

Recovery of the latest confined groundwater head in the Tokyo metropolitan area and its influence to the underground environment

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Groundwater is one of the important components of the hydrological cycle, and it had been used actively as the water resources for agriculture, industry, drinking and so on since early times. Severe ground subsidence has appeared on the alluvial lowland of the metropolitan area along with the remarkable decline in the confined groundwater head due to excessive groundwater usage. At the same time, various problems such as the oxygen deficiency during tunnel excavation, the pulling out of building basement, the negative friction, the decreased functional status of tide embankments and so on, also had become clear. Since the pumping restriction according to the regulations by the local government and the national law, so called the water law for industrial use and the building water law, had been established and applied, the problems had been diminished notably. On the contrary, however, 30 to 40m rise (recovery) of the confined groundwater head had been caused by the pumping restriction. It has completely changed the underground circumstances, and the underground infrastructure facilities have been forced to be in the strict condition. For example, in such cases as the railroad underground station built in the time when the groundwater head declined intensively, the groundwater springs to the inside of the structure and the buoyant force has become extremely increased, and therefore, countermeasures have been unavoidable. On the other hand, those groundwater springs contribute to the restoration of the dried-up pond and the water quality improvement of the urban rivers.

In this presentation, we will demonstrate (1) recovery condition of the latest confined groundwater head in the Tokyo metropolitan area, (2) actual adverse affect on the underground infrastructures caused by the groundwater recovery, (3) the regional groundwater flow system in the Kanto Groundwater Basin in relation to the discussed specific groundwater phenomena, and (4) possibility and/or proper procedure to control the groundwater level for the purpose of the groundwater head recovery restraint.