

7.4.3.2. Land ties

7.4.3.2.1. Introduction

The land ties of Phase 4 were constructed in two different phases – below named the Phase 4A and Phase 4B land ties. The Phase 4A land ties were constructed as a part of a larger re-organisation of the harbour front, changing the layout of the coastline from the earlier phases (Phases 2 and 3). The land ties should be seen in close connection with the land reclamation fills, as the construction of the land ties and the claiming of land were largely one process. The purpose of the land ties was to keep the bulwark in place. However, in no instance is a connection seen between the Phase 4A land ties and the parts of the early Phase 4 bulwark, SG712 (related to G626 bulwark). This is probably due to the structures being truncated by first the construction/repair cut for the later parts of the bulwark, SG713, and later by other large construction cuts. Thus, even though the land ties and the bulwarks are parts of the same overall structure, they are kept apart in the following. To some of the Phase 4A land ties, repairs are seen as replacements and/or additions of parts of the existing land tie structures.

The Phase 4B land ties can be seen as a series of reinforcements of the Phase 4A land ties, though some are to be seen as actual replacements, possibly also changing the layout of the coastline slightly. The construction style of the Phase 4B land ties differs from that of the Phase 4A land ties, indicating also a functional difference of the two land tie construction phases. It seems plausible that the Phase 4B land ties have been directly related to the bulwarks found, though the physical links between them have been truncated all along the bulwark.

In the following the Phase 4A and the Phase 4B land ties will be described as two different overall groups or construction sequences. The descriptions comprise observations on what seems to have been the general building sequence of the land ties (as seen when later truncations do not distort the structures), and some exceptions to this rule, as some land ties are structured differently.

7.4.3.2.2. Groups interpreted as Phase 4A land ties

The first phase of land ties consists of 26 groups and sub-groups, in table presented as seen from the west end of the excavation area to the east end:

Group	Sub-groups	Group name
524		Land tie
404		Land tie
507		Land tie
676		Land tie
641		Land tie
652		Land tie
653		Land tie
639		Land tie
564		Extra land tie?
601		Land tie with land reclamation
611		Land tie
609		Land tie
608		Land tie
603		Land tie
552		Land tie

448		Land tie repair
444		Land tie
455		Land tie repair
460		Land tie
462		Land tie
468		Land tie
466		Land tie repair
475 + 480		Land tie
484	483	Land tie and posthole
493		Land tie

Table 41 Groups and sub-groups related to the Phase 4A land ties

Due to the many truncations by later activities on Gammel Strand, some larger land ties were split into different groups during the fieldwork process. However, during the post-excavation process, it has been attempted to put the relevant groups and structures back together.

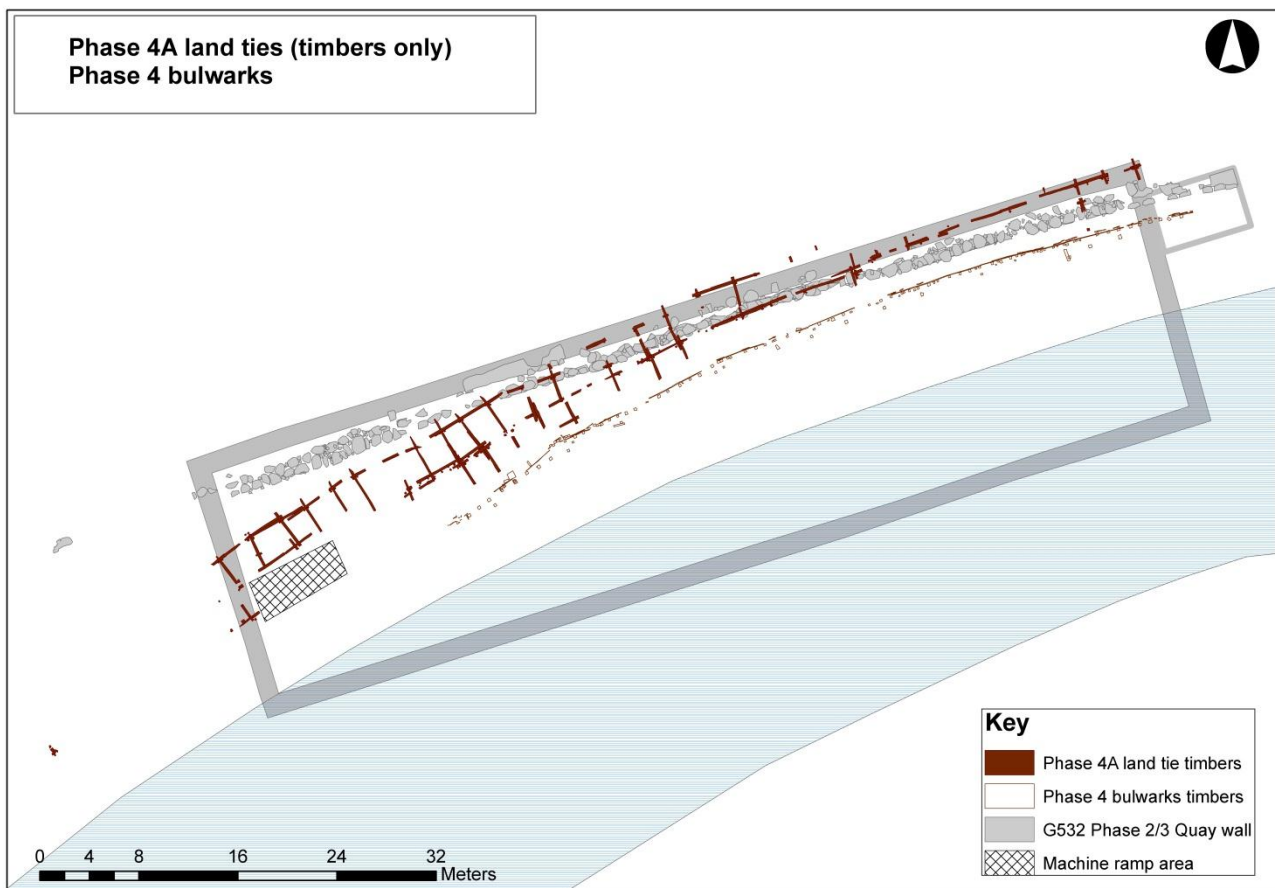


Fig. 143 Phase 4A land ties (timbers only) and Phase 4 bulwarks

The further east, the more frequent are the cuts and deposits related to this land tie phase – whereas the land ties in the west end of the trench almost exclusively consist of timber structures. This is reflecting the former layout of the harbour compared to the layout of Phase 4 – where the westernmost land ties are constructed in the same process as the land fill, whereas the eastern land ties are cut into already existing – formerly land filled – ground.

From the archaeological observations when excavating G601 a general building process of this type of large land ties was deduced, It seems plausible that the vertical posts were driven in first. After that, some land fill material was dumped around the posts. Overlying this, the lower rear stretchers were placed. (Then there is some evidence of a break in the construction process, where parts of the areas silted up – but this again may have happened over a very short period of time). The middle stretchers were placed and the anchor beams were laid on top of these and the lower rear stretchers. The upper rear stretchers were then laid. In some instances, (e.g. G601), extra anchor beams were placed on top of the ones already locked in between the back stretchers.

Land tie G524

G524 was excavated during a watching brief in May 2012. The excavation trench (ZT9047) was located approximately 18 m west of the Main Excavation trench. Structures and features in this trench were not fully excavated due to an excavation depth limit and the structures were left in-situ.

G524 consisted of five timber contexts. ST9001 and ST9005 were two vertical posts placed with approximately 0.2 m between them, but oriented NE-SW. The posts were both recorded as 0.15 by 0.15 m in cross section, but the length could not be measured, as the posts were left in-situ.

On the NW side of the two posts, a stretcher beam, ST9009 was placed horizontally up against the posts and with the same orientation. Only 0.6 m of its length was exposed, but the beam seemed to be approximately 0.2 m wide. On the top of the beam some corroded iron indicates the presence of an iron nail or spike, possibly fixing the stretcher beam to the underlying anchor beam. It is not certain that the anchor beam was seen due to the excavation depth limit, but on the NW side of the stretcher beam a piece of NW-SE oriented horizontal plank (ST9017) was recorded. Because of the depth limit, the timber could



Fig. 144 Land tie G524. Looking SSE. C115_1282

not be fully exposed, but it seems reasonable to suggest that this plank was actually the northern part of the anchor beam, continuing SE under the stretcher beam and that the two had been joined by halving laps and an iron nail or spike.

NW of the plank/anchor beam was another partially exposed post, ST9021, which seemed to be vertically set and with the same dimensions in cross section as the two other posts. It is, however, not clear if or how this post relates to the rest of the structure.

Interpretation

G524 was initially interpreted as parts of a bulwark or wharf, but in the post-excavation process the similarities between this and the land ties related to Phase 4 have become clear and thus, G524 is now interpreted as parts of a land tie. The structure should possibly be seen in close connection with the deposits related to G525 (Phase 4, land reclamation), as they seem to be interwoven.

Dating

From G524 no samples were taken for dendrochronological analysis. The date of this group relies completely on its similarities with other land ties, belonging with Phase 4 in terms of location and construction type.

Land tie G404

G404 was excavated during the Guide Wall excavations in 2012. The northern part of the group was excavated in Trench 1/ZT9164, while the southern part of it was excavated in Trench 4/ZT19000 in October 2012.

The group comprised horizontal beams, ST11566 placed on top of deposits SD11056 and SD11477 (G405, Phase 4 land reclamation). ST11566 measured 3.1 m by 0.19 m and lay on a NE-SW orientation. It was only exposed and measured due to periodic tidal flooding. The beam was attached to horizontal beam ST10790 lying above on a NW-SE orientation and measuring 3.1 m by 0.2 m by 0.14 m. The southern extension of beam ST10790 was later surveyed as ST19300. Beam ST10790/ST19300 had joints (not fully documented), indicating that the timber was not initially made for this purpose, or it had been transported in a way that had necessitated these joints. Secured by nails from above was horizontal beam ST10459 measuring 1.36 m by 0.25 m by 0.18 m, on the same orientation as ST11566. Beams ST10459 and ST11566 were kept in position by vertical posts ST9361 and ST9365. Post ST9361 was exposed to a height of 0.46 m and measured 0.14 m by 0.12 m in cross section. Post ST9365 was pulled from the soil to be measured fully. The post was sharpened to a point, measuring 2.15 m long by 0.15 by 0.13 m in cross section. The vertical posts were secured in their location by boulders SS12277 and SS12270, each roughly 0.3 m by 0.2 m by 0.2 m in size. East of ST10790 was another horizontal beam, surveyed as ST10785, which was seen as linked to this land tie, but truncated by later actions.

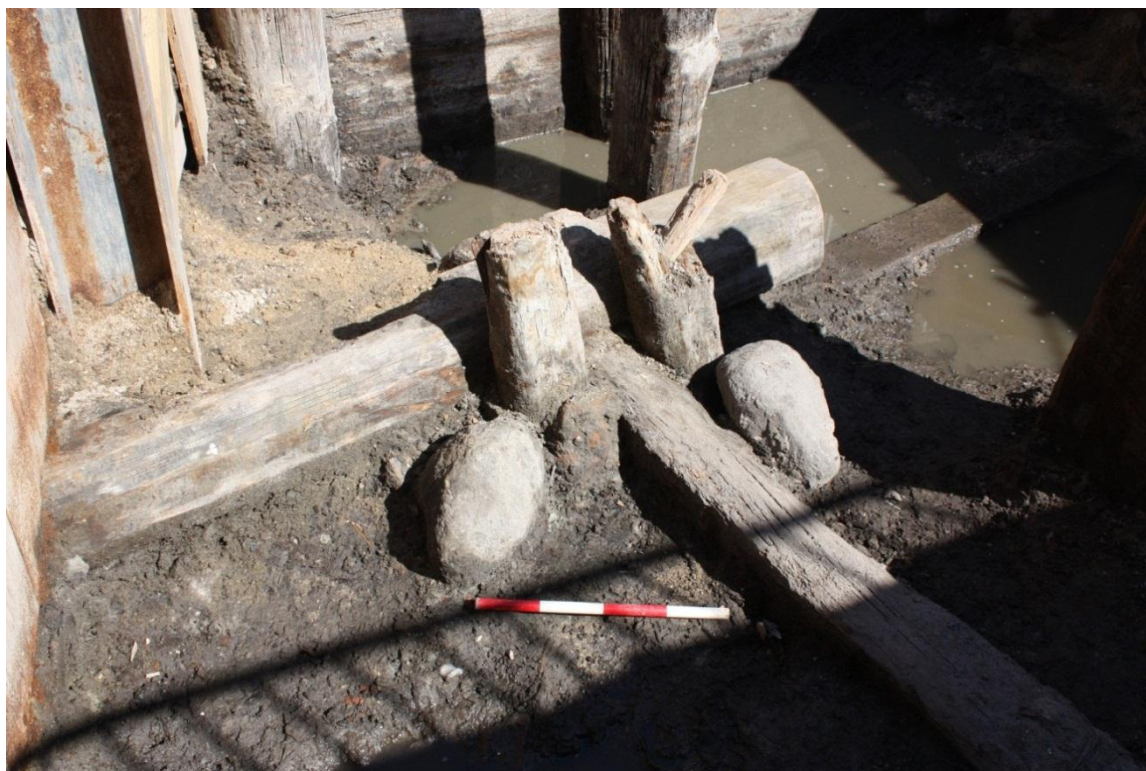


Fig. 145 G404 excavated during the 2012 Guide Wall excavations. Looking north. C03_20120725_5172

Beam ST10785 appeared to be contemporary with the rest of the structure and measured 0.53 m in length by 0.18 m in width. The southern extension of this was later surveyed as ST19296.

Immediately west of the southern end of the anchor beam ST10790/ST19300 was a vertical post, ST19304 interpreted as a support post for this part of the land tie. 1.8 m further to the WSW was another post, ST19324, slanting slightly (but not fully excavated), and interpreted as being part of the same land tie, G404. These posts (ST19304 and ST19324) were exposed to a depth of 0.40 m and were approximately 0.15 m by 0.12 m in cross section. They were driven into deposit 19095 of roud G513 (Phase 4 land reclamation).

Interpretation

G404 is interpreted as part of a land tie, consisting of double back stretchers, an anchor beam and support posts. An additional beam on the side of the anchor beam may be seen as a type of support or strengthening of the anchor beam – or maybe the continuation of the land tie southwards, which was later removed by construction activities. The post to the SW of the main body of G404 is not related to the group with certainty, but may represent a support post for a non-excavated anchor beam outside the excavation area.

As no construction cuts were seen in relation to this group, it seems plausible that the rear stretcher was simply placed onto a land filled area and the rest of the land tie placed around it. G404 probably only represents the rear part (furthest towards north) of the complete land tie of which the front parts were either destroyed by later activity or situated outside the excavation area.

Dating

G404 is stratigraphically placed above Phase 3 alluvials and Phase 4 land reclamation fills, possibly placing the construction of the land tie in Phase 4. A dendrochronological sample (PD202436) taken from the anchor beam, ST10790, resulted in felling date AD 1690/91 winter.

Land tie G507

G507 was excavated during the 2012 Guide Wall excavation. The area immediately east of it was included in the 2014 excavation, but was not fully excavated due to the placement of a soil ramp.

G507 consisted of three posts, ST19111, ST19310 and ST19314, driven into deposit SD19095 (G513, Phase 4 land reclamation). Overlying this deposit was also the anchor beams ST19065 and ST19091, which were possibly originally one beam, preserved at approximately 1.6 m length and NNW-SSE-oriented. The beam was made from a boxed heart timber cut and was square in cross section, 0.18-0.2 m. In the northernmost end, a mortise was piercing the timber, but it is not clear whether this timber would originally have extended longer, or if it had been truncated by the construction of later land ties, e.g. G509 (Phase 5). Overlying the anchor beam was stretcher beam ST19069, which was ENE-WSW oriented and preserved or exposed for 2.15 m length. The beam extended out of the trench towards the east, but no traces of it were found in the 2014 Main Excavation. The western and middle parts of the beam were highly truncated, but seemed originally to have had a chase mortise going half way through the middle of the beam, indicating that it was reused. From the descriptions, it is not clear how the beams were related to the posts.

Interpretation

G507 is interpreted as parts of a land tie. It is different from other Phase 4 land ties and the location and alignment of the anchor beam does not match with the land tie immediately north of it, G404. G507 may

have been a repair or replacement of an earlier land tie, and may represent a forward stretcher beam, anchor beam and supporting posts.

Dating

From G507 no dendrochronological samples were prioritized for analysis. The placing within Phase 4 depends on the levels as the alignment of the elements are slightly different from those of G404, a more regular Phase 4 land tie, north of G507. Thus, the dating is questionable.

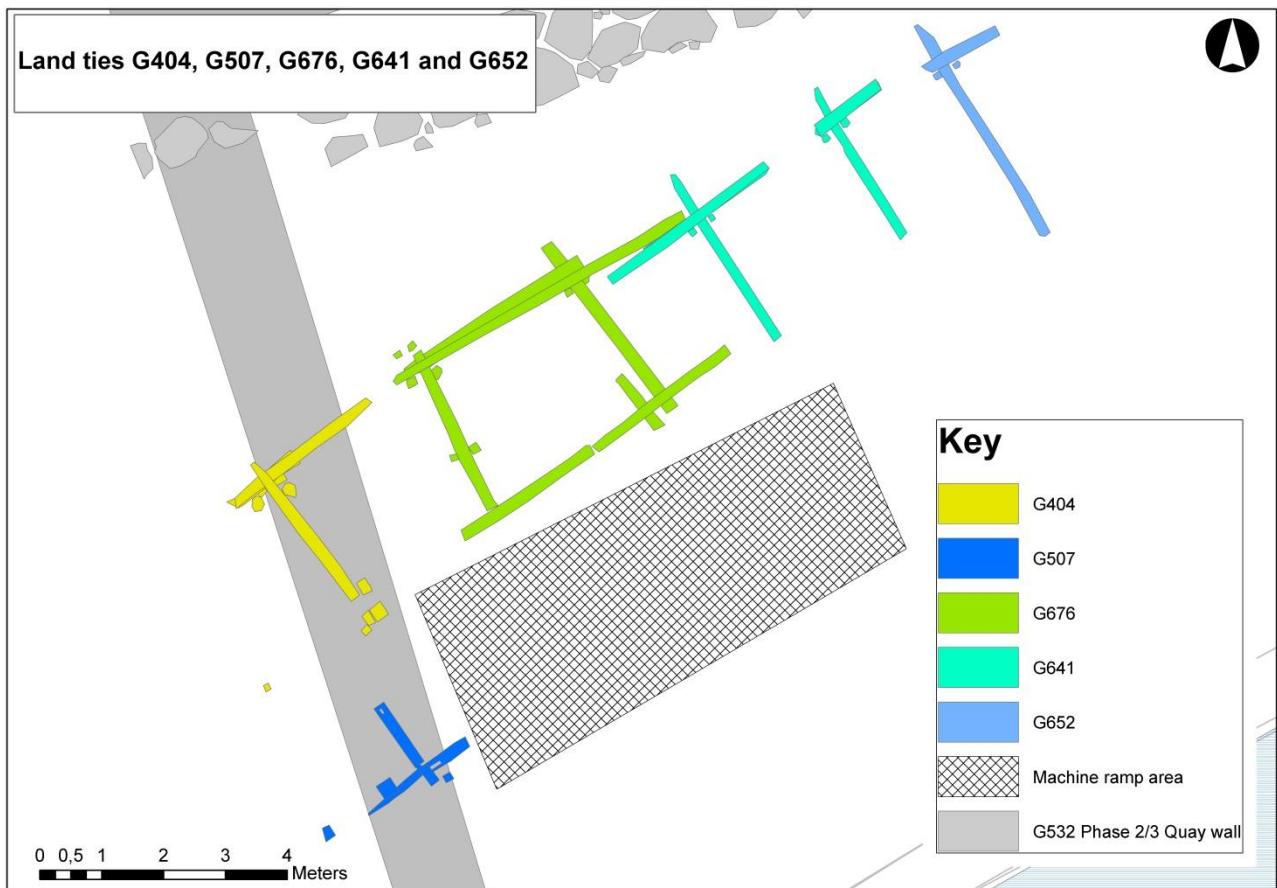


Fig. 146 Plan of Phase 4A land ties, G404, G507, G676, G641 and G652

Land tie G676

Group 676 was excavated during the Main Excavation in 2014. The group consists of a lower rear stretcher, ST37285, which was a pine timber and had joints and marks indicating that the timber was reused from somewhere else or had been transported in a way which necessitated such joints. ST37285 was placed on top of SD31304 (G640, Phase 3 land reclamation). Another pine stretcher (ST38315) was laid 2.7 m south of ST37285, parallel to this, and east of this was placed pine stretcher ST38298, parallel to the east end of ST37285. Attached to the stretchers were two anchor beams, ST36927 and ST53704 (west and east, respectively). The distance between the two anchor beams was 2.8 m at the north end and 3.1 at the south end. ST36927 was an oak timber which had two halving laps that did not serve any immediate purpose and therefore the timber was probably reused from another structure. ST53704 was likewise an oak timber with indications of reuse. On top of the north (rear) ends of the anchor beams was an upper stretcher beam, ST53713. ST53713 was made of spruce and was attached to the two anchor beams, ST36927 and ST53704 using large iron spikes. It had marks indicating reuse. In the northwest corner of the structure, two pine posts, ST53748 and ST53742 were driven into the ground and kept the stretcher beams and the anchor beam in place.



Fig. 147 G676 northwest part. ST37285, ST36927, ST53713, ST53748 and ST53742. Looking NNW. C02_20140514_9401

Approximately 0.5 m north of these, another pair of driven posts were recorded (ST53738 and ST53733), which could indicate that the anchor beam had originally extended longer north – but the posts may also not be related to this at all. Further towards the SSE another set of posts (ST36941 and ST36945) were placed on either side of the anchor beam ST36927. These posts do not serve any clear purpose and therefore may or may not be related to G676.

In the north-eastern part of structure, the two posts ST53728 and ST53722 kept anchor beam ST53704 in place with the rear stretcher beams.

A NNW-SSE oriented beam, ST38288, was located as it was joined by lap halving to the southern stretcher, ST32298. ST38288 was parallel to ST53704 on the western side of this. The beam was truncated towards the south by the cut (SM 20336/SC50193) for the concrete structure G589 (Phase 6) and was only preserved at 1.1 m length.

Interpretation

G676 is interpreted as the rear/land parts of a land tie consisting of two parallel anchor beams tied together with lower and upper stretcher beams to the rear and with only a lower stretcher in what was probably the middle stretchers when this was built. An indication for the land tie originally extending further south is the small part of an anchor beam, ST38288. Where the rear stretchers and the anchor beams met they were held together with iron spikes/bolts. Two sets of support posts were placed where the two anchor beams met the rear stretchers.

A further two sets of posts have been related to this group, but these are highly dubious, as it is unclear what their purpose would be. However, if they are in fact related to this structure, they would probably have served to keep the western anchor beam, ST36927, in place.

It is noticeable that the types of timbers used for this structure are oak, pine and spruce. This information, however, makes more sense when it is noted that quite a few of the timber elements used bore signs of being reused from another structure – or from being transported in a way that necessitated joints and fixings.

Dating

A series of dendrochronology dates were carried out on timbers from this structure. The two oak anchor beams were dated to AD 1679 winter and AD 1686? (PD210057 from ST53704 and PD210056 from ST36927, respectively). The two pine stretchers towards the south were dated to AD 1691 winter and AD 1692 spring/summer (PD210055 from ST38298 and PD210065 from ST38315, respectively), while the lower rear stretcher of pine was likewise dated to AD 1692 spring/summer (PD210058 from ST37285). The upper rear stretcher of spruce was not dateable. The dates are all quite close and may indicate when this structure was built. However, as all the dated timber parts had indications of reuse, the dates can be misleading. Based on stratigraphy, however, it seems probable that the construction of this structure took place around 1700.

Land tie G641

This group was excavated during the 2014 Main Excavation. G641 consisted of a lower stretcher beam, surveyed as ST36921 and ST37652 on the western and eastern side of the truncation SC33573 (construction



Fig. 148 Western parts of G641. Looking WSW from truncation SC33573. C02_20140508_9310

cut for eastern building wall, SG675, G707), respectively. In total this beam measured 5.38 m. It was placed on top of SD31304 (G640, Phase 3 land reclamation dumps) and slightly overlapped the lower stretcher beam ST37285 of land tie G676 west of G641. On top of the lower stretcher beam were two anchor beams, ST53677 and ST53643 (west and east, respectively), placed with a mutual distance of 2.6 m. The anchor beams were parallel and oriented NW-SE with a slight inclination towards NNW-SSE. Both

anchor beams were rectangular in cross section the southern end, but were tapered towards the north. The northernmost end of ST53643 was pierced by a tapered mortise, suggesting that the timber was reused from a different structure. The southern ends of both anchor beams were truncated by later features.

On top of the north ends of the anchor beams (the rear end of the land tie) was an upper stretcher beam, recorded as ST53687 and ST53659 on the western and eastern side of the truncation, SC33573. This was probably originally one long stretcher, approximately 4.6 m long. On the southern side of the rear

stretchers, two sets of vertical posts were recorded (ST53698 and ST53694 west and ST53671 and ST53666), keeping the anchor beams and the stretchers together. A dendrochronology sample from ST53694 could not be dated, but determined the timber species as spruce. It is not clear if all the posts were of spruce, and likewise the timber species for the other parts are not determined. The resemblance between the anchor beams in G641 and G676 west of this, however, makes it plausible that these were all made of oak.

Interpretation

G641 is interpreted as the northern (rear) parts of a land tie connected to the harbour front at Gammel Strand. It consisted of two parallel anchor beams and a lower and an upper rear stretcher as well as a set of two posts in the two places where anchor beams met the rear stretchers. It is not clear how far south, the structure would have extended, if it had not been truncated and removed by later features. It seems plausible that the construction of G641



Fig. 149 ST 53643 (G641). Tapered mortise in north end. Looking E.
C03_20140508_10123

occurred fairly contemporarily with the construction of G676, as the lower rear stretcher of G641 is placed directly on top of the lower rear stretcher of G676, but the two are kept as different groups as the orientation of the timber elements differs slightly between the two. The suggested contemporaneity is supported by the possibility of reused timbers as seen in other post land tie structures.

Dating

No timbers from G641 were dated using dendrochronology, but according to the stratigraphy as well as the suggested contemporaneity with land tie G676, it seems reasonable to place the construction of land tie G641 in the late 17th Century.

Land tie G652

G652 was excavated during the Main Excavation in 2014. The group comprises a lower stretcher, ST53634, preserved at 1.46 m length, ENE-WSW oriented. The timber was cut as boxed heart timber and had a semi-circular cross section. The stretcher beam was possibly truncated at the east end, where it may originally have been the same as ST37240 (G653, Phase 4 land tie, same type of timber cut and cross section), however, as the gap between these is 1.5 m wide, it cannot be said with certainty that they are the same. Overlying the stretcher was an anchor beam, ST53610, which was preserved to a length of 2.04 m. The anchor beam and the stretcher were joined by a halving lap as well as an iron bolt. The anchor beam was tapered at the NNW end and had a tapered mortise near the tip, as also seen on ST53643 (G641, Phase 4 land tie). Where the stretcher beam and the anchor beam met, two vertical posts (ST53623 and ST53628) were driven into the ground. These posts were very worn and soft and the shape could not be determined.

Interpretation

G652 is interpreted as part of a land tie structure. The documented timbers probably represent the rear, western part of a larger land tie system, possibly including (parts of) G653, which was found east of G652. The land tie would have extended further south, possibly consisting of a middle stretcher and a front stretcher, to meet with a bulwark structure, for which the land tie had its purpose. However, the southern parts would have been truncated by later activity and the assumed bulwark structure (the westerly continuation of SG604) could possibly be located south of the excavation area.



Fig. 150 G652, land tie. Looking SSE. C03_20140508_10127

Dating

No dendrochronology samples were prioritized for analysis from G652. However, by horizontal stratigraphy, it seems reasonable to suggest that the land tie forms part of the same overall land tie system as G641, G676 and G404 west of this, and G653 east of this. These are with all probability constructed in the late 17th or early 18th Century.

Land tie G653

G653 was excavated during the Main Excavation in 2014. A large baulk covered parts of this group during most of the excavation, and thus, the western parts were excavated in May 2014, whereas the eastern parts were excavated in July 2014, when the remaining part of the excavation was made available as part of the watching brief.



Fig. 151 G653, anchor beam ST47244, with unsurveyed vertical posts and upper and lower rear stretchers, ST53544 and ST39289. Looking SW. C03_20140711_11544

G653 comprised a lower stretcher beam, ST37240, which may be the eastern extension of the lower stretcher beam, ST53634 in land tie G652 west of G653. ST37240 is a boxed heart cut timber beam with a semi-circular cross section. It was preserved at 1.41 m length and was oriented ENE-WSW. The western end was truncated by the construction cut SC23502 (G677, Phase 5 water pipe) and the east end by construction cut SC52909 (G235, Phase 4 drain). A possible eastern extension of

ST37340 was ST39289, surveyed east of the truncation, SC53909, but hardly any information about this timber was recorded. It seems, however to have extended into the baulk and continued under the anchor beam, ST47244 (see Fig. 152). Both the anchor beam and the surrounding timbers were only partly recorded once the baulk was broken down.

