Article 119

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Performance of Oil-Grit Separators in Removing Pollutants at Small Sites

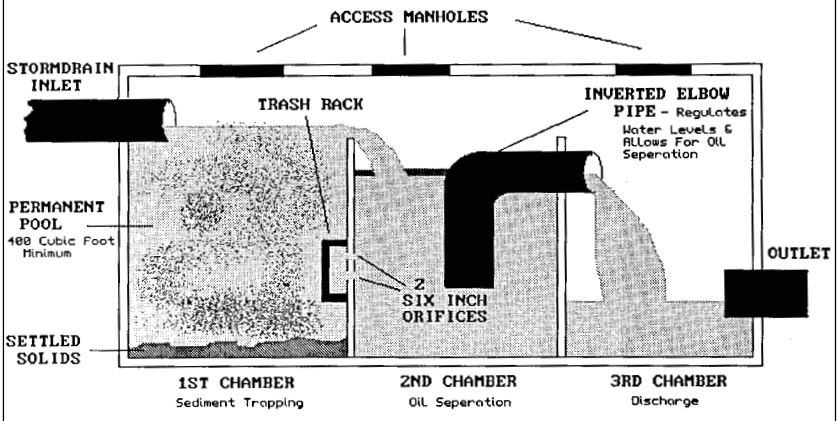
Despite our best hopes, some dogs just won't hunt. The same is true with the performance of some stormwater practices. A case in point is the standard oil-grit separator, or OGS (Figure 1). These underground structures consist of three chambers, two of which are wet. An inverted elbow pipe drains the second chamber, under the theory that oil and grease will initially float on the surface, but then adhere to suspended particles, which eventually settle to the bottom of the chamber. The first chamber is designed to trap grit, coarse sediments, trash and debris. The contents of both chambers are removed on a quarterly basis as part of the normal maintenance regime.

Oil-grit separators are popular because they are relatively cheap and can be easily installed at many small sites without sacrificing land. Unlike other stormwater practices that are sized to handle a half inch or more of runoff, the total design storage volume within an OGS is about a tenth of an inch. While it has always been acknowledged that such a small treatment volume limits overall pollutant removal, it was reasoned that the basic design should at least be capable of trapping oil, grit or trash generated at parking lots. Consequently, OGS systems have enjoyed wide application at gas stations, fast food joints and other small, but highly impervious development sites. Over the last decade, several hundred OGS have been installed across the Washington D.C. metropolitan area, and they are still routinely included in many stormwater practice manuals in other parts of the country.

Our understanding about the pollutant removal capability of the OGS has been fundamentally changed as a result of a five-year research study by Dave Shepp and his colleagues at the Metropolitan Washington Council of Governments. In the first phase of the study, Shepp discovered four indirect lines of evidence that suggest OGS pollutant removal performance is extremely limited. First, dye tests revealed that OGS had very short residence times during small storms (often less than 30 minutes). Second, an average of only two inches of sediment accumulation in the two pool chambers was measured in 109 installed OGSs, and deposition did not increase no matter how long an OGS had been in service. Third, the initial finding that OGS systems did not retain sediments was confirmed by monitoring the accumulation of sediment in 17 OGSs on a monthly basis. Shepp found sediment depths frequently changed within the OGS, but seldom accumulated over time. A characteristic profile is shown in Figure 2. Lastly, none of the 109 OGS surveyed in field were found to have had sediment cleanouts specified in their maintenance agreements.

In the second phase of the study, the pollutant removal performance of a typical OGS was directly measured in the field. The OGS served a one-acre parking lot of a fast food joint. Prior small site monitoring revealed that fast food parking lots generated above normal concentrations of many urban pollutants, such as hydrocarbons, nutrients, metals and carbon—giving new meaning to the term "a greasy spoon" (see Table 1). Thirteen storm samples were collected at the OGS site, using innovative sampling techniques within the confined spaces of the practice. Rainfall during the monitored storms ranged from 0.2 to 1.96 inches in depth (median 0.61 inches, mean duration three hours). Inflow and outflow event mean concentrations (EMCs) were then compared to examine pollutant removal performance for 18 different water quality parameters.

By almost any measure of performance, the oil-grit separator did not show any capability to remove pollutants in storm runoff (Table 2). Net negative removal efficiency was computed for suspended sediment, total organic carbon, hydrocarbons, total phosphorus, organic nitrogen, and extractable and soluble copper. Negative removal efficiencies were observed in over half the



An oil grit separator is an underground structure used to treat stormwater runoff at very small sites. Recent research demonstrates that this practice has little or no pollutant removal capability.

Figure 1: Schematic of Standard Design of Oil-Grit Separator