

RADIONUCLIDE DISTRIBUTION IN SOILS PERIODICALLY TREATED WITH MUNICIPAL SEWAGE SLUDGE

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ABSTRACT

In a continuing investigation of the fates of radioactive species contained in sludge that is applied to agricultural land, the activity concentrations of selected radionuclides were measured in soils, up to a maximum depth of 50 cm. Radionuclides studied were those detected in the sludge prior to land application; and they consisted of: Be-7, K-40, Co-60, I-131, Cs-137, Ra-228, U-235 and U-238. Measurements, in both sludge-treated and untreated (reference) areas, were made on five (5) tree and pasture farm sites where measured quantities of processed municipal sewage, previously analyzed for radionuclide content, have been applied periodically over periods ranging from 7 to 11 years.

Soil core samples from varying depths were taken at randomly selected locations on both the sludge application and reference areas of all five sites. The samples were placed in suitably sized marinelli beakers and, after weighing, were analyzed for sludge-derived radionuclides by gamma ray spectrometry, utilizing intrinsic germanium detector systems.

The distribution of sludge radionuclides in soil, due to land application, has been determined as a function of depth and, based on the experimental measurements, the sludge application records, and a one-dimensional model of contaminant transport, estimates have been made of the rates of downward migration of the longer-lived sludge radionuclides.