Overview

The concentration of suspended sediment in a river varies in space (i.e. with depth and distance across a channel) and time. Since the sediment concentration cannot be measured at all points across the cross-section continuously it is necessary to sample the concentration at selected points.

Sediment discharge at a given depth is the product of concentration and velocity. The sediment discharge in the vertical is derived by integrating the product of velocity and concentration throughout the depth. Sampling the integrated concentration throughout the depth is performed by lowering and raising the sampler between water surface and the bed at a uniform rate. The sediment discharge is then calculated from the depth integrated samples of concentration and the flow through the section which the vertical represents.

Documentation

Sediment gauging results are recorded in the Sediment gauging results.
Sediment gauging results can be calculated using form SSG 12 or using an Excel spreadsheet.

An example spreadsheet is located in:
\\ares\Hydrology\Catchment Data ISO9001-2008 QMS\Operations Manual\cd_om_9.22_Example_Sediment_Gauging_Calculation.xls

Flow in sediment gauging sections is established using the mid-section method for estimating flow.
This method defines the section boundary between two verticals as half way between the two measured verticals.
The vertical closest to the waters edge is taken as representative of the concentration for the flow from the waters edge to half way between itself and the next vertical.

For example, a sediment gauging with three verticals is shown in Table 1.
Three sections defined for the calculation. Section one includes the area from Waters edge (offset = 22m) to the midpoint of vertical 1 and vertical 2 (offset = 57.5m). Section 2 includes the area from the midpoint between vertical 1 and vertical 2 (57.5m) to the midpoint between vertical 2 and vertical 3 (72.5m). The third section includes the area from the midpoint between vertical 2 and vertical 3 (72.5m) and the waters edge right bank.

	Offset (m)	Section	Section width
Waters Edge (left bank)	22		
Vertical 1	50	1	22 -57.5
Vertical 2	65	2	57.5- 72.5
Vertical 3	80	3	72.5-115
Waters Edge (right bank)	115		

The percentage of flow in each is derived by one of two methods dependant on whether or not the sediment gauging has an associated flow gauging.

Calculation with Associated Flow Gauging.

Where an associated flow gauging (convention or ADCP) is available, it is used to define the percentage of flow in each section.
Sediment discharge gaugings collected during times of rapid changes in stage and flow are generally done after a flow gauging or between flow gaugings.
To compensate for any change in flow that occurs between sampling the sections of the river, the flow for each section is time weighted using the rating curve, recorded stage height and time of sampling for each vertical.

Calculation with no Associated Flow Gauging

For sediment gaugings where a flow gauging was not completed.

Flow in each section is established based on other flow gauging measurements at the site.
If flow relationships for the sections cannot be established based on other records at the site then flow can be assumed equal in each section.
The sediment concentration for the vertical is measured as the average of the replicate depth integrated samples for the vertical.
The sediment discharge for the section is calculated as the flow in the section multiplied by the average sediment concentration measured in the vertical. The total sediment discharge is then calculated as the sum of the sediment discharge in the all the sections. The average sediment concentration for the sediment gauging is calculated from the total sediment discharge divided by the total flow.
For information on entering the results of the sediment gauging calculation into Hilltop refer to the instruction sheet entering sediment gauging results into Hilltop.

Sediment Gauging Calculation

SUSPENDED SEDIMENT DISCHARGE DATA (SSG 12)

_____ River at _____ Station

Date/Time _____ Party_____ Gauging No. _____

Offset	Sample Concentration (SSC)	Mean Conc. in Vertical	Mean Conc. in Section	Discharge in Section (Qs)	Product (Ss.Qs)

Sc Mean Concentration for gauging $\frac{\Sigma Ss.Qs}{\Sigma Qs}$ = _____ mg/l

Total Sediment Discharge (Tonnes per Second) = _____ $Gs = K.Sc.Q.10^{-6}$