

**U.S. Department of Energy
Portsmouth Annual Environmental Report
for 2004
Piketon, Ohio**

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managing the
Environmental Remediation Activities at the
Portsmouth Gaseous Diffusion Plant
under contract DE-AC24-05OH20192
for the
U.S. DEPARTMENT OF ENERGY

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per review by:

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ACRONYMS

CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
Ci	curie
DOE	U.S. Department of Energy
DOE PORTS	facilities operated by DOE (not leased to USEC) at the Portsmouth Gaseous Diffusion Plant
EPA	Environmental Protection Agency
kg	kilogram
LLW	low-level radioactive waste
MCL	maximum contaminant level
mg/kg	milligram per kilogram (equivalent to part per million)
mg/L	milligram per liter (equivalent to part per million)
$\mu\text{g/g}$	microgram per gram (equivalent to part per million)
$\mu\text{g/L}$	microgram per liter (equivalent to part per billion)
$\mu\text{g/m}^3$	microgram per cubic meter
mrem	millirem
NPDES	National Pollutant Discharge Elimination System
PCB	polychlorinated biphenyl
pCi/g	picocurie per gram
pCi/L	picocurie per liter
pCi/mL	picocurie per milliliter
PK	Peter Kiewit
PORTS	Portsmouth Gaseous Diffusion Plant
ppb	part per billion
ppm	part per million
RCRA	Resource Conservation and Recovery Act
TSCA	Toxic Substances Control Act
USEC	United States Enrichment Corporation

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DEFINITIONS

absorption – The process by which the number and energy of particles or photons entering a body of matter are reduced by interaction with the matter.

activity – See “radioactivity.”

alpha particle – A positively charged particle having the same charge and mass as that of a helium nucleus (two protons and two neutrons). Alpha particles are emitted from the nucleus of an atom during radioactive decay.

ambient air – The atmosphere around people, plants, and structures.

analyte – A constituent or parameter being analyzed.

aquifer – A geologic formation capable of yielding a significant amount of groundwater to wells or springs.

atom – Smallest particle of an element capable of entering into a chemical reaction.

background radiation – Radiation that occurs naturally in the surrounding environment.

beta particle – A negatively charged particle emitted from the nucleus of an atom during radioactive decay. It has a mass and charge equal to those of an electron.

biota – The animal and plant life of a particular region considered as a total ecological entity.

categorical exclusion – A class of actions that either individually or cumulatively would not have a significant effect on the human environment and therefore would not require preparation of an environmental assessment or environmental impact statement under the National Environmental Policy Act.

chain-of-custody – A form that documents sample collection, transport, and analysis.

closure – Control of a closed hazardous waste management facility under Resource Conservation and Recovery Act requirements.

compliance – Fulfillment of applicable regulations or requirements of a plan or schedule ordered or approved by a government authority.

concentration – The amount of a substance contained in a unit volume or mass of a sample.

contamination – Deposition of unwanted material on the surfaces of structures, areas, objects, or personnel.

cosmic radiation – Ionizing radiation with very high energies that originates outside the earth's atmosphere. Cosmic radiation is one contributor to natural background radiation.

critical habitat – Specific areas that may require special management considerations or protection and on which physical or biological features essential to the conservation of a species are found.

curie (Ci) – A unit of radioactivity. One curie is defined as 3.7×10^{10} (37 billion) disintegrations per second. Several fractions and multiples of the curie are commonly used:

kilocurie (kCi) – 10^3 Ci, one thousand curies; 3.7×10^{13} disintegrations per second.

millicurie (mCi) – 10^{-3} Ci, one-thousandth of a curie; 3.7×10^7 disintegrations per second.

microcurie (μ Ci) – 10^{-6} Ci, one-millionth of a curie, 3.7×10^4 disintegrations per second.

picocurie (pCi) – 10^{-12} Ci, one-trillionth of a curie; 0.037 disintegration per second.

decontamination and decommissioning – The cleanup and removal of buildings, structures, or objects contaminated with hazardous substances during past production or disposal activities.

