Channel Tunnel Rail Link

London and Continental Railways

Oxford Wessex Archaeology Joint Venture

Human remains from Section 1 of the Channel Tunnel Rail Link, Kent

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CTRL Schemewide Specialist Report Series

2006

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ACKNOWLEDGMENTS

This report was complied using data collated from individual site reports produced by various specialist including Angela Boyle (OA assessments), Cerdiwen Boston (co. author Pepper Hill), Nicholas Márquez-Grant (Boys Balancing Pond), Jacqueline I. McKinley (Little Stock Farm and Saltwood), Natasha Powers (Cuxton), Bill White (Whitehill Road and Northumberland Bottom) and Annsofie Witkin (co. author Pepper Hill and recorder all remaining sites).

1 INTRODUCTION

Human bone – cremated and unburnt - was recovered from 17 sites, extending from the western-most site at Pepper Hill to the eastern-most at Saltwood Tunnel (Table1; Appendix 1; Figure 1). The various deposits covered a wide temporal range from the Late Neolithic to the late Anglo-Saxon, with both extremes occurring at White Horse Stone. The majority of the deposits fall in the later two of the four scheme-wide temporal groupings; Late Iron Age to Romano-British (*c*. 300BC to AD 500) - predominantly from Pepper Hill - and post-Roman/Anglo-Saxon (AD 500-1000) - mostly from Saltwood Tunnel.

A minimum of 395 individuals was identified from the cremated remains and 259 from the unburnt bone assemblage (Table 1). Most of the latter derived from the remains of inhumation burials with a small number represented amongst the disarticulated, redeposited material (Table 2) - one Early/Middle Iron Age context from White Horse Stone appears to have comprised a placed deposit. The majority of individuals identified within the cremated bone assemblage also derived from the remains of burials – urned, unurned and, in the Romano-British period, *busta* – with a small proportion from cenotaphs, pyre sites, forming redeposited material or from deposits of uncertain type (Table 2).

In most locations, burials comprised singletons or small groups, generally limited to one or other mortuary rite within in any one period. Similar numbers of cremation and inhumation graves were identified within the prehistoric phases. Larger cemeteries were limited to the Late Iron Age/Romano-British period at Pepper Hill, and the cemeteries at Cuxton and Saltwood Tunnel in the Anglo-Saxon period. The cemetery at Pepper Hill comprised one - the largest - of several associated with the settlement at Springhead to the south of which it lay; two small inhumation cemeteries and one small cremation cemetery have subsequently been found to the north-west of the town, together with numerous singletons (cremation and inhumation) scattered across the area and a possible cemetery to the south-east (P. Andrews *pers comm*.). The greater number of individuals identified from the remains of cremation burials at Pepper Hill is potentially misleading (Table 1), since a similar number of inhumation graves to those containing cremated remains were identified – 348 – but recoverable bone survived in only a few (see *taphonomy*). The imbalance towards the inhumation rite indicated for the Anglo-Saxon period is genuine, though the number of graves identified again greatly outnumber those containing extant burial remains.

The report aims to provide an overview of the various categories of data recovered from the analysis of the human remains by phase, setting those data in their broader regional context.

2 PROJECT DESIGN RESEARCH AIMS

Few of the research aims as presented in the human remains section of the Project Design were specific to the human remains themselves (RLE 2003). The scope of the aims was much broader, focusing on how an integrated consideration of data recovered from human bone, artefactual and contextual/stratigraphic analysis might inform various areas of research within the four scheme-wide temporal groupings. Broadly, the focus was on temporal changes and variations in the mortuary rites and what this may reflect in terms of population movement and structure, social change and hierarchy, and the function of the place of burial within the landscape. As such, a discussion of if and how these aims have been achieved is outside the realms of an overview of the human remains alone and will be dealt with in an integrated form in the appropriate period overviews (Booth *et al* 2007). A brief summary of the aims where most appropriate to the human remains is presented below.

Table 1: Minimum number of individuals (MNI) within the main scheme-wide phases by site (site presented in order from west to east)

Site	**Phase and MNI**					
	Neo.-EBA	**MBA-IA**	**LIA-RB**	**AS**	**undated**	**total**
Pepper Hill		U/B: 1	C: 339 U/B: 79			C: 339 U/B: 80
Whitehill Road Barrow	U/B: 1					U/B: 1
Northumberland Bottom	U/B: 3		C: 2; U/B: 4			C: 2 U/B: 7
Cuxton				U/B: 35		U/B: 35
White Horse Stone	C: 1	C: 3 U/B: 6		U/B: 1	C: 3 U/B: 2	C: 7 U/B: 9
Thurnham			U/B: 2		C: 1	C: 1 U/B: 2
Snarkhurst Wood			C: 1			C: 1
Eyehorne Street	C: 1					C: 1
Holm Hill			C: 1			C: 1
Chapel Mill			C: 2			C: 2
Hurst Wood		C: 2	C: 1			C: 3
Tutt Hill		C: 2			C: 1	C: 3
Beechbrook Wood	C: 2	C: 1	C: 6			C: 9
Boys Balancing Pond			C: 4			C: 4
Bower Road			C: 1 U/B: 1			C: 1 U/B: 1
Little Stock Farm		U/B: 2	C: 1			C: 1 U/B: 2
Saltwood	U/B: 2	C: 4 U/B: 5	C: 14	C: 1 U/B: 115	C: 1	C: 20 U/B: 122
Total	C: 4 U/B: 6	C: 12 U/B: 14	C: 372 U/B: 86	C: 1 U/B: 151	C: 6 U/B: 2	C: 395 U/B: 259

KEY: C – cremated bone; U/B – unburnt bone

Early agriculturalists – The Neolithic and Early Bronze Age landscape

The primary aim for this period was to consider how the evidence from the CTRL sites related to wider interpretations of Late Neolithic and Early Bronze Age funerary traditions at a regional and national level, and if that evidence contributed to the understanding of the social and political significance of funerary monuments and monument groups (*ibid.* 7.2.2; 7.2.4). Consideration was also to be given to the form of the monuments and any temporal variation.

The major aim for the Early-Middle Bronze Age transition period was to ascertain if the distribution and chronology of the change in mortuary rite to cremation and burial in small grave groups was reflective of social change (*ibid.* 7.2.9, 7.2.10).

Farming communities – The later Bronze Age and Iron Age landscape

Together with other data, that from the human remains was to be quantified to enable consideration of structured deposition and spatial organisation; for example, what isolated remains of burials may indicate about land division, boundaries, and symbolic or ritual activity in the open landscape (*ibid.* 7.2.16-7).

Towns and their rural landscapes: I – The later pre-Roman Iron Age and Romano-British landscapes (c. 300 BC – c. AD 500)

Recent research agendas for the later Iron Age have highlighted the need to understand indigenous transformations as distinct from those undertaken under the influence of Roman rule and continental contacts. Included in this are the cultural and chronological origins of the shift to the use of the mortuary rite of cremation, and the level and significance of the presence/retention of alternative mortuary practices (*ibid.* 7.2.19, 7.2.21-2).

The focus of analysis within the Romano-British period lay in the assemblages from the cemetery at Pepper Hill. The chronology and range of burial rites seen within this major cemetery were to be compared with funerary evidence for the period scheme-wide to illustrate any variation in practice within different landscape contexts (*ibid.* 7.2.26-7).

Towns and their rural landscapes: II – The later post-Roman and Anglo-Saxon landscape (c. AD 500- 1000)

Two Anglo-Saxon populations were identified at Cuxton and Saltwood Tunnel. Important research aims included assessing what the cemeteries indicated with respect to the social organization of the populations, similarities and differences between them and the range of social groups represented (i*bid.* 7.2.30-1).

3 RECORDING METHODOLOGY

The scheme-wide excavations were undertaken by four archaeological organisations; Canterbury Archaeological Trust (CAT), Museum of London Archaeological Services (MoLAS), Oxford Archaeology (OA) and Wessex Archaeology (WA). The osteological analysis of human remains excavated by each organisation was undertaken by their own specialists (except CAT material which was analysed together with WA material; see *Acknowledgements*). To maintain scheme-wide compatibility of osteological data and report structure – including age categories and terminology - a general osteological methodology was produced and presented in the 'Specialist Study Package 6' of the *CTRL Section 1 Project Design* (RLE 2003, 85-113). Recording was required to cover, where possible, five main categories of enquiry: Taphonomy, demographic data, metric data (skeletal indices) and morphological variations/non-metric traits, pathological lesions/conditions and mortuary studies – specifically data pertaining to pyre technology and ritual with reference to cremated remains.

This general scheme-wide protocol allowed for some variation in the detailed methodology and references followed by individual specialists, provided they were of an overall comparable and compatible nature. The condition of much of the unburnt bone assemblage in particular was highly variable and often very poor, consequently some variation in the methods employed in some types of data recovery was inevitable. Details of the methodology for individual sites is presented in each of the site specific specialist reports but some of the major references used throughout included: Standard procedures for recording cremated bone according with McKinley (1994a, 5-21; 2000a; 2004a); ageing and sexing criteria following Miles (1962a and b), Moorees *et al* (1963), Bass (1987), Buikstra and Ubelaker (1994), and Scheuer and Black (2000); metric data recorded according with Trotter (1970), Bass (1972), Buikstra and Ubelaker (1994); non-metric traits recorded according with Berry and Berry (1967) and Finnegan (1978); pathological lesions described and discussed with reference to Ortner and Putschar (1981), Rogers and Waldron (1995), and Aufderheide and Rodríguez-Martín (1998).

4 RESULTS

A summary of the minimum numbers of individuals (MNI) identified from the cremated and unburnt bone assemblages recovered from sites within the CTRL Project is presented in Table 1 for each of the four scheme-wide periods; Neolithic to Early Bronze Age (Neo.-EBA), later Bronze Age and Iron Age (MBA-IA), pre-Roman Iron Age and Romano-British (LIA-RB), and post-Roman and Anglo-Saxon (AS). Table 2 provides a more detailed temporal breakdown with further details pertaining to the deposit types from which the bone was recovered and to the individual/s identified. It should be noted, particularly with reference to the remains of inhumation burials, that poor bone preservation resulted in many of the inhumation graves containing no traces of surviving bone (see *taphonomy*) and the figures presented here relate specifically to those graves where bone was available for osteological examination. Full details of the assemblage from each sites may be found in the individual site related specialist reports available in ADS.

4.1 Taphonomy

The condition of the bone has a major effect on all aspects of osteological analysis. Poor skeletal recovery and/or survival limits the definition and confidence with which the age and sex of an individual may be attributed; evidence of pathological lesions/conditions may be destroyed; it may not be possible to collect metric data; and the interpretation and discussion of aspects of the mortuary rite may be curtailed. The ability to make comparisons with data from other sites, thereby setting an assemblage in its wider geographic and temporal context, will also be affected. Physical disturbance may affect the archaeological components either by removal or displacement, and/or by altering the burial microenvironment. While a variety of intrinsic and extrinsic factors may affect bone preservation, in general, other than where major truncation (surviving grave depth of 0.10m or less) or other extensive disturbance of a grave has occurred, the nature of the soil matrix – including water permeability - is the major factor affecting bone survival. A highly acidic burial environment will have a detrimental affect on the mineral components of the bone and an overly alkali one on the organic components; both, particularly where coupled with a free-draining environment, result in bone degradation (Henderson 1987; Nielsen-Marsh *et al* 2000; Millard 2001).

The variability of bone preservation in relation to the geology of Kent formed part of the review by Mays and Anderson (1995) of the county's excavated burials. They observed that although the calcareous nature of the chalk bedrock is theoretically well suited to good bone preservation, the majority of bones from graves cut into the chalk is very fragile as a result of loss of the organic component of the bone in the highly alkaline conditions. They suggest that – presumably pockets - of calcareous clays, gravels and sands - most extensively

the Hythe Beds forming a central band in the western half of the county - potentially form an advantageous burial environment. The remains from Anglo-Saxon cemeteries in the north-east of the county are highlighted as demonstrating poorer bone preservation than others within the region (*ibid.*).

