Introduction

There are few performance evaluations of replicated, full-scale, real-world permeable pavements. Practitioners need additional studies of permeable pavement systems operating in the intended use (parking lot, roadway, etc.) with climatic events, routine use, and maintenance. EPA’s National Risk Management Research Laboratory installed a 1-acre, 110-space permeable pavement parking lot that is instrumented and monitored for water quantity and selected water quality parameters. The working parking lot at the Edison Environmental Center will be used by facility staff and visitors. This parking lot facilitates side-by-side monitoring of porous asphalt, porous concrete, and permeable interlocking concrete paver systems. The lot has three monitored parking rows, each constructed using a different permeable surface. The driving lanes are conventional asphalt. Portions of the permeable pavement parking areas have integral impermeable liners to collect the porous pavement effluent. Alternating sections allow the effluent to infiltrate to the underlying soil. Each monitored parking row has four impermeable and five permeable sections that allows for statistical analyses of collected data. See Figure 1. Some research questions that will be examined during this project include:

• How do surface and subgrade infiltration rates change with time?
• What are the effects of maintenance on the performance of the permeable surfaces?
• How do the permeable surfaces perform in regard to hydrologic and stressor removal functions?

Pavement Profiles

EPA categorized permeable pavement as a stormwater Best Management Practice (BMP), as it provides stormwater runoff volume reduction through infiltration and can also enhance the runoff water quality after infiltrating the system. In a permeable pavement system, stormwater passes through several bedding layers after draining through the surface. Some stressors may be removed as the water moves through the underlying materials. The most commonly used permeable surfaces are porous asphalt, porous concrete, and interlocking concrete pavers, which are sometimes called porous pavers even though the pavers themselves are not porous. Figure 2 shows the profiles of the three porous surfaces.

Unlined Sections

The unlined sections of each permeable surface parking row enables monitoring of the interaction of the infiltrated water with the subgrade soil. A 5-foot diameter, 3-foot high vertical HDPE pipe isolates the water infiltrating downward. See Figure 3. Access pipes at the geotextile-subgrade soil interface allow instrument placement for event-based sampling. Differential pressure level loggers can be inserted into the pipes to measure the accumulated water depth. General water quality parameters (pH, conductivity, etc.) can also be measured at this location using a multi-parameter sonda. Permanent instrumentation installed in the permeable parking rows during construction include time domain reflectometers (TDRs) to monitor the passing of the wetting front and thermistors to measure temperature. In two other unlined sections of each permeable parking row, a cluster of one well and two piezometers is installed to measure water mounding at several depths using water level loggers.

Preliminary Data

Figure 5 shows the passing of the wetting front relative to the rainfall. The wetting front is delayed in the subsurface and the peaks are dampened in the deeper layers of the profile.

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