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PA Department of Environmental Protection
Policy Office
400 Market Street
P.O. Box 2063
Harrisburg, PA 17105-2063

Re: Water Quality Standard for Manganese; Advance Notice of Proposed Rulemaking [48 Pa.B 605]
[Saturday, January 27, 2018]

Dear Secretary McDonnell:

Pursuant to the public notice published by the Pennsylvania Bulletin on January 27, 2018, the Pennsylvania Coal Alliance (PCA) offers the following comments on the Pennsylvania Department of Environmental Protection's Water Quality Standard for Manganese; Advance Notice of Proposed Rulemaking (ANPR) [48 Pa.B 605].

The PCA is the principal trade organization representing underground and surface bituminous coal operators in Pennsylvania, as well as other associated companies whose businesses rely on coal mining and a strong coal economy. PCA member companies produce nearly 90 percent of the bituminous coal mined annually in Pennsylvania, making our Commonwealth the third largest coal producing state in the nation.

As indicated in the ANPR, on October 30, 2017, subsection (j) was added to §1920-A of the Administrative Code of 1929 (Act 40 of 2017). Act 40 directed the Environmental Quality Board to promulgate proposed regulations within 90 days requiring that the water quality criteria for manganese established under 25 Pa Code Chapter 93 (relating to water quality standards) shall be met consistent with the exception in 25 Pa Code §96.3(d) (relating to water quality protection requirements).

Initially, in the development of current regulations, manganese was chosen because it was seen as a surrogate for many metals. Hence, the control of manganese was thought to control other metals. This was based on the notion that manganese requires high pH and/or circumneutral pH with a strongly oxidizing environment in order to precipitate. Thus, theoretically, all transition metals should precipitate in conditions that would precipitate manganese. We have since learned that this theory does not work, especially for aluminum or oxyanions such as selenite, and as such the U.S. Environmental Protection Agency (EPA) has taken the position

that all water quality constituents should be addressed on an individual basis. Accordingly, metals such as aluminum and iron are individually regulated.

At most, adding manganese to the group of constituents for which the water quality criterion must be met at the point of all existing or planned surface potable water withdrawals found in 25 Pa Code §96.3(d) raises the manganese limit for coal mining discharges from 1.0 mg/l to the federally allowable limit of 2.0 mg/l at the point of discharge, aligning Pennsylvania with other states and the federal regulations. Manganese discharges from coal mining operations are, based on a survey of PCA operating members and consultants, on average greater than 40 miles from a PWS intake. When factoring for the federal discharge limit of 2.0 mg/l, assimilation, and with the added protection of the required reasonable potential analysis found in 40 CFR §122.44 and incorporated at 25 Pa. Code § 92a.44, the discharge of this naturally occurring element from mining facilities will not affect any water supply withdrawals, will protect aquatic life from harmful chemical over-treatment, and will provide a positive economic benefit to the coal industry, watershed associations, and other organizations that treat mine water or acid mine drainage from abandoned legacy sites.

The Department requested specific information in three subject matter areas: (1) the compliance point for the manganese standard, (2) the adequacy of the existing PWS Chapter 93 standard, and (3) the development of standards for other protected uses. We address each of these subjects below.

I.
INFORMATION REGARDING THE CHAPTER 96 COMPLIANCE POINT FOR THE Mn STANDARD

Changing the compliance point as directed by Act 40 will not change the maximum concentration of manganese permissible at a PWS point of intake because federal and state law limit the discharge from coal mining facilities to 2.0 mg/l on a daily average.

FEDERAL EFFLUENT LIMITATION GUIDELINES

Discharges from coal mining operations have been subject to federal effluent limitations guidelines and standards at 40 CFR Part 434 (ELGs) for over 40 years. EPA's coal mining ELGs apply to discharges from active coal mines, as well as coal preparation plants and associated areas. The coal mining ELGs cover six separate subcategories of coal mining operations, five of which could apply to coal mining activities in Pennsylvania. The coal mining ELGs are technology-based limits aimed at preventing pollution by requiring effluent quality attainable using demonstrated treatment technologies.

