THE NEOLITHIC OF EUROPE

PAPERS IN HONOUR OF ALASDAIR WHITTLE

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Edited by

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Front cover: Alleskoven dolmen, Denmark (Vicki Cummings).
Back cover: La Table des Marchands, France (Vicki Cummings); a reconstructed LBK longhouse in the Paris basin (Penny Bickle); Carrowmore, Ireland (Vicki Cummings); an excavation in progress at the Herpaly tell, Hungary (Pál Raczky).

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Tabula gratulatoria

In publishing this volume, the editors, contributors and publishers congratulate Alasdair on his contribution to many aspects of prehistoric archaeology: theoretical, practical and interpretational. His work and his teaching have been inspirational to the discipline as a whole and, in particular, to several generations of students, many of whom have gone on to make their own contribution.

The following wish to join us in congratulating Alasdair, and in celebrating his contribution to archaeology (so far).

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Rings of fire and Grooved Ware settlement at West Kennet, Wiltshire

Alex Bayliss, Caroline Cartwright, Gordon Cook, Seren Griffiths, Richard Madgwick, Peter Marshall and Paula Reimer

Introduction

Alasdair Whittle has had a career-long interest in the Neolithic of the Avebury area (Fig. 17.1). In the late 1980s and early 1990s he undertook a major research project in the region to investigate the Neolithic sequence and its environment (Whittle 1993). This included a series of excavations of early Neolithic sites including the causewayed enclosure at Windmill Hill (Whittle *et al*. 1999), the chambered tomb at Millbarrow (Whittle 1994), and an earthen long barrow at Easton Down (Whittle *et al*. 1993). A series of trenches were also cut through two palisade enclosures at West Kennet (Whittle 1997). This campaign of new excavation was accompanied by research into the archives of previous investigations, particularly the publication and subsequent dating of Richard Atkinson's excavation on and within Silbury Hill in 1968–70 (Bayliss *et al*. 2007a; Whittle 1997) and a reassessment of the date and development of Avebury itself (Pitts and Whittle 1992).

The subsequent decades have seen continued work in the Avebury region, given focus by the Archaeological Research Agenda for the Avebury World Heritage site (AAHRG 2001). Alasdair himself has been instrumental in producing refined chronologies for the West Kennet long barrow (Bayliss *et al*. 2007b) and the causewayed enclosures at Windmill Hill and Knap Hill (Whittle *et al*. 2011, chapter 3), and in producing synthetic narratives of early Neolithic sites in the region and beyond (Whittle *et al*. 2007; 2011, chapters 14 and 15). Further understanding of the late Neolithic landscape has been gained through research excavations at the Beckhampton Avenue and Longstones Cove and

Figure 17.1. Alasdair Whittle (back to camera!) directing excavations at Windmill Hill in 1988.

ditched enclosure (Gillings *et al*. 2008), and through rescue excavations undertaken in advance of consolidation works at Silbury Hill (Leary *et al*. 2013a).

The latter in particular has done much to improve our understanding of the development and date of Silbury Hill (Marshall *et al*. 2013; in prep. a; in prep. b), which has been put into context by a recent synthesis of the available scientific dating evidence for the Avebury area by Frances Healy (2016).

Objectives

The survival of late Neolithic monuments such as Stonehenge, Avebury and Silbury Hill in this part of Wiltshire is one of the key reasons for the World Heritage status of this area. There is an emerging narrative for the development of these sites (Darvill *et al*. 2012; Leary *et al*. 2013b; Marshall *et al*. 2013; a), and so the relatively poor chronology of the West Kennet palisade enclosures increasingly stands out as a lacuna in our understanding.

Alasdair was acutely aware of the need for precise dating to provide a specific context for each monument. Based on a series of 12 radiocarbon dates on animal bone and antler from the two palisade enclosures and on the associated assemblage of Grooved Ware, however, he was only able to suggest 'a broad range, somewhat at odds with the event-like character of the constructions, of 2600/2500–2200/2100 BC' (Whittle 1997, 139).

The aim of this research was to address this imprecision by producing a more precise and robust chronology for the West Kennet palisade enclosures. This would enable us to unravel the temporal relationships between the enclosures themselves and their associated features, and to place them within the monumental timescape of Avebury and the wider World Heritage site (e.g. Silbury Hill, Avebury, Stonehenge, Durrington Walls etc.). On a wider scale, palisade enclosures are monuments of a type which bear comparison across the British Isles.

Sampling

The new radiocarbon dating programme for the West Kennet enclosures was conceived from the start within the framework of Bayesian chronological modelling (Bayliss *et al*. 2007c; Buck *et al*. 1996). This allows the combination of calibrated radiocarbon dates with archaeological prior information using a formal statistical methodology. The project followed the reflexive approach to implementing Bayesian chronological modelling in archaeology that has been developed by English Heritage over the past twenty years (Bayliss 2009, fig. 9). The sampling strategy was thus devised using a series of simulation models which combined the available archaeological information (in this case the spatial relationships between features, and rarely vertical stratigraphy) with simulated radiocarbon dates from the available pool of potential suitable datable samples and the existing radiocarbon dates. These simulations were informed by the expected mid-third millennium cal BC date of the enclosures.

Samples were selected to try to target a range of features within the monument complex. The archaeological prior information was gathered from the site publication (Whittle 1997), supplemented by more detailed information from the excavation notebooks held in the site archive at the Alexander Keiller Museum, Avebury. This ensured that the selected samples came from well-recorded contexts.

Following an assessment of the surviving archive in the Alexander Keiller Museum, Avebury, it was decided to submit articulating animal bone and antler samples for dating. This is because the taphonomy of the charred plant macrofossils in the archive was regarded as less certain. Articulating bones were probably incorporated into the deposit from which they were recovered whilst still fleshed, and therefore there should be no significant time interval between the date of the context and the date of the death of the animal concerned. Where possible, the same zones of same-sided skeletal elements were selected for dating from a context to ensure that measurements were produced on different individuals. Antler samples were also selected from various features, on the basis that these would provide an estimate for the timing of digging activities associated with aspects of monument construction.

These results on the bone and antler samples seemed to confirm the third millennium dating of the enclosures, but in the interim we discovered that the charcoal samples from the burnt posts of the enclosures survived in the British Museum. Since this material must directly date the construction of the enclosures, a further suite of samples was submitted to assess the difference between the date of construction and the date of last use (as estimated from the associated animal bone samples).

Following the unexpected results produced by the charcoal samples from the enclosures, we searched for sapwood amongst the oak charcoal from the post-pipes of structures 1–3. Unfortunately, insufficient suitable material could be identified for radiocarbon dating to be undertaken directly on the posts of these structures.

Radiocarbon dating

Twelve radiocarbon dates were obtained as part of the original post-excavation programme (Whittle 1997, table 1). Two antler fragments from the outer ditch of enclosure 1 were dated by liquid scintillation spectrometry at the British Museum using methods described by Ambers *et al*. (1991). The remaining ten samples were dated by gas proportional counting of methane at Cardiff University (Dresser 1985). All consisted of animal bone, although unfortunately there appears to be no exact record of which bones were dated. From the published sample descriptions, however, it is apparent that most probably consisted of a number of bones – either because the sample consisted of mixed species (e.g. CAR-1297), or because it was

Table 17.1. West Kennet palisade enclosures – radiocarbon and stable isotope measurements.[1]

Laboratory Number	Sample Number	Material and context	Radiocarbon age (BP)	$\delta^{13}C$ (‰)	$\delta^{15}N$ (‰)	C:N
Palisade enclosure 1						
Outer ditch — trench G						
UBA-31101	Context [101] sample A	Charcoal, *Quercus* sp. sapwood (single fragment; C. Cartwright) from a postpipe row [101] seen intermittently through fill [111]	4419±37	−27.0±0.22		
SUERC-65177	Context [101] sample B	Charcoal, *Quercus* sp. sapwood (single fragment; C. Cartwright) from same context as UBA-31101	4535±28	−26.7±0.2		
SUERC-58623	Context [111] find <1038> sample A	Antler tine, probable pick (R. Madgwick) from [111] (Whittle 1997, 12, 62–3, fig. 29), the fill of enclosure 1 outer ditch [100] in trench G	3972±32	−22.8±0.2	4.5±0.3	3.2
UBA-22618	Context [111] find <1038> sample B	Replicate of SUERC-58623	3843±34	−22.8±0.22	4.3±0.15	3.2
	1038	T'=**7.6**; T'(5%)=3.8; ν=1	3912±24			
CAR-1293		Animal bone, bulked pig and cattle bone from the edge of postpipe [123] (Whittle 1997, 12, 63), enclosure 1 outer ditch [100] in trench G	3960±70			
Outer ditch — trench H						
UBA-31102	Context [207] sample A	Charcoal, *Quercus* sp. sapwood (single fragment; C. Cartwright) from postpipe (207), one of the central line with 217, 218, 209, 219 and 220 visible in the enclosure 1 outer ditch [200]	4511±38	−26.2±0.22		
SUERC-65178	Context [207] sample B	Charcoal, *Quercus* sp. sapwood (single fragment; C. Cartwright) from same context as UBA-31102	4559±28	−25.9±0.2		
UBA-31103	Context [218] sample A	Charcoal, *Quercus* sp. sapwood (single fragment; C. Cartwright) from postpipe (218), one of the central line with 207, 217, 209, 219 and 220 visible in the enclosure 1 outer ditch [200]	2901±38	−22.7±0.22		
SUERC-65352	Context [218] sample B	Charcoal, *Quercus* sp. sapwood (single fragment; C. Cartwright) from the same context as UBA-31103	4511±29	−24.5±0.2		
UBA-31104	Context [219] sample A	Charcoal, *Quercus* sp. sapwood (single fragment; C. Cartwright) from postpipe (219), one of the central line with 207, 217, 209, 218 and 220 visible in the enclosure 1 outer ditch [200]	2958±55	−25.7±0.22		
SUERC-65179	Context [219] sample B	Charcoal, *Quercus* sp. sapwood (single fragment; C. Cartwright) from same context as UBA-31104	2966±28	−22.2±0.2		
SUERC-58627	Context [208] find <2019>	Animal bone, pig right femur with refitting unfused distal epiphysis (R. Madgwick) from [208] (Whittle 1997, 12, 63), later redefined as context [217–218], fill around postpipes [217–218] in enclosure 1 outer ditch [200] in trench H	3820±32	−21.5±0.2	6.6±0.3	3.3
CAR-1289		Animal bone, pig from around postpipes F217–F219 (Whittle 1997, 12, 63, fig. 30) in enclosure 1 outer ditch [200] in trench H	3860±70			

(Continued)

Table 17.1. West Kennet palisade enclosures – radiocarbon and stable isotope measurements. (Continued)

Laboratory Number	*Sample Number*	*Material and context*	*Radiocarbon age (BP)*	*δ¹³C (‰)*	*δ¹⁵N (‰)*	*C:N*
CAR-1290		Animal bone, pig from around postpipes F219–F220 (Whittle 1997, 12, 63, fig. 30) in enclosure 1 outer ditch [200] in trench H	3900±70			
UBA-22630	Context [210] find <2422>	Animal bone, pig right femur with refitting unfused distal epiphysis (R. Madgwick) from [210] (Whittle 1997, 12, 63, fig. 30), later redefined as [219–220], fill around postpipes [219–220] in enclosure 1 outer ditch [200] in trench H	3842±38	−23.8±0.22	4.2±0.15	3.1
Outer ditch — trench D						
BM-2602	Find <262>	Red deer antler beam fragment from the fill of postpipe F40, enclosure 1, outer ditch [F26] (Whittle 1997, 12, 62, fig. 30) in trench D	3620±50	−20.7		
BM-2597	Find <322>	Red deer antler crown fragment from the inner edge of layer 2, deliberate rammed chalk backfill in upper part of outer ditch [F26] of enclosure 1 (Whittle 1997, 12, 62, fig. 30) in trench D	3810±50	−20.8		
Outer ditch — trench C						
	Find <462>	Antler beam fragment (No. 462) beneath postpipe F50 in chalk rubble fill of outer ditch F19 (Whittle 1997, 61).	Failed			
Outer ditch — trench E						
UBA-31111	F23 sample A	Charcoal, *Quercus* sp. sapwood (single fragment; C. Cartwright) from palisade line (F23) visible in the fill of the outer ditch of enclosure 1 (F12)	4488±35	−26.5±0.22		
SUERC-65189	F23 sample B	Charcoal, *Quercus* sp. sapwood (single fragment; C. Cartwright) from the same feature as UBA-31111	4614±29	−26.8±0.2		
Inner ditch — trench F						
UBA-31112	F31 sample A	Charcoal, *Quercus* sp. sapwood (single fragment; C. Cartwright) from the postpipe row (F31) that consisted of three substantial postpipes (F34–F36) cut into the fill of the inner ditch (F21)	4512±38	−26.2±0.22		
SUERC-65190	F31 sample B	Charcoal, *Quercus* sp. sapwood (single fragment; C. Cartwright) from same feature as UBA-31112	4590±28	−22.9±0.2		
Midden/?house — trench H						
SUERC-58630	Context [222] find <2393>	Antler tine fragments, probable pick (R. Madgwick) from [222] (same as [238]) (Whittle 1997, 71, 76, fig. 43), chalk layer associated with feature between inner and outer ditches of enclosure 1 in trench H	3877±32	−22.7±0.2	5.2±0.3	3.3
UBA-22627	Context [222] find <2359>	Animal bone, pig lumbar vertebrae with refitting unfused cranial plate (R. Madgwick) from same context as SUERC-58630	3810±40	−20.8±0.22	5.7±0.15	3.2

(Continued)

Table 17.1. West Kennet palisade enclosures – radiocarbon and stable isotope measurements. (Continued)

Laboratory Number	*Sample Number*	*Material and context*	*Radiocarbon age (BP)*	*δ¹³C (‰)*	*δ¹⁵N (‰)*	*C:N*
UBA-22628	Context [223] find <2389>	Animal bone, pig right femur with refitting unfused proximal epiphysis (R. Madgwick) from [223], dark flinty layer, about 50mm thick (Whittle 1997, 76) above [222/238] and below [215], from feature in between the inner and outer ditches of enclosure 1 in trench H extension	Failed: no collagen			
SUERC-58628	Context [215] find <2322>	Animal bone, pig right femur with refitting unfused distal epiphysis (R. Madgwick) from [215] mass of animal bone, mainly pig, in dark matrix with Grooved Ware, overlying dark flinty layer which in turn overlay a concave area of otherwise flat laid chalk [238] (Whittle 1997, 12, 76, fig. 43) from feature between the inner and outer ditches of enclosure 1 in trench H	3889±32	−21.0±0.2	6.0±0.3	3.3
SUERC-58629	Context [215] find <2325>	Animal bone, pig right femur with refitting unfused distal epiphysis (R. Madgwick) from same context as SUERC-58628	3902±32	−21.2±0.2	5.6±0.3	3.2
CAR-1296		Animal bone, cattle bone from same context as SUERC-58628	3590±70			
CAR-1297		Animal bone, pig and red deer bone from same context as SUERC-58628	3550±70			
UBA-22629	Context [215] find <2301>	Animal bone, pig right femur with refitting unfused distal epiphysis (R. Madgwick) from same context as SUERC-58628	3581±37	−22.0±0.22	5.4±0.15	3.4
Inner ditch — trench J						
UBA-31105	Context [310] sample A	Charcoal, *Quercus* sp. sapwood (single fragment; C. Cartwright) from postpipe (310), part of postpipe row (309) along with (311–315 and 364) in the fill of enclosure 1 inner ditch [301]	4524±38	−24.5±0.22		
SUERC-65180	Context [310] sample B	Charcoal, *Quercus* sp. sapwood (single fragment; C. Cartwright) from same context as UBA-31105	4524±30	−25.4±0.2		
UBA-31106	Context [313] sample A	Charcoal, *Quercus* sp. sapwood (single fragment; C. Cartwright) from postpipe (313), part of postpipe row (309) along with (310–312, 314–315 and 364) in the fill of enclosure 1 inner ditch [301]	4427±50	−25.5±0.22		
SUERC-65184	Context [313] sample B	Charcoal, *Quercus* sp. sapwood (single fragment; C. Cartwright) from same context as UBA-31106	4698±31	−24.4±0.2		
CAR-1291		Animal bone, pig bone from postpipes [311] and [313–315], in enclosure 1 inner ditch [301] (Whittle 1997, 12, 66, figs 30, 33) in trench J	3890±70			
SUERC-58631	Context [325] find <3089> sample A	Antler tine, probable pick (R. Madgwick) from [325], fill of enclosure 1 inner ditch [301] in trench J	3926±32	−21.1±0.2	4.3±0.3	3.3

