Locating and Investigating Palaeolithic Sites

1.Collating a Desk-Based Assessment (DBA) of Baseline Information to Determine Palaeolithic Potential

Ideally, exploration and investigation of the Palaeolithic record within any defined area (e.g. a development site) should be undertaken as part of a pre-designed investigation in response to a planning brief, Written Scheme of Investigation etc. Any such investigation should ideally commence with the commissioning of a Desk-Based Assessment (DBA), undertaken by a suitably qualified individual, ideally a geoarchaeologist or with support / advice from such an individual.

If significant Palaeolithic finds are made by chance, as part of site investigations which have a different remit, it is still considered good practice to undertake a DBA in order to contextualise the finds discovery and develop an appropriate management / mitigation strategy. Significant finds are considered primary, *in situ* material rather than isolated, abraded hands axes and / or the odd piece of faunal material (e.g. a mammoth tusk) etc. Whilst the approach set out below is primarily tailored to the terrestrial record, the task-list could be modified as needed to investigate submerged landscapes in the nearshore / offshore environment.

Task	**Goal**	**Sources of Information**	**Challenges with Data**
1.1 Characterise superficial geology to create broad stratigraphic and / or detailed deposit model			
1.1a. Define the broad characteristics of the superficial geology cropping out at the near surface (up to c.10m depth). **1.1b.** Assess the thickness, subsurface stratigraphy and geometry of the superficial geology. If appropriate, create a preliminary stratigraphic and / or more detailed deposit model from available geotechnical and geoarchaeological data using Historic England guidance.	To identify landforms and sediment types (depositional environments) typically associated with the discovery of Palaeolithic archaeology (most commonly artefacts) as well as environmental remain; these are often organic-rich silts, clays and peats capable of preserving proxy biological records of climate, vegetation history and landscape evolution (e.g. pollen, insects, macroscopic plant remains, molluscs and vertebrate remains).	British Geological Survey mapping. Memoirs of the British Geological Survey (especially older editions). Field guides of the Quaternary Research Association. Published articles (monographs, journal papers, etc.) and grey literature reports. Open-access geotechnical records (boreholes, test pits etc) held by the	Mapping may not always accurately define the limits of deposits; some units may be too thin to merit recognition and delimitation. Classifications may be different on adjoining map sheets. Information concerning the age of sediments and interpretation of depositional environments may be unknown or based on either old interpretations or assumed correlation with other sequences. This is sometimes the case with

1.1c. Assess the probable age and palaeoenvironmental potential of the deposits based on available information.	Landforms and sediments may include river terraces, raised beach and estuarine deposits, ancient lake beds, areas with windblown material (coversands) and silts (brickearths or loess), alluvial fans, and slope deposits associated with both periglacial (solifluction deposits, commonly termed 'head') and temperate climates (colluvium). To identify limestone bedrock where landforms created by past aqueous processes may preserve archaeologically significant sediments (including caves, rock shelters, fissures, solutional pockets and dolines) To identify other bedrock types where a combination of lithological characteristics and structural controls may have created landforms such as caves, rock shelters or fissures where archaeologically significant sediments may be preserved.	British Geological Survey; information provided by a client. Shallow geophysical data may prove useful in some terrestrial situations (e.g. Electrical Resistivity Tomography, Ground Penetrating Radar).	units labelled as 'glacial sand and gravel' which might represent river terraces (and *vice versa*). Even recent interpretations can be the subject of academic disagreement. Sediment descriptions may be poor (especially borehole and test-pit records). Intervention locations may not be accurately recorded, which is important if the data is to be used to create a deposit model.
1.2 Collate archaeological and palaeoenvironmental data			
1.2a. Collate and map Palaeolithic findspots (usually lithics) relating to the archaeological record. **1.2b.** Collate and map additional information (absolute dates, environmental records and	To determine the spatial distribution, chronological character and condition of preserved archaeological and/or palaeoenvironmental material.	Regional Historic Environment Record (HER) data Information that may not have made its way into the HER: for example, contained in published articles (monographs, journal	Known records are not robust and may reflect, for example, collector bias, taphonomic factors (particularly relating to landscape evolution or geological processes), poor knowledge of the findspot,

biological proxies that have been analysed)		papers, etc.), unpublished grey literature and academic theses (Masters, Doctorates), private, unpublished data (held notably by academics).	inaccurate recording of coordinates, etc. Lack of supporting information (especially chronological and environmental data)
1.3 Analysis and interpretation			
1.3a. Compare and synthesise archaeological and geological records. **1.3b.** Determine from the character of the sediments (fine to coarse grained) and energy conditions of the postulated depositional environment whether the context is likely to contain primary or secondary archaeological assemblages or both.	To develop a conceptual framework for understanding landscape evolution and, in turn, a predictive model for geoprospection and risk mapping	-	-