Anchor beam, ST47244 was preserved at approximately 4.1 m length and similarly to the anchor beams in e.g. G652 and G641, the northern end of the beam was tapered and had a tapered mortise cut into the tip. On top of the anchor beam was an upper rear stretcher, ST53544, which was preserved at 1.3 m length and truncated the west end by SC52909 (cut for drain pipe G235, Phase 4). On the western side of the truncation, ST53606 was another part of an upper stretcher, which is probably identical to ST53544. Both had the same semi-circular cross section, approximately 0.15 m by 0.20 m.

Where the anchor beam (ST27244) met the two rear stretchers (ST39289 and ST53544), two posts are seen on photos (e.g. C03_20140711_11544), but these were not surveyed or recorded in other ways. However, the location of these makes it plausible that they too are part of G653.

Crossing the southern end of anchor beam ST47244 was another beam, ST44800. The location of this indicated that this was an upper stretcher, though it was not fully recorded during the field phase. From photos it appears that this beam was not physically attached to the anchor beam, as there were several



Fig. 152 G653, land tie. Looking NNE. C03_20140711_11538 (cropped)

centimetres of soil in between. This can, however be explained by the slight moving of the timber elements, when the structure was truncated by later constructions. A post, surveyed as ST45227, was situated on the southeastern side of the anchor beam, ST47244. This may well be related to this group.

Interpretation

G653 is interpreted as part of a land tie. Based on the surveyed levels of the timber elements as well as the anchor beams being parallel, G653 may well be

part of the same, larger land tie as G652, which was excavated west of G653. The distance between the anchor beams in G652 and G653 (ST53610 and ST47244, respectively) is approximately 5.3 m. This large gap could indicate that another anchor beam would originally have been placed between them. It is possible that G639 (see below) should be seen in this connection.

The southern extensions of G653 were removed by later activities at Gammel Strand, and thus, only the rear stretchers and an anchor beam as well as two support posts (rear) were excavated alongside a possible middle stretcher and another support post. Parts of the corresponding bulwark – or later replacement of this – (G604) were recorded approximately 3.4 m south of the southernmost parts of G653.

Dating

From G653 no samples were prioritized for dendrochronological analysis. However, it seems reasonable to see this structure as contemporary with other land ties such as G676, G641 and G652 which places the construction of G653 in the late 17th or early 18th Century.

Land tie G639

G639 was excavated during the Main Excavation in 2014.

G639 comprises two parallel stretcher beams, ST53581 and ST53588, which were both lower stretchers, as the anchor beam, ST53575, was placed above them. The northernmost of the stretchers, ST53581 was a



Fig. 153 G639 land tie. Looking S. C03_20140508_10143

soft and worn beam, only preserved at 0.45 m length and truncated in the west end by SC24446 (G679, Phase 5 land tie) and to the east by SC52909 (G235, Phase 4 drain pipe). ST53588 was placed south of ST53581, leaving a gap of 0.21 m in between them. ST53588 was cut by the same features as ST53581, but was preserved to a length of 0.67 m. Both beams were rectangular in cross section and while ST53581 was 0.21 m by 0.22 m in cross section, ST53588 was only 0.14 m by 0.17 m in cross section.

Above the two stretcher beams, anchor beam ST53575 was placed in a NNW-SSE orientation. It was attached to the underlying ST53581 by a large iron nail or spike. Two halving lap joints are mentioned, but not fully recorded and it is not clear if these were structural parts of the land tie, or indications of reuse. It was noted that the anchor beam was more worn than the other elements of G639, which could be an



Fig. 154 G639 land tie. Looking N. C03_20140508_10147

indication of reuse. ST53575 was preserved at 1.8 m length and was rectangular or semi-circular in cross section. The anchor beam was truncated at the southern end by the construction cut SC50193 (G589, Phase 6 quay side), and at the northern end it may have been cut off in connection with the establishment of the modern gas pipe trench, SM20992.

Two vertical posts, ST53595 and ST53599 were placed in the gap between the two parallel stretcher beams on the eastern and western side of the anchor beam, respectively. The eastern post, ST53595 had been partially truncated by the cut for the drain pipe, SC52909 (G235, Phase 4), but was probably originally rectangular in cross section. Post ST53599 was recorded as sub-circular in cross section. The top of the post was probably truncated by the cut for the later land tie, SC24446 (G678, Phase 5). South of the southern

stretcher beam, ST53588, and on the western side of the anchor beam, another post can be seen in the photographs, but this was not surveyed or recorded during the fieldwork. However, it seems reasonable to suggest that this post was also part of G639.

Interpretation

G639 is interpreted as parts of a land tie. It consists of a possibly reused, truncated anchor beam, two stretcher beams that must be the middle stretchers in a larger land tie, and three posts, interpreted as support posts for the horizontal beams. The location of the structure suggests that G639 is actually parts of the same land tie as G653, but as the structures are heavily truncated, it cannot be said with certainty. The distance between the anchor beams in G639 and G653 is approximately 2.1 m which is very similar to the distance between anchor beams in other large land ties.

Dating

G639 is dated on the basis of its contemporaneity with other land ties, e.g. G676, G641, G652, G653, and G601. Thus, the construction of G639 must have been done around the turn of the Century i.e. 1700.

Extra land tie? G564

G564 was excavated during the 2014 Main Excavation. The group comprises only timber structures and a cut and fill would have been expected, but these may have been obscured by the machine excavation of the area.

The lowest feature in the group was the anchor beam, ST27343, which was placed on top of SD31532 (G598, Phase 4 land reclamation). The beam was preserved at 0.91 m length, but had been truncated at the south end by the construction cut, SC50193, belonging to a quay wall foundation (G589, Phase 6), and would probably have continued at least 2 m further south to meet with a bulwark for which the land tie had its purpose. The beam was made from a boxed heart timber cut, 0.19 by 0.2 m in cross section.

The stretcher beam, ST27343 was placed on top of the anchor beam and fixed with a large iron nail. The pine beam was preserved at 1.24 m length and was made from a boxed heart timber cut. The beam was orientated ENE-WSW and the land tie was thus parallel to the land tie system excavated just north of it, G601. The stretcher beam was probably truncated at both ends by cuts for later land ties G635 and G565 (both Phase 5).

South of the stretcher beam, on either side of the anchor beam, was placed two vertically set posts, ST27329 and ST27228.

Interpretation

G564 is interpreted as parts of a land tie. The structure and the placement of it differs from the rest of the land ties belonging with Phase 4A, in that there is only an anchor beam and an upper stretcher beam and the structure is placed out of the overall land tie system north of it. The orientation and stratigraphical level, however, matches the other land ties nicely, possibly being slightly later than G601, and therefore it should probably be interpreted as an extra land tie, constructed to support or strengthen the existing structures where such extra strength was needed.

Dating

Two dendrochronological samples were prioritized for analysis and dated. The stretcher beam was dated to After AD 1724 (PD208714), while one of the supporting posts was dated to AD 1727[?] (PD208716). There were no traces of reuse of the timbers recorded, and as such these felling dates may correspond well with when the structure was actually built.

The dendrochronology dates are supported by the stratigraphical observations and G564 is thus placed well within Phase 4.

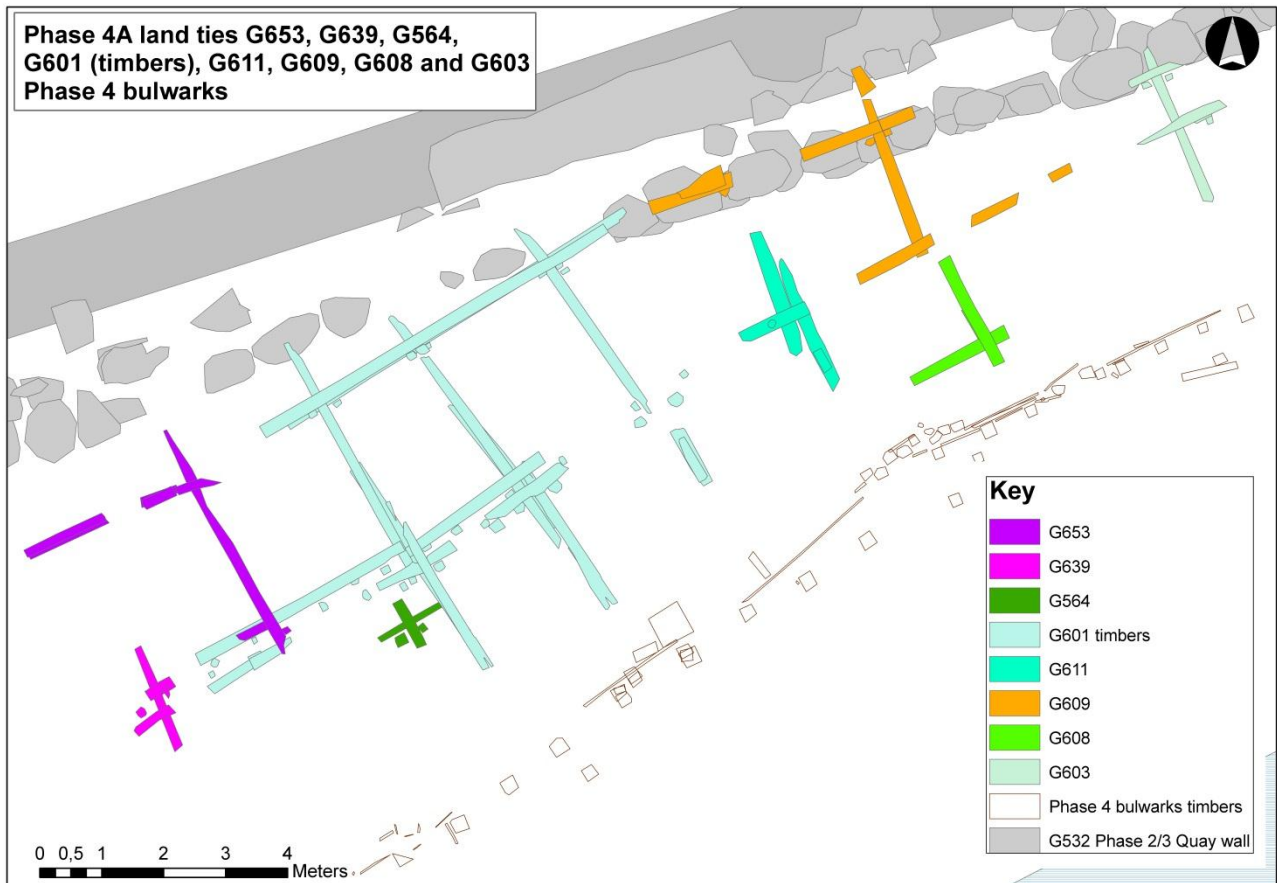


Fig. 155 Plan of Phase 4A land ties G653, G639, G564, G601 (timbers only), G611, G609, G608 and G603.

Land tie with land reclamation G601

G601 was excavated during the 2014 Main Excavation. The group possibly comprised part of the same land tie structure as G653 and G639, but due to the baulk remaining in the excavation until the last weeks, the structures were seen as separate and will be kept as such here. In G601 two large deposits are also related (SD52177 and SD211109), even if these deposits extended far beyond the extents of the timber structures related to this group. A large boulder (SS34750) was also documented, but this is however merely an inclusion in deposit SD52177 and will not be treated any further below.

In the following is a description of the group contexts – first the different timber elements and then the deposits, and in the interpretation section is an overview of the stratigraphy of the group, as suggested from the field observations.

G601 comprises a lower, rear stretcher, ST36724, which was a 6.47 m long pine beam, NE-SW orientated (with a slight deviation towards ENE-WSW). The beam was rectangular to square in cross section, with slightly rounded corners and was made from a boxed heart timber cut.



Fig. 156 15 G601, western parts of the land tie and the baulk. Looking SSE. C02_20140507_9187

Approximately 2.8 m south of ST36724 were stretcher beams ST36905 and ST36756 which were likewise boxed heart timber cuts but with rectangular cross sections and thus worked on all sides. ST36756 was determined as pine and 2.68 m long, while ST36905 west of ST36756 was preserved at 3.8 m length. ST36905 lined up nicely with ST53581 (G639), and it seemed possible that these two stretcher beams were originally parts of the same structure, only truncated by later activities. The top levels surveyed, did however not support this, as the difference between them was approximately 0.3 m, but this may be explained by the later truncations moving the timbers slightly out of situ.

South of ST36905 and ST36756 and parallel to these, were another set of shorter stretcher beams, ST53552, ST36885 and ST36739 (from west to east). The gaps between the longer beams ST36905 and ST36756 and these shorter beams were 0.14-0.3 m, but were slightly obscured by the fact that two of the beams, ST36885 and ST36739 were collapsed and broken in the middle, possibly putting them a little out of situ. Stretcher beam ST53552 was made from a boxed heart timber cut and was rectangular in cross section. It was preserved at approximately 1.5 m length but was probably truncated at the east end by the construction cut SC30605 (G635, Phase 5 land tie). At the western end, ST53552 seemed to have been truncated by a construction cut, SC52909 (G235, Phase 4 Drain pipe) and it may have had a western continuation, ST53588 (G639) on the other side of the truncation. The two collapsed beams, ST36885 and ST36739 were both registered as being boxed heart timber cuts, but with square and quartered cross sections respectively. ST36885 had a large nail in the western end as well as a mortise that did not seem to serve any purpose and this along with the fact that the beams seemed to have collapsed in antiquity suggested that they had been made from reused timbers. The timber species were not analysed.

Resting on top of the three parallel sets of stretcher beams were three sets of anchor beams. Each anchor consisted of more than one beam, seemingly an attempt to strengthen the structure. At the western side, oak beam ST36630 extended from the rear stretcher, ST36724, and towards SE (with a deviation towards SSE). The beam was 4.15 m long and was more or less rectangular in cross section. The northern end was tapered and remains of a mortise piercing the northern tip could be seen, though this end had been truncated at some point. ST36630 was placed parallel to and 2.4 m east of the anchor beam ST47244 in land tie G653, which is supportive of the suggestion that these are in fact parts of the same land tie structure. This is furthermore supported by the fact that ST47244 crosses over the two southern stretchers, ST36905 and ST53552 of G601. Another anchor beam, ST34081 was placed immediately east of ST36630 and extended from where two longer stretcher beams, ST36905 and ST36756 met and 2.75 m towards SE. Just north of the northern end of ST34081 a wedge shaped piece of wood, ST36657 was attached to the eastern side of ST36630. It is not clear if this had any structural purpose or if it was a mere indication of the beam being reused from another structure. Beam ST34081 too was made from oak and had traces of reuse, in that the tapered northern end was pierced by a mortise and it also had two halving laps for no apparent reason. The southern end of ST34081 extended under the timber and concrete structure G589 (Phase 5 quay side) but must have been truncated after the land tie went out of use. Resting on top of the two anchor beams, ST36630 and ST34081 was a third beam, ST52993. Like the other two anchor beams, this was made of oak and had traces of being reused from another structure. Its northern end was bolted to the underlying ST36630 by a large iron bolt and the southern end was merely resting on top of ST34081 without any clear fixings.

Approximately 1.8 m east of the anchor beam ST36630 was another anchor beam. The beam had been broken in two in antiquity, and the northern end had been registered as ST36609 while the rest was registered as ST36570. In total this beam was approximately 4.6 m long and made from oak. The northern end was tapered and had a mortise near the tip as seen on a lot of other Phase 4 land tie anchor beams. On the southeastern side of ST36570 was a (not surveyed) wedge shaped attachment, similar to ST36657 (see photo C02_20140508_9278). South of this attachment, another anchor beam, ST36684 was placed against the southeastern side of ST36570. Like the other anchor beams ST36684, was made of oak and bore the same traces of reuse. Like ST34081, ST36684 extended under the later quay structure, G589, and the south end of the beam was split, probably from a large nail having been hammered into it. On top of the middle

of ST36684 was a piece of beam, ST34531, preserved at only 0.8 m length. It seemed to have been truncated and partly removed by the construction of G589, but the remains of a large nail seen in underlying ST36684 could well indicate that the two beams had been nailed together. It is assumed that the anchor beams would originally have extended further south and met with a bulwark structure for which the land tie had its purpose. Parts of the assumed corresponding bulwark, SG604, was excavated less than a metre south of ST36684's south end, but the link between them was unfortunately removed. Resting on top of ST36570 was beam ST34254, which is possibly a means of reinforcing the anchor – like ST52993 west of this. ST34254 was 2.65 m long, made of oak and with indications of being reused from somewhere else.



Fig. 157 G601 eastern parts. Looking SW. C02_20140508_9278

Near the eastern end of the lower rear stretcher beam ST36724, anchor beam ST34373 was documented. This was placed almost parallel to ST36570, but located 2.4 m further east. The beam was not species analysed, but as it too was tapered in the north and bore other signs of reuse, it seems plausible that it was made of oak as were the other anchor beams in G601. The beam had collapsed in antiquity and was preserved at 3.6 m length. South of ST34373 two other pieces of assumed anchor beams were recorded as ST34680 and ST34505. It is likely that ST34505 should be seen as the same type of reinforcement of anchor beams as ST34254, ST34531, and ST52993 recorded in other parts of land tie G601. As it seems plausible that there would originally have been one or two middle stretcher beams near the southern end of ST34373, a large, non-visible truncation must have removed these, after the land ties went out of use.

Resting on top of the northern parts of anchor beams ST36630, ST36609/ST36570 and ST34373 was an upper rear stretcher beam, ST34270. ST34270 was a 6.58 m long beam made of pine with a sub-circular cross section. The beam was held on to the underlying anchor beams as well as the lower stretcher by large

iron bolts. The edges of the beam were worked, but it contained no traces, such as excessive joints or mortises, of being reused from another structure.

The many anchor and stretcher beams were held in place by vertical posts. These were usually placed in more or less vertical pairs immediately south of where the anchor beams crossed the stretcher beams, but exceptions as well as extra posts were also seen. Near the rear parts of the land tie structure, ST34834 and ST34266 kept anchor beam ST36630 in place. These two posts were species determined as spruce. Where the anchor beam ST36609/ST36570 met the rear stretchers, posts ST34283 and ST34339 were placed on either side of the anchor beam. Between them, under the anchor beam was another post, ST37353. Post ST34283 was made from pine, but the other posts were not species analysed. Where anchor beam ST34373 met the rear stretchers, three posts were seen. ST34397 was leaning towards north on the western side of the anchor beam, while ST34409 and ST34409 were both vertical and placed close together east of the anchor beam.

A more or less straight line of posts was seen in the gap between the two parallel sets of middle stretchers, made from ST36905 and ST36756 and ST53552, ST36885 and ST36739. The posts (from west to east) were ST53556, ST53566, ST22828 (which was held in place by wedge ST44806), ST45227 (currently in G653, but this is essentially the same structure), ST36913, ST27211, ST52985, ST27220, ST34124, ST34135, ST34140, ST34203 and ST34343. Of these, ST34140 was species analysed as spruce, whereas the others were not analysed. In alignment with these posts, further east (but without any stretcher beam, as this seems to have been removed) were posts ST34366 and ST34435.

Supporting the southern sides of the shorter middle stretchers, ST36885 and ST36739, were posts ST37224, ST37362, ST34115, ST34199, ST34212 and ST34349. Of these, ST34199 and ST34212 were species analysed and both made of pine. South of where the assumed middle stretcher would have been in the eastern part of the land tie were the posts ST34357 and ST34427.

SD52177 was a large (approximately 31 m by 6 m) greyish brown dump of sand with a large proportion of organic material. From the baulk section it appears to be 0.4-0.6 m thick and sloping downwards from north to south. The deposit was seen as the result of natural build-up of material, combined with dumped elements – especially building rubble. The deposit comprised a broad range of finds: ceramics, clay pipes, glass, leather, animal bones (especially a lot of cattle jaws) and a few metal artefacts. The stratigraphical relationship with the timbers in G601 was seen in that SD52177 was above or built up around all the posts belonging with G601. See further information on SD52177 in the land reclamation sub-chapter above.

Deposit SD211109 was created in the post excavation process after problems were seen in on-field stratigraphy. Using the previous contextual information and deposit measurements belonging to SD32429 (G598) they were transferred into SD211109. The deposit consisted of dark grey-brown sandy silt and was seen as having been created by a combination of natural deposition (alluvial) and dumping of material. No finds were related to SD211109.

Interpretation

G601 is interpreted as part of a large land tie, constructed with the purpose of securing a bulwark or quay. If including land tie groups G653 and G639 to which G601 seems directly related, the group consisted of four large anchor beams, of which three were made from more than one piece of timber. The anchor

beams were connected to two rear stretchers and two parallel sets of middle stretchers. Even though there were anchor beams extending further south, there were no traces of any front stretchers, which were expected to have been placed near the bulwark. During the construction of the land tie(s), deposits were built up as a result of alluvial activity and the dumping of waste.

From the observations in the field, a general stratigraphy was suggested: The earliest features of the group are the vertical posts (or at least some of them), which were driven in from the surface of SD33628 (G663, Phase 3 harbour use and deconstruction). Up against these posts, the deposit SD52177 built up, presumably as a combination of natural build-up and of dumped material. On top of this was placed the lower rear stretcher. After this was put in, there seems to have been a – longer or shorter – pause in the construction, where SD211109 was deposited as an alluvial deposit. On top of this was placed the middle stretchers, and then the anchor beams and the upper rear stretchers were placed. After this land reclamation went on (G598).

Dating

Quite a few dendrochronological samples were taken from different elements in land tie G601. However, almost all the timbers from which the samples were taken contained evidence of being either reused from another structure or having been transported in a way that necessitated laps and mortises etc. The dates resulting from the analysis of these timbers are however quite similar. Two of the anchor beams, ST34081 and ST36684 were dated to AD 1689(?) and AD 1690 (PD210066 and PD210127 respectively), whereas other anchor beams, ST36630, ST52993 and ST34254 were dated more broadly to AD 1676-88, AD 1684-98 and AD 1689-94 (PD210067, PD210064 and PD210130, respectively). Two pine stretcher beams, ST34270 and ST36724 were dated narrowly to AD 1690 and AD 1692 spring/summer (PD210126 and PD210053), while two pine posts ST34199 and ST34212 were both dated to AD 1691-92 winter. Of all these dated timbers, the two rear stretchers, ST34270 and ST36724, were not obviously reused.

From the stratigraphical evidence, the western parts of the land tie were truncated by a construction cut for a wooden drain pipe, G235. The drain pipe itself and the lid closing it were both dated by dendrochronology to after AD 1724 and to AD 1725 more accurately. Given that the timbers used for this structure were not reused from somewhere else, it narrows in the construction date for G601 to between AD 1692 and AD 1725.

The dateable finds materials from SD52177 (ceramics, clay pipes etc.) mostly consist of items with production dates in the 17th and early 18th Centuries, however a few porcelain artefacts and clay pipes seem to have been produced in the later half of the 18th Century. These may be seen as later intrusions (e.g. when later posts have been driven into the ground and moved material downwards in stratigraphy) and will not move the general date for the construction of G601.

Land tie G609

G609 was mainly excavated during the 2014 Main Excavation, but in the post excavation process it was realised that a piece of timber, excavated during the 2012 Guide Wall excavation, may well belong with G609. Land tie G609 is probably the same or at least partly the same as G611 and G608, but as they were excavated on either side of large truncations, they will be kept separate in the following.

G609 was constructed from a lower rear stretcher beam, surveyed as ST36718 and ST37597 on either side of the construction cut, SC34160, for a wooden drain pipe (G231, Phase 5). The two beams were probably originally the same beam, rectangular in cross section with a flat upper side. The orientation was ENE-WSW and the beam would have been 3.97 m long in total if not for the truncation in the middle. The orientation differs from that of the land ties to the west of this (G601), making it probable that there was a change of orientation of the harbour front.



Fig. 158 ST10224 (G609) excavated during the 2012 Guide Wall excavation. Looking SE. C03_07092012_4776

Approximately 2 m SSE of the rear stretcher and parallel to this was another stretcher beam, surveyed as ST37490, ST35930 and ST39651 (from west to east). The location and levels of the western part of this beam, ST37940, matches those of the stretcher beam of land tie G611, making it plausible that these two were originally part of the same structure, though truncated by the later drain pipe (G231, Phase 5). The eastern end ST37490 was truncated by the cut, SC24648, for a later gas pipe (G574, Phase 6) and on the eastern

side of this cut, ST35930 was recorded as being of the same type of timber cut, cross section, dimensions and levels and therefore probably the same beam originally. The eastern part (ST39651) of the middle stretcher beam was recorded at a somewhat lower level as the rest of the beam to which this seems to belong, but this may be due to the later construction of wooden drain pipe (G206, Phase 4), pushing the piece of beam deeper into the ground.

On the southern side of the rear stretcher beam were vertically set three posts (ST34571, ST35944 and ST35940), of which the two latter were placed in a pair on either side of the anchor beam near the eastern end of the stretcher. Post ST34571 did not have a “partner”, as this would probably have been removed, when the later drain pipe (G231) was constructed. The three posts were all relatively short – approximately 0.55 m in length – due to the location on top of the Renaissance quay wall (G532, Phase 2). On the side of ST34571 an X was cut into the timber. There was no anchor beam directly related to this post, as this also would have been removed by the cut for the wooden drain. However, the location of the land tie G611 (see below), makes it plausible, that the anchor beam belonging to G611 was actually part of the same land tie as G609.

Between the two posts, ST35944 and ST35940, was an anchor beam, the north end of which was surveyed as ST10224 in the 2012 Guide Wall excavation. The southern extension of this was recorded as ST37481. From photos it appears that the northern end of ST10224 was tapered in the same way as many other anchor beams from this phase (e.g. G676, G641, G653 etc.), but it was not possible to see if there had been a mortise near the tip.



Fig. 159 G609 land tie. Looking NNW.
C03_20140508_10165 (cropped)

The rest of the anchor beam, ST37481s was seen to be made from a boxed heart cut timber with rounded corners – very similar to other beams in Phase 4 land ties. In total the beam was preserved at 3.2 m length, but the southern end of the beam was truncated by the construction cut, SC24648, for a later gas pipe (G574, Phase 6).

On top of the anchor beam was an upper rear stretcher, which was recorded as ST34567 and ST34579 on either side of the drain pipe, G231. This beam was worn but may originally have been a minimum of 3.48 m long if both parts were considered the same.

A small deposit, SD37575, was recorded on the northern side of the rear stretchers. It consisted of silt and sand and may have been partly naturally accumulated and partly of dumped material. No finds were collected from this.

Interpretation

The contexts related to G609 are interpreted as parts of a land tie. Due to the severe truncation of the structure it was split from G611, but the two groups were with all probability originally parts of the same structure. Land tie G609 consisted of a lower rear stretcher, a middle stretcher beam, an anchor beam, an upper rear stretcher and three posts. A small deposit on the north side of the rear stretchers may have built up during the construction of the land tie.

Dating

From G609 no dendrochronology samples were sent for analysis, but given that the structure seems to be the same as G611, the dendrochronological dates from this group may be a valid date indicator for G609 also. The two dates from G611, were AD 1683-91 and AD 1664-71 respectively, but as both were obtained from possibly reused timbers, it seems reasonable to place the construction of G611 – and therefore also G609 – in the late 17th or early 18th Century. The stratigraphical relationship between G609 and the wooden drain pipe, G206, supports this date, as the timber pipe in G206 was dated to AD 1738-39 winter.

Land tie G611

G611 was excavated during the Main Excavation in 2014. The group are possibly parts of the same land tie as G609, but are kept apart in the following.

G611 comprised a vertical post, ST37584, which was driven into the ground (though exactly from which level/deposit is not clear). The post was circular in cross section (whole), but only approximately 0.13 m in diameter. On top of the post, but not fixed to it, was a stretcher beam, ST36602. The stretcher was 1.2 m long and ENE-WSW oriented, with a slight deviation towards E-W, and thus slightly different from the orientation of the stretcher beams in the land tie west of it (G601). The stretcher was preserved at an angle of approximately 35 degrees to the horizontal, possibly due to the disturbance from a wooden gutter (G231, Phase 5) immediately to the east of G611. It is plausible that ST36602 continued – if not as the same



Fig. 160 G611 land tie, Looking NNW.
C02_20140509_9317

beam cut, then as another piece of timber – towards east as ST37490 (G609, Phase 4). It is not clear if the western end of the beam ST36602 was the original western extension of the group.

On top of the stretcher were two anchor beams. Anchor beam ST34556 extended NNW from the stretcher (with a slight deviation towards N) and ST34541 placed directly up against the eastern side of ST34556 extended south (S-SSE). Both were attached to the underlying stretcher (ST36602) by means of lap halving joints and iron bolts. ST34556 was truncated at the north end by the construction cut for the wooden drain pipe, G231, which also truncated the stretcher. The anchor beam was a boxed heart cut oak timber with an irregular cross section (rectangular with rounded corners at the south end and semi-circular, on edge, at the north end). The direction of the beam corresponds with where the western anchor beam on G609 would have been expected, if the later drain pipe, G231 had not removed it. This supports the

idea that these two groups are actually the same. The other anchor beam, ST34541 was tapered at the north end and had a mortise piercing the tip as seen on many of the other land ties east of this. The southern end of the beam was truncated by the construction cut, SC24648, for a later gas pipe (G574, Phase 6). The southern half of the preserved beam was more or less half sectioned as a stepped lap joint or scarf and on top of this rested a smaller, truncated beam, ST34537, on the same alignment as ST34541. This



Fig. 161 G611 land tie. Looking WSW.

beam fragment was fixed by means of an iron bolt and may originally have extended further south as seen on land tie G601.