(Continued)

Table 17.1. West Kennet palisade enclosures – radiocarbon and stable isotope measurements. (Continued)

Laboratory Number	*Sample Number*	*Material and context*	*Radiocarbon age (BP)*	*$\delta^{13}C$ (‰)*	*$\delta^{15}N$ (‰)*	*C:N*
UBA-22622	Context [325] find <3089> sample B	Replicate of SUERC-58631	3870±34	−21.2±0.22	5.7±0.15	3.2
	Context [325] find <3089>	T’=1.4; T’(5%)=3.8; ν=1	3900±24			
Palisade enclosure 2						
Ditch — trench M						
GU36829	Context [604] find <6067>	Animal bone, pig left femur with refitting unfused distal epiphysis (R. Madgwick) from [604] (Whittle 1997, 81, fig. 44), a dark layer in the uppermost fill of enclosure 2 ditch [630] in trench M	Failed: insufficient carbon			
UBA-22626	Context [605] find <6101>	Animal bone, pig left femur with refitting unfused proximal epiphysis (R. Madgwick) from [605] (Whittle 1997, 81, fig. 44), a dark layer in the uppermost fill of enclosure 2 ditch [630] in trench M	3948±36	−20.4±0.22	7.6±0.15	3.2
UBA-31107	Context [608] sample A	Charcoal, *Quercus* sp. sapwood (single fragment; C. Cartwright) from [608], the postpipe core of postpipe [625], in a row of four substantial postpipes [626–628] within the backfill of enclosure 2 ditch [630]. These represent former posts, which had been let into shallow, slightly irregular sockets up to 0.2m deep and no more than 0.5m across	4427±36	−25.6±0.22		
SUERC-65185	Context [608] sample B	Charcoal, *Quercus* sp. sapwood (single fragment; C. Cartwright) from the same context as UBA-31107	4580±28	−24.2±0.2		
UBA-31108	Context [609] sample A	Charcoal, *Quercus* sp. sapwood (single fragment; C. Cartwright) from [609], the postpipe core of postpipe [626], in a row of four substantial postpipes [625, 627–628] within the backfill of enclosure 2 ditch [630]. These represent former posts, which had been let into shallow, slightly irregular sockets up to 0.2m deep and no more than 0.5m across	4449±36	−25.5±0.22		
SUERC-65186	Context [609] sample B	Charcoal, *Quercus* sp. sapwood (single fragment; C. Cartwright) from the same context as UBA-31108	4771±31	−25.2±0.2		
UBA-31109	Context [610] sample A	Charcoal, *Quercus* sp. sapwood (single fragment; C. Cartwright) from [610], the postpipe core of postpipe [627], in a row of four substantial postpipes [625–626, and 628] within the backfill of enclosure 2 ditch [630]. These represent former posts, which had been let into shallow, slightly irregular sockets up to 0.2m deep and no more than 0.5m across	4514±35	−24.5±0.22		
SUERC-65187	Context [610] sample B	Charcoal, *Quercus* sp. sapwood (single fragment; C. Cartwright) from same context as UBA-31109	4583±28	−24.8±0.2		

(Continued)

Table 17.1. West Kennet palisade enclosures – radiocarbon and stable isotope measurements. (Continued)

Laboratory Number	*Sample Number*	*Material and context*	*Radiocarbon age (BP)*	*δ^{13}C (‰)*	*δ^{15}N (‰)*	*C:N*
SUERC-58632	Context [610] find <6195>	Animal bone, pig right femur with refitting unfused distal epiphysis (R. Madgwick) from [610], fill of postpipe [627] (Whittle 1997, 81, fig. 30), cut into fill of enclosure 2 outer ditch [630] in trench M	3848±32	−20.4±0.2	6.8±0.3	3.2
SUERC-58633	Context [610] find <6247> sample A	Animal bone, pig right femur with refitting unfused proximal epiphysis (R. Madgwick) from [610], fill of postpipe [627] (Whittle 1997, 81, fig. 30), cut into fill of enclosure 2 outer ditch [630] in trench M	3679±32	−22.0±0.2	6.3±0.3	3.6
UBA-22619	Context [610] find <6247> sample B	Replicate of SUERC-58633	3790±36	−21.6±0.22	6.1±0.15	3.2
	Context [610] find <6247>	T'=**5.3**; T'(5%)=3.8; ν=1	3729±24			
UBA-22631	Context [610] find <6304>	Animal bone, pig right femur with refitting unfused distal epiphysis (R. Madgwick) from same context as SUERC-58632	3891±35	−22.0±0.22	5.7±0.15	3.2
CAR-1295		Animal bone, cattle from the core of postpipe [626] (Whittle 1997, 12, 81, fig. 30) cut into fill of enclosure 2 ditch [630] in trench M	4050±70			
CAR-1294		Animal bone, cattle from the core of postpipe [627] (Whittle 1997, 12, 81, fig. 30) cut into fill of enclosure 2 ditch [630] in trench M	3620±70			
UBA-31110	Context [611] sample A	Charcoal, *Quercus* sp. sapwood (single fragment; C. Cartwright) from [611], the postpipe core of postpipe [628], in a row of four substantial postpipes [625–627] within the backfill of enclosure 2 ditch [630]. These represent former posts, which had been let into shallow, slightly irregular sockets up to 0.2m deep and no more than 0.5m across	4455±37	−24.0±0.22		
SUERC-65188	Context [611] sample B	Charcoal, *Quercus* sp. sapwood (single fragment; C. Cartwright) from the same context as UBA-31110	4572±30	−24.1±0.2		
SUERC-58637	Context [612] find <6146> sample A	Animal bone, cattle first phalanx with refitting unfused epiphysis (R. Madgwick) from around the outer visible part of postpipe [625] and in the space between postpipes [626] and [627] (Whittle 1997, 81, fig. 30) cut into fill of enclosure 2 outer ditch [630] in trench M	3766±32	−23.2±0.2	6.3±0.3	3.4
UBA-22620	Context [612] find <6146> sample B	Replicate of SUERC-58637	3871±38	−23.2±0.22	6.3±0.15	3.2
	Context [612] find <6146>	T'=**4.5**; T'(5%)=3.8; ν=1	3810±25			
GU36833	Context [629] find <6377> sample A	Probable antler pick (R. Madgwick) from the main fill [629] (Whittle 1997, 77, fig. 44) of enclosure 2 ditch [630] in trench M	Failed			

(Continued)

Table 17.1. West Kennet palisade enclosures – radiocarbon and stable isotope measurements. (Continued)

Laboratory Number	*Sample Number*	*Material and context*	*Radiocarbon age (BP)*	*$\delta^{13}C$ (‰)*	*$\delta^{15}N$ (‰)*	*C:N*
UBA-22621	Context [629] find <6377> sample B	Replicate of GU36833	Failed			
Ditch — trench BB						
SUERC-58640	Context [7009] find <70057>	Animal bone, pig sacrum with unfused but articulating first and second sacral vertebrae (R. Madgwick) from postpipe [7009] (Whittle 1997, 82) set close to the inner edge of enclosure 2 outer ditch [7002] in trench BB	3770±32	−21.4±0.2	5.8±0.3	3.2
UBA-22624	Context [7012] find <70061>	Animal bone, medium mammal thoracic vertebra with refitting unfused caudal plate (R. Madgwick) from [7012], a small group of bones found in the main fill in outer ditch [7002] at 1m, on the outside of postpipe [7008] (Whittle 1997, 82). From the ditch of enclosure 2 in trench BB.	3858±35	−20.6±0.22	6.3±0.15	3.2
Structure 2 — trench Z						
SUERC-58638	Context [5113] find <51222>	Animal bone, sheep/goat left femur with refitting unfused proximal epiphysis (R. Madgwick) from [5113], packing from around a row of six postpipes [5046] (Whittle 1997, 84, fig. 54) cut into the fill of ditch [5002], part of the outer ring of structure 2 in trench Z	3785±28	−23.6±0.2	5.6±0.3	3.3
Structure 3 — trench AA						
SUERC-58639	Context [6006] find <60036> sample A	Antler pick (R. Madgwick) from fill [6006] of the inner ring ditch [6005] (Whittle 1997, 85, fig. 55) of structure 3 in trench AA	3496±32	−22.6±0.2	6.3±0.3	3.3
UBA-22623	Context [6006] find <60036> sample B	Replicate of SUERC-58639	3818±40	−22.6±0.22	6.1±0.15	3.2
	Context [6006] find <60036>	T'=**39.8**; T'(5%)=3.8; ν=1	n/a			
UBA-22625	Context [6021] find <60303>	Animal bone, pig left femur with refitting unfused distal epiphysis (R. Madgwick) from [6021], postpipe in outer ring [6003] (Whittle 1997, 85, fig. 55) of enclosure 2 structure 3 in trench AA	3861±41	−21.5±0.22	5.3±0.15	3.2
Structure 1 — trench Y						
UBA-22632	Context [4051] find <41019>	Animal bone, cattle left calcaneum with refitting unfused epiphysis (R. Madgwick) from [4051] (Whittle 1997, 84), a concentration of animal bone on the outer side and across the middle of the structure 1 inner ditch in trench Y	3781±37	−24.1±0.22	8.5±0.15	3.2
Outer radial ditch 1 — trench S						
CAR-1292		Animal bone, cattle from postpipe packing? (Whittle 1997, 12, 83, fig. 45) in bedding trench [560], enclosure 2, outer radial ditch 1 in trench S	3930±70			
CAR-1298		Animal bone, cattle from the same context as CAR-1292	3830±70			

from more than one post-pipe (e.g. CAR-1291), or because it consisted of pig bone (few of which would be large enough for conventional dating on their own, e.g. CAR-1289). One further antler was submitted for dating to the British Museum but failed to produce sufficient collagen for analysis.

Fifty-one further radiocarbon dates have been obtained in 2014–16 as part of this programme of research. All samples were single fragments of animal bone, antler or charcoal. All the charcoal samples were single fragments of oak sapwood.

The reported results are conventional radiocarbon ages (Stuiver and Polach 1977) (Table 17.1). The Scottish Universities Environmental Research Centre (SUERC) processed 12 samples of bone and antler using gelatinisation and ultrafiltration and 12 samples of charcoal, which were then combusted to carbon dioxide, graphitised and dated by Accelerator Mass Spectrometry (AMS) (Dunbar *et al*. 2016). The ^{14}CHRONO Centre, The Queen's University, Belfast processed 13 samples of bone and antler and 12 samples of charcoal using methods described by Reimer *et al*. (2015). All samples were graphitised using zinc reduction (Slota *et al*. 1987), except for UBA-22630, which was subject to hydrogen reduction (Vogel *et al*. 1984). Three further bone samples failed to produce sufficient protein for dating.

Five pairs of replicate radiocarbon measurements are available, three on antlers and two on animal bones that were dated by both SUERC and Belfast. Only one of these pairs of measurements is statistically consistent at 95% confidence (SUERC-58631 and UBA-22622), two are inconsistent at 95% confidence, but consistent at 99% confidence (SUERC-58633 and UBA-22619, SUERC-58637 and UBA-22620), and two are inconsistent at more than 99% confidence (SUERC-58623 and UBA-22618, SUERC-58639 and UBA-22623; Ward and Wilson 1978) (Table 17.1). This reproducibility is not within statistical expectation, and so the accuracy of these measurements has been assessed during the modelling process by their compatibility with related radiocarbon results.

Replicate carbon and nitrogen stable isotopic ratios are also available for these five samples. All the replicate pairs are statistically consistent at 95% confidence (Ward and Wilson 1978), except for the $\delta^{15}N$ values for the fragment of antler pick from context [325] (SUERC-58631 and UBA-22618), which are widely separated (Table 17.1). Both reported values are within the observed range for antler from this site, and so we have no indication which measurement is erroneous.

Chronological modelling

The chronological models presented in this paper have been constructed using the program OxCal v4.2 (Bronk Ramsey 2009; Bronk Ramsey and Lee 2013) and the atmospheric calibration curve for the northern hemisphere published by Reimer *et al*. (2013). The algorithms used are defined exactly by the brackets and OxCal keywords on the left-hand side of Figs 17.3, 17.5, 17.6, 17.10, 17.11, 17.13, 17.14 and 17.16a–b (http://c14.arch.ox.ac.uk/). The posterior density estimates output by the model are shown in black, with the unconstrained calibrated radiocarbon dates shown in outline. The other distributions correspond to aspects of the model. For example, the distribution '*build_WK_enclosure_1'* (Fig. 17.3) is the posterior density estimate for the date when palisade enclosure 1 was constructed. In the text and tables, the highest posterior density intervals of the posterior density estimates are given *in italics*.

An overall plan of the West Kennet palisade enclosures showing the locations of the dated samples is provided in Figure 17.2. The results on the charcoal samples from the posts of the enclosures are clearly nearly a millennium earlier than those from the articulating animal bone and, unexpectedly, must represent an unrelated episode of activity. We have therefore constructed two separate models for the different phases of use of the site.

The palisade enclosures

The model for the construction of the two palisade enclosures is shown in Figure 17.3. It has good overall agreement (Amodel: 65).

Palisade enclosure 1 comprises two roughly concentric, sub-circular ditches, with a series of post-holes demarking a timber palisade in each ditch. The palisade ditches were at least 2m deep, although some variability was apparent. The inner ditch was consistently wider than the outer ditch, reaching over 3m in trenches D and F, while in trenches C, D and G the outer ditch was less than 1m wide. Both the inner and outer ditches had been deliberately backfilled with spoil, and a more or less continuous line of posts had been erected.

Sixteen measurements are available on single fragments of oak sapwood from post-pipes, post-pipe rows and from around post-pipes. We interpret these samples as the outermost rings of the vertical timbers that formed the palisades. Six samples come from posts set into the inner ditch in trenches F and J, and ten from posts set into the outer ditch in trenches E, G and H (Fig. 17.2). Three of the samples from the outer ditch in trench H appear to relate to an otherwise unrecognised episode of activity at the end of the second millennium cal BC (UBA-31103–4 and SUERC-65179) (Table 17.1). These measurements are not included in the modelling and are not shown on Figure 17.3.

As the amount of sapwood in prehistoric oaks in England varies between 10–55 rings (Hillam *et al*. 1987), the best estimate for the date of construction of enclosure 1 is provided by the latest date on the sapwood. This model suggests that West Kennet palisade enclosure 1 was constructed in *3335–3095 cal BC (95% probability; build_WK_enclosure_1*; Fig. 17.3), probably in *3325–3240 cal BC (68% probability)*.

