Performance of porous asphalt pavements: stormwater quantity and quality mitigation

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Performance of Porous Asphalt Pavements - Stormwater Quantity & Quality Mitigation

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1) Porous asphalt QUANTITY – ability to attenuate stormwater, and effect of maintenance on infiltration rates
   
   Attenuates peak flows, absorbs a LOT of rainfall

2) Porous asphalt QUALITY – pollutant treatment in general, effect of drain depth

   Great for particulate matter!
Permeable Pavements

Pervious Concrete

Porous Asphalt
Porous Asphalt Experiment

Street dirt applied
Porous asphalt outflow
Porous Asphalt – water quality

Porous asphalt

- Concrete weir (6"
- Surface drain
- Pervious asphalt (3"
- Elevated drain
- 22.7 liter sampling container
- Aggregate subbase (18"
- Impermeable cell liner
- Tipping bucket flow gauge
- Native soil
- Automated Sampler
Conventionals

- TSS
- SC 62.5-125 µm
- SC 3.9-62.5 µm
- SC 250-500 µm
- SC 125-250 µm
- SC 1-3.9 µm
- SC > 500 µm
- SC < 1 µm
- pH
- o-Terphenyl
- Motor Oil
- Hardness
- Fine Sed.
- Diesel H.
- COD
- Coarse Sed.

Median Removal on a per storm basis (%)
Nutrients

The graph shows the median removal of various nutrients on a per storm basis (%). The analytes include Total P, TKN, Ortho-P, NO₂ + NO₃, and N-Ammonia. The bars represent two locations: Elevated and Under. The y-axis represents the analytes, and the x-axis represents the median removal percentage, ranging from -50 to 100%.
Metals

Median Removal on a per storm basis (%)

Analyte

Total Zn
Total Pb
Total Mg
Total Cu
Total Cr
Total Cd
Total Ca
Diss. Zn
Diss. Pb
Diss. Cu
Diss. Cr
Diss. Cd

Location
Elevated
Under
PAHs

![Bar chart showing median removal on a per storm basis for various PAHs at Elevated and Under locations.](image-url)
Performance Goal: The Basic Treatment Menu facility choices are intended to achieve 80% removal of total suspended solids for influent concentrations that are greater than 100 mg/l, but less than 200 mg/l. For influent concentrations greater than 200 mg/l, a higher treatment goal may be appropriate. For influent concentrations less than 100 mg/l, the facilities are intended to achieve an effluent goal of 20 mg/l total suspended solids.
TSS concentrations by location (all storms)

Concentration (g/L)

- 200mg/L
- 100mg/L
- 40mg/L
- 20mg/L
- 0.050
- 0.050
- 0.005
- 0.001

Storms:
- Storm 1
- Storm 2
- Storm 3
- Storm 4
- Storm 5
- Storm 6
- Storm 7
- Storm 8
- Storm 9
- Storm 10
- Storm 11
- Storm 12

Legend:
- Elevated
- Surface
- Under
- Phosphorus Treatment: 50 percent removal of TP for influent concentrations ranging from 0.1 to 0.5 mg/L.
Thank you!
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• Basic Treatment: 80 percent removal of TSS for influent concentrations that are greater than 100 milligrams/liter (mg/L), but less than 200 mg/L. For influent concentrations greater than 200 mg/L, a higher treatment goal may be appropriate. For influent concentrations less than 100 mg/L, the facilities are intended to achieve an effluent goal of 20 mg/L TSS.

• Enhanced Treatment: Provide a higher rate of removal of dissolved metals than most basic treatment facilities. The performance goal assumes that the facility is treating stormwater with dissolved copper typically ranging from 0.003 to 0.02 mg/L, and dissolved zinc ranging from 0.02 to 0.3 mg/L. Data collected for an “enhanced” best management practice (BMP) should demonstrate significantly higher removal rates than basic treatment facilities.

• Phosphorus Treatment: 50 percent removal of TP for influent concentrations ranging from 0.1 to 0.5 mg/L.

• Oil Treatment: No ongoing or recurring visible sheen, a daily average total petroleum hydrocarbon concentration no greater than 10 mg/L, and a maximum of 15 mg/L for a discrete (grab) sample.
Conventionals Loads

- TSS
- SC 62.5–125 µm
- SC 3.9–62.5 µm
- SC 250–500 µm
- SC 125–250 µm
- SC 1–3.9 µm
- SC > 500 µm
- SC < 1 µm
- pH
- o-Terphenyl
- Motor Oil
- Hardness
- Fine Sed.
- Diesel H.
- COD
- Coarse Sed.

Median Removal on a per storm basis (%)
Nutrient Loads

- Total P
- TKN
- Ortho-P
- NO₂ + NO₃
- N-Ammonia

Median Removal on a per storm basis (%)