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The Bryggen Monitoring Project, Part 13: report on the archaeological investigations in connection with re-infiltration measures, Bryggen, 2011

A. R. Dunlop

NIKU

Forord

Statsbygg og Multiconsult AS takkes i særdeleshet, og jeg vil også uttrykke min takknemlighet overfor eierne av de ulike grunnene hvor prøvehullene ble gravd (Bergen kommune, Margrethe Storheim, Stiftelsen Bryggen, Vestnorsk Hotell AS, og Viken Eigedom AS) for deres tillatelse.

Resten av rapporten, unntatt sammendraget, er på engelsk.

Innholdsfortegnelse

1 Sammendrag

Skriv her…

2 Introduction

In autumn 2011, various archaeological investigations were carried out by A. R. Dunlop from the Bergen office of the Norwegian Institute for Cultural Heritage Research (NIKU) in various parts of the Bryggen area in advance of proposed re-infiltration measures.

The report is in three main sections: the first presents the results of the test-pits dug in the proposed "swale" areas; the second presents the results of the shallow drillings carried out to try to determine the extent of the ditch on the outside of the hotel area's sheet-piling wall; and in connection with the second, the third presents the results of earlier drillings carried out close to the outside of the hotel area's sheet-piling wall.

The work comes under NIKU project number 156132931 and was carried out on commission from *Statsbygg*.

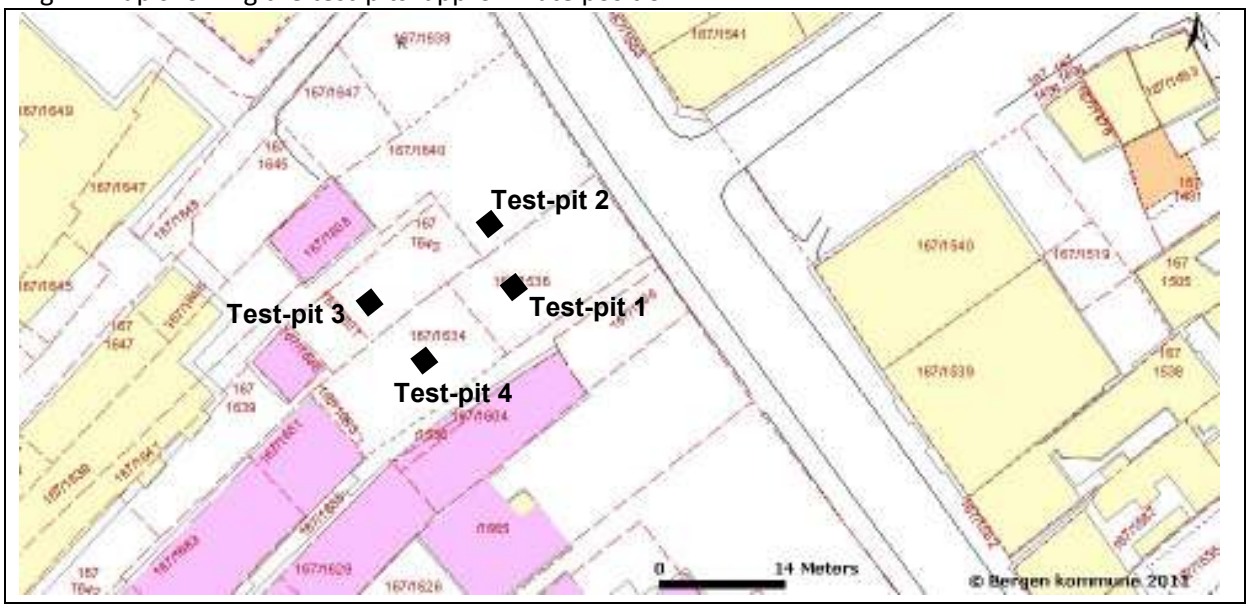
3 Test-pits for proposed swales

Four small test-pits were dug by hand, one test-pit in each of the areas proposed by Floris Boogard as candidates for the establishment of "swales" (see fig. 1), a swale being a small depression in the ground and acting more or less as a basin for catchment and slow infiltration of surface water. In the present case at Bryggen, the swales are intended to help "top up" the water-table in the area most severely affected by leakage of groundwater through the sheet piling.