Interpretation

G611 is interpreted as parts of a land tie – possibly the same as G609 is a part of. G611 comprises what must be interpreted as a middle stretcher, possibly moved a little out of situ towards S/SE as the post underneath it could well have been a vertical post keeping the stretcher and anchor beams in place. Two large parallel anchor beams with indications of reuse or transport were attached to the top of the stretcher beam by halving laps and large iron bolts. On top of the southern end of one of the anchor beams a fragmented beam, indicating that the structure would have originally extended further south, was attached with an iron nail.

Dating

From G611 two samples were analysed by dendrochronology. The results came out as AD 1664-71 and AD 1683-91 as felling dates for the anchor beams ST34541 and ST34556 (PD210063 and PD210068, respectively). Even though there are indications of possible reuse of the timber, the dates indicate a construction time for the land tie in the late 17th or early 18th Century. This is in correspondence with the dates obtained from land ties west of this.

Land tie G608

G608 was excavated during the 2014 Main Excavation. Due to many later truncations in the area, the timbers in this group has been kept separate from the land tie structures G609 and G611, but there are



Fig. 162 G608 land tie. Looking S. C03_20140508_10179

reasons to believe they were originally all part of the same land tie structure.

G608 comprised a large anchor beam, ST37610, which was NNW-SSE oriented and preserved at 1.85 m length. The north end of the beam was truncated and removed by the cut, SC24648 for a modern gas pipe (G574, Phase 6), but following the alignment of the beam further north, it would have been placed directly up

against the eastern side of ST37481, the anchor beam of G609. This is supportive of the suggestion that these are actually parts of the same land tie and is backed up by the fact that the layout of the two anchor beams (ST37481 of G609 and ST37610 of G608) are identical as well as parallel to the two anchor beams in G611, 2.2 m further west.

Overlying the southern half of ST37610, another anchor beam, ST35963 was placed. Two beams were joined by a stepped or hooked scarf as well as both a vertical and a diagonally placed iron nail. Beam ST35963 was only preserved at 0.5 m length. It is not clear what truncated or removed the southern parts of the anchor beam, as it was expected to have continued all the way to the bulwark (G604), which was excavated only 0.65 m south of the southernmost part of the anchor beam. On top of ST35963 and joined to this by a halving lap joint was a front stretcher beam, ST35967. This beam was placed parallel to, but 1.8 m SSE of ST37490, the middle stretcher of G609. The front stretcher beam was preserved at 1.9 m length, and was 0.14 m by 0.23 m in cross section with a flat upper side and rounded corners. The western end was truncated by the construction of the later wooden drain pipe/gutter (G231), while the eastern end was truncated by the construction cut for a land tie (G615, Phase 5). There were no posts preserved or recorded in relation with G608.

Interpretation

G608 is interpreted as parts of a land tie, along with G609 and G611. Together these have formed a land tie consisting of a lower rear stretcher beam, a middle stretcher beam, two sets of anchor beams (each consisting of two parallel beams), an upper rear stretcher beam, a front stretcher beam and at least four vertical posts keeping the beams in place. Due to later truncations, it was very difficult to see the structure in full during the field phase. A later addition to this land tie may be G705.

Dating

G608 is dated like G609 and G611 both by the dendrochronological dates obtained from G611 (AD 1664-71 and AD 1683-91), which may however have been taken from reused timbers, but also from the stratigraphical relationship with later structures, leaving the construction of G608 in either the late 17th or early 18th Century.

Land tie G603

G603 was excavated during the 2014 Main Excavation. It may be seen as the eastern extensions of the same land tie as also comprised G608, G609 and G611 – or possibly the western extension of G552 (see below) but due to large truncations between these, this cannot be proven with certainty and therefore they are kept apart here.

G603 comprised a lower stretcher beam, ST35864, which was found in perfect alignment with the middle stretcher beams in G609 and G611. It is not clear if the beam was truncated in the east end, but the eastern extension seems to correspond with the edge of the cut, SC22123 (G582, Phase 4 deconstruction). The western end of the beam seems a bit truncated or damaged, but it is not clear what caused this. The beam was preserved at 1.57 m length and was rectangular in cross section, 0.22 m wide and 0.1 m thick. On the south side of the beam, a post, ST23992, was recorded and between the beam and the post, a wedge (ST35872) was seen.



Fig. 163 G603 land tie. Looking NNW. C03_20140512_10221 (cropped)

Overlying the stretcher beam was anchor beam, ST35846. It is recorded as being placed 0.07 m above the stretcher beam and hence the two may not derive from the same structure. However, the symmetry of the beams when seen together points towards them being parts of the same. The anchor beam is described as being a possibly reused timber beam with a possible mortise, much like the other anchor beams in the land ties to the west of this. The anchor beam was NNW-SSE oriented and preserved at 2.68 m length. It had a square cross section, 0.18 m by 0.18 m, and was a boxed heart timber cut. It is not clear if the beam was fully exposed at the north end during excavation. The beam was recorded as not being truncated, but the southern extent of it, however, corresponds well with the edge of the construction cut, SC23885 for a later land tie (G581, Phase 5).

Near the north end of the anchor beam, on either side of this, two posts, ST35838 and ST35842 were placed up against the southern face of the Renaissance quay wall (G532, Phase 2). The length of the posts was not recorded, but they were both rectangular in cross section, and made from boxed heart timber cuts. Immediately behind the posts was a rear stretcher beam, ST35857, which was joined to the underlying anchor beam by a halving lap. The beam was only 0.97 m long, but did not appear to have been truncated. The placement of this rear stretcher beam differs from those of the other rear stretcher beams in the land ties west of this, as it is much closer – southern – to the middle stretcher beam, though still parallel to this. The reason for this is possibly to be found in that the remains of the Renaissance quay wall would have been in the way for putting in the vertical posts to hold back the stretcher beams, if they were to be placed further north.

Interpretation

The contexts related to G603 are interpreted as parts of a land tie – possibly the same as G609, G611 and G608, though this cannot be said with certainty as there are truncations in between, distorting the overall structure. The group consists of a middle stretcher beam, an anchor beam and a rear stretcher beam as well as three posts and a wedge keeping the beams in place. It is plausible that the anchor beam is made from an oak timber with the same indications of reuse or special working as also seen on the land ties west of this (e.g. G676, G641, G611 etc.), but this is not fully documented and the timber was not species analysed. Land tie G603 differs structurally from the majority of the land ties west of this, as it does not comprise a lower rear stretcher, but only a rear stretcher placed above the anchor beam. This, however, may well be due to the presence and location of the Renaissance quay wall (G532, Phase 2), This wall structure was found directly below the land tie, and may have functioned as a lower stretcher beam – or at least made such a beam redundant. The same quay wall may be the reason for the placement of the rear stretcher further towards the south than seen on other land ties in the area.

Dating

From G603 no samples were prioritized for dendrochronological analysis. However, from horizontal stratigraphy and the alignment of the structure as a whole, it is plausible that G603 was constructed at the same time as the land ties west of this, which were dated to the late 17th or early 18th Century.

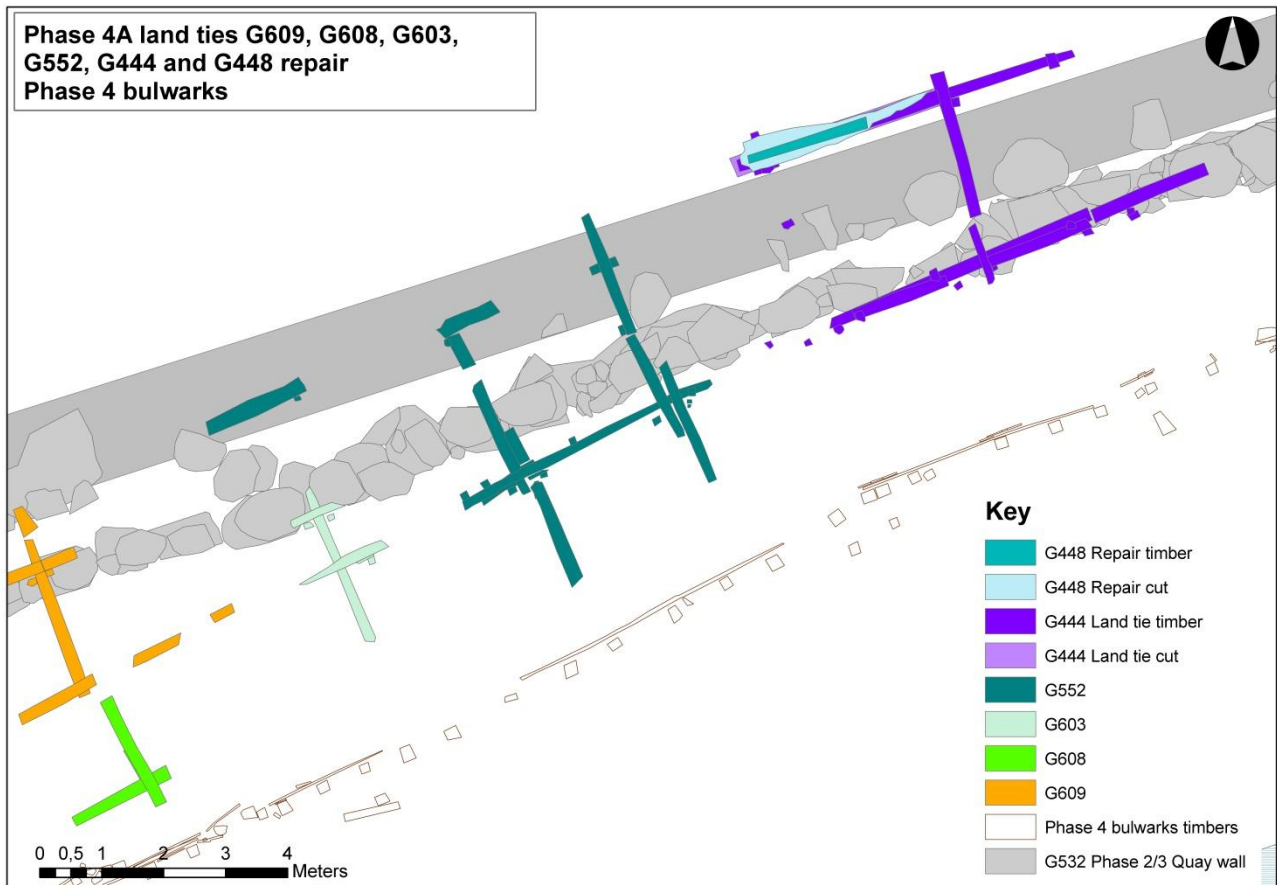


Fig. 164 Plan of Phase 4A land ties G609, G608, G603, G552, G444 and G448 repair.

Land tie G552

Group G552 was partly excavated during the 2012 Guide Wall excavation and partly during the Main Excavation in 2014. The northern parts, excavated in 2012, were first grouped as G440 and G443, but these have been fused with the eastern parts of the later excavated G552 (while the western parts of former G552 have been included in G444 – see below) in the post excavation process, and G440 and G443 are now voided.

G552 comprised a rear stretcher beam, ST9567, which was a pine beam oriented ENE-WSW and 1.7 m long, though it is not clear if the beam was truncated by anything either end. The beam was made from a boxed heart cut and the dimensions of the cross section were 0.18 m by 0.27 m. Below the southern side of the



Fig. 165 ST9612 taken out. The east end shaped to a conical taper. C03_07042012 4719 (cropped)

beam, near its eastern end was a post, ST9579, which was, however, not fully excavated. Under a modern concrete well (SM9763) near the east end of the beam were the remains of a N-S oriented beam, which may be part of the same structure. Beam ST9567 was aligned with another pine beam, ST9612, which had almost the same dimensions, but was excavated 2.35

m ENE of ST9567. In the western end of the beam was a nail hole and the eastern 0.43 m was worked into a cone shaped taper, which both were seen as indications of reuse of the beam. Near the western end of ST9612, on its southern side, another beam, ST9597, extended NNW-SSE. It is not clear whether ST9612 and ST9607 in anyway joined or fixed to each other, but a post, ST9623 found on the northwestern side of where ST9612 and ST9607 met, indicates that these timber parts together form parts of a structure. Beam ST9607 was only exposed over 0.68 m, and extended south, out of the Guide Wall trench and was possibly identical with ST21280, which was excavated in 2014.



Fig. 166 ST37865, east end with mortise. Looking N. C02_20140602_9595

Parallel to the rear stretcher beams, but recorded approximately 2.5 m SSE of ST9612 was an ENE-WSW oriented stretcher beam, ST37865. This was made of a halved timber cut and has a semi-circular cross section, 0.15-0.16 m wide. The beam was preserved at 4.5 m length, and did not seem to be truncated. The eastern end was tapered and a mortise very much like the ones seen on anchor beams in G676, G641, G601 etc. was present, indicating either reuse or a special function, e.g. for placing the timber.



Fig. 167 G552 westernmost part (southern end not excavated). Looking SSE. C03_20140303_8540

Overlying the stretcher beam ST37865 were two sets of anchor beams. The westernmost set comprised three timbers, ST21280, ST21294 and ST37856. ST21280 was probably the southern continuation of ST9607, which was excavated during the 2012 Guide Wall excavation. In total this was preserved as a 2.8 m long, NNW-SSE oriented beam, which was joined at the southern end with the underlying stretcher beam, ST37865, by both a halving lap and a large iron nail. On the immediate eastern side of ST21280 was a much worn beam, which seemed to have been broken in half at some point. The northern part of it (north of the stretcher beam, ST37865) was recorded as ST21294, while the larger part south of ST37865 was recorded as ST37856. In total, this beam was preserved at 2.73 m length, but it seems plausible, though not recorded, that the southern end was truncated by SC39183 (G626, Phase 4 bulwark), as the beam would have been expected originally to extend all the way towards the bulwark structure for which it had its purpose. The anchor beam sloped heavily downwards towards the south, and from photos (C03_20140527_10453) it can be seen that the southern end of the beam had a large scarf or lap, possibly made for another beam to be attached to the upper side of

this. This looks very similar to joints seen on anchor beams (e.g. G611). Placed above these western anchor beams was upper stretcher, ST21272, which was a pine beam, preserved at 1.3 m length. It was fastened to ST21280 by a large iron bolt and possibly also a rather roughly made lap. The eastern end of the beam seemed to have been cut into a scarf, but it is not clear if this was originally a structural part of the land tie or rather a trace of reuse of the beam – or simply a later truncation.



Fig. 168 G552 western parts. Looking NNW. C03_20140527_10453

A number of posts seemed to keep the two stretcher beams and the anchor beams in place. For most of them, it is not clear if they were driven into the ground before the beams were placed or after. Posts ST21304 and ST21308 were located on the southern side of the stretcher beams, on the western and eastern side of the anchor beams, respectively. Between

these posts and the lower stretcher beam, ST37865, to smaller pieces of wood were pressed down as wedges (ST40352 and ST40357).

On the north side of the lower stretcher beam, ST37865, were two posts recorded near the western end of the stretcher. ST55544 seemed to hold the westernmost end of the lower stretcher in place, while ST21300



Fig. 169 G552 western part. Posts ST21304 and ST21308 with wedges ST40352 and ST40357. Looking SSE. C02_20140602_9594

was a short post, possibly placed to keep the western end of the upper stretcher beam, ST21272 in place. On the eastern side of the anchor beams, post ST55548 was similar to ST55544 and was probably keeping the lower stretcher in place.

Over the eastern end of the lower stretcher beam, ST37865 was another set of anchor beams. ST39251 was extending north from the stretcher. This beam is probably identical to the southern extension of anchor beam ST17865, which was excavated during the 2012 Guide Wall excavation and related to land tie G443

then. If the two beams were in fact one, this beam would have been approximately 3.93 m long in total. It was 0.16 m wide and approximately 0.21 m thick and made from a boxed heart timber cut. ST39251 was fastened to the underlying stretcher beam, ST37865 by a halving lap joint as well as a large iron bolt. The northern part of the beam, ST17865, was not fastened to any rear stretcher, but two posts (ST17877 and ST17873) placed on either side of the beam may be an indication of the presence of a rear stretcher, either a lower stretcher not excavated due to the 2 m depth limit in the Guide Wall excavation or an upper stretcher removed by later activities,



Fig. 170 G552. Anchor beams ST39251 and ST37886. Looking WSW. C03_20140527_10454

e.g. the construction of the large gas pipe, SM18399. Remains of another post, ST17884 were placed on the western side of anchor beam ST17865, but 1 m SSE of ST17877. This may or may not be directly related to the land tie, as it could have had a function in keeping the anchor beam in place with the Renaissance quay wall (G532, Phase 2).

Immediately east of ST39251 was anchor beam ST37886, which extended south from

the stretcher, parallel to ST39251. The beam ST37886 measured 2.16 m and was in many ways similar to other anchor beams in the Phase 4 land ties west of this. The northern end was slightly tapered and had a mortise piercing the tip. The southern end was worked into a large stepped scarf or lap, and onto this another beam (however, surveyed only as part of ST37886) was fastened with a large iron bolt. The southern end of ST37886 was probably truncated by later activities, either SC39183 (G626 Phase 4 bulwark) or SC39213 (G568, Phase 6 land tie), though this is not recorded. However, as the anchor beams would be expected to have been fastened to a bulwark, it must have been disturbed by later activity. Keeping the stretcher beam and the anchor beams in place were two vertical posts, ST21360 and ST39260, on the western and eastern side, of the two anchor beams, respectively. In between ST39260 and the stretcher beam, ST37865 was a wedge, ST39264, whereas there was no wedge preserved between the stretcher and post ST21360. Both posts were slanting a little in that the top was further north than the bottom.

Directly underneath the easternmost end of stretcher beam ST37865 was another post, ST55552, which was recorded as leaning a little southwards. This post may be seen in connection with above mentioned posts ST55544 and ST55548.

Interpretation

G552 is interpreted as part of a land tie. It comprised rear stretcher beams, but due to both heavy truncation of the northern area and the 2 m depth limit of the Guide Wall excavation, it is not clear if these were placed above or below the anchor beams. Two sets of anchor beams, put together by several pieces of timber were overlying a lower middle stretcher. This stretcher beam as well as one of the anchor beams had mortises and tapering, indicating reuse. Also one of the rear stretchers had signs of reuse, though in a different way than seen on other timber parts of the land ties. An upper middle stretcher was recorded along with numerous posts keeping the beams in place. The land tie was in no way connected to the bulwark south of this (G626), which was possibly caused by the bulwark being renewed in the 1750s and the construction cut for this truncated the then redundant land tie, G552.

Dating

From G552 three samples were prioritized for dendrochronological analysis. From the northern part two were taken from ST9567 and ST9612 and the results of the analyses (PD202106 and PD216344) were very alike, in that ST9567 was dated to after AD 1692, whereas ST9612 was dated to AD 1692[?]. From the upper stretcher, ST21272 the dendrochronology sample (PD207763) resulted in a felling year of AD 1685[?]. These dates are in correlation with the dates obtained from dendrochronological analysis of a lot of the other Phase 4 land ties, excavated in 2014. As with many of the other land ties, the timbers bore indications of reuse – or special transport, so the dates may be seen as indications of the land ties being constructed in the late 17th or early 18th Century.

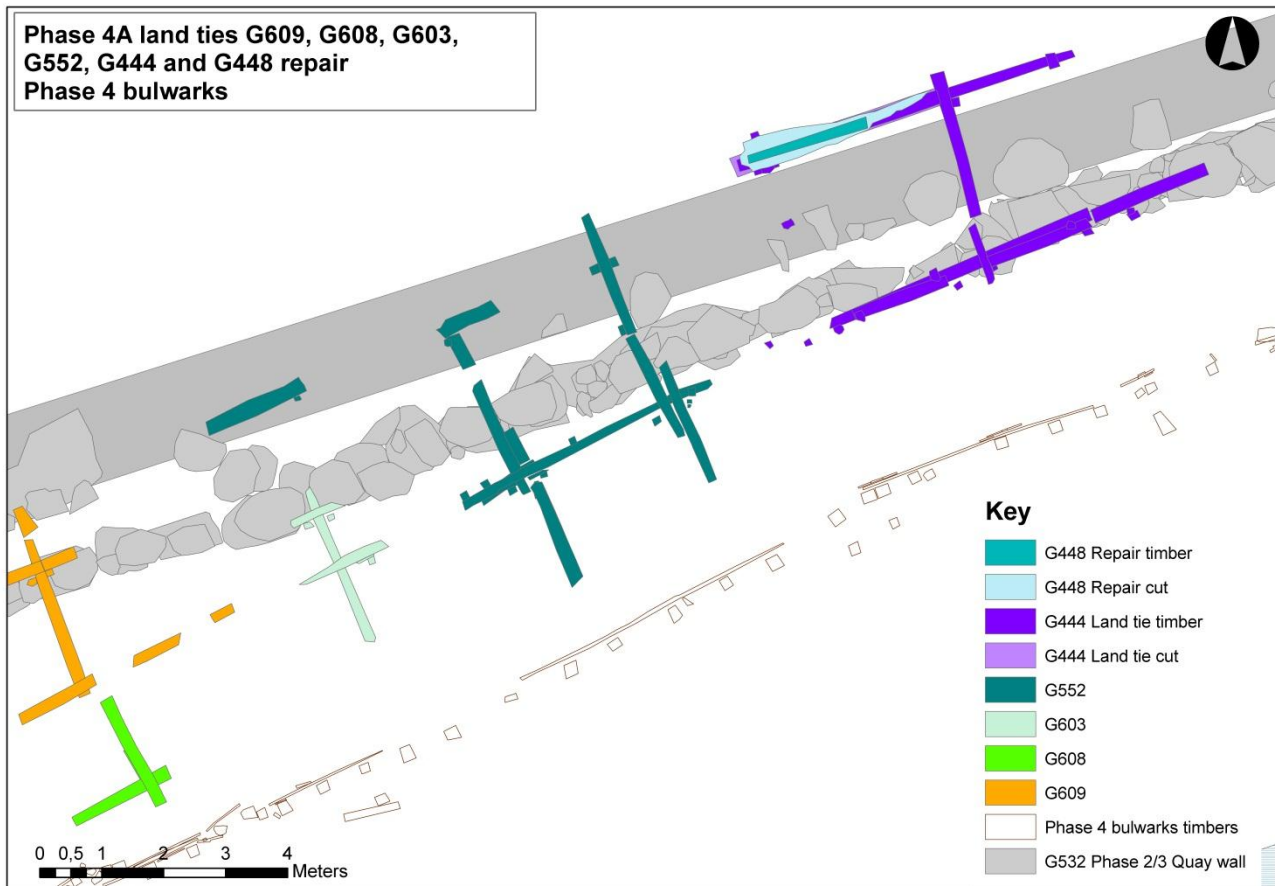


Fig. 171 Plan of Phase 4A land ties G609, G608, G603, G552 and G444 with Repair G448.

Land tie G444

Contexts related to G444 were excavated during the 2012 Guide Wall excavation. However, in the post excavation process it has been possible to see some possible connection between this and the western part of former G552, which has now been added to G444.

G444 comprised a linear construction cut, SC18668 seen only in the northern part of the land tie, when this was partly excavated in 2012. Within the construction cut was a backfill layer, SD18679, consisting of brown-grey sandy silt and containing only a few finds of ceramics and clay pipe. Apart from this layer, the cut contained a lower rear stretcher which, due to different excavation phases, was recorded as two different objects, ST18656 and ST17960, but may in fact be the same timber. In total this was approximately 5.7 m long and ENE-WSW oriented. Only little was recorded about the timber as it was not fully excavated due to the depth limit of the Guide Wall trench. It seemed to be a boxed heart cut timber with rectangular cross section.

Parallel to the rear stretcher, but placed 2.6 m SSE of this were two lower stretcher beams aligned with each other: ST40446 and ST40460. Stretcher beam ST40446 was the western of the two beams and was preserved at 4.58 m length. The beam was a boxed heart timber cut with a square cross section, 0.21 by 0.21 m. The stretcher beam rested on top of – but was not in any way fastened to – three posts, ST41029, ST41022 and ST41014, which all had tapered ends and were driven into the ground, though it is not clear from which stratigraphical level. It is not completely clear whether ST40446 was truncated at the western

end, but it seems plausible that it would have originally extended further west and be connected with an



anchor beam where the later land tie G531 (Phase 4B) was constructed (see below). The eastern end seemed fully exposed, and placed directly east of this was the other lower middle stretcher beam, ST40460. The beam ST40460 was only preserved at 2 m length, as construction cut SC34449 for later drain pipe G452 (Phase 4) truncated it at its eastern end. The beam was rectangular in cross section, 0.2 m by 0.16 m and was made from a boxed heart timber cut.

Fig. 172 G444, northeastern parts. Looking N. C19_20121001_4009 (cropped)

On top of the westernmost part of the rear stretcher ST18656 was a fragment of an anchor beam, ST18557. This was only preserved at 0.78 m length, as it was truncated by the cut for the large gas pipe, SM18399. 0.80 m south of the southern end of ST18557 was a small piece of a beam, ST18646, some with the same orientation. It is believed that these two pieces of timber were actually the same. South of the southern end of this, a later land tie (G531, Phase 4B) was constructed, and this process had probably removed the parts where this anchor beam would have met the western end of middle stretcher beam ST40446.

Parallel to ST18557, and located 2.85 m east of this was anchor beam ST17948. From excavating the beam it was not clear how it was fastened to the underlying rear stretcher ST18656/ST17960. ST17948 was recorded as a boxed heart timber cut with a rectangular cross section, 0.19 m by 0.23 m. Both the northern and the southern end of ST17948 extended out of the Guide Wall trench, and in the 2014 Main Excavation a beam, ST21433, was found to be in alignment and level with ST17948. Beam ST21433 was fastened to the underlying stretcher beam ST40446 by a halving lap and a large nail. ST21433 was recorded as a boxed halved timber cut with a semi-circular cross section, measuring 0.25 m by 0.21 m. However, the beam may have been slightly truncated or moved a little by the construction of the later land tie G555 (Phase 4B), which was placed on the immediate western side of the beam.

Beam ST21433 appears to be identical to anchor beam ST17948, and the difference in the recorded types of timber cuts may be due to the possible truncation by land tie G555. If the two beams are in fact the same, the total length would have been minimum of 3.52 m. ST17948 was species analysed and was made from oak.

A small fragment of a possible third anchor beam, ST203163, was seen attached to the rear stretcher, ST17960. From the photos it appears to be mostly a non-fashioned fragment of wood attached by a large iron nail or spike to the underlying stretcher, ST18656/ST17960, located approximately 1.9 m ENE of where anchor beam ST17948 was attached to stretcher. The stretcher probably extended SSE, but was truncated

and removed by both the later land tie G530 (Phase 4B) and the construction of a large gas pipe, SM18399 (Phase 6).

Above the lower middle stretcher, ST40446 was an upper stretcher, surveyed as ST21406 at the west end and ST21438 east of this. The reason for surveying this as two beams was the truncation made by the construction of the Phase 4B land tie, G555. These beams were both made of pine, perfectly aligned and recorded in the same level, and thus most probably were the same beam. After having this beam dated by dendrochronology, it appeared that this upper stretcher was a repair or replacement of a former beam in the land tie, as the felling date is approximately 30 years younger than the rest of the land tie. This repair was not visible in the stratigraphy of the land tie and it is not obvious either, what necessitated the repair.

Holding the beams in place were numerous posts. At the northwestern corner, posts ST17931 and ST18565 were recorded south of the stretcher beam ST18656 on either side of the anchor beam ST18557. Both posts were recorded as whole in cross section, but were not fully excavated due to the 2 m depth limit. Further east, post ST17956 was placed on the eastern side of anchor beam ST17948, on the south side of stretcher ST17960. This was recorded as a boxed heart cut, 0.17 m by 0.17 m in cross section. The presumed post opposite ST17956 was probably removed by the gas pipe truncation, SM18399.

Post ST55556 was located west of the western end of ST40446, but as this stretcher may originally have extended further west, the post should probably be seen as a support post for the stretcher beam. This post was truncated partly by the construction cut, SC38239 (G445, Phase 4 drain pipe). Likewise, post ST21384 was possibly originally placed on the south side of stretcher ST40446, on the west side of where the supposed southern extent of the anchor beam, ST18557/ST18646 would have been. However, like the anchor beam, the post was also partly truncated by the construction cut, SC23792 for the later land tie (G531, Phase 4B). ST41040 was the corresponding post to ST21384 on the assumed eastern side of the anchor beam. The post, ST41048 was placed further east, on the south side of stretcher beams, ST40446, but there were no other beams attached near this, so it may have been just a support post for the stretcher beam. On the eastern side of where the anchor beam ST21433 met the stretcher beams, ST40446, was another post, ST21444, and another 1.5 m ENE of this was post ST21448. The posts were relatively narrow (0.1-0.16 m wide) and preserved at up to 1.85 m in length. The last post, ST21452, was found on the south side of stretcher beam ST40460, where this would originally have been connected to an anchor beam. Between the post and the stretcher was a wedge, ST40998.

