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June 14, 2010

Independent Regulatory Review Commission
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Sent via Email to: irrc@irrc.state.pa.us

RE: Regulation #7-446 (IRRC #2806)

Dear Members of the Commission:

Consolidation Coal Company (CCC) submits these comments in response to the above referenced amendments to 25 Pa. Code Chapter 95 proposed by the Department of Environmental Protection (Department) and approved by the Environmental Quality Board (EQB).

CCC is the permittee and operator of the Blacksville No. 2 Mine which is located in Greene County, Pennsylvania. CCC is also the operator of the Loveridge Mine and the Robinson Run Mine which are located in northern West Virginia in the Monongahela River watershed. Also, CCC operates a number of mine water treatment plants in Pennsylvania and West Virginia in the Monongahela River watershed for the purpose of maintaining mine pools at levels low enough to prevent uncontrolled discharges of mine water to streams and the rivers. In addition, affiliates of CCC operate a number of mine water treatment plants in Pennsylvania to prevent uncontrolled discharges of water from long-closed underground coal mines to surface streams.

Drainage from active and closed coal mines is currently subject to technology based effluent limits that were promulgated by the U.S. Environmental Protection Agency and are codified at 40 CFR Part 434. Generally, the parameters regulated under the EPA coal mine drainage effluent limits are iron, manganese, total suspended solids and pH. These effluent limits can be economically met using conventional mine water treatment technologies. However, conventional treatment technologies will not significantly reduce sulfates or chlorides, two of the primary constituents of total dissolved solids (TDS) in coal mine water, to meet the effluent limits in the proposed amendments to Chapter 95. These constituents can only be removed from mine water by what DEPARTMENT refers to as "advanced treatment."

Clarity, feasibility and reasonableness of the regulation (71 P.S. § 745.5b(b)(3))

Clarity -

Section 95.10(a)(1)of the proposed regulations provides as follows:

(a) The following are not considered new and expanding mass loadings of TDS and are exempt from the treatment requirements in this section:

(1) Discharge loads of TDS that were **authorized by the Department as of [insert effective date of regulation]**. Such discharge loads shall be considered existing mass loadings by the Department. Relocation or combination of existing discharge points of existing mass loadings of TDS do not constitute new or expanding mass loading unless total mass loadings are increased. (Emphasis added.)

The phrase "authorized by the Department" does not clearly describe what existing discharge loads of TDS are exempt from the treatment requirements of proposed Section 95.10. There is a lack of clarity because the proposed final regulation exempts discharges that are "authorized by the Department" as of the effective date of the regulation, but the regulations do not define what "authorized by the Department" means. "Authorized by the Department" is ambiguous. The regulation could simply exempt all discharges in existence on the effective date, which the Department has contended is its intent. Instead, the preamble states that if TDS, sulfates or conductivity was sampled as part of the permit application, the discharge of TDS is "authorized by the Department" even if TDS is not addressed in the permit. There are two problems with this approach. First, not all permit applications included sample results for TDS, sulfates or conductivity. Second, statements in preambles are not binding on a court or the Environmental Hearing Board (EHB), so the regulated community cannot rely on them. See, *UMCO v. Department of Environmental Protection,* 938 A.2d 530 (Pa. Cmwlth. 2007) (Where a preamble is used to resolve an ambiguous regulation, the preamble is not controlling).

"Authorized by the Department" will be interpreted by the EHB or a Court or even the Department in the future and none of them are bound by the statements in the preamble. That is why the language of Section 95.10 has to expressly exempt existing discharges. It is curious that the language of the regulation is not clear on this point given that in the preamble the EQB states that it is its intent to exempt existing discharges. See the preamble at page 17 (From the inception of the rule, the intent of the Board was to exempt existing discharges, and insignificant discharges, from the effluent standards aimed at controlling the new, larger source of TDS).

Feasibility and Reasonableness -

Another major problem with the proposed exemptions which makes the proposed amendments infeasible and unreasonable is the pending proposed amendment to 25 Pa. Code Chapter 93 by which the Department proposes to establish ambient aquatic life water quality criteria for chloride, which was published as proposed rulemaking in the *Pennsylvania Bulletin* on May 1, 2010. Because the Department is proceeding with two separate rulemakings, people tend to forget about the relationship between them.

