Public Comment
Anti-Degradation Policy
Deadline: 12/17/08 by 12 noon

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SWRCB EXECUTIVE

December 17, 2008

Jeanine Townsend, Clerk to the Board
State Water Resources Control Board
1001 I Street, 24th Floor
Sacramento, CA 95814

SENT BY ~~EMAIL TO~~
commentletters@waterboards.ca.gov

Re: ***Comment Letter – Anti-degradation Policy (Resolution 68-16)***

Dear Ms Townsend:

Contra Costa Water District (CCWD) appreciates the opportunity to provide this letter with its comments on the questions posed in the Notice of Staff Workshop for the Periodic Review of the "Statement of Policy with Respect to Maintaining High Quality of Waters in California" (Anti-Degradation Policy adopted as State Water Resources Control Board Resolution No. 68-16).

CCWD will not address the questions pertaining to groundwater, and takes no position with regard to the Anti-Degradation Policy and the implementation procedures as contained in APU 90-004 (Implementation for NPDES Permitting) as they pertain to groundwater. The remainder of this letter will respond to the four questions posed in the Notice.

1. Should the State's Anti-degradation Policy be revised as it pertains to surface waters? If so, how should it be revised?

CCWD believes that the Anti-degradation Policy, enacted in October 1968 by the then newly created State Water Resources Control Board ("SWRCB"), as Resolution No. 68-16, is fundamentally sound in its present form. It begins by paraphrasing Water Code section 174[1]: "it is the policy of the State that the granting of permits and licenses for unappropriated water and the disposal of wastes into the waters of the State shall be so regulated as to achieve highest water quality consistent with maximum benefit to the people of the State," and that "the quality of some waters of the State is higher than that established by the adopted policies and it is the intent and purpose of this Board that such higher quality shall be maintained to the maximum extent possible." The SWRCB then resolved that (1) "the existing quality of water ... better than the quality established in policies ... will be maintained until it has been demonstrated to the State that any change will be consistent with maximum benefit to the people of the State, will not unreasonably affect present and anticipated beneficial use of such water and will not result in water quality less than that prescribed in the policies," (2) "Any activity which ... discharges or proposes to discharge to existing high quality waters will be required to meet waste discharge requirements which will result in the best practicable treatment or control of the discharge necessary to assure that ... the highest water quality consistent with maximum benefit to the people of the State will be maintained."[2]

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1. The first paragraph of section 174 comprises a legislative finding underlying the creation of the present State Water Resources Control Board "in order to provide for the orderly and efficient administration of the water resources of the state." The second paragraph states the Legislature's intention "to provide for consideration of water pollution and water quality, and availability of unappropriated water whenever applications for appropriation of water are granted or waste discharge requirements or water quality objectives are established."

2. The third "resolved clause" – "the Secretary of the Interior will be kept advised and will be provided with such information as he will need to discharge his responsibilities under the Federal Water Pollution Control Act" – although innocuous, is somewhat dated, as it predates the creation of the US EPA and the reporting requirements of the Clean Water Act.

There is little to quarrel with in this policy, although certain phrases clearly show their 40-year-old vintage. For example, the phrase "the quality established in policies" could be updated to refer to "adopted water quality control plans" rather than to "policies." In the second "resolved clause," there are several parameters besides "volume" and "concentration" that could be referenced (e.g., "total maximum daily load"). Should the SWRCB choose to update the third "resolved clause," it would make sense to explicitly incorporate the federal anti-degradation policy first adopted in 1968 and set forth since 1975 as 40 CFR 131.12.

2. **Should the implementation procedures as contained in APU 90-004 be revised? If so, how should they be revised?**

There is no dispute that much has happened since the current implementation procedures were adopted. A quick glance at the vintage of the documents attached reveals that the procedures, particularly with reference to the federal guidance, are out of date. At a minimum, the applicable portions of the current US EPA Water Quality Handbook, primarily Chapter 4, Antidegradation, [3] and Chapter 5 in Interim Economic Guidance for Water Quality Standards: Workbook (March 1995) attached as Appendix M to the Water Quality Handbook, should be attached or expressly incorporated by reference. The latter provides specific guidance for evaluating the existence of overriding socio-economic benefits.

In incorporating the federal antidegradation materials, the SWRCB should not look at the water quality in 1975 (when 40 CFR 131.12 became effective) as the appropriate baseline for purposes of determining degradation, but should instead look at 1968, when the federal antidegradation was first declared by then Interior Secretary Stewart:

> [I]n order to be consistent with the basic policy and objective of the Water Quality Act a provision in all State standards substantially in accordance with the following is required:
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> Waters whose existing quality is better than the established standards as of the date on which such standards become effective will be maintained at their existing high quality. These and other waters of a State will not be lowered in quality unless and until it has been affirmatively demonstrated to the State water pollution control agency and the Department of the Interior that such change is justifiable as a result of necessary economic or social development and will not interfere with or become injurious to any assigned uses made of, or presently possible in, such waters."

(February 8, 1968 Press Release entitled "Water Quality Degradation Issue Resolved, p. 1.) [4] Indeed, it was this declaration of policy to which California responded by enacting its own anti-

3. US EPA "published" this chapter at http://www.epa.gov/waterscience/standards/handbook/chapter04.html.

4 See U. S. Department of the Interior – Federal Water Pollution Control Administration Compendium of Department of the Interior Statements on Non-degradation of Interstate Waters (August 1968), pp. 5-6, available at http://www.epa.gov/waterscience/library/wqstandards/doiwaters.pdf. Secretary Udall's statement of federal antidegradation policy continues as follows:"This will require that any industrial, public or private project or development which would constitute a new source of pollution or an increased source of pollution to high quality waters will be required, as part of the initial project design, to provide the highest and best degree of waste treatment available under existing technology, and, since these are also Federal standards, these waste treatment requirements will be developed cooperatively." (February 8, 1968 Press Release, *supra*, pp. 1-2.)

degradation policy. [5]

CCWD continues to assert that any action that may result in the degradation of Delta waters must, as a matter of both federal and state law, take into account the impacts on other beneficial uses throughout the Delta. The federal antidegradation policy specifically requires the Board to "assure water quality adequate to protect existing uses fully" "[i]n allowing … degradation or lower water quality." (40 CFR § 131.12, subd. (a)(2).) In fact, the United States Supreme Court has makes clear that states must implement their antidegradation policies:

> EPA has promulgated regulations implementing § 303's antidegradation policy, a phrase that is not defined elsewhere in the Act. These regulations require States to "develop and adopt a statewide antidegradation policy and identify the methods for implementing such policy." 40 CFR § 131.12 (1993). These "implementation methods shall, at a minimum, be consistent with the ... [e]xisting instream water uses and the level of water quality necessary to protect the existing uses shall be maintained and protected." Ibid. EPA has explained that under its antidegradation regulation, "no activity is allowable ... which could partially or completely eliminate any existing use." EPA, Questions and Answers on Antidegradation 3 (Aug. 1985). Thus, States must implement their antidegradation policy in a manner "consistent" with existing uses….

