Chapter 10: Aspects of the Bronze Age Timber Structures

Chronology and function (Figs 10.1-10.4)

The evidence retrieved from the A13 fits within the general regional pattern of an increase in the construction of timber structures along the floodplain wetland margins during the 2nd millennium BC. Aside from the 'bridge' structure at Freemasons Road, three trackways and a possible platform were recorded at Woolwich Manor Way, and a further two trackways at Movers Lane. In addition a number of smaller stake built structures were recorded at all three sites. The dating of the A13 structures is largely based on radiocarbon dating of the worked wood, supported by the analysis of woodworking technology. Unfortun ately all attempts to date larger oak wood samples (both natural and humanly worked) by dendrochronology failed. In the case of the 'bridge' structure this was due to the fact that the timbers used for the piles were from rather fast grown oaks with too few annual rings. The earliest structure appears to have been built at Woolwich Manor Way where radiocarbon dates on roundwood from Trackway 50 date construction to the second half of the 3rd / earlier part of the 2nd millennium BC (see Fig. 10.1 and Appendix 1.2), the bridge structure at Freemasons Road, Trackway 29 at Woolwich Manor Way, and both trackways at Movers Lane date to the early to mid 2nd millennium BC. The overlap in the radiocarbon dating suggests some of these structures may have been contemporary, although when all the dates are combined together they are not statistically consistent. Trackway 29 and platform structure 61 at Woolwich Manor Way are a little later, dating to the latter part of the 2nd millennium BC.

The pile alignment at Freemasons Road can be compared with a number of other similar structures excavated in the Thames Valley. The closest parallel based on form is the middle Bronze Age pile group excavated in the Ebbsfleet Valley (Wenban-Smith *et al.* forthcoming). Obvious comparisons can also be drawn with the middle and late Bronze Age pile groups excavated at Vauxhall (Haughey 1999; Sidell *et al.* 2002, 29) and further upstream at Eton (Allen *et al.* forthcoming, Lambrick 2009, 232). The radiocarbon dates suggest that the structure at Freemasons Road is one of the earliest and may well have been contemporary with the larger Vauxhall structure (Fig. 10.2). At T=0.1 at 1df, the dates on the two structures are statistically consistent (chi-squared test using Beta-152738 and Beta-122970). Reconstruction of the contemporary topography at Freemasons Road tends to support the interpretation that this structure was a footbridge bridge or jetty running from the higher ground out into a wetland zone during a period of increasing wetness. Recent topographic modelling work in the Lea Valley suggests that during the early Bronze Age a large floodplain island existed immediately to the east of Freemasons Road and it is possible the structure linked the drier ground of the terrace to this island (Fig. 4.8b; Corcoran *et al.* 2011, 56 and fig 108).

The dates for the A13 trackways tend to be slightly earlier than a number of Bronze Age structures recorded in the immediate vicinity which appear to post-date 1500 cal BC (Figs 10.3 and 10.4). Further afield there are a number of other Bronze Age trackways and some, such as Bramcote Green in Bermondsey have produced pre-1500 cal BC dates (Thomas and Rackham 1996). There are also possible

Plate 33 Neolithic trackway exposed during excavations at STDR4 in the Ebbsfleet Valley

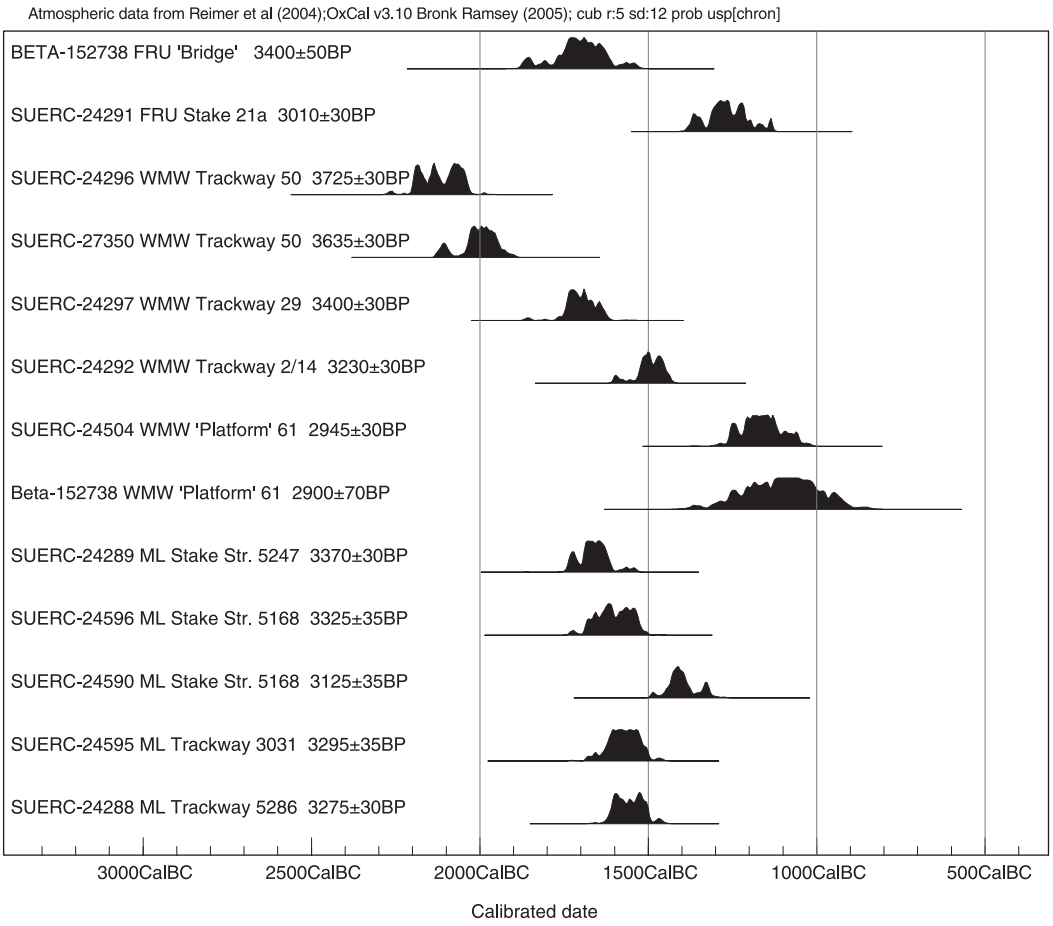

Fig. 10.1 Radiocarbon chronology of the A13 timber structures

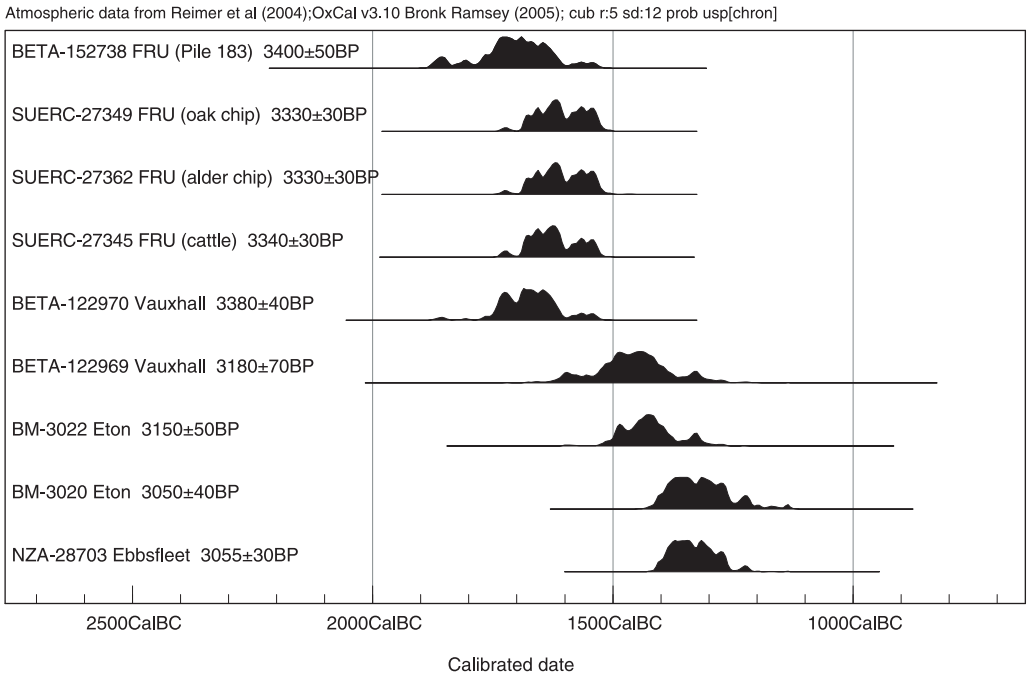

Fig. 10.2 Radiocarbon chronology of Bronze Age piled structures from the Middle and Lower Thames Valley

