

## **Appendix A. Glossary**



## Appendix A. Glossary

**absorption, atomic**—The process by which the number and energy of particles or photons entering a body of matter is reduced by interaction with the matter.

**accuracy**—The closeness of the result of a measurement to the true value of the quantity.

**ACM**—Asbestos-containing materials.

**aliquot**—The quantity of sample being used for analysis.

**alkalinity**—A measure of the buffering capacity of water, and because pH has a direct effect on organisms as well as an indirect effect on the toxicity of certain other pollutants in the water, the buffering capacity is important to water quality.

**alpha particle**—A positively charged particle emitted from the nucleus of an atom; it has the same charge and mass as that of a helium nucleus (two protons and two neutrons).

**ambient air**—The surrounding atmosphere as it exists around people, plants, and structures.

**analyte**—A constituent or parameter that is being analyzed.

**analytical detection limit**—The lowest reasonably accurate concentration of an analyte that can be detected; this value varies depending on the method, instrument, and dilution used.

**anion**—A negatively charged ion.

**anthropogenic**—Any effect caused by humans.

**aquifer**—A saturated, permeable geologic unit that can transmit significant quantities of water under ordinary hydraulic gradients.

**aquitard**—A geologic unit that inhibits the flow of water.

**ash**—Inorganic residue remaining after ignition of combustible substances.

**assimilate**—To take up or absorb into the body.

**atom**—The smallest particle of an element capable of entering into a chemical reaction.

**atomic absorption spectrometry (AA)**—Chemical analysis performed by vaporizing a sample and measuring the absorbance of light by the vapor.

**Atomic Energy Commission (AEC)**—A federal agency created in 1946 to manage the development, use, and control of nuclear energy for military and civilian applications. It was abolished by the Energy Reorganization Act of 1974 and was succeeded by the Energy Research and Development Administration (now part of the Department of Energy and the Nuclear Regulatory Commission).

**base flow**—The base flow of a spring or stream represents the normal day-to-day discharge of the spring or stream and is the result of groundwater seeping into the spring/stream.

**base/neutral and acid extractables (BNA)**—A group of organic compounds analyzed as part of Appendix IX of 40 CFR 264 and the Environmental Protection Agency (EPA) list of priority pollutants.

**beta particle**—A negatively charged particle emitted from the nucleus of an atom. 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.

**blank**—A control sample that is identical, in principle, to the sample of interest, except that the substance being analyzed is absent. In such cases, the measured value or signal for the substance being analyzed is believed to be a result of artifacts. Under certain circumstances, that value may be subtracted from the measured value to give a net result reflecting the amount of the substance in the sample. EPA does not permit the subtraction of blank results in EPA-regulated analyses.

**calibration**—Determination of variance from a standard of accuracy of a measuring instrument to ascertain necessary correction factors.

**carcinogen**—A cancer-causing substance.

**cation**—A positively charged ion.

**CERCLA-reportable release**—A release to the environment that exceeds reportable quantities as defined by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

**chain-of-custody**—A form that documents sample collection, transport, analysis, and disposal.

**chemical oxygen demand**—Indicates the quantity of oxidizable materials present in water and varies with water composition, concentrations of reagent, temperature, period of contact, and other factors.

**chlorocarbons**—Compounds of carbon and chlorine, or carbon, hydrogen, and chlorine, such as carbon tetrachloride, chloroform, and tetrachloroethene. They are among the most significant and widespread environmental contaminants. Classified as hazardous wastes, chlorocarbons may have a tendency to cause detrimental effects, such as birth defects.

**closure**—Specifically, closure of a hazardous waste management facility under Resource Conservation and Recovery Act (RCRA) requirements.

**compliance**—Fulfillment of applicable requirements of a plan or schedule ordered or approved by government authority.

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

**conductivity**—A measure of water's capacity to convey an electric current. This property is related to the total concentration of the ionized substances in water and the temperature at which the measurement is made.

**confluence**—The point at which two or more streams meet; the point where a tributary joins the main stream.

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

**cosmic radiation**—Ionizing radiation with very high energies, originating outside the earth's atmosphere. Cosmic radiation is one source contributing to natural background radiation.

**count**—A measure of the radiation from an object or device; the signal that announces an ionization event within a counter.