The general character of the palisade ditch of enclosure 2 was identical to enclosure 1, comprising a backfilled ditch

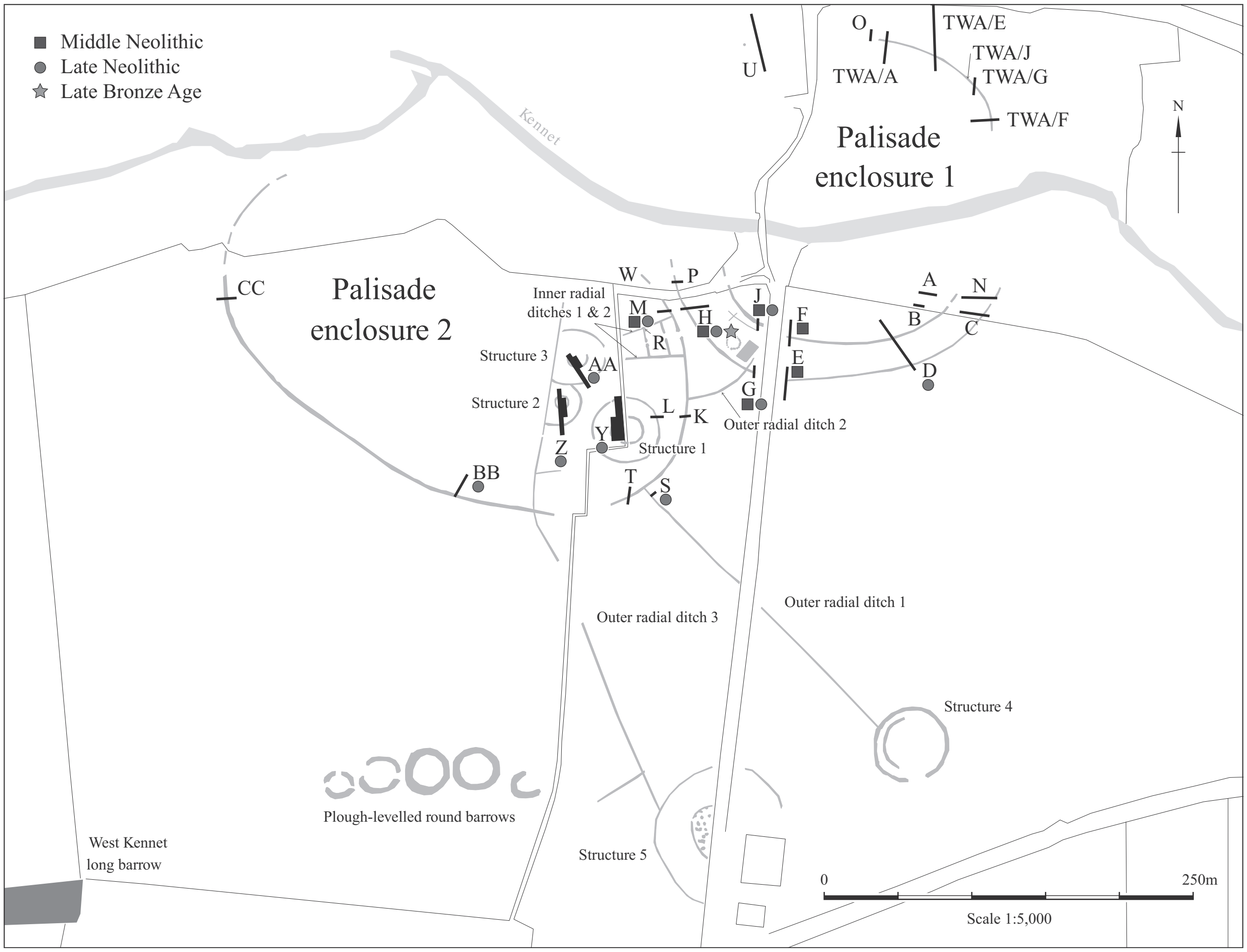


Figure 17.2. Overall plan of the West Kennet palisade enclosures showing the locations of the dated samples (© Historic England).

about 2m deep with basal sockets and closely spaced post-pipes. But unlike enclosure 1, enclosure 2 only has a single ovoid ditch varying in width from 1.6–1.8m (in trenches K and M) to 3m wide in trench T. Most of the post-pipes of enclosure 2 were of larger diameter than those of enclosure 1.

Eight measurements are available on single fragments of oak sapwood from post-pipes in trench M. Again, the best estimate for the date of construction of the enclosure is provided by the latest date on the sapwood. This model suggests that West Kennet palisade enclosure 2 was constructed in *3330–3080 cal BC (95% probability; build_WK_enclosure_2*; Fig. 17.3), probably in *3320–3235 cal BC (68% probability)*.

Figure 17.4 shows the difference between these estimates for the construction date of each enclosure. Clearly, within the uncertainties of our date estimates, the interval between their constructions was negligible. We must therefore consider whether they could have been built in a single episode. By combining the posterior distributions for their dates, we can estimate that this would have occurred in *3325–3215 cal BC (95% probability; build_WK_enclosures*; Fig. 17.5), probably in *3315–3270 cal BC (68% probability)*. The date estimates are in good agreement with this interpretation (Acomb: 150; An: 50; n: 2).

Figure 17.5 shows the estimated date of construction of the West Kennet palisade enclosures from three, alternative, archaeological readings. Scenario 1 treats the two circuits of enclosure 1 as a related, but not necessarily precisely contemporary, period of construction (Fig. 17.3). Scenario 2 treats each enclosure as unitary construction, but does not assume that these were related in any way. Scenario 3 treats the two enclosures as one unitary construction. Clearly these differences in archaeological interpretation do not affect the estimated date of the enclosure materially.

Within the interior of palisade enclosure 2 are three internal structures (structures 1, 2 and 3; Fig. 17.2). These take the form of much smaller ditched enclosures, each with at least two broadly concentric circular ditches into which were set a series of closely spaced timber uprights (Whittle 1997, figs 49–50, 52–5). A series of radial ditches also run from palisade enclosure 2. Inner radial ditches 1 and 2 have been recorded from aerial photographs and by geophysical survey,

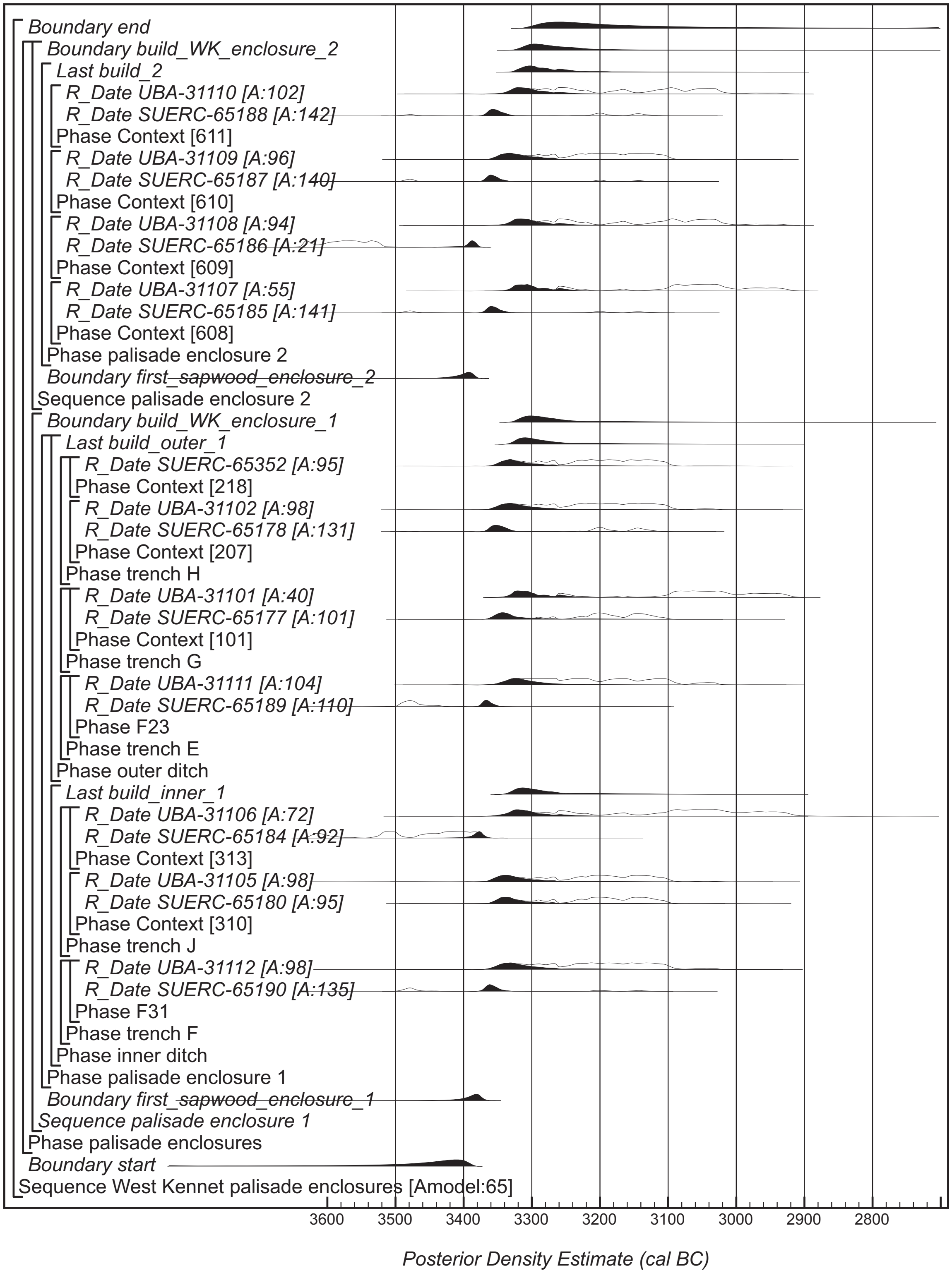


*Figure 17.3. Probability distributions of dates from the West Kennet palisaded enclosures. Each distribution represents the relative probability that an event occurs at a particular time. For each of the dates two distributions have been plotted: one in outline, which is the result of simple radiocarbon calibration, and a solid one, based on the chronological model used. Other distributions correspond to aspects of the model. For example, the distribution '*build_WK_enclosure_1*' is the estimated date when the West Kennet palisaded enclosure 1 was constructed. The large square brackets down the left-hand side of the diagram, along with the OxCal keywords, define the overall model exactly (http://c14.arch.ox.ac.uk/).*

but have not been sampled by excavation. Outer radial ditch 1 appears to lead to a fourth ditched enclosure only seen from aerial photographs (structure 4). A trench was cut through this ditch in 1990, revealing a burnt palisade of close-set timbers about 20–30cm apart (Whittle 1997, 83). Outer radial ditch 2 appears to run between palisade enclosures 1 and 2, but has not been sampled by excavation. Outer radial ditch 3, which appears to run south from the interior of palisade enclosure 2 to a further ditched enclosure (structure 5), was mapped through aerial photography in 2002 (Barber *et al*. 2003).

The presence of closely set timber uprights in these enclosures and ditches, all of which appear to have been burnt like those of the palisade enclosures, suggests that these elements of the complex were also constructed in the decades around 3300 cal BC. It should be noted, however, that sequence has been suggested (e.g. that structures 2 and 3 were constructed against the already standing palisade of outer radial ditch 3, Leary *et al*. 2013a, 234), although the time-depth of this relative dating cannot be known without excavation and further radiocarbon dating.

It seems clear that palisade enclosures 1 and 2 were constructed at more or less the same time (Fig. 17.5), and were thus probably in contemporary use. This has implications for interpreting their layout and understanding their function (e.g. Thomas 2002, 218). The chronological modelling does not tell us anything about the duration of their use, which has to be inferred from circumstantial evidence. Both enclosures, and at least the innermost area of outer radial ditch 1, seem to have been destroyed by fire. This raged across a distance of c. 500m, as the palisade of enclosure 2 in trench CC was burnt, as was the palisade of enclosure 1 in trench TWA O (Whittle 1997, 69–70, 82). In total, over 2.2km of palisade and 4400 timber posts were consumed in the conflagration. Given the difficulties of fire-setting substantial green oak timbers, this destruction must have been deliberate.

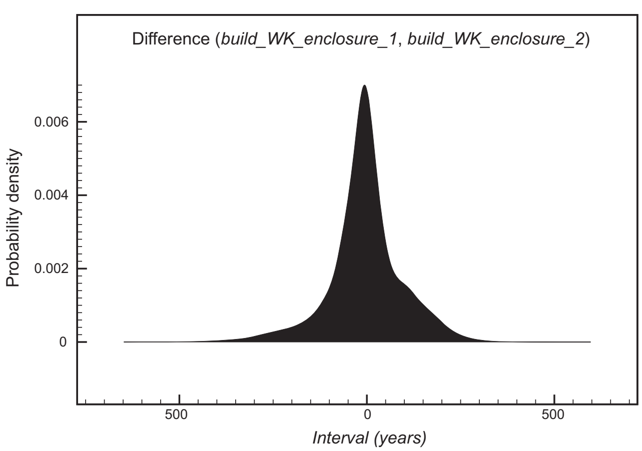


Figure 17.4. Probability distributions for the number of years between the constructions of the two palisaded enclosures at West Kennet (derived from the model shown in Fig. 17.3).

The scale of the timber constructions must be compared with the size of the associated assemblage of finds. This comprises one abraded rim of Peterborough Ware in the Mortlake sub-style from trench BB (Whittle 1997, 102, fig. 62 no. 34) and possibly a retouched fragment of a polished axe from the primary fill of the inner ditch of structure 1 (Whittle 1997, 92, fig. 59 no. 33). Even when we consider that well under 1% of the palisade ditches have been excavated, the contemporary finds assemblage can hardly have been extensive. None of the 25 samples of animal bone and antler that have been dated appear to relate to the construction and use of the palisade enclosures (although there were a few antler fragments from the backfill of their ditches that might be related to construction (Whittle 1997, 61)), and so it is probable that almost none of the faunal assemblage relates to this period of use of the site. Even if most everyday items in this period were made from perishable material, such a tiny finds assemblage from such an extensive site seems to suggest a limited period of use. If, following Wainwright and Longworth (1971, 224–5), we use a rough calculation of oak post decay as 15 years per inch (2.5cm), then the posts of enclosure 1 would have entirely decayed within 150–200 years, and the more substantial posts of enclosure 2 after about 300 years. But we know that both palisades were standing when they were burnt down and we have no evidence of later timber replacement from the assemblage of radiocarbon dates. Together these lines of evidence suggest a duration of perhaps a few generations or a century at most.

The Grooved Ware settlement

The second period of use of the area of the West Kennet palisade enclosures is represented by the radiocarbon dates on 25 samples of bone and antler, by an assemblage of over 500 sherds of Grooved Ware and (probably) by the majority of the struck flint recovered from the site. Since the excavations, these finds have been interpreted as associated with the use of the timber enclosures. Their respective radiocarbon dates clearly demonstrate that this was not the case.

Re-thinking the taphonomy of this later finds assemblage is obviously required. A close reading of the stratigraphic report demonstrates that the majority of bone and antler finds were found 'at the edge of post-pipes, and occasionally within them; hardly any was found in the backfill of the ditches' (Whittle 1997, 61, see also 76). Similarly, 'one of the most significant characteristics of the pottery in the ditches of palisade enclosures is its depth (often 2m below the surface), its fresh appearance, and its frequent occurrence resting on the edge of postpipes' (Whittle 1997, 116). This led the excavator to suggest that these finds were placed around posts as the ditch was backfilled. In contrast, given the disparity between the dates of the posts and the dates of the finds, it seems likely to us that the artefacts fell into the soft charcoal-rich sediments and voids of the post-pipes from overlying Grooved Ware occupation in the area of the enclosures.

