Review of Maximum Contaminant Levels

February 22, 2017

Summary of 2017 Findings

The State Water Resources Control Board (State Water Board) has reviewed the current Maximum Contaminant Levels (MCLs) in California to determine whether any of the current MCLs should be revised to better protect public health.

The review included the evaluation of contaminant occurrence data collected by public water systems from their groundwater and surface water sources. Water quality data collected from January 1, 2013 to December 31, 2016 was used in this evaluation. That dataset consists of over six million analytical results from over 23,000 sources from the more than 7,000 public water systems. This data evaluation helps to establish the public health risk related to exposure to a specific MCL.

Public Health Goals (PHGs) are used to evaluate current MCLs. PHGs are established by the Office of Environmental Health Hazard Assessment (OEHHA). The PHG value is the level of contaminant that would have essentially no health impact. The MCL is sometimes higher than the PHG since it is often not technologically or economically feasible to set the MCL at a level as low as the PHG.

Of 81 existing MCLs, there are 31 MCLs that are already set at the PHG value or lower. This means that there would be no additional benefit from lowering these 31 MCLs. These MCLs have been excluded from further review. Of the remaining MCLs, 29 have not been detected in public water system monitoring of sources statewide. Based on this lack of detections, these 29 are excluded from further review.

From the preliminary review, 21 contaminants were selected for additional review. Information on this additional review is provided further below in this document. The controlling laws in the Health and Safety Code require the State Water Board to establish MCLs as close as is technically and economically feasible to PHGs, and to amend any standard if any of the following occur: (1) Changes in technology or treatment techniques that permit a materially greater protection of public health or attainment of the PHG, or (2) New scientific evidence indicates that the substance may present a materially different risk to public health than was previously determined.

For 19 of these 21 MCLs, no changes in technology or treatment techniques have been identified that would permit a materially greater protection of public health or attainment of the PHG, and no new scientific evidence indicates that regulated contaminants may present a materially different risk to public health than was previously determined. For two of the contaminants (perchlorate and antimony), OEHHA issued revised PHGs since 2015 that have prompted additional review of these MCLs.

In 2016, the State Water Board initiated further review of the MCL for perchlorate to determine whether a formal revision of the MCL may provide benefits to public health. The PHG for perchlorate was reduced from 6 ppb to 1 ppb by OEHHA in 2015. The review of the MCL for perchlorate is underway but is not yet complete. The results of that review, including the analysis and staff recommendation, will be presented to the Board at a future State Water Board meeting.

In 2016, the PHG for antimony was lowered from 6 ppb to 1 ppb. The current MCL for antimony is 6 ppb, but the current laboratory methods limit the reliable detection of antimony to 6 ppb. In addition, there are five wells in the state with antimony levels greater than the MCL. Based on the low number of detections, we do not plan on further review of the antimony MCL.

For 2017, State Water Board staff recommends no further in-depth review of the MCLs. The rationale for this recommendation is shown below.

Background

This MCL review process consists of the evaluation of current MCLs by developing information on potential public health benefits and technical feasibility of potential revisions. This review process enables the State Water Board to prioritize work and decide where to focus resources to improve the protection of public health given the resources available.

If the State Water Board decides to proceed with the formal preparation a revised MCL, there are several steps in the process defined by State law These steps include an economic analysis and the development of information on the public health benefits of the proposed MCL. Compliance with the California Environmental Quality Act (CEQA) is required. There is a requirement for an external peer review of the scientific basis of any proposed standard. Public workshops and hearings and opportunities for public comment are also part of the State Water Board process.

Because of the complexity and resources required to revise an MCL, it is important to perform this review to prioritize and focus efforts and resources. In addition to the potential revision of MCLs, the State Water Board periodically examines its overall priorities for drinking water regulation. Current priorities for regulatory development are reflected in the SWRCB's Drinking water regulations development web page.

