

Particle size matters!

The importance of PSD when sizing stormwater BMPs

When sizing a stormwater quality device, some municipalities ignore a crucial piece of data that has a significant impact on stopping pollutants from reaching natural waterways – Particle Size Distribution (PSD).

A defined PSD identifies all sediment particle sizes found in a stormwater runoff sample, including their diameter, content and concentration. It’s a blueprint of what is barreling down the pavement during each rainfall. However, when sizing stormwater BMPs, PSD is often neglected. Instead, BMPs are often sized by their ability to remove an unspecified portion of Total Suspended Solids (TSS) – defined as the dry mass of solids retained on a 1 µm filter.

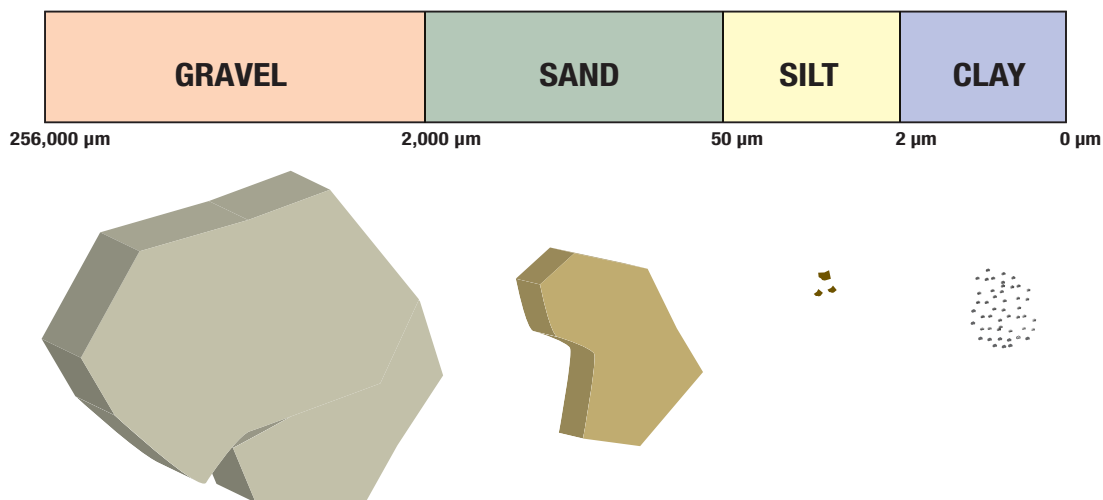
Many regulating authorities are content with simply removing 80% of TSS – an accepted standard for water quality. But the question is, 80% of what? The answer is 80% of whatever solids are trapped by this filter, regardless of particle size.

Specifiers then often seek any BMP that meets this 80% removal rate, though exactly what is being treated and what is allowed to pass is anyone’s guess. Some municipalities try to look beyond TSS by treating a mean particle size (d-50) of a sediment sample, but even this can be ineffective in sizing a stormwater treatment system.

If a complete PSD is not used, inadequate systems may be implemented, capturing larger coarser particles but letting smaller particles pass untreated. And yet smaller particles are potentially the most harmful to natural water resources.

Smaller particles, bigger environmental impact

Sediment can be divided into four categories: gravel, sands, silts and clays – their relative size difference can be seen in the image below.



A diagram of relative particle size in microns.

Clays and silts have the most surface area by mass, allowing pollutants (heavy metals, hydrocarbons, nutrients, etc.) to easily attach to them. In fact, smaller particles (less than 60 microns) contain up to 80% of a sample's contaminant load, making them the most important particles to capture.

Examining highway stormwater runoff, The Center for Research in Water Resources (CRWR) at the University of Texas at Austin stated in a 2005 report, "The concentration of metal, zinc for example, increased as the particle size decreased." Smaller particles also carried higher concentrations of copper, phosphorous and nitrogen. "Larger particles in stormwater runoff settle out, but smaller particles remain suspended in stormwater runoff and travel greater distances," the CRWR also noted.

These findings, along with the CRWR's research led it to conclude: "Treatment systems must be able to effectively remove fine particles in runoff to significantly reduce pollutant loads."

You get what you pay for

A stormwater treatment system designed to remove gravel and coarse sands is smaller and less expensive than a system designed to remove fine silts and clays – but at what cost to the environment? For a treatment system to be effective, it must capture and contain a complete PSD, especially the smallest particles.

Consider Stormceptor

- Stormceptor is the only oil and sediment separator on the market designed to remove a wide range of particle sizes – including clays and fine silts
- Units can be designed to remove a specified Particle Size Distribution (PSD)
- Stormceptor does not scour – scour prevention is as important as a treatment system's ability to capture contaminants

With over 40,000 units operating worldwide, Stormceptor performs and protects every day, in every storm.