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January 9, 2004

Water Docket  
Environmental Protection Agency, Mail Code 4101T  
1200 Pennsylvania Avenue, N.W.  
Washington, D.C. 20460

RE: Long-Term 2 Enhanced Surface Water Treatment Rule, Proposed Rule, 68  
Federal Register 47639, Docket No. OW-2002-0039

Filed Electronically to EPA Docket

Dear Sir or Madam:

The Massachusetts Water Resources Authority (MWRA) appreciates the opportunity to comment on the Proposed Long-Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) released on August 11, 2003 (68 Federal Register 47639). Given the volume of related materials, we also appreciate that EPA extended the comment period.

MWRA is an independent authority providing wholesale water and wastewater service to approximately 2.5 million people in 61 cities and towns primarily in the Boston metropolitan area. MWRA provides water service from the well-protected Quabbin and Wachusett Reservoirs in Central Massachusetts and is in the midst of a 10-year 1.7 billion dollar integrated water supply improvement program which includes continued aggressive watershed protection, a new water treatment plant using ozone and chloramines, a 17-mile long, 14-foot diameter new transmission tunnel for supply redundancy, replacement of open distribution reservoirs with covered storage and pipeline rehabilitation in both the MWRA system and our member community systems. Investments in our water and wastewater infrastructure over the past 20 years total over 6 billion dollars.

MWRA was actively involved in the Stage 2 Microbial / Disinfection By-Products Federal Advisory Committee (FACA) as a member of the Unfiltered Systems Working Group and agreed to the working group being a signatory to the Agreement in Principle (AIP). The Agreement in Principle included the following provisions specifically related to unfiltered systems:

- *Continue to meet filtration avoidance criteria, and*

- *Provide 4 log virus inactivation, and*
- *Provide 3 log Giardia lamblia inactivation, and*
- *Provide 2 log Cryptosporidium inactivation.*
- *Overall inactivation requirements must be met using a minimum of 2 disinfectants.*
- *Ongoing monitoring and any eventual reassignment to risk bins for unfiltered systems will be consistent with requirements for other systems of their size, with the provision that unfiltered systems must demonstrate that their Cryptosporidium occurrence level continues to be less than or equal to 1 in 100 liters (or equivalent, using advanced methods) or provide 3 logs of Cryptosporidium inactivation.*

**General Comments:**

MWRA offers the following comments based on our review of the rule language, preamble, guidance, and decision support documents. As we reviewed the documents three overall themes struck us.

First, that the overall broad structure of the proposed regulation represents the generally reasonable compromises of the Agreement in Principle. These include moving beyond the “one size fits all” approach of the original Surface Water Treatment Rule to treatment requirements locally tailored to source water quality, a measured step forward on the control of *Cryptosporidium*, and recognition of ultraviolet light (UV) as a significant cost-effective new treatment technology.

Second, that the devil is in the details, and that we were less comfortable with many of the implementing details in the regulation and guidance documents. This is particularly obvious with UV: what the broad outline gives, the details take away, with excess complexity and extreme layers of conservatism. We urge EPA to carefully sort through the comments received, focusing on simplifying the final regulations, and reducing unnecessary and costly requirements for overlapping safety and redundancy factors.

Third, that even where we agreed with the substance of the regulation, the supporting cost-benefit analysis in the preamble seemed to be substantially over-reaching what the science and evidence would justify. It was clear during the FACA process that the data to develop a cogent risk and benefits estimation was lacking. It still seems to be lacking. EPA will need to carefully rework this material if the analysis is to be believable and provide a basis for what will be substantial investments by water systems across the nation.

**Requests for comments on the treatment requirements for unfiltered systems:**

As it relates to those provisions directly affecting unfiltered surface water supplies, MWRA believes that the draft as published is in substantial agreement with the Agreement in Principle.