(*PUD No. 1 of Jefferson County, supra*, 511 U.S. at 718-719.) [6]

Similarly, the *Guidance on Implementing the Antidegradation Provisions of 40 CFR 131.12* was issued by Region 9 of the US EPA to "provide[] … guidance for the States of Region 9 on the development of procedures for implementing State anti degradation policies." (*Guidance on Implementing the Antidegradation Provisions of 40 CFR 131.12* (1987) p. 1) The *Region 9 Guidance* document identifies three types of water, each corresponding to the first three subdivisions of the federal antidegradation policy quoted above:

> Tier III waters, which have been designated as Outstanding National Resource Waters (40 CFR 131.12(a) (3)),
>
> Tier I waters, where the water quality is "just adequate to support the propagation of fish, shell fish and wildlife in and on the water,"
>
> Tier II waters, waters "in which water quality exceeds that necessary to support propagation of fish, shellfish and wildlife and recreation in and on the water."

(*Region 9 Guidance, supra*, p. 2.) The *Region 9 Guidance* document goes on to unequivocally state that "actions which would lower water quality in [either Tier I or Tier III] waters are prohibited." (*Region 9 Guidance, supra*, p. 4.) The *Region 9 Guidance* document explains the first step of any analysis of whether to relax water quality objectives as follows: "If the action could or will lower water quality, and the affected water is not a Tier I or Tier III water,

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5. After the provisions discussed in the text and the next note, the Resolution No. 68-16 went on to further resolve "that a copy of this resolution be forwarded to the Secretary of the Interior as part of California's water quality control policy submission."

6. The antidegradation policy is not merely a federal regulation; it has been incorporated as a substantive requirement of the Clean Water Act. (*PUD No. 1 of Jefferson County*, supra, 511 U.S. at 705; *Region 9 Guidance, supra*, p. 1 ("Section 303(a) (4) of the Clean Water Act explicitly refers to satisfaction of the antidegradation requirements of 40 CFR 131.12 prior to taking various actions which would lower water quality.").)

then the steps to be followed to determine whether or not 40 CFR 131.12 is satisfied are described in the following sections of this guidance." (*Region 9 Guidance, supra*, p. 4.) [7]

The federal antidegradation policy [8] is very specific about what the Board may lawfully consider in determining whether to allow the possible degradation of Tier II waters: "that quality shall be maintained and protected *unless the State finds … that allowing lower water quality is necessary to accommodate important economic or social development* ***in the area in which the waters are located.***" (40 CFR § 131.12, subd. (a)(2) (emphasis added).) [9]

CCWD submits that the phrase "the area in which the waters are located" effectively requires that the Board evaluate the water quality impacts of relaxation throughout the Delta when considering impacts caused by actions within, or upstream of, the Delta. This means that – assuming that it properly concludes that the waters in question are Tier II waters – that the Board must maintain the existing objectives "unless the State finds … that allowing lower water quality is necessary to accommodate important economic or social development" in (and immediately adjacent to) the Delta.

CCWD further asserts that, in order to provide the "hard look" at possible environmental effects that CEQA requires, even in the certified regulatory program context, such studies must review the impacts of the activity on water quality elsewhere in the Delta. Modeling activities are often necessary to properly review such impacts, and that the results of these modeling runs should include water quality impacts at the location of municipal intakes and other key long-term monitoring stations within the Delta, with discussion of the maximum and minimum daily values. Finally, the analysis of water quality impacts must look not only at the incremental effect of the activity under review but must also examine the cumulative impacts of other water-degrading activities.

3. **Should the implementation procedures be formally adopted as guidance or regulations by the State Water Board?**

CCWD believes that there is merit in the federal practice of using formally adopted guidance documents, as doing so would make an unequivocal statement of the importance of following those procedures. CCWD is not convinced that it is necessary to go the next step and adopt the procedures as a regulations, as it tends to complicate subsequent revisions, which might be called for, particularly with respect to pharmaceuticals and other emerging contaminants as described in the accompanying excerpt from the Summary of Drinking Water

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7 The "sections" referenced in the quotation in the text describe 4 tasks in deciding whether to allow degradation of Tier II waters: "Task A – Identify Actions that Require Detailed Water Quality and Economic Impact Analyses; Task B – Determine that Lower Water Quality will Fully Protect Designated Uses; Task C – Determine That Lower Water Quality is Necessary to Accommodate Important Economic or Social Development in the Area in which the Waters are Located; and Task D – Complete Intergovernmental Coordination and Public Participation." (*Region 9 Guidance, supra*, pp. 5-12.)

8. Although the federal antidegradation policy emphasizes protection of instream beneficial uses, especially protection of aquatic organisms, "the actual objective of the [Clean Water A]ct is to 'restore and maintain the chemical, physical, and biological integrity of our Nation's waters (section 101(a)" (EPA, Questions and Answers on Antidegradation, App. G to (EPA Water Quality Handbook, Second ed. (Aug. 1994), p. 3).

9. The omitted phrase requires the Board to "full[y] satisf[y] the intergovernmental coordination and public participation provisions of the State's continuing planning process."

Quality Issues submitted to the SWRCB in December 2007. [10] The procedure set forth in Water Code section 13147 may provide a useful model, provided that stakeholder input is obtained along with the input from the regional boards.

4. **Should the implementation procedures in APU 90-004 be expanded beyond the point source discharge permitting program?**

In light of the clear mandate that the SWRCB take water quality into account in water permitting and similar actions, CCWD does not believe that it is necessary to add procedures for doing so into the implementation procedures. A reference to these procedures in the regulations or other guidance documents pertaining to water right processing would, of course, be appropriate as desired. A more likely area for possible expansion would be the programs for discharges other than from point sources, but CCWD leaves it to others more affected by such programs to address the particulars about this might best be accomplished.

Yours Very Truly,

Carl P A Nelson

Carl P. A. Nelson

10. The full title of the referenced document is "Summary of Drinking Water Issues and Requested Permit Conditions for the Sacramento Regional Wastewater Treatment Plan NPDES Permit Renewal, December 2007." The document was submitted by Alameda County water District, Alameda County Flood control and Water Conservation District, Zone 7, CCWD, Metropolitan Water District of Southern California, and Santa Clara Valley Water District. Copies of pages 6 through 20 -- with permit-specific text removed -- of that Summary (which originally appeared under the heading, "**Discussion of Drinking Water Quality Issues and Concerns**") accompany this letter.

