PROBLEMS OF DRINKING WATER SUPPLY IN LATVIA'S COASTAL ZONE. CASE STUDY – CARNIKAVA AREA

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Drinking water supply in Latvia mainly is provided from groundwater sources, and commonly groundwater resources are sufficient. However, there are some areas, where no confined groundwater could be abstracted for drinking water supply, because of saline groundwater distribution there. Problematic is also use of shallow groundwater due to high iron (up to 20 mg/l) and ammonia (up to 6 mg/l) content and high colour of water. These problematic areas mainly are distributed in the coastal zone[1]. This study focuses on one of such areas – Carnikava site, where geological structure and hydro-geological conditions determine poor groundwater quality.

There are Quaternary sediments found in the whole area from the Earth's surface, mainly consisting of sand with interbeddings and layers of mud rich in organic matter. The sand sediments had formed during different stages of the Baltic Sea development and the last glaciation stage. Total thickness of the sandy sediments is 40-50 meters, but the upper part with admixture of mud and organic matter is 20-30 m thick. Glacial till deposits lie below, separating Quaternary sand and Upper Devonian Gauja Formation sandstone and siltstone deposits. Thickness of the till layer is about 10 meters, at some places it is almost completely eroded (washed out).

The unconfined water table aquifer is bound to the Quaternary sand deposits. Fresh groundwater is found at the water table aquifer, but the iron and ammonia content is very high. The first confined aquifer is bound to the sandstones of Upper Devonian Gauja Formation. There is a zone of hydro-chemical anomaly in the Gauja aquifer at Carnikava area. Saline groundwater with high content of chlorides (up to 1,5 g/l) and dry residue (up to 3,5 g/l) is found there[2].

The study specified on iron content investigations in the water table aquifer in Carnikava area. Groundwater samples were taken and iron content and colour of water were analysed *in situ*, using portable photometer of Hanna Instruments. Besides, pH, electrical conductivity, Eh, dissolved oxygen and temperature of groundwater was measured, using WTW portable microprocessors. The groundwater samples were taken from the wells with screen intervals at various depths from 2 to 40 meters below Earth's surface. In total 64 wells were investigated, and 40 of them screened upper part of the water table aquifer (0-10 m).

The investigations showed that the highest iron content is typical for the upper part of the aquifer, reaching up to 30 mg/l of total iron (Fig. 1), but dominating iron content is 5-15 mg/l in the depth 1-10 m. Iron content decreases with the depth and below 20 meters from the Earth's surface total iron content is 0.5-5 mg/l. There are some wells, screening water table aquifer close to the bottom at the depth of 35-40 m, where content of chlorides is significantly above the background values – 200-300 mg/l in the Carnikava area and background values 20-30 mg/l.

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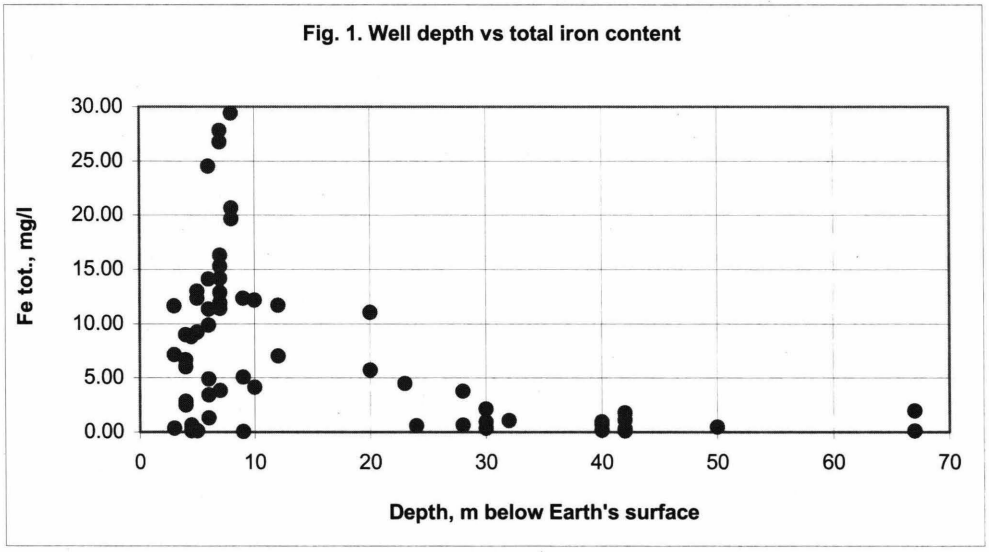
[1] Levins I., Levina N., Gavena I. Latvian groundwater resources. Riga, State Geological Survey, 1998. 24 p.
[2] Levina N., Levins I., Prols J., Straume J. Drinking water in Latvia. Utilisation and monitoring. Riga, State Geological Survey, 1995. 79 p.



Analysis of distribution of iron concentrations in the plan view shows, that higher concentrations are bound to the areas, where old riverbed had been located and where there are thick layers of mud rich in organic matter of marine origin. However, due to the lens-like structure of the aquifer, where sand layers changes with organic mud layers, low iron content could be found also close to the Earth's surface. These investigations are still in progress, but the scope is to find out areas with fresh groundwater suitable for drinking water supply at Carnikava area.