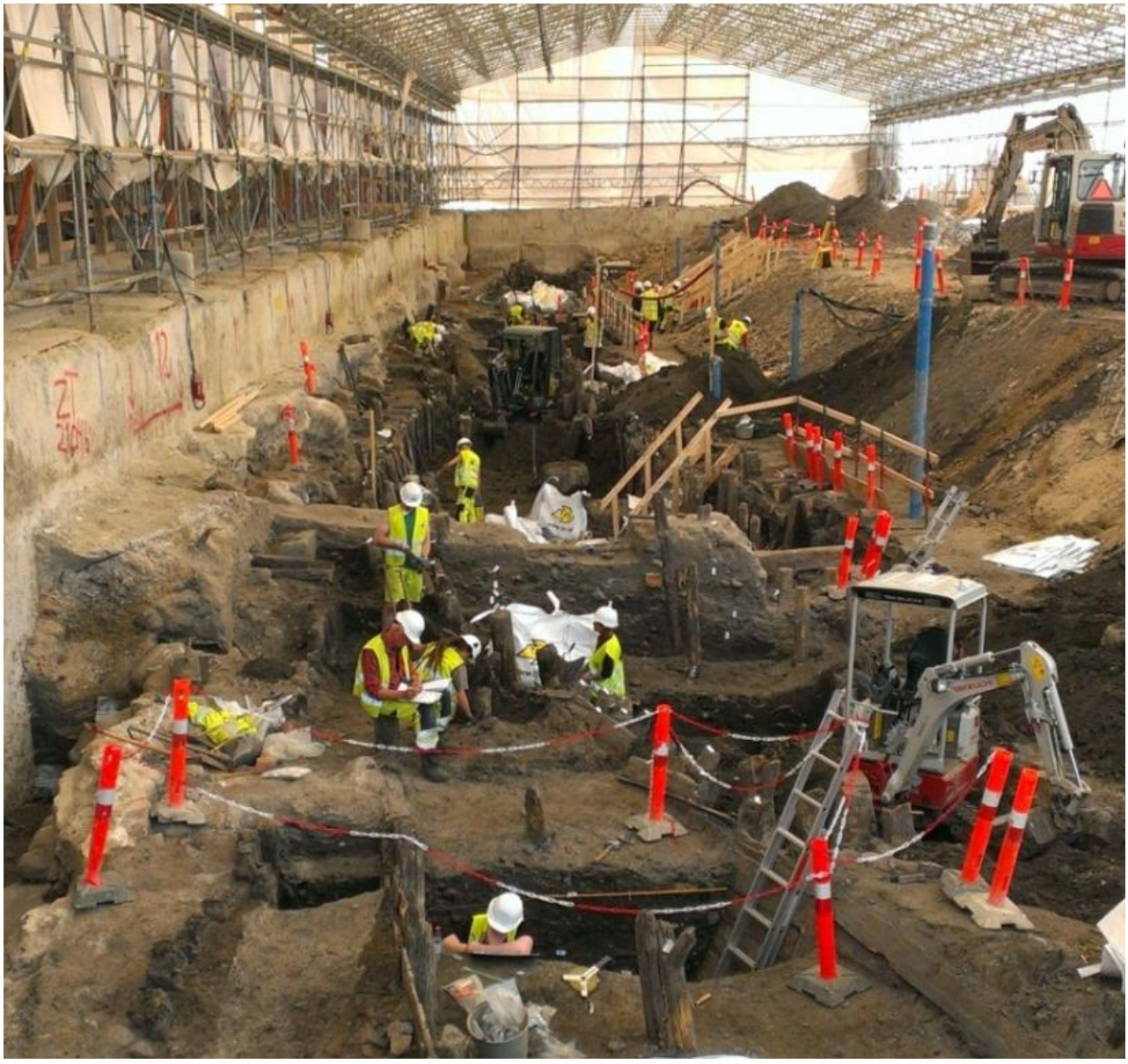
KØBENHAVNS MUSEUM MUSEUM OF **COPENHAGEN** / ARCHAEOLOGICAL REPORT

Gammel Strand, KBM3828

Cultural Historical Report, Metro Cityring Excavation



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Cover picture: The Gammel Strand excavation, Main Excavation trench looking east. Photo by K. K. Tayanin

Foreword

As a result of the extensive archaeological excavation work carried out as part of the "Metro Cityring" project, a vast amount of new knowledge has been brought to light. Previously unseen structures and concise dating of the development of Copenhagen's central harbourside through centuries have provided archaeologists with very important material to improve our understanding of the dynamics of the harbour's layout and functions over time.

Of other important discoveries are the large amounts of find materials, which – in combination with scientific analysis of animal bone and macro-botanical material – can provide a unique source of knowledge of a wide variety of aspects of the city and its inhabitants from the late 15th to the 19th Centuries. The finds, interpreted as primarily household waste and occasional loses of valuables, reveals details of the life of the people living close to the harbour as well as further away in the city, while materials linked directly to trade and exchange of goods portray the routes and networks of the growing capital.

In this cultural historical report the archaeologists describe the most important discoveries from Gammel Strand and give an overview of the results and new interpretations. For those who wish to read more, a comprehensive technical report of the excavation results is available in the museum archives and online.

It is hoped that the report will be read widely and that the results will make the reader reflect upon Copenhagen's rich past and the development of the city's urban way of life from the Late Medieval period and up to the present day.

Thomas Roland, Archaeological Leader, Museum of Copenhagen

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The Gammel Strand Archaeological Project

Fig. 1 Daguerreotype by T. Neubourgh from 1840. Museum of Copenhagen/VÆGGEN.

Introduction

The excavation at Gammel Strand was undertaken as part of the new Metro Cityring project which will provide a new transportation system in the city centre to the surrounding areas of the city. Where new Metro Stations are to be constructed over archaeological sensitive remains, archaeological excavations will be undertaken. The Museum of Copenhagen (KBM) is to conduct the archaeological work of the project.

The excavations revealed the expected archaeological remains such as harbour bulwarks, the *Vejerhus*, the Bargemen's Guild House and other administration buildings along with a large collection of archaeological artefacts showing evidence of trade, production, wealth, religion and thus consumption and networking. The single context recording method used on these excavations, in conjunction with the large quantity of dendrochronological dating of the wooden harbour sides enabled the opportunity of building a site chronology, and the creation of various site phases. Extra provenance work on various stone fragments from the harbour walls and from the various timber types also provided knowledge of where each constituent from the site structures was imported from.

The sheer number of harbour structures, and harbour phases from the 1400s to the modern day along with an unbroken finds register from land reclamation starting from the 1300s has enabled the archaeologists to uncover the story of how the area Ved Stranden, by the beach, later called Gammel Strand, the old beach was created and a view to how the harbour area was urbanized to first become the centre of the harbour in Copenhagen in the 1400s, and by the early 1600s, arguably the most important harbourside in Scandinavia as the centre of the harbour of the capital of Denmark. The results from the excavations from Gammel Strand are therefore of international importance, when comparing to the other important harbour cities within Late Medieval and Renaissance periods in Europe as the harbour transforms from a small harbour to a regional harbour and finally an important international harbour. Within the report are the archaeological results, historical documentation and a national and international selection of finds and natural science reports discussing the evidence from the excavations.

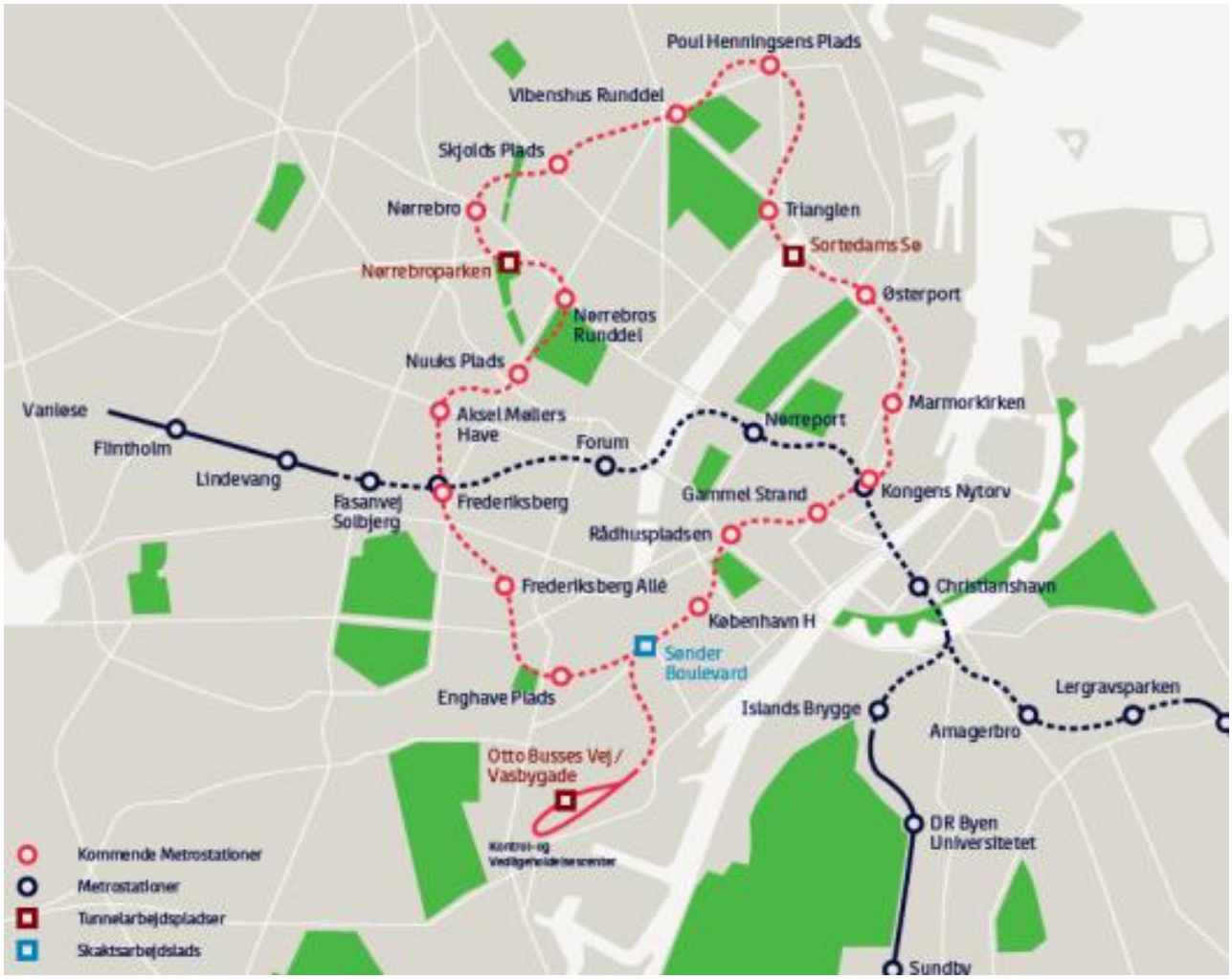


Fig. 2 Plan of the proposed new Metro Cityring. Map by Metroselskabet

The excavation was planned to be undertaken over a period of either 4 or 5 years. The watching brief for realignment and changing of the service pipes would start in 2010 and continue into 2011. It was proposed that excavation for the Guide Wall/station box would start in 2012, ending into 2013. The Main Excavation

experienced many delays and eventually started in January 2014, ending in August 2014 with only minor pieces of fieldwork occurring afterwards.

The location

Gammel Strand is located at the centre of the inner city of modern Copenhagen, bounded by the canal and *Slotsholmen* (Castle Island) to the south, *Højbro Plads* (High Bridge place) to the east, the Kulturministeriet (Culture Ministry) to the west and the most recent (1700s) Gammel Strand housing to the north. The area was created by land reclamation from the 1200s with the former beach and Medieval coastline under several metres of landfill. Today it is a modern tourist hub with cultural and governmental centres, restaurants, bars and private and public housing with Christiansborg palace on the opposite coastline.

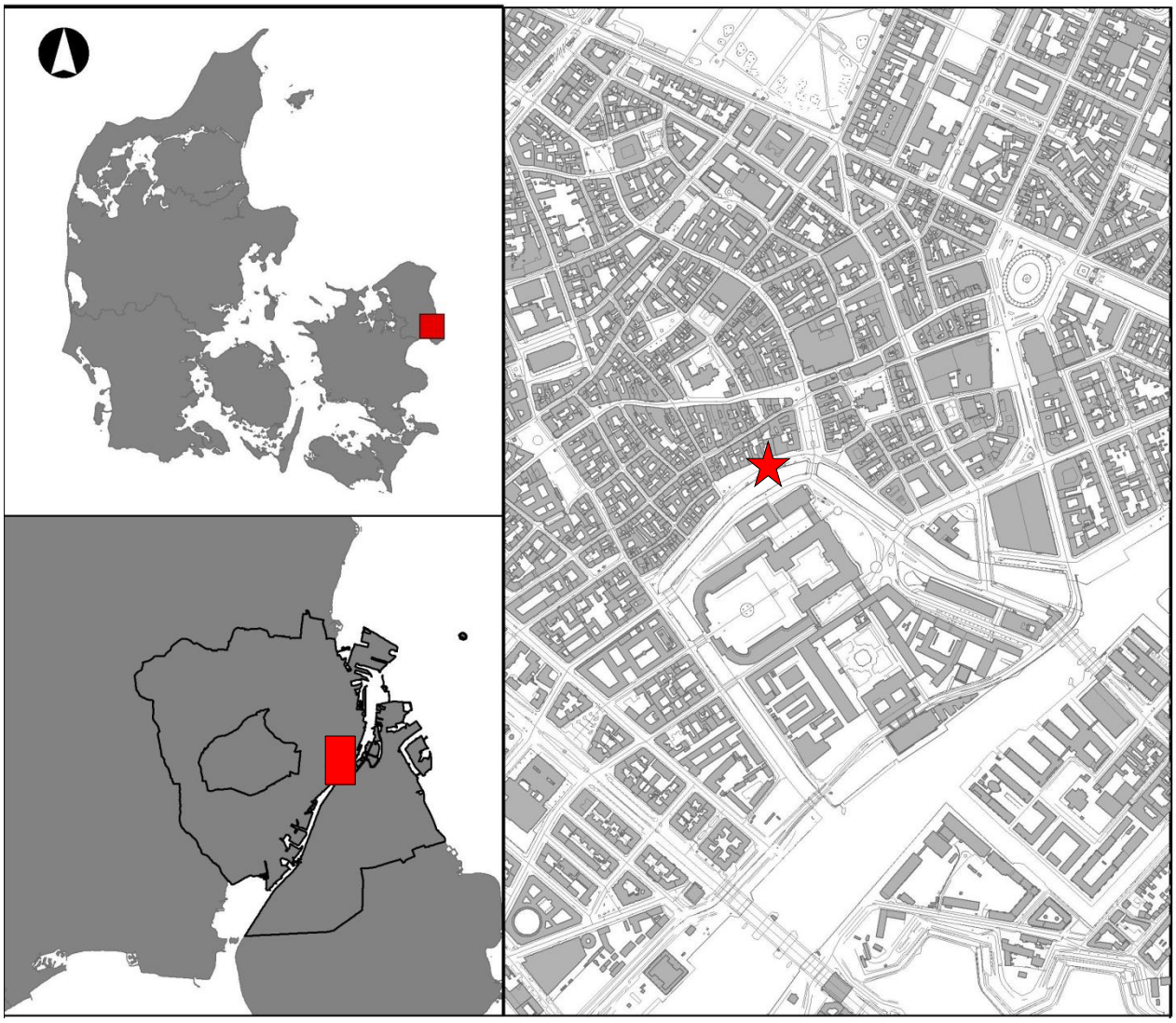


Fig. 3 Location plan of Gammel Strand.

By the Late Medieval period (1400-1536) the area was created and then transformed into the centre of the main harbour of the city with public tax buildings, private housing and moorage for the docking boats. The shape and style of the harbourside changed, at least six times from the 1400s-1800s, showing that the area

has always been undergoing redevelopment. The name of the site has also changed from *Ved Stranden* (by the beach or shore to its most recent incarnation of *Gammel Strand (*old beach*)* by the mid 1700s.

The use of the area as a harbourside had greatly decreased in the 1700s and a change in the tax laws by the mid 1800s made the administrative tax buildings obsolete. These buildings were then demolished and for approximately 80 years the area became a very popular fish market, and popular for tourism, which continued after the market was closed down in mid 20th Century.

Gammel Strand has always been a hub for international visitors from its conception as a boundary zone with the world via the sea. It has also been a transport hub and the new Cityring station and the remodelling of the harbourside is in the continuation of a process that has characterized the area for the last 800 years

The excavation

The excavation project was undertaken at the location of the new Metro Station and the surrounding areas. Firstly the service trenches within the excavation area had to be re-routed and joined to a new system surrounding the area. This led to many watching brief trenches being observed and excavated in 2010, following the schedule of the NCC Construction Company (See Gammel strand watching brief report, Olesen & Bork-Pedersen 2012). Once the area surrounding Gammel Strand was facilitated with power and water the footprint/construction box Guide Wall was excavated so that a cofferdam/station box could be created for the Main Excavation and station box. This construction work was undertaken with CMT Construction Company, who was also involved with building the cofferdam into the canal and providing a building platform to be placed over the canal. Due to health and safety the Guide Wall could only be excavated to a depth of two metres from the modern surface, so excavation ceased at the discovery of the Renaissance harbour wall and the Late Medieval wooden bulwarks which were exposed at various levels. Included in the report are several trenches excavated in 2013 that are related to the regulation and Re-infiltration of the water system for the harbour area.

The Main Excavation began in January 2014 after CMT completed the cofferdam and the surrounding area platform. A tent measuring 80 m long by 20 m wide and 9 m high from the ground surface was erected over the site underneath which the project took place with the assistance of Slagelse Erherv Service, who undertook all of the mechanical excavation and removal of soil.

The stairway trench on the eastern side of the station box measured 7 by 9 m, and was open to the elements. Due to protecting the water level, the water levels were regulated within the station box and outside of the main station box. The excavation was undertaken by a mixture hand digging and use of a mini digger. The Main Excavation method was by single context with sections/profiles sometimes being used to assist with further understanding, measuring and surveying was undertaken using total stations and the IntraSiS database system for storage and recording of data. The main report was written using national and international finds and natural science specialists from autumn 2014 to autumn 2016.

Metro Cityring project

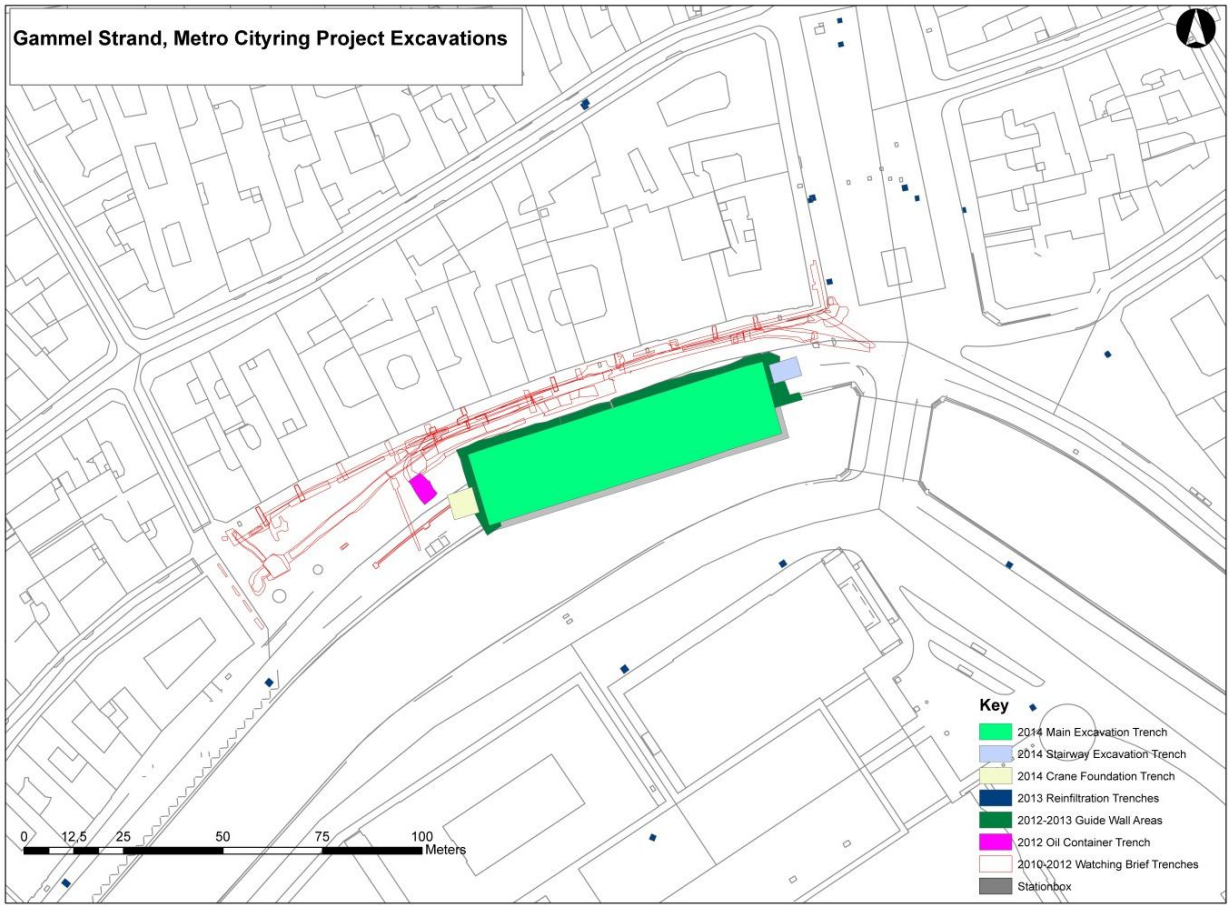


Fig. 4 Plan showing the Gammel Strand Metro Cityring excavation trenches, and their dates

Gammel Strand dates

The Watching briefs

Between February and September 2010 a series of watching briefs were undertaken beneath the Gammel Strand modern road and square. The trench sizes differed, but the area excavated as part of this work equalled 1669 m ^{2}. The watching brief revealed parts of the 1400s harbourfront, two phases of weighing houses, part of the Renaissance stone harbour wall and various fragments of other buildings and infrastructure such as pipes and drains.

Water supply trench

A trench measuring 19 m long and between1 m and 1.85 m wide was excavated in May 2012 to provide new water pipes for cabins in 2012 for the Guide Wall excavation. This was undertaken in watching brief conditions, stopping to record and excavate archaeology in the process. Various bulwarks and posts were uncovered as part of this process. A total area of 16 m^2 was excavated in this trench.

The Guide Wall excavation

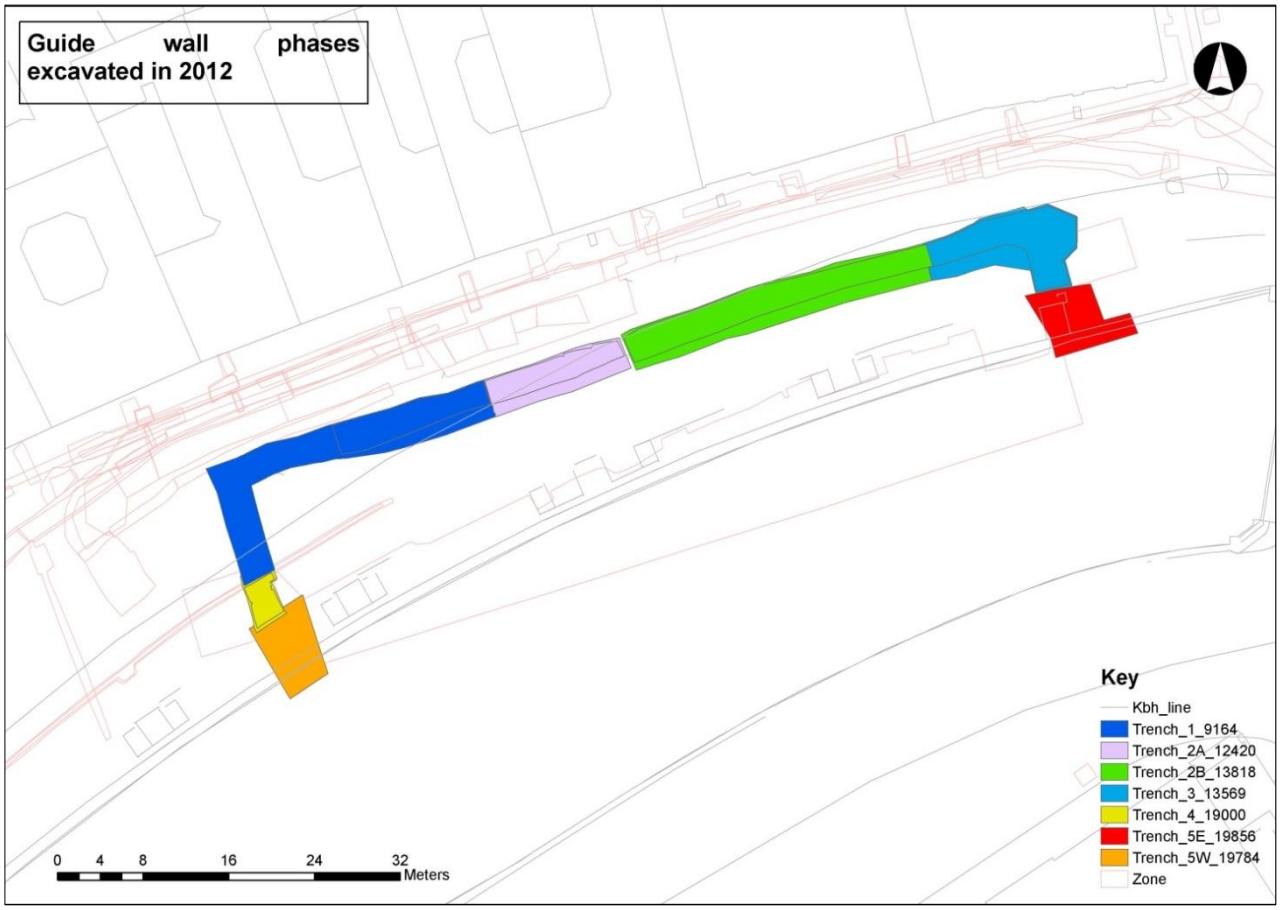


Fig. 5 Plan of the Guide Wall trenches

The trench was excavated in 2012 in Trenches 1-4 as an excavation, with Trenches 5 west and 5 east as a watching brief in 2013. Due to health and safety and the tidal canal, the trench could only be excavated to 2 m deep from the modern surface. The trench was due to be only 2 m wide, but due to modern intrusions such as pipes and strong foundations of certain features, the width increased in certain areas. In various places where the excavation ceased at the 2 m depth, important structures were found, which were largely identified in the Main Excavation. Some of the features uncovered could not be fully identified, so have been given subjective identification. From undertaking the excavation the main wall of the station box could be constructed, and the Main Excavation could occur.

The whole area excavated comprised 570 m^2

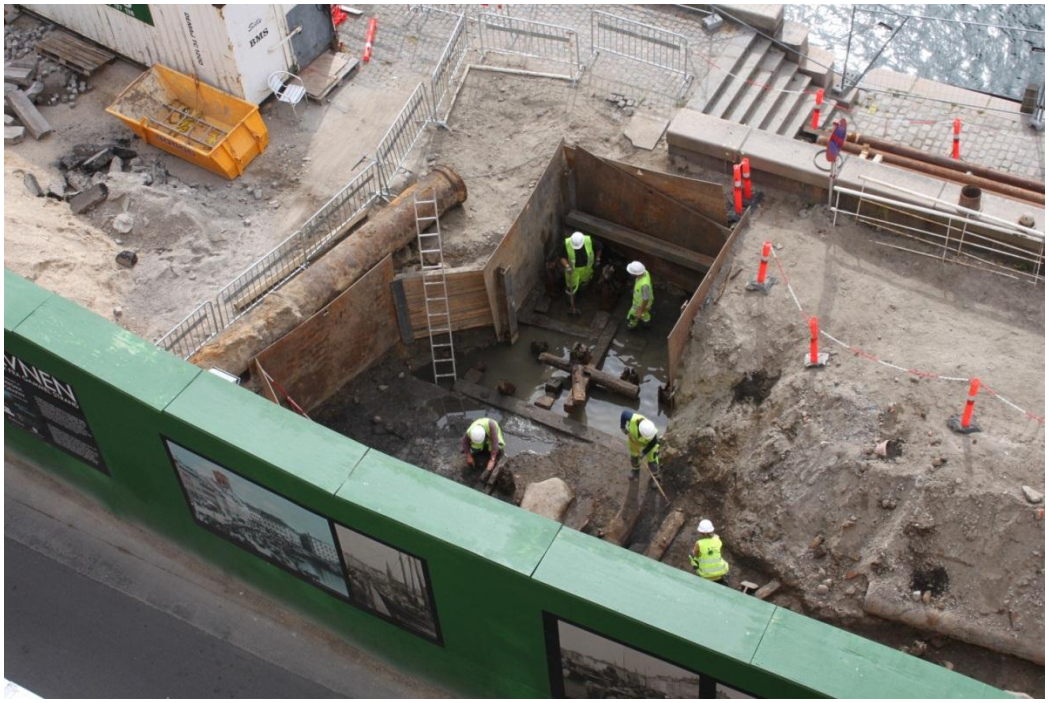


Fig. 6 Gammel Strand Guide Wall Trench 3, From above. C19_20120824_3702

The Oil Container trench

The trench was excavated briefly at the end of areas 1-4 in the Guide Wall excavation in October 2012. The 29.38 m² trench was excavated in watching brief conditions, which became a mini excavation after structures and features were found. The highlights of the trench comprise the unearthing of the foundations of the Renaissance harbour wall, bulwark posts and later Vragerbro building foundations.

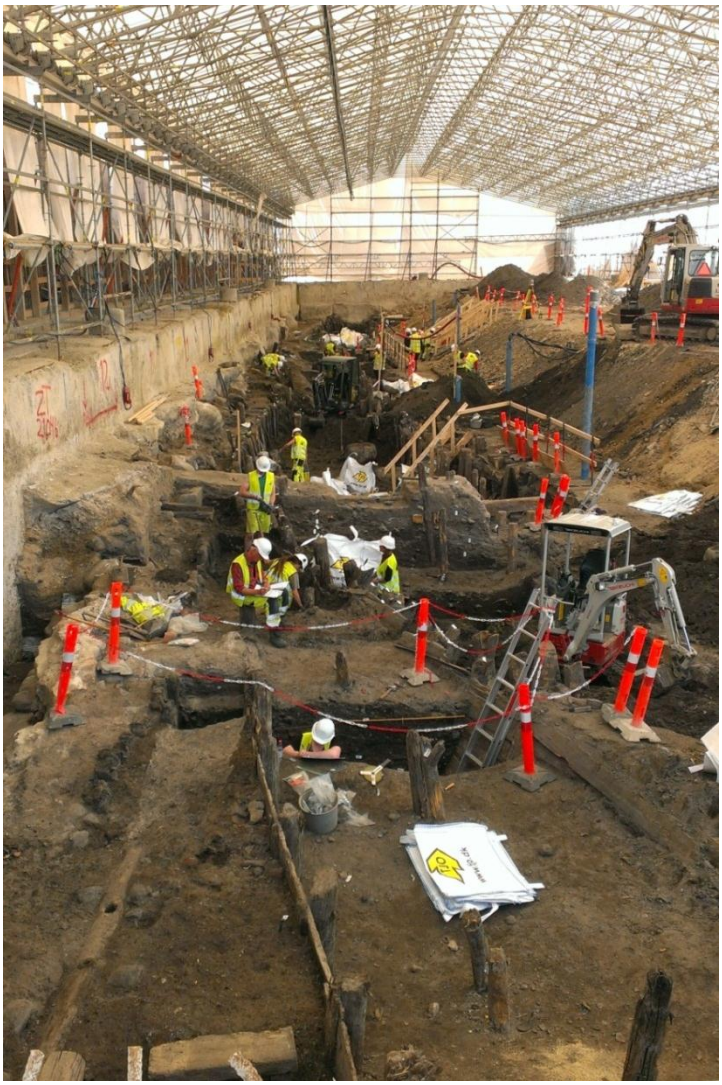
Fig. 7 Working photo of the Oil Container trench and the sawing of wood for a dendrochronological sample. C19-20121123_4354.

The Re-infiltration trenches

Sixteen Re-infiltration trenches were excavated between 2012 and 2013. These were all watching briefs with 1 person following the excavations. The trenches were excavated to up to 2 m deep and between 1-2 m long and wide, with the whole Re-infiltration project leading to 37.92 m excavated.

Fig. 8 Working photo of Trench ZT19718 Re-infiltration well. C03_20121220_5535.

The Main Excavation



The Main Excavation was undertaken in 2014. The station box and the stairway trench consisted of an area 1458.39 m². As part of the trench actually continued into the canal, and with that harbour base area being polluted, only the land part of the trench could be excavated, measuring 729.74 m². The other area was viewed as a watching brief from the trench edges, recorded by photo documentation and notes. The trench measuring 80 m by 16 m by 9 m high was covered in a tent containing a remote winch system for removing big bags of soil.

The main entrance to the excavation area was through the SW side of the trench. It is for this reason that parts of this area was not excavated, as seen by gaps in the plan in this area.

Fig. 9 Main Excavation trench looking NE. The concrete trench walls surround the Main Excavation and represent the former location of the Guide Wall trench. The Stairway trench is located behind (unseen) the eastern trench perimeter (at the far end of the photo). Photo: K. K. Tayanin

The Stairway trench

This trench was excavated in 2014 at the same time as the Main Excavation trench. The trench, measuring 35.25 m², was not covered, so experienced periods of heavy rain, and with flooding, was unworkable for small periods of time. It was excavated in full excavation style and used a winch system to remove big bags.

Fig. 10 Stairway trench looking west C02_20140508_9260

Crane base excavation

This small trench was located just outside of the south west area of the Guide Wall excavation and part of Areas 4 and 5 west. It was observed in September 2014. It was undertaken as a watching brief for the construction of a new base for a crane. The trench measured 6.75 m by 6.38 m and was excavated to a depth of 1m. Only modern deposits were seen.

Staffing

The Gammel Strand excavation team

The amount of project staff and constituents of the excavation team depended on the type of project. Overall, the site was managed by Excavation Leader and Museums Curator Stuart Whatley 2012-2016 and assisted by the field leaders Rikke Simonsen 2012 & 2014, Camilla Haarby Hansen 2014-2016 and Gareth Dickenson 2014. They were supported by Finds responsible archaeologists Jens Winter Johansen in 2012 and Mie Pedersen and Claes Hadevik in 2014. Total station and surveying responsibility was undertaken by; Per Jansson in 2012-2014. Rachel Morgan was Stratigraphic matrix responsible in the years 2012, 2014, 2015 & 2016 and Health and safety by Brendan Fagan in 2012, Jason Leech in 2014, under site responsible Stuart Whatley and Museum responsible Erik Van Acker.

A big thanks and gratitude is given to all the archaeologists who worked on the project in difficult conditions, providing the initial interpretations of the archaeological remains and created the foundation for this report through their documentation. After fieldwork they were also involved with undertaking post excavation work such as sieving, big bag sieving and find processing was also undertaken by this team. Thanks are also given to the University of Copenhagen and Lund University who provided students who later became members of the team.

Archaeologists taking part in the fieldwork and post excavation work over the course of the project included: Amanda Summerfield, Andreas Bonde Hansen, Ann Sølvia Jacobsen, Anthony Ruter, Bo Jensen, Brendan Fagan, Camilla Haarby Hansen, Christopher Reese, Claes Hadevik, Edgar Wróblewski, Fredric Grehn, Fredrik Wirband, Gareth Dickinson, Ilona Carlson, Ingeborg Sæhle, Jason Leech, Jens Winther Johannsen, Joss Davis, John Howorth, Kamilla Ramsøe Majland, Karina Holm Truelsen, Kasia Högström, Kirstine Ejby Møller, Krister Kam Tayanin, Karin Roug, Kristoffer Brink, Lars Haugesten, Lise Christensen, Louise Melchior Rasmussen, Magdalena Lyne, Marc Hauge, Mie Pedersen, Mikkel B. Siebken, Niels Henrik Andreasen, Per Jansson, Rachel Morgan, Rikke Melin, Rikke Simonsen, Sam Keenan, Sofie Renström, Thomas Grane, Toke Østergaard & Truls Månsson.

Fig. 11 Staff photo, Main Excavation 2014. Photo: K. K. Tayanin

Methodology

The purpose and process of archaeology may appear different to how it is portrayed publically. Sometimes it may appear that archaeology is simply excavation and finds retrieval for the purpose of collecting objects for storage and to be put on display. Archaeology, in reality, provides the opportunity to understand how an area was created developed over time, and to study past societies using a selection of methodological practices comprising field observations, finds and natural sciences. Modern, 21st Century archaeology is a process where excavation results and finds are analysed and then presented in a myriad of formats through reports, presentations, public tours, exhibitions and finally, if the material is important, through research.

On-site methodology:

Contrary to the belief of many, archaeological excavations are hardly ever undertaken with tea-spoons and paint brushes. Gammel Strand is no exception to this rule, and most of the site was excavated using larger tools such as shovels and gardening hoes – and in some cases even machine excavators were used to dig into the large amounts of soil and refuse on site. Smaller hand tools were used only when cleaning up areas or structures prior to photography or if anything small and fragile was encountered.

During the excavation, the archaeological remains encountered were perceived as what is known as *stratigraphical objects* or *contexts*. Examples of such contexts are soil layers (called *deposits*), timber structures, cuts and stone structures. When conducting the excavations, it was attempted to continuously excavate the youngest or latest context first, by observing what at all times was lying on top of something else. This is seen as a vertical stratigraphy, which in turn is also a vertical chronology: The events resulting in the different archaeological contexts are investigated in backwards order – from the most recent to the oldest. The contexts were delimited and surveyed using a total station, which recorded the upper outline of any context in three dimensions and created polygons with unique IDs in the GIS-part of the database, IntraSis. Information regarding the character of the single contexts was first recorded on paper (pre-made context sheets to standardize the information and speed up the recording process) and later typed into the IntraSis database, where it was linked to the surveyed polygons. During the excavation of a context, e.g. a soil layer/deposit, finds and samples were collected from this and relations between the collected material and the contexts were made in the database.

The on-site recording was undertaken by surveying, documentation and in some cases drawing and sketching. Photography was also used to document the archaeological observations. To organise the very large numbers of photographs, a journal was kept, in which it was noted which contexts was seen on each photo.

The finds, retrieved from the single deposits were divided into different materials (e.g. ceramics, animal bones, leather, clay pipes, glass, etc.) and put into plastic bags as soon as they were removed from the ground. The bags were then numbered with the ID for the deposit from which the finds were retrieved, along with the date and initials of the archaeologist who excavated them. An archaeologist with responsibility for finds registration added on to each bag a unique number (called FU/Finds Units) and made sure to link the finds unit to the context in the database. Later, once the finds had reached the Museum, a more thorough registration was made of the single finds. They were each given unique numbers (called FO/Finds Objects). Most finds were furthermore included in finds reports made on specific finds types and linked to the deposits in which they were found.

From wooden structures, samples for dendrochronological analysis were collected. As part of a prioritization process, not all timbers were sampled, but only parts representing larger structures. Apart from determining the wood species, the dendrochronological analysis can establish when a tree was felled and in many cases also in which region it had grown. In total more than 200 samples were dated from Gammel Strand.

Soil samples were taken for an array of purposes: Large samples were collected in big bags to be wet-sieved for finds materials through a 5 mm sieve and smaller samples were processed for the retrieval of preserved botanical remains (called macrofossils) as well as smaller zoological remains, e.g. fish bones. Such soil samples can also be used for retrieval of insect remains and other scientific analysis, but these were not conducted with the Gammel Strand material.

Off-site methodology

During the excavation – and to a wide extent after this, attempts were made to interpret the single contexts by using the recorded information as well as the finds and the analysis results of the samples linked to them. The purpose of these attempts was to define what type of events; the contexts were the result of. Furthermore the contexts were grouped to form larger structures or groups of what seemed to go together in terms of interpretation and contemporaneity.

To keep track of all the different groups and contexts, a matrix system (named after Dr. Edward C. Harris, who invented the' matrix system) was used. In this, the stratigraphical relationship (what was laying above and below any given context) was recorded and the matrix drawing thus illustrated a line of events dated relatively to each other. Using the matrix and the observations made in the field, six overall, chronological phases could be established for the excavation area at Gammel Strand.

Most of the timber structures excavated on Gammel Strand were interpreted whilst the excavation was ongoing. Examples include parts of bulwarks, wooden drain pipes and smaller structures such as a livewell and building foundations. Dendrochronology was then undertaken to determine when the timbers were felled, and thus obtain an indication of when the structures were built. In some cases it was then possible to link structures, which in the field had been seen as separate, to each other, and in combination with the matrix, the dendrochronology dates provided absolute dates to the groups and phases covering the period from the 1400s to the present day.

The very large finds rich deposits were, in most cases, interpreted as either the results of dumping of large amounts of the city's household rubbish (as part of the land reclamation processes for extending the harbour area southwards) or as the result of more random dropping and dumping of things and waste as parts of the activities going on near the harbourfront. Most of the finds material were artefacts that were either broken, appeared worn and contained evidence of use, but seen together, they represented household waste of both high and low status Copenhageners throughout the Centuries. This waste can be seen as representing the consumption of goods, preferences and networks of the people living in the city – e.g. the leather shoes and textiles along with personal finds such as jewellery may give insights into the high fashion and daily wear of the people discarding these items.

The macrofossil analysis and the analysis of zoological material (animal and fish bones as well as mollusc remains) provided further insights into aspects of the topographical development of the harbour area,

about the Copenhageners' diet over time and even about trade with foreign countries. This is further supported and extended by the timber provenance analysis carried out as part of the dendrochronology and by the typological analysis of the ceramic materials (pottery and clay pipes) and the glass.

The Late Medieval Harbourside 1400s - 1560s (Phase 1)

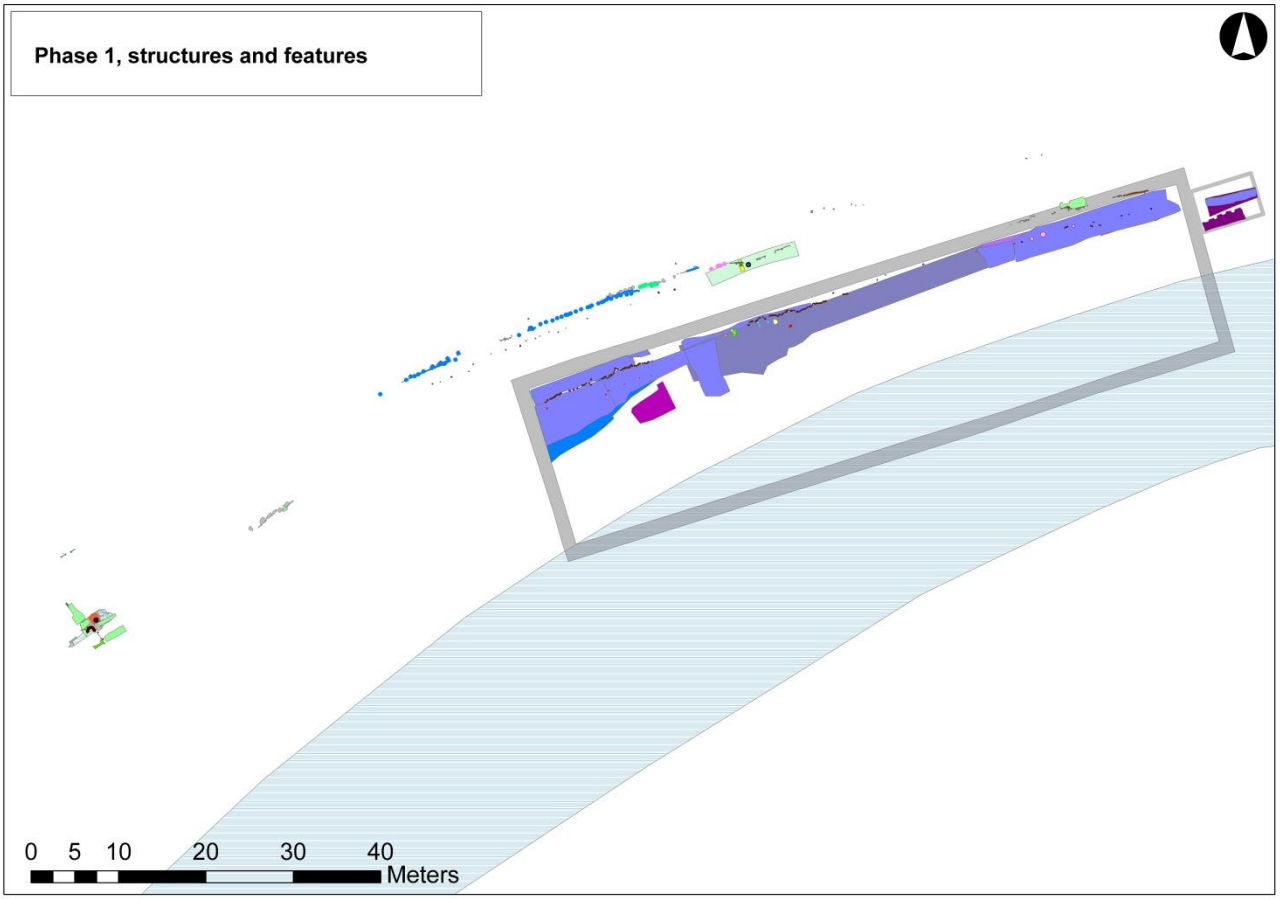


Fig. 12 Plan of the structures and features relating to Phase 1. For more detailed plans, see the internal section plans

Introduction

This chapter will describe the archaeological remains and events that occurred within Phase 1 on Gammel Strand. From the excavations at Gammel Strand it was discovered that the area was largely devoid of human activity until the early 1400s at the beginning of the Late Medieval period. The earliest Medieval activity from Gammel Strand is found within the 2010 watching brief excavations located north and west of the Main Excavation and Guide Wall excavation. In these trenches, bulwarks and posts were set within 1400s land reclamation deposits which were created to increase the urban area of Copenhagen and to provide a deeper harbour for the new larger and technologically advanced ships. Similar trends were seen in all urban maritime centres in Europe at this date. When writing about the harbourside, it should be noted that the Late Medieval harbourfront phase is in reality just another intermediary harbour phase in Copenhagen's long harbour history

The archaeology from Phase 1 has provided new information on the Late Medieval harbourside and the surrounding area. From the natural sciences, structural remains and deposits we have information on how

the area was created, used and how it looked. From the artefacts we have information on what was imported, consisting of finds that were related to fashion, religions, crafts, wealth, personal identity and trade whilst providing absolute and relative dating from the period. The finds from Phase 1 were varied. Some were of great quality, and represent an assemblage of the nearby wealthy elite. The ceramics and glass were imported from Bohemia, central Germany and the east Netherlands representing people who were able to afford more luxurious imports. Others are evidence of daily life for the perceived normal Copenhageners.

The residual finds

Within the excavation area, the earliest archaeological finds were found in deposits dating from the Medieval period. After a closer look, it was seen that some of these finds represent much earlier societies, and that activity at the harbour base had created some mixed period deposits. The earliest finds were therefore, Prehistoric flint, which was found in small quantities on Gammel Strand, and located within the deposits either residually, linked to the mixing of deposits within the city, or was redeposited due to later fluvial activity in the harbour region.

The Prehistoric evidence

The flint represents usage of the Copenhagen area from the Mesolithic period onwards, which far exceeds the use of the area as the urban centre of Copenhagen. The mixture of woodland, good soil, sea and internal waterways provided a good environment for the various Prehistoric and Viking societies to make use of the area. The flint tools that survive are Ertebølle-type flake axes and transverse arrowheads that were probably deposited on eroded glacial sand two metres above current sea level. This transgressive surface was probably created during one of the major transgressions of the Littorina Sea (Ruter 2016). The sand that was uncovered at the base of the trench was created in one of these major Littorina Sea transgressions.

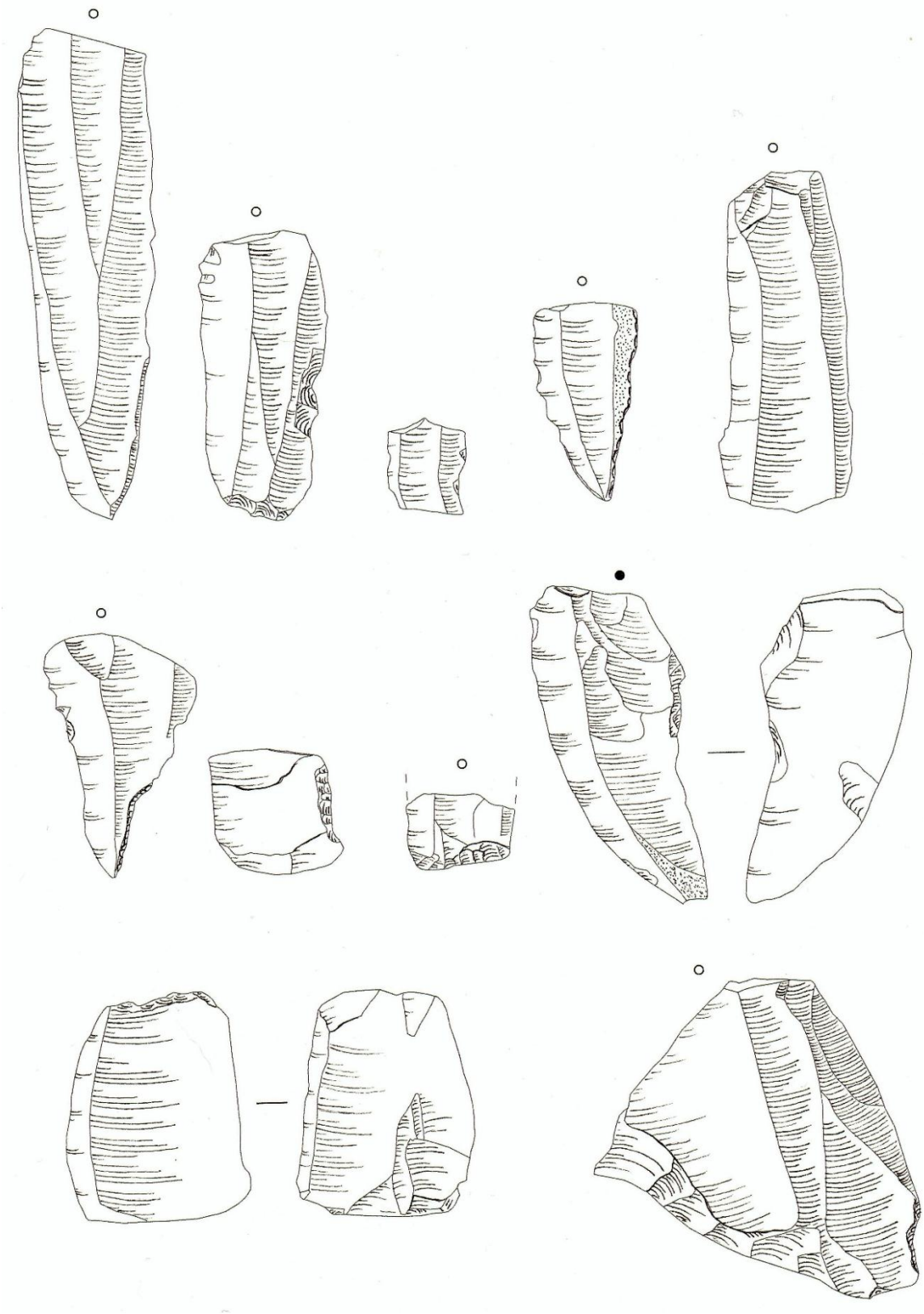


Fig. 13 Selection of lithic finds from Gammel Strand. Drawing: N. H. Andreasen

Viking, Early and High Medieval evidence

The Viking, Early and High Medieval evidence relates to a few ceramic vessels, which like the flint, are residual within later deposits. The ceramic assemblage comprised Baltic ware, which may have been produced either within Copenhagen or within Germany, Nearly stoneware from Germany and green glazed Copenhagen redwares. Of particular interest was a Pingsdorf type fragment, in the form of a flute. This type of musical instrument appears to have been discarded after fracturing, and perhaps shows more trade from central Germany. The location of the late Viking, Early Medieval and High Medieval settlement is located outside of the excavation area to the north, north-east and north-west.

Fig. 14 Pingsdorf type ware FO218772 SD33626, G663, Phase 3. Although not yet provenanced, the tubular shaped vessel represents a rare, (perhaps unique in Denmark) musical instrument from the Early or High Medieval period. Museum of Copenhagen.

Glass is also seen in very small quantities, and represents the trade with Bohemia in the High Medieval and Late Medieval period. A total of six sherds, all from different vessels represent the rare evidence of Bohemian glass in Copenhagen. These vessels were probably used by the wealthier members of Copenhagen and represent the social difference in Copenhagen from the 1300s and 1400s.

Fig. 15 *Fadenrippenbecher* Glass from Bohemia. FO202612, SD11091, G401, Phase 4. Found in Phase 4, but Phase 1 in date. Museum of Copenhagen.

Early Urbanisation, 1200-1300s

Before we discuss the archaeological structures from Phase 1, we should first briefly discuss the urbanisation of the area and creation of the harbour directly north of the excavation. This tie in the artefactual remains from the Early and High Medieval periods that are found residually in deposits from Phase 1 onwards.

The harbour area developed in the same style as many leading urban port centres i.e. Hamburg, Amsterdam, London and Lübeck, by creating new land by the process of land reclamation. By this procedure in Copenhagen, new harbourfronts or bulwarks was created south of the current harbourfronts, which was then filled-in or backfilled with a mixture of rubbish and soil from the surrounding areas. The purpose of this land reclamation was twofold; the first purpose was for creating new land for the city that was cheap to create as the other boundaries of the city were more static, consisting of fortifications, which cost a lot to dismantle, move and rebuild whilst also paying for new land.

The other purpose was for technical and harbour usage reasons linked to changes in maritime trade, the style of ships and the offloading of cargo. In the early 13th Century onwards, the style of maritime trade greatly changed from what was seen in the Late Viking and Early Medieval periods. Trade was more commonly undertaken with money rather than bartering and by merchants acting as middlemen instead of local boat owners and craftsmen transporting and selling their own goods. These merchants sometimes even owned many vessels. The creation of this new profession is seen in Copenhagen in the name of the city, as by the late 12th Century, the small town of *Havn*, (harbour) is from then on called *København* (merchants harbour). The change in technology of ships from rowing vessels in the Late Viking and Early Medieval period to deeper hulled caravels and cogs led to the need of constructing piers or vertical harbourfronts in harbour locations that were deeper, to allow the ships to dock. Within these new harbour areas were also new structures built to organize trade, tax trade and to store the goods from trade such as tax offices, custom houses and warehouses. This is seen at Gammel Strand with the Weighing House (*Vejerhus*) and Customs House (*Accisehus*).

Harbour activity was first denoted at Gammel Strand from the pre Metro Cityring excavations in 2006/7. Core tests in the area revealed a mixture of urban build-up in the area from dating the cores. Dates of764 cal BC, 778 cal AD and 1300's cal AD were obtained, arguably showing a mixture of build-up in the area and secondary deposition.