Manganese is one of only two nonconventional pollutants that EPA chose to regulate as part of the coal mining ELGs. Based on manganese removals achieved by the best available technology economically achievable (BAT) for certain coal mining operations, EPA imposed a 2.0 mg/l manganese effluent limitation, based on an average of daily values for 30 consecutive days. This manganese BAT limitation has been in place since 1985, and coal mining operations in

Pennsylvania and across the country must meet this limit before discharging to a receiving water. Coal mining operations have been, and will continue to be, subject to EPA's 2.0 mg/l end-of-pipe effluent limitation for manganese. Therefore, moving the compliance point for the Commonwealth's manganese water quality criteria to PWS intakes would not mean that coal mining operations would be free to discharge unrestricted levels of manganese into receiving waters.

OTHER COAL STATES

Pennsylvania's application of the 1.0 mg/l PWS criterion for manganese at coal mining discharges is more restrictive than any other coal mining state, and, as previously detailed, more restrictive than federal regulations. Specifically:

> In Ohio, designated uses are provided in in Chapter 3745-1-07 of the Ohio Administrative Code. Section (B)(3)(a) designates that "… *all surface waters within five hundred yards of an existing public water supply surface water shall be classified as 'Public Water Supply.'"* Further, Ohio does not have a PWS standard, an aquatic life standard, or a human health standard for manganese. Rather, it regulates mine discharges consistence with 40 CFR §434.
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> In Kentucky, all streams, according to 401 Kentucky Administrative Regulations 5:026, are designated for warm water aquatic habitat and primary and secondary contact recreation. "*The designation for domestic water supply is applicable only at points of intake."* Further, Kentucky does not have a PWS standard, an aquatic life standard, or a human health standard for manganese. Rather, it regulates mine discharges consistence with 40 CFR §434.
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> In Illinois, per Title 35, §303.202 "…*waters of the State shall meet the public and food processing water supply standards . . . at any point at which water is withdrawn for treatment and distribution as a potable supply or for food processing."*
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> In Indiana, Title 327, Article 2, *"All waters that are used for public or industrial water supply must meet the standards for those uses at the points where the water is withdrawn."* Further, Indiana does not have a PWS standard or an aquatic life standard for manganese.
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> In West Virginia, "*The manganese human health criterion shall only apply within the five-mile zone immediately upstream above a known public or private water supply used for human consumption."*

MINE WATER TREATMENT COST

The Department asked for information relating to the financial and economic impacts, and the cost or savings to the regulated community, including small businesses and state and local governments, of changing the point of compliance for manganese.

Coal mine discharges are located mostly in remote extreme headwater reaches far away from public drinking water supplies. As previously mentioned, based on a survey of PCA operating members and consultants, discharge sites are on average greater than 40 miles from a PWS intake. Given that all waters of the state do not serve, either legally or practically, as public drinking water supplies, the application of the PWS standard at such distances is overly restrictive and nonsensical. Water quality criteria for public drinking water withdrawals are protective of the use if the criteria are met at the point where the water is withdrawn for treatment for human consumption. The Department will employ its reasonable potential analysis to determine on a case-by-case basis whether a manganese limit is necessary for a permit.

Applying the federal technology-based 2.0 mg/l standard at the discharge, and the 1.0 mg/l PWS standard at the withdrawal, would result in significant chemical cost savings to coal mining operations. Discharge flow rates vary based on a number of factors, including the type of operation, season, and precipitation. However, as a reasonable estimate, treating coal mine discharges to 2.0 mg/l costs approximately $.00065 per gallon per minute (gpm) to treat manganese. If an average discharge rate is 200 gpm, the chemical cost savings for caustic addition at one discharge would be over $68,000 annually. Considering there are hundreds of National Pollution Discharge Elimination System permits for coal mining operations in Pennsylvania, including facilities being operated by watershed associations and other non-profit organizations to treat acid mine drainage from legacy operations, the economic impact could be upwards of a million dollars.

