Chapter 6
Overview of the Scientific Dating Evidence

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INTRODUCTION

Two chronometric techniques were employed to provide a scientific chronology for Winchester Discovery Centre (CC) and Northgate House (NH). Full details of the radiocarbon and archaeomagnetic sampling and laboratory processing are outlined in the digital report (*Digital Section 19*).

The recovery of a large number of undisturbed *in situ* fired hearths throughout the Saxon sequence from the Northgate House site offered the potential to provide a precise chronology for the site, addressing a series of specific research objectives:

- Did settlement on the site begin before the mid AD 880s (the date derived from Burghal Hidage for the foundation of the Alfredian *burh*)?
- How did the street pattern develop? Were the properties deliberately laid out at one time or did they spread organically from a central core?
- When did occupation of the Saxon properties on the site cease? Did it continue after AD 1066?
- Is it possible to refine the chronologies of the ceramics recovered from the sites?

Table 6.1: List of the hearths sampled for archaeomagnetic dating from Northgate House. N= number of samples per hearth.

	Hearth	*Feature No*	*N*	*Dimensions*
1.	WOA	2156	10	~0.15m thick, 0.6 x 0.45m
2.	WOB	3177	9	~0.10m thick, 1.0 x 1.0m
3.	WOC	5188	8	~0.20m thick, 1.0 x 0.7m
4.	WOD	2391	10	0.02–0.10m thick. Consists of two parts: 0.5 x 1.0m and 1.0 x 1.0m
5.	WOE	4261	8	0.02–0.10m thick, 1.0 x 0.6m
6.	WOF	4430	9	~0.05m thick, 1.0 x 1.3m
7.	WOG	3462	9	~0.03m thick, 3.0 x 0.8m
8.	WOH	3484	8	~0.05m thick. 0.7 x 0.5m
9.	WOI	7513	3	~0.04m thick, 0.5 x 0.2m
		7511	6	~0.07m thick, 0.5 x 0.8m
10.	WOJ	3506	8	0.03–0.10m thick, 1.25 x 1.50m
11.	WOK	4523	9	~0.05m thick, 0.25 x 0.80m
12.	WOL	3576	10	~0.05m thick, 1.0 x 1.4m
13.	WOM	4692	9	~0.04m thick, 1.3 x 1.8m
14.	WON	3680	9	0.02–0.05m thick, 0.8 x 1.0m
15.	WOO	4733	9	0.03–0.04m thick, 0.6 x 0.6m
16.	WOP	3780	9	0.03–0.05m thick, 0.3 x 1.2m

The radiocarbon dating programme also contributes to these objectives, but was principally designed to test the accuracy of the existing archaeomagnetic calibration data for Britain (Clark *et al.* 1988). These dates would also provide additional calibration data for archaeomagnetic directions in this period.

The results of these measurements were calibrated using the archaeomagnetic calibration and radiocarbon calibration curves. The calibrated radiocarbon results and archaeomagnetic results are shown in Tables 6.1–3 and Figs 6.1–2. The ranges in Table 6.2 have been calculated according to the maximum intercept method (Stuiver and Reimer 1986); all other ranges are derived from the probability method (Stuiver and Reimer 1993). Those ranges printed in italics in the text and tables are *posterior density estimates*, derived from the mathematical modelling described below.

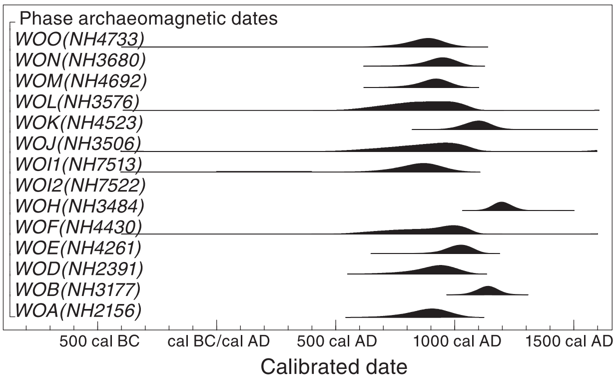

Fig. 6.1 Saxon archaeomagnetic dates from Northgate House, Winchester, calibrated by the probability method (Stuiver and Reimer 1993) using the calibration curve of Zananiri et al. *(2007); distributions have been truncated on the basis of archaeological information to exclude possible dates before 400 BC or after AD 1500*

Table 6.2: Radiocarbon determinations from Northgate House, Winchester

Context & Posterior density Sample Number	*Laboratory Number*	*Material and context*	*Radiocarbon Age (BP)*	$\delta^{13}C$ *(‰)*	*Weighted mean (BP)*	*range (95% confidence)*	*Calibrated date estimate (95% probability)*
<234>(NH3587)A	OxA–17173	charcoal, *Betula* sp., from an occupation horizon within property BW4	1153±25	-25.7		cal AD 780–970	cal AD 830–940
<234>(NH3587)B	SUERC–13907	charcoal, *Salix/Populus* sp., from the same context as OxA–17173	1175±35	-26.8		cal AD 730–970	cal AD 830–940
<232>(NH3578)A	OxA–17172	hazelnut shell from a lens of charcoal associated with the firing of hearth (3576)	1181±27	-26.2		cal AD 770–940	cal AD 770–900
<232>(NH3578)B	SUERC–13906	grain, *Triticum* sp., from the same context as OxA–17172	1065±35	-22.9		cal AD 890–1020	cal AD 890–950
<225>(NH3494)A	OxA–17181	charcoal, *Corylus* sp., from a occupation layer rich in charred plant remains	1138±24	-25.8	1151±18 (T′=0.7; T′(5%) =3.8 Ó=1; Ward and Wilson 1978)	cal AD 780–970	cal AD 910–970
<225>(NH3494)A	OxA–17182	replicate of OxA–17182	1166±25	-25.4			
<225>(NH3494)B	SUERC–13917	charcoal, Pomoideae, from the same context as OxA–17181–2	1105±35	-25.9		cal AD 880–1020	cal AD 900–970
<174>(NH2391)A	OxA–17137	grain, *Avena* sp., from a layer of *in situ* burning within hearth (2391)	1213±27	-23.0		cal AD 690–890	cal AD 840–900 (86%) or 920–950 (9%)
<174 >(NH2391)B	SUERC–13914	grain, *Avena* sp., from the same context as OxA–17137	1165±35	-25.3		cal AD 770–970	cal AD 840–950
<177>(NH2424)A	OxA–17179	charcoal, *Acer* sp., from a layer of charcoal within occupation deposits in property BW4	1130±25	-25.2		cal AD 870–980	cal AD 880–970
<177>(NH2424)B	SUERC–13915	charcoal, Pomoideae, from the same context as OxA–17179	1110±35	-27.9		cal AD 880–1020	cal AD 880–980
<164>(NH2156)A	OxA–17174	charcoal, Pomoideae, from a layer of *in situ* burning associated with the firing of hearth (2156)	1146±27	-27.3		cal AD 780–980	cal AD 780–980
<164>(NH2156)B	SUERC–13908	charcoal, *Salix/Populus*, from the same context as OxA–17174	1030±35	-25.3		cal AD 900–1040	cal AD 900–1010
<237>(NH3664)A	OxA–17178	charcoal, *Prunus* sp., from a layer of *in situ* burning within property BW3	1140±25	-25.0		cal AD 780–980	cal AD 780–790 (1%) or 810–980 (94%)
<237>(NH3664)B	SUERC–13910	charcoal, Pomoideae, from the same context as OxA–17178	1050±35	-26.2		cal AD 900–1030	cal AD 890–1010
<211>(NH3177)A	OxA–17175	charcoal, *Prunus spinosa*, from a layer of *in situ* burnt earth within hearth (3177)	432±24	-25.6		cal AD 1430–1470	cal AD 1420–1490
<550>(NH4697)A	OxA–17177	charcoal, Pomoideae, from a layer of silting forming over the Saxon street surface, sealed below layers of resurfacing	1181±25	-24.8		cal AD 770–940	cal AD 770–890
<550>(NH4697)B	SUERC–13909	charcoal, *Corylus* sp., from the same context as OxA–17177	1140±35	-25.4		cal AD 780–990	cal AD 770–920
<289>(NH4580)A	OxA–17183	hazelnut shell from a discrete charcoal–rich deposit associated with *in situ* burning on hearth (4692)	1172±26	-23.1		cal AD 780–960	cal AD 860–950
<289>(NH4580)B	SUERC–13918	hazelnut shell from the same context as OxA–17183	1115±35	-22.7		cal AD 830–1010	cal AD 880–950
<276>(NH4458)A	OxA–17180	grain, *Triticum* sp., from a discrete area of charred plant remains probably representing rake–out from oven (4485)	1027±25	-21.7		cal AD 980–1030	cal AD 970–1040
<276>(NH4458)B	SUERC–13916	grain, *Hordeum* sp., from the same context as OxA–17180	915±35	-25.2		cal AD 1020–1210	cal AD 1020–1090
<262>(NH4373)A	OxA–17176	hazelnut shell from an occupation layer above hearth (4430)	1012±25	-24.1		cal AD 990–1030	cal AD 970–1050 (91%) or 1090–1120 (4%)
<262>(NH4373)B	SUERC–13904	grain, *Triticum* sp., from the same context as OxA–17176	885±35	-20.6		cal AD 1030–1220	cal AD 1050–1230
<285>(NH4507)B	SUERC–13920	grain, *Avena* sp., from a spread of charred material within an occupation horizon	1120±35	-25.7		cal AD 780–1010	cal AD 890–960