2. Making an Initial Discovery

The potential significance of the discovery and the risk of destruction or further degradation should be assessed immediately, with input where appropriate from an accredited Palaeolithic specialist. Initial observations should be supported where appropriate by annotated location maps and field sketches illustrating the site stratigraphy and finds locations; field notes should be accompanied by photographs with a scale. All discoveries should include accurate spatial information (Easting; Northing; Height Ordnance Datum) using at the minimum a hand-held GPS, but ideally Differential GPS or equivalent survey equipment. If, at a minimum, a hand-held GPS is not available, measurements should be made with respect to a known fixed point (temporary bench-mark).

Task	Key Observations	Why it this important
2.1 Initial Observations	Is the find a single entity or part of a more complex set of archaeological deposits? What is the nature of the find locality? For example: an isolated surface discovery; eroded from a natural exposure; eroded from a current or abandoned artificial exposure (e.g. quarry face); from a secure context in a well-stratified sequence. Can the findspot be preserved to allow further investigation or is it at risk of imminent destruction? Are there Health and Safety concerns associated with investigation of the find spot? For example, is it below a large face of sediment prone to slumping?	Determines the complexity of the archaeological remains, whether more discoveries may be expected and what additional specialist advice should be sought. Determines whether a multi-methodological approach may be required (e.g. set-piece archaeological evaluation combined with sampling for absolute dating and further palaeoenvironmental analysis). Determines the timescale for further investigations and any Health and Safety considerations.
	Is this a chance find (not retrieved during archaeological investigations) and have other discoveries been made in the general area?	Determines the initial confidence that can be placed on the discovery and the level of factual checking that may be required. Determines whether key heritage managers need to be alerted with respect to the discovery (e.g. Planning Archaeologists).

	Is it a chance find recorded as part of a pre-planned programme of archaeological investigations focused on non-Palaeolithic archaeology? Was the find anticipated as part of a pre-planned programme of archaeological investigations focused on the Palaeolithic record?	Determines whether further specialist help needs to be sought and co-ordinated at an early stage. Determines whether the research strategy needs to be revised and if further funds should be sought to allow additional investigations.
	Can you classify the find from initial assessment? For example: lithic artefacts; worked or unworked wood; sediments with palaeoenvironmental potential (pollen, insects, plant remains, molluscs etc); human bone or other faunal remains (both large and small). What is your first assessment with respect to the state of preservation? Is the find pristine, moderately or badly degraded? Does the find provide an indication of chronology?	The type of material will provide evidence for the nature of the archaeological record (e.g. material culture or palaeoenvironmental data) and, in the case of sediments, information with respect to the depositional palaeoenvironment. The type of material will determine the fragility of the remains and how rapidly they might degrade prior to further investigation. It will also determine whether conservation measures will be needed immediately upon discovery (as recommended in *First Aid for Finds*). The type of material will provide an indication of whether the remains are likely to be primary or secondary assemblages at the find spot. Some remains can provide useful chronological information: for example, by reference to artefact typology or the presence/ absence of key animal species.

3. Undertaking a Detailed Investigation

Once assessment of a discovery has been made, further detailed investigation may be appropriate, with aims and objectives set within the framework of a well-developed research plan / Written Scheme of Investigation (WSI). If specialists are subcontracted to undertake analyses, it is desirable to make financial provision for some of these individuals to visit the site so they can advise on sampling, site contexts, and if required, take additional site measurements.