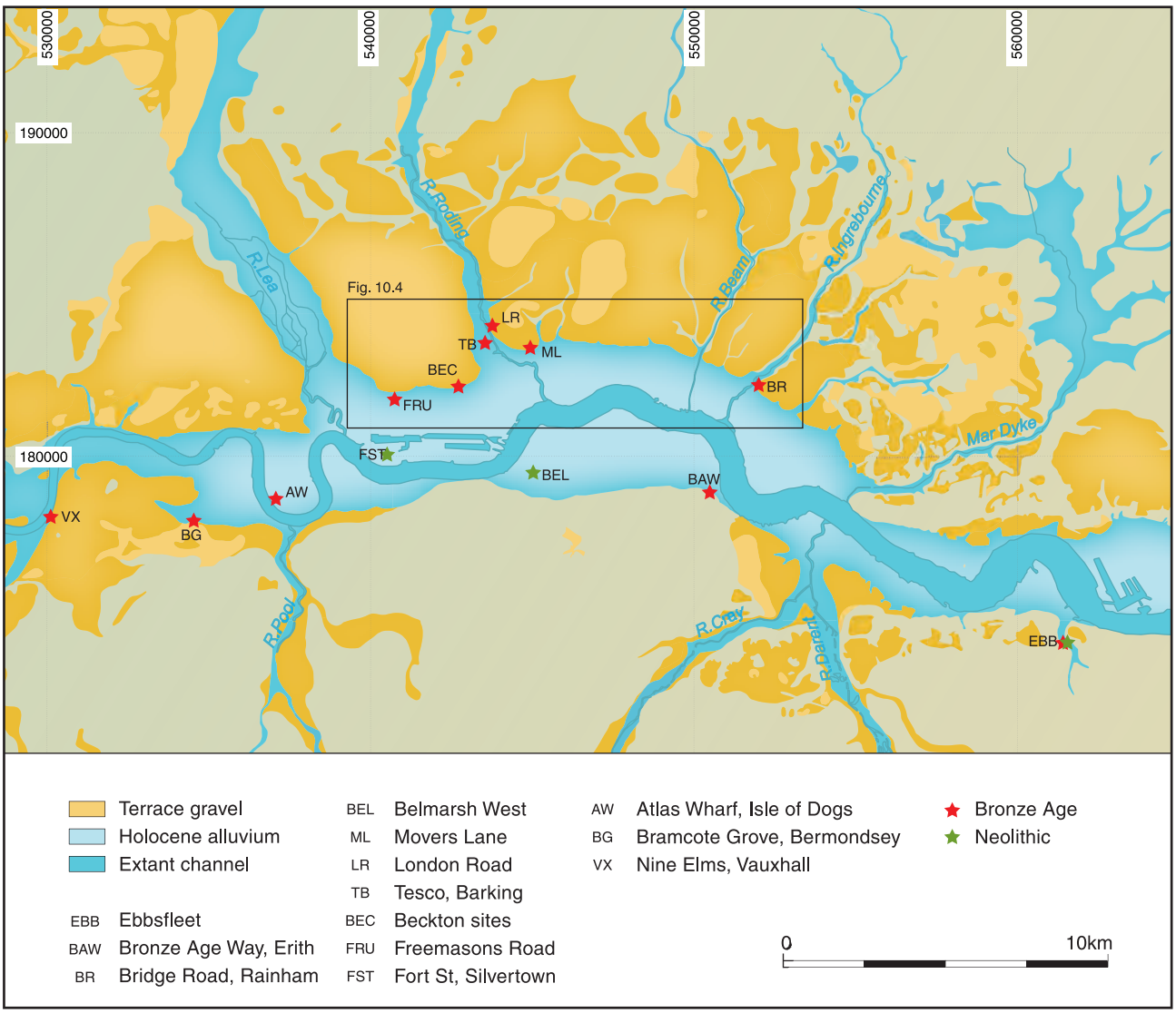

Fig. 10.3 Location of excavated timber structures from Central and East London

early examples, such as Fort Street, Silvertown (Crockett *et al.* 2002), Belmarsh (Hart 2010) and structures in the Ebbsfleet Valley (Wenban-Smith *et al.* in prep) that attest to a tradition of trackway building stretching back to into the Neolithic period (Fig. 10.3; Plate 33).

At Woolwich Manor Way, the trackways lie in close proximity to previously recorded structures at Beckton Nursery and Beckton 3-D (Meddens 1996) and the Golf Driving Range (Carew *et al.* 2010). At the latter site the calibrated date from an earlier platform structure appears to overlap with the dates for Trackways 50 and 29 at Woolwich Manor Way (Fig. 10.4). Although the age-ranges span a considerable time frame (max. around 600 years, min. 130 years) perhaps suggesting repairs to the structures, the youngest date for Trackway 50 and the two older dates from the platform passed a chi square test and are statistically consistent (T=4.9 at 2df). In addition the projection of the alignment of trackway 29 points directly to the platform structure suggesting they may well have been directly related (Fig. 5.5). The dates for the platform and the date for Trackway 29 are also statistically consistent (T=7.5 at 3df). The trackway structures at the other nearby Beckton sites (Beckton Nursery, Beckton 3D) and the Golf Driving Range coincide with the building of the latest trackway 2/14 at Woolwich Manor Way (Fig. 10.4). All dates from these structures appear to be statistically consistent and could be considered broadly contemporary. Modelling the dates (using OxCal. 4.17) helps to refine the age ranges, providing a modelled start for the phase of 1672-1420 cal BC and an end of 1484-1136 cal BC, with the most likely age range for the date of these structures of about 1450-1390 cal BC.

The building of the trackways, an activity which appears to have significantly increased during the 2nd millennium BC, was clearly a means of accessing the floodplain wetlands. The apparent repair and possible replacement of trackways, particularly at Woolwich Manor Way, suggests that

the construction and maintenance of these structures retained some relevance with the changing hydrology of the area and suggests that defined and established access routes into the marshland were respected and maintained. However as their points of origin and destinations are unknown it is difficult to speculate further. The palaeoenvironmental evidence from the A13 sites indicates that construction broadly coincides with rising water levels and a change from predominantly alder carr to a more open environment of sedge fen, reedswamp and marsh. Further into the marsh, closer to the Thames foreshore it is likely that saltmarsh environments existed. Access to the floodplain may have been required to exploit the range of natural resources that must have been abundant in such environments: plants for medicinal purposes or reeds for basketry and thatching, as well as activities such as hunting, fishing and waterfowling. However, as previously stated there is little evidence of such activities from sites along the A13 or the Thames Estuary in general during this period. Alternatively the trackways may have been used for herding of animals to seasonal pasture on the marshes. Given the light construction, the trackways themselves were probably only used for human foot traffic with the herd wading alongside through the wetter areas. The role of animal husbandry, particularly of cattle, in the local subsistence economies of the region is well attested.

