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Comments on Technical Deficiencies in the Interim Draft Clean Water Quality Criteria and Standards Plan - Priorities for the Future

October 10, 1998

J. Charles Fox, Assistant Administrator
Office of Water
US EPA Headquarters
401 M Street, S.W. (MC1801)
Washington, DC 20460

Dear Assistant Administrator Fox:

Please find attached comments on the "Water Quality Criteria and Standards Plan – Priorities for the Future" - Interim Draft, developed by the US EPA Office of Water, June 1998. As you may recall from previous correspondence, I am concerned about the significant technical problems associated with the US EPA's current approach for regulating urban area and highway stormwater runoff water quality impacts. The attached comments on the Water Quality Criteria and Standards Plan summarize key issues pertinent to the application of this Plan to urban area and highway stormwater runoff water quality management. As discussed, I find that the Agency, through this Plan, is perpetuating technically invalid approaches that will lead to more over- and, for some substances, under-regulation of water quality problems. The fundamental problem with the Plan is that the Agency is persisting with its technically invalid approach of focusing its water pollution control program on chemical concentration control, rather than chemical impact control.

Associated with the U.S. mailed copy of these comments, I have enclosed a number of papers and reports that we have developed which provide additional information on the topics discussed. All of this information and other papers and reports are available from Dr. Jones-Lee's and my website, <http://members.aol.com/gfredlee/gfl.htm>, as downloadable files. If you, other members of the Administration, or others have questions or comments on our comments, please contact me. If there is any way we can help redirect the Agency's efforts so that the water pollution control resources of this country are more appropriately focused on controlling real, significant water quality problems in a technically valid, cost-effective manner, please let me know.

Sincerely yours,

G. Fred Lee

G. Fred Lee, PhD, PE, DEE

Copy to: Attention: Plan Comments, US EPA Office of Science and Technology
GFL:jl

**Comments on
“Water Quality Criteria and Standards Plan – Priorities for the Future” - Interim Draft
Developed by the US EPA Office of Water, June 1998
With Particular Reference to Regulation of Urban Area and Highway Stormwater Runoff**

Submitted by

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Presented herein are comments on the US EPA’s June 1998 “Water Quality Criteria and Standards Plan – Priorities for the Future.” These comments focus on the inadequacies of the US EPA’s current water pollution control programs, as well as a proposed expansion of these programs under the proposed Plan with particular reference to the regulation of NPDES-permitted urban area and highway stormwater runoff-associated constituents.

Overall Assessment

The first sentence of the Executive Summary states, “*The US EPA, Office of Science and Technology in the Office of Water developed this Plan to identify and communicate key scientific and technical priorities the Agency plans to pursue together with the States and Tribes to enhance [sic] and improve water quality criteria and standards programs across the country.*” This objective is inadequate, in that the focus of this Plan is primarily an expansion of the regulatory activities of the US EPA, with little or no attention given to the highly significant problems that exist in the Agency’s current water quality management programs. The Agency should not follow the approach set forth in this Plan of expanding its regulatory activities without first correcting the significant technical problems associated with the current over-regulation of chemical constituents in certain types of sources such as urban area and highway stormwater runoff.

The second paragraph of the Executive Summary states that the Plan is designed to support the Clean Water Action Plan. The authors provided, “*Comments on Current Deficiencies in US EPA/USDA Water Pollution Control Programs: Suggested Revisions as Part of the Clean Water Action Plan,*” which discussed areas that needed to be addressed as part of developing a technically valid, cost-effective national Clean Water Action Plan. A review of this Plan shows that a number of key issues discussed by the authors have not been adequately or reliably addressed.

