EXECUTIVE SUMMARY

The unique Middle and Late Pleistocene sedimentary record preserved along the Sussex/Hampshire coastal corridor between Romsey and Brighton that formed over the last 500,000 years contains a wealth of Lower and Middle Palaeolithic archaeological remains. In this report we provide a summary of that work for curatorial staff to be used in conjunction with a set of ARC GIS Shape files defining differing Palaeolithic archaeological potential for the study region. The project has developed following consultation with archaeological curators for Hampshire and Sussex, where the project is located, in order to be tailored to their needs and integrated with the local minerals plans. This report summarises the background to the project (Section 2) and in particular the nature of the Palaeolithic resource, the project aims, objectives and methods. Section 3 summarises the current state of knowledge regarding the nature of the sequences within the West Sussex Coastal Plain and Solent area based on past work and the results of the recent field investigations. The Palaeolithic archaeological resource is described in Section 4. A geoarchaeological approach to the data and region is outlined in Section 5 that forms the rationale behind the structure of the GIS that is considered in Section 6; this is illustrated by two examples from the study area. In conclusion the data gathered through the project is considered within the structure of local research frameworks (Section 7) and finally within the field of development control (Section 8).

The current report draws on data and evidence drawn from previous phases of work on the project that included both data gathered from archaeological investigation of museum collections and fieldwork examining Pleistocene deposits and their associated palaeoenvironmental remains. These sources of evidence, along with age estimates provided by Optically Stimulated Luminescence dating and Amino Acid Geochronology form the basis for a palaeogeographic and landscape development model. This has provided the information to allow GIS zones to be constructed and the following statements regarding the spatial and temporal distribution and likely Palaeolithic importance of sequences within the study area have been made:

1. Areas associated with the Goodwood/Slindon Raised Beach are likely to contain high resolution in situ archaeological assemblage’s representative of “snap-shot” time intervals.

2. Attribution of the Aldingbourne Raised Beach raised beach to the early stages of MIS 7 implies that sediments from the interglacials associated with MIS 9 and 11 are missing from the WSCP. It is likely that any that were once laid down
have now been reworked and eradicated by the landward migration of the MIS 7 cliff line. Consequently we might anticipate some heavily rolled artefacts in this beach that span the temperate and cold phases between MIS 12 and 7, as well as fresher material contemporary with the formation of the deposit. This in fact corresponds with the known material (cf. Section 4.2.2.3), although the deposits have been subject to little formal archaeological investigation, which should perhaps be remedied at the earliest opportunity.

3. The majority of the lower coastal plain contains sediments associated with later MIS 7 and post-MIS 7 time. On the basis of evidence from elsewhere in the country it is anticipated that likely incidence of human activity would be low. However, evidence for activity in this time span is known in the UK and if present would be of considerable national importance.

4. The context or likely presence of any archaeological material associated with the other identified types of sequences in the WSCP is less easy to determine at present. Certainly in both channel fill sequences (such as those around Selsey Bill) and the cold climate deposits of the central plain area, sediments likely to preserve both in situ and reworked artefacts may occur. No such remains were found in the small investigation carried out for PASHCC, but this only impacted a miniscule proportion of the overall resource, so any further impacts should be evaluated, and perhaps a larger-scale investigative research programme initiated. Temporally these sequences also span time periods in which human occupation is known to have occurred in the UK.

4. Dating of Terrace 2 of the Eastern Solent to MIS 7 indicates considerable missing evidence covering MIS 2-6 in this part of the study region. The major change in dip of the long profile of Terrace 1, suggests a major palaeogeographic upheaval after MIS 7 that has had a major impact upon the Solent Basin drainage (perhaps as a function of changes in the Durlston Point and the Needles area. The presence of significant quantities of archaeological material associated with Terrace 2 suggests a very different pattern of human occupation (or preservation of record) between the Eastern Solent and the WSCP. Bearing in mind the sparse national record for MIS 7, this attribution makes all evidence from Terrace 2 of higher potential importance than previously recognised, requiring further investigation to assess the degree of derivation and the presence of less disturbed horizons within the gravel.

