MINIMUM FLOW SURVEY NETWORKS

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INTRODUCTION

The drainage problems of Dunfermline in Fife are being investigated by Dundee College of Technology (DCT) on behalf of the Regional Council. The town's sewerage serves a population of 52,000 and has four main branches with a total of 2000 discrete sewers, the largest of which is 2100 mm in diameter. The system is a mixture of sewerage types and has 33 overflows and one offline tank. The main sewers are two parallel pipes that are interconnected, and although they are nominally for separate storm and foul flows, the flow is actually combined and re-separated by overflows and cross-connections in a haphazard manner. These main parallel sewers drain some 650 ha of the total catchment 1100 ha and terminate at a major overflow chamber.

The principal problems are caused by urban expansion and have led to overloading of the system below the steeply sloping town centre and flooding at Inverkeithing before the long outfall discharges to the River Forth. Operational improvements without excessive capital expenditure can only be determined by simulation of the behaviour of the flows in the parallel sewers.

MODEL

In order to be able to refine the parallel sewer system model as necessary by further software development it was decided to develop a Wallingford Procedure simulation model from published theory rather than to purchase the WASSP package directly. It was believed that software refinement in this way would not have been possible using WASSP, as WASSP would only have been able to model the parallel sewers by assuming either an equivalent pipe system or a series of closely connected ancillary structures. A version of the simulation program especially tailored to this system has been developed using a DEC20 computer and subsequently transferred to an Apricot Xi microcomputer.

SYSTEM DESCRIPTION AND VERIFICATION

The Dunfermline study is being carried out as economically as possible in terms of manpower and equipment. Allowing for it to take some 2-3 years from inception, only 4 in-sewer loggers are in use with 2 high resolution rain gauges and 2 check gauges. The sewer records had important errors and omissions and ways of minimising the amount of physical system data collection were sought. The Procedure documents suggested that a considerable saving in effort could be made by using the sewered sub-area model as developed by IOH. Accordingly DUCTS includes this sewered sub-area model, as it was anticipated that its use would minimise data collection. Reported experiences, however, have suggested that this model is unreliable, and that system simplification can only be done on an ad-hoc basis for individual systems. Indeed it seems that the standard mothodology is now to collect all the system data; any simplifications then being made purely to save computer storage rather than field work. Without the economies in data collection offered by the standard sub-area model the Dunfermline model is being developed using representative areas to produce typical sub-area models which will then apply to other similar areas. This should then necessitate full data collection for only about 25% of the system.

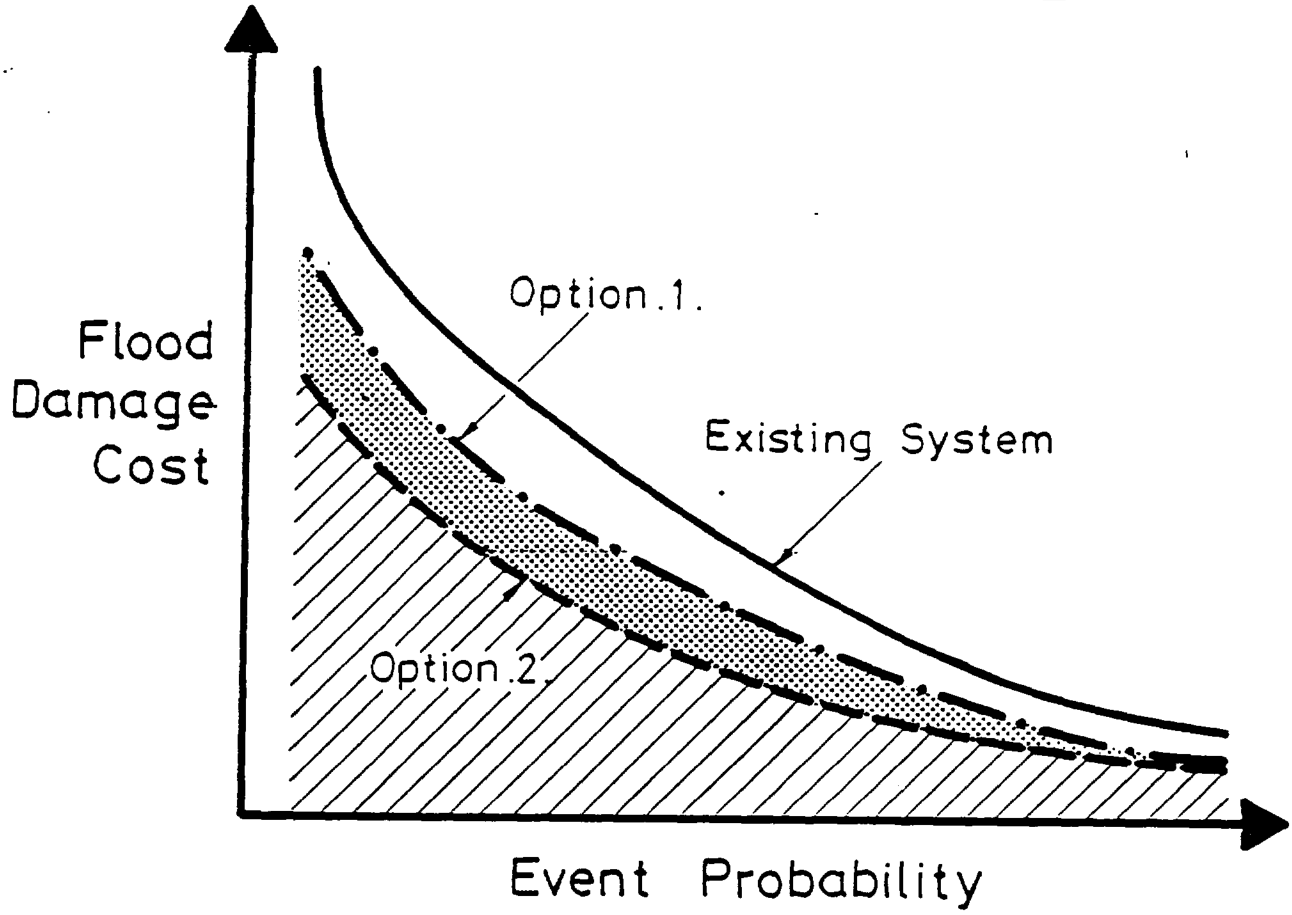

FIGURE 1

3. OTHER MEASURES OF PERFORMANCE

Flooding tends to be the most important measure of a sewer network's performance but other aspects of Pollution and Structural integrity can also be assessed using this technique. Measures of volume overflowed and surcharged sewer length are suggested to cover these other aspects of performance. The different "benefit" areas can be combined to give an overall benefit/cost assessment, with different measures weighted in accordance with Regional policy.

4. CONCLUSION

A simple Benefit/Cost appraisal of sewerage schemes designed using WASSP can be carried out, using available data. This would provide an aid to the Engineer to select the most cost effective scheme to deal with known sewerage problems.

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