SACRAMENTO SUBURBAN WATER DISTRICT

REPORT ON DISTRICT'S WATER QUALITY RELATIVE TO PUBLIC HEALTH GOALS

DATE: August 16, 2010

Background

A provision of the California Health and Safety Code, Section 116470(b), requires all public water systems serving more than 10,000 service connections to prepare a special report by July 1, 1998, and every three years thereafter, that gives information on the detection of any constituents above the public health goals (PHGs). PHGs are non-enforceable goals established by the Office of Environmental Health Hazard Assessment (OEHHA) which is part of California Environmental Protection Agency (Cal-EPA). In contrast, California Department of Public Health (CDPH) adopts maximum contaminant levels (MCLs) for constituents that are enforceable regulatory drinking water standards for all public water systems. The Health and Safety Code specifies the information that is required to be provided in the PHG report, and also requires that where OEHHA has not adopted a PHG for a constituent, the water suppliers are to use the maximum contaminant level goals (MCLGs) adopted by the United States Environmental Protection Agency (USEPA) for this special report. MCLGs are also non-enforceable health goals since MCLGs consider only public health and not the limits of detection and treatment technology, and are sometimes set at a level which water systems cannot meet. A list published by CDPH of all regulated constituents with the MCLs and PHGs or MCLGs is included as Exhibit II.

This special report is unique to California and the purpose of the legislative requirement is to give water system customers access to information on levels of contaminants even below the enforceable mandatory MCLs, including the numerical public health risk associated with the MCL and PHG or MCLG, the category or type of risk to health that could be associated with each constituent, the best treatment technology available that could be used to reduce the constituent level, and an estimate of the cost to install that treatment if it is appropriate and feasible.

This report is required in addition to the extensive public reporting of water quality information that California water utilities have been doing for many years, and in addition to the federally mandated annual Consumer Confidence Reports/Water Quality Reports. Hence, the District has issued the annual report which covers more water quality data in the system in greater depth.

There are a few constituents that are routinely detected in water systems at levels usually well below the drinking water standards for which no PHG nor MCLG have been adopted by OEHHA or the USEPA, including total trihalomethanes. These constituents will be addressed in a future required report after a PHG has been reviewed and adopted.

What are PHGs?

PHGs are set by OEHHA which is part of Cal-EPA and are based solely on public health risk considerations. None of the practical risk-management factors that are considered by the USEPA or CDPH in setting drinking water MCLs are considered in setting the PHGs. These factors include analytical detection capability, treatment technology available, benefits and costs of operating the treatment. The PHGs are not enforceable and are not required to be met by any public water system.

Water Quality Data Considered

A PHG Report was previously submitted in 2007, which included water quality data gathered during 2004, 2005, and 2006. For purposes of determining compliance with drinking water standards for this report, water quality data collected for the District during 2007 and 2009 was considered. This data, along with other detected constituents, are summarized in the 2009 Consumer Confidence Report, which will be mailed to all District customers by June 18, 2010.

Guidelines Followed

The Association of California Water Agencies (ACWA) formed a workgroup which prepared guidelines for water utilities to use in preparing these newly required reports. The ACWA guidelines were used in part for the preparation of this report. No guidance was available from state regulatory agencies.

Best Available Treatment Technology and Cost Estimates

Both the USEPA and CDPH adopt what are known as best available technologies (BAT) which are treatment methods approved by the regulatory agencies for reducing specific contaminant levels to the MCL. Although costs can be estimated for such technologies, many PHGs and all MCLGs are set much lower than the MCL, and it is not always possible, nor feasible, to determine what treatment is needed to further reduce the concentration of a constituent to the PHG or MCLG levels, many of which are set at zero. Estimating the costs to reduce a constituent to zero is difficult, if not impossible, because it is not possible to verify by analytical means that the level has been lowered to zero. In some cases, installing treatment to try and further reduce very low levels of one constituent may have adverse effects on other aspects of water quality. Where the District has not investigated actual treatment costs, this report will use cost estimates for treatment technologies prepared by ACWA.

Constituents Detected That Exceed a PHG or MCLG

During the period of this report, the water quality constituents that are required to be included in this report are coliform, arsenic, tetrachloroethylene, trichloroethylene, uranium, radium-228, lead, and copper. The following is a discussion of each constituent that was detected in one or more of the District's drinking water sources at levels above the PHG or MCLG.

<u>Coliform</u>

Contaminant Name	Health Risk	MCL	PHG	MCLG	Best Available Technology (BAT)
Coliform	Not a health threat in itself; it is used to indicate possible presence of other potentially harmful bacteria	5% in any one month	NA	0% in any one month	1. Protect wells from coliform contamination by appropriate placement and construction. 2. Maintenance of a disinfectant residual in distribution system. 3. Proper maintenance of the distribution system. 4. Filtration and/or disinfection of approved surface water.