Many of the sites from which human bone was recovered along the CTRL route lay along the Upper and Lower Greensands, which are of an acidic and free-draining nature. The sites towards the north-western end of the route lay over the chalk, but variable thickness in the drift geology, comprising deep deposits of acidic sands and gravels over brickearth in the area of Pepper Hill, over-ride any influence from the solid geology (Figure 1). Prior to the CTRL archaeological works relatively few graves had been excavated from the area covered by the route, mostly small Anglo-Saxon sites, the majority of the known graves within the county being concentrated to the north-east, with fewer numbers to the west (Figures 2-6).

Most of the graves excavated along the CTRL route had been truncated to some degree as a result of ploughing. Surviving grave depths were commonly between 0.10-0.20m, though depths of up to 0.86m were recorded on rare occasions (Saltwood, Bronze Age; McKinley 2006a). In most cases it is unlikely that much if any bone was removed from the grave as a result of the disturbance. A relatively small proportion of graves survived to a depth of less that 0.10m, some to as little as *c.* 0.03, and it is probable that at least some bone was lost from these graves; it is believed that at Pepper Hill some graves may have been totally eradicated as a result of plough damage (Witkin and Boston 2006). With the exception of Pepper Hill, where the high density of graves had resulted in frequent intercutting, there is limited evidence for intercutting between graves, with only a few cases from Cuxton and Saltwood (Powers 2006; McKinley 2006a). There was similarly limited damage due to other forms of later intrusion including ancient disturbance (e.g. Little Stock Farm; McKinley 2006b), animal burrowing (e.g. Snarkhurst Wood; Witkin 2006a), and metal-detectorist/vandal activity (e.g. Pepper Hill; Witkin and Boston 2006).

The majority of the cremated bone is recorded as being of a slightly worn and chalky appearance, with limited recovery of trabecular bone. The latter is the first to be lost in conditions detrimental to good bone survival and its paucity or absence may indicate poor bone condition even where the surviving bone appears unaltered (McKinley 1997a, 245; Nielsen-Marsh *et al* 2000). Exceptions to this observation include the cremated bone from Boys Balancing Pond, Little Stock Farm and Saltwood, most of which was in good visual condition and included good proportions of trabecular bone (Márquez-Grant 2006; McKinley 2006a and b). The reasons for these broad scheme-wide variations are not entirely clear. There is no temporal link to condition, nor does the type of deposit – e.g. urned or unurned burial – appear to have been a major factor, though the bone from the pyre sites at Pepper Hill (unmoved following cremation and lying on/embedded in charcoal fuel ash) was

observed to be in better condition that that from the burials (Witkin and Boston 2006). The three sites with good preservation were all from the southern end of the route, lying on the Greensand, but various other small sites with poor bone preservation lay within the same geographic and geological zones. In this case it is likely that a combination of factors local to individual sites will have had an effect; Pepper Hill, for example, clearly suffered far greater disturbance due to intercutting graves than was seen elsewhere and there is a suggestion that the impact of ploughing may have been more significant.

The condition of the unburnt bone was almost universally very poor. In general, bone from graves cutting the chalk natural – sites between Whitehill Road and White Horse Stone – is in slightly better condition than from those cutting the Greensand or at Pepper Hill. Bone was recovered from 94% of the 36 graves excavated Cuxton (Anglo-Saxon), with >50% skeletal recovery from most graves though only five had >75% skeletal survival (Powers 2006). The bone was frequently heavily eroded and in a similar condition to that commonly observed in chalk-cut graves elsewhere in Kent (Mays and Anderson 1995). The condition of the bone from the other sites on the chalk is variable, largely dependant on slight local variations in the soil matrix, but it generally appeared in relatively good condition with mild-moderate erosion of the bone cortex. Bone survival on the Greensand and at Pepper Hill was very poor. Only 23% of the inhumation graves from Pepper Hill (Late Iron Age/Romano-British) contained any recoverable human bone and only 52% of the Anglo-Saxon graves from Saltwood. The poor quality, demineralised bone evident in excavation often crumbled completely on lifting, and at Pepper Hill the position of the body was often only demonstrated by a soil stain. Where remains were recovered generally very little survived, commonly <5% of the skeleton from Pepper Hill and <1% from Saltwood, in both cases the tooth crown enamel being the most frequently recovered material. The surviving depth of the graves was of no significance with respect to the degree of bone survival. The affect of the presence of a coffin on bone preservation appears to have varied; at Pepper Hill coffined burials were generally less well preserved than those which were not coffined, the reverse being the case at Saltwood, while at Cuxton preservation was similar between the two rites. At Saltwood it was observed that adult male remains tended to survive better than those of females or immature individuals (related to bone density) and that more bone survived in graves inclusive of artefactual material but with no direct link between bone preservation and the proximity of an item. Slightly better bone preservation was observed at Thurnham (Witkin 2006b) and Little Stock Farm, and in some of the pre-Anglo-Saxon graves at Saltwood; in each case the grave fill incorporated other than just the Greensand natural – archaeological components or soil textural variation – which had had a sufficiently ameliorating effect on the natural soil acidity.

The bone from both Pepper Hill and Saltwood appears to be in a significantly poorer condition than that from Dover Buckland and Sarre, both highlighted by Mays and Anderson as being poor compared with that from elsewhere in Kent (1995) Although the bone from both these sites was severely eroded and crumbling, bone clearly survived in most graves and the preservation seems most similar to that from Cuxton (Powers and Cullen 1987; Barnacle *et al* 1992).

4.2 Demography

A minimum number of 652 individuals are represented within the CTRL scheme-wide assemblage (Table 1). The numbers are known not to be fully representative of all individuals from the excavated cemeteries due to poor bone survival limiting unburnt skeletal recovery, particularly from the two main cemeteries at Pepper Hill (LIA/RB) and Saltwood (AS). Poor skeletal preservation also affected the number of individuals it was possible to attribute age and sex to, and the definition and confidence with which these attributions could be made.

The nature of the mortuary rites within much of the prehistoric period, comprising dispersed small grave groups or singletons, often with no associated artefactual material, mitigates against their accidental discovery and/or recognition and this may, in part, explain the small numbers of individuals identified from these early phases. In their favour, the bone preservation in at least some of the earlier graves appears to have been slightly better than that seen in many of the later cemeteries; this suggests some variation either in burial practice, perhaps the addition of organic materials to the grave fills or – more likely - a temporal deterioration in the depth and form of soil profiles reflecting erosion due to agricultural activity (e.g. ploughing).

Neolithic-Early Bronze Age

No *in situ* deposits of human bone of Neolithic date were found, but very small quantities (up to 3g) of cremated bone (no age or sex) had been redeposited in the fills of various Late Neolithic and Late Neolithic/Early Bronze Age features from three sites within the route's central zones (Figures 2 and 3). Although not representative of burials or, convincingly, any other deliberate mortuary deposit, the material does demonstrate that cremation was being undertaken in these areas in the early prehistoric period. Previous osteological evidence for the Neolithic in Kent is sparse and mostly early in date, but both cremated and unburnt inhumed bone has been recovered in the vicinity of the northern part of the routeway and subject to osteological examination (MNI <20 (Mays and Anderson 1995); Figure 2). The remains mostly appear to represent those of unsexed or insecurely sexed adults (e.g. Wells

1966) but the small number of remains precludes confident conclusions on the possible, if any, significance of this observation.

The small Early Bronze Age assemblage comprises the remains of six inhumation burials, generally occurring as singletons, from three sites at either end of the route (Table 2; Figure 3). The overall assemblage includes both immature individuals and adults of both sexes. There is little comparable data for this period from the county (*ibid.*), though what does exist also comprises single inhumation graves containing the remains of adults, including individuals of both sex, from graves located in the east of the county (Perkins and Gibson 1990; Anderson 1994; Parfitt 2004).

Middle Bronze Age to Iron Age

The Middle-Late Bronze Age assemblage all derived from the remains of cremation burials or other cremation-related deposits, mostly recovered from sites (five) along the southern half of the route. A minimum of eight individuals were identified, mostly adults including both females and males. Elsewhere in the county, small numbers of contemporaneous cremation and inhumation burials have been recorded, most, again, comprising singletons or small groups, predominantly from sites close to the east coast (e.g. O'Connor 1975; Cruse 1985; Mays and Anderson 1995; Figure 3). The numbers of potential Late Bronze Age deposits has recently been substantially boosted by the minimum of 30 individuals from a large mortuary feature at Cliffs End Farm, Ramsgate (WA 2006a); this, together with the CTRL assemblage, increases the MNI for the period in Kent to *c*. 60 (Mays and Anderson 1995). Both cremated and unburnt remains include individuals across the age ranges from juvenile (*c*. 5-12 yr.) to older adult (>45 yr.), and adults of both sex; this suggests – in the general scheme - at least limited, if any, discrimination in mortuary rite dependant on age and/or sex.

Remains of Early-Middle Iron Age date were recovered from five sites spread across the length of the route. Although both cremation and inhumation was practiced at two sites – White Horse Stone and Saltwood – in the Middle Iron Age, disposal by inhumation of the unburnt corpse appears to have formed the dominant rite (possibly with subsequent human manipulation of remains), though the numbers within both rites are small (Table 2). The only infant within the assemblage was found amongst the cremated remains and one of the inhumation graves contained the remains of a juvenile; given the small numbers, no confident statement could be made with regards to the inclusion or exclusion of particular individuals from either rite with regard to their age. More males than females were identified within the assemblage, particularly amongst the unburnt bone, but since over half of the adults identified could not be sexed no significance can be attached to this observation. Kentish burials of this date as a whole are sparse (Parfitt 2004, 16), Mays and Anderson

citing a MNI of less than five in their review (1995, 380-1). Although a few additional – mostly cremation – burials have been found in the last decade, the numbers remain very low.

Late Iron Age and Romano-British

The remains of relatively few burials (11) of Late Iron Age or Later Iron Age/Early Romano-British date were recovered from five sites within the southern half of the CTRL route. In common with most others of this date from the county (*c*. 33 sites; Figure 4) they comprised cremation burials made as singletons or parts of small groups (Parfitt 2004, 16-17). Mill Hill, Deal provides the most notable variation in mortuary rite with its 42 inhumation burials in addition to the five cremation burials (Parfitt 1995). As with most of the rest of the prehistoric assemblage from CTRL there are relatively few immature remains, the two adults for whom a sex was suggested including a male and a female. Few immature remains have been identified amongst the contemporaneous cremated remains county-wide (e.g. Anderson 1999; Bowden *et al* 1998; Hammond *et al* 2003), but the inhumation cemetery at Mill Hill included 36% immature individuals, *c*. 22% <12 years old (Anderson 1995). This apparent discrepancy between the rites may be genuine but could be misleading; Mill Hill represents the largest single assemblage of this date from Kent - most others comprise a dozen or less (Parfitt 2003, 16) - and may, consequently, form a more representative reflection of the population from which its dead were drawn. Also, not all the known cremation burials have been subject to recent osteological analysis and data may be missing. In addition, immature remains may have suffered preferential destruction or accidental exclusion from the secondary part of the rite in cases where they were cremated with an adult; where, as is commonly the case with cremation burials, <50% of the adult remains were collected from the pyre site for burial the fragile remains of an infant could easily be overlooked entirely.

The Romano-British assemblage comprised the largest from any one period scheme-wide. The majority (418; 93.5%) of the MNI were recovered from the major cemetery of Pepper Hill, adjacent to the temple complex and town of Springhead. Small grave groups and singletons were found at 12 other sites distributed across the length of the route, mostly in the central and southern geographic zones (Figure 00). Many of the deposits which contained extant human remains, particularly from Pepper Hill, are of a non-specific Romano-British date (Table 2); where further definition was possible the majority (70.9%) are Early or Early-Mid, with 27.8% Mid or Mid-Late and 1.2% Late. The remains from all the inhumation graves at Pepper Hill are of a non-specific Romano-British date but the site report shows the number of inhumation graves to have outnumbered cremation graves across the temporal range, both peaking in the Early phase. Outside Pepper Hill, the majority of the burials were of cremated remains (75.6%) and concentrated in the Early phase. The inhumation burials were mostly of neonates (57.1%), at least one of which was recovered from below a building

foundation (Thurnham Roman Villa), the other neonate/young infant from the same site being buried in a cist grave nearby. The burial of young infants external to communal cemeteries or grave groups is a commonly recognised phenomena in the Romano-British period, as is the frequent location of their graves in the proximity of settlements/buildings (Philpott 1991, 97-101). This is seen as reflecting the Roman belief that a child did not possess a soul until the age of teething and therefore did not require the same burial rites as an older individual (*ibid.* 101).

