



Turbidity

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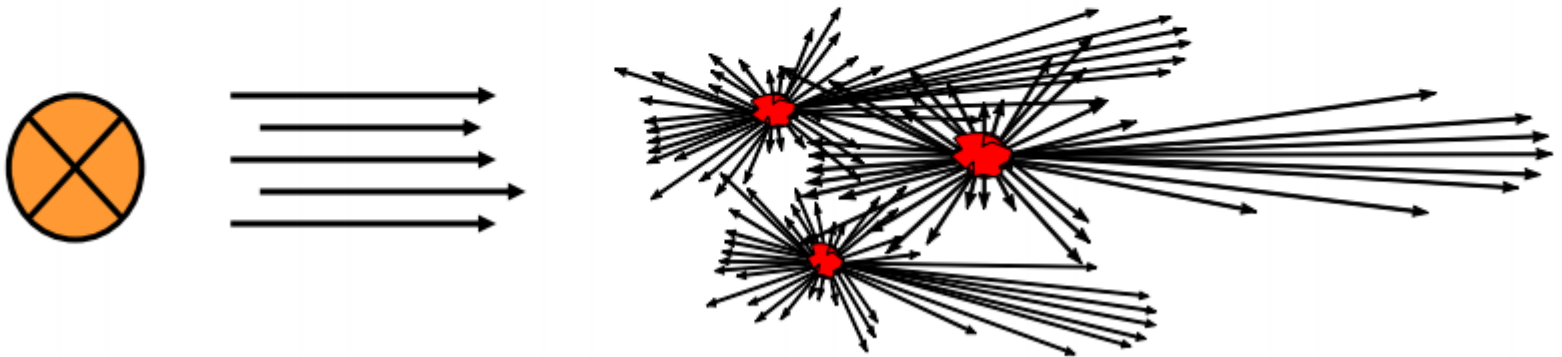


Definition

- * Measure of
 - * water clarity
 - * how much the material suspended in water decreases the passage of light through the water

What is turbidity?

Turbidity is the phenomenon where by a specific portion of a light beam passing through a liquid medium is deflected from undissolved particles.