Summary of Drinking Water Quality Issues and Requested Permit Conditions for the Sacramento Regional Wastewater Treatment Plant NPDES Permit Renewal

Submitted by:

Alameda County Water District
Alameda County Flood Control and Water Conservation District, Zone 7
Contra Costa Water District
Metropolitan Water District of Southern California
Santa Clara Valley Water District

December 2007

Nutrients

Issue

Elevated levels of nutrients (phosphorus and nitrogen compounds) can stimulate nuisance algal and aquatic weed growth that includes production, by specific Cyanobacteria, of noxious taste and odor compounds and algal toxins. In addition to algal produced taste and odor and algal toxin concerns, increases in algal and aquatic weed biomass can impede flow in conveyances, shorten filter run times and increase solids production at drinking water treatment plants, and add to organic carbon loading.

Current Water Quality Problems

Nutrient levels in water diverted from the Delta are already at concentrations that can produce nuisance algal and aquatic weed growth and adversely affect drinking water beneficial uses. Frequently annual phosphorus concentrations at Clifton Court Forebay have averaged 0.11 mg/L and total nitrogen has averaged 0.87 mg/L. Phosphorus is significantly higher than the 0.020 to 0.042 mg/L that has been associated with a high risk of nuisance growth and eutrophication.[7; 8] Levels of both nutrients exceed USEPA Ecoregion I phosphorus and total nitrogen reference conditions of 0.047 mg/L and 0.31 mg/l, respectively[9; 10] (Exhibit 1, Table 3). Ecoregion I includes the Central Valley.

Literature values and USEPA's ecoregion reference conditions[11] provide a starting point for determining whether nutrient concentrations in Delta waters are at levels that could cause water quality impairments, such as algal production of compounds that produce noxious tastes and odors. More importantly, there is already significant evidence of nutrient-related adverse impacts from Delta water. Through 2006, DWR has treated Clifton Court Forebay for aquatic weeds and algae multiple times each summer (Exhibit 5). This practice was halted in 2007, however, over concerns of potential impacts to listed fish species (*id.*). DWR has also treated the South Bay Aqueduct (SBA) to control algae that are stimulated by nutrient-rich Delta exports. Including preventative treatments, DWR has treated the SBA for algal control between 10 and 16 times per year in recent years. Periodic treatment of the California Aqueduct and Southern

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[7] Van Nieuwenhuyse and Jones (1996) and OECD (1992), cited in U.S. Environmental Protection Agency, Office of Water, ***Ambient Water Quality Criteria Recommendations: Information Supporting the Development of State and Tribal Nutrient Criteria; Rivers and Streams in Ecoregion I***, EPA 822-B-01-012 (December 2001): 20, http://www.epa.gov/waterscience/criteria/nutrient/ecoregions/rivers/rivers_1.pdf.

[8] National Academy of Sciences (1972) and Allum, Glessner, and Gakstatter (1977), cited in U.S. Environmental Protection Agency, *Trophic State of Lakes and Reservoirs*, Technical Report E-80-3 (1980).

[9] U.S. Environmental Protection Agency, Office of Water, ***Ambient Water Quality Criteria Recommendations: Rivers and Streams in Ecoregion I*** (December 2001), http://www.epa.gov/waterscience/criteria/nutrient/ecoregions/rivers/rivers_1.pdf. Ecoregion 1 consists of the Central Valley in California and Willamette Valley in Oregon.

[10] The reference condition is the 25th percentile of the nutrient data for sites within the ecoregion and is meant to represent the nutrient concentrations in minimally impacted water bodies.

[11] Significant questions have been raised about the use of reference conditions to establish regulatory criteria for nutrients. Nevertheless, they provide a starting point for evaluating water quality.

California SWP reservoirs is also necessary for the same reason. It has been suggested that algal and aquatic plant growth in the Delta is light limited, a situation that does not exist in the SWP conveyance facilities and downstream reservoirs. Given the increasing environmental concerns about the use of copper-based algaecides, it is likely that effective control will become increasingly more difficult and reduce the ability of downstream users to manage algae-related problems in the future.

The experiences of CCWD, ACWD, Zone 7, SCVWD and MWDSC provide further evidence of the effects of nutrient-related impairments. CCWD experiences algal growth in its Mallard, Martinez and Los Vaqueros reservoirs and in the Contra Costa Canal (Exhibit 6). Source waters for all of these facilities are from the Delta. Regular application of copper sulfate is standard in Mallard and Martinez Reservoirs, especially in the summer months, to control for the formation of toxins, to prevent taste and odor (T&O) problems, and to maintain healthy levels of dissolved oxygen. Copper sulfate is also applied in the Contra Costa Canal.

Even with treatment of the SBA, which conveys Delta water to ACWD, Zone 7, and SCVWD, water agencies still contend with algal-related T&O problems. At ACWD, where the majority of SBA water is treated with ozone, some 226 T&O complaints were received from 2000 to 2005, indicating that present treatment is unable to fully meet consumer acceptance criteria (Exhibit 7). The T&O complaints were related to the presence of MIB (2-methylisoborneol) and/or Geosmin, two algal compounds that are noticeable even at extremely low nanogram/L levels.

Zone 7's retail water supply contractors have also experienced customer complaints due to T&O events (Exhibit 8). Since 2004, Zone 7 has been operating using interim T&O control measures. In 2006, which was a relatively mild algal growth season, these control measures cost approximately $300,000 and were only marginally effective. Therefore, Zone 7's retailers continued to urge Zone 7 to include permanent, more effective T&O improvements to existing treatment plants under the Capital Improvement Program budget. Currently, a feasibility study is underway to identify costs related to such improvements. Initial estimates for the T&O improvements to control algal derivatives range from $9,000,000 to $21,000,000 depending on the technology determined feasible for this application.

Similarly, in recent years SCVWD has had to upgrade its powdered activated carbon (PAC) systems at its Penitencia and Rinconada water treatment plants (WTP) to address algae-related tastes and odors (Exhibit 9). In addition, SCVWD recently upgraded its Penitencia and Santa Teresa WTPs to ozone for primary disinfection in order to reduce disinfection byproducts and to improve the ability to remove taste and odors from source waters. SCVWD also added hydrogen peroxide which, when used together with ozone is intended to help with extreme T&O control. The Penitencia WTP and Rinconda WTPs have had to use PAC in every year since 2003 to ensure that water delivered to the public was aesthetically acceptable. In 2004, the Penitencia WTP used PAC for 97 days, or for more than 3 months of the year.

MWDSC has experienced a particularly large number of T&O episodes in recent years (Exhibit 10).[12] In 2002, MWDSC experienced 12 T&O events in reservoirs and conveyance facilities that required treatment with copper sulfate. Most of these facilities contained SWP water. In 2005, MWDSC experienced another 12 episodes requiring treatment. Even so, water delivered to the public exceeded public acceptance threshold levels for MIB and/or Geosmin in each year from 2001 to 2005. In 2004, concentrations of Geosmin reached 55 ng/L in water served from MWDSC's Joseph Jensen Filtration Plant. Geosmin has an earthy/musty odor that some consumers can begin to detect at concentrations as low as 5 ng/L. The SWP is the source of supply for the Jensen Filtration Plant.

