



## **Hydrothermal management of an urban shallow alluvial aquifer by numerical modelling**

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The use of geothermal energy in new building constructions has become of prime importance lately, especially when implemented in highly urbanised areas aiming at autonomous energy supply. In the present study, a low temperature open-loop well doublet hydrothermal system project is investigated. The project site is located in the city of Liège (Belgium) along the Meuse River, with a shallow hydrothermal system implemented in the local alluvial aquifer. A three-dimensional groundwater flow numerical model is conceptualised and run with coupled heat transport processes, by means of the FEFLOW code. Temperature breakthrough curves reveal very low temperature variations between the injection and the production wells in the aquifer due to high hydraulic conductivity and effective porosity values. This is supported by field experiments (i.e. pumping tests, solute and heat tracer tests), with a 45% calculated heat energy recovery. Potential thermal impact on the aquifer, based on daily thermal needs from future buildings and neighbouring groundwater use, is simulated and quantified. Multi-year transient scenarios are simulated with transient groundwater flow and heat transport.