5. The long terrace sequence in the Solent system prior to the MIS 7 deposits of terrace 2 therefore presents a valuable complementary archive (to that from the West Sussex Coastal Plain) of human presence in the Sussex/Hampshire Coastal Corridor region, since, as explained above, it appears that there is a major absence of deposits spanning the period MIS 12 through to 8.

The PASHCC GIS is the prime medium through which the project currently presents its results to the ‘end users’ such as the HER and development control teams in the local authorities. The structure of the GIS was developed in conjunction with staff in relevant curatorial roles in both West Sussex and Hampshire as well as through experience developed in the course of other on-going or recently completed projects (Medway Valley Palaeolithic Project;
Northern Tributaries Project); this data structure has necessarily evolved as the project results were generated. The ESRI GIS products, with the results of the project being presented as a series of individual shape files which could be used in versions of ArcView/ArcGIS v. 8.2 or later, were selected for use in the project. The core aim of these proposals were to ensure that the maximum and optimum Palaeolithic archaeological knowledge is recovered from deposits impacted by development.

Page 10. Insert at end of paragraph
The project was funded by English Heritage from the Aggregates Levy Sustainability Fund.

Page 11. insert after paragraph 2.
1.1 Aggregate extraction and curation of the Palaeolithic resource

The project was been developed following consultation with archaeological curators for Hampshire and Sussex, where the project is located, in order to be tailored to their needs and integrated with the local minerals plans.

This project included a review of Palaeolithic remains recovered from aggregate extraction sites in the area (Bates et al., 2004). In the course of the project in order to make sense of these finds, and to improve the capability to manage the aggregate extraction landscape, it was also necessary to take account of remains recovered from other areas than merely those affected by extraction and to carry out a dating and correlation programme of aggregate deposits to place them in a synthesised chrono-stratigraphic framework. Therefore the project was conceived specifically to address these aims.

It was also deemed of particular importance to integrate the project within the context of other on-going project works within the area. Specifically these included the work at Boxgrove and the wider Upper Coastal Plain Mapping Project being undertaken by staff at UCL and current project work being undertaken within the vicinity of Chichester Harbour by the Chichester Harbour Conservancy as part of the multi-stranded project ‘The Rhythms of the Tide’.

Aggregate extraction within the study area has been intense during the past although current pressure is significantly reduced. Key areas of rich Palaeolithic resource potential such as the Warsash area of eastern Hampshire or the upper coastal plain between Chichester and Arundel have been particularly heavily impacted by resource extraction. At present only limited numbers of quarries are operational in the area and the focus of major extraction is now concentrated on the offshore zone of the Arun and Solent, however with major governmental initiatives on housing and development in the south east during the foreseeable future it may well be that terrestrial aggregate extraction becomes increasingly necessary.

Despite the reduction in the number of operational pits within the area considerable quantities of data are available both to inform predicative modelling and interpret past discoveries. There is a strong and unavoidable correspondence of interest between Palaeolithic archaeology and aggregate extraction. The great majority of sands and gravels used as aggregates were formed during the Pleistocene and so contain evidence
of the Palaeolithic. In this context work through the ALSF is important not simply to
demonstrate Palaeolithic archaeological presence, context and age but also to address
those deposits without known Palaeolithic archaeology in order to clarify their status and
potential. In the study region for this project, there has been substantial extraction since
the second half of the 19th century focused on both the marine sands and gravels of the
West Sussex Coastal Plain and the fluvial gravels of the Solent and to a lesser extent the
Arun.

While previous extraction has inevitably impacted upon the Palaeolithic archaeological
resource, it has also provided exposures of the sediments, and there is a long history of
coop-eration and tolerance between Palaeolithic investigators and commercial quarrying.
Early hand-digging and screening of gravel provided ideal conditions for the recognition
and recovery of artefacts, and quarry owners often cooperated with archaeological
investigation on numerous occasions. Our current understanding of the Palaeolithic
would be much reduced without the opportunities afforded by previous aggregate
extraction. Far from being in conflict with the needs of Palaeolithic archaeology,
going and future aggregate extraction can be of benefit, so long as appropriate
mitigating investigations are carried out.

