SESSION TWO: GENERAL INFORMAL DISCUSSION
CHAIRMAN A. R. EADON, SEVERN-TRENT WATER AUTHORITY.

The discussion was based on question forms completed by delegates, and was split into two sections:-

a) The Wallingford Procedure.
b) The organisation of WaPUG and it's activities.

Dr. R. K. Price, Hydraulics Research Ltd., was asked to introduce the Wallingford Procedure User Notes. The notes are intended to provide a concise summary of particular aspects of the Procedure relevant to all users. A binder containing the first two notes is currently available from Hydraulics Research Ltd. at a cost of £5.50. Purchase of a binder registers a user to receive future notes free of charge.

Dr. D. Wright, Applied Research and Project Management Services.
Enquired about the legal aspects of WaPUG giving advice to engineers in the form of User Notes?

Session Chairman.
There is a covering note in the binder and the notes will only be supplied to WaPUG members.

D. Brace, Flowtechnics Ltd.
Requested details of User Note topics?

Session Chairman.
The first set of notes to be published will be as follows:-

(i) The Buxton Case Study - D. R. Dring.
(ii) Sewerage Rehabilitation using WASSP - D. I. Aikman
(iii) Management of Data for Partially Separate Systems - A. R. Eadon.
(iv) Modelling of Hydrobrakes - N. Orman.
(v) Overflow coefficients - D. J. Balmforth.

Future notes may include presentations from this meeting and topics raised during the discussion.

Session Chairman.
Invited delegates to suggest methods of modelling syphons? Modelling as an equivalent pipe is not always satisfactory, depending on the significance of the syphon within a network.

R. K. Price.
The syphon should be regarded as a separate pipe following a backdrop manhole.

D. J. Balmforth.
The downstream end can be modelled as a tank with a high level outgoing pipe following recent development to WASSP. However, problems have been experienced with tanks of small plan area.

Session Chairman.
Have delegates experienced problems in modelling bifurcations with outgoing pipes at similar levels?

B. Luck, Southern Water Authority.
If the pipes rejoin a short distance downstream they can adequately be modelled as an equivalent pipe. If not a nominal 50mm difference in pipe inverts is introduced.

D. Dring, Severn-Trent Water.
Should the overflow be modelled as a weir in preference to an orifice?

R. Chapman, WRc Engineering.
The reverse is true if surcharging occurs, i.e. an orifice is preferred.

B. Luck.
Requested advice on modelling an interconnecting pipe between two branches which can flow in either direction?

R. Chapman.
Recommended the use of a dummy overflow, i.e. model has an on-line tank and overflow on each branch.

R. K. Price.
Dummy overflows can cause instability and should be spaced if possible.

Session Chairman.
Such systems should be simplified if possible.

B. Luck.
Case studies relating to overcoming particular problems, such as those being discussed, would make important User Notes.

D. J. Balmforth.
This is a point often raised during training courses, particularly in relation to ancillary structures.
Dr. Balmforth then referred to his own User Note and the paper published in The Public Health Engineer (January 1986) by D. Williams concerning orifice discharge coefficients. A new range of coefficients have been produced to replace the value of 0.8 recommended previously.

P. Batten, City of Bristol.
During a flow verification survey, with monitors upstream and downstream of an overflow, sewer flows were insufficient to cause the overflow to operate. How can overflow coefficients be determined?

D. J. Balmforth.
If no field data is available the User Note formulae should be used. However, in this case there is sufficient information to verify the orifice coefficient (not the overflow coefficient).

A. R. Eadon then introduced a discussion on the PR equation and recommended a simple User Note on the interaction between PR, ANTEC and RRF.

T. Peacock, Thanet D.C.
High values of SMD (e.g. 130) used during model verification have resulted in PR values which appear to be too low. Should they be amended to improve the fit between measured and predicted hydrographs?

J. Packman, Institute of Hydrology.
Expressed surprise at the degree of fit demonstrated in examples. The results are much better than would be expected since PR errors can be significant. However, engineers should be wary of amending PR giving consideration to other factors first e.g. SOIL.

Session Chairman.
Asked if other delegates had experience of extreme SMD values or SOIL values different to the maps?

D. J. Balmforth.
Local changes in soil classification have been encountered. How can these be taken into account?

J. Packman.
Institute of Hydrology are currently engaged on the production of a 10 class soil map which will obviously be more accurate. The current ranges are too broad and moving to the next classification may be reasonable to improve verification.

