

7.4.3.7. Service pipes

Group	Sub-groups	Group name
	223; 708	Sewer complex with southern extension
	314	Wastepipe (sub-group to G224 gutter)
	423; 689	Sewer complex with southern extension
413		ENE-WSW oriented pipe
438		WNW-ESE oriented pipe
	212	Drain pipe (sub-group to G305)
235	584	Sewer and repair
442		Culvert
	206; 370	Service pipe
441		Possible drain foundation
445		Drain
446		Wooden pipe
638		Drain pipe
452		Culvert
459		Drain
464		Drain
612		Water pipe
474		Culvert
211		Service pipe
315		Culvert/drain
491		Drain

Table 50 Groups related to Phase 4 service pipes

7.4.3.7.1. Introduction

During the watching briefs in 2010-11 a series of timber structures interpreted as gutter canals in a large system of sewers were found and documented. In a number of cases the southern extensions of these were found during the Guide Wall excavation and even in the Main Excavation.

In the following the groups interpreted as service pipes, including drains, sewers and/or culverts are presented as seen in the Guide Wall and Main Excavation areas from west to east. The two sub-groups, SG223/SG708 and SG423/SG689, which seemed to be related directly to the buildings at the western end of the excavation area, have been partly described above in the buildings sub-chapter, but will be dealt with in more detail below.

In most cases, the groups interpreted as drains consist of a wooden pipe, but there are a few exceptions to this rule, where either the pipe is not preserved or the drain would have been constructed differently.

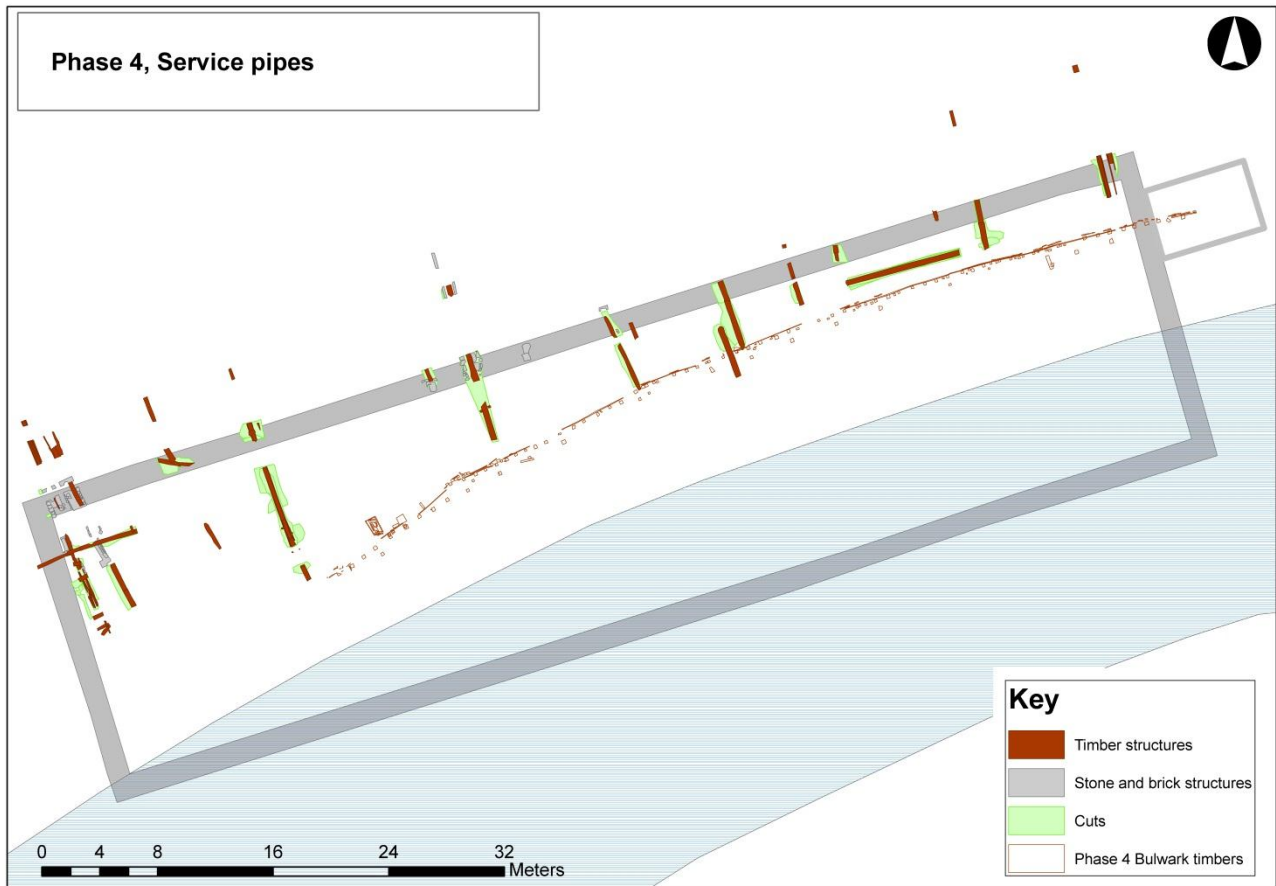


Fig. 276 Phase 4 service pipes

7.4.3.7.2. Groups interpreted as service pipes

The groups and sub-groups interpreted as service pipes, including drains and culverts are presented in the following from west to east.

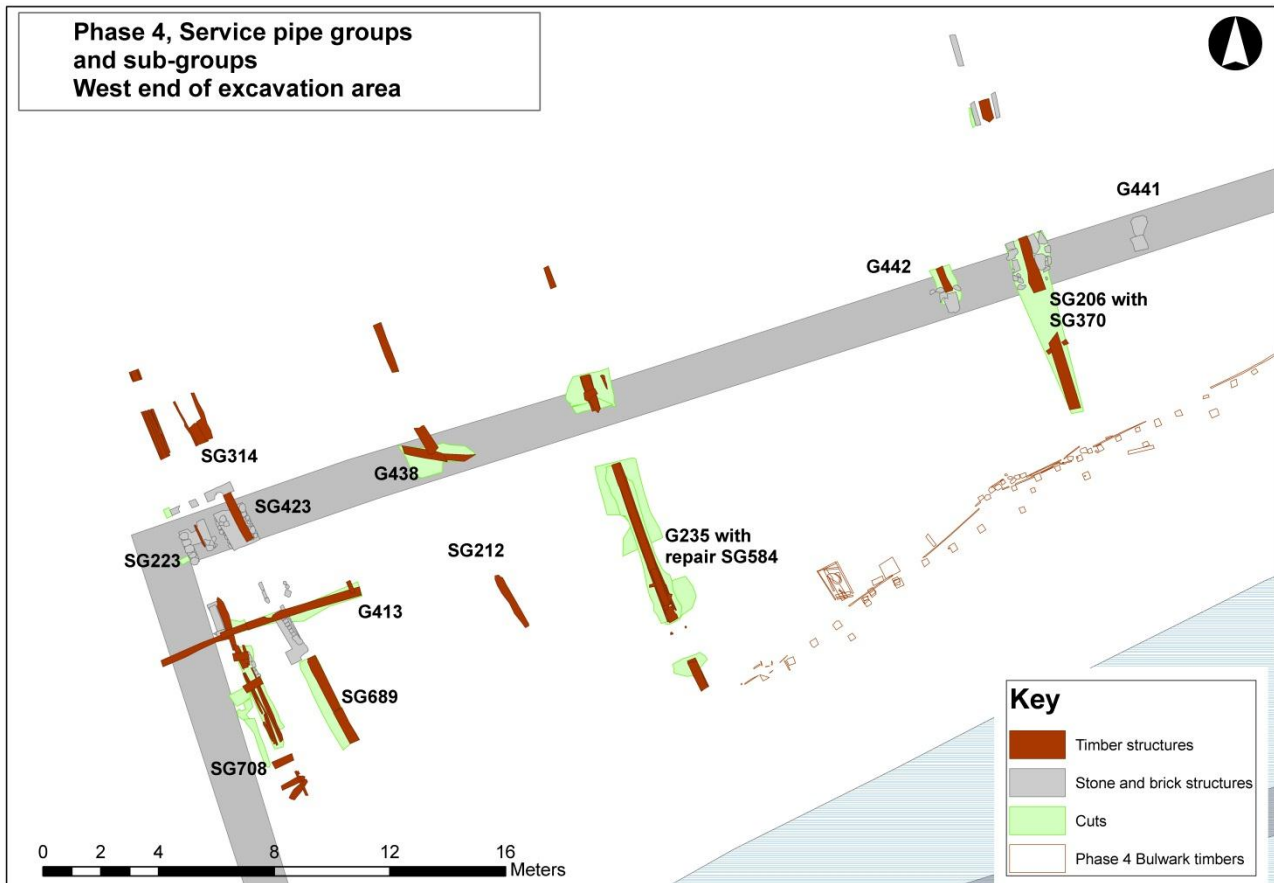


Fig. 277 Phase 4 service pipe groups and sub-groups, west end of excavation area

Sewer complex SG223

Sub-group SG223 was first partly excavated during the 2010 watching briefs on Gammel Strand. Then the timber structures ST6975, ST7437, ST7456 and ST7517 were interpreted as being part of a gutter system leading water and dirt from the street via a Main channel (not found) and several other channels towards the canal. More observations of structures and features belonging to SG223 were documented during the 2012 Guide Wall excavations. The sub-group was located in the northern part of the Guide Wall Trench 1/ZT9164 and down the eastern edge of this. The sub-group SG223 is a sub-group to SG709 (1st building phase of western building, G537). In 2014 structure SG708, following the same alignment NNW-SSE, was excavated south of SG223. It is not completely clear how these were related to each other, but SG708 seems to be part of the second building phase, SG710 of G537.

It was seen from the Guide Wall excavations that SG223 consisted of a construction cut, SC11609, measuring 1.99 m long and 0.22 m wide and 0.1 m deep. The dimensions were not the actual extent of the construction cut, as it extended out of the trench towards the NNW. In the SSE direction the cut seemed to vanish, whereas timber structures related to the same group were found further towards SSE. In the

northernmost part, the construction cut (SC11609) truncated underlying deposits belonging to G427 (Phase 4 levelling). Within the cut SC11609 was backfill deposit SD203107 from which no finds were collected.



Fig. 278 SS12545 (SG223) excavated during the 2012 Guide Wall excavation. Looking ENE. C03_20120726_5215 (cropped)

Above SD203107 was a stone structure, SS12545, which consisted of nine sub-rounded boulders (between 0.30 m and 0.28 m in length), forming the western and the eastern linear parts of a structure approximately 0.4 m apart. The structure was truncated towards the north by gas pipe construction cut SM9729 and to the south by gas pipe construction cut,

SM9090. In the northeastern part, no boulders were placed, and in stead an earlier stone structure, SS11789 (G430, Phase 2 road), seemed reused as foundation stones.



Fig. 279 SS9609, SG223 excavated during the 2012 Guide Wall excavations. Looking NNW. C03_280612 4623 (cropped)

Above SS12545 was the northern part of SS9609, a brick structure consisting primarily of mid yellow bricks (0.265 by 0.125 m by 0.06 m). The side walls, resting on each of the parts of SS12545 were built five courses (approximately 0.31 m high in total), and from here, a brick arch was built, forming a vaulted roof between the two walls. The inner height of the vaulted area was 0.62 m measured from the top of the foundation stones SS12545. The internal width of the structure was 0.32 m and its external width was up to 1 m. Brick structure SS9609 was highly truncated by later activities towards north and south. North of the disturbance SM9729 the structure survived only as two little fragments of brick structure (each only approximately 0.25 m by 0.25 m in plan), the western of these resting on a boulder similar to the stones in SS12545. On the south side of the modern disturbance, SM9090, SS9609 survived as a linear brick and stone structure, which would have been the southern extent of the western wall of SS9609. This part of the wall was resting on existing stone structure SS11242 (SG424, G537, Phase 4 building), and seemed also to have been surveyed

as SS9127. It is not clear if the structure would have been forming a vault all the way south, as the eastern side of it would have been east of the excavation limit of Trench 1/ZT9164, but did not survive in the Main Excavation area.

Linear timber structure ST13104 was seen at the northern part of G223. It was placed immediately west of and parallel to the eastern part of the foundation stones SS12545, recorded on the same level as the top of these. It is not clear if the timber was found in-situ, but it was interpreted as either foundation wattle or simply the floor of the vaulted brick structure SS9609. ST13104 did not appear to extend beneath the brick walls or stone foundation.

Further towards the SSE was ST11222, a plank built structure consisting of a flat plank base and a plank sat on edge on the western side of the base. This was excavated during the Guide Wall excavation and extended out of the trench towards east. The structure seemed founded on the existing stone foundations, SS11242 belonging with G424 (Phase 4, wall).



Fig. 280 SS9609 (/SS9127) and ST11222, SG223 excavated during the 2012 Guide Wall excavation. Looking SSE. C03_20120717_4949

Overlying the plank base as well as the lower parts of the stone and brick structures, SS9609 and SS9127, was deposit SD9701. From this 21 cowrie shells (FO203075, FO203254 and FO203255) were collected along with large amounts of glass, ceramics, clay pipes and animal bones.

The animal bone from SD9701 was all hand collected and was subjected to analysis. The analysis resulted in the following conclusions. The animal bone material from SG223 was dominated by the domesticated mammals. The small collection of fish remains, two fragments, from haddock and gadids represent the wild species. Otherwise the limited size of the collection, 22 fragments in total, does not facilitate many conclusions to be drawn for this group. But based on species and element distribution it is certainly likely that all of the bird and fish remains and most of the mammalian remains were part of meals. Cut marks were identified on elements from haddock, bird, pig, cattle and sheep/goat, thus supporting the notion that this material was waste from household consumption. The distribution of elements between fish, bird and mammals is likely to have been influenced by the lack of sieving from all SG223 contexts, thus

underrepresenting the first two and over representing the importance of the latter. The gnawing marks made by rodents on the cleithrum from haddock and the metatarsus from sheep/goat suggest that some of the bone elements were exposed on the surface for a while (Bangsgaard et al 2016).

Interpretation

SG223 is interpreted as a culvert or drain, possibly running from the buildings on the northern side of the square Gammel Strand (current Gammel Strand 44, in 1757 matr. 13, Strand Kvarter) and towards the canal. The structure consists of a box drain built of planks which in places has been covered over with brick arches, founded on either separate stone foundations or on building parts related directly to the building

complex, G537. The culvert seems to be planned along with the building complex, G537, in that it neither seems to truncate the underlying building structures nor be truncated by the construction of these.

Dating

From SG223 no directly dateable material was retrieved. However, as at least parts of the structure seem to have been built at the same time as the construction of the building, SG410/G537, the dating of the construction and possibly also the usage of the structure may be contemporary with this.

Southern extension SG708

The contexts related to SG708 were excavated first in the 2012 Guide Wall excavation and later extended in the 2014 Main Excavation. The sub-group was located in the southwestern corner of the Main Excavation area and Guide Wall Trench 1/ZT9164. Sub-group SG708 is a sub-group to G710 (Phase 4 western building).

From what was excavated during the Guide Wall and Main Excavations, SG708 consists of four construction cuts, SC9550, SC10276, SC10290 and SC28889, which may, however, all essentially be the same linear, NNW-SSE-oriented cut, but were excavated at different times and under different conditions and joined in the post excavation process. In total the length of these cuts was 5.2 m, but as it is not clear how SG708 relates to SG223 it may have extended further NNW. The total width of the construction cuts was 1.2 m and the deepest of the cuts was recorded as being 0.33 m deep. The cuts SC9550, SC10276 and SC10290 were recorded as truncating deposits belonging with groups G401 and G407 (both Phase 3 land reclamation dumps), while SC28889 truncated the upper rear stretcher beam of Phase 4A land tie, G676.



Fig. 281 ST27652, G223, excavated during the 2014 Main Excavation. Looking NNE. C03_20140325_9125 (cropped)

Construction cut backfills were recorded as SD10288 (in SC10276), SD202088 (in SC9550), SD10302 (in SC10290) and SD28934 (in SC28889). These backfill layers contained finds of animal bone, ceramics, clay pipes and glass as well as a few metal objects and organic materials.

Placed transversely in the cut, SC28889, were three short planks, recorded as ST36937. These were 0.65-0.75 m long and placed with 0.85 m and 2.55 m distance between them. Above the northern parts of ST36937 was another plank, ST27785. This plank was 0.8 m long and NNW-SSE oriented. ST36937 and ST27785 may be interpreted as a means of lifting the timber drain structure (ST27652 – see below) to the right angle. The even more southerly ST38341 and ST38328 may have served the same purpose.