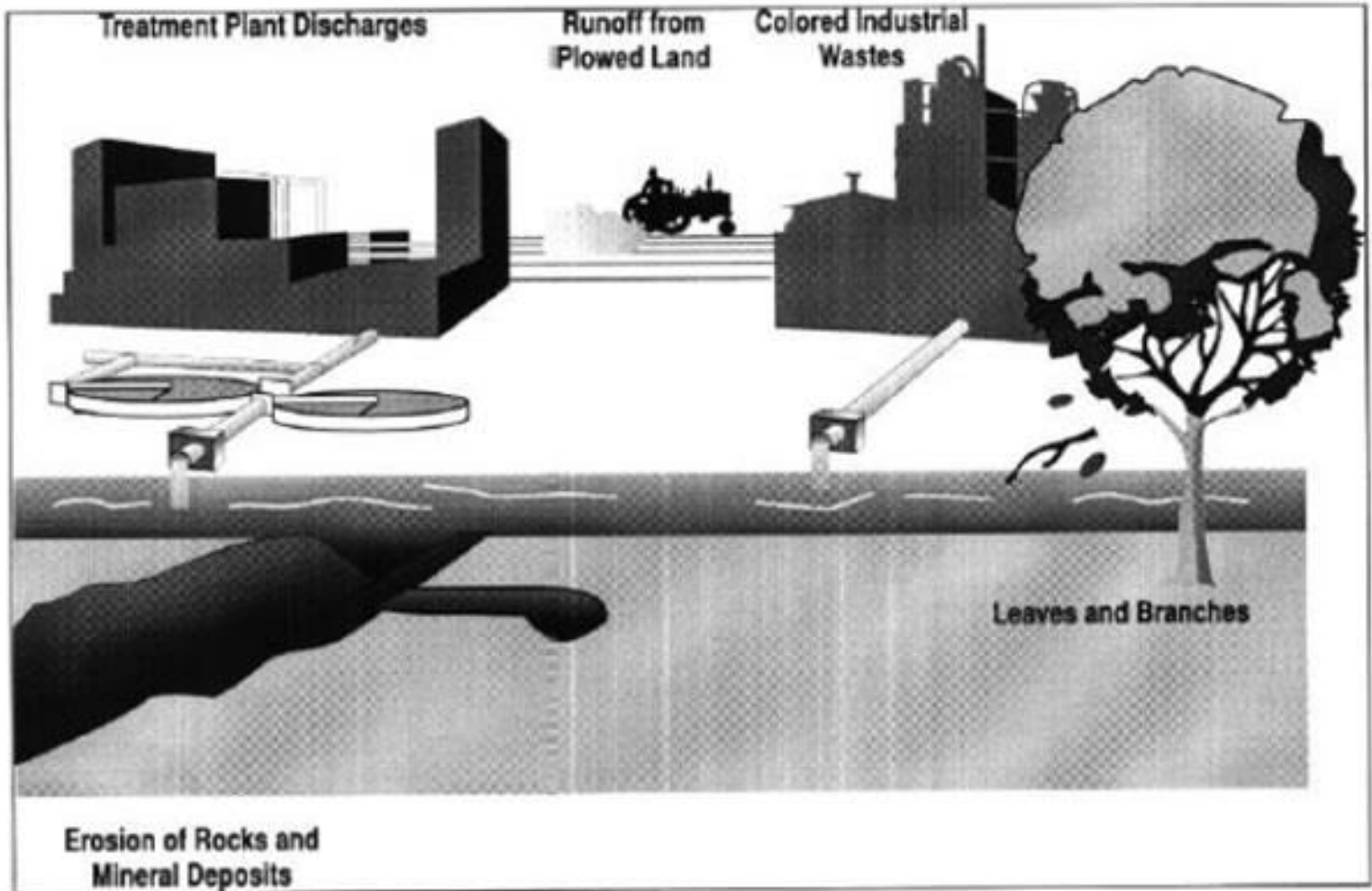
Cause of turbidity

- * May be caused by wide variety of suspended materials (both colloids and coarse dispersions)
 - * In lakes: typically colloidal and extremely fine dispersions
 - * In rivers: relatively coarse dispersions

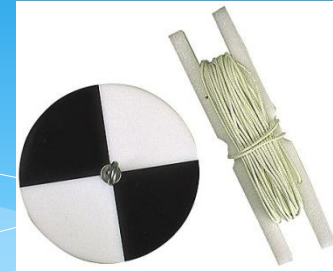
Sources of turbidity

- * Soil erosion
- * Waste discharge
- * Urban runoff
- * Eroding stream banks
- * Large numbers of bottom feeders (such as carp), which stir up bottom sediments
- * Excessive algal growth
- * Bacteria and other germs.