In the Chapter 93 proposed rulemaking, the Department is relying almost entirely on EPA's *Ambient Water Quality Criteria for Chloride* (EPA 1988) (the 1988 Criteria Document) and on EPA's development document for the 1988 Criteria Document. This reliance is misplaced because of significant scientific information that has been developed since 1988. Additionally, the 1988 Criteria Document does not establish national criteria, but instead merely sets out criteria that were recommended 22 years ago and which are not binding on any state.

Even before the 1988 Criteria Document was finalized, information was being developed which showed the limitations of the then proposed chloride criteria. Since that time, much additional information has become available on chloride toxicity, all of which was ignored by the Department when they proposed to accept the outdated criteria from the 1988 Criteria Document. For a detailed discussion of the currently available scientific information and how recalculation of the acute and chronic chloride criteria using EPA's recalculation procedure would result in instream aquatic life criteria of approximately 1200 mg/l chlorides acute and 800 mg/l chlorides chronic, please see the attached *Synopsis of Information on Chloride Toxicity Prepared to Assist in Review of Pennsylvania/s Proposed Chloride Rules.* Without higher instream limits, the Chapter 95 exemptions will be meaningless because the discharges will be assigned limits necessary to prevent exceedences of the too restrictive instream limits.

Economic or fiscal impacts of the regulation (71 P.S. § 745.5b(b)(1))

Section 5(a)(5) of the Pennsylvania Clean Streams Law, 35P.S. § 691.5(a)(5), requires the Department to consider the "immediate and long-range economic impact upon the Commonwealth and its citizens" when it adopts regulations. It also requires DEPARTMENT to exercise "sound judgment and discretion" in doing so. If the exemption for existing discharges is not clearly stated or if the exemptions are short lived due to adoption of the proposed overly stringent instream chloride limits, then the Department's analysis of the economic impacts of the proposed amendments to Chapter 95 is flawed because the Department has not included the costs of treating the preexisting discharges in its costs analysis.

Sincerely

Stan Geary

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Enclosure

SYNOPSIS OF INFORMATION ON CHLORIDE TOXICITY PREPARED TO ASSIST IN REVIEW OF PENNSYLVANIA'S PROPOSED CHLORIDE RULES

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SYNOPSIS OF INFORMATION ON CHLORIDE TOXICITY PREPARED TO ASSIST IN REVIEW OF PENNSYLVANIA'S PROPOSED CHLORIDE RULES

1.0 BACKGROUND

The information presented herein was prepared to support a review of the Pennsylvania Department of Environmental Protection's (DEP) proposed chloride rules (40 Pa. B. 2264), published in the *Pennsylvania Bulletin* on Saturday May 1, 2010. The information contained in Section D, Background of the Preamble to the proposed amendments, is sparse and misleading. As several states (Iowa, Illinois, Ohio and others), and the EPA themselves have questioned the appropriateness of the current national recommended criteria, it is misleading not to provide a synopsis of this readily available information in the Preamble.

Much of the information presented herein has been compiled to support recalculation of the water quality criteria for chloride for watersheds located in the central Appalachian and the Western Allegheny Plateau eco-regions using updated data (available since the original recommended criteria were calculated 22 years ago), and the consideration of resident taxa. This recalculation included correcting data from the previous calculation as well as expanding the database used for the calculation and the deletion of non-resident species. The proposed criteria resulting from the recalculation were 1200 and 800 mg/l Cl^- as acute and chronic criteria, respectively. The protectiveness to aquatic life of changes to the 1988 criteria was supported using an extensive survey of peer reviewed literature much of which is described herein.