The above lying structure consisted of six planks, surveyed as ST27652. These formed a partly destroyed box-like structure consisting of edge-set plank sides and what used to be the roof of the box – now collapsed into it. Altogether, ST27652 was 3.7 m long and 0.43 m wide. The edge-set plank, ST38358, found on top of ST38341 and ST38328 may well be the southern continuation of the eastern plank side of the box. This was probably supported by the narrow vertical plank, ST38353, driven into the ground. It is

not clear if there was a preserved base plank in the box structure all the way south, as this element was not recorded separately. However, two deposits, SD27793 and SD28362, were recorded as alluvial deposits from within the pipe, ST27652. The upper of these layers, SD27793 consisted of medium grained sand and thin clay lenses and contained a few fragments of clay pipe stems, window as well as bottle glass sherds, an iron bolt as well as ceramics and animal bones. The lower layer, SD28362 was actually two different types of material, the uppermost a reddish brown organic layer with rotten wood and possible straw or sawdust, manure, sand, bone and some fine gravel and the lowermost a deposit of coarse, well bedded but not laminated sand mixed with CBM, wood, bone, gravel, and many artefacts. SD28362 contained many finds of ceramics, glass, clay pipes and animal bone. Among these was a clay pipe fragment (FO212741) produced in Copenhagen in 1753-55 and a collection of 78 cowrie shells (FO211730).



Fig. 282 ST27652 and SS28299 excavated in 2014 Main Excavations. Looking ENE. C03_20140325_9130 (cropped)

From SD27793 and SD28362 samples were sent for macrobotanical analysis. The results were that both PM214848 (from SD27793) and PM214828 (from SD28362) showed only a few plant remains among which most were seeds of cultivated plants like elder (*Sambucus nigra*), figs (*Ficus carica*), rye (*Secale cereal*), raspberries (*Rubus idaeus*), grape (*Vitis vinifera*) as well as wild strawberry (*Fragaria vesca*) (Ranheden 2016).

The same two deposits, SD27793 and SD28362 were analysed for faunal remains, primarily collected from fine sieving. From these samples, PM214827 (from SD28362) and PM214847 (from SD27793), no less than 12 different species of fish (saltwater, fresh water and migrating species) were identified along with mammals (dominated by cattle, sheep/goat and pig, but also comprising a few bones of hare, rat and cat) and a few birds (Bangsgaard et al 2016).

On the eastern side of the northern part of ST27652 a linear stone and brick structure, SS28299, was documented. This consisted of a single row of mixed bricks and stones fitted into the construction cut, SC28889 and supporting the outer side of the eastern plank wall of structure ST27652. From the photos taken it is evident that there are also bricks lying within or directly on top of ST27652, which may be collapsed or demolished sections of a vault or arch over the wooden box structure. The location of both SS28299 and the bricks corresponds with where the structure passes through the stone wall and foundations SG409 and SG410 (both belonging with SG710, the second building phase of G537, Phase 4 western building).

Interpretation

Sub-group SG708 is interpreted as a drain or culvert constructed along with the second building phase (SG710). It may be a repair or replacement of a former drain/culvert of which parts were still preserved as SG223 NNW of SG708.

Dating

Two dendrochronological samples from ST27652 were analysed and the results were after AD 1747 (PD29156) and after AD 1750 (PD29155). Timber foundations of the building, on or into which SG708 was constructed (SG410, G537) were dated more accurately to AD 1778 winter which may provide the actual date for when this part of the drain structure was constructed. The dendrochronological dates are supported by the finds materials found within the drain pipe.

Wastepipe SG314

Sub-group SG314 was partly excavated during the 2010 watching briefs on Gammel Strand. In the report covering these excavations (Olesen & Bork-Pedersen 2012), it was linked to SG313 and the two sub-groups were related to G224, interpreted as part of a gutter system. During the 2012 Guide Wall excavations a wooden pipe was excavated and was linked to SG314 as the southern extension of this.



Fig. 284 ST13150 (SG314), partly excavated during the 2012 Guide Wall excavation. Seen in section towards N. C03_20120727_5252 (cropped)

Sub-group SG314 comprised three timber structures, documented during the watching briefs (ST7446, ST7477 and ST7489) with one timber structure (ST13150) partly excavated during the 2012 Guide Wall excavations. Together these formed a linear wooden structure oriented NNW-SSE. The descriptions are sparse, but it seems that ST13150 was a linear box structure consisting of a plank lid and an underlying base and sides made of either planks or a hollowed out log. It was rectangular in cross section. The structure was overlain by stone and brick culvert SG423 (Phase 4), which may be seen as a later replacement of SG314. Structure ST13150 was preserved at 1.29 m length and 0.28 m width. It was recorded as

being 0.16 m deep. Both SG314 and the overlying SG423 were truncated by the modern disturbances,



Fig. 283 ST13150 (SG314), excavated during the Guide Wall excavation. Base of drain pipe. Looking E. C03_20120727_5270 (cropped)

SM9729 and SM9090, and ST13150 did not survive anywhere south of SM9090. The sub-group SG314 was, after the Guide Wall excavation, interpreted as a closed box drain or culvert running in a NNW-SSE direction from the buildings at Gammel Strand (current Gammel Strand 42, in 1757 matr. 12, Strand Kvarter) towards the canal. As the drain pipe could not be found south of

modern disturbance SM9090, it is not clear where it would have had its outflow. The structure may be the predecessor of stone and brick built culvert, SG423, which was built partly on top of ST13150.

From SG314 no finds or dendrochronological samples were collected. It seems reasonable to assume that SG314 belongs with the majority of other drain pipes excavated at Gammel Strand, and thus is constructed in Phase 4.

Sewer complex SG423

Sub-group SG423 was partly excavated during the 2012 Guide Wall excavation as a culvert sub-group to the 1st building phase, SG709, of building complex G537. The sub-group was extended south during the Main Excavation and located in the northern part of Guide Wall Trench 1/ZT9164, immediately east of the structure SG223, and extending slightly into the northwestern part of the Main Excavation trench.



Fig. 285 SS9645, SG423 (to the right), SG223 is on the left), excavated during the 2012 Guide Wall excavations. Looking NNW. C03_20120725_5161 (cropped)

The sub-group, SG423 comprised three contexts, excavated during the Guide Wall excavation as well as one excavated in the Main Excavation. The earliest of these is SS12626, which consisted of two linear parts constructed from boulders of varying sizes between 0.15 m and 0.34 m in length. The structure was oriented NNW-SSE and was truncated to the north by modern disturbance SM9729 and to the south by modern disturbance SM9090. The eastern part of it was preserved over 1.32 m by 0.44 m and comprised the bigger stones, whereas the western part was preserved over 1.36 by 0.43 m in plan. The gap between the two parts was approximately 0.29 m wide.

The eastern side of SS12626 was placed on top of ST13150 (G314), which may be a predecessor of the culvert. The western part of the structure overlay SS11789 (G430, Phase 2 road).



Fig. 286 SS9645 and SD9702, SG423, seen in section in northern edge of Guide Wall trench. C03_280612 4661 (cropped)

Founded on SS12626 was brick structure SS9645, built primarily of light yellow bricks, measuring 0.23 m by 0.13 by 0.07 m. The brick structure consisted of two parallel walls, each built of five courses and between these an arch or vault. The inner height of the brick arch was 0.60 m measured from the top of the foundation stones, SS12626, to the inner top of the arch of SS9645. The outer width of SS9645 was approximately 0.99 m. The roof of the culvert comprised of more slender bricks of yellow/salmon pink colour. The slender roof bricks measured

approximately 0.235 m by 0.12 m by 0.05 m. The arched culvert was bricked up in the SSE end, close to the southern edge of the excavation area (Guide Wall excavation Trench 1/ZT9164). The bricks used to seal it appeared like those used in the construction of SS9645 and may have been reused from this. They were bonded by hard, grey coloured cement. There was no recognisable bonding of the bricks in the blockage.

Inside the brick structure, fill soil was recorded as SD9702. This was a sequence of different layers which may be deposited for several reasons. The material at the top of the sequence was coarse sand, and under this were lenses of alternating fine and coarse sand. Below this was material described as a 0.02 m thick layer of organic material/old wood and the lower 0.23 m consisted of coarse sand, containing animal bone and ceramics. The base was likewise rotted wood, approximately 0.03 m thick. The two animal bones collected from SD9702 were analysed and comprised of a pig's bone and an unidentified mammal bone.

During the 2014 Main Excavation, very poorly preserved remains of a brick structure, SS37428, were documented and suggested to belong with SG423. This structure comprised of two parallel, but hardly recognisable parts of a NNW-SSE oriented brick and stone structure. Only one course of salmon pink and yellow bricks and a small boulder survived in each side and was placed on top of the Renaissance quay wall (G532). The structure was 0.81 m long (NNW-SSE) and 0.95 m wide. The northern extent of this was found 1.37 m SSE of the southernmost extent of SS9645.

Interpretation

Sub-group SG423 was interpreted as an arched culvert having fed foul water from the buildings on the northern side of present day Gammel Strand towards the canal. It is not clear if the arch formerly contained a wooden drain pipe, as only a small proportion of what could be interpreted as such survived as the basal layer of SD9702. Like SG223, immediately west of SG423, it seems the arch was constructed as part of the 1st construction phase (SG709) of the building G537. It is possible that the southern extension, recorded as SG689, is the continuation of SG423, but it may also be a repair made in connection with the 2nd building phase, SG710 of building G537.

Dating

The culvert SG423 appears to be constructed at the same time as the 1st building phase, SG709 of building G537.

Southern extension SG689

The contexts related to SG689 were excavated during the 2014 Main Excavation. The group was located in direct alignment with SG423, SSE of this, but it is not clear if the two structures are in fact one and the same.

Sub-group SG689 consists of two different structure types, in that the northern part (possibly connecting SG689 to SG423) was a stone and brick structure, whereas the southern part consisted of a construction cut into which a wooden pipe was placed.

The northern part of SG689 comprised a linear, NNW-SSE oriented brick and stone structure, SS33431, which consisted of seven rectangular, red tiles and a large pan tile placed closely to each other and at the southernmost end two flat stones. The structure was preserved at 1.81 m length and was 0.21 m wide. The top levels of the structure were declining 0.13 m from north to south and the flatness of the top of it indicates that it could have worked as a base of a drain. To the west of this, an irregular brick structure,



Fig. 287 SS33431, drain base and SS26777 wall (to the left), SG689. To the right, wall SS24616, SG409. Looking NNW. C02_20140401_8812 (cropped)

SS26777 was seen to partly form the western edge of SS33431, partly overlie it. SS26777 was created from red bricks with dimensions 0.24 by 0.12 by 0.06 m. In its lower levels, the structure was narrow – only approximately 0.24 m wide, which changed at the higher courses to also cover partly over the tile and stone drain base. Stone structure SS26777 turned at the southern end towards west, and was thus almost L-shaped. The north western corner was truncated by a modern disturbance, SM27042, while the southern end was fully exposed. The eastern side of the drain base, SS33431 was made from the lower courses of wall SS24616 belonging to SG409 (south wall belonging to 2nd building phase, SG710 of G537, Phase 4 Building complex). It was noted during the excavation that parts of SS24616 appeared to have been partly demolished to facilitate the construction of the drain (see the Building sub-chapter above). Overlying the drain base, SS33431, was deposit SD28419. This deposit was not entirely uniform. For the most part it consisted of fine, well bedded sand with moderate flecks of charcoal throughout. The upper part of the deposit was capped by a thin clay-mixed sand horizon up to 0.01 m in thickness. This clay-mixed sand horizon was light grey in colour and

in some places rested 0.04 m from the roof of the drain cavity. Beneath this lay a thick dark grey sandy layer, 0.1 m in thickness. Directly beneath this lay a dark charcoal rich lens, 0.02 m in thickness. Finally, fine light grey sand, 0.04 m in thickness, rested at the base of the drain. Amongst the collected finds from SD28419 were animal bones, ceramics, clay pipes and fragments of window, bottle and Röhmer glass. A sample (PM214842) was analysed for the macro-botanical content and revealed very few macro fossils consisting only of fat hen (*Chenopodium album*) and raspberry (*Rubus idaeus*).

The southern part of SG689 comprised a linear construction cut, SC34950 as the earliest feature. The cut was NNW-SSE oriented and recorded with the dimensions 3.27 m length, 0.69 m width and 0.30 m depth. The base of the cut was flat, but sloping downwards towards south. Within the cut, a wooden pipe, ST34925 consisting of two separate pieces of hollowed out pine log was excavated. The northernmost piece of pipe was 2.0 m long and had an outer diameter of 0.35 m. The southern piece was 1.30 m long and the outer diameter was approximately 0.3 m. The hollow through the two logs was roughly 0.2 m in diameter. On the western side of the pipe, the construction cut was backfilled with SD34966, a greyish brown, silty sand which contained pieces of slag, CBM, wood and bark (probably from the log). No finds were collected

from this deposit. Inside the pipe was a deposit, recorded as SD35167. This consisted of weakly laminated, silty, coarse sand and contained a wide variety of finds: Animal bone, ceramics, glass, and clay pipes. Among the registered finds were two small glass beads (FO218107).



Fig. 288 Fill deposit SD28419 on top of drain base SS33431. Looking NNW. C02_20140328_8765 (cropped)

A macro-botanical sample (PM214830) was analysed from SD35167 and contained relatively few macrofossils. Weeds were almost absent, but a few charred seeds of cereals comprising wheat (*Triticum vulgare*), barley (*Hordeum vulgare*) and rye (*Secale cereale*) were found along with fig (*Ficus carica*), hops (*Humulus lupulus*), blackberry (*Rubus fruticosus*), elder (*Sambucus nigra*), grape (*Vitis vinifera*) and more numerous remains of raspberry (*Rubus idaeus*).

The animal bone from both SD28419 and SD35167 were analysed together and consisted mainly of mammalian remains – probably due to the large proportion of the material being hand collected instead of retrieved by fine sieving. Based on the species, cut marks and distribution of elements it was concluded that the zoological remains from these two deposits represented the waste from household consumption.

Interpretation

Sub-group SG689 is interpreted as the southern parts of a drain or culvert, possibly leading dirt and spill waters from the houses on the northern side of the Gammel Strand square (currently Gammel Strand 42, in 1757 matr. 12 Strand Kvarter) and into the canal. Sub-group SG423 was the northern part of the structure but north of this, and partly under it, SG313 and SG314 may have been predecessors of the drain. Both SG423 and SG689 comprise parts that are built into the walls of the building complex G537, but there is nothing to indicate that the usage of the culvert has anything to do with this building. However, the construction of the building and the drain may have been contemporary. East of SG423 and SG689 and parallel to these structures, was culvert SG223, which was likewise a culvert partly incorporated into G537, but not in other ways related to the building.

Dating

No samples for dendrochronological analysis were collected from the wooden pipe in SG689 and therefore the dating of this relies on stratigraphy and contemporaneity with the building complex G537, supported by finds dates. The base of the drain, SS33431 overlaid the timber foundations of G410, from which dendrochronological analysis has produced results to AD 1778 winter. Hence, SG423 and possibly also the southern extension of this, SG689, are younger than – or possibly more or less contemporary with this date.



Fig. 289 ST34925, SG689. Looking NNW. C02_20140502_9161 (cropped)

ENE-WSW oriented pipe G413

The western end of G413 was first partly exposed in the 2012 Guide Wall excavation in the southern part of Trench1/ZT9164, but not excavated due to the 2 metre depth limit. The eastern extent of the group was in 2014 excavated during the Main Excavation.



Fig. 290 ST12916, G413, exposed during the 2012 Guide Wall excavation. Looking S. C03_20120726_5220

The first part of G413 exposed was a hollowed out pine log (ST12916). The log was ENE-WSW oriented. The width of the pipe was 0.25 m and it had some bark preserved. It was noted that the pipe sloped gently downwards towards east. No construction cut was seen in connection with this part of the wooden pipe, but it is not clear if this was due to the poor observation conditions in the trench. When the area east of the former excavated part was opened in 2014, the eastern extension of what is believed to be the same pine pipe was excavated

along with another part of the same structure, ST41678. The exposed parts of the western part of the pipe (ST12916 and western part of ST41678) was in total 3.21 m long, while the preserved part of the eastern pipe was 4.14 m long. The two pipes appeared to have been joined together with a lead joint, which was however not documented. It is not clear if the documented eastern end of the structure was the original eastern extent, or if the pipe was at some point partly removed. A cut related to G650 may have removed the eastern end of the pipe, but the reasons for this were not clarified. The eastern pipe was of larger dimensions with the diameter at 0.28 m. Like the western part, it had some bark preserved on the exterior.



