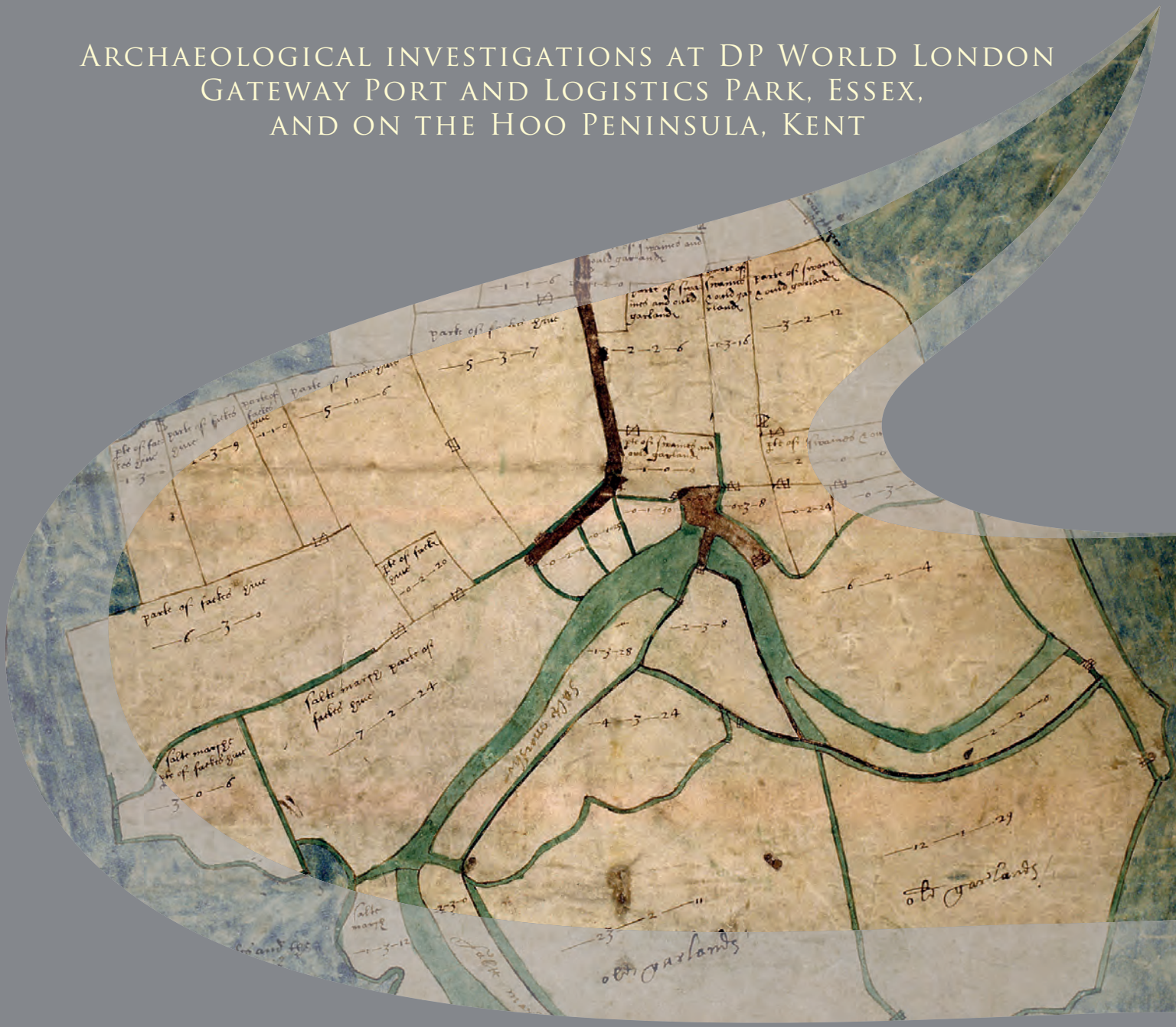
London Gateway

Settlement, farming and industry from prehistory to the present in the Thames Estuary

Archaeological investigations at DP World London Gateway Port and Logistics Park, Essex, and on the Hoo Peninsula, Kent