Success of the Current Water Pollution Control Program

Some Agency administration and staff assert that the US EPA's current water pollution control program is highly effective. This effectiveness, however, ignores the cost-effectiveness of the program. Since the mid-1980s, this program has been based on requiring NPDES-permitted wastewater dischargers to remove chemical constituents from the discharge so that no more than one exceedance of any magnitude for any regulated constituent for which there is a criterion/standard may occur every three years. This approach has been used for domestic and industrial wastewater discharges. It is recognized that it has caused and is causing significant unnecessary expenditures for chemical constituent control for which the public is gaining little, if anything, in the way of improved receiving water beneficial uses compared to what would be achieved if a more technically valid approach had been or is now adopted by the Agency in implementing the Clean Water Act (CWA) requirements. For about 15 years, the US EPA has been focusing its water pollution control efforts on chemical concentrations relative to worst-case-based water quality criteria/standards, rather than on technically valid, cost-effective assessment and management of chemical impacts on the beneficial uses of the receiving waters for NPDES-permitted and non-permitted sources of potential pollutants. The emphasis on chemical concentrations rather than impacts has led to a highly convoluted, misdirected water pollution control program that, as implemented, can readily lead to massive public expenditures for urban area and highway stormwater runoff-associated constituent control, with no to limited improvements in the beneficial uses of the receiving waters for the stormwater runoff.

Under-protection of Water Quality

Further, by focusing on chemical concentrations rather than impacts, the Agency has, for some constituents, failed to protect the designated beneficial uses of waterbodies. An example of this type of situation is the Cr VI water quality criterion. By focusing on Cr VI concentrations rather than on its toxicity, the Agency is inadequately considering the potential impact of Cr VI toxicity to zooplankton, which are key components of larval fish food. This criterion is not protective of important forms of aquatic life. At the operating level, regulatory agencies and others assume that if the chemical concentration standard is achieved, that it is protective and there is no need to determine whether a particular discharge causes toxicity in ambient waters. This may not necessarily be the case. If the Agency had focused their water pollution control programs on managing ambient water toxicity (integrated chemical impacts for potentially toxic chemicals) rather than chemical constituent concentrations, a far more technically valid, cost-effective water quality management program would be in place today. This issue is discussed by Lee and Jones-Lee in

Lee, G.F. and Jones-Lee, A., "Under-Regulation of Chromium in Ambient Waters," *Learned Discourses: Timely Scientific Opinions, SETAC News* 18(4):22 July (1998).

By far one of the most significant deficiencies in the chemical concentration-based approach, rather than chemical impact approach, is the failure of the Agency to meaningfully address the aquatic life toxicity problems that are occurring in urban stormwater runoff and some agricultural stormwater runoff and irrigation tail waters. Urban stormwater runoff is being found to be highly toxic to certain

forms of zooplankton due to homeowners' and commercial use of the OP pesticides diazinon and chlorpyrifos for structural and lawn and garden pest control. The Agency has yet to even acknowledge that this is a national problem, much less begin to address it. While the Agency has developed a water quality criterion for chlorpyrifos, the criterion has not been implemented by the states because chlorpyrifos is not one of the Priority Pollutants that is regulated under the National Toxics Rule. Again, if the impacts of potentially toxic chemicals were the focus of the regulatory activity, this problem would have been detected many years ago and possibly controlled today.

Regulation of Urban Area and Highway Stormwater Runoff

The lack of technical validity of the US EPA's current approach for regulating chemical constituents can best be understood in terms of what is happening today in the regulation of urban area and highway stormwater runoff. In January 1998 the US EPA Region 9 and Headquarters in Washington, DC reaffirmed the position that NPDES-permitted urban area and highway stormwater runoff must ultimately be treated sufficiently so that it does not cause or contribute to violations of water quality standards for the runoff receiving waters. While the timetable over which this requirement is to be implemented is not specified, it could be as short as about three years associated with certain California cities and stormwater management agencies' renewal of the current NPDES stormwater runoff permits. Environmental activist groups, through litigation, could force the US EPA and state regulatory agencies to require that NPDES-permitted urban area and highway stormwater runoff meet Clean Water Act requirements of not causing or contributing to violations of water quality standards in the receiving waters.

The inappropriateness of the current US EPA's regulatory approach, which focuses on chemical constituent concentrations as opposed to chemical impacts of urban area and highway stormwater runoff-associated constituents on the beneficial uses of waterbodies has been discussed in the attached paper:

Lee, G.F. and Jones-Lee, A., "Appropriate Application of Water Quality Standards to Regulating Urban Stormwater Runoff," Submitted for publication - preprint available from web site <http://members.aol.com/gfredlee/gfl.htm>, July (1998).

