

**California Regional Water Quality Control Board,
Lahontan Region
Barstow Groundwater Nitrate Pollution**



FACT SHEET

APRIL 24, 2012

“The State Water Board’s mission is to preserve, enhance and restore the quality of California’s water resources, and ensure their proper allocation and efficient use for the benefit of present and future generations.”

Una versión en español de datos acerca de la contaminación de nitrato en las aguas subterráneas está disponible en la página electrónica www.waterboards.ca.gov/lahontan. Esta página provee la manera de comunicarse con el personal de la junta de Control de Calidad de Agua – Región Lahontan (Junta de Agua).



Introduction

This fact sheet describes the status of groundwater nitrate pollution investigation and cleanup activities in the Soapmine Road area east of Barstow along the Mojave River. Since 2004, the Water Board has required the city of Barstow (City) to evaluate nitrate concentrations in groundwater, ensure that no one is drinking water with nitrate above drinking water standards, eliminate pollution sources, and clean up groundwater to either background levels or to what is feasible, but in no case greater than drinking water standards.

Nitrate Found Above Drinking Water Standards

As of the fourth quarter 2011, nitrate was found in four residential drinking water wells in the Soapmine Road area between Soapmine Road and the Mojave River (Soapmine Road area) at, or above, levels greater than the state standard for drinking water. The Water Board required the City to investigate this problem because the predominant source of pollution is the City’s historic wastewater disposal on fields north of the Mojave River and northwest of the wastewater treatment plant. Other potential nitrate sources include septic tank discharges and agricultural fertilizers. See Figure 1 for a site location map.

Health Effects from Nitrate

Total nitrogen is comprised of organic nitrogen, ammonia, nitrate, and nitrite. Nitrate nitrogen is the most highly oxidized form of nitrogen found in wastewater. The California drinking water standard for “nitrate as nitrate” (NO₃) is 45 milligrams per liter (equivalent to parts per million or ppm). Nitrate is also reported as “nitrate as nitrogen” (N) and 10 ppm nitrate as N equals 45 ppm nitrate as NO₃. Water containing nitrate in excess of this amount is a serious health concern for infants. For the purposes of this fact sheet, all nitrate concentrations will be reported as nitrate as N so that concentrations can be compared to the 10 ppm value.

According to the California Department of Public Health (CDPH), infants under six-months of age should not be given water containing nitrate exceeding the drinking water standard. This includes water mixed with formula, juice, or powdered milk. Nitrate causes a health threat to infants called “blue baby” syndrome, in which the nitrate adversely affects the blood’s ability to carry oxygen. Symptoms include shortness of breath and blueness of skin. If symptoms occur, medical attention should be sought immediately. Pregnant women should not drink water containing high levels of nitrate because of potential adverse effects to the unborn child.

Boiling, freezing, most types of filtering, and/or letting water stand does not reduce nitrate levels. Excessive boiling can increase the concentration of nitrate in the water because boiling does not eliminate nitrate, yet it reduces the volume of water through evaporation. More health information can be obtained at the CDPH website: <http://www.cdph.ca.gov/certlic/drinkingwater/Pages/Nitrate.aspx>.

Nitrate Sources

Nitrate is a type of salt containing nitrogen. Low levels of nitrate concentrations occur naturally in water. Nitrate levels that exceed water quality standards are most often due to inappropriate disposal of animal waste and human sewage, or the inappropriate application of nitrogen-based fertilizers that leach to groundwater. While these materials can safely and effectively be used on farms, they can result in nitrate pollution of ground and surface waters if they are over-applied, especially in sandy soils. Septic systems can pollute groundwater with nitrate. Drinking water wells should not be located near septic systems.

Completed/Ongoing Activities

Treatment Plant Upgrades - The Water Board has directed the City to delineate the nature and extent of elevated nitrate concentrations in groundwater on the north side of the Mojave River between Soapmine Road and the river, as well as the south side of the river near the wastewater treatment plant. The Water Board also directed the City to upgrade its wastewater treatment facility to reduce the concentration of nitrogen in the treated wastewater it disposes by July 2010. The City completed this upgrade in July 2010.

Residential Well Sampling - Groundwater has been affected by nitrogen leaching from sludge and treated wastewater applied to irrigation fields and percolation ponds. The Water Board has ordered the City to perform quarterly sampling of all residential wells that may be affected in addition to sampling the City’s monitoring wells.

Replacement Water - The Water Board required the City to provide bottled water to the residents within the affected area that have nitrate as N concentrations above 5 ppm. As of the fourth quarter 2011, there were 12 residential wells with nitrate as N concentrations greater than 5 ppm. Although the drinking water standard for nitrate as N is 10 ppm, the Water Board required the City to provide replacement bottled water to all residents with wells showing nitrate as N concentrations greater than 5 ppm because variation between sampling events could allow the drinking water standard to be exceeded in the meantime.

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Pilot Treatment Test - The City conducted a pilot program between October 2009 and January 2010 to determine if a fluidized bed reactor treatment method would reduce the levels of nitrate in groundwater pumped from the plume prior to disposal. In this process, a biomass growth is maintained by using methanol or ethanol as a food source for bacteria to reduce nitrate by conversion to nitrogen and carbon dioxide gases and additional biomass. The test successfully demonstrated that this technology is suitable to reduce nitrate as N concentrations to less than the drinking water standard of 10 ppm nitrate as N and a pilot test target level of 5 ppm nitrate as N. The Water Board will use the test results in establishing fluidized bed reactor treatment levels for nitrate that must be attained prior to disposing of treated water.

Recent Activities

The Water Board directed the City to evaluate and propose a groundwater cleanup strategy. The City submitted an initial groundwater cleanup plan in June 2010. That plan did not consider multiple scenarios to address polluted groundwater in the Soapmine Road area east of Webster Rd.

In January 2011, the City provided a revised plan evaluating different scenarios, including more scenarios that would install pumping wells east of Webster Rd. In June 2011, Water Board staff told the City that the computer groundwater model was not calibrated properly. Water Board staff also requested revised computer models and an aquifer pump test to evaluate the pumping radius of influence and draw down effect.

In January 2012, the City conducted an aquifer test along Webster Rd. that determined how the groundwater will respond to an extraction well pump and treat program. The test results indicated the water table in the Soapmine Road area near an extraction well could be lowered by 1.5 to 3 feet. Therefore, a pump and treat cleanup system may cause the water table to drop during the cleanup.

In February 2012, the City submitted a revised cleanup plan that would pump from four extraction wells along Webster Road and one well along Clay River Road, treat extracted water using a fluidized bed reactor, and dispose of treated water in ponds along the south side of the Mojave River. The City's plan would begin cleanup in October 2013 after environmental review and construction of extraction wells, pipelines, and a larger fluidized bed reactor.

Next Steps

While the City's final Remedial Action Plan is not complete at this time, the Water Board intends to issue a Cleanup and Abatement Order directing the City to (1) begin implementing elements of its plan and start cleanup as soon as practicable and (2) submit a specific plan addressing the nitrate plume east of Webster Rd. The Water Board will request public comments on the draft Order before it is brought to the Water Board for a decision later this fall. At a future date, public review comments will be requested before a final clean up decision is made.

Figure 1 – Nitrate Plume Map near Soapmine Road