Specialist Report 11
Woodwork
by Damian M Goodburn

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Background

A historical survey in connection with the archaeological work at the Proposed Development at Great Garlands Farm (COLP15) revealed that a wharf of the late 15th to 16th century and situated within a farm estate had been built close to the extreme western edge of the site, on the western bank of Carter's Creek. This seems to have slowly fallen into disuse in the later post-medieval period. The wharf was originally called 'Feake's Hithe', hithe or hythe being a common historical term for a working waterfront where cargoes were handled. The surrounding estate of Old Garlands farm passed through several owners with strong connections to the navy and the sea in the later 16th and early 17th centuries. The most famous of owners was the Elizabethan naval commander and administrator, Sir John Hawkins, who acquired the estate in 1591 and whose last ship was named 'Garland'. Construction of the ship began in Deptford in 1590 and he died on board the vessel in 1595. The charitable Hawkins Hospital owned much of the surrounding land until relatively recently.

The local marshland topography was much altered by the work of Dutch engineers by the mid-17th century during the time that the much larger area of Canvey Island just to the east was being 'inned' or won from the Thames estuary with the use of mud walls, sluices and wind powered pumps. Thus, as the land was known to be very low-lying marsh, the likelihood of the survival of waterlogged wooden structures was high, even within the 1m depth limit imposed by the impact level of the proposed development at Great Garlands Farm.

Two evaluation trenches (4 and 7) revealed historical structures. This report concerned the structural remains from Trench 4 close to the western edge of the marsh and the slightly higher land to the west and north.

The general nature of the woodwork

Despite the very low Ordnance Datum levels of the surface of the damp rough grazing land today, at no more than *c* +2.5m OD and often below +1.92m over the east end of

Trench 4, it is clear from the very decayed character of the surviving timber remains that there has been substantial lowering of the water-table periodically over the last 400 years. Despite this, the partially disturbed base of a solidly-built timber-framed waterfront (structure 412) was found close to the east end of Trench 4. This structure was aligned roughly N-S, parallel with what would have been the western bank of Carter's Creek. Though much reduced in height by decay and disturbed laterally, probably by severe scouring during a flood episode, perhaps aided by human partial demolition, several features could be recorded. The nature of the oak and elm raw materials used and how they had been arranged and jointed suggests a date range between the late 15th to early 17th century, but most likely the structure dates somewhere in the 16th century when compared with dated waterfront structures found elsewhere. Unfortunately, the fast-grown oak and elm timbers were not suitable for tree-ring dating, but radiocarbon dating supported a late 15th to early 17th century date.[1]

The wharf had been built by professional carpenters who produced a 'stave and muntin'-like front wall to the wharf similar to that of many partition walls in timber-framed houses of the period. However, the posts alternating with planking set on its ends were not grooved to hold the plank edges but simply overlapped, a cheaper alternative. This might have been an effort to give the structure a more sophisticated appearance. The prefabricated structure was anchored to the land by a long elm land-tie beam anchored with stakes to the west (structure 406). The posts were tenoned into a large elm sill beam, the top of which was set at *c* +0.45m OD. The vertical frontage survived *c* 0.5m above that level, rather more if upright (Fig. 1). However, work on the archaeological evidence for tidal ranges on the Thames estuary over the last 500 years suggests that the original top of the wharf must have reached *c* +1.9-2.0m OD to have been above virtually all high spring tides. It is likely that a second tier of land ties was originally used, as has been found in other related types of structures of 15th- to 17th-century on the Thames. This means that the wharf was probably around 1.5m high as built. Built to these proportions and levels, it would have been suitable for the use of boats, barges and possibly small coastal traders, but not larger vessels.

Some suggestions of repair and or providing fender piles were also recorded in the form of timbers slumped to the east of the frontage. The protruding land tie end(s)

[1] Timber 431: cal AD 1433-1630 (95% probability; SUERC-62754, GU38666); timber 432: cal AD 1420-1619 (95% probability; SUERC-62750, GU38665)

would potentially have been awkward for craft to come alongside in tidal conditions, and so extensive fendering or an off-lying jetty would have been necessary.