Managing algal blooms through the application of copper sulfate and other aquatic herbicides to reservoirs and conveyance facilities creates other problems. For example, SBA SWP contractors have reported spikes in T&O compounds after the application of copper sulfate due to the large mass of decaying algae and release of off-flavor compounds from within their cells (see, e.g., Exhibit 9). Large masses of decaying algae resulting from copper sulfate treatments can also impact water treatment plant operations, especially during the first couple events of the year (see, e.g., Exhibit 7). SBA water that is treated with copper sulfate also limits the ability of the SWP contractors to use the water for groundwater replenishment, which is a significant operational constraint.

Algal cell death can have more serious consequences as well, since algal toxins can be released. Microcystin, an algal neurotoxin, is currently under consideration for regulation by USEPA under the Safe Drinking Water Act. The North Coast Regional Water Quality Control Board and the USEPA have warned that microsystins from algae blooms in the Klamath River present a significant potential health threat to humans.[13] Blooms of *Microcystis aeruginosa*, Cyanobacteria that produce microcystin, have recently been reported in Delta waters.[14; 15] Although these Cyanobacteria have been detected before and are relatively common, Cyanobacteria blooms in the Delta appear to be occurring at greater frequency. While the data documenting the extent of these algae blooms are limited and the cause of the algae blooms is uncertain, there has been sufficient concern among local public health officials to post warnings against body contact recreation in Delta waters.

In addition to producing toxins, dying algal cells settle to the bottom of a reservoir and exert an oxygen demand on the water. This results in a decline in dissolved oxygen (DO) within the hypolimnion that can be detrimental to benthic and other aquatic organisms. If DO levels fall too low, the water can become septic and hydrogen sulfide can be produced. Hydrogen sulfide is

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[12] Exhibit 10, "Declaration of Mic Stewart, Metropolitan Water District of Southern California," includes presentations given by MWDSC to its member agencies to report on the T&O incidents and the resulting management efforts taken during 2002, 2004, 2005 and 2006. Excerpts from MWDSC's Annual Report to the Drinking Water Program for 2003 through 2006 are also included in Exhibit 10. These excerpts document and describe the complaints received as well as the corrective actions taken.

[13] "Authorities Advise Caution on Klamath River," *The Eureka Reporter*, October 4, 2005. (Exhibit 11)

[14] Mike Taugher, "Effects of Toxic Algae in Delta Unknown," *Contra Costa Times*, October 18, 2005. (Exhibit 11)

[15] Alex Breitler, "Tainted Delta Water May Pose Danger; Toxic Algae Levels High Enough To Kill Pets, Sicken Users," *The Record* (Stockton, CA), September 14, 2007. (Exhibit 11)

toxic to aquatic organisms, can increase oxidant chemical demand in the water treatment process and associated formation of disinfection by-products, and can also exacerbate T&O problems.

In recent years, there have been greater restrictions placed on the use of copper sulfate and other aquatic herbicides in source water reservoirs. As previously mentioned, the application of aquatic herbicides by DWR at Clifton Court Forebay was recently suspended over concerns of impacts to listed fish species in the Delta. The U.S. Army Corps of Engineers, which has jurisdiction over operations and maintenance activities in Clifton Court Forebay, is initiating consultation under Section 7 of the Endangered Species Act to cover this activity. The use of aquatic pesticides is also regulated under the Statewide General NPDES Permit for the Discharge of Aquatic Pesticides for Aquatic Weed Control in Waters of the U.S., adopted by the State Water Resources Control Board (SWRCB) in May 2004.[16] In addition, USEPA has revised the copper sulfate label to limit the relative size of the area that can be treated in any one application and limit the timing of successive applications to protect non-target species. These constraints challenge water agencies' abilities to address T&O and other algae related issues. For example, MWDSC has a comprehensive program to monitor and manage algae in its source water reservoirs. This program was developed to provide an early warning of algae related problems and T&O events to best manage the water quality within its system.[17]

Copper sulfate treatment can also create problems with sludge disposal. Lake and aqueduct treatment temporarily elevates copper concentrations in the drinking water treatment plant influent. Coagulation processes at the treatment plant remove much of this copper, but the copper is then transferred to the sludge. Depending on copper levels in the plant influent and coagulant dose, the sludge may be characterized as hazardous waste requiring special disposal. Sludge from MWDSC's drinking water treatment plant has already been characterized as hazardous waste on more than one occasion due to the presence of copper associated with the application of copper sulfate. In order to minimize copper accumulation at one of its treatment plants, MWDSC established a copper minimization strategy for Lake Skinner, a source water reservoir that accepts both SWP and Colorado River water. Minimizing copper in the system while still effectively addressing T&O concerns presents significant operational challenges.[18]

Treating T&O compounds at the treatment plant creates other risks. MWDSC, CCWD, ACWD and other agencies use ozone as a primary disinfectant at their treatment facilities, which, together with granular activated carbon filter media or hydrogen peroxide, oxidizes and removes most T&O forming compounds. However, Delta water is influenced by the salty waters of the

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[16] In November 2006, USEPA adopted a regulation that adds pesticide application to waters of the U.S. to the list of discharges that do not require NPDES permits. It is uncertain if the SWRCB will rescind the General Permit in response to the USEPA regulation. The SWRCB's chief counsel has recommended that the permit not be rescinded, pending the outcome of legal challenges to the new USEPA regulation (see State Water Resources Control Board, Office of Chief Counsel, "New Pesticide Regulation" (memorandum, January 2, 2007), http://www.waterboards.ca.gov/npdes/docs/aquatic/memorandum.pdf). Permittees can file a Notice of Termination to terminate coverage under the General Permit or continue coverage until the SWRCB determines if any action is needed.

[17] William D. Taylor et al., *Early Warning and Management of Surface Water Taste-and-Odor Events*, Project No. 2614 (Denver, CO: American Water Works Association Research Foundation (AwwaRF), 2006).

[18] MWDSC's copper minimization strategy for Lake Skinner is included in Exhibit 10.

San Francisco Bay and therefore contains bromide, which is oxidized by ozone to form bromate. Bromate is a regulated disinfection by-product and a known human carcinogen. When higher ozone dosages are required to counteract the added demand of increased organic carbon loading, including algae growth, bromate formation is increased[19] and may jeopardize compliance with regulatory limits.