Fig. 291 ST41678, G413. Wooden pipe with drilled holes near the eastern end. Looking SE. C03_20140603_10532 (cropped)

Two drilled holes were recorded in the upper part of the eastern pipe – the easternmost drilled hole was 0.09 m in diameter and placed 0.68 m from the east end of the pipe, while the westernmost hole was 0.12 m in diameter and placed 1.26 m from east end of the pipe. The latter contained wood within, which would have been either a plug or what is left of a vertical pipe, as the piece of wood appeared hollow. Around ST41678 traces of a construction cut (SC42931) were found. This was linear and seemed cut into the underlying organic layer, SD56202 (G651, Phase 3 land reclamation dumps). Within the cut was – apart from the wooden pipe – a wedge shaped piece of timber (ST44591), which seemed to have served as support for keeping the wooden pipe in place. There was no construction cut backfill recorded, but from the descriptions it seems that the pipe was put into the cut and shortly afterwards the area was covered with levelling layers, SD41737 and SD55839 (both Phase 4 levelling layers), which also backfilled the cut around the pipe.

Interpretation and dating

The group G413 was interpreted as a wooden pipe in two piece joined together with a lead joint – total exposed length being 7.45 m (ENE-WSW), though the eastern end may have been removed. It may have served as a water pipe, but it is not clear where the water would have been lead to, as a possible super-structure of other pipes connected to the top of the pipe via drilled holes, was no longer present when the structure was excavated. However, the location of the drilled holes may indicate some relation to the building complex G707, even if G413 seems to be located at a lower stratigraphical level. Another possibility is that the pipe simply was reused as backfill material during the land reclamation and levelling process for Phase 4. A dendrochronological sample was analysed from ST41678 (PD211101), which resulted in AD 1686 spring/summer as a felling date. Regardless if the pipe was in use as a water pipe where it was found – or if it was reused as backfill material, it seems reasonable to place it in the very early parts of Phase 4.

WNW-ESE oriented pipe G438

Group G438 was only partly excavated (due to the 2 m excavation depth limit) during the 2012 Guide Wall excavation. It was located in the northern, middle part of Trench 1/ZT9164. The expected southern extent of the group was not seen in the Main Excavation in 2014.



Group G438 comprised a linear cut SC12424, which was oriented WNW-ESE and measured 2.22 m by 1.32 m by 0.38 m. The cut had steep sides and a flat base and was cut into the underlying stone surface, SS11789 and plank ST10421 (both G430, Phase 2 road). Cut SC12424 was partly backfilled by a dark grey, silty clay deposit SD12438, containing ceramics, stone and bone. Along with the deposit, two timber structures were found within the

Fig. 292 ST12446, G438, excavated during the 2012 Guide Wall excavation. Looking S. C03_20120727_5257

cut: Structure ST12439 was a substantial plank, rectangular in cross section and partly covering over ST12446. Structure ST12446 was a hollowed out pine log, preserved in two parts (of which the eastern part was not surveyed due to the placement of a staircase). The western part of ST12446 was preserved at 1.6 m length, while the piece in the ESE continuation measured 1 m long. Both parts were measured 0.35 m in diameter. The two pieces of pipe did not connect, as lead caps were on the ends of the pipes (not documented).

Group G438 was truncated in the WNW end by modern disturbance, SM9150 (from the 2008 trial trench, KBM3785 Gammel Strand, Grøft 1) and at the ESE end by the gas pipe cut SM9773, which may have moved the eastern part of ST12446 out of situ.

The group G438 was interpreted as a water pipe or drain fashioned from one or two hollowed out pine logs. It was located within a construction cut and surrounded by backfill. The orientation of the pipe differed substantially from that of the majority of other pipes found at Gammel Strand, which suggests that the interpretation as a drain pipe for feeding waste water from the houses along the northern side of Gammel Strand is dubious. The pipe seemed to have been capped with lead (not clear which end), which indicates that it was taken deliberately out of use at some point. Group G438 can only be dated via ceramic finds to the 18th Century period. It is not clear when it was constructed and when it went out of use.

Drain pipe SG212

Sub-group SG212 was first partly excavated during the 2010 watching briefs on Gammel Strand. Here a NNW-SSE oriented timber structure (ST7368) was interpreted as part of a water supply system – a sub-group to G305. South of ST7368, a small part of a similar structure on the same alignment, ST9291, was excavated during the 2012 Guide Wall excavations, and in 2014 the southern extension of this was excavated in the Main Excavation. Below only the parts excavated in 2012 and 2014 are described.



Fig. 293 The northern part of SG212 as excavated during the 2012 Guide Wall excavation. Looking west. C03_280612 4602 (cropped)

Sub-group SG212 comprised timber structure ST9291, which was NNW-SSE oriented. This structure was fashioned from a hollowed out pine log, approximately 0.3 m in diameter, which seems to have been split in half lengthways and to have had its sides straightened to create a rectangular box-like structure. The box-like

pipe structure extended out of the Guide Wall trench northwards (towards ST7368, 2.1 m NNW of it), and was truncated at the southern end by something removing the southern extension of the pipe – probably the gas pipe truncation SM9773. The cut for the pipe was not surveyed but the description states that it truncated SD10244 (G429, Phase 4 levelling over road surface G430).

In 2014 timber structure ST38191 was excavated. This was very similar to ST9291 and excavated approximately 4.7 m south of this with the same alignment. This was preserved as a 2.12 m long and 0.24 m wide structure, consisting of a hollowed out pine log placed horizontally with a slight decline towards south. Either this had been sectioned lengthways, like above mentioned ST9291, or it had been truncated so it was only documented as the bottom half of a horizontal tree trunk. Inside the pipe was deposit SD40330 consisting of loose sand from which a few finds of ceramics and animal bone were collected. It was not clear if this sand had built up as part of the usage of the pipe, or if it was remains of the deconstruction of it, as it could have fallen into the open pipe after this had fallen into decay. There was no visible construction cut for the pipe, which appeared to end within or just south of the bulwark line for the southern Phase 3 bulwark (G648). It is however possible that this was not the original southern extent, as the modern gas pipe truncation, SM20992, may have extended further west than registered. The northern end of ST38191 had been truncated completely, but it is not clear, what had removed it.

A sample from the fill, SD40330, was analysed for its macro-botanical content. The sample contained some seed/fruits from weeds but not from many taxa. Remains from wet/fresh meadow were a bit better represented with fruits from sedges (*Carex* spp.) and from lesser spearwort (*Ranunculus flammula*).



Fig. 294 Wooden drain pipe, ST38191. Looking SSE. C02_20140602_9597

Nut shells from hazelnut and fruits from hops and raspberry were more than just occasionally present in the sample. Single seeds from fig and fruits from wild strawberry were also noted. These finds form a mix of ecological/functional traces of which some may come from household and some from spontaneously growing species, perhaps from areas where the transported water was taken from (Ranheden 2016).

The sub-group SG212 was interpreted as a drain or culvert, possibly feeding dirt and spill waters from the buildings on the northern side of Gammel Strand (current Gammel Strand 42, in 1757 matr. 12, Strand Kvarter) and towards the canal. It is doubtful that the pipe would have been an open drain, but a lid does not survive with any of the excavated parts. Based on the orientation and stratigraphy, it seems reasonable to place SG212 within Phase 4, but a more accurate date of construction and use cannot be obtained from the material.

Sewer G235 and repair SG584

Group G235 was first created from observations made during the 2010 watching briefs at Gammel Strand. Then, the suggestion for the interpretation of plank ST7254 was that it was part of a wooden drain structure. In 2012 more timbers aligned with the former were excavated and related to the same group and in the Main Excavation in 2014 even more were found to be part of the same. In the following the structures and features documented in 2012 and 2014 are described.



Fig. 295 Drain box G235 excavated during the 2012 Guide Wall excavation. Seen from above, South is upwards. C03_20120710_4872 (cropped)

Group 235 comprised a large number of structures and features, which to a certain extent were the same, just excavated at different times and with modern truncations in between. The northernmost of the construction cuts, SC10662, was a linear, rectangular feature with straight sides truncating deposits SD10244 and SD11185 of G429. It was NNW-SSE oriented and extended out of the trench towards the north (towards ST7254, the supposed drain found in the watching brief). At the southern end, it was truncated by the modern gas pipe cut, SM9773. On the southern side of SM9773, SC52909 was excavated in 2014. This was likewise a linear cut with the same orientation as SC10662. SC52909 was

truncated at the south end by SC50193, the cut for a concrete and timber structure (G589), but was preserved at 6.15 m length. On the southern side of SC50193, SC30938 was excavated. This was only preserved at 0.71 m length, as it was truncated to the south by SC30266, the construction cut for the 19th Century harbour wall (G533).

In the northernmost cut, SC10662, a flat support plank ST12803 and a stone, likewise interpreted as a kind of support, SS12810, was found to keep the wooden beam ST12361 in position. This beam measured 1.24 m in length and 0.35 m in width and was oriented like the construction cut, NNW-SSE. The plank formed the base of a structure, which in cross section was rectangular. The plank built sides of the structure, ST12296, appear to have been joined to the base with lead plates, but this is not documented. Around and beneath this structure was a deposit, SD11109, consisting of blue clay, which possibly was placed to keep the structure watertight. On top of the plank sides was a wooden lid, ST10877, which was constructed from a single plank and was preserved with the dimensions 1.37 m length and 0.3 m width. This plank was very thin – only 0.015 m and not very well preserved. Overlying the clay packing was deposit SD11006, a sandy deposit from which no finds were collected. This was partly backfilling the bottom of the construction cut. Near the southern end of the pipe, two lumps of yellow clay were found next to the pipe (SD10851). Above this backfill layer SD10683 was excavated. This consisted of silty sand which was brown with orange stains

from the large quantities of slag and iron nails found in it. Other finds collected were ceramics, window glass, drinking glass, clay pipes and a large amount of animal bones. Over the southern end of the pipe was



Fig. 296 Construction cut. SC52909 emptied. Looking NNW. C02_20140425_9082

another, secondary backfill deposit, SD10648, from which a large number of animal bone were collected. Inside the pipe was deposit, SD12312, which consisted of light, yellow-grey loose sand. From this was collected a few finds of clay pipe and ceramics and a bone button (FO204697). East of the pipe, along the eastern edge of the construction cut the remains of a 0.12 m wide plank, ST10886, set on edge. It is not clear if this had a structural function or was redeposited from somewhere else. South of the gas pipe truncation (SM9773), the longest of the construction cuts, SC52909, contained a wooden pipe made from a hollowed out timber log, ST33285. This seemed to have had been half sectioned lengthways and was preserved at 4.84 m length and 0.26 m width. The pipe was sloping slightly downwards towards the south end. The southern end of the pipe was levelled by three planks (ST52953) placed underneath it – one placed lengthways and two transversely to the pipe. Above the pipe was placed a wooden lid, made from one long piece of timber, ST25360. This lid was preserved at 5.2 metres length and therefore reached further south than ST33285. South of ST33285 and ST25360 a different part of the drain pipe was exposed. This consisted of a piece of a

hollowed out log, ST25376. The excavated piece was 0.51 m long and the diametre of the log was 0.38 m. The inside hole was 0.14 m in diametre. On the eastern side of the southern part of ST33285 and the northern part of ST25376 were two planks, ST33276 and ST25385, sat on edge. Plank ST33276 was the innermost of them and preserved at 1.81 m length. ST25385 was placed on the outside of this and was 0.89 m long. On the western side of the pipe, ST33272 was placed parallel to ST33276. There was a gap of approximately 0.60 m between the southern end of ST33285 and the northern end of ST25376, but the side planks seem to have acted as walls of the drain, and this seems to have functioned even though there was no base in it. A small piece of plank, ST25356 (0.44 m by 0.22 m) was placed on top of the lid plank, ST25360, in the southernmost end of it – maybe as a slightly out of situ lid to close the gap between the box drain and the hollowed out log pipe. The south end of the side planks, ST33276 and ST33272, and the hollowed out pipe, ST25376, were truncated by the cut (SC50193) for the timber and concrete structure, G589. Underneath this truncation, two vertical posts were excavated, ST52292 and ST52299. These were placed



Fig. 297 Levelling planks ST52953 (G235). Looking SSE. C02_20140424_9078

approximately 0.44 m apart and in alignment with the western and eastern sides of the G235 drain box respectively.

On both sides of the drain box ST33285, deposit SD52841 was seen to follow the outline of the construction cut, SC52909. SD52841 consisted of grey-brown silty sand, containing ceramics, stove tiles, glass, clay pipes, iron and animal bone. Underneath the hollowed out drain pipe, ST25376, another backfill layer, SD33624 was seen to consist of grey-brown silty sand and contain leather, ceramics, clay pipes, glass and animal bone.



Fig. 298 Drain pipes ST33285 and ST25376. Side planks ST33272 (west) and ST33276 and ST25385 (east). Looking NNW. C02_20140410_8963

The material inside the drain box was excavated as SD51324, but appeared to be stratified in that the bottom was primarily clay, the middle was primarily silt and the top of the layer consisted primarily of sand. Material was collected for big bag sieving and finds were also hand collected, but the three strata were not kept apart. The finds comprised ceramics (among other things a small sherd of a Chinese porcelain cup, FO217720), glass, clay pipes, leather, iron and a small copper alloy artefact, possibly a clasp (FO215373). The animal bones from SD51324 were recovered partly by hand collecting, big bag sieving (PB44725, mesh size 5 mm) and by fine sieving of two samples (PM PM214886 and PM214895, mesh sizes 2.8 mm, 2 mm and 1 mm). In total 948 bone fragments weighing 0.253 kg were sent for analysis. Of these fish bones dominated the assemblage with 95 % and comprised saltwater species like; herring all types of flatfishes (plaice, flounder and dab), gadids (including cod) and the migrating eel (Bangsgaard et al 2016)

From SD51324 two samples (PM214885 and PM214894) were analysed for the macro-botanical content. It is not clear if the two samples represent different parts of the fill, but the results were quite different. PM214885 was very rich in macrofossils and displayed a high diversity of weeds and of meadow plants as well as grown or collected plants, especially fig (*Ficus carica*), wild strawberry (*Fragaria vesca*), wild/sour cherry (*Prunus avium/cerasus*) and raspberry (*Rubus idaeus*). A few grains of cereals (*cerealis* sp.) and barley more specifically (*Hordeum vulgare*) were found along with black mustard (*Brassica nigra*), bear berry (*Arctostaphylos uva-ursi*), hemp (*Cannabis sativa*), hazelnut (*Corylus avelana*), hops (*Humulus lupulus*), flax (*Linum usitatissimum*) and common plum (*Prunus domestica*). The macro-botanical content of PM214894 was rather sparse in terms of weeds, but species of meadow plants as well as a few remains of hazelnut (*Corylus avelana*), fig (*Ficus carica*), hops (*Humulus lupulus*) and grape (*Vitis vinifera*) were found to represent household remains (Ranheden 2016).

South of the timber and concrete structure, G589, and within construction cut, SC30938 was wooden structure, ST51701 consisting of four pieces of timber. These comprise a base plank, two side planks and a joiner, keeping the side planks parallel. The total dimensions of these were 1.15 m by 0.31 m and the structure was 0.16 m deep. The side planks were held onto the base with six iron nails, whereas the piece of timber keeping the sides apart was joined to the sides with dovetail joints. Above this was a wooden lid (ST30952), preserved at 1.09 m length and 0.31 m width. Around the drain structure the deposit SD30951 was seen to consist of grey-brown silty sand containing animal bone, CBM, ceramics, clay pipes, glass, iron and stove tiles.

SG584 Repair

Linear cut, SC24947, with the same orientation as G235 was documented truncated deposit SD30951. In total SC24947 was preserved at 5.93 m length and 1.42 m width. The depth was recorded as 0.6 m. The cut and its fills were truncated by the modern pipe truncation, SM20992, which separated it into two areas. In the southern part of the cut was fill deposit, SD25003 consisting of brown silty sand that contained clay pipes, ceramics, glass, CBM, iron, slag and wood. In the northern half, the lower backfill, SD24981, consisted of grey-brown silty sand, containing clay pipes, ceramics, glass and animal bones, whereas the upper fill, SD23177, was a brown sand layer with many stones, 0.1-0.25 m in diametres. This contained ceramics, CBM, iron, glass, animal bone and clay pipes, among others a clay pipe bowl (FO215131), which was produced in the Netherlands in 1685-1700.

Interpretation

G235 is interpreted as a drain or culvert leading from the buildings on Gammel Strand (current Gammel Strand 40, in 1757 matr. 11 Strand Kvarter) towards the canal. The structure seems to be constructed of several different types of pipes – a rectangular plank box with a plank lid as excavated in the Guide Wall trench; a half sectioned log pipe with a plank lid; a piece of hollowed out log and another rectangular plank box at the southernmost end.



Fig. 299 Drain pipes and lid. At south end truncated by timber and concrete structure. Seen towards NNW. C02_20140312_8527 (cropped)

Because of truncations by later features it has not been possible to determine if all the different pieces were laid down at the same time, or if some of the variations in the structure are actually results of repairs. However, the subgroup SG584, seen as a repair cut and backfills, may indicate the latter, though it cannot be verified from the documentation.

