Seabed Prehistory:

Gauging the Effects of Marine Aggregate Dredging

Final Report

Volume III
Arun Additional Grabbing

Ref: 57422.33

February 2008

Wessex Archaeology

AGGREGATE LEVY SUSTAINABILITY FUND
MARINE AGGREGATE AND THE HISTORIC ENVIRONMENT

SEABED PREHISTORY:
GAUGING THE EFFECTS OF MARINE AGGREGATE DREDGING

ROUND 2
FINAL REPORT

VOLUME III: ARUN ADDITIONAL GRABBING

Prepared for:

English Heritage
1 Waterhouse Square
138-142 Holborn
London
EC1N 2ST

Prepared by:

Wessex Archaeology
Portway House
Old Sarum Park
Salisbury
SP4 6EB

Ref. 57422.33

February 2008

©Wessex Archaeology Limited 2008 all rights reserved
Wessex Archaeology Limited is a Registered Charity No. 287786

SEABED PREHISTORY R2

FINAL REPORT

VOLUME III: ARUN ADDITIONAL GRABBING

Ref. 57422.33

Summary

This study forms Volume III of the 'Seabed Prehistory: Gauging the Effects of Marine Aggregate Dredging - Final Report' commissioned by English Heritage (EH) and undertaken by Wessex Archaeology (WA). It was funded through Round 2 of the Aggregate Levy Sustainability Fund (ALSF) distributed by the Department for Environment, Food and Rural Affairs (DEFRA). The 'Final Report' comprises of eight volumes based on previous reports accomplished by WA for either EH or the Mineral Industry Research Organisation (MIRO), as part of Round 1 or Round 2 of the ALSF project 'Seabed Prehistory'.

The 'Arun Additional Grabbing' survey comprised part of the Round 2 'Seabed Prehistory' research project and was funded through the ALSF administered by EH. Its intention was to further investigate the relationship between struck flint and palaeogeographic features in the Palaeo-Arun area detected in the 'Seabed Prehistory' Round 1 project.

The grab sampling survey took place between 26th March and 9th June 2005 adjacent to the Owers Bank licensed dredging area 18km offshore south of Littlehampton, West Sussex, onboard the vessel *Valkyrie*. Titan Environmental Surveys Ltd. were contracted to carry out the survey under the supervision of WA staff. The grab samples were processed at WA's environmental premises during August 2005.

The results and conclusions of the grab sampling survey can be summarised as follows:

- Struck flint was recovered which does not appear to correlate spatially with palaeogeographic features;
- Large quantities of peat were recovered suggesting that deposits relating to the Palaeo-Arun valley are exposed on the seabed;
- Charcoal was recovered from one of the blocks of peat. This has been radiocarbon dated to the Early Mesolithic period and is a possible indication of human occupation in the area at this time;
- The methodology proved successful in assessing and evaluating prehistoric seabed deposits.

SEABED PREHISTORY R2

FINAL REPORT

VOLUME III: ARUN ADDITIONAL GRABBING

Ref. 57422.33

Acknowledgements

This survey was funded by the Aggregate Levy Sustainability Fund (ALSF) administered by English Heritage (EH). Wessex Archaeology (WA) commissioned Titan Surveys Ltd. to undertake the grab sampling survey. WA was in attendance for all the fieldwork.

Jack Russell supervised the grab sampling survey onboard the vessel and compiled this report. Nick Plunkett assisted in processing and scanning the grab samples. Mark Stewart and Dr Matt Leivers identified the flint. Dr Stephanie Knight undertook the animal bone identification. Dr Cathie Chisham identified the preserved wood and charcoal. Jack Russell and Sarah Wyles carried out the examination of the molluscs and Dr. Chris Stevens conducted the investigation of the plant remains. Dr Chris Stevens, Dr Michael Allen and Hayley Clark assisted in the formation of sampling strategies. Radiocarbon dating funded by English Heritage was conducted by the Scottish Universities Environmental Research Centre (SUERC) and the dating funded by Mineral Industry Research Organisation (MIRO) was conducted by the Rafter Radiocarbon Laboratory, Institute of Geological & Nuclear Sciences, New Zealand.

Dr Dietlind Paddenberg edited this report. The project was managed for WA by Stuart Leather.

SEABED PREHISTORY R2

FINAL REPORT

VOLUME III: ARUN ADDITIONAL GRABBING

Ref. 57422.33

Table of Contents

Figures

Tables

SEABED PREHISTORY R2

FINAL REPORT

VOLUME III: ARUN ADDITIONAL GRABBING

Ref. 57422.12

1. INTRODUCTION

1.1. PROJECT BACKGROUND

1.1.1. In 2005, Wessex Archaeology (WA) was commissioned by English Heritage (EH) to compile the final synthesis of the research project 'Seabed Prehistory – Gauging the Effects of Marine Aggregate Dredging'. The project synthesis was funded through Round 2 of the Aggregate Levy Sustainability Fund (ALSF) distributed by the Department for Environment, Food and Rural Affairs (DEFRA) (see **Volume I**).

1.1.2. Round 1 of the 'Seabed Prehistory' project was undertaken between 2003 and 2004 as part of the Sustainable Land Won and Marine Dredged Aggregate Minerals Programme (SAMP), funded by Round 1 of the Aggregate Levy Sustainability Fund (ALSF) and administered by Mineral Industry Research Organisation (MIRO) on behalf of the former Office of the Deputy Prime Minister (ODPM), now Department for Communities and Local Government (DCLG).

1.1.3. The project was extended to Round 2 in order to assess the application of the Round 1 methodologies to aggregate dredging zones with different geoarchaeological characteristics. Round 2 comprised different components, each component funded through either EH or MIRO, under the ALSF funding for Round 2. Each component was an independent stand alone project, resulting in the eight volumes of this report. **Table III.1** provides an overview of all volumes of 'Seabed Prehistory: Gauging the Effects of Marine Aggregate Dredging - Final Report', **Volumes I-VIII** (Wessex Archaeology 2007).

Volume	Title
I	Introduction
II	Arun
III	**Arun Additional Grabbing**
IV	Great Yarmouth
V	Eastern English Channel
VI	Humber
VII	Happisburgh and Pakefield Exposures
VIII	Results and Conclusions

Table III.1: Overview of the volume structure of this report.

1.1.4. This report is **Volume III** in the series and sets out the Round 2 investigations into the Arun area. It is an updated version of a previous 'Seabed Prehistory' project report for EH (Wessex Archaeology 2006).

1.1.5. The Arun Additional Grabbing project's intention was to further investigate the relationship between struck flint and palaeogeographic features in the Palaeo-Arun area recovered in the 'Seabed Prehistory' Round 1 project (**Volume II**). In order to achieve this, a grab sampling survey took place between 26th March and 9th June 2005 adjacent to the Owers Bank licensed dredging area *c.* 18km offshore Littlehampton, West Sussex, in the English Channel. The grab samples were processed during August 2005.

1.1.6. The results of the grab sampling in the Round 1 'Seabed Prehistory' project demonstrated for the first time the presence of possibly anthropogenic prehistoric material (humanly struck flint) adjacent to an aggregate dredging area in the Palaeo-Arun region, and the ability of archaeologists to recover such material by systematic investigation.

1.1.7. The condition of the struck flint recovered in Round 1 was such that it was difficult to ascribe it to a specific period. The flints were rolled and had been subject to erosive processes within the surface layer of seabed. While a large number of flints were struck (119), their condition was such that only a few (3) could be ascribed an anthropogenic origin with a certain probability.

1.1.8. The grab sampling survey from the Round 1 'Seabed Prehistory' project was extended to a further four 1km x 1km squares (C, E, F and H), within an overall area measuring 2km x 4km, inclusive of the area (labelled G) sampled in Round 1 (**Figure III.1**). The same sampling cell size of 100 metres applied in Round 1 was applied in Round 2. The choice of sampling areas was intended to produce results that could be assessed with respect to three hypotheses, which are discussed below:

1.1.9. *All struck flint is associated with the palaeovalley feature*. The distribution of humanly struck flint is therefore the result of Devensian fluvial transport (but with some patterning possible). If this is the case we would have expected to see further evidence of humanly struck flint along the course of the palaeovalley feature in Area C and in Area H, which were thought to comprise overtopped gravels. We would have expected to find limited evidence in Area F located to the west of the palaeochannel on the plateau of a ridge that forms the edge of the palaeovalley, and none in Area E (**Figure III.1**).

1.1.10. *All struck flint is associated with broader palaeogeographic landforms*. If there was a strong association with the surrounding landforms the flints would not have been deposited as a result of Devensian fluvial action or redistributed through transgressive or marine action, but deposited *in situ.* There might have been some local redistribution of artefacts but broadly the flints would be in the area of original deposition and have undergone limited modification from fluvial marine processes. We would therefore have expected to recover material from Area F, C and E with limited recovery from Area H. The palaeovalley feature contains environmental evidence of Mesolithic land surfaces and the inference was that the flint may have been deposited in the post-glacial period.

1.1.11. *All struck flint is widely distributed throughout the area, with no discernible relationship to underlying palaeogeographic features.* The material a) is widely

dispersed because of transgressional and marine processes or b) is much older 'background noise'. In this case the humanly struck flint would have been evenly distributed throughout all the areas. Through repeated glacial cycles material would have been distributed and reworked over a wide area throughout the different river catchments. The inference, therefore, was that the material is Palaeolithic in origin, or is so re-worked as to be undatable by context.

2. METHODOLOGY

2.1. INTRODUCTION

2.1.1. The methodological objectives of the study were:

- To collect material of archaeological significance by grab sampling and processing;
- to spatially interpret the data in conjunction with the geophysical and geotechnical data obtained from the Round 1 surveys;
- to comment on the significance and spatial patterning of recovered archaeological material.

2.1.2. All positions are provided in British National Grid (BNG) projection (Ordnance Survey Great Britain (OSGB 36 datum)), and all vertical datums are given in Ordnance Datum (OD) Newlyn.

2.2. STUDY AREA AND GRAB SAMPLING LOCATIONS

2.2.1. The study area was 18km offshore south of Littlehampton, West Sussex and consisted of four 1km^2 study areas adjacent to Area G, which was subjected to grab sampling in Round 1 (**Volume II, Figure II.16**). The coordinates (in British National Grid) of the four study areas C, E, F and H are given in **Table III.2** and **Figure III.1**.

Area	Eastings	Northings
H	512964	86077
H	513733	85439
H	513095	84669
H	512325	85308
C	511556	85946
C	512325	85308
C	511687	84538
C	510917	85176
F	511687	84538
F	512457	83900
F	511818	83130
F	511048	83768
E	511048	83768
E	511818	83130
E	511180	82360
E	510410	82999

Table III.2: Coordinates of the study areas (British National Grid projection).

2.2.2. Each 1km^2 area was divided into a grid of 100x100m, with the centre of each block comprising the designated sample position. For each sample location a number between 1and 100 was assigned, this was prefixed by the area letter to create a code for each sample (e.g. H34). The coordinates for each sampling location are given in **Appendix I** and **Appendix II.**

2.3. TECHNICAL SPECIFICATIONS AND DATUM

2.3.1. The grab sampling survey was conducted between 26th March and 9th June 2005 aboard the vessel *Valkyrie* with a crew of eight and working out of the vessels home port of Shoreham-by-Sea, West Sussex. Titan Environmental Surveys Ltd. were contracted to carry out the survey under the supervision of WA staff.

2.3.2. A Trimble Ag132GB was utilised as the navigation system during the survey. The GPS and differential antennae were integrated into the same housing, which were linked to the receiver. The Ag132GB can be configured to receive differential corrections from a specific frequency within the HF band or satellite based corrections via the SeaStar Spot Beam system. The system was configured to use corrections, in the HF band, received from the IALA base station located at St. Catherines on the Isle of Wight. Coordinate output in WGS84 datum were converted to the OSGB36 datum using the OSTN97 transformation.

2.3.3. The integrated navigation and data acquisition system was based on Trimble's HYDRO*pro* software running on a laptop computer. Interfaced to this system was the Trimble positioning system. Real time navigation and survey data were displayed on a surveyor's/helmsman's VDU.

2.4. GRAB SAMPLE RETRIEVAL AND ONBOARD PROCESSING

2.4.1. Grab samples were collected using a heavily weighted Hamon grab capable of sampling an area of 0.1m^2 to a depth of 0.15m. Grab deployment and recovery were achieved by using an A-frame and winch onboard the vessel *Valkyrie*.

2.4.2. At each sampling site the survey vessel was manoeuvred onto station with the aid of the navigation system, which included a helmsman's monitor displaying the target site, and a single grab sample of approximately ten litres taken within a ten metre radius of the planned position.

2.4.3. On recovery, each grab sample was inspected and if the amount of sediment in the grab was less than approximately eight litres, or if there was evidence that significant 'wash out' had occurred during sample recovery, a further sample was taken. Where the grab failed to obtain a sample the sites were re-sampled. Up to three attempts were made to recover a valid sample at anyone location.

2.4.4. The samples were wet sieved onboard the vessel using a 1mm stainless steel sieve and seawater. Material less than 1mm diameter was discarded in conjunction with standard artefactual sieving procedures. The sieved and washed residue from each sample was transferred to a labelled plastic storage container along with the sample identification tag. The grab and sieving equipment were washed prior to re-sampling.

For each sample collected or attempted, a record of the site number, date, time, water depth and coordinates was taken together with relevant comments and observations.