The model for Grooved Ware occupation in the area of the palisade enclosures is shown in Figure 17.6. It has good overall agreement (Amodel: 64). We consider the elements of this model from east to west.

Two single fragments of antler from the upper part of the ditch in trench D, BM-2602 from the edge of palisade post-pipe F40 and BM-2597 from upper deposits in the edge of the ditch, were dated soon after excavation. Post-pipe F40 contained a substantial void (Whittle 1997, 62).

Replicate measurements (SUERC-58623 and UBA-22618) on an antler pick from ditch fill [111] in trench G are statistically inconsistent at more than 99% confidence (Table 17.1), however, a weighted mean (3912±24 BP) was calculated as providing the best estimate for its age, which has good individual agreement in the model (*1038*; A: 100) (Fig. 17.6). The posts of the outer palisade of enclosure 1 were cut into this fill. Cattle bone (CAR-1293) from the edge of post-pipe [123] in trench G was dated at Cardiff in the mid-1990s.

Two samples have been dated from trench J. Measurements on an antler pick from fill [325] of the inner ditch of palisade enclosure 1 (SUERC-58631 and UBA-22622) are statistically consistent (Table 17.1) and a weighted mean (3900±24 BP) provides the best estimate for the age of the antler. The posts were set into this fill, and one cordoned Grooved Ware sherd was found in post-pipe [313] at a depth of 1.8m (Whittle 1997, 66). A bulk sample of pig bone from four of the palisade post-pipes, 311 and 313–15 (CAR-1291), was also dated in this trench.

Five dark and charcoal-rich post-pipes visible in the fill of the outer ditch of palisade enclosure 2 in trench H were surrounded by a quantity of animal bone. Measurements have been made on two samples of bulk pig bone (CAR-1289–90) and two immature pig femora with refitting unfused epiphyses (UBA-22630, SUERC-58627) from this deposit. Trench H was extended to the east, into the area between the inner and outer ditches of enclosure 1, and a number of features and deposits located. Samples from an antler pick (SUERC-58630) and an immature pig lumbar vertebra with refitting unfused plate (UBA-22627) were dated from chalky layer [222/238] that was stratigraphically below context [215]. Five determinations (SUERC-58628–9, CAR-1296–7 and UBA-22629) on samples from the rich assemblage of animal bone in [215] were dated.

Samples were dated from the outer zones of two ([626 and 627]) of the row of four substantial post-pipes [625–8] within the backfill [629] of the ditch of palisade enclosure 2 in trench M, together with samples from the bone packing around post-pipe [625]. Three pig femora with refitting unfused epiphyses were dated from the fill of post-pipe [627] (SUERC-58632–3, UBA-22619 and UBA-22631). Although only statistically consistent at 99% confidence (Table 17.1), a weighted mean of the two measurements on one pig femur (3729±24 BP; SUERC-58633 and UBA-33619) has been taken as providing the best estimate for its age, as they are from the same individual. A sample of cattle bone was also dated from this deposit in the 1990s (CAR-1294). At this time another radiocarbon measurement (CAR-1295) was produced on cattle bone from the core of post-pipe [626]. The two radiocarbon measurements on an immature cattle phalanx with refitting unfused epiphysis (SUERC-58637 and UBA-22620) from the bone packing [612] around post-pipe [625] are only statistically consistent at 99% confidence (Table 17.1), but a weighted mean (3810±25 BP) has been taken as providing the best estimate for its age. Finally, a single immature pig femur with refitting unfused epiphysis (UBA-22626) from a dark ashy layer [605] in the upper part of the ditch is stratigraphically later than its infilling after removal of the posts. This deposit may be a rare example of *in situ* Grooved Ware occupation on the site.

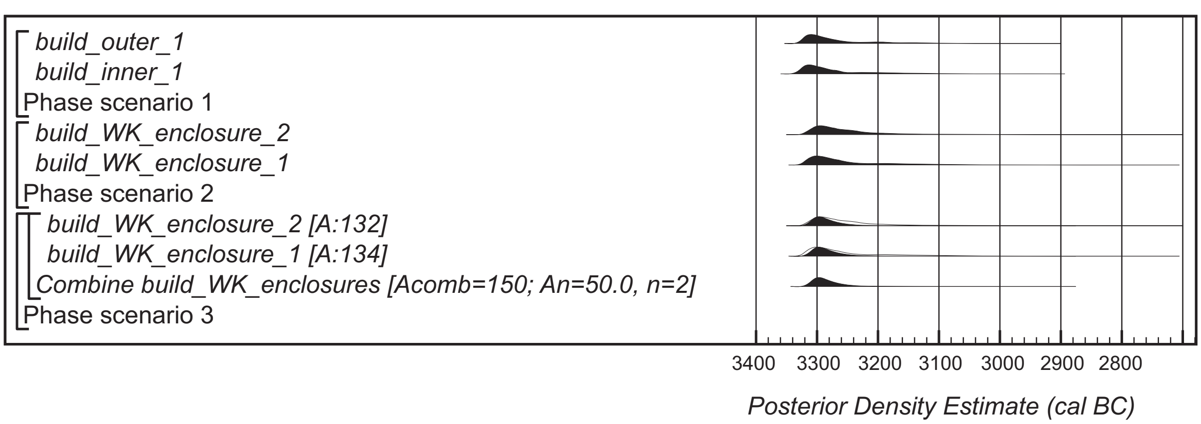


Figure 17.5. Probability distributions for the construction of the West Kennet palisaded enclosures following alternative archaeological interpretations: (1) separate unitary constructions for each circuit, (2) separate unitary constructions for enclosures 1 and 2, (3) unitary construction of entire complex.

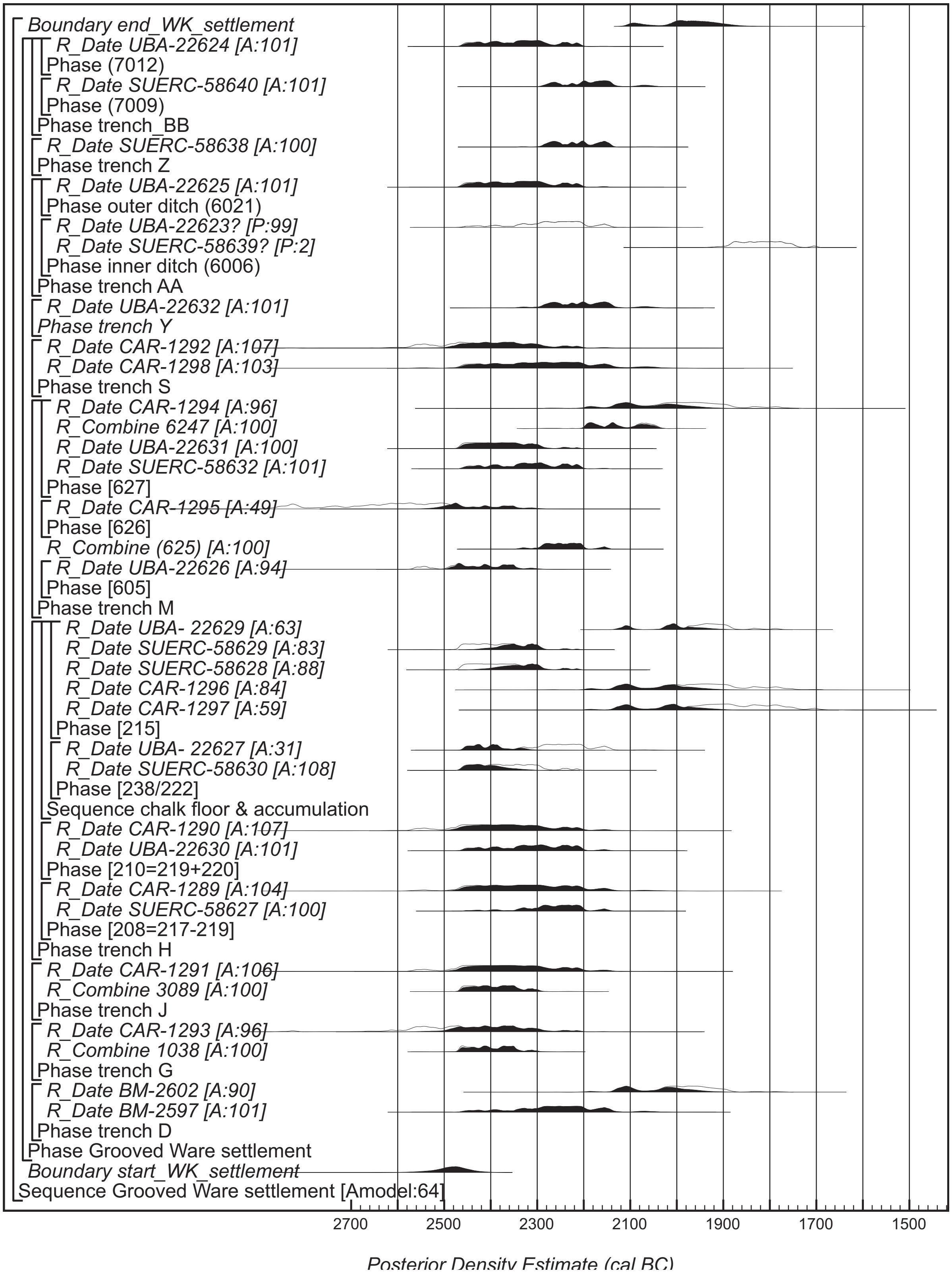


Figure 17.6. Probability distributions of dates from the West Kennet Grooved Ware settlement. The format is identical to that of Figure 17.3. Measurements followed by a question mark and shown in outline have been excluded from the model for reasons explained in the text and are simple calibrated dates (Stuiver and Reimer 1993). The large square brackets down the left-hand side of the figure, along with the OxCal keywords, define the model exactly.

Two samples of cattle bone from the bedding trench of the palisade in outer radial ditch 1 were dated in the 1990s (CAR-1292 and CAR-1298).

An immature cattle calcaneum with refitting unfused epiphysis (UBA-22632) was dated from a concentration of animal bone [4051] recovered from 'the outer side and across the middle of the ditch in the upper primary fill' (Whittle 1997, 84) of the inner ring of structure 1 in trench Y.

In trench AA, an immature pig femur with refitting unfused epiphysis was dated from [6021], one of the post-pipe fills of the outer ring of structure 3 (UBA-22625). Two measurements from a probable antler pick (SUERC-58639 and UBA-22623) from fill [6006] of the shallow inner ditch of structure 3 are statistically inconsistent at well over 99% confidence (T'=39.8; T' (5%)=3.8; *v*=1). Initially, both measurements were included separately in the chronological model for the Grooved Ware settlement (see below). Fill [6006] was cut by several post-pipes, but it should be noted that this ditch is of a very different character to the other ditches that we have interpreted as middle Neolithic at West Kennet.

Six post-pipes (row [5046]) with very dark fills with much charcoal flecking were identified in the outer circuit of structure 2 in trench Z. A backfilled deposit [5113] of flinty clayey gravel around the post-pipes contained some charcoal flecking and animal bones from which a caprine femur with refitting unfused epiphysis was dated (SUERC-58638).

In the main fill of the ditch of palisade enclosure 2 in trench BB at a depth of 1m a small group of bones [7012] was recovered from the outer side of post-pipe [7008]. A measurement (UBA-22624) on a medium mammal thoracic vertebra with refitting epiphyseal plate was obtained. Another measurement was made on a pig sacrum with unfused but articulating sacral vertebrae from the edge of post-pipe [7009] (SUERC-58640).

The model shown in Figure 17.6 treats all these dated samples as deriving from a single, continuous and relatively constant period of occupation in the area of the palisade enclosures. Both measurements from the antler pick in trench AA (SUERC-58639 and UBA-22623) have good individual agreement in this reading (A: 63 and A: 100 respectively; model not shown). Since these measurements are replicates on a single object, they cannot both be accurate. In the absence of independent information determining which is correct, we have chosen to exclude both from the final model.

This model suggests that the Grooved Ware occupation at West Kennet began in *2575–2405 cal BC (95% probability; start_WK_settlement*; Fig. 17.6), probably in *2520–2440 cal BC (68% probability)*. The occupation ended in *2115–1865 cal BC (95% probability; end_WK_settlement*; Fig. 17.6), probably in *2100–2080 cal BC (5% probability)* or *2015–1905 cal BC* (*63% probability*).[2] The area was occupied for a period of *310–615 years (95% probability; WK_settlement;* Fig. 17.7), probably for *420–575 years (68% probability)*.

There is a clear gap between the construction of the palisade enclosures and the establishment of Grooved Ware activity on the site, which is estimated as *685–895 years* (*95% probability*; *enclosures–settlement*; Fig. 17.8), probably *760–850 years* (*68% probability*).

This raises the question of why the Grooved Ware activity was located on the same site as the enclosures when, as discussed above, the timber palisades would have been long ago destroyed. There must have been visible earthworks, either in the form of slight banks formed from spoil that was not immediately replaced in the enclosure ditches as packing around the posts, or in the form of hollows in the top of the ditches themselves as these settled. Context [605], recorded in the upper part of the ditch of palisade enclosure 2 in trench M (Whittle 1997, fig. 44), may support the latter suggestion as this appears to be a coherent dump of occupation refuse rather than displaced material which fell into the post-pipes of the palisade.

Next we must consider the character of the late Neolithic activity in the area of the enclosures. Was this simply a spread of occupation debris on the surface, which only survived later erosion either in isolated patches in hollows in tops of the earlier ditches or when it fell deeper into those ditches down the voids and soft sediments of the post-pipes? There are hints that there may have been more. In trench H, between the ditches of palisade enclosure 1, was a laid chalky layer up to 10cm thick and at least 4m in length [222/238] (Whittle 1997, 71–6, fig. 43, plate 31). The site notebook describes it as containing a number of post-holes [227, 239–41, 246], with [238] described as a 'scoop' with a chalk base. The lowest infill of this scoop [223] also contained a number of post- or stake-holes [234–7]. This was subsequently filled with rubbish including bone deposit [215]. Similar features may be represented by a layer of chalk rubble, c. 10cm thick and at least 3.2m in length [228], recorded by Wessex Archaeology in TWA/F (Whittle 1997, fig. 39), and a 'paddled chalk floor' revealed in TWA/G (Whittle 1997, 69). With the benefit of hindsight, these may be chalk-floored structures, analogous to the better-preserved examples recently identified at Durrington Walls (Parker Pearson 2007, fig. 12.12) and Marden (Leary and Field 2012, fig. 4). They appear to be similar both in character and in dimensions, as that from Marden is 3.8 × 3.3m and, for example, house 851 at Durrington Walls was 4.8 × 5.2m.

If we are correct in suggesting that these features are the remnants of late Neolithic structures, then the settlement could have been extensive. Either Grooved Ware or animal bones with third millennium radiocarbon dates have been recovered from across the area of the palisade enclosures south of the Kennet stream (from trench CC in the west to trench B in the east, across a distance of almost 500m; Whittle 1997, table 30) (Figs 17.2 and 17.6). No information on the finds from the evaluation undertaken by Wessex Archaeology on West Kennet Farm has been published, so the existence of late Neolithic settlement north of the stream is more uncertain.

