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Detailed hydrogeological investigation and conceptual modelling of an Alpine Main Valley crossed by the Brenner Bases tunnel

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The Brenner Base Tunnel (BBT) will cross the Isarco Valley near the village of Fortezza (BZ) at a depth of approximately 20 m below the riverbed of the Isarco river. The design of this roughly 1 km long stretch through alluvial sediments and below groundwater level required detailed knowledge of the prevailing hydrogeological conditions. In particular, it was necessary to determine if dewatering procedures were feasible and what the impacts on natural water flows in the aquifer after completion of the infrastructure will be.
The study area is a typical Alpine valley, filled with alluvial sediments to a maximum depth of approximately 120m. The valley is bounded by granitic rocks with regional, water saturated main fault zones. In addition to the Isarco River, the area is shaped by two
lateral rivers. The deposits of these lateral rivers form main alluvial fans.
The aim of the study was to study the geological structure and the hydrogeological behaviour of this alpine valley. Therefor a detailed geological and hydrogeological investigation program was carried out, including a geological detailed mapping, construction of 40 boreholes (max. depth 120m; 35 are equipped to groundwater monitoring wells) and 5 large wells (55m – 87m).
In order to determine the hydrodynamic characteristics of the aquifer in the valley, several pumping tests were carried out in different study stages:
Stage 1: preliminary hydrogeological characterization of the area based on a pumping test carried out in the first well (100l/s pumping for 14 days).
Stage 2: individual step tests and constant rate tests in additional four wells
Stage 3: main pumping test including all the five wells with a maximum pumping rate of 450l/s for 14 days.
The main topics oh the presentation are:
- Overview of the BBT-project, the investigation area and investigation program
- Description of the validated geological model of the main alpine valley
- Results of the various hydraulic tests performed in the individual wells (step test and
constant rate test)
- Results of the long-term pumping test.
Based on the results of these tests a Conceptual hydrogeological model of the area and the dewatering concept will be presented. The conceptual model is the basis for the numerical model of groundwater flow developed and calibrated in two successive phases (see abstract: L. San Nicolò, U. Burger, R. Zurlo).