http://www.ebmud.com/water-and-drought/about-your-water/water-quality/EAST BAY MUNICIPAL UTILITY DISTRICT
REPORT ON WATER QUALITY RELATIVE TO
PUBLIC HEALTH GOALS

July 12, 2016

BACKGROUND

Provisions of the California Health and Safety Code Section require water utilities with more than 10,000 service connections to prepare a triennial report comparing water quality results to the Public Health Goals (PHG) or Maximum Contaminant Level Goals (MCLG). The next report is due on or before July 1, 2016, and covers the calendar years 2013, 2014, and 2015. PHGs are non-enforceable goals established by the California Environmental Protection Agency's (Cal-EPA's) Office of Environmental Health Hazard Assessment and are not required to be met by any public water system. The United States Environmental Protection Agency (USEPA) establishes MCLGs, which like the PHGs, are non-enforceable goals.

The PHG represents a level of concentration of a constituent that poses no significant health risk if consumed over a lifetime. Only constituents that have a California primary drinking water standard or Notification Level, and have either a PHG or USEPA MCLG, are addressed in this report. The MCLG is only used for constituents without a PHG. This report also includes information on the numerical public health risk associated with the constituent, the category of health risk, and an estimate of the cost to meet the PHG if a best available technology has been identified by the State Water Resources Control Board Division of Drinking Water (DDW).

This report was prepared following the guidelines developed by the Association of California Water Agencies. No other guidelines are available.

WATER QUALITY DATA USED IN THIS REPORT

All of the water quality data collected by the District's water system in calendar years 2013, 2014, and 2015, for purposes of determining compliance with drinking water standards, were used for this report. This data is summarized in the District's 2013, 2014, and 2015 Annual Water Quality Reports which are delivered annually to customers by July 1.

CONSTITUENTS DETECTED THAT EXCEED A PHG OR A MCLG

The following is a discussion of constituents that were detected in one or more of our drinking water sources at levels above the PHG or the USEPA MCLG.

Total Coliform[1]

Total coliform bacteria were detected above the MCLG of zero in seven months between 2013 and 2015 as summarized in the following table.

Month of Sampling	No. of Samples Collected	No. of Samples Positive	Samples Positive
December 2013	356	2	0.56 %
September 2014	354	2	0.56 %
December 2014	363	5	1.4 %
March 2015	353	2	0.57 %
April 2015	356	3	0.84 %
September 2015	353	2	0.57 %
November 2015	362	5	1.4 %

The number of months coliform was detected in the distribution system in this current reporting period is higher than the results reported in the previous PHG reports. The increase in detection is attributed to the significant lower water demand during the last several years which increased the difficulty of maintaining disinfectant residual concentration throughout the distribution system. The annual frequency with which this MCLG was exceeded increased between 2013 and 2015. During this time period the District experienced extended drought conditions (the last four years) and, under a state mandate, has been implementing and promoting water conservation measures to reduce the water use in order to manage the water supply shortage. The lowered water demand results in longer than usual travel time for the water to flow through the pipes, lower rate of refreshing the water in reservoirs, and allows for greater decay of the disinfectant residual, particularly in remote parts of the distribution system. To develop additional capability to restore and maintain chloramine disinfectant residual in the distribution system, the District has successfully tested and started installing small-scale booster chloramine injection systems at selected reservoirs. In addition, pilot testing is being planned to evaluate the use of ultraviolet light to minimize nitrification in the distribution system.

The Maximum Contaminant Level (MCL) for coliform is 5 percent positive samples per month and the MCLG is zero. The coliform MCL is established as close to the MCLG as feasible to minimize the possibility that waterborne pathogens are present. Coliform bacteria are an indicator organism, ubiquitous in water, and are generally not harmful. If a positive sample is found, it indicates a potential problem that needs to be investigated, including follow-up sampling and response, as needed, to prevent adverse public health effects.

Because total coliform is only a surrogate indicator of the potential presence of pathogens, it is not possible to establish a numerical public health risk based on their presence.

[1] The MCLG for Total Coliforms was deleted by the USEPA effective April 15, 2013. Although the District encountered no exceedances of the MCLG during the months prior to this date, the MCLG was applied for the full period of this report to avoid the misperception that water quality data were being selectively filtered by the District. Future PHG reports will follow the state regulations and will only report on existing PHGs and MCLGs.