As with many of the small prehistoric assemblages, and possibly for the same reason, external to Pepper Hill no immature individuals were identified amongst the cremated remains, which included individuals of both sexes across the adult age ranges. At Pepper Hill a full cross-section of the population appears to be represented with 16.9% immature individuals and 83.1% adults amongst the aged individuals, the latter spanning the age range with, as is commonly the case, most falling in the mature adult (*c*. 26-45 yr.) category (NB. a large proportion of the cremated cemetery population – 56.9% - was not aged; Witkin and Boston 2006). Although the proportions are similar to those commonly seen in contemporaneous cremation cemeteries (McKinley 2004b, 289; Witkin and Boston 2006 Table 7), as is frequently the case it appears probable that the immature – particularly neonatal – individuals are under-represented. In additional to the inherent problems of fragility and the probable tendency to preferential loss/destruction due to disturbance or acidic soil conditions, are the potential biases attached to the cremation rite and the known Romano-British cultural practice of not burying young infants within cemeteries as outlined above - though neonates have been recovered from some cemeteries e.g. St. Stephen's, St. Albans and Skeleton Green, Puckeridge, Herts. (McKinley 1992; Wells 1981). There was no apparent temporal variation in the proportion of immature individuals; a slight rise in the proportion of older adults (>45 yr.) in the later phases may be indicative of increased longevity or reflect an adherence to the older mortuary rite of cremation in the face of an increased fashion for burial by inhumation of the unburnt corpse. It was possible to sex only 47.9% of the cremated adults, the results showing slightly more males (27.6%) than females (20.3%), but given the very high percentage of unaged individuals (56.9%) and unsexed adults this figures may not be reflective of the population as a whole. Although no bone survived in a very large proportion of the inhumation graves from Pepper Hill (77%) and it was possible to age only 44.3% of the MNI from the surviving bone, a similar proportion of immature individuals (17.1%) to adults (82.9%) was found as for the cremated remains. It is likely there will have been an even greater bias towards the loss of the more fragile immature bone from the inhumation graves and, possibly, towards the loss of more gracile female remains. So few individuals could be sexed from the unburnt bone assemblage at Pepper Hill (13.9%) as to render the data of little use from an overall demographic view.

Most other osteologically recorded Kentish burials of Romano-British date comprise singletons or small groups distributed in dispersed clusters across the northern half of the county (Figure 5). Three sites represent more substantial cemeteries; Clubb's Pit, Isle of Grain with 42 inhumation and one cremation burial (Cameron 1985); Cranmer House, Canterbury, with 53 cremation and one inhumation burial (Frere *et al* 1987); and St. Dunstan's, Canterbury with 95 cremation and 23 inhumation burials (M. Diack *pers. comm*.). The unusually large size and consequent importance of the cemetery at Pepper Hill is demonstrated not only by comparison with these individual cemeteries but with the overall MNI for others county-wide. Combining the figures recorded by Mays and Anderson with those from recent analysis, a MNI of c. 327 is obtained (i.e. less than from Pepper Hill), most (211) derived from the remains of cremation burials (1995, 381; Frere *et al* 1987; Smith 1987; Hicks 1995; 1998; Hutchings 2001; Wessex Archaeology 2006b; McKinley 2004c; Diack *pers. comm*.). The cremated remains frequently appear to include few immature individuals, with none from Ash (Anderson 1998), only 7.5% from Cranmer House (Garrard 1987) and 11.8% from the Thanet pipeline burials groups (McKinley 2006c). The potential reasons for such a deficiency has been discussed above but it is interesting to note that amongst the inhumation burials from the Thanet pipeline, 58.8% were immature (1-18 yr.); currently the rites appear roughly contemporaneous and this may reflect a cultural variation in the treatment of young individuals or just differential survival and recovery associated with the rites.

Anglo-Saxon

In marked contrast with all the other periods, with the exception of a single inhumation burial from White Horse Stone, the CTRL assemblage derived from two cemeteries of moderate and substantial size at either end of the route – Cuxton and Saltwood (Tables 1 and 2). Both cemeteries were in use throughout the 7th century, Cuxton having commenced in the later and Saltwood in the early part of the 6th century. All except one burial was by inhumation of an unburnt corpse. The data from Cuxton is more representative of the cemetery as a whole than is that from Saltwood given the better bone preservation at the former; bone survived in only 52% of the graves from Saltwood (see above).

With the exception of neonatal remains – which could be missing as a result of deliberate exclusion (Mays and Anderson 1995) - individuals from across the age range and adults of both sexes were recovered from both sites (Table 2). A slightly higher proportion of immature individuals were recovered from Cuxton (30%; Powers 2006) compared with Saltwood (24%; McKinley 2006a). It is highly likely that infants (0-5 yr.) in particular are under-represented at both sites, especially at Saltwood; though such under-representation is, as discussed earlier, commonly the case in archaeological populations (e.g. Anderson and

Andrews 1997, 217-8). The median age for adults from both sites falls in the 'mature' range (20-40 yr. at Saltwood, 26-45 yr. at Cuxton). A slightly higher proportion of adults survived beyond 45 years at Cuxton (minimum 16.6%) compared with the 7% from Saltwood; the latter showing little variation between the sexes whereas males seemed prone to greater longevity at Cuxton. The proportion of sexed adults from both sites was low, with 50% from Cuxton and 36.9% from Saltwood. The proportions of males to females at Cuxton were equal, whilst at Saltwood the number of males identified (24 adults, 38 overall), greatly outnumbers the females (nine adults, no non-adults). A bias towards the preservation of the generally more robust adult male remains above those of immature individuals and females was observed in analysis at Saltwood. Preservation was also slightly enhanced by the inclusion of grave goods and the use of coffins with potential cultural and status biases attached to both factors.

Although a prolific number of Anglo-Saxon burial sites are known of in Kent, there are osteological reports from relatively few– only 16 in Mays and Anderson's review (1995, 381-2). This is either due to sites representing old finds with no osteological analysis or non-recovery/survival of the bone; similar problems of poor preservation have been encountered in many cemeteries which limits the amount and detail of local comparative data (see above also; Tester 1968, 128; Powers and Cullen 1987, 197-8; Anderson and Andrews 1997, 214). Several sites have been added since Mays and Anderson's 1995 review but the prime source of data remains inhumation burials (MNI *c*. 138), cremation burials making a minor contribution from only two sites – Orpington and Ringlemere – with a MNI *c*. 25 (Parfitt and Brugmann 1997; Boast and Gibson 2000; Parfitt *pers. comm*.). The figures from CTRL are similar to those recorded from contemporaneous sites in the region, being closest in the proportions of immature to adult individuals to Mill Hill, Orpington and Dover Buckland both having much lower percentages of immature individuals. The proportion of immature individuals from Saltwood, Cuxton and Mill Hill are all above the average of 21% of the population shown by Anderson and Andrews (1997, table 18) for Anglo-Saxon cemeteries nationally, all falling in the upper range. The proportions of young, mature and older adults are also similar to those seen elsewhere, with the majority of adults in the 'mature' range. Viewed overall, both cemetery groups, in common with their contemporaries, have the appearance of normal domestic populations.

4.3 Metric and Non-Metric Data

The recording of metric and non-metric data from the unburnt bone assemblage was severely hampered by the poor condition of the bone. Some indices were calculated from the remains of a few individuals from five sites, but the results were insufficient to be of use in making

any overall temporal or geographic assessment or for comparison with the – admittedly often almost equally sparse - data from contemporary sites in Kent.

The platymeric index (degree of anterior-posterior flattening of the proximal femur) was calculated for 16 individuals from four sites:

- two Early Bronze Age individuals from Northumberland Bottom (White 2006a); female 87.0 (eurymeric), male 75.1 (platymeric)
- two Romano-British individuals from Pepper Hill and Saltwood (both platymeric)
- 11 Anglo-Saxon individuals from Saltwood (two platymeric and 1 eurymeric) and Cuxton where most were platymeric, the mean values being slightly lower for the females

There was generally little observable different between the left and right femora; the relatively broad difference seen in the Romano-British male from Saltwood (73.0 and 83.2) probably reflecting uneven mechanical stress in what were both large robust bones. The majority (82.8%) of the adult femora from the Anglo-Saxon cemetery at Mill Hill were classed as platymeric, as were the majority of femora from other Kentish and Anglian sites in Anderson and Andrews' Table 22 (1997).

The platycnemic index (meso-lateral flattening of the tibia) was calculated for only five individuals from two sites:

- one Early/Middle Iron Age individual from Little Stock Farm; 62.6 (platycnemic)
- one Romano-British individual from Saltwood (platycnemic)
- three Anglo-Saxon individuals from Saltwood; most eurycnemic

The Anglo-Saxon data again corresponds with that obtained from the Mill Hill assemblage, which in itself was observed to be in contrast with data from other, predominantly East Anglian, sites (*ibid.*)

Stature was estimated for four adults from Cuxton, with a male mean of 1.76m and a female reading of 1.63m; the range is similar to that seen other contemporary sites (Powers 2006 Table 8; Anderson and Andrews 1997 Table 19).

Cranial index was calculated one only one individual, an Anglo-Saxon female from Cuxton, at 78.3 (mesocnemic).

Variations in skeletal morphology may, with other predisposing factors, indicate broad and occasionally closer genetic relationships within a 'population', but there are problems surrounding the heritability of many traits (Berry and Berry 1967; Saunders 1989; Tyrrell 2000). A limited range of non-metric traits were recorded in material from four sites - Little Stock Farm, Saltwood, Pepper Hill and Cuxton (McKinley a and b; Witkin and Boston 2006; Powers 2006) - mostly from amongst the unburnt bone (MNI 65) and rarely from amongst the cremated bone (MNI 11). Most traits were recorded in Anglo-Saxon material

(MNI 31 from Cuxton and 27 from Saltwood), with smaller numbers of Romano-British (MNI 15; 10 cremated, five unburnt from Pepper Hill and Saltwood), and Early/Middle Bronze Age (one from Saltwood and one from Little Stock Farm) information. The most comprehensive data derived from the two prehistoric burials and the Anglo-Saxon material from Cuxton but even here the prevalence rates are realistically non-representative and there would be little value in attempting temporal or geographic comparison. Most of the variants in the Anglo-Saxon assemblage from Saltwood were, not surprisingly given the condition of the bone, to the tooth crowns.

4.4 Pathology

The range of the type of lesions recorded and their frequency of observation was greatly influenced by the mixed mortuary rites and the very poor condition of most of the bone. The majority of the unburnt bone from the later phases had disintegrated, frequently leaving little other than the tooth crowns, consequently many of the recorded lesions relate to some form of dental disease. Where bone did survive there was often preferential destruction of the trabecular bone, which includes most of the axial skeleton and the articular surface of the long bones. Since the various forms of joint disease are generally amongst the most common conditions observed in archaeological bone assemblages, this loss of the trabecular bone has seriously reduced what would normally comprise a fairly substantial body of data. The loss of trabecular bone from much of the cremated bone assemblage has had similar consequences, though the nature of the rite – particularly the characteristic incomplete recovery of cremated bone from the pyre site for burial – always places restrictions on observable lesions and diagnoses. Few dental lesions are ever recorded in cremated remains due to the shattering of the tooth enamel during cremation, with rare subsequent recovery of the small remaining fragments.

Table 2 presents a summary of the pathological lesions/conditions observed in remains from individual sites by detailed phase. This report gives a brief overview of the frequency of the recorded conditions in the two bone assemblages, with, as far as is feasible given the limitations of the data, a brief discussion of the regional context. Overall comment regarding the general health of the different populations and what this may reflect of their lifestyles and social status will, inevitably, be substantially curtailed; not only is much of the data from the CTRL sites limited, but as much of the comparative material from the county shows a similarly poor level of preservation, there is a comparable reduction in pathological data. For more detailed data and discussion pertaining to the individuals sites readers should access the appropriate specialist reports on ADS.

