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INDEPENDENT REGULATORY REVIEW COMMISSION

June 14, 2010

Environmental Quality Board
Rachel Carson State Office Building, 16th Floor
400 Market Street
Harrisburg, PA 17101-2301

Re: Proposed Changes to 25 Pa. Code Ch. 93, Water Quality Standards, 40 Pa. Bulletin 2264 (May 1, 2010), Ambient Water Quality Criteria; Chloride

Members of the Board:

The West Point, PA site of Merck Sharp & Dohme Corp. (Merck) appreciates the opportunity to submit comments on the proposed rulemaking for 25 PA Code Chapter 93, Water Quality Standards, as published in the May 1, 2010 PA Bulletin. Merck respectfully offers the following comments concerning the proposal to develop new ambient water quality criteria for chlorides. This new criteria is in addition to the existing 250 mg/l water quality standard for chlorides which is applied at the inlet to water suppliers (PWS).

This proposal applies additional instream acute and chronic chloride numeric limits which are applied to Statewide water uses and the critical uses of Cold Water Fishes (CWF), Warm Water Fishes (WWF), Trout Stocked Fishery (TSF), and Migratory Fishes (MF). The proposed numeric limits are:

230 mg/l (Four-day average)
860 mg/l (1-hour average)

These proposed numeric limits were adopted from U.S. EPA's Ambient Water Quality Criteria for Chloride-1988[1] (EPA, 1988). The national criteria for chloride was derived based on the toxicity test data of sodium chloride in laboratory-reconstituted water. Criteria from fourteen acute toxicity studies on freshwater species, conducted from 1946 to 1987, were cited in EPA, 1988. However, only the eight acute studies using sodium chloride were used to derive the recommended chlorides criterion. According to EPA, 1988, sodium chloride is the only chloride compound with adequate data to facilitate deriving water quality criterion. It is also the most prevalent anthropogenic form of chloride in ambient waters. Twelve freshwater species were evaluated in the eight selected studies. The results were ranked by Genus Mean Acute Value, with Daphnia pulex being the most sensitive. The four most sensitive species (Cladoceran, Snail, Isopod, and Midge) were used to derive a Final Acute Value (FAV) of 1,720 mg/l based on the LC50 values of the tested species. The recommended acute criterion of 860 mg/l was set as ½ of the FAV. The basis of dividing the FAV by two, instead of using the FAV as the acute criterion, was to protect the most sensitive organisms since the FAV is intended to protect 95% of a diverse genera. To establish the chronic criterion of 230 mg/l, three species (Cladoceran, Rainbow Trout, and Fathead Minnow) were assessed using the acute criteria previously discussed, and three chronic studies for these species. Acute-to-chronic ratios (ACR) were developed for each species, and a final ACR of 7.594, as the geometric mean of the three species ACR, was calculated. The final chronic criterion of 230 mg/l was calculated by dividing the acute criterion by the ACR, then rounding the calculated chronic value.

[1] U.S. EPA. 1988. Ambient Water Quality Criteria for Chloride-1988. EPA 440/5-88-001. Washington, D.C.

In establishing statewide numeric criteria for toxic pollutants, a state may adopt the same numeric limits as the criteria developed by EPA. But as stated in the Forward of EPA, 1988, EPA's water quality criteria under section 304(a) are non-regulatory, scientific assessments, and do not impose legally-binding requirements. As stated under Implementation in EPA, 1988, a state may adopt the national criterion if one exists, or if adequately justified, a site-specific criterion.

Since publication of EPA, 1988, several states have adopted state-specific, EPA-approved chloride criteria that exceed EPA's recommended chloride criteria. For example, Kentucky's acute and chronic standards for chloride are 1,200 mg/l and 600 mg/l (401 KAR 10:031, Section 6, Table 1), Wisconsin's acute and chronic standards are 757 mg/l and 395 mg/l (NR 105.06, Tables 1 and 5), and Illinois has adopted a chlorides standard stating 500 mg/l shall not be exceeded <u>except in waters where mixing is allowed</u> (35 IL Code 302.208(g)), thereby implying limited applicability of this standard. Maryland, Ohio, and Tennessee do not have chloride limits.

