

# **Public Notice on Yellowish Water in the System**

## **Cause**

In the process of filling our potable water reservoirs, pumping cold snowmelt water from the Cosumnes river into lake Chesbro, which supplies the drinking water plant, has caused it to “turn-over” stirring up sediment containing the minerals iron and manganese. The dissolved portion of this water containing these minerals was not being filtered out through our membrane treatment process, and when chlorine is added after filtration, it oxidizes the dissolved minerals in a slow reaction and causes them to precipitate (go from a dissolved form to a solid form) and appear in the water after our detection equipment. This has been corrected in the treatment plant by the addition of a pre-oxidant so it will be filtered out in the treatment process.

## **Is it Safe to Drink?**

Yes. Our testing results showed that there was 0.086 mg/L of manganese in the Rio Oso tank feeding Units 3 & 4 and 0.071 mg/L of manganese in the VanVleck tank feeding the rest of the community, with no iron being detected. Manganese is considered a Secondary standard contaminant, meaning it is primarily an aesthetic concern. These levels are above the secondary standard level required by the State at 0.05 mg/L and we are working diligently to bring the levels down by producing better water and flushing the water distribution system to purge it of the lower quality water.

## **Sources of iron and manganese in drinking water**

Iron and manganese are the 4th and 13th most common metallic elements found in the Earth’s crust, respectively. Water percolating through soil and rock can dissolve minerals containing iron and manganese and hold them in solution in varying amounts. Iron pipe & valve corrosion may be a source of iron in drinking water.

When water containing iron and manganese is exposed to air, or any oxidant such as chlorine, these elements are oxidized and precipitate out of solution. Upon oxidation, colored forms of iron and manganese become visible in water. In the case of iron, white, then yellow and finally red-brown solid particles form that settle out of the water. Iron oxide particles may not settle out and can impart the water with a red tint. Oxidized forms of manganese usually remain dissolved in water, giving it a black or yellowish tint. These abrupt changes in the chemical forms of iron and manganese are responsible for the staining properties of waters containing these elements. Iron will cause reddish-brown staining of laundry, porcelain, dishes, utensils and even glassware. Manganese causes a brownish-black stain. Soaps and detergents do not remove these stains and use of chlorine bleach may set the stains. Clothing or fixture stains may sometimes be washed away using white vinegar.

Deposits of iron and manganese can build up in pipelines, pressure tanks, water heaters and water softeners. This may reduce the available quantity and pressure of the water supply and therefore periodic flushing of water pipelines and hot water heaters is recommended.

Iron and manganese can affect the flavor and color of food and water, which affects both taste and appearance. Most commercially available filter systems such as Brita or Pur Filters, cartridge filters in refrigerators, and tap mounted units, will remove iron and manganese.

## **Removal in treatment**

The District operates an aeration system in the Chesbro reservoir in an effort to oxidize iron and manganese out of solution, changing it from a dissolved form of the mineral to a solid, so it may be filtered out in its treatment process. However, this is only partially affective as it occurs by the water plant pipeline intake and not the entire reservoir. Additionally if needed, the District feeds drinking water approved oxidant Potassium Permanganate (NSF 60) at a low dose into its water plant intake to oxidize Iron &/or Manganese into a solid form for them to be filtered out.

## **Why wasn't this detected before it became a problem?**

The water treatment equipment that continually measures the clarity of the water has shown, and continues to show, very clear, clean water being produced. The issue is that the dissolved form of the mineral has not been visible until it has reacted with the chlorine that is added to the water for disinfection purposes. The oxidation reaction of chlorine with manganese is reported by the American Water Works Association handbook for Iron & Manganese removal as being between 2-3 hours. This is why it has only showed up in our water distribution system and brought to our attention via consumer complaints. Also, staff was in the process of routinely flushing the distribution system and early complaints were thought to be the result of the stirring up iron from opening and closing valves. We are working to change our monitoring systems to be able to deal with it proactively in the future.

## **Potential health effects of iron and manganese in drinking water**

Iron and manganese in drinking water are not considered health hazards by the EPA. In addition, iron and manganese are needed in low doses for human health. Grains, beans, nuts and teas in particular are rich in manganese. It is an essential trace mineral for the body to function, however excess manganese exposure has potential health implications. See website links below.

## **EPA's website regarding Iron and Manganese standards**

<https://www.epa.gov/dwstandardsregulations/secondary-drinking-water-standards-guidance- nuisance-chemicals>

## **State's website regarding Manganese**

[https://www.waterboards.ca.gov/drinking\\_water/certlic/drinkingwater/Manganese.html](https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/Manganese.html)