Neolithic-Early Bronze Age

Lesions – mostly dental – were observed in the unburnt remains of four Early Bronze Age individuals from three sites (Table 2). Bone preservation in the remains of this date was generally amongst the best seen scheme-wide, with 30-80% skeletal recovery. Minor dental caries was seen in the remains of one male dentition; mild-medium calculus (calcified plaque) in three dentitions (male and female); a dental abscess (infection) and linear hypoplasia were each seen in one female dentition from two sites. One adult male had a well-healed lateral fracture in the right fibula proximal shaft; a type of fracture most commonly associated with a direct blow over the bone (Adams 1987, 264). Fairly extensive age-related osteophytes were recorded in spinal, upper and lower limb joints of one adult male. The small numbers involved preclude much meaningful overall comment but there was nothing to suggest any unusual stresses within the groups. There is little comparative data for the period from Kent, though dental calculus and destructive spinal lesions have been recorded in remains from Aylesford and St. Margaret's-at-Cliffe (Thomson in Ashbee 1997; Anderson 1994).

Middle Bronze Age to Iron Age

Cremated bone from one individual and unburnt bone representative of six individuals from three sites showed the presence of pathological lesions. The unburnt remains from two sites (White Horse Stone and Little Stock Farm) were generally well preserved (*c*. 50-90% skeletal recovery), those from Saltwood comprising tooth crowns only; a discrepancy in preservation reflected in the pathological lesions observed. Some form of dental condition was observed in all the unburnt remains, most commonly mild-moderate calculus deposits. Periodontal disease (reflective of a gum disease resulting in bone resorption) was observed in two dentitions and slight enamel hypoplasia (a developmental defect indicative of growth arrest in the immature individual and reflective of periods of illness or nutritional stress; Hillson 1979) in three. Other minor lesions included caries and an abscess in one dentition each. Periosteal new bone, indicative of some form of soft tissue infection, was observed in the remains of two individuals. The position of the lesions seen in the young adult female from Little Stock Farm, on the left anterior surface of the sacrum, suggests some internal infection within the pelvic cavity (McKinley 2006b). Four individuals showed evidence of trauma. Three cases are potentially indicative of violence and one the probable cause of death of the individual, though it cannot be conclusively ruled out that the injury was sustained after death for some 'ritual' reason. The young adult female from Little Stock Farm has a lesion indicative of blunt force trauma was in the left disto-superior parietal bone, there was no sign of healing (Plate 1). Healed lesions in the distal parietals of the mature adult

male from White Horse Stone are indicative of sharp weapon trauma (Witkin 2006c). One other adult male from the same site had a healed fracture to the 4th metacarpal one of the common causes of which is a blow to the knuckles as may be sustained in boxing (Adams 1987, 188). Most other lesions were indicative of joint disease, demonstrating an increase in distribution, and to an extent, severity, with the age of the individual. Two minor neoplasms were also recorded at White Horse Stone.

As with the earlier material, the small numbers involved preclude much meaningful overall comment but this is the only scheme-wide period for which there is direct evidence for inter-personal violence, with a potential 21.4% of the individuals from the unburnt bone assemblage being affected. Violent trauma to the skull – resulting either from conflict, punishment or ritual activity – has been recorded from numerous Iron Age sites (Whimster 1981, 187; Dent 1983, 120-128; Hooper 1984, 471; Hooper 1991, 429-230; Anderson 1995, 121-122; Boylston 2000; McKinley 1999a; 2002). Whilst males appear to have predominated amongst the victims at least one other female is listed as having suffered weapon trauma to the skull (Boylston 2000, table 1). No other skull trauma has yet been reported from an Iron Age site in Kent, though this may in part be an artefact of the relatively low numbers of individuals identified from this period and the often poor bone survival.

Late Iron Age and Romano-British

Lesions were recorded in the cremated remains of 46 individuals from five sites (*c.* 12.4% of period assemblage) and the unburnt bone of 12 individuals (13.9% of period assemblage) from two sites. Most lesions were seen in adult remains. As with the other periods, dental lesions were amongst those most commonly recorded but even here the data was limited by poor skeletal recovery (<5% skeletal recovery from inhumation graves with extant bone). Amongst the unburnt bone, 18 individuals within the scheme-wide period assemblage were represented by - generally partial - dentitions, with a total of 201 teeth; that is only 20.9% of the identified individuals. Lesions were observed in 11 of the dentitions (61.1%) including; slight calculus in four, small carious lesion in three, *ante mortem* tooth loss in one, dental abscesses in two and slight hypoplasia in five. Roberts and Cox found an overall caries prevalence rate of 7.5% for the Romano-British period in their 2003 review (39 sites; table 3.10) which is significantly higher than the 2.7% observed at CTRL, though similarly low rates were observed in some of their assemblages and considerably greater rates in others. Anderson recorded a caries rate of 12.9% in the Late Iron Age assemblage from Mill Hill (1995). The apparently low prevalence rates seen within the CTRL assemblage are likely to be misleading. Bone preservation was very poor, and both bone and teeth with structures already weakened and partially destroyed by erosive lesions will have suffered greater post-mortem degradation than the more sound, robust remains. The amount of calculus observed

is also likely to be unrepresentative. It was clear in much of the Anglo-Saxon assemblage from Saltwood that calculus deposits tended to drop off the teeth either in excavation or post-excavation processing, and its original presence was often evident from very slight 'tide-marks on some teeth (McKinley 2006a); such may also have been the case some of the poorly preserved Romano-British dentitions.

Some dental disease - *ante mortem* tooth loss and an abscess – was also observed in the cremated bone assemblage but most lesions here where indicative of one of the commonly recorded joint diseases or those indicative of minor, repetitive muscle/ligament trauma. Similar minor lesions were recorded in the unburnt remains of only one individual. Periosteal new bone was observed in the remains of 10 cremated individuals; most lesions were seen in the tibia, the visceral surface of the rib being affected in three cases. Indicative of infection of the periosteal membrane covering the bone, such lesions may develop in response to a number of conditions (Manchester 1983, 37). In the latter cases the lesions are indicative of a pulmonary infection which may include conditions such as tuberculosis, pneumonia, pleurisy or chronic bronchitis (Roberts and Manchester 1995, 139; Roberts *et al* 1998, 56). Slight-mild lesions suggestive of anaemia were recorded in the remains of eight cremated individuals (2.1% period assemblage). *Cribra orbitalia* is most commonly indicative of an inadequate dietary intake of iron, and/or a severe intestinal parasitic infestation (Stuart-Macadam 1991, 101). The crude prevalence (CPR) rate of 9.64% given by Roberts and Cox for the period (2003, table 3.17) and that of 12.5% recorded at Mill Hill (Anderson 1995) are both considerably higher than that seen in the CRTL assemblage, but these figures were derived from material from inhumation burials with which data from cremation burials is not necessarily compatible for the reasons outlined above.

The only traumatic lesion observed – a short cut through the angle of the left ramus in the remains of a Late Romano-British adult male from Bower Road – could be indicative of decapitation (Witkin 2006d); the blade having clipped the jaw as it was brought down on the neck (Plate 2). In the absence of supporting evidence, however, the fragment of mandible being all that was recovered of this individual, the suggestion must remain tentative. Decapitated remains are relatively common within cemeteries of this date where they are not necessarily representative of violence against a living victim, the available evidence frequently suggesting the decapitations were undertaken post-mortem for ritual reasons (Harman *et al* 1981; Philpott 1991, 77-89; McKinley 1993a; Boylston 2000).

It is difficult, given the limited representation of the period assemblages as a whole and the in-built biases against the survival of lesions, to use this data to make any secure statement regarding the general health of the Late Iron and Romano-British populations. The rates as seen are probably under-representative and it is inevitable that the full range of conditions afflicting the various populations is not represented.

Anglo-Saxon

Pathological lesions were recorded in the remains of 81 individuals from three sites; i.e. 53.6% of period assemblage including the one cremated individual. Those affected were almost exclusively adults with lesions seen in only one immature individual from Cuxton (Powers 2006). At Saltwood a higher proportion of those individuals identified as males were affected (83%) compared with those identified as female (67%), though the significance which may be attached to this observation is punctuated by the various provisos discussed above regarding preferential preservation (McKinley 2006a). Similar proportions of the MNI from both Saltwood (51%) and Cuxton (57.1%) showed the presence of pathological lesions but, not surprisingly given the great disparity in bone preservation (see *taphonomy*), the range of conditions seen in the latter was greater than in the former where dental lesions predominated.

Table 3 presents the rates for the various dental diseases recorded in the CTRL assemblage with comparable data from Mill Hill, Deal (Anderson and Andrews 1997) and the nationwide review of Anglo-Saxon data by Roberts and Cox (2003; includes no Kentish sites). At both Cuxton and Saltwood the rates for all conditions shown tended to be higher in the males compared with the females, though this may be off-set at Saltwood by the high number of unsexed individuals, a greater proportion of which could have been female. In general, the rates for most conditions appear to have been lower at Saltwood by comparison with Cuxton, but this too could be an artefact of preservation as discussed previously with reference to the Romano-British remains. Preservation at Cuxton was far superior to that at Saltwood where the tooth crowns were often all that survived; heavily worn and consequently thin crowns would have suffered preferential destruction over those with lighter attrition, similarly those who's structure had been weakened by carious lesions would be more prone to collapse. The levels of occlusal attrition to the distal teeth at Saltwood appear to have been genuinely light, that to the anterior teeth often being heavy (McKinley 2006a), but it is possible that had the teeth of the older adults been extensively worn, as was observed at Cuxton, they may not have survived anyway (almost twice as many older adults were identified at Cuxton as at Saltwood). The Cuxton rates do, however, generally appear greater for most conditions in comparison with those from the other contemporaneous Kentish site and from Roberts and Cox's sample, the figures from Saltwood showing closer similarities to the figures from Mill Hill but falling slightly below those from the period sample, suggesting the data may not be too skewed, if at all.

Table 3: Summary of dental lesions in adult Anglo-Saxon dentitions from inhumation burials ([1] Anderson and Andrews 1997; [2] Roberts and Cox 2003, tables 4.14, 4.16-8)

	no. adult dentitions	**no. teeth**	**no. socket positions**	**calculus**	***ante mortem* tooth loss**	**caries**	**periodontal disease**
CTRL total	120	1419	342	35 (29.2%)	35 (10.2%)	45 (3.2%)	3 (2.5%)
Saltwood	96	973	117	20 (20.8%)	4 (3.4%)	15 (1.5%)	2 (2.1%)
Cuxton	24	446	225	15 (63%)	31 (13.8%)	30 (6.7%)	1 (4.2%)
Mill Hill [1]				22.4%	5.5%	3.8%	
Roberts & Cox 2003 [2]				39.2%	8.0%	4.2%	27% (CPR)

Taken at face value, the figures suggest there may have been some variation between the two populations in terms of diet which could potentially be reflective a variation in lifestyle/status. The variation in attrition levels suggest the Saltwood population had a less coarse, fibrous diet than their contemporaries at Cuxton, perhaps with a higher meat or dairy protein intake, though the latter is also suggested by the low caries rates at Cuxton (Hillson 1990). A good level of dental hygiene – particularly at Saltwood - may also have been a contributory factor to the observed rates (Hillson 1990, 287).

Childhood stress indicators in the form of dental hypoplasia and *cribra orbitalia* (see above) varied noticeably between the sites, though the absence of the latter from Saltwood is the result of poor bone preservation rather than a genuine absence (only five orbits were recorded). The CRP of 33% individuals with hypoplasia (4) from Saltwood compared with the absence of the condition from Cuxton and rates of 5.2% from Mill Hill and 18.8% from the period sample (Anderson and Andrews 1997; Roberts and Cox 2003 table 4.12), indicates that infants at Saltwood were prone to greater stress – either dietary or from disease – than many of their contemporaries. Data on other metabolic stress indicators and stature would have helped illustrate how the affects of such childhood stress translated into the adults. The *cribra orbitalia* rates from Cuxton (TPR max. 50%, CRP 20%) were higher than observed in the period sample (TRP 24.6%, CPR 7.6%), but Powers believed the small number of bones surviving created artificially high prevalence rates (2006).

