CARLSBAD MUNICIPAL WATER DISTRICT
2019 TRIENNIAL REPORT ON WATER QUALITY RELATIVE TO PUBLIC HEALTH GOALS

Introduction

Carlsbad Municipal Water District (CMWD) publishes Annual Water Quality Reports every year. These are published on the City of Carlsbad/ CMWD's website[1] and provided to customers upon request. Once every three years, the California Health and Safety Code[2] specifies that water utilities with more than 10,000 service connections prepare a special report by July 1st if their water quality measurements have exceeded any Public Health Goals (PHGs) in the previous three years.

The last CMWD PHG Report was published in 2013 for years 2010, 2011, and 2012. A report was due for 2016 for the years 2013, 2014, and 2015. This was inadvertently missed. Hence, this current report for 2019 covers six years (2013 through 2018).

The drinking water quality of the CMWD meets all State of California, Department of Public Health and USEPA drinking water health-based maximum contaminant level (MCL)[3] regulatory standards set to protect public health.

Guidelines Followed:

The Association of California Water Agencies (ACWA)[4] formed a workgroup which prepared guidelines for water utilities to use in preparing these required reports. The ACWA guidelines were used in the preparation of our report. No guidance was available from state regulatory agencies.

Best Available Treatment Technology and Cost Estimates:

Both the United States Environmental Protection Agency (USEPA[5]) and California Department of Public Health (CDPH)[6] adopt what are known as Best Available Technologies (BATs), which are the best known methods of reducing contaminant levels to the MCL. Costs can be estimated for such technologies. However, since many PHGs and all maximum contaminant level goals (MCLGs) are set much lower than the MCL, it is not always possible, nor feasible to determine what treatment is needed to further reduce

[1] https://www.carlsbadca.gov/services/depts/pw/utils/water/quality.asp
[2] https://leginfo.legislature.ca.gov/faces/codesTOCSelected.xhtml?tocCode=HSC
[3] MCLs are adopted as regulations. They are health protective drinking water standards to be met by public water systems. MCLs take into account not only chemicals' health risks but also factors such as their detectability and treatability, as well as costs of treatment. For more information, please refer to this site: https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/MCLsandPHGs.html
[4] https://www.acwa.com/
[5] https://www.epa.gov/
[6] https://www.cdph.ca.gov/

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a constituent downward to or near the PHG or MCLG, 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.

What are PHGs?

PHGs are non-enforceable goals established by the Cal-EPA's Office of Environmental Health Hazard Assessment (OEHHA)[7]. A PHG is the level of a chemical contaminant in drinking water that does not pose a significant risk to health. PHGs are not regulatory standards. However, state law requires State Water Resources Control Board (SWRCB) to set drinking water standards for chemical contaminants as close to the corresponding PHG as is economically and technologically feasible. In some cases, it may not be feasible for the SWRCB to set the drinking water standard for a contaminant at the same level as the PHG. The technology to treat the chemicals may not be available, or the cost of treatment may be very high. There are currently 91 chemicals on the PHG list.

The process for establishing a PHG for a chemical contaminant in drinking water is very rigorous. OEHHA scientists first compile all relevant scientific information available, which includes studies of the chemical's effects on laboratory animals and studies of humans who have been exposed to the chemical. The scientists use data from these studies to perform a health risk assessment, in which they determine the levels of the contaminant in drinking water that could be associated with various adverse health effects. When calculating a PHG, OEHHA uses all the information it has compiled to identify the level of the chemical in drinking water that would not cause significant adverse health effects in people who drink that water every day for 70 years. OEHHA must also consider any evidence of immediate and severe health effects when setting the PHG.

For cancer-causing chemicals, OEHHA typically establishes the PHG at the “one-in-one million” risk level. At that level, not more than one person in a population of one million people drinking the water daily for 70 years would be expected to develop cancer as a result of exposure to that chemical. The law 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).

The MCLG is the maximum level of a contaminant in drinking water at which no known or anticipated adverse effect on the health of persons would occur, allowing an adequate margin of safety. MCLGs are non-enforceable public health goals. MCLGs consider only public health and not the limits of detection and treatment technology effectiveness. Therefore, they sometimes are set at levels which water systems cannot meet because of technological limitations.