Additionally, since publication of EPA, 1988, there is sufficient new information and data to set chloride limits that differ from those proposed in EPA, 1988. U.S. EPA's National Exposure Research Laboratory in Cincinnati, Ohio (Pickering, 1996)[2] produced a chronic chloride value from Birge, 1985[3] that was much higher than a value utilized in EPA, 1988. The Wisconsin State Laboratory of Hygiene (WSLH) conducted routine chloride studies starting in 2000 (WSLH, 2007).[4] Based on these studies, WSLH recalculated the EPA, 1988 chlorides criteria, and determined that the chronic criterion of 230 mg/l was too low. Values of 372 mg/l for Warmwater-designated waters and 320 mg/l for Coldwater-designated waters were determined.

In 2009, the Iowa Department of Natural Resources (IDNR) revised its water quality standard for chloride. Prior to 2009, IDNR worked closely with EPA to update their state criteria based on the most recent scientific data. EPA contracted with the Great Lakes Environmental Center (GLEC) and the Illinois Natural History Survey (INHS) to perform additional toxicity analyses. The results of those studies (GNEC, 2008)[5] were key to development of IDNR's updated chlorides standard as well as EPA's approval of those standards. One of the most pronounced and vital outcomes of GNEC, 2008 is that the studies revealed that there is a correlation between chloride toxicity and water hardness and sulfate concentration. EPA, 1988 had drawn a conclusion that "no pronounced relationships have been observed between the acute toxicity of chloride to freshwater animals and hardness, alkalinity, or pH." This conclusion in EPA, 1988 was made in spite of data presented in documents referenced in EPA, 1988. For example, Birge, 1985 had presented data and concluded that chloride was twice as toxic using standard laboratory water, which is deionized water, as opposed to natural water which is much harder. This critical data from Birge, 1985, and other referenced resources that demonstrated the relationship of chloride toxicity and water hardness were discounted in determining the chloride criteria in EPA, 1988. Had the Department done a reasonable search of available science it would also have reviewed the extensive testimony on this issue provided to the Iowa Environmental Protection Commission which included the following statement from Dr. Wesley Birge, a Professor at the University of Kentucky's Graduate Center for Toxicology and Department of Biology. Dr. Birge, an internationally recognized expert in aquatic toxicology, has worked extensively with the U.S. EPA. His testimony before Iowa's Department of Natural Resources,

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[2] Pickering, Q.H., J.M. Lazorchak, and K.L. Winks. 1996. Subchronic sensitivity of one-, four-, and seven-day-old fathead minnow (*Pimephales promelas*) larvae to five toxicants. Environ. Toxicol. Chem. 15:353-359.

[3] Birge, W.J. et al., 1985. Recommendations on Numerical Values for Regulating Iron and Chloride Concentrations for the Purpose of Protecting Warmwater Species of Aquatic Like in the Commonwealth of Kentucky, School of Biological Sciences and Graduate Center for Toxicology, University of Kentucky, Lexington, KY.

[4] Wisconsin State Laboratory of Hygiene, 2007. Summary results available at www.iowadnr.gov/water/standards/files/cissue.pdf

[5] GLEC and INHS. 2008. Acute Toxicity of Chloride to Select Freshwater Invertebrates. Final Draft Report to USEPA. 9-26-08.

Environmental Protection Commission in 2004[6] unequivocally undercuts the conclusion of EPA, 1988. Dr. Birge provided the following written statements:

> "Based on the available information, I feel that establishing a chronic aquatic life criterion for chloride of 564 mg/L is scientifically justifiable and is protective of aquatic life, and that establishing a chronic criterion of 372 mg/L based on only one chronic test with Daphnia pulex in reconstituted water is not justified."
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> "U.S. EPA proposed a chronic value of 230 mg chloride/L. This was based solely on laboratory toxicity tests and acute-chronic ratios. The former most always overestimates risk and the ratios are clearly invalid. The basic mechanisms involved in acute toxicity most always are significantly different from those involved in chronic toxicity."

According to the results of GNEC, 2008, "Increasing the acclimation and dilution of water hardness reduced the acute toxicity of chloride by approximately 1.4 to 1.5 times. Sulfate over the range of 25 – 600 mg/l exerted only a small (inverse) effect on chloride toxicity to C. dubia," thereby validating the original findings of Birge, 1985.