The frequency with which other lesions were observed from both sites was affected by poor bone survival and, as in most of the scheme-wide assemblage, are of limited value for comparative purposes. Lesions indicative of various forms of joint disease were recorded in both assemblages. The remains of four individuals showed lesions indicative of infection including periosteal new bone, osteomylitis, and primary maxillary sinusitis (no fistula associated with the spread of infection from a dental abscess was seen). Evidence of trauma was seen in four adults (17%) from Cuxton including; two cases of compression trauma in the lumbar spine, dislocation of the elbow (Plate 3) and femoral fracture (Powers 2006). Most of those with traumatic lesions were older males – a common period-wide observation

(Roberts and Cox 2003, 202-9) – and none were suggestive of interpersonal violence, rather the result of accidents associated with the individual's lifestyle and occupation, most being suggestive of a heavy fall probably from a height.

4.5 Pyre technology and cremation ritual

The most representative data pertaining to this area of study are, not surprisingly, best obtained from undisturbed or only marginally disturbed deposits where the bone is known to be well preserved. As discussed above, trabecular bone in particular tends to be under-represented or entirely missing from acidic burial environments. Unlike in an inhumation grave where the missing skeletal elements are obvious, unquantifiable quantities of bone may be removed from a deposit as a result of disturbance. Lower levels of disturbance, including those of pressure from above e.g. causing cracking within a ceramic vessel, and an acidic burial environment may, even where no physical removal of bone has occurred, result in increased fragmentation along lines of dehydration formed during cremation.

Oxidation

Oxidation is influenced by three main requirements – time, temperature and oxygen supply – any one or all of which may be affected by a number of intrinsic or extrinsic factors (McKinley 1994a, 72-81; 2000a; 2006a). The degree and extent of oxidation is illustrated by the colour of the bone ranging from the brown/black of unburnt/charred bone, through the hues of blue and grey to the white of fully oxidised bone (Holden *et al.* 1995a and b). Variations in colour are frequently observed in the remains of one individual, commonly in fragments of the same bone and throughout the thickness of the bone (see McKinley 2006a). One potential factor which may have skewed the observations made in the CTRL assemblage is the high soil acidity. Although cremated bone is generally more resistant to destruction than unburnt bone in these circumstances, the paucity of trabecular bone from many site assemblages has already been observed, to this should be added the potential preferential destruction of the less well oxidised cremated bone – the lack of oxidation rendering it more akin to the unburnt bone.

The majority of the surviving bone across the temporal range was white in colour, indicative, as is commonly the case, of high levels of oxidation. Where variations did occur only a few fragments of any one skeletal element were generally affected not the whole element. So little bone was recovered from the Neolithic-Early Bronze Age deposits that it would be difficult to comment on how representative this is of the whole; very slight variation from the white of full oxidation was seen in one fragment from one site. The Middle Bronze Age-Iron Age material was also mostly white; some black skull vault and

femur shaft fragments were recorded in single deposits from Tutt Hill and White Horse Stone (Witkin 2006e and c); such variations probably reflect the peripheral position of the skull on the pyre and the dense soft tissue coverage over the femur. Slightly more extensive variations in the Late Bronze Age burial from White Horse Stone – including fragments of the lower limb and ribs – may have been due to some form of insulating wrapping (e.g. leather or fur) around the corpse.

Although the majority of the bone from the Late Iron Age/Romano-British deposits was white, with the exception of the few from Beechbrook Wood and Little Stock Farm (Witkin 2006f; McKinley 2006b), some incompletely oxidised bone was recovered from the eight other assemblages within this period group. The extent and degree of poor oxidation tended to be slightly greater than observed in the earlier periods. The relatively low proportion of burials - 14.9% - from Pepper Hill containing poorly oxidised bone compared with figures from contemporary cemeteries (average 53.8% of deposits from the towns and 44.8% from rural locations; McKinley in press) could, at least in part, be indicative of preferential destruction of such bone as discussed above (McKinley 2004c, 293-4; in press table 2; Witkin and Boston 2006 table 12). A higher proportion of the urned (20.7%) compared with the unurned burials (7.1%) from Pepper Hill contained poorly oxidised bone. Such a discrepancy has been observed elsewhere for the period; in a recent survey of 1720 burials from *c*. 60 Romano-British site in England, the writer found a consistently higher proportion of urned burials from town sites with less well oxidised bone compared with the unurned burials, though data from the smaller rural sites showed no consistent pattern (McKinley in press). This could be indicative of social and/or economic factors associated with the deceased such as those discussed by Witkin and Boston (2006), however, the effects of the additional protection from the burial environment offered to the bone by the urn may also have been a factor. In the writer's review of oxidation, the main cause of minor variability seen in Romano-British cremated remains appeared to relate to body mass and suggested that the quantity of wood and/or size of the pyre was not always adjusted to accommodate variations in the size of the deceased (*ibid*.); however, no age or sex linked variations were observed in the Pepper Hill assemblage. There were also indications that incomplete oxidation of the bone occurred more frequently and to a greater extent within the towns compared with the rural areas. In the former case, cremation would have been undertaken by professional *ustores* and payment made for the quantity of wood to be used (Toynbee 1971, 45; Noy 2005). Inevitably, the poor, unable to afford sufficient fuel, appear to have been less well cremated than the better-off (Morris 1992, 43). Contemporary written sources indicate that for the Romans incomplete cremation was '…to be deplored, being regarded as in insult to the deceased and … not enabling the soul to reach the afterlife…' (Noy 2005). What is unclear is what, exactly, they would have regarded as 'incomplete'.

Such a judgement would have been based on visual appearance; if what was chiefly required was to be able to distinguish the remains as bones variations in their colour may have been incidental (McKinley in press).

The one Anglo-Saxon cremation burial from Saltwood also showed some slight variation in levels of oxidation. The rite is relatively rare for the period in Kent, most, to date, having been recovered from Orpington, though the reports contain no data pertaining to the cremated bone (Tester 1968; 1969). All the bone from the five burials from Ringlemere currently being examined by the writer is well oxidised.

Weight of bone

None of the Neolithic/Early Bronze Age deposits were *in situ*, comprising very small quantities (max. 3 g) of redeposited bone. The average weight of bone from the Late Bronze Age/Early Iron Age unurned burials at Saltwood was 270.7g, with a range of 134-407.5g. This is considerably less than the maximum weight of 1288g for the scheme-wide Middle Bronze Age/Iron Age period; the nature of this burial, from Tutt Hill, is unclear due to substantial animal disturbance and vandalism but it seems likely to have been an urned burial of an adult male. A similarly large quantity of bone – 1235g – was also recovered from an undisturbed Late Bronze Age unurned burial (containing little trabecular bone), also that of an adult male, from White Horse Stone. The variations in weight are substantial and cannot be purely explained by differences in preservation and disturbance (some of the burials from Saltwood being relatively undisturbed), mode of burial or the sex of the buried individual (Table 2). The inclusion of large (>1000g) weights of bone in burials is a relatively infrequent characteristic of the rite, where averages of *c*. 500-800g are more common. The larger weights have most consistently been observed in burials of Bronze Age - mostly Early and Middle – date and it has been suggested that, as with other aspects of the cremation rite, the time expended on collecting bone for burial may have represented a reflection of the 'status' of the deceased, in whatever terms that may have been calculated by the mourners (McKinley 1997b).

The range of weights recovered from the Late Iron Age/Romano-British burials was again very broad, the relatively low averages of 214.7g from Saltwood and 397.5g from Pepper Hill being adversely influenced by the inclusion of all burials irrespective of disturbance. The undisturbed adult burials from Pepper Hill give a more representative range of 70-1526g, with an average of 775.6g. The maximum weights from other undisturbed adult burials within the assemblage further illustrate the variability in the quantities of bone included for burial; 272-1203g (unurned burial Beechbrook Wood and urned burial Boys Balancing Pond respectively). Pepper Hill represents the only site with sufficient numbers to allow intra-site variations to be observed (Witkin and Boston 2006). The type of deposit

appears to have been of some significance to bone weight, but possibly for intrinsic rather than extrinsic reasons. The greatest average bone weights occurred within the *busta* - 1121g – which is to be expected, the under-pyre pit forming the grave into which the pyre debris, including all the cremated bone, fell during cremation; unless there was some form of deliberate post-cremation manipulation and removal of bone, the *busta* should contain all the bone from the cremated individual. The lowest average bone weight of 461.8 g was recorded from the undisturbed unurned burials; here bone loss due to poor preservation and additional fragmentation may have been increased by the lack of protection afforded by an urn (average for urned burials not available). Although the maximum recorded weight of 1526g (urned burial) was for an adult male, the second largest weight of 1462g comprised the remains of an adult female, and of the nine burials of >1000g, five were of females and four of males. There was, as is commonly observed, no consistent link between the sex of the individual and the weight of bone included in the burial. There was no discernable temporal variation within the overall phase. Comparison of the scheme-wide Romano-British data and those from other contemporaneous cemeteries suggest a general variation in the range and average weights between the rural Kentish cemeteries and those associated with towns (McKinley 2006a table 9). This may, in part, reflect a genuine urban/rural divide but is perhaps linked to the influence of the greater numbers of burials – and, thereby, potential for variation - found in the urban cemeteries.

The weight of bone from the single Anglo-Saxon burial (578.7g) is slightly lower than the average from contemporaneous burials from central and northern England (McKinley 1993b; 1994a, 85), but data from some southern cemeteries suggests there may have been a regional variation with, on average, smaller quantities of bone being included in the burials (McKinley 2005).

Fragmentation

Numerous factors may affect the size of cremated bone fragments the majority of which are exclusive of any deliberate human action other than that of cremation itself (McKinley 1994b). The fragment size recorded during osteological analysis will be the product of a combination of factors including the additional fragmentation along lines of dehydration that occur post-depositionally, and during excavation and post-excavation processing of the bone. Levels of truncation and disturbance to the graves comprised a major factor within the CTRL assemblage, the slightly more protected bone from urned burials generally being marginally less fragmented than that from un-contained deposits.

The majority of the bone from most of the scheme-wide Middle Bronze Age-Iron Age phase burials was recovered from the 5mm sieve fraction with maximum fragment sizes from undisturbed burials at White Horse Stone and Tutt Hill ranging from 11-73mm. This

pattern of relatively high fragmentation continues, to a slightly lesser extent, into the Late Iron Age/Early Romano-British with maximum fragment sizes of 22-71mm and the majority of the bone in the 5mm sieved fraction in over half the burials excavated. With the exception of the one Mid Romano-British burial from Bower Road and the incompletely excavated burial from Little Stock Farm, where in the former 58% of the bone was recovered from the 5mm sieve fraction and the maximum recorded fragment was 33mm, there was a general increase in recorded fragment size amongst the Romano-British deposits. The majority of the bone from the Saltwood burials (average 72%) and from the undisturbed burial at Boys Balancing Pond (50%) was recovered from the 10mm sieve fraction, with a recorded range of 16-83mm for the maximum fragments. In general, this inter-phase difference reflects the variation in the proportion of urned burials compared with unurned ones, the effects of which may be demonstrated by figures from Pepper Hill where the majority of the bone (average 53.3%) from the undisturbed urned burials was recovered from the 10mm sieve fraction, compared with an average of only 29.5% of the bone from the *busta* (Witkin and Boston 2006). That the link is not universal is demonstrated by fact that the maximum recorded bone fragment from the assemblage (95.9mm) was recovered from the remains of an unurned burial. The majority of the bone from the one Anglo-Saxon deposit was also recovered from the 5mm fraction with a maximum fragment of 68mm.

Overall, there is little indication that deliberate fragmentation of bone occurred prior to burial. The fragmentation levels observed are generally commensurate with those expected due to the burial environment and levels of truncation/disturbance observed to deposits with varying levels of external protection available to the bone. It was felt that some of the fragmentation seen within the later deposits at Saltwood could be indicative of slightly greater degrees of tending during cremation – perhaps to re-oxygenate the pyre or help break down some of the charred soft tissues late in the cremation process - but this in itself would not qualify as deliberate fragmentation of the bone.