Discussion

The new dating of the West Kennet palisade enclosures and the identification of a previously unsuspected late Neolithic settlement on the site clearly demand rethinking the place of the West Kennet valley bottom in both the story of Neolithic Avebury and in the wider narrative of the British Neolithic.

The Avebury area in the Neolithic

The revised dating for the construction of the West Kennet palisade enclosures to the decades around 3300 cal BC (some 800 years earlier than previously suggested) places them in an entirely different contemporary context.

The causewayed enclosures at Windmill Hill and Knap Hill (and probably Rybury also) had been constructed several centuries earlier, but they had gone out of use perhaps only a few generations before the West Kennet palisade enclosures were built (Fig. 17.9). Some elderly members of the community which built them may even have remembered gathering within the circuits of the nearby causewayed enclosures for performances in the round. Circularity and enclosure was thus probably an actively remembered, if not living, tradition.

Long barrows were also an active part of the lived experience of the community. Some, West Kennet and perhaps Horslip, had been long abandoned but others, perhaps locally the majority (Millbarrow, South Street, perhaps Easton Down), were probably still in use, and at least one (Beckhampton) may not yet even have been built (Fig. 17.9).

At the time the palisade enclosures were constructed, the primary early Neolithic use of Windmill Hill had come to an end. There was, however, clearly later Neolithic activity around the circuits, particularly in the north-east quadrant of the outer ditch. Here, a major recut has been identified in the ditch in trench B, which may be also visible in Keiller's section across outer ditch III (Whittle *et al*. 2011, fig. 3.14). There are also third millennium radiocarbon dates on samples from the outer ditch in trenches B, C, outer ditch I and outer ditch V (Whittle *et al*. 2011, table 3.2). It is not clear whether activity extended around the whole circuit, as no late radiocarbon dates were obtained from trench A on the other side of the circuit, and the section here shows no clear recut (Whittle *et al*. 1999, fig. 81). Figure 17.10 shows a chronological model for the date of later Neolithic activity at Windmill Hill, including the relative sequence of samples inferred from stratigraphy (Whittle *et al*. 2011, 88–91). Whilst episodic activity clearly continued for much of the third millennium, it seems likely that the major recutting episode in the outer ditch dates to the thirty-first or thirtieth century cal BC and thus post-dates the construction of the palisade enclosures.

At the time when there was a hiatus in activity in the valley bottom, between the use of the palisade enclosures and the foundation of the Grooved Ware settlement, the enclosure at Longstones was constructed. Figure 17.11 shows a chronological model for this enclosure, interpreting the dated antler from trench 23 as collected for digging the ditch.[3] The latest of these thus provides a *terminus post quem* for its construction. As far as we know, next in the local sequence came the initial construction of the massive henge ditch at Avebury (Fig. 17.9). Further elements were added to the Avebury henge through the middle centuries of the third millennium.

The Grooved Ware settlement at West Kennet was then established *−40–140 years (95% probability; WK_Silbury*; Fig. 17.12) before the completion of the lower organic mound at the centre of Silbury Hill, probably *1−85 years* before (*68% probability*). The settlement seems to have been occupied through the twenty-fifth, twenty-fourth and twenty-third centuries cal BC during the time when people were constructing and enlarging the mound at Silbury. Occupation endured here, however, after the mound was finished. It continued until the end of the millennium, well into the currency of Beakers in the Avebury Area (Fig. 17.13).

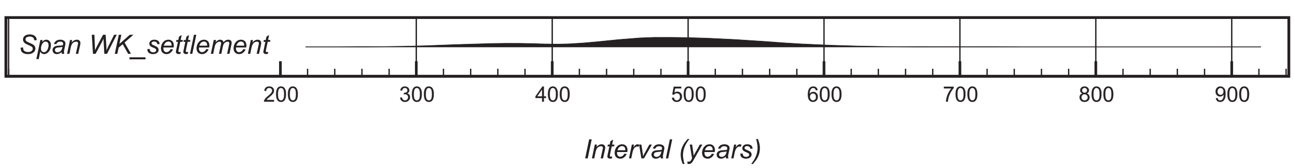


Figure 17.7. Probability distribution for the number of years during which settlement activity occurred at West Kennet, derived from the model defined in Figure 17.6.

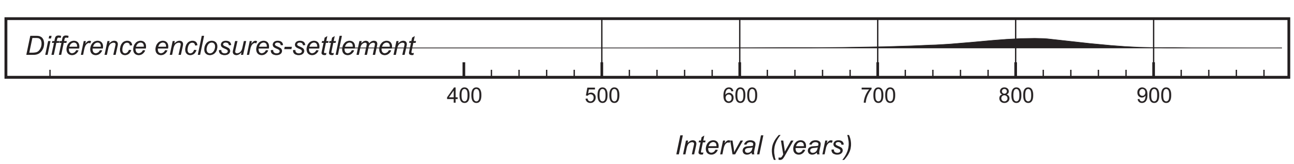


Figure 17.8. Probability distributions for the number of years between the constructions of the palisaded enclosures and the Grooved Ware settlement at West Kennet (derived from the models shown in Figs 17.3 and 17.6).

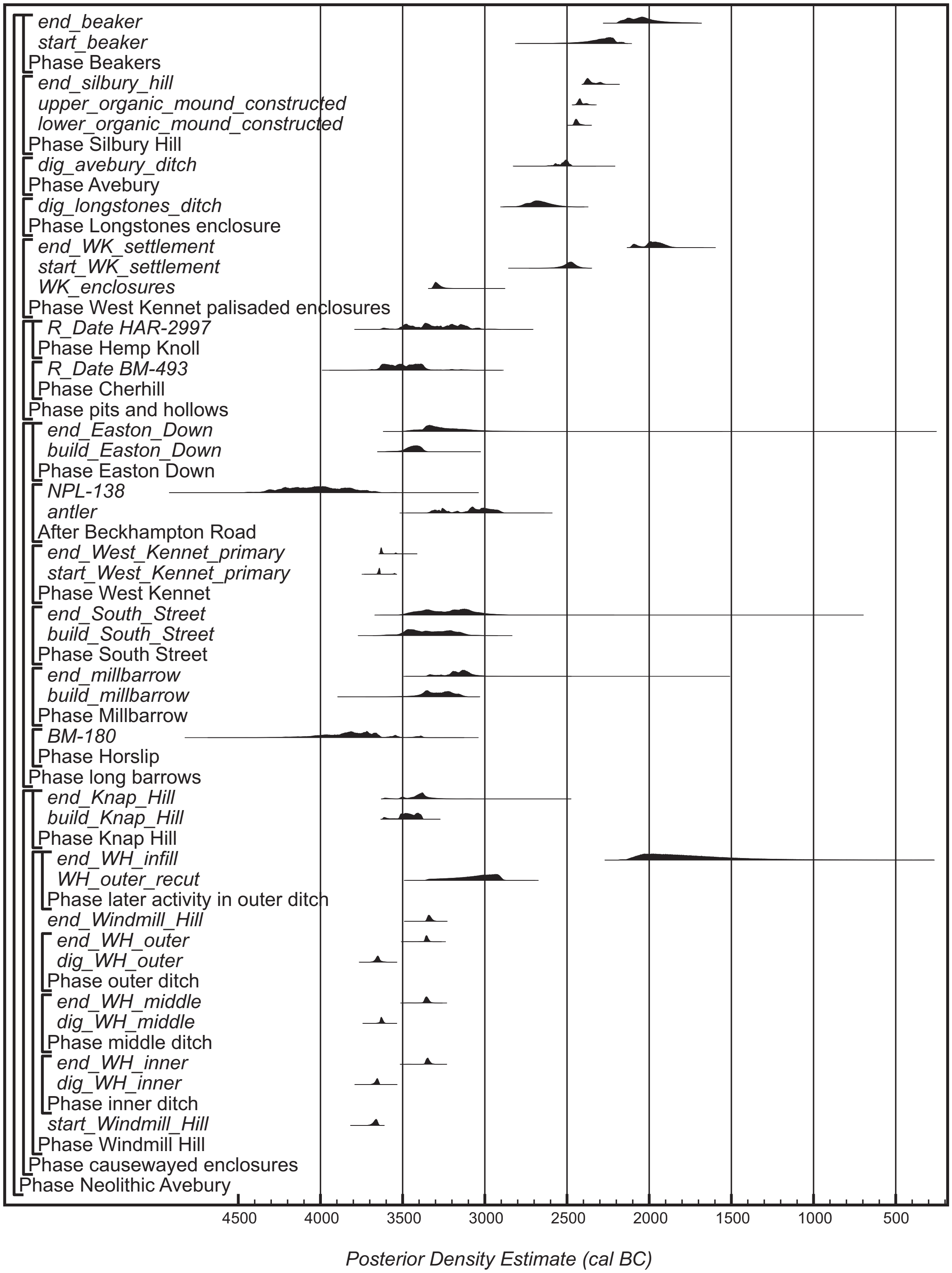


Figure 17.9. Probability distributions of dates from Neolithic activity in the Avebury area. Distributions have been taken from the models defined in Whittle et al. *(2011, figs 3.8–11, Windmill Hill), Figure 17.10 (Windmill Hill – ditch recut), Whittle* et al. *(2011, fig. 3.25, Knap Hill; fig. 3.31, Horslip; fig. 3.30, Millbarrow; fig. 3.31, South Street, Beckhampton and Easton Down; fig. 14.52, Cherhill), Bayliss* et al. *(2007b, figs 6–7, West Kennet long barrow), Figure 17.3 (West Kennet enclosures); Figure 17.6 (West Kennet settlement); Figure 17.11 (Longstones enclosure), Healy (2016, fig. 6, Avebury); Marshall* et al. *(2013, fig. 4.5, Silbury Hill) and Figure 17.12 (Beakers in the Avebury area); recalculated as necessary using IntCal13 (Reimer* et al. *2013).*

Rings of fire

The West Kennet palisade enclosures seem to have been constructed as a single episode in the decades around 3300 cal BC (Fig. 17.5). In a southern British context, this places them well after the time when new causewayed enclosures were established and after all but a few had gone out of use (Whittle *et al*. 2011, figs 14.12, 14.28). With them had gone Decorated and Plain Bowl pottery and the long-distance networks evidenced by the widespread distribution of polished stone axes far from their source (Whittle *et al*. 2011, fig. 14.145).

But there was continuity from earlier Neolithic times. Long barrows and cairns, not least in the immediate surroundings of the West Kennet palisade enclosures, continued to be constructed and used (Fig. 17.9). The focus of monument construction had, however, moved to the linear form of the cursus. These are notoriously difficult to date, largely due to an almost complete absence of finds, and no example has more than a handful of radiocarbon dates.

A model for the currency of cursus and related monuments in southern Britain is shown in Figure 17.14. This model is largely based on the data and interpretations set out by Barclay and Bayliss (1999, tables 2.1–2), augmented by additional measurements on samples from the primary ditch fills of the Stonehenge Greater cursus (Thomas *et al*. 2009), the Potlock cursus (Beamish 2009) and the Aston on Trent cursus (Loveday 2012) (Table 17.2). There are also now estimates for the dates of the Maiden Castle long mound and Godmanchester cursus derived from Bayesian chronological modelling of the complexes of which these monuments form part (Whittle *et al*. 2011, figs 3.8–11, 6.15).[4]

This model suggests that the construction of cursus and similar linear monuments in southern Britain may fall into a more concentrated horizon that previously suggested (*contra* Whittle *et al*. 2011, fig. 14.44). They were built between *3665–3400 cal BC (95% probability; start linear monuments*; Fig. 17.14), probably *3550–3415 cal BC (68% probability)*, and *3320–2940 cal BC (95% probability; end linear monuments;* Fig. 17.14), probably *3295–3085 cal BC (68% probability)*. The current lack of radiocarbon dates from primary contexts that clearly fall after the plateau of the calibration curve in the last centuries of the fourth millennium cal BC suggests that the construction of this type of monument probably did not continue to the end of the plateau at c. 3000 cal BC. Rather, few if any seem to have been constructed after the thirty-second century cal BC.[5]

The West Kennet palisade enclosures, however, were clearly constructed during the period when cursus and related monuments were the norm (*91% probable)*. Despite their circularity, there are many similarities. First, there is the sheer scale of construction. With a continuous palisade 2.2km long, the West Kennet enclosures are analogous in scale to classic cursus sites (Loveday 2006, 26–7). Together they enclose an area of c. 10ha, similar to the Dorchester upon Thames cursus (at 9.9ha) or the Avebury henge itself (at 11.4ha; Loveday 2006, 131–2). They are located in the valley bottom adjacent to the river Kennet (indeed enclosure 1 straddles the stream). In this they mirror the

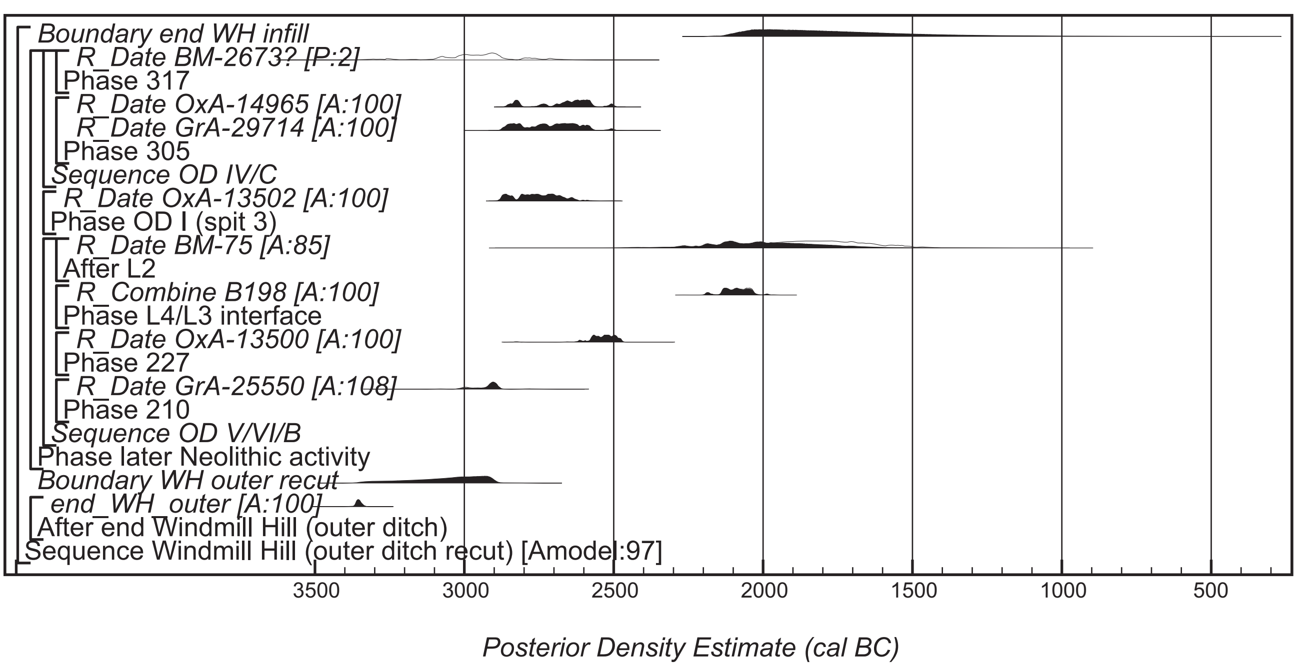


Figure 17.10. Probability distributions of dates for late Neolithic activity on Windmill Hill. The distribution 'end_WH_outer' is taken from the model defined by Whittle et al. *(2011, figs 3.8–11), recalculated using IntCal13 (Reimer et al. 2013). The format is identical to that of Figure 17.3. The large square brackets down the left-hand side of the diagram, along with the OxCal keywords, define the overall model exactly.*

long-established juxtapostioning of cursus monuments and rivers. Finally, as previously described, both cursus monuments and the West Kennet palisade enclosures are almost devoid of finds of any kind.

