



DHI CASE STORY

STORM WATER MANAGEMENT CONCEPT FOR THE SKAWINA ECONOMIC ZONE

Integrated hydraulic modelling: an innovative approach to assess flood risk

Skawina Economic Zone and the Rzepnik River are located in Southern Poland in Lesser Poland Voivodeship. The river is approximately 10 km long and flows into the Skawinka River, a tributary of the Vistula River. Due to investment plans covering a significant part of the Rzepnik River, there was a need to ensure that these imminent developments will not increase flood risk in the catchment. Under normal circumstances, Rzepnik is a small and calm river. However, during heavy rainfall, this peaceful stream transforms into a wild river, with massive currents which can potentially result in heavy flooding. We were approached by Skawina Water Company to create a storm water management concept for the Skawina Economic Zone and propose solutions to protect the area from flooding.

MIKE FLOOD: AN INNOVATIVE APPROACH TO ASSESS FLOOD RISK

Basing our solution on the MIKE FLOOD framework, we integrated one-dimensional (1D) and two-dimensional (2D) mathematical models of the urban collection system, river system and floodplains. The modelling allowed us to take on an innovative approach to flood risk assessment, simulating particular conditions so that we could better derive potential solutions to the challenges.

In the first stage of the project, a preliminary flood risk assessment was simulated based on the existing situation. We termed the existing scenario 'W0' for easy reference. The simulation allowed us to locate specific areas which were vulnerable to flooding, even if they had a low flood probability of Q1% (once in a hundred years). Our modelling showed existing retention capacity in the Rzepnik riverbed, channels and collection system. The results of the simulation confirmed the flood risk and showed the inflow of surface water into the sewerage system. When surface water gets into the pipes, it can cause flooding and interrupt production process.

PROPOSED CHANGES DUE TO MODELLING RESULTS IN SIGNIFICANT BENEFITS

In order to improve the storm water drainage system and protect the area from flooding, we developed alternative solutions based on integrated 1D and 2D modelling. Modelling results clearly proved that there was a significant effect of the river flood in the storm water pipes (see Figure 1). After verification of different options, we finally selected two measures to improve the situation in the area:

SUMMARY

CLIENT

Skawina Water Company

CHALLENGE

- Significant flooding in Rzepnik catchment during heavy rainfall
- Need to validate that new investments in the area will not increase flood risk

SOLUTION

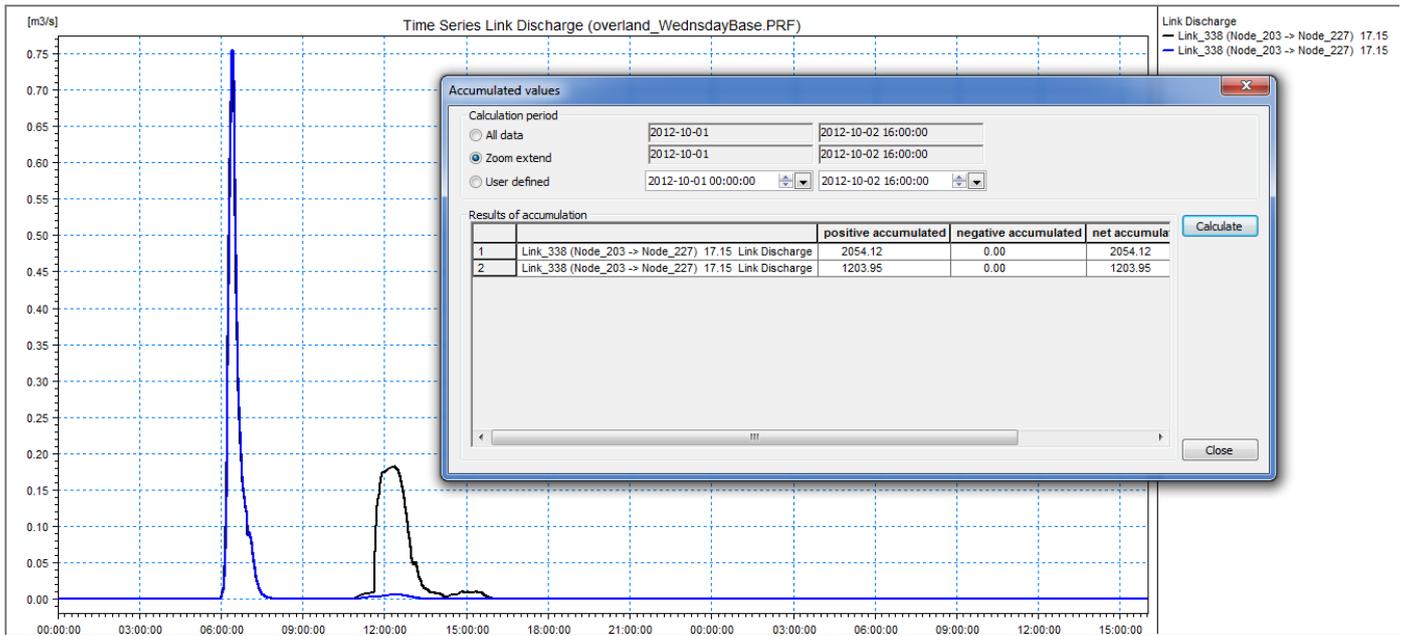
Based on assessment results from MIKE FLOOD, our all-in-one modelling tool, we adopted scenario W2- widening and alignment of the bottom riverbed, levelling slopes and so on.