Task	Key Observations	Why it this important
3.1 Establish a georeference system secured to national systems	Easting, Northing and Height OD	Whilst this should be considered a standard protocol, regardless of site age, it must be emphasized that 'Height OD' may be particularly important when dealing with Palaeolithic remains, including single, isolated finds. Having accurate height information may allow a find to be assigned to a discrete Pleistocene deposit, which in turn, may have independent dating evidence: for example, staircases of river terrace sediments. Dating may be absolute (e.g. 14C, OSL, AAR) or relative (e.g. faunal and/or faunal remains indicative of warm or cold stage climatic conditions; morphostratigraphic relationship to a nearby deposit with absolute dating control).
3.2 Describe and interpret the geological record to determine depositional environments and whether archaeological assemblages are Primary or Secondary	Can the geological sequence be subdivided on the basis of grain size?	Grain size will provide an indication of energy levels within the depositional environment. As a general rule, the coarser the sediment the higher the energy required to transport material. Fine-grained sediments deposited in low energy environments (silts, clays and peats) are much more likely to preserve *in-situ* or near *in-situ* environmental remains and material culture (i.e. primary rather than secondary assemblages). Biochemical precipitates such as spring tufas can preserve extremely fragile archaeological and palaeoenvironmental remains.
	If coarse, gravel-sized material is present, what is the lithological composition (i.e. rock types) and does it vary between units?	Study of the lithological composition of deposits can provide an indication of the provenance of sediments and whether they are derived from local bedrock sources or include far-travelled, (exotic) components. Mass movement (slope deposits) and cave sediments are usually derived locally. In contrast, river terrace sediments often include exotic lithologies, which may have been introduced into a catchment through glaciation, river diversion and catchment expansion/ retraction over time. Clast lithological signatures may be used to distinguish different river terrace units and provide a degree of chronological control if they can be linked to key geomorphological events (e.g. the input of *Rhaxella* Chert into fluvial sediments of eastern and southern England via tills associated with the Anglian glaciation). In terms of lithic studies, understanding the characteristics of the local bedrock and superficial geologies will help provide an understanding of what to expect in terms of artefact raw materials (i.e. the use of flint versus other raw materials such as quartzite, volcanic tuff etc).

	If coarse, gravel-sized material is present, what is the shape (sphericity and roundness) of the individual clasts and how well-sorted are they? Does shape and sorting vary between units?	Shape and sorting can provide an indication of how far sediments have travelled before deposition. The more transportation sediments undergo, the greater the degree of sorting, sphericity and roundness of individual clasts. Since mass movement (slope deposits) and cave sediments are usually derived locally, they tend to be characterised by poorly sorted, angular sediments; in contrast, away from headwater localities, fluvial sediments have usually undergone prolonged transportation, resulting in a greater degree of sorting, sphericity and roundness. However, as a note of caution, shape can also be influenced by rock type and past structural control. Shape may also be an inherited characteristic from processes operating during much earlier geological periods; for example, the shape of highly spherical quartz and quartzite gravels found commonly across the English Midlands is inherited from geological processes that operated during the Triassic Period.
	Do the sediments exhibit any structures?	Bedding structures are formed by the movement of sediments under various energy (flow) conditions. They are often best-developed in sands, silts and clays, though they can occur in gravel-sized material. Horizontal bedding is indicative of lower energy regimes and hence is more likely to be associated with the discovery of primary assemblages. Dipping bedding structures (foresets) can provide indications of past flow direction in aqueous and wind-blown sediments; generally, the steeper the angle of dip, the higher the flow velocity and hence potential for secondary assemblages (i.e. reworked archaeology). In the absence of clear bedding structures, the overall shape of the bedding unit should be recorded. Individual clasts of gravel-sized material in a variety of sediment types (fluvial, glacial and periglacial) may also exhibit preferred orientation (collectively known as fabric). Measurement of the inclination (dip) and orientation of this preferred fabric can also illustrate past flow direction.
	Does the colour of individual sediment units vary and are there signs of marked biochemical and / or biogenic alteration?	Variation in unit colour may provide an indication of changing sediment sources and / or post-depositional biogeochemical alteration in response to a variety of factors: for example, sub-aerial weathering and groundwater fluctuations; such processes can affect preservation potential. Colouration to reddish hues (rubification) may also be an indication of temperate soil development and other weathering processes within Pleistocene sediments. Since they indicate past landsurfaces, palaeosols have great potential to be associated with primary or secondary assemblages. However, even if archaeology is not present, they provide important stratigraphic marker horizons and can be used to establish relative chronologies and facilitate correlation between sites. Whilst bioturbation and other biogenic processes (e.g. root growth) can disrupt the structure of the soil, horizons with different biogeochemical characteristics can provide structure to such units. In cold environments, soil development can occur in tandem with periglacial processes; this may lead to a range of features such as cryoturbation and involutions, in turn providing important palaeoenvironmental information.