derived concentration guide – The concentration of a radionuclide in air or water that under conditions of continuous exposure for one year by one exposure mode (i.e., ingestion of water, submersion in air, or inhalation) would result in either an effective dose equivalent of 0.1 rem or a dose equivalent of 5 rem to any tissue, including skin and the lens of the eye. The guidelines for radionuclides in air and water are provided in DOE Order 5400.5, *Radiation Protection of the Public and the Environment*.

dissolved solids – Organic or inorganic material dissolved in water. Excessive amounts of dissolved solids make water unfit to drink or to use in industrial processes.

downgradient – In the direction of groundwater flow.

downgradient well – A well installed hydraulically downgradient of a site that may be capable of detecting migration of contaminants from a site.

effluent – A liquid or gaseous waste discharge to the environment.

effluent monitoring – The collection and analysis of samples or measurement of liquid and gaseous effluents to characterize and quantify the release of contaminants, assess radiation exposures to the public, and demonstrate compliance with applicable standards.

Environmental Restoration – A DOE program that directs the assessment and cleanup of its sites (remediation) and facilities (decontamination and decommissioning) contaminated with waste as a result of nuclear-related activities.

exposure (radiation) – The incident of radiation on living or inanimate material by accident or intent. Background exposure is the exposure to natural background ionizing radiation. Occupational exposure is exposure to ionizing radiation that takes place at a person's workplace. Population exposure is the exposure to the total number of persons who inhabit an area.

external radiation – The exposure to ionizing radiation when the radiation source is located outside the body.

formation – In geologic terms, a unit of rock or a unit of material that could form a rock such as sand.

friable – The ability of a material to be pulverized, crumbled, or reduced to powder by hand pressure when dry.

gamma ray – High-energy short-wavelength electromagnetic radiation emitted from the nucleus of a charged atom. Gamma rays are identical to X-rays except for the source of the emission.

glove box – An enclosure with built-in sleeves and gloves used by a person to manipulate hazardous materials such as highly enriched uranium without directly exposing the person to the material.

groundwater – Water below the land surface in a zone where all void space between rocks, soil, etc., is filled with water.

hexavalent – A compound that has six valence electrons.

half-life, radiological – The time required for half of a given number of atoms of a specific radionuclide to decay. Each nuclide has a unique half-life.

industrial solid waste landfill – A type of landfill that exclusively disposes of solid waste generated by manufacturing or industrial operations.

in situ – In its original place; field measurements taken without removing the sample from its origin; remediation performed while the contaminated media (e.g., groundwater) remains below the surface.

interim remedial measure – Cleanup activities initiated after it has been determined that contamination or waste disposal practices pose an immediate threat to human health and/or the environment. These measures are implemented until a more permanent solution can be made.

internal radiation – Occurs when natural radionuclides enter the body by ingestion of food or water or by inhalation. Radon is the major contributor to the annual dose equivalent for internal radionuclides.

ion – An atom or compound that carries an electrical charge.

irradiation – Exposure to radiation.

isotopes – Forms of an element having the same number of protons but differing numbers of neutrons in their nuclei.

leachate – A liquid that results from water collecting contaminants as it trickles through wastes, agricultural pesticides, or fertilizers. Leachate may occur in farming areas, feed lots, and landfills and may result in hazardous substances entering surface water, groundwater, or soil.

manifest – A form required by RCRA that is used to document and track waste during transportation and disposal.

maximally exposed individual – A hypothetical individual who remains in an uncontrolled area and would, when all potential routes of exposure from a facility's operations are considered, receive the greatest possible dose equivalent.

maximum contaminant level – The maximum permissible level of a contaminant in drinking water provided by a public water system.

migration – The transfer or movement of a material through air, soil, or groundwater.

monitoring – Process whereby the quantity and quality of factors that can affect the environment or human health are measured periodically to regulate and control potential impacts.

mrem – Millirem: the dose equivalent that is one-thousandth of a rem.

natural radiation – Radiation from cosmic and other naturally occurring radionuclide sources (such as radon) in the environment.