2.4.5. This sampling strategy was revised for samples which unexpectedly contained blocks (and large quantities) of fine-grained sediments including peat, silt and clay. These samples were transferred to the sample bucket with minimal or no onboard wet sieving.

2.4.6. It was noted during the grab sampling survey that the Hamon grab was having difficulty recovering sediment from the southern corner of area E. The only site not to produce a sample after three successive attempts was E11. The jaws of the Hamon grab were bent on more than one occasion in this area and had to be repaired. Sediment was recovered in sufficient quantities at most sample sites in this area after repeated grabs. This area was considered to have possibly been exposed bedrock.

2.5. ARTEFACT PROCESSING

2.5.1. Each sample was transferred to the environmental department at WA and wet sieved through a nest of sieves in accordance with standard artefactual recovery procedures. The mesh sizes used were 10mm, 4mm and 1mm. The less than 1mm residues (of those samples not already washed onboard).

2.5.2. The greater than 10mm and 4-10mm residues were scanned for archaeological material. Archaeological finds including flint, bone, slag, clinker, glass, burnt stone and ceramic building material (CBM) were retained for further analysis.

2.6. ENVIRONMENTAL PROCESSING

2.6.1. The sample processing strategy was reconsidered for those samples containing large amounts or blocks of sediment (peat) that appeared to show intact sedimentary architecture. Samples containing peat and fine-grained sediments (containing environmental material) were processed in the above manner and subsamples were taken for environmental analysis. The subsamples were also scanned for archaeological material before storage. Those samples chosen for subsampling are detailed in **Table III.3**.

Grab sample	p/d, f/o, rc subsamples	Flotation subsamples	Mollusc subsamples	Wood	Charcoal
C31				X	
C46	X				
C51	X				
C52	X				
C53	X				
C68	X	X	X		
C76	X			X	
C77	X				
C87	X				
F23	X				
F38	X	X	X		
F80			X		
F94	X				
H2	X	X			

Grab sample	p/d, f/o, rc subsamples	Flotation subsamples	Mollusc subsamples	Wood	Charcoal
H5	X				
H45				X	
H54	X				X
H60				X	

Table III.3: Environmental sub-sampling strategy.

2.6.2. Pollen and diatom (p/d) samples were taken from the centre of uncontaminated blocks of peat. Sample sizes of approximately 4cm^3 were taken, labelled and kept in cold storage.

2.6.3. Foraminifera/ostracod (f/o) samples were taken from the centre of uncontaminated blocks of peat. The sample size was usually in the region of 10cm^3.

2.6.4. Radiocarbon (rc) samples were taken from the centre of uncontaminated blocks of peat. The peats contained preserved stems and rhizomes of reeds (*Phragmites* sp.). Where possible stem remnants were taken and stored in cold storage for radiocarbon submission.

2.6.5. Two litre mollusc samples were taken from three grab samples (C68, F38 and F80). In each case the sediment was wet sieved through a nest of sieves of the sizes 10mm, 4mm, 1mm, 500µm and 250µm. After scanning the residues for archaeological material they were dried and kept for further analysis.

2.6.6. One litre subsamples from three grab samples (C68, F38 and H2) were processed by flotation for the retrieval of plant macrofossils and invertebrate remains. The samples were soaked in hot water for 24 hours to disaggregate the sediment. The samples were then sieved to 500µm using standard flotation practices. The residue was scanned for archaeological material and then stored in Industrial Methylated Spirit (IMS) for future analysis.

2.6.7. Wood and charcoal retrieved from the samples were kept for further analysis (**Appendix III**).

3. RESULTS

3.1. INTRODUCTION

3.1.1. Wet sieving produced a range of finds including struck flint, animal bone, molluscs (freshwater and terrestrial), wood, fossilised vertebrates, plant material, slag, clinker, glass and coal.

3.2. FLINT

3.2.1. A total of 668 struck flints were identified in 228 of the samples. These flints were mostly recovered from the 4-10mm residue and generally weighed less than 1gram. The flints displayed fracturing that has been assigned levels of potential anthropogenesis concurrent with the analysis of struck flint from the Round 1 survey (**Volume II**). Those criteria for determining potential anthropogenesis of struck flint are outlined in **Table III.4** and in **Appendix IV.**

Level	Criteria
Highly Probable	Recognisable tool or debitage type Obvious platform & bulb, preparation, regular anthropogenic dorsal scars
Probable	Obvious platform & bulb, irregular dorsal scars
Possible	Obvious bulb, irregular/no dorsal scars
Improbable	Unusually placed bulb, no dorsal scars

Table III.4: Criteria for determining potential anthropogenesis of struck flint.

3.2.2. The total numbers and the levels of potential anthropogenesis of struck flint from the Round 1 (G) and Round 2 (C, E, F and H) grab sampling areas are provided in **Table III.5.**

Potential for an anthropogenic origin	Round 2 areas				Round 1 area
	C	E	F	H	G
Highly Probable	4	3	0	5	3
Probable	4	2	3	1	4
Possible	10	1	4	4	18
Improbable	208	113	135	171	94

Table III.5: Numbers and levels of potential anthropogenesis of struck flint.

3.2.3. Spatial analysis of the occurrence of highly probable, probable and possible struck flint with reference to the underlying palaeogeographic features is shown in **Figure III.2.** Examples of highly probable, probable, possible and improbable struck flint are shown in **Figure III.3**.

3.2.4. Highly probable struck flint is most abundant in area H (5 pieces) and least abundant in area F (0 pieces). Probable struck flint is most abundant in areas C and G (4 pieces) and least abundant in area E (2 pieces). Possible struck flint is most abundant in area G (18 pieces) and least abundant in area E (1 piece). Improbable struck flint is most abundant in area C (208 pieces) and least abundant in area G (94 pieces).

3.3. SEDIMENTS

3.3.1. Most of the samples were dominated by high proportions of gravel and sand. The gravel was usually rounded to sub-rounded flint with a brown patina and cortex. The largest unstruck flint recovered was 180mm in diameter. Crustaceans, molluscs, bryozoans and annelids were noted adhering to some of the flint. The sand ranged in particle size and had a high shell content. Peat, silt and clay were also present in some of the samples. Those samples containing peat are described below. Samples containing large amounts of (grey) silt and clay were C14, C67, C68, C74, C88 and H47. The silt and clay did not display any sedimentary structure.

3.3.2. Erratics were present in varying quantities. Igneous rocks including granite were present in samples C30, C73, E28, F63, H58, H72, H82 and H88. They were usually sub-angular and ranged in size from 30 to 60mm diameter. No igneous rocks were recovered from Area F. Metamorphic rocks including quartz and shale were recovered from samples C10, E60, E75, E100, H17, H30, H31, H48, H86 and H95. Sedimentary rocks were recovered from Areas E, F and H. The southern corner of Area E produced high quantities of freshly broken yellow sandstone of up to 200mm diameter. Rounded sandstone was recovered from samples E41, F27, F75, H11, H30,

H40, H60, H71 and H98. Other sedimentary rocks recovered include silty sandstone (H12), limestone (H30), silt/mudstone (H100, H65, H79 and H98) and chert (H62). No erratic sedimentary rocks were recovered from Area C and relatively few from Area F.

3.3.3. Peat was recovered from 38 samples in varying quantities. It was mostly recovered as lumps, some quite large, up to 370mm in diameter and up to 120mm thick. Samples C46, C51, C52, C76, C77, C87, F23, F38, F65, F94, H2, H5 and H54 contained a high proportion of peat (more than 70%). Samples C14, C43, C74, C88, F25, F43, F49, F57, F67, F77, F85 and F98 contained very small amounts of probably reworked peat (1% or less). No peat was recovered in any of the samples in Area E. Burrows of the boring mollusc *Pholas dactylus* were common in the lumps of peat. The spatial distribution of peat recovered in the samples can be seen in **Figure III.2.** The peat contained well preserved plant matter including stems and rhizomes of reeds (*Phragmites* sp.).

3.4. MODERN FINDS

3.4.1. Modern finds were numerous in the samples and included slag, clinker, coal, glass, burnt stone and ceramic building material (CBM) the total amounts of which are given in **Table III.6**.

Modern finds	Area				Totals
	C	E	F	H	
Slag	259	46	287	363	955
Clinker	6	2	72	13	93
Coal	6	2	13	12	33
Glass	1	2	1	0	4
Burnt stone	2	2	2	2	8
CBM	1	0	0	0	1

Table III.6: Numbers and type of modern finds.

3.4.2. A total of 955 pieces and fragments of slag (vitrified ferrous material) were recovered from the samples weighing 3216 grams. Numerically, slag was most abundant in Area F (1061g/287 pieces) although by weight slag was most abundant in Area C (1107g/259 pieces). Slag was least abundant numerically and by weight in Area E (419g/46 pieces).

3.4.3. A total of 93 pieces and fragments of clinker (vitrified organic material) were recovered from the samples, weighing 402 grams. Clinker was most abundant in Area F (72 pieces) and least abundant in Area E (2 pieces).

3.4.4. A total of 33 pieces of coal were recovered from the samples. These were generally small in size and recovered from the 4-10mm residues. Coal was most abundant in Area F (13 pieces) and least abundant in Area E (2 pieces).

3.4.5. A total of four fragments of glass were recovered from samples C89, E23, E89 and F42. The glass appears to be modern and is probably bottle glass.

3.4.6. A total of 8 pieces of burnt stone (slate) were recovered from the samples. The burnt stone ranged from 50 to 120mm in diameter and was *c.* 5mm thick. Burnt stone was equally abundant in the separate areas.

3.4.7. One small worn fragment of orange/red fired clay with sand inclusions was recovered from sample C86. It is possibly a worn fragment of brick/tile (CBM).

3.5. FOSSILS

3.5.1. Fossil fish teeth and bone (derived from Tertiary sedimentary rocks) were abundant. A total of 241 teeth were recovered ranging in size from 3 to 20mm. These were most abundant in Area C (100 pieces) and least abundant in Area H (32 pieces). Other fossil material recovered totalled 195 pieces and mostly comprised of vertebra, ribs and small unidentifiable bones. The total amounts of fossils by area are given in **Table III.7**.

Fossil material	Area				Totals
	C	E	F	H	
Fish teeth	100	40	69	32	241
Other	54	54	35	52	195

Table III.7: Numbers and type of fossil material.

3.6. ENVIRONMENTAL REMAINS

3.6.1. Definition of environmental remains follows English Heritage guidelines (EH 2002). Plant material (reeds, wood and hazelnut) and animal remains (molluscs, beetles and animal bones) none of which were fossilised were recovered in varying quantities. The total amount of environmental remains recovered is given in **Table III.8**; a comprehensive list is provided in **Appendix II.**

Environmental remains	Area				Totals
	C	E	F	H	
Bone	1	0	3	0	4
Charcoal	0	0	0	1	1
Plant material	Y	N	Y	Y	Y
Beetles	1	0	2	0	3
Freshwater molluscs	21	0	11	22	54
Terrestrial molluscs	0	0	2	0	2

Table III.8: Numbers and type of environmental remains.

3.6.2. A total of four animal bones were recovered from samples C31, F44, F49 and F75. Seabird bones were recovered from samples F49 (tibio-tarsus) and F44 (vertebra). Part of the rib of a medium mammal was recovered from sample F75. An amphibian (frog or toad) pelvis was recovered from sample C31.

3.6.3. Charcoal was recovered from peat in sample H54 (**Figure III.2**, **Appendix III**). The charcoal was approximately 10mm in diameter and in good condition.

3.6.4. Hazelnuts (*Corylus* sp.) were recovered from samples F94 and H60. Wood, twigs and roots were recovered from samples C76, H45 and H60 (**Appendix III**).

3.6.5. Reed stems and rhizomes (*Phragmites* sp.) were recovered from all of the samples which contained peat. These reeds were also present in samples which contained high proportions of silt and clay (C67, C68) and also in samples C47, C75, C89, F64 and H61 which comprised gravel and sand.

3.6.6. Coleopteran (beetle) wing cases were recovered from samples C51, F31 and F46. The beetles were recovered from lumps of peat except in sample F46 (a mixed sediment) where the wing cases were recovered from an unconsolidated lump of clayey silt.

3.6.7. Marine molluscs were abundant in all of the samples except H29 and H50 which contained no shell. H100 contained a significantly large number of a boring mollusc (*Turritella* sp.). Oysters (*Ostrea edulis*) were very occasionally present. Freshwater molluscs (*Limnaea* sp.) were recovered from 20 samples and were most abundant in sample C31 which also contained planorbids (**Appendix II**). Two terrestrial molluscs (*Cepea nemoralis*) were recovered from sample F68.

3.7. DATING

3.7.1. Two samples were submitted for radiocarbon dating (^{14}C). One reed stem (*Phragmites* sp.) from sample H54 (SUERC-12007) gave a result of 8815±40 BP (8200-7740 cal. BC). The charcoal recovered from peat in sample H54 (NZA-26303) gave a result of 8893±30 BP (8230-7960 cal. BC) (**Figure III.2**, **Appendix V**).

4. DISCUSSION AND CONCLUSIONS

4.1. INTRODUCTION

4.1.1. The finds from the grab sampling have provided possible evidence of human occupation of the palaeo-Arun area. The charcoal recovered from a lump of peat is unlikely to have been produced by natural causes (**Appendix III**). Flint recovered from the Round 1 (**Volume II**) and Round 2 grab sampling surveys is also arguably of anthropogenic origin although in many cases it is difficult to distinguish from flint produced by mechanical or natural processes.