Based on GNEC, 2008 and collaboration with U.S. EPA, IDNR published proposed aquatic life chlorides standards on February 9, 2009, with an update on March 2, 2009[7]. Iowa's final acute and chronic chloride standards were published by the IDNR Environmental Protection Commission on October 7, 2009 (ARC 8214B, IAB 10/7/2009), amending subrule 61.3(3) Table 1 of the Iowa Code. These chloride standards were formula standards that incorporated site-specific hardness and sulfate levels to establish appropriate acute and chronic chloride levels. These standards are:

Acute	$287.8(\text{Hardness})^{0.205797}(\text{Sulfate})^{-0.07452}$
Chronic	$177.87(\text{Hardness})^{0.205797}(\text{Sulfate})^{-0.0745}$

This new EPA-approved methodology of establishing chloride limits significantly impacts the actual site-specific numbers. For example, to achieve a chronic chloride standard of 230 mg/l, which is the criteria in EPA, 1988 and the Department's proposed standard, would require a water hardness of 10 mg/l and sulfate level of 20 mg/l. But if a hardness of 144 mg/l and a sulfate concentration of 70 mg/l are used, the chronic chloride value is 360 mg/l, over 1.5 times higher than the chronic limit in EPA, 1988. The acute chloride value is 583 mg/l.

On February 5, 2010, the Missouri Clean Water Commission was petitioned by Newman, Comley & Ruth P.C., on behalf of the Missouri Agribusiness Association[8], to adopt the formula standards established by IDNR as a replacement to Missouri's current aquatic life chlorides standard. The current aquatic life chlorides standard for Missouri is EPA, 1988.

The Department's proposal to adopt EPA, 1988 is based on inadequate and outdated science, fails to recognize and account for recent scientific evaluations and approaches embraced by other states, and reflects a wholly inadequate evaluation as to the technological feasibility, economic and energy costs, and the impacts and implementation of the proposed standard. By their proposal, PA DEP is placing regulated dischargers in the Commonwealth at a considerable competitive disadvantage to the industries and dischargers in other states, since other states are studying, evaluating, and adopting the more scientifically-sound standards (which EPA is also approving). In addition, the Department has not successfully or adequately demonstrated that there is even a need for a chloride standard beyond the current 250 mg/l

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[6] http://www.iowadnr.gov/epc/archive/04feb16m.pdf. This document contains other testimony and data which calls into question the use of the *1988 EPA Recommended Criteria for Chloride* and which supports higher limits for Chlorides.

[7] Iowa Department of Natural Resources. Water Quality Standards Review: Chloride, Sulfate, and Total Dissolved Solids Consultation Package. February 9, 2009, updated March 2, 2009.

[8] Missouri Agribusiness Association, Petition Requesting Revision to Chloride and Sulfate Water Quality Standards. February 5, 2010 to Missouri Clean Water Commission.

standard applied at public water supply intakes. DEP's "Evaluation of Water Quality Criteria for Aquatic Life Use Protection – Chloride" (January 2010), was submitted to IRRC by the EQB to describe their basis for the proposed regulatory amendments. In that document, DEP including a discussion of water quality that was observed in the Monongahela River during the fall of 2009:

> While river flows reached seasonal lows, the concentrations of TDS and sulfates in the river increased to historic highs, exceeding the water quality standards at all of the seventeen Potable Water Supply (PWS) intakes from the border with West Virginia to Pittsburgh. Violations of water quality standards for TDS [total dissolved solids] and Sulfates persisted in the river through November and December 2008. Elevated Chloride levels were also observed in the Monongahela and at least one major tributary – South Fork Tenmile Creek. This sequence of events identifies a need to establish a chloride criterion for the protection of aquatic life at all locations on Pennsylvania surface waters.

It is unclear what standard for comparison PA DEP used to justify its assertion that "elevated" chloride levels were observed in the Monongahela River basin during the fall of 2008. Based on a review of 22 pages of water quality sampling data posted on PA DEP's website[9] describing conditions at multiple monitoring points in the Monongahela River basin during the fall of 2008 and certain periods thereafter, the highest level of chloride that was detected was 64.9 mg/l, less than 30% of the proposed four-day average water quality standard for chloride of 230 mg/l. PA DEP expressly asserts that these results are sufficient to establish the need for promulgating water quality standards for chloride applicable across the Commonwealth. With all due respect to PA DEP, the data do not even provide a rationale for imposing the proposed water quality standards for chloride in the Monongahela River, let alone the entire Commonwealth.

