SORPTION AND LEACHING CHARACTERISTICS OF HEAVY METALS IN ARTIFICIAL SOIL

Joshua Bergsten

Dr. William J. Likos, Thesis Supervisor

ABSTRACT

The objective of this study was to investigate the heavy metal sorption and leaching characteristics of an "artificial soil" formed by blending industrial and municipal by-products and implemented as a beneficial waste reuse and land reclamation strategy. Materials at the site include an organic-rich O-horizon (yard waste and biosolids) overlying a mineral-rich C-horizon (CKD and coal ash) to simulate a natural residual soil profile.

A laboratory investigation of the general engineering, sorptive, and leaching properties of an artificial soil comprising yard waste, biosolids, cement kiln dust (CKD) and coal ash was completed. It consisted of testing for natural (in-situ) moisture content, pH, carbon content, microstructure (via SEM imaging), batch sorption characteristics, and leaching characteristics determined by flow-through column tests. The trends evident in the moisture content, pH, and carbon content profiles support the presence of a cemented Bh layer noted in the field test site at the interface between the O and C Horizon.

Batch sorption tests show the artificial soil mix to be very effective in immobilizing free Cd, Pb, and Zn, even at very large concentrations. Leaching with ammonium nitrate to represent plant available amounts proved to be minimal. Column leaching tests confirmed these results, as no detectable amount of Cd, Pb, or Zn leached from prepared soil columns after more then 30 pore volumes of flow.