The test-pits' coordinates were determined by surveyors from the firm of Multiconsult AS.

The abbreviation "masl" stands for "metres above sea-level".

Fig. 1. Map showing the test-pits' approximate position



3.1 Test-pit 1

Test-pit 1 was located in the small garden plot that forms an extension of the Nordre Bredsgården tenement up towards Øvregaten. The hole was slightly in excess of 0.5 m^2 in area. The coordinates of the hole's centre are Nxxxxx/Exxxxx, and the modern soil surface was at x.xx masl.

The modern flowerbed soil was 25-30 cm thick. The next layer, from a depth of 25-30 cm down to a depth of 40 cm, consisted of dark-grey, relatively loose, sandy, stony soil with many pieces of modern brick/tile, some sherds of modern glass (increasing numbers from a depth of 30 cm and down), some rusty metal objects, a couple of pieces of ceramic sewage-pipe, and a plastic spoon at a depth of ca. 35 cm. The layer became very stony in its bottom 5 cm.

The next layer, from 40 to 50 cm below the surface, consisted of grey, very compact sand with gravel, pebbles and stones (some as big as a baby's head), only a few pieces of modern brick/tile, one sherd of a modern glass vase at ca. 45 cm. deep, and a piece of tarmac. If we ignore the man-made contents, this layer resembled nothing so much as a morainic deposit.

The final layer, from a depth of 50 cm, consisted almost entirely of stone crushed to the size of large pebbles/small stones (Norw.: *pukk*). It was quite loose and permeable, and it may be the fill in, for instance, a modern drainage ditch. However, probing with a thin, steel hand-drill revealed the presence of a very hard layer – probably the moraine-like deposit – at a depth of 35-40 cm over the surrounding area, so it is likely that the layers below the flowerbed soil constitute the modern make-up of the plot.

Creating a swale in this area would seem to offer little in the way of conflict with protected archaeological remains.

3.2 Test-pit 2

Test-pit 2 was in the grassy area to the north-west of the garden area in which test-pit 1 was dug. This area – which would be an extension of the Søndre Bugården tenement – lies just to the south-east of the site occupied by St. Peter's church and associated graveyard. The site was investigated by Christian Koren-Wiberg in the early 20th century, but it is uncertain just how much was excavated completely; in addition, the south-eastern boundary of the graveyard towards the south-east is not known with complete certainty, so there is some possibility that test-pit 2 might be located within the graveyard's extent. The hole was about 0.25 m^2 in area (it had to be small because of the presence of thick roots from the ash tree standing not far to the north-west of the hole). The coordinates of the hole's centre are Nxxxxx/Exxxxx, and the modern turf surface was at x.xx masl.

The turf was only about 10 cm thick and covered a semi-compact layer of dark-grey/brown sandy, gravelly soil with many stones (some quite large) and pieces of modern brick/tile; there was a profusion of roots from the nearby ash tree. Plastic, sherds of glass, and some strands of electrical wiring were also present – and some quite fragile bones, which were determined to be human by Katharina Lorvik from NIKU's Bergen office.

Excavation of the hole was abandoned at a depth of 30 cm, due to the presence of roots, stones, and a few more pieces of human bone. Probing with a thin, steel hand-drill revealed that the situation – at least with respect to roots and stones – was pretty much the same over the surrounding area.

Creating a swale in this area would seem to be problematical on at least two counts: firstly, possible conflict with protected archaeological remains; and secondly, the roots of the ash tree.

3.3 Test-pit 3

Test-pit 3 was located towards the south-western end of the grass-covered "cabbage patch" area that forms a north-eastward extension of the Søndre Bugården tenement. The hole was slightly in

excess of 0.5 m^2 in area. The coordinates of the hole's centre are Nxxxxx/Exxxxx, and the modern turf surface was at x.xx masl.