4.1.2. Spatial distribution of flint and other finds was noted to be less abundant in the southern part of area E. This is accounted for by many of the samples in this area containing large lumps of sandstone (bedrock?) with low quantities of other sediment (**Figure III.2**).

4.2. METHOD

4.2.1. The results have demonstrated that it is possible to recover prehistoric archaeological material utilising a Hamon grab. The method used in benthic surveys during the production of an environmental statement involves wet sieving through a 1mm mesh and retrieval of living benthic fauna. The non-living fraction is not normally kept and this can be used for archaeological analysis.

4.2.2. Finds were retrieved during onboard processing including struck flint, fossils, slag, clinker, glass and burnt stone. It is considered that the presence of an archaeologist

during the planning stages and onboard during sampling can be advantageous so that sampling strategies can be modified dependent upon sediments and/or artefact types that are retrieved. This would especially apply to organic artefacts (bone, wood, leather etc.) which can be preserved in waterlogged conditions but often need immediate attention to prevent rapid disintegration.

4.2.3. Retrieval of artefacts from the seabed by grab sampling is comparable to that of test pitting used in terrestrial archaeology. At Rock Common, West Sussex (Harding 2000) a series of test pits recovered 52,595 worked flints from a known Mesolithic site. The volume of these pits is equivalent to approximately 9,500 grab samples. In the Round 1 and Round 2 grab sample survey 507 grab samples recovered 41 flints regarded as possible, probable and highly probable struck flint. The comparison of finds distribution on the seabed and in the tillage zone is given in **Volume II**; continuative discussion of the subject is included in **Volume VIII**.

4.3. FLINT

4.3.1. The methodology of flint analysis from Round 1 (**Volume II**) has been applied to the Round 2 assemblage for comparative purposes (**Appendix IV**). The possibility that the struck flint is generated by mechanical fracture is supported by the absence of larger material such as tools, cores and diagnostic debitage. These types of flint artefacts are more commonly found (re-deposited) within gravel deposits. The assemblage as a whole is dominated by primary chips and flakes with linear and crushed platforms symptomatic of mechanical fracture. Comparison is possible to the Mesolithic site at Rock Common, West Sussex (Harding 2000), due to its geographical proximity and the publication of data relating to the sampling and recovery of flint chips and tools. At this site 19% of the assemblage is comprised of recognisable tools or cores, thus highlighting the lack of diagnostic elements within the grab sample assemblage, where only 0.2% comprises possible recognisable tool types.

4.3.2. Interpretation of the spatial distribution (**Figure III.2**) of highly probable, probable and possible struck flint (presence/absence of flint recovered rather than abundance) must take into account the difficulty in ascribing an anthropogenic origin or date to the flint assemblage. Highly probable and probable struck flint appears to correlate with the wider valley edges of the Palaeo-Arun. Of particular note is the highly probable and probable struck flint recovered in the vicinity of the charcoal (**Figure III.2**).

4.3.3. This distribution would appear to correlate with the hypothesis set out in **Section 1.1** '*All struck flint is associated with broader palaeogeographic landforms'.* The inference being that the material may have been deposited during the post-glacial period. The large sample spacing (100 metres) however precludes identification of small concentrations of struck flint.

4.4. SEDIMENTS

4.4.1. Some samples - particularly in the southern corner of Area E - produced freshly broken yellow sandstone. Recovery of samples was difficult in this area. It was considered likely that this area probably consisted of an exposed area of sandstone

bedrock or 'rocky ground' with occasional patches of sand and gravel. These results correlate well with the known underlying geology of the area (**Figure III.2**).

4.4.2. Where samples were recovered containing high proportions of peat it was considered likely that these sediments were exposed on the seabed. However, the possibility that these samples represented a collection of parts of large deposits of reworked or rafted peat cannot be ruled out. The samples containing peat were retrieved from within the Palaeo-Arun valley (**Figure III.2**) where early Mesolithic peat deposits have been identified by geophysical and geotechnical survey (**Volume II**). The spatial distribution (**Figure III.2**) of the grab samples containing peat matches those peat deposits identified by geotechnical and geophysical survey (both within the wider valley landform). An example of peat recovered by grab sampling is shown in **Figure III.3**.

4.4.3. In some of the vibrocores taken in the Round 1 study (**Volume II**) the top 0.15 metres recovered showed up to three different deposits. These deposits, if not consolidated (e.g. peat), would be mixed by the retrieval method used in this survey. The retrieval of sediment and finds from such a mixed sample precludes informative stratigraphic conclusions to be drawn about the deposits and therefore the integrity of finds retrieved from them. In some cases where lumps of peat were retrieved, it was possible to generate a basic stratigraphy and the way up of the sediment could be determined by the position of the intrusive boring mollusc *Pholas dactylus* within the sediment. The sediments could also be separated, thus any finds could be attributed to a dateable and (roughly) stratified deposit.

4.4.4. The gravels are thought to constitute a lag deposit formed as a transgressive beach during rising sea levels (Hamblin *et al.* 1992), probably during the Mesolithic period. Later winnowing has probably removed some of the finer sediments and encrusting by serpulids, bryozoans and crustaceans points towards a sediment that is not presently mobile (Hamblin *et al.* 1992). The erratic igneous and metamorphic rocks probably have a westerly origin and are most likely remnants of ice-rafted debris. Sedimentary rocks encountered may have a more local origin. The predominantly brown colour and patina of the flint suggests that these have been reworked from Tertiary beds rather than directly from Cretaceous strata.

4.5. MODERN FINDS

4.5.1. Modern materials recovered such as slag, clinker, coal, fired clay (CBM) and glass are most likely to have been results of shipping activities. Similar amounts and distribution of modern materials were recovered from the Round 1 grabbing survey (**Volume II**). The coal is possibly reworked by natural processes; however it is more likely to represent modern waste material discarded with the slag and clinker that was recovered. No concentrations indicative of dumps of modern material were observed.

4.6. FOSSILS

4.6.1. The large numbers of fossil fish teeth, vertebra and ribs are probably derived from the (Eocene) Barton Beds. Sharks teeth are common in the Lower Barton Bed or

Highcliff Member (Melville and Freshney 1982). The fossil material is evenly distributed across the areas.

4.7. ENVIRONMENTAL REMAINS

4.7.1. Freshwater and terrestrial environments are attested to by the large numbers of environmental indicators which were found within the samples. Freshwater and terrestrial molluscs were observed. These molluscs were mostly found in marine gravel and sand deposits and are therefore probably derived.

4.7.2. Bone was rare and the two seabird bones recovered are considered most likely although not necessarily to have a modern origin. The amphibian (frog or toad) pelvis fragment is highly likely to have originally been deposited in a terrestrial or freshwater context. The medium mammal rib fragment is also likely to have been reworked from a non-marine context. The possibility that these bones have a more modern provenance cannot be ruled out. The lack of bone relating to marine fish and mammals was noted and considered to be a result of either bottom detritus feeders or a depositional environment not conducive to the preservation of bone. A low abundance of bone was also found in the Round 1 grabbing survey.

4.7.3. The large amount of peat recovered (and the grey silts and clays) appear to show that deposits relating to the palaeo-Arun are being exposed and reworked. Wood, roots, beetles, reeds and twigs were observed within lumps of these sediments but also in the gravel and sand deposits where they are almost certainly reworked rather than *in situ*. The palaeoenvironmental analysis of samples retrieved from vibrocores in the area (**Volume II**) confirms that terrestrial environments existed in this area since the last glaciation and up until the early Mesolithic period.

4.7.4. Charcoal recovered from within a block of peat is considered to be a possible indication of human occupation of the area (**Figure III.2**). The possibility of its formation by natural causes (lightning/ forest fire) is noted but considered unlikely, 'since the only likely mechanism for the wood of a mature deciduous tree to be fully charred in this wetland landscape is deliberate anthropogenic burning e.g. for use as fuel in hearths' (C. Chisham, see **Appendix III**). The fact that the charcoal is unabraded would refute any suggestion of significant reworking.

4.8. DATING

4.8.1. The oak (*Quercus* sp.) heartwood charcoal dated to 8,893±30 BP (8,230-7960 cal. BC, NZA-26303) and reed (*Phragmites* sp.) dated to 8,815±40 BP (8,200-7740 cal. BC, SUERC-12007) from peat within the same sample (H54) demonstrate that the peat deposit and charcoal are possibly contemporary. The charcoal does not date a burning event and the potential age of oak heartwood introduces an error of up to around 500 years (**Appendix III**). This error is not present in the *Phragmites* reed as it only lives for one year. This means that the peat and charcoal could be considered contemporary even if the charcoal date were up to 500 years older than the *Phragmites* reed date.

4.8.2. Comparison of these results with the Round 1 dated peats (**Figure III.2**, **Appendix V**) demonstrates that the dated peats recovered from the Round 1 vibrocores are

older than the peat recovered in sample H54. This is as expected as sample H54 is slightly elevated in comparison to the other peats. The closest peat in elevation and date is from vibrocore VC3 at 32.86m below OD, dating to 9,131±45 BP (8,530-8,260 cal. BC, NZA-19298). The fact that the peat dates are proportional to their elevation (the oldest is the deepest) suggests that peat deposition is probably very closely linked to sea level rise and time in this area.

4.8.3. The oak charcoal is therefore a possible indication of occupation of this area in the latter part of the early Mesolithic period. The deposits containing stratified material of potential archaeological interest are also probably exposed on the seabed.

5. RECOMMENDATIONS FOR FURTURE WORK

5.1. Three mollusc samples have been taken from the three major sediment types encountered: one from peat, one from grey silty clay and one from the sandy gravel. It is considered that assessment of the molluscan material could provide information about the depositional environment relating to the formation of these sediments. Three samples have been also been taken for plant macrofossils and invertebrate remains which could also inform further about the depositional environments.

6. REFERENCES

English Heritage 2002, *Environmental Archaeology. A guide to the theory and practice of methods, from sampling and recovery to post excavation*, Swindon: English Heritage Publications.

Hamblin, R.J.O., Crosby, A., Balson, P.S., Jones, S.M., Chadwick, R.A., Penn, I.E. and Arthur, M.J., 1992, *The geology of the English Channel*, London: HSMO for the British Geological Survey.

Harding, P., 2000, 'A Mesolithic site at Rock Common, Washington, West Sussex', *Sussex Archaeological Collections* 138:29-48.

Melville, R. V. and Freshney, E. C., 1982, *The Hampshire Basin and adjoining areas*, London: HMSO.

Wessex Archaeology 2006, 'Seabed Prehistory: Round 2 Grab Sampling Survey', Unpublished report ref. 57421.06.

Wessex Archaeology 2007, 'Seabed Prehistory: Gauging the Effects of Marine Aggregate Dredging. Final Report, Volumes I-VIII', Unpublished report ref. 57422.10-17.

APPENDIX I: MODERN FINDS

Grab sample	Coordinates (British National Grid)		Seabed depth (m b OD)	Modern finds					
	Eastings	Northings		Slag	Clinker	Coal	Burnt stone	CBM	Glass
C1	510990	85185	30.2	4					
C2	511070	85122	31.5	4	1				
C3	511138	85054	32.5	1					
C4	511216	84996	34.1						
C5	511295	84926	35.8	6					
C6	511376	84866	36.9	1	1				
C7	511436	84809	36.9	7					
C8	511522	84723	36.9	1					
C9	511594	84674	38.6	4					
C10	511683	84607	35.8						
C11	511753	84688	35.5	1					
C12	511665	84745	37.2						
C13	511596	84807	36.9						
C14	511514	84879	36.2						
C15	511442	84941	36.2						
C16	511359	85014	35.1						
C17	511287	85074	33.8	4					
C18	511203	85135	33.1	1					
C19	511128	85196	31.9						
C20	511048	85266	30.6	2					
C21	511114	85334	30.7	1					
C22	511189	85269	31.9	24					
C23	511270	85210	33.1	1					
C24	511343	85152	33.4	1					
C25	511419	85074	35.1	4					
C26	511502	85017	35.8	1					
C27	511586	84953	35.8	3					
C28	511655	84896	35.5	1					
C29	511724	84829	36.2	1					
C30	511787	84767	36.2						
C31	511857	84843	36.2	12		2			
C32	511788	84914	36.2						
C33	511717	84962	35.8						
C34	511640	85030	36.5	10					
C35	511562	85099	36.2						
C36	511486	85163	34.8	1					
C37	511406	85218	34.0						
C38	511329	85290	33.4	15	1				
C39	511255	85345	32.7						
C40	511178	85408	30.9	1					
C41	511240	85489	31.5	1					
C42	511322	85424	32.5						
C43	511396	85360	33.1	6					
C44	511469	85303	34.4	3		1			
C45	511550	85234	35.5	2					
C46	511623	85176	35.8						
C47	511702	85113	36.9						
C48	511779	85038	35.8	4			1		
C49	511857	84978	35.8	1					