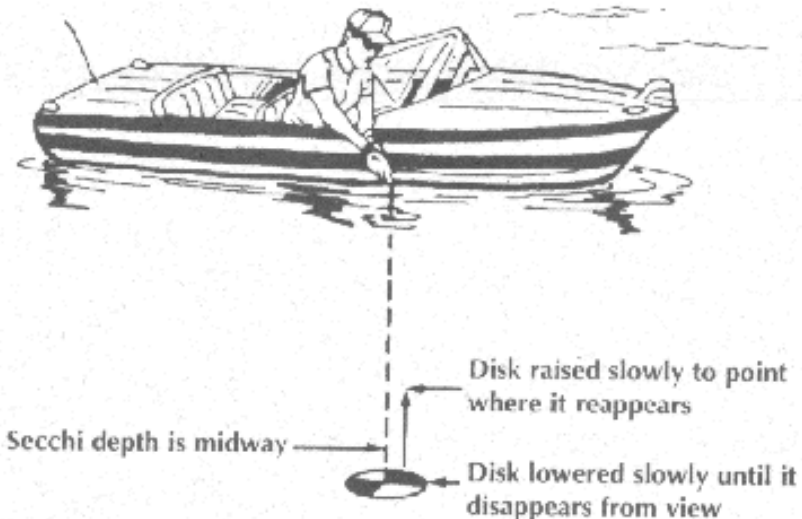
Sources of turbidity



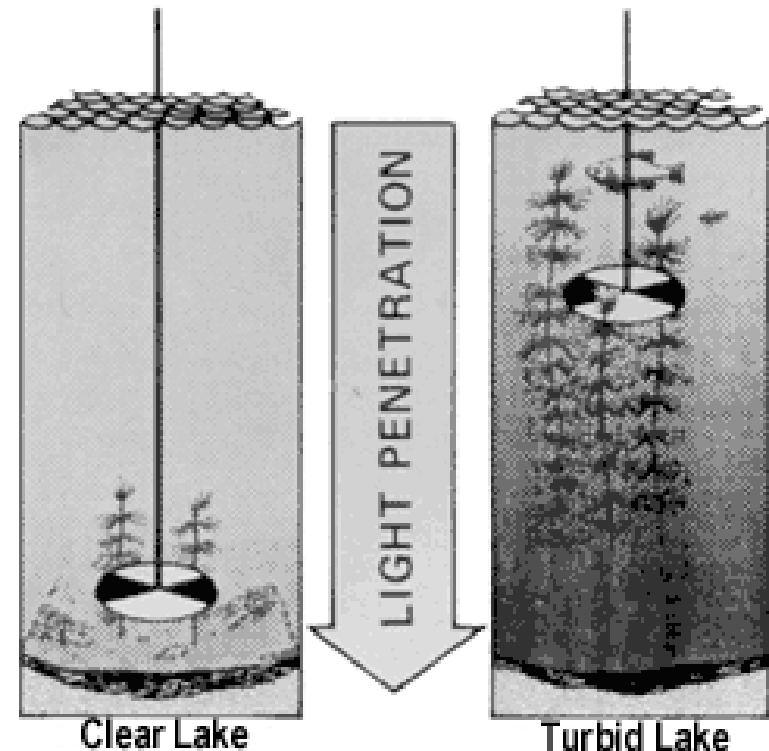
Turbidity Measurements



- * Slow-moving, deep waters
- * Secchi disk
- * Rule of Thumb: light penetrates 2-3x Secchi depth



Measuring Water Clarity with a Secchi Disk

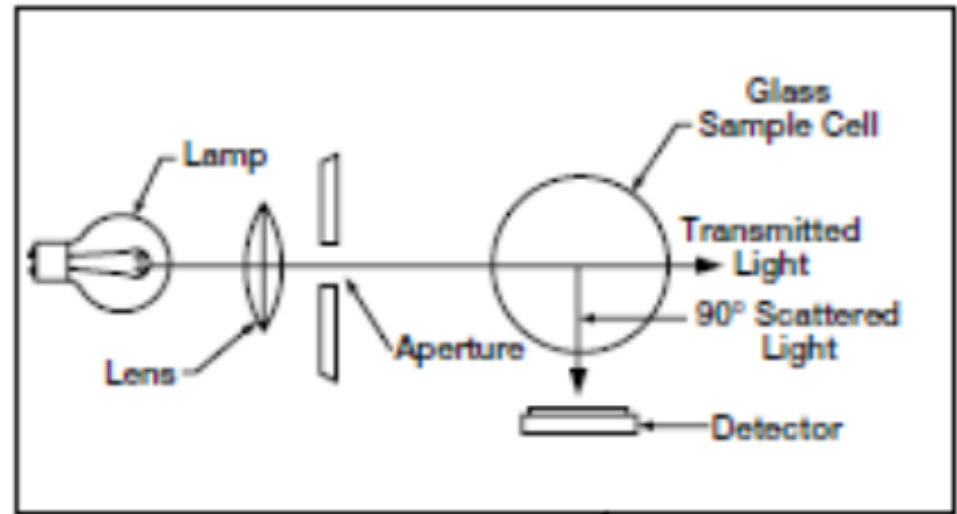


Secchi Disk



Turbidity Measurements

- * Fast-moving, shallow water
- * Turbidimeter (Nephelometer)
- * Nephelometric Turbidity Units (NTU's)