The pipe seems to have extended further than where the late 19th Century quay wall was situated (as the cut

for this truncated the southernmost parts of G235), and it probably had its outflow into the canal in the Phase 4 bulwark line (SG604).

Dating

Dendrochronology samples were taken and sent for analysis from three different parts of the G235 structure: from the lid of the structure excavated in the Guide Wall trench (ST10877) sample PD12360 could not be dated; From ST25360 sample PD25394 resulted in the date after AD 1724 and from the half sectioned log pipe, ST33285 the sample PD208649 resulted in felling date AD 1725 winter. This places the construction of at least these parts of the drain to the middle of the 18th Century. Unfortunately it is not clear if any of the other parts are older or younger than this. The finds from the construction cut backfills and the fills inside the pipes do not interfere with these dates.

Culvert G442

Group G442 was excavated during the 2012 Guide Wall excavations. The group comprised five features linked to a culvert.

The earliest feature was construction cut SC10352, a rectangular shaped cut orientated NNW/SSE. The cut truncated deposit SD9998 (G435, Phase 2 land reclamation). The cut was filled by timber pipe ST9959, which was a hollowed out log, preserved at 0.9 m length. The log had an outer diameter of 0.29 m, but the upper part seemed to be missing, making the structure only 0.21 m deep. At the southern end of the log, a



Fig. 300 G442 excavated during the 2012 Guide Wall excavations. Looking SSE. C03_07092012 4768 (cropped)

large, flat stone SS9966 was placed with the same top level as the inside of the log pipe. On top of SS9966 and next to it was a stone and brick structure, SS9982, which resembled a stone and brick built wall (at the southern part of the structure) at both sides of the timber pipe. Culvert SS9982 was, however, very coarsely made and furthermore truncated severely by the modern gas pipe, SM9773. Only the three *munkesten* bricks (Danish Medieval and Renaissance type) on the east side of the timber culvert mouth seemed to be forming a regular structure. Overlying and physically abutting pipe ST9959 and wall SS9982 on both sides was clay deposit SD9991. The clay deposit was 0.3 m deep and contained a single find of Late redware as the only find.

Group G442 is interpreted as a drain or culvert, consisting of a combined wooden and stone-brick built structure. It has probably led away grey waters from Gammel Strand properties (currently Gammel Strand 38, in 1757 matr. 10 Strand Kvarter). The design of the structure differs slightly from that of most of the drains or culverts found on Gammel Strand, as this seems to be a combination of two construction types – a hollowed out log and a stone and brick built culvert.

A sample for dendrochronological analysis was taken from ST9959 (PD202104), but this was not prioritized for analysis. However, based on stratigraphy and alignment with other drain pipes excavated in the area, the construction and use of G442 could very well belong in the 18th Century, this Phase 4.

Service pipe SG206 and SG370

The northernmost parts of SG206 were partly excavated during the 2010 watching briefs on Gammel Strand. It consisted of a NNW-SSE oriented construction cut (SC6480) in which a wooden pipe (ST6472) flanked by brick walls (SS7808 and SG370, SS6448) were placed. The structure was covered by deposits SD6479 and SD6488. The structure was interpreted as parts of a water supply system and was believed to link up with some E-W oriented water pipes excavated (SG209, G305). As the interpretation of SG206 has later changed (see below), it has now been taken out of SG209.

Before then, in 2008, a trial excavation had revealed parts of SG206 as well (KBM3785, Gl. Strand) in the area between the 2010 observations and the 2012 Guide Wall excavation trench. At the time, the structure was interpreted as a water pipe running under a demolished stone and brick built vault.



Fig. 301 Photo from KBM3785 Gammel Strand excavation 2008 showing parts of SG206. Looking east.

In 2012 and 2014 more fragments of pipe and culvert were uncovered. The parts of SG206 excavated during the 2012 and 2014 excavations comprised a construction cut (SC10190) as its earliest feature. The cut was only visible in the Guide Wall trench, but was extrapolated into the Main Excavation. The cut was

more or less linear, NNW-SSE orientated and truncated deposits belonging to G435 (Phase 2, land reclamation).



Fig. 302 SG206 with SG370 excavated during the 2012 Guide Wall excavations. SSE is upwards. C03_07042012 4745 (cropped)

In the northern parts of G206 were two parallel brick and stone wall-like structures (SS10069), which had been sub-grouped on their own (SG370) along with a clay layer (SD10202) below and between the stones. SS10069 consisted of different types of material. On the eastern side two of the stones were very straight and rectangular. The southern of the two is likely of granite, and ground very smooth. The surface of the northern stone was basalt like, very blistered and porous and the stone was kept (FU202459). The dimensions were 0.95 by 0.25 by 0.15 m and a horizontal line had been carved into it.

(however damaged by the machine), while the other was oblong and very destroyed (FU 202461). The western part of SS10069 was mostly made of small bricks and mortar. However, the two uppermost stones in the western part were made of a red, chalk like stone type, which had a very smooth surface. These were likely reused flagstones from a floor. Under this was a layer of bricks of a yellowish red colour measuring 0.24 m long by, 0.12 m wide and 0.04 m thick. The brick built part of the construction continued to the

Two other stones on the east side (on top of the basalt-like stone) were likely made of soapstone. One of these (FU 202460) was square and smooth



Fig. 303 SG206 with SG370 excavated during the 2012 Guide Wall excavations, after ST10057 has been partly removed. Looking NNW. C03_07092012 4817

bottom of the construction in the southern part of the wall, whilst there was only one course in the northern part, truncated by the steel shoring and thus extending out of the trench. Under the bricks was a carved stone measuring 0.25 m deep and at least 0.65 m long. Like the basalt like stone opposite it, it comprised a horizontal line carved into it.

As a whole, SS10069 was poorly constructed, which could indicate that it had been buried in the ground when in use, and was made not to be seen. It

measured 1.87 m by 0.34 m from the exposed western side, while 1.45 by 0.63 m of the eastern part was exposed. It is not clear whether the exposed southern limit of SS10069 is the actual southern extension of it, or if it extended further south, but it was not seen in the 2014 Main Excavation. The whole brick and stone structure was resting on two wooden beams which, however, neither surveyed nor described as they were not fully excavated due to the depth limit.



Fig. 304 G206 southern parts excavated during the 2014 Main Excavation. Looking NNW. C03_20140512_10227

The brick and stone structure is aligned with structures SS6448 and SS7808 towards the north (which is described as brick work in the 2010 watching briefs) and is thus likely the same construction.

Between the two brick and stone walls was a wooden pipe, made from a hollowed out pine log, surveyed as ST10057 in the Guide Wall trench and ST35907 in the Main Excavation. Wooden pipe ST10057 was 0.36 m in diameter and preserved at 2.10 m length. It extended out of the trench towards the north and south. ST35907 was 0.38-0.46 m in diameter and was preserved at 2.77 m length. It was truncated at the north end by a modern pipe cut (SC24648, G574), and from the excavation photos it seems that there is a part of the pipe north of the truncation, that was not surveyed. It is not clear if ST10057 and ST35907 were actually the same log, but it is possible and if so, it would have had a total length of at minimum 6.22 m. In the southernmost end of ST35907 the inner hollow was blocked off by a wooden “cork”. It is not clear whether the preserved southern part was the original extension of the pipe as it would have been expected to continue to

the harbour front/-s. At the northern end of ST35907 the pipe was supported or kept in place by a post on either side (ST35899 and ST35903). The posts seem to be driven into the ground.

Sub-group SG206 is interpreted as a drain pipe or culvert feeding grey water from the buildings at Gammel Strand (current Gammel Strand 36, in 1757 matr. 9 Strand Kvarter) and towards the canal. In the northern parts, the culvert consisted partly of a brick and stone structure – possibly a vault with an outer width of 1.0-1.5 m placed in a construction cut. Inside the vault was placed a wooden pipe made from a hollowed out pine log. At the southern end, the culvert consisted only of the wooden pipe. Here the pipe was kept in place by two vertical posts.

Wooden pipe ST10057 was sampled for dendrochronological analysis, which resulted in the felling year AD 1738/39 winter. This construction date is supported by the stratigraphy, placing SG206 in Phase 4.

Possible drain foundation G441



Drain G441 was excavated during the Guide Wall excavation in 2012. The group comprised two large stones. Stone SS9585 measured 0.75 m by 0.49 m and was 0.14 m high and SS9733 measuring 0.42 m by 0.49 m and was 0.2 m high. The stones lay close to each other and may form part of a structure orientated N-S. These stones overlay deposit SD9714 from G435 (Phase 2 land reclamation). Both stones were found partly under the modern disturbance, SM9773, and to the east of the stones was another disturbance, SM9748, while to the southwest the disturbance, SM9763 truncated the trench.

G441 was difficult to interpret as so little was preserved. The group was dated to the Post-medieval period from stratigraphy.

Fig. 305 G44. Excavated during the 2012 Guide Wall excavation. Looking N. C03_280612 4696 (cropped)

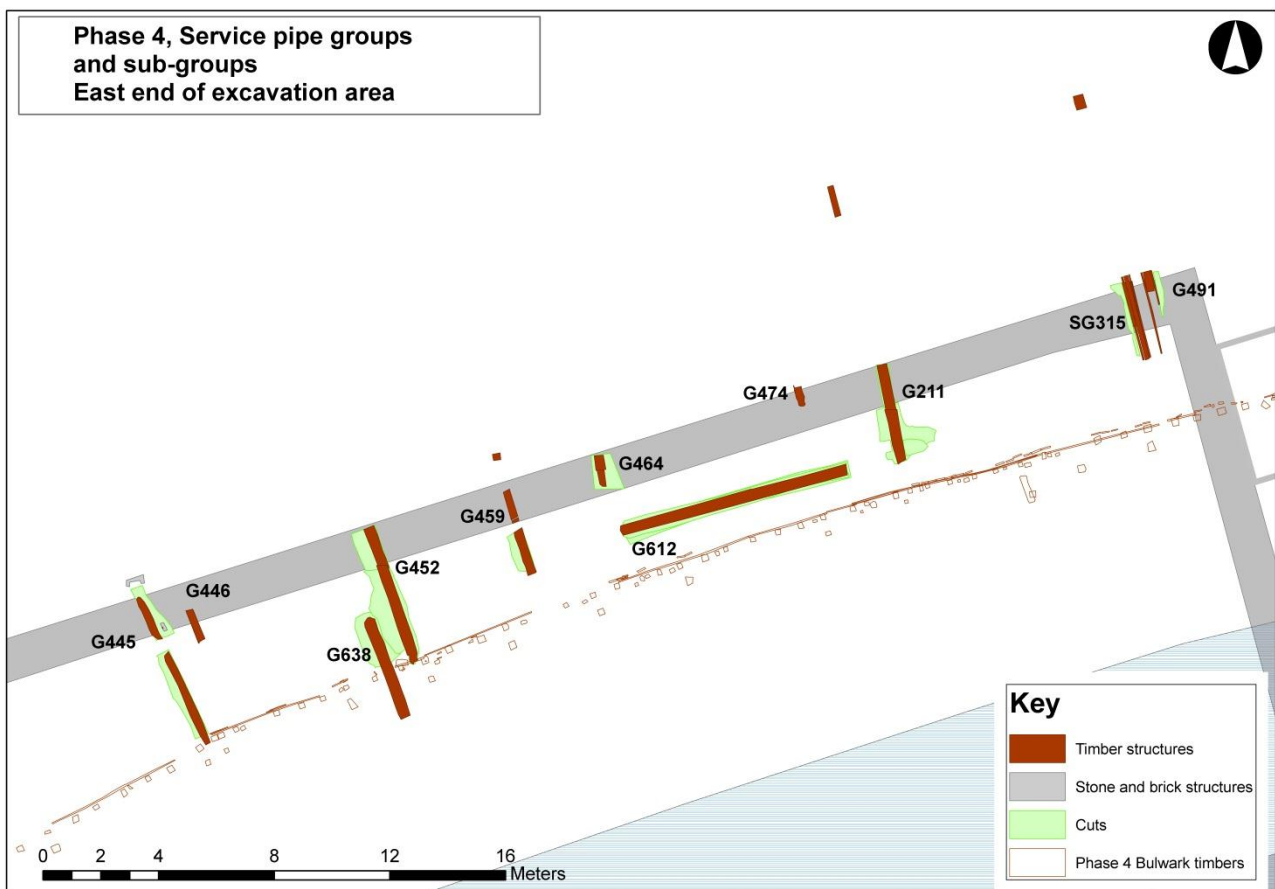


Fig. 306 Phase 4 service pipe groups and sub-groups, east end of excavation area

Drain G445

G445 was partly excavated during the Guide Wall excavation in 2012, but structures and features belonging to the same group were later excavated in the Main Excavation.



Fig. 308 Drain (SS18789, G445), excavated during the Guide Wall excavation. Looking NNW. C19_20121009_4158.

The group was constructed on a NNW-SSE orientation. The northern part of the construction cut (SC18874) was cut into foundation stones SS18830 of the Renaissance seawall. Within the cut was a brick built culvert (SS18789). The culvert survived only to a small degree at the extreme northern edge of Trench 2b/ZT13818, alongside the metal shoring. The brick built culvert was not fully excavated beyond the 1st brick course. SS18789 was constructed from a parallel arrangement of bricks each measuring approximately 0.20 m by 0.085 m by 0.045 m. The bricks were bonded by an off-white

coloured lime mortar. The brick sides of the culvert were capped by reddish pink and grey granite flagstones between 0.045 m and 0.055 m in thickness. An in-situ flag had traces of mortar adhering to its upper surface. It measured 0.51 m in width and measured at least 0.23 m in a north-south direction before extending north past the limit of excavation. A red pink granite block measuring 0.38 m by 0.22 m by 0.055 m lay nearby, interpreted as formerly belonging to the culvert. A wooden drain pipe (ST18859) was found to be resting within SS18789.



Fig. 307 Wooden drain pipe (ST38081, G445), excavated 2014. Looking NNW. C02_20140521_9517

Within the cut was also post ST18759. The post was also possibly used in the construction of the pipe and left in-situ afterwards. Overlying the culverts and pipes was a grey and white silty sand deposit (SD18730) and a mid grey brown silt sand deposit (SD18888).

The southern alignment of the construction cut (SC38239) truncated post ST55556 of G552 (Phase 4A land tie). In the cut was an extension of the wooden drain pipe (ST38081), which was made of one 3.5 m long, hollowed-out pine log, approximately 0.34 m in diameter. The pipe ended right where the Phase 4 bulwark (G626) ran perpendicularly to this, and this is taken as an indication of contemporaneity. Thus, the drain pipe was in use in Phase 4 – though maybe not from the beginning of the phase. Inside the pipe was a fill layer (SD38381), which was sampled for macrofossil

analysis (PM214883). The material in the sample contained a quite high degree of diversity with seeds/fruits from several weeds, some taxa from meadow plants (primarily from wet/dry meadows) as well as rich notations of grown/collected plants. Quite a lot of seeds from fig (*Ficus carica*), fruits from wild strawberry (*Fragaria vesca*) and raspberries (*Rubus idaeus*), cherries (*Prunus avium/cerasus*), plum (*Prunus domestica*) and grape (*Vitis vinifera*) form a wide aspect of traces from grown/collected plants with strong household connections (Ranheden 2016).

Above the pipe was backfill SD37816, which contained some bone and ceramics. These finds were, however, not prioritized for analysis, due to them being found in construction cut backfill.

Interpretation

Group 445 was a culvert system relating to the properties on Gammel Strand north of the excavation, and probably relating what is nowadays to Gammel Strand no. 34, in 1757 matr. 8 Strand Kvarter. The culvert transported waste and excess water from the household into the canal. The group consisted of a combined stone- and brick culvert which partially covered the pipe at the northern end only.

This structure was probably part of or identical with SS7709 (SG333, G208), seen in the watching brief trench ZT7745, 6.1 m north of the northernmost extension of G445 in the Guide Wall trench.

Dating

The date of the construction and use of the culvert is based on the drain pipe ending in the Phase 4 bulwark line. However, it may be that the bulwark was already in use, when the culvert was constructed.

Wooden pipe G446

The group G446 was excavated during the 2012 Guide Wall excavation. The group consisted solely of wooden planking, ST17909. This comprised the remains of two planks – one laid horizontally as a base and the other one set on edge as a side wall on the western side of the base plank. Another fragment of wood was visible in section on top of the base plank. The structure was NNW-SSE oriented and may have formed an open, plank built box, measuring 1.2 m by 0.34 m by 0.3 m. The structure overlay deposit SD18442 (G450, Phase 4 levelling) and was cut in the north by the modern gas pipe (SM18399, Group 5). At the southern end it extended out of the trench and a southern extension was not found in the 2014 Main Excavation.