[7] https://oehha.ca.gov/water/public-health-goals-phgs

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 has MCLG yet been adopted by OEHHA or USEPA.

The PHGs and MCLGs are not enforceable and are not required to be met by any public water system.

CMWD Water Quality Data

All the water quality data collected between 2013 and 2018 for purposes of determining compliance with drinking water standards was considered for this report. This data is usually available and summarized in the Annual Water Quality Reports published on the City of Carlsbad/ CMWD's website[8]. If a constituent was detected in the District's water supply between 2013 and 2018 at a level exceeding an applicable PHG or MCLG, this report provides the information required to understand the risks. Included is the numerical public health risk associated with the MCL and the PHG or MCLG[9], the category or type of health risk, the best treatment technology available that could be used to reduce the constituent leve1[10], and an estimate of the cost to install that treatment, if it is appropriate and feasible.

CMWD imports ALL of its drinking water from three sources:

- The Metropolitan Water District (MWD) Lake Skinner water treatment plant in Southern Riverside County,
- The San Diego County Water Authority (SDCWA) Twin Oaks Valley water treatment plant in San Marcos,
- The Claude "Bud" Lewis Carlsbad Desalination Plant, privately owned and operated, and sourced by SDCWA,

Water from these treatment plants are received by CMWD via SDCWA's complex system of aqueducts and pipelines where the water from all these sources are thoroughly blended before reaching CMWD's system connections. At any moment of time, it is very difficult for CMWD to know the exact proportion of the blend. Where applicable, data from all three treatment plants are included in this report.

Constituents Detected That Exceed a PHG or a MCLG:

The following is a discussion of constituents that were detected at a level above the associated PHG, or if there is no PHG, above the MCLG. The levels for theses constituents were well below their respective MCLs (regulatory standards), so this does not constitute a violation of drinking water regulations and is for advisory purposes only. These results are typical of all the water agencies in the region who receive their water from the same MWD and SDCWA water treatment plants.

[8] https://www.carlsbadca.gov/services/depts/pw/utils/water/quality.asp
[9] Health Risk Information for Public Health Goal Exceedance Reports (OEHHA) https://oehha.ca.gov/water/public-health-goal-report/health-risk-information-public-health-goal-exceedance-reports-2019
[10] Cost Estimates for Treatment Technologies (ACWA)

Arsenic

The contamination of a drinking water source by arsenic can result from either natural or human activities. Arsenic is an element that occurs naturally in rocks and soil, water, air, plants, and animals. Volcanic activity, the erosion of rocks and minerals, and forest fires are natural sources that can release arsenic into the environment. About 90 percent of the arsenic used by industry in the United States is currently used for wood preservative purposes; arsenic is also used in paints, drugs, dyes, soaps, metals and semiconductors. Agricultural applications, mining, and smelting also contribute to arsenic releases.

The CADPH and USEPA have determined that arsenic is a health concern at certain levels of exposure. The category of health risk associated with arsenic, and the reason that a drinking water standard was adopted for it, is that some people who drink water containing arsenic above the MCL over many years may experience skin damage and circulatory system problems and are at a higher risk of getting cancer. The numerical health risk for the PHG of 4 ng/L is one excess cancer case per million people. The numerical health risk for the MCL of 10 µg/L is 2.5 excess cancer cases per thousand people.

The level of arsenic detected in CMWD's source water supplied by MWD and SDCWA for 2013 and 2018 are listed below.

Constituent	Units	MCL	PHG (MCLG)		2013	2014	2015	2016	2017	2018
Source: SDCWA Twin Oaks Plant										
Arsenic	ppb	10	0.004	Average	2	3.4	3.0	2.4	2	3
Source: SDCWA Carlsbad Desal Plant										
Arsenic	ppb	10	0.004	Average	NA	NA	ND	0.42	0.42	ND
ppb = parts per billion. ND = Non Detect. NA = Not Available										

Uranium

Radiological constituents come from decay and erosion of natural deposits of certain minerals that are radioactive and may emit a form of radiation known as alpha radiation, photons and beta radiation. Uranium is a naturally occurring radioactive element that is ubiquitous in the earth's crust. Uranium is found in ground and surface waters due to its natural occurrence in geological formations. The uranium intake from water is about equal to the total from other dietary components. An additional source of radiological contamination is from mine tailings in Moab Utah.

