Perchlorate: Overview of Issues, Status, and Remedial Options

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EXECUTIVE SUMMARY

Perchlorate is both a naturally occurring and manmade anion consisting of chlorine bonded to four oxygen atoms (ClO_4^-). It is typically found in the form of perchloric acid and salts such as ammonium perchlorate, potassium perchlorate, and sodium perchlorate. This introduction provides basic information regarding perchlorate and perchlorate contamination. It is important to understand that information on perchlorate is continually being updated and that this document provides a snapshot in time of the current perchlorate situation.

While perchlorate was once thought to occur naturally only in one location in Chile, ongoing study has found naturally occurring perchlorate in other locations as well. As a manmade compound, it has been manufactured since before the turn of the last century, primarily for use in defense activities and the aerospace industry.

Highly soluble and mobile in water, perchlorate is also very stable. Most of the attention focused on perchlorate contamination concerns groundwater and surface water contamination. However, perchlorate can also contaminate soil and vegetation. The potential for perchlorate contamination in drinking water and food supplies is a human health concern because it can interfere with iodide uptake by the thyroid gland and, through this mode of action, result in decreased thyroid hormone production.

In general, past management practices did not prevent the release of perchlorate to the environment because it was not recognized or regarded as a contaminant of concern. Widespread perchlorate contamination in the United States was observed after the spring of 1997, when an analytical method with a reporting limit of 4 ppb was developed. Additional sampling and analysis techniques have since been developed that can detect perchlorate at concentrations of 1 ppb and lower.

A variety of remediation technologies are currently commercially available and being used for perchlorate remediation. These remediation technologies fall into two broad categories—ion exchange and biological processes. The majority of these treatment technologies have been applied to remediation of groundwater; however, biological processes are also being applied to the remediation of soils. This document provides an overview of the commercially available technologies (and summaries of emerging technologies) still at the bench or pilot-scale stage.