Group G446 is interpreted as a wooden drain pipe or culvert formed by planking. It may originally have had a cover or lid but this was presumably disturbed by the construction of the gas pipe laid in the 1920s. It is not clear how far south the drain pipe would have extended as it was not found in the Main Excavation trench in 2014. This may however, be caused by later truncations. Following the structure's direction north, it may have fed foul water from the buildings at Gammel Strand (currently Gammel Strand 34, in 1757 matr. 8 Strand Kvarter) and towards the canal. The type of construction differs from the majority of other pipes found at Gammel Strand (most being hollowed out pine logs), but a few other plank built drains were found (e.g. G491).

A sample for dendrochronological dating was taken from ST17909 (unknown which part, PD 18350), but this was not prioritized for analysis. Based on stratigraphy, the structure is probably 18th Century in date and thus belongs with Phase 4.

Drain pipe G638

Group G638 comprised a sub-circular construction cut (SC35150), approximately 2.0 m long and 0.7 m wide. The cut was preserved at 0.2 m depth and seemed orientated NNW-SSE. The base of the cut sloped downwards towards SSE and the cut could not be seen south of the bulwark line of G626. SC35150 was cutting into the underlying SD34660 (SG713). Within the cut was a hollowed out log pipe (ST35805). This was preserved to a length of 3.81 m and was 0.34-0.38 m in diameter. Like the construction cut, the pipe sloped downwards (approximately 45 degrees) towards the SSE, and was seen both north and south of the Phase 4 bulwark line G626. Some bark remained in-situ and the pipe was made of pine. At the southern end, the pipe was squared off, and a perforated lead plate affixed with nails. In the northern end of the pipe a circular hole appeared to have been placed on the upper side, but this was not fully documented. Above the pipe on the eastern side of it was a light, lensed sand deposit (SD35783), which may have been deposited by running water or overflowing after the pipe was placed in the cut, but before the cut was

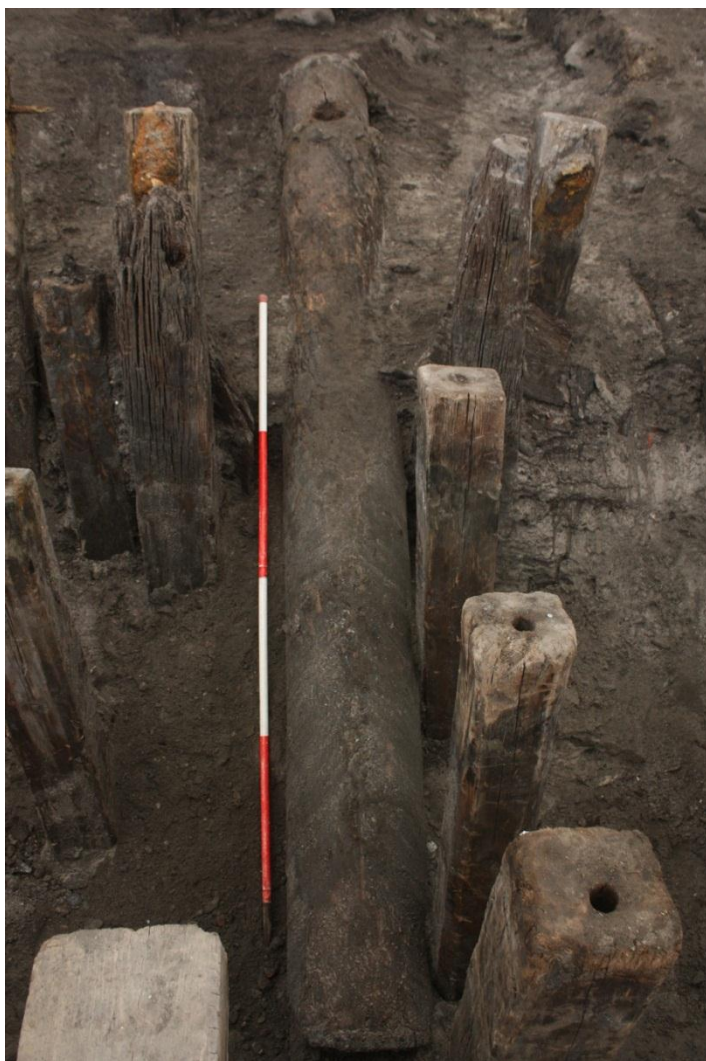


Fig. 309 ST35805 (G638). Looking NNW. C03_20140507_10098

backfilled. Around and above the pipe was a brownish grey sand deposit (SD35166), containing stones and CBM inclusions, but no finds were collected. The backfill was truncated by both the cut (SC34449) for water pipe G596 and by a construction cut (SC35577) for the Phase 6 land tie G562. It is not clear where or if the pipe extended further north, as it was not seen during either the Guide Wall excavation or the watching brief excavations in 2010-11.

The group, G638, is assumed to be a wooden drain pipe, a culvert, leading spill water from the buildings on the northern side of Gammel Strand (current Gammel Strand 34, in 1757 matr. 7 Strand Kvarter) and under the square and into the canal. It is not clear how or where the assumed northern extension would have been, but the hole in the northern end of the preserved pipe may be a connection point to another pipe, which is not preserved. The south end seems to have been partly blocked with a perforated lead plate, but the reason for this is not clear. It may be that G638 is simply the predecessor for water pipe G596?

The wooden pipe was not sampled for dendrochronological analysis, and no finds were collected to indicate the time of construction and use of the pipe. However, from stratigraphy it seems that G638 predates G596/G452, and is therefore placed in time after the construction of bulwark G626 and before this was demolished.

Culvert G452

Group G452 was initially partly excavated during the Guide Wall excavation in 2012. When in 2014 the Main Excavation was undertaken, the southern extension of the group was excavated as Group G596. G596 was voided during the post excavation process and the former two groups put together as G452. In total the group's dimensions were approximately 4.98 M by 1.3 m in plan.

The northern part, excavated in 2012, consisted of a linear construction cut, SC18253, truncating a deposit (SD18241), belonging to land tie G453 (Phase 4B land tie). The cut was NNW-SSE oriented and within it was placed a hollowed out pine log, ST18261, with the same orientation as the cut. The pipe was preserved at 1.5 m length and was approximately 0.83 m circumference. From the surveyed levels, it seems that the pipe was placed horizontally in the cut. Above and around the wooden pipe was a backfill layer, SD18260, which consisted of mid brown, silty clay containing charcoal and stones. Due to the limited depth of the excavation, the deposit was not fully excavated downwards. G452 was truncated in the north end by the cut for the 20th Century gas pipe, SM18399 at and extended out of the excavation towards the south.

The southern part of the group, excavated in 2014, comprised a linear cut, SC34449, aligned NNW-SSE. The



Fig. 310 ST35852 (G596). Looking NNW. C02_20140506_9168

cut was truncating the underlying fill, SD35266 for another wooden pipe, G638 (Phase 4). The cut edges were not always obvious. Within the cut was placed a hollowed out, wooden pipe, ST34852 with the same orientation as the cut. The pipe was preserved at 3.6 m length and was approximately 0.40 m in diameter. The pipe was slightly sloping down towards SSE and seemed to be ending in the bulwark line for the Phase 4 bulwark (G626). The pipe had a two truncations – one was an approximately 0.45 m long cut in the top, going only halfway through the pipe. At the SSE end of the truncation, a wooden plug was set in the central hole of the pipe. The other truncation was at the SSE end of the pipe, where it seemed to be chopped off roughly slightly behind the G626 bulwark (possibly when the bulwark was demolished?). Only a small part of the bark edge of the wooden pipe was preserved at the bottom of the truncation, indicating that the pipe would have originally extended all the way to the front of the bulwark. Above and around the pipe was a sandy backfill, SD34483, containing stones and a few finds of glass, ceramics and wall tiles, which, however, were not prioritized for analysis.

Group G452 comprised a water pipe leading from the Gammel Strand housing area (current Gammel Strand 34, in 1757 matr. 7 Strand Kvarter) towards the canal, thus functioning as a drain. In form and material it represented the normal drains in the 18th Century used by houses in Copenhagen. The southern part of the group may be a renewal of an older pipe, as the construction cut was truncating the backfill for pipe G638. It is not clear what the truncation going halfway through pipe ST34852 was for, but may be linked to some blocking off of the pipe after it had been in use for some time.

The pipe was not sampled for dendrochronological analysis, and the finds in the backfill around the pipe did not offer any certain dating possibilities for the construction of the pipe. However, due to the pipe ending near the G626 bulwark, it seems reasonable to establish that these two structures would have been functioning at the same time. The pipe may also have been demolished at the same time as bulwark G626 went out of use.

Drain G459

Group G459 was first excavated partly during the Guide Wall excavations in 2012 (northern part) and then extended south in the Main Excavation in 2014. In total the exposed parts of the structure were 4.39 m long (NNW-SSE), 0.68 m wide and approximately 0.32 m deep.



Fig. 311 G459 drain pipe, excavated partly during the Guide Wall excavations in 2012. Looking south, C19_20120927_3991

The group comprised a linear construction cut, surveyed as SC18373 and SC41052. The cut was orientated NNW-SSE and truncated SS14495 (SG457, belonging to G532, Phase 2/3 quay wall) in the northern part and SD41096 (G683, Phase 4 levelling) at the southern end. Within the cut a hollowed out pine log was partly excavated in 2012 (ST14460, only the upper part excavated) and the southern extension of this (ST25071) was fully excavated in 2014. The log was heavily truncated by a modern gas pipe cut (SM14362) at the northern end and by another modern gas pipe cut (SM22609,

G541) in the southern end. The log was sloping slightly downwards in the southern end. In total the pipe was preserved at 4.4 m length, but it is not clear if it was made out of more than one log.

Around the wooden pipe in the north end was a mid grey silt and sand deposit (SD18381). The deposit contained broken CBM, but no other finds were collected. In the south end, a very similar deposit (SD41059) was excavated.

Structure G459 is interpreted as a heavily truncated wooden drain or culvert leading from the current Gammel Strand 28 (in 1757 matr. 6 Strand Kvarter), under the street surface and into the canal. The drain pipe is heavily truncated by later activity, especially by the 1920s gas pipes. G459 may be the southern extension of the beam and plank sewer (ST7041, G232), excavated during the Watching Brief excavations in

2010. This was seen 6.4 m north of the northernmost part of G459, and the two structures were perfectly aligned.

The pipe (ST14460) was sampled for dendrochronological analysis (PD15634), but could not be dated due to the low number of year-rings. No other dateable material was found within the group. It is presumed to have dated to the 18th Century from stratigraphy and location.

Drain G464

Group 464 was only partly excavated during the Guide Wall excavations in 2012, due to the depth of excavation limit.

The group comprised a linear construction cut, SC18322, which was north-south oriented, or slightly turned towards NNW-SSE. The cut truncated the beam ST18231 of Phase 4 land tie G468. The cut appeared to be a lot wider than it was required to be and had a funnel shaped appearance in section (E-W). It was roughly twice as wide at the top as at the limit of excavation. In the cut, what resembled a hollowed out log made into a wooden pipe (ST18382), was placed. The wooden pipe was of unknown species and unknown length and width, as it extended out of the trench towards both north and south and downwards. The recorded piece of pipe was placed horizontally, but it is not clear whether the pipe was made from more than one piece of timber. Within the cut was also deposit SD18396, a sterile, mottled grey sand, deposit, probably representing rapid backfill with the same material as the underlying deposit (SD18469, Phase 4 levelling, G469). Overlying the wooden pipe was another deposit (SD18340), which consisted of dark grey sand with pebbles. No finds were collected from the two deposits.

It is not clear where the group extended north and south: North of the Guide Wall trench a number of watching brief trenches were excavated in 2010-11, but no similar structures were seen here. South of G464 a modern disturbance (SM22885) containing a ceramic drain pipe was recorded in 2014. This had exactly the same alignment as G464, but extended all the way to the Phase 6 quay wall (G533). There is a slight chance that G464 would somehow have been connected to the E-W-oriented pipe ST51975 (G612) as the levels match nicely, but where the two pipes would have met, the area was truncated by modern disturbance SM22885.

Group 464 represents a drain or culvert leading towards the canal from the Gammel Strand street area – it is aligned towards current Gammel Strand 28 (in 1757 matr. 5 Strand Kvarter), but no other pipes with the same alignment has been seen in the watching brief trenches between this and the buildings. The drain has been truncated and backfilled when its purpose was discontinued. It represents an unexcavated wooden water pipe which remains in-situ within its construction cut and associated backfills.

As the pipe was not excavated, no dendrochronological sample was taken either. No dating evidence from the contexts, but the stratigraphy and phasing link it to the late 17th Century onwards.

Water pipe G612

Group G612 consisted of a linear construction cut (SC23305), which was E-W oriented, turned slightly towards ENE-WSW. The cut was not very clear as it seemed to have been backfilled with the same material as it was dug into, but was probably dug into the underlying SD38691 (Phase 4 bulwark SG713). It was placed up against and aligned with the south side of the Renaissance quay wall (G532, Phase 2) and along the northern side of the bulwark G602 (Phase 2). In the cut was placed a horizontal, hollowed out wooden

pipe (ST51975), which was made of one pine log, stretching 7 metres E-W. In the west end the pipe was truncated by a modern disturbance (SM22885) and in the east end the pipe did not seem to be connected to anything – maybe what it had formerly been connected to, had been removed by the construction of the drain pipe, G622 (Phase 5). The fill within the pipe was not surveyed, but a sample of the soil was sent for macro-botanical analysis (PM214852). This resulted in a few finds of a couple of weeds and meadow species as well as a single fruit from dill (*Anethum graveolens*) (Ranheden 2016).

Within the construction cut was backfill deposit SD23320, which contained a few finds of leather, glass, ceramics and clay pipes.

Group G612 possibly represents a drain or water pipe, but as its orientation is very different to that of the many other Phase 4 drain pipes excavated – and the fact that it cannot be proven, what the pipe would have been connected to, it is also possible, that the pipe would have been reused from somewhere else and functioned as a land tie stretcher or simply as fill material along the front of the Renaissance quay wall (G532).

The pipe (ST51975) was sampled for dendrochronological analysis (PD209021), but the sample could not be dated. One of the clay pipe fragments retrieved from the backfill deposit was dateable within the period 1750-1770 (production date). Based on this and the type of water pipe found it seems reasonable to assume that this was placed here for some reason during Phase 4.

Culvert G474

Group G474 comprised solely of a plank, ST17018. The plank measured 0.77 by 0.22 m by 0.03 m and was placed horizontally in an almost N-S orientation, slightly turned towards NNW-SSE. The plank lay over deposit SD17730 (G521, Phase 2 dump layers/land reclamation). The plank extended out of the excavation towards the north and was cut by SC15233 (G472, Phase 4 land tie) at the south end.

There was no obvious cut for this plank, which could indicate that it was found out of situ. The N-S-orientation of the plank is, however, similar to the many grey water culverts found in the excavations at Gammel Strand and the orientation is the main reason why the plank was surveyed.

Even though no construction cut with relation to the plank has been observed, the orientation and the level, which is similar to other culverts in the trench, makes it reasonable to assume that the plank represents the lowest foundation plank of a wooden culvert as in culvert ST16952 (G476, Phase 2). Another interpretation could be that the plank is the lid for 16952, which was removed and redeposited when cut SC15233 (G472, Phase 4 land tie) was made.

This plank was not sampled for dendrochronological analysis, and there were no finds to indicate the date of the structure. From stratigraphy it seems that this could have been constructed somewhere between Phase 2 and Phase 4.

Service pipe G211

The structure, G211, was first partly excavated (ST7423, water pipe) during the Watching Briefs in 2010-11, and interpreted then as a water supply pipe. What was interpreted as the same structure's extension further south was excavated in the Guide Wall excavation in 2012 and lastly, in 2014 the southernmost extension of this group was fully excavated.

Group G211 consists of two construction cuts (SC15841 and SC54473) surveyed in 2012 and 2014 respectively. SC15841 was surveyed as a rather narrow, linear cut, running N-S, with a slight degree towards NNW-SSE. The cut was not fully excavated, but seems to have truncated deposits belonging to the Phase 4 land ties G475 and G484. SC54473 was regular and linear at the northern end, though wider than SC15841, and at the southern end it became very irregular. The irregular shape of the cut was reflecting of the shape of the stones of the underlying quay wall (ST42368, G532, Phase 2) removed when G211 was constructed. SC23705 was surveyed as a cut, but interpreted as a stone imprint, likewise reflecting partial demolition of the former quay wall in connection with construction of G211. A deposit surveyed as SD23364 consisted of light yellowish grey sand and pebbles and filled the stone imprint and contained only few finds (ceramics and clay pipe). Within the construction cut, a hollowed out log was placed (ST16346 and ST24735). This was also oriented N-S with a slight deviation towards NNW-SSE. Even though ST16346 and ST24735 were surveyed as two different timber structures, it seems reasonable to assume that they are one and the same. The log was 0.36 m in diameter and preserved to a length of 3.42 m. Around the log, deposits SD15852 and SD54507 were placed as backfill of the construction cuts in the 2012 and 2014 excavations respectively. SD15852 was not fully excavated in 2012, but finds were collected (ceramics, animal bones, wood, copper alloy, floor tiles). The deposit was characterized as greyish brown, sandy silt. SD54507 was described similarly and it is assumed to be the same. From this finds of animal bones, ceramics, clay pipes, floor tiles, glass, metal, stove tiles and wood were retrieved. It is not completely clear from the records if this group had been truncated at the southern end, or if it originally ended where the pipe met the G602 bulwark (Phase2/3).