Skeletal elements

The recovery of only small quantities of bone, together with high fragmentation and poor bone survival leading to a low percentage of fragments identifiable to skeletal element, can skew the record of skeletal elements included in a deposit. There is inevitably a bias in favour of skull elements which are easily identifiable even as very small fragments. Conversely, poor bone survival mitigated against identification of elements of the axial skeleton which largely comprises trabecular bone. In general, across the temporal range, most deposits show a ‘normal’ (once the preceding provisos are considered) distribution of skull, axial, upper and lower limb elements with no indication that a distinction was being made between elements during collection for burial. There are, however, two clear case of

deliberate exclusion of skull fragments from Romano-British burials – one at Pepper Hill and one from Saltwood (Witkin and Boston 2006; McKinley 2006a). Three other truncated urned burials from Saltwood contained only very small amounts of skull with lower limb elements predominating in each case. In these cases it may be that rather than skull having been excluded from the burials, different skeletal elements were distributed within different parts of the urn with most of the skull fragments towards the – subsequently truncated – top. If so, the implication is that the bone was put in the urn as it was collected from the pyre for burial with collection commencing at the foot end of the pyre and working up towards the head end. Other Romano-British burials from Saltwood with small amounts of bone did not show the same pattern, however, so if this were a result of collection procedures it was clearly not consistently followed. The exclusion of skull elements from Romano-British burials has, on very rare occasions, been observed elsewhere (McKinley 1997a, 252; 2004b, 301); the absence of such easily identifiable elements – both for the osteologist and for those who collected the bone from the pyre site for burial – indicates a deliberate action. The recognisable features and symbolic significance of the skull may have rendered these fragments most suitable for some other ritual purpose in some instances; particularly in a mortuary rite where burial was secondary and characterised by the inclusion of only some – albeit variable quantities – of the cremated remains (McKinley 2006d).

The variable inclusion of small skeletal elements – tooth roots and the small bones of the hands and feet - may be used to give some indication of the mode of recovery of bone from the pyre site for burial. Hand collection would tend to give a bias towards the recovery of the larger bones, the very small bones being more difficult to distinguish and more likely to be masked by wood ash. Raking or scrapping-off of the upper levels - where the bone would be concentrated - of the *in situ* pyre debris, with some subsequent form of winnowing (using a basket or water), would be more likely to ensure the random recovery of all bone including the smaller elements (McKinley 1997a, 68). The frequency of such elements was not recorded for the scheme-wide assemblage but data is available for three sites (Boys Balancing Pond, Little Stock Farm and Saltwood; Márquez-Grant 2006; McKinley 2006a and b). On the current evidence there is no clear distinction between phases at CTRL. A paucity in these skeletal elements has been observed and discussed by the writer with respect to other Romano-British cemeteries, e.g. Brougham, Cumbria (McKinley 2004b), and their relative multi-period frequency within the CTRL material may be indicative of regional – or maybe simply local – variation; though Anderson observed that very few of these bone were found in the burials from Ash (1998, 125).

Multiple burials

None of the cremation burials recovered external to Pepper Hill were identified as containing the remains of more than one individual. Even at Pepper Hill, the proportion of such deposits was towards the lower end of the recorded range at 2.7% (McKinley 2000a, 416; 2004b, 303). It is possible that the figures do not give a realistic representation. As is commonly the case, the dual burials each represented those of an adult with an immature individual (Witkin and Boston 2006). The general paucity of immature individuals was discussed above (*demography*), the potential reasons including the increased fragility of the bone in the known aggressive burial environment and the possible low/non-recovery of immature bone from a dual pyre site.

Two of the graves at Pepper Hill each contained the remains of two burials, apparently made contemporaneously (*ibid.*). Although such graves are relatively common in Anglo-Saxon cremation cemeteries relatively few have been reported in the Romano-British period, with rare cases from Baldock and St. Stephens' cemetery, St. Albans, Hertfordshire, Brougham in Cumbria (McKinley 2004b, 303) and Winchester, Hampshire (McKinley 2004d). In the case of Brougham, where many of the graves comprised stone-lined cists, it could not be assumed that the two burials had always been made simultaneous, and such was certainly not always the case in the Anglo-Saxon period where graves were sometime apparently extended to accommodate subsequent deposits (e.g. McKinley 1994a plate 16). It has been suggested that such graves may have been akin to 'burial plots' used for 'family' or burial club members (Saller and Shaw 1984; Toynbee 1971, 54-5; McKinley 2004b, 303).

Pyre goods

It may be difficult to distinguish pyre goods (items which accompanied the deceased on the pyre) from grave goods (items only added at the point of burial) as the degree of visible heat alteration to items will vary dependant on the material type and the location of the item on the pyre (McKinley 1994a, 90-92; 2006d). Iron objects often show no visible signs of having been on the pyre, whereas items made of glass or copper-alloy may show varying degrees of melting dependant on the level of heat to which they were exposed. Items placed on the pyre's peripheries may have remained relatively cool or could have fallen off in the early stages of cremation. Objects placed on the body, e.g. personal ornamentation, would have been shielded from the heat of the fire by the body itself until some way into the cremation process. Most organic items would be lost entirely and the fragments of pyre goods included in a burial will only ever represent a proportion of the items originally placed on the pyre.

The artefactual pyre goods from the scheme-wide assemblages are discussed in the individual cemetery site reports (in particular the Pepper Hill Roman cemetery report) and in relevant specialist artefact reports. However, there may be instances where the only evidence

for the original presence of an item on the pyre, or its position in relation to the body, is suggested by coloured staining to the bone or adhering melted globules of material. Iron staining or the adherence of iron objects to bone is more likely to occur as a result of post-depositional rusting rather than on the pyre where the temperature would not have been sufficient to melt the metal. Other than in the undated burial from Tutt Hill, blue-green staining to bone, suggestive of the presence of copper-alloy items on the pyre, was only observed in remains from Pepper Hill (Witkin 2006e; Witkin and Boston 2006). Bone from 21 burials (12.7%) showed blue/green staining; most comprised the remains of adults (17) of which two were sexed as female (11.8%) and eight as male (47.0%). As observed elsewhere, the pattern of staining – to cranial and upper body elements – suggests items of personal ornamentation though no such objects were recovered from the graves (McKinley 2004b, 302). The absence of such staining from bone elsewhere within the temporal range helps to illustrate the cultural shift in dress and display, both within and external to the mortuary rite. The overwhelming concentration of stained bone within the Pepper Hill assemblage in the Romano-British period may be an artefact of the large size of the cemetery compared with its contemporaries, or a reflection of the higher economic status of the town population compared with their rural counterparts (but see below).

The inclusion of animal offerings – as joints of meat or entire beasts – on the pyre is a common characteristic of the rite across the temporal range, generally showing an increase in frequency and quantity over time (McKinley 2006d). Small quantities of animal bone were recovered from two of the Mid-Late Bronze Age burials (15.4% of the scheme-wide Mid-Bronze Age-Iron Age phase) and 45 of the Late Iron Age/Romano-British burials (12% for the scheme-wide phase) from five sites (Table 2). These proportions are all likely to represent minima since, as with the human remains, not all the animal bone will have been collected from the pyre site for burial, with the potential for most, if not all, of the animal remains to have been accidentally or deliberately excluded. The proportion of Romano-British burials inclusive of animal bone varied between individual sites; Pepper Hill 23.9%, Beechbrook Wood 33%, Boys Balancing Pond 25%, Saltwood 40%. This may reflect a variation in the type of pyre goods those in different geographic zones choose to include with the deceased, which may also have been connected with how their wealth and social status was reflected. Elsewhere in the county two of the five Late Iron Age burials from Mill Hill contained small fragments of animal bone (Anderson 1995, 145), 25% of the burials from Each End, Ash (Anderson 1998) and both the burials from the Priory Centre, Dartford (McKinley 2001). As is common throughout the period the species most frequently recovered were pig and domestic fowl (Giorgi and Stafford 2006). The popularity of pig is likely to reflect the ritual status of the animal, which included the legal requirement for their sacrifice at the graveside prior to burial (Toynbee 1971, 50; Witkin and Boston 2006).

Deposit types and formation processes

Most of deposits within all periods represented the remains of burials (193), the majority of which were urned (52.8%), with 44% unurned and 3.6% comprising *busta* (Table 4). A temporal variation is evident, but the small number of prehistoric burials may have lead to a bias in the figures and *busta* are known to comprise specifically Roman period features.

Table 4: Number of major cremation-related deposit types by period (excluding redeposited pyre debris, cremation-related deposit of unknown type and all redeposited bone)

deposit type	**Middle Bronze Age- Iron Age**	**Late Iron Age-Romano-British**	**Anglo-Saxon**
urned burial	4	98	
Unurned burial	7	77	1
Busta		7	
pyre site		16	
Cenotaph	?2	24	

Details of the formation process of several of the urned burials from Pepper Hill were studied via the distribution of skeletal elements within the *c*. 57% excavated in 20mm spits (Witkin and Boston 2006). As with most other burials examined in this way, the majority showed no indication of ordered deposition of skeletal elements within the vessels (McKinley 2000a, 415). In five burials (6.5%), however, the majority of the bone from the lower spits levels comprised lower limb, that from the upper levels skull and that from the centre upper limb and elements of axial skeleton. These findings have similarities with those from some of the contemporaneous burials from Saltwood discussed above (see *skeletal elements*). The implication in these case is that the bone was being collected by hand from the pyre site, probably by one individual commencing recovery at the foot end and placing the bones immediately into the burial vessel. The more common mix of skeletal elements generally seen could indicate one or more of several possibilities; recovery by scrapping material off the pyre site and winnowing as discussed above (see *skeletal elements*); collection by more than one individual from different parts of the pyre site; initial storage in a different container with subsequent transfer to the burial vessel.

Relatively few *busta* have been excavated in the British Isle and the interpretation of many of them – particularly those associated with the Northern Frontier Forts - as the place of burial as well as the pyre site has been questioned elsewhere by the writer (Philpott 1991, 48-9; Strück 1993; McKinley 2000b; Witkin and Boston 2006). Many of these deposits were either disturbed, not subject to modern advised excavation and osteological analytical

techniques (McKinley 2000c), or have not yet been studied/published in full, and the relatively large number of these features found at Pepper Hill offered an important opportunity for detailed study of the formation processes to be undertaken. The three undisturbed deposits provided the most representative information (Witkin and Boston 2006, table 26). Two of the features contained large quantities of bone, 1211g (adult female) and 1424g (adult male), the third only 730g (adult female). The average weight of bone (>2mm fraction) recovered from an adult in a modern crematorium is 1625.9g, 1271.9g for females and 1621.9g for males (McKinley 1993c). The figures from the two *busta* containing >1000g of bone correspond closely with the averages from modern crematoria and suggest no post-cremation removal of bone occurred. Such does not appear to have been the case in the third instance, where the bone recovered represents only *c.* 57.4% of the total expected. The two females were both older adults, both deposits were intact and of similar form. Although the heavier deposit included more identifiable fragments of trabecular bone – nine fragments compared with five – the increase is not substantial, and even if the loss of some trabecular bone had occurred within the smaller assemblage as a result of disintegration there is still a strong possibility that some bone was deliberately removed. In all three cases the bone was found to be laying on a bed of wood ash towards the base of the cut with little or no overlying fuel ash; i.e. as would be anticipated given the way a pyre is known to collapse (McKinley 2000b). In the case of the adult male the bone had been raked into a heap prior to backfilling the feature; in the other two cases, although there is no clear statement to the effect, the implication is that the remains lay in roughly the correct anatomical order on the layer of fuel ash (Witkin and Boston 2006). These results illustrate several variations within the rite subsequent to cremation but prior to backfilling of the feature; burial with no further manipulation of the remains; removal of some bone, possibly to distribute as 'tokens' to mourners or to be dispatched elsewhere (Hiatt 1969, 105; McKinley 2006d, 85-6); manipulation of the bone to concentrate it within the feature – in some cases elsewhere the remains have been found urned (Strück 1995, 144).

