WQ-3

White Paper Topic: Treatment for Non-Conventional Constituents Associated with Mine Drainage

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Problem Definition:

- Coal mine drainage can contain a variety of constituents, such as arsenic, selenium, nickel, zinc, that are not routinely regulated or evaluated (non-conventional) but that may be toxic to aquatic and terrestrial plants and animals.
- Data generally are available on the chemical properties of relevant inorganic and organic substances and on their toxicity to fresh-water aquatic life, plants, and higher organisms.
- Data generally are available on the possible geological sources, transport mechanisms, and attenuation processes of potentially toxic constituents in mine drainage.
- However, few data are available (1) documenting the occurrence and distribution of non-conventional contaminants in mine drainage, associated streams, and sediments; (2) documenting the biological response and possible synergistic effects of multiple contaminants; and (3) providing guidance on design protocols for treatment methods that address conventional contaminants and meet toxicity thresholds for non-conventional constituents.

Course of Action:

- Various mine drainage sources and passive and active treatment systems need to be characterized and evaluated for efficiency of removal of non-conventional and conventional contaminants.
- Possible solubility, redox, and adsorption controls by hydroxide, sulfate, sulfide and other minerals need to be explored and compared with the environmental occurrence of trace elements and other nonconventional contaminants in mine drainage or associated streams.
- Key variables affecting transport and toxicity of non-conventional constituents need to be identified and evaluated through use of geochemical modeling, biological monitoring, and empirical testing.
- Toxicity effects on relevant plants and animals should be identified, with potential for specific organisms to be used as indicator species (biological monitors).
- Treatment processes and extraction methods that selectively remove non-conventional constituents should be explored for possible application in resource recovery.

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