

The Revised WaPUG Code of Practice for Sewer Modelling

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Background

It was at this conference, here in Blackpool, in 1990 that I co-presented a paper entitled *Hydraulic Modelling in the 1990's*. Among the issues I highlighted that was being taken on by the industry at that time was quality assurance and BS 5750 (now known as ISO 9000). I pointed out that a quality system would ensure a consistent standard of work, but not necessarily an adequate one. In other areas of engineering design the standards had been codified such as BS8110 The Structural Use of Concrete. At a time when the industry was about to embark on major programme of upgrading sewer networks to meet new environmental requirements, there was a need for a Code of Practice for hydraulic modelling.

The WaPUG Committee took up the challenge and set up a group to draft a code of practice. The group comprised myself, Barry Luck of Southern Water, Phil Deakin of Northumbrian Water, and Richard Allitt. Version 1.0 of the Code of Practice was launched here in Blackpool at the 1993 conference.

The industry moved on and by 1998 the use of terms like WASSP and WALLRUS made the document look very dated, though most of the content was still valid. The use of the Internet had then reached the point when the best method of publishing the code was now to make it free on the Web. Accordingly a number of members of the WaPUG committee met together in Reading and undertook an minor revision which resulted in version 2 being published on the Web in November 1998.

It is important to understand that a code of practice records current best practice. It does not therefore describe new ideas or developments. In it's 9 year life the code of practice has become an important work. It is referenced both in client specifications and in the Environment Agency's consent procedures and has become the basis for model audits.

The Revision Process

Further changes in modelling tools and practices highlighted the need for a further more thorough revision of the Code of Practice. Pressures on resources in the industry and the need for a much wider consultation with users and specifiers required a different approach. It was decided to hold a one day consultative workshop and to fund a technical author to carry out the revision.

Accordingly a representative group of about 40 people from the industry were invited to a consultative workshop which was held in Sutton Coldfield on 29th May 2002. The workshop was facilitated by Charles Ainger of Montgomery Watson Harza Ltd. The first session was used to capture all the issues that the participants thought needed addressing. The workshop then broke into groups to consider these issues in more detail and to prioritise them.

As technical author, I analysed the results of the workshop and produced a series of proposals for revision which were published on the WaPUG Website at the end of June 2002 and was reviewed by the Committee at the end of July. Detailed revision of the document then followed and a draft for comment was published on the Web at the end of August. Comments received by the end of October were considered and a final draft produced. This was reviewed by members of the committee prior to publication. Version 3.0 was published on the WaPUG Website earlier this week.

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The Structure of the Document

The document is currently divided into eight sections as follows:

- Introduction
- Project definition
- Data requirements
- Model building and testing
- Flow surveys
- Verification
- Use of models
- Documentation

There are also appendices covering simplification procedures and standards for coding of contributing area data.

The Principal Changes

General

The code of practice does not contain detailed technical guidance. Where this is necessary reference is made to appropriate WaPUG usernotes or other sources.

There have been some changes to the overall structure. The data preparation and model testing chapters have been combined into a new chapter on model building and testing. The use of models has been given greater prominence by making it a chapter in its own right, rather than an appendix. Since the software available has broadly similar functionality, and many clients specify the software to be used, it has been possible to replace the software selection chapter with a short section which has been incorporated into the model building and testing chapter.

Introduction

The only significant change to this chapter has been the addition of a section on planning of modelling work. Formerly it was common to plan the flow survey before model building had even commenced in order to shorten the timescales. Now with many projects updating existing models, it is practicable to have the model available during the planning of the flow survey. This is now the recommended sequence of work, though it is sometimes possible to use an earlier model for this purpose if updating work is likely to significantly delay the work.

Project Definition

The importance of defining the objectives of the model at the outset cannot be understated. It was felt that this was not adequately explained in previous versions so the opportunity has taken to expand this section.

In the early 1990's sewer quality modelling was in its infancy. Experience suggests that sewer quality models can be based on any of the different types of models. It is no longer helpful to class all such models as a single type. Type IV has therefore been deleted.

Data requirements

In the early 1990's sewer records were still largely paper based. Since then records have largely been transferred to Geographical Information Systems and the wording has been amended to reflect this change. There is more of an emphasis on the use of extended rainfall time series in models and this section has therefore been expanded.

More significantly there is a much greater emphasis on the need for operational and incident data, particularly during the flow survey, to allow the model to take these factors into account.

Model building and testing

There is now a much wider range of run-off models available and so a section has been added highlighting the need to select the most appropriate model. Reference is made to WaPUG usernotes where these are available and it is hoped that new usernotes can be produced to fill the gaps.

New sections have also been added on flood routing and interactions with other systems.

Since models now have the capacity to model more nodes and computing power to run large models is now available, less simplification is carried out. The model simplification section has therefore been summarised, with the excess material moved to an appendix.

The section on modelling ancillaries has been extended with more references made to the information available in usernotes.

Flow Surveys

There were a large number of requests for additional topics in this chapter and it has only been possible to cover some of these. Many need to be addressed in revisions to other documents. WRc is currently considering the feasibility of revising the *Guide to Short Term Sewer Flow Surveys*, and it may be possible to cover some of the other issues there. There were calls for the rainfall assessment criteria to be changed. However there were no suggestions as to how it should be changed. If there are problems with these criteria then alternatives need to be developed and tested before they can be included in this code of practice.

Good planning of flow surveys is essential if good results are to be obtained and if the flow survey results are poor then the verification will be poor. Many of the problems with flow survey data are associated with trying to measure flows in poor sites.

This section has therefore been extensively revised to help users select suitable sites. If the model is available it should be possible to understand the likely range of flows and the velocities. This can then be checked against the capabilities of the proposed instrumentation. A site survey is also required to establish whether there are any local features that would give rise to turbulence or anomalies in the flow pattern.

Good communications (both ways) between the contractor and modeller is imperative. Even with good pre-site checks there will still be a small proportion of problems sites. These need to be identified early so that, if possible, the monitor can be resited. This not only requires the contractor to report on such issues, it also requires the modeller to read the report in time to take action.

Verification

The differences between verification, calibration and force fitting of models are now explained in the introduction to this section and some guidance is now given on verification procedures.

The major issues highlighted by users was that too much emphasis is given to the criteria that can be calculated - the percentages - and not enough to the subjective issues such as the shape of the hydrographs. So to be clear, the primary criterion for fit is that **the shape, magnitude and timing of the observed and predicted hydrographs should be similar**.

Clearly any inaccuracies in the flow survey data are highly relevant, and the modeller should not only read the flow survey contractor's report but also to review the data with the benefit of their understanding of the system, for example by simple mass balance checks.

Documentation

It is vitally important to document models properly. The guidance on documentation has been substantially enhanced. Four different reports are anticipated which are different to any project report. The four reports are:

- A model building report – including the project definition, the sources of data and the checks carried out, and assumptions made during model building, calculations for ancillaries etc. and model testing
- A flow survey report (normally produced by the flow survey contractor);
- A verification report;
- An upgrading options report – including details of changes made to the model for each option.

The Future

This document aims to be a record of current best practice in hydraulic modelling of sewer systems. As practices continue to evolve it will need to be updated to reflect these changes. However it is not the role of a code of practice role to drive change.

The benefit of publishing on the Web is that more frequent changes can be made. As well as keeping the references (particularly the references to the usernotes) up to date it is hoped to make more frequent smaller updates in future. This is most likely to focus on a single chapter at a time rather than be a more general update.

To monitor the need for change it is essential that we get feedback from users, and it is hoped that many more users will make use of the discussion page on the WaPUG website to provide your comments.