

Conductivity: An Inappropriate Measure of Water Quality

The U.S. Environmental Protection Agency (EPA) recently issued guidance on water quality requirements for coal mines in Appalachia. The guidance, which was issued on April 1, 2010 and became immediately effective, relies solely on electric conductivity (also known as specific conductance) as an indicator of water quality impairment. The guidance establishes a range of between 300-500 microSiemens (a measure of conductivity) as triggering close scrutiny by EPA of the permit application and anything approaching or beyond 500 microSiemens as cause for EPA to deny a Clean Water Act (CWA) permit.

These permits are required to operate coal mines and to conduct mine land reclamation in the region. EPA's guidance establishes a de facto water quality standard that interferes with the states' statutory authority to set water quality standards and issue permits. Implementation of the conductivity limit also will make EPA the final decision-maker on permits issued by the U.S. Army Corps of Engineers and the Office of Surface Mining (OSM). The guidance is now open to public comment, but EPA has yet to make the underlying data available for outside peer review or public scrutiny.

Two questions arise from EPA's guidance:

- Is conductivity an appropriate measure of water quality impairment; and
- Are the conductivity levels set by EPA defensible or achievable?

The answer to both questions is "no."

Conductivity is an Inappropriate Measure of Water Quality

Conductivity is a measure of a given quantity of water to conduct electricity at a specified temperature. It is predicated upon the presence of dissolved solids, which conduct an electrical charge. It is not a meaningful measure of contamination or the ability of a given body of water to meet its designated use.

Conductivity has generally been used in the field as a first screen for water quality. Elevated conductivity levels indicate that further analysis should be done to determine the specific water chemistry, i.e. the makeup of the specific dissolved particles in the water, and whether those particles occur in amounts that are demonstrated to impair aquatic life specific to that stream. The EPA guidance eliminates this vital step—an approach that is scientifically and legally deficient.

The Conductivity Levels Set by EPA are Not Defensible or Achievable

The 300 – 500 microSiemens conductivity threshold set by EPA for coal mining permits is not an appropriate basis for determining water quality impairment for the following reasons:

- Higher levels of conductivity are often the result of virtually any activity that disturbs the surface of the earth (e.g., highway construction), thereby increasing dissolved solids;
- Background conditions can exceed the 300-500 microSiemens threshold;
- No evidence has been presented that uniquely correlates higher conductivity levels with coal mining or valley fills;
- The necessary scientific analysis, including collecting sufficient data, has not been conducted to establish a cause-and-effect relationship between conductivity and adverse effects on water quality. In fact, there is substantial data that show good macro invertebrate populations in streams with conductivity much higher than the 300-500 microSiemens threshold and poor macro invertebrate levels in streams with low conductivity—substantiating the need to look beyond conductivity as a measure of stream impairment;
- In developing the conductivity levels, EPA did not follow its national criteria development guidelines (1985 *Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and Their Use*);
- None of the studies cited by EPA in support of the range applicable to mining indicate the stream uses are harmed by conductivity at those levels. Rather, the studies focus on impacts to certain mayfly populations that are known to be especially sensitive and suggest that the absence of these mayflies in streams with elevated conductivity is directly related to upstream mining. EPA has ignored the fact that other aquatic life in the stream are robust and perform essentially the same stream function as the affected populations. EPA presents no evidence that the designated uses of these waters have been harmed.

Further, the levels are unachievable. EPA has noted they expect “few, if any” fill permit applications in Appalachia to meet the levels of conductivity set in the guidance. This limit will apply immediately to all coal mining, including underground operations, in the six Appalachian states. EPA has not ruled out applying the standard similarly to other industries throughout the water program.