The structure is interpreted as a drain pipe or culvert running from the buildings (current Gammel Strand 28, in 1757 matr. 4 Strand Kvarter) and towards the canal. To facilitate the construction of the culvert, several stones belonging to the Renaissance quay wall have been removed. It is not clear if the drain extended all the way out to the Phase 4 bulwark, G626, or if it was truncated by the construction cut for this. However, G211 can have been in use in the first part of Phase 4. If the piece of pipe (ST7423) recorded during the watching briefs in 2010 is counted in, the structure has a total length of 9.9 m.

The wooden pipe was not sampled for dendrochronological analysis. The group is dated to the 18th Century by the finds (clay pipes and ceramics) and this is supported by the stratigraphical relations to the Phase 4B land ties.

Culvert/drain SG315

This sub-group, SG315, was first partly excavated during the watching briefs in 2010, and in the 2012 Guide Wall excavation what was believed to be the southern extension of this was excavated.

The northernmost extension of this group is the heavily truncated, hollowed out log, ST200099, documented in 2010 in the trenches north of the Guide Wall and Main Excavation trenches.



Fig. 312 ST14052 (G315), timber built drain with plank lid. Excavated during the Guide Wall excavations in 2012, looking WNW. C03_20120828_5428

Sub-group SG315 furthermore comprises a linear construction cut (SC14395) excavated in the Guide Wall trench. The cut was oriented NNW-SSE and extended out of the trench in the north end. In the southern end it could not be fully identified as the group had been truncated by the modern gas pipe, SM13739. The cut truncated dump deposits of G429 and G492 (both Phase 4) as well as a deposit related to land tie G482 (Phase 4). In the cut a timber structure (ST14052) was placed. This consisted of a hollowed out pine log with an external diameter of 0.33 m

which had been split lengthways. The inner bore was 0.2 m in diameter and the sides of the log seemed to have been worked so that they were straightened out to create vertical walls. This part of the structure was preserved to a length of 3 m. On top of this was a lid made from a 0.055 m thick and 0.34 m wide plank. This was preserved to a length of 1.8 m and was truncated or removed at the southern end. Both the lid and the drain pipe had been truncated by a circular bore hole (approximately 0.25 m in diameter), probably recently. Above and beside the pipe was the deposit SD14407, which consisted of brownish grey, sandy silt and contained occasional stones, bone, wood and CBM. No finds were collected from this. Inside the drain pipe, the deposit SD15098 was excavated. This consisted of lenses of coarse and finer sand and less silt. From this two fragments of clay pipes and three sherds of green glass were collected along with some ceramics (late redware, faience, Westerwald stoneware and a single fragment of Danish Royal porcelain).

Sub-group SG315 is interpreted as a drain pipe or culvert leading from the houses on Gammel Strand (currently Gammel Strand 26, in 1757 matr. 3 Strand Kvarter) towards the canal. The type of drain differs slightly from other Phase 4 drain pipes seen west of this, as this consists of a hollowed out log for base and sides and a wooden lid, whereas others simply consist of hollowed out logs. It may be possible that the base is reused from being originally a water pipe, but this cannot be proven.

A dendrochronology sample was taken from ST14052, but it is not clear if it was sampled from the lid or the log part of the structure. The result of the dendrochronological analysis was after AD 1775. This places the structure late in Phase 4, which is supported by stratigraphical observations. However, if the sample is taken from a possibly reused part of the structure, the construction and use of SG315 may belong with an even later phase.

Drain G491

Group G491 was excavated during the Guide Wall excavation in 2012. The group comprised a narrow, linear cut, SC14145, which was only seen on the immediate eastern side of the timber structure ST13822. The cut tapered to a point at its southern end and was visible for only half the length of the eastern side of culvert ST13822. This is probably due to an obstruction in the form of large boulder SS14613 (G496, Phase 2 harbour wall). Presumably the line of the cut was shifted westwards slightly to negotiate the boulder and the southern end of the wooden culvert was built up against the edge of the cut which has obscured it. The cut truncated deposit SD14317 of Group G430 (Phase 2, road). The cut was thought to be the same as cut SC14052 (SG315, Phase 4) which suggests culverts ST13822 and ST14052 were constructed at the same time and laid in one wide construction cut. This is supported by the fact that the two structures are completely parallel, NNW-SSE oriented.



Fig. 313 ST14052 (G315) to the left and ST13822 (G491) to the right. Drain pipes without the lid. Looking NNW. C19_20120829_3824

Filling SC14145 was structure ST13822, a 2.9 m long, box-like structure constructed from broad timber planks of roughly similar dimensions at the top, base and sides, approximately 0.34-0.38 m wide and 0.03-0.04 m thick. The four timbers met at right angles and the drain still retained its rectangular box shaped profile internally. The plank which rested at the top of the drain extended over the edges of the upright planks. The base was formed by a flat pine plank placed between the upright timbers. The base was presumably fastened to the sides although no fastenings, pegs or nails were visible.

Overlying ST13822 was backfill deposit SD14153, which was mottled with rust brown stains and contained occasional lenses of white sand and lumps and flecks of white mortar and contained animal bone and a few finds of glass and ceramics. Inside the timber structure was deposit SD15194, which consisted of lenses of fine and coarser sand as well as silt. From SD15194 was collected few sherds of bottle glass and a fragment of early redware, dated to the Late Medieval period.

Group 491 was a drain or culvert orientated NNW-SSE leading from the Gammel Strand properties (currently Gammel Strand 26, in 1757 matr. 2 Strand Kvarter) into the canal. The drain differed in construction methodology from the majority of other pipes seen on Gammel Strand in that this was made out of pine planks, creating a narrow box-like structure, whereas many other pipes are made from (reused?) hollowed out pine logs. It also differed from the pipe just west of it (SG315) in that this had been

made partly from a hollowed out log as well as a plank lid. It is not clear whether G491 and SG315 are in fact two drain pipes constructed simultaneously, as they appear to be placed in the same construction cut.

It seems plausible that G491 is in fact the southern continuation of SG368, which was excavated during the 2010 watching briefs. This structure (ST3967) was then interpreted as a water pipe, being part of a water supply system (G242), but it now seems more reasonable that SG368 is actually a drain, feeding foul water away from the buildings at Gammel Strand instead of supplying it.

Wood from ST13822 (not clear which part) was sampled for dendrochronological analysis, but could not be dated. However, stratigraphy suggests that the pipe may belong in the 18th Century – especially if this structure is contemporary with SG315. It seems reasonable to place the construction and usage of the structure in Phase 4.

7.4.3.7.3. Discussions

It has been very difficult to differentiate between whether the excavated pipes were water pipes or drain pipes with the latter being a reuse of the former. However, within the Gammel Strand excavation area it seems to be that pipes leading downwards towards the canal were outflow or drainage pipes, whereas pipes oriented east-west may have functioned as either water pipes or land fill material.

The preferred timber specie used for wooden pipes appears to have been pine. All the dendrochronological samples from this group of structures were species determined as pine and this preference is also evident from finds of wooden water pipes in other excavations, e.g. Rådhuspladsen. In some cases the pipes were found with the exterior still covered in bark. This could indicate that these pipes were not reused from anywhere else, as the bark is easily loosened and would probably have fallen off if left to dry above ground even for a short period of time. The dendrochronological dates obtained from the samples of wooden service pipes from Gammel Strand in general spanned the time between after AD 1724 to after AD 1775, indicating that the 18th Century was the period in which this type of drainage would have been constructed and in use in the area. It is not clear, however, if some pipes may be replacements of earlier drain pipes or culverts and neither for how long the pipes would have been in use.

The finds materials collected from the fills within the pipes and sewers comprised a broad variety of ceramics (late redwares, stoneware, industrial ceramics, Chinese porcelain etc.); glass, including fragments of window glass, bottles and many types of drinking glasses; clay pipe fragments. Of the more curious items were the more than 100 cowrie shells retrieved from the fills inside the pipes in the sewer complex SG223 with southern extension SG708. Following the alignment of these structures northwards, it seems reasonable to suggest that the sewer or culvert would have fed the drain waters from the building on what is today Gammel Strand 44 towards the canal. It would be interesting to look further into who owned and lived in this building in the 18th Century and begin to imagine how such a large number of very similar sea shells would have ended up in the drain.

Samples taken from eight deposits within the pipes were analysed for their macro-botanical contents. The results of these varied in that most samples contained relatively sparse remains of macrofossils, while two samples were rich in plant remains from both weeds and meadow plants as well as grown or collected plants. The variations in the size of the materials may be due to a number of factors among which differences in preservation conditions is one, but it may also be relevant to consider if some of the drain

pipes were used differently than others (e.g. the E-W oriented G612 pipe, containing only a few weeds and meadow species and single fruits from dill as the only collected or grown species) or over a longer time period. For all other samples from the fills inside the service pipes, the grown or collected plants dominated and especially raspberries appear to have survived well.

The zoological material from deposits within some of the wooden pipes and brick built sewers were analysed and it was concluded for all the analysed deposits that the mammalian, bird and fish remains represented human consumption and thus normal household waste with a few exceptions such as rats and wild species. The great variation in number of bones collected from the single deposits is in most cases a direct result of the excavation and collection methodology. It is obvious that samples which have been fine sieved in down to 1 mm mesh sizes reveal a much longer list of fish species, whereas hand collected zoological material primarily comprises mammal bones and hardly any bird or fish bones.

7.4.3.8. Other group types

A number of other groups could not be directly related to any of the other overall groups and structures described in the sub-chapters above. These are described briefly and in numerical order below.

Group	Sub-groups	Group name
408		Posts/platform
428		Posthole
431		Pit
447		Posts
458		Robber cut
461		Pit
473		Pit
490		Deconstruction
499		Bulwark?
520		Demolition
526		Posts
538		Stakehole
578	577	Bulwark/pier and repair
582		Demolition/levelling
627		Demolition/levelling
650		Deconstruction
654		Pit

Table 51 Groups and sub-groups related to Phase 4 other group types

Posts/Platform? G408

Seven of the contexts related to G408 were excavated during the 2012 Guide Wall excavation, but the group was extended with another three contexts in the 2014 Main Excavation. The group was located in the south-western part of the excavation area, including the southern part of Guide Wall Trench 1/ZT9164.

Group G408 comprised ten posts, which were driven into the ground. The posts were registered at different stratigraphical levels (partly due to different excavation conditions as not all the posts were fully excavated because of the excavation depth limit) and displayed rather different attributes in terms of dimensions and timber species, but seemed to form a more or less regular, rectangular pattern.

Four vertically set posts (ST9211, ST9239, ST9243 and ST9353) were found forming a straight, NNW-SSE-oriented line, measuring 3.75 m. The two northernmost of these were oak, rectangular, measuring 0.13-0.22 m in cross section, while the two southernmost were stout pine post, with square cross sections, measuring 0.27 m by 0.27 m. Immediately east of the northernmost post, ST9211, was pine post ST9207, which was slightly larger in cross section, 0.18 m by 0.23 m. Surveyed approximately 1.75 m ENE of the oak post ST9239 was an oak post, ST9185, which with regards to cross section was similar to the pine posts ST9243 and ST9353, though placed perpendicular to the line formed by these. Posts ST9211, ST9207, ST9239 and ST9185 were all recorded as displaying signs of charring of the top.



Fig. 314 ST9211 and ST9207 of G408 as excavated during the 2012 Guide Wall excavation. Looking NNW. C03_20120720_5027

Located ENE of post ST9243 were two posts, ST37656 and ST38377 forming a line, perpendicular to the line made by ST9211, ST9239, ST9243 and ST9353. Post ST37656 was a large post preserved considerably higher than most of the other posts in ST408 and leaning slightly towards the south. Most of the posts in G408 were surveyed at the top with levels ranging between OD 0.60 and 0.80 m, but ST9243 and ST37656 were surveyed with top levels above OD 1.15 m. Post ST38377 was not fully recorded but seem from the surveyed polygon to have been of smaller dimensions.

Located 1.8 m to the WSW of the southernmost of the posts, ST9353, was another vertically set post, ST9357. It was described as identical to the afore mentioned ST9243 and ST9353, though the wood species analysis stated that this was made of pine in stead of oak. Continuing the ENE-WSW orientated line comprising ST9357 and ST9353 was vertical post ST38372, which was placed approximately 3.85 m ENE of ST9353. A post between ST9353 and ST38372 would have been expected, based on the pattern made by the rest of the posts in this group, but was not surveyed. From the photos (e.g. Fig. 315), however, it seems that a large post was present, but just not recorded in this area.



Fig. 315 The southwestern corner of the Main Excavation trench as seen in the watching briefs in July 2014. An un-surveyed post is seen to the left of the tall post ST37656. Looking west. C03_20140715_11600 (cropped)

Interpretation

Seen as one structure, G408 consisted of 10 (and possibly more) posts forming a more or less rectangular structure consisting of four NNW-SSE oriented rows of posts and covering an area at minimum of 5.9 m by 3.9 m. The structure is expected to have continued further west and south, beyond the limits of the excavation. The rectangular structure formed by the posts may be interpreted as the foundations for a pier or platform, though it is not clear if it would have extended into the water or been completely on dry land. All the exposed

posts of G408 were located on what would have been already claimed land in Phase 4, as the Phase 4

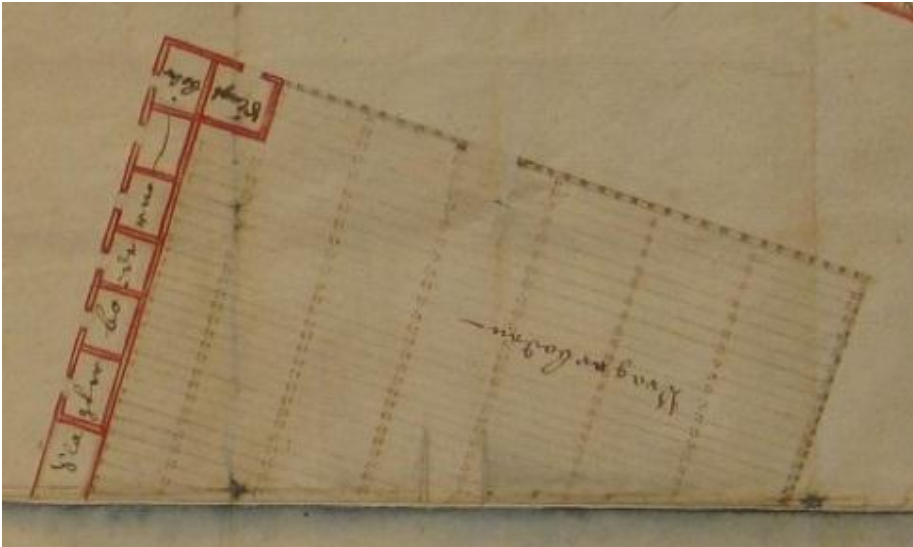


Fig. 316 Part of the 1683 map. *Vragerbro*. Northwest is upwards. Copenhagen City Archives

bulwark seemed to be places south of this part of the excavation area. It is very possible that G408 should be seen in close connection with the group G200 excavated during the 2010-11 watching brief excavations and interpreted as parts of a bulwark (Olesen & Bork-Pedersen 2012, 76), as these two groups appear fully aligned with each other.

It is possible that G408 (and G200) can be interpreted as parts of the structure known as *Vragerbro* in the written sources from the late 17th and early 18th Century, as this on some maps appear to be depicted as a large wooden platform or wooden-paved area (see Fig. 316).

Group G408 can however hardly be seen as just one phase of a structure, but rather a primary and a secondary construction phase. This is evident from the dendrochronological analysis (see below), the variations in timber species as well as the two northernmost posts being placed so close to each other, that one can be interpreted as the replacement of the other.

