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Technical Note 15

Total Suspended Solids from turbidity

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Total Solids is the term applied to material residue left in a vessel after evaporation of a water sample and subsequent drying of the residue. Total Solids includes Total Suspended Solids (TSS), the portion of total solids in a sample that can be retained by a filter, and Total Dissolved Solids (TDS), the portion that passes through a filter.

We are sometimes asked if turbidity readings can be converted to TSS values. The short answer to this is "no". Turbidity is the measure of a sample's tendency to scatter light. While the scattering is produced by the presence of suspended particles in the sample, turbidity is purely an optical property. The pattern and intensity of scatter changes with the size and shape of the suspended particles as well as with the material of which they are made. A sample containing 1,000 mg/L of fine talcum powder will give a different turbidity reading than a sample containing 1,000 mg/L of coarsely ground talc. Both of these samples will also have a different turbidity reading than a sample containing 1,000 mg/L ground pepper. Yet, all three samples contain the same quantity of TSS.

A user who wishes to convert turbidity readings to TSS measurements is obligated to first establish a correlation between the two for a specific sample site. The resulting correlation coefficient will give an estimate of how strong the relationship is. Conversion of turbidity readings to TSS values should be approached with caution even after a correlation is established, though. The composition of suspended material with respect to particle size and composition is likely to change both spatially and temporally.

Imagine a river along which multiple sample sites exist. The water in a fast moving section of the river will be able to keep larger particles suspended than will the same water in a slow moving section. Even if samples from both river sections had the same actual amount of suspended material in mg/L, the turbidity readings would likely be somewhat different due to differences in particle size distribution. Now imagine the same sample site on this river in spring versus winter. Due to differences in overland runoff patterns during the two seasons, the types of materials making up the TSS load is also likely to be different. A correlation between turbidity and TSS that was established in springtime may not be valid at other times of the year, even for the same sample site.

While establishing correlations between turbidity and TSS may prove expeditious for certain types of sampling, such estimates of TSS should only be used as a rough index of a sample's true sediment load. Critical quantification of TSS should always be done gravimetrically by filtering a sample of known volume, then drying and weighing the filtered material.

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