Table 6.2: Radiocarbon determinations from Northgate House, Winchester (continued)

<266>(NH4394)A	OxA–17184	charcoal, Pomoideae, from a discrete charcoal spread associated with *in situ* burning on hearth (4261)	1169±26	-27.0	cal AD 780–970	cal AD 910–980
<266>(NH4394)B	SUERC–13919	charcoal, *Prunus* sp., from the same context as OxA–17184	1105±35	-25.9	cal AD 880–1020	cal AD 900–980
<216>(NH3260)A	SUERC–19280	hazelnut shell, *Corylus avellana*, from occupation horizon (3260)	1105±30	-20.6	cal AD 880–1020	cal AD 920–990
<216>(NH3260)B	SUERC–19284	grain, *Avena sativa*, from occupation horizon (3260)	1070±30	-23.9	cal AD 890–1030	cal AD 930–990
<208> (NH3175)B	SUERC–19285	grain, *Triticum aestivum*, from occupation horizon (NH3175)	1240±30	-21.0	cal AD 670–890	cal AD 680–880
(NH3175)A	SUERC–19286	bone, unfused fragments of sternum, from medium mammal (probably sheep or goat) from occupation horizon (NH3175)	1145±30	-20.1	cal AD 770–990	cal AD 940–1000
(NH4379)A	SUERC–19287	bone, cattle rib from occupation horizon (NH4379)	1110±30	-20.9	cal AD 880–1020	cal AD 930–1000
(NH4379)B	SUERC–19288	Bone, cattle carpal, articulated with radius from occupation horizon (NH4379)	1040±30	-21.3	cal AD 900–1030	cal AD 940–1010
(NH6176)	OxA–16713	Bone, human – right ulna shaft fragment.	1901±28	-18.6	cal. AD 30–210	
(NH6177)A	OxA–16757	Charred bread wheat grain, *Triticum aestivum* from the fill of post–hole (NH6178)	1151±26	-23.4	cal. AD 780–980	
(NH6177)B	OxA–16758	Charred bread wheat grain, *Triticum aestivum* from the fill of post–hole (NH6178)	1134±26	-21.7	cal. AD 820–990	
(NH6204)B	OxA–16759	Charred grain, *Triticum aestivum* from from the fill of pit (NH6203)	1177±26	-23.4	cal. AD 770–950	
(NH6204)A	OxA–16775	Charred grain, *Triticum aestivum* from the fill of pit (NH6203)	1145±55	-20.4	cal. AD 720–1020	
(CC3251)A	OxA–16793	Bone, large mammal cf. cattle – rib from holloway (CC3408)	1966±27	-21	40 cal. BC – cal. AD 90	
(CC3251)B	OxA–16794	Tooth, sheep/goat, from holloway (CC3408)	1669±25	-21.2	cal. AD 260–430	

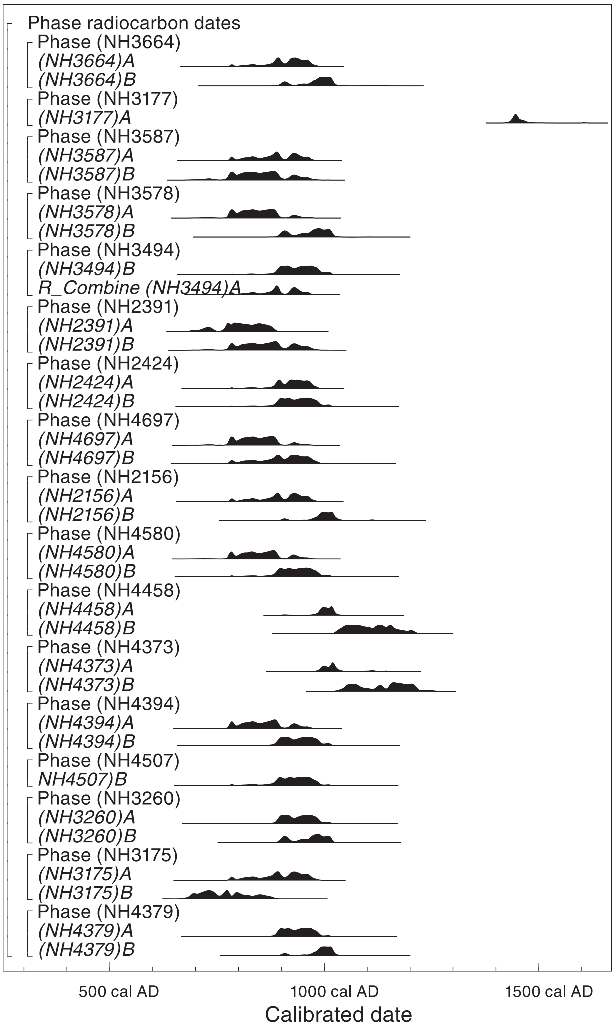

Fig. 6.2 Radiocarbon dates from Northgate House, Winchester, calibrated by the probability method (Stuiver and Reimer 1993) using the calibration curve of Reimer et al. *(2004)*

