%	45%	32%
Area AH, Beeches Pit	37%	31%	32%
Red Gravel, Foxhall Road	26%	45%	28%

TABLE 5.13 - COMPARISON OF THE PROPORTIONS OF FLAKE TYPES PRODUCED BY THE EXPERIMENTAL DATASETS COMPARED TO THAT FROM THE LOWLAND LACUSTRINE SITES

5.5. Plains

5.5.1. Boxgrove

Q1A – 4c – Grassland Plain

The assemblage from Quarry 1, Area A unit 4c totals 322 artefacts and almost entirely comprised of flakes (n=317, 98%), with the remaining 2% made up of handaxes (n=5) (Appendix II; figure 5.100). There are also a large number of artefacts (chips) of less than 20mm in length (Austin et al. 1999:315). Although these are noted in Appendix II, they will not be included in any detail here.

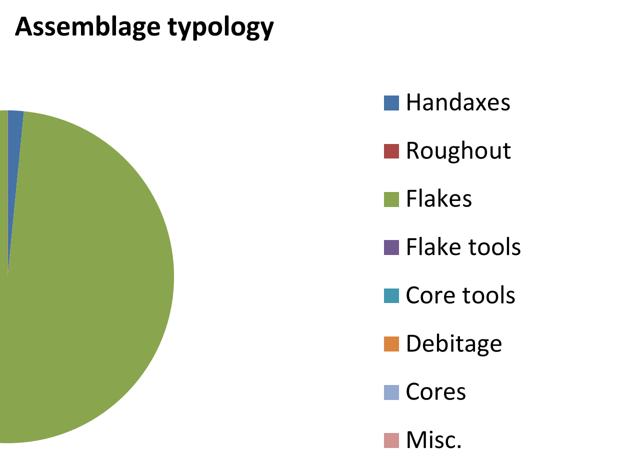


Figure 5.99 - Assemblage typology for Q1A, unit 4c, Boxgrove

Despite there being all stages of a handaxe chaîne opératoire present (table 5.10) (roughing out, thinning and finishing), it has been suggested that the relative proportions of these phases are not what would be expected given the data from experimental reduction sequences (e.g. Newcomer 1971; Bradley and Sampson 1986) cited in the Boxgrove report (Austin et al. 1999:317). Instead the interpretation is that tools were brought in partially worked and the later stages of reduction carried out on site. Five finished tools are also present (handaxes) although these must have been imported for use on site because none of the flakes refit with these tools. Conversely, the tools that produced waste material are not found in the immediate area and were obviously exported out for use elsewhere in the landscape (Austin et al. 1999:319-321).

In terms of the actual artefact numbers, if the assumption is made that all flakes originated from the five handaxes (estimate of 50 flakes each) this gives an average of 250 flakes. Given that the Boxgrove bifaces are well-worked and handaxes can yield upwards of 100 flakes greater than 20mm (current author's observations on the Durham experimental handaxes) then these could be argued to have produced all the flakes present at the site. However, as noted above the lack of refits suggest these materials come from separate sequences.

The available cortex data from the Boxgrove report focuses only on whole flakes (n=124) and for the flake cortex spits the early stage flakes into 50-75% and 75%-100% categories (Austin et al. 1999). To enable comparisons, these have been combined into a single category of >50% cortex. Whilst this doesn't allow us to identify those flakes from the start of manufacture (i.e. wholly cortical) it does allow cortex stages to be compared in the context of this research (i.e. primary, secondary and tertiary, see below). Therefore, using these categories figure 5.101 shows that the majority of flakes (63%, n=78) exhibit no cortex, followed by those with <50% cortex (n=38, 31%) and >50% and wholly cortical flakes (6%, n=8). The overall pattern demonstrates an over-representation of flakes from the latter stages of the chaîne opératoire, as noted above.

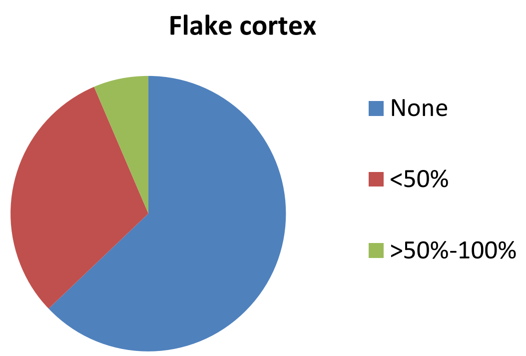


FIGURE 5.100 - FLAKE CORTEX FOR QUARRY 1A, UNIT 4C, BOXGROVE

		Boxgrove			Red Barns
Chaîne opératoire stage	**Present/ absent**	Q1a-4c	Q1B-4c	GTP17	
Raw material procurement	Cores	No	No	Yes	Yes
	Cortical flakes	Yes	Yes	Yes	Yes
	Test Pieces	No	Yes	yes	Yes
Debitage	Partially cortical flakes	Yes	Yes	Yes	Yes
	Non-cortical flakes	Yes	Yes	Yes	Yes
	Debitage	No	No	Yes	Yes
	Chips	Yes	Yes	Yes	Yes
	Hard hammer flakes	Yes	Yes	Yes	Yes
	Soft hammer flakes	Yes	Yes	Yes	Yes
Tool manufacture	Shaping flakes	Yes	Yes	Yes	Yes
	Roughout	No	No	No	Yes
	Thinning flakes	Yes	Yes	Yes	Yes
	Flake tool spall	No	No	No	?
Finished tools	Handaxe	Yes	Yes	Yes	Yes
	Flake tools	No	Yes	One	Yes
	Core tool	No	No	No	No
	Misc.	No	No	No	No
Other indicators	Cut marks	No	No	Yes	No
	Use-wear	No	No	No	No

TABLE 5.14– SUMMARY OF STAGES OF THE CHAÎNE OPÉRATOIRE PRESENT FOR THE ASSEMBLAGES FROM BOXGROVE AND RED BARNS

Moreover, if the flake signature for the Q1/A assemblage is compared to the experimental dataset (figure 5.102), it can be seen that the greatest number of flakes lie in the tertiary category, followed by secondary then primary, creating a triangular profile which is slanted to the right. This pattern is equivalent to that of Durham handaxe A, and corroborates the interpretation of the assemblage as that of handaxe manufacture. The interpretation of the signature as one representing mostly thinning and finishing stages could hold true as the number of primary flakes is very small, however Durham handaxe B also contains a similarly small proportion of primary flakes and that represents a full knapping sequence.

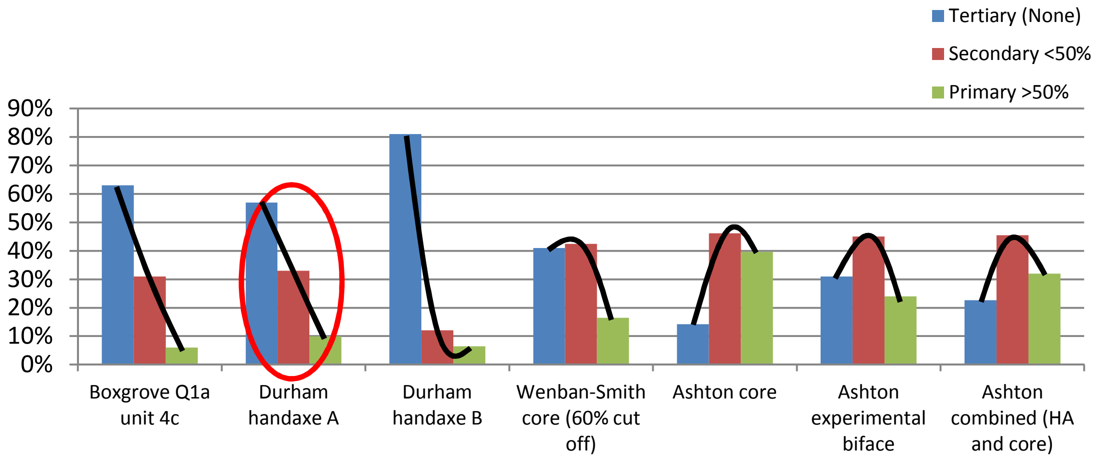


FIGURE 5.101 - COMPARISON OF THE Q1A-UNIT 4C DATA WITH THE EXPERIMENTAL DATASET

There are no flake tools present in this assemblage, however Austin et al. did identify flakes which appeared to have edge damage from being utilised in some form (1999:315), and would also perhaps tie in with a butchery event. This and the presence of the handaxes do indicate the signature may be related to butchery of some kind.

In summary, the signature from Quarry 1, Area A unit 4c represents short-term or multiple short-term occupations where material was introduced partially worked and finished off at this locale before being exported. In addition finished handaxes were also introduced, presumably for use in this area before being discarded. The exchange of implements with both import and export taking place indicates a fluid technological system with highly mobile toolkits. The processing event appears to be short-term and ephemeral focused on a specific activity, falling within the expected signature for Turq's 'ephemeral' site (Turq in Mellars 1996).

Q1B – 4C – WATERHOLE/ SPRING DEPOSIT

The data for the assemblage from Quarry 1 Area B unit 4c is taken from the information contained within the Boxgrove Report (Roberts and Parfitt 1999) rather than from Pope's thesis (2002) as, although the latter contains more recent details of the analysis of the locale, including the distinction of several deposits and associated assemblages which are suggested as being 'equivalent' to unit 4c, the actual specifics of the cortex and typological breakdown are absent. Therefore due to the lack of specific information regarding these 'additional' deposits this research will take the information detailed in Roberts and Parfitt (1999) to use here.

Consequently, the assemblage from Quarry 1 Area B unit 4c at Boxgrove totals 706 pieces over 20mm in length. There are chips (<20mm) present (Austin et al. 1999:343), but the discussion here is constrained to the larger pieces. The majority is made up of flakes (98%, n=689), along with eight handaxes (1%), three hammer stones (<1%, included in miscellaneous category), and four cores (<1%) (Appendix II; figure 5.103), which could viably be classed as tested nodules (noted as such in table 5.10) as they exhibit only one or two removals each (Austin et al. 1999:350). In addition, there appears to be two of what could be termed flake tools, a notched piece and a retouched piece, although in the Boxgrove report they are subsumed into the flake category (*Ibid* 1999:345). Despite the lack of information given these they have been added into this analysis accordingly.

Whilst in a similar situation to Q1/A, the assemblage here contains all stages of handaxe manufacture (roughing out, thinning, finishing), and once again the chaîne opératoire appears to represent the latter stages of manufacture. Nodules are suggested as being roughed out elsewhere, perhaps nearer the cliff line, and introduced for further working in Area B (Austin et al. 1999:348). In addition there are four 'cores' identified, although these only exhibit one or two removals and are elongated in form rather than the more classically shaped nodules one would expect for flake production. Consequently, due to their limited working they have been classed as test pieces. Therefore debitage is mostly the result of the later stages of handaxe manufacture (Austin et al. 1999:348) further indicating the spatially split manufacture sequence in operation at Boxgrove. Indeed the authors compare the proportion of identified roughing out, thinning and finishing flakes with those from studies by Newcomer (1971) and Bradley and Sampson (1986) to suggest that the focus of manufacture was on the latter stages of production and that nodules were mostly introduced partially knapped or decorticated prior to manufacture here (Austin et al. 1999:353).

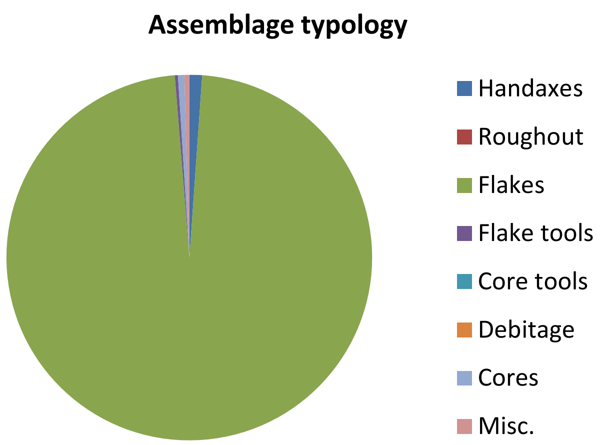


FIGURE 5.102 - ASSEMBLAGE TYPOLOGY FOR Q1B UNIT 4C, BOXGROVE

Moving on, if the assumption is made that all artefacts were manufactured in their entirety on site, then the eight handaxes (estimated 50 flakes each) give an average of 400 flakes. This leaves a total of 289 to be accounted for by the four cores, yet the cores only display one or two removals, which leaves a clear over-representation of flakes. This indicates that handaxes were worked on site and subsequently removed outside the excavated area.

The flake cortex data is taken only from the complete flakes as identified in the Boxgrove report (n=253), and again as with the data for Q1/A (see comments above) the >50% flakes and wholly cortical flakes are combined into a single category. Of the flakes over 50% are non-cortical (58%, n=148), with a further 31% (n=78) represented by <50% cortical surfaces, with the remainder being >50% to wholly cortical flakes (n=27, 11%) (figure 5.104), agreeing with the assessment that later stage working was predominant.

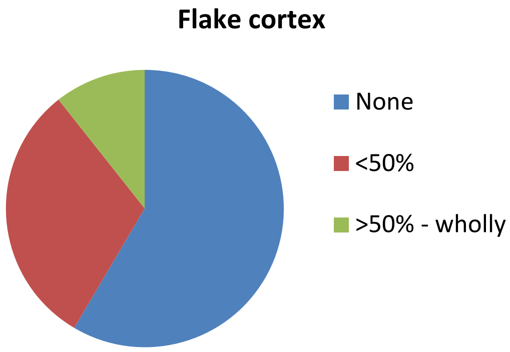


FIGURE 5.103 - FLAKE CORTEX COMPOSITION FOR Q1B UNIT 4C, BOXGROVE

Moreover, the flake signature indicates a predominance of tertiary, followed by secondary and primary, creating a triangular profile, matching almost exactly that shown for Durham handaxe A (figure 5.105). This suggests that although it is possible that the primary stages of manufacture are underrepresented, it is equally probable that the sequence represents full reduction of the bifaces, as in the case of Durham handaxe A. Indeed the Boxgrove bifaces are worked to a similar high state of reduction and finishing as the Durham examples.

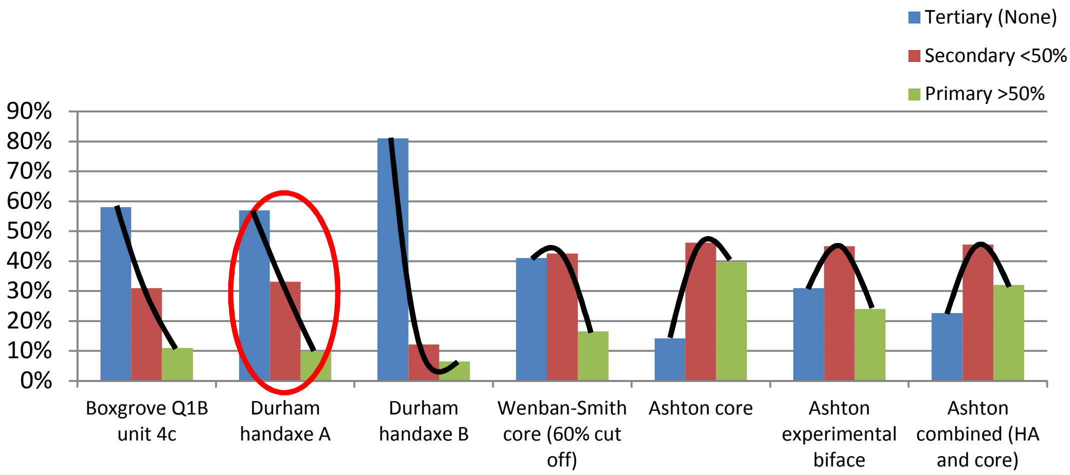


FIGURE 5.104 - COMPARISON OF THE FLAKE SIGNATURE FROM Q1B UNIT 4C, BOXGROVE, WITH THE EXPERIMENTAL DATASET

As discussed above, the presence of two flake tools identified as a notched implement and retouched piece could suggest links to carcass processing or meat procurement (figure 5.106). Although the use-wear results (section 2.5) identify a number of tasks with both tool types, retouched flakes are more commonly associated with carcass-related activities, and notches have been known to be utilised on bone.

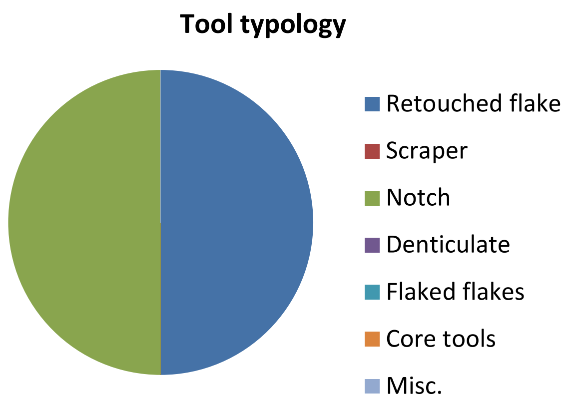


FIGURE 5.105 - TOOL TYPOLOGY FROM Q1B UNIT 4C, BOXGROVE

It is also interesting to note that refitting studies based on patination suggest at least two episodes of artefact manufacture and discard. Furthermore only one of the handaxes demonstrates links to the manufacturing waste through refitting, and again as with Quarry 1/A it suggests that it was imported partially worked for further reduction (Austin et al. 1999:244,245).

In summary, the signature appears to be comparable to that from Quarry 1/A above, with what appears to be a trade in artefacts with some pieces imported partially worked and further reduced on site before being exported. Alongside this is the introduction of finished tools for use on site. Whilst this manufacture and export signature suggests links to Turq's 'extraction and production' site, due to the small assemblage size and lack of primary stage flaking the signature more closely correlates to an 'episodic' site (Turq in Mellars 1996).

The assemblage from GTP17 Unit 4b, the horse butchery site, totals 1797 artefacts. These are broken up into mostly debitage in the form of flakes (n=1781, 99%), followed by cores (n=7, <1%), miscellaneous pieces (percussors) (n=6, <1%), handaxes (n=2, <1%) and a flake tool (n=1) (Appendix II; figure 5.107).

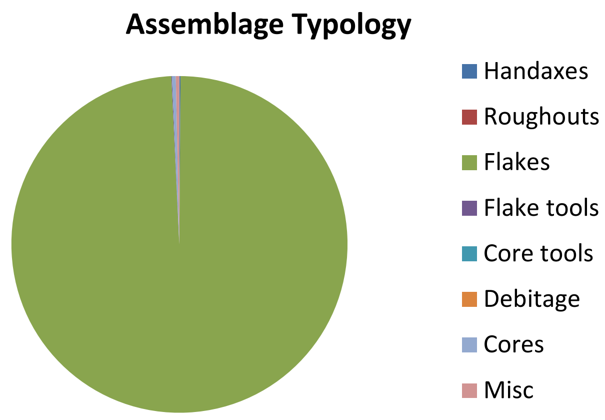


FIGURE 5.106 - TYPOLOGICAL COMPOSITION OF BOXGROVE GTP 17

In terms of the chaîne opératoire (table 5.10), whilst the early stages are represented (cores, test pieces, cortical flakes), these appear be in the form of tested or partially worked nodules aimed at handaxe manufacture, rather than core and flake sequences. Furthermore, despite a lack of roughouts, all stages of biface manufacture are present (partially and non-cortical, hard and soft hammer, debitage, chips, shaping and thinning flakes), however the manufacturing sequences appear disjointed with some nodules or bifaces introduced in various stages of reduction, as well the introduction of finished tools and resultant re-sharpening (Pope 2002:158,162). The only finished tools present are a flake tool (bifacial scraper) and two handaxes. Cut marks are also visible on elements of the horse carcass providing direct evidence of butchery.

There are 1797 flakes, which when compared to the extant cores and bifaces demonstrates a huge over-representation of flakes, suggesting that tools produced on site (i.e. handaxes) were exported after use. Indeed, Pope suggests that after the butchery event, hominins left taking any formally manufactured ovate bifaces and organic soft hammers for use elsewhere (2002:169)

Regarding the flake cortex, the values or breakdown of the cortex is not presented in any of the published works. However some information can be gathered from Pope's thesis. Here GTP 17 is discussed and the more complete flakes split into three categories. Firstly are what Pope terms 'primary flakes' (from the roughing-out stages, demonstrating wholly cortical faces and hard hammer percussion), although within this category there is a "small number of flakes with one or two dorsal scars but clearly derived from the same part of the reduction sequence" (2002). This category therefore can be equated with the primary flakes discussed in the methodology here, which comprise wholly cortical and those with >50% cortex. Secondly Pope identified a category he terms 'secondary flake', which originate from the later stages of biface reduction. Here these are defined as being "largely, but not exclusively" non-cortical (Pope 2002). Therefore these can approximately be equated with the 'tertiary flake' group used here. The remainder of the flakes are indeterminate, presumably with those that are not wholly cortical or non-cortical. Therefore, although there are conceivably flakes in this category that would usually be placed in the tertiary or primary groups this should give an approximate estimate of the secondary flakes (<50% cortex) present at the site. Therefore, with this borne in mind the numbers for these flakes will be taken as that for the secondary flake category here (figure 5.108).

Therefore, as can be seen from figure 5.108, based on this the flake signature for GTP 17 demonstrates a predominance of secondary flakes, followed by smaller numbers of tertiary and primary. Whilst the approximations discussed above may serve to create an over-representation of flakes in the secondary category, nevertheless the pattern is bell-shaped. This links in with the suggestion that hominins were roughing out nodules nearer the cliff line, then importing the partially worked nodules to the site for further manufacture (Pope 2002:169). The closest signature from the experimental dataset in terms of the shape of the distribution is that of Ashton's biface, with similar proportions of tertiary compared to primary flakes (figure 5.108). This pattern stands out from the others at Boxgrove (see above), and demonstrates the segmented nature of the operational sequences being conducted in this landscape.

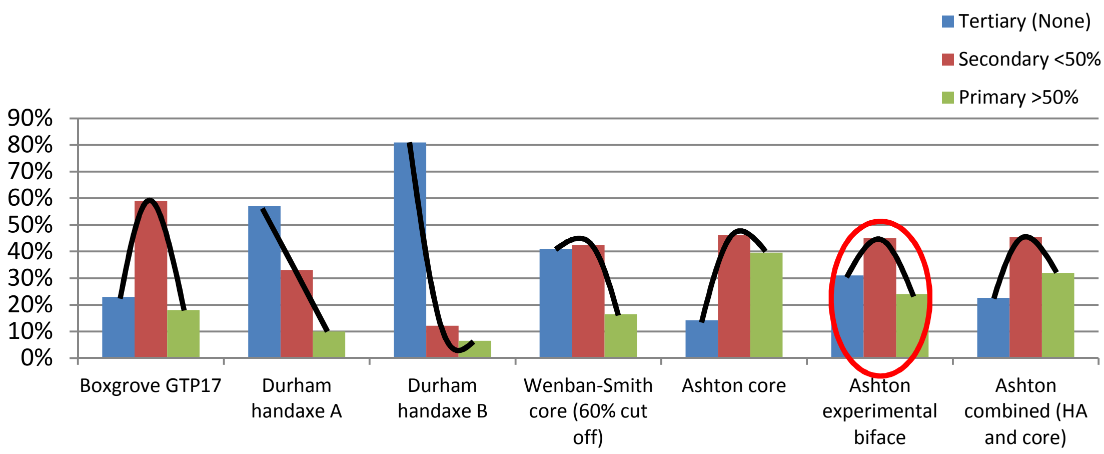


FIGURE 5.107 - COMPARISON OF GTP17 FLAKE SIGNATURES WITH THE EXPERIMENTAL SAMPLE

In summary, the site represents a short-term occupation related to the butchery of a horse carcass, and resultant introduction of partially reduced nodules, from the raw material source located at the nearby cliff line. These were worked on site with the aim of producing tools for immediate use in the butchery event. Additionally, complete tools were also introduced, used and exported with the majority of finished artefacts. The signature matches that of Turq's 'episodic locale' (in Mellars 1996) focused on procuring particular resources via a short-term occupation.

5.5.2. Red Barns

Grey Loam - Hillside

The assemblage from Red Barns totals 6631 artefacts, of which nearly 100% is debitage (n=6596). This large percentage is due to the fracturing properties of the raw material, as discussed below and in section 4.9. The frost fractures create weaknesses in the flint, resulting in more debitage than would usually be expected (Wenban-Smith et al. 2000:224). Additionally, 3472 artefacts in this debitage category measure <20mm and are classed as chips and spalls. The remaining 32 pieces from the assemblage are made up of flake tools (n=5), handaxes (n=18), roughouts (=5), cores (n=4) and miscellaneous artefacts (n=4) (all representing <1%) (Appendix II; figure 5.109).

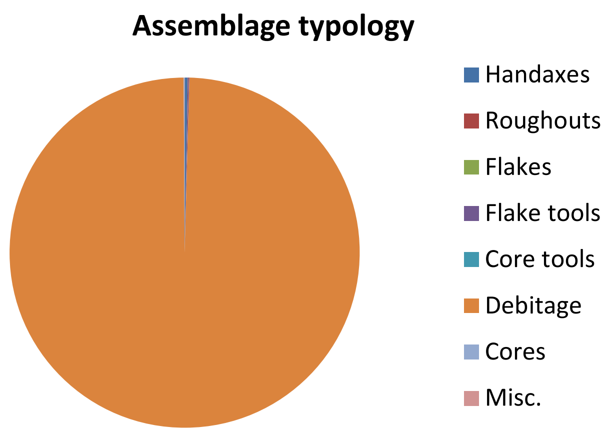


FIGURE 5.108 - ASSEMBLAGE TYPOLOGY FOR THE GREY LOAM, RED BARNS

Regarding the chaîne opératoire, both core and flake working and handaxe manufacture are represented, from primary working (cores, roughouts, test pieces, percussors) through to further reduction (partial and non-cortical hard and soft hammer flakes, debitage, chips, shaping and thinning flakes), including the production of finished tools (handaxes, flake tools) (table 5.10). However, despite the presence of a core and flake sequence the predominant chaîne opératoire at Red Barns is that of handaxes. Indeed both cores and flake tools are rare in the assemblage (Wenban-Smith et al. 2000:227), indicating limited consideration by the hominins utilising the locale.

In terms of actual artefact numbers, the 18 handaxes (50 flakes each) added to the roughouts (n = 5; 10 flakes each) could have produced an estimated 950 flakes. If only the artefacts over 20mm in length are taken into account this leaves over 2000 flakes and pieces of debitage which are certainly not accounted for by the remaining four cores and tested pieces. Whilst this could be related to the frost fracturing, as mentioned above, it is unlikely to account for such a large bias. In addition, the remaining handaxes are noted as being small with many displaying limited working (Wenban-Smith et al. 2000:239). Consequently a number of handaxes do appear to have been manufactured on site and exported out for use elsewhere.

The flake cortex data for Red Barns is presented in the site report divided into categories based on 20% intervals. Therefore, to aid compatibility the data presented here has been grouped into non-cortical, <60% cortex and >60% cortex (there being no split at 50%). However, investigations carried out and detailed in section 2.5 regarding the applicability of comparing data split at 60% and those with the split occurring at 50% demonstrates that it does not greatly alter the results. Consequently, this data can feasibly be compared with both the experimental dataset and the results from the other sites. In addition, there is no wholly cortical category in the site report as these are subsumed within the 80-100% category, however this data does provide us with an overall impression of the flake cortex for the assemblage. Overall there are low numbers of flakes exhibiting cortex >60% (16%, n=125), these are followed by greater numbers of <60% cortex (38%, n=302) and non-cortical flakes (n=373, 47%) (figure 5.110).

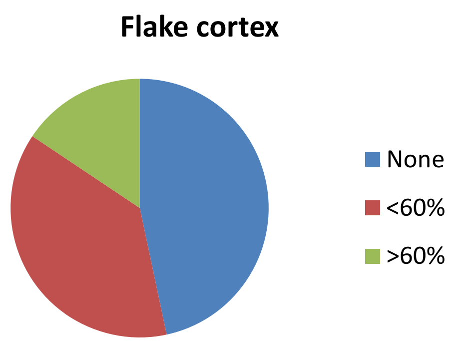


FIGURE 5.109 - FLAKE CORTEX DATA FOR THE GREY LOAM AT RED BARNS

The flake signature from Red Barns displays a predominance of tertiary flakes, followed by secondary then primary forming a triangular profile. This pattern matches the forms displayed by the Durham handaxes (figure 5.111), however the archaeological sample demonstrates a smaller proportion of tertiary flakes and higher secondary and primary than the experimental dataset. This could be linked, as Wenban-Smith et al. suggest, to the nature of the raw material, which would have produced a number of 'false starts' (2000:239), creating an increase in flakes exhibiting cortex, as hominins may have had to select a number of nodules to locate one that could carry the knapping process through to the end.

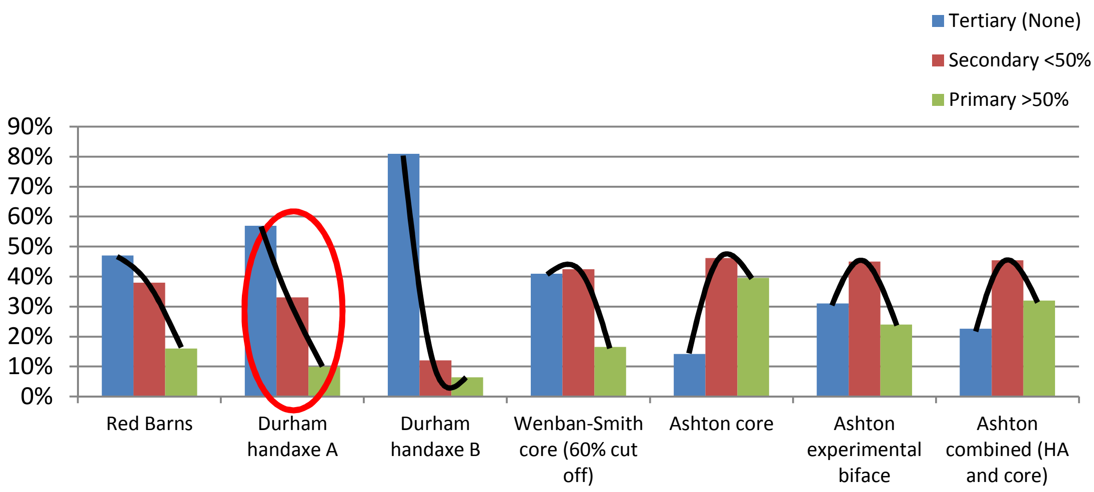


FIGURE 5.110 - COMPARISON OF THE RED BARNS FLAKE SIGNATURE WITH THE EXPERIMENTAL DATASET

In terms of the limited flake tools, they appear not to be formalised types, with *ad-hoc* retouch applied to the edges. The interpretation offered by the site report is of scraping and sawing activities based on the retouch angle and edge position (Wenban-Smith et al. 2000:227,233). Due to the lack of formality the tools are classed purely as retouched flakes for the purposes of this study.

The manufacture and export of handaxes is interesting in light of the position of Red Barns in the wider landscape. The site is located on the side of Ports Down Hill, and with the prevailing environment suggested as being open grassland, would have provided wide views over the landscape (Wenban-Smith et al. 2000:240), enabling hominins to track game and prepare hunting forays. This then could be interpreted as a tooling up location (Wenban-Smith et al. 2000:251).

In summary, Red Barns is centred on the manufacture and export of handaxes, with the occasional production of flakes and *ad-hoc* manufacture of flake tools to meet immediate needs. This perhaps links to the presence of horse bones and possible carcass processing activities suggested by the flake tools. The pattern indicates a site closely matching Turq's 'extraction and production' sites were tools are manufactured for export (in Mellars 1996).

In summary (table 5.11), the upland sites are split between those representing 'mixed strategy' are Westcliffe, Wood Hill and Malmains 1 from Kent, and Caddington, Round

Green and Whipsnade from the Chilterns. The remainder are split between an ‘ephemeral/ episodic’ locale at Malmains 2 (Kent) and sites focused more on resource extraction (Gaddesden Row and Green Lane Whitfield) likely centred on carcass procurement and processing.

In terms of the lowland sites, a mixture is again represented. The riverine sites representing ‘mixed strategy’ locations are Barnham Areas I and IV, High Lodge (Beds C2, D E), and the Lower Industry at Hoxne, although the Upper Industry exhibits both a ‘mixed’ signature coupled with exploitation of resources. The ‘ephemeral’ sites are represented by Barnham Area III, High Lodge (Bed C1), whilst Jaywick Sands at Clacton, Barnham Area V and Swanscombe’s Lower Loam and Lower Middle Gravel exhibit aspects of both episodic and extractive sites. Finally, sites focused on the exploitation of particular resources include the Golf Course and Lion Point at Clacton, Elveden Area I and III and the Lower Gravel at Swanscombe.

The lacustrine sites are split between Beeches Pit Area AH (extraction/ production), Foxhall Road’s Red Gravel (mixed) and Grey Clay (ephemeral). In contrast the sites located in grassland environments appear to be mostly ephemeral/ episodic in the case of Boxgrove, coupled with the extraction and exportation demonstrated at Red Barns.

TABLE 5.15 - SUMMARY OF SITE DESIGNATIONS. MORE DETAILED INFORMATION CAN BE FOUND IN THE SUMMARY TABLE IN APPENDIX III

Site	Location	Designation
Malmains 1	Pond	Manufacture, imported handaxes, mixed tool component but biased carcass. 'Mixed strategy'
Malmains 2	Pond	Ephemeral, general maintenance activities focus carcass processing/ butchery.
Caddington	Pond	Primary manufacture, use of handaxes and flake tools – mixed strategy site
Gaddesden Row	Pond	Butchery signature, resource procurement site ' episodic/ extractive'
Round Green	Pond	Manufacture and import of tools, focus butchery and carcass processing, but also mixed wood as well – 'mixed strategy'
Whipsnade	Pond	Mixed strategy, manufacture and use
Barnham Area I	Riverine	Raw material procurement and the manufacture and use of tools on site, with general subsistence activities wood slant 'mixed strategy'
Barnham Area III	Riverine	Ephemeral, tools imported, discarded on site – general subsistence
Barnham Area IV(4)	Riverine	Manufacture location related to butchery, production of bifaces and scrapers, subsistence activities
Barnham Area V	Riverine	Ephemeral, raw material imported to produce artefacts for specific task, possibly flake tool production. Which is then exported.
Clacton-On-Sea, Golf Course	Riverine channel	Manufacture location, but with a focus on the earlier stages of reduction, with the movement of cores in and out of the site, similar to Turq's designation of 'extraction and exploitation' site – production of flake tools – mixed tool signature.
Clacton-on-Sea, Jaywick	Riverine channels	Import partially worked cores, further reduced on site to produce flaked flakes, used and discarded. 'episodic' site.
Clacton-on-Sea, Lion Point	Riverine channels	Cores imported for manufacture of tools (flaked flakes) for use on site.
Elveden Area I	Riverine channels	Selection and manufacture nodules, HA and cores. General subsistence activities= flake tools. 'Extraction and production'.
Elveden Area III	Riverine channels	Selection and manufacture of nodules, production HA's and flake tools. General subsistence = flake tools, export HA's. 'Extraction and production'
High Lodge Beds C2, D, E	Riverine floodplain	Selection and manufacture nodules, production of flake tools for specific tasks 'mixed'
High Lodge Bed C1	Riverine floodplain	'Ephemeral/ episodic' Procurement and manufacture cores. Tools subsistence-based. Short-stay.

Site	Location	Designation
Hoxne, Lower Industry	Riverine, channels	Raw material procurement and manufacture locale, producing flake tools to meet an *ad-hoc* general subsistence need. Production and use of handaxes in likely butchery or carcass processing events. ‘mixed strategy’
Hoxne, Upper industry	Riverine, Floodplain	Procurement and manufacture locale with focus on flake tool activities with butchery/ carcass slant. ‘mixed strategy/ exploitation’
Swanscombe, Lower Gravel	Riverine, channels	Import and export cores, manufacture flake tools and use in wood procurement activities. ‘extractive/ episodic site’
Swanscombe, Lower Loam	Riverine, channels	Manufacture tools on site and possible export of these. Extant tools = subsistence activities. Opportunistic butchery and export of meat and flake tools. ‘ephemeral’ episodic’
Swanscombe, Lower Middle Gravel	Riverine, channels	‘Ephemeral, episodic’ occupation, primary manufacture, imported HA’s. Subsistence related butchery and wood procurement.
Beeches Pit AH	Spring/ pond	Procurement and manufacture locale, cores and HA’s, export partially worked, imported complete HA’s. ‘Extraction and production’. General subsistence activities wood focus.
Foxhall Road, Red Gravel	Lacustrine	Manufacture, import cores/ handaxes, butchery/ carcass processing + heavy duty component ‘mixed’
Foxhall Road, Grey Clay	Lacustrine	‘Ephemeral, episodic’ Some in-situ manufacture, most tools imported. Butchery/ carcass focus. Hearth.
Boxgrove, Q1/A unit 4c	Grassland plain	‘Ephemeral’, material brought in worked and exported – butchery event.
Boxgrove Q1/B unit 4c	Plains, spring deposits	‘Episodic’ import decorticated nodules for further reduction, import finished articles, export HA’s Butchery.
Boxgrove, GTP17	Plains	‘Episodic’, short-term butchery event, import reduction and export HA’s. Resource procurement.
Red Barns	Hillside plains	‘Extraction and production’ focus manufacture and export HA’s. *Ad-hoc* production flake tools for general subsistence activities, tooling up locale.

Chapter 6 – Integration of an experimental GIS Approach

6.1. Introduction

The implementation of GIS (Geographical Information Systems) within archaeological contexts has gained momentum during the last 20 years, with three main areas adopting the techniques: Cultural Resource Management, management of archaeological data (e.g. excavations) and landscape archaeology (Vermeulen 2001:9). The latter application is considered as one of the techniques' main strengths, providing a strong set of tools with which to collect, analyse and manipulate a wide variety of data (Green 1990).

The spatial information contained within landscapes makes GIS an ideal tool with which to investigate the interplay between humans and their environment. For example, the analysis sites and artefact distributions within the context of the geographical surface of a region (e.g. landforms, soils, hydrology, bedrock) provides an easier and clearer way to visualise and elucidate patterns (Crumley and Marquard 1990; Kvamme 1995). It offers a way to manipulate large amounts of data that would otherwise be impractical to incorporate (Lake et al. 1998:27), allowing the user to model behaviour and use new techniques to approach questions. Examples of such studies include modelling environmental changes (Spikins 2000), characterising landscapes on regional scales (Kvamme 1995:8), retro-modelling of landscape dynamics (Gillings 1995) and site location modelling (Espa et al. 2006). More basic (mapping) applications include artefact distributions (Schofield 1995:111) and settlement patterning (e.g. Bauer et al. 2004), to which can be added another level of complexity when combined with agent-based simulations to model a variety of scenarios (Itami and Gimblett 2001). GIS thus provides a way of integrating sites within their landscape, allowing a better understanding of their position and context, helping to move away from the idea of isolated points (Lock 1998 in Vermeulen 2001:9) or interconnecting nodes, to situating them within a dynamic backdrop of interplaying factors.

Some, however, have criticised the application of GIS. Concerns have been raised regarding the emphasis placed on the physical aspects of the landscape and the potential for environmental determinism to shape interpretations, with limited consideration of cultural constraints, interpretative approaches and the integration of theory (Vermeulen 2001:11,13; Limp 1997 in Vermeulen 2001:13; Llobera 2007). Most of these, however, are theoretical or even philosophical concerns, and recent research is more focused on addressing these issues, for example perception in viewsheds (Frieman and Gillings 2007).

Many GIS applications focus on historical or monumental case studies, although a number of interesting studies have recently been carried out on prehistoric mobility in the landscape (e.g. Howey 2011; Surface-Evans 2009). Until recently, though, there has been little application of the technique to Palaeolithic case studies, with the integration of GIS being rather slow. On the one hand, with its ability to reconstruct and analyse the physical landscape GIS provides a lot of scope for such studies. On the other, its reliance on the accurate modelling of past landscapes (especially tree cover in areas such as viewsheds, see discussion below), which the large time frames and large-scale glacial remodelling in certain areas makes difficult, hinders wider scale application. Despite this, use of the technique has been steadily growing over the past decade, with applications ranging from spatial modelling of regional landscapes (Hosfield 1999), neanderthal landscapes (Davies 2005), site distributions (Kamermans and Rensink 1999; Van Leusen 1993), and more recently site location preferences (Garcia 2013), Middle Palaeolithic raw material selection (Browne and Wilson 2013) and viewsheds (Garcia-Moreno 2013; Diez-Martîn et al. 2008: Figure 21, p130).

GIS as a technique, has in the past been seen as providing answers to questions (e.g. predicting the location of prehistoric sites, or determining why sites were situated where they are), however its strength rather lies in its ability to test hypotheses, and assist in formulating questions to ask of the data (Woodman and Woodward 2002:22). It is most reliable and powerful when combined within a multi-stranded archaeological analysis, as one component in an array of data to be considered (Williams et al. 1990:269). Therefore, in essence it should act as a positive feedback system, whereby questions are developed primarily through the archaeological data, aspects of these are tested or explored through GIS, which therefore informs more focused questions to feed back into the archaeological investigation. This then is the aim of using GIS in this context. It is not the purpose of this approach to create definite answers, but rather to be used in a way that explores concepts and ideas, and is essentially experimental (see below). As Fisher notes, provided this is viewed as the investigation of possibilities (1999:10) rather than certainties, that we remember the models prove nothing, rather give us the freedom to think and test theories (Zimmerman 1978:28), then the techniques are extremely beneficial.

6.2. Implementation of GIS within a Palaeolithic landscape context

This thesis focuses on questions about hominin use and exploitation of the landscape, and more specifically the types of activities that were conducted at particular locations. Due to difficulties relating to establishing landscape settings for sites forming in more dynamic contexts such as river valleys (Stern 2008:369), the models developed within this study are applied only to the higher level sites. The nature of the two upland landscapes selected (the Chilterns and Kent Downs), means that although they have almost certainly been affected by periglacial disturbance the overall configuration of the landscape is preserved. This makes them suitable for such an approach, and it was felt that GIS allowed a clearer, wider picture of the hominin landscapes to be formed, giving additional insights into sites which have limited lines of evidence apart from stone tools. Indeed, the role of the physical landscape in hominin site choice and questions over cultural development avoid the criticisms discussed above. Whilst the relationship between site presence and environmental variables cannot be argued to be a simple one (Warren 1990a in Woodman and Woodward 2002), it is less complex in earlier periods due to the nature of occupation and behaviour. Therefore the environment surrounding a site can be argued, in the case of these earlier occupations, to be a vital consideration in the location of a site. Consequently, GIS is used here as an experimental technique to explore the landscape settings of the sites in question. This methodological technique combined with the more traditional artefact analysis will be a strong combination in terms of allowing the landscape position to be analysed and discussed and resultant interpretations fed back into the assemblage analysis, aimed at providing a clearer picture of site use.

6.3. LOCATION OF THE STUDY AREAS

The basemaps which have been used throughout this study were created from DTM (Digital Terrain Model) data (OS land-form profile 1:10000 DTM) downloaded from Edina Digimap (Web 2 - digimap.edina.ac.uk/digimap/home). The raw data was converted from NTF format through MapManager into an ESRI grid, and the individual tiles combined to produce a single layer using the Union of Inputs function in the ArcGIS Toolbox. The DTM is displayed as a grayscale image, overlain by a coloured raster TIN to provide a more visually accurate depiction of the sites. The overlying layers are then added to this. These include shapefiles for the location of both the main and small sites, based on National Grid references found in the relevant publications (chapter 3). These were then converted into x-y coordinates through a coordinate website converter (Web 3) to georeference them with the underlying layers. Additional shapefiles were digitised from an OS 1:50000 scale colour raster map for Luton and the main rivers, which was again obtained from Edina (Web 2). These layers form the basis of most of the analyses and maps created in this research. The general location of the sites is discussed below.