The turf was 25 cm thick. From a depth of 25 cm to 35 cm, there was a layer of dark-grey, somewhat loose, sandy soil with a considerable quantity of stones and pieces of modern brick/tile, along with some sherds of modern glass. A "Vick's" cough-drop wrapper turned up at a depth of 30 cm.

From a depth of 35 cm to 40 cm, there was a loose layer of light-grey/-brown sand and gravel with some pebbles.

From a depth of 40 cm and on down, there was a mixture of modern soil and redeposited cultural-deposit material (quite dark because of the presence of some ash and charcoal). A piece of plastic turned up at a depth of 45 cm, and sherds of modern glass were present all the way down to a depth of 60 cm. In this layer were numerous large stones – jumbled, not in any kind of structural configuration – and these stones effectively prevented further excavation. The stones certainly did not form a floor, nor does it seem likely that they represent a foundation; they would appear to be nothing more than part of the bedding of the "cabbage patch".

Creating a swale in this area would seem to offer little in the way of conflict with protected archaeological remains.

3.4 Test-pit 4

Test-pit 4 was located towards the south-western end of the grass-covered "cabbage patch" area that forms a north-eastward extension of the Nordre Bredsgården tenement. The hole was slightly in excess of 0.5 m^2 in area. The coordinates of the hole's centre are Nxxxxx/Exxxxx, and the modern turf surface was at x.xx masl.

The turf was 15 cm thick. From a depth of 15 cm to 35 cm, there was a semi-compact layer of light-grey sand, gravel, pebbles and stones with some pieces of modern brick/tile, some pieces of plastic, and a piece of ceramic sewage-pipe.

At a depth of 35 cm, a quite uniform surface of stones – some large, but most were either large pebbles or small stones – that were "embedded" in a hard matrix of light-grey/-yellow sand containing only a few small pieces of brick/tile. The layer was about 15 cm thick altogether. It may well represent a kind of courtyard to the north-east of the *steinkjeller* that was found in "Henning's Hole".

From a depth of about 50 cm was encountered a dark-grey/black layer of quite loose, homogeneous humus – almost certainly an in situ cultural deposit. It could not be investigated in detail because it was impossible to expose a large portion of the layer's surface. However, it is likely to represent an occupation deposit associated with the use of the *steinkjeller*.

Creating a swale in this area may well be problematical, unless the swale's depth can be decreased in some way. Might it be an idea to raise the surface of the "cabbage patch" area by 20-30 cm prior to excavation of the swale?

3.5 Test-pits: conclusions

Going on the information thus far available, it would seem that only two of the investigated areas are suitable for establishing swales – the areas containing test-pits 1 and 3.

4 Drillings (2011, and earlier)

4.1 Drillings for IT-ditch, 2011

4.1.1 Preamble

In late October 2011, nine shallow drillings were carried out by Multiconsult AS at various points located close outside the sheet-piling wall encircling the hotel site (see fig. 2), with A. R. Dunlop and C. Tøssebro from the Bergen office of the Norwegian Institute for Cultural Heritage Research (NIKU) supervising the drilling in order to record any archaeological information.

The purpose of the work was two-fold:

- firstly, to try to determine the extent of the ditch excavated on the outside of the sheet piling, and particularly the depth at which the transition to in situ cultural deposits takes place
  ¤ this is because it is hoped to use the existing ditch to install a so-called IT-pipe that can reinfiltrate surface water in order to maintain the level of the water-table; the ditch for the IT-pipe will probably require a width of about 1.5 metres and a depth of no less than 1.4 metres – and it would be preferable that the ditch does not come into conflict with in situ cultural deposits, and certainly not deposits of medieval date;
- secondly, to install a monitoring system – consisting of short dipwells and various sensors – in what has up to the present been the unsaturated zone, in order to monitor the effects of any subsequent raising of the water-table (should establishment of the IT-pipe be given the go-ahead).

4.1.2 Methods

As in most previous dipwell installations, the drilling was done using an auger, a rotary drill, whose total "thread" length was 1.0 metre. The drill was driven down under rotation one metre at a time, and then retracted without rotation so that the adhering soil could be inspected (after having scraped away the outermost material, which is liable to become "contaminated" as a result of contact with higher strata under retraction).