A detailed study conducted by Tetra Tech NUS, Inc. (Tetra Tech)[10] identified a number of important discrepancies between DEP's analysis of conditions in the Monongahela River basin and the alleged causes identified by PADEP. The study found that drought conditions in the Monongahela River basin in 2008 decreased the amount of water and increased concentrations of total dissolved solids (TDS). The study also found that TDS concentrations in the Monongahela River were at or near the water quality standards upon entering Pennsylvania from West Virginia thereby indicating that the sources of TDS affecting downstream water intakes were not from within Pennsylvania; that the percentage of chlorides in TDS, typically present in oil and gas wastewaters, did not change significantly after the wastewater discharges associated with oil and gas exploration and production had been significantly reduced; and that instead, the primary chemical constituent detected in the elevated TDS concentrations was sulfate, a known constituent associated with acid mine drainage (AMD) which is a wide-spread contributor to water quality impacts in both West Virginia and Pennsylvania.[11] Additionally, a long-term statistical trend analysis has indicated that there has been no statistically significant difference in the mass loadings of TDS in the Monongahela River over the last seven years. Nevertheless, the Department has seized on what occurred in the Monongahela River during a limited period of drought conditions in 2008 and used that conclusion as a basis for seeking to impose a "one-size-fits-all" set of water quality standards for chloride that will apply across the Commonwealth. Moreover, a close examination of the data and information used by PA DEP demonstrates that chloride was not even a serious issue in the Monongahela River during the fall of 2008.

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http://files.dep.state.pa.us/RegionalResources/SWRO/SWROPortalfiles/monongahelarivertdschlorideandsulfatesamplingresults.pdf

[10] Tetra Tech NUS, Inc. Evaluation of High TDS Concentrations in the Monongahela River, January 2009

[11] AMD is a national problem that is particularly prevalent in Pennsylvania. According to a report prepared by PADEP, approximately one-third of waters impacted by AMD degradation are located in Pennsylvania. PADEP, Bureau of Abandoned Mine Reclamation, *The Science of Acid Mine Drainage and Passive Treatment.* (1999).

AMD is Pennsylvania's most significant water pollutant, impacting 2,500 miles of streams. Id.

The Preamble to the proposed rule discussed the relationship between chlorides and osmotic pressure. DEP states that the current osmotic pressure standard of 50 mOsm/kg is intended to protect aquatic life from the adverse impacts of parameters such as chlorides. The Department had indicated that the proposed new water quality standards for chloride are needed as a matter of administrative convenience (versus the current osmotic pressure standard) to protect aquatic life. PA DEP is developing the proposed water quality standard for chlorides because it is better suited to the mass-balance approach in order to maintain the existing osmotic pressure standard, while still retaining the current osmotic pressure standard. Therefore the Department is developing a water quality standard that achieves the same objective as a current water standard. It is unclear, therefore, why (beyond considerations of administrative convenience) a second set of water quality standards for chloride are necessary to protect aquatic life when such protection is already provided by the water quality standard for osmotic pressure. Indeed, in the comment and response document that DEP recently prepared in connection with the new chapter 95 wastewater discharge regulations for TDS, the Department rejected certain comments urging that even more restrictive standards for TDS be adopted to protect aquatic life, expressly stating that "the Department has reviewed the relevant data and determined that the current osmotic pressure criterion in water quality standards regulations provides protection for aquatic life at the point of discharge."[12] Additionally, in spite of DEP's basis and rationale (for the chloride standard as a mechanism of achieving osmotic pressure protection), the new chloride water quality standard is more restrictive that the current osmotic pressure standard. Using the Morse equation, the concentration of chlorides required to exceed 50 mOsm/kg osmotic pressure is 1,642 mg/l, which is far in excess of the proposed acute and chronic chloride levels. If DEP's intent is to issue a chlorides standard to ensure achieving the current osmotic pressure water quality standard, then the chlorides limits in the proposed Chapter 93 rule change is far too restrictive and must be re-evaluated.

Chlorides are a key component to TDS and by this proposed rule making, the Department is essentially taking a back-door approach to establishing an aquatic life standard for TDS. And therefore, similar to the very controversial Chapter 95 TDS discharge standard, the apparent lack of any real, extensive statewide problems with chlorides does not support the creation of an aquatic life protection standard for chlorides. And similar to extensive comment provided to DEP on the TDS issue, if there are localized stream issues with elevated chloride levels, then the Department has current regulatory authority and tools to manage that. The bottom line is that the impact to PA industry from adopting this proposed aquatic life protection standard for chlorides is exactly the same impact and result as the Chapter 95 TDS standard: extensive financial impacts to regulated dischargers to treat for chlorides without environmental benefit for most PA waterbodies.