To the west of the wharf frontage, in an extensive land fill deposit, a group of three weathered, roughly-trimmed oak timbers were found (structure or timber group 414). These timbers had been given very roughly square cross-sections and were cut from strongly curved parts of open grown oaks (Fig. 2a). They are typical of 'roughed out' large boat or ship-frame timbers, with the most angular example probably being a 'knee', a type of bracket used to hold a small ship or large boats, sides and cross beams in place (Fig. 2b). The three timbers appeared to have had historic rot voids, suggesting a reason why they may have been used as land fill. Initially, this material was interpreted as evidence for ship-, boat- or barge-building on or near the site, but the lack of the debris typical of such sites, such as off-cuts, tarred hair waterproofing material, wood chips, damaged wooden and iron fastenings etc, suggests that the site was quite possibly one where specifically nautical timbers were traded out to dockyards, rather than being used on site itself. The fact that several of the documented land owners during the period had strong naval connections and houses next to Chatham and Deptford dockyards is also suggestive here. The historic name of 'Sawpit Field', given in the tithe map of 1839 to the field immediately behind the wharf, may also be relevant with regard to building there or preparing material for export.

Comparative evidence

Several excavations on waterfronts further up the estuary have provided the key parallel information. Excavations on the Southwark, Rotherhithe, Limehouse, Poplar, Deptford and Woolwich waterfronts have revealed sequences of timber-built river and dock walls and working wharf frontages (eg Heard and Goodburn 2003; Goodburn 2009a; Goodburn 2017). Detailed trends in the development of carpentry and related crafts, such as the increasing use of pit-sawing to cut beams and planks from logs, changes in fastenings, jointing and structural arrangements, have been distinguished for structures of this time span. For example, the species groups used in waterfront carpentry of the region changed from the 15th to early 17th century, with the much wider use of elm and introduction of imported conifer timber by the 17th century, which was used alongside native oaks.

Many of the same sites have also produced evidence of reused nautical timbers

of the period, including roughed-out nautical timbers. This type of evidence was found in the largest quantity on known naval and shipyard sites, particularly two large sites in Deptford. At both Deptford Royal naval dockyard and the large private ship yard to the east at Stowage, roughed-out curved ship timbers, including knees were found. These were often used in slipway and building foundations from the beginning of the 17th century (Goodburn 2004). Roughed-out stock piled knees of boat scale dating from the end of the 15th century have also been found at the Poole Iron Foundry boatyard site (Watkins 1994). Finally, detailed study of knees and other curved framing timbers in the Mary Rose have provided insights into large 'ship-scale' crook-and-bend timber production and their trees of origin for the early to mid-16th century (Goodburn 2009b; 66-80).

Tidal levels in the Thames Estuary during the later historical period

The survival of waterfront woodwork and nautical timbers in the Thames region is intimately tied to relative sea levels. Current data relevant to the period and occupation level of the evidence at London Gateway can be summarised as approaching +2.7m OD for the 15th century near the Tower of London, rising to *c* 2.86m OD near the mouth of the river Lea by *c* 1500, and around +3.00m OD by *c* 1660 on the Rotherhithe frontage just east of the City. The equivalent level today would be close to +5.0m OD at that point in the inner estuary.

To translate the approximate absolute levels for a location lower down the Thames estuary, we must take account of the 'slope effect', which means that given low wind conditions, the absolute high tide levels fall as we travel down an estuary. The modern slope effect for the Thames estuary is calculated by the Port of London Authority and notes that spring tide high water levels are *c* 0.9 lower at Tilbury just west of our site compared with London Bridge (PLA 1982, 41). Up a sheltered creek like Carter's Creek, this adjustment factor suggests that a normally safe level for the top of the Feake's Hithe wharf during the later 16th century would have been somewhere in the region of +1.9m to +2.0m OD, very close to the current ground level where it was found and suggests that the original height of the wharf may have been *c* 1.5m.

Further description of structure 412

The basic form of the frontage is that of a carefully prefabricated, timber-framed wall made of oak posts, *c* 200mm x 100mm and set *c* 250mm apart, that supported oak planks on the landward side, set on end between them and overlapping their edges. This form of walling has very ancient origins and when the uprights have grooves cut in their edges to hold the plank or 'stave' edges, they are termed 'muntins'. As the uprights in this case were not edge-grooved, the work was a cheaper false stave and muntin form, though to most eyes it would have looked the same and suggested some expense. The posts were tenoned into to a substantial elm sill beam (timber 426) of *c* 250mm x 200mm. Some of the post tenons were locked with pegs, not a feature seen in similar timber-frame river and dock walls of the 15th and 16th century excavated in London (Goodburn 2009a, 200-221).