The State of California has a uranium MCL of 20 pCi/L based on earlier studies of toxicity to the kidney in rabbits. Cancer risk is stated in terms of excess cancer cases per million (or fewer) population exposed for a lifetime (theoretically 70 years). The numerical health risk at the MCL is $5x10^{-5}$. This means five cancer cases per 100,000 population. The numerical health risk at the PHG is $1x10^{-6}$. This means one cancer case per 1,000,000 population. The health risk category for uranium is carcinogenicity: chronic toxicity. Carcinogenic risk means capable of producing cancer. Chronic toxicity risk means there may be

adverse effects that usually develop gradually from low levels of chemical exposure and that persist for a long time. The primary non-carcinogenic toxic effect is on kidneys.

The level of radionuclide constituents detected in CMWD's source water supplied by MWD and SDCWA for 2013 and 2018 are listed below.

Constituent	Units	MCL	PHG (MCLG)		2013	2014	2015	2016	2017	2018
Source: MWD's Skinner Plant										
Uranium	pCi/L	20	0.43	Average	1	2	2	2	ND	ND
Source: SDCWA Twin Oaks Plant										
Constituent	**Units**	**MCL**	**PHG (MCLG)**		**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Uranium	pCi/L	20	0.43	Average	2.0	2.0	2.0	2.9	2.9	2.2

pCi/L = picoCuries per Liter of water (approximately parts per billion). ND= Non Detect

Bromate

Bromate is a byproduct of water disinfection and occurs when bromide in the water reacts with the ozone disinfectant. Bromate consumed in drinking water in excess of the MCL over many years may cause an increased risk of cancer. Bromate is categorized as a haloacetic acid.

The State of California has a bromate MCL of 0.010 mg/L and a PHG of 0.0001 mg/L. Bromate values ranged from 0.0001 to 0.0005 mg/L. The levels detected were below the MCLs at all times. Bromate can be found in drinking water as a byproduct of the ozonation disinfection process. The Office of Environmental Health Hazard Assessment (OEHHA) has developed a Public Health Goal for bromate in drinking water, based on its carcinogenicity. The numerical health risk at the MCL is $1x10^{-4}$. This means one cancer cases per 10,000 population. The numerical health risk at the PHG is $1x10^{-6}$. This means one cancer case per 1,000,000 population.

The level of bromate detected in CMWD's source water supplied by MWD and SDCWA for 2013 and 2018 are listed below.

Source: MWD Skinner Plant										
Constituent	**Units**	**MCL**	**PHG (MCLG)**		**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Bromate	ppb	10	0.1	Highest RAA	5.9	3.6	4.3	4.2	4.1	3.7
Source: SDCWA Twin Oaks Plant										
Constituent	**Units**	**MCL**	**PHG (MCLG)**		**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Bromate	ppb	10	0.1	Highest RAA	2.6	3.1	4.2	5.9	6.0	5.0

RAA = Running Annual Average. Highest RAA is the highest of all Running Annual Averages calculated as the average of all samples collected within a 12-month period. ppb = parts per billion.

Chromium VI

Hexavalent Chromium (chromium VI) occurs in natural waters in the environment and is present in water from the erosion of chromium deposits found in rocks and soils. It is also produced by industrial processes and manufacturing activities including discharges from steel and pulp mills, among others. It can also be released to the environment via improper storage and disposal practices.

Hexavalent chromium consumed in drinking water in excess of the MCL over many years may cause allergic dermatitis. This chemical has been shown to cause cancer in laboratory animals, such as rats and mice, and humans when they are exposed at high levels over their lifetimes. The numerical health risk for the PHG of 0.02µg/L is one excess case of cancer per million people. The numerical health risk for the MCL of 10 µg/L is one excess of cancer per fifty thousand people.