A turbidimeter

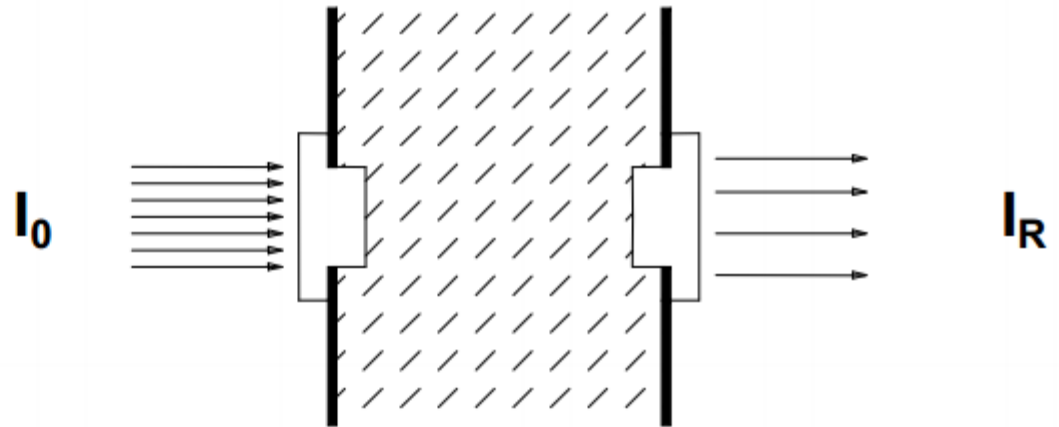


Absorbance vs scattered light

Absorbance of light:

(Concentration)