Documentation/recording adhered to the standard procedures employed by NIKU (but tailored to the specific situation), and all photography was done using a digital camera. No dating samples or small finds were recovered.

The drilling-point locations were assigned by Dunlop in consultation with J. A. Jensen of Multiconsult AS and Hans de Beer of the Geological Survey of Norway (NGU). The drilling points were originally numbered by Multiconsult AS, who also surveyed their positions. The abbreviation "masl" stands for "metres above sea-level".

4.1.3 Observations

4.1.3.1 IT1

Coordinates (IT1A): N6701392.984/E297493.949
Coordinates (IT1B): N6701391.834/E297494.812
Ground surface: 4.35 masl
Distance from sheet piling: xxxx
Depth to cultural deposits' top (IT1B): 130 cm
Two attempts were made here, designated IT1A and IT1B. In IT1A – which was situated about two metres from the western corner of the stone building called Arent Meyers Kjeller, and directly in line with the building's north-western wall – the auger was stopped by a stone obstruction at a depth of ca. 100 cm from surface (ca. 3.35 masl). This obstruction may have something to do with the sheet piling – or it may represent part of a possible earlier stone building (either a wall or a floor).

In IT1B, which was about one and a half metres towards the southeast from the first, the deposit sequence was as follows (depths in centimetres):

0 - 130: loose, coarse fill of sand, pebbles and stones – backfill in the sheet-piling ditch
130 - ca. 180: ash, charcoal and lime in stratified lenses, probably detritus from mortar production; no odour – in situ cultural deposit
ca. 180 - 220: difficult to be sure, because little soil adhered to the auger (on account of problems under the auger's retraction), but a patch of some brown humus and small woodchips was observed at about 200 cm depth

Drilling was abandoned at 220 cm depth.

4.1.3.2 IT2

Coordinates: N6701368.927/E297488.854
Ground surface: 2.90 masl
Distance from sheet piling: xxxx
Depth to cultural deposits' top: >220 cm

0 - 110: loose, coarse fill of sand, pebbles and stones – backfill in the sheet-piling ditch
110 - 195: loose, somewhat moist, mixed fill (dark soil with small stones and pieces of brick) with some redeposited cultural-deposit material; no odour – backfill in the sheet-piling ditch
195 - 210: timber, redeposited (relatively fresh colour, but poorly preserved; quite sour woody odour) – backfill in the sheet-piling ditch
210 - >220: same as from 110 to 195 – backfill in the sheet-piling ditch

Drilling was abandoned at 220 cm depth.

4.1.3.3 IT3

Coordinates: N6701361.600/E297483.071
Ground surface: 2.45 masl
Distance from sheet piling: xxxx
Depth to cultural deposits' top: >50 cm

Drilling at this point (2 separate locations about one metre apart were tried) was stopped by a concrete obstruction – very likely connected with the sheet piling – at a depth of roughly 50 cm. After consultation with Hans de Beer, further drilling at this point was abandoned.

4.1.3.4 IT4

Coordinates: N6701348.375/E297470.578
Ground surface: 1.90 masl
Distance from sheet piling: xxxx
Depth to cultural deposits' top: >220 cm

0 - 85: loose, coarse fill of sand, pebbles and stones – backfill in the sheet-piling ditch
85 - >220: relatively loose, somewhat moist, mixed fill (dark soil with small stones, pieces of brick and quite a few lumps of a tarry substance, possibly a by-product of the 1955-fire), along with one sherd of modern windowpane from 140 cm deep) with some redeposited cultural-deposit material (including some timber fragments) – backfill in the sheet-piling ditch

Drilling was abandoned at 220 cm depth.

4.1.3.5 IT5

Coordinates: N6701328.842/E297439.816
Ground surface: 1.35 masl
Distance from sheet piling: xxxx

Depth to cultural deposits' top: >60 cm
Drilling at this point was stopped by a concrete obstruction – very likely connected with the sheet piling – at a depth of roughly 60 cm. After consultation with Hans de Beer, further drilling at this point was abandoned.