The level of hexavalent chromium detected in CMWD's source water supplied by MWD and SDCWA for 2013 and 2018 are listed below.

Source: SDCWA Twin Oaks Plant										
Constituent	**Units**	**MCL**	**PHG (MCLG)**		**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Chromium VI	ppb	10	0.02	Average	ND	ND	0.04	0.06	ND	0.09
ppb = parts per billion. ND = Non Detect.										

NDMA

NDMA is a chemical formed in both industrial and natural processes. It is a byproduct of chlorination at wastewater treatment plants that use chloramines for disinfection. NDMA was also formerly used in the production of rocket fuel, antioxidants, and softeners for copolymers.

Although NDMA is listed as a priority toxic pollutant, no federal MCL has been established for drinking water. It is classified as a probable human carcinogen. The Notification Level (NL) for NDMA is a health-based advisory level established by the Division of Drinking Water (DDW) for chemicals in drinking water that do not have MCLs. In 2013, sample results included a value of 11 ppt, which exceeded the NL of 10 ppt.

The level of hexavalent N-Nitrosodimethylamine (NDMA) detected in CMWD's source water supplied by MWD and SDCWA for 2013 and 2018 are listed below.

Source: MWD Skinner Plant										
Constituent	**Units**	**MCL**	**PHG (MCLG)**		**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
NDMA	ppt	NL=10	3	Range			ND	ND-2.3	ND-3.1	ND-3.2
NDMA	ppt	NL=10	3	D. Wide			ND-	ND-	ND	ND-

Source: MWD Skinner Plant									
Constituent	**Units**	**MCL**	**PHG (MCLG)**		**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
							6.0	5.1		3.2
NDMA	ppt	NL=10	3	Single	6.5	2.0-2.9				
NDMA	ppt	NL=10	3	Sample	ND-6.7	ND-5.0				
ppt = parts per trillion. NL = Notification Level. D. Wide = District Wide. ND = Non Detect										

Cost Estimate for Treatment

The best available technology (BAT) to lower the level of these compounds below the PHG is reverse osmosis. Since the levels are already below the MCL, reverse osmosis would be required to attempt to lower the levels to below the PHG. Please note that accurate cost estimates are difficult, if not impossible, and are highly speculative and theoretical. All costs including annualized capital, construction, engineering, planning, environmental, contingency, and O&M are included, but only very general assumptions can be made for most of these items. Costs estimating guides from the Association of California Water Agencies guidance report were used in determining the estimated cost to implement the BAT. The cost of implementing RO treatment would start at approximately $1.85 - $4.33 per 1,000 gallons treated. CMWD's annual water usage is approximately 15,000 to 18,000 acre feet and therefore will cost approximately $23 million per year to treat, and does not include the capital costs of installation of such facilities and maintenance thereafter. There would be additional costs for corrosion control because water treated by reverse osmosis is corrosive and could cause the water to exceed the lead and copper regulations. Additionally, CMWD does not have a treatment plant of its own where such a treatment plant is not feasible. Hence, it is logistically not possible for CMWD to implement such a BAT. As previously stated, it is unclear whether treatment to lower a constituent below the PHG or MCLG would be feasible, as BATs are designated for treatment to achieve compliance with the corresponding MCL only, and not the PHG or MCLG.

Recommendations:

The drinking water quality of the Carlsbad Municipal Water District meets all State of California, Department of Public Health and USEPA drinking water standards set to protect public health.

To further reduce the levels of the constituents identified in this report that are already significantly below the health-based MCLs established, additional costly treatment processes would be required. The effectiveness of the treatment processes to provide any significant reductions in constituent levels at these already low values is uncertain.

The health protection benefits of these further hypothetical reductions are not at all clear and may not be quantifiable. Therefore, no action is proposed.

CMWD's drinking water is provided by the MWD and SDCWA water treatment plants and these source plants treat water prior to being received by CMWD. CMWD continues to work with MWD and SDCWA to ensure that the drinking water is safe and affordable.