The current planning legislation provides for mitigating the archaeological impact of all
development, including aggregate extraction, under PPG 16 (DoE 1990). However,
substantial unmitigated impact upon Palaeolithic evidence has taken place prior to PPG
16. This impact can to a large extent still be mitigated through study of surviving quarry
faces and of material recovered from known sites, and this is one objective of this
project.

Secondly, the piecemeal nature of mitigation work under PPG 16 — which is inevitably
focused on areas chosen for development and hence can deliberately avoid key
archaeological sites — means that it has been impossible to target key areas that can
increase curatorial understanding of the region. Carrying out such targeted work under
ALSF complements, and enhances the value of, other work carried out under PPG 16.

1.2 Relevance to ALSF priorities

The project produces a number of benefits corresponding to the priorities of the ALSF
in (a) promoting environmentally friendly extraction and transport (ALSF Objective 2)
and (b) reducing local effects of aggregate extraction (ALSF Objective 3). The project
has/would:

(a) Develop the capacity to manage the aggregate extraction landscape

(b) Collate and assess baseline information on the Quaternary
archaeology of the study

(c) Help improve curatorial decision-making with regard to
evaluation/mitigation of Quaternary archaeology of aggregate
deposits
The aims and objectives identified from Phase II work were specifically tailored to enhance our understanding of local and regional palaeogeography where clearer understanding will aid in ascribing the nature, distribution and age of sediments likely to contain Palaeolithic archaeological remains. This baseline information is clearly a prerequisite to refining the GIS required for curatorial purposes and to highlight areas where archaeological potential is high and where little is known about potential for human remains.

The core benefits of the project are in the areas of:

Promoting environmentally friendly extraction and transport (ALSF Objective 2) the project will:

(a) Develop the capacity to manage the aggregate extraction landscape

(b) Collate and assess baseline information on the Quaternary archaeology of the study

(c) Help improve curatorial decision-making within evaluation/mitigation of Quaternary archaeology of aggregate deposits

(d) Develop improved/appropriate methods for field investigations of aggregate deposits

(e) Develop an up-to-date research framework for Palaeolithic archaeology in the study area

(f) Identify areas of aggregate of potentially higher Palaeolithic significance

(g) Mitigate previous and ongoing aggregate extraction impact where not addressed under present planning conditions
Reducing local effects of aggregate extraction (ALSF Objective 3) — the project will undertake dissemination to local users (curators) to develop understanding and appreciation of Quaternary archaeology

The project also contributes to a number of current objectives in the national Palaeolithic research framework (English Heritage/Prehistoric Society 1999).

Page 20. Final sentence of paragraph 3 modified to
Additionally this project has provided a baseline dataset for comparison with information generated from the off-shore projects commissioned within the framework of the ALSF fund, e.g. the Arun Valley and Seabed Prehistory projects.

Page 21. **insert after point 6-**
Specifically a set of revised aims and objectives for the project has been undertaken principally with the curatorial requirements foremost. Acceptance that sufficient palaeoenvironmental assessment has been undertaken to characterise, rather than provide detailed palaeoenvironmental reconstructions, units then the tasks required to complete the project have the following aims and objectives:

1. To characterise the environments of deposition for each of the major stratigraphic groups identified in the study area [this has been substantially completed through the interpretation of contained sediment sequences and the assessment of the microfossil (mainly foram/ostracod) content] AIM 1

2. To define key marker sites of particular regional importance and tie points in the regional stratigraphic sequences which are likely to benefit from additional investigation [key identified sites are Lepe, Warblington, Portfield Pit Westhampnett and West Street Selsey; only Lepe and Warblington remain to be analysed in detail] AIM 2

3. To date using OSL the major stratigraphic groups identified in the study area [this has been partially completed through the Phase 1 dating program and samples for the remaining sites now exist from the Phase 2 works] AIM 3