Coliform bacteria are indicator organisms that are ubiquitous in nature and are not generally considered harmful. They are used in water quality sampling because of the ease in monitoring and analysis. If a positive sample is found, it indicates a potential problem that needs to be investigated and follow up sampling that needs to be done. It is not unusual for a water system to have an occasional positive coliform sample. It is difficult, if not impossible, to assure that a system will never get a positive sample.

The MCL for coliform is 5% positive samples of all samples per month, but the MCLG is set at zero percent per month. The reason for the coliform drinking water standard is to minimize the possibility of the water containing pathogens, which are organisms that cause waterborne disease. Because coliform is only a surrogate indicator of the potential presence of pathogens, it is not possible to state a specific numerical health risk. While USEPA normally sets MCLGs “at a level where no known or anticipated adverse effects on persons would occur”, they indicate that they cannot do so with coliform bacteria.

During the reporting period for this report, the District collected between 120 to 150 samples per month for coliform analysis. One of these monthly samples was reported as positive for presence of coliform bacteria in November, 2008. The repeat samples required by law from water samples collected upstream, downstream, and location of original sample site were all negative so no additional actions were necessary. The one positive result reflects a 0.81% of the monthly samples collected were positive, which exceeds the federal MCLG of zero per month and is included in this report.

The District adds chlorine to the water supply at each source to assure that the water served is microbiologically safe. The chlorine residual levels are carefully controlled to provide the best health protection without causing the water to have undesirable taste and odor or increasing the disinfection byproduct levels. This careful balance of treatment process is essential to continue supplying District customers with safe drinking water.

The District has already taken most of the steps described by CDPH as BAT for coliform bacteria, which include; an effective cross-connection control program, maintenance of a disinfectant residual throughout the distribution system, and maintaining positive pressures in the distribution system. To provide any additional treatment to reach the MCLG level for coliform may not be effective and is not proposed in this report. Therefore, no estimate of cost has been included for this constituent.

Arsenic

Chemical Name	Health Risk	MCL	PHG	MCLG	Best Available Technology (BAT)
		(ppb)			
Arsenic	Skin disorder; increased risk of cancer	10	0.004	Zero	1. Activated Alumina 2. Coagulation/Filtration 3. Electrodialysis 4. Ion Exchange 5. Lime Softening 6. Oxidation Filtration 7. Reverse Osmosis

Arsenic is a naturally occurring element in the earth's crust and is very widely distributed in the environment. All humans are exposed to microgram quantities of arsenic (inorganic and organic) largely from food (25 to 50 micrograms per day) and to a lesser degree from drinking water and air. A number of recent studies have associated chronic intake of arsenic in drinking water with a number of serious health effects including heart attack, stroke, diabetes mellitus, and hypertension. Other effects of ingested arsenic include decreased production of erythrocytes and leukocytes, abnormal cardiac function, blood vessel damage, liver and/or kidney damage, and impaired nerve function in hands and feet (paresthesia). Characteristic skin abnormalities are also seen appearing as dark or light spots on the skin and small "corns" on the palms, soles, and trunk. Some of the corns may ultimately progress to skin cancer. In addition, arsenic ingestion has been reported to increase the risk of cancer at internal sites, especially lung, urinary bladder, kidney, and liver.[1] Some people who drink water containing arsenic in excess of the MCL over many years may experience skin damage or circulatory system problems, and may have an increased risk of getting cancer.[2]

The District's water system meets the federal and state water quality standards for the presence of arsenic. Although all of the arsenic levels detected in the District were below the state MCL, results from some of the wells showed detections above the PHG of 0.004 parts per billion (ppb). In the North Service Area (NSA), the results from 2005 and 2007 samples ranged from non-detect (ND) to 3.9 ppb, with 26 of the 40 wells showing arsenic presence. In the South Service Area (SSA), the results from 2006 samples ranged from ND to 7.4 ppb, with 23 of the 44 wells showing arsenic presence.

[1] *Public Health Goal for Arsenic in Drinking Water*, OEHHA, April 2004.
[2] 'Appendix 64465-D, Health Effects Language', Title 22, California Code of Regulations

The BAT that the District is using for this report to lower the level below the PHG to 0.004 ppb is reverse osmosis. Since the arsenic levels in wells with the presence of arsenic are already below the MCL, reverse osmosis would likely be required to attempt to lower the level to below 0.004 ppb. The cost estimates for reverse osmosis to reliably treat arsenic to the federal MCLG level could range from $1.49 to $5.39 per 1000 gallons of water treated. If treatment were considered for the District, it has been previously reported the cost could reach approximately $67,951,836 per year, and could result in an assumed increase cost for each customer of $1,562 per year.