6.3.1. CHILTERN STUDY AREA

As can be seen from figure 6.1, the sites form two clusters, with the addition of Gaddesden Row positioned in isolation in the upper reaches of the valley of the Gade, and the smaller site of Slip End located on the plateaus between the Lea and the Ver. The first cluster includes the large assemblage of Round Green, situated on the plateaus surrounding the present day town of Luton, above the River Lea. This site is set close to the scarp edge and lowland plain to the north east of Luton. The smaller sites of Ramridge End and Mixies Hill are located close by on the plateau edge. The second grouping includes the main sites of Caddington, Whipsnade, and the smaller occurrence of Kensworth, spaced around the heads of the dry valley tributaries of the River Ver. This latter cluster is sited close to the present day source of the Ver, on the surrounding plateaus. Therefore all eight sites are clustered in the upper reaches of the dip slope and are grouped around the headwaters of the main valleys (figure 6.2), except Slip End which although situated between two dry valleys is located mid-way between the Lea and the Ver valleys.

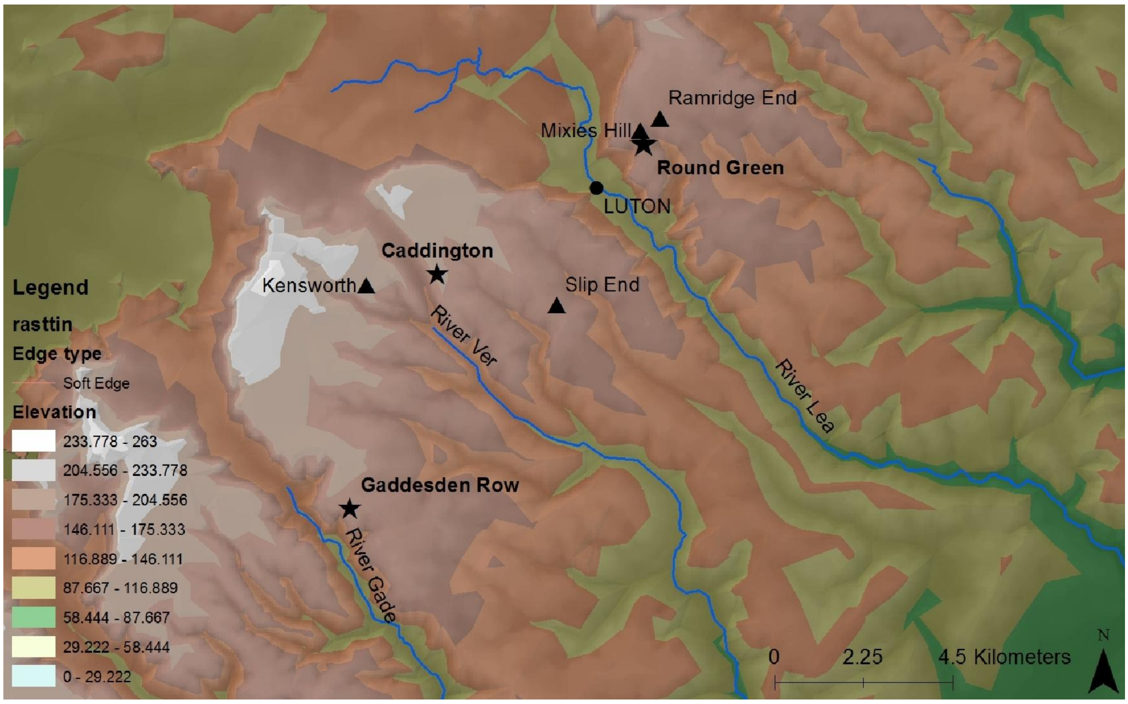


FIGURE 0.1 - MAP SHOWING GENERAL LOCATION OF BOTH THE MAIN (STARS) AND SMALL (TRIANGLE) CHILTERN SITES IN RELATION TO THE TOPOGRAPHIC STRUCTURE OF THE REGION AND POSITION OF THE RIVERS.

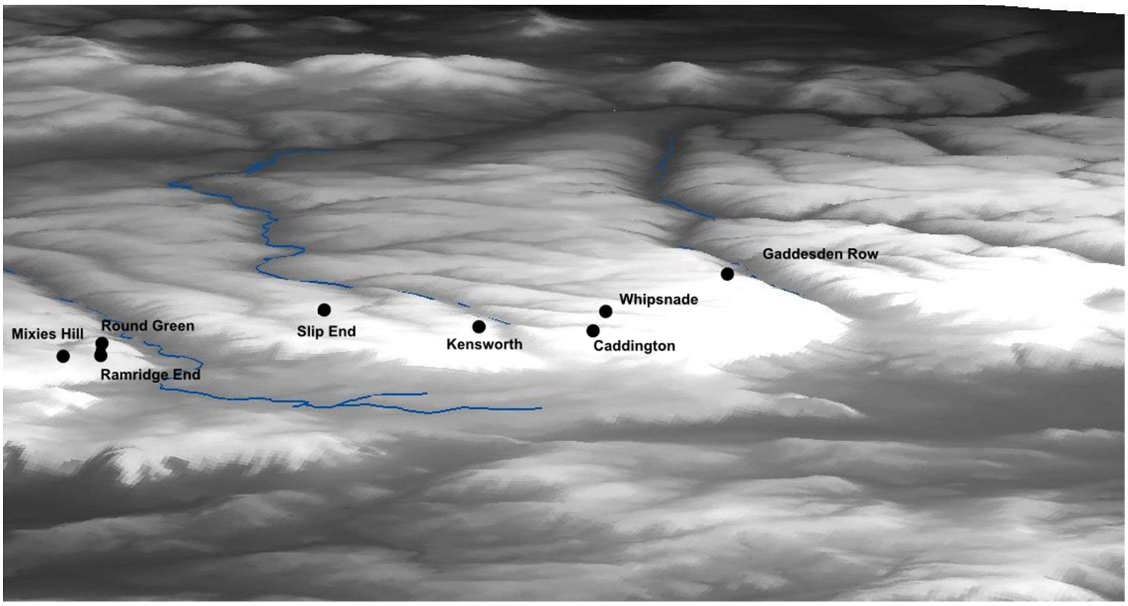


FIGURE 0.2 - MAP SHOWING 3D LOCATION OF CHILTERN SITES IN THEIR TOPOGRAPHIC POSITIONS

Additionally the presence of the dry valley network is an interesting point of note, as none of the sites are located far from this network (figure 6.3). Whilst it is arguable as to whether these features were present or indeed functioning as drainage networks at the time of hominin occupation, it can be argued that their likely formation, down cutting through the permafrost (see discussion in section 3.2) means it is likely that they were present in some form at the time of occupation, and could therefore have acted as routeways through the landscape. Indeed, if this was the case, instead of acting as an outlier, Slip End falls in line with the rest, in terms of its landscape context.

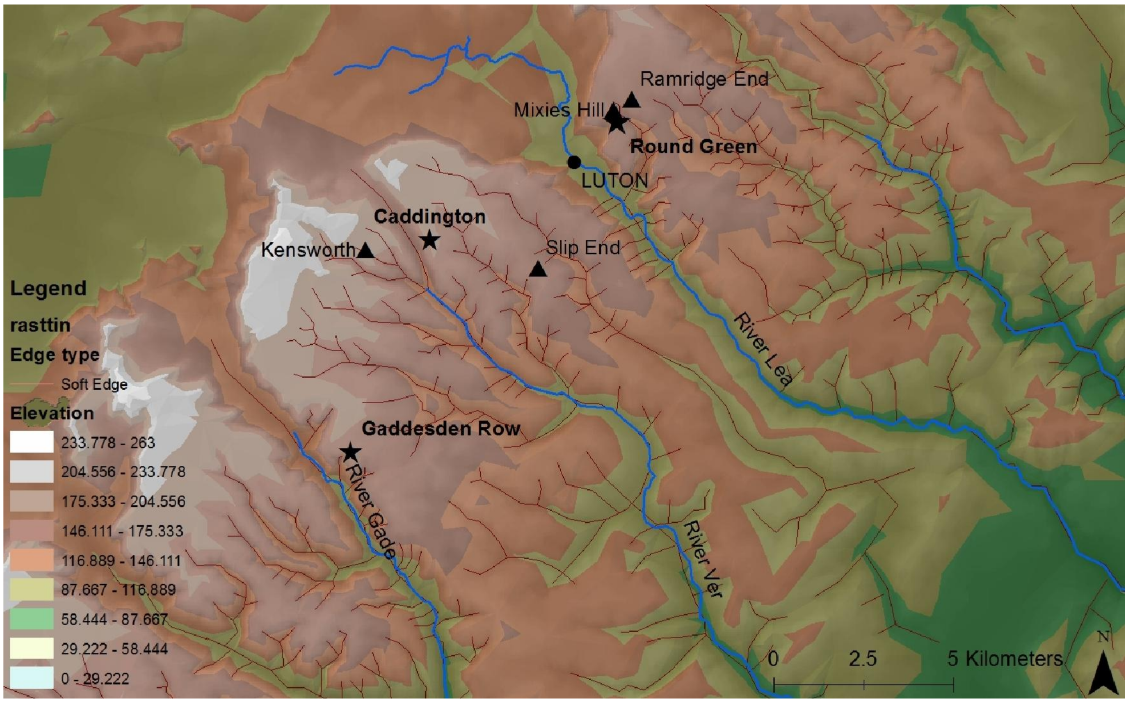


FIGURE 0.3 - MAP SHOWING LOCATION OF DRY VALLEYS AND SITES IN THE CHILTERNS (DRY VALLEYS SHOWN IN BROWN; MAIN SITES DESIGNATURE BY STARS, SMALL SITES BY TRIANGLES)

6.3.2. Kent Downs

The main sites from Kent are also clustered into three groups, although here they are defined by location on the dry valley interfluves (figure 6.4). In a similar situation to Gaddesden Row, the site of Green Lane, Whitfield is situated on its own on the plateau edge next to the valley where the current River Dour runs. If this was a river course during the Palaeolithic occupation of the area, it would have provided good access to the coastal plain. Wood Hill and Westcliffe are located to the east and north-east and are grouped together on the same chalk ridge between two dry valleys, with Wood Hill situated further down the dip slope closer to the lower ground. The final set of sites, Malmains 1 and 2, are also positioned on a chalk ridge but in closer proximity to each other than Westcliffe and Wood Hill, with both these sites located in the upper reaches of the dry valley network (figure 6.4).

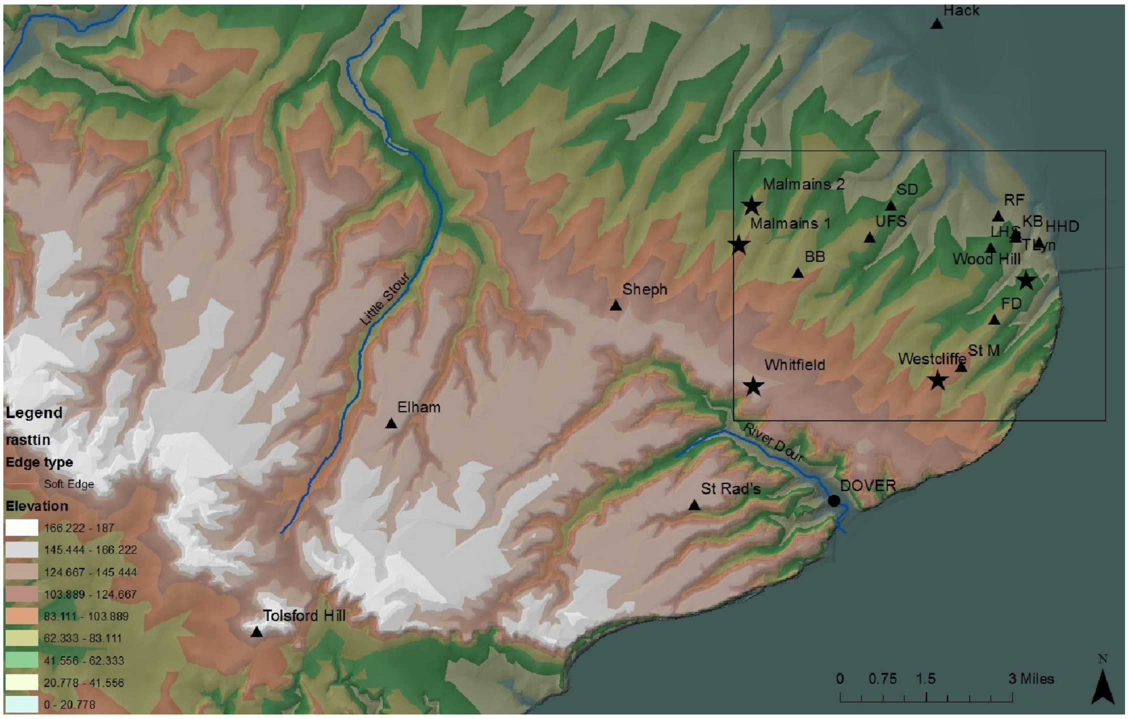


FIGURE 0.4 - MAP SHOWING THE LOCATION OF THE MAIN (BLACK STARS) AND SMALLER (BLACK TRIANGLE) KENT SITES AND TOPOGRAPHIC FEATURES OF THE REGION INCLUDING THE DRY VALLEY NETWORK (BROWN LINES). KEY: SHEPH – SHEPHERDSWELL; ST M – ST. MARGARET'S; BB – BROOME BUNGALOWS; UFS – UPPER FARM SUTTON; SD – SUTTON DOWNS; LHS – LADY HAMILTON'S SEAT; RF – RIPPLE FIELD; KB – KNIGHT'S BOTTOM; TLYN – THE LYNCH; HHD – HAWKSHILL DOWN; FD – FREEDOWN; HACK – HACKLINGE.

In addition to these larger artefact occurrences there are a number of smaller sites which have been identified by the Dover Archaeological Group and in publications (e.g. Tolsford Hill, Hartley 2004) (figure 6.4 and 6.5). The main concentration of sites is to be found on the lower reaches of the dry valley network and the lower ground around Wood Hill. These are sites situated between 20mOD to 104mOD. The remaining sites comprise Hacklinge to the north, located below 20mOD and a group of sites on the higher plateaus which include Green Lane, Shepherdswell, St. Rad's and Elham, all over 103mOD. To this can also be added Tolsford Hill, which is located to the south-west of the study region, right on the scarp edge overlooking the lowland plain. This pattern of smaller sites on the lower ground could indicate a focus for ephemeral resource acquisition activities, located away from the main occupation areas on the higher plateaus and dip slope.

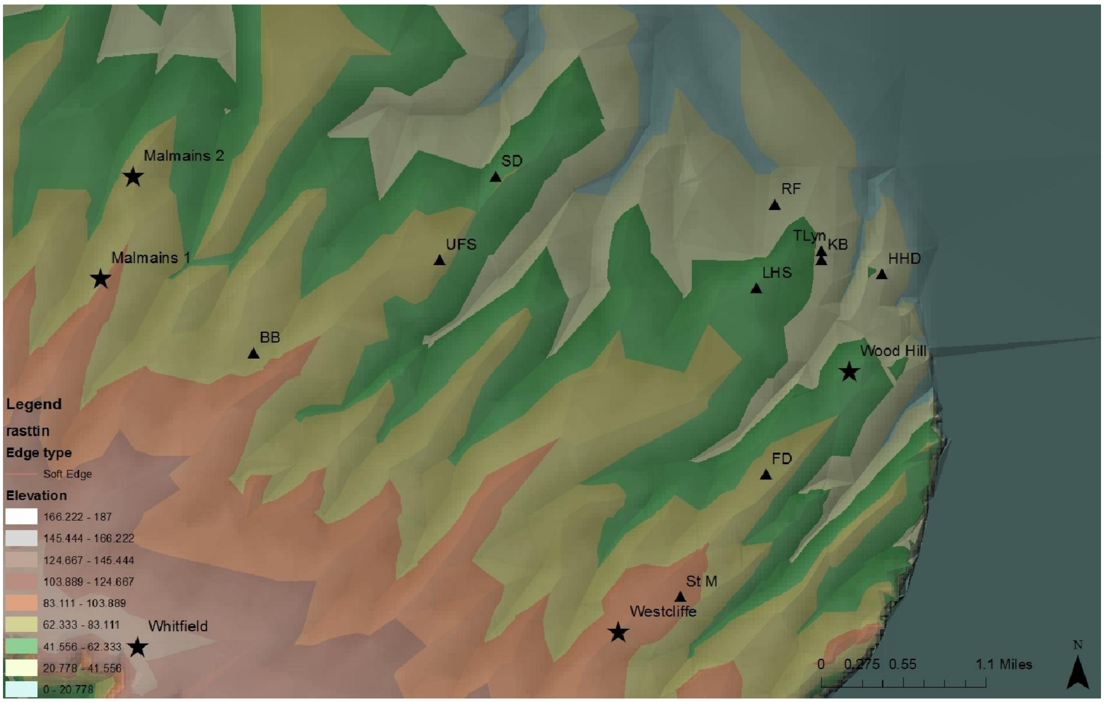


FIGURE 0.5 - CLOSE UP OF HIGHLIGHTED AREA ON FIGURE 6.4 - CLUSTER OF SMALL SITES. KEY: ST M – ST. MARGARET'S; BB – BROOME BUNGALOWS; UFS – UPPER FARM SUTTON; SD – SUTTON DOWNS; LHS – LADY HAMILTON'S SEAT; RF – RIPPLE FIELD; KB – KNIGHT'S BOTTOM; TLYN – THE LYNCH; HHD – HAWKSHILL DOWN; FD – FREEDOWN;

In terms of the clustering of sites (figure 6.4 and 6.5), the main group, as mentioned above, is located close to Wood Hill, and includes Hawkshill Down, Freedown, The Lynch, Knights Bottom, Ripple Field and Lady Hamilton's Seat. At similar heights on the dip slope but to the west of this group are Sutton Downs and Upper Farm Sutton, sited on the same dry valley interfluve, with Broome Bungalow higher up but on the same ridge at the head of the nearby dry valley. St. Margaret's is positioned in the upper reaches of the dry valley network, close to Westcliffe. The remaining sites, those on the plateaus (with the exception of Hacklinge on the lowland plain), give the appearance of outliers to the main concentration, all set in isolation. Elham sits between the Little Stour River and an incised dry valley on the top of the dip slope. In a similar position but to the east is St. Rad's, next to a deep dry valley which leads into the valley of the Dour. Shepherdswell stands midway between the Little Stour and the River Dour valleys, on the plateaus above the upper reaches of a dry valley. This is interesting because it is located at the only place where the plateau continues unhindered, forming a bridge between the main area of occupation and the land to the south-west, banded by the Little Stour and Dour rivers. Tolsford Hill however stands out as being sited right on the scarp edge overlooking the lowland plain. Again, as noted for the Chilterns, no site, with the exception of Tolsford Hill, is located far from the dry valley network and whilst it cannot be proved that these were evident at the time of occupation, their mode of formation (run off over permafrost) makes it highly possible. If this is the case they would have provided an easily navigable set of routeways through the landscape.

6.4. In the eye of the beholder: viewshed analysis in an upland context

6.4.1. Introduction and critique (or the applicability of a Sheppey)

"Sheppey (n). Measure of distance (equal to approximately seven eighths of a mile), defined as the closest distance at which a sheep remains picturesque (Adams and Lloyd 1983;122)." Taken from Gillings and Wheatley 2001. Pp.33.

One aspect that has been at the forefront of GIS studies for a number of years is viewshed analysis. This is especially so with visibility being considered as an important factor in the choice of location for many sites, being not only immediately applicable (e.g. site set into the backdrop of a landscape) but related to wider landscapes, taking account of not only natural features, but perhaps relating to earlier sites as well (Gillings and Wheatley 2001:26). Many studies utilise these techniques (e.g. Lake et al. 1998), but various aspects have been criticised (Gillings and Wheatley 2001; Wheatley and Gillings 2000) and these will be discussed briefly below.

Two issues are often the most highlighted and fit nicely together. These are problems of accounting for the palaeoenvironment, and consequently the vegetation. Firstly the baselayers of most GIS studies are built on modern maps and topography, which is likely to have been different in the past (see discussions in chapter 2 and 3 and above regarding dry valleys, periglacial action and landform movement). Normally dealing with Palaeolithic sites in such a study can be problematic as the majority occur in river valleys which have been subject to considerable change over time. However in the case of the upland datasets, the vertical landscape is likely to have changed little for reasons discussed in chapter 3. Secondly it is impossible to know where vegetation was positioned, e.g. was a site surrounded by trees and therefore would have no visibility outside the immediate area. One solution is to check geological palaeoenvironmental evidence (Gillings and Wheatley 2001:32,33) for tree cover or vegetation estimates and evidence of soil movement. However, as discussed before, the upland environment of these study areas is not conducive to the preservation of environmental remains. Despite this the little evidence we have, coupled with access to flint clasts from the chalk and sides of the solution features, does suggest an open environment with limited vegetation cover at the time of occupation (White 1997; Ashton et al. 2006). Furthermore, as Gillings and Wheatley note, the effect of this would have varied according to season (2001:33). However, the large scale (both spatial and temporal) of the viewsheds, coupled with the experimental nature of the study (e.g. more concerned with the extent of view a site *may* have had, rather than specific lines of sight, or intervisibility between sites) decreases the effects of these issues.

Another aspect that has been widely debated is that of 'object-background clarity'. This deals with visual recognition and the difference between being able to 'see' something and actually identifying what it is (e.g. a sheep, see quote above) (Gillings and Wheatley 2001:33). The standard values for the calculation of a viewshed in ArcGIS do not include a constraint over the distance a viewer can see (viewshed will be calculated to infinity). To counteract this aspect a distance of 10km was specified in the analysis for the viewshed extent to provide an estimation of human vision. Nevertheless, this aspect is again more applicable to studies that deal with specific lines of sight or more constrained time periods, than those in this research.

Finally, mobility is also highlighted as a concern, as the resultant views can change dramatically as the viewpoint (observer) moves, whereas viewsheds are always calculated from static points (Gillings and Wheatley 2001:33). This is particularly applicable in this research, as hominins were mobile agents, and would have travelled in search of a better location to view game. This would be an interesting aspect to address in further work, with alternative points created randomly nearby the main sites. However, the aim of the visibility analysis in this context is to see whether the location of the site at that particular spot would have any relevance to the views potentially obtainable from it and therefore have a bearing on the activities undertaken there as represented by the assemblage signature.

Here GIS viewshed analysis is employed as an experimental tool to provide additional information for these upland sites and aid interpretation of their assemblage signatures, allowing us to think about the landscape and how it may have been used, rather than as definitive results. Therefore, the integration of the viewsheds is aimed at seeing whether (in the present time) the sites have good all round visibility, in which case this could be linked to their assemblage signature e.g. hunting stand suitable for assessing game movement and planning hunting strategies. Alternatively if the viewshed is limited, but the site is situated near a good source of raw material one could infer that the activities at the site depended little on the site's situation in the landscape as such. Therefore this information, combined with the analysis of the lithic assemblages can help support and suggest site use. Moreover, each site will be treated in isolation in this study as contemporaneity cannot be demonstrated due to difficulties in dating the sites in question.

The viewsheds were computed using the viewshed function in ArcGIS 9/10, based on the DTM raster data acquired from the Edina website (Web 2), and have been compiled for the major and minor sites in each area. Hominin height has been estimated (1.5m) and used as an input in the OBSERVER A field, as has extent of view, using 10km in the RADIUS2 category to constrain the extent of the viewshed calculation, based on the extent of view of the human eye (Garcia 2013:219). The coloured areas on the viewshed maps denote areas of the landscape which can be seen from the specified viewpoint. However a function of the way ArcGIS calculates viewsheds is on a straight plain, therefore it is likely that hominins would have been able to see down the valleys as well.

6.4.2 Chilterns

Main sites

Caddington

The largest of the Chiltern assemblages, Caddington, is located close to the source of the River Ver, and shows a strong correlation between the size of the artefact assemblage and the extent of the viewshed (light blue area, figure 6.6). Indeed, such a large assemblage indicates repeated visits over time demonstrating that it was a favourable location for hominin activities. Its position in the landscape gives views extending across the plateaus and down the catchments of the Rivers Ver and Lea, with smaller spots on the higher ground to the north-west and south-west at the top of the valley of the Gade.

This extensive viewshed encompassing multiple landscape types (plateaus, dry valleys, river valleys) fits with the mixed strategy signature demonstrated for the site (section 5.2.1). Both manufacture and use of handaxes and flake tools indicates a more ‘residential’ emphasis with a variety of activities taking place. Whilst the tools indicate a mixed signature, there appears to be slight bias towards artefacts associated with wood procurement, which can perhaps be linked to the site’s position on the plateau tops, away from the scarp edge which is 3km to the north (figure 6.7). This proposed ‘wood’ signature raises an interesting question regarding the prevailing environmental conditions, and this will be discussed in more detail in chapter 7. In line with this, the main direction of the viewshed is in the opposite direction towards the south-east, with further views towards the north-east, east, south and south west.

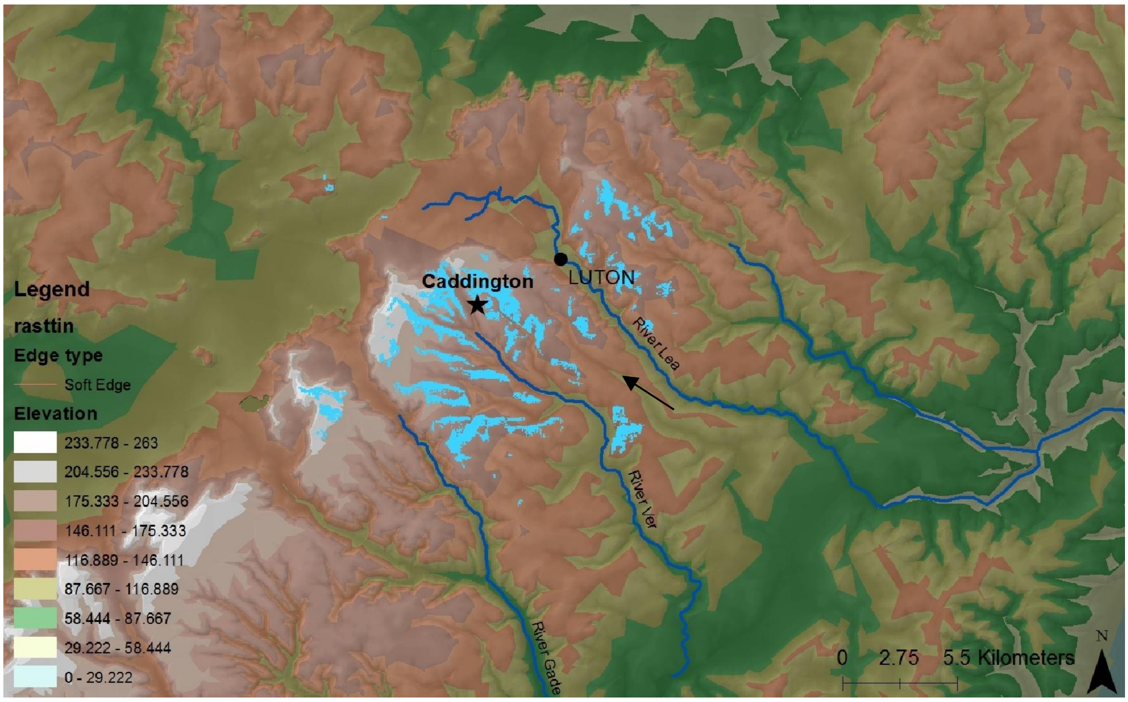


FIGURE 6.6 - VIEWSHED FROM CADDINGTON (LIGHT BLUE DENOTES THE AREAS THAT ARE VISIBLE; ARROW SHOWS DIRECTION 3D VIEW IS TAKEN FROM).

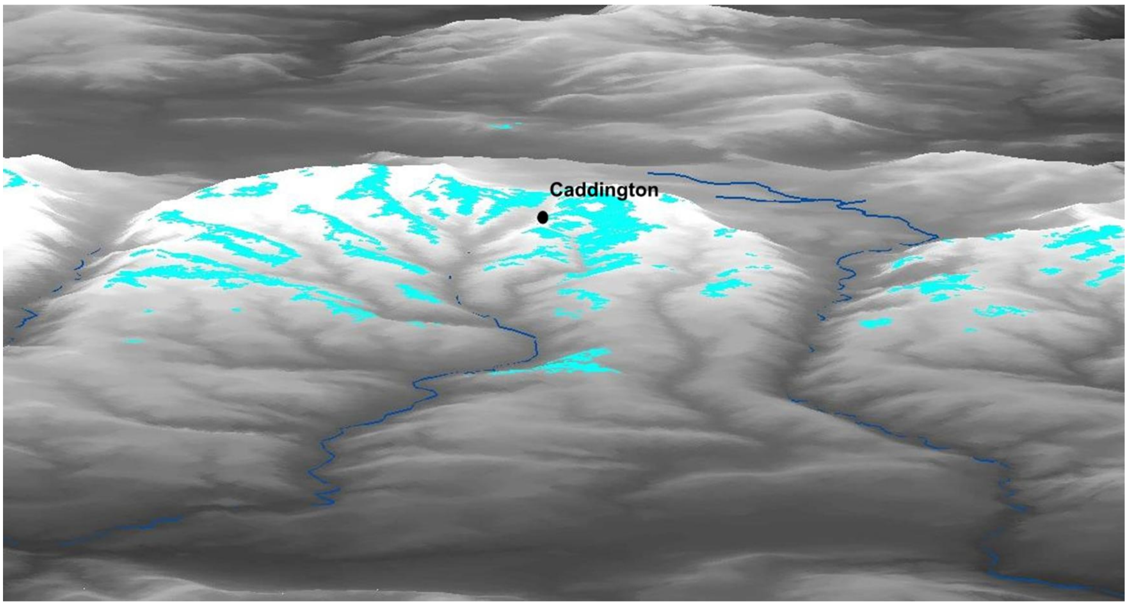


FIGURE 6.7 - 3D VIEW OF CADDINTON, ITS VIEWSHED AND THE SURROUNDING LANDSCAPE

Gaddesden Row

Gaddesden Row also demonstrates an extensive viewshed (areas of light green, figure 6.8) similar to that of Caddington above, however the location of the site provides an interesting contrast. It is situated apart from the others, in close proximity to the upper reaches of the River Gade and the scarp edge, with potential access via the lower ground to the north-west lowlands. Figure 6.8 shows views across the plateaus to the north-east and south-west of the site, down the valley of the River Gade and the upper reaches of the Ver. In addition there is a focus on the higher points across the valley and clustered along the boundary of the scarp to the north and north-west, framing the edges overlooking the lowland plain beyond (figure 6.9). This suggests a focal point along this area perhaps related to movement of herds in the northern lowlands or to resource exploitation along the edge. Consequently a correlation could be argued with the butchery and meat processing signature at the site, the scarp focus and quick access to the lowland hunting grounds.

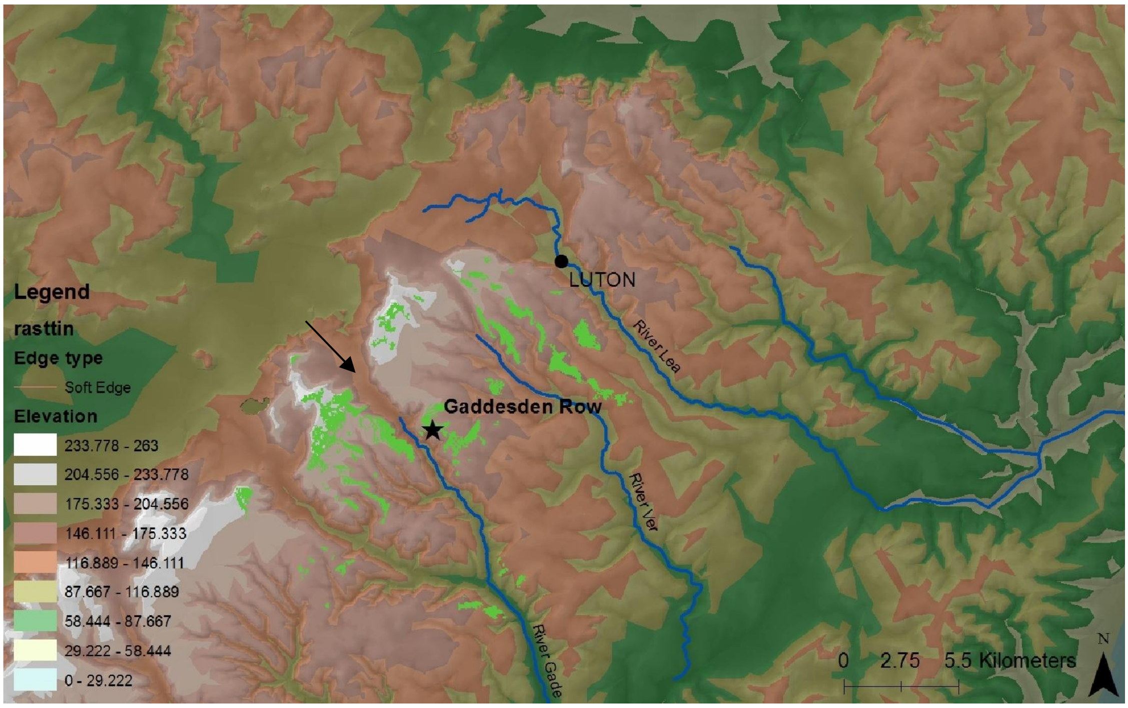


FIGURE 6.8 - VIEWSHED FROM GADDESDEN ROW (LIGHT GREEN DENOTES THE AREAS THAT ARE VISIBLE; ARROW SHOWS DIRECTION 3D VIEW IS TAKEN FROM).

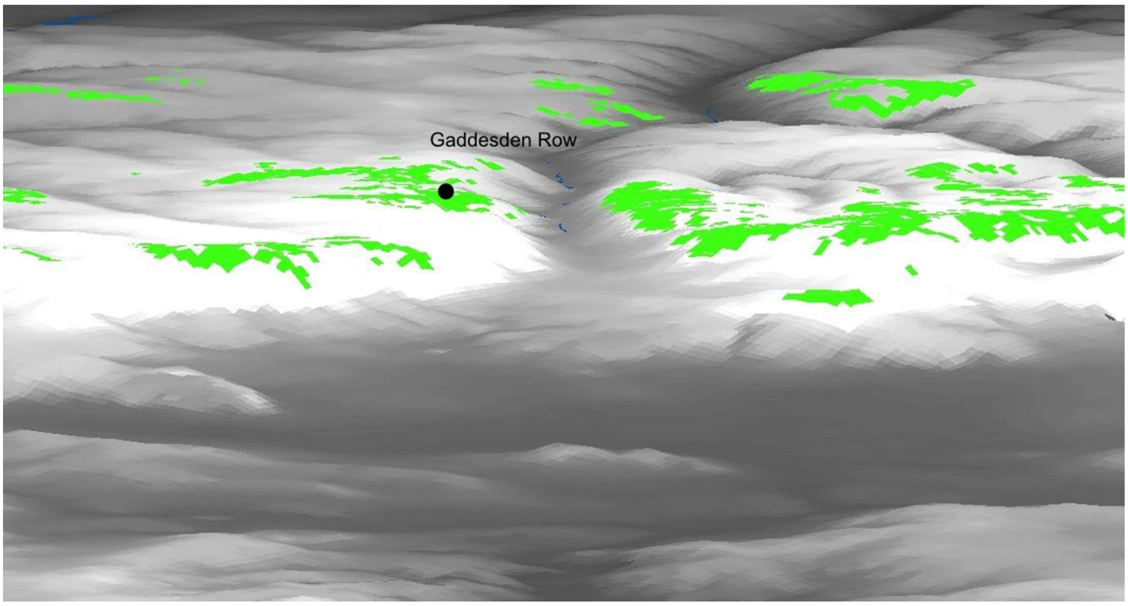


FIGURE 6.9 - 3D VIEW OF GADDESDEN ROW, ITS VIEWSHED AND SURROUNDING LANDSCAPE

ROUND GREEN

Compared to the previous two sites Round Green has a more restricted view constrained to the upper reaches of the valley of the Lea (figure 6.10) and the surrounding plateaus. In a similar situation to Gaddesden Row there appears to be a concentration along the scarp edges surrounding Luton and the headwaters of the Lea, banding the lower ground there. There are also visible areas clustered around the smaller river to the east, the Mimram.

Whilst the archaeological signature is again a mixed one centred on manufacture, the suggested dominance of carcass processing coupled with limited wood procurement suggested by the use-wear (section 2.5) indicates an emphasis on hunting-based tasks. This links with the positioning of the site on the edge of the scarp, overlooking the lowland plains to the north and east (figure 6.11) pointing to links with and easy access to the plain and hunting grounds below.

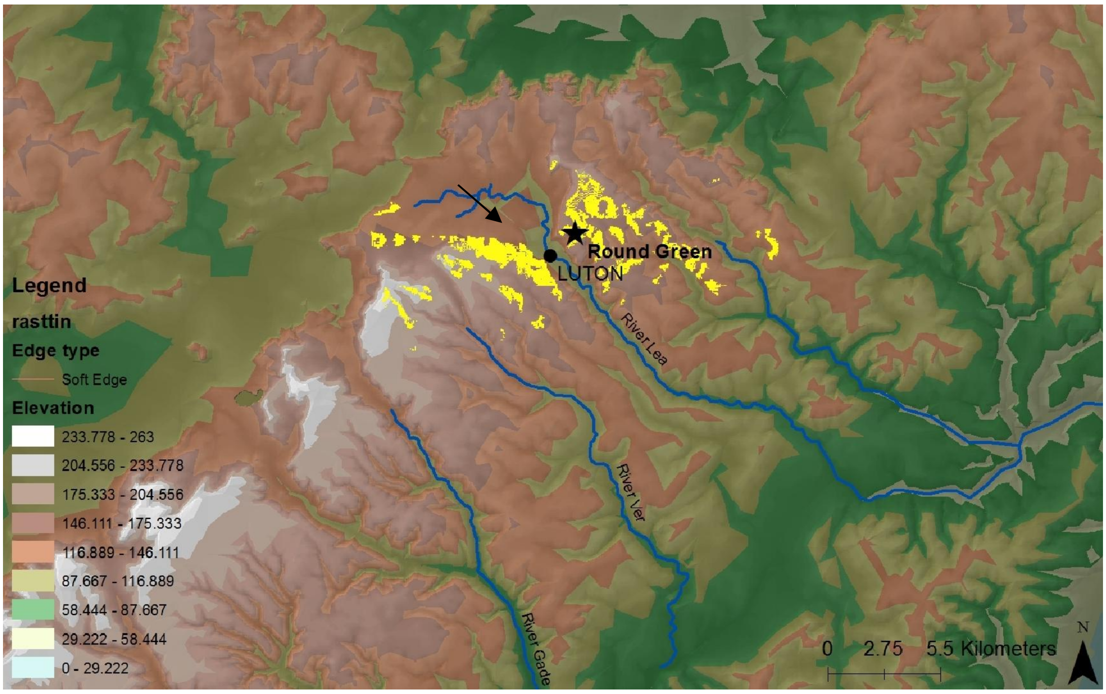


FIGURE 6.10 - VIEWSHED FROM ROUND GREEN (YELLOW DENOTES THE AREAS THAT ARE VISIBLE), ARROW SHOWS DIRECTION OF 3D VIEW.

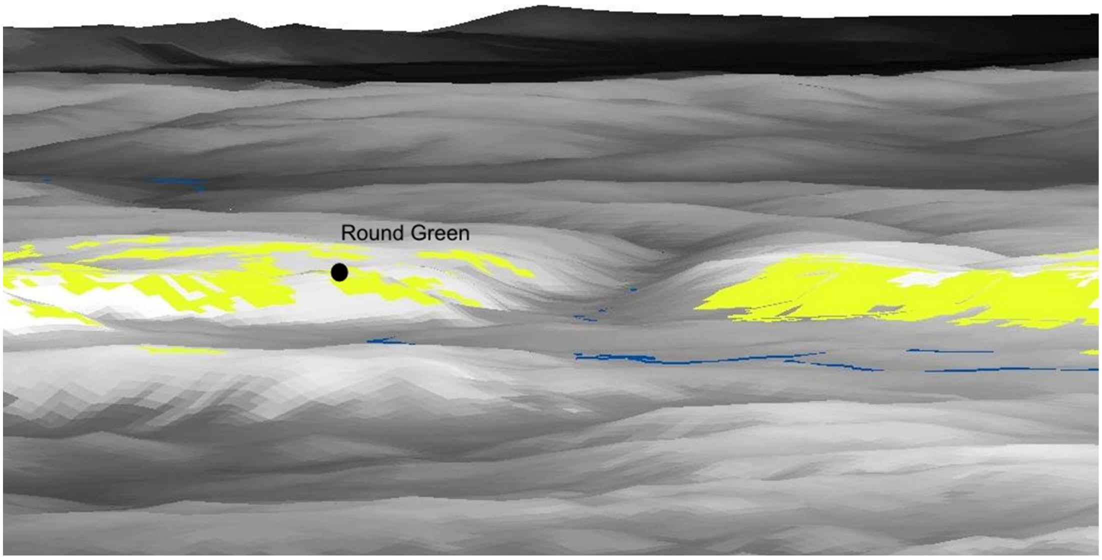


FIGURE 6.11 - 3D VIEW OF ROUND GREEN, ITS VIEWSHED AND SURROUNDING LANDSCAPE

WHIPSNADE

Finally, the last of the main sites, Whipsnade, has a viewshed concentrated on the valley of the River Ver to the south-east, and the interfluves and plateaus surrounding the site (figure 6.12), perhaps suggesting a focus on this natural routeway. In parallel to Round Green and Caddington, the lithic signature at Whipsnade suggests a mixed strategy site, with manufacture and butchery. However the tool focus is slanted towards artefacts that are arguably related to wood procurement, in line with that seen at Caddington. Furthermore, the location of the site, on the plateaus away from the immediate scarp or lowland area also matches that of Caddington (figure 6.13). Accordingly it suggests that the presence of artefacts most usually associated with wood working may be linked to this particular landscape location, a setting with no direct access to the lowland plains, resulting in an emphasis on the resources available in the vicinity of the site.

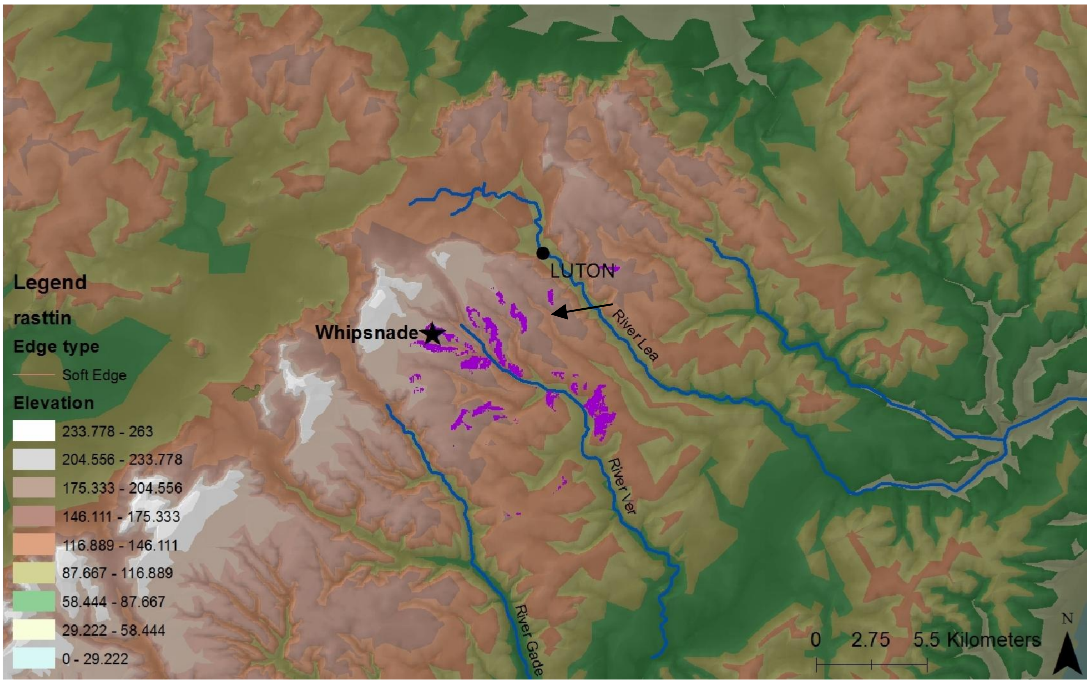


FIGURE 6.12 - VIEWSHED FROM WHIPSNADE (PURPLE DENOTES THE AREAS THAT ARE VISIBLE), ARROW SHOWS DIRECTION OF 3D VIEW.