*EPA solicited comments on the proposed requirement for unfiltered systems to use two disinfectants and for each disinfectant to meet by itself the inactivation requirement for at least one regulated pathogen.*

While no specific compelling technical argument is made for its inclusion in the regulation, the requirement as detailed in the draft regulations and preamble meets the intent of the FACA Agreement in Principle (AIP). As the risk analysis for unfiltered systems already assumed meeting a *minimum* inactivation (rather than the *average* removal credited to filtration plants), and given that by their very nature unfiltered sources have low *Cryptosporidium* levels, there may be no demonstrable health benefit from adding a second disinfectant at all times. In fact, depending on the choice of the disinfectants, there may be an increase in exposure to disinfection byproducts (or a lost opportunity to realize a reduction). Ongoing monitoring by MWRA and several of the largest unfiltered utilities indicates that the exposure assumptions for *Cryptosporidium* levels used by EPA in the preamble may be extremely conservative.

MWRA urges EPA to carefully conduct a risk analysis based on current occurrence and health data, and provide that documentation in the preamble to the final rule before finalizing the two primary disinfectants requirement.

MWRA is also concerned that while the preamble makes it clear that the second primary disinfectant only meet the full disinfection requirement for one pathogen, such as the example of 4-log virus inactivation, the regulatory language may be subject to misinterpretation by primacy agencies as they draft their own regulations. In addition, it is also possible that there could be misinterpretation if a system used three disinfectants, rather than two. The language in the regulation itself should be as clear as possible.

*EPA solicited comments on an alternate approach that would allow systems to meet the inactivation requirements using any combination of one or more disinfectants that achieved the required inactivation level for all pathogens.*

This approach would allow utilities additional flexibility to design and operate treatment plants that are responsive to the unique local water quality conditions. It does not appear to have any substantive disadvantages over the more rigid proposal in the current draft, and may allow more systems to effectively leverage their existing treatment investments with less expensive treatment process additions. More importantly, it may allow some systems to minimize their reliance on chlorine. MWRA is supportive of this additional flexibility.

*EPA solicited comments on whether the proposed requirements for use of two disinfectants establish an adequate level of multiple barriers in the treatment provided by unfiltered systems.*

The form of the solicitation ignores the unique distinction of the unfiltered systems. By virtue of complying with stringent source water quality and watershed control criteria contained in the Surface Water Treatment Rule, unfiltered systems already have a substantive barrier in place prior to treatment. The addition of the second primary disinfectant requirement represents not just the traditional “belt and suspenders” of high quality well protected source water and effective disinfection, but an approach of “belt, suspenders and two guys holding up your pants”. The proposed regulation proposes no similar degree of extreme redundancy for the substantially more at risk systems with wholly unprotected source waters that rely for substantially all of their *Cryptosporidium* risk reduction on the single barrier of filtration. Bin 1 systems have no source water protection, and rely on the average performance of their filters to achieve the required 3-log reduction of *Cryptosporidium*. The risk analysis suggests that Bin 2 utilities need 4-reduction, but redundancy is only required for 1-log. And so on. There simply does not appear to be a data supported, internally consistent argument for this modification to the proposed rule. MWRA urges EPA not to adopt this modification.

In response to all three of these requests for comment on the second primary disinfectant requirement, MWRA urges that the current proposal represent the most stringent disinfection requirement that EPA considers in drafting the final regulations. Given the lack of a demonstrable health benefit, we urge EPA to include as much flexibility for utilities to make site-specific decisions as possible.

*EPA also solicited comments on whether or how this possibility of unfiltered systems having a mean source water *Cryptosporidium* level of 0.075 oocysts/L or higher should be addressed.*

Based on the current data available to MWRA and the other unfiltered systems, and to EPA, this does not appear to be a realistic scenario. However, there are three significant physical and regulatory differences between filtered systems with unprotected sources, and those systems that meet the SWTR filtration waiver criteria which we believe render the question moot.

First, all unfiltered systems have source water watersheds which must be annually reviewed by the state primacy agency for adequate control of potential health threats: the Interim Enhanced Surface Water Treatment Rule has already made the inclusion of *Cryptosporidium* control a required goal of watershed protection plans. Any evidence of an actual source of *Cryptosporidium* at levels high enough to affect source water quality at the intake should already be grounds for the state primacy agency to take action to order the elimination of the threat or the additional of filtration. No new regulatory restrictions or authority is required.