The uprights were all truncated by decay and the wharf front had slumped to the western, landward side, but the 'tallest' survived to length of *c* 1.1m. Commonly, timber waterside walls collapse or slump towards the open 'water side' due to the pressure of the land-fill, rather than landward. The direction of the slumping might suggest severe flood scouring behind the frontage and possibly also some later efforts at salvaging some of the timbers.

By the late 15th century in south-east England, the post and plank elements were made by sawing rectangular section timbers from axe-hewn baulks. The oak planks and posts used in this structure included many knotty areas, and so sawing in some form must have been used to cut them from their 'parent logs', although the saw marks did not survive. The lower elm sill beam timber (426) was better preserved with some surviving tool marks, such as an 'in-cut' from notch-and-chop hewing from the parent log. On other sites, the upper and lower faces of such sill beams are often found to have been sawn out, providing a smoother, flatter surface from which to cut the post mortices etc. The form of mortice and tenon used for the posts/sill beam joints is unclear in the record, but in similar structures of the 16th century, a single shouldered 'bare faced' tenon was typically used.

So far, the wharf frontage can be seen to resemble a slightly cheaper version of a typical late 15th to 16th century stave and muntin wall, such as are found in many middle status standing buildings, often in the 'cross passage' in both timber and some stone structures. But wharfs and river walls also have to resist the pressure of the land built up behind them. Piles in front are normally insufficient to keep them upright when they are over about 1m tall. As it has been argued, this structure would have to have

reached very roughly +1.9-2m OD to have been above all but rare high spring tides in the 16th century. It would have been around 1.5m tall or possibly just over, if a little later in date. This means that it would have needed land tie structures, such as the low example found (timber 407 and others) to stay upright. These are sometimes found together with sloping front bracing extending into the water area, but this prevents access for vessels, and so renders the structure unsuitable for a working wharf unless a jetty is built out from it. The 2m+ exposure of the 'Feake's Hithe' wharf frontage was narrow and would be unlikely to have included all the types of structural elements used, but from what was visible, its builders used a simple form of land tie. A complete medium-sized elm tree was axe cut to a 6.5m length and roughly hewn 250 x 200mm square at the butt end, which then had a square through socket cut in it for locking timber 423. This larger end was axe-trimmed to a slightly rounded, bevel-edged form, but the smaller western end was left as an irregular crotched shape where the timber reached into the crown of the parent tree. This landward end was then simply anchored by driving one oak and one elm stake *c* 110mm in diameter, either side of the bulging crotch of the land tie beam (timbers 408 and 409). This anchor point was further secured by using two wedges of squared oak offcuts between the crotch and the paired stakes.

This unusual rustic method of locking a land tie end would have been cheap and quick, though probably not as secure as using the commonplace cross-wise lock bar. The slightly protruding rounded ends of the land ties would have posed a problem for craft coming directly alongside; when the vessels rose and fell with the tidal changes and small waves in extreme conditions, they might have banged against the land tie ends. A simple way of dealing with this problem when the projection is limited, as in this case, is to use fender piles set just in front of the main frontage, against which the vessels can ride. Two log form piles, the northern of elm, were found in this location (timbers 427 and 434). These may have acted as both fenders and locating piles for the frontage. However, another possible interpretation is discussed below.

The general form of the structure, the mix of oak and elm timbers shaped by both sawing and axe hewing is typical of *c* 16th century waterfront carpentry work found further up the estuary. If of 17th-century date, we might expect more evidence of the use of second-hand oak, more elm and conifer species and iron spikes as fastenings (Goodburn and Heard 2003; Goodburn 2009a, 206-215). The fast and often knotty growth of most the oak timber is also very typical of the 15th century onwards, when the larger trees often came from open land settings, such as hedgerows, and wood

pasture. Unfortunately, quick-growing oak trees produce timber with few annual rings, even in relatively large sizes, making tree-ring dating very difficult where a minimum of 50 rings are required. Elm also has growth characteristics that make it undatable using the same method, and so no tree ring dates could be obtained from the limited samples taken.