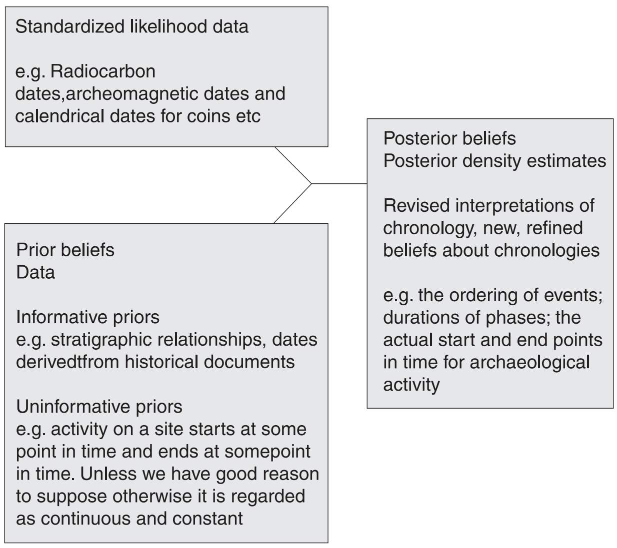

Fig. 6.3 Components of a Bayesian chronological model

Table 6.3: Weighed sample–mean ChRM directions for the hearths from Northgate House, Winchester

(Ê = 51.065˚Δ N, Ï = 1.3169˚ W, SU 47929). Specimen–mean directions for hearth WOI (features 7513 and 7511). Ns= number of data (samples or specimens), K = Fisher concentration parameter. D=declination, I=inclination, ·95=95% cone of confidence about the mean direction. Directions variation corrected. The 95% confidence intervals for the Northgate hearths are also shown. For hearth WOI the specimen–averaged directions are used.

Hearth	ChRM [˚] D	I	·95	Ns	K	Class	Calibrated Date (95% confidence)
WOA	20.4	69.4	3.8	7	252	C	AD 580–AD 1125
WOB	16.6	60.8	2.8	9	333	C	AD 1117–AD 1229
WOC	352.5	66.8	1.9	8	883	A	96 BC–AD 130
WOD	18.7	68.1	2.8	6	584	B	AD 800–AD 1125
WOE	22.7	64.8	3.3	8	269	C	AD 979–AD 1165
WOF	13.7	67.5	2.1	9	625	A	AD 477–AD 1175
WOH	13.6	58.9	2.4	7	652	A	AD 1195–AD 1267
WOI1	20.2	70.8	4.4	19	59	C	AD 559–AD 1084
WOI2	12.9	70.1	3.4	34	52	C	AD 498–AD 1125
WOJ	14.7	67.8	3.9	6	304	C	AD 436–AD 1175
WOK	18.7	62.4	4.3	6	239	B	AD 1065–AD 1245
WOL	13.6	68.1	2.2	8	613	C	AD 498–AD 1148
WOM	22.4	68.9	2.3	6	839	B	AD 880–AD 1093
WON	23.3	67.8	2.9	9	317	A	AD 914–AD 1121
WOO	19.1	69.8	2.5	8	494	A	AD 559–AD 1084
JSB5991	359.2	67.9	2	9	661	??	150 BC–AD 130
JSB1572	346.3	66	2.4	11	477	??	96 BC–AD 25
SG1–8	30.7	65.9	2.6	6	646	A	AD 975–AD 1102

A Bayesian statistical chronological model was used for the analysis and interpretation of the calibrated archaeomagnetic and radiocarbon results. A Bayesian chronological model consists of three fundamental components—the 'standardised likelihoods' and 'prior information' which are the inputs of the model, and the 'posterior beliefs' which are the output (Fig. 6.3). In this case, the probability distributions of calibrated archaeomagnetic and radiocarbon dates, and calendrical dates derived from coins, form the 'standardised likelihoods'. The 'prior information' consists of the relative dating provided by the stratigraphic sequence and our statistical assumption that activity on the site was continuous (see Bayliss 2007 and Bayliss *et al.* 2007 for further discussion of building chronological models).

THE FOUR SAXON TENEMENTS

Scientific dating is available from four tenements, and four Saxon coins were recovered from the excavations, three of which can be associated with the properties. Two archaeomagnetic dates are available from hearths in Property BW 6 (WOI1 and WOI2), and must date the use of this tenement. These deposits cannot be related by stratigraphy.

Scientific dates are available from three sequential deposits in Property BW 5 (Fig. 6.4). Two statistically consistent radiocarbon measurements are available from two oat grains dated from a layer of *in situ* burning (NH2391) (OxA-17137 and SUERC-13914; T'=1.2; T'(5%)=3.8; df=1), along with an archaeomagnetic date on the same feature (WOD NH2391). Later than this deposit are two statistically consistent results on fragments of short-life charcoal from a charcoal-rich layer (NH2424) within occupation deposits in the structure (OxA-17179 and SUERC-13915; T'=0.2; T'(5%)=3.8; n=1). Later again is a hearth, dated by archaeomagnetism (WOA NH2156) and by two statistically inconsistent radiocarbon results on short-life charcoal from an *in situ* layer of

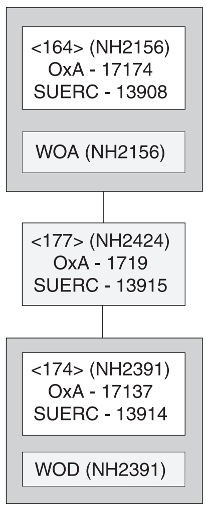

Fig. 6.4 Summary of the relationships between dated deposits in Property BW 5

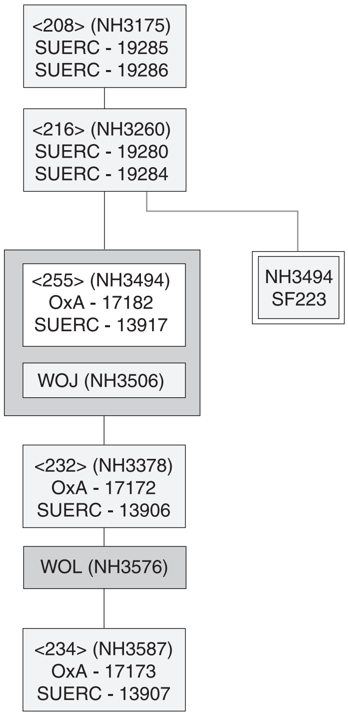

Fig. 6.5 Summary of the relationships between dated deposits in Property BW 4

burning within the hearth (OxA-17174 and SUERC-13908; T′=6.3; T′=3.8; n=1). Because of this inconsistency, the earlier of these two charcoal fragments has been interpreted as redeposited and therefore incorporated into the Bayesian model only as a *terminus post quem* for the end of the use of this phase of activity in the property.

