Use of secondary construction materials in a landfill covers

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Background

The implementation of EU landfill directive (1999/31/EC) will result in closing of many landfills both in Sweden and EU states. Large amounts of landfill lining materials will be needed for covering these landfills. The utilization of natural materials in landfill covers result in high costs and in a strain to the environment through the exploitation. Secondary construction materials (e.g. ashes, sand from fluid bed incineration, sludge) may be an alternative to natural materials. In order to test secondary construction materials as a part of landfill cover on a real scale, a 4 ha large test area is established at Tveta landfill at Södertälje, Sweden. This is the first Swedish full scale application of alternative landfill cover materials. The test area is divided in 6 different sub areas with different lining mixtures. The design of each experimental area is presented in figure 1.

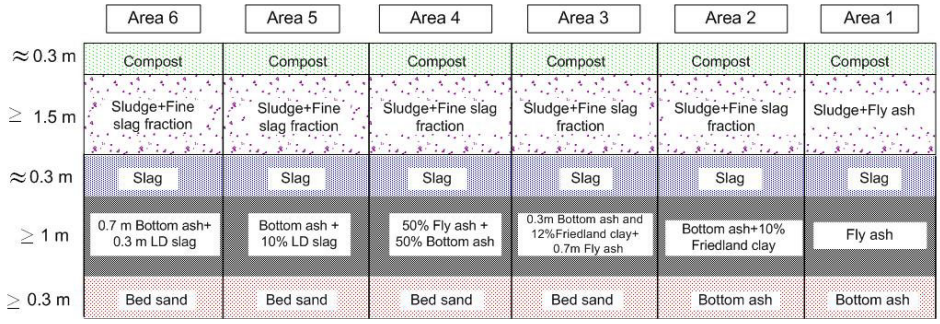

Figure 1 Schematic sections of the different test areas using secondary construction materials

Research questions:

- What are quality changes of infiltrating water when it passes through different layers of landfill cover?
- What are treatment needs for infiltrating water?

Results and Conclusions

A comparison of the leachate and drainage water quality from the areas 1, 2 and 4 is presented in Figure 2. Four groups of samples can be distinguished: leachate from area 1, 2 and 4 and drainage water (marked with "well"). "Limit" represents the tentative criteria for the discharge of landfill leachate into the local recipient.

The difference between drainage and leachate is mainly caused due to different concentrations of metals and salts. The leachate can be characterised by higher concentrations of K, Na, Ca, As, Ba, Cl and alkalinity, while the drainage water contains more Mg, Mn, Fe, Zn, Co, Ni and Pb. The lower concentrations of Pb and Zn in the leachate are probably caused by chemical changes occurring during ash hydration. TOT-N, S, Hg, Sb, Ni, Pb and Cr are similar in both water qualities.

At the moment, both the water below and above the liner needs treatment before discharge into a local recipient. However, the concentrations of most of the pollutants are decreasing so that the drainage water is expected to meet the requirements for direct discharge in the near future. The future monitoring will enable a modelling of the solid-water interaction and prediction of treatment needs.

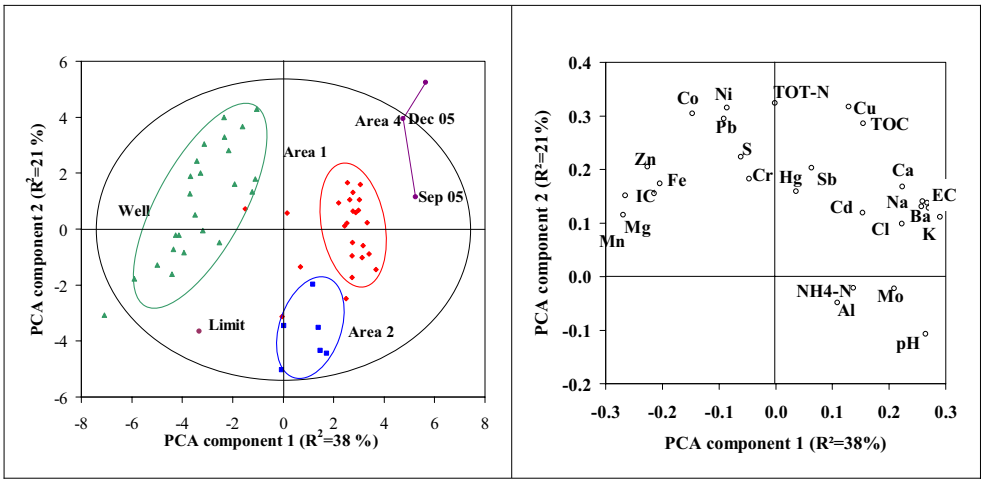

Figure 2 PCA score and loading plot for leachate and drainage water from area 1 and 2