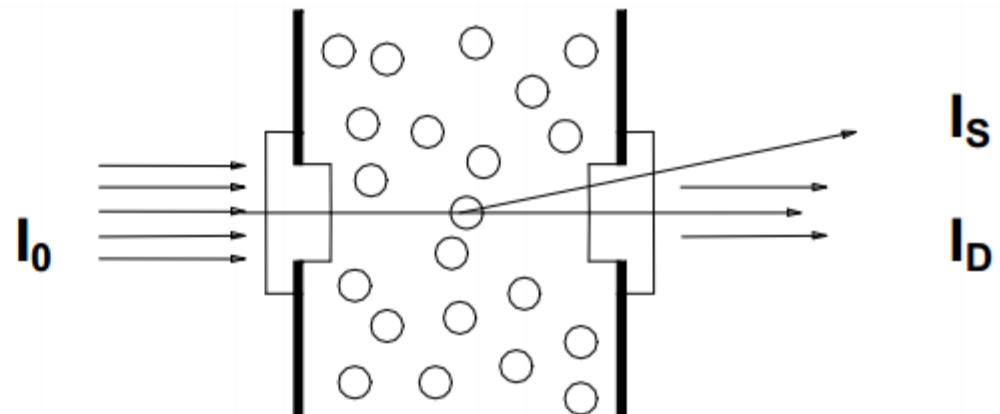
Dissolved Solids



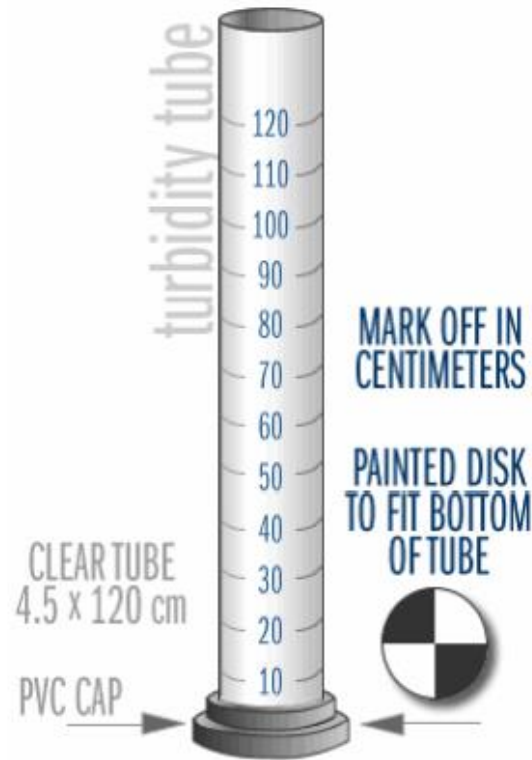
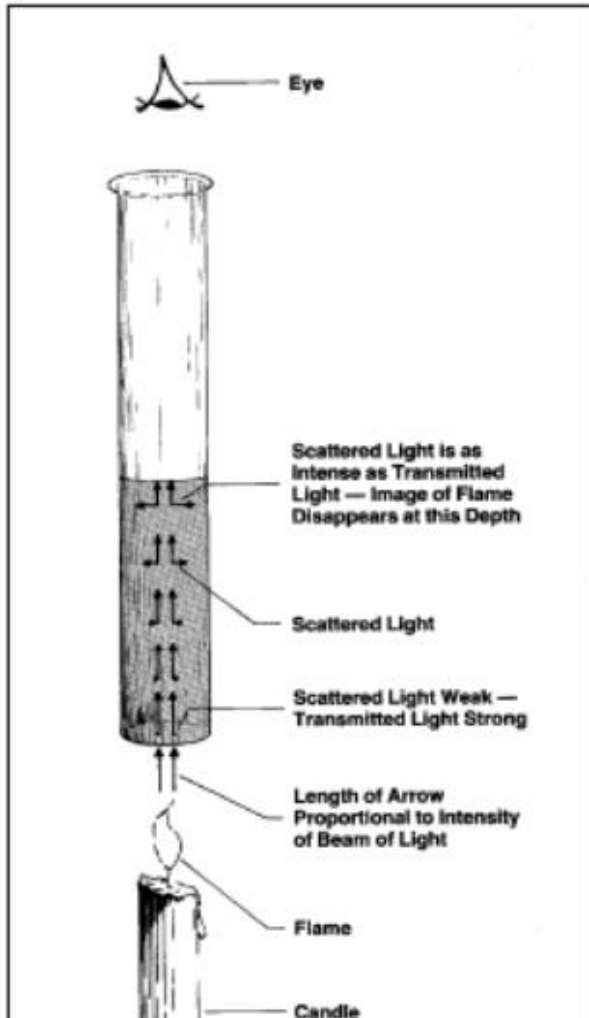
Scattering of light:

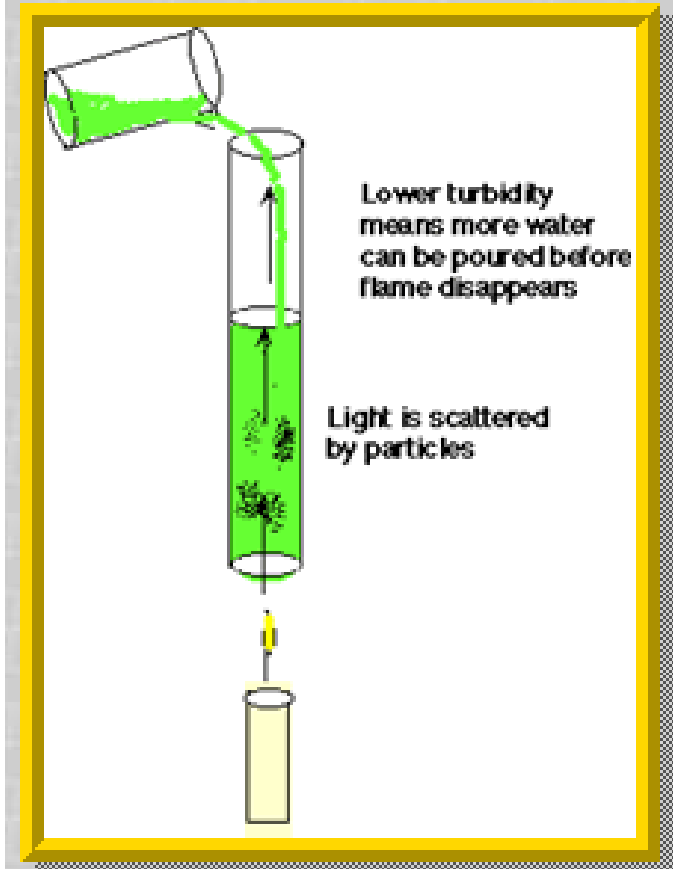
(Turbidity)