This paper discusses the significant technical problems with the Agency's current approach of regulating chemical constituents in urban area and highway stormwater runoff, based on their concentrations relative to worst-case-based water quality criteria and state standards based on these criteria, of the type that the Agency is now using as the primary basis for regulating chemical constituents in aquatic systems. As being implemented now, the development of conventional stormwater runoff BMPs such as detention basins, grassy swales, filters, etc., will cost urban area dwellers on the order of one to two dollars per person per day, in perpetuity. However, as discussed by Jones-Lee and Lee in

Jones-Lee, A. and Lee, G.F., "Stormwater Managers Beware of Snake-Oil BMPs for Water Quality Management," Submitted for publication - preprint available from web site <http://members.aol.com/gfredlee/gfl.htm>, July (1998).

In this paper, Jones-Lee and Lee discuss the inadequacies of traditional urban area and highway stormwater runoff best management practices (BMPs) for treating urban area and highway stormwater runoff so that the residual constituents in the runoff waters do not cause or contribute to violations of water quality standards in the receiving waters for the runoff. In order to achieve this level of treatment, it will be necessary to install, operate, and maintain advanced wastewater treatment systems that would collect and treat all of the stormwater runoff from an area using such techniques as reverse osmosis, ion exchange, activated carbon columns, etc. The cost for implementation of this approach is estimated for part of the Los Angeles area to be on the order of \$50 billion. A large part of these costs are devoted to control of heavy metals that occur in urban area and highway stormwater runoff at concentrations above US EPA worst-case-based water quality criteria. A number of studies have shown, however, that the heavy metals in this type of stormwater runoff are in nontoxic, nonavailable forms. This situation raises significant questions about the need to control heavy metals and other constituents in urban area street and highway stormwater runoff so that they do not cause violations of water quality standards in the receiving waters for the runoff.

Appropriate Use of US EPA Water Quality Criteria

Additional information on the problems with the US EPA's current chemical concentration-based approach is provided in the attached paper.

Lee, G.F. and Jones-Lee, A., "Appropriate Use of Numeric Chemical Water Quality Criteria," *Health and Ecological Risk Assessment*, 1:5-11 (1995). Letter to the Editor, *Supplemental Discussion*, 2:233-234 (1996).

This paper discusses the technically valid approach for using US EPA worst-case-based water quality criteria in a cost-effective water pollution control program.. Dr. Lee served as a member of the US EPA Peer Review Panel that was responsible for development of the criteria development approach that is being used today. He is, therefore, familiar with how these criteria were developed and how they should be used in controlling chemical constituent impacts in a technically valid, cost-effective manner. As discussed in the paper, the criteria should be used as triggers for detection of potential problems, and not as a basis for mechanical development of water quality standards which are established as regulatory limits which cannot be exceeded by any amount more than once every three years.

It is well known by professionals within and outside of the US EPA that the Agency's current chemical concentration-based approach is overprotective in most situations. It has been known since the mid-1980s that the frequency of exceedance, the duration of exposure (one day or four-day averages), and the failure to adjust the worst-case based criteria for aquatic life toxicity/availability can lead to massive public and private expenditures for the control of chemical constituents which

have little or no impact on the beneficial uses of the receiving waters for the constituents present in point and nonpoint source discharges/runoff. For many constituents, considerably greater concentrations than those allowed under current EPA regulatory requirements can occur without adverse impact on the beneficial uses of the receiving waters for the runoff.

Inappropriate Independent Applicability Policy

By far the most significant error made by the US EPA in developing its current water pollution control programs was the adoption, without public review, of its independent applicability policy. The problems with this policy are discussed in the attached paper.

Lee, G.F. and Jones-Lee, A., "Independent Applicability of Chemical and Biological Criteria/Standards and Effluent Toxicity Testing," *The National Environmental Journal*, 5(1):60-63, (1995), Part II, "An Alternative Approach," 5(2):66-67 (1995).

