

# CORAL BEACH SAND AS ENGINEERED SAND FILTER IN SEPTIC TANK EFFLUENT DRAINAGE FIELDS IN KIRIBATI

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## ABSTRACT

Within some areas of the Pacific there are issues related to the safe disposal of human waste. Within the low lying atolls of Kiribati approximately 60% of the population open defecation with additional waste treatment options being pit latrines or basic septic tanks. Where septic tanks are being used many are poorly functioning and the disposal field are not effective for removal of contaminants including human pathogenic microorganisms. In these atolls potable water is most often sourced from shallow untreated groundwater held within unconfined coral sand deposits. This coupled with the close proximity of groundwater to waste disposal poses a serious threat to public health in Kiribati.

There have been few studies on microbial transport through coral beach sand material. Previous research conducted at ESR on the efficacy of coral sand for attenuating microbial pathogens has revealed that it contains a high affinity for *E. coli* bacteria.

An assessment of the drainage and microbial removal properties of coral sand under controlled conditions was completed for the purpose of applying such media as an active sand filter in septic tank effluent drainage fields in Kiribati. To achieve this bacterial and viral tracers were injected into coral beach sand lysimeters with tests conducted on clean, conditioned and contaminated sand and also included modeling an aged system operating under continual use.

*E. coli* showed a consistent log removal during the experiments due most likely to filtration playing a significant role in its attenuation within the coral sands due to its larger surface area compared to MS2 phage and *E. faecalis*. All organisms tested showed removal efficiencies over 5 Log<sub>10</sub> giving an effective removal of between 99.99 and 99.999% for all organisms tested.

The results have demonstrated the effectiveness of coral sand for attenuation and removal of microbial pathogens. The use of a readily available low cost media could offer vast improvements for waste treatment in Kiribati and offer enhanced protection of the limited potable water supply.

## KEYWORDS

Coral sands, Kiribati, Pathogen attenuation, septic tank disposal field