Grab sample	Coordinates (British National Grid)		Seabed depth (m b OD)	Modern finds					
	Eastings	Northings		Slag	Clinker	Coal	Burnt stone	CBM	Glass
C50	511938	84923	36.2	3					
C51	512001	84986	36.2	3					
C52	511919	85057	35.5						
C53	511845	85118	35.5	1					
C54	511779	85183	36.5	3					
C55	511685	85254	36.9	6					
C56	511613	85311	35.8						
C57	511531	85382	34.8	6		1			
C58	511458	85437	33.4	2					
C59	511377	85504	32.1	2					
C60	511307	85569	31.1	1					
C61	511369	85644	30.8						
C62	511445	85583	31.9	2					
C63	511523	85516	33.8						
C64	511600	85452	34.7						
C65	511674	85382	36.2	8	1				
C66	511750	85332	36.9						
C67	511828	85255	36.5						
C68	511904	85199	35.8						
C69	511985	85135	36.2	4					
C70	512065	85070	36.9	5					
C71	512121	85138	37.2	2					
C72	512052	85209	36.2	8					
C73	511984	85276	35.5	20	1				
C74	511895	85343	36.9	2					
C75	511819	85403	35.8						
C76	511738	85472	34.2						
C77	511660	85540	33.4						
C78	511585	85604	32.9	5					
C79	511508	85654	31.3	1					
C80	511433	85721	29.4						
C81	511492	85796	32.6						
C82	511574	85739	28.6						
C83	511651	85670	31.1			2			
C84	511728	85604	32.7	6					
C85	511797	85554	33.5						
C86	511871	85470	35.1	1				1	
C87	511954	85420	35.1						
C88	512033	85361	34.6	1					
C89	512111	85298	35.1	15					1
C90	512191	85219	37.2	1			1		
C91	512250	85295	36.5						
C92	512173	85360	34.8						
C93	512090	85437	34.0	2					
C94	512029	85491	35.5	2	1				
C95	511942	85559	35.1						
C96	511868	85623	33.7	6					
C97	511789	85687	32.4	10					
C98	511713	85745	30.7						
C99	511642	85814	32.6	2					
C100	511556	85879	33.4						
E1	510480	83002	24.4						

Grab sample	Coordinates (British National Grid)		Seabed depth (m b OD)	Modern finds					
	Eastings	Northings		Slag	Clinker	Coal	Burnt stone	CBM	Glass
E2	510553	82944	25.2						
E3	510633	82878	25.5						
E4	510716	82812	26.5						
E5	510792	82747	27.8						
E6	510863	82685	26.3						
E7	510947	82627	26.6						
E8	511017	82564	27.2	1					
E9	511096	82501	26.6						
E10	511175	82436	26.9	1					
E11	n/a	n/a	n/a						
E12	511159	82576	26.9						
E13	511084	82643	26.1						
E14	511007	82699	26.1						
E15	510929	82770	26.6						
E16	510849	82827	26.7						
E17	510780	82894	25.3						
E18	510697	82950	25.2						
E19	510621	83016	25.1	1					
E20	510544	83086	27.7						
E21	510605	83157	27.8						
E22	510685	83101	27.8	5					
E23	510760	83030	25.5						1
E24	510840	82968	25.7						
E25	510916	82904	25.8						
E26	510996	82837	26.9						
E27	511070	82768	26.3						
E28	511153	82708	26.9	1					
E29	511218	82647	26.1						
E30	511303	82582	24.4						
E31	511369	82649	24.4						
E32	511293	82722	24.2	1					
E33	511217	82797	25.9	1					
E34	511139	82855	27.0	1					
E35	511054	82909	26.0						
E36	510981	82981	25.5						
E37	510899	83042	25.2						
E38	510830	83105	28.5	2					
E39	510743	83174	28.5	3					
E40	510670	83236	30.0						
E41	510731	83315	29.4						
E42	510819	83252	29.8						
E43	510888	83181	28.5						
E44	510962	83122	28.5						
E45	511038	83062	26.4						
E46	511128	82990	26.4	3	2				
E47	511193	82935	24.8						
E48	511281	82865	24.1						
E49	511357	82800	24.2						
E50	511431	82738	24.5						
E51	511502	82816	24.8						
E52	511418	82869	23.8						
E53	511341	82938	23.3						

Grab sample	Coordinates (British National Grid)		Seabed depth (m b OD)	Modern finds					
	Eastings	Northings		Slag	Clinker	Coal	Burnt stone	CBM	Glass
E54	511263	83012	24.2						
E55	511186	83071	25.6						
E56	511111	83136	27.8						
E57	511028	83201	29.0	4					
E58	510958	83256	30.4						
E59	510876	83329	29.9						
E60	510802	83391	25.1						
E61	510862	83465	26.7	1					
E62	510942	83407	25.7	3					
E63	511010	83339	30.4						
E64	511092	83269	30.9						
E65	511171	83210	27.2						
E66	511246	83150	25.3						
E67	511320	83083	24.4						
E68	511403	83013	24.2						
E69	511481	82957	23.2						
E70	511557	82890	23.6						
E71	511622	82966	24.2						
E72	511537	83040	24.0						
E73	511464	83096	24.7						
E74	511382	83165	24.8						
E75	511310	83219	29.1	2					
E76	511240	83292	30.4						
E77	511148	83347	30.9						
E78	511079	83420	27.0						
E79	511005	83476	27.6						
E80	510924	83543	29.5	2					
E81	510988	83626	31.5	1					
E82	511068	83552	30.0	5					
E83	511141	83497	28.6						
E84	511217	83432	27.8						
E85	511299	83369	31.6						
E86	511372	83298	31.8	1		2			
E87	511449	83236	31.0						
E88	511528	83168	26.4						
E89	511591	83085	24.7						1
E90	511683	83040	24.0						
E91	511754	83120	26.9						
E92	511672	83187	32.3						
E93	511587	83255	33.4	1					
E94	511521	83312	34.2						
E95	511440	83380	34.0	3			2		
E96	511360	83442	29.6						
E97	511283	83503	30.2						
E98	511212	83570	31.3	1					
E99	511133	83639	32.1	2					
E100	511054	83703	31.9						
F1	511109	83774	29.0						
F2	511197	83709	33.7	1	1				
F3	511274	83646	33.5	4	5				
F4	511352	83582	33.0	1					
F5	511427	83514	31.7	3					

Grab sample	Coordinates (British National Grid)		Seabed depth (m b OD)	Modern finds					
	Eastings	Northings		Slag	Clinker	Coal	Burnt stone	CBM	Glass
F6	511498	83449	31.3	2					
F7	511581	83392	36.2						
F8	511652	83332	35.8						
F9	511730	83270	35.5						
F10	511815	83197	34.8						
F11	511871	83265	37.6						
F12	511795	83342	37.2		2				
F13	511713	83407	37.2						
F14	511647	83471	33.1						
F15	511565	83534	33.7						
F16	511490	83594	34.6						
F17	511413	83659	35.8	9	14	1			
F18	511340	83725	36.5	1					
F19	511258	83793	35.1	4	4				
F20	511180	83859	31.3	3	1				
F21	511244	83922	33.4	12	8	1			
F22	511323	83873	33.3	1					
F23	511399	83805	37.9	4	1				
F24	511475	83732	37.9	1					
F25	511552	83676	37.9	3					
F26	511630	83608	35.8	1					
F27	511704	83543	34.8	1					
F28	511785	83486	34.4	2		1			
F29	511869	83421	39.0						
F30	511946	83349	39.0						
F31	512006	83441	38.6						
F32	511927	83499	35.1	1					
F33	511848	83560	35.1	1					
F34	511774	83625	36.2						
F35	511692	83689	39.3	2	1				
F36	511620	83754	40.4		2				
F37	511541	83812	39.7	1					
F38	511465	83871	35.5						
F39	511394	83940	35.8						
F40	511313	84012	35.5						
F41	511376	84085	36.2						
F42	511454	84016	37.2	2					1
F43	511537	83951	36.9	1	1				
F44	511595	83896	36.9	15	5	1			
F45	511683	83823	40.7	1	2	2			
F46	511759	83759	40.4	1					
F47	511838	83697	39.0	2	2				
F48	511917	83633	37.2						
F49	511987	83570	35.8	2					
F50	512064	83501	36.2	1	2				
F51	512130	83583	36.9	2	2		1		
F52	512053	83649	37.6	1					
F53	511978	83711	38.6						
F54	511897	83780	40.7		1				
F55	511819	83841	41.4	1	1				
F56	511757	83908	37.6	2					
F57	511675	83966	37.9	6	1				

Grab sample	Coordinates (British National Grid)		Seabed depth (m b OD)	Modern finds					
	Eastings	Northings		Slag	Clinker	Coal	Burnt stone	CBM	Glass
F58	511599	84032	37.6	5	2				
F59	511518	84098	37.2	1	1				
F60	511441	84158	36.9	1					
F61	511498	84242	37.6	7					
F62	511579	84170	38.3	1	1				
F63	511656	84109	38.3				1		
F64	511738	84043	38.6						
F65	511812	83974	37.6	3					
F66	511884	83920	37.6						
F67	511957	83859	41.1	17	4				
F68	512042	83787	40.0	4					
F69	512118	83725	39.3	4					
F70	512197	83656	38.3	1	1				
F71	512256	83746	39.7	1					
F72	512185	83808	39.7	4	1				
F73	512104	83863	39.7	2					
F74	512025	83932	36.2	2	1				
F75	511955	83993	36.9	8					
F76	511871	84057	37.9	6	1				
F77	511797	84123	37.9	6	1				
F78	511722	84182	38.6	1		1			
F79	511646	84256	37.9						
F80	511564	84310	38.6	6	1	1			
F81	511628	84385	36.9			1			
F82	511707	84322	37.6	10		1			
F83	511782	84257	37.6	2					
F84	511863	84197	37.2	5					
F85	511942	84129	37.2	12		1			
F86	512022	84070	37.6	29		1			
F87	512101	84009	35.8	1					
F88	512165	83951	36.2						
F89	512248	83885	41.1	5					
F90	512322	83822	41.4	2					
F91	512391	83895	42.8	9					
F92	512304	83955	37.9	5		1			
F93	512236	84020	36.9						
F94	512158	84084	36.5						
F95	512084	84146	37.9	8	2				
F96	512009	84210	37.9	7					
F97	511925	84276	37.2	1					
F98	511850	84338	35.8	3					
F99	511764	84392	34.2	1					
F100	511692	84469	30.9	12					
H1	512398	85307	35.8	17	2				
H2	512473	85255	31.5						
H3	512553	85185	31.3						
H4	512621	85134	30.7	11					
H5	512705	85065	32.3	1		1			
H6	512779	84988	36.2						
H7	512863	84934	37.9						
H8	512930	84874	37.9	5					
H9	513012	84806	37.9	12					

Grab sample	Coordinates (British National Grid)		Seabed depth (m b OD)	Modern finds					
	Eastings	Northings		Slag	Clinker	Coal	Burnt stone	CBM	Glass
H10	513084	84742	30.3	14					
H11	513144	84823	30.3	3					
H12	513069	84883	35.8						
H13	512994	84947	37.9	5					
H14	512921	85006	38.3	7					
H15	512846	85073	33.4	1					
H16	512773	85134	32.3	9		1			
H17	512694	85205	31.1	4					
H18	512613	85268	29.0	2					
H19	512537	85335	33.7						
H20	512456	85393	35.1	2					
H21	512526	85461	33.1						
H22	512594	85403	34.2	5					
H23	512677	85342	35.8	6					
H24	512757	85278	32.3	7					
H25	512829	85219	32.5	1					
H26	512905	85145	33.1	1	1				
H27	512988	85089	37.6	1		1			
H28	513065	85016	35.1	1					
H29	513136	84957	30.3						
H30	513215	84897	33.3						
H31	513276	84980	32.9						
H32	513204	85032	31.0	1					
H33	513126	85104	31.0						
H34	513053	85157	33.5	3					
H35	512974	85228	33.4	5					
H36	512896	85284	33.3	9					
H37	512810	85357	35.8	9					
H38	512748	85416	35.5	4					
H39	512659	85494	34.0	8	2	1			
H40	512590	85537	33.7	3					
H41	512657	85621	31.3	5					
H42	512727	85561	34.0	4					
H43	512807	85492	34.7						
H44	512876	85430	35.5	2					
H45	512967	85376	36.2	4					
H46	513033	85311	36.5	1					
H47	513113	85243	31.3	2					
H48	513193	85175	28.4	4		2			
H49	513263	85110	29.8						
H50	513344	85042	31.0	1					
H51	513409	85129	34.4						
H52	513334	85192	27.4	3					
H53	513254	85249	26.7	4					
H54	513175	85324	32.5	11					
H55	513098	85387	34.0						
H56	513022	85442	34.0						
H57	512945	85501	34.3	2					
H58	512871	85577	33.8	3					
H59	512789	85629	32.3	3	1				
H60	512717	85697	31.5	8		1			
H61	512787	85772	31.4	1	1				