4.1.3.6 IT6

Coordinates: N6701431.929/E297461.965
Ground surface: 4.70 masl
Distance from sheet piling: xxxx
Depth to cultural deposits' top: 120 cm

0 - 15:	loose sandy humus (flowerbed earth)
15 - 120:	loose, coarse fill of sand, pebbles and stones – backfill in the sheet-piling ditch
120 - 250:	"fatty", brownish humus with some woodchips/pieces of wood and a few hazelnut shells; slight H_2S odour; no datable artefacts; soil sample taken from 170–180 m deep – in situ cultural deposit

Drilling was abandoned at 250 cm depth.

4.1.3.7 IT7

Coordinates: N6701429.161/E297467.025
Ground surface: 4.85 masl
Distance from sheet piling: xxxx
Depth to cultural deposits' top: 140 cm

0 - 15:	loose sandy humus (flowerbed earth)
15 - 140:	loose, coarse fill of sand, pebbles, stones, humus and pieces of brick – backfill in the sheet-piling ditch
140 - 250:	"fatty", brownish humus with a few woodchips/pieces of wood and hazelnut shells; slight H_2S odour; no datable artefacts – in situ cultural deposit

Drilling was abandoned at 250 cm depth.

4.1.3.8 IT8

Coordinates: N6701416.256/E297483.722
Ground surface: 4.85 masl
Distance from sheet piling: xxxx
Depth to cultural deposits' top: 180 cm

0 - 60:	light-coloured, loose sand and gravel – backfill in the sheet-piling ditch
60 - 180:	loose, sandy humus with pebbles and pieces of brick – backfill in the sheet-piling ditch (probably redeposited cultural-deposit material mixed with modern material)
180 - 250:	"fatty", dark-brown humus with a some woodchips/pieces of wood, hazelnut shells and a few pieces of charcoal, possible timber at 240-250 depth; slight H_2S odour; no datable artefacts – in situ cultural deposit

Drilling was abandoned at 250 cm depth.

4.1.3.9 IT9

Coordinates: N6701408.132/E297492.462
Ground surface: 5.00 masl
Distance from sheet piling: xxxx
Depth to cultural deposits' top: not determined

This point was drilled without auger to a depth of about 140 cm in order to install a sensor casing for later use by Henning Matthiesen. The bottom 50 cm was quite soft – offering no resistance to the thin steel rod used for drilling – and may be in situ cultural-deposit material.

4.2 Earlier drillings

4.2.1 Rotary drillings for the Piling Project, Bugården, Bryggen, 2005

In November 2005 three drillings (all of them on the Bryggen side of the piling) were carried out in the area behind Bugården – where the sheet piling forms an angle just by the truncated tenement's northern corner – in connection with the "Piling Project". Drilling PB1 was located right next to the sheet piling, PB3 about 0.5 metres from the sheet piling, and PB2 about 1 metre from the sheet piling. None were used to install dipwells. [NB.: the coordinates have not been converted to UTM yet.]

4.2.1.1 PB1

Coordinates: N67208.75/E59833.30
Ground surface: 1.75 masl
Top of sheet piling: 1.12 masl
Distance from sheet piling: ca. 10 cm
Depth to cultural deposits' top: 520 cm

0 - 35: Red bricks in bedding sand
35 - 215: Modern fill containing stones/large pebbles with pieces of brick – backfill in the sheet-piling ditch
215 - 280: Dark-grey, rather loose, sandy, gravelly stratum with some humus content and a few half-rotted woodchips (lying at all angles), some hazelnut shells, one twig, one piece of animal bone, and a few small pieces of red brick – may be redeposited cultural deposit
280 - 355: As above, but somewhat more compact
355 - 520: As above: apparently a mixture of organic cultural deposit with non-organic material

4.2.1.2 PB2

Coordinates: N67207.75/E59834.65
Ground surface: 1.75 masl
Distance from sheet piling: ca. 100 cm
Depth to cultural deposits' top: 210 cm

0 - 40: Red bricks in bedding sand with some stone/pebble fill underneath
40 - 110: Redeposited culture-layer: slightly sandy and humic soil with some stones and pieces of red brick
110 - 210: As above, but with a little silt and with greater organic content (severely rotted woodchips and some pieces of charcoal, bark and hazelnut shells), and a few interspersed small patches of light-grey clay