Tetrachloroethylene (PCE)

Chemical Name	Health Risk	MCL	PHG	MCLG	Approved Best Available Technology (BAT)
		(ppb)			
PCE	Liver problems; increased risk of cancer	5	0.06	Zero	1. Granular Activated Carbon (GAC) 2. Packed Tower Aeration (PTC

Tetrachloroethylene, also known as perchloroethylene or PCE, is primarily used as a chemical intermediate for the production of chlorofluorocarbons and as a solvent used in cleaning operations (metal cleaning, vapor degreasing, and dry cleaning). In addition, numerous household products contain some level of PCE. Due to widespread use, PCE is a common environmental contaminant. Typical exposures to PCE from drinking water are not expected to result in any acute health effects, due to the low levels involved. Exposure from drinking water can be in the form of household airborne exposures from showering, flushing of toilets, and other contact with water. PCE is readily absorbed through the lungs and gastrointestinal tract, and to a lesser extent, it can be absorbed through the skin. Acute and chronic neurological changes, and liver and kidney toxicity, have been reported in humans and animals exposed to PCE. However, these effects were observed with higher exposures than typical background levels in the general indoor or outdoor environment.[3]

All public water systems, including the District, are required to routinely monitor this chemical along with numerous other volatile organic chemicals. This contaminant was not detected in the NSA, but was detected in one of the 44 active wells in the SSA in June, 2009. Previous results for this well were ND and 2.2 ppb. In 2009, a sample analysis showed a result of 5.9 ppb. Upon receiving these results, the well was immediately removed from service. A verification sample was collected and the result was reported at 10 ppb. This well has remained inactive since, and the electrical motor for this well has been disabled to prevent any potential for accidental use.

As of the date of this report, the final disposition of this well has not yet been determined. If treatment is pursued for this source, CDPH lists the BAT for removing PCE as treatment with granular activated carbon (GAC) or by packed tower aeration (PTA). An analysis of the cost for a neighboring water system which is using GAC to treat the PCE

[3] *Public Health Goal for Tetrachloroethylene in Drinking Water*, OEHHA, August 2001

to MCL levels include $750,000 initial cost and an annual cost projection of approximately $20,000 to $25,000 for replacement charcoal media. In order to consistently remove PCE to below the PHG or MCLG levels may require more extensive GAC treatment with a long empty bed contact time (EBCT). It has been previously reported that the cost to install and operate GAC removal systems to remove PCE to below the PHG is estimated (includes annualized capital and O&M costs) to treat this well that would reliably reduce the PCE level to below the PHG and MCLG would be approximately $1,253,556 per year. This would result in an assumed increase cost for each customer of $28.81 per year.

Trichloroethylene (TCE)

Chemical Name	Health Risk	MCL	PHG	MCLG	Best Available Technology (BAT)
		ppb			
TCE	Liver problems; increased risk of cancer	5	1.7	Zero	1. Granular Activated Carbon (GAC) 2. Packed Tower Aeration (PTC

TCE is a volatile organic compound that has been extensively used as a metal degreaser, a solvent in adhesives, textile manufacturing, paint stripping, and dry cleaning, etc. Production in the United States was estimated as about 130,000 metric tons/year (Agency for Toxic Substances and Disease Registry, 1997). There are currently two U.S. manufacturers of TCE with a combined capacity of 145,000 metric tons/year (ATSDR, 1997). Due to widespread use, TCE is a common environmental contaminant. The primary public health concern from chronic low-level exposures via contaminated drinking water is the cancer risk.[4] The category of health risk associated with TCE, and the reason that a drinking water standard was adopted, is that people who drink water containing TCE above the MCL throughout their lifetime could experience an increased risk of getting cancer.[5]

The MCL for TCE has been set at 5 ppb, however, the PHG was recently revised from the 0.8 ppb established in February, 1999, to 1.7 ppb, which was just established in July, 2009. TCE was not detected in any of the SSA wells, but was detected in one of the 39 active well in the NSA in 2007, 2008, and 2009. The results ranged from 2.1 ppb to 4.3 ppb and were all below the MCL. Although the TCE levels were below the MCL, this well is not a major producer of water and is primarily activated to meet fire flow and peak day demand during the summer months.

The BAT for TCE to lower the level below the MCL is either GAC or PTA. Since the TCE level in the wells is already below the MCL, GAC with a long EBCT would likely be required to attempt to lower the TCE level to below the PHG and MCLG levels. The estimated cost to install and operate such a treatment system that would reliably reduce the TCE level to below the PHG and MCLG levels would be similar to the cost of

[4] *Public Health Goal for Trichloroethylene in Drinking Water*, OEHHA, July 2009.
[5], 'PHG guidelines', ACWA, March 2010

removing PCE, which (including annualized capital and O&M costs) could be approximately $1,253,556 per year. This would result in an assumed increase cost for each customer of $28.81 per year.