R. Chapman.
During verification of a model for Bournemouth, WASSP-SIM always under-predicted flows. The flow survey was carried out during a very dry period and changing the value of SOIL to suit actual local conditions resulted in significant changes in predicted flows, which then matched measured flows.

B. Luck.
Experienced similar problems with low UCWI values.

T. Peacock.
Referred to the problem of poor fit between measured and predicted hydrographs for flat catchments. The minimum surface slope permissible in WASSP is often greater than actual slopes. WASSP should be improved by allowing lower values of slope index to be used.

J. Packman.
WASSP predictions should not be very sensitive to this factor.

P. Hill, Southern Water Authority.
The predicted response times in WASSP-SIM are usually too short. Why is this?

J. Packman.
The main cause is network simplification.

R. K. Price.
Expressed concern at network simplification. The value of PLAG referred to by Mr. Nussey must be carefully checked.

Session Chairman.
Asked delegates to discuss problems experienced with flow monitors particularly in relation to silting around the transducer?

D. Williams, WRc Engineering.
When silting occurs the doppler signal can be cut out and velocities are not recorded. Depth values are measured by pressure strain gauge and will still be recorded although they may be unreliable. The usual method of preventing these problems is to rotate the transducer part way up the pipe wall.

R. K. Price.
The comparison of depth hydrographs is likely to be difficult because depths are very sensitive to local geometry. Discharges are much less sensitive.

D. Dring.
When using predicted hydrographs engineers should be careful to select the correct node point in the network. Level hydrographs are produced at upstream nodes of a specified pipe length and discharge hydrographs at downstream nodes.

J. Packman.
If velocity calibration values are not available for a flow survey, what velocity ratio is applied to recorded values?

D. Williams.
No correction is made - the equipment is assumed to be correct.

D. Wright.
When comparing measured and predicted hydrographs, what degree of fit is deemed to be satisfactory?

Session Chairman.
There should not be a specific standard. Differences in hydrographs should be used to re-examine the data model in order to identify as many errors as possible for a reasonable cost before proceeding with design work.

D. Dring.
The extent of cost and effort applied to verification should be based on the consequences of an inadequate model.

D. J. Brace.
From experience of flow surveys many pipes are silted. Do people make appropriate allowances for loss of cross-sectional area and changes in roughness?

J. Bartlett, Binnie and Partners.
In a model for Kings Lynn a series of roughness values were attempted before making alterations to pipe diameters. Equivalent sections are less important if the pipe is to be replaced anyway.

D. J. Balmforth.
It is important that sewers are not cleaned prior to a flow survey if silting is likely to re-occur.

Session Chairman.
Requested information on the use of an appropriate head-loss index when a number of intermediate manholes are specified? Multiplication of head-loss factors does not work.

D. J. Balmforth.
The head-loss factors specified in WASSP do not increase linearly. Also under certain conditions straight manholes can cause greater head-losses than bends.

R. Chapman.
The head-losses suggested in WASSP appear to be generally too high. They are unlikely to be significant anyway at velocities less than 1 m/s.

D. J. Wright.
Requested Hydraulics Research Ltd. to produce an index of WASSP versions currently available.

R. K. Price.
Agreed to investigate the work.

There was a short discussion concerning the use of raingauge data from flow surveys. R. Chapman expressed concern at the practise of averaging rainfall profiles because of the smoothing effect on peak intensities. The use of a single profile can be more accurate. R. K. Price recommended the use of the spatial rainfall variation package, available from HRL at a cost of approximately £700.

The Session Chairman then requested delegates to comment on the format and activities of WaPUG.

D. J. Wright.
Requested the circulation of papers prior to the day of a meeting. He also asked why proposals for a subscription rather than payments for meetings had not been adopted.

Session Chairman.
Charges are currently made for meetings so that only those who attend have to pay. If subscriptions were charged all meetings would have to be made open. The current practise is for attendance at the autumn meeting to be by invitation only. The main reasons why a subscription had not been levied were a) to reduce administrative effort, and b) to avoid wasting time in seeking nominations. Delegates were asked if they were content with the current situation.

The general opinion was that subscriptions should not be levied. Some delegates thought that their employers would be unwilling to pay.

A. R. Eadon summarised the days proceedings before formally closing the meeting, which was attended by 70 delegates.

SESSION TWO: GENERAL INFORMAL DISCUSSION.
CHAIRMAN A. R. EADON, SEVERN-TRENT WATER AUTHORITY.