Palisades are also part of the contemporary repertoire of the third quarter of the fourth millennium cal BC. There were certainly wooden palisades at some causewayed enclosures: at Orsett and Crickley Hill, and less certainly at Eton Wick and Haddenham. Those at Orsett and Crickley Hill were definitely burnt down, the latter during a violent attack. The dating of Haddenham is particularly insecure (Whittle *et al*. 2011, fig. 6.9), but the other three palisades probably fall in the latter part of the currency of causewayed enclosures in the thirty-fifth or earlier thirty-fourth centuries cal BC (Whittle *et al*. 2011, figs 7.10, 8.5, 9.7–10). In scale these palisades seem slighter than those from West Kennet; that at Orsett, for example, was about 1.1km long but was set in a palisade trench only 0.75m deep.

Late in the history of its use, perhaps only a generation or two before the construction of the palisade enclosures at West Kennet (Fig. 17.15), there were also massive works on the top of Hambledon Hill which would have required over a third of the total labour input of the whole complex, totalling over 16,690 worker days (Mercer 2008). This included earthen outworks and palisades along the southern and western sides of the hill, and also perhaps some rebuilding of the eastern entrance. In all approaching 3km of earthwork and palisade were constructed, making this enterprise analogous in scale those of the major cursus monuments.

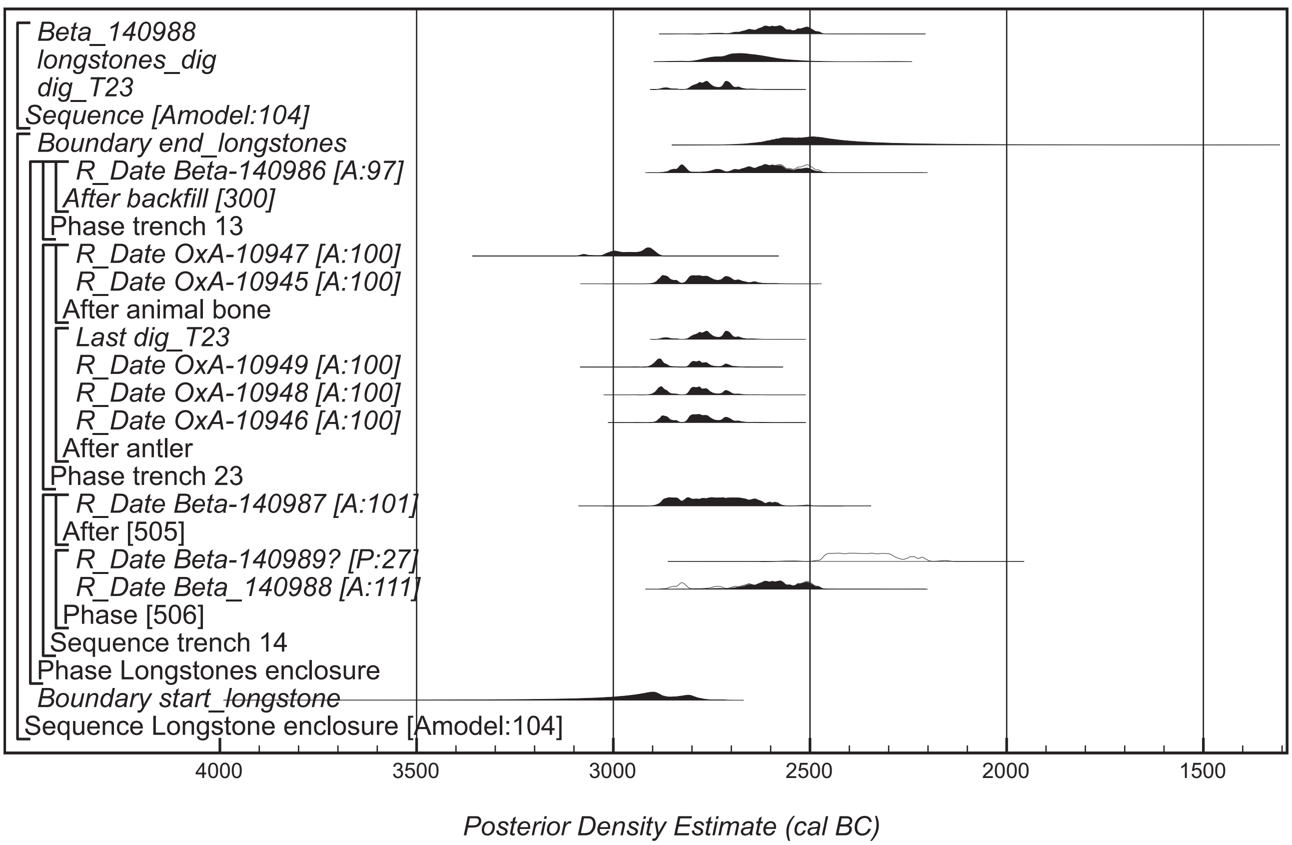


Figure 17.11. Probability distributions of dates from the Longstones enclosure. The format is identical to that of Figure 17.3. The large square brackets down the left-hand side of the diagram, along with the OxCal keywords, define the overall model exactly (http://c14.arch.ox.ac.uk/).

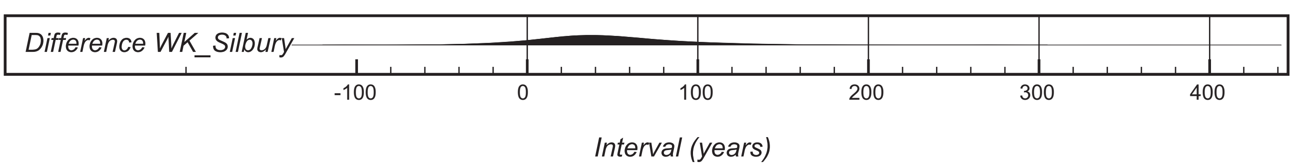


Figure 17.12. Probability distributions for the number of years between the foundation of the Grooved Ware settlement at West Kennet and completion of the lower organic mound in the centre of Silbury Hill (derived from parameters illustrated in Fig. 17.9).

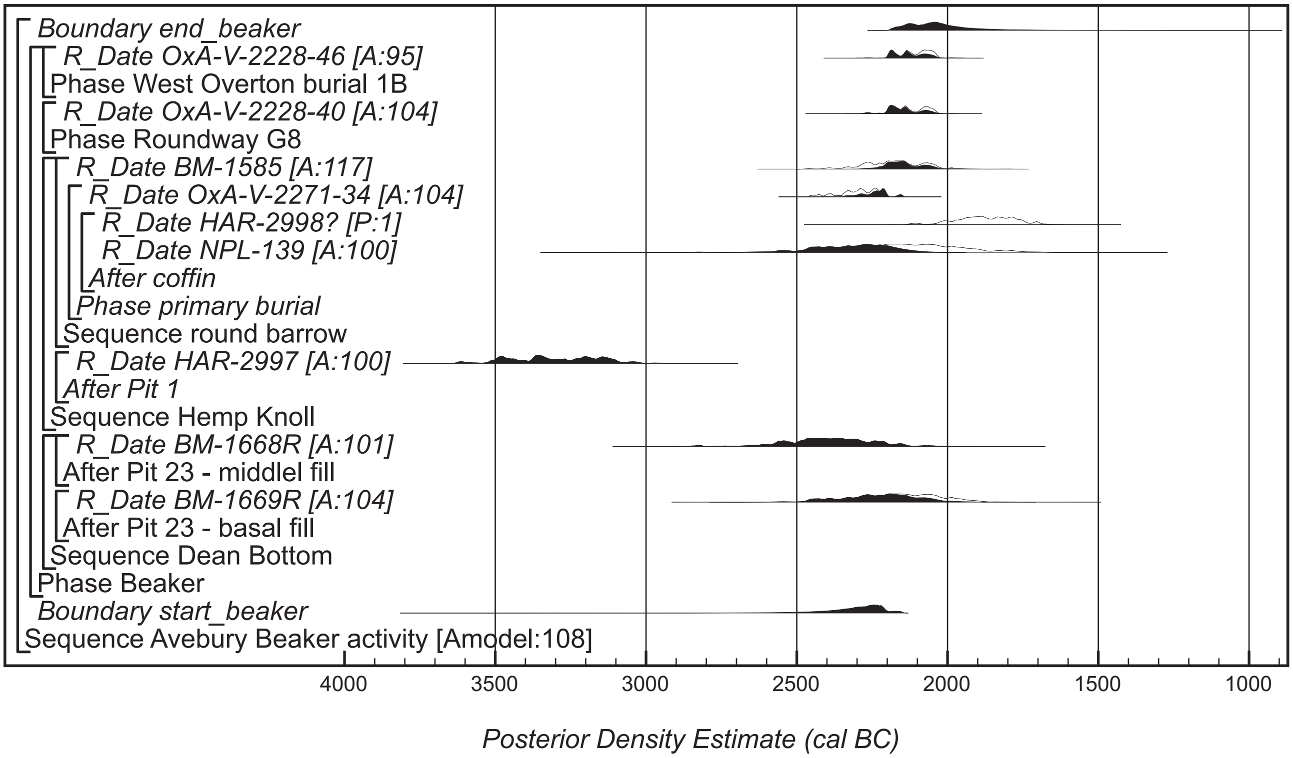


Figure 17.13. Probability distributions of dates associated with Beaker pottery in the Avebury area. The format is identical to that of Figure 17.3. The large square brackets down the left-hand side of the diagram, along with the OxCal keywords, define the overall model exactly (http://c14.arch.ox.ac.uk/).

Table 17.2. Radiocarbon and stable isotope measurements from selected English cursus.

Laboratory code	*Sample and context*	*Radiocarbon Age (BP)*	*δ¹³C (‰)*
Aston on Trent (Loveday 2012)			
Beta-100928	Waterlogged twig from the basal fill of the cursus ditch	4780±70	
Potlock (Beamish 2009)			
KIA-2768	Unknown sample from the basal fill of the cursus ditch	4465±30	
Stonehenge Greater (Thomas *et al*. 2009)			
OxA-17953	Antler, red deer, battered frontal tine from below primary chalk rubble (context 032) at base of western ditch terminal in Tr 26	4716±34	−21.7
OxA-17954	Replicate of OxA-17953	4695±34	−21.6
OxA-1403	Antler, red deer, from base of ditch	4100±90	−21.0 (assumed)

The impact of the West Kennet enclosures on what came after is harder to assess. Especially if construction of cursus monuments was, as we have suggested, largely confined to the third quarter of the fourth millennium cal BC, it is hard to identify monuments of the thirty-second or thirty-first centuries cal BC in southern Britain. Dating of both timber circles and stone circles is scant and generally of poor quality, although neither seem to have appeared in any numbers before 3000 cal BC (Gibson 1998, fig. 39; Griffths and Richards 2013, 282–9). Small single-ditched enclosures at Stonehenge and Flagstones probably date to this period (Fig. 17.15), although neither had a palisade. Whether the Aubrey Holes at Stonehenge contained timber posts or stones, if they were constructed at the time the first cremation deposits were placed in them these do not predate the thirty-first century cal BC.

Grooved Ware settlement

The recognition of the eroded remnants of Grooved Ware settlement in Wessex is extremely difficult. Only recently, with large-scale open area excavations, have structures been identified at Durrington Walls (Parker Pearson 2007) and Marden (Leary and Field 2012). The settlement at West Kennet is similarly located in close proximity to a major late Neolithic monument that was under construction during

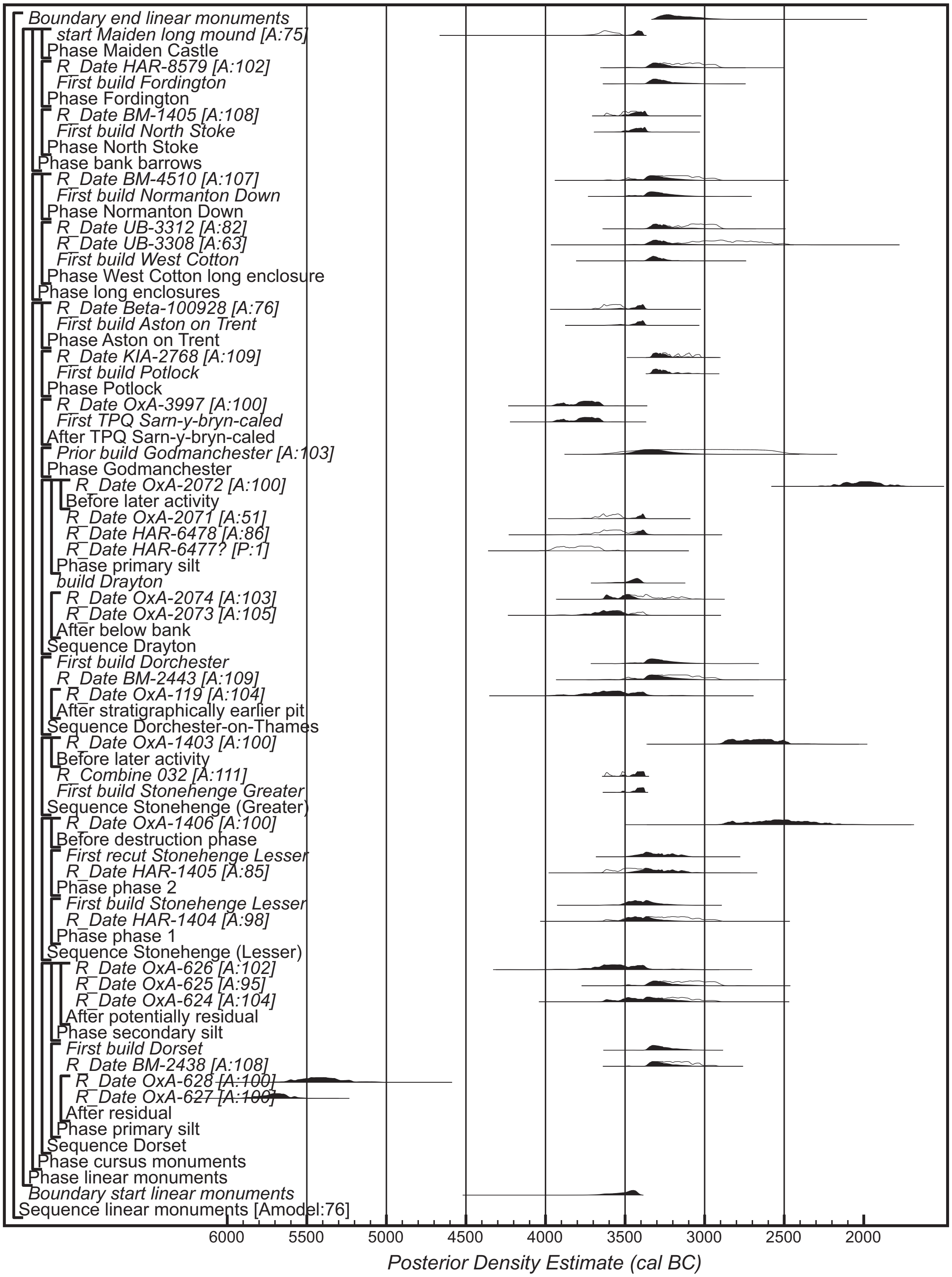


Figure 17.14. Probability distributions of dates from Neolithic linear monuments. Details of the radiocarbon dates from cursus monuments included in the model are given in Barclay and Bayliss (1999, table 2.1), apart from the distribution that has been taken from the model defined in Whittle et al. *(2011, fig. 6.15, Godmanchester) and the dates given in Table 17.2. Details of the radiocarbon dates from bank barrows included in the model are given in Barclay and Bayliss (1999, table 2.2), apart from the distribution that that has been taken from the model defined in Whittle* et al. *(2011, figs 4.41–5, Maiden Castle). The distributions for* Godmanchester *and* Maiden Castle *have been recalculated using IntCal13 (Reimer* et al. *2013). The large square brackets down the left-hand side of the diagram, along with the OxCal keywords, define the overall model exactly (http://c14.arch.ox.ac.uk/).*

