

Hornobe URL Project - Construction of groundwater flow model based on data from borehole explorations and well tests

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Japan Atomic Energy Agency is constructing the Horonobe Underground Research Laboratory (URL) at the northern part of Hokkaido, Japan. Geology of the study area consists of Miocene to Pliocene diatomaceous argillaceous formations, Wakkanai Formation and Koetoi Formation in ascending order. In the central part of the study area, the Omagari fault, a reverse fault in NNW-SSE strike and plunging toward east, exists. Folding structures parallel to the fault are found to prevail and the URL is located at the west wing of one of the anticlines. Prior to the URL construction, exploration boreholes, length of 500 to 1000 m, were excavated from the ground surface to obtain the information of geology and hydraulic properties at the depth. From geophysical explorations, fluid logging and well tests, relatively higher hydraulic conductivities comparing to those from laboratory tests were observed, especially at fractured zones in Koetoi and Wakkanai Formations. This observation suggests that the fractures are playing important roles in groundwater flow in this area.

In this study, the spatial fracture distribution was estimated based on the results from geophysical explorations, such as Electrical Micro Imaging, Borehole Televiwer and Fluid Electric Conductivity Logging. Hydraulic properties in the depth were then evaluated by adding information from well tests. A specially designed sequential well test approach, that is a series of different type of well tests, i.e., pulse, slug and pumping test, was employed to obtain reliable hydraulic properties of the formations. Both site scale and the regional scale hydrogeological models were constructed by integrating the above information. The groundwater simulation was conducted using these models and the results were compared to the observations such as groundwater pressure monitorings and surface hydrology measurements. In the conference, we will present the several findings obtained through the above study.