II.
INFORMATION RELATING TO THE ADEQUACY OF THE EXISTING PWS CHAPTER 93 Mn STANDARD

FEDERAL REGULATIONS FOR DRINKING WATER

On June 3, 2002, EPA published a preliminary notice not to regulate manganese with a National Primary Drinking Water Regulation (NPDWR):

> "*The Agency has made a preliminary determination not to regulate manganese with a NPDWR because it is generally not considered to be very toxic when ingested with diet because drinking water accounts for relatively small proportion of manganese intake."*[1]

The EPA finalized its initial determination on July 18, 2003:

> *"After reviewing the best available public health and occurrence information, EPA has made the determination not to regulate manganese with a NPDWR at this time, because it would not*

[1] 67 Fed. Reg. 38235 (June 3, 2002), pages 38235-38236

present meaningful opportunity for health risk reductions for persons served by PWS."[2]

EPA has established .05 mg/l for manganese as a secondary maximum contaminant level (SMCL) in National Secondary Drinking Water Regulations. SMCLs are established to provide guidance to public water systems in managing drinking water for aesthetic considerations such as taste, color and odor and are not considered to present a risk to human health. Contrary to the Department's ANPR, SMCLs are not enforceable, and public water systems only test for SMCLs on a voluntary basis. [3] Manganese is listed as a SMCL for aesthetic reasons such as laundry staining, and organoleptic effects like taste.

PCA believes that EPA's conclusions are sound and that there is no reason to revisit the SMCL or the underlying data on which it is based.

STATE REGULATIONS AND TECHNICAL GUIDANCE DOCUMENT

The effluent limitation for manganese related to coal mining activities, found in 25 PA Code Chapters 87 (bituminous surface), 88 (anthracite), 89 (bituminous underground), and 90 (coal refuse) and mirroring 40 Code of Federal Regulations §434, is 2.0 mg/l average daily value for 30 consecutive days and 4.0 mg/l daily maximum.

25 Pa Code, Chapter 93 establishes criteria for a Potable Water Supply (PWS) which, for manganese, is 1.0 mg/l. It is important to note that PWS is defined in 25 Pa Code Chapter 93 as "Used by the public as defined by the Federal Safe Drinking Water Act, 42 U.S.C.A §300F, or by other water users that require a permit from the Department under the Pennsylvania Safe Drinking Water Act (35 P.S. §631-641), after conventional treatment, for drinking, culinary, and other domestic purposes, such as inclusion into foods, either directly or indirectly." Thus, the 1.0 mg/l manganese criterion is not a human health criterion, it is taste and odor criterion that applies after conventional treatment of water. Therefore, there should not be additional water-quality-based permitting for Mn, beyond what is regulated in 25 Pa Code, Chapters 86 - 90 and 40 CFR Part 434 in discharges of water from an area disturbed by coal mining activities that do not have a reasonable potential to interfere with a public water supply intake. However, at present, the Department is applying the aforementioned PWS standard, a standard for drinking water, directly at the outfalls from permitted coal mining treatment facilities and sedimentation ponds.

After the Environmental Quality Board promulgates a regulation establishing that the water quality criteria for manganese be met consistent with the exception in 25 Pa Code §96.3(d), consistent with 40 CFR §122.44 and 25 Pa. Code § 92a.44, permit writers will use the

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[2] 68 Fed. Reg. 42898 (July 18, 2003), pages 42903-42904

[3] Secondary Drinking Water Standards: Guidance for Nuisance Chemicals https://www.epa.gov/dwstandardsregulations/secondary-drinking-water-standards-guidance-nuisance-chemicals

Department's Technical Guidance Document (TGD) 563-2112-115, *Developing National Pollutant Discharge Elimination System (NPDES) Permits for Mining Activities*, to evaluate whether a water-quality-based effluent limitation for manganese or another constituent is necessary in a coal mining activity permit to ensure that the water quality criteria in Section 93.7 will be met at the specified point of compliance in Section 96.3, which includes public water supply intakes. This is known as a reasonable potential analysis. If there is a reasonable potential to exceed §93.7 levels, a more stringent and appropriate effluent limit may be applied to the NPDES permit to protect existing and designated surface water uses.

