

Quantification and Detection of Non-Sewer Water Infiltration and Inflow in Urban Sewer Systems

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Abstract : Separated sewer systems are designed to transfer the wastewater from houses and industrial sections to wastewater treatment plants. Unwanted water in the sewer systems is a well-known problem, i.e. storm-water inflow is around 50% of the foul sewer, and groundwater infiltration to the sewer system can exceed 50% of total wastewater volume in deteriorated networks. Infiltration and inflow of non-sewer water (I/I) into sewer systems is unfavorable in separated sewer systems and can trigger overloading the system and reducing the efficiency of wastewater treatment plants. Moreover, I/I has negative economic, environmental, and social impacts on urban areas. Therefore, for having sustainable management of urban sewer systems, I/I of unwanted water into the urban sewer systems should be considered carefully and maintenance and rehabilitation plan should be implemented on these water infrastructural assets. This study presents a methodology to identify and quantify the level of I/I into the sewer system. Amount of I/I is evaluated by accurate flow measurement in separated sewer systems for specified isolated catchments in Trondheim city (Norway). Advanced information about the characteristics of I/I is gained by CCTV inspection of sewer pipelines with high I/I contribution. Achieving enhanced knowledge about the detection and localization of non-sewer water in foul sewer system during the wet and dry weather conditions will enable the possibility for finding the problem of sewer system and prioritizing them and taking decisions for rehabilitation and renewal planning in the long-term. Furthermore, preventive measures and optimization of sewer systems functionality and efficiency can be executed by maintenance of sewer system. In this way, the exploitation of sewer system can be improved by maintenance and rehabilitation of existing pipelines in a sustainable way by more practical cost-effective and environmental friendly way. This study is conducted on specified catchments with different properties in Trondheim city. Risvollan catchment is one of these catchments with a measuring station to investigate hydrological parameters through the year, which also has a good database. For assessing the infiltration in a separated sewer system, applying the flow rate measurement method can be utilized in obtaining a general view of the network condition from infiltration point of view. This study discusses commonly used and advanced methods of localizing and quantifying I/I in sewer systems. A combination of these methods give sewer operators the possibility to compare different techniques and obtain reliable and accurate I/I data which is vital for long-term rehabilitation plans.

Keywords : flow rate measurement, infiltration and inflow (I/I), non-sewer water, separated sewer systems, sustainable management

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