<u>Uranium</u>

Chemical Name	Health Risk	MCL	PHG	MCLG	Best Available Technology (BAT)
		(picocuries/liter)			
Uranium	Excess levels in drinking water leads to toxicity in the kidney and cancer in laboratory animals	20	0.43	zero	1. Ion exchange 2. Reverse Osmosis 3. Lime softening 4. Coagulation/Filtration

Uranium is a metallic element, which is weakly radioactive and naturally occurring in the environment. This radiological constituent is a naturally occurring contaminant in some groundwater and surface water supplies. Exposure to uranium in drinking water may result in toxic effects to the kidney. This constituent has also been shown to cause cancer in laboratory animals such as rats and mice when the animals are exposed at high levels over their lifetimes. Constituents that cause cancer in laboratory animals also may increase the risk of cancer in humans who are exposed over long periods of time. CDPH has set the drinking water standard for uranium at 20 picocuries/liter (pCi/L) to reduce the risk of cancer or other adverse health affects that have been observed in laboratory animals.

The District's water supply meets the federal and state water quality standards for the presence of Uranium. Samples from the South Service Area (SSA) showed results that ranged from ND to 3.1 pCi/L during this reporting period. Results for the North Service Area (NSA) ranged from ND to 2.68 pCi/L. The MCL for uranium is 20 pCi/L and the PHG is set at 0.43 pCi/L.

The federal EPA has identified many ways to treat radiological contaminants but the one BAT considered for this report to reduce the levels to the PHG levels is reverse osmosis (RO). Guidelines by ACWA did not provide information on the cost to install and operate a RO removal system to treat any radiological contaminants to their PHG levels but reports from the City of Los Angeles and the City of Pasadena approximated a range from $15 million to $30 million annually, which includes construction and annual operational cost to treat the radiological contaminants. This translates into an approximate annual cost of $339 to $679 per customer.

Radium 228

Chemical Name	Health Risk	MCL	PHG	MCLG	Best Available Technology (BAT)
		(picocuries/liter)			
Radium	Increased risk of cancer	5 (Combined $_{226}$Ra and $_{228}$Ra)	$_{226}$Ra – 0.05 $_{228}$Ra- 0.019	zero	1. Ion exchange 2. Reverse Osmosis 3. Lime softening

Radium is a radiological compound that is naturally occurring in the environment and is nearly ubiquitous at low concentrations in air, water, soil, rock, and food. The median concentrations of Radium 226 ($_{226}$Ra) and Radium 228 ($_{228}$Ra) in drinking water are generally low, but there are regions in the country where higher concentrations are known to occur. The mining of coal and uranium ore and their use in energy production has resulted in the redistribution of radium in the environment, but the overall effect appears small. Although $_{228}$Ra is chemically similar to $_{226}$Ra, its distribution in groundwater is very different for several reasons. The relatively short half-life of $_{228}$Ra limits the potential for transport without the parent being present. Consequently, $_{228}$Ra cannot migrate far from its source before it decays to another progeny.

The District's water supply meets the federal and state water quality standards for the presence of $_{226}$Ra and $_{228}$Ra. Results for $_{228}$Ra ranged from ND to 1.31 pCi/L from the SSA and in the NSA, ranged from ND to 1.07 pCi/L. The MCL for $_{226}$Ra and $_{228}$Ra is a combined 5 pCi/L, but there are PHG levels for each isotope set at 0.05 pCi/L $_{226}$Ra and 0.019 pCi/L for $_{228}$Ra.

As mentioned in the discussion on Uranium, RO is considered the treatment for this report to reduce the levels to the PHG levels. Using the same assumptions for Uranium, treatment for the radiological contaminants to the PHG levels is approximated to be between $15 million to $30 million annually, including construction and annual operational cost. This translates into an approximate annual cost of $339 to $679 per customer.

Lead and Copper

Chemical Name	Health Risk	Action Level	PHG	MCLG	Best Available Technology (BAT)
		(ppb)			
Lead	Neuro-behaviorial	15	0.2	Zero	Treatment technology including "optimized corrosion control".
Copper	Gastro-intestinal	1300	300	1300	

Lead is a widespread contaminant in the human environment and occurs in drinking water. Pipes and solder made with lead may corrode and leach lead into tap water used for drinking, food preparation, and other household uses. Lead has toxic effects on many systems of the body, particularly on the developing nervous system, the hematological and cardiovascular systems, and the kidney.[6] Copper is an essential nutrient, but it is toxic at higher intake levels. Children under 10 years of age appear to be particularly susceptible to copper toxicity. Copper may enter the water from natural sources or may enter tap water in the distribution system of the individual households.[7]
The health risk category for lead is damage to human kidneys or nervous system, and copper is gastrointestinal irritation. Numerical health risk data on lead and copper have not yet been provided by OEHHA.

