



Aalborg Universitet

AALBORG UNIVERSITY
DENMARK

The Effect of Converting Combined Sewers to Separate Sewers

Schaarup-Jensen, Kjeld; Rasmussen, Michael R.; Thorndahl, Søren Liedtke

Published in:
12th International Conference on Urban Drainage : proceedings

Publication date:
2011

Document Version
Accepted author manuscript, peer reviewed version

[Link to publication from Aalborg University](#)

Citation for published version (APA):
Schaarup-Jensen, K., Rasmussen, M. R., & Thorndahl, S. L. (2011). The Effect of Converting Combined Sewers to Separate Sewers. In *12th International Conference on Urban Drainage : proceedings: Porto Alegre/Brazil, 10-15 September 2011* International Association of Hydraulic Engineering and Research (IAHR).

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal -

Take down policy

If you believe that this document breaches copyright please contact us at vbn@aub.aau.dk providing details, and we will remove access to the work immediately and investigate your claim.

The effect of converting combined sewers to separate sewers

K. Schaarup-Jensen, M. R. Rasmussen and S. Thorndahl

Aalborg University, Department of Civil Engineering, Sohngaardsholmsvej 57, DK-9000
Aalborg, Denmark

Extended Abstract

In 1997 a research and monitoring station was established as a part of the intercepting sewer from Frejlev, a small town of 2000 inhabitants 7 kilometers southwest of Aalborg, Denmark (Schaarup-Jensen et al., 1998) – cf. fig. 1.

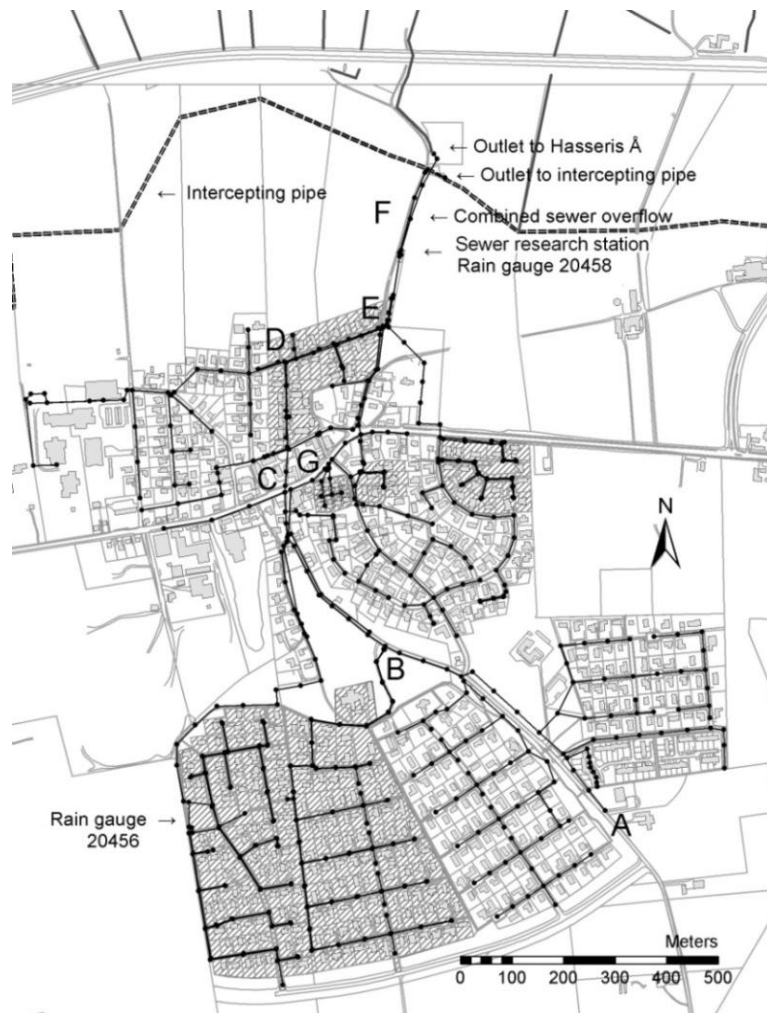


Figure 1: The town of Frejlev, the rain gauges, the sewer system, the research station, the CSO structure and the outlets to the intercepting pipe and the Hasseris stream. Areas without shading are catchments supplied with combined sewers; areas with shading are catchments supplied with separate sewers.

Approx. one third of the catchments in this town are supplied with separate sewers, but these catchments are characterized by diverting both waste water as well as storm water to the old part of the sewer system, which is a combined sewer system. This is quite a typical situation in many Danish cities. The old catchments of cities are supplied with combined sewers, while the more recent parts of the cities has been supplied with “modern” separate sewer systems. But in many cases this is “uncompleted” separate sewers as they often divert storm water to the old system – and not directly to the receiver, which in this case is a small stream, Hasserris, with a west-east going course approx.1 kilometre north of the town. During the years this stream has received combined sewers overflows (CSO’s) from Frejlev from a downtown placed CSO structure in the northern part of the town. Waste water from Frejlev is diverted to a central WWTP in the western part of Aalborg. This is done by an intercepting pipe which during wet weather situations receives a mixture of waste water and storm water from Frejlev as well as other (small) cities linked to this intercepting pipe.

In November 2009 the Municipality of Aalborg has released a plan (Vision 2100, 2009), with the vision that all sewer systems in the Municipality must be separate sewers before the end of this century. In Frejlev this vision will have an almost instant impact as the sewer system authorities has decided within a few years to convert the 2 sub-catchments in the south-western part of the city to “really” separated catchments. Instead of diverting storm water from these catchments to the existing combined sewer, storm water – through a suitable designed basin – in near future must be diverted to a small catchment in the north-western of the city and from here discharged to the Hasserris stream through an existing outlet pipe passing another basin before the stream itself is reached.

Based on MOUSE LTS (Jakobsen *et al.*, 2001) simulations the authors of this paper will investigate to what degree the “conversion” of these 2 sub-catchments will influence:

- The annual amount of mixture of waste water and storm water diverted to the WWTP.
- The size and frequency of CSO’s from the present CSO structure.
- The annual and extreme amounts of storm water – including pollutants – to the Hasserris stream.

The overall option of this paper will be to contribute to the standing debate concerning the advantages of separate sewer systems compared to traditional combined sewers.

References

- Schaarup-Jensen, K., T. Hvitved-Jacobsen, B. Jütte, B. Jensen and T. Pedersen (1998). A *Danish sewer research and monitoring station*, Water Science & Technology, Vol. 37, No. 1, pp. 197-204.
- Jakobsen, C., A. Brink-Kjaer and M. Moeller Hansen (2001). *Using MOUSE LTS to analyze sewer mains in Greater Copenhagen*. DHI software conference, June 6-8, 2001, Scanticon, Denmark.
- Vision 2100 (2009). (In Danish) *Vision 2100 – samt udviklingsplan frem til 2025*. Aalborg Forsyning, Kloak A/S. Stigsborg Brygge 5, DK-9400 Nørresundby. November 2009.