WaPUG SPRING MEETING 1990

Experience in the use of MOSQITO

A P Baldwin, HRL
C J Hutchings, WRc

Early this year the water quality program, MOSQITO, was put through a rigorous testing programme to assess its ability to predict water quality in urban drainage systems.

The testing programme was divided into two stages; 1) theoretical testing, and 2) catchment testing. The theoretical tests assessed the numerical accuracy of the program based on the conservation of mass. These tests highlighted errors with the pollutant routing algorithm which are now being corrected. The catchment tests involved comparing predicted results with recorded data obtained for a selection of storm events. Comparisons were made for suspended solids, BOD, COD and ammonia concentrations.

Generally the results were good, although inaccuracies were observed for events with very high intensity rainfall. The following is a brief description of various interesting modelling problems which were encountered during the testing programme.

A common feature of pollutants in storm flows is a rapid increase in pollutant concentration at the beginning of a storm event, known as a first foul flush (FFF). During the initial MOSQITO tests, a FFF was not observed, due to the lack of pipe sediment in the system. Two methods were tried to simulate a FFF. Firstly, consolidated sediment (shear strength = 10 N/m^2) was placed in the pipes, but the flow had insufficient energy to erode the sediment, hence <u>no</u> FFF. Secondly, unconsolidated pipe sediment was created by deposition of fine sediment from the foul flow during the dry weather flow period. This has no shear strength and was eroded causing a FFF, comparing well with the recorded data. Approximately 10kg of fine sediment with a density of 1200 kg/m^3 was required to produce a FFF for a catchment with 170 pipes.

MOSQITO is designed to simulate the quantity and quality of water discharged over overflows. Initial tests showed the tank/overflow model became numerically unstable at low flows. The problem was caused when water drained out of the tank, leaving it completely dry. The solution was obtained by lowering the base level of the tank by approximately 0.1m below the invert of the continuation pipe. This allowed an initial volume of water to exist in the tank, thus eliminating the numerical problems. Note the hydraulic properties of the tank are not affected as the WALLRUS part of MOSQITO accounts for the extra volume of water.

As tanks and overflow chambers hold large volumes of quiescent water, sediment is allowed to settle. This process affects the quantity of sediment passed over the overflow, and down the continuation pipe. MOSQITO simulates settlement of sediment, therefore tests were carried to observe the changes in sediment concentrations by varying the size and densities of sediment particles. As expected more fine sediment was passed over the overflow than coarse sediment.

Finally the erosion and deposition of sediment in pipe systems was briefly assessed. The mass and distribution of coarse sediments were predicted by MOSQITO having large sediment deposits close to the outfall, more deposition in pipes with flat gradients, and small amounts of sediment deposited in the upstream pipes.