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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

Elevated drain (102 mm)
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
Water Quality Results
Conventional:

- 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 (%)
PAHs

Analyte

Pyrene
Phenantherene
Naphthalene
Fluorene
Fluoranthene
d14-Dibenzo(a,h)anthracene
d10-2-MethylNaphthalene
Chrysene
Benzo(a)pyrene

Median Removal on a per storm basis (%)
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
0.500
0.500
0.050
0.050
0.005
0.005
0.001
0.001

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

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.
Nutrient Loads

The bar chart illustrates the median removal of various nutrients on a per storm basis (%). The analytes include Total P, TKN, Ortho-P, NO_2 + NO_3, and N-Ammonia. The chart shows the percentage of removal for each nutrient, with Total P having the highest removal rate, followed by Ortho-P, TKN, NO_2 + NO_3, and N-Ammonia having the lowest removal rate.