

City of Brentwood Public Works Department

PUBLIC HEALTH GOAL REPORT

JULY 2010

Introduction

The limits established in California's regulatory drinking water standards protect the public from harmful substances, but no water supply is ever completely free of contaminants. Some substances, such as arsenic and uranium, can occur naturally. Contaminants, such as fuels, industrial solvents, pesticides and metals, may enter water supplies from chemical spills and leaking tanks and pipelines, or they may be a legacy of agricultural and waste disposal practices that pre-dated modern environmental laws.

It is natural for people to want their drinking water to be completely free of all contaminants. However, preventing or removing all contamination often is not economically or technologically feasible. State health authorities are responsible for determining the levels of contaminants that, based on current laws and recommendations, can remain in water supplies without compromising human health.

Public Health Goals and Drinking Water Standards

To help keep drinking water safe, the California Legislature passed the Calderon-Sher Safe Drinking Water Act of 1996. This law requires the California Department of Public Health (CDPH) to regularly test drinking water supplies and set standards for contaminants in Water. The Act also requires the Office of Environmental Health Hazard Assessment (OEHHA) to develop Public Health Goals (PHGs) for contaminants in California's publicly supplied drinking water. Public water utilities with more than 10,000 service connections are required by the provisions of the California Health and Safety Code Section 116470 (b) to prepare a Public Health Goal report by July 1, 1998 and every three years thereafter if any water quality measurements exceed the Public Health Goal levels or Maximum Contaminant Level Goal levels.

What is a Public Health Goal?

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 CDPH to set drinking water standards for chemical contaminant as close to the corresponding PHG as is economically and technically feasible.

In some cases, it may not be feasible for CDPH 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. CDPH must consider these factors when developing a drinking water standard. PHGs are non-enforceable goals established by the California Environmental Protection Agency's Office of Environmental Health Hazard Assessment. The law 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). Only constituents which have a primary drinking water standard and for which either a PHG or MCLG has been set are addressed in this report. Appendix 1 is a list of California's PHGs, Federal MCLGs and the results for City of Brentwood for the years 2007-2009.

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If a constituent was detected in the City's water supply from years 2007 to 2009 at a level exceeding an applicable PHG or MCLG, this report provides the information required by law. Also included in this report is the numerical public health risk associated with the PHG and/or MCLG, the category or type of risk to health that could be associated with 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 appropriate and feasible.

The purpose of the law is to give water system customers access to information on levels of contaminants even below the enforceable mandatory drinking water standard known as Maximum Contaminant Levels (MCLs). In addition, the law intends to provide an idea of the cost to totally eliminate any trace of contaminant from drinking water regardless of how minimal the risk might be. The required report is unique to California.

How does OEHHA Establish a Public Health Goal?

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 effect 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. In performing the health risk assessment, OEHHA considers the following factors:

- Certain groups of people, such as pregnant women, young children, the elderly or persons with pre-existing illnesses, who may be especially susceptible to the chemical's adverse effects. The PHG must consider health effects on individuals in these groups.
- Accumulated effects of exposure to the chemical from other sources, such as food, air and soil; as well as and other forms of drinking water, such as showering.
- The chemical's potential to interfere with bodily functions in a way that increases the risk of chronic health problems, such as liver damage.
- Possible synergistic effects from the combined exposure to the chemical in question with other chemicals, which may further increase health risks.

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 assumes that an adult will drink two liters of water per day and a child will drink one liter per day. OEHHA must also consider any evidence of immediate and severe health effects when setting the PHG.

Water Quality Data Considered

All of the water quality data collected by the City of Brentwood in the years 2007, 2008, and 2009 for purposes of determining compliance with drinking water standards were considered. This data is also summarized in the City's Annual Water Quality reports which are mailed out to all of our customers in July of each year.

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 preparation of this report. No guidance was available from state regulatory agencies.

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PHGs Set at Levels That Protect Human Health

For carcinogens, OEHHA 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 2 liters of water daily for 70 years would be expected to develop cancer as a result of exposure to that chemical. For chemicals that cause health effects other than cancer, OEHHA sets the PHG at a level that is not expected to cause any toxic effects, including birth defects and chronic illness.

Best Available Treatment Technologies and Cost Estimates

Both the USEPA and CDPH adopted what are known as Best Available Technologies (BATs). BATs are the best known methods of reducing contaminant levels to below MCL. Costs can be estimated for such technologies. Since many PHGs and all MCLGs are set much lower than the MCL, it is not always possible or feasible to determine what treatment is needed to further reduce a constituent downward to or near the PHG or MCLG, many of which are set at zero. Estimating costs to reduce a constituent to zero is difficult, if not impossible, to verify by analytical means that the level has been lowered to zero. Additionally, 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.

Constituents Detected That Exceed a PHG or MCLG

The following is a discussion of the constituents that were detected in the City's drinking water sources and water distributions system above the PHG, or if no PHG, above the MCLG.

Arsenic

Arsenic is a naturally occurring element in the earth's crust and is very widely distributed in the environment. All humans are exposed to small quantities of arsenic (inorganic and organic) largely from food and to a lesser degree from drinking water and air. Some edible seafood may contain higher concentrations of arsenic which is predominantly in less acutely toxic organic forms.

