City of Modesto
Utilities Department – Water Services Division
Public Health Goals Report 2016

Background Information:
The California Health and Safety Code Title 22 Section 116470 specifies that utilities with greater than 10,000 service connections prepare a special report if any of the water quality measurements taken during the previous three years have exceeded a Public Health Goal (PHG). A **PHG** is the level of a chemical contaminant in drinking water that does not pose a significant risk to health in people who drink that water every day for 70 years. PHGs are set at a level where no known or anticipated adverse health effects would occur, with an ample safety margin. PHGs are established by the California EPA's Office of Environmental Health Hazard Assessment (OEHHA), and are not regulatory standards.

Maximum Contaminant Levels (MCLs) on the other hand 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. MCLs are required to be set by the State Water Resource Control Board (SWRCB) as close to its PHG as is technologically and economically feasible, placing primary emphasis on the protection of public health.

For contaminants where OEHHA has not adopted a PHG, water suppliers use United States Environmental Protection Agency (USEPA) Maximum Contaminant Level Goals (MCLGs).

The Association of California Water Agencies (ACWA) formed a work group to provide guidelines to prepare this report, because no guidance is available from the state regulatory agencies. The report was prepared using all water quality data collected between 2013 and 2015. This data was previously summarized and presented to customers through the annual Consumer Confidence Reports. Only constituents that have a California primary drinking water standard (MCL) and a PHG (or MCLG if there is no PHG) are addressed.

State law specifies what information is to be provided in this report, including:

- Numerical public health risk
- Category / type of health risk
- Best Available Treatment (BAT) technology
- Estimated treatment costs

Best Available Treatment Technology and Cost Estimates:
Both the USEPA and SWRCB adopt what are known as the Best Available Technologies (BATs). Costs can be estimated for such technologies because these are currently used to reduce contaminant levels below the MCL. However, since many PHGs and MCLGs are set much lower than the MCL, it is not feasible to determine what treatment is needed to further reduce a constituent to the PHG or MCLG.

Estimating costs to reduce a constituent to zero is difficult because it is not possible to verify by analytical means that the level has been lowered to zero. If the contaminant is not detected in a sample the result is reported as less than the detection level for reporting. In some cases installing treatment to further reduce a very low level of one constituent may have an adverse affect on other aspects of water quality. The actual costs to reduce contaminants to PHG levels may differ dramatically from the estimates provided in this report.

The table attached provides a list of all contaminants found above the PHG in Modesto Wells, the PHG, Health Risk Category, the Numeric Cancer risk at the PHG, the Number of Sites Above the PHG, California MCL, the Numeric Cancer risk at the MCL, the Maximum Concentration detected, Best Available Technology, the Volume of water above the PHG that would need to be treated each year, Estimated cost in Dollars per million gallons of water to be treated, and Estimated Treatment Cost per Year to meet the PHG.
The estimated operations and maintenance costs per year to reduce all contaminant in our well water to the Public Health Goal is approximately 50 million dollars per year.

Arsenic: There are 54 wells that contain Arsenic above the PHG. The best available technology (BAT) for arsenic includes ion exchange treatment. The estimated cost to reduce arsenic below the PHG to all 54 wells is approximately $15 million (M) dollars per year. This cost estimate is based on the cost of ion exchange treatment provided by ACWA.

DBCP: There are 17 sites that contain DBCP above the PHG. The BAT for DBCP includes GAC. The estimated cost to reduce DBCP below the PHG to all 17 wells is approximately $3.3 M per year.

Fluoride: There is one well containing Fluoride above the PHG. The BAT for Fluoride is Activated Alumina. The estimated cost to treat this well below the PHG is estimated to be about $0.5M per year.

Hexavalent Chromium: There are 64 wells that contain Hexavalent Chromium (Cr+6) above the PHG. The BAT for Cr+6 is ion exchange. It may be concurrently removed with Arsenic, which would reduce the cost, however, nitrate may also be removed during treatment, which would significantly raise the cost because nitrate concentrations are present in part per million levels and will dramatically decrease bed volumes between regeneration. The cost to reduce Cr+6 to the PHG to all 64 wells would be around $19 M per year, without taking the above issues into consideration.

Nitrate and Nitrite: The PHG for nitrate and nitrite is the same as the MCL so wells that exceed the PHG are either currently being treated or are out of service.

Radium: There are 9 wells that contain Radium that do not also contain Uranium. Radium removal may occur concurrently when these wells are treated for Uranium using ion exchange. This does not take into consideration that the cost to dispose mixed Radium and Uranium wastes could increase disposal costs. There are 45 additional wells that contain Radium above the PHG. We assume Radium will be removed with Uranium, so additional costs for these wells are not included in the cost estimates. The estimated cost to reduce Radium below the PHG to 9 wells is estimated to be about $3M per year.

PCE and TCE: There are 4 active wells that contain PCE. One additional well contains TCE and one of the PCE wells contains both PCE and TCE. The BAT for volatile organics includes Granular Activated Carbon (GAC). While the volatile organics are removed concurrently, each pound of carbon will remove a specific mass of contaminant, so the removal cost are additive. The estimated cost for PCE treatment is approximately $0.6 M and for TCE is ~$0.2 M per year to reduce these contaminants to the PHG.

Gross Alpha, Uranium: All of the Gross Alpha detected in the City of Modesto well water is largely due to naturally occurring Uranium. There are 41 wells in Modesto that contain Uranium above the PHG. The BATs for Uranium include ion exchange. Nitrate would also be removed by ion exchange and would increase the cost of treatment by reducing the bed volumes that can be treated. Uranium may be removed along with Arsenic by ion exchange, which may reduce the treatment cost, since so many wells would already need arsenic treatment and the cost to treat both may not be additive. However the individual costs to treat Arsenic and Uranium are listed in this report because brine waste from Uranium must be disposed of at a Class 1 landfill and if Arsenic concentrations in the brine exceed California standards, the brine could be considered to be mixed hazardous waste, which would

further limit disposal options and dramatically increase costs. The estimated cost to meet the PHG in the currently active wells is around $9 M per year. There are several additional wells that are out of service due to Uranium that are not included in this cost estimate.

Coliform Bacteria: Routine Coliform samples are collected from the distribution system at 142 sites monthly. The MCL for Coliform is 5% positive samples per month and the MCLG is zero. Because Coliform is a surrogate indication of the potential presence of pathogens, it is not possible to state a specific numerical health risk. Positive, proactive steps are already in place to prevent Coliform contamination in the distribution system, including maintaining a disinfectant residual.

RECOMMENDATIONS FOR FUTHER ACTION:

The drinking water quality of the City of Modesto meets all State Water Resource Control Board and USEPA drinking water standards set to protect public health. City of Modesto's treated surface water, which represents approximately half of the water delivered, does not contain arsenic, uranium, radium, DBCP, PCE, TCE, Freon or Coliform above the detection limit for reporting. Since PHGs are set based on the volume of contaminant ingested, conjunctive use of well water and surface water provides for greater protection of public health without additional investment in wellhead treatment.

The Water Services Division is recommending that no action be taken because:

- The cost to further reduce the levels of the contaminants identified in this report is estimated at over fifty million dollars per year.
- The effectiveness of the treatment processes to provide any significant reductions in contaminant levels is uncertain.
- The health protection benefits of reductions below the MCL are unclear and may not be quantifiable.
- The funds that are available might provide better health protection benefits if spent on water system operation, maintenance, surveillance and monitoring programs.