Interpretation

G444 is interpreted as part of a large land tie consisting of rear stretcher beams, middle stretcher beams and three anchor beams as well as numerous posts keeping the beams in place. Due to heavy truncations by later land ties and a large gas pipe, the land tie does not seem as complex as land ties from the same phase found west of this. Land tie G444 has a slight change in orientation compared to G552, which was excavated to the west of G444, in that the stretchers in G444 are turned a little more towards E-W than G552. This may indicate a slight change of orientation of the waterfront, as the anchor beams were supposedly always placed perpendicular to the bulwark and the stretchers parallel to the bulwark. The upper middle stretcher beam seems to have been replaced some 30 years after the initial establishment of the land tie.

Dating

From G444 three samples were prioritized for dendrochronological analysis. From anchor beam, ST17948 the sample (PD18440) resulted in a felling date, AD 1689[?], corresponding well with the oak timbers used in other land ties west of this (even though this was not recorded as bearing signs of reuse). From the upper stretcher beams ST21406 and ST21438 (which may be the same beam, essentially) felling dates resulted in AD 1726[?] (PD208133) and AD 1726 (PD208129). As there was no information on possible reuse of this timber beam, these dates may be the result of a repair of the land tie. From the stratigraphy it is clear that the land tie must be in use until the 1750s, as it is truncated by the Phase 4B land ties, G530 and G531, which have dendrochronology dates from AD 1748-60.

Land tie repair G448

Cut SC18306 was the construction cut for the horizontally placed beam ST17926. Cut SC18306 truncated a number of deposits located directly north of it, deposits SD18506 and SD18573 of G449 (Phase 4, Levelling). These sand rich deposits contained undisturbed Early Post-medieval pottery and animal bone. The cut SC18306 was backfilled by SD18338, a mixed mottled deposit comprising mostly light grey and dark grey sand, but with minor inclusions of crushed mortar and charcoal flecks. Some fragments of red brick and tile were also present in SD18338. The edges of SC18306 were difficult to discern. This was especially the case towards the NE end. Towards the NE end the cut appeared more as a shallow linear depression.

Structure ST17926 was a pine beam. It was recorded as a whole timber with a flat base. Elsewhere the timber was sub-rounded in cross section but no visible traces of bark remained. The beam appeared to have been broken at both ends. Beam ST17926 rested against the upright post ST17931 (G444) to the south and rested upon a horizontal north-south orientated timber ST18557 (G444). ST17926 was fastened to the timber underneath by an iron bar, which was square in cross section and measured 0.025 m by 0.025 m. Some heavily corroded iron was found adhering to both sides of ST17926. This perhaps suggests that the bar was threaded at the ends and was secured with washers and nuts.

Deposit SD18338 was the backfill of the construction cut SC18306. SD18338 was a mixed mottled deposit comprising mostly light grey and dark grey sand but with minor inclusions of crushed mortar, tile and charcoal flecks. Fragments of red brick were also present.

Interpretation

The group was physically placed above G444, and cut into the levelling materials (G449, Phase 4), which overlie that group. As it was aligned with stretcher beam ST18656 (G444) underneath, and seemed to abut the two posts ST18565 and ST17931 (also both G444), this beam was probably put in place while the structure was still in-situ, and could therefore be part of a repair or strengthening event.

Dating

From the beam ST17926 a sample was sent for dendrochronological analysis (PD18441). This resulted in a probable felling date to After AD 1792. The date is strange, as the Phase 4B land ties already in the 1750s seem to have made G444 redundant. From the finds recovered, the group seems to be dated to the 18th Century.

Land tie G460

G460 was partly excavated during the 2012 Guide Wall excavation and partly in the 2014 Main Excavation. The group has undergone a lot of editing during post excavation.

G460 consisted of a stretcher beam surveyed as two different beams, ST40466 and ST46303 as they were truncated by the construction cut SC41052 for a later drain pipe (G459, Phase 4). In total the beam was preserved at 5.7 m length, but the western end was truncated by construction cut SC34449 for a drain pipe (G452, Phase 4) and the eastern end by the construction of a later land tie (G456, Phase 4B). The beam was constructed from a boxed heart timber cut, rectangular in cross section. The western part (ST40466) was preserved at 0.18 m by 0.12 m in cross section while the eastern part (ST46303) was preserved at 0.22 m by 0.15 m in cross section. The difference between the dimensions was probably due to the beams being rather worn – possibly an effect of the many later truncations. The orientation of the beam was ENE-WSW and thus very similar to land tie G444 west of this.

Overlying the eastern end of the stretcher beam was an anchor beam, recorded as ST14261 in the Guide Wall excavation and ST21666 in the Main Excavation. However, from the alignment and the surveyed levels of the two parts, this beam is clearly the same. The anchor beam was preserved at a total length of 2.15 m, but as the northern end was truncated by a modern gas pipe trench (SM14362), it may originally have extended further north. From the recordings it is not completely clear if this was a boxed heart timber cut or a quartered timber cut, and this is probably due to the north and south end, respectively looking different from each other. Related to the anchor beam was a construction cut, recorded as SC17777 in the Guide Wall excavation and the southern extent of this as SC39774 in the Main Excavation. Both parts of the cut were seen north of the stretcher beam (ST46303) and the purpose of the cut was probably to place the northern end of the anchor beam horizontally in the ground. The cut truncated the underlying fill of a deconstruction cut, G684, (Phase 3). Backfilling the construction cut were deposits SD17791 and SD39780 which were dark grey, sand rich silts. No finds were collected from these deposits.

North of the modern gas pipe truncation, SM18399/SM14362, two fragments of beams, ST18021 and ST14551, may be remains of anchor beams related to this land tie. ST18021 was the westernmost of the two and was only preserved at 0.5 m length. This was made from a square boxed heart timber cut, 0.15 m in cross section. At approximately 2.1 m ENE of this, ST14551 was recorded as a heavily truncated beam or post, preserved at 0.55 m length and placed diagonally – probably due to later truncations.

South of the westernmost end of the stretcher beam, ST40466, were two timbers, ST21480 and ST21476. The location of these corresponds with where anchor beam ST18021 would have met stretcher beam ST40466 had it not been for the modern truncation, SM18399 and the construction cut, SC18248/SC23831 for the later land tie G453 (Phase 4B). Post ST21476 was preserved at 1.3 m length, while ST21480 appeared more like a wedge, placed between post ST21476 and stretcher ST40466.

Southeast of where the anchor beam, ST21666, was attached to the stretcher beam, ST46303, another post, ST25083 was preserved. The length of this was not recorded, but it seemed to be a more or less square post of a boxed heart timber cut.

Interpretation

G460 is interpreted as parts of a land tie, which however, was heavily truncated by later activities. The drain pipe, G459 seems to have truncated the stretcher beam, but shortly after the construction of this drain, a later addition seems to have been made the land tie, in that G455 seems to be strengthening it where the drain pipe cut through the stretcher – and maybe because of this.

Dating

No dendrochronology samples were prioritized for analysis from G460 and no finds were collected from features related to it. The land tie is therefore dated on the basis of stratigraphical observations. The land tie is most probably part of the same larger land tie system as G444 and G552 west of it. These were dated by dendrochronology as well as stratigraphy to the late 17th or early 18th Century. This date also matches G460 nicely, as it is overlain by Phase 4B land ties G453 and G454 which have felling dates to after AD 1745 and after AD 1739, respectively.

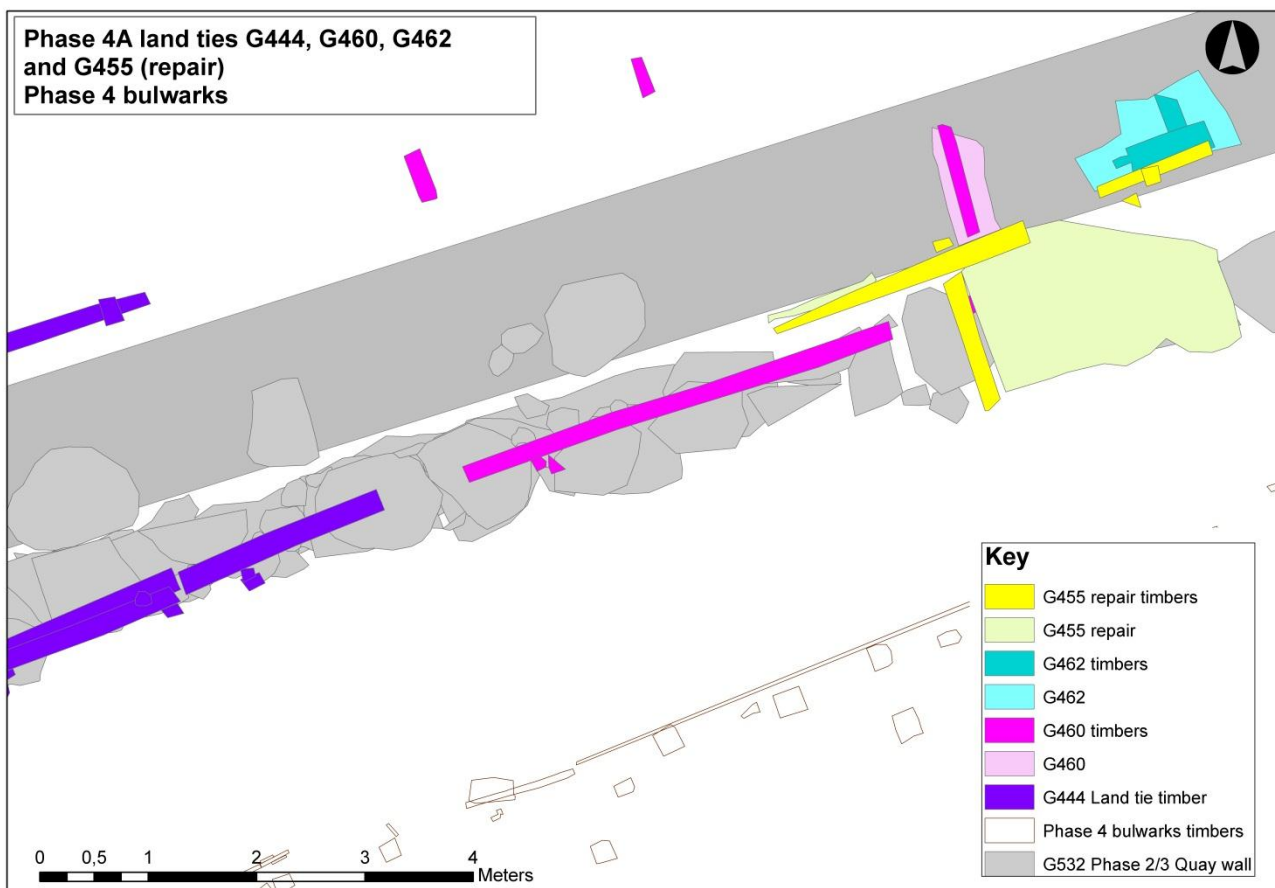


Fig. 173 Plan of Phase 4A land ties G444, G460, G462 and G455 (repair)

Land tie G462

Contexts related to G462 were excavated during the 2012 Guide Wall excavation, and though the area immediately south of G462 was excavated during the 2014 Main Excavation, no traces were found of the southern extents of G462. This was however, probably due to large truncations in the area. G462 is probably part of same structure as G468, excavated east of this, but they are kept separate here.

The earliest feature in this group was construction cut SC17369, which truncated the underlying stone/brick structure, SS17599 (SG457, part of G532, Phase 2 Renaissance quay wall).



Fig. 174 G462 (and parts of G455 and later G456), excavated during the 2012 Guide Wall excavation. Looking S. C19_20120927_3963

Placed within the cut was horizontal stretcher beam ST17495 orientated ENE-WSW and measuring 0.85 m by 0.27 m in plan. The stretcher beam had the same orientation but was not completely aligned with the stretcher beams in land ties west of this (G460 and G455), which indicates that although this structure was built on its own, it was probably part of the same overall land tie system. The beam was made from a boxed heart timber cut, but was probably reused from a different structure, as the west end of the beam was made into a large tenon.

The tenon would probably have fitted into a mortise when the beam was once joined with another timber in its former use. The eastern end was probably truncated by the construction cut for a drain pipe (G464, Phase 4), and as the stretcher beam immediately on the eastern side of the drain (ST18231, G468 land tie) has the same orientation, level and alignment as ST17495, it can be suggested that these are parts of the same structure.

Overlying the stretcher beam was anchor beam ST14240, which was NNW-SSE oriented and was attached to the underlying stretcher by a lap halving joint as well as a large iron nail. Anchor beam ST14240 was truncated by the gas pipe cut located to the north and the beam extended out of the Guide Wall trench towards the south. No remains of this were found during the Main Excavation in 2014.

Overlying the stretcher beam was deposit SD17358. The deposit comprised ceramics, charcoal, stone and bone as inclusions, but no finds were collected from this.

Interpretation

G462 is interpreted as part of a land tie. Apart from timber structures, it comprised a construction cut and backfill, as it is located on the north side of the Renaissance quay wall (G532, Phase 2), and thus constructed partly on already land filled ground. Based on levels, orientation and alignment, the stretcher beams, ST17495 may be the same as the eastern part of the stretcher ST18231 of G468, the land tie immediately east of G462, and thus these two structures appear to be the same.

Dating

From G462 no samples were prioritized for dendrochronological analysis and no finds were collected, thus the dating of the structure depends on the stratigraphical observations. As the structure is aligned with the land tie east of this, G468, it is plausible that the dendrochronological date obtained from G468, also

applies to G462. The felling date for one of the beams in G468 was After AD 1692, but as the beam had possible traces of reuse, the construction of land tie G462 can be later than this.

Land tie repair G455

G455 was excavated mainly during the 2012 Guide Wall excavation, with the southern parts excavated during the 2014 Main Excavation. The group was rearranged during the post excavation process.



Fig. 175 ST21659 (G455) joined to underlying stretcher beam, ST46303 (G460). Looking E. C02_20140624_10033

G455 comprised a linear construction cut, SC17505, which was only seen as very narrow and running along the north side of the western end of the beam, ST14257. The cut appeared to be cut into deposits SD17676 (G517, Phase 4 dump) and SD18372 (G458, Phase 4 robber cut). Backfilling the cut was deposit SD17519, which consisted almost exclusively of loose, clean sand. No finds were collected from this.

Parts of a NNW-SSE oriented anchor beam were recorded as ST14456 in the Guide Wall excavation and as ST21659 in the Main Excavation. The anchor beam was placed parallel to and only approximately 0.09 m west of the anchor beam in underlying land tie, G460. The part of the beam surveyed as ST21659, was joined to underlying stretcher beam ST46303 of land tie G460 by a halving lap and a large iron bolt. In total the beam ST14456/ST21659 was preserved at 1.6 m length, but the southern end was truncated by modern gas pipe cut SM22609. The anchor beam was made from a boxed heart timber cut, but the cross section was irregular, as the western side of the beam seemed to have been shaped more than the eastern – maybe to fit it in next to the drain pipe, G459.



Fig. 176 G455 stretcher overlying former land tie G460 and drain pipe G459. Looking S. C19_20120927_3991

Overlying the northern part of the anchor beam – and fixed to it by a large iron bolt – was the stretcher beam, ST14257. This beam was placed within the construction cut, but also overlying the anchor beam ST14261/ST21666 of underlying land tie G460 as well as overlying the wooden drain pipe, G459 (Phase 4). The stretcher beam was preserved at 2.52 m length. It was made from a boxed heart timber cut, and the cross section was rectangular to square, 0.15-0.2 m. The southwestern end of the beam extended out of the Guide

Wall trench, but as it was not found in the Main trench, it was probably surveyed more or less as preserved. The eastern end was truncated by the construction cut, SC17241 for a Phase 4B land tie (G456), but on the eastern side of G456, a beam surveyed as ST14244 appeared to have the same function as ST14257 – or rather be identical to this. In total this stretcher beam would have been at least 4.4 m long and possibly even longer, as the eastern end of ST14244 was truncated by the construction cut, SC18264 for a drain pipe (G464, Phase 4). The stretcher beam ST14257/ST14244 was completely parallel to the stretcher beam in underlying land tie G460. The eastern part, ST14244 was fixed to the anchor beam of Phase 4A land tie, G462 by a large iron bolt.

One post, ST17661 was surveyed south of the eastern part of the stretcher, ST14244, but it was not excavated fully, due to the depth limit. Below the stretcher beam another post, ST18462 was surveyed, but likewise not excavated due to the depth limit. The two posts were linked to G455 as supporting posts, but the relation is uncertain.

Interpretation

The group, G455, can be interpreted as parts of a repair of the land ties G460 and G462. The repair was probably necessary after the drain pipes, G459 and G464 had cut through the G460 and G462 stretchers. After only a few years of use, the repair was then truncated – and replaced – by the Phase 4B land tie, G456.

Dating

From G455 no samples were sent for dendrochronological analysis. Thus, the dating of this group relies on stratigraphical observations. As G455 is interpreted as a repair of the land ties, G460 and G462, after these had been truncated by the construction of drain pipes G459 and G464, the construction of G455 must be later than these events – but earlier than the construction of Phase 4B land tie G456. With caution the construction of the G455 land tie repair can be placed between the 1730s and 1750s.

Land tie G468

Contexts related to G468 were excavated during the 2012 Guide Wall excavation. It is probably part of the same land tie as G462, excavated immediately west of G469, but the two groups are kept apart here.

In G468, the construction cuts SC16822 and SC16893 were the earliest features. These cuts were originally probably the same, but were surveyed as two different features due to a large truncation between them



Fig. 177 ST16875, stretcher in G468 with carved letters D X D (FO202950). Looking S. C19_20120920_3907

(Phase 4B land tie, G465). Seen as one cut, it was a rather shallow, linear cut, made for the simple reason of removing any large inclusions in the underlying levelling layers, SD16905 and SD16784 (both G469, Phase 4) in order to allow the beam (ST16818 and ST16875) to be placed in a level setting. The cut was backfilled by deposits SD16826 and SD16902. These differed in that SD16826 was recorded as a blue-grey clay-mixed silt deposition, while SD16902 was greyish brownsandy silt. No finds were collected from any of the deposits.

Within the construction cut was a pine stretcher beam, surveyed as two different timbers, ST16818 and ST16875, due to truncations by Phase 4B land tie G465. West of these beams was a third fragment of a beam, ST18231. This beam did not seem to be placed within a cut, but was probably the western extension of ST16818 on the western side of the truncation caused by Phase 4B land tie G463. It is plausible that this beam is also identical to the stretcher beam ST17495 in G462, excavated immediately west of G468 (on the western side of the truncation made by the construction cut for drain pipe, G464) as they all match in level, alignment and type of timber cut. Leaving the G462 beam out, the stretcher in G468 was originally at least 4.95 m long. The eastern end of ST16875 did not seem to be truncated but had what looked like an inscription “D X D” carved into it. This part of the beam was collected as a find (FO202950). The middle part of the stretcher, ST16818 had an anchor beam, belonging with the (repair?) land tie, G466, fixed to it. However, immediately east of where this anchor beam crossed the stretcher, remains of iron as well as a possible halving lap may indicate that a former anchor beam, belonging with G468 had been placed here.



Fig. 178 Stretcher, ST16818 with possible halving lap and iron nail from earlier anchor beam? Looking E. C19_20120925_3952 (cropped)

Linked to G468 was levelling layer SD16749, which seemed deposited over the stretcher beam, ST16818. The layer consisted of brownish grey silty sand with pebbles, charcoal, CBM and bone inclusions, but no finds were collected from the deposit. It was very similar to other dumps of material, interpreted as levelling layers in other areas of the excavation. As with the stretcher beam and the underlying cut and backfill, SD16749 was truncated on both the eastern and western side by later land ties.

South of the stretcher beam was vertical post, ST14200, which was very soft due to poor preservation. It is not clear if this had been driven in before the placement of the stretcher beam – or after. The location of it could indicate where an anchor beam had once been placed, but no traces of such a beam were seen and it could also just be a supporting post for the stretcher beam as seen in other Phase 4 land ties. On the north side of the stretcher beam, another post, ST14204, was recorded and may likewise indicate the former existence of an anchor beam, crossing over the middle of ST16818 – or it was simply not linked to G468.

Interpretation

The group, G468, is interpreted as parts of a land tie, which may be directly linked to land tie G462, excavated immediately west of it. It seems plausible that G468 originally had at least one anchor beam linked to it, but this seems to have been replaced by the anchor beam belonging with G466. One post seems to be related correctly to G468 as a support post on the southern side of the stretcher beam, whereas another post recorded north of the stretcher does not seem to fulfil any purpose with G468.

Dating

From G468 one sample was prioritized for dendrochronological analysis. This was taken from stretcher beam ST16818 (PD16904) and the result of this was a felling date after AD 1692. However, if ST16818 is actually identical with the stretcher beam in G462, this bore traces of reuse, which may challenge the dendrochronological date. It seems plausible that G468 was constructed in the late 17th Century or early 18th Century along with other land ties west of it.

Land tie G475 and G480

The two groups, G475 and G480 were both excavated during the 2012 Guide Wall excavations, but during different phases of the excavation. However, in the post excavation process, they have been linked and will be treated as one in the following.

The group consists of a construction cut, surveyed as SC16827 and SC15948. The former was a linear cut, cut into underlying deposit, SD16964 (G476, Phase 2 culvert), whereas the latter was only surveyed as a line and does not seem to have a function with the land tie. The cut, SC16827 along with its fill, was truncated in the east end by the construction cut, SC15841 for a wooden drain pipe (G211, Phase 4) and the west end was probably truncated by the construction of Phase 4B land tie, G472. Backfilling the cut was deposit, SD16839, which was described as consisting of grey, silty sand with occasional inclusions of charcoal, wood, shell and CBM. From the deposit a small range of animal bones, ceramics, clay pipes and stove tile fragments was collected.

Within the cut was a stretcher beam, recorded as two different timbers excavated on either side of the G211 drain pipe. On the western side, ST16849 was a beam made from a boxed heart timber cut, 0.14-0.18 m in cross section. The beam was recorded as rounded on the sub side and flat on the upper side. There was a possible iron nail near the eastern end of it, but it is not clear whether this had had a function for the land tie, or if it was an indication of a reused beam. On the eastern side of the drain pipe, G211, stretcher beam ST15853 was possibly the same as ST16849. It was likewise made from a boxed heart timber cut, but 0.23-0.24 m in cross section, which, however, could be due to the better preservation of the beam, compared to ST16849. South of the western end of ST15853 a vertically set post, ST15687 was recorded and interpreted as a support post for the stretcher beam.

Interpretation

The groups G475 and G480 are interpreted as parts of the same land tie. This land tie was only preserved as a construction cut containing a backfill deposit, a stretcher beam and a support post. It seems reasonable to suggest that the stretcher beam was originally a lower stretcher, and one or two anchor beams would have been connected to this. The iron nail in the eastern end of the western stretcher beam as well as the location of the support post may indicate where this anchor beam would have been placed, before it was removed by the construction of drain pipe G211. After this truncation, the land tie seems to have been repaired or strengthened by the eastern part of G466, as this was overlying the drain pipe.

Dating

From G475/G480 no samples were prioritized for dendrochronological analysis. The dating of the group is thus dependent on the stratigraphical observations. From this it seems reasonable to place the construction of G475/G480 in the late 17th Century or early 18th Century, as the group is truncated by the Phase 4B land tie, G472, from which two dendrochronological date results were after AD 1743 and after AD

1751. Furthermore the group was truncated by the drain pipe G211, from which no dates were obtained, but the land tie was repaired with the eastern part of G466, which may have been constructed in the mid 1720s judging from the dendrochronological date obtained from the stretcher beam further west.

Land tie repair G466

G466 was excavated during the 2012 Guide Wall excavation.

The earliest feature of the group was construction cut SC16965, which was a shallow cut for the post ST16869. The posthole was backfilled with mid grey silt sand deposit SD16972. Another shallow, early cut was made in the eastern end of the group, where SC15675 was a linear cut, assumingly originally meant for the placing of the stretcher beam, ST14040. However, the cut was backfilled with SD15686; a mottled, greyish brown sandy silt deposit containing little charcoal and CBM, and another construction cut, SC14752 was made partly into this.

SC14752 was recorded in three parts, which was due to the cut and its fill being truncated by Phase 4B land ties, G465 and G472. The western part of the cut was shallow and irregular and seemed made to contain both the anchor beam, ST14214, and the overlying stretcher beam, ST14187. The middle part of the cut was likewise shallow, but more linear and was made for the placing and levelling of stretcher beam ST14175. The eastern part of the cut was shallow and apparently made partly into the backfill of the former construction cut, to make place for the eastern stretcher beam ST14040.

The anchor beam ST14214 was NNW-SSE oriented and preserved at 1.27 m length. It was made from a boxed heart timber cut and the cross section was rectangular with rounded corners, 0.21 m by 0.24 m. ST14214 seemed placed secondarily, but directly on top of underlying stretcher beam ST16818 of G468, but it is not clear if ST14214 was in any way fixed to ST16818. It was suggested that ST14214 was actually reused from the underlying land tie, G468, as the halving lap and nail hole found on ST16818 immediately east of where ST14214 now crossed it, seemed to match traces found on ST14214.



Fig. 179 G466, west end, anchor beam ST14214 and stretcher ST14187. Looking NNW. C19_20120827_3750 (cropped)

Attached to the upper side of the anchor beam with a large iron nail was stretcher beam ST14187. This was an ENE-WSW oriented pine beam, made from a boxed heart timber cut with a square cross section, 0.16 m. It was preserved at 2.01 m length, but the west end was probably truncated by the construction cut for land tie G463, while the eastern end was truncated by the construction of land tie G465 (both Phase 4B).

Following the alignment of ST14187 was ST14175, which likewise was a stretcher beam, made from a boxed heart timber cut. This was rectangular, 0.17 m by 0.13 m in cross section. However, judging from the levels and alignment, this may originally have been the same beam as ST14187, only truncated by G465. The alignment of ST14187 and ST14175 differed slightly from the underlying stretcher beams of G468, in that the G466 stretchers were turned a bit more towards NE-SW than the G468 stretchers.

On the eastern side of the large truncation made for the Phase 4B land tie G472, was another stretcher



beam, ST14040, supposedly also belonging with G466. This was overlying but completely aligned with the stretcher beam belonging with G475/G480, but also overlying the wooden drain pipe, G211, which had truncated the G475/G480 land tie. ST14040 was made from a boxed heart timber cut, and was rectangular, 0.18 m by 0.22 m, in cross section. It was preserved at 2.29 m length.

Supposedly belonging with G466 were two posts, ST16869 and ST14182, of which the former seemed placed below the eastern end of ST14175, and had the construction cut for the stretcher, ST14752, cut into its fill, making it dubious if it really belonged with this structure. ST14182 was placed north of the middle of stretcher beam ST14175, but apart from the surveyed top levels, there was nothing to confirm that the post belonged with G466.

Backfilling the construction cut and overlying the beams was deposit SD14777, which was recorded as a mottled layer of brown-grey sand. From this deposit animal bone, ceramics, clay pipes, glass artefacts and stove tile fragments were collected.

Fig. 180 G466 stretcher beams. Looking ENE.
C19_20120828_3769

Interpretation

G466 can be seen as a repair of the underlying land tie groups, G468 and G475/G480, very much like G455 can be seen as a repair of G462 and G460. G466 consisted of the replacement of an anchor beam as well as a system of upper stretcher beams, either replacing other upper stretcher beams, or simply reinforcing the lower stretchers belonging with G468 and G475/G480 after these had been truncated by, for instance, the wooden drain pipe G211. A large proportion of G466, the beam which had probably connected ST14175 with ST14040, was probably removed by the construction of later land tie G472.

Dating

From G466 one sample from stretcher beam ST14187 was dated by dendrochronology (PD15637). The result of this was a felling date in AD 1723[?]. If this felling date is correct, it would be reasonable, if not a little too early for the construction of G466, given that this is interpreted as a repair of a land tie system, which was thought to have been constructed in the late 17th or early 18th Century. However, if the anchor beam ST14214 was seen as possibly reused in G466 from underlying G468, the stretcher beams may well

have been at least partly reused from the structure that they were supposed to repair, and the date of the timber may thus reflect the felling date for the timber used in the earlier land tie.