2.0 CHLORIDE WATER QUALITY STANDARDS

Section D of the Preamble indicates that chloride occurs naturally in the aquatic environment and that freshwater fish and aquatic communities cannot survive in elevated concentrations of chlorides but fails to describe the importance of chlorides in natural systems. Chloride is widely distributed in nature, usually occurring either as a dissolved anion or as a solid in the form of calcium, magnesium, sodium chloride or potassium chlorides (salts). It is an **essential element** for aquatic and terrestrial organisms that is involved in maintaining proper osmotic pressure, water balance, and acid base balance in animal tissues (Government of British Columbia, 2003). Chloride salts are extremely water soluble; chloride easily crosses cell membranes, and is generally excreted from animal tissues via the kidney or equivalent renal organs to achieve osmoregulatory balance. Thus, aquatic organisms are designed to regulate internal chloride levels and to use their ability to regulate ion concentrations, within an acceptable range, to maintain other internal conditions. Because chloride can be excreted as necessary, bioaccumulation potential is low and the toxic effects of chloride salts generally result from elevated or fluctuating chloride levels causing osmoregulatory imbalance which leads to impaired survival, growth, or reproduction (Government of British Columbia, 2003).

Section D in the Preamble notes that maintaining a proper salt-to-water balance in a freshwater environment challenges most aquatic life but does not clearly describe that the "challenge" is because freshwater chloride concentrations are often very low creating a situation where the organism must expend significant energy to actively "collect" chloride ions that are useful in maintaining the proper osmoregulatory balance. Although Section D does indicate that macroinvertebrate actively transport chloride ions in and out of their bodies, it does not make the point that the addition of chloride ions to aquatic systems is not inherently unfavorable. The referenced "disruption in water balance and ion exchange....causing stress or death" can occur when chloride concentrations are EITHER too high or too low, basically when the concentrations fall outside of the range of concentrations which the organisms prefer and/or can tolerate.

Chloride is elevated in natural systems primarily as a result of deicing salt, urban and agricultural runoff, discharges from municipal wastewater plants and industrial plants, and the drilling of oil and gas wells (USEPA, 1988). Chloride in mine water tends to be elevated due to weathering of increased rock surface area, concentration of naturally occurring chlorides in treatment plants where water is re-circulated, or in underground mines where saline groundwater is encountered.

The aquatic life chloride water quality criteria proposed to be adopted for the Commonwealth of Pennsylvania were derived from the USEPA's recommended water quality criteria for chloride of 230 mg/l for chronic aquatic life, and 860 mg/l for acute aquatic life protection. Section D of the Preamble indicates that the Pennsylvania Department of Environment Protection (Department) has reviewed the EPA's ambient water quality criteria development document for chloride (Criteria Document) and agrees with the data analysis, interpretation and methods used to develop the criteria. This statement irresponsibly ignores the plethora of more recent data, some of which directly dispute the accuracy of the 1988 criteria document. The acute criterion was developed based on a limited database of only 12 species with the chronic criterion based on three acute to chronic ratios (USEPA, 1988). One of the acute to chronic ratios used in the document has been shown to be flawed and has been revised. Several states have calculated different chloride criteria since 1988 using new and alternative data. Studies conducted by Birge et. al. in 1985 indicated that chlorides tested in laboratory water produced twice the toxicity as when natural waters were used. Based on this information, the Kentucky Natural Resources and Environmental Protection Cabinet adopted the criteria recommended by the Birge study which consist of an acute criterion of 1200 mg/l and a chronic criterion of 600 mg/l. The State of Wisconsin also developed its own toxicity data which were used in conjunction with the EPA database in determination of standards and considers biological survey data when determining when to impose Water Quality Board limits for chloride. A more thorough description of the limitations of the 1988 criteria document which the Department has failed to recognize is given below.

3.0 CRITERIA FOR CHLORIDES

Currently, the nationally recommended water quality criteria are an acute criterion of 860 mg/l, chronic criterion of 230 mg/l based on the USEPA's 1988 document. These criteria have been shown to be flawed based on:

- Updates to the acute to chronic ratio used for chronic criterion development.
- Discovery of contamination of salts used in older toxicity testing.
- Development of standard testing methods which improved test acceptability.
- General expansion of the limited database used in the original criteria calculation.