Neither the preamble to the proposed regulations nor the supporting documents provided to IRRC contain any type of detailed analysis of the costs that the proposed regulations will impose on the regulated community. For example, the Preamble states that "the proposed amendment to Chapter 93 may impose additional compliance costs on the regulated community." In the Regulatory Analysis Form submitted to IRRC, PA DEP has stated that costs and revenue losses associated with the proposed regulations are "not measurable." If this is really the case, PA DEP is blindly proceeding with adding new layers of regulations with no idea of what the economic consequences will be. Because chloride is one of the constituents of TDS, the treatment technology to remove chlorides is the same as TDS. The available technologies are limited: reverse osmosis and evaporation/crystallization. As has been exhaustively presented by the PA Chamber of Business and Industry (Chamber), the WRAC TDS Task Force, and many other industries and regulated dischargers in PA, these technologies (1) require various treatment steps in advance of the chloride/TDS treatment process to remove materials that would foul or ruin the reverse osmosis and evaporation/crystallization units; (2) involve extremely high energy usage; (3) are extremely costly to install and maintain; and (4) result in the production of substantial volumes of concentrated brine and salt cake waste. In the Preamble to the proposed Chapter 93 chlorides regulation, DEP suggests costs of up to $0.50 per gallon for chloride removal using these technologies. Framing costs in cents per gallon units implies the financial consequences are low. But using the data that has been already been presented by PA industries during discussions on the TDS discharge regulation, the costs to PA industries for the proposed aquatic life chlorides standard would equate to billions of dollars per year. Details on the financial impacts

[12] Comment and Response Document for Wastewater Treatment Requirements (25 Pa. Code Chapter 95). p. 35

to PA business, and the collateral damages to the PA environment from the proposed Chapter 93 chlorides regulation can be fully reviewed in the Chamber's February 12, 2010 comments to the PA Environmental Quality Board on the proposed amendments to 25 PA Code Ch. 95.

In addition to the previous comments and issues, what is also particularly troubling is that the Regulatory Analysis Form indicates that only persons "proposing new or expanded activities or projects which result in discharges of chloride to waters of this Commonwealth may be adversely affected by the proposed regulations," and that only those same persons will be required to comply with the proposed regulations. These statements are incorrect. If the proposed water quality standards for chloride are finalized, both existing and new dischargers of wastewater will be required to meet the new water quality standards. The water quality standards in 25 PA Code chapter 93 do not differentiate between new or existing dischargers. They are the in-stream standards that must be met for the applicable Waters of the Commonwealth, and dischargers into those waters will receive permit limits as necessary to ensure the water quality standards are maintained. For existing dischargers, the best case scenario is that they will be able to comply with the new water quality standard, and therefore new discharge limits in their permits issued under the National Pollutant Discharge Elimination System ("NPDES") program by utilizing additional monitoring equipment and methods. In other instances, however, existing dischargers will need to significantly change their operations or install new and very expensive treatment technology in order to comply with the new water quality standards. New dischargers are also likely to face the prospect of installing such advanced treatment technology. Indirect dischargers will also be affected as POTWs face new and restrictive permit limits in their NPDES permits and adjust their pretreatment requirements accordingly.

In summary:

1. There is a substantive lack of data to support establishing a statewide aquatic life standard for chlorides in PA.

2. The Department is using outdated and flawed science in its proposed chloride standard.

3. DEP has not performed an adequate financial impact evaluation.

4. The proposed chloride standard is a redundant, overly restrictive, and unnecessary surrogate for the current osmotic pressure water quality standard.

5. It has been improperly stated that this standard will only impact new or expanded activities which result in chlorides discharges.

Merck requests that the Department abandon this proposed change to Chapter 93, and go back and more extensively study the issue to ensure the Department is acting appropriately. Merck recommends that DEP must:

1. Fully evaluate and study the expansive network of streams and lakes in PA to determine if, and where, there are instream chlorides issues.

2. Utilize their current, existing regulatory authority and tools to address the few chlorides issues that may exist

3. And if an aquatic life standard for chlorides is truly necessary in PA, then:

    a. Extensively evaluate the more recent science in the twenty-two years since EPA, 1988, implement their own studies that incorporate these recent developments, assess chloride toxicity using watershed and ecological risk based assessment tools, and develop standards that are responsible as well as protective, such as the recent IDNR standards.

b. Perform a thorough financial evaluation, partnering with the regulated community to ensure the economic impacts of a new chloride standard are fully understood.

Merck appreciates DEP's consideration of our comments, and looks forward to continuing to work with the Department in evaluating and pursuing better approaches.

Sincerely,

Robert Cavett
Senior Environmental Engineer

cc: Alice L. Lenthe, P.E., Director, West Point Safety and Environment