MWD
METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

July 24, 1992

To: Board of Directors (Executive Committee--Information) (Engineering & Operations Committee--Information)

From: General Manager

Subject: Update on Status of Disinfectants/Disinfection By-Products Regulation and Impact of Metropolitan's Research Efforts

Report

In June 1992, the United States Environmental Protection Agency (USEPA) announced that it intends to develop the Disinfectants/Disinfection By-Products (D/DBP) Rule by a process called "regulatory negotiation" or "reg-neg". Reg-neg is an alternative method of developing regulations. It is a collaborative problem-solving process in which a draft rule is developed by consensus among parties affected by the regulation (regulated community, environmental groups, public interest groups, state agencies, product manufacturers, etc.). A feasibility study to determine the likelihood of success of a reg-neg process for the D/DBP Rule is currently under way, and the USEPA intends to make a final decision in September 1992.

The USEPA has used reg-neg successfully for thirteen regulations. The USEPA and the parties who have been involved believe that the process results in significantly better rules, earlier implementation of rules, higher compliance rates, and better working relationships than occurs under the traditional adversarial rulemaking process.

Metropolitan will be a key participant in the D/DBP reg-neg. Edward G. Means, Director of Water Quality, will be the official representative for the National Water Resources Association. Also, other staff will participate through activities in the American Water Works Association (AWWA) D/DBP Technical Advisory Workgroup (AWWA is another group that will be "at the table"), and through activities providing Mr. Means with information and data as the negotiations progress. The reg-neg is anticipated to take 6 to 12 months.

According to the USEPA, the decision to develop the regulation through reg-neg was driven largely by the realization that the complexities and the unknowns of the DBP issue are so great, that any regulation the USEPA develops could result in either higher microbial risk or implementation of costly new technologies which may not significantly decrease DBP risk. The USEPA believes that a collaborative problem-solving process, in which interested parties from various perspectives and areas of

expertise are involved, presents the best opportunity for an optimum solution to this difficult problem.

It is fair to say that the majority of the technical information which led to the USEPA's decision was developed by Metropolitan, or with Metropolitan as a key participant. Attachment 1 lists the key projects, their cost to Metropolitan, the most significant findings, and the impact on the D/DBP rulemaking.

In response to the request of a Director at the May Board meeting, Attachment 2 is an estimate of the total cost savings Metropolitan has experienced due to our Water Quality Division's proactive efforts involving disinfection and the DBP regulations. Many of the figures are approximate, but the estimates convey an accurate idea of the general magnitude of the savings. Highlights include the avoidance of a mandate for granular activated carbon (estimated cost of $2-3 billion for Metropolitan), and the development of the PEROXONE process as an alternative to conventional ozone technology (estimated cost savings of $175 million). It should also be noted that Metropolitan has been instrumental, if not pivotal, in deferring a new DBP regulation until scientific data are available to develop rational new standards (see Attachment No. 3). This provides much needed time to develop better standards, and has an incidental effect of deferring the annual costs for operation and for paying off the capital investment for new facilities (e.g., $40 million per year for PEROXONE for Metropolitan).

Board Committee Assignment

This letter was referred for information to:

The Executive Committee because of its authority to study, advise, and make recommendations with regard to legislation affecting the District, pursuant to Administrative Code Section 2417 (a); and

The Engineering and Operations Committee because of its authority to study, advise, and make recommendations with regard to the production and treatment of water pursuant to Administrative Code 2431 (c).

Recommendation

For information only.