Scientific dates are available from six sequential deposits in Property BW 4 (Fig. 6.5). Two statistically consistent radiocarbon determinations on short-life charcoal fragments are available from an occupation horizon (NH3587) (OxA-17173 and SUERC-13907; T′=0.3; T′(5%)=3.8; n=1). These dates are earlier than a hearth, which has been dated by archaeomagnetism (WOL(NH3576)). Later again are two statistically inconsistent radiocarbon results on short-life material from a lens of charcoal associated with firing hearth (NH3578) (OxA-17172 and SUERC-13906; T′=6.9; T′(5%)=3.8; n=1). Again, because of the inconsistency in the radiocarbon results, the earlier of the two charcoal fragments has been interpreted as redeposited and has only been used as a *terminus post quem* for overlying deposits. Later than this is another hearth dated by archaeomagnetism (WOJ(NH3506)). Two statistically consistent measurements on fragments of short-life charcoal from fuel associated with the firing of this hearth (NH3494) (SUERC-13917 and OxA-17181–2; T′=1.4; T′(5%)=3.8; n=1) are also available. Later than this, are two statistically consistent radiocarbon measurements on charred plant remains from occupation horizon (NH3260) (SUERC-19280 and SUERC-19284; T′=0.7; T′(5%)=3.8; n=1). A silver penny of Edgar or Alfred (SF223) from underlying context (NH3466) provides a *terminus post quem* of 871–975 for occupation layer (NH3260). Two statistically inconsistent radiocarbon results (SUERC-19285 and SUERC-19286; T′=5.0; T′(5%)=3.8; n=1), however, have been obtained from another occupation horizon (NH3175), which is stratigraphically later than (NH3260). The earlier of these, SUERC-19285 on a grain of wheat, has been interpreted as residual and has been included in the model only as a *terminus post quem* for the end of the use of Property BW 4.

Scientific dates are available from three stratigraphic strings in Property BW 3 (Fig. 6.6). A hearth which has been dated by archaeomagnetism (WON(NH3680)) is earlier than two statistically inconsistent radiocarbon results on short-life

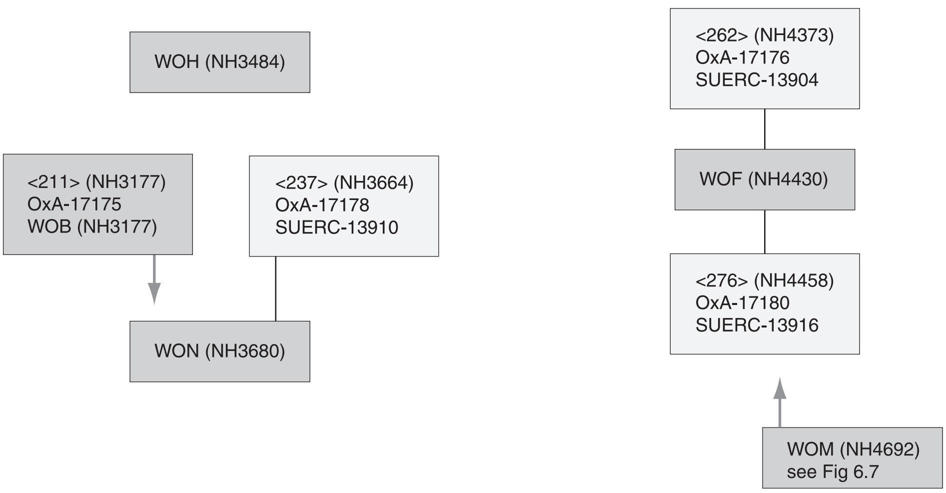

Fig. 6.6 Summary of the relationships between other dated deposits in Property BW 3, (NH4458) is stratigraphically later than hearth (NH4692) in Property BW 2 (see Fig. 6.7)

charcoal fragments from a layer of *in situ* burning within the property (NH3664) (OxA-17178 and SUERC-13910; T'=4.4; T'(5%)=3.8; n=1). Because of the inconsistency in these radiocarbon results, the earlier of the two charcoal fragments has been interpreted as redeposited and has only been used as a *terminus post quem* for overlying deposits. Also later than hearth (WON(NH3680)) is another hearth dated by archaeomagnetism (WOB(NH3177)). A layer of burning within this hearth produced a short-life charcoal fragment which must be intrusive as it dates to the 15th century (OxA-17175). Hearth (WOB(NH3177)) dates to cal 1117–1229 (95% confidence), which is consistent with the associated Phase 6 pottery assemblage. It has been included in the model as a *terminus ante quem* for the end of Phase 4.

The second sequence of dated deposits in Property BW 3 cannot be related to the sequence just described, and contains a series of deposits in Phase 5. For this reason they have only been included in the model as *termini ante quos* for the end of Phase 4. All are comfortably later than hearth (NH4692) in Property BW 2 (see below), which is stratigraphically earlier than (NH4458), a discrete rake-out from oven (NH4485). This produced two statistically inconsistent radiocarbon measurements on cereal grains (OxA-17180 and SUERC-13916; T'=6.7; T'(5%)=3.8; n=1). The earlier of these (OxA-17180) has only been included in the model as a *terminus post quem* for the overlying hearth, which has been dated by archaeomagnetism (WOF(NH4430)). Later than this hearth are two statistically inconsistent radiocarbon measurements on short-life material from an occupation layer (NH4373) (OxA-17176 and SUERC-13904; T'=8.7; T'(5%)=3.8; n=1). The earlier of these may therefore be residual and has only been included in the model as a *terminus post quem* for the end of occupation of Property BW 2.

Hearth WHO(NH3484) has been dated by archaeomagnetism to cal 1195–1267 (95% confidence). This Phase 5 feature is recorded as being stratigraphically earlier than (NH4458) and the rest of the sequence just described. The scientific dates are in poor agreement with this interpretation, as both the archaeomagnetic date from Hearth WOF(NH4430) and the radiocarbon dates from (NH4458) and (NH4373) are earlier than the archaeomagnetic date from WOH(NH3484). Both archaeomagnetic dates in this sequence are Class A and so it is unlikely that either is inaccurate. In these circumstances, it appears that the stratigraphic record may be in error. Examination of the sequence of stratigraphic relationships between (NH3484) and (NH4458) suggests that it may be the relationship of unplanned occupation horizon (NH3486) with floor (NH3667) which has been misinterpreted. This relationship was inferred over a horizontal distance of more than 4 m in an area of heavy slumping, and it appears that similar charcoal rich occupation horizons may have been conflated. For this reason, we suggest that WOH(NH3484) is not related stratigraphically to the other dated deposits from Property BW 3, and so it has been included in the model simply as a *terminus ante quem* for the end of Phase 4.

Dates are available from 12 deposits that can be stratigraphically related in Property BW 2 (Fig. 6.7). From the base of the sequence, an archaeomagnetic date has been produced on hearth WOO(NH4733). This feature is earlier than hearth (NH4692), which has also been dated by archaeomagnetism (WOM(NH4692)). Two statistically consistent determinations on short-life charcoal from the silting of the Saxon street surface (Street NH4697) (OxA-17177 and SUERC-13909; T'=0.9; T'(5%)=3.8; n=1) provide *termini post quem* for hearth (WOM (NH4692)). The uncertain taphonomy of the dated material means that we have not interpreted these dates as later than hearth (NH4733), even though the street surface itself sealed this hearth (see Fig. 6.7).