Second, by their nature, the source waters of unfiltered supplies are significantly more likely to have a higher fraction of older, more degraded, and non-infectious oocysts, and to have a lower fraction of potentially human infectious oocysts. While for the purpose of the binning procedure in the Agreement in Principle, the unfiltered systems agreed with the simplifying approach to treat all enumerated oocysts the same way, they are not. Many filtered systems have direct discharges of sewerage treatment effluent to their sources, in some cases in large volumes and in close proximity. This is certainly an opportunity for fresh, human infectious oocysts to arrive at their treatment plants. This is not the case for unfiltered systems. The detention time in most unfiltered systems is substantial: not hours or days from pollutant source to source water sampling point, but months or years. For example, MWRA's reservoir system has a detention time of almost 5 years. The physical nature of such systems serves to allow for natural degradation, reducing the potential of any given enumerated oocyst to be infectious. And finally, because of their well-protected watersheds, it is likely that any oocysts present came from non-human sources.

Third, all unfiltered systems are required to have some type of outbreak monitoring program in place and annually must demonstrate that there have been no water-borne disease outbreaks to their state primacy agency. Filtered utilities are not required to do this. In MWRA's case, we fund approximately four staff at the Boston Public Health Commission and the state Department of Public Health to conduct active disease surveillance of both endemic levels and outbreaks. This additional layer of vigilance and oversight provides an additional opportunity to discover any actual threat to public health, and any evidence of a source water related disease outbreak would be grounds for the primacy agency to withdraw the waiver of filtration status.

### **Responses to other aspects the treatment requirements for unfiltered systems:**

Minimum level of *Cryptosporidium* inactivation required: The preamble described the process used to establish the required two log (99%) inactivation requirement. The analysis uses the simplifying assumption that the ICR data for unfiltered is only about 10 times lower than that of utilities required to filter, and then further assumes that a well operated filtration plant can achieve an *average* of 3 log reduction<sup>1</sup>. Unfiltered systems are required to utilize disinfection with a regulatory required target of a *minimum* of 2 logs inactivation: in practice to reliably achieve the minimum requirement, systems must employ a margin of safety to account for normal variations in flow, temperature and pH as well as disinfectant dosing. For example, MWRA routinely sets a target of 130 to 150 percent of the required CT as its operational target. Both by the use of *minimum* rather than *average*, and by the very conservative exposure assumptions, the draft regulations require more treatment than the actual risk would warrant. This in effect diverts

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<sup>1</sup> A review of the preamble reveals that virtually every reference to filtration performance cites average performance, rather than the minimum performance of the particular technology. Given the higher likelihood of extreme variability in an uncontrolled and unprotected source water, attention to minimum performance for filtration technologies would have seemed commonsensical. Given that literature available does not seem to support the ability to achieve this, some explicit acknowledgement of the disparate approaches might be appropriate in the final rule documents.

resources away from other investments that would have a higher water quality or public health benefit.

Ongoing monitoring by MWRA of its finished water indicates that the exposure assumptions for *Cryptosporidium* levels used by EPA in the preamble may be extremely conservative. Based on over two years of weekly composite samples of 1,000 liters each taken with the IDEXX foam filter (a total of 124,000 liters sampled and analyzed using Method 1623) MWRA's actual levels are averaging 0.05 oocysts per 100 liters: more than an order of magnitude lower than the average levels cited for unfiltered utilities from the ICR, and almost 2 orders lower than the median. This is particularly note worthy given that these results are based on using sample volumes and analytic techniques which are at least 50 to 100 times more sensitive than the very low volumes and low recoveries of many ICR samples used as the data source for much of the analysis cited in the preamble.