Instead of adopting MCLs for lead or copper, USEPA and CDPH have adopted Action Levels (AL) set at the 90th percentile value of all samples from household taps in the distribution system for lead at 15 ppb, and for copper at 1300 ppb. The PHG for lead is 0.2 ppb and copper is 300 ppb. In 2007, the District conducted it's reduced triennial lead and copper monitoring, and the results showed that in the NSA, the 90th percentile for lead was ND and copper was 60 ppb. The 90th percentile in the SSA for lead was 7.9 ppb and copper was at 310 ppb. These levels were well below the AL for these constituents, but levels in the SSA exceeded their PHGs.

The District's water system is in full compliance with the federal and state Lead and Copper Rule. Based on sampling in 1993, 1994, 1997, 2001, 2004, and 2007, it was determined, according to EPA and state regulatory requirements, that the District meets the AL for both lead and copper. Therefore, the District is deemed by CDPH to have optimized corrosion control for its system.

In general, optimizing corrosion control is considered to be the best available technology to deal with corrosion issues and with any copper findings. The District continues to monitor the water quality on an annual basis for constituents that relate to corrositivity, such as pH, hardness, alkalinity, and total dissolved solids, and will take action if necessary to maintain the system in an "optimized corrosion control" condition.

Since the District is meeting the "optimized corrosion control" requirements, it is not prudent to initiate additional corrosion control treatment as it involves the addition of other chemicals, which could cause additional water quality issues. Therefore, no estimate of cost has been included.

RECOMMENDATIONS FOR FURTHER ACTION

The quality of the District's drinking water meets all state and federal drinking water standards set to protect public health. To further reduce the levels of coliform, arsenic, tetrachloroethylene, trichloroethylene, lead, and copper to below the PHG and/or MCLG,

[6] *Public Health Goal for Lead in Drinking Water*, OEHHA, April 2009
[7] *Public Health Goal for Copper in Drinking Water*, OEHHA, February 2008

additional costly treatment processes would be required. The effectiveness of the treatment processes to provide any significant reductions in constituent levels is uncertain. The health protection benefits of these further hypothetical reductions are not at all clear and may not be quantifiable. The money that would be required for these additional treatment processes might provide greater public health protection benefits if spent on other water system operations, surveillance, and monitoring programs. Therefore, no action is proposed.

ACRONYMS USED

BAT ....Best Available Technology
PHG ....Public Health Goal
OEHHA ....Office of Environmental Health Hazard Assessment
MCL...Maximum Contaminant Level
MCLG...Maximum Contaminant Level Goal
USEPA ....United States Environmental Protection Agency
Cal EPA.......................................California Environmental Protection Agency
CDPH ....California Department of Public Health *(formerly known as Department of Health Services)*
ppb ....parts per billion, or equivalent to micrograms per liter
NSA...North Service Area
SSA ....South Service Area
EBCT...Extended Bed Contact Time
GAC ....Granular Activated Charcoal
PTA ....Packed Tower Aeration
TCE ....Trichloroethylene
PCE...Tetrachloroethylene, also known as perchloroethylene
AL...Action Level

EXHIBITS

1. Excerpt from California Health and Safety Code : Section 116470 (b)

2. California MCLs and PHGs and Federal MCLGs

3. Cost estimates for treatment technologies by ACWA

Exhibit 1

California Health and Safety Code 116470 (b)

116470(b) On or before July 1, 1998, and every three years thereafter, public water systems serving more than 10,000 service connections that detect one or more contaminants in drinking water that exceed the applicable public health goal, shall prepare a brief written report in plain language that does all of the following:

(1) Identifies each contaminant detected in drinking water that exceeds the applicable public health goal.
(2) Discloses the numerical public health risk, determined by the office, associated with the maximum contaminant level for each contaminant identified in paragraph (1) and the numerical public health risk determined by the office associated with the public health goal for that contaminant.
(3) Identifies the category of risk to public health, including, but not limited to, carcinogenic, mutagenic, teratogenic, and acute toxicity, associated with exposure to the contaminant in drinking water, and includes a brief plainly worded description of these terms.
(4) Describes the best available technology, if any is then available on a commercial basis, to remove the contaminant or reduce the concentration of the contaminant. The public water system may, solely at its own discretion, briefly describe actions that have been taken on its own, or by other entities, to prevent the introduction of the contaminant into drinking water supplies.
(5) Estimates the aggregate cost and the cost per customer of utilizing the technology described in paragraph (4), if any, to reduce the concentration of that contaminant in drinking water to a level at or below the public health goal.
(6) Briefly describes what action, if any, the local water purveyor intends to take to reduce the concentration of the contaminant in public drinking water supplies and the basis for that decision.

Exhibit 2

MCLs, DLRs, and PHGs for Regulated Drinking Water Contaminants
(Units are in milligrams per liter (mg/L), unless otherwise noted.)
Last Update: April 14, 2010

This table includes:

CDPH's maximum contaminant levels (MCLs)

CDPH's detection limits for purposes of reporting (DLRs)

Public health goals (PHGs) from the Office of Environmental Health Hazard Assessment (OEHHA)

Also, PHGs for NDMA and 1,2,3 Trichloropropane (not yet regulated) are included at the bottom of this table.