Disturbed woodwork to the east

Two log-form piles were found just to the east of the frontage sill beam of the wharf. The northern example, timber 427, was of elm and smaller than the example to the south (timber 433), which was *c* 200mm in diameter. These may well date to the construction phase of the wharf frontage and have been intended as locating and fender piles, but they might also be evidence of a localised repair to the frontage with the disturbed timbers lying over them on their western edges, perhaps being revetment sheathing, though this is far from certain. That these piles and the other timbers were found slumped to the east might just support the interpretation that they were part of a ramshackle pile and plank repair to the earlier timber-framed revetment, which had slumped to the west.

Further description of timber group 414

It was immediately clear that the group of three, strongly curved timbers found to the west of the wharf frontage 414 were roughed-out nautical timbers. Any planked vessel of the *c* 16th century required the use of some strongly curved timbers, varying from a gentle sweep or 'S' curve ('bends' or 'compass timbers') to angular shapes approaching a right angle ('knees'). Until the mid-20th century, the larger framing timbers were selected, wherever possible, from naturally curved timbers in England, normally of our two native, rot-resistant oaks or their hybrids. Oaks growing in open woodland and more particularly hedgerows and pasture land produce heavy branches springing from the main stems with strong natural curves. These were selected from the upper parts of medium sized and large spreading oaks to make the most curved timbers in vessels. A mid-17th century map of the area surrounding Great Garlands includes images of many stylised hedgerow trees and it is quite possible that the timbers found derived from such farmland sources in the locality.

Detailed recording of curved vessel frames and knees shows that a wide variety of sizes were needed and that small and larger vessel framing dimensions typically overlapped. This can be seen in the early to mid-16th century vessel, the Mary Rose, for example where the cross-section of the knees and framing declines markedly in the lighter build of the upper decks where weight was kept down for stability reasons. This trend makes it difficult to attribute roughed-out framing to particular sizes and forms of vessels with any degree of certainty, except for the largest and smallest examples. At one end, we have the large main deck standing knees of the Mary Rose with a widest finished dimension of 0.7m, and the other we have roughed-out boat knees found at the boatyard site at the Poole Iron Foundry where the smallest are barely 100mm across (Allen *et al.* 1994; Goodburn 2009b). Some roughed-out timbers with defects such as rot patches have also been found reused in waterfront structures, particularly those of ship- or boatyard sites, such as the large private post-medieval shipyard site investigated by Pre-Construct Archaeology at Deptford (Divers 2004,72).

The largest lowest element of the dump of roughed out ships timbers was a medium sized angular knee timber, timber 417. This was a little less acute than a right angle and had been roughly hewn to a square cross-section with a widest dimension of *c* 220mm (in the 'moulded' direction) x c 200mm thick ('sided' dimension) and was *c* 2m long. This timber would have been large enough for use in a small ship or the upper parts of a large one. The two other timbers (415 and 416) were slightly less acutely curved and could have been cut to serve either as fairly open knees or tightly curved frame timbers, such as in the 'turn of the bilge' of a vessel with a flatish bottom or inverted as framing close to a transom stern. The turn of the bilge and 'tuck' of the transom are areas of tight curves in vessel cross-sections in some craft. The southernmost timber was *c* 200mm in width and thickness, while the more northerly example was *c* 150mm square in cross-section.

Initially the finding of the abandoned defective knee timbers was taken by this writer as an indication that ship or large boat-building took place close to what we now know was Feake's Wharf, but with hindsight and the lack of the debris typically found at ship and boat building sites, an alternative indication might be taken. This is that the knees were samples of what was being exported from the quay and estate to regional shipyards. This might well fit with the nautical connections of the various landowners documented for our period, particularly Sir John Hawkins. It is quite possible that he or one of the other landowners owned their own small cargo vessel for transporting

produce out, including specialist nautical timber and probably also farm produce. Small farm wharfs were well-known in the Thames estuary region well into the 19th century (Sattin 2004, 65). The implied location of sawpits near the quay by the name sawpit field is also related to converting timber at the site from logs and baulks to smaller elements and planks. However, the sawpits could have served *in-situ* building yards or have been used to produce timber for export from the site.

