

Chromium-6 and Drinking Water

Revised September 2016

What is chromium-6?

Chromium-6 is an oxidized form of chromium, which is a relatively abundant element in the Earth's crust and is naturally found in rocks, soil, plants and animals. The most common forms of chromium that occur in the environment are trivalent chromium (chromium-3) and hexavalent chromium (chromium-6). Chromium-3 is an essential human dietary element and is found in many vegetables, fruits, meats, grains and yeast. Chromium-6 in the environment is generally from the erosion of rocks containing chromium. Chromium-6 is soluble in water. It can be found in both surface water and groundwater in areas where rocks containing chromium occur. Chromium is also used in a variety of industrial processes.

Is chromium-6 hazardous?

Most studies on chromium toxicity relate to inhalation of airborne chromium-6 in the industrial workplace. These studies have found that airborne chromium-6 is a carcinogen when inhaled. There have only been limited human and animal studies on the ingestion of chromium-6 in drinking water. Experts disagree on the toxicity of chromium-6 in drinking water because there is evidence that chromium-6 changes to the essential and non-toxic element chromium-3 in the stomach. This change does not occur when chromium-6 is inhaled, which may explain why there is disagreement. More information on chromium toxicity can be found on the California Office of Environmental Health Hazard Assessment (OEHHA) and on the US Environmental Protection Agency (USEPA) websites.

Is our drinking water tested for chromium-6?

The San Francisco Public Utilities Commission (SFPUC) monitors chromium-6 in all of our waters, including reservoirs and in the treated water delivered to homes. Our drinking water is safe to drink, with chromium-6 levels far below the drinking water standard of 10 ppb. As summarized in the table below, the highest detected level in our surface water supply is 0.35 ppb. Water samples from the Hetch Hetchy and Moccasin Reservoirs did not detect any chromium-6 in the water, even though the SFPUC uses the most sensitive test method that can detect chromium-6 down to 0.02 ppb.

What is the drinking water standard for chromium-6?

California's maximum contaminant level (MCL) for chromium-6 is 10 parts per billion (ppb) in public drinking water systems. This level was developed to minimize adverse health effects from long-term exposure. One ppb is equal to 1 second in nearly 32 years.

Prior to July 1, 2014 there was no State or federal MCL specific to chromium-6. In drinking water, chromium-6 was regulated through the total chromium MCL (chromium-6 is one of the forms of chromium making up total chromium). California's MCL for chromium-6 is the only in the nation to directly regulate this chemical in public drinking water systems. California's MCL for chromium-6 took effect on July 1, 2014.

Chromium-6 Monitoring Results of Surface Water Supplies (ppb)

Source Name	Date	Test Result
Hetch Hetchy Reservoir	2013-2016	Non-detect
Moccasin Reservoir	2013-2016	Non-detect
Local Reservoirs in East Bay	2013-2016	0.04 – 0.35
Local Reservoirs in San Mateo County	2013-2016	0.03 – 0.20
Treated Water from Harry Tracy Water Treatment Plant	2013-2016	0.07 – 0.17
Treated Water from Sunol Valley Water Treatment Plant	2013-2016	0.04 – 0.10
San Francisco Distribution System	2013-2016	Non-detect – 0.15

Chromium-6 and the Westside Groundwater Basin

Is chromium-6 in the Westside Groundwater Basin, our groundwater source?

To assess the occurrence and extent of chromium-6 in the groundwater sources, the SFPUC tested groundwater from wells in the Westside Groundwater Basin located in San Francisco and northern San Mateo County. While the wells are not currently part of the drinking water supply, SFPUC will be diversifying its water supply by blending a small amount of groundwater with existing surface water starting in early 2017.

Sampling results between 2007 and 2016 indicate that chromium-6 levels in test wells range from non-detect to 30 ppb. As part of our groundwater projects, the SFPUC is working with the State Water Resources Control Board, Division of Drinking Water (SWRCB DDW) to ensure that the water delivered to customers from these projects will meet the standard for chromium-6.

Chromium-6 Monitoring of Potential (Untreated) Groundwater Supplies (ppb)

Source Name	Date	Test Result
Untreated Future Groundwater	2007 – 2016	Non-detect – 30

Why is chromium-6 found in groundwater?

Chromium-6 detected in the Westside Groundwater Basin occurs naturally. The underlying water bearing sediments are derived from many rock types (including serpentine) that contain chromium, which is a relatively abundant element in the Earth's crust. As rainwater moves through the water bearing layers, chromium can be leached from these sediments. The major source of chromium-6 in drinking water is oxidation of naturally occurring chromium present in geologic formations. Industrial sources and wastes are not related to these chromium-6 detections.

Is the Westside Groundwater Basin a safe water source?

Groundwater is an essential part of the state and the nation's water supply. In fact prior to the construction of the Hetch Hetchy system, San Francisco relied on groundwater for part of its supply. In extensive drought years, groundwater can provide close to 60% of the State's water supply. Many of the SFPUC's wholesale customers utilize a blend of groundwater and Hetch Hetchy System water. While San Francisco residents are not currently drinking groundwater, approximately 80% of Californians depend upon groundwater for at least part of their drinking supply, and have been doing so safely for generations.

Since chromium-6 can occur naturally in rocks and soil, it can be present in some groundwater aquifers. The chromium-6 standard requires over 100 public water systems throughout California to implement blending strategies or other treatment to ensure that the standard is met.

We have been studying and monitoring the quality of the Westside Groundwater Basin for more than a decade as

Once the Westside Groundwater Basin source is added, how will our drinking water meet the drinking water standard?

Our groundwater projects are developed to:

1. diversify and expand our water supply and
2. supplement the existing surface water supply during drought conditions.

When the projects are implemented, a limited portion of groundwater will be mixed with a large portion of water from Hetch Hetchy and/or local reservoirs to supplement the supply. The amount of groundwater that will be mixed into these other supplies will be limited by the SFPUC to ensure all water delivered to customers meets all water quality standards, including the chromium-6 standard. State regulatory officials will review SFPUC's blending and operations strategy before issuing a permit and will regularly review water quality monitoring data while groundwater is in use.

we prepare to bring groundwater back into our supply. Compliance with MCLs using the planned blending strategy is a practice approved by the SWRCB DDW.

Upon supplementing surface water supplies with groundwater, our drinking water will continue to be among the highest quality water in the nation and will continue to be monitored for compliance with all drinking water standards.

Is our drinking water safe to drink?

Water supplied by the SFPUC meets, and will continue to meet, all drinking water standards including the chromium-6 MCL. Future water supplies that include a small percentage of groundwater will be operated in a way that ensures continued compliance with all drinking water standards. The SWRCB DDW regulates drinking water supplies, oversees compliance, and issues a permit before any drinking water, including future supplies that contain groundwater, is delivered to our customers.

Consumer Resources:

- SFPUC 2016 Public Health Goal Report: sfwater.org/quality/2016PHGReport
- OEHHA: <http://oehha.ca.gov/water/chemicals/chromium-hexavalent>
- USEPA Information About Chromium in Water: <https://www.epa.gov/dwstandardsregulations/chromium-drinking-water>
- SWRCB DDW: www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/Chromium6.shtml