Particulate and Solids



Some history-Jackson Candle





Scattered Light-Formazine Standard



ingredients: Hexamethylentetramine + **Hydrazinsulfate**

standard-formazin-solution = 4000 FNU

1 FNU = 1 FTU = 1 NTU = 1 TU/F = 0,25 EBC

FNU = formazine nephelometric unit

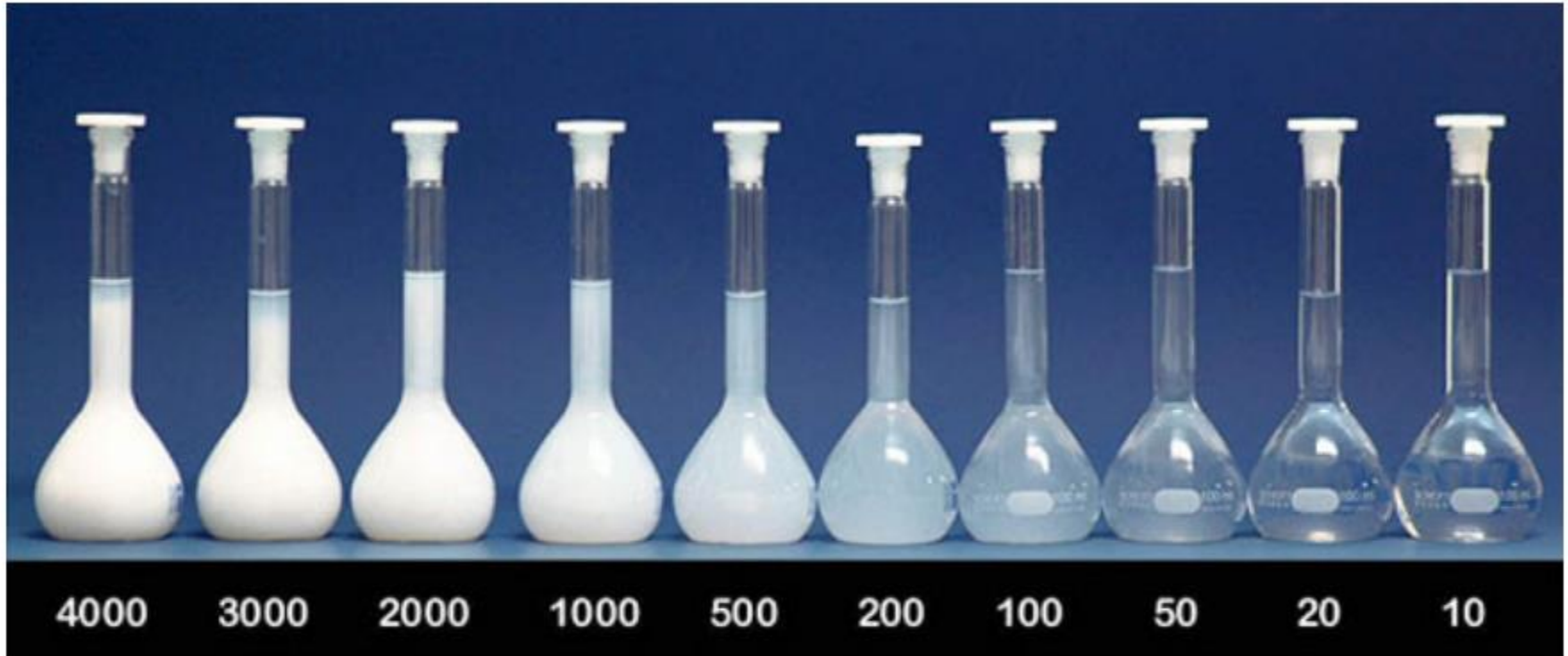
FTU = formazine turbidity unit

NTU = nephelometric turbidity unit

TU/F = turbidity units formazin

EBC = European Brewery Convention

What does turbidity look like?