Best Available Treatment (BAT) Technology and Cost Estimates

Chloramines are used as a disinfectant in the distribution system to ensure the water served meets microbiological standards. Chloramine levels are carefully controlled to provide the best health protection without causing the water to have undesirable taste and odor or increased disinfection by-product levels.

The District has also taken all of the steps described in the DDW drinking water regulation as BAT for coliform bacteria, including implementation of an effective cross-connection control program, maintenance of a disinfectant residual throughout the system, an effective monitoring and surveillance program, and maintaining positive pressures in the distribution system.

There is no commercially available treatment technology that will guarantee complete removal or inactivation of total coliforms, and therefore, the cost of attaining the MCLG of zero cannot be estimated.

Bromate

Between 2013 and 2015, the average bromate concentration in the District's finished water was 1.0 µg/L, which exceeds the bromate PHG of 0.1 µg/L. The MCLG for bromate is set at zero and the MCL is 10 µg/L. The state's analytical detection limit is 1.0 µg/L, which is an order of magnitude higher than the PHG.

Bromate is a by-product of ozonation. Naturally-occurring bromide reacts with ozone to form bromate. Ozone is used at the District's Sobrante and Upper San Leandro Water Treatment Plants to control taste and odor. Occasional algal blooms in the source water reservoirs can impart significant taste and odor to the raw water. Ozone is used to remove the taste and odor compounds prior to serving the water to consumers.

Health Effects

USEPA classifies bromate as a probable human carcinogen. For the MCL of 10 µg/L, the theoretical excess cancer risk is 100 extra cancer cases per million individuals consuming the water on a daily basis over a lifetime (70 years). For a PHG of 0.1 µg/L, the theoretical excess cancer risk is one in a million. For our treated water with an average bromate level of 1.0 µg/L, the theoretical excess cancer risk is estimated to be 10 in one million.

Best Available Treatment (BAT) Technology and Cost Estimates

Both the USEPA and the DDW adopt BATs, which are the best known methods of reducing contaminant levels to meet the MCL. However, since PHGs and MCLGs can be established at concentrations much lower than current analytical methods are capable of measuring, it is not always possible or feasible to determine if the BAT can reduce a constituent down to or near the PHG or MCLG; such is the case with bromate.

The DDW and USEPA cite "Control of ozone treatment process to reduce production of bromate." as the BAT to control bromate formation. The lack of specificity in the DDW and USEPA BAT designation for bromate control clearly indicates the need for more research in this area, as control requires balancing the water quality needs of taste and odor control with disinfection against disinfection by-product production.

To date, no BAT to remove bromate has been identified, but work on pretreatment techniques that can affect the reaction between ozone and bromide are demonstrating their ability to lower bromate concentrations to below the MCL. These technologies include pH suppression and chloramination before ozonation. The only known treatment technology that can remove bromate is reverse osmosis, but it has not been identified by the DDW or USEPA as a BAT.

At present, the evaluation of all treatment technologies is limited by detection limits of the current analytical methodologies. It is uncertain whether these control methods can effectively reduce bromate formation to the PHG level, which is set at one hundred times lower than the MCL and ten times lower than the method detection limit of 1 µg/L. In addition, the technologies previously mentioned have yet to be designated as BAT by the regulatory agencies. For these reasons, it is premature to develop treatment costs for bromate control.

RECOMMENDATIONS FOR FURTHER ACTIONS

The District's drinking water quality meets all DDW and USEPA drinking water standards. From 2013 to 2015, the only constituent detected above its MCLG was total coliform bacteria, and the only constituent detected above its PHG was bromate.

The District has taken all of the steps described in the DDW drinking water regulations as BAT to control coliform bacteria. The chloramine residual levels in the distribution system will continue to be carefully controlled to provide the best health protection without causing the water to have undesirable taste and odor or increased disinfection by-product levels. The District is installing on-site chloramine injection systems at several reservoirs to restore and maintain chloramine residual, and plans to test and evaluate the use of ultraviolet light to control nitrification. No further action is recommended.

Current operational controls are sufficient and effective for meeting the bromate MCL. Until analytical technology is available to measure bromate below the PHG and a BAT is identified, it is premature to identify any treatment technology for meeting the PHG.