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Laboratory investigation for management of clogging in managed aquifer recharge infiltration basins

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Spreading infiltration basins are one of the main managed aquifer recharge modules and are well distributed all over the globe. The majority of them make use of river water to recharge the underlying aquifer. The suspended solids, organic compounds and bacterial content cause the gradual blocking of the voids of the basin floor surface, reducing the infiltration rate of the recharge unit. This phenomenon is defined as clogging and avoiding it is nearly unattainable. A widespread method employed to deal with the problem is scrapping, where the affected volume of soil is removed. Scrapping is financially intensive and has to be repeated in order to achieve optimum levels of recharge. This study seeks to quantify the impact of scrapping campaigns on the hydraulics of the basins and determine the actual recovery of the hydraulic properties of the medium before it clogs again.

The setup of the experiment involved four lab scaled infiltration units that were fed in parallel with river water (DOC: 5 mg/l & TSS:5-20 mg/l) under a hydraulic loading rate regime of 300 m/a and a hydraulic loading cycle of one infiltration day and one dry day (1:1). The dimensions of the infiltration basins were 0.30m x 0.20m x 0.10m and they featured a security valve for overflow events. The scrapping in each of the four basins was carried out at set intervals, and its impact on the hydraulic parameter quantified via tracer experiments (NaCl).

The scrapping of basins achieves a robust recovery of the recharge unit in short time, but not entirely to 100%, especially when is not the first material removal campaign. Most of the clogged volume relies in the first centimetres of the surface. Nevertheless, clogging sources have been also identified in minor levels at deeper layers; these sources lead to a faster blocking process of the pores even after the scrapping. The organic content accumulated upon the infiltration unit floor accrues faster once the upper material has been repeatedly scrapped.