

Biosolids Glossary of Terms

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Aquifer — A subsurface formation that stores or transmits water in recoverable quantities and can be used as a source of well water for domestic and agricultural use.

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Available water holding capacity — The capacity of soil to hold water between field capacity and the wilting point of plants. It is the pool from which growing plants obtain the water necessary for plant growth.

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ADEQ — The Arizona Department of Environmental Quality. ADEQ was established by the Arizona Legislature in 1986 in response to growing concerns about groundwater quality. ADEQ administers a variety of programs to “improve the health and welfare of our citizens and ensure the quality of Arizona's air, land and water resources meets healthful, regulatory standards.” The mission statement of ADEQ reads as follows “protect and enhance public health, welfare and the environment in Arizona.” ADEQ is committed to leading Arizona and the nation in protecting the environment and improving the quality of life for the people of our state. More information about ADEQ's Core Functions, Organization, Agency-wide Projects, Leadership, ADEQ Sunset Audit Report, History, Budget and Performance, Contacts and Office Locations at <http://www.azdeq.gov/index.html>

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AWPCA— The Arizona Water & Pollution Control Association (AWPCA) is a nonprofit educational organization founded in 1928 with a membership of 3200 water/wastewater professionals dedicated to preserving and enhancing Arizona's water environment. AWPCA provides its members access to information, resources, and services. Additionally, it informs the general public of what AWPCA and the water/wastewater industry is doing to ensure high-quality water in Arizona. Although AWPCA is an independent organization, it also serves as the Arizona section of the American Water Works Association (AWWA) and the Arizona member association of the Water Environment Federation (WEF). <http://www.awpca.org/default.aspx>

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AZPDES — Arizona Pollutant Discharge Elimination System is the permit program under the federal Clean Water Act administrated by the state of Arizona.

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Beneficial use — Use of a product with a defined benefit, such as biosolids used as soil amendment. Disposal, such as landfilling or incineration, is not beneficial use.

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Bioaccumulation — The tendency for substances to increase in concentration in living organisms as they take in contaminated air, water, or food because the substances are very slowly metabolized or excreted.

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Biochemical Oxidation Demand (B.O.D.) — A measure of the oxygen consumed in organic rich water by aerobic microorganisms for metabolic functions.

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Biosolids — The soil-like residue of materials removed from sewage during the treatment process. During treatment, bacteria and other tiny organisms break sewage down into simpler, harmless organic matter. The organic matter combined with bacterial cell masses, settles out to form biosolids.

Biosolids in their liquid form look like muddy water and contain 1-10% solids. Biosolids may be dewatered in a second step of the treatment process, which turns it into a "cake" with the texture of a wet sponge. In this stage it contains 11-40% solids.

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BMP — Best Management Practices (BMP) are operating methods that ensure the proper land application of biosolids for protection of the environment. BMP include agronomic loading rates, slope limitations, soil pH limitations, buffer zones, public access restrictions, grazing deferrals, soil conservation practices, restrictions for saturated and frozen soils, protection of endangered species and other site restrictions.

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Cation Exchange Capacity (CEC) — The capacity of a soil to exchange and retain positively charged ions (cations) expressed in terms of milliequivalents per 100 grams of soil (me/100 g).

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Chemical Oxidation Demand (C.O.D.) — A measure of the oxygen needed to oxidize organic and inorganic compounds in water.

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Class A Biosolids — Material that has met the Class A pathogen reduction requirements or equivalent treatment by a Process to Further Reduce Pathogens (PFRP) in accordance with 40 CFR 503. Processes include composting, heat drying, heat treatment, thermophilic aerobic digestion, beta or gamma ray irradiation and pasteurization.

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Class B Biosolids — Material that has met the Class B pathogen reduction requirements or equivalent treatment by a Process to Significantly Reduce Pathogens (PSRP) in accordance with 40 CFR 503. Processes include aerobic digestion, composting, anaerobic digestion, lime stabilization and air drying.

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Coliform Organisms — Microorganisms found in the intestinal tract of humans and animals. Their presence in water indicates fecal pollution and potentially adverse contamination by pathogens.

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Composting — This is the process in which solid organic materials are decomposed in the presence of oxygen through the action of bacteria and other microorganisms. Dewatered biosolids are mixed with sawdust or wood chips that act as bulking agent by absorbing water and increasing the porosity of the mixture. This mix is then composted and cured for a minimum of six weeks. High temperatures (103 degrees to 150 degrees Fahrenheit) generated during this process pasteurize the mixture. A peat like product is the end result. Composted biosolids are easier to handle, store and use than liquid and dewatered biosolids.

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Crops — Crops are plants grown for human or animal consumption and use. Crops used directly for human consumption are those eaten by humans with only superficial washing in water. Crops may be processed for human consumption by many means, most of which reduce the likelihood of contact with or ingestion of pathogens. Food chain crops are those crops ultimately used for food by humans and other animals.

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Designated Beneficial Use - Desirable uses that water quality should support (e.g., drinking water, recreation, aquatic life). Each designated use has a unique set of water quality requirements that must be met for the use to be realized.

