UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Region 1
5 Post Office Square, Suite 100
Boston, MA 02109-3912

May 16, 2013

Patricia W. Aho, Commissioner
Maine Department of Environmental Protection
17 State House Station
Augusta, ME 04333-0017

Re: Review and Action on Water Quality Standards Revisions

Dear Commissioner Aho:

By letter of January 14, 2013, the Maine Department of Environmental Protection ("DEP") submitted revisions of the State's surface water quality standards to Region 1 of the United States Environmental Protection Agency ("EPA" or "Region") for review. The revisions were adopted by the DEP on July 13, 2012. By letter to EPA dated January 9, 2013, Maine's Assistant Attorney General in the Natural Resources Division certified the revisions as having been duly adopted pursuant to state law. The Region has completed its review of the submitted revisions to the arsenic criteria as further described below.

Pursuant to Section 303(c)(2) of the Clean Water Act and 40 C.F.R. Part 131, I hereby approve the following water quality standards revisions to 38 MRSA §420, sub-§2 as set forth in P.L. 2011, Ch. 194 (LD 515) "An Act To Review State Water Quality Standards" and CMR 584, Surface Water Quality Criteria for Toxic Pollutants.

1. Revision of the cancer risk level used to calculate the human health criteria for arsenic from one in 1,000,000 to one in 10,000 and
2. Revision of the arsenic criteria to protect human health from 0.012 to 1.3 µg/L for the consumption of water and organisms and from 0.028 to 3.7 µg/L for the consumption of organisms only.

We are still reviewing revisions to the acrolein and phenol criteria and are not taking action on those revisions at this time.

EPA acknowledges your request to approve the revisions for all waters, including waters that are within Indian territories. Today's approval does not extend to waters that are within Indian territories. EPA intends to publish a notice explicitly seeking public input on the applicability of the revised arsenic criterion in question to waters within Indian territories before completing its review. Therefore, EPA is taking no action to approve or disapprove the State's revisions with respect to those waters at this time. In the meantime, EPA will retain responsibility under Sections 303(c) and 303(d) of the Clean Water Act for those waters.

Discussion

In implementing LD 515, DEP reviewed the available scientific literature on the factors that are used to derive water quality criteria to protect human health uses including fishing, recreation in and on the water, and, where applicable, drinking water. DEP also reviewed data specific to waters in Maine and used the information to derive arsenic criteria for Maine's waters.

Arsenic is a known carcinogen that may cause cancer in skin or internal organs such as the liver, lungs and bladder.[1] In its 304(a) criteria recommendations, EPA states that arsenic criteria should be applied as inorganic arsenic.[2] As is the case for all pollutants, EPA's 2000 Human Health Methodology encourages states to use local and regional data when making risk management decisions inherent in developing criteria, including decisions inherent in selecting the appropriate fish consumption rate, target risk level and bioaccumulation factor.[3]

Maine's revised numeric criteria for arsenic were derived using the same general methodology and equations used to calculate EPA's current 304(a) recommended criteria for carcinogens. The revised criteria and the input variables used to calculate the criteria are summarized in Table 1 below. The paragraphs that follow explain those components of the calculation that have been revised to form the basis of Maine's new arsenic criteria.

Cancer Risk Factor (RF): The State of Maine enacted LD 515 in 2011 directing DEP to revise Maine's human health water quality criteria for arsenic based on a cancer risk factor of 1 in 10,000 rather than the previous RF of 1 in 1,000,000. EPA's recommended methodology for the derivation of water quality criteria states that 1 in 1,000,000 or 1 in 100,000 may be acceptable cancer risk factors for the general population and that highly exposed populations should not exceed a 1 in 10,000 risk level.[4]

Fish Consumption Rate (FCR): Maine's previous 32.4 g/day FCR represents the 94th percentile for Native American anglers in Maine and the 95th percentile for the total angler population in Maine, based on data from a 1990 survey of licensed Maine anglers[5]. In deriving the new arsenic criteria, DEP used 138 g/day, which is the 99th percentile of this survey, to ensure that the criteria are protective of subsistence fishers, a highly exposed population. This approach is consistent with EPA recommendations for

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[1] Agency for Toxic Substances and Disease Registry (ATSDR). *Toxicological Profile for Arsenic.* Atlanta, Georgia, August 2007. Available at: http://www.atsdr.cdc.gov/substances/toxsubstance.asp?toxid=3

[2] EPA, *National Recommended Water Quality Criteria*, human health criteria for arsenic published 1992, available at: http://water.epa.gov/scitech/swguidance/standards/criteria/current/index.cfm