Review Point	Do your interpretations of Quaternary sediment types and geological characteristics at the site agree with the interpretation of the British Geological Survey map surveyors?	The spatial limits of mappable units and the interpretations of the British Geological Survey provide working models against which to test geological interpretation. These models should not be considered fully proved interpretations, and at this review point it may be necessary to formulate new interpretations for your units based on the collated evidence.
3.3 Describe and Interpret the archaeological, stratigraphic and spatial context	How does the recorded archaeology relate to the geological sequence of sediments: for example, is the archaeology found upon, within or beneath other sediments?	Allows the archaeology to be contextualised within a secure stratigraphic framework and highlights opportunities to consider geological processes immediately before, during and after emplacement.
	Is there clear superposition of separate assemblages or is there a merging of material (displaying mixed characteristics of patination, wear characteristics, typology, and technology etc)?	Important for distinguishing primary and secondary assemblages.
	How thick is the layer in which the artefacts occur and is there any obvious change in artefact abundance or size?	Important for distinguishing primary and secondary assemblages and advancing understanding of depositional processes.
	At what angle do the lithics (and any elongated or platey objects) lie?	A significant proportion of pieces lying at angles diverging markedly from the horizontal indicates the degree and type of disturbance. If there is a tendency towards a preferred non-horizontal angle in section or towards a preferred orientation in plan view (or two such orientations at right angles one to the other) the assemblage has probably been moved by geological processes such as solifluction.

	Does the site preserve stratigraphic and/or artefactual evidence that might indicate structural remains or zones of activity? How can the general spatial distribution be classified on a continuum from uniform/diffuse to clustered?	Whilst Palaeolithic built/cut structures are extremely rare, evidence should be sought for remains indicative, for example, of the controlled use of fire and the construction of temporary shelters. Hearths, although rare, represent the most commonly observed feature. Indicators of hearths might include the reddening of sediments, heat-crazed or fractured stones and charcoal. Knapping scatters, waste piles or areas outlined with larger stones might also reflect zones of activity. Undisturbed sites tend to have markedly clustered (heterogeneous) spatial distributions (although some natural processes such as periglacial activity can also produce a similar, but rarely identical, effect). If concentrated, the archaeological 'layer' may represent an 'activity' floor, though such features are very rare.
	If the site sits within a feature with rock walls, do the hard surfaces show evidence of rock art?	Such evidence will provide information on levels of cognitive development and insights into the character of human activity.
3.4 Describe and interpret remains of material culture	What are the compositional characteristics (i.e. rock types) of the lithic assemblage?	Historically, the majority of lithic tools found in Britain have comprised flint, obtained either directly from nodules where Cretaceous Chalk rocks crop out at the surface, or from material eroded by glacial activity and subsequently preserved in a range of superficial deposits (glacial tills and outwash gravels, river terrace gravels etc). However, in regions where flint of appropriate size and quality was not abundantly available for tool manufacture, it is now recognised that early hominins probably relied of other locally available rock types; in the English Midlands, this was primarily Triassic quartz and quartzite pebbles. Tools comprised of these latter rock types are difficult to identify due to the abundance of such rocks regionally and the degradation of individual tools when transported as river bedload.
	What is the general abundance of lithics?	Higher densities of lithics tend to indicate more substantial, possibly less disturbed sites, although some more ephemeral primary sites can still be lithic-poor.
	What is the relative abundance of finer, knapping debris? Has a check been made for very fine debris?	The significant presence of fine debris (defined by the relatively low maximum dimension and thinness of pieces) tends to indicate a near primary site, although some lithic-poor primary sites may not have experienced knapping at all. The presence of significant debris under *c*. 3mm in maximum dimension is usually a good indicator of a primary site. Sieves and hand-lenses are useful aids to quantifying these data.

	What is the general flake/blade to core/core tool ratio?	Natural disturbance and differential depositional processes tend to drag this parameter away from the original high value (commonly >100 in lithic-rich sites); derived contexts in, for example, reworked fluvial gravels (or in insufficiently sampled assemblages) may often show values of <0.1.
	What is the relative abundance of cortical pieces?	Cortex (particularly noticeable as a porous, whitish material on flint) is a long-term weathering crust naturally occurring on stone nodules. The significant presence of cortical pieces tends to indicate knapping activity.
	Are there any conjoinable pieces?	Conjoins are very difficult to recognise but may sometimes be readily apparent. They divide into two classes: breaks (a flake/blade snapped into two or more pieces) and technological conjoins (for example, waste flakes fitting the scars of previous flake removals). Especially in the latter case, conjoins tend to indicate a lack of disturbance. Even without actual conjoins, the presence of several pieces in any particularly distinctive raw material (in either the type of surface/cortex and/or interior of the stone) should be reported.
	Are there any non-knapped mineral artefacts or manuports in the assemblage?	The assemblage may include evidence of hammerstones, rubbers, raw nodules, large 'marker/weight' stones, red ochre and even ancient fossils.
	What condition state(s) do the lithics show?	The degree of patination and staining provides information not only on weathering and transportation processes but also antiquity. The degree of edge damage or rounding (consistent 'nibbling', 'battering' or 'grinding' of formerly sharp edges) and of arrêt rounding (the 'ridges' between scars of previous removals) provides evidence of weathering and transportation processes. Extreme rounding, coupled with an almost 'melted' look and surface bright patches, may indicate sand-blasting. Heavily burnt ('crazed') stone (whether or not an artefact) in unlikely to have survived significant transport by natural processes. These parameters and the frequency in an assemblage of pieces with these characteristics help in judging the archaeological significance of contexts.
3.5 Describing and Interpreting Environmental Remains	Are there any bone / tooth remains on site that might be considered human (hominin)? Does the condition of any such material indicate modification by human or other agencies, including:	Such faunal remains are exceedingly rare in the British Palaeolithic and their presence would immediately serve to classify the site as being of possible international significance. Modern laboratory analyses can be applied to such material, including techniques to characterise DNA and Stable Isotope ratios; these can aid interpretation of important research questions relating to matters such as lineage, environmental setting and diet. The identification of footprints at Happisburgh 3, Norfolk, has provided information on the composition of groups (adults and juveniles) and adult stature, in turn providing information on species.