Introduction to the MCL Review

Health and Safety Code §116365(g) requires the Water Board, at least once every five years, to review its MCLs. In the review, the State Water Board's MCLs are to be consistent with criteria of §116365(a) and (b). Those criteria state that the MCLs cannot be less stringent than federal MCLs, and must be as close as is technically and economically feasible to the PHGs established by OEHHA. Consistent with those criteria, the State Water Board is to amend any standard if any of the following occur: (1) Changes in technology or treatment techniques that permit a materially greater protection of public health or attainment of the PHG, or (2) New scientific evidence indicates that the substance may present a materially different risk to public health than was previously determined. Each year by March 1, the State Water Board is to identify each MCL it intends to review that year.

For a list of all regulated chemicals' MCLs and PHGs, click here (Excel).

In 2016, OEHHA revised PHGs for antimony, carbofuran, diquat, endrin, picloram, and thiobencarb.

At the request of the California Department of Public Health's (CDPH's) Drinking Water Program (now DDW), OEHHA has established PHGs for two unregulated chemicals, 1,2,3-trichloropropane (1,2,3-TCP) and N-nitrosodimethylamine (NDMA). The State Water Board has not yet proposed MCLs, though each chemical has an advisory notification level. An MCL is for 1,2,3-TCP is currently under development. Neither NDMA nor 1,2,3-TCP is considered further in this review.

The Review Process

The first step in the review process (PDF) is an initial screening. The criteria for this screening include: (1) The relationship between the PHG and both federal and state MCLs (PDF); (2) any changes in technology or treatment techniques that permit a materially greater protection of public health or attainment of the public health goal; and (3) any new scientific evidence indicating that the substance might present a materially different risk to public health than was previously determined.

To assess chemical occurrence in drinking water sources, that is, in drinking water wells or surface water supplies, we obtained four years of recent analytical data from the State Water Board's Division of Drinking Water's (DDW's) water quality database (WQIR) and analyzed each chemical being considered for review.

For each regulated contaminant, we have also established in regulation a standardized quantification level called the "detection level for purposes of reporting" (DLR). The DLR represents the level at which we are confident about the accuracy of the quantity of contaminant being reported by laboratories. Although any findings below DLRs are considered "non-detects" and are not technically required to be reported, some

laboratories may on occasion report lower levels for chemicals. For some chemicals, the DLR affects the technical feasibility of revising the MCL, in that the limits on a chemical's detectability by analytical laboratories also serve to limit the extent to which the MCL might be lowered.

Since this MCL review process began in 1999, MCLs for these chemicals have been revised downward, that is, made more stringent: cyanide, ethylbenzene, 1,2,4-trichlorobenzene, atrazine, oxamyl, and methoxychlor. (No MCLs have been made less stringent.) In addition, the 2014 MCL for hexavalent chromium resulted from a review of the MCL for total chromium.

MCL Review

The steps in selecting contaminants for possible MCL review are as follows:

Exclusion of Some Chemicals

Six contaminants were excluded from this review process. They include chemicals regulated by other rules other than MCLs (lead and copper), others that are added to drinking water for public health benefit (aluminum and fluoride), and disinfection byproducts (bromate and chlorite) that may result from water disinfection for public health benefit. More information about them is presented at the bottom of this webpage.

Regulated Contaminants with Established PHGs

The selection process for MCLs for possible review first considers the regulated chemicals with PHGs. From the list of regulated contaminants, those with PHGs established through 2016 were identified. (see OEHHA's list of contaminants with PHGs)

There are 81 contaminants with MCLs that have PHGs that require further review. These 81 MCLs are then divided into two groups, (1) contaminants with MCLs equal to or less than PHGs, and (2) contaminants with MCLs greater than their PHGs (Table 1). Several other contaminants with MCLs do not have PHGs, as shown in the table of MCLs, DLRs and PHGs.

There are 31 contaminants with MCLs equal to or below their PHGs that were not considered for further review, since their MCLs provide the same or greater protection to the drinking water consumer as their PHGs. The 31 contaminants are listed in Table 1.

The remaining 50 contaminants with MCLs greater than PHGs are evaluated in terms of whether or not they have been recently detected. The selection process excludes contaminants with no recent detections at or above the DLR in at least one drinking water source. Two detections in a source at or above the DLR is a "detection" for purposes of this step.