	MCL	DLR	PHG	Date of PHG
Chemicals with MCLs in 22 CCR §64431—Inorganic Chemicals				
Aluminum	1	0.05	0.6	2001
Antimony	0.006	0.006	0.02	1997
Antimony	--	--	0.0007	2009 draft
Arsenic	0.010	0.002	0.000004	2004
Asbestos (MFL = million fibers per liter; for fibers >10 microns long)	7 MFL	0.2 MFL	7 MFL	2003
Barium	1	0.1	2	2003
Beryllium	0.004	0.001	0.001	2003
Cadmium	0.005	0.001	0.00004	2006
Chromium, Total - OEHHA withdrew the 0.0025-mg/L PHG	0.05	0.01	withdrawn Nov. 2001	1999
Chromium-6 - MCL to be established - currently regulated under the total chromium MCL	--	0.001	0.00006	2009 draft
Cyanide	0.15	0.1	0.15	1997
Fluoride	2	0.1	1	1997
Mercury (inorganic)	0.002	0.001	0.0012	1999 (rev2005)*
Nickel	0.1	0.01	0.012	2001
Nitrate (as NO3)	45	2	45	1997
Nitrite (as N)	1 as N	0.4	1 as N	1997
Nitrate + Nitrite	10 as N	--	10 as N	1997
Perchlorate	0.006	0.004	0.006	2004
Selenium	0.05	0.005	0.03	2010 draft
Thallium	0.002	0.001	0.0001	1999 (rev2004)
Copper and Lead, 22 CCR §64672.3				
Values referred to as MCLs for lead and copper are not actually MCLs; instead, they are called "Action Levels" under the lead and copper rule				
Copper	1.3	0.05	0.3	2008
Lead	0.015	0.005	0.0002	2009

Radionuclides with MCLs in 22 CCR §64441 and §64443—Radioactivity [units are picocuries per liter (pCi/L), unless otherwise stated; n/a = not applicable]				
Gross alpha particle activity - OEHHA concluded in 2003 that a PHG was not practical	15	3	none	n/a
Gross beta particle activity - OEHHA concluded in 2003 that a PHG was not practical	4 mrem/yr	4	none	n/a
Radium-226	--	1	0.05	2006
Radium-228	--	1	0.019	2006
Radium-226 + Radium-228	5	--	--	--
Strontium-90	8	2	0.35	2006
Tritium	20,000	1,000	400	2006
Uranium	20	1	0.43	2001
Chemicals with MCLs in 22 CCR §64444—Organic Chemicals				
(a) Volatile Organic Chemicals (VOCs)				
Benzene	0.001	0.0005	0.00015	2001
Carbon tetrachloride	0.0005	0.0005	0.0001	2000
1,2-Dichlorobenzene	0.6	0.0005	0.6	1997 (rev2009)
1,4-Dichlorobenzene (p-DCB)	0.005	0.0005	0.006	1997
1,1-Dichloroethane (1,1-DCA)	0.005	0.0005	0.003	2003
1,2-Dichloroethane (1,2-DCA)	0.0005	0.0005	0.0004	1999 (rev2005)
1,1-Dichloroethylene (1,1-DCE)	0.006	0.0005	0.01	1999
cis-1,2-Dichloroethylene	0.006	0.0005	0.1	2006
trans-1,2-Dichloroethylene	0.01	0.0005	0.06	2006
Dichloromethane (Methylene chloride)	0.005	0.0005	0.004	2000
1,2-Dichloropropane	0.005	0.0005	0.0005	1999
1,3-Dichloropropene	0.0005	0.0005	0.0002	1999 (rev2006)
Ethylbenzene	0.3	0.0005	0.3	1997
Methyl tertiary butyl ether (MTBE)	0.013	0.003	0.013	1999
Monochlorobenzene	0.07	0.0005	0.2	2003
Styrene	0.1	0.0005	0.0005	2010 draft
1,1,2,2-Tetrachloroethane	0.001	0.0005	0.0001	2003
Tetrachloroethylene (PCE)	0.005	0.0005	0.00006	2001
Toluene	0.15	0.0005	0.15	1999
1,2,4-Trichlorobenzene	0.005	0.0005	0.005	1999
1,1,1-Trichloroethane (1,1,1-TCA)	0.2	0.0005	1	2006
1,1,2-Trichloroethane (1,1,2-TCA)	0.005	0.0005	0.0003	2006
Trichloroethylene (TCE)	0.005	0.0005	0.0017	2009
Trichlorofluoromethane (Freon 11)	0.15	0.005	0.7	1997
1,1,2-Trichloro-1,2,2-Trifluoroethane (Freon 113)	1.2	0.01	4	1997
Vinyl chloride	0.0005	0.0005	0.00005	2000
Xylenes	1.75	0.0005	1.8	1997
(b) Non-Volatile Synthetic Organic Chemicals (SOCs)				
Alachlor	0.002	0.001	0.004	1997
Atrazine	0.001	0.0005	0.00015	1999
Bentazon	0.018	0.002	0.2	1999 (rev2009)
Benzo(a)pyrene	0.0002	0.0001	0.000004	1997
Benzo(a)pyrene	--	--	0.000013	2010 draft

