Alpha Natural Resources
RUNNING RIGHT

Coal & Water – The Cost to Comply
West Virginia 2013 Energy Summit

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December 17, 2013

Alpha Natural Resources Environmental Policy

Philosophy

Running Right, **Leading Right** and **Living Right** are the cornerstones of Alpha Natural Resources, Inc.'s (the "Company") operating philosophy. These principles apply to safety, environmental stewardship and all business practices across the Company

Running Right

- Environmentally, **Running Right** is our commitment not only to designing, building, operating and restoring our mine sites and facilities with the goal of compliance with environmental requirements, but also our commitment to promote innovation by drawing on the knowledge and experience of our employees
- Although mining by definition has an impact on the environment, **Running Right** means that we strive to minimize that impact as well as the risks associated with unplanned or unauthorized events

Leading Right

- **Leading Right** means that we promote and encourage continuous improvement in environmental performance throughout the Company. We support this effort by devoting the appropriate personnel, resources and technical support to environmental compliance

Living Right

- **Living Right** means that we recognize that our mines and facilities are located in and near communities, and we strive to be good neighbors wherever we operate

WV Water Pollution Control Act §22-11-2

Declaration of policy

(a) It is declared to be the public policy of the state of West Virginia to maintain **reasonable standards** of purity and quality of the water of the state consistent with (1) public health and public enjoyment thereof; (2) the propagation and protection of animal, bird, fish, aquatic and plant life; and (3) the expansion of employment opportunities, maintenance and expansion of agriculture and the provision of a permanent foundation for healthy industrial development.

Coal & Water – A look back

Before the 1972 Federal Clean Water Act

- Water discharges from mining operations were largely unregulated and uncontrolled, which resulted in widespread abuse of the waters of the state.
  - Direct releases of black water from wash plants to surface streams were common
  - No efforts were made to avoid or treat acid mine drainage
  - Streams were impacted by heavy sedimentation
- Early attempts to regulate water pollution were largely ineffective
  - Lack of vigorous enforcement
  - Absence of corresponding engineering-based standards for water treatment facilities such as sediment ponds

Coal & Water – 1972 to 2005

Adapting to new rules….

- The Clean Water Act (CWA) and subsequent state rules established standards for basic water quality measures such as pH, Total Suspended Solids and Iron.
- Passage of the Surface Mining Control and Reclamation Act (SMCRA) in 1977 led to national standards for the design, construction and maintenance of drainage and sediment control systems.
  - The standards addressed safety as well as water quality issues
- Prevention and treatment of acid mine drainage (AMD) was recognized as a challenge that needed research.
  - In 1978, the WV AMD Task Force was created to solve the AMD problem and develop methods to avoid future AMD generation. The Task Force continues to sponsor research in the field of water quality.

Coal & Water – 1972 to 2005

Simple solutions to basic problems

- Ponds and good water management practices proved to be effective in removing **Total Suspended Solids** to prevent sedimentation in streams below mining operations.
  - Ponds and ditches are relatively inexpensive to construct and maintain
  - Ponds can also be used for storm flow management
- Mining practices were changed to prevent **pH** problems
  - Certain coal seams were rendered essentially unmineable due to the potential for creating AMD
  - Carefully managed handling plans that segregate acid-producing materials allowed many “at risk” coal reserves to be mined without creating AMD
  - Chemical treatment of existing AMD sources has helped restore many previously impacted streams
- Physical treatment (aeration) was employed to remove excessive levels of **Iron** in discharge water at a reasonable cost.

Coal & Water – 1972 to 2005

Slightly more complex solutions to specific problems

- **Manganese** is listed as a Secondary Drinking Water contaminant due to its “nuisance” impact on taste, odor and color. Many mining operations have manganese as an enforceable limit in their discharge permits. Physical treatment alone is not sufficient, so chemical treatment is required but the cost is not unreasonable.

- Elevated levels of **Aluminum** can be toxic to cold water fish such as trout. Treatment involves the application of chemicals but the cost is typically not unreasonable. Proper material handling and water management can reduce the need for treatment.

Coal & Water – A Turning Point

- From the early water quality regulations in the 1960's and 1970's to about 2005, the emphasis for the coal industry was on **fixing** ongoing problems and **preventing** future problems.
  - Total Suspended Solids – Control of TSS eliminated fouling of waterways with excessive sedimentation
  - pH – Avoidance of AMD and treatment of existing sources of AMD eliminated "dead" streams
  - Iron and Manganese – Prevented aesthetic impact due to staining and adverse impacts to aquatic life.
  - Aluminum – Protected sensitive cold water fisheries
- The conditions that were being addressed were **visible** and the resulting environmental **improvements** were obvious.
- The efforts clearly passed a **cost-benefit** test.

Coal & Water – 2005 to 2013

Water Quality – Going beyond the basics…

- In 2005, the *Mountaintop Mining / Valley Fills Mining in Appalachia Programmatic Environmental Impact Statement* introduced a new water quality parameter to the WV coal industry – **Selenium**.
- Prior to 2005, selenium was known to be a problem in the western US and at a coal-fired generating plant in North Carolina but not in WV.
  - Selenium is concentrated in irrigation and process water in the arid western regions of the US. High selenium levels in aquatic vegetation have led to toxic impacts on wildlife and cattle.
  - The selenium level in a power plant's cooling water reservoir was elevated by a wet ash disposal system employed initially at the site. After effects on the fish community were discovered, the ash disposal system was changed to a dry process and the aquatic community recovered.
  - In these situations, adverse impacts on fish and animal communities led investigators to determine that selenium was the causative agent.

