

SECTION 8 PERCHLORATE WASTES

I. INTRODUCTION

Perchlorate is not currently regulated as a drinking water contaminant, although federal and state efforts are underway to develop best management standards for perchlorate. The state and federal agencies have become aware of the widespread contamination of perchlorate in the country's drinking water systems after 1997, when a new test was developed, capable of detecting perchlorate in water at concentrations of 4 parts per billion (ppb).

II. SOURCES OF PERCHLORATE WASTES

The most significant sources of perchlorate wastes are from the manufacture, testing, and disposal of solid rocket fuel, explosives, and fireworks. A variety of other industrial processes have also been known to produce perchlorate wastes. For a more extensive list of operations that may generate perchlorate wastes, please refer to the listing in Section 3 of this report.

The large scale production of perchlorate began in the U.S. in the 1940s with the defense and aerospace industries purchasing more than 90 percent of all the perchlorate manufactured, or approximately 20 million pounds per year. Rocket fuel containing ammonium perchlorate has a limited shelf life, and thus it was periodically washed out of rocket engines using high pressure jets. These and other military operations such as open burn, open detonation of rocket motors, have generated large volumes of water contaminated with perchlorate, which eventually ended up in nearby groundwater and drinking water systems. In the future, more perchlorate wastes will be generated, as more weapon systems reach the end of their service life, and need to be dismantled. The country's inventory of propellant containing perchlorate awaiting demilitarization is believed to exceed 164 million pounds in 2005¹.

Recycling of ammonium perchlorate wastewater has not been considered a feasible alternative to disposal. Although perchlorate could theoretically be recovered from solution and used again, the recycling process has not been deemed cost effective.^{1 above} Perchlorate can be recovered from the wastewater at concentrations greater than 1 percent, but no economically feasible method exists for recovering lower concentrations from water.

III. HAZARDOUS WASTE CLASSIFICATION AND MANAGEMENT

Generally, perchlorate salts and perchloric acid are strong oxidizers, which may react and ignite spontaneously when spilled. Perchlorate wastes are incompatible and should not be commingled with certain wastes, such as: acetic

acids or other organic acids, concentrated mineral acids, and other flammable and combustible wastes². Potential consequences of such impermissible mixing of wastes are fire, explosion, or violent reaction.

Perchlorate wastes, if classified as hazardous, would be subject to regulation under the Resource Conservation and Recovery Act (RCRA) at the federal level, and under the California program which is equivalent to, and in some areas more stringent than, the RCRA requirements. Hazardous wastes in California must be managed in accordance with standards specified in California Code of Regulations, title 22, division 4.5. Hazardous waste management requirements include proper labeling and storage of the waste at the generation site, use of the Hazardous Waste Manifest when transported, and disposal of the waste by shipment to a permitted Treatment, Storage, or Disposal Facility. Perchlorate wastes and materials are also subject to Department of Transportation (DOT) regulations for purposes of transportation and labeling.

Perchlorate containing wastes would be characterized as hazardous under California Code of Regulations, title 22, section 66261.21, by meeting the hazardous waste characteristic of ignitability described in that section. Specifically, perchlorate wastes are likely oxidizers under section 66261.21(a)(4). Because perchlorate wastes are not “listed” wastes (which remain hazardous regardless of concentration), perchlorate wastes would cease to be considered hazardous if they no longer displayed the hazardous waste characteristic. For example, ammonium perchlorate doused with water, if no longer ignitable or an oxidizer would not be subject to hazardous waste requirements and disposal restrictions.

Ammonium perchlorate, the most widely used perchlorate salt, is an explosive and would meet the ignitability characteristic for hazardous waste. However, when diluted to 70 percent or less in water, ammonium perchlorate is completely ionized and is relatively inert³. Thus under existing regulations, ammonium perchlorate ceases to display a hazardous waste characteristic when dissolved or doused with water. Residuals from combusted perchlorate materials also are not considered hazardous wastes, if they no longer display the ignitable/oxidizer characteristic.

Safety is an over-riding consideration when handling perchlorate salts. Material Safety Data Sheets list dousing with water as accidental release measures for spills or as a fire fighting measure. Although dousing perchlorate with water eliminates the immediate hazard, this practice generates large amounts of perchlorate wastewater.

Contamination from perchlorate being washed out and draining into the groundwater and drinking water systems was not readily apparent, because prior testing devices could not identify perchlorate at a concentration lower than 400 ppb. After new testing methods have been developed, state and federal

agencies became aware of the fact that perchlorate contamination in drinking water was widespread.

In light of the new awareness of the perchlorate contamination, the Department of Toxic Substances Control and other regulatory agencies in California are actively working to develop best management practices for the management and disposal of perchlorate containing materials.

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¹ Senate Office of Research report. 2004. *Addressing Perchlorate Contamination of Drinking-Water Sources in California*. Available at: http://www.swrcb.ca.gov/rwqcb4/html/perchlorate/articles/04_0130_SenateOfficeofResearch.pdf

² Title 40 Code of Federal Regulations, Part 264, Appendix V

³ The Aerospace Corporation, El Segundo, California. 2001. *Assessment of Perchlorate Releases in Launch Operations*. Aerospace Report No. TR-2001(1306)-3. Available at: <http://ax.losangeles.af.mil/axf/pp/tr200113063.pdf>

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