This policy ignores the extensive aquatic chemistry and toxicology literature on how chemical constituents impact aquatic life and other beneficial uses of waterbodies. This policy is based on a 1960s level of understanding of the basic science relating the concentrations of constituents as measured by various standardized analytical methods, and their impacts on the beneficial uses of waterbodies of concern to the public. While the US EPA management and many others understand and acknowledge that the independent applicability policy should never have been adopted, much less persist today, the Agency management thus far has failed to adequately address this issue. It was encouraging to find that the US EPA staff at the AMPRM meeting that was held in Philadelphia the last week of August 1998, is at least considering modifying this Policy. The modifications discussed thus far, however, fall far short of addressing the fundamental errors that were made, and that persist associated with the continued use of this Policy. Current policy assumes that any violation of any magnitude of a water quality standard that occurs more than once every three years is a violation that must be corrected through constituent control, which typically means construction of additional treatment works. The Agency should provide the NPDES permittee the opportunity to conduct site-specific studies that would determine whether the exceedance of a water quality standard represents a real, significant impairment of the beneficial uses of the water in which the exceedance occurs. Where such problems are found, the regulatory approach should allow the permittee to control those sources of the constituents responsible for the use impairment to the maximum extent practicable and economically feasible, considering the benefits that the public may realize in improved beneficial uses of the waterbody as a result of the expenditure of funds for the pollutant control.

While the Agency has developed guidance on how to adjust the worst-case-based water quality criteria/state standards so that they more appropriately regulate chemical constituents in NPDES-permitted sources than is being done today, this guidance falls far short of adequately and reliably addressing the over-regulation that commonly occurs with the current Agency's approach of focusing on chemical constituent concentrations, rather than their impacts. At this time, there has been little incentive for POTW dischargers to apply this guidance, primarily because of the

independent applicability policy and the significant deficiencies in the guidance in addressing the over-regulation.

Summary of Areas of Needed Attention

In summary, before the US EPA implements the proposed new regulatory requirements set forth in the Interim Draft Plan, which would add more constituents to the list of constituents that would be over-regulated, the Agency should devote considerable attention to correcting the significant technical problems in how the US EPA water quality criteria are being implemented into NPDES-permitted wastewater discharge limits, and will be implemented under the current regulatory regime to urban area and highway stormwater runoff. The first steps that should be taken are to terminate the use of the independent applicability policy, and shift the water pollution control program in this country from a chemical concentration-based to a chemical impact-based program. The Agency should immediately address the significant over-regulation that occurs with the frequency of exceedance of a water quality standard from once every three years to an approach that will be protective of beneficial uses, without significant over-regulation. Further, the somewhat arbitrary translation of acute and chronic toxicity-based criteria to a one-hour average and a four-day average implementation approach should be abandoned in favor of a more appropriate concentration- of-toxic-form/duration-of-exposure relationship that properly incorporates aquatic chemistry/toxicology information on toxicity as a function of duration of exposure.

Regulation of Urban Stormwater Runoff

The Agency should devote considerable attention to addressing the problems that are beginning to occur in California and will soon occur across the nation associated with requiring that NPDES-permitted urban area and highway stormwater runoff must, within a few years, not cause or contribute to water quality standards violations. In cooperation with urban area and highway NPDES-permitted stormwater management agencies, regulatory agencies, environmental groups, and the public, the Agency should promote watershed-based, representative, site-specific studies at several locations across the country to determine the real, significant water quality problems associated with urban area and highway stormwater runoff-derived constituents that are occurring in the receiving waters for the runoff. Based on the results of these studies, the Agency should develop a technically valid, cost-effective regulatory program that could be used to control the real, significant water quality problems - use impairments caused by urban area residential and commercial street and highway stormwater runoff-associated constituents to the maximum extent practicable and economically feasible. The implementation of this program should consider the improvements in the designated beneficial uses of the receiving waters for the treated runoff as a result of expenditure of public and private funds for constituent control.

Where violations of water quality standards are occurring in urban area and highway stormwater runoff, the Agency should promote and help fund site-specific investigations to determine if these violations represent significant use impairments or are simply administrative violations that reflect the overly protective nature of water quality standards, including site-specific standards that

evolve from the US EPA's worst-case-based water quality criteria. Adoption of the approaches advocated herein would begin to address the well-known significant over-regulation that is occurring throughout the country in NPDES-permitted wastewater discharges and stormwater runoff.

