

Bank storage affected aquifer along the river Kitinen in Sodankylä, Northern Finland

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Water management in mining projects has long been discussed but the properties and extent of associated aquifers are usually inadequately known. The aim of this PhD study is to carry on targeted hydrogeological research connected to planning of possible future mining sites in Northern Finland. The study site presented here is in Sodankylä, Northern Finland where AA Sakatti Oy has a prominent ore showing in Viiankiaapa mire, which belongs to the Natura 2000 network.

There are groundwater table measurements from 30 observation wells locating in the western part of the Viiankiaapa mire as well as continuous on-line record from 17 automatic stations measuring groundwater table and temperature since April 2012. Hydraulic conductivities of the sediments were evaluated from slug-test ($n = 12$) and grain size analyzes ($n = 14$). Water table data of river Kitinen, mire and groundwater, as well as DEM was combined in ArcGis to study flow directions and interactions between surface and groundwater bodies.

Groundwater temperature is in summer about 2-5 °C and in late autumn 4-8 °C which is almost reversed in comparison to air temperature, thus alluding the recharge rate. Groundwater flow direction in the main study area, western part of Viiankiaapa mire, is mainly from east to west but it changes gradually towards more NE-SW direction within the times of spring thaw (snowmelt). Near the river Kitinen annual groundwater level fluctuations are more prominent than farther away from the river. River Kitinen has flooded since historical times but the construction of the power plants in 1967-2001 and regulation of the river by Kemijoki Oy has diminished the intensity of floods. Regulation also caused 2-5 m rise of the river level and many wells in the banks sunk into river.

Viiankiaapa has clear flark and string pattern reflecting surface water flow directions, which are in the study area mainly towards river Kitinen. Hydraulic conductivities are lower in the banks of river Kitinen than in the sandy layers beneath the Viiankiaapa mire. The sand-till-gravel formation in the banks of river Kitinen hosts a bank storage system where floodwaters recharge. It is possible that the bank storage influences to the biodiversity values of the mire, as well.