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Hydrogeological Modeling Results of Kanto Groundwater basin

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At the alluvial lowland in the central part of the Kanto plain, intensive drawdown of groundwater head due to excessive pumping caused the considerable land subsidence in the past times, and on the contrary, remarkable rise of the confined groundwater head depending on the regulation of groundwater withdrawal has brought adverse affect on many important infrastructures such as underground railway stations in late years. In order to understand such behaviors of the groundwater, it is essential to clarify actual conditions of the regional groundwater flow system within the Kanto plain. Primary specific approaches are to analyze basic data, and also to grasp the hydrogeological structure. For several years, authors have experimented with the hydrogeological structure modeling of the Kanto groundwater basin. In this conference, we will explain the basic concept for the modeling composed of groundwater basin coverage limitation, hydrogeological stratigraphic classification and hydrogeological structure evaluation.

The coverage of the Kanto groundwater basin was decided from the distribution of Pleistocene and/or Holocene formations which contain aquifer systems and are subject to recharge, storage and flow of groundwater. The extent is generally coincide with commonly called Kanto plain.

At first we experimented with the hydrogeological stratigraphic classification based on geological stratigraphic correlation in the whole Kanto plain. However, it proceeded with difficulty because no geological research for the whole Kanto plain was carried out previously and, in case of the researches for specific areas, interpretation and/or classification was considerably different by every local governments and/or research institutes. We adopted a deliberate policy of the five basic conditions for the correlation of geological layers, such as (1) use of almost all of the previous relative studies' fulfillments, (2) application of the latest knowledge on the geological stratigraphic classification, (3) use of the isotopic stage of oxygen, and so on. As the result of the trial, we classified Quaternary sediments into nine hydrogeological layers as shown below. Within the geological formation of Pleistocene age, Kazusa F. was divided into the layers-VII to IX, Shimousa F. was divided into the layers-III to VI, and terrace deposits were corresponded to the layer-II. Fan deposits of Pleistocene age and Alluvium were corresponded to the layer-I. The layer-IX is considered to be the hydrogeological base rock according to its facies and present groundwater development condition.

The hydrogeological structure was evaluated as the following steps. (1) First of all, depth to the hydrogeological base rock and the basement of the layer-IV (the lowest layer of Shimousa F.) were determined according to available drill-logs of production wells and the previous study results on the geological structure. (2) Then, hydrogeological profiles were prepared on the basis of the existing geological cross-sections considering the hydrogeological stratigraphic classification. (3) Finally, according to the hydrogeological profiles, basement contour of each hydrogeological unit; the layers-I to VIII, was prepared. The basement contours; fruits of the hydrogeological structure evaluation, show two basin-like depression areas near the northern part of Saitama Prefecture and in the Tokyo bay off the coast of Chiba city. Long axis of the basin-like area near the northern part of Saitama Prefecture is parallel to and concordant with the nearby active fault. In addition, these basin-like structures become clear more and more in the deeper layers. Since there seem to be close relation between the fault activity and the basin-like depression, it is necessary to pay attention to this hydrogeological conditions especially in case of evaluating the distribution of the groundwater flow indexes such as groundwater head, quality and temperature.

Keywords: Kanto groundwater basin, Regional groundwater flow system, Hydrogeological modeling