



UKWIR Project WW17C205

Ribble SIMCAT Pilot Study - Assessment of Relative Contributions and the Impact of Control Measures on Water Quality

Complying with proposed Water Framework Directive (WFD) water quality standards for 'good ecological status' and 'good ecological potential' in England and Wales potentially requires a range of Programmes of Measures (PoMs) to control point and diffuse sources of pollution. The regulated nature of the Water Industry, and a potential funding mechanism through the 5 year cycle of asset management plans (AMP), make it easier to target pollution from continuous Wastewater Treatment Works (WWTWs) discharges, and intermittent discharges from Combined Sewer Overflows (CSOs) and Stormtank discharges at WWTWs.



The Water Industry identified an urgent need to quantify the water quality benefits of PoMs applied to Water Industry discharges at 'end of pipe' and other, more diffuse sources of pollution; for example, from urban runoff and agriculture.

This research project has addressed the need by using a catchment based water quality modelling approach as a 'test bed' to illustrate how different sources of pollution can be apportioned and how the impacts of different strategies for load reduction can be quantified in terms of water quality benefits.

In the UK, river water quality modelling with the Environment Agency's SIMCAT

catchment water quality model is recognised as the best current approach to support decision making for river water quality management and planning.

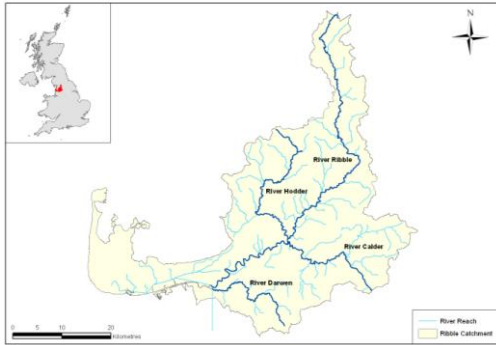
The project, carried out by WRc plc, was supported by the Environment Agency, United Utilities (UU) and Emaginating (affiliated with the University of Leeds and funded by Defra) who provided data and guidance for its use in the study.

The objectives of the study were:

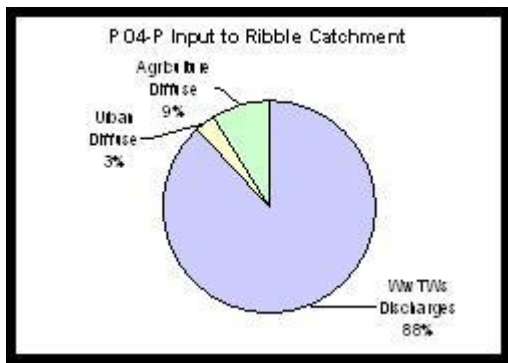
- to quantify pollution loads from point and diffuse inputs to a catchment from water company discharges, agriculture and urban runoff;
- to develop and calibrate a SIMCAT model of the Ribble catchment in the North West of England for BOD, Ammonia, Phosphate and total Nitrogen based on the identified pollution loads; and,
- to assess the water quality benefits that would arise from a range of individual and in-combination PoMs scenarios for point source and diffuse pollution control.

The project was the first to apply estimated loads for different sources of diffuse pollution derived from a range of other modelling approaches to a SIMCAT model. This has produced a more reliable assessment of the apportionment of loads from individual source types across the catchment and, as a consequence, a more robust assessment of the water quality spatial co-benefits that could arise from reductions in the different sources of pollution.





The Ribble SIMCAT model was used to examine a total of 59 individual and combined PoMs scenarios to demonstrate the impact of reducing WwTWs loads alone and in combination with other measures to reduce diffuse inputs from urban areas and agriculture.



The results demonstrated that a catchment modelling approach can be used to apportion sources of pollution load across a catchment and to identify the water quality co-benefits of point source and diffuse pollution control measures to achieve compliance with proposed WFD river quality standards. In particular, achieving proposed river quality standards for Phosphate is recognised as (and in this study has been proved to be) potentially the greatest technical and financial challenge to meet the requirement of the WFD in the UK. The scenario results show that improved, but not full, compliance with the WFD water quality standards could be achieved by point source control alone. However, this would not necessarily reflect a cost effective approach. The results from

the study have been provided to Defra and have been used in the preliminary Cost Effectiveness Analysis for England and Wales.

In many respects the issues facing the Ribble Catchment are not atypical of other large catchments and approach developed by the project can be transferred to other catchments. In the future, a catchment modelling approach should ensure that catchments are provided with a satisfactory level of environmental protection at a realistic cost. A key issue for achieving compliance with the WFD, or not, will be ability to develop alternative solutions that can reduce both the use of additional natural resources and carbon footprints.

Direct benefits to the Water Industry from the project include:

- direct support to other stakeholders to develop River Basin Plans;
- achieving the greatest benefit from point source control solutions;
- defending against abortive investment and minimizing potential increases in customer bills; and,
- informing negotiations with OFWAT and Defra.