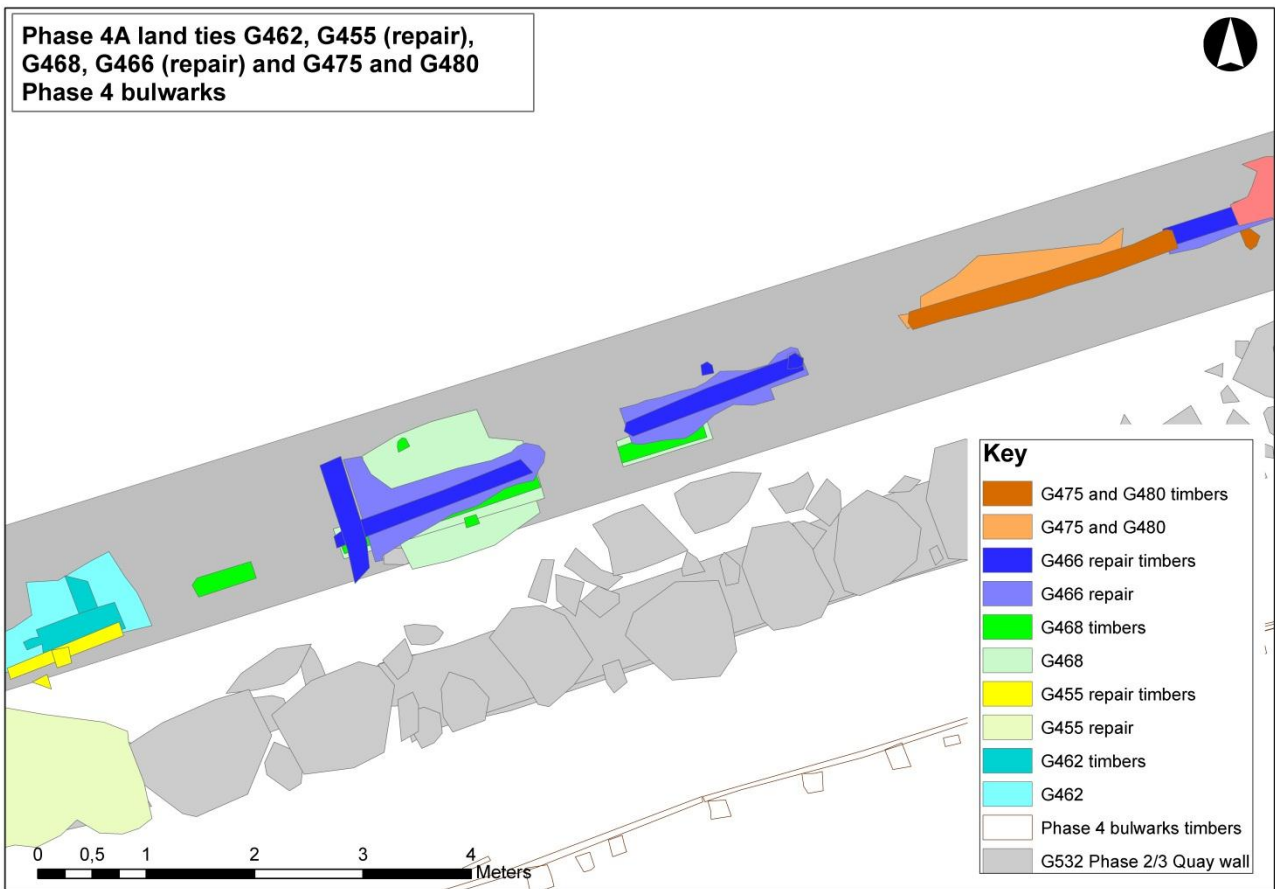


Fig. 181 Plan of Phase 4A land ties G462, G455 (repair), G468, G466 (repair) and G475/G480

Land tie G484 and posthole SG483

G484 comprises four construction cuts, of which the three, SC16502, SC16566 and SC16582 are essentially the same and are cut into underlying deposits belonging with G702 (Phase 2, levelling). Within the cuts, the lower stretcher beam, ST16078 seemed to be placed first. The beam was preserved at 5.75 m length and was made from a boxed heart timber cut, 0.22 m by 0.19 m in cross section. The orientation of the beam



Fig. 182 Knife handle, FO204695 found in SD16518 (G484). Museum of Copenhagen

was ENE-WSW. It is not clear if the beam was truncated at the east end by the construction of drain pipe G315 (Phase 4), and likewise it was not recorded if the beam's west end was truncated. Overlying the lower stretcher beam was a number of deposits. SD16605 and SD16518 were placed on either side (south and north) of the lower stretcher beam's east end, in construction cuts SC16582 and SC16502, respectively. The deposits were both grey-brown silty sand, and were essentially the same. Seen as they comprised a few mammal bones, a few ceramic sherds (early redware, late redware and faience) and a knife handle (FO204695).

Further west, the construction cut on the north side of the stretcher beam, SC16566 was backfilled with deposit, SD16578, which consisted of light coloured sand. From this no finds material was collected.



Fig. 183 Parts of land tie G484 (upper stretcher removed). Looking N. C19_20120907_3875

Covering over the southeastern part of the construction cut and backfill and partially over the stretcher beam was another deposit, SD16519, consisting of dark grey sand and silt with occasional patches of blue-grey clay. SD16519 contained a few sherds of ceramics, glass and stove tile. Above SD16519 was another deposit, SD15911, which consisted of brownish clay and sand with orange particles. This contained a few stove tile sherds and glass sherds and a wide range of animal bones (pig, sheep/goat, cattle, roe/red deer). Partly overlying and

partly west of SD15911 were two deposits, which were interpreted as essentially the same: SD15581 and SD15789. Both consisted of sand with vast amounts of CBM. Collected from these deposits were also large amounts of animal bone and ceramics as well as a few clay pipe fragments and a flint flake.

Cut into the backfill deposits over the lower stretcher beam ST16078, was SC14121, which was interpreted as a construction cut for the remaining parts of the land tie. This seemed to have been created to place the two anchor beams, ST14087 (mid) and ST14736 (east end), while remains of what could well be a third anchor beam in the west end, ST16622, were not recorded in detail but was placed beyond the extend of SC14121. Both ST14087 and ST14736 were boxed heart timber cuts and were placed approximately 2.2 m apart. They were attached to the underlying stretcher beam by large iron nails or pig irons. ST14736 was preserved at 1.3 m length, but had been truncated at the south end by the construction of later land tie, G482 (Phase 4B). ST14087 seemed from the photo documentation to be truncated the southern end, but it is not clear what caused this truncation. It was preserved at 1.55 m length. Overlying the north ends of ST14087 and ST14736 was an upper stretcher beam, ST14048 which was preserved at 4.07 m length, but truncated in the east end by the cut for a wooden drain pipe (G315, Phase 4). The beam was made from a boxed heart timber cut with a rectangular/square cross section, 0.20-0.21 m.

Along the south side of the stretcher beams a number of posts were driven in to keep the structure in place. From stratigraphical observations it was seen that the three posts, ST14091, ST14067 and ST14083 were placed along with the lower stretcher beam, ST16078 within cut SC16582, while posts ST14079, ST14722, ST14729 and ST14063 seemed to be later additions. Along with these posts was ST14095, a small plank which had been wedged in between upper stretcher beam, ST14048 and the lower post, ST14091. Likewise did ST14071 serve as a wedge on the south side of the eastern end of ST14048 and ST15754 also served a wedge-type function in this area.



Fig. 184 Upper parts of land tie G484, Looking NNW. C03_20120820_5329

Backfilling the secondary construction cut SC14121 on the south side of upper stretcher beam ST14048 was SD203007. This was a mid brown clay and sand deposit with no finds collected from it. On the north side SD14142 was a lighter sand fill of SC14121. From this. finds of animal bone, window glass, ceramics and a single clay pipe fragment along with a flint flake were collected.

Cutting into the surface of SD203007 was a posthole, sub-grouped as SG483. This consisted of a construction cut, SC14112, which was circular and approximately 0.2 m in diameter. The depth was not recorded but it was noted that the post seemed to have been removed, leaving only traces of wood in a vertical pattern within the fill, SD14120. CBM and stones, recorded as SD14867 probably derived from the nearby rubble layer and did not seem to be structural. The posthole was related to G484 as a deconstructed post similar to the other posts in the land tie. It is not clear what caused the deconstruction of this post.

Interpretation

G484 is interpreted as a land tie – probably built in two phases, or built first and partly replaced later. The lower construction cuts, the lower stretcher beam, the backfill deposits and three of the vertical posts seem to belong to the first construction phase. The second phase or repair is made from the second

construction cut and backfill along with the upper stretcher beam and the rest of the posts along with wedges put in between the posts and the stretcher beam. The posthole sub-grouped as SG483 is also part of the land tie, possibly in the second construction phase. It is not clear why this post was deconstructed, while the rest of the structure remained in-situ. G484 is aligned with the Phase 4A land ties, and is therefore seen as part of these.

Dating

From G484 no samples were sent for dendrochronological analysis. The finds materials derive from backfills of construction cuts and comprise materials of both Medieval and Post-medieval production date. Thus, these cannot be used directly to date the construction of the land tie. The dating will therefore have to depend on the horizontal stratigraphy, where G484 is nicely aligned with the other Phase 4A land ties and the first construction phase of G484 is therefore dated to the late 17th or early 18th Century. However, as both the western and the eastern parts of G484 were truncated by the construction of the Phase 4B land ties G479, G481 and G482, this indicates that all of G484 was constructed and used in the period before the 1750s.

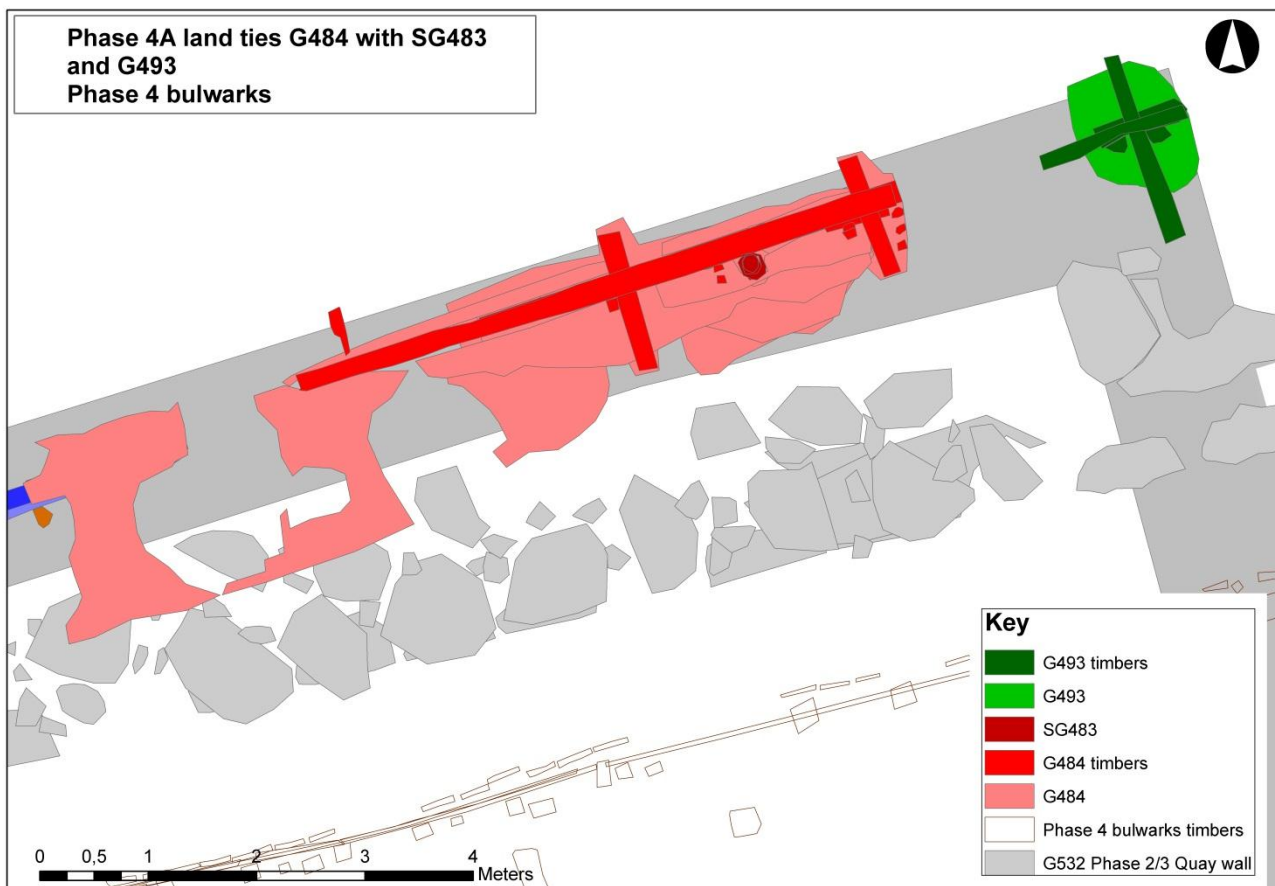


Fig. 185 Phase 4A land ties G484 with SG483 and G493

Land tie G493

G493 was excavated during the 2012 Guide Wall excavation. It consisted of a construction cut, SC14431, which was an irregular cut, truncating into underlying SD14317 (G430, Phase 2 road). Within the cut was a stretcher beam, ST14814, which was not fully excavated due to the 2 m depth limit, but oriented ENE-

WSW. ST14814 was preserved at 1.53 m length but truncated in the east end by modern truncation, SM13729 and at the west end by the cut for a drain pipe, SC14145 (G491, Phase 4). Overlying ST14814 was an anchor beam, ST13847, which was joined to the stretcher by a halving lap as well as an iron nail or nails (seen only from corrosion). The anchor beam extended out of the trench towards N, and the southern end seemed truncated by later activities, possibly the construction of Phase 4B land tie G494. The preserved and exposed part of ST13847 was 1.9 m long and oriented NNW-SSE, which was parallel to the two anchor beams in the land tie just west of this (G484). The timber cut was not recorded, but the beam was 0.24 by 0.21 m in cross section.



Fig. 186 Land tie G493, Looking NNW.
C03_20120822_5363

Above the anchor beam, an upper stretcher beam, ST13547 was preserved at 0.88 m length. The eastern end may have been truncated by the modern pipe cut, SM13729, while it is uncertain if the western end was truncated or not. The beam was very soft and worn and neither tool marks nor type of timber cut were visible. It seemed that this beam was fixed to the underlying anchor beam by three large nails.

On the south side of the stretcher beams, on either side of the anchor beam, were two vertically set posts, ST13556 and ST13561, which were, however, not fully exposed.

The construction cut was backfilled by a mid brown, silty deposit with lenses of white sand and yellow mortar, SD14448. From the deposit a few finds of rope, clay pipe, animal bone and ceramics were collected.

Interpretation

G493 is interpreted as parts of a land tie. As well as seen on other land ties west of this, the connection between the land tie and the bulwark, for which it had its purpose was missing, as the area was truncated by later activities.

Dating

From G493 no dendrochronology samples were prioritized for analysis. The land tie is therefore dated on the basis of its spatial relation to other land ties in Phase 4. These were probably constructed in the late 17th Century or the first part of the 18th Century.

7.4.3.2.3. Discussions – Phase 4A land ties

A wide range of dendrochronology samples were sent for analysis from this first phase of land ties. Of the dateable samples, the majority were dated to the period between AD 1689 and AD 1692. One of these timbers did not display any traces of being reused, whereas the majority of the accurately dated timbers had cuts and joints which initially were interpreted as a result of different use as ships- or buildings timber. However, after having consulted Otto Uldum from Langelands Museum and Karl-Magnus Melin from Knadriks Kulturbygg in Kristianstad, it seems most reasonable to suggest that the majority of these mortises and joints are linked to transport of the timbers (pulling holes placed at one end of the timbers) and thus do not indicate that the timbers were reused. This gives more weight to the results of the dendrochronological analysis made on samples from these timbers, as it suggests that the felling dates are more directly related to the construction of the structures. Thus, the construction of the main parts of the Phase 4A land ties probably took place in the early 1690s or shortly thereafter.

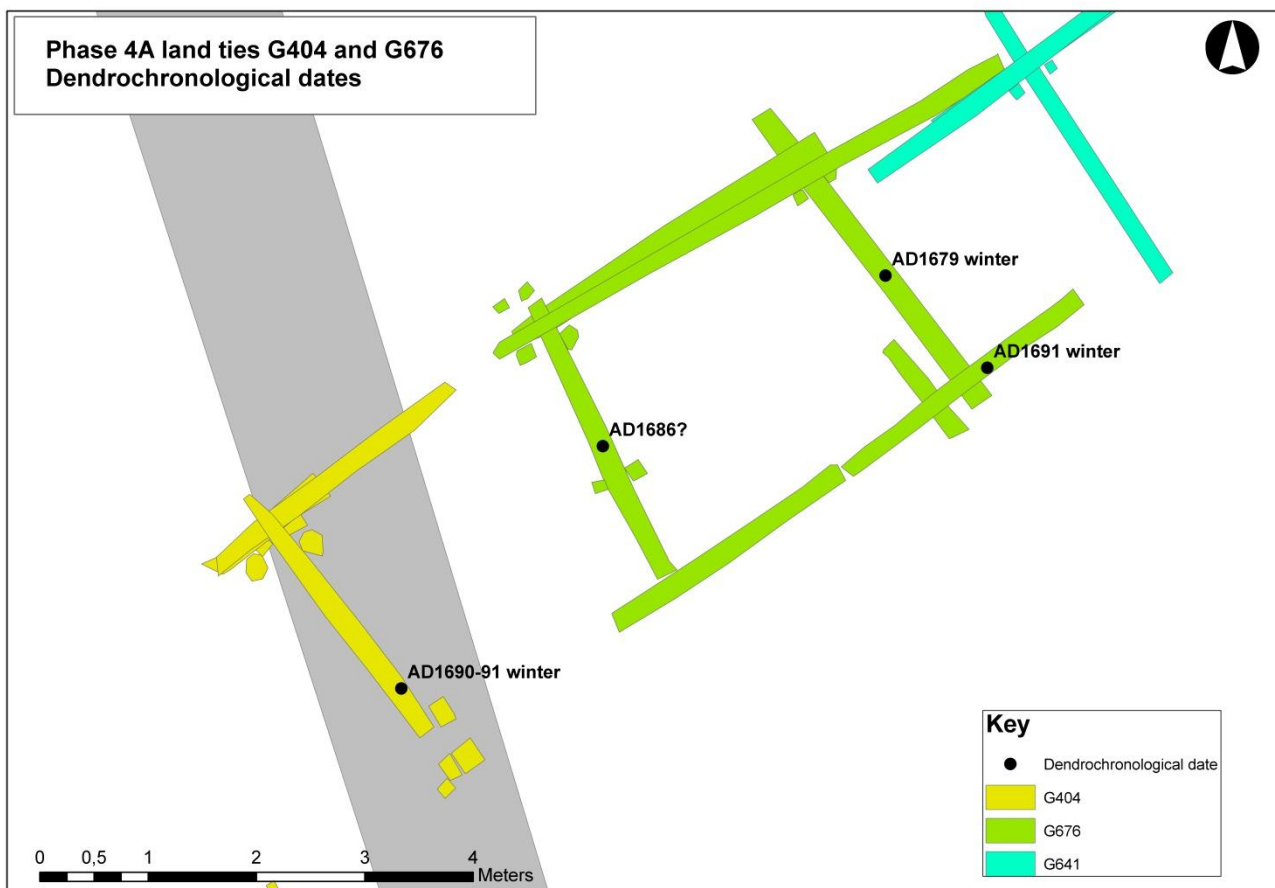


Fig. 187 Dendrochronological dates obtained from samples from Phase 4A land ties G404 and G676

A few timbers seem to have felling dates that are earlier. Two of the anchor beams in G676 as well as one of the anchor beams in G611 appeared to have been felled between the late 1660s and AD 1686. This may indicate that these were actually reused timbers, though the documentation material does not offer any suggestions as to which structures they were reused from.

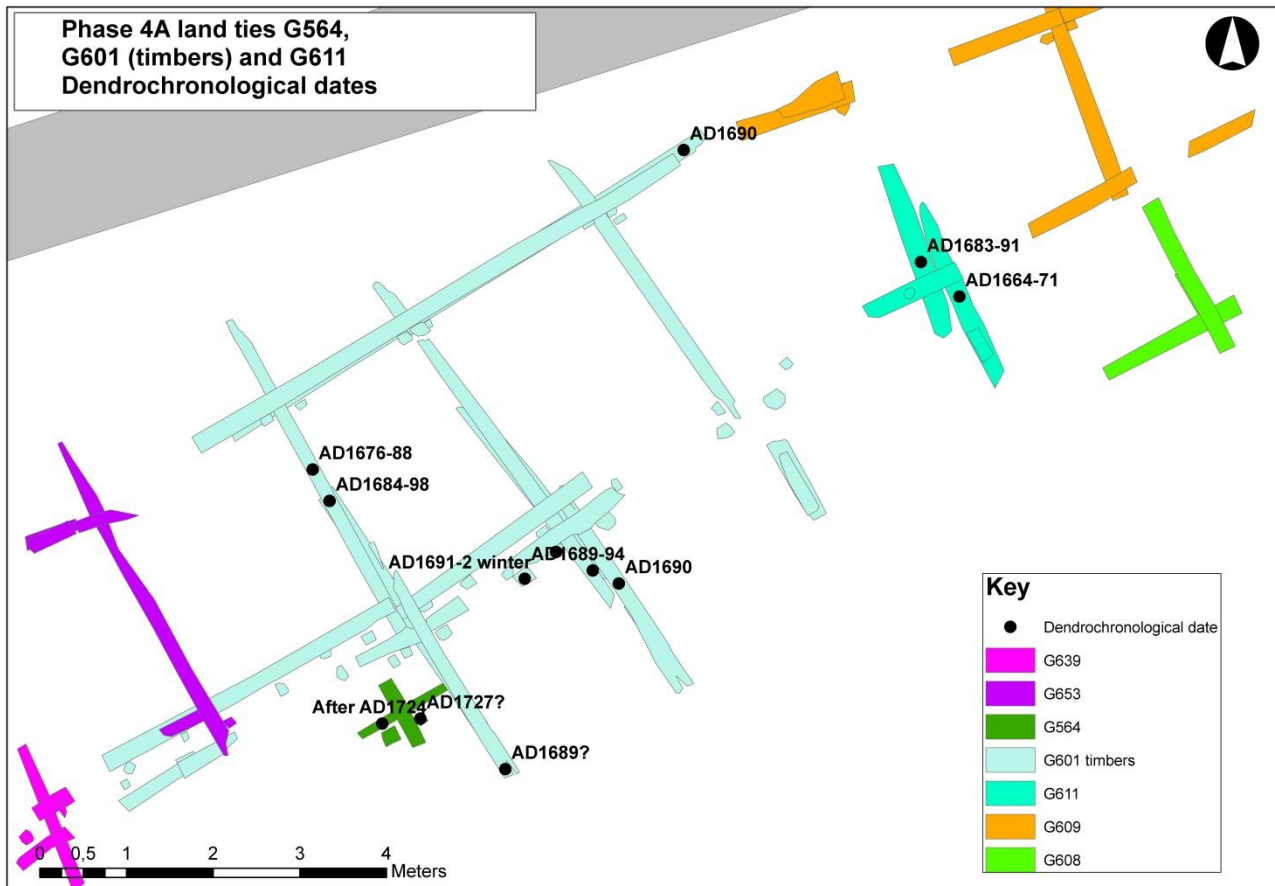


Fig. 188 Dendrochronological dates obtained from samples from G564, G601 and G611

The very accurate dates, e.g. AD 1691 winter, as seen with some of the dendrochronological results, indicate that the timbers are used with the bark edges on – unlike the sub-phase of Phase 4B, which merely has dendrochronological dates to “After ...”, indicating that the bark edges are not present.

In general the Phase 4A land ties appear to have been constructed in the 1690s, but there are repairs and alterations made, that were possibly made in the first half of the 18th Century. A number of dendrochronology dates from the AD 1720s may point towards a repair campaign undertaken around this time. These are seen with land ties G564, G444 as well as the repair G466.

In no place has the relation between the Phase 4A land ties and the bulwark structure (G626) been seen, though they were expected to have been found connected, as seen in the later Phases 5 and 6. This can only be explained by the fact that the Phase 4 bulwark was largely replaced in the 1750s and a large construction/repair cut was made on the north side of the former bulwark, to facilitate the repair work. This truncated the south ends of the Phase 4A land ties. The new bulwark (SG713) was held in place by a new series of land ties, the Phase 4B land ties (see sub-chapter 7.4.3.2.4.).

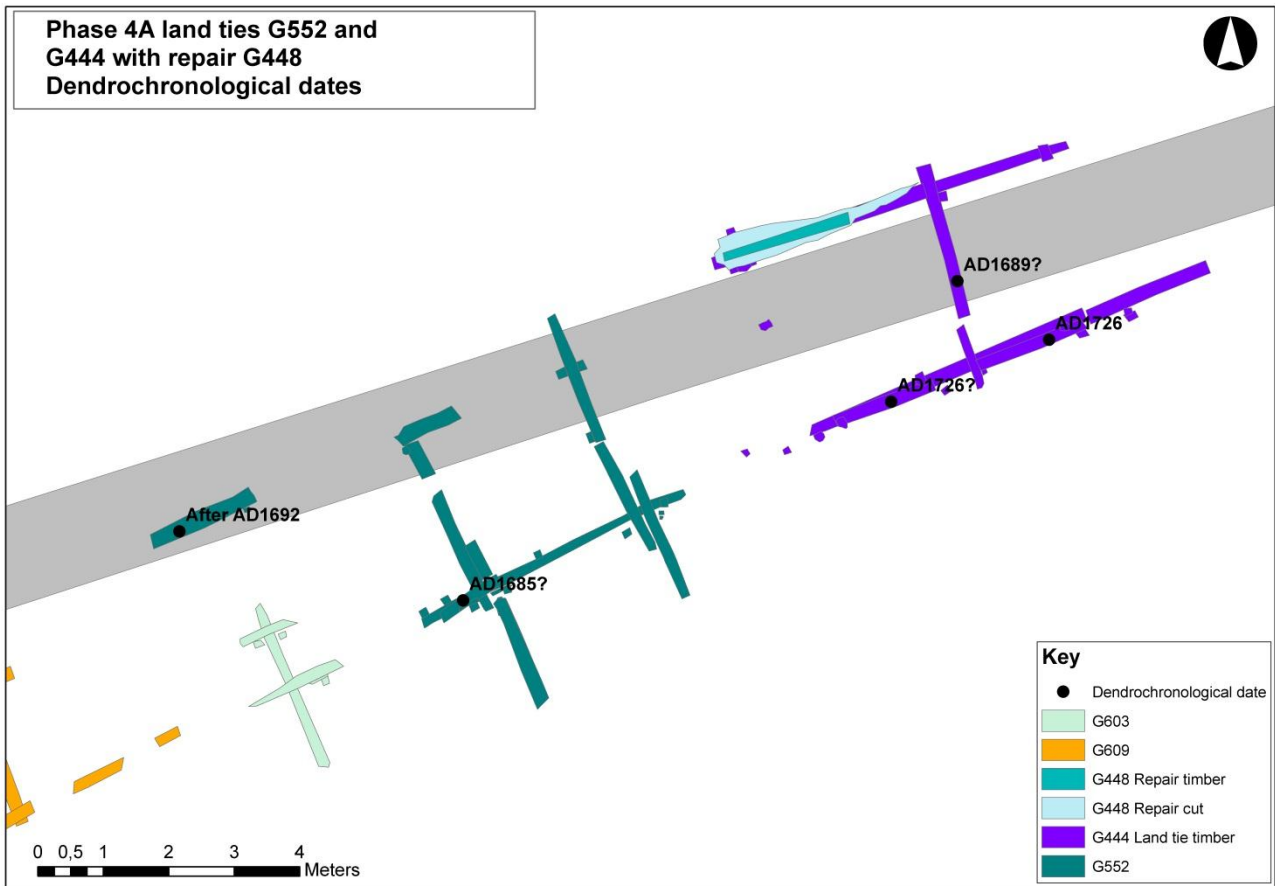


Fig. 189 Dendrochronological dates obtained from Phase 4A land ties G552 and G444 and repair G448

7.4.3.2.4. Groups interpreted as Phase 4B land ties

The later phase of Phase 4 land ties consists of 21 groups, in the table presented as seen from the west end of the trench to the east end.

