SUMMARY

In the context of the presented research project systematic investigations have been carried out to investigate the leaching behaviour of fresh concrete. Two tests were used: the static and the dynamic laboratory test. In the static test fresh concrete is applied on moist or water-saturated soil. After hardening the concrete can be taken off from the sand without destruction. Then sand samples are taken in layers. The samples are leached and the eluate is analysed. The pH value, the electrical conductivity and the contents of different trace elements are determined. From the concentrations in the eluates, the contents in the sand are computed. The dynamic test is carried out in a vessel with a length of 2.4 m, filled with sand and flowing water. The flow rate is adjusted to approximately 1 m/d. For the sampling perforated PE pipes are buried upright at fixed distances behind the concrete slab. The water flows along the undersurface of the concrete and can be sampled using the perforated pipes. In the eluates the same parameters as in the static test are determined.

In the static test two concrete mixtures (with and without fly ash) on water-saturated and moist soil were examined. It was found that usually the water-saturated soil represents the more unfavourable case. A significant contamination of the soil was determined for sodium, potassium, sulphate, aluminium, arsenic, chromium and vanadium. The concentrations of zinc and copper lay in the range of the blank values. Concrete with fly ash usually releases lower pollutant quantities despite higher total contents. Arsenic is an exception from this rule: it is leached from the fly ash concrete in slightly higher, but innoxious concentrations. Altogether it has to be stated that the exchange of cement by fly ash affects the leaching of fresh concrete positively, since the fly ash reacts only in the later process of the hydration and therefore heavy metals do not leach within the regarded period of 24 hours.

In the dynamic test only the concrete without fly ash was investigated. A contamination was determined for sodium, potassium, sulphate, aluminium, chrome and vanadium. The concentrations of zinc and copper lay in the range of the blank values as well. Arsenic is leached in very small concentrations. A temporary exceeding of the insignificance thresholds was determined for chromate only (for less than 24 hours within 30 cm distance).

To evaluate the leaching behaviour of fresh concrete under different hydrogeological and constructional boundary conditions model calculations should be accomplished. As input for the transportation program the emission determined in the static test should be used. Therefor a calibration on the basis of the dynamic test is necessary. In the course of this calibration the dynamic test should be recalculated with the emissions measured in the static test. It was found that the concentrations measured in the dynamic test, cannot be computed with the emissions of the static test. Obviously the release of pollutants is much higher in the dynamic test than in the static test. Therefore the source term for the transportation program cannot be transferred from standing groundwater to flowing water. In order to provide reliable prognoses of the spread of pollutants it is necessarily to examine the mechanisms of the leaching behaviour of fresh concrete more closely. Because of this no evaluation criteria can be suggested to date. A continuation project is requested.