Contaminants that were not detected were not considered further in this review, since they are not found to be present in drinking water supplies; 29 contaminants were not detected. They are listed in Table 1.

Contaminants for Further Review

There are 21 contaminants with recent (2013-2016) detections. They are:

Antimony	Selenium	1,2-Dichloropropane
Arsenic	Radium-226	Styrene
Cadmium	Radium-228	Tetrachloroethylene (PCE)
Chromium, Hexavalent	Uranium	1,1,2-Trichloroethane (1,1,2-TCA)
Mercury (inorganic)	Benzene	Trichloroethylene (TCE)
Nickel	Carbon tetrachloride	1,2-Dibromo-3-chloropropane (DBCP)
Perchlorate	1,1-Dichloroethane (1,1-DCA)	Ethylene dibromide (EDB)

The most commonly detected contaminants with MCLs greater than PHGs include arsenic, hexavalent chromium, perchlorate, uranium, tetrachloroethylene (or perchloroethylene, PCE), trichloroethylene (TCE), and 1,2-dibromo-3-chloropropane (DBCP).

The 21 contaminants with MCLs greater than their PHGs and with recent detections were evaluated to determine chemicals for further review of the MCL for possible regulations changes. They were considered in terms of the number of sources (active, standby, and combined sources) with reported detections above the PHG or the MCL, and in terms of the criteria presented earlier. Based on these considerations, we determined whether or not a more extensive review and evaluation of the chemical detections and their associated drinking water sources - including an analysis of possible more stringent MCLs - would be appropriate. The 21 contaminants are discussed individually below

Notes pertinent to individual chemicals:

With regard to the basis for the PHG mentioned below, PHGs for cancer-causing substances are set at a theoretical level of 1 X 10-6, or up to one excess case of cancer per million people per 70-year lifetime exposure. This is also called "de minimis" cancer risk. Public health and environmental regulatory agencies generally consider risks within the 10-6 to 10-4 cancer risk range to be "acceptable," though on occasion a higher theoretical cancer risk may be acceptable, when setting a health-based standard. Values 10 or 100 times the PHG correspond to risk levels of 10-5 or 10-4, respectively.

For chemicals considered to be non-carcinogens, PHGs are set at a level equivalent to the no observed adverse effect level (NOAEL) divided by an uncertainty factor (UF) that reflects limitations in available scientific information related to the evaluation of effects. For some contaminants, the UF may include an extra factor to account for a possibility of cancer -- this would occur, for example, if the chemical is known to be carcinogenic when inhaled, but hasn't been found to be carcinogenic when ingested.

California and federal MCLs are frequently set at the same level. Where California and federal MCLs differ, this is noted in the chemical-specific information.

Detections refer to the number of drinking water sources with a peak detection above the PHG and above the MCL, based on sampling from 2013 through 2016, unless otherwise noted. As mentioned above, at least two findings at or above the DLR from a drinking water source are needed to be considered a detection for this evaluation.

Inorganic Chemicals (8)

Antimony - MCL = 6 ppb; DLR = 6 ppb; PHG = 1 ppb.
Basis for PHG: Non-cancer effects, based on liver toxicity in studies in rats. PHG includes a 1,000-fold UF. **Detections (2013-2016):** 5 sources with a peak detection above the PHG and above the MCL. **COMMENTS:** There have been few detections of antimony, and the MCL is equal to the DLR. Thus, we do not plan on further review of the antimony MCL.

Arsenic - MCL = 10 ppb; DLR = 2 ppb; PHG = 0.004 ppb.
Basis for PHG: Cancer risk, based upon epidemiological studies in people, along with studies in experimental animals. **Cancer risk at PHG:** 1 X 10-6. Cancer risk at DLR: 5 X 10-4. Cancer risk at MCL: 2.5 X 10-3. **Detections (2013-2016):** 1,806 sources with a peak detection above the PHG (i.e., equal to or greater than the DLR) and 546 above the MCL. Arsenic is among the most frequently detected contaminants, reflecting its natural occurrence. **COMMENTS:** We are not aware of changes in treatment that would permit materially greater protection of public health, nor of new scientific evidence of a materially different public health risk than was previously determined. Thus, we do not plan on further review of the arsenic MCL.