Group	Sub-groups	Group name
508		Land tie
705		Land tie
610		Land tie
616		Land tie
553		Land tie
554		Land tie
531		Land tie
555		Land tie
530		Land tie
453		Land tie
454		Land tie
456		Land tie
463		Land tie
465		Land tie
472		Land tie
479		Land tie
481		Land tie
487		Land tie

482		Land tie
494		Land tie
719		Land tie

Table 42 Groups related to Phase 4B land ties

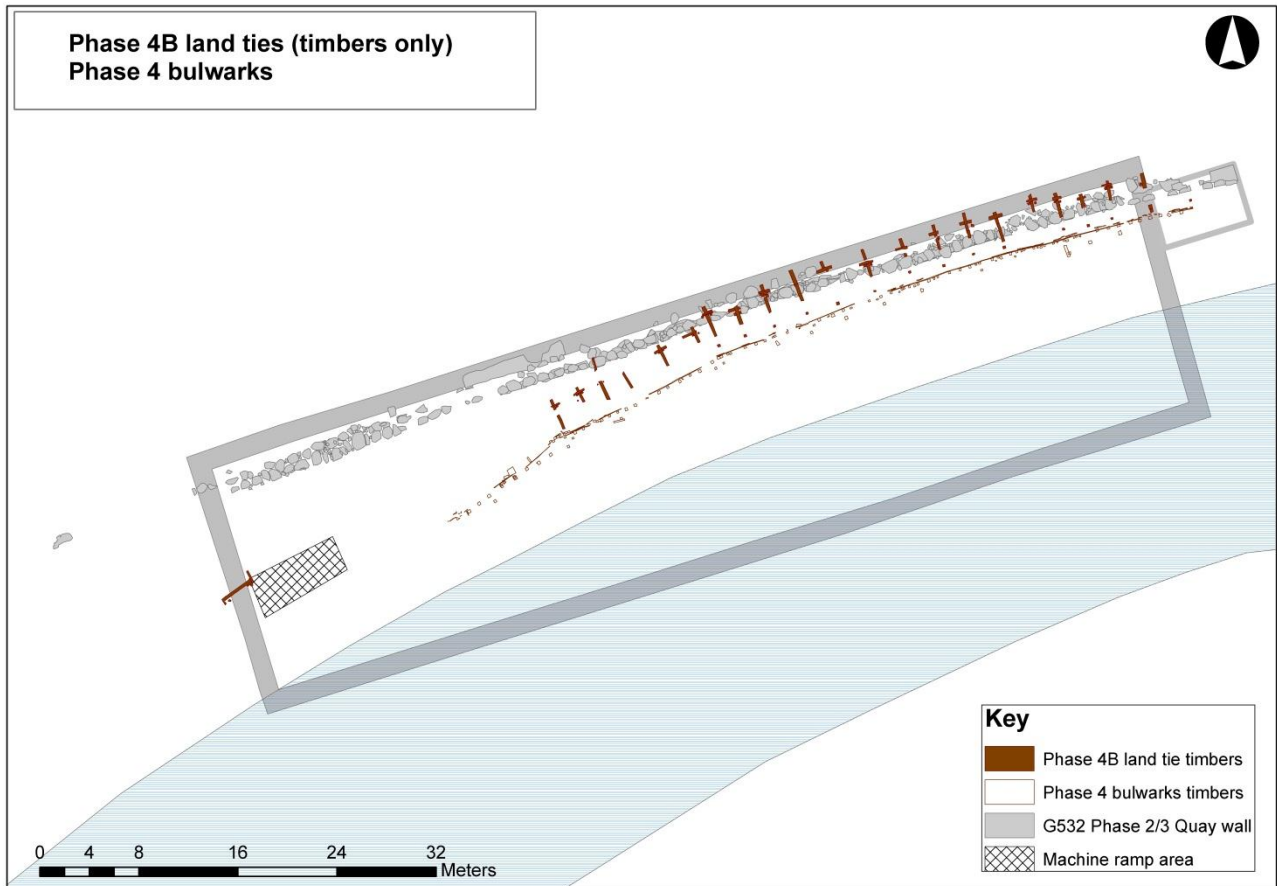


Fig. 190 Phase 4B land ties (timbers only) and Phase 4 bulwarks

Land tie G508

The timber structures related to G508 were all excavated during the 2012 Guide Wall excavation, but in two different areas. The northernmost parts were excavated in June 2012 in Trench 1/ZT9164, while the majority of the structure was excavated south of this, in Trench 4/ZT19000 in October 2012. The area immediately east of where G508 was excavated was within the Main Excavation trench, but was not fully excavated due to the placement of an access ramp for the machine to enter and exit the excavation in 2014.

Near the western edge of the Trench 4/ZT19000, two oak posts, surveyed as ST18968 were placed with 0.23 m distance between them in an ENE-WSW oriented “line”. The posts were soft and worn and neither the cross section nor the length was recorded. The posts may originally have been vertically set, but seemed pushed slightly outwards, to be recorded as diagonal, leaning towards the south. It could not be seen from which level the posts were driven into the ground. The two posts were placed immediately south of a large, horizontal oak beam, ST19181, which was ENE-WSW oriented and at least 3.65 m long, but extended out of the trench towards WSW. The beam was made from a boxed heart cut timber and

measured 0.22 m by 0.22 m in cross section. Immediately north of the gap between the two posts, ST18968, a shallow halving lap (0.05 m deep) was seen on ST19181 along with remains of a nail placed centrally in the halving lap, but there were no traces of the anchor beam, which would probably have been placed in this.



Fig. 191 Land tie G508 excavated in Trench 4/ZT19000. Looking SSE. C19_20121017_4229

In the easternmost side of the trench was a similar post, ST19128, likewise on the south side of the stretcher beam, ST19181. Only the northern side of the west side of the post was exposed, as the post was half-sectioned by the steel shoring and the main part was outside the trench. No tool marks, joints or fixings could be observed. Also, it could not be seen from which stratigraphical level the post was driven into the ground.

On the NE side of ST19128 was timber structure ST9349. This was first partly recorded in Trench 1/ZT9164 and later extended towards SSE when Trench 4/ZT19000 was opened – but still not fully excavated as at least part of the structure continued out of the trench in the southeast corner. Structure ST9349 comprised two wooden beams lying horizontally, one on top of the other along the same alignment, which meant they were unable to be surveyed separately. The NNW ends seemed to be truncated, as they were cut off

vertically, but it is not clear what had truncated them (possibly the gas pipe cut, SM9105). Both beams were square in cross section, approximately 0.2 m by 0.2 m, but the upper timber seemed to have been worked or worn into a more rounded cross section in the preserved NNW end. The lower timber appeared to be lying on top of deposit SD9892 (G400, Phase 3 land reclamation). The two beams seemed to be joined to each other by shallow laps. The uppermost beam was furthermore nailed to the lowest with a massive nail, which was square in its cross section. Near the middle of the upper beam's upper side was a very shallow, possible halving lap, but it is not clear what would have fitted into this or if it is just an indication of reuse of the beam. The lower beam seemed to be continuing out of the trench towards SSE and crossed over the stretcher beam ST19181, and the two were joined by halving laps (in the upper side of ST19181 and the underside of the lower beam in ST9349). The uppermost beam appeared to end in alignment with the southern edge of ST19181, but it is not clear if it was



Fig. 192 ST9349 in land tie G508. NNW end, excavated in June 2012. Looking SE. C03_20120724_5098

truncated by anything or if this was the original end of the beam.

Overlying the southeastern side of ST19181 was another ENE-WSW oriented beam, ST18961. ST18961 extended out of the excavation trench towards ENE, so the length could not be recorded. The beam appeared to be of square cross section with rounded corners and the cross section measured 0.18 m by 0.22 m. A halving lap was recorded and must have been placed on the underside of the beam, where ST18961 was joined to the upper side of the lower beam in ST9349 by a corresponding halving lap. It seems plausible that the placing of ST18961 is what has truncated the upper beam in ST9349.



Fig. 193 Land tie G508, beams at ENE end. Looking ESE.
C19_20121016_4220

Parallel to ST18961, but placed approximately 0.25 m south of this was another beam, ST19216 of which only the westernmost 0.11 m were uncovered, as the rest of the beam extended out of the trench under the steel shoring. It is not completely clear if this was related to G508 (currently related to G510, Phase 3 bulwark, but this seems odd), but it seems reasonable, based on the location and the beam's similarity with ST18961.

The final context in the group was SS19255. It comprised a single stone which was used as a brace between the

beam ST19181 and the easternmost of the posts in ST18968.

Interpretation

With caution, G508 can be interpreted as a land tie consisting of two posts (ST18968) at the west side (for the support of a now missing anchor beam) and one post (ST19128), at the east side – all placed on the south side of a large, ENE-WSW oriented stretcher beam, ST19181. On top of the stretcher at the east side was an anchor beam, ST9349, consisting of two beams on top of each other, joined to each other by both a shallow lap and a large nail. The lower of the beams was joined to the stretcher by halving laps in both beams. The anchor beam may be either strengthened or made longer by the upper part of the structure as seen with land ties in Phase 4A.

The beam ST18961 could represent a repair or replacement of parts of the land tie structure. It was joined to the lower beam in anchor beam, ST9349, and may have cut through the upper beam in this. However, this interpretation cannot be proven. As it is not clear if the post, ST19128, was originally placed close to the south edge of the stretcher beam, ST19181 – or was driven in at the distance (0.16 m) at which it was surveyed – the relation to the early parts vs. the later replacement of G508 is not clear.

G508 differs from other later Phase 4 land ties in that it seems to be a double structure (or even more), whereas the rest of these are in general single construction land ties (anchor beam, stretcher and posts). G508 is structurally more like the Phase 4A land ties, but the location, the stratigraphy as well as the dendrochronological dating argues against it.

Dating

From G508 two samples were sent for dendrochronological analysis, but only one (PD203088 from ST19181) could be dated. The felling date for this timber is After AD 1761. This implies that G508 is either part of the Phase 4B land ties – or an even later structure or repair.

Land tie G705

Contexts related to G705 were excavated during the 2014 Main Excavation and consisted only of three timbers. The vertically set post, ST35984, seemed to have been the earliest feature. This was driven into the underlying deposit, SD31532 (G598, Phase 4 land reclamation). On the western side of the post, the anchor beam, ST34634, was placed directly above a beam in the Phase 4A land tie, G609 at the northern end, and on the deposit at SD28797 (G718, Phase 4) in the southern end. The anchor beam was irregular in cross section, from rectangular at the north end to the upper part being almost round at the southern end. The anchor beam was truncated in the middle by a later pipe trench, SC24648 (G574, Phase 6 pipe). The south end of the beam was possibly also truncated, as it would have been expected to continue south to meet with a bulwark structure – possibly SG604.



Fig. 194 Land tie G705 Looking SSE.
C03_20140508_10174

Placed above the northern half of the anchor beam, were the remains of a stretcher beam, ST35975 which was very decayed – possibly by insects. The stretcher beam was connected to the anchor beam by a lap halving and there would possibly also have been a wooden peg originally, based on a hole through the beams. It was suggested that the stretcher beam was originally the same as the stretcher beam (ST35924) belonging with land tie G610 just east of G705, but truncated by the later pipe construction cut for G574 (Phase 6).

Interpretation

The group, G705 is interpreted as a wooden land tie, constructed with the purpose of keeping bulwark, SG604 in place. It is possible that the land tie was originally part of a larger land tie with G610, but this cannot be said with certainty. It seems strange that no construction cut was seen with G705, as the underlying land ties, G608 and G609 (both Phase 4A land ties) would probably have been covered over with soil for a period of time before G705 was constructed. However, as a construction cut like that would possibly have been backfilled with the dug up material, this would have been easily missed during the fieldwork process.

Dating

No dateable material was found with G705 and the land tie was not sampled for dendrochronological analysis. The date is therefore based solely on stratigraphical observations, placing G705 in the period after the construction and use of land ties G608 and G609. The construction of these was dated by the

stratigraphical relationship with G611 to the late 17th or early 18th Century. If G705 was constructed as parts of the re-working of the Phase 4 bulwark (G604/G626) this indicates a construction period in the middle of the 18th Century.

Land tie G610

Contexts related to G610 were excavated during the 2014 Main Excavation.



Fig. 195 Land tie, G610 Looking NE. C03_20140508_10186

The land tie consisted of two posts, ST35911 and ST35916, driven into the ground from a level somewhere above SD31532 (G598 Phase 4, land reclamation). The two posts were both very short – only preserved at 0.9 m and 0.95 m respectively, and were leaning slightly southwards. Between the posts was a NNW-SSE-oriented anchor beam, ST35920, which was made from a boxed heart timber cut with a square cross section, 0.21 m by 0.21 m. The anchor beam was preserved at 1.34 m length, but was recorded as truncated at the north

end by later pipe cut SC24648 (G574, Phase 6 service pipe) and in the south end by the construction cut, SC22510 for a later land tie, G615 (Phase 5). The preserved north end of the anchor beam was located directly on top of a stretcher beam from a Phase 4A land tie (ST35930, G609). Connected to the anchor beam by a halving lap was overlying stretcher beam, ST35924, which was badly worn and possibly decayed as a result of insects. This may or may not originally have been the same beam as the stretcher ST35975 in land tie G705 west of G610, as these shared many similarities, but the construction cut for the later service pipe, G574, had truncated the area between them. The western end of the stretcher beam seemed placed above the wooden drain pipe, ST35907 (SG206, Phase 4).

Interpretation

The group is interpreted as a land tie constructed for the purpose of holding the Phase 4 bulwark, SG604/G626 in place. However, the expected physical connection between these structures was truncated by later construction activities. No construction cut was seen during the excavation of G610, but it is expected to have been blurred by the backfill being identical to the dug up material.

It is not clear if G610 is actually part of a larger land tie with G705 as the area between them was truncated by a later pipe. However, the badly decayed stretcher beams with both land ties having the same dimensions and orientation points to this interpretation.

Dating

None of the timber elements from G610 were sampled for dendrochronological analysis and no finds materials were collected from the group either. Thus, the dating of the structure must rely solely on stratigraphical observations. The land tie is later than the Phase 4A land ties and also overlies the southern part of wooden drain pipe SG206. The northern end of this drain structure was dated by dendrochronology

to AD 1738/39 winter, which gives the earliest date for the construction of G610. Given that the land tie was truncated by a Phase 5 land tie, it must have been constructed and used before then. In general the Phase 5 land ties seem dated to the AD 1820s. It seems most probable that G610 was constructed at the same time as the preserved Phase 4 bulwark, SG604/G626 in the AD 1750s.

Land tie G616

Contexts related to G616 were excavated during the 2014 Main Excavation.

Group G616 was highly truncated by later construction activities. The Main part of the structure consisted of two timber posts, ST35894 and ST35885, placed on either side of an anchor beam, ST35889. This anchor beam was in bad preservation but seemed to be made from a boxed heart timber cut with a rectangular cross section, 0.23 m by 0.24 m. It was preserved at 1.65 m length but the north end was truncated by cut, SC22123 (G582, Phase 4, deconstruction). From the photos of ST35889 it appears that the south end was also truncated, but it is not clear what caused this. It seems however, probable that there would have been



Fig. 196 Land tie G616, Looking N. C03_20140512_10215 (cropped)

an unidentified construction cut for the corresponding part of the bulwark, SG604, as the land tie would probably have been connected to this structure, but was not. The surveyed top levels of ST35889 ranged from OD + 0.06 m to + 0.16 m. The anchor beam was recorded as stratigraphically above SD33628 (G663, Phase 3) and below SD52177 (G601, Phase 4 land tie with land reclamation). However, it seems probable that there would originally have been a cut into SD52177, as this land reclamation material is linked to

the Phase 4A land ties. On the north side of the truncation, G582, another timber beam, ST35880, was recorded and related to G616. In appearance, however, this is very different from ST35889, but as this may be due to different preservation conditions, it might not be significant for whether or not the two anchor beams were originally part of the same structure. ST35880 was recorded as a boxed heart timber cut with rectangular cross section, 0.14 m by 0.19 m. It was preserved at 1.08 m length and the orientation was slightly more N-S than ST35889's. No other structures or features were seen to relate to G616 near ST35880.

At approximately 1.75 m east of ST35889 another beam, ST35876, was located. This was placed parallel to ST35889 but at a slightly deeper level (surveyed top levels ranged between OD + 0.03 m at the north end and OD – 0.17 m at the south end). It is not clear if this timber beam belongs structurally with ST35889 or not as no other structures or features were seen to support this.

West of ST35889, a single post was recorded as ST35935. It was placed more than 2 m west of the rest of the G616 structure and thus it is dubious if it originally was part of this. However, it was linked to G616 due to being recorded at the same stratigraphical level as ST35889 (above G663, Phase 3 and below G601, Phase 4).

Interpretation

The timbers related to G616 are interpreted as possible parts of one or more land ties. These would have been heavily truncated by later building activities. Based on the location of the structures, the anchor beams probably belonged with the later Phase 4 land ties, but this interpretation cannot be proven.

Dating

G616 cannot be dated by finds or dendrochronology. It is probably parts of the later Phase 4 land ties and may thus be dated on this basis to the middle of the 18th Century.

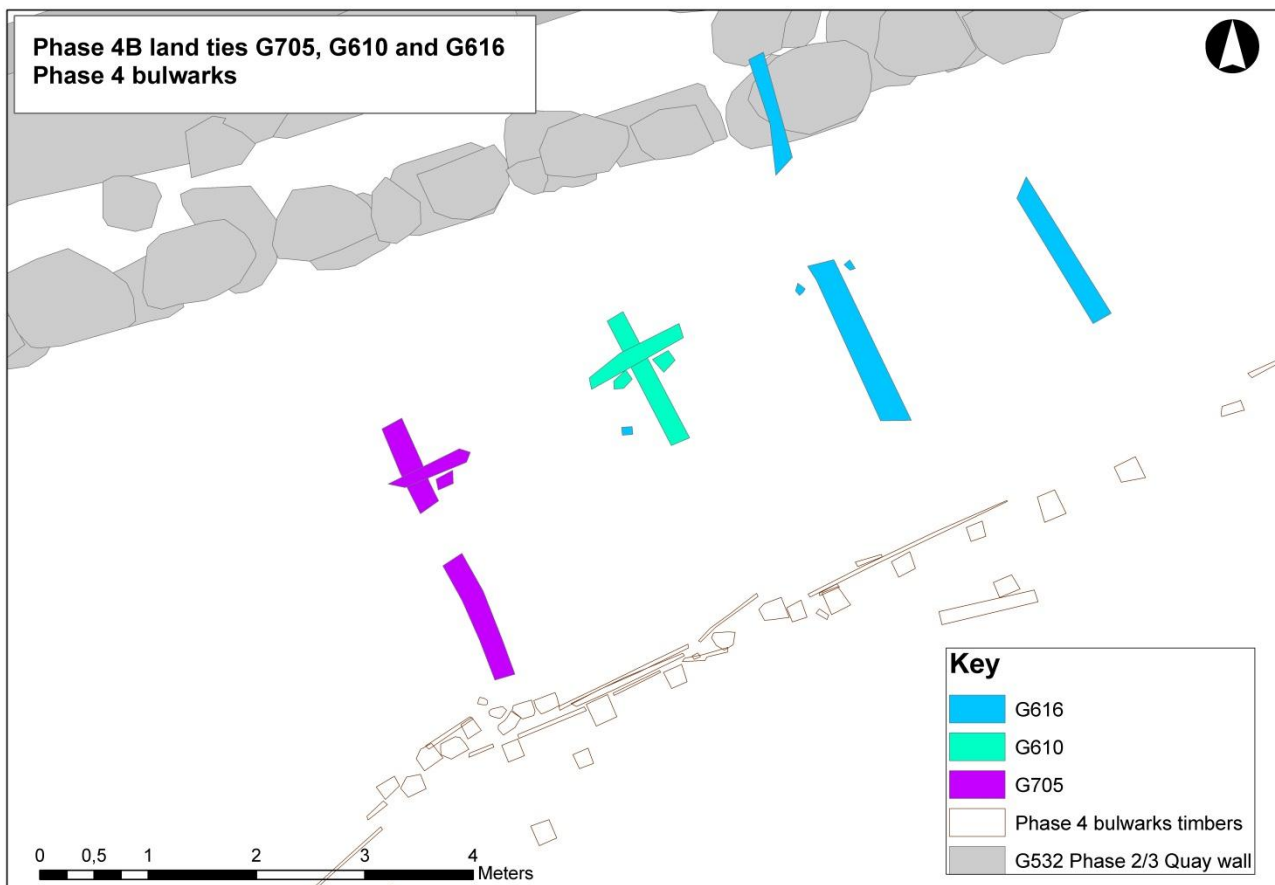


Fig. 197 Plan of Phase 4B land ties G705, G610 and G616

Land tie G553

The group G553 was excavated during the 2014 Main Excavation.

The earliest feature related to G553 was a construction cut, SC22821, which was seen as irregular in shape and cutting into underlying SD25633 (G598, Phase 4 land reclamation). In the cut a NNW-SSE oriented anchor beam, ST21327, was placed. This was surveyed as a 1.85 m long beam, which was approximately 0.21 m wide (not fully recorded). Above the anchor beam, a transverse stretcher beam, ST21317, was attached with a halving lap and a wooden peg. The stretcher was recorded as 1.17 m long and made from a boxed heart timber cut with an almost square cross section, 0.17-0.18 m. The alignment and orientation of the stretcher was similar to that of the stretcher in G554 east of G553 and likewise to that of G705 and G610 west of G553. Placed on either side of the anchor beam, just south of the stretcher were two posts, ST21339 and ST21343, keeping the land tie in place. It is not clear from which level the posts were driven in. Covering the structure and backfilling the construction cut was SD22884, which was recorded as orange-brown sand with pebbles. A few finds were collected (animal bone, ceramics, glass, CBM) but only one, broadly dated clay pipe fragment was registered.



Fig. 198 G553. Looking NNW. C02_20140228_8305

Truncating the south end of the land tie G553 was the construction cut for the large Phase 5 land tie, G562.

Interpretation

Group G553 is interpreted as a land tie, made with the purpose of holding the Phase 4 bulwark in place. The construction cut was shaped to fit in the timber elements. However, as the later land tie, G562, had truncated the southern end of G553, the physical link with the Phase 4 bulwark did not exist. Likewise the upper levels of the construction cut and backfill are believed to have been removed by later building activities in the area.

Dating

From G553, two samples were analysed by dendrochronology (PD207765 from the anchor beam, ST21327 and PD207771 from the stretcher, ST21317). The results were that the stretcher beam's felling date was After AD 1722 and the felling date for the pine anchor beam was AD 1734[?]. These dendrochronological dates are not very accurate, and as it is not clear from the descriptions if any of the timbers bore traits of reuse from earlier structures, it is probable that G553 belongs with the later Phase 4 land ties, constructed in the middle of the 18th Century. This is supported by the location of the structure.

Land tie G554

Contexts related to G554 were excavated during the 2014 Main Excavation.

The group, G554 consisted of a timber land tie structure and an overlying levelling layer. The land tie structure comprised an anchor beam (ST21368), which seemed placed on or at least stratigraphically above SD32429 (G598, Phase 4 land reclamation). The anchor beam was preserved at 1.45 m length and was made from a boxed heart timber cut with square cross section, 0.23-0.24 m. From the dendrochronological analysis, it was evident that the anchor beam was made from pine wood, which is unusual for the Phase 4B land ties. In the upper side of the anchor beam was a halving lap, in which the stretcher supposedly originally would have been placed, transversely to the anchor. The stretcher beam, ST21364, was however



Fig. 199 G554 land tie. Looking SSE. C02_20140303_8358

moved slightly west – possibly by later building activities. This beam was 1.2 m long and made from a different type of timber cut, as it was circular in cross section and 0.2 m in diameter. It had a halving lap on the under side, very similar to the one recorded on the anchor beam. Remains of a large iron fixing were seen on the top of the stretcher beam. The stretcher beam was in alignment with and orientated the same way as the stretcher beam in the Phase 4B land tie west of this, G553.

On either side of the anchor beam, immediately south of the stretcher beam, were two posts, ST21376 and ST21380. The western of the posts, ST21376, was only preserved at 0.72 m length, whereas ST21380 was preserved at 0.95 m length. Both posts were tapered for the bottom 0.4 m but were otherwise boxed halved timber cuts with rectangular cross sections.

Overlying the timber elements was a deposit, SD23053. This extended from the eastern side of the land tie and approximately 4 m west, almost reaching land tie G553. The deposit consisted of grey-brown sandy silts and within it was found a wide range of finds materials: animal bones, ceramics, glass and iron was not registered fully. A fragment of wall tile (FO213720) seemed to have been produced in Holland/Netherlands in the period AD 1625-1675, while one of the clay pipe fragments (FO214898) bore a makers mark with a crowned pipe, relating it to the works of L. de Roos in Gouda, AD 1730-1746. Initially the deposit was interpreted as a dump, but the re-evaluation of the purpose for its deposition has changed the interpretation to a levelling layer. Within it may also be a construction cut for the land tie itself, but this was not seen in the field. The group was truncated at the southern end by a modern truncation, SM22609 (G541, Phase 6 gas pipe).

Interpretation

Group G554 is interpreted as a land tie with a levelling layer on top. Originally the land tie would have been keeping the Phase 4 bulwark in place, but the physical link between these structures was removed by the modern pipe cut (G541), if it had not already been removed earlier.

Dating

The shortness of the two vertical posts made the excavator think that these were parts of a fairly late structure. This was supported by the two dendrochronology samples analysed (PD207766 from stretcher

beam ST21364 and PD207769 from anchor beam ST21368), which resulted in felling dates After AD 1722 (PD207766) and After AD 1761 (PD207769). The latter date seem rather late in comparison with other dendrochronological dates from Phase 4B land ties.

Land tie G531

Features and structures related to G531 were first excavated during the 2012 Guide Wall excavation, but when the area south of these was excavated during the 2014 Main Excavation, more were added to G531. In this process some structural parts seem to have been surveyed again and therefore have two ID numbers now.

The earliest features of G531 were the two construction cuts: SC18483 (recorded in the north end in 2012) and SC23792 (documented to the south in 2014). These may essentially be the same cut, only seen in two different excavation phases. Seen as one, this was a 2.93 m long, irregularly shaped cut, orientated NNW-SSE. The northern end seemed to truncate the underlying Phase 4A land tie G444 as well as into levelling deposits belonging with G451 (Phase 4), while the cut at the southern end was stratigraphically over G444 as well as the levelling deposit SD23053 belonging with, (and overlying), the land tie, G554 on the west.

Within the construction cut was the anchor beam (ST18543 at the north end and ST21392 at the south end), which in total was preserved at 2.58 m length. This was made from a boxed heart timber cut and had



Fig. 200 Land tie G531 extending SSE from under the Guide Wall. Looking NNW. C02_20140304_8394

a square cross section, 0.25 m by 0.25 m. The southern end of the anchor beam was truncated by the Phase 6 pipe cut, SC22609 (G541), and thus could not be measured in total. Near the northern end of the beam was a halving lap holding overlying stretcher beam ST18526/ST21388 in place. This stretcher beam which was recorded twice, was 0.9 m long and made from a boxed heart timber cut with a square cross section, though the dimensions are recorded differently between the two excavation phases. The halving lap documented on the anchor beam corresponded to that seen on the underside of the stretcher beam. On the south side of where the stretcher crossed the anchor beam, two posts were driven in: ST21398 on the west side of the anchor beam and ST18635/ST21402 on the east side. The full dimensions of these were not recorded, but they both seemed to be made from boxed heart timber cuts with square cross sections, 0.23 m by 0.23 m.

Overlying the main parts of the timber structures and backfilling the cut were deposits SD18505 and SD23800. These are here considered the same and consisted of grey sand comprising finds of ceramics, clay pipe, animal bone and shell, stove tiles and other CBM. The deposition process was seen as rapid backfill.

Placed approximately 0.75 m SSE of the southernmost preserved part of the anchor beam was a post, ST35621, which due to its location in direct alignment with the rest of the land tie, was related to this as a supporting post. This post was diagonally set, leaning slightly northwards and preserved at 1.63 m length. It was made from a boxed heart cut timber and had a square cross section, 0.22 by 0.22 m. From stratigraphical observations it seemed to have been driven into one of the fills in the bulwark cut SD34660 (G626, Phase 4 bulwark). Because of the later truncations made by the Phase 5 land tie, G562 and the Phase 6 pipe, G541, it is however not clear whether ST35621 directly belong with the other parts of G531. The distance between the post and the bulwark planking belonging with G626 was approximately 0.64 m.

Interpretation

The group G531 is interpreted as a land tie belonging with a later phase of Phase 4 land ties. It is cut into levelling belonging with Phase 4, and also into one of the Phase 4A land ties. The stretcher beam was placed further north than the stretchers of the later Phase 4 land ties west of this (G554, G553, G610 and G705). This may be due to the presence of the remaining parts of the Renaissance quay wall, G532, making it impossible to drive in the vertical posts keeping the stretcher in place, if the land tie had been placed in alignment with the former.

A post placed SSE of the main body of the land tie may originally have been part of this, serving as a supporting post under the anchor beam close to where this would have been joined to the bulwark at a higher, now destroyed, level.

Dating

From G531, two dendrochronology samples were analysed. The result of the dendrochronological analysis from the stretcher beam, ST21388 was after AD 1709 (PD208124), while the felling date of the anchor beam, ST21392 was in the period AD 1748-60 (PD208128). The finds materials were retrieved from the backfilling of a construction cut, which is problematic in terms of using the finds for dating the structure. Finally the stratigraphical observations indicate that the structure G531 was later than the Phase 4A land ties and maybe even later than G554, though this was dated by dendrochronology to after AD 1761. Considering that G531 was placed very close to G554, however, it is a possibility that G531 was constructed as a repair or strengthening of the land tie system sometime after AD 1761, using or re-using older timber. This would correspond with the southernmost post ST35621 being driven into the backfills of the construction/repair cut for bulwark G626.