	injuries indicative of trauma; alteration by burning; cut marks and/or fractures inflicted post-mortem; gnawing by scavenging animals? Is there any indirect evidence for a physical hominin presence, for example, footprints?	
	Are any large faunal remains present, how are they spatially organised and what is their condition?	Large mammalian remains may provide evidence for food resources available for exploitation and insights into procurement strategies, in turn providing information on the nature of social cohesion and cognition. The spatial distribution of humanly modified bone complements judgements on site integrity and function derived from studies of lithic artefacts. Bone can be adapted and modified to create tools, but these are not commonly recorded before the Upper Palaeolithic. Modern laboratory analyses afford a range of opportunities to study the past DNA and isotopic signatures of bone.
	Are any remains of small fauna such as micro-invertebrates (rodents, small birds, amphibians), molluscs and insects present?	These remains have the potential to provide important palaeoenvironmental and palaeoclimatic evidence and can assist in site dating (e.g. from studies of vole evolution). The presence or absence of such remains may not be obvious during field recording and will require the sieving of bulk samples. Modern laboratory analyses afford a range of opportunities to study the past DNA and isotopic signatures.
	Are any micro-palaeontological remains (pollen, diatoms, foraminifera etc) or macroscopic plant material remains present? What is the condition of the sediments (desiccated, moist to saturated and waterlogged)?	Such remains are often preserved in fine-grained humic silts and clays, as well as in peats. With the exception of plant remains, they will not be visible to the naked eye. These remains have the potential to provide important palaeoenvironmental and palaeoclimatic information. The condition of the sediments will provide a first approximation of preservation potential, with desiccated sediments likely to be characterised by degraded evidence. If larger woody material is included with the macroscopic plant remains, the species should be recorded and any potential evidence for working noted (though wooden artefacts are exceedingly rare in the Palaeolithic). Modern laboratory analyses afford a range of opportunities to study past isotopic signatures.

	Is charcoal present and how is it distributed?	Whilst charcoal in the environment may result from natural processes such as lightning strikes, it can also be indicative of the controlled use of fire. Understanding the volume of charcoal and its spatial distribution may help to identify hearths.
Establishing chronological control	Are sediments or other materials present that afford opportunities to apply absolute dating techniques?	Establishing secure and robust chronologies for Palaeolithic human activity is critical to contributing to debates focusing upon human evolution and social, technological and cognitive developments. Bone, burnt bone and charcoal can be dated by radiocarbon in younger assemblages (mainly the Upper Palaeolithic, but extending back to the very end of the Middle Palaeolithic); AMS determinations should be used where possible. Burnt stone (including flint) may be susceptible to Thermoluminescence (TL) dating (as may any substantial patch of burnt ground). Sediments comprising sands and silts may be datable by Optically-Stimulated Luminescence (OSL). Electron Spin Resonance (ESR) and possibly Uranium-series dating may be applied to tooth enamel and speleothems. Amino-Acid Racemization (AAR) may be applied to mollusc remains.

Useful Sources of Information

Bridgland, D.R. 1986 (ed). *Clast Lithological Analysis*. Technical Guide No 3. Cambridge: Quaternary Research Association.

Jones, A.P., Tucker, M.E. and Hart, J.K. 1999 (eds). *The Description and Analysis of Quaternary Stratigraphic Field Sections*. Technical Guide **7**. London: Quaternary Research Association.

Useful Websites

Quaternary Research Association
ww.qra.org.uk