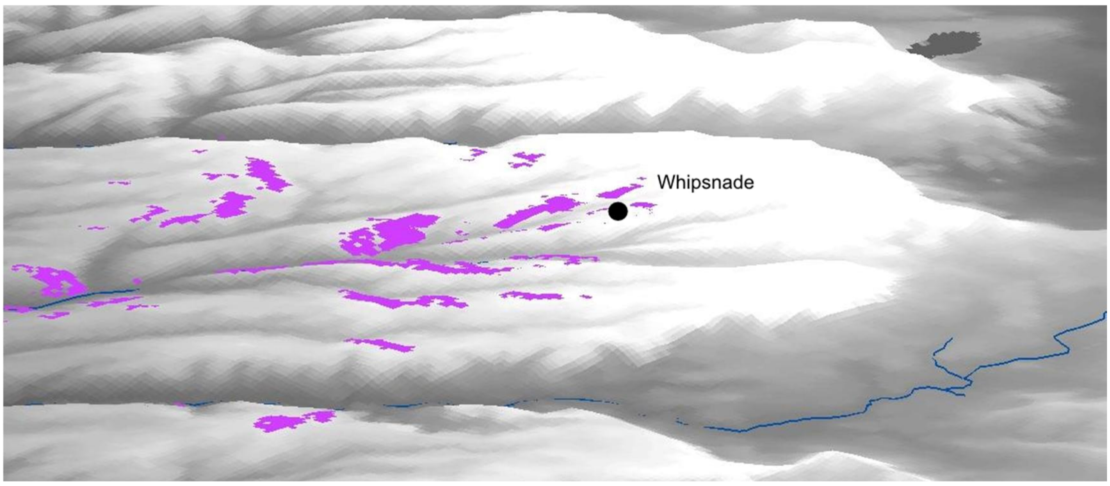


FIGURE 6.13 - 3D VIEW OF WHIPSNADE AND ITS LOCATION IN THE LANDSCAPE

SMALL SITES

Whilst the information about the assemblages from the smaller sites is very limited, general inferences can still be made regarding their location in the landscape, and their viewsheds which may give further insight into how hominins used the landscape.

SLIP END

The first of these smaller concentrations is Slip End. Roe records only one handaxe (Roe 1968:6), although the original assemblage was likely much larger, as Smith discusses the presence of thirty implements and a large number of flakes (1894:95). The site is located on the plateaus between the valley of the Lea and the Ver, 3.5km from the lowland area to the north. The viewshed is restricted to the north of the site, with the main focus along the dip slope above the River Lea. Further views extend to the plateau edge to the east near Caddington, Kensworth and Whipsnade, and additional banding on the scarp edge adjacent to Round Green and the group of sites there (figure 6.14). The site shows affinities with the plateaus and scarp edges, and also may have had access via the dry valleys to the lowlands to the south-east (figure 6.15). Unfortunately no further inferences can be made regarding the assemblage composition and the viewshed due to limited surviving evidence.

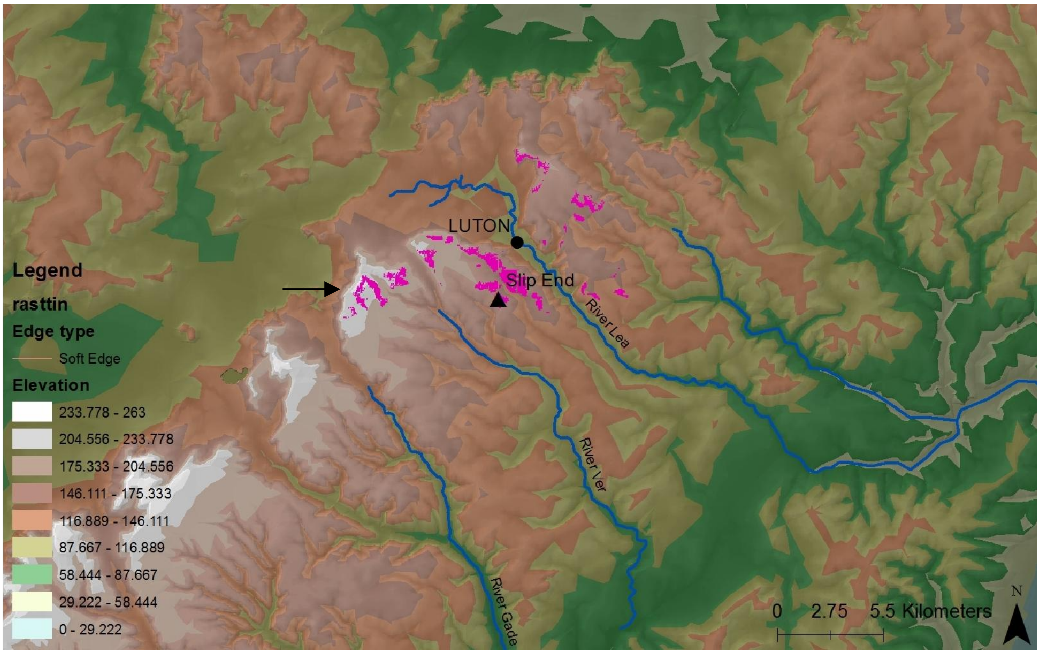


FIGURE 6.14 - VIEWSHED FROM SLIP END (PINK DENOTES THE AREAS THAT ARE VISIBLE), ARROW DENOTES THE DIRECTION THE 3D VIEW IS TAKEN FROM.

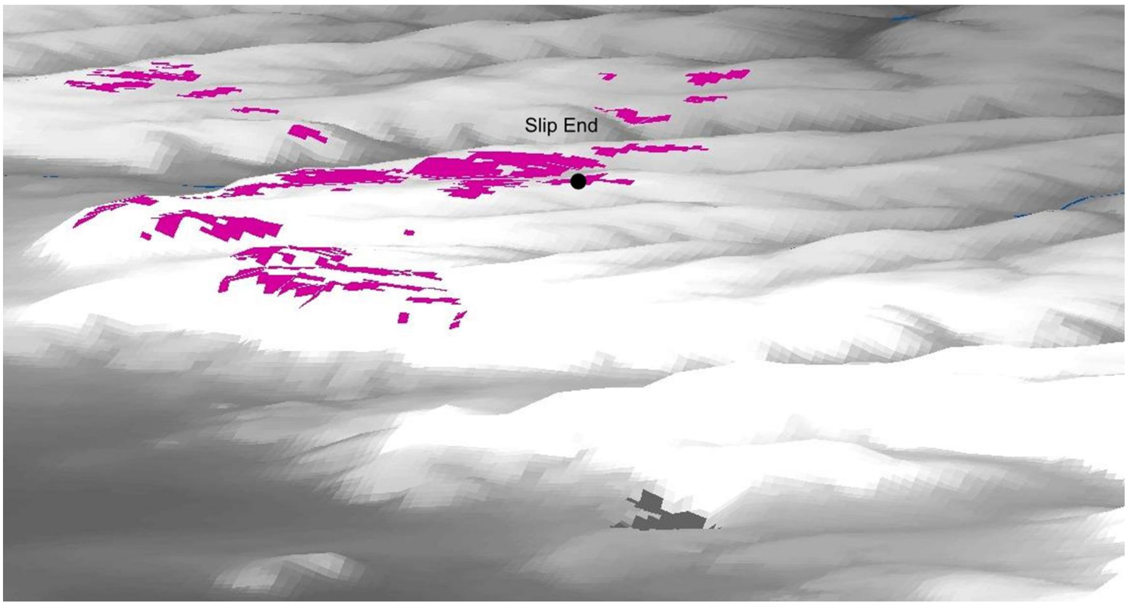


FIGURE 6.15 - 3D VIEW OF SLIP END AND SURROUNDING LANDSCAPE

RAMRIDGE END

The view from Ramridge End is limited, and appears restricted to the north-east of the site and the nearby plateau edges around the lowland area, near the source of the River Lea (figure 6.16). In terms of the artefacts recovered, however, this site produced a sizeable quantity for a secondary site. Of the 85 artefacts noted by Roe, eleven were handaxes, inferring butchery activities, along with a single flake tool (although the particular type is not specified). The rest comprises 72 flakes and a miscellaneous artefact (1968:6). Although Ramridge End is not located immediately on the scarp edge it is still within close proximity (1km) to the lowland area at the head of the River Lea (figure 6.17), in a similar situation to Round Green, with views of the scarp edges around this area. Therefore, coupled with the handaxes, this suggests a focus on the lowland plain to the north and east with easy access to the plains below, again suggesting a link to butchery activities and the function of the site serving as a processing or viewing station.

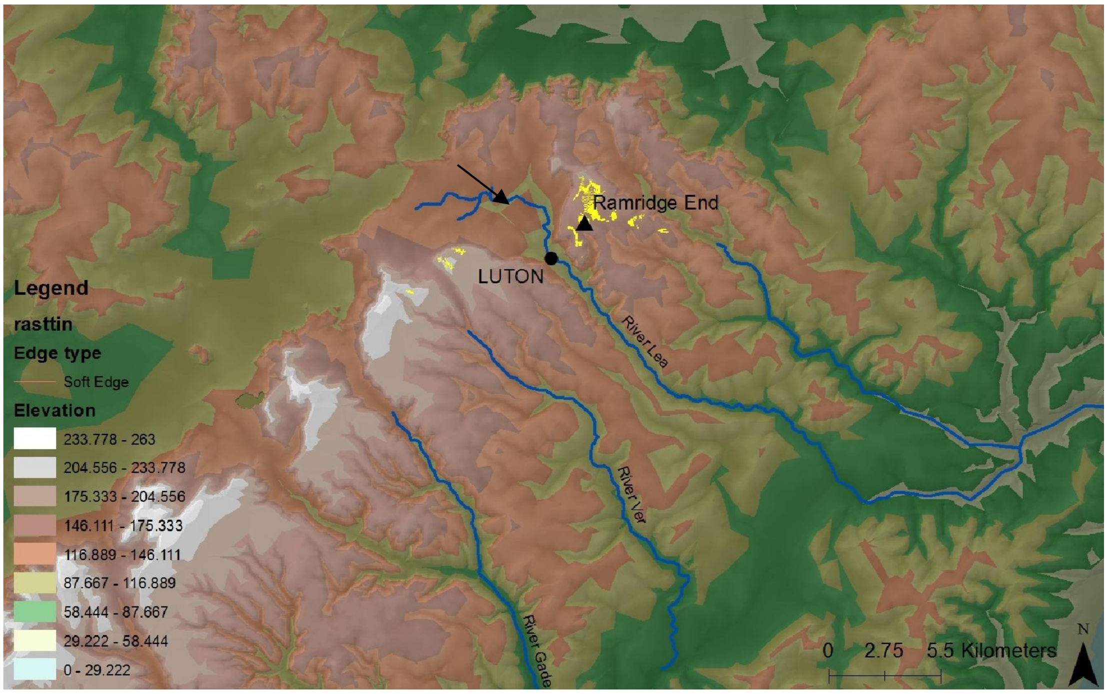


FIGURE 6.16 - VIEWSHED FROM RAMRIDGE END (YELLOW DENOTES THE AREAS THAT ARE VISIBLE), ARROW SHOWS THE DIRECTION OF THE 3D VIEW

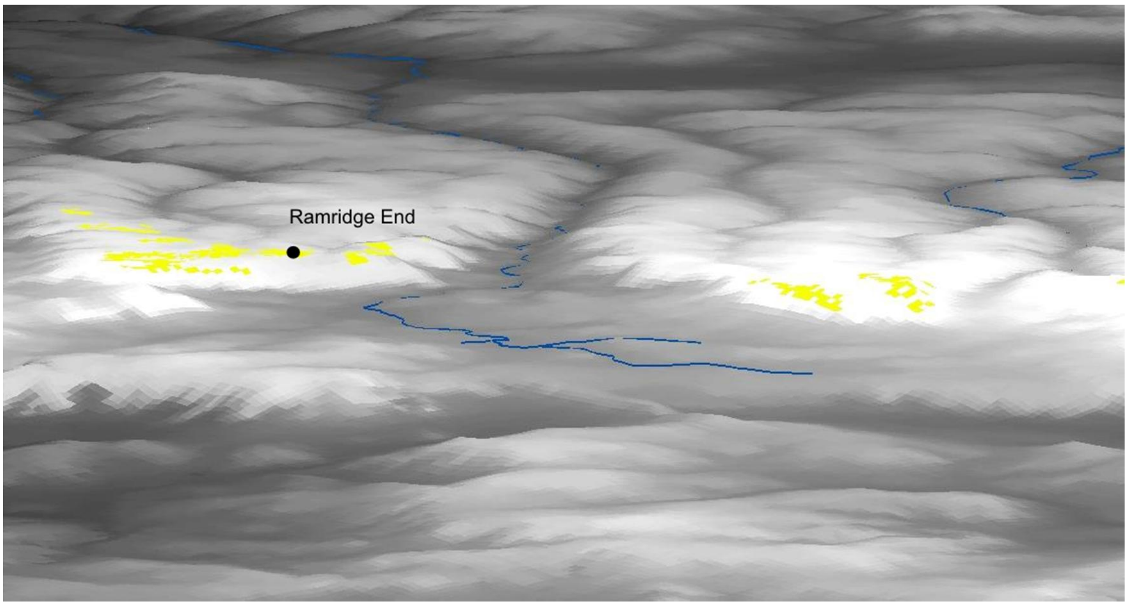


FIGURE 6.17 - 3D VIEW OF RAMRIDGE END, ITS VIEWSHED AND SURROUNDING LANDSCAPE

Mixies Hill

Mixies Hill on the other hand has very little information about the original assemblage. Roe notes that flakes were found (Roe 1968), however there is no mention of numbers. The site is again located close to the scarp edge (less than 1km) near Luton (figure 6.18), however in this case the viewshed appears restricted to the plateau edge surrounding the site and across to the interfluves to the south-east (figure 6.19). Not much can therefore be said about the site's purpose, except that it is in a position to give easy access to the lowlands, in a similar situation to that of Round Green and Ramridge End.

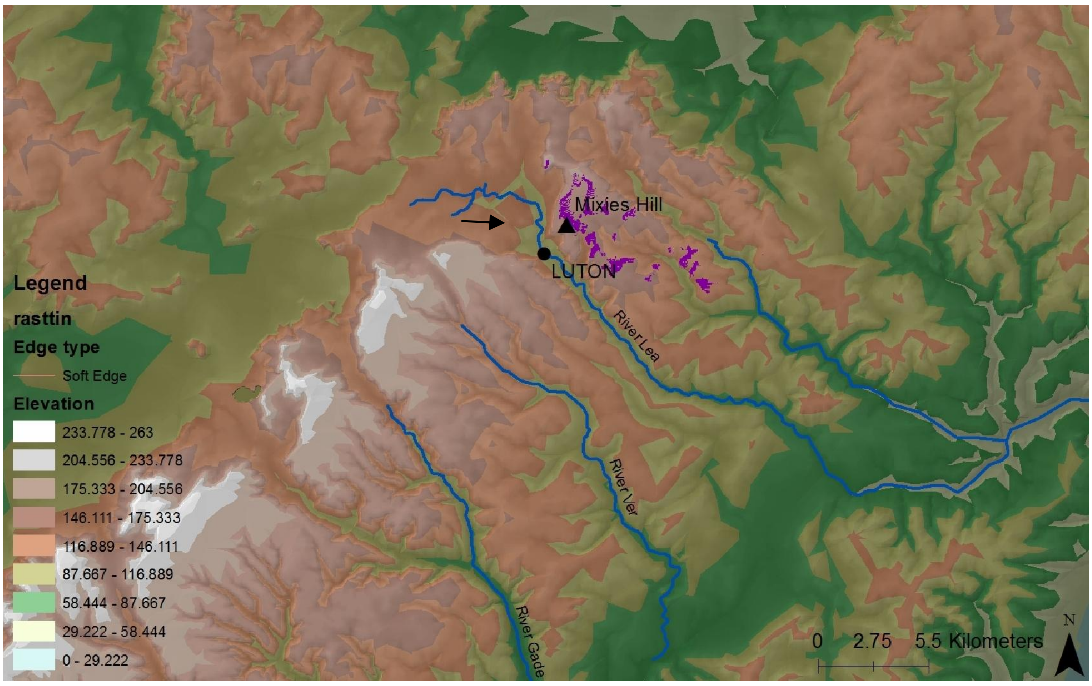


FIGURE 6.18 - VIEWSHED FROM MIXIES HILL (PURPLE DENOTES THE AREAS THAT ARE VISIBLE), ARROWS DENOTES DIRECTION 3D VIEW IS TAKEN FROM

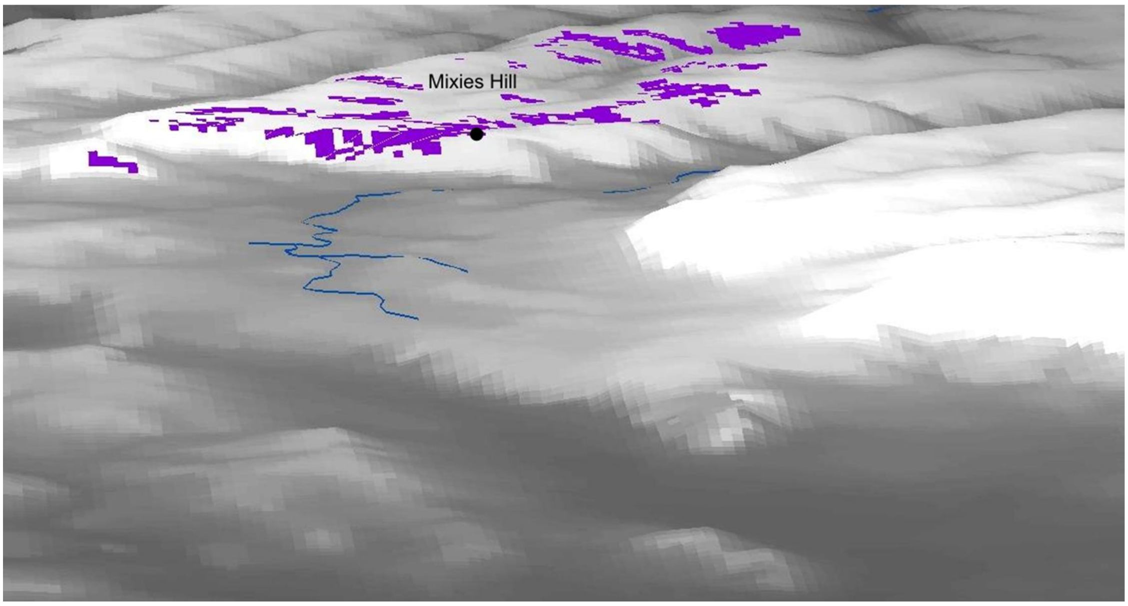


FIGURE 6.19 - 3D VIEW OF MIXIES HILL, ITS VIEWSHED AND SURROUNDING LANDSCAPE

KENSWORTH

The final site in this group is Kensworth, which is recorded as producing an assemblage made up entirely of flakes (Roe 1968:5), although Evans mentioned that Smith obtained Palaeolithic implements (handaxes?) from the site (1908:1). The viewshed (figure 6.20) is unusual in that it appears to be entirely restricted to the south-east of the site, down the valley of the Ver (figure 6.21), perhaps suggesting the use of this area as a routeway through the landscape, although the lack of access to the lowland plains could explain the purely flake signature, if this is not just a result of the preservation of the assemblage. This site is in a similar situation to Caddington and Whipsnade regarding distance from the scarp edge (3km).

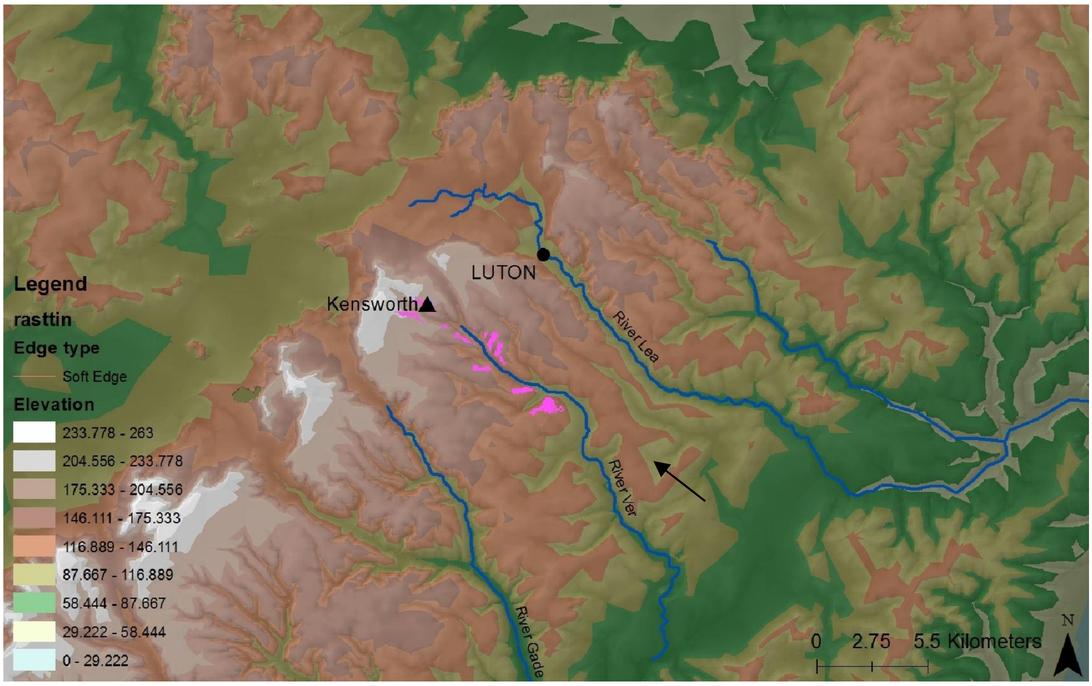


FIGURE 6.20 - VIEWSHED FROM KENSWORTH (PINK DENOTES THE AREAS THAT ARE VISIBLE), ARROW SHOWS DIRECTION 3D VIEW IS TAKEN FROM.

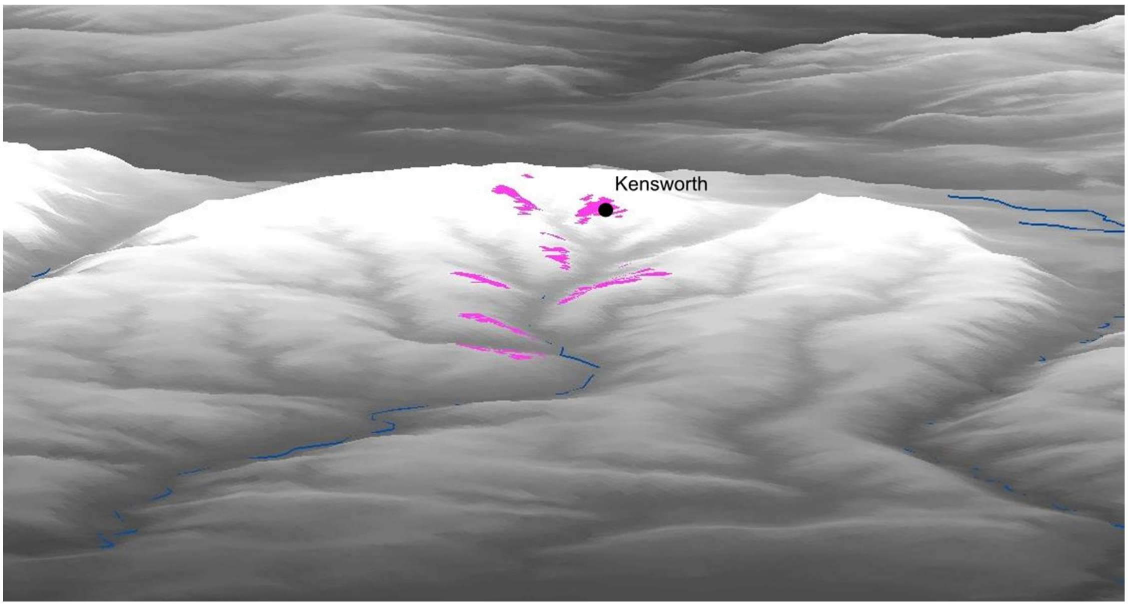


FIGURE 6.21 - 3D VIEW OF KENSWORTH, ITS VIEWSHED AND SURROUNDING LANDSCAPE

SUMMARY

In summary, the viewshed analysis for the Chiltern study area has highlighted a number of aspects. Firstly there is an apparent correlation between the size of the assemblage and the extent of viewshed, with the main sites demonstrating larger view-scapes (all greater than 3000 pixels), compared to the smaller assemblages, which range from Slip End with 2863 to Ramridge End with 936 (table 6.1). Indeed, Caddington is the largest assemblage and exhibits a much larger view area than any of the others. This suggests that an extensive view of the surrounding landscape may have been a factor in repeated visits and selection of site locations.

Secondly, there appears to be some correlation with distance from the northern scarp edge. For example, Gaddesden Row, which is located close to the valley of the Gade and the scarp edge, with access to the lowlands, demonstrates a strong butchery signature (chapter 3 and 5 for discussion of biases) and contains 44 handaxes (45%), coupled with a tool signature, assumed on the basis of the use-wear (section 2.5) to be focused on carcass processing. Two other sites located in close proximity to the scarp edge and the lowlands, Round Green (25 handaxes, 9%) and Ramridge End (11 handaxes), also demonstrate large numbers of handaxes and in the case of Round

Site	Aspect	Assemblage size	Site type	Slope	Extent viewshed (pixels)	Distance from scarp edge	Viewshed focus	Predominant viewshed direction
Caddington	North-west (296)	1431	Mixed strategy Slight wood slant	0.6	10999	3km	Dip slope, plateaus, scarp edge	180 degree view, north-east to south-west
Gaddesden Row	South-west (243)	89	Episodic/ extractive Butchery signature favoured	0.6	8674	1km	Plateaus, dip slope, valley of Gade and Ver	360 degrees, focus north-east, west, south-west
Round Green	West (270)	282	Mixed strategy Bias meat processing	1.7	7295	1km	Dip slope, scarp edge, lowlands around Luton	West, north, east
Whipsnade	South-east (141)	196	Mixed strategy Slight wood slant	1.8	3708	4km	Valley of the Ver, dry valleys and dip slope	South-east
Kensworth	South (180)	Flakes (implements?)	Episodic	0.6	985	3km	Down valley of Ver	South-east
Mixies Hill	East (71)	Flakes (Roe)	Episodic	0.9	1764	<1km	Scarp edge and plateau	North/ south-east
Ramridge End	North-west (315)	85	Episodic	0.8	936	1km	Scarp edges	North/east
Slip End	South-east (115)	1 (Roe) 30 implements and flakes (Smith)	Episodic	3.6	2863	3km		

TABLE 6.1 – SUMMARY OF THE MAIN GIS DATA AND THE RESULTS FROM THE ASSEMBLAGE ANALYSIS FOR THE CHILTERN SITES

Green a tool signature suggesting a focus on meat-related tasks. This is in contrast to the sites located three or more kilometers away from the scarp edge (table 6.1), Caddington (13 handaxes, 1%) and Whipsnade (8 handaxes, 4%), which although still display what could be termed a butchery signature, show a slight bias towards wood-related activities in the flake tools. This could be a function of their location on the dip slope, clustered around the source of the Ver, as opposed to being closer to the scarp edge. The smaller sites of Kensworth, Mixies Hill and Slip End do not have enough available information to corroborate or dismiss this pattern, so have been excluded from this discussion. It could be argued however, that sites in close proximity to the scarp edge afforded quick access to herds on the lowland plains as well as good viewing opportunities.

The viewsheds have all been calculated using a radius of 10km to simulate the range of sight of a human eye (see above). This is also an approximate estimate of the distance that can be covered in two hours (walking at approximately 3mph), and can therefore be used as a proxy for ranging distance for hominins at these sites. To model this buffers were constructed for each site for a distance of 10km using the ArcMap toolbox buffer function. It can be seen from figure 6.22 that buffers created around each of the main sites mean that every site location (main and small) is located within 10 kilometers distance of at least one other site. Whilst issues over dating mean that these cannot be considered part of the same settlement system, it is interesting to note that they all fall within an estimated (as the crow flies) two hour walk of each other.

Furthermore, when the viewsheds for the main sites are displayed as a combined coverage (figure 6.23) they overlay a substantial section of this area of the hills, providing good views of the surrounding landscape and the resources it affords. This stands out when compared to the combined coverage from only the minor sites (figure 6.24), which covers much less distance and only focuses on the scarp edge and the dip slope and valleys around the River Ver and Lea. This further strengthens the correlation between site size and viewshed extent.

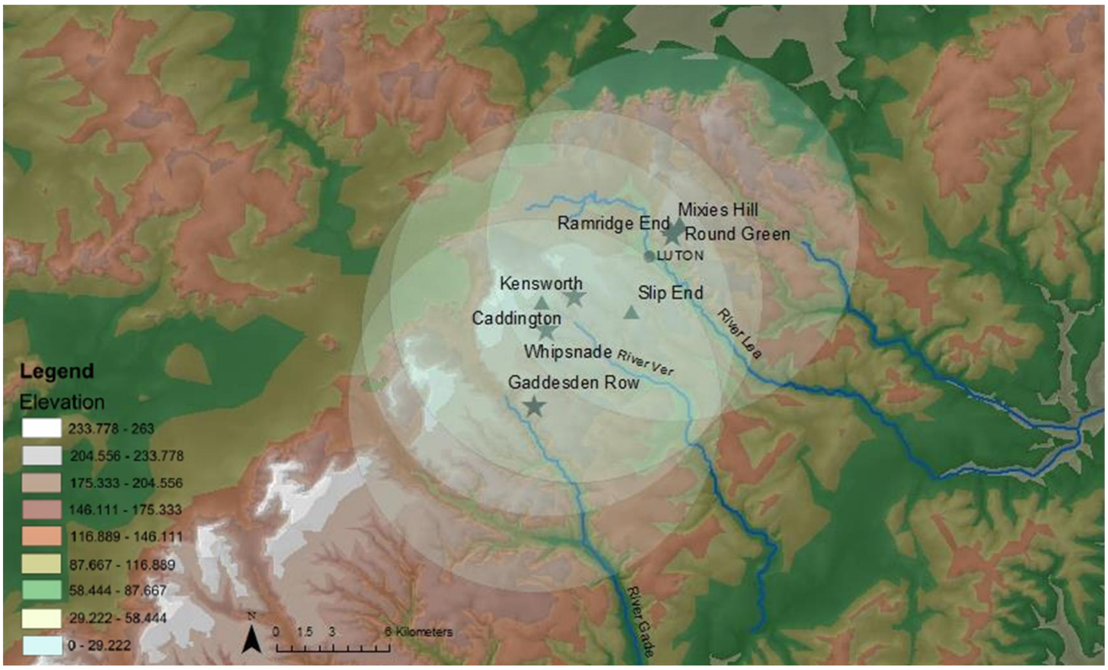


FIGURE 6.22 - MAPS SHOWING THE CHILTERN SITES WITH A 10KM BUFFER AROUND THE MAIN SITES TO SIMULATE AN ESTIMATE OF TRAVELLING DISTANCE (2 HOURS) OR RANGING ZONE.

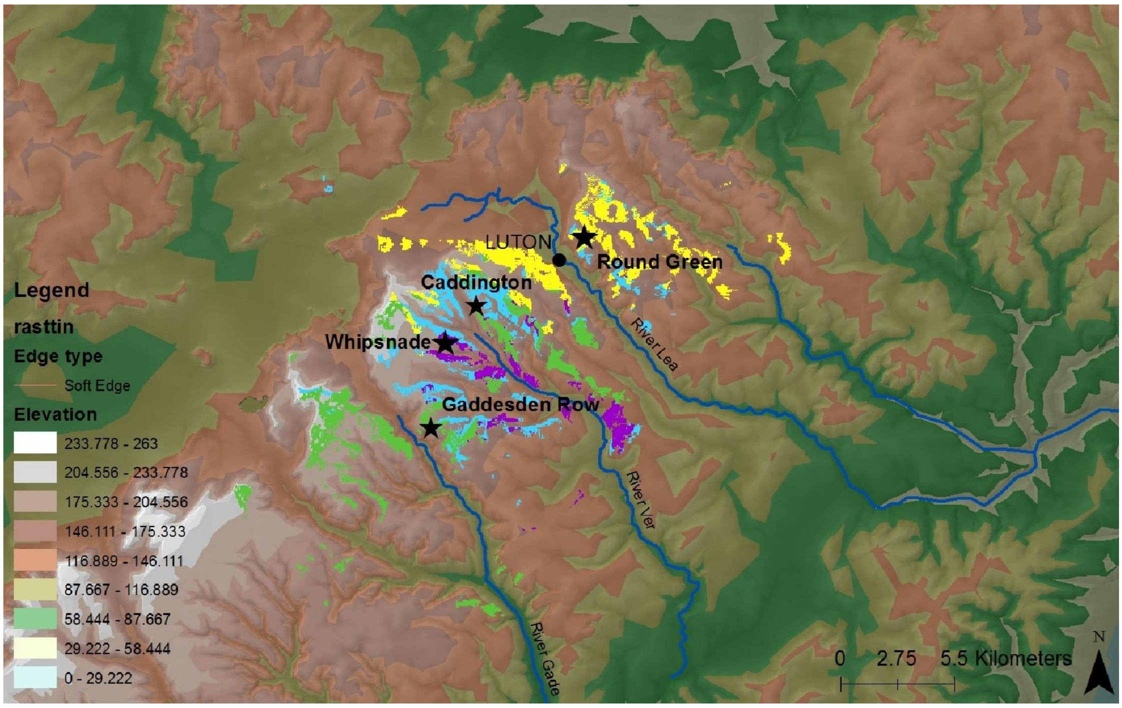


FIGURE 6.23 - MAP SHOWING THE COMBINED VIEWSHEDS FOR THE MAIN SITES IN THE CHILTERNS.

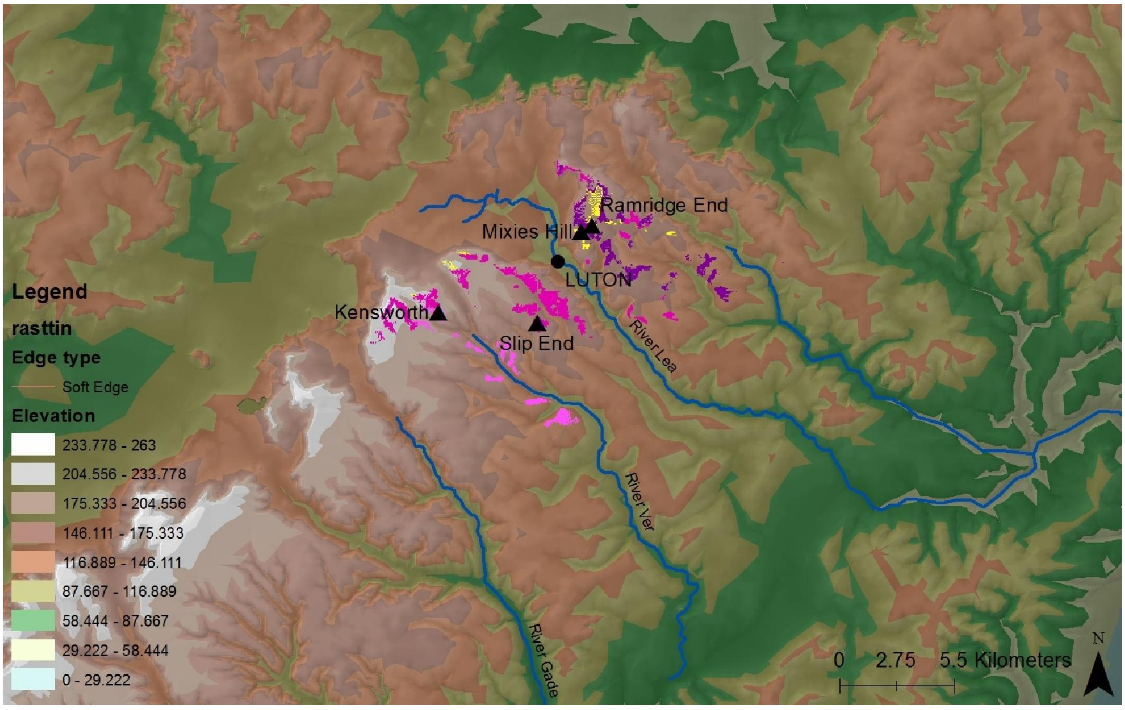


FIGURE 6.24 - MAP SHOWING THE COMBINED VIEWSHEDS FOR THE SMALLER CHILTERN SITES

Another aspect to consider is the grouping of the two main areas, Caddington, Kensworth and Whipsnade around the head of the Ver, and Round Green, Mixies Hill and Ramridge End around the Lea. The combined viewsheds from these two groups were compared, and it is curious that the views from Ramridge End and Mixies Hill are covered completely by that from Round Green (figure 6.26), whereas the combined map for the other group shows a contribution from not only Caddington but Whipsnade and Kensworth as well (figure 6.25). If these sites were theoretically assumed to be contemporary, then in this context it could be argued that Round Green is the main site in that area and Mixies Hill and Ramridge End are satellite or subsidiary sites, acting as locales within the hominin network, perhaps performing a more ephemeral function such as Turq's episodic sites (in Mellars 1996). This then links into the idea of Local Operational Networks as discussed in Chapter 7 (White and Pettitt 2011).

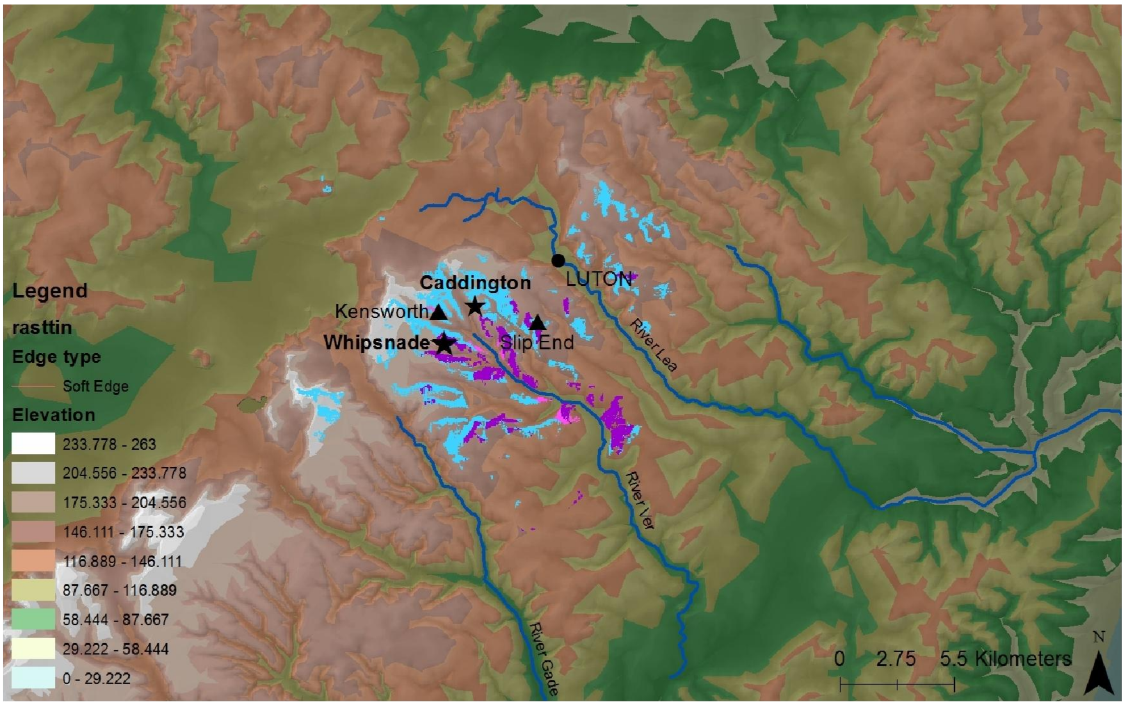


FIGURE 6.25 - MAP SHOWING COMBINED VIEWSHEDS FOR THE GROUP OF SITES CLUSTERED AROUND THE HEADWATERS OF THE VER: CADDINGTON, WHIPSNADE AND KENSWORTH

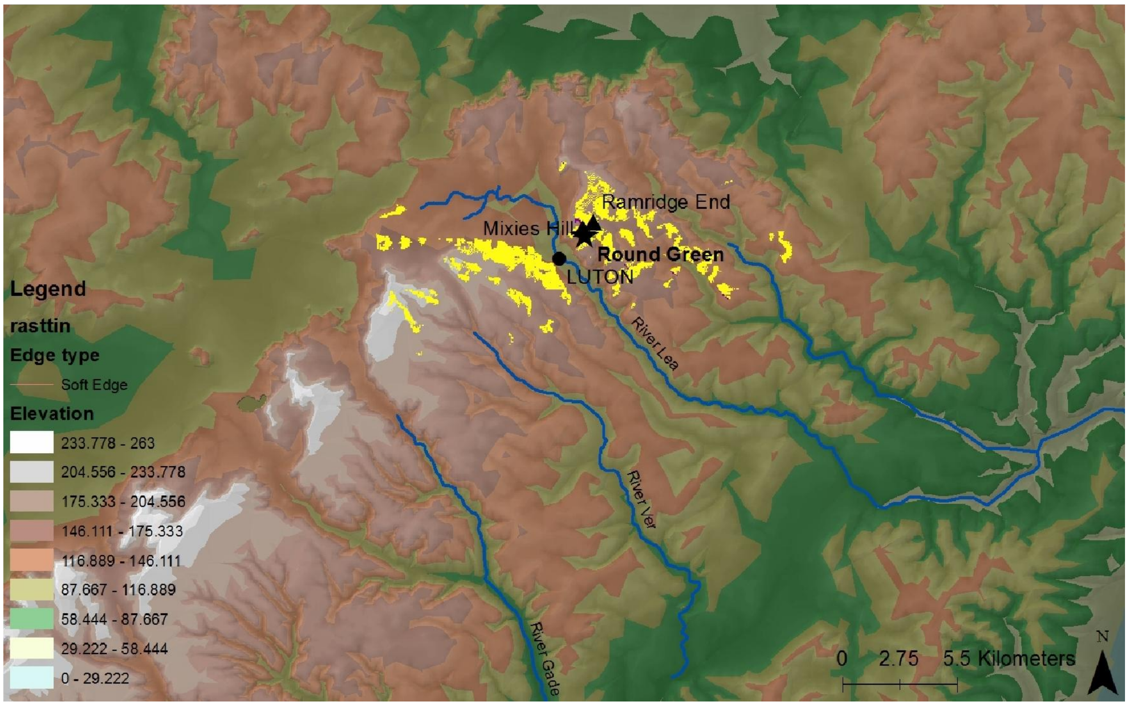


FIGURE 6.26 - MAP SHOWING THE COMBINED VIEWSHEDS FOR THE GROUP OF SITES LOCATED IN CLOSE PROXIMITY TO THE SCARP SLOPE AND THE LEA: ROUND GREEN, MIXIES HILL AND RAMRIDGE END.