VALUE

- Eliminated water inflow to the sewerage system
- Reduced the capacity of the planned reservoir by 1000 m³
- Improved existing retention system

LOCATION / COUNTRY

Skawina Economic Zone, Poland



The pipe discharge peaks © DHI

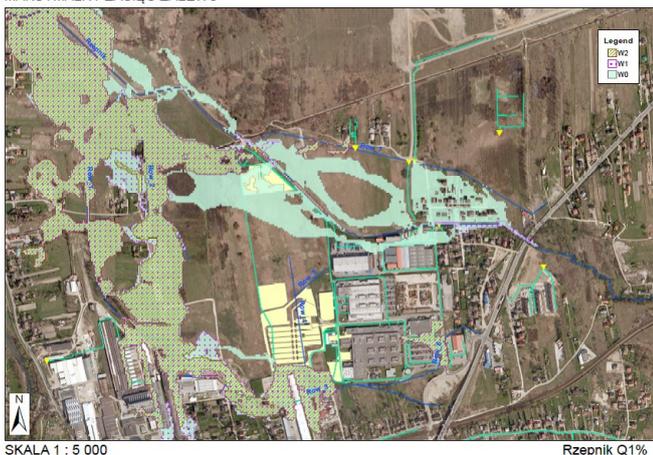
- W1 Scenario- cleaning of existing ditches and channels
- W2 scenario- widening and alignment of the bottom river bed, levelling slopes and so on

Based on achieved results, we decided to adopt the W2 scenario as the changes it proposed had a more significant impact on improving the drainage and collection system in both existing and planned stages (see Figure 2). At the same time, the current problem of water inflow into the sewerage system was practically eliminated by the changes suggested in W2. Our proposed actions will also reduce the capacity of the planned reservoir by 1000 m3. Without implementing the suggested changes, there was a possibility of retention and capacity problems within the existing pipe system.

INTEGRATED HYDRAULIC MODELLING TO IMPROVE RELIABILITY

Our approach of integrated modelling enabled us to verify the performance of the combined drainage system, surface open channels as well as the underground pipe system and its interactions. Integrated hydraulic modelling improves the reliability of proposed measures and brings about overall system improvements. In this project, it evaluated the effects of river floods on the area's sewerage system. We provided a solution which not only significantly improved the existing retention system but also positively impacted the collection system of the city.

MAKSYMALNY ZASIĘG ZALEWU



Different flood scenarios based on proposed flood safety measures. © DHI

Contact: info@dhigroup.com
 For more information visit: www.dhigroup.com