MWRA urges EPA to consider adding at least one additional bin for unfiltered systems with lower levels of *Cryptosporidium* in their source waters. This would move the regulatory approach for unfiltered more nearly in line with that filtered systems, and open up additional treatment flexibility for systems which already have treatment facilities which might be modified to achieve 1-log *Cryptosporidium* inactivation and for groundwater under the direct influence of surface waters (GWUDI) systems which may have very low *Cryptosporidium* levels. Filtered systems have four separate bins – it is not unreasonable that the unfiltered systems have at least three.

Compliance Determination for UV disinfection: For unfiltered systems using UV disinfection to meet the required inactivation requirements, the draft regulations propose that compliance with the standard be based on a 95<sup>th</sup> percentile. This is a commonsense approach to extending the existing SWTR requirements for chemical disinfection in unfiltered systems to UV, and MWRA supports this approach. In that it provides additional information on disinfection system performance, particularly short periods of disruption, it improves on the current reporting system. It is protective of public health, while avoiding the excesses of extraordinary redundancy.

EPA may want to consider separating “off-spec” from down time (i.e. lamp off). There is clearly a difference in the health risk of having no UV irradiation from that of providing 98 percent as much as is required. As most systems will have multiple reactors, having a single reactor at slightly less than full capacity, and others above their required capacity, may still yield an average above the minimum. MWRA urges EPA to draft the final rule and guidance to provide clarity on this topic. MWRA is not supportive of the suggested alternative approach that suggests that each and every reactor must meet the 95% standard independently. The intent is to ensure that the water leaving the plant is within specification.

EPA may also want to consider the merit of offering this approach as an alternate for compliance for those unfiltered systems that use chemical disinfectants, but monitor continuously. It would provide additional data to operators and primacy agencies on how

plants actually operate over the course of the days and month, and capture and regulate short periods of 'off-spec' or under disinfected water in periods other than the hour of maximum flow rate.

Minor Exceedances of Filtration Avoidance Criteria: Another area where the regulations might be improved by consistent adoption of the approaches afforded the filtered systems is the consequence of minor exceedances of the filtration avoidance criteria. As the SWTR regulations have been promulgated, and as their approach is extended by these new regulations, almost any minor water quality variation or upset in treatment plant operation automatically triggers a violation, but more critically, the requirement for that system to add filtration. Filtered systems, on the other hand, receive the violation, and must work with their state primacy agency to come back into compliance. Normally, a water quality or process upset results in changes to standard operating procedures, additional staff training, or adjustments to process control set points. Normally it would not result in an immediate and unconsidered requirement for substantial capital investment in new treatment processes. This, however, is the situation in the current and proposed rules for unfiltered systems.

MWRA urges EPA to consider language in the final rule that allows the state primacy agency to examine the specifics of any exceedance of an avoidance criterion, and determine with the water system, the most appropriate means to come back into compliance. In some cases this may very well be to add filtration, but in others it may be to adjust disinfectant doses or chemicals, or to move an intake location, or simply change operating procedures. Water systems must be sure that any capital investment cost-effectively results in real risk reductions and water quality improvements for consumers. There are always competing investment opportunities at the source, within the treatment processes and within the distribution system. Let the primacy agency and the specific facts dictate the solution.

### **Treatment Issues Affecting Both Filtered and Unfiltered Systems:**

Implications of Missing or Un-Approved *Cryptosporidium* Samples: As currently drafted the rule requires that a 24 month sampling period must be an unbroken record of samples; any missing samples, or samples which for whatever reason fail to meet laboratory quality assurance standards result in the system being required to provide the maximum level of treatment. The Agreement in Principle does not require this, nor is it required by good sampling design. Any number of unintentional utility or laboratory errors or accidents could result in a missing sample. A missing sample does not alter the source water quality nor the underlying public health risk. A missed sample costing a few hundred dollars could result in the expenditure of tens to hundreds of millions of dollars when there was no basis in public health risk. To so severely penalize these commonplace occurrences is unacceptable public policy.

We urge EPA to consider allowing resampling and the addition of additional samples at the tail end of the sampling period. Both are needed for particular circumstances, and

neither influences the resultant source water concentration estimation. We are supportive of AWWA's more detailed recommendations on this topic:

- Additional provisions to take replacement samples at the end of the defined monitoring period,
- Greater flexibility in handling of missed samples when utility collected 48 or more samples, and
- Greater flexibility in handling of missed samples in pre-existing data.