Grab sample	Coordinates (British National Grid)		Seabed depth (m b OD)	Modern finds					
	Eastings	Northings		Slag	Clinker	Coal	Burnt stone	CBM	Glass
H62	512852	85722	32.5	5			1		
H63	512937	85645	32.5	2					
H64	513018	85585	31.1	7					
H65	513089	85519	28.0						
H66	513168	85453	28.2	2					
H67	513241	85399	26.3	3					
H68	513312	85324	27.6						
H69	513390	85257	24.4						
H70	513472	85199	25.7						
H71	513538	85273	26.4						
H72	513457	85349	29.2	5	1				
H73	513379	85412	28.6	1		1			
H74	513302	85466	26.7	4					
H75	513223	85531	26.2	1					
H76	513151	85592	26.9	3					
H77	513078	85659	27.4	2	1				
H78	512997	85723	31.9	5		1			
H79	512917	85787	31.4	9					
H80	512837	85848	31.3	3					
H81	512912	85937	30.6	16					
H82	512990	85872	30.8	7					
H83	513054	85798	29.5	19	1				
H84	513140	85742	27.1	4	1				
H85	513218	85678	27.6						
H86	513292	85605	25.5	9		3			
H87	513368	85540	27.2	6					
H88	513442	85483	28.6	6					
H89	513523	85419	29.4	1					
H90	513599	85359	29.4						
H91	513662	85437	29.9						
H92	513589	85490	29.2	4					
H93	513498	85563	28.8	6					
H94	513440	85622	26.8	2					
H95	513360	85688	26.6	1			1		
H96	513274	85748	26.7						
H97	513198	85821	28.9	3					
H98	513125	85878	28.7	5					
H99	513057	85943	30.0	6	2				
H100	512973	86012	28.4	1					

APPENDIX II: ENVIRONMENTAL REMAINS AND FOSSIL FINDS

Grab sample	Coordinates (British National Grid)		Seabed depth (m b OD)	Environmental remains						Fossils	
	Eastings	Northings		Bone	Char-coal	Plant matter	Beetles	Fresh water snails	Terrestrial snails	Teeth	Other
C1	510990	85185	30.2							2	
C2	511070	85122	31.5							3	3
C3	511138	85054	32.5							1	
C4	511216	84996	34.1							1	2
C5	511295	84926	35.8								
C6	511376	84866	36.9								
C7	511436	84809	36.9							1	1
C8	511522	84723	36.9							2	
C9	511594	84674	38.6								
C10	511683	84607	35.8								1
C11	511753	84688	35.5								1
C12	511665	84745	37.2								
C13	511596	84807	36.9							2	
C14	511514	84879	36.2								
C15	511442	84941	36.2							1	
C16	511359	85014	35.1								
C17	511287	85074	33.8							10	1
C18	511203	85135	33.1								
C19	511128	85196	31.9							3	2
C20	511048	85266	30.6							1	1
C21	511114	85334	30.7								
C22	511189	85269	31.9							1	
C23	511270	85210	33.1							1	2
C24	511343	85152	33.4							2	2
C25	511419	85074	35.1								
C26	511502	85017	35.8								1
C27	511586	84953	35.8								
C28	511655	84896	35.5								1
C29	511724	84829	36.2								
C30	511787	84767	36.2								
C31	511857	84843	36.2	1				>22		2	1
C32	511788	84914	36.2							2	
C33	511717	84962	35.8							1	2
C34	511640	85030	36.5							1	
C35	511562	85099	36.2								
C36	511486	85163	34.8							2	1
C37	511406	85218	34.0								1
C38	511329	85290	33.4								1
C39	511255	85345	32.7							4	2
C40	511178	85408	30.9								1
C41	511240	85489	31.5							1	1
C42	511322	85424	32.5								
C43	511396	85360	33.1								1
C44	511469	85303	34.4							1	1
C45	511550	85234	35.5							4	4

Grab sample	Coordinates (British National Grid)		Seabed depth (m b OD)	Environmental remains						Fossils	
	Eastings	Northings		Bone	Char-coal	Plant matter	Beetles	Fresh water snails	Terrestrial snails	Teeth	Other
C46	511623	85176	35.8			Y					
C47	511702	85113	36.9			Y					
C48	511779	85038	35.8								
C49	511857	84978	35.8								2
C50	511938	84923	36.2							2	
C51	512001	84986	36.2			Y	1				
C52	511919	85057	35.5			Y					
C53	511845	85118	35.5			Y					
C54	511779	85183	36.5								
C55	511685	85254	36.9							3	
C56	511613	85311	35.8							2	1
C57	511531	85382	34.8							3	3
C58	511458	85437	33.4							1	
C59	511377	85504	32.1			Y				1	1
C60	511307	85569	31.1								
C61	511369	85644	30.8								
C62	511445	85583	31.9							1	1
C63	511523	85516	33.8								1
C64	511600	85452	34.7								
C65	511674	85382	36.2							3	3
C66	511750	85332	36.9							2	
C67	511828	85255	36.5			Y					
C68	511904	85199	35.8			Y					
C69	511985	85135	36.2							2	1
C70	512065	85070	36.9								
C71	512121	85138	37.2								
C72	512052	85209	36.2								
C73	511984	85276	35.5								
C74	511895	85343	36.9							3	2
C75	511819	85403	35.8			Y				1	
C76	511738	85472	34.2								
C77	511660	85540	33.4			Y				1	
C78	511585	85604	32.9							3	1
C79	511508	85654	31.3							1	
C80	511433	85721	29.4							3	2
C81	511492	85796	32.6							1	
C82	511574	85739	28.6								
C83	511651	85670	31.1								
C84	511728	85604	32.7								
C85	511797	85554	33.5							5	1
C86	511871	85470	35.1							1	
C87	511954	85420	35.1			Y					
C88	512033	85361	34.6							1	
C89	512111	85298	35.1			Y					
C90	512191	85219	37.2								
C91	512250	85295	36.5								
C92	512173	85360	34.8			Y					
C93	512090	85437	34.0							1	

Grab sample	Coordinates (British National Grid)		Seabed depth (m b OD)	Environmental remains						Fossils	
	Eastings	Northings		Bone	Char-coal	Plant matter	Beetles	Fresh water snails	Terrestrial snails	Teeth	Other
C94	512029	85491	35.5							2	1
C95	511942	85559	35.1							3	
C96	511868	85623	33.7							4	
C97	511789	85687	32.4					1			
C98	511713	85745	30.7								
C99	511642	85814	32.6							1	
C100	511556	85879	33.4								
E1	510480	83002	24.4								
E2	510553	82944	25.2								
E3	510633	82878	25.5								
E4	510716	82812	26.5							1	
E5	510792	82747	27.8								
E6	510863	82685	26.3							3	
E7	510947	82627	26.6								
E8	511017	82564	27.2								1
E9	511096	82501	26.6								
E10	511175	82436	26.9								
E11	n/a	n/a	n/a								
E12	511159	82576	26.9								
E13	511084	82643	26.1								
E14	511007	82699	26.1								
E15	510929	82770	26.6							2	
E16	510849	82827	26.7								
E17	510780	82894	25.3								
E18	510697	82950	25.2								
E19	510621	83016	25.1							1	
E20	510544	83086	27.7							1	
E21	510605	83157	27.8								
E22	510685	83101	27.8								
E23	510760	83030	25.5								
E24	510840	82968	25.7								
E25	510916	82904	25.8							1	
E26	510996	82837	26.9							1	3
E27	511070	82768	26.3								
E28	511153	82708	26.9							2	2
E29	511218	82647	26.1							2	1
E30	511303	82582	24.4								
E31	511369	82649	24.4								
E32	511293	82722	24.2								
E33	511217	82797	25.9								
E34	511139	82855	27.0							1	
E35	511054	82909	26.0								
E36	510981	82981	25.5								
E37	510899	83042	25.2								
E38	510830	83105	28.5							1	2
E39	510743	83174	28.5								
E40	510670	83236	30.0								
E41	510731	83315	29.4							1	

Grab sample	Coordinates (British National Grid)		Seabed depth (m b OD)	Environmental remains						Fossils	
	Eastings	Northings		Bone	Char-coal	Plant matter	Beetles	Fresh water snails	Terrestrial snails	Teeth	Other
E42	510819	83252	29.8								
E43	510888	83181	28.5								1
E44	510962	83122	28.5							2	1
E45	511038	83062	26.4								
E46	511128	82990	26.4							1	
E47	511193	82935	24.8								
E48	511281	82865	24.1								
E49	511357	82800	24.2								
E50	511431	82738	24.5								
E51	511502	82816	24.8								
E52	511418	82869	23.8								
E53	511341	82938	23.3								
E54	511263	83012	24.2								
E55	511186	83071	25.6								
E56	511111	83136	27.8								
E57	511028	83201	29.0								3
E58	510958	83256	30.4								
E59	510876	83329	29.9								
E60	510802	83391	25.1							1	1
E61	510862	83465	26.7								
E62	510942	83407	25.7								
E63	511010	83339	30.4								
E64	511092	83269	30.9							1	
E65	511171	83210	27.2								
E66	511246	83150	25.3								
E67	511320	83083	24.4							1	
E68	511403	83013	24.2								
E69	511481	82957	23.2								
E70	511557	82890	23.6								
E71	511622	82966	24.2								
E72	511537	83040	24.0								
E73	511464	83096	24.7								
E74	511382	83165	24.8								1
E75	511310	83219	29.1								
E76	511240	83292	30.4							1	1
E77	511148	83347	30.9								2
E78	511079	83420	27.0							1	
E79	511005	83476	27.6								
E80	510924	83543	29.5							2	1
E81	510988	83626	31.5							3	10
E82	511068	83552	30.0								
E83	511141	83497	28.6								1
E84	511217	83432	27.8								
E85	511299	83369	31.6							1	1
E86	511372	83298	31.8							1	
E87	511449	83236	31.0							1	1
E88	511528	83168	26.4							1	1
E89	511591	83085	24.7								

Grab sample	Coordinates (British National Grid)		Seabed depth (m b OD)	Environmental remains						Fossils	
	Eastings	Northings		Bone	Char-coal	Plant matter	Beetles	Fresh water snails	Terrestrial snails	Teeth	Other
E90	511683	83040	24.0								
E91	511754	83120	26.9								
E92	511672	83187	32.3								
E93	511587	83255	33.4								2
E94	511521	83312	34.2							2	1
E95	511440	83380	34.0								4
E96	511360	83442	29.6								2
E97	511283	83503	30.2								7
E98	511212	83570	31.3							1	
E99	511133	83639	32.1								4
E100	511054	83703	31.9							3	
F1	511109	83774	29.0							1	
F2	511197	83709	33.7								1
F3	511274	83646	33.5							2	
F4	511352	83582	33.0								
F5	511427	83514	31.7								
F6	511498	83449	31.3							3	
F7	511581	83392	36.2							1	
F8	511652	83332	35.8							2	
F9	511730	83270	35.5							1	
F10	511815	83197	34.8								
F11	511871	83265	37.6								2
F12	511795	83342	37.2								
F13	511713	83407	37.2							2	
F14	511647	83471	33.1								
F15	511565	83534	33.7							2	
F16	511490	83594	34.6								
F17	511413	83659	35.8								
F18	511340	83725	36.5							1	
F19	511258	83793	35.1								
F20	511180	83859	31.3							1	
F21	511244	83922	33.4					3		10	7
F22	511323	83873	33.3							1	4
F23	511399	83805	37.9			Y					
F24	511475	83732	37.9								1
F25	511552	83676	37.9								
F26	511630	83608	35.8							1	1
F27	511704	83543	34.8							2	1
F28	511785	83486	34.4							1	
F29	511869	83421	39.0							2	
F30	511946	83349	39.0							1	1
F31	512006	83441	38.6								1
F32	511927	83499	35.1								
F33	511848	83560	35.1								
F34	511774	83625	36.2								
F35	511692	83689	39.3								
F36	511620	83754	40.4								
F37	511541	83812	39.7							3	

Grab sample	Coordinates (British National Grid)		Seabed depth (m b OD)	Environmental remains						Fossils	
	Eastings	Northings		Bone	Char-coal	Plant matter	Beetles	Fresh water snails	Terrestrial snails	Teeth	Other
F38	511465	83871	35.5			Y	1				
F39	511394	83940	35.8							2	
F40	511313	84012	35.5							2	1
F41	511376	84085	36.2								
F42	511454	84016	37.2							2	
F43	511537	83951	36.9			Y					
F44	511595	83896	36.9	1		Y		2			2
F45	511683	83823	40.7							2	
F46	511759	83759	40.4			Y	1				
F47	511838	83697	39.0					1		2	
F48	511917	83633	37.2								
F49	511987	83570	35.8	1		Y					
F50	512064	83501	36.2							5	
F51	512130	83583	36.9							4	
F52	512053	83649	37.6			Y					1
F53	511978	83711	38.6								
F54	511897	83780	40.7								
F55	511819	83841	41.4			Y		1			
F56	511757	83908	37.6								
F57	511675	83966	37.9								
F58	511599	84032	37.6								
F59	511518	84098	37.2							1	
F60	511441	84158	36.9								1
F61	511498	84242	37.6								
F62	511579	84170	38.3								
F63	511656	84109	38.3								1
F64	511738	84043	38.6			Y					
F65	511812	83974	37.6								
F66	511884	83920	37.6								
F67	511957	83859	41.1	1		Y		2			
F68	512042	83787	40.0	1					2	1	
F69	512118	83725	39.3								1
F70	512197	83656	38.3								
F71	512256	83746	39.7								
F72	512185	83808	39.7								
F73	512104	83863	39.7								
F74	512025	83932	36.2								
F75	511955	83993	36.9	1		Y					
F76	511871	84057	37.9								
F77	511797	84123	37.9								
F78	511722	84182	38.6							1	
F79	511646	84256	37.9								
F80	511564	84310	38.6								
F81	511628	84385	36.9							3	
F82	511707	84322	37.6					1			
F83	511782	84257	37.6							1	1
F84	511863	84197	37.2							1	
F85	511942	84129	37.2								