The algal growth potential test (AGP), also called the algal assay procedure (AAP), is used to predict the potential of a water source to support algal growth and to determine the effect of specific nutrients when added to the water.[20, 21] AGP testing of SWP water, during the mid-nineties, by MWDSC illustrates the effect of nutrients on algal productivity (Exhibit 10). In these tests, SWP water was spiked with nitrogen and/or phosphorus. The tests showed that an increase in nitrogen concentration of 2 mg/L resulted in increased algal production, as measured on a dry weight basis, by 70 to 100%. Increases in phosphorus of 0.5 mg/L, in combination with increased nitrogen, acted synergistically to increase algal production by over 100%. Other experiments showed that blending of SWP water with Colorado River water (which is phosphorus limited), significantly increased algal productivity in the blended supplies. Increasing the blend of SWP water with Colorado River water from 0 to 50% increased potential algal production by over 400%. MWDSC's reservoirs such as Diamond Valley Lake contain blended supplies, and the percentage blend could exceed 50%.

Water utilities are caught in the middle. Despite best management practices, treatment with copper sulfate is sometimes the only effective alternative to control algal growth and protect drinking water beneficial uses. The use of copper sulfate, however, has been subject to increasing restrictions. Applicators of copper sulfate now often obtain NPDES permits for the discharge of aquatic pesticides under the SWRCB's General Permit. The need to use copper sulfate to treat planktonic Cyanobacteria could be greatly reduced if nutrient concentrations in source waters were below levels that stimulate algal blooms.

conditions (*id.*). As described previously, nutrient concentrations in Delta water are already at levels that lead to algal blooms and result in serious impacts to drinking water utilities. Any

[19] Issam N. Najm and Stuart W. Krasner, "Effects of Bromide and NOM on By-product Formation," in *Journal AWWA* 87 (1995): 106-115.

[20] Lenore S. Clesceri, Arnold E. Greenburg, and Andrew D. Eaton, eds., *Standard Methods for the Examination of Water and Wastewater*, 20th ed. (Washington, D.C.: American Public Health Association, American Water Works Association, and Water Environment Federation, 1998).

[21] Thomas E. Maloney and William E. Miller, *Algal Assays: Development and Application*, special publication 573 (American Society for Testing and Materials, 1975).

additional increase in nutrients will exacerbate current problems.

Organic Carbon

Issue

Organic carbon, measured as total organic carbon (TOC), is a precursor to many disinfection by-products (DBPs). Increased levels of TOC affect DBP concentrations in two ways. First, higher TOC increases the amount of precursor material available to react with the disinfectant, which increases DBP formation. Secondly, higher TOC can increase the amount of disinfectant required to achieve adequate disinfection, which leads to further DBP formation.

DBPs have been associated with an increased risk of cancer and adverse reproductive outcomes, among other health endpoints. While many DBPs have been identified and some are regulated under the Safe Drinking Water Act, there are others that are not yet known. Even for those that are known, the potential adverse health effects have not been fully characterized.

As indicated in USEPA's Stage 1 Disinfectants and Disinfection Byproducts (D/DBP) Rule, "EPA continues to believe that the Stage 1 DBPR [Disinfectants and Disinfection Byproducts Rule] is necessary for the protection of public health from exposure to potentially harmful DBPs."[22] USEPA also recognizes the connection between TOC levels in source water and the protection of public health. In order to ensure adequate protection of human health, USEPA requires drinking water utilities "to remove specified percentages of organic material (measured as total organic carbon) [from the source of the water supply, i.e., plant influent] that may react with disinfectants to form DBPs. With lower precursor concentrations, lower levels of DBPs will be formed.[23] CALFED has set a water quality target for Delta water of 3.0 mg/L TOC, which recognizes the importance of low precursor concentrations for maintaining drinking water beneficial uses.[24]

[22] U.S. Environmental Protection Agency, "National Primary Drinking Water Regulations: Disinfectants and Disinfection Byproducts," *Federal Register* 63, no. 241 (December 16, 1998): 69,390, http://www.epa.gov/safewater/mdbp/dbpfr.pdf.

[23] TOC removal requirements were added as part of U.S. EPA's 2001 Stage 1 Disinfectants and Disinfection Byproducts Rule which also established a lower MCL for total trihalomethanes and new MCLs for other disinfection by-products.

[24] The 3.0 mg/L TOC target was developed by a panel of drinking water quality experts under contract with the California Urban Water Agencies (CUWA), based on reasonable assumptions regarding future drinking water regulations and available advanced water treatment technology. The CUWA expert panel report titled "Bay-Delta

The Stage 1 D/DBP Rule requires compliance with DBP maximum contaminant levels (MCLs) for trihalomethanes (THM) and haloacetic acids (HAA) as well as the treatment technique requirement designed to remove TOC, as a surrogate for the removal of DBP precursors. The Stage 1 D/DBP Rule includes Step 1 TOC removal requirements that identify the percentage of TOC required to be removed based on the source water TOC and alkalinity levels. The rule also provides a number of acceptable alternative options to the Step 1 removal requirements. For Step 1 requirements, as TOC levels in the source water increase and/or alkalinity decreases, greater TOC removal is required at the water treatment plants. For example, if the influent TOC is between 2.0 mg/L and 4.0 mg/L, and the alkalinity is between 60 mg/L and 120 mg/L, drinking water suppliers must remove 25.0% of the TOC in the source water influent, unless an approved alternative compliance criteria is used. Further in this example, if the TOC concentration exceeds 4.0 mg/L at the same alkalinity, utilities must achieve at least 35.0% removal of TOC, independent of the alternative compliance criteria otherwise utilized. USEPA's Stage 2 D/DBP Rule will make regulatory compliance more challenging as utilities will need to comply with THM and HAA MCLs on a locational basis (average at each compliance monitoring point within the distribution system), rather than on a distribution system-wide average basis, as is currently required in the Stage 1 D/DBP Rule.[25] For some utilities, this may require even greater TOC removal to ensure compliance with DBP MCLs under these new regulations.

Current Water Quality Problems

Levels of TOC in water exported from the Delta regularly exceed 3.0 mg/L and frequently exceed 4.0 mg/L.[26] Drinking water agencies utilizing Delta water that have smaller reservoirs and limited buffering capacity must often remove a higher percentage of TOC in the water treatment process, but even agencies with large reservoirs may need to achieve the higher TOC removal rates.

The Drinking Water Agencies have invested hundreds of millions of dollars to upgrade water treatment plants to utilize ozone as their primary disinfectant. The Stage 1 D/DBP Rule allows utilities that can use ozone to reduce THM and HAA to less than 40 ug/L and 30 ug/L, respectively, to use alternative compliance criteria to avoid enhanced coagulation and additional TOC removal. However, the alternative compliance criteria can only be used if utilities maintain a running annual average (RAA) of influent TOC less than 4.0 mg/L and alkalinity greater than 60 mg/L. If the RAA of TOC levels exceed 4.0 mg/L, the alternative compliance criteria cannot be used, which compromises the substantial investments made in ozone retrofits. In 2005, MWDSC's Mills Filtration Plant, which treats 100 percent SWP water, needed to utilize enhanced coagulation during 3 of 4 quarters that year due to elevated TOC levels (Exhibit 10).

