environment 21
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STORM BULLETIN 8

ESTIMATING PARTICLE REMOVAL IN STORMWATER TREATMENT SYSTEMS

- **The important factors of particle removal** are the size and the gradation of the sediment particle. Smaller particles are much more difficult to remove due to their lower settling rate as illustrated by the table below:

Particle Size, Microns	45	76	105	149	210	500	1000
Settling Rate, ft/sec	0.005	0.015	0.028	0.055	0.086	0.21	0.34

   Note: 210 μ particles can theoretically settle nearly 13 times faster than 45 μ particles. Consequently, a system designed to remove 210 μ particles will be significantly smaller than one designed to remove 45 μ particles.

- **Since stormwater sediment will contain variable particle sizes**, a representative distribution is needed in order to design the stormwater treatment system. From a practical point of view, the distribution must be assumed based on criteria acceptable to the local environmental review agency. A distribution is demonstrated below:

Soil Classification	Silt	Fine Sand	Fine Sand	Medium Sand	Medium Sand	Coarse Sand	Gravel
Mesh Size	425	200	100	40	18	10	5
Particle Size, Microns	21	76	149	420	1000	2000	4000
Particle Size, Inches	0.0008	0.003	0.006	0.015	0.015	0.080	0.110
Weight %	10	15	20	25	22	5	3

   In order to remove 80 wt% of the particles listed in the table above, the sediment removal system must have the capability to remove all of the particles that are 149 μ and larger in size, and one third of the particle that are 76 μ in size.

If the design distribution contained a higher fraction of 21 μ and 76 μ particles, the system would need to be significantly larger and more expensive in order to obtain 80% mineral sediment removal efficiency. Consequently, the sediment design distribution is an important parameter in determining the size and cost of the stormwater treatment system.