6.4.3 KENT

MAIN SITES

WESTCLIFFE

The largest of the Kent assemblages, Westcliffe, is located away from the higher plateaus on the upper reaches of the dry valleys, on the dip slope (figure 6.28). It displays a somewhat restricted viewshed, contrasting with the large assemblage size. The focus is on the interfluves and the higher plateau to the west and south-west of the site, near the River Dour (figure 6.27), suggesting that activities conducted at the site were not reliant on extensive views but more concerned with resources located on the nearby plateaus. The signature of the assemblage, whilst containing handaxes and flake tools, is primarily focused on raw material procurement and working, which ties in with the restricted view observed in figure 6.27. This indicates that the location may have been chosen for the availability of its raw material resources as opposed to views over the rest of the landscape.

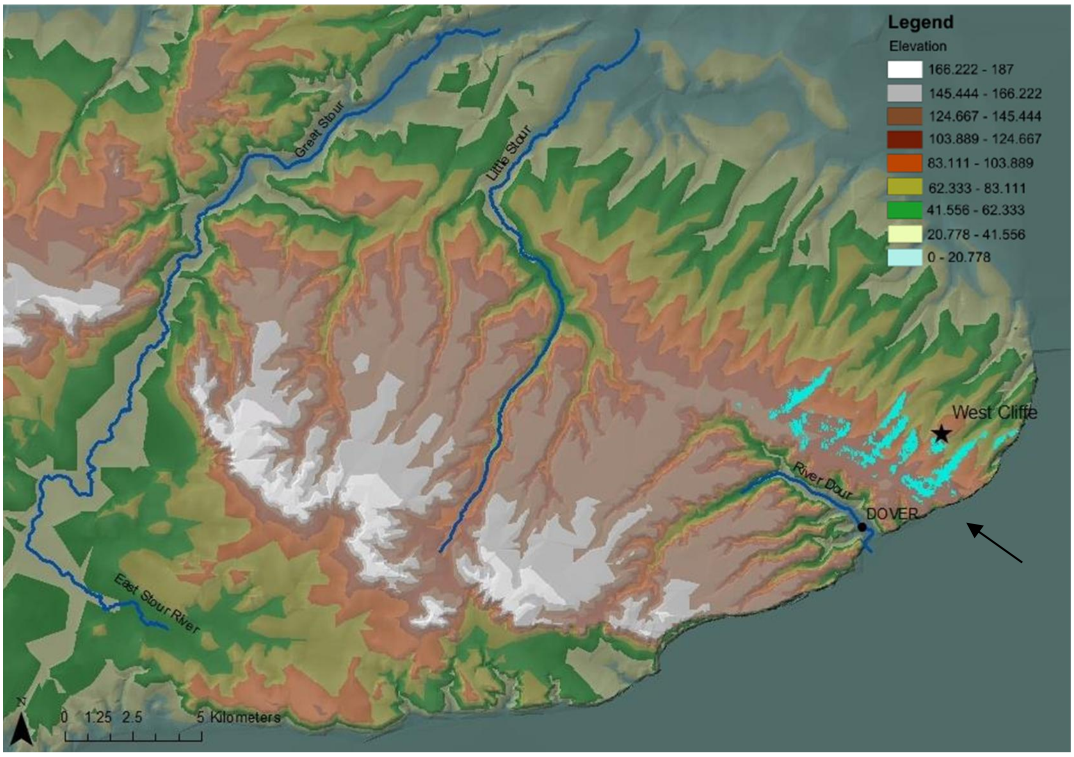


FIGURE 6.27 - VIEWSHED FROM WESTCLIFFE (LIGHT BLUE DENOTES THE AREAS THAT ARE VISIBLE), ARROW SHOWS DIRECTION OF 3D VIEW.

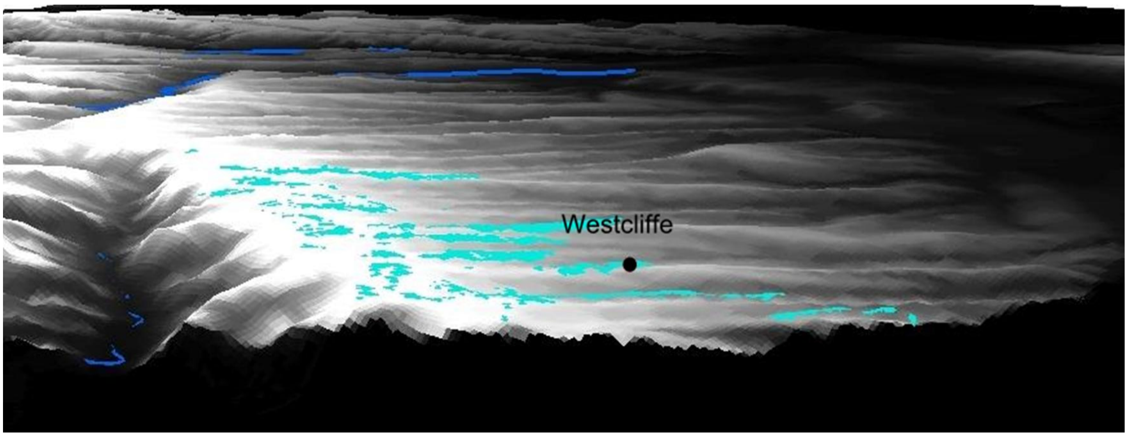


FIGURE 6.28 - 3D VIEW OF LANDSCAPE AND VIEWSHED FOR WESTCLIFFE

GREEN LANE, WHITFIELD

The second site, Green Lane, Whitfield is located on the higher plateau close to the valley of the River Dour. Here the assemblage signature suggests manufacture and game procurement tasks, with higher proportions of handaxes and flake tools linked to carcass processing. There is manufacture present but the main focus appears to be game related. The location of the site is close to the valley of the Dour and would have provided easy access to the lowland channel plain through the river valley (if this was assumed to be present at the time of occupation). The viewshed itself is interesting as there is a limited view of the immediate area of the site, giving the suggestion of a specific viewing focus (figure 6.29). The emphasis, therefore, appears to be on the valley of the Dour and its tributaries, plateaus, interfluves and dry valleys to the south-west of the site. This signifies links with the river valley and potentially the observation of game, with the site functioning as a hunting stand (figure 6.30) or indeed as a site to which game was brought back to be processed. Moreover the steepness of the valley, and tributaries leading in at right angles (although again this is assuming the valley was also present in a similar state in the Pleistocene) could form the basis for the trapping of game or driving it along the valley.

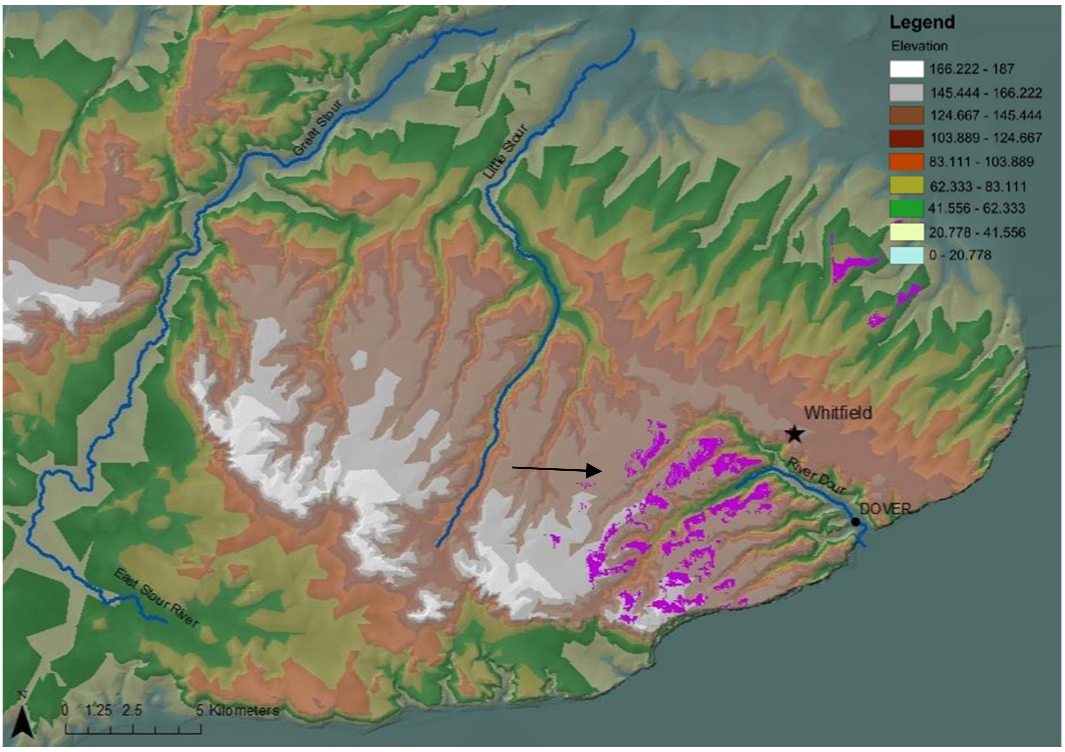


FIGURE 6.29 - VIEWSHED FROM GREEN LANE, WHITFIELD (PURPLE DENOTES THE AREAS THAT ARE VISIBLE), ARROW DENOTES DIRECTION 3D VIEW IS TAKEN FROM

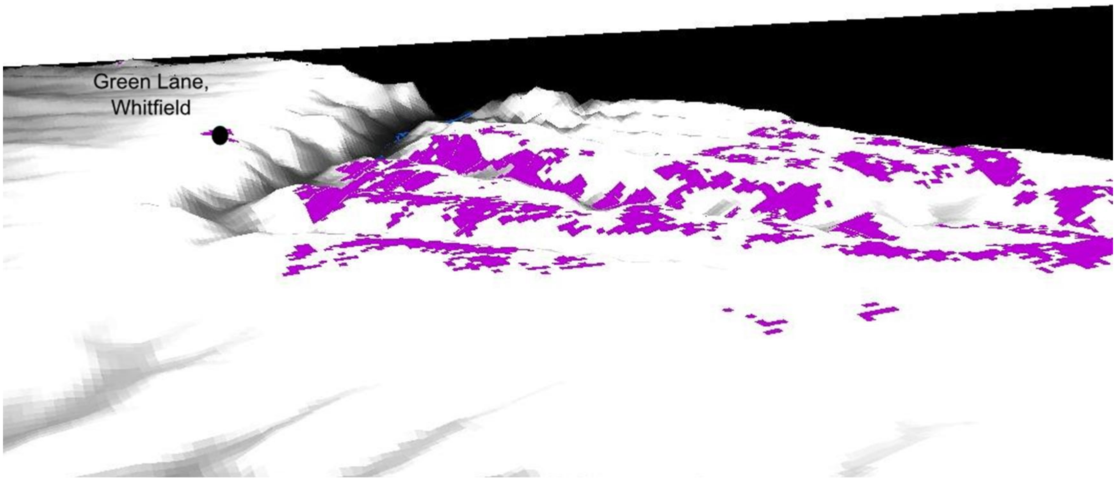


FIGURE 6.30 - 3D VIEW OF LANDSCAPE AND VIEWSHED OF GREEN LANE, WHITFIELD

WOOD HILL

In contrast, Wood Hill, which is situated along the same interfluve as Westcliffe, but further down the dip slope, demonstrates an extensive viewshed, encompassing not only the nearby plateaus and dry valleys, but across the higher plateau to Green Lane and the south-west (figure 6.31). Furthermore it also affords extensive views of the lowland channel plain and areas to the north, which stands out when compared to the results for Westcliffe discussed above. It is interesting to note that this site provides a completely different directional viewshed from that of Green Lane and Westcliffe, which both display views up the dip slope away from the sites. Wood Hill, by contrast, has views which are almost 360 degrees and spread both up and down the dip slope. In terms of the assemblage signature the site is focused on raw material procurement and the use and manufacture of handaxes, coupled with general subsistence activities slanted towards carcass processing. This carcass/ butchery emphasis could be linked to the wide views (figure 6.32), with handaxes being manufactured on site (Winton 2004) and exported out for use in the lowland plain.

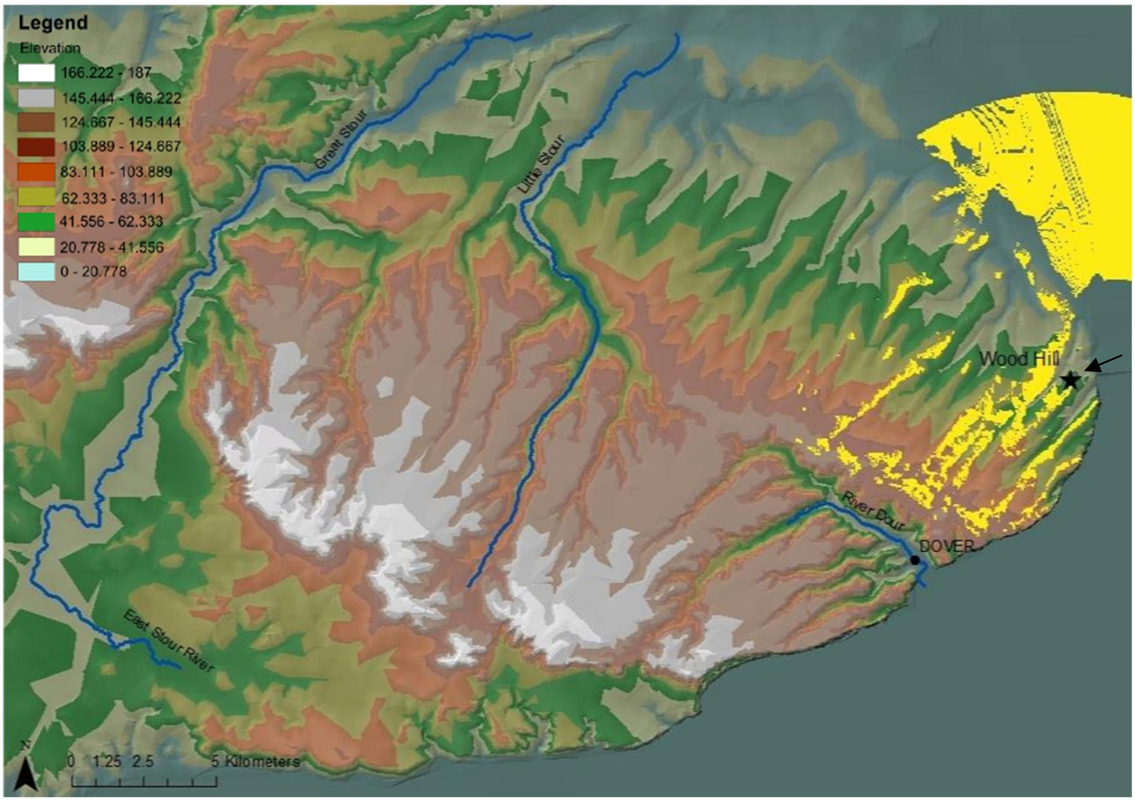


FIGURE 6.31 - VIEWSHED FROM WOOD HILL (YELLOW DENOTES THE AREAS THAT ARE VISIBLE), ARROW DENOTES DIRECTION 3D VIEW IS TAKEN FROM.

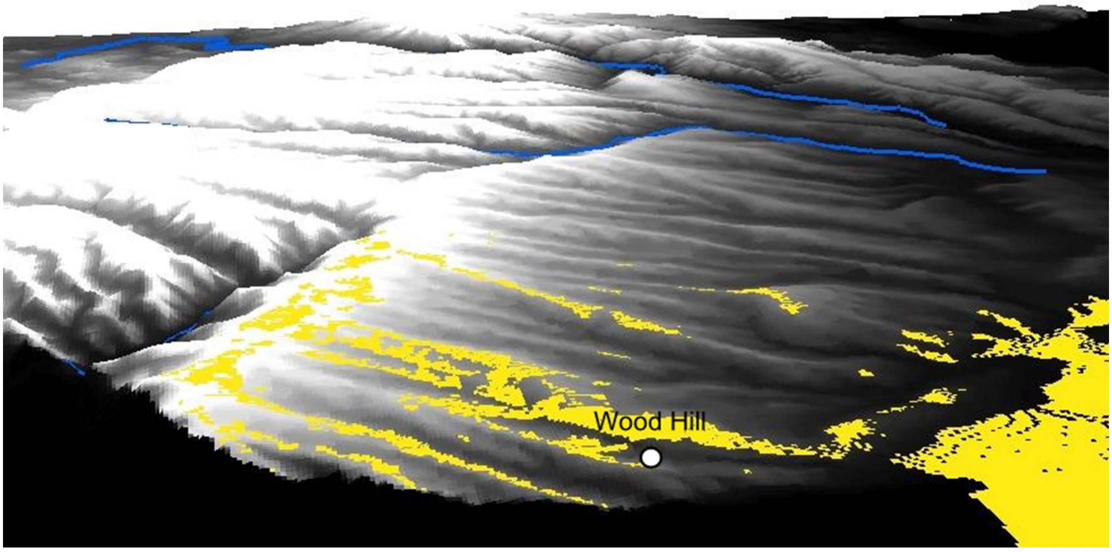


FIGURE 6.32 - 3D VIEW OF THE LANDSCAPE AND VIEWSHED SURROUNDING WOOD HILL

MALMAINS 1

The last two locations are situated only 1km apart on the same interfluve. The first, Malmains 1, has a signature suggesting a mixed strategy site, with manufacture and a focus on butchery and carcass processing, but also with some wood working. This signature shares similarities with Green Lane, Whitfield but displays more of a mixed assemblage, with some handaxes likely imported. In terms of the viewshed (figure 6.33) the focus is on the dry valleys and interfluves to the north and north-west of the site, extending to the higher plateaus and the gap between the Little Stour and River Dour, possibly indicating a crossing point between these two rivers (figure 6.34).

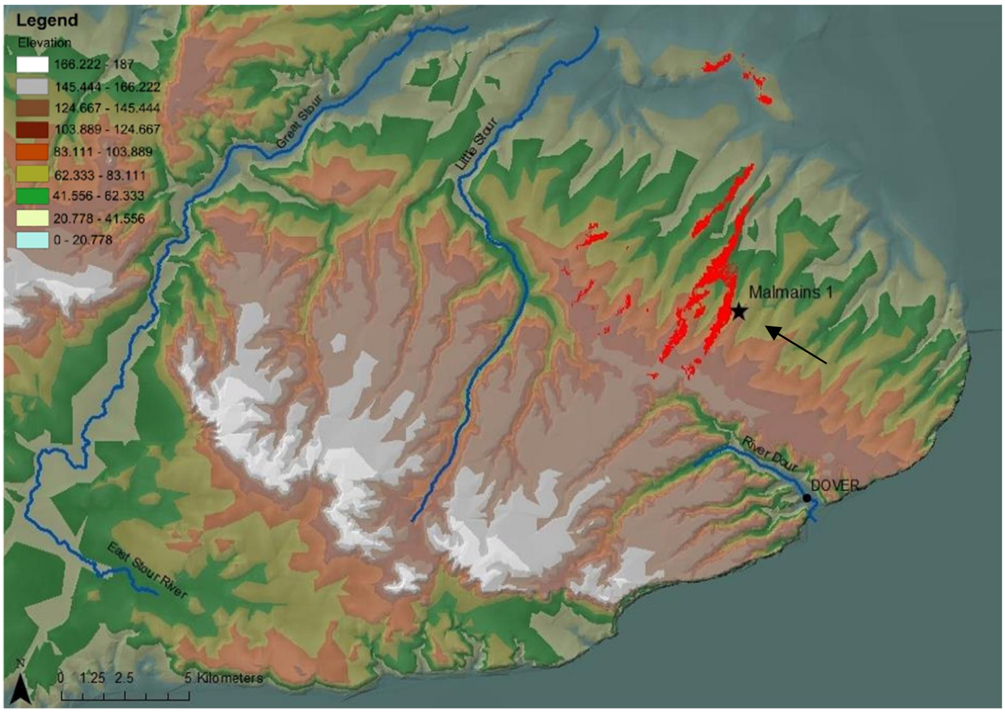


FIGURE 6.33 - VIEWSHED FROM MALMAINS 1 (RED DENOTES THE AREAS THAT ARE VISIBLE), ARROWS SHOWS DIRECTION FROM WHICH 3D VIEW IS TAKEN

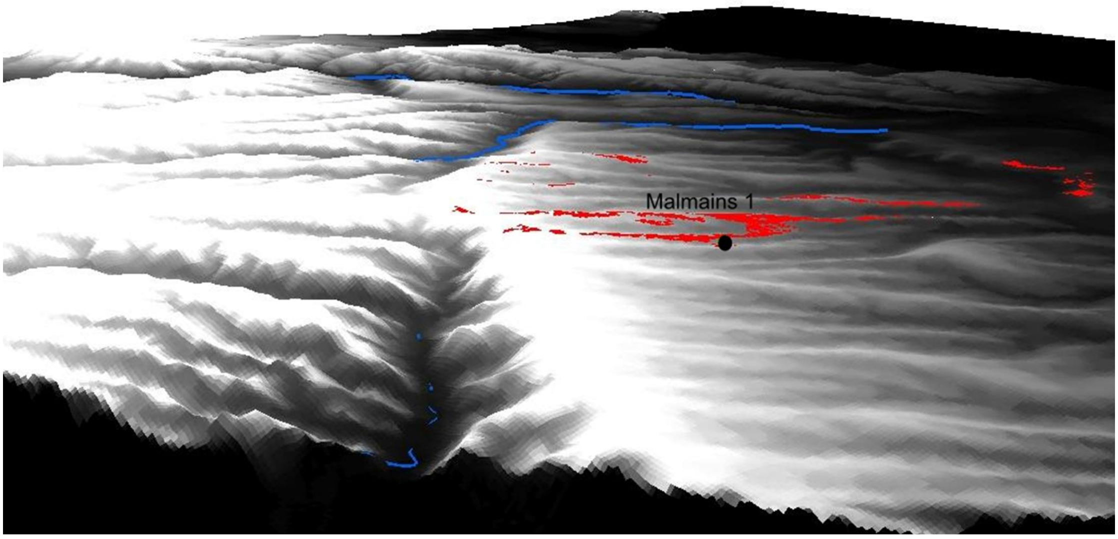


FIGURE 6.34 - 3D VIEW FOR MALMAINS 1

MALMAINS 2

The second, Malmains 2 is of a different character, being a short-stay ephemeral occupation, with a mixed signature indicative of general subsistence activities, although the small number of tools present do suggest carcass related activities (section 2.5; section 5.1.4). The viewshed (figure 6.35) is more extensive, although similar to that of Malmains 1, and concentrates again on the dry valley interfluves to the west and south-west of the site, and again on the plateau gap between the tributaries of the River Dour and the Little Stour (figure 6.36). It displays a broader localised focus with visible areas on the interfluves behind it to the south-east. This view spans a variety of landscapes from the plateaus to the upper and lower reaches of the dry valley network and the lower ground to the north.

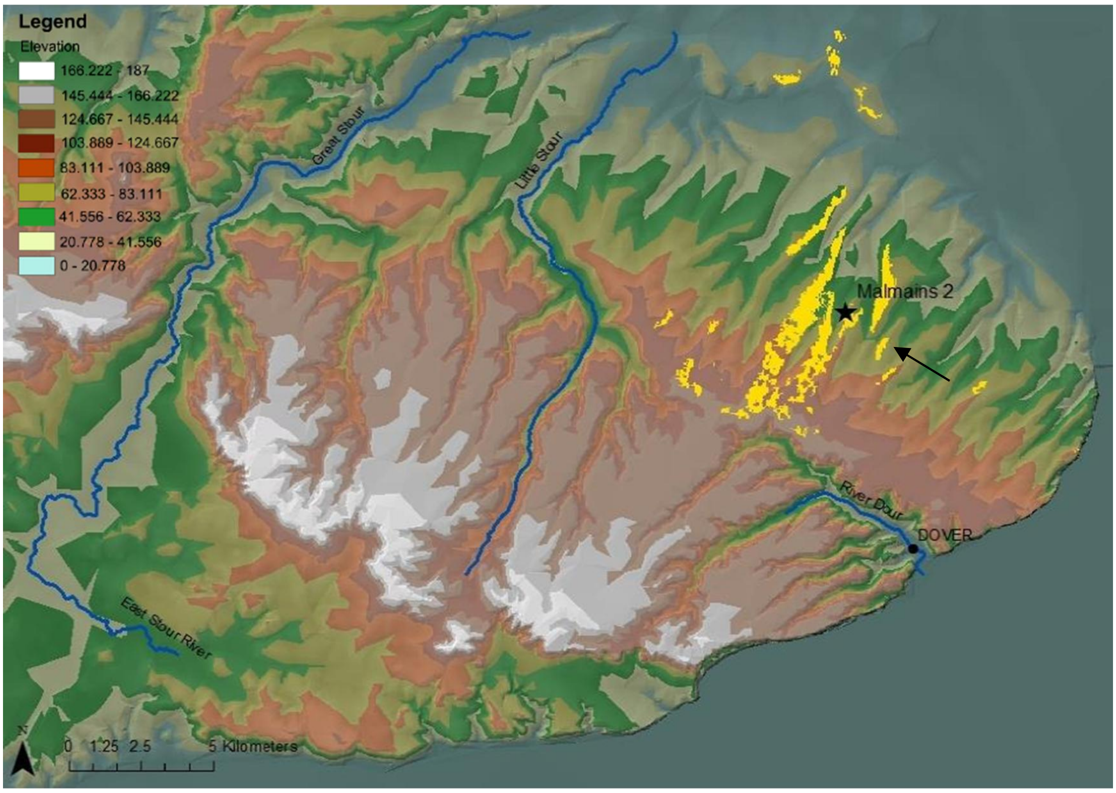


FIGURE 6.35 - VIEWSHED FROM MALMAINS 2 (YELLOW DENOTES THE AREAS THAT ARE VISIBLE), ARROW SHOWS DIRECTION IN WHICH 3D VIEW WAS TAKEN

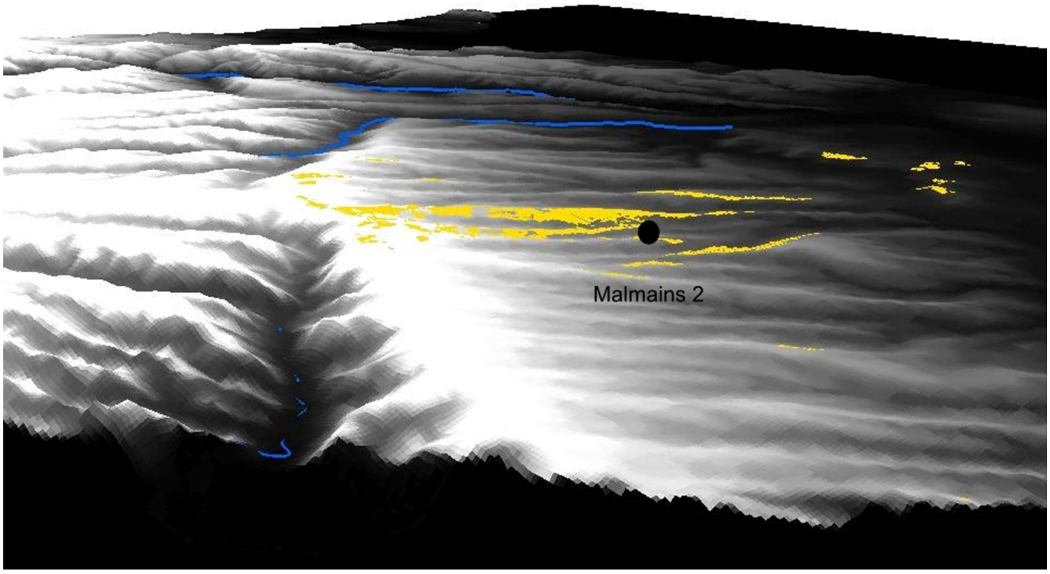


FIGURE 6.36 - 3D VIEW OF MALMAINS 2

In summary, the overall character of the viewsheds for the main sites is interesting. Each has a distinct focus which ties in with the varying assemblage signatures. For example, Westcliffe with its manufacture signature is focused on the upper dip slope and plateaus, contrasting with Green Lane, which displays a carcass processing and hunting signature with views of the Dour valley, and its tributaries and surrounding plateaus. Whereas Wood Hill has extensive views of the plateaus, dip slope and lowland plain, with a signature indicating raw material procurement and the production of handaxes. The only exceptions are Malmains 1 and 2 which demonstrate similar viewsheds, but have assemblages of different characters: mixed versus ephemeral occupation.

SMALL SITES

ELHAM

The first and one of the largest of the viewsheds from the smaller Kent findspots is that from the site of Elham (figure 6.37). In contrast to many of the assemblages (with the exception of Tolsford Hill) Elham is positioned on the plateau area, on a dry valley interfluve between the sources of the River Dour and Little Stour. The assemblage contains both Lower and Middle Palaeolithic types, although Tester identified five handaxes, a flake and a scraper (1952). Regarding the types of activities undertaken at the site the handaxes and scraper suggest butchery and carcass processing (see comments in use-wear section 2.5). The viewshed focuses on the plateau regions either side of the Little Stour valley to the east and west of the site. Further views can be seen to the north-east and the plateau gap between the Dour and Little Stour, and also to the south-west and the edge of the scarp (figure 6.38). The extent of the viewshed correlates with the presence of handaxes in these smaller sites (see discussion for the Chilterns regarding the observed relationship between handaxes and large viewsheds). Furthermore, despite the small assemblage it could be argued that this site demonstrates affinities with butchery and carcass processing tasks. The extensive views would have allowed herd tracking and prey spotting, perhaps across the plateaus of the Little Stour valley, which indicates a perceived emphasis on this particular river valley.

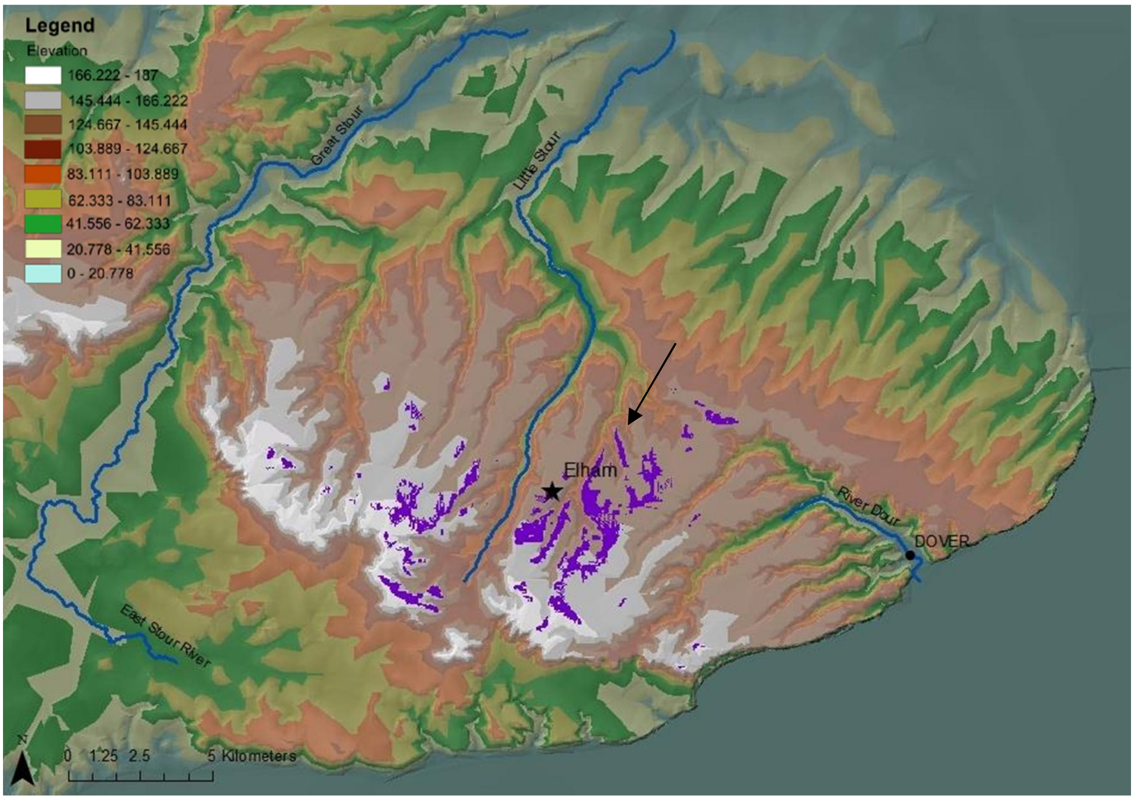


FIGURE 6.37 - VIEWSHED FROM ELHAM (PURPLE DENOTES THE AREAS THAT ARE VISIBLE), ARROW SHOWS DIRECTION THAT 3D VIEW WAS TAKEN FROM

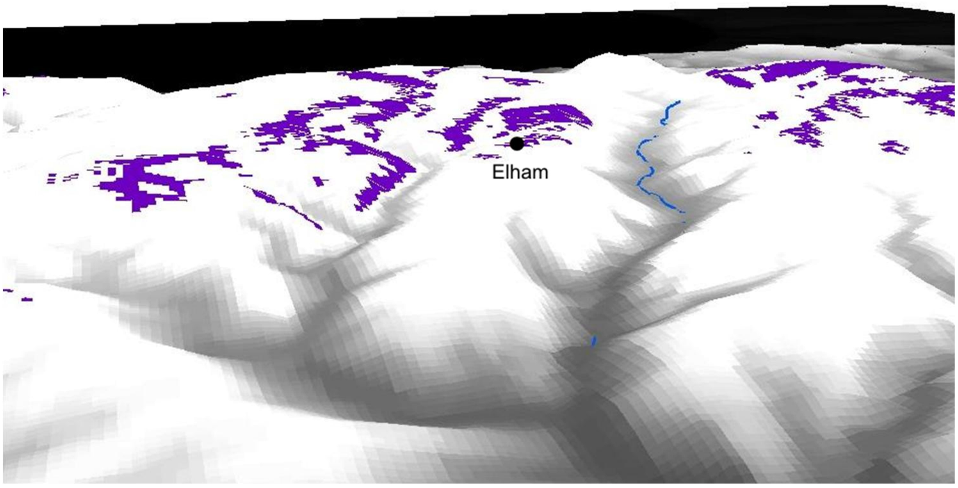


FIGURE 6.38 - 3D VIEW FOR ELHAM

Broome Bungalows

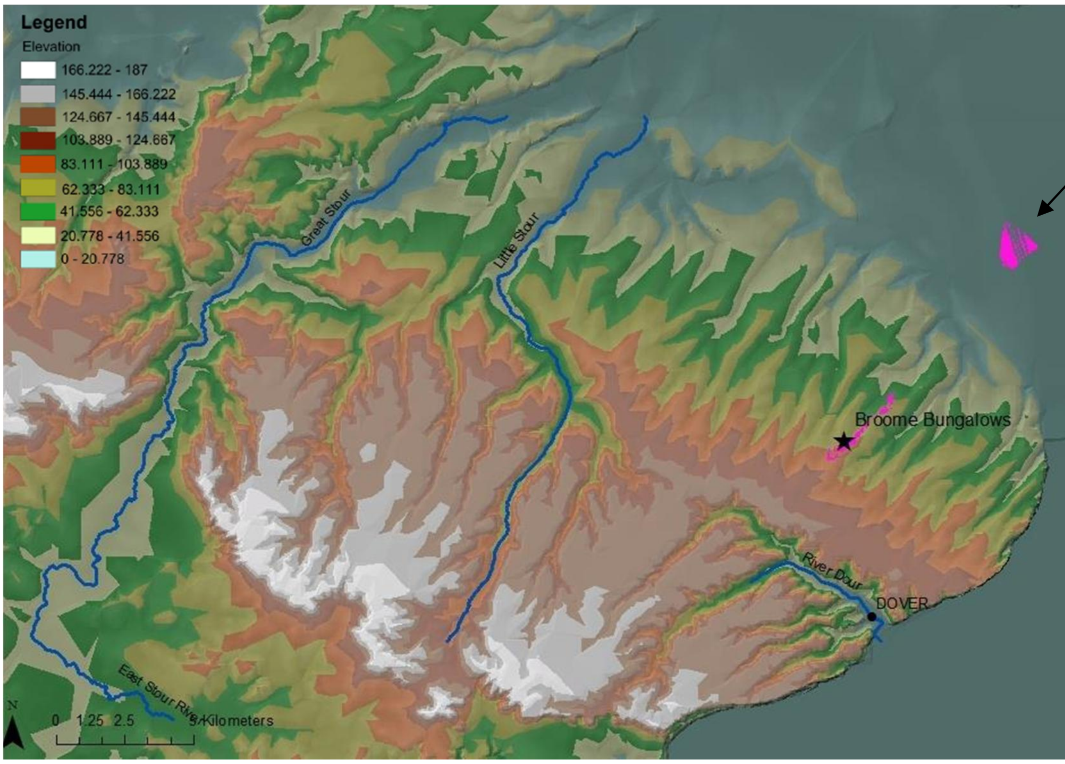


FIGURE 6.39 - VIEWSHED FOR BROOME BUNGALOWS (PINK AREA DENOTES VISIBLE LANDSCAPE), ARROW DENOTES THE DIRECTION THE 3D VIEW IS TAKEN FROM

In contrast, the viewshed from Broome Bungalows exhibits a pattern which conflicts with that for Elham (above). Here the purview is restricted to a single dry valley spreading from the site north-east down the dip slope to the lowland area beyond (figures 6.39 and 6.40), perhaps signifying the use of the dry valleys as route ways through the landscape. Only a single flake has been recovered from this site, which fits with the observed restricted location if the association between view extent and handaxe presence holds true.

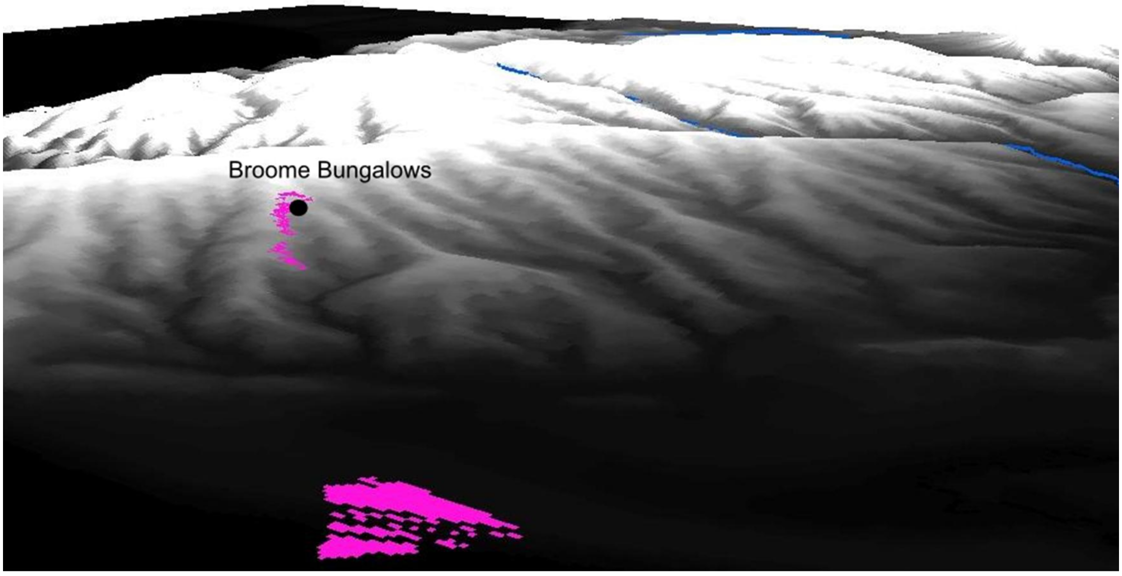


FIGURE 6.40 - 3D VIEW FOR BROOME BUNGALOWS

FREEDOWN

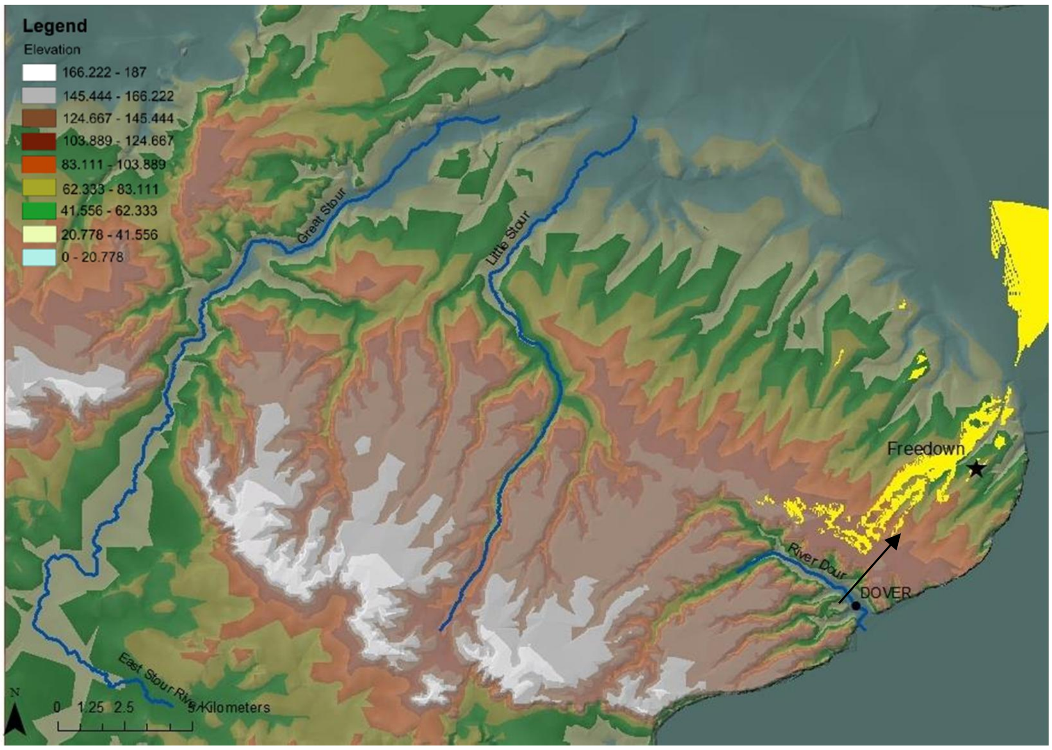


FIGURE 6.41 - VIEWSHED ANALYSIS FOR FREEDOWN (AREA IN YELLOW IS VISIBLE), ARROW SHOWS DIRECTION 3D VIEW TAKEN FROM

Freedown is located in a similar position to Wood Hill, and displays an extensive viewshed (figure 6.41) which ranges from the site, up the dipslope (taking in several dry valleys) to the plateaus around Green Lane and the River Dour to the south-west. There are also views to the north-east down the lower reaches of the dry valley network and the lowland plain, as well as the immediate dry valleys to the north and east of the site (figure 6.42). The assemblage comprises only one handaxe, which could be argued to relate to the lower position of the site, with extensive views of and easy access to the lowland plain.