Water Quality Evaluation" is available at http://cuwa.org/library/Bay_DeltaWaterQualityEvaluation.pdf. The CALFED Record of Decision Water Quality Section that includes the TOC target is provided as Exhibit 12.

[25] U.S. Environmental Protection Agency, "National Primary Drinking Water Regulations: Stage 2 Disinfectants and Disinfection Byproducts Rule," *Federal Register* 71, no. 2 (January 4, 2006): 388, http://www.epa.gov/fedrgstr/EPA-WATER/2006/January/Day-04/w03.pdf.

[26] See time series chart of TOC levels at Banks Pumping Plant 1998-2006, from the CALFED Water Quality Program Stage 1 Final Assessment, Final Draft (October 2007). (Exhibit 13)

Even if additional TOC removal is not required, increases in TOC can increase DBP formation. For plants such as CCWD's Bollman and Randall Bold Treatment Plants, MWDSC's Jensen and Mills Filtration Plants, as well as treatment plants owned by the ACWD and the Los Angeles Department of Water and Power that use ozone as the primary disinfectant, increased influent TOC levels will increase the required ozone dosage. Higher levels of ozone in the presence of bromide can increase bromate concentrations, as discussed above. Drinking water suppliers that treat SWP water with ozone already must take steps to ensure that bromate levels do not exceed the bromate MCL. SWP water is high in bromide, and bromate can easily form at levels of health concern, even with well-managed treatment.

Pathogens

Issue

Secondary wastewater treatment is not very effective in inactivating/removing pathogens such as *Cryptosporidium*. Nor do conventional drinking water treatment plants provide adequate inactivation/removal if source water concentrations are elevated. USEPA's Long Term 2 Enhanced Surface Water Treatment Rule recognizes the importance of source water quality in ensuring safe and healthy drinking water by requiring water utilities to undertake additional treatment or other measures as the concentration of *Cryptosporidium* oocysts in drinking water supplies increases.[28] For conventional drinking water treatment plants, no further treatment or management actions are required if the source water concentration is less than 0.075 oocysts/L.

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[28] U.S. Environmental Protection Agency, "National Primary Drinking Water Regulations: Long Term 2 Enhanced Surface Water Treatment Rule," *Federal Register* 71, no. 3 (January 5, 2006): 654, http://www.epa.gov/fedrgstr/EPA-WATER/2006/January/Day-05/w04a.pdf; http://www.epa.gov/fedrgstr/EPA-WATER/2006/January/Day-05/w04b.pdf; http://www.epa.gov/fedrgstr/EPA-WATER/2006/January/Day-05/w04c.pdf.

If concentrations equal or exceed this level, however, additional treatment and/or source water protection or other measures are required, regardless of whether or not the detected oocysts are viable. Thus, a reasonable water quality goal for the protection of drinking water beneficial uses would be to ensure that concentrations of *Cryptosporidium* in drinking water supplies do not exceed 0.075 oocysts/L.

California's water quality regulations require every community water system to annually prepare a Consumer Confidence Report (CCR) to inform consumers of the quality of their water supply. (Cal. Code Regs., tit. 22, § 64480.) Under these regulations, *any* detection of *Cryptosporidium* in a water system's raw water must be reported, regardless of the whether the detected oocysts are viable or whether treatment effectively removes the oocysts.[29]

Analytical methodologies for measuring levels of pathogens in surface water and treated wastewater effluent have improved in recent years. USEPA has determined that existing methods are adequate for monitoring the occurrence of pathogens in water samples and determining the level of drinking water treatment and other actions needed to protect public health. USEPA's Long Term 2 Enhanced Surface Water Treatment Rule requires the use of USEPA Methods 1622 or 1623 for measuring pathogen levels in untreated source waters. A recent study addressing the occurrence of *Cryptosporidium* in wastewater effluent using a slightly modified version of Method 1623 found good performance of the method.[30] The study found that matrix spike recoveries of *Cryptosporidium* in secondary treatment wastewater effluent ranged from 33% to 71%, and matrix spike recoveries of *Cryptosporidium* in tertiary treatment wastewater effluent were about 68%.

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[29] "If the system has performed any monitoring for *Cryptosporidium*, including monitoring performed to satisfy the requirements of 40 CFR §141 143 (Information Collection Rule, *Federal Register* 61, p 24354, May 14, 1996), that indicates that Cryptosporidium may be present in the source water or the finished water, the Consumer Confidence Report shall include a summary of the monitoring results and an explanation of their significance." (Cal. Code Regs., tit. 22, § 64481, subd. (e).)

[30] Randi M. McCuin and Jennifer L. Clancy, ***Cryptosporidium in Wastewater: Occurrence, Removal, and Inactivation***, Report 98-HHE-1 (Alexandria, VA: Water Environment Research Foundation (WERF), 2006). Executive Summary available at http://www.werf.org/AM/CustomSource/Downloads/uGetExecutiveSummary.cfm?File=ES-98-HHE-1.pdf&ContentFileID=4645.

Salinity

Issue

Elevated levels of TDS, a measure of salinity, can adversely affect household plumbing, water heaters and other appliances; industrial process water uses such as for cooling towers; water recycling activities; groundwater replenishment; agricultural crops; automotive cooling systems; and the amount of soap/detergent needed to wash clothes and for personal hygiene. High levels of salinity and chloride, one of the constituents of TDS, can also impart an unpleasant taste in drinking water. Many municipal water suppliers have established their own objectives for TDS and chloride based on local requirements.

For example, CCWD has established a chloride goal of 65 mg/L to meet consumer expectations for taste. In 1997, CCWD built the $450 million, voter-approved Los Vaqueros Reservoir to improve delivered water quality for its customers, and has continued with significant investments in water treatment and distribution system enhancements to improve delivered water quality and meet consumer expectations for taste (Exhibit 6). Prior to building the Los Vaqueros Reservoir, CCWD used direct diversions from its Delta intakes to provide water to its customers. Thus, salinity levels in CCWD's delivered water varied widely throughout the year, and often reached levels that customers found objectionable. Since Los Vaqueros Reservoir was built, CCWD has operated it to provide customers with lower salinity water year round, greatly decreasing salinity-related complaints.