4. To characterise, for each of the main project regions investigated archaeologically (Eastern Solent and West Sussex Coastal Plain), (a) the broad pattern through time (as represented in the stratigraphic sequence of major sediment bodies) of human occupation, (b) broad chronological changes through time in material culture and (c) synchronic material cultural variations across the landscape. In this case of course "material culture" solely concerns lithic artefacts, and particularly handaxes, which constitute the main archaeological evidence of the Lower/Middle Palaeolithic, which is the focus of this study. AIM 4

5. To produce a detailed GIS layer for the region using known Palaeolithic archaeology, sediment mapping and palaeoenvironmental data to (a) characterise the landscape in terms of Lower/Middle Palaeolithic significance and potential and (b) highlight areas of particular importance, identifying for such areas key research framework goals, and critical data/methods for addressing them. AIM 5
6. To disseminate the diverse project results as appropriate to a range of end users, namely: development control officers, curatorial staff, minerals planners, academic archaeologists and Quaternary scientists, schools and the general public in the project area. AIM 6

**Page 21. points 1 and 2 modified**

1. Shape files defining a series of polygons across the study area (these polygons define zones of similar geological (solid and drift) and Palaeolithic archaeological character within which approaches to the Palaeolithic archaeological record may be similar).

2. A series of characteristics defining the unique nature of each zone (in terms of archaeological, geological and chronological parameters).

**Page 24. third paragraph, line 14 removed**

And note that they are far more complex than originally thought

**Page 29. 2nd paragraph, 1st sentence change to**

These deposits are well known as a source of aggregate and much attention, by both the British Geological Survey and sand and gravel extraction companies, have been exerted in mapping the distribution and nature of these deposits (e.g. Lovell and Nancarrow, 1983). However, until recently little has been known of their sedimentological and chronological properties.

**Page 32. Line 7, sentence changed to**

In addition, Westaway et al. (2006) use a mixture of archaeological tie-points and uplift modelling to suggest ages for the Eastern Solent/Test Valley terrace sequence.

**Page 32. 5th paragraph last sentence text added at end**

that cannot therefore date the deposition of the underlying fluvial gravels.

**Page 34. 2nd paragraph, sentence added at end of paragraph**

Full details of the methods of lithic analysis and criteria for nominative categories such as "degree of rolling" are given in the report on the first phase of work (Bates et al. 2004).

**Page 34. 4.2.1 references added at end of 1st sentence**

(Calkin 1934; Woodcock 1981; Wessex Archaeology 1994; Roberts 1986; Roberts et al. 1987; Roberts and Parfitt, 1999).

**Page 35. 2nd paragraph, line 8 insert text after ‘routinised’**

(i.e. repeated and structured — cf. Gosden 1994; Gamble 1996)

**Page 35. Insert new paragraph after paragraph 3.**

The lack of Lower/Middle Palaeolithic evidence for the Period MIS 11 through to 9 is a direct result of the lack of survival of deposits of this period. This must reflect that the high sea-level stand of MIS 7, which we now equate with deposits of the Aldingbourne Raised Beach, must have reached at least the same level as those of MIS 9 and 11, and so must have wiped out deposits of this period. Whether this is because the MIS 7 high point was sustained over a longer period, and hence eroded
further inland, or whether it just reached a higher level is uncertain without further research. As a direct result of PASHCC (cf. Section 5), we now have a model for the region's landscape development where the surviving deposits are integrated into a big picture of landscape evolution, and this incorporates a substantial gap in sediment survival between MIS 12 and MIS 7, with the possible exception of specific buried channels at Selsey; this makes the Selsey Bill area of prime importance in the region for addressing this gap in the evidential/depositional record.

Page 37. end of 4th paragraph insert
However, this may also be due to a different activity focus at the excavated Boxgrove sites, or their different role in the overall pattern of hominin activity in the local landscape, rather than reflecting different typological preferences at the period.

