RADIOCARBON DATES

This volume holds a datelist of 476 radiocarbon determinations carried out between 2002 and 2004 in support of research funded by English Heritage through the Aggregates Levy Sustainability Fund. It contains supporting information about the samples and the sites producing them, a comprehensive bibliography, and two indexes for reference and analysis. An introduction provides information about the scientific dating undertaken, and methods used for the analyses reported. Details of technical reports available for programmes of luminescence dating and amino-acid racemization funded under this scheme are also provided.

The datelist has been collated from information provided by the submitters of samples and the dating laboratories, in order to provide easy access to raw scientific and contextual data which may be used in further research. Many of the sites and projects from which dates have been obtained are published, or are in the process of publication. Full references are given to these reports for those requiring further detail.

Front cover: excavating a posthole at Hartshill Copse, Berkshire. (©Cotswold Archaeology)
Back cover: preparing a sample for AMS dating. (©EH)

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ENGLISH HERITAGE

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from samples funded by English Heritage under the Aggregates Levy Sustainability Fund 2002–4

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Scientific Dating and the Aggregates Levy Sustainability Fund (2002–4)

Introduction

The Aggregates Levy Sustainability Fund (ALSF) was introduced as a two-year pilot scheme in April 2002 to provide funds to help address the environmental costs of aggregate extraction. This was based on a proportion of the Aggregates Levy, a tax of £1.60 per tonne on all newly-won aggregates.

In England the ALSF was set up to provide grant support for a number of initiatives, including research into more environmentally-friendly extraction and transport and greater use of recycled materials. A significant proportion of the ALSF was set aside to mitigate the environmental impacts of aggregate extraction. English Heritage, along with English Nature and the Countryside Agency, was a major distributor for this part of the fund on behalf of the Department of Environment, Food and Rural Affairs (DEFRA).

The English Heritage ALSF scheme aims to reduce the impacts of aggregate extraction on the historic environment. For the pilot scheme, applications for awards in three key areas were encouraged:

Fig 1 *Coring for palaeoenvironmental deposits in the Swale/Ure Washlands, Yorkshire (© Durham University)*

Fig 2 *Excavation of a ditch of the Neolithic causewayed enclosure at Lodge Farm, St Osyth, Essex (© Essex County Council Field Archaeology Unit)*

Projects which would deliver reliable predictive information and techniques to enable planning authorities and the aggregates industry to minimise the impact of aggregates extraction on the historic environment in the future (Fig 1).

Projects which would increase understanding and dissemination of knowledge gained from previous work on aggregates extraction landscapes, thus informing the future management of such areas (Fig 2).

In partnership with English Nature and the Countryside Agency, the targeted buying-out of old mineral permissions to enable the long-term management of aspects of the historic environment.

In total, English Heritage funded projects worth over £9.5 million during the pilot scheme. Further details of this programme can be found at http://www.english-heritage.org.uk, and further details of the wider ALSF programme can be found at http://www.defra.gov.uk.

Scientific dating

As the project proposals began to flood in during the spring of 2002, it quickly became apparent that an extensive programme of scientific dating would be required to underpin the objectives of the scheme. It was also clear that, once project designs had been agreed and suitable material retrieved for dating, this dating programme would have to be delivered in a very short timescale (in fact the vast majority of the work was completed during 2003).

For radiocarbon dating framework agreements were established with a number of laboratories to enable the programme of radiocarbon research to be completed in the necessary timescale. In total, 476 radiocarbon ages have been reported at a cost of £129,000. The central provision of radiocarbon dating for all the projects funded through this scheme has not only enabled the production of this volume, but also provided economies of scale which have allowed considerable cost savings to be achieved. Streamlining the sample selection and submission process, along with the efficiency and hard-work of the staff of our collaborating laboratories, enabled the provision of radiocarbon dating within the extremely challenging timescale demanded.

No tree-ring dating was undertaken from any of the projects funded by the ALSF. A single dendrochronology assessment was undertaken by Robert Howard of the Nottingham University Tree-ring Dating Laboratory on material from Watermead Country Park, Birstall, Leicestershire. This demonstrated that there was no potential for tree-ring dating from these timbers, and his results have been incorporated in the subsequent radiocarbon dating programme for the site (see p32–9).

Large-scale programmes of dating using Optically Stimulated Luminescence (OSL) (Aitken 1998) were funded for a number of projects, at a cost of more than £60,000. This method dates the last time a sediment was exposed to light, and is particularly appropriate for dating sands and gravels. Technical advances in the past few years have improved the precision and accuracy of the method considerably (Duller 2004).

Fig 3 *sampling the Dungeness Foreland for Optically Stimulated Luminescence dating (© Dr A Long, Durham University)*

Fig 4 *middle Pleistocene river terrace sands and gravels at Pratt's New Pit, Broom, Dorset (© Dr Robert Hosfield, University of Reading and Dr Jenni Chambers, Birmingham University)*

This is undoubtedly a swiftly developing discipline, however, and it is essential that these measurements are interpreted in the light of technical information which enables an assessment of the reliability of the dates to be undertaken. For this reason, full archive reports have been commissioned for each OSL application. These reports are available from English Heritage, Fort Cumberland, Fort Cumberland Road, Eastney, Portsmouth, PO4 9LD (res.reports@english-heritage.org.uk).

OSL dating was undertaken as part of the research programmes into the evolution of the Dungeness Foreland, Kent (Fig 3; Roberts and Plater 2005), the Palaeolithic archaeology of the Sussex/Hampshire corridor (Schwenninger *et al* 2006), and of Palaeolithic deposits at Lynford Quarry, Norfolk (Schwenninger and Rhodes 2005) and Broom on the Devon/Dorset border (Fig 4; Toms *et al* 2005).

Deposits from Flixborough and Welton-le-Wold, Lincolnshire (Schwenninger 2005; 2007) were also dated by OSL, as were sub-marine gravels off the coast of Sussex as part of the palaeo-Arun project (Bailey forthcoming). Technically challenging material was analysed using single-grain techniques from two Neolithic cursus monuments at Barford Road, St Neots, Cambridgeshire (Rhodes 2007), and from the Swale-Ure Washlands (Duller 2007). Both Thermoluminescence (TL) and Optically Stimulated Luminescence (OSL) dates were obtained from excavations of Mesolithic occupation at North Park Farm, Bletchingley, Surrey (Toms 2005)

Dating of molluscs recovered from gravel deposits using Amino-Acid Racemization (Johnson and Miller 1996; Hare *et al* 1997; McCarroll 2002) was also attempted as part of two projects—the Palaeolithic archaeology of the Sussex/Hampshire corridor, and Lynford Quarry, Norfolk. In both cases, no absolute dating was achieved, although useful research was undertaken which may enable successful dating of similar deposits in the future. Detailed archive reports for both of these studies are also available from English Heritage (Collins and Penkman 2004a–b).

Finally, a programme of dating marsh sediment cores using Palaeomagnetic Secular Variation (PSV) was attempted as part of the project to examine the depositional history of Dungeness Foreland (Tarling 1983; Barendregt 1998; English Heritage 2006). A full report on this work is also available from English Heritage (Plater *et al* 2006).

Radiocarbon dating: sample selection

Most radiocarbon samples processed as part of the ALSF research programme were dated using Accelerator Mass Spectrometry (AMS)(Fig 5). This proportion (84%) is equivalent to the proportion of samples dated by AMS from the other archaeological research programmes funded by English Heritage during this period (81%). The remaining samples were dated by Gas Proportional Counting (12%) or Liquid Scintillation Spectrometry (4%). An introduction to these methods of measuring radiocarbon is provided in Bayliss *et al* (2004).

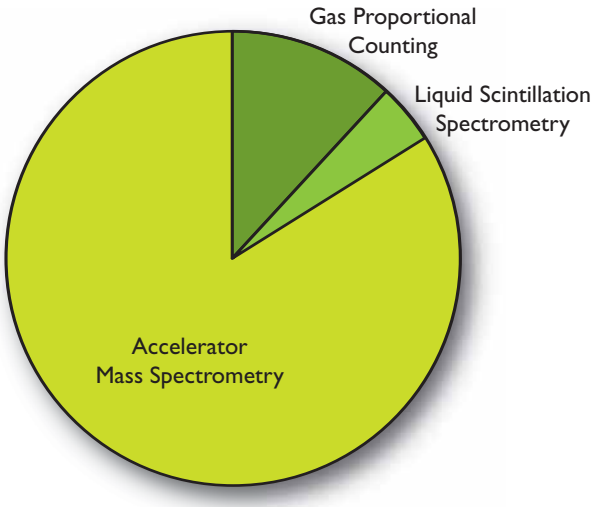

Fig 5 *techniques of radiocarbon dating used for ALSF samples 2002–4*

The proportion of bone and antler samples dated under the ALSF programme is extremely low (Fig 6), 8% compared to 28% for samples dated in support of the other archaeological research programmes funded by English Heritage in 2002–4. This is undoubtedly caused by the poor survival of bone on many gravel sites. Even where bone is recovered, samples may not be datable because of poor collagen preservation (Hedges and van Klinken 1992; van Klinken 1999). Research investigating this problem, which can be a severe impediment to constructing reliable chronologies for archaeological sites on aggregate deposits, has been undertaken by Oxford University (Brock *et al* 2007).

The relative rarity of adequate bone preservation means that the articulated and articulating bone groups, which provide a large proportion of the samples selected for dating on other archaeological sites, are not available from sands and gravels. Consequently, more reliance has to be placed on single-entity samples of charred plant remains (Ashmore 1999). Typically more uncertainty is attached to the taphonomy of such samples, and so more replication is required in the hope that consistent results from the same context suggest that the dated material was fresh when deposited. All carbonised plant remains were confirmed as short-lived species or sapwood before submission for dating. Samples consisted of material from a single plant (eg one cereal grain, one nutshell, one fragment of charcoal) unless otherwise specified.

Carbonised residues adhering to the internal surfaces of ceramics provide another large group of samples suitable for dating from aggregate sites (Fig 6). In this case, refitting sherds may suggest that a sample is close in age to the deposit from which it was recovered. Even when fragments do not refit, the degree of abrasion of the sherds, and the fragility of much of the pottery concerned, may suggest that it was freshly deposited. Internal residues are interpreted as carbonised food remains from the use of vessels. External residues are avoided as these may represent sooting from fires which may introduce an age offset if heartwood or peat was used as fuel (Bowman 1990, 15). Most carbonised residues are, however, poorly characterised chemically, and technical problems with their dating remain (Hedges *et al* 1992). Although the first steps have been taken to enable the dating of absorbed fatty residues from pottery (Stott *et al* 2003), this technique is not yet routine and was not used for samples funded as part of this research programme.

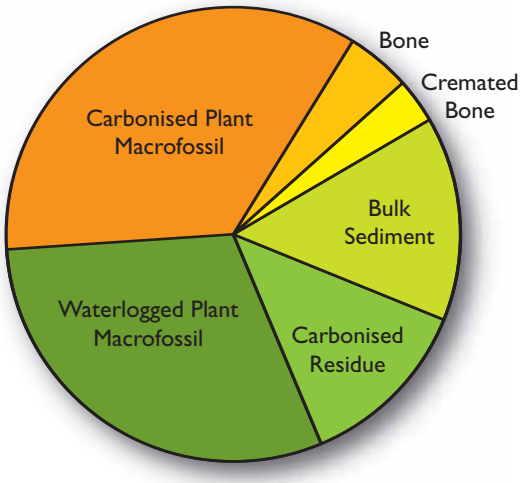

Fig 6 *types of sample material dated*

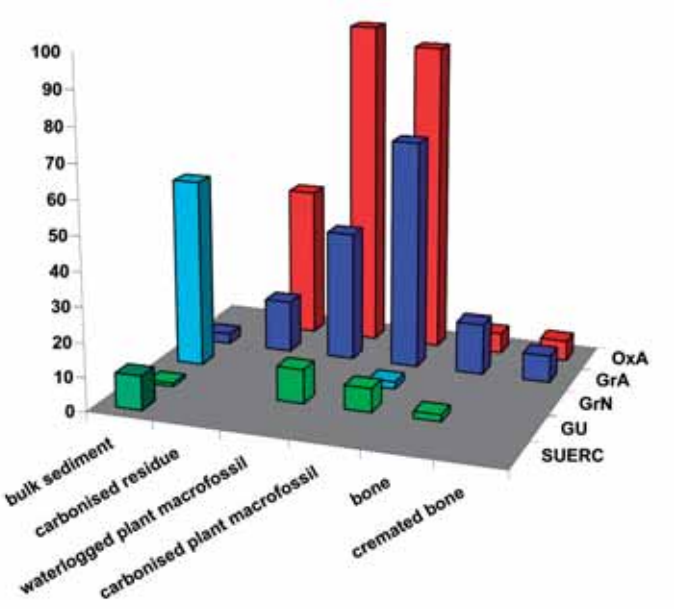

Fig 7 *types of sample material processed by each collaborating facility*

A number of samples of cremated bone were dated, however, using a new protocol which has recently been developed to date this type of sample reliably (Lanting *et al* 2001; van Strydonck *et al* 2005). Replicate determinations on fragments of cremated bone and charred plant macrofossils were obtained from eight deposits. Statistically consistent results were obtained from all of these contexts, in each case with measurements obtained from two different laboratories (Fig 7).

As part of the landscape characterisation which formed a core objective of many ALSF projects, a large number of organic deposits were dated. Wherever possible single fragments of waterlogged plant material were submitted for dating, although in some cases these were too small even for AMS dating and a number of items had to be combined to form a viable sample. In all cases these plant macrofossils were identified as short-lived material of terrestrial origin. Aquatic species were not selected for dating to avoid the possibility of hard water error (Bowman 1990, 25–6). The reliability of these samples for dating the deposits from which they were recovered was assessed by the consistency of the results in relation to the relative dating of the deposits provided by stratigraphy, and by the consistency of results on duplicate macrofossils from the same level.

Unfortunately, in many instances suitable plant material could not be recovered from the organic deposits selected for dating as they were too humified (Fig 8). In these cases,

Fig 8 *sediments retrieved from the base of Muddymore Pit, Dungeness Foreland, Kent (© Dr A Long, Durham University)*

bulk organic material had to be dated. This is a hazardous process, and a number of safeguards were adopted in an attempt to assess the reliability of the dates obtained. Firstly, material was submitted from stratigraphically related deposits so that the agreement between the stratigraphic information and the radiocarbon results could be assessed. Multiple measurements on different chemical fractions of the same sample were also obtained. In cases where these measurements are statistically consistent, more confidence can be placed in the estimated date of the deposit concerned. When these replicate measurements do not agree, then caution is indicated. Finally, in an attempt to address potential problems of inhomogeneity within deposits, relatively large samples suitable for radiometric dating were submitted wherever possible.

The humic acid and humin fractions were dated from 19 samples, 16 by Gas Proportional Counting, two by Accelerator Mass Spectrometry, and one where the humic acid fraction was dated by accelerator and the humin fraction conventionally. Fifteen of these samples produced statistically consistent radiocarbon ages, but four did not (including all three with AMS measurements). This proportion of outliers is greater than would be expected simply from the statistical scatter on the measurements, and the inconsistent ages are widely divergent (see, for example, GrN-24065 and GrA-28101 from The Rye area project: Greyfriars, p99). It seems that when the organic content of a bulk sample is particularly low, contamination is more problematic. However, even consistent ages on different fractions are not a foolproof indication that radiocarbon dates accurately date a sediment deposit: for instance, consistent ages from Dungeness, Wickmaryholm Pit (GrN-27873 and GrN-27912) are significantly earlier than statistically consistent replicate ages on a macrofossil from the same level (GrA-22407 and GrA-22413)(p46–7), and the coarse humin fraction from a sample at Rye Harbour, Pewis Marsh is significantly earlier than consistent ages on the fine humin and humic acid fractions of the same sample (GrN-28059–61; p108). Further discussion of the difficulties of dating organic deposits can be found in Dresser (1970), Shore *et al* (1995), and Cook *et al* (1998).

Radiocarbon ages and calibrated dates

The conventions for quoting radiocarbon dates and supporting information used here conform to the international standard known as the Trondheim Convention (Stuiver and Kra 1986).

The uncalibrated results are given as radiocarbon years before present (BP) where present has been fixed at AD 1950. These results are conventional radiocarbon ages (Stuiver and Polach 1977). Some material dates to after AD 1950. The radiocarbon content of these samples is expressed as a fraction of modern carbon (Mook and van der Plicht 1999).

Results which are, or may be, of the same actual radiocarbon age have been tested for statistical consistency using methods described by Ward and Wilson (1978).

These results, of course, are not true calendar ages, but have to be converted to calendar time by using a calibration curve made up of radiocarbon measurements on samples of wood whose age is known through dendrochronology (Pearson 1987). The calibrated date ranges provided in the datelist have been calculated using the maximum intercept method (Stuiver and Reimer 1986), OxCal v4.0 (Bronk Ramsey 2007), and the currently internationally agreed

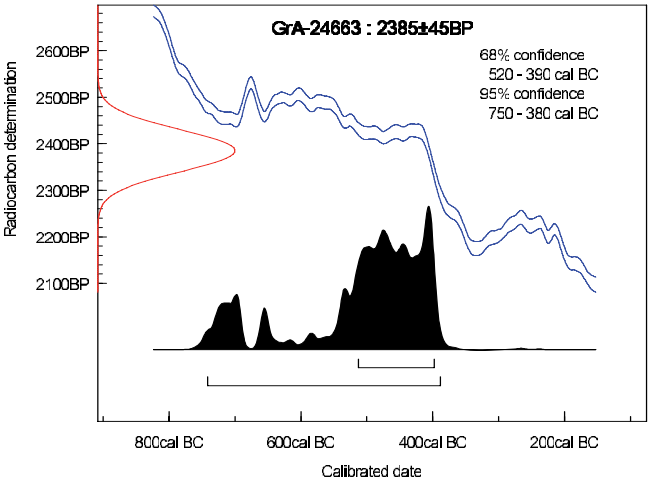

Fig 9 *calibrated radiocarbon date for GrA-24663*

dataset for terrestrial samples from the Northern hemisphere published by Reimer *et al* (2004). Date ranges are quoted in the form recommended by Mook (1986) with the end points rounded outwards to 10 years (or five years when error terms are less than ±25 BP). Ranges in the datelist itself are quoted at 68% and 95% confidence; the calibrated date ranges referred to in the commentaries are those for 95% confidence unless otherwise specified.

Whilst it is hoped that readers will find the calibrations provided helpful, it is necessary to recognise their limitations. First, the intercept method itself is best regarded as a 'quick and simple' way of providing an indication of the calendar date of a sample. The full complexity of the calendar age is only apparent from the probability distribution of the calibrated date. This can be illustrated by considering the calibration of GrA-24663 from Hartshill Copse, Berkshire (see below p55). This measurement (2385±45BP) calibrates to 750–380 cal BC (at 95% confidence) and 520–390 cal BC (at 68% confidence) using the maximum intercept method. The calibration of this sample using the probability method (Stuiver and Reimer 1993) is shown in Fig 9. It can be seen that some parts of the calibrated range—particularly when this is cited at 95% confidence—are more probable than others. It is not so much that the intercept calibration is wrong, but it does not necessarily convey the full complexity of the scientific information available.

The second limitation of the calibrated dates provided in this volume is that they are not definitive. Radiocarbon calibration is continually being refined, with updated and internationally agreed calibration curves being issued periodically (eg Stuiver and Pearson 1986; Pearson and Stuiver 1986; Stuiver *et al* 1998; and currently Reimer *et al* 2004). It is thus certain that the calibrated dates quoted here will become outdated, and that the measurements listed here will need to be re-calibrated. It is one of the major objectives of this datelist to provide easy access to the information needed for such re-calibration so that these data can be used in future research. It is for this reason that it is so important that users cite both the unique laboratory identifier for each measurement and the uncalibrated radiocarbon age when using the results listed in this volume—this is a courtesy and convenience to the readers of your publications who will themselves need to re-calibrate the results in due course!

Results older than *c* 21,380 BP fall beyond the limit of the presently internationally agreed calibration data (26,000 cal BP; van der Plicht *et al* 2004), and have not been calibrated.

This is an area of active research, however, and this situation is likely to change in the next few years. Measurements more recent than AD 1950 have been calibrated using the atmospheric data of Kueppers *et al* (2004).

Radiocarbon dating: laboratory methods

Full details of the methods used for the preparation and radiocarbon dating of the samples included in this volume are provided in the references cited in this section. It is important that these technical details can be traced for each measurement as scientific methods are continuously evolving. For example, a method for reliably dating an entirely new type of material (cremated bone) became available as recently as 2001 (Lanting *et al* 2001). This information will be valuable in assessing the reliability of these measurements in the future.

Samples of charred and waterlogged plant remains, and carbonised residues processed at the Oxford Radiocarbon Accelerator Unit were prepared using methods outlined in Hedges *et al* (1989); cremated bones were processed as described by Lanting *et al* (2001); other bones were processed using the revised gelatinisation protocol described by Bronk Ramsey *et al* (2004a). Samples were combusted, graphitised, and dated by Accelerator Mass Spectrometry (AMS) as described by Bronk Ramsey *et al* (2004b)(Fig 10). All targets were graphite, except those for OxA-13770 and OxA-11163 which were carbon dioxide. These two samples were dated as described by Bronk Ramsey and Hedges (1997). Measurements provided by ORAU are identified by the laboratory code OxA.

The majority of samples dated at the Rijksuniversiteit, Groningen were processed using the acid/alkali/acid protocol of Waterbolk and Mook (1985); samples of cremated bone were prepared as described by Lanting *et al* (2001); samples of unburnt bone were prepared as described by Longin (1971); carbonised residues on pottery sherds were pretreated

Fig 10 *inspecting the Oxford Accelerator*

Fig 11 *combusting a sample for dating by gas proportional counting at Groningen*

Fig 12 *cleaning carbon dioxide prior to benzene synthesis*

by using the acid/alkali/acid method on the entire sherd and selecting the alkali-soluble fraction for dating (Mook and Streurman 1983). The samples were then combusted to carbon dioxide and graphitised as described by Aerts-Bijma *et al* (1997; 2001) and dated by Accelerator Mass Spectrometry (AMS) (van der Plicht *et al* 2000). Measurements made at Groningen by AMS are identified by the laboratory code GrA.

Further samples were dated at Groningen using Gas Proportional Counting of carbon dioxide (Fig 11). These samples were prepared using the acid/alkali/acid method (Waterbolk and Mook 1985) and dated as described by Mook and Streurman (1983). Many of these samples were bulk organic sediment which was too humified for the preservation of waterlogged plant macrofossils. In many cases the acid insoluble/alkali soluble ('humic acid') and alkali/acid insoluble ('humin') fractions of the sample were separated after pre-

treatment, combusted, and dated. Measurements made at Groningen using Gas Proportional Counting are identified by the laboratory code GrN.

Samples dated at the Scottish Universities Environmental Research Centre were processed as described by Stenhouse and Baxter (1983), except for two samples of unburnt bone from Wellington Quarry, Herefordshire (see below p135) which were prepared using the methods outlined in Ambers *et al* (1991). Samples were combusted to carbon dioxide and converted to benzene using a method similar to that initially described by Tamers (1965)(Fig 12). They were dated using Liquid Scintillation Spectrometry (Noakes *et al* 1965). A few samples of bulk sediment did not produce enough carbon dioxide for conventional dating, and so were graphitised according to procedures outlined in Slota *et al* (1987) and measured by Accelerator Mass Spectrometry (AMS)(Xu *et al* 2004). Results produced by the Scottish Universities Environmental Research Centre by Liquid Scintillation Spectrometry are identified by the laboratory code GU, those produced by AMS have the code SUERC.

Radiocarbon dating: quality assurance

All three laboratories maintained continual programmes of quality assurance procedures at the time when these measurements were made. No offsets were observed. In addition all the laboratories participated in international inter-comparison exercises during the periods when the measurements were made (Scott 2003). These tests indicate no laboratory bias and demonstrate the validity of the precision quoted.

As part of these quality control protocols, ten single-entity samples were measured in duplicate. In all cases the results are statistically consistent (Fig 13). The replicate pairs are on samples of carbonised residue on pottery, cremated bone, charcoal, a waterlogged plant macrofossil, and unburnt bone. In addition, three bone/antler samples from Hazleton North that had been dated by the Oxford Radiocarbon Accelerator Unit in the early 1980s (Saville *et al* 1987) were re-dated by the Groningen laboratory, in each case providing statistically consistent, although more precise, results (Meadows *et al* 2007).

Five samples of bulk material were also dated in replicate, in each case producing statistically consistent radiocarbon determinations (Fig 13). The double burial from Wellington Quarry, Herefordshire also produced statistically consistent measurements on samples from two articulated human skeletons buried in the same grave (GU-5976–7; p135).

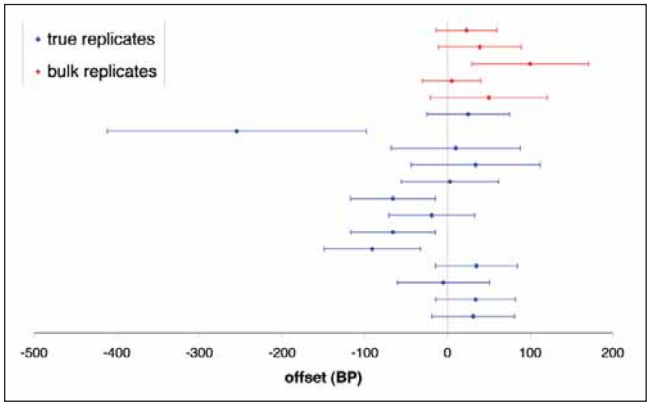

Fig 13 *offsets between replicate radiocarbon measurements on the same material (error bars are those for 68% confidence)*

Stable isotope measurements

All radiocarbon ages reported in this datelist have been corrected for fractionation as described in Stuiver and Polach (1977). The $\delta^{13}C$ values quoted were measured from sub-samples of carbon dioxide taken after combustion of the radiocarbon sample and measured by conventional mass spectrometry. These values have been used in the calculation of the radiocarbon ages reported by the Scottish Universities Environmental Research Centre. At Oxford and Groningen $\delta^{13}C$ values for each sample were also measured by AMS, and it is these (unreported) values which have been used to calculate the reported ages (Bronk Ramsey *et al* 2004b; van der Plicht *et al* 2000).

For collagen samples from bone and antler, $\delta^{15}N$ values from sub-samples of the same gas have also been reported by Oxford and Groningen. The protocol at the Scottish Universities Environmental Research Centre was different because of the flow-through combustion used for radiometric radiocarbon dating. In this case, sub-samples of the carbon dioxide produced during benzene synthesis were taken and provide the $\delta^{13}C$ values used for age calculation. Since the fractionation reported might derive from the combustion process in addition to the natural isotopic composition of the dated material, however, sub-samples of bone collagen were processed by closed-combustion and their isotopic values measured (Cook *et al* 2001). These are the $\delta^{13}C$ (diet) and $\delta^{15}N$ (diet) values reported in the datelist. These values are comparable with those from AMS laboratories.

Chronological modelling

Although the simple calibrated date ranges of radiocarbon measurements (such as those provided in this volume) are accurate estimates of the dates of the samples, this is usually not what we really wish to know as archaeologists. It is the dates of the archaeological events that are represented by those samples which are of interest, or the dates of phases of archaeological activity made up of those events. Fortunately explicit statistical methodology is now available which allows us to combine the results of the radiocarbon analyses with other information which we may have, such as stratigraphy, to produce realistic estimates of these dates of archaeological interest.

This methodology is known as the Bayesian approach to the interpretation of archaeological data (Buck *et al* 1996), and is becoming widely used in English archaeology (Bayliss and Bronk Ramsey 2004). Lindley (1985) provides a user-friendly introduction to the principles of Bayesian statistics, and Bayliss *et al* (2007) provide an introduction to the practice of chronological modelling for archaeological problems.

Most of the dates produced as part of the ALSF research programme between 2002 and 2004 have been interpreted within a Bayesian framework. This modelling has been undertaken by staff of the Scientific Dating Section of English Heritage (Alex Bayliss and Peter Marshall), in partnership with the project teams. Models have been implemented using the program OxCal (v3.5–3.10) (http://www.rlaha.ox.ac.uk/; Bronk Ramsey 1995; 1998; 2001), which uses a mixture of the Metropolis-Hastings algorithm and the more specific Gibbs sampler (Gilks *et al* 1996; Gelfand and Smith 1990). Full details of the algorithms employed by this program are available from the on-line manual, and fully worked examples are given in a series of papers by Buck *et al* (1991; 1992; 1994a–b).

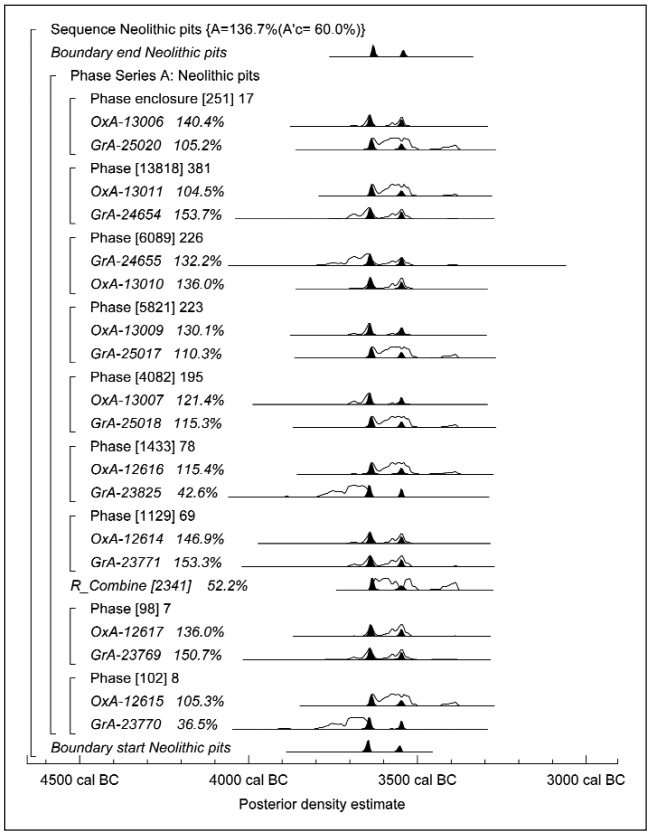

Fig 14 *probability distributions of dates from the causewayed enclosure at Lodge Farm, St Osyth. The large square brackets down the left-hand side of along with the OxCal keywords define the overall model exactly.*

The chronological models produced as part of this ALSF research programme are discussed in the relevant project publications or reports. These are cited in the datelist entries. The value of this approach is demonstrated by the example shown in Figs 14 and 15.

This model estimates the date of the Neolithic causewayed enclosure at Lodge Farm, St Osyth, Essex (Germany 2007; Fig 2). In Figure 14 each distribution represents the relative probability that an event occurred at a particular time. For each of the dates two distributions have been plotted,

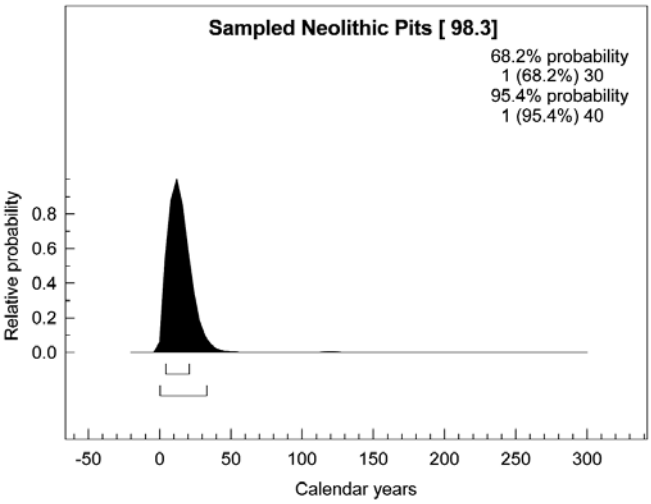

Fig 15 *probability distribution of the number of years during which the St Osyth causewayed enclosure was in use, derived from the model shown in Fig 13.*

one in outline which is the result produced by the scientific evidence alone (the calibrated radiocarbon date), and a solid one which is based on the chronological model used. The other distributions correspond to aspects of the model. For example, the distribution '*start Neolithic pits*' is the estimated date when the first pit within the enclosure was dug. In this example, this distribution is strongly bi-model and we can only suggest that this happened in either *3670–3630 cal BC (61% probability; start Neolithic pits)* or *3570–3540 cal BC (34% probability)*.

Perhaps more importantly in this case, by comparing our formal estimates for the dates when the first pit and the last pit were dug on the site, it is possible to estimate the duration of use of the enclosure. This suggests that it was in use for *1–40 years (95% probability; Neolithic pits)*—probably for a single generation!

This unexpectedly short period of use is not apparent from examination of the simple calibrated radiocarbon dates (shown in white in Fig 14). The dangers of interpreting suites of radiocarbon dates by visual inspection of the graphs of calibrated dates is discussed further in Bayliss *et al* (2007).

Further chronological modelling in support of the ALSF research programme was provided through an 18-month project specifically designed to increase capacity for this form of analysis in English archaeology. This project was based at the Institute of Archaeology, University College London, and supervised by Professor Clive Orton. It provided training in scientific dating and Bayesian modelling. In addition to providing valuable assistance to the English Heritage Scientific Dating Team in the chronological modelling of other ALSF projects, John Meadows also undertook two projects specifically for training purposes.

Fig 16 *Amanda Grieve sampling a human bone from Hazleton North Long Cairn*

The first of these was the modelling and further dating of the Neolithic Cotswold Long Cairn at Hazleton North, Gloucestershire (Saville 1990), selected because of the scale and quality of the existing suite of radiocarbon determinations, the detailed site publication which enabled modelling without further examination of the primary archive, and because of the apparent potential to refine the chronology of the site through integrating the dates with the stratigraphic sequence revealed through excavation. In the event, additional sampling and dates (Fig 16) enabled a further series of detailed questions to be addressed (Meadows *et al* 2007).

The second specifically training project re-assessed and analysed existing data for the Younger Dryas episode and the radiocarbon chronologies of the lake Huleh and Ghab valley pollen diagrams, Israel and Syria. This work has also been published (Meadows 2005).

Using the datelist

Radiocarbon determinations are identified by a unique laboratory code. So, for example, OxA is the code for the Oxford Accelerator, and OxA-12683 is the 12,683rd measurement produced by the laboratory. This code is the internationally-agreed identifier by which every radiocarbon determination can be traced. OxA-12683 refers to the age produced on a hazel/alder twig sieved from sediment from the Lower Tweed valley at Coldstream (p117) and only to that measurement. An index of these codes is therefore provided to enable further details of dates cited elsewhere to be easily traced.

A more traditional index of key terms is also provided. This enables dates from particular sites, or of particular materials, of with particular archaeological associations to be traced (eg dates relating to the elm decline or Mildenhall Ware). Readers are cautioned that the latter entries in particular may be partial or even unreliable! Much of the information in this datelist was provided on sample submission and revised during post-excavation analysis. In many cases the appearance of this datelist precedes the full academic publication of the projects concerned. Alternatively, the results of projects may have been disseminated through archive reports, the internet, or other more appropriate media. Every effort has been made, however, to provide a link to further information about each project which produced dated samples.

Acknowledgements

This datelist has be compiled and edited by Amanda Grieve and Henriette Johansen, on the basis of information provided by the submitters of the samples dated and by the radiocarbon laboratories. Design has been the responsibility of Mark Simmons, and the overall production of the volume has been overseen by David Jones.

The information has been output from the English Heritage Radiocarbon Database. This has been developed over many years, successively by Paul Cheetham, Sarah Hill, Manuela Lopez, Marcos Guillen, Mike Gratton, David Head, and Carlton Carver. The appearance of this volume marks a significant milestone in the development of this system.

Radiocarbon dating is a complex and labour-intensive process which takes time. It is a tribute to the effort and efficiency of the staff of our dating laboratories that such numbers of accurate measurements were made in such a small space of time. The logistics of this task fell principally upon Henny Deenen, Peter Marshall, Tom Higham, Clare Owen, and Diane Baker. For the actual preparation and dating of samples we are grateful to Angela Bowles, Peter Ditchfield, Celia Sykes, Martin Humm, Philip Leach, and Christine Tompkins at the Oxford Radiocarbon Accelerator Unit; Anita Aerts-Bijma, Henk Been, Fsaha Ghebru, Bert Kers, Harm-Jan Streurman, Stef Wijma and Dicky van Zonneveld at the Rijksuniversiteit Groningen; and Robert Anderson, Andrew Dougans, Elaine Dunbar, Stuart Freeman, Philip Naysmith, Christoph Schnabel, and Sheng Xu of the Scottish Universities Environmental Research Centre.

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RADIOCARBON DATES

from samples funded by English Heritage
under the Aggregates Levy Sustainability Fund 2002–4

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Contents

Scientific Dating and the Aggregates Levy Sustainability Fund (2002–4)

Introduction

The Aggregates Levy Sustainability Fund (ALSF) was introduced as a two-year pilot scheme in April 2002 to provide funds to help address the environmental costs of aggregate extraction. This was based on a proportion of the Aggregates Levy, a tax of £1.60 per tonne on all newly-won aggregates.

In England the ALSF was set up to provide grant support for a number of initiatives, including research into more environmentally-friendly extraction and transport and greater use of recycled materials. A significant proportion of the ALSF was set aside to mitigate the environmental impacts of aggregate extraction. English Heritage, along with English Nature and the Countryside Agency, was a major distributor for this part of the fund on behalf of the Department of Environment, Food and Rural Affairs (DEFRA).

The English Heritage ALSF scheme aims to reduce the impacts of aggregate extraction on the historic environment. For the pilot scheme, applications for awards in three key areas were encouraged:

Fig 1 *Coring for palaeoenvironmental deposits in the Swale/Ure Washlands, Yorkshire (© Durham University)*

Fig 2 *Excavation of a ditch of the Neolithic causewayed enclosure at Lodge Farm, St Osyth, Essex (© Essex County Council Field Archaeology Unit)*

Projects which would deliver reliable predictive information and techniques to enable planning authorities and the aggregates industry to minimise the impact of aggregates extraction on the historic environment in the future (Fig 1).

Projects which would increase understanding and dissemination of knowledge gained from previous work on aggregates extraction landscapes, thus informing the future management of such areas (Fig 2).

In partnership with English Nature and the Countryside Agency, the targeted buying-out of old mineral permissions to enable the long-term management of aspects of the historic environment.

In total, English Heritage funded projects worth over £9.5 million during the pilot scheme. Further details of this programme can be found at http://www.english-heritage.org.uk, and further details of the wider ALSF programme can be found at http://www.defra.gov.uk.

Scientific dating

As the project proposals began to flood in during the spring of 2002, it quickly became apparent that an extensive programme of scientific dating would be required to underpin the objectives of the scheme. It was also clear that, once project designs had been agreed and suitable material retrieved for dating, this dating programme would have to be delivered in a very short timescale (in fact the vast majority of the work was completed during 2003).

For radiocarbon dating framework agreements were established with a number of laboratories to enable the programme of radiocarbon research to be completed in the necessary timescale. In total, 476 radiocarbon ages have been reported at a cost of £129,000. The central provision of radiocarbon dating for all the projects funded through this scheme has not only enabled the production of this volume, but also provided economies of scale which have allowed considerable cost savings to be achieved. Streamlining the sample selection and submission process, along with the efficiency and hard-work of the staff of our collaborating laboratories, enabled the provision of radiocarbon dating within the extremely challenging timescale demanded.

No tree-ring dating was undertaken from any of the projects funded by the ALSF. A single dendrochronology assessment was undertaken by Robert Howard of the Nottingham University Tree-ring Dating Laboratory on material from Watermead Country Park, Birstall, Leicestershire. This demonstrated that there was no potential for tree-ring dating from these timbers, and his results have been incorporated in the subsequent radiocarbon dating programme for the site (see p32–9).

Large-scale programmes of dating using Optically Stimulated Luminescence (OSL) (Aitken 1998) were funded for a number of projects, at a cost of more than £60,000. This method dates the last time a sediment was exposed to light, and is particularly appropriate for dating sands and gravels. Technical advances in the past few years have improved the precision and accuracy of the method considerably (Duller 2004).

Fig 3 *sampling the Dungeness Foreland for Optically Stimulated Luminescence dating (© Dr A Long, Durham University)*

Fig 4 *middle Pleistocene river terrace sands and gravels at Pratt's New Pit, Broom, Dorset (© Dr Robert Hosfield, University of Reading and Dr Jenni Chambers, Birmingham University)*

This is undoubtedly a swiftly developing discipline, however, and it is essential that these measurements are interpreted in the light of technical information which enables an assessment of the reliability of the dates to be undertaken. For this reason, full archive reports have been commissioned for each OSL application. These reports are available from English Heritage, Fort Cumberland, Fort Cumberland Road, Eastney, Portsmouth, PO4 9LD (res.reports@english-heritage.org.uk).

OSL dating was undertaken as part of the research programmes into the evolution of the Dungeness Foreland, Kent (Fig 3; Roberts and Plater 2005), the Palaeolithic archaeology of the Sussex/Hampshire corridor (Schwenninger *et al* 2006), and of Palaeolithic deposits at Lynford Quarry, Norfolk (Schwenninger and Rhodes 2005) and Broom on the Devon/Dorset border (Fig 4; Toms *et al* 2005).

Deposits from Flixborough and Welton-le-Wold, Lincolnshire (Schwenninger 2005; 2007) were also dated by OSL, as were sub-marine gravels off the coast of Sussex as part of the palaeo-Arun project (Bailey forthcoming). Technically challenging material was analysed using single-grain techniques from two Neolithic cursus monuments at Barford Road, St Neots, Cambridgeshire (Rhodes 2007), and from the Swale-Ure Washlands (Duller 2007). Both Thermoluminescence (TL) and Optically Stimulated Luminescence (OSL) dates were obtained from excavations of Mesolithic occupation at North Park Farm, Bletchingley, Surrey (Toms 2005)

Dating of molluscs recovered from gravel deposits using Amino-Acid Racemization (Johnson and Miller 1996; Hare *et al* 1997; McCarroll 2002) was also attempted as part of two projects—the Palaeolithic archaeology of the Sussex/Hampshire corridor, and Lynford Quarry, Norfolk. In both cases, no absolute dating was achieved, although useful research was undertaken which may enable successful dating of similar deposits in the future. Detailed archive reports for both of these studies are also available from English Heritage (Collins and Penkman 2004a–b).

Finally, a programme of dating marsh sediment cores using Palaeomagnetic Secular Variation (PSV) was attempted as part of the project to examine the depositional history of Dungeness Foreland (Tarling 1983; Barendregt 1998; English Heritage 2006). A full report on this work is also available from English Heritage (Plater *et al* 2006).

Radiocarbon dating: sample selection

Most radiocarbon samples processed as part of the ALSF research programme were dated using Accelerator Mass Spectrometry (AMS)(Fig 5). This proportion (84%) is equivalent to the proportion of samples dated by AMS from the other archaeological research programmes funded by English Heritage during this period (81%). The remaining samples were dated by Gas Proportional Counting (12%) or Liquid Scintillation Spectrometry (4%). An introduction to these methods of measuring radiocarbon is provided in Bayliss *et al* (2004).

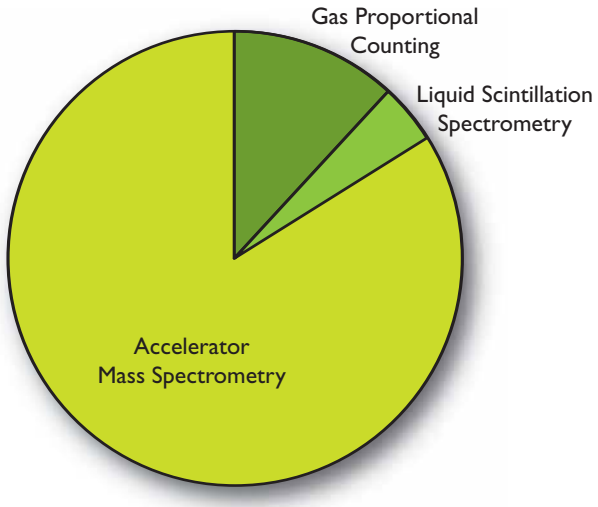

Fig 5 *techniques of radiocarbon dating used for ALSF samples 2002–4*

The proportion of bone and antler samples dated under the ALSF programme is extremely low (Fig 6), 8% compared to 28% for samples dated in support of the other archaeological research programmes funded by English Heritage in 2002–4. This is undoubtedly caused by the poor survival of bone on many gravel sites. Even where bone is recovered, samples may not be datable because of poor collagen preservation (Hedges and van Klinken 1992; van Klinken 1999). Research investigating this problem, which can be a severe impediment to constructing reliable chronologies for archaeological sites on aggregate deposits, has been undertaken by Oxford University (Brock *et al* 2007).

The relative rarity of adequate bone preservation means that the articulated and articulating bone groups, which provide a large proportion of the samples selected for dating on other archaeological sites, are not available from sands and gravels. Consequently, more reliance has to be placed on single-entity samples of charred plant remains (Ashmore 1999). Typically more uncertainty is attached to the taphonomy of such samples, and so more replication is required in the hope that consistent results from the same context suggest that the dated material was fresh when deposited. All carbonised plant remains were confirmed as short-lived species or sapwood before submission for dating. Samples consisted of material from a single plant (eg one cereal grain, one nutshell, one fragment of charcoal) unless otherwise specified.

Carbonised residues adhering to the internal surfaces of ceramics provide another large group of samples suitable for dating from aggregate sites (Fig 6). In this case, refitting sherds may suggest that a sample is close in age to the deposit from which it was recovered. Even when fragments do not refit, the degree of abrasion of the sherds, and the fragility of much of the pottery concerned, may suggest that it was freshly deposited. Internal residues are interpreted as carbonised food remains from the use of vessels. External residues are avoided as these may represent sooting from fires which may introduce an age offset if heartwood or peat was used as fuel (Bowman 1990, 15). Most carbonised residues are, however, poorly characterised chemically, and technical problems with their dating remain (Hedges *et al* 1992). Although the first steps have been taken to enable the dating of absorbed fatty residues from pottery (Stott *et al* 2003), this technique is not yet routine and was not used for samples funded as part of this research programme.

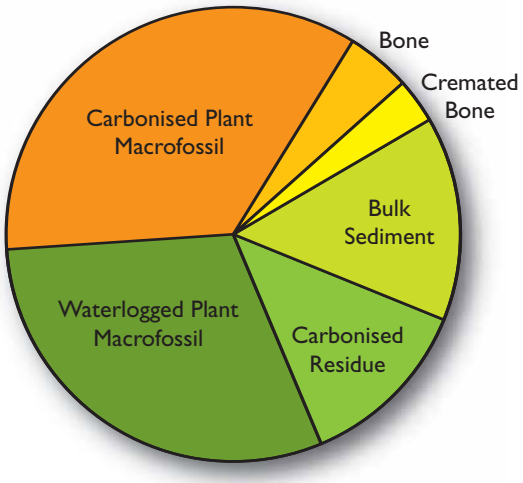

Fig 6 *types of sample material dated*

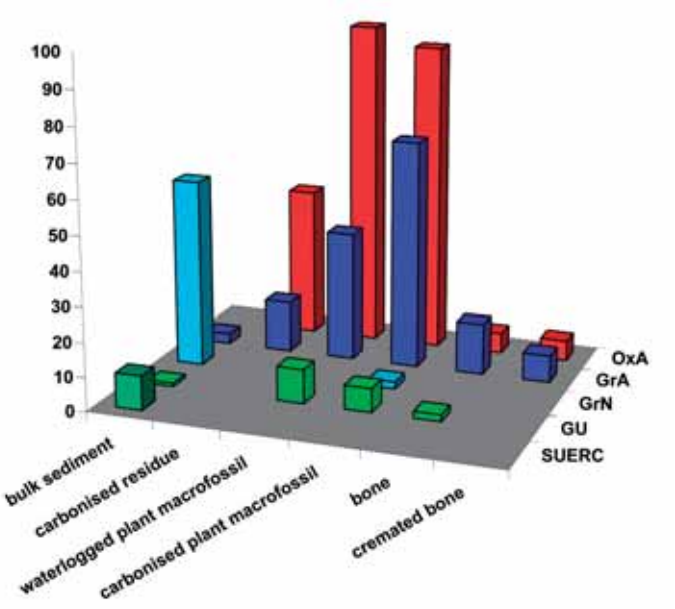

Fig 7 *types of sample material processed by each collaborating facility*

A number of samples of cremated bone were dated, however, using a new protocol which has recently been developed to date this type of sample reliably (Lanting *et al* 2001; van Strydonck *et al* 2005). Replicate determinations on fragments of cremated bone and charred plant macrofossils were obtained from eight deposits. Statistically consistent results were obtained from all of these contexts, in each case with measurements obtained from two different laboratories (Fig 7).

As part of the landscape characterisation which formed a core objective of many ALSF projects, a large number of organic deposits were dated. Wherever possible single fragments of waterlogged plant material were submitted for dating, although in some cases these were too small even for AMS dating and a number of items had to be combined to form a viable sample. In all cases these plant macrofossils were identified as short-lived material of terrestrial origin. Aquatic species were not selected for dating to avoid the possibility of hard water error (Bowman 1990, 25–6). The reliability of these samples for dating the deposits from which they were recovered was assessed by the consistency of the results in relation to the relative dating of the deposits provided by stratigraphy, and by the consistency of results on duplicate macrofossils from the same level.

Unfortunately, in many instances suitable plant material could not be recovered from the organic deposits selected for dating as they were too humified (Fig 8). In these cases,

Fig 8 *sediments retrieved from the base of Muddymore Pit, Dungeness Foreland, Kent (© Dr A Long, Durham University)*

bulk organic material had to be dated. This is a hazardous process, and a number of safeguards were adopted in an attempt to assess the reliability of the dates obtained. Firstly, material was submitted from stratigraphically related deposits so that the agreement between the stratigraphic information and the radiocarbon results could be assessed. Multiple measurements on different chemical fractions of the same sample were also obtained. In cases where these measurements are statistically consistent, more confidence can be placed in the estimated date of the deposit concerned. When these replicate measurements do not agree, then caution is indicated. Finally, in an attempt to address potential problems of inhomogeneity within deposits, relatively large samples suitable for radiometric dating were submitted wherever possible.

The humic acid and humin fractions were dated from 19 samples, 16 by Gas Proportional Counting, two by Accelerator Mass Spectrometry, and one where the humic acid fraction was dated by accelerator and the humin fraction conventionally. Fifteen of these samples produced statistically consistent radiocarbon ages, but four did not (including all three with AMS measurements). This proportion of outliers is greater than would be expected simply from the statistical scatter on the measurements, and the inconsistent ages are widely divergent (see, for example, GrN-24065 and GrA-28101 from The Rye area project: Greyfriars, p99). It seems that when the organic content of a bulk sample is particularly low, contamination is more problematic. However, even consistent ages on different fractions are not a foolproof indication that radiocarbon dates accurately date a sediment deposit: for instance, consistent ages from Dungeness, Wickmaryholm Pit (GrN-27873 and GrN-27912) are significantly earlier than statistically consistent replicate ages on a macrofossil from the same level (GrA-22407 and GrA-22413)(p46–7), and the coarse humin fraction from a sample at Rye Harbour, Pewis Marsh is significantly earlier than consistent ages on the fine humin and humic acid fractions of the same sample (GrN-28059–61; p108). Further discussion of the difficulties of dating organic deposits can be found in Dresser (1970), Shore *et al* (1995), and Cook *et al* (1998).

Radiocarbon ages and calibrated dates

The conventions for quoting radiocarbon dates and supporting information used here conform to the international standard known as the Trondheim Convention (Stuiver and Kra 1986).

The uncalibrated results are given as radiocarbon years before present (BP) where present has been fixed at AD 1950. These results are conventional radiocarbon ages (Stuiver and Polach 1977). Some material dates to after AD 1950. The radiocarbon content of these samples is expressed as a fraction of modern carbon (Mook and van der Plicht 1999).

Results which are, or may be, of the same actual radiocarbon age have been tested for statistical consistency using methods described by Ward and Wilson (1978).

These results, of course, are not true calendar ages, but have to be converted to calendar time by using a calibration curve made up of radiocarbon measurements on samples of wood whose age is known through dendrochronology (Pearson 1987). The calibrated date ranges provided in the datelist have been calculated using the maximum intercept method (Stuiver and Reimer 1986), OxCal v4.0 (Bronk Ramsey 2007), and the currently internationally agreed

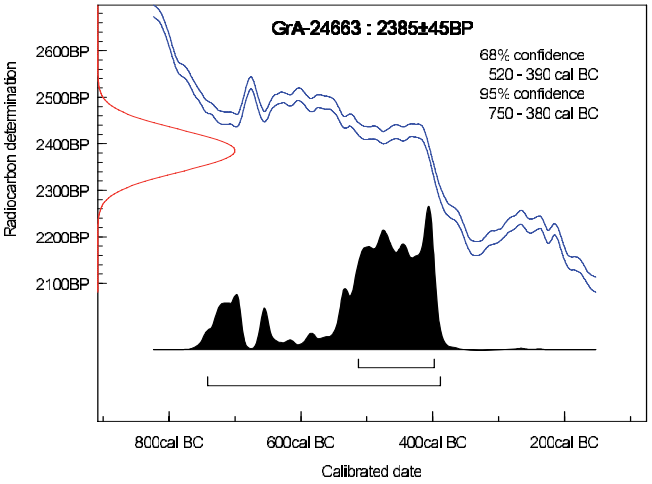

Fig 9 *calibrated radiocarbon date for GrA-24663*

dataset for terrestrial samples from the Northern hemisphere published by Reimer *et al* (2004). Date ranges are quoted in the form recommended by Mook (1986) with the end points rounded outwards to 10 years (or five years when error terms are less than ±25 BP). Ranges in the datelist itself are quoted at 68% and 95% confidence; the calibrated date ranges referred to in the commentaries are those for 95% confidence unless otherwise specified.

Whilst it is hoped that readers will find the calibrations provided helpful, it is necessary to recognise their limitations. First, the intercept method itself is best regarded as a 'quick and simple' way of providing an indication of the calendar date of a sample. The full complexity of the calendar age is only apparent from the probability distribution of the calibrated date. This can be illustrated by considering the calibration of GrA-24663 from Hartshill Copse, Berkshire (see below p55). This measurement (2385±45BP) calibrates to 750–380 cal BC (at 95% confidence) and 520–390 cal BC (at 68% confidence) using the maximum intercept method. The calibration of this sample using the probability method (Stuiver and Reimer 1993) is shown in Fig 9. It can be seen that some parts of the calibrated range—particularly when this is cited at 95% confidence—are more probable than others. It is not so much that the intercept calibration is wrong, but it does not necessarily convey the full complexity of the scientific information available.

The second limitation of the calibrated dates provided in this volume is that they are not definitive. Radiocarbon calibration is continually being refined, with updated and internationally agreed calibration curves being issued periodically (eg Stuiver and Pearson 1986; Pearson and Stuiver 1986; Stuiver *et al* 1998; and currently Reimer *et al* 2004). It is thus certain that the calibrated dates quoted here will become outdated, and that the measurements listed here will need to be re-calibrated. It is one of the major objectives of this datelist to provide easy access to the information needed for such re-calibration so that these data can be used in future research. It is for this reason that it is so important that users cite both the unique laboratory identifier for each measurement and the uncalibrated radiocarbon age when using the results listed in this volume—this is a courtesy and convenience to the readers of your publications who will themselves need to re-calibrate the results in due course!

Results older than *c* 21,380 BP fall beyond the limit of the presently internationally agreed calibration data (26,000 cal BP; van der Plicht *et al* 2004), and have not been calibrated.

This is an area of active research, however, and this situation is likely to change in the next few years. Measurements more recent than AD 1950 have been calibrated using the atmospheric data of Kueppers *et al* (2004).

Radiocarbon dating: laboratory methods

Full details of the methods used for the preparation and radiocarbon dating of the samples included in this volume are provided in the references cited in this section. It is important that these technical details can be traced for each measurement as scientific methods are continuously evolving. For example, a method for reliably dating an entirely new type of material (cremated bone) became available as recently as 2001 (Lanting *et al* 2001). This information will be valuable in assessing the reliability of these measurements in the future.

Samples of charred and waterlogged plant remains, and carbonised residues processed at the Oxford Radiocarbon Accelerator Unit were prepared using methods outlined in Hedges *et al* (1989); cremated bones were processed as described by Lanting *et al* (2001); other bones were processed using the revised gelatinisation protocol described by Bronk Ramsey *et al* (2004a). Samples were combusted, graphitised, and dated by Accelerator Mass Spectrometry (AMS) as described by Bronk Ramsey *et al* (2004b) (Fig 10). All targets were graphite, except those for OxA-13770 and OxA-11163 which were carbon dioxide. These two samples were dated as described by Bronk Ramsey and Hedges (1997). Measurements provided by ORAU are identified by the laboratory code OxA.

The majority of samples dated at the Rijksuniversiteit, Groningen were processed using the acid/alkali/acid protocol of Waterbolk and Mook (1985); samples of cremated bone were prepared as described by Lanting *et al* (2001); samples of unburnt bone were prepared as described by Longin (1971); carbonised residues on pottery sherds were pretreated

Fig 10 *inspecting the Oxford Accelerator*

Fig 11 *combusting a sample for dating by gas proportional counting at Groningen*

Fig 12 *cleaning carbon dioxide prior to benzene synthesis*

by using the acid/alkali/acid method on the entire sherd and selecting the alkali-soluble fraction for dating (Mook and Streurman 1983). The samples were then combusted to carbon dioxide and graphitised as described by Aerts-Bijma *et al* (1997; 2001) and dated by Accelerator Mass Spectrometry (AMS) (van der Plicht *et al* 2000). Measurements made at Groningen by AMS are identified by the laboratory code GrA.

Further samples were dated at Groningen using Gas Proportional Counting of carbon dioxide (Fig 11). These samples were prepared using the acid/alkali/acid method (Waterbolk and Mook 1985) and dated as described by Mook and Streurman (1983). Many of these samples were bulk organic sediment which was too humified for the preservation of waterlogged plant macrofossils. In many cases the acid insoluble/alkali soluble ('humic acid') and alkali/acid insoluble ('humin') fractions of the sample were separated after pre-

treatment, combusted, and dated. Measurements made at Groningen using Gas Proportional Counting are identified by the laboratory code GrN.

Samples dated at the Scottish Universities Environmental Research Centre were processed as described by Stenhouse and Baxter (1983), except for two samples of unburnt bone from Wellington Quarry, Herefordshire (see below p135) which were prepared using the methods outlined in Ambers *et al* (1991). Samples were combusted to carbon dioxide and converted to benzene using a method similar to that initially described by Tamers (1965)(Fig 12). They were dated using Liquid Scintillation Spectrometry (Noakes *et al* 1965). A few samples of bulk sediment did not produce enough carbon dioxide for conventional dating, and so were graphitised according to procedures outlined in Slota *et al* (1987) and measured by Accelerator Mass Spectrometry (AMS)(Xu *et al* 2004). Results produced by the Scottish Universities Environmental Research Centre by Liquid Scintillation Spectrometry are identified by the laboratory code GU, those produced by AMS have the code SUERC.

Radiocarbon dating: quality assurance

All three laboratories maintained continual programmes of quality assurance procedures at the time when these measurements were made. No offsets were observed. In addition all the laboratories participated in international inter-comparison exercises during the periods when the measurements were made (Scott 2003). These tests indicate no laboratory bias and demonstrate the validity of the precision quoted.

As part of these quality control protocols, ten single-entity samples were measured in duplicate. In all cases the results are statistically consistent (Fig 13). The replicate pairs are on samples of carbonised residue on pottery, cremated bone, charcoal, a waterlogged plant macrofossil, and unburnt bone. In addition, three bone/antler samples from Hazleton North that had been dated by the Oxford Radiocarbon Accelerator Unit in the early 1980s (Saville *et al* 1987) were re-dated by the Groningen laboratory, in each case providing statistically consistent, although more precise, results (Meadows *et al* 2007).

Five samples of bulk material were also dated in replicate, in each case producing statistically consistent radiocarbon determinations (Fig 13). The double burial from Wellington Quarry, Herefordshire also produced statistically consistent measurements on samples from two articulated human skeletons buried in the same grave (GU-5976–7; p135).

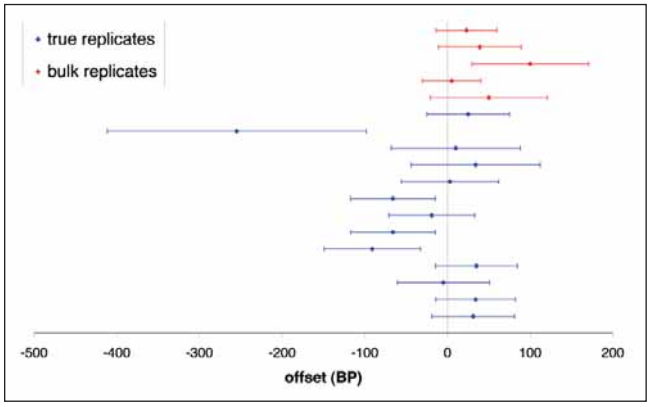

Fig 13 *offsets between replicate radiocarbon measurements on the same material (error bars are those for 68% confidence)*

Stable isotope measurements

All radiocarbon ages reported in this datelist have been corrected for fractionation as described in Stuiver and Polach (1977). The $\delta^{13}C$ values quoted were measured from sub-samples of carbon dioxide taken after combustion of the radiocarbon sample and measured by conventional mass spectrometry. These values have been used in the calculation of the radiocarbon ages reported by the Scottish Universities Environmental Research Centre. At Oxford and Groningen $\delta^{13}C$ values for each sample were also measured by AMS, and it is these (unreported) values which have been used to calculate the reported ages (Bronk Ramsey *et al* 2004b; van der Plicht *et al* 2000).

For collagen samples from bone and antler, $\delta^{15}N$ values from sub-samples of the same gas have also been reported by Oxford and Groningen. The protocol at the Scottish Universities Environmental Research Centre was different because of the flow-through combustion used for radiometric radiocarbon dating. In this case, sub-samples of the carbon dioxide produced during benzene synthesis were taken and provide the $\delta^{13}C$ values used for age calculation. Since the fractionation reported might derive from the combustion process in addition to the natural isotopic composition of the dated material, however, sub-samples of bone collagen were processed by closed-combustion and their isotopic values measured (Cook *et al* 2001). These are the $\delta^{13}C$ (diet) and $\delta^{15}N$ (diet) values reported in the datelist. These values are comparable with those from AMS laboratories.

Chronological modelling

Although the simple calibrated date ranges of radiocarbon measurements (such as those provided in this volume) are accurate estimates of the dates of the samples, this is usually not what we really wish to know as archaeologists. It is the dates of the archaeological events that are represented by those samples which are of interest, or the dates of phases of archaeological activity made up of those events. Fortunately explicit statistical methodology is now available which allows us to combine the results of the radiocarbon analyses with other information which we may have, such as stratigraphy, to produce realistic estimates of these dates of archaeological interest.

This methodology is known as the Bayesian approach to the interpretation of archaeological data (Buck *et al* 1996), and is becoming widely used in English archaeology (Bayliss and Bronk Ramsey 2004). Lindley (1985) provides a user-friendly introduction to the principles of Bayesian statistics, and Bayliss *et al* (2007) provide an introduction to the practice of chronological modelling for archaeological problems.

Most of the dates produced as part of the ALSF research programme between 2002 and 2004 have been interpreted within a Bayesian framework. This modelling has been undertaken by staff of the Scientific Dating Section of English Heritage (Alex Bayliss and Peter Marshall), in partnership with the project teams. Models have been implemented using the program OxCal (v3.5–3.10) (http://www.rlaha.ox.ac.uk/; Bronk Ramsey 1995; 1998; 2001), which uses a mixture of the Metropolis-Hastings algorithm and the more specific Gibbs sampler (Gilks *et al* 1996; Gelfand and Smith 1990). Full details of the algorithms employed by this program are available from the on-line manual, and fully worked examples are given in a series of papers by Buck *et al* (1991; 1992; 1994a–b).

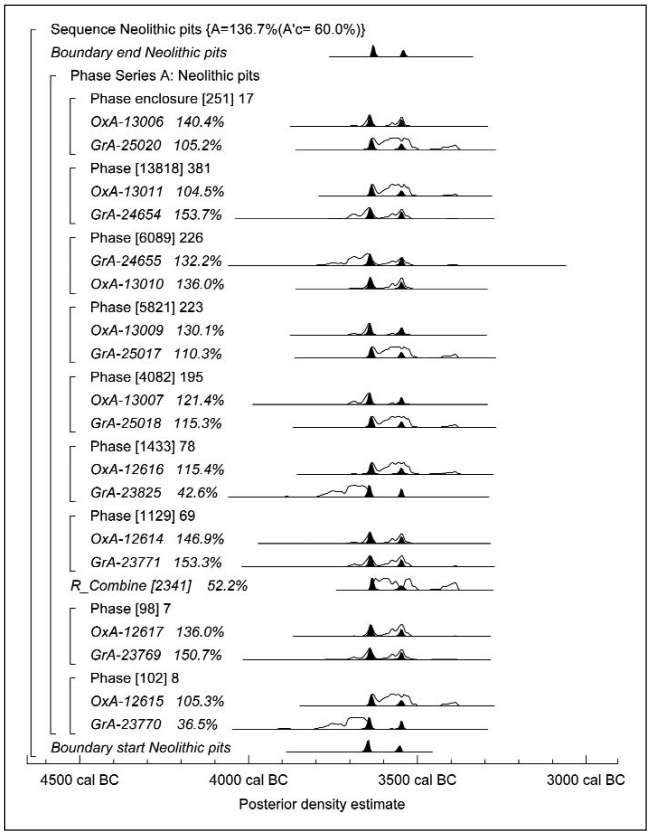

Fig 14 *probability distributions of dates from the causewayed enclosure at Lodge Farm, St Osyth. The large square brackets down the left-hand side of along with the OxCal keywords define the overall model exactly.*

The chronological models produced as part of this ALSF research programme are discussed in the relevant project publications or reports. These are cited in the datelist entries. The value of this approach is demonstrated by the example shown in Figs 14 and 15.

This model estimates the date of the Neolithic causewayed enclosure at Lodge Farm, St Osyth, Essex (Germany 2007; Fig 2). In Figure 14 each distribution represents the relative probability that an event occurred at a particular time. For each of the dates two distributions have been plotted, one in outline which is the result produced by the scientific evidence alone (the calibrated radiocarbon date), and a solid one which is based on the chronological model used. The other distributions correspond to aspects of the model. For example, the distribution '*start Neolithic pits*' is the estimated date when the first pit within the enclosure was dug. In this example, this distribution is strongly bi-model and we can only suggest that this happened in either *3670–3630 cal BC (61% probability; start Neolithic pits)* or *3570–3540 cal BC (34% probability)*.

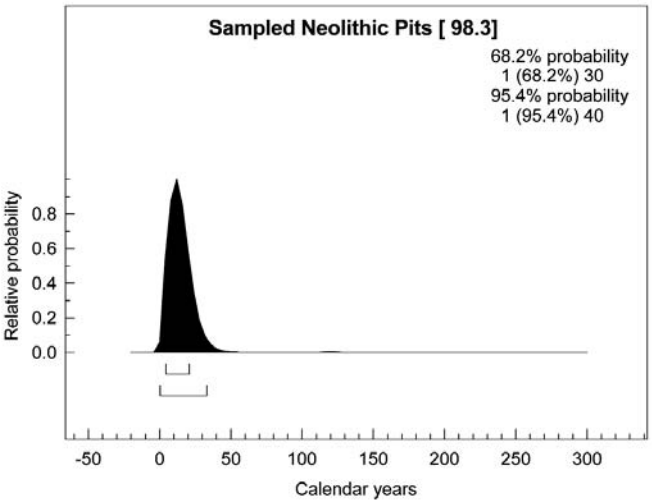

Fig 15 *probability distribution of the number of years during which the St Osyth causewayed enclosure was in use, derived from the model shown in Fig 13.*

Perhaps more importantly in this case, by comparing our formal estimates for the dates when the first pit and the last pit were dug on the site, it is possible to estimate the duration of use of the enclosure. This suggests that it was in use for *1–40 years (95% probability; Neolithic pits)*—probably for a single generation!

This unexpectedly short period of use is not apparent from examination of the simple calibrated radiocarbon dates (shown in white in Fig 14). The dangers of interpreting suites of radiocarbon dates by visual inspection of the graphs of calibrated dates is discussed further in Bayliss *et al* (2007).

Further chronological modelling in support of the ALSF research programme was provided through an 18-month project specifically designed to increase capacity for this form of analysis in English archaeology. This project was based at the Institute of Archaeology, University College London, and supervised by Professor Clive Orton. It provided training in scientific dating and Bayesian modelling. In addition to providing valuable assistance to the English Heritage Scientific Dating Team in the chronological modelling of other ALSF projects, John Meadows also undertook two projects specifically for training purposes.

Fig 16 *Amanda Grieve sampling a human bone from Hazleton North Long Cairn*

The first of these was the modelling and further dating of the Neolithic Cotswold Long Cairn at Hazleton North, Gloucestershire (Saville 1990), selected because of the scale and quality of the existing suite of radiocarbon determinations, the detailed site publication which enabled modelling without further examination of the primary archive, and because of the apparent potential to refine the chronology of the site through integrating the dates with the stratigraphic sequence revealed through excavation. In the event, additional sampling and dates (Fig 16) enabled a further series of detailed questions to be addressed (Meadows *et al* 2007).

The second specifically training project re-assessed and analysed existing data for the Younger Dryas episode and the radiocarbon chronologies of the lake Huleh and Ghab valley pollen diagrams, Israel and Syria. This work has also been published (Meadows 2005).

Using the datelist

Radiocarbon determinations are identified by a unique laboratory code. So, for example, OxA is the code for the Oxford Accelerator, and OxA-12683 is the 12,683rd measurement produced by the laboratory. This code is the internationally-agreed identifier by which every radiocarbon determination can be traced. OxA-12683 refers to the age produced on a hazel/alder twig sieved from sediment from the Lower Tweed valley at Coldstream (p117) and only to that measurement. An index of these codes is therefore provided to enable further details of dates cited elsewhere to be easily traced.

A more traditional index of key terms is also provided. This enables dates from particular sites, or of particular materials, of with particular archaeological associations to be traced (eg dates relating to the elm decline or Mildenhall Ware). Readers are cautioned that the latter entries in particular may be partial or even unreliable! Much of the information in this datelist was provided on sample submission and revised during post-excavation analysis. In many cases the appearance of this datelist precedes the full academic publication of the projects concerned. Alternatively, the results of projects may have been disseminated through archive reports, the internet, or other more appropriate media. Every effort has been made, however, to provide a link to further information about each project which produced dated samples.

Acknowledgements

This datelist has be compiled and edited by Amanda Grieve and Henriette Johansen, on the basis of information provided by the submitters of the samples dated and by the radiocarbon laboratories. Design has been the responsibility of Mark Simmons, and the overall production of the volume has been overseen by David Jones.

The information has been output from the English Heritage Radiocarbon Database. This has been developed over many years, successively by Paul Cheetham, Sarah Hill, Manuela Lopez, Marcos Guillen, Mike Gratton, David Head, and Carlton Carver. The appearance of this volume marks a significant milestone in the development of this system.

Radiocarbon dating is a complex and labour-intensive process which takes time. It is a tribute to the effort and efficiency of the staff of our dating laboratories that such numbers of accurate measurements were made in such a small space of time. The logistics of this task fell principally upon Henny Deenen, Peter Marshall, Tom Higham, Clare Owen, and Diane Baker. For the actual preparation and dating of samples we are grateful to Angela Bowles, Peter Ditchfield, Celia Sykes, Martin Humm, Philip Leach, and Christine Tompkins at the Oxford Radiocarbon Accelerator Unit; Anita Aerts-Bijma, Henk Been, Fsaha Ghebru, Bert Kers, Harm-Jan Streurman, Stef Wijma and Dicky van Zonneveld at the Rijksuniversiteit Groningen; and Robert Anderson, Andrew Dougans, Elaine Dunbar, Stuart Freeman, Philip Naysmith, Christoph Schnabel, and Sheng Xu of the Scottish Universities Environmental Research Centre.

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Bestwall Quarry, Dorset

Location: SY 935880
Lat. 50.41.31 N; Long. 02.05.34 W

Project manager: L Ladle (Bestwall Quarry Archaeology Project) 1992–2003

Description: excavations at this 55ha gravel quarry have uncovered a multi-period landscape during a 12 year 'rescue' archaeology project. Features date from the late Mesolithic to the post-medieval period and comprise field systems, droveways, working areas, domestic structures, pit clusters, industrial activity, burials, and ritual deposits. The best represented periods are the middle Bronze Age, late Bronze Age, and Roman.

Objectives: the scientific dating programme was designed to answer a number of fundamental questions about human activity at Bestwall. It was hoped to date the construction and use of the field/enclosure systems, to determine whether the structural remains discovered within the field systems were contemporary with the use of those systems, and to date the burnt mound activity and determine its relationship with the underlying hut and earlier and later field systems. It was also hoped that the dating of the prehistoric ceramic assemblages could be refined. Another major objective of the dating programme included determining whether the 'charcoal pits' represented a single phase of activity, and to provide absolute dating for this activity. A number of other samples were submitted to date artefacts, features, and archaeobotanical remains of intrinsic interest.

Final comment: L Ladle and A Woodward (8 May 2004), although insufficient samples were available to date the construction and use of the Bronze Age field systems, the results from the burnt mound and middle Bronze Age House series have provided important dating evidence for the construction and use of seven roundhouses, the activities associated with the burnt mound, which succeeded House 1, and the relative currency of the different occupation areas (and one cremation) distributed across the site. The results from the four middle Bronze Age ceramic series have shown that all three regional styles of Deverel-Rimbury pottery represented on the site occurred concurrently and throughout the middle Bronze Age period, although the Dorset Downs and Central Wessex styles may have lasted longest. The late Bronze Age pottery series has dated the substantial plainware assemblage to the first half of the late Bronze Age period. Therefore although some decorated wares are present these do not appear to belong to the 'decorated' tradition of the later phases of the late Bronze Age. A metalworking crucible and a socketed bronze gouge were also dated to the late Bronze Age. The dated samples indicate that the middle Bronze Age and late Bronze Age ceramic traditions overlapped in use on the site for a period covering several generations. The dating of the post-Roman ceramic assemblages to the sixth/early seventh century, eighth/ninth century, and the tenth century AD respectively was confirmed. A series of dates from 20 charcoal-filled pits gave a middle Saxon date, and has implications for other such features at nearby sites. Iron working may have been contemporary with some of the charcoal pit activity.

References: Ladle and Woodward forthcoming

Bestwall Quarry: Bronze Age Crucible, Dorset

Location: SY 935880
Lat. 50.41.31 N; Long. 02.05.34 W

Project manager: L Ladle (Bestwall Quarry Archaeology Project), 1992–2004

Archival body: Dorset County Museum

Description: from a pit, which contained a Bronze Age crucible - rim fragments of ceramic crucible. Morphologically it belongs to late Bronze Age type 2 crucibles, as defined at Dainton in Devon (Needham 1980).

Objectives: no dates for late Bronze Age crucibles are known. Other examples have been dated by the style of associated clay mould fragments (Curle 1934; Needham 1980). The Bestwall F375 crucible was associated with two shouldered vessels of late Bronze Age style and dating the crucibles will also provide a date for these pots.

Final comment: A Woodward (6 May 2004), this determination provides the first date for a crucible from a late Bronze Age context, and confirms that metalworking was taking place on the site during this period. The date is in accord with the associated pottery assemblage, which belongs to the plainware tradition of the earlier part of the late Bronze Age.

References: Curle 1934
Needham 1980
Needham 1991

GrA–25177 3010 ±110 BP

$\delta^{13}C$: -27.3‰

Sample: BQ 97F 375B, submitted on 20 October 2003 by L Ladle

Material: charcoal: *Sambucus* sp., cf, a single fragment (5g) (R Gale 2003)

Initial comment: sub-oval feature with steep sloping sides and a flat base. The fill comprised a mid-brown sandy loam with frequent charcoal flecks. Burnt flint, heathstone, pottery, and charcoal fragments were present. There was no intrusion or residuality. The valley gravels were overlain by sandy acidic subsoils and topsoils. The sides of the feature were cut into sand, the base into gravel. The feature was approximately 0.40m from the present ground surface.

Objectives: to provide an absolute date for the deposition of a crucible following its last use in a melting episode.

Calibrated date: *1σ:* 1420–1050 cal BC
2σ: 1500–920 cal BC

Final comment: A Woodward (6 May 2004), charcoal from pit F375 was from a filling which included large portions from a crucible and an assemblage of diagnostic late Bronze Age plainware pottery. The pottery had been deposited deliberately and included large fragments from a shouldered jar and a small fine ware shouldered bowl; no decorated sherds were present. The determination falls within the earlier part of the late Bronze Age, which is in accord with the presence of plainware pottery, and provides a date for metalworking activity on the site.

Laboratory comment: Ancient Monuments Laboratory (April 2004), the target quality of the sample was poor.

OxA–12925 2758 ±30 BP

δ¹³C: -24.9 ±0.3‰

Sample: BQ 97F 375A, submitted on 20 October 2003 by L Ladle

Material: wood: *Quercus* sp., sapwood, a single fragment (5g) (R Gale 2003)

Initial comment: as GrA-25177

Objectives: as GrA-25177

Calibrated date: *1σ:* 930–840 cal BC
2σ: 1000–820 cal BC

Final comment: see GrA-25177

Laboratory comment: Ancient Monuments Laboratory, the two results are statistically inconsistent (T′=5.0, T′(5%)=3.8, ν=1) (Ward and Wilson 1978).

References: Ward and Wilson 1978

Bestwall Quarry: Burnt Mound, Dorset

Location: SY 935880
Lat. 50.41.31 N; Long. 02.05.34 W

Project manager: L Ladle (Bestwall Quarry Archaeology Project), 1992–2003

Archival body: Dorset County Museum

Description: an irregular, kidney-shaped burnt mound, comprising a dense, compact deposit of burnt flint 0.27m deep. The total quantity of burnt flint present is estimated to be 9.18kg.

Objectives: to establish the date of House 1 and the features and activities associated with the burnt mound.

Final comment: A Woodward (6 May 2004), this series of dates relate to the construction, use and abandonment of House 1, the final use of the Burnt Mount, which succeeded it, and midden deposits associated with the final stages of activity around the Burnt Mound. Seven further dates from the three middle Bronze Age ceramic style series also relate to this stratigraphic sequence. The dates are in accord with the stratigraphic relationships. The dates for construction and abandonment of House 1 confirm its expected middle Bronze Age date and provide an indication that this house was established fairly early within the total phase of the middle Bronze Age occupation on the site. The dates for activities associated with the Burnt Mound range rather later than expected, with ranges extending to the very end of the middle Bronze Age period.

References: Ehrenberg *et al* 1991
Passmore and Pallister 1967

GrA–23594 3025 ±45 BP

δ¹³C: -25.8‰

Sample: BQ 01J 678B, submitted on 7 July 2003 by L Ladle

Material: charcoal: *Alnus glutinosa*, roundwood with >40 rings, a single fragment (R Gale 2003)

Initial comment: from a circular, steep-sided pit, with a flat base. The pit was cut by section J676 of the middle Bronze Age house gully. The pit fill was a silty/sandy loam with 9.25kg of burnt flint, plus pottery and charcoal.

Objectives: to establish the period of use, activity, and abandonment of House 1 and the associated Burnt Mound.

Calibrated date: *1σ:* 1390–1210 cal BC
2σ: 1420–1120 cal BC

Final comment: see GrA-23595

Laboratory comment: Ancient Monuments Laboratory (2004), the two samples from pit J678 produced radiocarbon results, which are statistically consistent (T′=0.0; T′(5%)= 3.8; ν=1; Ward and Wilson 1978).

References: Ward and Wilson 1978

GrA–23595 3025 ±45 BP

δ¹³C: -26.3‰

Sample: BQ 01J 678A, submitted on 7 July 2003 by L Ladle

Material: charcoal: *Alnus glutinosa*, a single fragment (R Gale 2003)

Initial comment: see GrA-23594

Objectives: as GrA-23594

Calibrated date: *1σ:* 1390–1210 cal BC
2σ: 1420–1120 cal BC

Final comment: A Woodward (6 May 2004), the charcoal sample from the filling of a small pit cut by the eaves drip gully of House 1. This pit therefore pre-dated the construction of the house. The range of the determination, however, commences only a little earlier than those for samples dating construction and use of the house, so the pit was probably dug and filled not long before the period of construction.

GrA–23691 3100 ±40 BP

δ¹³C: -25.8‰

Sample: BQ 01J 260A, submitted on 7 July 2003 by L Ladle

Material: charcoal: *Betula* sp., a single fragment (2g) (R Gale 2003)

Initial comment: from a circular 'hearth' (J261) comprising large gravels set in a matrix of burnt clay; the charcoal came from within the clay matrix. There was no evidence of intrusion or residuality.

Objectives: as GrA-23594

Calibrated date: *1σ:* 1430–1310 cal BC
2σ: 1450–1260 cal BC

Final comment: A Woodward (6 May 2004), the charcoal dated came from hearth J260 located centrally within House 1 and contemporary with its use. The date related to the period of use of the structure and is consistent with the dates for interior pit J292. This dating conforms with the middle Bronze Age date expected for this structure, based on its morphology and the associated Deverel-Rimbury assemblage.

GrA–23694 3075 ±40 BP

δ¹³C: -23.7‰

Sample: BQ 01J 292A, submitted on 7 July 2003 by L Ladle

Material: charcoal: *Alnus glutinosa*, a single fragment (2g) (R Gale 2003)

Initial comment: from a sub-oval pit with sloping sides and an undulating base. The fill was of loamy sand, raw clay, burnt flint, pottery, and worked flint, with no intrusion or residuality.

Objectives: as GrA-23594

Calibrated date: *1σ:* 1410–1300 cal BC
2σ: 1440–1220 cal BC

Final comment: A Woodward (6 May 2004), this date relates to the filling of a pit located within the interior of House 1 and probably contemporary with the use of the house. The determination provides a date for the period of use of the structure and is consistent with the dates from the interior hearth J261. This dating conformed with the middle Bronze Age date expected, based on its morphology and the associated Deverel-Rimbury pottery assemblage.

Laboratory comment: Ancient Monuments Laboratory (2004), the two samples from this pit produced radiocarbon measurements, which are statistically consistent ($T'=0.2$; $T'(5\%)=3.8$; $\nu=1$; Ward and Wilson 1978).

References: Ward and Wilson 1978

GrA–24658 2530 ±50 BP

δ¹³C: -27.6‰

Sample: BQ 01J 610, submitted on 7 November 2003 by L Ladle

Material: carbonised residue

Initial comment: from the uppermost fill of pit (J475), a dark brown sandy loam with a little charcoal. Burnt flint and burnt heathstone were also present. The sherd is unlikely to be residual.

Objectives: as GrA-23594

Calibrated date: *1σ:* 800–540 cal BC
2σ: 810–420 cal BC

Final comment: A Woodward (4 March 2004), this sample was on a plain wall sherd, in a coarse sandy fabric of late Bronze Age/early Iron Age type. The piece of pottery appears to be intrusive in its context, because the vast majority of material from this pit is of middle Bronze Age character. The residue sample derived from a sherd from the upper filling of pit J475, located to the east of the Burnt Mound. It came from an extensive deposit of pottery, which seemed to have been associated with feasting episodes, which took place in the vicinity of the burnt mound. Three residues on other pots from this context produced six results of the expected middle Bronze Age date, although from the end of that period (*see* GrA-22418 and OxA-12153 in the Central Wessex series and OxA-12167, OxA-12201, OxA-12202, and OxA-12211 in the Avon/Stour ceramic series).

OxA–12494 3101 ±35 BP

δ¹³C: -24.2‰

Sample: BQ 01J 292B, submitted on 7 July 2003 by L Ladle

Material: charcoal: *Alnus glutinosa*, a single fragment (2g) (R Gale 2003)

Initial comment: from a sub-oval pit with sloping sides and an undulating base. The fill was of loamy sand, raw clay, burnt flint, pottery, and worked flint; with no intrusion or residuality.

Objectives: as GrA-23594

Calibrated date: *1σ:* 1420–1320 cal BC
2σ: 1440–1290 cal BC

Final comment: see GrA-23694

Laboratory comment: see GrA-23694

OxA–12495 3001 ±34 BP

δ¹³C: -25.7‰

Sample: BQ 01J 384A, submitted on 7 July 2003 by L Ladle

Material: charcoal: *Alnus glutinosa*, a single fragment (2g) (R Gale 2003)

Initial comment: this context was part of the basal fill of large pit (J989). The fill was sandy loam with small amounts of charcoal and a very large quantity of pottery. There was no evidence of intrusion or residuality.

Objectives: as GrA-23594

Calibrated date: *1σ:* 1310–1210 cal BC
2σ: 1390–1120 cal BC

Final comment: A Woodward (6 May 2004), the dated charcoal derived from the filling of pit J989, located centrally within the curving area of the Burnt Mound (J990). It dates the final filling of this pit, which is thought to have been associated with a final episode enacted in the vicinity of the burnt mound. As expected, the determination falls later than those dating the use of House 1, but still falls within the middle Bronze Age period. A further date for this context (OxA-12152 in the Dorset Downs ceramic series) fell slightly later, however, but still within the expected span of the middle Bronze Age.

Laboratory comment: Ancient Monuments Laboratory (2004), the two charcoal samples from this pit produced radiocarbon measurements, which are statistically consistent ($T'=0.6$; $T'(5\%)=3.8$; $\nu=1$; Ward and Wilson 1978).

References: Ward and Wilson 1978

OxA–12496 3037 ±34 BP

δ¹³C: -26.9‰

Sample: BQ 01J 384B, submitted on 7 July 2003 by L Ladle

Material: charcoal: *Prunus spinosa*, roundwood, a single fragment (2g) (R Gale 2003)

Initial comment: see OxA-12495

Objectives: as GrA-23594

Calibrated date: *1σ:* 1390–1260 cal BC
2σ: 1410–1210 cal BC

Final comment: see OxA-12495

Laboratory comment: see OxA-12495

OxA–12497 3041 ±33 BP

δ¹³C: -26.4‰

Sample: BQ 01J 260B, submitted on 7 July 2003 by L Ladle

Material: charcoal: *Quercus* sp., roundwood (cf 5 years growth), a single fragment (2g) (R Gale 2003)

Initial comment: see GrA-23691

Objectives: as GrA-23594

Calibrated date: *1σ:* 1390–1260 cal BC
2σ: 1410–1210 cal BC

Final comment: see GrA-23691

Laboratory comment: Ancient Monuments Laboratory (2004), the two samples from this hearth produced radiocarbon measurements, which are statistically consistent (T′=1.3; T′(5%)=3.8; ν=1; Ward and Wilson 1978).

References: Ward and Wilson 1978

OxA–12882 3580 ±130 BP

δ¹³C: -27.3‰

Sample: BQ 02T 568, submitted on 28 June 2003 by L Ladle

Material: carbonised residue (<2g)

Initial comment: this is a ditch section of an early Bronze Age ditch, with a steep side to the south and more sloping side to the north. Lower fill (T568) of yellow silty sand with sparse charcoal flecks. Two sherds of Beaker (18g) were present. There was no intrusion or residuality. The valley gravels were overlain with sandy acidic subsoils and topsoils. The feature was cut into sand (upper fill) and gravel (lower fill and base). The feature was approximately 0.4m from the ground surface.

Objectives: to establish the period of use of a ditch, which transverses the site in discontinuous sections.

Calibrated date: *1σ:* 2140–1740 cal BC
2σ: 2300–1610 cal BC

Final comment: A Woodward (6 May 2004), this date relates to the filling of a spinal boundary ditch. This ditch underlies House 1 although the sherd concerned came from a more distant sector of the ditch. The residue was deposited on a sherd of fingernail rusticated domestic Beaker Ware. The date provides a *terminus post quem* for House 1 and also provides a *terminus post quem* for this ditch system, although, as there is lithic and ceramic evidence of Beaker activity in this part of the site, the sherd may be in a secondary context. As was expected, this date is the earliest within the Burnt Mound series.

Bestwall Quarry: Ceramic Residues - late Bronze Age, Dorset

Location: SY 935880
Lat. 50.41.31 N; Long. 02.05.34 W

Project manager: L Ladle (Bestwall Quarry Archaeology Project), 1992–2003

Archival body: Dorset County Museum

Description: this style of pottery belongs to a distinctive style of late Bronze Age post Deverel-Rimbury pottery, which has been recognised, discussed, and dated by a recent reconsideration of some of the material from Eldon's Seat in Purbeck. A further large assemblage of very similar material has been excavated very recently from a site at Sherborne in north Dorset. The tradition is characterised by plain bowls and jars, often very thin-walled and with distinctive hooked or internally bevelled rims.

Objectives: the only dates currently available for this regional late Bronze Age pottery are those obtained by the British Museum for the review of the Eldon's Seat assemblage. Dates for late Bronze Age pottery elsewhere in the Wessex region are very few, and there is a good opportunity in this project to date the currency of the pottery, and to compare the dates with those from Eldon's Seat, as well as with dates for late Bronze Age material elsewhere (eg from the Thames Valley).

Final comment: A Woodward (7 May 2004), this series of dates forms a very consistent set, with its range falling mainly in the first half of the late Bronze Age period (*c* 1000-800 BC). Although some of the dated late Bronze Age ceramic pit assemblages contained small numbers of pots bearing decoration, the dated samples from these contexts occurred throughout the period of use of plainwares at Bestwall. This indicates that none of the material falls into Barrett's (1980) 'decorated' tradition. The dates match those obtained for the assemblage of similar a style from Eldon's Seat. It is likely that the late Bronze Age tradition at Bestwall overlapped with the currency of the middle Bronze Age tradition for several generations.