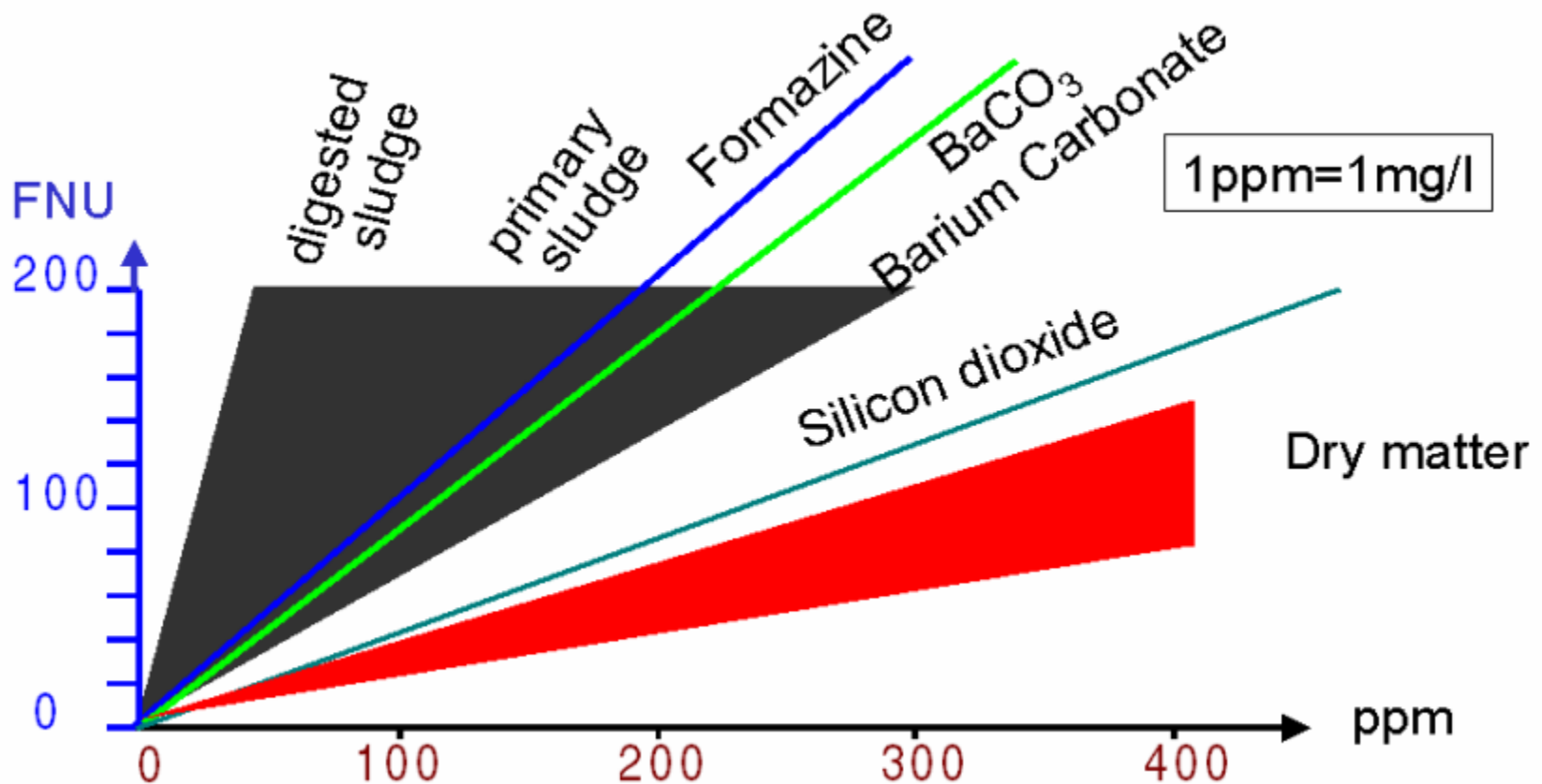


- Formazin Turbidity Standards - NTU

Turbidity-Typical values

Measured Sample	Measured Value
Waste Water	70-2000 NTU
Final outlet sewage treatment plant	4-20 NTU
Well Water	0.05 - 10 NTU
Potable water	0.05 - 1.5 NTU
Milk	> 4000 NTU
Orange juice	300 - 900 NTU
Primary sludge	6-3%(60 - 30 g/l)
Activated sludge	3-7 g/l
Recirculated sludge	6-8 g/l
Digested sludge	5-8%(50-80 g/l)

Turbidity as a function of concentration



Environmental Significance of Turbidity

- * Aesthetics

- * Consumers expect turbidity-free water



- * Filterability

- * Filtration of water is rendered more difficult and costly when turbidity increases

- * Disinfection

Particles of turbidity may provide protection for microorganisms during disinfection