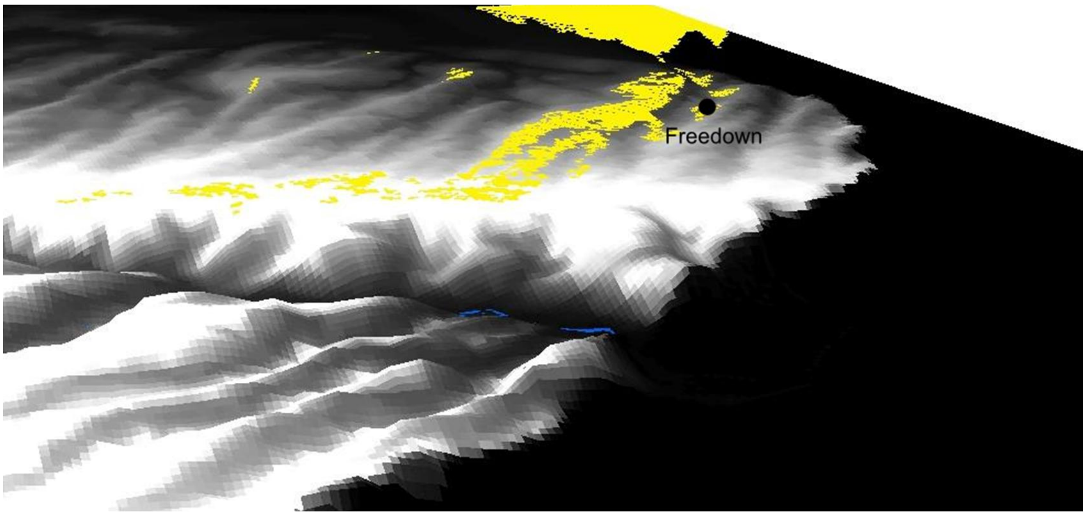


FIGURE 6.42 - 3D VIEW OF FREEDOWN LANDSCAPE

HACKLINGE

The most northerly of the sites is Hacklinge, located on the lowlands with easy access to the herds traversing the channel plain. The viewshed here is almost 360 degrees and encompasses the lower reaches of the dipslope as well as a sizeable portion of the lowland area surrounding the site (figure 6.43), although the focus appears to be to the north-east/ east of the site and to the south (figure 6.44). Similar to Freedown above, the site has also produced only a single handaxe, which, as above, can be linked to proximity to the hunting grounds and the large viewshed demonstrated from the site.

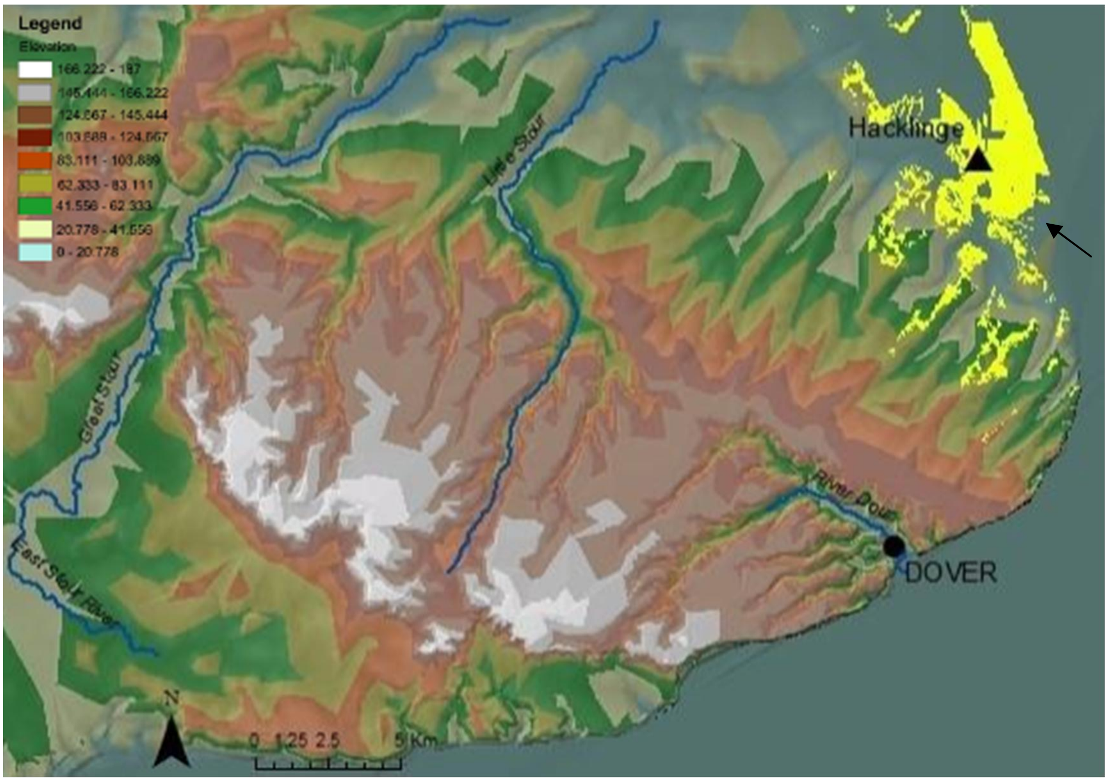


FIGURE 6.43 - VIEWSHED FOR HACKLINGE (AREA IN YELLOW IS VISIBLE), ARROW SHOWS DIRECTION 3D VIEW IS TAKEN FROM

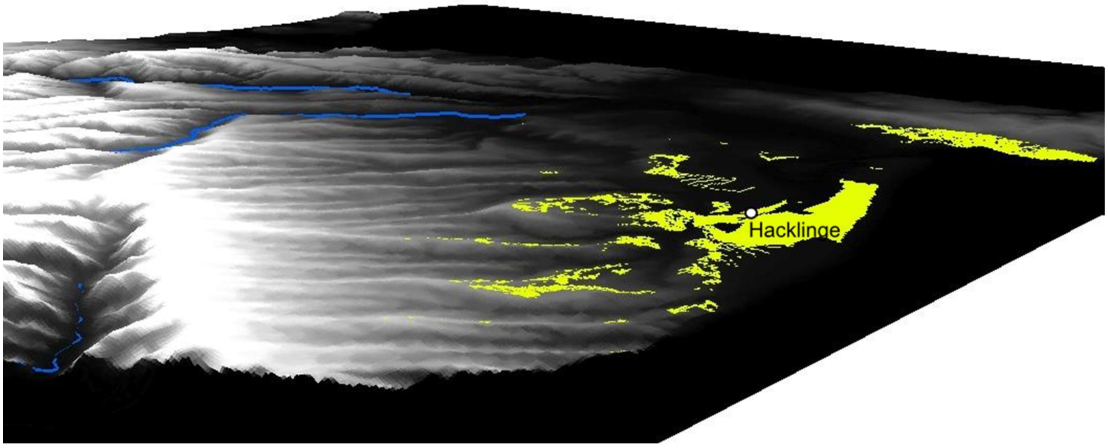


FIGURE 6.44 - 3D VIEW OF VIEWSHED AND LANDSCAPE AROUND HACKLINGE

HAWKSHILL DOWN

One of the sites located in the main cluster on the lower dipslope is Hawkshill Down. The assemblage comprises two handaxes, six flakes and a core. Of the flakes, one is wholly cortical, one exhibits >50% with the rest being both non-cortical and <50%. Again in a similar situation to Ripple Field (see below) despite the small assemblage size it does in fact contain all stages of flake types, which when coupled with the cores indicates on site working.

Hawkshill Down displays a viewshed with two main focuses (figure 6.45). Firstly an extensive and wide view to the east across much of the lowland plain, in addition to a second, very focused and narrow corridor up the dry valley and interfluve to the south-west, extending from the lower reaches of the dry valley network up to the plateau area to the north of the Dour valley. This conceivably indicates a form of routeway using the dry valleys to access plateau resources (figure 6.46). Furthermore, as with many of the other sites the presence of handaxes ties in with close links to the lowland area.

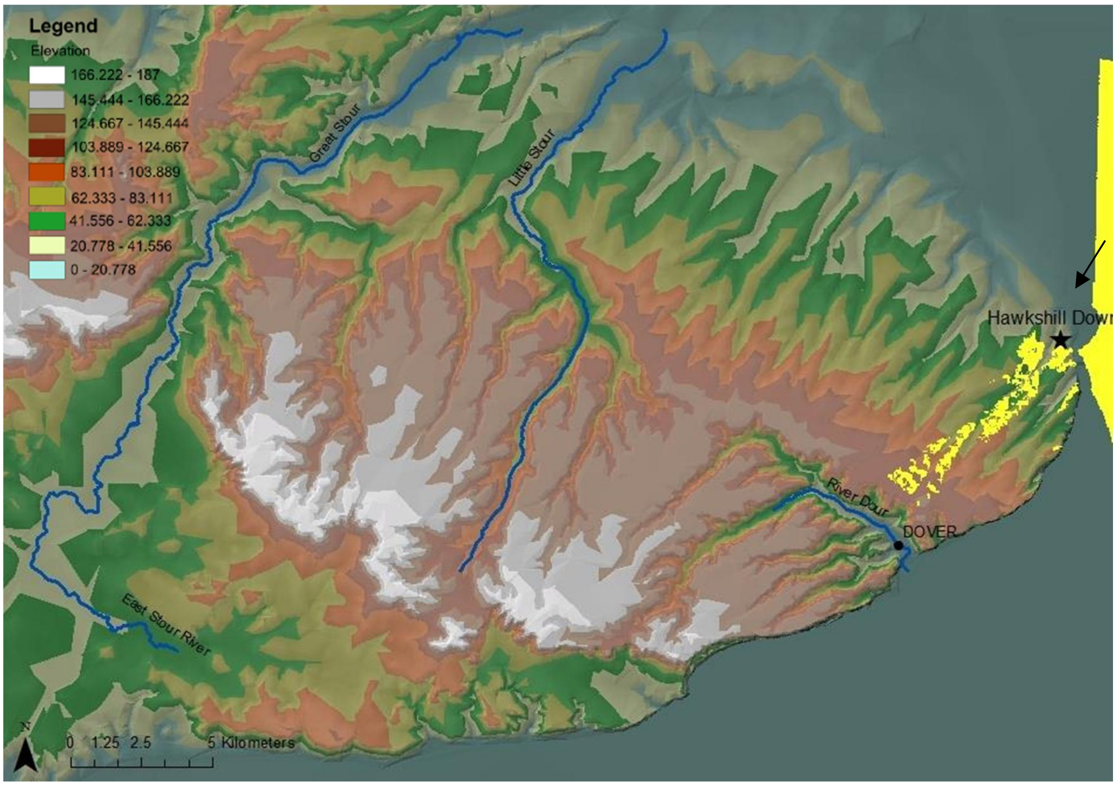


FIGURE 6.45 - VIEWSHED FROM HAWKSHILL DOWN (YELLOW DENOTES THE AREAS THAT ARE VISIBLE), THE ARROW DENOTES THE DIRCTION FROM WHICH THE 3D VIEW IS TAKEN.

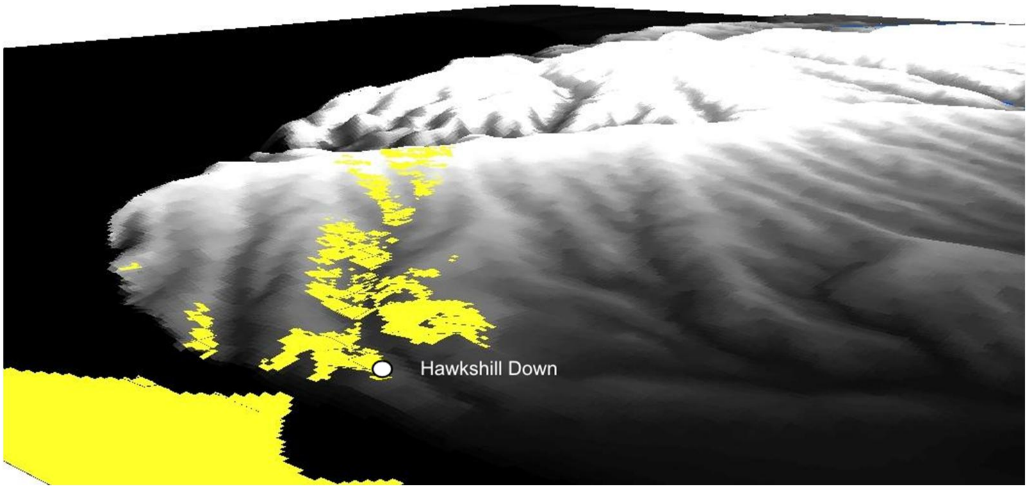


FIGURE 6.46 - 3D VIEW FROM HAWKSHILL DOWN

KNIGHTS BOTTOM

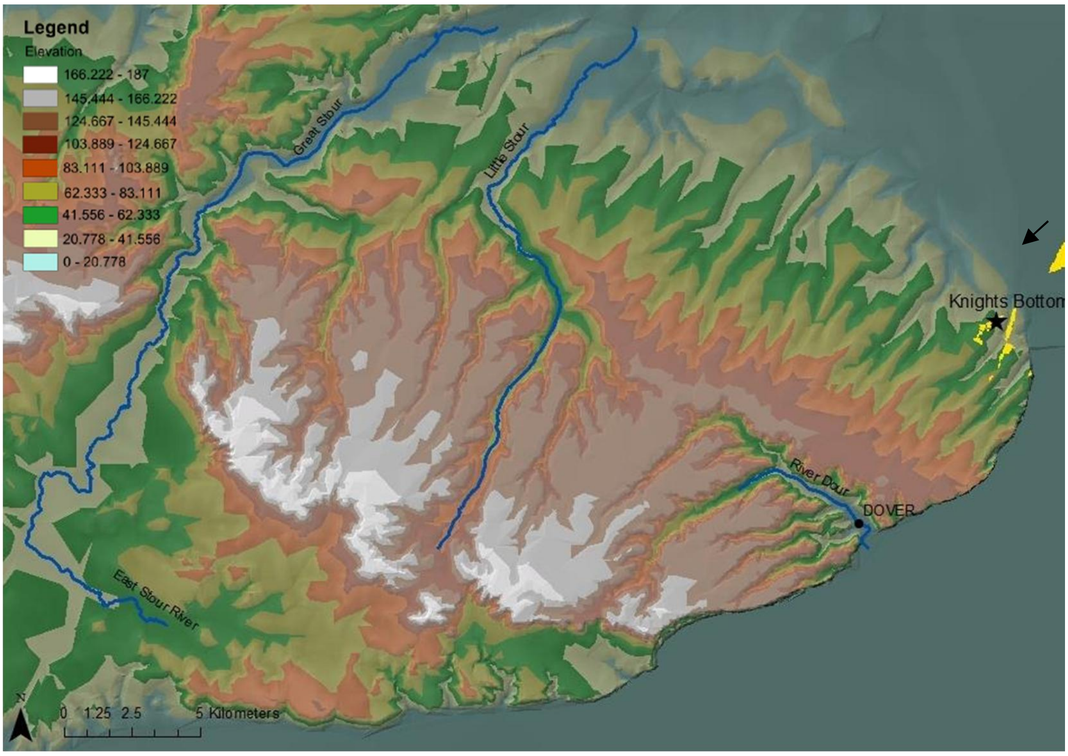


FIGURE 6.47 - VIEWSHED FROM KNIGHTS BOTTOM (YELLOW DENOTES THE AREAS THAT ARE VISIBLE), ARROW SHOWS THE DIRECTION THE 3D VIEW WAS TAKEN FROM

In contrast to many of the other sites in this area, Knights Bottom exhibits an exceptionally restricted viewshed, despite its lowland position, only extending to the immediate area surrounding the site, part of the adjacent dry valley and interfluve to the east and a narrow focus across the lowland channel plain to the north-east (figures 6.47 and 6.48). The assemblage here comprises just a single flake with >50% cortex. This limited assemblage matches the general trend of small viewsheds for limited (non-handaxe) assemblages, suggesting this was perhaps an ephemeral site, stop over or merely represents an artefact discarded by a passing hominin.

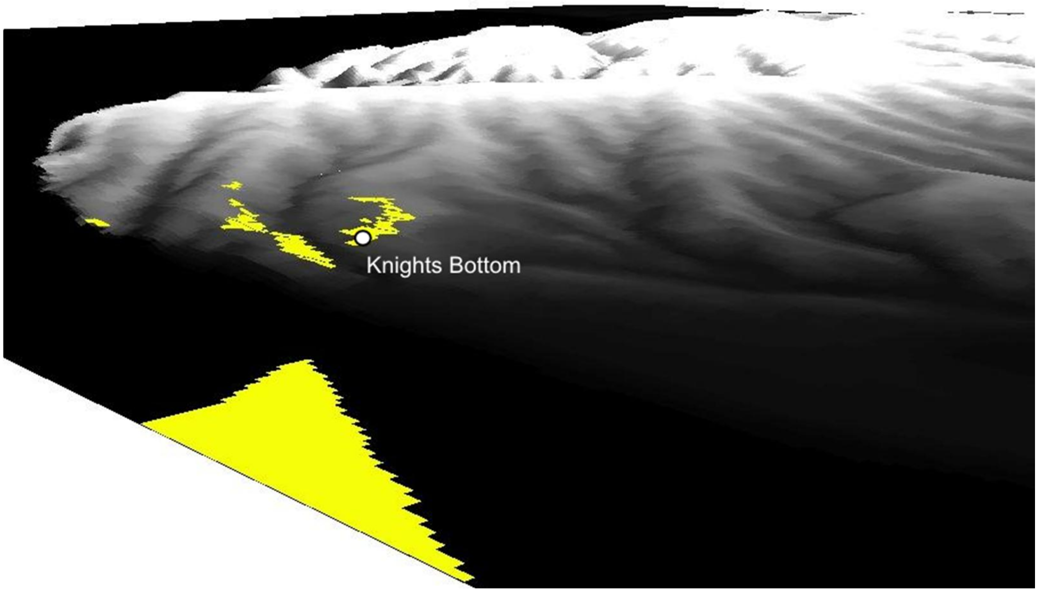


FIGURE 6.48 - 3D VIEW FROM KNIGHTS BOTTOM

LADY HAMILTON'S SEAT

Lady Hamilton's Seat is another unusual small site, but with almost 360 degree views (figure 6.49), similar to but more widespread than that for Hacklinge (see above). In contrast however, the only artefact recovered from this site is the butt of an ovate handaxe. Despite the extensive all round views (which encompass the whole of the area around modern day Deal) the main focuses appear to be the channel plain to the north and the dry valley interfluves and plateaus to the south-west (figure 6.50). Again the presence of the handaxe, coupled with extensive views suggests some sort of hunting function for the site.

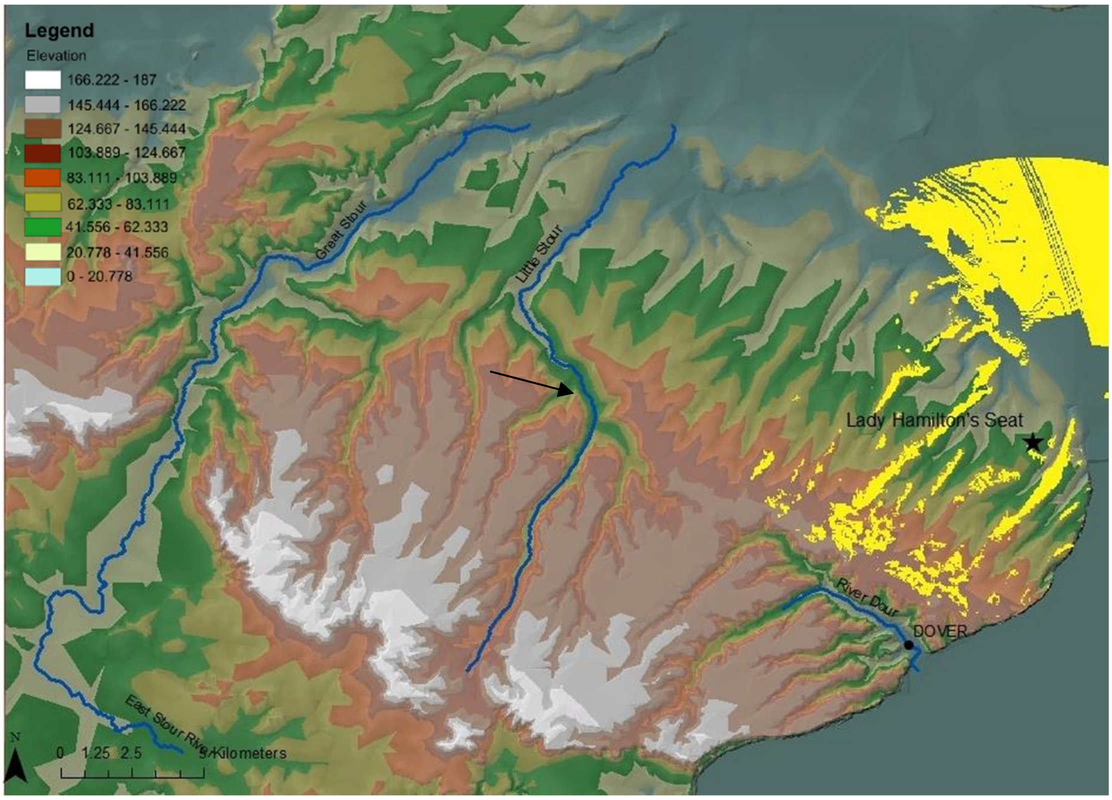


FIGURE 6.49 - VIEWSHED ANALYSIS FOR LADY HAMILTON'S SEAT (AREA IN YELLOW IS VISIBLE), ARROW SHOWS THE DIRECTION THE 3D VIEW IS TAKEN FROM

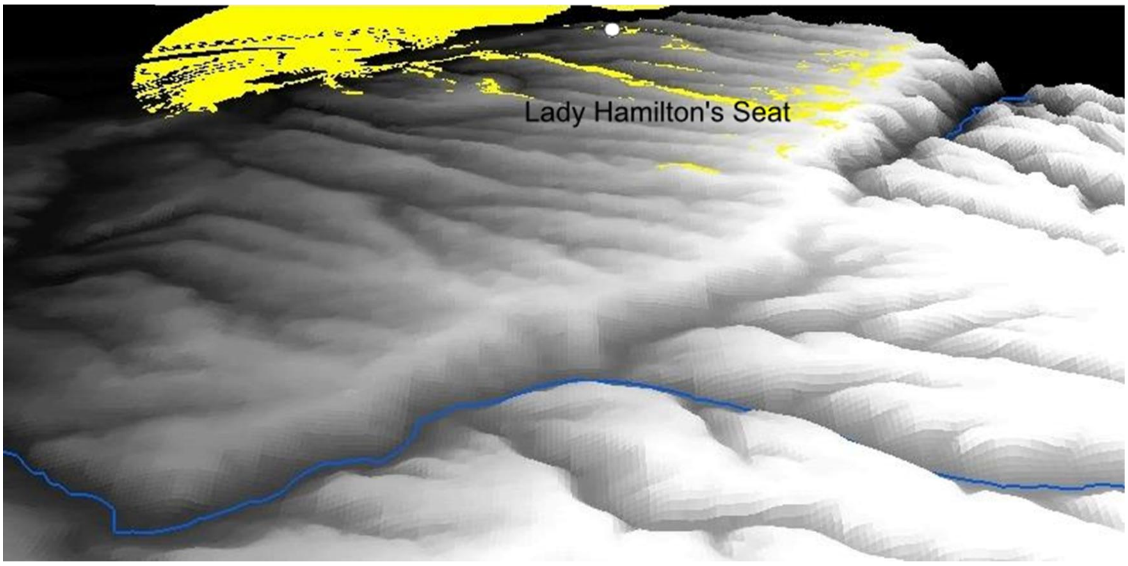


FIGURE 6.50 - 3D VIEW OF LADY HAMILTON'S SEAT

Ripple Field

Close to Lady Hamilton's Seat is Ripple Field (which also includes artefacts labelled as Coldblow/ Mayer's Road) which is again located on low ground to the north-east of Dover. The assemblage contains a handaxe, eight flakes and a denticulate. The handaxes and flake tool indicate butchery and processing tasks in the vicinity. Of the flakes, one is fully cortical suggesting primary working, whilst the rest are mostly non-cortical with <50% cortex, however there is a single flake exhibiting >50%. Therefore despite the limited numbers all stages of flake working can be said to be represented, indicating that manufacture did take place at this locale.

The viewshed is focused on a corridor of land to the north-west of the site, which bands the lower area to the north (proximity to hunting grounds?) (figure 6.51). Additional views can be seen surrounding the site along short sections of adjacent dry valleys (figure 6.52).

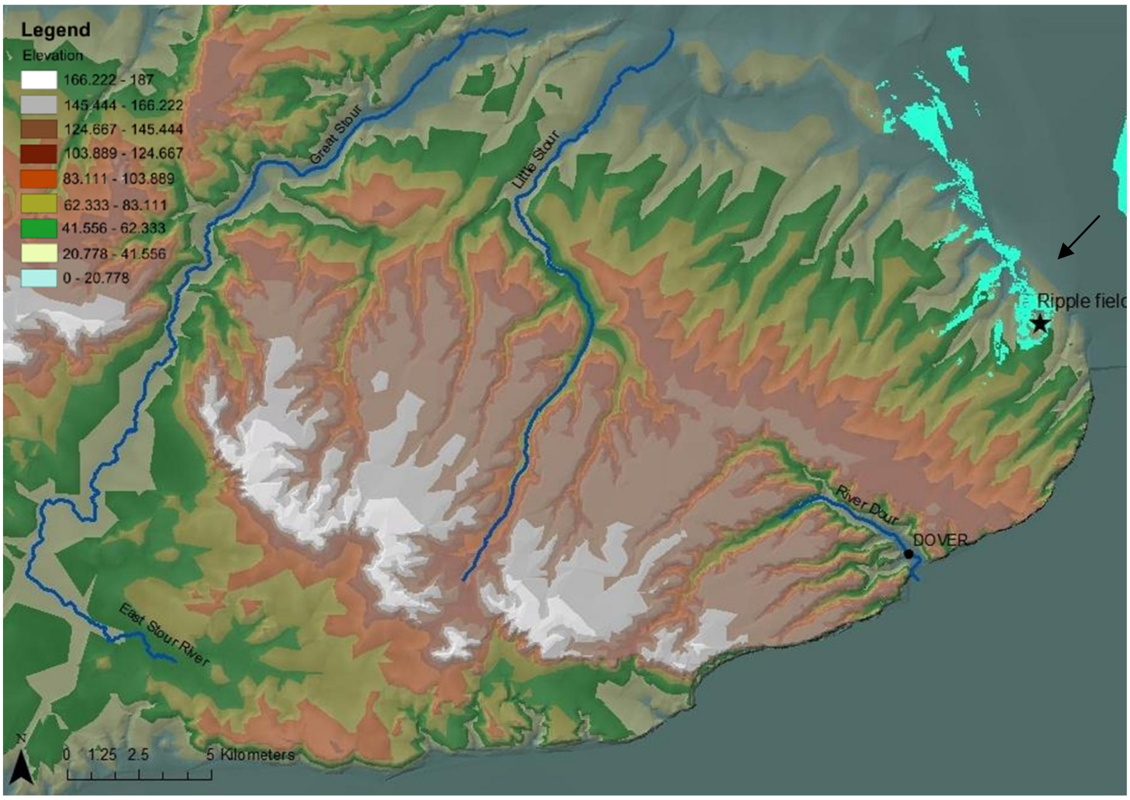


FIGURE 6.51 - VIEWSHED FROM RIPPLE FIELD (LIGHT BLUE DENOTES THE AREAS THAT ARE VISIBLE), ARROW DENOTES DIRECTION OF 3D VIEW

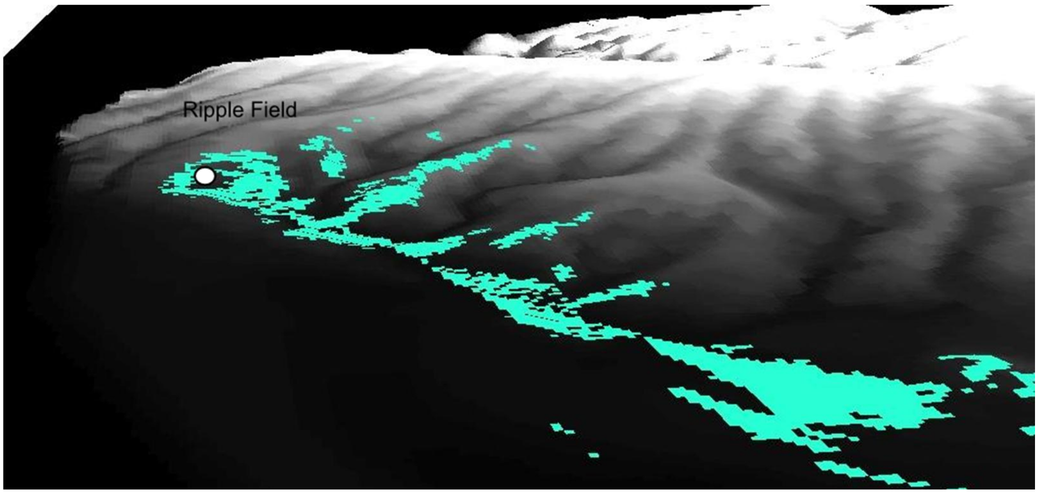


FIGURE 6.52 - 3D VIEW OF RIPPLE FIELD

SHEPHERDSWELL

In section 6.3 a number of sites were highlighted due to their isolated locations on the upper plateaus to the south-west of the area. One of these, Shepherdswell, is situated midway between the Little Stour and the River Dour, to the north-west of Dover. The location is notable due to the fact that this plateau area serves as a bridge between the scarp to the south-west and the dip slope and lower plain to the north-east. If the assumption is made that the rivers were present at the time of occupation, then this would have created a natural routeway between the two areas (figure 6.53).

The viewshed itself is reasonably restricted but with a definitive focus to the north of the site along the lower dip slope. The cone-shape, similar in form to Tolsford Hill (see below), spreads out along one of the dry valley interfluves towards the lowland plain (figure 6.54). The site contains a single handaxe as well as other implements (Parfitt and Halliwell 1996:60). The butchery implications of the handaxe again ties into the links to the plain and possible routeway highlighted above.

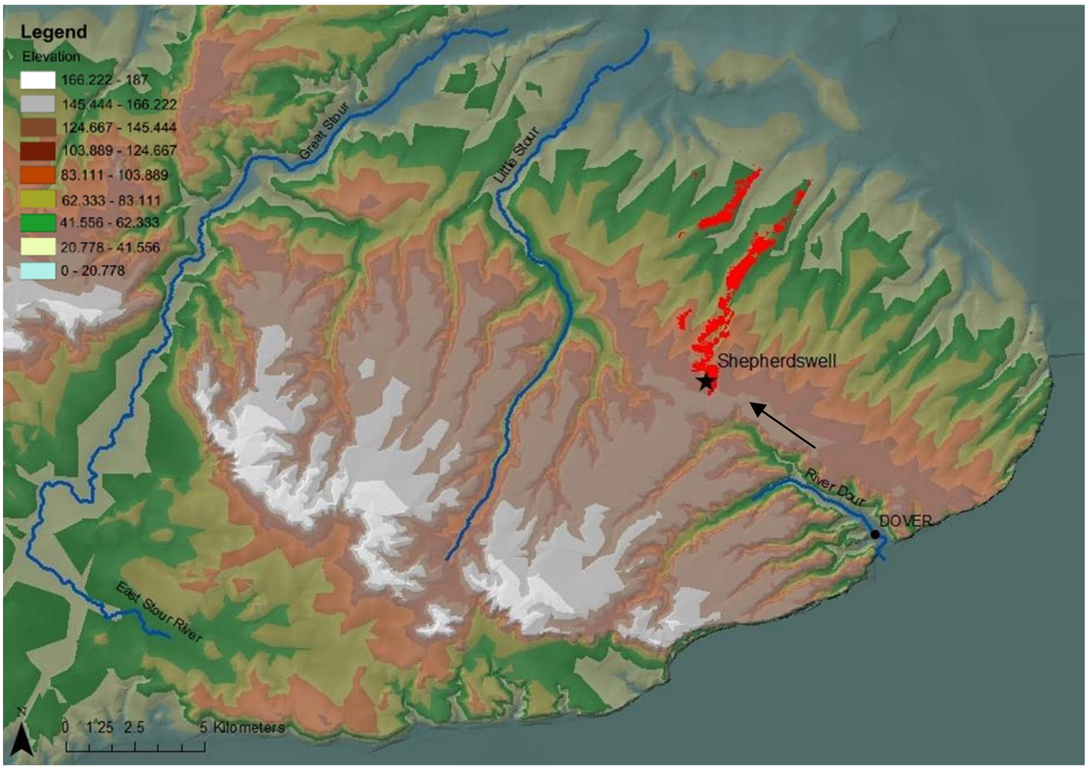


FIGURE 6.53 -1 VIEWSHED FROM SHEPHERDSWELL (RED DENOTES THE AREAS THAT ARE VISIBLE), ARROW SHOWS DIRECTION 3D VIEW IS TAKEN FROM.

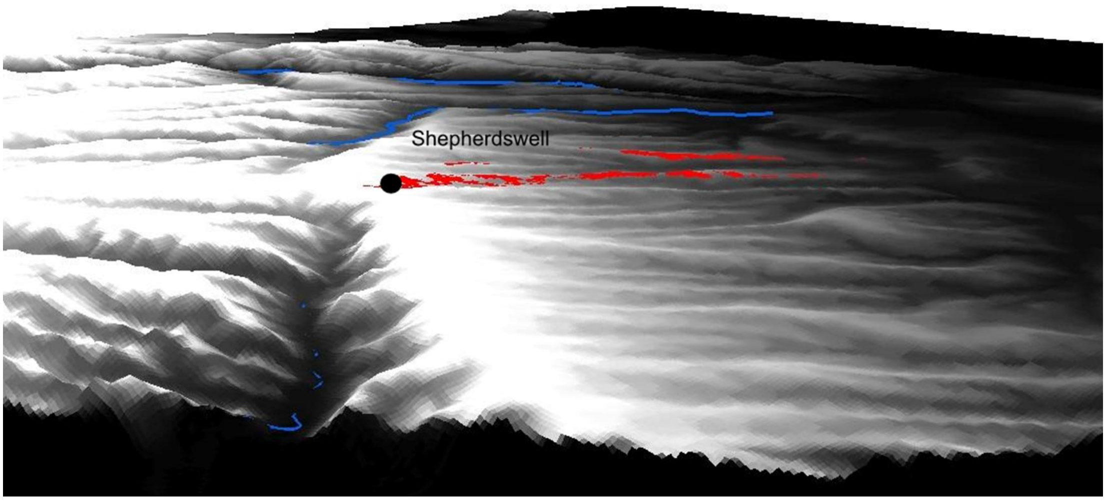


FIGURE 6.54 - 3D VIEW FOR SHEPHERDSWELL

Sutton Downs

Another site in the lower dip slope cluster is Sutton Downs. This displays a similarly large viewshed to Lady Hamilton's Seat, although the focus here is more in a cone shape covering the north-east, fanning out across the lowland plain, and south-west of the area up the dip slope to the plateaus above the Dour (figure 6.65). In keeping with the extensive views and focus on the lowlands (figure 6.66) the site has produced a handaxe, as well as two flakes, both of which exhibit mostly cortical surfaces, linking to early stage manufacture.

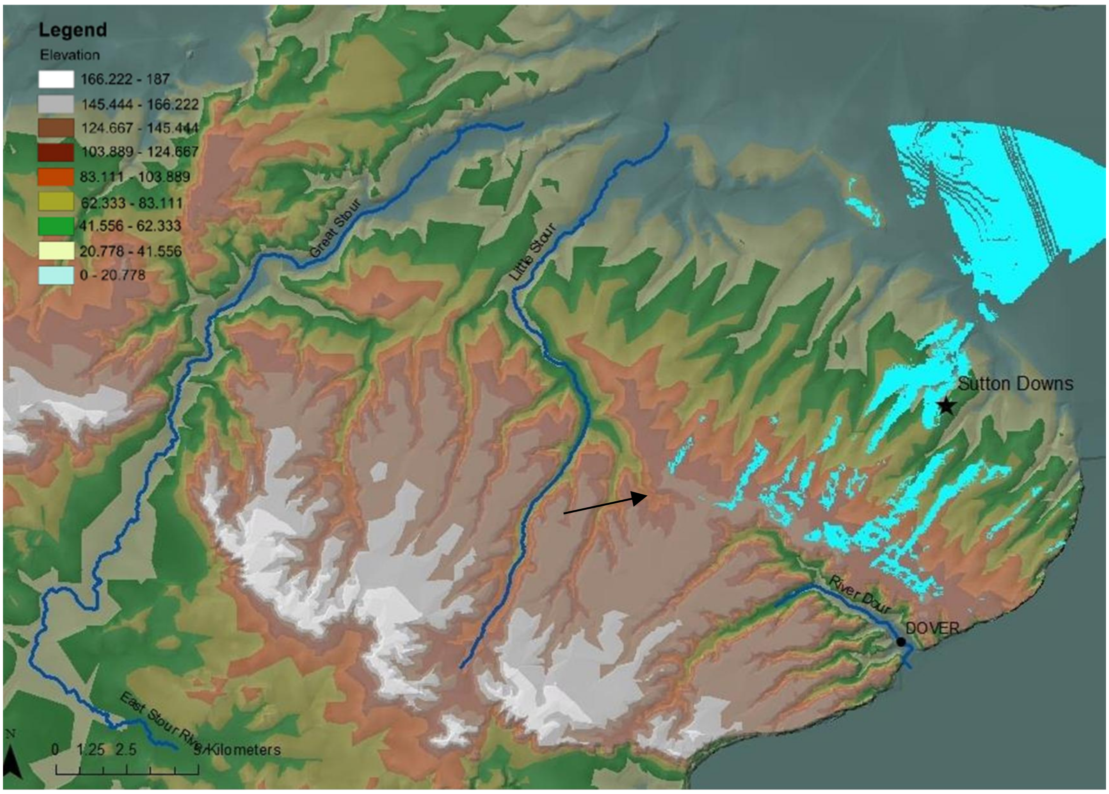


FIGURE 6.55 - VIEWSHED FROM SUTTON DOWNS (LIGHT BLUE DENOTES THE AREAS THAT ARE VISIBLE), ARROW DENOTES DIRECTION FOR THE 3D VIEW

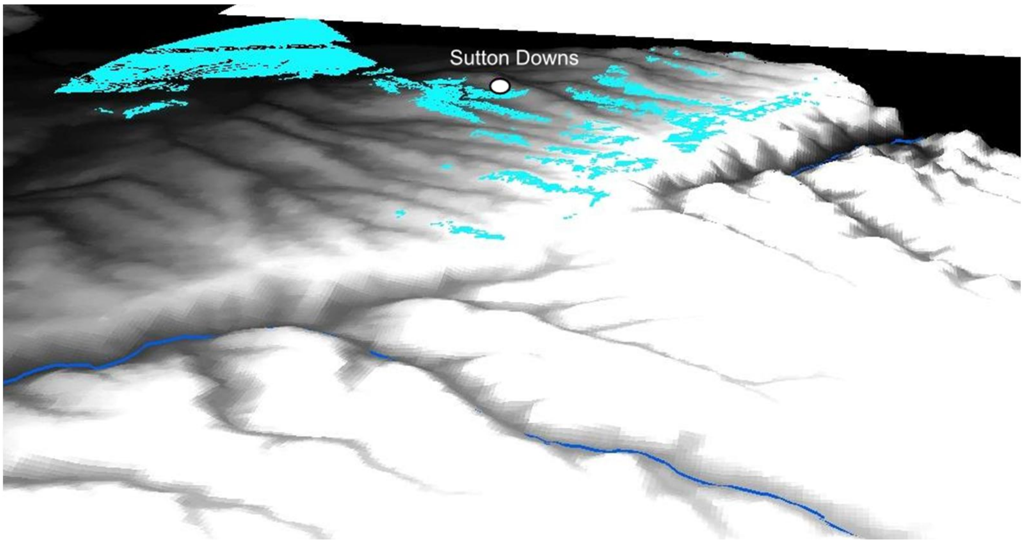


FIGURE 6.56 - 3D VIEW OF SUTTON DOWNS

ST. RADS

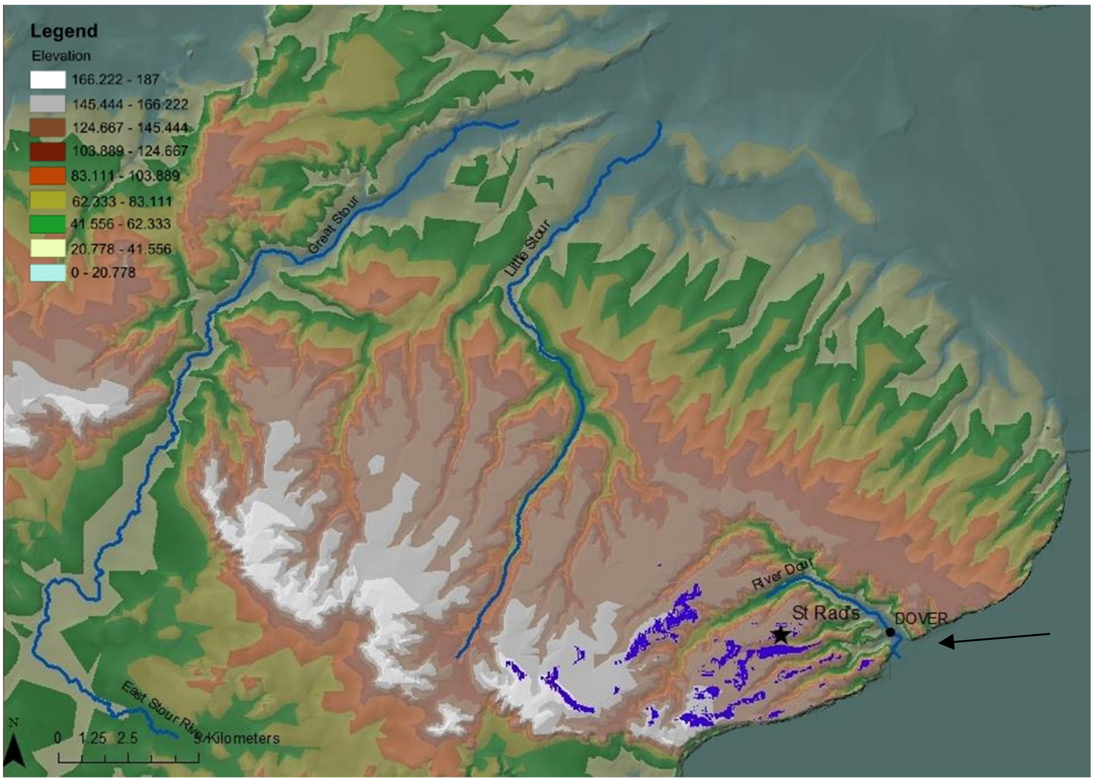


FIGURE 6.57 - VIEWSHED FOR ST. RADS (AREA IN DARK BLUE IS VISIBLE), ARROW DENOTES DIRECTION OF 3D VIEW

St. Rad's is one of the few sites in this study which is located to the south-east of the River Dour, set apart from the main collection of sites located in the lower dry valley system and dip slope to the north. The assemblage is represented by a single handaxe, however the viewshed is extensive and covers a large proportion of the plateaus, with a focus to the south-east and east of the site on the higher ground and scarp edge. Its position in the landscape is on the plateau overlooking one of the tributaries of the River Dour, potentially giving good access through the dry valley tributaries either side of the site, into the Dour valley to the plains beyond. This gives rise to the possibility, backed up by the handaxe, that this site was associated with game procurement and hunting.