In between *Lederstræde* and Gammel Strand ,along the north south orientated Naboløs road, many posts, set in a line were found, dating between 1200-1400AD from dendrochronology. These results were seen in the 2003 excavations. These posts may suggest land reclamation and the advancement of the harbour area southwards within these dates. The earliest structural evidence from the site is found from a harbourfront believed to date from the 1400s (from insertion into Late Medieval deposits), when this new type of harbour, a merchant's type harbour, had been in use for at least a few hundred years. The aim of this section is to describe all the major constructions and changes and to show how the area was created, was used and how it was transformed. This will be undertaken by describing each major change in the areas' use and in construction phases.

Gammel Strand and the harbour in the 1400s

The 1400s period on Gammel Strand begins with discovery of a wooden harbourfront and surrounding reclamation deposits. The harbourfront was located beneath the present day street at the centre and western part of the Gammel Strand area, north of the station box.

Fig. 16 A section of bulwark group SG256 looking south. Note the vertical posts, horizontal planks and variety of stone at front of photo. C07_20101026_0455

The harbourfront in the central area consisted of a horizontal wooden façade of planks, set behind vertical posts. Behind the wooden façade were large stones, either as packing, top of the stone harbourfront or road on the stone harbourfront. A line of posts were then located south of this area, suggesting a line of storm posts. To the east of this structure was located an extension of this harbour, or perhaps a new harbour. The 1400s harbour was spread over an area measuring 59.5 m. It was backfilled to the north with Late Medieval waterlogged soils, which then built up south of the harbourfront at the harbour base. Within these soils were late residual High Medieval sherds from earlier rubbish dumps from the city and Late Medieval finds from use of the harbourfront. Finds that represent this harbourfront comprise pottery such as Siegburg ware, grey ware and some local Copenhagen redwares, glass from Bohemia, leather shoes and a rare galloche, fastenings from clothing and diet represented by animal bones and fish bones.

Fig. 17 Medieval galloche FO200484, SD200252. Waste pipe trench, 2010 excavation. Museum of Copenhagen.

These results correspond with many excavations in the area. The 2003 excavations by the museum revealed at Gammel Strand number 52 revealed a bulwark type structure with a terminus ante quem of after 1270 and approximately 1332 AD with finds relating to the 1400s and 1500s. The 2008 excavations revealed within Trench 2 a bulwark dating to 1405/06 AD. This was followed by a cobbled area to the south which was bordered by pine planks and posts. The excavations of settlement undertaken by Johansen (1999a, 139) directly east at Højbro Plads which uncovered wells and corner posts from the winter of 1449/50 along with horn crafting waste and urban rubbish.

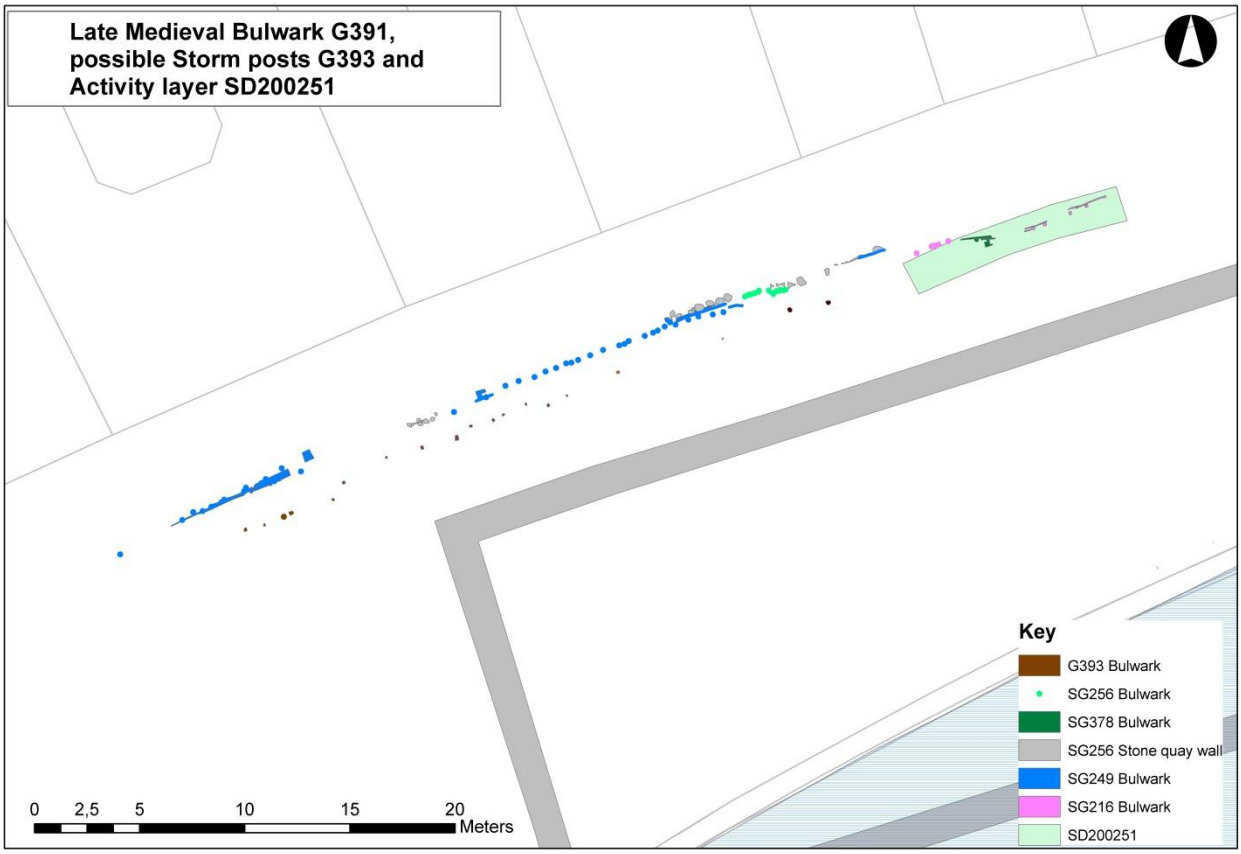


Fig. 18 Plan of the bulwarks uncovered in watching brief phase 2010

The late 1400s/early 1500s harbour

Within the Guide Wall and Main Excavation trenches we found from dendrochronological analysis that the harbourfronts were replaced every 50 years, and behind the new harbourfronts new land was created, as part of the backfilling process. This expansion continued with the build-up of alluvial soils encroaching southwards into the northern part of the Main Excavation trench. These deposits were only discovered in the Guide Wall trench with the use of an auger as they lay below the 2 m depth limit of that phase of excavation. Bulwarks were built into these groups of deposits which represent the harbourside of the late 1400s and early 1500s. One of the posts was from a tree felled *After* 1492 but it is believed to have been incorporated into the harbour in the early 1500s. Unfortunately due to truncation and the 2 m depth excavation limit. The exact form of the harbourfront this bulwark form cannot be completely verified, but it appears to have been a double frontage of oak planks and posts pushed into the soils, very similar to the form in the watching brief trenches.

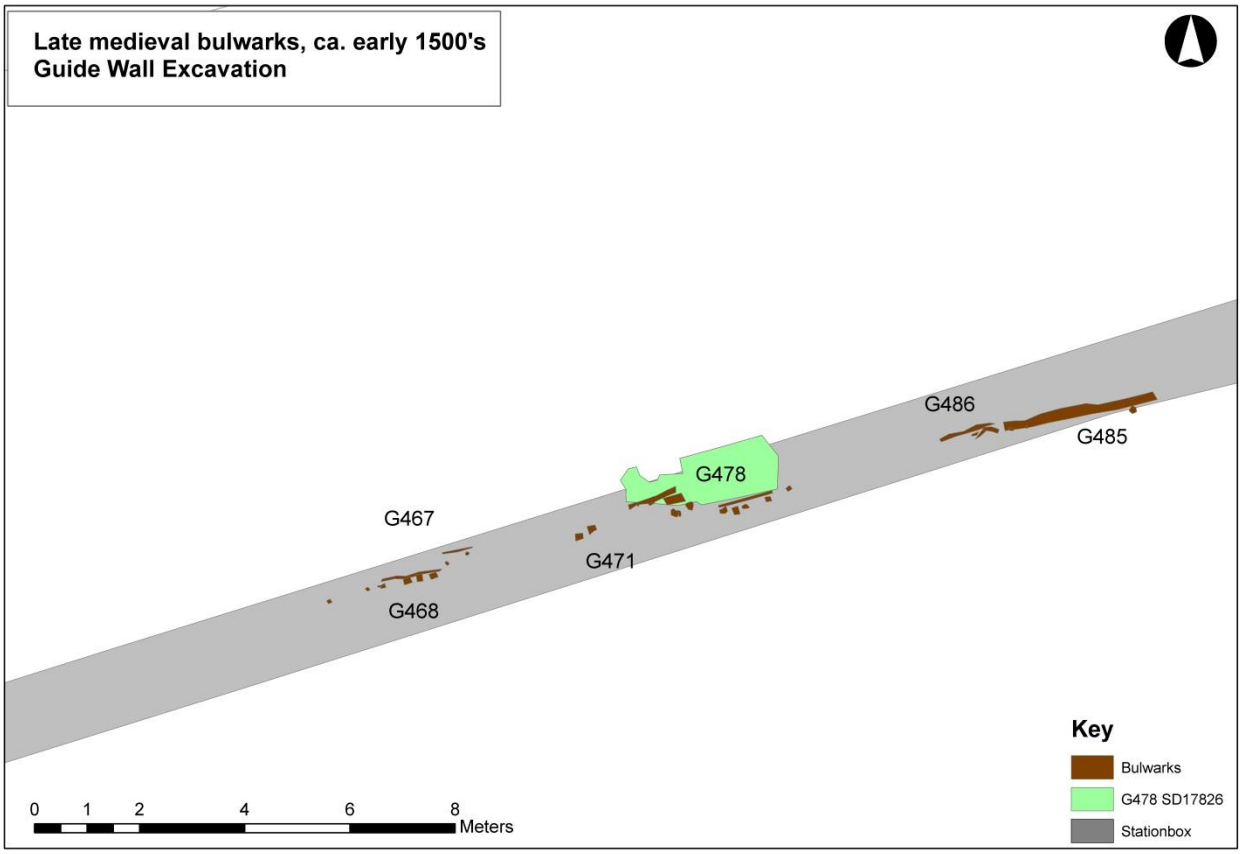


Fig. 19 Plan of the Late Medieval bulwarks from the Guide Wall trench excavated in 2012

The evidence for this bulwark phase comes from 5 disjointed bulwark groups located at the north eastern end of the Guide Wall trench, in Trench areas 2b and 3. They may relate to either a double harbourfront, or a differentially constructed harbourfront. These bulwarks were seen at 2 m below the modern surface, so could only be measured and registered due to decisions made for excavating the Guide Wall trench. At the western and central parts of the trench the service pipes, orientated E-W, had truncated the majority of the archaeology until 2 m deep, and thus perhaps preventing the discovery of the western parts of this possible bulwark. Relating to these structures was one surrounding deposit, and another found from an augur, which also helped to show the depth of natural in the area.

Fig. 20 Bulwark Group 467 in foreground. Stone harbour wall 532 from Phase 2 in centre, with Phase 4 land tie at the top of the photo. Photo facing south east. C19_20120924_3933

Parts of these bulwarks were also found from the 2008 excavations within Trench 1 outside number 42, Gammel Strand. The bulwark continued into the Guide Wall trench area but it is unsure whether the bulwarks dating to this period either related to the early 1500 harbour or perhaps the next 1530s harbour.

The early 1500s harbour as a dumping ground

Directly south of the late 1400s/early 1500s bulwarks and overlying the natural sand were alluvial groups (G647 and G678) which comprised both light brown sand and silt deposits to dark brown organic humic soils comprising components such as twigs and leaves. These groups were created before the harbour was built in the area by a mixture of dumping rubbish and organic waste over the harbour side (located just north from the excavation site in the Late Medieval periods), dumping rubbish from boats and by the action of fluvial activity in the harbour..

Fig. 21 Section containing SD40492 at the base and THE bottom right of photo. Facing NE. C02_20140624_10044 (cropped)

These deposits were pure Late Medieval deposits as seen by the Late Medieval finds. At the northern part of the Main Excavation trench they were "boxed in" by the Phase 2 overlying stone harbour wall group G532 and wooden posts group G602. However as the deposits continued south of this location later activity such as dredging in the Early Renaissance period and machining in the excavation may have pressed in pottery and other artefacts from the late 1500s and. 1600s into the earlier deposits.

Fig. 22 Proto or Nearly stoneware jug from Siegburg, c. 1250-1400, FO218598, SD37646, G647, Phase 1. Museum of Copenhagen

Fig. 23 Plan of G647 & G648. Alluvial and activity layers in Phase 1

The area comprising groups G647 and G678 measured 84.41 m long (east-west) by (north-south) 6.11 m wide in the centre and 8.41 m at the western end of the Main Excavation trench. The deposits in the groups were generally thicker at the northern end of the site, reducing in size as they continued southwards. Groups 647 were mainly located in the central and eastern areas of the main trench and partly in the western area and stairway trench. Group 678 was found in the stairway trench and in the far western end of the Main Excavation beneath the bulwarks in Phases 2 and 3.

Fig. 24 Decorated scabbard FO218150, SD37646, G647. Museum of Copenhagen

The Western Area of Gammel Strand

The harbourfront in this area was not seen, but the remains discovered in the trenches represent the activity behind the harbourfront, and the formation of this area into an urban setting. It comprises a series of levelling groups, pits and bulwarks located 4m south from bulwark group G394. These groups, which can be explored in more detail in the Main Excavation report, show how the area transforms after the initial land reclamation behind the harbourfront. What was seen was the dumping of various rubbish deposits on top of the original reclaimed land. These deposits comprised a wide variety of soils, some urban waste, some soil from urban meadows and some sand dredged from the harbour base and surrounding areas. These conclusions are seen from the different types of soils observed in the deposits, the natural inclusions, and the various types of finds which portray urban rubbish. Examples include High and Late Medieval wares such as old Siegburg stoneware, late redware, early Cologne and Frechen stoneware with Late Medieval bottle sherds redwares, imported grey wares and animal and fish bones.

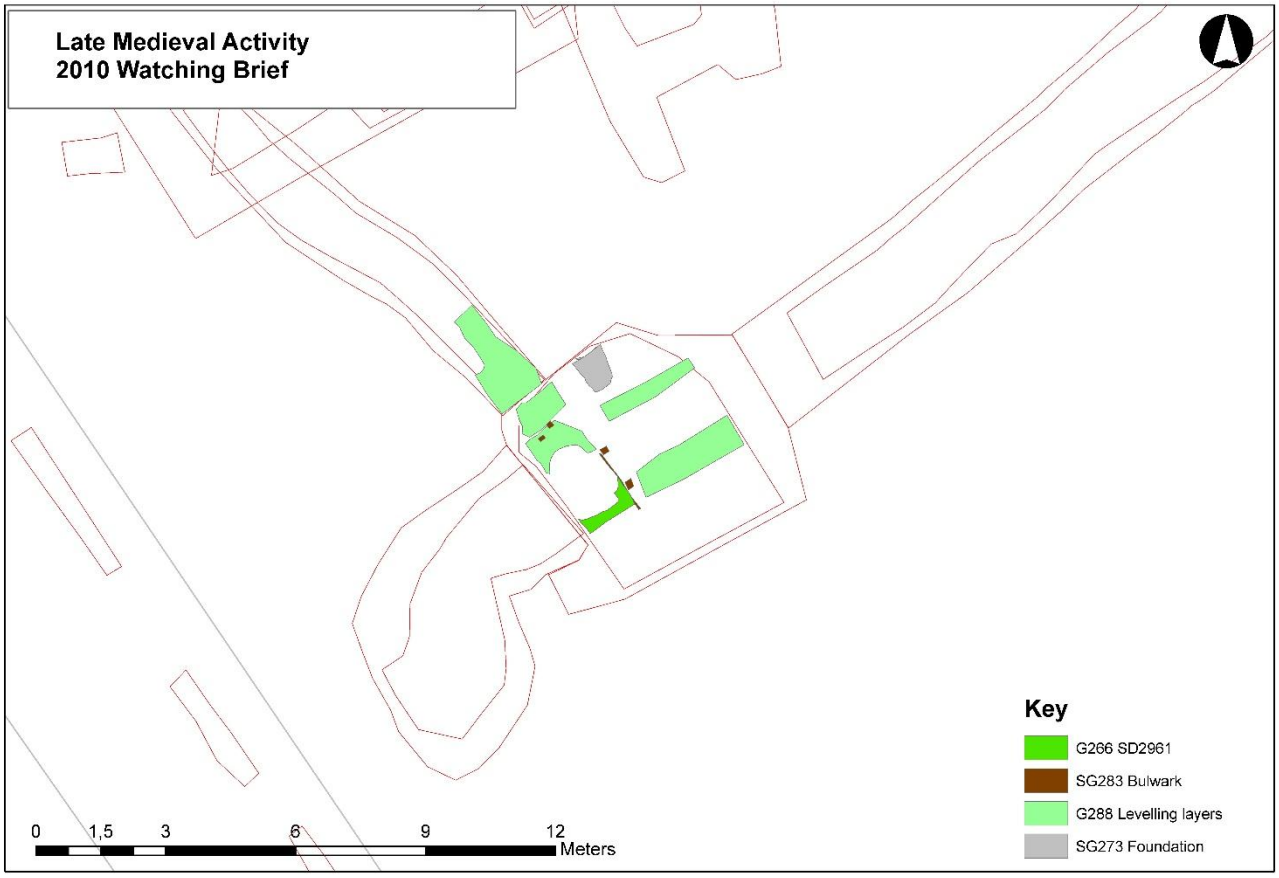


Fig. 25 Plan of land reclamation and Late Medieval activity at the western end of Gammel Strand

As shown in figure, pushed through these soils was bulwark sub group SG283. The bulwark comprised a plank and 2 posts measuring 1.75 m long on a north-west south east orientation. This bulwark was probably an extra foundation for the overlying structural foundations in an attempt to solidify building G389 in newly created land.

The Buildings of Phase 1

The two buildings uncovered from the 2010 watching brief, G389 and G390, has been attributed in the past to the Weighing House (*Vejerhus*) and Customs and Excise house (*Accisehus*) which have been recorded in documentation from the Late Medieval period as being present on the harbourside. Neither of these two structures can be conclusively attributed to either the *Accisehus* or *Vejerhus*, but it is quite probable that G389 represents a wealthy structure on the harbourfront and was probably the *Vejerhus*.

Structure G390 interpreted as the *Accisehus* comprised only of large boulder foundations which suggests the base of a wealthy structure. No overlying remains of the structure were found, so it has been removed in antiquity. The size of the boulders suggests it could support a large wall. No other information can be attributed to the wall though.

Fig. 26 Floor G233 within building G389. Looking NW. C07_20100628_0173

The possible Weighing House/Vejerhus

At the western part of the Gammel Strand street, beneath the present square was the possible remains of an important building of the Late Medieval period, and one of the few that was recorded in historical documents. This building may have been the *Vejerhus* that was asked to have been built by Christopher of Bavaria in the 1440s, and from historical records, existing by at least the 1500s. It was built on a foundation of a smaller building and some bulwarks, inserted to solidify the area. The bulwark here was on a north south orientation, a strange angle due to the harbour lying east-west, so it is believed to have been a former foundation to the overlying building..

The possible *Vejerhus* comprised a few layers of wooden floor, perhaps constantly refurbished due to flooding of the soil below from the tides. It comprised sturdy walls with a basement consisting of a barrel re-used for drainage and an earthen base that was kept relatively clean until its demolishing. The foundations were set with a construction cut consisting of a large stone base with an overlying brick wall. The purpose of the building was to weigh and then tax the goods from the harbour, an essential cog in the trade system. They were located in every major harbour town, sometimes incorporating a custom house or separate from them.

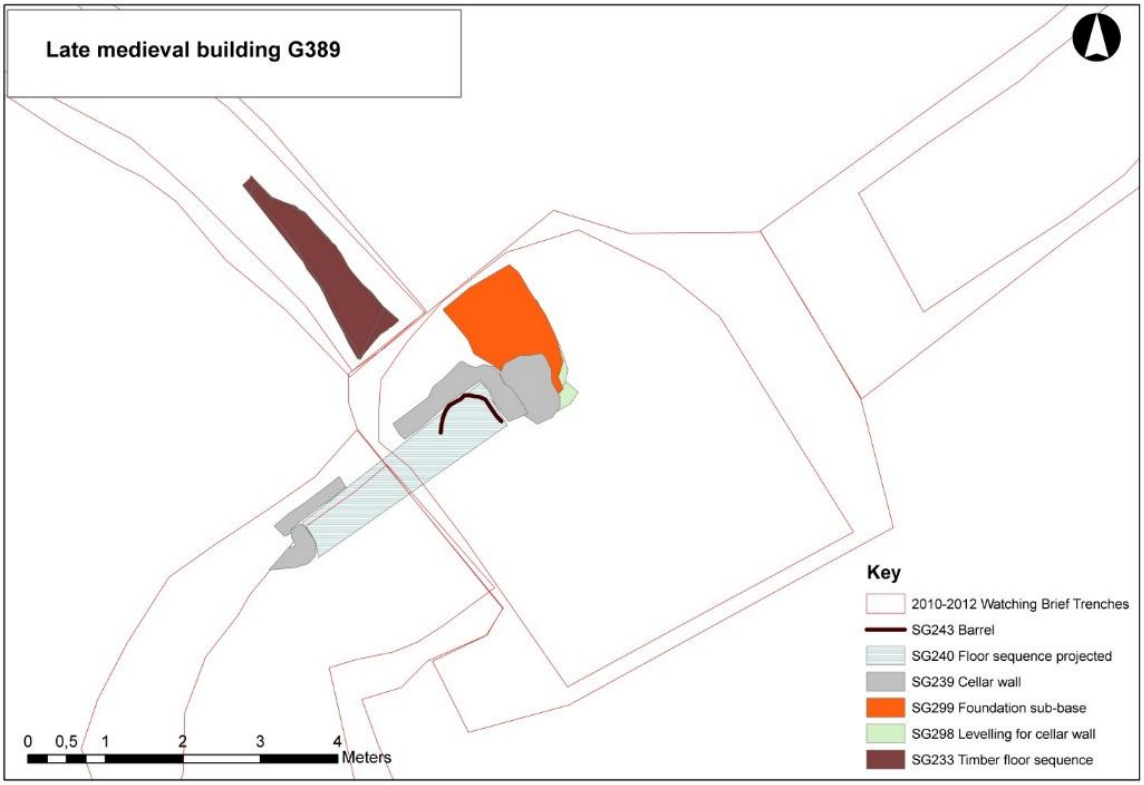


Fig. 27 Remains of building group G389

The 1530s harbour

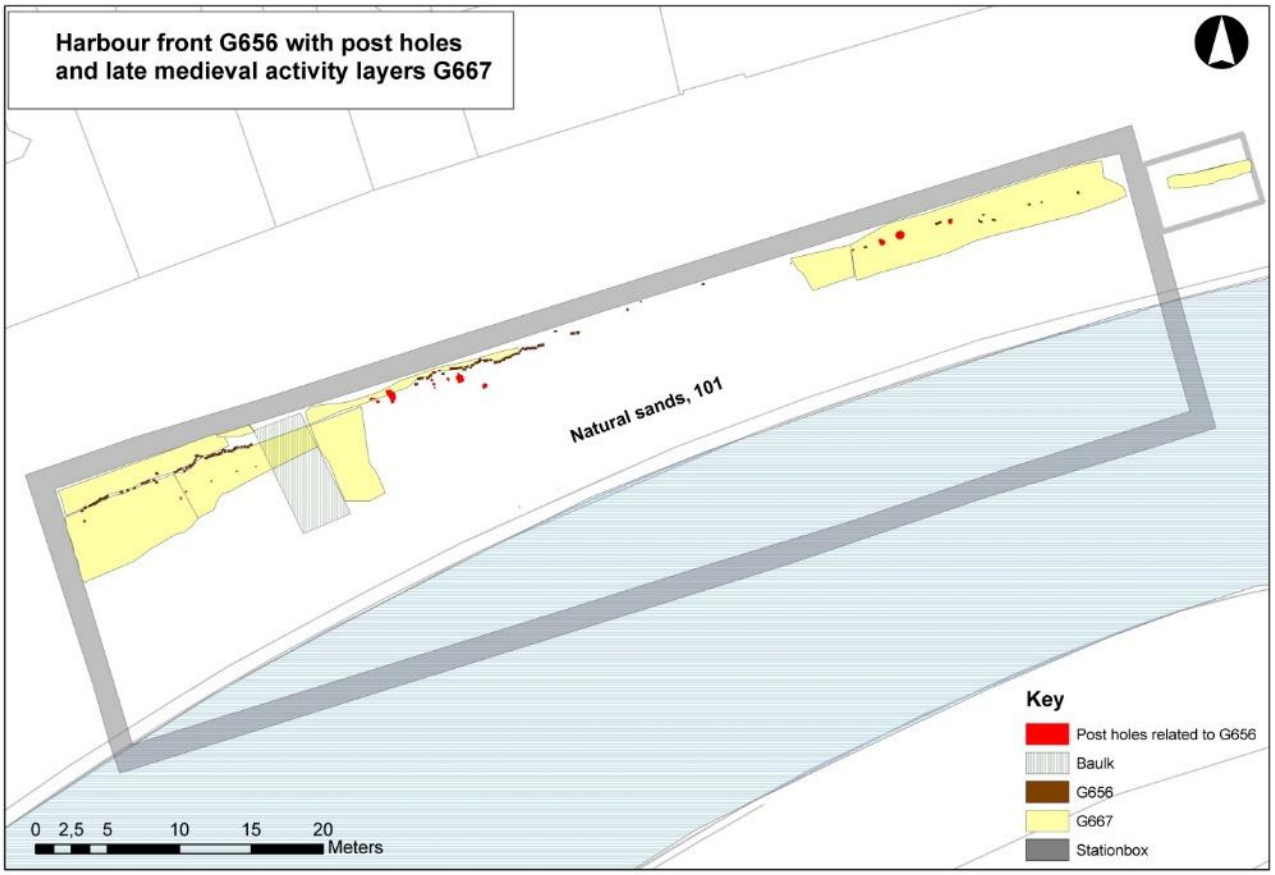


Fig. 28 Plan of the Late Medieval harbour, c. 1530s. Gammel Strand Main Excavation.

Within the Main Excavation trench a new line of oak posts are then set into the harbour floor between 2-4 metres south of the Guide Wall trench harbourfront. The posts were felled between the dates 1510-1532, and are thought to have been used in the harbour very soon afterwards. Around the harbour posts a new group of alluvial deposits built up overlying earlier Late Medieval harbour alluvial deposits, which themselves are a mixture of fluvial action with dumping of rubbish from the city.

The 1530s harbour comprised posts set over an area 76 metres long, and was uncovered only in the Main Excavation trench. These posts were pushed into Late Medieval alluvial deposits which lay at the base of the harbour. They were mainly oak, probably from *Skåne*, *Sjælland* or *Halland*, cut into a rectangular shape with one pointed end and one flat end. The majority of these posts were approximately 2m long and 0.3m long, pushed into the ground, vertically. There date range was quite broad from the 1490s to the 1530s and it is probable that some were re-used from the early 1500s harbour.

Fig. 29 Oak posts from a Late Medieval bulwark in the Main Excavation, central area. Part of Group 656. Note the truncated top of the posts with the c. 1580s stone harbour above, concreted into the Guide Wall. Photo looking NE. C02_20140623_10013

Fig. 30 Working photo showing post ST544550 with carpenters mark. C02_20140612_9723

The majority of the posts were found measuring only 1m long, with one end truncated and one end sharpened. This was due to truncation at the end of Phase 1 where the harbour changes in style and material. These posts appear to have been re-used in another role as part of foundations for harbour wall G532 after the Phase 1 harbour went out of use, whilst some were pushed in at angles and some were simple discarded as seen by post holes.

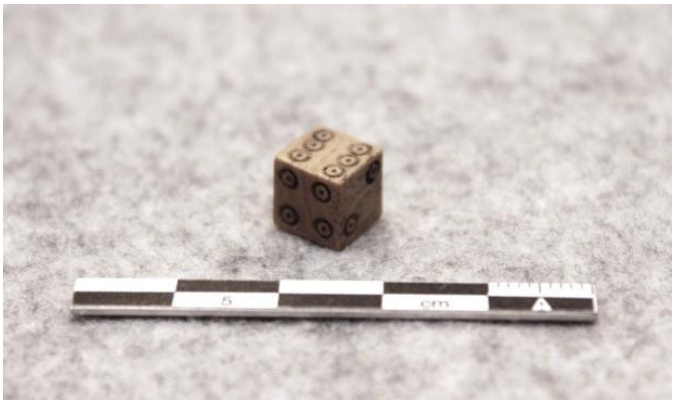


Fig. 31 FO218291. Medieval cubic bone die, with irregular numbering as opposite sides do not equal 7. Ring and dot number decoration. SD54997, G667. Museum of Copenhagen

It is not known if this harbourfront replaced the late 1400s harbourfront, or was an addition to the existing late 1400s harbourfront. The line of posts may have had had a role of protecting the earlier harbourfront rather than being a new harbourfront in themselves. The dates of the posts between the two bulwarks are similar, but in no area do they meet between the Guide Wall and Main Excavation and there appears to be a space of 1-2m between the bulwarks.

No structures outside of the trench related to this particular new harbour phase, and it is presumed no other major building activity occurred in this phase, but as not all of the surrounding area has been excavated, there are possibilities.

Fig. 32 FO213528, Scabbard fashioned from leather and copper alloy. Found in SD42912, G667. Museum of Copenhagen

A mixture of dumping over the harbour walls and fluvial activity led to the creation of new deposits around these posts which also overlay the harbour alluvial deposits. The majority of these deposits comprised a large quantity of Late Medieval pottery and building material.

Fig. 33 Cooking pot FO211681, pre-conservation. Retrieved from SD42912, G667. Museum of Copenhagen.

Fig. 34 Deposit SD42912 of sub-group SG667, central area of Main Excavation. The deposit overlies SD37646 of Group G647, a less organic and more sand rich deposit. C03_20140623_11124

Various finds represent the households from the harbour dumping. From building materials such as munkesten bricks, lead came and floor tile we can see the wealth of the houses. This is further endorsed by the discovery of stove tiles, brass chandeliers and brass cauldrons.

Fig. 35 Brass candle holders from a large candelabra or chandelier. FO212789, SD54997, G667. Pre-conservation photos. Evidence of wealthy households in the region.

Fig. 36 Well preserved Siegburg jugs, c. 1300-1550. FO218513, FO218514, SD54997, G667. Museum of Copenhagen

The date range of the ceramics extends across the entire Medieval period but the majority are from c. 1200-1450. Only one sherd of Baltic ware is datable to the earliest part of the Medieval period (*c.* 950-1250) (FO218593). Late Medieval period is also only represented by a few sherds e.g. Dutch redware, although many of the Medieval sherds could not be split between High Medieval and Late Medieval and it is presumed they had a long phase of use between 1250 and 1500.

In general, the Medieval ceramic assemblage from Phase 1 dates from 1400-1560s, with a few High Medieval and Early Medieval sherds. The majority of the imported ceramics came from Germany, in particular the Rhineland area. The locally made wares were mainly redwares from *Skåne*, *Sjælland* and perhaps from kiln sites yet to be discovered in Copenhagen.

The form types from this period are mainly pots, jugs and drinking vessels with a solitary Siegburg bowl fragment. The truncation of these deposits is represented by the Post-medieval ceramics which represent nearly three times the amount of Medieval sherds at 1,355 ceramic sherds. These sherds mainly dated from

Fig. 37 Sherds from highly decorated early redware jugs, c. 1200-1350. FO218557, SD54997, G667. Museum of Copenhagen

the late 16th and throughout the 17th Century. The Early Post-medieval sherds mainly came from Jutland *(Jydepotte*) but German and Dutch imports are also very common amongst some locally produced ceramics.

The glass artefacts tell a similar story to the ceramics but in smaller quantities, probably due to its fragility. There were only about a dozen of Medieval glass finds which is 4.5% of the total prioritized glass assemblage. Six of them belong to the Bohemian tradition dating to the 14th and 15th Centuries whilst the others represented styles made in Western Germany in the late 15th and early 16th Centuries. The majority recovered from Phase 1 dates from the late 1500s and early to mid 1600s in the form of *Römer* glass, *Pasglas*, beakers as well as normal bottles. These finds are evidence of the dredging of the Late Medieval deposits in the harbour and represent material used in Phase 2 and 3.

Fig. 38 Flower-like prunt (FO214651) found in SD40492 (G667). Photo G. Haggrén.

Destruction of the harbour

The 1530s harbour went out of use in the 1560s with the construction of the new harbourside directly above. Part of the bulwarks were removed and are seen as post holes whilst some were cut at 1m from the base of the post and became part of the new harbour. By this time the Late Medieval harbour had served its use, and was to be replaced by something more important and better constructed.

Fig. 39 Photo showing the west facing section of wall G532. Note that the rear of the wall has been truncated, as had the top of the wall by later activity. The Late Medieval harbour bulwark G656 has been cut or snapped with the upper part of the post horizontally placed on a north-south orientation C03_20140630_11307

It is not known exactly when building G389 was destroyed but the finds relate to use of the structure from the Late Medieval and the Early Renaissance so it is presumed the building was destroyed at the end of Phase 1 or early Phase 2. There is a possibility that the building may also have continued into Phase 2 or 3 existing as a building entitled the hop farm, with a role of assessing the hop.

Fig. 40 FO200592 Schnelle mug with coat of arms of Elizabeth 1st of England, 1560s. Museum of Copenhagen

The harbour base issue

The Late Medieval alluvial deposits chart the gradual movement southwards of the harbour, which is seen at the northern and central part of the Main Excavation trench. These deposits were a real mixture of both sand from the base, and silt and rubbish from the city. The closer the deposits were to the town, the richer they were in quantity of finds. The problem with these deposits was that they became more mixed the further south they went. The depth of the harbour needs to be maintained to enable easy passage for ships, this is achieved by dredging. This process was ongoing to the south of the harbourfront so deposits that formed in these areas would get contaminated with later artefacts pushed into the deposits.

Evidence of this was seen from early 17th Century finds in Phase 1 deposits where *Römer* glass, clay pipe and some 17th Century fabrics.

A total of 273 pipe fragments were recovered from alluvial groups G647 and G667. These finds were later intrusions due to the effect of dredging in the harbour from Phases 2 and 3. As they do not physically date to the Phase 1 period dates, they do not warrant further discussion. Clay pipes were imported into Denmark in the early 1600s (Phase 2 on Gammel Strand) so represent a later intrusion.

Beginning of the Metropolitan harbour (Phase 2) 1570s-1620s

Fig. 41 Plan of Phase 2 structures and features

Introduction

The Phase 2 period on Gammel Strand began in the 1570s, in the Early Renaissance period in Denmark (Early Post-medieval Period). It was characterized by a new harbourside consisting of a stone harbour wall, road and administration buildings, with the harbour wall and road in use in both Phases 2 and 3. The Fredrik II and Christian IV period harbour was arguably the most expensive of the harbour phases, due to the large quantity of stone and represents Copenhagen becoming the pre-eminent city in Scandinavia. The construction of the new harbour wall began with the digging of a large linear construction cut, which was seen at the northern part of the Main Excavation trench and the Guide Wall trench. The cut was rectangular in shape, truncating the Late Medieval harbour producing a flat base. A line of hundreds of posts were added into the southern part of the cut. The posts were cut in the mid-1560s, so may represent the wall was older than its previous completing date of 1583 (Fabricius 1999, 229). They were fashioned from oak and imported from the same location as the other oak posts, in areas surrounding the Ørestad region. They measured up to 3 m long and shaped rectangular with one pointed end and one flat end. These posts were pushed into the Late Medieval deposits, vertically. The wall was then built behind,

between 1.5-2 m wide and up to at least 2 m high (as seen from the truncated areas. It was built on a levelled small stone and brick sub base with large stone foundations measuring, c*a*.1 m3 with rubble on top. A harbour frontage was created using rectangular stones with less shaped stones at rear. In the centre was laid packing stones. The style of the wall differed along the exposed area as at the eastern end of the trench they comprised brick sections laid in rows, with a possible extra base foundations set under water. There also comprised a two prong culvert consisting of brick channels in the wall and wooden pipes behind the wall.

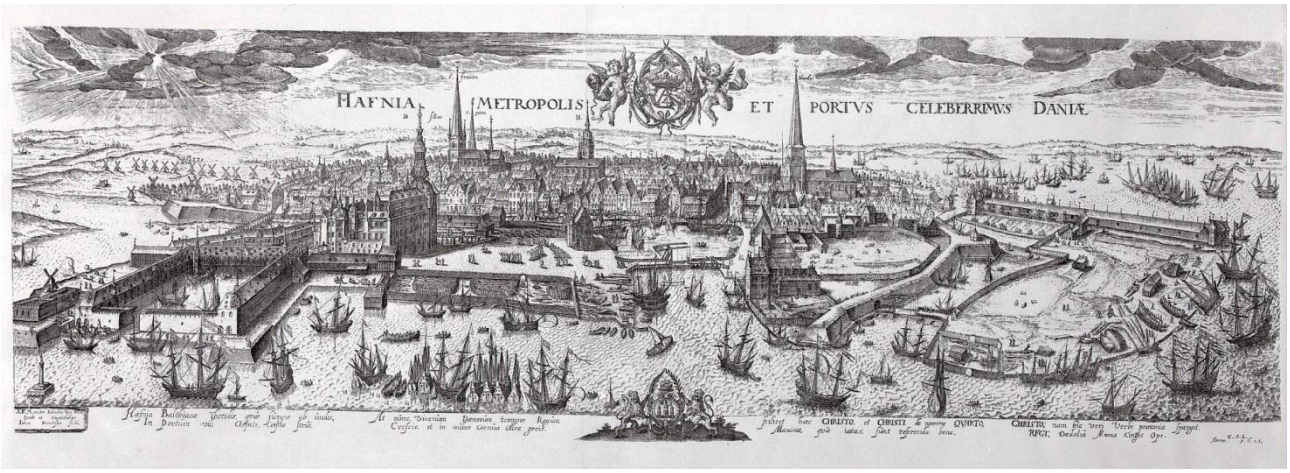


Fig. 42 Hafnia Metropolis et Portvs Celeberrimvs Daniæ (Copenhagen Metropolis and Celebrated Danish Port). Engraving by Jan Dircksen van Campen 1611 after a painting by Johan Van Wijck. The National Museum of Denmark.

Set behind the wall was a stone path running east west, and bounded by planks and vertically set posts. This was the harbour path of the early 1600s, which was in use till the late 1600s, although the replacement has not been found.

To the west was constructed the large new *Vejerhus*, also attributed to Valkendorf. Fredrik II asked for a new structure to be built as the last structure was decaying. The old *Vejerhus* was destroyed, as seen by the finds record and the deconstruction evidence in the area and the new building was constructed slightly to the east. The new building was rectangular shaped and 3 stories high as seen in the 1840 Daguerreotype photo. It was constructed in the same style as the earlier *Vejerhus* with the foundation set within a construction cut. The foundation consisted of large stones with brick walls added above. It was stated that is was a wonder how such a structure was built so close to the sea, where the part of the northern, eastern and western foundations were found. It has been suggested that part of the structure was built out into the sea, and if the wall group G389 continued westwards on the same orientation, then the structure would have continued into the sea. Excavation will need to solve these theories.

A few deposits were found in the harbour relating to dumping and fluvial activity in this phase. Not many of these deposits were existed to the central and eastern part of the trench as frequent dredging removed them from the base of the harbour, as well as the tops of the earlier deposits. Only the heavier finds remained, pushed into the earlier deposits and thus polluting them with later dates.

Under Christian IV, the trade continued to flourish, and with it, the harbour would have to be extended. The harbour area was changing, and with the movement of the *Dansk Ostindisk kompagni (*Danish East

India Company) on to Gammel Strand in 1616. The area cemented its place as the area where not only the harbour was administered, but also where the organization of trade goods occurred. This was the area where a large quantity of money was passed within Copenhagen, and Denmark, and also located directly next to the king. With the construction of the Børsen stock exchange in 1619 on Slotsholmen and the location to the toll house, also on Slotsholmen, (Fabricius. 2007. 85) this harbour area was the economic border area

Stone harbour wall and bulwarks

The wooden harbourside from Phase 1 was not adequate to fulfil the needs of the Copenhagen Renaissance harbour of Phase 2. It was old and neither strong enough nor representative of what a harbourside should be in an important European capital city. The facilities would have been upgraded, to bring the harbour up to standard which is shown with the new construction at Gammel Strand. A stone harbourfront is stronger than a wooden harbourfront, and would last longer, so although expensive at the beginning, the cost would decrease as maintenance or replacement of parts of a wooden bulwark would require more maintenance and replacement at an earlier date. The granite boulders for the foundations were collected from all over *Sjælland* from stones that had arrived on the island as a result of glaciation. The limestone came from various areas, with Stevns Klint being one such possible site. It was then cut, dressed and brought to Gammel Strand. The wood used for the bulwark also represents wealth, and as in Phase 1, it was cut from oak from areas surrounding Copenhagen, from *Sjælland*, *Blekinge*, *Skåne* or *Halland*.

Fig. 43 Plan of harbour wall G532, Bulwarks G602, G503 and G415 and the harbour deposits, featuring the re-use of Phase 1 groups G647, G678 and Phase 2 alluvial group G642.

The harbour wall and bulwarks were built at the beginning of Phase 2 and represent the main construction activity. The walls and the wooden posts suggest that a large sum of money was used for quarrying and in some cases shaping the stone. Money was also spent on tree felling and working the wood, transport of materials and construction.

Fig. 44 profile containing sand G101 (at bottom of photo), overlain by SD55781 of Group G678, below SD55780 and SD55779 of sub group 667 levels at western area of Main Excavation. Note that construction cut SC57441 of Phase 2 Group wall G532 truncated the upper part of bulwark G656. A single post from bulwark G602 is at the right of the photo. Photo C03_20140624_11176 by Museum of Copenhagen.

Associated with the harbour wall were various wooden bulwarks, set either in-front or south of the wall G532. The post line was found to continue outside of the Main Excavation trench and the stairway trench, and was represented by G415 in the Guide Wall excavation and G503 in the Oil Container trench.

The bulwarks from G602, comprised a mixture of in-situ posts labelled ST39575 and measured individually. The posts were on average between 2 m and 3 m long and located at an average height OD of-0.03 m (with the occasional post being much lower e.g. -0.65 m). They were generally square in profile, with a boxed heart and straightened sides, measuring 0.2 m by 0.2 m wide. They all were manufactured from oak and comprised one flat terminus and one pointed terminus. They were driven through the Late Medieval alluvial deposits from groups G647, G678 and SG667, depending on the area of the trench, and into the

harbour sand to the depth of 0.3 m. They were driven in so strongly that a mechanical excavator was needed in order to remove them.

Fig. 45 Photo of Harbour wall group G532 and bulwarks group 602.Located at the eastern end of the Main Excavation looking NE. C03_20140602_10517

The stone harbour wall, G532, stretched for 88 m through out the Guide Wall trench and Main Excavations. Historical records state that it was constructed by 1583 and it was in use until the 1690s when the new wooden harbour was constructed. In the western area the stone harbour was in use until the 1630s when a new wooden reclamation box and then wooden harbourfront was constructed. Here, at the western end of the Main Excavation trench, the upper reaches of the wall are demolished and a new harbour is constructed southwards.

The wall was uncovered approximately 1.5 m below the present ground surface in the Guide Wall excavation and between 1.5 m and 2 m below the modern surface in the Main Excavation at an average height OD: -0.24 m at the top of the wall. It survived at a width of 2 m to 2.6 m wide and from 1.5 m to 2.5 m in height. The destruction of the upper wall part leads to an estimation of the original height. It was built within a linear construction cut with steep sides and flat base truncating the remains of the Late Medieval harbour, structures and deposits.

Fig. 46 Photo of central section of harbour wall G532 with bulwark G602 in front. Looking NW.C03_20140611_10788

The wall was first seen in the Guide Wall excavation in 2012 and in the Main Excavation and the Stairway trenches in 2014. It was built on a NE-SW orientation, although it curves slightly in the centre of the Main Excavation, which may reflect the former fluvial channel of the canal in the Renaissance period. The wall group was built directly on top of the Phase 1 Late Medieval bulwark group G616, and directly south of the Phase 1 bulwarks G467, G478 and G485. It was also built into the Phase 1 groups G647, G678, SG667 and the Phase 2 group G642 in the west.

Fig. 47 Photo of eastern end of wall G532 after bulwark G602 was removed. Photo shows the different construction methodology to areas in the centre and west. C03_20140613_10888

The new Weighing House / *Vejerhus*

To run a harbour effectively, administration buildings should be placed on the harbourside. This was seen by the construction of the new *Vejerhus*, which at various parts of this phase also comprised an *Accisehus* function. The new structure with the weighing and tax functions would enable the King and the Burgomasters to collect tax and govern what was received and sent out of the harbourside. With the fiscal benefits being so high for the elites a new building was needed, and the construction of a vast new structure was fulfilled in the new Vejerhus. The location of the structure on the harbourfront would allow quicker use of all the tax and fiscal parts of trade system, and its close proximity to the Renaissance markets on *Gammel Torv* and *Amager Torv* would also be a determining factor as the movement of goods to the market place would be a short journey.

After describing the functional and symbolic nature of the harbourside, the date of the construction should also be addressed. The key to the new date of the harbour is linked to the felling of the oak posts, undertaken in the winter 1557/1558. The posts were new cuts that appear to have been fashioned for this harbourside. The posts would have been waiting to be used for 25 years if we use the historical date of 1583 given by Valkendorf for completing the harbourside. It does not seem economical to cut the wood and store it for 25 years. This leads to many suggestions; either the harbour wall was built in the early 1560s, or the harbour was built over a long period of time or perhaps Valkendorf claimed credit for the construction or reconstruction. It is believed by the authors that the wall is actually earlier, from the early 1560s, and the Valkendorf credit belongs to a reconstruction or refashioning of the walls in the late

1570s/or early 1580s. Obviously the harbour wall could not have been built all in one short phase, as the harbour still needs to function, but it is expected it could be built over a few years, and with the new construction of the Vejerhus and dredging in the late 1570s and early 1580s is it logical that repair to the walls also occurred around the same date.

The 2010 watching brief revealed that the brick walls of the G221 structure was built on stone foundations with munkesten red brick the main form used for the brick walls. The building group consisted of 7 subgroups SG218 (western foundation wall), SG219 (eastern foundation wall), SG220 (northern foundation wall), SG289 (demolition sequences of the *Vejerhus*), SG346 (outhouse), SG347 (structural elements) and 28 contexts representing the remains of the large brick and stone built structure. These quite well preserved structural remains which were found in the western half of Gammel Strand but close to its centre, represent the northern foundation in its full length of 9.5 m, but not full width (only 1.1 m), the 2.15 m of the c. 2.2 m wide western foundation and 1.76 m of the also c.2.2 m wide eastern foundation. The whole building was approximately 13 metres wide by possibly 18 m long (using measurements linked to the believed former harbour location in the Vejerhus area and archaeological remains).

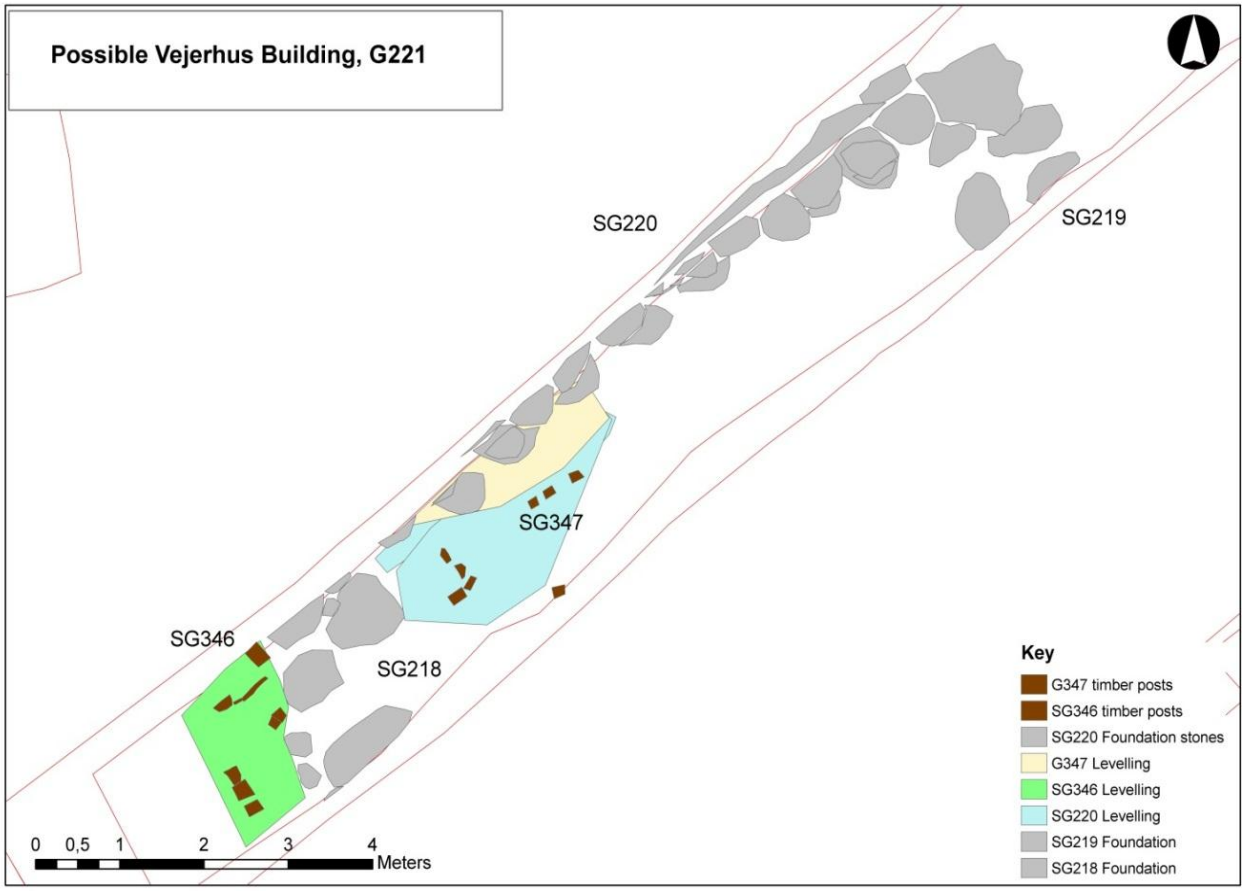


Fig. 48 Plan of possible Vejerhus building, G221. Watching brief phase, 2010

The remains of a suggested lean-to/outhouse, SG346, located on the western side of the building and the possible remains of structural elements, which potentially could be room divisions, are supposedly related to the building.

The *Vejerhus* was an extraordinarily solid building, consisting of three floors, over which there was an attic. The upper floors and the attic were used as storage floors, while the lower ones were used as *Accisebod* for taxing wine and beer. Besides housing the *accise*-work, the lower floors also housed the town weight, used to calculate the amount of food goods shipped into Copenhagen through Gammel Strand. Weighing the freight was a job undertaken by the town weight master and his men whose job it was to ensure the correct *accise* (tax) was paid. The building was demolished in 1857.

Fig. 49 Northern foundation wall SG220. Comprises Lower course (SS4298), upper course (SS4350) and overlying brick structure (SS4453) C07_20100729_0318

Based on the excavation results and knowledge about the 19th and 20th Century activities in the area, it is likely that the building, even though truncated, may exist in some format beneath the asphalt road and square area at Gammel Strand as the preservation of the archaeology in this area is of high standard.

New wealth in the area – finds from the harbour

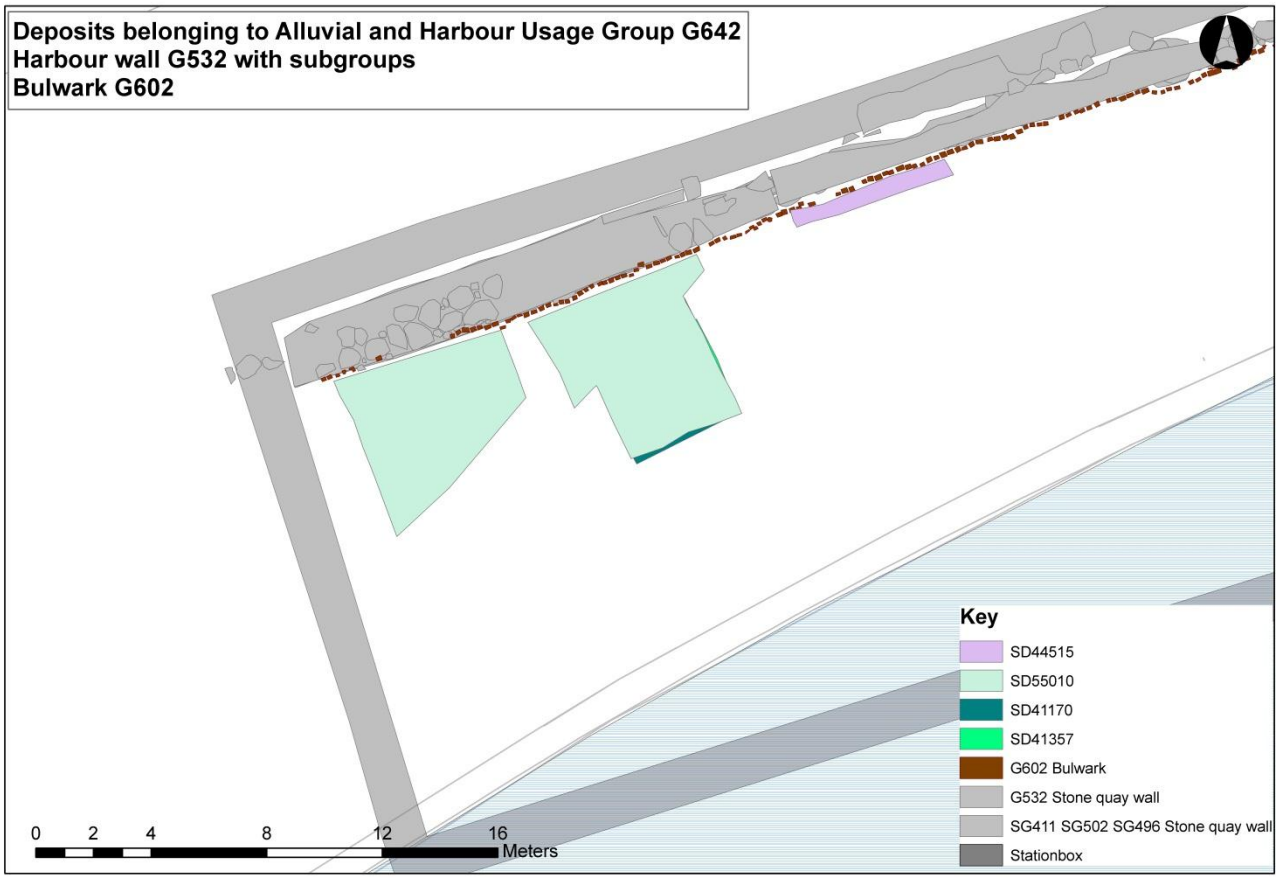


Fig. 50 Western end of trench G642. Individual deposits listed in key

The artefacts from Phase 2 were found within harbour activity and alluvial layers in G642, within structures G532, land reclamation layers behind the wall G435 and within usage layers of structures as seen within road G430 and harbour wall culverts G476 and G477

As discussed in Phase 1, various Medieval deposits at the bottom of the harbour within Groups G647, G678 and G667 were affected by dredging activity in the harbour in Phase 2. Some of the deposits that were fully enclosed under wall G532 were not affected by this activity, but groups such as G647 and G667 were placed partly beneath G532 and then continued into the Phase 2 harbour area. This meant that parts of the deposits were pure Medieval, and the other parts were dredged in Phase 2 and thus comprised Phase 2 finds.

