

# Hydrological and hydraulic Modelling of the Zwalm Catchment



**Financed by:** Ministry of the Flemish Community

**Client:** Ministry of the Flemish Community, AMINAL, Water Management

**Date:** 1998 – 1999

**Budget:** € 162 500

**Location:** Zwalm catchment between the cities of Oudenaarde and Geraardsbergen (Flanders, Belgium)

**Partners:** University of Ghent (Hydrology)

## Assignment:

In 1997 the Ministry of the Flemish Community launched a prestigious programme of integrated water management, focusing on flood mitigation. The study of the Zwalm catchment is a pilot study with an example function on integrated water management for Flanders.

## Scope of Services:

- Rainfall run-off modelling
- Hydrological modelling using PDM
- Hydraulic modelling using ISIS
- Integrated water management

## Technical Description:

The Zwalm catchment is located in the Flemish Ardennes, a hilly area consisting of marine Tertiary deposits, which are locally covered by important loess deposits.

The upstream part of the catchment is deeply incised and in the alluvial plain of the main river, problems of flooding frequently occur at the junction with the main tributaries. Heavy storms are also invariably associated with peaks of sediment transport. Due to the nature of the soil, severe erosion problems are identified and associated with the flooding problems.

Because of these reasons and of the integrated value of the area due to its ecological, socio-economic and cultural values, the studied catchment has frequently been the object of research, and represents as such an example function to other integrated water studies.

A detailed inventory is undertaken to map the parameters relevant to rainfall run-off relation in the catchment.



*Old water mill site along the Zwalm*

To describe the actual water system, a picture of both actual landuse and geomorphology is generated in a GIS environment. Both historical precipitation time series and synthetic precipitation time series, corresponding to statistically prepared return times, are used to calculate hydrological hydrograms of the respective upstream subbasins.

A hydraulic model is being set up using the ISIS mathematical model in order to study the hydraulic response to flooding events.

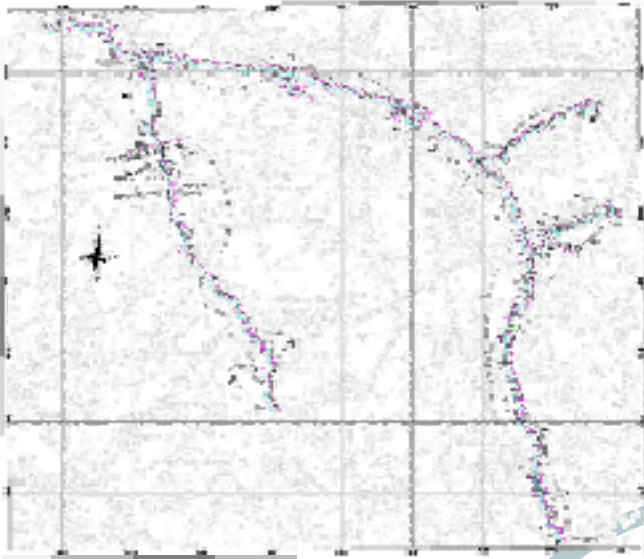


Soresma nv  
Britselei 23  
B-2000 Antwerpen  
tel. +32 (0)3 221 55 00

Soresma nv - haecon  
Poortakkerstraat 41  
B-9051 Gent  
tel. +32 (0)9 261 63 00

Soresma sa  
Chaussée de Louvain 484  
B-5004 Namur  
tel. +32 (0)81 20 18 91

info@soresma.be  
www.soresma.be  
Dr. ir. Marc Huygens  
Contract Manager



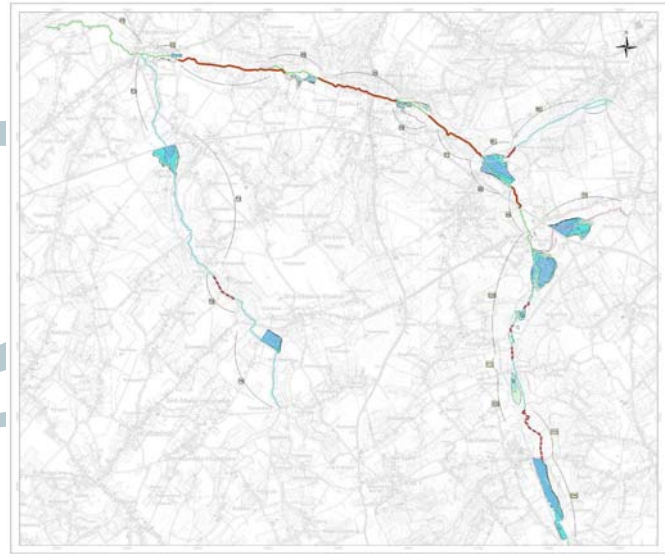
General set up of the ISIS model

Both field records of water stages and flow or (historical) flood observations are used to calibrate the hydraulic model of the actual river system. Based on this validated numerical model, water management potentials in the catchment are validated through discrete scenario simulations in the ISIS model.

As a result, possible sites for water retention in the upstream part of the catchment are being defined (natural flooding plains), in function of the benefits reaped for nature and

landscape. Combining ecological potentials with flood protection induces integrated water management in the Zwalm catchment. Since water flow is mainly managed with weirs at old water mills in the Zwalm catchment, some adapted weir management philosophy is implemented in the hydraulic model in order to evaluate its impact on the flood control.

The effect of introducing flooding plains is investigated through simulation with the hydraulic calibrated model.



Flood simulations in the Zwalm catchment



Zwalm upstream gated weir at Zwalm mill



Automatic weir and entrance of bypass at IJzerkot Mill



Sedimentation basin at Zwalm Mill



Fixed weir at Zwalm Mill

Zwalm and current water management infrastructure