Carl Boronkay

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Attachments

ATTACHMENT 1

Key D/DBP Research Projects, Cost to Metropolitan, and Impact on D/DBP Rule-making

D/DBP Research Project	Cost ($1,000)[1] Total	Cost ($1,000)[1] Metropolitan[2]	Key Findings	Impact on D/DBP Regulation Development
Optimization and Economic Evaluation of Granular Activated Carbon (GAC) for Organics Removal	1,001	701	GAC shifts trihalomethane (THM) speciation from chlorinated to brominated forms, which have higher theoretical cancer risk; also is extremely costly	Significant improvements in technology are needed before GAC can be considered effective for DBP control, therefore, GAC cannot be viewed as a panacea for DBP control
Pilot-Scale Evaluation of Ozone and PEROXONE	2,380	2,100	Effective control of taste and odor, minimal halogenated DBP formation, and compliance with SWTR disinfection requirements can be achieved by ozone; however, ozone produces bromate which may have a higher theoretical cancer risk than THMs	Helped establish disinfection credit for use of ozone; showed that additional study on bromate control is needed before use of ozonation in high bromide waters
Disinfection By-Products in U.S. drinking waters	500	0	Most predominant DBPs upon chlorination are THMs and haloacetic acids (HAAs); ozone followed by chloramines minimizes these DBPs	DBP regulation expanded to include HAAs, as well as THMs; other DBPs dropped from consideration because of low occurrence; ozone/chloramines a promising strategy for DBP control
THM Survey	17	< 1	Determined the extent and costs of nationwide compliance with the existing maximum contaminant level (MCL) of 0.10 mg/L for total THMs. Estimated national capital expenditures were $31-102 million and yearly O&M costs were $8-29 million	Although compliance with the 0.10 mg/L MCL was not particularly costly for water utilities, lowering the MCL significantly below 0.050 mg/L would cause massive numbers of utilities to exceed the MCL and would require billions of dollars of capital expenditures to bring those utilities into compliance

[1] Includes direct costs and labor/overhead costs
[2] Difference between total and amount paid by Metropolitan is the amount paid by AWWA, AWWA Research Foundation, or the USEPA

D/DBP Research Project	Cost ($1,000)[1] Total	Metropolitan[2]	Key Findings	Impact on D/DBP Regulation Development
Ozone/Bromide/State Project Water Bench-Scale Study	95	95	Ozonation of SPW produced bromate and cyanogen bromide; ammonia addition prior to ozonation did not reduce bromate formation; reducing pH prior to ozonation shows promise for bromate control	Additional study on bromate control is needed before use of ozone in high bromide waters
Identification and Occurrence of Ozonation By-Products in Drinking Water	500	120	Some ozone by-products can be removed through biologically active filter; GAC can be used for this purpose without regeneration; bromate formation can be significantly reduced by lowering pH of ozone contactor influent.	Feasible ozone by-product control strategies can probably be developed with additional research
AWWA D/DBP Database and Model Project	190	40	Established database on THM and HAA formation kinetics and impacts of various water quality parameters; developed chlorine residual decay equations.	Information on THM and HAA formation used to develop equations for a mathematical model to predict THM levels under various regulatory scenarios
Effect of Coagulation and Ozonation on Formation of Disinfection By-Products	354	54	Optimized alum coagulation removes organic DBP precursors but not bromide, providing poor control for brominated THMs; also established large database on bromate formation upon ozonation of waters nationwide	Showed that ability of optimized coagulation for THM control is limited; bromate data will be used by the USEPA to develop a mathematical model to predict bromate formation under a variety of treatment scenarios

D/DBP Research Project	Cost ($1,000)[1] Total	Cost ($1,000)[1] Metropolitan[2]	Key Findings	Impact on D/DBP Regulation Development
Mathematical Modeling of THM and HAA Formation	100	0	THM predictive equations developed by the USEPA have serious limitations; those developed by AWWA are better, but still have important limitations; HAA equations were developed, but have important limitations	DBP mathematical modeling inadequate at this time; DBP regulations must have basis other than mathematical models
Characterization of Natural Organic Matter in Support of Bench-Scale Evaluation of Chemical Coagulation	19	19	Coagulation removes primarily humic and high molecular weight organic matter; nonhumic and low molecular weight organic matter is poorly removed	Optimized coagulation cannot be relied upon for DBP control in all waters
National Survey of Bromide Ion Concentration in Drinking Water Sources	87	25	Bromide occurs in source waters nationwide, not just in areas impacted by seawater intrusion.	Bromate formation upon ozonation is a nationwide issue, not a regional one
Evaluation of Safe Drinking Water Act Impacts on Metropolitan Member Agencies	197	12	Ozone/Chloramines is the most cost-effective means for meeting THM regulations for most of Metropolitan's member agencies	Data used to evaluate USEPA's mathematical model of THM formation and control
Bay-Delta THM Modeling	100	100	Clearly demonstrated water quality degradation (increased DBP formation) in Sacramento-San Joaquin Delta; developed predictive equations for THM formation in SPW	Clearly established need for source protection to control THMs