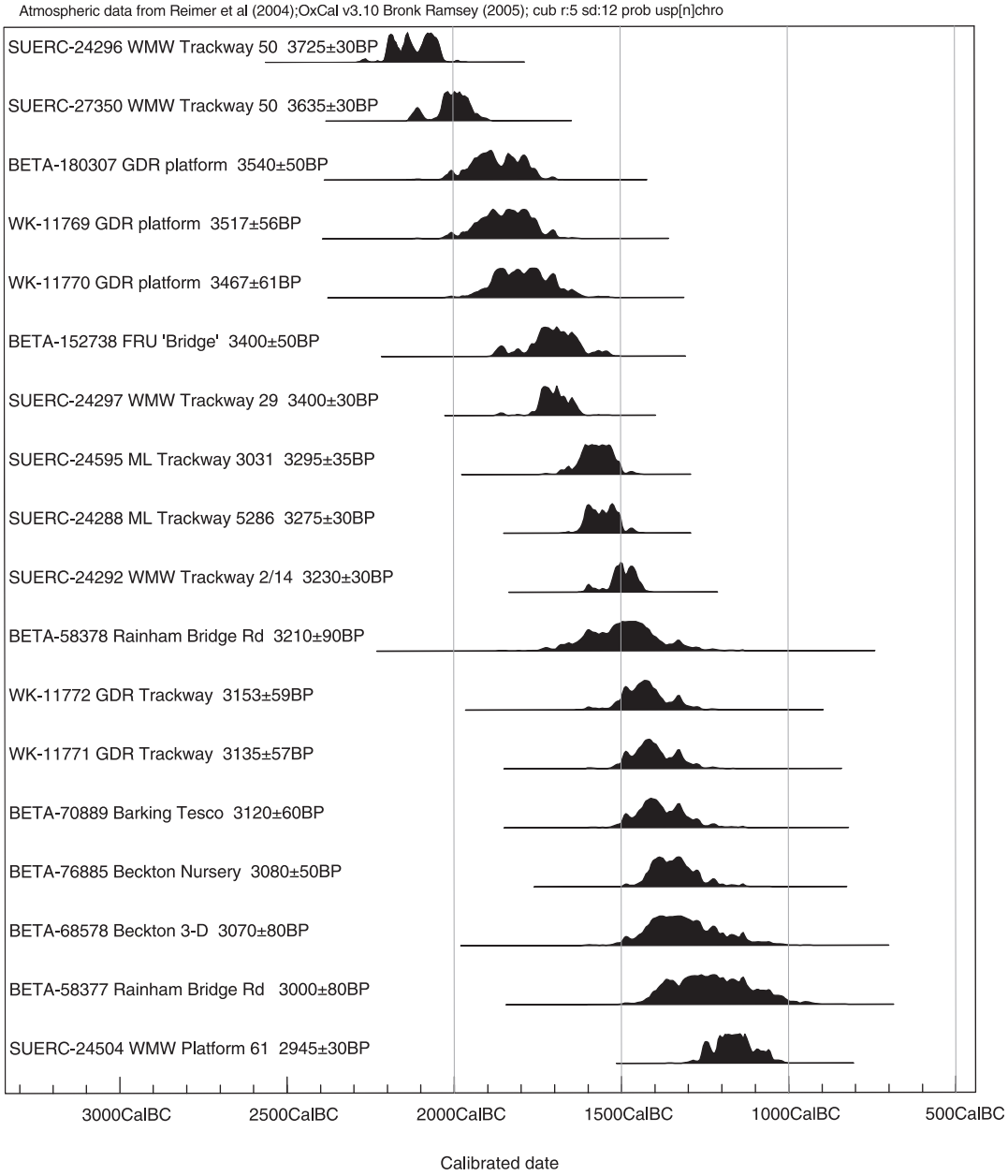

Fig. 10.4 Radiocarbon chronology of Bronze Age timber trackways in East London

Construction methods

Freemasons Road 'bridge' (Fig. 10.5)

Form

The Freemasons Road 'bridge', a double pile alignment, was the most substantial wooden structure found during the A13 project. No elements of the upper works of the structure were found, although the oak sliver chips from the organic silt that accumulated around the base of the piles (layer 49) do suggest that the trimming of large oak planks of the sort likely to have been used in a walkway had occurred close-by. The reconstruction presented in Figure 10.5 is tentative and has been based on the use of a range of joints and materials documented in Bronze Age timber structures from south-east England. Other possible assemblies can not be ruled out, but axe hewn tusk tenons on the tops of piles for carrying cross planks with socket joints are known in the Bronze Age and later simple trestle type structures. At Swalecliffe in Kent, for example, a substantial cleft plank was supported by two piles with elongated tusk tenons at the base of a waterhole or well (Masefield *et al.* 2003, 66) and another larger example of a tusk tenoned pile comes from Flag Fen (Pryor 1991, fig. 79). Having established a moderately rigid trestle it would have been relatively easy to lay down cleft planks or half logs to form the longitudinals and walkway. There is no evidence of the use of lashings or wooden pegs in such situations so they have not been used in the illustration.

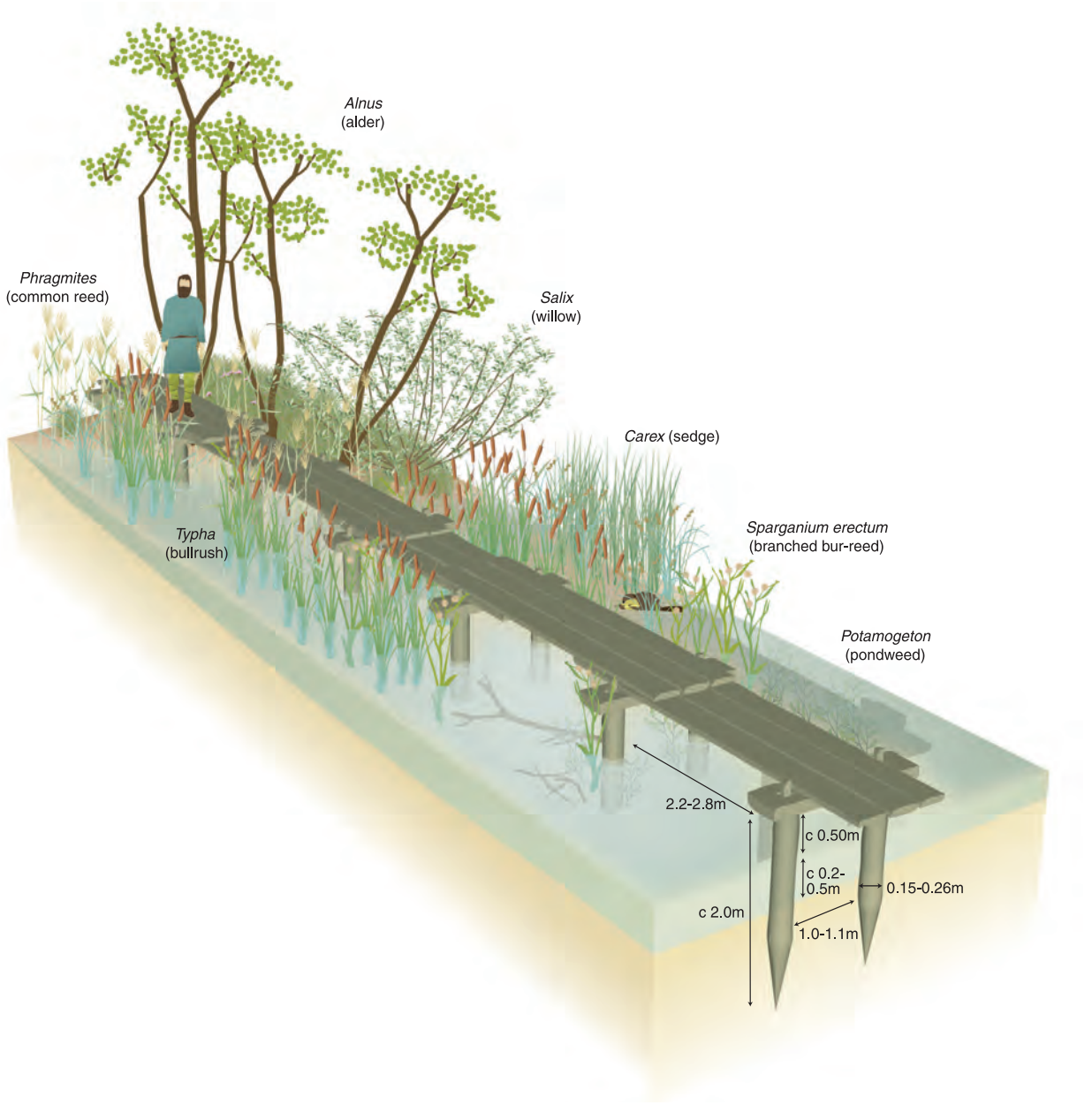

Fig. 10.5 Reconstruction of the Freemasons Road 'bridge'

Comparison of scale

The making, moving and driving of such piles was a substantial undertaking, but not unique in the Thames Valley and estuary floodplain (Cromarty *et al.* 2006; Haughey 1999; Lambrick 2009; Wenban-Smith *et al.* in prep.). In terms of scale, at around 150-260mm diameter the Freemasons Road piles were a little larger than most other piled structures of similar date. A relatively close parallel is the double pile alignment from Ebbsfleet, Kent which appears to have carried a footbridge over a tributary channel (Fig. 10.6). This structure was slightly later in date, at 1410-1220 cal BC (NZA-28703: 3055±30 BP). Here the round oak log piles, 105mm to 150mm in diameter, were set in pairs roughly 1m apart; approximately the same spacing as at Freemasons Road, although the spacing of each pair was a little greater at about 3m rather than 2.2m-2.8m (Wenban-Smith *et al.* in prep.).