G. Wooldridge of Hydraulics Research Ltd. was asked to comment on the concern expressed at the last WaPUG meeting at communication problems between HRL and users. Mr. Wooldridge divided his comments into 2 sections:-

a) Distribution of information to users - HRL are currently drafting the first set of notes to licensed users detailing problems experienced by users and their solutions. The notes will be issued at two monthly intervals in future.

b) Dealing with problems found by users - A quicker response will be facilitated by a new electronic mailing system. Users should use forms produced by HRL and enclose copies of data incorporating the problem.

P. Deakin, Northumbrian Water Authority.
Concerned that the WASSP-CHECK program should not fail since some problems cannot be identified until others have been corrected.

G. Wooldridge.
Every effort has been made to ensure that errors encountered in these CHECK programs are dealt with by warning messages. However, it is not possible to avoid some 'fatal' errors which cause the program to fail.

The following discussion was based on question forms completed by delegates on the following topics:-

a) Ancillary Structures.
b) Data Verification.
c) Mixed Urban/Rural Catchments.
d) Cost of WASSP Analysis.

a) ANCILLARY STRUCTURES.

Mr. Gooch, Southern Water Authority.
Experienced instability problems in attempting to model a tank sewer with an on-line tank of 1750m^2 plan area. Is there an upper limit to plan area?

G. Wooldridge, Hydraulics Research Ltd.
Such large tanks probably cannot be modelled. The outflow is defined by the rate of change of water levels in the tank which in this case would be very small and the progress may not accurately reflect these values. The upper limit to plan area is increased with higher flows.

Session Chairman.
Now that level pool effects have been modified in WASSP it should be possible to model a tank sewer directly, i.e. as a large diameter pipe.

A. G. Spray, Welsh Water Authority.
Requested general advice to ensure flow volume balance through overflows where the overflow pipe rejoins branch downstream.

Session Chairman.
Confirmed that every ancillary should be checked for volume balance (e.g. inflow = outflow + overflow).

G. Wooldridge.
If the overflow pipe is subject to surcharging WASSP is unable to cope. Tanks will not accept reverse flows over an overflow.

D. Williams, WRc Engineering.
Where there is surcharging downstream of an overflow, orifice overflows will be more accurate than weir overflows.

A. M. Crawshaw, Northumbrian Water Authority.
Requested advice on modelling an overflow comprising a high level pipe straight out of a manhole.

Session Chairman.
An on-line tank with orifice overflows is ideal for this situation and also for bifurcations.

D. Walters, Bolton MBC.
Can syphon overflows be modelled?

G. Wooldridge.
The most accurate method is to use an on-line tank with a specified head/discharge relationship.

b) DATA VERIFICATION.

C. Jefferies, Dundee College of Technology.
Invited views on the siting of raingauges with particular reference to underexposure/overexposure.

S. D. Roberts, Delta Surveys Ltd.
Referred to Meteorological Office recommendations. Raingauges should be level and 4 times the height of an obstruction (such as buildings, walls) away from the obstruction. Tall buildings or trees can cause eddies and gusts which can increase or decrease the rain collected. However, such requirements have to be balanced against the security of the equipment making good sites rare in urban areas.

Further information is available from the Met. Office or raingauge suppliers.

G. Catterson, North West Water Authority.
Some form of local windspeed measurement would give confidence in the reliability of measured rainfall.

M. Gooch, Southern Water Authority.
Higher winds are often encountered on the type of exposed sites generally required. Church graveyards have been successfully used in S.W.A!

J. Packman, Institute of Hydrology.
Daily total raingauges should be used at ground level to check raingauges sited on roofs. Other suitable sites include electricity sub-stations and private gardens. It may be possible to install the raingauge in a shallow pit with a covering steel grille.

P. Deakin, Northumbrian Water Authority.
Daily total raingauges for checking purposes have shown that accuracies of 5% are achievable.

C. Jefferies.
A list of usable locations is required and WaPUG could circulate a questionnaire.

A. R. Eadon, Severn-Trent Water Authority.
Agreed to circulate a questionnaire prepared by C. Jefferies and publish the results.

K. Burrows, Trafford Borough Council.
Using a version of WASSP which is limited to 480 time steps. Thus using a 30 second increment the maximum event duration which can be analysed is 4 hours. How can longer storms be investigated?

P. Hill, Southern Water Authority.
Program uses vary. Another package should be used or Trafford's program amended.

M. Dewhurst, North West Water Authority.
The NWWA main-frame computer has a limit of 1000 time steps and may be used by Trafford. However, longer run times are involved and it may be better to select short duration events for verification.

T. Webster, Severn-Trent Water Authority.
Warned of the danger of increasing time increments above 30 second in order to run longer duration events. Predictions become much less reliable.