Much effort was made to limit the amount of waste and rubbish thrown into the harbour, with people asked to report anyone throwing waste into the harbour in 1590, and in 1620. This situation had obviously proliferated for the creation of a *Brofoged* (”paving inspector”) position in 1624 to manage the cleanliness of the streets so that dirt would not flow into the harbour.

Group G642 was a collection of layers that were formed by harbour activity and dumping at the base of the harbour at the western end of the Main Excavation and in the stairway trench. This dumping activity occurred mostly from the landward side which can be seen in section profiles. They were formed after wall G532 and bulwark G602 was in place, and overlay both parts of these features, mostly over bulwark G602 as it was located south of G532. These groups overlay the former Medieval deposits at the western end of the trench but were not seen at the central and eastern parts of the harbour due to dredging. They instead survived due to the construction of a harbour extension in the western area at the start of Phase 3.

The artefactual remains from Phase 2

The finds from Phase 2, as with every other phase, represent the Copenhagener or the visitor to Copenhagen, its examples of everyday life, differential status, fashion etc. Unlike every other phase it appears more obvious that there is more evidence of the elite from the rubbish in this phase, which was expected from the location and the elite inhabitants who lived in the area.

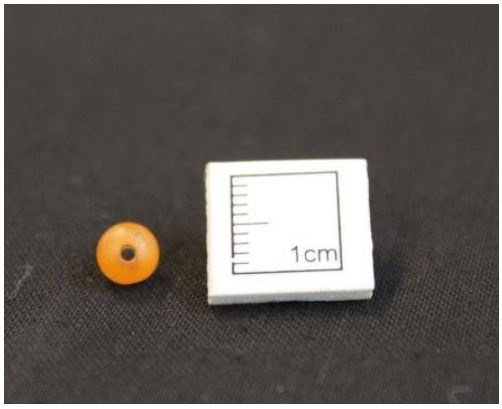


Fig. 51 Amber Bead FO203259, SD12455, G435. Retrieved from sieving PM12802. Phase 2. Museum of Copenhagen

New levelling layers behind and to the north of the harbour wall, and waste found dumped in the harbour over the wall or from ships represents the activity from which finds were retrieved. The artefacts comprise many imported Majolica, stoneware and Faience ceramic vessels from the Netherlands and the area that is now modern Germany with a few vessels from further afield. The glass vessels were mainly also from the same regions.

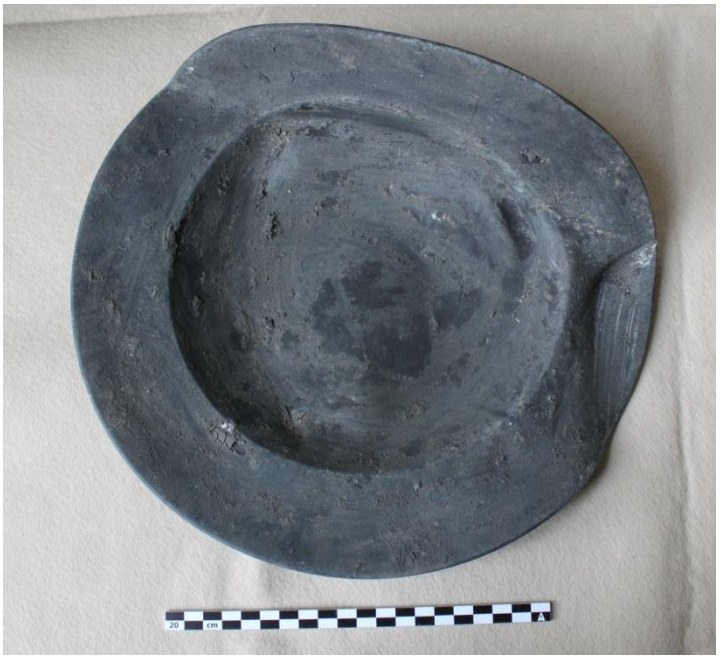


Fig. 52 Pewter plate FO 212784, SD55010, G642, pre conservation. Museum of Copenhagen

The act of dredging had mixed the finds in the harbourside pushing the artefacts into earlier, Late Medieval deposits in the harbour. As with Phase 1 the finds, behind and to the north of the wall and in the far west of the main trench under the later Phase 3 structure, were found in secure contexts and represent the societies of the time, such as the elites living at Gammel Strand. Here we see the continuance of consumerism, as in Phase 1, with Renaissance societies importing fine goods from abroad, mainly from around the Baltic, and also starting the new elite pastimes, such as smoking. The clay pipes from this phase are imported, mostly from the Netherlands, with some from England. The Netherlands

appeared to get a cultural hold on trade in Copenhagen in this period not only in artefacts but also in new architecture and this would propel Copenhagen into the globalisation period with their new luxury goods.

There were 213 ceramic sherds analysed from Phase 2 deposits, with some residual Medieval pottery and some Later Post-medieval period. A small amount of sherds date back to the later part of the 16th Century but most of the sherds related to Phase 2 are of typical 17th Century types. The majority of the sherds were Danish from Jutland representing regional trade. Dutch sherds were in the form of tin-glazed earthenware and white wares are well represented but it is mainly the redware kitchen utensils which dominate the Dutch ceramic imports. German imports are also frequent; it is generally composed of different kinds of stoneware from the Rhineland area.

The forms are varied and consist mostly of pots, jugs, mugs, bowls, and dishes but many subtypes occur. Much of the ceramics bear signs of use and in this way cannot be associated directly with the trading activity at Gammel Strand.

There were only a few Medieval residual sherds in this deposit, located within the make-up of the harbour wall G532 and within the foundations of the harbour wall culvert G477. These Late Medieval Siegburg sherds probably relate to disturbance of the underlying layers and layers behind the newly created Phase 2 harbour.

The glass from Phase 2 comprised 46% table glass, 30.7% bottle glass and 21.3% window glass and 2 % other glass. Within the deposits were some residual Medieval sherds and later Phase 3 pollution due to dredging in the harbour. The majority of the glass comprised used fragments, the result of use within the urban landscape rather than dumping in the harbour. It was in this period that the fine table glass arrived in large quantities in the assemblage, representing the new wealth flowing into Copenhagen. This was seen in the remains of *Pasglas*, *Röhmer* glass, Club beakers and *Humpen* glass and winged vessels imported from the modern Netherlands area, Germany and perhaps from Venice. This was also seen in the Metro Cityring excavations at Kongens Nytorv and Rådhuspladsen, though not in the same quantity in the same time period. The high status of the glass represents the wealth of the people living around the harbour; this is also suggested by the large size of the sherds representing primary dumping straight from households.

The clay pipes analysed in Phase 2 numbered 67 fragments from the prioritized contexts, and reflect a percentage of those collected from this phase. Many could not be narrowed in their date, nor could their provenance be seen. They reflect the start of smoking within Denmark and new trade networks linked to the manufacture of clay pipes and import of tobacco from the Netherlands.

Land reclamation and harbour infrastructure

Land reclamation

The land reclamation and levelling groups were located to the north of the Harbour wall Group, G532. They were a mixture of groups of backfills behind the wall for the new reclaimed land. Shortly after the first reclamation layers were added, more layers were deposited to increase the height of the ground surface and provide a flat base for the road, G430, and any other structures north of the wall. The Groups that represented this function were numbers G434, G435, G437 and G438. It was hard to differentiate which were reclamation layers and groups, and which were levelling layers, so they were called both types of deposits and groups. They comprised of urban dump material as suggested from the various types of finds

which represent the spectrum of the society. Examples include numerous redwares and greywares, the staple household wares within Copenhagen, and more elite stove tiles made from local clay but decorated with designs from Germany. The locations of these new land reclamation and levelling deposits are found behind the harbour wall G532, located geographically north of the excavations, and mainly in the Guide Wall areas. They were located on average between 0.25 m and 0.5 m OD.

Fig. 53 Stove tile with a boy playing the flute. A Germanic mould on Sjælland fabric dating to 1480s. Representing urban rubbish within the land reclamation layers north of the harbour wall. FO202816, SD12455, Group G435. Museum of Copenhagen.

The Road

The harbour path/road, G430, was found in fragments within Trench 1, 2A and 3 in the Guide Wall Excavation. It was greatly truncated by later culverts and land ties from Phase 4 and modern truncations in Phase 6. The road spread over an area measuring 74 m, of which 24 m of the harbour road was seen. It was located at the average height OD of 0.55 m.

Fig. 54 Working photo of Road Group 430 looking SW in Trench 1 of the Guide Wall trench. The photo comprises road deposit 11789 at rear and road deposit 10493 in foreground. C03_20120723_5083

The road surfaces appeared to represent a harbourside road dating from the 16th and 17th Century. This was suggested from the stratigraphy and from the finds, i.e. clay pipes and pottery, embedded within the surface. Unfortunately the wood was too fragmented to be used for dendrochronology. The construction cut for the road truncated the construction deposit for the known upper reaches of Renaissance quay wall group G532. It was presumed from the artefactual evidence that the road construction occurred in the same phase as the harbour wall. Although the road was quite narrow at 1 m wide it was found to continue into the northern boundary of the Guide Wall trench. It is of the opinion that the road was wider than what has been exposed leading into an area not seen from excavation.

Evidence of many planks in the planking system, laid in crude fashion suggests a haphazard way of construction and maintenance.

Although some parts of the road contained embedded finds, it is expected to have been kept relatively clean. Around 1624, a Brofoged (”paving inspector”) was appointed. The role was to manage the cleanliness of the streets so that dirt would not flow into the harbour as a large amount of costs have been spent repairing and cleaning the harbour.

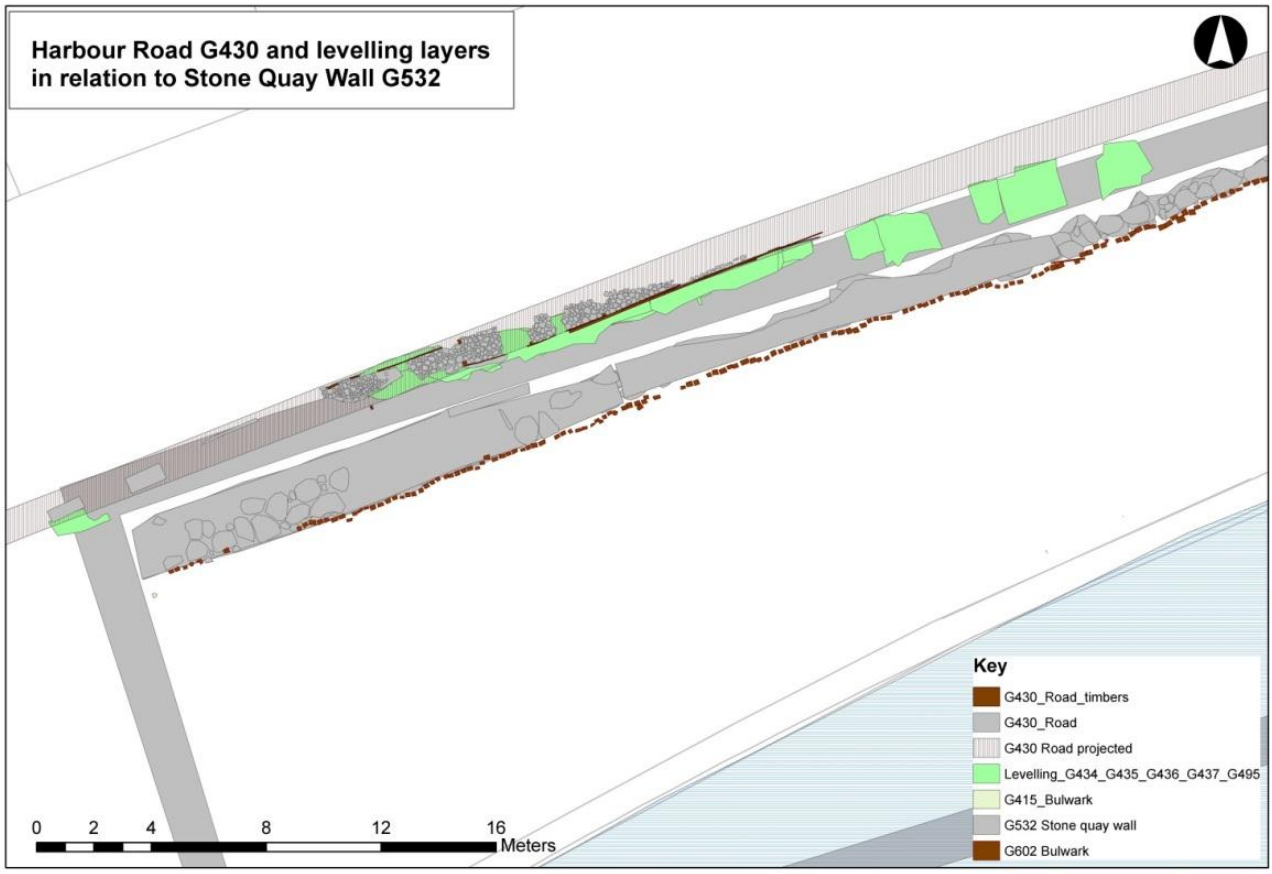


Fig. 55 Plan of western part of road G430, and underlying levelling layers

Group G430 comprised three cobbled stone surfaces, SS11789 in Area 1, SS10493 in Area 2A and SS14909 in Area 3. The road was orientated NE-SW and continues into the northern section of the Guide Wall trenches. The cobbled stone road comprised many unfinished stones measuring on average 0.2 m by 0.2 m by 0.1 m that were tightly compacted together. The road was built within similar construction cuts in the three exposed areas. The stone surface was held in place by planks to the north and south which were laid horizontally on their side. A series of stakes were then driven into the ground vertically to the north and south of the planks to keep them in position.

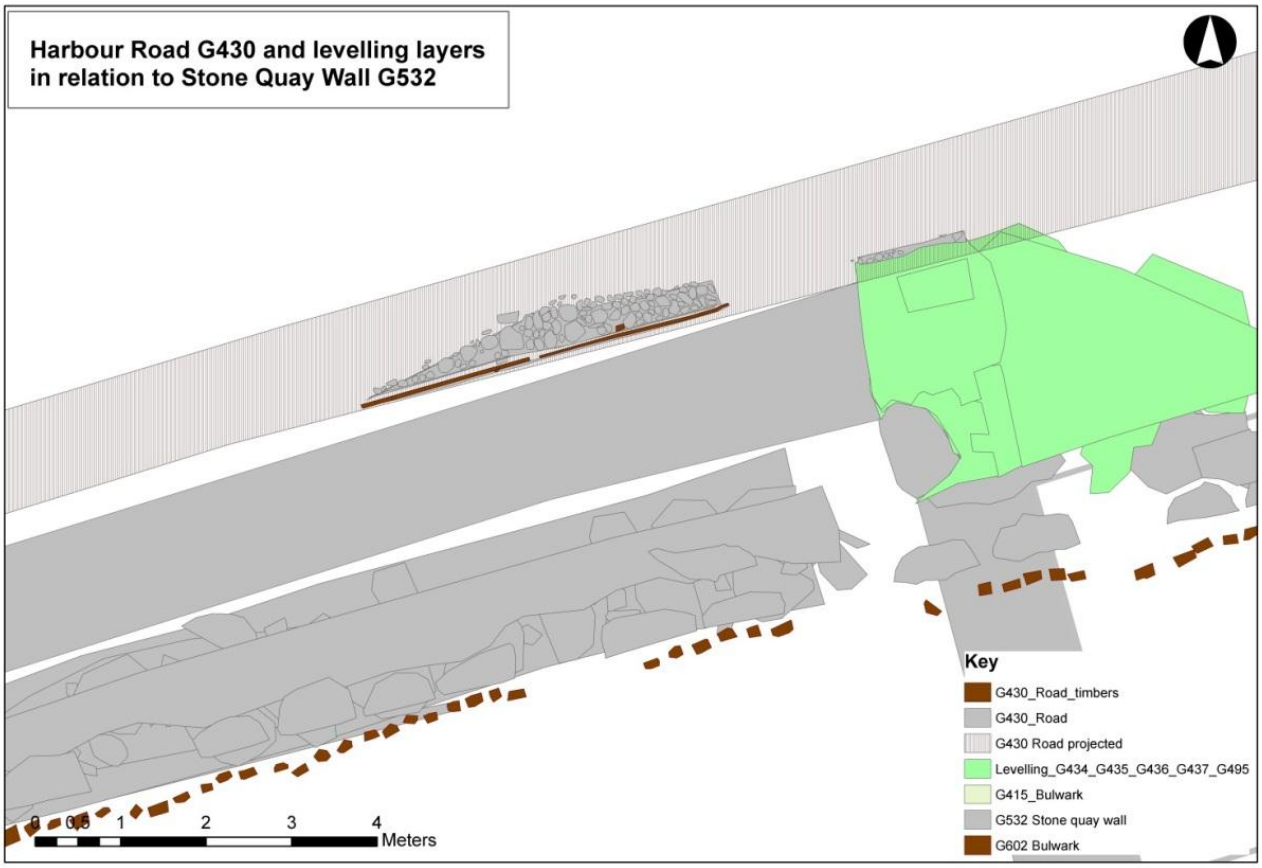


Fig. 56 Plan of eastern part of road G430, with the underlying levelling layers

The end of Phase 2

The end of Phase 2 at Gammel Strand sees Gammel Strand obtaining big trading bodies, stationed at the harbour region. Copenhagen had already obtained special privileges to trade with Iceland in 1547 for a few years (at the end of Phase 1 period on Gammel Strand), and a loading area was assigned. The privileges were re-instated in the early 1600s.

A sign of increased trade is seen with the establishment of a sister town, Christianshavn, built to the south between 1606-19, awarded trade privileges for the citizens (KD I, nr. 421, p. 593-94). Slotsholmen, linked mainly to the monarchy and the navy, was increased in sized between 1615-20 with various military and royal structures as well as the building of Børsen, the first proper trading centre in Scandinavia.

By 1616 the Danish East India Company in 1616 was created, with the headquarters on Gammel Strand. This Company became very powerful in Denmark setting up the colony of Tranquebar (1620) in India to allow trading with India and the Far East. The new goods coming into Copenhagen led to the transformation of the whole harbour area within Copenhagen and expansion of the harbour region in Phase 3 at Gammel Strand.

The Mid to Late Renaissance harbour; Phase 3, 1620s-1680s

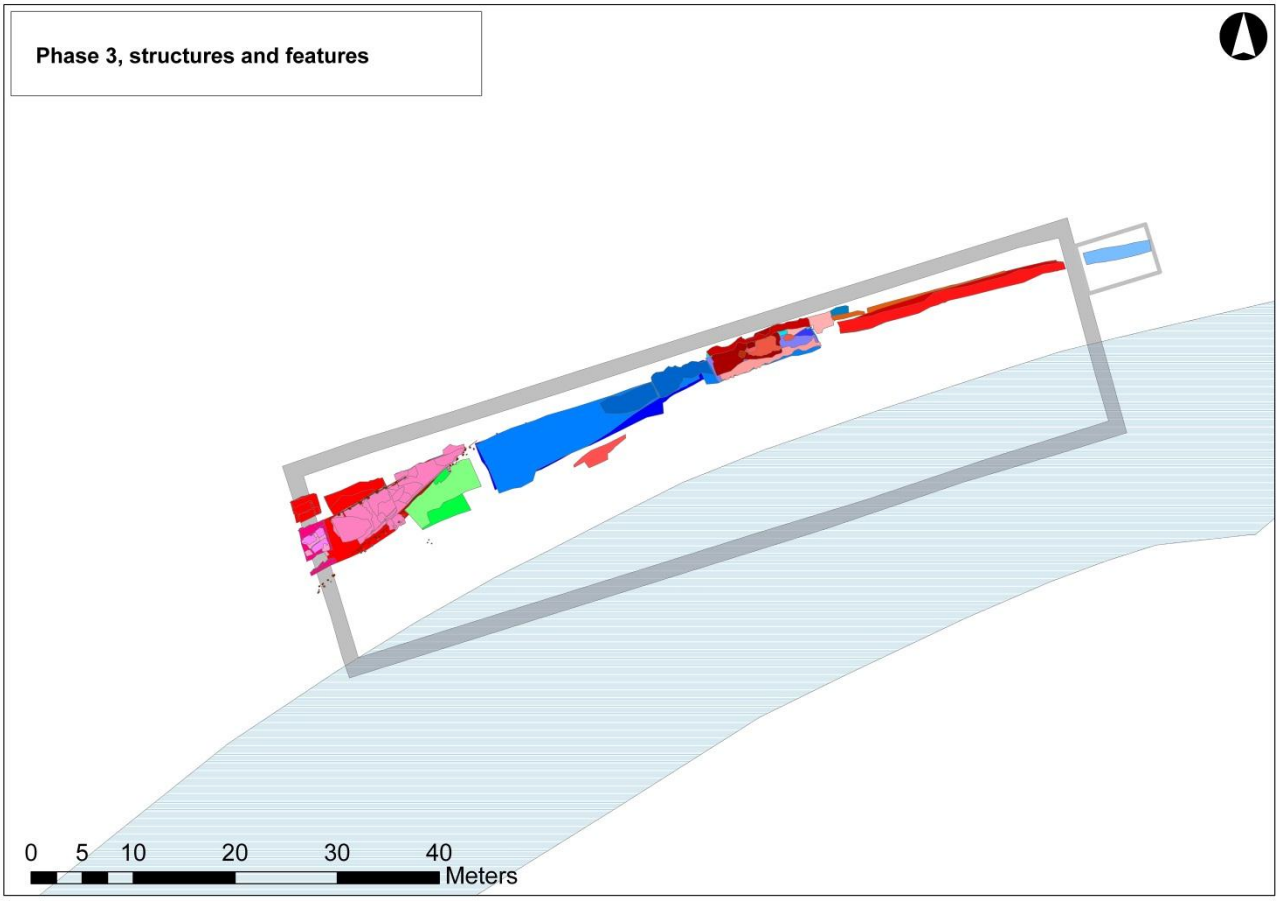


Fig. 57 Plan showing all Phase 3 structures and features

Introduction

Phase 3 represents the Late Renaissance period in Denmark (and end of the Early Post-medieval period in NW Europe) on the Gammel Strand Metro Cityring project. It featured the construction of two large wooden harbour structures in the western area of the Main Excavation trench, maintenance and use of the harbour between the 1630s-1680s. The main activity for construction was located in the western part of the harbour in the Main Excavation trench. These posts and bulwarks (from G674 and G648) were revealed within Trench 1 of the Guide Wall trench and the area west of the baulk in the Main Excavation trench. As discussed in the previous chapter, Phase 3 consists of the second part of the Renaissance harbour use and continues the Globalisation period with Copenhagen where there is more evidence of a higher number of luxurious goods being imported from outside of Europe into Copenhagen via Gammel Strand. The phase ends at the end of 1680s which is shown by the removal of stone from the harbour wall to be reused elsewhere, and discarding large quantities of rubbish into the harbour for the beginning of land reclamation in Phase 4.

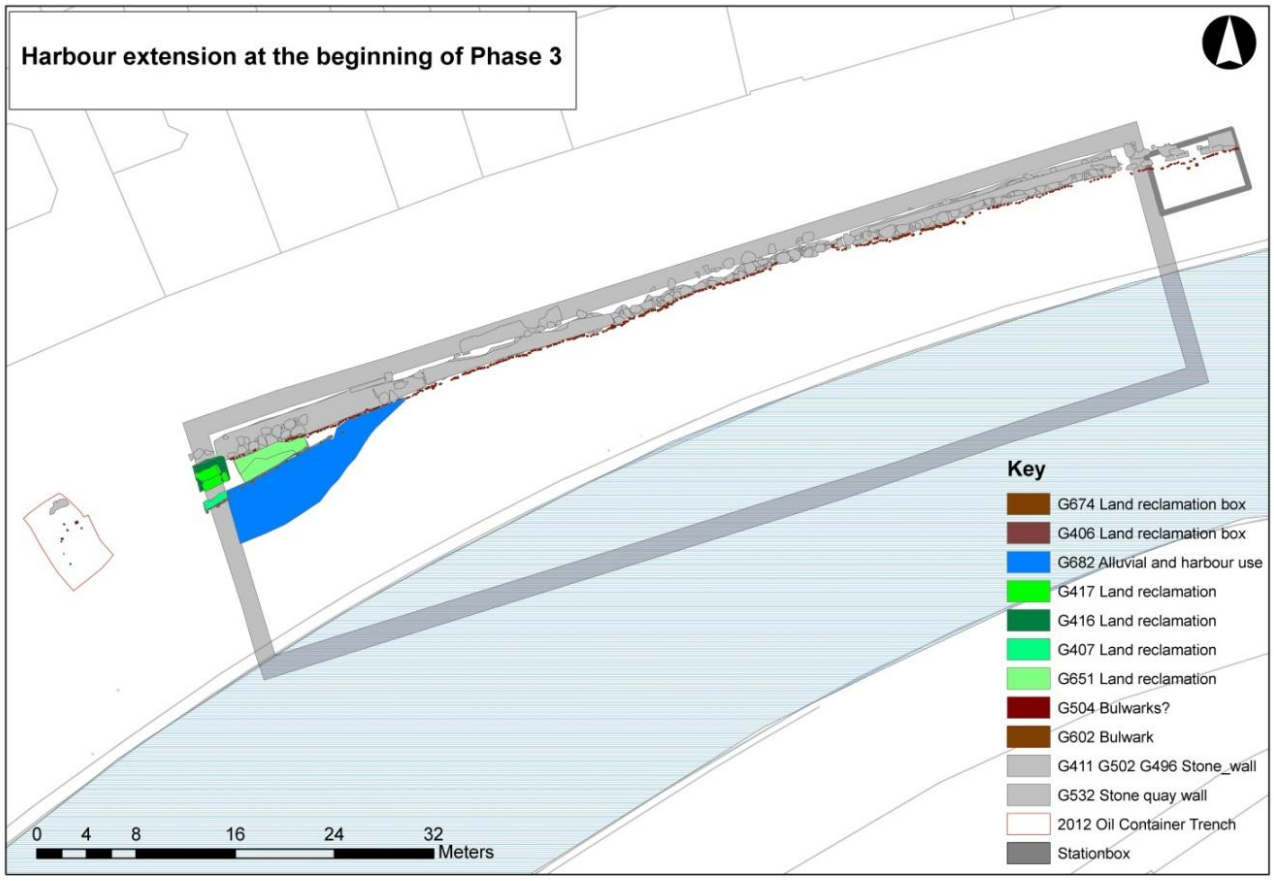


Fig. 58 Plan showing activity in Phase 3 in the mid 1620s.

The early bulwarks and land reclamation

The first action in Phase 3 was the gradual creation of a new harbourside. This began with the construction of a land reclamation bulwark or box to start the movement south. The land reclamation bulwark was found in two periods of fieldwork, Group G406 in the Guide Wall excavation, and G674 in the Main Excavation. The whole structure measured 12.37 m long by 0.4 m in width and up to 3 m in height. It functioned as the eastern part of either a short-lived reclamation box/fence for the expansion of the area south in the western part of the excavation.

Fig. 59 Photo of reclamation n fence G406, looking SW. Guide Wall excavation 2012. C03_20120725_5207

The top of the western section of the fence, G406, was uncovered at 0.8 m OD. It measured 2.72 m by 0.75 m and was exposed to the depth of 0.6 m. The group comprised 5 vertically set posts and a horizontal plank to form the fence. The use of the fence G406 was short-lived but still long enough for the formation of alluvial/usage deposits created to the south, as seen with G682. This mini phase was short-lived as 4 metres south a proper harbourfront was constructed, built into alluvial deposits and natural sand. The area behind was backfilled with urban waste, as seen from Group G651.

The top of the reclamation fence in the Main Excavation trench was located between 0.02m and 0.72 m OD, and measured 9.65 m long by 0.35 m wide. It comprised of posts up to 3 m long and 0.2 m wide. The structure in this area comprised ten vertical rectangular shaped posts, three horizontal planking systems belonging to ST55660 and eight support posts driven into deposit below**.** The support posts were tangentially shaped and very thin at 0.04 m thick. They were attached to the posts and the support posts by nails. The fence line was orientated NE-SW, nearly reaching wall G532 at the NE end.

Fig. 60 Reclamation Fence G674, Looking N-W. Note, the bulwark was constructed in two different parts, and that bulwark G602 may have been removed to build this structure. C03_20140624_11187

All sections had been nailed through the rear support planks into the front support beams. This indicated that the back, the NW facing side of the bulwark, was exposed completely prior to backfilling. The top level of planking was thought to have been truncated during demolition phase of G674 bulwark, presumably at the end of Phase 3. Surrounding these posts to its southern side was sub group SG682 from the bulwark group. The alluvial type deposit was formed by usage around the structure. The timber has since found to have been fashioned from spruce and imported from an unknown source

Fig. 61 Working photo of the excavation between G602 and G674 looking NE. Note the majority of the backfill has been removed. C03_20140624_11196.

Dendrochronological analysis was undertaken on 18 posts and planks from G674. Of the samples, only the spruce (used for planks and some posts) was able to be dated. None of the oak posts were successful. The oak timber probably came from southern Scandinavia, perhaps from Skåne, Hålland or Sjælland. The spruce was found to have been felled in the winter of 1625/6.

Land reclamation

Sub-Group SG651 and group G407, represent a group of backfill deposits behind the bulwark (G674 and G406) for the purpose of reclaiming land. The groups consisted of many different deposits comprising a mixture of urban rubbish, manure and the remains of the upper parts of harbour wall, G532, which was discontinued in use in this area. The remains of other buildings from the city had also been dumped amongst the waste reflecting many levels of society. Land reclamation sub group 651 comprised seven deposits spread over an area measuring 6.12 m long by 1.9 m wide and 1.7 m deep, and was located, at the top, at -0.25 m OD. Group 407 was located slightly higher up at 0.46 m OD and measured 2.51 m by 0.73 m by 0.2 m. Of particular interest within G407 were the discoveries of rat bones that rarely survive. The presence of goshawk bones reveals that there were wealthy Copenhagen inhabitants who were able to own birds of prey and were also allowed to hunt.

The intermediary harbour usage

The alluvial and usage sub group, SG682, was located to the south of bulwark G674. The sub-group, SG682, comprised a single large usage layer formed by activity when the bulwark Group G674 was open to the elements and the sea. It was also affected by the building of the later bulwark G648. The deposit was a dark

brown grey silt deposit with some sand; it measured 6.85m by 4.44 m by 0.25 m thick at the greatest extent. It comprised pebbles, stones, bone and wood with medium amounts of CBM along with ceramics, iron, slag, bone, glass and leather dating to the late 16th to the early 17th Century. The deposit was found to be thicker next to the bulwark and thinner as it moved southwards. This was probably due to the process of fluvial activity and people throwing in rubbish from the bulwark. Physically the group overlies the lower parts of Bulwark G674.

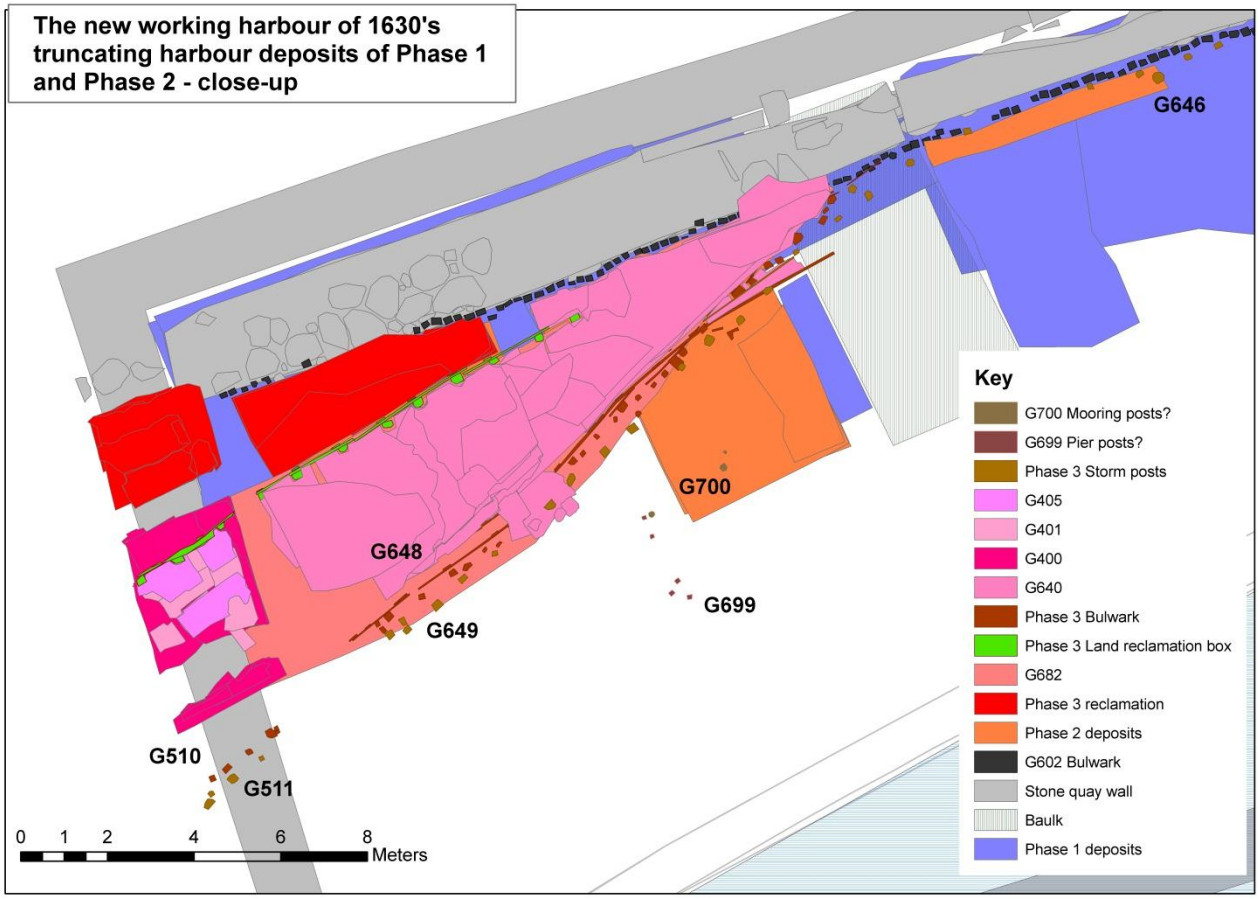


Fig. 62 Plan of the 1630s new working harbour G648, with associated deposits.

The western harbour extension

The next activity was seen in the creation of the harbourfront G648, the wood used came from trees felled in the mid to late 1620s. The new harbour bulwark was located In the Main Excavation trench on a NE-SW orientation, leading in from the western section of the 2012 Guide Wall trench, which joined into the earlier stone harbour wall G532 at 18m from the western end of the trench. When the bulwarks were completed, they were backfilled with rubbish from the city (G640).

Built in front and to the south of the new harbourfront G648, wall G532 and bulwarks G602 from were storm posts (G511, G646 and G649) these were added to protect the harbour and provide temporary mooring.

The new harbourside and reclamation fence was a mixture of oak and pine imported from areas within Denmark, Norway and Sweden, with most posts and planks newly felled. The whole construction project

seemed to have occurred around the same time in the mid-1620s according to dendrochronological dates. The main harbourside was also refurbished with the addition of storm posts which were pushed into earlier alluvial deposits of Phases 1 and 2. The storm posts were imported oak felled in 1637 and 1638 with the new western harbour comprising oak from Norway and the central and eastern area comprising oak from Öland. The different provenance of the storm posts is interesting and may be represented by many factors, without a confirmed answer by historical documentation. They may represent different shipments; different companies furbishing the harbour or simply using the next two shiploads to furnish the harbourside.

The new bulwark

Bulwark G648 originally comprised a total of thirty-six vertical posts and seven horizontal timber planking structures. An additional five planks and posts were added later for repair. The structure measured 16.67 m long by 1.1 m wide by 1.36 m high and it was located at the levels of 0.14 m to -0.3 m OD. The vertical posts ranged between 3.5m long by 0.20m by 0.20m. They were fashioned from oak, boxed heart style, fairly rectangular in shape with one flat and one pointed terminus. They were usually pushed into alluvial deposits from Group 642 rather than having a whole purposely dug for them. When uncovered, most were still vertical, but some had warped or were now at an angle due to the weight of the harbour expansion to the north.

Fig. 63 Harbour wall G532 to the far left of photo, Bulwarks G674 near left, backfill group G640 centre and bulwark G648 right of photo. Looking NW. C03_20140616_10952

The horizontal planking structures were fashioned from pine. They were between 1 m to 2 m long by 0.1 m thick and 0.2 m wide. They were set behind the vertical posts, attached by nails, and placed or added in

layers. Leaning into these planks were support posts, positioned at an angle. The support posts were fashioned from oak and spruce, with oak being the dominant type. The bulwark was in use from the late 1620s to the late 1680s when it was finally replaced by the new Phase 4 harbourside

Fig. 64 Close up of harbour bulwark G648 next to the baulk. The photo is centered on an area of repair shown by horizontal plank ST41884 and three vertically set planks (ST39435, ST39413, ST55582) used as the plank's support. The photo is looking N. C03_20140613_10920

The backfills behind the new bulwark

To solidify the new harbourfront, soil had to be placed behind the new harbourfronts which in turn lead to new land creation in the harbour region. Group G640 represents the dumping of waste behind the harbourfront G648 and groups G400, G401 and G405 behind group G510. The deposits were mainly created by dumping backfill in the area between bulwarks G674 and G648, and in the eastern area between the Renaissance harbour wall G532 and bulwark G648. This occurred mainly in the 1630s and 1640s, when structure G648 was first built but the upper deposits were probably affected when creating the new harbour in Phase 4.

The group (G648) was located in an area measuring 14.97m by 3.22m by 1.5m deep. It consisted of a total of twenty five deposits of various sizes, rapidly dumped to backfill an area between the new harbourfront and a land reclamation fence. Tip lines were visible in the profiles of the groups and it was evident that deposits were not able to slump and settle.

The majority of the layers were mid brown silt with some sand, comprising mixed urban waste with finds material such as clay pipes, leather, animal bone, ceramics glass and textiles. The deposits were also

organic in places with the remains probably representing manure and other waste from the streets, which were seen in deposits SD55586, SD40743, and SD56082. These were a mixture of cess and horse manure representing everyday life from the city. Certain deposits, as in SD54972 and SD42941, contained primarily building waste/rubble probably from either the dismantling from earlier stone harbour wall Group G532, or from demolished buildings. Deposit SD55783 contained less building material, but comprised a large quantity of mortar representing excess materials from building structures. There were three highly organic deposits SD55586, SD40743, and SD56082. Most of the layers were created by the late 1620s, but they were probably affected by levelling and the placement of land ties and buildings in Phase 4.

Fig. 65 Well preserved stove tile depicting Judith with the head of Holofernes flanked by Adam (not preserved) and Eve and with a depiction of the Veil of Veronica, FO213816 and FO213811, SD55586 (G640). Museum of Copenhagen

The Storm posts

Placed in front and to the south of the bulwark groups, G510 and G646, the harbour wall, G532, and bulwark group G602 were storm post groups G511, G646 and G649. All three storm post groups fulfilled the same purpose but were assigned different numbers as they related to different parts of the harbourfront. It is believed that they were all pushed into the underlying deposits and the harbour base around the same time in Phase 3, perhaps the early 1640s. The purpose of these posts may be varied. They may represent extra protection of the harbour wall, extra ties for ships or perhaps they represent harbour locations for docking. All three groups span an area 76m long in the Guide Wall excavation and Main Excavation trench. It is suggested that these posts were in use until the end of Phase 3 in the late 1680s, and were then covered over with backfill for the construction of the harbour in Phase 4.

The posts were mainly rectangular shaped with a pointed tip and in good condition due to the preservation conditions. Post ST34393 comprised a fish basket fashioned from wicker, F0219487, which was later attached to the post. It is believed that the basket represents storage of caught fish, rather than a fish trap.

The majority of the posts from G649, located outside timber bulwark G648 were pine, with confirmed to have been felled, mainly, in the winter between 1639 and 1640, and imported from Middle Baltic region, perhaps from Gotland/Eastern Sweden area. The pine posts from G646 were felled in the winter of 1642/43, and probably transported from Norway, from the Oslo region. These posts were located directly south of the stone harbour wall G532.

The usage of the harbour, 1620s-1650s

As mentioned in chapters for Phase 1 and Phase 2, a mixture of dredging and other harbour activity affected the soil deposits at the harbour base. It is not until the post 1650s that we can visibly distinguish new deposits at the harbour base in the central and eastern areas. What was largely seen in those areas is the continuance of Phase 1 deposits, but with Phase 2 and Phase 3 finds pushed into the deposit and added to the Phase 1 assemblage. This is viewed in Fig. 68 where the deposits in the harbour from Phases 1 to 3 are shown. It would be wrong to remove the finds results from the Phase 1 assemblage, so they are kept in the Phase 1 deposits, with the knowledge that mixing of finds from Phases 1 to 3 have occurred.

Fig. 66 Plan showing harbour activity from 1620s-1650s. Note the re-use of Phase 1 and Phase 2 deposits at the harbour base due to harbour dredging.

Maintenance of the harbour wall, and cleaning of the harbour base

Historical records relating to Gammel Strand in Phase 3 relate to two main topics; cleaning of the harbour or preventing the harbour being filled and the maintenance of the harbour. Unless a specific building on Gammel Strand area is mentioned in these records, they may not actually relate to the Gammel Strand area but at least they provide an insight into activity. Records from 1633, 1635, 1637, 1639 and 1642, running for five years state the continuance of the *accise* tax, in total fourteen years of work, to be used on maintenance and repair of the harbour. This obviously links well in the time period for the construction of harbour extension G674, harbourfront G648 and G510 and storm posts G511, G646 and SG649 from the

Main Excavation area. In 1680 people living next to the new canal were told to fix the harbour when maintenance is needed, which implies that all areas had a responsibility to provide upkeep of the harbour next to their properties.

Regarding the cleaning of the harbour, in 1658, due to moving of the stream at *Løngangen*, the citizens asked for it to be cleaned up. This, amongst other issues led to the king appointing *Henrich Bielcke* in 1663 to keep an eye on the harbours and make sure they were equipped with bulwarks and not filled up with dirt and sand as has happened. A harbour tax is used in 1665 for five years to support the harbour. In 1671 a regulation was placed forbidding the loading and off-loading of ballast or throwing dirt out into the harbours or canals.

The mid to late 17th Century in this phase is mainly represented by the build-up of rubbish next to the harbourfront and to the south of the harbourfront. Many of the lower deposits of groups; G664 to the west, G663 to the centre and G666 to the east of the main trench were sand rich layers coupled with what appears to be short bouts of the dumping of urban rubbish over the harbour wall. This process of dumping changes at the end of the phase with thick deposits of manure, waste, building material and food remains created by throwing rubbish into the harbour showing the end of the harbour use. The anaerobic soil conditions created from this activity led to the preservation of organic artefacts revealing knowledge of the Copenhageners and the visitors in the period. This will now be discussed in more detail below.

The decrease in maintenance of the harbour

The final phase of the Renaissance harbourside dates from the late 1640s to the late 1680s when it was partially dismantled and a new harbour was created to the south. The deconstruction deposits then merge into the Phase 4 construction deposits for the construction of the new Phase 4 harbourside. This was not so apparent when excavating the areas, and near impossible to distinguish in the post excavation phase, but it is evident that these groups consist of harbour usage, deconstruction and construction with some deposits continuing into the early 1700s.

It appears from this phase that the harbour was not as frequently cleaned as in the earlier part of Phase 3 which is shown by the creation of large usage groups at the harbour base. This was apparent in the western area of the trench with G664, central area of the Main Excavation trench with G663, and in G666 at the eastern area. This occurred despite of the laws and regulations added to the harbourside from the 1660s.

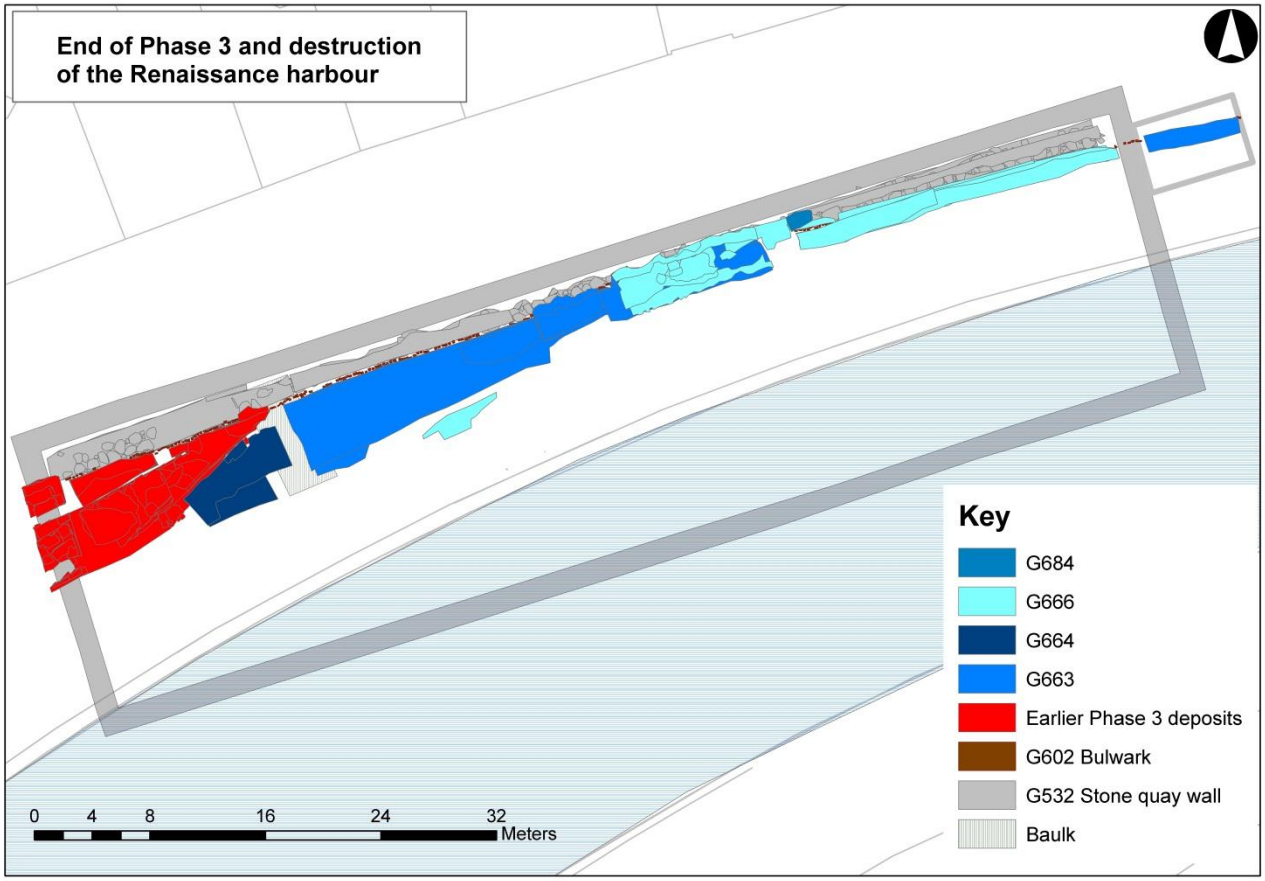


Fig. 67 Plan showing the end of Phase 3 and the destruction of the Renaissance harbour.

Usage phases of the harbourside from the 1640s were then represented by alluvial group G664 in the west, the lower deposits of G663 in the central area of the main trench, and the lower layers of Group G666 in the eastern area of the trench. At the end of the phase, in the 1680s, the use of the Renaissance harbour ends. The upper levels of wall Group G532 were removed or robbed, as seen in G682 although some of these stones were found dislodged south and north of the wall in various destruction deposits. To prepare it for the construction of the Phase 4 bulwark the area to the south of Harbour wall G532 and bulwark G648 became a dumping area for urban waste. This was represented by G620 in the west, and the upper levels of G663 and G666 in the centre and east of the main trench and the stairway trench. As expected, the end of the phase merges in with Phase 4, so the deconstruction deposits can also be viewed as construction deposits.

The west end

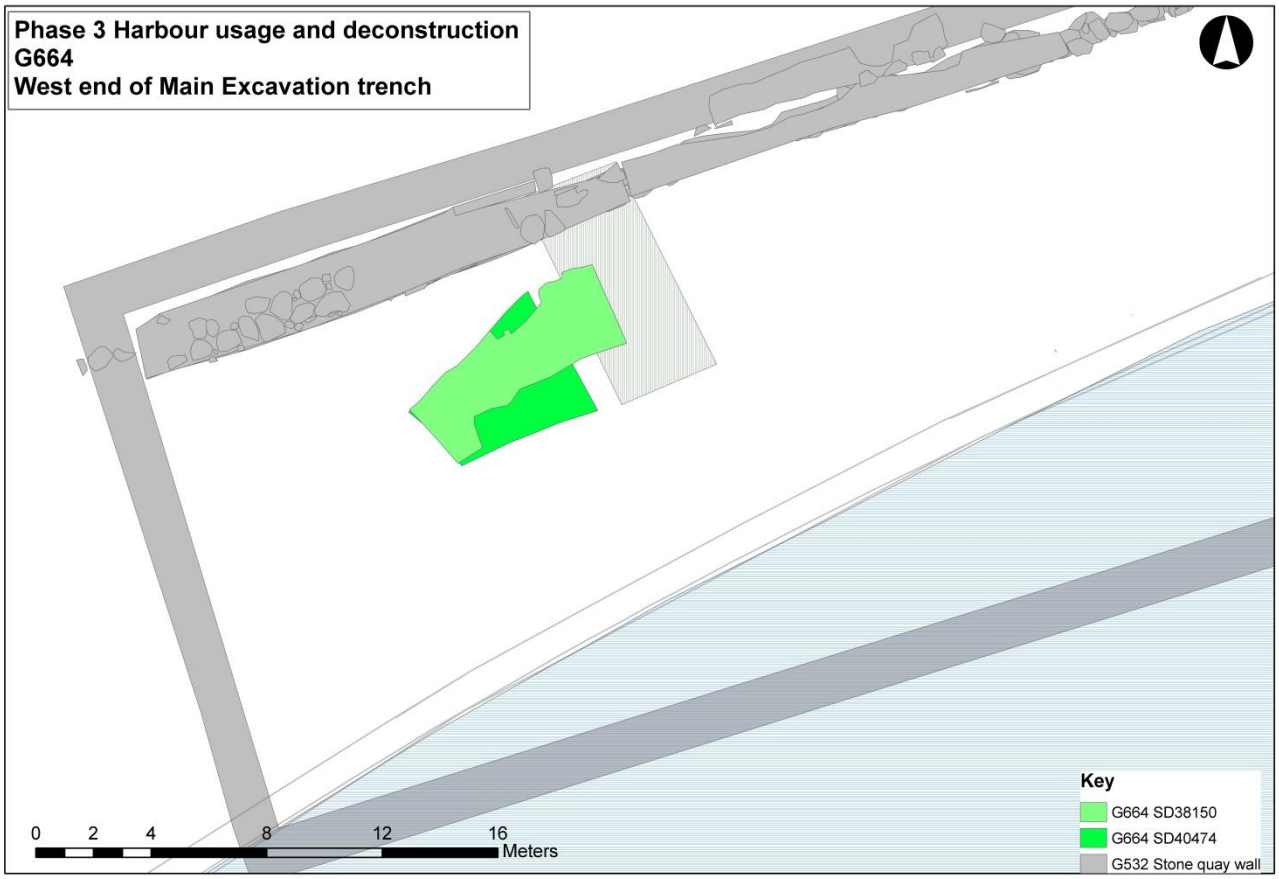


Fig. 68 Plan of G664 and the deposits within the group

The west end group comprised two deposits. The lowest layer (SD38150) represents a fairly large deposit, of almost pure sand, excavated immediately to the seaward side of the southernmost timber bulwark. Where SD38150 met the timbers of the wooden bulwark, clusters of mussel shells were found immediately around the posts. This strongly suggests the area was open to the sea and that this deposit was washed in. The small patches of mid brown silt revealed evidence of many cultivated plants from the city.

Fig. 69 Deposit SD31850, from G664. Note the large quantity of shellfish from the usage deposit. Looking N. C02_20140526_9538

Fig. 70 Sherd from a Chinese Kraak porcelain bowl, c. 1580-1644, FO 216855, SD38150, G664. Museum of Copenhagen

Overlying deposit SD38150 was deposit SD40474,both physically and stratigraphically. Deposit SD40474 was very thick and the matrix was very organic. When first uncovered it was black but later turned brown after oxidization and comprised a lot of clay. It contained a large quantity of animal bones, especially jaw bones. The deposit ended in being used in the late 1600s.

Fig. 71 Leather gun holster from the 17th Century, F0 213540, SD40474, G664. Museum of Copenhagen

The central part

Group G663 was located in the central area of the main 2014 excavation and within the stairway trench of the 2014 Main Excavation. Within the main trench the group was spread over an area measuring 35 m by 5.65 m. The location of the deposits varied in height; in the northern area from -0.24 to -0.8 m OD, and to -1.1 m to the south. In the stairway trench one deposit is represented in this group measuring 6.5 m by 1.47 m by 1.47 m.

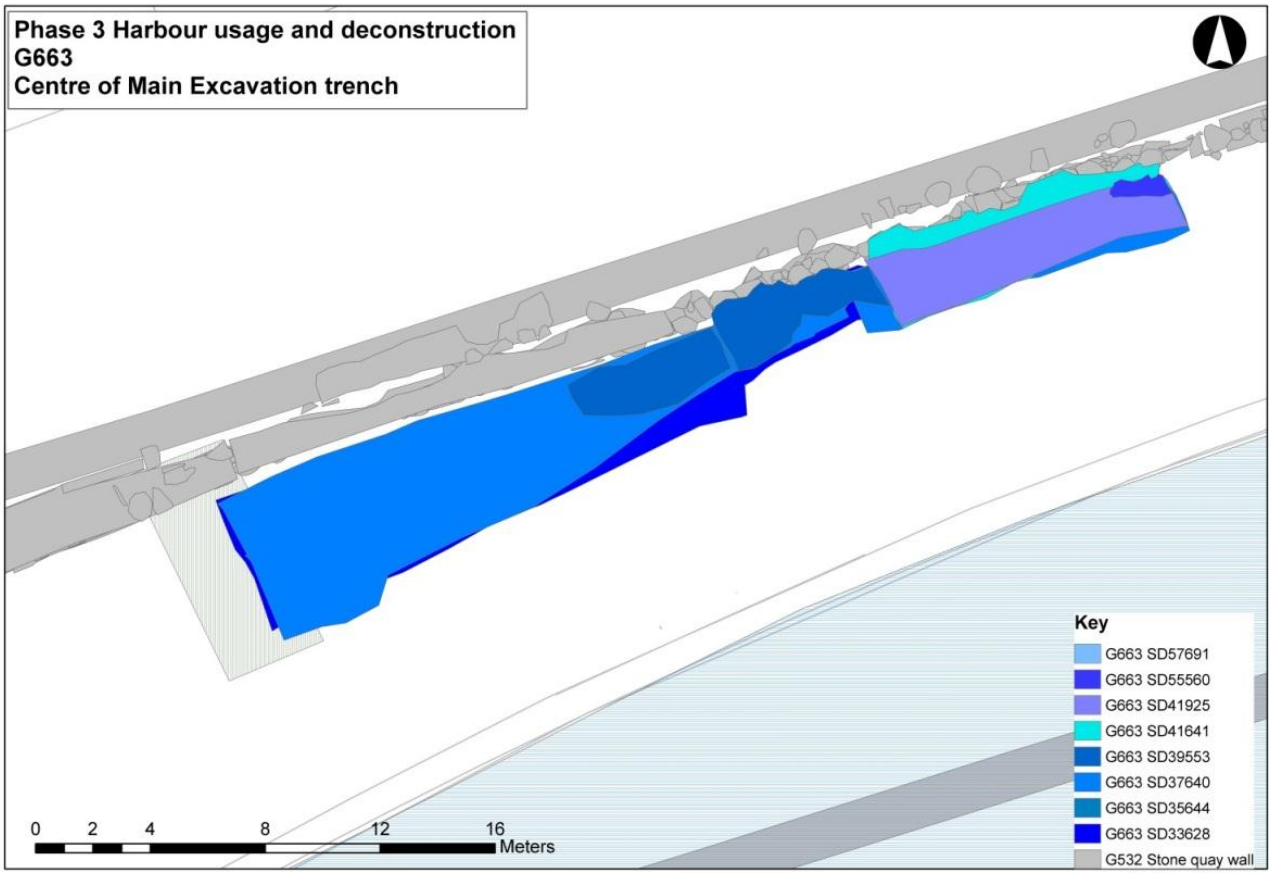


Fig. 72 Plan showing the contexts within G663, Main Excavation trench.