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

**kilocurie (kCi)**— $10^3$  Ci, one thousand curies;  $3.7 \times 10^{13}$  disintegrations per second.

**millicurie (mCi)**— $10^{-3}$  Ci, one-thousandth of a curie;  $3.7 \times 10^7$  disintegrations per second.

**microcurie ( $\mu$ Ci)**— $10^{-6}$  Ci, one-millionth of a curie;  $3.7 \times 10^4$  disintegrations per second.

**picocurie (pCi)**— $10^{-12}$  Ci, one-trillionth of a curie; 0.037 disintegrations per second.

**DAPC**—Division of Air Pollution Control (state of Tennessee).

**daughter**—A nuclide formed by the radioactive decay of a parent nuclide.

**decay, radioactive**—The spontaneous transformation of one radionuclide into a different radioactive or nonradioactive nuclide, or into a different energy state of the same radionuclide.

**dense nonaqueous phase liquid (DNAPL)**—The liquid phase of chlorinated organic solvents. These liquids are denser than water and include commonly used industrial compounds such as tetrachloroethene and trichloroethene.

**derived concentration guide (DCG)**—The concentration of a radionuclide in air or water that, under conditions of continuous exposure for 1 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 (1 mSv) or a dose equivalent of 5 rem (50 mSv) to any tissue, including skin and lens of the eye. The guides for radionuclides in air and water are given in DOE Order 5400.5.

**desorption**—The process of removing a sorbed substance by the reverse of adsorption or absorption.

**dilution factor**—The mathematical factor by which a sample is diluted to bring the concentration of an analyte in a sample within the analytical range of a detector (e.g., 1 mL sample + 9 mL solvent = 1:10 dilution, or a dilution factor of 10).

**disintegration, nuclear**—A spontaneous nuclear transformation (radioactivity) characterized by the emission of energy and/or mass from the nucleus of an atom.

**dissolved oxygen**—A desirable indicator of satisfactory water quality in terms of low residuals of biologically available organic materials. Dissolved oxygen prevents the chemical reduction and subsequent leaching of iron and manganese from sediments.

**dose**—The energy imparted to matter by ionizing radiation. The unit of absorbed dose is the rad, equal to 0.01 joules per kilogram in any medium.

**absorbed dose**—The quantity of radiation energy absorbed by an organ, divided by the organ's mass. Absorbed dose is expressed in units of rad (or gray) (1 rad = 0.01 Gy).

**dose equivalent**—The product of the absorbed dose (rad) in tissue and a quality factor. Dose equivalent is expressed in units of rem (or sievert) (1 rem = 0.01 sievert).

**committed dose equivalent**—The calculated total dose equivalent to a tissue or organ over a 50-year period after known intake of a radionuclide into the body. Contributions from external dose are not included. Committed dose equivalent is expressed in units of rem (or sievert).

**committed effective dose equivalent**—The sum of the committed dose equivalents to various tissues in the body, each multiplied by the appropriate weighting factor. Committed effective dose equivalent is expressed in units of rem (or sievert).

**effective dose equivalent**—The sum of the dose equivalents received by all organs or tissues of the body after each one has been multiplied by an appropriate weighting factor. The effective dose equivalent includes the committed effective dose equivalent from internal deposition of radionuclides and the effective dose equivalent attributable to sources external to the body.

**collective dose equivalent/collective effective dose equivalent**—The sums of the dose equivalents or effective dose equivalents of all individuals in an exposed population within a 50-mile (80-km) radius, and expressed in units of person-rem (or person-sievert). When the collective dose equivalent of interest is for a specific organ, the units would be organ-rem (or organ-sievert). The 50-mile distance is measured from a point located centrally with respect to major facilities or DOE program activities.

**dosimeter**—A portable detection device for measuring the total accumulated exposure to ionizing radiation.

**dosimetry**—The theory and application of principles and techniques involved in the measurement and recording of radiation doses. Its practical aspect is concerned with using various types of radiation instruments to make measurements.

**downgradient**—In the direction of decreasing hydrostatic head.

**downgradient well**—A well that is installed hydraulically downgradient of a site and may be capable of detecting migration of contaminants from a site.

**DRH**—Division of Radiological Health (state of Tennessee).

**drinking water standard (DWS)**—Federal primary drinking water standards, both proposed and final, as set forth by the EPA.

**duplicate result**—A result derived by taking a portion of a primary sample and performing an analysis on that portion identical to that performed on the primary sample.

