



Federal Facilities Restoration and Reuse Office

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Technical Fact Sheets and Emerging Contaminants

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Technical Fact Sheets - FFRRO Contaminants of Concern

The US Environmental Protection Agency (EPA) Federal Facilities Restoration and Reuse Office (FFRRO) published the following technical fact sheets, which provide brief summaries of contaminants of concern that present unique issues and challenges to the environmental community in general and to FFRRO in particular. Each fact sheet provides a brief summary of the contaminant, including physical and chemical properties, environmental and health impacts, existing federal and state guidelines, and detection and treatment methods. Sources of additional information about each contaminant are also included in the fact sheets. These fact sheets are intended for use by project managers and field personnel in addressing specific contaminants at cleanup sites and are updated annually to ensure they include timely information.

[1,2,3-Trichloropropane \(TCP\) \(PDF\)](#) (4 pp, 178K)

EPA Publication Number: EPA 505-F-11-008

This fact sheet provides a brief summary of 1,2,3-trichloropropane (TCP), including physical and chemical properties, environmental and health impacts, existing federal and state guidelines, and detection and treatment methods. TCP is a man-made chlorinated hydrocarbon and is typically found at industrial or hazardous waste sites. It is not likely to sorb to soil and has a low solubility in water. As result, TCP is likely to exist as a dense nonaqueous phase liquid (DNAPL) in its pure form. Exposure commonly occurs through vapor inhalation, dermal exposure, or ingestion at industrial or hazardous waste sites. EPA has classified TCP as "likely to be carcinogenic to humans," and it is recognized by the State of California to cause cancer. While no federal maximum contaminant level (MCL) exists, the State of Hawaii has established a state MCL of 0.6 micrograms per liter ($\mu\text{g/L}$).

[1,4-Dioxane \(PDF\)](#) (5 pp, 204K)

EPA Publication Number: EPA 505-F-11-004

This fact sheet provides a brief summary of 1,4-dioxane, including physical and chemical properties, environmental and health impacts, existing federal and state guidelines, and detection and treatment methods. 1,4-Dioxane is a synthetic industrial chemical that has been found in ground water at many federal facilities throughout the United States as a result of its widespread use as a stabilizer for chlorinated solvents, paint strippers, greases, and waxes. The physical and chemical properties and behavior of 1,4-dioxane create challenges for its characterization and treatment. It is short-lived in the atmosphere, migrates rapidly in ground water, and is relatively resistant to biodegradation in the subsurface. EPA has classified 1,4-dioxane as "likely to be carcinogenic to humans" by all routes of exposure. While no federal drinking water standards have been established, many states and EPA regions have set guidelines and action levels.

[2,4,6-Trinitrotoluene \(TNT\) \(PDF\)](#) (6 pp, 281K)

EPA Publication Number: EPA 505-F-11-010

This fact sheet provides a brief summary of 2,4,6-trinitrotoluene (TNT), including physical and chemical properties, environmental and health impacts, existing federal and state guidelines, and detection and treatment methods. TNT is a highly explosive compound that does not occur naturally in the environment. It is widely used in U.S. military munitions and accounts for a large part of the explosives contamination at active and former U.S. military installations. TNT is sorbed by most soils, limiting its migration to water, and is not expected to persist for a long period of time in surface water as a result of its transformation processes. It is classified by the EPA as possible human carcinogen; exposure also can cause damage to the liver and blood systems if inhaled or ingested. EPA has established a minimal risk level for oral exposure to TNT in addition to various other screening levels and guidelines.

[Hexahydro-1,3,5-trinitro-1,3,5-triazine \(RDX\) \(PDF\)](#) (5 pp, 208K)

EPA Publication Number: EPA 505-F-11-009

This fact sheet provides a brief summary of hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX), also known as royal demolition explosive, including physical and chemical properties, environmental and health impacts, existing federal and state guidelines, and detection and treatment methods. RDX is a secondary explosive that does not occur naturally in the environment and is present in munitions fillers. It is used extensively by the U.S. military in manufacturing explosives and accounts for a large part of the explosives contamination at active and former U.S. military installations. RDX is not significantly retained by most soil and biodegrades very slowly under aerobic conditions. As a result, it can easily migrate to ground water. It is classified by the EPA as a possible human carcinogen; exposure also can cause damage to the nervous system if inhaled or ingested. EPA has established a minimal risk level for oral exposure to RDX and plans to update its toxicity benchmarks and health risk assessment in its database of chemical risk values.