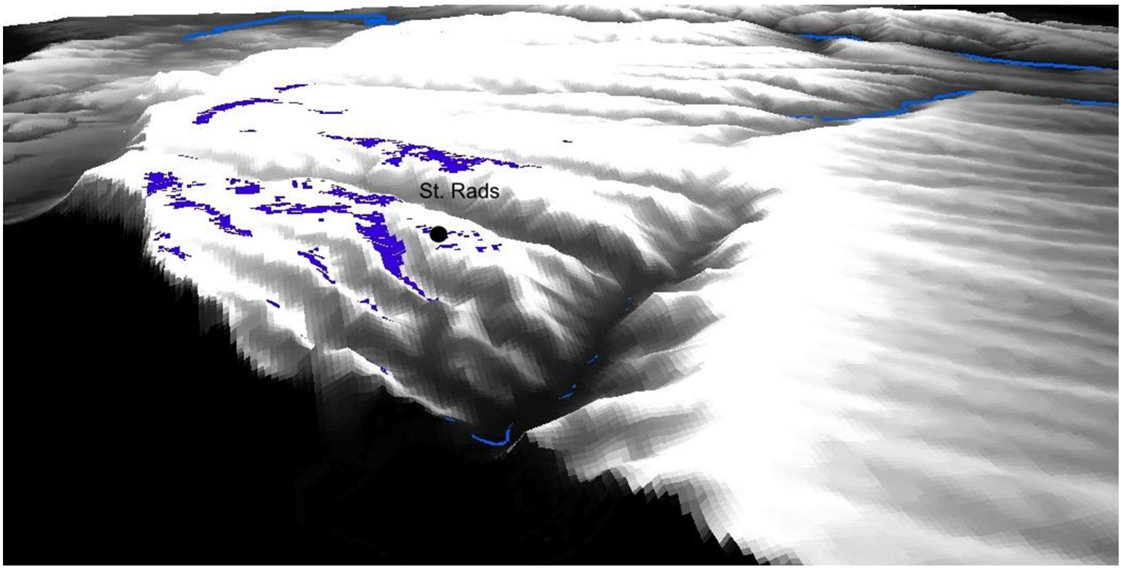


FIGURE 6.58 - 3D VIEW FROM ST. RADS

St. Margaret's

The next site, located close to Westcliffe and in the upper reaches of the dry valley network, is St. Margaret's. The viewshed here, in contrast to Westcliffe's is focused on the area to the north-east of the site. It excludes the nearby plateaus and instead extends to the east and north east down the lower reaches of the interfluve the site is located on as well as the adjacent dry valley to the east (figure 6.59). These limited views also tie in with the lack of artefacts from this location, with only a single flake being recovered. The site can conceivably be categorised as an ephemeral location, perhaps part of a routeway (figure 6.60) between the plateau tops and the dip slope and lower ground.

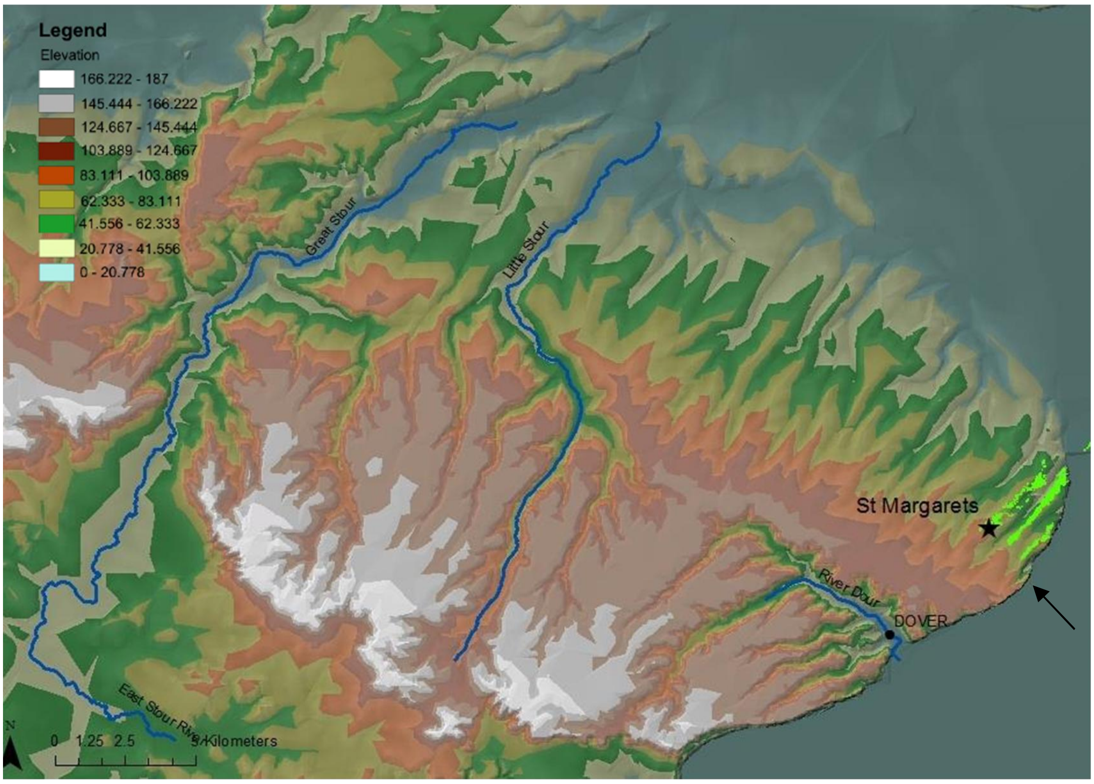


FIGURE 6.59 - VIEWSHED FOR ST. MARGARET'S (VISIBLE AREA IN LIGHT GREEN), ARROW SHOWS DIRECTION 3D VIEW IS TAKEN FROM

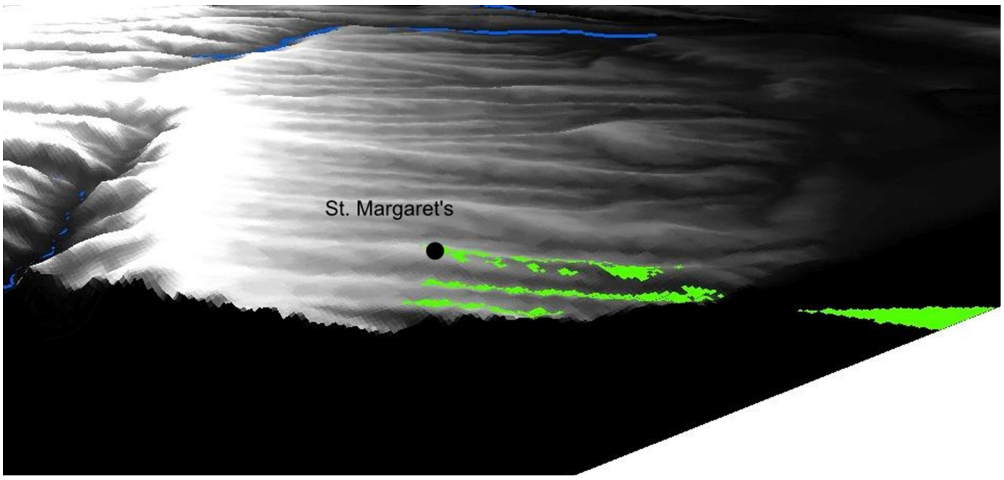


FIGURE 6.60 - 3D VIEW FOR ST. MARGARET'S

THE LYNCH

Located in the lowland cluster of sites near present day Deal is The Lynch. The site is positioned on the lower reaches of the dipslope on a dry valley interfluve. In terms of its position in the landscape and viewshed focus similarities can be seen with Knights

Bottom and Hawkshill Down in terms of the form, with the focus being north-east and south-west (figure 6.61). The overall extent is limited, restricted to an area around the site and the adjacent dry valley extending up the dip slope towards the upper reaches. To the north-east the view continues into the lowland and channel plain (figure 6.62). The artefacts from this location include two flakes, one of which is cortical, and a core. The suggested character of the assemblage (manufacture waste) ties in with the limited views of the site, although proximity to the lowland area could suggest a re-tooling locale in preparation for activities conducted in the plain area.

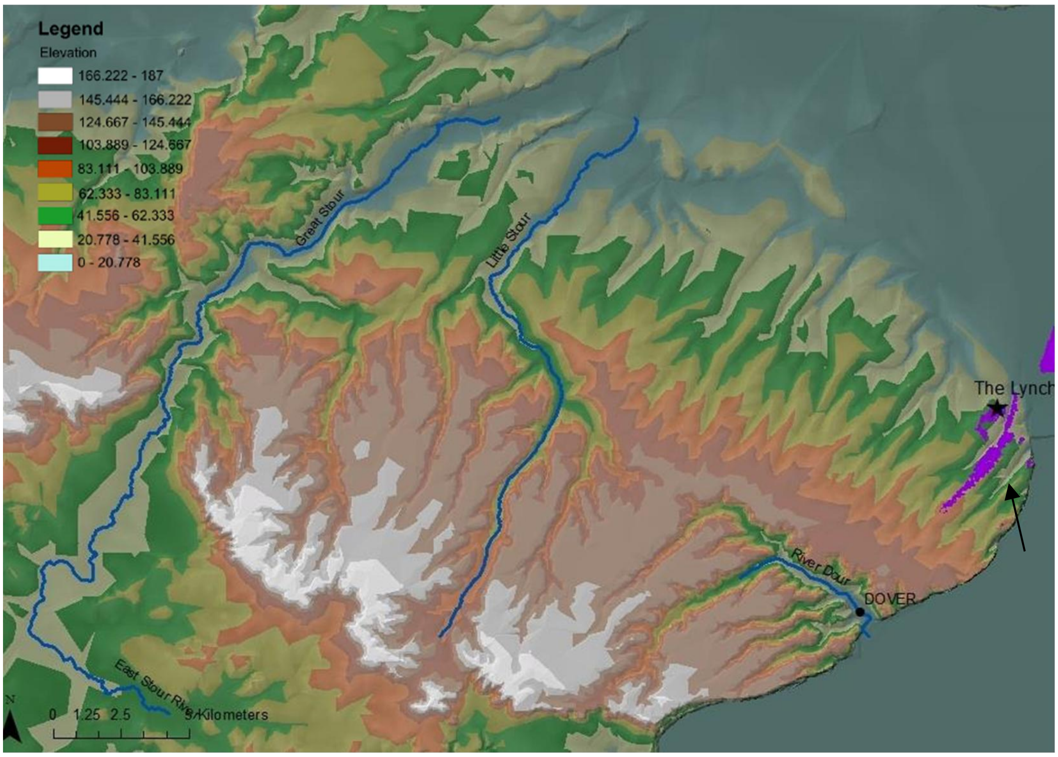


FIGURE 6.61 - VIEWSHED FOR THE LYNCH (AREA IN PURPLE IS VISIBLE), ARROW SHOWS DIRECTION 3D VIEW IS TAKEN FROM

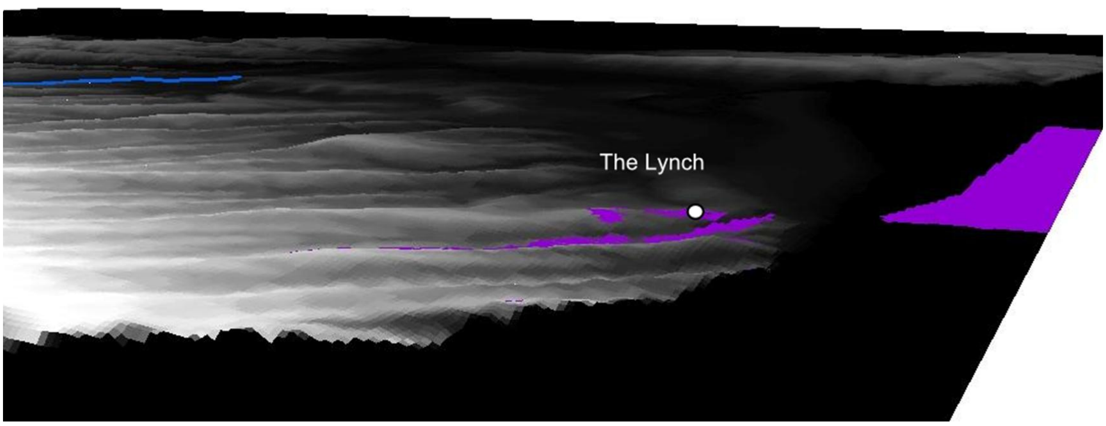


FIGURE 6.62 - 3D VIEW FOR THE LYNCH

TOLSFORD HILL

In contrast, one site in particular stands out in the study area. Tolsford Hill was recorded by Hartely (2004) (TR 155381) as containing a scatter of waste flakes and a palaeolithic handaxe. The positioning of this particular location is notable as it is situated on the edge of the scarp slope to the south-west of Dover. The viewshed is extensive and displays a characteristic cone-shaped focus out towards the south-west, providing views (figure 6.63) across the lower area towards the East Stour River, and the lowland channel plain. The landscape location and form of viewshed suggests use as a viewing station or hunting stand, which the presence of the handaxe supports (figure 6.64) defined by good views and easy access to the lowland hunting ground in the plains beyond.

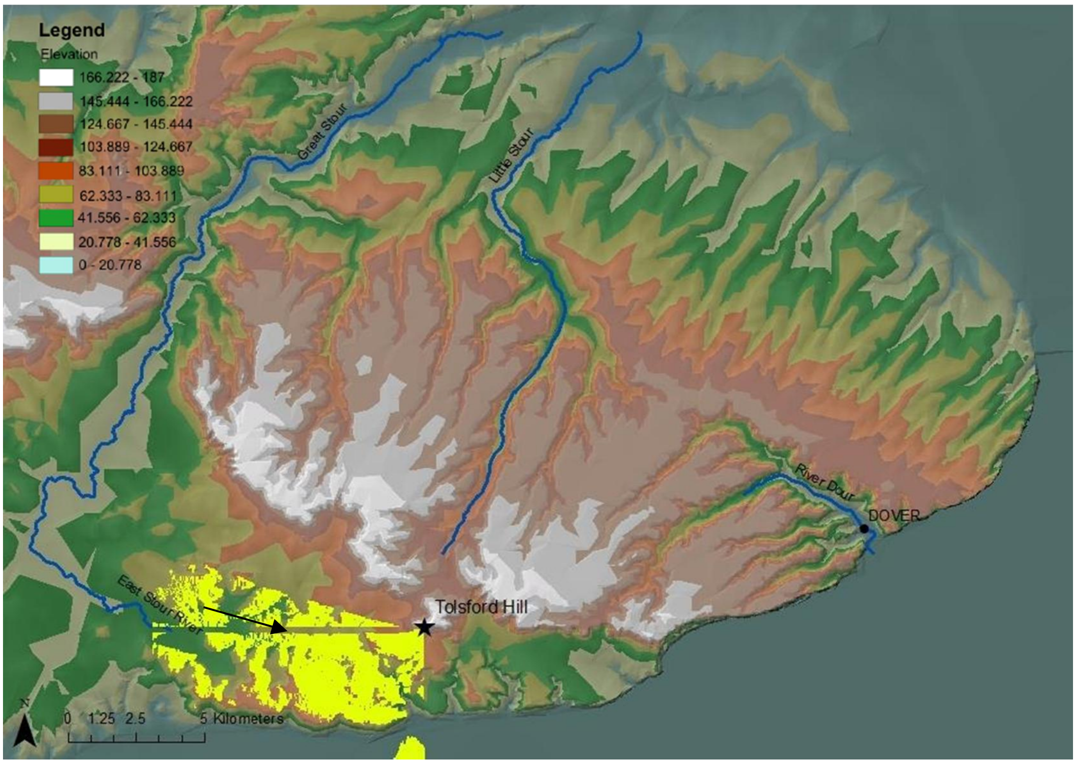


FIGURE 6.63 - VIEWSHED FROM TOLSFORD HILL (YELLOW DENOTES THE VISIBLE AREA), ARROW SHOWS THE DIRECTION THE 3D VIEW IS TAKEN FROM

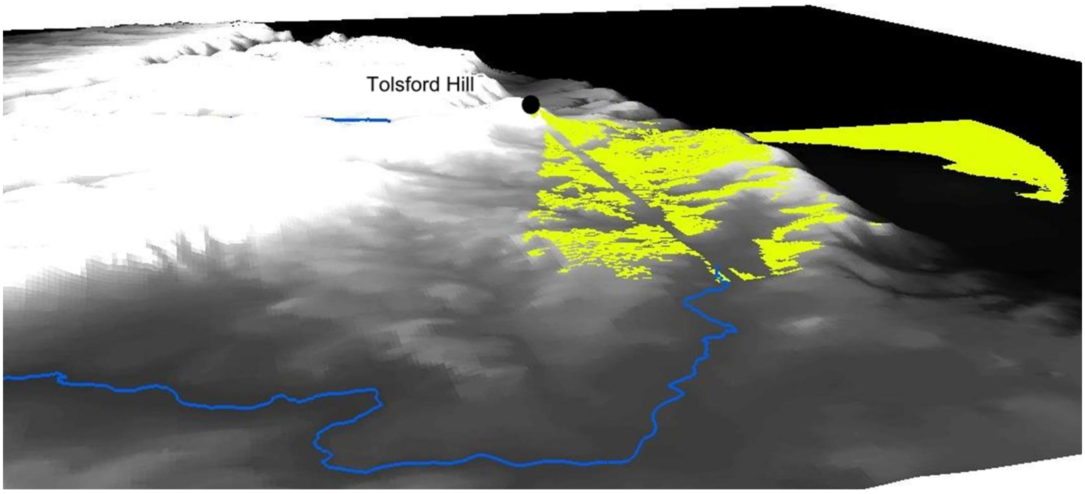


FIGURE 6.64 - 3D VIEW OF TOLSFORD HILL

Upper Farm Sutton

The final small site in Kent is Upper Farm, Sutton. The artefacts recovered from the site total five flakes and a notch. One of the flakes is indicative of handaxe manufacture and another is cortical, suggesting that some on-site working was conducted at this spot. The remaining flakes do contain some cortex on their dorsal surfaces, but all are below 50% coverage, suggesting links to middle or later stage manufacture. The notch suggests some form of limited processing activities, linked to wood or carcass processing (use-wear section 2.5).

The viewshed (figure 6.65) extends across the interfluves to the south-east, although the main focus is to the north-east, spreading out into the channel plain and the lower dipslope, and south-west through the upper reaches of the dry valleys to the plateau area adjacent to the River Dour. The extent is large for such a small assemblage lacking in handaxes, however it could be argued that the presence of a handaxe manufacture flake does indicate the site had links to these tools. Furthermore the views suggest hunting or resource procurement in the wider landscape.

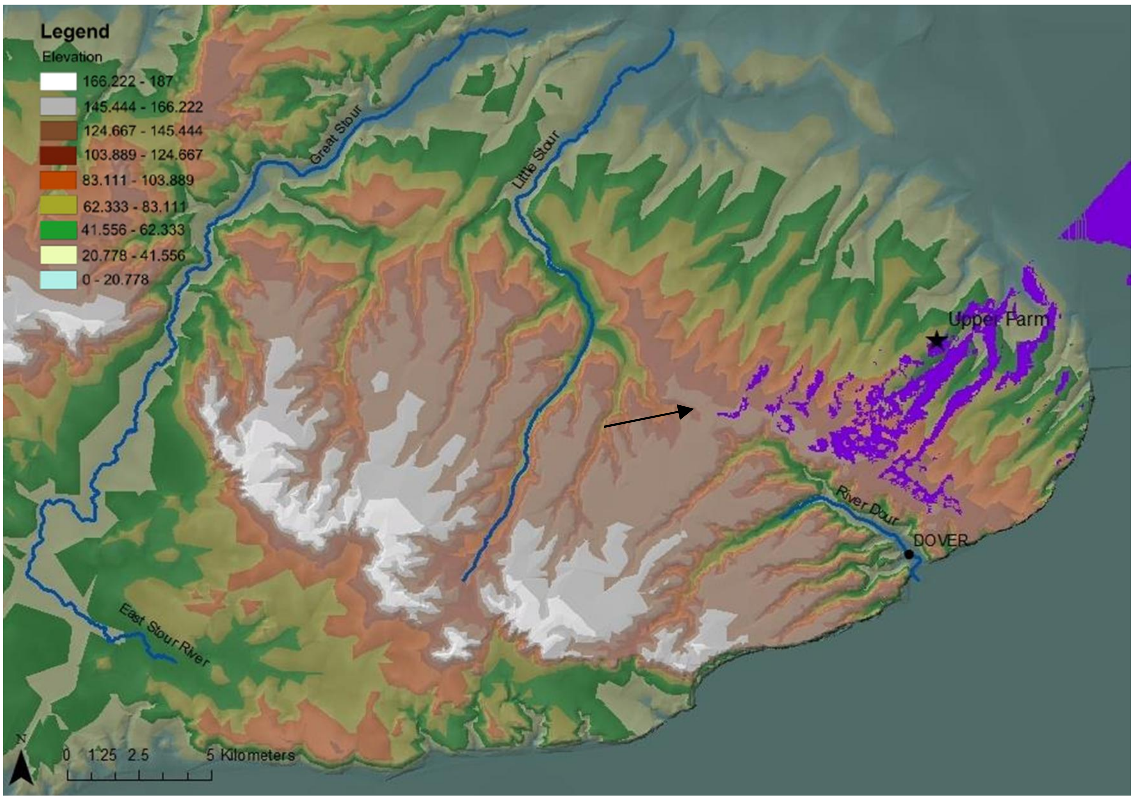


FIGURE 6.65 - VIEWSHED FROM UPPER FARM, SUTTON (PURPLE DENOTES THE AREAS THAT ARE VISIBLE FROM THE SITE), ARROW SHOWS DIRECTION 3D VIEW IS TAKEN FROM.

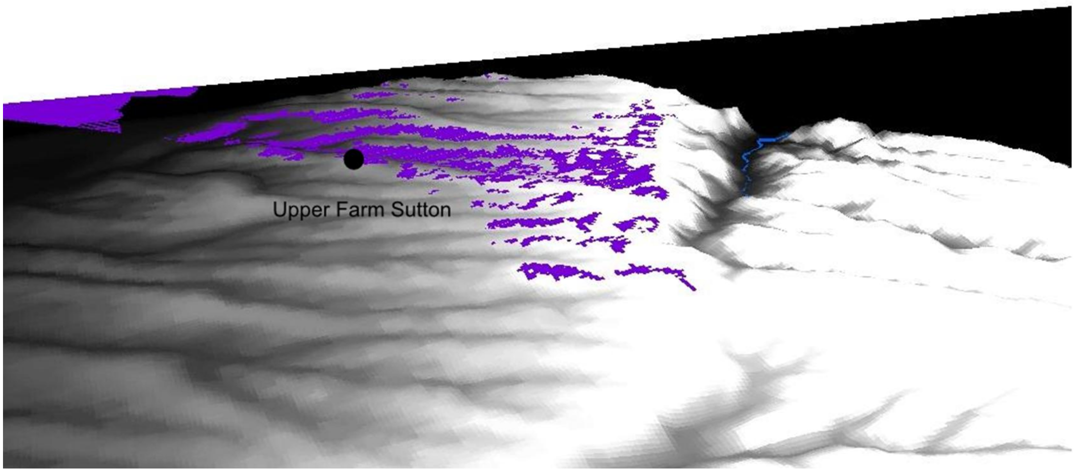


FIGURE 6.66 - 3D VIEW OF UPPER FARM, SUTTON

Site	Aspect	Assemblage size	Site type	Slope	Extent viewshed (pixels)	Altitude (m OD)	Viewshed focus	Viewshed direction
Malmains 1	North	555	Mixed strategy Carcass bias	3.7	2340	81	Upper and lower reaches dry valleys/ bit on plateaus	N/SW/W
Malmains 2	South-east	70	Ephemeral	1.09	3621	70	Upper and lower reaches dry valleys, plateaus	N/E/SW
Westcliffe	South	1294	Mixed strategy Raw material + butchery slant	1.58	1970	96	Plateaus/ upper reaches of dry valleys	S/SW/W
Green Lane	South	310	Episodic/ mixed strategy Butchery slant	0.4	3772	130	Plateaus south-west of R. Dour/ lower dry valley	NE/SW
Wood Hill	North-west	506	Mixed strategy Raw material, butchery slant	4.9	18991	60	Channel plain/ lowland area, dry valleys, plateaus	Almost 360 view
Broome Bungalows	East	1	Ephemeral	1.14	586	77	Small section channel plain, local dry valley	NE
Elham	South	7	Ephemeral	0.45	3886	138	Plateaus and either side Little Stour valley	NE/S/SW/W/NW
Freedown	North-west		Ephemeral	1.87	7883	69	Channel plain/ Upper, lower reaches dry valley close by/ plateaus	NE/SW
Hacklinge	Flat	1	Ephemeral	0	8938	3	Lowland plain, lower reaches dry valleys	Almost 360.
Hawkshill Down	South-east	9	Ephemeral	2.43	9486	41	Lowland plain/ Up dry valley to plateaus	SW/NE/E/SE
Knights Bottom	East	1	Ephemeral	0.86	843	39	Channel plain, lower reaches of nearby dry valleys	NE

Site	Aspect	Assemblage size	Site type	Slope	Extent viewshed (pixels)	Altitude (m OD)	Viewshed focus	Viewshed direction
Lady Hamilton's Seat	East	1	Ephemeral	1.01	22112	60	Lowland plain, upper and lower reaches dry valleys, plateaus	S/SW//NW/N/ NE Almost 360 view
Ripple Field	North	10	Ephemeral	1.35	4848	32	Lowland plain/ lower reaches dry valleys	NE/NW
Shepherdswell	North-East	1+	Ephemeral	4.29	1666	113	Upper and lower reaches of one dry valley	N/ NNE down dry valley
St. Margaret's	North-East	1	Ephemeral	2.43	970	88	Lower reaches of dry valleys	SE/E
St. Rad's	South	1	Ephemeral	3.37	2130	130	Plateaus to SW of R. Dour	W/SW/S
Sutton Downs	North-west	3	Ephemeral	3.24	17468	55	Lowland plain/ lower and upper reaches dry valleys/ broad section plateaus north of R. Dour.	N/NE/S/SW/W
The Lynch	South-East	3	Ephemeral	2.03	4383	40	Single or double dry valley, and out to lowland plain	NE/SW
Tolsford Hill	South-west	1+	Ephemeral / Hunting	10.8	16909	143	Lowland plains next to scarp	S/SW/W
Upper Farm Sutton	South-East	6	Ephemeral	3.3	8262	69	Upper and lower reaches of dry valleys and plateaus	NE/E/SW

TABLE 6.2 – SUMMARY OF THE MAIN GIS DATA AND THE RESULTS FROM THE ASSEMBLAGE ANALYSIS FOR THE KENT SITES

SUMMARY

In summary, the viewshed analysis for the Kent study area has highlighted a number of aspects. Firstly, in contrast to the pattern demonstrated for the Chilterns (section 6.4.2), extent of viewshed does not appear to correlate with size of assemblage. For example, Westcliffe contains the largest assemblage yet has the smallest viewshed of the main sites (1970 pixels; table 6.2), compared to many of the smaller sites (e.g. The Lynch, Sutton Downs, Freedown) which have much greater viewshed extents. However, it must be noted that the site with the largest viewshed is Lady Hamilton's Seat (22112 pixels) which only has a single artefact associated with it (butt of an ovate handaxe). This site, together with Wood Hill (18991), Sutton Downs (17468) and Tolsford Hill (16909) are all over 10,000 pixels (table 6.2).

Secondly, whilst assemblages exhibiting flakes but no handaxes do appear to have mostly limited viewsheds (under 1000 pixels; table 6.2; Broome Bungalows, Knights Bottom, St. Margaret's), it could be argued that in these cases the flakes may have been deposited as hominins traversed the landscape, or during ephemeral short stops. However there are two sites which go against this pattern: The Lynch (4383), which has an assemblage comprising flakes and a core, and Upper Farm Sutton (8262), which has yielded flakes and a notch. One suggestion for the former site is that it represents perhaps a longer occupation than the others, with the core worked at a location which allowed the maker to keep an eye on the rest of the landscape. Indeed the presence of a cortical flake further corroborates this as a manufacture location (see above) albeit on a small scale. Regarding the second site, the notch indicates some form of processing took place in the area, and in addition one of the flakes is related to handaxe manufacture, suggesting that this site too might also have served a different purpose to the ones with the smaller viewsheds highlighted above.

There also appears to be no correlation between a site's position in the landscape, aspect, slope or indeed elevation (table 6.2) and flake tool signature, compared to what was found in the Chilterns (discussed above). Here the locations with presumed signs of wood working (Westcliffe, Malmains 1, Ripple Field) appear to have no differences compared to those sites with predominantly carcass processing signatures (see discussion in section 2.5 and chapter 5). This is also the case when comparing proportions of handaxes versus flake tools in the main assemblages. Whilst Westcliffe and Malmains 2 both have assemblages with greater numbers of handaxes to flake tools, they show no differences in any physical way (table 6.2) to those sites which have larger numbers of flake tools compared to handaxes (Green Lane, Whitfield, Wood Hill, Malmains 1).

As discussed for section 6.4.2 above, the viewsheds have all been calculated using a radius of 10km to simulate the range of sight of a human eye and also the estimated distance covered in two hours (walking at approximately 3mph) as a proxy for ranging pattern (see above). These were modelled using the ArcMap toolbox buffer function for the main sites (figure 6.67) and it can be seen that they encompass all of the smaller occurrences except Elham, which is just on the periphery, and Tolsford Hill. Again, as for the Chilterns, the sites are all located within two hours' walk of each other (as the crow flies). Furthermore if the smaller sites are added in, the potential views range over this part of the downs encompassing the plateaus and scarp edge, down the dip slope and across the channel plain giving the impression of a somewhat self-contained system (if the sites are given assumed contemporaneity).

Furthermore, when the viewsheds for the main sites are displayed as a combined coverage (figure 6.68) they also spread across most of this area of Kent. This indicates that from these main sites, all within walking distance of each other, hominin bands could view and gain access to a wide variety of resources and landscapes across this corner of England.

However it is interesting to note, that in contrast to the Chiltern sites, the combined viewsheds for the small Kent sites (figure 6.69) actually envelop a larger area than the main locations. However, in figure 6.68, this is constrained for the most part to the area to the east of the Little Stour. Therefore, when the main and small sites are pooled, the coverage encompasses this entire corner of Kent (figure 6.70). Moreover, these differences in views between the two study areas further emphasize the differences in settlement structure in these regions. Whereas for the Chilterns the main sites had the largest viewsheds and covered a large proportion of the hills compared to the relatively restricted views of the smaller sites, here in Kent there is no such distinction, with the smaller sites in many cases producing greater views than the main sites.

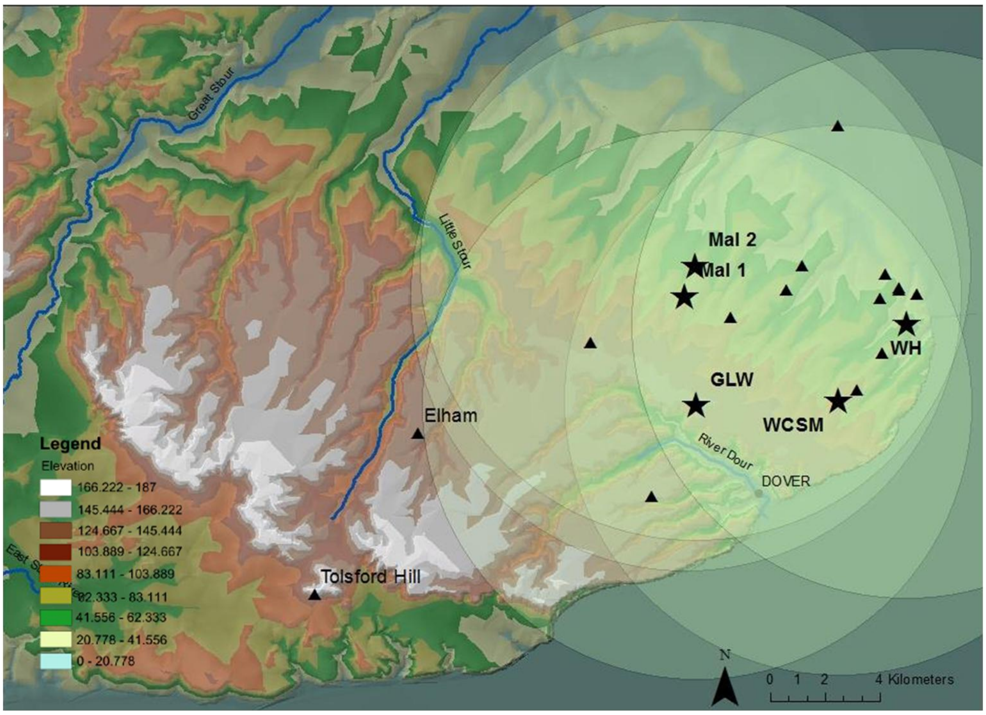


FIGURE 6.67 - MAP SHOWING 10KM BUFFERS AROUND MAIN SITES. SMALL SITES IDENTIFIED BY TRIANGLES. MAL1 – MALMAINS 1; MAL2 – MALMAINS 2; WH – WOOD HILL; GLW – GREEN LANE, WHITFIELD; WCSM – WESTCLIFFE.

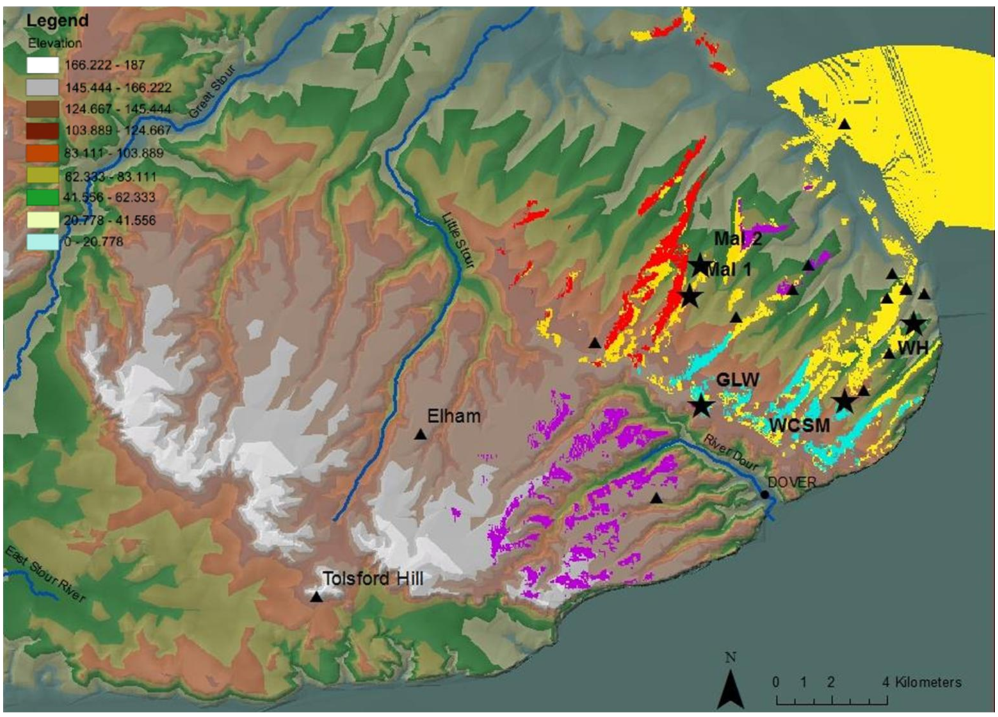


FIGURE 6.68 - MAP SHOWING THE COMBINED VIEWSHEDS FOR THE MAIN KENT SITES

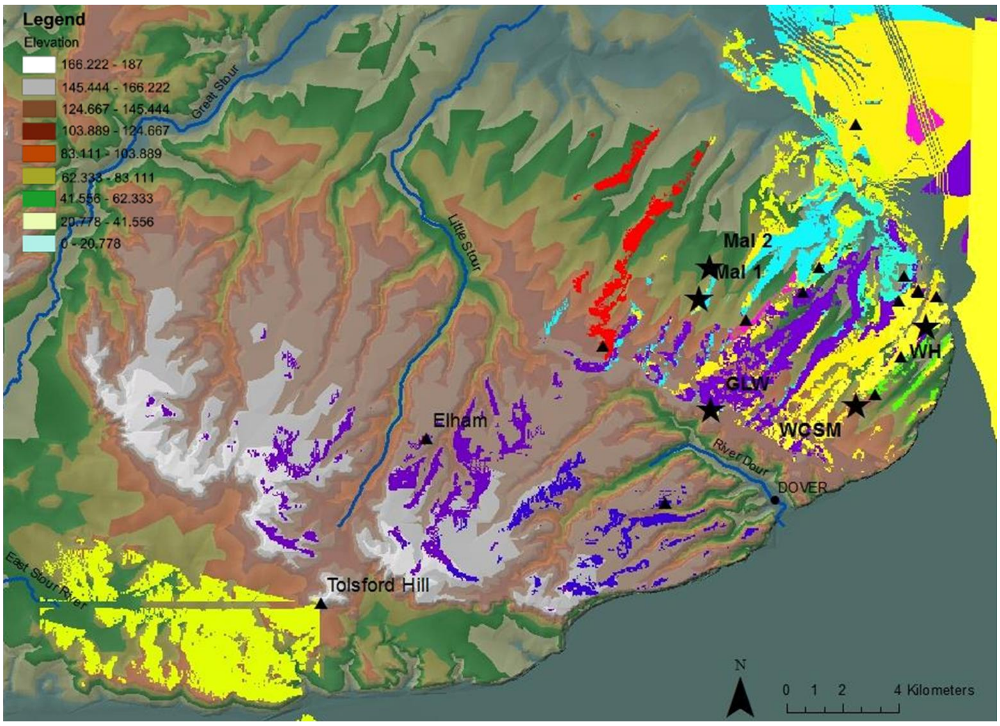


FIGURE 6.69 - MAP SHOWING COMBINED VIEWSHEDS FOR THE SMALL KENT SITES ONLY

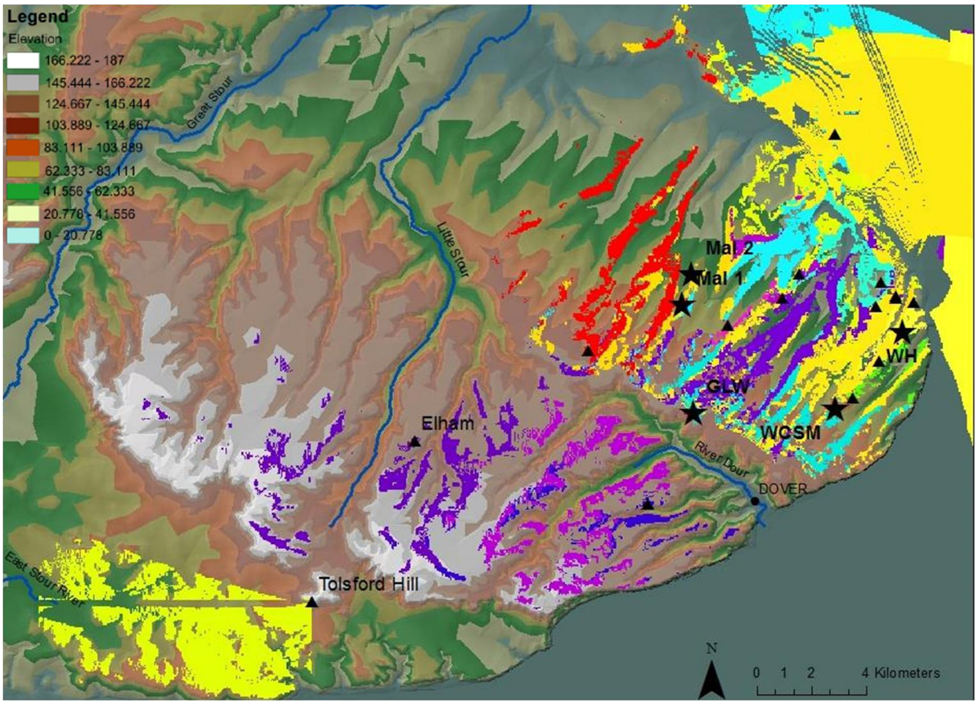


FIGURE 6.70 - MAP SHOWING COMBINED VIEWSHEDS FOR BOTH MAIN AND SMALL KENT SITES

The lack of any formal correlations between physical aspects and site assemblages suggests that perhaps a less structured settlement system or mobility network was in operation in Kent compared to that of the Chilterns. Indeed the Chilterns sites appear to be structured around the heads of the major river valleys and positioned to make the best use of the resources within the scarp and dip slope area. In Kent the main sites are spread on the dip slope with no real structure, whilst the main concentration of sites (but not the areas with the largest number of artefacts) are situated on the lower reaches of the dip slope close to modern day Deal and the channel plain. Moreover, this may indicate links to the channel plain and the resources it affords, as well as across to France.

Chapter 7 – 'Squeezing the blood from the stones': a discussion of behavioural variation and landscape use

7.1. Outline thesis aims and objectives

The results of the assemblage analyses in Chapter 5 highlighted the signatures displayed at each site and their main activity foci, while Chapter 6 explored the landscape settings for the upland sites through the use of Geographical Information Systems (GIS). This chapter will further explore the main conclusions placing them in the broader context of behavioural variation. In the following discussion, the caveats relating to assumed use outlined in earlier chapters apply.

7.2. Site analysis

7.2.1. Assemblage signatures and overall character – broad patterns

The large numbers of handaxes present at sites within riverine settings has led to the general assumption that these represented butchery locales within corridors of movement for game and hominins (Wymer 1982, 1996; Pope 2002; Ashton et al. 2006). Given this interpretation, the upland sites were approached with the initial assumption that they represented another facet of activity, namely plant and wood procurement, or a mixed signature as would perhaps be expected from Robert's downland 'camps' (1999:425). However, the results from the assemblage analysis suggest that the majority of sites are actually focused on tasks associated with scrapers and retouched flakes, interpreted as a butchery and carcass signature (Chapter 5). Whilst this statement holds true for the majority of sites in the Chilterns study area, there are exceptions. Caddington demonstrates more of a mixed assemblage and Whipsnade has a flake tool signature with over half represented by flaked flake related activities linked to wood processing. Accordingly, these differences can be explained with reference to the individual site's position in the landscape. Indeed, Caddington and Whipsnade are located further from the scarp edge on the plateaus and therefore have less easy access to the lowland areas, as noted in Chapter 6. This is also highlighted by the viewshed evidence, with the direction of view south down the valley of the Ver rather than north towards the plateau edges (Chapter 6). In addition, there is an indication that a number of the Chiltern sites originally contained faunal remains (Mixies Hill [Smith 1906, Smith 1916]; Ramridge End [Smith 1904b, Smith 1916]; Round Green [Smith 1894; 1906]), although the actual evidence has been lost due to the antiquity of the discovery and friable nature of the material. Consequently, whilst links to faunal remains cannot conclusively be proven, the combined evidence does suggest butchery was likely an important activity in these particular upland areas. The Kent assemblages also adhere to this form, displaying a bias towards activities associated with scrapers and retouched flakes (carcass slant). Westcliffe stands out as demonstrating a more mixed signature (perhaps a similar type of site to Caddington), but with a similar bias towards scraper activities. However, this pattern could potentially just be a function of sample bias, with both these sites representing the largest assemblages in their respective areas. However, as discussed above in Chapter 5, this bias may not actually affect the overall pattern much. Therefore, this mixed signature could also be seen in terms of the movement of carcasses to places where plentiful raw material was available (e.g. around solution hollows), thus decreasing energetic costs in transporting tools within the landscape (Potts 1984; Foley 1987) and removing carcasses from the immediate vicinity (kill site) away from predators (see comment below regarding viewshed).