**duplicate samples**—Two or more samples collected simultaneously into separate containers.

**effluent**—A liquid or gaseous waste discharge to the environment.

**effluent monitoring**—The collection and analysis of samples or measurements of liquid and gaseous effluents for purposes of characterizing and quantifying the release of contaminants, assessing radiation exposures of members of the public, and demonstrating compliance with applicable standards.

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

**exposure (radiation)**—The incidence of radiation on living or inanimate material by accident or intent. Background exposure is the exposure to natural background ionizing radiation. Occupational exposure is the exposure to ionizing radiation that takes place during a person's working hours. Population exposure is the exposure to the total number of persons who inhabit an area.

**external radiation**—Exposure to ionizing radiation when the radiation source is located outside the body.

**falling limb**—The falling limb is when discharge decreases and a spring or stream level falls. It has a gentler gradient than the rising limb as most overland flow has now been discharged, and it is mainly throughflow that makes up the spring/stream flow.

**fecal coliform**—The coliform group comprises all of the aerobic, non-spore-forming, rod-shaped bacteria. Testing determines the presence or absence of coliform organisms.

**flux**—A flow or discharge of a substance (in units of mass, radioactivity, etc.) per unit of time.

**formation**—A mappable unit of consolidated or unconsolidated geologic material of a characteristic lithology or assemblage of lithologies.

**friable asbestos**—Asbestos that is brittle or readily crumbled.

**gamma ray**—High-energy, short-wavelength electromagnetic radiation emitted from the nucleus of an excited atom. Gamma rays are identical to x-rays except for the source of the emission.

**gamma spectrometry**—A system consisting of a detector, associated electronics, and a multichannel analyzer that is used to analyze samples for gamma-emitting radionuclides.

**genotoxicology**—The study of the effects of chemicals or radioactive contaminants on the genetics of individual animals or plants.

**grab sample**—A sample collected instantaneously with a glass or plastic bottle placed below the water surface to collect surface water samples (also called dip samples).

**groundwater, unconfined**—Groundwater exposed to the unsaturated zone.

**half-life, biological**—The time required for a biological system, such as that of a human, to eliminate by natural processes half the amount of a substance (such as a radioactive material) that has entered it.

**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; half-lives can range in duration from less than a second to many millions of years.

**halogenated compound**—An organic compound bonded with one of the five halogen elements (astatine, bromine, chlorine, fluorine, or iodine).

**halomethane**—Any compound that includes a methane group (CH<sub>3</sub>) bonded to a halogen element (astatine, bromine, chlorine, fluorine, or iodine).

**hardness**—Water hardness is caused by polyvalent metallic ions dissolved in water. In fresh water, these are mainly calcium and magnesium, although other metals such as iron, strontium, and manganese may contribute to hardness.

**heavy water**—Water in which the molecules contain oxygen and deuterium, an isotope of hydrogen that is heavier than ordinary hydrogen.

**hectare**—A metric unit of area equal to 10,000 square meters or 2.47 acres.

**herbaceous**—Having little or no woody tissue.

**hydrogeology**—Hydrologic aspects of site geology.

**hydrology**—The science dealing with the properties, distribution, and circulation of natural water systems.

**in situ**—In its original place; field measurements taken without removing the sample from its origin; remediation performed while groundwater remains below the surface.

**internal dose factor**—A factor used to convert intakes of radionuclides to dose equivalents.

**internal radiation**—Internal radiation occurs when radionuclides enter the body by ingestion of foods, milk, and water, and 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.

**ion exchange**—Process in which a solution containing soluble ions is passed over a solid ion exchange column that removes the soluble ions by exchanging them with labile ions from the surface of the column. The process is reversible so that the trapped ions are removed (eluted) from the column and the column is regenerated.

**irradiation**—Exposure to radiation.

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

**laboratory blank**—An analyte-free matrix to which all reagents are added in the same volumes or proportions as used in sample processing. The laboratory blank should be carried through the complete sample preparation and analytical procedure. The laboratory blank is used to document contamination resulting from the analytical process.

**lower limit of detection (LLD)**—The smallest concentration/amount of analyte that can be reliably detected in a sample at a 95% confidence level.

**maximally exposed individual (MEI)**—A hypothetical individual who, because of proximity, activities, or living habits, could potentially receive the maximum possible dose of radiation from a given event or process.

