

What is the bioavailability of contaminants in highway stormwater runoff?

Relevance to WSDOT: In 1992 EPA recommended that states no longer use total metals as an indicator of toxicity in lieu of dissolved-phase metals, with the rationale that dissolved-phase metals was a better indicator of actual aquatic toxicity. The method for measuring dissolved metals uses a 0.45 micron filter prior to acid digestion of the sample. Elemental contaminants may pass through the filter as a free ions, complexed with colloidal natural organic matter, or as mineral compounds. In general the colloidal and mineral-metal complexes tend to be not bioavailable, whereas the free ionic portions are. So while a “dissolved metals” analysis may be a somewhat better indicator of direct toxicity than total metals concentrations, it is still likely to vastly overestimate toxic effects in receiving waters. WSDOT is faced with technical challenges to improve dissolved metals removal in the BMPs constructed to treat highway stormwater runoff. By using either a “treatment train” approach or by modifying current designs to accommodate improved dissolved metals removal, WSDOT will incur significant expenses designing, constructing, and monitoring these systems for pollutant capture effectiveness. I

Biogeochemistry of trace metals: speciation, bioavailability and mobility

http://www.eawag.ch/research_e/aqu/e_gruppe_sigg/e_group_sigg.html

Current and Past Activities: This is a relatively new research area and is rapidly evolving. Bioavailability and bioaccumulation of metals contained in highway runoff appears to be toxicant and organism-specific. Metals are particularly problematic because of most metal's ability to form multiple organic or inorganic compounds (speciation). To further complicate the issue, metals speciation may change as the background water quality (pH, concentrations and types of anions) is altered. Many of these compounds can be smaller than 0.45 μm , are not bioavailable, but they can influence dissolved metals concentrations.

Appropriate Actions: This is a highly technical and arcane subject area that influences heavy industry to a far greater degree than transportation. Technical literature should be reviewed periodically and relevant results compiled.

Partnering Opportunities: Nationwide, but sparse. It is unlikely that public agencies outside of universities will be able to fund or conduct relevant research that aids transportation project delivery.

Priority: Low.

Estimated Cost: High.