General importance of the woodwork

The section of a timber-framed wharf, which must have been part of the documented Feake's Hithe of broadly 16th century date, is very rare survival of what must have been a common rural waterfront feature in later medieval and post-medieval times. The carpentry of the waterfront is most typical of the 16th century and broadly comparable to medium- to high-status timber waterfronts built at the head of the Thames estuary in London at the time. There is some evidence that it was designed to impress in terms of the false stave and muntin construction form used, even though money-saving shortcuts were employed. The later 16th century in particular was a time when sea, estuary and river-born trade was massively expanding, with the newly founded Thames and Medway dockyards beginning to act as the first factories, drawing in huge volumes of specialised materials such as curved oak timbers. The defective knees found abandoned at the site are probably diagnostic waste of this developing specialised trade network, without which 16th-century ships like the Mary Rose (repaired at Chatham and Deptford) or the more recently discovered Essex-built Gresham ship could not have been built (Marsden 2009; Auer *et al.* 2009).

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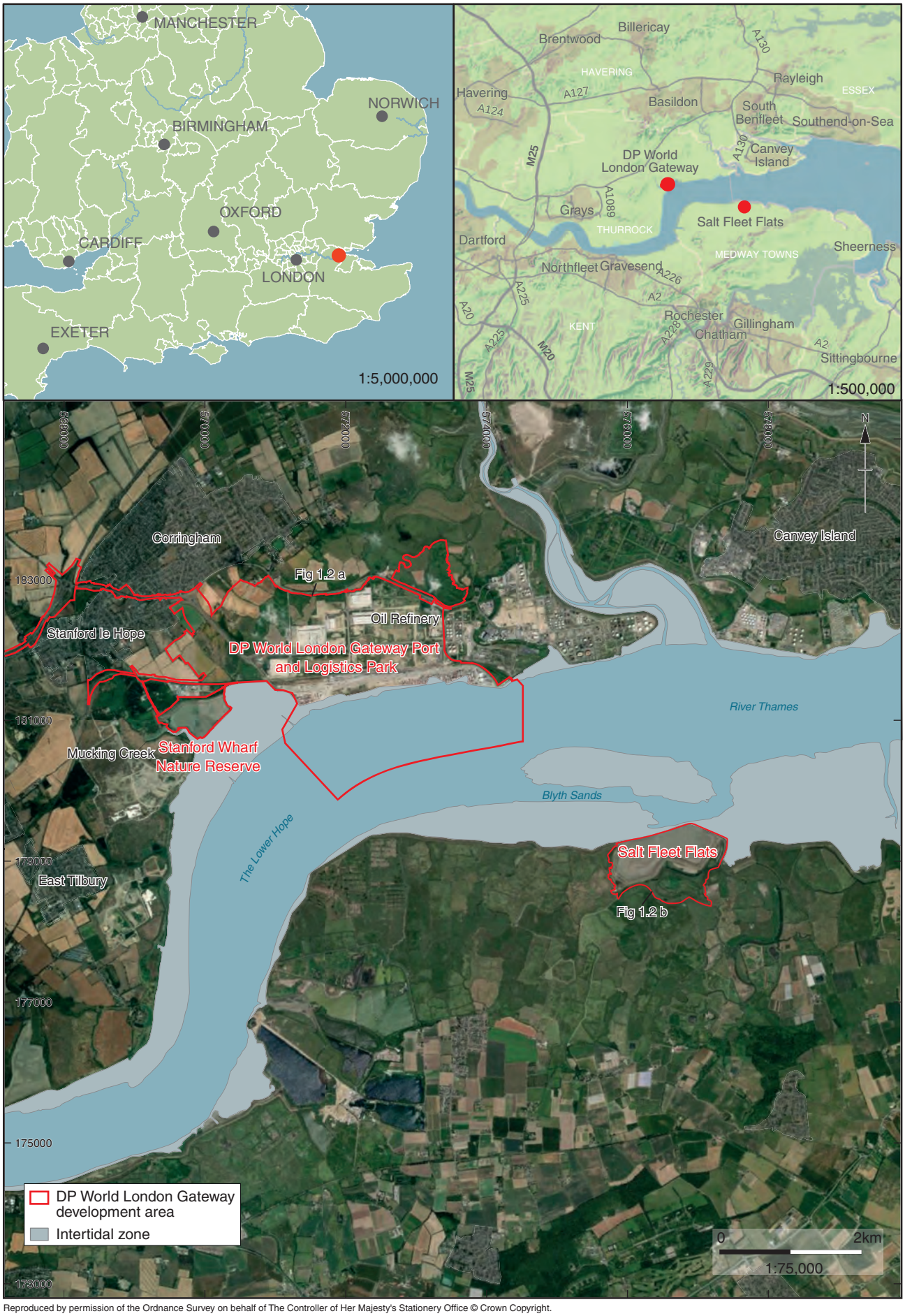