Additionally, work conducted by Wes Birge (University of Kentucky) has indicated higher toxicity of chlorides in laboratory water as compared with natural water and the presence of healthy aquatic communities in a second order stream at higher chlorides concentrations. More recent work by Soucek (2005 and 2007) and Mount (1997) has supported this finding by demonstrating toxicity occurs from an ion imbalance if single salts are "spiked" into laboratory water. For these reasons, which are described in greater detail below, the recalculation of the chlorides criteria is appropriate and warranted.

3.1 Contaminated Salts and Updated Methods

The last 20 to 25 years have seen great advances in the development of whole effluent toxicity tests (WET tests) traditionally employed in developing water quality criteria for single constituents. Tests done decades ago had variable methods and were not subject to quality assurance procedures necessary to generate acceptable data today. Tests were not standardized for such things as control mortality, temperature control, or the culturing methods of test organisms as they are now. For these reasons, data generated prior to the incorporation of standardized methods (first published by the USEPA in 1975 and updated in 1978, 1985, 1993 and 2002) should be used with caution and great attention to the methods. For example, the Ambient Water Quality Criteria for Chlorides (1988) (Criteria) specifically excluded data from literature that did not describe their test procedures, used inappropriate dilution waters, conducted tests without controls or had high control mortality, or did not provide other relevant information. Also of concern with respect to earlier testing was the purity of reagents used to produce test solutions and testing and culturing water due to limitation in analytical methodology. The Illinois Environmental Protection Agency has indicated that when salts were tested, particularly those requiring a high level to produce a response, heavy metal contamination in the reagents was likely and might have contributed to the toxicity ultimately seen in the tests (IEPA, 2007). For these reasons, the incorporation of newer data into the database used to calculate the water quality criterion is appropriate and warranted.

3.2 Acute to Chronic Ratio Updates

In recent work on sulfate by the Illinois EPA, it was concluded that common salt is not a toxicant in the category of heavy metals, pesticides or other toxic substances. With regard to chronic toxicity, it was concluded that if an organism can withstand the osmotic shock initially, it will probably continue to survive and function at a given sulfate level indefinitely (IEPA, 2007). This is similar to the USEPA's conclusions regarding chloride salts that if freshwater animals do not die within the first 24 hours of the test, they will probably not die during periods ranging from 48 hours to 11 days (USEPA, 1988). Due to the propensity of organisms to acclimate to increased ion concentrations, if not immediately lethal, acute to chronic ratios for exposure to chlorides would be expected to be fairly low. The acute to chronic ratios (ACR) used to calculate the chronic standard in 1988 were 3.951, 7.308, and 15.17 for *Daphna pulex*, rainbow trout and fathead minnows, respectively. Newer data summarized by the Iowa Department of Natural Resources (DNR) (June 2007) indicated that the unexpectedly high 15.17 ACR for fathead minnows has not been substantiated in subsequent testing. Separate evaluations by Wisconsin State Laboratory of Hygiene and National Exposure Research Laboratory in Cincinnati, Ohio (Pickering, 1996) have produced higher chronic values and lower ACRs. The two independent labs have produced ACRs of 2.39 and 1.96 which have a geometric mean of 2.16. Substituting this value for the anomalous value and utilizing a newly calculated ACR for Ceriodaphnia (WISLOH, 2007) to replace the rainbow trout, which is a coldwater species, provides a final acute to chronic ratio (FACR) of 3.16 rather than the value of 7.594 used in the original 1988 calculation. The acute to chronic ratio can be further updated to include the expanded database as described below.

3.3 Expanded National Dataset

The database of toxicity tests used in 1988 to calculate the current standard has expanded substantially since that time allowing for more accurate calculation of protective criteria. The original chloride criteria calculations involved 12 genera with Daphnia being the most sensitive taxa. Major points from the original calculation include the finding that 24- and 48- hour acute tests could be used in conjunction with the 96-hour acute tests recommended in the USEPA's criteria development guidance document (1985) because the acute values changed little from the first 24 hours (USEPA, 1988). The Criteria went on to conclude that if freshwater animals do not die within the first 24 hours of the test, they will probably not die during periods ranging from 48 hours to 11 days (USEPA, 1988). The Criteria also found that invertebrates were generally more sensitive than vertebrates and that sodium chloride was an appropriate chloride salt for use in calculation of the criteria. Most anthropogenic chloride in ambient water is associated with sodium and a more extensive database exists for this chemical as compared to other chloride salts; although chlorides associated with potassium, magnesium and calcium are generally more toxic to aquatic organisms (USEPA, 1988). Additionally, sodium is the most common cation in stream water associated with the outfalls described herein. Another significant contribution of the 1988 Criteria Document was the general description of available data which were acceptable for use in criteria calculation.

