have to be done frequently. This is accomplished by sediment sampling means **10**.

A set of random numbers must be selected before sampling each period to be monitored. This is done by making a preliminary estimate, Y', of Y, the total suspended sediment yield expected during the period to be monitored. To insure that the random numbers cover a sufficiently large range to sample the expected yield of suspended sediment, Y' is multiplied by a factor, W, to obtain:

$$Y^* = W\,Y'.$$

W is essentially a factor of safety ensuring a near zero probability that the total estimated suspended sediment yield, X, is greater than Y*. If X exceeds Y* the sampling algorithm will run out of random numbers. The magnitude of W will reflect the quality of existing data and the consequent uncertainty of the estimate, Y', but it will usually be in the range from 2 to 10.

A procedure is described in the incorporated by reference Thomas paper to establish n*, the number of random numbers that must be preselected to obtain a specified level of performance for the estimators. Assuming temporarily that its value is known, n* uniform random numbers are selected from the interval (0,Y*], where the parenthesis indicates exclusion of the boundary point from the interval, and the square bracket indicates inclusion. The actual selection is carried out in the calculator using a pseudorandom number generator. The random numbers are sorted into ascending order (to facilitate their use during sampling) and stored in the computer.

The SALT sampling process and the procedure for estimating total suspended sediment yield are fully described in the referenced Thomas paper, and attention is directed thereto for such disclosure. A procedure for establishing sample size is also described in that paper. Data are retrieved from the calculator by a portable digital cassette recorder and can be transferred to a computer without intermediate reduction or manual entry.

INDUSTRIAL APPLICABILITY

While the SALT scheme has been described as the means for controlling the sampling process, other schemes are also available due to the versatility of the programmable calculator. Another effective control scheme includes basing the sampling on the estimated suspended sediment yield. In such a scheme, each time the calculator wakes up it measures the stage height and estimates the sediment yield based on past sediment vs. stage height relationships for the particular waterway being monitored. This predicted value is stored in memory. Each new predicted value is added to the predicted value already stored in the memory. When the summation of predicted yield values exceeds a preselected level, a water/sediment sample is collected. In this manner, the sampling procedure is controlled by the estimated amount of suspended sediment passing the monitoring station. Other sediment sampling methods can also be used by altering the program in the calculator accordingly.

If no rating data exist for the waterway of interest, temporary equations can be constructed from a similar watershed. As rating data are developed, the program is modified to reflect any changes, and changed as frequently as every storm event, if desired.

While the wake-up period has been disclosed as being ten minutes, other intervals can be used.

The calculator can also be used to accumulate hydrographic data. For example, every time the calculator wakes up, stage height is measured, if the just-measured stage height corresponds to that height which is predicted within a stated tolerance by a straight line extrapolation of the last two stored measurements, the just-measured value is not stored. However, if the just-measured value deviates from the predicted value by more than the tolerance, the just-measured value is stored and used to modify the straight line extrapolation.

We claim:

1. A method of controlling the sampling of flow related variables from a waterway which has various stages including steps of:

obtaining a sample from the waterway with a pumping sampler;
sensing the stage of the waterway with a water stage sensor;
providing a programmable calculator;
providing an interface circuit board to electronically connect said programmable calculator to said pumping sampler and to said water stage sensor; and
using a SALT scheme to automatically control when a sample is taken from the waterway.

2. The method defined in claim **1** wherein the flow-related variables include the level of suspended sediment.

3. The method defined in claim **2** further including a step of comparing the sensed stage of the waterway to a predicted value of stage height.

4. The method defined in claim **3** further including a step of recording the sensed stage height of that sensed stage height differing from the predicted stage height by more than a predetermined value.

5. A method of controlling the sampling of sediment from a waterway including steps of:

providing a pumping sampler for sample collection from the waterway;
providing a water stage sensor for sensing the stage of the waterway;
providing a programmable calculator;
providing an interface circuit board to electrically connect said programmable calculator to said pumping sampler and to said water stage sensor;
and automatically controlling when a sample is taken from the waterway by measuring stage height of the waterway with said water stage sensor,
predicting the amount of sediment which corresponds to that stage height with said programmable calculator,
recording a value which corresponds to the amount of sediment predicted, and
collecting the sample of sediment when the recorded value reaches a predetermined value with said pumping sampler.

6. The method defined in claim **5** including measuring stage height and predicting the amount of sediment a plurality of times and further including a step of adding the predicted values together to define an accumulated sediment value and then collecting a sediment sample when that accumulated sediment value reaches the predetermined value.