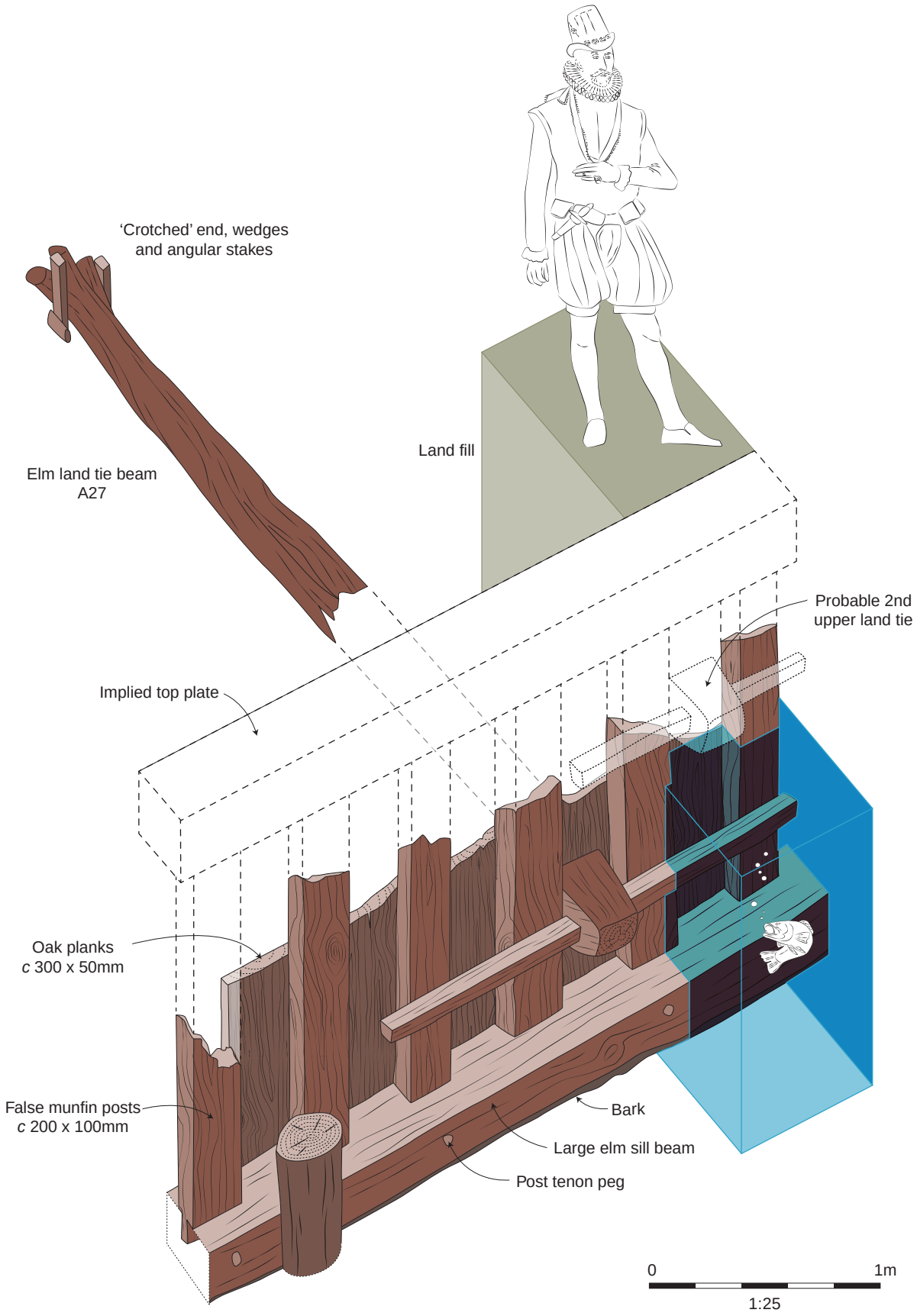
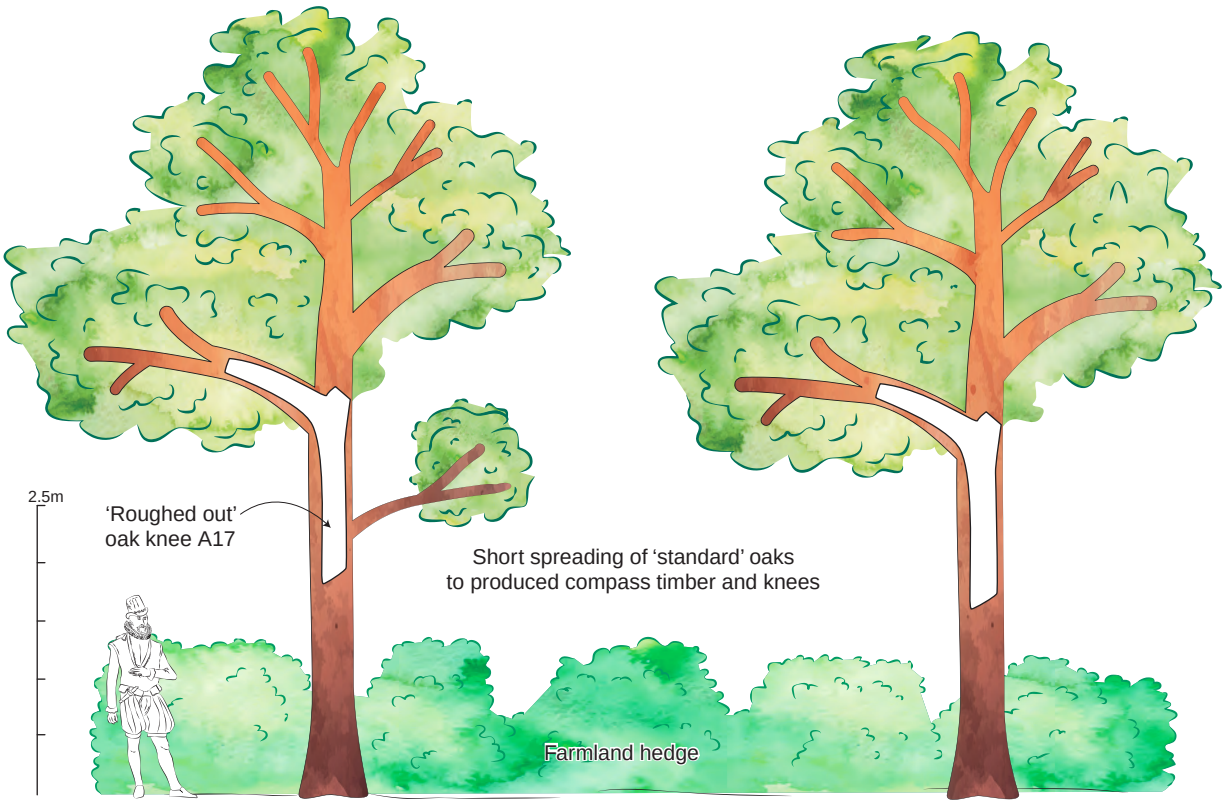


Figure 1: Freake's Hithe Wharf (16th century), front part reconstructed



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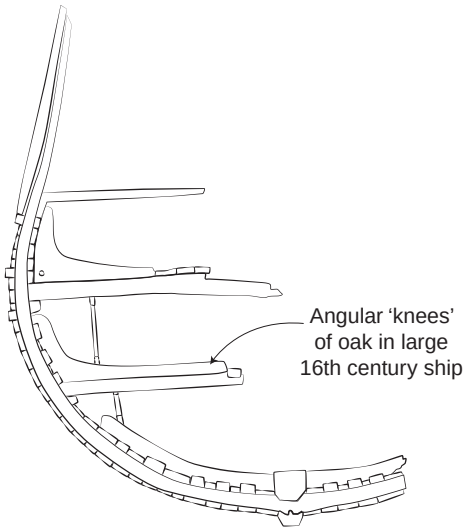

B) Simplified trace off from Marsden ed. 2009 *The Mary Rose*, figure 13.6

Figure 2: Great Garlands ship knees and typical 16th century use

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