The Bronze Age pile groups excavated at Vauxhall (Haughey 1999, Sidell *et al.*, 29) and further upstream at Eton (Lambrick 2009, Allen *et al.* forthcoming) appear to be larger and the arrangement of piles a little less regular. This may have been due to the structures spanning wider, faster flowing water courses and a longer lifespan requiring some maintenance. At Eton two roughly parallel rows of oak timber piles were set about 1.5m–2m apart with the pile diameters averaging 200mm to 230mm, although some were much larger at up to 420mm. The radiocarbon dates for two piles were, respectively, 1530-1300 cal BC (BM-3022: 3150±50 BP) and 1420-1200 cal BC (BM-3020: 3050±40 BP). The Vauxhall structure was even wider; here, the massive piles were set roughly 4m apart with diameters of up to 600mm and could clearly have accommodated wheeled vehicles. Radiocarbon dates on two piles span a considerable period of time; 1770-1530 cal BC (Beta-122970: 3380±40 BP) and 1630-1290 cal BC (Beta-122969: 3180±70 BP). Although there is an overlap in the dates ranges, it is possible that some of the piles had been replaced.

The logistics behind the building of the bridge

One of the authors (DG) has some experience of working with fresh oak logs of the size and growth rate used in the bridge and of working with middle Bronze Age replica tool kits and low-tech aids such as pole levers and this is drawn upon here (Goodburn 2004). The original height of the piles is impossible to reconstruct accurately, however, as water levels along the Thames floodplain edge at this time are unlikely to have been higher than about +1.5m OD, a length of perhaps 2.5m to 3.0m seems adequate to support a decking level above high water levels. This means, if 3m long, the largest freshly cut piles would have weighed around 0.12 tonnes. Whilst a pile this size could be manoeuvred by two adults, to carry or drag the log any distance might take four. In addition, small increases in log diameter make exponential increases in weight. Freshly cut green oak logs of medium to fast growth can weigh as much as about 1.073 tonnes/m^3 and generally do not float (Millett and McGrail 1987, 106). This means, unless they were transported by boat as is known in a few cases for stone in the Bronze Age, that water was probably not used to move them. If the piles were around 3m long, many parent trees would have produced two piles. The largest butt log of at least one would have been cleft into sections for the cleft piles. It is likely that the suggested longitudinal planking would have been carried into place by two people during periods of low water level. However, if they were of great width and thickness a team of four might be needed for planks of 3.5m in length, which is long enough to overlap at each end.

The driving of the piles

The driving of piles using percussive rams and medieval documentation of rams of various forms is now well known, at least to archaeologists (Watson *et al*. 2001, 120). This led one of the authors (DG) and other archaeologists to make a simple piling ram to drive piles about the size of the average pile known at Freemasons Road. The occasion was provided by the Channel 4 Time Team investigations of the Vauxhall Bronze Age piled structure. The ram comprised a pole tripod lashed at the head with a greased 'dumb sheave' (a block of ash with two smoothly gouged holes, one for suspension and one for the ram rope). The ram was a 0.7m length of oak log *c* 350mm in diameter, with a pierced projection similar to those seen on the Shardlow Bronze Age logs (on display in Derby Museum). It took four people to position the tripod and three to haul the ram log up and let it drop onto a pile. This was set in a starting hole, and supported by forked poles. The experimental piles were only about 1.6m long. With longer piles a taller heavier tripod would have been needed which might have required a crew of six adults to move. Something similar may have been possible using a natural fibre rope in the summer time, during low water levels at Freemasons Road.

Experimental work, however, at the Loch Tay Scottish Crannog Centre suggests that another less labour intensive method may have been use to set the piles in place if the sediments were soft enough. Nicholas Dixon, Barrie Andrian and their team were able to set long log piles of about the diameter of the smaller examples at Freemasons Road by twisting them, almost screwing them into place in the loch bed just off shore (Dixon 2004, fig 28). In that technique the pile is reared vertically and guyed in place with rope then one person on a light temporary scaffold turns the pile back and forward using a lashed on cross bar. The turning action liquefies the wet silts surrounding the pile tips allowing them to sink. They can be set as much as 0.7 to 1.0m deep by this method (B. Andrian, Scottish Crannog Centre, pers. comm.).

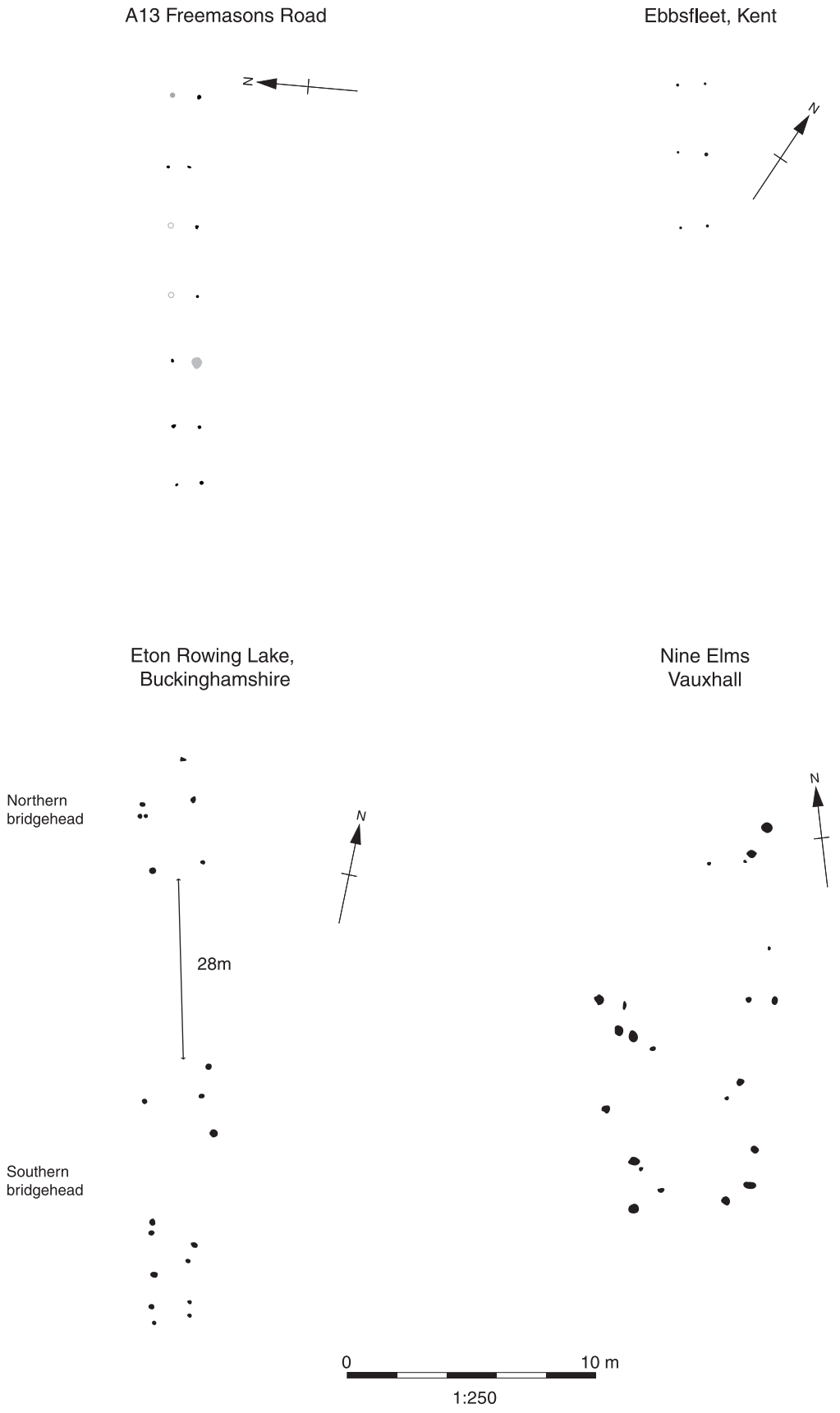

Fig. 10.6 Plans of Bronze Age piled structures from the Middle and Lower Thames Valley