[N-Nitroso-dimethylamine \(NDMA\) \(PDF\)](#) (4 pp, 174K)

EPA Publication Number: EPA 505-F-11-006

This fact sheet provides a brief summary of N-nitroso-dimethylamine (NDMA), including physical and chemical properties, environmental and health impacts, existing federal and state guidelines, and detection and treatment methods. NDMA is a semivolatile organic chemical that was formerly used in the production of rocket fuel, antioxidants and softeners for copolymers. Currently, it is used only for research and is an unintended byproduct of chlorination of wastewater at treatment plants that use chloramines for disinfection, causing significant concern as a drinking water contaminant. NDMA is highly mobile in soil and has the potential to leach into ground water. EPA has classified it as a B2 carcinogen (reasonably anticipated to be a human carcinogen), and exposure to high levels of the compound can

cause liver damage in humans. It is listed as a priority pollutant by EPA, but no federal standards have been established for drinking water.

[Perchlorate \(PDF\)](#) (5 pp, 181K)

EPA Publication Number: EPA 505-F-11-003

This fact sheet provides a brief summary of perchlorate, including physical and chemical properties, environmental and health impacts, existing federal and state guidelines, and detection and treatment methods. Perchlorate is a naturally occurring and man-made anion that has been detected in high concentrations at sites historically involved in the manufacture, maintenance, use, and disposal of ammunition and rocket fuel. It is highly soluble in water and migrates quickly from soil to ground water. As a result, perchlorate plumes in ground water can be extensive. The primary pathways for human exposure include ingestion of food and contaminated drinking water. Short-term exposure to high doses may cause eye and skin irritation, coughing, nausea, vomiting, and diarrhea. EPA has initiated the process of proposing a national primary drinking water regulation. In addition, various states have developed health-based goals and drinking water standards.

[Polybrominated diphenyl ethers \(PBDEs\) and Polybrominated biphenyls \(PBBs\) \(PDF\)](#) (5 pp, 188K)

EPA Publication Number: EPA 505-F-11-007

This fact sheet provides a brief summary of polybrominated diphenyl ethers (PBDE) and polybrominated biphenyls (PBB), including physical and chemical properties, environmental and health impacts, existing federal and state guidelines, and detection and treatment methods. PBDEs and PBBs are man-made brominated hydrocarbons that serve as flame retardants for electrical equipment, electronic devices, furniture, textiles and other household products. PBB has been banned in the United States since 1973, but PBDEs have been in widespread use in the U.S. since the 1970s. They are structurally similar and exhibit low volatility in the environment. Lower brominated congeners of PBDE tend to bioaccumulate more than higher brominated congeners and are more persistent in the environment. EPA has classified PBBs as "possibly carcinogenic to humans," and both PBBs and PBDEs may act as endocrine system disrupters in humans. EPA has issued a Significant New Use Rule (SNUR) to phase out PBDE homologs (pentaBDE and octaBDE), and the American Conference of Government Industrial Hygienists has established workplace environmental exposure levels for PBDEs and PBBs.

[Tungsten \(PDF\)](#) (4 pp, 177K)

EPA Publication Number: EPA 505-F-11-005

This fact sheet provides a brief summary of tungsten, including physical and chemical properties, environmental and health impacts, existing federal and state guidelines, and detection and treatment methods. Tungsten is a naturally occurring element that is a common contaminant at industrial sites that use the metal and Department of Defense (DoD) sites involved in the manufacture, storage, and use of tungsten-based ammunition. At low to neutral pH levels, tungsten has a low solubility in water and high sorption coefficients. However, recent research indicates that tungsten may not be as environmentally stable as was indicated in earlier studies. Exposure may cause eye and skin irritation, cough, nausea, diffuse interstitial pulmonary fibrosis, and changes in blood. No federal drinking water standard has been established, but exposure limits have been set by the National Institute for Occupational Safety and Health (NIOSH) and the American Conference of Governmental Industrial Hygienists (ACGIH).

Emerging Contaminants Fact Sheets

An emerging contaminant (EC) is a chemical or material characterized by a perceived, potential, or real threat to human health or the environment or by a lack of published health standards. A contaminant also may be "emerging" because of the discovery of a new source or a new pathway to humans. The EPA FFRRO published the following emerging contaminant fact sheets, which provide brief summaries of contaminants that present unique issues and challenges to the environmental community. Each fact sheet provides a brief summary of the contaminant, including physical and chemical properties, environmental and health impacts, existing federal and state guidelines, and detection and treatment methods. Sources of additional information about each contaminant are also included in the fact sheets. These fact sheets are intended for use by project managers and field personnel in addressing specific contaminants at cleanup sites and are updated annually to ensure they include timely information.