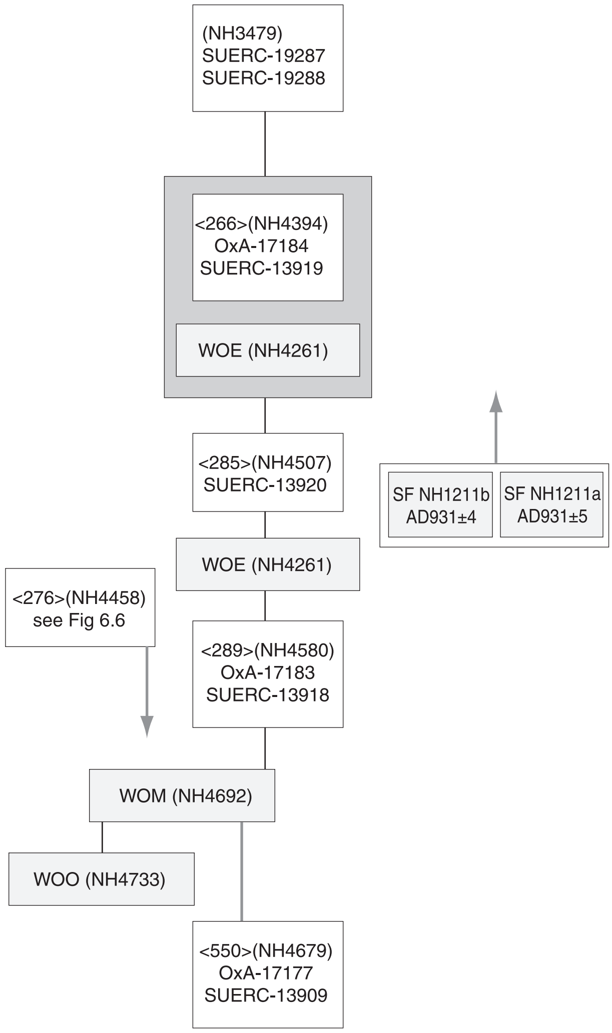

Fig. 6.7 Summary of the relationships between other dated deposits in Property BW 2, hearth (NH4692) is stratigraphically later than (NH4458) in Property BW 3 (see Fig. 6.6)

Two stratigraphic sequences are later than hearth (NH4692). The first sequence begins with two statistically consistent radiocarbon measurements on charred hazelnut shell from a discrete charcoal-rich deposit (NH4580) associated with *in situ* burning of burnt surface (NH4557) (OxA-17183 and SUERC-13918; T′=1.7; T′(5%)=3.8; n=1). Later than deposit (NH4580) is hearth (NH4523), which has produced an archaeomagnetic date (WOK(NH4523)). This produced an anomalously late archaeomagnetic date, both in relation to the stratigraphic sequence and the associated ceramic assemblage. There is evidence in this hearth of possible disturbance, since four of the nine samples show consistent within-sample deviation from the remaining five samples which have tightly grouped specimen directions. It has therefore been excluded from the model. Above this was a charcoal spread within an occupation horizon (NH4507), which produced a single radiocarbon age on a charred oat grain (SUERC-13920). In turn, this is earlier than hearth (NH4261), dated by an archaeomagnetic date (WOE(NH4261)) and two statistically consistent radiocarbon determinations on short-life charcoal from a discrete charcoal spread (NH4394) associated with *in situ* burning from the hearth (OxA-17184 and SUERC-13919; T′=2.1; T′(5%)=3.8; n=1). Later than this are two statistically consistent radiocarbon measurements on animal bone from occupation deposit (NH4379)(SUERC-19287–8; T′=2.7; T′(5%)=3.8; n=1). One of these samples, SUERC-19288, was a cattle carpal which was recovered in articulation with a radius. This sample, at least, cannot be residual. The second sequence contains a series of Phase 5 deposits in Property BW 3, as hearth WOM(NH4692) is stratigraphically earlier than rake-out (NH4458). The sequence above this has been described above (see Fig. 6.6).

Pit (NH4095) cannot be stratigraphically related to those deposits from Property BW 2 that produced scientific dates. It did, however, produce a silver penny of Athelstan (924–939) and an Anglo-Saxon sceat, tentatively assigned to series K and thus probably minted between *c* 720 and 740. These provide *termini post quem* for the end of the use of Property BW 2.

Archaeological interpretation: the site chronology

The overall structure of the chronological model which incorporates this interpretation of the archaeological data as prior information is shown in Fig. 6.8. This treats the phase of activity represented by Phase 4 as a continuous and relatively constant period of occupation. Although in reality the tenements probably continued in use beyond this pottery phase, these deposits frequently have not survived later truncation and had been under-sampled by both the excavation and the dating programme. For this reason, it was decided that a chronological model of this period of use of the site

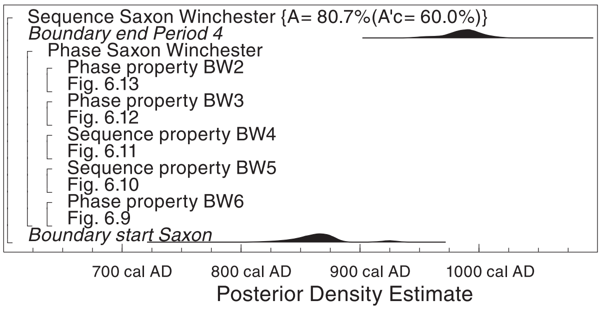

Fig. 6.8 Overall structure for the chronological model of Phase 4 deposits from Northgate House, Winchester. The component sections of this model are shown in detail in Figures 6.9–6.13.

The distributions correspond to aspects of the model. For example, the distribution 'start Saxon' is the estimated date when activity on the site began. The large square brackets down the left hand side of these figures along with the OxCal keywords define the overall model exactly.

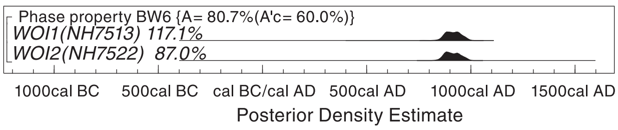

Fig. 6.9 Probability distributions of dates from Property BW 6 at Northgate House, Winchester. Each distribution represents the relative probability that an event occurred at a particular time. For each of the dates two distributions have been plotted, one in outline, which is the result produced by the scientific evidence alone, and a solid one, which is based on the chronological model used. The 'event' associated with, for example, 'WOI17513Batt', is the last firing of hearth (NH7513).

Dates followed by a question mark have been calibrated (Stuiver and Reimer 1993), but not included in the chronological model for reasons explained in the text.