Grab sample	Coordinates (British National Grid)		Seabed depth (m b OD)	Environmental remains						Fossils	
	Eastings	Northings		Bone	Char-coal	Plant matter	Beetles	Fresh water snails	Terrestrial snails	Teeth	Other
F86	512022	84070	37.6					1			
F87	512101	84009	35.8								
F88	512165	83951	36.2							2	
F89	512248	83885	41.1								
F90	512322	83822	41.4								3
F91	512391	83895	42.8								
F92	512304	83955	37.9								
F93	512236	84020	36.9								
F94	512158	84084	36.5			Y					
F95	512084	84146	37.9								1
F96	512009	84210	37.9								
F97	511925	84276	37.2							3	2
F98	511850	84338	35.8								
F99	511764	84392	34.2								2
F100	511692	84469	30.9								
H1	512398	85307	35.8							1	1
H2	512473	85255	31.5								
H3	512553	85185	31.3								
H4	512621	85134	30.7							1	1
H5	512705	85065	32.3			Y					
H6	512779	84988	36.2								
H7	512863	84934	37.9								
H8	512930	84874	37.9								
H9	513012	84806	37.9							2	2
H10	513084	84742	30.3								
H11	513144	84823	30.3					1		1	
H12	513069	84883	35.8							1	2
H13	512994	84947	37.9					1		2	
H14	512921	85006	38.3								
H15	512846	85073	33.4								
H16	512773	85134	32.3					1			
H17	512694	85205	31.1								
H18	512613	85268	29.0								
H19	512537	85335	33.7								1
H20	512456	85393	35.1								1
H21	512526	85461	33.1								
H22	512594	85403	34.2								
H23	512677	85342	35.8								
H24	512757	85278	32.3								
H25	512829	85219	32.5								
H26	512905	85145	33.1					1			
H27	512988	85089	37.6								
H28	513065	85016	35.1							2	1
H29	513136	84957	30.3								
H30	513215	84897	33.3								
H31	513276	84980	32.9							1	1
H32	513204	85032	31.0								
H33	513126	85104	31.0								

Grab sample	Coordinates (British National Grid)		Seabed depth (m b OD)	Environmental remains						Fossils	
	Eastings	Northings		Bone	Char-coal	Plant matter	Beetles	Fresh water snails	Terrestrial snails	Teeth	Other
H34	513053	85157	33.5								2
H35	512974	85228	33.4								
H36	512896	85284	33.3					1			
H37	512810	85357	35.8							1	
H38	512748	85416	35.5							1	1
H39	512659	85494	34.0					1		1	2
H40	512590	85537	33.7								1
H41	512657	85621	31.3			Y		11			1
H42	512727	85561	34.0								1
H43	512807	85492	34.7								2
H44	512876	85430	35.5								
H45	512967	85376	36.2			Y					
H46	513033	85311	36.5					1		1	
H47	513113	85243	31.3								
H48	513193	85175	28.4								
H49	513263	85110	29.8								
H50	513344	85042	31.0								
H51	513409	85129	34.4								
H52	513334	85192	27.4								
H53	513254	85249	26.7								
H54	513175	85324	32.5		1						
H55	513098	85387	34.0								1
H56	513022	85442	34.0								
H57	512945	85501	34.3								
H58	512871	85577	33.8								
H59	512789	85629	32.3								1
H60	512717	85697	31.5			Y					
H61	512787	85772	31.4								
H62	512852	85722	32.5					1		2	3
H63	512937	85645	32.5								1
H64	513018	85585	31.1								2
H65	513089	85519	28.0								
H66	513168	85453	28.2					2			
H67	513241	85399	26.3								
H68	513312	85324	27.6								
H69	513390	85257	24.4								
H70	513472	85199	25.7								
H71	513538	85273	26.4								
H72	513457	85349	29.2								
H73	513379	85412	28.6								1
H74	513302	85466	26.7								
H75	513223	85531	26.2								
H76	513151	85592	26.9								
H77	513078	85659	27.4								1
H78	512997	85723	31.9								
H79	512917	85787	31.4								2
H80	512837	85848	31.3	2							
H81	512912	85937	30.6					1		3	5

Grab sample	Coordinates (British National Grid)		Seabed depth (m b OD)	Environmental remains						Fossils	
	Eastings	Northings		Bone	Char-coal	Plant matter	Beetles	Fresh water snails	Terrestrial snails	Teeth	Other
H82	512990	85872	30.8							2	1
H83	513054	85798	29.5								1
H84	513140	85742	27.1								
H85	513218	85678	27.6							1	
H86	513292	85605	25.5								1
H87	513368	85540	27.2								
H88	513442	85483	28.6								
H89	513523	85419	29.4								
H90	513599	85359	29.4								
H91	513662	85437	29.9								
H92	513589	85490	29.2								
H93	513498	85563	28.8								
H94	513440	85622	26.8								
H95	513360	85688	26.6	1							
H96	513274	85748	26.7					1			
H97	513198	85821	28.9							2	1
H98	513125	85878	28.7								
H99	513057	85943	30.0								
H100	512973	86012	28.4	2						7	11

APPENDIX III: WOOD AND CHARCOAL IDENTIFICATIONS

Catherine Chisham
Wessex Archaeology

Method

Waterlogged wood and charcoal recovered on the 10mm, 4mm and 1mm sieves during flotation of bulk samples from 18km offshore south of Littlehampton, West Sussex, were retained and prepared for identification.

The charcoal was prepared according to the standard methodology of Leney and Casteel (1975, see also Gale and Cutler 2000). Fragments were fractured with a razor blade so that three planes could be seen: transverse section (TS), radial longitudinal section (RL) and tangential longitudinal section (TL). The pieces were mounted using modelling clay on a glass microscope slide, blown to remove charcoal dust and examined under bi-focal epi-illuminated microscopy at magnifications of x50, x100 and x400 using a Kyowa ME-LUX2 microscope.

A fine slice was taken from each waterlogged wood fragment (sample H60 comprising a 50% sub-sample of waterlogged fragments >4mm) along the three planes (TS, RL and TL) using a razor blade. The thin sections were mounted in water on a glass microscope slide, and examined under bi-focal transmitted light microscopy at magnifications of x50, x100 and x400 using the Kyowa ME-LUX2 microscope.

Identification was undertaken according to the anatomical characteristics described by Schweingruber (1990) and Butterfield and Meylan (1980). Identification was to the lowest taxonomic level possible, usually that of genus, and nomenclature is according to Stace (1997).

Results

A limited number of woody types were identified. The wood fragments were found to be in generally good condition although several in sample H60 were highly humified and had been subject to deposition of manganese within cells. The assemblage was clearly dominated by *Salix/ Populus* sp. (willow/ aspen) but waterlogged wood fragments of Cornus sanguinea (dogwood) were present in the peat sample H60. The single wood fragment from sample H45, queried in the field as driftwood, is the only coniferous type represented, being of *Pinus sylvestris* (pine). The table below summarises the waterlogged wood identifications:

Sample	ID	No. of fragments	Comments	Sediment
C76 (peat)	*Salix/ Populus* sp (willow/ aspen)	3	Root wood	Peat
	Herbaceous stem cf. Phragmites	1		
	unidentified	1	1mm twigwood, too small for safe ID	
C31	Herbaceous (part woody) stems cf. *Phragmites*	8	including nodes, culm bases	Mixed sand and gravel, finer matrix
H45	*Pinus sylvestris* (pine)	1	Mature (suggestion this may be driftwood)	Sands and gravels
H60 (peat)	Cornus sanguinea (dogwood)	3	Small roundwood (<5 years)	Sands and gravels with 10% reworked peat
	Cf. *Cornus sanguinea* (dogwood)	1		
	unidentified	4	Highly humified, degraded and Manganese deposition in cells	
	Salix/ Populus sp. (willow/ aspen)	5	Mature, including large fragments (1 of max 9cm, 1 of max 5.5cm), humified, some fragments slightly rounded	
	Salix/ Populus sp. (willow/ aspen)	3	Small roundwood and twigwood	
	Herbaceous (part woody) stems	1		

The single fragment of charcoal recovered is of mature Quercus sp. (oak) wood:

Context	ID	Comments	Sediment
H54	*Quercus sp.* (oak)	Firm fresh mature wood charcoal	Peat

Discussion

Salix (willow) and *Populus* (aspen) cannot be differentiated on the basis of their wood anatomy but both are shrubs or small trees which favour relatively open and damp conditions such as a wetland or floodplain edge and both can become locally dominant, aspen in particular forming thickets given the right conditions. Both taxa are indicative of interglacial conditions with aspen particularly important in the early Mesolithic (e.g. Chisham 2004, Dark 1998), while willow has been ubiquitous through the Holocene in wetland edge environments. Cornus too is a shrub that requires relatively open, light conditions rather than closed woodland. The earliest remains in southern England have been found in deposits of early Mesolithic date though it has not been recorded from earliest Holocene deposits, rather appearing or expanding after hazel (e.g. at Thatcham Reedbeds, Berkshire, the first appearance was dated to 7,950-7,520 cal. BC/8,629±82 BP AA-55308, Chisham 2004). It is notable that the peat sample C76 contained *Salix/ Populus* sp. root wood (with fine roots still attached), indicating fully stabilised terrestrial conditions during the peat growth, with a stable wetland environment such as a moist fen adjacent to a freshwater channel.

The presence of *Pinus sylvestris* in sample H45 is somewhat suggestive of an early Holocene (Mesolithic) date since it declined with the establishment of deciduous woodland in the early

Holocene in Southern England and does not reappear in substantial numbers in the palaeoenvironmental record until recent times. However, the fragment was queried as driftwood and does appear in (marine?) sands and gravels, and may therefore probably represent material reworked from deposits older than that from which the wood was recovered, rather than being contemporary with the deposit.

The presence of quantities of herbaceous stems and stem bases (likely *Phragmites australis,* common reed) supports an interpretation that emergent wetland vegetation was present during inception and accumulation of the peat. Their presence in the coarse minerogenic sediments may represent reworking of the remains.

The charcoal fragment was of oak, a common tree of mixed deciduous woodland throughout the Holocene. The very presence of this charcoal is of note since the only likely mechanism for the wood of a mature deciduous tree to be fully charred in this wetland landscape is deliberate anthropogenic burning e.g. for use as fuel in hearths. Being macroscopic charcoal its presence is highly suggestive of human activity in the local area but clearly no further interpretation can be made based on a single fragment. Oak is intolerant of wet or saline conditions and indicates fully terrestrial (though clearly damp) conditions existed in the local area. The nature of this deposit (peat) and the fresh and good condition of the charcoal with no indication of rolling or transport would suggest relatively local and rapid deposition.

It has been queried whether the charcoal fragment could be used to date the deposit, assuming that it is contemporary with it. However, the fragment is of mature wood with no sapwood and oak can live for many hundreds of years, so introducing the possibility that the fragment is up to 500 years older than the burning event and deposit and is therefore only capable of providing a very broad indication of chronology. Short-lived plant material of terrestrial origin such as the *Phragmites* stems noted in other samples or the small roundwood of *Salix/ Populus* sp. (willow/ aspen) from sample H60 provide better opportunities for precise radiocarbon dating of particular deposits.

References

Butterfield, B.G. and Meylan, B.A., 1980, *Three-Dimensional Structure of Wood. An Ultrastructural Approach*. London and New York: Chapman and Hall.

Chisham, C., 2004, *Early Mesolithic Human Activity and Environmental Change: A Case Study of the Kennet Valley.* Unpublished PhD thesis, Dept. of Archaeology, University of Reading.

Dark, P., 1998, 'Palaeoecological Investigations' in Mellars, P and Dark, P *Star Carr in Context*. Cambridge: McDonald Institute Monographs. 111-182.

Gale, R. and Cutler, D., 2000, *Plants in Archaeology,* Westbury and Royal Botanic Gardens Kew.

Leney, L. and Casteel, R.W., 1975, 'Simplified Procedure for Examining Charcoal Specimens for Identification', *Journal of Archaeological Science* 2:153-159.

APPENDIX IV: STRUCK FLINT

Matt Leivers
Wessex Archaeology

668 pieces of flint were analysed, retrieved from 228 locations in four sample areas (squares C, E, F and H). The majority are small (under 20mm) and light (under 5g).

Very few of the pieces are in any way diagnostic. Most are small chips or flakes, while one (from C3) is blade-like. The only example which may derive directly from tool manufacture is the piece from E85, which *may* be a microburin.

The main difficulty with this material lies not in the absence of tool types, but in the ambiguous nature of its means of production. In no instance is it absolutely certain that any piece is the result of anthropogenic processes, and consequently the methodology devised in **Volume II** of this report, which provides for the assessment of likelihood of anthropogenesis, has been retained. For the purposes of this assessment, criteria for distinguishing between levels of likelihood include:

Level	Criteria
Highly probable	Recognisable tool or debitage type Obvious platform & bulb, preparation, regular anthropogenic dorsal scars
Probable	Obvious platform & bulb, irregular dorsal scars
Possible	Obvious bulb, irregular/no dorsal scars
Improbable	Unusually placed bulb, no dorsal scars

1.8% of pieces have been assessed as highly probable, with 1.5% probable, 2.8% possible and 93.9% improbable. The limiting factors in more accurately assessing individual pieces have been discussed in **Section 3.2** and **Appendix II** of **Volume II** of this report and apply equally to this material.

