THE DUNDEE GATES-AN UPDATE

Since the initial presentation of the unique flow control gates found in Dundee, at the Autumn 1986 meeting of WaPUG, work has continued in Dundee in an attempt to accurately model the gate flow characteristics using WASSP. These infamous gates appear to be found only in Dundee and are unique in that in certain configurations they act as a stormwater overflow in reverse, ie they divert the baseflow out of the system while keeping the stormwater in the system (see diag 1). The main problem found in modelling is deciding on appropriate discharge coefficients. To attempt to and assess accurate coefficients Dundee College of Technology (DCT) is at present constructing a 1:7 scale model of a typical gate chamber for detailed laboratory testing.

The need for an accurate gate model arises because at present Tayside Regional Council are constructing a WASSP model of the Dundee central area sewer system. This model will have to account for the 257 gates known to be in the system.

The Dundee model has been divided into 14 discrete sub-catchments, of which the most complex is the Perth road area. This sub-model represents a catchment area of 169.2 Ha, with a population of 5400. Within the Perth road sewer system there are no less than 15 gate type overflows (see diag 2). To model this system on MICRO-WASSP the catchment had to be split into 2 smaller models each of which was verified separately.

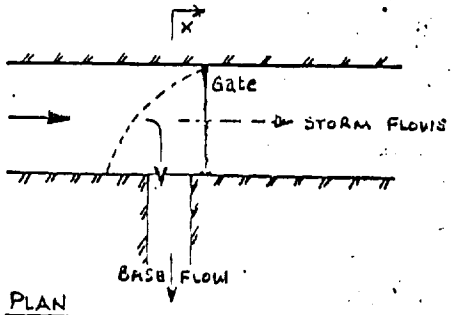
The verification data for the models were collected at the outfalls of the sub-catchments. When these data had been collected a "guestimate" of suitable discharge coefficients for the gates were made based upon the details given in the WaPUG user note No 2 and experience gained from previous work carried out. Then, with fingers, crossed the models were run. The results from these runs showed a high degree of correlation (see diag 3).

The only uncertainties that arose from these simulations were:-

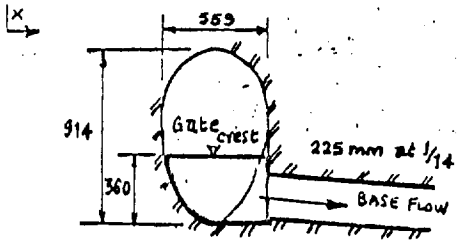
i) that the gates were not in fact being modelled correctly, however the models were producing a low cumulative error.

ii)that since the models were verified using low intensity rainfall, the simulation of high intensity design storms would produce erroneous results.

The general opinion of the meeting appeared to agree with the modelling techniques used in this case. However doubt over the accuracy of the individual gate performance, and the behaviour of the model under high intensity rainfall still remained.