In contrast, a different pattern appears to be present in the lowland riverine sites. Whilst there is a variety of site foci, as one would expect from a large dataset, assemblages with tool components dominated by flaked flakes, and a resultant wood and plant processing signature, appear to be marginally more commonplace (9 verses 7 sites). This can be seen particularly in assemblages such as Clacton-on-Sea (Jaywick Sands, Lion Point) Swanscombe (Lower Middle Gravel, Lower Gravel) (Appendix III), where flaked flakes form a substantial part of the tool assemblage, and could perhaps be argued as associating with, in the case of Clacton, the production of wooden spears (Warren 1951). It is also interesting to note that differences in activity facies has been one of the reasons proposed for the differences between Clactonian and Acheulean industries (Pettitt and White 2012:184), however the data here demonstrate that similar activities were occurring at both types of site (Appendix III).

This suggests that site signatures are in part conditioned by the broad landscape setting, although the individual context of a site and localised affordances is perhaps a more important influence. For instance the upland sites are located close to large lowland plains, providing good access to herd resources, and certainly with the prevailing environmental conditions, would have provided good views, with less opportunity to procure wood resources. Indeed, as Ashton et al. (2006) suggest, interglacial river valleys with their mosaic habitat and adjacent forest provided easy access to woodland resources, resulting in a higher incidence of wood-related activities. Consequently this raises the question of how hominins adapted to the changing environmental conditions throughout climatic cycles. Behaviour would necessarily have had to adapt, with hominins altering their resource acquisition strategies and tool use behaviour, with more of a reliance on wooded resources and associated technologies (e.g. spears - Schöningen [Thieme 1997] and Clacton [Warren 1951]) in interglacial environments, perhaps migrating to more stone-based technological strategies in cooler periods when the wooded resources were not as readily available.

Moreover, when the assemblages are considered in terms of the number of handaxes versus the number of flake tools, the upland study areas are split relatively equally between those with greater proportions of flake tools to handaxes as demonstrated by Wood Hill, Green Lane, Malmains 1, Caddington, and those with more handaxes than flake tools (Westcliffe, Malmains 2, Gaddesden Row, Round Green), with Whipsnade showing equal amounts of both. This demonstrates that a mixture of activities was undertaken in the uplands consisting of both processing activities and butchery. Conversely, all the riverine sites (both flood plain and riverbank occupations) display either only flake tools or more flake tools than handaxes (figure 7.1). This is an interesting point to note when bearing in mind that many handaxes are found incorporated into river terraces. Whilst it could be argued that part of this pattern is due to the use of Clactonian sites, which lack the biface component, the fact remains that the signature is the same when only the Acheulean *in-situ* sites are considered. This then perhaps gives weight to the idea that large numbers of handaxes in riverine settings are derived from other areas of the landscape and that the pattern from the *in-situ* assemblages propose a different explanation. If considered in light of Pope's hypothesis that single butchery events produce handaxe-poor signatures with tools being exported, this then ties in with cut-mark evidence at some of these sites. However, in terms of the 'landscape' side of the model, he suggests that handaxes are discarded in areas that are repeatedly visited due to the large range of resources afforded (Pope 2002:271). Indeed, it could be suggested that the upland sites fit within the definition of 'biface-rich' assemblages (Pope 2002:267) relating to handaxe discard at favoured re-occupied locales which offer a varied range of affordances (water, views, flint and plant resources).

Furthermore, the general trend observed in the flake tools (discussed above) suggests that the dominant use is away from handaxes and carcass-linked activities and more towards an affinity with wood and plant resources. Indeed, this pattern might link in with Pope's suggestion, based on the evidence from the Boxgrove palaeolandscapes (Pope 2002), that handaxes were used but rarely deposited in these areas which are parts of the landscape that might not be visited again. In contrast to the riverine pattern the grassland plain sites (Boxgrove and Red Barns) appear to be dominated by handaxes rather than flake tools, further emphasizing the links between broad plains and exploitation of animal herds. Meanwhile the lowland ponded lacustrine sites appear in a similar situation to the upland ponds, seemingly spread between handaxe dominated (Foxhall Road) and flake tool dominated (Beeches Pit) signatures. Although the evidence is limited it does hint at mixed usage for these landscape types.

Thus, on the basis of the evidence from the two aspects discussed above, there does appear to be a distinction between the assemblage signatures in the uplands compared to the lowlands, despite differences in site age. Moreover variations can be interpreted in terms of individual context of the sites, especially their location in the landscape and the resources this afforded. Furthermore, an additional facet common in the upland dataset is the presence of core tools. Although the numbers are minimal (one or two per site), this does suggest more of a heavier processing component in the activities associated with this landscape type, linking in perhaps to the exploitation of a particular resource. Only two upland sites are lacking in core tools, Gaddesden Row, which demonstrates a signature focused on butchery (handaxes) and carcass processing (scrapers), and Whipsnade, where the dearth is likely connected to preservation issues (Chapter 3). Interestingly, when considering the lowland sites, core tools can also be found in both the assemblages from Foxhall Road and at the Golf Course site at Clacton-on-Sea. In terms of the types of activities being undertaken, the Foxhall Road sites mirror the retouched flake and scraper bias indicative of carcass processing and the lacustrine, ponded setting of the uplands. In contrast, however, the Golf Course site at Clacton-on-Sea reveals a different pattern. Although the site has a mixed tool signature, it demonstrates a preference for activities associated with flaked flake tools and a wood or plant bias conducted in a riverine setting. Despite the fact that there does not appear to be a uniform pattern, it hints that whatever was going on at the upland sites in terms of heavier processing activities may also have been occurring in these particular lowland locations. Conversely, the rest of the lowland sites do not include core tools in their assemblages, a feature which contrasts to the pattern displayed for the uplands. Therefore, with the exception of the Clacton Golf Course site, none of the riverine locations include activities associated with this tool type.

Comparisons were also made between the number of cores, handaxes and roughouts and the amounts of debitage (flakes, debitage, flake tools etc.). Taken at face value (discounting preservation bias) this hints at an over-representation of source artefacts (handaxes and cores) in the upland sites, with these components being imported. Whilst this could relate to concerns over recovery, with the smaller component being missed, the evidence from the excavations at Westcliffe demonstrates that this may be a result of other factors. The only site which bucks this trend is Wood Hill, with no visible net import/ export bias. These results could link in with the proposal by Roberts (1999) and Pope (2002:167) that the Downs acted as a nightly refuge, with hominins transferring tools from the lower coastal plains up onto the downs. Furthermore, there does appear to be a fluid system in operation of artefact movement and transfer into and out of the sites, paralleling to some extent the evidence from Boxgrove regarding the spatially separated handaxe chaîne opératoires observed (Pope 2002). In many sites there is a lack of cortical flakes compared to extant cores suggesting that nodules were imported partially worked, and either exploited on site and discarded, or carried out again as the hominins left, with a similar pattern observed with the handaxe component.

Indeed, one interpretation could be a fluid, cyclical 'anticipated mobility' system similar to that proposed by Sellett (2013) for much later palaeoindian contexts. Here, raw material was imported in the form of blanks and used to produce the tools needed for that particular scenario. Local material was then used to replenish the lost 'stock' and removed when the human groups moved on (2013). Indeed, Folsom points were manufactured and exported in roughout form, functioning as sources for blanks as well as having the potential to be worked into fully finished objects. Any lost points were replaced at locations which had suitable raw material, with most sites demonstrating a pattern of like-for-like replacement, supplemented by intermittent gearing up locations (2013).

The idea of provisioning a toolkit (Kuhn 1995; Binford 1979) to act as a safeguard for future needs is a likely scenario given the increasing evidence for planning depth demonstrated for the Lower Palaeolithic. This cyclical technological strategy is based on a very mobile lifestyle, adapted to ensure that resource procurement opportunities would not be missed. Certainly this could be used to explain at least some of the patterning displayed in the Lower Palaeolithic, where artefacts appear to have been manufactured on site and exported, whilst others were imported fully manufactured and then discarded. Whereas, this pattern of artefact movement might also be explained by multiple visits to the locale, with tools being brought in and discarded during one visit, and manufactured and exported in the next. If survival depended on a successful hunt then mitigation of risks would have been an important factor in tooling up. Moreover it is likely that even operating a strategy based on the provisioning of people with mobile toolkits, this would over time and with repeated visits to locations, actively develop provisioning of place, whether by accident or design.

A flexible technological strategy, similar to that described by Sellett (2013) is designed to cope with a multitude of possibilities, centred on the mitigation of the risks involved in hunting, would have been an advantage. As an activity, hunting cannot always be fully predicted only anticipated (Ashton 1998c) and as such bifaces would have been part of a mobile toolkit transported around the landscape. It is likely that hominins would have transported not only a single tool, but also carried spares, or tools which would have done similar jobs, serving to buffer the risks encountered in the search for food. For example if a biface broke in the middle of processing a carcass for transport, and there is no local raw material hominins would have had a number of options. The axe could either be repaired or used it to produce suitable flakes to enable the continued butchery task. If, however, neither of these options was viable a third possibility would be to leave the carcass to locate suitable material and risk carnivores filching it. It would make little sense to engage in high risk strategy hunting only to lose your prey at the end, so presumably strategies would be in place to deal with such a scenario.

If this idea is explored further, making the assumption that tool use-life was a significant concern, a situation where hominins exported handaxes to a butchery locale with a nearby source of raw material might conceivably generate a pattern of 'pristine' handaxe discard. Such a scenario would result from the discard of the previous tool after minimal use, and the manufacture of a replacement, aiming to create a tool with a longer use-life than one that had just been utilised and perhaps slightly blunted or damaged. Whilst such a handaxe would still have use-life left, to minimise the risk of breakage in an area with little access to raw material, it would be beneficial to exchange it for a new one, in a similar way to people exchanging new cars on a regular basis (less likely to break down and the warranty is still valid). There is also the possibility that it would have been more functionally advantageous, rather than transporting handaxes across the landscape, to transport cores or nodules that could be manufactured on the spot as needed into whatever tool was required (flake tool, handaxes etc.).

This pattern of exchange and transportation of tools and cores across the landscape is something that is slowly coming to light in Lower Palaeolithic contexts (Hallos 2004). It is interesting to see that the recent paper by Turq et al. (2013) notes a similar pattern of import and export and a 'strong fragmentation' and high mobility of artefacts displayed in the chaîne opératoires practiced by Neanderthals in the Middle Palaeolithic of France. Sites such as Les Fieux (Quercy) indicate that handaxes were imported, reduced and sharpened on site before being removed. A similar strategy of export is also suggested for the cortical flakes from the same site. Furthermore sites in the Aquitaine area (e.g. Grotte Vaufrey and Petit-Bos) also display transportation of artefacts, especially handaxes, which always appear to be discarded away from their initial area of manufacture. Indeed, this flexible and mobile use of stone also arises when sites are situated directly on raw material sources (e.g. Combe Brune 1), with both import, discard, export and manufacture occurring on site (Turq et al. 2013 and references therein for each site). This exchange of tools and material shares similarities with Sellett's model discussed elsewhere in this chapter (2013), with technological strategies centred on flexible exchange and movement.

One interesting point highlighted by Turq et al. is that sites containing all the stages of reduction for a single tool are rare. They go on to note that whilst many assemblages may appear to contain complete chaîne opératoires, involving the manufacture of artefacts on site, they are actually composites, made up of numerous transport events (2013). Consequently, one must ask how this relates to the pattern observed for the Lower Palaeolithic of Britain? Is it the case that such 'fragmented' transport patterns are purely the province of later periods, or are the slight clues observed hinting at more complex transport practices, which are currently obscured by the ubiquitous nature of the raw material? This is perhaps a key question to address in further research.

One situation that warrants further discussion is the assemblage signatures at the three Clacton sites (Golf Course, Jaywick Sands, Lion Point), other, that is, than the obvious fact that they are all part of the Clactonian type site. As noted in Chapter 4, these are located at intervals along the same channel system, and whilst strict or indeed occupational contemporaneity as defined by Conard and Adler (1997:156-158) cannot be proven, the signatures form an interesting pattern. The Golf Course site, demonstrates a configuration symptomatic of mixed activities and longer occupation similar to Price's (1978) 'base camps' or home base-type sites, with an additional focus on the primary stages of manufacture and an over-representation of cores. Conversely Jaywick exhibits a lack of the primary stages of reduction, but with no net import or export, similar to the pattern also displayed at Lion Point, although this assemblage is the least reliable of the three suffering from collection biases and winnowing. Therefore, if these were considered as part of the same hominin operational system (Local Operational Network as defined by White and Pettitt [2011:77]), it could be suggested that cores were decorticated at the Golf Course site, then transported downstream for further working and reduction. This transport may well have been linked to the exploitation of a particular resource as discussed in Chapter 5. In light of this it is also interesting to note that the predominant flaked flake signature on the foreshore (Lion Point) is mirrored, but on a much smaller scale, at Jaywick. Perhaps hominins selected and prepared flint at the Golf Course site, moving from the interior downstream to exploit the wooded resources present. If this scenario is correct, the number of cores at the Golf Course suggests that cores could also have been returned to their point of origin, or others imported, as part of a technological exchange. An alternative explanation is that the cores may be minimally worked, thereby providing an over-representation of flakes. However, details of reduction sequences from the site report suggest that over half of the cores demonstrated nine or more flake removals, which would indicate the over-emphasis on cortical flakes is real. The authors do however suggest that the raw material would have been smaller (majority under 20cm) than at other sites (e.g. Barnham) and demonstrates limited removals (Singer et al. 1973:32,34).

7.2.2. Site signature links to landscape location

Correlations can be seen between the mixed signatures evident in the upland sites and the site's positions in the landscape. For example, the plateau locations of Westcliffe, Whipsnade, Caddington and Wood Hill produce more mixed assemblages focused on manufacture, whereas the sites of Green Lane and Gaddesden Row are located next to river valleys, with easy access out to the plains and lowland hunting grounds. These patterns are most clearly shown in the GIS (Geographical Information Systems) analysis, backed up by the viewshed results (Chapter 6). In the Chilterns this correlation probably relates to distance from the northern scarp edge and the assemblage signature, most notably the flake tool types. In essence, the sites closest to the scarp exhibit a signature that is likely to be related to butchery and carcass processing, whereas locations further away from this in the 'plateau' group (Caddington and Whipsnade) indicate a more mixed component with a wood/ plant slant. This may well be linked to access to resources moulding assemblage composition. For instance the scarp edge sites have good access to the lowland plain and the likely hunting grounds; in contrast the 'plateau' sites have rapid access to and a focus on (as suggested by the viewsheds) the river valleys to the south, but are not in close proximity to the lowlands. Therefore the function of these sites is different, focusing on locally available resources on the plateau tops. One further point to note regarding the viewsheds of these two sites (Caddington and Whipsnade) down the valley of the Ver is that during the open conditions at the time of occupation, the upper slopes of the plateaus would have been exposed. It is possible, however, that the valley offered more shelter from the prevailing winds and contained a wider diversity of plant species, including greater access to wooded resources. This would serve to create an assemblage signature containing tools biased towards the exploitation of these resources, as opposed to the carcass signature observed elsewhere on the hills.

Overall, the application of a GIS analysis to investigate the landscape context of the sites has revealed some interesting patterns, highlighting both differences between the sites within the study areas and in the character of occupation between the study areas themselves, which will be summarised below.

Chilterns

Firstly, it is obvious from Figure 6.1 and 6.2 that both the main and smaller sites form distinct clusters around the headwaters of the three key river valleys draining the hills (Lea, Ver, Gade), in the upper reaches of the dip slope. The exception to this is Slip End, situated between two dry valleys located mid-way between the Lea and the Ver valleys. These clusters form two distinct groups with Caddington, Kensworth and Whipsnade spread around the source of the Ver, and Round Green, Mixies Hill and Ramridge End arranged around the source of the Lea. In addition to Slip End, Gaddesden Row is also set apart from these chief groupings, located next to the River Gade. Whilst the sites cannot be considered as contemporary, the patterning does suggest that these groupings are significant in terms of the choice of site location. This is doubly true when considering the amount of working undertaken by the brick industry.

The apparent structure noted above is further emphasized by the fact that all the sites are located within 10km of each other (figure 6.22). The significance of this is that within two hours' walk (as the crow flies) hominins occupying these sites have views encompassing most of the plateaus and associated lowlands, and the resources contained within these areas. In addition, when comparing the combined viewsheds for the main sites versus the smaller locations it can be seen that a reduced coverage is produced by the minor localities, suggesting that these may indeed be representative of subordinate occupation areas. For the group comprising Round Green, Ramridge End and Mixies Hill, the viewsheds for the two smaller sites are covered by that of Round Green alone. This indicates that Round Green might be considered the major site with the others acting more as 'satellite' occupations. This all serves to suggest that despite their lack of temporal boundaries the geographical associations demonstrated advocate a connection to the same Local Operational Area (White and Pettitt 2011:77).

There is also a general trend displaying a positive correlation between assemblage size and viewshed extent. Consequently, this suggests that an extensive view of the surrounding landscape was a likely factor in repeated visits and selection of the site locations. For example, Caddington contains the largest assemblage resulting from repeated visits over a long time span (Foulds 2012; Foulds in press). Hominins, it seems, were preferentially selecting areas of the landscape that had superior views, in order to assess resource exploitation possibilities and act accordingly, especially in relation to carcass acquisition. This aspect however does not seem to hold true in Kent, and the reasons for this will be discussed in the next section.

One pattern that has been elucidated in both upland study areas regarding viewshed extent is the overall correlation, demonstrated by the smaller sites, between the presence of handaxes and greater viewshed ranges. Whilst this mostly holds true, there are exceptions. Two of the Kent sites, Upper Farm Sutton and The Lynch, exhibit large viewsheds but have no discarded handaxes. However, it could be argued that these sites were associated with handaxe manufacture (Upper Farm Sutton) or connected with a manufacture signature (i.e. hominins stopping in a location with good views whilst they manufactured needed tools) (The Lynch). This links with the mobile role of handaxes within subsistence systems. Certainly in Ashton's static vs. mobile resource model (1998), mobile resources (prey) are considered to be unpredictable, and would likely be exploited in a more opportunistic fashion compared to other resources. This would have necessitated the occupation of areas with greater views in order to actively intercept prey species and keep abreast of herd movement in the surrounding landscape. If the discard of handaxes was indeed practised at sites immediately after use (e.g. butchery/ carcass processing) then it could also be argued that larger views would also alleviate the problems associated with predators. It would be beneficial to process a carcass away from the kill zone, moving it to an area with greater views so as not to be taken unawares by predators intent on stealing the carcass(es), thus explaining the movement of handaxes into sites.

This also chimes with comments discussed elsewhere regarding the movement of tools from the lowland plains to the Downs (Roberts 1999; Pope 2002), and also to Pope's (2002) observations at Boxgrove, proposing that handaxes were only discarded at locations which hominins repeatedly visited and which contained set resources. Therefore, the sites on the Downs, located around solution hollows may have acted as re-stocking locales, where hominins took carcasses in order to repair or manufacture new tools from the material eroding out of the hollows sides (see formation discussion in Chapter 3).

KENT

On the Kent Downs there are three main site grouping defined by their location on the dip slope.

1. sites on the plateaus
2. associated with the upper dry valleys and dip slope
3. sites in the lower dry valleys and the lowland areas of the landscape.

Group 3 forms a cluster of sites on the lower reaches of the drainage network near Wood Hill. This likely relates to the exploitation of a particular resource or hunting focus, with the proximity to the lowland channel plain being a factor. In addition some sites form alignments linked to the interfluves of the dry valley network, with the addition of the plateau sites and lowland cluster near the channel plain. Malmains 1 and 2 are situated on the same interfluve, with another group formed by Broome Bungalows, Upper Farm Sutton and Sutton Downs to the east. The final collection consists of Westcliffe, St. Margaret's, Freedown, Wood Hill and Hawkshill Down. These suggest that the interfluves as well as the valleys were used as routeways through the landscape, with hominins following paths and tracks between resource patches.

In agreement with the pattern from the Chilterns, all sites are located within 10km (two hours' walk) of at least one of the main sites (Westcliffe, Woodhill, Green Lane, Malmains 1 and 2). The only exceptions are two located on the higher plateaus to the west, Elham, which is just on the periphery, and Tolsford Hill on the western scarp edge. This again suggests that operating within a settlement situated on the Kent Downs, hominin bands could view and gain access to a wide variety of resources and landscapes (plateaus, scarp edge, dip slope and channel plain) across this corner of England. In the same way as the Chilterns, this structuring gives the impression of a somewhat self-contained system (if the assumption is made that the sites are broadly contemporary), which again suggests that these could be part of a Local Operational Area (White and Pettitt 2011:77).

In contrast to the pattern observed in the Chilterns, there is no apparent relationship between the size of a site (assemblage) and the extent of the viewshed. For example, Westcliffe has a large assemblage but a restricted viewshed, compared to Lady Hamilton's Seat which consists of only one artefact but has the largest viewshed of all the sites. Interestingly it can be argued that each of the main sites displays a different viewshed, which is largely dependent on site function. For example, Westcliffe with its manufacture signature has a constricted viewshed focused on the upper dipslope and plateaus. This contrasts with Green Lane, which demonstrates a carcass processing and hunting signature with views of the Dour valley, and its tributaries and surrounding plateaus, located with easy access to the lowland area. Furthermore Wood Hill has extensive views of the plateaus, dip slope and lowland plain, with a signature indicating raw material procurement and the production of handaxes. The only exceptions are Malmains 1 and 2 which demonstrate similar viewsheds, but have assemblages of different characters: mixed versus ephemeral occupation. In addition, Wood Hill also stands out from the main sites due to its extensive viewshed which is much larger than any of the others.

Another point of contrast with the Chilterns is that when combining the viewshed coverage for the smaller sites (figure 6.69), this actually encompasses a larger area than that of the main sites. For the main part, however, as in figure 6.68, this is constrained to the area to the east of the Little Stour. However this does beg the question whether these smaller occurrences are perhaps not 'tips of the iceberg' given the formation processes of these solution hollow sites (Chapter 3, Bailiff et al. 2013) and the collection of the artefacts rather than archaeological excavation. As discussed above, investigation has been less intensive in the Downs compared to the Chilterns due to the lack of industrial activity. It is possible, therefore, that some patterns are being obscured.

7.2.3. Comparison with the European Data

The points highlighted above regarding the variations between landscape types have been developed on the basis of the British Lower Palaeolithic record, but do these features hold true for other areas of Europe? Can similar characteristics be identified in comparable landscape locations elsewhere?

The Duero Basin most likely comprises sites of varying ages but there are some curious similarities with Britain. The large proportion of flake tools and dominance of scraper types, representing nearly half of the tools studied (Diez Martin et al. 2008:119,124), parallels the assemblage composition and resultant carcass-related signatures found in the British upland dataset. In contrast however, handaxes are less common in the Spanish uplands compared to the river valleys (Diez Martin et al. 2008:125), the opposite pattern to that displayed in the British evidence. One possible explanation for this is that the handaxes recovered from the riverine locations in the Duero basin are in a derived state, having been transported from elsewhere, although the majority of the signature is almost certainly moulded by the requirement to transport raw material up from the river valleys. The situation is, therefore, actually quite dissimilar to that in Kent and the Chilterns, which have plentiful accessible raw material around the solution hollow margins. Moreover, if the suggested ‘anticipated mobility’ strategy discussed above was also in operation here at Duero, it might result in the discard of ‘used’ handaxes in the lowland area, as replacements were manufactured from immediate raw material, rather than discard occurring in the raw material impoverished uplands. The Spanish data, therefore, suggests that these upland karstic locations were selected not on their proximity to raw material but on the affordances offered by their landscape context (views of the surrounding landscape), access to water or other desirable resources (Diez-Martin et al. 2008).

The Cagny sites in the Somme Valley in France also display interesting correlations with the features discussed above. The sites of Cagny la Garenne (1 and 2) and Cagny l’Epinette display low numbers of bifaces and a flake tool component dominated by denticulates and notches, with occasional scrapers (Tuffreau et al. 2008; Appendix IV). This bears a resemblance to the pattern displayed for many of the lowland riverine sites in this study. Interestingly Ferme de l’Epinette has a much greater percentage of bifaces, reaching about a quarter of the assemblage and has been interpreted as a game viewing station (Tuffreau et al. 2008), which could be argued as being comparable to sites such as Gaddesden Row in the Chilterns and Green Lane in Kent, both of which display 'hunting' signatures (see discussion in Section 2.5 and Chapter 5). Conversely, but in parallel again to the pattern found in the upland dataset (discussion above), although the evidence from the multiple occupation doline site at Gentelles has a later date (MIS 10/8 to MIS 5) and the evidence is limited, where data is available, at least two of occupations display tool signatures with a dominance of scrapers and one instance of core tools being present (Tuffreau et al. 2008). This tentatively suggests that similar activities may have been taking place in such landscapes, likely conditioned by the range of resources they afforded. Again it is interesting to note that Gentelles is situated on an interfluve above a valley network (Tuffreau et al. 2008), perhaps being an ideal spot for game viewing and tooling up in preparation for hunting activities.

The evidence from Soucy in the Yonne valley in France demonstrates a differentiation of site type based on topographic position within the valley itself, along with a segmented biface chaîne opératoire, with manufacture and use occurring at different points in the landscape. At these sites the focus appears to have been on the production and use of bifaces, with flake tools produced in an *ad-hoc* fashion to meet immediate needs (Lhomme 2007:551). Regarding the landscape types utilised, the sandy banks of the river seem to have attracted brief ephemeral occupation focused on specific activity episodes (biface shaping, production and use of notched flakes), whereas on the gravel hillocks, which contain a lot of faunal remains, the focus is on the acquisition and collection of raw materials (antlers, stone) as well as the exploitation of carcasses (Lhomme 2007:553). In contrast the archaeology from the floodplain is closer to the 'scatter' pattern observed on the grassy coastal plain at Boxgrove (Pope 2002). The occupation here is set back from the river and consists of a low density of lithic and faunal remains (Lhomme 2007:553). Here at Soucy the composition of the tool component appears to be linked to the available local resources rather than any broad landscape trends as the proportion of retouched flakes, scrapers, denticulates and notches in each assemblage is related to the individual activities undertaken at that site. Therefore there are broad similarities with regard to assemblage patterning occurring in Europe as in Britain, although again individual differences are observed related to the local site context.

7.3. FURTHER WORK

Now the initial characteristics highlighted by this work have been identified, there is scope to take these results further, building on this initial research to expand and develop various themes that have been touched on above. One of the main aims of this research was to investigate the upland dataset and to incorporate it into wider themes of behavioural variation, technological structuring and landscape use. The research presented here has demonstrated that the upland dataset is intrinsically interesting and that the sites provide a valuable addition to the corpus of Lower Palaeolithic sites, serving to supplement the lowland archive, providing a fuller understanding of hominin landscape use and behavioural organisation.

Whilst it must be acknowledged that the upland dataset does pose problems (see discussion in Chapters 2 and 3) it has the potential to provide huge amounts of data, particularly if the burial conditions and geological context (formation of the solution hollows) are favourable (see discussion of formation processes, Section 3.1). Intimations of this untapped resource have been given in the Chilterns with mention of a skeleton present at Mixies Hill (Smith 1906), preservation of friable faunal remains (Smith 1894; Smith 1904b, Smith 1906, Smith 1916) and reeds seemingly wrapped around handaxes at Caddington (Smith 1894). Consequently, we need to continue to build on our knowledge about these upland sites with targeted excavations (for example at Malmains 1 and 2 in Kent), aimed at exposing larger surface areas and potentially greater depths as has been done on the continent (5 metres at Cantalouette, France; (Bourguignon et al. 2008; web 4). Indeed doline sites in Africa can extend up to 12 metres deep, such as at Kathu Pan, with the lower levels containing Pleistocene deposits (Porat et al. 2010). In Britain we have not had this depth of excavation, with the exception of the Chiltern sites in the 19th century where brick workers extracted the infill of these features for industrial use, although here the antiquity of such excavations precludes a more detailed understanding. Investigations such as these would not only aid in the understanding of the formation processes of these features and the manner in which artefacts were incorporated into the deposits, but also allow multiple occupation levels to be identified such as at Cantalouette, France (Bourguignon et al. 2008). Moreover new investigations of these features would allow the extraction of samples for dating (Optically Stimulated Luminescence) to be obtained from the complete sedimentary depositional sequence filling the doline, providing information not only on the dates and stages of sedimentation but on their modes of formation, the feasibility of which is demonstrated at Westcliffe, Kent (Bailiff et al. 2013). In addition, investigation of the smaller findspots in Kent would also serve to determine whether these are ephemeral occupations consisting of artefacts dropped in the course of short-term activities, or in fact represent buried horizons and larger accumulations, which have hitherto been beneath the reach of the plough.

Unfortunately, due to the nature of the deposits no environmental evidence has survived within the British examples (except for the Chilterns mentioned above). Nevertheless, components such as diatoms or phytoliths might survive better in the Kent and Chiltern soils than pollen grains. If present these may provide further information on climate and environment at the time these features were active and would be worth sampling for in any excavations. Moreover, given the issues with the survival of environmental remains in areas with chalk bedrock it would therefore be beneficial to investigate other areas of the country which perhaps offer a better chance to recover this type of information. Indeed, the European evidence amply demonstrates the potential for survival, with flora and fauna being recovered at sites in the Duero Basin, Spain (Diez-Martin et al. 2008) as the archaeological deposits in limestone preserve more organic remains than that found in chalk. Therefore further research should aim to identify limestone solution features in an attempt to gain more associated evidence and environmental remains with which to interpret the context of these upland, plateau sites. In addition, such features as the fissures identified at Beedings in West Sussex (Pope 2008) also serve to act as ‘artefact traps’, holding the potential to preserve Palaeolithic remains and might be a profitable avenue of research. Additional excavations would also offer the opportunity to apply microwear analysis to further test the ideas presented above regarding the function of tools and activities conducted at these sites.

Further exploration of landscape use could also be conducted on the European data, with more examples and detailed investigations added to the dataset to enable a fuller picture to emerge. The experimental Geographical Information Systems (GIS) approach has proved beneficial in helping to inform site use for sites with limited other lines of evidence available. The combination of assemblage signatures and investigation of the landscape context has proved a powerful technique, which has aided understanding of the upland study areas and hominins' use of landscape in these locations. GIS also has the potential, with suitable datasets, to explore the application of other tools such as cost-surface analysis, least-cost path, and a combination of artefactual analysis. GIS techniques and agent-based modelling could be used to simulate and explore proposed scenarios, for example the operation of technological strategies, artefact movement and discard and hominin landscape choice.

In summary, to enable us to gain a better idea of hominins use of their landscape the focus needs to change to sites in less well studied areas of the landscape (e.g. the uplands) to expand the dataset and create a broader spectrum from which interpretations can be drawn. Only then can we get a clearer picture of hominin behavioural choices, landscape use and technological variation.

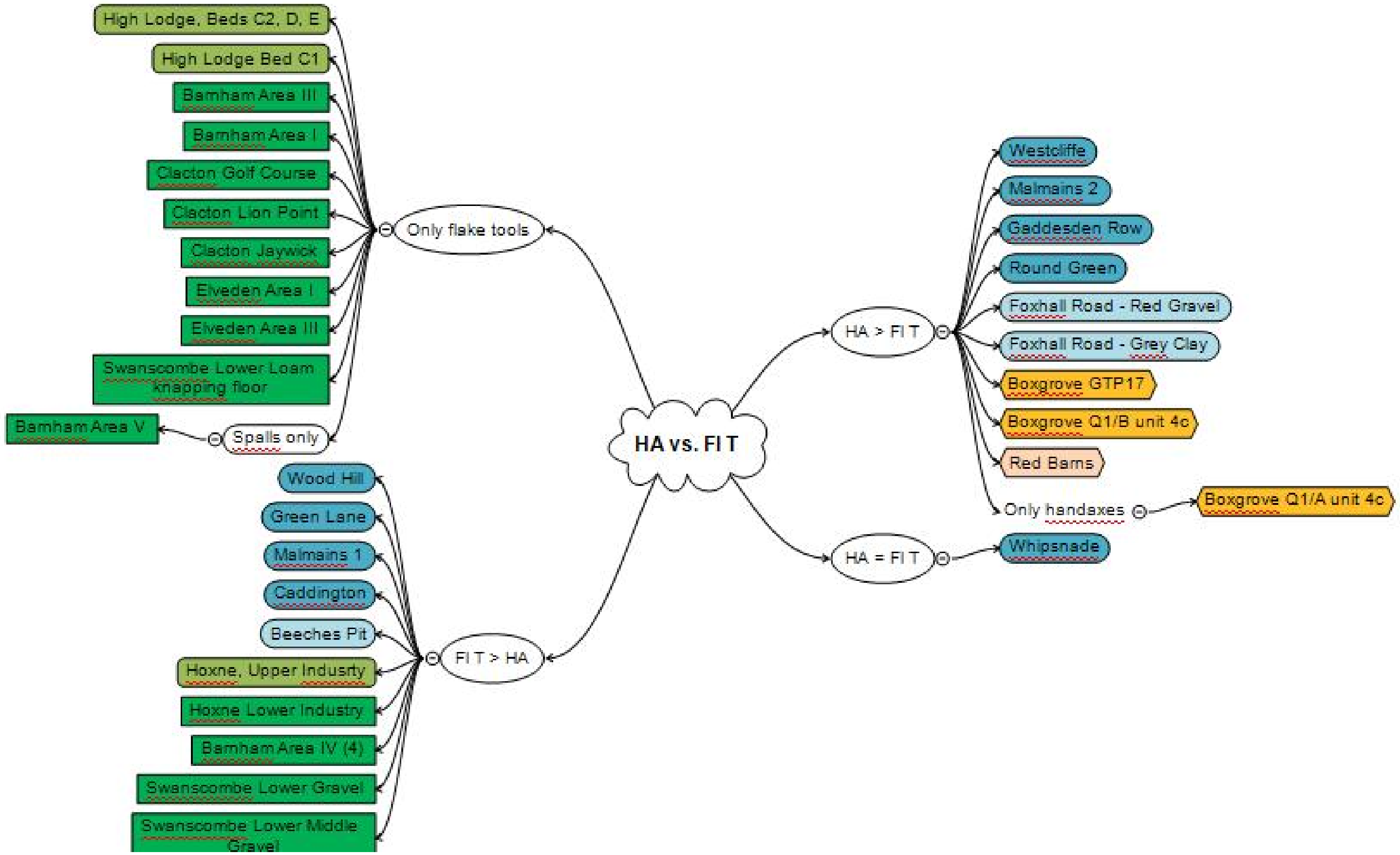


FIGURE 0.1 - DIAGRAM SHOWING GROUPINGS OF SITES BASED ON THE NUMBERS OF HANDAXES COMPARED TO FLAKE TOOLS. BLUE – UPLAND PONDS, LIGHT BLUE – LOWLAND LACUSTRINE/PONDS, GREEN – RIVERINE BANK OCCUPATION, LIGHT GREEN – FLOODPLAIN OCCUPATION, ORANGE – GRASSY PLAIN, LIGHT ORANGE – GRASSY HILLSIDE.

CHAPTER 8 – CONCLUSIONS

The discussion in Chapter 7 explored the results of the assemblage analysis and the Geographical Information Systems (GIS) approach, integrating them within wider themes of artefact movement, behavioural variation, organisation and provisioning across the landscape. The aims and objectives of the thesis outlined in Chapter 1 will now be addressed, incorporating the evidence discussed so far into key questions regarding Lower Palaeolithic behaviour:

- What are hominins doing in these upland locations?
- Are there any differences observed between the different upland study areas?
- What activities are hominins conducting in the lowland sites?
- How, if at all, does behaviour respond to landscape context and can this be observed in the tasks carried out in the lowlands as opposed to the uplands?
- Is the same pattern seen in continental Europe?
- Is the Lower Palaeolithic record actually monotonous or purely a result of time-averaged assemblages and an inappropriate scale of analysis?

8.1. WHAT ARE HOMININS DOING IN THESE UPLAND LOCATIONS?

One of the aims of this research was to investigate the types of activities present in upland locations and to explore hominin behavioural variation and organisation within these landscapes. The Chilterns study area comprises mixed strategy sites such as Caddington where the focus was on primary manufacture of artefacts and associated subsistence activities linked to handaxes, coupled with a mixed flake tools signature. This contrasts with the evidence from Gaddesden Row which has a signature linked to butchery and the procurement of carcasses. Round Green and Whipsnade, however seem to be somewhere in between with a mixed signature, but displaying more of a focus on manufacture and the import of tools associated, in the case of Round Green, with a butchery and carcass processing signature coupled with minimal other extractive tasks. Whipsnade on the other hand has a wood-associated tool component, likely, as suggested above, to be linked to the site's location on the plateaus, further away from the scarp edge. This agrees with the suggestion that land-use models are based on the distance of a site to resources, forming a critical backdrop to behavioural choices and activity patterning (Ashton et al. 1998:264).

This mix of resource procurement sites and locations exhibiting 'mixed strategies' can also be seen in Kent, with Westcliffe, Malmains 1 and Wood Hill predominantly focused on manufacture, with a mixed subsistence signature. Whereas Green Lane is in stark contrast, sharing similarities with Gaddesden Row, not only in the assemblage signature (butchery and carcass processing) but the site's position in the landscape as well (overlooking a valley with easy access to the lowland plains). Moreover, Malmains 2 demonstrates a more ephemeral occupation with general maintenance activities represented. As noted in Chapter 7, whilst there are denticulates and flaked flakes present in most of the upland assemblages they rarely represent the dominant tool type, except in the case of Whipsnade, which has been discussed above. Consequently the overall signature exhibited by sites in these upland situations is one of 'mixed strategy' occupations with carcass slants, coupled with the occasional 'extractive' sites focused on the procurement of resources, namely carcass/ butchery related.

Furthermore, in the Chilterns the correlation between a carcass and butchery related signature and proximity to the scarp edge, coupled with the evidence from the viewshed analysis, suggests that sites may have been used as viewing platforms, allowing hominins opportunities to oversee activity in the lowland plains. This is also exemplified by Tolsford Hill in Kent, which is situated right on the scarp edge overlooking the plains below and demonstrates a wonderfully focused viewshed across the lowland area below, indicating an ideal locale for a hunting stand. The question here though is whether they also functioned as places to which carcasses were brought for processing, or indeed served as 'gearing up' loci, where tools were manufactured for transport and use in the wider landscape. It is probable, given the results above, that these upland sites served both functions. Handaxes appear to have been introduced and discarded in these areas, presumably in the course of carcass processing, and manufacture also took place, likely provisioning hominins for further hunting forays in the adjacent lowlands. Furthermore, parallels could be drawn between the British upland sites and those in the Duero Valley in Spain. Here sites are located in similar situations around solution hollows interpreted by the authors as acting as viewing locales, serving to not only provide good views but also control over the valleys below (Diez-Martin et al. 2008).

8.2. Are there any differences observed between the different upland study areas?

In terms of the types of assemblage signatures present in both study areas they represent similar spreads of activity. Nevertheless there does appear to be a disparity in the way the sites are organised in the landscape. For example, in the Chilterns, occupation appears to be more structured, with sites arranged around the sources of the rivers draining the hills, demonstrating links between the types of signatures observed and their proximity to the northern scarp edge and associated lowland plains. Conversely, the sites on the Kent Downs give the impression of a less structured system. This could be related to the lack of strong landforms in the Downs, however it is interesting to note as discussed elsewhere (chapter 6 and 7) that a cluster of sites can be seen on the lower dip slope near Wood Hill, and it is possible that the spatial patterning observed is partly absent, with other sites perhaps located under the present day sea level.

8.3. What activities are hominins conducting in the lowland sites?

In terms of the types of activities being undertaken in the lowland sites, the signature is essentially mixed, with a variety of sites represented and activities conducted. Extraction and production sites are represented by Elveden Areas I and II, Red Barns and Beeches Pit, where tools were manufactured fully or in part and exported for use elsewhere. Barnham Area V represents an ephemeral, short-stay locale also with the production and export of tools, whereas Barnham Area III represents an ephemeral occupation or series of occupations where tools were brought into the vicinity, used then discarded. A similar situation exists at Foxhall Road (Grey Clay) and at High Lodge Bed C1, but here tools were imported for a specific event related to butchery or carcass processing. Ephemeral butchery signatures can also be seen in all the Boxgrove assemblages, although of a more transitory nature than those above, with tools manufactured, introduced and exported. Wood procurement and manufacture is seen at Clacton-on-Sea Lion Point and at Jaywick Sands, although the latter is of a more ephemeral nature and on a smaller scale, suggested as being linked to the production of spears. A similar extractive signature with a predominance of flaked flakes is also observed in the Lower Gravel at Swanscombe.

It can therefore be seen that there are various types of occupations and activities being undertaken at these sites, suggesting that the hitherto missing variation is in fact there, but on a smaller scale than perhaps usually sought.

8.4. How, if at all, does behaviour respond to landscape context and can this be observed in the tasks carried out in the lowlands as opposed to the uplands?

One of the key questions was whether the current prevalence of lowland riverine sites was biasing our understanding of hominin behavioural variation and landscape use. In order to explore this, sites from both landscape areas were investigated with a view to deducing whether activity patterning was different between the areas. Furthermore the role that plateau sites played in hominin landscape systems and landscape use needs to be better understood. Ashton et al. (2006) have suggested that plateau sites were occupied in cooler environments, therefore could be functioning in the same way as the lowland sites but within different climatic cycles.

For example hominins were doing the same things but merely did it at a higher level, migrating down again when climate changed. If this was true we would see the same patterns of resource exploitation and behaviour as the lowlands, which does not appear to be the case.

Whilst there are a variety of different activities seen in both the lowland sites and upland locales there are a number of general patterns which highlight differences between the two areas of the landscape. The upland sites appear to be focused more on carcass acquisition, processing and butchery, indicated by the flake tools and a strong handaxe presence. In contrast the lowland sites exhibit a dominance of flake tools over handaxes, and a general trend towards flake tool components which are more focused on wood-related resources. This, as has been discussed above, could be a factor of different suites of resources resulting in differential patterning of behaviour. There also appears to be more variation in terms of the types of activities carried out in the lowlands.

8.5. IS THE SAME PATTERN SEEN IN CONTINENTAL EUROPE?

The evidence from Europe suggests that this landscape patterning and behaviour is not restricted to a British setting. Regarding the upland landscapes, similar patterns can be observed in the Duero River Basin, Spain, in terms of the flake tool types present, however, here there is a dearth of handaxes on the higher-level sites (Diez-Martín et al. 2008), which contrasts to the British pattern. Possible reasons for this have been discussed above (Chapter 7), however it is likely that the lack of raw material in this particular upland setting (hominins transported material up from the river valleys) has conditioned the discard of handaxes in the lowland river valleys, in close proximity to the raw material source. A similar pattern of flake tool types can also be seen, although the data is currently limited, at the doline site of Gentelles, France, with a dominance of scrapers (Tuffreau et al. 2008). The contrasts in raw material availability between the different upland areas discussed above indicate that raw material was not the primary attraction for hominins utilising these sites. Whilst water may have been an important consideration it seems increasingly likely that views are the main unifying factor in the selection of these sites, with importance placed on good access to, and the opportunity to observe game movements, in the adjacent lowlands.

Furthermore, the riverine sites also appear to follow a similar pattern to that observed in this research. The sites in the Somme valley display a similar pattern to that from Britain, with low numbers of handaxes and a flake tool component centred on denticulates and notches. Moreover, the evidence from Ferme de l'Epinette matches that from Gaddesden Row in the Chilterns and Green Lane, Whitfield in Kent, in terms of its landscape position and large number of bifaces, indicating similar tasks were carried out (Tuffreau et al. 2008). However, the sites at Soucy (Lhomme 2007) appear to contrast with these signatures, with the tool component linked to the available local resources and localised site context.