The national dataset (ECOTOX) currently available for consideration in generating water quality criteria contains over 500 data points for sodium chloride toxicity representing 54 organisms. The USEPA maintains this comprehensive toxicity database which provides information on adverse effects of chemical stressors to both aquatic and terrestrial species. The primary sources of data for the ECOTOX database are peer reviewed literature sources however; it also includes data from the USEPA, US Geological Survey and other organizations. As the database is used for the derivation of water quality standards, it has focused on encoding standard calculated test endpoints, such as the LC50 (ECOTOX website). The database is generally updated quarterly.

4.0 RECALCULATION OF THE CHLORIDE CRITERIA WITH THE EXPANDED NATIONAL DATASET.

Clearly, the Department is remiss in their statement that it agrees with the data analysis, interpretation and methods used to develop the 1988 chloride criteria. For the above stated reasons, updated chloride criteria are warranted. The mechanism for updating water quality criteria using the current national database is provided by the USEPA; it is the Recalculation Procedure (USEPA-823-B-94-001). The recalculation procedure involves making corrections and additions to the national dataset and may be used to update criteria or to create site-specific criteria. The latter application involves deleting species if they are not found in a specific area or at a specific site. Using the recalculation procedure to develop site-specific criteria develops criteria which are intended to come closer than the national criteria to providing the intended level of protection to the aquatic life, usually by taking into account the site-specific biological and/or chemical conditions (USEPA-823-B-94-001). A recalculation procedure was recently designed for streams located in the central Appalachian and the Western Allegheny Plateau eco-regions. For the purpose of developing these site-specific criteria, the database was corrected and updated to include additional data. The deletion procedure was implemented to develop site-specific criteria using resident taxa. The dataset satisfied the applicable minimum data requirements for the Eight Family Rule. As described previously the newly calculated criteria for the streams would be 1,200 mg/l and 800 mg/l chlorides as acute and chronic criteria, respectively. It is anticipated that implementing the recalculation procedure to calculate updated criteria for Pennsylvania would result in similar increases from the outdated criteria.

4.1 Summary of Updated Database

Even before the 1988 Criteria Document was finalized, information was being developed which showed the limitations of the then proposed chloride criteria (Birge et al, 1985). Since that time, much additional information has become available on chloride toxicity, all of which was ignored by the Department when they proposed to accept the outdated criteria. The following discussion is a summary of available peer reviewed scientific data or agency generated data which should be considered in the development of chloride criteria.

Although the national dataset are described as being updated quarterly, there is generally a lag between current literature and data included in the database. As such the most current data in the database were published in 1999 and many recent studies on the toxicity of chlorides and other salts are not included. Attention has recently focused on salinity and dissolved solids toxicity in part because the toxicity of significantly toxic chemicals has been well characterized and in part because of recognition of toxicity associated with high dissolved ions such as in produced brine waters, road salt runoff and treated mine discharges. The discussion below focuses on summarizing the findings of recent literature, some of which may not be included in the recalculation procedure discussed herein.

Studies on salts in general (without specific chloride information) are used in the present discussion to evaluate the relative sensitivities of benthic macroinvertebrates. Toxicity levels are variable, just as ion toxicity is variable, based on specific ion toxicity and relative ion concentrations (Goodfellow et al, 2000). Where possible, studies are included which report results in mg/l chlorides. However, when studies reporting toxicity of organisms to NaCl are included they must be evaluated based on the relative chloride ion concentration which is about 60 percent of the total concentration. For consideration when reviewing the toxicity data, Horrigan and others (2007) found that organism occurrence in salinity affected streams generally correlates well with laboratory toxicity values.

