

Maintaining "WALLRUS" Models

by

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The aims of this paper are to identify shortfalls in the creation of models for planning purposes and to discuss possible solutions for extending the life of a model.

The name WALLRUS is being used as a generic term for modelling tools. Principles discussed in this paper are applicable to modelling generally. Yorkshire Water (YW) has more than forty copies of the WALLRUS software in use and therefore forms the standard modelling tool for catchment planning purposes at this time.

What do we mean by "Maintenance"?

Creating drainage models has in the past, been a snapshot operation and therefore maintaining the models has not been an issue. However, the trend in recent years has been to extend the life of the model by using it for purposes other than Drainage Area Studies (DAS). YW has indicated that models should be transportable and where possible used to assist operational efficiency. It appears that models no longer have a finite life, in terms of providing solutions in accordance with the Sewerage Rehabilitation Manual (SRM), but are being treated more and more as "live" models. Providing a "live" model changes the prevailing philosophy of providing models that are reproduced on the snapshot basis, which can sometimes be "fit for purpose", within narrow bands for which the model was verified, then leaving it on the shelf.

A "live" model should reflect the behaviour of the drainage system under a variety of conditions.

Models do not mirror reality they represent reality. Therefore assumptions have to be made, tested and finally accepted. Where these changes have been made they should be fully documented. This is the minimum acceptable "maintenance" that is required of a "live" model. The aim is to be able to document all changes, assumptions, simplifications and comments in a fashion that can be globally understood by successive users of the model or users with other requirements. We would define "maintenance," therefore as the system that provides a model that is fit for further use.

Why maintain models?

The industry in the main has treated sewer network models as a means to solve acute problems known to exist within the sewer network. However, increasing awareness of the effects of pollution and the need to ensure customer levels of service, have put increased value on the sewer network models that have been created and will be created in the future. Also, the emphasis in the future will be on increasing efficiencies in the operation of our networks, therefore requiring models that will be able to predict, perhaps in real time, potential problems. Investment in solving all the actual and predicted problems will not occur overnight therefore models will require updating as the network is improved and enlarged. Creating and verifying these models is proving to be very costly. The costs are compounded when the trigger to revisit a model occurs. Documentation describing its creation is either missing or at best in a form that is not easily followed. Reasoning behind the model is missing and frequently only a result is recorded. This is not acceptable and a move to an more auditable system is inevitable.

The benefits of adopting a maintenance path are not confined to the company but obviously will benefit them most. Even if a model is built for traditional purposes the maintenance process has great value. It will give added confidence, generate a better product and will also allow an assessment on the possibility of using the model for other purposes.

Having discovered all the problems in a plan area these are then prioritised and the necessary funding targeted and scheduled. Allowing the Company to effectively manage its liabilities and programme repairs according to its budgets. This approach can also lead to increased awareness and possible transfer of knowledge that is of benefit to other activities within the Company. The model or DAS created from the model then becomes a live document that can serve many users or customers. The modelling process can now be seen to be part of a wider activity within the Company.

Who carries out the maintenance?

Protecting the Companys' investment by ensuring that models can be maintained should now be thought about at the start of the model building process. Who carries out this maintenance will in the main depend on why the model was created and who built the model. If the organisation which creates the model is different from the organisation which builds the model then the maintainer needs access during model building. Staff with modelling skills must maintain the models.

How do we maintain models?

Yorkshire Water has recently introduced its Drainage Area Planning Technical Approach. This is a document that specifies the requirements of the Company for carrying out Drainage Area Plans and the required complexity of model. This follows the principles outlined within the SRM. However YW has refined and expanded on some recommendations so as to ensure that work that is carried out is thoroughly documented in a fashion that can be understood by all the Company's modellers.

Various Company documents lay down guidelines as does the forthcoming Code of Practice for Hydraulic Modelling of Sewer Systems. These like any other guideline can be interpreted in many ways. The value therefore of the maintenance may only be of local worth, and still not transportable to a person who has not seen or been involved with the model.

In brief the methods of maintaining models are as follows :-

a) no audit trails

"Snapshot" models only serve a single purpose and after that purpose has been served the model is filed as are old contract documents.

b) creating a paper audit trail

Theoretically this is possible. However these systems require close and vigilant management. Practically this is usually very onerous to follow to and can always be abused, or the minimum only, fulfilled. A paper system which shows all the changes and interpretations of a model, which now can average around one thousand pipes, would take a great deal of effort to create and would return little benefit, to the modeller, as manipulation of this data would be impossible.

However these principles are valid and all information is valuable. An more automatic or automated process is more appropriate.

c) computer based audit trail

The principles adopted with the paper system can be automated with a computer based system. This would have all the benefits of the paper system but would automate the process for the modeller and take away many of the more tedious tasks. It would also allow the modeller to analyse the model in many different ways which were not previously possible.

The model is then be thought, as the knowledge which was gained from building the model together with the reasons behind any assumptions made are available in

one place that is easily found, interrogated and reported on.

In summary in order to maintain models, codes of practice should be put in place and adopted. Where possible practices should be automated to standardise procedures.

Quality assurance cannot be properly carried out unless it is embedded within the procedures adopted. As a minimum these should form part of an audit trail that starts at the sewer records and continues throughout the life of the model.

Yorkshire Water Approach.

Over the last year Yorkshire Water has developed and prototyped its first attempt at answering the fundamental question raised by this paper. Namely "How do we maintain Wallrus models?". Model_Mate is being created to help our modellers fulfil some of the requirements already adopted by the company. It will form the prototype system for what eventually will become a total model audit trail or version control system !

Summary

Of the three options discussed and considering the large amounts of money now invested in drainage area studies the following conclusions can be made :-

- a) Having no maintenance is not an acceptable way forward.
- b) A paper based audit trail would create more capital expenditure on areas no beneficial to the mode building process in managing and creating and maintaining a paper system that is of limited benefit. Essentially this is a database so why not use one to do it.
- c) Computerised maintenance by audit trail is the most sensible way forward for future models.

The first steps towards creating a maintenance environment are therefore :-

- 1) introducing a standard that is accepted throughout an organisation and
- 2) creating a recording system that can be seen to fulfil the users modelling requirements and the Companys' global requirements.

**MAINTAIN WALLRUS MODELS, GIUSEPPE CIAFFARAFÀ, YORKSHIRE
WATER SERVICES, PAUL DAVIES, CHESTERFIELD BOROUGH COUNCIL**

Question

Martin Osbourne, HR Wallingford

Could the speakers comment on staff mobility and the continuity aspect of one person working on a model?

Answer

This will always be a problem. The answer is not to rely on the person but to rely on the system.

With an audit trail it is the knowledge you need to keep not the modeller.

Question

Andrew Eadon, Severn Trent Water Plc

What are the main uses for models? What are the revised uses and what are the cost implications of implementing a system?

Answer

The cost of maintenance, what is cost of not maintaining? You may well have to rebuild the model from scratch just to model in 1 new area. The estimate would be a 20 to 30% increase in cost to implement an audit system.

The other approach is to build a snapshot model they throw the models away.

The main use of any model is to represent a real system. This is then used to test performance and failure and also proposed works.

In addition uses could include overflow performance and real time control.

Question

Dave Walters, MW Barber Group

A standard package like wordperfect can compare files?

2

Answer

It is easy to compare like with like. The need is to include thoughts and reasoning behind changes to the model.

If there is not an enforced system this tends not to happen. There is a need to ensure compliance rather than just rely on the modeller.