References: Barrett 1980

GrA–22541 2670 ±50 BP

δ¹³C: -27.8‰

Sample: BQ 97F 259, submitted on 21 February 2003 by L Ladle

Material: carbonised residue

Initial comment: from a circular pit with steep sides and a flat base. The fill comprised sandy soil with most of the pottery fragments near the surface. Other finds included worked and burnt flint and burnt heathstone. There was no evidence of intrusion or residuality. The local geology is valley gravels overlain by sandy acidic subsoils and topsoils. The feature was cut into natural sand and was approximately 0.35m below the ground surface. There was no disturbance.

Objectives: to date the period of use of a pottery vessel of post Deverel-Rimbury plainware.

Calibrated date: *1σ:* 890–800 cal BC
2σ: 920–780 cal BC

Final comment: A Woodward (25 March 2004), this sherd was from a flat-rimmed ovoid jar. The context group contained plainware vessels only.

GrA–22542 2620 ±45 BP

δ¹³C: -26.8‰

Sample: BQ 99G 431C, submitted on 21 February 2003 by L Ladle

Material: carbonised residue

Initial comment: from a circular pit with a steep side and a flat base. The upper fill (G431) comprised a sandy loam with quantities of burnt flint, burnt heathstone, and charcoal. Large amounts of pot occurred throughout the fill. The pit (G431) was cut by a small scoop (G78). No intrusion or residuality was observed. The local geology is valley gravels overlain by sandy acidic subsoils and topsoils. The feature was cut into gravel and was approximately 0.35m from the ground surface. There was no disturbance.

Objectives: as GrA-22541

Calibrated date: *1σ:* 820–790 cal BC
2σ: 840–670 cal BC

Final comment: A Woodward (25 February 2004), from a plain wall sherd, from a different vessel to G431A (OxA-12164) and G431B (OxA-12165). The context produced rim sherds of simple, flattened, and everted forms.

GrA–22623 2750 ±50 BP

$\delta^{13}C$: -27.1‰

Sample: BQ 98G 351B, submitted on 21 February 2003 by L Ladle

Material: carbonised residue

Initial comment: from a circular, steep sided, flat-based pit. The basal fill (G351) comprised of gravel cobbles embedded in clay with large amounts of pottery present. Much of this was large sherds, possibly wasters. No intrusion or residuality was observed. The local geology is valley gravels overlain by sandy acidic subsoils and topsoils. The feature was cut into sandy gravel and was approximately 0.30m from the ground surface. There was no disturbance.

Objectives: as GrA-22541

Calibrated date: *1σ:* 970–830 cal BC
2σ: 1010–800 cal BC

Final comment: A Woodward (25 February 2004), from a plain wall sherd. The pit assemblage contained a series of bowls and decorated vessels.

OxA–12154 2837 ±24 BP

$\delta^{13}C$: -24.0‰

Sample: BQ 98G 349, submitted on 21 February 2003 by L Ladle

Material: carbonised residue (internal)

Initial comment: from a circular, vertical sided, flat-based pit. The fill comprised a dark sandy loam with large amounts of burnt heathstone and small pieces of pottery. There was no evidence of intrusion or residuality. The local geology is valley gravels overlain by sandy acidic subsoils and topsoils. The feature was cut into sandy subsoil and was approximately 0.40m from the ground surface. There was no disturbance.

Objectives: as GrA-22541

Calibrated date: *1σ:* 1020–935 cal BC
2σ: 1055–915 cal BC

Final comment: A Woodward (25 February 2004), this sample was a plain wall sherd from a context, which contained no diagnostic vessels.

OxA–12155 2771 ±27 BP

$\delta^{13}C$: -25.1‰

Sample: BQ 98F 696, submitted on 21 February 2003 by L Ladle

Material: carbonised residue (internal)

Initial comment: from a circular scoop with moderately sloping sides and a flat base. The sandy fill contained pottery and charcoal flecks, with no evidence of intrusion or residuality. The local geology is valley gravels overlain by sandy acidic subsoils and topsoils. The feature was cut into sand, and was approximately 0.35m from the ground surface. There was no disturbance.

Objectives: as GrA-22541

Calibrated date: *1σ:* 970–890 cal BC
2σ: 1010–830 cal BC

Final comment: A Woodward (25 February 2004), this sherd was a base angle from a plainware vessel.

OxA–12156 2614 ±28 BP

$\delta^{13}C$: -25.4‰

Sample: BQ 98G 117, submitted on 21 February 2003 by L Ladle

Material: carbonised residue (internal)

Initial comment: from an irregular oval feature with shallow sloping sides and an undulating base (G117). The fill, of sandy loam, contained substantial pieces from two vessels. There was no evidence of intrusion or residuality. The local geology is valley gravels overlain by sandy acidic subsoils and topsoils. The feature was cut into sand and was approximately 0.35m from the ground surface. There was no disturbance.

Objectives: as GrA-22541

Calibrated date: *1σ:* 810–790 cal BC
2σ: 820–770 cal BC

Final comment: A Woodward (25 February 2004), this sample was a sherd from a plain shouldered jar with everted rim. The context also contained other plainware vessels.

OxA–12157 2820 ±25 BP

$\delta^{13}C$: -27.5‰

Sample: BQ 98G 82, submitted on 21 February 2003 by L Ladle

Material: carbonised residue (internal)

Initial comment: from a shallow, flat-based, oval pit. The fill was composed of 18kg of burnt flint (from a half section) with charcoal and ash on the base. There was no evidence of intrusion or residuality. The local geology is valley gravels overlain by sandy acidic subsoils and topsoils. The feature was cut into sandy gravels and was approximately 0.35m below the ground surface. There was no disturbance.

Objectives: as GrA-22541

Calibrated date: *1σ:* 1010–920 cal BC
2σ: 1050–900 cal BC

Final comment: A Woodward (25 February 2004), this sample was adhering to a base angle derived from a vessel with rows of fingertip impressions and an internally bevelled rim. Formerly identified as a vessel of middle Bronze Age style, detailed analysis suggested, on the basis of the vessel form, wall thickness, and fabric that it should be assigned to the late Bronze Age post Deverel-Rimbury tradition.

OxA–12161 2792 ±23 BP

$\delta^{13}C$: -25.4‰

Sample: BQ 97P 1546, submitted on 21 February 2003 by L Ladle

Material: carbonised residue

Initial comment: from a circular pit with steep, almost vertical, sides and flat base. Layer P1546 comprised a dark, silty sand with charcoal flecks and pottery sherds. There was no evidence of intrusion or residuality. The local geology is valley gravels overlain by sandy acidic subsoils and topsoils. The feature was cut into sand and was approximately 0.35m from the ground surface. There was no disturbance.

Objectives: as GrA-22541

Calibrated date: *1σ:* 980–905 cal BC
2σ: 1010–895 cal BC

Final comment: A Woodward (25 February 2004), the sample derived from a plain wall sherd from a plainware vessel. No diagnostic vessels were recovered from this context.

OxA–12162 2655 ±23 BP

$\delta^{13}C$: -26.4‰

Sample: BQ 98G 143, submitted on 21 February 2003 by L Ladle

Material: carbonised residue

Initial comment: from a circular pit with rounded base and gently sloping sides. This had a compacted fill of burnt heathstone with large pottery fragments from top to base. Some charcoal flecks were present in the sandy fill. Worked flints were also present. There was no evidence of intrusion or residuality. The local geology is valley gravels overlain by sandy acidic subsoils and topsoils. The top of the feature had been truncated by mechanical excavator during stripping and was approximately 0.4m from the ground surface. Otherwise, there was no disturbance.

Objectives: as GrA-22541

Calibrated date: *1σ:* 820–800 cal BC
2σ: 835–795 cal BC

Final comment: A Woodward (25 February 2004), this sample came from a plain wall sherd from a context which contained no diagnostic vessels.

OxA–12163 2705 ±23 BP

$\delta^{13}C$: -28.4‰

Sample: BQ 98G 352, submitted on 21 February 2003 by L Ladle

Material: carbonised residue

Initial comment: from an oval pit with steep sides and a flat base (G352). The fill comprised a dark sandy loam with frequent flecks of charcoal, and contained abundant pottery varying from fresh to abraded. Burnt heathstone was also present. There was no intrusion or residuality. The local geology is valley gravels overlain by sandy acidic subsoils and topsoils. The feature was cut into sandy gravel and was approximately 0.35m from the ground surface. There was no disturbance.

Objectives: as GrA-22541

Calibrated date: *1σ:* 895–815 cal BC
2σ: 910–805 cal BC

Final comment: A Woodward (25 February 2004), the sample was from a plain ovoid jar with everted rim. Further plainware vessels were also represented in this context.

OxA–12164 2708 ±23 BP

$\delta^{13}C$: -26.6‰

Sample: BQ 99G 431A, submitted on 21 February 2003 by L Ladle

Material: carbonised residue

Initial comment: as GrA-22542

Objectives: to date the period of use of a pottery vessel of post Deverel-Rimbury plainware. Different vessel from BQ 99G 431B (OxA-12165) and BQ 99G 431C (GrA-22542).

Calibrated date: *1σ:* 900–820 cal BC
2σ: 910–805 cal BC

Final comment: A Woodward (25 February 2004), from a plain wall sherd. The context produced rim sherds with simple, flattened, and everted forms.

OxA–12165 2628 ±27 BP

$\delta^{13}C$: -26.6‰

Sample: BQ 99G 431B, submitted on 21 February 2003 by L Ladle

Material: carbonised residue

Initial comment: as GrA-22542

Objectives: to date the period of use of a pottery vessel of post Deverel-Rimbury plainware. Different vessel from BQ 99G 431A (OxA-12165) and BQ 99G 431C (GrA-22542).

Calibrated date: *1σ:* 810–790 cal BC
2σ: 830–780 cal BC

Final comment: A Woodward (25 February 2004), from a plain wall sherd, from a different vessel to G431A (OxA-12164) and G431C (GrA-22542). The context produced rim sherds of simple, flattened, and everted form.

OxA–12200 2771 ±31 BP

$\delta^{13}C$: -25.8‰

Sample: BQ 99H 308B, submitted on 21 February 2003 by L Ladle

Material: carbonised residue

Initial comment: from a circular pit with near-vertical sides and a flat base. The fill was of dark, almost black, humic loamy sand. Other finds include charcoal lumps, burnt flint, and burnt heathstone. Much of the pottery was found on or near the base of the pit. There was no evidence of intrusion or residuality. The local geology is valley gravels overlain by sandy acidic subsoils and topsoils. The feature was cut into subsoil and natural gravel and was approximately 0.5m below the ground surface. There was no disturbance.

Objectives: to date the period of use of a pottery vessel thought to be of Central Wessex style. From a different vessel than BQ 99H 308A (GrA-22427).

Calibrated date: *1σ:* 980–890 cal BC
2σ: 1010–830 cal BC

Final comment: A Woodward (25 February 2004), following detailed ceramic analysis, this sherd with its applied fingertipped impressed horseshoe cordon, was reassigned to the later Bronze Age tradition. It is from a pit assemblage containing decorated wares.

OxA–12300 2724 ±31 BP

$\delta^{13}C$: -25.7‰

Sample: BQ 98G 351A, submitted on 21 February 2003 by L Ladle

Material: carbonised residue

Initial comment: as GrA-22623

Objectives: to date the period of use of a pottery vessel of post Deverel-Rimbury plainware. This sample is from a different vessel to BQ98G 351B (GrA-22623).

Calibrated date: *1σ:* 910–820 cal BC
2σ: 930–810 cal BC

Final comment: A Woodward (25 February 2004), this sherd was from a plain fine carinated bowl. The context also contained a further series of bowls and decorated vessels.

OxA–12827 2890 ±170 BP

$\delta^{13}C$: -27.3‰

Sample: BQ 97F 393, submitted on 7 July 2003 by L Ladle

Material: carbonised residue (<2g) (internal)

Initial comment: from the fill of a circular pit with steep sides and a flat base. The single fill was mid-brown loamy sand. Pottery was dispersed throughout the fill.

Objectives: as GrA-22541

Calibrated date: *1σ:* 1380–840 cal BC
2σ: 1510–770 cal BC

Final comment: A Woodward (25 February 2004), this sample was on a plain wall sherd from a context which contained a series of plain jars with internally bevelled rims and a single wall sherd with incised linear decoration.

Laboratory comment: Oxford Radiocarbon Accelerator Unit (May 2007), the error for this sample is unusually large because the pre-treated residue only contained 2.2% carbon (164µg).

Bestwall Quarry: Ceramic Residues - middle Bronze Age Series 1, Central Wessex Style, Dorset

Location: SY 935880
Lat. 50.41.31 N; Long. 02.05.34 W

Project manager: A Woodward (Birmingham Archaeology), 1992–2004

Archival body: Dorset County Museum

Description: a regional tradition of middle Bronze Age Deverel-Rimbury pottery, centred on Wiltshire and Hampshire, characterised by globular urns of Type I, and specific domestic wares such as simple barrel urns (plain or decorated with fingertip or fingernail impressions); Ellison type CW 2, plain shouldered buckets (type CW4), or flared mouth buckets with fingertipped cordons (type CW5).

Objectives: absolute dates for the series are very few, and further dates would much enhance knowledge of the chronology of this ceramic style. It is probably roughly contemporary with the Dorset Downs style ceramics (according to closed associations) but its currency relative to the Avon/Stour style ceramics is not known.

Final comment: A Woodward (6 May 2004), the five dates in the series span most of the middle Bronze Age period and seem to be roughly contemporary with dates obtained for the other two styles (Dorset Downs and Avon/Stour). However, none of the Central Wessex dates were particularly early. It was thought that some early dates for this style might have been obtained, but unfortunately the most diagnostic sherds seldom carried residues, and one determination on such a sherd failed. The occurrence of dates very late within the middle Bronze Age period is also of interest. The latest date overlaps with some of the dates in the late Bronze Age pottery series.

Laboratory comment: Ancient Monuments Laboratory (2004), two further samples failed to produce results (BQ99 R195 and BQ98F 661B).

References:
Barrett *et al* 1976
Barrett *et al* 1991
Dacre and Ellison 1981
Ellison 1975

GrA–22418 2970 ±35 BP

$\delta^{13}C$: -27.3‰

Sample: BQ 01J 549(F2), submitted on 21 February 2003 by L Ladle

Material: carbonised residue (internal)

Initial comment: from the upper fill of a large pit (J475). Fill J549 was composed of silty sand with burnt and worked flint and a large amount of pottery. The local geology is valley gravels overlain by sandy acidic subsoils and topsoils. The feature was cut into gravel and was approximately 0.45m below the ground surface. There was no disturbance.

Objectives: to date the period of use of a pottery vessel of the Central Wessex tradition.

Calibrated date: *1σ:* 1270–1120 cal BC
2σ: 1370–1050 cal BC

Final comment: A Woodward (25 February 2004), the sample is a plain wall sherd. Fragments from a Type I globular urn of Central Wessex style were found in the same context. This date was also used to enhance the Burnt Mound/House 1 series.

GrA–22425 3050 ±35 BP

δ¹³C: -24.9‰

Sample: BQ 99R 235A, submitted on 21 February 2003 by L Ladle

Material: carbonised residue (internal)

Initial comment: from a small circular pit with a deposit of two complete, but broken, vessels. There was no evidence of intrusion or residuality. The local geology is valley gravels overlain by sandy acidic subsoils and topsoils. The feature was cut into subsoil and was approximately 0.35m below the ground surface. There was no disturbance.

Objectives: as GrA-22418

Calibrated date: *1σ:* 1390–1260 cal BC
2σ: 1420–1210 cal BC

Final comment: A Woodward (25 February 2004), the sample was a sherd from a Type I globular urn of Central Wessex style. This vessel was part of a deliberate deposit, which also incorporated a Dorset Downs style vessel (*see* OxA-12500).

OxA–12151 2916 ±27 BP

δ¹³C: -27.3‰

Sample: BQ 94D 443, submitted on 21 February 2003 by L Ladle

Material: carbonised residue (internal)

Initial comment: part of a feature 15m long, observed in section. The layer comprised sandy loam with pottery and burnt flint, within cut D414. There is no evidence of intrusion or residuality. The local geology is valley gravels overlain by sandy acidic subsoils and topsoils. The feature was cut into gravel and was approximately 1.0m below the ground surface. There was no disturbance.

Objectives: as GrA-22418

Calibrated date: *1σ:* 1190–1050 cal BC
2σ: 1260–1010 cal BC

Final comment: A Woodward (25 February 2004), on submission for dating, this sherd was recorded as bearing all over fingertip rustication, which is characteristic of some Dorset Downs vessels. Detailed analysis, however, showed that the fingertip impressions were arranged in two rows, and double rows of such impressions are found more commonly amongst vessels of the Central Wessex style.

OxA–12153 2826 ±28 BP

δ¹³C: -25.9‰

Sample: BQ 01J 549, submitted on 21 February 2003 by L Ladle

Material: carbonised residue (internal)

Initial comment: from the upper fill of large pit (J475). The fill was composed of silty sand with burnt and worked flint, and large amounts of pottery. The local geology is valley gravels overlain by sandy acidic subsoils and topsoils. The feature was cut into gravel and was approximately 0.45m below the ground surface.

Objectives: as GrA-22418

Calibrated date: *1σ:* 1020–920 cal BC
2σ: 1060–900 cal BC

Final comment: A Woodward (25 February 2004), the sample was a plain wall sherd. Fragments from a Type I globular urn of Central Wessex style were found in the same context. This date was also used to enhance the Burnt Mound/House 1 series.

OxA–12206 3063 ±31 BP

δ¹³C: -23.1‰

Sample: BQ 98F 661A, submitted on 21 February 2003 by L Ladle

Material: grain: *Hordeum vulgare* L., twisted (4mm × 3.1mm) (G Campbell 2003)

Initial comment: from within a complete pottery vessel in a small pit. The fill comprised sandy soil with some charcoals as well as grain. There was no evidence of intrusion or residuality. The local geology is valley gravels overlain by sandy acidic subsoils and topsoils. The feature was cut into sandy subsoil and was approximately 0.35m below the ground surface. There was no disturbance.

Objectives: to date a deposit of grain, which was a primary deliberate deposit in the feature (a diagnostic sherd of Central Wessex style globular urn was also within the complete pot).

Calibrated date: *1σ:* 1400–1290 cal BC
2σ: 1420–1260 cal BC

Final comment: A Woodward (25 February 2004), the dated grain was associated with a rim sherd from a Type I globular urn of Central Wessex style, all within the filling of a near complete bucket urn. This result was also used to assist in the dating of House 4 (see middle Bronze Age Houses series).

Bestwall Quarry: Ceramic Residues - middle Bronze Age Series 2, Dorset Downs Style, Dorset

Location: SY 935880
Lat. 50.41.31 N; Long. 02.05.34 W

Project manager: A Woodward (Birmingham Archaeology), 1992–2004

Archival body: Dorset County Museum

Description: a regional tradition of middle Bronze Age Deverel-Rimbury pottery, centred on chalk downlands of southern and central Dorset. It is characterised by globular urns of Type II and by specific domestic wares, such as plain bucket urns with large imperforate lugs (Ellison type DDa) or straight-sided buckets with imperforate lugs and a row of fingertip impressions at the girth (type DDd).

Objectives: this ceramic style is very poorly dated, and further dates would be of extreme significance. According to

associations, the style may be roughly contemporary with the Central Wessex style of ceramics, but its total currency is not known, nor its chronological relationship to pottery of the Avon/Stour style.

Final comment: A Woodward (7 May 2004), the seven dates obtained relate to four vessels only. The dates span the whole middle Bronze Age period and seem to be roughly contemporary with dates obtained for the other two styles (Central Wessex and Avon/Stour). However the span may reach later than the range of Avon/Stour dates. There is a gap in the dated Dorset Downs examples; this is probably due to the inadequate sampling density. The results are very important as so few dates have previously been obtained for this style of pottery. The late date overlap with some of the dated samples in the late Bronze Age pottery series.

References: Barrett *et al* 1976
Ellison 1975
Rahtz and ApSimon 1962
Woodward 1991, 54

GrA–22540 2830 ±60 BP

$\delta^{13}C$: -25.6‰

Sample: BQ 94D 420A, submitted on 21 March 2003 by L Ladle

Material: carbonised residue

Initial comment: from a fill of a large feature, 15m long, observed in section (D414). The layer comprised sandy loam with large quantities of pottery, worked flint, and burnt flint. There was no evidence of intrusion or residuality. The local geology is valley gravels overlain by sandy acidic subsoils and topsoils. The feature was cut into gravel and was approximately 1m from the ground surface. There was no disturbance.

Objectives: to date the period of use of a pottery vessel of Dorset Downs style.

Calibrated date: *1σ:* 1060–910 cal BC
2σ: 1200–830 cal BC

Final comment: A Woodward (25 February 2004), the sample was on a sherd from a decorated Type II globular urn Dorset Downs style. OxA-12396 and OxA-12828 date the same vessel.

Laboratory comment: Ancient Monuments Laboratory (2004), the three measurements from this vessel are statistically consistent (T′=4.0; T′(5%)=6.0; ν=2; Ward and Wilson 1978).

References: Ward and Wilson 1978

OxA–12152 2802 ±26 BP

$\delta^{13}C$: -26.6‰

Sample: BQ 01J 397, submitted on 21 March 2003 by L Ladle

Material: carbonised residue (internal)

Initial comment: from the basal layer of a large 'triangular' shaped pit (J989). The fill consisted of dark, humic, loamy sand. Large amounts of pottery were retrieved from all layers. There was no evidence of intrusion or residuality. The local geology is valley gravels overlain by sandy acidic subsoils and topsoils. The feature was cut into gravelly sand and was approximately 0.6m below the ground surface.

Objectives: as GrA-22540

Calibrated date: *1σ:* 1000–910 cal BC
2σ: 1020–890 cal BC

Final comment: A Woodward (25 February 2004), the sample was adhering to a sherd from a Type II globular urn of Dorset Downs style. This had initially been identified as a Type I globular urn of Central Wessex style. Detailed analysis, however, showed that the tall narrow profile and the band of deeply incised horizontal line decoration was more typical of globular urns of Type IIb (Dorset Downs style). This date was also used to enhance the Burnt Mound/House 1 series.

OxA–12204 3265 ±30 BP

$\delta^{13}C$: -27.3‰

Sample: BQ 97F 568A, submitted on 21 February 2003 by L Ladle

Material: grain: *Hordeum vulgare*, (4.8mm × 3.1mm) (1g) (G Campbell 2003)

Initial comment: from the lower fill of oval pit (F566). The fill consisted of humic loam with bone and charcoal spread throughout. Pottery was in the same layer as the grain sample. There was no evidence of intrusion or residuality. The local geology is valley gravels overlain by sandy acidic subsoils and topsoils. The feature was cut into the sandy subsoil and was approximately 0.40m from the ground surface. There was no disturbance.

Objectives: to date a deposit of grain which was deliberately deposited in the feature and directly associated with pottery in the Dorset Downs style.

Calibrated date: *1σ:* 1610–1500 cal BC
2σ: 1620–1450 cal BC

Final comment: L Ladle (26 February 2004), this sample is earlier than the other dated grain from this context, and so must be residual. Therefore it does not date the vessel. This date was also considered in relation to dating House 4 (see middle Bronze Age House series).

Laboratory comment: Ancient Monuments Laboratory (2004), the two grains of barley from this pit produced radiocarbon results which are statistically significantly different (T′=21.1; T′(5%)=3.8; ν=1; Ward and Wilson 1978).

References: Ward and Wilson 1978

OxA–12205 3070 ±30 BP

$\delta^{13}C$: -23.9‰

Sample: BQ 97F 568B, submitted on 21 February 2003 by L Ladle

Material: grain: *Hordeum vulgare*, (4.2mm × 2.7mm) (1g) (G Campbell 2003)

Initial comment: as OxA-12204

Objectives: as OxA-12204

Calibrated date: *1σ:* 1410–1300 cal BC
2σ: 1420–1260 cal BC

Final comment: A Woodward (25 February 2004), this grain was in the same context as sherds from a Type II globular urn of Dorset Downs style.

Laboratory comment: see OxA-12204

OxA–12396 2765 ±50 BP

$\delta^{13}C$: -26.6‰

Sample: BQ 94D 420B, submitted on 21 February 2003 by L Ladle

Material: carbonised residue

Initial comment: from the same context as GrA-22540.

Objectives: as GrA-22540

Calibrated date: *1σ:* 980–830 cal BC
2σ: 1030–810 cal BC

Final comment: see GrA-22540

Laboratory comment: see GrA-22540

OxA–12500 3070 ±32 BP

$\delta^{13}C$: -25.5‰

Sample: BQ 99R 235B, submitted on 7 July 2003 by L Ladle

Material: carbonised residue (internal)

Initial comment: from the fill of a small, steep-sided, flat-based pit, with a single dark sandy loam fill, containing two complete pots.

Objectives: as GrA-22540

Calibrated date: *1σ:* 1410–1300 cal BC
2σ: 1420–1260 cal BC

Final comment: A Woodward (25 February 2004), this sample was a sherd from a Type II globular urn of Dorset Downs style. This vessel was part of a deliberate deposit which also incorporated a Central Wessex style vessel (GrA-22425).

OxA–12828 2655 ±65 BP

$\delta^{13}C$: -27.6‰

Sample: BQ 94D 416, submitted on 7 July 2003 by L Ladle

Material: carbonised residue (internal)

Initial comment: from a fill of a large feature, 15m long, observed in section (D414).

Objectives: as GrA-22540

Calibrated date: *1σ:* 890–790 cal BC
2σ: 930–670 cal BC

Final comment: see GrA-22540

Bestwall Quarry: Ceramic Residues - middle Bronze Age Series 3, Avon/Stour Valleys Style, Dorset

Location: SY 935880
Lat. 50.41.31 N; Long. 02.05.34 W

Project manager: A Woodward (Birmingham Archaeology), 1992–2004

Archival body: Dorset County Museum

Description: a regional tradition of middle Bronze Age Deverel-Rimbury pottery, centred on the lower reaches of the Avon and Stour river valleys in south Hampshire and south-east Dorset. It is characterised by globular urns of Type III, and specific domestic wares such as straight-sided storage vessels with vertical cordons (Ellison types AS2 and AS3), bucket urns with shoulder grooves (type AS6), and plain vessels of ovoid profile and with lugs at the belly (type AS5).

Objectives: current absolute dating evidence for this style derives from urn cemeteries, and the results from one of these, Simons Ground (most of which appear to be very late), are problematic (White 1982). However they may indicate an extended currency for this particular style, and this possibility, as well as chronological relationships with pottery of the Central Wessex and Dorset Downs styles, could be investigated in this dating programme.

Final comment: A Woodward (7 May 2004), the date series demonstrated that pottery of Avon/Stour style was current throughout the middle Bronze Age period, although at Bestwall some slightly later dates were obtained for some vessels in the Central Wessex and Dorset Downs styles. The earliest dates are from Avon/Stour vessels, but the lack of early determinations on Central Wessex or Dorset Downs examples may be due to the inadequate sampling density. The Avon/Stour dates indicate that the Simons Ground series was indeed in error, and that all three styles of Deverel-Rimbury were roughly contemporary.

References: Barrett *et al* 1976
Calkin 1964
Ellison 1975
White 1982

GrA–22417 3070 ±35 BP

$\delta^{13}C$: -26.8‰

Sample: BQ 97F 564, submitted on 21 February 2003 by L Ladle

Material: carbonised residue (internal)

Initial comment: from an oval pit with sloping sides and moderately flat base (F564). This had a sandy fill with pottery, worked and burnt flint, burnt heathstone, and charcoal flecks. There was no evidence of intrusion or residuality. The local geology is valley gravels overlain by sandy acidic subsoils and topsoils. The feature was cut into natural sand, and there appeared to be some 'iron-panning' on top of the feature. There was no disturbance.

Objectives: to date the period of use of a pottery vessel of the Avon/Stour tradition.

Calibrated date: *1σ:* 1410–1300 cal BC
2σ: 1430–1260 cal BC

Final comment: A Woodward (25 February 2004), the dated sherd was a plain wall sherd from the same context as a highly diagnostic Avon/Stour vessel, and was probably from a vessel in the same tradition. This date was also used in the dating of House 4 (see middle Bronze Age Houses series).

GrA–22544 3160 ±50 BP

δ¹³C: -25.5‰

Sample: BQ 99R 198, submitted on 21 February 2003 by L Ladle

Material: carbonised residue (internal)

Initial comment: from an oval pit with almost vertical sides and a flat base (R198). The fill was of loamy sand with charcoal flecks, raw clay, and gravel nodules. Large amounts of pottery were present. There was no evidence of intrusion or residuality. The local geology is valley gravels overlain by sandy acidic subsoils and topsoils. The feature was cut into subsoil and was approximately 0.40m below the ground surface. There was no disturbance.

Objectives: as GrA-22417

Calibrated date: *1σ:* 1500–1400 cal BC
2σ: 1530–1310 cal BC

Final comment: A Woodward (25 February 2004), the sample came from a sherd which belonged to a vessel with a fingertip impressed cordon. This was probably of the Avon/Stour style.

GrA–22565 3010 ±45 BP

δ¹³C: -25.5‰

Sample: BQ 97F 241, submitted on 21 February 2003 by L Ladle

Material: carbonised residue (internal)

Initial comment: from a circular, steep-sided, flat-based pit (F241). The majority of the pottery sherds were in the upper, sandy loam fill. Also present were worked and burnt flint, burnt heathstone, gravel cobbles, and charcoal. There was no evidence of intrusion or residuality. The local geology is valley gravel overlain by sandy acidic subsoils and topsoils. The feature was cut into gravelly sand and was approximately 0.40m below the ground surface. There was no disturbance.

Objectives: as GrA-22417

Calibrated date: *1σ:* 1380–1200 cal BC
2σ: 1410–1120 cal BC

Final comment: A Woodward (4 February 2004), this sample was a sherd which belonged to a vessel with a row of fingertip impressions and plain lug. This form of vessel is typical of the Avon/Stour style.

OxA–12158 3037 ±24 BP

δ¹³C: -24.6‰

Sample: BQ 96E 1459, submitted on 21 March 2003 by L Ladle

Material: carbonised residue (external)

Initial comment: from a circular, steep-sided, flat-based pit (E1459). The fill comprised of sandy loam with frequent gravel and charcoal flecks. There was a basal layer of charcoal ash. Large amounts of pottery, worked and burnt flint, and heathstone were recovered from the fill. There was no evidence of intrusion or residuality. The local geology is valley gravel overlain by sandy acidic subsoils and topsoils. The feature was cut into sandy gravel and was approximately 0.35m below the ground surface. There was a small amount of animal disturbance in the form of a burrow.

Objectives: as GrA-22417

Calibrated date: *1σ:* 1380–1260 cal BC
2σ: 1395–1215 cal BC

Final comment: A Woodward (4 February 2004), the sample adhered to a sherd which belonged to a vessel with a row of fingertip impressions. This form is probably of the Avon-Stour style. This date was also considered in the dating of House 3 (see middle Bronze Age Houses series).

Laboratory comment: Ancient Monuments Laboratory (July 2007), this sample, although external carbonised residue, was submitted as it was placed so high on the vessel that it looked as if the food had boiled over.

OxA–12160 2902 ±23 BP

δ¹³C: -25.7‰

Sample: BQ 98C 42, submitted on 21 February 2003 by L Ladle

Material: carbonised residue (external)

Initial comment: from the upper fill of a large, rectangular feature, possibly a firing floor (C31). The fill comprised of sandy loam with large amounts of charcoal, worked and burnt flint, and abundant pottery. There was no evidence of intrusion or residuality. The local geology is valley gravel overlain by sandy acidic subsoils and topsoils. The feature was cut into subsoil and was approximately 0.35m below the ground surface. There was no disturbance.

Objectives: as GrA-22417

Calibrated date: *1σ:* 1130–1040 cal BC
2σ: 1195–1005 cal BC

Final comment: A Woodward (4 February 2004), the sample came from a sherd which belonged to a large shouldered bucket urn with a row of fingertip impressions at the shoulder. This form of vessel is typical of the Avon/Stour style.

Laboratory comment: see OxA-12158

OxA–12166 3191 ±25 BP

δ¹³C: -25.1‰

Sample: BQ 98G 134, submitted on 21 February 2004 by L Ladle

Material: carbonised residue

Initial comment: from an oval pit with a flat base (G134). The fill was comprised of sandy loam with frequent charcoal flecks, burnt flint, and burnt heathstone, and moderate amounts of pottery throughout the fill. There was no evidence of intrusion or residuality. The local g eology is valley gravels overlain by sandy acidic subsoils and topsoils. The feature was cut into gravely sand and was approximately 0.35m below the ground surface. There was no disturbance.

Objectives: as GrA-22417

Calibrated date: *1σ:* 1500–1430 cal BC
2σ: 1510–1410 cal BC

Final comment: A Woodward (25 February 2004), the sample came from a plain wall sherd. An Avon/Stour vessel with a fingertip row and a lug came from the same context.

OxA–12167 3173 ±25 BP

$\delta^{13}C$: -24.0‰

Sample: BQ 02J 423C, submitted on 21 February 2003 by L Ladle

Material: carbonised residue

Initial comment: from an upper fill of a large pit (J475). The fill was comprised of silty sand, with burnt and worked flint. Large amounts of pottery were present. There was no evidence of intrusion or residuality. The local geology is valley gravels overlain by sandy acidic subsoils and topsoils. The feature was cut into gravel and was approximately 0.45m below the ground surface. There was no disturbance.

Objectives: as GrA-22540

Calibrated date: *1σ:* 1500–1420 cal BC
2σ: 1500–1400 cal BC

Final comment: A Woodward (25 February 2004), originally this sherd appeared to be from the same vessel as BQ 02J 423A (OxA-12201) and BQ 02J 423B (oxA-12202), but the result is statistically inconsistent with those from these sherds. As they were not joining sherds, presumably 423C is from a different vessel. This date was also used to enhance the Burnt Mound/House 1 series.

OxA–12201 3918 ±31 BP

$\delta^{13}C$: -25.5‰

Sample: BQ 02J 423A, submitted on 21 February 2003 by L Ladle

Material: carbonised residue

Initial comment: as OxA-12167

Objectives: as GrA-22417

Calibrated date: *1σ:* 2470–2340 cal BC
2σ: 2480–2290 cal BC

Final comment: A Woodward (25 February 2004), this sherd was thought to be part of the same vessel as BQ 02J 423B and BQ 02J 423C, based on its fabric, colour, thickness, and surface finish. However, none of these three sherds joined, so this attribution cannot be positive. BQ02J 423C is certainly from a second vessel because of its radiocarbon result (OxA-12167), so there is a possibility that sherds BQ 02J 423B and BQ 02J 432C also came from different vessels. This date was also used to enhance the Burnt Mound/House 1 series.

OxA–12202 3006 ±30 BP

$\delta^{13}C$: -24.6‰

Sample: BQ 02J 423B, submitted on 21 February 2003 by L Ladle

Material: carbonised residue

Initial comment: as OxA-12167

Objectives: as GrA-22417

Calibrated date: *1σ:* 1310–1210 cal BC
2σ: 1390–1120 cal BC

Final comment: see OxA-12201

OxA–12203 2907 ±30 BP

$\delta^{13}C$: -27.6‰

Sample: BQ 97F 178, submitted on 21 February 2003 by L Ladle

Material: carbonised residue (internal)

Initial comment: from the terminal of ditch (179). The cut had steep sides and a flattish base. The single fill was composed of a sandy loam with frequent charcoal pieces, and pottery and worked flint. There was no evidence of intrusion or residuality. The local geology is valley gravels overlain by sandy acidic subsoils and topsoils. The feature was cut into gravely sand and was approximately 0.40m below the ground surface. There was no disturbance.

Objectives: as GrA-22417

Calibrated date: *1σ:* 1190–1040 cal BC
2σ: 1260–1000 cal BC

Final comment: A Woodward (25 February 2004), the dated sherd belonged to an ovoid vessel with plain bosses. This form of vessel is typical of the Avon/Stour style.

OxA–12211 2975 ±40 BP

$\delta^{13}C$: -24.7‰

Sample: BQ 02J 423B, submitted on 21 February 2003 by L Ladle

Material: carbonised residue

Initial comment: replicate of OxA-12202

Objectives: replicate of OxA-12202

Calibrated date: *1σ:* 1290–1120 cal BC
2σ: 1380–1050 cal BC

Final comment: see OxA-12201

Laboratory comment: Ancient Monuments Laboratory (2004), the two measurements on this sherd are statistically consistent ($T'=0.4$; $T'(5\%)=3.8$; $\nu=1$; Ward and Wilson 1978).

References: Ward and Wilson 1978

Bestwall Quarry: Ceramic Residues - Undiagnostic middle Bronze Age Style, Dorset

Location: SY 935880
Lat. 50.41.31 N; Long. 02.05.34 W

Project manager: A Woodward (Birmingham Archaeology), 1992–2004

Archival body: Dorset County Museum

Description: following detailed analysis of the Bronze Age pottery during 2003, it was concluded that three residues from vessels initially identified to one of the three regional styles could not in fact be regarded as diagnostic. They are therefore grouped together as being of undiagnostic middle Bronze Age date.

Objectives: dates from these sherds could provide additional information concerning the overall span of middle Bronze Age ceramics at Bestwall, and could also be used in the

investigation of the spatial distribution of activity areas through time.

Final comment: A Woodward (7 May 2004) as expected, these dates fall within the middle Bronze Age period. Their span, with no particularly late determinations represented, gives a pattern most similar to that of the Avon/Stour style. Although these items turned out to be undiagnostic, they provide an important contribution to the middle Bronze Age date set as a whole, and will be useful in the overall assessment of the spatial distribution of activity areas on the site through time.

Laboratory comment: see also OxA-12575, OxA-12576, OxA-12577, and OxA-12881

References:
Barrett *et al* 1976
Barrett *et al* 1991
Calkin 1964
Dacre and Ellison 1981
Ellison 1975
Petersen 1981
Rahtz and ApSimon 1962
White 1982
Woodward 1991

GrA–22427 3110 ±35 BP

$\delta^{13}C$: -25.6‰

Sample: BQ 99H 308A, submitted on 21 February 2003 by L Ladle

Material: carbonised residue

Initial comment: from a circular pit with near-vertical sides and a flat base (H308). The fill was composed of dark, almost black humic loamy sand. Other finds include charcoal lumps, burnt flint, and burnt heathstone. Much of the pottery was found on/near the base of the pit. There was no evidence of intrusion or residuality. The local geology is valley gravels overlain by sandy acidic subsoils and topsoils. The feature was cut into subsoil and natural gravel and was approximately 0.5m below the ground surface. There was no disturbance.

Objectives: to date the period of use of a pottery vessel thought to be of the Central Wessex tradition.

Calibrated date: *1σ:* 1430–1320 cal BC
2σ: 1450–1300 cal BC

Final comment: A Woodward (13 January 2004), this vessel was originally assigned to the Central Wessex tradition, but on further analysis was reassigned to the generic middle Bronze Age ceramic tradition. The sherd was probably residual in this context.

OxA–12159 3123 ±24 BP

$\delta^{13}C$: -27.7‰

Sample: BQ 96E 1271, submitted on 21 February 2003 by L Ladle

Material: carbonised residue (external)

Initial comment: from a fill, comprising of sandy loam with moderate gravel nodules, in ditch (E1139). The finds also included worked flint. There was no evidence of intrusion or residuality. The local geology is valley gravels overlain by sandy acidic subsoils and topsoils. The feature was cut into gravels and was approximately 0.30m below the ground surface. There was no disturbance.

Objectives: to date the period of use of a pottery vessel of the Avon/Stour tradition.

Calibrated date: *1σ:* 1430–1390 cal BC
2σ: 1440–1320 cal BC

Final comment: A Woodward (13 January 2004), this vessel with a flat rim was originally assigned to the Avon/Stour tradition, but on further analysis was reassigned to the generic middle Bronze Age ceramic tradition.

OxA–12199 2913 ±36 BP

$\delta^{13}C$: -25.9‰

Sample: BQ 98G 178, submitted on 21 February 2003 by L Ladle

Material: carbonised residue

Initial comment: from a large oval, steep-sided, flat-based pit (G178). The fill was composed of sandy loam with charcoal flecks and lumps of raw clay. Large quantities of abraded pottery were present, also a single shale spindle whorl. The pit was cut by a ditch section (G181). Regarding the pottery - there is no possibility of intrusion or residuality. The local geology is valley gravels overlain by sandy acidic subsoils and topsoils. The feature was cut into gravel and was approximately 0.35m from the ground surface. There was no disturbance.

Objectives: to date the period of use of a pottery vessel thought to be of late Bronze Age tradition.

Calibrated date: *1σ:* 1200–1040 cal BC
2σ: 1260–1000 cal BC

Final comment: A Woodward (25 February 2004), following detailed pottery analysis, it became apparent that this flat rim sherd derived from a vessel of middle Bronze Age date, not of late Bronze Age tradition as had initially been thought.

Laboratory comment: Ancient Monuments Laboratory (2004), the two measurements on this residue (OxA-12199 and OxA-12210) are statistically consistent ($T'=0.5$; $T'(5\%)=3.8$; $\nu=1$; Ward and Wilson 1978).

References:
Ward and Wilson 1978

OxA–12210 2879 ±32 BP

$\delta^{13}C$: -26.2‰

Sample: BQ 98G 178, submitted on 21 February 2003 by L Ladle

Material: carbonised residue

Initial comment: replicate of OxA-12199

Objectives: replicate of OxA-12199

Calibrated date: *1σ:* 1120–1000 cal BC
2σ: 1200–930 cal BC

Final comment: see OxA-12199

Laboratory comment: see OxA-12199

References:
Ward and Wilson 1978

Bestwall Quarry: Charcoal-filled Pits, Dorset

Location: SY 935880
Lat. 50.41.31 N; Long. 02.05.34 W

Project manager: L Ladle (Bestwall Quarry Archaeology Project), 1992–2003

Archival body: Dorset County Museum

Description: the site produced 1031 pits, the average diameter is 1.50m, the depths vary between 0.10m-0.50m. The pits vary in shape from sub-rectangular to circular and generally consist of a basal layer of charcoal and an upper layer of soil, often containing charcoal pieces. Some pits do not have a charcoal layer. A number of pits have produced Bronze Age, Iron Age, and Roman pottery. Prehistoric worked flint has been found in more than half of the pits. These features could belong to one or more periods and some could be medieval.

Objectives: to discover whether the charcoal-filled pits are of a single period and if so, which, or whether they date from several periods.

Final comment: L Ladle (5 March 2004), the charcoal pits are the most numerous type of feature on the Quarry, and they occur all over the site. The artefacts within these features provided little, no, or conflicting dating evidence. The radiocarbon results form a very tight group, and tell us that these features date to the middle Saxon period.

References: Cox and Hearne 1991

GrA–22396 1240 ±30 BP

$\delta^{13}C$: -26.7‰

Sample: BQ 2KS 196A, submitted on 7 February 2003 by L Ladle

Material: charcoal: *Quercus* sp., sapwood, a single fragment (R Gale 2003)

Initial comment: circular pit with steep sides and a flat base, which was cut into gravelly sand. The fill comprised of sand and gravels with burnt flint and charcoal lumps throughout. No pottery was present and there was no evidence of intrusion or residuality. The local geology consists of valley gravels overlain by sandy acidic subsoils and topsoils. The feature was cut into the subsoil and was approximately 0.30m below the ground surface. There was no disturbance.

Objectives: to determine whether the large number of charcoal pits at Bestwall Quarry represent a single phase of activity, and if so, to estimate the date and duration of this activity. The pit contained no datable finds and was located in the northern central area of the site. It was atypical because the charcoal was distributed throughout, rather than as a basal fill.

Calibrated date: *1σ:* cal AD 690–810
2σ: cal AD 670–890

Final comment: L Ladle (5 March 2004), this pit falls within the main middle Saxon period of activity.

Laboratory comment: Ancient Monuments Laboratory (2004), the two fragments of charcoal from this pit (GrA-22396 and GrA-22397) produced radiocarbon results which are statistically consistent ($T'=0.1$; $T'(5\%)=3.8$; $\nu=1$; Ward and Wilson 1978).

References: Ward and Wilson 1978

GrA–22397 1225 ±35 BP

$\delta^{13}C$: -26.3‰

Sample: BQ 2KS 196B, submitted on 7 February 2003 by L Ladle

Material: charcoal: *Quercus* sp., sapwood, a single fragment (R Gale 2003)

Initial comment: as GrA-22396

Objectives: as GrA-22396

Calibrated date: *1σ:* cal AD 710–880
2σ: cal AD 680–890

Final comment: see GrA-22396

Laboratory comment: see GrA-22396

GrA–22398 1280 ±30 BP

$\delta^{13}C$: -23.9‰

Sample: BQ 98G 348A, submitted on 7 February 2003 by L Ladle

Material: charcoal: *Ilex* sp., a single fragment (R Gale 2003)

Initial comment: from the basal layer of charcoal (0.10m deep) in a sub-rectangular pit. The pit cut into sand, which showed evidence of burning on the base. Pottery was found in the upper fill as well as on the base of the pit. There was no evidence of intrusion or residuality. Four unabraded sherds of middle Bronze Age pottery were recovered from the pit. The local geology is of valley gravels overlain by sandy acidic subsoils and topsoils. The feature was cut into subsoil and was approximately 0.35m below the ground surface. There was no disturbance and no waterlogging.

Objectives: to determine whether the large number of charcoal pits at Bestwall Quarry represent a single phase of activity, and if so, the date and duration of this activity. This pit was thought to be middle Bronze Age on the basis of the finds assemblage recorded during assessment.

Calibrated date: *1σ:* cal AD 670–780
2σ: cal AD 660–780

Final comment: L Ladle (5 March 2004), subsequent analysis of the pottery revealed that the upper fill of contained 13 sherds of late Bronze Age/early Iron Age pottery, and 40 sherds of latest Iron Age pottery. The pit falls into the main period of middle Saxon activity, but is unusual in being sub-rectangular. The burning on the base of the feature suggests that the charcoal is in a primary context.

Laboratory comment: Ancient Monuments Laboratory (2004), the two fragments of charcoal from this pit (GrA-22398 and GrA-22399) produced radiocarbon results, which are statistically consistent ($T'=0.0$; $T'(5\%)=3.8$; $\nu=1$; Ward and Wilson 1978).

References: Ward and Wilson 1978

GrA–22399 1285 ±35 BP

$\delta^{13}C$: -26.3‰

Sample: BQ 98G 348B, submitted on 7 February 2003 by L Ladle

Material: charcoal: *Quercus* sp., sapwood, a single fragment (R Gale 2003)

Initial comment: as GrA-22398

Objectives: as GrA-22398

Calibrated date: *1σ:* cal AD 670–780
2σ: cal AD 650–810

Final comment: see GrA-22398

Laboratory comment: see GrA-22398

GrA–22401 1380 ±35 BP

$\delta^{13}C$: -25.8‰

Sample: BQ 94B 384A, submitted on 7 February 2003 by L Ladle

Material: charcoal: *Ilex* sp., a single fragment (R Gale 2003)

Initial comment: from a circular feature with a basal layer of charcoal 0.10m thick. There was no possibility of intrusion or residuality. One sherd of late third century Roman Black Burnished Ware was found in the fill. The local geology is valley gravels overlain by sandy acidic subsoils and topsoils. The feature was cut into subsoil and was approximately 0.40m below the ground surface. There was a small amount of disturbance by worms and/or moles but no waterlogging.

Objectives: to determine whether the large number of charcoal pits at Bestwall Quarry represent a single phase of activity, and if so, the date and duration of this activity. This pit was selected because it contained one sherd of late third century AD Roman Black Burnished Ware, and so was considered likely to be late Roman.

Calibrated date: *1σ:* cal AD 640–670
2σ: cal AD 600–680

Final comment: L Ladle (5 March 2004), this pit falls into the main period of middle Saxon activity.

Laboratory comment: Ancient Monuments Laboratory (2004), the two fragments of charcoal from this pit (GrA–22401 and GrA–22402) produced radiocarbon results, which are statistically consistent ($T'=0.4$; $T'(5\%)=3.8$; $\nu=1$; Ward and Wilson 1978).

References: Ward and Wilson 1978

GrA–22402 1350 ±35 BP

$\delta^{13}C$: -26.1‰

Sample: BQ 94B 384B, submitted on 7 February 2003 by L Ladle

Material: charcoal: *Quercus* sp., sapwood, a single fragment (R Gale 2003)

Initial comment: as GrA-22401

Objectives: as GrA-22401

Calibrated date: *1σ:* cal AD 650–680
2σ: cal AD 640–770

Final comment: see GrA-22401

Laboratory comment: see GrA-22401

GrA–22403 1200 ±35 BP

$\delta^{13}C$: -25.8‰

Sample: BQ 96E 987A, submitted on 7 February 2003 by L Ladle

Material: charcoal: *Quercus* sp., sapwood, a single fragment (R Gale 2003)

Initial comment: from a circular feature with thick deposits of charcoal in an otherwise loamy/sandy fill, which contained occasional charcoal pieces. There was no evidence of intrusion or residuality, and no pottery. The local geology is valley gravels overlain by sandy acidic subsoils and topsoils. The feature was cut into subsoil and was approximately 0.30m below the ground surface. There was no disturbance or waterlogging.

Objectives: to determine whether the large number of charcoal pits at Bestwall Quarry represent a single phase of activity, and if so, the date and duration of this activity. This pit contained no datable finds. It had an atypical fill with occasional thick deposits of charcoal, and no basal charcoal deposit. It was located in the central northern part of the site.

Calibrated date: *1σ:* cal AD 770–890
2σ: cal AD 690–950

Final comment: L Ladle (5 March 2004), this pit falls within the main period of middle Saxon activity.

Laboratory comment: Ancient Monuments Laboratory (2004), the two fragments of charcoal from this pit (GrA–22403 and GrA–22406) produced radiocarbon results which are statistically consistent ($T'=0.0$; $T'(5\%)=3.8$; $\nu=1$; Ward and Wilson 1978).

References: Ward and Wilson 1978

GrA–22406 1215 ±35 BP

$\delta^{13}C$: -26.1‰

Sample: BQ 96E 987B, submitted on 7 February 2003 by L Ladle

Material: charcoal: *Quercus* sp., sapwood, a single fragment (R Gale 2003)

Initial comment: as GrA-22403

Objectives: as GrA-22403

Calibrated date: *1σ:* cal AD 720–890
2σ: cal AD 680–900

Final comment: see GrA-22403

Laboratory comment: Ancient Monuments Laboratory (2004), GrA-22423 is a replicate measurement on the same fragment of charcoal. These measurements are statistically consistent at 95% confidence ($T'=0.5$; $T'(5\%)=3.8$; $\nu=1$; Ward and Wilson 1978). *See* also GrA-22403.

References: Ward and Wilson 1978

GrA–22423 1180 ±35 BP

$\delta^{13}C$: -25.6‰

Sample: BQ 96E 987B, submitted on 7 February 2003 by L Ladle

Material: charcoal: *Quercus* sp., sapwood, a single fragment (R Gale 2003)

Initial comment: replicate of GrA-22406

Objectives: replicate of GrA-22406

Calibrated date: *1σ:* cal AD 770–900
2σ: cal AD 720–970

Final comment: see GrA-22403

Laboratory comment: see GrA-22406 and GrA-22403

GrA–23592 1280 ±40 BP

$\delta^{13}C$: -24.8‰

Sample: BQ 02N 282A, submitted on 7 July 2003 by L Ladle

Material: charcoal: *Quercus* sp., sapwood, a single fragment (2g) (R Gale 2003)

Initial comment: from a sandy loam fill of sub-oval, bowl-shaped pit (N281) with moderately sloping sides and a flat base, which cuts a middle Bronze Age ditch section (N283). Finds included 21 sherds of Roman pottery and 1117g of slag. Charcoal and ash were abundant but denser on the base, which was burnt red.

Objectives: to determine whether the large number of charcoal pits at Bestwall Quarry represent a single phase of activity, and if so, to estimate the date and duration of this activity. This pit was thought to be Roman on the basis of its finds.

Calibrated date: *1σ:* cal AD 670–780
2σ: cal AD 650–860

Final comment: L Ladle (5 March 2004), this pit dates to the main period of middle Saxon activity on the site. It contained an unusual deposit of slag, and may be associated with the broadly contemporary furnace in Field T (T314). The *in situ* burning on the base of the pit suggests that the charcoal was in a primary context.

Laboratory comment: Ancient Monuments Laboratory (2004), the two fragments of charcoal from this pit (GrA-23592 and OxA-12506) produced radiocarbon results which are statistically consistent ($T'=0.2$; $T'(5\%)=3.8$; $\nu=1$; Ward and Wilson 1978).

References: Ward and Wilson 1978

GrA–23600 1475 ±45 BP

$\delta^{13}C$: -24.9‰

Sample: BQ 02T 334A, submitted on 7 July 2003 by L Ladle

Material: charcoal: *Quercus* sp., sapwood, a single fragment (<2g) (R Gale 2003)

Initial comment: from a sandy loam fill of sub-oval pit (332), which had a basal layer of charcoal (334).

Objectives: to determine whether the large number of charcoal pits at Bestwall Quarry represent a single phase of activity, and if so, to estimate the date and duration of this activity. This pit contained no datable finds and was on the extreme north-east of the site.

Calibrated date: *1σ:* cal AD 540–640
2σ: cal AD 440–660

Final comment: L Ladle (5 March 2004), this sample is significantly earlier than the other measurement from this pit (OxA-12574), and so is probably residual.

Laboratory comment: Ancient Monuments Laboratory (2004), the two fragments of charcoal from this pit produced radiocarbon results which are statistically significantly different ($T'=11.8$; $T'(5\%)=3.8$; $\nu=1$; Ward and Wilson 1978).

References: Ward and Wilson 1978

GrA–23696 1140 ±35 BP

$\delta^{13}C$: -24.9‰

Sample: BQ 95C 738A, submitted on 7 July 2003 by L Ladle

Material: charcoal: *Quercus* sp., sapwood, a single fragment (2g) (R Gale 2003)

Initial comment: from the basal layer of charcoal within a shallow, circular pit with sloping sides and a flat base (C738).

Objectives: to determine whether the large number of charcoal pits at Bestwall Quarry represent a single phase of activity, and if so, to estimate the date and duration of this activity. This pit contained no datable finds and was located to the north-west of the site.

Calibrated date: *1σ:* cal AD 880–970
2σ: cal AD 770–990

Final comment: L Ladle (5 March 2004), this pit falls towards the end of the main period of middle Saxon activity.

Laboratory comment: Ancient Monuments Laboratory (2004), the two fragments of charcoal from this pit (GrA-23696 and OxA-12505) produced radiocarbon results which are statistically consistent ($T'=1.7$; $T'(5\%)=3.8$; $\nu=1$; Ward and Wilson 1978).

References: Ward and Wilson 1978

GrA–23757 1315 ±35 BP

$\delta^{13}C$: -25.3‰

Sample: BQ 03M 237B, submitted on 7 July 2003 by L Ladle

Material: charcoal: *Quercus* sp., sapwood, a single fragment (2g) (R Gale 2003)

Initial comment: from the sandy loam fill of a circular pit with gently sloping sides and a rounded base. Overlain by a layer of charcoal. The base of the pit was burnt red. There were no finds other than charcoal.

Objectives: to determine whether the large number of charcoal pits at Bestwall Quarry represent a single phase of activity, and if so, to estimate the date and duration of this activity. This pit contained no datable finds, and was in the south-eastern part of the site.

Calibrated date: *1σ:* cal AD 660–770
2σ: cal AD 650–780

Final comment: L Ladle (5 March 2004), this pit falls into the main period of middle Saxon activity, and shows

evidence of *in situ* burning, suggesting that the charcoal was in a primary context.

Laboratory comment: Ancient Monuments Laboratory (2004), the two fragments of charcoal from this pit produced radiocarbon results, which are statistically consistent (T′=0.3; T′(5%)=3.8; ν=1; Ward and Wilson 1978).

References: Ward and Wilson 1978

GrA–23764 1240 ±35 BP

$\delta^{13}C$: -27.4‰

Sample: BQ 93A 109A, submitted on 7 July 2003 by L Ladle

Material: charcoal: *Quercus* sp., sapwood, a single fragment (2g) (R Gale 2003)

Initial comment: from a thick layer of charcoal within a sub-circular pit.

Objectives: to determine whether the large number of charcoal pits at Bestwall Quarry represent a single phase of activity, and if so, to estimate the date and duration of this activity. This pit contained no datable finds, and was in the extreme north-west corner of the site.

Calibrated date: *1σ:* cal AD 690–810
2σ: cal AD 670–890

Final comment: L Ladle (5 March 2004), this pit falls within the main period of middle Saxon activity.

Laboratory comment: Ancient Monuments Laboratory (2004), the two fragments of charcoal from this pit (GrA-23764 and OxA-GrA-2376) produced radiocarbon results which are statistically consistent (T′=3.3; T′(5%)=3.8; ν=1; Ward and Wilson 1978).

References: Ward and Wilson 1978

GrA–23766 1330 ±35 BP

$\delta^{13}C$: -23.5‰

Sample: BQ 93A 109B, submitted on 7 July 2003 by L Ladle

Material: charcoal: *Ilex aquifolium*, a single fragment (2g) (R Gale 2003)

Initial comment: as GrA-23764

Objectives: as GrA-23764

Calibrated date: *1σ:* cal AD 650–690
2σ: cal AD 640–770

Final comment: see GrA-23764

Laboratory comment: see GrA-23764

GU–5939 1340 ±50 BP

$\delta^{13}C$: -25.8‰

Sample: BQ 96E 1078A, submitted on 7 March 2003 by L Ladle

Material: charcoal: *Quercus* sp., sapwood, bulk (R Gale 2003)

Initial comment: from a circular pit with almost vertical sides and a flat base. The main fill was a sandy loam with occasional charcoal fragments above a basal fill (E1078) that was comprised of a dense spread of charcoal. There was evidence of burning on the base of the pit, and small sherds BB1 pottery. There was no evidence of intrusion or residuality. The local geology is valley gravels overlain by sandy acidic subsoils and topsoils. The feature was cut into sandy gravel and was approximately 0.35m below the ground surface. There was no disturbance.

Objectives: to determine whether the large number of charcoal pits at Bestwall Quarry represent a single phase of activity, and if so, the date and duration of this activity. The pit contained small sherds of Black Burnished Ware and so was thought to be of Roman date.

Calibrated date: *1σ:* cal AD 650–690
2σ: cal AD 610–780

Final comment: L Ladle (5 March 2004), this pit falls into the main period of middle Saxon activity, but is larger than most of the charcoal pits. Burning on the base suggests that the charcoal may be in a primary context.

Laboratory comment: Ancient Monuments Laboratory (2004), the two results on samples of bulk charcoal from this context (GU-5939 and GU-5940) are statistically consistent (T′=0.5; T′(5%)=3.8; ν=1; Ward and Wilson 1978).

References: Ward and Wilson 1978

GU–5940 1290 ±50 BP

$\delta^{13}C$: -26.0‰

Sample: BQ 96E 1078B, submitted on 7 March 2003 by L Ladle

Material: charcoal: *Quercus* sp., sapwood, bulk (R Gale 2003)

Initial comment: as GU-5939

Objectives: as GU-5939

Calibrated date: *1σ:* cal AD 660–780
2σ: cal AD 650–880

Final comment: see GU-5939

Laboratory comment: see GU-5939

OxA–12127 1430 ±26 BP

$\delta^{13}C$: -26.6‰

Sample: BQ 99R 160A, submitted on 7 February 2003 by L Ladle

Material: charcoal: *Ilex* sp., sapwood, a single fragment (2g) (R Gale 2003)

Initial comment: from a circular pit. The upper layer (160) was packed with charcoal lumps, however there was also a lower layer consisting of ashy sand and smaller charcoal pieces. No evidence of intrusion or residuality was observed, and no pottery was recovered. The local geology is valley gravels overlain by sandy acidic subsoils and topsoils. The feature was cut into subsoil and was approximately 0.40m below the ground surface. There was no disturbance or waterlogging.

Objectives: to determine whether the large number of charcoal pits at Bestwall Quarry represent a single phase of activity, and if so, the date and duration of this activity. This pit contained no datable finds and was located in the centre of the site.

Calibrated date: *1σ:* cal AD 600–650
2σ: cal AD 570–660

Final comment: L Ladle (5 March 2004), this sample is earlier than OxA-12128, and may be residual.

Laboratory comment: Ancient Monuments Laboratory (2004), the two fragments of charcoal from this pit (OxA-12127 and OxA-12128) produced radiocarbon results, which are statistically significantly different (T′=11.3; T′(5%)=3.8; ν=1; Ward and Wilson 1978).

References: Ward and Wilson 1978

OxA–12128 1311 ±24 BP

δ¹³C: -25.9‰

Sample: BQ 99R 160B, submitted on 7 February 2003 by L Ladle

Material: charcoal: *Quercus* sp., sapwood, a single fragment (2g) (R Gale 2003)

Initial comment: as OxA-12127

Objectives: as OxA-12127

Calibrated date: *1σ:* cal AD 530–990
2σ: cal AD 230–1220

Final comment: L Ladle (5 March 2004), this pit falls within the main middle Saxon activity.

Laboratory comment: see OxA-12127

OxA–12129 1344 ±25 BP

δ¹³C: -25.1‰

Sample: BQ 97F 302A, submitted on 7 February 2003 by L Ladle

Material: charcoal: *Quercus* sp., sapwood, a single fragment (2g) (R Gale 2003)

Initial comment: from a subrectangular pit with a 0.10m basal deposit of charcoal. The upper fill was sandy loam with dispersed pieces of charcoal. There was burnt sand on the base of the pit. No evidence of intrusion or residuality was observed. Five sherds of late Iron Age pottery were found in the fill. The local geology is valley gravels overlain by sandy acidic subsoils and topsoils. The feature was cut into subsoil and was approximately 0.40m below the ground surface. There was no disturbance or waterlogging.

Objectives: to determine whether the large number of charcoal pits at Bestwall Quarry represent a single phase of activity, and if so, the date and duration of this activity. This pit was thought to be of late Iron Age date.

Calibrated date: *1σ:* cal AD 650–680
2σ: cal AD 640–690

Final comment: L Ladle (5 March 2004), subsequent analysis of the pottery assemblage revealed that there were five late Iron Age and three early/middle Iron Age sherds in this pit. The pit falls within the main period of the middle Saxon activity, but is unusual because it was subrectangular. The *in situ* burning implies that the charcoal was in a primary context.

Laboratory comment: Ancient Monuments Laboratory (2004), the two fragments of charcoal from this pit (OxA-12129 and OxA-12130) produced radiocarbon results, which are statistically significantly different (T′=6.5; T′(5%)=3.8; ν=1; Ward and Wilson 1978).

References: Ward and Wilson 1978

OxA–12130 1256 ±24 BP

δ¹³C: -25.2‰

Sample: BQ 97F 302B, submitted on 7 February 2003 by L Ladle

Material: charcoal: *Quercus* sp., sapwood, a single fragment (2g) (R Gale 2003)

Initial comment: as OxA-12129

Objectives: as OxA-12129

Calibrated date: *1σ:* cal AD 685–780
2σ: cal AD 675–810

Final comment: see OxA-12129

Laboratory comment: see OxA-12129

OxA–12149 1239 ±25 BP

δ¹³C: -24.6‰

Sample: BQ 99R 119A, submitted on 7 March 2003 by L Ladle

Material: charcoal: *Ilex* sp., a single fragment (R Gale 2003)

Initial comment: from an oval feature with near-vertical sides and a flat base. The fill was of sandy loam with lumps of charcoal throughout, heathstone, and worked flint. There was no evidence of intrusion or residuality. There was 59g of Black Burnished Ware (BB1) pottery present (AD 120-200). The local geology is valley gravels overlain by sandy acidic subsoils and topsoils. The feature was cut into subsoil and was approximately 0.35m below the ground surface. There was no disturbance.

Objectives: to determine whether the large number of charcoal pits at Bestwall Quarry represent a single phase of activity, and if so, the date and duration of this activity. This pit contained 12 sherds of fresh early Roman pottery, and so was thought to be of Roman date.

Calibrated date: *1σ:* cal AD 710–810
2σ: cal AD 680–880

Final comment: L Ladle (5 March 2004), this pit falls into the main period of the middle Saxon activity, despite containing fresh sherds of BB1 pottery. It is slightly unusual in being of oval shape.

Laboratory comment: Ancient Monuments Laboratory (2004), the two fragments of charcoal from this pit (OxA-12149 and OxA-12150) produced radiocarbon results which are statistically significantly different (T′=3.9; T′(5%)=3.8; ν=1; Ward and Wilson 1978).

References: Ward and Wilson 1978

OxA–12150 1313 ±28 BP

δ¹³C: -25.1‰

Sample: BQ9R 119B, submitted on 7 March 2003 by L Ladle

Material: charcoal: *Quercus* sp., sapwood, a single fragment (R Gale 2003)

Initial comment: as OxA-12149

Objectives: as OxA-12149

Calibrated date: *1σ:* cal AD 660–770
2σ: cal AD 650–780

Final comment: see OxA-12149

Laboratory comment: see OxA-12149

OxA–12184 1243 ±26 BP

$\delta^{13}C$: -24.8‰

Sample: BQ 99H 317A, submitted on 7 March 2003 by L Ladle

Material: charcoal: *Quercus* sp., sapwood, a single fragment (R Gale 2003)

Initial comment: from a circular pit with gently sloping sides and a flat base. The fill comprised of sandy loam with abundant charcoal pieces, many of which were concentrated near the base. There was one sherd (6g) of worn, sandy Roman pottery. There was no evidence of intrusion or residuality. The local geology is valley gravels overlain by sandy acidic subsoils and topsoils. The feature was cut into gravel and was approximately 0.40m below the ground surface. There was no disturbance.

Objectives: to determine whether the large number of charcoal pits at Bestwall Quarry represent a single phase of activity, and if so, the date and duration of this activity. This pit contained a single sherd of Roman pottery, and so was thought to be Roman. It was atypical because it did not have a charcoal layer on the base.

Calibrated date: *1σ:* cal AD 690–800
2σ: cal AD 680–880

Final comment: L Ladle (5 March 2004), this pit dates to the main period of middle Saxon activity.

Laboratory comment: Ancient Monuments Laboratory (2004), the two fragments of charcoal from this pit (OxA-12184 and OxA-12185) produced radiocarbon results which are statistically consistent ($T'=0.0$; $T'(5\%)=3.8$; $\nu=1$; Ward and Wilson 1978).

References: Ward and Wilson 1978

OxA–12185 1236 ±29 BP

$\delta^{13}C$: -24.6‰

Sample: BQ 99H 317B, submitted on 7 March 2003 by L Ladle

Material: charcoal: *Quercus* sp., a single fragment (R Gale 2003)

Initial comment: as OxA-12184

Objectives: as OxA-12184

Calibrated date: *1σ:* cal AD 710–810
2σ: cal AD 680–890

Final comment: see OxA-12184

Laboratory comment: see OxA-12184

OxA–12186 1591 ±26 BP

$\delta^{13}C$: -26.1‰

Sample: BQ 01J 253A, submitted on 7 March 2003 by L Ladle

Material: charcoal: *Quercus* sp., sapwood, a single fragment (R Gale 2003)

Initial comment: from an oval feature with steeply sloping sides and a flat base. The fill was comprised of sandy loam with charcoal ash and charcoal pieces throughout. There was evidence of burning on the base of the pit, but no evidence of intrusion or residuality. The local geology is valley gravels overlain by sandy acidic subsoils and topsoils. The feature was cut into natural gravel and was approximately 0.35m below the ground surface. There was no disturbance.

Objectives: to determine whether the large number of charcoal pits at Bestwall Quarry represent a single phase of activity, and if so, the date and duration of this activity. This pit had no datable finds, and was located to the north-east of the site.

Calibrated date: *1σ:* cal AD 420–540
2σ: cal AD 400–550

Final comment: L Ladle (5 March 2004), subsequent ceramic analysis revealed one sherd of late Iron Age pottery from this feature. This oval pit is rather earlier than the other charcoal pits, falling in the post-Roman period. The burning on its base, however, suggests that the charcoal was in a primary deposit and was not residual.

Laboratory comment: Ancient Monuments Laboratory (2004), the two fragments of charcoal from this pit (OxA-12186 and OxA-12187) produced radiocarbon results which are statistically significantly different ($T'=5.8$; $T'(5\%)=3.8$; $\nu=1$; Ward and Wilson 1978).

References: Ward and Wilson 1978

OxA–12187 1504 ±25 BP

$\delta^{13}C$: -25.7‰

Sample: BQ 01J 253B, submitted in March 2003 by L Ladle

Material: charcoal: *Quercus* sp., sapwood, a single fragment (R Gale 2003)

Initial comment: as OxA-12186

Objectives: as OxA-12186

Calibrated date: *1σ:* cal AD 540–600
2σ: cal AD 530–620

Final comment: see OxA-12186

Laboratory comment: see OxA-12186

OxA–12188 1264 ±24 BP

$\delta^{13}C$: -26.1‰

Sample: BQ 94D 472A, submitted on 7 March 2003 by L Ladle

Material: charcoal: *Quercus* sp., sapwood, a single fragment (R Gale 2003)

Initial comment: from a circular pit with a thick layer of charcoal below a dark loamy sand (also with fragments of charcoal). There was no evidence of intrusion or residuality. The local geology is valley gravels overlain by sandy acidic subsoils and topsoils. The feature was cut into natural sand and was approximately 0.50m below the ground surface. There was no disturbance.

Objectives: to determine whether the large number of charcoal pits at Bestwall Quarry represent a single phase of activity, and if so, the date and duration of this activity. This pit contained no datable finds, and is located to the south-west of the site.

Calibrated date: *1σ:* cal AD 685–775
2σ: cal AD 670–805

Final comment: L Ladle (5 March 2004), this pit dates to the main period of middle Saxon activity.

Laboratory comment: Ancient Monuments Laboratory (2004), the two fragments of charcoal from this pit (OxA-12188 and OxA-12189) produced radiocarbon results, which are statistically significantly different (T′=4.3; T′(5%)=3.8; ν=1; Ward and Wilson 1978).

References: Ward and Wilson 1978

OxA–12189 1186 ±29 BP

$\delta^{13}C$: -23.0‰

Sample: BQ 94D 472B, submitted on 7 March 2003 by L Ladle

Material: charcoal: *Quercus* sp., sapwood, a single fragment (R Gale 2003)

Initial comment: as OxA-12188

Objectives: as OxA-12188

Calibrated date: *1σ:* cal AD 770–890
2σ: cal AD 720–950

Final comment: see OxA-12188

Laboratory comment: see OxA-12188

OxA–12190 1236 ±26 BP

$\delta^{13}C$: -24.6‰

Sample: BQ 99R 208A, submitted on 7 March 2003 by L Ladle

Material: charcoal: *Quercus* sp., sapwood, a single fragment (R Gale 2003)

Initial comment: from a circular pit with gently sloping sides and a flat base. The fill was composed of a sandy loam with occasional dense concentrations of largish charcoal pieces. There was evidence of burning on the base, and one sherd of Black Burnished Ware pottery. There was no evidence of intrusion or residuality. The local geology is valley gravels overlain by sandy acidic subsoils and topsoils. This feature was cut into natural sand and was approximately 0.35m below the ground surface. There was no disturbance.

Objectives: to determine whether the large number of charcoal pits at Bestwall Quarry represent a single phase of activity, and if so, the date and duration of this activity. This pit had one sherd of Roman pottery, and so was thought likely to be Roman.

Calibrated date: *1σ:* cal AD 710–810
2σ: cal AD 680–890

Final comment: L Ladle (5 March 2004), this pit dates to the main period of middle Saxon activity. The *in situ* burning on its base suggests that the charcoal was in a primary context.

Laboratory comment: Ancient Monuments Laboratory (2004), the two fragments of charcoal from this pit (OxA-12190 and OxA-12273) produced radiocarbon results, which are statistically consistent (T′=0.0; T′(5%)=3.8; ν=1; Ward and Wilson 1978).

References: Ward and Wilson 1978

OxA–12273 1232 ±27 BP

$\delta^{13}C$: -25.3‰

Sample: BQ 99R 208B, submitted on 7 March 2003 by L Ladle

Material: charcoal: *Quercus* sp., sapwood, a single fragment (R Gale 2003)

Initial comment: as OxA-12190

Objectives: as OxA-12190

Calibrated date: *1σ:* cal AD 710–810
2σ: cal AD 680–890

Final comment: see OxA-12190

Laboratory comment: see OxA-12190

OxA–12505 1200 ±29 BP

$\delta^{13}C$: -23.9‰

Sample: BQ 95C 738B, submitted on 7 July 2003 by L Ladle

Material: charcoal: *Quercus* sp., sapwood, a single fragment (R Gale 2003)

Initial comment: as GrA-23696

Objectives: as GrA-23696

Calibrated date: *1σ:* cal AD 770–890
2σ: cal AD 710–940

Final comment: see GrA-23696

Laboratory comment: see GrA-23696

OxA–12506 1300 ±30 BP

$\delta^{13}C$: -25.3‰

Sample: BQ 02N 282B, submitted on 7 July 2003 by L Ladle

Material: charcoal: *Quercus* sp., sapwood, a single fragment (2g) (R Gale 2003)

Initial comment: as GrA-23592

Objectives: as GrA-23592

Calibrated date: *1σ:* cal AD 660–770
2σ: cal AD 650–780

Final comment: see GrA-23592

Laboratory comment: see GrA-23592

OxA–12574 1290 ±30 BP

δ¹³C: -24.3‰

Sample: BQ 02T 334B, submitted on 7 July 2003 by L Ladle

Material: charcoal: *Quercus* sp., sapwood, a single fragment (2g) (R Gale 2003)

Initial comment: as GrA-23600

Objectives: as GrA-23600

Calibrated date: *1σ:* cal AD 670–770
2σ: cal AD 660–780

Final comment: L Ladle (5 March 2004), this sub-oval pit falls in the main period of middle Saxon activity.

Laboratory comment: see GrA-23600

OxA–12589 1291 ±28 BP

δ¹³C: -23.7‰

Sample: BQ 03M 237A, submitted on 7 July 2003 by L Ladle

Material: charcoal: *Quercus* sp., sapwood, a single fragment (2g) (R Gale 2003)

Initial comment: as GrA-23757

Objectives: as GrA-23757

Calibrated date: *1σ:* cal AD 670–770
2σ: cal AD 660–780

Final comment: see GrA-23757

Laboratory comment: see GrA-23757

OxA–12590 111 ±27 BP

δ¹³C: -25.7‰

Sample: BQ 92A 7A, submitted on 7 July 2003 by L Ladle

Material: charcoal: Ericaceae, a single fragment (<2g) (R Gale 2003)

Initial comment: from a thick layer of charcoal within a circular pit, which was excavated on the second day of excavations.

Objectives: to determine whether the large number of charcoal pits at Bestwall Quarry represent a single phase of activity, and if so, to estimate the date and duration of this activity. The pit contained no datable finds and was in the extreme north-west of the site.

Calibrated date: *1σ:* cal AD 1680–1930
2σ: cal AD 1680–1940

Final comment: L Ladle (5 March 2004), this pit does not conform in date to the other sampled pits. The charcoal species suggest that it may well have had a different function, as well as a later date.

Laboratory comment: Ancient Monuments Laboratory (2004), the two fragments of charcoal from this pit (OxA-12590 and OxA-12591) produced radiocarbon results which are statistically significantly different ($T'=14.3$; $T'(5\%)=3.8$; $\nu=1$; Ward and Wilson 1978).

References: Ward and Wilson 1978

OxA–12591 253 ±26 BP

δ¹³C: -23.9‰

Sample: BQ 92A 7B, submitted on 7 July 2003 by L Ladle

Material: charcoal: *Ulex/Cytisus* sp., a single fragment (2g) (R Gale 2003)

Initial comment: as OxA-12590

Objectives: as OxA-12590

Calibrated date: *1σ:* cal AD 1640–1670
2σ: cal AD 1530–1800

Final comment: see OxA-12590

Laboratory comment: see OxA-12590

OxA–12610 1292 ±31 BP

δ¹³C: -23.9‰

Sample: BQ 03M 225A, submitted on 25 July 2003 by L Ladle

Material: charcoal: *Quercus* sp., sapwood, a single fragment (2g) (R Gale 2003)

Initial comment: from the sandy loam fill of a shallow sub-circular pit with moderately sloping sides and flat base (M224). The fill contained pockets of charcoal.

Objectives: to determine whether the large number of charcoal pits at Bestwall Quarry represent a single phase of activity, and if so, to estimate the date and duration of this activity. This pit contained no datable finds, and was located in the south-eastern part of the site.

Calibrated date: *1σ:* cal AD 660–770
2σ: cal AD 650–780

Final comment: L Ladle (5 March 2004), this pit falls into the main period of middle Saxon activity.

Laboratory comment: Ancient Monuments Laboratory (2004), this pit produced two radiocarbon measurements (OxA-12610 and OxA-12611) which are statistically consistent ($T'=2.5$; $T'(5\%)=3.8$; $\nu=1$; Ward and Wilson 1978).

References: Ward and Wilson 1978

OxA–12611 1224 ±31 BP

δ¹³C: -23.9‰

Sample: BQ 03M 225B, submitted on 25 July 2003 by L Ladle

Material: charcoal: *Quercus* sp., sapwood, a single fragment (2g) (R Gale 2003)

Initial comment: as OxA-12610

Objectives: as OxA-12610

Calibrated date: *1σ:* cal AD 720–870
2σ: cal AD 680–890

Final comment: see OxA-12610

Laboratory comment: see OxA-12610

OxA–12612 1278 ±31 BP

δ¹³C: -31.0‰

Sample: BQ 03L 137A, submitted on 25 July 2003 by L Ladle

Material: charcoal: *Ilex aquifolium*, a single fragment (2g) (R Gale 2003)

Initial comment: from a layer of charcoal in ashy sand, (L137), the middle fill of a sub-circular pit with moderately sloping sides and flat base (L135). The base of the pit was burnt red. There were no finds other than charcoal and 46g of burnt flint.

Objectives: to determine whether the large number of charcoal pits at Bestwall Quarry represent a single phase of activity, and if so, to estimate the date and duration of this activity. This pit has no datable finds, and was located in the central southern part of the site.

Calibrated date: *1σ:* cal AD 670–780
2σ: cal AD 660–810

Final comment: L Ladle (5 March 2004), this pit falls into the main period of middle Saxon activity.

Laboratory comment: Ancient Monuments Laboratory (2004), this pit produced two radiocarbon measurements (OxA-12612 and oxA-12613) which are statistically consistent (T′=0.0; T′(5%)=3.8; ν=1; Ward and Wilson 1978).

References: Ward and Wilson 1978

OxA–12613 1270 ±29 BP

$\delta^{13}C$: -25.9‰

Sample: BQ 03L 137B, submitted on 25 July 2003 by L Ladle

Material: charcoal: *Quercus* sp., sapwood, a single fragment (2g) (R Gale 2003)

Initial comment: as OxA-12612

Objectives: as OxA-12612

Calibrated date: *1σ:* cal AD 680–780
2σ: cal AD 660–810

Final comment: see OxA-12612

Laboratory comment: see OxA-12612

Bestwall Quarry: Cremation, Dorset

Location: SY 935880
Lat. 50.41.31 N; Long. 02.05.34 W

Project manager: L Ladle (Bestwall Quarry Archaeology Project), 1992–2003

Archival body: Dorset County Museum

Description: samples from a single urned cremation.

Objectives: to determine the date of the cremation. Replicate samples of short-lived wood charcoal and cremated human bone were submitted as part of a wider programme to assess the accuracy of the dating of cremated bone (Lanting *et al* 2001).

Final comment: A Woodward (6 May 2004), the vessel containing the cremation was thought originally to have been of late Bronze Age date, but is in fact a bucket urn of Deverel-Rimbury type. A middle Bronze Age determination for this cremation is therefore as expected. All four dates were statistically consistent. Human cremations often occur near middle Bronze Age houses, in this case between Roundhouses 5 and 6.

Laboratory comment: Ancient Monuments Laboratory (2004), this cremation produced four statistically consistent radiocarbon measurements (T′=2.2; T′(5%)=7.8; ν=3); Ward and Wilson 1978), and so a weighted mean can be taken before calibration. This is 3022 ±19 BP, which calibrates to 1380–1130 cal BC. The measurements on cremated bone from different laboratories are consistent, both with each other and with results on charcoal samples from within the urn. This suggests that the protocol for dating cremated bone is robust.

References: Lanting *et al* 2001
McKinley *et al* 2000
Ward and Wilson 1978

GrA–23636 3030 ±60 BP

$\delta^{13}C$: -22.3 ±1.5‰

Sample: BQ 99R 249.4, submitted on 7 July 2003 by L Ladle

Material: human bone (7g) (cremated, apatite fraction)

Initial comment: from the fill of a complete urn, broken during site stripping, which was deposited in a small pit. The pot contained a dark sandy loam with a large quantity (813g) of bone. There was some bone in the surrounding soil.

Objectives: to establish date of a late Bronze Age cremation.

Calibrated date: *1σ:* 1400–1210 cal BC
2σ: 1430–1110 cal BC

Final comment: L Ladle (5 March 2004), these results suggest that the cremation is middle Bronze Age. This is consistent with the bucket urn in which it was found.

GrA–23697 3055 ±40 BP

$\delta^{13}C$: -25.0‰

Sample: BQ 99R 249.7B, submitted on 7 July 2003 by L Ladle

Material: charcoal: *Quercus* sp., sapwood, a single fragment (R Gale 2003)

Initial comment: as GrA-23636

Objectives: as GrA-23636

Calibrated date: *1σ:* 1400–1260 cal BC
2σ: 1420–1210 cal BC

Final comment: see GrA-23636

OxA–12493 3036 ±34 BP

$\delta^{13}C$: -24.2‰

Sample: BQ 99R 249.7A, submitted on 7 July 2003 by L Ladle

Material: charcoal: *Quercus* sp., sapwood, a single fragment (R Gale 2003)

Initial comment: as GrA-23636

Objectives: as GrA-23636

Calibrated date: *1σ:* 1390–1260 cal BC
2σ: 1410–1190 cal BC

Final comment: see GrA-23636

OxA–12730 2985 ±32 BP

$\delta^{13}C$: -21.7‰

Sample: BQ 99R 249.6, submitted on 7 July 2003 by L Ladle

Material: human bone (7g) (cremated)

Initial comment: as GrA-23636

Objectives: as GrA-23636

Calibrated date: *1σ:* 1300–1130 cal BC
2σ: 1380–1120 cal BC

Final comment: see GrA-23636

Bestwall Quarry: Intrinsic Interest (Charred Plants), Dorset

Location: SY 935880
Lat. 50.41.31 N; Long. 02.05.34 W

Project manager: L Ladle (Bestwall Quarry Archaeology Project), 1992–2003

Archival body: Dorset County Museum

Description: from unusually rich archaeobotanical assemblages.

Objectives: to securely date the relevant features, and to help interpret their function. As early prehistoric deposits rarely produce large plant assemblages, the results will add significantly to the national database.

Final comment: A Woodward (6 May 2004), this series has incidentally provided important early dates for two groups of Beaker pottery belonging to two different styles. The dating of the pottery of later Beaker Age date within pit 1712 to the middle or late Bronze Age period is however still under review.

W Carruthers (29 May 2004), the early dates for acorn, hulled and naked barley, and emmer/spelt wheat are important additions to the plant record, as little information is available for this period. The middle Bronze Age date for the beans needs to be reconciled with the pottery information. The two 'late' dates for context F235 are difficult to explain without further information about the sample location and sample processing.

References: Carruthers 2003, 83–90

GrA–23591 3095 ±45 BP

$\delta^{13}C$: -26.0‰

Sample: BQ 97F 235B, submitted on 7 July 2003 by L Ladle

Material: grain: *Hordeum vulgare*, hulled, a single fragment (W Carruthers 2003)

Initial comment: from the dark brown sandy loam fill of an oval pit with sloping sides and a flat base. Finds included a large quantity of burnt flint, burnt heathstone, and Beaker sherds below the heathstone. The carbonised grain was under the sherds.

Objectives: to establish date of the grains (it is rare to find hulled and naked barley together in this period) and to date the Beaker vessel.

Calibrated date: *1σ:* 1430–1310 cal BC
2σ: 1450–1260 cal BC

Final comment: A Woodward (6 May 2004), the Beaker vessel found in this pit cannot be dated by this determination, which falls within the middle Bronze Age period. The Beaker is thought to be *in situ*, so the barley grain was most probably intrusive.

W Carruthers (29 May 2004), a well-preserved grain of hulled barley (*Hordeum vulgare)* was submitted for dating. The date obtained was much later than the naked barley grain from the same assemblage (OxA-12492). Since these grains were well-sealed below a hearthstone and Beaker sherds, it is difficult to see how the grain could be intrusive.

GrA–23692 3045 ±40 BP

$\delta^{13}C$: -26.2‰

Sample: BQ 01J 712A, submitted on 7 July 2003 by L Ladle

Material: plant macrofossil: *Vicia faba*, a single fragment (2g) (W Carruthers 2003)

Initial comment: from the dark sandy loam fill of a small circular pit with steep sloping sides and a flat base. Finds included 13 perforated clay objects and two broken but complete pottery vessels.

Objectives: to establish the date of this 'special' deposit (late Bronze Age sherds were subsequently identified from the fill of this pit).

Calibrated date: *1σ:* 1390–1260 cal BC
2σ: 1420–1130 cal BC

Final comment: W Carruthers (29 May 2004) *see* also OxA-12491. The two beans have produced similar dates confirming that either they are residual, or that the pottery dating may need to be revised. As only a few Celtic beans have been dated to this period before and it is around their time of introduction, these are useful dates for the archaeobotanical records.

Laboratory comment: Ancient Monuments Laboratory (20 February 2007), this result is statistically consistent with OxA-12491 on another Celtic bean from the same context ($T'=0.3$, $T'(5\%)=3.8$, $\nu=1$) (Ward and Wilson 1978).

GrA–24697 3830 ±60 BP

$\delta^{13}C$: -22.7‰

Sample: BQ 97F 235C, submitted on 7 July 2003 by L Ladle

Material: grain: *Triticum dicoccum*, a single grain (2g) (W Carruthers 2003)

Initial comment: as GrA-23591

Objectives: as GrA-23591

Calibrated date: *1σ:* 2460–2150 cal BC
2σ: 2470–2050 cal BC

Final comment: W Carruthers (29 May 2004), a probable emmer grain (long, slender emmer/spelt grain) was submitted. This date was consistent with that from naked barley grain from the same assemblage (OxA-12492) but not with the hulled barley grain (GrA-23591). The fourth grain submitted (OxA-12924) confused matters further (see comments for OxA-12924).

GrN–28062 3825 ±25 BP

$\delta^{13}C$: -24.1‰

Sample: BQ 98G 128A, submitted on 7 July 2003 by L Ladle

Material: grain (10g) (acorns, *Quercus* sp., bulk sample)

Initial comment: from the dark loamy sand fill of a sub-oval pit with moderately sloping sides and a flat base. Finds (from the upper fill only) included 176 sherds of Beaker pottery (1690g), burnt flint, heathstone, worked flint, fired clay, animal bone, and charred acorns.

Objectives: to establish date of the use of the pit and finds therein.

Calibrated date: *1σ:* 2300–2200 cal BC
2σ: 2400–2150 cal BC

Final comment: A Woodward (6 May 2004), the assemblage of Beaker domestic pottery belongs to the Wessex/middle Rhine style. Pottery of this style generally occurs early within the Beaker sequence, during the late Neolithic. However, this date is particularly early for such material, and thus of considerable significance.

W Carruthers (29 May 2004) *see* GrN-28063. This separate date for the acorns is useful in ensuring the cereals and acorns are likely to be contemporary.

Laboratory comment: Ancient Monuments Laboratory (2004), the two measurements from this deposit are statistically consistent ($T'=0.0$; $T'(5\%)=3.8$; $\nu=1$; Ward and Wilson 1978), and as they are bulk samples the best estimate of the date of this pit is provided by the weighted mean of these results. This is 3823 ±18 BP, which calibrates to 2400-2200 cal BC.

References: Reimer *et al* 2004
Ward and Wilson 1978

GrN–28063 3820 ±25 BP

$\delta^{13}C$: -24.3‰

Sample: BQ 98G 128B, submitted on 7 July 2003 by L Ladle

Material: grain (7g) (plus acorns, *Quercus* sp., bulk): *Hordeum vulgare sl*; *Triticum* sp. (W Carruthers 2003)

Initial comment: as GrN-28062

Objectives: as GrN-28062

Calibrated date: *1σ:* 2300–2200 cal BC
2σ: 2350–2150 cal BC

Final comment: W Carruthers (29 May 2004), the plant assemblage contained hulled and naked barley, emmer/spelt (most likely to be emmer) and several acorns. Evidence for the use of acorns in the British Isles is rare and well-preserved cereal assemblages are scarce from this period, so it has been particularly important to obtain a good date from this deposit.

Laboratory comment: see GrN-28062

OxA–12491 3071 ±33 BP

$\delta^{13}C$: -25.2‰

Sample: BQ 01J 712B, submitted on 7 July 2003 by L Ladle

Material: plant macrofossil: *Vicia faba*, a single fragment (2g) (W Carruthers 2004)

Initial comment: as GrA-23692

Objectives: as GrA-23692

Calibrated date: *1σ:* 1410–1300 cal BC
2σ: 1430–1260 cal BC

Final comment: A Woodward (5 May 2004), the pottery from this pit, along with a series of perforated clay objects, forms a deliberate deposit. The assemblage is currently dated typologically to the late Bronze Age, which would indicate that the bean was residual. However, the pottery dating may be revised, as excavation in this vicinity progresses.