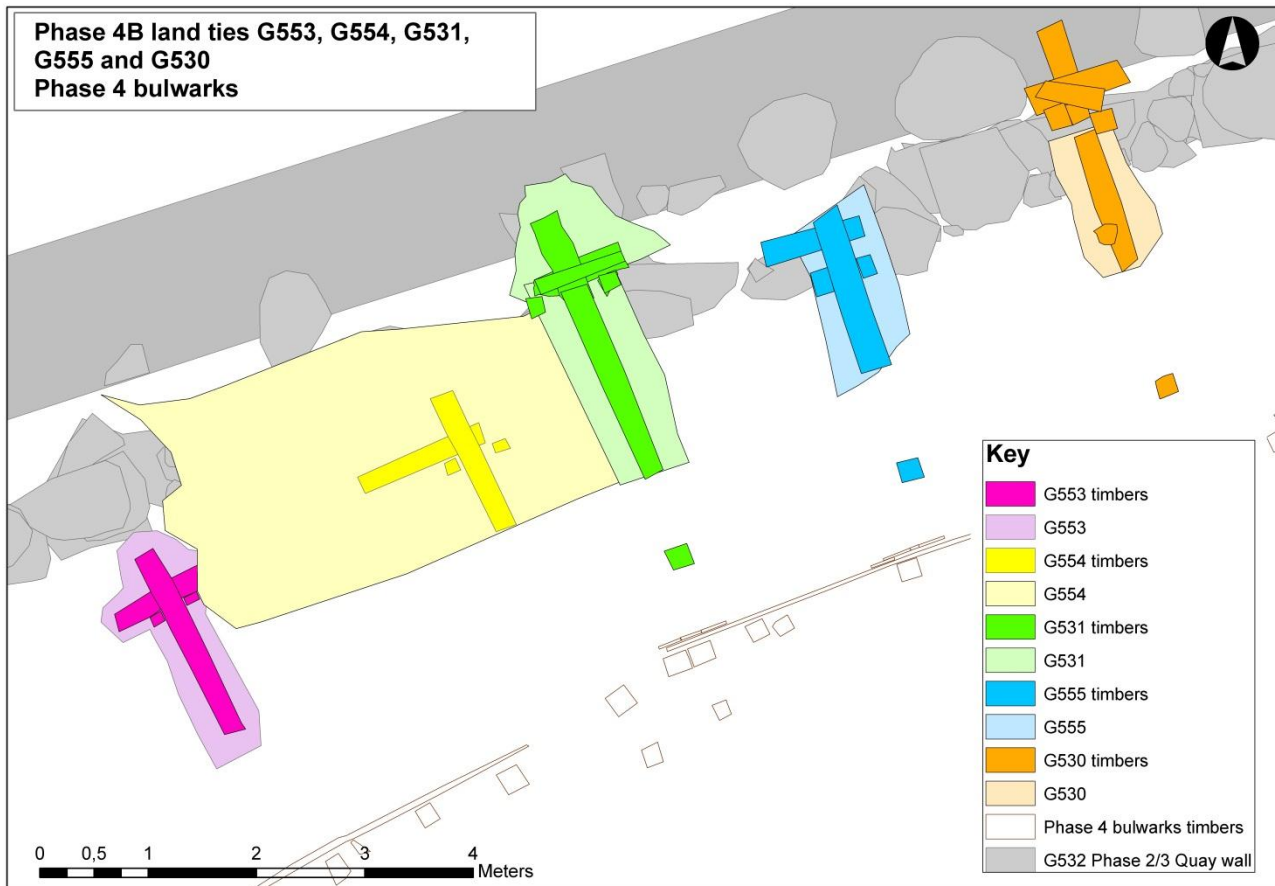


Fig. 201 Plan of Phase 4B land ties G553, G554, G531, G555 and G530

Land tie G555

Structures and features belonging to G555 were excavated during the 2014 Main Excavation.



Fig. 202 Land tie G555 with underlying parts of Phase 4A land tie G444. Looking NNW. C02_20140312_8504

Group G555 consisted of a construction cut, SC23801, as its earliest feature. The cut could not be fully exposed as it extended northwards into the area where the modern Guide Wall was built in 2013. Cut SC23801 was recorded as lying stratigraphically over timber structures belonging to Phase 4A land tie, G444, though it is not clear which deposit it was cut into or from which stratigraphical level.

Within the cut, anchor beam, ST23812 was placed. This was a boxed heart timber cut beam, preserved at 1.68 m length. It had a square cross section, 0.225 m by 0.225 m. Originally, the beam would have extended further south, but it was truncated along with the rest of the group by the Phase 6 pipe cut belonging to G541. In the top of the beam a halving lap was recorded, but unlike other laps seen with similar land tie structures, this was twice as wide as necessary if needed to fit in the overlying stretcher beam. The reason for this is not obvious, but it may either be a timber beam reused from

somewhere else – or some last minute alterations were made, when the land tie was established.

The stretcher beam, ST21418, was also made from a boxed heart timber cut with a square cross section, 0.22 m-0.23 m and was recorded as 1 m long. The stretcher had a halving lap on the sub side, and was fitted into the northern half of the lap seen on the anchor beam. An iron nail kept the beams fixed to each other. South of the stretcher, on either side of the anchor beam were two posts, ST21425 and ST21429. These were both diagonally set, leaning slightly towards north. From the survey it seems that the posts were not placed as close to the stretcher beam as seen with all other land ties, but it is not clear whether the presence of underlying Phase 4A land tie G444 had an impact on the construction of the Phase 4B land tie.



Fig. 203 Post ST35617 belonging with G555. Darker material pushed with the post into the lighter sands of SD34660. Looking SE. C03_20140430_9987

Regardless of the reason, land tie G555 will not have been as strong or well built as other land ties, as the structure elements were not fixed closely to each other.

Overlying the timbers in the construction cut was deposit, SD23811. This was a brown-grey mottled mixture of silt and sand and was recorded as very similar to the deposit through which SC23801 was cut. From the backfill a few finds of animal bones and ceramics were collected but not prioritized for registration.

In alignment with the anchor beam, but placed 0.87 m SSE of the southern extent of the beam was another post, ST35617. This was a vertically set, boxed heart cut timber post with square cross section and it was driven into one of the backfill deposits (SD34660) for the bulwark, G626. The distance between the post and the bulwark planking was approximately 0.65 m. The post was very similar to that seen SSE of the land tie, G531, and had probably served the same purpose in connecting the land tie with the bulwark structure at a higher, now destroyed, level.

Interpretation

G555 is interpreted as parts of a land tie, belonging with the later land ties of Phase 4B. The land tie differs from the others in that the halving lap connecting the anchor beam and the stretcher is considerably wider than it needed to be and thus would not hold the stretcher in a fixed position. Also the supporting posts on either side of the anchor beam were not placed as close to the stretcher beam as seen with other land ties.

As seen in G531, a post was placed in alignment with the anchor beam of G555, but SSE of this and in similar distance to the bulwark G626 as the post in G531 was. This probably served as a supporting structure close to where the anchor beam would have met the bulwark structure. Unfortunately the links between the anchor beam, the supporting post and the bulwark were removed by later construction activities.

Dating

From G555 two dendrochronology samples were analysed and the results were after AD 1741 (PD207755 from ST21418) and after AD 1745 (PD207770 from ST23812). This, along with the similarity in construction

(and thus possible contemporaneity) to G531, which probably was constructed around AD 1760, indicate that G555 was constructed at the beginning of the second half of the 18th Century.

Land tie G530

Structures and features related to G530 were excavated both during the 2012 Guide Wall excavation and the 2014 Main Excavation. Some of the same structural elements were thus recorded twice.

The earliest feature of G530 was the construction cut, SC23818, seen in the Main Excavation only. This was recorded as a more or less rectangular construction cut, which, however extended out of the Main Excavation trench towards NNE, where it would probably have been excavated during the 2012 Guide Wall excavation had it not been for the 2 m depth limit. At the south end the construction cut was truncated by the Phase 6 gas pipe cut, G541. Cut SC23818 was recorded as truncating the underlying levelling layer, SD25843 (G683, Phase 4 levelling). In the construction cut the anchor beam was placed. The northernmost part of this was recorded as ST17966 in 2012, while the southern part was recorded as ST21460 in 2014. Seen as one, the beam was preserved at approximately 2.37 m and it was made from a boxed heart cut timber with a square cross section, 0.23 m by 0.23 m. At the north end of the anchor beam was a halving lap, at which the stretcher beam was placed. The stretcher was in 2012 recorded as ST17977, but when it was re-excavated in 2014 it had been moved slightly out of situ and was then recorded as ST50499. The stretcher was originally fastened to the underlying anchor beam by joints as well as a large iron nail or spike which had corroded into a large lump of rust on top of the stretcher beam.



Fig. 204 Land tie G530, northern part as excavated in 2012. Looking SSE. C19_20121001_4007

Placed on either side of the anchor beam – and possibly driven in from the bottom of the construction cut – were the two posts, ST17984 and ST17980. These were both vertically set and of boxed heart cut timbers with square cross sections, 0.20 m-0.22 m wide. Both posts were relatively short – only preserved at approximately 0.80 m length and with tapered ends for being driven into the ground. The relative shortness of the posts was possibly due to them being set almost directly into the former quay wall, G532, which was stone built and probably very difficult to insert anything into.

Overlying the timbers in the cut was backfill deposit, SD23830, which consisted of dark grey-brown clay and sand. From this was a few finds of animal bone, ceramics and glass collected (not registered) as well as clay pipe stem fragments.

Placed approximately 1 m SSE of the southernmost preserved part of the anchor beam was another short post, ST35609. This was similar to posts in the land ties west of G530 related to the land tie on the basis of location.

Interpretation

G530 is interpreted as parts of a land tie made for the purpose of holding the bulwark on to the ground. G530 was very similar in construction style to the land ties immediately west of this, G555 and G531 and should thus be seen as established as parts of the same system of land ties.

Dating

From G530 two dendrochronology samples were analysed: PD208131 from stretcher beam ST50499 showed that the timber was felled after AD 1753, while PD207758 from the anchor beam, ST21460 resulted in a felling date in the period AD 1749-60. The few finds registered from the construction cut backfill do not contradict these dates.

Land tie G453

Structures and features related to G453 were first excavated during the 2012 Guide Wall excavation, but extended in the 2014 Main Excavation.

The earliest features are the two construction cuts, SC18248 and SC23831, recorded in the Guide Wall and Main Excavation, respectively. This is considered to be the same, just excavated in two different excavation phases. Seen as one the cut was preserved as a 2.72 m long (NNW-SSE), 1.25 m wide and 0.2 m deep, irregular cut. The northernmost part of it seemed to have been truncated by the cut, SC18253, for the wooden drain pipe, G452 (Phase 4), while the south end of the cut was truncated by the Phase 6 construction cut for a gas pipe (G541).

Within the cut was an anchor beam, recorded as ST18015 in the Guide Wall excavation and as ST21470 in the Main Excavation. The beam is clearly the same, though. This was NNE-SSW oriented and placed horizontally in the cut. The beam was made from a boxed heart cut timber and was square in cross section, 0.24 m-0.27 m. At the northern end of the beam a halving lap was seen. The southern end was truncated and removed by the construction cut, SC22609 for the gas pipe, G541 (Phase 6). The stretcher beam was missing, but the location of the halving lap indicates where it would have been placed. Had the stretcher been present, it would have aligned with the stretcher beam in the land tie west of G453, G530. The distance between the anchor beams in these two land ties was approximately 2.5 m.

Covering over the timber structures in the construction cut was backfill deposit, SD18241/SD23841, which was essentially the same deposit. This consisted of dark grey sand and contained few CBM inclusions as well as finds materials of ceramics, glass and clay pipe.

Placed 0.98 m SSE of the anchor beam, and in perfect alignment with this, was a post, ST37519. This was made from a boxed heart cut timber and preserved at 1.02 m length. The setting was slightly diagonal, as it seemed to be leaning northwards. The post seemed driven into the backfill SD34660 of the construction cut belonging with the bulwark, G626, and would thus be later than this deposit.

Interpretation

G453 is interpreted as a land tie consisting originally of an anchor beam, stretcher beam and support posts, but only the anchor beam and a support post in southern alignment with this was preserved. The reason why the rest of the structure, missing is not clear, but may be partly due to the truncation made by the drain pipe, G452 (Phase 4).

Dating

One dendrochronology sample was analysed from G453: from the anchor beam, ST21470 the analysis of sample PD207761 resulted in a felling date After AD 1745. Seen in connection with the land ties west of G453, G530, G555 and G531 this could indicate that this whole row of structures was built around AD 1760 or just after.

Land tie G454

Group G554 was primarily excavated during the 2012 Guide Wall excavation, but one structure excavated in 2014 was added to the group in the post excavation process.

The group consisted of a construction cut, SC17204, which was recorded in the Guide Wall excavation. The cut was irregular in plan and seemed to extend out of the Guide Wall trench towards S, but it was, however, not seen in the Main Excavation in 2014.

Within the cut was first an anchor beam, ST14482, which was preserved at 1.07 m length, but was truncated in the north end by a later gas pipe truncation (SM14362) running on the north side of the Guide Wall trench. Even though the beam seemed to extend out of the south limit of the Guide Wall trench, no traces of it was recorded in the Main Excavation. The anchor beam was recorded as a boxed heart cut oak timber with square cross section. A halving lap was recorded on top of the anchor beam and in this the stretcher beam, ST14469 was placed. Traces of what looked like a large iron nail or spike were seen in connection with the beams. The stretcher was made from a boxed heart cut oak timber and was measured as 1.31 m long. On the southern side of the stretcher beam and on the eastern side of the anchor beam



Fig. 205 Land tie G454, excavated in 2012 Guide Wall excavation. Looking SSE. C19_20120925_3949

was a post, ST14478, which likewise was species determined as oak. It is not clear why the corresponding post on the west side of the anchor beam was missing, and likewise the parts of the land tie which should have extended into the Main Excavation trench.

Over and around the timber elements within the construction cut was SD17226, a grey-brown sand layer with lenses of orange/yellow sand. Within this a wide range of finds materials were found: Animal bones, ceramics (Westerwald stoneware and late redwares), glass (window glass and a glass bottle sherd), a leather shoe heel, and an undecorated clay pipe stem.

Located 2.68 m SSE of the southernmost part of the main (northern) body of G454 was a single post, which was related to this structure due to its similarity with the posts placed in alignment with the anchor beams in the land ties west of G454. ST37524 was measured as 0.9 m long and made from a boxed heart cut

timber. The post was placed in a straight line of similar posts related to G453, G530, G555 and G531, respectively.

Interpretation

G454 is interpreted as a land tie made for the purpose of holding back a bulwark structure. Even though it must have been heavily truncated and therefore not very well preserved, the similarities with the land ties G453, G530, G555 and G531 are strong and suggestive of contemporaneity between these and land tie G454.

Dating

From land tie G454 three dendrochronology samples were analysed, but only two resulted in felling dates: PD18351 from the stretcher beam, ST14469, was felled, after AD 1739, while PD15633 from the vertical post, ST14478, resulted in felling after AD 1726. The sample PD15632 from the anchor beam, ST14482, could not be dated. The dendrochronological results do not differ substantially from the other dates obtained from the land ties west of this and thus it seems probable that G454 was constructed sometime around AD 1760.

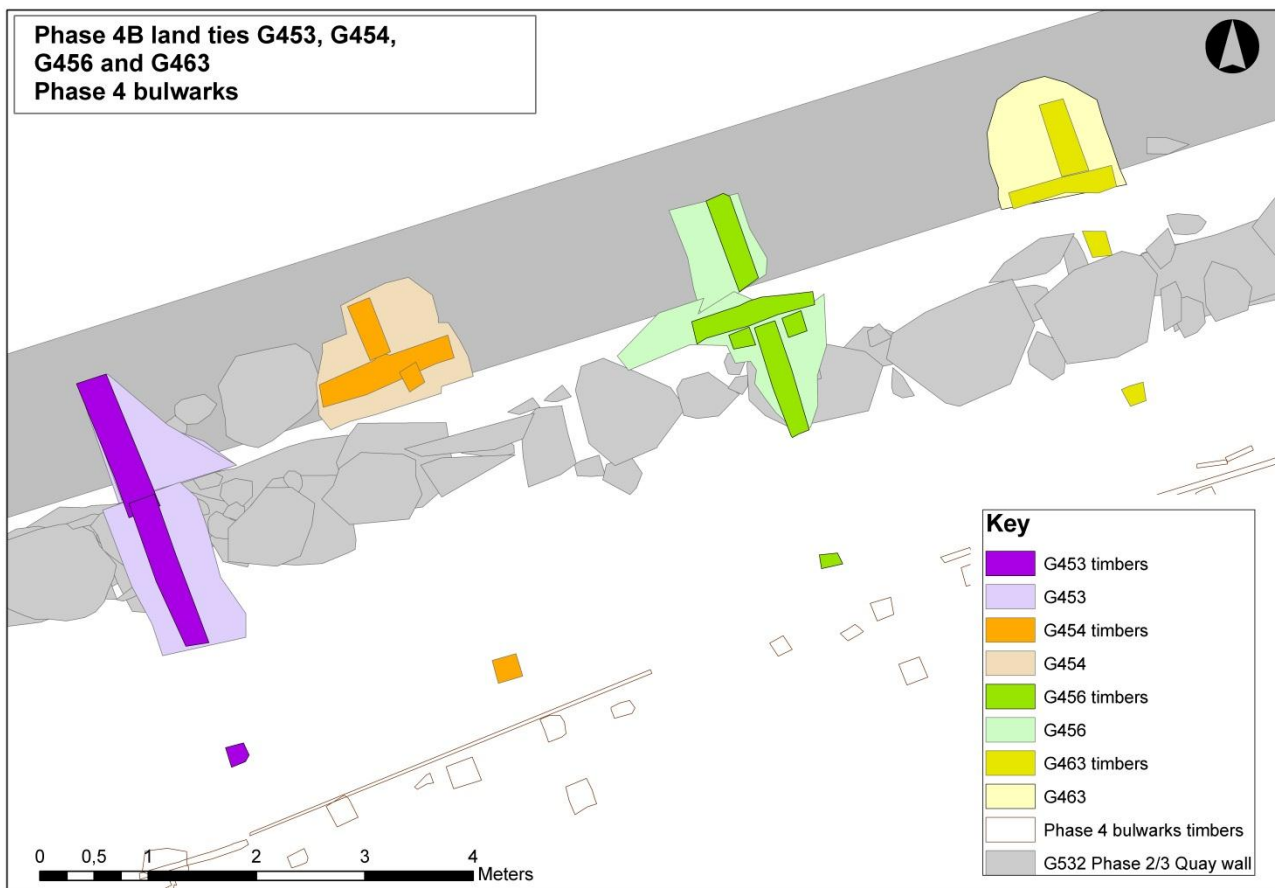


Fig. 206 Plan of Phase 4B land ties G453, G454, G456 and G463

Land tie G456

Group G456 was partly excavated during the 2012 Guide Wall excavation, but was extended in the 2014 Main Excavation.

The earliest feature in G456 was construction cut, SC17241, which was only seen and recorded in the Guide Wall excavation. Cut SC17241 had truncated underlying land tie structure, G455 (Phase 4). Within the cut was anchor beam, ST14248/ST21682 which was probably the same beam, only surveyed as two different



Fig. 207 Land tie G456, excavated during the Main Excavation. Looking ENE. C02_20140310_8469

structures in 2012 and 2014, respectively. In total, the anchor beam was preserved at 2.32 m length, but it seemed to have been truncated by later gas pipe construction cuts at both the NNW and the SSE end (SM14362 and SM22609, respectively). In the northern half of the anchor beam was a halving lap, in which an overlying stretcher beam, ST21671, was placed with a corresponding halving lap and an iron fixing (nail?). The stretcher beam was excavated in the Main Excavation and was found to have been made from a boxed heart cut oak timber, preserved at 1.16 m length. The dimensions of the cross section were recorded as 0.18 m by 0.22 m.

Immediately south of the stretcher beam were two posts, ST21691 and ST21695, which were both vertically set and made from boxed heart cut timbers with rectangular to square cross sections, 0.24-0.25 m.

Two deposits were related to G456: SD17250 was seen to backfill the construction cut in the northern end of the land tie structure, while SD25088 seemed to underlie the anchor beam in the Main Excavation. Deposit SD17250 was described as light grey sandy silt comprising occasional pebbles, charcoal etc. and a single find, a glass bottle neck sherd. Deposit SD25088 consisted of darker sand with a single ceramic sherd (not registered). It is not clear if SD25088 was the backfill of an unseen construction cut, but it seems plausible that the southern part of the land tie also would have been inserted in a construction cut. The many truncations in this area have probably blurred the picture, though.

Placed 1.14 m SSE of the southern end of the anchor beam was a post, ST46346, which was related to G456 due to its alignment with the anchor beam and its similarities with the posts placed south of the land ties in the area west of G456. Post ST46346 was vertically set and was fashioned from a boxed heart cut timber with a square cross section, 0.25 m by 0.25 m. It was preserved at 1.26 m length, but was probably heavily truncated by the modern gas pipe cut (G541, Phase 6).

Interpretation

Group G456 is interpreted as a land tie, consisting of an anchor beam, a short stretcher beam, two support posts by the stretcher, and one support post near the bulwark. The land tie is part of a larger system of single land tie structures dug into areas that already had land ties – but as replacements of these.

Dating

From land tie G456, two dendrochronological samples were analysed. The samples from the stretcher beam ST21671 (PD24927) was not dated, while the sample from the anchor beam, ST21682 (PD24926) resulted in a felling date after AD 1711. Considering the stratigraphy it is clear that G456 is younger than the Phase 4A land tie repair, G455. Group G455 is however also dated solely by stratigraphy and the date between 1730 and the 1750s cannot be proven. Placing G456 with similar land ties constructed around or After AD 1760 seems reasonable though not verifiable.

Land tie G463

Structures and features related to G463 were first excavated during the 2012 Guide Wall excavation, but were later extended in the 2014 Main Excavation.

The earliest feature belonging to G463 was the construction cut, SC18117. This was only seen in the Guide Wall excavation, and could not be identified in the Main Excavation area. The cut was sub-rectangular with rounded corners and a flat base. It appeared to be cut into the backfill over Phase 4A land tie repair G466 as well as into levelling layer SD18162 (Phase 4).

Within the construction cut, an anchor beam was placed. This was recorded as ST15220 in the Guide Wall excavation as extending out of the trench towards south, and the southernmost, preserved part was seen in the Main Excavation as ST24398. Seen as one, the anchor beam was preserved at 1.51 m length and was NNW-SSE oriented. It was made from a boxed heart cut timber with square cross section, 0.23-0.24 m. At the south end, the beam was truncated by the construction cut, SM22609 for the Phase 6 gas pipe (G541), whilst at the north end of the anchor beam, a halving lap was seen and in this, a stretcher beam, ST14227 was fixed. The stretcher had a halving lap on the underside, where it met with the anchor beam. A large lump of rust on the top of the stretcher beam indicated that an iron nail or spike had fixed the two beams to each other. The stretcher beam was preserved at 0.98 m length, but seemed to be asymmetrically placed on the anchor beam, in that the eastern side of the stretcher was considerably shorter than the western. This could be done intentionally to fit the beam in immediately west of the anchor beam, ST14214 belonging with the underlying Phase 4A land tie repair, G466. The stretcher beam was made from a boxed heart cut timber with rectangular cross section, 0.20 by 0.25 m.

Overlying the timbers in the construction cut was backfill deposit SD18130 consisting of mottled, grey sand with inclusions of bone and ceramics (not collected).

At 1.22 m SSE of the main parts of the land tie, a post, ST30820 was placed in alignment with the anchor beam. The post was vertically set and preserved at 1.38 m length, but was truncated from above – first by the construction cut for the large land tie, G562 (Phase 5) and later by the gas pipe construction cut, SM22609 (G541, Phase 6).

Interpretation

Group G463 is interpreted as part of a land tie consisting of construction cut and backfill, anchor beam, stretcher beam and one support post, placed under the anchor beam. Two support posts placed immediately south of the stretcher beam on either side of the anchor were expected, but such posts were not recorded. This may, however, be due to the limits of the excavation trenches, as the 2012 Guide Wall trench and the 2014 Main Excavation, did not overlap or even meet in this area.

The land tie was part of a larger system of single land ties placed as repairs or possible reinforcements of the former, existing land tie system.

Dating

From G463 one dendrochronology sample was analysed and dated. PD207329 from the south part of the anchor beam, ST24398, resulted in a felling date within the period AD 1741-56. This is in correspondence with the land tie being later than the underlying land tie repair, G466, from which the dendrochronological analysis resulted in a felling date, AD 1723[?].

Land tie G465

Structures and features related to G465 were first excavated in the 2012 Guide Wall excavation, and later extended in the 2014 Main Excavation.

Group G465 comprised a construction cut, SC15016 as the earliest feature. The cut was only seen in the Guide Wall excavation, and was recorded as irregular in shape and extending out of the excavation trench towards south, where it would have been expected to be seen in the Main Excavation. The cut was dug into the backfill over the underlying land tie, G466 (Phase 4A).

Within the cut was an anchor beam, ST15211, which extended out of the Guide Wall excavation trench towards south and was re-found in the Main Excavation and recorded as ST24402. Seen as one, this timber beam was preserved at 2.06 m length, but was truncated at the south end by the construction cut, SM22609 for a later gas pipe (G541, Phase 6). The anchor beam was made from a boxed heart cut timber, which was more or less square in cross section, 0.22 m by 0.22-0.24 m. At the north end was a halving lap in which the stretcher beam ST15036 was placed. This beam was measured as 0.77 m long and recorded as made from a quartered timber, with square cross section, 0.22 m by 0.22 m. The halving lap on the underside of the beam was placed in the lap on the anchor beam and the beams were additionally fixed with a large iron nail, leaving a lump of corrosion on the top of the stretcher beam. Near the southeastern corner of where the anchor beam and the stretcher beam met, a large, vertical support post, ST14196 was recorded. This was well preserved and taller than other posts excavated in the Guide Wall excavation.

Backfilling the construction cut was deposit SD15138, which consisted of grey sand (with a tint of red) comprising sherds of ceramics (late redwares, stoneware etc.), clay pipes (Jonah and the Whale-type), wall tile and a glass bottle sherd.

Placed 1.25 m south of the southernmost preserved part of the anchor beam, and in alignment with this, was a vertically set post, ST51948. This post was only preserved at 1.08 m length, due to truncations by the construction cut for the Phase 5 land tie, G562. The post was made from a boxed heart cut timber, 0.22 m by 0.23 m in cross section. The bottom 0.47 m was tapered into a square point.

Interpretation

G465 was interpreted as parts of a land tie, belonging with a larger system of single land ties functioning as repairs or strengthening of the former land tie system (Phase 4 A land ties).

Dating

One sample, PD25046 from anchor beam ST24402, was sent for analysis, but could not be dated. However, based on the structure design and stratigraphical observations, it seems reasonable to place G465 with other similar land ties in the vicinity, and thus, the construction of G465 can probably be dated to around AD 1760.

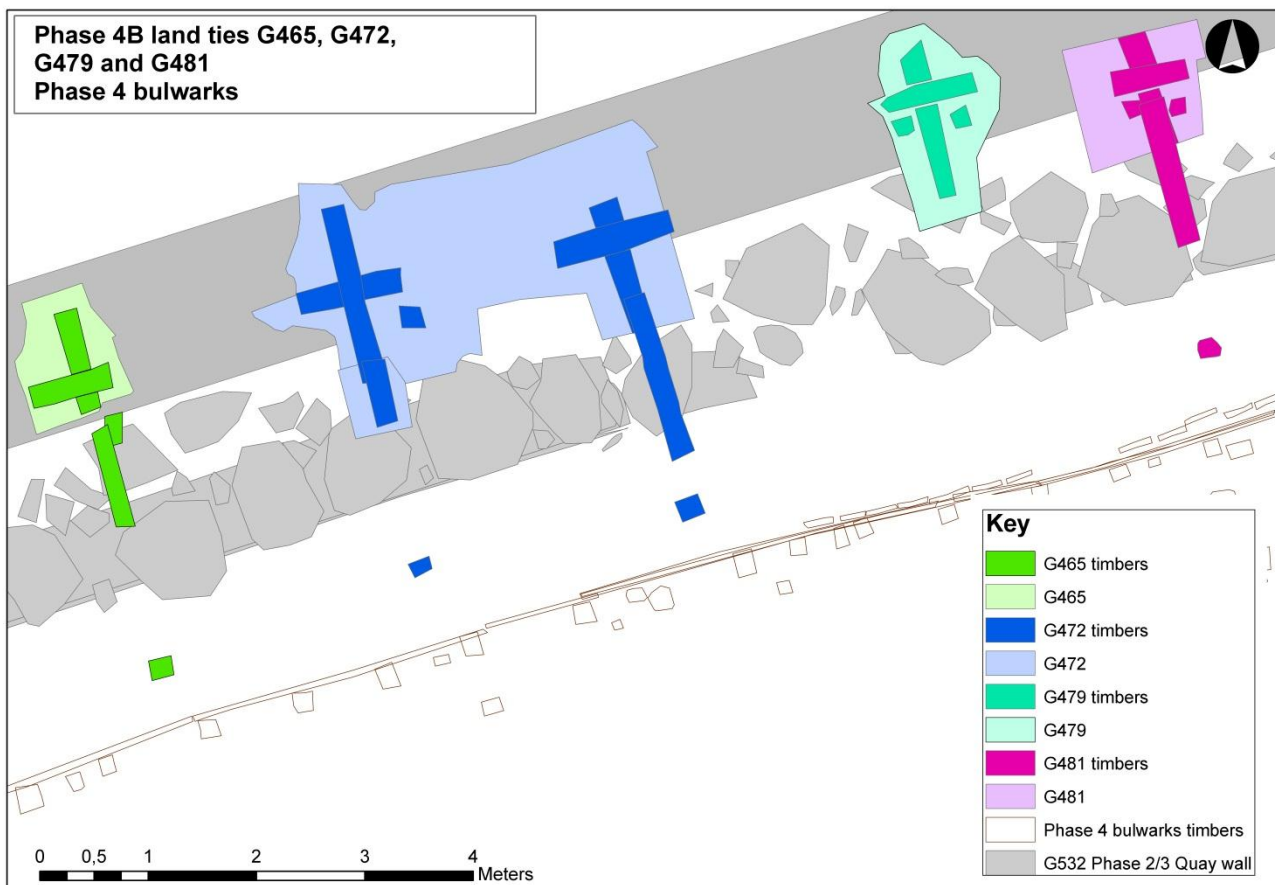


Fig. 208 Plan of Phase 4B land ties G465, G472, G479 and G481

Land tie G472

Structures and features related to G472 were initially excavated and recorded during the 2012 Guide Wall excavation, but when the area south of the Guide Wall excavation trench was excavated in 2014, further parts of the group were recorded.

