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OCCURRENCE AND FATE OF ORGANIC CHEMICALS AT A BIOSOLIDS-APPLICATION AREA—THE LINK BETWEEN BIOSOLIDS AND GROUND-WATER QUALITY

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ABSTRACT: Trace concentrations of chemicals that are used every day in homes, industry, and agriculture have been found in the environment in many settings, including urban waterways and rural landscapes, and in soil, stream sediment, surface water, and ground water. The chemicals found include detergents, disinfectants, fragrances, fire retardants, pharmaceuticals, hormones, and pesticides. These anthropogenic chemicals can be introduced into the environment directly by people using these chemicals in that environment, as well as indirectly when chemicals are washed or flushed into sewer systems, accumulated in treated wastewater effluent (water and biosolids), and then released or applied to the environment. Biosolids that meet regulations for land application have been found to contain a mixture of many anthropogenic chemicals and associated degradates. Little has been reported on the fate of these chemicals in biosolids after land application. Do the chemicals break down in situ, or can they leach into the soil and even into the ground water? Are the chemicals mobilized by runoff water and transported to streams? Are any of these chemicals or mixtures sufficiently unique and persistent to act as indicators of human sewage or municipal waste in ground water? Does the presence of any of these chemicals in ground-water samples collected from a biosolids-application area mean that biosolids applications have contaminated the ground water? A Colorado study is investigating the occurrence, transport, and transformation of these chemicals when biosolids are applied as an agricultural soil amendment. Samples of fresh, wet biosolids; fresh, dry biosolids; field-aged biosolids; and fresh, dried cow manure were leached with high-purity water in a laboratory to evaluate the mobility of the organic chemicals in biosolids exposed to precipitation or runoff after application. The resulting organic-compound chemical data were contrasted to produce a possible biosolids signature and a possible cow-manure signature for water. Ground-water data were compared with the signatures to evaluate the source of these chemicals in ground water at the biosolids-applied area.

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