III.
INFORMATION RELATED TO THE DEVELOPMENT OF ADDITIONAL CHAPTER 93 Mn STANDARDS FOR OTHER PROTECTED USES

FEDERAL REGULATIONS FOR AQUATIC LIFE

There are no federally recommended acute or chronic criteria for manganese toxicity or freshwater organisms.

HUMAN HEALTH

Manganese is a naturally occurring element that constitutes approximately 0.1% of the Earth's crust. Manganese occurs naturally at low levels in soil, water, and food and is essential for normal physiological functioning in humans and all animal species.[4] Manganese is an element essential to the proper functioning of both humans and animals, as it is required for the functioning of many cellular enzymes and can serve to activate many others.[5]

Like many water quality constituents, in excess manganese can be toxic, however, deficiencies may also prove harmful. Foods high in manganese include mussels, clams, nuts, pumpkin seeds, pineapple, whole wheat bread, tofu, beans, fish, spinach, whole grains, and black tea. Dining on 6 ounces of mussels results in the ingestion of 11.6 mg of manganese; add 100 g of whole wheat bread to the meal and another 2.174 mgs is ingested. Manganese is a nutritionally essential mineral necessary for antioxidant function, bone development, and metabolism.[6]
A review of typical Western and vegetarian diets found average adult manganese intakes ranging from 0.7 to 10.9 mg/day, with the upper range manganese intake value of 11.0 mg/day from dietary studies is considered a no observed-adverse effect level (NOAEL). It is not believed that this amount of manganese in the diet represents an overexposure to the element.[7]

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[4] 67 Fed. Reg. 38235 (June 3, 2002), pages 38235-38236
[5] World Health Organization. Manganese in Drinking-water: Background document for development of WHO Drinking-water quality. World Health Organization 2011; page 1.
[6] Oregon State University. Linus Pauling Institute Micronutrient Information: Manganese
[7] World Health Organization. Manganese in Drinking-water: Background document for development of WHO Drinking-water quality. World Health Organization 2011; page 4.

The World Health Organization's Guidelines for Drinking-water Quality lists manganese as a naturally occurring chemical that has no adverse health effects,[8] but does provide acceptability aspects for taste, odor and appearance.[9]

EPA's Integrated Risk Information System summary indicates that while average levels of manganese in various diets have been determined, no quantitative information is available, and environmental, biological, and host factors such as alcohol consumption, anemia, liver function, and general nutritional status can significantly influence an individual's manganese status. Further, of the one study describing toxicologic responses in humans consuming large amounts of manganese, it was determined that the concentration of manganese exposure was as high as 28.0 mg/l[10], which is fourteen times the criterion in 25 Pa Code Chapters 86-90 and 40 CFR §434.

Applying the criterion for manganese regulated under 25 Pa Code Chapters 86 - 90 and 40 CFR §434 would have no adverse impact on human health. In addition, the Department's Technical Guidance Document (TGD) 563-2112-115, *Developing National Pollutant Discharge Elimination System (NPDES) Permits for Mining Activities* already requires a reasonable potential analysis to ensure that a coal mine discharge does not increase the constituent concentration above the listed requirements of 25 PA Code §93.7 for public water supply intakes. Therefore, promulgating this regulation would have no adverse impact on human health.

AQUATIC LIFE

While manganese has low toxicity to aquatic life, its treatment and removal can be highly dangerous for fish and invertebrates due to the tremendous increase in pH required for manganese removal. This is evident based on review of an Eh-pH diagram for manganese as compared to iron.[11] Removal of manganese from mine drainage requires either high pH (generally greater than 9.0, often at 10.5 or 11.0) or strong oxidation combined with near-neutral pH. Because of the difficulties in obtaining strong oxidation sufficient to remove manganese, pH adjustment is necessary.