This group portrays usage of the harbourside from the mid to late 1600s and is represented by six deposits which consist of a mixture of alluvial, slow accumulating layers and sporadic dumping of waste and demolition material at the end of the Renaissance harbour use. The deposits ranged in thickness between 0.3 m and 1 m and between 1.5 and 4.5 m wide. They were rich in organic finds due to the anaerobic soil conditions and consist of assemblages full of ceramics, clay pipes, animal bones, organic and other special finds.

Fig. 73 Left: FO 218778. Decorated Siegburg ware. SD33628, G663. From the eastern part of the central area. Right: FO 214424 Winged goblet, 17th Century (right). Perhaps from the Netherlands. SD37640, G663.

An interesting deposit

The first deposit in this group, SD37640 extends over the whole central area at 34 m by 5.6 m by 1 m, shown in plan. It consisted of dark brown silt and clay and represents a long period of dumping over perhaps 40 years. Deposit SD37640 comprised many layers of mussels and fishbone that seem to have accumulated naturally in the organic layer. The musses were whole so they were living in the harbour. The deposit comprised a large quantity of urban waste with finds from all over northern Europe as seen in the glass, ceramic and stove tile assemblage. The large collection of clay pipes were found to have been imported from the Netherlands although some English pipes were registered (FO 212998 as an example). Special finds were represented from more coins, household materials and fishing artefacts.

Fig. 74 Leather book cover with imprinted floral decoration, after conservation. FO 213533, from SD37640, G663. Museum of Copenhagen

The deposit also contained remains of a ship with an oak timber beam Keel FO218893. The keel was in two fragments measuring 1.6 m long with 18 square iron nails still present. The keel was believed to be from either a small rowing boat or clinker built sailing vessel. 5-10 m in length.

Fig. 75 FO 212520 Christian IV coin. Photo of Obverse with minting date of 1644, pre conservation. Museum of Copenhagen.

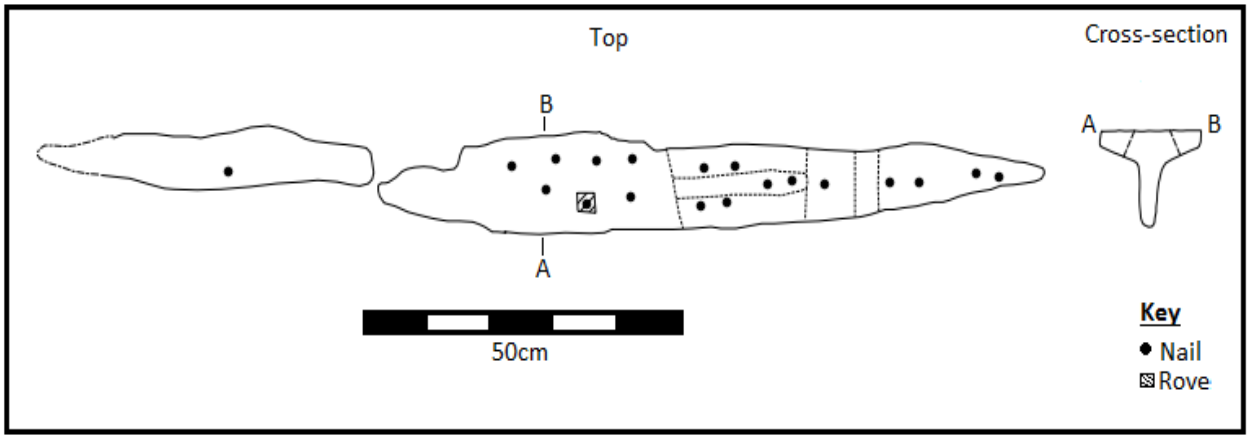


Fig. 76 FO218893 Reconstructed keel. Dashes on cross-section show angle of nails. SD37640, G663. Drawing by G. Dickinson.

Destruction of part of wall G532 via a cannon ball

It is believed that at some point in antiquity, perhaps in the mid-late 1600s that the plank repair G704 collapsed and posts from G701 were pushed away, hence their discovery at different angles to other posts from the earlier G602. This area was then further backfilled and covered over at the end of Phase and beginning of Phase 4. It is not known what caused the plank G704 and repair posts G701 to collapse, but within the soil deposit SD55560, cannonball or grenade FO212798 was found. This deposit overlay the planks, posts and lower soil deposit SD41925, and arguably the impact of the cannon ball smashed the wall, posts and planks and led to the partial creation of deposit SD55560, which then continued to be formed in the later 1600s.

Fig. 77 Iron cannonball FO212798, from SD55590, G663. Pre-conservation photo. Museum of Copenhagen.

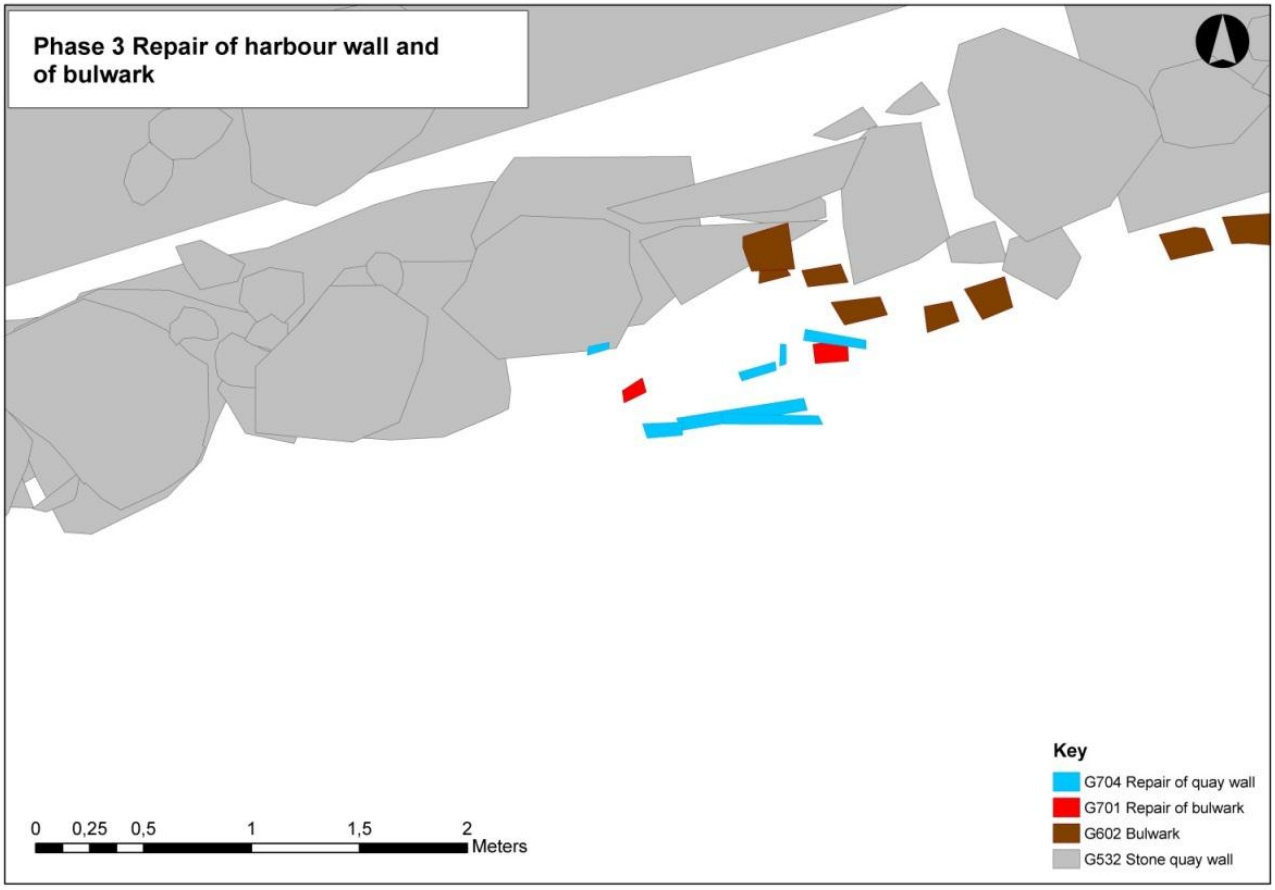


Fig. 78 Plan showing activity linked to groups G701, G704 which may suggest repair of wall G532 and bulwark G602.

The eastern end

Group G666 comprised thirteen deposits. The group was a mixture of urban dump deposits within the harbour and the demolition of wall group G532 in the form of mortar dumps, brick dumps and foundation stones merging with construction activity with reclamation layers for Phase 4. This phase dates from the mid 1600s until the late 1600s. The deposits were either found south of the wall G532 or physically above the remains of former wall G532.

The group was located in the central east and eastern area of the Main Excavation trench and measured 59.85 m by 3.89 m by 1.5 m to 2 m deep, with highest points of the groups between c.0.1 m OD to the north, to -1.2 m OD in the south, reflecting the slope of the landscape and tipping style of the dumping procedure.

Fig. 79 Left: FO217959. Post-medieval lead buzz disc, SD39102, G666. Right: Part of Portuguese faience vase or jug? Dates from 1575-1650. FO 216631, SD39811. G666. Photos by the Museum of Copenhagen

In general the artefactual assemblage in G666 was uniform in nature with 403 clay pipes mainly from the Netherlands, with a few from England. The glass was imported from mainly the Netherlands and the area that comprises modern Germany. The pottery was a collection of Danish redwares and *Jydepotte*, with light and redwares from the Netherlands and Westerwald stonewares from Germany. Only a few fragments were represented from tableware, mostly in the form of faience and majolica. The metal finds comprised a few corroded coins and unidentified corroded metal objects. The nature of the deposits, comprising of mostly rubble and demolition material was represented from a standard late 17th Century urban assemblage. It is presumed that this urban waste was brought into the area and dumped as it would only represent household or storage ware from the prestigious structures in the area, not the exquisite tableware.

The end of the Phase 3 harbour

The final act within the phase is shown by the demolition and robbing of the harbour wall. Very little of the wall is dumped into the harbour as the stone was of high standard and would have been robbed and reused, as seen in the foundations of structures in the next site phase. Large quantities of brick and mortar from the upper reaches of the wall were mainly thrown into the harbour, as they were not deemed so important to keep. It is expected that complete bricks were reused elsewhere.

The late 17th to early 19th Century harbour (Phase 4)

Introduction

Phase 4 of the Gammel Strand excavation began with a large re-structuring of the harbour side in the 1690s. This process started with land reclamation south of the Phase 3 water front, 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 harbour side 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. In the 1750s the bulwark was replaced by a new bulwark and the land ties were supplemented and partly replaced by new sets of land ties.

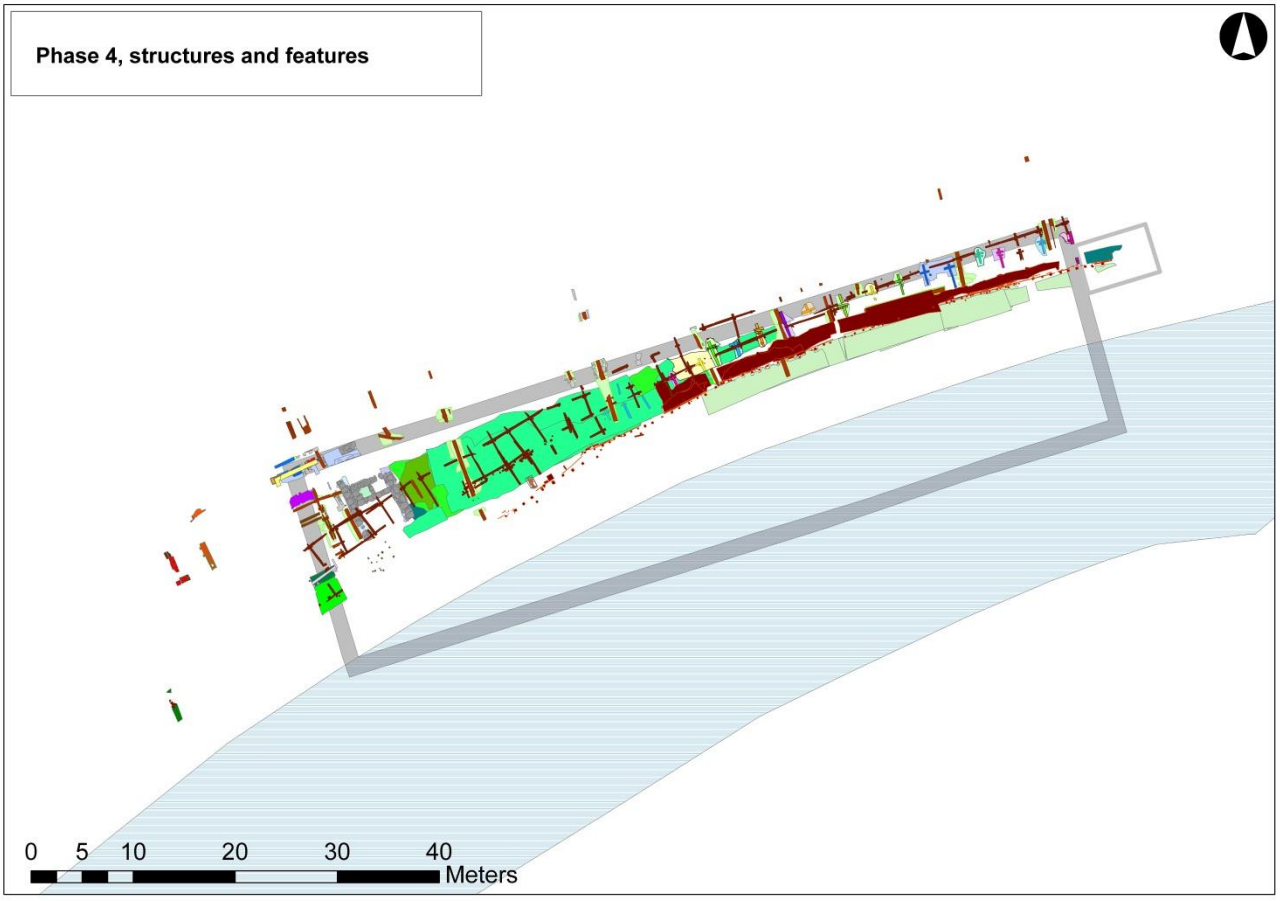


Fig. 80 Plan of structures and features relating to Phase 4

The land reclamation

Deposits interpreted as land reclamation layers were found on the south side of the former, Phase 2/3 waterfront and/or partly covering the top of this. The former waterfront (Phase 3) consisted in the west end of a bulwark with storm posts and in the central and eastern end of the excavation area by the stone quay wall and the associated bulwark, which were built already in Phase 2. The Phase 4 land reclamation layers excavated during in the Guide Wall and Main Excavation covered an area measuring 52.2 m (ENE-WSW) by 7.1 m (NNW-SSE), but when adding the area excavated west of the station box area in a narrow trench in 2012, the shear size of the land reclamation is better seen.

Fig. 81 Child's leather shoe, FO213534, retrieved from land reclamation layer, SD52177, G601. Phase 4. Museum of Copenhagen

The land reclamation appears in general to have been undertaken in close connection with the construction of the timber land ties (see below). This was most clearly seen in group G601 which comprised both land reclamation and land tie structures. However, to facilitate the land reclamation an outer/water side boundary must have been present for the purpose of keeping the soil in place so it would not float away during the construction of the new harbour. Such preliminary structures, which could be named land reclamation fences or boxes, were not seen on Gammel Strand during Phase 4. It is not clear what the reason for this absence would have been, but it is possible that the land reclamation bulwark would have been placed in the same line as – or rather been identical to – the early parts of the bulwark recorded as SG604/SG606 and SG712.

Fig. 82 Stove tile, FO213821, collected from land reclamation layer, SD37744, G620. Phase 4. Museum of Copenhagen

On the water side of the former harbourfront, the land reclamation layers would have been deposited directly on top of the layers related to usage of the former harbour and in most instances it is very difficult to differ between these types of depositions, as both the usage/activity layers of the former harbour phase and many of the land reclamation layers consisted of waste material, possibly deriving from house holds both nearby and further away around the city.

Fig. 83 Bone needle, FO218157, retrieved from land reclamation layer SD32429, G598, Phase 4. Museum of Copenhagen

In general the land reclamation appears to have occurred from the land side of the harbour, which is evident from the depositions partly overlying the former harbourfront and sloping downwards from there and towards the south.

Fig. 84 Double-sided bone comb, FO213512 found in land reclamation layer SD52177, G601. Phase 4. Museum of Copenhagen

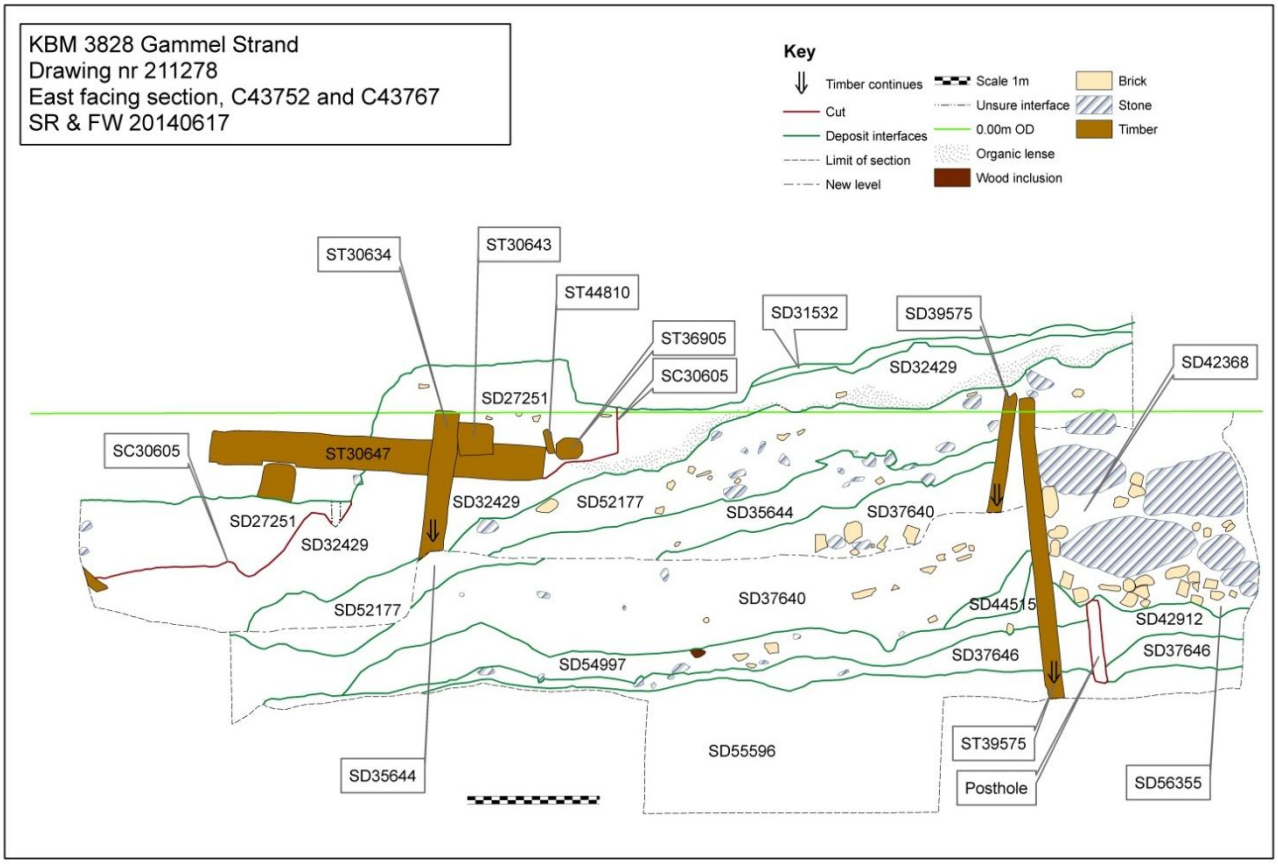


Fig. 85 Digitized drawing 211278 of east facing section, C43752 and C43767

Fig. 86 Neck fragment from a green carafe with handle FO214814, found in land reclamation layer, SD52177, G601, Phase 4. Photo: G. Haggrén.

The material used for the land reclamation contained vast amounts of artefacts, which in most instances appear to be linked to household waste, e.g. broken pottery and glass. This was supported by the results from the macro-botanical analysis and the analysis of the zoological material. Taking into consideration, the very large amounts of waste used within a relatively short time to fill up the harbour as land reclamation, around 1690, it seem probable, that the waste would have come from a wider area of the city, and thus not the Gammel Strand area alone. A very similar situation was found recently at the Rådhuspladsen excavation, where waste from the city had been used to fill up the former moat, around 1670. Such 'time capsules' reflecting the inhabitants of Copenhagen over time, will be further touched upon in the "Life on the Border" chapter below.

Fig. 87 Sherds from an opaque white glass tankard with dark violet threads, FO214669 collected from land reclamation layer, SD32429, G598, Phase 4. Photo: G. Haggrén

Land ties

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

Fig. 88 Plan of Phase 4A Land ties and Phase 4 bulwarks

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

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

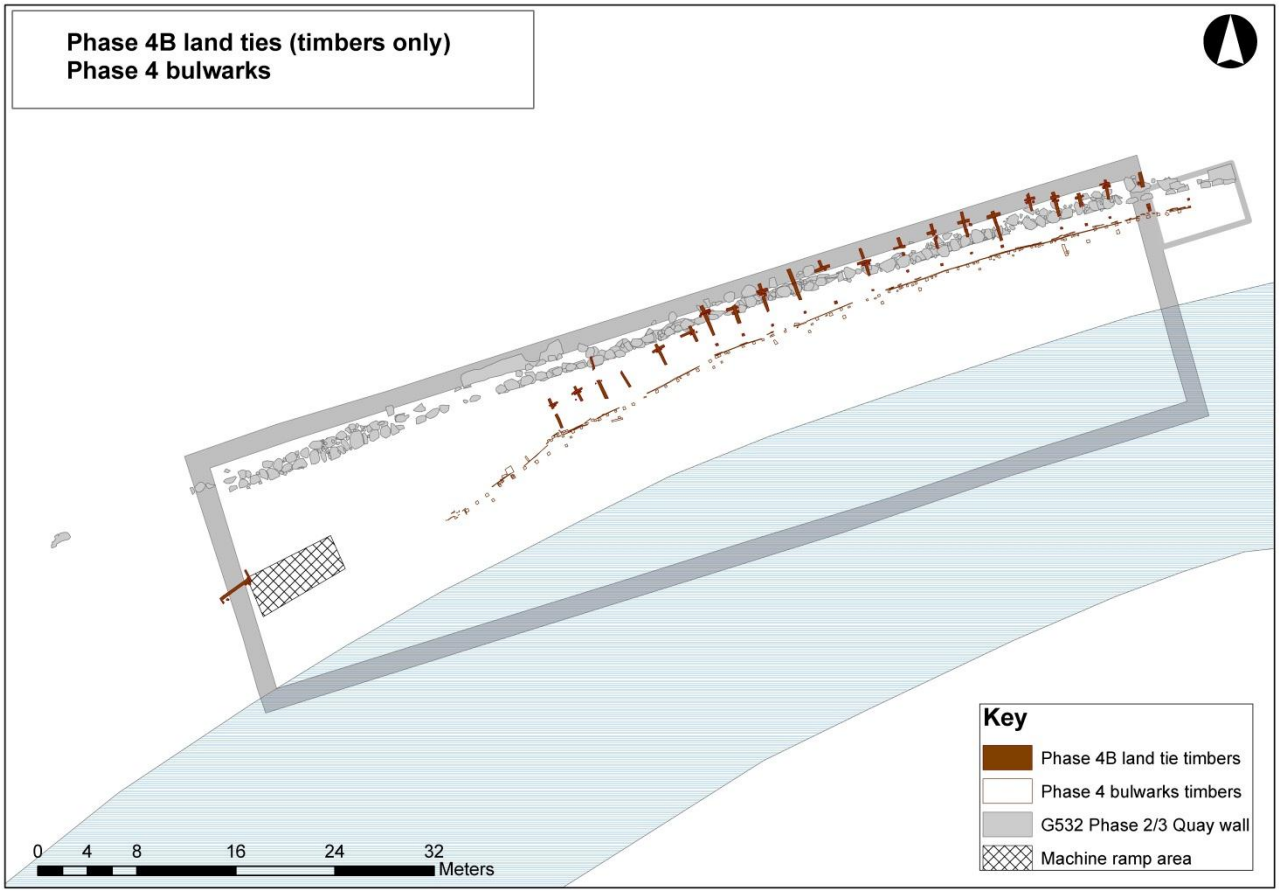


Fig. 89 Plan of 4b land ties and bulwarks

Bulwarks

When dealing with the bulwark structures, the biggest challenge was the continuous reuse and incorporation of timber built structures into later structures as well as the problems of observing the stratigraphical relationships between driven in posts and planks and the deposits into which they were driven.

The westernmost, exposed part of the Phase 4 bulwark was only partly excavated during the 2014 Main Excavation and was grouped as SG604, while the easternmost parts were documented in more detail and originally grouped as G626. Likewise the storm posts grouped as SG606 and SG595 were probably parts of the same overall storm post structure in the western and eastern end, respectively. Late in the post-excavation process G626 was split into an earlier and a later construction phase, defined as sub-groups SG712 and SG713 respectively. The division into an earlier and a later building phase was based primarily on the later part being relatively well-preserved and evenly structured, while the earlier parts seem to have survived as single posts in between the later ones. Stratigraphical observations were not documented for all timber elements and other construction parts, but in the instances they were, the stratigraphy supports the division. Likewise, a series of dendrochronological samples from selected posts and other bulwark elements were analysed and supported the division, though far from all posts are dated.

The exposed eastern part of the Phase 4 harbourfront consisted of an almost invisible first building phase, (SG712, including post holes from deconstructed posts, SG637), which had been almost entirely replaced by the later bulwark (SG713). A number of repairs of the later bulwark was defined and sub-grouped individually.

Fig. 90 Gold ring, FO208936, from backfill in bulwark construction cut, SD53452, SG713, Phase 4. Museum of Copenhagen

The eastern part of the bulwark consisted of more than one construction phase. The earliest phase (SG712) was almost invisible and comprised a group (SG637) of deconstructed posts, seen as post holes against the soil at the base of the harbour along with a number of bulwark posts. The later construction phase (SG713), differed, and instead comprised a large construction/repair cut, 50 evenly dispersed bulwark posts as well as horizontal and vertical planking on the north side of the bulwark posts.

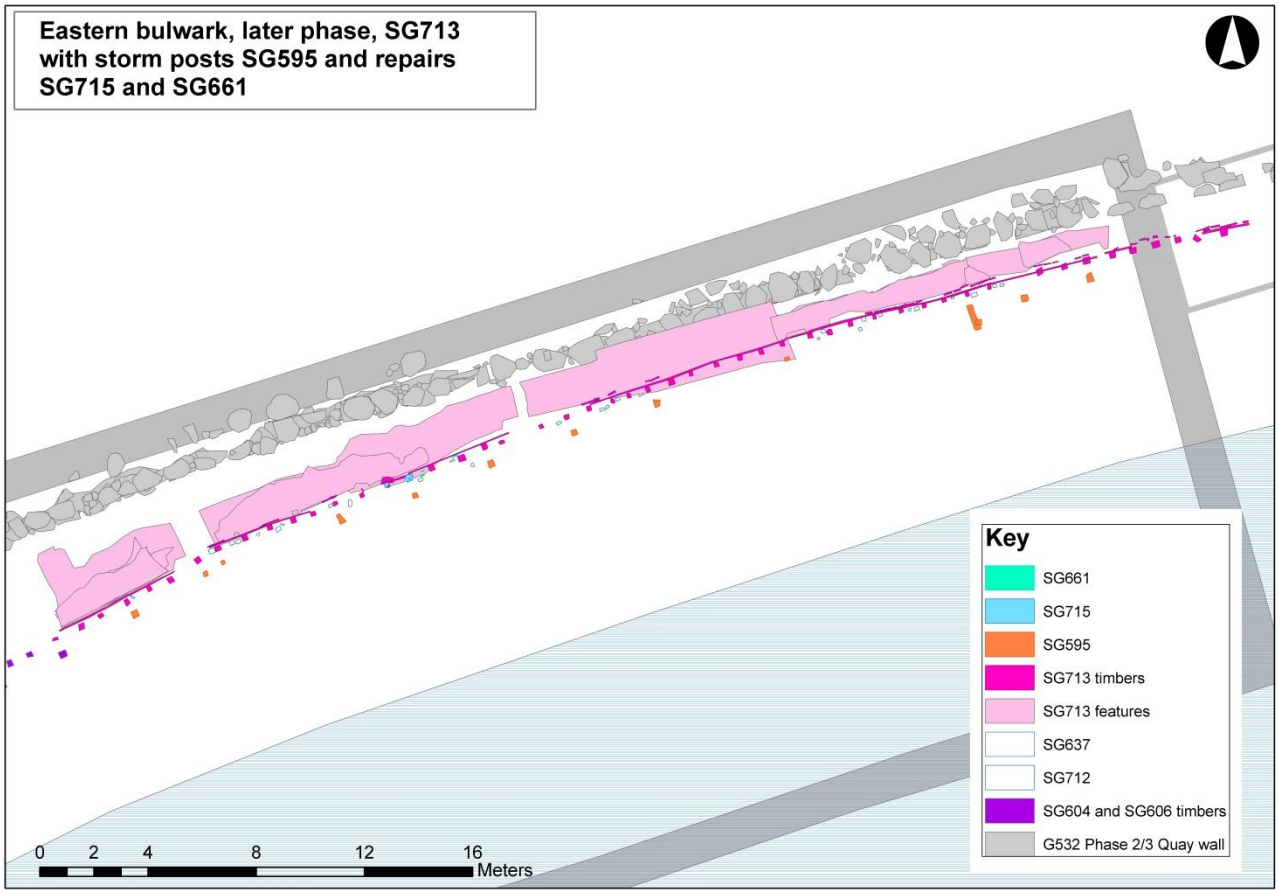


Fig. 91 The eastern part of Phase 4 bulwark

Fig. 92 Parts of Phase 4 bulwark, G626, partly exposed. Storm posts (G595) are seen as slanting towards the bulwark posts. Later structures related to Fiskegangen (G583, Phase 5) with peg holes on top. Looking WSW. C03_20140425_9863

Fig. 93 The easternmost section of bulwark SG713, excavated in the Stairway trench/ZT22798. Looking NNE. C03_20140723_11702 (cropped)

Livewell

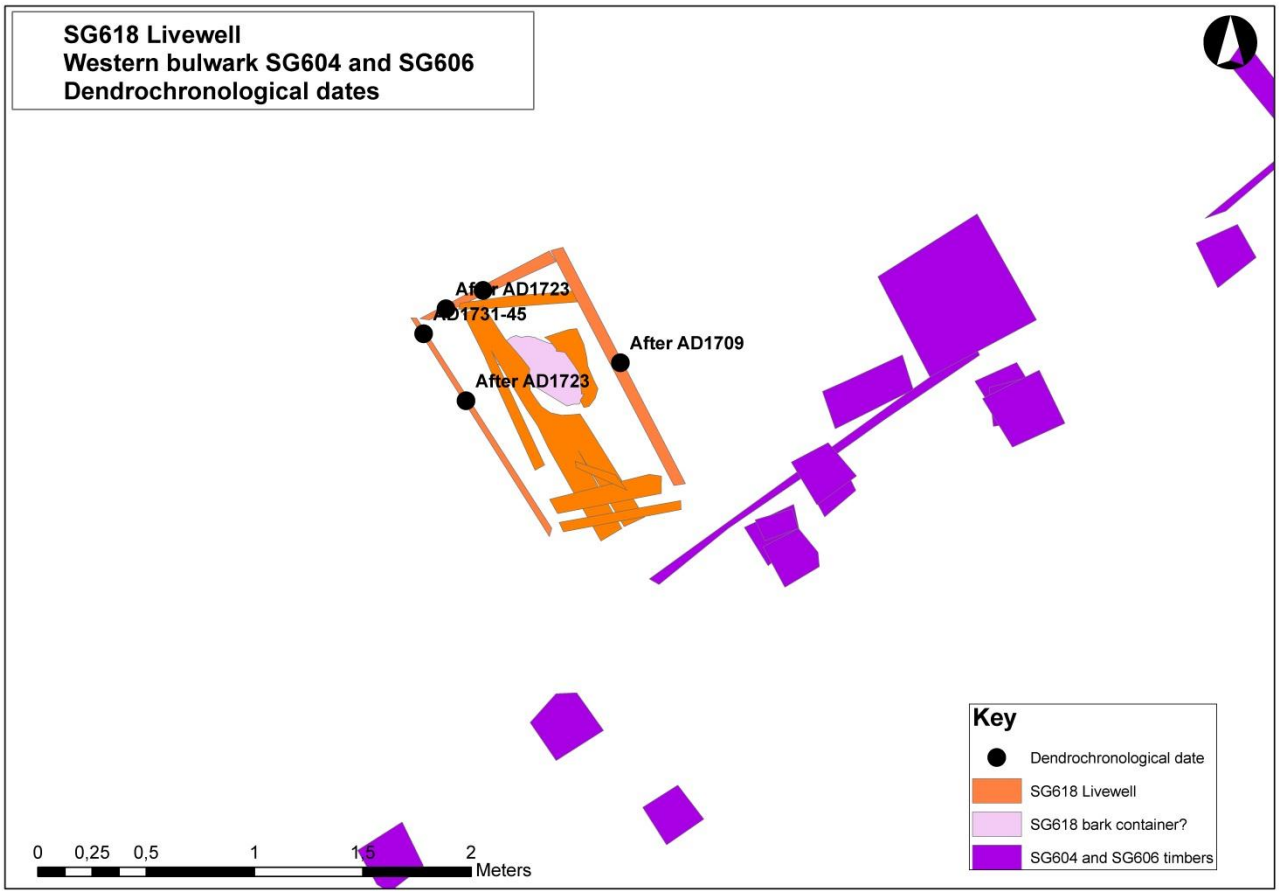


Fig. 94 Plan of livewell (SG618)

A timber structure (SG618) was interpreted as a partly deconstructed livewell for storing fish. Though the construction sequence was not very clear, it seems probable that the box was built into the north side of the Phase 4 bulwark, when this was changed in the middle of the 18th Century. The structure was preserved below the water level and only the south side of the structure was equipped with holes for the water to pass through, supporting the interpretation that this was a "built-in" structure. The bark or wood container excavated at the base of the structure may have been a bucket or barrel used to hoist fish in or out of the livewell, using the circular hole in the lid or roof of the structure.

Fig. 95 Livewell (SG618) seen towards NNW. Loose timber parts placed next to the box.

Levelling layers

The differences between deposits interpreted as levelling and land reclamation are in some cases minimal. However, levelling is defined as deposits created on already reclaimed land to increase the level before construction of buildings or open spaces or to even out a surface after a construction work or similar.

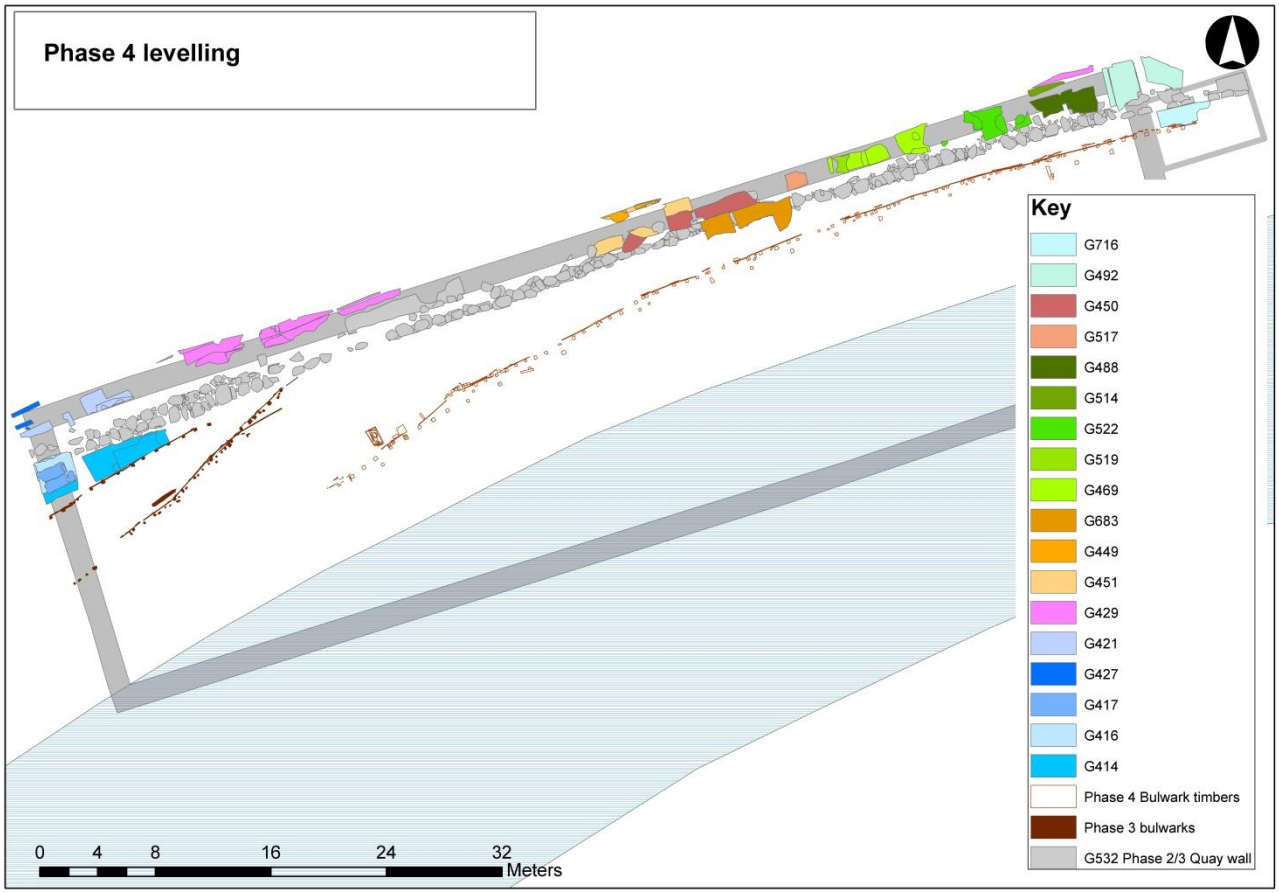


Fig. 96 Plan of all Phase 4 levelling groups (excluding G527 and G506 as these were placed further west)

The majority of the groups consisting of levelling layers were excavated during the 2012 Guide Wall excavation and only two groups interpreted as Phase 4 levelling were excavated during the 2014 Main Excavation. The large number of groups related to Phase 4 levelling is explained by the methodology used for the grouping of contexts during the Guide Wall excavations. As these excavations were undertaken in a number of smaller trenches within set periods of time (usually resulting in trenches having to be closed before new were opened), the contexts were grouped only within the single trenches and hardly ever across trench limits. Thus, contexts which may originally have been part of the same deposition or line of events have not been grouped together, if they were found in different trenches.

The groups interpreted as levelling comprised a wide variety of deposits. Most deposits were recorded as consisting mainly of sand with varying elements of silts and clay. Others consisted of building debris, including large proportions of rubble and mortar, while a few deposits seemed to be more local dumps of e.g. oyster shells or materials with a high organic content. The finds materials from both the sand rich and the more organic deposits indicate that the material used for the levelling was collected from areas where

Fig. 97 Pasglas, FO214250, collected from levelling layer, SD55839, G414, Phase 4. Photo G. Haggrén

household waste was dumped *en masse*. The finds were dominated by ceramics, clay pipes and glass and a large collection of animal bones.

From the zoological analysis of the animal bones from two of the levelling groups (G414 and G429) it was concluded that the analysed deposits in both groups represented what is considered normal household debris but also including elements of higher status households. The macro-botanical analysis of deposits from the same two groups supported some of the results made from the archaeological observations and the zoological analysis. From G414 the macro fossils from two deposits consisted mainly of plants from dry or fresh meadows as well as a series of grown plants in combination with fragments of charcoal and un-charred wood. This could well correspond to areas of open spaces in the city, where weeds and meadow plants would have grown, while household waste built up as a result of the ill-functional, though highly regulated garbage disposal system in the late 17th Century.

Usage of the harbour

The usage of the harbour was seen both in the building activities located near the harbourfront (see below), but also in terms of garbage and activity traces dumped into the water in front of the bulwark as well as dredging activities affecting these dumped deposits.

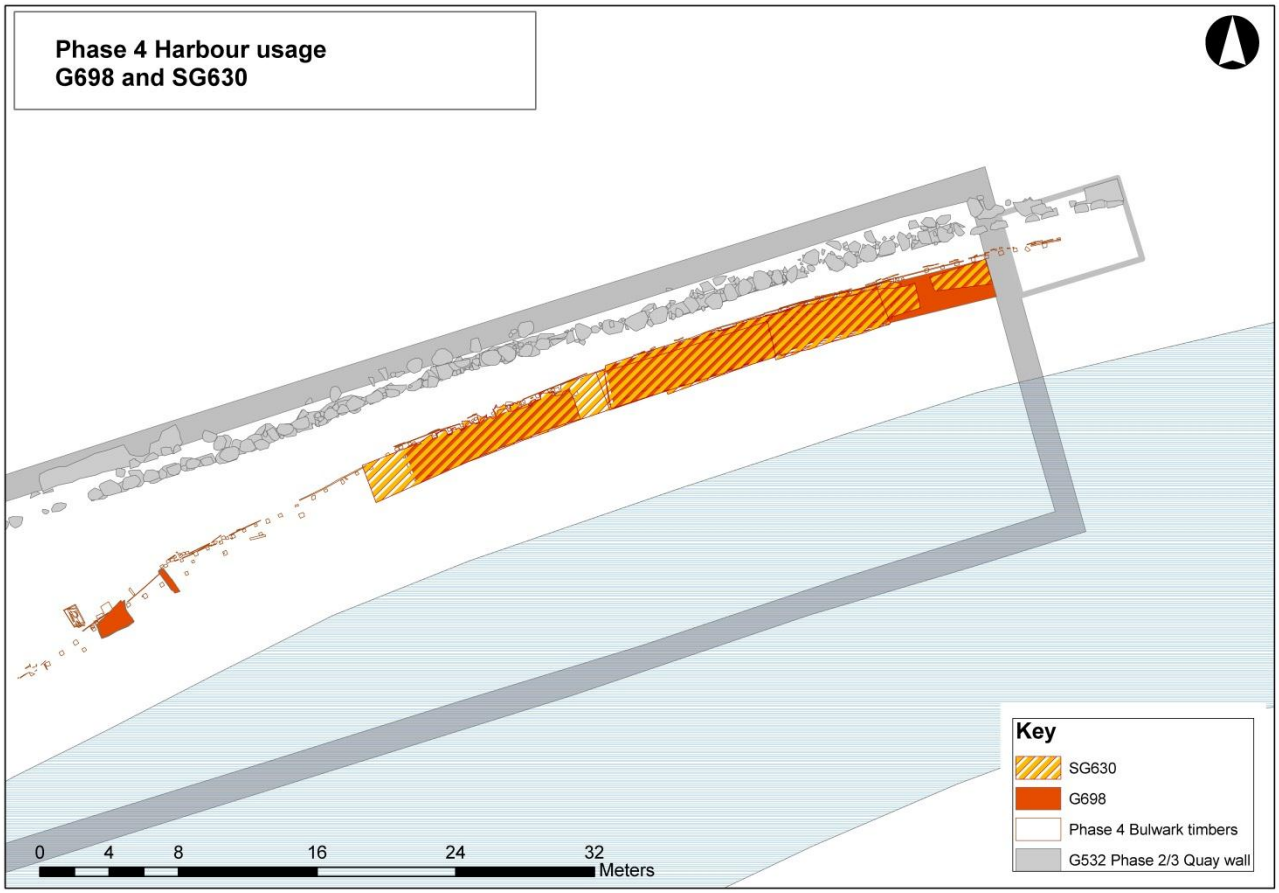


Fig. 98 Plan of Phase 4 usage layers

During the post-excavation process two large groups have been interpreted as linked to the usage of the harbour. Contexts related to these two groups (G698 and SG630) were excavated at the eastern end of the excavation trench, where also the Phase 4 bulwark was best preserved (see above). Some areas south of the Phase 4 bulwark were excavated by machine only, and the usage deposits were not extended into these areas, even though they were probably present. At the western end on the excavation area, the Phase 4 bulwark was not identified (as it would have been located beyond the southern limits of the excavation), and thus the usage layers related to this, could not be excavated.

Fig. 99 Copper alloy jetton, FO212549, found in SD54707, G698. Coat of arms with three French lilies. "HANS WEIDINGER RECH P". Museum of Copenhagen

Fig. 100 Westerwald mug, produced ca. 1600-1650, FO 217847, retrieved from SD37142, G698. Museum of Copenhagen

The first group (G698) comprised of deposits that were probably formed naturally, but had been affected by dredging through the 17th and 18th Century, in which process artefacts had made their way into the otherwise rather sterile soil. The contexts related to the above placed group (SG630) were formed during this period as well as being affected by dredging.

Among the finds from the upper usage layers (SG630) were large amounts of ceramics, including imported wares from Germany, the Netherlands, England and even China, along with pottery produced in Denmark – so-called slip-ware from Bornholm and a few sherds of faience from the Store Kongensgade factory in Copenhagen as well as the more frequently found *jydepotter*.

Fig. 101 Sherds of Chinese porcelain, probably a parrot figure, FO217707, retrieved from SD35259, SG630, Phase 4. Museum of Copenhagen

Fig. 102 Sherd of Copenhagen faience, produced at the Store Kongensgade factory, FO214966, collected from usage layer SD36034, SG630, Phase 4. Museum of Copenhagen

Finds of clay pipes and fragments of these were likewise numerous and may reflect the smoking habits of the people living, working and spending time and money in the vicinity of Gammel Strand.

Fig. 103 Well preserved clay pipe, FO213418 found in usage layer, SD36034, SG630, Phase 4. The small maker's mark (depicting a milk maid and a coat of arms) on the pipe reveals that it was produced in Gouda in the Netherlands in the period 1730 to 1750. Museum of Copenhagen

From maker's marks on the clay pipes as well as certain typological traits, it is often possible to determine where the pipes were produced – and even when. Most of the clay pipes found at Gammel Strand are from the Netherlands, but there were also pipe makers in England, Scotland and even in Denmark, whose pipes were used for smoking in the area around Gammel Strand and eventually ended among the trash and waste in the harbour, in front of the Phase 4 bulwarks.

Fig. 104 Maker's mark on the heel of a clay pipe, FO215265, collected from usage layer SD35259, SG630, Phase 4. The mark is known as Lion in the Dutch Garden and the coat of arms of Gouda is stamped on the side, showing it was made in Gouda, probably between 1740 and 1760. Museum of Copenhagen

Fig. 105 All these pipes are from the same context, SD35240 from SG630, and they are all Dutch. The date of the pipes from left to right: 1: 1640-1660. 2: 1670-1690. 3: 1720-1740. 4: 1730-1750. 5: 1780-1800. Museum of Copenhagen

Fig. 106 Clay pipe produced in Stubbekøbing, Denmark, probably in the middle of the 18th Century, FO213225, retrieved from usage layer, SD35240, SG630, Phase 4. Museum of Copenhagen

Similar to ceramics and clay pipes, glass were both imported and produced in Denmark (which in this period also included present-day Norway). Most of the glass retrieved from deposits related to Phase 4 was bottle glass and window glass, but a wide selection of table glass was also seen. The glass fragments found in the usage layers in front of the Phase 4 bulwark may be seen as representing the activities and waste from the immediate surroundings of Gammel Strand.

Fig. 107 Fragment from a pedestal bowl with blobbed and feathered decoration, FO214796 found in usage layer SD36034, SG630, Phase 4. This glass bowl was probably produced in France or Venice. Photo: G. Haggrén

Fig. 108 Fragment of pearl goblet, FO214226 found in usage layer, SD34718, SG630, Phase 4. Photo G. Haggrén.

Buildings on Gammel Strand

There were two discernible structures excavated in the Guide Wall and Main Excavation trenches, which lay in the northwest corner of the excavations. Both buildings had been subject to periods of rebuilding or alteration, and between them demonstrated various methods of construction ranging from fully laid masonry walls to timber pile foundations. The easternmost building was a NNW-SSE oriented structure (G707), identified as probably being the Bargemen's Guild house ('*Pramlaugets hus*'). To the west of this and abutting it was a building of poorer quality construction (G537), which was identified as probably being one of the buildings delineating the 'Vragerbro'. This structure may initially have been a yard to the west of the Guild house building which was enclosed by a wall to the north, which at a later stage was further enclosed by the addition of a southern wall and the partial rebuilding of the northern wall to create a small structure (see G537 below). A third building (G539) was uncovered in the Oil Container trench in 2010. It may have been either a separate structure or the western part of building G537.

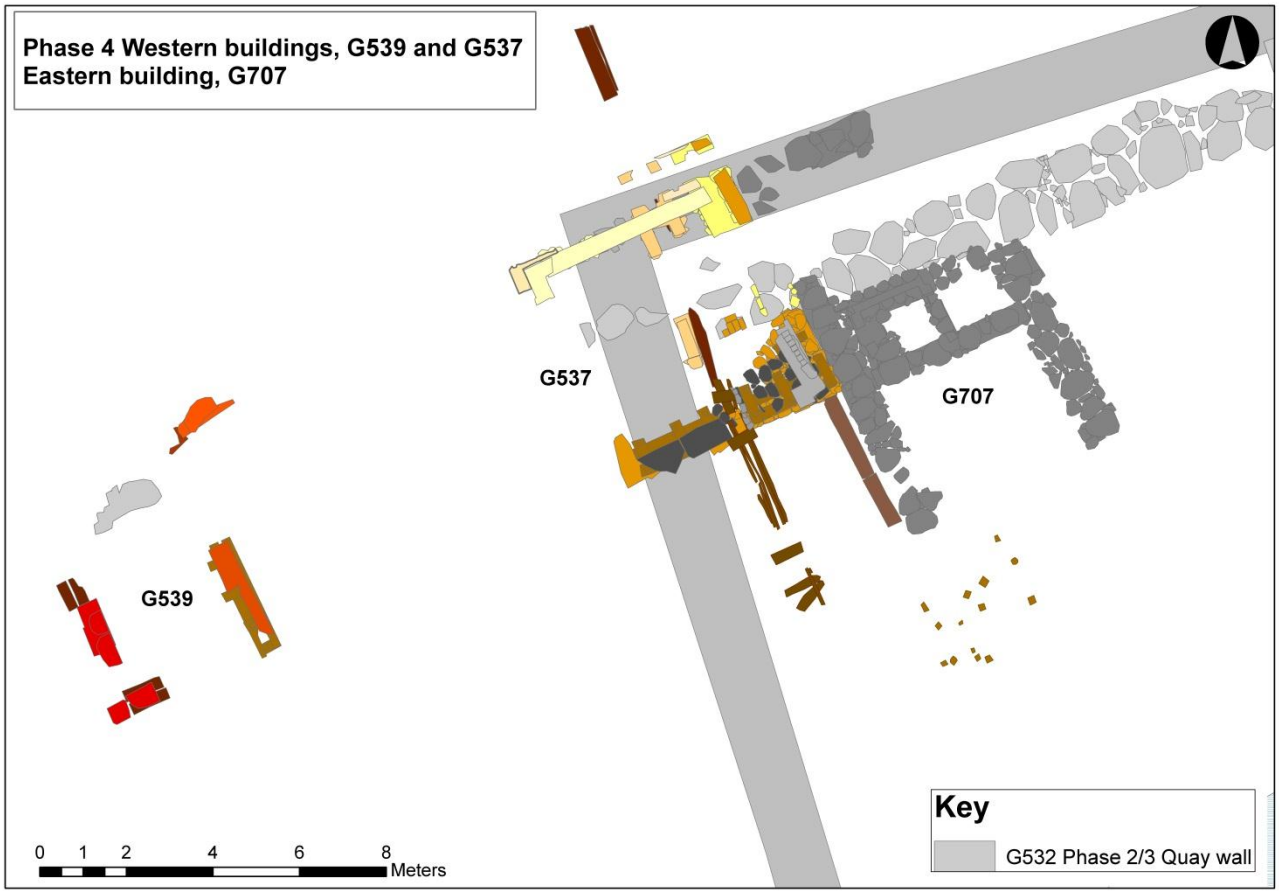


Fig. 109 Plan of building structures in the western end of the excavation area

The probable Bargemen's Guild house ('*Pramlaugets hus*')

The first building to be constructed within this area of Gammel Strand was a brick walled structure with stone foundations aligned NNW-SSW, which would have orientated its southern wall parallel with the alignment of Phase 4 of the harbour. The overall dimensions of the structure were 9.45 m NNW-SSE by 5.35 m ENE-WSW, with an interior width of 3.98 m. The walls survived to a total height of 0.62 m at 0.42 m OD. The southern wall of the building was missing, so the total dimensions of the structure are unknown,

however the inventories of the building undertaken in 1811 and 1822 stated its relative dimensions as two bays wide by five long. By extrapolating from the known width of the remains, the internal length of the structure would appear to be approximately 10 m, and the external dimension of approximately 11.6 m.

Each exterior wall had a foundation of large, sub-rounded and sub-angular granite boulders which were set into a construction cut. The eastern and northern walls, respectively, contained mixed construction backfill over the boulders to stabilise them, with broken red pan tiles placed along the side of the cut as packing infill. The brick structure situated centrally within the external walls of the building was interpreted as the base for a chimney, which had undergone alterations or repairs during its lifetime.