Specific Comments

Comments on the Water Quality Criteria and Standards Plan Priority Areas are presented below.

Ambient Water Quality Criteria. Review of the Agency's proposed activities for developing aquatic life criteria states on Page 17 that the Agency will "*Review the need for adjustments to frequency and duration components of existing guidelines by the end of 2000.*" There is no need to spend a year and a half reviewing the need to adjust the frequency and duration for implementation of the US EPA water quality criteria. The need for correcting the errors made in the current approach has been known for over 15 years. The Agency should immediately begin an aggressive program to correct this very significant problem that leads to gross over-regulation in many situations.

Beginning on Page 19 is a discussion of sediment quality protection where, in the first paragraph, it is stated, "*As successful as the aquatic life criteria have been in improving the quality of the Nation's waters, many waterbodies are not yet "fishable and swimmable."*" This is more of the Agency's propaganda on the success of the current chemical concentration-based water quality criteria implementation approach. This approach is only successful if wise use of the public's funds is ignored for the regulated constituents and the Agency's failure to develop a credible water quality management program for organophosphate pesticides which are toxic to key forms of aquatic life in urban area and some agricultural stormwater runoff - drainage. As discussed herein, the Agency's chemical concentration-based approach will, in fact, fail when applied to urban area and highway stormwater runoff, which could cost the American public hundreds of billions of dollars in unnecessary treatment of stormwater runoff beyond that needed to address real, significant use impairments of the receiving waters for the runoff. The Agency must abandon its chemical concentration-based approach and focus its water pollution control programs on chemical impact approaches

Pages 19 and 20 summarize some of the Agency's activities in contaminated sediment management issues. This discussion, however, fails to point out the significant technical problems that exist in the sediment quality management program that have caused this program to have to abandon its original, ill-conceived goals of developing stand-alone sediment quality criteria that would be used in a mechanical way similar to how water quality criteria are now used to limit discharges of constituents from NPDES-permitted sources. Of particular concern are the Agency's attempts to develop sediment quality guidelines based on Long and Morgan co-occurrence-based values. As discussed by Lee and Jones-Lee in,

Lee, G.F. and Jones-Lee, A., "Evaluation of the Water Quality Significance of the Chemical Constituents in Aquatic Sediments: Coupling Sediment Quality Evaluation Results to Significant Water Quality Impacts," In: WEFTEC '96, Surface Water Quality and Ecology I & II, Vol 4, pp 317-328, Proc. Water Environ. Fed. Annual Conference (1996),

Lee, G.F. and Jones-Lee, A., "Sediment Quality Criteria: Numeric Chemical- vs. Biological Effects-Based Approaches," Proc. Water Environment Federation National Conference, Surface Water Quality & Ecology, pp. 389-400, (1993),

the co-occurrence based sediment quality guidelines are obviously technically invalid and should not be used for any purpose, since they can and normally do provide unreliable information on the water quality significance of chemical constituents in aquatic sediments. The Agency urgently needs

to revise its sediment quality management approaches to focus on well-established biological impact assessments, rather than on chemical concentrations.

Human Health Protection. The protection of human health from bioaccumulatable chemicals must be shifted from a chemical concentration-based to an excessive aquatic organism tissue-based program. The current worst-case-based program for developing bioaccumulation-based water quality criteria leads to gross over-regulation in most situations. This is another example of the lack of technical validity of the Agency's current regulatory program, which ignores the aqueous environmental chemistry of constituents that tend to bioaccumulate in fish tissue.

Nutrient Criteria. In June 1998 the US EPA issued a draft approach for regulating excessive fertilization of the nation's waters, which is based on the development of chemical-specific N and P concentration-based criteria that would be implemented in a manner similar to the current "Gold Book" criteria for toxic substances. The authors have developed, "*Comments on National Strategy for the Development of Regional Nutrient Criteria*," submitted to the US EPA in August 1998, which discusses the significant technical problems with the Agency's proposed approach for managing excessive fertilization of the nation's waters. Again, the Agency is trying to adopt a technically invalid approach focusing on nutrient concentrations rather than nutrient impacts. As discussed in the authors' comments, there is a substantial literature on why standardized chemical concentrations (nutrient criteria/standards) of nutrients are not valid for controlling excessive fertilization. The Agency needs to more appropriately critically review the literature and reformulate a nutrient control strategy that addresses controlling excessive fertilization in a technically valid, cost-effective manner.

