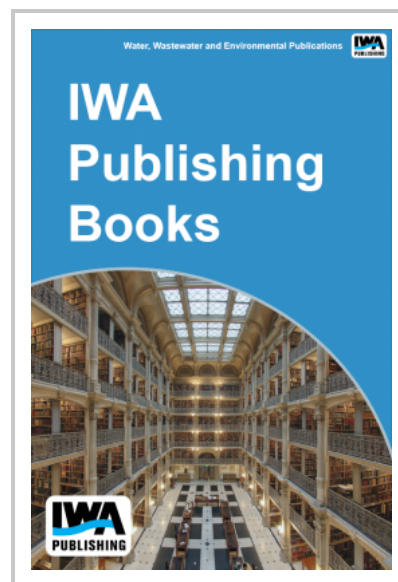


State of the Science: Review of Quantitative Tools to Determine Wastewater Soil Treatment Unit Performance

The literature review described in this report is part of a larger research project to assess STU performance with respect to treatment of important wastewater constituents. The overall goal of the project is to provide a toolkit and tool-use protocol that is easy to implement and available to a wide range of users to assess STU performance. This literature review is not a preview of tools that we will develop and propose, but rather an analysis of the information and data and the literature, to help guide our tool development. All tools developed will be based on rigorous experimental data and quantitative models verified with field data from operating systems. In some cases, more sophisticated tools (e.g., complex mathematical models) may be warranted depending on the relative complexity of the problem and the relative risk associated with a poor design. This literature review focused on STU performance, key conditions or factors potentially affecting STU performance, and the current best practices for using models and other available tools to predict expected STU performance. The information gained during this literature review will guide the future direction of the project. Constituents of interest include nitrogen (N), phosphorus (P), microbial pollutants, and emerging organic wastewater contaminants (OWCs).



Based on this literature review, it is clear that due to the variability of data collected at field sites, simple binary relationships (e.g., C/Co versus depth for various soil types) for statistical predictions of the attenuation of N, P, microorganisms or OWCs cannot be justified. Specific to N, hydraulic loading rate appears to be more important than soil texture or soil depth within the first 30-60 cm, although both soil depth and texture remain important variables. Most of the reported results related to the interaction of P with soil appear to be from laboratory batch tests. Similarly, field-scale evaluations of pathogen removal are limited. Finally, most of the existing OWC work has focused on the occurrence and concentrations of selected compounds in streams, lakes, and groundwater impacted by wastewater treatment plant effluents.

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