W Carruthers (29 May 2004), two Celtic beans (*Vicia faba* var. minor) were submitted for dating to help to date this 'special' deposit. As the date obtained was earlier than the pottery suggests, the beans could be residual. However, they were well-preserved and are large charred remains that are fairly easily damaged. They have also been recovered from 'ritual' deposits before (Le Pinacle, Jersey, dated to 3170 ±110 BP (OxA-2519; 1530–1310 cal BC at 68% confidence and 1690–1130 cal BC at 95% confidence)) (Patton *et al* 2001; Reimer *et al* 2004). Celtic beans occur from the middle Bronze Age onwards.

References: Patton 2001
Reimer *et al* 2004

OxA–12492 3888 ±36 BP

$\delta^{13}C$: -23.2‰

Sample: BQ 97F 235A, submitted on 7 July 2003 by L Ladle

Material: grain: *Hordeum vulgare* L., a single grain (2g) (W Carruthers 2003)

Initial comment: as GrA-23591

Objectives: as GrA-23591

Calibrated date: *1σ:* 2470–2290 cal BC
2σ: 2480–2210 cal BC

Final comment: A Woodward (6 May 2004), sherds from a single Beaker vessel are probably dated by this determination. The vessel belongs to Clarke's Southern 1 style. The date suggests a rather early occurrence for such a vessel, and is a useful addition to the lists of dates for Beaker pottery of this style.

W Carruthers (29 May 2004), a well-preserved grain of naked barley (*Hordeum vulgare* var. nudum) was submitted for dating, since securely dated assemblages of this date are rare. The grain was found beneath Beaker sherds beneath

a hearthstone. Naked barley occurs from the Neolithic to the late Bronze Age, so providing the date is consistent with the pottery results the date appears to be reasonable.

OxA–12924 3074 ±29 BP

δ¹³C: -23.9‰

Sample: BQ 97F 235D, submitted on 17 October 2003 by L Ladle

Material: grain: *Hordeum vulgare*, naked, a single grain (2g) (W Carruthers 2003)

Initial comment: as OxA-12492

Objectives: as GrA-23951

Calibrated date: *1σ:* 1410–1310 cal BC
2σ: 1420–1260 cal BC

Final comment: W Carruthers (29 May 2004), a well-preserved naked barley grain was submitted. The date obtained was similar to the late date for the hulled barley (GrA-23591). As noted for GrA-23591, it is difficult to see how this material could be intrusive. The species involved do not provide clues as they are all found from the Neolithic onwards. It may be worth looking at the sample processing records to see if cross contamination could have occurred from a rich later Bronze Age sample such as BQ97F 104.9.

Laboratory comment: Ancient Monuments Laboratory (2004), the four results on grains from this pit are not statistically consistent (T′=414.7; T′(5%)=7.8; ν=3; Ward and Wilson 1978).

References: Ward and Wilson 1978

Bestwall Quarry: Intrinsic Interest (Metalworking Debris), Dorset

Location: SY 935880
Lat. 50.41.31 N; Long. 02.05.34 W

Project manager: L Ladle (Bestwall Quarry Archaeology Project), 1992–2003

Archival body: Dorset County Museum

Description: the samples came from an area of metalworking activity, with furnace bases, spreads of slag, and other metalworking debris.

Objectives: to establish the dates of these features and their associated activities.

Final comment: L Ladle (13 May 2004), the three dates relate to a period of an ironworking industry. The determinations suggest two phases of activity, firstly in the immediately post-Roman period and secondly in the ninth century AD. The ironworking may have been contemporary with some of the charcoal pit activity on the site. The slag morphology indicated little change in smelting technology from the Iron Age through to the early medieval period; this seems unlikely, but further work may help to clarify this issue. The morphology study and archaeometallugical analysis of Bestwall slags have demonstrated that the assemblage is of national importance.

References: Aiano 1977
Salter 1988

GrA–24464 1195 ±40 BP

δ¹³C: -29.2‰

Sample: BQ 02T 316A, submitted on 14 October 2003 by L Ladle

Material: charcoal: *Quercus* sp., sapwood (2g) (R Gale 2003)

Initial comment: from the sandy loam fill of a possible 'slag' pit with associated base of ironworking furnace (T314). Finds included abundant slag and burnt flint, charcoal, and ash.

Objectives: to establish the date of the features and associated activities.

Calibrated date: *1σ:* cal AD 770–890
2σ: cal AD 690–970

Final comment: L Ladle (11 May 2004), the charcoal was derived from the fill of a pit associated with the base of an ironworking furnace - with abundant charcoal, ash, burnt flint, and slag. The determination suggests that the structure dates to the ninth century and towards the end of the use of the charcoal pits. The metalworking debris was identified as tap slags, smelting slags, and smithing slag.

OxA–12819 1559 ±31 BP

δ¹³C: -24.1‰

Sample: BQ 02T 462, submitted on 14 October 2003 by L Ladle

Material: charcoal: *Quercus* sp., sapwood, a single fragment (2g) (R Gale 2003)

Initial comment: from the silty sand fill of a large rectangular slag deposit (T462). Finds included abundant slag and burnt heathstone, charcoal, and clay.

Objectives: to establish the date of the features and associated activities.

Calibrated date: *1σ:* cal AD 430–550
2σ: cal AD 420–580

Final comment: L Ladle (13 May 2004), the charcoal came from the fill of a rectangular 'dump' of slag. Other finds included burnt hearthstones and clay. The associated slag residues may be broadly contemporary with the earliest dated charcoal pit J523. The metalworking debris was identified as smelting slag.

OxA–12820 1224 ±30 BP

δ¹³C: -22.4‰

Sample: BQ 02T 316B, submitted on 14 October 2003 by L Ladle

Material: charcoal: *Ilex aquifolium*, a single fragment (2g) (R Gale 2003)

Initial comment: as GrA-24464

Objectives: as GrA-24464

Calibrated date: *1σ:* cal AD 720–870
2σ: cal AD 680–890

Final comment: L Ladle (11 May 2004), charcoal from the fill of a slag pit associated with the base of an ironworking furnace (*see* GrA-24464).

Laboratory comment: Ancient Monuments Laboratory (2004), the two samples from this pit produced statistically consistent radiocarbon results (T′=0.3; T′(5%)=3.8; ν=1; Ward and Wilson 1978).

References: Ward and Wilson 1978

Bestwall Quarry: Intrinsic Interest (Socketed Gouge), Dorset

Location: SY 935880
Lat. 50.41.31 N; Long. 02.05.34 W

Project manager: L Ladle (Bestwall Quarry Archaeology Project), 1992–2003

Archival body: Dorset County Museum

Description: the wooden handle of a bronze socketed gouge.

Objectives: to date this Bronze Age artefact.

Final comment: A Woodward (6 May 2004), the bronze gouge, the wooden handle of which was dated, belongs to the Class II group of socketed gouges. This determination places the Bestwall example in the Ewart Park phase of metalworking, alongside another dated collared gouge in the Bodwrog hoard, Anglesey (B O'Connor forthcoming). The gouge is of particular interest as it appears to have been deliberately placed on the site when it passed out of use. The radiocarbon date provides a *terminus post quem* for this event.

References: Coombs and Pryor 2001
Needham *et al* 1997
O'Connor *et al* forthcoming

OxA–12572 2743 ±33 BP

$\delta^{13}C$: -25.4‰

Sample: BQ 98G 138 <1641>, submitted on 30 June 2003 by L Ladle

Material: wood: Pomoideae, a single fragment (2g) (R Gale 2003)

Initial comment: the sample is a wooden handle of a bronze socketed gouge, from the sandy fill of a circular pit with shallow sloping sides and a flat base. Finds included small pieces of heathstone and burnt flint. The gouge was resting, point upwards, against a larger piece of heathstone.

Objectives: to establish the period of use of a bronze gouge, which was 'placed' in a small pit.

Calibrated date: *1σ:* 920–830 cal BC
2σ: 980–810 cal BC

Final comment: L Ladle (4 March 2004), the gouge belongs to Coombs Class II gouges within the Ewart Park phase of metalworking (B O'Connor forthcoming).

References: O'Connor *et al* forthcoming

Bestwall Quarry: Late Saxon, Dorset

Location: SY 935880
Lat. 50.41.31 N; Long. 02.05.34 W

Project manager: L Ladle (Bestwall Quarry Archaeology Project), 1992–2003

Archival body: Dorset County Museum

Description: a sample from a pit containing both Roman Black Burnished Ware and late Saxon pottery.

Objectives: to determine the date of the pit and the date of use of the pottery, in particular to find out whether Black Burnished Ware pottery continued in use into the Saxon period.

Final comment: L Ladle (11 May 2004), the determinations provide dates for two pits containing both Saxon and Black Burnished Ware pottery and suggests that these vessel types might have been in concurrent use. The dates suggest continuing activity into the middle and late Saxon period.

References: Ladle 2001

OxA–12501 1220 ±45 BP

$\delta^{13}C$: -23.0‰

Sample: BQ 01J 627A, submitted on 7 July 2003 by L Ladle

Material: charcoal: *Quercus* sp., roundwood – 11 rings, a single fragment (2g) (R Gale 2003)

Initial comment: from the fill of a large circular pit with vertical sides and undulating base, consisting of a sandy loam with small charcoal pieces, lumps of raw clay, gravel nodules, burnt flint, iron, lead, worked flint, and foreign stone. Pottery includes late Saxon (seven sherds, 37g) and Black Burnished Ware (27 sherds, 357g).

Objectives: to establish the date of a pit containing late Saxon pottery together with Black Burnished Ware.

Calibrated date: *1σ:* cal AD 710–890
2σ: cal AD 670–940

Final comment: L Ladle (5 March 2004), this large pit, 3.1m in diameter, dates to the eighth or ninth centuries AD. It included Saxon chert/flint-tempered coarseware and Saxon mixed grit coarseware.

Laboratory comment: Ancient Monuments Laboratory (2004), the two samples from this pit (OxA-12501 and OxA-12502) produced radiocarbon results, which are statistically indistinguishable (T′=0.0; T′(5%)=3.8; ν=1; Ward and Wilson 1978).

References: Ward and Wilson 1978

OxA–12502 1220 ±29 BP

$\delta^{13}C$: -23.6‰

Sample: BQ 01J 627B, submitted on 7 July 2003 by L Ladle

Material: charcoal: *Quercus* sp., roundwood - 10 rings, a single fragment (2g) (R Gale 2003)

Initial comment: as OxA-12501

Objectives: as OxA-12501

Calibrated date: *1σ:* cal AD 720–880
2σ: cal AD 680–890

Final comment: see OxA-12501

Laboratory comment: see OxA-12501

OxA–12503 1135 ±30 BP

δ¹³C: -23.6‰

Sample: BQ 01J 256A, submitted on 7 July 2003 by L Ladle

Material: charcoal: *Ilex aquifolium*, twig, a single fragment (2g) (R Gale 2003)

Initial comment: from the fill of a circular pit with gently sloping sides and irregular base, consisting of a sandy loam with lumps of raw clay, heathstone, and burnt flint. Pottery includes late Saxon (eight sherds, 116g) and Black Burnished Ware (ten sherds, 79g).

Objectives: to establish the date of a pit containing late Saxon pottery, together with Black Burnished Ware.

Calibrated date: *1σ:* cal AD 880–970
2σ: cal AD 780–990

Final comment: L Ladle (5 March 2004), this pit, of similar shape and form to pit J627, contained late Saxon mixed grit coarseware, but is probably later than pit J627.

Laboratory comment: Ancient Monuments Laboratory (2004), the two samples from this pit (OxA-12503 and OxA-12504) produced statistically consistent radiocarbon measurements (T′=0.2; T′(5%)=3.8); ν=1; Ward and Wilson 1978).

References: Ward and Wilson 1978

OxA–12504 1155 ±29 BP

δ¹³C: -22.0‰

Sample: BQ 01J 256B, submitted on 7 July 2003 by L Ladle

Material: charcoal: *Ilex aquifolium*, twig, a single fragment (2g) (R Gale 2003)

Initial comment: as OxA-12503

Objectives: as OxA-12503

Calibrated date: *1σ:* cal AD 870–950
2σ: cal AD 770–980

Final comment: see OxA-12503

Laboratory comment: see OxA-12503

Bestwall Quarry: Middle Bronze Age Houses, Dorset

Location: SY 935880
Lat. 50.41.31 N; Long. 02.05.34 W

Project manager: L Ladle (Bestwall Quarry Archaeology Project), 1992–2003

Archival body: Dorset County Museum

Description: six discrete structures (rings of postholes) have been excavated. Three of these had evidence of an eaves-drip gully.

Objectives: to determine whether the houses are all of the same date, or whether they were constructed over a period of time.

References: Rahtz and ApSimon 1962, Chapter 4
Woodward 1991

GrA–23755 2885 ±35 BP

δ¹³C: -24.6‰

Sample: BQ 96E 1217B, submitted on 14 July 2004 by L Ladle

Material: charcoal: *Quercus* sp., roundwood – *c* 20 rings, a single fragment (2g) (R Gale 2003)

Initial comment: from the sandy loam fill of a steep-sided circular pit with a flattish base (E1217). The fill included charcoal fragments, ash, and sherds from two vessels.

Objectives: to date the period of use of House 2.

Calibrated date: *1σ:* 1130–1000 cal BC
2σ: 1210–930 cal BC

Final comment: A Woodward (6 May 2004), the charcoal dated came from a small pit E1217 within a group of features located north of House 2. Along with the other dates from this pit group, the determination indicated that activity near House 2 occurred late within the middle Bronze Age period, and this house may have been the latest in use on the site as a whole.

Laboratory comment: Ancient Monuments Laboratory (2004), the two measurements from this feature (GrA-23755 and GrA-23767) are statistically consistent (T′=1.5; T′(5%)=3.8; ν=1; Ward and Wilson 1978).

References: Ward and Wilson 1978

GrA–23756 3005 ±40 BP

δ¹³C: -24.9‰

Sample: BQ 96E 1317A, submitted on 14 July 2003 by L Ladle

Material: charcoal: *Quercus* sp., roundwood – *c* 20 rings, a single fragment (2g) (R Gale 2003)

Initial comment: from the dark sandy loam fill of a steep-sided circular pit with a flattish base. Fill E1317 contained small charcoal pieces and large amounts of pottery. The pit was next to a hearth.

Objectives: as GrA-23755

Calibrated date: *1σ:* 1370–1130 cal BC
2σ: 1400–1120 cal BC

Final comment: A Woodward (6 May 2004), the charcoal came from the fill of a very small pit E1317, which cut a hearth located within a complex of pits north of House 2. Along with other dated from this pit group, the determination indicates that activity near House 2 occurred late within the middle Bronze Age period and within the settlement sequence for the whole site.

Laboratory comment: Ancient Monuments Laboratory (2004), the two measurements from this feature (GrA-23756 and OxA-12594) are statistically consistent (T′=0.6; T′(5%)=3.8; ν=1; Ward and Wilson 1978).

References: Ward and Wilson 1978

GrA–23767 2950 ±40 BP

δ¹³C: -24.5‰

Sample: BQ 96E 1217A, submitted on 14 July 2003 by L Ladle

Material: charcoal: *Quercus* sp., roundwood – *c* 20 rings, a single fragment (2g) (R Gale 2003)

Initial comment: as GrA-23755

Objectives: as GrA-23755

Calibrated date: *1σ:* 1260–1110 cal BC
2σ: 1310–1010 cal BC

Final comment: see GrA-23755

Laboratory comment: see GrA-23755

GrA–24517 3035 ±45 BP

δ¹³C: -27.7‰

Sample: BQ 03M 680B, submitted on 13 November 2003 by L Ladle

Material: charcoal: *Corylus/Alnus* sp., a single fragment (R Gale 2003)

Initial comment: from the sandy loam fill of a round posthole with vertical sides and a flat base (M679). The fill contained visible charcoal but no other finds.

Objectives: to date the period of use of House 7.

Calibrated date: *1σ:* 1390–1210 cal BC
2σ: 1420–1130 cal BC

Final comment: A Woodward (6 May 2004), charcoal from a posthole within Roundhouse 7 produced a middle Bronze Age date, as expected. The dates from M680 and two other features within House 7 were consisted and indicate that this roundhouse was in use at a middle stage within the currency of such houses across the site as a whole.

Laboratory comment: Ancient Monuments Laboratory (2004), the two samples from this posthole (GrA-24517 and OxA-12971) produced statistically consistent radiocarbon results (T′=0.1; T′(5%)=3.8; ν=1; Ward and Wilson 1978).

References: Ward and Wilson 1978

GrA–24523 2990 ±45 BP

δ¹³C: -23.9‰

Sample: BQ 03M 628A, submitted on 7 November 2003 by L Ladle

Material: charcoal: Ericaceae, a single fragment (R Gale 2003)

Initial comment: from the greyish-brown sandy loam fill of an oval pit with steep sides and an uneven base, which was burnt red in places (M627). The fill contained pottery and a large amount of burnt flint.

Objectives: as GrA-24517

Calibrated date: *1σ:* 1310–1130 cal BC
2σ: 1390–1050 cal BC

Final comment: A Woodward (6 May 2004), charcoal from an oval pit associated with House 7 produced a middle Bronze Age date, as expected. The dates from M628 and two other features within House 7 were consistent and indicate that this house was in use at a middle stage within the currency of such houses across the site as a whole.

Laboratory comment: Ancient Monuments Laboratory (2004), the two samples from this pit (GrA-24523 and OxA-12927) produced radiocarbon results, which are statistically consistent (T′=0.1; T′(5%)=3.8; ν=1; Ward and Wilson 1978).

References: Ward and Wilson 1978

GrA–24634 3060 ±50 BP

δ¹³C: -24.9‰

Sample: BQ 03M 686B, submitted on 24 November 2003 by L Ladle

Material: grain: *Hordeum* sp., a single grain (2g) (W Carruthers 2003)

Initial comment: from the dark brown sandy loam fill of a sub-circular posthole with steep sides and a flat base (M685). The fill contained small gravels, pieces of burnt flint, and some pottery.

Objectives: as GrA-24517

Calibrated date: *1σ:* 1410–1260 cal BC
2σ: 1440–1130 cal BC

Final comment: A Woodward (6 May 2004), barley from a posthole within Roundhouse 7 produced a middle Bronze Age date, as expected. The dates from M686 and two other features within House 7 were consistent and indicate that this roundhouse was in use at a middle stage within the currency of such houses across the site as a whole.

Laboratory comment: Ancient Monuments Laboratory (2004), the two samples from this posthole (GrA-24634 and OxA-12974) produced statistically consistent radiocarbon results (T′=0.1; T′(5%)=3.8; ν=1; Ward and Wilson 1978).

References: Ward and Wilson 1978

GrA–24640 3015 ±45 BP

δ¹³C: -25.6‰

Sample: BQ 96E 1459B, submitted on 7 November 2003 by L Ladle

Material: charcoal: *Quercus* sp., roundwood, three rings, a single fragment (R Gale 2003)

Initial comment: from the mid brown sandy loam fill of a round pit with steep sides and a flat base (E1459). The fill contained frequent gravel nodules, quantities of pottery, and charcoal flecks throughout.

Objectives: to date the period of use of House 3.

Calibrated date: *1σ:* 1380–1210 cal BC
2σ: 1410–1120 cal BC

Final comment: A Woodward (6 May 2004), charcoal from pit E1459 in House 3, *see* OxA-12577.

Laboratory comment: Ancient Monuments Laboratory (2004), the two measurements from this pit (GrA-24640 and OxA-12577) are statistically consistent (T′=0.2; T′(5%)=3.8; ν=1; Ward and Wilson 1978).

References: Ward and Wilson 1978

GrA–24694 3050 ±45 BP

δ¹³C: -24.5‰

Sample: BQ 96F 568, submitted on 7 November 2003 by L Ladle

Material: grain: *Hordeum vulgare*, hulled, a single grain (W Carruthers 2003)

Initial comment: from the lower fill (humic sandy loam) of a large oval pit with sloping sides and a rounded base (F566). Fill F568 contained bone fragments, pottery, and charcoal throughout.

Objectives: to date the period of use of House 4.

Calibrated date: *1σ:* 1400–1260 cal BC
2σ: 1430–1130 cal BC

Final comment: A Woodward (6 May 2004), a grain of barley from the lower fill F568, which was located within the main posthole complex of House 4, yielded a middle Bronze Age date and this conforms with the expected date of the house based on morphology and the associated Deverel-Rimbury pottery assemblage. This date, together with those from two further contexts (GrA-22417 in the Avon/Stour series and OxA-12206 in the Central Wessex series), do confirm the middle Bronze Age date of this roundhouse. These dates also suggest that House 4 may have been the earliest roundhouse on the site as a whole.

GU–5989 3310 ±50 BP

δ¹³C: -25.4‰

Sample: BQ 97F 528, submitted on 14 July 2003 by L Ladle

Material: charcoal: *Quercus* sp., sapwood, bulk (11g) (R Gale 2003)

Initial comment: from a layer of charcoal and ash within the dark sandy loam fill of a sub-circular pit with near-vertical sides and a flat base (pit F528). The fill contained potsherds and a large amount of burnt flint.

Objectives: as GrA-24694

Calibrated date: *1σ:* 1670–1520 cal BC
2σ: 1740–1460 cal BC

Final comment: A Woodward (6 May 2004), charcoal from a pit F258, located on the western margin of the House 4 posthole complex, produced a date within the early Bronze Age period. Some of the grain from fill F568 within pit F566 (*see* OxA-12204 in the Dorset Downs ceramic series) also produced an early Bronze Age date, so it seems that some activity of this period predated the construction of House 4, which otherwise has produced middle Bronze Age dates from three different contexts.

OxA–12575 3024 ±35 BP

δ¹³C: -26.8‰

Sample: BQ 99R 309, submitted on 7 July 2003 by L Ladle

Material: carbonised residue (internal surface of undiagnostic middle Bronze Age sherd)

Initial comment: from the dark sandy loam fill of a circular pit with steep sides and a flat base (R309). Finds included large amounts of burnt flint, charcoal and clay fragments, and 62 sherds of pottery.

Objectives: to date the period of use of House 5.

Calibrated date: *1σ:* 1380–1210 cal BC
2σ: 1400–1130 cal BC

Final comment: A Woodward (6 May 2004), the residue sample from a middle Bronze Age rim sherd (form R2) dates the filling of layer R309 with pit R319. This pit was located immediately south of the main concentration of postholes forming House 5. This is the only date relating to this house and, as expected, falls within the middle Bronze Age. It is not possible to indicate any relative dating between this and the other dated roundhouses.

OxA–12576 2939 ±34 BP

δ¹³C: -25.4‰

Sample: BQ 99R 251, submitted on 7 July 2004 by L Ladle

Material: carbonised residue (internal surface of undiagnostic middle Bronze Age sherd)

Initial comment: from the mid-brown sandy loam fill of a shallow circular pit (R251) containing large fragments of pottery.

Objectives: to date the period of use of House 6.

Calibrated date: *1σ:* 1260–1060 cal BC
2σ: 1270–1010 cal BC

Final comment: A Woodward (6 May 2004), the residue sample from a middle Bronze Age base sherd dates the filling of a pit F251, which lay to the east of House 6. A further residue date, listed in the Avon/Stour ceramic series (GrA-22544) relates to a pit, R198, located immediately south of this same house. This date (OxA-12576) is notably later than that obtained for R198 (GrA-22544) but both fall within the middle Bronze Age period and provide a general date range for activity around House 6.

OxA–12577 2989 ±34 BP

δ¹³C: -23.2‰

Sample: BQ 96E 1459A, submitted on 7 July 2003 by L Ladle

Material: carbonised residue (undiagnostic middle Bronze Age sherd)

Initial comment: as GrA-24640

Objectives: as GrA-24640

Calibrated date: *1σ:* 1300–1130 cal BC
2σ: 1380–1120 cal BC

Final comment: see GrA-24640

Laboratory comment: see GrA-24640

OxA–12587 3089 ±31 BP

δ¹³C: -24.1‰

Sample: BQ 96E 1462A, submitted on 14 July 2003 by L Ladle

Material: grain: *Hordeum vulgare*, hulled, a single grain (W Carruthers 2003)

Initial comment: from the lower fill (dark, humic, sandy loam) of a steep-sided circular pit (E1460). Fill E1462 contained large amounts of pottery.

Objectives: as GrA-24640

Calibrated date: *1σ:* 1420–1310 cal BC
2σ: 1430–1270 cal BC

Final comment: A Woodward (6 May 2004), the grain came from the lower fill of small pit E1460, which lay at the centre point of the projected ring gully of House 3. The three dates from this grain deposit (*see* OxA-12588 and OxA-12926) were consistent and indicate that House 3 was occupied in the later stages of the middle Bronze Age (*see* also the dates from pit E1459 in House 3: OxA-12577 and OxA-12158).

OxA–12588 3004 ±32 BP

δ^{13}*C:* -23.0‰

Sample: BQ 96E 1462B, submitted on 14 July 2003 by L Ladle

Material: grain: *Hordeum vulgare*, hulled, a single grain (2g) (W Carruthers 2003)

Initial comment: as OxA-12587

Objectives: as GrA-24640

Calibrated date: *1σ:* 1310–1210 cal BC
2σ: 1390–1120 cal BC

Final comment: see OxA-12587

Laboratory comment: see OxA-12926

OxA–12592 2961 ±28 BP

δ^{13}*C:* -23.5‰

Sample: BQ 96E 1323A, submitted on 14 July 2003 by L Ladle

Material: charcoal: *Quercus* sp., sapwood, a single fragment (2g) (R Gale 2003)

Initial comment: from the ashy sandy loam fill of a small circular scoop/pit containing the complete base of a ceramic vessel. The fill contained pieces of burnt flint and charcoal.

Objectives: as GrA-23755

Calibrated date: *1σ:* 1260–1120 cal BC
2σ: 1300–1050 cal BC

Final comment: A Woodward (6 May 2004), the charcoal came from the fill of a small scoop or pit E1323 adjacent to the hearth located within a complex of pits north of House 2. Along with other dates from this pit group, the determination indicated that this activity occurred late with the middle Bronze Age period and towards the end of the currency of roundhouses on the site as a whole.

Laboratory comment: Ancient Monuments Laboratory (20 February 2007), the two measurements from this feature (OxA-12592 and OxA-12593) are statistically consistent ($T'=2.6$; $T'(5\%)=3.8$; $\nu=1$; Ward and Wilson 1978).

References: Ward and Wilson 1978

OxA–12593 3025 ±28 BP

δ^{13}*C:* -23.8‰

Sample: BQ 96E 1323B, submitted on 14 July 2003 by L Ladle

Material: charcoal: *Quercus* sp., sapwood, a single fragment (2g) (R Gale 2003)

Initial comment: as OxA-12592

Objectives: as GrA-23755

Calibrated date: *1σ:* 1380–1220 cal BC
2σ: 1390–1130 cal BC

Final comment: see OxA-12592

Laboratory comment: see OxA-12592

OxA–12594 2968 ±28 BP

δ^{13}*C:* -24.4‰

Sample: BQ 96E 1317B, submitted on 14 July 2003 by L Ladle

Material: charcoal: *Quercus* sp., roundwood – *c* 20 rings, a single fragment (R Gale 2003)

Initial comment: as GrA-23756

Objectives: as GrA-23755

Calibrated date: *1σ:* 1270–1120 cal BC
2σ: 1310–1110 cal BC

Final comment: see GrA-23756

Laboratory comment: see GrA-23756

OxA–12881 2735 ±60 BP

δ^{13}*C:* -25.2‰

Sample: BQ 97F 423, submitted on 7 July 2003 by L Ladle

Material: carbonised residue (undiagnostic middle Bronze Age sherd)

Initial comment: from the dark sandy loam fill of a sub-rectangular scoop (1.90 × 1.20m), possibly a floor area. The fill included frequent finds of burnt flint, burnt heathstone, raw clay, charcoal fragments, worked flint, and pottery.

Objectives: as GrA-24694

Calibrated date: *1σ:* 970–810 cal BC
2σ: 1020–790 cal BC

Final comment: A Woodward (6 May 2004), this residue date relates to a plainwall sherd from a scoop, F423, located within the structural area of House 4. The sherd was thought to be of middle Bronze Age date but the determination fell in the earlier part of the late Bronze Age period. The scoop is therefore unlikely to belong to the roundhouse and maybe connected with the extensive late Bronze Age activity, which occurs to the south of this structure in Field F.

OxA–12926 2976 ±29 BP

δ^{13}*C:* -24.7‰

Sample: BQ 96E 1462C, submitted on 17 October 2003 by L Ladle

Material: grain: *Hordeum vulgare*, hulled, a single grain (W Carruthers 2003)

Initial comment: from lowest fill of a steep sided circular pit (E1460), which contained large amounts of pottery.

Objectives: as GrA-24640

Calibrated date: *1σ:* 1270–1130 cal BC
2σ: 1320–1110 cal BC

Final comment: see OxA-12587

Laboratory comment: Ancient Monuments Laboratory (2004), the three measurements from this pit are statistically significantly different (T′=7.5; T′(5%)=6.0; ν=2; Ward and Wilson 1978).

References: Ward and Wilson 1978

OxA–12927 3008 ±30 BP

$\delta^{13}C$: -23.2‰

Sample: BQ 03M 628B, submitted on 21 October 2003 by L Ladle

Material: charcoal: *Ilex aquifolium*, a single fragment (R Gale 2003)

Initial comment: as GrA-24523

Objectives: as GrA-24517

Calibrated date: *1σ:* 1320–1210 cal BC
2σ: 1390–1130 cal BC

Final comment: see GrA-24523

Laboratory comment: see GrA-24523

OxA–12971 3050 ±31 BP

$\delta^{13}C$: -27.0‰

Sample: BQ 03M 680A, submitted on 17 October 2003 by L Ladle

Material: charcoal: Ericaceae, a single fragment (R Gale 2003)

Initial comment: as GrA-24517

Objectives: as GrA-24517

Calibrated date: *1σ:* 1390–1260 cal BC
2σ: 1410–1210 cal BC

Final comment: A Woodward (6 May 2004), heather charcoal from a posthole within Roundhouse 7 produced a middle Bronze Age date, as expected. The dates from M680 and two other features within House 7 were consistent and indicate that this roundhouse was in use at a middle stage within the currency of such houses across the site as a whole.

Laboratory comment: see GrA-24517

OxA–12974 3043 ±31 BP

$\delta^{13}C$: -21.4‰

Sample: BQ 03M 686A, submitted on 19 November 2003 by L Ladle

Material: grain: *Hordeum vulgare*, a single grain (W Carruthers 2003)

Initial comment: as GrA-24634

Objectives: as GrA-24517

Calibrated date: *1σ:* 1390–1260 cal BC
2σ: 1410–1210 cal BC

Final comment: see GrA-24634

Laboratory comment: see GrA-24634

Bestwall Quarry: Post-Roman, Dorset

Location: SY 935880
Lat. 50.41.31 N; Long. 02.05.34 W

Project manager: L Ladle (Bestwall Quarry Archaeology Project), 1992–2003

Archival body: Dorset County Museum

Description: a sample from a pit containing both Roman and post-Roman pottery.

Objectives: to determine the date of the pit and the date of use of the pottery, in particular to find out whether Black Burnished Ware pottery continued in use after the fifth century AD.

Final comment: L Ladle (11 May 2004), the determination provides a date for the use of grass tempered and Black Burnished Ware pottery. The date is in accord with the grass tempered pottery (Saxon organic tempered ware) and confirms the early origins of this fabric and of post Roman activity at Bestwall.

References: Ladle and Woodward forthcoming

OxA–12498 1490 ±31 BP

$\delta^{13}C$: -25.9‰

Sample: BQ 01J 803A, submitted on 7 July 2003 by L Ladle

Material: charcoal: *Ilex aquifolium*, a single fragment (2g) (R Gale 2003)

Initial comment: from the fill of a circular pit with steep-vertical sides and a flat base, consisting of a sandy loam with a dense concentration of large limestones and heathstones, including part of a rotary quern. The pottery includes post-Roman (three sherds, 132g) and Black Burnished Ware (BB1, nine sherds, 53g).

Objectives: to establish the date of a pit containing grass tempered, post-Roman pottery, together with Black Burnished Ware and a large piece of a (probably) Roman rotary quern.

Calibrated date: *1σ:* cal AD 540–610
2σ: cal AD 530–650

Final comment: L Ladle (4 April 2004), these results confirm the post-Roman dating of the grass-tempered pottery.

Laboratory comment: Ancient Monuments Laboratory (2004), the two samples from this pit (OxA-12498 and OxA-12499) produced statistically consistent radiocarbon measurements (T′=1.3; T′(5%)=3.8; ν=1; Ward and Wilson 1978).

References: Ward and Wilson 1978

OxA–12499 1539 ±29 BP

δ^{13}*C:* -25.9‰

Sample: BQ 01J 803B, submitted on 7 July 2003 by L Ladle

Material: charcoal: *Ilex aquifolium*, a single fragment (2g) (R Gale 2003)

Initial comment: as OxA-12498

Objectives: as OxA-12498

Calibrated date: *1σ:* cal AD 440–570
2σ: cal AD 420–600

Final comment: see OxA-12498

Laboratory comment: see OxA-12498

Birstall Watermead Country Park, Leicestershire

Location: SK 605101
Lat. 52.41.05 N; Long. 01.06.18 W

Project manager: S Ripper (University of Leicester)
May–June 1996

Description: a Bronze Age burnt mound. The site was excavated following the chance discovery of human bone in spoil during gravel extraction. In an attempt to establish how and where these human remains had been deposited, a survey was completed of the exposed quarry face. This revealed an expansive silt peat deposit lying within what was thought to be an old course of the River Soar. Towards the southern end of the quarry, two parallel rows of upright timber posts were observed, probably the remains of a simple bridge structure. On the banks of the channel, at the western extent of the bridge, a second stage of excavations revealed a further series of features.

Objectives: the initial aim of the dating programme was to help in assessing the significance of the site. Once this had been established, the dating programme aimed to determine when the burnt mound was in use, how long it remained in use, and whether some notable finds recovered from the spoil of machine excavations of the adjacent palaeochannel were similar in age to the burnt mound. It also aimed to provide a chronological framework for the palaeoenvironmental records obtained from columns 2, 4, and 8.

Final comment: P Clay (6 September 2004), the dating programme has been essential in identifying separate phases of activity which could not be identified in any other way. It identified Mesolithic origins for the organic deposits/palaeochannel; early Neolithic human deposition; late Neolithic burnt mound; late Bronze Age human deposition; late Iron Age activity and animal butchery; an early Anglo-Saxon bridge; and Anglo-Saxon water meadows. It emphasises the value of dated sequences and shows the weakness in interpretation from limited numbers of radiocarbon dates.

References: Ripper 2004

Birstall Watermead Country Park: bones and timbers from the palaeochannel, Leicestershire

Location: SK 605101
Lat. 52.41.05 N; Long. 01.06.18 W

Project manager: S Ripper (University of Leicester), May–June 1996

Archival body: Heritage Services, Leicestershire County Council

Description: series B includes bones from four animals (two aurochsen, a horse, and a cow) and three waterlogged timbers. The former were found in the spoil of machine excavation of peat and other sediment from the palaeochannel of the River Soar, adjacent to the burnt mound. The latter formed part of an alignment of wooden posts, interpreted as the remains of a bridge across the palaeochannel.

Objectives: a programme of radiocarbon dating will set the excavated events within a changing environmental setting, potentially a sequence from the late Upper Palaeolithic to the late Bronze Age. The dating programme may also help to elucidate whether the recorded 'events' (burnt mound, bridge, animal bone, and human remains) were broadly contemporary or probably unrelated. Dates may also help to determine whether the burnt mound was a short-lived monument or a more permanent facility.

References: Beamish and Ripper 2000
Ripper 1996
Ripper 1997a
Ripper 1997b
Ripper 2002

GrA–23572 2165 ±45 BP

δ^{13}*C:* -22.6‰

Sample: A57.1996, no 114, submitted on 27 June 2003 by S Ripper

Material: animal bone: *Equus equus*, skull (335g) (S Ripper 1996)

Initial comment: the animal bone was recovered from peaty silt context 129, around the timber bridge structure; many bones had butchery marks.

Objectives: to determine whether butchery activity was coeval with the nearby burnt mound activity.

Calibrated date: *1σ:* 360–160 cal BC
2σ: 380–50 cal BC

Final comment: P Clay (6 September 2004), the late Iron Age date is contemporary with the fill of the gully context (229) sample (OxA-12548). The bones were unstratified in the waterlogged deposits and have possible butchery marks but the surface was too damaged to be certain.

GrA–23584 2105 ±45 BP

δ^{13}*C:* -22.3‰

Sample: A57.1996, no. 111, submitted on 27 June 2003 by S Ripper

Material: animal bone: *Bos taurus*, skull (415g) (S Ripper 1996)

Initial comment: as GrA-23572

Objectives: as GrA-23572

Calibrated date: *1σ:* 200–50 cal BC
2σ: 350-1 cal BC

Final comment: P Clay (6 September 2004), the sample was contemporary with the fill of the late Iron Age gully context (229) sample 89. Dental marks from scavenging animals, such as foxes, were found on the bones.

GrA–23585 3925 ±45 BP

$\delta^{13}C$: -23.1‰

Sample: A57.1996, no. 03, submitted on 27 June 2003 by S Ripper

Material: animal bone: *Bos primigenius*, femur, with butchery marks, male (752g) (S Ripper 1996)

Initial comment: as GrA-23572

Objectives: as GrA-23572

Calibrated date: *1σ:* 2480–2340 cal BC
2σ: 2570–2280 cal BC

Final comment: P Clay (6 September 2004), the bone was dated to the late Neolithic period and was recovered, with 26 other bones and fragments identified as aurochs, from palaeochannel deposits. This dated bone was of a male and butchery marks showed the removal of the back leg separated at the knee by chopping. Other marks suggest breaking through the tendons at the back of the knee joint during disarticulation. This was possibly contemporary with the burnt mound.

GrA–23589 3840 ±50 BP

$\delta^{13}C$: -23.4‰

Sample: A57.1996, no. 190, submitted on 27 June 2003 by S Ripper

Material: animal bone: *Bos primigenius*, femur, female (673g) (S Ripper 1996)

Initial comment: as GrA-23572

Objectives: as GrA-23572

Calibrated date: *1σ:* 2460–2200 cal BC
2σ: 2470–2140 cal BC

Final comment: P Clay (6 September 2004), the bone was dated to the late Neolithic period and was recovered with others from the palaeochannel deposits. The bone was of a auroch and was butchered having been chopped through at the shoulder and elbow joints in dismembering the carcase. The bone could be contemporary with the burnt mound activity.

GU–5980 1580 ±50 BP

$\delta^{13}C$: -27.5‰

Sample: A57.1996, timber 01, submitted on 27 June 2003 by S Ripper

Material: wood: *Quercus* sp., waterlogged, roundwood containing 14 rings (877g) (R Howard 2003)

Initial comment: five timber posts, forming a double row, were identified immediately adjacent to the burnt mound. The posts, apparently part of a longer alignment removed by machine-stripping of overburden, were sealed by a thick anaerobic alluvial deposit, which they appear to predate. They were driven into a peaty silt deposit, but did not penetrate the sand and gravel substrate.

Objectives: to determine whether this structure, described as bridge remains, was contemporary with the nearby burnt mound activity or other archaeological features on site. If the structure was a timber bridge, it is one of the earliest known in England, and as such its date is of intrinsic interest.

Calibrated date: *1σ:* cal AD 410–550
2σ: cal AD 380–600

Final comment: P Clay (6 September 2004), part of timber bridge upright. In view of association it was thought this may be contemporary with the burnt mound. However radiocarbon dates show it to be early Saxon in date. Re-examination of tool marks confirms that they are very different from prehistoric timbers and a Saxon date, although unexpected, is correct and highlights problems of dating structures without radiocarbon.

Laboratory comment: Ancient Monuments Laboratory (2004), the three results (GU-5980 to GU-5982) on samples of timber from this alignment/structure are statistically consistent ($T'=1.0, T'(5\%)=6.0, \nu=2$) (Ward and Wilson 1978).

References: Ward and Wilson 1978

GU–5981 1530 ±50 BP

$\delta^{13}C$: -27.5‰

Sample: A57.1996, timber 03, submitted on 27 June 2003 by S Ripper

Material: wood: *Quercus* sp., waterlogged, roundwood containing nine rings (921g) (R Howard 2003)

Initial comment: as GU-5980

Objectives: as GU-5980

Calibrated date: *1σ:* cal AD 430–600
2σ: cal AD 410–640

Final comment: see GU-5980

Laboratory comment: see GU-5980

GU–5982 1510 ±50 BP

$\delta^{13}C$: -25.9‰

Sample: A57.1996, timber 04, submitted on 27 June 2003 by S Ripper

Material: wood: *Quercus* sp., waterlogged, roundwood containing 17 rings (821g) (R Howard 2003)

Initial comment: as GU-5980

Objectives: as GU-5980

Calibrated date: *1σ:* cal AD 530–610
2σ: cal AD 420–650

Final comment: see GU-5980

Laboratory comment: see GU-5980

Birstall Watermead Country Park: burnt mound sequence, Leicestershire

Location: SK 605101
Lat. 52.41.05 N; Long. 01.06.18 W

Project manager: S Ripper (University of Leicester), May–June 1996

Archival body: Heritage Services, Leicester County Council

Description: series A includes macrofossils from gully 229 (latest feature cutting the site), from the grey clay layer predating the burnt mound, and from trough fill 101; wood samples from timbers lining the base of the trough and withies from the walls of the trough; and charcoal from the latest burnt spread, 236, the early burnt spread, 248, the northernmost hearth, the southernmost hearth, and context 147 (beneath the timbers lining the base of trough).

Objectives: a programme of radiocarbon dating will set the excavated events within a changing environmental setting, potentially a sequence from the late Upper Palaeolithic to the late Bronze Age. The dating programme may also help to elucidate whether the recorded 'events' (burnt mound, bridge, animal bone, and human remains) were broadly contemporary or probably unrelated. Dates may also help to determine whether the burnt mound was a short-lived monument or a more permanent facility.

Final comment: P Clay (6 September 2004), the dating programme for the burnt mound sequence has been successful in dating the activity to the late Neolithic placing it within the earliest known group of burnt mounds. It has also helped establish how long the burnt mound was used and which were the earliest structural elements of the trough, when the hearths were used and which parts of the mound and associated charcoal were earlier or later phases of activity reinterpreting the stratigraphic data.

References: Beamish and Ripper 2000
Ripper 1996
Ripper 1997a
Ripper 1997b
Ripper 2002

GrA–23698 3850 ±40 BP

$\delta^{13}C$: -26.3‰

Sample: sample 86A, context 236, submitted on 27 June 2003 by S Ripper

Material: charcoal: *Corylus avellana*, a single fragment (R Gale 2003)

Initial comment: charcoal from the latest layer of shattered stone and charcoal, which overlay other burnt spread layers around the timber-lined trough. Charcoals from these spreads are thought to represent the 'working life' of the trough. Definition between the layers of burnt material was not clear (often relying on slight changes in colour, density, and shifts in proportions of charcoal to silt etc) but they were all well-compacted enough to suggest they were not residual or reworked.

Objectives: the difference between this result and those from context 248 and trough construction should provide an indication of the duration of burnt mound activity.

Calibrated date: *1σ:* 2460–2200 cal BC
2σ: 2470–2150 cal BC

Final comment: P Clay (6 September 2004), although originally interpreted as later than 205, 235, and 248, radiocarbon dates suggest that the original relationship was mis-interpreted and that 236 is earlier (*see* GrA-24516, GrA-24519, and OxA-12573).

Laboratory comment: Ancient Monuments Laboratory (2004), the five results from single charcoal fragments from spread 236 (GrA-24516, GrA-24519, OxA-12573, GrA-23698, and OxA-12959) are statistically consistent ($T'=1.8$, $T'(5\%)=9.5$, $\nu=4$) (Ward and Wilson 1978).

References: Ward and Wilson 1978

GrA–23700 3835 ±40 BP

$\delta^{13}C$: -26.1‰

Sample: sample 92A, context 248, submitted on 27 June 2003 by S Ripper

Material: charcoal: *Corylus avellana*, a single fragment (R Gale 2003)

Initial comment: charcoal from the earliest layer of shattered stone and charcoal, sealed beneath other burnt spread layers, which arc around the timber-lined trough. Charcoals from these spreads are thought to represent the 'working life' of the trough. Definition between the layers of burnt material was not clear (often relying on slight changes in colour, density, and shifts in proportions of charcoal to silt etc) but they were all well-compacted enough to suggest they were not residual or reworked.

Objectives: the difference between this result and those from context 236 should provide an indication of the duration of burnt mound activity.

Calibrated date: *1σ:* 2390–2200 cal BC
2σ: 2470–2140 cal BC

Final comment: P Clay (6 September 2004), charcoal from burnt stone layer believed to be early phase (pre-236). However ^{14}C dates now suggest that 236 may be earlier than 248. Consistent with date range from GrA-24520.

Laboratory comment: Ancient Monuments Laboratory (2004), the five results on charcoal fragments from this context (GrA-23700, OxA-12484, GrA-24520, OxA-12958, and OxA-12957) are not statistically consistent ($T'=5901.2$, $T'(5\%)=9.5$, $\nu=4$). The four results other than OxA-12484 are consistent, however ($T'=6.1$, $T'(5\%)=7.8$, $\nu=3$) (Ward and Wilson 1978).

References: Ward and Wilson 1978

GrA–23745 4100 ±40 BP

$\delta^{13}C$: -28.4‰

Sample: pollen tin 107, sample B, submitted on 27 June 2003 by S Ripper

Material: wood: bark, fragments from one timber (<2g) (R Gale 2003)

Initial comment: following the disintegration of timber 36, which was regarded as evidence of site clearance immediately before burnt mound activity began, waterlogged macrofossils were selected from pollen tin 107, which sampled the layer of blue-grey clay (173) into which the 'cleared branch' (timber 36) was dumped.

Objectives: stratigraphically, the clay layer is earlier than any of the burnt mound deposits. Macrofossils found in the clay provide a *terminus post quem* for the formation of this layer. The date of this sample should therefore also provide a *terminus post quem* for the start of burnt mound activity.

Calibrated date: *1σ:* 2860–2570 cal BC
2σ: 2880–2490 cal BC

Final comment: P Clay (6 September 2004), the mid-late Neolithic date is consistent with a clearance phase before burnt mound activity. This date is earlier than OxA-12585, perhaps suggesting that this bark sample is residual.

GrA–24516 3850 ±50 BP

$\delta^{13}C$: -25.3‰

Sample: sample 86D, context 236, submitted on 14 November 2003 by S Ripper

Material: charcoal: *Prunus spinosa*, a single fragment (<5g) (R Gale 2003)

Initial comment: as GrA-23698

Objectives: as GrA-23698

Calibrated date: *1σ:* 2460–2200 cal BC
2σ: 2470–2140 cal BC

Final comment: P Clay (6 September 2004), charcoal associated with burnt stone spread (see also GrA-23698, GrA-24519, and OxA-12573). Although originally interpreted as later than 205, 235, and 248, the radiocarbon dates suggest that this may not be the case that 236 is in fact earlier.

Laboratory comment: see GrA-23698

GrA–24519 3890 ±50 BP

$\delta^{13}C$: -27.2‰

Sample: sample 86C, context 236, submitted on 14 November 2003 by S Ripper

Material: charcoal: Pomoideae, a single fragment (<5g) (R Gale 2003)

Initial comment: as GrA-23698

Objectives: as GrA-23698

Calibrated date: *1σ:* 2470–2290 cal BC
2σ: 2550–2200 cal BC

Final comment: P Clay (6 September 2004), a second sample from 236 (see OxA-12573). The date confirms the results from OxA-12573 and suggests that 236 may be from an earlier phase of burning, not later as had originally been thought. The results from the two laboratories are consistent with each other.

Laboratory comment: see GrA-23698

GrA–24520 3700 ±50 BP

$\delta^{13}C$: -27.8‰

Sample: sample 92C, context 248, submitted on 14 November 2003 by S Ripper

Material: charcoal: *Alnus glutinosa*, a single fragment (<5g) (R Gale 2003)

Initial comment: as GrA-23700

Objectives: as GrA-23700

Calibrated date: *1σ:* 2200–2020 cal BC
2σ: 2280–1940 cal BC

Final comment: P Clay (6 September 2004), charcoal from burnt stone layer believed to be an early phase of the burnt mound activity (pre-236). However, the radiocarbon dates now suggest that 236 may be earlier than 248. Consistent with radiocarbon date range from GrA-23700.

Laboratory comment: see GrA-23700

GU–5983 3890 ±50 BP

$\delta^{13}C$: -23.9‰

Sample: A57.1996, timber 17, submitted on 27 June 2003 by S Ripper

Material: wood: *Alnus* sp., probably, waterlogged (816g) (G Morgan 2003)

Initial comment: one of several alder planks lining the base of a circular cut (the trough); these could be a later addition to the trough (charcoal was found behind the planks), but (unlike oak) they could not have remained in use for long.

Objectives: to date the beginning of burnt mound activity at this site, as the construction of the trough must predate this activity.

Calibrated date: *1σ:* 2470–2290 cal BC
2σ: 2550–2200 cal BC

Final comment: P Clay (6 September 2004), the date confirmed the stratigraphical evidence that these were a later addition to the trough and appear to be contemporary with withy 31/2 (OxA-12644). Similar date to spread 248.

Laboratory comment: Ancient Monuments Laboratory (2004), the four results from alder planks lining the base of the trough (GU-5983, GU-5984, GU-5994, and GU-5995) are not consistent with a single radiocarbon age ($T'=13.5$, $T'(5\%)=7.8$, $\nu=3$) (Ward and Wilson 1978). Timber 17 (GU-5983) is apparently older than the other three timbers, whose radiocarbon results are statistically consistent ($T'=5.1$, $T'(5\%)=6.0$, $\nu=2$) (Ward and Wilson 1978).

References: Ward and Wilson 1978

GU–5984 3800 ±50 BP

$\delta^{13}C$: -29.4‰

Sample: A57.1996, timber 18, submitted on 27 June 2003 by S Ripper

Material: wood: *Alnus* sp., probably waterlogged (770g) (G Morgan 2003)

Initial comment: as GU-5983

Objectives: as GU-5983

Calibrated date: *1σ:* 2300–2140 cal BC
2σ: 2460–2040 cal BC

Final comment: P Clay (6 September 2004), not the same radiocarbon age as timber 17 (GU-5983) but likely to have been added at the same time. A later phase of use of trough, of similar age to spread 248 and withy 31.

Laboratory comment: see GU-5983

GU–5985 3890 ±50 BP

$\delta^{13}C$: -25.9‰

Sample: Sample 108, context 317, submitted on 27 June 2003 by S Ripper

Material: charcoal: *Corylus avellana*, bulk (1g); *Alnus glutinosa* (11g) (R Gale 2003)

Initial comment: charcoal found within the cut of hearth feature 318. Stones lining the feature were reddened on their upper faces (ie burnt *in situ*). The charcoal represents the final heating episode of the hearth and may be contemporary with the final heating episode of the trough. Charcoal from fill 317 is more likely to represent the final heating episode; charcoal in fill 315 may be reworked.

Objectives: the result should provide a *terminus post quem* for the hearth. Comparison with the date of the southern hearth (see GU-5986) may indicate whether the two hearths are contemporaneous, or whether they date different episodes of burnt mound activity.

Calibrated date: *1σ:* 2470–2290 cal BC
2σ: 2550–2200 cal BC

Final comment: P Clay (6 September 2004), northernmost hearth feature, final heating episode of hearth. Appears that both hearths, final use could have been at the same time and that they both correspond to earlier phases of the burnt mound. Pollen from deposit suggests undisturbed woodland, some shrubs and water plants and some drier grassland.

Laboratory comment: Ancient Monuments Laboratory (20 February 2007), a bulk sample

GU–5986 3940 ±100 BP

$\delta^{13}C$: -25.5‰

Sample: sample 111, context 246, submitted on 27 June 2003 by S Ripper

Material: charcoal: *Alnus* sp. (7g); bark, bulk (1g) (R Gale 2003)

Initial comment: charcoal within the cut of hearth feature 329, which represents the final heating episode of the hearth and may be contemporary with the final heating episode of the trough. The compact nature of the fill (particularly sample 111) suggests it is likely to be *in situ* burning.

Objectives: the result should provide a *terminus post quem* for the hearth. Comparison with the date of the northern hearth (*see* GU-5985) may indicate whether the two hearths are contemporaneous, or whether they date different episodes of burnt mound activity.

Calibrated date: *1σ:* 2580–2290 cal BC
2σ: 2860–2140 cal BC

Final comment: P Clay (6 September 2004), charcoal within cut of hearth feature 329 representing the final heating episode of the hearth – contemporary with final heating episode of the trough. However, it does correspond to earlier phases of the use of the mound from the radiocarbon dates. Associated with undiagnostic late Neolithic vessel.

GU–5987 3870 ±50 BP

$\delta^{13}C$: -26.9‰

Sample: sample 67A, context 147, submitted on 27 June 2003 by S Ripper

Material: charcoal: *Corylus*/*Alnus* sp., bulk (13g) (R Gale 2003)

Initial comment: charcoal found at the base of the trough, lining the wall of the cut, and thought to represent the final use of the trough.

Objectives: result should provide *terminus post quem* for the end of burnt mound activity.

Calibrated date: *1σ:* 2470–2210 cal BC
2σ: 2480–2150 cal BC

Final comment: P Clay (6 September 2004), charcoal at base of trough below alder planks (original interpretation as final use cannot be correct). Radiocarbon dates are consistent with an early phase of use of the burnt mound. Also consistent with other samples from the same context (GU-5988).

Laboratory comment: Ancient Monuments Laboratory (2004), this result is statistically consistent with another from the same context (GU-5988) ($T'=2.0, T'(5\%)=3.8, \nu=1$; Ward and Wilson 1978). As both results were from bulk samples, the pooled mean of the two results may be taken as the best estimate of the radiocarbon age of this deposit. This is 3820 ±35 BP, which calibrates to 2310-2200 cal BC (1σ) or 2460-2140 cal BC (2σ) (Reimer *et al* 2004; Ward and Wilson 1978).

References: Reimer *et al* 2004
Stuiver and Kra 1986
Ward and Wilson 1978

GU–5988 3880 ±50 BP

$\delta^{13}C$: -27.5‰

Sample: sample 67B, context 147, submitted on 27 June 2003 by S Ripper

Material: charcoal: *Corylus avellana* (3g); *Corylus*/*Alnus* sp., bulk (7g); *Alnus glutinosa* (5g) (R Gale 2003)

Initial comment: as GU-5987

Objectives: as GU-5987

Calibrated date: *1σ:* 2470–2280 cal BC
2σ: 2480–2200 cal BC

Final comment: P Clay (6 September 2004), charcoal at base of trough below alder planks (original interpretation as final use cannot be correct). Radiocarbon dates are consistent with an early phase of use of the burnt mound. Also consistent with other sample from the same context (GU-5987).

Laboratory comment: see GU-5987

GU–5994 3640 ±50 BP

δ¹³C: -29.6‰

Sample: A57.1996, timber 15, submitted on 27 June 2003 by S Ripper

Material: wood: *Alnus glutinosa*, waterlogged, roundwood (140g) (R Gale 2003)

Initial comment: as GU-5983

Objectives: GU-5983

Calibrated date: *1σ:* 2130–1940 cal BC
2σ: 2200–1880 cal BC

Final comment: P Clay (6 September 2004), one of several alder planks at the base of the trough. The later additions post dated the original construction. This radiocarbon date is older than the other alder planks (17, 18, and 20) but it is still likely to have been added at the same time.

Laboratory comment: see GU-5983

GU–5995 3730 ±50 BP

δ¹³C: -29.7‰

Sample: A57.1996, timber 20, submitted on 27 June 2003 by S Ripper

Material: wood: *Alnus glutinosa*, roundwood, waterlogged (280g) (R Gale 2003)

Initial comment: as GU-5994

Objectives: as GU-5994

Calibrated date: *1σ:* 2210–2030 cal BC
2σ: 2290–1970 cal BC

Final comment: P Clay (6 September 2004), although a different radiocarbon date from other alder planks (15, 17, and 18) they are likely to have been added at the same time. It appears to be contemporary with spread 248.

Laboratory comment: see GU-5983

OxA–12484 932 ±28 BP

δ¹³C: -25.4‰

Sample: sample 92B, context 248, submitted on 27 June 2003 by S Ripper

Material: charcoal: *Alnus glutinosa*, a single fragment (R Gale 2003)

Initial comment: as GrA-23700

Objectives: as GrA-23700

Calibrated date: *1σ:* cal AD 1030–1160
2σ: cal AD 1020–1180

Final comment: P Clay (6 September 2004), charcoal from burnt stone layer believed to be from an early phase. However, radiocarbon dates now suggest that 236 may in fact be earlier than 248. This date is medieval and must have resulted from intrusive material being introduced into the matrix (worm action?). This result is inconsistent with GrA-23520, GrA-23700, and OxA-12958, and should be disregarded in the context of the burnt mound use.

Laboratory comment: see GrA-23700

OxA–12548 2042 ±25 BP

δ¹³C: -25.5‰

Sample: sample 89, context 229, submitted on 27 June 2004 by S Ripper

Material: plant macrofossil (95 waterlogged seeds (<5g)): *Cirsium* sp., bulk; *Ranunculus* subgen *Ranunculus*; *Carex* sp. (A Monckton 2003)

Initial comment: seeds were extracted from a fill of the gully cut 228. The gully clearly cut through burnt mound features (including both hearths) and therefore postdates burnt mound activity. Although charcoal fragments in this fill are regarded as residual, the peat content of the gully fill suggests that the waterlogged macrofossils are from plants which grew *in situ*.

Objectives: the silting of this gully represents a period when burnt mound activity had ceased. The date of this sample should therefore provide a *terminus ante quem* for the end of burnt mound activity.

Calibrated date: *1σ:* 90–1 cal BC
2σ: 160 cal BC–cal AD 30

Final comment: P Clay (6 September 2004), the date is consistent with post burnt mound activity.

OxA–12573 3877 ±34 BP

δ¹³C: -25.6‰

Sample: sample 86B, context 236, submitted on 27 June 2003 by S Ripper

Material: charcoal: *Prunus spinosa*, a single fragment (R Gale 2003)

Initial comment: as GrA-23698

Objectives: as GrA-23698

Calibrated date: *1σ:* 2470–2290 cal BC
2σ: 2470–2200 cal BC

Final comment: P Clay (6 September 2004), this sample came from charcoal within a spread of burnt series formally interpreted as a later deposit than 205, 235, and 248. These were more densely compacted. The dates from 236 suggest that at least two phases of burning took place although the stratigraphy appears to have been inverted. The radiocarbon dates suggest the initial interpretation of the relationship between 236 and 248 was incorrect and 236 is earlier.

Laboratory comment: see GrA-23698

OxA–12585 3971 ±34 BP

δ¹³C: -28.1‰

Sample: pollen tin 107, sample A, submitted on 27 June 2003 by S Ripper

Material: wood (bark fragments from single timber)

Initial comment: as GrA-23745

Objectives: as GrA-23745

Calibrated date: *1σ:* 2570–2460 cal BC
2σ: 2580–2400 cal BC

Final comment: P Clay (6 September 2004), the late Neolithic date is consistent with a clearance phase before burnt mound activity. *See* also GrA-23745 of earlier date although from the same context.

OxA–12586 4172 ±34 BP

$\delta^{13}C$: -28.8‰

Sample: sample 56, context 101, submitted on 27 June 2003 by S Ripper

Material: wood (170g) (waterlogged monocot stem/leaf)

Initial comment: sample 56 is the uppermost fill of the trough, and appears to represent a period of disuse. Although charcoal fragments within this layer will undoubtedly be reworked, it is thought that waterlogged macrofossils will be from plants growing *in situ*, after the trough was abandoned.

Objectives: the timber-lined trough was a secure feature, integral to burnt mound activities. The silting-up of the trough represents a period when burnt mound activity had ceased. The date of this sample should therefore provide a *terminus ante quem* for the end of burnt mound activity.

Calibrated date: *1σ:* 2880–2670 cal BC
2σ: 2890–2620 cal BC

Final comment: P Clay (6 September 2004), the sample is a plant growing *in situ* following the abandonment of the trough. The early Neolithic date however indicates that this material is residual having been redeposited (possibly due to a flood).

OxA–12644 4039 ±31 BP

$\delta^{13}C$: -28.8‰

Sample: A57.1996, withies 31/32, submitted on 27 June 2003 by S Ripper

Material: wood: *Corylus/Alnus* sp., waterlogged, roundwood with three rings (<2g) (R Gale 2003)

Initial comment: from the wattle walls lining a circular cut (the trough); the withies should date the construction of the trough.

Objectives: to date the beginning of burnt mound activity at this site, as the construction of the trough must predate this activity.

Calibrated date: *1σ:* 2580–2490 cal BC
2σ: 2840–2470 cal BC

Final comment: P Clay (6 September 2004), this sample post dates withy 30 (OxA-12988) and suggests that this is part of a repair of a later phase of the use of the trough not the original construction. It may have been added at the same time as the alder planks (eg GU-5983). Radiocarbon dates have refined the phasing of the trough construction, use, and repair.

Laboratory comment: Ancient Monuments Laboratory (2004), the two results from alder withies from the wall of the trough (OxA-12644 and OxA-12988) are not consistent with a single radiocarbon age ($T'=36.6$, $T'(5\%)=3.8$, $\nu=1$; Ward and Wilson 1978), suggesting that there was more than one episode of trough construction/repair.

References: Ward and Wilson 1978

OxA–12957 3725 ±34 BP

$\delta^{13}C$: -26.6‰

Sample: sample 92E, context 248, submitted on 19 November 2003 by S Ripper

Material: charcoal: *Alnus glutinosa*, a single fragment (<5g) (R Gale 2003)

Initial comment: as GrA-23700

Objectives: as GrA-23700

Calibrated date: *1σ:* 2200–2040 cal BC
2σ: 2270–2020 cal BC

Final comment: P Clay (6 September 2004), charcoal from burnt stone layer, thought to be from an early phase of the burnt mound's use (pre-236). However, radiocarbon dates suggest that 236 may in fact be earlier than 248. Consistent with GrA-23520, GrA-23700, and OxA-12958.

Laboratory comment: see GrA-23700

OxA–12958 3765 ±34 BP

$\delta^{13}C$: -28.3‰

Sample: sample 92D, context 248, submitted on 19 November 2003 by S Ripper

Material: charcoal: *Alnus glutinosa*, a single fragment (<5g) (R Gale 2003)

Initial comment: as GrA-23700

Objectives: as GrA-23700

Calibrated date: *1σ:* 2280–2130 cal BC
2σ: 2290–2040 cal BC

Final comment: P Clay (6 September 2004), this charcoal from a burnt stone layer, is believed to be from an early phase of the burnt mound. However, radiocarbon dates now suggest that 236 may in fact be earlier than 248. Consistent with GrA-23700, GrA-23520, and OxA-12957.

Laboratory comment: see GrA-23700

OxA–12959 3913 ±36 BP

$\delta^{13}C$: -24.5‰

Sample: sample 86E, context 236, submitted on 19 November 2003 by S Ripper

Material: charcoal: *Alnus glutinosa*, a single fragment (<5g) (R Gale 2003)

Initial comment: as GrA-23698

Objectives: as GrA-23698

Calibrated date: *1σ:* 2470–2340 cal BC
2σ: 2490–2290 cal BC

Final comment: P Clay (6 September 2004), charcoal associated with burnt stone spread (see also GrA-23698, GrA-24519, and OxA-12573). Although originally interpreted as later than 205, 235, and 248, the radiocarbon dates suggest that this may not be the case, and that 236 is in fact earlier.

Laboratory comment: see GrA-23698

OxA–12998 4039 ±31 BP

δ¹³C: -28.8‰

Sample: A57.1996, withy 30, submitted on 19 November 2003 by S Ripper

Material: wood: *Alnus glutinosa*, waterlogged, roundwood, 8mm including bark, single withy (8g) (R Gale 2003)

Initial comment: from the wattle walls lining a circular cut (the trough); the withies should date the construction of the trough.

Objectives: to date the beginning of burnt mound activity at this site, as the construction of the trough must predate this activity.

Calibrated date: *1σ:* 2580–2490 cal BC
2σ: 2840–2470 cal BC

Final comment: P Clay (6 September 2004), the date should indicate when the trough was constructed. Dates are consistent with it being part of the original wooden trough. It also predates all other charcoal samples. Radiocarbon dates have enabled phasing of the trough to be confirmed.

Laboratory comment: Ancient Monuments Laboratory (2004), the two results from alder withies from the wall of the trough (OxA-12644 and OxA-12988) are not consistent with a single radiocarbon date (T′=36.6, T′(5%)=3.8, ν=1) (Ward and Wilson 1978), suggesting that there was more than one episode of trough construction/repair.

References: Ward and Wilson 1978

Birstall Watermead Country Park: human bones from the palaeochannel, Leicestershire

Location: SK 605101
Lat. 52.41.05 N; Long. 01.06.18 W

Project manager: S Ripper (University of Leicester), May–June 1996

Archival body: Heritage Services, Leicestershire County Council

Description: this series includes the skull of a man (small find 47) (not from the same individual as the vertebra with cut marks dated by OxA-6831), and a possible female human femur (small find 55).

Objectives: a programme of radiocarbon dating will set the excavated events within a changing environmental setting, potentially a sequence from the late Upper Palaeolithic to the late Bronze Age. The dating programme may also help to elucidate whether the recorded 'events' (burnt mound, bridge, animal bone, and human remains) were broadly contemporary or probably unrelated. Dates may also help to determine whether the burnt mound was a short-lived monument or a more permanent facility.

Final comment: P Clay & S Ripper (6 September 2004), this was a major surprise. Although found during a watching brief (not observed by University of Leicester Archaeological Services) the femur and skull were found in close proximity to other human bones, including an atlas vertebrae still attached to the skull which dated to 1050–800 cal BC (A57 1996.32; OxA-6831; 2760 ±55BP) (Reimer *et al* 2004) and it was assumed that the human remains were deposited in the same location within the same period. The results of A57.1996.55 (GrA-23588) and A57 1996.47 (GrA-23586) suggest that the area had been used for human deposition *c* 2000 years before AS7 1996.32. Were it not for the results from A57 1996.47 and 55 these would have been considered to be anomalous dates and the possibility of contamination by earlier material would have to have been considered. Two dates suggest the early Neolithic interpretation to be correct.

Laboratory comment: Ancient Monuments Laboratory (2004), stable isotope values for both individuals are normal and do not indicate that either radiocarbon result was subject to a reservoir effect.

References: Beamish and Ripper 2000
Reimer *et al* 2004
Ripper 1996
Ripper 1997a
Ripper 1997b
Ripper 2002

GrA–23586 4280 ±45 BP

δ¹³C: -21.2‰
δ¹⁵N (diet): +11.8‰

Sample: A57.1996, no. 47, submitted on 27 June 2003 by S Ripper

Material: human bone (646g) (skull, male)

Initial comment: one of ten human bones recovered from spoil produced by stripping of overburden for gravel extraction. Bones had peaty silt matrix adhering to them, and apparently were from a peaty silt deposit within the palaeochannel, which was sealed by 1.5m of alluvial clay containing no post Bronze Age finds or features.

Objectives: to determine whether this individual was contemporary with other human remains (OxA-6831 above), and whether burial activity was coeval with the nearby burnt mound activity or other archaeological features on site.

Calibrated date: *1σ:* 2920–2880 cal BC
2σ: 3010–2870 cal BC

Final comment: P Clay (6 September 2004), metal tool marks on atlas vertebra and late Bronze Age date (OxA-6831) of 32 led to 55 being expected to be late Bronze Age in date and that it was deposited at the same time or within the same period. Singly this date would have been considered anomalous and perhaps not accepted. Together with the date of small find 47 (GrA-23586), however, it can be interpreted that the area had been used for the deposition of human remains.

GrA–23588 4290 ±45 BP

δ¹³C: -21.2‰
δ¹⁵N (diet): +10.9‰

Sample: A57.1996, no. 55, submitted on 27 June 2003 by S Ripper

Material: human bone (270g) (femur, possibly female)

Initial comment: as GrA-23586

Objectives: as GrA-23586

Calibrated date: *1σ:* 2920–2880 cal BC
2σ: 3020–2870 cal BC

Final comment: see GrA-23586

Birstall Watermead Country Park: macrofossils in pollen columns 4 and 8, Leicestershire

Location: SK 605101
Lat. 52.41.05 N; Long. 01.06.18 W

Project manager: S Ripper (University of Leicester), May–June 1996

Archival body: Heritage Services, Leicestershire County Council

Description: this series includes seven bulk macrofossil samples from Column 4, immediately adjacent to the burnt mound.

Objectives: a programme of radiocarbon dating will set the excavated events within a changing environmental setting, potentially a sequence from the late Upper Palaeolithic to the late Bronze Age. The dating programme may also help to elucidate whether the recorded 'events' (burnt mound, bridge, animal bone, and human remains) were broadly contemporary or probably unrelated. The dates may also help to determine whether the burnt mound was a short-lived monument or a more permanent facility. Pollen diagrams from the two monoliths have the potential to reveal local deforestation, perhaps associated with the structures found on site.

References: Beamish and Ripper 2000
Ripper 1997a
Ripper 1997b
Ripper 2002

GrA–24528 1620 ±45 BP

$\delta^{13}C$: -26.9‰

Sample: column 4, WPB/4/44–46, submitted on 17 November 2003 by S Ripper

Material: plant macrofossil: *Prunus/Crataegus* sp., twigs, bulk (<2g) (J Greig 2003)

Initial comment: monoliths collected in 50 × 10 × 10cm tins and double-bagged. Sample of sediment from 44–46cm of Column 4 (monolith 78, top of organics) was sorted for waterlogged macrofossils.

Objectives: to date an environmental sequence associated with a prehistoric burnt mound. Column 4 was located adjacent to the burnt mound site, within the same palaeochannel. This sample was selected to date the section of the pollen diagram between OxA-12482 (81cm) and OxA-12549 (20cm).

Calibrated date: *1σ:* cal AD 390–540
2σ: cal AD 330–550

Final comment: A Monckton (6 September 2004), the date fits into the Roman sequence with evidence of the open occupied landscape from pollen and insects. Insect remains add to the evidence for pasture, and pollen shows that peas as well as cereals were cultivated from a record of pollen of *Pisum* sp. at 45cm.

OxA–12482 4490 ±33 BP

$\delta^{13}C$: -23.9‰

Sample: column 4, WPB/4/81, submitted on 27 June 2003 by S Ripper

Material: plant macrofossil (waterlogged seeds (<5g)): *Mentha* sp., bulk; *Persicaria lapthifolia*; *Apium* cf *nodiflorum*; *Carex* subgen *Carex*; *Galium* sp.; *Ranunculus* subgen *Ranunculus* (J Greig 2003)

Initial comment: monoliths collected in 50 × 10 × 10cm tins and double-bagged. Sample of sediment from 81–83cm of Column 4 (monolith 78) was sorted for waterlogged macrofossils.

Objectives: as GrA-24528

Calibrated date: *1σ:* 3340–3090 cal BC
2σ: 3360–3020 cal BC

Final comment: A Monckton (6 September 2004), this sample gave an early Neolithic date out of sequence with the dates above and below it. There was little pollen at this level and the material was thought to be reworked. This may represent material deposited by flooding at this point in the sequence. This shows the importance of dating a sequence of samples from palaeochannel.

Laboratory comment: Ancient Monuments Laboratory (2004), comparison of this result to other Column 4 results suggests that this sample almost certainly included reworked (residual) material.

OxA–12549 1207 ±27 BP

$\delta^{13}C$: -25.0‰

Sample: column 4, WPB/4/20, submitted on 16 June 2003 by S Ripper

Material: plant macrofossil: *Schoenoplectus* sp., waterlogged seeds, bulk (<5g) (A Monckton 2003)

Initial comment: monoliths collected in 50 × 10 × 10cm tins and double-bagged. Sample of sediment from 20–5cm of Column 4 (monolith 77, top of organics) was sorted for waterlogged macrofossils.

Objectives: as GrA-24528. The top of Column 4 will date the final silting episode of the palaeochannel prior to alluviation, providing a *terminus post quem* for alluviation and a *terminus ante quem* for palaeochannel activity. Dating this layer, which also contained dated animal bones (*see* bones and timbers from the palaeochannel series) may indicate whether the bone was deposited on a particular horizon, or whether the bones were intrusive.

Calibrated date: *1σ:* cal AD 770–890
2σ: cal AD 710–900

Final comment: A Monckton (6 September 2004), this part of the profile shows that cultivation, grazing, and use of nearby land as traditional flood meadow continued into the late Saxon period. It is unusual to find such good evidence for flood meadow and the date here provides rare evidence of the Saxon economy in the area. After this date alluviation increased, probably as a result of increased farming on heavier soils.

Laboratory comment: Ancient Monuments Laboratory, this date demonstrates that the dated bones were residual in this deposit.

OxA–12550 1044 ±24 BP

Sample: column 8, monolith 114, submitted on 27 June 2003 by S Ripper

Material: plant macrofossil: monocot, stem/leaf, a single fragment (Angela Monckton)

Initial comment: monoliths collected in 50 × 10 × 10cm tins and double-bagged. Sample of sediment from 24–26cm of monolith 114 (top of organics) was sorted for waterlogged macrofossils. As there were no seeds, a monocot stem/leaf was selected.

Objectives: column 8 was located some 45m to the south of the burnt mound site, within the same palaeochannel. An initial evaluation of the pollen sequence by Dr Tony Brown (Exeter University) indicates that the sequence spans a high-magnitude local clearance event (late Neolithic–Bronze Age). There are indications that the base of the monolith may extend rather earlier, perhaps into the Mesolithic, and there may be a hiatus within the sequence. The column has the potential to reveal local deforestation, perhaps associated with artefacts and structures found at the site.

Calibrated date: *1σ:* cal AD 985–1020
2σ: cal AD 900–1025

Final comment: A Monckton (6 September 2004), the sample is dated to the late Saxon period. The pollen was dominated by alder and oak with *c* 20% grasses and sedges. Unlike Column 4 upper samples, no cereals were found, although of a similar date. This part of the monolith overlaps with the upper tin 113 and the pollen shows significant differences, although only 0.13m apart.

OxA–12634 1048 ±28 BP

$\delta^{13}C$: -29.5‰

Sample: column 8, monolith 113, submitted on 27 June 2003 by S Ripper

Material: plant macrofossil: monocot, stem/leaf, a single fragment (<5g) (A Monckton 2003)

Initial comment: monoliths collected in 50 × 10 × 10cm tins and double-bagged. Sample of sediment from 2–4cm of monolith 113 (top of organics) was sorted for waterlogged macrofossils. As there were no seeds, a monocot stem/leaf was selected.

Objectives: as OxA-12550

Calibrated date: *1σ:* cal AD 980–1020
2σ: cal AD 900–1030

Final comment: A Monckton (6 September 2004), the top of the organics dates to the early medieval period in sequence with the previous sample (114A). This part of the profile shows a decline in tree pollen and increase in grasses sedges and herbs. Above this level cereals appear and comparison with the top of Column 4 showing evidence of an open environment.

OxA–12635 1698 ±30 BP

$\delta^{13}C$: -29.3‰

Sample: column 8, monolith 114, B, submitted on 27 June 2003 by S Ripper

Material: plant macrofossil: monocot, stem/leaf, a single fragment (<5g) (A Monckton 2003)

Initial comment: monoliths collected in 50 × 10 × 10cm tins and double-bagged. Sample of sediment from 32–4cm of monolith 114 (middle of organics) was sorted for waterlogged macrofossils. As there were no seeds, a monocot stem/leaf was selected.

Objectives: as OxA-12550

Calibrated date: *1σ:* cal AD 260–400
2σ: cal AD 250–420

Final comment: A Monckton (6 September 2004), the sample is dated to the Roman period and falls between the sample below and above it. This sample is also in the zone dominated by pine (*Pinus sylvestris)*, unlike samples of a similar date from Column 4 on the site. Above this level pine declines, which was a reason this profile was studied, although the dates are unexpected.

OxA–12773 2256 ±28 BP

$\delta^{13}C$: -27.7‰

Sample: column 8, monolith 114, C, submitted on 27 June 2003 by S Ripper

Material: plant macrofossil: monocot, stem/leaf, a single fragment (<5g) (A Monckton 2003)

Initial comment: monoliths collected in 50 × 10 × 10cm tins and double-bagged. Sample of sediment from 42.5–44.5cm of monolith 114 (bottom of organics) was sorted for waterlogged macrofossils. As there were no seeds, a monocot stem/leaf was selected.

Objectives: as OxA-12550

Calibrated date: *1σ:* 390–230 cal BC
2σ: 400–200 cal BC

Final comment: A Monckton (6 September 2004), the sample was dated to the middle Iron Age, which was unexpected as the profile was thought to contain early Holocene material. The samples at the base of the organics (pollen zone WW114A) were dominated by pine with low amounts of other trees, grasses, and sedges. The profile produced only sparse organic material and was dated from monocot leaf and stem fragments. The results are inconsistent with others from the site and region.

OxA–12823 2110 ±90 BP

$\delta^{13}C$: -27.4‰

Sample: column 4, WPB/4/100, submitted on 27 June 2003 by S Ripper

Material: plant macrofossil (<5g): *Viola* sp., seeds, bulk; *Ranunculus* subgen *Ranunculus*, seeds; *Sambucus nigra*, seeds; *Urtica dioica*, seeds; *Corylus avellana*, nutshell (J Greig 2003)

Initial comment: monoliths collected in 50 × 10 × 10cm tins and double-bagged. Sample of sediment from 100–2cm of Column 4 (monolith 78, bottom of organics) was sorted for waterlogged macrofossils.

Objectives: as GrA-24528

Calibrated date: *1σ:* 350–1 cal BC
2σ: 390 cal BC–cal AD 80

Final comment: A Monckton (6 September 2004), pollen analysed by J Greig showed signs of woodland with alder, hazel, and oak. Traces of elm and lime indicated the formerly extensive wild wood. There were a few traces of human activity, including cereal pollen, greater plantain, and charcoal. Although this was not contemporary with the burnt mound as hoped, it provided the base of a valuable Iron Age to Saxon environmental sequence.

OxA–12826 1625 ±50 BP

$\delta^{13}C$: -26.4‰

Sample: column 4, WPB/4/54, submitted on 27 June 2003 by S Ripper

Material: plant macrofossil (waterlogged seeds, <5g): *Mentha* sp., bulk; *Ranunculus* subgen *Ranunculus*; *Eleocharis* sp.; *Carex* subgen *Carex*; *Urtica dioica*; *Persicaria lapthifolia*; *Rorippa* sp.; *Lychnis flos-cuculi*; *Apium* cf *nodiflorum* (J Greig 2003)

Initial comment: monoliths collected in 50 × 10 × 10cm tins and double-bagged. Sample of sediment from 54-6cm of Column 4 (monolith 78, top of organics) was sorted for waterlogged macrofossils.

Objectives: as GrA-24528

Calibrated date: *1σ:* cal AD 380–540
2σ: cal AD 260–550

Final comment: A Monckton (6 September 2004), this date fits with the Roman part of the sequence. The information from pollen and insect remains adds to that from the sample below (OxA-12973).

OxA–12973 1682 ±33 BP

$\delta^{13}C$: -26.8‰

Sample: column 4, WPB/4/68–70, submitted on 17 November 2003 by S Ripper

Material: plant macrofossil (waterlogged seeds, <2g): *Cerastium fontanum*, bulk; *Potentilla reptans*; *Stellaria media*; *Rumex* sp.; *Rumex acelosella*; *Chenopodium* cf *album*; *Carex* sp.; *Mentha* sp.; *Apium nodiflorum*; *Isolepis setacea*; *Polygonum lapathifolium*; *Lychnis flos-cuculi*; *Ranunculus sceleratus*; *Ranunculus flammula* (J Greig 2003)

Initial comment: monoliths collected in 50 × 10 × 10cm tins and double-bagged. Sample of sediment from 68-70cm of Column 4 (monolith 78, middle of organics) was sorted for waterlogged macrofossils.

Objectives: as GrA-24528

Calibrated date: *1σ:* cal AD 260–420
2σ: cal AD 250–430

Final comment: A Monckton (6 September 2004), this date forms the start of the sequence of Roman to Saxon periods. In this part of the pollen diagram there was little local woodland with grassland plants much in evidence. Local water plants were indicated. Cereals and arable weeds were found suggesting cultivated land was not far away. Insect remains suggested grassland and pasture nearby.

OxA–12999 1207 ±27 BP

$\delta^{13}C$: -25.0‰

Sample: column 4, WPB/4/33–35, submitted on 17 November 2003 by S Ripper

Material: plant macrofossil (waterlogged seeds, <2g): *Eleocharis* sp., bulk; *Carex* subgen *Carex*; *Potentilla* sp.; *Oenanthe* sp.; *Lychnis flos-cuculi*; *Ranunculus sceleratus*; *Prunella?*; *Schoenoplectus* sp. (J Greig 2003)

Initial comment: monoliths collected in 50 × 10 × 10cm tins and double-bagged. Sample of sediment from 33–5cm of Column 4 (monolith 77, middle of organics) was sorted for waterlogged macrofossils.

Objectives: as GrA-24528

Calibrated date: *1σ:* cal AD 770–890
2σ: cal AD 710–900

Final comment: A Monckton (6 September 2004), more signs of crops and occupation were found. The cereals included rye, and Cannabis-type pollen (probably hemp), which are typical Saxon crops. Grassland plants were abundant including evidence for hay meadow, with other plants of damp grassland suggesting that there was flood meadow here. These remains provide evidence of the environment of the Saxon bridge.

Bletchingley: North Park Farm, Surrey

Location: TQ 331523
Lat. 51.15.17 N; Long. 00.05.36 W

Project manager: N Branch (Royal Holloway College, University of London), 2002

Description: a group of possible hearths and pits associated with an assemblage of Mesolithic flint artefacts were excavated. The site is located at *c* 115m OD, between the North Downs chalk escarpment (230m OD) less than 1km to the north and the Lower Greensand escarpment (165m OD) 2km to the south, on a low spur within the Gault vale. The main excavation areas, trenches A and B, contained a 0.5m thick horizon of friable grey-white sand, containing Mesolithic artefacts, directly overlying the Lower Greensand bedrock. This unit was overlain by 0.2m of darker grey, more compact sandy sediment. The latter was overlain by 0.5m of reddish-brown, compact, gritty sand, which contained post Mesolithic artefacts of various periods, and directly underlay the ploughsoil.

Objectives: to establish, prior to the analysis stage of the project, the merits of radiocarbon dating under the specific taphonomic conditions prevailing at Bletchingley, and to assist in the formulation of research hypotheses for the analysis stage.

References: Branch *et al* 2003
Branch and Poulton 2003
Poulton *et al* 2002

OxA–13042 2735 ±55 BP

$\delta^{13}C$: -24.3‰

Sample: A11.1/2/NPF02B, by 29/09/2004

Material: charcoal: *Corylus* sp., a single fragment (R Gale 2003)

Initial comment: excavation of test pit A11 within trench A at North Park Farm revealed the presence of a complex lithostratigraphic sequence consisting of (from the base upward): 1) undisturbed Lower Greensand, 2) windblown sand with poorly preserved bedding containing Mesolithic flint artefacts, 3) soil development containing Mesolithic flint artefacts (buried soil), and 4) ploughsoil. the sample came from the top 5cm layer of test pit A11.1, within a buried soil containing burnt and unburnt Mesolithic flint.

Objectives: to determine whether further radiocarbon dating is justified in the analysis stage of this project, by testing the hypothesis that the charcoal and burnt flint (dated by thermoluminescence) are of the same date, and that this is consistent with the chronology of the sedimentary sequence (dated by OSL).

Calibrated date: *1σ:* 930–810 cal BC
2σ: 1010–800 cal BC

Final comment: N Branch (29 September 2004), the result of the radiocarbon dating indicates that the charcoal is of late Bronze Age date. This result is consistent with the OSL age obtained from the buried soil (2.8 ±0.2 ka; GL03109), but is inconsistent with the TL age (20.1 ±4.7 ka and 10.3 ±1.2 ka; GL03112 and GL03113 respectively; Toms 2005). The results suggest that during the late Bronze Age the soil containing the Mesolithic artefacts was exposed (probably by erosion of the ground surface) causing the OSL signal to be reset. Burning of this surface as a result of a wildfire or human activity led to the deposition of the charcoal, which subsequently became mixed with the Mesolithic flint artefacts and burnt flint. In conclusion, the results confirm that the soil was once a land surface subject to Mesolithic human activities, but that a later event (or events) associated with erosion of the ground surface led to incorporation of late Bronze Age charcoal. It is recommended that further radiocarbon dating at North Park Farm be confined to suitable organic materials from specific archaeological contexts eg hearths, rather than buried soils.

Laboratory comment: Ancient Monuments Laboratory (2004), the two results from this level (OxA-13061 and OxA-13042) are statistically consistent, according to the method of Ward and Wilson (1978) (T′=0.6, T′(5%)=3.8), ν=1).

References: Toms 2005
Ward and Wilson 1978

OxA–13061 2781 ±26 BP

$\delta^{13}C$: -22.6‰

Sample: A11.1/2/NPF02A, submitted on 20 November 2003 by N P Branch

Material: charcoal: *Corylus* sp., a single fragment (R Gale 2003)

Initial comment: as OxA-13042

Objectives: as OxA-13042

Calibrated date: *1σ:* 980–900 cal BC
2σ: 1010–840 cal BC

Final comment: N Branch (29 September 2004) as OxA-13042

Laboratory comment: see OxA-13042

Dungeness Foreland, Kent

Location: TR 094169
Lat. 50.54.49 N; Long. 00.58.39 E

Project manager: A Long (University of Durham) 2003

Description: the Dungeness foreland consists of three pits containing organic deposits: Muddymore Pit, Open Pit, and Wickmaryholm Pit.

Objectives: the overall objective is to provide a date for the onset of organic sedimentation as well as allow construction of a high-resolution chronology of detailed pollen, plant macrofossil, and diatom analysis on sediment from the pits.

References: Long *et al* 2002
Long and Hughes 1995

Dungeness: Muddymore Pit, Kent

Location: TR 062176
Lat. 50.55.13 N; Long. 00.56.03 E

Project manager: A Long (University of Durham), 2003

Archival body: School of Earth Science & Geography, Kingston University

Description: a (closed) natural pit on the surface of the Dungeness Foreland gravel, partly infilled by organic sediment; currently supports dense *Phragmites* reedswamp.

Objectives: to date the stabilisation of the gravel surface at Muddymore, and provide a chronology for the palaeoenvironmental data (pollen, diatoms, and plant macrofossils) collected from a core through the organic sediment.

Final comment: M Waller and J E Schofield (16 April 2004), the bulk dates from this series are notably older than the dates derived from plant macrofossils. The latter appear more compatible with the high values from *Cannabis sativa* (indicative of retting) in the pollen record. An eleventh–thirteenth century, rather than a fourth–sixth century, date for the growing and retting of *Cannabis* is more consistent with the development of adjacent marshland and the port of Lydd. The bulk dates have probably been contaminated by the inwash of older organic material (possibly derived from the erosion of the main marsh peat) as at Wickmaryholm.

References: Long *et al* 2002
Long and Hughes 1995
Meadows *et al* forthcoming

GrA–22408 930 ±30 BP

$\delta^{13}C$: -27.9‰

Sample: Mudd 1.1, submitted on 3 March 2003 by J E Schofield and M P Waller

Material: plant macrofossils (waterlogged, -2.76 – -2.81m OD, bulk): unknown moss, 1 fragment; cf *Salix*, 1 fragment; *Rumex* cf *crispus*, 14 fruiting tepals; cf *Sparganium*, 1 nutlet; *Schoenoplectus* sp., 4 seeds; cf *Polygonum lapathifolium* , 1 seed; *Rumex* sp., 6 seeds; Chenopodiaceae, 1 seed; *Carex* sp., 3 seeds (J E Schofield 2003)

Initial comment: Mudd 1.1 comprises macrofossils removed from a 5cm slice of peat, from the base of the peat layer at Muddymore (345–50cm), immediately above a thin band of silty detritus mud containing shells; bulk peat from the same level was also dated (Mudd 1.2: GrN-27874 and GrA-22855), to investigate the reliability of bulk sediment dates in this environment.

Objectives: to date the onset of organic sedimentation at Muddymore Pit, and thus provide a *terminus ante quem* for the stabilisation of the gravel substrate at this location.

Calibrated date: *1σ:* cal AD 1030–1160
2σ: cal AD 1020–1180

Final comment: M Waller and J E Schofield (16 April 2004), this date marks the onset of organic sedimentation and very high *Cannabis sativa* pollen values. An early medieval date is much more likely for the growing and retting of *Cannabis* on the marshland around Lydd than the much earlier dates derived from the bulk samples (GrA-22855 and GrN-27874) from this stratigraphic level.

Laboratory comment: Ancient Monuments Laboratory (2004), sample is significantly more recent than bulk humin and humic acid fractions from the same level (Mudd 1.2: GrA-22855 and GrN-27874).

GrA–22855 1565 ±45 BP

$\delta^{13}C$: -22.9‰

Sample: Mudd 1.2 (humic acid), submitted on 3 March 2003 by J E Schofield and M P Waller

Material: peat (81.80g) (-2.76 – -2.81m OD, bulk, pH 8.3; loss on ignition 45.2%)

Initial comment: Mudd 1.2 comprises a 5cm slice of peat, from the base of the peat layer at Muddymore (345–50cm), immediately above a thin band of silty detritus mud containing shells; humin from Mudd 1.2 was also dated (GrN-27874).

Objectives: as GrA-22408

Calibrated date: *1σ:* cal AD 420–560
2σ: cal AD 400–600

Final comment: M Waller and J E Schofield (16 April 2004), this date is *c* 500 years older than the macrofossil date from the same stratigraphic level (GrA-22408). The growing and retting of *Cannabis sativa* (as indicated by the biostratigraphy) on the marshland around Lydd at this earlier date seems unlikely and this bulk date (along with GrN-27874) has probably been contaminated with older carbon (possibly peat being reworked along the shore face).

