HRR Hegmatten – Optimization of the Separation Building (2005)

The Eulach canal in the City of Winterthur suffers from insufficient capacity when passing under the main railway station, as to discharge a flood with a return period of 100 years. Maximum discharges reach approx. 110 m³/s.

A feasibility study of the office for waste, water, energy and air of the Canton of Zurich (AWEL) shows adequate protection of Winterthur being possible making use of appropriate flood retention basins in the outskirts.

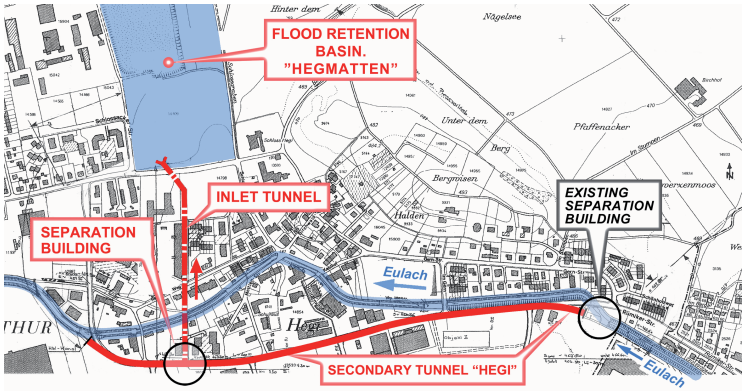

Fig. 1: Overview of the flood retention basin (HRR) "Hegmatten".

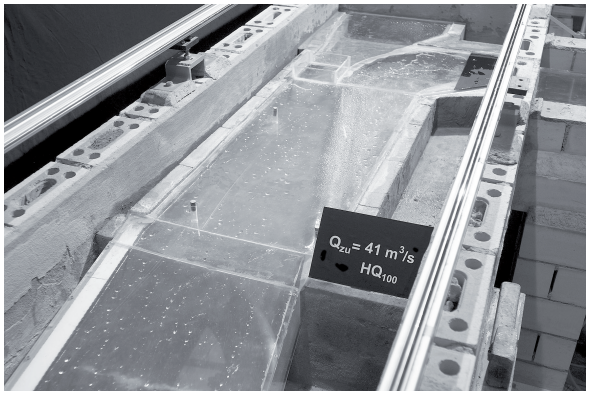

Fig. 2: The optimized separation building with the design flow.

Therefore, a flood retention basin (HRR) is planned in the Hegmatten area (near the quarter "Hegi" which belongs to the City of Winterthur) creating a retention volume of 330'000 m³ and thereby controlling a large partial catchment area of the river Eulach. Currently, Hegi is protected against floods by a secondary tunnel, which allows discharging ca. 80 % of an HQ100 (ca. 50 m³/s at this location) while only ca. 9 m³/s remain in the river Eulach while passing Hegi. Downstream of Hegi, the tunnel discharge joins the river Eulach again.
Partial flood diversion into the HRR "Hegmatten" will be effected by a new inlet channel, connecting the existing secondary tunnel with the HRR. Point of diversion will be some 800 m downstream of the beginning of the tunnel.
In the case of an HQ100 approximately half of the tunnel discharge shall be diverted to the HRR (i.e. ca. 20 m³/s), reducing the remaining tunnel discharge to 20 m³/s.
Separation shall take place by means of a side weir. Due to the prevailing conditions (Fr ~ 1.3 to 1.4 in the diversion tunnel with a bottom slope of 4 ‰), performance of such a side weir had to be carefully assessed and optimized. Key element of the investigations was the separation characteristics of the side weir. As the weir crest had to be elevated as to optimize management of the HRR, an undular jump along the weir crest was inevitable, which affects the separation characteristics unfavorably.

In order to examine the project draft a hydraulic model of the side weir was built at VAW at a scale of 1:20. The performance of this first draft proved not being sufficient in a first series of model test.

Optimization finally led to a solution within the set of boundary conditions (fig. 2). The design flow of 20 m³/s can be discharged to the HRR Hegmatten, preventing flooding of the river Eulach in Winterthur. At the same time, the rather sharp separation characteristics also prevent the HRR "Hegmatten" from excessively frequent flooding. Additionally, extreme flood events can be handled without excessive damage. The danger of driftwood jam in the underground side weir is reduced and the accesibility (also with construction machines) to the critical bottleneck of the separation building is always ensured.

Keywords:	flood protection, side weir, supercritical flow
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