The uniformity of most of the material in terms of size and weight, and the lack of any recognisable concentrations means that it is unlikely that any of it correlates directly with any submerged archaeology within the sample areas.

The locations of the flint and the likelihood of its anthropogenesis are summarised in the following table.

Grab Sample	Coordinates		Depth	Struck Flint					
	Easting	Northing	mbOD	No	Highly	Probable	Possible	Improbable	Comments
C1	510990	85185	30.2	5				5	
C2	511070	85122	31.5	2				2	
C3	511138	85054	32.5	3	1			2	bladey
C4	511216	84996	34.1	1				1	
C5	511295	84926	35.8	1				1	
C6	511376	84866	36.9	1	1				primary flake
C7	511436	84809	36.9	3				3	
C8	511522	84723	36.9	5			2	3	

Grab Sample	Coordinates		Depth	Struck Flint					
	Easting	Northing	mbOD	No	Highly	Probable	Possible	Improbable	Comments
C10	511683	84607	35.8	2		1		1	
C11	511753	84688	35.5	2				2	
C15	511442	84941	36.2	5				5	
C17	511287	85074	33.8	1				1	
C16	511359	85014	35.1	1				1	
C18	511203	85135	33.1	2				2	
C19	511128	85196	31.9	2				2	
C20	511048	85266	30.6	1				1	
C21	511114	85334	30.7	3				3	
C22	511189	85269	31.9	2				2	
C23	511270	85210	33.1	5				5	
C24	511343	85152	33.4	4				4	
C26	511502	85017	35.8	3				3	
C27	511586	84953	35.8	1				1	
C29	511724	84829	36.2	3				3	
C30	511787	84767	36.2	5		1	1	3	
C31	511857	84843	36.2	2				2	
C33	511717	84962	35.8	3				3	
C35	511562	85099	36.2	2				2	
C36	511486	85163	34.8	1				1	
C38	511329	85290	33.4	14				14	
C39	511255	85345	32.7	6				6	
C40	511178	85408	30.9	5			1	4	
C41	511240	85489	31.5	2				2	
C42	511322	85424	32.5	4		1	1	2	
C43	511396	85360	33.1	7			1	6	
C44	511469	85303	34.4	1				1	
C45	511550	85234	35.5	1				1	
C48	511779	85038	35.8	3				3	
C49	511857	84978	35.8	2				2	
C51	512001	84986	36.2	2				2	
C53	511845	85118	35.5	1				1	
C54	511779	85183	36.5	3				3	
C55	511685	85254	36.9	2				2	
C56	511613	85311	35.8	5				5	
C59	511377	85504	32.1	3				3	
C62	511445	85583	31.9	1				1	
C64	511600	85452	34.7	2				2	
C65	511674	85382	36.2	3				3	
C66	511750	85332	36.9	1				1	
C67	511828	85255	36.5	1				1	
C70	512065	85070	36.9	3	1			2	primary flake
C72	512052	85209	36.2	4				4	
C73	511984	85276	35.5	2				2	
C74	511895	85343	36.9	2				2	
C81	511492	85796	32.6	8	1	1		6	secondary flake
C84	511728	85604	32.7	1			1		
C85	511797	85554	33.5	4				4	
C86	511871	85470	35.1	2				2	
C88	512033	85361	34.6	1				1	
C89	512111	85298	35.1	1				1	

Grab Sample	Coordinates		Depth	Struck Flint					
	Easting	Northing	mbOD	No	Highly	Probable	Possible	Improbable	Comments
C90	512191	85219	37.2	2				2	
C91	512250	85295	36.5	1				1	
C92	512173	85360	34.8	1				1	
C94	512029	85491	35.5	5				5	
C95	511942	85559	35.1	4				4	
C99	511642	85814	32.6	10			3	7	
C100	511556	85879	33.4	35				35	
E4	510716	82812	26.5	3				3	
E7	510947	82627	26.6	1				1	
E8	511017	82564	27.2	2				2	
E10	511175	82436	26.9	2				2	
E15	510929	82770	26.6	2				2	
E16	510849	82827	26.7	2				2	
E19	510621	83016	25.1	1				1	
E20	510544	83086	27.7	1				1	
E22	510685	83101	27.8	2				2	
E23	510760	83030	25.5	1				1	
E24	510840	82968	25.7	4	1			3	secondary flake
E25	510916	82904	25.8	1				1	
E26	510996	82837	26.9	3				3	
E29	511218	82647	26.1	1				1	
E34	511139	82855	27.0	3				3	
E35	511054	82909	26.0	2				2	
E36	510981	82981	25.5	4				4	
E37	510899	83042	25.2	1				1	
E38	510830	83105	28.5	8				8	
E41	510731	83315	29.4	1				1	
E43	510888	83181	28.5	1				1	
E44	510962	83122	28.5	1				1	
E46	511128	82990	26.4	1				1	
E57	511028	83201	29.0	1				1	
E58	510958	83256	30.4	3				3	
E60	510802	83391	25.1	6				6	
E61	510862	83465	26.7	1				1	
E62	510942	83407	25.7	4				4	
E76	511240	83292	30.4	2				2	
E77	511148	83347	30.9	3				3	
E78	511079	83420	27.0	3				3	
E80	510924	83543	29.5	2				2	
E81	510988	83626	31.5	4				4	
E82	511068	83552	30.0	5				5	
E83	511141	83497	28.6	5		1		4	
E84	511217	83432	27.8	3				3	
E85	511299	83369	31.6	1	1				microburin?
E86	511372	83298	31.8	1				1	
E88	511528	83168	26.4	2				2	
E89	511591	83085	24.7	2				2	
E93	511587	83255	33.4	3	1			2	tertiary flake
E94	511521	83312	34.2	5				5	
E95	511440	83380	34.0	5		1	1	3	
E96	511360	83442	29.6	4				4	

Grab Sample	Coordinates		Depth	Struck Flint					
	Easting	Northing	mbOD	No	Highly	Probable	Possible	Improbable	Comments
E97	511283	83503	30.2	1				1	
E98	511212	83570	31.3	3				3	
E100	511054	83703	31.9	2				2	
F1	511109	83774	29.0	1				1	
F3	511274	83646	33.5	1				1	
F8	511652	83332	35.8	5				5	
F9	511730	83270	35.5	2				2	
F11	511871	83265	37.6	2				2	
F12	511795	83342	37.2	6				6	
F13	511713	83407	37.2	2				2	
F15	511565	83534	33.7	3				3	
F16	511490	83594	34.6	3		1		2	
F19	511258	83793	35.1	2				2	
F21	511244	83922	33.4	7				7	
F22	511323	83873	33.3	2			1	1	
F23	511399	83805	37.9	1				1	
F25	511552	83676	37.9	10				10	
F26	511630	83608	35.8	6				6	
F28	511785	83486	34.4	2				2	
F30	511946	83349	39.0	1				1	
F31	512006	83441	38.6	5				5	
F34	511774	83625	36.2	2				2	
F39	511394	83940	35.8	1				1	
F40	511313	84012	35.5	2				2	
F41	511376	84085	36.2	1				1	
F42	511454	84016	37.2	2			1	1	
F44	511595	83896	36.9	2			1	1	
F47	511838	83697	39.0	3				3	
F48	511917	83633	37.2	11				11	
F49	511987	83570	35.8	6				6	
F50	512064	83501	36.2	1				1	
F52	512053	83649	37.6	7				7	
F53	511978	83711	38.6	3				3	
F55	511819	83841	41.4	1				1	
F58	511599	84032	37.6	1				1	
F59	511518	84098	37.2	1				1	
F65	511812	83974	37.6	3				3	
F66	511884	83920	37.6	1			1		
F68	512042	83787	40.0	1				1	
F69	512118	83725	39.3	2				2	
F71	512256	83746	39.7	2				2	
F73	512104	83863	39.7	2				2	
F77	511797	84123	37.9	1				1	
F79	511646	84256	37.9	2				2	
F80	511564	84310	38.6	1				1	
F88	512165	83951	36.2	3				3	
F90	512322	83822	41.4	3		1		2	
F91	512391	83895	42.8	3				3	
F92	512304	83955	37.9	2				2	
F93	512236	84020	36.9	4				4	
F94	512158	84084	36.5	1				1	

Grab Sample	Coordinates		Depth	Struck Flint					
	Easting	Northing	mbOD	No	Highly	Probable	Possible	Improbable	Comments
F96	512009	84210	37.9	1				1	
F97	511925	84276	37.2	1		1			
F99	511764	84392	34.2	3				3	
F100	511692	84469	30.9	1				1	
H1	512398	85307	35.8	2				2	
H4	512621	85134	30.7	2				2	
H5	512705	85065	32.3	2				2	
H8	512930	84874	37.9	1				1	
H9	513012	84806	37.9	1				1	
H10	513084	84742	30.3	5				5	
H12	513069	84883	35.8	5				5	
H13	512994	84947	37.9	1				1	
H15	512846	85073	33.4	3				3	
H16	512773	85134	32.3	1				1	
H19	512537	85335	33.7	1				1	
H20	512456	85393	35.1	2	1			1	tertiary flake
H22	512594	85403	34.2	2				2	
H23	512677	85342	35.8	2				2	
H25	512829	85219	32.5	2				2	
H27	512988	85089	37.6	1				1	
H28	513065	85016	35.1	2				2	
H29	513136	84957	30.3	3				3	
H31	513276	84980	32.9	4	1			3	secondary flake
H32	513204	85032	31.0	2				2	
H35	512974	85228	33.4	5				5	
H39	512659	85494	34.0	2				2	
H40	512590	85537	33.7	4				4	
H41	512657	85621	31.3	2				2	
H42	512727	85561	34.0	4				4	
H43	512807	85492	34.7	3				3	
H46	513033	85311	36.5	1	1				broken tertiary flake
H47	513113	85243	31.3	2				2	
H48	513193	85175	28.4	22		1		21	
H49	513263	85110	29.8	2				2	
H50	513344	85042	31.0	2				2	
H51	513409	85129	34.4	6				6	
H52	513334	85192	27.4	1				1	
H53	513254	85249	26.7	3				3	
H55	513098	85387	34.0	3				3	
H56	513022	85442	34.0	3				3	
H58	512871	85577	33.8	1				1	
H59	512789	85629	32.3	6				6	
H60	512717	85697	31.5	2				2	
H61	512787	85772	31.4	2			1	1	
H62	512852	85722	32.5	1				1	
H63	512937	85645	32.5	6			1	5	
H64	513018	85585	31.1	2				2	
H67	513241	85399	26.3	2				2	
H68	513312	85324	27.6	2				2	
H69	513390	85257	24.4	1				1	

Grab Sample	Coordinates		Depth	Struck Flint					
	Easting	Northing	mbOD	No	Highly	Probable	Possible	Improbable	Comments
H73	513379	85412	28.6	2				2	
H77	513078	85659	27.4	3				3	
H78	512997	85723	31.9	3				3	
H80	512837	85848	31.3	7	1			6	tertiary flake
H81	512912	85937	30.6	2				2	
H82	512990	85872	30.8	2				2	
H83	513054	85798	29.5	5				5	
H84	513140	85742	27.1	1				1	
H86	513292	85605	25.5	1				1	
H87	513368	85540	27.2	1				1	
H88	513442	85483	28.6	1				1	
H89	513523	85419	29.4	1				1	
H90	513599	85359	29.4	3				3	
H95	513360	85688	26.6	2			1	1	
H96	513274	85748	26.7	1				1	
H97	513198	85821	28.9	4				4	
H98	513125	85878	28.7	2				2	
H99	513057	85943	30.0	1				1	
H100	512973	86012	28.4	5	1		1	3	tertiary flake
Totals				668	12	10	19	627	

APPENDIX V: RADIOCARBON (^{14}C) RESULTS

Michael J. Allen
Wessex Archaeology

Two samples were submitted for AMS radiocarbon dating, one at the Scottish Universities Environmental Research Centre (SUERC) and one at Rafter Radiocarbon Laboratory, Institute of Geological & Nuclear Sciences, New Zealand. In the first case short-lived plant remains (*Phragmites*) were dated (funded by EH), and in the second case a piece of oak heartwood charcoal was dated (funded by MIRO). The radiocarbon results have been calibrated with the atmospheric data presented by Stuiver *et al.* (1998) and performed on OxCal ver 3.9 (Bronk Ramsey 1995; 2001) and are expressed at the 95% confidence level with the end points rounded outwards to 10 years following the form recommended by Mook (1986). They are presented in Table 1.

Grab sample	*Depth below OD (m)*	*Material*	*Lab no*	*Result no*	*δC^{13} ‰*	*Result BP*	*Cal. BC*
H54	*c.* 32.5	*Phragmites*	-	SUERC-12007	-26.2	8815±40	8200-7740
H54	*c.* 32.5	Oak heartwood charcoal	R-29367	NZA-26303	-24.3	8893±30	8230-7960

Table 1. Radiocarbon results from Arun Additional Grabbing project

When compared with dates of peat recovered from cores in the area (see **Volume II Appendix IV**) these fall later (Figure 1), but still fall within the Boreal climatic phase.