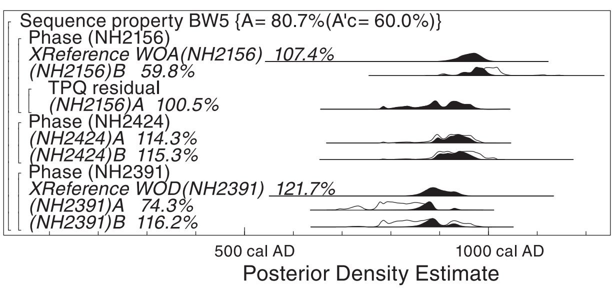

Fig. 6.10 Probability distributions of dates from Property BW 5 at Northgate House, Winchester. The format is identical to that of Figure 6.9.

alone was more realistic than that for the full span of the use of the properties. The component section of this model relating to Property BW 6 is shown in Fig. 6.9. Elements relating to Properties BW 5, BW 4, BW 3 and BW 2 are shown in Figs 6.10 to 6.13 respectively. The large square brackets down the left hand side of these figures along with the OxCal chronological command language define the model exactly.

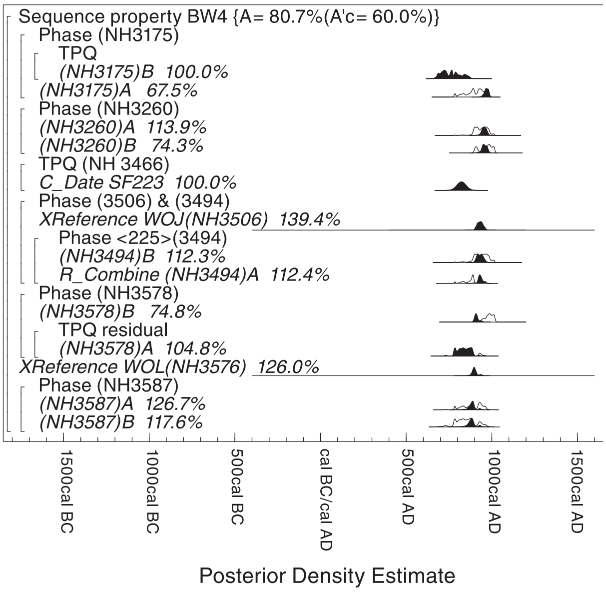

Fig. 6.11 Probability distributions of dates from Property BW 4 at Northgate House, Winchester. The format is identical to that of Figure 6.9.

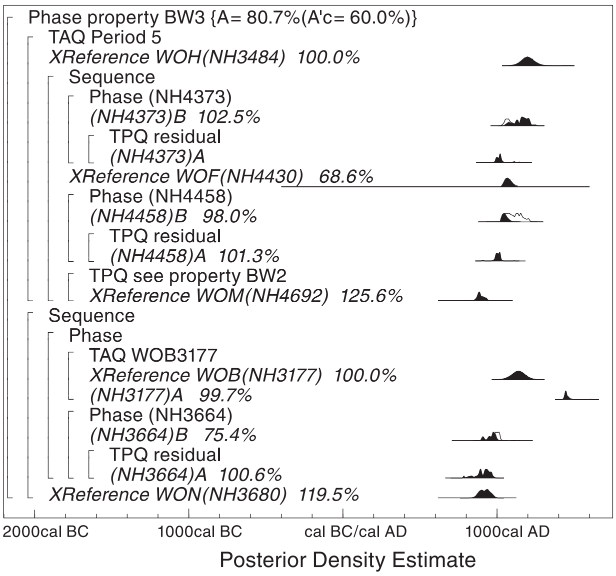

Fig. 6.12 Probability distributions of dates from Property BW 3 at Northgate House, Winchester. The format is identical to that of Figure 6.9.

This model has good overall agreement (Aoverall =80.7%, A'c=60.0%; Bronk Ramsey 1995, 429), and suggests that the Saxon occupation of these tenements began in cal 810–890 (88% probability; start Saxon; Fig. 6.8) or cal 910–940 (7% probability) and probably cal 840–890 (68% probability). It is 86.3% probable that these tenements were established before the 880s, which according to the Burghal Hidage, is regarded as the foundation date of the Alfredian *burh*. It is also probable that these properties and the associated street pattern were established after the Viking raid of Hamwic documented in AD 842 (*87.1% probable*). It is not possible to establish whether these properties were established before or after the documented Viking raid of Winchester in AD 860 (the probability that they existed before AD 860 is *41.1%*, or only after AD 860 is *58.9%*).

Properties BW 2, BW 4 and BW 5 appear to have been established in the second half of the 9th century (Fig. 6.14); it is possible that Properties BW 3 and BW 6 were established slightly later, in the

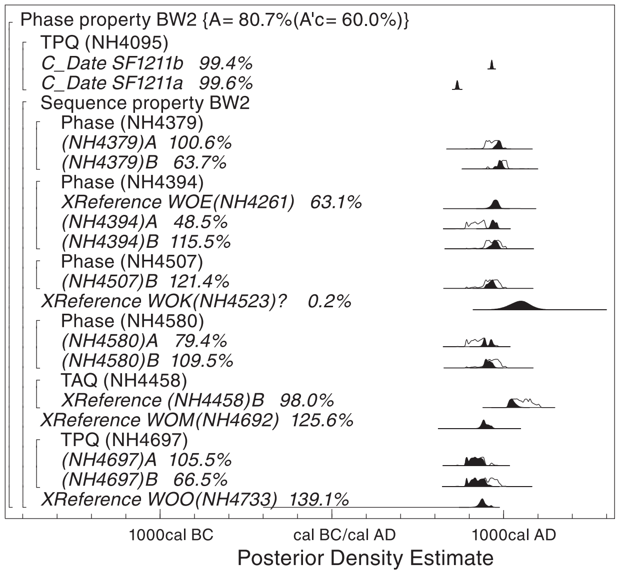

Fig. 6.13 Probability distributions of dates from Property BW 2 at Northgate House, Winchester. The format is identical to that of Figure 6.9.

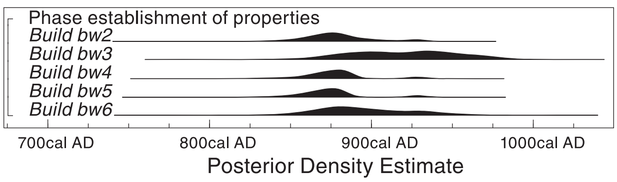

Fig. 6.14 Probability distributions of the first dated events in Properties BW 2, BW 3, BW 4, BW 5, and BW 6 at Northgate House, Winchester, derived from the model defined in Figures 6.8–6.13.

