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Perchlorate in Groundwater and Drinking Water Supply in Region 9 March, 1998

Perchlorate (ClO_4^-) is a man-made inorganic salt used as a component of solid rocket fuel, in munitions and in the pyrotechnics industry. Perchlorate in the form of ammonium perchlorate, potassium perchlorate or sodium perchlorate is essentially as soluble as table salt and easily dissolves and moves through both groundwater and surface water.

Perchlorate has been found at 7 Superfund (NPL) sites in California (Aerojet and Mather Air Force Base, San Gabriel Valley, NASA-JPL, Edwards Air Force Base, Lawrence Livermore National Lab Site 300 and San Fernando Valley), at 6 other California non-NPL sites, two sites in the Henderson Nevada area and at one site in Utah. Water suppliers in both northern and southern California, and the Las Vegas Water Authority have found perchlorate in their systems. Perchlorate has also been detected at low levels in the Colorado River as a result of manufacturing activities in Nevada. This potentially affects the water supply of over 1 million people in Nevada, more than 1 million in Arizona, over 10 million people in California as well as Native American tribes along the Colorado.

At this time, the primary human health concern related to perchlorate is that it can interfere with the thyroid gland's ability to properly utilize iodine to produce thyroid hormones. Thyroid hormone deficiencies can affect normal metabolism, growth and development.

Limited Toxicological Data.

Currently, there is limited toxicity data available. A provisional reference dose (RfD) range has been set by EPA, which corresponds to concentrations of 4 to 18 parts per billion (ppb) in water. The contaminant is not regulated by the Safe Drinking Water Act. California's Action Level has been set at 18 ppb. Perchlorate was highlighted as a potential priority contaminant in the October Federal Register notice on the draft drinking water Contaminant Candidate List.

Efforts to obtain additional toxicological data are underway. The Air Force and an industry group are conducting a series of animal toxicological studies. EPA has reviewed and commented on the study protocols. EPA experts will interpret the results as they become available during the spring and summer of 1998 and produce a revised provisional reference dose by September, 1998. EPA will sponsor a review of this analysis by an external panel of scientists to be completed in October 1998.

Need for Treatment Technologies.

Currently, there are no perchlorate treatment systems in operation at any public water supply systems in the United States and there are no known technologies which been demonstrated to be cost-effective for treating large volumes with low concentrations of perchlorate in water supplies. Anaerobic biological systems developed by the Air Force can handle high perchlorate concentration in low volumes, and a biological treatment pilot plant is under construction at the Aerojet Superfund site. Reverse Osmosis is effective but is considered infeasible for large volume water supply applications. The several Ion Exchange technologies tested so far exhibit

similar difficulties. Granular Activated Carbon (GAC) has limited effectiveness on perchlorate. One innovative process involving advanced oxidation followed by GAC has shown promise but is still unproven. An electrochemical treatment process is also being investigated.

Research efforts into treatment technologies are through EPA oversight of PRPs, state oversight of PRPs in CA and NV, local water supplier initiative in San Gabriel Valley and an American Water Works Association Research Foundation effort to be funded by $2M of EPA Science and Technology budget. EPA's Cincinnati Office is conducting a review of the technologies through a Region 9 Technical Support request.

Developing an Analytical Method for Use Nationwide

EPA's Las Vegas Laboratory is continuing its evaluation of the analytical protocol developed by the State of California which is capable of detecting the perchlorate ion at 4 parts per billion. The preliminary evaluation is complete and additional work is planned.

Public, Media and Political Interest

The magnitude of the perchlorate contamination in water supply affects a number of stakeholders. Water supply agencies have expressed their strong concern to state and EPA officials and to congressmen and senators. Native American Tribes along the Colorado River have demanded EPA action to protect their water supply. Environmental organizations in California and Nevada are extremely concerned about the threat of a thyroid-disrupting chemical in the water supply. Particular emphasis has been placed on the potential effect on children and developing fetuses, long term effects and the perceived lack of objectivity in toxicological tests conducted by Air Force and industry. The news media has been active particularly in Nevada. Rep. Lewis (R-CA), Sen. Boxer (D-CA) and Sen. Reid (D-NV) have introduced various pieces of legislation seeking solutions to the perchlorate issue, and a number of other legislators have expressed interest.