City wells have an average of 0.0011 milligrams per liter (mg/L) arsenic level, which is well below the current not-to exceed level of 0.01 milligrams per liter arsenic MCL. The California Office of Environmental Health Hazard Assessment has established a Public Health Goal of 0.000004 milligrams per liter.

Category of Risk to Public Health

The Office of Environmental Health Hazard Assessment has determined arsenic as a carcinogen.

Numerical Health Risks

The Office of Environmental Health Hazard Assessment has a numerical cancer risk of 1×10^{-6} for the 0.000004 mg/L PHG, and 1 in four hundred for the EPA Maximum Contaminant Level of 0.01 mg/L. Note that, as previously described, cancer risk is stated in terms of excess cancer per million (or fewer) population. The value of 1×10^{-6} means 1 excess cancer case per 1,000,000 people.

Best Available Technology to Remove or Reduce the Concentration of Arsenic and Approximate Treatment Cost

Activated alumina, ion exchange, reverse osmosis, lime softening, coagulation/filtration are the water treatment technologies available for achieving compliance with the MCL for arsenic.

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It would cost the City approximately \$ 4.1 million dollars in capital cost including annual operation and maintenance costs to reduce the arsenic levels of all its well water to the PHG level of 0.000004 mg/L.

Gross Alpha Particle Activity

Radionuclides such as alpha in water supplies are from erosion of natural deposits. The term radionuclide refers to naturally occurring elemental radium, radon, uranium, and thorium with unstable atomic nucleus that spontaneously decays producing ionizing radiation. Gross alpha is defined as the sum total of these radionuclides. Exposure to ionizing radiation in concentrations exceeding the maximum contaminant level may have carcinogenic (cancer causing), mutagenic (causing mutation of cells) or teratogenic (causing abnormalities in offspring) effects.

The EPA's Maximum Contaminant Level Goal (MCLG) for gross alpha particle is 0 and the California Maximum Contaminant Level (MCL) is 15pCi/L. The City's average level of gross alpha is 4.83pCi/L. The levels detected were below MCL at all times.

Category of Risk to Public Health

Health risk category based on experimental animal testing data evaluated in the U.S. EPA MCLG document and California MCL has determined gross alpha particle as a carcinogen.

Numerical Health Risks

The USEPA's MCLG for Gross Alpha is zero (0) and a cancer risk of 1×10^{-6} for the California Department of Public Health Maximum Contaminant Level of 15pCi/L.

Note: Cancer Risk = theoretical 70-year lifetime excess cancer risk at a statistical confidence limit. Actual cancer risk may be lower or zero. Cancer risk is stated in terms of excess cancer per million (or fewer) population exposed for a lifetime. The value of 1×10^{-6} means 1 cancer case per 1,000,000 people.

Best Available Technology to Remove or Reduce the Concentration of Gross Alpha Particles and Approximate Treatment Cost

Similar to uranium, reverse osmosis, lime softening, and coagulation/filtration are the water treatment technologies available for achieving compliance with the MCL for uranium. Removal and reduction could be achieved concurrently with uranium.

Gross Beta Particle Activity

Certain minerals are radioactive and may emit a form of radiation known as photons and beta radiation. Gross beta particle activity has averaged 1.33pCi/L in the groundwater supplied to the system. There is no PHG for gross particle activity. The MCLG is zero pCi/L, and the MCL is 50pCi/L. The levels detected in our system were below the MCL at all times, but were over the level identified by the USEPA as the MCLG.

The CDPH and USEPA, which set drinking water standards, have determined that gross beta particle activity is a health concern at certain levels of exposure. This radiological constituent is a naturally occurring contaminant in some groundwater and surface water supplies. The category of health risk associated with gross beta particle activity, and the reason that a drinking water standard was adopted for it, is that some people who drink water containing beta and photon emitters in excess of the MCL over many years may have an increased risk of getting cancer. The numerical health risk for the MCLG of zero pCi/L is zero. CDPH and USEPA set the drinking

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water standard for gross beta particle activity at 50pCi/L to reduce the risk of cancer or other adverse health effects.

Best Available Technology to Remove or Reduce the Concentration of Gross Beta Particles and Approximate Treatment Cost

The Best Available Technologies (BATs) identified to treat gross beta particle activity are ion exchange and reverse osmosis (RO). The most effective method to consistently remove beta and photon emitters to the MCLG is to install RO treatment at the select groundwater and surface water connection sites where the water exceeds the MCLG. The cost to install and operate RO removal systems to remove beta and photon emitters to the MCLG in our system would be approximately \$4.1 million annually which includes construction and annual operational cost. This could be accomplished concurrently with Gross Alpha and Uranium.

Uranium

Naturally occurring uranium is found in groundwater supplies as a result of leaching from uranium-bearing sandstone, shale, and other rock formations. Uranium may also be present in surface water, carried through runoff from areas with mining operations.