Laboratory comment: see GrN-27874

GrN–27874 1420 ±40 BP

$\delta^{13}C$: -23.8‰

Sample: Mudd 1.2 (humin), submitted on 3 March 2003 by J E Schofield and M P Waller

Material: peat (81.80g) (bulk, pH 8.3; loss on ignition, 45.2%)

Initial comment: Mudd 1.2 comprises of a 5cm slice of peat, from the base of the peat layer at Muddymore (345–50cm), immediately above a thin band of silty detritus mud containing shells; humic acid from Mudd 1.2 was also dated (GrA-22855).

Objectives: as GrA-22408

Calibrated date: *1σ:* cal AD 600–660
2σ: cal AD 560–670

Final comment: M Waller and J E Schofield (16 April 2004), this date is *c* 400 years older than the macrofossil date from the same stratifigraphic level (GrA-22408). The growing and retting of *Cannabis sativa* (indicated by the biostratigraphy) on the marshland around Lydd at this earlier date seems unlikely and this bulk date (along with GrA-22855) has probably been contaminated with other carbon (possibly peat being reworked along the shore face).

Laboratory comment: Ancient Monuments Laboratory (2004), results from the humin and humic acid fractions of this sample (GrN-27874 and GrA-22855) are not statistically consistent, according to the method of Ward and Wilson (1978) ($T'=5.8, T'(5\%)=3.8, \nu=1$).

References: Ward and Wilson 1978

GrN–28274 910 ±40 BP

$\delta^{13}C$: -23.0‰

Sample: Mudd 3.1 (humin), submitted on 1 September 2003 by J E Schofield and M P Waller

Material: peat (86.10g) (bulk, -2.16 – -2.21m OD; pH 6.9; loss on ignition 69.4%)

Initial comment: Mudd 3.1 represents the uppermost 5cm (285–90cm) of the peat layer in this pit, immediately below a layer of grey brown silt with occasional rhizomes. Humic acid was also dated (GrN-28275).

Objectives: the result provides a maximum age estimate for the end of organic sediment accumulation at Muddymore Pit.

Calibrated date: *1σ:* cal AD 1030–1180
2σ: cal AD 1020–1220

Final comment: M Waller and J E Schofield (16 April 2004), this bulk date from the top of the organic sequence at Muddymore is of similar age to the macrofossil sample taken from a lower stratigraphic level (OxA-12891). Although the age discrepancy is not as large as the basal bulk/macrofossil samples from Muddymore some contamination of this sample with older carbon seems likely.

Laboratory comment: Ancient Monuments Laboratory (2004), results from the humin and humic acid fractions of this sample (GrN-28274 and GrN-28275) are statistically consistent, according to the method of Ward and Wilson (1978) ($T'=0.5, T'(5\%)=3.8, \nu=1$); their pooled mean (925 ±33 BP) is therefore regarded as the best estimate of the sample's radiocarbon age. This calibrates to cal AD 1030–1170 (1σ) or cal AD 1020–1220 (2σ) (Reimer *et al.* 2004).

References: Reimer *et al* 2004
Ward and Wilson 1978

GrN–28275 960 ±60 BP

$\delta^{13}C$: -21.9‰

Sample: Mudd 3.1 (humic acid), submitted on 2 September 2003 by J E Schofield and M P Waller

Material: peat (86.10g) (bulk, -2.16 – -2.21m OD; pH 6.9; loss on ignition 69.4%)

Initial comment: as GrN-28274

Objectives: as GrN-28274

Calibrated date: *1σ:* cal AD 1010–1160
2σ: cal AD 980–1220

Final comment: see GrN-28274

OxA–12891 841 ±31 BP

$\delta^{13}C$: -25.0‰

Sample: Mudd 2.2, submitted on 15 August 2003 by J E Schofield and M P Waller

Material: plant macrofossil (waterlogged, -2.56 – -2.61m OD, bulk): *Rumex* sp., fruiting tepals (0.01g, 100%) (J E Schofield 2003)

Initial comment: bulked macrofossils recovered from a 5cm slice of peat (325–30cm) within a layer of peat/organic detritus mud.

Objectives: to construct a high-resolution chronology for palaeovegetational studies into the history of Muddymore Pit and the surrounding gravel foreland.

Calibrated date: *1σ:* cal AD 1160–1230
2σ: cal AD 1150–1270

Final comment: M Waller and J E Schofield (16 April 2004), this date forms a consistent series with the lower macrofossil sample (GrA-22408) and suggests that Muddymore (as with the other open pits on Dungeness Foreland) infilled rapidly.

Dungeness: Open Pit, Kent

Location: TR 073184
Lat. 50.55.38 N; Long. 00.57.01 E

Project manager: A Long (University of Durham), 2002

Archival body: School of Earth Science & Geography, Kingston University

Description: the larger of two natural pits on the surface of the Dungeness foreland gravel, which supports *c* 0.5km^2 of open water, with a maximum depth of 0.75m, surrounded by reedswamp and *Salix* scrub.

Objectives: to allow construction of a high-resolution chronology for the detailed palaeoenvironmental data (pollen, diatoms, and plant macrofossils) collected at the site.

Final comment: M Waller and J E Schofield (16 April 2004), the Open Pits are believed to have a natural origin, dating from 800–1000 years ago (Ferry and Waters 1988). The radiocarbon dates are therefore unexpectedly recent. Either the Pit sampled is of recent (possibly anthropogenic) origin or organic sedimentation commenced some considerable time after the adjacent shingle ridges formed. The contact between the silts and organic sediment is very sharp, though there is no indication in the biostratigraphy of a break in sedimentation or disturbance within the organic sediment.

References: Ferry and Waters 1988
Long and Hughes 1995
Meadows *et al* forthcoming

OxA–12684 1.62 ±0.004 fM

$\delta^{13}C$: -28.0‰

Sample: Open Pit 1.3, submitted on 15 August 2004 by J E Schofield and M P Waller

Material: plant macrofossil (unidentified leaf fragment, 0.46–0.51m OD, single fragment)

Initial comment: open Pit 1.3 comprises bulked terrestrial plant macrofossils, found in organic detritus mud 95–100cm below the surface (20cm below the mud/lake water interface).

Objectives: to provide a high-resolution chronology for palaeovegetational studies; this result provides a maximum age for the top of the organic detritus mud unit.

Calibrated date: *1σ:* cal AD 1967–1968
2σ: cal AD 1967–1968

Final comment: M Waller and J E Schofield (16 April 2004), this date suggests organic sedimentation in the pit has continued into recent years. The increase in *Salix* values above this level and the consistent occurrence of *Rubus* pollen are comparable with the vegetation of the pit as reported by Ferry and Waters (1988) in the period AD 1972–85.

References: Ferry and Waters 1988
Kueppers *et al* 2004

OxA–12867 1.39 ±0.003 fM

$\delta^{13}C$: -30.0‰

Sample: Open Pit 1.2, submitted on 15 August 2003 by J E Schofield and M P Waller

Material: plant macrofossil (-1.03m OD): cf *Salix*, leaf, a single macrofossil (0.11g, 100%) (J E Schofield 2003)

Initial comment: Open Pit 1.2 comprises a single terrestrial plant macrofossil, found in organic detritus mud 249cm below the surface (43cm above the contact with grey sandy silt).

Objectives: to provide a high-resolution chronology for palaeovegetational studies.

Calibrated date: *1σ:* cal AD 1962–1976
2σ: cal AD 1962–1976

Final comment: M Waller and J E Schofield (16 April 2004), this dates a change in biostratigraphy with aquatic pollen (eg *Potamogeton natans*-type and *Myriophyllum alteriflorum*) declining and high values of *Sparganium emersum*-type pollen above this level. While this is compatible with the infilling of the basin, the pollen record does not reflect the vegetation changes reported at the site (Ferry and Waters 1988) over the period AD 1946–72, particularly the increase in *Salix*.

Laboratory comment: Ancient Monuments Laboratory (in 2007), calendar age estimated from atmospheric $^{14}CO_2$ data in Kueppers *et al* 2004.

References: Ferry and Waters 1988
Kueppers *et al* 2004

OxA–12890 161 ±30 BP

δ¹³C: -25.8‰

Sample: Open Pit 1.1, submitted on 15 August 2003 by J E Schofield and M P Waller

Material: plant macrofossil (-1.16 – -1.21m OD, bulk sample): *Rumex* sp., fruiting tepals (0.01g, 100%) (J E Schofield)

Initial comment: Open Pit 1.1 comprises a terrestrial plant macrofossil, found in organic detritus mud between 262–67cm below the surface (25–30cm above contact with grey sandy silt).

Objectives: the result provides a *terminus ante quem* for the start of organic detritus mud deposition.

Calibrated date: *1σ:* cal AD 1660–1950
2σ: cal AD 1660–1950

Final comment: M P Waller and J E Schofield (16 April 2004), the date is younger than expected, though the lower end of the calibrated date range and an initial slow rate of sediment accumulation would be compatible with the historic evidence (Ferry and Waters 1988) for this pit. There is no indication in the biostratigraphy of the vegetation changes recorded at this site between AD 1946 and 1970 (eg the spread of *Salix*), though the declines in aquatic and increases in emergent aquatic pollen are consistent with the infilling of the basin.

References: Ferry and Waters 1988, 27-41

Dungeness: Wickmaryholm Pit, Kent

Location: TR 034172
Lat. 50.55.02 N; Long. 00.53.39 E

Project manager: A Long (University of Durham), 2003

Archival body: School of Earth Science & Geography, Kingston University

Description: a (closed) natural pit on the surface of the Dungeness foreland gravel, partly infilled by organic sediment and still supporting open water (<1m depth).

Objectives: to date the stabilisation of the gravel surface, the onset of organic sedimentation, and the palaeoenvironmental data (pollen, diatoms, and plant macrofossils) collected from a core through the organic sediment.

Final comment:, the dates for the macrofossil samples (GrA-22407, GrA-22413, OxA-12685, OxA-12686, and OxA-12687) at Wickmaryholm form a consistent series, though the $\delta^{13}C$ values suggest that some of the macrofossils dated may have been derived from aquatics. The bulk dates from the base of the organic sequence (GrN-27873 and GrN-27912) are consistenly older than the equivalent macrofossil samples, as is a previously reported bulk date (UB-3727) from this stratigraphic position (Long and Hughes 1995). The bulk dates have probably been contaminated by the inwash of older carbon (possibly derived from the main marsh peat) as at Muddymore.

References: Long *et al* 2002
Long and Hughes 1995
Meadows *et al* forthcoming

GrA–22407 1705 ±30 BP

δ¹³C: -42.6‰

Sample: Wick 1.1, submitted on 3 March 2003 by J E Schofield and M P Waller

Material: plant macrofossils (waterlogged, -1.75 – -1.80m OD, bulk sample): unidentified leaf, 7; unidentified moss, > 50 stems; *Rumex* cf *crispus*, 9 fruiting tepals; *Rubus* sp., 1 seed; *Carex* sp., 1 seed (J E Schofield 2003)

Initial comment: Wick 1.1 comprises macrofossils removed from a 5cm slice of peat (284–9cm), immediately above blue-grey silt. A second measurement of the same sample (GrA-22413) was undertaken for quality control purposes. Bulk peat from this level was also dated (GrN-27873 and GrN-27912). Although from a different core, the sample is also stratigraphically equivalent to Wick 2.1 (OxA-12685).

Objectives: the result dates the onset of organic sediment accumulation in Wickmaryholm Pit, and thus provides a *terminus ante quem* for the stabilisation of the gravel substrate. Comparison between bulk sample and macrofossil results from this level should indicate the reliability of bulk dating techniques in this environment.

Calibrated date: *1σ:* cal AD 260–400
2σ: cal AD 240–420

Final comment: M Waller and J E Schofield (16 April 2004), this date (and its replicate GrA-22413) is comparable with a further macrofossil sample from the same stratigraphic level (OxA-12685) and probably accurately dates the onset of organic sedimentation in this pit. The low $\delta^{13}C$ value indicates the mosses dated may have been aquatic in origin. However, the similarity in age to OxA-12685 (with a $\delta^{13}C$ of 27.7‰) suggests that either the aquatic plants did not take up DIC or the initial radiocarbon activity of the DIC was close to that of the contemporary atmosphere.

Laboratory comment: Ancient Monuments Laboratory (2004), there are five radiocarbon results from this level. Two, GrA-22407 and GrA-22413, are replicate measurements of the same sample of macrofossils, which (according to the stable isotope measurements) appears to have consisted mainly of aquatic plants. The two results are statistically consistent, according to the method of Ward and Wilson (1978) ($T'=0.2$, $T'(5\%)=3.8$, $\nu=1$), and their pooled mean (1696 ±24 BP) is thus the best estimate of the sample's radiocarbon age. This is consistent with the result (OxA-12685) of another macrofossil sample from this horizon, Wick 2.1, which consisted of terrestrial plant remains ($T'=1.6$, $T'(5\%)=3.8$, $\nu=1$). The humin and humic acid fractions of a bulk peat sample from this level (Wick 1.1), however, appear to be significantly older than the macrofossils. These results (GrN-27873 and GrN-27912) are statistically consistent ($T'=0.0$, $T'(5\%)=3.8$, $\nu=1$), and their pooled mean (2226 ±45 BP), therefore can be used as the radiocarbon age of the bulk sample. The fact that the humin and humic acid results are consistent tends to suggest that the bulk (humified) peat was not reworked, and that its radiocarbon age therefore provides a reliable date for this horizon (1σ: 390–200 cal BC; 2σ: 400–170 cal BC) (Reimer *et al* 2004). If this is the case, the macrofossil samples must be intrusive. As the aquatic and terrestrial macrofossil samples gave consistent radiocarbon results, any reservoir effect appears to have been negligible.

References: Reimer *et al* 2004
Ward and Wilson 1978

GrA–22413 1680 ±40 BP

$\delta^{13}C$: -41.9‰

Sample: Wick 1.1, submitted on 3 March 2004 by J E Schofield and M P Waller

Material: plant macrofossil (waterlogged, -1.75 – -1.80m OD, bulk sample): unidentified leaf, 7; unidentified moss, > 50 stems; *Rumex* cf *crispus*, 9 fruiting tepal; *Rubus* sp., 1 seed; *Carex* sp., 1 seed (J E Schofield 2003)

Initial comment: as GrA-22407

Objectives: as GrA-22407

Calibrated date: *1σ:* cal AD 260–420
2σ: cal AD 250–430

Final comment: M Waller and J E Schofield (16 April 2004) as GrA-22407

Laboratory comment: see GrA-22407

GrN–27873 2230 ±50 BP

$\delta^{13}C$: -29.8‰

Sample: Wick 1.2 (humin), submitted on 3 March 2003 by J E Schofield and M P Waller

Material: peat (76.80g) (pH 7.3; loss on ignition 43.1%)

Initial comment: Wick 1.2 represents the bottom 5cm (284–9cm) of the peat/detritus mud layer in this pit. The humic acid fraction was also dated (GrN-27912). Macrofossils from this level were also dated (GrA-22407 and GrA-22413). Although from a different core, the sample is also stratigraphically equivalent to Wick 2.1 (OxA-12685).

Objectives: as GrA-22407

Calibrated date: *1σ:* 390–200 cal BC
2σ: 400–170 cal BC

Final comment: M Waller and J E Schofield (16 April 2004), the date is comparable with those derived from two further bulk samples from the base of the organic mud at Wickmaryholm (GrN-27912 and UB-3727). However, the date is much older than the macrofossil samples from the same level (GrA-22407, GrA-22413, and OxA-12685), which with further macrofossil dates higher up the sequence, form a consistent series. This sample probably contained older carbon derived from the main marsh peat as the barrier reworked eastward.

Laboratory comment: see GrA-22407

GrN–27912 2210 ±100 BP

$\delta^{13}C$: -27.9‰

Sample: Wick 1.2 (humic acid), submitted on 3 March 2003 by J E Schofield and M P Waller

Material: peat (76.80g) (pH 7.3; loss on ignition 43.1%)

Initial comment: as GrN-27873

Objectives: as GrA-22407

Calibrated date: *1σ:* 400–120 cal BC
2σ: 480–1 cal BC

Final comment: M Waller and J E Schofield (16 April 2004) as GrN-27873

Laboratory comment: see GrA-22407

GrN–28276 1140 ±50 BP

$\delta^{13}C$: -22.0‰

Sample: Wick 3.1 (humin), submitted on 2 September 2003 by J E Schofield and M P Waller

Material: peat (109.50g) (-1.25 – -1.30m OD, pH 7.5; loss on ignition 20.4%)

Initial comment: Wick 3.1 represents the top 5cm (220–5cm) of the organic-rich silty clay layer, which overlies the peat/detritus mud layer in this pit. The humic acid fraction was also dated (GrN-28277).

Objectives: the result dates the end of organic-rich silty clay accumulation in Wickmaryholm Pit, which is a key stratigraphic boundary for palaeoenvironmental studies being undertaken. Comparison between this result and those from earlier samples at this location (Wick 1.1, 1.2, 2.1, 2.2, and 2.3) will indicate how reliable bulk sediment dating is in this environment.

Calibrated date: *1σ:* cal AD 820–980
2σ: cal AD 770–1020

Final comment: M Waller and E Schofield (16 April 2004), this bulk date is comparable (both stratigraphically and in age) with two further bulk samples (GrN-28277 and UB-3729). In contrast to the basal bulk dates from Wickmaryholm and Muddymore, the upper bulk dates appear to have been less influenced by the input of older carbon. This may reflect the shift in the relative position of the pits, from adjacent to the southern open shore face to the back-barrier environment, over the time the organic sediment accumulated. GrN-28276 forms a consistent series with the dates below and may therefore accurately date the end of organic sedimentation at Wickmaryholm.

Laboratory comment: Ancient Monuments Laboratory (2004), results from the humin and humic acid fractions of this sample (GrN-28276 and GrN-28277) are statistically consistent, according to the method of Ward and Wilson (1978) ($T'=1.6$, $T'(5\%)=3.8$, $\nu=1$); their pooled mean (1095 ±35 BP) is therefore regarded as the best estimate of the sample's radiocarbon age. This calibrates to cal AD 890–1000 (1σ) or cal AD 880–1020 (2σ) (Reimer *et al* 2004).

References: Reimer *et al* 2004
Ward and Wilson 1978

GrN–28277 1050 ±50 BP

$\delta^{13}C$: -20.2‰

Sample: Wick 3.1 (humic acid), submitted on 2 September 2003 by J E Schofield and M P Waller

Material: peat (109.50g) (-1.25 – -1.30m OD; pH 7.5; loss on ignition 20.4%)

Initial comment: Wick 3.1 represents the top 5cm (220–25cm) of the organic-rich silty clay layer, which overlies the peat/detritus mud layer in this pit. The humin fraction was also dated (GrN-28276).

Objectives: as GrN-28276

Calibrated date: *1σ:* cal AD 900–1030
2σ: cal AD 880–1120

Final comment: M Waller and J E Schofield (16 April 2004) *see* GrN-28276

Laboratory comment: see GrN-28276

OxA–12685 1652 ±25 BP

$\delta^{13}C$: -27.7‰

Sample: Wick 2.1, submitted on 15 August 2003 by J E Schofield and M P Waller

Material: wood (-1.78 – -1.79m OD, bulk sample): unidentified, woody detritus (0.14g) (J E Schofield 2003)

Initial comment: Wick 2.1 comprises macrofossils removed from a 5cm slice of peat/detritus mud (273–74cm), immediately above the blue-grey silt layer. Although from a different core, the sample is stratigraphically equivalent to Wick 1.1 and 1.2 (GrA-22407, GrA-22413, GrN-27873, and GrN-27912).

Objectives: the result dates the onset of organic sediment accumulation in Wickmaryholm Pit, and thus provides a *terminus ante quem* for the stabilisation of the gravel substrate. Comparison between bulk sample and macrofossil results from this level should indicate the reliability of bulk dating techniques in this environment.

Calibrated date: *1σ:* cal AD 380–430
2σ: cal AD 330–440

Final comment: M Waller and J E Schofield (16 April 2004), the date is comparable with further macrofossil samples from the same stratigraphic level (GrA-22407 and GrA-22413) and probably accurately dates the onset of organic sedimentation in this pit.

Laboratory comment: see GrA-22407

OxA–12686 1542 ±25 BP

$\delta^{13}C$: -27.1‰

Sample: Wick 2.2, submitted on 15 August 2004 by J E Schofield and M P Waller

Material: wood (-1.55 – -1.57m OD): unidentified, woody detritus, twig (0.38g) (J E Schofield 2003)

Initial comment: Wick 2.2 comprises a macrofossil removed from a 2cm slice of peat (250–52cm), 3–5cm below the contact between the peat/detritus mud layer and an overlying layer of organic-rich silty clay.

Objectives: the result provides a *terminus post quem* for the end of peat/detritus mud deposition at Wickmaryholm Pit, in order to provide a high-resolution chronology for palaeovegetational studies being undertaken at this site.

Calibrated date: *1σ:* cal AD 440–560
2σ: cal AD 420–590

Final comment: M Waller and J E Schofield (16 April 2004), this date forms a consistent series with the macrofossil (OxA-12685) and below (OxA-12687) and suggests, as with Muddymore and the Open Pits, that the organic material in the open pits of Dungeness Foreland accumulated rapidly.

OxA–12687 1491 ±25 BP

$\delta^{13}C$: -29.4‰

Sample: Wick 2.3, submitted on 15 August 2003 by J E Schofield and M P Waller

Material: wood (-1.47– -1.49m OD): unidentified, woody detritus, twig (0.21g) (J E Schofield 2003)

Initial comment: Wick 2.3 comprises a macrofossil removed from a 2cm slice of organic-rich silty clay (242–44cm), 3–5cm above the contact between this layer and the peat/detritus mud layer beneath it.

Objectives: the result provides a *terminus ante quem* for the end of peat/detritus mud deposition at Wickmaryholm Pit, and will allow the construction of a high-resolution chronology for palaeovegetational studies being undertaken at this site.

Calibrated date: *1σ:* cal AD 550–610
2σ: cal AD 530–640

Final comment: M Waller and J E Schofield (16 April 2004), this date forms a consistent series with the macrofossil dated below (OxA-12685 and OxA-12686) and suggests, as with Muddymore and the Open Pits, that the organic material in the open pits of Dungeness Foreland accumulated rapidly.

References: Ferry and Waters 1988
Kueppers *et al* 2004

East London Gravels, Greater London

Location: TQ 452899
Lat. 51.35.21 N; Long. 00.52.08 E

Project manager: D Swift (Museum of London Archaeology Service) 1989–1997

Description: this project is made up of selected rescue archaeological excavations in east London. The excavations took place between 1963 and 1999 on crop-mark sites during aggregate extraction, although the vast majority of the work took place before the implementation of Planning policy guidance note 16 (PPG16; Department of the Environment 1990).

Objectives: radiocarbon dating will be used to provide absolute dating for the prehistoric ceramic sequence in order to improve the phasing of the individual site sequences. The late Iron Age/Roman and prehistoric pottery specialists will also work together to refine the classification and dating of shell-tempered wares in the middle Iron Age and late Iron Age/early Roman transition.

References: Department of the Environment 1990
Swift *et al* forthcoming

East London Gravels: Fairlop Quarry, Greater London

Location: TQ 464910
Lat. 51.35.57 N; Long. 00.06.47 E

Project manager: P Allen (Essex County Council Field Archaeology Unit), 1993–99

Archival body: Redbridge Museum

Description: the site, which covers 24ha, lies on the Fairlop plain between the rivers Roding and Rom, on Boyn Hill terrace gravels capped by a 1m thick layer of brickearth. It is currently a gravel quarry. The earliest activity is represented by two small middle Bronze Age ring-ditches, with good evidence for cremation burial and pyre debris. Other cremations are scattered across the site. One urned cremation was dated, to the late Bronze Age/early Iron Age, but the others are undated and it is uncertain whether they are middle Bronze Age like the ring-ditches or of late Bronze Age/early Iron Age date. There is some evidence of late Bronze Age/early Iron Age settlement, in the form of a timber structure, hearths, and pits. This suggests the beginning of a shift from a ceremonial landscape to one that was being settled. Two middle Iron Age roundhouses in the 1993/4 excavation area provide further evidence of settlement. There were other roundhouses in the north of the site, although their date is uncertain. The site was transformed in the late Iron Age and early Roman period, when extensive enclosures and field boundaries were laid out, showing that landscape was now intensively settled and farmed. This was sustained into the late Roman period, when the field system was extended. There is evidence of a late Roman structure used for crop processing (querns and charred grain were recovered), and the landscape would have been predominately agricultural at this time. The site was abandoned at the end of the Roman period, and for the medieval and post medieval periods it was part of Hainault Forest. This series consists of four samples from unurned cremations extending across the south of the site.

Objectives: there are two objectives: 1) to collate and present the evidence for the ritual and ceremonial activities, and 2) to examine the evidence for the transformation from a ceremonial landscape to an enclosed agrarian landscape with increasingly long-lived patterns of settlement during the late second and first millennium BC. There is clear evidence on site for a middle Bronze Age ceremonial landscape in the form of two ring-ditches for round barrows, both of which provide clear evidence of cremation burials. About 20 other cremations are scattered around the site, especially in the south, and dating these would help understand the character and extent of the middle Bronze Age ceremonial landscape. In particular, are the scattered cremations contemporary with the ring-ditches or do they represent later phases of burial? More precise dating of the cremations would also help understand their context - some cremations in the south-west of the site may be contemporary with late Bronze Age/early Iron Age settlement activity. Cremations in the north of the site were either dated to the middle Bronze Age, and related to the ring-ditch to the extreme north, or did not represent good, well-stratified evidence. No samples have been submitted from the north of the site for these reasons.

Final comment: P Allen (14 April 2004), the radiocarbon dates have refined the dating of four cremation burials extending across the 1997 excavation area (FLQ 97). One (samples 114 (822) A and B) is middle Bronze Age and contemporary with the middle Bronze Age ring ditch 878 in this area. Two (samples 134 (908) A and B and 129(888) A and B) are early/mid Roman and form a separate burial group in a Roman enclosure. The fourth (sample 121(844) A and B) is early medieval and is a completely isolated feature. Re-examination of the field record suggests this was a crude hearth rather than a cremation.

GrA–24570 3300 ±45 BP

$\delta^{13}C$: -26.5‰

Sample: 114 (cremation 822, pit 821)B, submitted on 20 November 2003 by P Allen

Material: charcoal: *Corylus avellana*, a single fragment (R Gale 2003)

Initial comment: cremation 822 in pit 821 (the other half of feature numbered cremation 820 in pit 819) was a discrete feature cutting natural brickearth and below the topsoil. There was no physical relationship with any other feature. The pit was well-defined but truncated. The pit fill contained a cremation and consisted of clay-silt with very frequent charcoal and occasional fragments of cremated bone, which was too fragmented for radiocarbon dating. The pit was sealed by 0.3m of topsoil and cut into natural brickearth. The soil was moist, with evidence of worm action, but no obvious modern contaminants.

Objectives: to establish the date of cremation burials across the southern end of the site. Specifically, to establish whether unurned cremation 821/822 was related to the middle Bronze Age ceremonial landscape represented by ring-ditch 878, or was instead related to the nearby late Bronze Age/early Iron Age timber structure, pits, and urned cremation (823 on plan). Refining the dating of features in the south-west of the site will help understand the extent of the middle Bronze Age ceremonial landscape or whether there was mixed settlement/burial activity in the late Bronze Age/early Iron Age.

Calibrated date: *1σ:* 1630–1510 cal BC
2σ: 1690–1460 cal BC

Final comment: P Allen (14 April 2004), the radiocarbon dating confirmed that this unurned cremation burial was related to the middle Bronze Age ceremonial landscape represented by the ring-ditch 878.

Laboratory comment: Ancient Monuments Laboratory (2004), the two single fragments of charcoal from this feature (GrA-24570 and OxA-12977) produced statistically consistent results (T′=0.1, T′(5%)=3.8, ν=; 1Ward and Wilson 1978).

References: Ward and Wilson 1978

GrA–24572 1005 ±45 BP

$\delta^{13}C$: -22.9‰

Sample: 121 (cremation 844, pit 843)A, submitted on 20 November 2003 by P Allen

Material: charcoal: *Quercus* sp., sapwood, a single fragment (R Gale 2003)

Initial comment: cremation 844 in pit 843 (the other half of feature numbered 842 in pit 841) was a discrete feature cutting natural brickearth and below the topsoil. There was no physical relationship with any other feature. The pit was well-defined but truncated. The pit fill contained a cremation and consisted of sandy-silt with very frequent charcoal, but no cremated bone survived. The pit was sealed by 0.3m of

topsoil and cut into natural brickearth. The soil was dry, with evidence for root and worm action, but no obvious modern contaminants.

Objectives: to establish the date of cremation burials across the southern end of the site. Specifically, to establish whether unurned cremation 844/843 was related to the middle Bronze Age ceremonial landscape represented by ring-ditch 878, or was instead related to the nearby late Bronze Age/ early Iron Age timber structure, pits, and urned cremation. Refining the dating of features in the south-west of the site will help understand the extent of the middle Bronze Age ceremonial landscape or whether there was mixed settlement /burial activity in the late Bronze Age/early Iron Age.

Calibrated date: *1σ:* cal AD 990–1040
2σ: cal AD 900–1160

Final comment: P Allen (14 April 2004), the radiocarbon date (early medieval) is unexpected and shows that the feature was not a middle Bronze Age or late Bronze Age/early Iron Age cremation as was originally thought. It is now thought the feature was not a cremation (no cremated bone was present) but a crude hearth pit. No other medieval features are known on site, which had reverted to forest at that time, and the feature represents isolated evidence of activity within the forest.

Laboratory comment: Ancient Monuments Laboratory (2004), the two single fragments of charcoal from this feature (GrA-24572 and OxA-13005) produced statistically consistent results (T′=2.6, T′(5%)=3.8, ν=1; (Ward and Wilson 1978).

References: Ward and Wilson 1978

GrA–24573 1875 ±40 BP

$\delta^{13}C$: -23.2‰

Sample: 129 (cremation 888, pit 887)B, submitted on 20 November 2003 by P Allen

Material: charcoal: *Quercus* sp., roundwood, a single fragment (R Gale 2003)

Initial comment: cremation 888 in pit 887 (the other half of feature numbered 906 in pit 905) was a discrete feature cutting natural brickearth and below the topsoil. There was no physical relationship with any other feature. The pit was well-defined but truncated. Part of a cluster of three cremations, including sample 134 (cremation 908 in pit 907). The pit fill contained a cremation and consisted of sandy clay with very frequent charcoal and moderate fragments of cremated bone, which was too fragmented for radiocarbon dating. The pit was sealed by 0.3m of topsoil and cut into natural brickearth. The soil was dry, with evidence of root action, but no obvious modern contaminants.

Objectives: to establish the date of cremation burials across the southern end of the site. Specifically, to establish whether unurned cremation 888/887 was related to the middle Bronze Age ceremonial landscape represented by ring-ditch 878 to the south-west. Refining the dating of features in the south-east of the site will help understand the extent of the middle Bronze Age ceremonial landscape.

Calibrated date: *1σ:* cal AD 70–220
2σ: cal AD 50–240

Final comment: P Allen (14 April 2004), the radiocarbon dating shows that this cremation burial was not related to the middle Bronze Age ring ditch, but was part of a small group of early/mid Roman cremation burials in a Roman enclosure, along with sample FLQ97 134.

Laboratory comment: Ancient Monuments Laboratory (2004), the two single fragments of charcoal from this feature produced statistically consistent results (T′=0.1, T′(5%)=3.8, ν=1)(GrA-24573 and OxA-13081) (Ward and Wilson 1978).

References: Ward and Wilson 1978

GrA–24574 1850 ±40 BP

$\delta^{13}C$: -22.7‰

Sample: 134 (cremation 908, pit 907)A, submitted on 20 November 2003 by P Allen

Material: charcoal: *Fraxinus excelsior*, sapwood, a single fragment (R Gale 2003)

Initial comment: cremation 908 in pit 907 (the other half of feature numbered 890 in pit 889) was a discrete feature cutting natural brickearth and below the topsoil. There was no physical relationship with any other feature. The pit was well-defined but truncated. Part of a cluster of three cremations, including sample 134 (cremation 888 in pit 887). The pit fill contained a cremation and consisted of sandy clay with very frequent charcoal and moderate fragments of cremated bone, which was too fragmented for radiocarbon dating. The pit was sealed by 0.3m of topsoil and cut into natural brickearth. The soil was dry, with evidence of root action, but no obvious modern contaminants.

Objectives: to establish the date of cremation burials across the south of the site. Specifically, to establish whether unurned cremation 908/907 was related to the middle Bronze Age ceremonial landscape represented by ring-ditch 878 to south-west. Refining the dating of features in the south-east of the site will help understand the extent of the middle Bronze Age ceremonial landscape.

Calibrated date: *1σ:* cal AD 80–240
2σ: cal AD 60–250

Final comment: P Allen (14 April 2004), the radiocarbon dating shows this cremation burial was not related to middle Bronze Age ring ditch 878, but was part of a small group of early/mid Roman cremation burials in a Roman enclosure, along with sample FLQ 97 129.

Laboratory comment: Ancient Monuments Laboratory (2004), the two single fragments of charcoal from this feature produced statistically consistent results (T′=0.0, T′(5%)=3.8, ν=1) (GrA-24574 and OxA-13004) (Ward and Wilson 1978).

References: Ward and Wilson 1978

OxA–12977 3315 ±45 BP

$\delta^{13}C$: -26.5‰

Sample: 114 (cremation 822, pit 821)A, submitted on 20 November 2003 by P Allen

Material: charcoal: *Fraxinus excelsior*, a single fragment (R Gale 2003)

Initial comment: as GrA-24570

Objectives: as GrA-24570

Calibrated date: *1σ:* 1670–1520 cal BC
2σ: 1740–1490 cal BC

Final comment: see GrA-24570

Laboratory comment: see GrA-24570

OxA–13004 1858 ±29 BP

δ^{13}*C:* -22.2‰

Sample: 134 (cremation 908, pit 907)B, submitted on 20 November 2003 by P Allen

Material: charcoal: *Fraxinus excelsior*, sapwood, a single fragment (R Gale 2003)

Initial comment: as GrA-24574

Objectives: as GrA-24574

Calibrated date: *1σ:* cal AD 90–220
2σ: cal AD 70–240

Final comment: see GrA-24574

Laboratory comment: see GrA-24574

OxA–13005 918 ±30 BP

δ^{13}*C:* -24.6‰

Sample: 121 (cremation 884, pit 843)B, submitted on 20 November 2003 by P Allen

Material: charcoal: *Quercus* sp., sapwood, a single fragment (R Gale 2003)

Initial comment: as GrA-24572

Objectives: as GrA-24572

Calibrated date: *1σ:* cal AD 1040–1170
2σ: cal AD 1020–1210

Final comment: see GrA-24572

Laboratory comment: see GrA-24572

OxA–13081 1887 ±26 BP

δ^{13}*C:* -23.0‰

Sample: 129 (cremation 888, pit 887)A, submitted on 20 November 2003 by P Allen

Material: charcoal: *Quercus* sp., roundwood, a single fragment (R Gale 2003)

Initial comment: as GrA-24573

Objectives: as GrA-24573

Calibrated date: *1σ:* cal AD 70–140
2σ: cal AD 60–220

Final comment: see GrA-24573

Laboratory comment: see GrA-24573

East London Gravels: Hunts Hill Farm, Greater London

Location: TQ 566831
Lat. 51.31.32 N; Long. 00.15.24 E

Project manager: D Swift (Museum of London Archaeology Service), 1989–1997

Archival body: Museum of London

Description: the site was approximately 16ha in area, and was recorded archaeologically by Newham Museum Service. It offers a sequence dating from the early Bronze Age to the post medieval periods. The series consists of carbonised residues found on the interior surface of three prehistoric potsherds.

Objectives: to help refine the assessment dating of Hunts Hill Farm.

Final comment: D Swift (2 April 2004), sample 2843 was confirmed to be late Bronze Age/early Iron Age whilst 6570A and 6570B confirmed the presence of late Bronze Age pottery.

References: Greenwood 1997

GrA–24646 2805 ±45 BP

δ^{13}*C:* -28.0‰

Sample: [6570]A, submitted in November 2003 by D Swift

Material: carbonised residue (internal)

Initial comment: from context 6570, the only fill of a pit in the north-west part of the site, which contained 320+ sherds of pottery. This pit was possibly associated with a roundhouse. The local geology is dry gravel. Different pot to 6570B.

Objectives: to refine the dating of either a late Bronze Age/early Iron Age transitional, or early Iron Age, assemblage.

Calibrated date: *1σ:* 1010–900 cal BC
2σ: 1110–830 cal BC

Final comment: C S Thompson (20 April 2004), the residue provides a late Bronze Age date for this sherd. This refines the dating of the sherd to the earlier end of the dating suggested upon initial examination and contributes to our understanding of the late Bronze Age fabrics.

Laboratory comment: Ancient Monuments Laboratory (2004), this result is statistically consistent with another result from the same context, GrA-24681 (T'=3.4, $T'(5\%)$=3.8, ν=1) (Ward and Wilson 1978).

References: Ward and Wilson 1978

GrA–24653 2575 ±45 BP

δ^{13}*C:* -28.1‰

Sample: [2843], submitted in November 2003 by D Swift

Material: carbonised residue (internal)

Initial comment: the context was a secondary fill of a very large pit or back-filled waterhole in the south of the site. There is the possibility of intrusion as the feature was cut by

a ditch, although this seems unlikely from the excavator's records. The local geology is gravel and thought to be quite wet.

Objectives: to refine the dating of the early Iron Age ceramic assemblages in this part of Essex.

Calibrated date: *1σ:* 800–760 cal BC
2σ: 820–550 cal BC

Final comment: C S Thompson (20 April 2004), the dating for this sherd provides a transitional late Bronze Age/early Iron Age or very early Iron Age date. Although at the early end of the date suggested for the sherd upon initial examination, this contributes to our knowledge of this period.

GrA–24681 2680 ±50 BP

$\delta^{13}C$: -27.2‰

Sample: 6570B, submitted in November 2003 by D Swift

Material: carbonised residue (internal)

Initial comment: as GrA-24644

Objectives: as GrA-24646

Calibrated date: *1σ:* 900–800 cal BC
2σ: 930–790 cal BC

Final comment: C S Thompson (20 April 2004), the residue for this sherd provides a late Bronze Age date. This places it at the earlier end of the dating suggested by initial examination and contributed to our understanding of late Bronze Age fabrics.

Laboratory comment: see GrA-24646

Hartshill Copse, Berkshire

Location: SU 53106865
Lat. 51.24.50 N; Long. 01.14.11 W

Project manager: M Collard (Cotswold Archaeology)
January-April 2003

Description: the site lies within a gravel quarry, *c*15ha in area, and lies on a ridge above the Kennet Valley. The underlying geology is plateau gravel. An archaeological evaluation in 1986 identified late Bronze Age settlement activity including a cremation cemetery, discrete areas of further prehistoric features, and an area of Romano-British activity limited to the southern part of the site. The area of excavation funded by the ALSF covers *c* 1ha, in the south-western corner of the site. Approximately 6ha were excavated to the north prior to the excavation of the ALSF area, demonstrating activity across the site dating from the late Bronze Age through to the second century AD, and then from the twelfth and thirteenth centuries into the modern period. Excavation of the ALSF site revealed two unenclosed late Bronze Age roundhouses (one of which, from the ceramic evidence, is presumed to have burnt down). The southern part of a ditched enclosure containing a further roundhouse was identified, dated to the late Bronze Age/early Iron Age and post-dating two long fence lines, which evidently represent the earliest phases of the enclosure. A substantial number of pits and postholes were revealed throughout the site, discernibly concentrated in certain areas. The majority of these dates to the earlier (late Bronze Age) phase of activity, but a considerable number are probably associated with the later (late Bronze Age/early Iron Age) phase. Quantities of iron hammerscale and slag, as well as seeds and other palaeoenvironmental remains have been identified within the bulk samples recovered from features associated mainly with the roundhouses, but also from those other features associated with both phases of activity.

Objectives: to establish chronological frameworks for palaeoenvironmental, ceramic, and archaeometallurgical evidence recovered at Hartshill.

Laboratory comment: Ancient Monuments Laboratory (2004), six samples failed to date; 56i [358], 75i [878], 87ii [1270], 127i [1436], and posthole 322 21i and one was withdrawn - 81ii [1126].

References: Bowman 1990
Collard 2004

Hartshill Copse: Cremation, Berkshire

Location: SU 53106865
Lat. 51.24.50 N; Long. 01.14.11 W

Project manager: M Collard (Cotswold Archaeology), January–April 2003

Archival body: Newbury District Museum/West Berkshire Heritage Service

Description: series of four samples (two fragments of cremated bone, two of wood charcoal) from an unurned cremation within a small pit located between the two ditch terminals of the eastern entrance to the ditched enclosure. Dated to late Bronze Age by association with pottery recovered with environmental sample.

Objectives: to establish whether this cremation is associated with the ditched enclosure, any of the roundhouses, or other urned and unurned cremations across the site.

Final comment: M Brett (23 April 2004), consistent dates provided by all four samples in this series indicate that the cremation is the earliest feature on the site and is contemporary with other cremations previously found outside the excavation area. It also clearly pre-dates the roundhouses and the enclosure. The consistency of all four results also dismisses the possibility of contamination of the represented contexts.

References: Collard *et al* 2006
Collard 2004

GrA–23638 3070 ±50 BP

$\delta^{13}C$: -24.8‰

Sample: HBC03 (448) 27(i), submitted on 9 July 2003 by M Collard

Material: human bone (<5g) (cremated (white))

Initial comment: sample recovered from the western half of the single fill of this feature 4461, a cremation within the entrance to the ditched enclosure. There was no physical relationships with other features. The context was sealed by topsoil, ploughed for at least the last 15 years. The topsoil

was stripped prior to excavation and left exposed for two years. Resultant weed growth was cleared by mechanical removal of uppermost gravel surface, immediately prior to excavation. Underlying geology is acidic flint gravel, free-draining, and fine-fractioned.

Objectives: to establish whether this cremation is associated with the ditched enclosure, any of the roundhouses, or other urned/unurned cremations across the site.

Calibrated date: *1σ:* 1420–1260 cal BC
2σ: 1440–1210 cal BC

Final comment: M Brett (23 April 2004), this sample correlates well with OxA-12731, a similar sample of cremated bone, and also with the two samples of charcoal from the same feature, confirming that the cremation is the earliest date feature on the site, and that it pre-dates the roundhouses and the enclosure.

Laboratory comment: Ancient Monuments Laboratory (2004), this result is statistically consistent with GrA-23746, OxA-12578, and OxA-12731 on samples from the same context (T′=4.5, T′(5%)=7.8, ν=3) (Ward and Wilson 1978).

References: Ward and Wilson 1978

GrA–23746 2945 ±35 BP

$\delta^{13}C$: -26.6‰

Sample: HBC03 (448) 27(iii), submitted on 9 July 2003 by M Collard

Material: charcoal: *Quercus* sp., sapwood, a single fragment (<5g) (R Gale 2003)

Initial comment: as GrA-23638

Objectives: as GrA-23638

Calibrated date: *1σ:* 1260–1110 cal BC
2σ: 1300–1020 cal BC

Final comment: M Brett (23 April 2004), this sample is closely consistent with those from the other three samples recovered from cremation 446. Together they verify that it is the earliest dated feature on the site, and that it pre-dates the roundhouses and the enclosure.

Laboratory comment: see GrA-23638.

OxA–12578 3002 ±32 BP

$\delta^{13}C$: -24.1‰

Sample: HBC03 (448) 27(iv), submitted on 9 July 2003 by M Collard

Material: charcoal: *Corylus* sp., a single fragment (R Gale 2003)

Initial comment: as GrA-23638

Objectives: as GrA-23638

Calibrated date: *1σ:* 1310–1210 cal BC
2σ: 1390–1120 cal BC

Final comment: see GrA-23746

Laboratory comment: see GrA-23638

OxA–12731 2979 ±30 BP

$\delta^{13}C$: -18.6‰

Sample: HBC03 (448) 27(ii), submitted on 9 July 2003 by M Collard

Material: human bone (<5g) (cremated (white), a single fragment)

Initial comment: as GrA-23638

Objectives: as GrA-23638

Calibrated date: *1σ:* 1270–1130 cal BC
2σ: 1370–1110 cal BC

Final comment: M Brett (23 April 2004), this sample correlate well with GrA-23638, a similar sample of cremated bone, and also with the two samples of charcoal from the same feature, confirming that the cremation is the earliest date feature on the site, and that it pre-dates the roundhouses and the enclosure.

Laboratory comment: see GrA-23638

References: Ward and Wilson 1978

Hartshill Copse: House B, Berkshire

Location: SU 53106865
Lat. 51.24.50 N; Long. 01.14.11 W

Project manager: M Collard (Cotswold Archaeology), January-April 2003

Archival body: Newbury District Museum/West Berkshire Heritage Service

Description: two pairs of samples, each taken from one half of each of two individual postholes associated with a double-ringed Roundhouse B. Pottery dates the structure to late Bronze Age/early Iron Age.

Objectives: to establish the date of construction or destruction/disuse of this structure; to place the structure within chronological framework of occupation of the remainder of the site and within the more general settlement pattern of the region. To inform on the introduction of ironworking technology indicated by the presence of hammerscale within bulk samples from which this series of samples was recovered.

Final comment: M Brett (23 April 2004), the results from the samples in this series helped to establish the chronology of the occupation of the site and in particular, provided reliable date ranges for the construction and abandonment/disuse of Roundhouse B. The results also aided the establishment of chronological frameworks for the different categories of cultural material recovered from the site, including demonstrating that the ironworking which began in the late Bronze Age continued in the Iron Age.

References: Collard 2004

GrA–23747 2255 ±35 BP

$\delta^{13}C$: -22.7‰

Sample: HBC03 (657) 61(i), submitted on 9 July 2003 by M Collard

Material: plant macrofossil: *Corylus* sp., carbonised hazelnut shell, a single fragment (<5g) (W Carruthers 2003)

Initial comment: the sample was recovered from the northern half of single fill of the feature, one of inner ring of postholes forming Roundhouse B. No physical relationships with further features. The underlying geology is an acidic flint gravel, free-draining and fine-fractioned. The archaeological features are cut into the upper surface of the gravel and were covered by a ploughsoil up to 0.5m thick. The site was under arable cultivation for at least the last fifteen years. Prior to excavation the ploughsoil had been stripped and the site left exposed for 23 months, resulting in weed growth over the exposed surface. The weeds were cleared by mechanical removal of the uppermost gravel surface immediately prior to excavation.

Objectives: to establish a reliable date for the abandonment of Structure B (thus providing a postulated date for its construction) and use the results of the analysis together with those from Structures C and D, as well as from other features across the site, to aid more detailed phasing of the ALSF site, as well as placing the structure within a chronological framework for the occupation of the remainder of the site and within the wider, regional settlement pattern. The dating was also carried out to aid in the establishment of a secure chronological framework for ceramic types for the region.

Calibrated date: *1σ:* 390–230 cal BC
2σ: 400–200 cal BC

Final comment: M Brett (23 April 2004), this sample aided in the establishment of a reliable date-range for the abandonment/disuse of Roundhouse B, hence helping to place it within the chronological framework for the occupation of the site and within the wider, regional settlement pattern. The results have also added to the ongoing construction of a chronological framework for a ceramic typology for the region.

Laboratory comment: Ancient Monuments Laboratory (2004), this result is statistically consistent with OxA-12579, on another sample from the same context ($T'=0.1$, $T'(5\%)=3.8$, $\nu=1$) (Ward and Wilson 1978).

References: Ward and Wilson 1978

GrA–23749 2475 ±35 BP

$\delta^{13}C$: -25.4‰

Sample: HBC03 (788) 71(ii), submitted on 9 July 2003 by M Collard

Material: charcoal: *Corylus* sp., a single fragment (<5g) (R Gale 2003)

Initial comment: sample recovered from northeastern half of the single fill of this feature 4021, one of the outer ring of postholes forming Roundhouse B. There was no physical relationship with other features. The context was sealed by topsoil, ploughed for at least the last 15 years. The topsoil was stripped prior to excavation and left exposed for two years. Resultant weed growth was cleared by mechanical removal of uppermost gravel surface, immediately prior to excavation. Underlying geology is acidic flint gravel, free-draining and fine-fractioned.

Objectives: to establish a reliable date for the abandonment of Structure B (and thus a postulated date for its construction). To use the results of the analysis together with those from Structures C and D, and other features across the site, to place the structure within a chronological framework for the occupation of the remainder of the site and within a wider regional settlement pattern. To aid in the construction of a chronological framework for regional ceramic typology.

Calibrated date: *1σ:* 760–510 cal BC
2σ: 780–410 cal BC

Final comment: M Brett (23 April 2004), this result correlates closely with OxA-12580, from the same feature, and with those from other samples associated with Roundhouse B, providing a reliable date for the construction and abandonment/disuse of the structure. This in turn helped to place the structure within a chronological framework for occupation of the site and within a wider, regional settlement pattern.

Laboratory comment: Ancient Monuments Laboratory (2004), this result is statistically consistent with OxA-12580, on another single fragment of charcoal ($T'=2.2$, $T'(5\%)=3.8$, $\nu=1$) (Ward and Wilson 1978).

References: Ward and Wilson 1978

GrA–24522 2440 ±50 BP

$\delta^{13}C$: -25.1‰

Sample: HBC03 (735) 66(ii), submitted on 21 October 2003 by M Collard

Material: charcoal: *Quercus* sp., sapwood, a single fragment (<5g) (R Gale 2003)

Initial comment: the sample was recovered from the northeastern half of the single fill of this feature 4021, one of the outer rings of postholes forming Roundhouse B. There was no physical relationship with other features. The context was sealed by topsoil, ploughed for at least the last 15 years. The topsoil was stripped prior to excavation and left exposed for two years. Resultant weed growth was cleared by mechanical removal of uppermost gravel surface, immediately prior to excavation. Underlying geology is acidic flint gravel, free-draining and fine-fractioned.

Objectives: to compare with dates from the results of previous radiocarbon analysis of other postholes associated with Structure B and to elucidate the structural sequence of the structure, ie are there two phases, and if so, are they continuous or not? To aid in the establishment of a chronology for prehistoric ironworking both on the site and regionally. To establish a reliable date for the abandonment of Structure B (thus providing a postulated date for its construction) and use the results of the analysis together with those from Structures C and D, as well as from other features across the site, to aid more detailed phasing of the ALSF site, as well as placing the structure within a chronological framework for the occupation of the remainder of the site and within the wider, regional settlement pattern. To aid in the establishment of a secure chronological framework for ceramic types for the region.

Calibrated date: *1σ:* 750–400 cal BC
2σ: 780–390 cal BC

Final comment: M Brett (23 April 2004), this result correlates closely with OxA-13032, from the same feature, and with those from further samples associated with Roundhouse B. Collectively, these results indicate a single phase of construction, for which they provide a reliable date range, as they do also for abandonment/disuse of the structure. The results also helped place the structure within a chronological framework for occupation of the site and within a wider, regional settlement pattern, as well as informing on the chronology of the prehistoric ironworking, both on the site and regionally.

GrA–24526 2350 ±45 BP

$\delta^{13}C$: -27.8‰

Sample: HBC03 (878) 75(ii), submitted on 21 October 2003 by M Collard

Material: charcoal: *Corylus* sp., a single fragment (<5g) (R Gale 2003)

Initial comment: the sample was recovered from the southern half of single fill of feature 299, a posthole cutting pit/posthole 297, which appears to form part of porch of Roundhouse B. 297 is cut to the north-east by a further posthole 1674, which is similar to 299. These later features may or may not be associated with Structure B. Context sealed by topsoil, ploughed for at least the last 15 years. The topsoil was stripped prior to excavation and left exposed for two years. Resultant weed growth was cleared by mechanical removal of uppermost gravel surface, immediately prior to excavation. Underlying geology is acidic flint gravel, free-draining, and fine-fractioned.

Objectives: as GrA-24522

Calibrated date: *1σ:* 410–390 cal BC
2σ: 520–370 cal BC

Final comment: M Brett (23 April 2004), this sample indicates that although Roundhouse B is essentially of single-phase construction, limited alterations to the entrance may have been effected towards the end of its use-life. The results also aided the establishment of a chronological framework for occupation of the site, in turn helping to place it within the wider, regional settlement pattern.

GrA–24663 2385 ±45 BP

$\delta^{13}C$: -24.1‰

Sample: HBC03 (634) 57(ii), submitted on 21 September 2003 by M Collard

Material: charcoal: *Prunus spinosa*, a single fragment (<5g) (R Gale 2003)

Initial comment: sample recovered from north-eastern half of the single fill of this feature, one of the outer ring of postholes forming Roundhouse B. No physical relationship with other features. Context sealed by topsoil, ploughed for at least the last 15 years. Topsoil was stripped prior to excavation and left exposed for two years. Resultant weed growth was cleared by mechanical removal of uppermost gravel surface, immediately prior to excavation. Underlying geology is acidic flint gravel, free-draining, and fine-fractioned.

Objectives: as GrA-24522

Calibrated date: *1σ:* 520–390 cal BC
2σ: 750–380 cal BC

Final comment: M Brett (23 April 2004), this result correlates closely with those from other features associated with Structure B. Collectively, the results indicate a single phase of construction, for which they provide a reliable date range, as they also do for abandonment/disuse of the structure. The results also helped place the structure within a chronological framework for occupation of the site and within a wider, regional settlement pattern, as well as informing on the chronology of the prehistoric ironworking, both on the site and regionally.

OxA–12579 2271 ±32 BP

$\delta^{13}C$: -23.4‰

Sample: HBC03 (657) 61 (ii), submitted on 9 July 2003 by M Collard

Material: grain: *Triticum dicoccum/Triticum spelta*, carbonised, a single grain (<5g) (W Carruthers 2003)

Initial comment: as GrA-23747

Objectives: as GrA-23747

Calibrated date: *1σ:* 400–260 cal BC
2σ: 400–210 cal BC

Final comment: see GrA-23747

Laboratory comment: see GrA-23747

OxA–12580 2405 ±31 BP

$\delta^{13}C$: -26.1‰

Sample: HBC03 (788) 71(i), submitted on 9 July 2003 by M Collard

Material: charcoal: *Crataegus* sp., a single fragment (<5g) (R Gale 2003)

Initial comment: as GrA-23749

Objectives: as GrA-23749

Calibrated date: *1σ:* 520–400 cal BC
2σ: 740–390 cal BC

Final comment: see GrA23749

Laboratory comment: see GrA-23749

References: Ward and Wilson 1978

OxA–12968 2265 ±29 BP

$\delta^{13}C$: -21.9‰

Sample: HBC03 (1126) 81(i), submitted on 21 October 2003 by M Collard

Material: grain: *Hordeum* sp., a single grain (<5g) (W Carruthers 2003)

Initial comment: as GrA-24663

Objectives: as GrA-24522

Calibrated date: *1σ:* 390–260 cal BC
2σ: 400–210 cal BC

Final comment: see GrA-24663

OxA–13032 2413 ±37 BP

δ¹³C: -25.7‰

Sample: HBC03 (395) 65(i), submitted on 21 October 2003 by M Collard

Material: charcoal: *Quercus* sp., sapwood, a single fragment (<5g) (R Gale 2003)

Initial comment: as GrA-24522

Objectives: as GrA-24522

Calibrated date: *1σ:* 710–400 cal BC
2σ: 750–390 cal BC

Final comment: see GrA-24522

Hartshill Copse: House C, Berkshire

Location: SU 53106865
Lat. 51.24.50 N; Long. 01.14.11 W

Project manager: M Collard (Cotswold Archaeology), January–April 2003

Archival body: Newbury District Museum/West Berkshire Heritage Service

Description: two pairs of samples, each taken from the fill of one half of each of two individual postholes (1235 and 1241) associated with Roundhouse C. One sample from the fill of posthole 1223. Iron hammerscale was found with all five samples. Pottery dates the structure to the late Bronze Age.

Objectives: to establish date of construction or destruction/disuse of this structure. To place structure within chronological framework of occupation of the remainder of the site and within the more general settlement pattern of the region. To inform on the introduction of ironworking technology indicated by the presence of hammerscale within bulk samples from which this series of samples was recovered.

Final comment: M Brett (23 April 2004), this series provided relatively accurate and consistent date ranges for the construction and abandonment/disuse of the structure, and prove its contemporaneity with Roundhouse D. They also aided in determining the chronology of occupation of the site, helping place it in a wider settlement pattern. The consistency of the results strongly suggests that ironworking residues found in the majority of the postholes of Roundhouse C are unlikely to be intrusive.

References: Collard 2004

GrA–23701 2835 ±40 BP

δ¹³C: -25.7‰

Sample: HBC03 (1236) 126(ii), submitted on 9 July 2003 by M Collard

Material: grain: *Triticum dicoccum*/*Triticum spelta*, a single grain (W Carruthers 2003)

Initial comment: sample recovered from southern half of the single fill of this feature, 1235, one of the postholes associated with roundhouse Structure C. No physical relationships with other features. Context sealed by topsoil, ploughed for at least the last 15 years. Topsoil was stripped prior to excavation and left exposed for two years. Resultant weed growth was cleared by mechanical removal of uppermost gravel surface, immediately prior to excavation. Underlying geology is acidic flint gravel, free-draining, and fine-fractioned.

Objectives: to establish a reliable date for the abandonment of Structure C (and thus a postulated date for its construction) and use the results of the analysis together with those from Structures B and D, and other features across the site, to place the structure within a chronological framework for the occupation of the remainder of the site and within a wider regional settlement pattern. To aid in the construction of a chronological framework for regional ceramic typology.

Calibrated date: *1σ:* 1050–920 cal BC
2σ: 1130–900 cal BC

Final comment: M Brett (23 April 2004), this result, together with OxA-12581, confirms that posthole 1235 is contemporary with those in the main ring of the structure. The results helped place the structure within a chronological framework for occupation of the site, and within a wider, regional settlement pattern.

Laboratory comment: Ancient Monuments Laboratory (2004), this result is statistically consistent with OxA-12581, on another sample from the same context (T′=0.1, T′(5%)=3.8, ν=1) (Ward and Wilson 1978).

References: Ward and Wilson 1978

GrA–23750 2780 ±35 BP

δ¹³C: -25.6‰

Sample: HBC03 (1272) 90(ii), submitted on 9 July 2003 by M Collard

Material: charcoal: *Corylus*/*Alnus* sp., a single fragment (R Gale 2003)

Initial comment: sample recovered from north-eastern half of the single fill of this feature, 1241, one of the postholes forming roundhouse Structure C. No physical relationships with other features. Context sealed by topsoil, ploughed for at least the last 15 years. Topsoil was stripped prior to excavation and left exposed for two years. Resultant weed growth was cleared by mechanical removal of uppermost gravel surface, immediately prior to excavation. Underlying geology is acidic flint gravel, free-draining, and fine-fractioned.

Objectives: as GrA-23701

Calibrated date: *1σ:* 980–890 cal BC
2σ: 1020–830 cal BC

Final comment: M Brett (23 April 2004), this sample, together with that from OxA-12582, from the same context, and those from posthole 1235, aided in establishing reliable date ranges for the construction and abandonment of Roundhouse C. They also helped in determining the chronology of the occupation of the site, which in turn assisted in placing the site in a wider, regional settlement pattern.

Laboratory comment: Ancient Monuments Laboratory (2004), this result, on a single fragment of charcoal, is statistically consistent with OxA-12582, on another sample from the same context (T′=1.0, T′(5%)=3.8, ν=1) (Ward and Wilson 1978).

References: Ward and Wilson 1978

GrA–24695 2800 ±50 BP

δ¹³C: -23.7‰

Sample: HBC03 (1224) 86(i), submitted on 21 October 2003 by M Collard

Material: grain: *Triticum dicoccum*/*Triticum spelta*, a single grain, carbonised (<5g) (W Carruthers 2003)

Initial comment: sample recovered from western half of single fill of feature 1223, one of the postholes associated with Roundhouse C. No physical relationships with further features. Context sealed by topsoil, ploughed for at least the last 15 years. Topsoil was stripped prior to excavation and left exposed for two years. Resultant weed growth was cleared by mechanical removal of uppermost gravel surface, immediately prior to excavation. Underlying geology is acidic flint gravel, free-draining, and fine-fractioned.

Objectives: to compare with dates from the results of previous radiocarbon analysis of other postholes associated with Structure C. To aid in the establishment of a chronology for prehistoric ironworking both on the site and regionally. To establish a reliable date for the abandonment of Structure C (thus providing a postulated date for its construction) and use the results of the analysis together with those from Structure B and D, as well as from other features across the site. To aid more detailed phasing of the ALSF site, as well as placing the structure within a chronological framework for the occupation of the remainder of the site and within the wider, regional settlement pattern. To aid in the establishment of a secure chronological framework for ceramic types for the region.

Calibrated date: *1σ:* 1010–900 cal BC
2σ: 1120–830 cal BC

Final comment: M Brett (23 April 2004), this sample correlated closely with those from other sample from Roundhouse C, submitted previously. They confirmed the date ranges for the construction and abandonment/disuse of the structure, thus aiding determination of the chronology of the occupation of the site. They also emphasized the improbability of ironworking residues found in the majority of the postholes of Roundhouse C being intrusive.

OxA–12581 2817 ±32 BP

δ¹³C: -23.6‰

Sample: HBC03 (1236) 126(i), submitted on 9 July 2003 by M Collard

Material: grain: *Triticum dicoccum*/*Triticum spelta*, a single grain (<5g) (W Carruthers 2003)

Initial comment: as GrA-23701

Objectives: as GrA-23701

Calibrated date: *1σ:* 1010–910 cal BC
2σ: 1060–900 cal BC

Final comment: see GrA-23701

Laboratory comment: see GrA-23701

OxA–12582 2827 ±32 BP

δ¹³C: -22.4‰

Sample: HBC03 (1272) 90(i), submitted on 9 July 2003 by M Collard

Material: grain: *Triticum dicoccum*/*Triticum spelta*, carbonised, a single grain (<5g) (W Carruthers 2003)

Initial comment: as GrA-23750

Objectives: as GrA-23701

Calibrated date: *1σ:* 1020–920 cal BC
2σ: 1060–900 cal BC

Final comment: see GrA-23750

Laboratory comment: see GrA-23750

Hartshill Copse: House D, Berkshire

Location: SU 53106865
Lat. 51.24.50 N; Long. 01.14.11 W

Project manager: M Collard (Cotswold Archaeology), January–April 2003

Archival body: Newbury District Museum/West Berkshire Heritage Service

Description: two pairs of samples, each taken from one half of each of two individual postholes, 1382 and 1439, associated with double-ringed Roundhouse D. One sample came from the fill of posthole 1436. Pottery dates the structure to late Bronze Age/early Iron Age.

Objectives: to establish date of construction or destruction/disuse of this structure; to place structure within chronological framework of occupation of the remainder of the site and within the more general settlement pattern of the region. To inform on the introduction of ironworking technology indicated by the presence of hammerscale within bulk samples from which this series of samples was recovered.

Final comment: M Brett (23 April 2004), this series provided relatively accurate and consistent date ranges for the construction and demolition/disuse of Structure D, and demonstrated its contemporaneity with Roundhouse C. They also helped determine the chronology of the occupation of this site, helping to place it within a wider, regional settlement pattern. The consistency of the results strongly suggests that ironworking residues found in the majority of the postholes of Roundhouse D are unlikely to be intrusive.

References: Collard 2004

GrA–23710 2785 ±40 BP

δ¹³C: -24.8‰

Sample: HBC03 (1383) 114(i), submitted on 9 July 2003 by M Collard

Material: grain: *Triticum dicoccum*/*Triticum spelta*, a single grain (<5g) (W Carruthers 2003)

Initial comment: sample recovered from northern half of the single fill of this feature, 1382, one of the postholes forming Roundhouse D. No physical relationships with other features. Context sealed by topsoil, ploughed for at least the last 15 years. Topsoil was stripped prior to excavation and left exposed for two years. Resultant weed growth was cleared by mechanical removal of uppermost gravel surface, immediately prior to excavation. Underlying geology is acidic flint gravel, free-draining, and fine-fractioned.

Objectives: to establish a reliable date for the abandonment of Structure D (and thus a postulated date for its construction) and use the results of the analysis together with those from Structures B and C, and other features across the site, to place the structure within a chronological framework for the occupation of the remainder of the site and within a wider regional settlement pattern. To aid in the construction of a chronological framework for regional ceramic typology.

Calibrated date: *1σ:* 1000–890 cal BC
2σ: 1030–830 cal BC

Final comment: M Brett (23 April 2004), this sample, together with that from OxA-12583, from the same context, and those from two further postholes associated with Roundhouse D, aided the establishment of reliable date ranges for the construction and abandonment/disuse of Roundhouse D. They also helped to determine the chronology of the occupation of the site, in turn assisting in placing it in a wider regional settlement pattern.

Laboratory comment: Ancient Monuments Laboratory (2004), this result is statistically consistent with OxA-12583, on another sample from the same context ($T'=1.5$, $T'(5\%)=3.8$, $\nu=1$) (Ward and Wilson 1978).

References: Ward and Wilson 1978

GrA–23751 2765 ±35 BP

$\delta^{13}C$: -26.2‰

Sample: HBC03 (1440) 125(ii), submitted on 9 July 2003 by M Collard

Material: charcoal: *Crataegus* sp., a single fragment (<5g) (R Gale 2003)

Initial comment: sample recovered from north-western half of the single fill of this feature 1439, one of the postholes forming Roundhouse D. No physical relationships with other features. Context sealed by topsoil, ploughed for at least the last 15 years. Topsoil was stripped prior to excavation and left exposed for two years. Resultant weed growth was cleared by mechanical removal of uppermost gravel surface, immediately prior to excavation. Underlying geology is acidic flint gravel, free-draining, and fine-fractioned.

Objectives: as GrA-23710

Calibrated date: *1σ:* 970–840 cal BC
2σ: 1010–820 cal BC

Final comment: M Brett (23 April 2004), this sample, together with that from OxA-12584, from the same context, and those from two further postholes associated with Roundhouse D, aided the establishment of reliable date ranges for the construction and abandonment/disuse of Roundhouse D. They also helped to determine the chronology of the occupation of the site, in turn assisting in placing it in a wider regional settlement pattern.

Laboratory comment: Ancient Monuments Laboratory (2004), this result, on a single fragment of charcoal, is statistically consistent with OxA-12584, on another sample from the same context ($T'=0.1$, $T'(5\%)=3.8$, $\nu=1$) (Ward and Wilson 1978).

References: Ward and Wilson 1978

GrA–24659 2860 ±45 BP

$\delta^{13}C$: -21.3‰

Sample: HBC03 (1626) 166(ii), submitted on 21 October 2003 by M Collard

Material: grain (a single grain)

Initial comment: sample recovered from northern half of single fill of feature, 1436, one of the postholes forming inner ring of Roundhouse D. No physical relationships with further features. Context sealed by topsoil, ploughed for at least the last 15 years. Topsoil was stripped prior to excavation and left exposed for two years. Resultant weed growth was cleared by mechanical removal of uppermost gravel surface, immediately prior to excavation. Underlying geology is acidic flint gravel, free-draining, and fine-fractioned.

Objectives: as GrA-23710

Calibrated date: *1σ:* 1120–940 cal BC
2σ: 1200–900 cal BC

Final comment: M Brett (23 April 2004), close in date to other samples recovered from Roundhouse D, submitted previously. They confirmed the date ranges for the construction and demolition/disuse of the structure, helping to determine the chronology of the occupation of the site. The results also emphasized the improbability of ironworking residues found in the majority of the postholes of Roundhouse D being intrusive.

OxA–12583 2848 ±31 BP

$\delta^{13}C$: -23.5‰

Sample: HBC03 (1383) 114(ii), submitted on 9 July 2003 by M Collard

Material: grain: *Hordeum* sp., a single grain (W Carruthers 2003)

Initial comment: as GrA-23710

Objectives: as GrA-23710

Calibrated date: *1σ:* 1050–940 cal BC
2σ: 1130–910 cal BC

Final comment: see GrA-23710

Laboratory comment: see GrA-23710

OxA–12584 2780 ±32 BP

$\delta^{13}C$: -21.6‰

Sample: HBC03 (1440) 125(i), submitted on 9 July 2003 by M Collard

Material: grain: *Triticum dicoccum*/*Triticum spelta*, a single grain (<5g) (W Carruthers 2003)

Initial comment: sample recovered from northwestern half of the single fill of this feature 1439, one of the postholes forming Roundhouse D. No physical relationships with other features. Context sealed by topsoil, ploughed for at least the last 15 years. Topsoil was stripped prior to excavation and left exposed for two years. Resultant weed growth was cleared by mechanical removal of uppermost gravel surface, immediately prior to excavation. Underlying geology is acidic flint gravel, free-draining, and fine-fractioned.

Objectives: as GrA-23710

Calibrated date: *1σ:* 980–900 cal BC
2σ: 1010–830 cal BC

Final comment: see GrA-23751

Laboratory comment: see GrA-23751

Hartshill Copse: Posthole 322, Berkshire

Location: SU 53106865
Lat. 51.24.50 N; Long. 01.14.11 W

Project manager: M Collard (Cotswold Archaeology), January–April 2003

Archival body: Newbury District Museum/West Berkshire Heritage Service

Description: charcoal recovered from the fill of posthole 322, in a relatively isolated part of the site, within the ditched enclosure, which contained pottery dated to the late Bronze Age/early Iron Age.

Objectives: to aid in establishing whether Roundhouse B is contemporary with activity within the enclosure. Evidence for continuation of occupation through the late Bronze Age and into the Iron Age, and from unenclosed to enclosed settlement. What date is the earliest phase of occupation, and how far into the Iron Age can it be shown to have extended with any degree of certainty? Evidence to place activity within the chronological framework of the remainder of the site. To provide evidence for environmental reconstruction of the site. To aid in the establishment of a chronological framework for ceramic types for the region.

Final comment: M Brett (23 April 2004), this single sample series helped to determine that the large majority of activity within the enclosure is contemporary with Roundhouse B, and that there was a hiatus occupation of the site between the late Bronze Age and the early to middle Iron Age. The results also helped established a chronological framework for occupation of the site, helping to place it within a wider, regional settlement pattern. They also provided evidence for environmental reconstruction of the site and added to the ongoing construction of a chronological framework for a ceramic typology for the region.

References: Collard 2004

GrA–24524 2375 ±45 BP

$\delta^{13}C$: -25.3‰

Sample: HBC03 21(ii), submitted on 21 October 2003 by M Collard

Material: charcoal: *Prunus spinosa*, a single fragment (<5g) (R Gale 2003)

Initial comment: charcoal recovered from the fill of posthole 322, in a relatively isolated part of site, within the ditched enclosure, which contained pottery dated to the late Bronze Age/early Iron Age.

Objectives: to aid in establishing whether Roundhouse B is contemporary with activity within the enclosure. Evidence for continuation of occupation through the late Bronze Age and into the Iron Age, and from unenclosed to enclosed settlement. What date is the earliest phase of occupation, and how far into the Iron Age can it be shown to have extended with any degree of certainty? Evidence to place activity within the chronological framework of the remainder of the site. To provide evidence for environmental reconstruction of the site. To aid in the establishment of a chronological framework for ceramic types for the region.

Calibrated date: *1σ:* 490–390 cal BC
2σ: 740–380 cal BC

Final comment: M Brett (23 April 2004), this single sample series helped to determine that the large majority of activity within the enclosure is contemporary with Roundhouse B, and that there was a hiatus occupation of the site between the late Bronze Age and the early to middle Iron Age. The results also helped established a chronological framework for occupation of the site, helping to place it within a wider, regional settlement pattern. They also provided evidence for environmental reconstruction of the site and added to the ongoing construction of a chronological framework for a ceramic typology for the region.

Hartshill Copse: Pot residue, Berkshire

Location: SU 53106865
Lat. 51.24.50 N; Long. 01.14.11 W

Project manager: M Collard (Cotswold Archaeology), January–April 2003

Archival body: Newbury District Museum/West Berkshire Heritage Service

Description: four sherds of pottery with adherent burnt residues, from four individual features, three outside the ditched enclosure. Three features are part of a cluster to the west of the ditched enclosure, the remaining feature is situated inside the south-western corner of the ditched enclosure. Sherds from contexts 69, 89, and 639 all dated to late Bronze Age. Sherd from context 425 dated to late Bronze Age/early Iron Age.

Objectives: to establish whether the three earlier features are contemporary with the occupation of Roundhouses C and D, and whether the later feature is contemporary with the occupation of the enclosed, later roundhouse; to inform on the introduction of ironworking technology indicated by the presence of hammerscale within the bulk sample from context 639; to investigate continuity of occupation from the late Bronze Age to the early Iron Age, and from unenclosed to enclosed settlement.

Final comment: M Brett (23 April 2004), the results for this series of samples indicated that the three earlier features (represented by samples OxA-12640–2) post-date the main late Bronze Age occupation represented by Roundhouses C and D, and that the later feature (represented by sample OxA-12643) is likely to be contemporary with the latest occupation of Roundhouse B in the early and middle Iron Age. The results also assisted in determining that occupation of the site was not continuous from the late Bronze Age into the Iron Age.

References: Collard 2004

OxA–12640 2618 ±33 BP

δ¹³C: -26.1‰

Sample: HBC03 (639), submitted on 3 July 2003 by M Collard

Material: carbonised residue (adhering to internal surface of pot sherd)

Initial comment: sample recovered from primary fill of oval pit 638. Sealed by a deposit of highly carbon-rich material, in turn overlain by topsoil, ploughed until recently. No physical relationships with other features, however part of a small cluster of similar features of contemporary date. Context sealed by topsoil, ploughed for at least the last 15 years. Topsoil was stripped prior to excavation and left exposed for two years. Resultant weed growth was cleared by mechanical removal of uppermost gravel surface, immediately prior to excavation. Underlying geology is acidic flint gravel, free-draining, and fine-fractioned.

Objectives: to establish whether the pit from which this sample was recovered, together with the two pits nearby, are contemporary with the earliest phase of activity on the site, especially the occupation of Roundhouses C and D. Evidence to place activity within the chronological framework of activity across the remainder of the site and also within a regional context.

Calibrated date: *1σ:* 810–790 cal BC
2σ: 830–770 cal BC

Final comment: M Brett (23 April 2004), this sample indicates that pit 638 is late Bronze Age in date, however it post-dates the main period of late Bronze Age occupation, represented by Roundhouses C and D. The results also helped to determine that occupation of the site was not continuous from the late Bronze Age into the Iron Age.

OxA–12641 2729 ±34 BP

δ¹³C: -27.5‰

Sample: HBC03 (069), submitted on 3 July 2003 by M Collard

Material: carbonised residue (adhering to internal surface of pot sherd)

Initial comment: sample recovered from the single fill of a shallow, irregularly cut feature 968. No physical relationships with other features, but part of a small cluster of similar features of contemporary date. Context sealed by topsoil, ploughed for at least the last 15 years. Topsoil was stripped prior to excavation and left exposed for two years. Resultant weed growth was cleared by mechanical removal of uppermost gravel surface, immediately prior to excavation. Underlying geology is acidic flint gravel, free-draining, and fine-fractioned.

Objectives: to establish whether the pit from which this sample was recovered and two pits nearby, are contemporary with the earliest phase of activity on the site, especially the occupation of Roundhouses C and D. To place activity within the chronological framework of activity across the remainder of the site and also within a regional context. To aid in the establishment of a secure chronological framework for ceramic types for the region.

Calibrated date: *1σ:* 910–820 cal BC
2σ: 970–810 cal BC

Final comment: M Brett (23 April 2004), this sample indicates that pit 068 is late Bronze Age in date, but it post-dates the main period of late Bronze Age occupation, represented by Roundhouses C and D. The results also helped to determine that occupation of the site was not continuous from the late Bronze Age into the Iron Age.

OxA–12642 2579 ±34 BP

δ¹³C: -26.5‰

Sample: HBC03 (089), submitted on 3 July 2003 by M Collard

Material: carbonised residue (adhering to internal surface of pot sherd)

Initial comment: sample recovered from the final fill of an oval, steep-sided pit, 1715. No physical relationships with other features, but part of a small cluster of similar features of contemporary date. Context sealed by topsoil, ploughed for at least the last 15 years. Topsoil was stripped prior to excavation and left exposed for two years. Resultant weed growth was cleared by mechanical removal of uppermost gravel surface, immediately prior to excavation. Underlying geology is acidic flint gravel, free-draining, and fine-fractioned.

Objectives: as OxA-12641

Calibrated date: *1σ:* 800–770 cal BC
2σ: 810–670 cal BC

Final comment: M Brett (23 April 2004), this sample indicate that pit 1715 is late Bronze Age in date, but post-dates the main period of late Bronze Age occupation, represented by Roundhouses C and D. The results also helped to determine that occupation of the site was not continuous from the late Bronze Age into the Iron Age.

OxA–12643 2293 ±34 BP

δ¹³C: -26.5‰

Sample: HBC03 (425), submitted on 9 July 2003 by M Collard

Material: carbonised residue (<5g) (adhering to internal surface of pot sherd)

Initial comment: sample recovered from final fill of clay-lined pit, 423. This fill sealed a carbon-rich deposit, and probably represents silting/natural infilling subsequent to disuse. No physical relationships with other features, but located within southwestern corner of ditched enclosure. Context sealed by topsoil, ploughed for at least the last 15 years. Topsoil was stripped prior to excavation and left exposed for two years. Resultant weed growth was cleared by mechanical removal of uppermost gravel surface, immediately prior to excavation. Underlying geology is acidic flint gravel, free-draining, and fine-fractioned.

Objectives: to establish whether the pit from which this sample was taken is contemporary with the later phase of activity on the site, especially the occupation of Roundhouse B.

Calibrated date: *1σ:* 400–370 cal BC
2σ: 410–230 cal BC

Final comment: M Brett (23 April 2004), this sample confirmed that pit 423 is contemporary with the latest

(early to middle Iron Age) phase of prehistoric activity on the site, including the latest occupation of Roundhouse B. This helped to determine the chronology of occupation of the site, as well as placing it within the wider, regional settlement pattern.

Hazleton North, Gloucestershire

Location: SP 07271889
Lat. 51.52.05 N; Long. 01.53.38 W

Project manager: J Meadows (Institute of Archaeology, London) 2002–4

Description: an early Neolithic chambered long cairn of the Cotswold-Severn group. This trapezoidal long cairn is an example of the laterally-chambered type of tomb with two very similar L-shaped chambered areas near its centre, entered from opposite sides of the monument.

Objectives: to provide greater definition to the site history and to our understanding of the Neolithic sequence in general.

References: Darvill 2004
Meadows *et al* 2007
Saville 1990

Hazleton North: antler series, Gloucestershire

Location: SP 07271889
Lat. 51.52.05 N; Long. 01.53.38 W

Project manager: J Meadows (Institute of Archaeology, London), 2002–4

Archival body: Corinium Museum

Description: many red deer antlers were discarded in the two quarries. Some of these bore usewear marks, and were apparently used to quarry limestone to build the cairn, which means that they are very close in age to the date of cairn construction. Two antlers were found in the primary rubble layers on which the cairn was built, and should also date the construction of the monument. One of these, and an antler from the north quarry, were previously dated at Harwell.

Objectives: the antlers, if used as tools in the construction of the cairn, should be extremely close in age to the cairn itself, as antlers are shed annually and soon become too brittle for stoneworking. A precise date for the construction of the cairn will constrain the dating of both the pre-cairn domestic activity and of the articulated burials in the cairn's chambered areas.

Final comment: J Meadows (10 November 2004), the two new results appear to be sound, but have interesting implications for the dating of the burial phase, which will be discussed in a forthcoming article. Unlike HAR- 8351, which was unknown when these samples were submitted, the results do not suggest that the antlers are unrelated to burial activity at Hazleton. The four Neolithic antler results are consistent with a single radiocarbon age ($T' = 4.5$, $T'(5\%) = 7.8$, $\nu = 3$; Ward and Wilson 1978), and may therefore all be very close in date to the construction of the monument.

References: Meadows *et al* 2007
Saville 1990
Ward and Wilson 1978

GrA–24513 4830 ±50 BP

$\delta^{13}C$: -23.0‰
$\delta^{15}N$ (diet): +5.2‰

Sample: 9740, submitted on 20 October 2003 by J Meadows

Material: antler: *Cervus elaphus* (19.50g) (B Levitan 1990)

Initial comment: this antler was found in the primary fill (context 328/214) of the south quarry, near its western edge (Saville 1990, fig 199) and shows evidence of having been used as a quarrying tool (Saville 1990, fig 201). The fill, 'derived from the weathering of the exposed limestone', apparently was deposited while quarrying was going on (Saville 1990, 23). It is therefore assumed that this antler was used in the quarrying of stone for the construction of the cairn.

Objectives: to date the construction of the cairn; the antler appears to have been used to quarry limestone for the construction of the cairn, which was calculated to have taken no more than five years to complete (Saville 1990, 242). It cannot be much older than the cairn itself, therefore. A precise estimate of the date of construction is necessary to assess the duration of burial activity at Hazleton North.

Calibrated date: *1σ:* 3660–3530 cal BC
2σ: 3710–3520 cal BC

Final comment: J Meadows (10 November 2004), the result is consistent with those of other dated antlers, other than HAR-8351, which supports excavator's interpretation that this antler was used as a quarrying tool in the cairn's construction phase.

References: Saville 1990

GrA–24638 4790 ±50 BP

$\delta^{13}C$: -22.1‰
$\delta^{15}N$ (diet): +3.5‰

Sample: 13042, submitted on 20 October 2003 by J Meadows

Material: antler: *Cervus elaphus* (15.60g) (B Levitan 1990)

Initial comment: this antler was found in context 314, one of the dumps of rubble (soil, marl, and stone fragments) on which the cairn structure was built (adjacent to orthostat 408, a fine-grained limestone slab in the southwest corner of the north chamber). The source of this rubble appears to have been the spoil from quarrying stone for the cairn's construction (Saville 1990, 243). Many other antlers were found in the quarry primary fills. It is assumed that this antler was used as a quarrying tool. The antler cannot be more recent than the construction of the cairn, and if it was used in quarrying it cannot be more than a few years older than the cairn.

Objectives: as GrA-24513

Calibrated date: *1σ:* 3650–3520 cal BC
2σ: 3660–3380 cal BC

Final comment: J Meadows (10 November 2004), the result is consistent with those of other dated antlers, other than

HAR-8351, which supports excavator's interpretation that this antler was used as a quarrying tool in the cairn's construction phase. Unless this result is a statistical outlier, however, it implies that some of the disarticulated human bones in the burial chambers (those dated by OxA-910, OxA-907, OxA-912/GrA-24564, OxA-905, GrA-24506, OxA-12875, and OxA-12876) could predate the cairn's construction (Meadows *et al* 2007).

References: Meadows *et al* 2007
Saville 1990

Hazleton North: articulated bone series, Gloucestershire

Location: SP 07271889
Lat. 51.52.05 N; Long. 01.53.38 W

Project manager: J Meadows (Institute of Archaeology, London), 2002–4

Archival body: Corinium Museum

Description: these samples must be more recent in date than the construction of the cairn, as the bones in question were found in an articulated state. They include the foreleg of a roe deer, a perinatal sheep or goat skeleton, and a human leg, all from the south chambered area, and two relatively complete skeletons found in the entrance of the north chambered area.

Objectives: all previously dated samples from the south chambered area were from bones found in a disarticulated state, which could have come from secondary burials and could predate the construction of the cairn. These samples will provide a better estimate of the date of cairn construction and of the duration of the period of burial activity in the south chambered area. The north entrance samples are from two bones previously dated by AMS, when that method was relatively new. Redating these bones will check the accuracy of the earlier measurements. The north entrance samples can also be placed in age order, as the burial sequence is known. The articulated bone samples therefore will provide a tight chronology for the period of burial activity.

Final comment: J Meadows (10 November 2004), the new measurements of previously dated bones were statistically consistent with earlier results from these samples. Results from other samples in this series were also consistent with expectations.

References: Meadows *et al* 2007
Saville 1990

GrA–24504 4800 ±50 BP

$\delta^{13}C$: -21.3‰
$\delta^{15}N$ (diet): +9.5‰

Sample: 5037–32, submitted on 20 October 2003 by J Meadows

Material: human bone (5.14g) (right femur)

Initial comment: this bone is from skeleton 1, the last burial in the entrance of the north chambered area. The skeleton was practically complete and was fully articulated (Saville 1990, fig 135). It cannot have been moved after burial (Saville 1990, 89; 125). The skeleton was found within context (267), which was sealed by the collapse of the entrance-blocking orthostat (273) and then by (612), a layer of stones from the collapsed roof of the entrance passage.

Objectives: to date the end of burial activity in the north chambered area (this individual was almost certainly the last to be buried in this area). To assess the accuracy of the two earlier measurements on this bone (OxA-643 and OxA-902), which were made when the AMS method was still relatively new. To obtain dietary data from this individual ($\delta^{13}C$ and $\delta^{15}N$), which were not previously reported.

Calibrated date: *1σ:* 3650–3520 cal BC
2σ: 3660–3380 cal BC

Final comment: J Meadows (10 November 2004), stable isotope measurements do not indicate any dietary offsets, and the radiocarbon age of this individual is consistent with this position late in the stratigraphic sequence at Hazleton.

Laboratory comment: Ancient Monuments Laboratory (2004), this result is statistically consistent with the two earlier measurements on the same bone (OxA-643, and OxA-902) ($T'=2.7$, $T'(5\%)=6.0$, $\nu=2$) (Ward and Wilson 1978). The best estimate of the radiocarbon age of the sample is the pooled mean of these measurements; 4786 ± 39 BP. This calibrates to 3640–3520 cal BC (1σ) or 3650–3380 cal BC (2σ) (Reimer *et al* 2004).

References: Reimer *et al* 2004
Saville 1990
Ward and Wilson 1978

GrA–24508 4850 ±50 BP

$\delta^{13}C$: -21.5‰
$\delta^{15}N$ (diet): +9.9‰

Sample: 6672–16, submitted on 20 October 2003 by J Meadows

Material: human bone (3.05g) (left femur)

Initial comment: this bone is from skeleton 2, a burial in the entrance of the north chambered area. Although part of the skeleton was apparently pushed aside to make room for the burial of skeleton 1, the spine and left leg of skeleton 2 were found articulated (Saville 1990, 104; fig 119). The alignment of the spine 'clearly respected the northern edge of the collapsed orthostat 359'. Skeleton 2 is therefore known to pre-date skeleton 1, but to post-date the collapse of the inner portal orthostats (358) and (359) (Saville 1990, 125). The skeleton was found within context (267), which was sealed by the collapse of the entrance-blocking orthostat (273) and then by (612), a layer of stones from the collapsed roof of the entrance passage.

Objectives: to date the duration of burial activity in the north chambered area. To assess the accuracy of the earlier measurement on this bone (OxA-903), which was made when the AMS method was still relatively new. To obtain dietary data from this individual ($\delta^{13}C$ and $\delta^{15}N$), which were not previously reported.

Calibrated date: *1σ:* 3660–3630 cal BC
2σ: 3710–3520 cal BC

Final comment: J Meadows (10 November 2004), stable isotope measurements do not indicate any dietary offsets,

and the radiocarbon age of this individual is consistent with their position late in the stratigraphic sequence at Hazleton.

Laboratory comment: Ancient Monuments Laboratory (2004), this result is statistically consistent with an earlier measurement on the same bone (OxA-903; 4840 ±60 BP) (T′=0.0, T′(5%)=3.8, ν=1) (Ward and Wilson 1978). The best estimate of the radiocarbon age of the sample is the pooled mean of these measurements, 4846 ±38 BP. This calibrates to 3660–3630 cal BC (1σ) or 3710–3530 cal BC (2σ) (Reimer *et al*2004).

References: Reimer *et al* 2004
Saville 1990
Ward and Wilson 1978

GrA–24509 4750 ±50 BP

δ¹³C: -21.4‰
δ¹⁵N (diet): +8.7‰

Sample: 7835b, submitted on 20 October 2003 by J Meadows

Material: human bone (3.02g) (right femur)

Initial comment: this bone is from a partially-articulated right leg, found in the entrance of the south chambered area (Saville 1990, 95). It was paired with the left femur <7837>, and therefore cannot belong to any other dated individual. The skeleton was found within context (354), which directly overlay the paving (353) in the entrance to the south chambered area, and was sealed by (11), a layer of stones and soil from the collapsed roof of the entrance passage. The southern end of these layers had been disturbed (probably by recent ploughing), creating a mixed deposit (236), but (354) was regarded as an intact burial deposit (Saville 1990, 88; fig 95). The articulated leg must therefore pre-date the end of burial activity, and post-date the construction of the monument.

Objectives: to date the duration of burial activity in the south chambered area (this individual must post-date the construction of the cairn and pre-date the end of burial activity). To obtain dietary data from this individual ($\delta^{13}C$ and $\delta^{15}N$), which were not previously reported.

Calibrated date: *1σ:* 3640–3380 cal BC
2σ: 3650–3370 cal BC

Final comment: J Meadows (10 November 2004), stable isotope measurements do not indicate any dietary offsets, and the radiocarbon age of this individual is consistent with his/her position in the stratigraphic sequence at Hazleton (apparently post- dating the antler samples).

Laboratory comment: Ancient Monuments Laboratory (2004), this result is statistically consistent with a second measurement on the same bone (OxA-12872) (T′=0.0, T′(5%)=3.8, ν=1) (Ward and Wilson 1978). The best estimate of the radiocarbon age of the sample is the pooled mean of these measurements, 4748 ±26BP. This calibrates to 3640–3510 cal BC (1σ) or 3640–3380 cal BC (2σ) (Reimer *et al* 2004).