Simplified Diagram of a Pathogen Encapsulated by a Particulate

Virus or Bacteria hiding in a small orifice of the particulate.
(Size = .1 to 100 μm)

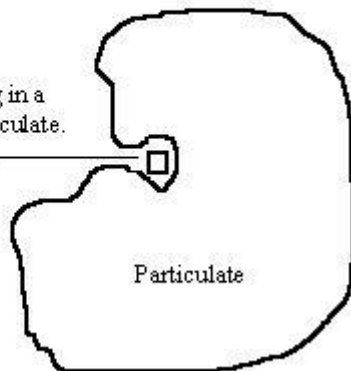
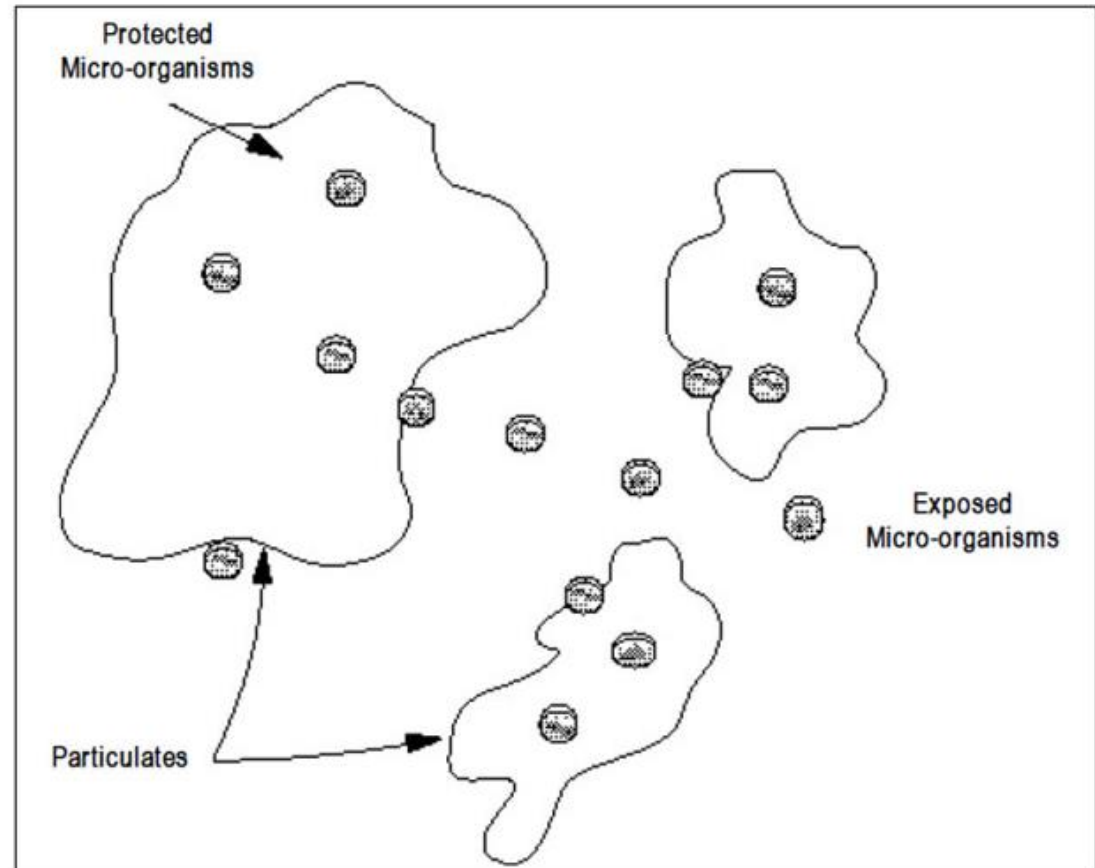


Figure 1 Courtesy of Eric Karch and David Loftis



Regulation of turbidity

- * USEPA (2002): Turbidity < 1NTU and should be <0.3 NTU in 95% of daily samples in any one month
- * WHO suggests <5 NTU for appearance, recommends a median value of <1 NTU for disinfection
- * TS: <1 NTU

İSKİ ÖMERLİ İÇMESUYU ARITMA TESİSLERİ Akım Şeması