Pyre sites of any form are relatively rare across the temporal range, probably due to their ephemeral nature where constructed on a flat ground surface, as most appear to have been; the effects of burning extending only *c*. 80mm into the underlying soil and consequently easily erased by later disturbance (*pers. obs.*; McKinley 1997b; 2000b). The 16 pyre sites at Pepper Hill constitute a substantial addition to the growing number from the Romano-British period, comprising the largest number identified from any one site to date. The survival of evidence of their presence was assisted by their form which included under-pyre draught pits/scoops of a type occasionally found in Late Iron Age/Romano British cemeteries elsewhere (Fitzpatrick 1997). As has previously been indicated, both by the condition of the *in situ* deposits themselves and the frequent recovery of large quantities of

pyre debris from numerous contemporaneous cremation cemeteries, the individual sites appear to have been re-used for several cremations (*ibid*.; Barber and Bowsher 2000; McKinley 2000b; 2000d, 61-66; Witkin and Boston 2006). Clearance of the site prior to re-use would have been necessary to ensure efficient functioning of the draught-pit; the presence of *in situ* pyre debris within them suggests that most of this clearance occurred prior to construction of the new pyre rather than at completion of each cremation. The small quantities of bone (1-282g) from amongst the pyre debris, which in all but one case indicated the remains of no more than one individual, reinforces this interpretation.

The recovery of cremated bone from pyre debris – either *in situ* or redeposited – is a common feature of the rite, reflecting the incomplete recovery of bone after cremation for inclusion in the burial and the importance of the primary part of the rite, i.e. the cremation, in comparison with the secondary rite of burial (McKinley 2000b; 2006d). Pyre debris may be found in a range of features and deposits, and is commonly included in the backfills of cremation graves, reflecting the proximity of the pyre site to the place of burial (McKinley 1997a; 2000b). Pyre debris was recovered from cremation grave fills across most of the temporal range at CTRL, predominantly those containing the remains of unurned burials. Lone deposits of pyre debris were also recovered from several sites including Pepper Hill and Saltwood. The deliberate 'burial' of redeposited pyre debris appears to have been carried out in several periods in which the mortuary rite was practised (McKinley 1997b; 2000b); whether this represented a purely practical 'cleaning-up' process or part of the 'closure' of burial is uncertain, but the latter is likely to be the case where formal disposal has occurred.

The concept of a cenotaph – a sepulchral monument without a burial 'for some person whose remains were buried elsewhere' (Toynbee 1971, 54) – is hardly new, but there seems to have been a long resistance to its recognition as a separate mortuary feature within archaeological cremation cemeteries; the extreme paucity or absence of cremated bone from such features being accounted for either by destruction during cremation or post-depositionally (neither of which occurs to the implied degree) or by referring to 'token burials' (McKinley 2000b; 2004b). In additional to the documentary records from the Roman world for the use of cenotaphs (Toynbee 1971, 54), numerous examples from both Britain and continental Europe have been recorded (Todd 1977; Topal 1981, 76; Wheeler 1985) and the descriptions of various other Romano-British mortuary-related features suggest the same more appropriate interpretation (McKinley 2004b). A potential 26 such features were identified at Pepper Hill, all apparently similar to other cremation graves within the cemetery but devoid of cremated bone (Witkin and Boston 2006). In considering the features identified at Brougham, Cumbria, the writer suggested that these may represent memorials to individuals who lived, died and were cremated at the Northern Frontier Fort at

Brougham, but whose remains – infinitely more portable cremated in an urn – were transported back to their place of origin, a fate known to have been afforded military leaders who died whilst campaigning both in the Roman period and later (Wenham 1968, 25; Oestigaard 1999; McKinley 2004b). Who then, were those requiring such features at Pepper Hill? Members of the local population who died whilst away from home – possibly at sea, the coast being so close – or visitors to the Springhead temples who died and were cremated there and their remains returned home?

A similar type of deposit may be represented by some or all of a number of Middle/Late Bronze Age contexts observed at four sites; Tutt Hill (Brady 2006a), Beechbrook Wood (Brady 2006b), Chapel Mill (URS 2000a) and West of Blind Lane (URS 2000b). Two Middle Bronze Age ceramic vessels from Tutt Hill, surviving to depths of 0.35m and 0.18m, each contained very small quantities of bone (6g and 7 g) and, in one case 'substantial' quantities of charcoal and in the other charcoal and burnt flint. No human bone was recovered from the other three vessels but that from Chapel Mill contained charcoal. These examples join a growing corpus of similar contemporaneous deposits of vessels, for example; Portsdown, Twyford Down and Langstone Harbour, Hampshire (Nicholls 1987; Walker and Farwell 2000, 29; Allen and Gardiner 2000, 156-8), Cippenham, Berkshire (McKinley 1998), Harrold, Bedfordshire (McKinley 1999b) and Elburton, Plymouth (Watts and Quinnell 2001). In all these cases the vessels contained little or no bone, their fills comprising either large quantities of charcoal or burnt flint, occasionally some of both. Some were found in the general vicinity of cremation-related features and deposits, that from Twyford Down, for example, laying *c.* 40m from a mixed-rite barrow cemetery (Walker and Farwell 2000). The inclusion of burnt material could suggest that these deposits, at least in some instances, may be associated with the mortuary rite of cremation, where, amongst other things, they could have functioned in a similar way to the cenotaphs seen in later phases. The suggestion can only be tentative, however, particularly in the common absence of cremated bone to provide any link between events.

5 CONCLUDING REMARKS

It was previously understood that much of the geology of Kent was not conducive to good bone survival, but the highly destructive nature of the Greensands and the sands and gravels associated with the brickearth in north-west Kent, does not seem to have been fully appreciated. Whilst this has undoubtedly severely limited some areas of osteological data recovery, the overall size of the human bone assemblage, and its broad temporal and geographic distribution - the latter across areas where relatively little has previously been recovered - has undoubtedly made an important contribution to the county's human bone assemblages. The major Romano-British cemetery at Pepper Hill represents the largest yet excavated in the county, and the range and diversity of the mortuary features and deposits will assist in advancing our understanding of mortuary rites both regionally and nationally.

The limited number and small scale of the earlier prehistoric mortuary-related deposits can do little to assist in achieving the primary scheme-wide aims for the period. The material from the Late Neolithic deposits was all redeposited and of limited significance. There was a change in rite from individual inhumation in the Early Bronze Age to cremation in the Middle Bronze Age, but the numbers are so small that in the absence of other evidence an attempt to link this to any social change would be tenuous. Most of the human remains from later Bronze Age and Iron Age period derived from formal burials, though at least two deposits comprising disarticulated unburnt bone may have represented 'placed' deposits reflective of some broader spatial organisation and structural ritual deposition. The only direct evidence for inter-personal violence was recovered from two of the Early/Middle Iron Age sites and could be related to wider social pressures in the region. Although most of the Early-Middle Iron Age burials were by inhumation of an unburnt corpse (13), cremation was already being undertaken at two sites (four burials) by this stage, suggesting that the predominance of the rite by the Late Iron Age/Early Romano-British was not solely a Roman imposition. Inhumation also continued as a major rite – though the bone did not always survive - throughout the Romano-British period. The presence of a relatively high number of *busta* – predominantly found in Britain in cemeteries associated with the Northern Frontier Forts and known to have strong military links (Strück 1993, 92) - in the Early Romano-British period at Pepper Hill raises the possibility of an early military presence in the town, but at very least is indicative of strong Continental influences. The comparatively high number of possible cenotaphs from the cemetery is also suggestive that other than just the normal population of the town was being served (see *deposit types*). The temple complex would have encouraged a large number of visitors, both by road along Watling Street and river along the Ebbsfleet, many of whom would have been seeking to benefit from the healing waters of the springs (possibly up to seven; Phil Andrews *pers com.*; Andrews *et al*

in prep.). It is likely that at least some of these pilgrims will have died whilst seeking relief for their ills.

The two Anglo-Saxon populations at Cuxton and Saltwood have similar population structures, both having the appearance of 'normal' domestic populations. There are some indications for variations in diet between the two sites, the individuals at Saltwood apparently enjoying a slightly higher protein based and less coarse diet than their counterparts at Cuxton, which could have social and economic implications. There is, however, some evidence for greater childhood health stress at Saltwood than at Cuxton, which may be indicative of variations in the pathogens to which children were exposed at each site, or the consistency of food availability and division within different parts of the two populations.

The presence of a possible cremation grave within an Anglo-Saxon cemetery of 213 inhumation graves at Saltwood appears a little incongruous (see Riddler and Trevarthen 2006). The possible cremation grave is set amongst the inhumation graves – one of which it cut - associated with the central barrow. Cremation burials of this date from Kent are rare (Tester 1968; Mays and Anderson 1995, 376; Lucy 2000, fig 4.7) and it is unclear why this one individual would be cremated when all the others were inhumed. One obvious suggestion would been that this individual was of a different ethnic or cultural origin to the others; there are characteristics of the burial – unurned, inclusion of pyre debris, absence of pyre goods – which signify it has more in common with southern cremation burials than those of central or northern England (McKinley 2005). There are some queries pertaining to the security of the deposits' contextual position which render any interpretation tentative (Riddler and Trevarthen 2006), but the possibility of this representing a genuine Anglo-Saxon unurned cremation burial and the implications such a deposit may carry, is intriguing.

6 DIGITAL ARCHIVE

This schemewide specialist report has been prepared and published as part of the Channel Tunnel Rail Link Section 1 Post-excavation Project. The report is one of five publication level schemewide specialist reports available to download from the Archaeology Data Service website: **http://ads.ahds.ac.uk/catalogue/projArch/ctrl/**. These provide synthetic overviews of the specialist data from CTRL Section 1 in its regional context. The ADS site also includes 20 integrated site reports, which present synthesised data from key site sequences at an interpretative level that can be readily assimilated into complementary studies. Underpinning the site reports and overviews, is a comprehensive archive of individual specialist reports and databases, which are also available to download. The CTRL reports and data can be accessed through the 'Project Archives' section of the ADS website.

Hard copy publication of the CTRL Section 1 results comprises a single volume synthetic overview of the excavated results in their regional context, which includes a complete site gazetteer and guide to the archive (Booth et al 2007).

Table 4 below details all available digital data for the human remains schemewide overview. Reports and accompanying figures are presented as downloadable, print-ready Adobe Acrobat files (.pdf). ADS also maintain archivally stable versions of report image pages (.tiff). Human remains catalogue data is available for each site.

Table 5: Digital archive contents

Principal site name	Filename root	Principal authors and organisation
Schemewide specialist report		
Human Remains Schemewide Report	HUM_SSR	McKinley J (OWA JV)
Specialist research reports		
02 Pepper Hill	HUM_PHL	Witkin A and Boston C (OWA JV)
03 Whitehill Road Barrow	HUM_WHR	White B (MoLSS)
04 Northumberland Bottom	HUM_WNB	White B (MoLSS)
07 Cuxton	HUM_CXT	Powers N (MoLSS)
09 White Horse Stone	HUM_WHS	Witkin A (OWA JV) and Boston C (OWA JV)
12 Thurnham Villa	HUM_THM	Witkin A (OWA JV)
13 Snarkhurst Wood	HUM_SNK	Witkin A (OWA JV)
14 Eyhorne Street	HUM_EYH	Witkin A (OWA JV)
18 Leda Cottages	HUM_LED	Witkin A (OWA JV)
19 Tutt Hill	HUM_TUT	Witkin A (OWA JV)
21 Beechbrook Wood	HUM_BBW	Witkin A (OWA JV)
26 Bower Road	HUM_BOW	Witkin A (OWA JV)
30 Saltwood Tunnel	HUM_SLT	McKinley J (OWA JV)
Specialist research datasets		
02 Pepper Hill	HUM_PHL	Witkin A (OWA JV)
03 Whitehill Road Barrow	HUM_WHR	White B (MoLSS)
04 Northumberland Bottom	HUM_WNB	White B (MoLSS)