Microbial Pathogens. The Agency is moving in an appropriate direction for beginning to control microbial pathogens that impact contact recreation. In addition to bacterial and viral-caused diseases, there is need to incorporate protozoan-caused diseases, as well, into this program. A key area that must be addressed, however, is how to get the local health departments to abandon the use of what are well known to be technically invalid contact recreation sanitary quality indicator organisms. As it stands now, unless this issue is properly addressed, the regulation of contact

regulation will be based on indicators of pathogens that the Agency develops, as well as the technically invalid indicators of pathogens.

Biocriteria. The Agency's development of biocriteria is appropriate. I am concerned, however, about how the Plan presents these criteria, where it states on Page 33, "*EPA envisions that biocriteria and bioassessments will be valuable in managing urban storm water runoff and other wet weather flows. Storm water discharge pollutant monitoring data indicates that pollutant concentrations in storm water runoff can fluctuate drastically from storm to storm. With high variabilities in pollutant concentrations it can be difficult to assess storm water discharge compliance with water quality standards using traditional steady-state chemical criteria. Biocriteria and bioassessments will help to identify the cumulative impact of storm water discharges over time. Using biocriteria and bioassessments, storm water managers will have a more useful management endpoint to determine if the storm water discharges are causing aquatic life impairments and to determine if storm water controls and pollution prevention efforts are effective.*"

While biocriteria and bioassessments have some utility in detecting gross impacts of pollution, they are not sufficiently specific to detect subtle impacts, except under long periods of observation. The primary value of biocriteria will be for addressing the over-regulation that is occurring with the independent application of the chemical-specific worst-case-based water quality criteria/standards.

Total Maximum Daily Loads (TMDLs) and Modeling. The TMDL situation in this country is out of control. US EPA's neglect of this area for years is now trapping the public into technically invalid approaches for regulating chemical constituents. While there is need to regulate true pollutants, i.e. those constituents which impair uses, under a TMDL process, the kinds of TMDLs that are being developed today, which ignore basic principals of aquatic chemistry, aquatic toxicology/biology and water quality can cause the public and private interests to spend large amounts of funds for constituent control with little or no improvement in water quality. Valid TMDLs must be implemented on a watershed basis. So long as nonpoint source pollution is exempt from regulation, valid watershed-based TMDLs will be difficult, if not impossible, to develop. The Agency needs to expand its TMDL program to work toward incorporating higher quality aquatic chemistry, aquatic toxicology/biology/water quality into developing TMDLs that focus specifically on the sources of constituents that are responsible for significant use impairments in various parts of a waterbody and its watershed. Additional information on this issue is available from

Lee, G.F. and Jones-Lee, A., "Aquatic Chemistry/Toxicology in Watershed-Based Water Quality Management Programs," In: Proc. Watershed '96 National Conference on Watershed Management, Water Environment Federation, Alexandria, VA, pp. 1003-1006 (1996).

List of Enclosures

“Comments on Current Deficiencies in US EPA/USDA Water Pollution Control Programs; Suggested Revisions as Part of the Clean Water Action Plan,” (1997).

“Appropriate Application of Water Quality Standards to Regulating Urban Stormwater Runoff,” (1998)

"Appropriate Use of Numeric Chemical Water Quality Criteria," (1996).

"Independent Applicability of Chemical and Biological Criteria/Standards and Effluent Toxicity Testing," (1995).

“Evaluation Monitoring as an Alternative to Conventional Water Quality Monitoring for Water Quality Characterization/Management,” (1998)

"Aquatic Chemistry/Toxicology in Watershed-Based Water Quality Management Programs," (1996).

“Information on the Consulting Activities of Drs. G. Fred Lee and Anne Jones-Lee”

“Summary of Biographical Information, G. Fred Lee and Anne Jones-Lee”

Copies of these, as well as other papers and reports pertinent to this discussion are available as downloadable files from the author's website, <http://members.aol.com/gfredlee/gfl.htm>.