Page 38. At end of 3rd paragraph insert
The focus on handaxe manufacture at the site, together with the disproportionately high amount of handaxe manufacturing debitage present compared to the number of handaxes (Wenban-Smith 2004), suggest the site was used as a tooling up base before going on hunting/foraging trips, and support the idea that these early hominins were using the landscape in a pro-active structured and organised way, rather than wandering around reactively encountering resources. The presence of some proto-Levallois material suggests that Levalloisian technology was incipient in handaxe-dominated industries (similar proto-Levallois material has been identified in MIS 11 deposits from Swanscombe in recent investigations by Wenban-Smith, in prep.), and that therefore the later development in MIS 8 of more fully-fledged Levalloisian industries (cf. Bridgland 1994) need not reflect influx of a new population from the continent, but could just as easily represent in situ technological development of the native British population.

Page 39. At end of 1st paragraph insert

Page 41. 4.2.3 line 4 insert
(based on our stratigraphic interpretation and associated radiometric dates),

Page 42. 4.2.3.2 at end of paragraph insert
on the basis of the stratigraphic position of the site linked to AAR results and mammal biostratigraphic dating.

Page 45. 4.3.2.3 paragraph 2 insert new paragraph at end of paragraph 2
Overall, the collection from Terrace 5 is very restricted, being from only one site. The implications of the rolled pointed assemblage are that it is perhaps derived from the pre-existing Terrace 6, which produced numerous handaxes of the same type in much fresher condition. Therefore it may be that we have no good evidence from Terrace 5 in the region, which would be an interesting gap in the occupational record if it was confirmed by subsequent investigations — which, incidentally highlights the importance and value of carrying out investigations that produce "no results" (cf. Section 7.2.4).

Page 46. Paragraph 2, end of line 2 insert
However, it is difficult to unravel the data in light of uncertainty over the depositional flow energies associated with the deposition of the artefact-bearing sediment for each terrace. The total absence of fresh or mint condition material perhaps suggests little contemporary deposition of pointed handaxes, although the concurrent absence of very rolled material suggests we are not simply dealing with a linear progression of degree of rolling as material is reworked from one terrace to another. This whole subject requires much more careful analysis, beyond the scope of this document, supplemented by consideration of the depositional energies of artefact-bearing contexts.

Page 47. **4.3.3.1 at end of paragraph insert**
on the basis of its location within the terrace staircase.

Page 49. **4.4. at end of 1st paragraph insert**
However, the provenance and dating of these is far too imprecise to be regarded as a contemporary cultural contrast with Boxgrove. At this stage, all that can be said is that the cultural preference at Boxgrove was for ovate forms, and just why this was in their heads rather than a pointed form remains a conundrum. One factor that can be ruled out is raw material, since the flint raw material at Boxgrove could have been made into whatever shape they wanted.

Page 55. **point 4 line 5 insert new sentence after ‘occur’**
No such remains were found in the small investigation carried out for PASHCC, but this only impacted a miniscule proportion of the overall resource, so any further impacts should be evaluated, and perhaps a larger-scale investigative research programme initiated.

Page 55. **last paragraph change 4. to 5.**

Page 61. **title for 7.1 modified to**
7.1 Development control, aggregate extraction and Palaeolithic archaeology

Page 61. **Add at start of section 7.1**
This section is relevant to all forms of development that have an impact upon the Palaeolithic resource. One major form of such development is, of course, aggregate extraction, and the PASHCC project has as one of its prime objectives to provide background information for curators and aggregate extractors alike on where Palaeolithic potential is likely to be highest, how to investigate if Palaeolithic remains are present and how to deal with them if they are. This objective has been primarily met (within this phase of PASHCC) through the GIS model prepared for, and given to, the county curators. It can also be made available by the county councils directly to other interested parties if they desire, such as archaeologists and consultants planning for mitigation in advance of development on behalf of aggregate extractors. This has broken down the PASHCC study area into a series of zones, and identified for each zone:

- The known Palaeolithic resource
- The importance of the known resource
- The likelihood of important remains
- Key research questions
Suitable methods of investigation

The remainder of this section provides a more general discussion of the research and curatorial framework within which Palaeolithic mitigation can take place in advance of aggregate extraction and other development. The unique nature of the Palaeolithic resource requires some special knowledge and methods compared to more conventional archaeological remains, but, nonetheless, can be approached within the same framework.