



Discharge of indicator bacteria from on-site wastewater treatment systems

Inga Herrmann*, Brenda Vidal, Annelie Hedström

Department of Civil, Environmental and Natural Resources Engineering, Luleå University of Technology, Laboratorievägen 14, 97 187 Luleå, Sweden, Tel. +46920492528; Fax: +46920491399; emails: Inga.Herrmann@ltu.se (I. Herrmann), Brenda.Vidal@ltu.se (B. Vidal), Annelie.Hedstrom@ltu.se (A. Hedström)

Received 23 December 2016; Accepted 6 September 2017

ABSTRACT

Small-scale on-site wastewater treatment facilities present the risk of microbial pollution of ground-water used for drinking water and surface water used for recreational purposes. This study assessed the discharge of indicator bacteria, total coliform, *Escherichia coli*, intestinal enterococci and *Clostridium perfringens*, by flow-proportional sampling from 12 full-scale on-site treatment systems featuring biological treatment units (mainly sand filters) and alkaline filter beds for phosphorus treatment (P-filters). Correlations of effluent bacterial concentrations with pH, total and dissolved organic carbon, filter age and hydraulic load were evaluated. The bacterial concentrations in the effluents of the sand filters were considerable. The concentrations for excellent bathing water quality set in the EU bathing water directive, 200 and 500 colony forming units (cfu)/100 mL for intestinal enterococci and *E. coli*, respectively, were exceeded in three (intestinal enterococci) and one (*E. coli*) of the eight investigated sand filters. In one of the sand filters, effluent *E. coli* concentrations were high although no obvious malfunction of the filter was observed. In the effluent from the other investigated biological treatment units (a trickling fibre filter, two units with attached growth treatment and one aerated activated sludge technique), bacterial concentrations were very high (75,000 cfu/100 mL of *Clostridium perfringens* and 85,000 cfu per 100 mL of total coliform), possibly because of a shorter retention time of the wastewater in these facilities, missing aeration and little time between start-up and measurements. Three and four of the nine investigated P-filters exceeded excellent bathing water quality in coastal waters as stipulated by the EU bathing water directive in respect of *E. coli* and intestinal enterococci, respectively.

Keywords: Sand filter; Alkaline filter; Polonite; Total organic carbon; pH

* Corresponding author.

Presented at the 13th IWA Specialized Conference on Small Water and Wastewater Systems & 5th IWA Specialized Conference on Resources-Oriented Sanitation, 14–16 September, 2016, Athens, Greece.

1944-3994/1944-3986 © 2017 Desalination Publications. All rights reserved.