References: Reimer *et al* 2004
Saville 1990
Ward and Wilson 1978

OxA–12871 4758 ±31 BP

δ¹³C: -21.4‰

Sample: 7424, submitted on 20 October 2003 by J Meadows

Material: animal bone (1.17g): *Capreolus capreolus*, metacarpal (B Levitan 1990)

Initial comment: four elements of a roe deer foreleg (radius, ulna, carpal, and metacarpal) were found scattered in a restricted area of (323), the lower fill of the passage of the south chambered area. These are the only roe deer remains in the chambered areas and must represent an articulated limb at the time of deposition, although the bones have subsequently been disturbed (Saville 1990, 211; fig 205). The context (323) was formed directly on the unpaved floor of the passage, in the course of the period of burial activity (there are human bones within and on top of this deposit) (Saville 1990, 82; fig 95, section 8). Given the completeness of the roe deer foreleg, and the near-absence of roe deer remains in pre-cairn contexts, it is highly improbable that these remains are residual in context (323). It is also difficult to conceive how an articulated foreleg could have been introduced (after the burial phase) to a context sealed by the collapse of the passage roof.

Objectives: to date the burial activity. The sample must date to the period when the cairn was in use for human burial (the roe deer foreleg was regarded by the excavators as an offering). Given the risk that dietary offsets may bias radiocarbon results from human bones, dating a terrestrial herbivore of the same calendar age as the burial activity is a useful check on the human bone results.

Calibrated date: *1σ:* 3640–3520 cal BC
2σ: 3640–3380 cal BC

Final comment: J Meadows (10 November 2004), the radiocarbon age of this animal is consistent with its position in the stratigraphic sequence at Hazleton (apparently post dating the antler samples).

References: Saville 1990

OxA–12872 4747 ±31 BP

δ¹³C: -20.1‰
δ¹⁵N (diet): +8.7‰
C/N ratio: 3.2

Sample: 7835a, submitted on 20 October 2003 by J Meadows

Material: human bone (3.02g) (right femur)

Initial comment: as GrA-24509

Objectives: as GrA-24509

Calibrated date: *1σ:* 3640–3510 cal BC
2σ: 3640–3380 cal BC

Final comment: see GrA-24509

Laboratory comment: see GrA-24509

OxA–12873 4763 ±32 BP

δ¹³C: -21.4‰
δ¹⁵N (diet): +6.8‰
C/N ratio: 3.2

Sample: 8641, submitted on 20 October 2003 by J Meadows

Material: animal bone

Initial comment: an incomplete skeleton of a perinatal sheep or goat was found in context (412), the primary fill of the south chamber. Although scattered by later disturbance, it is very likely that these bones were articulated when deposited in the chamber (Saville 1990, 209-11). Perinatal sheep/goat bones were found only in the south chamber, so it seems unlikely that any could be residual or intrusive. Context (412) was sealed between a paved floor, context (452) (or (453), the pre-cairn surface, where paving was absent), and (352), a horizontal layer of limestone slabs. This appears to have been the collapsed roof of the chamber. The perinatal sheep/goat was evidently deposited while the chamber was still open.

Objectives: to date the burial activity. The sample must date to the period when the cairn was in use for human burial (the perinatal sheep/goat was regarded by the excavators as an offering). Given the risk that dietary offsets may bias radiocarbon results from human bones, dating a terrestrial herbivore of the same calendar age as the burial activity is a useful check on the human bone results.

Calibrated date: *1σ:* 3640–3520 cal BC
2σ: 3640–3380 cal BC

Final comment: J Meadows (10 November 2004), the radiocarbon age of this animal is consistent with its position in the stratigraphic sequence at Hazleton (apparently post-dating the antler samples).

References: Saville 1990

Hazleton North: disarticulated bone series, Gloucestershire

Location: SP 07271889
Lat. 51.52.05 N; Long. 01.53.38 W

Project manager: J Meadows (Institute of Archaeology, London), 2002–4

Archival body: Corinium Museum

Description: these samples (all from human femora) are from bones that were found in the chambered areas in a disarticulated state, and which may therefore have been the result of secondary burial. They could, in theory, be older than the cairn itself.

Objectives: one of these bones has been dated previously, and appeared to be older than the cairn itself. It is important to establish whether the reburial of relics was practised in the Neolithic, or whether this measurement was misleading (for example, due to a dietary offset). The other samples in this series are all from bones not previously dated, including femora attributed to identifiable individuals (E, G, and H), as well as isolated bones. Radiocarbon results from these samples should identify whether any were ancient relics at the time they were placed in the cairn, and improve the reliability of the chronological model. All the results will provide *termini post quem* for the end of burial activity, and the north chamber results will provide *termini post quem* for the collapse of orthostats 358 and 359 and for the burial of the articulated skeletons in the north entrance.

Final comment: J Meadows (10 November 2004), stable isotope measurements do not indicate any dietary offsets, so these results should accurately date the deaths of the individuals concerned. Even allowing for the slow rate of bone collagen turnover in humans (Wild *et al* 2000), the new results (given that some of the individuals dated in this series were infants or children), together with those of the antler series, appear to suggest that some of the disarticulated human bones found in the chambered areas may belong to individuals who died before the monument was built. This conclusion depends heavily on GrA-24638, one of the new antler measurements.

References: Saville 1990
Wild *et al* 2000

GrA–24506 4940 ±50 BP

$\delta^{13}C$: -21.7‰
$\delta^{15}N$ (diet): +8.6‰

Sample: 5463, submitted on 20 October 2003 by J Meadows

Material: human bone (2.83g) (right femur)

Initial comment: this bone is one of a cluster of disarticulated bones found in context (336) of the north chamber, attributed to a child, individual G, and evidently did not belong to another identified or dated individual (Saville 1990, fig 130). Context (336) was sealed between a paved floor, context (357/457), and (391), a horizontal layer of limestone slabs and other rubble. This appears to have been the collapsed roof of the chamber. The bones of individual G were evidently deposited while the chamber was still open.

Objectives: to date the end of burial activity in the north chambered area (this result will provide a *terminus post quem* for the collapse of the inner portal orthostats (358) and (359), which prevented access to the north chamber). To determine whether this bone was an ancient relic at the time it was deposited in the cairn. To obtain dietary data from this individual ($\delta^{13}C$ and $\delta^{15}N$), which were not previously reported.

Calibrated date: *1σ:* 3780–3650 cal BC
2σ: 3910–3640 cal BC

Final comment: J Meadows (10 November 2004), stable isotope measurements do not indicate dietary offsets, and the age at death of this individual (three-four years) precludes an age offset due to slow rates of bone collagen turnover. The calibrated result is therefore regarded as an accurate estimate of the individual's calendar date of death.

References: Meadows *et al* 2007
Saville 1990

GrA–24510 4810 ±50 BP

$\delta^{13}C$: -21.7‰
$\delta^{15}N$ (diet): +9.9‰

Sample: 8343, submitted on 20 October 2003 by J Meadows

Material: human bone (5.18g) (infant's left femur, unpaired)

Initial comment: this bone is an unpaired infant femur found in context (336) of the north chamber, and evidently does not belong to another identified or dated individual. Context (336) was sealed between a paved floor, context (357/457), and (391), a horizontal layer of limestone slabs and other

rubble. This appears to have been the collapsed roof of the chamber. This bone was evidently deposited while the chamber was still open.

Objectives: as GrA-24506

Calibrated date: *1σ:* 3650–3530 cal BC
2σ: 3700–3380 cal BC

Final comment: J Meadows (10 November 2004), stable isotope measurements do not indicate dietary offsets, and the age at death of this individual (infant; precise age estimate not available) precludes an age offset due to slow rates of bone collagen turnover. The calibrated result is therefore regarded as an accurate estimate of the individual's calendar date of death.

GrA–24512 4860 ±50 BP

$\delta^{13}C$: -21.6‰
$\delta^{15}N$ (diet): +8.9‰

Sample: 8679, submitted on 20 October 2003 by J Meadows

Material: human bone (3.19g) (juvenile left femur)

Initial comment: this bone is one of several disarticulated bones found in context (412) of the south chamber, attributed to a juvenile, individual E, and evidently not from another identified or dated individual. Context (412) was sealed between a paved floor, context (452) (or (453), the pre-cairn surface, where paving was absent), and (352), a horizontal layer of limestone slabs. This appears to have been the collapsed roof of the chamber. The bones of individual E were evidently deposited while the chamber was still open.

Objectives: to date the end of burial activity in the south chambered area (this result will provide a *terminus post quem* for the end of burial activity). To determine whether this bone was an ancient relic at the time it was deposited in the cairn. To obtain dietary data from this individual ($\delta^{13}C$ and $\delta^{15}N$), which were not previously reported.

Calibrated date: *1σ:* 3700–3630 cal BC
2σ: 3720–3530 cal BC

Final comment: J Meadows (10 November 2004), stable isotope measurements do not indicate dietary offsets, and the age at death of this individual (12–15 years) precludes a significant age offset due to slow rates of bone collagen turnover. The calibrated result is regarded as an accurate estimate of the individual's calendar date of death.

GrA–24564 4945 ±45 BP

$\delta^{13}C$: -21.2‰
$\delta^{15}N$ (diet): +9.3‰

Sample: 11035, submitted on 20 October 2003 by J Meadows

Material: human bone (2.65g) (adult female, left femur)

Initial comment: this bone is one of a pair of femora (<11035> and <9554>) found in context (412) of the south chamber, attributed to an adult female and evidently not belonging to another identified or dated individual. Context (412) was sealed between a paved floor, context (452) (or (453), the pre-cairn surface, where paving was absent), and (352), a horizontal layer of limestone slabs. This appears to have been the collapsed roof of the chamber. The two femora were evidently deposited while the chamber was still open.

Objectives: to date the end of burial activity in the south chambered area (this result will provide a *terminus post quem* for the end of burial activity). To assess the accuracy of the earlier measurement on this bone (OxA-912), this was made when the AMS method was still relatively new and seems to be earlier than the date of construction of the cairn. To determine whether this bone was an ancient relic at the time it was deposited in the cairn. To obtain dietary data from this individual ($\delta^{13}C$ and $\delta^{15}N$), which were not previously reported.

Calibrated date: *1σ:* 3780–3650 cal BC
2σ: 3900–3640 cal BC

Final comment: J Meadows (10 November 2004), stable isotope measurements do not indicate dietary offsets. The age at death of this individual (adult; precise age estimate not available) may imply an age offset, however, due to slow rates of bone collagen turnover.

Laboratory comment: Ancient Monuments Laboratory (2004), this result is statistically consistent with the earlier measurement on the same bone (OxA-912; 5200 ±150 BP) ($T'=2.7$, $T'(5\%)=3.8$, $\nu=1$) (Ward and Wilson 1978). The best estimate of the radiocarbon age of the sample is the pooled mean of these measurements, 4967 ±43 BP. This calibrates to 3790–3700 cal BC (1σ) or 3940–3650 cal BC (2σ) (Reimer *et al* 2004).

References: Meadows *et al* 2007
Reimer *et al* 2004
Ward and Wilson 1978

OxA–12874 4606 ±32 BP

$\delta^{13}C$: -20.9‰
$\delta^{15}N$ (diet): +9.7‰
C/N ratio: 3.3

Sample: 4108, submitted on 20 October 2003 by J Meadows

Material: human bone (6.67g) (left femur)

Initial comment: this bone is one of a cluster of disarticulated bones found in context (267) of the entrance to the north chambered area, attributed to an infant, individual B, and evidently not belonging to another identified or dated individual (Saville 1990, 125; fig 136). This burial apparently predates the burial of skeleton 1, but its stratigraphic relationship with other burials in the north entrance is ambiguous. The bones were found within context (267), which was sealed by the collapse of the entrance-blocking orthostat (273) and then by (612), a layer of stones from the collapsed roof of the entrance passage.

Objectives: to date the end of burial activity in the north chambered area (this result will provide a *terminus post quem* for the burial of skeleton 1). To determine whether this bone was an ancient relic at the time it was deposited in the cairn. To obtain dietary data from this individual ($\delta^{13}C$ and $\delta^{15}N$), which were not previously reported.

Calibrated date: *1σ:* 3490–3350 cal BC
2σ: 3500–3340 cal BC

Final comment: J Meadows (10 November 2004), the result is apparently too recent for individual B to predate skeleton 1 (pooled mean age: 4786 ±39 BP; 3650–3380 cal BC). Individual B may be contemporary with rib 3705 (OxA-383 and OxA-1177; pooled mean 4558 ±60 BP;

3500–3030 cal BC), although the latter can hardly have belonged to an infant, and was in any case found at the opposite entrance to the long cairn. This suggests that another phase of burial activity took place at Hazleton during the second half of the fourth millennium cal BC. This was the only sample dated under the ALSF programme whose radiocarbon age was too recent for its stratigraphic position, as recorded by the excavator, and it appears that the stratigraphic relationship between individual B and skeleton 1 was not correctly recorded.

References: Saville 1990

OxA–12875 4883 ±31 BP

$\delta^{13}C$: -20.7‰

Sample: 6625, submitted on 20 October 2003 by J Meadows

Material: human bone (5.00g) (right femur)

Initial comment: this bone is one of a cluster of disarticulated bones found in context (336) of the north chamber, attributed to a child, individual H, and evidently did not belong to another identified or dated individual (Saville 1990, fig 130). Context (336) was sealed between a paved floor, context (357/457), and (391), a horizontal layer of limestone slabs and other rubble. This appears to have been the collapsed roof of the chamber. The bones of individual H were evidently deposited while the chamber was still open.

Objectives: as GrA-24506.

Calibrated date: *1σ:* 3700–3640 cal BC
2σ: 3710–3630 cal BC

Final comment: J Meadows (10 November 2004), stable isotope measurements do not indicate dietary offsets, and the age at death of this individual (two-three years) precludes an age offset due to slow rates of bone collagen turnover. The calibrated result is therefore regarded as an accurate estimate of the individual's calendar date of death.

References: Meadows *et al* 2007
Saville 1990

OxA–12876 4870 ±33 BP

$\delta^{13}C$: -21.0‰
$\delta^{15}N$ (diet): +10.4‰
C/N ratio: 3.2

Sample: 9113, submitted on 20 October 2003 by J Meadows

Material: human bone (10.23g) (infant's left femur, unpaired)

Initial comment: this bone is an unpaired infant femur found in context (336) of the north chamber, and evidently does not belong to another identified or dated individual. Context (336) was sealed between a paved floor, context (357/457), and (391), a horizontal layer of limestone slabs and other rubble. This appears to have been the collapsed roof of the chamber. This bone was evidently deposited while the chamber was still open.

Objectives: as GrA-24506

Calibrated date: *1σ:* 3660–3640 cal BC
2σ: 3710–3630 cal BC

Final comment: J Meadows (10 November 2004), stable isotope measurements do not indicate dietary offsets, and the age at death of this individual (infant; precise age estimate not available) precludes an age offset due to slow rates of bone collagen turnover. The calibrated result is therefore regarded as an accurate estimate of the individual's calendar date of death.

References: Meadows *et al* 2007

Hazleton North: pre-cairn series, Gloucestershire

Location: SP 07271889
Lat. 51.52.05 N; Long. 01.53.38 W

Project manager: J Meadows (Institute of Archaeology, London), 2002–4

Archival body: Corinium Museum

Description: samples of carbonised residues on the internal surfaces of potsherd from a buried soil horizon (context 211) immediately beneath the cairn, associated with a period of domestic activity at the site (the 'pre-cairn phase').

Objectives: dating these samples will provide more precise estimates of the date of commencement and the duration of pre-cairn activity, and of the date of cairn construction. By dating these samples, we will also improve the dating of the pre-cairn ceramic assemblage.

Final comment: J Meadows (10 November 2004), all three results are acceptable, given earlier dating of pre-cairn phase samples (OxA-646, OxA-738, and OxA-739) and old and new dates from the stratigraphically later cairn phase.

References: Saville 1990

OxA–12969 5125 ±34 BP

$\delta^{13}C$: -26.3‰

Sample: 11846, submitted on 31 October 2003 by J Meadows

Material: carbonised residue (<1g) (adhering to internal surface of potsherd)

Initial comment: the sherds were found in the pre-cairn buried soil (211), beneath cell O of the cairn structure. The overlying rubble dump was (379). There is some possibility that these sherds are residual or intrusive, but they should not derive from the Mesolithic use of the site. Nor is it likely that the sherds could have penetrated the buried soil after the cairn was built over it. The sherds should therefore date to the pre-cairn Neolithic 'domestic' activity at Hazleton, or possibly to the post-midden, pre-cairn interval in which the site was cultivated.

Objectives: to date the use of the sherd directly. Carbonised organic residues provide the most secure contextual association between the dated sample and the pottery itself, but very few early Neolithic potsherds in Britain have been dated directly. To date the pre-cairn 'domestic' activity: this is necessary to determine when the site was first occupied in the early Neolithic, how long it remained a 'domestic' site, and whether there was an interval between this phase and the construction of the cairn; these dates will also help to date the pre-cairn ceramic assemblage.

Calibrated date: *1σ:* 3970–3940 cal BC
2σ: 3990–3800 cal BC

Final comment: J Meadows (10 November 2004), the result is acceptable, given earlier dating of pre-cairn phase samples (OxA-646, OxA-738, and OxA-739) and old and new dates from the stratigraphically later cairn phase.

OxA–13374 5110 ±90 BP

δ^{13}*C:* -29.2‰

Sample: 20040, submitted on 31 October 2003 by J Meadows

Material: carbonised residue (<1g) (adhering to internal surface of potsherd)

Initial comment: the sherds were found in <12243>, the heavy fraction of sample <23>, which was taken from the 'midden' (561) (stratigraphically equivalent to the pre-cairn buried soil (211)), beneath cell O of the cairn structure. The overlying rubble dumps were (442) and (379). There is some possibility that these sherds are residual or intrusive, but they should not derive from the Mesolithic use of the site. Nor is it likely that the sherds could have penetrated the buried soil after the cairn was built over it. The sherds should therefore date to the pre-cairn Neolithic 'domestic' activity at Hazleton, or possibly to the post-midden, pre-cairn interval in which the site was cultivated.

Objectives: as OxA-12969

Calibrated date: *1σ:* 3990–3790 cal BC
2σ: 4230–3700 cal BC

Final comment: see OxA-12969

Laboratory comment: Ancient Monuments Laboratory (July 2007), the sample contained insufficient carbon for a graphite target. A gas target was dated, hence the larger error term.

OxA–13375 4980 ±100 BP

δ^{13}*C:* -27.0‰

Sample: 12897, submitted on 31 October 2003 by J Meadows

Material: carbonised residue (<1g) (adhering to internal surface of potsherd)

Initial comment: the sherds were found in the pre-cairn buried soil (211), beneath cell W of the cairn structure. There is some possibility that these sherds are residual or intrusive, but they should not derive from the Mesolithic use of the site. Nor is it likely that the sherds could have penetrated the buried soil after the cairn was built over it. The sherds should therefore date to the pre-cairn Neolithic 'domestic' activity at Hazleton, or possibly to the post-midden, pre-cairn interval in which the site was cultivated.

Objectives: as OxA-12969

Calibrated date: *1σ:* 3950–3650 cal BC
2σ: 3980–3530 cal BC

Final comment: see OxA-12969

Laboratory comment: see OxA-13374

Lynford Quarry, Mundford, Norfolk

Location: TL 82399482
Lat. 52.31.15 N; Long. 00.41.13 E

Project manager: W A Boismier (Norfolk County Council), 8 April – 2 November 2002

Archival body: Norfolk Museums and Archaeology Service

Description: the site comprised the surviving eastern end of a major palaeochannel feature, filled with organic deposits, within the current application area of Lynford Quarry. The feature appears to have been a meander cut-off, acting as a small basin or oxbow lake, originally orientated in an east/north-east to west/south-west direction. Approximately 199m^2 of the palaeochannel survived *in situ* to a depth of *c* 1.5m. The palaeochannel fill was composed of organic sediment with very fine alternating organic/merogenic laminae, and contained faunal and lithic material. These deposits had accumulated on basal minerogenic fine sand. Truncating the northern edge of the palaeochannel was a later palaeochannel, filled with minerogenic fine sand and organic/merogenic sediment. Overlying both was a sequence of braided river channel deposits, composed of a series of gravel and sand-filled features. At the top of the sequence was a succession of Holocene channels and sediments. The palaeochannel fill with artefactual and faunal material was dated by OSL to 64,000 ±5000 cal BP (OxL-1338) and 67,000 ±5000 cal BP (OxL-1340).

Objectives: to use the radiocarbon dates, together with OSL age estimates, to establish an 'absolute' chronology for the stratigraphic sequence of deposits, and to correlate this with other dated sequences in the region and the marine isotope record.

Final comment: W Boismier (3 September 2004), the ^{14}C dates together with OSL age estimates (Schwenninger and Rhodes 2005) have established an absolute chronology for the site in terms of the timing of fluvial deposition and, in particular, the changes in depositional style indicated by the transitions between the facies associations established for the stratigraphic sequence. The calibrated ^{14}C and OSL age estimates are in good agreement with each other and have identified a significant hiatus in the fluvial sequence between the Holocene deposits and underlying Devensian deposits at the site. The dating of organic palaeochannel sediments exposed in section on the western edge of the quarry has established that this channel is younger than the organic palaeochannel deposits containing the archaeological material on the eastern side of the quarry. Comparison between the ^{14}C and OSL dates indicate that the exposed channel deposits are of the same age as the braided river deposits overlying the excavated palaeochannel on the eastern side of the quarry.

References: Schwenninger and Rhodes 2005

GrN–28395 35710 $^{+930}_{-830}$ BP

δ^{13}*C:* -25.8‰

Sample: 30377 (humin), submitted on 25 October 2003 by W A Boismier

Material: sediment (humin)

Initial comment: the sample was taken from a palaeochannel cut by the east- facing section at the western edge of the quarry, *c* 118m west of the excavation area. The stratigraphic sequence consisted of a set of deposits of laminated grey silts with organic lenses and grey to brown medium sand, followed by a deposit of coarse gravel with light grey to white medium sand, and a succession of deposits of interbedded

grey silt, organic material, light brown to dark grey medium sand, peat, and dark grey organic sand. At the top of the sequence were light brown to grey/white medium sands with brown organic silt laminations. Sample 30377 came from context 20415 (laminated grey silt with organic lenses) in the earliest part of sequence, *c* 4m below the surface. The sample would have been below the water table prior to drainage (12-18 months before the excavation). The western edge of the quarry pit had probably been exposed for *c* 26 months at the time of sampling, and was covered by scree and patchy vegetation. These were removed when the section was cleaned, prior to recording and sampling. No post-depositional disturbance was identified during excavation and recording.

Objectives: to establish the date of the start of the succession of organic deposits in the palaeochannel exposed in the section. Comparison of this date with that obtained from the upper fill of the palaeochannel (GrN-28397 and GrN-28398) will establish whether these deposits are similar in age. As no *in situ* channel deposits survived in the machine-excavated area of the quarry, the date will be used to determine whether the channel is of the same date (Middle Devensian) as that excavated on the other side of the quarry.

Final comment: W A Boismier (3 September 2004), the dating has established the start of the succession of the organic deposits in the palaeochannel and agrees chronologically with the ^{14}C dates obtained from later deposits within the same channel. It has also established that the palaeochannel is *c* 25-30 ka younger than the organic deposits containing the archaeological material within the excavated palaeochannel on the eastern side of the quarry and in general agreement with the OSL age estimate of 34.75 ±2.87 ka (OxL/X-1496) for the sequence braided river deposits exposed on the west facing section on the eastern side of the quarry (Schwenninger and Rhodes 2005).

Laboratory comment: Ancient Monuments Laboratory (2004), the two results from this sample (GrN-28395 and GrN-28396) are statistically consistent, according to the method of Ward and Wilson (1978) ($T'=0.0, T'(5\%)=3.8$), $\nu=1$, using the smaller of the two error terms). The result is beyond current limits of the internationally agreed calibration range (Reimer *et al* 2004).

References: Reimer *et al* 2004
Schwenninger and Rhodes 2005
Ward and Wilson 1978

GrN–28396 35800 ±1200 BP

$\delta^{13}C$: -25.8‰

Sample: 30377 (humic acid), submitted on 25 October 2003 by W A Boismier

Material: sediment (745g) (bulk)

Initial comment: as GrN-28395

Objectives: as GrN-28395

Final comment: see GrN-28395

Laboratory comment: see GrN-28395

GrN–28397 30340 ±350 BP

$\delta^{13}C$: -28.3‰

Sample: 30378 (humin), submitted on 25 October 2003 by W A Boismier

Material: peat (bulk)

Initial comment: the sample was taken from a palaeochannel cut by the east- facing section at the western edge of the quarry, *c* 118m west of the excavation area. The stratigraphic sequence consisted of a set of deposits of laminated grey silts with organic lenses and grey to brown medium sand, followed by a deposit of coarse gravel with light grey to white medium sand, and a succession of deposits of interbedded grey silt, organic material, light brown to dark grey medium sand, peat, and dark grey organic sand. At the top of the sequence were light brown to grey/white medium sands with brown organic silt laminations. Sample 30378 came from context 20423 (very dark brown/black peat) in the later part of the sequence, *c* 3m below the surface. The sample would have been below the watertable prior to drainage (12–18 months before the excavation). The western edge of the quarry pit had probably been exposed for *c* 26 months at the time of sampling, and was covered by scree and patchy vegetation. These were removed when the section was cleaned, prior to recording and sampling. No post-depositional disturbance was identified during excavation and recording.

Objectives: to establish the date of the end of the succession of organic deposits in the palaeochannel exposed in section. Comparison of this date with that obtained from the lower fill of the palaeochannel (GrN-28395 and GrN-28396) will establish whether these deposits are similar in age. As no *in situ* channel deposits survived in the machine-excavated area of the quarry, the date will be used to determine whether the channel is of the same date (middle Devensian) as that excavated on the other side of the quarry.

Final comment: W A Boismier (3 September 2004), the dating has established the start of the succession of the organic deposits in the palaeochannel and agrees chronologically with the ^{14}C dates obtained from later deposits within the same channel. It has also established that the palaeochannel is *c* 25-30 ka younger than the organic deposits containing the archaeological material within the excavated palaeochannel on the eastern side of the quarry and in general agreement with the OSL age estimate of 34.75 ±2.87 ka (OxL/X-1496) for the sequence braided river deposits exposed on the west facing section on the eastern side of the quarry (Schwenninger and Rhodes 2005).

Laboratory comment: Ancient Monuments Laboratory (2004), the two results from this sample (GrN-28397 and GrN-28398) are statistically consistent, according to the method of Ward and Wilson (1978) ($T'=0.3, T'(5\%)=3.8$), $\nu=1$); the pooled mean (30429 ±305 BP) therefore represents the best estimate of the age of the sample. The result is beyond current limits of the internationally agreed calibration range (Reimer *et al* 2004).

References: Reimer *et al* 2004
Schwenninger and Rhodes 2005
Ward and Wilson 1978

GrN–28398 30690 ±620 BP

$\delta^{13}C$: -27.8‰

Sample: 30378 (humic acid), submitted on 25 October 2003 by W A Boismier

Material: peat (>950g) (bulk)

Initial comment: as GrN-23897

Objectives: as GrN-23897

Final comment: see GrN-23897

Laboratory comment: see GrN-23897

GrN–28399 1050 ±110 BP

$\delta^{13}C$: -28.2‰

Sample: 30085 (humin), submitted on 25 October 2003 by W A Boismier

Material: sediment (bulk)

Initial comment: three monoliths of sediment were collected for pollen analysis from upper deposits of the south-facing section. Contexts 20319 (dark brown organic silty clay) and 20317 (grey organic sand) were sampled. The lowest monolith (segment 0.94–1.03m, *c* 2.04m below the surface) was subsampled by the sedimentologist for radiocarbon dating. The deposits sampled for pollen included a succession of Holocene channels and sediments. The earliest features sampled were braided channels filled with grey to dark brown organic sand, with lower beds of medium to coarse gravels (sample 30085 was taken from context 20317 within this group). Next in the sequence was a series of east-to-west migrating channels. These had basal layers of coarse gravel, and fills of interbedded dark grey organic sand and coarse gravel, coarse gravel with clasts of redeposited organic material, grey to brown medium sand with lenses of brown organic sand, and moderately-sorted coarse gravel and dark brown organic sand. The last feature in this sequence was a north-south channel, filled by dark grey organic sand with rare flint gravel. The sequence was capped by topsoil, composed of brown sand and organic matter and disturbed deposits of grey to dark brown sand and organic material redeposited by quarrying activity. The sample was likely to have been at or just below the watertable prior to drainage (12–18 months before the excavation).

Objectives: to date the basal unit of the Holocene (Flandrian) sequence, in order to establish the date of the end of the succession of braided river deposits and the start of the later post-glacial channels, which represent a meandering river system.

Calibrated date: *1σ:* cal AD 880–1150
2σ: cal AD 690–1220

Final comment: W A Boismier (3 September 2004), the dating has established an absolute chronology for the sequence of deposits at the site by providing a date for the basal unit of the Holocene deposits that agrees with the sequence of OSL age estimates obtained for the deposits at the site. The calibrated ^{14}C date is in good agreement with the OSL age estimate of 970 ±80 years BP (OxL-1498) and indicates a significant hiatus in the fluvial sequence between the Holocene deposits and the underlying braided river deposits dated by OSL to *c* 34750 ±2870 (OxL-1496) and 32,360 ±2210 (OxL-1500) years BP.

Laboratory comment: Ancient Monuments Laboratory (2004), the two results from this sample (GrN-28399 and GrN-28400) are statistically consistent, according to the method of Ward and Wilson (1978) ($T'=3.6$, $T'(5\%)=3.8$), $\nu=1$); the pooled mean (1223 ±65 BP) therefore represents the best estimate of the age of the sample. This calibrates to cal AD 690–900 (1σ) or cal AD 660–980 (2σ) (Reimer *et al* 2004).

References: Reimer *et al* 2004
Schwenninger and Rhodes 2005
Ward and Wilson 1978

GrN–28400 1310 ±80 BP

$\delta^{13}C$: -29.2‰

Sample: 30085 (humic acid), submitted on 25 October 2003 by W A Boismier

Material: sediment (550g) (bulk)

Initial comment: as GrN-28399

Objectives: as GrN-28399

Calibrated date: *1σ:* cal AD 650–780
2σ: cal AD 590–890

Final comment: see GrN-23897

Laboratory comment: see GrN-28399

Palaeo-Arun Owers Bank cores, West Sussex

Location:
Lat. 51.04.16 N; Long. 0_.23.37 W

Project manager: S Gupta (Imperial College London), June 1998 and June 2003

Description: the Arun palaeo-valley system is located offshore Littlehampton in water depths ranging from 25m to 35m, on the northern English Channel shelf. The aim of the project is to identify seabed geomorphology and sediment deposit distribution that contains archaeological features. The submerged landscape reconstruction will aid identification of geomorphic niches suitable for human occupation, and identify locations with the greatest archaeological potential, especially the terrace edge along rivers. The sedimentary bodies, associated with these valley systems, hold unique information on the palaeo-environmental evolution of the region. The valley is infilled in the most northern and in shore part of the study area. The southern part is unfilled and merges with the most southern part of the main English Channel palaeo-valley. It also appears from bathymetric data that the smaller channels drain into an embayment feature. Five vibrocores containing peat layers from locations across the main Arun palaeo-valley were sampled. The samples were all located on riverbank terraces in the unfilled area of the valley system. All of the samples were taken within the same seismostratigraphic level or the youngest incision, most probably reflecting the Younger Dryas event. However, changes in local sea level and meandering of the channels will shift similar environments not only in space but also in time.

Objectives: up to now there is no time control on the development and evolution of the different geomorphological and depositional features in the palaeo-valley. The dating of the most recent incision in the area will provide a date when the sea level last rose and drowned the

river system, and the potential areas for occupation along the riverbanks. The dating of similar peat layers at different geographic and geomorphological occupations will illustrate the variation of the environment and evolution of the river system. These dates will be used to compare with OSL dates of cores in the same area to set up a chronostratigraphy.

References: Gupta *et al* 2004

GrA–23799 9300 ±60 BP

$\delta^{13}C$: -27.5‰

Sample: VC30, submitted on 4 August 2003 by J Dickinson

Material: plant macrofossils (<1g) (four leaf fragments)

Initial comment: infill sequence of the last incision of the valley system. The infill is covered by a transgressive veneer. Local environment is buried fluvial channel infilled by fine-grained sediments (silty-clay). The upper 12cm contains sand. The lower portion of the core consists of clay inter-bedded by sand. Two peat layers occur at 237–55cm and 371–400cm. The water depth is 15.0–26.7m. Sample from base of lower peat layer, estimated altitude -38.38m OD.

Objectives: there are two peat horizons present within the vibrocore from which this sample is taken. The dating of this lower sample will establish how these relate to the two peat samples (VC15 and VC34) from different stratigraphic heights in different cores to the east. This sample is also taken from the channel farthest to the west, thus providing a comparison with dates from the eastern channels.

Calibrated date: *1σ:* 8630–8460 cal BC
2σ: 8720–8320 cal BC

Final comment: J Dickinson (18 March 2003), the age of the peats all fall within an interval after the last glacial maximum, during the subsequent transgression. The dates indicate that the palaeo-Arun was still sub-aerially exposed at 8240 cal BC, and perhaps as late as 7600 cal BC, and at this time the sea had yet to flood the area. There is a strong correlation between the age of the sample and the depth at which it was collected, such that the greater the depth of peat below OD, the older the deposition. This possibly reflects the influence of the advancing sea, with environments appropriate for peat accumulation retreating landward, resulting in peat deposition at progressively higher altitudes.

GrA–23802 8870 ±60 BP

$\delta^{13}C$: -26.9‰

Sample: VC34, submitted on 4 August 2003 by J Dickinson

Material: plant macrofossil (<1g) (probably a stem, possibly a monocotyledon)

Initial comment: infill sequence of the last incision of the valley system. The infill is covered by a transgressive veneer. Local environment is buried fluvial channel infilled by fine-grained sediments (silt-clay). The upper 20cm of the core consists of gravel (brown flint and shells). The lower part contains clay with black organic stains and root modules at 201–15cm and a peat layer is intercalated. The water depth is 15.0–26.0m. Sample from base of peat layer, estimated altitude -32.13m OD.

Objectives: to establish the age of a terrace associated with a central channel. To determine if this sample at a higher stratigraphic height than VC30 is in fact older or represents different rates of sedimentation between the two or changes in the meander of the channel.

Calibrated date: *1σ:* 8220–7940 cal BC
2σ: 8250–7750 cal BC

Final comment: see GrA-23799

GrA–23803 9770 ±60 BP

$\delta^{13}C$: -28.8‰

Sample: VC55, submitted on 4 August 2003 by J Dickinson

Material: plant macrofossils (<1g) (three leaves, possibly monocotyledonous)

Initial comment: infill sequence of the last incision of the valley system. The infill is covered by a transgressive veneer. Local environment is buried fluvial channel, infilled by fine-grained sediments (silt-clay). The upper 15cm consists of fine sand and gravel. The lower part of the core contains clay with rootlets. The peat horizon appears in the clay at 228-–4cm below the sea floor. The water depth is 28.5m. Sample from base of peat horizon, estimated altitude -41.82m OD.

Objectives: to determine the age of the embayment formation relative to the channels which feed it, and thereby establish if there is a connection between the formation of the two or if this took place at different periods in the systems evolution.

Calibrated date: *1σ:* 9290–9220 cal BC
2σ: 9320–9150 cal BC

Final comment: see GrA-23799

GrA–24568 8870 ±60 BP

$\delta^{13}C$: -26.2‰

Sample: ICVC1 306–7cm, submitted on 25 November 2003 by J Dickinson

Material: plant macrofossil (<2g) (herbaceous plant fragment)

Initial comment: infill sequence of the terrace, which forms the eastern margin of the main channel of the Arun palaeo-valley. The infill is covered by a transgressive veneer. Local environment is buried fluvial channel infilled by fine-grained sediments. The upper 18cm of the core consists of gravely sand. The lower part of the core contains silty clay with an interval of peat at 297–307cm and 432–42cm. The water depth to the top of the core is -28.6m OD, and the depth of the sample is -31.6m OD.

Objectives: to establish the age of the terrace to the east of the main channel of the Arun palaeo-valley. To determine the timing of development of this terrace with the excavated portion of the main channel which it flanks. A second objective is to determine the chronology and timing of deposition and erosion of the southern portion of the valley system. Thirdly, to compare the age for this sample with those derived from peat horizons in cores further to the south and thereby establish the rate of sea level rise associated with this area of the English Channel. Finally, to compare with the second peat within this vibrocore (ICVC1), to determine the association of the timing of peat accumulation with sea level change in the area.

Calibrated date: *1σ:* 8220–7940 cal BC
2σ: 8250–7750 cal BC

Final comment: see GrA-23799

GrA–24569 9200 ±60 BP

$\delta^{13}C$: -28.6‰

Sample: ICVC1 440–1cm, submitted on 25 November 2003 by J Dickinson

Material: plant macrofossil (<2g) (herbaceous leaf fragment, monocotyledon)

Initial comment: infill sequence of the terrace, which forms the eastern margin of the main channel of the palaeo-Arun. The infill is covered by a transgressive veneer. Local environment is buried fluvial channel infilled by fine-grained sediments. The upper 18cm of the core consists of gravely sand. The lower part of the core contains silty clay with an interval of peat at 294–307cm and 432–42cm. The water depth of the top of the core is -28.6m OD, depth of the sample is -33.0m OD.

Objectives: to establish the age of the terrace to the east of the main channel of the Arun palaeo-valley. To determine the timing of development of this terrace with the excavated portion of the main channel which its flanks. To determine the chronology and timing of deposition and erosion of the southern portion of the valley system. To compare the age for this sample with those derived from peat horizons in cores further to the south and thereby establish the rate of sea level rise associated with this area of the English Channel.

Calibrated date: *1σ:* 8540–8300 cal BC
2σ: 8610–8280 cal BC

Final comment: see GrA-23799

GrN–28212 9100 ±110 BP

$\delta^{13}C$: -26.7‰

Sample: VC15, submitted on 4 August 2003 by J Dickinson

Material: peat (6.50g)

Initial comment: infill sequence of the last incision of the valley system. The incision is probably of Younger Dryas age. The infill is covered by a transgressive veneer. Local environment is buried fluvial channel infilled by fine-grained sediments (silt-clay). The upper 22cm of the core consists of gravel. The lower portion out of clay with organic staining. The peat is interbedded in the clay between 135–48cm. The water depth of sampling is 27.0m. Sample from base of peat layer, estimated altitude -31.96m OD.

Objectives: to provide an age for the terrace on a central channel and correlate this with the nearby but stratigraphically higher VC34. To establish if the two peats (VC15 and VC34) are of the same age or not, which may reflect two different cycles of channel formation related to channel meander.

Calibrated date: *1σ:* 8450–8240 cal BC
2σ: 8610–7980 cal BC

Final comment: see GrA-23799

GrN–28213 9550 ±60 BP

$\delta^{13}C$: -27.9‰

Sample: VC58, submitted on 4 August 2003 by J Dickinson

Material: peat (6.90g) (-38.18m OD)

Initial comment: infill sequence of the last incision of the valley system. The infill is covered by a transgressive veneer. Local environment is buried fluvial channel infilled by fine-grained sediments. The upper 12cm consists of fine sand. The lower part of the core contains silty clay with an intercalation of peat at 280–90cm below the sea floor. The water depth is 32.6m. Sample from base of peat layer, estimated altitude -38.18m OD.

Objectives: to establish an age of information for the terrace associated with the eastern-most channel of the Arun palaeo-valley system. Furthermore, to provide a comparative sample for the age of the embayment (VC55), which this channel drains into and see how it correlates with the peat on the other terraces.

Calibrated date: *1σ:* 9140–8770 cal BC
2σ: 9220–8720 cal BC

Final comment: see GrA-23799

OxA–12975 8820 ±70 BP

$\delta^{13}C$: -29.5‰

Sample: VC9 145–6cm, submitted on 25 November 2003 by J Dickinson

Material: plant macrofossil (<2g) (herbaceous plant fragments, leaf and root/tuber)

Initial comment: infill sequence of the last incision of the valley system. The infill is covered by a transgressive veneer. Local environment is buried fluvial channel infilled by fine-grained sediments. The upper 25cm of the core consists of gravelly sand. The lower part of the core contains sandy-silty clay with an interval of peat at 124–45cm and 385–88cm. The water depth to the top of the core is -31.0m OD, and the altitude of the sample is -32.5m OD.

Objectives: to establish the age of the main channel of the Arun palaeo-valley. To compare the age for this sample with those derived from peat horizons in cores further to the south and thereby establish the rate of sea level rise associated with this area of the English Channel. To compare the radiocarbon ages with OSL dates derived from sands within the fill of the main channel.

Calibrated date: *1σ:* 8190–7750 cal BC
2σ: 8240–7610 cal BC

Final comment: see GrA-23799

OxA–12976 8820 ±70 BP

$\delta^{13}C$: -29.5‰

Sample: ICVC9 387–8cm, submitted on 25 November 2003 by J Dickinson

Material: plant macrofossil (<2g) (herbaceous leaf material, monocotyledon)

Initial comment: infill sequence of the last incision of the valley system. The infill is covered by a transgressive veneer.

Local environment is buried fluvial channel infilled by fine-grained sediments. The upper 25cm of the core consists of gravelly sand. The lower part of the core contains sandy-silty clay with an interval of peat at 124–45cm and 38–-88cm. The water depth of the top of the core is -31.0m OD, and the water depth of the sample is -34.9m OD.

Objectives: to establish the age of the main channel of the Arun palaeo-valley. To compare the age for this sample with those derived from peat horizons in cores further to the south and thereby establish the rate sea level rise associated with this area of the English Channel. To compare the radiocarbon ages with OSL dates derived from sands within the fill of the main channel. To compare with the second peat within this vibrocore (VC9), to determine the association of the timing of peat accumulation with sea level change in the area.

Calibrated date: *1σ:* 8190–7750 cal BC
2σ: 8240–7610 cal BC

Final comment: see GrA-23799

Southworth Hall Farm, Southworth-with-Croft, Cheshire

Location: SJ 623941
Lat. 53.26.34 N; Long. 02.34.06 W

Project manager: R Cowell (National Museums Liverpool), April-May 2003

Archival body: Liverpool Museum, pending transfer to Warrington Museum

Description: the site lies on a low sandstone promontory at a height of *c* 30m OD, on land that has been ploughed until recently. It includes a Romano-British cropmark enclosure and a number of small flint scatters of early and later prehistoric date. Trial excavations adjacent to the enclosure in 1993 produced a number of pits, postholes, and gulleys, indicative of settlement activity. This activity was not dated as no finds were recovered, even though sieving was employed. Trial trenches were also dug in relation to the location of a number of the flint scatters. There were more subsurface features in areas where early Bronze Age surface flintwork was more common than earlier prehistoric flintwork. These consisted of a number of widely scattered pits, some of which had been recut. One of these produced a few sherds of later prehistoric pottery; the rest yielded only small fragments of burnt material. One trench, close to the surface findspot of a fine early Bronze Age flint, exposed a large, shallow hollow. This contained a few small fragments of possible prehistoric pottery, and was cut by the occasional pit, but neither its date nor their function were clear from the excavations.

Objectives: to try to identify whether there is a horizon of activity in the later prehistoric period characterised by the digging of scattered pits, and to see whether there is a potential link between this activity and the earlier Bronze Age flintwork found on the surface in the same areas of the site.

References: Cowell 1992
Philpott *et al* 1993

OxA–13078 4855 ±34 BP

$\delta^{13}C$: -22.0‰

Sample: 243A, submitted in September 2003 by R Cowell

Material: plant macrofossil: *Corylus avellana*, nutshell, charred, a single fragment (<5g) (E Huckerby 2003)

Initial comment: sample from context 2027, a lower fill of pit 2028, consisting of silty mid-to-dark-grey mottled brown loamy sand with frequent flecks of charred material. This fill was cut by a later pit, 2026, whose fill, 2025, was sandier and a strong yellow-brown in colour, and contained later prehistoric pottery. The contrast between the fills of the two pits suggests that they were not mixed, and that samples from context 2027 are not intrusive. The pottery from 2025 could date from the Bronze Age to the late Iron Age. Surface finds in this area included probable early Bronze Age flint and the occasional early prehistoric flint, suggesting activity nearby in both periods.

Objectives: to date the fill of this feature and, together with other samples in this series, to establish the general date of activity represented by a series of scattered pits in one corner of the field. This will help to determine whether there was a single phase of pit digging activity (perhaps in the early Bronze Age) or whether this activity took place over several periods, in contrast to permanent settlement, which seems to have been restricted to the Romano-British period. The date will also provide a *terminus post quem* for the prehistoric pottery, which is not closely datable in this region. The low density of features in this part of the field suggests that 2026 was an intentional recut of pit 2028, which implies that the pottery in 2025 may not be much later than the fill of 2027.

Calibrated date: *1σ:* 3660–3630 cal BC
2σ: 3710–3530 cal BC

Final comment: R Cowell (23 August 2004), the radiocarbon evidence suggests that in each of the two areas, lying *c* 100m apart, burning took place in the early prehistoric period (Mesolithic/early Neolithic), and that features contemporary with early Bronze Age flintwork in these areas either do not exist or were not sampled. The two areas are *c* 140–200m from the main distribution of early prehistoric lithics in the field, although each produced a few surface pieces of flint waste potentially of this date, which may provide a context for the activity associated with the burning at these locations. The dates suggest that at each location early to mid-Neolithic activity incorporated burnt material from a little earlier into pit fills. The two pits from which dates were obtained also contained charred cereals. That both pits contain residual material places a little uncertainty on the association between the charred cereals and the dated hazelnut from them, but equally, there may be the potential here for the earliest evidence, in the early part of the fouth millennium BC, for domesticated plants in the region. The fact that one pit with early Neolithic burnt material cut a potential ancient truncated soil profile, containing possible ard marks, as well as charred cereals and a sherd of probable prehistoric pottery, may also enhance the potential for identifying facets of early to mid Neolithic settlement and subsistence here. OxA-13139, and a little Mesolithic struck flint within *c* 100m of the pits, suggest activity had also place in the same locations several centuries earlier, in the late Mesolithic, possibly around the time that that Neolithic culture was being adopted in the North-West. Thus, allowing

for the fact that the evidence is sparse and relates to archaeologically ephemeral activity identified in an evaluation, the series of dates obtained helps to suggest that evidence of relevance to understanding the nature of early and mid-Neolithic subsistence and settlement in the region and to the relationship between Mesolithic hunter-gatherers and farmers may potentially exist at Southworth Hall Farm.

OxA–13079 5042 ±34 BP

$\delta^{13}C$: -25.2‰

Sample: 243B, submitted in September 2003 by R Cowell

Material: plant macrofossil: *Corylus avellana*, nutshell, charred (<5g) (E Huckerby 2003)

Initial comment: as OxA-10378

Objectives: as OxA-10378

Calibrated date: *1σ:* 3950–3780 cal BC
2σ: 3960–3710 cal BC

Final comment: see OxA-13078

OxA–13138 4890 ±170 BP

$\delta^{13}C$: -29.5‰

Sample: 251A, submitted in September 2003 by R Cowell

Material: plant macrofossil: *Corylus avellana*, nutshell, charred (E Huckerby 2003)

Initial comment: sample from context 2159, fill of pit/posthole 2160, consisting of silty sand mottled with dark grey silt, occasionally 'peaty'. The pit was cut into context 2155, a light brown sandy layer, which may have been a buried soil or the fill of a larger archaeological feature extending beyond the excavated area. Small fragments of pottery, possibly pre-Roman, were found on the surface of this layer, and unstratified early prehistoric and early Bronze Age flints were found in the same general area. The fills of the pit may include material derived from this earlier layer.

Objectives: to date the fill of this feature and, together with other samples in this series, to establish the general date of activity represented by a series of scattered pits in one corner of the field. This will help to determine whether there was a single phase of pit digging activity (perhaps in the early Bronze Age) or whether this activity took place over several periods, in contrast to permanent settlement, which seems to have been restricted to the Romano-British period. The date of the sample may also be relevant to the date of the layer, 2155, into which pit 2160 was cut.

Calibrated date: *1σ:* 3940–3520 cal BC
2σ: 4050–3350 cal BC

Final comment: see OxA-13078.

OxA–13139 5500 ±140 BP

$\delta^{13}C$: -27.1‰

Sample: 251B, submitted in September 2003 by R Cowell

Material: plant macrofossil: *Corylus avellana*, nutshell, charred (E Huckerby 2003)

Initial comment: as OxA-13138

Objectives: as OxA-13138

Calibrated date: *1σ:* 4460–4230 cal BC
2σ: 4690–3990 cal BC

Final comment: see OxA-13078

Spratsgate Lane, Somerford Keynes, Gloucestershire

Location: SU 02429579
Lat. 51.39.38 N; Long. 01.57.54 W

Project manager: J Vallender (Gloucestershire County Council Archaeology Service), 1995–6

Archival body: Corinium Museum

Description: middle Iron Age settlement, covering 2.2ha, with several roundhouses, stockyards, a boundary ditch with two gateways, and a well outside one of the gateways. Some features of Bronze Age date.

Objectives: to confirm the middle Iron Age date of the fill of this well, which can be compared to similar features 600m to the north-west, which date to the middle Bronze Age and were considered to be peculiar to that period.

References: Brossler *et al* 2002

OxA–12803 2207 ±29 BP

$\delta^{13}C$: -28.0‰

Sample: PRN 2318 [706], submitted in September 2003 by J Vallender

Material: carbonised residue (adhering to the interior surface of a pot sherd)

Initial comment: [706] is the fill of cut [704], a large pit, 1.2m in width and 1m in depth.

Objectives: to date the fill of this feature.

Calibrated date: *1σ:* 370–200 cal BC
2σ: 390–180 cal BC

Final comment: J Vallender (6 September 2004), dating of the sherd from the backfill of the well confirmed it was still in use into the middle Iron Age. It also confirmed that date of the ceramic sequence for the settlement site. The well is not a unique landscape/settlement feature for the Upper Trent Valley, but features of this type are not usually associated with Bronze Age activity.

St Osyth Lodge Farm, Essex

Location: TM 13551545
Lat. 51.47.49 N; Long. 01.05.44 E

Project manager: M Germany (Essex County Council Field Archaeology Unit) May–November 2000; August 2001–February 2003

Description: rural site, 4.3ha in area, excavated in advance of aggregate extraction. The main feature was a causewayed enclosure with three ditch circuits. Within it were many small pits containing large groups of Neolithic artefacts. Pieces of Grooved Ware in the topmost fills of the

causewayed enclosure ditches indicate that they were still partly open in the late Neolithic. In the middle of the causewayed enclosure are an early Bronze Age pond barrow and a large group of middle Bronze Age ring ditches. Scorched ground and an unurned cremation within the pond barrow suggest that it was used for cremation fires, as do the cremations in large Collared Urns on its outside edge. In and around the middle Bronze Age ring ditches are many cremations in Bucket Urns. A middle Iron Age settlement of roundhouses, post-built structures, enclosures, and trackways overlies the earlier features.

Objectives: sufficient dating material was available to date the Bronze Age cremation activity, and the early Neolithic pit digging phase, which appears to be related to the construction of the causewayed enclosure, to a degree of precision that would be archaeologically useful.

Final comment: M Germany (6 August 2004), series A and C demonstrate that the causewayed enclosure and the activity that took place inside it had a duration of about 40 years. The radiocarbon dates indicate that the monument was in use in either *c* 3550 BC or *c* 3650 BC. Series B has dated the pond barrow and the early Bronze Age and middle Bronze Age cremation cemeteries, and demonstrate that they were separated by a period of about 200 years.

References: Hamilton *et al* 2007

St Osyth Lodge Farm: A (Neolithic pits), Essex

Location: TM 13551545
Lat. 51.47.49 N; Long. 01.05.44 E

Project manager: M Germany (Essex County Council Field Archaeology Unit), May–November 2000; August 2001–February 2003

Archival body: Colchester Museum

Description: one hundred and twenty small Neolithic pits across the interior of the causewayed enclosure were excavated. Each contained up to eight deposits. Large groups of Mildenhall Ware and/or worked flint were found in many of the pits. Many pits were arranged in groups of two, three, or four.

Objectives: to determine whether activity within the causewayed enclosure was episodic, prolonged, or short-lived. To establish whether pit-digging occurred in different areas of the enclosure at different times.

Final comment: M Germany (6 August 2004), the dating of the ten Neolithic pits has established that the activity carried out within the interior area of the causewayed enclosure was unexpectedly relatively short-lived with a duration of about 40 years. Consequently, it has not been possible to determine if the focus of the pitting and the type of material being deposited in the pits changed overtime.

References: Hamilton *et al* 2007

GrA–23769 4830 ±40 BP

$\delta^{13}C$: -25.6‰

Sample: [98] 7B, submitted on 25 July 2003 by M Germany

Material: charcoal: *Corylus avellana*, shell, a single carbonised fragment (<5g) (V Fryer 2003)

Initial comment: the sample came from a small pit 96, 0.9m wide, and 0.32m deep, containing three deposits (97, 98, and 99). The pit was located close to a segment of one of the causewayed enclosure ditches in the north-east corner of the site. The sample was from the second fill, 98, a dark grey/black/brown silty sand which contained a very large cache (4.5kg) of cores, chippings, and unfinished flint tools (like nearby pit 103), and rare flecks of carbonised macrofossils. The pit was not stratigraphically related to any other excavated feature, but was truncated by modern ploughing. It was cut into the glacio-fluvial drift deposit of acidic sand and gravel, and was sealed by 0.3m of modern ploughsoil. The bottom of the pit was *c* 1m above the watertable before excavation began.

Objectives: to assess whether carbonised plant remains in Neolithic pits have the potential to meet the objectives of this series, and to assess whether this pit was contemporary with the nearby pit 103 (which may indicate a short phase of flintworking in this area of the site).

Calibrated date: *1σ:* 3650–3540 cal BC
2σ: 3700–3520 cal BC

Final comment: M Germany (6 August 2004), this sample was part of an initial assessment to determine the potential of the carbonised material from St Osyth for ^{14}C dating. The dating established that pit 96 was more or less contemporary with the other Neolithic pits, including nearby pit 103, which like 96 contained evidence for a flintworking area in the north-east part of the excavation.

Laboratory comment: Ancient Monuments Laboratory (2004), the two results from this context (GrA-23769 and OxA-12617) are statistically consistent, according to the method of Ward and Wilson (1978) ($T'=0.1, T'(5\%)=3.8, \nu=1$).

References: Ward and Wilson 1978

GrA–23770 4910 ±45 BP

$\delta^{13}C$: -27.0‰

Sample: [102] 8A, submitted on 12 July 2004 by M Germany

Material: charcoal: *Corylus avellana*, shell, a single carbonised fragment (<5g) (V Fryer 2003)

Initial comment: the sample came from a small pit 103, 0.75m wide and 0.42m deep, containing a single deposit, 102. The pit was located close to a segment of one of the causewayed enclosure ditches in the north-east corner of the site. The sample was fill 102, a black sand silt, which contained a small amount of Mildenhall ware (0.4kg), a very large cache (6.8kg) of cores, chippings, and unfinished flint tools (like nearby pit 98), and infrequent lumps and flecks of charcoal. The west side of the pit was cut by an Iron Age ditch 111, with a single fill 110. The pit was cut into the glacio-fluvial drift deposit of acidic sand and gravel, and was sealed by 0.3m of modern ploughsoil. The bottom of the pit was *c* 1m above the watertable before excavation began.

Objectives: to assess whether carbonised plant remains in Neolithic pits have the potential to meet the objectives of this series, and to assess whether this pit was contemporary with the nearby pit 96 (which may indicate a short phase of flintworking in this area of the site).

Calibrated date: *1σ:* 3710–3640 cal BC
2σ: 3790–3630 cal BC

Final comment: see GrA-23769

Laboratory comment: Ancient Monuments Laboratory (2004), the two results from this context (GrA-23770 and OxA-12615) are not statistically consistent, according to the method of Ward and Wilson (1978) (T′=5.2, T′(5%)=3.8, ν=1).

References: Ward and Wilson 1978

GrA–23771 4825 ±45 BP

$\delta^{13}C$: -24.5‰

Sample: [1129] 69B, submitted on 27 July 2003 by M Germany

Material: plant macrofossil: *Corylus avellana*, shell, a single carbonised fragment (<5g) (V Fryer 2003)

Initial comment: the sample came from a small pit 1114 measuring 0.87m long, 0.4m wide, and 0.6m deep, containing four deposits (1115, 1116, 1128, and 1129). The pit was located within the interior of the causewayed enclosure. The samples have been extracted from the primary fill 1129 - a greyish black sand silt with infrequent lumps and flecks of charcoal, which occupies the lower 25%. The pit contains more than 4kg of worked flint and over 2kg of Mildenhall ware. Most of these finds come from the primary deposit. The pit touches no other features, but has been truncated by 0.3m by modern ploughing. The pit was cut into the glacio-fluvial drift deposit of acidic sand and gravel, and was sealed by 0.3m of modern ploughsoil. The bottom of the pit was *c* 1m above the watertable before excavation began.

Objectives: to assess whether carbonised plant remains in Neolithic pits have the potential to meet the objectives of this series, and to assess whether this pit was contemporary with other Neolithic pits (series A).

Calibrated date: *1σ:* 3650–3530 cal BC
2σ: 3700–3520 cal BC

Final comment: M Germany (6 August 2004), this sample was part of an initial assessment to determine the potential of the carbonised material from St Osyth for a programme of ^{14}C dating. The carbon dating of the sample established that pit 1114 was more or less contemporary with the other Neolithic pits, and the activity carried out within the area of the causewayed enclosure was (unexpectedly) a relatively short-lived (*c* 40 years) affair.

Laboratory comment: Ancient Monuments Laboratory (2004), the two results from this context (GrA-23771 and OxA-12614) are statistically consistent, according to the method of Ward and Wilson (1978) (T′=0.0, T′(5%)=3.8, ν=1).

References: Ward and Wilson 1978

GrA–23825 4910 ±50 BP

$\delta^{13}C$: -22.5‰

Sample: [1433] 78B, submitted on 25 July 2003 by M Germany

Material: plant macrofossil: *Corylus avellana*, shell, a single carbonised fragment (<5g) (V Fryer 2003)

Initial comment: the sample came from a small pit 1432, 0.86m long, 0.43m wide, and 0.36m deep, containing three deposits (1435, 1434, and 1433). The pit was located within the interior of the causewayed enclosure. The samples have been extracted from the primary fill 1433 - a greyish brown sand silt with infrequent lumps and flecks of charcoal, which is slumped against the sides of the feature. The pit contains more than 0.6kg of worked flint and over 2.2kg of Mildenhall ware. Most of these finds come from the primary deposit. The pit touches no other features, but has been truncated by 0.3m by modern ploughing. The pit was cut into the glacio-fluvial drift deposit of acidic sand and gravel, and was sealed by 0.3m of modern ploughsoil. The bottom of the pit was *c* 1m above the watertable before excavation began.

Objectives: to assess whether carbonised plant remains in Neolithic pits have the potential to meet the objectives of this series, and to assess whether this pit was contemporary with other Neolithic pits (series A).

Calibrated date: *1σ:* 3710–3640 cal BC
2σ: 3800–3630 cal BC

Final comment: M Germany (6 August 2004), this sample was part of an initial assessment to determine the potential of the carbonised material from St Osyth for a programme of ^{14}C dating. The radiocarbon dating of the sample established that pit 1432 was more or less contemporary with the other Neolithic pits, and the activity carried out within the area of the causewayed enclosure was (unexpectedly) relatively short-lived (*c* 40 years).

Laboratory comment: Ancient Monuments Laboratory (2004), the two results from this context (OxA-12616 and GrA-23825) are not statistically consistent, according to the method of Ward and Wilson (1978) (T′=3.9, T′(5%)=3.8, ν=1). GrA-23825 may be residual.

References: Ward and Wilson 1978

GrA–24654 4840 ±50 BP

$\delta^{13}C$: -26.7‰

Sample: [13818] 381B, submitted on 27 November 2003 by M Germany

Material: charcoal: *Corylus avellana*, shell, a single carbonised fragment (<5g) (V Fryer 2003)

Initial comment: the two samples came from a small pit 13817, 0.75m long, 0.66m wide, and 0.34m deep, containing two deposits (13818 and 13819), located in the space between the inside and outside circuits of the causewayed enclosure. Both samples have been extracted from the primary fill 13818 - a dark greyish brown silt sand with frequent flecks of charcoal and small to large pieces of carbonised wood, which contained 94g of Mildenhall ware and 192g of worked flint. No finds were found in the top deposit. The pit is in contact with no other features, and modern ploughing has truncated it by 0.3m. The pit cuts a glacio-fluvial drift deposit of brownish grey sand silt 13661. The bottom of the pit was *c* 1m above the watertable.

Objectives: is the pit contemporary with the other Neolithic pits (series A) within the causewayed enclosure, or was activity within the causewayed enclosure spread out over a long period of time? If the latter, then did the type of material being deposited in the pits change over time?

Calibrated date: *1σ:* 3660–3540 cal BC
2σ: 3710–3520 cal BC

Final comment: M Germany (6 August 2004), this date established that pit 3817 was more or less contemporary with the other Neolithic pits, and the activity carried out within the area of the causewayed enclosure was relatively short-lived (*c* 40 years).

Laboratory comment: Ancient Monuments Laboratory (2004), the two results from this context (GrA-24654 and OxA-13011) are statistically consistent, according to the method of Ward and Wilson (1978) (T′=1.0, T′(5%)=3.8, ν=1).

References: Ward and Wilson 1978

GrA–24655 4860 ±60 BP

$\delta^{13}C$: -25.0‰

Sample: [6089] 226A, submitted on 27 November 2003 by M Germany

Material: charcoal: *Corylus avellana*, shell, a single carbonised fragment (<5g) (V Fryer 2003)

Initial comment: the two samples came from a small pit 6088, 0.76m diameter and 0.26m deep, containing one deposit 6089 - a greyish black sandy silt with occasional small flecks and lumps of charcoal, located within the interior of the causewayed enclosure. It contains 1075g of Mildenhall ware and 241g of worked flint. A small undatable posthole 6036 cuts the west side of the pit. Modern ploughing has truncated both features by 0.3m. The pit cuts a glacio-fluvial drift deposit of acidic sand and gravel. The bottom of the pit was *c* 1m above the watertable.

Objectives: as GrA-24654

Calibrated date: *1σ:* 3700–3630 cal BC
2σ: 3770–3520 cal BC

Final comment: M Germany (6 August 2004), this date established that pit 6088 was more or less contemporary with the other Neolithic pits, and the activity carried out within the area of the causewayed enclosure was relatively short-lived (*c* 40 years).

Laboratory comment: Ancient Monuments Laboratory (2004), the two results from this context (GrA-24655 and OxA-13010) are statistically consistent, according to the method of Ward and Wilson (1978) (T′=0.4, T′(5%)=3.8, ν=1).

References: Ward and Wilson 1978

GrA–25017 4780 ±40 BP

$\delta^{13}C$: -28.3‰

Sample: [5821] 223B, submitted on 27 November 2003 by M Germany

Material: charcoal: *Corylus avellana*, shell, a single carbonised fragment (<5g) (V Fryer 2003)

Initial comment: the two samples came from a small pit 5819, 1.13m diameter and 0.26m deep, containing two deposits (5820 and 5821). Both samples come from the primary fill 5821 - a dark greyish brown silt sand with frequent flecks of charcoal, which contains 937g of Mildenhall ware and 1404g of worked flint. No finds were found in the top deposit. The feature is in contact with no other archaeological cuts or deposits, and is in a small group with two other Neolithic pits (5817 and 5758). The pit cuts a glacio-fluvial drift deposit of acidic sand and gravel and is sealed by 0.3m of modern sandy ploughsoil. The bottom of the pit was *c* 1m above the watertable.

Objectives: as GrA-24654

Calibrated date: *1σ:* 3640–3520 cal BC
2σ: 3650–3380 cal BC

Final comment: M Germany (6 August 2004), this date established that pit 5819 was more or less contemporary with the other Neolithic pits, and the activity carried out within the area of the causewayed enclosure was (unexpectedly) relatively short-lived (*c* 40 years).

Laboratory comment: Ancient Monuments Laboratory (2004), the two results from this context (GrA-25017 and OxA-13009) are statistically consistent, according to the method of Ward and Wilson (1978) (T′=1.4, T′(5%)=3.8, ν=1).

References: Ward and Wilson 1978

GrA–25018 4785 ±40 BP

$\delta^{13}C$: -23.2‰

Sample: [4082] 195B, submitted on 27 November 2003 by M Germany

Material: charcoal: *Corylus avellana*, shell, a single carbonised fragment (<5g) (V Fryer 2003)

Initial comment: the two samples came from a small pit 4060, 1.23m long, 1.14m wide, and 0.62m deep, containing five deposits (4061, 4062, 4068, 4081, and 4082). The pit was located within the interior of the causewayed enclosure. The samples have been extracted from the primary fill 4082 - a black silt sand with frequent small lumps and flecks of charcoal. The pit contains 2249g of Mildenhall Ware and 280g of worked flint. Forty percent of the pottery comes from the primary fill. The pit clips pit 4084, which contains one deposit, but no finds or charcoal. The pit cuts a small, shallow, undatable pit with no finds or charcoal, 4084, and has been dug into a glacio-fluvial drift deposit of acidic sand and gravel. The bottom of the pit was *c* 1m above the watertable.

Objectives: as GrA-24654

Calibrated date: *1σ:* 3640–3520 cal BC
2σ: 3650–3380 cal BC

Final comment: M Germany (6 August 2004), this date established that pit 4060 was more or less contemporary with the other Neolithic pits, and the activity carried out within the area of the causewayed enclosure was (unexpectedly) relatively short-lived (*c* 40 years).

Laboratory comment: Ancient Monuments Laboratory (2004), the two results from this context (GrA-25018 and OxA-13007) are statistically consistent, according to the method of Ward and Wilson (1978) (T′=1.5, T′(5%)=3.8, ν=1).

References: Ward and Wilson 1978

GrA–25022 4740 ±45 BP

$\delta^{13}C$: -29.0‰

Sample: [2341]B, submitted on 27 November 2003 by M Germany

Material: carbonised residue (<5g) (on sherd of Mildenhall ware)

Initial comment: the sample came from a small pit 2340, 0.75m long, 0.63m wide, and 0.26m deep, containing one deposit 2341 - a brown silt sand with frequent small lumps and flecks of charcoal. Located within the interior of the causewayed enclosure. The pit contained 2666g of Mildenhall Ware and 445g of worked flint. The pit is in contact with no other features, and is one of a small group of four Neolithic features (2340, 2337, 2403, and 2398), which appear to be contemporary. Modern ploughing has truncated it by 0.3m. The pit cuts a glacio-fluvial drift deposit of acidic sand and gravel. The bottom of the pit was *c* 1m above the watertable.

Objectives: as GrA-24654

Calibrated date: *1σ:* 3640–3380 cal BC
2σ: 3640–3370 cal BC

Final comment: M Germany (6 August 2004), this date established that pit 2340 was more or less contemporary with the other Neolithic pits, and the activity carried out within the area of the causewayed enclosure was (unexpectedly) relatively short-lived (*c* 40 years).

Laboratory comment: Ancient Monuments Laboratory (2004), the two results from this context (GrA-25022 and OxA-13008) are statistically consistent, according to the method of Ward and Wilson (1978) (T′=0.0, T′(5%)=3.8, ν=1).

References: Ward and Wilson 1978

OxA–12614 4828 ±37 BP

$\delta^{13}C$: -23.0‰

Sample: [1129] 69A, submitted on 27 July 2003 by M Germany

Material: charcoal: *Corylus avellana*, shell, a single carbonised fragment (<5g) (V Fryer 2003)

Initial comment: as GrA-23771

Objectives: as GrA-23771

Calibrated date: *1σ:* 3650–3540 cal BC
2σ: 3700–3520 cal BC

Final comment: see GrA-23771

Laboratory comment: see GrA-23771

OxA–12615 4777 ±37 BP

$\delta^{13}C$: -25.3‰

Sample: [102] 8A, submitted on 12 July 2003 by M Germany

Material: charcoal: *Corylus avellana*, nutshell, a single fragment (<5g) (V Fryer 2003)

Initial comment: as GrA-23770

Objectives: as GrA-23770

Calibrated date: *1σ:* 3640–3520 cal BC
2σ: 3650–3380 cal BC

Final comment: see GrA-23770

Laboratory comment: see GrA-23770

OxA–12616 4787 ±37 BP

$\delta^{13}C$: -23.7‰

Sample: [1433] 78A, submitted on 25 July 2003 by M Germany

Material: charcoal: *Corylus avellana*, nutshell, a single carbonised fragment (<5g) (V Fryer 2003)

Initial comment: as GrA-23825

Objectives: as GrA-23825

Calibrated date: *1σ:* 3640–3520 cal BC
2σ: 3650–3380 cal BC

Final comment: see GrA-23825

Laboratory comment: see GrA-23825

OxA–12617 4812 ±35 BP

$\delta^{13}C$: -25.3‰

Sample: [98] 7A, submitted on 25 July 2003 by M Germany

Material: plant macrofossil: *Corylus avellana*, nutshell, a single fragment (<5g) (V Fryer 2003)

Initial comment: as GrA-23769

Objectives: as GrA-23769

Calibrated date: *1σ:* 3650–3530 cal BC
2σ: 3660–3520 cal BC

Final comment: see GrA-23769

Laboratory comment: see GrA-23769

OxA–12978 3800 ±650 BP

$\delta^{13}C$: -28.4‰

Sample: [1191], submitted on 27 November 2003 by M Germany

Material: carbonised residue (on sherd of Mildenhall Ware (<5g))

Initial comment: the sample came from a small pit 1189, 0.87m long, 0.8m wide, and 0.35m deep, containing two deposits (1190 and 1191), located within the interior of the causewayed enclosure. The pit contained 73g of Mildenhall Ware and 16g of worked flint. The top deposit 1191, from which the sherd comes, contain most of the finds and fills the bulk of the feature. The pit is in contact with no other features, and modern ploughing has truncated it by 0.3m. The pit cuts a glacio-fluvial drift deposit of acidic sand and gravel. The primary deposit 1990 is a light yellowish brown deposit of loose silt sand. The bottom of the pit was *c* 1m above the watertable.

Objectives: as GrA-24654

Calibrated date: *1σ:* 3270–1430 cal BC
2σ: 4040–790 cal BC

Final comment: M Germany (6 August 2004), this date established that pit 1191 was more or less contemporary with the other Neolithic pits, and the activity carried out within the area of the causewayed enclosure was (unexpectedly) relatively short-lived (*c* 40 years).

Laboratory comment: Oxford Radiocarbon Accelerator Unit (2004), the large error associated with this measurement is due to the low carbon content of the graphite sample.

OxA–13007 4850 ±34 BP

δ¹³C: -23.0‰

Sample: [4082] 195A, submitted on 27 November 2003 by M Germany

Material: charcoal: *Corylus avellana*, nutshell, a single carbonised fragment (<5g) (V Fryer 2003)

Initial comment: as GrA-25018

Objectives: as GrA-24654

Calibrated date: *1σ:* 3660–3630 cal BC
2σ: 3700–3530 cal BC

Final comment: see GrA-25018

Laboratory comment: see GrA-25018

OxA–13008 4745 ±33 BP

δ¹³C: -27.3‰

Sample: [2341], submitted on 27 November 2003 by M Germany

Material: carbonised residue (on sherd of Mildenhall ware (<5g))

Initial comment: as GrA-25022

Objectives: as GrA-24654

Calibrated date: *1σ:* 3640–3380 cal BC
2σ: 3640–3370 cal BC

Final comment: see GrA-25022

Laboratory comment: see GrA-25022

OxA–13009 4840 ±31 BP

δ¹³C: -25.0‰

Sample: [5821] 223A, submitted on 27 November 2003 by M Germany

Material: charcoal: *Corylus avellana*, nutshell, a single carbonised fragment (<5g) (V Fryer 2003)

Initial comment: as GrA-25017

Objectives: as GrA-24654

Calibrated date: *1σ:* 3650–3630 cal BC
2σ: 3700–3530 cal BC

Final comment: see GrA-25017

Laboratory comment: see GrA-25017

OxA–13010 4820 ±31 BP

δ¹³C: -24.5‰

Sample: [6089] 226B, submitted on 27 November 2003 by M Germany

Material: charcoal: *Corylus avellana*, nutshell, a single carbonised fragment (<5g) (V Fryer 2003)

Initial comment: as GrA-24655

Objectives: as GrA-24654

Calibrated date: *1σ:* 3650–3540 cal BC
2σ: 3660–3520 cal BC

Final comment: see GrA-24655

Laboratory comment: see GrA-24655

OxA–13011 4870 ±31 BP

δ¹³C: -22.5‰

Sample: [13818] 381A, submitted on 27 November 2003 by M Germany

Material: charcoal: *Corylus avellana*, nutshell, a single carbonised fragment (<5g) (V Fryer 2003)

Initial comment: as GrA-24654

Objectives: as GrA-24654

Calibrated date: *1σ:* 3660–3640 cal BC
2σ: 3710–3630 cal BC

Final comment: see GrA-24654

Laboratory comment: see GrA-24654

St Osyth Lodge Farm: B (cremations), Essex

Location: TM 13551545
Lat. 51.47.49 N; Long. 01.05.44 E

Project manager: M Germany (Essex County Council Field Archaeology Unit), May–November 2000; August 2001–February 2003

Archival body: Colchester Museum

Description: there were sixteen cremations, with ten in urns. Early Bronze Age cremations were located within and around a pond barrow. Middle Bronze Age cremations were placed within and around middle Bronze Age ring ditches. Some of the cremations are well preserved and complete or near complete.

Objectives: to establish the duration of the middle Bronze Age cremation cemetery. To determine how closely the pond barrow and early Bronze Age creations relate to each other. To determine the length of the chronological gap between the early Bronze Age pond barrow/cremations and middle Bronze Age ring ditches/cremations. To date the cremations, which are currently undated, and to determine if they are early or middle Bronze Age. To see how the dates from the radiocarbon dating of the cremated bone compare with the dates from the charred plant remains from the cremations, and with the dating of the Bronze Age cremations from nearby Brightlingsea and Ardleigh (Brown 1999).

Final comment: M Germany (6 August 2004), the dating of series B has accomplished the following: 1) confirmed the suspected early Bronze Age date of the pond barrow, 2) dated and placed five previously undated cremations, 3) established that the early Bronze Age and middle Bronze Age cremation cemeteries were separated by a *c* 200 year gap, 4) re-affirmed the feasibility of radiocarbon dating cremated bone, and 5) provided an indication as to the durations of the early Bronze Age and middle Bronze Age cemeteries.

References: Brown 1999
Hamilton *et al* 2007

GrA–23795 2185 ±45 BP

$\delta^{13}C$: -20.7‰

Sample: [62] 4B, submitted on 7 May 2003 by M Germany

Material: grain: *Triticum* sp., carbonised, a single grain (<5g) (V Straker 2003)

Initial comment: the samples come from a small cremation pit 60, 0.87m wide and 0.46m deep, containing two deposits (61 and 62). Located in the north-east corner of the site, away from the other cremations. The samples have been extracted from the top fill 62 - a dark grey sand silt with infrequent patches of charcoal. The fill occupies the bulk of the feature and contains 162g of cremated human bone. It also contains infrequent patches of carbonised material, that are assumed to have come from an associated (unlocated) pyre. The pit touches no other features, but has been truncated to a depth of 0.3m by modern ploughing. The pit cuts a glacio-fluvial drift deposit of acidic sand and gravel. The bottom of the pit was *c* 1m above the watertable.

Objectives: to assess the potential of carbonised material from the cremations for radiocarbon dating. Is the cremation Bronze Age like the other cremations? If so, then why is it in an isolated position from the others?

Calibrated date: *1σ:* 360–170 cal BC
2σ: 390–100 cal BC

Final comment: M Germany (6 August 2004), the middle Iron Age to late Iron Age date obtained from samples GrA-23795 and OxA-12599 confirmed that cremation burial 60 is unrelated (as was suspected from its isolated position) to either the early Bronze Age or middle Bronze Age cremation cemeteries. The burial now appears to be part of the middle Iron Age settlement.

Laboratory comment: Ancient Monuments Laboratory (2004), the two results from this context (GrA-23795 and OxA-12599) are statistically consistent, according to the method of Ward and Wilson (1978) ($T'=0.1, T'(5\%)=3.8, \nu=1$).

References: Ward and Wilson 1978

GrA–23797 2995 ±45 BP

$\delta^{13}C$: -26.7‰

Sample: [3365] 179B, submitted on 25 July 2003 by M Germany

Material: charcoal: *Alnus glutinosa*, a single fragment (<5g) (R Gale 2003)

Initial comment: the sample came from a small cremation pit (3367), 0.80m wide and 0.55m deep, containing three deposits (3364, 3365, and 3366). Located in the middle of the site, halfway between the early Bronze Age pond barrow and the middle Bronze Age ring ditches. The samples have been extracted from the secondary fill 3365 - a very dark, almost black silt sand with frequent lumps and flecks of charcoal. The fill occupies the central third of the feature and contains 1280g of cremated human bone. It also contains frequent lumps and flecks of carbonised material, which is assumed to have come from an associated (unlocated) pyre. The pit touches no other features, but has been truncated to a depth of 0.3m by modern ploughing. The pit cuts a glacio-fluvial drift deposit of acidic sand and gravel. The bottom of the pit was probably less than 1m above the watertable.

Objectives: to assess the potential of carbonised material from the cremations for radiocarbon dating. The cremation is ceramically undatable. It contains much cremated bone, including some very large pieces. The material will be next to useless, however, if it cannot be dated. The cremation is placed halfway between the early Bronze Age group of cremations and the middle Bronze Age group of cremations. Is it Bronze Age and, if it is, to which group does it belong?

Calibrated date: *1σ:* 1320–1130 cal BC
2σ: 1400–1050 cal BC

Final comment: M Germany (6 August 2004), this date comes from ceramically undatable cremation burial 3367, which was placed halfway between the early and middle Bronze Age cremation cemeteries. The sample contains the remains of a sub-adult and is part of the middle Bronze Age cremation cemetery.

Laboratory comment: Ancient Monuments Laboratory (2004), the two results from this context (GrA-23797 and OxA-12623) are statistically consistent, according to the method of Ward and Wilson (1978) ($T'=0.4, T'(5\%)=3.8, \nu=1$).

References: Ward and Wilson 1978

GrA–23798 3090 ±45 BP

$\delta^{13}C$: -25.8‰

Sample: [3636] 188B, submitted on 25 July 2003 by M Germany

Material: charcoal: *Alnus glutinosa*, a single fragment (<5g) (R Gale 2003)

Initial comment: the samples come from a small cremation pit 3647, 0.56m wide and 0.4m deep, containing three deposits (3635, 3635, and 3646). Located close to the north of an early Bronze Age pond barrow. The samples have been extracted from the primary fill 3636 – a very dark, almost black silt sand with frequent lumps and flecks of charcoal. The fill occupies the lower third of the feature and contains 196g of cremated human bone. It also contains frequent lumps and flecks of carbonised material, which is assumed to have come from an associated (unlocated) pyre. The pit has been truncated to a depth of 0.3m by modern ploughing. An undatable pit or posthole 3634 with one deposit and no charcoal cuts the west side of the feature and the west edge of the primary fill. The pit cuts a glacio-fluvial drift deposit of acidic sand and gravel. The bottom of the pit was *c* 1m above the watertable.

Objectives: to assess the potential of carbonised material from the cremations for carbon dating. The cremation is ceramically undatable, but is located with the early Bronze Age cremations within and surrounding the early Bronze Age pond barrow. Is it early Bronze Age, as its location suggests?

Calibrated date: *1σ:* 1420–1310 cal BC
2σ: 1450–1260 cal BC

Final comment: M Germany (6 August 2004), this date comes from ceramically undatable cremation burial 3647, which is located to the immediate north of an early Bronze

Age pond barrow. The date obtained from the sample gives a middle Bronze Age date for the burial, and suggests, along with other evidence obtained from the excavation, that the early Bronze Age pond barrow was reused as a focus for ritual activity in the middle Bronze Age. Cremation burial 3647 contains the remains of an adult female.

Laboratory comment: Ancient Monuments Laboratory (2004), the two results from this context (GrA-23798 and OxA-12622) are statistically consistent, according to the method of Ward and Wilson (1978) ($T'=1.1, T'(5\%)=3.8, \nu=1$).

References: Ward and Wilson 1978

GrA–24827 3040 ±35 BP

Sample: [5144] 211, submitted on 27 November 2003 by M Germany

Material: human bone (<6g) (calcined humerus)

Initial comment: one piece of charcoal and one piece of cremated bone from inside one of the two upright bucket urns within cremation pit 5141, *c* 40m south-east of pond barrow 3890 were dated. The cremation pit has a diameter of 0.5m and is 0.23m deep. Both pots contain cremated bone, and one pot sits inside the other. Both samples come from the fill 5144 of the larger of the two vessels. No other archaeological features touch the cremation pit. The pit cuts a glacio-fluvial deposit of acidic sand and gravel and is sealed by 0.3m of sandy ploughsoil. The watertable was *c* 1.4m below the ground surface when the fieldwork began.

Objectives: to help establish the duration of the early and middle Bronze Age cremation cemeteries, to determine more clearly their relationship to each other and the pond barrow. Was the site of the pond barrow/early Bronze Age cremation cemetery reclaimed in the middle Bronze Age after a prolonged break or was there an unbroken transition from one to the other? To re-examine the feasibility of dating cremated bone, by comparing the radiocarbon dates of the related cremated bone and charcoal samples.

Calibrated date: *1σ:* 1390–1260 cal BC
2σ: 1410–1210 cal BC

Final comment: M Germany (6 August 2004), this date confirms the middle Bronze Age date of cremation burial 5141, which contains the remains of two individuals (adult female and a three year old child).

Laboratory comment: Ancient Monuments Laboratory (2004), the two results from this context (GrA-24827 and OxA-13059) are statistically consistent, according to the method of Ward and Wilson (1978) ($T'=1.7, T'(5\%)=3.8, \nu=1$).

References: Ward and Wilson 1978

GrA–24828 3060 ±35 BP

Sample: [10188], submitted on 27 November 2003 by M Germany

Material: human bone (<4g) (cremated long bone)

Initial comment: one piece of charcoal and one piece of cremated bone from middle Bronze Age urned cremation 4967, *c* 40m east of pond barrow 3890. The cremation pit 4967 has a diameter of 0.5m and 0.2m deep. The fill (4968=10188) of the cremation vessel, from which the samples come, contains 452g of cremated bone. Modern ploughing has truncated the cremation pit by more than 0.3m, and has removed half to two thirds of the cremation vessel (a Bucket Urn). The cremation pit truncates a small posthole 4984, and is clipped on the east side by a north-south ditch 4941. The pit cuts a glacio-fluvial deposit of acidic sand and gravel and is sealed by 0.3m of sandy ploughsoil. The watertable was *c* 1.4m below the ground surface when the fieldwork began.

Objectives: to help establish the duration of the early and middle Bronze Age cremation cemeteries, to determine more clearly their relationship to each other and the pond barrow. Was the site of the pond barrow/early Bronze Age cremation cemetery reclaimed in the middle Bronze Age after a prolonged break or was there an unbroken transition from one to the other? Was there an overlap in the use of Collared Urns and Bucket Urns, as has been suggested? To re-examine the feasibility of dating cremated bone, by comparing the radiocarbon dates of the related cremated bone and charcoal samples.

Calibrated date: *1σ:* 1400–1270 cal BC
2σ: 1420–1210 cal BC

Final comment: M Germany (6 August 2004), this date confirms the middle Bronze Age date of cremation burial 4967, which contains the remains of a young child.

Laboratory comment: Ancient Monuments Laboratory (2004), the two results from this context (GrA-24828 and Ox-13055) are statistically consistent, according to the method of Ward and Wilson (1978) ($T'=0.1, T'(5\%)=3.8, \nu=1$).

References: Ward and Wilson 1978

GrA–24838 3365 ±35 BP

$\delta^{13}C$: -21.8‰

Sample: [4200] 198, submitted on 27 November 2003 by M Germany

Material: human bone (<5g) (calcined long bone)

Initial comment: one piece of cremated bone and one piece of charcoal from the primary fill (4200=3980) of early Bronze Age cremation pit 3979. The cremation pit cuts the base of pond barrow 3890 and is 1.2m long, 0.9m wide, and 0.23m deep. The fills of the pond barrow seal the top fill 4199 of the cremation pit. Two small postholes (3981 and 4143) cut through the primary fill of the pond barrow, and truncate the south end of the cremation pit below. Fire has scorched the natural silt clay sides of the cremation pit and the base of the pond barrow. The watertable was *c* 1m below the base of the cremation pit.

Objectives: to help establish the duration of the early and middle Bronze Age cremation cemeteries, to determine more clearly their relationship to each other and the pond barrow. The pond barrow, from which this cremation comes, is not closely dated, and is currently assumed to be early Bronze Age, because of its apparent (ie spatial) association with the surrounding collared urns, and the fact that middle Bronze Age placed-deposits cut the topmost fills of it. To re-examine the feasibility of carbon dating cremated bone, by comparing the radiocarbon dates of the related cremated bone and charcoal samples.

Calibrated date: *1σ:* 1730–1610 cal BC
2σ: 1750–1530 cal BC

Final comment: M Germany (6 August 2004), this date comes from a ceramically undatable cremation burial 3979, which cuts the base of an early Bronze Age pond barrow. The date obtained from the sample gives an early Bronze Age date for the pond barrow. The burial contains the remains of a young male.

Laboratory comment: Ancient Monuments Laboratory (2004), the two results from this context (GrA-24838 and OxA-13060) are statistically consistent, according to the method of Ward and Wilson (1978) ($T'=1.1, T'(5\%)=3.8, \nu=1$).

References: Ward and Wilson 1978

GrA–24841 3050 ±35 BP

Sample: [5138] 214, submitted on 27 November 2003 by M Germany

Material: human bone (<4g) (calcined long bone)

Initial comment: one piece of charcoal and one piece of cremated bone from middle Bronze Age urned cremation 5137, which is located *c* 50m south-east of pond barrow 3890. The cremation pit for the upright vessel is 0.66m long, 0.42m wide, and 0.25m deep. The rim of the vessel, a large Bucket Urn, is no longer present due to truncation. Both samples come from the single fill 5138 of the pot. No other archaeological features touch the cremation pit. The pit cuts a glacio-fluvial deposit of acidic sand and gravel and is sealed by 0.3m of sandy ploughsoil. The watertable was *c* 1m below the base of the cremation pit.

Objectives: to help establish the duration of the early and middle Bronze Age cremation cemeteries, to determine more clearly their relationship to each other and the pond barrow. Was the site of the pond barrow/early Bronze Age cremation cemetery reclaimed in the middle Bronze Age after a prolonged break or was there an unbroken transition from one to the other? Was there an overlap in the use of Collared Urns and Bucket Urns, as has been suggested? To re-examine the feasibility of dating cremated bone, by comparing the carbon dates of the related cremated bone and charcoal samples.

Calibrated date: *1σ:* 1390–1260 cal BC
2σ: 1420–1210 cal BC

Final comment: M Germany (6 August 2004), this date confirms that middle Bronze Age date of cremation burial 5137, which contains the remains of three individuals (adult, sub-adult, and child).

Laboratory comment: Ancient Monuments Laboratory (2004), the two results from this context (GrA-24841 and OxA-13058) are statistically consistent, according to the method of Ward and Wilson (1978) ($T'=0.4, T'(5\%)=3.8, \nu=1$).

References: Ward and Wilson 1978

GrA–24843 3460 ±40 BP

Sample: [10190], submitted on 27 November 2003 by M Germany

Material: human bone (<7g) (calcined long bone)

Initial comment: two pieces of charcoal and two pieces of cremated bone from early Bronze Age urned cremation 3914, to south-east of pond barrow 3890. The cremation pit 3914 for the inverted urn is 0.6m long, 0.48m wide, and 0.4m deep. The samples come from the fill (3917=10190) of the vessel, which is a large collared urn. No other archaeological features touch the cremation pit. The Collared Urn is complete, although modern ploughing has truncated the cremation pit by 0.3m. The contents of the Collared Urn were excavated in 4cm spits (labelled from A (bottom) to I (rim)). The samples of bone and charcoal come from near the rim (spits G and I respectively) of the upside-down vessel. The pit cuts a glacio-fluvial deposit of acidic sand and gravel and is sealed by 0.3m of sandy ploughsoil. The watertable was *c* 1m below the base of the cremation pit.

Objectives: as GrA-24828

Calibrated date: *1σ:* 1880–1690 cal BC
2σ: 1890–1680 cal BC

Final comment: M Germany (6 August 2004), this date confirms the early Bronze Age date of cremation burial 3914, which contains the remains of a mature male.

Laboratory comment: Ancient Monuments Laboratory (2004), the four results from shared context [10190]/[3917] (GrA-24843, GrA-25021, OxA-13041, and OxA-13054) are statistically consistent, according to the method of Ward and Wilson (1978) ($T'=4.6, T'(5\%)=7.8, \nu=3$).

References: Ward and Wilson 1978

GrA–24844 3550 ±40 BP

Sample: [3139], submitted on 27 November 2003 by M Germany

Material: human bone (<5g) (calcined femur)

Initial comment: two pieces of charcoal and two pieces of cremated bone from early Bronze Age urned cremation 3136, to the north-west of pond barrow 3890. The cremation pit 3136 for the upright vessel (a Collared Urn) is 0.53m in diameter and 0.22m deep. The samples come from fill 3139 of the vessel. No other archaeological features touch the cremation pit. The rim and collar of the cremation vessel are no longer present, due to truncation to a depth of 0.3m by modern ploughing. The contents of the cremation urn were excavated in 2.5m spits (labelled A (bottom) to E (top)). The bone and charcoal samples come from near the top and bottom of the vessel (spit D and A) respectively. The pit cuts a glacio-fluvial deposit of acidic sand and gravel and is sealed by 0.3m of sandy ploughsoil. The watertable was *c* 1m below the base of the cremation pit.

