Stichting RIONED

Ondergrondse infiltratie van regenwater

Een literatuur- en praktijkonderzoek naar milieurisico's

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Summary

Introduction
Infiltration of storm water is the preferred strategy for making urban drainage more sustainable. In the dense populated Dutch cities most infiltration devices are placed under roads and pavements. Compared to infiltration at surface level the environmental risks of subsurface infiltration are presumed to be higher due to high groundwater levels. Although subsurface infiltration systems are widely spread in The Netherlands little knowledge is available for operation and maintenance. The operators want information about the hydraulic and environmental performance in the long term, about the required maintenance and about the useful life spans to be expected.

Methodology
In seven sites with different subsurface constructions and different geo-hydrological situations, the hydraulic and environmental performance have been monitored over a period of ten to thirteen years. Specific attention has been given to environmental risks due to micro pollutants, heavy metals and PAH's in the infiltrated storm water. At sequential distances around the infiltration devices and at consequent depths samples of the soil and groundwater have been taken and analyzed. Two locations have been studied to obtain insights in the hydraulic functioning of the infiltration systems. The rainfall and water levels inside and around the infiltration devices have been measured over several months to get insight in possible loss of infiltration capacity.

Conclusions and recommendations
SUDS can function quite well as long as design and maintenance is in accordance with the guidelines. After ten years of monitoring no significant loading of pollutants nor a significant loss of infiltration capacity has been found. Common failures in the design, construction and maintenance of SUDS are gathered from several locations and translated to recommendations. Important factors for maintaining the hydraulic performance are:
- a sound survey of infiltration capacities of the soil;
- investigation of statistics of groundwater tables;
- choice of the pore width of geo-textiles;
- construction of the swales or soakaway units in dry conditions;
- drainage of the area during the construction phase in a housing project;
- mowing of swales only at sufficient dry weather conditions;
- SUDS need an adequate communication towards the citizens.

All infiltration sites have specific features and therefore it is hard to give a general conclusion of all results. However, despite the high groundwater levels and low permeability of the soil, the results from the seven research locations are generally comparable with similar research: most heavy metals are bound within the first 0.5 meter under the infiltration system. At all research locations the concentrations are below the Dutch standards so infiltrating storm water seems an acceptable risk for the environment.

For interpretation of the environmental performance of subsurface infiltration systems the results of soil and groundwater sample analyses should be related to the specific pollutant bounding capacities. The remaining particle-bounding capacity gives a better prediction of the movement of the pollutant frontier down- and side-

ward from the infiltration system then the absolute concentrations. The specific bounding capacities of the different soil layers around a subsurface infiltration system depend on the clay and humus fractions. Therefore sampling should follow a survey of fractions, permeability's and statistics of groundwater tables within the different soil layers.
For the future further research is needed to gain more insight in the long term effects of polluting the soil and groundwater due to underground infiltration systems.
The research should be repeated within a period of ten years to predict the required frequencies of maintenance and replacement.