Fig. 110 The robbed out remains of a building (G707), with the remains of the chimney base to the center of the picture, and the remains of a wall belonging to the probable Vragerbro building (G537) to the left. Looking NE. C03_20140226_8277

'*Vragerbro*' building?

The building to the west of the probable Bargemen's Guild house ('*Pramlaugets hus*'/G707) has been identified as probably the buildings limiting the *Vragerbro*; an area where goods underwent quality control. Due to the differences in construction methods, materials and discernible phases, this structure appeared to have undergone three distinct phases of construction and subsequent alteration. This began with the construction of a northern wall, oriented northeast-southwest, which overlay two perpendicular brick culverts (SG223 and SG423). It was followed by the construction of another wall on the same alignment further south with a drain (SG708, a continuation of SG223), integral to the structure, and the partial deconstruction of one of the walls and a new wall, built above. The final phase consisted of a series of small buttresses to support the northern part of the building.

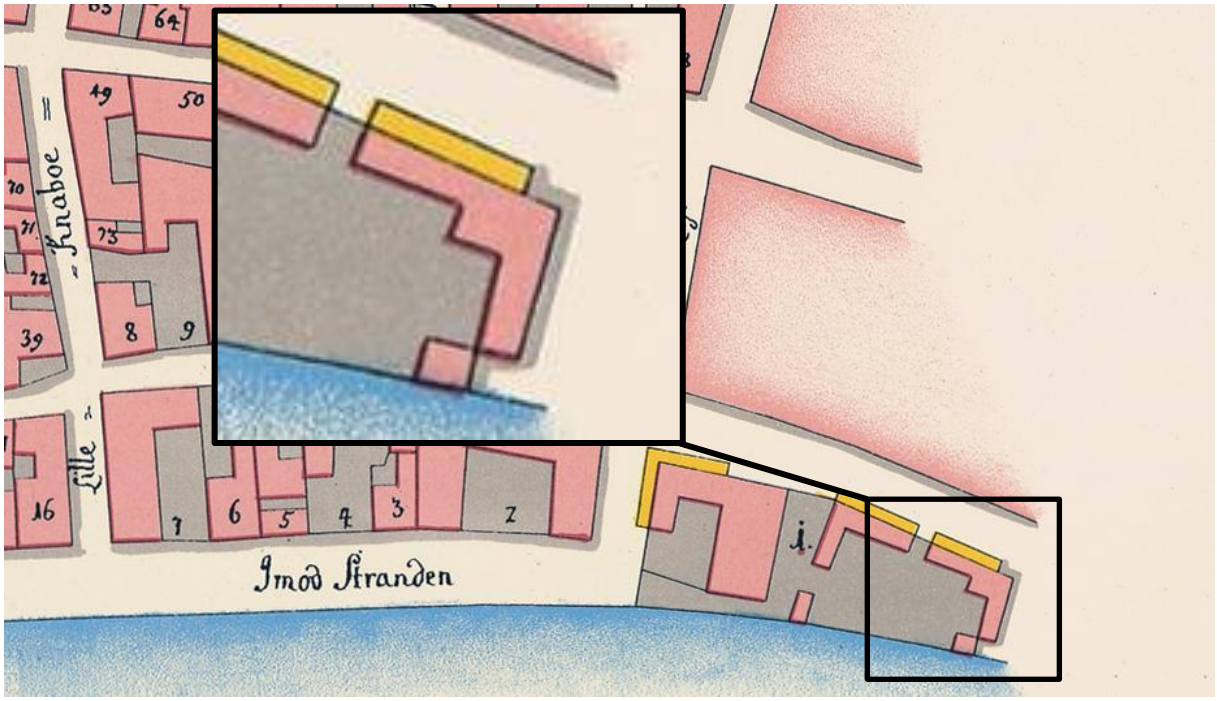


Fig. 111 Detail from Gedde's 1757 'Snarens kvarter' map showing the layout of the buildings in the area. The structure in the corner between the north-south and east-west buildings can easily be seen. Copenhagen City Archives

It would appear from Gedde's 1757 'Snarens kvarter' map that a structure existed at that time in the northeast corner created by the north-south and east-west buildings in the area. However, there was no mention of the *Vragerbro* on this map, just the *Vejerhus* and *Pramlaugets hus*. In the *Københavnske Jævnførelsesregistre* (Copenhagen plot correspondence registers), the *Vragerbro* is not mentioned in 1756, but seem to be present in both 1689 (in Snarens Kvarter, plot nr. 1) and 1806 (in Strand Kvarter, plot nr. 57). The dendrochronology dates retrieved from the foundation timbers post date the map thereby indicating that this structure was re-built.

Fig. 112 Timber foundation in the Main Excavation. Looking south. C02_20140507_9194 (cropped)

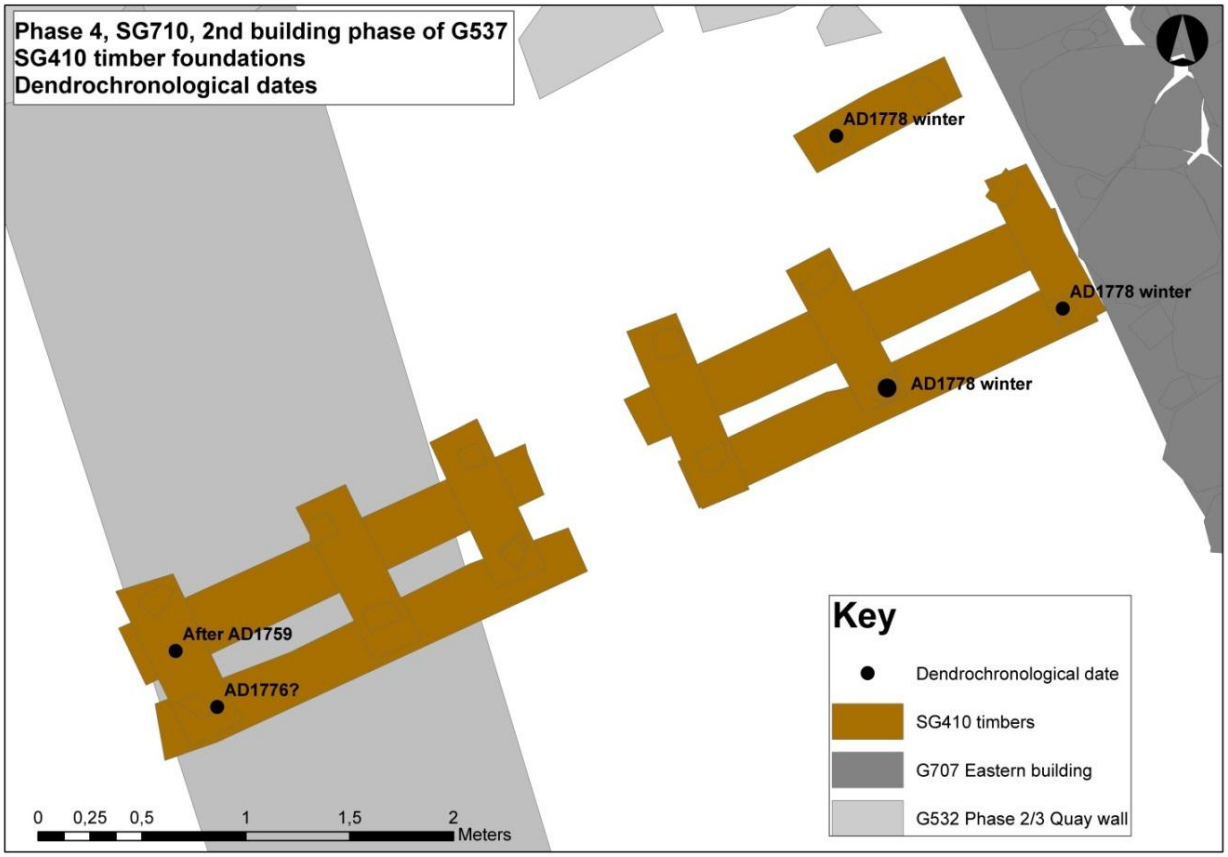


Fig. 113 Plan of parts of the possible Vragerbro building (G537). Timber groups relating to the second construction phase of the building.

Western Building

Located west of the Guide Wall trenches and Main Excavation were the partial remains of a building found during a watching brief for the oil separator trench. The building was most likely the western extent of the probable *Vragerbro* (G537). This structure consisted of two parallel northwest-southeast oriented walls, which lay 2.85 m apart, a fragmentary northeast-southwest oriented wall, and a short section of red brick wall on a timber foundation.

Service Pipes

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

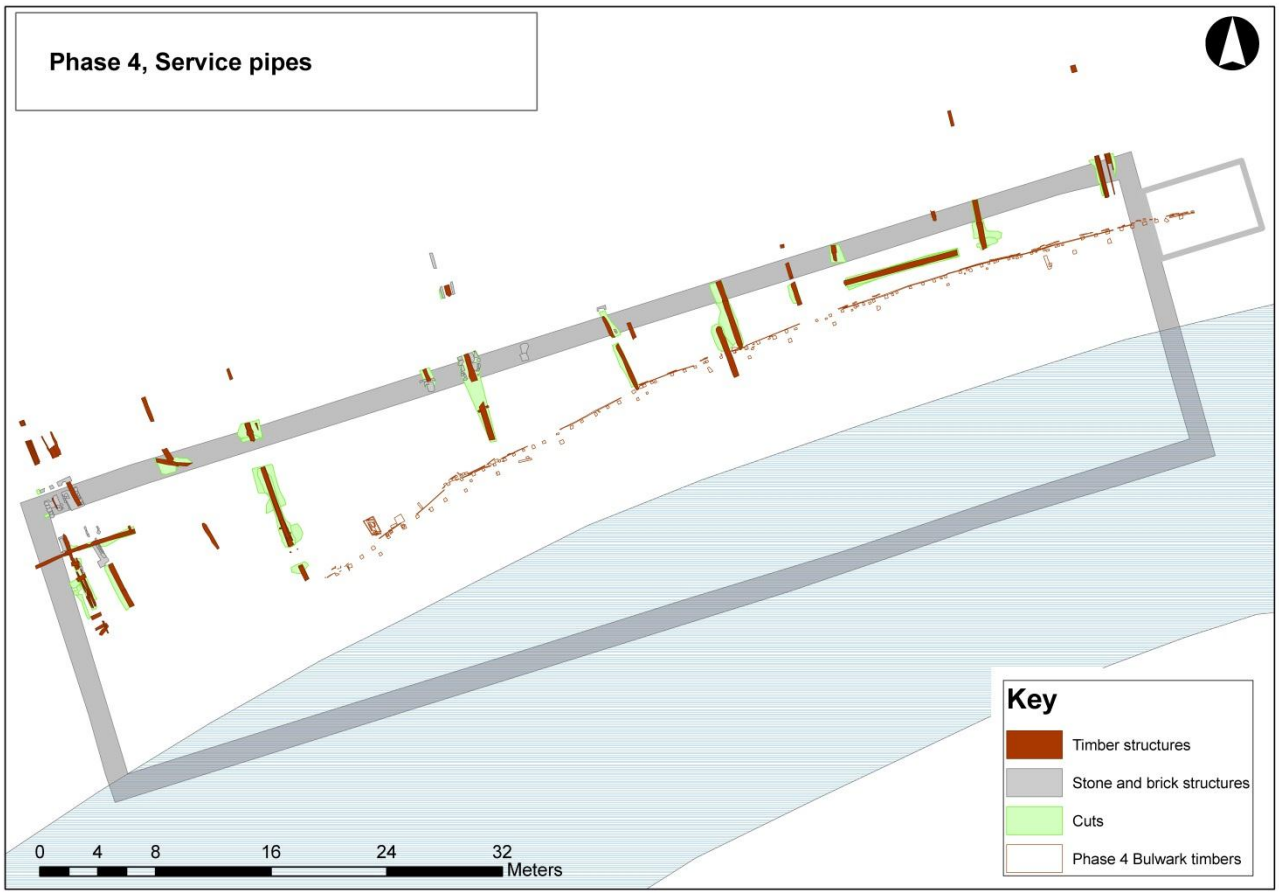


Fig. 114 Plan of Phase 4 drains and culverts.

Within some of the drains, soil and finds were found to represent waste 'flushed out' from the houses north of the excavation area. In most cases this comprised similar types of finds as also seen within the land reclamation and usage deposits in the harbour, but a number of surprises were also seen. In the drain, G708, at the western end of the excavation area, more than 70 cowrie shells were found together with a clay pipe, produced in Copenhagen between 1753 and 1755. The shells represent more global trade at Gammel Strand and may have been previously used as either currency or for decorative purposes. As an example they may have been used at the African Gold Coast, where the Danish settlement and trading post of *Christiansborg* was located, as an alternative means of payment. They have been also used by the Danish Life Guard since 1786 as decoration (*snekketøj)* of the horses head collars, and, originally, for protecting the horses from sabre cuts.

Fig. 115 Cowrie shells FO211730, SD28362, G708. Museum of Copenhagen.

The End of the Working Harbour (Phase 5) 1820s-1870s

Introduction

Phase 5 lasted approximately 50 years. In this phase Gammel Strand continued briefly as a working harbour, fishing harbour and administrative centre for the Copenhagen harbour. This ended in 1850s with the tax laws changing in Denmark. The buildings were demolished in the 1850s and the former area became an open square. Many plans were made for the area but due to lack of funds, they did not develop. This led to the harbour continuing as a fishing harbour into Phase 6.

Fig. 116 Plans and structures related to Phase 5

The new phase of harbour-front rebuilding used the same method of land tie and bulwark construction seen in Phase 4. The bulwarks from this phase were only fully extant in the Stairway trench to the east of the Main Excavation trench, although some partial remains were also uncovered underneath the later 1880s wall. The land ties associated with the new harbourfront were extant throughout the Main Excavation trench; however the connections between most of the land ties and bulwarks of this phase were destroyed during the construction of the final phase of harbour development. Contemporary with the new

harbour-front was a structure referred to as the 'fiskegang'. This was a low level quay running along the south of the harbour side, which would have formed an elongated walkway just above sea level, and survived as a series of in-situ posts which would have held a timber platform.

Fig. 117 Painting of Gammel Strand by A. Juul, ca. 1820. Museum of Copenhagen/VÆGGEN

There were several contemporary episodes of construction at the beginning of the 1820s on Gammel Strand which mark Phase 5 of the harbour development. This began with a series of land reclamation dumps, G634, at the western end of the Main Excavation trench, to stabilise the southern edge of building G707 prior to the deconstruction of the previous phase of bulwarks and the construction of new bulwarks further south into the harbour. This episode of levelling could be contemporary with the reported construction undertaken in the area by A.H.Seith in 1823, but this could not be corroborated archaeologically.

Land reclamation

The initial activity during this phase was an episode of levelling at the western end of the Main Excavation trench in order to reclaim land southwards further out into the harbour. The levelling area extended to 15.6 m northeast-southwest and 3.44 m northwest-southeast and was 0.4 m thick, with the top of the deposits at 0.18 m OD. The material used was very mixed in colour and composition. A horizon of wood chips within one of the deposits was likely to have been residue from the construction of these early 19th Century bulwarks (see below), and demonstrated that the timbers were worked on site prior to assembly.

Harbourside

This fifth phase of harbourside development consisted of twenty land ties and 60 m of remaining timber bulwark, of which 7.6 m was fully extant in the Stairway trench at the easternmost end of the excavation. The land ties were aligned northwest-southeast, perpendicular to the bulwark which ran northeast-southwest, and were constructed using the same method as the previous phases; northwest-southeast anchor beams were supported on lower posts and often jointed to them with lap-half joints, stretcher beams were then placed across the northern end of the anchor beams to which they were fixed with lap half joints and iron bolts. Vertical support posts to hold the structure in place were driven in to the south of the stretcher beams and were fixed to them with horizontal iron bolts. The single stretchers were an average of 1.2 m long and 0.25 m in cross section. The lower posts were an average of 0.22 m in cross section dimensions and the support posts were an average of 0.2 m. The lengths of these were not often recorded but where they were, they appear to have been approximately 2.5 m long. While all of the anchor beams were truncated, they were an average of 0.2 m in cross section and the longest was 4.6 m in length. The land ties occurred at an average height of 0.2 m OD and the bulwark seen to the east was at 0.3 m OD. All timber elements were pine, although no provenance was suggested for the timber.

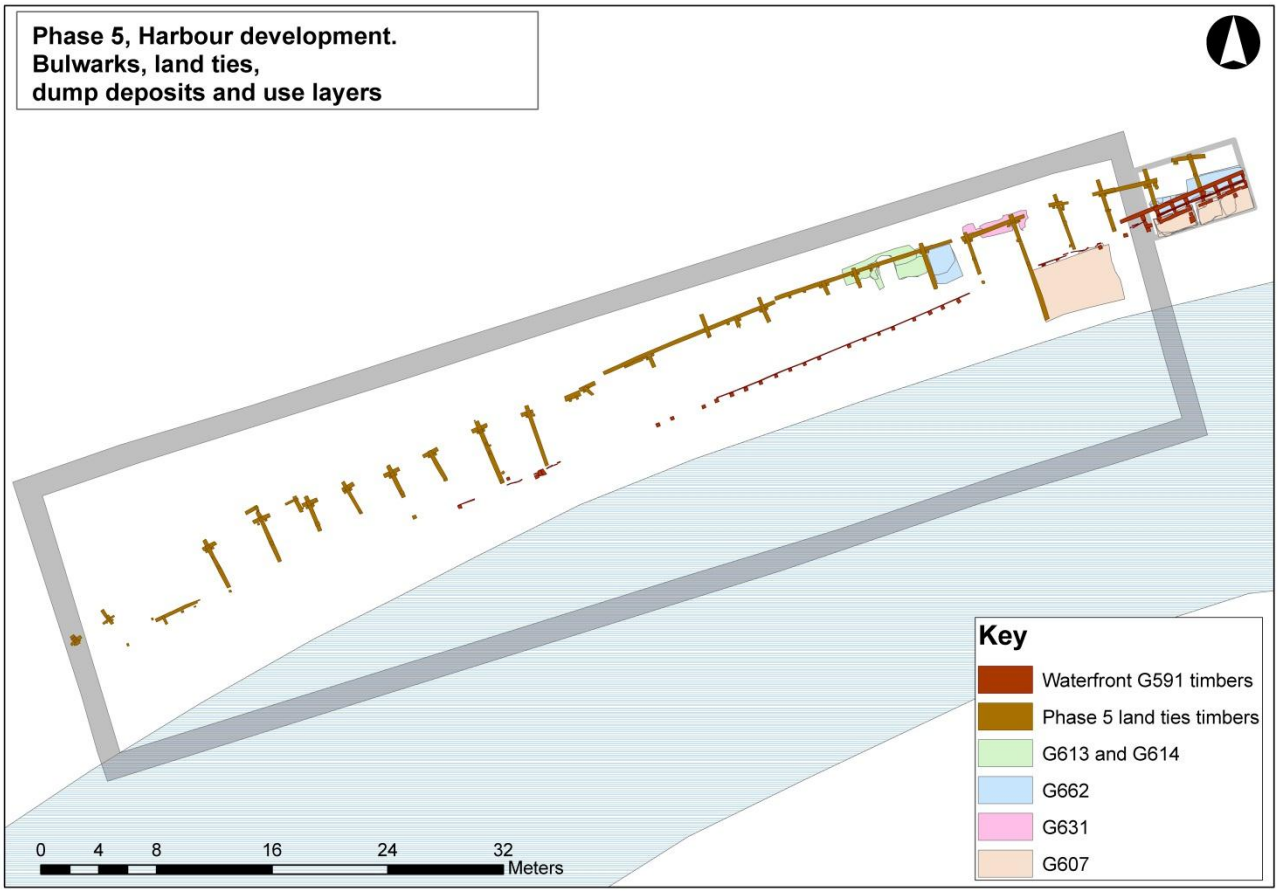


Fig. 118 Phase 5 harbour development. Bulwarks, land ties, dump deposits and use layers.

Fig. 119 Land tie group G562 to the left, with truncated and disturbed anchor beams. The upright posts with peg holes for the contemporary *Fiskegang* (G583) can be seen to the right hand side of the picture. C03_20140331_9244 (cropped)

Fig. 120 A photogrammetric rendering of land ties G580 of the Phase 5 harbour and G576 of the Phase 6 harbour, showing how the land ties were related to each other

The Bulwark

The bulwark only remained complete in the stairway trench in the eastern end of the Main Excavation trench. It was constructed from southwest-northeast aligned planks ST13627 held in place with a batten (14013) across the top to the south. This was reinforced by a row of square posts driven into the underlying deposits with a beam in front of them. Behind the planking, to the north, were a series of blocks between the planks and a stretcher beam. All these elements were fastened together with an iron bolt. The planks formed two rows; lay horizontally to the south and vertically to the north. It was suggested that the upper edge of the planks would have corresponded with the old waterline, and the alternating of wet and dry environments would have resulted in the deterioration to the top edge of the planks seen in the excavation, and consequently the upper extent of the bulwark may have originally been higher. One storm post, ST51882, was recorded towards the easternmost end of the excavation. Behind the timberwork was a series of four mixed dump deposits which contained building rubble and very mixed finds.

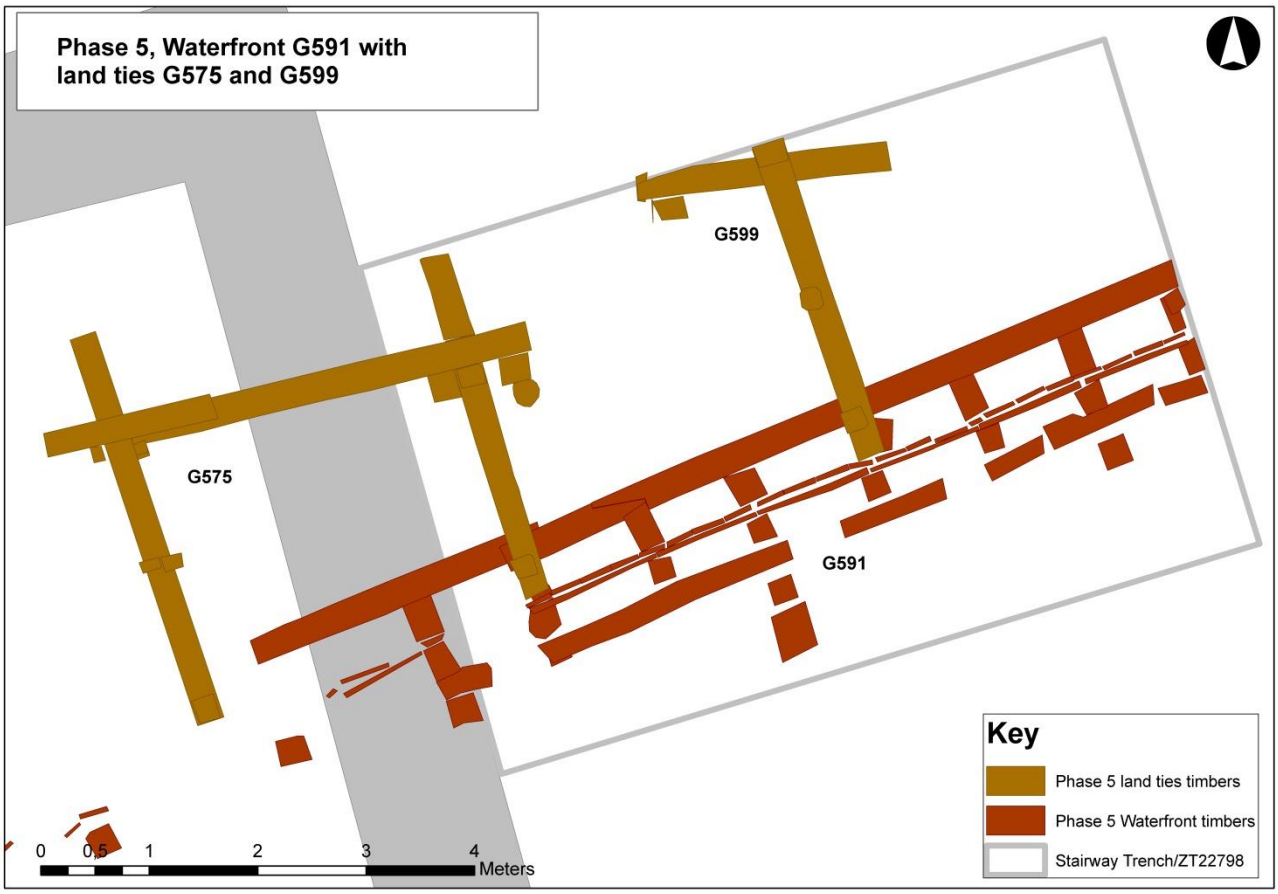


Fig. 121 Plan showing the extant remains of bulwark G591 from the 5th phase of harbour development and its relation with land ties G575 and G599

To the west of the stairway trench, the bulwark was only recorded during a watching brief at the end of the excavation. A row of 19 square posts with planking behind was recorded extending southwest underneath the later 1880s harbour wall foundation.

Fig. 122 The remains of the bulwark under excavation in the Stairway trench/ZT22798, looking west. C03_20140403_9295 (cropped)

Fig. 123 Bulwark post SD28486 with marks incised into the surface.

Fig. 124 The excavated planking construction of the bulwark in the Stairway trench, looking north. C03_20140718_11660

Three dendrochronology samples taken from bulwark G591 dated from the mid 18th Century; the planking, ST13627, dated to After AD 1726 (PD212240), one of the posts, ST51252, to After AD 1753 (PD212227), and the southern beam, ST13623, to After AD 1760 (PD208507). One of large bulwark posts, ST28486, had marks incised onto its east facing surface. They were not carpenter's marks, but presumably relate to the construction of the harbourfront in the 1820's.

Usage deposits

In front, to the south, of the remaining bulwark was a series of fourteen silt and dumping deposits, G607, which measured 16.25 m by 3.9 m and 2 m deep. This material accumulated while the bulwark was in use. The sequence of deposits began with a sandy layer, which contained a large quantity of mixed finds from the late 18th and early 19th Centuries which included many clay pipes, glass fragments, and ceramics derived from China, Denmark and Holland, and point to a contemporary deposition rather than re-deposition from earlier layers, thereby reflecting the general ceramic consumption in Copenhagen during this time. A sherd of Siegburg ware dating from 1300-1550 was likely to be part of a small episode of re-deposition within the sequence. A small, slightly corroded cannonball (FO215160) was also recovered from this deposit. It was thought to derive from a small ship's or land cannon and did not show any signs of having impacted, so may have been lost overboard accidentally rather than fired. It also contained a possible ramrod for a rifle (FO218246). Thereafter, the sequence of deposition alternated between organic rich silting and more sterile sand layers. The organic deposits were richer in finds, with the lowest deposit, SD47888, having contained many fish bones and cattle jaws which was indicative that the market was still in use while this deposit was laid down. A silt deposit in the middle of the sequence contained part of a rubber shoe from Edinburgh, which represented a more unusual piece of household waste. A deposition of concrete towards the base of the sequence appeared to have set in situ due to the presence of concrete within surrounding pottery fragments, and was thought to have been a waste dump from local construction. The sandy layers were thought to derive from dredging activity to clear the harbour; however they could also have derived from the *sandkiste* (sand-chest) which was located to the east of Højbro bridge or from the barges which delivered the sand.

Fig. 126 Toy tin pot, FO212842, found in SD53437, G607. Museum of Copenhagen

Fig. 125 Post-medieval bone cone ("kaste gris"), FO213584. SD53367, G607. Phase 5. Museum of Copenhagen

Fig. 127 Rubber shoe, FO218278 found in SD53437, G607. Museum of Copenhagen

Fiskegang

The *fiskegang* ("fish-walk") was a low level quay (located at 0.25 m OD) along the south of the harbourside, which formed an elongated walkway just above sea level, and was accessed by a short flight of steps down from street level at either end. Beside this quay were moored small barges which contained fish to be sold on the harbour by the *fiskekoner* (literally "fish wives").

The remains of the *fiskegang* G583 consisted of 74 square pine posts, vertically set and arranged in 26 rows. Each post measured approximately 0.2 by 0.2 m in cross section, was 3-3.5 m long and tapered to a four sided point which was driven into the underlying silting layers of the harbour. Saw marks were present on 16 posts, and 50 contained peg-holes to the top, 17 of which had round pegs remaining which would have been used to fix overlying planking to form the walkway. These posts formed the foundations for the northeast-southwest aligned structure which would have run parallel to and abutted the old harbourside to the northwest.

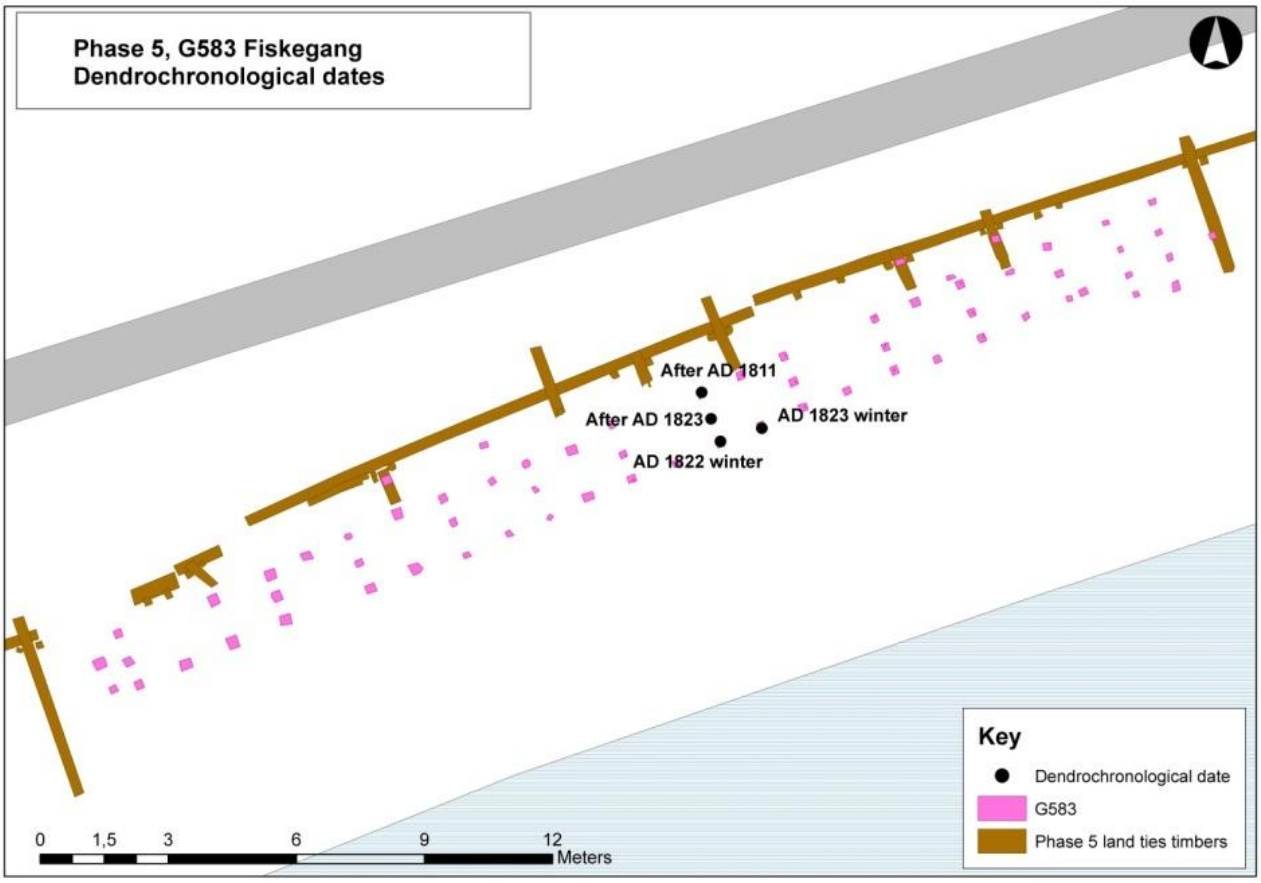


Fig. 128 Plan showing the upright square posts in rows which formed the foundation of the fiskegang. Dendrochronological dates were obtained from four of the posts.

Four dendrochronology samples were taken from the fiskegang posts, three of which (PD209027 from ST 26000, PD209024 from ST26008 and PD209025 from ST26016) dated from the winter of 1822-3 and one (PD209026 from ST27539) returned a date of after 1811.

Fig. 129 FO 212841. A toy plate recovered from SD33971 (G629). Museum of Copenhagen

The posts appear to have been backfilled around with building rubble, probably as a stabilisation measure, although the precise stratigraphic relation of the posts with the underlying deposits through which they were pushed was unclear. The backfill, grouped as G629, also contained mixed artefacts from domestic sources with many clay pipe stems and bowls recovered, window and bottle glass, and stove and floor tiles. A small toy plate was also found (FO212841). The presence of a disarticulated humerus and a femur, from different skeletons (one adult and one juvenile) suggests that part of the deposit came from a disturbed former burial ground. Nearly all of the artefacts date from the mid 17th to mid 18th Centuries, with three pot sherds dating from the Medieval period, which indicates that this backfill was derived from redeposited material and does not therefore reflect contemporary use of the harbourside.

There are one or two artefacts which could be contemporary, such as a porcelain cup and saucer which date between 1800-1900 (FO217954 and FO217953 respectively) and the lead line FO212461. Some of this material is also indicative of the trade which had been occurring during the mid to late 18th Century, with faience which originated from the Netherlands and stoneware from Germany, along with Chinese porcelain among the finds recovered. The 18th Century dates for the bulk of the ceramics could indicate that this deposit derived from previously dumped material which was redeposited here after the *fiskegang* was constructed in 1822-3.

Fig. 130 FO 212461. A lead line to ascertain the depth of water. Recovered from SD53332 (G629)

Fig. 131 Detail of the Daguerreotype showing Gammel Strand in 1840. The *fiskegang* can be seen as a break in the harbourside behind the ship masts, although the walkway itself is hidden from view by the Højbro Bridge

Drainage

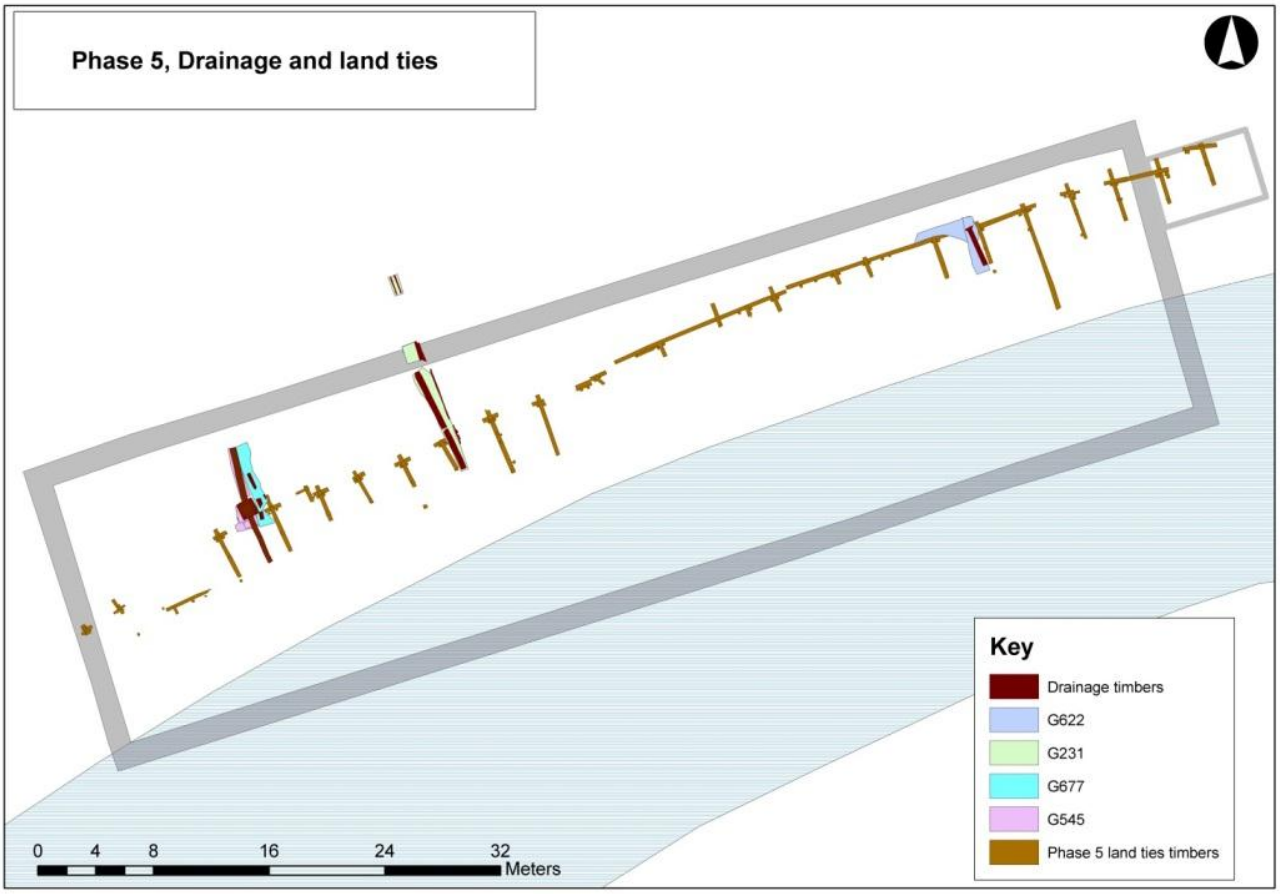


Fig. 132 Plan showing the four drainage features in relation to the Phase 5 land ties

Three features in this phase of harbour development were connected with the management of water, and one other represented the location of another drainage feature which had been removed in antiquity. All of the elements were on a northwest-southeast alignment, which would have run perpendicular to the harbourfront, and although it is assumed that the waterpipes and drains would have linked with properties to the north side of Gammel Strand, only one pipe (G231) was seen to extend beyond the Main Excavation trench.

Fig. 133 Drain G231, Looking NNE

Drain G231 was cut through the backfill deposits of the previous phases of harbour development, and also necessitated the removal of stones from the Renaissance harbour wall. To the north, during a watching brief, the feature consisted of two planks lining a cut, although the timber pipe itself was not seen. This could be due to the relative depth of the watching brief and Guide Wall trenches compared to the Main Excavation trench which was c. 0.4 to 0.6 m lower. In the Main Excavation trench, the wooden

pipe was truncated through the middle by a modern gas pipe cut. The southern half, which still retained bark, was sampled for dendrochronology but returned no date.

Fig. 134 Plan showing the timber elements of water filter G545 in relation to the surrounding land ties of this phase of harbour development.

The feature interpreted as a water-filter, G545, consisted of a timber box with two waterpipes extending from it; one to the north and one southeast. The box was constructed from four sill beams, into which were jointed four timber posts, one in each corner, with timber planks set horizontally between; four surviving to the south, two to the north and east, and one to the west, and a timber plank floor, constructed of five planks. The lower three side planks on the north and south sides were shaped to fit around the two water pipes, and so the pipes and timber sides must have been constructed simultaneously. The plank floor sat inside the timber sides and was shaped to fit around the posts. The exterior of the waterpipes were packed with blue clay to cover the joint with the timber box to make it watertight.

Fig. 135 Overview of the water filter pipes with the timber box between, looking north. C02_20140312_8529

This feature was interpreted as a water filter used to remove waste products from foul water before it was disgorged into the canal, as it is very similar to a structure found on 19th Century plans. This feature could also have been part of a stand-pipe at street level which would have been attached to the small bored hole in the top of the northern pipe. The box 'filter' would then have been used to catch the overspill water which was then channelled back into the canal via the southern water-pipe. The cut on the western side could then represent the time when the stand pipe was removed.

Fig. 136 Detail of the excavated central filter, looking south east. C03_20140314_8795

Fig. 137 Detail from an etching of 1869 "Vinteren 1869 I Kjobenhavn III ved Gammel Strand" by B. Dlien, showing a stand pipe on Gammel Strand by the harbour wall. Højbro can be seen in the background. National Museum

Destruction of the harbour buildings, 1850s onwards

Change in the tax law in 1849 led to the end of use to the *Vejerhus* as a tax institution, and also the *Vragerbro* area. With the decaying buildings on the Gammel Strand harbourfront having no use, a decision was made in 1859 to demolish them along with the poorly constructed Bargeman Guild house. The buildings were then demolished with only the foundations left in the ground. The area was then levelled, and covered over with a new cobbled surface. A large space and square now was created in the former location of the building that has not really changed in over 150 years.

Concrete Quayside

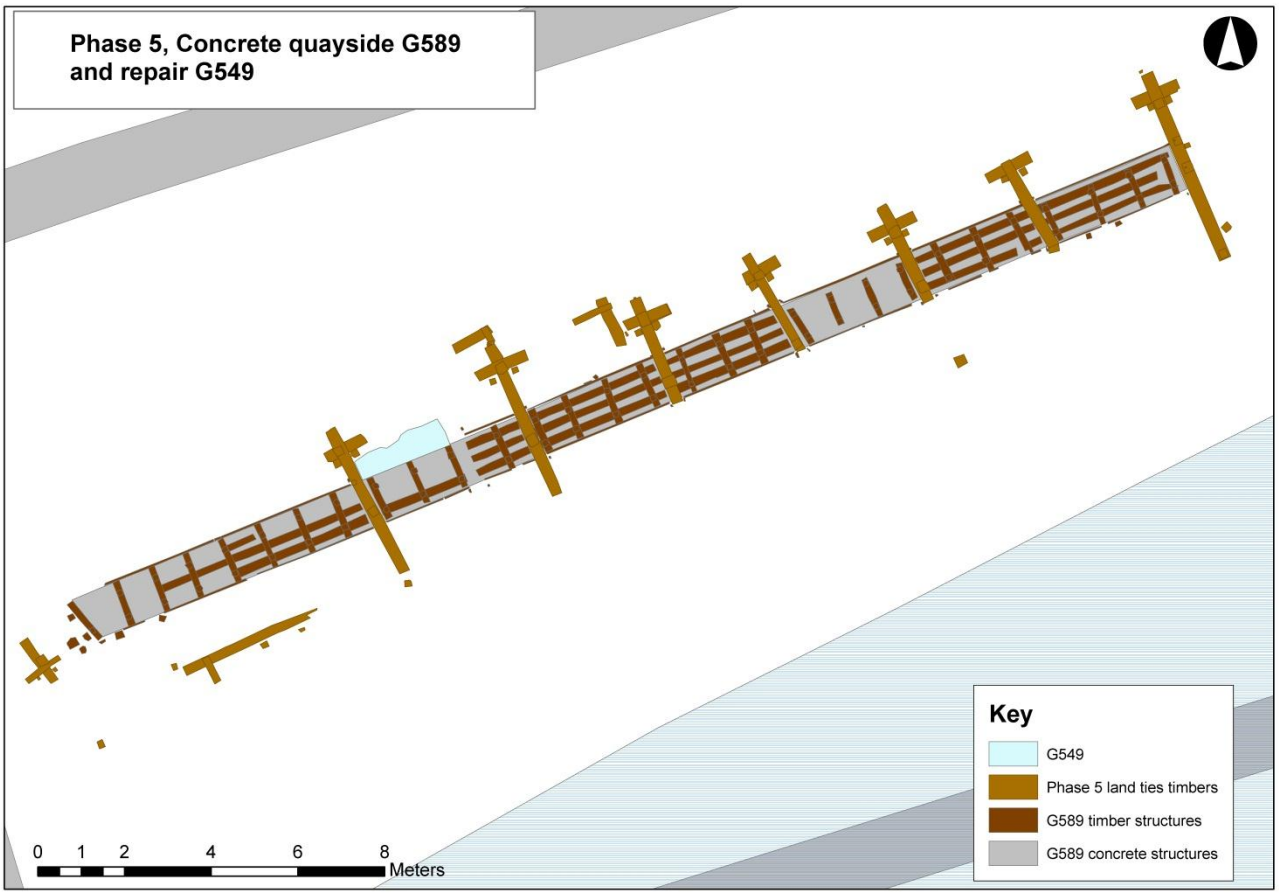


Fig. 138 Plan showing the structural elements of the concrete quayside

This concrete structure measured 27.94 m by 1.2 m with its upper surface at -0.14 m OD, and lay to the north of the 1880s harbour wall towards the western end of the Main Excavation, forming a continuous alignment with the western end of the 'fiskegang' G583. It was constructed within a trench, the sides of which were lined with 25 planks, which measured c. 2.8 m long, 0.04 m thick and 0.19 m deep, standing on edge horizontally, two planks deep, and were held in place by wedges. 58 square posts, which measured c. 0.12 m square by 0.75 m long, were driven through the base of the trench in pairs approximately 0.8 m apart and stabilised with a hard-core layer of packing stones, to form a foundation for the concrete. Each pair of posts was jointed with a lap joint to an overlying transverse beam. Between each of these beams lay three parallel longitudinal beams – 23 in total, although some were removed along with the overlying

concrete. The planking acted as shuttering to contain the liquid concrete, SS50128, which was then poured over the timberwork to create a foundation or walkway. The depth of the concrete was not recorded but appears to have been c. 0.5-0.6 m.
The timber structures were dated using dendrochronology to 1868.

Fig. 139 "Udsigt over Gammel Strand og Højbro ved Stranden" dated to c. 1865? (source Væggen/Museum of Copenhagen), however this must post-date 1868, the construction of the concrete quay which can be seen here. The absence of any buildings on Gammel Strand at this time supports their probable near contemporary demolition.

Conclusion

The inclusion of the *fiskegang* at the eastern extent of the harbour during this phase of construction illustrates the increasing importance the sale of fish played in the function of the harbour at this time. The area was no longer exclusively for the import of goods, with the expansion of other harbour areas around the city during the course of the 17th and 18th Centuries, however, the harbour infrastructure itself now reflected the downturn in the importance of Gammel Strand in the trading life of the city, even though the *Vejerhus* retained its function until 1849. Thirty five years after the re-build this change was reinforced by the deconstruction of the previous trade administration buildings in the area in 1857, thereby again confirming through infrastructure the change in function of the area away from trading goods. This deconstruction created a large open area in front of the harbour where markets were subsequently held (Linvald, 2006). Whether this demolition was due to the deterioration of the buildings is unrecorded, however, the obsolescence from their previous functions is evident by the lack of any subsequent

replacement. The addition of the western extent to the *fiskegang* in 1868 indicated the further expansion of fishing as the main role of the harbour.

The presence of the water filter to the western end of the Main Excavation demonstrates an acknowledgement that the waste water from the houses to the north of the harbour would have been polluting the water in which the fish were kept alive prior to being sold. It is unfortunate that no dates were provided through dendrochronology to be able to show a relative sequence for the installation of the pipes, and where this structure would have be placed in that sequence, as it is unique in the area and tempting to think it was the most recent.

The Modern Harbour 1880s-2007

Introduction

The final phase of the development of Gammel Strand was categorised by the construction of the recognisable modern harbour. During this period the *loppetorv* (flea market) which had been established on the site of the demolished *Vejerhus* moved to Vandkunsten (Københavns Historie, u.d.), although the *fiskekoner* (fishwives) continued to sell fish from the harbourfront until their stalls were disbanded in 1958 following the construction of a new *fisketorv* (fish market) building in Gasværkshavnen (Kongsbak Larsen 2008, 5). One single booth remained on Gammel Strand until the owner, Doris Marx, retired in 2008. The Gammel Strand area had become in the late 20th and early 21st Century, a tourist centre with restaurants, bars, museums and small boutiques and part of the tourist boat tour, with the new harbour of Copenhagen located at the far north east of Copenhagen at Nordhavn (North harbour) on the Øresund. The time of Gammel Strand being the centre and maritime harbour of the Scandinavian metropolis had long since passed.

Fig. 140 Plan of all structures and features related to Phase 6

The major episode of activity during this phase was the re-building of the harbour wall in stone in the 1880s. This expanded the harbour slightly further south, and was constructed using the same method of

land ties and land reclamation dumps which had been used in the two previous episodes of harbour building. The main difference in this instance was the construction of the harbour wall in stone rather than the continued use of timber bulwarks which had distinguished all previous phases. This demonstrated a willingness to re-invest in the area thirty years after the demolition of the old administrative buildings on the site which had created an open space, and implied a will to 'gentrify' the old harbour side through the replacement of timber with dressed stone. The Højbro Bridge at the eastern end of Gammel Strand had been reopened in 1879 after being rebuilt, so the rebuilding of the harbour side at this time was likely to have been the continuation of a program of development.

Fig. 141 The newly redeveloped harbour-front c. 1890-1900, with the fiskekoner wearing their distinctive white head coverings, selling fish along the harbour-side. Nationalmuseet Antikvarisk Topografisk Arkiv Fotografier

Thereafter were a series of discrete interventions which may either have been associated with the repair or maintenance of the harbour wall, or the removal of features on the harbour side such as the whale-oil street lamps or salt water pumps. The archaeological identification of contemporary street furniture is impossible due to the depth at which the archaeology began. There was, however, evidence of two tall street lamps seen in early 20th Century photographs, in the form of two square, brick foundations. Photographs from 1924 also show a large gas pipe being laid which was identified during the Main Excavation.

Overlying all features was an extensive episode of levelling which formed a ground raising layer and a foundation for the cobbled surface of the harbour side. One further pit cut through these layers was probably associated with an isolated repair incident, indicated by the presence of a lens of mortar within the base.

The final major intervention to the harbour side was the renovation of the harbour wall undertaken in 2007 where the upper courses of the 1880s harbour wall were replaced and the waterside edge remodelled. The statue of the *fiskekone* to honour the hard work of the fishwives situated at the far eastern end of the harbourside by Charles Svejstrup Madsen dates from 1939/40.

Fig. 142 The statue of the Fiskekone by Charles Svejstrup Madsen dated 1939/40. The statue has currently been relocated due to the Metro Cityring construction. Photo: Københavns Kommune

Harbour Wall Construction

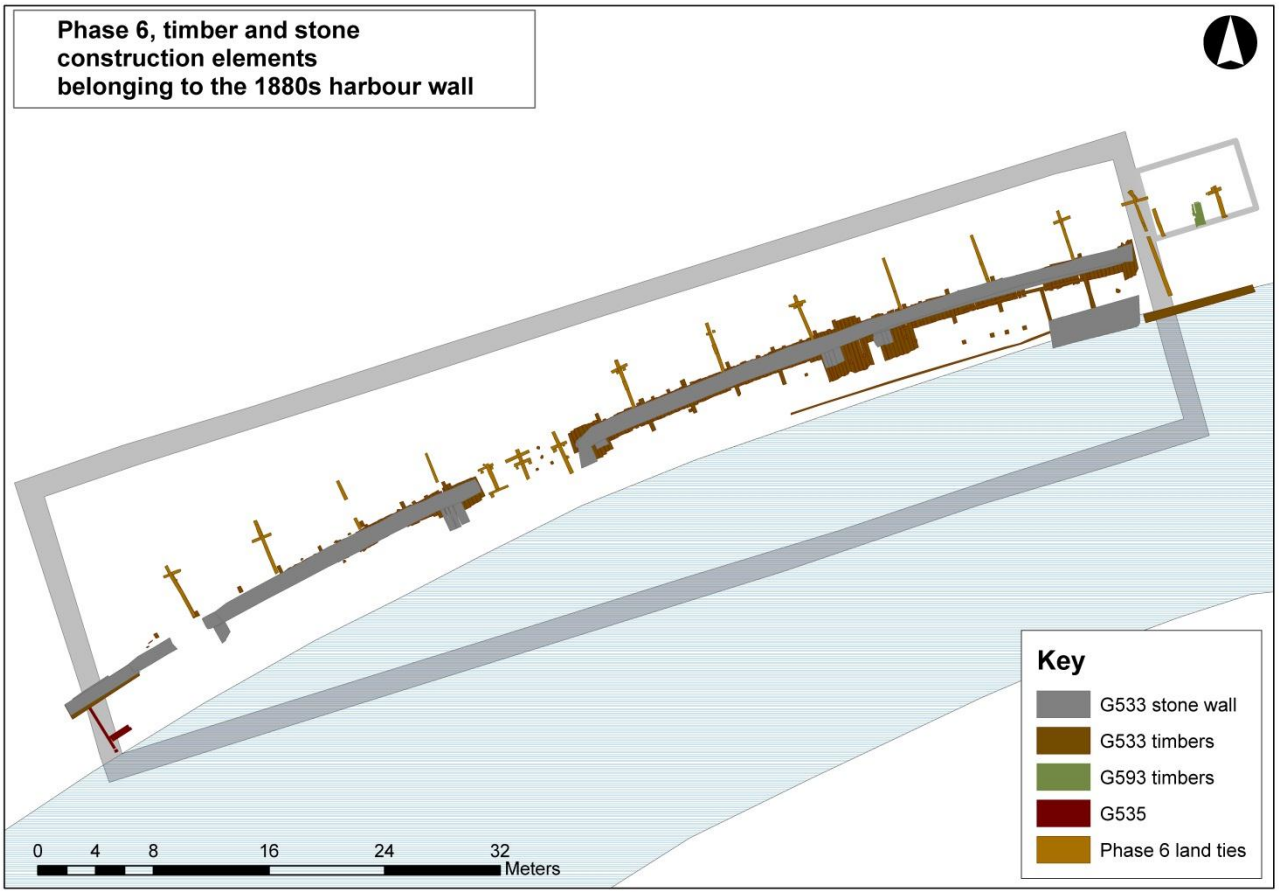


Fig. 143 Plan of 1880s harbour wall showing the timber and stone construction elements

Timber Foundations

The new harbour wall was built on a timber foundation. This was constructed from 104 support posts which carried northeast-southwest aligned horizontal beams jointed to the posts with mortise and tenon joints, which in turn carried northwest-southeast aligned horizontal planks. The support posts were seen during the machining at the end of the Main Excavation, so their full lengths were not recorded, however they measured 0.26 m^2 with a mortise to the top. Most of the foundation structure was uncovered by machine during the final stages of the excavation, so only seven of the overlying beams were fully recorded in the Main Excavation. Their lengths varied in size from 1.48 m to 3.64 m, and they were laid end to end in three rows over the support posts to which they were jointed with tenons, with approximately two to three joints per beam. These beams carried 202 horizontal planks, aligned northwest-southeast, which created a flat, stable surface onto which the stone wall was constructed. The lengths of these planks varied from 1.55 m to 3.5 m with the majority being shorter, and they were an average of 0.28 m wide at a height of -0.32 m OD. The longer planks extended south beyond the others, and were laid together to create a platform approximately 6.7 m wide which corresponded with the positions of flights of steps which lead south down to a lower level of the quayside outside the area of excavation.

