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SOIL AND GROUNDWATER CONTAMINATION BY HYDROCARBONS AT THE ALYTUS OIL STORAGE

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Alytus oil storage is constructed within the third sanitary protection zone of Vidzgiris well field that supplies 5-6 thousand cubic metres per day of potable water for the inhabitants and industry of the town. The oil storage itself occupies an area of 5.4 hectares, but contaminated soil and groundwater were detected over the territory of more than 400 thousand m².

Data of hydrogeological investigations of the site show that contaminated unconfined groundwater lies within the depth of 7-11 m and the thickness of the aquifer varies from few to 8 meters, average being 5 meters. Mostly contaminated part of the subsurface is 1-2 m thick soil layer near the unconfined groundwater level. From the surface to the depth of 8-17 m soil is composed of different grained sand, silt and clayey sediments. The lithological composition of the soil is favourable for a downward leakage of contaminants. It has been calculated that about 2075 tons of light hydrocarbons penetrated into subsurface. From 50 to 70% of contaminants are composed of BTEX.

Groundwater monitoring is carried out for the period of two years at and around the contaminated site by the hydrogeologists and chemists of the "Grotā" company. Groundwater samples are analysed at the laboratory of the company by liquid chromatography method. It has been detected that mainly light non-aqueous phase liquids (LNAPL) penetrated into subsurface. Chemical composition of contaminants is as follows: benzene 5.9-40.4 µg/l, toluene 5.2-37.0 µg/l, ethylbenzene 0.005-2.3 µg/l, para- and methaxylene 3.7-8.3 µg/l, orthoxylene 1.5-3.7 µg/l. Mentioned light hydrocarbons compose 80 per cent of oil products and the rest are aliphatic and alicyclic hydrocarbons. The contaminant plume migrated with groundwater flow in two main directions of north - east and south - east at a distance of 1350 m and 550 m correspondingly. Concentration of dissolved hydrocarbons in shallow groundwater fluctuates from 0.67 to 12.8 mg/l. Main part of oil contaminants (84%) is adsorbed to the soil particles and also free phase oil layer flows above the groundwater table. The thickness of free phase oil layer changes from 1 to 14 cm. The territory where a free phase oil flows on the groundwater table occupies an area of more than 18 thousand m².

Sixteen polycyclic aromatic hydrocarbons (PAH) according to the US EPA list were analysed in the groundwater samples by liquid chromatography at the "Grotā" laboratory. Elevated concentrations of bi- and tricyclic aromatic compounds have been detected in the samples contaminated with hydrocarbons. Concentration of naphtalene reaches 14.8 µg/l, fluorene - 1.6 µg/l and phenantrene - 8.2 µg/l. From 50 to 70% of all peaks detected in the chromatograms depend to 2-metilnaphtalele and 1- metilnaphtalene that are not included into the US EPA list. These components were found also outside the boundaries of hydrocarbon contamination. High concentrations of 1- and 2- metilnaphtalene in the contaminated groundwater, sensible analytical methods and high stability of the components comparing with other PAH, allows to use them as the first indices of subsurface contamination by hydrocarbons.