

SUMMARY OF FINDINGS

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On-site Wastewater Treatment: Investigation of Rapid Percolating Subsoils, Reed Beds and Effluent Distribution

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The safe disposal of on-site wastewater is essential for the protection of both groundwater and surface water resources in Ireland. This project reports the results from field trials carried out on three separate sites investigating the attenuation of chemical and microbiological pollutants in domestic wastewater through relatively fast percolating subsoil and also through reed bed treatment systems. In addition, the distribution performance of several different devices designed to split the on-site effluent evenly across the percolation areas was evaluated.

Background

The aim of the research project was to carry out a series of rigorous on-site trials in order to enhance the understanding of the processes involved and pollutant attenuation performance of relatively fast percolating subsoils (T-value < 5) receiving typical domestic onsite wastewater effluent. The project also studied the potential application of the horizontal subsurface flow reed bed process as treatment systems of such effluents. The third area of research was to investigate the efficacy of gravity flow distribution devices which should be used to split the on-site effluent evenly across a percolation area.

Key Points

- The discharge of septic tank effluent or packaged plant secondary treated effluent onto gravity fed percolation areas with subsoils of relatively quick percolation

characteristics (T-values down to 3.5) provides a reasonable protection to groundwater, providing there is at least 0.95 m of unsaturated subsoil. However, secondary treated effluent discharged into such subsoils results in a much reduced biomat with equivalent increases in the hydraulic loading. This seems to promote a higher nitrogen load on the groundwater and also there was evidence of breakthrough of the indicator bacteriophages. Hence, packaged plants should not be promoted over septic tanks in areas where the reasonable unsaturated subsoil depths and percolation rates exist.

- The effects of increased percolation in these sites with relatively fast percolation characteristics compared to previous studies on higher T-value sites is evident – muted biomat development and reduced nitrogen removal on the percolation area receiving septic tank effluent, and isolated incidences of bacterial breakthrough of *E. coli* under trenches receiving both septic tank and secondary treated effluent. Hence, it is recommended that the current lower T-value limit for fast percolating subsoils of $T = 1$ should be raised to $T = 3$ on a precautionary basis.
- The use of three different bacteriophage tracers on the sites has demonstrated that enteric viruses in on-site effluent should be almost completely removed with 0.95 m of subsoil. However, as small concentrations were still detected after 0.95 m beneath the trenches receiving secondary treated effluent, the trials confirm the decision to increase the depth of subsoil required in the new Code of Practice from 0.6 to 0.9 m for percolation areas receiving such effluent.
- The minimal spread of the biomat on the trenches receiving secondary treated effluent means that consideration should be given on such sites as to how to distribute the effluent over a wider area for percolation, as the majority of the trench in the current design is not being used.
- The design criteria given for horizontal flow reed beds in the forthcoming Code of Practice are appropriate for both secondary and tertiary systems, although the limitations of the systems need to be acknowledged. The effluent from tertiary treatment reed beds will still need to pass through a polishing filter before discharging to groundwater.
- The maintenance requirements are important on a regular basis, especially for packaged plants and distribution devices, which is a message that should be heavily reinforced in the forthcoming Code of Practice. The existing distribution devices on the market are not suitable for use in gravity fed on-site situations without regular maintenance.

For Further Information

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The report *On-site Wastewater Treatment: Investigation of Rapid Percolating Subsoils, Reed Beds and Effluent Distribution* by Laurence Gill *et al.* is published by the Environmental Protection Agency and is available from <http://www.epa.ie/downloads/pubs/research/water/name,27449,en.html>