**mercury**—A silver-white, liquid metal solidifying at  $-38.9^{\circ}\text{C}$  to form a tin-white, ductile, malleable mass. It is widely distributed in the environment and biologically is a nonessential or nonbeneficial element. Human poisoning from this highly toxic element has been clinically recognized.

**microbes**—Microscopic organisms.

**migration**—The transfer or movement of a material through the air, soil, or groundwater.



**millirem (mrem)**—The dose equivalent that is one one-thousandth of a rem.

**milliroentgen (mR)**—A measure of x-ray or gamma radiation. The unit is one-thousandth of a roentgen.

**minimum detectable activity**—The smallest activity of a radionuclide that can be distinguished in a sample by a given measurement system at a preselected counting time and at a given confidence level.

**monitoring**—A process whereby the quantity and quality of factors that can affect the environment and/or human health are measured periodically in order to regulate and control potential impacts.

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

**nuclide**—An atom specified by its 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.

**parts per billion (ppb)**—A unit measure of concentration equivalent to the weight/volume ratio expressed as micrograms per liter or nanograms per milliliter.

**parts per million (ppm)**—A unit measure of concentration equivalent to the weight/volume ratio expressed as milligrams per liter.

**peak flow**—Peak flow discharge occurs when a spring or stream reaches its highest level. The time difference between the peak of the rain event and the peak discharge is known as the basin lag.

**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 through 6, basic solutions have a pH > 7, and neutral solutions have a pH = 7.

**piezometer**—An instrument used to measure the potentiometric surface of the groundwater. Also, a well designed for this purpose.

**precision**—The closeness of approach of a value of similar or replicate results to a common value in a series of measurements.

**priority pollutants**—A group of approximately 130 chemicals (about 110 are organics) that appear on an EPA list because they are toxic and relatively common in industrial discharges.

**process sewer**—Pipe or drain, generally located underground, used to carry off process water and/or waste matter.

**process water**—Water used within a system process.

**purge**—To remove water prior to sampling, generally by pumping or bailing.

**quality assurance (QA)**—Any action in environmental monitoring to ensure the reliability of monitoring and measurement data.

**quality control (QC)**—The routine application of procedures within environmental monitoring to obtain the required standards of performance in monitoring and measurement processes.

**quality factor**—The factor by which the absorbed dose (rad) is multiplied to obtain a quantity that expresses, on a common scale for all ionizing radiation, the biological damage to exposed persons. It is used because some types of radiation, such as alpha particles, are more biologically damaging than others.

**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**—An unstable nuclide capable of spontaneous transformation into other nuclides by changing its nuclear configuration or energy level. This transformation is accompanied by the emission of photons or particles.

**reclamation**—Recovery of wasteland, desert, etc., by ditching, filling, draining, or planting.

**reference material**—A material or substance with one or more properties that is sufficiently well established and used to calibrate an apparatus, to assess a measurement method, or to assign values to materials.

**regression analysis**—A collection of statistical techniques that serve as a basis for drawing inferences about relationships among quantities in a scientific system.

**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  $\times$  the radiation quality factor). Dose equivalent is frequently reported in units of millirem (mrem), which is one one-thousandth of a rem.

**remediation**—The correction of a problem. See Environmental Restoration.

**RFI Program**—RCRA Facility Investigation Program; EPA-regulated investigation of a solid waste management unit with regard to its potential impact on the environment.

**RFI/RI Program**—RCRA Facility Investigation/Remedial Investigation Program; on the Oak Ridge Reservation (ORR), the expansion of the RFI Program to include CERCLA and hazardous substance regulations.

**rising limb**—The rising limb of the hydrograph represents the rapid increase resulting from rainfall causing surface runoff and later throughflow.

**roentgen**—A unit of radiation exposure equal to the quantity of ionizing radiation that will produce one electrostatic unit of electricity in one cubic centimeter of dry air at 0°C and standard atmospheric pressure. One roentgen equals  $2.58 \times 10^{-4}$  coulombs per kilogram of air.

**screened interval**—In well construction, the section of a formation that contains the screen, or perforated pipe, that allows water to enter the well.

**seepage basin**—An excavation that receives wastewater. Insoluble materials settle out on the floor of the basin, and soluble materials seep with the water through the soil column, where they are removed partially by ion exchange with the soil. Construction may include dikes to prevent overflow or surface runoff.