The latter two provisions are of particular interest to unfiltered utilities as many already collect source water samples regularly or expect to conduct more frequent sampling for the purposes of the LT2 rule.

Excessive Conservatism in UV Guidance Manual: An important factor in the completion of the FACA process resulting in consensus on the AIP was the recognition that inactivation of *Cryptosporidium* using UV was possible at a low cost. Unfortunately, as developed in the UV Disinfection Guidance manual, the multiple layers of redundant safety factors conspire to unnecessarily raise the costs of compliance. MWRA's Wachusett Reservoir system serving metro Boston is the second largest unfiltered system in the US. We are concerned that the validation protocols developed in the guidance manual be such that we can cost-effectively procure UV systems. For larger reactors, computational fluid dynamics (CFD) modeling may be a cost-effective validation method. We urge EPA to explicitly permit CFD analysis without site-specific flow testing in the regulation, with more specific technical requirements to be developed and presented in guidance manuals as the science advances. Not doing so may eliminate this option for the future.

The UV Disinfection Guidance Manual must explicitly allow use of CFD to predict UV inactivation for reactors that are too large to subject to the physical validation test protocol currently described in the Guidance Manual. The required quantities of test organisms, the large volumes of water needed, and the disposal of contaminated water during testing, all present significantly different challenges for bioassay tests of large reactors. In addition, the safety factor, if any, added due to the use of CFD must be reasonable: the 20% increase in required dose described in the current version of the manual is absurdly conservative.

More information is needed as to whether and what future changes would require revalidation. It is important to allow for incorporation of new UV and water treatment technology in the future. Would future incorporation of new UV lamps/sensors require complete revalidation? Would changes to other processes upstream of UV in a treatment facility require revalidation? If initially validated as an unfiltered system, would future addition of filtration require revalidation? The regulation and guidance manual must provide clear direction to implementing state primacy agencies on this topic.

The MWRA urges EPA to use the UV dose table for *Cryptosporidium* and *Giardia* from the proposed rule in the final rule. The UV Manual should be refocused on a more straightforward process to ensure that the applied UV dose reliably equals or exceeds the required dose in the rule. Clarity and simplicity will be needed if UV is expected to be the inactivation technology of choice for compliance with the LT2.

Excessive Conservatism in Application of Ozone: MWRA is aware of and appreciates the progress made by EPA between the pre-proposal draft and this draft in realistically determining required CT levels. We participated in the technical evaluations and review of alternative approaches conducted by AWWA. While substantial progress has been made, MWRA still believes that the statistical approach adds excessive conservatism to the calculation of the required CT for a given level of inactivation, raising capital and operating costs, and increasing the levels of ozone byproducts unnecessarily.

Because of the higher ozone doses required to inactivate *Cryptosporidium* compared to *Giardia*, particularly in the colder water temperatures that several of our systems experience, it is important to further develop the SWTR concept of segregated flow analysis (SFA) to allow utilities to better estimate and manage the application of ozone for CT. SFA is not currently in the Guidance Manual: we urge that the Guidance Manual explicitly indicate that a system may demonstrate the SFA method to the Primacy Agency for use at its plant, include an appendix to the Guidance Manual that details the use of the SFA method.

### **Inaccuracies in Risk and Cost Information Presented in the Preamble:**

*EPA estimates on page 47743 that the new rule is expected to reduce cases of illness for the 12 million people served by unfiltered systems by an estimated 168,000-547,000 cases, and 28 to 91 premature deaths annually. The EPA estimates that up to 1 in 22 people in unfiltered systems are getting ill.*

EPA's estimates come with well-developed lists of studies referenced, and assumptions made. However, notably absent is any attempt to "ground truth" the results. A primary responsibility of any analyst creating an estimate is to look for alternative ways to validate the answers: if the answer is not the correct order of magnitude, additional research or an alternative approach may be called for. This step appears to have been missed out. MWRA and several other systems with aggressive public health surveillance systems have conducted a ground-truthing of the preamble estimates based on actual local data on illnesses and deaths.