Exposure to road salt runoff has prompted studies to determine the effects of sodium chloride in laboratory and field settings. A study by Blasius and Merritt (2002) summarized available toxicity data for aquatic macroinvertebrates and contributed additional data. Separating the data into those collected prior to the early 1980's and later data (due to the possible contamination mentioned above) indicates the following information from the older data: no effect on drift or mortality for *Gammarus psuedolimnaeus* at 800 mg/l NaCl concentrations, no mortality after 10 days of exposure of *Hydropsyche betteni, H. bronta*, and *H. slossonae* to 800 mg/l NaCl, some drift of organisms in field studies at concentrations greater than 1,000 mg/l NaCl and no effect on drift or mortality of *Hydropshyche betteni* and *Cheumatopsyche analis* at a concentration of 1,650 mg/l NaCl. Organism mortality was observed at high concentrations of the salt such as 80 percent mortality to *H. betteni* exposed to 6,000 mg/l NaCl (3,600 mg/l Cl^-), 100 percent mortality of *Chironomus attenatus* exposed for 12 hours to 9,995 mg/l (5,997 mg/l Cl^-), and 100 percent mortality for 48 hour exposure of *Nias variabilis*, *Cricoptus Trifascia* and *Hydroptila angusta* to 3,735, 8,865 and 10,136 mg/l NaCl, (2,241, 5,319, and 6,082 mg/l Cl^-) respectively. These data indicate no effects at lower concentrations and that significant salt concentrations are necessary to generate toxicity. Clearly, even in the older dataset, organisms common to Pennsylvania streams, such as Cheumatopsyche, Hydropsyche, Chironomus, Hydroptila, and Gammarus exhibit effects at chlorides concentrations much higher than the proposed criteria and would be protected at the 1,200 mg/l and 800 mg/l chloride criteria (as acute and chronic criteria) which were proposed in the aforementioned recalculation procedure.

Later studies, likely undertaken with less contamination of the testing material, indicated similar growth rates among different treatments for *Hexagenia limbate* at concentrations of 0, 2,000, 4,000 and 8,000 mg/l NaCl. LC50 values were 2,400 and 6,300 mg/l NaCl at 28 and 18°C for 96-hour exposures which provides a species mean acute value of 2,333 mg/l Cl^- for this traditionally sensitive organism. Similarly, *Tricorythus* had LC50 values greater than 1,568 mg/l Cl^-. Laboratory experiments indicated no significant drift for *Hydropsyche betteni* at 2,000 to 8,000 mg/l NaCl and mortality was observed for *H. betteni* at 13,308 mg/l (LC50). *Lepidostoma sp, Nemoura trispinosa and Gammarus psuedolimnaeus* exhibited mortality of 50 percent, 70 percent and 100 percent at concentrations of 6,000mg/l NaCl (3,600 mg/l Cl^-) in 96-hour exposure periods. Again, the genera described herein are common sensitive organisms in streams of Pennsylvania. The most sensitive organisms, the mayfly taxa, still report conservative LC50s (higher temperatures) which are above the water quality criterion calculated using the recalculation procedure.