Dating

A series of seven dendrochronological samples from contexts related to G408 were sent for analysis. Of these were four date.: The oak posts, ST9211 and ST9239 were dated to AD 1687-1700 (PD202446) and AD 1677-91 (PD202441), respectively. The two pine posts, ST9243 and ST9353, placed further south in the same line had analysis resulting in felling dates after AD 1737 (PD202437) and after AD 1757 (PD202407), respectively. This is taken as a clear indication of an early part of G408 being constructed along with or slightly after the Phase 4 early land ties and bulwark were established, while in the middle of the 18th Century repairs or replacements of parts of the structure were undertaken.

Posthole G425

The two contexts related to G425 were excavated during the 2012 Guide Wall excavation and located in the north-eastern part of Trench 1/ZT9164.

Group G425 consisted of a circular cut, SC10564, measuring 0.26 m in diameter and 0.43 m deep, cutting into the underlying backfill over a drain pipe related to G235 (Phase 4). The cut was recorded as having straight, vertical sides, but the base was not fully excavated due to ground water problems. It was noted that the cut was more obvious to the north where it seemed to be lined (?) with darker organic material, perhaps the remains of the timber once filling the posthole. To the south the cut was close to the edge of the area truncated by the cut for the modern gas pipe, SM9773. The cut was backfilled with deposit SD10572, a dark layer of grey-brown sandy silt. A few animal bones were collected and comprised domestic

goose, sheep/goat as well as unspecified mammals. Overlying SD10572 was the machining layer (Phase 103).

Group G425 was interpreted as a posthole, though it is not clear which purpose it had once served as there are no obvious structures to relate it to. The group could not be dated very accurately. The stratigraphy suggests that it was later than the part of the drain, G235, exposed in the Guide Wall trench. Parts of G235 excavated further south were dendrochronologically dated to the AD 1720s, so the posthole must belong to a structure later than this. As the upper stratigraphical relation could not be established, the posthole may even be of modern date.

Posthole? G428

The two contexts related to G428 were excavated during the 2012 Guide Wall excavation. G428 was located around the middle of the northern part of Trench 1/ZT9164.

Group G428 comprised a cut, SC10233, measuring 0.28 by 0.22 m by 0.54 m deep. The cut was sub-rectangular in shape with straight sides and a flat base and truncated underlying levelling layer, SD10244 belonging with G429 (Phase 4). It was noted that the cut was very sharp-edged, indicating a relatively late date. Filling the cut was deposit SD10242, consisting of light brown-grey, coarse sand. The backfill comprised a piece of slag (FO202273) and an iron nail (FO204559). The upper stratigraphical relation could not be established, as the posthole was found during the cleaning after removal of the machining layer (Phase 103).

Group G428 is interpreted as a cut, probably for a post, for some use in the harbour area. It was backfilled when the timber was removed and the hole went out of use. It was not obvious what the function of this feature was, as there were no structures nearby to relate it to. It was suggested by the excavator, that it was actually a modern cut, related to the metal shoring, but this cannot be verified.

The dating of G428 cannot be determined very accurately. From stratigraphy it is clear that the posthole was made after the Phase 4 levelling layer belonging with G429 was deposited, but there is no upper limit for the dating.

Robber cut? G431

The two contexts related to G431 were excavated during the 2012 Guide Wall excavations. The group was located at the interface between Trench 1/ZT9164 and Trench 2A/ZT12420.

Group G431 comprised a sub-rounded cut, SC9704, with gradual sides and a concave base. It measured 1.5 m by 0.7 m wide by 0.2 m deep. The stratigraphy was not completely clear and thus it is not obvious what it was cut into. The fill of the cut, SD9712, consisted of compact, sandy clay of a light yellowish grey hue. The deposit contained a few finds, comprising flint flakes, roof tile, bottle glass, window glass, ceramics and animal bones. The pit and its backfill was covered by levelling layer, SD9644 belonging with Phase 6, G432. The south side of G431 was truncated by the modern gas pipe cut, SM9773. The deposit and cut were approximately the same size and level as the boulders on the south side of the gas pipe line cut.

The size and level of the deposit and the nearby two large boulders, makes it tempting to interpret G431 as a robber cut or demolition of the stone quay wall, G532 (Phase 2/3). It has been interpreted by the excavator that the pit was rapidly backfilled, and the finds were deposited vertically.

The dating of G431 is very questionable. The stratigraphy was not clear and the finds material could have been dug up from underlying layers. Thus, it is not even clear if this group belongs with Phase 4.

Posts G447 – not dateable

The contexts related to G447 were excavated during the 2012 Guide Wall excavation and located in the western end of Trench 2b/ZT13818.

The group comprised three timber posts, ST18797, ST18569 and ST18641, forming a 2.3 m long, WSW-ENE oriented line. The posts were all surveyed at the top of the posts with levels around OD 0.40 m, but could not be followed downwards due to the excavation depth limit. It appeared the posts were stratigraphically above a levelling layer belonging with G451 (Phase 4, early levelling), and were overlain by deposits belonging with G449 (Phase 4, levelling), but as they seemed to have been driven into the ground, the stratigraphical observations recorded may be misleading. As the posts were not fully excavated, only a little was recorded about them, but they all seemed to be vertical posts with rectangular cross sections, dimensions ranging between 0.1 m and 0.18 m.

Group G447 cannot be easily interpreted, as the posts, though forming a straight line, do not seem to be linked to any other structure. This may however have been present beyond the limits of the excavation, north of the posts.

From G447 no samples were prioritized for dendrochronological analysis. Due to the stratigraphy being unclear, it is not possible to date the structure very accurately. The orientation of the structure may, however suggest that it belongs with Phase 4, as the majority of the harbour related structures from this Phase are found to be ENE-WSW oriented. Though as the same goes for earlier structures also, this is not very reliable for dating the group.

Robber cut? G458

The two contexts belonging with G458 were excavated during the 2012 Guide Wall excavation and located in the western half of Trench 2B/ZT13818.

Group G458 comprised a cut, SC18366, and backfill deposit, SD18372. The cut was recorded as rectangular in plan with irregular sides and base. The cut measured 1.1 m by 0.35 m by 0.16 m in depth. It cut into the underlying brick structure, SS14486 of SG457 (related to G532, Phase 2/3 quay wall). The cut was filled by deposit SD18372, a mid grey layer of brown sandy silt. The deposit comprised fragments of charcoal and bone. The group was truncated by land tie repair cut SC17204 (G455, Phase 4).

Group G458 is interpreted as a robber cut to remove brick material or other parts of the former quay wall when the land reclamation continued south of this.

The dating of G458 can only be based on stratigraphy. From this it seems reasonable to place this deconstruction of the former quay wall at the very beginning of Phase 4 in the late 17th Century.

Robber cut? G461

The two contexts related to G461 were recorded during the 2012 Guide Wall excavation, but due to the excavation depth limit, it was not excavated. The group was located in the central part of Trench 2B/ZT13818.

G461 comprised two features, cut SC17766 and fill SD17776. Cut SC17766 measured 0.52 m by 0.32 m. It truncated into wall fragment SS17752 of SG457 (related to G532, Phase 2/3 quay wall). The pit was sub-circular in shape. No depth was recorded as it was located at the base of the excavation. It was filled by mid brown silty clay, SD17776. The deposit was truncated by cut SC17777 from G460 (Phase 4A land tie).

G461 is interpreted as a robber cut for stone from the harbour area. It seemed to have been backfilled by surrounding soil when the stone had been removed. The dating of G461 is uncertain. No finds were collected from the deposit, related to the group. From stratigraphy it seems dated to either the end of Phase 3 or the very beginning of Phase 4, before the insertion of the early land tie, G460.

Pit? G473

The two contexts related to G473 were excavated during the 2012 Guide Wall excavation. The group was located in the eastern part of Trench 2B/ZT13818.

Group G473 comprised a sub-oval, shallow cut, SC15163, which was recorded as truncating the backfill over Phase 4 later land tie, G472. The cut was backfilled with white-grey silt and sand, SD15181. The deposit contained a few finds of ceramics, animal bone, iron and clay pipe, indicating domestic waste from the 17th or 18th Century. The northern side of the cut was truncated by the modern gas pipe cut, SM14362.

Group G473 was interpreted as a pit. The size of the pit, resembling that of a quay wall stone suggests it was a cut to remove a stone – either for levelling out the area or for secondary use of the stone. But as this was found north of the location of the Renaissance quay wall, the purpose may have been another.

The finds from the backfill of the cut seem produced in the 17th or 18th Century. However, as these may be secondarily deposited, this does not provide a very accurate date of the cut. Stratigraphically the cut was younger than the Phase 4 later land tie G472, placing G473 in the second half of the 18th Century or thereafter.

Pit? G490

The two features related to G490 were excavated during the 2012 Guide Wall excavation and were located in the northern part of Trench 3/ZT13569.

Group G490 comprised a shallow cut, SC13904 and fill, SD202582. The pit was irregularly shaped with straight sides and a flat base measuring 0.95 m by 0.45 m by 0.13 m. The cut truncated deposits SD14153 and SD15194 of the Phase 4 drain pipe, G491 below. It was backfilled by deposit SD202582, a mid grey silty sand deposit containing animal bone, clay pipes and ceramics. This was overlain by SD13758 of G492 (Phase 4 levelling).

Group G490 is difficult to interpret. It was a shallow cut filled by rapid backfill, which was very similar to other cuts interpreted as robber cuts for stones. However, G490 seemed to be cut into the upper parts of a Phase 4 drain at a higher level than the stones from the former quay wall. It is possible, but not certain, that the cut could have been linked to maintenance of the drain pipe.

Stratigraphically G490 is placed in Phase 4 – probably in the later 18th Century. This is not contradicted by the finds materials.

Bulwark? G499

The contexts belonging with G499 were all excavated during a watching brief in 2012 in what was named the Oil Container trench/ZT19393. The structures related to G499 were seen in a part of the trench which was heavily truncated by later activities and the full extend of the structures could not be documented.

Group G499 comprised six vertical posts, two planks (one vertically set and one horizontal) and a horizontal beam, preserved and surveyed at varying levels between OD 0.22 m and 1.37 m. In total these were spread over an area measuring 3.03 m by 0.83 m. The timbers do not form a visible pattern and may thus belong to different structures. They were all recorded as stratigraphically above the depth limit of the excavation (Phase 102) and overlain by SD19537, belonging with G505 (Phase 6, demolition of buildings in the area).

Four of the posts, ST19447, ST19430, ST19443 and ST19671 were recorded as made from boxed heart cut timbers with square cross sections – ranging from 0.15 m to 0.22 m in cross section dimensions. The three latter even seemed to form a straight, NE-SW oriented line, while ST19447 was placed north of this. The horizontally placed plank, ST19679 may originally have been set on edge and as another plank seemed to have been placed below it (not recorded), this could indicate that these were originally parts of NE-SW oriented bulwark planking. The other timber elements showed very varying timber cuts and dimensions and could not be linked to each other.

Interpretation

Group G499 could be different parts of a bulwark, land tie or foundation posts for a building, but this could not be definitely determined due to excavation conditions in the watching brief. If some of the timber elements constituted a bulwark, the orientation of this is very different to the bulwark structures seen in the Main Excavation trench, east of the Oil Container trench. Based on the location and preserved levels of the posts, some of these may even be parts of the same structure as G408 (Phase 4, platform?), but the distance between the trenches in which these structures are excavated does not allow a verification of this hypothesis. Thus, the interpretation of G499 is very uncertain.

Dating

The dating of the structures related to G499 could not be established by finds, dendrochronology (no samples were taken from the timbers) or stratigraphy, as only very little could be recorded. It does seem, however, that the timbers went out of use before or during the middle of 19th Century, from which the demolition layer belonging with G505 derived. The rather northerly location of the timbers suggest an early date, if these are to be interpreted as a bulwark – but if they are merely a dry land structure, they may have been parts of structures established during Phase 4.

Demolition/levelling G520

The single context related to G520 was excavated during the 2012 Guide Wall excavation. It was located in the central part of Trench 2B/ZT13818.

Group G520 comprised a single deposit only, SD18295. This consisted of light grey sand and judging from the photo a large proportion of stones, bricks and mortar. The deposit was placed directly on top of a large stone, SS18361, belonging with SG411 (related to G532, Phase 2/3 quay wall). Partly overlying SD18295 was a Phase 4 levelling layer, related to G451.

The interpretation of G520 is not completely clear. It seems that the deposited material was formerly part of a structure – possibly the Renaissance quay wall, but it is not clear what disturbed it and changed the structure, resulting in the rather mottled and mixed deposit, SD18295. It may, however be, that an unseen disturbance cut would have turned the material upside down. This indicates that SD18295 is actually a result of demolition and levelling.

The dating of G520 is not very accurate. The material constituting the deposit may derive from the Renaissance quay wall, but the disturbance causing it to be a deposit rather than a structure may have taken place in the late 17th or early 18th Century, before the levelling layers belonging with G451 were laid out.

Posts G526 – not dateable

The contexts related to G526 were excavated in a narrow, NNW-SSE oriented service trench, ZT9047 in May 2012, prior to the Guide Wall excavations.

Group G526 comprised four timber posts placed on a 7.43 m long, rather irregular, NNW-SSE oriented line, ST9071, ST9075, ST9079 and ST9025. None of the posts were fully excavated, but uncovered up to a height/depth of 0.2 m. The three northernmost posts, ST9071, ST9075 and ST9079 were all recorded as having square cross sections measuring 0.2 m by 0.2 m and surveyed with top levels ranging from OD 1.06 m to 1.41 m, while the southernmost post, ST9025, was recorded as 0.15 m by 0.2 m in cross section and preserved under OD 0.80 m. The trench was excavated completely by machine and only to a certain excavation depth limit. Thus, the three northern posts were recorded as above the limit of excavation (Phase 102) and below the machine layer (Phase 103). The southern post was likewise extending into the limit of excavation, but was overlain by the assumed land reclamation layer, SD9029 related to G525 (Phase 4, land reclamation).

The group, G526, is interpreted as a series of post which may or may not originally derive from the same structure. The recorded, quite similar dimensions of the posts may indicate that they were related in a structure, but as they were found with distances of 3.1 m, 1.5 m and 2.9 m between them and not in a straight line, this cannot be said with certainty. If they do really derive from the same, this – or just some of it – may be seen in connection with the posts in G408 (Phase 4, platform?), excavated approximately 20 m east of them.

Only very little can indicate the date of the posts in G526, as no dendrochronology samples were taken from the posts. The stratigraphical relationship with G525 is a relatively unreliable means of dating, as the posts were probably driven into the ground and thus difficult to register. Due to the location of the posts, it is probable though that they should be dated to some time between the late 17th and late 19th Century.

Stakehole G538 – not dateable

The two contexts related to G538 were excavated during the 2012 Guide Wall excavation and located in the northern, middle part of Trench 1/ZT9164.

Group G538 comprised two contexts, cut SC11643 and fill SD11647. The cut measured 0.11 m by 0.07 m in plan and was 0.15 m deep. It truncated into the levelling layer SD10244 of group G429 (Phase 4, levelling). The cut was sub-rectangular in shape with straight sides, rounded edges and a flat base. It was filled by light brown grey sand deposit SD11647. The deposit was uncovered after cleaning machining layer, Phase 103.

Group G538 is interpreted as a small stakehole, but the function is not clear as no other structures or features were located nearby, that it could be related to.

The group G538 can only be dated based on stratigraphy. It was seen as truncating the levelling layers of G429 (Phase 4), but may have been driven in from a much higher level. This makes it probable that the stake was driven in during the 18th, 19th or even 20th Century.

Jetty? G578 and repair SG577

Contexts related to G578 were first excavated during the 2012 Guide Wall excavation, but the group was changed and extended in the 2014 Main Excavation and extended even further during the watching briefs in July 2014. The group was located in the eastern end of the Main Excavation trench and a little was found in the Guide Wall Trench 3/ZT13569 east of the Main Excavation.

The eastern part of the structure was excavated primarily during the 2012 Guide Wall excavation. It consisted of a vertically set post, ST13638, which was driven into the ground, though it was not clear from which level, because of the excavation depth limit. Post ST13638 was placed up against the south side of elements belonging to Phase 4 bulwark, G626, but the stratigraphical relationship between these timbers could not be clarified. Extending south from this post was a row of nine vertically set pine planks, ST13663. Plank structure ST13663 consisted of eight vertically set planks set in close pairs as well as a single vertical plank. Together these planks formed a 1.37 m long line with N-S orientation (with a deviation towards NNW-SSE). The planks measured 0.21 m-0.29 m in width, but the length was not recorded. The top-levels of the planking were surveyed at between OD 0.43 and 0.52 m, except for the southernmost pair of planks, which were only preserved to OD 0.20 m-0.25 m. Also part of ST13663 was a horizontal edge-set plank (or possibly two worn planks) placed against the eastern side of the vertical planking. This was recorded as 1.23 m long and 0.22 m wide. The horizontal part of ST13663 was resting on top of another horizontal beam with the same orientation, ST13646. This beam measured 1.95 m long and was exposed to a depth of



Fig. 317 G578 and other timber structures as seen in the 2014 Main Excavation. Looking NW. C03_20140429_9971

at least 0.29 m (not fully exposed). The width was 0.07 m. Placed immediately south of the southern pair of vertically set planks in ST13663 was a vertical post, ST13701. This was either rectangular in cross section with a fissure down the middle, or consisting of two closely set narrow timber posts. As with the rest of the structure, it was not fully exposed during

the Guide Wall excavation. In the 2014 Main Excavation, this eastern part of G578 was re-exposed, but not fully recorded.