Table 6.4: Posterior density estimates from alternative models of the dating of the site phases

	Model A (contiguous sequence of posterior density estimates derived from the site chronology)	*Model B (contiguous sequence of dates)*	*Archaeological estimate*
Start site phase 4.1	cal AD 825–895 (95%)	cal AD 825–895 (74%) or 905–940 (21%)	
	cal AD 855–890 (68%)	cal AD 855–895 (58%) or 915–930 (10%)	AD 850
Transition site phase 4.1–4.2	cal AD 855–965 (95%)	cal AD 890–965 (95%)	AD 950
	cal AD 890–910 (34%) or 925–955 (34%)	cal AD 890–910 (17%) or 925–955 (51%)	
Transition site phase 4.2–5	950–1020 (95%)	cal AD 945–1055 (95%)	AD 1050
	cal AD 975–1010 (68%)	cal AD 975–1025 (68%)	
End site phase 5	cal AD 1060–1305 (95%)	cal AD 1065–1325 (95%)	AD 1225
	cal AD 1125–1245 (68%)	cal AD 1130–1250 (68%)	

first half of the 10th century. However, the earlier parts of the sequences from Properties BW 3 and BW 6 are more poorly dated than those from the other properties. The establishment of Properties BW 2, 4 and 5 might therefore have formed part of a planned development, and it is possible that the other two properties were also established as part of this initial phase. It is possible that the properties could have been built up over a few decades rather than all being established at exactly the same time. Either way, it is likely that the first inhabitants of each tenement knew each other, and that occupation in this place, at this time, was directly related to the development of Brudene Street.

Archaeological interpretation: the ceramic chronologies

The site matrix provides the primary means of presenting change through time derived from stratigraphic relationships. Further to this, ceramic typologies provide means of exploring change through time at the site. Four pottery site phases were established at Winchester Northgate House which have relevance for Saxon chronometric results. The pottery phases were generated from the assemblages recovered from the site, and estimates for them are shown in Table 6.4. The end of Phase 4.1 and start of Phase 4.2 is defined by the appearance of Late Saxon flinty wares. These include MAV, the probably local chalk tempered ware, with some flint. Also present in Phase 4.2 are the more diagnostic Michelmersh ware and Winchester ware. The end of Phase 4.2 and the start of Phase 5 is defined by a number of wares, most diagnostic of which is the Tripod Pitcher ware, but also represented by Newbury/Kennet Valley Fabric B, coarse grey sandy ware (MOE), sandy ware with flint and chalk (MBK), and sandy ware with flint, chalk and 'organic' temper (MAF). In actuality, the calendar dates of these pottery chronologies are relatively poorly understood, with considerable variability in the dating of individual wares, and especial reliance placed on rare finewares (see Cotter, *Digital Section 1.3*). The archaeomagnetic and radiocarbon data provide independent means of estimating the calendar dates for these phases as described below.

The model shown in Fig. 6.15 is based on the assumption that the ceramic Phases 4.1, 4.2 and 5 are abutting (Buck *et al*. 1992; Naylor and Smith 1988), with the estimated dates of the samples

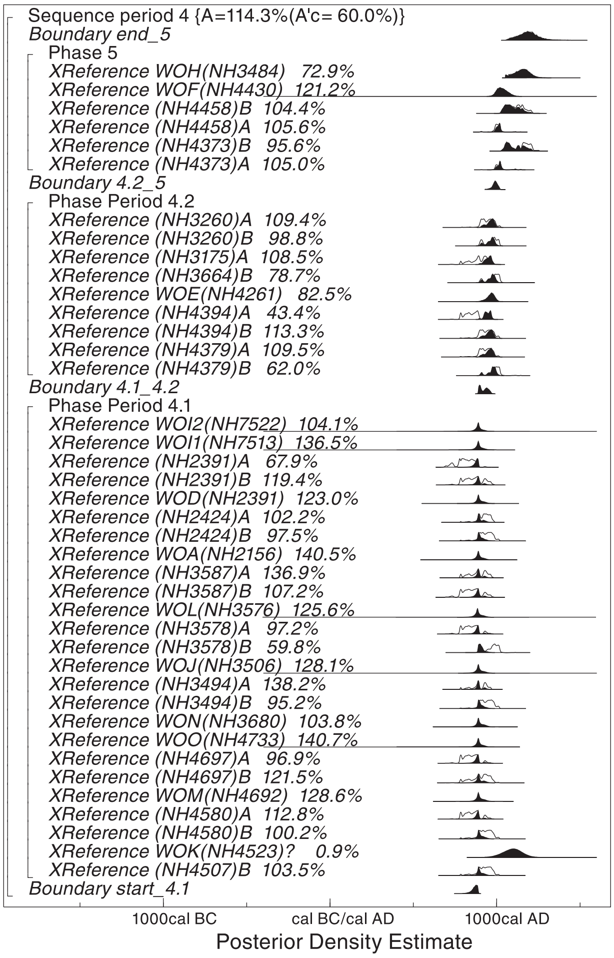

Fig. 6.15 Probability distributions of dates from ceramic phases. Each distribution represents the relative probability that an event occurs at a particular time. Posterior density estimates from the model defined in Figures 6.8–6.13 form the standardised likelihood component of this model.

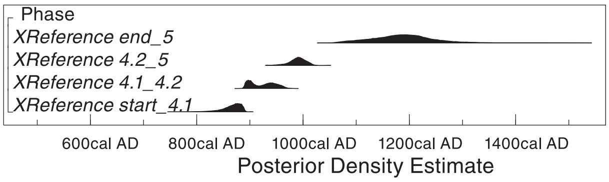

Fig. 6.16 Probability distributions of dates relating to the beginnings and endings of ceramic phases. The distributions are derived from the model shown in Figures 6.15.

derived from the model shown in Fig. 6.8. From this, the dates of certain unknown archaeological 'events' (the beginning of ceramic Phase 4.1, the end of ceramic Phase 4.1, start of ceramic Phase 4.2, etc) can be derived as estimates of the dates of transition from one phase to another. The model has good overall agreement (Aoverall=114.3%, A'c=60.0%); estimates for the dates of ceramic phases are given in Table 6.4, and in Fig. 6.16.

Sensitivity analysis

Sensitivity analyses are alternative interpretive models constructed from alternative ways of modelling the information previously presented. By comparing different analyses it is possible to investigate the extent to which the answers are dependent on the radiocarbon measurements, and the stratigraphic sequence. The format of the model is identical to that shown in Fig. 6.15, but this time the radiocarbon and archaeomagentic dates have not been derived from the model shown in Fig. 6.8. This has been undertaken to explore how much the results are influenced by the stratigraphic relationship between samples. The model has good overall agreement (Aoverall=109.4%, A'c=60.0%); estimates for the dates of ceramic phases are given in Table 6.4, and in Fig. 6.17. The results suggest that the use of prior estimates derived from the stratigraphic relationships between samples in Fig. 6.8 included in the model shown in Fig. 6.15 does not strongly affect the outputs of the model.

OTHER ARCHAEOLOGICAL FEATURES

Radiocarbon results were generated from a number of features that were stratigraphically isolated or which contained material culture of uncertain period attribution. The measurements listed below were intended to clarify the phase attribution of these features or material culture. All these contexts were originally recorded as being below the late Roman dark earth and the late prehistoric/early Roman subsoil layers (Steve Teague pers. comm.).