Cadmium - MCL = 5 ppb; DLR = 1 ppb; PHG = 0.04 ppb.
Basis for PHG: Non-cancer effects, based upon tubular damage in human kidneys indicated by the presence of small proteins and other substances. The PHG includes a 50-fold UF (including a 10-fold factor reflecting the possible carcinogenic potential from ingested cadmium). **Detections (2013-2016):** 58 sources with a peak detection above the PHG (i.e., equal to or greater than the DLR) and 5 above the MCL. **COMMENTS:** The MCL is only 5 times the DLR, but the several dozen sources with detections of cadmium suggest that it would be reasonable to further evaluate the cadmium findings in terms of peak versus average cadmium concentrations in those sources. At this time, we do not plan on further review of the cadmium MCL.

Chromium, Hexavalent - MCL = 10 ppb (there is no federal MCL specific for hexavalent chromium); DLR = 1 ppb; PHG = 0.02 ppb.
Basis for PHG: Cancer risk, based upon studies in experimental animals. Cancer risk at PHG: 1 X 10-6. Cancer risk at DLR: 5 X 10-5. Cancer risk at MCL: 5 X 10-4. **Detections (2013-2016):** 1,508 sources with a peak detection above the PHG (i.e., equal to or greater than the DLR) and 199 above the MCL. Hexavalent chromium is among the most frequently detected contaminants and may be naturally occurring. **COMMENTS:** The MCL for hexavalent chromium was adopted in 2014. Although there is no federal MCL, there is a 100-ppb MCL for total chromium. The California MCL for total chromium is 50 ppb. We are not aware of changes in treatment that would permit materially greater protection of public health, nor of new scientific evidence of a materially different public health risk than was previously determined. Thus, we do not plan on further review of the hexavalent chromium MCL. We note that OEHHA announced in October 2016 that it is initiating a review of the hexavalent chromium PHG.

Mercury - MCL = 2 ppb; DLR = 1 ppb; PHG = 1.2 ppb.
Basis for PHG: Non-cancer effects based on kidney toxicity in short term studies in rats. PHG includes a 1,000-fold UF. **Detections (2013-2016):** 7 sources with a peak detection above the PHG and 6 above the MCL. **COMMENTS:** There have been few detections of mercury and the MCL is just 1.7 times the PHG. Thus, we do not plan on further review of the mercury MCL.

Nickel - MCL = 100 ppb (no federal MCL); DLR = 10 ppb; PHG = 12 ppb.
Basis for the PHG: Non-cancer effects, based upon reproduction toxicity studies in rats. PHG includes a 1,000-fold UF (including a 10-fold factor reflecting the possible carcinogenic potential from ingested nickel). **Detections (2013-2016):** 122 sources with a peak detection above the PHG and 8 above the MCL. **COMMENTS:** Although there have been a number of detections of nickel, few have exceeded the current MCL, which is only 8 times the PHG. We plan to look further at the distribution of the nickel detections, but we do not plan on further review of the nickel MCL at this time. We note that OEHHA announced in October 2016 that it is initiating a review of the nickel PHG.