A summary paper by Kefford and others in 2003 reported on the tolerance of freshwater macroinvertebrates to salts in general and found that the most salt-sensitive groups were Baetidae, Chironomidae and several soft bodied non-arthropods (Oligochaeta, Gastropoda, Nematomorpha, Tricladida and Hirudinea). Other salt sensitive groups, from least to most tolerant included: non-baetid Ephemeroptera, Plecoptera, Trichoptera, Corixidae, non-corixid Hemiptera, Coleoptera, Hydracarina, Odonata and macrocrustaceans (Decapoda, Isopoda and Amphipoda). Similarly, Dunlop et al (2007) evaluated salinity tolerance of 102 macroinvertebrates in Eastern Australia and found the most sensitive to be a mayfly from the family Leptophlebiidae followed by a representative of the family Baetidae. Chronic testing in the AQUIRE data base using a Baetid mayfly puts the effect concentration in the 4,500 to 8,000 mg/l NaCl range (2,700 to 4,800 mg/l Cl^-) for these organisms which Kefford found to be the most sensitive. The species geometric mean for the Baetid mayfly in the national dataset is 3,661 mg/l Cl^- and is well above the 230 mg/l Cl^- chronic criteria proposed in the Preamble and the calculated chronic criteria of 800 mg/l chlorides proposed in the aforementioned recalculation. Chironomidae were represented in the original 1988 database with a species mean acute value of 4,900 mg/l Cl^- and are represented in the new AQUIRE database with a similar genus geometric mean value of 4,952 mg/l Cl^- and a single chronic value of 6,000 mg/l Cl^-. Soft bodied arthropods were represented in the original data set by a snail (Physidae) with a species mean acute value of 2,540 mg/l Cl^- and are well represented in the newer database by snails, mussels, nematodes, oligochaetes, and leeches.

Horrigan and others (2007) also reported Leptophlebidae to be the most sensitive family followed by: Notonectidiae, Baetidae, Caenidae, Calamoceratidae, Corixidae, Chironomidae, and Physidae which were also determined to be sensitive to salinity. In their study comparing laboratory and field derived salinity tolerance data, Horrigan and others found LC50's were correlated with maximum salinity at which species were collected in the field. They concluded that laboratory studies of acutely lethal salinity tolerances are predictive of the salinity levels that macroinvertebrates are known to inhabit in the field.

In 2004, Benbow and Merritt conducted testing on road salt with four species:

Callibaetis fluctuans, Choaborus americanus, Physella integra and *Hyallela azteca* and found acute (96-hour) LC50's greater than 5000 mg/l road salt for the mayfly and the mollusk and greater than 10,000 mg/l salt for the dipteran and the amphopod. In 15-day exposures, the mortality of mayflies was never greater than 30 percent at concentrations less than 10,000 mg/l salt. For the dipteran and the amphipod 16 day mortality was generally less than 20 percent under all road salt concentrations and the mollusk had no 15-day mortality at road salt concentrations less than 5,000mg/l NaCl. The estimated 96-hour LC50s for the organisms of >5,000mg/l or >10,000 mg/l NaCl corresponds to chloride ion concentrations of >3,000 mg/l and >6,000 mg/l chloride.

In a study conducted to evaluate the effect of current on toxicity in laboratory testing, Baetidae were exposed to sodium chloride solutions of varying concentration with multiple flow regimens. Lowell and others (1995) report that previous studies have shown that freshwater animals are fairly similar in their sensitivity to NaCl with EC50s and LC50s ranging from 3.3 (Daphnia) to 10.2 g/l (Culex) in studies utilizing the Baetid *Centroptilum*, the Dipteran *Culex*, Crustaceans (*Daphnia*) and fish (*Pimephales promelas, Carassius auratus*). Their findings are similar to those reported literature values which places the Baetidae less sensitive than Daphna but more sensitive than the other organisms. Lowell et al (1995) also reports that their data support previous studies which indicate that NaCl toxicity does not change much with increasing time of exposure and in fact, a flat sensitivity versus time curve appears to be a general feature of freshwater animals exposed to high concentrations of NaCl.

Consideration of the above described literature supports several conclusions. First, the data pertaining to the toxicity of chlorides is not sparse. Due to the reference toxicant status of sodium chloride and recent interest in road salt and brine water toxicity, a substantial database exists for chloride. Also, chlorides have been demonstrated in multiple studies to produce toxicity primarily in the first 24 hours of exposure. This finding has significant implication for the establishment of chronic criteria particularly when the current criterion was established based on unsubstantiated (now corrected) data. Also of significance is the finding from field surveys that benthic organisms begin to disappear from in-stream communities at chloride concentrations similar to those predicting toxicity in laboratory studies. This finding supports the conclusion that criteria established based on toxicity testing (as described in the 1985 Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses (USEPA, 1985)) will be protective of aquatic communities in the streams.