The work force required

As a result of this, all that can be tentatively suggested is the minimum size of the work force required to build the Freemasons Road footbridge. Clearly a larger team could have built the structure much faster. The limited experiments in possible Bronze Age piling methods indicate that the work force could have been at the scale of the extended household rather than a huge communal effort. However, if the structure was built by one extended household rather than a village sized community it would have taken many weeks to build allowing for all the stages in the work required from felling to erection on site. Although some of the woodworking debris found on site might have been the debris left from the finishing of planking for the super-structure of the bridge, no chips from trimming and pointing the piles were found and this most likely took place elsewhere. Hewing the tips a few days or weeks ahead of setting them would have made the piles lighter to move and allowed the tips to dry, thus hardening the surfaces prior to setting.

Tool kits

The implied tool kit used for the woodworking needed to build this bridge is a simple one comprising one or more axes to fell and buck the parent trees and make the pile points; logs would also have been required for skidding the timber and as poles for moving and temporary shoring. Other items that must have been included are ropes, a maul and some wooden wedges for cleaving some of the piles and the super-structure elements. The socket joint holes in the implied cross planks would have been cut using narrow bladed axes and or adzes as the tool mark studies of such joints in other timbers shows (Orme and Coles 1983, 41; Goodburn 2003a, 66).

The stake alignments

The mainly roundwood stake alignments found during the A13 project were simple structures. Once the roundwood material was felled, lopped and bucked a variety of point types were hewn, with small Bronze Age axes of varied form, but all far smaller and lighter than most used since the Iron Age. Roundwood to be woven ('weavers') would have been handled in a similar way, although it may have been cut to longer lengths. The stakes were used to support horizontal elements mainly woven round them as in 'wattle work'. When the wattle work was laid flat in water-logged deposits it is often preserved and here we are able to move beyond the examination of pointed stake ends and examine weave patterns. The wattle hurdles used as a trackway surface at Movers Lane were a distinctive, quickly woven but rather weak, version of the 'slew' weave. The slew weave involved weaving three or four weavers together in and out behind the originally upright stakes. Where paired stake lines have been found, for example at Freemasons Road, these may represent either a phase of repair or possibly the use of a form of 'dead hedging' where wood branch and stem debris was held between pairs of stakes. Finally, it is also possible that stake lines may have been used to support nets or sheet materials such as bark or natural fibre matting.

Evidence for more specialised older work parties

The level of skill and strength needed to carry out these types of work is modest and well within the abilities of all adults and many children from the age of perhaps five or six years upward. It seems very likely that the building of such simple round-wood structures would have been a whole family affair in Bronze Age Greater London. This is not true, however, of the weaving of complicated weaves or with the use of large diameter weavers where adult strength in arms and shoulders is required. Where stake alignments included cleft timber stakes and large timbers, for example at Movers Lane Area 3, Woolwich Manor Way Platform 61 and elements of Structure 32 (the 'bridge') at Freemasons Road, they imply the logistics and complexity of the work would have reached a different level. The work required physical strength as well as knowledge of larger trees and woodworking skills. This would most likely have been carried out at a greater distance from home and hearth. It may even have been in areas of wildwood where predatory animals might also be found. We might reasonably suggest that it is probably the case that the work parties involved in this included mainly adult men and some older children.

Tool kits

For most of the stake alignments found on the A13 project the tool kit required was meagre; an axe and a large mallet or 'maul' would be all that was needed apart from a chopping block or log end to trim the stake points on. If cleft material was involved a set of wooden wedges and possibly a chisel would also be required. The chisel would be used to cut fibrous slivers in the narrow clefts made during log cleaving.

Evidence of repairs

Clearly the prolonged use of a site in a similar way is indicated by archaeological evidence of repairs to wooden structures or even rebuilds. Such evidence is typically found in wooden property boundaries on waterlogged urban sites, where wattle fence lines are often found superimposed in virtually the same place on the same alignment. In relation to stake alignments from the A13 project, only the rather mysterious stake groups at Movers Lane (Str. 5168 and possibly Str. 5144) probably show signs of the repair or rebuilding of a stake built structure on the same alignment. This is particularly true of Structure 5168 which had a great density of varied

stakes, including larger and smaller roundwood and even some cleft timber examples (see Fig. 7.11 and 7.12c).

The trackways

The restricted range of trackway forms found on the A13

Of the five wooden trackways recorded, four were what has been loosely termed brushwood tracks made of roundwood dumped lengthwise (Trackways 50, 29 and 2/14 at Woolwich Manor Way and Trackway 3031 at Movers Lane). Structure 5268 at Movers Lane was a hurdle trackway (Fig. 7.11; Plate 17). In national terms the brushwood tracks were the simplest requiring only the felling, lopping and bucking of poles, coppice stems and some branchwood. The key issue for the builders was moving the material and laying it end to end to form a moderately level walkway. Such trackways represent a modest investment of labour and materials if short in length. However, when extending over hundreds of metres many tons of material would have been required. This trackway type can be paralleled widely in Britain and Ireland from the Neolithic onwards (Coles and Orme 1980a and b; Coles and Orme 1985; Raftery 1990). The fact that Trackway 3031 at Movers Lane (Fig 7.9; Plate 15) and Trackway 2/14 at Woolwich Manor Way (Fig. 5.8; Plates 9 and 10) included some heterogeneous and even burnt material suggests that the settlements associated with the routeways were close at hand. This is because short and irregular heterogeneous material could be easily carried and dumped at low points in the trackways which seems an unlikely practice for work at a distance.

The wattle hurdle structure at Movers Lane, Trackway 5268, represents a somewhat more elaborate, though lightweight, construction. Having made the hurdle panels out of thin, pliable, rods on dry land they could be laid out rapidly to form a light fairly level trackway. Coppicing is fundamental to the production of such fine rods for this particularly light, regular weaving. The quick multi-weaver 'slew' weave is not exactly paralleled but similar multi-weaver weaves are known from several of the Derryoghil Bronze Age hurdle trackways and on the Thames floodplain at Erith (Raftery 1990, 24; Bennell 1998, 29). No trace of trackway elements with rail logs, cradling stakes or planks were found, although these are known from several other Bronze Age prehistoric wetland sites in Britain, Ireland and elsewhere in north-west Europe. In the immediate vicinity cradle structures are known from the Beckton 3D and Beckton Nursery sites (Fig. 10.7 a and b).

Evidence for trackway repairs

The wattle hurdle surface of Trackway 5268 at Movers Lane had been laid as at least three layers of wattlework, with the uppermost surviving only in very disturbed condition. It is possible that each layer represents annual or biennial doubling-up repairs as the hurdle broke or sank into the bog. In the mixed brushwood of Trackway 3031 from Movers Lane, roundwood of various sizes seems to have been laid in distinct groups as if filling in hollows suggesting phases of repair. In the heterogeneous brushwood Trackway 2/14 at Woolwich Manor Way the poles, rods and logs were accompanied by an assortment of more extensively worked and sometimes weathered timbers, such as a radially cleft oak pale, a weathered ash half log and branch material which may well have been laid as *ad hoc* repairs.

