

Hydrological and hydraulic study of the Maarkebeek catchment



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Location: Maarkedal, Oudenaarde, Flanders, Belgium

Assignment:

The Maarkebeek catchment is studied in the frame of the management programme of Division Water, the Flemish authority for water quantity management of non-navigable watercourses. Because of important flooding and erosion problems related to agricultural practices the study of this catchment involves many interests.

Scope of Services:

- Identification of problems, inventory catchment characteristics
- Study of rainfall run-off response
- Rainfall and discharge field measurements
- Hydrological modelling using PDM
- Hydraulic modelling using ISIS
- Scenario analysis of flood mitigating measures

Technical Description:

The Maarkebeek catchment is a typical hilly stream catchment in Flanders. A pronounced relief results in a relatively narrow valley by the intensive river action on the soft sediments of the soil. The fertile soils assure important crop yields, agriculture is developed using productive modern techniques.

However, agricultural practice results not only in higher erosion rates but also in rapid rainfall run-off response, reduction of retention/infiltration capacity and consequently high run-off coefficients. As a result, a hydrological quick response induces a direct transfer from precipitation to water flow.

Flooding seems to occur more frequently and may result in severe problems in the downstream catchment area. It is clearly identified that this direct hydrological impact in the upstream catchment induces severe stresses for the downstream river flow control.



Maarkebeek bankfull flow

The downstream section of the Maarkebeek is situated in the alluvial plain of the Scheldt River and is heavily urbanised.

During the storm of December 1999 several square kilometres were flooded, including important parts of the urbanised net of the City of Oudenaarde.



Flooding in Oudenaarde (1999)



Based on an intensive inventory of the actual state of the catchment, all relevant pressures and potentials are identified in the river basin. A calibrated (and validated) numerical river flow model of the actual status was developed, based on intensive field recording of water flow and stages.

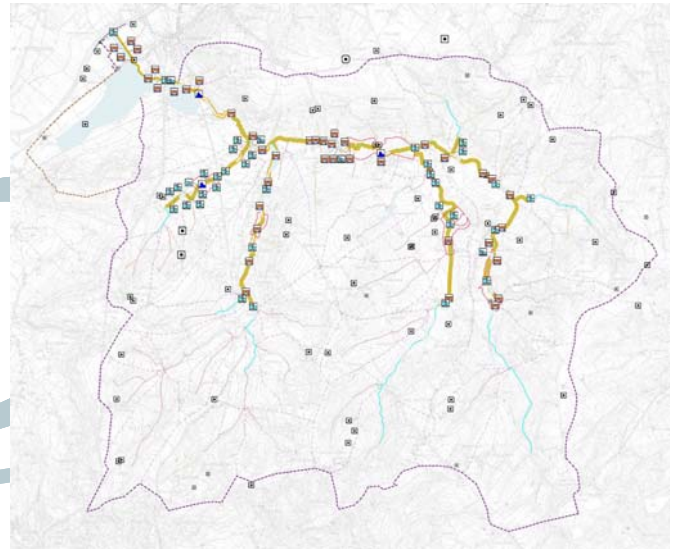


Field records along the Maarkebeek

The study is using hydrological and hydraulic modelling to investigate the effect of required capacity flood plain (retention) for controlled flooding by forcing peak flow into the alluvial plain of the upper catchment area, on the mitigation of flooding hazard in the downstream section.

The study uses the Wallingford Software: PDM hydrological model for rainfall run-off simulations and the ISIS hydraulic model for open channel flow.

The scenario analysis with the developed model includes rules for control of sluices and abstraction rules at a screw pump, siphons with trash screens, ... in order to generate appropriate water management measures to control flooding in the river catchment.



Catchment area and implemented model topology



Impressions of structures implemented in the hydraulic ISIS model