In summary, the data from Europe, although coming from only a limited number of examples, does suggest that the patterns displayed in the British dataset do occur in a European context. This indicates that the behavioural variation and structure of settlement systems observed is part of a universal pattern and in the context of the upland sites, served to explain repeated choice of these landscapes by hominins in different geographical areas.

8.6. IS THE LOWER PALAEOLITHIC RECORD ACTUALLY MONOTONOUS OR PURELY A RESULT OF TIME-AVERAGED ASSEMBLAGES AND AN INAPPROPRIATE SCALE OF ANALYSIS?

One of the ideas at the start of this thesis was to investigate the claim that behaviour in the lower Palaeolithic is monotonous, with similar activities occurring everywhere in the landscape. One possibility was that the signatures observed at sites were too time-averaged to hold anything useful, except within rare sites such as Boxgrove, or that manufacturing debris 'swamped' activity signals.

This research has shown that in looking at *in-situ* sites there is actually a lot of variation, with a variety of different types of site being observed (tooling up, resource extraction or procurement centred areas, manufacturing bases, mixed occupation and ephemeral locales). Whilst the overall character can seem similar, the real variation appears not only in the typological patterning and stages of chaîne opératoire that are present, but in the character of the tool component. The types and proportions of the flake tools present demonstrate clear differences between sites with a predominance of scraper and retouched-flake related activities and those with a focus on flaked-flakes and denticulate dominant events.

Furthermore, the prevailing interpretation of riverine sites as lowland hunting grounds (based on the large numbers of handaxes present) does not appear to hold true. When only the *in-situ* assemblages are considered a different pattern emerges, one of a mixed resource base with a slight bias towards wood-related resources. Indeed, the numbers of handaxes present are disproportionately low.

It is hoped that the research conducted here has served to highlight the importance of these upland locations in terms of the information they can offer, the potential to discover more sites, and their role in hominin behavioural organisation, artefact patterning and settlement systems. In 1914 Jamieson suggested that the earliest record of the 'Stone Age' was to be found "*written not in pits of transported gravel, but at fountain head and parent source of these gravels – the Clay-with-Flints of the Chalk Downs*" (Jamieson 1914:458). Whilst the chalk downs may not represent the earliest record of hominin occupation, their importance is paramount in furthering our understanding of hominin variation of the Lower Palaeolithic occupation of Britain.

APPENDIX I

METHODOLOGY

The methodology employed for the primary analysis of the assemblages is defined below. The analysis utilises a combination of typological and technological attributes aimed at identifying specific variables of interest to this research. As discussed in the text this is based on a mixture of methodologies from White and Plunkett (2004) and Ashton (1998a, b) with modifications where necessary. The descriptions of the flake tools are based on Bordes (1961 in Debénath and Dibble 1994) and flaked flakes were identified using the definition provided by Ashton et al. (1991).

The recording methodology was facilitated by the use of a recording form (see below), and the following qualitative and quantitative attributes were recorded.

GENERAL INFORMATION

The first section of the recording sheet contains general details about the site and artefact to aid identification at a later date. Firstly the sheet code was recorded, created using the designated site code (e.g. Malmains would be Mal) then a consecutive number (e.g. Mal1). The date of analysis, site name and flint code (only recorded if the flint had previously been marked with a code to facilitate easy matching of artefact sheets and photos) were then recorded.

In addition to the above, a typological designation was also attributed at this stage. This was recorded in the 'Type' field and consisted of the typological designation (e.g. flake, scraper, core etc.). While this encompassed a variety of categories during the recording of the data, for the purposes of the analysis they were grouped into set categories. These were flakes, debitage, cores, flake tools (scrapers, denticulates, flaked flakes, notches), handaxes. The purpose of this was to facilitate comparison between the primary and secondary datasets, upland and lowland sites, and especially the European dataset where additional categories were used that were not in the British assemblages. It also allowed them to be grouped into categories which related to stages in the chaîne opératoire and possible uses of artefacts, allowing easier comparison and analysis of site signatures.

Conditional variables

This section includes those variables or attributes which were recorded for each artefact regardless of typological classification.

Preservation

This records whether an artefact is broken or whole, with an additional section for description. This was to enable the nature of the break or other damaged to be noted.

Rolling

Based on the methodology from Ashton 1998:288, this provides information on the extent of rolling and therefore the extent of potential post-depositional movement, critical in assessing whether a site is *in situ*.

1. Mint (Sharp edges, no evidence of natural abrasion or edge damage)
2. Fresh (Sharp edges, occasional evidence of natural abrasion or edge damage)
3. Moderately rolled (Edges with clear abrasion and damage. Arrêtes on dorsal surface slightly rounded)
4. Very rolled (Edges considerably rolled and abraded, clear rounding of arêtes on dorsal surface)

Patination

Based on Ashton 1998:288, but modified by the author to better represent the assemblage, this gives an indication of the depositional environment.

1. None - Flint is black/ dark grey all over, no evidence of white patination
2. Moderate - Mostly black but with light grey and white sections
3. Very - Mostly white/ patinated, with a few grey bits
4. Wholly - Completely white with no trace of grey or black areas

Surface sheen

Providing another indication of post-depositional movement (Ashton 1998:288).

1. Matt
2. Slight
3. Gloss

Colour and staining

This was left open-ended so that a full description could be entered. This section aimed to highlight any differences in colour which could be attributed to differing depositional environments and identify artefacts that may have been from a different location. However, in practice differing patterns and depths of staining, certainly in the context of the upland sites located within solution hollows, may well be a product of depth of burial, or burial processes active in the formation of these hollows (see discussion of formation mechanisms, Section 3.1).

Metric attributes

All measurements were recorded in millimeters to a 0.005+/- accuracy using digital callipers. These were also zeroed before each measurement to ensure constant accuracy. The measurements were taken in accordance with the principle of smallest square, measuring at the point in each plane where the value would be greatest, creating a measure of the smallest square the artefact could fit into.

Length - This was a measure of the greatest length exhibited by the artefact and was recorded parallel to the axis of percussion.

Width - This was a measure of the greatest width of the piece and was recorded perpendicular to the axis of percussion, across the widest part of the dorsal surface.

Thickness - This variable measured the greatest thickness of the artefact through its cross section.

Butt width – This measured the maximum width of the surface of the butt, where this could reliably be determined and did not exhibit a break.

Butt thickness – This was a measure of the thickness of the butt, taken perpendicular to the butt width measurement. This was only taken if there was no breakage, or the maximum thickness could be easily determined.

TECHNOLOGICAL ANALYSIS

REFINEMENT

This is a qualitative measure and depends on the analyst's opinion, however it is a useful quick assessment of whether a tool is well made or *ad-hoc* in appearance, a very rough idea of expedient technology.

- Crude
- Average
- Fine

CORTEX

This is essential if we are to look at an artefact's position in the chaîne opératoire and therefore get an idea of the activities and site signatures present at a site (Ashton 1998:288).

- Wholly cortical
- >50% cortex
- <50% cortex
- No cortex

RAW MATERIAL

This is the section which records raw material, and has space to allow as much detail as possible, e.g. flint, chert, rough, fine material etc. This again is useful if we are determining the source of raw material, and trying to elucidate hominin resource procurement practices.

FLAKE/ TOOL METHODOLOGY

BUTT TYPE

Ashton and McNabb 1996 - except 8

- *Plain* – Flake removed from a single flake scar
- *Dihedral* – Flake removed from the intersection of two flake scars
- *Cortical* – Flake removed from cortical surface
- *Natural* – Flake removed from natural (but non-cortical) flint surface (e.g. frost shatter surface)
- *Marginal* – Flake removed from edge of core, forming narrow, indeterminate butt
- *Soft hammer* – Flake removed with antler/ bone/ wood hammer forming diffuse bulb of percussion, wide point of percussion and often with a lip at the contact between the butt and the ventral surface. The butt is often very thin and in these cases frequently associated with shattering
- *Mixed* – Flake removed from a combination of natural and flake surfaces (e.g. cortical/ plain or natural/ plain)
- *Removed* – No butt present

FLAKE TYPES

The flake types are designed to give an indication of knapping stage, and are based on the amount of cortex on the dorsal surface and the butt. (Ashton 1998:290) (except 6, addition by author)

- Cortical dorsal surface and cortical butt.
- Either >50% cortical dorsal surface + cortical butt (a), or (b) cortical dorsal surface + non-cortical butt.
- Either <50% cortical dorsal surface + cortical butt (a), or (b) >50% cortical dorsal surface + non-cortical butt.
- Either non-cortical dorsal surface + cortical butt (a), or (b) <50% cortical dorsal surface + non-cortical butt.
- Non-cortical dorsal surface + non-cortical butt.
- Lack of butt, not categorised.

Dorsal scar pattern

Previous flakes, as indicated by the dorsal scar pattern, removed in the following directions (Ashton 1998:288).

- Flakes removed from proximal end only
- Flakes removed from proximal and left only, or proximal and right only
- Flakes removed from proximal, left and right.
- Flakes removed from proximal, distal and right only, or proximal, distal and left only.
- Flakes removed from either left only, or right only.
- Flakes removed from distal
- Flakes removed from proximal and distal
- Flakes removed from right and left.
- Flakes removed from proximal, right, left and distal
- Dorsal wholly cortical or natural
- Flakes removed from right, left and distal
- Flakes removed from distal and right only, or distal and left only.

Flake termination

Based on Ashton 1998:290 Addition of 5 by the author

- Feather
- Stepped
- Hinged
- Plunged overshoot.
- Removed - Modification to termination either human or natural

Percussion

- *Hard hammer* - Thicker and straighter than soft hammer.
- *Soft hammer* - More diffuse bulb, thinner platform.

Cortical Index

This was included in the original recording sheet, but was not used in the end as it was deemed unnecessary during the course of recording.

Relict core edges

This is not of prime consideration for the methodology used here, however it was interesting to note if it did occur on an artefact.

Number of dorsal scars

Record of the number of dorsal scars on the dorsal surface.

Core recording section

Core type

The system of analysis of the cores is based on the notion that core reduction can be divided up into a number of different stages, each described as a core episode. Each core-episode consists of a series of removals that naturally follow on from each other. (Ashton 1998:291).

- *Single removal, Type A* - This consists of a single flake removal from a natural surface or from flake scars that are part of a different core episode.
- *Parallel flaking, Type B* - Two or more flakes removed in a parallel direction from the same or adjacent platforms.
- *Alternate flaking, Type C* - One or more flakes removed in parallel from the platform or platforms at their proximal ends for the next on or more removals. They in turn may form the platform or platforms at their proximal ends for further removals in the same direction as the original set of removals. The core may be turned several times in this way. This can be divided into several types:
    - *Simple alternate flaking, Type Ci* - The core is turned just once, with 1 or more removals forming the platform for the second set of removals.
    - *Complex alternate flaking, Type Cii* - The core is turned at least twice and consists of at least 3 sets of removals.
    - *Classic alternate flaking, Type Ciii* - A single flake forms the platform for the second flake which in turn forms the platform for the third flake. Several more flakes may be removed in this way.

If episodes of parallel flaking occur as part of *Ci or Cii*, then they are termed *Cip or Ciip*.

Where previous flake scars can be recognised, but not attributed to a specific sequence, then *Type D* is recorded.

NUMBER OF PREVIOUS REMOVALS

Number of scars present on the dorsal surface

DESCRIPTION AND DRAWING

This section included a hand-drawn sketch of the artefact recorded, with any aspects of interest labelled. This allowed later correlation with the photos taken during the course of the recording session. A description was also included, allowing further details of any relevant features to be recorded.

Sheet code – Kent Flints

Record Sheet

Date - Flint code -

Site - Type -

Condition

Preservation - Whole ☐ Broken ☐ Details –

Rolling - Mint ☐ Fresh ☐ Mod. R ☐ V. Roll ☐

Patination - None ☐ Mod. ☐ Very ☐ Wholly ☐

Surface sheen - Matt ☐ Slight ☐ Gloss ☐

Colour and Staining -

Measurements

L (mm) - W (mm) - Th (mm) -

BW (mm) – BTh (mm) -

Technological Analysis

Refinement - Crude ☐ Average ☐ Fine ☐

Cortex - Wholly ☐ >50% ☐ <50% ☐ None ☐

Raw material -

Flake/ Tool data

Butt Type Plain ☐ Dihedral ☐ Cortical ☐ Natural ☐ Marginal ☐ Soft Hammer ☐ Mixed ☐ NA ☐

DSP P ☐ P&L/R ☐ PL&R ☐ PD&L/R ☐ L/R ☐ D ☐ P&D ☐ R&L ☐ All ☐ C or N ☐ RL&D ☐ D&R/L ☐

Flake Type cD&B ☐ >50% cD+cB ☐ cD&ncB ☐ <50% cD+cB ☐ >50% cD+ncB ☐ ncD&cB ☐ <50% cD+ncB ☐ nC ☐ nB ☐

Flake Term Feather ☐ Stepped ☐ Hinge ☐ Pl. O ☐ Removed ☐

Percussion Hard ☐ Soft ☐

Cortical Index - *Relict core edges -*

No. dorsal removals –

Cores

Core Type - A – Single ☐ B – Parallel ☐ C – Alternate ☐
Ci – Simple Alternate ☐ Cip – Simple Alternate Parallel ☐
Cii – Complex Alternate ☐ Ciip – Complex Alternate Parallel ☐
Ciii – Classic Alternate ☐ D – Unclassified ☐

No. Previous removals -

Description and Drawing

APPENDIX II

TABLE A - SUMMARY OF ASSEMBLAGE TYPOLOGY FOR THE SITES IN CHAPTER 5

Sites		**Handaxes**	**Roughouts**	**Flakes**	**Cores**	**Flake tools**	**Core tools**	**Debitage**	**Misc**	Total
Caddington	*n*	13	11	1249	4	63	9	24	58	1431
	%	1%	1%	87%	0%	4%	1%	2%	4%	100%
Gaddesden Row	n	45	3	34	4	11	0	1	0	98
	%	46%	3%	35%	4%	11%	0%	1%	0%	100%
Round Green	*n*	25	7	221	11	15	1	0	2	282
	%	9%	2%	78%	4%	5%	0%	0%	1%	100%
Whipsnade	n	8	2	170	0	8	0	2	6	196
	%	4%	1%	87%	0%	4%	0%	1%	3%	100%
Green lane, Whitfield	*n*	23	0	199	12	34	2	34	6	310
	%	7%	0%	64%	4%	11%	1%	11%	2%	100%
Wood Hill	n	8	0	443	16	11	1	14	13	506
	%	2%	0%	88%	3%	2%	0%	3%	3%	100%
Westcliffe	*n*	24	7	904	41	19	4	291	4	1294
	%	2%	1%	70%	3%	1%	0%	22%	0%	100%
Malmains 1	n	19	0	412	24	30	1	65	4	555
	%	3%	0%	74%	4%	5%	0%	12%	1%	100%
Malmains 2	*n*	3	0	50	3	2	1	9	2	70
	%	4%	0%	71%	4%	3%	1%	13%	3%	100%

Sites		Handaxes	Roughouts	Flakes	Cores	Flake tools	Core tools	Debitage	Misc	Total
Barnham Area I	*n*	0	0	443	29	32	0	0	0	504
	%	0%	0%	88%	6%	6%	0%	0%	0%	100%
Barnham Area III	*n*	3	0	12	3	1	0	0	0	19
	%	16%	0%	63%	16%	5%	0%	0%	0%	100%
Barnham Area IV	n	1	1	362	13	2	0	0	0	379
	%	0%	0%	96%	3%	1%	0%	0%	0%	100%
Barnham Area V	*n*	0	0	75	4	0	0	0	0	79
	%	0%	0%	95%	5%	0%	0%	0%	0%	100%
Clacton - Lion Point	n	2		725	454	118	0	27	0	1326
	%	0%	0%	55%	34%	9%	0%	2%	0%	1
Clacton - Jaywick	*n*	0	0	153	21	6	0	1	0	181
	%	0%	0%	85%	12%	3%	0%	1%	0%	1
Clacton - Golf Course	n	0	0	79	12	4	0	10	0	105
	%	0%	0%	75%	11%	4%	0%	10%	0%	1
Elveden Area I	*n*	0	0	515	14	3	0	1631	0	2163
	%	0%	0%	24%	1%	0%	0%	75%	0%	100%
Elveden Area III	n	4		646	22	6	0	787	0	1465
	%	0%	0%	44%	2%	0%	0%	54%	0%	1
High Lodge Bed C1	*n*	0	0	59	7	7	0	8	0	81
	%	0%	0%	73%	9%	9%	0%	10%	0%	100%
High Lodge Bed C2, D, E	*n*	14		1538	32	91	0	152	0	1827
	%	1%	0%	84%	2%	5%	0%	8%	0%	1
Hoxne, Lower Industry	*n*	13		719	17	30	0	131	15	925
	%	1%	0%	78%	2%	3%	0%	14%	2%	1

Sites		Handaxes	Roughouts	Flakes	Cores	Flake tools	Core tools	Debitage	Misc	Total
Hoxne, Upper Industry	n	9		341	27	95	0	0	7	479
	%	2%	0%	71%	6%	20%	0%	0%	1%	1
Swanscombe Lower Gravel	*n*	1		932	85	70	0	17	0	1105
	%	0%	0%	84%	8%	6%	0%	2%	0%	1
Swanscombe Lower Loam	n	0	0	72	0	6	0	176	0	254
	%	0%	0%	28%	0%	2%	0%	69%	0%	1
Swanscombe Lower Middle Gravel	*n*	3		122	13	7	0	6	0	151
	%	2%	0%	81%	9%	5%	0%	4%	0%	1
Beeches Pit AH	*n*	7	0	1724	53	22	0	0	6	1812
	%	0%	0%	95%	3%	1%	0%	0%	0%	100%
Foxhall Road Grey Clay	n	19		6	2	1	1	0	0	29
	%	66%	0%	21%	7%	3%	3%	0%	0%	1
Foxhall Road Red Gravel	*n*	30		179	20	10	7	0	8	254
	%	12%	0%	70%	8%	4%	3%	0%	3%	1
Boxgrove GTP17 unit 4b	*n*	2		0	7	1	0	1781	6	1797
	%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Boxgrove Q1A Unit 4c	*n*	5		317	0	5	0	0	0	327
	%	2%	0%	97%	0%	2%	0%	0%	0%	100%
Boxgrove Q1B unit 4c	*n*	0	0	691	4	0	0	0	3	698
	%	0%	0%	99%	1%	0%	0%	0%	0%	100%
Red Barns	*n*	19		0	4	5	0	6600	4	6632
	%	0%	0%	0%	0%	0%	0%	100%	0%	1

Table B - Summary of tool typology for the sites in Chapter 5

Site		Retouched flake	Scraper	Flaked flake	Notch	Denticulate	Misc.	Core tool	Total
Caddington - Sampson	*n*	9	15	0	22	13	4	9	72
	%	13%	21%	0%	31%	18%	6%	13%	100%
Gaddesden Row	n	0	11	0	0	0	0	0	11
	%	0%	100%	0%	0%	0%	0%	0%	100%
Round Green	*n*	**0**	10	4	0	1	0	1	16
	%	0%	63%	25%	0%	6%	0%	6%	100%
Whipsnade	n	0	3	5	0	0	0	0	8
	%	0%	38%	63%	0%	0%	0%	0%	100%
Green lane, Whitfield	*n*	13	11	3	4		3	2	36
	%	36%	31%	8%	11%	0%	8%	6%	100%
Wood Hill	n	6	2	0	1	0	2	1	12
	%	50%	17%	0%	8%	0%	17%	8%	100%
West Cliffe	*n*	3	8	3	5	1	0	4	24
	%	13%	33%	13%	21%	4%	0%	17%	100%
Malmains 1	n	5	13	0	7	4	0	1	30
	%	17%	43%	0%	23%	13%	0%	3%	100%
Malmains 2	*n*	1	1	0	0	0	0	1	3
	%	33%	33%	0%	0%	0%	0%	33%	100%
Barnham Area I	*n*	1	10	19	0	2	24	0	56
	%	2%	18%	34%	0%	4%	43%	0%	100%
Barnham Area III	*n*	0	1	0	0	0	0	0	1
	%	0%	100%	0%	0%	0%	0%	0%	100%
Barnham Area IV	*n*	0	2	0	0	0	0	0	2
	%	0%	100%	0%	0%	0%	0%	0%	100%

Site		Retouched flake	Scraper	Flaked flake	Notch	Denticulate	Misc.	Core tool	Total
Barnham Area V	*n*	0	0	0	0	0	1	0	1
	%	0%	0%	0%	0%	0%	100%	0%	100%
Beeches Pit AH	*n*	0	3	5	6	7	1	0	22
	%	0%	14%	23%	27%	32%	5%	0%	100%
Boxgrove GTP17 unit 4b	*n*	0	1	0	0	0	0	0	1
	%	0%	100%	0%	0%	0%	0%	0%	100%
Boxgrove Q1A Unit 4c	*n*	0	0	0	0	0	0	0	0
	%	0%	0%	0%	0%	0%	0%	0%	0%
Boxgrove Q1B unit 4c	*n*	1	0	0	1	0	0	0	2
	%	50%	0%	0%	50%	0%	0%	0%	100%
Clacton - Lion Point	*n*	0	3	110	1	4	0	0	118
	%	0%	3%	93%	1%	3%	0%	0%	100%
Clacton - Jaywick	*n*	0	0	6	0	0	0	0	6
	%	0%	0%	100%	0%	0%	0%	0%	100%
Clacton - Golf Course	*n*	2	2	0	0	0	0	0	4
	%	50%	50%	0%	0%	0%	0%	0%	100%
Elveden Area I	*n*	0	3	0	1	0	0	0	4
	%	0%	75%	0%	25%	0%	0%	0%	100%
Elveden Area III	*n*	0	1	0	5	0	0	0	6
	%	0%	17%	0%	83%	0%	0%	0%	100%
Foxhall Road Grey Clay	*n*	0	1	0	0	0	0	0	1
	%	0%	100%	0%	0%	0%	0%	0%	100%
Foxhall Road Red Gravel	*n*	0	3	4	0	1	2	7	17
	%	0%	18%	24%	0%	6%	12%	41%	100%
High Lodge Bed C1	*n*	0	22	53	10	5	6	0	96
	%	0%	23%	55%	10%	5%	6%	0%	100%

Site		Retouched flake	Scraper	Flaked flake	Notch	Denticulate	Misc.	Core tool	Total
High Lodge Bed C2, D, E	*n*	0	4	0	0	1	0	0	5
	%	0%	80%	0%	0%	20%	0%	0%	100%
Hoxne Upper Industry	*n*	20	72	0	0	3	0	0	95
	%	21%	76%	0%	0%	3%	0%	0%	100%
Hoxne Lower Industry	*n*	8	13	0	1	1	7	0	30
	%	27%	43%	0%	3%	3%	23%	0%	100%
Red Barns	*n*	5	0	0	0	0	0	0	5
	%	100%	0%	0%	0%	0%	0%	0%	100%
Swanscombe Lower Gravel	*n*	2	2	66	2	0	0	0	72
	%	3%	3%	92%	3%	0%	0%	0%	100%
Swanscombe Lower Loam	*n*	1	0	2	0	1	2	0	6
	%	17%	0%	33%	0%	17%	33%	0%	100%
Swanscombe Lower Middle Gravel	*n*	0	0	6	1	0	0	0	7
	%	0%	0%	86%	14%	0%	0%	0%	100%
Swanscombe Upper Middle Gravel	*n*	0	68	0	0	0	14	15	97
	%	0%	70%	0%	0%	0%	14%	15%	100%

Table C - Summary of flake cortex data for the sites in Chapter 5

Flake cortex		None	<50%	>50%	Wholly	Total
Caddington	**n**	95	158	45	29	327
	%	29%	48%	14%	9%	100%
Gaddesden Row	*n*	18	12	3	1	34
	%	53%	35%	9%	3%	100%
Round Green	*n*	52	127	29	12	220
	%	24%	58%	13%	5%	100%
Whipsnade	n	57	98	12	3	170
	%	34%	58%	7%	2%	100%
Green lane, Whitfield	n	51	85	33	11	180
	%	28%	47%	18%	6%	100%
Wood Hill	*n*	164	166	73	23	426
	%	38%	39%	17%	5%	100%
West Cliffe	*n*	113	111	45	29	298
	%	38%	37%	15%	10%	100%
Malmains 1	n	113	203	71	25	412
	%	27%	49%	17%	6%	100%
Malmains 2	*n*	6	32	10	2	50
	%	12%	64%	20%	4%	100%
Barnham Area I	**n**	132	183	84	42	441
	%	30%	41%	19%	10%	100%
Barnham Area IV	*n*	138	147	45	32	362
	%	38%	41%	12%	9%	100%
Barnham Area V	n	47	21	5	2	75
	%	63%	28%	7%	3%	100%
Beeches Pit AH	n	256	213	138	85	692
	%	37%	31%	20%	12%	100%
Boxgrove GTP17 unit 4b	*n*	239	609	186	N/A	1034
	%	23%	59%	18%	0%	100
Boxgrove Q1A Unit 4c	*n*	78	38	8	N/A	124
	%	63%	31%	6%	0%	100%
Boxgrove Q1B unit 4c	*n*	148	78	17	N/A	243
	%	61%	32%	7%	0%	100%
Clacton - Lion Point	n	135	568	0	8	711
	%	19%	80%	0%	1%	100%
Clacton - Jaywick	*n*	24	91	N/A	6	121
	%	20%	75%	0%	5%	100%
Clacton - Golf Course	*n*	18	28	33	N/A	79
	%	23%	35%	42%	0%	100%
Elveden Area I	n	170	210	83	75	538
	%	32%	39%	15%	14%	100%
Elveden Area III	*n*	53	73	164	92	382
	%	14%	19%	43%	24%	100%
Foxhall Road Grey Clay	*n*	N/A	N/A	N/A	N/A	0
	%	0%	0%	0%	0%	0%

Flake cortex		None	<50%	>50%	Wholly	Total
Foxhall Road Red Gravel	*n*	47	81	34	17	179
	%	26%	45%	19%	9%	100%
High Lodge Bed C1	*n*	N/A	N/A	N/A	N/A	0
	%	0%	0%	0%	0%	0%
High Lodge Bed C2, D, E	*n*	62	96	32	10	200
	%	31%	48%	16%	5%	100
Hoxne Upper Industry	*n*	139	160	106		405
	%	34%	40%	26%	0%	100%
Hoxne Lower Industry	*n*	402	201	112		715
	%	56%	28%	16%	0%	100%
Red Barns	*n*	373	302	125		800
	%	47%	38%	16%	0%	100%
Swanscombe Lower Gravel	*n*	190	442	216	84	932
	%	20%	47%	23%	9%	100%
Swanscombe Lower Loam	*n*	24	27	15	6	72
	%	33%	38%	21%	8%	100%
Swanscombe Lower Middle Gravel	*n*	30	55	24	13	122
	%	25%	45%	20%	11%	100%

APPENDIX III

TABLE D - TABLE OF SITE SUMMARIES FROM THE RESULTS OBTAINED FROM CHAPTER 5

Site	Location	HA vs. Fl T	% HA	% Fl T	Import/ export	Cortical flakes	Flake signature	Tool types	Carcass vs. Wood/plant	Tool signature
Westcliffe	Pond	HA > FlT	2% 24	1% 19	Import source nodules (HA/ Core)	Lack of cortical flakes compared to number of cores	HA signature	Scraper > notches > Core tools > retouched flakes > flaked flakes > denticulates	Carcass	Mixed
Wood Hill	Pond	Fl T > HA	2% 8	2% 11	No net imp/exp	Lack cortical flakes – product HA manufacture d on flakes	Right-handed L-shape – Co and Fl working – HA's on flakes	Retouched flakes > Scrapers > misc > core tool = notch	Carcass	Biased
Green Lane	Pond	Fl T > HA	7% 23	11% 34	Import of HA/ Co	Deficit cortical flakes vs. cores	Bell-curve – Combined HA and Co	Retouched flake > Scrapers > notch > misc > Core tools	Carcass	Biased

Site	Location	HA vs. Fl T	% HA	% FlT	Import/ export	Cortical flakes	Flake signature	Tool types	Carcass vs. Wood/plant	Tool signature	Designation
Malmains 1	Pond	Fl T > HA	3% 19	5% 30	Import HA/Core	Deficit cortical flakes vs. cores	Bell-curve - combined	Scrapers > notches > retouched flakes > denticulates > Co tool	Carcass	Biased	Manufacture, imported handaxes, mixed tool component but biased carcass. 'Mixed strategy'
Malmains 2	Pond	HA > Fl T	4% 3	3% 2	Import HA's or cores	Deficit cortical flakes vs. cores	Extended bell-curve - Combined	Retouched flake = scraper = core tool	Carcass	Bias	Ephemeral, general maintenance activities focus carcass processing/ butchery.
Caddington	Pond	Fl T > HA	1% 13	4% 63	? No net import/ export	? Over rep cortical – result of preservation bias	Bell-curve – combined sig	Notches > scrapers > denticulates > retouched flakes > core tools > misc	Mixed	Mixed	Primary manufacture, use of handaxes and flake tools – mixed strategy site
Gaddesden Row	Pond	HA > Fl T	45% 44	11% 11	Import HA/Co	Deficit cortical vs. cores	Right-slanted - handaxe	Scrapers	Carcass	Bias	Butchery signature, resource procurement site ' episodic/ extractive'
Round Green	Pond	HA > Fl T	9% 25	5% 15	Imported HA/ Co	Deficit cortical vs. cores	Bell-curve – Ashton's biface/ combined	Scrapers > flaked flakes > denticulate = core tool	Carcass (e.g. dominant of scrapers but flaked flakes)	Bias	Manufacture and import of tools, focus butchery and carcass processing, but also mixed wood as well – 'mixed strategy'

Site	Location	HA vs. Fl T	% HA	% FlT	Import/ export	Cortical flakes	Flake signature	Tool types	Carcass vs. Wood/plant	Tool signature	Designation
Whipsnade	Pond	HA = Fl T	4% 8	4% 8	Imported HA/ Co (latter case exported)	?Over rep cortical flakes	Extended bell-curve – Ashton biface?	Flaked flakes > scrapers	Wood	Bias but mixed	Mixed strategy, manufacture and use
Barnham Area I	Riverine	Fl T	0% 0	6% 32	No net import/ export	Slight under rep cortical flakes	Bell-curve – Ashton's biface or combined	Flaked flakes > scrapers > denticulates > retouched flakes	Wood	Bias	raw material procurement and the manufacture and use of tools on site, with general subsistence activities wood slant 'mixed strategy'
Barnham Area III	Riverine	Fl T	0% 0	5% 1	All imported	N/A	N/A	Scraper modified flaked flake	Mixed	Mixed	Ephemeral, tools imported, discarded on site – general subsistence
Barnham Area IV(4)	Riverine	Fl T > HA	<1% 1	1% 2	Export of HA/Co	Correct number core cores?	Right handed L-Shape – Wenban-Smith core	Scrapers	Carcass	Bias	Manufacture location related to butchery, production of bifaces and scrapers, subsistence activities
Barnham Area V	Riverine	Fl Fl spall only	0% 0	0% 0	Cores introduc ed, worked then exported	Deficit in cortical flakes vs. cores	Right slanted curve – Handaxe	Manufacture flaked flakes on site – use?	Wood??	N/A	Ephemeral, raw material imported to produce artefacts for specific task, possibly flake tool production. Which then exported.

Site	Location	HA vs. Fl T	% HA	% FlT	Import/ export	Cortical flakes	Flake signature	Tool types	Carcass vs. Wood/plant	Tool signature	Core tools	Designation
Clacton-On-Sea, Golf Course	Riverine channel	Fl T	0% 0	9% 65	Over-rep cores and over-representation primary stages manufacture – opposite to Jaywick.	Over-representation flakes from primary stages	Left-handed L-shape – Ashton's core	Flaked flakes > misc. > retouched flakes > core tools > endscrapers > scrapers > denticulates	Wood	Mixed		manufacture location, but with a focus on the earlier stages of reduction, with the movement of cores in and out of the site, similar to Turq's designation of 'extraction and exploitation' site – production of flake tools – mixed tool signature.
Clacton-on-Sea, Jaywick	Riverine channels	Fl T	0% 0	3% 6	No net import/export	Lack cortical flakes vs. cores	N/A	Flaked flakes	Wood	Bias		Import partially worked cores, further reduced on site to produce flaked flakes, used and discarded. 'episodic' site.
Clacton-on-Sea, Lion Point	Riverine channels	Fl T	<1% 2	9% 118	Import cores/ HA's	Over-representation cores. Huge deficit of cortical flakes.	N/A	Flaked flakes 93%> denticulates > scrapers > notch	Wood	Bias		Cores imported for manufacture of tools (flaked flakes) for use on site.
Elveden Area I	Riverine channels	FlT	0% 0	<1% 3	Export cores/ HA's	No deficit cortical flakes vs. cores	Bell-curve (slight right slant, minimal)	Scrapers > notch	Carcass	Bias		Selection and manufacture nodules, HA and cores. General subsistence activities= flake tools. 'Extraction and production'.

Site	Location	HA vs. Fl T	% HA	% FlT	Import/ export	Cortical flakes	Flake signature	Tool types	Carcass vs. Wood/plant	Tool signature	Core tools	Designation
Elveden Area III	Riverine channels	FlT	0% 0	<1% 6	Export HA's and likely cores. Some import partially worked cores or handaxes	Lack of cortical flakes if HA's also made from scratch on site. Import partly worked cores or HA's	Bell-curve (left slanted)	Notches> scrapers	Wood/bone ?	Bias		Selection and manufacture nodules, production HA's and flake tools. General subsistence = flake tools, export HA's. 'Extraction and production'
High Lodge Beds C2, D, E	Riverine floodplain	FlT	0% 0	5% 91	Deficit cores - exported	N/A	Bell-curve (right slanted)	Flaked flakes (55%)>scrapers >notches >denticulates > misc	Wood	Mixed with bias		Selection and manufacture nodules, production of flake tools for specific tasks 'mixed'
High Lodge Bed C1	Riverine floodplain	FlT	0% 0	9% 7	No net import/ export	N/A	N/A	Scrapers (80%)> denticulate	Carcass	Bias but limited numbers		'Ephemeral/ episodic' Procurement and manufacture cores. Tools subsistence-based. Short-stay.
Hoxne, Lower Industry	Riverine, channels	FlT > HA	1% 11	3% 30	Overall no net import/ export	N/A Later stage reduction more common	Right-slanted triangle	Scrapers 30%> retouched flakes > misc.> denticulate	Carcass	Mixed		Raw material procurement, manufacture flake tools, handaxes in likely butchery or carcass processing events. 'mixed strategy'

Site	Location	HA vs. Fl T	% HA	% FlT	Import/ export	Cortical flakes	Flake signature	Tool types	Carcass vs. Wood/plant	Tool signature	Core tools	Designation
Hoxne, Upper industry	Riverine, Floodplain	FlT > HA	2% 8	20% 95	Some handaxes likely imported	N/A	Bell curve, right-slanted	Scrapers 58%> retouched flakes> endscrapers > denticulates.	Carcass	Mixed but bias		Procurement and manufacture locale with focus on flake tool activities with butchery/ carcass slant. 'mixed strategy/ exploitation'
Swanscombe, Lower Gravel	Riverine, channels	FlT>HA	<1% 1	6% 70	Import and export of partially knapped cores	Deficit in cortical flakes to cores	Bell curve, left-slanted	Flaked flakes 92%> retouched flakes> scrapers> notches	Wood	Bias		Import and export cores, manufacture flake tools and use in wood procurement activities. 'extractive/ episodic site'
Swanscombe, Lower Loam	Riverine, channels	FlT	0% 0	2% 4	Cores imported, worked and then exported	Deficit in cortical flakes (6), so cores likely imported part-worked	Bell-curve, slight right-slant	Flaked flakes 50%> retouched flake= denticulate	Wood but minimal	Mixed but bias		Manufacture tools on site and possible export of these. Extant toos = subsistence activities. Opportunistic butchery and export of meat and flake tools. 'ephemeral' episodic'
Swnscombe, Lower Middle Gravel	Riverine, channels	FlT > HA	2% 3	5% 7	Imported HA's, possible export cores	Deficit cortical flakes to cores = cores imported	Bell-curve, Left-slanted	Flaked flakes 86%> notch	Wood	Bias		'Ephemeral, episodic' occupation, primary manufacture, imported HA's. Subsistence related butchery and wood procurement.

Site	Location	HA vs. Fl T	% HA	% FlT	Import/ export	Cortical flakes	Flake signature	Tool types	Carcass vs. Wood/plant	Tool signature	Designation
Beeches Pit AH	Spring/ pond	FlT> HA	<1% 7	1% 22	Export part-worked HA's and import fully worked.	Deficit cortical flakes – import some HA's or/and cores, but focus more primary stages manufacture.	Shallow L-shape, right-slanted	Denticulates 32%> notches> flaked flakes> scrapers> misc.	Wood	Bias, mix tool types	Procurement and manufacture locale, cores and HA's, export partially worked, imported complete HA's. 'Extraction and production'. General subsistence activities wood focus.
Foxhall Road, Red Gravel	Lacustrine	HA> FlT	11% 27	4% 10	Import some cores/ HA's	Deficit cortical flakes vs. cores – cores imported part-worked	Bell-curve, slight left-slant	Core tools?%> flaked flakes> scrapers> misc> denticulate	Heavy processing, mix wood and carcass	Bias core tools, flake tools = mixed	Manufacture, import cores/ handaxes, butchery/ carcass processing + heavy duty component 'mixed'
Foxhall Road, Grey Clay	Lacustrine	HA> FlT	66% 19	3% 1	Import of HA's and some cores	N/A	N/A	Scraper=core tool	Carcass?	Bias	'ephemeral, episodic' Some in-situ manufacture, most tools imported. Butchery/ carcass focus. Hearth.
Boxgrove, Q1/A unit 4c	Grassland plain	HA	2% 5	0% 0	Export HA's, import other HA's	No cores	Right-slanted triangle	N/A unretouched flakes	Carcass	N/A	'Ephemeral', material brought in worked and exported – butchery event.

Site	Location	HA vs. Fl T	% HA	% FlT	Import/ export	Cortical flakes	Flake signature	Tool types	Carcass vs. Wood/plant	Tool signature	Designation
Boxgrove Q1/B unit 4c	Plains, spring deposits	HA> FlT	1% 8	<1% 2	Import part-reduced cores. Over-representation flakes, export of bifaces?	N/A	Right-slanted triangle	Notch = retouched flake	carcass	Bias	'Episodic' import decorticated nodules for further reduction, import finished articles, export HA's Butchery.
Boxgrove, GTP17	Plains	HA> FlT	<1% 2	<1% 1	Over-representation flakes – export cores/ HA's	N/A	Extended bell-curve, right-slanted, predominance secondary flakes	Scraper	Carcass	Bias	'Episodic', short-term butchery event, import reduction and export HA's. Resource procurement.
Red Barns	Hillside plains	HA> FlT	<1% 18	<1% 5	Export HA's	N/A	Right-slanted triangle	Retouched flakes	Carcass?	Bias	'Extraction and production' focus manufacture and export HA's. Ad-hoc production flake tools for general subsistence activities, tooling up locale.

APPENDIX IV

TABLE E - SUMMARY OF THE EUROPEAN SITES MENTIONED IN THE TEXT

Site	Date	Occupation	Environment	Assemblage	Flake tools	Activities	Sources
Cagny La Garenne 1	MIS 12/11	On river bank close to chalk talus.	Mosaic environment. Trees – Pine, Birch. Bushes.	Manufacture on flint from talus. Bifaces - various production stages. Core tools	Dominated by notches > denticulates.	Workshop for production of bifaces and flake tools.	Tuffreau et al. 1997 Tuffreau et al. 2008 Hallos 2001.
Cagny La Garenne 2	MIS 12/11	On river bank next to chalk talus.	Mosaic environment, boreal trees and bushes (pine and birch).	Tested nodules, cores, biface manufacture (shaping, tranchet). Low numbers finished artefacts. Cortical flakes dominant Core tools > flake tools.	Predominantly notches and denticulates, but also scrapers	Primary raw material procurement (extraction site) and export.	Tuffreau et al. 1997 Tuffreau et al. 2008 Hallos 2001.
Ferme de l'Epinette	MIS 10	Terrace hill slope overlooking valley		High proportion cores. Flake Tools > Handaxes Core tools. Lack early stage reduction, cores imported, HA's in roughout form or as full tools (used, re-sharpened (trimming flakes) and discarded). Manufacture of flake tools on site.	Denticulates > notches > scrapers > composite > flaked flakes > core tools > misc.	Specific activities related to movement, rather than to longer duration occupation.	Tuffreau et al. 1997 Tuffreau et al. 2008 Hallos 2001.

Site	Date	Occupation	Environment	Assemblage	Flake tools	Activities	Sources
Cagny l'Epinette	MIS 9	Channel edge next to chalk talus	Bone fragments	Tested nodules, limited cores (imported reduced and exported). All stages CO but low numbers cortical products. High % flake tools. Small number bifaces.	Notches > denticulates > scrapers	Mixed strategy site, tool production and use related to exploitation of carcasses at channel edge.	Tuffreau et al. 1997 Tuffreau et al. 2008 Hallos 2001.
Gentelles	MIS 10 >	Interfluvial plateau between Somme and Avre valleys. Several palaeolithic industries with bifaces preserved in doline system in chalk.		Lot of debitage - all reduction stages, retouch of tools, handaxe shaping.	Scrapers most common.		Tuffreau et al. 2008
Gouzeaucourt	MIS 8	Karstic depression		All stages manufacture, core working, handaxes produced and finished away from site (lack of shaping stages).	Notches and denticulates make up half tools		Tuffreau et al. 2008
Soucy 6, France	MIS 9	River bank	Faunal remains of large herbivores	CO based on the production of flakes.	Denticulates > retouched flakes > notches	Production and probable utilization of notched flakes	Lhomme 2007
Soucy 5 (level II)	MIS 9	Palaeochannels, Sandy bank, middle of multiple channel river bed	Faunal remains: deer and rhino.	knapping stations. Heaped flint. Production bifaces for export. Primary stages biface roughout.	Notches > retouched flakes > scrapers > denticulates.	Short-term occupation	Lhomme 2007

Site	Date	Occupation	Environment	Assemblage	Flake tools	Activities	Sources
Soucy 3 (level P)	MIS 9	Sandy hillock. palaeochannels	Deciduous forest and grassland environment. Occupation all year round through number of years	Bifaces and biface fragments < flake tools, flakes, tested nodules, limited cores. Bifaces imported partly or fully worked.	Retouched flakes > scrapers > denticulates > notches > burins	Butchery and carcass processing. Collection of shed antlers.	Lhomme 2007
Soucy 5 (level O)	MIS 9	Floodplain occupation		Lithics introduced as finished pieces.		Low density faunal and lithic remains, short manufacture sequences and use of tools	Lhomme 2007
Soucy 1	MIS 9	Floodplain occupation Slope formed by levee at limit of floodplain	Meadows and light forest	Production of bifaces and flake tools. Stockpiles of raw material	Scrapers and notched or retouched flakes	Several short-spaced occupations - processing of large herbivores	Lhomme 2007
Soucy 4		Floodplain occupation	Lithics introduced as finished pieces.			Low density faunal and lithic remains, short manufacture sequences, use of tools	Lhomme 2007
Soucy 5 – Level I		River bank (occupied not exclusively) at end of spring/ beginning of summer.	Wooded, faunal remains, red deer, rhino, wild boar, bear, horse, bovids.	Manufacture on site. Exploitation over 40 blocks of flint. Refits, biface utilization and shaping - only abandoned when no longer useable	Scrapers, retouched flakes, notches, denticulates	Core and flake and biface CO. Bifaces introduced Animals brought whole onto site, processed and consumed.	Lhomme 2007

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