D/DBP Research Project	Cost ($1,000)[1] Total	Metropolitan[2]	Key Findings	Impact on D/DBP Regulation Development
Ozonolysis By-Products Research	42	42	Improved methodology for measuring aldehydes produced by ozonation	Allows measurement of an important ozone by-product
Biologically Active Filtration for Control of Assimilable Organic Carbon (AOC) and Aldehydes	130	130	AOC and aldehydes produced by ozone can be removed through biologically active filtration	Biologically active filtration may be an effective means for controlling some ozone DBPs
Demonstration-Scale Testing of Ozone and PEROXONE	23,000	21,600	Project recently begun; full-scale optimization of ozonation and PEROXONE treatment for taste and odor control, SWTR disinfection requirements, minimization of DBPs (including bromate)	Will provide critical data on feasibility of ozone and PEROXONE for disinfection and DBP control
Chlorate from Use of Hypochlorination	160	3	Chlorate, a compound of health concern, is produced upon storage of liquid chlorine used for drinking water disinfection; elevated temperatures increase formation	Chlorate occurrence is not restricted to utilities using chlorine dioxide (as was previously assumed); proper storage of chlorine feedstocks can minimize chlorate formation
Regeneration of GAC	202	202	Thermal regeneration of GAC in Southern California in quantities required to minimize DBPs would be extremely difficult, from the point of view of cost and of public acceptance	Limitations to GAC include air quality issues, as well as increased brominated THMs and cost

ATTACHMENT NO. 2

BENEFITS REALIZED FROM THE WATER QUALITY DIVISION'S PROACTIVE APPROACH ON WATER QUALITY REGULATIONS

ITEM	BENEFIT
o GAC pilot work	Showed GAC does not significantly decrease THM risk and is not economical ($2-3 billion savings)
o Pilot and demonstration evaluation of ozone/ PEROXONE	Probable $175 million cost reduction in ozone retrofit
o Identified bromate issue with ozone	Deferral of ozonation online date. Each year of delay avoids $40 M/year for PEROXONE
o Eliminate filter-to-waste, post-filtration disinfection, mandatory CT in Surface Water Treatment Rule (SWTR)	Avoided costs of major plant modifications ($10-100 million or more savings)
o CT (disinfection) credit for ozone under SWTR modified	Reduced probable ozone dose by 0.5 mg/L ($20 million savings)
o Showed that backwash coagulants not necessary (SWTR)	Avoided cost of facilities and chemicals (cost savings undetermined)
o Pathogen Monitoring Program	Avoided both cost of additional disinfection, as well as higher levels of DBPs, by demonstrating low pathogen occurrence in source waters (cost savings undetermined)
o Nitrification Study	Minimize labor, disinfection requirements for nitrification problems (cost savings undetermined)

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ATTACHMENT NO. 3

CHRONOLOGY OF DBP REGULATION DEVELOPMENT

Period	Regulatory Proposal or Direction
1986	Safe Drinking Water Act Amendments
1986 - 1988	GAC under consideration as Best Available Technology (BAT) for DBP control
1989 - 1991	THM standard tightened from 100 to 25-50 μg/L, facilities online in 1996
1991 - 1992	Two phased regulation with optimized use of conventional coagulation/ filtration until 2001
Beyond 1992	Regulatory Negotiation

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