PLAN



SECTION X-X

TYPICAL DUNDEE SEWER GATE

DIAGRAM 1

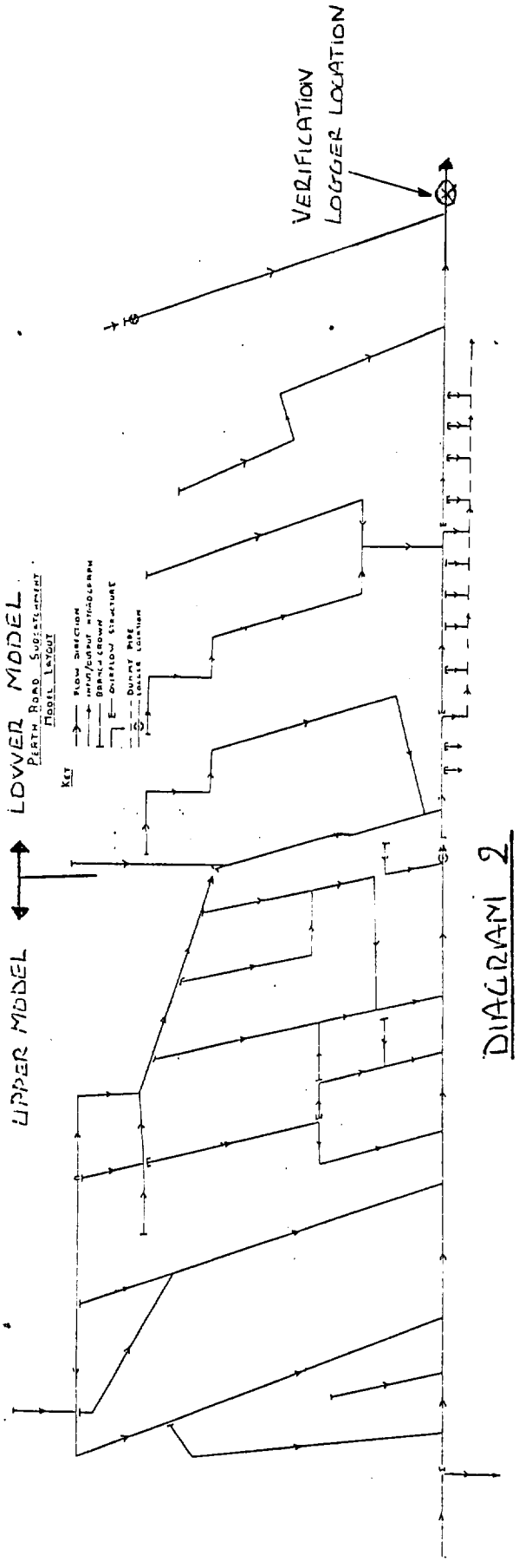


DIAGRAM 2

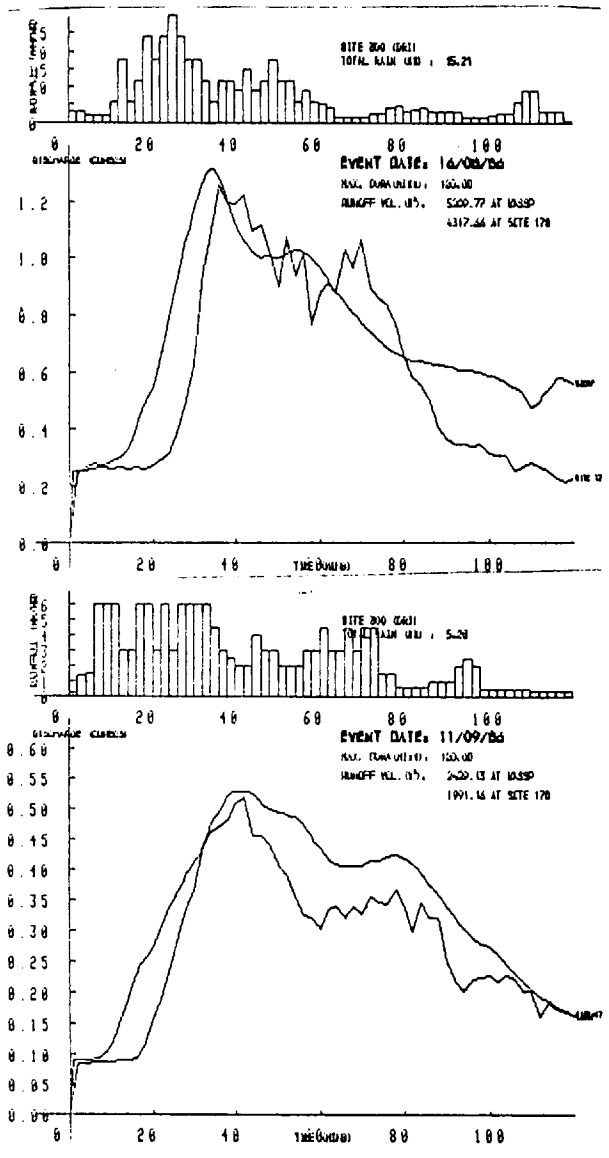


DIAGRAM 3

Discussion on Mr. Goodisons' presentation

Dr. D. Balmforth, Sheffield City Polytechnic.

The coefficients for the tanks used to model the gates have clearly been considered carefully. There are always problems in extrapolating the performance of a system under verification to its performance under design events of 1Ø - 3Ø year return periods. Due to the initial care in choosing coefficients, the system should respond correctly on extreme events.

Good fits are usually achieved further downstream because the system behaves increasingly like a pipe system.

The model will be adequate for predicting flows at the downstream end for input into the core area model. If detail is required in the sub-area, then further work will be required.

Dr. R Price, H.R.Ltd.

Would wish to emphasise Dr. Balmforths' remarks. It is important to examine each individual gate and always check the modelled flow regime against the actual flow regime, for large events.

M. Goodison,

It is intended to build models of the gates in the laboratory to examine the hydraulic performance of the various types.