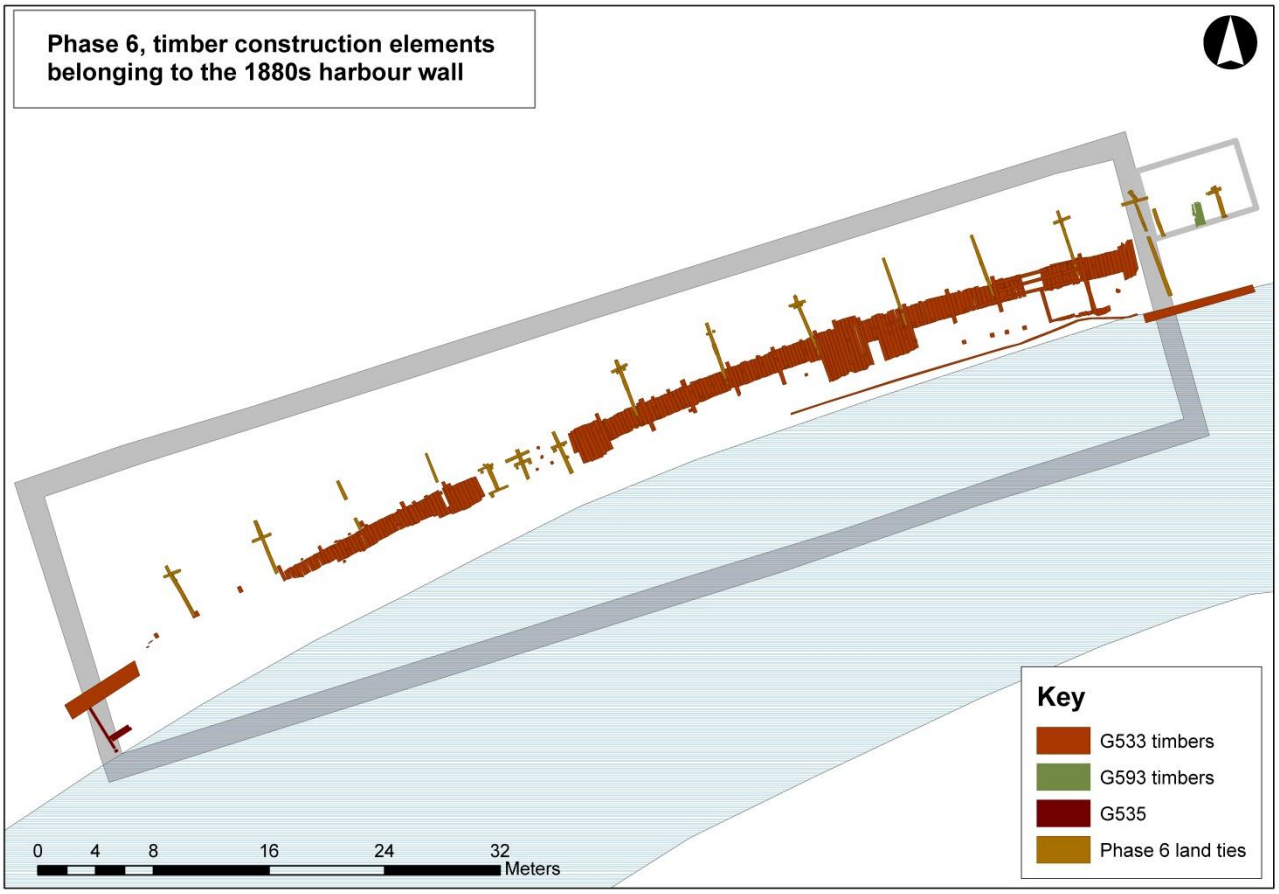


Fig. 144 Plan showing the timber elements of the 1880s quay wall including the timber planking foundation and sixteen land ties

Land ties

The timber foundations were held in place with sixteen land ties each constructed from support posts, a stretcher beam and an anchor beam. In the eastern half of the Main Excavation, the southern end of seven of the land tie anchor beams were jointed into the plank platform of the wall foundation, but this was not observed in the western extent. While each of the land ties varied in its construction depending on the placing or reuse of extant surrounding elements, they were all constructed from the basic formula which had been seen in the previous phases. This was, namely, a northwest-southeast aligned anchor beam with a northeast-southwest aligned stretcher beam above and two posts either side. The anchor and stretcher beams were often fixed together with an iron bolt, and sometimes, e.g. G669 and G600, with a lap half joint.

Fig. 145 View of the stone harbour wall looking west shows some of the land ties in situ. In the middle of the picture the anchor beam from G600 can be seen overlying the stretcher beam from G562 from Phase 5, and fastened to it by means of a lap joint and an iron bolt. The square timber posts throughout are the *fiskegang* from the previous phase, and the truncated anchor beam in the foreground is also from land tie G562 in Phase 5. C03_20140331_9229 (cropped)

The stone harbour wall was constructed on top of the timberwork foundation by bedding large stones onto a layer of mortar over the planks. Three courses of 19th Century stonework were recorded with squared-off stones lying on their long edge to the seaward side of the wall, and more roughly shaped boulders behind. The stone sizes varied from between 0.23 m by 0.13 m, up to approximately 0.8 m by 0.5 m, but were generally fairly uniform in size. The stonework was a mixture of Öland sandstone, fine grained sandstone and concrete. Each course was mortared together, with a mortar 'lip' between the first and second courses.

Harbour wall

The construction of the stone harbour wall necessitated the partial removal or truncation of some of the elements of the previous, Phase 5 harbour side. The construction cut for the new harbour wall extended back (northwest) a maximum of approximately 4.7 m from the previous bulwarks i.e. far enough to expose the rear long stretcher beams from the previous phase in the eastern half of the Main Excavation. This was to remove many of the land ties which would have interfered with the construction of the new harbour wall, although nineteen of the anchor beams which connected with the previous phase of bulwarks were merely sawn off at their southern ends. In the western half of site, the construction cut for the wall was only observed to extend to a maximum width of 1 m, although the construction cuts for the associated land ties in that area extended further northwest from the harbour wall (none of the previous phase of bulwark was extant in that area); from 2.73 m for the easternmost land tie, to a maximum length of 4.16 m for the westernmost land tie. The construction cut may not have been observed here due to disturbance in this area or the excavation conditions, and the initially undetermined relationship with the concrete quay from Phase 5.

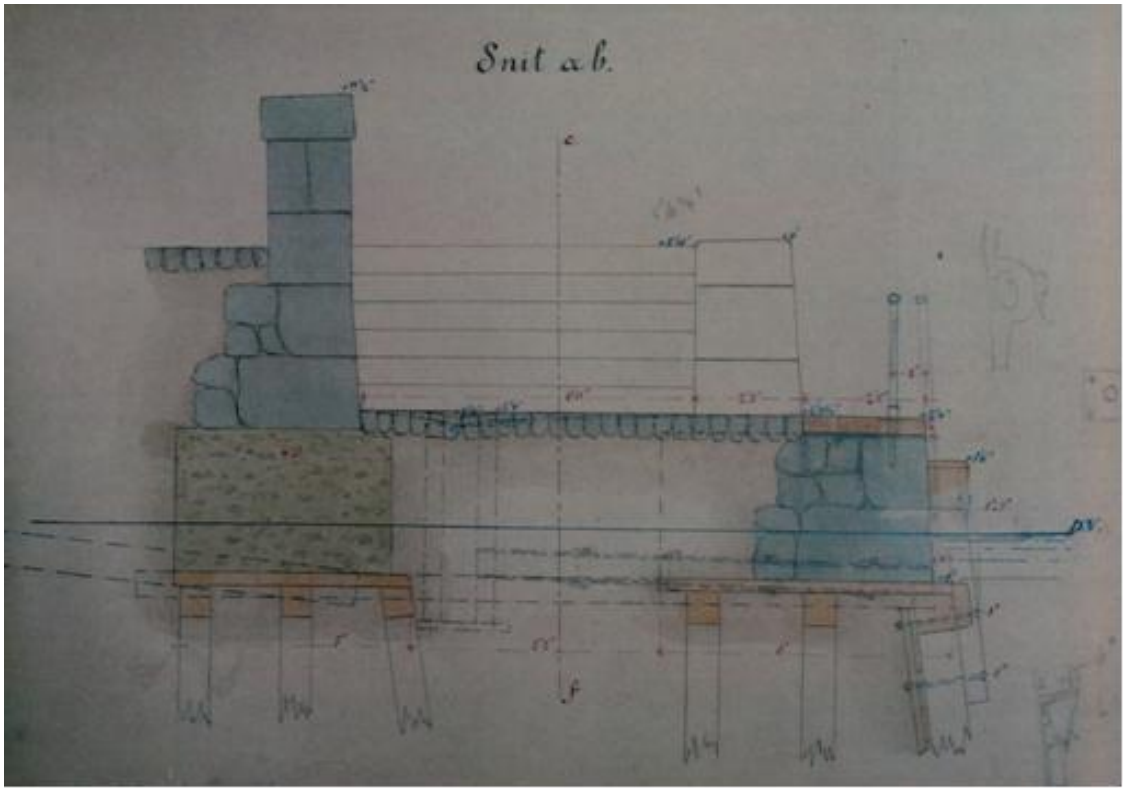


Fig. 146 Undated (?) section through the proposed 1880s harbour wall and fiskegang, showing the various construction elements of the wall itself. An anchor beam from a land tie is shown as two dotted lines in the left of the picture, and the steps are shown in outline in the middle of the picture.

Street Lighting

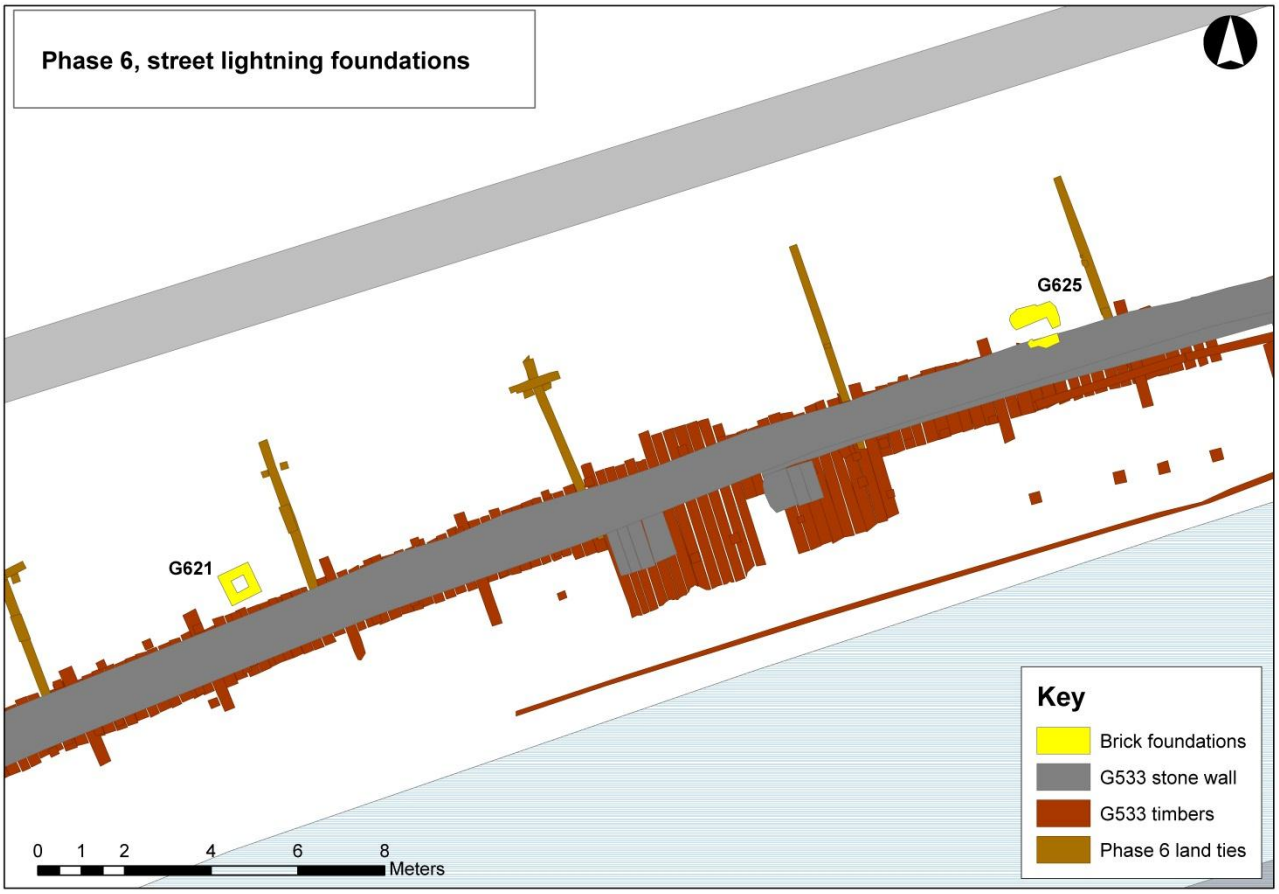


Fig. 147 Plan of the brick street lighting foundations

Cut through the upper backfills behind the 1880s harbour wall and situated close to the wall itself, were two hollow square structures approximately 18.75 m apart. These were constructed of yellow brick in alternating rows of headers and stretchers. The construction of these foundations differed slightly from each other; the eastern one had a single course step foundation; and the exterior face of western one was rendered, presumably to prevent damp penetration. They were initially thought to be either drains or manholes behind the harbour wall; however the presence of a narrow iron pipe protruding southwards from the base of the western structure is suggestive that these structures were associated with the gas street lighting of the harbour.

Fig. 148 Brick street light foundation G625 abutting and built into the earlier 1880s stone harbour wall, looking south. C03_20140204_7913 (cropped)

Fig. 149 Photo of Gammel Strand dated to ca. 1908. The shorter, more common street lamps can be seen in the left foreground, along with the tall iron lamps along the harbourfront. Museum of Copenhagen

Gas pipes

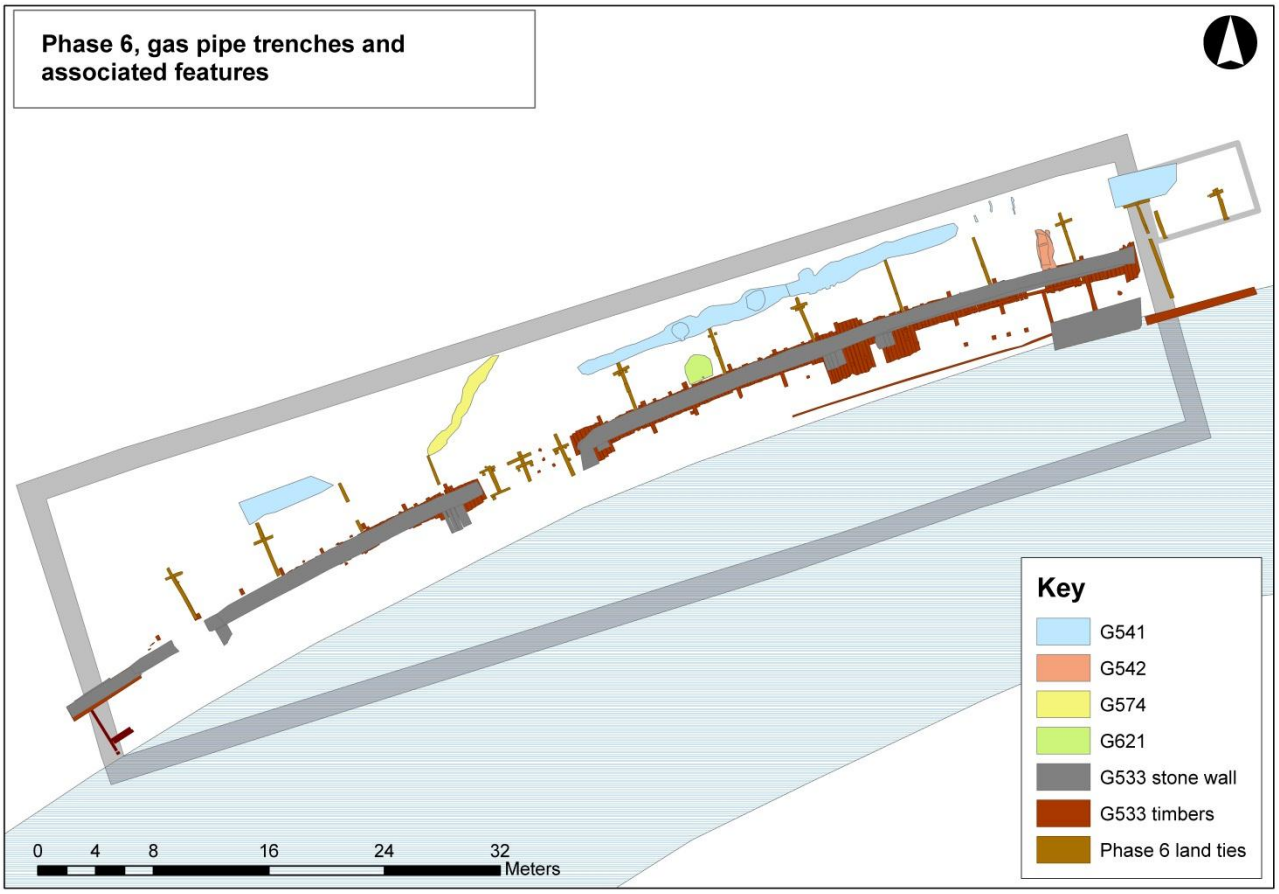


Fig. 150 Plan of the gas pipes trenches and associated features

Gas street lighting was first introduced to Copenhagen in 1857, but a map from 1852 showed the projected route of the proposed gas pipelines. Three gas pipes were found within the Main Excavation trench, one with a large diameter and two narrower. There was also a narrow iron pipe to the south of one of the street light foundations (see above). The gas pipes in the Guide Wall trench were surveyed as disturbance and can be seen to disrupt many of the relationships between the features in the area.

The large northeast-southwest oriented gas pipe, which measured 43.78 m by 2.11 m and 0.5 m deep from an average height of 0.33 m OD, truncated most of the late 19th Century deposits along the northern side of the Main Excavation and stairway trench, however it did not extend into the western half of the trench. There were probably two episodes of gas pipes within this cut, with the first being removed before the other was placed on to the wooden strut supports found further east. Two large vertical iron pipes, c. 1.2 m in diameter located towards the western end of the pipe, may have been connected to the pipe or may have been beneath it for support. The gas pipe itself was removed by machine and was not surveyed. Neither of the two narrower gas pipes connected with the large east-west pipe.

Levelling

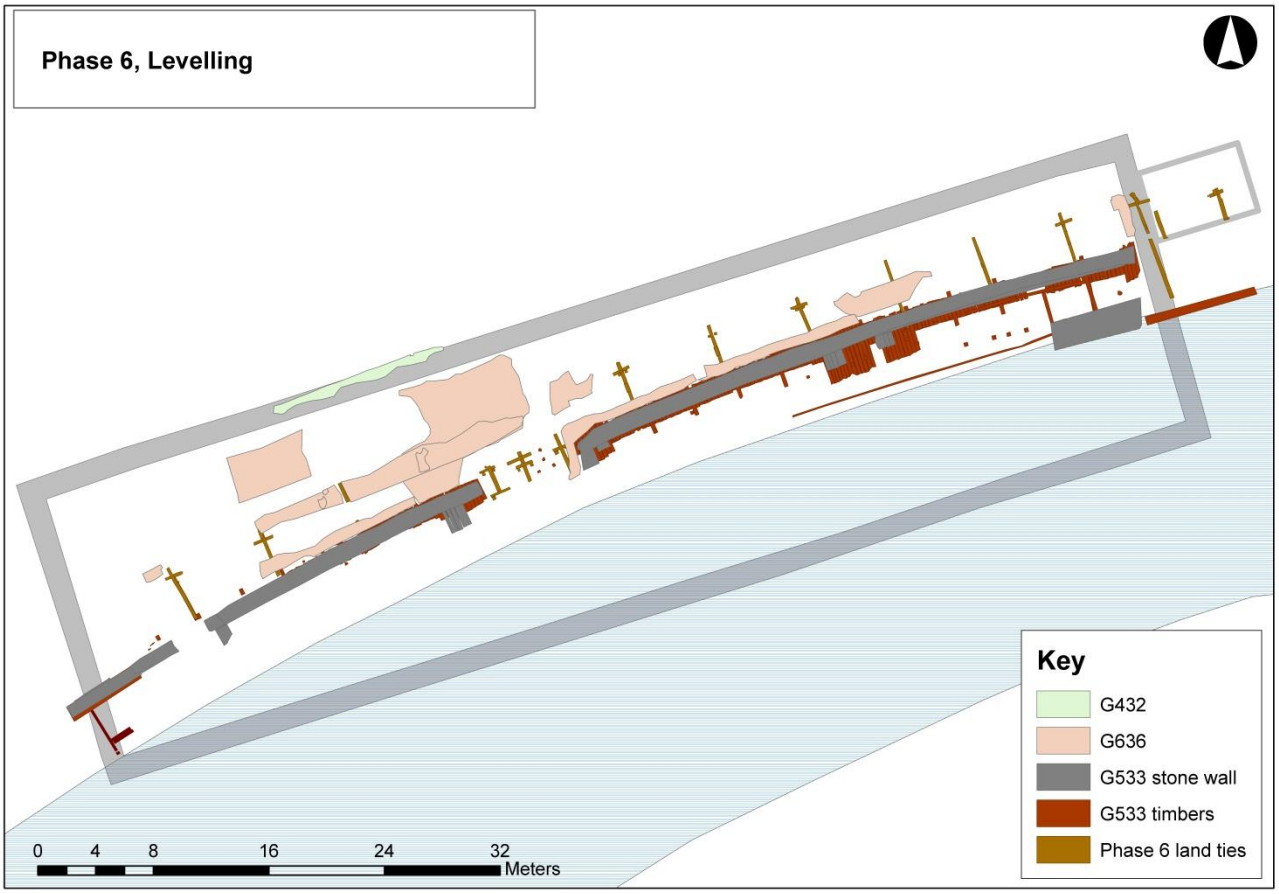


Fig. 151 Plan of Phase 6 levelling

Overlying all of the previous features and extending across the entire Main Excavation area was a series of thirteen dumped deposits, covering an area of 77.32 m by 9.93 m at an average of 0.3 m OD. The material within and between these deposits was very mixed, but there was a high content of building waste throughout in the form of CBM and rubble.

The main deposit, SD20146, which overlay all of the Main Excavation area consisted of general waste which contained ceramic and glass sherds, animal and fish bones, slag, leather and clay pipe fragments. The only objects which could be associated with the contemporary use of the harbour were a pine fid FO212448, and the five small copper alloy coins, FO212523, FO212525, FO212533, FO212536 and FO212537, which were too corroded to date. The remaining artefacts consisted of those

Fig. 152 FO211629. Well preserved lead cloth seal (probably from Hamburg) found in the large levelling dump SD20146 (G636) which covered the entire site. This demonstrates the very mixed nature of the material with a probably 16th-17th Century cloth seal found in a late 19th Century deposit. Museum of Copenhagen

which could have been accidentally lost or thrown out, such as a bone comb FO213515, and iron padlock, FO218090, and various copper or bone buttons and cutlery. Much of the material was likely to have been re-deposited, as illustrated by the recovered glass fragments which date from the 17th Century to 1754, two lead cloth seals, FO211629 and 212822 which are likely to date from the 16th to 17th Century, and the discovery of a Medieval leather shoe FO218263. Five corroded musket balls were also recovered, and although three of them were shot only one of these appears to have suffered impact. However, muskets were out of use by 1900 so again these are likely part of the re-deposition.

Fig. 153 Clay pipe, FO213419, found in the levelling dump, SD20146, G636. Its design comes from the Schmidt family in Stubbekøbing and dates to around 1740-70. The unusual lid is probably brass which contains four holes and is attached to the body of the stem with a decorative wire. Museum of Copenhagen

The full depth of the levelling varied across site, with the main deposit, SD20146, having a maximum recorded depth of 2.4 m, but this would have fluctuated depending on the depth of the underlying archaeology. This deposit extended across the whole of the Main Excavation and was removed by machine. The purpose of these deposits was to raise and level the ground surface to the required height and to provide a foundation layer for the overlying stone-block paving. Finds from these deposits were dated as either Post-medieval or 19th Century, with no modern material observed, so this episode of levelling was likely to be contemporary with the construction of the 1880s stone harbour wall.

Fig. 154 FO213355 (left) and FO213357 (right). Two spoons with the stamp 'London' on the back, found in the levelling layer SD20146, G636. Museum of Copenhagen

Fig. 155 FO213530. A small glass bottle found in the levelling layer SD20146, G636. The remains within the base of the bottle could be the bottle stopper. Museum of Copenhagen

Conclusion

The final phase of harbour redevelopment was characterised by the deconstruction of the Phase 5 timber bulwark and the construction of a substantial harbourfront in stone which maintained the form of the Phase 5 harbour with *fiskegang*. This was part a programme of general improvement of the harbourfront and continued on from the rebuilding of Højbro Bridge just to the east. The use of stone demonstrated a willingness to invest in the area rather than using cheaper wood, and may also have been seen as more cost-effective in the long term by mitigating the requirement for replacing a decayed structure every fifty or so years. Economy in design can also be seen through the re-use of some of the stretchers from the Phase 5 land ties to the east of site. The rebuilding not only made the design of the harbourside uniform along its entire length, but also did not allow for further expansion, possibly preventing the channel between Gammel Strand and Christiansborg from becoming too narrow.

The subsequent interventions identified in the harbour side all related to larger infrastructure development such as the installation of street lights and the large gas mains, rather than to the specific use of the harbour, although it can be inferred from the necessity for street lights that this area was a main public space. The artefacts recovered from this phase were mostly re-deposited from earlier phases, and as such do not contribute much to the understanding of the life in the city or use of the harbour at this time.

The finds and natural science work undertaken for Phase 6 was small in quantity due to the overall prioritisation strategy on Gammel Strand. What was analysed point to a collection of redeposited material from the 18th Century with some contemporary finds within 19th and 20th Century deposits. The finds were most prevalent from backfill group G543 and various other modern interventions and truncations linked to the early 20th Century service pipes into earlier Post-medieval layers. This may explain the recovery of even some Late Medieval finds and Post-medieval artefacts from Phase 6.

The Gammel Strand themes

Introduction

The aim of this chapter is to summarise the results from the phases into various themes. These themes will be organised into sub-chapters and link with the other Metro Cityring excavations and are also stand-alone discussions on the excavation themselves. For Gammel Strand the sub-chapters will focus on four areas; the buildings of Gammel Strand, Gammel Strand as a boundary, trade and the fisher wives of Copenhagen.

The first theme will focus on the buildings of Gammel Strand, where the archaeological remains of the structures will be discussed in more detail with the known buildings in the area and using both historical records and maps and plans. The first theme section will focus on the boundary theme of Gammel Strand. It will involve a discussion the southern maritime boundary of Copenhagen, how the area was created, functioned, and the lives of the inhabitants in regards to the artefactual evidence and natural science remains.

Representing the networks and connections results will be the sub-chapter on trade. This will look at the process of trade, diffusion of ideas and networking by analysing the provenance of artefacts, types of artefacts traded, and seeing how this process changes over time. The artefacts will be discussed relating to important events in Denmark and outside of Denmark.

The final sub chapter, the fisher wives, will discuss the origin of the harbour as a fisher port, and how the harbour developed into the fishing harbour that became so popular on Gammel Strand in the 19th and early 20th Centuries.

The buildings at Gammel Strand

As described in the chronological chapters above, a number of building remains were found during the Gammel Strand excavations. As part of the work of interpreting and identifying these remains, the relevant historical maps of the area were assessed and used. Some buildings are seen on the maps dating back to around 1600, and written sources provide plenty of information regarding buildings and houses in the area. The challenge is, however, to identify the mentioned buildings on the maps and *vice versa*, as mapped buildings are not always mentioned in written sources, and mentioned buildings are not always mapped – and of course both source types need to be treated with caution.

In the following, a wide selection of relevant maps and sources for identifying the buildings and other physical remains at Gammel Strand are presented. The excavated drains and sewers can in some instances be linked to the building plots north of the excavation area, which will also be touched upon and finally information on the people working and living in the area is presented.

Relevant maps and sources

A number of historical maps are relevant for the description of the topographical development of Gammel Strand during the Renaissance and later periods. Unfortunately no contemporary maps of Medieval Copenhagen exists, but it is often assumed that the map from around AD 1600 gives an impression of the city at least in terms of streets, churches and limitation/fortification during the later Medieval period as well. Further knowledge about Medieval Copenhagen and the Copenhageners can be obtained from the preserved written sources as well as from the archaeological excavations undertaken in recent years.

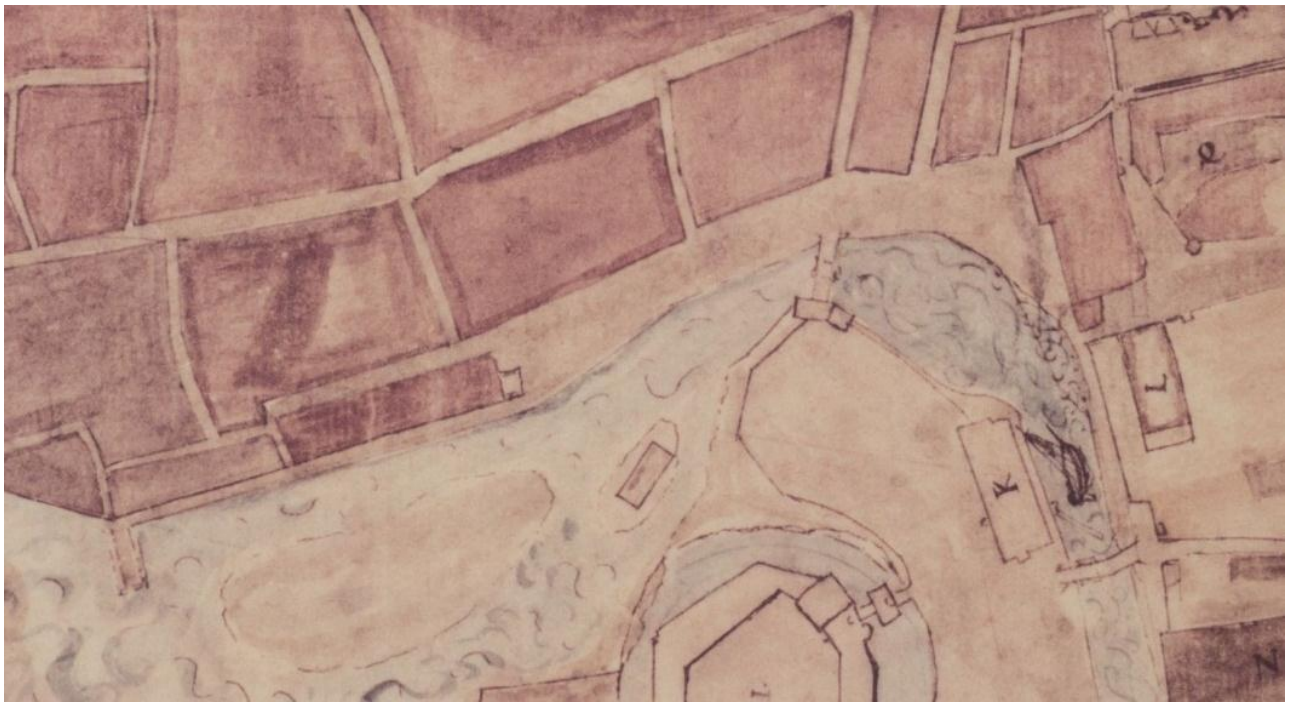


Fig. 156 Section of the earliest map of Copenhagen (cropped and turned) showing the Gammel Strand area. North is almost upwards. Original at the Royal Library

The earliest map depicting Copenhagen is from the years around AD 1600 (based on knowledge of when certain depicted buildings were erected) and the producer of the map and the intensions for making it are unknown. The map shows the main outline of the city with fortifications, streets, churches and few other public buildings. For Gammel Strand, however, only one, rectangular building is shown in the westernmost end of the area (with no signature) and there are no details on bulwarks or bridge structures. The areas around the city are drawn as fields and gardens and the coastal areas – with a different outline than today – are not shown in great detail.

Peder Hansen Resen's Map from 1674 is a depiction of both the older and newer parts of Copenhagen. Whereas the latter is not depicted very accurately, with a number of never-realised plans of buildings, it is believed that the former, the older parts of the city, are shown as a more accurate depiction of the outline of streets and buildings – though the buildings themselves are merely signatures than realistic depictions. In the Gammel Strand area, both street names and certain buildings can be identified in the legend, which is written in German. The original of Resen's 1674 map are part of the Resen's *Atlas Danicus*, a collection of copper engravings, kept by the Danish Royal Library and published in part by I. R. Kejlbo in 1974.

Fig. 157 Resen's map of Copenhagen, 1674. This section showing the Gammel Strand Area. North is downwards. The Danish Royal Library, Kejlbo 1974

A document from 1683, depicting and describing plans for changing certain structures at what is now the Gammel Strand square is stored at the Copenhagen City archives (*Stadsarkivet*). The map includes a lot of interesting information about current and future lay out of the area and seems to be issued and signed by the King, Christian the 5th. The text at the top of the map outlines the plans for creating a street in the alignment of Naboløs, running towards the Canal. This would in 1683 require the tearing down of slaughter booths and other buildings in the westernmost end of nowadays Gammel Strand.

The transcribed text is as follows: *"Voris allernaad (iste) villie og befalinger effter denne affridtzning skal imellom Veyer huuset og begyndelsen aff Snaregaden ned til Canalen, gaer een gade, som skal Være atten alen bred tet (tæt) forbi de Vaaninger, som ligger imellom Snarregade og Canalen. Paa dend anden side Ved Veyer huuset bliffver een pladz, lige saa bred og saa lang som Veyer huusets bygninger, som byen beholder at bygge paa, og som er i linie med begge ender aff Veyer huset uden for hvilken pladzes begreb alle Slagterboder og fieleboder skal strax nedbrydis, for at haffde een magelig fart faa husene Ved Stranden, giennem ommeldte nye gade, langs med med Canalen. Vor effter de ved kommende sig aller unded(anigst) haffver at rette skreffe(t) paa Vort Slott Kiøbenhaffn di 7. April 1683. Christian (V)".*

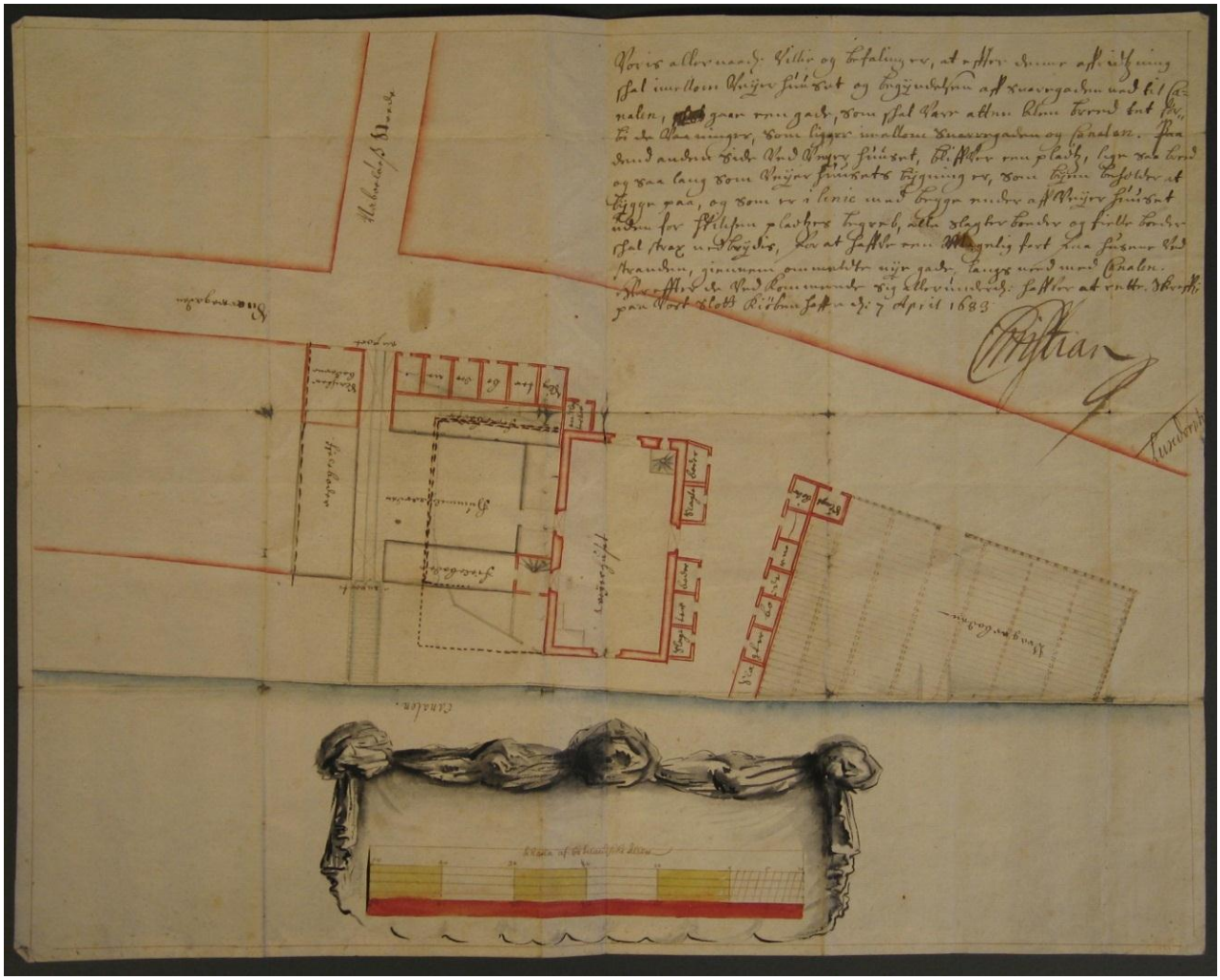


Fig. 158 Map of plans of changing the area of current Gammel Strand in 1683. NW is upwards. Copenhagen City Archive

As a result of the great Copenhagen fire in 1728, Engineer officer Christian Gedde was appointed to draw new maps of the Copenhagen plots and buildings in the 1750's. The maps covered the 12 Kvarterer (different parts) of Copenhagen. Two of these maps are relevant for the Gammel Strand area, as the buildings on the northern side of what is now the square Gammel Strand in the 1750's were part of Strand Kvarter, whereas the building complex in the western end of the area was part of Snaren's Kvarter. Later (between 1756 and 1806), the area was re-organised and the buildings in the western part were included in Strand Kvarter.

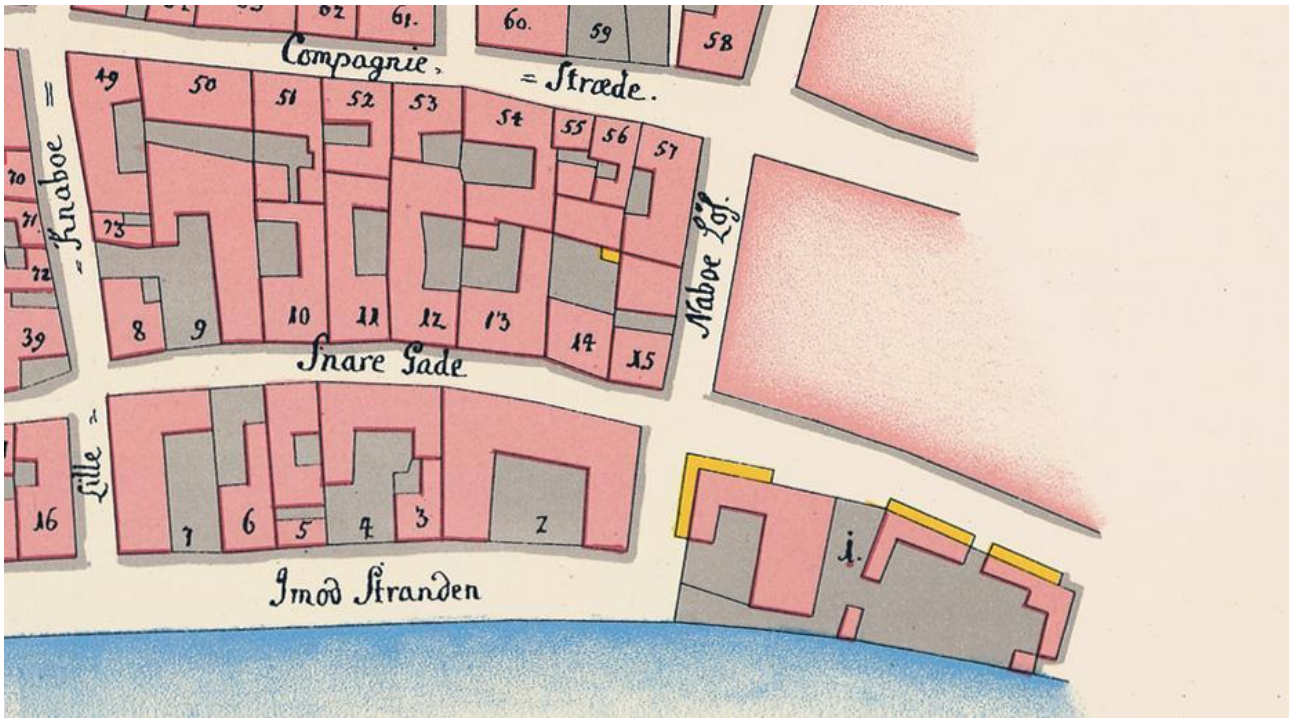


Fig. 159 Section of Gedde's 1757 map of Snaren's Kvarter. North is upwards. Copenhagen City Archive

In 1761 Gedde had his 12 area maps assembled as one big map of Copenhagen. This map is known as Gedde's elevated map as the buildings were depicted more or less three dimensionally. However, even though the map was made very carefully and accurately there are certain bias' – for instance, some of the buildings are "turned around" to show their facades in stead of their rear sides. It is not clear how accurately the map depicts the single buildings in the Gammel Strand area, but it appears certain that the buildings indicated would have been present in 1761. Both Gedde's Kvarter maps of 1750's and the elevated maps are stored at Copenhagen City Archives (Stadsarkivet), but can be accessed online: http://www.kbharkiv.dk/udforsk/kobenhavn-1761 (accessed October 25th 2016).

The Copenhagen plot registers are valuable sources to the development of the city from late 17th Century and till today. Based on the plot registers are digitized maps made either from contemporary plot maps (e.g. Gedde's maps from the 1750s) or from reconstruction maps, based on the plot descriptions (e.g. Ramsing's work with the 1689 plot registers). The plot register maps can be accessed online, via: http://www.kbharkiv.dk/kbharkiv/collections/matrikelkort/ (accessed October 25th 2016) and to help follow the development of the plots, a thorough database, known as the Copenhagen *Jævnførelsesregister* can also be found online: http://www.kobenhavnshistorie.dk/bog/matrikel/ (accessed October 25th 2016).

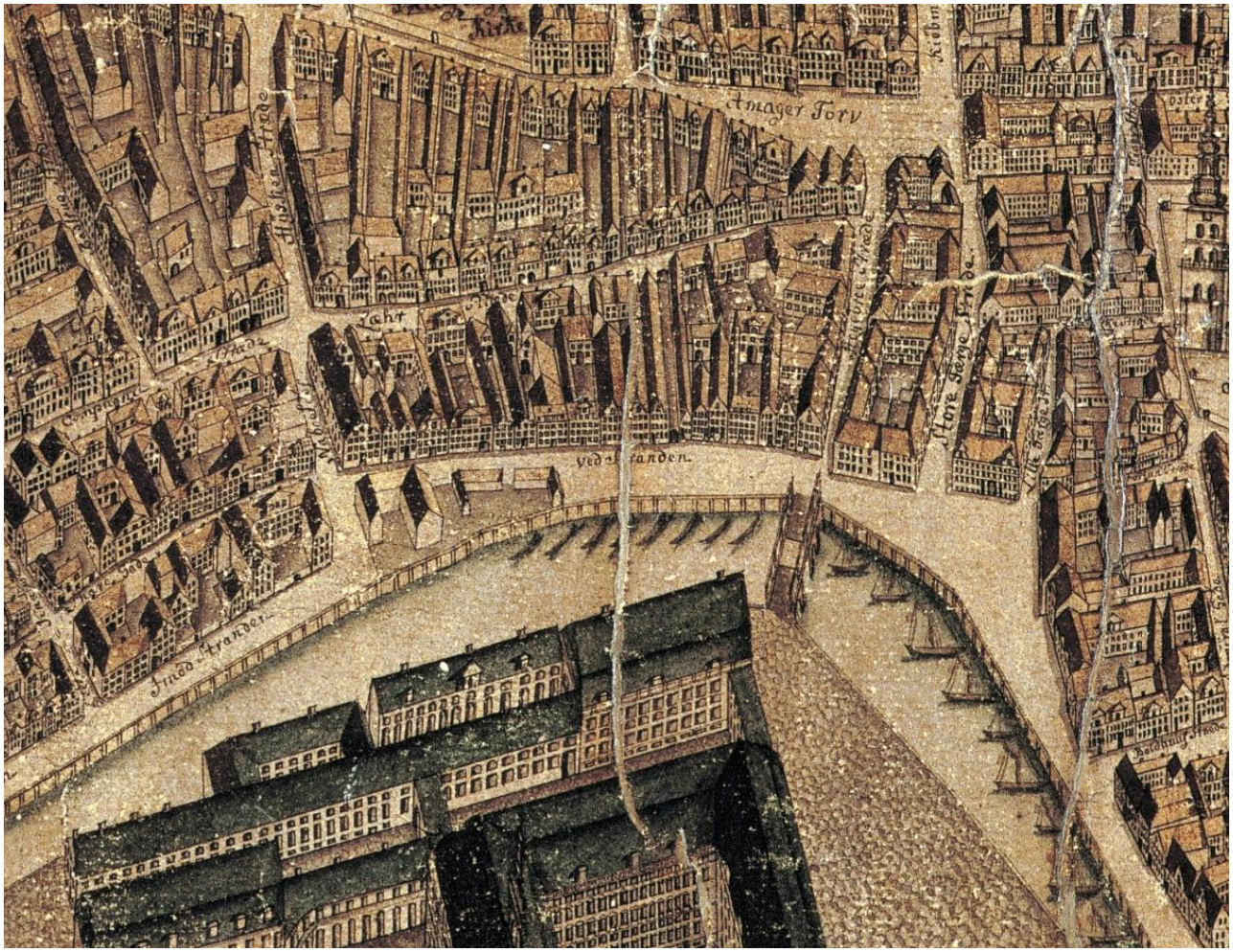


Fig. 160 Gedde's 1761 Elevated map. Section showing the Gammel Strand area. North is upwards. Copenhagen City Archive

Buildings on Gammel Strand

Prior to the 2012-11 excavations at Gammel Strand, some archive work was undertaken, resulting among other things in the finding of a map of structures at Gammel Strand around the middle of the 19th Century. Unfortunately only parts of the map was then photographed, and it was not noted, where the original map was found or if there was other information to support the date deciphered from the scribbles in the lower left corner of it, 1839. It has subsequently not been possible to re-find the map, and of course this has bearing on the source value of it, but it has been included here, as it in many ways provides a missing link between the buildings mentioned in written sources and the layout of the buildings.

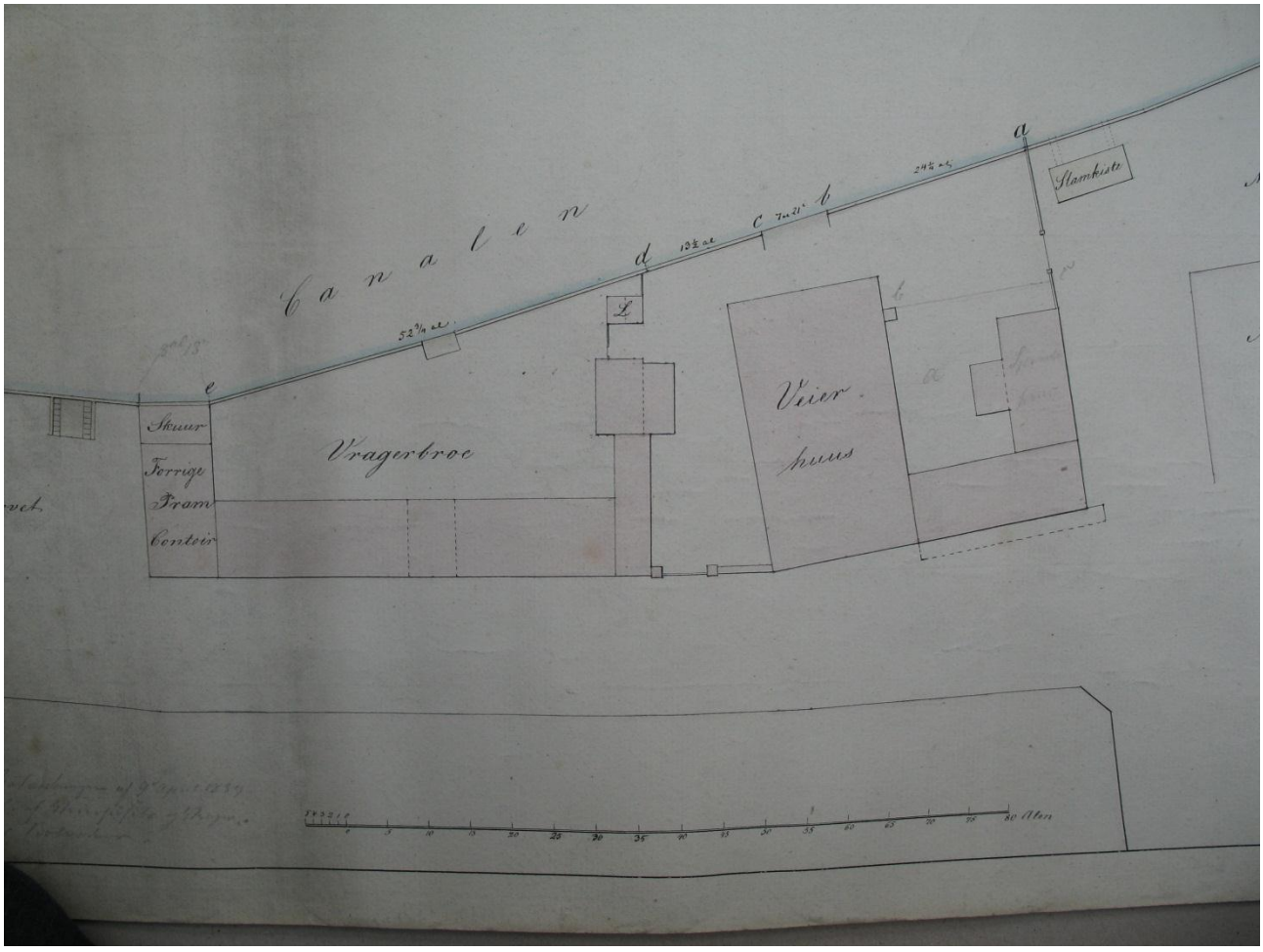


Fig. 161 Map of structures at Gammel Strand, presumably from 1839. SSE is at the top of the plan. Source unknown

The Weight house

Already in 1281, the reason for establishing a weight house was presented in a document from the Bishop, giving the "*Fogeden*" (bailiff) and the town council the authority to establish anything that may benefit the town and the inhabitants – especially in terms of weighing, controlling and price assessment of goods and with special reference to the measurement of German beer, as this had been sold with too much inaccuracy – resulting in loss for the buyers and destruction of the salesmen's souls. This was confirmed in the 1443 town privileges, issued by Christopher of Bavaria, but it is not clear whether such a building actually existed at the time or if it is just planned for. However, at some point a weight house must have

been erected and O. Nielsen stated that the old weight house was situated between present day Kompagnistræde and Snaregade – later Nielsen revised this to be on the southern side of Snaregade, on the corner of Naboløs.

From the early 16th Century onwards the written sources mentioning the weight house are a little more numerous, and indicating where the weight house would have been placed at the time, in that the location of other buildings are related to the location of the weight house in the deeds.

In 1580 the old weight house seems to have fallen in decay, and this among many other issues was complained about by the citizens. In April 1581 the King issued a document – the so-called Fredrik II's *Stadsret* (privileges) – settling the dispute between the Magistrate and the citizens. In this, the weight house was to be rebuilt by the mayors and the town council at their expense and the town and the citizens should not be troubled with this. In December 1581 the King declared that the mayors and council were exempted of taxation (*siisefrij*) of 100 "*læster*" (a number of barrels) of Rostocker beer while the rebuilding and mending of the weight house was undertaken.

In the document called "Christopher Valkendorfs credits of the town" it is stated that in 1581, Valkendorf let the beautiful weight house be built on (or into) the beach, "where no one would have thought a house would ever be built" (own translation). The rather odd wording may be seen in the connection with the location of one of the public toilets, *Østre Mag*, (the eastern latrine) which allegedly was placed near Hyskenstræde and even given the name to this street. As the new weight house was built at the end of Naboløs, the later name for the southern part of Hyskenstræde, it may have been placed where a former latrine was and thus where no one would have expected it to be built.

On the earliest map of Copenhagen only one building like signature is depicted and there is nothing written to indicate which building it is representing. However, it seems reasonable to assume that the mapped building is the Weight house from the late 1500's, though depicted more square in plan than it was in reality. On Resen's map from 1674, the letter "V" is placed in the street Snaregade, west of Gammel Strand. In the legend this refers to "*die Waage und die neue Fleich-Buden*" (the weight and the new slaughter booths). In correspondence with this, on Gedde's 1757 map of Snaren's Kvarter, plot number 1 is listed as owned by "*Stadens Vejerhus med Slagterboderne og Pramlaugets Hus*" (the Town's Weight House with the slaughter booths and the Bargemen's Guild house).

The exact location of the late 16th Century Weight house is well known as the building existed until 1857, when it was torn down along with all other buildings in what is now the square Gammel Strand. The Weight house was placed in the western end of today's Gammel Strand square, south of current Gammel Strand 50. The building was a stout, brick built house with three floors and an attic, as seen from a Daguerreotype photo from 1840.

Vragerbro/Vragerbod

Occasionally the term "*Vragerbod*" or "*Vragerbro*" is mentioned in the written sources. The "*vrager*" or "*wrager*" is an old Danish term used for a person who did quality assessment of trading goods (internet source: http://ordnet.dk/ods/ordbog?query=Vrager, assessed August 10th 2016).

On Resen's 1674 map, the letter "X" seems to be surrounded on three sides by a structure or fence and is placed east of the Weight house. In the legend to the map "X" refers to "*Waage-Brücke*", which could be

directly translated to “weight-bridge”, but must be identical to what is labelled Wragerboden on the map from 1683. Here, a rhomboid area is limited on the western side by slaughter booths and judging from the sketch-like drawing, it could consist mainly of a timber platform. On Gedde’s maps from 1757 and 1761 an area of the same shape and size seems delineated by buildings, but there are no references to Vragerbro on these. On the above mentioned map, presumably from 1839, the area between the buildings east of the weight house is labelled “Vragerbroe”, indicating that it was an open space, delineated by buildings.

In 1635 The King Chr 4th hired a hop “*vrager*” to assess the hop. It is not clear whether this refers to hop imported into Copenhagen or if is was grown either in the town or near by, and neither is it clear if this was in any way related to the Vragerbro or if it took place somewhere else.

In a document from 1581, listing properties in Copenhagen, a number of additions seem to have been made in 1656. Among these, *Wragerbroen* is mentioned as placed east of the weight house. If the date of the note is correct, this is the earliest mentioning of *Vragerbroen* on what is now Gammel Strand.

In a document from 1689, instructions for what a new *vrager* must do were described. The instructions indicate a highly specialized work area with advanced division of labour in the harbour. The *vrager* was responsible for the quality assessment of the goods that came in (all kinds of salted fish, salted meat, as well as train oil and tar) – and he had to make sure that no non-quality proofed goods were offered for sale. Only goods which were already taxed were to be proofed. Along with the *vrager*, two coopers worked with packing the goods after the quality had been checked. The goods were put onto the *Vragerbro* using a *Vippe* (probably a crane) operated by two workers. Four carrier men took turns, two at the time, to work with the goods, while the other two were to guard the *Vragerbro* area. If any merchant violated the rules, his goods would be assigned to *Børnehuset*, which was an orphanage and later a jail house. The quality assessment was in many ways a strongly rationalized, public task related to the protection of legal rights of both buyers and sellers.