In 2014 a similar timber structure was excavated west of the former but completely parallel to this. This consisted of a multiple plank structure, ST20403. The vertical planking structure ST20403 formed a 1.8 m long line, parallel to the line created by ST13663, but 1.5 m WSW of this. Like ST13663, the north end of ST20403 seemed to correspond with the Phase 4 bulwark, G626. Structure ST20403 comprised 14 vertically set planks of differing dimensions. Unlike ST13663 the planks were not set in pairs, but rather overlapping each other in two rows. The surveyed top-levels of the planking ranged from OD 0.40 m to 0.49 m, except for the southernmost plank, which was preserved only to OD 0.3 m. This was seen similarly in the eastern part of the structure, ST13663, and it must be assumed that a later, though invisible, disturbance would have truncated into the southern part of the structure. The length of the planks was not recorded due to the planks being left in-situ until the end of the excavation. On the western side of the vertical planking, a horizontal, edge set plank was surveyed as ST25654. This was recorded as 1.82 m long and sloping slightly downwards from north to south, in that the surveyed toplevels was OD 0.26 m at the north end and OD - 0.01 m at the south end. It did not seem to be fastened to ST20403 in any way. It was not clear if ST20403 also comprised a horizontal element, as the surveyed timber structure was changed in August 2014 to comprise a very long horizontal beam or plank continuing southwards beyond the southern limits of the Main Excavation trench.

Two timber elements, ST28491 and ST28495, were placed near the southern end of the exposed parts of the vertical planking in ST20403. These were described as wedges and ST28491 appeared to be wedged in between the southern vertical plank in ST20403 to the east and a plank, ST27944, belonging with G591 (Phase 5, waterfront). Structure ST28495 was placed on the eastern side of the planking, ST20403, and it is not clear how it was related to the structure.

Two deposits were related to G578. Deposit SD26677 measured 2 m by 1.27 m and 0.44 m thick, located on the western side of the planking, ST20403, and seemingly stratigraphically younger than ST25654. SD26677 was recorded as heavy and extremely compact greyish blue clay. It is not clear what bounded the deposit in

the west. From this layer a number of copper alloy items were collected, among these was a four-leaf clover shaped buckle with a rectangular hole in the middle (FO213361) as well as three coins or coin-like items (FO212531, FO212532 and FO212548). Deposit SD34713 was deposited over the southern part of SD26677 with the exposed part measuring 1.38 m in length (E-W) and 0.45 m in width. It consisted of brown-grey silt and sand and no finds were



Fig. 318 FO212231, a possible coin from SD26677 (G578). Museum of Copenhagen

collected from it. It is not known how or if the deposit was directly related to G578, as it may have been deposited in connection with the planking, ST27944 (G591, Phase 5 waterfront).

A repair sub-group, SG577, was recorded as comprising a construction cut, SC25644, which was cut into underlying deposits belonging to G578, but along the northern face of the Phase 5 bulwark, G591. Overlying this was SD25188, consisting of compact grey-blue clay mixed with grey sand. The deposit extended further north than the cut. Limiting SD25188 towards north was an ENE-WSW oriented timber plank, surveyed as ST25184, but interpreted as being moved from its original structure and thus merely an inclusion. On the northern side of the plank was SD24871, consisting of yellow-grey silt and clay. It was recorded as possibly related to a repair of the timbers to the east of it (G578), but it is not clear how this would have been done, as no cut is recorded in that area. Overlying the north eastern part of SD24871 was another deposit, SD22601, which was deposited against the planking, ST20403 of G578. Deposit SD22601 was recorded as orange-yellow and consisting of compact, sterile clay. Overlying all the other contexts related to SG577 was SD22369, a deposit measuring 2.1 m by 1.4 m by 0.34 m in depth and consisting of grey-yellow sand. From the deposits within SG577 only a few finds were collected, and none was prioritized for registration.

Interpretation

Group G578 represents a timber construction consisting of two parallel “walls” of timber planking, set 1.4 m apart. It was N-S oriented, with a slight deviation towards NNW-SSE. The structure’s northern extent seemed to correspond with the southern face of Phase 4 bulwark, G626, but it was not clarified whether these structures were actually related to each other. The southern extent of G578 was not exposed as it seemed to continue beyond the southern limits of the Main Excavation area, just as the lower parts of the structure were not fully excavated until the July 2014 watching briefs where detailed observations could not be made. Thus, the interpretation is problematic. It may be that G578 represents two sides of a foundation for a jetty belonging with the Phase 4 bulwark, though the material and construction type do not match that of the bulwark. Another possibility is that G578 belongs with a later construction and served as the shoring for a deep construction or repair cut made for a no longer visible purpose.

The interpretation of SG577 is likewise very problematic, as it seems partly to be related to G578 and partly to the Phase 5 waterfront, G591.

Dating

Four samples were taken for dendrochronological analysis from ST13663, but none of these could be dated. Beam ST13646 was likewise sampled for dendrochronological analysis (PD202628) with a dating result of After AD 1792. From ST20403 three samples (PD211040, PD211041 and PD211042) were dated using dendrochronology, resulting in dates after AD 1727, after AD 1726 and after AD 1786, respectively.

The dating results make it probable that G578 was constructed some time during or after the 1790s, but it is not possible to come closer. Thus, the structure possibly belongs either with Phase 4 or Phase 5.

Deconstruction G582

The four contexts related to G582 were excavated during the 2014 Main Excavation. The group was located in the central part of the excavation area, north of the Phase 4 later land tie, G616.

Cut SC22123 was an irregularly shaped, elongated cut, measuring 1.3 m long (ENE-WSW) by 0.5 m wide and 0.5 m deep. What it was cut into was not recorded, but from the surveyed top levels it seems to have truncated into the Phase 4 later land tie, G616. Placed centrally within the cut was a timber post, ST22229, which was recorded as 0.47 m long. From the field descriptions it seems possible that the post was an older feature protruding into the base of the cut from an earlier stratigraphic level. On the western side of the post was a small deposit, SD22222, consisting mainly of stones and interpreted as a stone packing for the post. Backfilling the cut over the stone deposit was deposit, SD22135, which consisted of brown-green sand with many stones. A few finds of glass, ceramics and iron were collected, but not prioritized for registration. Overlying SD22135 was SD21485 belonging with Phase 6 Levelling G636.

The interpretation of G582 is difficult as only a little was observed that could clarify the interpretation. It seems probable that the cut has removed the rear stretcher beam belonging with underlying Phase 4 later land tie, G616, but it is not clear if this removal was the actual purpose for the cut or if it was made for another reason. The presence of the post, ST22229, is not clear either. It could have been part of an earlier structure – maybe related to the underlying land ties, G616 (Phase 4 later land tie) or G603 or G609 (Phase 4 early land ties) – or it could have been a later structure of which only this post survived. The related deposits do not shed light on the purpose of G582.

From stratigraphical observations, G582 is later than the Phase 4 later land tie, G616, but older than the Phase 6 levelling, G636. This places G582 somewhere between the late 18th Century and the 20th Century.

Demolition/levelling G627

The four deposits related to G627 were all excavated during the 2014 Main Excavation and located in the northeastern end of the Main Excavation trench.

The four deposits, SD24245, SD24416, SD24728 and SD30660, formed an ENE-WSW oriented line, covering an area of approximately 18 m by 1.5 m. These deposits rarely overlapped. The westernmost deposit, SD24416, was recorded as consisting of grey-brown silt and sand overlying land ties G463 and G465 (Phase 4, later land ties), whilst being truncated by the construction cut for Phase 4 later land tie, G472. From SD24416 only a few finds of ceramics, shell and clay pipe were collected and only the clay pipe was registered. This, FO215192 was a Dutch clay pipe bowl with monogram, which was produced around 1660-1680. The surveyed top levels of SD24416 ranged from OD 0.26 m to 0.46 m.

Deposit SD24728 was smaller and located east of SD24416, but separated by the southeastern part of the double land tie, G472 (Phase 4 later land tie). The deposit measured 1.6 m long (N-S) by 0.63 m wide and 0.05 m deep. It consisted of a rubble layer consisting mainly of CBM, mortar and pebbles. It is not clear what delimited the deposit towards north and south, but the western side coincided with the anchor beam, ST20229 (G472, later Phase 4 land tie), while the eastern side was defined by the wooden drain pipe, ST24735 (G211, Phase 4). The surveyed top levels ranged from OD 0.17 m to 0.28 m.

On the eastern side of the Phase 4 drain pipe, G211 was deposit SD24245, measuring 3.6 m (ENE-WSW) by 1.53 m consisting mainly of CBM and mortar. The CBM was *munkesten* type bricks (Danish Medieval and Renaissance) which seemed to derive from the underlying, preserved parts of the Renaissance quay wall (G532, Phase 2/3). From the description and top levels, SD24245 and SD24728 were the same deposit, only deposited on either side of the drain pipe, G211.

With a slight overlap, SD30660 was deposited east of SD24245, but likewise recorded as consisting predominantly of brick and mortar. The surveyed top-levels were very similar to that of SD24245.

The four deposits were very similar and may derive from the same structure originally, the Renaissance quay wall. The deposits were three deconstructed parts of the quay wall, overlying the top of it, but the stratigraphical relationships with the Phase 4 later land ties makes the interpretation of the depositions problematic. It seems the deposition of the rubble material is linked to one or more episodes of deconstruction of the quay wall, but there are no deconstruction cuts recorded – unless the deconstruction occurred as parts of the construction of the Phase 4 later land ties in which case it is to be related to this construction work. However, as some of the material is deposited above the land ties, there may be more than one interpretation. It was suggested by the field archaeologist that the demolished parts of the wall were the remains of the process in which the reusable parts of the quay walls were removed. It is not clear whether such deconstruction for reuse purposes could have happened more than once – or if some of the deposited rubble is instead parts of levelling out of the area (and the deconstruction material on top of the former quay wall) in connection with the construction of the Phase 4 later land ties.

There is no datable material linked to G627, except stratigraphical observations. From these it seems probable that the deposition of the material related to G627 occurred some time during the 18th Century – either before or just after the construction of the later Phase 4 land ties.

Deconstruction cut? G650

The two contexts related to G650 were excavated during the 2014 Main Excavation. The group was located in the western end of the Main Excavation trench.

The possible cut, SC55690, was recorded as sub-rectangular with rounded corners, ENE-WSW oriented and cut into the underlying levelling layer, SD55839, belonging to G414 (Phase 4 levelling). The cut was 1.85 m long, 0.75 m wide and approximately 0.15 m deep and the surveyed top levels ranged from OD -0.21 m at the WSW end and +0.07 m at the ENE end. There were some doubts during the excavation if this was actually a cut or just a variation in the fill layers in the area as the fill, SD55709, was similar to surrounding deposits (white sand lensed with organic material). Deposit SD55709 contained finds such as animal bone, ceramics and clay pipes, but only the latter were fully registered. The deposit was registered as cut by SC33573 for the wall SG675 (G707 Phase 4, eastern building), as this cut appears to truncate the eastern end of G650.

Based on the location and orientation of the cut, it seems plausible that it is linked to the deconstruction of the drain/water pipe, G413, as it is located where the supposed western edge of G650 is located. It is however not clear what the purpose of removing the eastern end of the pipe would have been, but it may be related to the establishment of the building, G707, as the pipe may have been in the way for this. In that case there may have been a pause between the removal of the pipe and the construction of the wall, where the cut in G650 either silted up again or was backfilled.

The date of G650 relies on stratigraphy. If G650 did indeed truncate and remove the eastern part of the pipe, G413, it must have happened after the late 17th Century, as the felling date for the pipe was AD 1686 spring/summer. However, if G650 was really truncated by the construction cut for wall SG675 (G707, Phase 4, eastern building), this makes the timespan in which G650 would have been made relatively short as this

building seems to be in place by the mid 1700s according to historical maps. However, if the wooden pipe would have had a purpose in relation to the building, G650 must have been made after the building had been in use for some time.

Bulwark related cut? G654

The two contexts related to G654 were excavated in section only during the 2014 Main Excavation. The group was located at the south-western end of the excavation.

As the cut, SC44732 and fill, SD44739 were only seen in the east-facing section of the large baulk in this area, the features were not fully excavated. The exposed part of the cut was 0.76 m wide (N-S) and approximately 0.51 m deep, but the length could not be measured. It was recorded as cut into SD33628 (G663, Phase 2/3 harbour usage), but this is uncertain, as this deposit is not recorded in the area, where G654 was excavated. The fill, SD44739, was described as dark, grey-brown sandy silt with lenses of grey sand. No finds were collected from the deposit. The deposit was recorded as truncated by the bulwark (repair?) cut, SC44726, belonging with SG604 (Phase 4).

Due to the group not being fully excavated and only seen in section, interpretation is difficult. The group may represent a cut linked to the construction or repair of the bulwark, SG604, but as G654 is recorded as truncated by the repair cut for this bulwark, this interpretation is questionable.

Stratigraphically the cut appeared to be later than the Phase 2/3 G663, but older than the repair or replacement of the Phase 4 bulwark. This – with caution – places G654 in the late 17th or early 18th Century.

7.4.4. Phase 4 Conclusion

Phase 4 of the Gammel Strand excavation began with a large re-structuring of the harbourside in the 1690s. This process started with land reclamation south of the Phase 3 waterfront, closely followed by the construction of a new bulwark and land ties. This process was completed with the levelling of the area. The land ties and bulwarks comprised of large timber structures interlinked with each other and built from oak, pine and spruce timbers. This re-structuring of the harbourside was undertaken as a response to new requirements of the harbour administration as well as the need for more storage facilities and space in connection with the harbour. The material used for the land reclamation and levelling consisted primarily of household waste, which appeared to have been collected from streets and open areas in the city, where garbage would have built up fast, due to the large amounts of foodstuffs and commodities being consumed within Copenhagen.

Following the initial extension of the harbour area was the construction of a building located at the western end of the Main Excavation and Guide Wall Trench 1. This is probably identical to *Pramlaugets hus* (The Bargemen's Guild House), which is known from contemporary written sources as well as later depictions. A series of culverts and drains running under the street surface from the buildings on the north side of today's square and towards the canal was then constructed to feed drain water and waste away from these houses. The construction of the culverts in the Gammel Strand area may have been undertaken over many years, but at least two appear to have been constructed at the same time as the buildings at the western end of the Main Excavation area as the super-structures of these culverts were incorporated into the foundations of the buildings. These buildings appear to have been located at the boundary of the northeastern corner of an area known as *Vragerbro* – the area of quality assessments of goods traded in Copenhagen.

In the middle or late 1750s, a renovation of the harbour structures was undertaken. A new bulwark, placed in the same position as the now old and defunct Phase 4 bulwark was constructed, along with a series of new land ties. These land ties were smaller structures than the earlier Phase 4 land ties, built singularly and tied into the new bulwarks. The building materials used were oak timbers, along with some pine, which may have been reused timbers or later repairs.

Evidence of 18th Century life around the harbourside was seen in the large assemblage of finds materials retrieved from the harbour usage deposits on the southern side of the bulwarks – witnessing not only harbour-related activities, but also the daily life of the inhabitants of the area dumping their household waste by pouring it into the canal in spite of the numerous laws and regulations forbidding this.

The finds assemblage retrieved from the deposits in Phase 4 suggests an increasing global trade and new networks (as represented by the gold ring in the backfill of the bulwark repair cut as well as the large number of cowrie shells from within a drain or sewer) in comparison to earlier phases. However, local production becomes more obvious within the 18th Century assemblage as stoneware and porcelain as well as clay pipes were now being produced in Denmark. Following the glass import embargo from 1760, glass was also imported from the then Danish Norway from the 1760s (Haggren 2016).

The vast amounts of macrofossils retrieved from environmental samples show a wide selection of deposits and deposit types. These deposits not only reveal evidence of the anaerobic conditions but also clear indications of the city's dietary preferences of the late 17th and 18th centuries. This is supported by the

analysis of the zoological material collected from the same deposit types. Most of the zoological material is directly related to normal household waste, though butchering processes are also seen as well as evidence of consumption of wild game, indicating the waste of higher social strata.

The Phase 4 harbourside would have been a cosmopolitan place linked to the process of trade and physical use of the waterway along with actions of daily life of the inhabitants.