Green Science Policy Institute

November 21, 2016

The Drinking Water Quality Institute
401 East State Street
Trenton, New Jersey 08625
(Comments submitted via email to watersupply@dep.nj.gov)

Re: Comments on the Subcommittee reports pertaining to the development of a maximum contaminant level (MCL) recommendation for perfluorooctanoic acid (PFOA)

Dear Sir/Madame,

We appreciate the opportunity to comment on the Subcommittee reports pertaining to the development of a maximum contaminant level (MCL) recommendation for perfluorooctanoic acid (PFOA).

As scientists with a mission of protecting human and ecological health from adverse effects of harmful chemicals, we agree that there is a need for a binding PFOA MCL for drinking water in order to protect New Jersey residents from exposure to this chemical. For reasons outlined below we urge the Drinking Water Quality Institute (DWQI) to recalculate and propose PFOA MCL based on the available endpoints of concern from human studies. Also, we call on the Drinking Water Quality Program of the New Jersey Department of Environmental Protection (DEP) to propose, adopt, and implement a PFOA MCL as soon as it is officially proposed by the DWQI.

We are the co-authors of the 2015 Madrid Statement,[1] which based on reviews of extensive scientific literature, provided consensus from more than 200 scientists on the potential for harm associated with the entire class of poly- and perfluoroalkyl substances (PFASs). This includes PFOA as well as their short-chain PFAS replacements. We are also co-authors of a peer-reviewed study published in August 2016 in the *Environmental Science & Technology Letters*,[2] which links drinking water contamination to fire-fighting foams used at military sites and airports; industrial sites (including PFAS manufacturing facilities and those that use PFASs in their production process); and wastewater treatment plants. Such sources of contamination are often located in low-income communities, in some cases with few environmental controls, which creates environmental justice concerns.

We would like to complement the Subcommittee Members on the excellent work that went into reviewing, evaluating, and summarizing the existing toxicological and epidemiological evidence associated with exposure to PFOA. Also, given the associations of PFOA with a number of adverse health effects in the general population, reports about wide spread drinking water contamination, as well as PFOA's persistence and bioaccumulation, we support the adoption of a health-based MCL for drinking

[1] Blum A, Balan SA, Scheringer M, Trier X, Goldenman G, Cousins IT, Diamond M, Fletcher T, Higgins C, Lindeman AE, Peaslee G, de Voogt P, Wang Z, Weber R. The Madrid Statement on Poly- and Perfluoroalkyl Substances (PFASs). *Environ Health Perspect.* 2015;123(5):A107-A111.

[2] Hu XC, Andrews D, Lindstrom AB, Bruton TA, Schaider LA, Grandjean P, Lohmann R, Carignan CC, Blum A, Balan SA, Higgins CP, Sunderland EM. Detection of poly- and perfluoroalkyl substances (PFASs) in U.S. drinking water linked to industrial sites, military fire training areas and wastewater treatment plants. *Environ Sci Technol Lett.* 2016;;3(10):344-350.

water. We also agree with the reasons outlined in your September 22, 2016 presentation slides and report entitled "Health- based maximum contaminant level support document: Perfluorooctanoic acid (PFOA)" that the U.S. Environmental Protection Agency (EPA) lifetime drinking water PFOA health advisory of 70 ppt is not adequately protective of human health.

However, we are concerned that the DWQI proposed level, even though considerably lower than the U.S. EPA PFOA health advisory, exceeds a previously estimated threshold protective of PFOA-associated immunotoxicity.[3] A number of peer-reviewed studies suggest adverse human health effects at the current exposure levels. These findings include:

- Decreased antibody response associated with PFOA exposure,[4,5]
- Inverse association of serum-PFOA concentrations with the response to booster vaccination in children and adults,[6,7,8]
- Shorter breastfeeding duration in women with higher serum-PFOA concentrations, [9,10]
- Positive association between maternal serum-PFOA concentration at childbirth and the number of episodes of common cold and gastroenteritis in children,[11]
- Association of prenatal PFOA exposure in the high- compared to the low-tertile with a statistically significant increased odds of experiencing days with fever above the median at age 1-4,[12]
- Association of adverse birth outcomes (e.g., decreased birth weight) with serum PFOA concentrations during pregnancy.[13]

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[3] Grandjean P, Clapp R. Perfluorinated Alkyl Substances: Emerging insights into health risks. *New Solut A J Environ Occup Heal Policy*. 2015;25(2):147-163.

[4] DeWitt JC, Peden-Adams MM, Keller JM, Germolec DR. 2012. Immunotoxicity of perfluorinated compounds: Recent developments. *Toxicol Pathol.* 2012;40:300-311.

[5] DeWitt JC, Williams WC, Creech NJ, Luebke RW. Suppression of antigen-specific antibody responses in mice exposed to perfluorooctanoic acid: Role of PPARα and T- and B-cell targeting. *Journal of Immunotoxicology*. 2016;13(1):38-45.