It is not very clear which type of structure this *Vragerbro* would have been, but it seems probable that it was at least partly timber built as it seemed to stretch all the way out to the harbourfront and was possibly interlinked with the bulwark. In some of the maps the area seems to have been delineated by buildings on three sides, but it is not clear from the sources, if these buildings would have been related directly – physically as well as functionally – to the *Vragerbro* area, or if they would have served other purposes as slaughter booths etc.

Pramlaugets Hus – The Bargemen’s Guild House

A structure referred to as *Pramlaugets Hus*/*Kontor* (The Bargemen’s Guild house or Office) seems to have been present at Gammel Strand, at least from the middle of the 18th Century, when Gedde drew his map of Snarens Kvarter. The building is not depicted on the 1683 map and in the plot correspondence registers (*Københavnske Jævnførelsesregistre*), the Bargemen’s Guild house is not mentioned in 1689, but it is in 1756. At this point the plot (the large plot number 1 in Snarens Kvarter) is listed as owned by the Weight house, the Slaughter booths and the Bargemen’s Guild House. Later (but before 1806) the plot was split into several plots, where number 1A of Snarens Kvarter is listed as owned by the Bargemen’s Guild, but unfortunately we have no maps depicting which of the buildings this is. In 1806 the plots were re-organized and the former plots 1A-1D in Snarens Kvarter were now divided into plots 55-60 in Strand Kvarter (though

on the digital plot register map the whole complex is still seen as one, plot number 55). *Pramlaugets Hus* was by then plot 55.

From the written sources, it is a little difficult to identify the Bargemen's Guild house. In 1783 N. Jonge, a contemporary writer, described the *Pramlavets Contoir* as a small one storey building placed at the western end of the fish market, across the pavement next to the Gammel Strand Canal. From the probable 1839 map, the "former Barge office" (*Forrige Pram-Contoir*) seems to be the easternmost of the buildings in the complex at the western end of Gammel Strand – and the building depicted in the foreground to the right on the painting from around 1820 and the Daguerreotype from 1840. This was in other sources (tax assessments, see below) from the early 19th Century described as belonging to *det ophævede Pram- og Steenfører Laug* (the former/dissolved Barge- and Stone transport Guild):

Twice, in 1811 and again in 1822 the building and its outhouses were assessed and valuated (records in the Copenhagen city archive, *Stadsarkivet, Vurderinger til prioritetsefterretninger, Strand 46-55*). In both instances the building was described as consisting of a basement, a first and a second floor and a floor under the roof. The building was brick built and the width of the building was five bays towards the square (meaning east) and two bays towards the street (meaning north). As the width of the bays was not recorded, it can only be estimated that the building would probably have been approximately 4 by 10 m. In the basement level there was a brick floor (in the 1822 source called S*teengulve,* stone floors, which can probably mean either a brick floor or a stone floor) and both a bilægger-ovn (a type of oven/stove), a kitchen with an open chimney as well as a two level wind oven with pipe (*to etagers vind ovn med rør/tromle*) – the latter probably the same as also mentioned on the first and second floor. In the descriptions are also some outhouses, but nothing is described as the annex with the rounded roof as seen on the southern side of the building on the picture from 1840 and on the painting from around 1820. It is possible, however, that it is identical to the building described just as a small yard room with cobblestones.

In Villads Christensen's accounts of the city 1840-1857, written in 1912, what must be the same building is referred to as built by a huckster named Seith in 1823 after being granted Royal permission to build in this area (source not found) and in the middle of the 19th Century owned by a bar keeper named Hansen. However, it seems more probable that Seith was given permission to rebuild an existing building and did not build a completely new one.

From the discrepancies of the descriptions, it is possible, that there would have been two different buildings owned by the Bargemen's Guild – or that the one, Jonge mentioned in 1783, would have been later rebuilt into the structure seen on the 19th Century photos.

Other buildings on and near Gammel Strand

The row of houses along the northern side of the square Gammel Strand was spared by the fire in 1728, but was unfortunately ruined by the other great fire in 1795. According to H. Fabricius (2006), the buildings on Gammel Strand were during the Medieval and Renaissance periods large merchants' and noblemen's estates, and though the houses were located right next to the harbour, the maritime professions do not appear on the lists of who lived in these buildings. Such people working with rope-making and other maritime related crafts, ships clerks, skippers etc. primarily lived in the streets leading towards the harbour. At Gammel Strand there were however public houses and bars also.

In O. Nielsen's synthesis over the history of Copenhagen 1536-1660, it is mentioned that the old weight house (see above) was turned into a "humlegaard" (a hop farm?), where probably the imported hop would have been quality assessed. In the Grundtaxt from 1668, the Weight house by the hop garten (?) is mentioned and value estimated 400 rdl. Likewise in a document from 1581 with notes added in 1656, "*Hommelgaarden*" (the hop farm?) is mentioned, but it is not clear if it is a building or merely an area, where the former weight house was once situated. In the map from 1683, an area called "Humlegaarden" is depicted just west of the later weight house. According to the map, this was to be torn down to make room for a broad street or space leading from the Naboløs street to the Canal.

On Resen's 1674 map there seems to be a signature just north of the Weight house – this is either something to indicate a large gate with wheel tracks – or could it be "ll" (two small L's) which in the legend refers to "the old East-India house". In a deed from 1627, the King, Christian the 4th, conveyed a building to the East India Company. It was indicated that the company already owned another building next to this and they were placed at Ved Stranden. Together these two must have been of considerable size – when the King sold his part to one of the directors of the company, Roland Crappe, in 1639, this part of the building was described as being 50 alen (=100 feet) wide towards the harbour. It is not clear exactly which of the buildings on Gammel Strand this covered, as the plots were changed since then, but it was in the western end of the area, on either the eastern or the western side of current Gammel Strand 48.

Booths for selling salt, fish and meat are mentioned several times in the written sources, but it is not very clear where these would have been situated, or what types of buildings they were. A document from 1609 witnesses that a lot of illegal booths, sheds and other light structures had started to crowd the streets of Copenhagen. At Gammel Strand (called Ved Stranden in Snarens Kvarter), drinking booths, cellar/basement booths and other booths are mentioned, but the exact location is not given. It seems probable, however, that these would have been erected along the facades of the houses on the northern side of todays square. In 1683 it seems to have been prohibited to build timber sheds near the streets and squares – the buildings should have masonry outer walls. According to the above mentioned map from 1683 with orders from king Christian the 5th, a number of wooden booths (*fjelleboder*) and slaughter booths were to be removed to fulfil the plans of making a wide street leading towards the harbour west of the weight house. On the eastern side of the weight house, slaughter booths are mapped, as well as delimiting the western side of the *Vragerbro*-area. On Gedde's 1757 map of Snarens Kvarter, the yellow markings seem to indicate wooden booths, placed on the northern and western side of the weight house and Vragerbro complex.

As part of the Weight house complex a *sprøjtehus* (engine house) is mentioned to have been built to contain material for fire fighting. It is not clear when the engine house itself was built, but by 1792 it must have been supplemented by a *brandskur* as well as a *vandskur* (sheds for fire equipment). From the possible 1839 map the engine house seems to be placed on the western side of the weight house, which is supported by the description of the city's fire fighting equipment in a publication from 1835 describing the location as "by the weight house in the wall towards Assistenshuset".

West of the excavation area, in Nybrogade 2, a large building, known as *Assistenshuset* has since 1962 housed the Danish Ministry of Culture. The building was originally a three winged structure, built in 1729-30 after the large fire in 1728 had demolished this part of the area (though sparing the weight house and Bargemen's Guild house). The building was bought in 1757 by the *Assistenshuset* (by then a Royal

institution for privileges functioning as a pawnbroker) and the fourth wing towards the canal was built in 1765.

Drains and sewers

As seen in the outline of the chronological phases of the development of Gammel Strand, a large number of drains, culverts and sewers were found to lead into the canal from somewhere beyond the northern limits of the excavation. The earliest drains found at Gammel Strand were already functioning during Phase 2 of the harbour area, while the vast majority of the drains, culverts and sewers appear to have been constructed and used during Phase 4. A few later structures were also found to be constructed and used in Phase 5.

Using the direction of the drain pipes, they can in most cases be linked to the building plots north of the excavation. By doing so, the drains and thus the waste can even be linked to the people owning and living in these buildings in the 18th and 19th Century, when cross references to the plot registers are made.

An example is the drain, G708 in the western end of the excavation, mentioned in the Phase 4 chapter above. The dendrochronological analysis revealed that this drain was built after 1750 – and possibly even after 1778 as it was placed above foundations with dendrochronological dates to 1778. This was supported by the finds of a clay pipe made in 1753-55 in the fill inside the drain pipe. The direction of the drain points towards the eastern side of the building which today is Gammel Strand 44. The current building was built in 1797 (and rebuilt in 1855 and 1930), but before then, the eastern side was registered as plot number 13 in Strand Kvarter. According to *Københavnske jævnførelsesregistre*, this was in 1756 owned by a Jewish man named Amsel Jaob Meyer, and in 1806 by a tradesman named Simon Jacob. Whether any of these people was the direct or indirect link between Gammel Strand and the numerous finds of exotic cowrie shells retrieved from the fill of the drain is not known, but the thought is tempting.

Life on the boundary

The Southern boundary of Copenhagen

Gammel Strand, for many years of its existence was the southern boundary of Copenhagen by sea, but as a harbour it was the boundary to the Sound (*Øresund*), the Baltic, Europe and the world. The boundary location was never constant, it was slowly moving south every 30-100 years, as seen from the either dendrochronological dates of the harbourside or from the historical records.

From the Gammel Strand excavation results, we follow the creation of a new southern boundary containing part of a new harbour and land behind in the 1400s. This process continued, although the boundary has basically stayed the same since 1880 and till today. From the creation of the harbour area of Copenhagen, Gammel Strand forms only part of the boundary, as from the area between *Læderstræde* and Gammel Strand there lies both posts and bulwarks dating from 1200-1400, suggesting the creation of land between those dates. This follows the general trend in European urban harbour regions.

There were at least 6 construction phases (containing possibly two more harbour phases within Phase 1) of Gammel Strand being part of the southern boundary of Copenhagen. Whilst the boundaries around Copenhagen has been suggested as being fixed in the north, west and east, protected and enclosed by a physical defensive boundary from the 1200s to the early 1600s, only the southern area could have been expanded. This was seen with an expansion southwards, and the incorporation of *Bremerholm* (then *Gammelholm*) and *Slotsholmen* into the south east side of the city during the 1500s. This process was followed by the establishment of *Christianshavn* in the early 1600s.

The ferry point

The ferry area was located east of Gammel Strand, and east of the Højbro (High Bridge). The street named Ferry Street or *Færgestræde* was first mentioned in the written sources from the 1400s. H. Fabricius writes that in 1526, *Færgebrøen* (the Ferry Bridge) was first recorded as the ferry point to Scania and Amager. This was the local and regional ferry point with the bridge or pier for the ferries. The area became a storage area, ropewalk and ship building area in the late 1500s, so the ferry point may have moved elsewhere. Where the ships for longer voyages would have been stationed is not known, but is probable that they would have paid for passage on merchant ships that would have been unloading around Gammel Strand and the surrounding areas.

Economic boundary

Gammel Strand was part of the economic boundary of Copenhagen. From the mid 1400s until the mid 1600s, Gammel Strand comprised a weighing house (*Vejerhus*), customs and excise house (*Accisehus* – from the 1580s incorporated into the new weighing house) and later also the Vragerbro (quality assessment area) and Bargemen's Guild house (*Pramlaugets hus*). Presumably, but still to be researched, the toll house (placed opposite Gammel Strand, on *Slotsholmen*) dealt with tax on ships using the harbour, and then the weighing house was used with taxing goods and *Accisehus* specifically with wine and beer. The bargemen or ferrymen were used with guiding ships and transporting goods around via the harbour.

Living near the boundary

The buildings that were exposed during the excavations appear to have been primarily administrative buildings, linked to different functions of the harbour. Thus, they were probably not fully inhabited. In contrast to this, the buildings along the north side of today's Gammel Strand, were owned by privately. From written sources it appears that mostly wealthy people owned and inhabited these buildings. People with professions linked to the harbour probably lived in the streets north and west of the Gammel Strand area itself.

Examples of the people owning houses at Gammel Strand in the 17th and 18th Century can be retrieved from the plot registers and by using the *Københavnske Jævnførelsesregistre*. Among these is Mayor Bartholomæus Jensen, who owned plot number 1 in Strand Kvarter (now Gammel Strand 22) in 1689. The same building was in 1756 owned by *vintapper* (wine bottler/bar owner) Johan Mathias Rose. Plot nr. 3, which is today Gammel Strand 26, was in 1689 owned by an English shoemaker named Johan Reinholt, while the building in 1756 was owned by a man surnamed Duus, who is registered as *Vejermester* – the weight master. A wine salesman, Henrik Verner, owned the neighbouring house, Strand Kvarter plot nr 4 in 1689, while in 1756 this was owned by a barber called Christopher Baltzer. What is today Gammel Strand 34 was earlier split into two plots, Strand Kvarter plot nr. 7 and 8, which in 1689 was owned by skipper Christen Morgensen and merchant Claus Reimer, respectively. By 1756 the two plots had been turned into one and were owned by the hat maker Jacob Lyders. Current Gammel Strand 38 was in 1689 owned by barber master, Christian Franch, in 1756 by glass merchant called Meer and in 1806 by a copper smith named Christian Petersen. Another *vintapper,* Evert Funch, owned plot number 10 in 1689, which is today the Gammel Strand 40. In 1756 this had been taken over by the Royal engraver (David?) Aron Jacobsen, who rebuilt the house in 1799-1800. Plot number 11, which is today's Gammel Strand 42, was in 1689 owned Rudolf Boldevin, who was the king's furrier. In 1756 the building was owned by a Thomas Morville and in 1806 by a so-called *urtekræmmer* (selling vegetables, pharmaceuticals etc.), S. M. Salomonsen.

Of course the owners of the buildings would not have lived there alone – they would have had households, which would have included maids and possibly even tenants living in the houses as well. Further study into the wide array of preserved written sources from the 17th to 19th Century – e.g. inventories and insurance documents would provide a greater level of detail and a link between the archaeological findings and the past.

The usage layers recorded in front of the different harbourfronts or bulwarks are believed to reflect the activities in the immediate surroundings of the area – the occasional dropping of personal belongings or goods into the harbour along with sand from the barges as well as the illegal, yet deliberate, dumping of garbage and other un-wanted material into the water.

However, the large amounts of waste retrieved from the land reclamation material in the harbour reflect a much wider population. It is believed that in the Medieval period, and a large part of the Renaissance period, that the finds reflect the inhabitants of the neighbourhood, though the sheer amounts of material dumped into the water as land reclamation may suggest also, that not all the rubbish and other materials came from the immediate vicinity. In the 1600s the appointment of a *Brofoged* (street or bridge bailiff), a position that managed the pavements and the rubbish discarded onto the streets. This may then suggest that the discarding of rubbish became more organised and thus rubbish used to backfill the areas behind

the new harbour constructions may reflect rubbish from all over the city, not just from the neighbourhood of Gammel Strand.

In the following, a selection of artefacts representing different aspects of society is presented.

Personal Identity

Certain artefacts from Gammel Strand help us to understand the former societies in Copenhagen. One such artefact type is clothes, shoes and other artefacts of attire which help us to identify the individual. From Gammel Strand artefacts representing clothes are seen throughout the chronological phases and by analysing the various finds over time we may start to see evidence of fashion. In this short section we will see various examples which will be shown through examples such as copper alloy hoods and leather shoes.

Copper Alloy head dresses

Copper alloy Head dresses are just one part of a large French hood style fashion of the Late Medieval and Early Renaissance period. The style was originally said to have started in France, which had then spread over other parts of Europe. It comprised a single wire head frame of which was attached a scarf or cloth, and then set in place in place by using hundreds of copper alloy pins. The remains of the French hood fashion is usually found in the ground as separate pieces, either as head frame fragments or as copper alloy pins, rarely are either finds type seen with the cloth attached. These type of fashion artefact represents clothing of an elite lady, and would have had needed a few people to create the style of clothing. These artefacts have been found on other excavations at Kongens Nytorv and Rådhuspladsen, and would have been the style of choice for high status women through out Europe.

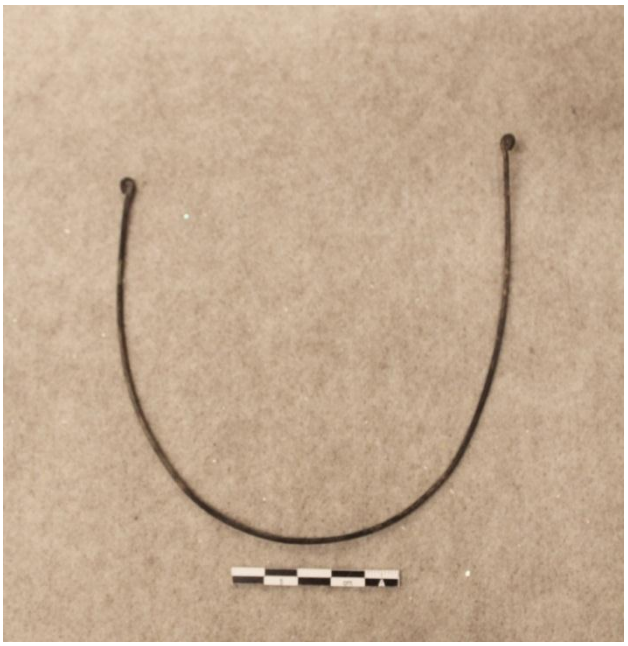


Fig. 162 Head dress FO215337. SD37640, G663. Phase 3. Museum of Copenhagen

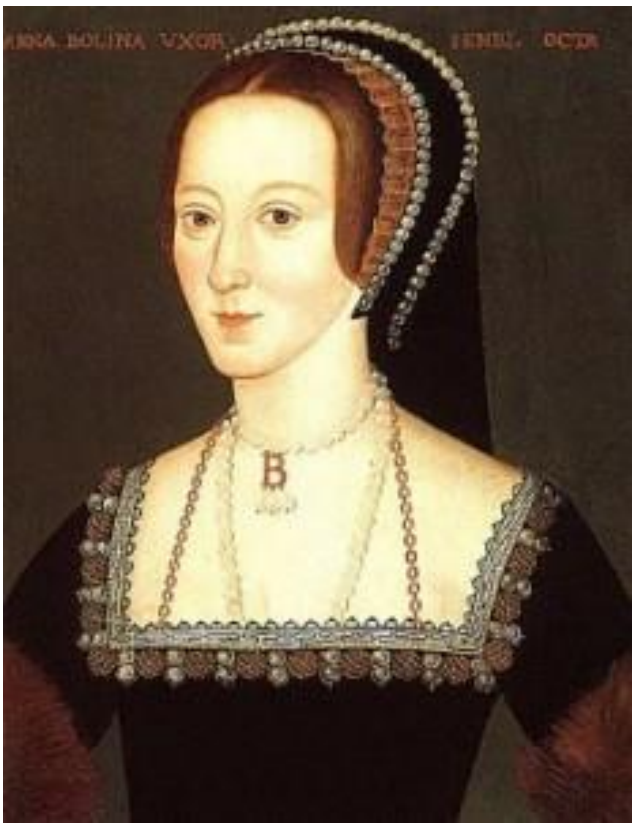


Fig. 163 Queen of England, Anne Boleyn, wearing a French hood head dress. Source: National Portrait Gallery

Leather shoes

By Vivi Lena Andersen

When finding an object in an archaeological excavation it is not always possible to link the item to an individual person of the past. But when recovering pieces of garments and personal accessories the link is more straightforward. The shoes and mittens from Gammel Strand tell the personal stories of adults and children, men and women, boys and girls.

The shoes found in the excavations in Copenhagen, do not appear to excel in climate adaption. On the contrary, the typical footwear design of for example the 17th century was a high heeled, suede shoe with low cut quarters and decorative holes and cut-outs on the vamp and at the side seams. Vanity becomes more distinct both seen from the development in adornment of the footwear and from the willingness to wear fashionable footwear that caused physical pain. Due to the footwear fashion and shoe construction of especially the 17th and 18th century shoes foot deformities were common. Flat footedness, bunions and hammertoes are deformities Copenhageners lived with at that time according to the wear and alterations on the found shoes. In comparison shoes from the medieval Copenhagen do not show the same level of foot defects. The inventions around 1600 of the high heel and symmetrical and narrow shoe design take the blame for the foot defects in the 17th century and onwards. One had to suffer for the ideal of a small foot and to fit in as a fashionable inhabitant in an urban environment.

Fig. 164 Mule with wear at the one side of the vamp that could be the result of the wearer hyper pronating or a bunion at the root of the big toe, FO218268. Photo: Museum of Copenhagen

A foot deformity can leave traces on the vamp, sole or heel of the shoe. Hammer toe is a deformity that causes your toe to bend or curl downward instead of pointing forward. It usually develops over time due to wearing ill-fitting shoes, e.g. shoes being too tight, narrow or wearing high heels that put pressure on the

front of the foot. These are all elements that are integrated and are an unavoidable part of the 17th century footwear idea, which also provoked bunions.

Flatfoot or hyper pronation is another foot defect that leaves traces on the shoes of the wearer. Former studies show that flat footedness was a very normal defect as it still is today. Some are born with the defect, some develop it through childhood and for others the defect is triggered by the use of improper footwear. Flatfoot was a very normal feature on the majority of the shoes. Flatfoot and bunions can leave a severe wear on the inner side of the shoe´s sole and/or heel, as e.g. seen on the FO218268 (see photo). In order to prevent the shoes from wearing out too fast in this area the Gammel Strand finds show signs of reinforcement features, e.g. repair patches attached with pegs or the area being reinforced with several wooden pegs.

Fig. 165 Man´s shoe from the second half of the 17th century, FO218186. A slit is cut in the middle of the vamp, presumably to make room for a large foot or foot deformity. Photo: Museum of Copenhagen.

FO218186 is an example of a shoe from the second half of the 17th century with a slit cut through the middle of the vamp. This feature is seen on other shoes from Copenhagen and was a way to make room in the too narrow shoes for a large or a damaged foot or foot deformity that could not fit into a normal shoe.

Professions

Many finds from Gammel Strand represent professions of former positions in society. These can be seen from certain tools which denote various craftsmen, rings denoting merchants or even fishing equipment representing fishermen. An example of a profession that can be shown from an artefact is the merchant's ring, which is presented below.

Merchants

The ring (as seen below) represents a merchant, perhaps from Copenhagen, dating from the early 1600s. The role of a merchant appears to have been central in Copenhagen and is even reflected in the name of Copenhagen, Merchant's harbour, recorded in 1188. Merchants were the middlemen in the process of trade, buying and selling goods to consumers, and if wealthy, transporting the goods over seas. The merchant class grew in importance in Copenhagen from the Late Medieval period (as in most European cities) becoming an important level and place of society in-between the elites and the workers, farmers or craftsmen. The role of the merchant in Copenhagen was of great importance as the trade undertaken or sponsored by the merchant class became one of the main catalysts for the development and growth of the city, and the transformation of Copenhagen into becoming a global city. Lead ring FO211653 probably belonged to one such merchant and comprises a merchant's mark stamp. This mark or design would have been used by merchants, artisans or guild members to authenticate and identify them, rather like a trademark today. The merchant ring was probably lost, rather than discarded as it is expected that if it was no longer needed, it would have been melted down. This type of ring was commonly used by owners in the Late Medieval and early Post-medieval/ Renaissance period. An object of this type would be expected in Copenhagen.

Fig. 166 FO211653 Lead ring with Stamp SD44563, G651. Phase 3. Pre-conservation photo. Museum of Copenhagen

The example here is a lead stamp seal ring. The lead ring is fairly well preserved, but slightly distorted in shape. The stamp seal has a reverse depiction of * L * B * followed by a wave, followed by a marker´s mark of two reverse triangle split by a line and flanked by half moons. The motif is set within a circular band.

Status/wealth

Various artefacts within the Gammel Strand assemblage show differences in wealth within the local neighbourhood and the city itself. Good examples includes the gold ring, described below in the Trade sub-chapter, the leather gun holster and leather book binding..

Leather Gun holster

A single gun holster was retrieved from the excavation, representing a former wealthy owner. The gun holster would have formerly been attached to a saddle. Due to the date of the gun holder it is believed to have contained a matchlock gun, (although flintlock guns became available in the 1640s according to Foard 2012, 41). It is not known whether the holster was used for hunting or military use, but the gun holster was linked to the Dragoon type of soldier in this period. The style of this holster, with it being attached to a horse, represents wealth, as horses were expensive to buy and also own. The artefact is produced from only one fragment and it consists of folded-over leather, which is funnel shaped with a rand type seem. The former attachments to the saddle are missing though. The gun holster was retrieved from a deposit thrown into the harbour in the middle of the 17th Century, and due to the anaerobic condition of the soil, it is in a good condition.

Fig. 167 Gun holster FO213540, SD40474, G664. Museum of Copenhagen

Leather book binding

By Vivi Lena Andersen

One book binding was recovered from Gammel Strand. Some book bindings can be found with both back, cover and bark plates intact and some with only a fragment of one side. The book binding from GLS is not intact and has secondary cut marks. Yet it is easy to see, that the size of the book it once covered was quite large (compared to contemporary standards). The other known finds of book bindings from the Metro Cityring excavations are all quite small – possibly hymn books and small bibles. The book binding from GLS is only about ¼ preserved from one side the cover, but the estimated original size tells us it once covered a more extraordinary type of book. Perhaps related to an institution (church, monastery, city hall etc.). Some book bindings are visually simple and plain. The found example from GLS is on the contrary ornate with advanced decoration in a variety of patterns in bands. See picture below.

Fig. 168 Detail of book binding, FO213533. Decorated with a variety of patterns in bands. Museum of Copenhagen

Trade

Within this sub chapter of trade we will discuss trade, diffusion of ideas and networking in the context of Gammel Strand. This discussion will be undertaken with using both the artefactual and natural science results. With the archaeological sequence, believed to start from the 1400s to the present day, and an artefactual sequence starting earlier from the mid-1300s from residual pottery Development over time can be viewed. Change in trade routes and the amount of trade from certain areas can be seen and quantified. This sub chapter will first contain aspects of both the glass and ceramic trade with articles ceramics that delve in a deeper history and knowledge of the artefact type. It will then highlight various finds linked to different periods of trade which represent connections and networks, from which information on a myriad of subjects was spread. It will also include various natural science remains that represent the known and lesser known trade routes as well as work undertaken for provenance.

Trade involving Gammel Strand can be found to have occurred locally (in and around Sjælland and the Oresund), regionally (from different areas of Denmark) and finally internationally. The overall picture of Gammel Strand shows the area contains, as expected, large quantities of finds and a large percentage, in all periods from regional or local production centres. This was seen in many daily life goods. From international areas, various production centres within the location of modern Germany contributed greatly to the overall Gammel Strand finds assemblage from all phases. The next biggest trading partner was the Netherlands which became very important in Phases 2-4 (even though they were a lot of finds in phase 1, from truncated areas, and from phase 5, from residual finds). Other trading areas include England, and to a lesser degree, Scotland, Norway and Sweden. Mediterranean manufactured objects are very small in quantity from ceramic vessels to food remains.

Fig. 169 Global trade as seen in the painting A view of Tranqebar. Tranqebar and the fortress Dansborg. Painted ca. 1650.Skokloster slott, Sverige

Global finds are restricted to Chinese porcelain, cowrie shells from the Indian Ocean, shellfish and turkeys from North America (which should include tobacco but that hasn't survived) and a single ring from South America. Incorporated as well are also the structural items, as where possible, these objects were analysed for provenance, e.g. wood and stone. The pottery has also been provenanced, but by ICP analysis on the clay matrix of the soil. Pottery, like most offer finds are then typologically and stylistically dated.

Finds representing trade and connections

With the rise of the merchants and middle classes in the Late Medieval period, a new type of urban networking was occurring. Through trade, political and marriage, links between urban societies were becoming far more obvious. It is best viewed through luxury goods as these were used to cement ties as well as the contest to obtain the best objects. It can be viewed at Gammel Strand from cloth seals, with cloth imported from Hamburg in Phase 1 and London in Phase 2. It can be seen from glass, with rare vessels from Bohemia, then western Germany in phase 1 with the import of *Façon de Venice* and possible a Venetian vessel itself amongst the imports. Through pottery we have Pingsdorf from central Germany, a rare find, even if it is residual from a later phase context. Ceramics are also upgraded with decorated Siegburg stoneware, then Chinese porcelain, Majolica from Spain and Italy and parts of amphorae containing wine or oil from Portugal. From special finds we have a merchant ring representing the merchant class, a gold emerald ring from Colombia for the extreme wealthy, and the early period clay pipes from the Netherlands representing new elite social hobby of smoking. We have bear skins for fashion along with copper alloy French hoods and French type shoes, and finally in the small example section we have fig seeds from the Mediterranean, which were imported not only for their taste but for their medicinal qualities. These finds represent a small quantity of what remains, and a tiny amount of what was traded. What they do represent is a trading journey sometimes outside of the normal trade route and shows the extra effort needed to obtain certain objects not for functionality but for special reasons. They also represent the scope and contact with the Gammel Strand harbour, and the people living in and around Gammel Strand.

The aim of this sub-chapter is to present certain types of finds and natural sciences that represent trade, and show how they helped to build the new picture of trade and connections, as seen from Gammel Strand.

Ceramics

The ceramic assemblage on Gammel Strand was split between two reports, Medieval pottery dating from 1000-1535, and Post-medieval pottery from 1536-present day. Ceramics are important artefacts as they can be used as a dating tool (by typology, morphology, fabric and style amongst other things) so by comparing the assemblage per context, a relative date may be obtained. The material not only provides evidence of status, fashion, production and technology, but also trade. By analysing the provenance of various ceramics per phase we can observe trade routes, and through quantity, the popularity of trade routes. A picture of trade can then be created, and after comparing the various trade routes we can start understanding how and perhaps why trade routes change over time and then start building up knowledge of networks to and from Copenhagen, and Copenhagen's connections with the regional and global world

As with the natural science remains, the ceramics (along with all the bulk finds) were prioritised with an emphasis on sherds from deposits dating to the Medieval and Early Post-medieval phases. The quantity of

finds that were analysed decreased in the later periods, so, by Phase 6, only a few bags were registered. The non prioritised finds were stored in the archives for future analysis.

Selected below are three difference examples of ceramics portraying provenance as examples of how we have used the material to identify networks and trade routes.

Decorated Westerwald sherd FO218800

A fragment of Westerwald ware is the first example of ceramics and their provenance. The sherd depicts the French King's coat of arms with the three lilies and a profile portrait of a woman dressed in Renaissance dress and headgear. The richly decorated type of jug, a baluster formed jug, was produced in Westerwald, Germany in the first decades of the 17th Century but similar examples from Siegburg also exist. Due to the very light fabric, this may be a Siegburg jug. The sherd shows a Renaissance scene of France with the French style of fashion, which became common all over North and Western Europe. The mould in the depiction was then added onto pottery fired and fashioned in western Germany, and it was then traded to Copenhagen (either directly or indirectly via a transfer of cargo in other harbours. It is probable that it was used by people in the neighborhood of Gammel Strand, and discarded at some point in the 17th Century. It was deposited into the harbour area, along with other small rubbish deposits from the surrounding area in the creation of the late 1600s harbour. The sherd portrays the trade with western Germany, but also the areas' connection with France from the sherd design.

Fig. 170 A fragment of decorated Westerwald ware. FO218800, SD12895, G414. Phase 4. Museum of Copenhagen

High Medieval Flemish ware, FO218601

This small fragment of Flemish ware represents a trade and network connection within the period between the years 1200-1350. This sherd was discarded with other rubbish at the base of the harbour in a deposit that contained both High Medieval and Late Medieval pottery. Although this artefact is earlier than when the harbour base deposits were created, it represents rubbish from an earlier part of the city dumped into the harbour after a development within the city. The importance of the sherd (along with other Flemish ware sherd from the Metro Cityring excavations) is that it represents an earlier trade route that has not been greatly represented before, and helps to recreate former urban connections.

Fig. 171 Flemish ware Neck sherd, FO218601. covered with roller stamp decoration. lead glaze. 1200-1350. SD37646, G647, Phase 1.

Ligurian Faience, FO217281

These two fragments of Ligurian ware represent a trade in luxury items from Northern Italy to Denmark, and perhaps to one of the inhabitants of the Gammel Strand neighbourhood. Within the early to mid 1600s, it has become more obvious within the assemblages of sites in Copenhagen of new trade routes and connections with countries and cities within the Mediterranean. Although the quantity of finds from these regions is small in comparison to other vessels from other cities within Northern Europe it represents a trade of special items to enrich the households of certain individuals within this period. It was within this period that some parts of society was noticeably changing within Copenhagen and from the remains we can see glimpses of how households were competing with luxurious objects, furniture and food to impress visitors to the household and to dinner parties. This find and other similar imported luxurious objects represent this process.

Fig. 172 Liguria, yellow blue plastic ware, faience dating from1600-1650. FO217281 ,SD52177, G601. Phase 4. Museum of Copenhagen

Clay pipes

By Mie Pedersen

Clay pipes are one of the most common Post-medieval finds. The white fragments are easy to spot in the soil, and because they are hard fired clay they are often very well preserved. On the Gammel Strand site there has been collected 8619 fragments weighing about 37 kg. Some 580 fragments are from the Guide Wall Excavation, and those fragments are not as detailed registered as the ones from the Main Excavation. The clay pipes from the Guide Wall Phase are not included in this report.

From Gammel Strand, a total of 272 FO-numbers belongs to the Guide Wall Phase, and the remaining 1860 FO-numbers belongs to the Main Excavation. Not surprisingly, most of the pipes found at Gammel Strand are Dutch, but this site is the first of the major Metro sites to contain pipes from Denmark, Scotland and Germany. A single English pipe was recognized from Rådhuspladsen, but from a Gammel Strand total of 30 pipes has been recognized as being English. The overall dating of all the fragments appears to date to date from the early 1600s up until the early 1900s. Most of the pipes are however, date wise, and clustered around the second half of the 17th Century. There were also two porcelain pipes collected from this site and they are also included in the main report.

Clay pipes are important artefacts as their provenance can be found from historical records helping to show connections and trade routes. This combined with their ability to act as a dating tool from a mixture of morphology (whose styles are dated by a relative typology) and from various stamps known as maker's marks one can attribute either their name or design to clay pipe production sites. By using stratified archaeological layers, it can be seen how trade routes change over time and from quantity, consumption and import from certain areas.

Fig. 173 Jonas type pipes from Gouda, Netherlands, ca. 1640. Left: Green glazed pipe FO215135. Right: Pipes FO213121-23. All from SD37640, G663. Phase 3. Museum of Copenhagen

It is believed that the earliest pipes in Denmark were brought here around 1606. But in fact that year corresponds with a written source with information about an estate in Helsingør (Elsinore) where the owner had a small, well-stocked shop with all sorts of items. The declaration of estate mentions all sorts of goods such as knives, buttons, spices and also tobacco pipes. The year the first pipes were brought to Denmark is still unknown, but it is commonly thought to have been brought to Helsingør by sailors in the late 16th Century. We do not know either when the first pipes came to Copenhagen, but early 17th Century pipes have been found at e.g. Rådhuspladsen (KBM3827) and now at Gammel Strand.

Most of the pipes in Copenhagen are imported, mostly from the Netherlands. Attempts were made to produce pipes locally, but none were very successful.

Around the 1680s-1690s at least three different men were given privileges to start a pipe production in Copenhagen, but there is no information where the factories were placed or for how long they existed. They haven't been proved archaeologically either. But throughout the 18th Century there were several factories, and some of them have been proved archaeologically too. But even though locally made pipes were available we rarely see the pipes in archaeological contexts. Various bans were made to help the sale of these locally made pipes, but they didn't have the desired effect and Dutch pipes were still brought to Copenhagen in large amounts.

As far as is known from written sources and iconographic material (such as paintings) both men and women smoked, perhaps men more than women. The different qualities in the pipes could indicate that a broader selection of smokers had access to the pipes; which means that no matter your social status you would be able to purchase pipes.

On a more fashion-related note there weren't many options to stand out with your pipe. During the 17th and 18th Century the pipes only came in that white fired clay, but you could get your pipe glazed with e.g. a green lead glaze. Not many did that and finds of glazed pipes are rare.

Rings

A total of seven rings of gold, copper alloy and iron and glass were registered and analysed as part of the personal finds assemblage. Two rings were of particular interest for differing reasons. Lead ring FO211653 comprised a merchant's mark stamp and has been discussed already (see Life on the border section).

The final ring is an exquisite artefact, not only for its design and the materials used to craft it, but for the story. The gold and emerald ring FO208396 resembles a similar ring found near Florida in 1622, made from gold and emerald from Colombia. The Gammel Strand ring is believed to have also been made in Columbia as the emerald also comes from emerald mines in Columbia. The ring was found in the backfill layers behind the construction of the new 1690s harbour extension. It is possible that the ring was accidently lost and then thrown in with all the other rubbish. The ring was of 14-18 carat gold with a square setting with an emerald bezel. It is believed that the Columbian provenance for the emerald also contained gold from the same Muzo area mines. It probably dated to the 17th Century and perhaps belonged to one of the inhabitants around Gammel Strand. The ring represents the local elite surrounding Gammel Strand taking advantage of the new period of globalisation where goods were now imported from the Americas, Africa and Asia for the elites. Gammel Strand was the centre of the global harbour of Copenhagen, the biggest and most important harbour in Denmark, dealing with this type of trade.

Fig. 174 Gold ring with emerald bezel FO208396 SD53452, G713. Phase 4. Museum of Copenhagen

Cloth seals

This small assemblage from Gammel Strand comprised 11 lead cloth seals. Cloth seals were attached to the fabric and were used for quality control and taxation purposes from the 13th to the 19th Century. The identified ones are all of foreign provenance representing international trade. Cloth seals were fashioned from lead and stamped with a myriad of designs representing either coat of arms, letters, numbers or symbols for identification of the fabrics quality and origin.

The *Gammel Strand* seals are quite evenly distributed over the chronological phases: one in Phase 1 and 2, two in Phase 3 and 4 and five in Phase 6. However, since most deposits are re-deposited, the true ages of the items are not always obvious.

Lead cloth seal (FO211629)

Lead cloth seal (FO211629) contains a legend containing the town gate comprises three towers motif which probably relates to Hamburg, Germany, and one of the main cities within the Hanseatic League. The reverse has a legend: ..AMBU../...KR.../...AL.../ and perhaps afleur-de-lis? This seal is obviously older than the 20th Century deposit and probable dates to the 16th or 17th Century. The trading network with north west Germany was very popular in the Medieval and early Post-medieval period, even though Denmark had been in a trade and military war with the Hanseatic League for many years of its Medieval and early Post-medieval history.

Fig. 175 Post-medieval cloth seal (FO211629) before conservation. SD20146, G636, Phase 6. Museum of Copenhagen

Lead cloth seal (FO211650)

Lead cloth seal FO211650 consists of only one disc dating to the early 17th Century style seal. The obverse shows a shield of arms with a ridged cross and a sword, and has a surrounding legend: DE: LONDI:NO, depicting the name London with the crest representing the coat of arms of the city of London. The reverse is blank. Similar seals are seen in British Museum, London, are dated 1633 and 1634. The cloth seal represents the network and trade with London, which was also exporting clay tobacco pipes and tobacco to Copenhagen in this period.

Fig. 176 Lead cloth seal from London. FO 211650, SD38150, G664, Phase 3. Museum of Copenhagen

Zoological material representing trade and connections

By the Zoologisk museum, University of Copenhagen

For the excavation, due to the very large quantity of zoological material (perhaps consisting of 500,000 fragments) it was decided that the remains would be heavily prioritised, and a scientific sample was undertaken from the assemblage. The remaining non prioritised material was then given to the Zoologisk museum for future analysis and research. The entire prioritised collection from Gammel Strand was analysed, which included a total number of 47080 fragments equalling 230405 grams (230 kg) of amphibians, crustacean, bird, mammal and fish bones divided among 5 phases from both the Guide Wall excavation and the Main Excavation.

The faunal collection from Gammel Strand included a minimum of 75 species/families of which 39 were fish, 2 were crustacean, 1 was amphibian, 14 were bird and 19 species or families were mammalian. In Number of Identified SPecimens (NISP) fish dominates the collection with 28203 fragments followed by 17904 mammals, 881 bird, 5 amphibian and 87 crustacean fragments, see table 1 for the entire list.

The extremely good preservation of the collection in general can clearly be seen by the presence of bones from the lump sucker, which has bones that are paper-thin and extremely fragile.

Zoological analysis is a very important aspect of the archaeological process. The material not only provides evidence of diet, but the environment, status, fashion, craft working and trade. In this section the trade aspect will be discussed and shown through the remains of the turkey, and from the mollusc section, the cowrie shell and soft shell clam.

Turkey *Meleagris gallopavo*

By Zoologisk Museum

From the excavation, one of the most noteworthy species was perhaps the three bone fragments from a turkey. They include a part of a calvarium and a distal and a proximal part of one or two humeri, both from the left side of the bird. According to historical records, the turkey arrived in Germany in 1530 from the Americas and probably reaches Denmark shortly thereafter. The first written source of its arrival is a letter from 17th of May 1575 where the dean of Herlufsholm, Hans Michelsen, wrote to Christopher Gøye and offered him some turkey chicks.

The first time the turkey is mentioned as part of a menu, is from the royal court in 1648 and hereafter it is commonly found on the menu. The three turkey bones from Gammel Strand were therefore an early find of this bird in a Danish context dating to the 17th Century. They probably represent the remains of a consumed turkey from the neighbourhood properties which were then discarded as rubbish. Within this period, it is presumed that turkeys were a more luxurious food item on the menu, so it is presumed it may relate to the surrounding area which comprised wealthy inhabitants.

The Brown bear *Ursus arctos*

Of particular interest from Gammel Strand was the rare find of six phalanges from brown bear (Fig. 180). The zoologists suggest that the elements along with the two cut-marks indicates that the brown bear

remains made their way into the archaeological record as the remains of a bear skin and not as a food item, or a by-product of the skinning and butchering process.

The six bones all belong to the extremities, specifically one of the paws. Although brown bear was naturally found in Denmark into the postglacial period, the last confirmed finds of this species belong to around 2500 BCE. It is therefore highly probable that this bear was imported, and, based on the distribution of bones; it is likely that it was imported as a skin and not as a complete and living animal. The use of the bear skin is not known, it may have been used as ostentatious decoration of an internal room of a building or perhaps clothing. At some point in the early to mid 1600s it was discarded, along with urban waste into deposits as part of the land reclamation of the late 1620s western harbour extension in Phase 3.

Fig. 177 Photo of 2 Phalanges III, 2 phalanges II and 2 phalanges I from brown bear animal remains. G640, Phase 3. Photo by Zoologisk museum

The money cowrie- *Cypraea moneta*

By Sven Visby Funder

Migration and invasion of animals and plants into areas where they are not wanted is on a Global scale a major threat to biodiversity and economy, and great efforts have gone into studying the immigration history of invasive organisms (e.g. Convention on Biological Diversity 2016). One of the species in the Gammel Strand collection is considered to be invasive to Europe, the soft-shell clam (*Mya arenaria*).This is an old invader, *i.e*. it arrived several hundred years ago, and now have consolidated its' place in the ecosystems where they both have become dominant in their respective habitats – sandy and muddy bottoms in the littoral zone (soft-shell clam). Their history of expansion in 19th and 20th Centuries is well

known, but the time of arrival in Europe is still a matter of discussion and of interest for understanding the mechanisms behind invasions. Recently DNA studies performed on shells of the specie have shed some light on origin and transport route, but their time of arrival is not well established[1].

The spread of cowrie-economy and its consequences for international trade has been described in detail by Hogendorn & Johnson[2]. The Maldive cultivation of money cowrie goes back over Centuries, or even millennia and the small shells from the Maldives have been used as petty cash for trading, first in areas around the Bay of Bengal, later in all of India, and via the Silk Road in northern China, then, via Southeast Asia, in southern China[3].

Expansion of the trade into Africa goes back maybe for millennia, and the Maldive cowries were used both as currency and adornment in the West African Mali Empire at least as far back as the 11th Century, transported by Arabian merchants and slave dealers after arduous and costly travelling. They were also known both to Romans and Carthaginians, but the European involvement in cowrie trade began in the late 15th Century when Portuguese sea-farers met cowries both as currency in *North* Africa and at their place of origin in The Bay of Bengal. They soon realised that large profits could be earned by transporting the cowries in ocean-going ships and putting them up for auction among Africa-traders in Lisbon. As ballast the small shells rode on a free ticket, because they did not take up precious space in the hold, serving a practical purpose at the same time.

By mid-17th Century the Portuguese were ousted from the Indian trade by Dutch and English trading companies, and the cowries were now landed and put up for sale in Amsterdam and London instead. Here they became closely associated with the European and later also American slave trade, which reached a zenith in the late 18th Century before it was generally abolished in the early 1800s. The annual import of cowries to markets in London and Amsterdam amounted to c. 200 t - or c. 45 million shells.

In spite of attempts first by the Portuguese, and later by the Dutch and English companies to take control of the trade by subjugating the Maldives, the sultans there somehow managed to repel the attacks, and remain in control of the production and transport away from the islands. The cowries were landed in markets on the Bengal coast, and here the European merchants obtained most of the cowries bound for Europe – and eventually Africa.

The cowries at Gammel Strand probably came from this source, and were obtained in Amsterdam or London, although some cowries were traded directly at Trankebar[4]. The cowries at Gammel Strand therefore signal Denmark's entry into colonial and slave trade, and they were an obligatory part of the load in every slave ship that was sent out from Copenhagen, bound for the colonies on the African Gold Coast.

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[1] Cross, M.E., Bradley, C.R., Cross, T.F., Culloty, S., Lynch, S. & McGinnity, P. O'Riordan1, Vartia, S., Prodöhl, P.A. 2016. Genetic evidence supports recolonisation by *Mya arenaria* of western Europe from North AmericaMarine Ecology Progress Series. 549, 99–112.; Lasota, R., Pierscieniak, K., Garcia, P., Simon-Bouhet, B., Wolowicz, M., 2016. Large-scale mitochondrial COI gene sequence variability reflects the complex colonization history of the invasive soft-shell clam*, Mya arenaria* (L.) (Bivalvia), Estuarine, Coastal and Shelf Science, doi: 10.1016/j.ecss.2016.08.033

[2] Hogendorn, J. & Johnson, M. 1986: The Shell Money of the Slave Trade. Cambridge University Press: Cambridge, 230 pp

[3] Yang, B. 2011: The Rise and Fall of Cowrie Shells: The Asian Story. Journal of World History 22, 1-25.

[4] Same as (2)

The need for Maldive cowries in Copenhagen would therefore have been proportional to the number of ships setting out on the Triangular route and the number of slaves that were bought on the Gold Coast.

Fig. 178 "Small Maldives", money cowries (Cypraea moneta) from the Maldives. FO211730, SD28362, G708. Phase 4

Cowries and Danish slave trade

The Danish colonial trade began with the establishment of a permanent trading station, Trankebar, on the Coromandel Coast in south-eastern India in 1620. This was followed by the seizure of the Danish Gold Coast in the Gulf of Guinea, present day Ghana, in 1663, and the annexation and acquisition of three of the Virgin Islands in the Caribbean between 1672 and 1733[5]. This combination of trading stations on three continents enabled the trading companies to enter the highly lucrative triangular trade, involving the exportation of firearms and other manufactured goods to Africa in exchange for slaves, who were then transported to the Caribbean to work the sugar plantations. The final stage of the triangle was the exportation of cargo of sugar and rum back to Denmark. The cowries played their role in the first step in the triangle, closely tied up with slave trade.

As noted by Gøbel[6] the trade along the triangular route out of Copenhagen began c. 1676. However, in the beginning the trade was sluggish with several years without any traffic; only at c. 1730 did the regular shipping begin. The trade reached a maximum with up to 12 ships per year and altogether 25,000 imported slaves in the period from 1793 to 1802 in the years immediately before the slave trade was generally abolished in 1806. The abolishment of slave trade set a stop to triangular route ships. Also, Denmark's catastrophic defeat during the Napoleonic wars was devastating for colonial trade, because it resulted in the loss of the fleet, and British occupation of colonial trading stations.

In summary, the c. 100 cowries from Gammel Strand belong to the species *Cypraea moneta*, money cowry, and most likely originated in the Maldives, following a long journey and shifting ownership before they were obtained by Danish merchants in Amsterdam or London where they were packed in barrels, sailed to Copenhagen. Here they were stocked later to be loaded on ships setting off for the triangular route. Had they not been spilled during handling in Copenhagen harbour they would have ended up on Africa's Gold Coast as part of the pay for some of the 100,000 slaves that were acquired by Danish trading companies bound for the Danish West Indies. This trade began on a small scale around 1675, but picked up speed in the last half of the 18th Century, before it collapsed in 1806. The spilling of our cowries could of course have

[5] Feldbæk, O. 1986: The Danish trading companies of the seventeenth and eighteenth centuries. Scandinavian Economic History Review 34, 204-218.
[6] Gøbel, E. 2011. Danish Shipping along the Triangular Route, 1671–1802: voyages and conditions on board. Scandinavian Journal of History 36, 135–155

happened at any time during the 130 years of Danish slave trade (or later), but the rarity of "triangular-route-ships" in the late 17th Century, could point to an age later in 18th Century – somewhat later than the "1680/90s" age suggested for sample SD39811.

They have been also used by the Danish Life Guard since 1786 as decoration (*snekketøj)* of the horses head collars, and, originally, for protecting the horses from sabre cuts. They are now worn for ceremonial purposes.

The soft-shell clam (Mya arenaria)

The soft-shell clam is a large (up to 15 cm) and conspicuous bivalve, characterized by its gaping posterior end and the hinge with a large chondrophore in the left valve and a corresponding deep receptacle in the other. The soft-shell clam is distributed along Europe's western seaboard from the White Sea in the north to Portugal in the south. It is a burrower in sandy and muddy sea floors in the littoral zone. It is euryhaline and penetrates deep into the brackish Gulf of Bothnia[7]. However, it is absent from kitchen middens from the stone and iron ages, and considered to have emigrated from North America in historical times. The easily accessible clams have been exploited on a small scale for bait, pig's fodder or – in times of famine – human consumption in many European countries, but not in Denmark[8].

In our material the soft-shell clam is represented by a single medium sized intact left valve from Phase 1 (SD54997), a few fragments in a sample from Phase 3 (SD33628), (where it occurs together with a fragment of the related *M. truncata*, which lives in deeper water). Finally there is a large fragment of a left shell in Phase 4 (SD35240). Of interest here is the specimen from Phase which should date it to before 1560, which makes it a very early immigrant to Europe.

Fig. 179 Soft shell clam (Mya arenaria) from Phase 1, on of the first I Europe. Phase 1 SD54997.

[7] Strasser, M., 1999. *Mya arenaria*—an ancient invader of the North Sea coast. Helgolander Meeresuntersuchungen 52, 309–324; Jensen, K. R. 2010.: NOBANIS – Invasive Alien Species Fact Sheet – *Mya arenaria* – From: Identification key to marine invasive species in Nordic waters – NOBANIS www.nobanis.org, Date of access 22/9/2016

[8] MacKenzie, C.L., Burrell, V.G., Rosenfield, A., Hobart,W.L. (editors) 1997. NOAA Technical Report NMFS 129: The History, Present Condition, and Future of the Molluscan Fisheries of North and Central America and Europe, 3: Europe, 240 pp

The soft-shell clam was not only one of the first marine invaders to be recognized as such[9], but also one of the earliest immigrants, although its history in Europe is still far from well understood. As summarized by Esslink *et al*. (in press) the large and conspicuous shells are missing from kitchen middens and refuse. They occur neither in stone-, bronze-, iron-, or Roman-age context. They are also missing from an early authoritative fauna list from France and Germany in 1534. The first record of a living specimen in Europe dates to 1583 in Belgium.

It was therefore a great surprise when a fragment of soft-shell clam from Skagen Odde in northern Denmark came up with an AMS-C14-age in the interval AD 1245-1295[10] – several Centuries before Columbus and regular ship connection between Europe and America. Later this has been followed up with amino aspartic acid racemisation dating of two *in situ* soft-shell clams from the bottom of the Bay of Greifswald, southern Baltic Sea, giving almost identical ages of AD 1310 +/-70[11] (Behrends *et al*. 2005), and recently soft-shell clam shells from five locations in the coastal landscape of Holland from the Wadden Sea in the north to the Rhine estuary in the south have been C14-dated to between c. 1300 and c. 1450 (Essink *et al*. in press).

This shows beyond doubt that the soft-shell clam was present in Europe before Columbus, but how did it manage to cross the Atlantic? Hessland[12] pointed out that the clams' only way to move over longer distances is in their larval stage, and since this lasts only some three weeks, it is not enough to cross the Atlantic. Ship-transport is needed where the larvae can settle in the bilge water and arrive in Europe in the juvenile stage.

Before Columbus the only known shipping connection between America and Europe were the Viking ships, and Petersen *et al*.[13] suggested that this was the source for the clam fragments found at Skagen, an interpretation that has also been followed by Behrends *et al*. [14] and Essink *et al*. (in press). However, as appealing as this theory may be, it poses some problems. As pointed out by Wolffe[15] there is no record of any Viking ship passing from America to Denmark, or to Europe for that matter, and such a passage is very unlikely, being too long even for Vikings. The expeditions to America that we know of started out and ended in Greenland with a main aim to collect timber for use in Greenland. Ships could be thrown off course, and although it cannot be excluded that a ship from America heading for Greenland or Iceland up in Europe this seems very unlikely – so unlikely that it should have been on record. It should be noted that both Greenland and Iceland were too cold for soft-shelled clams. It should also be noted that while the three first Vinland expeditions, taking place in the early 1000s, were well documented, very little is known

[9] Hessland, I. 1946. On the quaternary *Mya* period in Europe. Arkiv for Zoologi 37A: 1-51.

[10] Petersen, K.S., Rasmussen, K.L., Heinemeier, J. & Rudd, N., 1992. Clams before Columbus? Nature 359, p. 679 only.

[11] Behrends, B., Hertweck, G., Liebezeit, G. & Goodfriend, G., 2005. Earliest Holocene occurrence of the soft-shell clam, *Mya arenaria*, in the Greifswalder Bodden, Southern Baltic. Marine Geology 216, 79-82.

[12] Same as (9)

[13] Same as (10)

[14] Same as (11)

[15] Wolff, W.J. 2005. Non-indigenous marine and estuarine species in the Netherlands. Zoologische Meddelingen, Leiden 79, 116 pp

about later voyages[16]. Therefore transportation of the clams by Viking ships require a set of rather unlikely coincidences – maybe not more likely than the odd chance for larval dispersal during strong westerly winds.

A recent study of DNA in American and European soft-shell clams suggest that colonisation occurred from the north of the eastern North American range[17], which is both where the Norse travelled, and the offset for the shortest passage to Europe for larval dispersal. The closest DNA relationship between American and European clams is between populations in the Gulf of St Lawrence and those in the Netherlands, suggesting that this was the nucleus for further spread in Europe. These investigations also indicated that the colonisation may have been carried out by intermittent movements by small numbers of individuals between America and Europe.

In any case, the single shell from Gammel Strand joins a small ensemble of scattered finds of soft-shell clam in Northwest Europe that date back to a time before the species had become invasive, which may have happened when large-scale shipping between Europe and America began in the 16th Century.