The Northgate House contexts are effectively stratigraphically isolated from the street frontage area. The results from Northgate House (OxA-16757, -16758, -16759, -16775) which proved to

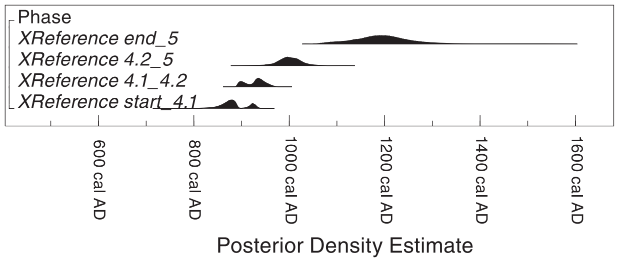

Fig. 6.17 Probability distributions of dates relating to the beginnings and endings of ceramic phases from the alternative model where calibrated radiocarbon dates form the standardised likelihoods component of the model (see text). Each distribution represents the relative probability that an event occurs at a particular time.

represent further Saxon activity on the site, were not included in the model for the Saxon tenements because the features were not stratigraphically related.

The neonate burial

A single radiocarbon measurement was produced on the neonate burial recovered from context (NH6176) from Northgate House. The result indicates that the individual died in the early first millennium; most probably in the late 1st to early 3rd century cal AD (cal AD 30–210 95.4% confidence; or cal AD 70–130 68.2% confidence; OxA-16713). The collagen from this sample had a $\delta^{13}C$ value of -18.6 ‰, a $\delta^{15}N$ value of 9.8 ‰. and a C/N ratio of 3.2, all of which are within the normal range for human bone. The C:N value of gelatinous extracts of sampled bone is one means to assess collagen preservation, potential diagenesis and to ensure the measurement of in vivo derived carbon isotopes. Ratios between 2.9 and 3.6 are indicative of carbon and nitrogen proportions from unaltered bone (see Hedges and van Klinken 1992).

Northgate House negative features

Four radiocarbon measurements were produced on charred plant remains from two features from Northgate House.

Context NH6177

Two measurements were produced on samples of bread wheat, from the fill (NH6177) of a posthole (NH6178), part of Structure NH8502. The measurements made on these wheat samples are statistically consistent (T'=0.2, T'5%=3.8, v=1; OxA-16757, -16758). The consistency in the measurements could indicate that the dated material derives from the same short-lived phase of archaeological activity, in this case, the harvesting of the cereal grains. This interpretation means it would be appropriate to take a weighted mean prior to calibration; the resultant estimate for the harvesting of the cereal grains is cal 870–975 (95.4% confidence; or cal 890–945 68.2% confidence).

The weighted mean provides an estimate for the presence of the wheat grains on the site in the 9th or 10th century. Bread wheat is considered a staple in the Saxon period in southern England, and its presence during this period is unsurprising. This calibrated range also provides a *terminus post quem* for the infilling of the posthole. If the association of the posthole with the rest of the structure is accurate, this estimate would be applicable for at least a phase of use of the structure. The consistency of the results from this feature provides robust support for the interpretation that the posthole was infilled in the Saxon period, not during an earlier phase of activity on the site.

Context NH6204

Two measurements were produced on charred bread wheat grains recovered from the fill (NH6204) of a shallow pit (NH6203). The measurements made on these wheat grains were statistically consistent (T'=0.3, T'5%=3.8, v=1; OxA-16759, -16775). These results indicate that the wheat grains sampled to produce these data could have been harvested at the same point in time. Because these measurements could be related, it could be more appropriate to take a weighted mean prior to calibration. The estimate for the harvesting of these cereal grains is cal 775–950 (95.4% confidence; or cal 780–895 68.2% confidence). The material was most probably harvested in the 9th century. This mean provides a *terminus post quem* for the infilling of the pit, most probably in the 9th century.

Discussion

All the results on the cereal grains detailed here are statistically consistent, indicating that they all could measure the same point in time, or a short-lived phase of activity. The results from posthole NH6177 are entirely consistent with the results from pit NH6204 (T'=1.4, T'5%=7.8, v=3). If all these measurements were related to the same event, a weighted mean would suggest that this took place cal 780–970 (95.4% probable; or cal 870–950; OxA-16757, -16758, -16759, -16775).

Holloway

Two radiocarbon measurements were produced on material from context (CC3251) recovered from the Holloway in the Discovery Centre (CC3408). The measurements were produced on disarticulated faunal remains. One measurement was produced on a rib from a large mammal, probably cattle (OxA-16793), and one result was produced on a tooth from an ovicaprid (OxA-16794). The two results are not statistically consistent (T'=65.3%, T'5%=3.8, V=1), indicating that the measurements sampled different archaeological events. Neither of the results are thought to include offsets (neither *in vivo* dietary offsets, nor post-mortem contamination). The inconsistency of the results could indicate that the Holloway was open for a considerable period of time, from 40 cal BC–cal AD 90 (95.4% confidence, or cal AD 1–70 (68.2% confidence; OxA-16793) to cal AD 260–430 (95.4% confidence, or cal AD 340–420 68.2% confidence; OxA-16794). The interpretation of a long-lived landscape feature is, however, problematic because of the uncertain taphonomies of the dated skeletal material.

There are a number of issues concerning the taphonomy of both the dated skeletal elements:

- the material is disarticulated;
- the material does not derive from a context which indicates a functional association between the skeletal material and the depositional environment;
- the material is not of the same radiocarbon age;
- the feature does not represent a 'sealed' context, one which demonstrably can be shown to have been infilled rapidly, or one which contains a range of material culture derived from a limited phase of activity.

Both these results provide poorly understood *termini post quos* for the infilling of the Holloway. It is possible that both these results were produced on redeposited material derived from other primary depositional contexts; neither of these results should be used as robust basis for the phasing of the feature or its use. Both these results could provide mistakenly early estimates. The date of establishment of the Holloway certainly cannot be estimated from these results. The later result should be seen as the most accurate *terminus post quem* for the infilling of the feature of cal AD 260–430 (95.4% confidence; or cal AD 340–420 68.2% confidence; OxA-16794).

SUMMARY OF SIGNIFICANT FINDINGS

- The Saxon occupation of these tenements began in cal 810–890 (*88% probability; start Saxon*; Fig. 6.8) or cal 910–940 (*7% probability*) and probably cal 840–890 (*68% probability*).
- It is *86.3% probable* that these tenements were established before the 880s, which according to the Burghal Hidage, is regarded as the foundation date of the Alfredian *burh*.
- Properties BW 2, BW 4 and BW 5 appear to have been established in the second half of the 9th century.
- It is possible that Properties BW 3 and BW 6 were established slightly later, in the first half of the 10th century. However, Properties BW 3 and BW 6 are more poorly dated for the earlier parts

of their sequences than the other properties, meaning the models for these properties are slightly less robust than the others.

- The establishment of Properties BW 2, 4 and 5 might therefore have formed part of a planned development, and it is possible that the other two properties were also established as part of this initial phase.
- It is possible that the properties could have been built up over a few decades rather than all being established at exactly the same time.
- It is likely that the first inhabitants of each tenement knew each other, and that the earliest Saxon occupation sampled here was directly related to the development of Brudene Street.
- Four pottery site phases were established at Winchester Northgate House, and estimates for the transition between these pottery typologies (as presented in the Bayesian model Fig. 6.15) are shown in Table 6.4, and in Fig. 6.16.
- On present understanding, the Holloway cannot be demonstrably phased to any period by the chronometric results alone.