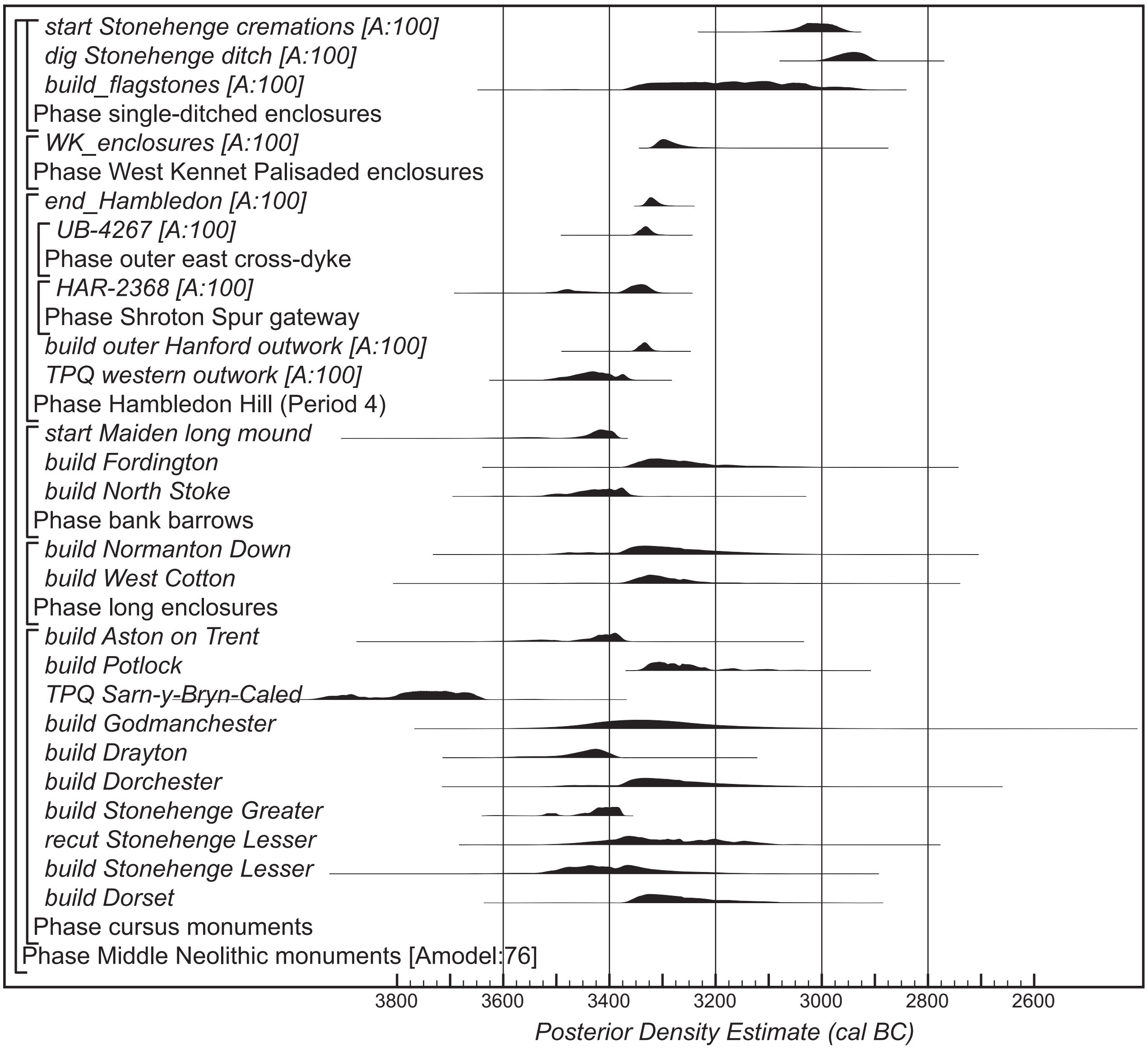


Figure 17.15. Key parameters for estimated dates of construction for selected middle Neolithic monuments in England. Distributions have been taken from the models defined in Figures 17.5 and 17.14, Whittle et al. *(2011, figs 4.7–13, Hambledon Hill; fig. 4.48, Flagstones) and Marshall* et al. *(in prep. b, figs 7.1–4, Stonehenge).*

the period when the settlement was occupied. Similarities extend not only to the form of the houses, but also to the repertoire of ceramic forms that were used and to an economic dependence on pig husbandry. The composition of both the faunal assemblage and the range of vessel forms at West Kennet is consistent with feasting perhaps associated with the process of monument construction (Gillings and Pollard 2016), although in apparent contrast to both this suggestion and the short-lived nature of the settlement at Durrington Walls, that at West Kennet seems to have endured (the duration of the Marden settlement is currently unknown).

Despite their close similarities in scale and form, discussion of West Kennet in relation to late Neolithic palisaded enclosures is now something of a red herring. It is clear that typology can be extremely misleading. A model for the chronologies of palisaded enclosures in Britain is shown in Figures 17.16, a–b (based on data listed in Table 17.3) and Figure 17.17. Constructions are estimated to be shortly after the latest dated palisade posts, with constraining dates on material from later activity being available at Meldon Bridge and Dunragit. It is clear that the palisades set within continuous ditches at West Kennet are not contemporary with similar continuous fence lines

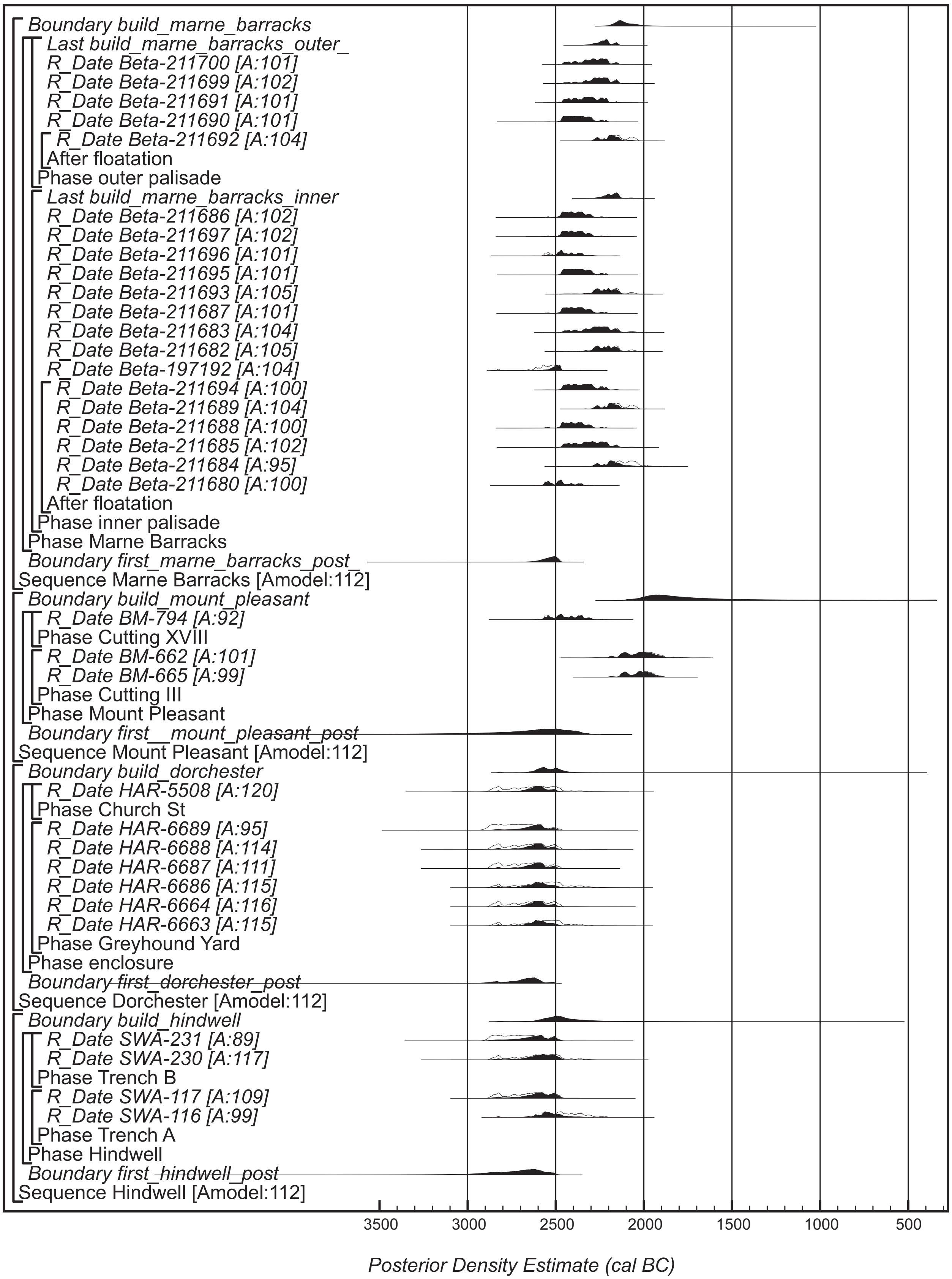
Table 17.3. Radiocarbon and stable isotope measurements from selected English and Welsh palisaded enclosures.

Laboratory code	*Sample and context*	*Radiocarbon Age (BP)*	*δ[13]C (‰)*
Hindwell, Powys (Gibson 1999)			
SWA-116	Charcoal, oak, from outer rings of post 1 spit 3	3960±70	
SWA-117	Wood, oak, from outer rings of post 4 spit 3	4070±70	
SWA-230	Charcoal, oak, from outer rings of post 2, enclosure perimeter	4040±80	
SWA-231	Charcoal, oak, from outer rings of post 3, enclosure perimeter	4130±80	
Mount Pleasant, Dorset (Wainwright 1979)			
BM-794	Domestic animal bone, *Bos* sp. (R. Harcourt), from refilled cavity in palisade trench (pit XVI)	3956±45	
BM-665	Charcoal, *Quercus robur* (G.C. Morgan) from layer of ash in palisade trench	3645±43	
BM-662	Antler, *Cervus elaphus* L. (R. Harcourt) pick, from packing of palisade trench	3637±63	
Dorchester, Greyhound Yard, **Dorset** (Woodward *et al.* 1993)			
HAR-6663	Antler, *Cervus elaphus L.*, frontal bone and skull attached to antler, from layer 4947, the chalk ramp of post pit 4885	4020±80	−23.8
HAR-6664	Antler, *Cervus elaphus L.*, base and shaft, mature and shed, from a primary deposit in postpipe 4165, layer 4166, pit 4163	4070±70	−23.6
HAR-6686	Charcoal, *Quercus* sp. crushed and broken large timbers, from the infill on the outer edge of postpit layer 1648, pit 1635, postpipe 1647	4020±80	−27.0
HAR-6687	Charcoal, *Quercus* sp. crushed and broken large timbers, from 'festoons' of charcoal along the edge of the inner postpipe, layer 1649, pit 1635, postpipe 1647	4090±70	−25.9
HAR-6688	Charcoal, *Quercus* sp. large timbers, from 'festoons' of charcoal in the lower postpipe fill; layer 1653, pit 1631, postpipe 1639	4080±70	−26.5
HAR-6689	Charcoal *Quercus* sp. large timbers, from the fill of postpipe 1642, layer 1642, pit 1631	4140±90	−26.3
Dorchester, Church Street, **Dorset** (Woodward *et al.* 1993)			
HAR-5508	Charcoal *Quercus* sp. from pit	4060±90	−26.5
Marne Barracks, North Yorkshire (Hale *et al.* 2009)			
Inner palisade			
Beta-197192	Charcoal, *Quercus* sp. outer rings of *in situ* outer post [394]	4030±40	
Beta-211680	Charcoal, *Quercus* sp. from outer post [511]	3960±40	
Beta-211682	Charcoal, *Quercus* sp. outer rings of *in situ* outer post [532]	3780±40	
Beta-211683	Charcoal, *Quercus* sp. outer rings of *in situ* inner post [534]	3810±50	
Beta-211684	Charcoal, *Quercus* sp. from inner post [560]	3730±50	
Beta-211685	Charcoal, *Quercus* sp. from inner post [566]	3840±50	
Beta-211687	Charcoal, *Quercus* sp. outer rings of *in situ* outer post [3578]	3900±40	
Beta-211688	Charcoal, *Quercus* sp. from outer post [5178]	3910±40	
Beta-211689	Charcoal, *Quercus* sp. from inner post [592]	3750±40	
Beta-211693	Charcoal, *Quercus* sp. outer rings of *in situ* inner post [610]	3780±40	
Beta-211694	Charcoal, *Quercus* sp. from outer post [616] of inner palisade	3870±40	
Beta-211695	Charcoal, *Quercus* sp. from outer post [697]	3890±40	
Beta-211696	Charcoal, *Quercus* sp. outer rings of *in situ* inner post [698]	3950±40	
Beta-211697	Charcoal, *Quercus* sp. outer rings of *in situ* inner post [709]	3910±40	

(Continued)

Table 17.3. Radiocarbon and stable isotope measurements from selected English and Welsh palisaded enclosures. (Continued)