Perchlorate - MCL = 6 ppb (no federal MCL); DLR = 4 ppb; PHG = 1 ppb.
Basis for PHG: Non-cancer effects, based upon studies in people; perchlorate interferes with iodide uptake by the thyroid gland, which can affect thyroid hormone production. The PHG, which includes a 10-fold UF, takes infant exposure to perchlorate, whereas the 2004 PHG was established to protect pregnant women and their fetuses. **Detections (2013-2016):** 98 sources with a peak detection above the PHG (i.e., equal to or greater than the DLR) and 55 above the MCL. **COMMENTS:** The PHG was revised to 1 ppb in 2015 from its prior 6-ppb value, established in 2004. We are not aware of changes in treatment techniques for perchlorate that permit materially greater protection of public health nor of new scientific evidence of a materially different public health risk than was previously determined. The reduction in the PHG from 6 to 1 ppb reflects different assumptions and methods OEHHA used in calculating the revised PHG, based on the same human studies that provided the basis for the 2004 PHG. The revised PHG uses infant-specific water consumption data, as well as the contribution of perchlorate provided by food. The current 6-ppb MCL continues to provide adequate public health protection to drinking water consumers and to the thyroid glands of the developing young. Any reduction of the MCL would be limited to 4-ppb (because of the current DLR of 4-ppb), and a 4-ppb MCL would not differ greatly from the current standard. Given the number of detections and the recent reduction in the PHG to take into account infant exposures, we believe it appropriate to examine the perchlorate detections and the drinking water sources involved, and to develop an analysis of a possible MCL revision. Staff has initiated this review which will be completed in 2017 and will be presented to the Board at a future Board meeting. This will enable us to determine whether the perchlorate MCL (adopted in 2007) should be revised downward or maintained at the same level. More information about perchlorate is here.

Selenium - MCL = 50 ppb; DLR = 5 ppb; PHG = 30 ppb.
Basis for the PHG: Non-cancer effects, based upon hair loss and nail damage in people. PHG includes a 3-fold UF. **Detections (2013-2016):** 12 sources with a peak detection above the PHG and 7 above the MCL. **COMMENTS:** Selenium is an essential nutrient. There have been few detections and the MCL is just 1.7 times the PHG. Thus, we do not plan on further review of the selenium MCL.

Radionuclides (3)

Radium 226 - MCL = 5 picocuries per liter (pCi/L) for sum of Ra-226 + Ra-228; DLR = 1 pCi/L; PHG = 0.05 pCi/L.
Basis for PHG: Cancer risk, based upon human epidemiological data for exposures to ionizing radiation. Cancer risk at PHG: 1 X 10-6. Cancer risk at DLR: 2 X 10-5. Cancer risk at MCL, if all from Ra-226: 1 X 10-4. **Detections (2013-2016):** 42 sources with a peak detection above the PHG (i.e., equal to or greater than the DLR) and 7 above 5 pCi/L. These raw values do not take into account statistical evaluations required to determine compliance with the MCL. **COMMENTS:** We are not aware of changes in treatment that would permit materially greater protection of public health, nor of new scientific evidence of a materially different public health risk than was previously determined. Thus, we do not plan on further review of the radium-226 + radium-228 MCL.

Radium 228 - MCL = 5 pCi/L for sum of Ra-226 + Ra-228; DLR = 1 pCi/L; PHG = 0.019 pCi/L.
Basis for PHG: Cancer risk, based upon human epidemiological data for exposures to ionizing radiation. Cancer risk at PHG: 1 X 10-6. Cancer risk at DLR: 5 X 10-5. Cancer risk at MCL, if all from Ra-228: 2.6 X 10-4. **Detections (2013-2016):** 131 sources with a peak detection above the PHG (i.e., equal to or greater than the DLR) and 2 above 5 pCi/L. These raw values do not take into account statistical evaluations required to determine compliance with the MCL. **COMMENTS:** We are not aware of changes in treatment that would permit materially greater protection of public health, nor of new scientific evidence of a materially different public health risk than was previously determined. Thus, we do not plan on further review of the radium-226 + radium-228 MCL.

Uranium - MCL = 20 pCi/L (federal MCL is 30 ppb); DLR = 1 pCi/L; PHG = 0.43 pCi/L.
Basis for PHG: Cancer risk, based upon human epidemiological data for exposures to ionizing radiation. Cancer risk at PHG: 1 X 10-6. Cancer risk at DLR: 2.3 X 10-6. Cancer risk at MCL: 4.7 X 10-5. **Detections (2012-2015):** Uranium is a frequently detected contaminant. 859 sources with a peak detection above the PHG (i.e., equal to or greater than the DLR) and 144 above the MCL. These raw values do not take into account statistical evaluations required to determine compliance with the MCL. **COMMENTS:** We are not aware of changes in treatment that would permit materially greater protection of public health, nor of new scientific evidence of a materially different public health risk than was previously determined. Thus, we do not plan on further review of the uranium MCL.