The City of Brentwood conducted monitoring of uranium in water samples collected from all wells. The samples collected from wells in three consecutive years of 2007 to 2009 contained an average of 0.84pCi/L uranium. The State of California has a MCL for uranium of 20pCi/L and a PHG of 0.43 pCi/L based on the numerical health risk of one in a million. The health risks associated with long term drinking intake at levels above MCL are the increased risk of getting cancer and potential kidney problem.

The *Public Health Goal* for uranium is 0.43 pico-Curies per liter (pCi/l), and the Maximum Contaminant level (MCL) is 20pCi/L. The City's average uranium level is 0.84pCi/L. The levels detected were below MCL at all times.

Category of Risk to Public Health

The Office of Environmental Health Hazard Assessment has determined uranium as a carcinogen.

Numerical Health Risks

The Office of Environmental Health Hazard Assessment has a numerical cancer risk of 1×10^{-6} for the 0.43 pCi/L PHG, and a cancer risk of 5×10^{-5} for the California Department of Public Health Maximum Contaminant Level of 20pCi/L. As previously described, 1×10^{-6} means 1 excess cancer case per 1,000,000 people; 5×10^{-5} means 5 excess cancer cases per 100,000 people.

Best Available Technology to Remove or Reduce the Concentration of Uranium and Approximate Treatment Cost

Ion exchange, reverse osmosis, lime softening, coagulation/filtration are the technologies available for achieving compliance with the MCL for uranium. Using reverse osmosis, it would cost the City about \$4.1 million dollars in annualized capital, including operation and maintenance cost to achieve the PHG level*.

* based on CH2M Hill Study, for a 1.0 mgd plant operated at 100% design capacity, October 1991 adjusted for 2010 dollars with estimated annual inflation.

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Total Coliform Bacteria

Total coliform (TC) bacteria are indicator organisms that indicate a potential microbial water quality problem that requires confirmation follow-up sampling, testing, and investigation. When the City receives a positive TC result from the in-house laboratory, a repeat sample set is immediately taken for a retest. In addition, the disinfection procedures are reviewed and the sample collection site and the adjacent section of the water distribution system are analyzed.

The MCLG for total coliform (TC) bacteria is zero percent (0%) of samples with presence of coliform per month. The MCL for TC is not to exceed five percent (5%) of positive or coliform-presence samples per month.

The City of Brentwood collects between 80 and 100 samples every month at points throughout the water distribution system that are analyzed for total coliforms. Total coliform bacteria were only present in 4 samples of the 3,012 samples collected during the 36 months from 2007 through 2009. The MCL for total coliform is 5 percent of monthly samples and the MCLG is 0 percent for monthly samples. During February 2007, total coliforms were found in 9.3% of the samples which is more than the allowable 5 percent MCL and 0 percent MCLG. The impacted area was due to a water main replacement that affected 17 houses. Each of the households was formally notified of the situation when it occurred.

Factors that can produce positive TC test besides degraded water quality include, but are not limited to, the weather and environmental conditions when samples are taken, and the human factor associated with the collection methods, handling, and test procedures.

The CDPH and USEPA, which set drinking water standards, have determined that the presence of total coliform is a possible health concern. Coliforms are common in the environment and are generally not harmful themselves. The presence of these bacteria in drinking water, however, generally is a result of a problem with water treatment or the pipes that distribute the water, and indicates that the water may be contaminated with organisms that can cause disease. Disease symptoms may include diarrhea, cramps, nausea, and possibly jaundice, and any associated headaches and fatigue. These symptoms, however, are not just associated with disease causing organisms in drinking water, but also may be caused by a number of factors other than your drinking water.

Because total coliform is only an indicator of the potential presence of pathogens, it is not possible to state a specific numerical health risk. The CDPH has set an enforceable drinking water standard for total coliform to reduce the risk of these adverse health effects. Under this standard, no more than 5 percent of the samples collected during a month can contain these bacteria. Drinking water that meets this standard is usually not associated with a health risk from disease causing bacteria and should be considered safe.

Chloramines are added at the city's sources to assure that the water served is microbiologically safe. The chloramines 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 level. This careful balance of treatment processes is essential to continue supplying our customers with safe drinking water.

Other equally important measures that the city has implemented include: an effective cross-connection control program, maintenance of a disinfectant residual throughout our system, an effective monitoring program and maintaining positive pressures in the city's water distribution

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system. The City of Brentwood has already taken all of the steps described by CDPH as “best available technology” for coliform bacteria in Section 64447, Title 22, CCR.

Summary of Findings:

Drinking water provided by the City of Brentwood meets 100 percent of all enforceable State of California, Department of Public Health, and United States Environmental Protection Agency primary drinking water standards.

Overall, arsenic, uranium, gross alpha particles, gross beta particles, and total coliform bacteria constituents were detected in our water system at concentrations above PHGs or MCLGs. At no time did the City of Brentwood serve water containing contaminants above recognized and enforceable MCLs. The drinking water quality of the City of Brentwood meets all drinking water standards to protect public health.

If you have any questions about this report, please call us at (925) 516-6000. We are available to answer your questions Monday through Friday between the hours of 7:30 am to 4 pm, or visit our website at www.ci.brentwood.ca.us.