Principal site name	Filename root	Principal authors and organisation
07 Cuxton	HUM_CXT	Powers N (MoLSS)
09 White Horse Stone	HUM_WHS	Witkin A (OWA JV) and Boston C (OWA JV)
12 Thurnham Villa	HUM_THM	Witkin A (OWA JV)
13 Snarkhurst Wood	HUM_SNK	Witkin A (OWA JV)
14 Eyhorne Street	HUM_EYH	Witkin A (OWA JV)
17 Chapel Mill	HUM_CML	Witkin A (OWA JV)
18 Leda Cottages	HUM_LED	Witkin A (OWA JV)
19 Tutt Hill	HUM_TUT	Witkin A (OWA JV)
21 Beechbrook Wood	HUM_BBW	Witkin A (OWA JV)
26 Bower Road	HUM_BOW	Witkin A (OWA JV)
27 Little Stock Farm	HUM_LSF	McKinley J (OWA JV)
30 Saltwood Tunnel	HUM_SLT	McKinley J (OWA JV)

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APPENDIX 1: CTRL SECTION 1: SUMMARY OF HUMAN REMAINS RECOVERED BY PERIOD

KEY: * subject to assessment only; ** data mixed assessment and full analysis; nfe – not fully excavated; u/b – unburnt; crem. – cremated; rpd - redeposited pyre debris; crd – cremation-related deposit; amtl - *ante mortem* tooth loss; djd – degenerative joint disease (commonly osteophytes)

site	deposit types	MNI	age/sex	pathology	pyre goods
			Late Neolithic		
White Horse Stone	2 redep.	C: 1	?		
			Late Neolithic/Early Bronze Age		
Eyehorne Street	2 redep.	C: 1	?		
Beechbrook Wood	2 redep.	C: 1	?		
			Bronze Age (unspec.)		
Beechbrook Wood	1 unurned ?burial 1 ?redep.	C: 1	adult		
			Early Bronze Age		
Northumberland Bottom	3 inhumation burials	U/B: 3	adult female (26-45 yr.), adult male (26-45 yr.), infant (3-5 yr.)	caries	
Whitehill Road Barrow	1 inhumation burial	U/B: 1	adult female (18-25 yr.)	hypoplasia; calculus	
Beechbrook Wood	2 redep. (crem. bone)				
Saltwood	2 inhumation burials	U/B: 2	adult female (25-45 yr); adult male (>45 yr.)	calculus; dental abscess; fracture; osteophytes	
			Middle Bronze Age		
Tutt Hill	2 crd (?cenotaphs)	C: 1	?		
Saltwood	1 unurned burial	C: 1	adult female (>25 yr.)	osteophytes; exostoses	
			Late/Middle Bronze Age		
Tutt Hill	1 ?urned burial	C: 1	adult male >18 yr.		animal bone
			Late Bronze Age		
White Horse Stone	1 urned burial;	C: 2	adult male (>18 yr.); adult ??female (>18 yr.)		1 with

site	deposit types	MNI	age/sex	pathology	pyre goods
	1 unurned burial/rpd				animal bone
Hurst Wood (Newlands)	1 ?urned burial; 1 ?burial	C:2	adult ? female (>18 yr.); adult >18 yr.		
Tutt Hill	1 rpd				
Beechbrook Wood	1 ?unurned burial 1 rpd	C: 1	immature (<18 yr.)		
			Late Bronze Age/Iron Age		
Saltwood	3 crd				
			Early/Middle Iron Age		
White Horse Stone	1 inhumation burial 9 redep. (u/b), inc. 'placed'	U/B: 5	1 juvenile (9-11yr.) 1 subadult (13-18 yr.), adult (25-36 yr.) male, adult (>18 yr.)	calculus; osteochondritis dissecans, osteochondroma calculus; abscess; hypoplasia; porotic hyperostosis; button osteoma; cut-marks ; djd	
Little Stock Farm	1 ?disturbed/redep. inhumation burial 2 redep. (u/b)	U/B: 2	adult (20-30 yr.) female adult (>35 yr.)	calculus; periodontal disease; blunt weapon trauma; periosteal new bone	
Saltwood	4 inhumation burials 3 unurned burials 1 crd 1 redep. (crem.) in inhumation grave	U/B: 4 C: 3	subadult-young adult (14-25 yr.) male, 2 adults (18-25 yr, >18 yr.), subadult/adult (>13 yr.) 1 infant (0.25-1.5 yr.), 2 adults (>18 yr.) inc. 1 female	calculus; hypoplasia	
			Middle Iron Age		
Pepper Hill	1 inhumation burial	U/B: 1	adult (>40 yr.) male		
White Horse Stone	1 inhumation burial 1 urned cremation ?burial	U/B: 1 C: 1	adult male 1 immature	caries; periodontal disease; osteoarthritis; djd; fracture	
Saltwood	1 inhumation burial	U/B: 1	adult (>45 yr.) male	periosteal new bone; osteoarthritis; degenerative disc disease; osteophytes; exostoses	

site	deposit types	MNI	age/sex	pathology	pyre goods
			Mid/Late Iron Age		
Beechbrook Wood	1 redep. (crem.)		?		
			Late Iron Age		
Chapel Mill*	2 unurned burials	C: 2	2 adults (>18 yr.)		1 with animal bone
Beechbrook Wood	1 rpd, 3 redep. (crem.)				
			Late Iron Age/Early Romano-British		
Snarkhurst Wood	1 unurned burial + rpd	C: 1	Adult (>25 yr.) ??male		
Tutt Hill	1 crd		?		
Beechbrook wood	4 urned burials 5 redep. (crem.)	C: 4	2 immature (<18 yr.), 2 adults (>18 yr.)		1 with bird bone
Saltwood	3 unurned burials, 1 unurned burials + rpd/rpd; rpd	C: 4	2 adults (25-40 yr., >25 yr.) female, 2 subadult/adult (>13 yr.)	osteophytes	2 with animal bone
			Romano-British (unspec.)		
Pepper Hill	*bustum*, 1 urned burial, 11 unurned burials, 3 pyre sites, 8 cenotaphs, 8 crd	C: 202	10 adults (>18 yr.); ? 192	NB: ref. to <u>all</u> RB material amtl; abscess; *cribra orbitalia*; periosteal new bone; Schmorl's nodes; osteoarthritis; djd	NB: ref. to <u>all</u> RB burials: 34 with animal/ bird bone
	79 inhumation graves	I: 79	1 infant (0.05-5 yr.); 5 subadults (13-18 yr.); 11 adult (18-25 yr.) inc. 3 female, 1 male; 2 adults (26-45 yr.) inc. 1 female; 2 adult (>45 yr.) males; 25 adults (>18 yr.) inc. 2 females, 2 males; 33 ?	amtl; abscess; caries; periodontal disease; calculus; hypoplasia; osteophytes	
White Horse Stone	1 redep. (u/b)		subadult/adult (>13 yr.)		
Little Stock Farm	1 crd (nfe)	C: 1	adult (>25 yr.)		
			Early Romano-British		
Pepper Hill	6 *busta*; 29 urned burials, 32 unurned burials, 13 pyre sites, 11 cenotaphs, 2 crd	C: 68	8 juvenile (5-12yr.), 3 subadult (13-18 yr.); 1 adult (19-25 yr.) female; 11 adults (26-45 yr.) inc. 5 females, 6 males; 3 adults (>45 yr.) inc. 2 males; 42 adult (>18 yr.) inc. 8 females & 11 males	*see non-specific RB*	*see non-specific RB*
Northumberland Bottom	2 urned burials	C: 2	immature (<15 yr), adult >18 yr.		

site	deposit types	MNI	age/sex	pathology	pyre goods
	2 inhumation burials, disartic. u/b bone	U/B: 4	2 neonates (*in situ*); 2 adults (>18 yr.), one ??male		
Thurnham	1 inhumation burial	U/B: 1	neonate		
Holm Hill*	3 ?rpd	C: 1	adult (>18 yr.)		
Hurst Wood (Leda Cottages)	1 redep.	C: 1	?		
Beechbrook Wood	?1 urned burial	C: 1	1 adult (>18 yr.)		
Boys Hall Balancing Pond**	4 urned burials	C: 4	adult (18-45 yr.) male, rest ?	*cribra orbitalia*; periosteal new bone; osteoarthritis; enthesophytes	1 with animal bone
Saltwood	9 urned & 1 unurned burials; 1 rpd	C: 10	1 subadult/adult (>13 yr.), 9 adults (1 x 18-25yr. female; 4 x >25 yr. inc. 2 female; 1 x >45 yr. female; 3 x >18 yr. inc. 1 male)	osteophytes; exostoses	4 with animal bone
			Early-Mid Romano-British		
Pepper Hill	19 urned burials, 12 unurned burials, 6 cenotaphs, 5 crd	C: 25	1 infant (0.5-5 yr.), 2 juveniles (5-12 yr.), 1 subadult (13-18 yr.); 2 adults (26-45 yr.) 1 female, 1 male; 1 adult (>45 yr.) male; 17 adult (>18 yr.) inc. 2 females, 2 males; 1 ?	*see non-specific RB*	*see non-specific RB*
			Mid Romano-British		
Pepper Hill	23 urned burials, 11 unurned burials, 2 crd	C: 37	3 infants (0.5-5 yr.), 2 juveniles (5-12 yr.), 1 immature (<18 yr.); 4 adults (26-45 yr.) inc. 2 females, 2 males; 4 adult (>45 yr.) males; 23 adult (>18 yr.) inc. 5 females, 4 males;	*see non-specific RB*	*see non-specific RB*
Bower Road	1 urned burial 1 redep. (u/b)	C: 1	adult (>25 yr.)	periosteal new bone	animal bone
			Mid-Late Romano-British		
Pepper Hill	5 urned burials, 2 unurned burials, 1 cenotaph	C: 7	1 juvenile (5-12 yr.); 1 immature (<18 yr.); 1 adult (18-25 yr.); 4 adults (>18 yr.) male, female	*see non-specific RB*	*see non-specific RB*
Beechbrook Wood	1 unurned burial + rpd	C: 1	adult ??male	amtl; djd	animal bone
			Late Romano-British		
Thurnham	1 inhumation burial	U/B: 1	neonate/infant (4-8 months)		
Bower Road	1 redep.	U/B: 1	adult male (>18 yr.; see MRB u/b)	calculus; hypoplasia; ?trauma	

site	deposit types	MNI	age/sex	pathology	pyre goods
			Anglo-Saxon		
Cuxton	35 inhumation burials	U/B: 35	5 juveniles (5-12 yr.), 4 infants (<5 yr.), 1 immature (<18 yr.); 24 adults (4 x 18-25yr; 12 x 26-45 yr; 4 >45 yr.; 5 >18 yr.) inc. 6 females, 6 males	calculus; caries; amtl; periodontal disease; *cribra orbitalia* osteomylitis; Schmorl's nodes; degenerative disc disease; osteoarthritis; fractures; dislocation	
White Horse Stone	1 inhumation burial	U/B: 1	adult (25-35 yr.) female	Schmorl's nodes; pitting (djd);	
Saltwood	113 inhumation burials + redep. bone	U/B: 115	3 infants (<5 yr.); 5 infant-juvenile (3-8 yr.); 10 juvenile (6-10 yr.); 3 juvenile-subadult (7-18 yr.); 6 subadult (13-18 yr.) inc. 4 male; 9 subadult-young adult (14-25 yr.) inc. 5 male; 65 adult (14 x 18-25 yr.; 18 x 18-40 yr.; 22 x 25-45 yr.; 5 x >25 yr.; 4 x >45 yr.; 2 >18 yr.) 23 male, 9 female; 7 subadult/adult (>13 yr.) inc. 1 female; 2 >5 yr.; 5 >2 yr.	calculus; periodontal disease; amtl; caries; hypoplasia; maxillary sinusitis; periosteal new bone; djd; osteophytes; exostoses	
	1 unurned ?burial; redep. in 48 inhumation graves	C: 1	adult (>25 yr.) female	amtl; infection; osteoarthritis	
			Undated		
White Horse Stone	3 unurned cremation burials 3 redep. (crem.)	C: 3	adults (>18 yr.)		
	2 redep. (u/b)	U/B: 2	infant (2-3 yr.), adult (>40 yr.) male		
Thurnham	1 unurned burial	C: 1	adult >18 yr. ?female		
Tutt Hill	1 unurned burial; 2 crd	C: 1	adult >18 yr.		
Saltwood	1 unurned burial; 4 rpd; 2 crd; 11 redep.	C: 1	adult (>25 yr.) male	osteophytes	