4.2.1.3 PB3

Coordinates: N67208.40/E59834.40
Ground surface: 1.75 masl
Distance from sheet piling: ca. 50 cm
Depth to cultural deposits' top: 210 cm

0 - 35: Red bricks in bedding sand
35 - 120: Modern fill containing stones/large pebbles with pieces of brick – backfill in the sheet-piling ditch
120 - 210: Redeposited culture-layer: very humified with severely rotted woodchips, some pieces of charcoal and red brick, and a few interspersed small patches of light-grey clay

4.2.2 Dipwell drillings close to the sheet piling

Several drillings for dipwell installation have been carried out previously at points close to the sheet piling.

4.2.2.1 MB13 (2005)

Coordinates: N6701355.87/E297477.47
Ground surface: 2.10 masl
Distance from sheet piling: ca. xx cm
Depth to cultural deposits' top: 245 cm
0 - 40: Cobblestones in mortar
40 - 130: Modern brownish earth fill containing stones/large pebbles with pieces of brick (NB but **not** the loose stony fill found elsewhere along the sheet piling) – backfill in the sheet-piling ditch
130 - 150: Apparently grey-black sandy earth with pieces of brick (but not much material adhered to the drill)
150 - 245: Sandy, brown humus with a quantity of relatively decomposed woodchips, some small stones and small pieces of red brick, one piece of plastic at ca. 160 cm deep

4.2.2.2 MB22 (2006)

Coordinates: N6701422.67/E297473.095
Ground surface: 4.65 masl
Distance from sheet piling: ca. xx cm
Depth to cultural deposits' top: 180 cm
0 - 30: Cobblestones in sand
30 - 120: Modern fill containing sand and stones/large pebbles – backfill in the sheet-piling ditch
120 - 180: Mixed, redeposited cultural deposits

4.2.2.3 MB15 (2009)

Coordinates: N6701355.22/E297476.61
Ground surface: 1.90 masl
Distance from sheet piling: ca. xx cm
Depth to cultural deposits' top: 210 cm
0 - 40: Cobblestones in mortar
40 - 210: Modern fill containing stones/large pebbles with pieces of brick – backfill in the sheet-piling ditch

4.2.2.4 MB32 (2009)

Coordinates: N6701396.00/E297493.80
Ground surface: 4.55 masl
Distance from sheet piling: ca. xx cm
Depth to cultural deposits' top: 190 cm
0 - 35: Red bricks in bedding sand
35 - 190: Modern fill containing stones/-large pebbles with pieces of brick – backfill in the sheet-piling ditch

4.2.2.5 MB33 (2009)

Coordinates: N6701377.10/E297492.90
Ground surface: 3.35 masl
Distance from sheet piling: ca. xx cm
Depth to cultural deposits' top: 185 cm
0 - 35: Red bricks in bedding sand
35 - 185: Modern fill containing stones/-large pebbles with pieces of brick – backfill in the sheet-piling ditch

4.3 Drillings: conclusions

Probably the best way to present the information is by means of a table, with the various drillings – omitting IT9 – shown in order from north to south.

Drilling ID	Ground surface	Available depth	Available width	Distance from sheet piling	Obstructions
IT6	4.7	1.2			
IT7	4.85	1.4			
MB22	4.65	1.8			
IT8	4.85	1.8			
MB32	4.55	1.9			
IT1A	4.35	1.0			Stone wall, or floor
IT1B	4.35	1.3			
MB33	3.35	1.85			
IT2	2.9	>2.2			
IT3	2.45	(>0.5)			Concrete
MB13	2.1	2.45			
MB15	1.9	2.1			
IT4	1.9	>2.2			
PB1	1.75	5.2		0.1	
PB2	1.75	2.1		1.0	
PB3	1.75	2.1		0.5	
IT5	1.35	(>0.6)			Concrete

This shows that there are two main areas where the laying of the IT-pipe will encounter problems (discounting the concrete obstructions encountered in IT3 and IT5).