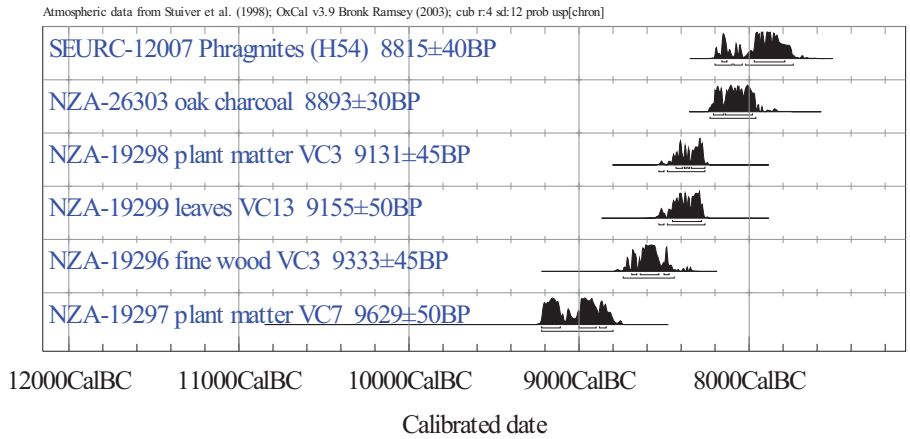


Figure 1. Calibrated radiocarbon results of the peat sampled from cores with accompanying palaeoenvironmental interpretation (NZA-19297, NZA-19296, NZA-19299 and NZA-19298, see **Volume II Appendix IV**) compared with the oak and peat dates from grab sample H54 (NZA-26303 and SUERC-12007).

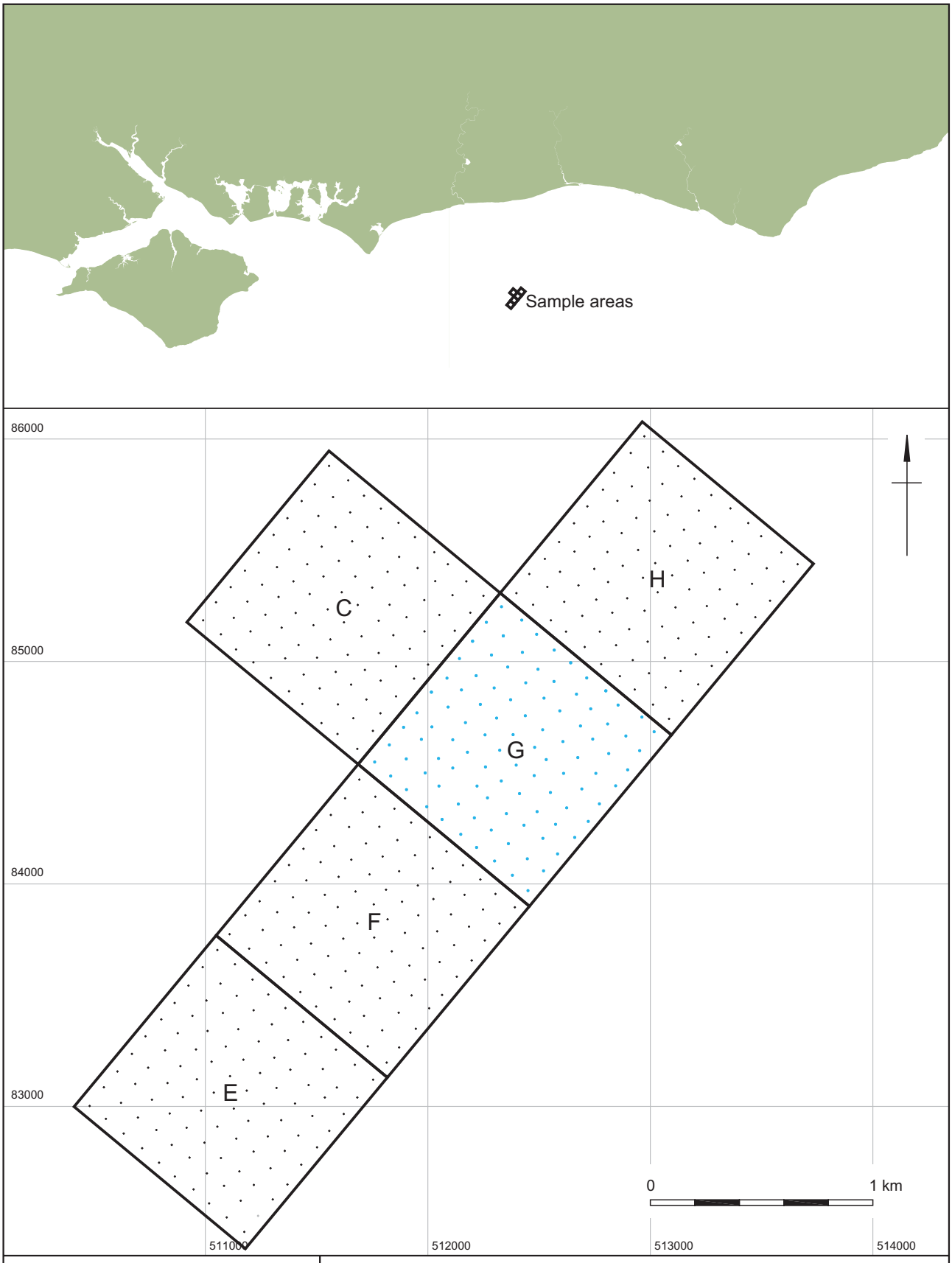
References

Bronk Ramsey C., 1995, Radiocarbon Calibration and Analysis of Stratigraphy: The OxCal Program, *Radiocarbon* 37(2):425-430.

Bronk Ramsey C., 2001, Development of the Radiocarbon Program OxCal, *Radiocarbon* 43 (2A):355-363.

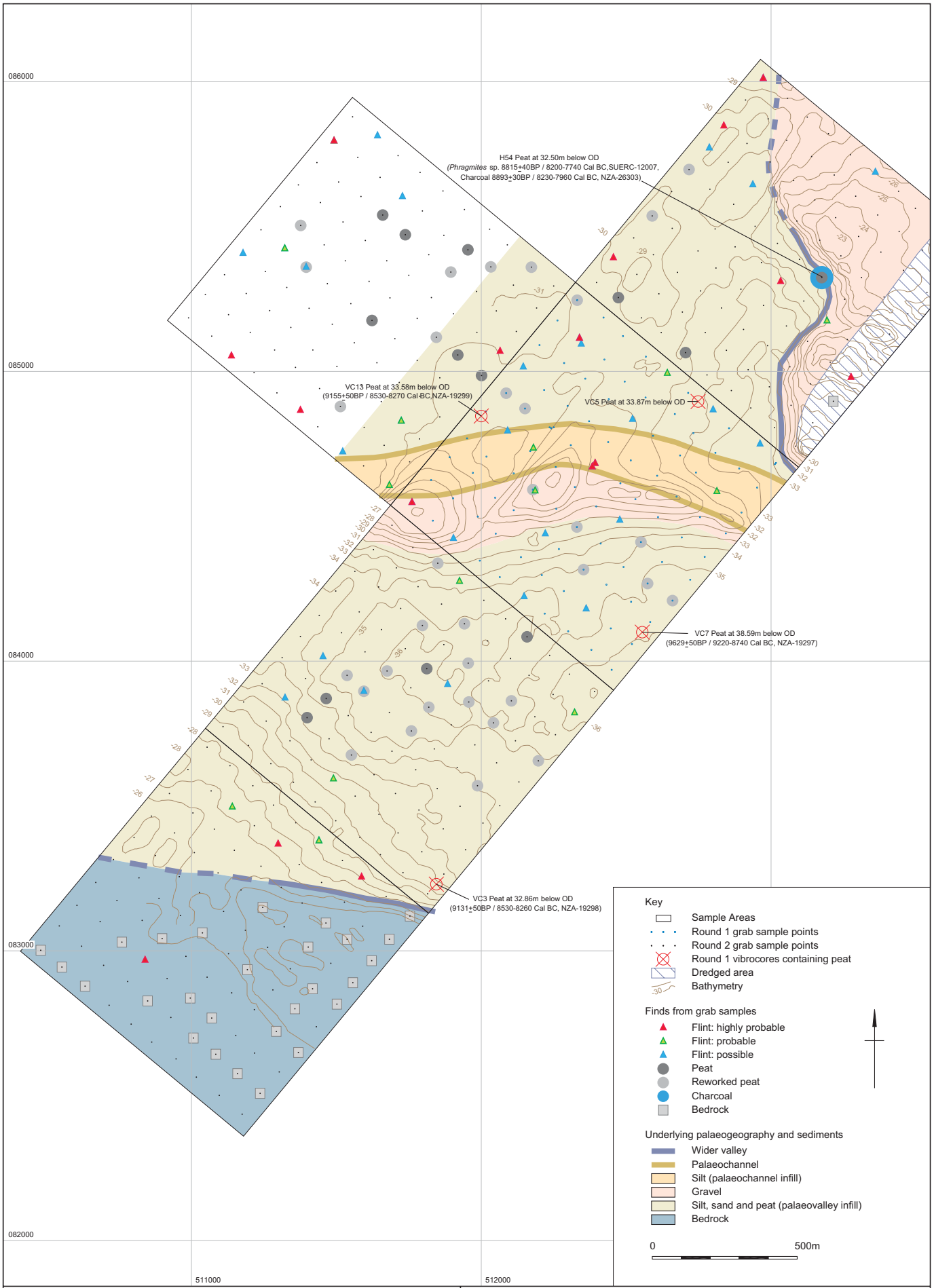
Mook, W.G., 1986, Business meeting: recommendations/resolutions adopted by the twelfth International Radiocarbon Conference, *Radiocarbon* 28:799.

Stuiver, M., Reimer, P.J., Bard, E., Beck, J.W., Burr, G.S., Hughen, K.A., Kromer, B., McCormac, G., van der Plicht, J. and Spurk, M., 1998, INTCAL98 Radiocarbon Age Calibration, 24000-0 cal. BP, *Radiocarbon* 40(3):1041-1083.



Grab sample locations

Figure III.1



Projection OSGB

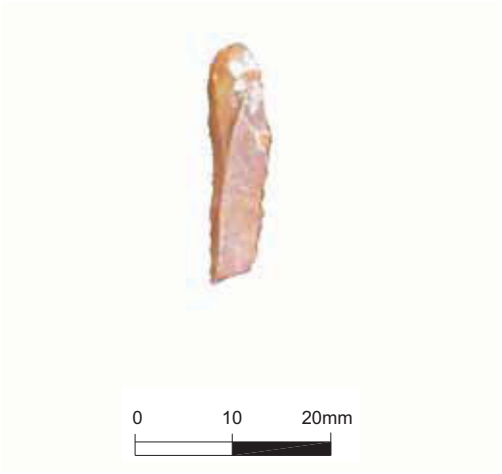
This material is for client report only © Wessex Archaeology. No unauthorised reproduction.

Date:	23/05/07	Revision Number:	2
Scale:	1:12500	Illustrator:	KMN
Path:	W:\Projects\57422\Drawing Office\Report Figs\FINAL REPORTS\VOLUME 3		

Wessex Archaeology

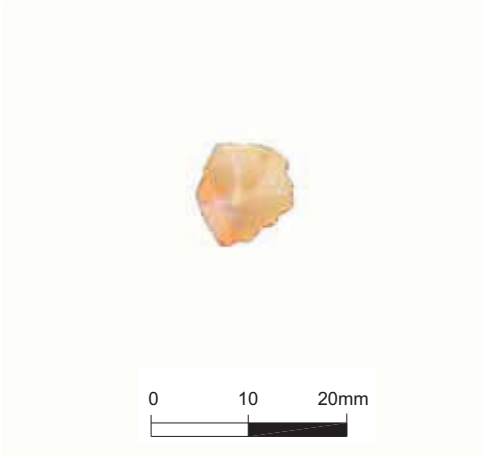
Distribution of flint, peat and charcoal

Figure III.2



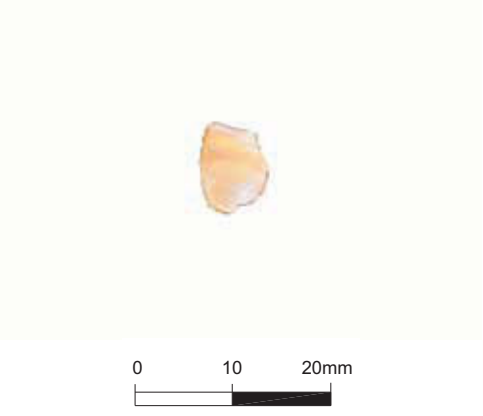
a) Highly probable blade-like flint (sample C3)

b) Highly probable microburin? (sample E85)



c) Probable struck flint (sample C10)

d) Possible struck flint (sample H100)



e) Improbable struck flint (sample H100)

f) Peat (sample C52)

Wessex Archaeology	Date:	24/11/06	Illustrator:	KJB/KMN
	Path:	W:\Projects\57422\Drawing Office\Report Figs\FINAL REPORTS\VOLUME 3		

Selection of finds

Figure III.3

WESSEX ARCHAEOLOGY LIMITED.
Head Office: Portway House, Old Sarum Park, Salisbury, Wiltshire SP4 6EB.
Tel: 01722 326867 Fax: 01722 337562 info@wessexarch.co.uk www.wessexarch.co.uk
London Office: Unit 113, The Chandlery, 50 Westminster Bridge Road, London SE1 7QY.
Tel: 020 7953 7494 Fax: 020 7953 7499 london-info@wessexarch.co.uk www.wessexarch.co.uk

Registered Charity No. 287786. A company with limited liability registered in England No. 1712772.