**self-absorption**—Absorption of radiation by the sample itself, preventing detection by the counting instrument.

**sensitivity**—The capability of a methodology or an instrument to discriminate among samples with differing concentrations or containing varying amounts of analyte.

**settleable solids**—Material settling out of suspension within a defined period.

**settling basin**—A temporary holding basin (excavation) that receives wastewater, which is subsequently discharged.

**sievert (Sv)**—The SI (International System of Units) unit of dose equivalent, 1 Sv = 100 rem.

**slurry**—A suspension of solid particles (sludge) in water.

**specific conductance**—The ability of water to conduct electricity; this ability varies in proportion to the amount of ionized minerals in the water.

**spike**—The addition of a known amount of reference material containing the analyte of interest to a blank sample.

**spiked sample**—A sample to which a known amount of some substance has been added.

**split sample**—A sample that has been portioned into two or more containers from a single sample container or sample-mixing container.

**stable**—Not radioactive or not easily decomposed or otherwise modified chemically.

**stack**—A vertical pipe or flue designed to exhaust airborne gases and suspended particulate matter.

**standard deviation**—An indication of the dispersion of a set of results around their average.

**standard reference material (SRM)**—A reference material distributed and certified by the National Institute of Standards and Technology.

**statistical significance testing**—A procedure for decision making and data evaluation based on mathematical probability that provides a consistent, scientific methodology for collecting, analyzing, and presenting data. Statistical significance testing reflects the mathematical likelihood of certain outcomes but says nothing about its environmental significance.

**storm water runoff**—Surface streams that appear after precipitation.

**strata**—Beds, layers, or zones of rocks.

**substrate**—The substance, base, surface, or medium in which an organism lives and grows.

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

**temperature**—The thermal state of a body considered with its ability to communicate heat to other bodies.

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

**total activity**—The total number of atoms of a radioactive substance that decay per unit of time.

**total dissolved solids**—Dissolved solids and total dissolved solids are terms generally associated with freshwater systems and consist of inorganic salts, small amounts of organic matter, and dissolved materials.

**total organic halogens**—A measure of the total concentration of organic compounds that have one or more halogen atoms.

**total solids**—The sum of total dissolved solids and suspended solids.

**total suspended particulates**—The concentration of particulates in suspension in the air irrespective of the nature, source, or size of the particulates.

**transect**—A line across an area being studied. The line is composed of points where specific measurements or samples are taken.

**transmissive zone**—A zone of sediments sufficiently porous and permeable to allow the flow of groundwater through the zone.

**transuranic waste**—Solid radioactive waste containing primarily alpha-emitting elements heavier than uranium.

**transuranium elements**—Elements with higher atomic weights than uranium; all 13 known transuranic elements are radioactive and are produced artificially.

**trip blank**—A sample container of deionized water that is transported to a sampling location, treated as a sample, and sent to the laboratory for analysis; trip blanks are used to check for contamination resulting from transport, shipping, and site conditions.

**tritium (<sup>3</sup>H)**—The hydrogen isotope with one proton and two neutrons in the nucleus. It emits a low-energy beta particle (0.0186 MeV maximum) and has a half-life of 12.5 years.

**t-test**—Statistical method used to determine whether the means of groups of observations are equal.

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

**unconsolidated zone**—Soil zone located above the water table.

**uncontrolled area**—Any area to which access is not controlled for the purpose of protecting individuals from exposure to radiation and radioactive materials.

**upgradient**—In the direction of increasing hydrostatic head.

**upper tolerance limit (UTL)**—The upper endpoint of an interval that contains a specified fraction of a population with a specified probability (confidence level). Data points or calculated values that fall above a UTL indicate the existence of a statistical difference that is not explained by inherent random variation.

**volatile organic compounds**—Used in many industrial processes; the levels of these carcinogenic compounds must be kept to a minimum. They are measured by volatile organic content analyses. Common examples include trichloroethane, tetrachloroethene, and trichloroethene.

**watershed**—The region draining into a river, river system, or body of water.

**wetlands**—Lowland areas, such as marshes or swamps, inundated or saturated by surface water or groundwater sufficiently to support hydrophytic vegetation typically adapted for life in saturated soils.

**wind rose**—A diagram in which statistical information concerning direction and speed of the wind at a location is summarized.