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Dewatering, dewatered biosolids — A process used to remove water from biosolids producing dewatered biosolids that contain equal to or greater than 20 percent dry solids.

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Disposal — Method of final disposition that does not provide any beneficial use. Disposal includes landfilling and incineration. Sludge-only lagoons where sludge remains for more than two years are also defined as disposal by regulation.

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Domestic wastewater — Wastewater from restrooms and sanitary conveniences of residences, cities, mobile home parks, subdivisions, restaurants, rest homes, resorts, motels, factories, stores and other commercial businesses. It also includes industrial contributions when domestic and industrial wastewater are combined in a city sewer system.

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Domestic wastewater sludge — Sludge generated from the treatment of domestic wastewater.

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Dry Weight Basis — Calculated on the basis of having been dried at 105 degrees Celsius until reaching a constant mass (i.e. essentially 100 percent solids).

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EPA — United States Environmental Protection Agency. The federal agency assigned to administer the federal Clean Water Act and other federal environmental laws.

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Exceptional Value Waters — A stream or watershed which constitutes an outstanding national, state, regional or local resource, such as waters of national, state, or county parks or forests, or waters which are used as a source of unfiltered potable water supply, or waters of wildlife refuges or state game lands, or waters which have been characterized by the Fish Commission as "Wilderness Trout Streams," and other waters of substantial recreational or ecological significance.

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Fallow, fallow land — Land is considered fallow if it is kept free of growing plants during the growing season (March to October) using cultivation. The process is called "fallowing."

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40 CFR 503 — Regulations for setting "Standards for the use or disposal of sewage sludge," Title 40 Code of Federal Regulations Part 503.

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Generator — Any publicly-or privately-owned sewage treatment plant that handles residential and domestic sewage.

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Giardia Lamblia — Protozoan in the feces of humans and animals that can cause severe gastrointestinal ailments. It is a common contaminant in surface water.

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Groundwater — The subsurface water within the zone of saturation. This water moves under the influence of gravity and is, in many instances, a source of well water for domestic and agricultural use.

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Hydraulic conductivity — The ease of movement of water through the soil relative to a potential gradient.

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Incorporation — Incorporation means mixing biosolids with the soil. Incorporation includes injection, moldboard plowing, roto-tilling, chisel or disk plowing and tandem disk harrowing.

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Industrial sludge — Any sludge that is not domestic wastewater sludge is industrial sludge. This includes wastewater sludge from manufacturing or processing of raw materials, intermediate products, final products or other activities that include pollutants from non-domestic wastewater sources.

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Intermittent Stream — A body of water flowing in a channel or bed composed primarily of substrates associated with flowing water which, during periods of the year, is below the local water table and obtains its flow from both surface runoff and groundwater discharges.

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Leaching — Leaching refers to the movement of soluble components in solution from the soil by water.

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Land application — The beneficial use of biosolids applied to land based upon crop needs and the composition of biosolids.

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NACWA — The National Association of Clean Water Agencies represents the interests of over 300 public agencies and organizations that have made the pursuit of scientifically based, technically sound and cost effective laws and regulations their objective. NACWA members serve the majority of the sewered population in the United States and collectively treat and reclaim more than 18 billion gallons of wastewater daily. NACWA maintains a key role in the development of environmental legislation, and works closely with federal regulatory agencies in the implementation of environmental programs. <http://www.nacwa.net/index.cfm>

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NBP – The National Biosolids Partnership is a not-for-profit alliance formed in 1997 with the National Association of Clean Water Agencies (NACWA) (formerly Association of Metropolitan Sewerage Agencies), Water Environment Federation (WEF), and U.S. Environmental Protection Agency (EPA). The goal of NBP is to advance environmentally sound and accepted biosolids management practices. Biosolids producers, service contractors, and users - together with stakeholders from regulatory agencies, universities, the farming community, and environmental organizations - will have input into shaping NBP priorities through scientific and technical support and communications linkages relating to biosolids issues. <http://www.biosolids.org/>

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NPDES — National Pollutant Discharge Elimination System is the permit program under the federal Clean Water Act.

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NSF-UA Water Quality Center — The National Science Foundation Water Quality Center at the University of Arizona consists of a prestigious group of research scientists within the University of Arizona. This interdisciplinary group of biologists, chemists, physicists, hydrologists and engineers works together to resolve water quality problems. Funding for the Center is supplied by the National Science Foundation as well as a variety of companies and agencies who are interested in specific water quality issues. It is the combination of University expertise and corporate funding that leads to scientific discoveries that can enhance water quality for the community at large. The integration of the University with the private sector and governmental agencies makes the Center unique.

<http://wqc.arizona.edu/>

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Nutrient Management - Identifying how the major plant nutrients (nitrogen, phosphorous and potassium) are to be annually managed for expected crop production and for the protection of water quality.

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Nutrient Management Plan - A written site specific plan which describes how the major plant nutrients (nitrogen, phosphorus and potassium) are to be managed, annually. The goal of farm nutrient management planning is to minimize adverse environmental effects, primarily upon water quality, and avoid unnecessary nutrient applications above the point where long run net farm financial returns are optimized.