These three points support the finding that development of updated chloride criteria is warranted and that reliance on the outdated Criteria Document is unjustified. These data further support that updated criteria which are higher than the existing criteria can be shown to be protective of the aquatic life use in the streams because the size of the database and the number or organisms represented gives confidence that it is representative of the organisms in the streams.

4.2 Toxicity to Resident Organisms

Pennsylvania's topography supports a diverse and abundant aquatic fauna including coldwater and warm water fish species and a diverse benthic macroinvertebrate assemblage. As has been well described in the literature, representatives of the mayfly, stonefly and caddisfly orders (Ephemeroptera, Plecoptera and Trichoptera) are widely considered the most sensitive taxa in Appalachian streams.

Toxicity information for many taxa which are represented in Pennsylvania has been generated. The lethal concentration to 50 percent of the test organisms (LC50) is the value most often reported for acute toxicity testing. At this concentration, half of the test organisms survived the treatment and half did not. Table 1 lists LC50 values (as species means or from individual test results and other endpoints) and other endpoints for several taxa with representatives native to Pennsylvania streams. As is evidenced by the table, the proposed acute water quality criteria are substantially overprotective of even the most sensitive organisms in Pennsylvania waters. Higher acute criteria, such as the 1,200 mg/l Cl^- criteria in the previously referenced recalculation procedure, would be adequately protective of the sensitive mayfly taxa in Table 1, as well as the other taxa. Although these comparisons are made with acute toxicity tests, due to the propensity of organisms to acclimate to higher salt concentrations and the low acute to chronic ratios associated with sodium chloride, they are also likely protective of chronic exposures.

5.0 CONCLUSIONS

The Pennsylvania DEP has proposed chloride rules (40 Pa.B 2264), published in the PA Bulletin on Saturday May 1, 2010 which include the adoption of the USEPA's recommended water quality criteria for chloride of 230 mg/l for chronic aquatic life, and 860 mg/l for acute aquatic life protection. As several states (Iowa, Illinois, Ohio and others), and the EPA themselves have questioned the appropriateness of these current national recommended criteria, it is inappropriate to adopt the outdated criteria without appropriately considering errors and limitations of the 1988 criteria and information generated since the original criteria development.

The information contained in Section D, Background of the Preamble, is sparse and misleading. This section indicates that the Pennsylvania Department of Environment Protection (Department) has reviewed the EPA's ambient water quality criteria development document for chloride (Criteria Document) and agrees with the data analysis, interpretation and methods used to develop the criteria. This statement irresponsibly ignores the plethora of more recent data, some of which directly dispute the accuracy of the 1988 criteria document. Updates to the original criteria calculations are warranted due to:

- Corrections to the acute to chronic ratio used for chronic criterion development.
- Discovery of contamination of salts used in older toxicity testing.
- Development of standard testing methods which improved test

acceptability.

- General expansion of the limited database used in the original criteria calculation.
- Findings of higher toxicity of chlorides in laboratory water as compared with natural water.

Clearly, the Department is remiss in their statement that it agrees with the data analysis, interpretation and methods used to develop the 1988 chloride criteria. For the above stated reasons, acceptance of the outdated chloride criteria is improper. If the Department believes the application of chloride water quality criteria are preferable to the osmotic pressure standard, appropriate and scientifically defensible standards should be calculated and presented for consideration rather than relying on outdated and flawed standards which are readily available.

6.0 REFERENCES

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2806

From: Geary, Stan [StanGeary@consolenergy.com]
Sent: Monday, June 14, 2010 9:35 PM
To: IRRC
Cc: Geary, Stan
Subject: Regulation #7-446 (IRRC #2806)
Attachments: Consol Ch 95 Comments 6-14-10.pdf; Consol Comments Attachment Chloride synopsis.doc

Dear Commissioners:

Attached are comments of Consolidation Coal Company on the EQB's proposed final regulations amending 25 Pa. Code Chapter 95. Please contact me if you have any questions.

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Stan Geary
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CONSOL Energy Inc.
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The message is ready to be sent with the following file or link attachments:

Consol Ch 95 Comments 6-14-10.pdf
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