[6] Looker C, Luster MI, Calafat AM, Johnson VJ, Burleson GR, Burleson FG, Fletcher T. Influenza Vaccine Response in Adults Exposed to Perfluorooctanoate and Perfluorooctanesulfonate. *Toxicol. Sci*. 2014;138(1):76-88.

[7] Kielsen K, Shamim Z, Ryder LP, Nielsen F, Grandjean P, Budtz-Jørgensen E, Heilmann C. Antibody response to booster vaccination with tetanus and diphtheria in adults exposed to perfluorinated alkylates. *J Immunotoxicol*. 2016;13(2):270-3.

[8] Grandjean P, Andersen EW, Budtz-Jørgensen E, Nielsen F, Mølbak K, Weihe P, Heilmann C. Serum vaccine antibody concentrations in children exposed to perfluorinated compounds. *JAMA*. 2012;307(4):391-7.

[9] Timmermanna CAG, Budtz-Jørgensenb E, Skaalum Petersenc M, Weihec P, Steuerwaldc U, Nielsena F, Kold Jensena T, Grandjeana, P. Shorter duration of breastfeeding at elevated exposures to perfluoroalkyl substances. *Reproductive Toxicology.* 2016 (in press).

[10] Romano ME, Xu Y, Calafat AM, Yolton K, Chen A, Webster GM, Eliot MN, Howard CR, Lanphear BP, Braun JM. Maternal serum perfluoroalkyl substances during pregnancy and duration of breastfeeding. *Environ Res*. 2016;149:239-46.

[11] Granum B, Haug LS, Namork E, Stølevik SB, Thomsen C, Aaberge IS, van Loveren H, Løvik M, Nygaard UC. Pre-natal exposure to perfluoroalkyl substances may be associated with altered vaccine antibody levels and immune-related health outcomes in early childhood. *J Immunotoxicol*. 2013;10(4):373-9.

[12] Dalsager L, Christensen N, Husby S, Kyhl H, Nielsen F, Høst A, Grandjean P, Jensen TK. Association between prenatal exposure to perfluorinated compounds and symptoms of infections at age 1-4 years among 359 children in the Odense Child Cohort. *Environ Int.* 2016;96:58-64.

[13] Whitworth KW, Haug LS, Baird DD, Becher G, Hoppin JA, Skjaerven R, Thomsen C, Eggesbo M, Travlos G, Wilson R, Cupul-Uicab LA, Brantsaeter AL, Longnecker MP. Perfluorinated Compounds in Relation to Birth Weight in the Norwegian Mother and Child Cohort Study. *Am. J. Epidemiol*. 2012;175:1209-1216.



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As scientists concerned with the adverse health effects associated with PFOA, and other PFASs exposure, we believe that it is vital to identify and remediate contaminated water supplies as well as sources leading to their contamination. Since it is crucial to consider the most vulnerable populations and health endpoints when establishing the MCL, we urge the DWQI to recalculate and propose PFOA MCL based on the available endpoints of concern from human studies.

Also, we would like to take this opportunity to bring to your attention that as levels of some long-chain, well studied PFASs (i.e., PFOA and PFOS) in human blood samples and environmental media are decreasing, levels of short-chain PFASs are increasing. Short-chain PFASs are sometimes called "safe" because they are more rapidly excreted from the human body. However, these alternatives may have similar environmental persistence and potential for long-range transport and toxicity as the substances they are replacing.[14,15] They are also expected to be more mobile in the environment and more difficult to remove from drinking water.[16] The shift toward production of short-chain PFASs is a "regrettable substitution" on a major scale. Consequently, we urge the New Jersey authorities to screen its drinking water not only for PFOA, but for a broader class of PFASs, including PFOA replacements.

Finally, to learn from the New Jersey residents' exposure to PFASs, we would like to highlight the importance of biomonitoring, especially of the individuals who live near known contaminated sites, and we urge the New Jersey authorities to initiate a PFAS biomonitoring program.

Thank you for the opportunity to comment on the Subcommittee reports pertaining to the development of an MCL recommendation for PFOA. We would be happy to answer your follow up questions or provide additional supportive information that might be helpful in your decision making process.

Sincerely,

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[14] Scheringer M, Trier X, Cousins IT, de Voogt P, Fletcher T, Wang Z, Webster TF. Helsingør statement on poly- and perfluorinated alkyl substances (PFASs). *Chemosphere*. 2014;114:337-9.

[15] Kjølholt J, Jensen AA, Warming M. *Short-chain Polyfluoroalkyl Substances (PFAS). A literature review of information on human health effects and environmental fate and effect aspects of short-chain PFAS.* 2015; The Danish Environmental Protection Agency. Available at: http://www2.mst.dk/Udgiv/publications/2015/05/978-87-93352-15-5.pdf

[16] Sun M, Arevalo E, Strynar M, Lindstrom A, Richardson M, Kearns B, Pickett A, Smith C, Knappe DRU. Legacy and emerging perfluoroalkyl substances are important drinking water contaminants in the Cape Fear River watershed of North Carolina. Environ. Sci. Technol. Lett. 2016 (in press).