[3] 84 EPA. 2000. *Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health.* U.S. Environmental Protection Agency, Office of Water, Washington, D.C. EPA-822-B-00-004. page 2-6. Available at: http://www.epa.gov/waterscience/criteria/humanhealth/method/complete.pdf

[4] EPA. 2000. *Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health.* U.S. Environmental Protection Agency, Office of Water, Washington, D.C. EPA-822-B-00-004. page 2-6. Available at: http://www.epa.gov/waterscience/criteria/humanhealth/method/complete.pdf

[5] Ebert, E.S., R.E. Keenan, J.W. Knight, and N.W. Harrington, *Consumption of Freshwater Fish by Maine Anglers,* proceedings of the 1992 TAPPI Environmental Conference.

Table 1 – Comparison of Maine's Previous and Revised Arsenic Criteria

Parameter	2005 criteria	2012 criteria
Cancer Risk Factor (RF)	1×10^{-6}	1×10^{-4}
Body Weight (BW)	70 kg	70 kg
Cancer Potency Factor (q1*)	1.75 mg/kg/day	1.75 mg/kg/day
Water Consumption (DW)	2 L/day	2 L/day
Bioconcentration Factor (BCF)	44 L/kg	26 L/kg
Fish Consumption Rate (FCR)	32.4 g/day	138 g/day
Inorganic Factor (IF)	none[6]	30%
Criteria to protect human health for consuming fish and drinking water (water + organism) $=1{,}000 \times \frac{RF \times BW}{q1^* \times [DW + (BCF \times FCR \times IF)]}$	0.012 µg/L	1.3 µg/L
Criteria to protect human health for consuming fish only $=1{,}000 \times \frac{RF \times BW}{q1^* \times BCF \times FCR \times IF}$	0.028 µg/L	3.7 µg/L

estimating fish consumption rates for subsistence fishers and is appropriate to ensure that highly exposed subpopulations are not exposed to a risk level greater than 1 in 10,000.

Inorganic Factor (IF): Arsenic is present in the environment and in fish tissue in both organic and inorganic forms. Inorganic arsenic is the form that is most toxic to humans and used to develop toxicity data for cancer and other end points. The IF is the ratio of inorganic arsenic to total arsenic in fish tissue. DEP conducted its own literature search which found a range of observed IF values from 10 to 30%. According to DEP's review, the lower end of this range is based on average results, whereas maximum amounts are observed to approach or exceed the upper end of the range depending on species and other factors. DEP chose the more protective end of this range.[7]

Bioconcentration Factor (BCF): Bioconcentration refers to the uptake and retention of a chemical by an aquatic organism from water. The BCF is the ratio of the concentration of a substance in the tissue of an aquatic organism to its concentration in the ambient water in situations where the organism is exposed through the water only and the ratio does not

[6] The 2005 criteria did not include adjustment to the criteria based on an assumption of a ratio of inorganic to total arsenic. Therefore, IF was not included in the 2005 calculation. Instead, DEP assumed a ratio of 50% inorganic arsenic to total arsenic in developing water quality based effluent limits for dischargers subject to licensing under Maine's National Pollution Discharge Elimination System. EPA understands that with the adoption of the new arsenic criteria, DEP will no longer make those adjustments.

[7] *See* 1/27/2011 email from Robert D. Stratton, DEP, to Ellen Weitzler and Stephen Silva, EPA.

change substantially over time. Maine has updated the BCF used for the arsenic criteria based on a 2011 BCF derivation for arsenic conducted by EPA in support of an arsenic criteria revision in Oregon.[8] The 2011 derivation used a larger set of studies than were available in 1980 when the 44kg/L BCF (used in the 2005 Maine arsenic criteria) was developed.

EPA approves of the WQS revision to the arsenic criteria on the basis of the demonstrated use of available sound science, including state specific data, to derive the new criteria.

We look forward to continued cooperation with Maine in the development, review and approval of water quality standards pursuant to our responsibilities under the Clean Water Act. Please contact Ellen Weitzler (617-918-1582) if you have any questions.

Sincerely,

Kenneth Moraff, Acting Director
Office of Ecosystem Protection

cc: Brian Kavanah, MEDEP
Tracy Bone, EPA SSB
Jennie Bridge, EPA

[8] EPA, Region 10, *Technical Support Document for Action on the State of Oregon's New and Revised Human Health Water Quality Criteria for Toxics and Associated Implementation Provisions Submitted July 12 and 21, 2011*, October 17, 2011