Volatile Organic Chemicals (8)

Benzene - MCL = 1 ppb (federal MCL = 5 ppb); DLR = 0.5 ppb; PHG = 0.15 ppb.
Basis for PHG: Cancer risk, based upon human data from workplace exposures. Cancer risk at PHG: 1 X 10-6. Cancer risk at DLR: 3.3 X 10-6. Cancer risk at the 1-ppb MCL: 6.7 X 10-6. **Detections (2013-2016):** 4 sources with a peak detection above the PHG (i.e., equal to or greater than the DLR) and 1 above the MCL. **COMMENTS:** There have been few detections and the MCL is just 2 times the DLR. Thus, we do not plan on further review of the benzene MCL.

Carbon tetrachloride - MCL = 0.5 ppb (federal MCL = 5 ppb); DLR = 0.5 ppb; PHG = 0.1 ppb.
Basis for PHG: Cancer risk, based upon experimental studies in mice. Cancer risk at PHG: 1 X 10-6. Cancer risk at DLR: 5 X 10-6. Cancer risk at MCL: 5 x 10-6. **Detections (2013-2016):** 32 sources with a peak detection above the PHG (i.e., equal to or greater than the DLR) and the MCL. **COMMENTS:** The MCL is the same as the DLR, and the MCL is just 5 times the PHG. Thus, we do not plan on further review of the carbon tetrachloride MCL.

1,1-Dichloroethane - MCL = 5 ppb (no federal MCL); DLR = 0.5 ppb: PHG = 3 ppb.
Basis for PHG: Cancer risk, based upon experimental studies in rates. Cancer risk at PHG: 1X10-6. Cancer risk at MCL: 1.7 X 10-6 ppb. **Detections (2013-2016):** 1 source with a peak detection above the PHG and 0 above the MCL. **COMMENTS:** There have been a few detections above the PHG and MCL is 1.7 times the PHG. Thus, we do not plan on further review of the 1,1-dichloroethane MCL.

1,2-Dichloropropane - MCL = 5 ppb; DLR = 0.5 ppb; PHG = 0.5 ppb.
Basis for PHG: Cancer risk, based upon experimental studies in mice. Cancer risk at PHG: 1 X 10-6. Cancer risk at DLR: 1 X 10-6. Cancer risk at MCL: 1 X 10-5. **Detections (2013-2016):** 6 sources with a peak detection above the PHG and 0 above the MCL **COMMENTS:** There have been few detections, and the MCL is 10 times the DLR and PHG. Thus, we do not plan on further review of the 1,2-dichloropropane MCL.

Styrene - MCL = 100 ppb; DLR = 0.5 ppb; PHG = 0.5 ppb.
Basis for the PHG: Cancer risk, based upon laboratory studies in rodents. Cancer risk at PHG: 1 X 10-6. Cancer risk at DLR: 1 x 10-6. Cancer risk at MCL: 2 X 10-4. **Detections (2013-2016):** 2 sources with peak detections above the PHG and 0 above the MCL. **COMMENTS:** The PHG, established in 2010, is based on cancer risk while the prior health concern was related to non-cancer effects. Thus, scientific evidence presented in the PHG indicates that styrene might present a materially different risk to public health than was previously determined. Styrene was detected in two sources with peak concentrations of 1.3 ppb each. Given these findings, we plan to evaluate further the analytical results associated with those sources. Depending on the outcome of that evaluation, styrene may be a candidate for possible MCL revision. At this time, however, we do not plan on further review of the styrene MCL.