Carbofuran	0.018	0.005	0.0017	2000
Chlordane	0.0001	0.0001	0.00003	1997 (rev2006)
Dalapon	0.2	0.01	0.79	1997 (rev2009)
1,2-Dibromo-3-chloropropane (DBCP)	0.0002	0.00001	0.0000017	1999
2,4-Dichlorophenoxyacetic acid (2,4-D)	0.07	0.01	0.02	2009
Di(2-ethylhexyl)adipate	0.4	0.005	0.2	2003
Di(2-ethylhexyl)phthalate (DEHP)	0.004	0.003	0.012	1997
Dinoseb	0.007	0.002	0.014	1997
Diquat	0.02	0.004	0.015	2000
Endrin	0.002	0.0001	0.0018	1999 (rev2008)
Endothal	0.1	0.045	0.58	1997
Ethylene dibromide (EDB)	0.00005	0.00002	0.00001	2003
Glyphosate	0.7	0.025	0.9	2007
Heptachlor	0.00001	0.00001	0.000008	1999
Heptachlor epoxide	0.00001	0.00001	0.000006	1999
Hexachlorobenzene	0.001	0.0005	0.00003	2003
Hexachlorocyclopentadiene	0.05	0.001	0.05	1999
Lindane	0.0002	0.0002	0.000032	1999 (rev2005)
Methoxychlor	0.03	0.01	0.03	1999
Methoxychlor	--	--	0.00009	2010 draft
Molinate	0.02	0.002	0.001	2008
Oxamyl	0.05	0.02	0.026	2009
Pentachlorophenol	0.001	0.0002	0.0003	2009
Picloram	0.5	0.001	0.5	1997
Polychlorinated biphenyls (PCBs)	0.0005	0.0005	0.00009	2007
Simazine	0.004	0.004	0.004	2001
2,4,5-TP (Silvex)	0.05	0.001	0.025	2003
2,3,7,8-TCDD (dioxin)	$3x10^{-8}$	$5x10^{-9}$	$1x10^{-9}$	2007 draft
Thiobencarb	0.07	0.001	0.07	2000
Toxaphene	0.003	0.001	0.00003	2003
Chemicals with MCLs in 22 CCR §64533—Disinfection Byproducts				
Total Trihalomethanes	0.08	--	--	--
Bromodichloromethane	--	0.001	0.0004	2009 draft
Bromoform	--	0.001	0.005	2009 draft
Chloroform	--	0.001	0.001	2009 draft
Dibromochloromethane	--	0.001	0.0007	2009 draft
Bromate	0.010	0.005	0.0001	2009
Chlorite	1	0.02	0.05	2009
Chemicals with PHGs established in response to CDPH requests. These are not currently regulated drinking water contaminants.				
N-Nitrosodimethylamine (NDMA)	--	--	0.000003	2006
1,2,3-Trichloropropane	--	--	0.0000007	2009

*OEHHA's review of this chemical during the year indicated (rev200X) resulted in no change in the PHG.

EXHIBIT NO. 3

COST ESTIMATES FOR TREATMENT TECHNOLOGIES

(INCLUDES ANNUALIZED CAPITAL AND O&M COSTS)