Objectives: to help establish the duration of the early and middle Bronze Age cremation cemeteries, to determine more clearly their relationship to each other and the pond barrow. Was the site of the pond barrow/early Bronze Age cremation cemetery reclaimed in the middle Bronze Age after a prolonged break or was there an unbroken transition from one to the other? Was there an overlap in the use of Collared Urns and Bucket Urns, as has been suggested? What is the date of the pond barrow, and how does that date relate to the date of the surrounding cremations? To re-examine the feasibility of dating cremated bone, by comparing the radiocarbon dates of the related cremated bone and charcoal samples.

Calibrated date: *1σ:* 1950–1780 cal BC
2σ: 2020–1750 cal BC

Final comment: M Germany (6 August 2004), this date confirms the early Bronze Age date of cremation burial 3136, which contains the remains of a mature male.

Laboratory comment: Ancient Monuments Laboratory (2004), the four results from this context (GrA-24844, GrA-25025, OxA-13040, and OxA-13057) are statistically consistent, according to the method of Ward and Wilson (1978) (T′=5.5, T′(5%)=7.8, ν=3).

References: Ward and Wilson 1978

GrA–25021 3485 ±40 BP

$\delta^{13}C$: -23.0‰

Sample: [3917], submitted on 27 November 2003 by M Germany

Material: charcoal: *Quercus* sp., sapwood, a single fragment (<7g) (R Gale 2003)

Initial comment: as GrA-24843

Objectives: as GrA-24828

Calibrated date: *1σ:* 1890–1740 cal BC
2σ: 1920–1690 cal BC

Final comment: see GrA-24843

Laboratory comment: see GrA-24843

References: Ward and Wilson 1978

GrA–25025 3460 ±40 BP

$\delta^{13}C$: -24.2‰

Sample: [3139]B, submitted on 27 November 2003 by M Germany

Material: charcoal: *Prunus spinosa*, a single fragment (<5g) (R Gale 2003)

Initial comment: as GrA-24844

Objectives: as GrA-24844

Calibrated date: *1σ:* 1880–1690 cal BC
2σ: 1890–1680 cal BC

Final comment: see GrA-24844

Laboratory comment: see GrA-24844

GrA–25026 3010 ±40 BP

$\delta^{13}C$: -25.2‰

Sample: [3233], submitted on 27 November 2003 by M Germany

Material: charcoal: *Prunus spinosa*, a single fragment (<8g) (R Gale 2003)

Initial comment: one piece of charcoal and one piece of cremated bone come from middle Bronze Age cremation 3230, within interior space of ring ditch 3336. The cremation pit 3230 has a diameter of 0.61m and 0.30m deep. Both samples come from the fill of 3233 of the cremation vessel, which is an upright bucket urn. The top quarter of the Bucket Urn has been destroyed by modern ploughing, which has truncated the feature by 0.3m. The fill of the urn was excavated in 4cm spits (labelled A (top) to D (bottom)). The sample of bone and charcoal come from spits A and C respectively. No other archaeological features touch the cremation pit. The pit cuts a glacio-fluvial deposit of acidic sand and gravel and is sealed by 0.3m of sandy ploughsoil. The watertable was *c* 1m below the base of the cremation pit.

Objectives: as GrA-24828

Calibrated date: *1σ:* 1370–1210 cal BC
2σ: 1400–1120 cal BC

Final comment: M Germany (6 August 2004), this date confirms the middle Bronze Age date of cremation burial 3230, which contains the remains of a mature male.

Laboratory comment: Ancient Monuments Laboratory (2004), the two results from this context (GrA-25026 and OxA-13111) are statistically consistent, according to the method of Ward and Wilson (1978) (T′=3.8, T′(5%)=3.8, ν=1).

References: Ward and Wilson 1978

GrA–25027 3020 ±40 BP

$\delta^{13}C$: -26.1‰

Sample: [3229], submitted on 27 November 2003 by M Germany

Material: charcoal: *Betula* sp., a single fragment (<3g) (R Gale 2003)

Initial comment: one piece of charcoal and one piece of cremated bone come from the fill 3229 of middle Bronze Age cremation vessel. The cremation pit 3226, within which the upright vessel sits, is 0.56m long, 0.5m wide, and 0.09m deep, and is situated within the enclosed space of middle Bronze Age ring ditch 3336. Modern ploughing has truncated the cremation by 0.3m, and only the base and a small part of the sides of the pot survive. The feature cuts a large undatable pit 3287. The pit cuts a glacio-fluvial deposit of acidic sand and gravel and is sealed by 0.3m of sandy ploughsoil. The watertable was more than 1m below the base of the cremation pit.

Objectives: as GrA-24828.

Calibrated date: *1σ:* 1380–1210 cal BC
2σ: 1410–1120 cal BC

Final comment: M Germany (6 August 2004), this date confirms the middle Bronze Age date of cremation burial 3226, which contains the remains of an adult.

Laboratory comment: Ancient Monuments Laboratory (2004), the two results from this context (GrA-25027 and OxA-13039) are statistically consistent, according to the method of Ward and Wilson (1978) (T′=1.5, T′(5%)=3.8, ν=1).

References: Ward and Wilson 1978

GrA–25289 3050 ±35 BP

$\delta^{13}C$: -26.8‰

Sample: [4869] 208A, submitted on 27 November 2003 by M Germany

Material: charcoal: *Betula* sp., a single fragment (<5g) (R Gale 2003)

Initial comment: two pieces of charcoal from unurned cremation 4867, *c* 40m east of pond barrow 3890. The cremation pit contains three deposits (4868, 4869, and 4870) and has a diameter of 0.7m and 0.22m deep. The two samples have been taken from the secondary fill 4869, which contains 228g of cremated bone and frequent pieces of charcoal. The cremation pit cuts the west side of pit 4895, and also probably cuts postholes 4873 and 4898, although this is not completely certain. The south edge of the cremation pit is clipped by east-west ditch 4833. The surrounding geology is a glacio-fluvial drift deposit of acidic sand and gravel, beneath 0.3m of modern ploughsoil.

Objectives: to help establish the duration of the early and middle Bronze Age cremation cemeteries, to determine more clearly their relationship to each other and the pond barrow. Was the site of the pond barrow/early Bronze Age cremation cemetery reclaimed in the middle Bronze Age after a prolonged break or was there an unbroken transition from one to the other?

Calibrated date: *1σ:* 1390–1260 cal BC
2σ: 1420–1210 cal BC

Final comment: M Germany (6 August 2004), this date confirms the middle Bronze Age date of cremation burial 4867, which contains the remains of a sub-adult.

Laboratory comment: Ancient Monuments Laboratory (2004), the two results from this context (GrA-25289 and OxA-13056) are not statistically consistent, according to the method of Ward and Wilson (1978) (T′=6.6, T′(5%)=3.8, ν=1).

References: Ward and Wilson 1978

OxA–12599 2201 ±27 BP

$\delta^{13}C$: -21.2‰

Sample: [62] 4A, submitted on 7 March 2003 by M Germany

Material: grain: *Hordeum* sp., carbonised, a single grain (<5g) (V Straker 2003)

Initial comment: as GrA-23795

Objectives: as GrA-23795

Calibrated date: *1σ:* 360–200 cal BC
2σ: 380–180 cal BC

Final comment: see GrA-23795

Laboratory comment: see GrA-23795

OxA–12622 3032 ±34 BP

$\delta^{13}C$: -25.0‰

Sample: [3636] 188A, submitted on 25 July 2003 by M Germany

Material: charcoal: *Alnus glutinosa*, a single fragment (<5g) (R Gale 2003)

Initial comment: as GrA-23798

Objectives: as GrA-23798

Calibrated date: *1σ:* 1380–1260 cal BC
2σ: 1410–1130 cal BC

Final comment: see GrA-23798

Laboratory comment: see GrA-23798

OxA–12623 3030 ±34 BP

$\delta^{13}C$: -26.1‰

Sample: [3365] 179A, submitted on 25 July 2003 by M Germany

Material: charcoal: *Alnus glutinosa*, a single fragment (<5g) (R Gale 2003)

Initial comment: as GrA-23797

Objectives: as GrA-23797

Calibrated date: *1σ:* 1380–1220 cal BC
2σ: 1410–1130 cal BC

Final comment: see GrA-23797

Laboratory comment: see GrA-23797

OxA–13039 2950 ±40 BP

$\delta^{13}C$: -24.3‰

Sample: [3229], submitted on 27 November 2003 by M Germany

Material: human bone (<5g) (femur)

Initial comment: as GrA-25027

Objectives: as GrA-24828

Calibrated date: *1σ:* 1260–1110 cal BC
2σ: 1310–1010 cal BC

Final comment: see GrA-25027

Laboratory comment: see GrA-25027

References: Ward and Wilson 1978

OxA–13040 3569 ±33 BP

$\delta^{13}C$: -22.8‰

Sample: [3139], submitted on 27 November 2003 by M Germany

Material: human bone (<5g) (femur)

Initial comment: as GrA-24844

Objectives: as GrA-24844

Calibrated date: *1σ:* 1960–1880 cal BC
2σ: 2030–1780 cal BC

Final comment: see GrA-24844

Laboratory comment: see GrA-24844

OxA–13041 3526 ±32 BP

$\delta^{13}C$: -24.9‰

Sample: [10190], submitted on 27 November 2003 by M Germany

Material: human bone (<7g) (long bone)

Initial comment: as GrA-24843

Objectives: as GrA-24828

Calibrated date: *1σ:* 1900–1770 cal BC
2σ: 1950–1750 cal BC

Final comment: see GrA-24843

Laboratory comment: see GrA-24843

OxA–13054 3554 ±27 BP

δ¹³C: -19.7‰

Sample: [3917]B, submitted on 27 November 2003 by 18/08/2004

Material: charcoal: *Quercus* sp., sapwood, a single fragment (<7g) (R Gale 2003)

Initial comment: as GrA-24843

Objectives: as GrA-24828

Calibrated date: *1σ:* 1940–1880 cal BC
2σ: 1960–1770 cal BC

Final comment: see GrA-24843

Laboratory comment: see GrA-24843

OxA–13055 3071 ±25 BP

δ¹³C: -20.4‰

Sample: [4968] 209, submitted on 27 November 2003 by M Germany

Material: charcoal: *Betula* sp., a single fragment (<5g) (R Gale 2003)

Initial comment: as GrA-24828

Objectives: as GrA-24828

Calibrated date: *1σ:* 1400–1310 cal BC
2σ: 1420–1260 cal BC

Final comment: see GrA-24828

Laboratory comment: as GrA-24828

OxA–13056 3164 ±27 BP

δ¹³C: -23.1‰

Sample: [4869] 208B, submitted on 27 November 2003 by M Germany

Material: charcoal (<5g) (unidentified bud, a single fragment)

Initial comment: as GrA-25289

Objectives: as GrA-25289

Calibrated date: *1σ:* 1460–1410 cal BC
2σ: 1500–1400 cal BC

Final comment: M Germany (6 August 2004), this date, which is at variance to the date obtained from associated sample GrA-25289, suggests that the piece of charcoal from which it was obtained was residual in middle Bronze Age cremation burial 4867.

Laboratory comment: see GrA-25289

OxA–13057 3565 ±28 BP

δ¹³C: -21.4‰

Sample: [3139]A, submitted on 27 November 2003 by M Germany

Material: charcoal: *Prunus spinosa*, a single fragment (<5g) (R Gale 2003)

Initial comment: as GrA-24844

Objectives: as GrA-24844

Calibrated date: *1σ:* 1950–1880 cal BC
2σ: 2020–1780 cal BC

Final comment: see GrA-25025

Laboratory comment: see GrA-25025

OxA–13058 3078 ±27 BP

δ¹³C: -24.5‰

Sample: [5138] 214, submitted on 27 November 2003 by M Germany

Material: charcoal: *Prunus spinosa*, a single fragment (<4g) (R Gale 2003)

Initial comment: as GrA-24841

Objectives: as GrA-24841

Calibrated date: *1σ:* 1410–1310 cal BC
2σ: 1420–1260 cal BC

Final comment: see GrA-24841

Laboratory comment: see GrA-24841

OxA–13059 3098 ±27 BP

δ¹³C: -22.7‰

Sample: [5144] 211, submitted on 27 November 2003 by M Germany

Material: charcoal: *Corylus avellana*, a single fragment (<6g) (R Gale 2003)

Initial comment: as GrA-24827

Objectives: as GrA-24827

Calibrated date: *1σ:* 1420–1320 cal BC
2σ: 1440–1300 cal BC

Final comment: see GrA-24827

Laboratory comment: see GrA-24827

OxA–13060 3413 ±28 BP

δ¹³C: -21.8‰

Sample: [3980] 197, submitted on 27 November 2003 by M Germany

Material: charcoal: *Quercus* sp., sapwood, a single fragment (<5g) (R Gale 2003)

Initial comment: as GrA-24838

Objectives: as GrA-24838

Calibrated date: *1σ:* 1750–1680 cal BC
2σ: 1870–1630 cal BC

Final comment: see GrA-24838

Laboratory comment: see GrA-24838

OxA–13111 3120 ±40 BP

δ¹³C: -23.6‰

Sample: [3233], submitted on 27 November 2003 by M Germany

Material: human bone (<8g) (tibia, cremated)

Initial comment: as GrA-25026

Objectives: as GrA-25026

Calibrated date: *1σ:* 1440–1320 cal BC
2σ: 1500–1300 cal BC

Final comment: see GrA-25026

Laboratory comment: see GrA-25026

St Osyth Lodge Farm: C (causewayed enclosure), Essex

Location: TM 13551545
Lat. 51.47.49 N; Long. 01.05.44 E

Project manager: M Germany (Essex County Council Field Archaeology Unit), May–November 2000; August 2001–February 2003

Archival body: Colchester Museum

Description: two samples from recut 215 within the causewayed enclosure ditch 13930 (part of middle circuit), in north-east corner of excavation.

Objectives: to determine when the causewayed enclosure ditch was in use, and to see if it was contemporary with the main phase of Neolithic pitting (series A, Neolithic pits). To place the causewayed enclosure in a national context, by making it more directly comparable with other monuments from the same class, to add to the current English Heritage Programme of re-evaluating the monuments through a comprehensive program of radiocarbon dating old excavations (Whittle *et al* in prep).

Final comment: M Germany (6 August 2004), the dating has indicated that recut 215, which was part of the causewayed enclosure, was more or less contemporary with the Neolithic pitting (series A). This includes pits 96 and 103, which together with recut 215 contain evidence for a flintworking area in the north-east part of the excavation.

References: Hamilton *et al* 2007
Whittle *et al* in prep.

GrA–25020 4775 ±40 BP

δ¹³C: -22.7‰

Sample: [251] 17 A, submitted on 27 November 2003 by M Germany

Material: plant macrofossil (carbonised): *Corylus avellana*, shell, a single fragment (<5g) (V Fryer 2003)

Initial comment: recut (251) of north end of causewayed enclosure ditch 13930, part of middle circuit with seven deposits. Both samples come from the tertiary fill, which contains 356g of Mildenhall Ware and 2492g of flint, largely consisting of waste material-cores, chipping, and unfinished tools. Two pits (96 and 103) with exceptionally large amounts of waste flint material, suggesting a flintworking area in this part of this site, lie to the immediate north. Radiocarbon dates from both pits (series A) are in the region of *c* 3600 cal BC. An east-west late Iron Age linear feature 09/211 cuts the north end of the recut. The surrounding natural is a glacio-fluvial drift deposit of acidic sand and gravel. Deposit 251 is undisturbed by late Iron Age linear cut 209/211, which cuts the north end of the recut. The watertable is *c* 1.4m below the stripped surface.

Objectives: was the causewayed enclosure ditch in use at the same time as the main phase of pitting within the interior of the causewayed enclosure? In particular, is the flint waste material from adjacent pits 96 and 103 (series A) contemporary with the flint waste material from the recut (ie was there a flintworking area in the north-east corner of the site)? How does the date of the main phase of activity at the causewayed enclosure compare nationally?

Calibrated date: *1σ:* 3640–3520 cal BC
2σ: 3650–3380 cal BC

Final comment: M Germany (6 August 2004), this date suggests that recut 215, which is part of the causewayed enclosure, was more or less contemporary with the Neolithic pitting (series A). This includes pits (96 and 103), which like recut 215, contain evidence for a flintworking area in the north-east part of the excavation.

Laboratory comment: Ancient Monuments Laboratory (2004), the two results from this context (GrA-25020 and OxA-13006) are statistically consistent, according to the method of Ward and Wilson (1978) ($T'=1.2, T'(5\%)=3.8, \nu=1$).

References: Ward and Wilson 1978

OxA–13006 4832 ±33 BP

δ¹³C: -22.1‰

Sample: [251] 17 B, submitted on 27 November 2003 by M Germany

Material: plant macrofossil (carbonised): *Corylus avellana*, shell, a single fragment (<5g) (V Fryer 2003)

Initial comment: as GrA-25020

Objectives: as GrA-25020

Calibrated date: *1σ:* 3650–3630 cal BC
2σ: 3660–3530 cal BC

Final comment: see GrA-25020

Laboratory comment: see GrA-25020

Swale-Ure Washlands

Location: SE 937958
Lat. 54.20.57 N; Long. 0_.33.36 W

Project manager: A J Long (University of Durham) 2003

Description: the Swale-Ure Washlands encompasses a little known region, south of the Tees-Swale watershed and between the eastern fringe of the Pennines and the North Yorkshire Moors. This area is a major source of aggregate, with numerous extant and former quarries exploiting the abundant sands and gravels that accumulated during and following deglaciation of the last (Devensian) ice sheet.

Objectives: this is an ALSF project concerned with the late Devensian landscape and fluvial history of the Swale and Ure washlands. Of particular interest is the history of Holocene fluvial activity, including changes in the pattern of fluvial behaviour, flood events, changes in vegetation, as well as human impact on the landscape. The project is interested in establishing millennial scale patterns of change.

Final comment: A Long (14 September 2004), the Swale-Ure dating comprises 45 radiocarbon dates, collected from nine sites, seven in the Ure Valley and two in the Swale Valley. The ages span from the late Glacial to the late medieval period and provide the first robust dating control on the vegetation and landscape history of this part of lowland northern England. The dates provide important new information on the timing and nature of river dynamics, and chronological control on several significant phases of climate change and human impact on vegetation cover and landscape stability. Just under half of the dates provide a chronology for vegetation change and human impact at the important archaeological site of Thornborough Henges. Despite some problems associated with age inversions and contaminated samples, the age series have made a major contribution to the successful outcome of this research project.

References: Bridgland *et al* forthcoming
Howard *et al* 2000

Swale-Ure Washlands: Brown Potter Quarry, North Yorkshire

Location: SE 333695
Lat. 54.07.15 N; Long. 01.29.29 W

Project manager: A Long (University of Durham), February 2003

Description: the site exposed by the quarry excavations represents a former channel of the River Ure. The site is underlain by the Triassic Mercia Mudstone Group, which is capped by glacial till. The sands and gravels, which overlie the till, are of a temperate fluvial origin, probably of post Glacial (Holocene) age. The site lies below the local watertable, and is located on the present floodplain of the River Ure. Access to the site is via a working quarry. The stratigraphy records distinct coarsening-upwards sequences, as well as a pronounced increase in cereal pollen, which we interpret as evidence for prehistoric agriculture. The site comprises a peat bed, *c* 2m thick, underlain by gravels and overlain by *c* 2m of alluvium (silts and sands). The peat accumulated in an abandoned meander. Pollen, mollusca, beetle, and plant macrofossil data indicate that the peat initially accumulated under slow-running water, and then became a *Phragmites* reedswamp. Grain size and organic carbon content indicate the presence of a sequence of coarsening and fining upwards sediment sequences within the peat bed. These record flooding episodes.

Objectives: to establish a chronology for the start and end of peat accumulation, the timing of each of the coarsening upwards sequences, as well as dating the increase in cereal pollen. Dating samples BPQ (2)1 and BPQ (1)4 would provide a chronology for the start and end of peat accumulation. Dating samples BPQ (1)2, BPQ (1)3, and BPQ (1)4 will establish the timing of the start of the three coarsening upwards cycles within the section. Dating sample BPQ (1)3 will date the rise in cereal pollen.

Final comment: A Long (14 September 2004), the dates from this profile form a good chronological series. The lowest date provides a limiting age for the abandonment of this former channel and the establishment of the Ure in its present location, as well as valuable constraining data for the rate of incision of the river in the Holocene. The other dates demonstrate rapid sedimentation during medieval times of alternating fine and coarse sediment units related to flooding episodes. These may reflect agricultural history as well as climatic shifts. The dating series has therefore met the objectives of the dating strategy at this site.

References: Bridgland *et al* forthcoming
Howard *et al* 2000

OxA–12551 752 ±25 BP

$\delta^{13}C$: -28.5‰

Sample: BPQ(1)2 (125cm), submitted on 14 July 2003 by A Long

Material: plant macrofossils (<5g) (waterlogged, bulk sample): *Sonchus* sp.; Caryophyllaceae; Chenopodiaceae; *Rumex* sp. (M Field 2003)

Initial comment: the sample was taken from 125cm below the top of a sequence of monolith tins placed against the cleaned surface of the quarry face. There is possible downward intrusion by *Phragmites* roots.

Objectives: this sample is required to date the onset of organic accumulation in the meander fill. This will provide a minimum age for the abandonment of the channel by the main river, as well as for the start of the first coarsening upwards sequence.

Calibrated date: *1σ:* cal AD 1260–1280
2σ: cal AD 1220–1290

Final comment: A Long (14 September 2004), this date gives an age for the start of the infilling of an abandonment river channel. A medieval date in the late thirteenth-century AD is not contradicted by the pollen data, which indicate an open agricultural landscape and little woodland other than heath scrubland. Agricultural improvement and expansion occurring at that time would seem to correspond with the vegetation record in this profile. The coarsening grain size in the sediment column at this point may reflect increased farming activity and local erosion of mineral soils.

OxA–12552 627 ±27 BP

$\delta^{13}C$: -28.2‰

Sample: BPQ(1)3 (65cm), submitted on 14 July 2003 by A Long

Material: plant macrofossils: *Rumex* sp., waterlogged, bulk (<5g) (M Field 2003)

Initial comment: the sample was taken from 65cm below the top of a sequence of monolith tins placed against the cleaned surface of the quarry face. There is possible downward intrusion by *Phragmites* roots.

Objectives: this sample is required to date the increase in cereal pollen identified in the pollen data. This will also provide a date for the base of the third coarsening upwards cycle.

Calibrated date: *1σ:* cal AD 1290–1400
2σ: cal AD 1280–1410

Final comment: A Long (14 September 2004), this date gives an age for a phase of arable expansion with major local cereal growing and the almost complete removal of even scrub woodland. The date of the fourteeth-century AD would not be inconsistent with this. A coarsening of sediment grain size after this point may again reflect the result of this medieval activity.

OxA–12553 504 ±26 BP

δ^{13}*C:* -26.9‰

Sample: BPQ(1)4 (15cm), submitted on 14 July 2003 by A Long

Material: plant macrofossils: *Rumex* sp., waterlogged, bulk (<5g) (M Field 2003)

Initial comment: the sample was taken from 15cm below the top of a sequence of monolith tins placed against the cleaned surface of the quarry face. There is possible downward intrusion by *Phragmites* roots.

Objectives: this sample is required to date the base of the fourth coarsening-upwards cycle. The samples will also provide a date for the end of organic accumulation within the sequence.

Calibrated date: *1σ:* cal AD 1410–1440
2σ: cal AD 1400–1450

Final comment: A Long (14 September 2004), this date gives an age for the end of organic sedimentation and the start of minerogenic deposition. A late medieval age of the first half of the fifteenth-century AD is acceptable for the almost completely open agricultural landscape shown by the pollen data.

OxA–12636 4011 ±40 BP

δ^{13}*C:* -26.1‰

Sample: BPQ(2)1 (208cm)–2, submitted on 14 July 2003 by A Long

Material: plant macrofossils: Cyperaceae spp., waterlogged, bulk sample (<5g) (C O'Brien 2003)

Initial comment: the sample is derived from a 3cm thick horizon of detrital plant macrofossils, which forms an extensive sheet of sediment across the site (exposed over an area of *c* 30 × 50m). The deposit is interbedded within a sequence of fluviatile sands and gravels, and records a temporary period of reduced energy conditions at the study site.

Objectives: this sample is required to provide a minimum age for the incision of the River Ure to its current position on the floodplain. A single date from Howard *et al* (2000) indicates that the River Ure incised from a higher terrace some time after *c* 9800 BP (*c* 9280-9250 cal BC*) (*Reimer *et al* 2004*)*. The rate of incision is of scientific importance, since this is a function of land uplift, base level change, as well as sediment supply to the river during the Holocene. A deep excavation through floodplain sediments indicates that this is the deepest organic deposit on the site above weathered bedrock. The sample will, therefore, provide a minimum age for the incision of the River Ure to this elevation. Pollen data suggest a mid-Holocene age (post-alder rise but pre-elm decline).

Calibrated date: *1σ:* 2580–2470 cal BC
2σ: 2630–2460 cal BC

Final comment: A Long (14 September 2004), this second date on the same level as date OxA-12748 gives a similar result at this time of the Neolithic to Bronze Age transition. Although not strictly consistent with the other date, it confirms the general age of this thin detrital plant macrofossil layer and confirms this minimum value for the establishment of the Ure in its modern location.

Laboratory comment: Ancient Monuments Laboratory (2004), the two results from this horizon (OxA-12636 and OxA-12748) are not statistically consistent, according to the method of Ward and Wilson (1978) (T'=5.2, $T'(5\%)$=3.8, ν=1).

References: Howard *et al* 2000
Ward and Wilson 1978

OxA–12748 3896 ±31 BP

δ^{13}*C:* -31.2‰

Sample: BPQ(2)1 (208cm)–1, submitted on 14 July 2003 by 27/09/2004

Material: wood: *Corylus* sp., waterlogged, a single fragment (<5g) (C O'Brien 2003)

Initial comment: as OxA-12636

Objectives: as OxA-12636

Calibrated date: *1σ:* 2470–2300 cal BC
2σ: 2480–2280 cal BC

Final comment: A Long (14 September 2004), this dates gives a minimum age for the incision of the Ure in its present floodplain position and shows this to have taken place by late Neolithic to early Bronze Age times. This date significantly constrains the period during which this important change took place. The substantial elm pollen frequencies at this level suggested an earlier age for this sample, probably before the elm decline around *c* 3750–3710 cal BC (*c* 5000 BP). The date is considerably younger, however, and local surviving elm populations must have been responsible for the high elm percentages.

Laboratory comment: see OxA-12636

Swale-Ure Washlands: Core 69, The Flasks, Nosterfield, North Yorkshire

Location: SE 278806
Lat. 54.13.15 N; Long. 01.34.28 W

Project manager: A Long (University of Durham), September 2003

Description: the site is known as 'The Flasks' and is located at the northern end of the Tarmac gravel quarry at Nosterfield. The Russian Core 69 is taken from the north-eastern part of The Flasks. The underlying bedrock is Magnesian Limestone. There are four samples in the series, all from the same core.

Objectives: dating four samples from Core 69 will provide a chronology for peat accumulation at this site, and allow correlation between this core and previously dated material from Nosterfield.

Final comment: A Long (14 September 2004), the four dates from Core 69, The Flasks, form a good chronological series and the upper three at least are very close to expected ages for the lithostratigraphic and pollen zone changes which they were selected to date. The lowest date seems rather recent to conform with the pollen data in that part of the profile. The series has fulfilled the dating strategy for the site, demonstrating a late Glacial and early Holocene chronology for sediment accumulation which agrees well with the pollen stratigraphy. This site record continues the pollen record recovered from the nearby Nosterfield Shake Hole 1 site and extends the local vegetation history to cover almost the entire late Glacial and Holocene time period.

References: Bridgland *et al* forthcoming
Tipping 2000

OxA–12932 9990 ±45 BP

$\delta^{13}C$: -26.5‰

Sample: Core 69/2 (83–5cm), submitted on 15 September 2003 by A Long

Material: plant macrofossils (<5g) (waterlogged, bulk sample): *Menyanthes trifoliata*, seed; *Schoenoplectus lacustris*, nutlets; *Betula* sp., fruit (C O'Brien 2003)

Initial comment: the core was taken from the area of deepest peat thickness in the eastern part of The Flasks. The sample was taken from close to the base of the upper layer of crumbly brown/black humified peat, where there was good macrofossil recovery, 85cm below the surface.

Objectives: the dating strategy for this site is to establish a chronology for the accumulation of the peat sediments and to establish and evaluate human impact on the landscape.

Calibrated date: *1σ:* 9660–9360 cal BC
2σ: 9760–9310 cal BC

Final comment: A Long (14 September 2004), this date provides an age for the main rise in *Betula* pollen and confirms that the rise represents its early Holocene rational limit, replacing more open habitat herbaceous plant cover. The date conforms with other dates for this pollen zone boundary in lowland northern England.

OxA–12960 8725 ±45 BP

$\delta^{13}C$: -27.5‰

Sample: Core 69/1 (49–50cm), submitted on 15 September 2003 by A Long

Material: wood: bark, indeterminate, waterlogged, a single fragment (<5g) (R Gale 2003)

Initial comment: the core was taken from the area of deepest peat thickness in the eastern part of The Flasks. The sample was taken from close to the top of the upper layer of brown humified peat, where the first macrofossils were recovered, 49–50cm below the surface.

Objectives: the dating strategy for this site is to establish a chronology for the accumulation of the peat sediments and to establish and evaluate human impact on the landscape.

Calibrated date: *1σ:* 7790–7610 cal BC
2σ: 7960–7600 cal BC

Final comment: A Long (14 September 2004), this date provides an age a little after the main rise of *Corylus* pollen and confirms that pollen zone boundary as the early Holocene rational limit of hazel. It also provides a date just prior to the top of the undisturbed peat in the profile. The date conforms with other dates for the *Corylus* rise in lowland northern England.

OxA–12972 10510 ±55 BP

$\delta^{13}C$: -27.5‰

Sample: Core 69/3 (153–4cm), submitted on 15 September 2003 by A Long

Material: plant macrofossils (<5g) (waterlogged, bulk sample): Ericaceae, stem; Salicaceae, ? root; *Carex* sp., three trigonous nutlets (C Thompson and R Gale 2003)

Initial comment: the core was taken from the area of deepest peat thickness in the eastern part of The Flasks. The sample was taken from the top of the lower layer of brown humified peat, 153cm below the surface.

Objectives: as OxA-12932

Calibrated date: *1σ:* 10720–10440 cal BC
2σ: 10780–10290 cal BC

Final comment: A Long (14 September 2004), this date gives the age of the start of an increasing silt clay fraction within the organic detrital lake mud of the profile and an increase in Cyperaceae (sedge) pollen and gradual decline in *Betula*. It marks the start of the vegetation changes associated with the increasingly cold climatic conditions of the late Glacial (Loch Lomond) stadial. The date conforms with other dates for this climatic and vegetation change in northern England.

OxA–12997 10920 ±45 BP

$\delta^{13}C$: -29.2‰

Sample: Core 69/4 (163–4cm), submitted on 15 September 2003 by A Long

Material: plant macrofossils (bulk sample): monocot, ? fragment; cf Salicaceae, wood; *Carex* sp., three trigonous nutlets (C Thompson and R Gale 2003)

Initial comment: the core was taken from the area of deepest peat thickness in the eastern part of The Flasks. The sample was taken from the top of the lower layer of brown humified peat, 163–4cm below the surface.

Objectives: as OxA-21932

Calibrated date: *1σ:* 10960–10900 cal BC
2σ: 10990–10880 cal BC

Final comment: A Long (14 September 2004), this date provides an age for sediment a little after the start of organic detrital lake mud accumulation above inorganic shell rich clay. It is near the start of a phase of increased *Betula* frequencies and reduced herb values and so probably warmer conditions. The underlying shell rich clay contains a more open ground pollen assemblage and the date seems rather recent for the switch to warmer conditions during the late Glacial interstadial.

Swale-Ure Washlands: F45, Nosterfield, North Yorkshire

Location: SE 278806
Lat. 54.13.15 N; Long. 01.34.28 W

Project manager: A Long (University of Durham), September 1998

Description: the site, which no longer exists, was a collapsed feature, formed in the gravels of the Ure, as a result of dissolution of the underlying limestone. The feature accumulated organic sediments. There are seven samples in the series.

Objectives: the material from F45 presents an opportunity to understand changes in vegetation and human impact on the landscape at a location very close to the Thornborough Henges. Initial pollen analysis (Swale-Ure project) of core F45 has shown a late Holocene history from 136cm (elm decline). The potential for detailed pollen work to elucidate human impact on this very important archaeological landscape requires good dating control.

Final comment: A Long (14 September 2004), the dates from this profile form a broadly consistent chronological series, although there are age inversions between individual adjacent dates. The exception is date OxA-13530, which has a late Glacial age and is clearly unreliable. The other dates form a chronology from mid-Neolithic until late Iron Age times. The profile forms a valuable record of local prehistoric vegetation change near to the major Thornborough archaeological monuments and landscape.

References: Bridgland *et al* forthcoming
Tipping 2000

GrA–25299 2365 ±35 BP

$\delta^{13}C$: -30.2‰

Sample: F45–2 (33–4cm), submitted on 8 March 2004 by A Long

Material: wood: bark, a single fragment (<5g) (C O'Brien 2004)

Initial comment: a Russian core and monolith tins were used to sample organic from a collapsed feature labelled 'F45' at the Nosterfield sand and gravel quarry. The pit from which the samples were taken has since been stripped by the gravel company. The pits or collapsed features are interpreted as 'probably natural features within the already forming fluvioglacial gravels bordering the River Ure' (Tipping 2000). The section occurs in a gravel quarry, where it was exposed temporarily during quarry excavation. The collapse features probably formed in the gravels as a result of cavern collapse in the underlying limestone. The collapse features would then quickly fill up with sediment.

Objectives: to date the pollen work as this will elucidate human impact on this very important archaeological landscape. Previous cores from Nosterfield have already yielded evidence for Bronze Age activity in the vicinity of the henges.

Calibrated date: *1σ:* 410–390 cal BC
2σ: 520–380 cal BC

Final comment: A Long (14 September 2004), this date provides an age for the final fall of woodland pollen represented by *Corylus* and establishment of open wet grassland vegetation dominated by Cyperaceae (sedges), Poaceae (grasses), *Plantago lanceolata* (ribwort plantain), and *Pteridium* (bracken). The date indicates that this change took place during the late Iron Age. The vegetation change is compatible with environmental conditions at that time.

References: Tipping 2000

GrA–25300 2395 ±35 BP

$\delta^{13}C$: -30.8‰

Sample: F45–3 (41–2cm), submitted on 8 March 2004 by A Long

Material: wood: bark, a single fragment (<5g) (C O'Brien 2004)

Initial comment: as GrA-25299

Objectives: as GrA-25299

Calibrated date: *1σ:* 520–400 cal BC
2σ: 740–390 cal BC

Final comment: A Long (14 September 2004), this date provides an age for the fall of most types of woodland pollen, particularly *Alnus* and the start of the establishment of open wet grassland vegetation dominated by Cyperaceae, Poaceae, *Plantago lanceolata,* and *Pteridium*. The date indicates that this change took place during the late Iron Age. The vegetation change is compatible with environmental conditions at that time.

GrA–25301 4050 ±40 BP

$\delta^{13}C$: -27.4‰

Sample: F45–4 (93–4cm), submitted on 8 March 2004 by A Long

Material: wood: bark, a single fragment (<5g) (C O'Brien 2004)

Initial comment: as GrA-25299

Objectives: as GrA-25299

Calibrated date: *1σ:* 2630–2490 cal BC
2σ: 2840–2470 cal BC

Final comment: A Long (14 September 2004), this date provides an age for mid-profile dominance of woodland vegetation, particularly *Pinus*, *Betula*, and *Corylus*. Non-arboreal pollen types are low and very few agricultural indicators are present. *Ulmus* frequencies are low and the pollen assemblage is compatible with this date in the late Neolithic.

GrA–25355 4000 ±50 BP

$\delta^{13}C$: -27.1‰

Sample: F45–7 (145cm), submitted on 8 March 2004 by A Long

Material: wood: *Alnus* sp., a single fragment (<5g) (C O'Brien 2004)

Initial comment: as GrA-25299

Objectives: as GrA-25299

Calibrated date: *1σ:* 2580–2470 cal BC
2σ: 2830–2360 cal BC

Final comment: A Long (14 September 2004), this date provides a date for the upper part of the non polleniferous profile. There are therefore no pollen data with which to test this date. It lies 25cm below the level of OxA-13553, and is similar in age. The calibration given below for OxA-13553 is similar but not identical. The ages are inverted, however, and it seems that this date of 4000 ±50 BP (2580-2460 cal BC at 68% confidence and 2830-2350 cal BC at 95% confidence) (Reimer *et al* 2004) is too young, although not excessively so. It broadly confirms this section of the profile as Neolithic in age, but beyond that is unreliable.

OxA–13494 4124 ±30 BP

δ¹³C: -26.8‰

Sample: F45–4 (93–4cm), submitted on 8 March 2004 by A Long

Material: wood: bark, a single fragment (<5g) (C O'Brien 2004)

Initial comment: as GrA-25299

Objectives: as GrA-25299

Calibrated date: *1σ:* 2860–2620 cal BC
2σ: 2880–2570 cal BC

Final comment: A Long (14 September 2004), this date provides another age estimate from the same level as GrA-25301 and confirms it as an accurate age for this post elm decline woodland phase. The pollen assemblage is compatible with this late Neolithic date.

OxA–13530 11675 ±50 BP

δ¹³C: -25.0‰

Sample: F45–6 (128–9cm), submitted on 8 March 2004 by A Long

Material: wood: twig, charred, a single fragment (<5g) (C O'Brien 2004)

Initial comment: as GrA-25299

Objectives: as GrA-25299

Calibrated date: *1σ:* 11680–11480 cal BC
2σ: 11740–11430 cal BC

Final comment: A Long (14 September 2004), this date was intended to provide an age for a decline in *Betula* frequencies and the first record of cereal-type pollen near the base of the polleniferous profile. The late Glacial date is clearly far too old to be acceptable for the pollen data and this date must therefore be considered unreliable.

OxA–13553 4193 ±31 BP

δ¹³C: -27.1‰

Sample: F45–5 (119–20cm), submitted on 8 March 2004 by A Long

Material: wood: *Alnus glutinosa*, possibly, a single fragment (<5g) (C O'Brien 2004)

Initial comment: as GrA-25299

Objectives: as GrA-25299

Calibrated date: *1σ:* 2890–2700 cal BC
2σ: 2900–2670 cal BC

Final comment: A Long (14 September 2004), this date provides an age for levels soon after the decline in *Betula* pollen and the first presence of cereal-type pollen, which sample OxA-13530 was intended to date. The small scale disturbance of the woodland for cultivation would appear to have taken place in mid-Neolithic times not long before the woodland regeneration phase at the level of this date. The pollen assemblage is compatible with such a date for this activity.

OxA–13558 2256 ±32 BP

δ¹³C: -26.3‰

Sample: F45–1A (22–3cm), submitted on 8 March 2004 by A Long

Material: plant macrofossil (<5g) (waterlogged, bulk sample): *Ranunculus flammula* achenes; *Carex* sp., nutlets; *Eleocharis* sp., nutlets (C O'Brien 2003)

Initial comment: as GrA-25299

Objectives: as GrA-25299

Calibrated date: *1σ:* 390–230 cal BC
2σ: 400–200 cal BC

Final comment: A Long (14 September 2004), this date provides an age for the upper part of the upper peat profile in this basin. The date suggests a late Iron Age date for this infill. The very low tree pollen frequencies and high indicators of grassland conditions would be compatible with such a late prehistoric age. The date is similar to a date for the top of the profile obtained by Tipping (2000) at the University of Stirling of 2330 ±40 BP (Beta-143452; 480–360 cal BC at 95% confidence) (Reimer *et al* 2004) (Stuiver and Kra 1986). High Cyperaceae (sedges) and other wetlands herbs would conform with conditions of wet and cold climate in the later Iron Age.

References: Reimer *et al* 2004
Stuiver and Kra 1986
Tipping 2000

OxA–13559 2229 ±34 BP

δ¹³C: -26.7‰

Sample: F45–1B (23–4cm), submitted on 8 March 2004 by A Long

Material: plant macrofossil (<5g) (waterlogged, bulk sample): *Potentilla* sp. *acheries*; *Ranunculus flammula* achenes; *Carex* sp., nutlets; *Eleocharis* sp., nutlets (C O'Brien 2003)

Initial comment: as GrA-25299

Objectives: as GrA-25299

Calibrated date: *1σ:* 390–200 cal BC
2σ: 400–190 cal BC

Final comment: A Long (14 September 2004), this date is from a level immediately below that of date OxA-13558 and is almost indistinguishable from it. It confirms that date as

accurate and shows the vegetation of local Cyperaceae (sedge), Poaceae (grasses), and *Pteridium* (bracken) vegetation to be late Iron Age in date. Human activity and climatic deterioration at this time is compatible with the pollen evidence.

Swale-Ure Washlands: Langland's Farm, North Yorkshire

Location: SE 333912
Lat. 54.18.57 N; Long. 01.29.20 W

Project manager: A Long (University of Durham), July 2003

Description: the site is east of the River Swale and south of Morton-on-Swale. The area is called 'The Bottoms', and is a low-lying area flooded by the Swale during periods of high rainfall. The site comprises a peat bed *c* 1m thick, underlain by sands and silts, and overlain by *c* 70cm of alluvium. A single sample was selected for dating.

Objectives: dating this sample will provide a chronology for the start of river sediment accumulation and the termination of peat accumulation at this site.

Final comment: A Long (14 September 2004), the single date in this series has accomplished its objective of providing an age for the change from terrestrial peat accumulation to riverine alluvial sedimentation.

References: Bridgland *et al* forthcoming

GrA–24660 5520 ±50 BP

$\delta^{13}C$: -28.8‰

Sample: LF1 (69–70cm), submitted on 15 September 2003 by A Long

Material: wood: cf *Alnus glutinosa*, waterlogged, a single fragment (<5g) (R Gale 2003)

Initial comment: the sample was collected using a Russian corer. The sample is from the first macrofossils encountered at the base of the organic-rich silts close to the top of the peat. The peat deposits show a transition from freshwater-dominated sedges and grasses to woodland dominated environments. No reworking of older pollen is recorded within the peat section. The field from which the sample was taken is flooded in winter and/or during periods of high rainfall.

Objectives: dating this sample will provide a chronology for the start of river sediment accumulation and the termination of peat accumulation at this site.

Calibrated date: *1σ:* 4450–4330 cal BC
2σ: 4460–4260 cal BC

Final comment: A Long (14 September 2004), the sample for dating was taken at a point in the profile where elm pollen frequencies were high but about to decline sharply to very low values. The date shows this elm pollen reduction to equate with the main mid-Holocene *Ulmus* decline, supported by the start of a *Plantago lanceolata* (ribwort plantain) curve and then other agricultural indicators. The date confirms that peat formation ended and riverine alluvial sedimentation began in early Flandrian III around *c* 3790–3710 cal BC (*c* 5000 BP) (Reimer *et al* 2004).

References: Reimer *et al* 2004

Swale-Ure Washlands: Newby Wiske, North Yorkshire

Location: SE 368866
Lat. 54.16.27 N; Long. 01.26.08 W

Project manager: A Long (University of Durham), November 2003

Description: the site is located three miles south of Northallerton and one mile south of the village of Newby Wiske, in the valley of the Spudling Dike, a tributary of the River Wiske. More than 4m of clay, marl, and peat were proven in the centre of the valley. There are eight samples in the series, all from the same core.

Objectives: dating eight samples from Newby Wiske will provide a chronology for late Glacial and Holocene peat and marl accumulation, and for major vegetation changes and pollen zone boundaries.

References: Bridgland *et al* forthcoming

GrA–25028 8040 ±50 BP

$\delta^{13}C$: -26.9‰

Sample: NW–1 (191–2cm), submitted on 9 December 2003 by A Long

Material: wood: *Alnus* sp., waterlogged chunk of wood, a single fragment (<5g) (C O'Brien 2003)

Initial comment: the core was taken from the area of deepest sediment thickness in the centre of a drainage channel at Newby Wiske. This sample was taken from 192cm depth in peat, where the main rise, or rational limit, of *Alnus* pollen begins. The subsurface sample is taken from 192cm below the surface. Well below the watertable. The sediments are undisturbed. The substrate is calcareous.

Objectives: the dating strategy for this site is to establish a chronology for the accumulation of the peat sediments, for major pollen zone boundaries, and to establish and evaluate human impact on the landscape.

Calibrated date: *1σ:* 7070–6860 cal BC
2σ: 7090–6780 cal BC

Final comment: A Long (14 September 2004), this date was intended to provide an age for the main mid-Holocene rise in *Alnus* pollen to high frequencies in its rational limit. Although some considerable variation in age for this feature has been recorded, most dates fall around *c* 5950–5850 cal BC (*c* 7000 BP) (Reimer *et al* 2004) in lowland northern England. This date is therefore unusually old for this pollen zone boundary. Although not entirely unacceptable, the date must be considered suspect.

References: Reimer *et al* 2004

GrA–25030 11280 ±60 BP

$\delta^{13}C$: -22.5‰

Sample: NW–5 (355–6cm), submitted on 9 December 2003 by A Long

Material: plant macrofossils (<5g) (monocot stems, bulk sample)

Initial comment: the core was taken from the area of deepest sediment thickness in the centre of a drainage channel at Newby Wiske. This sample was taken from 355cm depth, the lowest point in the limnic mud from which plant macrofossils are available. The main rise, or rational limit, of *Betula* pollen begins where the sediment type changes from silty clay to limnic mud at 364cm, so this date will provide a limiting date for that event.

Objectives: as GrA-25028

Calibrated date: *1σ:* 11290–11160 cal BC
2σ: 11330–11120 cal BC

Final comment: A Long (14 September 2004), this date was intended to provide an age as close as possible to the main early Holocene rise in *Betula* pollen, its rational limit. The pollen data show the expected complete sequence of pollen zone changes for the early Holocene, and so the age of the rise of birch pollen would be expected to be a little after *c* 9650–9350 cal BC (*c* 10,000 BP). The calibration given above for GrA-25355 is similar but not identical. This date is incompatible with the pollen stratigraphy and is clearly too old and must be assumed to be unacceptable as a true age for this level.

GrA–25031 4315 ±40 BP

$\delta^{13}C$: -26.6‰

Sample: NW–8 (1–2cm), submitted on 9 December 2003 by A Long

Material: wood: bark, a single fragment (<5g) (C O'Brien 2003)

Initial comment: the core was taken from the area of deepest sediment thickness in the centre of a drainage channel at Newby Wiske. This sample was taken from 1–2cm depth below the surface, above the watertable. The sediments appear undisturbed, although the roots of surface vegetation may have penetrated. The substrate is calcareous.

Objectives: as GrA-25028

Calibrated date: *1σ:* 2930–2890 cal BC
2σ: 3030–2880 cal BC

Final comment: A Long (14 September 2004), this date provides an age for the surface of the surviving peat in the Newby Wiske channel, presumably truncated by recent drainage and other activities, and so also for the end of the pollen record. The date is mid-Neolithic in age, which is in accordance with the pollen data, with low *Ulmus* values, high non-tree pollen frequencies and the continuous presence of agricultural and open-ground indicators including cereal-type, *Plantago lanceolata*, *Pteridium*, and several others.

OxA–13107 8660 ±55 BP

$\delta^{13}C$: -27.8‰

Sample: NW–3 (214–5cm), submitted on 9 December 2003 by A Long

Material: plant macrofossils (0.06g) (waterlogged, bulk sample): bark, cylinder; *Carex* sp., fruits and nutlets; *Sparganium* subgen *Xanthosparganium*, fruits and nutlets; *Mentha* sp., fruits and nutlets; *Eupatorium*, fruits and nutlets; *Betula* sp., fruits and nutlets (C O'Brien 2003)

Initial comment: the core was taken from the area of deepest sediment thickness in the centre of a drainage channel at Newby Wiske. This sample was taken from 215cm depth in peat, where the sediment changes from peat to marl.

Objectives: as GrA-25028

Calibrated date: *1σ:* 7740–7590 cal BC
2σ: 7800–7580 cal BC

Final comment: A Long (14 September 2004), this date was intended to date the transition from marl to organic mud deposition in the basin. The pollen data at this level show very high *Corylus* frequencies and moderate *Ulmus, Pinus,* and *Quercus* are low, and *Alnus* is not yet recorded. The date is not incompatible with these pollen data although is perhaps a little old compared with dates from similar pollen assemblages elsewhere in lowland northern England.

OxA–13112 6710 ±50 BP

$\delta^{13}C$: -28.0‰

Sample: NW–4 (341–3cm), submitted on 9 December 2003 by C O'Brien

Material: plant macrofossil: *Betula* sp., waterlogged, fruits and bud scales, bulk sample (0.04g) (C O'Brien 2003)

Initial comment: the core was taken from the area of deepest sediment thickness in the centre of a drainage channel at Newby Wiske. This sample was taken from 342cm depth in peat, where the main rise, or rational limit, of *Corylus* pollen begins, *Betula* pollen falls, and the sediment type changes from limnic mud to marl.

Objectives: as GrA-25028

Calibrated date: *1σ:* 5670–5570 cal BC
2σ: 5720–5540 cal BC

Final comment: A Long (14 September 2004), this date was intended to provide an age for the pollen zone boundary defined by the main fall in *Betula* pollen and the main early Holocene rise in *Corylus* pollen, its rational limit. The pollen data show the expected complete sequence of pollen zone changes for the early Holocene, and so the age of the *Corylus* rise, by analogy with many other dated profiles, would be expected to be about *c* 8270–8230 cal BC (*c* 9000 BP) or a little earlier. This date is incompatible with the pollen stratigraphy and is clearly too young and must be assumed to be unacceptable for this level.

OxA–13321 4921 ±33 BP

$\delta^{13}C$: -27.4‰

Sample: NW–10 (54–6cm), submitted on 9 December 2003 by A Long

Material: wood: *Alnus glutinosa*, a single fragment (<5g) (C O'Brien 2003)

Initial comment: the core was taken from the area of deepest sediment thickness in the centre of a drainage channel at Newby Wiske. This sample was taken from 54–6cm depth below the surface, above the watertable. The sediments appear undisturbed. The substrate is calcareous.

Objectives: as GrA-25028

Calibrated date: *1σ:* 3710–3650 cal BC
2σ: 3780–3640 cal BC

Final comment: A Long (14 September 2004), this date provides an age for the end of the main agricultural episode associated with the *Ulmus* decline in this profile. Agricultural indicators continue after this level but at lower frequencies than before. Cereal-type pollen and the main weeds of cultivation decline and are replaced by more general open ground indicators, mainly Poaceae and Cyperaceae.
The date is very close to an expected age for the closing phases of the elm decline.

OxA–13322 5241 ±32 BP

δ^{13}*C:* -26.5‰

Sample: NW–II (61–2cm), submitted on 9 December 2003 by A Long

Material: wood: *Alnus glutinosa*, a single fragment (<5g) (C O'Brien 2003)

Initial comment: the core was taken from the area of deepest sediment thickness in the centre of a drainage channel at Newby Wiske. This sample was taken from 54–6cm depth below the surface, above the watertable. The sediments appear undisturbed. The substrate is calcareous.

Objectives: as GrA-25028

Calibrated date: *1σ:* 4050–3980 cal BC
2σ: 4230–3970 cal BC

Final comment: A Long (14 September 2004), this date provides an age for the start of the main mid-Holocene *Ulmus* decline and is closely comparable with other dates for the start of this event in lowland northern England. As well as the fall in elm frequencies, other trees decline, including *Tilia* and *Alnus*. Continuous pollen curves for agricultural indicators cereal-type, *Plantago lanceolata* and other open ground weeds begin at this level, supporting its identification as the early Neolithic elm decline.

Swale-Ure Washlands: Ripon Hanson Quarry, North Yorkshire

Location: SE 30317670
Lat. 54.11.07 N; Long. 01.32.13 W

Project manager: A Long (University of Durham), December 2003

Description: the site is a channel infill revealed by quarry working. Organic sediments are present within an overall clastic sequence.

Objectives: the abandoned meander or channel has been infilled by sediment that reflects a series of flood events. Two samples were submitted: one was a piece of wood from the gravel beneath the channel fill, and one was of macrofossils from the organic sediment.

Final comment: A Long (14 September 2004), the two dates from this gravel and organic clay channel infill sequence form a good chronological series and fulfil the objectives of the site dating strategy, providing ages for the changes from gravel deposition to fine-grained organic sedimentation.

References: Bridgland *et al* forthcoming

GrA–25377 2325 ±50 BP

Sample: RH–1 (69–70cm), submitted on 8 March 2004 by A Long

Material: plant macrofossil (<5g) (bulk sample): *Pteridium* spp.; Chenopodiaceae; *Polygonum* spp.; *Polygonum aviculare* (C O'Brien 2004)

Initial comment: monolith cores were taken from a channel fill exposed through quarry excavation. The monolith is from about 25m from the site of GU-5998. The stratigraphy of the monolith shows dark grey that grade upwards into a series of thin sand layers and clay. The section occurs in a gravel quarry, where it was exposed temporarily during quarry excavation. Core material was collected in monolith tins. The bedrock is Permian marls and gravels.

Objectives: to establish a chronology for organic sedimentation at this location. This links to development of river terraces of the Ure at this site. Preliminary pollen work suggests a late Holocene age.

Calibrated date: *1σ:* 410–380 cal BC
2σ: 520–230 cal BC

Final comment: A Long (14 September 2004), this date confirms the later Holocene age inferred from the pollen data recovered from the organic fine channel infill. It provides a chronology for the change to low energy deposition after the period of gravel aggradation.

GU–5998 3900 ±50 BP

δ^{13}*C:* -25.9‰

Sample: RH wood, submitted on 9 December 2003 by A Long

Material: wood: *Alnus glutinosa*, waterlogged, wide roundwood, a single fragment (100g) (R Gale 2003)

Initial comment: the sample was part of a larger log (60 × 25 × 15cm) from the upper 1m of gravel. This sample comes from the upper gravel sequence that has been sampled for OSL dates of a site about 100m away and at about the same stratigraphic level. The gravels in which it was found are thought to be of mid-Holocene age from shell fragments within the gravels. We have also extracted a 1m monolith about 25m from the site of the wood. This shows dark grey clay that grades upwards into a series of thin sand layers and clay. This appears to be sediment from an abandoned meander. The wood was found near the top of the gravels that underlie this sediment.

Objectives: to constrain the dating of channel infill deposits by providing a maximum date for the end of gravel aggradation. The gravels have also been sampled for OSL dates, and dating the wood would allow calibration of the OSL.

Calibrated date: *1σ:* 2470–2290 cal BC
2σ: 2570–2200 cal BC

Final comment: A Long (14 September 2004), this date provides an age for the end of gravel deposition in this river channel and provides a limiting date for the start of fine grained sediment deposition in the channel. The date has confirmed the suspected mid-Holocene age for the gravel deposition events.

References: Duller 2007

Swale-Ure Washlands: Shake-Hole 1, Nosterfield, North Yorkshire

Location: SE 278806
Lat. 54.13.15 N; Long. 01.34.28 W

Project manager: A Long (University of Durham), September 2003

Description: the site is known as 'The Flasks' and is located in the northern part of the Tarmac gravel quarry at Nosterfield. The core is taken from a shake-hole, which formed as a result of dissolution from the underlying Magnesian Limestone. The shake-hole was infilled with a 5m thick peat sequence. The samples in this series are all from the same core, SH-1.

Objectives: the dating strategy for this site is to establish a chronology for the accumulation of the peat and to establish and evaluate human impact on the landscape. The peat has the potential to record detailed environmental and cultural history between the rivers Swale and Ure, and close to the Thornborough henge complex. Detailed pollen work is currently being undertaken to establish and interpret this history.

Final comment: A Long (14 September 2004), these dates form a consistent chronological series and may be accepted as providing a reliable chronology of the profile. The lower dates seem rather old for their relation to the *Alnus* pollen curve, which usually falls around *c* 7000 BP (*c* 5980–5840 cal BC; Reimer *et al* 2004) in lowland northern England. Considerable variable occurs in the age of this pollen zone boundary however, and the two lower dates are acceptable. The two upper dates are very compatible with their pollen stratigraphic context and can be accepted. The association of the upper date with evidence of a major climatic shift to increased wetness is supported by several similar dates for this switch elsewhere in northern England.

References: Bridgland *et al* forthcoming
Reimer *et al* 2004

GrA–24566 2715 ±45 BP

$\delta^{13}C$: -30.0‰

Sample: SH–1/2 (84–5cm), submitted on 6 October 2003 by A Long

Material: plant macrofossil: bark, indeterminate, a single fragment (<5g) (R Gale 2003)

Initial comment: macrofossil from 84–5cm below the top of a 5m core. The sediments are undisturbed.

Objectives: the value of dating this particular depth is that it records a vegetational change from woodland to grassland and sedge, which may represent forest clearance and increased arable and pastoral activity (perhaps the Bronze Age/Iron Age transition, or later). The macrofossils are from the top of the 'woodland' assemblage.

Calibrated date: *1σ:* 910–810 cal BC
2σ: 980–800 cal BC

Final comment: A Long (14 September 2004), this date provides an age for a major vegetation change from an at least partially wooded local landscape to one completely dominated by non-tree taxa. The date falls around the Bronze Age to Iron Age transition and there are enough pollen indicators of agricultural activity to suggest that farming activity contributed to the change. Cyperaceae provide most of the increase in herbaceous pollen, however, and a major climatic shift to wetter conditions which occurred throughout north-west Europe at this time was probably responsible. The date is typical for the age of this climatic change recorded in peat profile in northern England and beyond.

GrA–25048 3230 ±40 BP

$\delta^{13}C$: -30.1‰

Sample: SH–1/6 A (119–20cm), submitted on 10 December 2003 by A Long

Material: wood: *Alnus* sp., twig, a single fragment (0.25g) (C O'Brien 2003)

Initial comment: macrofossil from 119–20cm below the top of a 5m core. The sediments are undisturbed.

Objectives: to establish a date for a relative 'peak' of cereal pollen together with weeds of cultivation, eg *Plantago lanceolata*, *Taraxacum* spp.

Calibrated date: *1σ:* 1530–1440 cal BC
2σ: 1620–1420 cal BC

Final comment: A Long (14 September 2004), this date provides an age for a phase of increased agricultural activity with peak pollen frequencies for cereal-type, *Plantago lanceolata*, and other weeds of cultivation and pasture. A decline in woodland cover also occurs. The date shows these vegetation changes to have taken place in the later Bronze Age, an acceptable time for the agricultural activity recorded, and the date is considered reliable.

Laboratory comment: Ancient Monuments Laboratory (14 September 2004), The two measurements from this level (GrA-25048 and OxA-13225) are not statistically consistent ($T'=13.7; T'(5\%)=3.8, \nu=1$) (Ward and Wilson 1978).

References: Ward and Wilson 1978

OxA–13012 7705 ±39 BP

$\delta^{13}C$: -25.4‰

Sample: SH–1/3 (495–6cm), by 28/09/2004

Material: plant macrofossil: monocot, waterlogged culm (stem), a single fragment (<5g) (R Gale 2003)

Initial comment: macrofossil from 495–6cm below the top of a 5m core. The sediments are undisturbed.

Objectives: the dating of this particular depth will provide age control for the base of the peat.

Calibrated date: *1σ:* 6600–6470 cal BC
2σ: 6640–6460 cal BC

Final comment: A Long (14 September 2004), this date provides an age for the start of peat formation within the depression. The mid-Holocene mixed deciduous forest trees dominate the pre-*Ulmus* decline pollen assemblage and so the date is acceptable in relation to the pollen data. Substantial *Alnus* pollen, which may indicate the alder rise, is usually dated to around *c* 7000 BP (*c* 5980–5840 cal BC; Reimer *et al* 2004) in lowland northern England.

This date seems therefore rather old, but there is considerable variation in the dating of the *Alnus* rise and so the date is likely to be reliable.

References: Reimer *et al* 2004

OxA–13104 7435 ±39 BP

δ¹³C: -24.4‰

Sample: SH–1/7 (338–40cm), submitted on 10 December 2003 by A Long

Material: plant macrofossil (<5g) (waterlogged): *Menyanthes trifoliata*, a single fragment (C O'Brien 2003)

Initial comment: macrofossil from 338–40cm below the top of a 5m core. The sediments are undisturbed.

Objectives: to establish date at the top of a recognised limnic unit.

Calibrated date: *1σ:* 6390–6240 cal BC
2σ: 6420–6220 cal BC

Final comment: A Long (14 September 2004), this date provides an age for the major lithological change from limnic mud to moss peat which occurred as part of the hydrological succession. *Ulmus* pollen frequencies are relatively low but there are no indicators of vegetation disturbance due to human activity, and it is probable that a mid-Holocene age is correct. *Alnus* values are high and the date seems rather old, for the alder rise, but the date of the *Alnus* rise varies considerably due to local conditions and this date is not unacceptable.

OxA–13225 3427 ±35 BP

δ¹³C: -27.5‰

Sample: SH–1/6 B (119–20cm), submitted on 10 December 2003 by A Long

Material: plant macrofossils (<5g) (bulk sample): *Rubus idaeus*, fruitstone; *Carex* sp., nutlet; *Ranunculus* achene, wood and bark (C O'Brien 2003)

Initial comment: as GrA-25048

Objectives: as GrA-25048

Calibrated date: *1σ:* 1760–1680 cal BC
2σ: 1880–1630 cal BC

Final comment: A Long (14 September 2004), this date provides an age for the phase of increased agricultural activity with peaks in pollen indicators of cultivation and pasture. It is from the same level as OxA-13104 and is almost the same age, providing confirmation of the Bronze Age date for the expansion in farming shown in the pollen data.

Laboratory comment: see GrA-25048

Swale-Ure Washlands: Sharow Mires, Sharow, North Yorkshire

Location: SE 235715
Lat. 54.08.21 N; Long. 01.38.28 W

Project manager: A Long (University of Durham), April 2003

Description: the site is a palaeochannel of the Ure and may also have formed as a result of dissolution of the underlying gypsum beds. The site contains a 9m-deep record of organic-rich sediments of late Holocene age. These may provide a high-resolution database of vegetational history and human land use of middle-late Holocene age. There are eight samples in the series.

Objectives: to establish a detailed chronology for human impact on the landscape and changes in vegetation history.

Final comment: A Long (14 September 2004), this dating series has achieved its objectives in providing a detailed chronology for the alluvial sediments in this channel. The dates form a consistent chronological series and provide an age range for human agricultural activity and changes in alluvial history from Bronze Age to late medieval times.

References: Bridgland *et al* forthcoming

GrA–24645 3360 ±50 BP

δ¹³C: -30.4‰

Sample: SM–1/7 (731–2cm), submitted on 10 November 2003 by A Long

Material: plant macrofossil: cf Salicaceae, waterlogged, a single fragment (<5g) (R Gale 2003)

Initial comment: the sample is located at 731–2cm below the surface, and within dark grey/black peaty silt.

Objectives: this particular sample is required to provide chronological control towards the base of the section.

Calibrated date: *1σ:* 1740–1600 cal BC
2σ: 1760–1510 cal BC

Final comment: A Long (14 September 2004), this date provides an age for sediment accumulation near the base of the sampled profile. The date is just after a level with falls in *Quercus, Alnus* and *Betula* pollen and increases in open ground weeds including *Plantago lanceolata*. This limited woodland opening is therefore dated to the middle Bronze Age. This is an acceptable date for the pollen changes recorded.

Laboratory comment: Ancient Monuments Laboratory (14 September 2004), the two measurements (GrA-24645 and OxA-12928) are statistically consistent (T′=0.0; n=2; T′(5%)=6.0) (Ward and Wilson 1978).

References: Ward and Wilson 1978

GrA–25050 605 ±35 BP

δ¹³C: -26.7‰

Sample: SM–1/3 (253–4cm), submitted on 11 December 2003 by A Long

Material: plant macrofossils: monocot, stems, bulk sample (<5g) (C O'Brien 2003)

Initial comment: the sample is located at 253–4cm below the surface and occurs within an organic silt, which contains distinct organically richer layers. Shell-rich horizons are present beneath this and grade with depth to sand.

Objectives: to establish millennial scale patterns of change in vegetational history and human impact on the environment. This particular sample provides chronological control at a relative peak in cereal pollen.

Calibrated date: *1σ:* cal AD 1300–1410
2σ: cal AD 1280–1420

Final comment: A Long (14 September 2004), this date provides an age for a phase of increased agricultural indicator pollen within a highly organic part of the alluvial profile. Tree and scrub pollen frequencies are particularly low and cereal-type pollen rises to a peak. Agricultural weeds including *Urtica* and *Plantago lanceolata* are also present in high values. *Linum* is present also. The date indicates a late medieval, fourteenth-century AD, age for this agricultural expansion, which fits well with the pollen evidence.

OxA–12928 3371 ±31 BP

$\delta^{13}C$: -24.4‰

Sample: SM–1/7 (731–2cm), submitted on 10 November 2003 by A Long

Material: plant macrofossil (<5g) (waterlogged, bulk sample): *Alisma* ssp., two fragments; *Rumex* sp., one fragment; *Lycopus europaeus*, one fragment; *Carex* sp., ten nutlets (C O'Brien 2003)

Initial comment: the sample is located at 731-2cm below the surface, and within dark grey/black peaty silt.

Objectives: this particular sample is required to provide chronological control towards the base of the section.

Calibrated date: *1σ:* 1740–1620 cal BC
2σ: 1750–1540 cal BC

Final comment: A Long (14 September 2004), this date provides another age estimate from the same level as GrA-24645, the result being almost identical with it. It supports the age of this small scale clearance of *Quercus, Alnus,* and *Betula* woodland and spread of more open conditions as middle Bronze Age.

Laboratory comment: see GrA-24645

OxA–12929 482 ±27 BP

$\delta^{13}C$: -27.2‰

Sample: SM–1/1 (173–4cm), submitted on 15 April 2003 by A Long

Material: plant macrofossil (waterlogged, bulk sample): *Carex* sp., five and a half trigonous nutlets; *Rumex* sp., two nutlets; *Betula* sp., one fruit (C O'Brien 2003)

Initial comment: the sample is located at 173–4cm below the surface and is at the top of a peat-rich interval. Above this, sediments are dominated by silts and clays, with occasional sand layers.

Objectives: this particular sample is required to provide chronological control at the top of the section, where organic sedimentation is largely replaced by inorganic clays and silts.

Calibrated date: *1σ:* cal AD 1420–1450
2σ: cal AD 1410–1450

Final comment: A Long (14 September 2004), this date provides an age for the switch in lithology from highly organic peat rich sediments to deposits dominated by alluvial silts and clays. The date result indicates a late medieval, early fifteenth-century AD, for this transition to increased alluviation. Low tree pollen values, indicating only patchy scrub growth, and high non-arboreal frequencies in this upper part of the profile are compatible with this date.

OxA–12930 2450 ±31 BP

$\delta^{13}C$: -29.0‰

Sample: SM–1/5 (530–1cm), submitted on 10 November 2003 by A Long

Material: wood: *Alnus glutinosa*, waterlogged stem, a single fragment (<5g) (R Gale 2003)

Initial comment: the sample is located at 530–1cm below the surface, and represents an organic unit within an organic clay/silt interval.

Objectives: this particular sample is required to provide chronological control for an apparent vegetational shift between hazel and alder dominated woodland to a landscape dominated by grasses and sedges. This sample would date the base of the grass/sedge assemblage.

Calibrated date: *1σ:* 750–410 cal BC
2σ: 770–400 cal BC

Final comment: A Long (14 September 2004), this date provides an age near the replacement of *Alnus* and *Corylus* woodland by Poaceae and Cyperaceae dominated vegetation. Agricultural-indicator pollen types also increase during this change. This layer is more organic than those below and above it. The date suggests an age between the fourth and seventh centuries BC for this vegetation. This is an acceptable date for the pollen data. Iron Age agriculture may be partly responsible for this reduction in tree cover and spread of cultivation and open ground. A climatic shift around this time towards wetter and colder conditions may also have caused such changes, increasing wetland communities.

OxA–12931 2426 ±30 BP

$\delta^{13}C$: -27.2‰

Sample: SM–1/6 (616cm), submitted on 10 November 2003 by A Long

Material: wood: *Alnus* sp., waterlogged chunk, a single fragment (5g) (C O'Brien 2003)

Initial comment: the sample is located at 616cm below the surface, within an organic-rich clay/silt interval.

Objectives: this particular sample is required to provide chronological control for an apparent vegetational shift between hazel and alder- dominated woodland to a landscape dominated by grasses and sedges. This sample would date the top of the woodland assemblage.

Calibrated date: *1σ:* 730–400 cal BC
2σ: 750–400 cal BC

Final comment: A Long (14 September 2004), this date provides another age estimate of the change from woodland to sedge grassland with increased agricultural indicators recorded by date OxA-12930 and supports its result. The date is acceptable for the pollen data at this level.

OxA–13105 1494 ±28 BP

$\delta^{13}C$: -28.4‰

Sample: SM–1/4 (476–7cm), submitted on 17 December 2003 by A Long

Material: plant macrofossils: *Rumex* sp., waterlogged, nutlet, two monocot stems, bulk sample (0.06g) (R Gale 2003)

Initial comment: the sample is located at 476–7cm below the surface, beneath a significant sandy interval. The sediments are dark grey/black organic silts and mark the end of organic sedimentation in this part of the core.

Objectives: this particular sample is required to provide chronological control for the onset of cereal pollen, as recorded in the current pollen diagram.

Calibrated date: *1σ:* cal AD 540–610
2σ: cal AD 530–640

Final comment: A Long (14 September 2004), this date provides an age for a switch from highly organic alluvial sediments to a minerogenic layer. This corresponds with an increase in tree pollen frequencies and reduction in probably local Poaceae percentages. Cereal-pollen peaks and *Plantago lanceolata* occur prior to this switch in increased frequencies. The date suggests that these vegetation changes occurred in the late sixth and early seventh centuries AD. The pollen data are quite compatible with such a date.

OxA–13141 1170 ±100 BP

$\delta^{13}C$: -27.1‰

Sample: SM–1/4 (479–82cm), submitted on 17 December 2003 by A Long

Material: plant macrofossils (0.06g) (waterlogged, bulk sample): cf Salicaceae; *Menyanthes trifoliata*, monocot stem (C O'Brien and R Gale 2003)

Initial comment: the sample is located at 479–82cm below the surface, beneath a significant sandy interval. The sediments are dark grey/black organic silts and mark the end of organic sedimentation in this part of the core.

Objectives: this particular sample is required to provide chronological control for the onset of cereal pollen, as recorded in the current pollen diagram

Calibrated date: *1σ:* cal AD 710–990
2σ: cal AD 650–1030

Final comment: A Long (14 September 2004), this date is from a level only a few centimetres below date OxA-13105. It also provides an age for the mid-profile switch from highly organic alluvial sediments to a minerogenic layer with high Poaceae, cereal-type and *Plantago lanceolata* pollen before the change represented by increased tree pollen frequencies above it. The date, with a greater standard deviation than date OxA-13105, indicates an age range between the eighth and tenth centuries AD. Again the pollen data are compatible with such an age.

Swale-Ure Washlands: Thornton's Plantation, North Yorkshire

Location: SE 356832
Lat. 54.14.37 N; Long. 01.27.16 W

Project manager: A Long (University of Durham), July 2003

Description: the site is a peat bed *c* 50cm thick, underlain by sands and silts and overlain by *c* 70 cm of organic-rich alluvium.

Objectives: the dating strategy for this site is to establish a chronology for the onset of alluviation and the end of peat accumulation.

Final comment: A Long (14 September 2004), this dating series achieves its objectives in providing an age for the onset of alluviation at this site. These two dates from the same level are sufficiently similar to be accepted as a reliable estimate of the start of riverine silt deposition within the peat unit. They are broadly supported by the pollen data although some anomalies exist. The early Holocene age for the start of alluviation is older than expected for this process.

References: Bridgland *et al* forthcoming

GrA–24656 9060 ±60 BP

$\delta^{13}C$: -28.2‰

Sample: TP2(C) (74–5cm), submitted on 6 October 2003 by A Long

Material: plant macrofossils (<5g) (waterlogged (herbaceous), bulk sample)

Initial comment: the sample is taken from the top of the main organic unit.

Objectives: dating this sample will provide a chronology for the start of river sediment accumulation and the termination of peat accumulation at this site.

Calibrated date: *1σ:* 8300–8240 cal BC
2σ: 8340–8220 cal BC

Final comment: A Long (14 September 2004), this date provides an age for the change from purely peat deposition to organic sedimentation with a high alluvial silt fraction. The age agrees with the pollen data, as at this level *Corylus* replaces *Betula* as the main pollen type, a feature dated elsewhere in northern England to around 9000 BP *(c* 8300–8200 cal BC; Reimer *et al* 2004). Significant deciduous tree pollen frequencies below this level, however, seem anomalous and some disturbance of the peat profile seems possible. This date for the start of the transition to alluvial deposition seems early. The final change to purely minerogenic alluvial sediments occurs higher in the profile in the mid-Holocene.

Laboratory comment: Ancient Monuments Laboratory (14 September 2004), the two measurements (GrA-24656 and GrA-25290) are statistically inconsistent ($T'=7.3; T'(5\%)=3.8; \nu=1$) (Ward and Wilson 1978).

References: Ward and Wilson 1978

GrA–25290 8850 ±50 BP

$\delta^{13}C$: -29.3‰

Sample: TP2(C)/74–5cm/B, submitted on 6 October 2003 by A Long

Material: plant macrofossils (<5g) (a single fragment): *Corylus/Alnus* sp., twig and unidentified bark (R Gale 2003)

Initial comment: as GrA-24656

Objectives: as GrA-24656

Calibrated date: *1σ:* 8210–7830 cal BC
2σ: 8230–7740 cal BC

Final comment: A Long (14 September 2004), this date from the same level as date GrA-24656 provides confirmation of the early Holocene age of the start of silt deposition in the organic unit at this site. Although the two dates are not identical, this later age is still within the range limits of the pollen changes observed at this level.

The Rye area project

Location: TQ 922203
Lat. 50.57.02 N; Long. 00.44.08 E

Project manager: A J Long (University of Durham)
November 2002–March 2004

Description: the environmental, coastal, and landscape history of the port of Rye over the last 2000 years.

Objectives: to determine temporal and spatial variations in the timing of the late Holocene marine inundation of the Rye area. The results will show whether the inundation was the product of a westward expansion of a major back-barrier estuary or represents an early breach in the gravel barrier in the vicinity of Rye.

References:
Long *et al* 1996
Long *et al* 2002
Long *et al* 2006a
Long *et al* 2006b
Long *et al* forthcoming
Waller *et al* 2006
Waller and Schofield on-line 2006

The Rye area project: Cadborough Cliff, East Sussex

Location: TQ 909194
Lat. 50.56.34 N; Long. 00.43.00 E

Project manager: M P Waller and J E Schofield (Kingston University), November 2002

Archival body: School of Earth Science and Geography, Kingston University

Description: samples were collected from an area of rough pasture *c* 0.25km south from the base of Cadborough Cliff.

Objectives: Cadborough Cliff is one a series of sites investigated to determine temporal and spatial variations in the timing of the late Holocene marine inundation of the Rye area. The results will show whether the inundation was the product of a westward expansion of a major back barrier estuary or represents an early breach in the gravel barrier in the vicinity of Rye.

Final comment: M P Waller and J E Schofield (8 June 2004), the dates from immediately beneath the stratigraphic contact between the peat and overlying marine/brackish clastic sediments in the vicinity of Rye range from 2860 ±60 BP (GrN-28106 at Roadend) to 1240 ±50 BP (GrN-28104 at East Guldeford). There is no clear spatial pattern to these dates. Given the marked decline experienced in the peat accumulation rate from *c* 4000 BP, as documented at sites beyond the limits of the marine/brackish sedimentation (Peasmarsh and Lea Farm), it is likely that the older dates in the Rye series (such as that obtained from Cadborough Cliff) do not accurately record the onset of marine conditions in this area.

References:
Long *et al* 2006b
Waller *et al* 2006
Waller and Schofield on-line 2006

GrN–28105 2480 ±60 BP

$\delta^{13}C$: -28.7‰

Sample: CADBOROUGH, submitted on 9 July 2003 by M P Waller and J E Schofield

Material: peat (27.55g) (humin, -1.00 – -1.04m OD)

Initial comment: the sample was taken from the top of a unit of dark brown woody peat (B), immediately below a contact with marine/intertidal silty clays (A). The solid geology of the area around Cadborough Cliff is the Hastings Bed Group (mainly sandstones, siltstones, and clays). The watertable at the site is within 1m of the modern ground surface. The depth from which the sample is taken precludes any possibility of contamination by modern rootlet penetration. Pollen assemblages from the top of the peat indicate fen carr vegetation was locally dominant at the time of peat accumulation. Rising percentages of *Myrica gale* pollen suggest the environment was becoming increasingly acidic and nutrient poor. A transitional (non-erosive) contact between units A/B is indicated.

Objectives: this sample will provide an age-estimate for the end of peat accumulation at Cadborough Cliff, and a maximum date for late Holocene marine inundation of the peat bed at this location.

Calibrated date: *1σ:* 770–410 cal BC
2σ: 800–400 cal BC

Final comment: M P Waller and J E Schofield (8 June 2004), despite the litho- and biostratigraphic evidence for a gradual transition to marine/brackish conditions, a date of 800–400 cal BC; 2480 ±60 BP for the return of marine brackish conditions appears too early when compared to the total Rye area dataset. Peat accumulation must have effectively ceased at Cadborough Cliff long before marine inundation occurred.

The Rye area project: Greyfriars, East Sussex

Location: TQ 906170
Lat. 50.55.17 N; Long. 00.42.40 E

Project manager: M P Waller & J E Schofield (Kingston University), November 2002

Archival body: School of Earth Science and Geography, Kingston University

Description: samples collected from rough pasture situated between Friars Cliff and the Royal Military Canal.

Objectives: Greyfriars is one of a series of sites investigated to determine temporal and spatial variations in the timing of the late Holocene marine inundation of the Rye area. The results will show whether the inundation was the product of a westward expansion of a major back barrier estuary or represents an early breach in the gravel barrier in the vicinity of Rye.

Final comment: M P Waller and J E Schofield (8 June 2004), the dates from immediately beneath the stratigraphic contact between the peat and overlying marine/brackish clastic sediments in the vicinity of Rye range from 2860 ±60 BP (GrN-28106 at Roadend) to 1240 ±50 BP (GrN-28104 at East Guldeford). There is no clear spatial pattern to these dates. Given the marked decline experienced in the peat accumulation rate from *c* 4000 BP, as documented at sites beyond the limits of the marine/ brackish sedimentation (Peasmarsh and Lea Farm), it is likely that the older dates in the Rye series (such as that obtained from Greyfriars) do not accurately record the onset of marine conditions in this area.

References: Long *et al* 2006b
Waller *et al* 2006
Waller and Schofield on-line 2006

GrA–24065 2730 ±40 BP

$\delta^{13}C$: -28.6‰

Sample: GREYFRIARS (humic acid), submitted on 9 July 2003 by M P Waller and J E Schofield

Material: peat (41.29g) (-0.55 – -0.59m OD)

Initial comment: the sample was taken from the top of a unit of black well-humified peat (B), containing monocot stems and woody detritus, and immediately below a contact with brown marine/intertidal clay (A). The solid geology of the area around Greyfriars is the Hastings Bed Group (mainly sandstones, siltstones, and clays). The watertable at the site is within 1m of the modern ground surface. The depth at which the sample is taken precludes any possibility of contamination by modern rootlet penetration. Pollen assemblages from the A/B contact are dominated by pollen of *Myrica gale* with lesser percentages of Cyperaceae and Poaceae. These indicate open, oligotrophic conditions at the time of peat accumulation. Microfossil studies indicate the A/B contact is transitional (ie non-erosive).

Objectives: this sample will provide an age-estimate for the end of peat accumulation at Greyfriars, and a maximum date for late Holocene marine inundation of the peat bed at this location.

Calibrated date: *1σ:* 920–820 cal BC
2σ: 980–800 cal BC

Final comment: M P Waller and J E Schofield (8 June 2004), despite the litho- and biostratigraphic evidence for a gradual transition to marine/brackish conditions, this date for the return of marine brackish conditions appears too early when compared to the total Rye area dataset. Peat accumulation must have effectively ceased at Greyfriars long before marine inundation occurred.

GrN–28101 2940 ±40 BP

$\delta^{13}C$: -28.1‰

Sample: GREYFRIARS (humin), submitted on 9 July 2003 by M P Waller and J E Schofield

Material: peat (41.29g) (-0.55 – -0.59m OD)

Initial comment: as GrA-24065

Objectives: as GrA-24065

Calibrated date: *1σ:* 1260–1050 cal BC
2σ: 1300–1010 cal BC

Final comment: see GrA-24065

References: Ward and Wilson 1978

The Rye area project: Houghton Green, East Sussex

Location: TQ 928222
Lat. 50.57.51 N; Long. 00.43.00 E

Project manager: M P Waller and J E Schofield (Kingston University), December 2002

Archival body: School of Earth Science and Geography, Kingston University

Description: rough pasture immediately west of the Military Road and River Rother.

Objectives: Houghton Green is one of a series of sites investigated to determine temporal and spatial variations in the timing of the late Holocene marine inundation of the Rye area. The results will show whether the inundation was the product of a westward expansion of a major back barrier estuary or represents an early breach in the in the gravel barrier in the vicinity of Rye.

Final comment: M P Waller and J E Schofield (8 June 2004), the dates from immediately beneath the stratigraphic contact between the peat and overlying marine/brackish clastic sediments in the vicinity of Rye range from 2860 ±60 BP (GrN-28106 at Roadend) to 1240 ±50 BP (GrN-28104 at East Guldeford). There is no clear spatial pattern to these dates. Given the marked decline experienced in the peat accumulation rate from *c* 4000 BP, as documented at sites beyond the limits of the marine/ brackish sedimentation (Peasmarsh and Lea Farm), it is likely that the older dates in the Rye series (such as that obtained from Houghton Green) do not accurately record the onset of marine conditions in this area.

References: Long *et al* 2006b
Waller *et al* 2006
Waller and Schofield on-line 2006

GrN–28103 2500 ±40 BP

$\delta^{13}C$: -29.8‰

Sample: HOUGHTON, submitted on 9 July 2003 by M P Waller and J E Schofield

Material: peat (31.95g) (+2.17 – 2.21m OD)

Initial comment: the sample was taken from the top of a unit of black well-humified silty peat (B), immediately below a layer of grey-brown marine/intertidal clay (A). The solid geology of the area around Houghton Green is the Hastings Bed Group (mainly sandstones, siltstones, and clays). The watertable at the site is within 1m of the modern ground surface. The depth from which the sample is taken should prove sufficient to minimise possible contamination by modern rootlet penetration. Pollen assemblages from Houghton Green contain 'super abundant' percentages of *Alnus glutinosa* pollen, indicating the presence of dense alder carr vegetation around the site

at the time of peat accumulation. A transitional (non-erosive) A/B contact is indicated.

Objectives: this sample will provide an age-estimate for the end of peat accumulation at Houghton Green, and a maximum date for late Holocene marine inundation of the peat bed at this location.

Calibrated date: *1σ:* 770–540 cal BC
2σ: 800–410 cal BC

Final comment: M P Waller and J E Schofield (8 June 2004), despite the litho- and biostratigraphic evidence for a gradual transition to marine/brackish conditions, a date of 2500 ±40 BP for the return of marine brackish conditions appears too early when compared to the total Rye area dataset. Peat accumulation must have effectively ceased at Houghton Green long before marine inundation occurred.

The Rye area project: Lea Farm, East Sussex

Location: TQ 908222
Lat. 50.58.05 N; Long. 00.43.00 E

Project manager: M P Waller and J E Schofield (Kingston University), April 2003

Archival body: School of Earth Science and Geography, Kingston University

Description: rough pasture in a tributary valley that drains south into the River Tillingham. The samples were collected from an area of extremely wet ground in the valley bottom. A *Phragmites* reed bed is established across a small area at the eastern end of the side.

Objectives: at Lea Farm the presence of a 'residual' peat bed (ie peat close to the level of the modern ground surface) provides a unique opportunity for the study of late Holocene landscape evolution and coastal stability in the Rye area. These dates will provide a high resolution chronology to accompany a late Holocene pollen record from Lea Farm.

Final comment: M P Waller and J E Schofield (8 June 2004), the Lea Farm dates form a consistent series and suggest (along with the Peasmarsh and Pewis Marsh series) that peat formation ceased in the 'side valleys' of the region at a very early date. While documenting the late Holocene decline in the rate of peat accumulation, the early cessation of peat formation here made the site unsuitable for the detailed late Holocene pollen studies originally envisaged.

References: Long *et al* 2002
Waller *et al* 1999

GrN–28055 3120 ±40 BP

$\delta^{13}C$: -30.1‰

Sample: LEA1 (humin), submitted on 9 July 2003 by M P Waller and J E Schofield

Material: peat (43.90g) (+1.97 – 2.02 m OD)

Initial comment: this sample is taken from the top of a unit of dark brown peat (C), immediately below a contact with overlying clays (B). The solid geology of the area around Lea Farm is the Hastings Bed Group (mainly sandstones, siltstones, and clays). The watertable at the site is within 0.5–1.0m of the modern ground surface. Modern rootlets have been removed from the sample with forceps, although there is a possibility some may remain. Pollen assemblages from the top of the peat are diverse and dominated by pollen from herbaceous taxa (particularly grasses and sedges), and spores of ferns and bracken (*Pteridium*). An open landscape dominated locally by sedge fen, reedswamp, or wet grassland, is indicated.

Objectives: to provide an age-estimate for the end of peat accumulation at Lea Farm. Together with other samples in the same series (LEA2 and LEA3), the result will provide the basis for the construction of a high-resolution chronology for late Holocene environmental charges at the site.

Calibrated date: *1σ:* 1440–1320 cal BC
2σ: 1500–1300 cal BC

Final comment: M P Waller and J E Schofield (8 June 2004), this appears to be an early date for a sample less than 50cm below the modern surface. However, it forms a consistent series with the dates below and is comparable with the Peasmarsh series and other sites in the Romney Marsh area, such as Horsemarsh Sewer (Waller *et al* 1999). At sites beyond the limits of the marine/brackish influence, very little sedimentation appears to have occurred over the last *c* 3000 radiocarbon years.

References: Waller *et al* 1999

GrN–28056 3080 ±90 BP

$\delta^{13}C$: -31.0‰

Sample: LEA1 (humic acid), submitted on 9 July 2003 by M P Waller and J E Schofield

Material: peat (43.90g) (+1.97 – 2.02m OD)

Initial comment: as GrN-28055

Objectives: as GrN-28055

Calibrated date: *1σ:* 1440–1210 cal BC
2σ: 1530–1050 cal BC

Final comment: see GrN-28055

References: Ward and Wilson 1978

GrN–28057 3180 ±35 BP

$\delta^{13}C$: -29.4‰

Sample: LEA2, submitted on 9 July 2003 by M P Waller and J E Schofield

Material: peat (36.50g) (humin, +1.90 – 1.94m OD)

Initial comment: this sample is taken from a unit of dark brown peat containing woody detritus and herbaceous rootlets (C). The solid geology of the area around Lea Farm is the Hastings Bed Group (mainly sandstones, siltstones, and clays). The watertable at the site is within 0.5–1.0m of the modern ground surface. Modern rootlets have been removed from the sample with forceps, although there is a possibility some finer rootlets may remain. Declining percentages of *Alnus glutinosa* pollen in association with rising percentages for pollen of grasses (Poaceae) and sedges (Cyperaceae) indicate replacement of alder fen carr by open fen communities over interval covered by LEA2.

Objectives: to provide an age-estimate for the replacement of the alder fen carr by sedge fen and grassland communities. Comparison with a date returned for LEA3 will help determine whether biostratigraphic changes registered towards the top of the peat are the result of rapid ecological change or simply the product of a slowing down (hiatus) in sedimentation.

Calibrated date: *1σ:* 1500–1420 cal BC
2σ: 1520–1400 cal BC

Final comment: M P Waller and J E Schofield (8 June 2004), this forms a consistent series with the other dates from Lea Farm and with these dates indicates a dramatic decline in the rate of peat accumulation during the late Holocene.

GrN–28058 3350 ±40 BP

$\delta^{13}C$: -29.1‰

Sample: LEA3, submitted on 9 July 2003 by M P Waller and J E Schofield

Material: peat (30.10g) (humin, +1.82 – 1.86m OD)

Initial comment: this sample is taken from a unit of dark brown peat containing woody detritus and herbaceous rootlets. The solid geology of the area around Lea Farm is the Hastings Bed Group (mainly sandstones, siltstones, and clays). The watertable at the site is within 0.5–1.0m of the modern ground surface. Modern rootlets have been removed from the sample with forceps, although there is a possibility some finer rootlets may remain. Pollen assemblages around LEA3 indicate dense *Alnus glutinosa* fen carr was locally present at the time of peat accumulation.

Objectives: form part of a series of dates used to construct a high resolution chronology for late Holocene environmental changes at Lea Farm. Comparison with the date returned for LEA2 will help determine whether biostratigraphic changes registered towards the top of the peat are the result of rapid ecological changes or simply the product of a slowing down (hiatus) in sedimentation.

Calibrated date: *1σ:* 1690–1600 cal BC
2σ: 1750–1520 cal BC

Final comment: see GrN-28057

The Rye area project: near surface site 1 (Old House Farm, Peasmarsh), East Sussex

Location: TQ 890237
Lat. 50.58.56 N; Long. 00.41.31 E

Project manager: M P Waller and J E Schofield (Kingston University), 8 August 2003

Archival body: School of Earth Science and Geography, Kingston University

Description: the site is a seepage bog that drains northwards into the Rother valley. The site currently supports a diverse range of fen shrubs, herbs, and semi-emergent aquatics including *Salix* spp., *Phragmites australis, Potentilla,* and *Filipendula.*

Objectives: to construct a high resolution chronology for a detailed late Holocene pollen diagram from Romney Marsh. The availability of 'near-surface' peat in the Rother valley affords an opportunity to reconstruct changes in wetland and adjacent dryland communities across a time period for which there is very little existing data of this type.