Laboratory code	*Sample and context*	*Radiocarbon Age (BP)*	*δ^{13}C (‰)*
Outer palisade			
Beta-211686	Charcoal, *Quercus* sp. outer rings of *in situ* inner post [573]	3910±40	
Beta-211690	Charcoal, *Quercus* sp. outer rings of *in situ* outer post [596]	3890±40	
Beta-211691	Charcoal, *Quercus* sp. outer rings of *in situ* outer post [603]	3850±40	
Beta-211692	Charcoal, *Quercus* sp. from outer post [608]	3750±40	
Beta-211699	Charcoal, *Quercus* sp. outer rings of *in situ* outer post [751]	3810±40	
Beta-211700	Charcoal, *Quercus* sp. outer rings of *in situ* outer post [778]	3830±40	
Beta-211701	Charcoal, *Quercus* sp. outer rings of *in situ* post [850]	>46,000	
Dunragit (Thomas 2015)			
SUERC-2099	Charcoal, oak, well sealed in uppermost fill (010) of posthole	7535±35	−25.9
SUERC-2104	Charcoal, hazel, from fill (048) of large pit [050] near the innermost ring of the later Neolithic enclosure	4085±35	−26.3
SUERC-2106	Charcoal, hazel, from fill (004) of large pit [050] near the innermost ring of the later Neolithic enclosure	4055±35	−24.8
SUERC-2107	Carbonised hazel nutshell, from the basal fill (049) of a large pit 050 near the innermost ring of the Later Neolithic enclosure	4150±35	−29.3
SUERC-2108	Charcoal, hazel, from primary gravel fill (244) first-phase posthole of inner ring of later Neolithic enclosure	4025±35	−25.3
SUERC-2109	Charcoal, oak, from fill (048) of large pit [050] near the innermost ring of the later Neolithic enclosure	4025±35	−25.3
SUERC-36378	Bone, calcined (unidentified), from discrete cremation deposit (227) at base of secondary recut (217) within large posthole [215] forming part of the second inner palisade ring	4125±30	−24.4
Meldon Bridge (Burgess 1976; Speak and Burgess 1999)			
GU-1048	Charcoal, unidentified bulk sample, from the packing (LY77 L13.12) of a main perimeter post pit	3800±80	−26.2
HAR-796	Charcoal, unidentified bulk sample, from base of weathering cone B03 of timber post of large timber enclosure. The residue of the sample was identified as oak	4280±80	
HAR-797	Charcoal, unidentified bulk sample, from base of weathering cone D02 of timber post of large timber enclosure. The residue of the sample was identified as oak	4100±130	
SRR-648	Charcoal, unidentified bulk sample, from base of weathering cone BF1 of timber post (LY 74 BF 1/d/6 B01) of large timber enclosure, formed after destruction of timber post in insertion pit BF1	3730±70	
Forteviot (Noble and Brophy 2011)			
SUERC-21564	Charcoal, *Quercus*, non-heartwood, from context 159/066	4155±40	−25.2±0.2
SUERC-21565	Charcoal, *Quercus*, non-heartwood, from context 150/058	4250±40	−25.9±0.2
SUERC-21570	Charcoal, *Quercus*, non-heartwood, from context 121/SF061	3965±40	−25.7±0.2
SUERC-21571	Charcoal, *Quercus*, non-heartwood, from context 118/SF051	4065±40	−26.2±0.2
SUERC-21572	Charcoal, *Quercus*, non-heartwood, from context 103/050	4140±40	−24.2±0.2
SUERC-21573	Charcoal, *Quercus*, non-heartwood, from context 032/053	4025±40	−24.7±0.2
SUERC-21574	Charcoal, *Quercus*, non-heartwood, from context 044/043	4065±40	−25.8±0.2
SUERC-21575	Charcoal, *Quercus*, non-heartwood, from context 112/SF020	4070±40	−25.8±0.2
Blackshouse Burn (Lelong and Pollard 1998)			
GU-1983	Waterlogged wood, *Quercus*, outer heartwood, from posthole 140	4035±55	−25.3


Boundary build_marne_barracks
Last build_marne_barracks_outer_
R_Date Beta-211700 [A:101]
R_Date Beta-211699 [A:102]
R_Date Beta-211691 [A:101]
R_Date Beta-211690 [A:101]
R_Date Beta-211692 [A:104]
After floatation
Phase outer palisade
Last build_marne_barracks_inner
R_Date Beta-211686 [A:102]
R_Date Beta-211697 [A:102]
R_Date Beta-211696 [A:101]
R_Date Beta-211695 [A:101]
R_Date Beta-211693 [A:105]
R_Date Beta-211687 [A:101]
R_Date Beta-211683 [A:104]
R_Date Beta-211682 [A:105]
R_Date Beta-197192 [A:104]
R_Date Beta-211694 [A:100]
R_Date Beta-211689 [A:104]
R_Date Beta-211688 [A:100]
R_Date Beta-211685 [A:102]
R_Date Beta-211684 [A:95]
R_Date Beta-211680 [A:100]
After floatation
Phase inner palisade
Phase Marne Barracks
Boundary first_marne_barracks_post_
Sequence Marne Barracks [Amodel:112]
Boundary build_mount_pleasant
R_Date BM-794 [A:92]
Phase Cutting XVIII
R_Date BM-662 [A:101]
R_Date BM-665 [A:99]
Phase Cutting III
Phase Mount Pleasant
Boundary first__mount_pleasant_post
Sequence Mount Pleasant [Amodel:112]
Boundary build_dorchester
R_Date HAR-5508 [A:120]
Phase Church St
R_Date HAR-6689 [A:95]
R_Date HAR-6688 [A:114]
R_Date HAR-6687 [A:111]
R_Date HAR-6686 [A:115]
R_Date HAR-6664 [A:116]
R_Date HAR-6663 [A:115]
Phase Greyhound Yard
Phase enclosure
Boundary first_dorchester_post
Sequence Dorchester [Amodel:112]
Boundary build_hindwell
R_Date SWA-231 [A:89]
R_Date SWA-230 [A:117]
Phase Trench B
R_Date SWA-117 [A:109]
R_Date SWA-116 [A:99]
Phase Trench A
Phase Hindwell
Boundary first_hindwell_post
Sequence Hindwell [Amodel:112]
3500
3000
2500
2000
1500
1000
500
Posterior Density Estimate (cal BC)

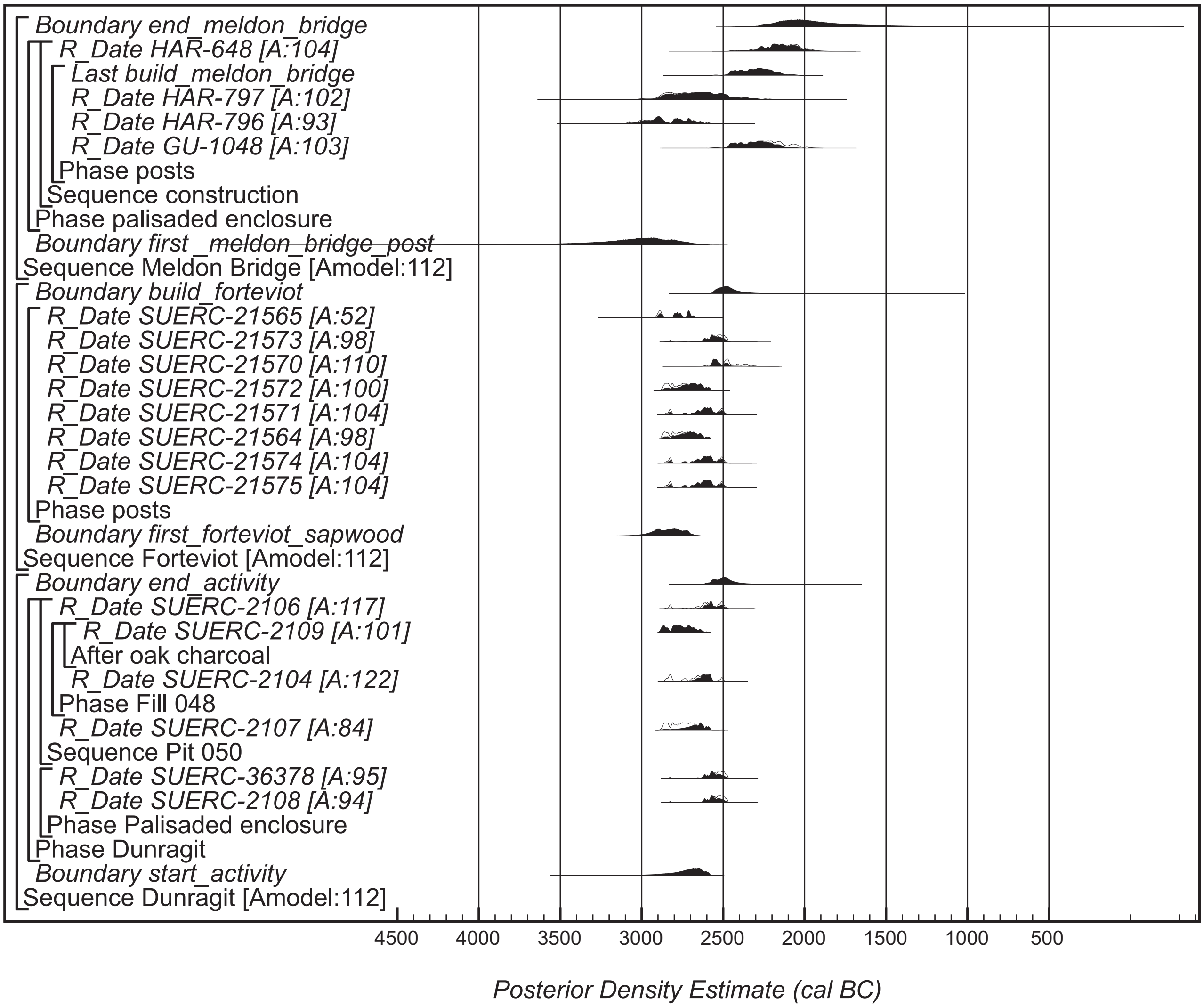


Figure 17.16 a–b. Probability distributions of dates from other palisade enclosures in Britain. The format is identical to that of Figure 17.3.

at Mount Pleasant and Marne Barracks (*contra* Noble and Brophy 2011, 75). Gibson (2002, 6) suggests that the Scottish sites, with closely spaced timber posts in pits, were the earliest form. This is clearly also not the case, unless the West Kennet examples are defined as something entirely different.[6]

Conclusions

The radiocarbon dating and chronological modelling on samples from Alasdair's excavations at the West Kennet palisaded enclosures was undertaken in the expectation of providing more precise timings for their construction and destruction. Unexpectedly our new dating not only demonstrates that the palisaded enclosures are some 800 years earlier than was originally thought, but re-dating of the palisades has demanded a new explanation for the large assemblages of late Neolithic material recovered from the site. Close reading of the excavation report and the site archive suggests that the Grooved Ware and associated finds were part of an extensive settlement that may have been the 'worker's camp' for Silbury Hill.

It is salutary to reflect that, had the charcoal samples from the 1990s excavations not been carefully preserved by the British Museum or if the palisades had not been destroyed by fire, our site narrative would have been very different and largely in error.

It is a tribute to Alasdair's careful excavations at West Kennet and their prompt and thorough publication that we have been able to propose such a fundamental re-thinking of the site without new fieldwork. On the one hand, this exercise demonstrates the potential of past archives of even very limited interventions (well under 1% of the palisaded enclosures have been excavated); on the other hand, we suspect that without the larger-scale excavations that have recently been undertaken at Durrington Walls and Marden (which have told us what a

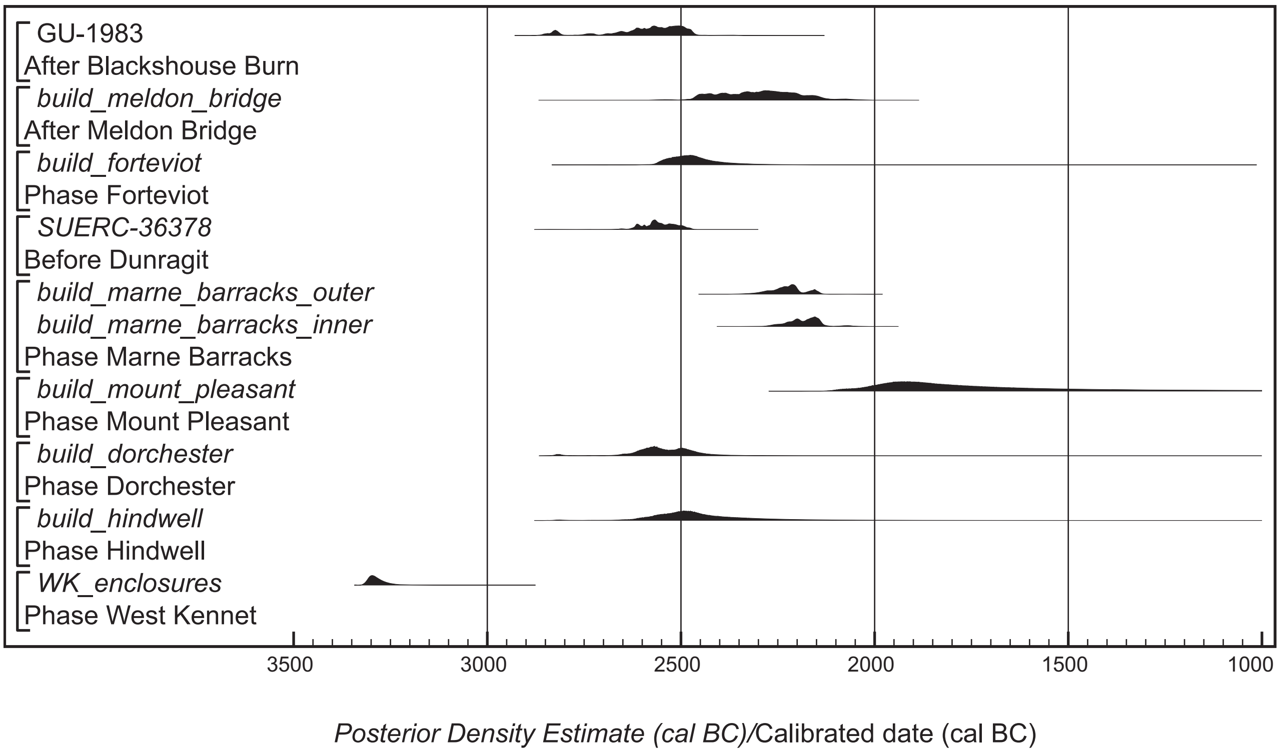


Figure 17.17. Key parameters for palisaded enclosures in Britain, derived from the models defined in Figures 17.3 and 17.16a–b (note that some of the tails of these distributions have been truncated to enable detailed examination of the highest area of probability).

Grooved Ware house in southern Britain looks like), we would have interpreted the late Neolithic finds from West Kennet simply as a spread of occupation debris.

As we were writing this paper, wrapping our new chronologies in their archaeological context, we were conscious of how much more eloquent Alasdair's arguments would have been, and how much enjoyment and stimulation he would have gained from having to rewrite his *prior beliefs* completely!

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Ros Cleal and the trustees of the Alexander Keiller Museum, Avebury, kindly gave us permission to sample the collection, and Ros and Michele Drisse facilitated access to the site archive. Paul Halsted kindly tracked down copies of the MSc theses undertaken on the animal bones from palisade enclosure 1 (Alice Edwards) and palisade enclosure 2 (Martin Horne) at Sheffield University in 1994. Sharon Soutar drew Figure 17.2 and Frances Healy kindly commented on an early draft of this paper. The project was funded by Historic England.

Notes

1 All stable isotopic ratios reported in this paper were measured by Isotope Ratio Mass Spectrometry (IRMS).

2 This date range is more compatible with the expected dating of the associated Grooved Ware (Barclay *et al*. 2011, 178–81) than that suggested by Healy (2016).

3 It should be noted that OxA-10945–9 were prepared using the original ultrafiltration protocol used by the Oxford Radiocarbon Accelerator Unit (Bronk Ramsey *et al*. 2000), which was subsequently shown to produce ages that could be slightly too old (Bronk Ramsey *et al*. 2004). We have thus incorporated these measurements in the model as *termini post quos* only, using the AFTER function of OxCal.

4 Series of luminescence ages from the Eynesbury and Stanwell C1 cursus ditches are not included in this model, as they appear problematic for technical reasons (Lewis *et al*. 2010, 34; Whittle *et al*. 2011, 285–6); similarly, the radiocarbon dates from the Raunds long mound are not included, as the taphonomy of the dated material from this site is extremely problematic (Whittle *et al*. 2011, 301–3).

5 Although bedevilled by a plethora of radiocarbon dates on samples of charcoal from long-lived species (or unidentified charcoal), analogous constructions in Scotland are probably earlier than the examples from southern Britain (Whittle *et al*. 2011, fig. 14.170).

6 We note here the existence of palisade enclosures of similar form from Denmark attributed to the Funnel Beaker Culture, and thus also probably dating to the last centuries of the fourth millennium cal BC (Brink 2014).

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