Diversion Tunnel Altbach, Kloten

Figure 1: Physical model of the inlet area at a scale of 1:20

The Altbach river has a significant flood protection deficit in the Kloten area, with the threat of damages of up to 100 million Swiss francs in Kloten and over one billion Swiss francs at the airport. The implementation of the Glattalbahn extension between the airport and the city of Kloten will make this deficit even more pronounced by narrowing the channel of the Altbach. Therefore, a flood protection project for the Altbach is being implemented at the same time as the extension of the tram line.
In the urban area of Kloten, an expansion of the channel is not possible to the necessary extent due to the narrow space conditions. To meet the flood protection requirements, a diversion tunnel with a length of about 2 km and a diameter of 3.2 m is planned. Large floods will be collected upstream of the city of Kloten, diverted under Kloten and into the existing Altbach culvert under the airport.

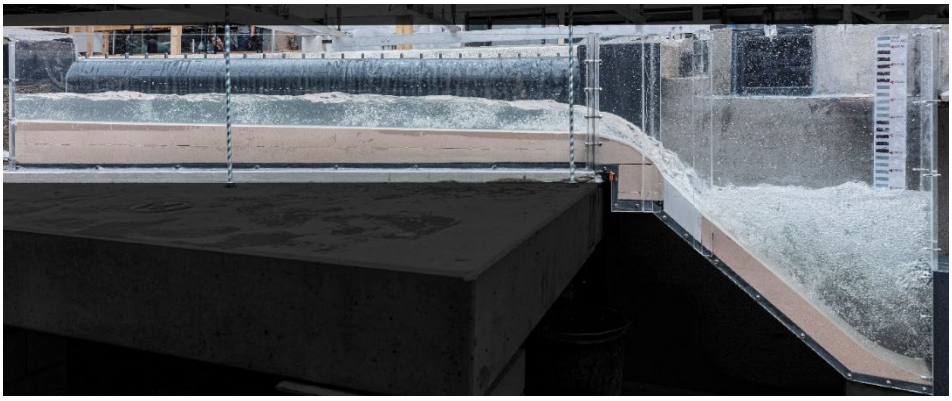
Figure 2: Side channel and drop shaft of the diversion tunnel with high air entrainment at HQ_{100}

For this purpose, an unregulated sluice gate will throttle the discharge in the Altbach to around 10 m^3/s. Higher discharges will be retained by the sluice gate and diverted over a 35 m wide weir crest, which leads the water into the side channel, the drop shaft, and the diversion tunnel, as shown in Figure 2.

The water and river engineering measures planned by IUB AG have been tested and optimised by VAW on behalf of VBG Verkehrsbetriebe Glattal AG by means of the physical model tests (Figure 1) on a scale of 1:20. The following questions were investigated:

- Testing and optimization of the hydraulic components and of the flow in and around the intake structure regarding the functionality and separation characteristics of the structure.

- Bedload transport processes with regard to sediment input into the diversion tunnel, sedimentation in the backwater area and bedload continuity during small floods. The stream channel and the stilling basin design have been optimized to improve bedload continuity.
- Driftwood transport processes regarding input into the diversion tunnel and influence on the separation characteristics
- Testing of overload scenarios

Keywords:	Flood Protection, Diversion Tunnel, Sediment Transport, Sediment Continuity, Driftwood
Commissioned by:	VBG Verkehrsbetriebe Glattal AG