Tetrachloroethylene (Perchlorethylene, PCE) - MCL = 5 ppb; DLR = 0.5 ppb; PHG = 0.06 ppb.
Basis for the PHG: Cancer risk, based upon experimental studies in rodents. Cancer risk at PHG: 1 X 10-6. Cancer risk at DLR: 8.3 X 10-6. Cancer risk at MCL: 8.3 x 10-5. **Detections (2013-2016):** 272 sources with a peak detection above the PHG (i.e., equal to or greater than the DLR), and 34 above the MCL. **COMMENTS:** We are not aware of changes in treatment that would permit materially greater protection of public health, nor of new scientific evidence of a materially different public health risk than was previously determined. PCE is among the more frequently detected organic contaminants. Its MCL is 10 times the DLR. We have previously mentioned our intention to examine the PCE detections, and to develop an analysis of possible MCL revisions. Our intention initially was to perform this evaluation along with a similar analysis for TCE, another frequently detected VOC contaminant (see below). However, because OEHHA is reviewing the TCE PHG, we have put the review of both of these VOCs on hold. We note at the federal level, in 2012 US EPA released its evaluation of PCE and determined that a concentration of 20 ppb in drinking water is associated with a 10-6 lifetime cancer risk. (Go to US EPA's Integrated Risk Information System (IRIS) - PCE.)

1,1,2-Trichloroethane - MCL = 5 ppb; DLR = 0.5 ppb; PHG = 0.3 ppb.
Basis for PHG: Cancer risk, based on experimental studies in mice. Cancer risk at PHG: 1 X 10-6. Cancer risk at DLR: 1.7 X 10-6. Cancer risk at MCL: 1.7 X 10-5. **Detections (2013-2016):** 1 source with a peak detection above the PHG (i.e., equal to or greater than the DLR) and 0 above the MCL. **COMMENTS:** There have been few detections and the MCL is 10 times the DLR, which is slightly greater than the PHG. Thus, we do not plan on further review of the 1,1,2-trichloroethane MCL.

Trichloroethylene (TCE) - MCL = 5 ppb; DLR = 0.5 ppb; PHG = 1.7 ppb.
Basis for the PHG: Cancer risk, based upon experimental studies in mice. Cancer risk at PHG: 1 X 10-6. Cancer risk at MCL: 2.9 x 10-6. **Detections (2013-2016):** 110 sources with a peak detection above the PHG and 40 above the MCL. **COMMENTS:** TCE is among the more frequently detected organic contaminants. The MCL is about 3 times the PHG established in 2009. In 2001, when the PHG was at a lower concentration (0.8 ppb), considering the large number of TCE detections, even though there were no changes in treatment techniques nor new scientific evidence regarding different risks to public health, we developed a draft analysis (PDF) of possible MCL revisions. No public comment period was scheduled for that document. In July 2004, when OEHHA announced its plans to review the PHG for TCE, we suspended our evaluation of TCE. In 2012, OEHHA announced its intention to again review the PHG for TCE. At the present time we no longer plan on further review of the TCE MCL. If a review is performed in the future, it will likely be done along with a similar analysis for PCE, as mentioned above. At the federal level, in 2011 US EPA released an assessment of the human health risks associated with TCE and determined that a concentration of 0.5 ppb is associated with a 10-6 lifetime cancer risk. (Go to US EPA's IRIS - TCE.)

Synthetic Non-Volatile Organic Chemicals (2)

1,2-Dibromo-3-chloropropane (DBCP) - MCL = 0.2 ppb; DLR = 0.01 ppb; PHG = 0.0017 ppb.
Basis for PHG: Cancer risk, based upon experimental studies in mice. Cancer risk at PHG: 1 X 10-6. Cancer risk at DLR: 5.9 X 10-6. Cancer risk at MCL: 1.2 x 10-4. **Detections (2013-2016):** 244 sources with a peak detection above the PHG (i.e., equal to or greater than the DLR), and 40 above the MCL, even though DBCP's use as a fumigant has been prohibited for many years. **COMMENTS:** Previously we considered DBCP to be a candidate for possible MCL revision, given the number of detections and the 20-fold difference between the MCL and the DLR. At the end of the process, we concluded (PDF) that reduction of the current MCL (i.e., making it more stringent) would not be economically feasible. As a result of the findings of the prior evaluation, we do not plan on further review of the DBCP MCL.