With approximately 1.6 million customers in fully supplied communities, MWRA represents 13.3% of EPA's estimate of the 12 million person served by unfiltered systems. Thus, the EPA estimate would yield a presumed annual *reduction* of between 22,400 and 72,900 cases, and between 4 and 12 deaths. Yet, under active surveillance, there were only 11 cases of Massachusetts-acquired cryptosporidiosis in 2001 and 7 in 2002. Recognizing that even active surveillance does not capture every case (although it generally will catch the most serious cases), and adjusting for an under-reporting factor of

50 or 100, as reported by the CDC (Mead et al, Emerging Infectious Diseases, Vol. 5, No.5), the preamble estimates appear to be off by a substantial amount. Essentially, the analysis suggests that adding additional disinfection will reduce 22,000 to 72,000 more cases than the actual public health surveillance indicates occur in total.

The deaths attributed to cryptosporidiosis also seem high. Through our active surveillance and an informal review of Massachusetts Vital Records, there is no record of any deaths in Massachusetts associated with cryptosporidiosis in the past several years. While it is possible that some deaths might be misattributed to other causes, it is reasonable to assume that any death caused by cryptosporidiosis would at least result in a reported case. The estimates in the preamble assume that improved disinfection will reduce more water-borne illness related deaths than were reported as total cases, yet there are no reported deaths in Massachusetts, let alone the MWRA service area. This estimate for mortality associated with cryptosporidiosis seems incorrect.

Another way to ground truth the estimates is to review the information now being collected by state and local health authorities as part of bio-terrorism detection systems. MWRA participates with the Massachusetts Department of Public Health and Boston Public Health Commission in a series of surveillance programs to detect any changes in a variety of syndromic based illnesses including monitoring sentinel sites (nursing homes, schools, and prisons) for diarrheal disease, daily analysis of electronic records at a cooperating HMO and hospital emergency room admissions, and weekly review of anti-diarrheal medicine sales.

The level of diarrheal disease estimated to be caused by cryptosporidiosis in unfiltered systems is not credible, and ignores years of active surveillance work completed by MWRA and other large utilities across the country. MWRA understands that the preamble numbers are estimates, but the degree to which the estimated number of cases assumed to be reduced is different than the actual number of total cases from all sources found is dramatic. Of course, if the number of cases of illnesses is grossly overestimated, then the estimates of benefits are also grossly overestimated. MWRA urges EPA to reach out to state and local health authorities to develop more realistic estimates for the final rule.

The Appendices to the Economic Analysis present the cost estimating tables and graphs used by EPA is estimating the cost of complying with the proposed rule. MWRA is currently in the process of conceptual design for two UV facilities – one with a capacity of 405 mgd, the other with a capacity of 25 mgd. In each case the capital costs to add UV to the water treatment plants are almost twice what the cost tables would estimate. The larger plant is estimated by EPA to cost about \$24 million; our current estimate is \$43.5. The smaller plant is estimated by EPA to cost \$1.8 million versus our cost estimate of \$4.7 million. We are aware of many other water systems with similar experiences, with actual cost estimates about twice what EPA is using in the cost/benefit analyses. We urge EPA to conduct additional work in developing realistic cost estimates for the final rule.

MWRA is also concerned that the dollar values placed on the cases of illness are overstated. Many of the illnesses indicated may be minor or even asymptomatic. Cases that do not show up on any of the public health radar screens may simply be too mild to be economically significant. Based on the discussion above, it is clear that the only way to arrive at the number of cases included in the analysis is to include a vast number of “illnesses” in which the individual did not realize they were sick.

Thank you for the opportunity to comment on these important regulations. If we can provide EPA any additional data on any of these topics, please feel free to contact us. You may direct questions to Stephen Estes-Smargiassi, Director of Planning at 617-788-4303 (smargias@mwra.state.ma.us).

Very Truly Yours,

-- Signed --

Michael J. Hornbrook  
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