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SALT WATER IN THE ARTESIAN AQUIFER OF STEVNS. EAST ZEALAND, DENMARK:

Resume.

The main aquifers in the eastern part of Zealand consist of Danian Limestone or Paleocene glauconitic sandstone. The aquifers are confined by clayey till. The transmissivity is about 10^{-3} - 10^{-4} m^2/sec. and 10^{-2} - 10^{-3} m^2/sec. respectively in the two aquifers.

Salty ground water is often found in wells within the area. The salinity increases with depth, in the upper part of the aquifer 30 - about 600 mg Cl^-/l and in the deeper part (about 100 m b. s.l.) more than 5000 mg Cl^-/l. Great discrepancies in chloride concentration are observed in wells within short distances. The origin of the salt water is the deep underground, where the rock salt formation is present at depth of 1000 - 1500 m b. s.l. Faults through the White Chalk formation may make an upward migration of salty water possible, even at places where the piezometric head is many metres above sea level. Therefore the upward migration of salt water is produced by formation stress.

The topography of the prequaternary surface contains two NE-SW glacial eroded valleys, presumably gouverned by the tectonic feature.

The salt-fresh water relationships in this area are mapped using conductivity logging combined with simultaneous pumping successively from top and bottom of the uncased part of the aquifer. This logging procedure directly gives the conductivity of the bottom water and the top water of the formation.

Furthermore from these two salinity logs it is possible to determine the vertical distribution of inflow (qx) and the salinity (Cx) at different levels, knowing the pumping capacity (Q_o) of the pumped water. (J.C. van Dam 1972).

Examples of conductivity logs from the Stevns area was demonstrated. Some of these logs show a flow of salty water from the bottom to the top of the aquifer, through the borehole, due to differences in hydraulic head. Such a flow of salty water results in a saltwater contamination of the upper fresh-water aquifer.

Intervals of no inflow to the wells can easily be located by a conductivity log

during pumping as the conductivity is constant within such intervals.

From the chemical composition of the groundwater it appears that the content of chloride normally has the same equivalent amount as the sodium. However, a single well yields water where magnesium equivalents the chloride content.

Such a composition could be interpreted as a result of an upward moving flow of water rich in magnesium under an increasing delution. It is remarkable that the chloride concentration is relatively low, about 600 Cl^- mg/l. How such a delution of chloride is possible together with a high content of magnesium has not been explicable up to now.

References:

Van Dam, J. C. 1972: A simple method for determination of the distribution of inflow and salinity of groundwater entering into a pumped well. Expert-meeting on Salinization of groundwater in coastal regions. Vogelenzang 13th, 14th and 15th of May 1970.