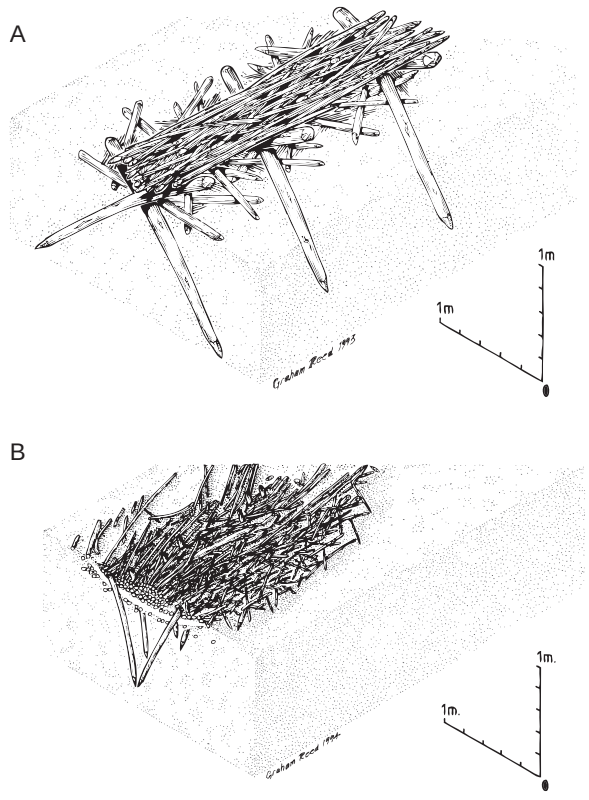

Fig. 10.7 Artist's reconstruction of Bronze Age trackways from Beckton 3-D and Beckton Nursery (from Meddens 1996)

'Platform' 61 from Woolwich Manor Way and some parallels

The term 'platform' in prehistoric wetland archaeology covers a wide range of often ill-defined types of structures; from solidly made structures with timber poles, logs, uprights, through to small spreads of irregular cut roundwood. Structure 61 appears to represent the north-east corner of a fairly solid horizontal spread of cleft logs, poles and smaller material including reused oak plank fragments. A series of stakes were also found driven apparently around the eastern and northern edges of the platform, possibly the remnants of a fence surrounding it (Fig. 5.6, SW corner). Another slightly earlier platform was found just to the south

of this structure on the Beckton Golf Driving Range. However, this was more lightly built comprising a layer of possible cut yew stems and branches covered with a layer of close set alder logs (Carew *et al.* 2010; Goodburn 2003b). Platform 61 was mainly made of much larger section material set close together, a little like the log and branch floors of later prehistoric buildings excavated from the eroding edges of the Lower Severn Estuary (Bell and Caseldine 2000, 88). It also broadly resembles the more heavily constructed parts of the Atlas Wharf 'platform' found on the Isle of Dogs, which was of similar date (Goodburn 1998). Unfortunately the trench at Woolwich Manor Way could not be extended southwards to expose more of the structure to ascertain whether it might have supported a dwelling for example. Although the evidence is limited such a function is possible.

Woodworking debitage as an indicator of activity

For a great many years archaeologists have excavated and studied stone tool making debris as standard practice. Sometimes stone tool specialists are able to refit stone flakes showing roughly what had been made where the debris spread lay, in other words the 'debitage' is diagnostic of particular knapping activities and in broad terms the production of certain types of stone artefact. It is less well known that the targeted sampling and study of different types of wood chips and other working debris can provide similar information (Meddens and Beasley 1990, 243; Goodburn 1996, 241). Several finds of woodworking debris, or what might be loosely called wood chips, were made during the A13 investigations which have provided extra insights into the behaviour of those that occupied the area. They have also shed some light on the technological aspects of the woodworking carried out at certain locations, and the range of species being worked. Probably the most important, from a forensic point of view, were the distinctive elongated slivers from smoothing large cleft oak timbers found in layer 49 at Freemasons Road. Apart from some broken fragments in the platform (Str. 61) at Woolwich Manor Way no wide cleft planks were found i*n situ*. Using experimental parallels it has been suggested that the debris may have derived from trimming parts of the Freemasons Road bridge superstructure, particularly walkway planking. A smaller scatter of yew wood chips at Movers Lane (Area 3) again suggested the working of timber not used on the site itself, although several items of worked yew wood were found at Woolwich Manor Way and the nearby Beckton Golf Driving Range site (Carew *et al.* 2010).

Bronze Age double pointed sticks; note on a recurring class of wooden artefact

The A13 project produced two mysterious objects of radially cleft wood that resemble each other, and a larger example from beside a Bronze Age trackway was found at Erith on the southern edge of the estuarine flood plain. It should be noted that all these objects were found lying horizontally, not used as some form of stake. At Freemasons Road object 32 was made from an axe trimmed cleft section of yew, 0.44m long by about 25mm square and carved to a point at both ends (Fig. 4.14). Next to trackway 2/14 at Woolwich Manor Way another similar object was found, radially cleft and 0.56m long, 37mm wide and about10mm thick and pointed at both ends (Fig. 5.9, f). The possible parallel from Erith was around twice as large; a radially cleft and double pointed stick of alder, about 1.11m long, 60mm wide and 30mm thick. These objects have similar form and were found in similar contexts but there is little other evidence to point to their function. A role in the drying, smoking and/or cooking fish is possible, although evidence for the exploitation of fish resources is otherwise lacking (see above, Chapter 9) this could extend to other cuts of meat (Fig. 10.8). In the damp temperate climate of the Pacific north-western coast of America Native Americans used to cook opened up cleaned fish held flat by flat pointed stick(s) threaded through slits in the body. The assembly was then set, near up right, leaning slightly over a small fire (Stewart 1984, 84). The fish would be cooked or even smoked and dried using this method, which relies mainly on radiant heat. Today a modernised version of the method, with the fish nailed to a board, is still practiced in the Pacific north-western region.

Raw materials, treescapes and Bronze Age woodmanship (Fig 10.9)

In any situation past or present, the materials selected for different types of structural work are dictated by a combination of factors such as: local availability, itself a result of natural conditions and often human management of the land, the structural characteristics of the species, and often seemingly irrational cultural prejudices. Clearly for these sites the most important natural factor influencing the availability of certain species is the degree of waterlogging and distance to drier land. These factors varied through time and across locations on the A13 project. Environmental archaeologists have been identifying waterlogged wood samples and tree pollen to species or group for over half a century (Godwin 1956; Coles and Orme 1985). Ever since the beginnings of work by Rackham and others in the early 1970s on ancient systems of woodland management or 'woodmanship', seeking evidence for tree management practices such as coppicing, pollarding and other systems has been a key aim of wetland archaeology. In coppicing, young trees are repeatedly harvested as regrowth from an established root system or 'stool'; in pollarding the regrowth springs from higher up a stem out of reach of browsing animals. Each system produces many

Fig. 10.8 Artist's reconstruction of a cooking scene using double pointed sticks (by M Gridley)

young pliable rods (Rackham 1976, 20). Rackham clearly defined a series of terms to describe ancient forms of woodmanship that shaped the landscape or 'treeland'. Prior to the early 13th century AD early treescapes in England were often a distinctive mosaic of managed tree-land forms ranging from orchard and hedgerow trees to areas of more or less unmanaged wildwood. Regarding the A13 project, the concern is therefore not just with the range of species used but also whether the parent trees were subject to a woodmanship practice or not. Due to the cultural and practical selection criterion used by early woodworkers other strands of evidence have also to be considered. For example, the pollen study shows that linden (lime: *Tilia* sp.) was common on the dry land bordering the wetlands but virtually no trace of it was found in the examined worked roundwood or timber

Based on field identifications of the larger stems cross checked with the microscopic identifications, species used as larger structural timber in the round or cleft included one of the two native oaks (or both) with a little ash, alder and elm. A much wider range of species were used as poles, cut branches, and smaller rods, including in order of magnitude: alder, ash, willow/poplar, and less commonly yew, hazel, oak, elm and a single pole of holly.

