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ADCP-Measurements and Evaluation of Hydrodynamics for potential River Sites at the River Rhine to install an Instream River Turbine

Client: KSB AG

Location: Rhine at Germersheim and St. Goar (Ehrenthaler Werth)

Scope of Work: 3D current measurements and hydrodynamic model

Method: ADCP measurements

INTRODUCTION

KSB AG proposed to perform a one-year test for a river turbine in tributaries of the river Rhine (Figure 1).

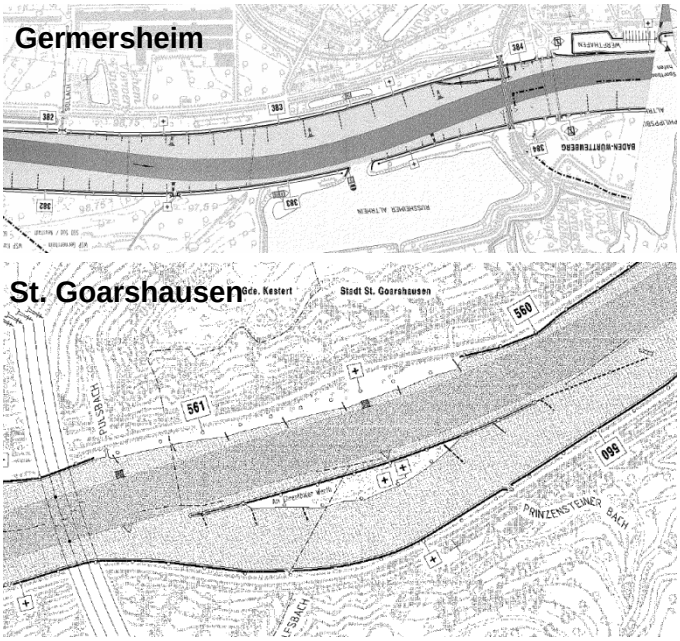

Figure 1: Rhine at Germersheim and St. Goarshausen

Especially in the Ehrenthaler Werth near St. Goarshausen the flow velocities can reach 2-4 m/s, necessary for the trial operation of the river turbine ($P_{elec.,eff}$ from 10 to 40 KW).

METHODOLOGY

3D flow measurements were performed using an ADCP,(Workhorse Rio Grande, RDI Teledyne) in 11 water sections (Figure 2) for a pre-selection of a potential site.

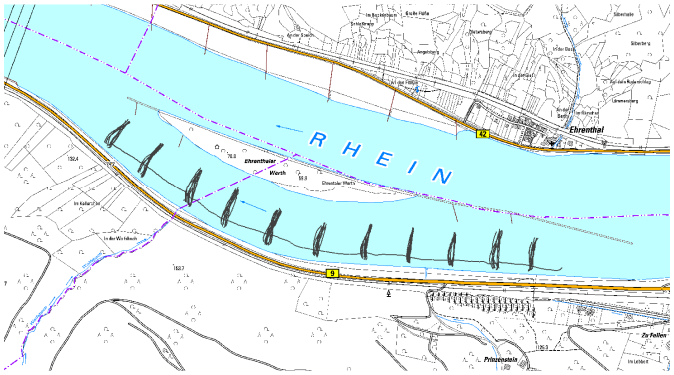

Figure 2: Cross-Section of ADCP-Measurements

Additional, the water depths were determined and used with official bathymetry data to setup a hydrodynamic model (Figure 3).

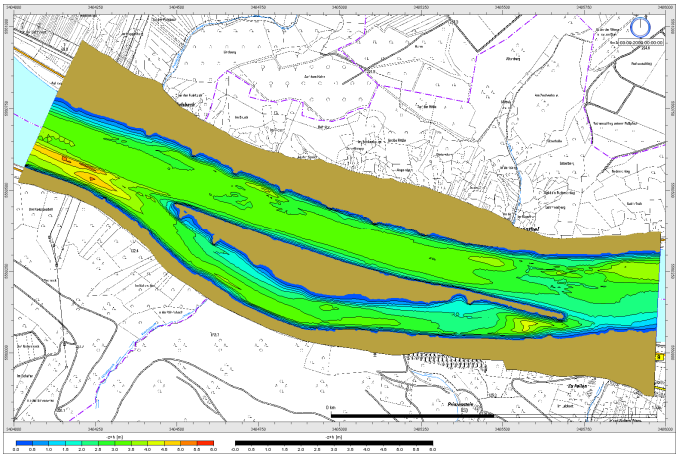

Figure 3: Water depths and model boundaries in the Ehrenthaler Werth

RESULTS & CONCLUSION

A comparison of measured and calculated flow velocities (Figure 4) shows a relatively good conformity.

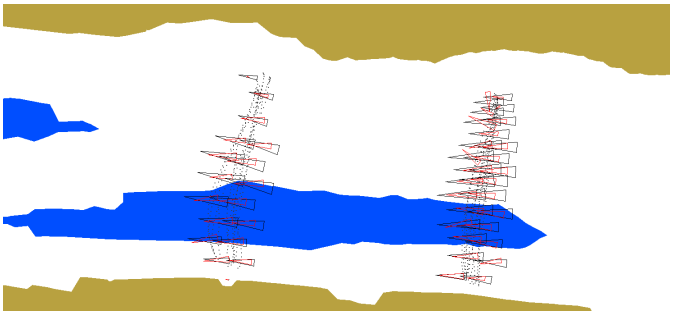

Figure 4: Comparison of calculated and measured flow velocities

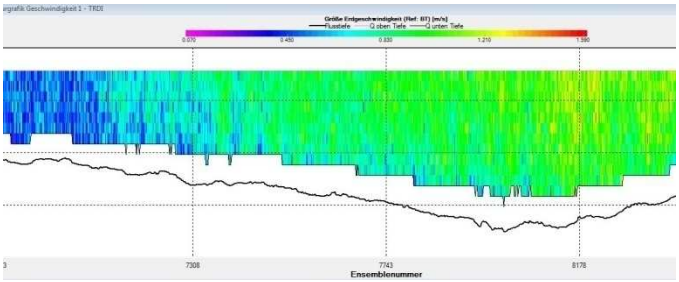

Figure 5: ADCP-Measurement in cross section 9

Through the evaluation of the measuring cross-sections, the best position for the river turbine was determined.