Zone 7's retail agencies also experience consumer complaints due to elevated levels of salinity. Moreover, to permit regional use of recycled water, the San Francisco Regional Water Quality Control Board required Zone 7 to adopt a Salt Management Program (which is, in turn, part of the Groundwater Management Plan) (Exhibit 8). One component of local salt management is to use SWP water conjunctively to recharge the groundwater basin which not only reduces the salt loading but also allows for local banking with later use of the reserves in drought periods. Another part of the valley's salt management program is to remove excess salts through use of demineralization facilities. Higher salinities in SWP water will require additional demineralization facilities for salt management and water quality purposes, which necessitate not only higher capital expenditures but also ongoing increases to operations and maintenance costs due to the energy-intensive reverse osmosis (RO) technology used for demineralization.

MWDSC has established a TDS goal of 500 mg/L to minimize economic and aesthetic impacts to the Southern California region and meet customer expectations (Exhibit 10). While TDS in SWP water is below the target, MWDSC depends on low salinity SWP water to blend with high salinity Colorado River supplies. Similarly, Zone 7 has a salinity goal of 500 mg/L and relies on lower salinity SWP water to blend-down higher-salinity ground water. Article 19 (a) of the State Water Contract sets a target of 220 mg/L for salinity and 55 mg/L for chlorides over the long term for SWP deliveries, although the target is rarely achieved. The SWRCB's Water Quality Control Plan for the Bay-Delta includes salinity standards for locations within the Delta to protect beneficial uses. The salinity standards are enforced in part through restrictions on water project operations. Currently, the western and southern portions of the Delta are listed as impaired, under section 303(d) of the Clean Water Act, for electrical conductivity, a measure of salinity.

The level of salinity in imported water supplies has a direct economic impact to water consumers and utilities. MWDSC and the United States Bureau of Reclamation (USBR) developed a salinity economic impacts model that assessed the overall impact of changes in salinity of MWDSC water supplies.[33] The model estimates that the total regional economic impact associated with increasing the TDS of MWDSC supplies by 100 mg/L is approximately $95 million per year.

Increases in the river's salinity further contribute to exceedances of water utility targets, adversely affect the ability to meet salinity standards within the Delta, shift the economic burden of higher salinity to the downstream user and/or increase the amount of water needed for blending purposes[34]. The western and southern portions of the Delta has already been designated as impaired for electrical conductivity and further increases in salinity contribute to the impairment.

Emerging Contaminants

Issue

Significant attention has been paid recently to pharmaceuticals, personal care products and other unregulated xenobiotics that have been detected in the nation's water supply. These compounds can disrupt the endocrine system and other biological functions, and some compounds have already been associated with adverse reproductive outcomes in aquatic life. A study upstream and downstream of two wastewater treatment plants in Colorado found skewed sex ratios, fish with altered reproductive systems and reduced fertility in downstream waters.[35]

33 Metropolitan Water District of Southern California and U.S. Bureau of Reclamation, *Salinity Management Study: Final Report* (June 1999). (Included in Exhibit 10)

34 Water suppliers that depend on low salinity water from the Delta to blend with other higher salinity supplies need to divert more water from the Delta as salinity rises in order to meet salinity blending targets.

35 David Norris et al., "Estrogenic Chemicals in Wastewater: Effects on Fish Reproduction" (paper presented at the American Water Works Association's Water Quality Technical Conference, Denver, CO, 2006).

In 1999 and 2000, the United States Geological Survey (USGS) conducted a nationwide reconnaissance of the occurrence of pharmaceuticals, hormones, and other organic wastewater contaminants in streams across 30 states.[36] Six of the sites selected were located in the Central Valley, although none directly downstream of the SRWTP discharge location.[37] Another USGS study investigated the occurrence of pharmaceutical compounds in Las Vegas Wash and Lake Mead, within the Colorado River system.[38] These sampling locations were downstream of large municipal wastewater treatment plants and the constituents found may be considered typical of those that may be found downstream of other wastewater treatment plants such as SRWTP.

The California State Water Project Watershed Sanitary Survey – 2006 Update (2006 SWP Sanitary Survey) presents an overview of the issues associated with emerging contaminants and cites a number of studies that identify the presence of these contaminants within the SWP system. The 2006 SWP Sanitary Survey cites a study (Daughton, 2006a, Snyder et al., 2005) that indicates "although PPCPs [pharmaceuticals and personal care products] and EDCs [endocrine disrupting compounds] can potentially originate from numerous sources and enter the environment by many routes, municipal wastewater treatment plant effluents have been identified as a major source of these chemicals in surface waters." EDCs and PPCPs are not completely removed by current wastewater treatment technologies and are often found in treated effluent. The section from the 2006 SWP Sanitary Survey that discusses emerging contaminant issues is included as Exhibit 15. (The full 2006 SWP Sanitary Survey is submitted separately in CD format.)

Efforts are underway by drinking water agencies to better understand the impacts of emerging contaminants within California's drinking water supply. MWDSC and the Orange County Water District have begun a study, funded through the National Water Research Institute (NWRI), on the source, fate and transport of endocrine disruptors, pharmaceuticals, and personal care products in drinking water sources in California. Three major drinking water sources are being assessed, which include SWP water, Colorado River water, and the Santa Ana River. Twelve sampling locations have been proposed within the SWP system including sites directly upstream and downstream of wastewater treatment plants. This study will provide a systematic assessment of the occurrence of a wide range of emerging contaminants in major drinking water sources and will evaluate the impact of treated wastewater discharges on a seasonal basis and during wastewater spill events. The NWRI grant proposal for this study is included as Exhibit 16.

Another emerging contaminant that is of significant concern to drinking water agencies is N-Nitrosodimethylamine (NDMA). NDMA, part of a family of very potent carcinogens called

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[36] Dana W. Kolpin et al., "Pharmaceuticals, Hormones, and Other Organic Wastewater Contaminants in U.S. Streams, 1999-2000: A National Reconnaissance," in *Environmental Science & Technology* 36, no. 6 (2002). (Exhibit 14)

[37] Exhibit 14 includes a table that identifies these sites and the occurrence of the selected organic wastewater constituents at each location.

[38] U.S. Geological Survey, *Human-Health Pharmaceutical Compounds in Lake Mead, Nevada and Arizona, and Las Vegas Wash, Nevada, October 2000-August 2001*, by Robert A. Boyd and Edward T. Furlong, open-file report 02-385 (Carson City, NV, 2002), http://pubs.usgs.gov/of/2002/ofr02385/ofr02385.pdf.

nitrosamines, is an organic chemical often formed during wastewater treatment as a disinfection by-product of chloramination disinfection and organic nitrogen-containing precursors. NDMA is also often present in raw sewage prior to wastewater treatment. NDMA is also an organic chemical that is associated with the use of liquid rocket fuels and has been used in various industrial applications (e.g., fish and rubber processing).

