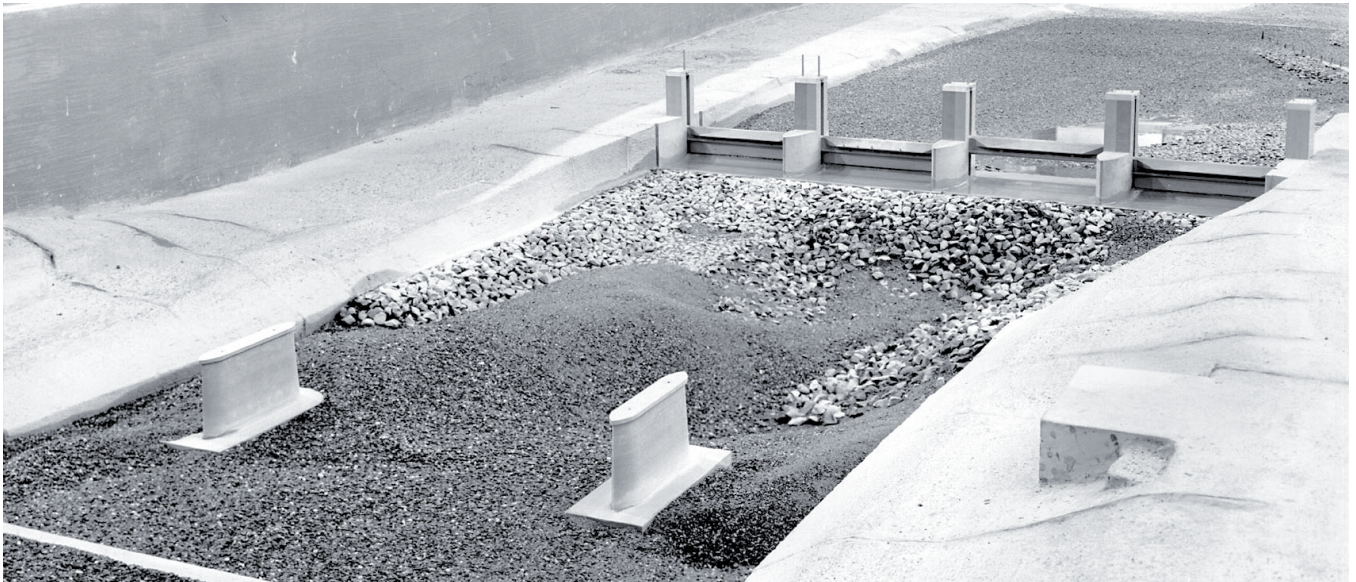


Scour protection in the plunge pool at the Dietikon weir (2003)



scour due to gate with underflow in the plunge pool downstream of the Dietikon weir.

At the River Limmat in Switzerland the Electricity Company of the State of Zurich (EKZ) operates a hydroelectric power plant. The water is diverted by a separate channel to the power house and given back to the river some distance downstream of the facility. The plant was built in 1931/32 and has recently been refurbished. With the Kaplan turbines an amount of approximately 20 Mill kWh can be produced per year. The design discharge is 100 m³/s.

The extreme flood event during May and June in 1999 at the River Limmat caused river bed erosion and scouring processes downstream and upstream of the weir. The lateral extension of the scour in the vicinity of the left bank reaches the bridge crossing the river some 80 m downstream of the weir. Blocks protecting the embankment slid into the scour hole and therefore undercutting has occurred. Relative to the river bed level of 1932, maximum scour depths of 7.2 m were measured. Urgent measures were necessary to protect the endangered embankment.

Due to continuous scouring demanding several stabilisation measures after flood events in the last decade EKZ assigned VAW with the evaluation of the reason of this phenomenon and the optimisation of a permanent riverbed protection by means of a hydraulic model (scale 1:40).

For the reproduction of the today's condition the operating reports of several flood events over the past years were consulted. The examination showed that often one gate was raised to allow underflow. The three other gates automatically controlled backwater level with overflow. As a result a higher flow rate was discharged through the orifice of the underflow gate. Therefore, the jet impact is laterally more concentrated leading to additional scouring. The project engineering in 1931 provided the stilling basin for flow conditions where the discharge was uniformly distributed on all four weir bays.

The scour can still expand in lateral direction endangering the bridge foundation. It is therefore recommended to enrich the river area-wide with rough blocks. The aim of this solution is to re-design of the scour hole to an energy dissipation basin. Besides the bed stabilisation, a new weir control system has been commissioned guaranteeing uniform impact of the four gates.

Keywords:	scour, scour at low head structures, scour protection, scour due to gate with underflow, weir, plunge pool
Commissioned by:	Elektrizitätswerke des Kantons Zürich EKZ
Project status:	Completed 2003