Final comment: M P Waller and J E Schofield (8 June 2004), the Old House Farm, Peasmarsh, dates suggest (along with the Lea Farm and Pewis Marsh series) that peat formation ceased in the 'side valleys' of the region at a very early date. While documenting the late Holocene decline in the rate of peat accumulation, the early cessation of peat formation here unfortunately means the detailed late Holocene pollen diagram covers a much shorter period than had been envisaged.

References: Long *et al* 2002
Waller 1993

GrN–28514 2980 ±90 BP

$\delta^{13}C$: -26.7‰

Sample: OLD HOUSE 1 (humin), submitted on 15 December 2003 by M P Waller and J E Schofield

Material: sediment (26.80g) (organic, +3.71 – 3.75m OD)

Initial comment: the sample comes from a 4cm slice of sediment (20–24cm). The solid geology of the area around Old House Farm is the Hastings Bed Group (mainly sandstones, siltstones, and clays). The sample is taken from relatively close to the modern ground surface, suggesting there could be a possibility of contamination by modern rootlet penetration. However, all such rootlets were removed from the sample using forceps prior to submission. Pollen assemblages at this depth predominantly comprise open ground taxa (herbs, such as Poaceae and Cyperaceae) with smaller numbers of poor fen shrubs and herbs indicated by pollen from *Betula*, *Myrica gale,* and *Alnus glutinosa*. These indicate relatively open, oligotrophic local conditions at the time of sediment deposition.

Objectives: to establish a minimum age-estimate for a rise in pollen frequencies of Poaceae. This appears likely to reflect opening-up of the local environment in response to human activity following a phase of domination by *Betula*-poor fen communities.

Calibrated date: *1σ:* 1380–1050 cal BC
2σ: 1440–930 cal BC

Final comment: M P Waller and J E Schofield (8 June 2004), GrN-28514 is slightly older than the date (GrN-28515) obtained from 6cm beneath this sample. As the material used for this date contained a clastic component (the GrN-28515 sample consisted of peat) it may also have included some reworked carbon. The date of the upper clearance phase (the rise in Poaceae) at Peasmarsh is therefore uncertain, but at *c* 2900 BP it appears to be younger than a similar clearance event recorded in the Pannel valley at Pannel Bridge (Waller 1993) and Pannel Farm.

References: Waller 1993

GrN–28515 2960 ±70 BP

$\delta^{13}C$: -28.8‰

Sample: OLD HOUSE 2 (humin), submitted on 15 December 2003 by M P Waller and J E Schofield

Material: sediment (22.10g) (organic, +3.61 – 3.65m OD)

Initial comment: the sample comes from a 4cm slice of sediment (30–34cm). The solid geology of the area around Old House Farm is the Hastings Bed Group (mainly sandstones, siltstones, and clays). Pollen assemblages indicate a local environment dominated by acid, nutrient–poor *Betula* fen. *Alnus glutinosa* and *Salix* spp. also appear to have been important components of the local vegetation community.

Objectives: to establish a minimum age-estimate for the local expansion of *Betula*–dominated poor fen across the site. The sample will also provide a maximum date for the stratigraphic change from woody peat to organic clay.

Calibrated date: *1σ:* 1310–1050 cal BC
2σ: 1410–940 cal BC

Final comment: M P Waller and J E Schofield (8 June 2004), GrN-28515 suggests peat formation at Peasmarsh ceased as early as *c* 3000 BP. This is comparable with the dates obtained at Lea Farm, where overlying marine/brackish sediments are also absent.

GrN–28516 3160 ±50 BP

$\delta^{13}C$: -28.5‰

Sample: OLD HOUSE 3 (humin), submitted on 15 December 2003 by M P Waller and J E Schofield

Material: sediment (26.30g) (organic, +3.38 – 3.43m OD)

Initial comment: the sample comes from a 5cm slice of sediment (52–57cm). The solid geology of the area around Old House Farm is the Hastings Bed Group (mainly sandstones, siltstones, and clays). Pollen assemblages around OLD HOUSE 3 are dominated by herbaceous pollen types, particularly Poaceae and fern spores. A local peat-forming community of *Phragmites* reedswamp appears likely. An increase in ruderal pollen types (*Rumex acetosella, Plantago lanceolata*) and occurrences of cereal-type pollen grains coincide with a decrease in arboreal pollen types, reflecting opening up of the dryland landscape around the site in response to human activity.

Objectives: to establish a minimum age-estimate for a rise in the Poaceae pollen curve (and associated decrease in arboreal pollen frequencies) that reflects opening-up of the local landscape, most likely in response to human activity.

Calibrated date: *1σ:* 1500–1400 cal BC
2σ: 1530–1310 cal BC

Final comment: M P Waller and J E Schofield (8 June 2004), GrN-28516 suggests that the major clearance phase in the upland areas around Old Farm occurred a few hundred radiocarbon years prior to the activity previously documented in the Pannel valley (Waller 1993). Nevertheless, together they suggest widespread clearance activity across the Rye area in the late Bronze Age/early Iron Age.

References: Waller 1993

GrN–28517 4700 ±70 BP

$\delta^{13}C$: -29.0‰

Sample: OLD HOUSE 4 (humin), submitted on 15 December 2003 by M P Waller and J E Schofield

Material: sediment (29.20g) (organic, +2.37 – 2.41m OD)

Initial comment: the sample comes from a 4cm slice of peat (154–58cm). The solid geology of the area around Old House Farm is the Hastings Bed Group (mainly sandstones, siltstones, and clays). Pollen assemblages around 158cm reveal a temporary disturbance in the local vegetation cover that may reflect a short phase of local woodland clearance/agriculture.

Objectives: to provide an age-estimate for a short phase of woodland disturbance and agricultural activity indicated in the pollen diagram for the site. This event may date to the Neolithic or early Bronze Age.

Calibrated date: *1σ:* 3640–3370 cal BC
2σ: 3650–3350 cal BC

Final comment: M P Waller and J E Schofield (8 June 2004), this sample suggests that the short-lived clearance phase evident at the base of the pollen diagram from Peasmarsh occurred during the Neolithic.

GrN–28518 4510 ±110 BP

$\delta^{13}C$: -27.7‰

Sample: OLD HOUSE 4 (humic acid), submitted on 15 December 2003 by M P Waller and J E Schofield

Material: sediment (29.20g) (organic, +2.37 – 2.41m OD)

Initial comment: as GrN-28517

Objectives: as GrN-28517

Calibrated date: *1σ:* 3370–3020 cal BC
2σ: 3630–2900 cal BC

Final comment: see GrN-28517

Laboratory comment: Ancient Monuments Laboratory (in 2007), the two results are consistent ($T' = 2.1$, $T'(5\%)=3.8$), $\nu=1$). The pooled mean is 4647 ±59 BP (Ward and Wilson 1978).

References: Ward and Wilson 1978

The Rye area project: near surface site 2 (East Guldeford), East Sussex

Location: TQ 943219
Lat. 50.57.51 N; Long. 00.45.59 E

Project manager: M P Waller and J E Schofield (Kingston University), December 2002 and December 2003

Archival body: Schools of Earth Science and Geography, Kingston University

Description: rough pasture at the centre of East Guldeford Level, 1km east of East Guldeford church. The location was once the site of a raised mire that was subsequently buried by late Holocene marine alluvium following marine inundation of Romney Marsh.

Objectives: to construct a high resolution chronology for a detailed late Holocene pollen diagram from Romney Marsh. The availability of raised bog deposits underlying marine clay at the centre of East Guldeford Level affords the opportunity to reconstruct changes in local and regional

vegetation communities for the period *c* 2500–1000 cal BP, a time frame for which there is currently little information of this type.

Final comment: M P Waller and J E Schofield (8 June 2004), the East Guldeford samples form a consistent series through the peat. The dates suggest a major decline in the accumulation rate occurred during the latter stages of peat formation. However, given that peat formation here continued well into the late Holocene and the upper sediment appears to have formed in a raised bog, this trend is more likely to be the result of compaction after the deposition of the overlying marine/brackish sediments rather than the general trend noted at the other Rye area sites. The date from the top of the peat (GrN-28104) is comparable to that obtained from West Winchelsea and suggests that marine inundation of the Rye area occurred *c* 1200 BP. GrN-28662 from the upper organic-rich clay represents an inversion. The organic material in this sample probably therefore includes older material reworked into the deposit during the marine/brackish inundation of the site.

References: Long *et al* 2002
Waller *et al* 1999

GrA–25717 2100 ±35 BP

$\delta^{13}C$: -27.5‰

Sample: GULDEFORD3 (humic acid), submitted on 10 February 2004 by J E Schofield

Material: peat (38.20g) (6.0 pH, 83.9% LOI)

Initial comment: sample taken from a 5cm slice of peat (-0.81 – -0.86m OD). The solid geology of the area around East Guldeford is the Hastings Bed Group (this includes mostly non-calcareous rocks such as sandstones, siltstones, and clays). The watertable at the site is within 2m of the modern ground surface.

Objectives: this sample will provide an age-estimate for a time period, which displays elevated pollen frequencies for taxa closely associated with early cultural landscapes. At East Guldeford this is evidenced through increased percentages of pollen from open ground herbs, particularly grasses and agricultural 'weeds' (eg *Plantago lanceolata* and *Rumex* spp.), together with traces of pollen from cereal-type and grapevine (*Vitis vinifera*). As GULDEFORD3 is located immediately below a stratigraphic change to *Sphagnum* peat, the sample should also provide a maximum age-estimate for a brief period of increased bog surface wetness.

Calibrated date: *1σ:* 180–50 cal BC
2σ: 340–40 cal BC

Final comment: M P Waller and J E Schofield (8 June 2004), this date suggests that the elevated frequencies of pollen associated with a cultural landscape, and the wetter conditions, date to the pre-Roman Iron Age.

GrN–28662 2040 ±70 BP

$\delta^{13}C$: -27.2‰

Sample: GULDEFORD2 (humin), submitted on 10 February 2004 by J E Schofield

Material: sediment (41.70g) (organic rich clay, pH 5.8, 25.5% LOI)

Initial comment: sample taken from a 6cm slice of organic-rich clay (-0.58 – -0.64m OD). The solid geology of the area around East Guldeford is the Hastings Bed Group (this includes mostly non-calcareous rocks such as sandstones, siltstones, and clays). The watertable at the site is within 2m of the modern ground surface. There is a very small chance of contamination by older (inwashed) carbon as the sample comes from organic clay containing rare occurrences of pre-Quaternary spores.

Objectives: this sample will establish an age-estimate for the succession from a saltmarsh environment to tidal flats/marine conditions at East Guldeford. This is indicated on the pollen diagram by the apprearance of foraminitera test linings in pollen assemblages above the EG-4a/b boundary. The sample should provide an age that post-dates cal AD 660–900 (GrN-28104; 1240 ±50 BP) ie the end of peat formation. East Guldeford appears to form part of the same raised mire that was flooded at Little Cheyne Court (4km to the east) in cal AD 890–1040 (SRR-6511; 1050 ±45 BP) (Reimer *et al* 2004; Stuiver and Kra 1986, Waller *et al* 1999).

Calibrated date: *1σ:* 170 cal BC–cal AD 50
2σ: 350 cal BC–cal AD 120

Final comment: M P Waller and J E Schofield (8 June 2004), GrN-28662, from the upper organic-rich clay, is older than GrN-28104 from the underlying peat. The organic material in this sample therefore probably includes older carbon reworked into the deposit during marine/brackish inundation of the site.

References: Reimer *et al* 2004
Stuiver and Kra 1986
Waller *et al* 1999

GrN–28663 2260 ±30 BP

$\delta^{13}C$: -27.4‰

Sample: GULDEFORD3 (humin), submitted on 10 February 2004 by J E Schofield

Material: peat (38.20g) (-0.81 – -0.86m OD, pH 6.0, 83.9% LOI)

Initial comment: as GrA-25717

Objectives: as GrA-25717

Calibrated date: *1σ:* 390–230 cal BC
2σ: 400–200 cal BC

Final comment: see GrA-25717

Laboratory comment: Ancient Monuments Laboratory (in 2007), the two results are statistically inconsistent ($T'=12.01$, $T'(5\%)=3.8$, $\nu=1$) (Ward and Wilson 1978).

References: Ward and Wilson 1978

GrN–28665 3520 ±30 BP

$\delta^{13}C$: -27.9‰

Sample: GULDEFORD4 (humin), submitted on 10 February 2004 by J E Schofield

Material: peat (40.50g) (humified, pH 5.7, 84.4% LOI)

Initial comment: sample taken from a 5cm slice of peat (-1.25-1.30m OD). The solid geology of the area around East

Guldeford is the Hastings Bed Group (this includes mostly non calcareous rocks such as sandstones, siltstones, and clays). The watertable at the site is within 2m of the modern ground surface.

Objectives: this sample will establish a date for the base of the pollen diagram from East Guldeford, and will also provide an age-estimate for the rise in frequency of *Sphagnum* spores at the site. At Little Cheyne Court (4km east of East Guldeford) the same biostratigraphic event returned a date of 2505 ±45 BP (SRR-5612; 780-540 cal BC at 68% confidence and 800-410 cal BC at 95% confidence) (Reimer *et al* 2004) and was seen as a response to a change to wetter cooler climatic conditions (ie late Holocene climatic deterioration) (Waller *et al* 1999).

Calibrated date: *1σ:* 1900–1770 cal BC
2σ: 1940–1740 cal BC

Final comment: M P Waller and J E Schofield (8 June 2004), this date suggests the major rise in frequency of *Sphagnum* spores at East Guldeford pre-dates a similar change in biostratigraphy at Little Cheyne Court (Waller *et al* 1999). Comparison based on the radiocarbon chronologies suggests that a second rise in *Sphagnum* at the base of EG-3 (350cm) probably represents the sub-boreal/sub-Atlantic boundary at East Guldeford.

References: Reimer *et al* 2004
Waller *et al* 1999

The Rye area project: Pett Level, East Sussex

Location: TQ 900162
Lat. 50.54.52 N; Long. 00.42.08 E

Project manager: M P Waller and J E Schofield (Kingston University), November 2002

Archival body: School of Earth Science and Geography, Kingston University

Description: samples collected from wet pasture (designated SSSI) on land between Wickham Manor and the Royal Military Canal. The surface of the site is subject to flooding during the winter months.

Objectives: to obtain a high-resolution chronology covering the period from the end of peat formation to marine/ brackish sedimentation. As at Pewis Marsh and Pannel Farm, the Pett Level site contains an intervening organic deposit, which at Pett level may represent a buried soil.

Final comment: (8 June 2004), the Pett Level dates form a consistent series. Peat accumulation seems to have ceased as early as 3330 ±50 BP (GrN-28109) (1690–1520 cal BC at 68% probability and 1750–1490 cal BC at 95% probability) (Reimer *et al* 2004). This is comparable with the date for the end of peat accumulation from 'side valley' sites (Peasmarsh, Lea Farm, Pannel Farm, and Pewis Marsh) in the Rye area. The 'buried soil' overlying the peat may have accumulated gradually (eg from material washed off the adjacent steep slopes). However, the variable lithostratigraphy in neighbouring boreholes and the consistent pollen stratigraphy suggest that the apparently conformable transition at the base of this unit may be the result of the incorporation of reworked material (older carbon) from the underlying peat into the sample dated. GrN-28107/GrN-28108 from the top of the 'buried soil' may not accurately date the subsequent onset of marine/brackish sedimentation as other sites in the Rye area dataset (East Guldeford and West Winchelsea) indicate that inundation did not occur for another *c* 700 radiocarbon years.

References: Long *et al* 2006b
Reimer *et al* 2004
Waller *et al* 2006
Waller and Schofield on-line 2006

GrN–28107 1900 ±60 BP

$\delta^{13}C$: -28.5‰

Sample: PETT1 (humin), submitted on 9 July 2003 by M P Waller and J E Schofield

Material: peat (55.20g) (bulk, -0.45 – 0.49m OD)

Initial comment: the sample comes from the top of a unit of organic-rich silty clay (B) containing small pebbles, and immediately below a contact with grey marine/ intertidal silts (A). The solid geology of the area around Pett Level is the Hastings Bed Group (mainly sandstones, siltstones, and clays). The watertable at the site is within 1m of the modern ground surface. The depth at which the sample is taken precludes any possibility of contamination by modern rootlet penetration. Pollen assemblages from the A/B contact are dominated by herbaceous taxa, particularly Poaceae and Cyperaceae, suggesting open fen or coastal reedswamp was the dominant local vegetation community at the time unit B was deposited. A transitional (non-erosive) contact is indicated between A/B.

Objectives: unit B (305–56cm) may represent a 'buried soil' horizon post- dating the end of peat accumulation at Pett Level. Sample Pett 1 will provide an age-estimate for the top of this unit, and a maximum date for the late Holocene marine inundation of this site.

Calibrated date: *1σ:* cal AD 30–210
2σ: 40 cal BC–cal AD 250

Final comment: M P Waller and J E Schofield (8 June 2004), GrN-28107 is one of a series of dates (Pewis Marsh GrN-27910/GrN-27875, Pannel Farm GrN-28586/GrN-28587, and Pett Level GrN-28108) that suggest marine/brackish conditions returned to the Rye area before *c* cal AD 260–400 *(c* 1700 BP). Dates from East Guldeford (GrN-28104) and West Winchelsea (GrN-28734/GrN-28735), however, indicate that inundation may not have occurred for another *c* 500 radiocarbon years (Reimer *et al* 2004).

Laboratory comment: Ancient Monuments Laboratory (in 2007), the two measurements, GrN-28107-8, are statistically consistent ($T'=0.0$, $T'(5\%)=3.8$, $\nu=1$) (Ward and Wilson 1978).

References: Reimer *et al* 2004
Ward and Wilson 1978

GrN–28108 1880 ±100 BP

$\delta^{13}C$: -27.6‰

Sample: PETT1 (humic acid), submitted on 9 July 2003 by M P Waller and J E Schofield

Material: peat (55.22g) (bulk, -0.45 – -0.49m OD)

Initial comment: as GrN-28107

Objectives: as GrN-28107

Calibrated date: *1σ:* cal AD 20–250
2σ: 100 cal BC–cal AD 390

Final comment: see GrN-28107

Laboratory comment: see GrN-28107

GrN–28109 3330 ±50 BP

$\delta^{13}C$: -28.3‰

Sample: PETT2 (humin), submitted on 9 July 2003 by M P Waller and J E Schofield

Material: peat (55.20g) (bulk, -0.96 – -1.00m OD)

Initial comment: the sample comes from the top of a unit of black well humified woody peat (C) containing occasional twigs and rootlets, and immediately below a unit of light brown organic-rich silty clay (B) containing small pebbles. The solid geology of the area around Pett Level is the Hastings Bed Group (mainly sandstones, siltstones, and clays). The watertable at the site is within 1m of the modern ground surface. The depth at which the sample is taken precludes any possibility of contamination by modern rootlet penetration. A pollen assemblage from the top of the peat is dominated by arboreal pollen from *Betula, Quercus, Alnus,* and *Corylus,* and contains abundant fern spores. Local vegetation dominated by wet woodland is indicated.

Objectives: sample will provide a maximum age-estimate for an important stratigraphic change from peat to 'buried soil' (organic-rich clay) at the unit B/C contact (356cm).

Calibrated date: *1σ:* 1690–1520 cal BC
2σ: 1750–1490 cal BC

Final comment: M P Waller and J E Schofield (8 June 2004), GrN-28109 indicates that peat accumulation seems to have ceased as early as 3330 ±50 BP (1670-1520 cal BC at 68% confidence and 1750-1490 at 95% confidence) (Reimer *et al* 2004). This is comparable with dates for the end of peat accumulation at 'side valley' sites (Peasmarsh, Lea Farm, Pannel Farm, and Pewis Marsh) in the Rye area.

References: Reimer *et al* 2004

The Rye area project: Pewis Marsh (Pewis 1), East Sussex

Location: TQ 900168
Lat. 50.55.11 N; Long. 00.42.09 E

Project manager: M P Waller and J E Schofield (Kingston University), 5 February 2003

Archival body: School of Earth Science and Geography, Kingston University

Description: Pewis Marsh is located immediately west of the town of Winchelsea, in a sheltered valley that drains northwards into the River Brede. The site supports wet pasture, the surface of which is often flooded during the winter.

Objectives: to obtain a high-resolution chronology for a detailed pollen record covering the end of peat accumulation and transition to marine sedimentation. Dates from Pewis Marsh will be combined with subsequent dates from other sites in the Rye basin to determine spatial variations in the timing of the late Holocene marine inundation in this region.

Final comment:, the combined dates from series 1 and 2 at Pewis Marsh document the decline in the peat accumulation rate in the Rye area from *c* 4000 BP onwards (see also the Peatmarsh and Lea Farm series). This is accompanied in the pollen stratigraphy by a shift from *Alnus* to *Betula*, suggesting the acidification of the local fen carr community. Peat formation appears to have ceased *c* 3500 BP (GrN-27876; 1890–1750 cal BC at 68% confidence and 1915–1740 cal BC at 95% confidence) (Reimer *et al* 2004). Subsequently organic-rich clay was deposited. An accompanying stratigraphic survey suggests this material was probably derived from the adjacent slopes. As it will have effectively formed the ground surface until later marine inundation, it is likely to have been disturbed by forming processes. The dates from the 'buried soil' (GrN-27875, GrN-27910, GrN-28060, and GrN-28061) probably do not either indicate the length of time over which this unit formed or the date of the subsequent marine incursion.

References: Long *et al* 2006b
Reimer *et al* 2004
Waller *et al* 2006
Waller and Schofield on-line 2006

GrA–22409 3755 ±35 BP

$\delta^{13}C$: -28.5‰

Sample: PEWIS 1.4b, submitted on 3 March 2003 by M P Waller and J E Schofield

Material: plant macrofossil (3.52g) (twig bark intact, -1.29 – -1.34m OD)

Initial comment: sample PEWIS 1.4 comprised two plant macrofossils (a and b, although PEWIS 1.4a failed) taken from a 5cm slice of woody peat (unit C), 30–35cm below a contact with organic-rich clay. The solid geology of the area around Pewis Marsh is the Hastings Bed Group (mainly sandstones, siltstones, and clays). The watertable at the site is close to the surface (within 0.5m). Pollen assemblages around the sample indicate successional reversal from poor fen (dominated by *Betula*) to fen carr (dominated by *Alnus glutinosa*) at the time of sediment deposition.

Objectives: to provide an age-estimate for a successional reversal from poor fen to fen carr (an event indicating the re-establishment of groundwater control over vegetation dynamics at Pewis Marsh).

Calibrated date: *1σ:* 2210–2130 cal BC
2σ: 2290–2030 cal BC

Final comment: M P Waller and J E Schofield (8 June 2004), this macrofossil sample forms a consistent series with the other dates obtained from the peat at Pewis Marsh and is likely to accurately date the biostratigraphic change from *Betula* to *Alnus* fen carr. It also helps document the rapid decline in the peat accumulation rate post *c* 2600–2400 cal BC (*c* 4000 BP) (Reimer *et al* 2004) at Pewis Marsh. It is comparable with the bulk dates obtained from the same stratigraphic level (GrN-27877 and GrN-27914).

Laboratory comment: Ancient Monuments Laboratory (in 2007), The three results, GrN-22409, GrN-22877, and GrN-27914 are consistent (T′= 0.9, T′(5%)=3.8), ν=1) (Ward and Wilson 1978).

References: Reimer *et al* 2004
Ward and Wilson 1978

GrN–27875 1870 ±35 BP

$\delta^{13}C$: -28.0‰

Sample: PEWIS 1.1 (humin), submitted on 3 March 2003 by M P Waller and J E Schofield

Material: sediment (108.60g) (-0.69 – -0.74m OD, pH 4.5, 19.7% LOI)

Initial comment: sample PEWIS 1.1 is taken from the top of a unit of organic-rich clay (unit B) immediately below a contact with marine/intertidal silt (unit A). The solid geology of the area around Pewis Marsh is the Hastings Bed Group (mainly sandstones, siltstones, and clays). The watertable at the site is close to the surface (within 0.5m). The depth from which the sample is taken (2.00–2.05m) precludes any possibility of modern rootlet penetration. Pollen assemblages from the top of unit B contain significant frequencies of pollen from grasses (Poaceae) and bog taxa (eg *Myrica gale* and *Calluna vulgaris*), together with *Sphagnum* spores. These indicate relatively open, oligotropic local conditions at the time of sediment deposition.

Objectives: to provide a maximum age-estimate for the marine inundation of Pewis Marsh. Together with results from other samples in the series, PEWIS 1.1 will be used to construct a high-resolution chronology for late Holocene environmental changes at Pewis Marsh.

Calibrated date: *1σ:* cal AD 80–220
2σ: cal AD 60–240

Final comment: M P Waller and J E Schofield (8 June 2004), this sample gives a maximum age for the deposition of the overlying marine/brackish clastic sediments at Pewis Marsh. Later dates from a more seaward site (West Winchelsea) suggest, however, that deposition of the organic-rich clay (the material from which this date was obtained) may have ceased sometime prior to marine inundation of Pewis Marsh.

Laboratory comment: Ancient Monuments Laboratory, the two results GrN-27875 and GrN-27910 are consistent (T′= 2.5, T′(5%)=3.8, ν=1). The pooled mean is 1843 ±30 BP (Ward and Wilson 1978).

References: Ward and Wilson 1978

GrN–27876 3500 ±30 BP

$\delta^{13}C$: -28.2‰

Sample: PEWIS 1.2 (humin), submitted on 3 March 2003 by M P Waller and J E Schofield

Material: peat (88.70g) (-0.99 – -1.04m OD, pH 6.8, 73.7% LOI)

Initial comment: sample PEWIS 1.2 is taken from the top of a unit of woody peat (unit C), immediately below a contact with organic-rich clay (unit B). The solid geology of the area around Pewis Marsh is the Hastings Bed Group (mainly sandstones, siltstones, and clays). The watertable at the site is close to the surface (within 0.5m). The depth from which the sample is taken (2.30–2.35m) precludes any possibility of modern rootlet penetration. Pollen assemblages from the top of unit C indicate a successional change from fen carr (dominated by *Alnus glutinosa* and *Salix*) to bog at the time of sediment deposition.

Objectives: to provide a minimum age-estimate for the end of peat accumulation at Pewis Marsh. It will also provide a date for an important successional change at the site (ie the establishment of an acid bog community following a period of local domination by *Alnus* and *Salix* fen carr). Together with results from other samples in the series, PEWIS 1.2 will be used to construct a high- resolution chronology for late Holocene environmental changes at Pewis Marsh.

Calibrated date: *1σ:* 1890–1750 cal BC
2σ: 1920–1740 cal BC

Final comment: M P Waller and J E Schofield (8 June 2004), this sample forms a consistent series with the other dates obtained from the peat unit at Pewis Marsh (series PEWIS 1 and 2). It probably therefore accurately dates the end of peat formation at this site. This apparently early age for the end of peat formation is also recorded from other 'side valley' sites in the Tillingham, Pannel, and Rother valleys (Peasmarsh, Pannel Farm, and Lea Farm). The overlying organic-rich clay may have accumulated slowly or after a break in sedimentation (see comments for GrN-28059, GrN-28060, and GrN-28061).

Laboratory comment: Ancient Monuments Laboratory (in 2007), the two results, GrN-27876 and GrN-27913 are consistent (T′= 2.0, T′(5%)=3.8). The pooled mean is 3485 ±28 BP (Ward and Wilson 1978).

References: Ward and Wilson 1978

GrN–27877 3960 ±30 BP

$\delta^{13}C$: -28.2‰

Sample: PEWIS 1.3 (humin), submitted on 3 March 2003 by M P Waller and J E Schofield

Material: peat (92.90g) (-1.29 – -1.34m OD, pH 7.8, 76.0% LOI)

Initial comment: sample Pewis 1.3 is taken from a unit of woody peat (unit C), 30–35cm below a contact with organic-rich clay (unit B). The solid geology of the area around Pewis Marsh is the Hastings Bed Group (mainly sandstones, siltstones, and clays). The watertable at the site is close to the surface (within 0.5m). The depth from which the sample is taken (2.60–2.65m) precludes any possibility of modern rootlet penetration. Pollen assemblages around the sample indicate successional reversal from poor fen (dominated by *Betula*) to fen carr (dominated by *Alnus glutinosa*) at the time of sediment deposition.

Objectives: to provide an age-estimate for a successional reversal from poor fen to fen carr (an event indicating the re-establishment of groundwater control over vegetation dynamics at Pewis Marsh). Together with results from other samples in the series, Pewis 1.3 will be used to construct a high resolution chronology for late Holocene environmental changes at Pewis Marsh.

Calibrated date: *1σ:* 2490–2460 cal BC
2σ: 2570–2350 cal BC

Final comment: M P Waller and J E Schofield (8 June 2004), this bulk sample forms a consistent series with the other dates obtained from the peat at Pewis Marsh (series PEWIS 1 and 2) and is likely to accurately date the biostratigraphic change from *Betula* to *Alnus* fen carr. It also helps document the rapid decline in the peat accumulation rate post *c* 2600–2400 cal BC (*c* 4000 BP) at Pewis Marsh. It is comparable with the macrofossil date obtained from the same stratigraphic level (GrA-22409).

Laboratory comment: see GrN-22409

GrN–27910 1760 ±60 BP

δ^{13}*C:* -27.3‰

Sample: PEWIS 1.2 (humic acid), submitted on 3 March 2003 by M P Waller and J E Schofield

Material: sediment (108.60g) (-0.69 – -0.74m OD)

Initial comment: as GrN-27875

Objectives: as GrN-27875

Calibrated date: *1σ:* cal AD 210–380
2σ: cal AD 120–420

Final comment: see GrA-27875

GrN–27913 3380 ±80 BP

δ^{13}*C:* -28.8‰

Sample: PEWIS 1.2 (humic acid), submitted on 3 March 2003 by M P Waller and J E Schofield

Material: peat (88.70g) (-0.99 – -1.04m OD)

Initial comment: as GrN-27876

Objectives: as GrN-27876

Calibrated date: *1σ:* 1760–1530 cal BC
2σ: 1890–1490 cal BC

Final comment: see GrN-27876

Laboratory comment: see GrN-27876

GrN–27914 3860 ±100 BP

δ^{13}*C:* -28.1‰

Sample: PEWIS 1.3 (humic acid), submitted on 3 March 2003 by M P Waller and J E Schofield

Material: peat (92.90g) (-1.29 – -1.34m OD)

Initial comment: as GrN-27877

Objectives: as GrN-27877

Calibrated date: *1σ:* 2480–2140 cal BC
2σ: 2580–2030 cal BC

Final comment: M P Waller and J E Schofield (8 June 2004) *see* GrN-27877

Laboratory comment: see GrN-22409

The Rye area project: Pewis Marsh (Pewis 2), East Sussex

Location: TQ 900168
Lat. 50.55.11 N; Long. 00.42.09 E

Project manager: M P Waller and J E Schofield (Kingston University), November 2002 and February 2003

Archival body: School of Earth Science and Geography, Kingston University

Description: Pewis Marsh is located immediately west of the town of Winchelsea, in a sheltered valley that drains northwards into the River Brede. The site supports wet pasture, the surface of which is often flooded during the winter.

Objectives: to obtain a date for the onset of the deposition of the 'buried soil' unit at Pewis Marsh, and to date a vegetational change from *Alnus* to *Betula* fen carr recorded in the pollen stratigraphy from the same site. These dates will supplement four existing ^{14}C age estimates from Pewis Marsh, enabling the construction of a high resolution chronology to accompany detailed pollen analytical studies at the site.

Final comment: M P Waller and J E Schofield (8 June 2004), the combined dates from Series 1 and 2 at Pewis Marsh document the decline in the peat accumulation rate in the Rye area from c 2600–2400 cal BC onwards (see also the Peasmarsh and Lea Farm series). This is accompanied in the pollen stratigraphy by a shift from *Alnus* to *Betula*, suggesting the acidification of the local fen carr community. Peat formation appears to have ceased *c* 3500 BP (GrN-27876) (1890–1750 cal BC at 68% confidence and 1920–1740 cal BC at 95% confidence). Subsequently, organic-rich clay was deposited. An accompanying stratigraphic survey suggests this material was probably derived from the adjacent slopes. As it will have effectively formed the ground surface until later marine inundation, it is likely to have been disturbed by forming processes. The dates from the 'buried soil' (GrN-27875, GrN-27910, GrN-28060, and GrN-28061) probably do not indicate the length of time over which this unit formed or the date of the subsequent marine incursion.

References: Long *et al* 1996
Waller *et al* 1999

GrA–23753 4450 ±40 BP

δ^{13}*C:* -28.8‰

Sample: PEWIS 2.2, submitted on 9 July 2003 by M P Waller and J E Schofield

Material: plant macrofossil (terrestrial plant remains, bark from twig, 0.07g, -0.99 – -1.04m OD)

Initial comment: PEWIS 2.2 is taken from the centre of a unit of black woody (C). The solid geology of the area around Pewis Marsh is the Hastings Bed Group (mainly sandstones, siltstones, and clays). The watertable at the site is within 1m of the modern ground surface. The depth from which the sample is taken precludes the possibility of contamination by modern rootlet penetration or disturbance. Pollen assemblages around PEWIS 2.2 indicate succession from *Alnus* fen carr to *Betula* poor fen.

Objectives: to provide an age-estimate for an important successional vegetation change from alder to birch fen carr at Pewis Marsh. Together with the result from PEWIS 2.1, and ^{14}C dates provided by samples from earlier series (Pewis 1), this sample can be used to construct a high resolution chronology for late Holocene environmental changes at Pewis Marsh.

Calibrated date: *1σ:* 3330–3020 cal BC
2σ: 3350–2920 cal BC

Final comment: M P Waller and J E Schofield (8 June 2004), this macrofossil sample forms a consistent series with the other dates obtained from the peat at Pewis Marsh (series PEWIS 1 and 2) and is likely to accurately date the biostratigraphic change from *Alnus* to *Betula* fen carr. It also helps document the rapid decline in the peat accumulation rate post *c* 2600–2400 cal BC (*c* 4000 BP) at Pewis Marsh.

GrN–28059 2490 ±90 BP

$\delta^{13}C$: -27.6‰

Sample: PEWIS 2.1 (coarse humin), submitted on 9 July 2003 by M P Waller and J E Schofield

Material: sediment (99.60g) (-0.94 – -0.99m OD)

Initial comment: PEWIS 2.1 is taken from the base of a 'buried soil' horizon (unit B), immediately above a contact onto black woody peat (unit C). The solid geology of the area around Pewis Marsh is the Hastings Bed Group (mainly sandstones, siltstones, and clays). The watertable at the site is within 1m of the modern ground surface. The depth from which the sample is taken precludes the possibility of contamination by modern rootlet penetration or disturbance. Pollen assemblages from unit B contain significant frequencies of pollen from grasses (Poaceae) and bog taxa (eg *Myrica*, *Calluna*) together with spores of *Sphagnum*. These indicate relatively open, oligotrophic conditions at the time of sediment deposition.

Objectives: to provide a date for the onset of the deposition of the 'buried soil' unit (B). This date can be compared with GrN-27876 (top of the peat, unit C; PEWIS series) to determine whether sedimentation was continuous across the stratigraphic contact C/B.

Calibrated date: *1σ:* 800–410 cal BC
2σ: 820–390 cal BC

Final comment: M P Waller and J E Schofield (8 June 2004), a substantially younger date was returned for this sample of 'buried soil' relative to the peat sample immediately underlying it (GrN-27876 and GrN-27913). This appears to indicate a substantial break in deposition (*c* 1000 BP) across the sediment contact. Alternatively the organic-rich clay unit overlying the peat may have formed very slowly, with organic material becoming incorporated through the profile as a result of soil forming processes.

Laboratory comment: Ancient Monuments Laboratory (in 2007), the three results, GrN-28059–61, are inconsistent ($T' = 13.5$, $T'(5\%)=6.0$, $\nu=2$).) (Ward and Wilson 1978).

References: Ward and Wilson 1978

GrN–28060 2140 ±50 BP

$\delta^{13}C$: -28.5‰

Sample: PEWIS 2.1 (fine humin), submitted on 9 July 2003 by M P Waller and J E Schofield

Material: sediment (99.60g) (-0.94 – -0.99m OD)

Initial comment: as GrN-28059

Objectives: as GrN-28059

Calibrated date: *1σ:* 350–100 cal BC
2σ: 370–40 cal BC

Final comment: see GrN-20859

Laboratory comment: see GrN-28059

GrN–28061 2140 ±50 BP

$\delta^{13}C$: -27.9‰

Sample: PEWIS 2.1 (humic acid), submitted on 9 July 2003 by M P Waller and J E Schofield

Material: sediment (99.60g) (-0.94 – -0.99m OD)

Initial comment: as GrN-28059

Objectives: as GrN-28059

Calibrated date: *1σ:* 350–100 cal BC
2σ: 370–40 cal BC

Final comment: see GrN-28059

Laboratory comment: see GrN-28059

The Rye area project: Roadend, East Sussex

Location: TQ 896187
Lat. 50.56.13 N; Long. 00.41.52 E

Project manager: M P Waller and J E Shofield (Kingston University), November 2002

Archival body: School of Earth Science and Geography, Kingston University

Description: samples collected from an area of rough pasture, *c* 1km north-east of Roadend Farm.

Objectives: Roadend is one of a series investigated to determine temporal and spatial variations in the timing of the late Holocene marine inundation of the Rye area. The results will show whether the inundation was the product of a westward expansion of a major back barrier estuary or represents an early breach in the in the gravel barrier in the vicinity of Rye.

References: Long *et al* 2006b
Waller *et al* 2006
Waller and Schofield on-line 2006

GrN–28106 2860 ±60 BP

$\delta^{13}C$: -28.7‰

Sample: ROADEND (humin), submitted on 9 July 2003 by M P Waller and J E Schofield

Material: peat (29.19g) (+0.10 – 0.14m OD)

Initial comment: the sample was taken from the top of a unit of black well-humified silty peat (unit B), immediately below

a layer of grey-brown marine/intertidal clay (unit A). The solid geology of the area around Roadend is the Hastings Bed Group (mainly sandstones, siltstones, and clays). The watertable at the site is within 1m of the modern ground surface. The depth at which the sample is taken precludes any possibility of contamination by modern rootlet penetration. Pollen assemblages across the A/B contact are dominated by pollen of fen carr taxa (*Betula*, *Salix*, and *Alnus*). Rising pollen percentages for *Myrica gale* indicate the development of increasingly acid, oligotrophic conditions. A transitional (non erosive) contact between units A/B is indicated.

Objectives: this sample will provide an age-estimate for the end of peat accumulation at Roadend, and a maximum date for late Holocene marine inundation of the peat bed at this location.

Calibrated date: *1σ:* 1130–930 cal BC
2σ: 1260–890 cal BC

Final comment: M P Waller and J E Schofield (8 June 2004), despite the litho- and biostratigraphic evidence for a gradual transition to marine/brackish conditions, a date of 2860 ±60 BP (1130–920 cal BC at 68% confidence and 1260–890 cal BC at 95% confidence) (Reimer *et al* 2004) for the return of marine brackish conditions appears too early when compared to the total Rye area dataset. Peat accumulation must have effectively ceased at Roadend long before marine inundation occurred.

References: Reimer *et al* 2004

The Rye area project: Rye (East Guldeford), East Sussex

Location: TQ 943219
Lat. 50.57.51 N; Long. 00.45.59 E

Project manager: M P Waller and J E Schofield (Kingston University), December 2002

Archival body: School of Earth Science and Geography, Kingston University

Description: rough pasture at the centre of East Guldeford Level, 1km east of East Guldeford church.

Objectives: to provide a chronology for a detailed late Holocene diagram. Unusually the sequence at East Guldeford includes the development of a raised bog, comparable in the Romney Marsh region only with a previously investigated site at Little Cheyne Court (Waller *et al* 1999). The raised bog peat is overlain, in an apparently conformable sequence, by marine/brackish deposits, which previous attempts to date had yielded an unexpectedly wide date range from 2860 ±60 BP (GrN-28106) (1130-920 cal BC at 68% confidence and 1260–890 cal BC at 95% confidence) at Roadend to 1300 ±60 BP (GrN-28735) (cal AD 650–780 at 68% confidence and cal AD 640–890 at 95% confidence) (Reimer *et al* 2004) at West Winchelsea.

Final comment: M P Waller and J E Schofield (8 June 2004), the East Guldeford samples form a consistent series through the peat. The dates suggest a major decline in the accumulation rate occurred during the latter stages of peat formation. However, given that peat formation here continued well into the late Holocene and the upper sediment appears to have formed in a raised bog, this trend is more likely to be the result of compaction after the deposition of the overlying marine/brackish sediments rather than the general trend noted at the other Rye area sites. The date from the top of the peat (GrN-28104) is comparable to that obtained from West Winchelsea and suggests that marine inundation of the Rye area occurred *c* cal AD 700–800 (*c* 1200 BP). GrN-28662 from the upper organic-rich clay represents an inversion. The organic material in this sample probably therefore includes older material reworked into the deposit during the marine/brackish inundation of the site.

References: Reimer *et al* 2004
Waller *et al* 1999

GrN–28104 1240 ±50 BP

$\delta^{13}C$: -27.7‰

Sample: GULDEFORD (humin), submitted on 9 July 2003 by M P Waller and J E Schofield

Material: peat (29.07g) (-0.70 – -0.74m OD)

Initial comment: sample taken from a unit of well-humified *Sphagnum* peat (B), immediately below a contact with marine/intertidal silty clay (A). The solid geology of the area around East Guldeford is the Hastings Bed Group (mainly sandstones, siltstones, and clays). The watertable at the site is within 1m of the modern ground surface. The depth from which the sample is taken precludes any possibility of contamination by modern rootlet penetration. Pollen assemblages from the top of the peat indicate an acid (bog) surface supporting ericaceous shrubs (*Calluna*) and *Sphagnum* mosses. A transitional (non erosive) contact between units A/B is indicated.

Objectives: this sample will provide an age-estimate for the end of peat accumulation at East Guldeford, and a maximum date for late Holocene marine inundation of the peat bed at this location.

Calibrated date: *1σ:* cal AD 680–880
2σ: cal AD 660–900

Final comment: M P Waller and J E Schofield (8 June 2004), this late date for the peat-marine contact (compared to the rest of the Rye dataset) is consistent with GrN-28734 and GrN-28735 at West Winchelsea and probably therefore accurately dates the subsequent marine inundation at East Guldeford.

The Rye area project: Rye (Pannel Farm), East Sussex

Location: TQ 883151
Lat. 50.54.18 N; Long. 00.40.39 E

Project manager: M P Waller and J E Schofield (Kingston University), December 2002

Archival body: School of Earth Science and Geography, Kingston University

Description: Pannel Farm is situated in the Pannel valley *c* 0.25km east of Pannel Bridge. Material for radiocarbon dating was collected from fields supporting rough pasture to the south of the river channel. Land immediately north of the channel encloses an area of dense fen carr vegetation.

Objectives: the Pannel Farm series accompanies a late Holocene pollen sequence. The objectives included dating critical biostratigraphic changes and linking these with a previously studied site at Pannel Bridge (Waller 1993). Unlike the latter sequence, the Pannel Farm peat is overlain, in an apparent conformable sequence, by marine/brackish clays and unusually contains an additional intercalated silt layer. The dates from the contacts with these sediments would allow correlation with the other sites from the Rye area.

Final comment:, the Pannel Farm dates form a consistent series. The major biostratigraphic changes, including a clearance phase (pollen zone PF-2), are comparable with the Pannel Bridge sequence (Waller 1993). Peat accumulation seems to have ceased as early as *c* 2900 BP (GrN-28098)(1190–940 cal BC at 68% probability and 1270–900 cal BC at 95% probability) (Reimer *et al* 2004). This is comparable with other 'side valley' sites (Peasmarsh, Lea Farm, and Pewis Marsh) in the Rye area. However, unlike these other sites, sedimentation (probably fluvial given the lack of marine/brackish indicators in the pollen diagram) appears to have continued through to *c* 1700 BP (GrN-28587)(cal AD 220–430 at 68% probability and cal AD 70–570 at 95% probability) (Reimer *et al* 2004). The final phase of sedimentation (the upper clay) was certainly deposited in a marine/brackish environment. This may, as the radiocarbon dates imply, have been deposited relatively recently. Alternatively the material dated could be intrusive.

References: Long *et al* 2002
Reimer *et al* 2004
Waller *et al* 1999
Waller 1993

GrN–28098 2880 ±60 BP

$\delta^{13}C$: -29.5‰

Sample: PANNEL1(humin), submitted on 9 July 2003 by M P Waller and J E Schofield

Material: peat (38.84g) (+1.00 – 1.04m OD)

Initial comment: this sample is taken from the top of a unit black well-humified *turfa* peat (B) containing abundant herbaceous rootlets and *Phragmites* rhizomes, and immediately below a contact with grey-brown marine/intertidal silts (A). The solid geology of the area around Pannel Farm is the Hastings Bed Group (mainly sandstones, siltstone, and clays). The watertable at the site is within 1m of the modern ground surface. The depth from which the sample is taken (178-80cm) precludes any possibility of contamination by modern rootlet penetration. Pollen assemblages from the A/B contact indicate relatively open fen carr vegetation existed around the site at the time peat was accumulating, and suggest that the contact between units A and B is transitional (ie non erosive).

Objectives: to provide an age-estimate for the end of peat accumulation at Pannel Farm, and maximum date for late Holocene marine inundation of the peat bed at this location.

Calibrated date: *1σ:* 1190–940 cal BC
2σ: 1270–900 cal BC

Final comment: M P Waller and J E Schofield (8 June 2004), this sample forms a consistent series with the other dates obtained from the peat unit at Pannel Farm. It probably therefore accurately dates the end of peat formation at this site. This apparently early age for the end of peat formation is also recorded at other 'side valley' sites in the Brede, Tillingham, and Rother valleys (Pewis Marsh, Peasmarsh, and Lea Marsh).

GrN–28099 3030 ±50 BP

$\delta^{13}C$: -28.0‰

Sample: PANNEL2 (humin), submitted on 9 July 2003 by M P Waller and J E Schofield

Material: peat (33.89g) (+0.70 – 0.74m OD)

Initial comment: this sample is taken from the base of a unit black well-humified *turfa* peat (B) containing abundant herbaceous rootlets and *Phragmites* rhizomes, and immediately above a contact with grey-brown marine/intertidal silts (C). The solid geology of the area around Pannel Farm is the Hastings Bed Group (mainly sandstones, siltstones, and clays). The watertable at the site is within 1m of the modern ground surface. The depth from which the sample is taken (208–10cm) precludes any possibility of contamination by modern rootlet penetration. A pollen assemblage analysed from 215cm indicates relatively dense alder fen carr vegetation surrounded the site around the time the peat was accumulating.

Objectives: the silt unit (unit C, 210–20cm) present within the peat at Pannel Farm may represent evidence for a short period of higher relative sea level pre-dating the main phase of marine inundation of Romney Marsh. Sample Pannel 2 will provide a minimum age-estimate for the end of this event. Further microfossil studies will be performed across the peat-silt contact at 210cm to confirm the nature of the sedimentary environment during the period of silt deposition.

Calibrated date: *1σ:* 1390–1210 cal BC
2σ: 1420–1120 cal BC

Final comment: M P Waller and J E Schofield (8 June 2004), this date (along with GrN-28100) provides an age-estimate and accumulation rate for the intercalated silt unit. The apparently early age of deposition *c* 1850–1750 cal BC to 1300–1200 cal BC (*c* 3500–3000 BP) is prior to the return of marine/brackish conditions to back-barrier sites in the Romney Marsh area. Given this and the absence of any marine/brackish indicators in the pollen record, the silt seems likely to be fluvial in origin, possibly the product of channel avulsion. In addition, GrN-28099 marks the beginning of a clearance phase in the Pannel valley previously dated *c* 1300–1200 cal BC (*c* 3000 BP) at Pannel Bridge (Waller 1993).

References: Waller 1993

GrN–28100 3510 ±50 BP

$\delta^{13}C$: -28.8‰

Sample: PANNEL3 (humin), submitted on 9 July 2003 by M P Waller and J E Schofield

Material: peat (33.96g) (+0.58 – 0.62m OD)

Initial comment: this sample is taken from a unit of medium brown peat (D) containing abundant woody detritus, immediately below the contact with grey-brown silty peat

(C). The solid geology of the area around Pannel Farm is the Hastings Bed Group (mainly sandstones, siltstones, and clays). The watertable at the site is within 1m of the modern ground surface. The depth from which the sample is taken (220–22cm) precludes any possibility of contamination by modern rootlet penetration. A pollen assemblage analysed from 215cm indicates relatively dense alder fen carr vegetation surrounded the site around the time the peat was accumulating.

Objectives: the silt unit (unit C, 210–220cm) present within the peat at Pannel Farm may represent evidence for a short period of higher relative sea-level (RSL) pre-dating the main phase of marine inundation of Romney Marsh. Sample Pannel 3 will provide a maximum age-estimate for the onset of this event. Further microfossil studies will be performed across the peat-silt contact at 220cm to confirm the nature of the sedimentary environment during the period of silt deposition.

Calibrated date: *1σ:* 1910–1750 cal BC
2σ: 1960–1690 cal BC

Final comment: M P Waller and J E Schofield (8 June 2004), this date (along with GrN-28099) provides an age-estimate and accumulation rate for the intercalated silt unit. The apparently early age of deposition *c* 1850–1750 cal BC to 1300–1200 cal BC (*c* 3500–3000 radiocarbon years BP) is prior to the return of marine/brackish conditions to back-barrier sites in the Romney Marsh area. Given this and the absence of any marine/brackish indicators in the pollen record, the silt seems likely to be fluvial in origin, possibly the product of channel avulsion.

The Rye area project: Rye 3 (Pannel Farm), Sussex

Location: TQ 883151
Lat. 50.54.18 N; Long. 00.40.39 E

Project manager: M P Waller and J E Schofield (Kingston University), December 2002

Archival body: School of Earth Science and Geography, Kingston University

Description: Pannel Farm is situated in the Pannel valley *c* 0.25km east of Pannel Bridge. Material for radiocarbon dating was collected from fields supporting rough pasture immediately south of the river channel. Land to the north of the channel encloses an area of dense fen carr vegetation and was the subject of earlier work by M Waller in 1993.

Objectives: to provide a date for the marine inundation in the Pannel valley. Establishing an age for a unit of organic clay intercalculated between the marine clay and the peat proper will also determine whether sedimentation was continuous throughout the period of rising sea-level.

Final comment: (8 June 2004), the Pannel Farm dates form a consistent series. The major biostratigraphic changes, including a clearance phase (pollen zone PF-2), are comparable with the Pannel Bridge sequence (Waller 1993). Peat accumulation seems to have ceased as early as 1270-900 cal BC (GrN-28098; 2880 ±60BP). This is comparable with other 'side valley' sites (Peatmarsh, Lea Farm, and Pewis Marsh) in the Rye area. However, unlike these other sites, sedimentation (probably fluvial given the lack of marine/brackish indicators in the pollen diagram) appears to have continued through to cal AD 70-570 (GrN-28587; 1710 ±100 BP) (Reimer *et al* 2004). The final phase of sedimentation (the upper clay) was certainly deposited in a marine/brackish environment. This may, as the radiocarbon dates imply, have been deposited relatively recently. Alternatively the material dated could be intrusive.

References: Long *et al* 2002
Waller 1993

GrA–25291 395 ±35 BP

$\delta^{13}C$: -26.3‰

Sample: PANNEL6, submitted on 19 January 2004 by J E Schofield

Material: plant macrofossils (+1.40 – 1.45m OD): Phragmites, stems and leaves, bulk (46g) (J E Schofield 2004)

Initial comment: Phragmites remains were sieved from a 5cm slice of sediment (1.45–1.40m OD). The solid geology of the area around Pannel Farm is the Hastings Bed Group (mainly sandstones, siltstones, and clays). The watertable at the site is within 1m of the modern ground surface.

Objectives: attempts at establishing an accurate date for the late Holocene marine inundation of the Rye basin have previously concentrated upon radiocarbon dating the top of the peat immediately below the marine-terrestrial sediment contact. This has proved problematic due to: a) erosion of the upper peat surface in many locations, b) slow peat accumulation rates combined with the (low) sample resolution provided by conventional (bulk) ^{14}C dating techniques from laboratory cores, c) the highly humified nature of the peat, in which few (if any) identifiable terrestrial macrofossils remain for AMS dating. Sample PANNEL6 will approach this problem from a different perspective through dating plant macrofossils (*Phragmites* stems and leaves) retrieved from the base of the marine clay. The date returned will provide a minimum age-estimate for the onset of deposition of brackish/marine sediment following inundation of the Pannel valley.

Calibrated date: *1σ:* cal AD 1440–1610
2σ: cal AD 1430–1640

Final comment: M P Waller and J E Schofield (8 June 2004), GrA-25291 is *c* 800 radiocarbon years younger than a date (GrA-25302) of similar provenance (rootlets from the base of the marine/brackish deposits) at West Winchelsea. The material dated at Pannel Farm may therefore be intrusive.

Laboratory comment: Ancient Monuments Laboratory (8 June 2004), the two results, GrN-25291 and OxA-13227 are consistent (T′= 0.6, T′(5%)=3.8). The weighed mean for the bulk AMS samples is 376 ±25 BP.

GrN–28585 2220 ±60 BP

$\delta^{13}C$: -28.6‰

Sample: PANNEL4 (humin), submitted on 19 January 2004 by J E Schofield

Material: sediment (48g)

Initial comment: this sample is a 5cm slice of sediment (1.171–.12m OD). The solid geology of the area around

Pannel Farm is the Hastings Bed Group (mainly sandstones, siltstones, and clays). The watertable at the site is within 1m of the modern ground surface.

Objectives: at other locations in the Rye area, where the peat bed is directly overlain by a unit of colluvial organic-rich clay (eg Pewis Marsh, TQ 900168), radiocarbon dating has established a *c* 1000 ^{14}C year difference in age between the top and base of the clay. This discontinuity appears likely to reflect a period of zero, or very slow, peat accumulation prior to burial by the clay. Sample PANNEL4 can be compared with an existing date from the top of the peat (GrN-28098, 2880 ±60 BP, 1190–940 cal BC at 68% confidence and 1270–900 cal BC at 95% confidence) (Reimer *et al* 2004) to establish whether a similar pattern of sedimentation occurred at Pannel Farm, or whether sedimentation at this site was in fact continuous across the peat-clay contact.

Calibrated date: *1σ:* 390–190 cal BC
2σ: 400–110 cal BC

Final comment: M P Waller and J E Schofield (8 June 2004), GrN-28585 suggests that sedimentation across the peat/organic clay boundary at Pannel Farm may have been continuous, though the late Holocene decline in the peat accumulation rate evident at other sites in the Rye series is clearly also manifested here.

References: Reimer *et al* 2004

GrN–28586 1640 ±50 BP

δ^{13}C: -26.7‰

Sample: PANNEL5 (humin), submitted on 19 January 2004 by J E Schofield

Material: sediment (46.20g)

Initial comment: this sample is a 5cm slice of sediment (1.39 – 1.34m OD). The solid geology of the area around Pannel Farm is the Hastings Bed Group (mainly sandstones, siltstones, and clays). The watertable at the site is within 1m of the modern ground surface.

Objectives: to provide an age-estimate for the top of a unit of organic-rich silty-clay located stratigraphically below a unit of marine clay. The date returned will provide a maximum age-estimate for late Holocene marine inundation of the Pannel valley.

Calibrated date: *1σ:* cal AD 350–510
2σ: cal AD 250–550

Final comment: M P Waller and J E Schofield (8 June 2004), GrN-28586 is one of a series of dates (Pewis Marsh GrN-27910 and GrN-27875, Pett Level GrN-28107and GrN-28108, Pannel Farm GrN-28587) that suggest marine/brackish conditions returned to the Rye area *c* cal AD 250–400 (*c* 1700 BP). Dates at East Guldeford (GrN-28104) and West Winchelsea (GrN-28734 and GrN-28735), however, indicate that inundation may not have occurred for another 500 radiocarbon years (Reimer *et al* 2004).

Laboratory comment: Ancient Monuments Laboratory (in 2007), the two measurements (GrN-28586 and GrN-28587) are consistent (T′= 0.4, T′(5%)=3.8) (Ward and Wilson 1978).

References: Reimer *et al* 2004
Ward and Wilson 1978

GrN–28587 1710 ±100 BP

δ^{13}C: -27.8‰

Sample: PANNEL5 (humic acid), submitted on 19 January 2004 by J E Schofield

Material: sediment (46.20g) (+1.34 – 1.39m OD)

Initial comment: this sample is a 5cm slice of sediment (1.39 – 1.34m OD). The solid geology of the area around Pannel Farm is the Hastings Bed Group (mainly sandstones, siltstones, and clays). The watertable at the site is within 1m of the modern ground surface.

Objectives: to provide an age-estimate for the top of a unit of organic-rich silty-clay located stratigraphically below a unit of marine clay. The date returned will provide a maximum age-estimate for late Holocene marine inundation of the Pannel valley.

Calibrated date: *1σ:* cal AD 220–430
2σ: cal AD 70–560

Final comment: see GrN-28586

Laboratory comment: see GrN-28586

OxA–13227 356 ±36 BP

δ^{13}C: -24.7‰

Sample: PANNEL6, submitted on 19 January 2004 by J E Schofield

Material: plant macrofossil (+1.40 – 1.45m OD): Phragmites, stems and leaves, bulk sample (20g) (J E Schofield 2004)

Initial comment: as GrA-25291

Objectives: as GrA-25291

Calibrated date: *1σ:* cal AD 1450–1640
2σ: cal AD 1440–1650

Final comment: see GrA-25291

Laboratory comment: see GrN-25291

The Rye area project: RYE2, Pett Level, East Sussex

Location: TQ 900162
Lat. 50.54.52 N; Long. 00.42.08 E

Project manager: M P Waller and J E Schofield (Kingston University), November 2003

Archival body: School of Earth Science and Geography, Kingston University

Description: samples collected from wet pasture (designated SSSI) on land between Wickham Manor and the Royal Military Canal, at the base of Iham Hill (site of New Winchelsea. The surface of the site is subject to flooding during the winter months.

Objectives: together with the earlier series (RYE), the PETT3 date will help to determine temporal and spatial variations in the timing of the late Holocene marine inundation of the Rye area. Specifically the PETT3 date will provide an age-

estimate for the base of a 'buried soil' horizon underlying marine clay at one location on Romney Marsh.

Final comment: M Waller and J E Schofield (8 June 2004) the Pett Level dates form a consistent series. Peat accumulation seems to have ceased as early as 1750–1490 cal BC (GrN-28109; 3330 ±50 BP) (Reimer *et al* 2004). This is comparable with the date for the end of peat accumulation from 'side valley' sites (Peasmarsh, Lea Farm, Pannel Farm and Pewis Marsh) in the Rye area. The 'buried soil' overlying the peat may have accumulated gradually (eg from material washed off the adjacent steep slopes). However, the variable lithostratigraphy in neighbouring boreholes and the consistent pollen stratigraphy suggest that the apparently conformable transition at the base of this unit may be the result of the incorporation of reworked material (older carbon) from the underlying peat into the sample dated. GrN-28107/GrN-28108 from the top of the 'buried soil' may not accurately date the subsequent onset of marine/brackish sedimentation as other sites in the Rye area dataset (East Guldeford and West Winchelsea) indicate that inundation did not occur for another *c* 700 radiocarbon years (*c* cal AD 1250-1300) (Reimer *et al* 2004).

References: Long *et al* 2006b
Reimer *et al* 2004
Waller *et al* 2006
Waller and Schofield on-line 2006

GrN–28519 3100 ±60 BP

$\delta^{13}C$: -27.7‰

Sample: PETT3 (humin), submitted on 15 December 2003 by M P Waller and J E Schofield

Material: sediment (23.30g) (organic, -0.91 – -0.95m OD)

Initial comment: this sample is a 4cm slice of sediment, taken immediately above the contact with the peat (351–55cm). The solid geology of the area around Pett Level is the Hastings Bed Group (mainly sandstones, siltstones, and clays). The sediment unit from which the sample is drawn appears to be an old land surface ('buried soil') that incorporates a large amount of slopewash material from Iham Hill (site of New Winchelsea).

Objectives: to provide a minimum age-estimate for the base of the 'buried soil' unit at Pett Level. Comparison of this result with the date established for the top of the peat (GrN-28109) will also show if sedimentation was broken or continuous across the soil-peat contact (356cm). Radiocarbon dating of a similar sequence of deposits at Pewis Marsh (*c* 0.5km north of Pett Level) reveals a hiatus of *c* 900–1400 radiocarbon dating years between the end of peat accumulation and the onset of soil formation. A similar scenario is anticipated at Pett.

Calibrated date: *1σ:* 1440–1300 cal BC
2σ: 1500–1210 cal BC

Final comment: M P Waller and J E Schofield (8 June 2004), GrN-28519 is only *c* 200 radiocarbon years younger than the date obtained from the underlying peat (GrN-28109). This suggests the 'buried soil' may have accumulated conformably, if gradually, above the peat (eg from material washed off the adjacent slope). However, the variable lithostratigraphy in neighbouring boreholes and the consistent pollen stratigraphy suggest that the apparent transition at the base of this unit may be the result of the incorporation of reworked material (older carbon) from the underlying peat into the sample dated.

The Rye area project: RYE4, West Winchelsea, East Sussex

Location: TQ 8953517751
Lat. 50.55.41 N; Long. 00.41.44 E

Project manager: M P Waller and J E Schofield (Kingston University), 22 February 2004

Archival body: School of Earth Science and Geography, Kingston University

Description: grazing land/pasture in the lower Brede valley, approximately 150m south of the present river channel.

Objectives: to provide a date for the late Holocene marine inundation in the lower Brede valley. WINCH1 will establish a date for the end of peat formation and the maximum age-estimate for the marine transgression. WINCH2 will establish a date for the onset of clay/silt deposition and a minimum age-estimate for the marine transgression.

Final comment: M P Waller and J E Schofield (8 June 2004), the dates from the peat and rootlets are in close agreement and suggest (along with the dates from East Guldeford) that marine inundation of the Rye area occurred *c* cal AD 750–900 (Reimer *et al* 2004). Dates as early as 2860 ±60 BP (GrN-28106 at Roadend) (1130-920 cal BC at 68% confidence and 1260–890 cal BC at 95% confidence) (Reimer *et al* 2004) obtained from peat beneath marine/brackish sediments from the remaining Rye dataset are probably, therefore, the consequence of an early decline/cessation in peat accumulation.

References: Reimer *et al* 2004
Waller 1993
Waller 1998

GrA–25302 1170 ±35 BP

$\delta^{13}C$: -27.5‰

Sample: WINCH 2, submitted on 4 March 2004 by J E Schofield

Material: plant macrofossil (1.25g) (fine herbaceous rootlets - species unknown, bulk sample)

Initial comment: the sample comes from a 10cm slice of clay (-1.82 – -1.92 OD). The local solid geology is the (non-calcareous) Hastings Bed Group (sandstones, siltstones, and clays). These are covered by several metres of Holocene drift deposits (marine alluvium and peat). The sample is recovered from several metres below the level of the local watertable. Foraminifera indicate the environment of deposition to be a saltmarsh or brackish lagoon. The rootlets submitted as sample WINCH2 appear to be *in situ* within the clay and are likely to represent remains of the vegetation growing on the marsh at the time the clay was being deposited. The rootlets were sieved and picked by hand from the residue with care taken to avoid inclusion of any other allochthonous plant material that may have been carried into the site on the tide.

Objectives: attempts at establishing an accurate date for the late Holocene marine transgression of the Rye Basin have previously concentrated upon radiocarbon dating the top of the peat bed immediately below the marine-terrestrial sediment contact. This has proved problematic due to: a) erosion of the upper peat surface in many locations, b) slow peat accumulation rates combined with the (low) sample resolution provided by conventional (bulk) ^{14}C dating techniques from laboratory cores, c) the highly humified nature of the peat, in which few (if any) terrestrial macrofossils remain for AMS dating. Sample WINCH2 will approach this problem from a different perspective by dating plant macrofossils (in this case fine herbaceous rootlets) retrieved from the base of the clay. These rootlets appear *in situ* and should provide a minimum age-estimate for the deposition of a unit of saltmarsh clay that directly overlays the peat.

Calibrated date: *1σ:* cal AD 780–940
2σ: cal AD 770–980

Final comment: M P Waller and J E Schofield (8 June 2004), GrA-25302 suggests the rootlets where deposited immediately after peat cessation at West Winchelsea (GrN-28734/GrN-28735). They appear therefore to be *in situ* and accurately date the early stages of marine inundation into the lower Brede.

Laboratory comment: Ancient Monuments Laboratory (in 2007), the two measurements (GrA-25302 and OxA-13460) are statistically inconsistent ($T'=8.0, T'(5\%)=3.8, \nu=1$) (Ward and Wilson 1978).

References: Ward and Wilson 1978

GrN–28734 1360 ±30 BP

$\delta^{13}C$: -28.5‰

Sample: WINCH 1 (humin), submitted on 4 March 2004 by 24/06/2004

Material: peat (67.90g) (bulk)

Initial comment: the sample comes from a 4cm slice of peat (-1.99– -2.03m OD). The local solid geology is the (non-calcareous) Hastings Bed Group (sandstones, siltstones, and clays). These are covered by several metres of Holocene drift deposits (marine alluvium and peat). The samples are recovered from several metres below the level of the local watertable. Pollen analysis of sediment across the span of the sample WINCH1 indicate a rich-sedge fen community transitional between alder/willow carr and saltmarsh vegetation.

Objectives: to establish a date for the end of peat formation in the Lower Brede valley west of Winchelsea. The result will also provide a maximum age-estimate for the late Holocene marine transgression in this location.

Calibrated date: *1σ:* cal AD 650–670
2σ: cal AD 640–690

Final comment: M P Waller and J E Schofield (8 June 2004), this date is consistent both with that obtained from rootlets in the overlying marine/brackish clay (GrA-25302) and the top of the peat at East Guldeford (GrN-28104). It probably therefore accurately dates the subsequent marine inundation of the Lower Brede valley.

Laboratory comment: Ancient Monuments Laboratory (in 2007), the two measurements (GrN-28734 and GrN-28735) are statistically consistent ($T'=0.8, T'(5\%)=3.8, \nu=1$) (Ward and Wilson 1978).

References: Ward and Wilson 1978

GrN–28735 1300 ±60 BP

$\delta^{13}C$: -29.3‰

Sample: WINCH 1 (humic acid), submitted on 4 March 2004 by J E Schofield

Material: peat (67.90g) (bulk, -1.99 – - 2.03m OD)

Initial comment: as GrN-28734

Objectives: as GrN-28734

Calibrated date: *1σ:* cal AD 650–780
2σ: cal AD 640–890

Final comment: see GrN-28734

Laboratory comment: see GrA-25302

OxA–13460 1297 ±28 BP

$\delta^{13}C$: -26.7‰

Sample: WINCH 2, submitted on 4 March 2004 by J E Schofield

Material: plant macrofossils (1.25g) (fine herbaceous rootlets. Species unknown, bulk sample)

Initial comment: as GrA-25302

Objectives: as GrA-25302

Calibrated date: *1σ:* cal AD 660–770
2σ: cal AD 650–780

Final comment: M P Waller and J E Schofield (15 June 2004), OxA-13460 suggests the rootlets where deposited immediately after peat cessation at West Winchelsea (GrN-28734/GrN-28735). They appear therefore to be *in situ* and accurately date the early stages of marine inundation into the Lower Brede.

Till-Tweed Project

Location: NU 553997
Lat. 56.11.12 N; Long. 01.06.38 W

Project manager: D Passmore (University of Newcastle Upon Tyne)

Description: the Till-Tweed project studies the valley floor of the River Till (called the River Breamish in its upper reaches) down valley from Ingram (NU 020165) to the Tweed confluence at Tweedmill (NT 870430), and thence downstream through the lower Tweed corridor to Berwick (NT 001524). Geomorphological analysis of this area has subdivided the valley floors into five broad geomorphological settings that present contrasting scenarios for the preservation and evaluation of archaeological and palaeoenvironmental resources.

Objectives: to establish the chronology for aggradation, reworking, and incision of Holocene alluvial deposits and

terrace levels in the Lower Tweed valley (this chronology helps to evaluate the maximum age of potential archaeological remains contained within and on top of the various fluvial landforms). Also, to determine the age of preserved deposits of palaeoenvironmental and geoarchaeological significance developed on and within the sand and gravel terraces of the study area. The dates in the organic rich sequences of the valley fill will provide a preliminary chronology for pollen, plant macrofossil and beetle remains analyses. These palaeoecological analyses enable the reconstruction of the changing landscape context over the Holocene.

References: Passmore and Waddington forthcoming

Till-Tweed: Lower Tweed River at Coldstream and Green Hill, Northumberland

Location: NU 845390 and NU 910495
Lat. 55.38.16 N; Long. 00.39.30 W, to
Lat. 55.43.51 N; Long. 00.33.06 W

Project manager: T van der Shriek (University of Newcastle upon Tyne)

Description: the final reach (TW) is located between Coldstream and Berwick upon Tweed. The Lower Tweed River is characterised by low sinuosity meandering channels that are inset into Cementstone (Limestone), sandstone, and till deposits. The valley floor features wide alluvial basins at Coldstream, LadyKirk House, Norham (the tidal limit), Green Hill, and below Gainslaw House that are connected by narrow, drift, and bedrock confined reaches with little alluvial storage. The alluvial valley floor reaches a maximum width of 1.5km at Coldstream. The selected study sites in the valley floor at Coldstream and Green Hill are representative for the fifth reach. There have been no previous studies of Holocene valley floor development and sediments in this part of the valley floor. Two alluvial basins with contrasting geomorphological settings have been selected for dating. The largest basin of the entire reach is located at Coldstream and displays the most complete terrace sequence of the Lower Tweed. Its terrace sequence can be correlated to the downstream alluvial basins in the Lower Tweed area. A second alluvial basin, at Green Hill, is located at the upper part of the tidal limit and has been selected to characterise valley floor evolution in the tidally influenced downstream part of the Lower Tweed. The five samples come from different sedimentary sequences in the Lower Tweed valley floor near Coldstream and Green Hill. The intent is to establish the age of various terrace units by dating samples from organic rich sequences incorporated within the fluvial terraces that have potential for pollen, beetle, and plant macrofossil analyses. The samples have a direct relationship with the palaeochannel fills and floodbasins they aim to date. Each sample has its position taken by a handheld Garmin GPS. The narrow corridors connecting the alluvial basins have no terrace preservation, due to their limited accommodation space related to high streamflow velocities during floods and the migration of the channel belt over the entire width of the valley floor.

Objectives: to establish the chronology for aggradation, reworking, and incision of Holocene alluvial deposits and terrace levels in the Lower Tweed valley (this chronology helps to evaluate the maximum age of potential archaeological remains contained within and on top of the various fluvial landforms). Also, to determine the age of preserved deposits of palaeoenvironmental and geoarchaeological significance developed on and within the sand and gravel terraces of the study area. The dates in the organic rich sequences of the valley fill will provide a preliminary chronology for pollen, plant macrofossil, and beetle remains analyses. These palaeoecological analyses enable the reconstruction of the changing landscape context over the Holocene.

References: Passmore *et al* 2002
Tipping 1998

OxA–12600 1996 ±27 BP

$\delta^{13}C$: -27.6‰

Sample: TWcd–1, submitted on 28 July 2003 by T van der Schriek

Material: plant macrofossils (herbareous stem and seeds, bulk sample)

Initial comment: sample TWcd-1 is taken from the central part of a fine-grained palaeochannel fill, at the southern edge of the valley floor, on the T3 terrace level at location TW10 in the valley floor of Coldstream. The depth of the fine-grained channel fill is 3.22m and the date will be taken from 273–85cm. The sediment core shows a succession of bedded fine sandy silt and silty sand with frequent macros from 250–322cm. The relatively thick fine-grained organic palaeochannel fill shows the same succession in adjacent cores. The stratified sediments on top of the proposed sample and the similar sediment sequence in adjacent cores argue against post-depositional disturbance of the sampled organic-rich layer. There is no contamination with younger organic material. The sample consists of selected plant macrofossils from an organic-rich sediment (pH 6.9, LOI 19%) deposited in an abandoned channel (oxbow lake sedimentation). The upstream catchment area of the Lower Tweed River consists of a variety of metamorphic and igneous rock, and additionally of some local sandstone, till, and limestone with coal. There is no natural contamination anticipated of the selected plant macrofossils in the sample. The sample is waterlogged year-round.

Objectives: sample TWcd-1 dates the first stages of local channel abandonment and infill of an oxbow-type depression. The organic-rich palaeochannel fill will be used for palaeoenvironmental reconstruction (pollen and macros) and this date is a basal range-finder for this sequence. Based on geomorphological evidence, this date is believed to be the oldest date for the T3 terrace. The T3 terrace is the largest, and presumably longest active, terrace in the Coldstream reach. In combination with dates TWcd-1, TWcd-2, and TWcd-4 this sample will 1) indicate the period of activity and channel migration in various parts of the T3 terrace, and 2) bracket the end of fluvial activity in the (higher – presumably early, early Holocene) T2 terrace surface. The subsequent incision of T3, followed by the creation of T4/5 is the beginning of progressive narrowing of the active channel belt and ongoing incision of the valley floor. Preliminary dates for T3 in the Lower Tweed reach at Coldstream indicate activity between

c 1300–600 BP (SRR-6183/SRR-6185). However, Mesolithic flint found in the SW T3 terrace level suggests that parts of T3 already existed in pre-/early Mesolithic times. It is of prime importance to know when T3 was formed and active for an accurate landscape reconstruction and for evaluating the age-range of potential (buried) archaeological remains in and on top of the terrace surface. The extensive period of activity suggested for the T3 terrace level is comparable to the T3 terrace level in the wide Milfield basin. These levels and their associated landscape history might be correlated.

Calibrated date: *1σ:* 40 cal BC–cal AD 50
2σ: 50 cal BC–cal AD 70

Final comment: T van der Schriek, the sequence of palaeochannels and (minor) terrace escarpments in the valley floor of the Coldstream sub-reach of the study area suggest that the floodplain has been formed by the migration of a large meander bend. This meander bend migrated laterally to the east, from Wark-upon-Tweed to Cornhill-on-Tweed. This geomorphological interpretation is sustained by OxA-12600, which is located in a palaeochannel that is truncated by a more easterly palaeochannel abandoned around cal AD 990–1170 (OxA-12601).

OxA–12601 969 ±26 BP

$\delta^{13}C$: -27.0‰

Sample: TWcd–2(a), submitted on 28 July 2003 by 05/05/2004

Material: plant macrofossil: Salicaceae, a single fragment (R Gale 2003)

Initial comment: sample TWcd-2 is taken from a fine-grained palaeochannel fill, at the southern edge of the valley floor, on the central T3 terrace level at location CDS1 in the Coldstream study area. The depth of the fine-grained channel fill is 2.7m and the date will be taken from 183–97cm. The sediment core shows a succession of bedded fine sandy silt and silty sand with frequent macros and wood fragments from 180–270cm. The relatively thick fine-grained organic palaeochannel fill shows the same succession in adjacent cores. The stratified sediments on top of the proposed sample and the similar sediment sequence in adjacent cores argue against post-depositional disturbance of the sampled organic-rich layer. There is no contamination with younger organic material. The sediment includes frequent wood fragments (pH 6.95, LOI 22%) and is deposited in an abandoned channel (oxbow lake sedimentation). The upstream catchment area of the Lower Tweed River consists of a variety of metamorphic and igneous rocks, and additionally of some local sandstone, till, and limestone with coal. There is no natural contamination anticipated of the selected wood fragments. The sample is waterlogged year-round.

Objectives: as OxA-12600

Calibrated date: *1σ:* cal AD 1020–1150
2σ: cal AD 1010–1160

Final comment: T van der Shriek (April 2004), despite the large distance between samples TWcd-2 and TWcd-3, these dates are broadly consistent and indicate a period of channel abandonment between cal AD 990–1170 (OxA-12601, OxA-12681, OxA-12682, and OxA-12683). An additional, unpublished, date on a bulk sample from core CDS1 yielded an age of cal AD 650–780 (SRR-6183; 1315 ±45 BP (Reimer *et al* 2004). However, dates TWcd-2 and TWcd-3 show a consistent pattern and are taken on individual plant macrofossils, avoiding potential contamination by charcoal, which is present in the valley fill deposits.

Laboratory comment: Ancient Monuments Laboratory (2004), the result is statistically consistent with OxA-12681, from the same level (T′=0.1, T′(5%)=3.8, ?=1) (Ward and Wilson 1978).

References: Reimer *et al* 2004
Ward and Wilson 1978

OxA–12681 980 ±24 BP

$\delta^{13}C$: -26.6‰

Sample: TWcd–2(b), submitted on 28 July 2003 by T van der Schriek

Material: wood: Salicaceae, roundwood with bark (16mm diameter), a single fragment (R Gale 2003)

Initial comment: as OxA-12601

Objectives: as OxA-12600

Calibrated date: *1σ:* cal AD 1020–1040
2σ: cal AD 1015–1155

Final comment: see OxA-12601

Laboratory comment: see OxA-12601

OxA–12682 943 ±25 BP

$\delta^{13}C$: -30.4‰

Sample: TWcd–3(a), submitted on 28 July 2003 by T van der Schriek

Material: wood: cf *Corylus*/*Alnus* sp., twig, a single fragment (R Gale 2003)

Initial comment: sample TWcd-3 is taken from the central part of a fine-grained palaeochannel fill on the T3 terrace level at location TW11 in the valley floor of Coldstream. The depth of the fine-grained channel fill is 2.60m and the sample for dating will be taken from 238–50cm. Sediment core TW11 shows a succession of bedded fine sandy silt and silty sand with frequent macros from 215–60cm. The relatively thick fine-grained organic palaeochannel fill shows the same succession in adjacent cores. The stratified sediments on top of the proposed sample and the similar sediment sequence in adjacent cores argue against post-depositional disturbance of the sampled organic rich layer. There is no contamination with younger organic material. The sediment sampled contains wood fragments and plant macrofossils (pH 6.8; LOI 27%) and is deposited in an abandoned channel (oxbow lake sedimentation). The upstream catchment area of the Lower Tweed River consists of a variety of metamorphic and igneous rocks, and additionally of some local sandstone, till, and limestone with coal. There is no natural contamination anticipated of the wood fragments and plant macrofossils in the sample. The sample is waterlogged year-round.

Objectives: sample TWcd-3 dates to the first stages of local channel abandonment and infill of an oxbow-type of

depression. The organic-rich palaeochannel fill will be used for palaeoenvironmental reconstruction (pollen and macros) and this date is a basal range finder for this sequence. This date is taken *c* 800m west of TWcd-2, from the same channel fill. Based on preliminary date cal AD 640–780 (SRR-6183; 1315 ±45 BP) (Reimer *et al* 2004) this sample is expected to have an age of *c* 1300 BP (the same age as TWcd-2). The date will: 1) establish the age of the main palaeochannel in T3 at different locations (improving accuracy of the time of channel abandonment), and 2) allow for correlation between the palaeoecological analyses of core CDS1 and TW11. The T3 terrace is the largest, and presumably longest active, terrace in the Coldstream reach. In combination with dates TWcd-1, TWcd-2, and TWcd-4 this sample will 1) indicate the period of activity and channel migration in various parts of the T3 terrace, and 2) bracket the end of fluvial activity in the (higher-presumably early Holocene) T2 terrace surface. Final abandonment of T3 indicates locally the end of the valley-wide lateral activity of the Tweed, and its progressive confinement. Preliminary dates for T3 in the Lower Tweed reach at Coldstream indicate activity between *c* 1300–600 BP. Cal AD 640–780 (SRR-6183; 1315 ±45 BP) and cal AD 1270–1420 (SRR-6185; 635 ±50 BP) (Reimer *et al* 2004). However, Mesolithic flint found in the SW T3 terrace level suggests that parts of T3 already existed in pre-/early Mesolithic times. It is of prime importance to know when T3 was formed and active for an accurate landscape reconstruction and for evaluating the age-range of potential (buried) archaeological remains in and on top of the terrace surface. The extensive period of activity suggested for the T3 terrace level is comparable to the T3 terrace level in the wide Milfield basin. These levels and their associated landscape history might be correlated.

Calibrated date: *1σ:* cal AD 1030–1160
2σ: cal AD 1020–1170

Final comment: see OxA-12601

Laboratory comment: Ancient Monuments Laboratory (2004), result is statistically consistent with OxA-12683, from the same level ($T'=2.2$, $T'(5\%)=3.8$, $\nu=1$) (Ward and Wilson 1978).

References: Reimer *et al* 2004
Ward and Wilson 1978

OxA–12683 996 ±25 BP

$\delta^{13}C$: -28.3‰

Sample: TWcd–3(b), submitted on 28 July 2003 by T van der Schriek

Material: plant macrofossil: cf *Corylus/Alnus* sp., twig, a single fragment (R Gale 2003)

Initial comment: as OxA-12682

Objectives: as OxA-12682

Calibrated date: *1σ:* cal AD 1010–1030
2σ: cal AD 990–1150

Final comment: see OxA-12601

Laboratory comment: see OxA-12682

Till-Tweed: River Breamish at Powburn, Northumberland

Location: NU 030165 to NU 075185
Lat. 55.26.34 N; Long. 01.57.12 W, to
Lat. 55.27.39 N; Long. 01.52.56 W

Project manager: T van der Schriek (University of Newcastle upon Tyne)

Description: the first of these reaches, between Ingram and New Berwick Bridge, is the piedmont reach of the Breamish as it leaves the steep and deeply incised valley upstream of Ingram. The gravel bed Breamish occupies a valley floor up to 1km wide and is characterised by a low sinuosity channel, which is upstream of the A697 bridge at Powburn divided by unstable active gravel bars. Historic maps indicate that the channel in this reach has been characterised by episodic channel division and lateral migration since the mid-nineteenth century. The selected study site in the valley floor near Powburn is representative for the first reach. Recent work and previous publications at the Powburn Quarry have demonstrated the valley floor to be locally infilled by at least 7m of late Glacial and Holocene gravels. Lateral mobility increased after *c* 790-540 cal BC (*c* 2500 BP) (Reimer *et al* 2004) and successive fluvial incision and narrowing of the valley floor presumably took place since late medieval times. The nine dates come from different sedimentary sequences in the Breamish valley floor near Powburn. Over this reach the floodplain gradient changes from 0.0083m/m to 0.0044m/m and the gravel bed river transforms from an anabranching to a single thread meandering channel. The dating intends to establish the age of the various terrace units by dating organic rich deposits in lake-sediment and palaeochannels. The samples come from organic matter incorporated within and below the fluvial terrace sequence. The samples have a direct relationship with the palaeochannels and lacustrine sediments they aim to date. Each sample has its position taken by a handheld Garmin GPS.

Objectives: to establish the chronology for aggradation, reworking, and incision of Holocene alluvial deposits and terrace levels in the Lower Tweed valley (this chronology helps to evaluate the maximum age of potential archaeological remains contained within and on top of the various fluvial landforms). Also, to determine the age of preserved deposits of palaeoenvironmental and geoarchaeological significance developed on and within the sand and gravel terraces of the study area. The dates in the organic rich sequences of the valley fill will provide a preliminary chronology for pollen, plant macrofossil, and beetle remains analyses. These palaeoecological analyses enable the reconstruction of the changing landscape context over the Holocene.

References: Reimer *et al* 2004
Tipping *et al* 1994

GU–5972 7580 ±130 BP

$\delta^{13}C$: -28.6‰

Sample: Bcd–5 (humin), submitted on 11 June 2003 by T van der Schriek

Material: peat (264g) (decomposed)

Initial comment: sample Bcd-5 is taken from the base of a shallow peat palaeochannel fill of the T1 terrace level at location B19 in the valley floor. The depth of the fine-grained channel fill is *c* 0.5m. The sediment core shows a succession of 0.41m of oxidised dark brown peaty silt on top of 0.10m of peaty clay silt and sand and is grounded on gravel at a depth of 0.5m. The channel has a clear morphological expression at the T1 surface. The thin organic palaeochannel fill shows signs of oxidation and the basal part shows lamination and sand lenses, which argues against the possibility of post-depositional disturbance of the basal peaty silt. There might be rootlet penetration. The sample consists of silty peat (pH 4.3, LOI 94%), which formed in a shallow palaeochannel on top of the gravel deposits of T1. The sample has been taken at a depth of 0.40–0.50m below surface and is overlain by a thin sand layer and silty peat. The upstream catchment area of the Breamish River consists mainly of metamorphic and igneous rocks of the Cheviot massive, and additionally of some sandstone. There is no natural contamination anticipated. The sampling site is waterlogged in winter.

Objectives: sample Bcd-5 dates the first stages of local channel abandonment and infill of the oxbow-type of depression. The clear morphological expression of the channel at the terrace surface suggests that its channel fill might be younger than Bcd-2, Bcd-3, and Bcd-4a/b. This date will determine the period of fluvial activity and lateral reworking at the T1 terrace surface together with samples Bcd-2, Bcd-3, and Bcd-4a/b and the dates for the T1 terrace of Tipping (1998) in the upstream T1 terrace surface. Furthermore, this series of dates 1) might indicate a period of increased fluvial activity starting around the Bronze Age and 2) prove whether there is a downstream movement of the gravel sheet underlying T1. Current dates suggest that increased fluvial activity from the Bronze Age onwards correlates with the expansion of agriculture in the local valley floor and the creation of the T2 terrace level and channel belt at the south-side of the valley floor. The incision of T1 is the beginning of progressive narrowing of the active channel belt and ongoing incision of the valley floor during the later Holocene. It is of prime importance to know the period of activity at the T1 terrace surface for accurate landscape reconstruction and for evaluating the age-range of potential (buried) archaeological remains in and on top of the terrace surface.

Calibrated date: *1σ:* 6570–6360 cal BC
2σ: 6660–6210 cal BC

Final comment: T van der Shriek (April 2004), the date has been accepted and indicated the lateral shifts of the gravel-bed channel across the floodplain represented by the highest terrace level.

Laboratory comment: Ancient Monuments Laboratory (2004), the result is statistically consistent with SUERC-1155, the humic acid fraction from the same level ($T'=0.5$, $T'(5\%)=3.8$, $\nu=1$) (Ward and Wilson 1978).

References: Tipping *et al* 1994
Ward and Wilson 1978

GU–5978 3090 ±50 BP

$\delta^{13}C$: -28.2‰

Sample: Bcd–2, submitted on 11 June 2003 by T van der Schriek

Material: wood: *Alnus glutinosa*, a single fragment (R Gale 2003)

Initial comment: sample Bcd-2 is taken in Hedgely Quarry at location QH1, cut away from a tree trunk in the active gravel face. The tree trunk is located *c* 2m below the T1 terrace surface. The quarry shows a sequence of *c* 1m of silt and sand, followed by *c* 4m of clast-supported gravel with sand lenses/layers of *c* 1m thick that shows cross-bedding, peaty-clayey channel fills (0.5m<thick) and tree trunks (the latter deeper than *c* 2m below surface). These T1 terrace deposits overlay dark brown-grey massive clayey silt layer with extensive organic remains of more than 1m thick (equivalent of the layer of samples Bcd-1a/b). This layer lies conformably on top of a pinkish-blue finely laminated silt and clay with mm-scale fine sandy lamination. The thick sedimentary sequence on top of the samples excludes the possibility of post-depositional disturbance. There is no intrusion of younger organic material. The sample consists of wood, cut-out of a tree trunk, which is incorporated in fluvial channel sediments. The wood fragment comes from the outer part of the tree trunk and contains some bark. The tree trunk is located at a depth of *c* 2m below surface and is overlain by fluvial sand and gravels. The upstream catchment area of the Breamish River consists mainly of metamorphic and igneous rocks of the Cheviot massive, and additionally of some local sandstone. There is no natural contamination anticipated. The sampling site was waterlogged year-round until *c* 2 years ago when quarrying started.

Objectives: the sample dates the period of activity of the local palaeochannel in the upper part of the T1 terrace. This date will determine the period of fluvial activity and lateral reworking at the T1 terrace surface together with samples Bcd-3 and Bcd-4a/b in the same quarry, date Bcd-5 in the downstream T1 terrace surface and the dates for the T1 terrace of Tipping (1994). Furthermore, this series of dates might indicate a period of increased fluvial activity starting around the Bronze Age and indicate whether there is downstream movement of the gravel sheet underlying T1. Current dates suggest that increased fluvial activity from the Bronze Age onwards correlates with the expansion of agriculture in the regional archaeological record. However, parts of the terrace surface are not reworked and date probably from the early Holocene age. Furthermore, the dates in the palaeochannels near the T1 terrace surface will give a *terminus post quem* age for the beginning of the fluvial incision in the local valley floor and the creation of the T2 terrace level and channel belt at the south-side of the valley floor. The incision of T1 is the beginning of progressive narrowing of the active channel belt and ongoing incision of the valley floor during the later Holocene. It is of prime importance to know the period of activity at the T1 terrace surface for accurate landscape reconstruction and for evaluating the age-range of potential (buried) archaeological remains in and on top of the terrace surface.