Coal & Water – 2005 to 2013

Selenium in WV

- The extensive testing done for the MTM EIS found selenium levels above the national standard of 5.0 µg/l (parts per billion) at numerous locations in West Virginia.
  - Unlike the other selenium events, this was not a search for a culprit because ***no discernible environmental effects had been observed*** that would have triggered an investigation.
  - Mining has most likely released selenium into the flowing streams of WV for decades without causing the adverse impacts typically associated with selenium poisoning.
- Besides the lack of observed adverse impacts, the conditions that caused selenium poisoning elsewhere do not generally exist in WV.
  - High concentrations (100-150 µg/l) discharged to lakes and wetlands is much different than low concentrations (10 – 50 µg/l) discharged into flowing headwater streams.

Coal & Water – 2005 to 2013

Selenium

Since WV had previously adopted the federal selenium standard of 5.0 µg/l, new and reissued water discharge permits started including selenium limits after 2005.

- Conventional physical and chemical treatment does not remove selenium, so there was a scramble to find a practical solution.
- Permittees with immediately effective limits became an easy target for third-party lawsuits and regulatory enforcement actions.

Coal & Water – 2005 to 2013

Current Status - Selenium Treatment

- Without good alternatives for treatment, many companies agreed to install systems such as Fluidized Bed Reactors and Moving Bed Bioreactors that rely on a biologic process.
  - The total cost per unit ranges from about $8M to over $50M.

Moving Bed Bioreactor under construction

Coal & Water – 2005 to 2013

Current Status - Selenium Treatment

- Constructed wetlands that act as bioreactors are becoming the favored treatment option for remote sites.
  - Media is typically compost with a high organic content
  - Installed cost can range from $1M to over $5M depending on complexity.

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Coal & Water – 2005 to 2013

Selenium Summary

- Prior to 2005, selenium was not considered a water quality problem in WV
  - Over $100M will be spent by coal mining companies in WV to address selenium, even though there will be no environmental benefits.
  - Efforts are underway to assign limits based on actual impacts to aquatic life, but the process is proceeding slowly.

- One ray of hope; EPA recently approved Kentucky's proposal to use 5.0 µg/l as a threshold value that would trigger an investigation into actual impacts as indicated by an analysis of downstream fish. A final limit would be assigned based on the findings.
  - WV has the option of pursuing this approach

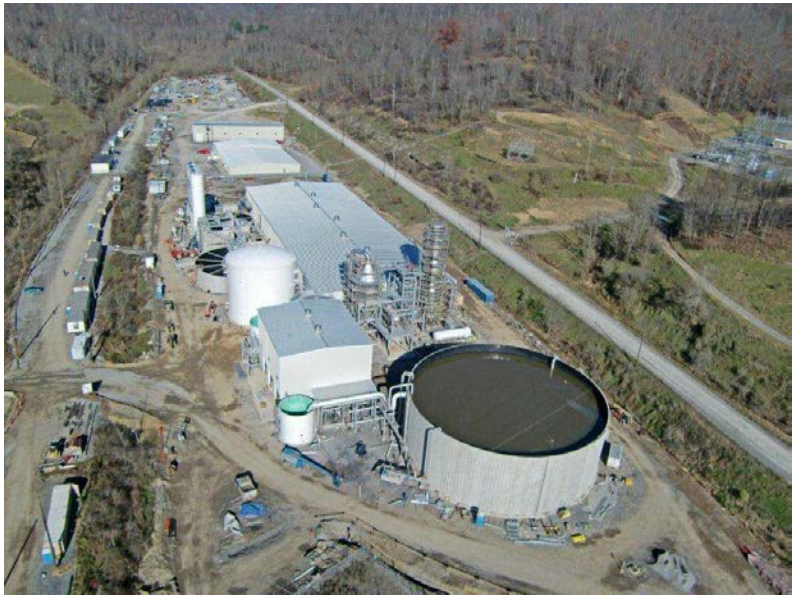
Total Dissolved Solids / Conductivity

- A 2008 EPA study linked **Conductivity**, which is a measure of total dissolved solids, to degradation of surface waters as reflected in reduced WV Stream Condition Index (WVSCI) scores.
- Starting in 2009, EPA has pressured the states to place enforceable limits for Conductivity in mining related permits.
  - EPA suggests limits of 300 to 500 µS/cm
  - Typical surface mine runoff shows conductivity of 1000 and higher
- WV has not acquiesced to EPA's request but has maintained that conductivity and the WVSCI are not the sole factors in assessing stream health.
- EPA is reportedly considering a national guideline for Conductivity

Coal & Water – 2014 and beyond

Is Reverse Osmosis in the industry's future?

- Unlike other water quality parameters that can be addressed using simple treatment, the only practical method for controlling high Conductivity is Reverse Osmosis.
- A northern WV operator recently commissioned a 3,500 gpm Reverse Osmosis plant and water collection system that was constructed at a publicly disclosed cost of $211M. This facility treats water from several underground mines.
- Application of this technology to the thousands of individual outlets associated with all coal mining in WV would be astronomically expensive.



Coal & Water –The Cost to Comply

Are we at the point of diminishing returns?

- Treatment for **Total Suspended Solids**, **pH** and **Iron**
  - Prompt and highly visible environmental benefits
- **Selenium** removal
  - No benefit to water quality or aquatic life
  - May actually create a negative environmental impact
  - Retention of treatment facilities and associated waste disposal facilities for decades after mining is completed
- **Conductivity** limits at the levels being discussed by EPA
  - Could effectively ban new mining operations
  - If applied retroactively, would make virtually every permittee a violator under the CWA

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