No.	Treatment Technology	Source of Information	Estimated 2007* Unit Cost ($/1,000 gallons treated)
1	Granular Activated Carbon	Reference: Malcolm Pirnie estimate for California Urban Water Agencies, large surface water treatment plants treating water from the State Water Project to meet Stage 2 D/DE and bromate regulation, 1998	0.46 - 0.8784
2	Granular Activated Carbon	Reference: Carollo Engineers, estimate for VOC treatment (PCE), 95% removal of PCE, Oct. 1994,1900 gpm design capacity	0.21
3	Granular Activated Carbon	Reference: Carollo Engineers, est. for a large No. Calif. surf. water treatment plant (90 mgd capacity) treating water from the State Water Project, to reduce THM precursors, ENR construction cost index = 6262 (San Francisco area) - 1992	1.017
4	Granular Activated Carbon	Reference: CH2M Hill study on San Gabriel Basin, for 135 mgd central treatment facility for VOC and SOC removal by GAC, 1990	0.394 - 0.5783
5	Granular Activated Carbon	Reference: Southern California Water Co. - actual data for "rented" GAC to remove VOCs (1,1-DCE), 1.5 mgd capacity facility, 1998	1.823
6	Granular Activated Carbon	Reference: Southern California Water Co. - actual data for permanent GAC to remove VOCs (TCE), 2.16 mgd plant capacity, 1998	1.178
7	Reverse Osmosis	Reference: Malcolm Pirnie estimate for California Urban Water Agencies, large surface water treatment plants treating water from the State Water Project to meet Stage 2 D/DE and bromate regulation, 1998	1.367 -2.616
8	Reverse Osmosis	Reference: Boyle Engineering, RO cost to reduce 1000 ppm TDS in brackish groundwater in So. Calif., 1.0 mgd plant operated at 40% of design flow, high brine line cost, May 1991	3.224
9	Reverse Osmosis	Reference: Boyle Engineering, RO cost to reduce 1000 ppm TDS in brackish groundwater in So. Calif., 1.0 mgd plant operated at 100% of design flow, high brine line cost, May 1991	1.984
10	Reverse Osmosis	Reference: Boyle Engineering, RO cost to reduce 1000 ppm TDS in brackish groundwater in So. Calif., 10.0 mgd plant operated at 40% of design flow, high brine line cost, May 1991	2.15
11	Reverse Osmosis	Reference: Boyle Engineering, RO cost to reduce 1000 ppm TDS in brackish groundwater in So. Calif., 10.0 mgd plant operated at 100% of design flow, high brine line cost, May 1991	1.66
12	Reverse Osmosis	Reference: Arsenic Removal Study, City of Scottsdale, AZ - CH2M Hill, for a 1.0 mgd plant operated at 40% of design capacity, Oct. 1991	5.394
13	Reverse Osmosis	Reference: Arsenic Removal Study, City of Scottsdale, AZ - CH2M Hill, for a 1.0 mgd plant operated at 100% of design capacity, Oct. 1991	3.19
14	Reverse Osmosis	Reference: Arsenic Removal Study, City of Scottsdale, AZ - CH2M Hill, for a 10.0 mgd plant operated at 40% of design capacity, Oct. 1991	2.39
15	Reverse Osmosis	Reference: Arsenic Removal Study, City of Scottsdale, AZ - CH2M Hill, for a 10.0 mgd plant operated at 100% of design capacity, Oct. 1991	1.48
16	Reverse Osmosis	Reference: CH2M Hill study on San Gabriel Basin, for 135 mgd central treatment facility with RO to remove nitrate, 1990	1.485 - 2.616
17	Packed Tower Aeration	Reference: Analysis of Costs for Radon Removal... (AWWARF publication), Kennedy/Jenks, for a 1.4 mgd facility operating at 40% of design capacity, Oct. 1991	0.86
18	Packed Tower Aeration	Reference: Analysis of Costs for Radon Removal... (AWWARF publication), Kennedy/Jenks, for a 14.0 mgd facility operating at 40% of design capacity, Oct. 1991	0.46
19	Packed Tower Aeration	Reference: Carollo Engineers, estimate for VOC treatment (PCE) by packed tower aeration, without off-gas treatment, O&M costs based on operation during 329 days/year at 10% downtime, 16 hr/day air stripping operation, 1900 gpm design capacity, Oct. 1994	0.22

COST ESTIMATES FOR TREATMENT TECHNOLOGIES

(INCLUDES ANNUALIZED CAPITAL AND O&M COSTS)

No.	Treatment Technology	Source of Information	Estimated 2007* Unit Cost ($/1,000 gallons treated)
20	Packed Tower Aeration	Reference: Carollo Engineers, for PCE treatment by Ecolo-Flo Enviro-Tower air strippin without off-gas treatment, O&M costs based on operation during 329 days/year at 10% downtime, 16 hr/day air stripping operation, 1900 gpm design capacity, Oct. 1994	0.24
21	Packed Tower Aeration	Reference: CH2M Hill study on San Gabriel Basin, for 135 mgd central treatment facility packed tower aeration for VOC and radon removal, 1990	0.3680 - 0.6046
22	Advanced Oxidation Processes	Reference: Carollo Engineers, estimate for VOC treatment (PCE) by UV Light, Ozone, Hydrogen Peroxide, O&M costs based on operation during 329 days/year at 10% downtime, 24 hr/day AOP operation, 1900 gpm capacity, Oct. 1994	0.45
23	Ozonation	Reference: Malcolm Pirnie estimate for CUWA, large surface water treatment plants using ozone to treat water from the State Water Project to meet Stage 2 D/DBP and bromate regulation,*Cryptosporidium* inactivation requirements,1998	0.1051 - 0.2080
24	Ion Exchange	Reference: CH2M Hill study on San Gabriel Basin, for 135 mgd central treatment facility ion exchange to remove nitrate, 1990	0.4995 - 0.6441

Note:

*Costs were escalated from date of original estimates to present, where appropriate, using Engineering News Record (ENR) construction indices for Los Angeles and San Francisco.

#######