

Characterizing and Modeling the Hydrologic Properties of Coal Combustion By-Products in Landfill Disposal Sites

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Abstract. Coal combustion byproducts (CCBs) disposed of in unlined landfills can impact the quality of adjacent water resources. In previous studies, CCBs have been found to leach toxic heavy metals such as arsenic, mercury, and lead into groundwater. This has led to recent proposals to regulate the disposal of these materials. In the past, many locations have disposed of these CCBs in unlined landfills. Such unlined landfills can contain pits of over 30 m deep containing CCBs. Understanding water movement through these pits is necessary to estimate the potential impacts of this disposal method. CCBs include fly ash, bottom ash, and gypsum. The focus of this investigation is fly ash and bottom ash. Samples have been collected from a power plant in northern New Mexico. Fresh ash samples from a power plant as well as cores from a nearby landfill pit have been collected and their hydrologic properties measured. Saturated hydraulic conductivity has been measured using falling head tests. Moisture characteristic curves have been developed from hanging column tests, pressure plate tests, dew point potentiometer measurements and relative humidity measurements. Hydrologic properties have been measured at various densities to simulate a range of conditions expected in the deep disposal pits. The measured hydrologic properties have been utilized in a one-dimensional HYDRUS model of CCB disposal pits. The model uses historical climatic conditions at the ground surface, and estimates water infiltration through the CCB pits. These results can be used to estimate the expected impact of landfill disposal of CCBs on the local water resources.

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