Ethylene dibromide (EDB) - MCL = 0.05 ppb; DLR = 0.02 ppb; PHG = 0.01 ppb.
Basis for PHG: Cancer risk, based upon forestomach tumors in experimental studies in rats and mice. Cancer risk at PHG: 1 X 10-6. Cancer risk at DLR: 2.5 X 10-6. Cancer risk at MCL: 5 X 10-6. **Detections (2013-2016):** 12 sources with a peak detection above the PHG (i.e., equal to or greater than the DLR) and 5 above the MCL. **COMMENTS:** There are few detections and the MCL is just 2.5 times the DLR and 5 times the PHG. Thus, we do not plan on further review of the EDB MCL.

Chemicals and Contaminants Not Considered in this Review

Chemicals Regulated by the Lead and Copper Rule:

Lead - Action Level = 15 ppb; DLR = 5 ppb; PHG = 0.2 ppb. Copper - Action Level = 1,300 ppb; DLR =50 ppb; PHG = 300 ppb.
Basis for PHG: The PHG for lead is based on neurobehavioral effects in children, and hypertensive effects in adults. The PHG for copper is based on gastrointestinal effects in infants. **COMMENTS:** Lead and copper do not have MCLs. Instead, they are covered by "action levels" and a different regulatory approach that involves statistical analyses of analytical samples of drinking water taken from customers taps (see 22 CCR §64678). If more than 10 percent of samples exceed the action level, corrosion control treatment must occur. Lead's action level is 3 times its DLR. Copper's action level is 4.3 times the PHG. Click here for more about the Lead and Copper Rule.

Chemicals Used in Drinking Water Treatment to Provide a Public Health Benefit:

Aluminum - MCL = 1,000 ppb; DLR = 50 ppb; PHG = 600 ppb. Fluoride - MCL = 2,000 ppb; DLR is 100 ppb; PHG =1,000 ppb.
Basis for PHG: The PHG for aluminum is based on elevated aluminum blood levels in adults, and on avoidance impaired neurological development in premature infants. The PHG for fluoride is based on dental fluorosis in children. **COMMENTS:** Aluminum and fluoride may be added during drinking water treatment, so they are not necessarily always "contaminants". Aluminum compounds may be added in the treatment process to help precipitate out other chemicals. Aluminum's MCL is 1.7 times the PHG. Aluminum also has a secondary MCL of 200 ppb that is more restrictive than its PHG. There is no federal primary MCL for aluminum, though there is a federal secondary MCL of 50 to 200 ppb. Fluoride may be added to provide a public health benefit by preventing tooth decay. Fluoride's MCL is 2 times the PHG. The federal MCL is 4,000 ppb, to protect against skeletal fluorosis; there is a federal secondary MCL of 2,000 ppb, established to address dental fluorosis.

Chemicals That Are Byproducts of Disinfection Treatment:

Bromate - MCL = 10 ppb; DLR = 1 or 5 ppb (laboratory analytical method dependent); PHG = 0.1 ppb. Chlorite - MCL = 1,000 ppb; DLR = 20 ppb; PHG = 50 ppb.
Basis for PHG: The PHG for bromate is based on cancer risk, derived from studies in laboratory animals. It is set at a *de minimis* (10-6) theoretical lifetime cancer risk (see Notes, below, for more information about PHG endpoints). The PHG for chlorite is based on non-cancer effects (hematological changes) derived from studies on experimental animals. The PHG includes an uncertainty factor (UF) of 300. **COMMENTS:** Bromate and chlorite are byproducts of drinking water disinfection, which is required for the removal of disease-causing microbiological organisms for public health protection. Bromate's MCL is 2-10 times the method-dependent DLR. Chlorite's MCL is 20 times its PHG. The theoretical health risk that results from disinfection byproducts is offset by the important public health benefit provided by drinking water disinfection. Water systems take steps to reduce the production of DPBs by limiting the presence of precursor chemicals in their water supplies that may interact with disinfection chemicals.

More Information on Drinking Water Contaminants

- OEHHA's PHGs and Technical Support Documents
- Chemicals and Contaminants in Drinking Water

Contacts and Other Information for Drinking Water System

- Information for Drinking Water Systems
- Division of Drinking Water

Drinking Water Laws

- Drinking Water-Related Statutes and Regulations