Only a small proportion of the material excavated was of likely to have been of wildwood origin, in other words being derived from large old trees and typically narrow ringed (that is 2mm wide annual rings or narrower) and straight-grained (Goodburn 1991). It seems that any stands of trees growing in wildwood type conditions were probably a little distance away from the wetland edge zone where various forms of managed treeland and farmland dominated (Fig. 10.9). Oak timber having wildwood characteristics was found as occasional radially cleft stakes at Movers Lane (for example stake 5244, sample 1125) and in the elongated trimming slivers found at Freemasons Road derived from timbers that were not found on site (layer 49). However, the vast bulk of material clearly derived from more open forms of treeland where trees could put on moderately or very wide rings. The process that opened up the woodland was probably frequent fellings although the opening of the wildwood through hurricanes and flash flooding might also have been a factor. The oak piles of the bridge or jetty found at Freemasons Road varied between about 150mm and 200mm in diameter with around 50-70 rings but also include a few cleft timbers from larger diameter fast grown logs up to about 450mm in diameter (for example pile 79). As some of the piles were a little knotty it is likely that they were cut from a log taken well above the base of the tree. It is possible that some or all the above grew in managed woodland with

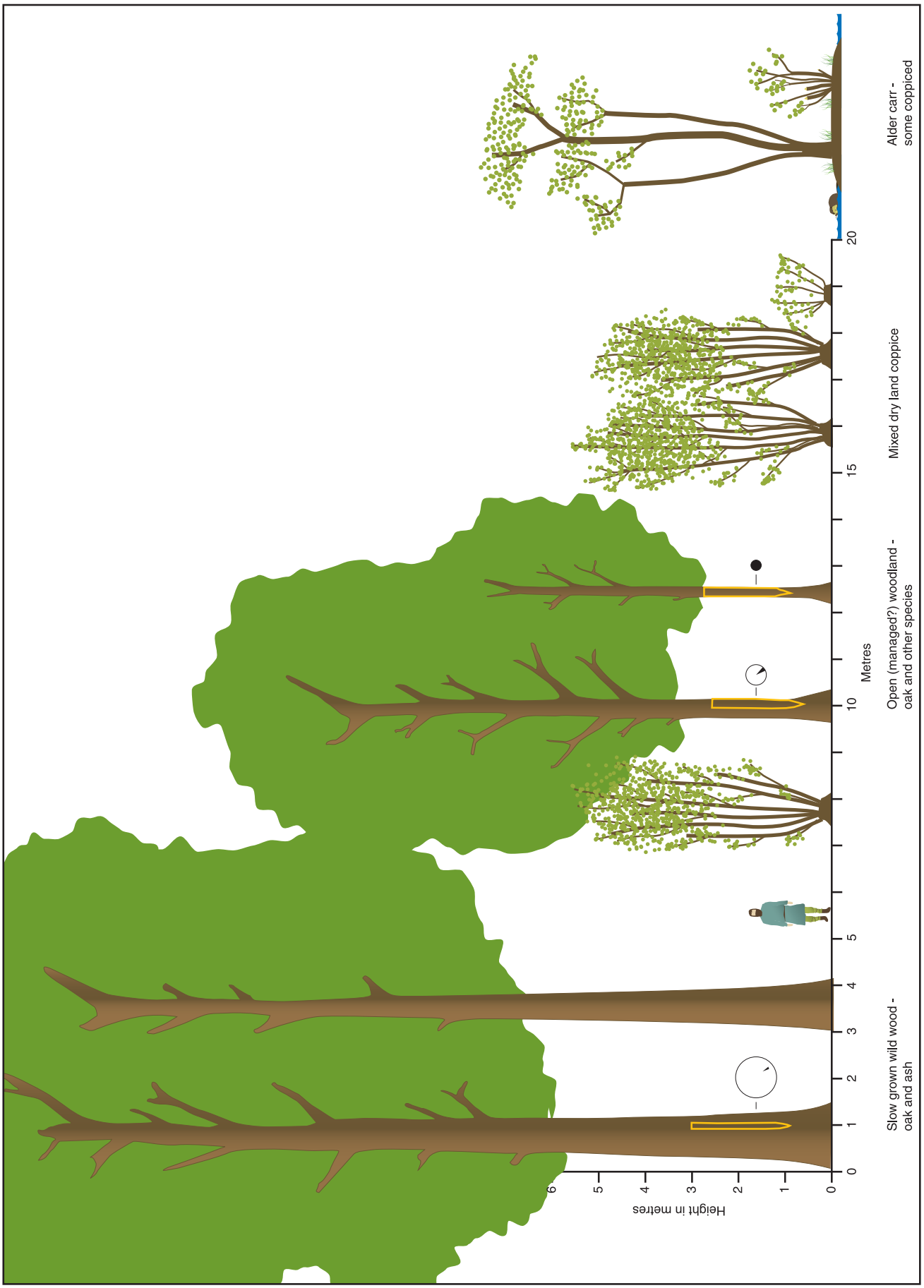

Fig. 10.9 Parent trees for selected timbers of Bronze Age date

Plate 34 Coppiced hazel woodland (photo by Michael J Spiller)

small timber trees and coppice ('coppice with standards' still common in parts of the south-east today) (Plate 34).

The fine, regular young roundwood weavers, *c* 25mm max diameter, in wattle trackway 5268 at Movers Lane were clearly derived from coppiced woodland, in this case mainly of alder. Similar, slightly larger material, also of alder, was used at Movers Lane for stake structure 5247, while a bundle of regular small rods dumped by trackway 3031 was mainly of a mix of alder and willow or poplar. The presence of a small beaver dam on the site shows that we should not assume that all the coppiced material was necessarily evidence of human woodmanship; some areas may well have been cut and maintained by beavers. The coppice derived from species more typical of slightly drier land such as ash, elm and hazel was presumably growing on the drier edges of the wetland or even a little distance up on the gravel terraces. The yew wood elements found probably came from the now extinct wetland yews that were once common in the floodplain wildwood around 2000 BC (Goodburn 1998). The almost total lack of the use of easily worked linden (lime) wood, evidenced in the pollen sequences, is difficult to explain, but perhaps there were cultural prejudices against its use.

From the woodworkers point of view the woodmanship practices employed and the ecotonal natural environment produced woody materials of many sizes, shapes and species to suit different functions. In a real sense the woodmanship was part of their traditions of woodworking and it is almost certain that the same people were both woodsmen (possibly including children and women in the lighter work) and woodworkers. This contrasts with today, in most cases, when a woodworker buys a timber of a certain size made by someone else from logs supplied at a distance by others, so that the connection between end user and landscape is broken.

Technical details on the recording and analysis of waterlogged wood assemblages

Tool marks, tool kits and dating in relation to some other key Bronze Age assemblages

The level of the preservation of tool marks was disappointing for most of the woodwork found during the A13 project, bearing in mind the very fine preservation of some prehistoric wetland woodwork excavated in the region, such as at Beckton Golf Driving Range (Carew *et al.* 2010; Goodburn 2003b). The general lack of very well-preserved marks was due to various factors such as compression by overburden, ancient weathering, localised drying before full excavation and in some cases hurried excavation and poor wrapping prior to recording. However, some information on the form, size and method of use of Bronze Age axe type tools was recorded which enables some comparisons to be made with toolmarks recorded in other assemblages spanning the Bronze Age. Here we are concerned only with marks on the larger roundwood and timber used where fairly complete tool marks might be expected. Also, for the vast majority of the A13 material, the preservation was not good enough to identify the signatures left by the unique pattern of nicks on individual axe blades.

Although it was soon recognised during work in the Somerset Levels in the 1980s that axes of different periods, from the Neolithic to Iron Ages, left different marks (Orme and Coles 1983, 32), the realisation that the key difference was in the size of the facets and width of the stop marks (or 'jam curves') came later (O'Sullivan 1997). Although the smoothness of the facets and angle of the cut are also factors worth consideration and there are marked differences in these features between stone and metal worked material from the early Bronze Age, these are of much less importance. O'Sullivan, working systematically on prehistoric wetland woodwork from central Ireland, was able to show that there were distinctive changes in the size of the best preserved marks found in assemblages over time from the Neolithic to Iron Ages. Working on material from Oak Bank Crannog in Loch Tay, Sands (1997) was able to take tool mark recording further and distinguish late Bronze Age from early

Iron Age axe marks as well as carry out innovative work on comparing individual axe signature marks. It is now clear that there are predictable trends in the sizes of the largest axes or adzes that groups of woodworkers used through time (Goodburn 2003a, 104; 2004, 129; Webley and Hiller 2009). This is, of course, entirely unremarkable as it has long been known that there were substantial changes in Bronze Age axe forms and that blade width was a key factor. Clearly in any one period there are smaller and larger tools but the working assumption here is that in the vast majority of cases the woodworkers would use the largest heaviest tool for the heaviest jobs such as felling trees over pole size and heavy duty hewing. Thus, near or fully complete axe facets and stop marks can be correlated with broad date ranges in the Bronze Age of early, middle and late, so far the correlations have