[16] Seaver, K.A. 2010. The Last Vikings: The Epic Story of the Great Norse Voyagers. London: I.B. Tauris, 277 pp

[17] Cross, M.E., Bradley, C.R., Cross, T.F., Culloty, S., Lynch, S. & McGinnity, P. O'Riordan1, Vartia, S., Prodöhl, P.A. 2016. Genetic evidence supports recolonisation by *Mya arenaria* of western Europe from North AmericaMarine Ecology Progress Series. 549, 99–112.

Dendrochronology

By Aoife Daly

Over three years, from 2013 to 2016, samples from timbers from the archaeological excavation at Gammel Strand in Copenhagen have been analysed dendrochronologically. The excavations were carried out by Københavns Museum in connection with Metro Cityring project, with Stuart Whatley as the excavation leader. The dendrochronological analysis was carried out to enable the precise dating of the felling of the trees used in a series of large quayside constructions and to determine the region where these trees had grown. This analysis thus has provided details of the chronology of the many constructions that were established over several Centuries at the site and has allowed insight into the changes in trade of timber to Copenhagen through the post-Medieval period, both in terms of timber type (genus) and source region.

Fig. 180 Photo of Phase 4 wooden structures, before removal and dendrochronological analysis. Main Excavation, 2014. C02_20140507_9207. Museum of Copenhagen.

A total of 366 samples were submitted for analysis. Some of these were not analysed however, often when they contained less than c. 40 rings. Others were reserved for later analysis if necessary, on the basis of results as they emerged. A number of these remain not analysed. In all then, 320 samples were analysed. A total of 108 of the analysed samples could not be dated. Of the oak, 122 samples are dated and 11 not. For the pines 81 are dated while 86 could not be dated. And 9 of the 20 spruce samples could be dated (see fig 1)

Fig. 181 Posts from the bulwark, ready for packing and then sent for analysis Main Excavation, 2014. Photo: K. K. Tayanin

Methodology

The science of dendrochronology is described extensively elsewhere so this will not be described in extensive detail here[18]. The method utilised the phenomenon that trees, as they grow, form an annual ring. The width of the ring is strongly influenced by the climate affecting the tree, so that two trees growing at the same time, in the same region will display very similar growth, as reflected in the variation, year by year, in their ring width. By measuring the rings widths along an old tree's growth, across the cross-section of a timber, it is possible to compare trees to each other, and find where they cross-match. Due to extensive tree-ring datasets that have been built across Europe by colleagues over the last 50 years or so, it is now possible to compare timbers of unknown age to a range of regional chronologies and precisely date these.

Also, as the climate signal preserved in timber is to a large extent region-specific, the method can also be used to identify the region of origin of the timber, so-called provenance determination.

[18] Baillie, M. G. L. 1982. *Tree-Ring Dating and Archaeology*. London: Croom, Helm; Baillie, M. G. L. 1995, *A Slice Through Time, dendrochronology and precision dating*. London; Daly, A., 2007a. *Timber, Trade and Tree-rings. A dendrochronological analysis of structural oak timber in Northern Europe, c. AD 1000 to c. AD 1650*. Ph.D. thesis submitted February 2007, University of Southern Denmark.

Fig. 182 Photo displaying the use of chainsaw cutting the timbers for analysis. Guide Wall excavation 2012. C19_20121018_4271

In order to carry out the analysis of timbers from Gammel Strand slices through chosen timbers were taken with a chain saw. The criteria for identifying suitable timbers included choosing ones with bark or bark-edge preserved so that the dating of the actual felling year of the tree would be achieved. It was also important to choose timbers with at least 50 rings, usually more, to maximise the possibility of achieving successful dating results. Also, other timbers without sapwood or bark preserved were selected from each construction to enable insight into the timber procurement for each extensive structure. Of course, timbers from all phases that were observed archaeologically were selected, to achieve full detail of the chronology of building activity on the site, and to identify repairs and maintenance to structures over time.

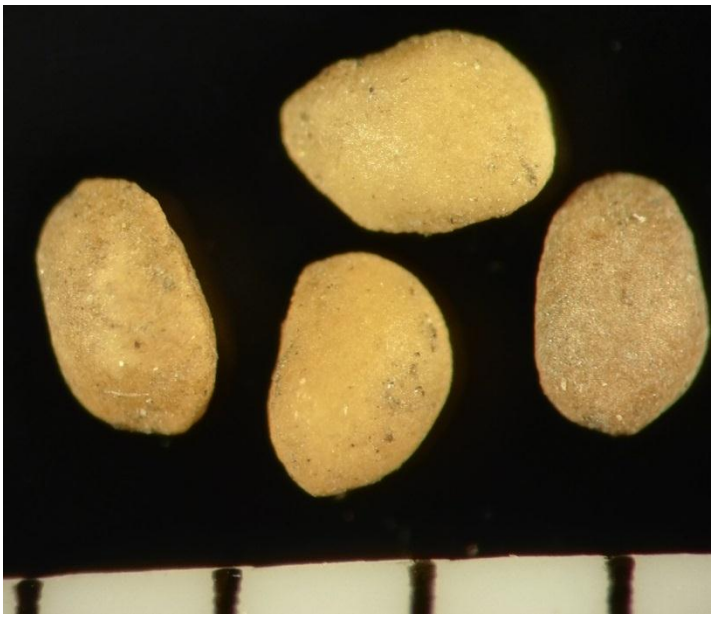
Macrofossil evidence

Whilst macrofossil analysis was used greatly to understand diet, the environment, agriculture and production, it can also identify evidence of trade from the identification of plants with a provenance that doesn't relate to the area. One such plant was the fig.

The Fig – *Ficus Carica*

By Håkan Ranheden

Fig (*Ficus carica*) is an old cultural plant and is today grown in southern Europe and around the Arabic peninsula, particular in Turkey. Seeds from fig are recurrently observed in these samples from Gammel Strand relating to Phases 1 to 4 but lacks totally from Phase 5. They were very frequent in those samples that were collected from inside drains/water pipes which may point out the importance of fig within the house hold and for its laxative effect. In Sweden seeds from fig have been found in latrine remains from the 17th Century Jönköping (southern middle Sweden). They were there noted together with peat-moss (*Sphagnum* sp.), the latter might have been used instead of modern toilet-paper[19].



Seeds from fig (*Ficus carica*) from PM214885 (SD51324, G235). Scale (mm) along the lower edge. Photo: H. Ranheden

The fig represents, in Phases 1 and 2, the transport of luxurious food to Copenhagen for the elites. They represent the increasing evidence of global trade and the import of luxurious objects.

[19] Heimdahl 2009: Bolmörtens roll i magi och medicin under den svenska förhistorien och medeltiden. Fornvännen 104 (2009).

Stone provenance

By Anthony Ruter

The purpose of this analysis was to identify the type of stone and assign as specific a geographic provenance as possible to items, with the expectation that the information could be used to help interpret: 1) the use and identification of the artefacts themselves, 2) the economic activities at the site, and 3) changes in the patterns of trade over time at the site. A wide range of items were selected for analysis including unworked raw materials and artifacts. The report increased the knowledge on stone provenance on Gammel Strand, helping to identify and provenance not only stone goods, i.e. millstone and whetstones, that arrived via trade, but also how all the materials used for structures such as the harbour wall, the possible Weighing houses (1 and 2) and the Bargemen Guild house reached the area.

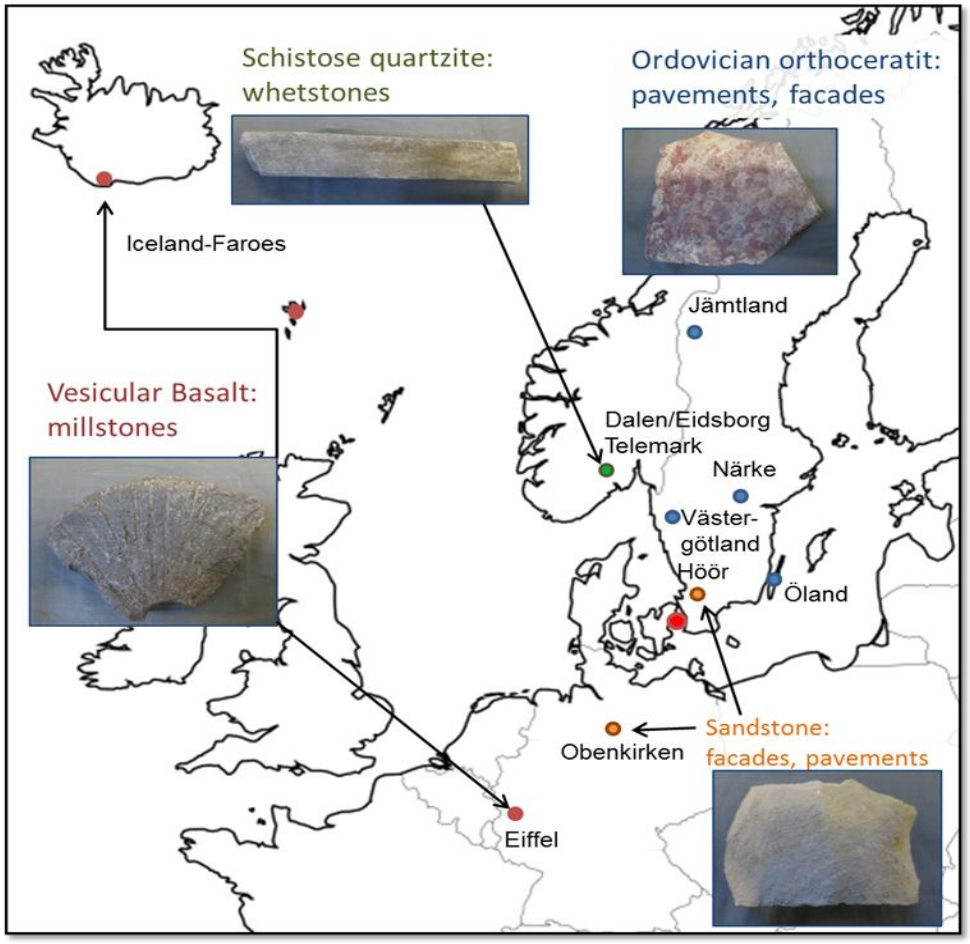


Fig. 183 Map of Northern Europe, with related stones from Gammel Strand

Fragments of Medieval Bohemian glass trade

By Georg Haggren

Bohemia, located in Eastern Central Europe, became a major glass producing area during the 14th Century. Most of the Medieval glass made in Western Germany was more or less green forest glass named after the colour of the glass and the forest rich regions where it was produced. In contrast to that most Medieval Bohemian glass was more or less colourless, but usually with a greenish, greyish or yellowish tint.

Fig. 184 Bohemian glassworks circa 1420. Sir John Mandeville's travels. British Library

Bohemian glass blowers produced various types of beakers both for domestic use and for export. The glassworks that were involved with trade to the northern markets were located deep in the forests of Ore Mountains (Ger. Erzgebirge). Finished glass vessels, mostly beakers, were then carried by wandering peddlers or horse over the mountains to Saxony (Ger. Sachsen) where they were transferred to river boats. The River Elbe and some other waterways offered a convenient trade route towards the coastal towns along the southern Baltic. Most probably the same boats also carried loads of German stoneware. In the 14th Century stoneware vessels made in Lower Saxony (Ger. Niedersachsen) were popular in the Baltic markets. Later on, during the 15th Century Lower Saxon vessels were replaced by stoneware made in Waldenburg and other places in Saxony.

After a long and time consuming journey through Northern Germany the fragile cargoes of Bohemian glass reached Hanseatic towns such as Hamburg and Lübeck. A great deal of the glass was sold here but some of the beakers were now transferred to deep sea going cogs and hulks by which the Hanseatic merchants shipped a large variety of commodities to destinations along the Baltic and North Sea. All ocean going ship cargoes heading from the Baltic towards the North Sea and Atlantic Ocean were forced to sail through the Øresund. Some of the ships were destined for Copenhagen or the Scanian herring markets, but many others made a halt in the Øresund before continuing the journey over the hazardous North Sea.

The boom of the Medieval Bohemian glass industries came to an end in the early 1420s when religious conflicts called The Hussite Wars took place in Bohemia. Like the 16th Century Protestants, the Hussites challenged the authority of the Roman Catholic Church. This caused a long unsettled era in large parts of Eastern Central Europe. Marauding troops wiped out settlements and industrial plants. All trade not only became difficult but also carried a lot more risk. The Hussite Wars ceased in 1434 but in the 1460s and

1470s they were followed by The Bohemian War. Some glass made in Bohemian tradition was made through the 15th Century but the major flow of Bohemian glass towards the north ceased soon after 1420.

Archaeologists have found Medieval Bohemian glass from all around the Baltic coastline as well as from coastal towns of Western Scandinavia. The finds from Denmark are not numerous but they show how this trade also reached Copenhagen. From Gammel Strand there are several fragments of a Bohemian ribbed beaker decorated by applied glass threads (Ger. Fadenrippenbecher). The encircling of the decorative threads was made before the final forming of the vessel with the result that the encircled blue thread has transformed to decorative dots on the ribs covering the body of the beaker. This kind of beaker was difficult to produce and, although these beakers were not rare, they must have been expensive which is shown by the exclusivity of them. Fragments of almost 400 beakers of this type have been found throughout a wide area of Central and North Western Europe but only from prosperous urban sites or aristocratic residences. These beakers were far from affordable for people not belonging to the aristocracy or at least the urban middle class.

Fig. 186 Fragment of ribbed beaker decorated by applied glass threads. Photo G. Haggrén.

In contrast to the common impression glass beakers were not rare items during the Late Middle Ages. Not all the Bohemian glass was exclusive. There were some exclusive glass vessels like the ribbed beakers with applied glass threads, but there were also humble glass vessels that were accessible to common townspeople or even peasants. Base fragments of some small colourless beakers belonging to the Bohemian tradition were also found at Gammel Strand. Instead of being luxury items, these beakers were commodities used by less prosperous merchants or artisans.

Fig. 185 Three base fragments from humble Bohemian beakers. Photo G. Haggrén.

During the 15th Century the Bohemia lost its role as the most important glass producer for the northern markets. The more or less colourless Bohemian glass was replaced by beakers mostly made in Western Germany, in provinces such as Hesse (Ger. *Hessen*) and Rhineland. At Gammel Strand this trade is shown by green fragments of prunted beakers like the cabbage-stalk-glass (Ger. *Krautstrunk*) and optically decorated beakers (Ger. *Kreuzrippenbecher*).

Later, after the series of religious wars and during the early modern era, some Bohemian glass found its way to Copenhagen again. Beginning in the 1650s and 1660s some German and Bohemian glass sellers settled down in Copenhagen. The most important glass sellers lived and had their stores on Østergade. Some itinerant glass sellers from Bohemia and Germany visited Copenhagen too. Especially from the 18th Century, there is a lot of information about the glass that the glass merchants in Copenhagen imported from Bohemia, Saxony, Silesia and Thuringia. However, in contrast to the Late Middle Ages, this time the flow of Bohemian glass is hardly shown in the archaeological record from Gammel Strand.

Renaissance glass produced in Denmark?

By Georg Haggren

According to the written sources, the first glassworks was founded in Denmark in about 1550 when a noble man called Enevold Jensen Seefeld hired a master glass blower on his estate, Visborggård, in Jutland. Between 1550 and 1660 there were about 20 glassworks in Denmark, mostly in Jutland and Scania. There are some survived written sources concerning most of them, but archaeologists have recently found some previously unknown glass making sites too. One of them is in Glarborg in Zealand. The Danish glassworks concentrated on the production of window glass and green tableware. A rare exception among the Danish glassworks was the short-lived factory in Copenhagen which produced high quality tableware in the Venetian style. This glassworks was located in the vicinity of the former Christiansborg, on Slotsholmen, and in the 1650s it produced high quality glass especially for the court.

In about 1660 almost all glass production in Denmark ceased – Scania was lost to Sweden in 1658 and all the glassworks in Jutland as well as those in Copenhagen were shut down. It was only in Holstein, a North German duchy ruled by the King of Denmark, where Danish glass production continued. An important reason behind the closing down of the glass industry was the common lack of firewood. There was some small scale glass production in Denmark during the late 17th Century but not much is known about this. In the 1690s two short lived glassworks started up in Copenhagen, one in the vicinity of Børsen and another one in Christianshavn It was first in the 1820s when new glassworks were founded in Denmark.

Fig. 187 A still life with a pasglas (cf. e.g. http://levinrodriguez.blogspot.fi/2014/11/common-glassware-in-dutch-still-life.html)

The early glass blowers recruited to Denmark were mostly Germans especially as the connections to Hesse (Ger. Hessen) were close. (Killing 1927, 16–32.) The glass blowers in Northern Germany and Southern Scandinavia had a common tradition

and often same the masters wandered from one glassworks to another. Actually, the earliest Danish master glass blowers were members of the guild of glass blowers in Hesse. Because of the common tradition, it is very difficult to identify production of certain areas or glassworks. Fortunately, a couple of the sites of Danish glassworks have been excavated and based on the finds from these excavations and some other field studies we know a little about their production.

The most popular glass beaker of the Renaissance was *pasglas* (Ger. Passglas). These usually octagonal glasses have got their name from the applied glass threads grouped in a couple of "passes". *Pasglas* were made in several Danish glassworks in Jutland and in Scania as well as in Germany, Sweden and the Netherlands.

According to the account books of the Danish court at least in the late 16th Century thousands of *pasglas* were bought for the needs of the royal court. For example in 1579 there was an order for 4000 *pasglas*. No wonder that from Gammel Strand there are hundreds of sherds of *pasglas*.

Pasglas were decorated by milled or in some cases plain horizontal glass threads. Sometimes these threads were of blue glass but usually they were made of the same light green glass as the entire body of the vessel.

Fig. 189 *Pasglas* sherds with black threads (FO214370). Photo G. Haggrén.

At Gammel Strand *pasglas* decorated by blue threads are almost as usual as the green ones. In addition to that, during the first half of the 17th Century people here have also used *pasglas* decorated by very dark brown or violet, almost black threads (for example FO214370), which are unknown from elsewhere.

Pasglas were made in several places in North-western Europe. Large quantities were produced in Northern Germany, the Netherlands and Scandinavia. The earliest ones used in Denmark were probably of German origin but in the late 16th and early 17th Century the Danish production including that of Holstein and Scania has been remarkable too. Some of the *pasglas* found in Copenhagen have been made of glass metal of poor quality containing lots of impurities and air bubbles. These beakers of low quality are hardly imported from distant localities. It is more probable that they are made in Danish glassworks in Eastern Jutland, Zealand or Scania and produced for the needs of domestic townspeople and wealthy peasants. The unique finds of *pasglas* decorated by black threads are probably of Danish origin too.

Fig. 188 Fragments of an igel (FO218504). Photo G.Haggrén.

Another tall beer glass of the Renaissance was the club beaker or igel, as these beakers were called in Denmark. The upper part of the body of these beakers was usually wider than the mouth. Following the design these beakers resembled a kind of club. Like *pasglas* the club beakers were often decorated by a milled horizontal glass thread (cf FO214336, 218504). There are fragments from at least twelve club beakers from Gammel Strand. Club beakers were popular in Denmark during the late 16th Century. In addition to the finds from Gammel Strand there are several finds of club beakers also from Kongens Nytorv but none from Rådhuspladsen, where the majority of the glass finds date to the third quarter of the 17th Century. Based on the popularity of club beakers in Denmark it is probable that many of them were also made in Danish glassworks.

Fig. 190 Fragments of a pedestal beaker (FO214324). Photo G. Haggrén.

An interesting group among the finds from Gammel Strand consists of fragments of large cylindrical beakers with optical decoration made of vertical rims. These pedestal beakers were made of light green glass of poor quality containing many air bubbles and other impurities in the glass metal. Similar beakers were made in the Netherlands and Northern France but the homogenous group found here indicates a Danish origin. For example, from the castle of Rosenholm as well as the glassworks of Rye in Jutland there are parallel finds dating to the late 16th Century. From Gammel Strand there is also a sherd from a ewer decorated with similar rims and made of same kind of glass of poor quality (FO214295).

We can assume that a large part of these *pasglas*, igels and cylindrical beakers originate from Danish glassworks. This would explain the unique finds of *pasglas* with applied threads of black glass as well as the uniform group of cylindrical beakers made of low quality glass. All these beakers are typical beer glasses, in contrast most of the wine beakers used in Gammel Strand seem to have been imported from Germany or the Netherlands while some of them were made in Holstein.

High quality glass in a Venetian style from the Netherlands?

By Georg Haggren

After the middle of the 16th Century, colourless Venetian glass of high quality called *christallo* gained popularity among the aristocracy and prosperous merchants all over Europe. This new fashion was soon followed in the west. While the older glassworks concentrating on products of more or less green glass were located in forested areas, far from towns, the Italians founded their new glassworks in urban environments.

During the late 16th but especially in the 17th Century the glass blowers in Western European towns made extremely elaborate vessels in the Venetian style. One of the first of the new factories lead by Italian

masters was in Antwerp. This Flemish city became an important centre of glass production during the second half of the 16th Century but soon *christallo* glass of high quality was produced in many other Western European towns such as Brussels, Cologne, Liège, London and Middelburg. In the 17th Century one successful glassworks was in Amsterdam, another factory was in Kiel and even in Copenhagen there was a short lived Italian glassworks in the 1650s.

Glass made by the Italian methods in Western and Central Europe was called glass made in the Venetian fashion or *façon de Venice*. Probably best known examples of this sophisticated production are the winged goblets or *Flügelglas*. Winged goblets have a twisted-cable stem decorated by applied impressed wings and beaks. The stem usually contains coloured filigree canes in opaque white, yellow, red or blue glass. Winged goblets were precious items and were taken care of. As a result dozens of these exclusive items are preserved in European museum collections. It is because of this that sherds of the winged goblets are usually rarely found in archaeology. However, from Gammel Strand there are sherds from more than 15 goblets of this kind. The number is exceptionally high being from one single site but not unique in Copenhagen. For example, a similar number of these finds were found from Rådhuspladsen.

Fig. 191 Fragment of winged goblet (FO214812). Photo G. Haggrén.

Excavations in Gammel Strand also revealed fragments of other kinds of glasses, especially beakers and goblets, made in the Venetian fashion. Among the goblet fragments there are, for example, an elegant cigar shaped stem (FO214535), an inverted-baluster stem (FO214377) and a foot with a massive round knop in the lower end of the stem (FO214267). Similar to the winged goblets these colourless wine glasses were mostly used when drinking red wine. When people drank white wine they preferred prunted green beakers, so called *Röhmer* glasses.

When people drank beer or spirits they usually used beakers instead of goblets. Among the most popular *façon de Venice* -beakers in early 17th Century Copenhagen were those decorated with narrow opaque white trails encircled around the upper end of the bowl. Some other beakers had *vetro á fili* – decoration (FO214657) or vertical opaque white canes covering the body (FO214655).

Fig. 192 Cigar shaped stem (FO214535). Photo G. Haggrén.

Bossed beakers (Ger. Warzenbecher) or beakers decorated with optic-blown bosses resembled finer glass of Venetian style even if they were made in German forest glassworks. Bossed beakers were common especially in the Netherlands but also in Germany. From Gammel Strand there are sherds of five bossed beakers, some of them from beakers made of colourless glass of rather high quality and some others from beakers of much lower quality.

Most of the sherds of the *façon de Venice* glass found from Gammel Strand are of colourless but slightly yellowish glass. These sherds indicate a sophisticated bourgeois culture typical for prosperous early modern urban societies in North-western Europe. This culture is thoroughly illustrated in Dutch and Flemish 17th Century paintings in which elegant glasses *a la façon de Venice* are well represented.

High quality 17th Century wine bottles from Holstein

By Georg Haggren

Bottles were seldom made of high quality glass. They were utility vessels for transporting and storing liquids. It was only in the late 16th Century when glass bottles began to become everyday items, before that they were very rare. Most of the bottle glass found from Gammel Strand is iridized dark green glass but there are some exceptions. Some 17th Century backfills contained well preserved sherds of green bottle glass of high quality. Similar finds are known already from earlier excavations in Copenhagen. Luckily some of these bottles have been equipped by seals showing their origin in the Duchy of Holstein. Today Holstein is the northernmost part of Germany but until the 1860s it was ruled by the King of Denmark.

After 1660 glass was not produced in heartlands of Denmark but in Holstein the production continued. In the late 17th and early 18th Century there was flourishing glass industry in an area around the Lake Plön in southern Holstein. Between 1650 and 1720 the production of bottle glass there was remarkable.

During the 17th Century, glass bottles became more and more important vessels for storing beverages and other liquids. From the middle of the Century, glass makers added applied glass seals to some of the bottles. This tradition began in England in about 1650 followed by glassmakers in Holstein only a few years later. During the second half of the 17th Century, sealed bottles were typical only for England and Holstein but later during the 18th Century they were produced in widespread areas of North-western Europe.

Three seals found from Gammel Strand are from bottles made in Holstein during the second half of the 17th Century. In one of them there is Bacchus, the god of wine, sitting on a barrel with a goblet in his hand (FO214613). The motif is surrounded by a text fragment "…WEL" leftover from the original sentence "PRVFT DE WIEN EN REIS WEL" meaning something like "tasted the wine and travelled well". The motif shows that the seal is from a wine bottle. This seal was used in bottles made in four different glassworks in Holstein between 1660 and 1685. In addition to Holstein similar seals have been found in the Netherlands and Sweden as well as in Copenhagen. Together they illustrate the export of wine bottles.

Another seal found from Gammel Strand has a figure of Fortuna, the goddess of luck, encircled by the text "IOHAN CVNCKEL" (FO218703). Belonging to a famous glassmaker family Johann Kunckel was a master glass blower in the glassworks of Langwedel (1667–1672) and Bossee (1672 – about 1680). Two members of the family, Eberhart and Fritz Kunckel are already mentioned in 1406 when the oldest

Fig. 193 Illustration of bottle seal with Fortuna and the name "IOHAN CVNCKEL". Illustration by Charlotte Firring Jensen.

known glassmakers' guild in Germany was founded in Spessart. Johann Kunckel had a contemporary namesake, Johannes Kunckel. Born in 1629 the region of Plön in Holstein Johannes Kunckel became a famous alchemist and glassmaker employed by Friedrich Wilhelm, the Elector of Brandenburg and Duke of Prussia, and later by Karl XI, the King of Sweden. In 1679 he published a handbook on glassmaking, Ars Vitraria Experimentalis.

A third seal with an origin in Holstein is from a bottle directed at customers in the Netherlands. This exceptionally large and impressive seal with a diameter of 60 mm carries the portrait of Prince William III who became the Prince of Orange in 1672 (FO214805). The portrait is surrounded by the text "VIVAT DE PRINCE VON ORANGIEN". The Prince as well as the coat-of-arms of the house of Orange-Nassau was very popular motif in seals put on the bottles made for the export to Dutch markets. These seals have been dated to the period before 1689 when William became the king of England. Bottles with this particular seal have been produced in five glassworks beginning in 1669 to the 1680s. This seal is not unique in Copenhagen, there is at least one similar seal previously found in the city.

Fig. 194 Seal with the portrait of Prince William III, the Prince of Orange (FO214805). Photo G. Haggrén.

During the Metro Cityring excavations in the early 2010s eight seals from bottles made in Holstein were found from Rådhuspladsen. Four of them show the name or initials of a master glass blower, colleagues to Johann Kunckel. Three others carry political symbols made for bottles used by the supporters of Prince

William III, Prince of Orange. A large seal (FO205995) has the Dutch coat of arms and two others personal attributes of the Prince (FO204373, FO208140).

At least during Christian V's reign (1670–1699) some of the bottle production in Holstein was directed to the Danish markets. The excavations in Rådhuspladsen revealed a seal with a monogram "C5" and a figure illustrating the Norwegian lion rampart (FO204390) while some other kinds of seals with the Danish King's monogram have previously been found in Copenhagen.

In addition to the seals, the excavations in Gammel Strand revealed other fragments of glass bottles made in Holstein. There are, for example, several sherds from an exceptionally large square case bottle found together with a neck fragment which is probably from a bulbous wine bottle made in Holstein (FO214121). Round string rings were typical for the late 17th Century wine bottles made in Holstein (FO214610). A folded base rim characteristic for pear shape bottles as well as similar finds from Kongens Nytorv also have the same origin. (FO218489; cf. KGN/FO209254, FO221128).

Fig. 195 Three bottle necks from Gammel Strand (FO214194). Photo G. Haggrén.

Late 17th Century bottles made in Holstein were usually made of lighter and thinner glass than those in England. Normally early bottle glass was of secondary quality but the production of the glassworks in Holstein during the second half of the 17th Century was of much higher quality than that in most of 17th and 18th Century factories producing bottle glass. At least all of the seals from bottles made in Holstein are of

clear green glass lacking air bubbles and impurities. Even the design of the bottles blown in Holstein was different. Their shape was much more bulbous than the typical 17th Century shaft-and-globe bottles made in England. (FO218490/SG667). The glassworks in Holstein produced large quantities of wine bottles and also flasks for spirits directed especially at the markets in the Netherlands. The Dutch immigrants in Copenhagen were probably also interested in buying items sympathising with the House of Orange while some other bottles were made especially for Danish customers supporting King Frederick.

Signs of the early Danish China trade?

By Rikke Søndergaard Kristensen

In November 1618 King Christian IV (1588-1648) wrote in his diary: "Our Indian fleet sailed out of the Sound". The Indian fleet, which the king with great satisfaction watched leave the Sound was the first Danish fleet to be sent out by the newly founded *Danish East India Company.* The King was personally engaged in the founding of the Company. He was an eager supporter of the Danish expanding mercantile policy and saw a great potential of profiting from the thriving Asian trade, which was dominated by the Dutch and the English. In 1620, the Company established a permanent trade post at Tranquebar in south-east India and from Tranquebar Denmark was able to take part in the trade in the Indian Ocean and Indonesia. The Company ran into financial problems and was dissolved in 1650 but was re-established again in 1670.[20]

One of the very much sought after exotic articles to be traded from the Indian Ocean and Indonesia was the Chinese porcelain. Porcelain was not known in Europe until the beginning of the 18th Century and when the first Chinese porcelain items began to appear in Europe in the earlier part of the 16th Century, it became a much desired luxury item which only few people could possess.

The preserved trade records from this first Danish East Indian Company do not give much information on porcelain purchases. In the first half of the 17th Century the Dutch heavily controlled the inter-Asiatic trade, which also included the Chinese porcelain trade from Java and Taiwan, and it seems to have been difficult for the Danish merchants to get hold of any larger quantities of porcelain. Most of the porcelain that did arrive at Copenhagen in these early years may just as well have come through private Dutch merchants or maybe Danish merchants engaged in the East Indian trade more than from the Company trade itself.

A few porcelain items were kept in the 17th Century collections of curious in Copenhagen e.g. in the famous Danish physician Ole Worm's collection and in Frederic III's personal collection *Kunstkammeret* established c. 1650 (Fig. 1). The porcelain in these exquisite collections was high quality items pursued though private connections with Dutch merchants as far as we know from the archival material. Only people with high status and powerful connections like Worm and the Danish king had the opportunity to buy such items.

[20] The second Danish East India Company lasted until 1729. In 1732, it was replaced by The Danish Asiatic Company which conducted a direct trade with China.

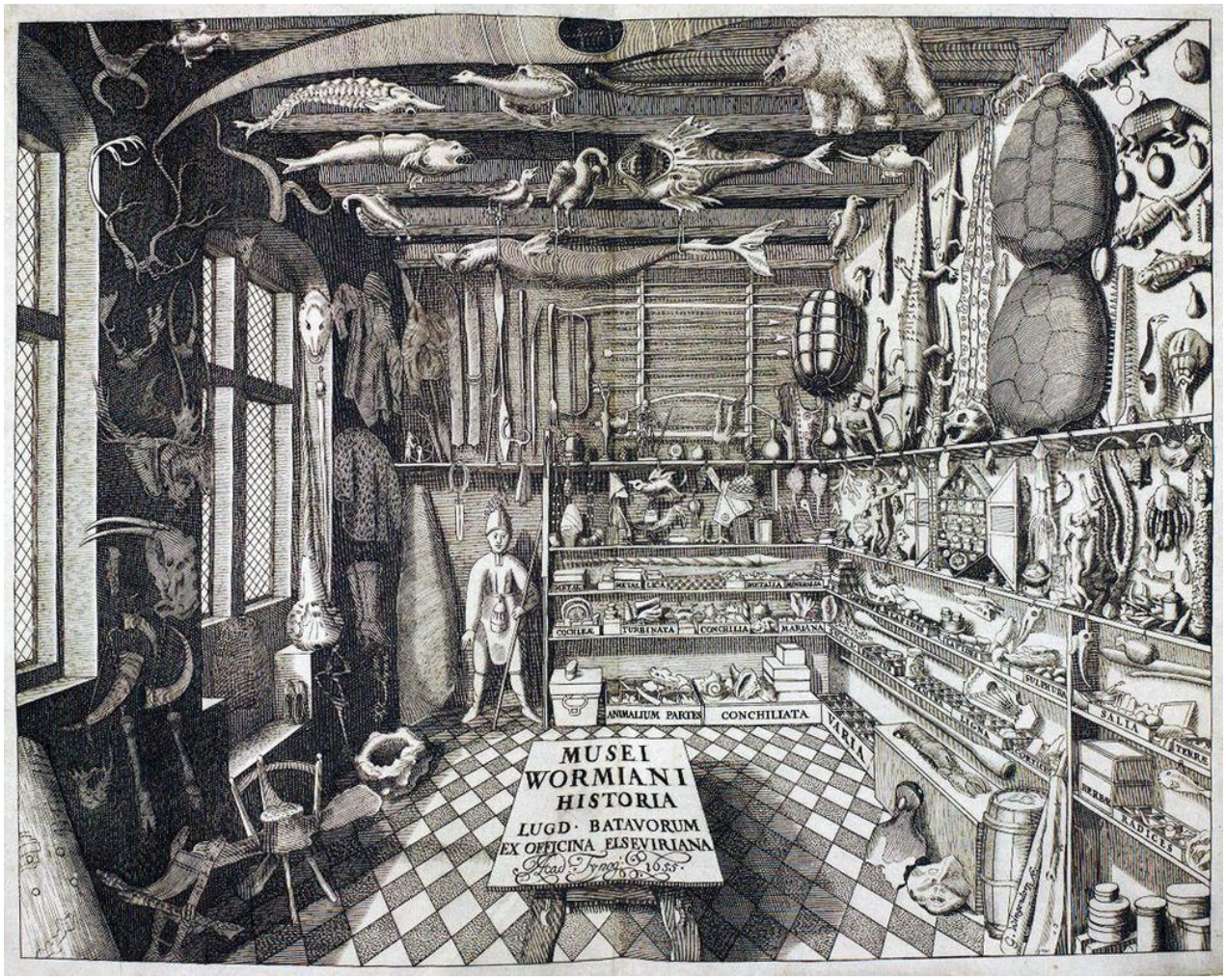


Fig. 196 "Musei Wormiani Historia", the frontispiece from the Museum Wormianum depicting Ole Worm's cabinet of curiosities. None of the recorded porcelain items are visual on this depiction.

But in addition to the high quality and high status porcelain a small-scale consumption of mass-exported porcelain ware are present in Copenhagen from *c.* 1600 or maybe even the last decades of the 16th Century. The excavation at Gammel Strand has revealed some very nice and rare examples of this early Chinese porcelain (Fig. 2).

The ware is called *kraak ware* after the Portuguese ship type that were used in the Asian trade and on which the porcelain was carried. The kraak porcelain was produced in the Chinese town Jingdezhen in the period of the late Ming dynasty (1573-1644). It was the first type of Chinese porcelain ware to be produced in large quantities for the European marked and exported in large quantities especially the Netherlands.

Fig. 197 Part of kraak type dish with landscape motif found at Gammel Strand, c. 1580-1650, (FO216366). Museum of Copenhagen

Fig. 198 Chinese blue and white Kraak dish, Wanli (1537-1619), decorated in the centre with emblems, the border with scroll and pendant tassels, diameter: 12 5/16in., 31.3cm. (From http://www.chinese-porcelain-art.com/).

The *kraak* porcelain is well-made porcelain painted an underglaze cobalt blue style and mostly decorated in with very delicate Chinese landscape motives with animals and Buddhist auspicious emblems (Fig. 3).

The *kraak* porcelain seems not to have been part of the Royal collection and it can only be identified through archaeological findings in Copenhagen. In the refuse layers at Gammel Strand three kraak porcelain items have been found, which is a high number of this rare type (Fig. 4).

Fig. 199 Part of kraak type dish found at Gammel Strand, with landscape motif and Buddhist symbols, c. 1580-1650, (FO 217949)

We know from e.g. Dutch 17th Century paintings how the kraak porcelain was used in the homes. We often see them on display objects on selves or used on tables as fruit bowls as seen on Figure 5. They express luxury, exotic way of life. Archaeological finds from the Netherlands show that the kraak porcelain was related to the well-to-do households but still not the highest rang of kings and the like but the wealthy burghers and merchants. In Copenhagen we must suspect the same was the case. The kraak porcelain found in Copenhagen could very well have belonged to people connected to trade and some of these could have been of Dutch origin. Several Dutch people lived in Copenhagen in this period and they could also have brought their own bowls and dishes with them from the Netherlands, where kraak porcelain was much more common than in Copenhagen.

We can only guess if these kraak porcelain items were brought to Copenhagen by Danish or Dutch private merchant or if they were actually brought by the Danish East-Indian Company.

Fig. 200 Jan Davis de Heem, still life with fruit and lobster, second half of the 17th Century, oil on canvas 75x105 cm, Museum Boymans-van-Beuningen

The ‘missing’ fishwives of Gammel Strand

By Rachel C. Morgan

Within living memory, the area of Gammel Strand has been mostly closely associated with the fiskekoner, the fishwives, of Copenhagen. So much so that numerous photographs and paintings exist of the fish market and fish wives from the mid-19th Century onwards, and a statue commemorating the fishwives was installed in 1940 while their stalls were still situated on Gammel Strand. However, without this social knowledge these women are almost entirely absent from the archaeological record generated during the recent Metro Cityring excavation. Very few artefacts were found which relate to the long-running use of the site as the main fish market in Copenhagen, and there are none which indicate the importance or even presence of the fishwives themselves.

Fig. 201 The fiskekoner were an institution in Copenhagen, attracting famous customers. Here Frank Sinatra buys fish on Gammel Strand in 1956. (Photo A. E. Andersen, Berlingske Tidende)

This absence is due to the nature of archaeology, especially the types of remains found on Gammel Strand, and are highlighted in this case due to the existence of other socio-historic sources of information relating to the fishwives. The 19th and early 20th Century archaeology found at Gammel Strand, which dated from the times when the fish market was very active, only revealed the underlying stone and timber framework beneath the harbour. The street level of the harbourfront where the market was physically situated and where remains could expect to be found was destroyed by subsequent renovations. The fish market itself was also impermanent, as the booths the fishwives sold from were constructed of timber crates which were set up and taken down daily. These circumstances created the conditions for the fishwives to be ‘invisible’ in the archaeological record.

A movable feast

The fish market in historical Copenhagen was not a stationary structure but moved from place to place as the city developed. The first written record of a fish market dates from 1449 which located the market on Amagertorv. When Gammel Torv became the main town market place in the 17th Century the fish market moved between it and Gammel Strand, to the area of Vandkunsten, eventually settling at Gammel Strand itself sometime in the 17th Century (Ømann 2012).

The fish market remained at Gammel Strand for the next two hundred years, and became a city institution. The market appears to have co-existed with the remaining assize and tax functions of the harbour which took place in the buildings towards the western end of Gammel Strand. Paintings from the period show the fishwives selling from their booths along the harbour-front near Højbro Bridge. When the harbour's administrative buildings were demolished in the mid 19th Century the fish market expanded to fill the

available space. Contemporary photographs show the fishwives at their booths spread out along most of the newly created square.

Fig. 202 Storm Post ST34393 (G646) with wicker fish basket F0219487, G646. The upper part of the post had been recently removed to help excavation. K. K. Tayanin

The importance of the fish market to the city at this time is demonstrated by the construction and later expansion of the *fiskegang,* which was found during the excavations and which is the one structure which can be specifically linked to the fish market. This 'fish-walk', a narrow timber walkway beside the harbour-front just above sea level was used as a landing platform for the flotilla of small fishing boats which supplied or stored the catch. Some of these small boats seen in contemporary photographs appeared to contain water and were used to keep the fish alive, and therefore fresh, for as long as possible. When the *fiskegang* was expanded further west in 1868, as shown by dendrochronological dating, the surface of the walkway itself was constructed from concrete which demonstrated the importance and permanence of the market.

When the harbour-front was redeveloped in the late 19th Century, a plan was created to build a formal *fiskehal,* a fish market hall, on the site of Gammel Strand. The design drawings show a open hall, sunk below both the street level and the sea level, with small windowed sky-lights in the roof to let in light and fresh air. A section drawing through the proposed fish hall shows a fishwife sitting at a small trough stationed over a drain in the floor and a female customer waiting to purchase. This building was never constructed and eventually a new fish market was built at Kalveboderne.

Absence of evidence, not evidence of absence

Without earlier direct archaeological evidence for the fishwives, information about them has to come from other sources. Apart from the later paintings and photographs one of the most interesting pieces of evidence is a diktat issued by the master of police in April 1751. In it Politimester Torm issued a warning directly to the fishwives about their behaviour. It appears that selling fish could be a cut-throat business with regular enough trouble at the market leading to an official police warning.

Some physical evidence for the fishing trade was uncovered during the excavation at Gammel Strand. Among these were fishing tools, a fishing weight and a live-well. The latter was a fishing basket which was tied to a post to store the live catch before they were killed and sold at the market – a smaller scale version of the boats seen in some of the early photographs.

Fig. 203 Remains of the mid 19th Century linear Fiskegang (in centre of photo) after the 1860s concrete base has been removed. This was replaced in the 1880s by the harbour wall to the right of the photo.

The final find from the excavation which related to the market at Gammel Strand was discovered in the construction backfill behind the 1880's stone wall. The presence of the complete skeleton of a fish showed that even during these major construction works the market continued to function in the area.

The end of an era

The fish market as it existed on Gammel Strand ended in 1958. A new *fiskehal* was built at Kalveboderne and the fishwives moved there. A farewell parade for the iconic *fiskekoner* was held in the snow on 2nd December 1958, which demonstrated the importance of the women and their fish market to the citizens of Copenhagen. One stall remained by the statue of the *fiskekoner* as a symbol of the tradition until 2008 when the owner, Doris Marx, retired. The statue itself will be returned to the site once the Metro station is completed and will then be the only remaining symbol of this long-lived Copenhagen institution.

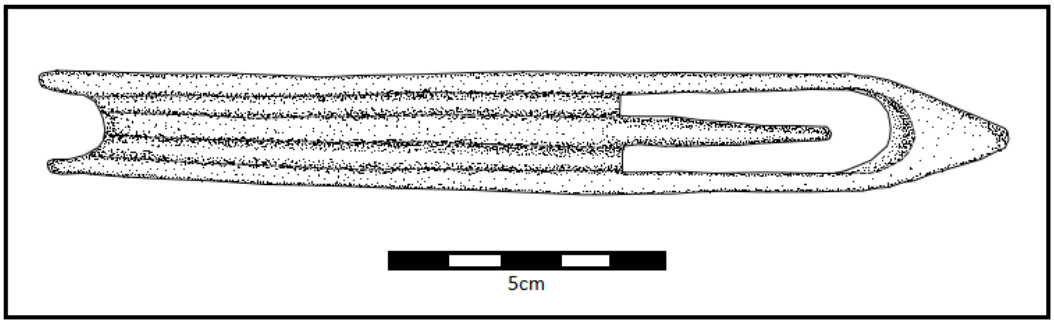


Fig. 204 Netting Needle complete FO212435. SD 42280, G666. Phase 3. Drawing by G. Dickenson

Conclusion

This bygherre/cultural historical report comprises a summary of the archaeological work undertaken at Gammel Strand, Copenhagen (KBM 3828) by the Museum of Copenhagen from 2010-2016. This work was conducted in association with the Metro Company prior to the construction of the new Metro station at Gammel Strand, one of seventeen as part of the Metro Cityring project.

Prior to the Metro Cityring project, a series of small excavations in the area over the last 100 years revealed various fragments of buildings and posts and bulwarks suggesting that earlier harbours were preserved beneath the modern surfaces. Photo documentation of Gammel Strand using the Daguerreotype form in the 1840s also portrayed the former harbour administrative buildings of the Gammel Strand harbourside with the *Vejerhus* (weighing house) and *Pramlaugets hus* (Bargemen's Guild house), so their foundations were known in the excavation vicinity. A combination of the photographic record and the physical archaeological structural remains, combined with historic records and cartographic evidence of the area suggested that the preservation of Renaissance archaeology and later archaeology was expected and that earlier Medieval archaeology was presumed.

The excavations revealed the expected archaeological remains such as harbour bulwarks, the Weighing House, the Bargeman's Guild House and other administration buildings along with a large collection of archaeological artefacts showing evidence of trade, production, wealth, religion and thus consumption and networking. The single context recording method used on these excavations, in conjunction with the large quantity of dendrochronological dating of the wooden harbour sides, enabled the opportunity of building a site chronology, and the creation of various site phases. Extra provenance work on various stone fragments from the harbour walls and from the various timber types also provided knowledge of where each constituent from the site structures was imported from.

The sheer number of harbour structures, and harbour phases from the 1400s to the present day along with an unbroken finds register from land reclamation from the 1400s has enabled the archaeologists to uncover the story of how the area *Ved Stranden* (by the beach), later called Gammel Strand (the old beach) was created. We now have the knowledge of how the harbour area was urbanized to become the centre of the harbour of Copenhagen in the 1400s, and by the early 1600s, arguably the most important harbourside in Scandinavia.By the 1700s, the harbour, due to its small size, could not be used by the large ships, leading to the greater importance of the bargemen transport the goods from the large ships to be weighed and taxed at the Weighing House at Gammel Strand. The harbour itself falls into decline, but the harbourside continues as the administrative centre up until the 1850s when the tax law changes and the need for the administration structures ends, leading to their demolition. Up until the 1960s the area was an important local and regional centre as a fishing harbour before the transfer of the industry to *Fiskertorv*. The site today is now a leisure area comprising galleries, restaurants and service industries which are visited by the tourists and Copenhageners, who generally do not know of its' former important international former status. The results from the excavations from Gammel Strand will therefore change this viewpoint of the area and will rightfully now place the harbour again amongst the upper echelons of the Late Medieval and Renaissance harbours within Europe with the new information of regional, Northern European and finally global evidence of trade and connections.

Additional reading

Anonymous 1835, *Inventarium over Kjøbenhavns Brandvæsens Eiendele m.m. Optaget i Aaret 1835; med hosføiet Register.* Copenhagen: Jens Hostrup Schultz.
Online access: http://www.kb.dk/e-mat/dod/130018503205.pdf Accessed October 3rd 2016

Deggim, C. 2005, *Hafenleben in Mittelalter und Früher Neuzeit. Seehandel und Arbejdsregelungen in Hamburg und Kopenhagen vom 13. bis zum 17. Jahrhundert.* Schriften des Deutschen Schiffahrtsmuseums, Band 62. Bremerhaven/Hamburg

Fabricius, H. 1999a, *Københavns Topografiske Udvikling indtil 1300. Aarbøger for Nordisk Oldkyndighed og Historie* 1998. Copenhagen: Det Kongelige Nordiske Oldskriftselskab

Fabricius, H. 1999b, Development of town and harbour in medieval Copenhagen. In: Bill, J. & Clausen, B. L. (eds.): *Maritime Topography and the Medieval Town. Papers from the 5th International Conference on Waterfront Archaeology in Copenhagen, 14-16 May 1998*. Pp. 221-236. Copenhagen: National Museum of Denmark

Fabricius, H. 2006, *Gader og mennesker i middelalderens & renæssancens København. Inden for middelaldervolden*. Copenhagen: Aschehoug

Fleischer, J. 1985/2006, *København. Kulturhistorisk opslagsbog med turforslag*. København: Politikens Forlag.
Online access: http://www.kobenhavnshistorie.dk/bog/kko/ Accessed October 4th 2016

Johansen, U. 1999a, Fra strand til stenhuse på Højbro Plads. *Historiske Meddelelser om København* 1999, p. 131-153. Copenhagen: Københavns Kommune

Johansen, U. 1999b, Byggeri på Højbro Plads efter reformationen. *Historiske Meddelelser om København* 1999, p. 235-251. Copenhagen: Københavns Kommune

Jonge, N. 1783, *Den Kongelige Hoved- og Residentz-Stad Kiøbenhavns Beskrivelse, forestillende Stadens Tilstand, Beskaffenhed oc Merkværdigheder i en sammenhængende Orden i de ældste, mellemste oc nyeste Tider.* Copenhagen: Printed by Nicolaus Møller.
Online access: http://kobenhavnshistorie.dk/bog/dkhkb/1/dkhkb_1-6.html Accessed October 3rd 2016

Kejlbo, I. R. (ed.) 1974, Kobberstikkene fra Peder Hansen Resen Atlas Danicus 1677. Copenhagen: Rosenkilde og Bagger

Lorenzen, V. 1930, *Haandtegnede kort over København 1600-1660*. Copenhagen: Henrik Koppels Forlag

Milne, G. 1999, Marine topography & medieval London. In: Bill, J. & Clausen, B. L. (eds.): *Maritime Topography and the Medieval Town. Papers from the 5th International Conference on Waterfront Archaeology in Copenhagen, 14-16 May 1998*. Pp. 145-152. Copenhagen: National Museum of Denmark

Møller, J. 1988, *København før og nu – og aldrig*. Bind 3, Strøget og Gammel Strand. Copenhagen: Palle Fogtdal

Nielsen, O. (ed.) 1872, *Kjøbenhavns Diplomatarium* I. Copenhagen: Thiele
Online access: http://www.eremit.dk/ebog/kd/1/kd_1.html Accessed October 6th 2016

Nielsen, O. (ed.) 1874, *Kjøbenhavns Diplomatarium* II. Copenhagen: Thiele
Online access: http://www.eremit.dk/ebog/kd/2/kd_2.html Accessed October 6th 2016

Nielsen, O. (ed.) 1877a, *Kjøbenhavns Diplomatarium* III. Copenhagen: Thiele
Online access: http://www.eremit.dk/ebog/kd/3/kd_3.html Accessed October 6th 2016

Nielsen, O. 1877b: *Kjøbenhavn Historie og Beskrivelse I. Kjøbenhavn i Middelalderen*. Copenhagen: G.E.C. Gad
Online access: http://www.eremit.dk/ebog/khb/1/index.html Accessed October 6th 2016

Nielsen, O. (ed.) 1879a, *Kjøbenhavns Diplomatarium* IV. Copenhagen: Thiele
Online access: http://www.eremit.dk/ebog/kd/4/kd_4.html Accessed October 6th 2016

Nielsen, O. 1881, *Kjøbenhavn Historie og Beskrivelse III. Kjøbenhavn i Aarene 1536-1660* - første del. Copenhagen: G.E.C. Gad
Online access: http://www.eremit.dk/ebog/khb/3/index.html Accessed October 6th 2016

Nielsen, O. (ed.) 1884, *Kjøbenhavns Diplomatarium* VI. Copenhagen: Thiele
Online access: http://www.eremit.dk/ebog/kd/6/kd_6.html Accessed October 6th 2016

Nielsen, O. 1885, *Kjøbenhavn Historie og Beskrivelse IV. Kjøbenhavn i Aarene 1536-1660* - anden del. Copenhagen: G.E.C. Gad
Online access: http://www.eremit.dk/ebog/khb/4/index.html Accessed October 6th 2016

Nielsen, O. (ed.) 1886, *Kjøbenhavns Diplomatarium* VII. Copenhagen: Thiele
Online access: http://www.eremit.dk/ebog/kd/7/kd_7.html Accessed October 6th 2016

Villads Christensen, C. 1912, *København i Kristian den Ottendes og Frederik den Syvendes tid – 1840-1857*. Copenagen: G.E.C. Gad.
Online access: http://www.eremit.dk/ebog/40k57/40k57_1.html Accessed October 5th 2016

Museum of Copenhagen internal documents and other unpublished sources

Andreasen, H. N. 2016, Flaked lithics from KBM 3828 Gammel Strand. Unpublished finds report: Museum of Copenhagen

Andersen, V. L. 2016, Leather artefacts from KBM3828 Gammel Strand. Unpublished finds report: Museum of Copenhagen

Bangsgaard, P; Magnussen, B.; Enghoff, I.B,; Schonfeld, C. & Yeomans, L. 2016, Gammel Strand Z.M.K. 57/2011; KBM 3828 Faunal Report. Unpublished report, Zoologisk Museum København

Bork-Pedersen, K. 2008, Beretning for det arkæologiske arbejde på KBM 3785 Gl. Strand. Unpublished excavation report: Københavns Bymuseum

Daly, A. 2016, Dendrochronological analysis of timber from Gammel Strand, Copenhagen (KBM3828). Dendro.dk report 44: 2016. Unpublished report: Dendro.dk

Dickinson, G. 2016, Ships and fishing items, Gammel Strand excavations 2014, KBM3828. Unpublished finds report: Museum of Copenhagen

Funder, S. 2016 Gammel Strand Z.M.K. 57/2011; KBM 3828 Molluscs and other macrobentos. Unpublished report, Zoologisk Museum København

Haggrén, G. 2016, Gammel Strand (KBM3828) Glass. Unpublished Gammel Strand finds report: Museum of Copenhagen

El-Sharbouby, H. 2007a, Rapport over de arkæologiske forundersøgelser på "Klasse 1 lokaliteterne" i forbindelse med Cityringen. Unpublished report: Københavns Bymuseum

Jark Jensen, J. & Søndergaard, M. 2003: KBM2747 Udfor Gammel Strand 52, Naboløs 5 samt Snaregade 4-8. Unpublished excavation report: Københavns Bymuseum

Kristensen, R. S. 2015, Floor tile. Unpublished Gammel Strand finds report: Museum of Copenhagen

Kristensen, R. S. 2016a, Medieval ceramics. Unpublished Gammel Strand finds report: Museum of Copenhagen

Kristensen, R. S. 2016b, Post Medieval ceramics. Unpublished Gammel Strand finds report: Museum of Copenhagen

Olesen, C. R. & Bork-Pedersen, K. 2012, Gammel Strand excavations 2010, KBM 3828. Unpublished excavation report: Museum of Copenhagen

Pedersen, M. 2016a, Byens folk vs. Søens folk: en komparativ analyse af brug og forbrug af kridtpiber fra et urbant miljø og et maritimt miljø. Unpublished Master Thesis from University of Copenhagen

Pedersen, M. 2016b, Clay pipes. Unpublished Gammel Strand finds report: Museum of Copenhagen

Ranheden, H. 2016, Macrofossil remains from Gammel Strand, Copenhagen (KBM3828). Unpublished report, National Historical Museums, Stockholm

Ruter, A. 2014, Gammel Strand: Geological Context and Stratigraphic Model. Unpublished report: Museum of Copenhagen

Ruter, A. 2016, Report on selected lithic artefacts from Metro Excavations at Gammel Strand. Unpublished report, Statens Naturhistoriske Museum

Whatley, S. 2015, Personal finds, Gammel Strand. Unpublished finds report: Museum of Copenhagen

Whatley, S. 2016, Gammel Strand Arms and Armour. Unpublished finds report: Museum of Copenhagen

Whatley, S. Hansen, C. & Morgan, R. 2016, Gammel Strand Metro Cityring project, KBM3828. Unpublished excavation report: Museum of Copenhagen