G472 seems to consist of two single land tie structures inserted into one construction cut. For the sake of overview the structures are here treated separately as G472 western and eastern part respectively.

A large construction cut, SC15233, was cut into underlying backfill, SD14777 for early land tie repair, G466 (Phase 4A). Another construction cut, SC24410 was excavated south of the former in the Main Excavation

area, but the two cuts were essentially parts of the same. Seen as one, the construction cut was recorded as an irregularly shaped cut, approximately 3.9 m long (ENE-WSW) and 2.41 m wide. The recorded depth was 0.45 m. Within the cut were two anchor beams, of which the western was recorded as ST15444 during the Guide Wall excavation and the southern extension of this was recorded as ST24406 in the Main Excavation. In the eastern side of the cut, anchor beam ST15224 was recorded in the Guide Wall trench, while the southern extent of this was recorded as ST20229 in the Main Excavation.



Fig. 209 Land tie G472, north-western side. Looking NNW. C03_20120830_5459

The western anchor beam ST15444/ST24406 was preserved as a 2.10 m long beam in total, made from a boxed heart cut timber with a square cross section, 0.24 m by 0.24 m. The southern end of the anchor beam was truncated by the construction cut for the Phase 6 gas pipe, G541. A halving lap was seen 0.7 m from the north end of the anchor beam, in which the stretcher beam ST14164 was placed. The stretcher beam had the same orientation (ENE-WSW) as the stretcher in the land ties west of it (G465, G463 etc.), but was not completely aligned with these, as it was placed slightly further north. The stretcher measured 1.02 m in length and was made from a boxed heart cut timber, 0.24 m by 0.24 m. On the underside of the beam, a corresponding halving lap was found to fit into the lap on the anchor beam, and on the upper side a large lump of corrosion indicated that the structure was kept in place by a large iron nail or spike.

Near the SE corner, where the anchor beam and the stretcher beam were kept together, a large post, ST14160 was recorded. This was vertically set and measured 1.24 m in length and 0.20 m by 0.20 m in cross section. It seemed to be made from a box quartered cut timber with square cross section. Even though it was placed a little

away from the anchor and stretcher beams, it is interpreted as being a support post for the land tie.

Further SSE of the main part of the land tie structure, another support post, ST41630 was excavated during the Main Excavation. This was placed in complete alignment with similar posts west and east of it and was also aligned with the anchor beam and thus related to G472 as a support post. The post had been truncated from above by the construction cut for the later land tie, G562 (Phase 5), and was thus only preserved at 1.32 m length. It was made from a boxed heart cut timber with square cross section, 0.24-0.25 m. The distance between the stretcher beam and the post was approximately 2.5 m and from the post to the bulwark structure, G626, there was approximately 0.7 m.

Backfilling the construction cut over both the western and eastern land tie structure was a deposit, SD15276, which was recorded in the Guide Wall excavation. Another backfill in the cut SC24410 seen in the Main Excavation was recorded as SD24415. From the descriptions it seems plausible, however, that the two

cuts as well as their backfills are the same. The fill is described as a mottled layer of brown-grey sand with silt or clay. From SD15276 was collected a wide variety of animal bone (pig, cattle, sheep/goat as well as domestic goose), CBM (wall tile, floor tile and stove tile), leather, glass (window glass, sherds of bottles, beakers and a medicine flask), ceramics (redwares, grey wares, faience, Chinese porcelain, Majolica, stoneware and late light fired) along with clay pipes (a few with maker's marks).



Fig. 210 Land tie, G472, north-eastern part. Looking ENE. C03_20120830_5461

At the eastern side of the construction cut, SC15233 was another anchor beam, of which the northern end was registered as ST15224 in 2012, while the southern part was recorded as ST20229 in 2014. It is however clear that the two structures are one and the same. Seen as one, ST15224/ST20229 was preserved as a 2.45 m long beam, made from a boxed heart cut timber with square cross section, 0.24 m by 0.24 m. The beam did not extend as

far NNW as the anchor beams in the land ties west of this, which may be due to the presence of a stretcher beam in former land tie repair, G466. It may have been wished to avoid cutting further into this stretcher beam, by simply shortening the new anchor beam slightly, before inserting it. The south end of the anchor beam was truncated, but it is not clear if it was by the construction cut for later land tie, G562 (Phase 5) or something else. The gas pipe cut (G541, Phase 6) seems to be of less depth in this area than in the area west of it, but the placing of the gas pipe, seems to have left a depression in the top part of ST20229, and it may, thus have served secondarily as a bed for the gas pipe. Only 0.23 m from the north end of the anchor beam was a halving lap in which the overlying stretcher beam, ST14154 was placed. Beam ST14154 measured 1.1 m in length and was made from a boxed heart cut timber with square cross section, 0.24 m by 0.24 m. The stretcher beam was equipped with a halving lap on the underside, which was joining the stretcher to the anchor beam. It was further kept in place by a metal fixing, having left a large lump of corroded iron on the top of the stretcher beam.

Placed only 0.38 m SSE of the south end of the anchor beam ST15224/ST20229 was a vertically set post, ST38414, driven into SD37528 (G626, Phase 4 backfill of bulwark construction cut). This was made from a boxed heart cut timber with a square cross section, 0.25 m by 0.25 m. The post was only preserved at 1.1 m length, and seemed to have been reused as a support post for a later anchor beam (G624, Phase 6 land tie), at which time it had been equipped with a wooden peg at the top.



Fig. 211 ST38414 in land tie G472. Looking NNW. C02_20140527_9548

It is not completely clear if the land tie stretchers were originally meant to be aligned with each other, but could not be because of the presence of the former quay wall, G532 (Phase 2) in the area – or if the land ties were built completely individually. However, as the two parts of G472 seem to be constructed within the same construction cut – and show differences in lay-out – it seems reasonable to suggest that land ties constructed at the same time can be made with differences in the construction/layout. This can be due to former structures still in-situ in the ground that were respected either to keep the structures more or less intact – or to save the trouble of having to cut through more timbers in the ground than necessary.

Interpretation

G472 was interpreted as a somewhat unusual land tie, in that it was two single land tie structures inserted into the same construction cut. The single land tie structures were similar to the other land tie structures interpreted as parts of the same overall land tie construction phase.

Dating

From G472 two dendrochronology samples were sent for analysis – one from each of the anchor beams, ST24406 and ST20229, respectively. The results were that ST20229 (PD207276) was felled after AD 1743, while ST24406 (PD207247) was felled after AD 1751. These dates correspond with the overall impression that the series of land ties among which G472 is counted was constructed some time around AD 1760.

Land tie G479

Features and structures related to G479 were excavated in the 2012 Guide Wall excavation. One post, excavated in the Main Excavation, may originally belong with G479, but was reused in a later land tie and related to that (G632, Phase 5).

The earliest feature in G479 is construction cut SC15366, which was cut into underlying deposit SD14777, backfilling the cut for land tie repair G466. Cut SC15366 was rather irregular in shape and was recorded as extending out of the trench towards SW – but was not seen in the Main Excavation.

Within the cut was a NNW-SSE oriented anchor beam, ST14026, which was made from a boxed heart cut timber with square cross section. The beam was surveyed 1.46 m length, but recorded as 2 m long. The cross section was 0.25 m by 0.25 m. On top of the north end of the beam, a halving lap was seen to join the anchor beam with the overlying stretcher beam, ST14030. This beam was measured 0.95 m long and 0.22 by 0.22 m in cross section and made from a boxed heart cut timber. The halving lap joining it to the underlying anchor beam was placed centrally and a large lump of corroded metal on top of the stretcher beam indicates that the two beams were further kept together with a large nail or similar. The stretcher beam had signs of reuse – the western end of the beam looked tapered, and thus, the function as stretcher beam in this land tie may not have been its primary use.

Immediately south of the stretcher beam, on either side of the anchor beam, were two vertically set posts, ST14021 and ST14017. These were both made from boxed heart cut timbers with square cross sections, 20 by 0.2 m and 0.18 m by 0.18 m, respectively. It is not clear if ST14017 was lifted out of the ground during the excavation, as the length is measured to 1.21 m – but as no length is recorded for ST14021 this must have stayed in the ground.



Fig. 212 Post ST51244 - possibly originally a support post in Phase 4 land tie G479, but reused in Phase 5 land tie, G632. Looking NE. C02_20140404_8855

G632 (Phase 5), but may originally have been a support post for land tie G479. This is based on the location of the post in direct alignment with the anchor beam and in alignment with similar support posts in the land ties on either side of G479. The description and photos of the post further support that this has been secondarily used as slanting (though vertical) post in G632. The post was irregular in shape, shorter and had a flat top and did not look like the other posts in the Phase 5 land ties.

The backfill, SD15393 in the construction cut was described as coarse grey-brown sand with moderate inclusions of CBM – much like the backfills of other land tie cuts belonging to the same construction phase. Finds collected consisted of a few fragments of clay pipe and ceramic sherds as well as animal bone.

At 2.05 m SSE of the surveyed southern limit of anchor beam ST14026, was post ST51244. This was related to the later land tie,

Interpretation

Group G479 was interpreted as a land tie constructed to keep the bulwarks in place. It seems to be very similar in construction and layout to the other later Phase 4 land ties in the area – consisting of construction cut and backfill, anchor beam, stretcher beam, two posts on the south side of the stretcher as well as one below the anchor beam, closer to the bulwark.

Dating

From G479 no dendrochronology samples were sent for analysis and the dating of the construction is thus based on stratigraphy and the similarity with other well dated land tie structures. From this it seems reasonable to place G479 among the late land tie structures in Phase 4B which seem built around the 1750s.

Land tie G481

Features and structures related to G481 were initially excavated during the 2012 Guide Wall excavation, but more was added in the 2014 Main Excavation.

The earliest feature of G481 was the construction cut, SC15430. This was recorded as extending out of the Guide Wall trench towards south, but was not seen in the Main Excavation. The cut was described as sub-



Fig. 213 Land tie G481 excavated during the 2012 Guide Wall excavation. Looking SSE. C19_20120830_3836 (cropped)

rectangular with rounded corners, steep sides and a flat base. Within the cut, the NNW-SSE oriented anchor beam was recorded as ST15517 in the Guide Wall excavation, and the southern extension of this was excavated and recorded as ST20202 in the Main Excavation. Seen as one, the anchor beam measured 2 m long and was made from a boxed heart cut timber with a square cross section, 0.26 by 0.26 m. Located 0.3 m from the NNW end was a halving lap in the upper side of the anchor beam, in which the stretcher beam, ST14353 was placed. This was also made from a boxed heart cut timber and measured 0.85 m long. The halving lap on the underside of the beam kept it joined with the anchor beam and a large lump of corrosion on top of the beam indicates that the beams were fixed to each other with a large iron nail or spike. Immediately south of the stretcher beam, on either side of the anchor beam were two posts, ST14099 and ST14103, which were both boxed heart cut timbers.

ST14099 was taken out of the ground for further examination and was seen to be tapered to a point at the lower end. The post was only preserved at 1.26 m length, but may not have been much longer originally, as it was driven into the top of the former stone quay wall, G532 (Phase 2). This would probably have caused the slight bending of the tip of the post.



Fig. 214 ST14099, G481, taken out of situ. The tip of the driven in post is bend. C19_20120906_3856

The backfill, SD15440 was located over and around the timbers within the cut. Deposit SD15440 was described as mottled, brown-grey sand with silt. A lot of animal bone (cattle, pig, sheep/goat and domestic goose) were collected along with a few sherds of window and bottle glass, roof tile and ceramics (late redware, late grey ware, late light fired and stoneware).

Placed approximately 0.90 m SSE of the southernmost extent of the anchor beam ST20202 and in alignment with this was post ST38400. This was recorded as a boxed heart cut timber set at an approximate 5 degree angle (from vertical) and thus leaning slightly northwards. The post was square in cross section, 0.18-0.21 m in dimensions. The recorded length was 1.65 m and the lower 0.57 m was tapered on all four sides to a point. The top of the post was cut flat and it was placed approximately 0.65 m NNE of the bulwark structure, G626.

Interpretation

G481 was interpreted as parts of a land tie consisting of a construction cut, an anchor beam, a stretcher beam, two posts keeping the stretcher in place and a support post under the anchor beam, near the bulwark for which the land tie had its purpose. The physical link between the bulwark and the land tie was not preserved, as the area was heavily truncated by later building activities. Group G481 is part of a larger system of Phase 4B land ties, all made as single land ties, possibly as repairs or strengthening of the existing Phase 4A land tie system.

Dating

From G481 one sample (PD207277) from the anchor beam, ST20202, was sent for dendrochronological analysis. The result was that the timber was felled After AD 1747, which corresponds nicely with the other dendrochronological analysis results from this land tie construction phase. The dates obtained from these are all “after-dates” and thus, the timbers must have had the bark and sapwood removed.

Land tie G487

G487 was initially excavated during the 2012 Guide Wall excavation, but partly re-excavated and one additional timber post excavated in 2014.



Fig. 215 Land tie G487 as seen in the 2014 Main Excavation. Looking W. C02_20140407_8867 (cropped)

G487 comprised four timbers of which two were vertical posts, ST14747 and ST16115 driven into the ground from an unknown stratigraphical level (due to the 2 m depth limit in the Guide Wall excavation this could not be identified – and it was not recorded in the Main Excavation). Between these posts were the remains of an anchor beam, ST14740. This was surveyed as at least 1.15 m long, but as the north end of it seemed to extend into the depth limit of the Guide Wall trench it could not be followed. The south end, re-surveyed in 2014, was truncated by the construction cut for a Phase 5

land tie, G580. The anchor beam was NNW-SSE-oriented and was made from a boxed heart timber cut, which was rectangular in cross section, 0.25 m wide and at least 0.15 m deep. It is not completely clear what the physical relationship between G484 and G487 was, as G487 seems to be extending under the south end of the G484 anchor beam ST14087, as this is visible from the photos (e.g. C19_20120907_3875) – on the other hand the same anchor beam, ST14087 (G484) seems truncated in a way that indicate, that the construction of the anchor beam ST14740 (G487) was what actually truncated it, though no construction cut was recorded. In the top of the anchor beam was a halving lap, but there were no timbers found to fit into this. A stretcher beam placed north of the two posts and into the halving lap would have been expected, but must have been removed at some stage.

Within the Main Excavation trench, one post, ST28033 was excavated in 2014. Due to its location in alignment with the anchor beam, ST14740, and its similarities with support posts for the Phase 4B land ties west of this (boxed heart cut, square cross section etc.), it was grouped as part of G487 as a support post.

Interpretation

G487 can be interpreted as parts of a land tie, belonging with a larger system of single land tie structures made to replace or reinforce the existing Phase 4A land tie system. In the first place it may seem odd that the anchor beam belonging with G487 is seen partly below the anchor beam of the land tie, G484 (Phase 4A), but as the anchor beams of the Phase 4B land ties are in general placed at a lower level above the sea than the earlier, the (unrecorded) cut for the anchor beam truncated the earlier anchor beam and the G487 anchor beam must then have slid a little under the southernmost part of the former anchor beam.

Dating

No dendrochronological samples were sent for analysis from G487 and the dating of the structure therefore relies on the similarity between this land tie with other Phase 4B land tie structures, supported by stratigraphical observations.

Land tie G482

Contexts related to G482 were mainly excavated during the 2012 Guide Wall excavation, but some of the contexts were re-excavated in the Main Excavation and more added.

The first feature of G482 was the construction cut, SC15639, which was cut into the underlying backfill, SD203007 of a cut for land tie G484 (Phase 4). The cut was irregular in shape, but had a flat base. Within the cut was an anchor beam, ST14367, which was made from a boxed heart cut timber with a more or less square cross section, 0.22-0.26 m wide and deep. The orientation of the beam was N-S with a slight deviation towards NNW-SSE. Near the northern end was a halving lap in which the stretcher beam, ST14357 was joined to the anchor beam with a corresponding halving lap. The beams seemed further fixed to each other by an iron nail or spike. The stretcher beam was likewise a boxed heart cut timber with rectangular cross section, 0.18-0.22 m in dimensions. The beam was measured as 0.81 m long, but seemed to have been truncated at the east end by the construction cut, SC14395, for the timber drain pipe, G315 (Phase 4).

Placed immediately south of the stretcher beam, on either side of the anchor beam, were two vertically set posts, ST14377/ST20252 and ST15750/ST20256. These were both initially documented in the Guide Wall excavation but re-excavated and recorded with new numbers in the Main Excavation. The posts length could not be measured, but they seemed both to be boxed heart cut timbers with rectangular cross sections, 0.17-0.21 m in cross section dimensions. Wedged in between the westernmost post, ST14377/ST20252 and the stretcher beam, ST14357, was a piece of timber plank, recorded as ST14373. It is not clear why this wedge was put in or at which stage this was done.

Overlying the timbers within the construction cut was backfill deposit, SD15654, which was a layer consisting of mottled, brown-grey silt and sand. The deposit contained animal bone (cattle, pig, sheep/goat, domestic hen, domestic goose, roe deer along with uncharacteristic mammal bones), glass sherds (pas-glass, bottle), and ceramics (late redware, stoneware, late light fired, late grey ware).

Placed 1.4 m south of the southernmost preserved part of the anchor beam, ST14367 was a post, ST38430, which was recorded as 1.4 m long with a tapered bottom end and square cross section, 0.21 m by 0.21 m. Based on the alignment with the anchor beam and with the similar support posts belonging with other land ties west of this, ST38430 is related to the land tie as a support post.

Interpretation

Group G482 was interpreted as parts of a land tie structure belonging with a larger system of singularly constructed land ties, made to keep the bulwark structure in position as a replacement or reinforcement of the Phase 4A land tie system.

Dating

G482 was not prioritized for dendrochronological analysis. However, due to the structure's similarities with other land ties, it is reasonable to assume that this was also constructed at the same time. The structure was truncated by the construction cut for the box built wooden drain pipe, G315, which was dated to after AD 1775 (PD202642 from ST14052), which then offers an upper time limit for the construction of G482.

Land tie G494

Features and structures were excavated during the 2012 Guide Wall excavation, but the group was changed during the post excavation process after the 2014 Main Excavation.

Unlike other land ties, no construction cut was related to G494. Anchor beam, ST14663 appears to have been placed partly on top of or abutting a beam belonging with underlying land tie, G493 (Phase 4A land tie). The southern end of the anchor beam was truncated, possibly due to the construction of gas pipe G541 (Phase 6). A possible southern extension of the anchor beam was recorded as ST14339, but this cannot be said with certainty. This was a short piece of timber beam placed between a post, ST13500 (G494) and a stretcher beam, ST13531 (G575, Phase 5 land tie), but the stratigraphical relations between these timbers were not clear and thus it stays un-verified if ST14339 is actually a heavily truncated piece of the anchor beam for G494. In the north end of ST14663 a shallow lap joint was seen, but there were no timbers joined to this, so it may also be an indication of a former use of the timber beam.

Placed on the western side of anchor beam, ST14663 was a vertically set post, ST13541, which was square in cross section, measuring 0.2 m by 0.2 m. This may have served as a post to keep a stretcher beam in place on top of the anchor beam. The opposite side of the anchor beam was truncated by an unrecorded disturbance, so the post expected in this area was not seen.

Overlying the northern parts of G494 were two deposits, SD14381 and SD14318. These are probably construction cut backfills, which were described quite similarly; grey-brown silt and sand.

A post, ST13500 was placed S of the anchor beam and in alignment with this. This was not fully excavated and was first seen to be part of an even later land tie structure, but may instead have been a support post for the land tie G494, as the placement and general attributes are very similar to those of support posts for Phase 4B land ties west of this.

Interpretation

Group G494 is interpreted – with caution – as parts of a land tie belonging with the large system of singularly constructed land ties in Phase 4, made to keep the bulwark in place. However, based on the

dendrochronological date (see below) it may be a repair of the Phase 4A land tie, G493 – or a replacement of a land tie, using old or reused timber.

Dating

One dendrochronological sample was analysed from G494 (PD202638 from post ST13500) and resulted in a felling date after AD 1726.

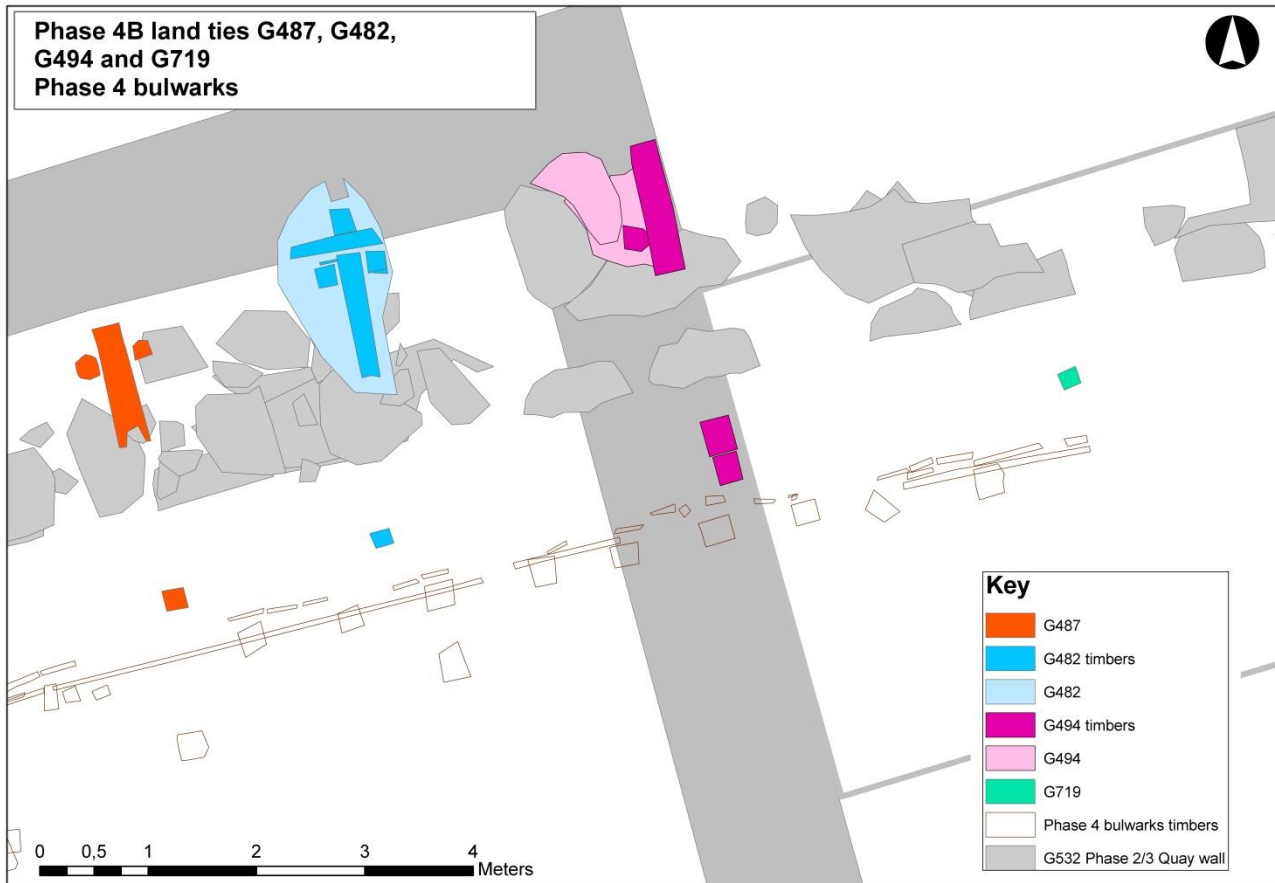


Fig. 216 Plan of Phase 4B land ties G487, G482, G494 and G719

Land tie G719

G719 was excavated in the Stairway trench in 2014. It consisted of one post only, ST36298, recorded as a 2 m long timber post, made from a boxed heart timber cut with square cross section, 0.22 m by 0.22 m. Due to its location it was first thought to belong to the Renaissance quay wall as a storm post, but the result of the dendrochronological analysis required a change of interpretation.

The one post in G719 is interpreted as part of a land tie structure. The post was probably a support post, formerly placed under the south end of an anchor beam, which was however not preserved. The structure was probably truncated – almost beyond recognition – by the Phase 5 land tie, G599, as well as by the cut for a modern gas pipe. The post is placed in alignment with similar land tie support posts seen in the Phase 4B land ties, west of this, e.g. G484, G482 etc. and the date supports the interpretation.

From the post, ST36298, a dendrochronology sample (PD212231) resulted in a felling date after AD 1743.

7.4.3.2.5. Discussions – Phase 4B land ties

From the large group of Phase 4B land ties, 25 samples were sent for dendrochronological analysis. Of these, 21 resulted in felling dates. Four of the samples had relatively accurate results: AD 1734[?], AD 1741-5, AD 1748-60 and AD 1749-60, whereas the rest resulted in felling dates ranging between “After AD 1709” and “after AD 1761”.

The overweight of “after”-dates indicate that the timbers were in general worked in a way that meant that the sapwood and bark was removed – contrary to the Phase 4A land ties, where the majority of the timbers analysed were preserved with the sapwood and bark still on. From the dendrochronological analysis it is also evident that the Phase 4B land ties were made primarily from oak, but a few timbers were pine. One of the pine timbers (ST21368, G554) was dated to after AD 1761 (PD207769) and may thus be a repair of the land tie’s anchor beam. Another pine timber (ST21327, G553) was probably felled in AD 1734[?] (PD207765), and is probably a reused timber beam, though this was not visually evident from the observations made in the field.

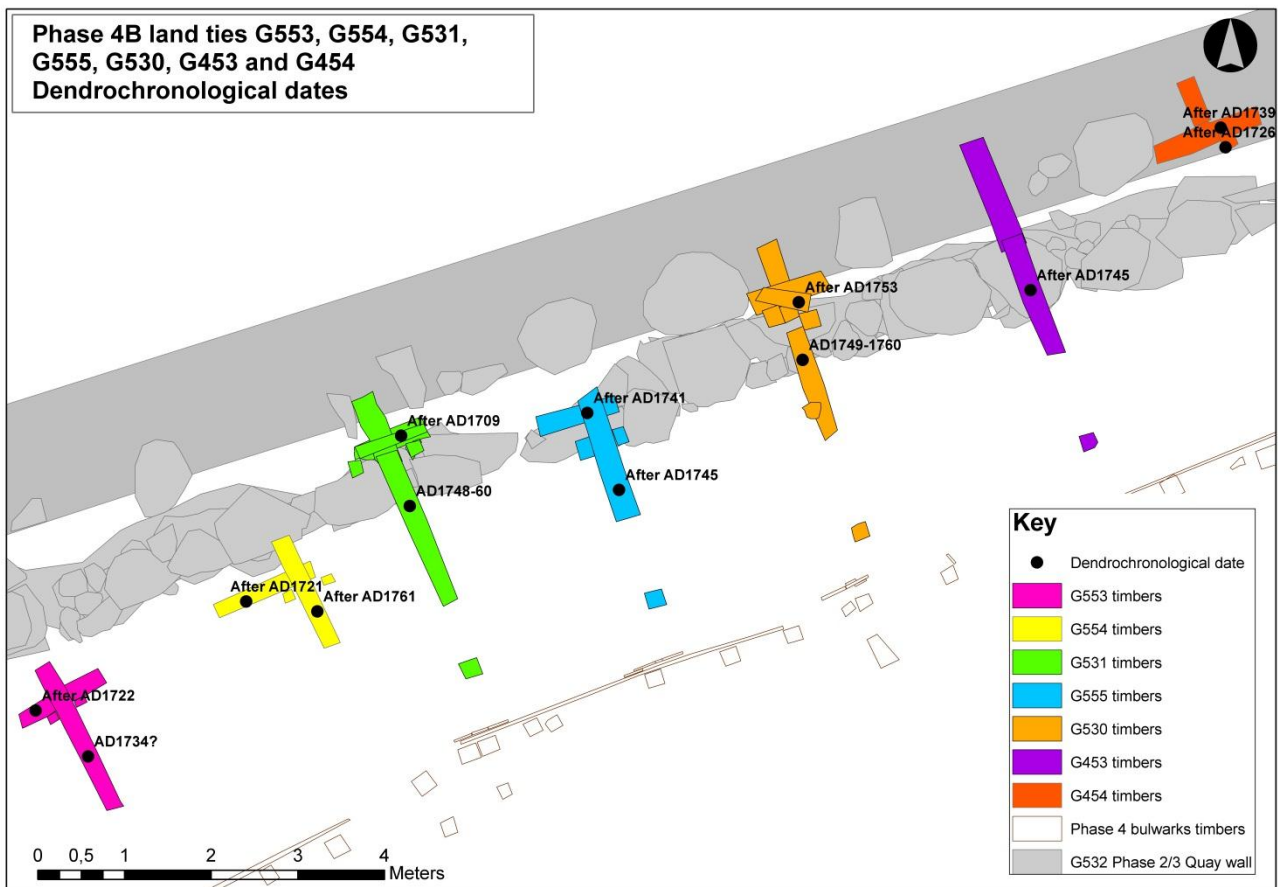


Fig. 217 A section of Phase 4B land ties with dendrochronological dates ranging from after AD 1709 to after AD 1761

The finds material collected from the construction cut backfills of the Phase 4B features is varied, but appears to be materials dug up from older contexts and put back into the construction cuts as backfills. Thus, the dates of the finds are expected to be older than the construction of the land ties.