Chlorination of secondary wastewater effluent typically results in the formation of NDMA between 20 and 100 ng/L.[39] Nitrosamine precursors from wastewater plant effluent are also of concern for some utilities as they may react with chloramines during disinfection and form NDMA and other nitrosamines at drinking water treatment plants. Studies indicate that most treated wastewater contains NDMA precursors. One study surveyed 11 drinking water treatment plants in the U.S. and showed that the occurrence of NDMA precursors in wastewater effluent-impacted water supplies is much greater than in other drinking water supplies.[40] Another study compared different treatment processes for the control of NDMA precursors.[41] Figure 16 of this study (included as Exhibit 18) illustrates that NDMA precursors at wastewater treatment plants can often be an order of magnitude higher than those found at drinking water treatment plants, depending on the type of treatment employed.

In Southern California, elevated levels of NDMA have impacted the use of drinking water production wells in areas where groundwater recharge reuse projects have been implemented. Groundwater recharge and injection operations have also been restricted at times due to the presence of NDMA contained in wastewater treatment effluent.[42]

Several nitrosamines, including NDMA, are listed on California's Proposition 65 chemicals list as a chemical known to the state of California to cause cancer.[43] Currently, no drinking water MCL has been established for NDMA (or any other nitrosamine). In 2002, California Department of Health Services (now CDPH) revised its notification levels for NDMA to 10 ng/L (notification levels are non-regulatory, health-based advisory levels established by CDPH for chemicals in drinking water that do not have MCLs), and in December 2006, the California Office of Environmental Health Hazard Assessment (OEHHA) established a Public Health Goal (PHG) for NDMA at 3 ng/L. Notification levels also exist for other nitrosamines, including N-nitrosodiethyamine (NDEA) and N-nitroso-n-propylamine (NDPA), both of which have notification levels of 10 ng/L.

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[39] William A. Mitch and David L. Sedlak, "Factors Controlling Nitrosamine Formation during Wastewater Chlorination," in *Water Science & Technology: Water Supply* 2, no. 3 (2002): 191-198.

[40] See Stuart W. Krasner et al., "Wastewater and Algal Derived N-DBPs" (paper presented at the American Water Works Association's annual conference, Toronto, Canada, 2007). (Exhibit 17, figure 3)

[41] Stuart W. Krasner et al., "Impact of Wastewater Treatment Processes on Organic Carbon, Organic Nitrogen, and DBP Precursors in Effluent Organic Matter" (paper presented at the American Water Works Association's Water Quality Technical Conference, Denver, CO, 2006). (Exhibit 18)

[42] William A. Mitch et al., "*N*-Nitrosodimethylamine (NDMA) as a Drinking Water Contaminant: A Review," in *Environmental Engineering Science* 20, no. 5 (2003).

[43] The Office of Environmental Health Hazard Assessment's (OEHHA) September 28, 2007 list of Proposition 65 listed chemicals can be found at http://www.oehha.ca.gov/prop65/prop65_list/files/P65single092807.pdf.

NDMA has a high potential to degrade in surface water through sunlight photolysis. However, depth and flow conditions in the surface water can impact the degradation potential and NDMA can remain relatively stable in surface water with shallow photic zones.[44] For example, NDMA and other nitrosamines have been found in the South Platte River (downstream of Denver's Metro Wastewater Reclamation District's Central Treatment Plant) at the City of Aurora's drinking water intake location (see Exhibit 20, Slide 16). NDMA levels in the South Platte River have been seen exceeding California's notification level. The City of Aurora is investing in additional treatment technologies, including riverbank filtration and advanced oxidation processes, to address emerging contaminants. Although studies have not been conducted to assess the fate and transport of NDMA in the SWP system, possible light limiting conditions within the Delta could allow NMDA to remain stable in the environment and impact downstream utilities using Delta water; in particular, those utilities with lesser amount of travel time from SRWTP's effluent discharge location.

There are major efforts underway by federal and state regulators to understand the impact of these emerging contaminants on human and aquatic populations and the concentrations at which such impacts might occur. In Southern California, the Santa Ana Regional Water Quality Control Board is considering requiring monitoring for select emerging contaminants in imported supplies, which includes SWP water, used for groundwater recharge.

The USEPA's drinking water Contaminant Candidate List (CCL) is the primary source to prioritize emerging contaminants for research to quantify occurrence in drinking water supplies and determine the resulting human health effects. In this capacity, the CCL also serves as the first step in the regulatory determination process for drinking water supplies. The contaminants on the CCL, many of which are of wastewater origin, are known or anticipated to occur in public water systems; however, they are currently unregulated within the national primary drinking water regulation structure. Contaminants from this list present an unknown threat to public health. If they become regulated, they will then present as-yet unquantified technical and financial challenges to drinking water providers. The list of emerging contaminants currently appearing on the 2005 CCL 2 List from USEPA is provided as Exhibit 21.[45]

Although USEPA announced in May 2007 that it had sufficient health and occurrence information to make the determination not to regulate boron, the dacthal mono- and di-acid degradates, 1,1-dichloro-2,2-bis(p-chlorophenyl)ethylene (DDE), 1,3-dichloropropene (Telone), 2,4-dinitrotoluene, 2,6-dinitrotoluene, *s*-ethyl propylthiocarbamate (EPTC), fonofos, terbacil, and 1,1,2,2-tetrachloroethane, the remaining emerging chemical and microbiological contaminants listed on the CCL are still of concern for drinking water utilities because many of them originate from municipal and industrial wastewater.

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[44] See Baiyang Chen, Paul K. Westerhoff, and Stuart W. Krasner, "Fate and Transport of Wastewater-Derived Disinfection By-Products in Surface Waters," in *Occurrence, Formation, Health Effects and Control of Disinfection By-products in Drinking Water* (Washington, D.C.: American Chemical Society, forthcoming). (Exhibit 19)

[45] Additional information on the USEPA CCL can be found at http://www.epa.gov/safewater/ccl/index.html.

Significant investments are being made by agencies to better understand and address the impacts of these emerging contaminants. Potential monitoring requirements by the Santa Ana Regional Water Quality Control Board and USEPA suggest that source identification will become an important priority for those contaminants that are detected.

Water Agency Investments

Drinking water utilities have already made or have committed to make significant capital investments to address water quality issues related to wastewater discharges and other contaminant sources. CCWD, SCVWD, ACWD, Zone 7 and MWDSC have planned or recently committed over $1 billion to capital programs for treatment to ensure compliance with drinking water regulations and address taste and odor issues that are related to the constituents of concern (see Exhibits 6-10). These water treatment infrastructure upgrades include ozone retrofits and expansions; conversion from direct filtration to conventional treatment, with enhanced coagulation; increased granular activated carbon (GAC) filter media replacement; solids processing and handling; chemical system upgrades, including pH suppression for bromate control; and wellhead demineralization facilities. The increased load as a result of the SRWTP expansion further shifts the economic burden of degraded source water quality to the drinking water agencies, not only in the form of increased capital expenditure, but also in increased operational and maintenance costs associated with water treatment process upgrades and expansion.