Treating manganese to accomplish a limit of 1mg/l requires significant caustic addition to achieve high pH levels in treatment ponds. High pH levels in the discharge can cause a more significant adverse harm to the receiving stream's aquatic life than a manganese concentration in the discharge of up to 2.0 mg/l, which is the best available technology (BAT) standard. The national recommended criteria for pH is limited to 6.5 to 9.0 due to the impact on aquatic life. A pH range of 6.5 to 9.0 protects fish and aquatic life, which Pennsylvania has adopted as a water quality criterion in Chapter 93. Outside of this range, fish suffer adverse physiological

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[8] World Health Organization. Guidelines for Drinking-water Quality: Fourth edition incorporating the first addendum. Chemical aspects; pages 155-210

[9] World Health Organization. Guidelines for Drinking-water Quality: Fourth edition incorporating the first addendum. Acceptability aspects; pp. 219-23

[10] U.S. Environmental Protection Agency. Integrated Risk Information System Chemical Assessment Summary: Manganese, Reference Dose for Oral Exposure; page 7.

[11] *Methods for Passive Removal of Manganese from Acid Mine Drainage*, Rose et al.

effects increasing in severity as the degree of deviation increases until lethal levels are reached.[12] Further, while aluminum is relatively insoluble at pH 6 to 8, the solubility of aluminum increases under alkaline conditions. Thus, increase in pH for treatment of manganese at 1.0 mg/l results in soluble aluminum, Al^{+4} $(OH)_4$, which is toxic to aquatic life.

Other States have acknowledged, and US EPA has concurred, that an aquatic life criteria for manganese is not necessary. Until the mid-1990s, West Virginia maintained a water quality criterion of 1.0 mg/L for manganese in streams classified as either public drinking water supplies or aquatic life uses. In 1997, after an exhaustive review of technical information and supporting scientific data, the West Virginia Environmental Quality Board deleted the aquatic life criterion for manganese. EPA Region III subsequently approved the deletion of the aquatic life criterion for manganese.

In 1995, a Penn State University professor, Dr. Dean Arnold, assisted by Penn State graduate students, began monitoring the benthic macroinvertebrate community in Otter Run in Lycoming County for impairment from exposure to manganese. Later, in 1998, Normandeau Associates took over monitoring, and in 2000 a new sampling and data analysis methodology was developed by a work group that included consultants, the PA Fish and Boat Commission, and US Geological Survey, which was put in effect in August 2000 and continues today. This methodology, which is used in determining a significant loss of biota, has resulted in the determination that the benthic macroinvertebrate community is not considered impaired at the manganese levels measured, which frequently exceeded 2mg/l, often by more than double.[13]

Further, while the vast majority of research in US EPA'S ECOTOX database for aquatic life toxicity was conducted on species not native to Appalachia or in some instances the United States and not appropriate for use in a criteria calculation, ECOTOX does indicates that manganese has low toxicity to aquatic life.[14]

CONCLUSION

Commenters have expressed concern that the implementation of this regulation would mean that manganese discharges would be unregulated. This is simply untrue. As stated above, technology-based effluent limitation guidelines for manganese are well established, both under state and federal regulations, at 2.0 mg/l for activities specific to coal mining.

Adopting the regulation required by Act 40, which requires the water quality criteria for manganese to be met consistent with the exception in 25 Pa. Code §96.3(d) (relating to water quality protection requirements), will serve multiple, common sense purposes; it will protect aquatic life from harmful chemical over-treatment of manganese discharges; it will have no impact on human health; it will not increase cost for water treatment facilities; it will result in several millions of dollars in chemical cost savings to coal mining operations, watershed

[12] U.S. EPA Quality Criteria for Water, 1986. Page 180.
[13] Attachment A.
[14] Attachment B.

associations and other non-profit organizations that treat mine discharges; and, it will align Pennsylvania with other states and the federal government, which will allow Pennsylvania's coal producers to be more competitive with their out-of-state competitors. Given these considerations, we urge the Department and the EQB to move forward with the implementation of Act 40 as expeditiously as possible.

PCA appreciate the opportunity to comment on the Department's ANPR. Please direct any questions or comments to Rachel Gleason at gleason@pacoal.org at your earliest convenience.

Sincerely,

Rachel Gleason
Executive Director
Pennsylvania Coal Alliance