Nanomaterials (PDF) (8 pp, 227K)

EPA Publication Number: EPA 505-F-11-009

This fact sheet provides a brief summary of the emerging contaminant nanomaterials (NM), including physical and chemical properties, environmental and health impacts, existing federal and state guidelines, and detection and treatment methods. NMs are a diverse class of small-scale substances that have structural components smaller than 1 micrometer (1000 nanometers [nm]) in at least one dimension. Because of their unique properties, NMs are increasingly being used in a wide range of scientific, environmental, industrial, and medicinal applications. The mobility of NMs depends on their surface chemistry and particle size, biological and abiotic processes in the media, among other factors. They may stay in suspension as individual particles, aggregate, dissolve or react with other materials. As a result of their small size and large surface area, some NMs may be able to translocate from the deposition site and interact with biological systems. However, there are insufficient scientific data to determine whether NMs, under realistic exposure scenarios, may present adverse health effects to humans. Currently, there are no specific federal standards that regulate NMs based solely on their size.

Perfluorooctane sulfonate (PFOS) and Perfluorooctanoic acid (PFOA) (PDF) (6 pp, 191K)

EPA Publication Number: EPA 505-F-11-011

This fact sheet provides a brief summary of perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA), including physical and chemical properties, environmental and health impacts, existing federal and state guidelines, and detection and treatment methods. PFOS and PFOA are fully fluorinated, human-made compounds that are used as surface-active agents in a variety of products, such as fire fighting foams, coating additives, and cleaning products. They are extremely persistent in the environment and can be transported long distances in air. As a result, they are widely distributed across the higher trophic levels and are found in soil, air, and ground water at a number of sites across the United States. Studies have shown both PFOS and PFOA have the potential to bioaccumulate and biomagnify in wildlife. They are readily adsorbed after oral exposure and accumulate primarily in the serum, kidney, and liver. Both EPA and states have developed health-based advisories or screening levels for PFOS and PFOA.

Additional Information

Perchlorate Resources

Perchlorate is used in a wide range of applications, including military munitions (mortars, flares, grenades), solid rocket fuel, pyrotechnics and fireworks, blasting agents, matches, air bags, and certain types of fertilizers. It has been detected in the ground water at 54 federal facilities and 29 private (Superfund or RCRA) sites in 26 states. EPA and states are addressing the contamination at many of the sites through investigations and response actions (e.g., blending, providing alternative water supplies, remediating ground water contamination) or through enforcement actions against potentially responsible parties (PRPs). For additional perchlorate information, visit the following:

- [US EPA: Perchlorate](#)
 - [US EPA: Revised Assessment Guidance for Perchlorate - January 2009 \(PDF\)](#) (2 pp, 650K)
 - [US EPA: Perchlorate Treatment Technology Update - May 2005 \(PDF\)](#) (84 pp, 2.5MB)
See also [Errata Sheet - September 2005 \(PDF\)](#) (4 pp, 105K)
 - [U.S. Department of Defense: Environmental Data Quality Workgroup - Perchlorate](#)
 - [U.S. Department of Defense: Perchlorate Release Management Policy - April 2009 \(PDF\)](#) (8 pp, 477K)
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Vapor Intrusion

Vapor intrusion (VI) also is being examined as an emerging contaminant because of concerns about the VI pathway. Vapor intrusion generally occurs when there is a migration of volatile chemicals from contaminated ground water or soil into indoor air spaces of overlying buildings.

For additional information on vapor intrusion, visit [EPA's Vapor Intrusion Web site](#).

Emerging Contaminants

For additional emerging-contaminant information, visit the following:

- [Agency for Toxic Substances and Disease Registry \(ATSDR\)](#)
- [Contaminated Site Clean-Up Information \(CLU-IN\)](#)
- [Environmental Council of the States \(ECOS\)](#) [EXIT Disclaimer](#)
- [Federal Remediation Technologies Roundtable \(FRTR\)](#)
- [Interstate Technology & Regulatory Council \(ITRC\)](#) [EXIT Disclaimer](#)
- [Strategic Environmental Research and Development Program \(SERDP\) | Environmental Security Technology Certification Program \(ESTCP\)](#)
- [U.S. Department of Defense: Emerging Chemical and Material Risks](#)
- [US EPA: Safe Drinking Water Act \(SDWA\)](#)