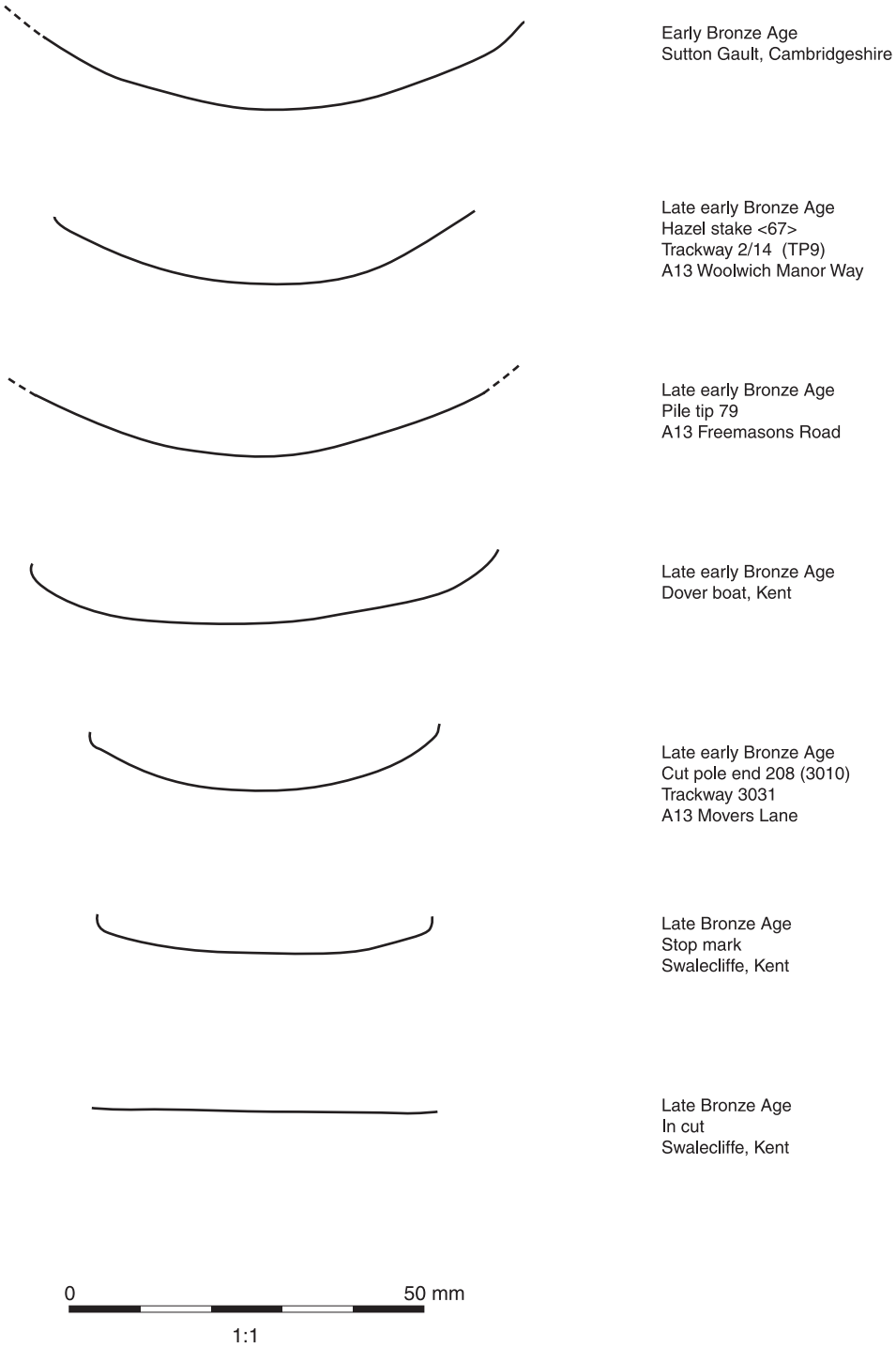

Fig. 10.10 Axe stop marks

proved reliable with assemblages dated by radiocarbon and tree-ring matching. One notable exception is the partially excavated pile from the middle Bronze Age Vauxhall Bridge now at the Museum of London, where the widths of the facets of the upper parts are narrow and more typical of the late Bronze Age. However, hitherto very little detailed recording of elements of that structure has been possible.

In the case of the Freemasons Road assemblage the pile tips were fairly well preserved and once all of them had been cleaned and recorded the largest nearly complete facets and stop marks could be seen. They were moderately rounded and 65mm wide, implying the use of an axe blade about 70mm wide, which is typical of the middle Bronze Age but at the smaller end of the early Bronze Age spectrum. Similar marks were documented on the Dover Boat (Goodburn 2004, 129, Fig. 10.10). Some of the larger wood chips from the site also implied the use of blades about 70mm wide. However, one of the piles (pile 80), had facets only about 35mm wide indicating the use of a second, much smaller, implement Initially smaller marks were found on the two least well preserved piles and a late Bronze Age date was suggested demonstrating the need to examine as much of the material as possible.

From Woolwich Manor Way there were no nearly complete facets that could be compared, although a fine partial signature survived on one piece of worked yew. Most of the worked material was small roundwood, or had been weathered in antiquity. Similar problems prevented the survival of a range of crisp and clear facets and stop marks from Movers Lane; most of the worked material was small roundwood and the larger material was generally weathered with eroded facets. However, in a few cases fairly well-preserved axe marks did survive such as on the end of a pole from Trackway 3010 (sample 208) which bore a very rounded axe stop mark, 50mm wide, which was from a deep blow and seemed fairly complete. Such a mark would be typical of the larger end of the late Bronze Age spectrum fitting the narrow rounded cutting edges/blades of nearly all socketed axes (Goodburn 2003a, 104). However, radiocarbon dating of the trackway produced a date in the early to middle Bronze Age and this may be another example of a lack of fit of the tool mark to radiocarbon date. An intrusive stake tip 5108 (sample 1000) was found driven through the upper part of the wattle hurdle trackway (Str. 5268) clearly from some way above. The axe facets were small, rounded and only up to 35mm wide which would be best matched in the late Bronze Age (Goodburn 2003a, 104).

The limits of previously existing terminology for describing cut roundwood ends

By the beginning of the A13 project a commonly adopted terminology had gradually evolved to describe the forms of the cut ends of worked roundwood so common in Bronze Age wetland assemblages. The terms described three main categories that all cut roundwood was supposed fall into (O'Sullivan 1997, 307):

1. The chisel form, with one oblique face forming the point or end
2. The wedge form, with two oblique cut faces forming the point or end
3. The pencil form, with multiple oblique cut faces forming the point or end

However, recording work during the A13 project and for other smaller assemblages of Bronze Age woodwork from London shows that the tripartite categories are inadequate with many examples falling outside. The most common exception was pointed or cut roundwood ends formed by cutting two adjacent oblique faces, as exemplified in stake 67 from TP9 at Woolwich Manor Way (Fig. 5.9g). This feature was also noticed by the pioneering prehistoric wetland investigators in the mid 1980s (Coles and Orme 1985, 26), but a simplified schema then gradually evolved. The reason for shaping points or cut ends leaving two adjacent facets becomes apparent when coppice rods are cut for making replicas of early roundwood structures. This was clearly demonstrated by D. Goodburn during the reconstruction of section of the Erith Bronze Age wattle hurdle trackway for Bexley Museum with middle Bronze Age tools. Similarly it was experimental works that led Coles and Orme to the same conclusion.

Many coppice shoots curve tightly in at their base to form a curved butt to the stem (Rackham 1976, 21). If the stem is cut low the simplest way of making a point is to form it with two adjacent oblique faces. If the stem is cut higher then chisel, wedge and pencil forms are more likely to be convenient. A variation on the point of two adjacent faces is one where a third face is also slightly cut so as to taper in, similarly dealing with the curving ends of many coppice stems. Thus, these two categories can be added to the checklists used during the recording of early roundwood found on archaeological sites. None of these issues apply to straight stems grown from seed known as 'maidens'. Ultimately the experience of the A13 woodwork recording has refined recording terminology for smaller roundwood and aided a more subtle understanding of woodworking processes and woodmanship in the Bronze Age of south-east England.