Background

Perchlorate has been found in California drinking water wells at the Aerojet Superfund site and neighboring Mather Air Force Base site near Sacramento; in Azusa, in the Baldwin Park area of the San Gabriel site; in the Raymond Basin associated with the NASA-JPL site; in the Santa Clarita Basin; in the Redlands area; and in the Rialto area of San Bernardino County. In addition to these, perchlorate has been discovered in groundwater in San Jose, Hollister, Santa Susanna, San Fernando Valley and Edwards Air Force Base in California. All eleven of these sites appear to be associated with rocket and rocket fuel manufacturing and testing. Very high levels of perchlorate contaminates the groundwater at two sources involved in perchlorate manufacturing near Las Vegas. This contamination is entering surface water flowing into the Colorado River. This potentially affects the water supply of over 1 million people in Nevada, more than 1 million in Arizona, over 10 million people in California as well as Native American tribes along the Colorado. Another rocket manufacturing facility in Utah has contaminated a large private water supply. Of the many potential sources of perchlorate contamination around the country from

rocket manufacturing operations, few outside Region 9 have been tested for release of perchlorate to water.

Perchlorate historically has not been considered a common contaminant, and no Federal or State drinking water limits exist. EPA has stated that, based on current information, the concentration of 18 ppb of perchlorate in drinking water is adequately protective of pubic health. California Department of Health Services (DHS) has adopted an interim action level for perchlorate of 18 ppb based on a reference dose range developed by EPA. The State of California does not consider perchlorate levels below 18 ppb a health concern for the public, including pregnant women and children. This value was derived from findings in 1992 and 1995 EPA reports which adopted a provisional range corresponding to 4-18 ppb. A bill is pending in the California state legislature to mandate that DHS adopt a state primary drinking water standard for perchlorate by July, 1999.

OREGON
IDAHO
GREAT SALT LAKE
Salt Lake City
NEVADA
Reno
Lake Tahoe
Carson City
Sacramento
UTAH
Tracy
San Francisco
San Jose
Hollister
Las Vegas
CALIFORNIA
ARIZONA
Santa Clarita
Edwards AFB
Santa Susanna
Glendale
Pasadena
Redlands
Rialto
Los Angeles
Baldwin Park
MEXICO
PERCHLORATE RELEASES
Drinking Water Contamination
Monitoring Wells or Soil Only
Colorado River Contamination
EPA
REGION 9
March, 1998

CALIFORNIA - Perchlorate in Water Supply Wells MARCH ~~February~~, 1998

Area	Source	Water System
Sacramento	Aerojet	
(Rancho Cordova)		Arden Cordova
		Sacramento County WC
		Mather AFB (not in use)
Upper Santa Ana Valley	Lockheed	
(Redlands)		Victoria Farms
		City of Loma Linda
		City of Redlands
		City of Riverside
		Loma Linda University
Raymond Basin	NASA-JPL	
(Pasadena)		Cal-American
		City of Pasadena
		Las Flores WC
		Lincoln Ave. WC
		Rubio Canyon Land and Water Assc
		Valley WC
San Gabriel Valley	Aerojet	
(Baldwin Park)		Azusa Light and Power
		La Puente Valley WD
		San Gabriel Valley WC
		Suburban Water System
		Valley County WD
Santa Clarita Valley	Whittaker Bermite	
		Newhall CWD
		Santa Clarita WC
		Valencia WC
Rialto	B.F. Goodrich?	
	(Rocket Fuel Operation)	City of Rialto WD
		West San Bernardino County WD
Santa Susanna	Rocketdyne	Monitoring wells only
Hollister	Whittaker	One private well; agr.& monitor wells
San Jose	UTC (United Tech.)	Monitoring wells and seasonal surface water
San Fernando Valley	Grand Central Rocket?	Monitoring well only
(Glendale Operable Unit)	(Rocket Manufacture)	
Edwards AFB	Jet Propulsion Lab, North Base	Soil and monitoring wells
Lawrence Livermore Site 300	Dept of Energy research	Monitoring wells only