nuclide – An atom specified by atomic weight, atomic number, and energy state. A radionuclide is a radioactive nuclide.

outfall – The point of conveyance (e.g., drain or pipe) of wastewater or other effluents into a ditch, pond, or river.

person-rem – Collective dose to a population group. For example, a dose of 1 rem to 10 individuals results in a collective dose of 10 person-rem.

pH – A measure of the hydrogen ion concentration in an aqueous solution. Acidic solutions have a pH from 0 to 7, neutral solutions have a pH equal to 7, and basic solutions have a pH from 7 to 14.

polychlorinated biphenyl (PCB) – An industrial compound, used primarily as a lubricant, which is produced by adding chlorine to biphenyl, a colorless, crystalline compound.

preliminary remediation goal – The concentration of a constituent in environmental media (soil, groundwater, etc.) that is considered protective of human health and the environment.

quality assurance – Any action in environmental monitoring to demonstrate the reliability of monitoring and measurement data.

quality control – The routine application of procedures within environmental monitoring to obtain the required standards of performance in monitoring and measurement processes.

rad – The unit of absorbed dose deposited in a volume of material.

radioactivity – The spontaneous emission of radiation, generally alpha or beta particles or gamma rays, from the nucleus of an unstable isotope.

radioisotopes – Radioactive isotopes.

radionuclide – A radioactive nuclide capable of spontaneous transformation into other nuclides by changing its nuclear configuration or energy level. This transformation is accomplished by the emission of photons or particles.

release – Any discharge to the environment. "Environment" is broadly defined as any water, land, or ambient air.

rem – The unit of dose equivalent (absorbed dose in rads multiplied by the radiation quality factor). Dose equivalent is frequently reported in units of millirem (mrem), which is one-thousandth of a rem.

remediation – The correction or cleanup of a site contaminated with waste. See "Environmental Restoration."

reportable quantity – A release to the environment that exceeds reportable quantities as defined by the Comprehensive Environmental Response, Compensation, and Liability Act.

Resource Conservation and Recovery Act (RCRA) – Legislation that regulates the transport, treatment, and disposal of solid and hazardous wastes.

source – A point or object from which radiation or contamination emanates.

stable – Not radioactive or not easily decomposed or otherwise modified chemically.

Superfund – The program operated under the legislative authority of the Comprehensive Environmental Response, Compensation, and Liability Act and Superfund Amendments and Reauthorization Act that funds and conducts EPA emergency and long-term removal and remedial actions.

surface water – All water on the surface of the earth, as distinguished from groundwater.

suspended solids – Mixture of fine, nonsettling particles of any solid within a liquid or gas.

terrestrial radiation – Ionizing radiation emitted from radioactive materials in the earth's soils such as potassium-40, thorium, and uranium. Terrestrial radiation contributes to natural background radiation.

transuranics – Elements such as plutonium and neptunium that have atomic numbers (the number of protons in the nucleus) greater than 92. All transuranics are radioactive.

trichloroethene – A colorless liquid used in many industrial applications as a cleaner and/or solvent. One of many chemicals that is classified as a volatile organic compound.

trip blank – A quality control sample of water that accompanies sample containers from the analytical laboratory, to the field sampling location where environmental samples are collected, back to the analytical laboratory to determine whether environmental samples have been contaminated during shipment.

troughing system – A system designed to collect leaking PCBs in the PORTS process buildings.

turbidity – A measure of the concentration of sediment or suspended particles in solution.

upgradient – In the opposite direction of groundwater flow.

upgradient well – A well installed hydraulically upgradient of a site to provide data to compare to a downgradient well to determine whether the site is affecting groundwater quality.

volatile organic compounds – Chemicals composed primarily of hydrogen, oxygen, and carbon that readily volatilize into the air. They include light alcohols, acetone, trichloroethene, dichloroethene, benzene, vinyl chloride, toluene, methylene chloride, and many other compounds.

wetland – An area that is inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and under normal circumstances does support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, floodplains, fens, and similar areas. A jurisdictional wetland is one that falls under state or federal regulatory authority; a non-jurisdictional wetland does not.

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