Calibrated date: *1σ:* 1420–1300 cal BC
2σ: 1460–1210 cal BC

Final comment: see GU-5972

References: Tipping *et al* 1994

GU–5979 5010 ±60 BP

δ^{13}*C:* -28.6‰

Sample: Bcd–3, submitted on 11 June 2003 by T van der Schriek

Material: wood: *Alnus glutinosa*, a single fragment (R Gale 2003)

Initial comment: sample Bcd-3 is taken from Hedgely Quarry at location QH3-4, cut out from a tree trunk in the active gravel face. The tree trunk is located *c* 2m below the T1 terrace surface. The quarry shows a sequence of *c* 1m of silt and sand, followed by c 4m of clast-supported gravel with sand lenses/layers of *c* 1m thick that show cross-bedding, peaty-clayey channel fills (<0.5m thick) and tree trunks (the latter deeper than *c* 2m below surface). These T1 terrace deposits overlay dark brown-grey massive clayey silt layer with extensive organic remains of more than 1m thick (equivalent of the layer of samples Bcd-1a/b). This layer lies conformably on top of a pinkish-blue finely laminated silt and clay with mm-scale fine sandy lamination. The thick sedimentary sequence on top of the sample excludes the possibility of post-depositional disturbance. There is no intrusion of younger organic material. The sampling site was waterlogged year-round until *c* 2 years ago when quarrying started.

Objectives: the sample dates the period of activity of the local palaeochannel in the upper part of the T1 terrace. Samples Bcd-4a/b from the same channel fill post-date the period of channel activity registered by sample Bcd-3 (instead Bcd-4a/b indicates the first stages of channel abandonment). This date will determine the period of fluvial activity and lateral reworking at the T1 terrace surface together with samples Bcd-2 and Bcd-4a/b in the same quarry, date Bcd-5 in the downstream T1 terrace surface and the dates for the T1 terrace of Tipping 1994). Furthermore, this series of dates might indicate a period of increased fluvial activity starting around the Bronze Age and indicate whether there is a downstream movement of the gravel sheet underlying T1. Current dates suggest that increased fluvial activity from the Bronze Age onwards correlates with the expansion of agriculture in the regional archaeological record. However, parts of the terrace surface are not reworked and date probably from the early Holocene age. Furthermore, the dates in the palaeochannels near the T1 terrace surface will give a *terminus post quem* age for the beginning of fluvial incision in the local valley floor and the creation of the T2 terrace level and channel belt at the south-side of the valley floor. The incision of T1 is the beginning of progressive narrowing of the active channel belt and ongoing incision of the valley floor during the later Holocene. It is of prime importance to know the period of activity at the T1 terrace surface for accurate landscape reconstruction and for evaluating the age-range of potential (buried) archaeological remains in and on top of the terrace surface.

Calibrated date: *1σ:* 3940–3700 cal BC
2σ: 3960–3650 cal BC

Final comment: see GU-5972

References: Tipping *et al* 1994

OxA–12571 2529 ±32 BP

δ^{13}*C:* -27.1‰

Sample: Bcd–4b, submitted on 11 June 2003 by T van der Schriek

Material: wood: *Alnus glutinosa*, twig of two-years' growth, a single fragment (R Gale 2003)

Initial comment: sample Bcd-4b is taken in Hedgely Quarry at location QH3-4, from a woody-peat channel fill (subsampled from Bcd-4a). The organic rich channel fill is located *c* 2m below the T1 terrace surface. The quarry shows a sequence *c* 1m of silt and sand, followed be *c* 4m of clast-supported gravel with sand lenses/layers of *c* 1m thick that show cross-bedding, peaty-clayey channel fills (<0.5m thick) and tree trunks (the latter deeper than *c* 2m below surface). These T1 terrace deposits overlay dark brown-grey massive clayey silt layer with extensive organic remains of more than 1m thick (equivalent of the layer of samples Bcd-1a/b). This layer lies conformably on top of a pinkish-blue finely laminated silt and clay with mm-scale fine sandy lamination. The thick coarse-grained sedimentary sequence on top of the sample excludes the possibility of post-depositional disturbance. There is no intrusion of younger organic material. The sample consists of twigs, sub-sampled from the woody peat of Bcd-4a. The woody peat is located at the base of a channel fill adjacent of the tree trunk of sample Bcd-3. The fine-grained and peaty channel fill is surrounded by coarse sand and gravel. The woody-peat fill is located at a depth of *c* 2m below surface and is overlain by fluvial sand and gravels. The upstream catchment area of the Breamish River consists mainly of metamorphic and igneous rocks of the Cheviot massive, and additionally of some local sandstone. There is no natural contamination anticipated. The sampling site was waterlogged year-round until *c* 2 years ago when quarrying started.

Objectives: sample Bcd-4b acts as a duplicate to date Bcd-4a and dates the first stages of channel abandonment and infill of the oxbow-type of depression. The sample post-dates Bcd-3, which is contemporary with fluvial activity in this palaeochannel of the T1 terrace. This date will determine the period of fluvial activity and lateral reworking at the T1 terrace surface together with samples Bcd-2 and Bcd-3 in the same quarry, date Bcd-5 in the downstream T1 terrace surface and the dates for the dates for the T1 terrace of Tipping (1994). Furthermore, this series of dates 1) might indicate a period of increased fluvial activity starting around the Bronze Age, and 2) prove whether there is a downstream movement of the gravel sheet underlying T1. Current dates suggest that increased fluvial activity from the Bronze Age onwards correlates with the expansion of agriculture in the regional archaeological record. However, parts of the terrace surface are not reworked and date probably from the early Holocene age. Furthermore, the dates in the palaeochannels near the T1 terrace surface will give a *terminus post quem* age for the beginning of fluvial incision in the local valley floor and the creation of the T2 terrace level and channel belt at the south-side of the valley floor. The incision of T1 is the beginning of progressive narrowing of the active channel belt and ongoing incision of the valley floor during the later Holocene. It is of prime importance to know the period of activity at the T1 terrace surface for accurate

landscape reconstruction and for evaluating the age-range of potential (buried) archaeological remains in and on top of the terrace surface.

Calibrated date: *1σ:* 790–590 cal BC
2σ: 800–540 cal BC

Final comment: see GU-5972

Laboratory comment: Ancient Monuments Laboratory, this result is statistically consistent with SUERC-1154, the humic acid fraction of peat from the same level (T′=0.1, T′(5%)=3.8, =1) (Ward and Wilson 1978).

References: Tipping *et al* 1994
Ward and Wilson 1978

SUERC–1147 905 ±40 BP

δ¹³C: -29.0‰

Sample: Bcd–1a (humic acid), submitted on 11 June 2003 by T van der Schriek

Material: sediment (300g) (organic silt), (pH 6.44, LOI 24%)

Initial comment: sample Bcd-1a is taken in Powburn Quarry at location QP1 from the active gravel pit by quarry machinery. There is a thick sequence of *c* 0.5m of silty sand and fine gravel, followed by >7m of massive clast supported gravel with down-valley imbication, followed by a well-sorted medium sand layer of *c* 1–1.5m thick at its base. Subsequently there is a dark brown-grey massive clayey silt layer with extensive organic remains of *c* 1.5m thick. The sample is sub-sampled from a *c* 1m thick coherent sample of this layer. The dark brown-grey clayey silt layer lies conformably on top of a pinkish-blue finely laminated silt and clay with mm-scale fine sandy lamination, the top 1m of which is visible in the bank section. The thick sedimentary sequence of *c* 1.5m on top of the sample and the lamination within the clay sample exclude the possibility of post-depositional disturbance and intrusion of younger organic material. The sample consists of organic rich silty clay deposited in a lacustrine environment. Sediments underlying the sample are deposited in a peri-glacial lacustrine environment. The sample has been taken at a depth of *c* 9m below surface and is overlain by fluvio-glacial and fluvial sand and gravels. There is no natural contamination anticipated. The sampling site is waterlogged year-round.

Objectives: this date (together with date Bcd-1b) will establish the final stages of lake presence in this part of the valley floor (probably late Glacial). This age will show the potential overlap with the regional archaeological record. Furthermore, the date will give a *terminus post quem* age for the beginning of gravel deposition of terrace T1 in the local valley floor. Currently there is confusion about the age of the gravel deposits. Clapperton (1971a) states that the gravels are fluvio-glacial (fan/sander) deposits of late Glacial age, whereas Tipping (1994) argue for a date around *c* 790–540 cal BC (*c* 2500 BP) (Reimer *et al* 2004). It is of prime importance to know if gravel deposition commenced during the late Glacial or in the mid-late Holocene for an accurate landscape reconstruction and for evaluating the potential of buried archaeological remains below the gravels. Finally, this date will help to interpret the pollen, beetle, and macrofossil analyses on samples from the dated dark brown-grey massive silt-clay layer and from the underlying pinkish-blue laminated fine sandy clay silt.

Calibrated date: *1σ:* cal AD 1040–1190
2σ: cal AD 1020–1220

Final comment: T van der Schriek (April 2004), this result and SUERC-1148 date one single sediment sample taken *c* 9m below the surface at the base of the sand and gravel layer in Powburn Quarry. Their radiocarbon ages are much younger than expected based on environmental and stratigraphic context. The published dates (Tipping 1994) and dates Bcd-2 to Bcd-5 from palaeochannel fills in the upper levels of the gravel layer fall between *c* 6600 cal BC and cal AD 300. These two samples have at least 6m lower absolute elevation than these dates and are therefore contradicting the general chronostratigraphy. Furthermore, these samples have a glaciolacustrine (late Glacial) context. As accuracy of the radiocarbon measurements is not questionable, the composition and provenance of these samples needs to be re-interpreted. SUERC-1147 and SUERC-1148 were recovered by quarrying machinery, the sample appeared to have been contaminated with modern organic material during the dredging operation. Accordingly these dates have been rejected.

Laboratory comment: Ancient Monuments Laboratory (2004), result is statistically inconsistent with SUERC-1148, the humin fraction from the same sample (T′=13.6, T′(5%)=3.8, ν=1) (Ward and Wilson 1978).

References: Clapperton 1971a
Tipping *et al* 1994
Ward and Wilson 1978

SUERC–1148 1140 ±50 BP

δ¹³C: -29.8‰

Sample: Bcd–1a (humin), submitted on 11 June 2003 by T van der Schriek

Material: sediment (300g) (organic silt)

Initial comment: as SUERC-1147

Objectives: as SUERC-1147

Calibrated date: *1σ:* cal AD 820–980
2σ: cal AD 770–1020

Final comment: see SUERC-1147

Laboratory comment: see SUERC-1147

SUERC–1149 27100 ±200 BP

δ¹³C: -22.3‰

Sample: Bcd–1b (humin), submitted on 11 June 2003 by T van der Schriek

Material: sediment (1000g) (clayey silt with organic material, (pH 6.44, LOI 24%))

Initial comment: sample Bcd-1b is taken in a bank section at location B18 from a cleaned sediment face (with a spade), *c* 1.5m below surface. There is a thick sequence of *c* 2m of a dark brown-grey massive clayey silt layer with extensive organic remains, directly below the surface at the valley side. This dark brown-grey clayey silt layer lies conformably on top of a pinkish-blue finely laminated silt and clay with mm-scale fine sandy lamination, the top 1m of which is visible in the bank section. The thick sedimentary sequence of *c* 1.5m on top of the sample and the lamination within

the clay sample exclude the possibility of post-depositional disturbance and intrusion of younger organic material. There is no modern root penetration. The sample consists of organic rich silty clay deposited in a lacustrine environment. Sediments underlying the sample are deposited in a periglacial lacustrine environment. The sample has been taken at a depth of *c* 1.5m below surface and is overlain by the massive brown-grey clay. The upstream catchment area of the Breamish River consists mainly of metamorphic and igneous rocks of the Cheviot massive, and additionally of some local sandstone. There is no natural contamination anticipated. The sampling site is waterlogged in winter.

Objectives: this date (together with the upstream Bcd-1a) will establish the final stages of lake presence in this part of the valley floor (probably late Glacial). This age will show the potential overlap with the regional archaeological record. Furthermore, the date will give a *terminus post quem* age for the beginning of gravel deposition of terrace T1 in the local valley floor. Currently there is confusion about the age of the gravel deposits. Clapperton (1971a) states that the gravels are fluvio-glacial (fan/sander) deposits of late Glacial age, whereas Tipping (1998) argues for a date around *c* 790–540 cal BC (*c* 2500 BP) (Reimer *et al* 2004). It is of prime importance to know if gravel deposition commenced during the late Glacial or in the mid-late Holocene for an accurate landscape reconstruction and for evaluating the potential of buried archaeological remains below the gravels. Finally, this date will help to interpret the pollen, beetle, and macrofossil analyses on samples from the dated dark brown-grey massive silt-clay layer and from the underlying pinkish-blue laminated fine sandy clay silt.

Final comment: T van der Schriek (April 2004), the radiocarbon date of 25,560–24,760 cal BC is consistent with the regional late Glacial history of the area (Clapperton 1970, 1971a, and 1971b, Tipping 1998) and dates the lake presence; the date has been accepted. However, given the *c* 18m of Glacial and Glaciolacustrine sediment on top of this sample, this date does not give a *terminus post quem* age for the beginning of gravel deposition in the valley floor. The contact between the sand and gravel deposits of the floodplain and the underlying silty clay is erosive.

References: Clapperton 1970
Clapperton 1971a
Clapperton 1971b
Reimer *et al* 2004
Tipping 1998

SUERC–1154 2510 ±40 BP

$\delta^{13}C$: -30.1‰

Sample: Bcd–4a (humic acid), submitted on 11 June 2003 by T van der Schriek

Material: peat (400g) (woody, pH 5.96, LOI 61%)

Initial comment: as OxA-12571

Objectives: as OxA-12571

Calibrated date: *1σ:* 780–540 cal BC
2σ: 800–410 cal BC

Final comment: see GU-5972

Laboratory comment: see OxA-12571

SUERC–1155 7485 ±45 BP

$\delta^{13}C$: -28.6‰

Sample: Bcd–5 (humic acid), submitted on 11 June 2003 by T van der Schriek

Material: peat (264g) (decomposed)

Initial comment: as GU-5972

Objectives: as GU-5972

Calibrated date: *1σ:* 6430–6260 cal BC
2σ: 6440–6230 cal BC

Final comment: see GU-5972

Laboratory comment: see GU-5972

SUERC–1156 430 ±40 BP

$\delta^{13}C$: -30.2‰

Sample: Bcd–6 (humic acid), submitted on 11 June 2003 by T van der Schriek

Material: peat (110g)

Initial comment: sample Bcd-6 is taken from the central part of a fine-grained palaeochannel fill on the T2 terrace level at location B12 in the valley floor. The depth of the fine-grained channel fill is 1.41m and the sample is taken from 90–6cm. The sediment core shows a succession of 0.84m of sandy to clayey silt on top of 0.32m of peaty silt and silty peat with abundant macros, followed by 0.25m of clayey silt to silty sand and is grounded on gravel at a depth of 1.41m. The relatively thick fine-grained organic palaeochannel fill shows the same succession in adjacent observation points (B13 and B11). The stratified sediments on top of the peat layer and the lateral continuation of the latter in several sediment sequences argue against the possibility of post-depositional disturbance of the basal peaty silt. There is no contamination with younger organic material. The sample consists of silty peat (pH 5.25, LOI 92%) that formed at the base of a deep palaeochannel, expressed in the surface morphology of terrace level T2. The sampling site is waterlogged year-round.

Objectives: sample Bcd-6 dates the first stages of local channel abandonment and infill of the oxbow-type of depression. The organic-rich palaeochannel fill will be used for palaeoenvironmental reconstruction and this date is a range-finder for this sequence. The T2 terrace, in which this palaeochannel lies, is found at the mouth of the abandoned channel belt at the south-side of the valley floor. This geomorphology of the T2 terrace implies that date Bcd-6 may be representative of the end of T2 terrace formation, indicating the end of the active channel belt at the south-side of the valley floor and the beginning of fluvial activity in the present channel at the north-side of the valley floor. In combination with dates Bcd-2, Bcd-3, Bcd-4a/b, and Bcd-5 and the dates for the T1 terrace of Tipping (1994), this sample will: 1) indicate the period of deposition of the T2 terrace level and 2) bracket the end of fluvial activity in the T1 terrace surface. The incision of T1, followed by the creation of T2 is the beginning of progressive narrowing of the active channel belt and ongoing incision of the valley floor. There is a change in channel platform between T1 and T2, from braiding/anabranching to single meandering, which must be related to a change in water/sediment supply.

Abandonment of T2 indicates the end of the valley-wide lateral activity of the Breamish, and its progressive confinement in a narrow northern channel belt, with its implications for archaeological preservation in/on the T1 and T2 terrace surfaces. There are no current dates for T2, but the last dates for T1 (Tipping 1994) suggests that T2 was created in late Roman to early medieval times. It is of prime importance to know when T1 was incised and T2 formed for accurate landscape reconstruction and for evaluating the age-range of potential (buried) archaeological remains in and on top of the terrace surface.

Calibrated date: *1σ:* cal AD 1430–1470
2σ: cal AD 1420–1620

Final comment: T van der Schriek (April 2004), both SUERC-1156 and SUERC-1157 are younger than the dates for the highest terrace level, and therefore consistent with the chronostratigraphy of the valley floor landforms; these dates are accepted. These dated palaeochannels represent stages of a lateral migrating meander bend and bracket the period of channel activity in the outer palaeochannel from (earliest) cal AD 1160–1290 (SUERC-1157) (following the abandonment of the inner palaeochannel dated by SUERC-1157), to cal AD 1410–1620 (SUERC-1156), when the outer palaeochannel was abandoned and a new floodplain level was created inside the dated palaeochannel meander belt.

References: Tipping *et al* 1994

SUERC–1157 800 ±40 BP

$\delta^{13}C$: -29.0‰

Sample: Bcd–7 (humic acid), submitted on 11 June 2003 by T van der Schriek

Material: peat (190g)

Initial comment: sample Bcd-7 is taken from a basal peat layer in a fine-grained palaeochannel fill of the T3 terrace level at location B6. The depth of the fine-grained channel fill is 0.73m and the sample is taken at 66–73cm. The sediment core shows a succession of 0.73m of peat, silty peat, and peaty silt with clayey silt lenses and contains abundant macros. The core is grounded on gravel at a depth of 0.73m. The fine-grained organic palaeochannel fill shows the same sedimentary succession in adjacent cores B5 and B7. The well-developed, undisturbed stratigraphy of the sediments on top of the sample and the lateral continuation of the layers in several sediment observations argue against the possibility of post-depositional disturbance of the basal peaty silt. There might be limited root penetration from the surface. The sample consists of silty peat (pH 6.2, LOI 51%), which formed in a palaeochannel that is clearly visible in the surface morphology of terrace level T3. The sampling site is waterlogged year-round.

Objectives: sample Bcd-7 dates the first stages of local channel abandonment on T3 and the initial infill of an oxbow-type of depression. The organic-rich palaeochannel fill will be used for palaeoenvironmental reconstruction and this date is a range-finder for this sequence. In combination with date Bcd-6, sample Bcd-7 will establish the period of incision in T2 and subsequent aggradation of the T3 terrace level. The T3 terrace levels occupy a position at the north-side of the valley floor, indicating an avulsion event since deposition and occupation of the T2 terrace belt. This transition which might be linked to climate change and human impact, influencing the sediment and water supply to the catchment. Finally, the requested date will be a maximum age for the formation of the younger, inset terrace levels, that reflect the ongoing confinement and incision of the valley floor (group of T4 terrace levels) is presumably reflecting unstable conditions (water-sediment supply) during the late Holocene. There are no current dates for T3, but the last dates for T1 (Tipping 1994) and the formation of T2 suggest that T3 was created during or after the late medieval period. It is important to know when the T3 terrace surface was active for an accurate landscape reconstruction and for evaluating the age-range of potential (buried) archaeological remains in and on top of the terrace surface.

Calibrated date: *1σ:* cal AD 1210–1270
2σ: cal AD 1160–1280

Final comment: see SUERC-1156

References: Tipping *et al* 1994

Till-Tweed: River Breamish-Till at Saw Mill and Newtown Bridge, Northumberland

Location: NU 550220 to NU 048251
Lat. 55.29.32 N; Long. 01.54.49 W, to
Lat: 55.31.12 N; Long. 01.55.29 W

Project manager: T van der Schriek (University of Newcastle upon Tyne)

Description: the second reach (BT) is located between New Berwick Bridge and Weetwood. This reach of the Breamish/Till River is characterised by high-sinuosity meandering channels that occupy a till-mantled valley consisting of several wider alluvial basins connected by confined corridors. The alluvial valley floor reaches a maximum width of 0.5km. The reach is narrowly confined by a Fell sandstone ridge immediately upstream of Weetwood. The selected study sites in the valley floor near Saw Mill and Newton Bridge are representative for the second reach. There have been no previous studies of the Holocene valley floor development and sediments in this part of the valley floor. The six samples come from different sedimentary sequences in the Breamish-Till valley floor near Saw Mill and Newton Bridge. The two subreaches, Saw Mill and Newton Bridge are located in the widest parts of the valley floor over reach BT and have several terraces and preserved palaeochannels. The organic-rich sequences in local palaeochannels are suitable for dating, pollen, and plant macrofossil analyses. The narrow corridors that connect the wider alluvial basins have no terrace preservation, probably due to high streamflow velocities during floods and the migration of the channel belt over the entire width of the valley floor. Dating is intended to establish the age of the various terrace units by dating organic-rich deposits in palaeochannels. The samples have come from organic matter incorporated within the fluvial terrace sequence. The samples have a direct relationship with the palaeochannel fills they aim to date. Each sample has its position taken by a handheld Garmin GPS.

Objectives: to establish the chronology for aggradation, reworking, and incision of Holocene alluvial deposits and terrace levels in the Lower Tweed valley (this chronology helps to evaluate the maximum age of potential archaeological remains contained within and on top of the various fluvial landforms). Also, to determine the age of preserved deposits of palaeoenvironmental and geoarchaeological significance developed on and within the sand and gravel terraces of the study area. The dates in the organic-rich sequences of the valley fill will provide a preliminary chronology for pollen, plant macrofossil, and beetle remains analyses. These palaeoecological analyses enable the reconstruction of the changing landscape context over the Holocene.

References: Needham *et al* 1992
Passmore *et al* 2002
Tipping *et al* 1994

GrA–23759 385 ±35 BP

$\delta^{13}C$: -31.7‰

Sample: BTcd–4A, submitted on 14 July 2003 by T van der Schriek

Material: wood: *Alnus glutinosa*, roundwood (four rings including bark), a single fragment (2g) (R Gale 2003)

Initial comment: sample BTcd-4 is taken from the central part of a fine-grained palaeochannel fill on the T2 terrace at location BT19 in the valley floor of Newtown Bridge. The depth of the fine-grained channel fill is 2.00m and the sample is taken from 192–5cm. The sediment core shows a succession of 1.14m of silt and silty clay, followed by 0.86m of silty sand and sand with organic material, and is grounded on gravel at 2.00m. The stratified channel fill sediments on top of the sample and the lateral continuation of the latter in several sequences argue against post-depositional disturbance of the sequence. There is no contamination with younger organic material. The sample is waterlogged year-round.

Objectives: sample BTcd-4 dates the initial channel abandonment and infill of an oxbow-type of depression on the local T2 terrace level at Newton Bridge. The T2 terrace is the middle terrace level in the Newton Bridge area. In combination with dates BTcd-5 and BTcd-6 this sample will indicate the period of abandonment and incision in the T2 terrace surface. There are no current dates for T2 in Newton Bridge (reach BT), but dates in a similar sequence and geomorphological setting in the Glenn River near the Milfield Basin suggests that T2 was created in medieval times. It is of prime importance to know when T2 formed for an accurate landscape reconstruction and for evaluating the age-range of potential (buried) archaeological remains in and on top of the terrace surface.

Calibrated date: *1σ:* cal AD 1440–1620
2σ: cal AD 1440–1640

Final comment: T van der Schriek, the difference between GrA-23759 (cal AD 1440–1620) and GrA-23760 (cal AD 1070–1260) suggests that the wood fragments were reworked prior to incorporation in the sedimentary sequence.

Laboratory comment: Ancient Monuments Laboratory (April 2004), result is statistically inconsistent with GrA-23760, from the same level ($T'=78.9$, $T'(5\%)=3.8$, $\nu=1$) (Ward and Wilson 1978).

References: Ward and Wilson 1978

GrA–23760 825 ±35 BP

$\delta^{13}C$: -28.0‰

Sample: BTcd–4B, submitted on 14 July 2003 by T van der Schriek

Material: wood: Salicaceae, (certainly *Salix* sp.) roundwood (two rings) (2g) (R Gale 2003)

Initial comment: as GrA-23759

Objectives: as GrA-23759

Calibrated date: *1σ:* cal AD 1180–1260
2σ: cal AD 1150–1270

Final comment: see GrA-23759

Laboratory comment: see GrA-23759

GrA–23761 310 ±35 BP

$\delta^{13}C$: -27.7‰

Sample: BTcd–5A, submitted on 14 July 2003 by T van der Schriek

Material: wood: Salicaceae, roundwood almost certainly (four rings including bark), a single fragment (2g) (R Gale 2003)

Initial comment: sample BTcd-5 is taken from the central part of a fine-grained palaeochannel fill on the T3 terrace at location BT18 in the valley floor of Newton Bridge. The channel cuts at the sample location through the older T1 terrace surface. The depth of the fine-grained channel fill is 2.00m and the sample is taken from 176–8cm. The sediment core shows a succession of 0.60m of silt and silty clay, followed by 1.40m of silty sand and sand with organic material, and is grounded on gravel at 2.00m. The stratified, bedded channel fill sediments on top of the sample and the lateral continuation of the latter in several sequences argue against post-depositional disturbance of the sequence. There is no contamination with younger organic material. The sample is waterlogged year-round.

Objectives: sample BTcd-5 dates the initial stages of channel abandonment in a palaeochannel fill, connected to terrace level T3. The T3 terrace is the lowest terrace level in the Newton Bridge area. The date is expected to be older than BTcd-6, in the same channel *c* 300m downstream, which dates the initial infill stages of an oxbow-depression/lake. There are no current dates for T3 in Newton Bridge (reach BT), but dates in a similar sequence and geomorphological setting in the Glenn River near the Milfield Basin suggests that T3 was created in late medieval to historic times. It is of prime importance to know when T3 formed for an accurate landscape reconstruction and for evaluating the age-range of potential (buried) archaeological remains in the and on top of the terrace surface.

Calibrated date: *1σ:* cal AD 1510–1650
2σ: cal AD 1460–1660

Final comment: T van der Schriek, again the difference between these two dates, GrA-23761 and GrA-23763, suggests that the wood fragments were reworked prior to incorporation in the sedimentary sequence. It is therefore concluded that the earliest infill stages of this dated palaeochannel occurred at, or after cal AD 1470–1660.

Laboratory comment: Ancient Monuments Laboratory (2004), result is statistically inconsistent with GrA-23763, from the same level (T′=216.8, T′(5%)=3.8, ν=1) (Ward and Wilson 1978).

References: Ward and Wilson 1978

GrA–23763 1040 ±35 BP

$\delta^{13}C$: -29.3‰

Sample: BTcd–5B, submitted on 14 July 2003 by T van der Schriek

Material: wood: *Alnus glutinosa*, roundwood (5 rings), a single fragment (R Gale 2003)

Initial comment: as GrA-23761

Objectives: as GrA-23761

Calibrated date: *1σ:* cal AD 980–1030
2σ: cal AD 890–1040

Final comment: see GrA-23761

Laboratory comment: see GrA-23761

GrN–28096 520 ±30 BP

$\delta^{13}C$: -29.4‰

Sample: BTcd–6 (humin), submitted on 14 July 2003 by T van der Schriek

Material: sediment (768g) (bulk organic peaty silt)

Initial comment: sample BTcd-6 is taken from the central part of a fine-grained palaeochannel fill on the T3 terrace at location BT20 in the valley floor of Newton Bridge. The depth of the fine-grained channel fill is 2.20m and the sample is taken from 175–190cm. The sediment core shows a succession of 1.00m of clayey silt, followed by 1.00m of peaty silt and silty peat with abundant macros on top of 0.2m of silty sand with abundant macros, and is grounded on gravel at 2.20m. The thick fine-grained organic palaeochannel fill shows the same succession in adjacent cores. The stratified sediments on top of the peat layer and the lateral continuation of the latter in several sediment sequences argue against post-depositional disturbance of the basal peaty silt. There is no contamination with younger organic material. The sample consists of peaty silt (pH 6.24, LOI 42%) and is deposited after abandonment of the palaeochannel in an oxbow lake. The sample is waterlogged year-round.

Objectives: sample BTcd-6 dates the first stages of local channel abandonment characterised by infill of an oxbow lake in terrace level 3. The organic-rich palaeochannel fill will be used for palaeoenvironmental reconstruction (pollen and macros) and this date is a range-finder for this sequence. The T3 is the lowest terrace level in the Newton Bridge reach. In combination with date BTcd-5 this sample will indicate the period of fluvial activity associated with the T3 terrace surface. Date BTcd-6 is the youngest date on the T3 terrace surface (post-dating BTcd-5), indicative of the first stages of infill after abandonment of the channel. There are no current dates for T3 at Newton Bridge (reach BT), but dates in a similar sequence and geomorphological setting in the Glenn River near the Milfield Basin suggests that T3 was created in late medieval to historical times. It is of prime importance to know when T3 was formed for an accurate landscape reconstruction and for evaluating the age-range of potential (buried) archaeological remains in and on top of the terrace surface.

Calibrated date: *1σ:* cal AD 1400–1440
2σ: cal AD 1320–1450

Final comment: T van der Schriek, the humin and humic acid fraction samples from TWcd-6 yielded different dates of cal AD 1320–1440 and cal AD 770–1150 respectively. Therefore, these dates can only be used with caution and the younger date should be accepted on a preliminary basis.

Laboratory comment: Ancient Monuments Laboratory (in 2004), result is statistically inconsistent with GrN-28097, the humic acid fraction from the same sample (T′=42.0, T′(5%)=3.8, ν=1) (Ward and Wilson 1978).

References: Ward and Wilson 1978

GrN–28097 1060 ±80 BP

$\delta^{13}C$: -29.9‰

Sample: BTcd–6 (humic acid), submitted on 14 July 2003 by T van der Schriek

Material: sediment (bulk organic peaty silt (*c* 76g))

Initial comment: as GrN-28096

Objectives: as GrN-28096

Calibrated date: *1σ:* cal AD 890–1030
2σ: cal AD 770–1160

Final comment: see GrN-28096

Laboratory comment: see GrN-28096

References: Ward and Wilson 1978

SUERC–1158 1015 ±40 BP

$\delta^{13}C$: -29.5‰

Sample: BTcd–1 (humic acid), submitted on 14 July 2003 by T van der Schriek

Material: peat (214g) (bulk)

Initial comment: sample BTcd-1 is taken from the central part of a fine-grained palaeochannel fill on the T1 terrace level at location BT2 in the valley floor of Saw Mill. The depth of the fine-grained channel fill is 2.66m and the sample is taken from 200–14cm. The sediment core shows a succession of 0.93m of clayey silt on top of 1.21m of peaty silt and silty peat with abundant macros, followed by 0.52m of clayey silt to silty sand (with abundant macros), and is grounded on gravel at 2.66m. The relatively thick fine-grained organic palaeochannel fill shows the same succession in adjacent cores. The stratified sediments on top of the peat layer and the lateral continuation of the latter in several sediment sequences argue against post-depositional disturbance of the basal peaty silt. There is no contamination with younger organic material. The sample consists of silty peat (pH 6.45, LOI 48%) and is deposited in an abandoned channel (oxbow lake sedimentation). The sample was waterlogged year-round.

Objectives: sample BTcd-1 dates the first stages of local channel abandonment on the T1 terrace and infill of an

oxbow-type depression. The organic-rich palaeochannel fill will be used for palaeoenvironmental reconstruction (pollen and macros) and this date is a basal range-finder for this sequence. The T1 terrace is the highest, and presumably oldest, terrace in the Saw Mill reach. In combination with dates BTcd-2 and BTcd-3 this sample will: 1) indicate the period of deposition of the T2 terrace level, and 2) bracket the end of fluvial activity in the T1 terrace surface. The incision of T1, followed by the creation of T2, is the beginning of progressive narrowing of the active channel belt and ongoing incision of the valley floor. Abandonment of T1 indicates locally the end of the valley-wide lateral activity of the Breamish, and its progressive confinement. There are no current dates for T1 in reach BT, but dates in a similar sequence and geomorphological setting in the Glenn River near Milfield Basin suggests that T1 was created in medieval times. It is of prime importance to know when T1 was incised and T2 formed for an accurate landscape reconstruction and for evaluating the age-range of potential (buried) archaeological remains in and on top of the terrace surface.

Calibrated date: *1σ:* cal AD 990–1030
2σ: cal AD 900–1150

Final comment: T van der Schriek (April 2004), dates SUERC-1158 to SUERC-1160 were accepted and indicated the lateral shifts of the sinuous gravel-bed channel across the terrace level.

SUERC–1159 1585 ±40 BP

$\delta^{13}C$: -28.4‰

Sample: BTcd–2 (humic acid), submitted on 14 July 2003 by T van der Schriek

Material: peat (131g) (bulk)

Initial comment: sample BTcd-2 is taken from the central part of a fine-grained palaeochannel fill on the T2 terrace level at location BT5 in the valley floor of Saw Mill. The depth of the fine-grained channel fill is 1.80m and the sample is taken from 160–70cm. The sediment core shows a succession of 1.70m of peaty silt and silty peat with abundant macros, followed by 0.10m of sand and is grounded on gravel at 1.80m. The relatively thick fine-grained organic palaeochannel fill shows the same succession in adjacent cores. The stratified sediments on top of the peat layer and the lateral continuation of the latter in several sediment sequences argue against post-depositional disturbance of the basal peaty silt. There is no contamination with younger organic material. The sample consists of silty peat (pH 6.57, LOI 68%) and is deposited in an abandoned channel (oxbow lake sedimentation). The sample is waterlogged year-round.

Objectives: sample BTcd-2 dates the first stages of local channel abandonment and infill of an oxbow-type depression on terrace level T2. The organic-rich palaeochannel fill will be used for palaeoenvironmental reconstruction (pollen and macros) and this date is a range-finder for this sequence. The T2 terrace is the intermediate terrace level in the Saw Mill reach. In combination with date BTcd-3 this sample will indicate the period of fluvial activity in the T2 terrace surface. Date BTcd-3, on the same terrace level, comes from a younger palaeochannel fill, as determined from the geomorphological relationship between the channel fills. There are no current dates for T2 in reach BT, but dates in a similar sequence and geomorphological setting in the Glenn River near Milfield Basin suggests that T2 was created in late medieval to historical times. It is of prime importance to know when T2 formed for an accurate landscape reconstruction and for evaluating the age-range of potential (buried) archaeological remains in and on top of the terrace surface.

Calibrated date: *1σ:* cal AD 420–540
2σ: cal AD 390–570

Final comment: see SUERC-1158

SUERC–1160 1220 ±40 BP

$\delta^{13}C$: -29.3‰

Sample: BTcd–3 (humic acid), submitted on 14 July 2003 by T van der Schriek

Material: peat (108g) (bulk)

Initial comment: sample BTcd-3 is taken from the central part of a fine-grained palaeochannel fill on the T2 terrace level at location BT10 in the valley floor of Saw Mill. The depth of the fine-grained channel fill is 1.10m and the sample is taken from 95–110cm. The sediment core shows a succession of 1.10m of peat and silty peat with abundant macros and is grounded on gravel sand at 1.10m. The relatively thick fine-grained organic palaeochannel fill shows the same succession in adjacent cores. The stratified sediments on top of the peat layer and the lateral continuation of the latter in several sediment sequences argue against post-depositional disturbance of the basal peaty silt. There might be some contamination with younger organic material. The sample consists of peat (pH 6.48, LOI 85%) and is deposited in an abandoned channel (oxbow lake sedimentation). The sample is waterlogged year-round.

Objectives: sample BTcd-2 dates the first stages of local channel abandonment and infill of an oxbow-type depression on terrace level T2. The organic-rich palaeochannel fill will be used for palaeoenvironmental reconstruction (pollen and macros) and this date is a range-finder for this sequence. The T2 terrace is the intermediate terrace level in the Saw Mill reach. In combination with date BTcd-3 this sample will indicate the period of fluvial activity in the T2 terrace surface. Date BTcd-3, on the same terrace level, comes from a younger palaeochannel fill, as determined from the geomorphological relationship between the channel fills. There are no current dates for T2 in reach BT, but dates in a similar sequence and geomorphological setting in the Glenn River near Milfield Basin suggests that T2 was created in late medieval to historical times. It is of prime importance to know when T2 formed for an accurate landscape reconstruction and for evaluating the age-range of potential (buried) archaeological remains in and on top of the terrace surface.

Calibrated date: *1σ:* cal AD 710–890
2σ: cal AD 680–940

Final comment: see SUERC-1158

Trent Valley Survey

Location: SK 460631
Lat. 53.09.47 N; Long. 01.18.48 W

Project manager: A J Howard (University of Newcastle upon Tyne) July–September 2002

Description: the Trent Valley has a rich archaeological resource that has been well documented over the last 40 years. This archaeology is multi-period. It includes archaeological field monuments and landscapes that are predominantly recognised through cropmarks, but also through earthworks, field-scatters, and isolated finds of objects. It also includes river palaeochannels and alluvial deposits, historic settlements and buildings, and historic landscape features. The degree of preservation within it is variable according to context, ranging from poor or limited through to high, rich, and extensive. It exists within a modern landscape that has been extensively changed over the last 50 years. Organic deposits preserved in palaeochannels on river valley floors are capable of providing high-resolution proxy records of climate and landuse change and are an important component of the archaeological record.

Objectives: to provide an assessment of the dates of the organic sediments surviving in the palaechannels of the river Trent mapped during this project.

Final comment: A J Howard (21 August 2004), these dates demonstrate that well preserved organic-rich palaeochannels of varying ages are preserved throughout the Trent Valley and away from areas studied as part of the PPG Planning Process. The dates confirm: 1) inorganic alluviation is a strongly historic process, especially Roman/post Roman, 2) some terrace surfaces are of considerable antiquity (certainly prehistoric), and 3) there are a number of discrete phases of alluvial activity, which should be compared with national datasets and dovetailed with the drawing mechanisms of landscape change (ie climate and landuse).

References: Bridgland *et al* forthcoming
Havelock and Howard 2002

Trent Valley Survey: Barton in Fabis North, Nottinghamshire

Location: SK 5185832463
Lat. 52.53.14 N; Long. 01.13.51 W

Project manager: A J Howard (University of Newcastle upon Tyne), July 2002

Archival body: A J Howard and Trent Valley Geoarchaeology

Description: core taken from a meander loop located on the Holocene floodplain of the River Trent (second terrace), core identified from aerial photography analysed as part of the palaeochannel mapping programme funded by Nottinghamshire County Council.

Objectives: to provide a chronological control, which will allow the determination of the timing channel development. A minimum and/or maximum age for the terrace surface in which the palaeochannel is located. Assessment of specific age relationships between palaeochannel units (TV-BFN 6) in close proximity. The timing of fine-grained inorganic alluviation (the organic unit is sealed by red-brown alluvium, which is often assumed to be an indicator of soil erosion associated with Roman agricultural practices).

Final comment: A J Howard (31 August 2004), these two dates provide important information on the timing of floodplain development and indicates that during the Roman/Anglo-Saxon period, the river was close to the southern margin of the valley. This is particularly interesting since a Roman Villa complex is known within 1km of the palaeochannel and this channel complete could provide important palaeoenvironmental evidence of Roman/post Roman activity from the peat infill – a period we know little about in the Trent Valley.

References: Havelock and Howard 2002

OxA–12780 1450 ±26 BP

$\delta^{13}C$: -24.5‰

Sample: TV–BFN6.61, submitted in September 2002 by A J Howard

Material: plant macrofossil: unidentified herbaceous stem, a single fragment (0.05g) (A Hall 2002)

Initial comment: from an organic-rich core taken from a meander loop palaeochannel located on the Holocene floodplain of the River Trent (second terrace). The palaeochannel is incised into a Holocene terrace, which comprises basal sands and gravels overlain by fine grained sediments. This sample was collected from the upper part of an organic horizon of a palaeochannel at a depth of between 1.55–1.75m. Local geology comprises Permo-Triassic sandstones. No root penetration or contamination of the core was observed.

Objectives: to provide a chronological control, which will allow the timing of channel development of the Holocene floodplain in the middle Trent to be determined. To estimate a minimum age for the terrace surface in which the palaeochannel is located. An assessment of specific age relationships between palaeochannel units in close proximity (TV-BFS 5). An assessment of the timing of fine-grained (inorganic) alluviation, which is usually associated with Roman farming practices.

Calibrated date: *1σ:* cal AD 590–650
2σ: cal AD 560–650

Final comment: A J Howard (31 August 2004), the upper date provides evidence of Roman/post Roman fluvial sedimentation at the southern margin of valley floor. The date fits in well with the palaeobotanitical/entomological evidence of a cleared landscape used for some cereal production and pasture. The unit dated is sealed by red-brown alluvium, often observed to be Roman/post Roman in date. A good result to identify palaeochannels which are not later prehistoric.

OxA–12781 1609 ±27 BP

$\delta^{13}C$: -27.6‰

Sample: TV–BFN 6.62, submitted in September 2002 by A J Howard

Material: plant macrofossil: unidentified herbaceous stem, woody fragments, bulk sample (0.03g) (A Hall 2002)

Initial comment: as OxA-12780. This sample was collected from the basal part of an organic horizon of a palaeochannel at a depth of between 2.30-2.55m. Local geology comprises Permo-Triassic sandstones. No root penetration or contamination of the core was observed.

Objectives: as OxA-12780

Calibrated date: *1σ:* cal AD 410–530
2σ: cal AD 390–540

Final comment: A J Howard (31 August 2004), the lower date fits in chronologically with the sequence and suggests no contamination of samples by fluvial mixing. A good result - Roman/post Roman fluvial activity and a channel, which affords the opportunity to study a period for which we have little information.

Trent Valley Survey: Barton in Fabis South, Nottinghamshire

Location: SK 5215232170
Lat. 52.53.04 N; Long. 01.13.35 W

Project manager: A J Howard (University of Newcastle upon Tyne), July 2002

Archival body: A J Howard and Trent Valley Geoarchaeology

Description: core taken from a meander loop located on the Holocene floodplain of the River Trent (second terrace), core identified from aerial photography analysed as part of the palaeochannel mapping programme funded by Nottinghamshire County Council.

Objectives: to provide a chronological control, which will allow the determination of the timing channel development. A minimum and/or maximum age for the terrace surface in which the palaeochannel is located. Assessment of specific age relationships between palaeochannel units (TV-BFN 6) in close proximity. The timing of fine-grained inorganic alluviation (the organic unit is sealed by red-brown alluvium, which is often assumed to be an indicator of soil erosion associated with Roman agricultural practices.

Final comment: A J Howard (31 August 2004), a single Roman/Anglo-Saxon date on a palaeochannel in the middle Trent. The date is significant since the channel is close to a 'Villa' complex and therefore has the potential to provide an excellent proxy record. It suggests that the channel was 'in use' at the same time 'broadly' as Barton in Fabis North.

References: Havelock and Howard 2002

OxA–12782 1550 ±27 BP

$\delta^{13}C$: -27.0‰

Sample: TV–BFS 5.52, submitted in September 2002 by A J Howard

Material: plant macrofossil: unidentified herbaceous stem, a single fragment (0.04g) (A Hall 2002)

Initial comment: from an organic-rich core taken from a meander loop palaeochannel located on the Holocene floodplain of the River Trent (second terrace). The palaeochannel is incised into a Holocene terrace, which comprises basal sands and gravels overlain by fine grained sediments. This sample was collected from the mid-lower part of an organic horizon of a palaeochannel at a depth of between 0.95–1.10m. Local geology comprises Permo-Triassic sandstones. No root penetration or contamination of the core was observed.

Objectives: to provide a chronological control, which will allow: the timing of channel development of the Holocene floodplain in the middle Trent to be determined. To estimate a minimum age for the terrace surface in which the palaeochannel is located. An assessment of specific age relationships between palaeochannel units in close proximity (TV-BFN6). An assessment of the timing of fine-grained (inorganic) alluviation, which is usually associated with Roman farming practices.

Calibrated date: *1σ:* cal AD 430–550
2σ: cal AD 420–580

Final comment: A J Howard (31 August 2004), the date compares favourably with the palaeobiological/entomological record (open landscape, grassland, and cereal practices). Provides evidence of terrace age, channel activity, and the timing of inorganic alluviation in this part of the Valley floor.

Trent Valley Survey: Bulcote Farm, Nottinghamshire

Location: SK 6634143531
Lat. 52.59.06 N; Long. 01.00.48 E

Project manager: A J Howard (University of Newcastle upon Tyne), July 2002

Archival body: A J Howard and Trent Valley Geoarchaeology

Description: core taken from a sinuous palaeochannel located on the Holocene floodplain of the River Trent (second terrace), core identified from LiDAR imagery supplied by the Environment Agency.

Objectives: to provide a chronological control which will allow the determination of the timing channel development. A minimum and/or maximum age for the terrace surface in which the palaeochannel is located. Assessment of specific age relationships between palaeochannel units in close proximity. The timing of fine-grained inorganic alluviation (the organic unit is sealed by red-brown alluvium, which is often assumed to be an indicator of soil erosion associated with Roman agricultural practices).

Final comment: A J Howard (31 August 2004), two good dates which demonstrate fluvial sedimentation in a single thread sinuous channel during the Roman/Anglo-Saxon period. Given the sinuousity of the channel, it is tempting to say this is the lateral equivalent of the two channels sampled at Barton in Fabis. Two dates provide an indication of the antiquity of the terrace surface and the timing of inorganic alluviation.

References: Havelock and Howard 2002

OxA–12778 1594 ±28 BP

$\delta^{13}C$: -25.1‰

Sample: TV–BUF 7.71, submitted in September 2002 by A J Howard

Material: plant macrofossil: unidentified herbaceous stem, and woody fragments, bulk sample (0.07g) (A Hall 2002)

Initial comment: from an organic-rich core taken from a meander loop palaeochannel located on the Holocene floodplain of the River Trent (second terrace). The palaeochannel is incised into a Holocene terrace, which comprises basal sands and gravels overlain by fine grained-sediments. This sample was collected from the upper part of an organic horizon of a palaeochannel at a depth of between 0.30–0.50m. Local geology comprises Permo-Triassic sandstones. No root penetration or contamination of the core was observed.

Objectives: to provide a chronological control, which will allow the timing of channel development of the Holocene floodplain in the middle Trent to be determined. To estimate a minimum age for the terrace surface in which the palaeochannel is located. An assessment of specific age relationships between palaeochannel units in close proximity. An assessment of the timing of fine-grained (inorganic) alluviation, which is usually associated with Roman farming practices.

Calibrated date: *1σ:* cal AD 420–540
2σ: cal AD 400–550

Final comment: A J Howard (31 August 2004), the date provides evidence of Roman/Anglo-Saxon fluvial sedimentation and indicated inorganic alluviation is post Roman in this part of the valley. The date fits with the palaeobotanical/entomo-logical evidence, which suggests open grassland around marshland habitats. A good date for a period we know little about in the Trent Valley.

OxA–12779 1705 ±27 BP

$\delta^{13}C$: -24.5‰

Sample: TV–BUF 7.72, submitted in September 2002 by A J Howard

Material: plant macrofossil: unidentified herbaceous stem, and woody fragments, bulk sample (0.16g) (A Hall 2002)

Initial comment: as OxA-12778. This sample was collected from the basal (?) part of an organic horizon of a palaeochannel at a depth of between 3.50–3.70m (although the base of the organic unit was not penetrated in this core, it was encountered at 3.85m in an adjacent borehole). Local geology comprises Permo-Triassic sandstones. No root penetration or contamination of the core was observed.

Objectives: as OxA-12778

Calibrated date: *1σ:* cal AD 260–390
2σ: cal AD 250–420

Final comment: A J Howard (31 August 2004), the date provides evidence of Roman/Anglo-Saxon fluvial activity and fits with the palaeobotanical/entomological evidence. The date is lower in the stratigraphic sequence and fits with the chronological framework and hence suggests no contamination. A good date for a period we know little about in the Trent Valley.

Trent Valley Survey: Great Haywood, Staffordshire

Location: SJ 9930723248
Lat. 52.48.24 N; Long. 02.00.42 W

Project manager: A J Howard (University of Newcastle upon Tyne), July 2002

Archival body: A J Howard and Trent Valley Geoarchaeology

Description: core taken from a sinuous palaeochannel located on the Holocene floodplain of the River Trent (second terrace), core identified from LiDAR imagery supplied by the Environment Agency.

Objectives: to provide a chronological control, which will allow the determination of the timing channel development. A minimum and/or maximum age for the terrace surface in which the palaeochannel is located. Assessment of specific age relationships between palaeochannel units in close proximity. The timing of fine-grained inorganic alluviation (the organic unit is sealed by red-brown alluvium, which is often assumed to be an indicator of soil erosion associated with Roman agricultural practices).

Final comment: A J Howard (31 August 2004), two relatively young dates for an abandoned meander of the upper Trent. The dates fit with the palaeobotantical/entomological evidence (the presence of tomato seeds) for a young deposit.

References: Havelock and Howard 2002

OxA–12787 211 ±25 BP

$\delta^{13}C$: -30.1‰

Sample: TV–GH 1.11, submitted in September 2002 by A J Howard

Material: plant macrofossil: twig, unidentified fragments, bulk sample (0.05g) (A Hall 2002)

Initial comment: from an organic-rich core taken from a sinuous palaeochannel located on the Holocene floodplain of the River Trent (second terrace). The palaeochannel is incised into a Holocene terrace, which comprises basal sands and gravels overlain by fine grained sediments. This sample was collected from the upper levels of an organic horizon of a palaeochannel at a depth of between 0.70–0.90m. Local geology comprises sandstones and mudstones (Carboniferous and Permo-Triassic). No root penetration or contamination of the core was observed.

Objectives: to provide a chronological control, which will allow: the timing of channel development of the Holocene floodplain at Great Haywood to be determined. To estimate a minimum age for the terrace surface in which the palaeochannel is located. An assessment of specific age relationships between palaeochannel units in close proximity. An assessment of the timing of fine-grained (inorganic) alluviation, which is usually associated with Roman farming practices.

Calibrated date: *1σ:* cal AD 1650–1950
2σ: cal AD 1640–1950

Final comment: A J Howard (31 August 2004), the position of the meander on the floodplain indicated it is still probably regularly inundated by floodwaters. The upper date is younger, indicating no contamination or mixing of the fluvial sequence.

OxA–12788 330 ±25 BP

δ¹³C: -27.9‰

Sample: TV–GH 1.12, submitted in September 2002 by A J Howard

Material: plant macrofossil: unidentified herbaceous stem, a single fragment (0.14g) (A Hall 2002)

Initial comment: as OxA-12787. This sample was collected from the upper levels of an organic horizon of a palaeochannel at a depth of between 0.9–1.1m.

Objectives: as OxA-12787

Calibrated date: *1σ:* cal AD 1490–1640
2σ: cal AD 1460–1650

Final comment: A J Howard (31 August 2004), the position of the meander on the floodplain indicated it is still probably regularly inundated by floodwaters. The lower date is older, indicating no contamination or mixing of the fluvial sequence.

Trent Valley Survey: Holme Pierrepont, Nottinghamshire

Location: SK 62003835
Lat. 52.56.20 N; Long. 01.04.44 W

Project manager: A J Howard (University of Newcastle upon Tyne), September 2003

Archival body: A J Howard and Trent Valley Geoarchaeology

Description: exposures at the edge of a former sand and gravel quarry revealed two small organic-filled channels during landscaping operations; the channels were not related, but were both within 0.5m of the bedrock, incised into cold-climate sands and gravels (ice wedge casts were recorded in the gravels). In total, the terrace sands and gravels at this site were approximately 4m thick. Sections were cleaned in both channels and material was sampled in approximately 0.1m spits.

Objectives: the stratigraphic position of these organic channels, within the lower part of the Holme Pierrepont sand and gravel, in sediments containing evidence of syndepositional ice-wedge development suggests that these organic layers were deposited towards the end of the Devensian. Palaeoenvironmental information from this period is incredibly rare within the region, although there is significant evidence for human activity. Palaeoenvironmental analysis (pollen, plant macros, insects and molluscs) of these sediments (in progress) will provide a detailed picture of the environment which hunter-gatherers encountered towards the end of the Devensian. Dating of these deposits will provide a secure chronological framework for this work.

Final comment: A J Howard (31 August 2004), a really close set of three dates which places these organic channels, as hoped, into the late Glacial. This corroborates the palaeobiological data (pollen, molluscs, and insects), which all indicate cool, but not glacial conditions. This type of site is rare within the Trent Valley and is therefore extremely important.

References: Havelock and Howard 2002

OxA–13062 11055 ±45 BP

δ¹³C: -25.6‰

Sample: TV–HP 9.1.3, submitted in September 2003 by A J Howard

Material: plant macrofossil: unidentified herbaceous stem, a single fragment (0.09g) (A Hall 2003)

Initial comment: exposure at the edge of a former sand and gravel quarry revealed two small organic-filled channels during landscaping operations; the channels were not related, but were both within 0.5m of the bedrock, incised into cold climate sands and gravels (ice-wedge casts were recorded in the gravels). In total, the terrace sands and gravels at this site were approximately 4m thick. Sections were cleaned in both channels and material was sampled in approximately 0.1m spits. This sample represents the middle spit (3) of material from channel 1. The channel was approximately 0.5m above the Mercia Mudstone Group rockhead and could be mapped as a discrete channel running across the quarry floor. The quarry had been actively dewatered but the unit was moist on collection. No root penetration or contamination of the core was observed.

Objectives: the stratigraphic position of these organic channels, within the lower part of the Holme Pierrepont sand and gravel, in sediments containing evidence of syndepositional ice-wedge development suggests that these organic layers were deposited towards the end of the Devensian. Palaeoenvironmental information from this period is incredibly rare within the region, although there is significant evidence for human activity.

Calibrated date: *1σ:* 11100–10960 cal BC
2σ: 11140–10930 cal BC

Final comment: A J Howard (31 August 2004), very good date which places channels in the late Glacial and confirms the palaeobiological evidence.

OxA–13063 11080 ±45 BP

δ¹³C: -26.4‰

Sample: TV–HP 9.2.2, submitted in September 2003 by A J Howard

Material: plant macrofossil: herbaceous dicotyledonous stem, bulk sample (0.08g) (A Hall 2003)

Initial comment: as OxA-13062. This sample represents the lowermost spit (2) of channel 2.

Objectives: as OxA-13062

Calibrated date: *1σ:* 11120–10980 cal BC
2σ: 11160–10940 cal BC

Final comment: see OxA-13062

OxA–13113 11170 ±50 BP

δ¹³C: -29.0‰

Sample: TV–HP 9.1.4, submitted in September 2003 by A J Howard

Material: plant macrofossils (bulk sample): unidentified herbaceous stem, (0.064g); twig, probably *Salix* sp. (A Hall 2003)

Initial comment: as OxA-13062. This sample represents the lowest spit (4) in which datable material was recovered from channel 1.

Objectives: as OxA-13062

Calibrated date: *1σ:* 11180–11090 cal BC
2σ: 11250–10990 cal BC

Final comment: see OxA-13062

Trent Valley Survey: Lower Dove Valley, Derbyshire

Location: SK 2728526769
Lat. 52.50.16 N; Long. 01.35.47 W

Project manager: A J Howard (University of Newcastle upon Tyne), July 2002

Archival body: A J Howard and Trent Valley Geoarchaeology

Description: core taken from a sinuous palaeochannel located on the Holocene floodplain of the River Dove (second Terrace), core identified from LiDAR imagery supplied by the Environment Agency.

Objectives: to provide a chronological control which will allow thedetermination of the timing channel development. A minimum and/or maximum age for the terrace surface in which the palaeochannel is located. Assessment of specific age relationships between palaeochannel units in close proximity. The timing of fine-grained inorganic alluviation (the organic unit is sealed by red-brown alluvium, which is often assumed to be an indicator of soil erosion associated with Roman agricultural practices).

Final comment: A J Howard (31 August 2004), two dates provide evidence of post-medieval channel activity close to the confluence with the Trent. The two dates are inverted and hence suggests mixing of the stratigraphy in this part of the floodplain. This is not surprising given the hydrological conditions. Nevertheless, this is valuable evidence for the timing of sedimentation and the age of the floodplain.

References: Havelock and Howard 2002

OxA–12785 206 ±25 BP

$\delta^{13}C$: -26.7‰

Sample: TV–LDV 2.21, submitted in July 2002 by A J Howard

Material: wood (bulk sample): *Salix* sp., twigs (0.06g) (A Hall 2002)

Initial comment: from an organic-rich core taken from a meander loop palaeochannel located on the Holocene floodplain of the River Dove (second terrace). The palaeochannel is incised into a Holocene terrace, which comprises basal sands and gravels overlain by fine-grained sediments. This sample was collected from the upper levels of an organic horizon of a palaeochannel at a depth of between 0.85–1.10m. Local geology comprises Permo-Triassic sandstones. No root penetration or contamination of the core was observed.

Objectives: to provide a chronological control, which will allow the timing of channel development of the Holocene floodplain in the lower Dove to be determined. To estimate a minimum age for the terrace surface in which the palaeochannel is located. An assessment of specific age relationships between palaeochannel units in close proximity. An assessment of the timing of fine-grained (inorganic) alluviation, which is usually associated with Roman farming practices.

Calibrated date: *1σ:* cal AD 1660–1950
2σ: cal AD 1640–1950

Final comment: A J Howard (31 August 2004), this date suggests relatively recent activity of this part of the floodplain, probably linked to the last Neoglacial (little Ice Age). Sample older than one lower in sequence, which suggests that mixing of sediments, not surprising for a confluence zone (OxA-12785).

Laboratory comment: Ancient Monuments Laboratory (in 2007), the apparent inversion of these ages is not statistically significant.

OxA–12786 165 ±24 BP

$\delta^{13}C$: -24.8‰

Sample: TV–LDV 2.22, submitted in July 2002 by A J Howard

Material: plant macrofossils: *Equisetum* sp., rhizome and stem epidermis, bulk sample (0.05g) (A Hall 2002)

Initial comment: as OxA-12785. This sample was collected from the upper levels of an organic horizon of a palaeochannel at a depth of between 1.10–1.35m.

Objectives: as OxA-12785

Calibrated date: *1σ:* cal AD 1665–1950
2σ: cal AD 1665–1950

Final comment: A J Howard (31 August 2004), the date suggests recent activity in this part of the floodplain, probably linked with the last Neoglacial period (little Ice Age). Sample younger despite earlier in the stratigraphic sequence, suggests mixing of floodplain sequence, not unexpected at a confluence (*see* OxA-12785).

Trent Valley Survey: Mill Plantation, Derbyshire

Location: SK 3282827680
Lat. 52.50.44 N; Long. 01.30.51 W

Project manager: A J Howard (University of Newcastle upon Tyne), July 2002

Archival body: A J Howard and Trent Valley Geoarchaeology

Description: core taken from a sinuous palaeochannel located on the Holocene floodplain of the River Trent (second terrace), core identified from LiDAR imagery supplied by the Environment Agency.

Objectives: to provide a chronological control which will allow the determination of the timing channel development. A minimum and/or maximum age for the terrace surface in which the palaeochannel is located. Assessment of specific age relationships between palaeochannel units in close proximity. The timing of fine grained inorganic alluviation

(the organic unit is sealed by red-brown alluvium, which is often assumed to be an indicator of soil erosion associated with Roman agricultural practices).

Final comment: A J Howard (31 August 2004), two interesting dates providing evidence for medieval channel development in the middle Trent Valley. The dates fit well with evidence for an intensively cultivated landscape and have helped identify a channel sequence worthy of further study.

References: Havelock and Howard 2002

OxA–12789 653 ±26 BP

$\delta^{13}C$: -27.2‰

Sample: TV–MP 4.41, submitted in September 2002 by A J Howard

Material: plant macrofossils: twig, unidentified fragments, bulk sample (0.04g) (A Hall 2002)

Initial comment: from an organic-rich core taken from a sinuous palaeochannel located on the Holocene floodplain of the River Trent (second terrace). The palaeochannel is incised into a Holocene terrace, which comprises basal sands and gravels overlain by fine- grained sediments. This sample was collected from the mid-upper levels of an organic horizon of a palaeochannel at a depth of between 0.90–1.05m. Local geology comprises Permo-Triassic sandstones. No root penetration or contamination of the core was observed, although rootlets were common in the overlying grey silt.

Objectives: to provide a chronological control, which will allow the timing of channel development of the Holocene floodplain in the middle Trent to be determined. To estimate a minimum age for the terrace surface in which the palaeochannel is located. An assessment of specific age relationships between palaeochannel units in close proximity. An assessment of the timing of fine-grained (inorganic) alluviation, which is usually associated with Roman farming practices.

Calibrated date: *1σ:* cal AD 1280–1390
2σ: cal AD 1280–1400

Final comment: A J Howard (31 August 2004), the upper date is younger and indicates no contamination of the fluvial sequence.

OxA–12790 796 ±23 BP

$\delta^{13}C$: -27.1‰

Sample: TV–MP 4.42, submitted in September 2002 by A J Howard

Material: plant macrofossils: twig, unidentified fragments, bulk sample (0.05g) (A Hall 2002)

Initial comment: as OxA-12789. This sample was collected from the basal part of an organic horizon of a palaeochannel at a depth of between 1.5–1.7m. Local geology comprises Permo-Triassic sandstones.

Objectives: as OxA-12789

Calibrated date: *1σ:* cal AD 1220–1265
2σ: cal AD 1210–1275

Final comment: A J Howard (31 August 2004), the lower date is older, indicating no contamination of the fluvial sequence.

Trent Valley Survey: Old Trent Water Repton, Derbyshire

Location: SK 3115727616
Lat. 52.50.43 N; Long. 01.32.20 W

Project manager: A J Howard (University of Newcastle upon Tyne), July 2002

Archival body: A J Howard and Trent Valley Geoarchaeology

Description: core taken from a sinuous palaeochannel located on the Holocene floodplain of the River Trent (second terrace), core identified from LiDAR imagery supplied by the Environment Agency.

Objectives: to provide a chronological control which will allow the determination of the timing channel development. A minimum and/or maximum age for the terrace surface in which the palaeochannel is located. Assessment of specific age relationships between palaeochannel units in close proximity. The timing of fine grained inorganic alluviation (the organic unit is sealed by red-brown alluvium, which is often assumed to be an indicator of soil erosion associated with Roman agricultural practices).

Final comment: A J Howard (31 August 2004), two dates which demonstrate relatively recent sedimentation in this channel on the southern margin of the Valley. The straightness of this palaeochannel suggests that perhaps more than one channel operated on this part of the valley floor until the relatively recent past. The slightly older date is recorded from the upper sample suggesting some mixing of the sequence.

References: Havelock and Howard 2002

OxA–12783 202 ±24 BP

$\delta^{13}C$: -27.1‰

Sample: TV–OTWR 3.31, submitted in September 2002 by A J Howard

Material: plant macrofossils: *Salix* sp., twigs, bulk sample (0.20g) (A Hall 2002)

Initial comment: from an organic-rich core taken from a sinuous palaeochannel located on the Holocene floodplain of the River Trent (second terrace). The palaeochannel is incised into a Holocene terrace, which comprises basal sands and gravels overlain by fine- grained sediments. This sample was collected from the upper part of an organic horizon of a palaeochannel at a depth of between 0.3–0.5m. Local geology comprises Permo-Triassic sandstones. No root penetration or contamination of the core was observed, although rootlets were common in the overlying grey silt.

Objectives: to provide a chronological control, which will allow the timing of channel development of the Holocene floodplain in the middle Trent to be determined. To estimate a minimum age for the terrace surface in which the palaeochannel is located. An assessment of specific age relationships between palaeochannel units in close proximity. An assessment of the timing of fine-grained (inorganic) alluviation, which is usually associated with Roman farming practices.

Calibrated date: *1σ:* cal AD 1660–1950
2σ: cal AD 1650–1950

Final comment: A J Howard (31 August 2004), a relatively young date, and the older date occurring higher up in the sequence suggests some mixing of the fluvial sequence. Date fits with the palaeobotanical/entomological interpretation of heavily (anthropogenically) modified landscape.

Laboratory comment: Ancient Monuments Laboratory (in 2007), the apparent age inversion of the dates in this core is not statistically significant.

OxA–12784 192 ±24 BP

$\delta^{13}C$: -27.9‰

Sample: TV–OTWR 3.32, submitted in September 2002 by A J Howard

Material: plant macrofossil (bulk sample): unidentified herbaceous stem (0.03g); *Salix* sp., twigs (A Hall 2002)

Initial comment: as OxA-12783. This sample was collected from the upper part of an organic horizon of a palaeochannel at a depth of between 1.05-1.20m.

Objectives: as OxA-12783

Calibrated date: *1σ:* cal AD 1660–1950
2σ: cal AD 1650–1950

Final comment: A J Howard (31 August 2004), a relatively young date and the younger date occurring lower down in the sequence, suggests some mixing of the fluvial sequence. Date fits with the palaeobotanical/entomological interpretation of heavily (anthropogenically) modified landscape.

Laboratory comment: see OxA-12783

Trent Valley Survey: Seymour Drain, Nottinghamshire

Location: SK 8195380318
Lat. 53.18.48 N; Long. 00.46.17 W

Project manager: A J Howard (University of Newcastle upon Tyne), July 2002

Archival body: A J Howard and Trent Valley Geoarchaeology

Description: core taken from a sinuous palaeochannel located on the Holocene floodplain of the River Trent (second terrace). Core location identified from aerial photographs studied as part of a palaeochannel mapping project commissioned by Nottinghamshire County Council.

Objectives: to provide a chronological control which will allow the determination of the timing channel development. A minimum and/or maximum age for the terrace surface in which the palaeochannel is located. Assessment of specific age relationships between palaeochannel units in close proximity. The timing of fine grained inorganic alluviation (the organic unit is sealed by red-brown alluvium, which is often assumed to be an indicator of soil erosion associated with Roman agricultural practices).

Final comment: A J Howard (31 August 2004), a good chronology of three dates which fit well with the stratigraphic sequence and suggest no contamination. Demonstrates that this channel is of considerable antiquity though does not seem to be the lateral equivalent of earlier channels in this part of the valley floor (ie Bole Ings Mesolithic channel). Provides evidence for the age of the terrace surface and the timing of the inorganic alluviation in this part of the valley floor.

References: Havelock and Howard 2002

OxA–12775 2476 ±29 BP

$\delta^{13}C$: -26.6‰

Sample: TV–SD 8.81, submitted in September 2002 by A J Howard

Material: plant macrofossils: twig, fragments including *Alnus*, bulk sample (0.43g) (A Hall 2002)

Initial comment: from an organic-rich core taken from a sinuous palaeochannel located on the Holocene floodplain of the River Trent (first terrace). The palaeochannel is incised into a early Holocene terrace, which comprises basal sands and gravels overlain by fine-grained sediments. This sample was collected from the upper part of a brown silty peat at a depth of between 0.3–0.5m. Local geology comprises Permo-Triassic sandstones. No root penetration or contamination of the core was observed.

Objectives: to provide of channel development of the Holocene floodplain in the middle Trent to be determined. To estimate a minimum age for the terrace surface in which the palaeochannel is located. An assessment of specific age relationships between palaeochannel units in close proximity. An assessment of the timing of fine-grained (inorganic) alluviation, which is usually associated with Roman farming practices.

Calibrated date: *1σ:* 760–520 cal BC
2σ: 770–410 cal BC

Final comment: A J Howard (31 August 2004), the date of Bronze Age/Iron Age fits in well with the palaeobotanical/entomological evidence (partially wooded landscape, some grazing, some cereal production). Provides evidence for timing of inorganic alluviation and timing of alluvial sedimentation in this part of the valley floor and age of terrace surface. It demonstrates that the palaeochannel is younger than some of its proposed regional correlations (eg Bole Ings).

OxA–12776 2593 ±30 BP

$\delta^{13}C$: -26.4‰

Sample: TV–SD 8.82, submitted in September 2002 by A J Howard

Material: plant macrofossils: twig, fragments including *Alnus*, bulk sample (0.43g) (A Hall 2002)

Initial comment: as OxA-12775. This sample was collected from the upper part of a grey peaty silt at a depth of between 2.2-2.35m.

Objectives: as OxA-12775

Calibrated date: *1σ:* 810–780 cal BC
2σ: 810–670 cal BC

Final comment: see OxA-12775

OxA–12777 3434 ±30 BP

δ¹³C: -26.6‰

Sample: TV–SD 8.83, submitted in September 2002 by A J Howard

Material: plant macrofossils: twig, unidentified fragments, bulk sample (0.05g) (A Hall 2002)

Initial comment: as OxA-12775. This sample was collected from the upper part of a sandy clay at a depth of between 2.5–2.7m.

Objectives: as OxA-12775

Calibrated date: *1σ:* 1760–1690 cal BC
2σ: 1880–1660 cal BC

Final comment: see OxA-12775

Trent Valley Survey: Tutbury, Derbyshire

Location: SK 21352975
Lat. 52.51.53 N; Long. 01.41.03 W

Project manager: A J Howard (University of Newcastle upon Tyne), September 2003

Archival body: A J Howard and Trent Valley Geoarchaeology

Description: organic-rich channel beneath highest Holocene terrace (T1) on the floodplain of the River Dove. The channel is blanketed by red-brown inorganic alluvium, which forms the oldest fine grained alluvial deposit in this part of the Trent catchment.

Objectives: to provide a chronological control which will allow the determination of the maximum age for inorganic alluviation in this part of the Trent catchment. This information will augment the information provided by geochemical and mineralogical analysis of fine-grained alluvial deposits in the same section and allow the development of alluvial signatures, which can be related to units of different age. Dating the cessation of coarse grained sedimentation T1 in this part of the catchment (the organic-rich channel was infilled as part of meander core migration during deposition of T1).

Final comment: A J Howard (31 August 2004), two very interesting dates, which seem to confirm that the inorganic alluviation is strongly late to post-Roman in date. The geochemistry of this sediment is very different from the later (metal-rich) alluvium since it is derived from local Triassic bedrock and tills. These dates and the geochemical significance of the sediment represents a huge step forward in recognising early alluviation in the Trent Valley.

References: Havelock and Howard 2002

OxA–13033 1654 ±30 BP

δ¹³C: -26.9‰

Sample: TV–Tut–001, submitted in November 2003 by A J Howard

Material: wood: bark, tree, degraded, a single fragment (R Gale 2003)

Initial comment: from the upper boundary of the organic-rich channel when its contact with the red-brown inorganic alluvium was visible. The sample was taken at a depth of approximately 2m from the terrace surface. The underlying local geology comprises Permo-Triassic mudstones. Although the organic channel was less than 1m from the level of the modern river, the organic-rich channel appeared quite dry at the surface (moister when cut back). No modern root penetration or contamination was observed in the channel.

Objectives: to provide a chronological control, which will allow the determination of the maximum age for inorganic alluviation in this part of the Trent catchment. This information will augment the information provided by geochemical and mineralogical analysis of fine-grained alluvial deposits in the same section and allow the development of alluvial signatures, which can be related to units of different age. Dating the cessation of coarse grained sedimentation T1 in this part of the catchment (the organic-rich channel was infilled as part of meander core migration during deposition of T1).

Calibrated date: *1σ:* cal AD 380–430
2σ: cal AD 260–510

Final comment: A J Howard (31 August 2004), a good date which places inorganic alluviation firmly in the late Roman/post Roman period.

OxA–13140 1660 ±90 BP

δ¹³C: -26.3‰

Sample: TV–Tut–002, submitted in November 2003 by A J Howard

Material: wood: bark, degraded, a single fragment (R Gale 2003)

Initial comment: as OxA-13033

Objectives: as OxA-13033

Calibrated date: *1σ:* cal AD 250–540
2σ: cal AD 130–600

Final comment: see OxA-13033

Laboratory comment: Ancient Monuments Laboratory (in 2007), the two radiocarbon measurements (OxA-13033 and OxA-13140) are statistically consistent ($T'=0.0$, $T'(5\%)=3.8$, $\nu=1$) (Ward and Wilson 1978).

References: Ward and Wilson 1978

Wellington Quarry

Location: SO 508479
Lat. 52.07.36 N; Long. 02.43.08 W

Project manager: R Jackson (Worcestershire) 1986–96

Description: a sand and gravel quarry on the floodplain of the Lugg, near its confluence with a tributary, Wellington Brook. The site is deeply alluviated, and has well-preserved palaeoenvironmental evidence from the late Glacial period onwards. Human activity is represented by Neolithic pits, a Beaker burial and other Beaker period activity, Iron Age activity and Romano-British settlement, and medieval ovens.

Adjacent areas of the quarry, excavated with developer funding, provide further evidence of human occupation in these periods, as well as middle and late Bronze Age activity, and an eighth-century AD watermill.

Objectives: dating programme designed to refine or establish dating of periods of significant site activity, which could not readily be determined by other means.

References: Jackson and Miller 2004

Wellington Quarry: Crop Processing SRIV, Herefordshire

Location: SO 508479
Lat. 52.07.36 N; Long. 02.43.08 W

Project manager: R Jackson (Worcestershire Historic Environment and Archaeology Service), 1986–96

Archival body: Herefordshire City Museum and Art Gallery

Description: charred debris relating to crop processing. Sample comprises of chaff, etc fraction of sorted charred crop debris, which included range of other cereal crop waste (rye, spelt, bread wheat, and weed seeds). Derives from environmental sample taken from a well-defined and sealed pit in an area of the site, which included both Roman and medieval features.

Objectives: the environmental remains from this feature represent an important assemblage from the site that includes a long sequence of palaeoenvironmental deposits and deposits associated with phases of human occupations. This pit contained a single sherd of Roman pottery but no other dating evidence. However, the sherd may be residual since the crop debris appears more likely to be medieval and similar assemblages have been recorded from nearby medieval ovens. In light of the quality and importance of the environmental material in this pit, dating is needed to confirm which period of site activity the material relates to.

Final comment: R Jackson, dating designed to confirm medieval date of a rich assemblage of crop-processing waste in a feature with a possible association with two bread ovens. The latter could be dated ceramically to thirteenth-fourteenth century AD, but feature only contained a suspected residual sherd of Roman pottery. Dating confirmed the feature was medieval but of earlier phase of crop processing than the nearby ovens, extending the sequence of medieval activity.

References: Brown 1992

OxA–12483 934 ±26 BP

$\delta^{13}C$: -24.8‰

Sample: 3606A, submitted on 16 June 2003 by R Jackson

Material: carbonised grain and charcoal (>2g) (charred fine cereal chaff, bulk sample)

Initial comment: charred crop-processing debris, including a range of cereals and weeds, from a well-defined sealed pit in an area of the site containing both Roman and medieval features.

Objectives: to determine whether the charred crop processing debris is of the same age as the nearby medieval ovens, or whether it dates to the Roman period (which the solitary sherd in this feature suggests).

Calibrated date: *1σ:* cal AD 1030–1160
2σ: cal AD 1020–1170

Final comment: R Jackson (May 2004), sample confirmed residuality of Roman pottery and successfully dated feature to medieval period and thus associated crop processing waste, providing evidence of such activity earlier than that represented by two thirteenth/fourteenth century ovens in the vicinity. The well preserved crop processing waste provides an important and rare sample from this region for this period.

Laboratory comment: Ancient Monuments Laboratory (2004), result is statistically consistent with OxA-12567, which dates charred cereal chaff from the same context ($T'=0.1, T'(5\%)=3.8, \nu=1$) (Ward and Wilson 1978); the pooled mean of these results is 927 ±18 BP (cal AD 1020–1190) (Reimer *et al* 2004).

References: Ward and Wilson 1978

OxA–12567 920 ±26 BP

$\delta^{13}C$: -24.6‰

Sample: 3606B, submitted on 16 June 2003 by R Jackson

Material: carbonised grain and charcoal (>2g) (charred fine cereal chaff, bulk sample)

Initial comment: as OxA-12483

Objectives: as OxA-12483

Calibrated date: *1σ:* cal AD 1040–1160
2σ: cal AD 1020–1210

Final comment: see OxA-12483

Laboratory comment: see OxA-12783

References: Ward and Wilson 1978

Wellington Quarry: Inhumations SRIII, Herefordshire

Location: SO 508479
Lat. 52.07.36 N; Long. 02.43.08 W

Project manager: R Jackson (Worcestershire Historic Environment and Archaeology Service), 1986–96

Archival body: Herefordshire City Museum and Art Gallery

Description: two unaccompanied inhumations recovered from alluvial/fill deposits on margin of a palaeochannel. No grave goods or other dating evidence present, although late Bronze Age pottery has been recovered from the channel margins and a prehistoric date is considered likely. Although neither skeleton was complete, surviving elements were clearly articulated at time of burial. No grave cut could be discerned.

Objectives: the two samples are submitted (one from each inhumation) to date the burials. The site provides a long

sequence of human activity and it is uncertain to which period/phase they belong, although a later prehistoric date (late Bronze Age or Iron Age) is considered probable. In the light of the paucity of evidence for burial practice of this period these are of considerable potential importance.

Final comment: R Jackson (May 2004), the dates established the period/phase of burial, which fell within the anticipated date range (later prehistoric). They provide important evidence of Iron Age funerary/ritual activity at the site, the paired inhumations providing an apparently unique example of such a pairing and the evidence adding to a growing body of information on Iron Age burial practice associated with river channels and marshy environments.

References: Edwards 1990

GU–5976 2020 ±110 BP

$\delta^{13}C$: -22.3‰

Sample: 3530, submitted on 16 June 2003 by R Jackson

Material: human bone (440g) (pelvis, right femur, and right arm)

Initial comment: one of two unaccompanied inhumations (3530 and 3531) recovered from alluvial fill on the margin of a palaeochannel. No grave goods or other dating evidence. Neither skeleton was complete, but surviving bones were clearly articulated at the time of burial. Grave cut was not discerned during excavation.

Objectives: to establish whether the burials are, as appears, a rare example of burial practice in the late Bronze Age or Iron Age.

Calibrated date: *1σ:* 180 cal BC–cal AD 80
2σ: 370 cal BC–cal AD 240

Final comment: R Jackson (May 2004), GU-5976 and GU-5977 together confirmed later prehistoric, Iron Age date of deposition of one of the two inhumations in or on the margins of a former watercourse. These provide a rare example of Iron Age funerary practice and in their pairing are possibly unique.

Laboratory comment: Ancient Monuments Laboratory (2004), result is statistically consistent with GU-5977, on a bone from the other individual buried in the same location ($T'=1.2, T'(5\%)=3.8, \nu=1$) (Ward and Wilson 1978).

References: Ward and Wilson 1978

GU–5977 2160 ±60 BP

$\delta^{13}C$: -20.5‰

Sample: 3531, submitted on 16 June 2003 by R Jackson

Material: human bone (580g) (left and right legs)

Initial comment: as GU-5976

Objectives: as GU-5976

Calibrated date: *1σ:* 360–110 cal BC
2σ: 390–40 cal BC

Final comment: see GU-5976

Laboratory comment: see GU-5976

References: Ward and Wilson 1978

Wellington Quarry: Pit 3853, Herefordshire

Location: SO 508479
Lat. 52.07.36 N; Long. 02.43.08 W

Project manager: R Jackson (Worcestershire Historic Environment and Archaeology Service), 1986–96

Archival body: Herefordshire City Museum and Art Gallery

Description: samples from a well-defined Neolithic pit with a single phase fill. One of a group of 13 pits considered to be broadly contemporaneous.

Objectives: to date the pit group and the associated ceramic, flint and environmental assemblages. The ceramic assemblage is of particular importance, being a large group of early Neolithic pottery from a region which has produced little material of this date. Dating will establish the date of use of this ware, tradition (and fabric type) in this area.

Final comment: R Jackson (27 April 2004), dates confirmed early Neolithic date of ceramic assemblage from these pits, along with series pit 3855 (OxA-12568 and OxA-12569). These provide a dated assemblage of open and carinated bowls for the West Midlands region. Dating falls within later part of the period of this tradition, which is of early to middle fourth millennium BC and is widespread over Britain, Ireland, and continental Europe.

References: Fagan *et al* 1993

OxA–12547 4850 ±31 BP

$\delta^{13}C$: -24.5‰

Sample: 3852/2, submitted on 16 June 2003 by R Jackson

Material: plant macrofossil: *Triticum* sp., a single grain (E Pearson 2003)

Initial comment: from the fill of pit 3853, which, with adjacent pit 3855, contained a rich assemblage of pottery, flint, bone, and charred plant remaind - the most comprehensive early Neolithic assemblage from the West Midlands to date.

Objectives: to establish the date of early Neolithic activity at the site, and to correlate human occupation of the site with the palaeoenvironmental sequence recorded in a pollen diagram from the site.

Calibrated date: *1σ:* 3660–3630 cal BC
2σ: 3700–3530 cal BC

Final comment: R Jackson (27 April 2004), date successfully achieved objectives confirming ceramic dating of the pit group.

Laboratory comment: Ancient Monuments Laboratory (2004), the result is statistically inconsistent with OxA-12570, a hazelnut shell from the same context ($T'=4.0, T'(5\%)=3.8, \nu=1$) (Ward and Wilson 1978), but the four results from adjacent Neolithic pits with conjoining potsherds (OxA-12547, OxA-12570, OxA-12568, and OxA-12569) are statistically consistent ($T'=4.2, T'(5\%)=7.8, \nu=3$).

References: Ward and Wilson 1978

OxA–12570 4762 ±31 BP

δ^{13}*C:* -22.8‰

Sample: 3852/1, submitted on 16 June 2003 by R Jackson

Material: plant macrofossil (<5g) (charred hazelnut shell fragment, a single fragment)

Initial comment: as OxA-12547

Objectives: as OxA-12547

Calibrated date: *1σ:* 3640–3520 cal BC
2σ: 3640–3380 cal BC

Final comment: see OxA-12547

Laboratory comment: see OxA-12547

References: Ward and Wilson 1978

Wellington Quarry: Pit 3855, Herefordshire

Location: SO 508479
Lat. 52.07.36 N; Long. 02.43.08 W

Project manager: R Jackson (Worcestershire Historic Environment and Archaeology Service), 1986–96

Archival body: Herefordshire City Museum and Art Gallery

Description: samples from a well-defined Neolithic pit with a single phase fill. One of a group of 13 pits considered to be broadly contemporaneous.

Objectives: to date the pit group and the associated ceramic, flint and environmental assemblages. The ceramic assemblage is of particular importance, being a large group of early Neolithic pottery from a region which has produced little material of this date. Dating will establish the date of use of this ware, tradition (and fabric type) in this area.

Final comment: R Jackson (27 April 2004), dates confirmed early Neolithic date of ceramic assemblage from these pits. Along with series Pit 3853 (OxA-12570 and OxA-12547), these provide a dated assemblage of open and carinated bowls for the West Midlands region. Dating falls within part of the period of use of this tradition, which is of early to middle fourth millennium BC and is widespread over Britain, Ireland, and continental Europe.

References: Fagan *et al* 1993

OxA–12568 4823 ±32 BP

δ^{13}*C:* -24.4‰

Sample: 3854/1, submitted on 16 June 2003 by R Jackson

Material: plant macrofossil: *Corylus avellana*, charred shell fragment, a single fragment (5g) (E Pearson 2003)

Initial comment: from the fill of pit 3855, which with adjacent pit 3853, contained a rich assemblage of pottery, flint, bone, and charred plant remains - the most comprehensive early Neolithic assemblage from the West Midlands to date.

Objectives: to establish the date of early Neolithic activity at the site, and to correlate human occupation of the site with the palaeoenvironmental sequence recorded in a pollen diagram from the site.

Calibrated date: *1σ:* 3650–3540 cal BC
2σ: 3660–3530 cal BC

Final comment: R Jackson (27 April 2004), date successfully achieved objectives confirming ceramic dating of pit group.

Laboratory comment: Ancient Monuments Laboratory (2004), result is statistically consistent with OxA-12569, a wheat grain from the same context ($T'=0.1$, $T'(5\%)=3.8$, $\nu=1$) (Ward and Wilson 1978). The four results from adjacent Neolithic pits with conjoining potsherds (OxA-12547, OxA-12570, OxA-12568, and OxA-12569) are also statistically consistent ($T'=4.2$, $T'(5\%)=7.8$, $\nu=3$).

References: Ward and Wilson 1978

OxA–12569 4810 ±33 BP

δ^{13}*C:* -23.5‰

Sample: 3854/2, submitted on 16 June 2003 by R Jackson

Material: plant macrofossil: *Triticum* sp., a single grain (5g) (E Pearson 2003)

Initial comment: as OxA-12568

Objectives: as OxA-12568

Calibrated date: *1σ:* 3650–3530 cal BC
2σ: 3660–3520 cal BC

Final comment: see OxA-12568

Laboratory comment: see OxA-12568

References: Ward and Wilson 1978

Wellington Quarry: WQM, Herefordshire

Location: SO 508479
Lat. 52.07.36 N; Long. 02.43.08 W

Project manager: J Greig (Freelance), 1986–96

Archival body: Herefordshire City Museum and Art Gallery

Description: organic material and charcoal extracted from a pollen core in an organic profile from Wellington Quarry, Marden, Herefordshire.

Objectives: to establish a chronology for the pollen diagram prepared from the profile so a date/depth curve can be prepared, and the events dated.

Final comment: J Greig (May 2004), OxA-12638, OxA-12639, OxA-12662, and OxA-12688 date particular parts of a single profile. The depth date curve is fairly consistent for the last dates, suggesting steady accumulation. The first sample (OxA-12639) seems to show a much more rapid accumulation, perhaps from alluvium as this part of the profile has more inorganic sediment. The whole sequence allows a very accurate idea of prehistoric activity, with small clearings in the early Neolithic, then large-scale woodland clearance in the late Neolithic-early Bronze Age. There are

very few other pieces of work with such a detailed prehistoric sequence enabling one to see which archaeological or cultural periods are associated with the changing landscape.

References: Jackson 2000

OxA–12638 3669 ±37 BP

$\delta^{13}C$: -26.5‰

Sample: WQM 150/2 149–50cm, submitted in May 2003 by J Greig

Material: plant macrofossils (<5g) (bulk sample): *Rubus* sp.; *Urtica* sp.; *Ranunculus* sp.; *Hypericum* sp.; *Carex* sp. (J Greig 2003)

Initial comment: waterlogged plant macrofossils from pollen monolith (149–50cm below modern surface).

Objectives: to establish the chronology of the pollen diagram(profile collected in palaeochannel adjacent to archaeoloical site).

Calibrated date: *1σ:* 2140–1980 cal BC
2σ: 2200–1940 cal BC

Final comment: J Greig (May 2004), this date fits well.

Laboratory comment: Ancient Monuments Laboratory (2004), the result is in good agreement with the sample's stratigraphic position.

OxA–12639 1379 ±32 BP

$\delta^{13}C$: -29.0‰

Sample: WQM 100/2 100–2cm, submitted in May 2003 by J Greig

Material: plant macrofossil (<5g) (waterlogged – fine rootlets, bulk sample)

Initial comment: uppermost sample from pollen profile (100–02cm below modern surface); little suitable material available: rootlets could represent modern contamination.

Objectives: as OxA-12638

Calibrated date: *1σ:* cal AD 640–670
2σ: cal AD 610–680

Final comment: J Greig (May 2004), at AD 640–670 I might have expected *Secale* (rye) and Cannabaceae (hemp) from Saxon farming. There were none so the real date may be a century or so earlier. The only available material for dating was not as safe as seeds.

OxA–12662 3940 ±29 BP

$\delta^{13}C$: -27.0‰

Sample: WQM 170 169–70cm, submitted in May 2003 by J Greig

Material: plant macrofossils (<5g) (bulk sample): cf *Alnus* sp.; *Urtica* sp.; *Rumex* sp.; *Sambucus* sp. (J Greig 2003)

Initial comment: waterlogged plant macrofossils from pollen monolith (169–70cm below modern surface).

Objectives: as OxA-12639 and date the start of noticeable signs of human impact in the pollen diagram.

Calibrated date: *1σ:* 2480–2460 cal BC
2σ: 2570–2340 cal BC

Final comment: J Greig (May 2004), there is a slight date reversal with this date the same as the last one in the series, OxA-12688.

Laboratory comment: Ancient Monuments Laboratory (2004), the result is in good agreement with the sample's stratigraphic position.

OxA–12663 3535 ±29 BP

$\delta^{13}C$: -25.9‰

Sample: WQM 130/2 129–30cm, submitted in May 2003 by J Greig

Material: plant macrofossils (<5g) (bulk sample): *Rubus* sp.; *Sambucus nigra*; *Carex* sp. (J Greig 2003)

Initial comment: uppermost pollen profile sample (129–30cm below modern surface) with good dating material.

Objectives: as OxA-12639

Calibrated date: *1σ:* 1920–1780 cal BC
2σ: 1950–1760 cal BC

Final comment: J Greig (May 2004), this date fits fairly well with the sequence.

Laboratory comment: Ancient Monuments Laboratory (2004), the result is in good agreement with the sample's stratigraphic position.

OxA–12688 3904 ±31 BP

$\delta^{13}C$: -28.4‰

Sample: WQM 185, submitted in August 2003 by J Greig

Material: plant macrofossils (<5g) (bulk sample): *Alnus* sp., catkin and twigs; *Sambucus nigra*, seed; *Carex* sp., subgenus *Carex* seed (J Greig 2003)

Initial comment: waterlogged plant macrofossils from pollen monolith (185cm below modern surface).

Objectives: as OxA-12639; may approximate to the elm decline horizon.

Calibrated date: *1σ:* 2470–2340 cal BC
2σ: 2480–2290 cal BC

Final comment: J Greig (May 2004), this date is more or less the same as OxA-12622. The dates obtained by Roseff: 5840–5560 cal BC (OxA-2880; 6790 ±80 BP) and 6000-5660 cal BC (OxA-2881; 6930 ±80 BP) from the bottom of the pollen sequence are somewhat older than might be expected from the sedimentation rate shown by this series of dates (Reimer *et al.* 2004).

Laboratory comment: Ancient Monuments Laboratory (2004), the result is in good agreement with the sample's stratigraphic position

References: Reimer *et al* 2004

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