G. Wooldridge.
Another problem with long duration events is that the UCWI value changes significantly during the event as the catchment becomes wetter.

Tony Lewis, North West Water Authority.
a) How does the ESMD value required by WASSP relate to the Morecs system of SMD estimates now operated by the Met. Office and which value do the Met. Office give when engineers ask for "an SMD value"?
b) Invited discussion on experiences of high variability of SMD estimates between stations. Variations of greater than 100 have occurred between adjacent stations.

J. Packman.
The ESMD value is calculated directly for particular sites. The new Morec stations average values over a 40Km square grid. The Met. Office will probably give Morec values if ESMD values are not specifically requested. However, the values should be similar and make little difference to the PR value.

Session Chairman.
Met. Office guidance should be sought when large variations in SMD are encountered but engineers must consider the significance of any such variation on the value of PR and eventually, sewer discharges.

R. Brown, Nuneaton and Bedworth B.C.
Invited comment on Severn-Trent Water Authority's policy to limit the use of flow volume measuring equipment for verification purposes, relying on long term depth monitors to measure surcharge.

D. Williams, WRc Engineering.
The methods developed by WRc rely on the measurement of flow volumes enabling verification information to be collected over very short periods. The STWA approach is to monitor performance during more severe storms (surcharge depths) with a volume check at the outfall.

Session Chairman.
Prepared to accept inaccuracies during initial verification. More verification can be done later if a cost effective rehabilitation option is dependent upon a more accurate model.

P. Deakin.
Requested a future User Note comparing case studies of verification accuracy and the effect on final solutions.

D. Walters, Bolton MBC.
Existing flow survey equipment could be used to record flows for longer periods enabling real data capture to replace computer predictions.

Session Chairman.
This may be something for the future but reaction times are too slow to cope with current problems.

A. Crawshaw, Northumbrian Water Authority.
Permanent flow recorders are now often installed on system outfalls and may provide useful information in future in conjunction with short term monitoring of sub-catchments.

P. Murphy, MRM Partnership.
Do not spend too much time fine tuning models. Inaccuracies in design storm values etc. will outweigh the effect of such inaccuracies on final solutions.

c) MIXED URBAN/RURAL CATCHMENTS.

K. Walters, Warrington B.C.
How can revised PR equations be incorporated in WASSP? Can two different equations be used in one run?

G. Wooldridge, Hydraulics Research Ltd.
This cannot be done. However, a derived value of PR can be inserted.

J. Packman, Institute of Hydrology.
Two separate models should be used for mixed catchments (greater than 25% urban and rural) and hydrographs combined as required.

A. Crawshaw, Northumbrian Water Authority.
Described a mixed catchment where lengths of natural watercourses have been piped into the sewer network. In order to achieve good correlation during flow verification it has been necessary to artificially lengthen watercourses in the model. Why?

J. Packman.
The problem arises in the surface routing component of WASSP which is based on fast responses from urban areas. Rural responses are much slower. The two types of catchment should be modelled separately.

d) COST OF WASSP ANALYSIS.

M. Gooch, Southern Water Authority.
Requested information on the costs of analysis. SWA have calculated factors for elements of analysis e.g. build model, verify, assess performance.

P. Deakin, Northumbrian Water Authority.
The main problem is that computer costs are often unknown. If computer work is carried out in-house and overnight the real costs will be very low. A rough target for analysis costs is 10% of final scheme cost.

J. Packman, Institute of Hydrology.
A study of costs may be irrelevant since there is no alternative to WASSP anyway.

A. Taylor, WRc Engineering.
Currently involved in North West Water Regional Contract comprising a number of catchments throughout the Authority. More information will be available in future but some factors are already recognised as having a significant effect on overall costs. These include computer costs when the work is carried out by external agencies and data collection when carried out by direct labour organisations.

B. Wilkinson, Yorkshire Water Authority.
Cost information would be welcomed but it must be remembered that analysis will become cheaper as engineers become more experienced. In addition analysis work completed now will be used for other schemes in the future.

Session Chairman.

S.T.W.A. use a rough guide of between fifty pence and one pound per head of population, excluding computer costs, to develop a model of a single sewer system.

There was then a short discussion on the format of WaPUG particularly in relation to raising annual subscriptions. It was generally agreed that the existing system works well and that a small increase in funds could not significantly improve the service currently provided to members.

Severn-Trent, Northumbrian and North West Water Authorities all reported the development of local user groups.

A. R. Eadon summarised the days proceedings and requested papers for the autumn meeting in Glasgow before formally closing the meeting, which was attended by 112 delegates.