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Pathogen — An organism capable of causing a susceptible host to develop a disease or infection.

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Pathogen Reduction — Decreasing the presence of disease-causing organisms through sewage sludge processing and site management practices.

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PCBs — **Polychlorinated biphenyls** are a class of organic compounds with 1 to 10 chlorine atoms attached to biphenyl and a general chemical formula of $C_{12}H_{10-x}Cl_x$. PCB's are classified as persistent organic pollutants. Most of the 209 congeners of PCB are colorless, odorless crystals. The commercial mixtures are clear viscous liquids (the more highly chlorinated mixtures are more viscous, for example, Aroclor 1260 is a "sticky resin"). Although the physical and chemical properties vary widely across the class, PCBs have low water solubility and low vapor pressures. They are soluble in most organic solvents, oils, and fats. PCBs are very stable compounds and do not degrade readily. PCBs may be destroyed by chemical, thermal, and biochemical processes, though it is extremely difficult to achieve full destruction, and there is the risk of creating extremely toxic dibenzodioxins and dibenzofurans through partial oxidation. Because of the high thermodynamic stability of PCBs, all degradation mechanisms are difficult to sustain. Intentional degradation as a treatment of unwanted PCBs generally requires high heat or catalysis. Environmental and metabolic degradation generally proceeds quite slowly relative to most other compounds. Most PCBs were manufactured as cooling and insulating fluids for industrial transformers and capacitors. PCB production was banned in the 1970s due to the high toxicity of most PCB congeners and mixtures.

http://en.wikipedia.org/wiki/Polychlorinated_biphenyl

<http://www.epa.gov/pcb/>

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Pelletization — In this process biosolids are first stabilized (see definition), then completely dried and pressed into small pellets. The pellets are then used as fertilizer since they are high in nitrogen.

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Percolation — The movement (normally downward) of water through and out of the soil. This downward movement accentuates the leaching process.

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Perennial Stream — A body of water flowing in a channel or bed composed of substrates associated with flowing waters and capable, in the absence of pollution or other manmade disturbances, of supporting a benthic macroinvertebrate community which is composed of two or more recognizable taxonomic groups of organisms which are large enough to be seen by the unaided eye and can be obtained by United States Standard No. 30 sieve (28 meshes per inch, 0.595 mm openings) and live at least part of their life cycles within or upon available substrates in a body of water or water transport system.

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Permeability, permeability rate — The ease of movement of water and/or gases through a soil material.

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Plant Available Nitrogen (PAN) — Plant available nitrogen is a calculated quantity of nitrogen made available during the growing season after application of biosolids. PAN includes a percentage of the organic nitrogen (20 percent in year 1), a percentage of the ammonium N (depends on pH and incorporation) and all the nitrate nitrogen in the biosolids.

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Porosity — The porosity of a soil is the percentage of the soil volume not occupied by soil solids.

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Public contact or public use sites — Land with a potential for use or contact by the public. This includes parks, ball fields, cemeteries, plant nurseries, turf farms, golf courses, schools, lawns, home gardens, road banks, residential land or other similar areas. It does not include agricultural land.

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Recreation area — Any area used by the public for recreation is a recreation area. Examples include, but are not limited to, golf courses, parks, campgrounds, picnic grounds, athletic fields, fairgrounds, race tracks and others.

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Rivers, streams — Natural water courses, or altered water courses including intermittent streams, which have flowing water at some time during the year and which drain landscapes.

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Routine storage — The storage of biosolids (for extended periods of time) until the land is in a condition to receive the biosolids.

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Seasonal High Water Table — The minimum depth from the soil surface at which redoximorphic features are present in the soil.

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Septage — The biodegradable waste from septic tanks and similar treatment works. Septage includes the sediments, water, grease and scum pumped from a septic tank.

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Sewage Sludge — A solid, semi-solid or liquid residue generated during the treatment of domestic sewage in a treatment works.

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Sink Hole — A naturally occurring basin which has no visible external or surface drainage, and in which ponding may occur during or following periods of rainfall.

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Sludge lagoon — An earthen basin that receives only sludge that has been removed from a wastewater treatment facility. It does not include a wastewater treatment lagoon or sludge treatment units that are a part of a mechanical treatment.

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Soil — A natural body synthesized over time from a mixture of inorganic and organic parent materials, now supporting living plants. Soils with depth have natural horizons (layers) that give them their properties. Such properties include texture, color, structure, and bulk density.

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Soil pH — An index of the acidity or alkalinity of a suspension of soil in a liquid such as distilled water or dilute salt solution. The index is the logarithmic expression of the activity of H-ions in the liquid

surrounding the soil particles. A pH >7.0 is alkaline and <7.0 is acid. A soil pH is not a measure of total acidity in a soil. It is a measure of the acidity or alkalinity of the soil.

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Soil saturation — The water content of a soil beyond which no more water is absorbed.

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Soil structure — The arrangement of soil particles into larger particles or clumps. This arrangement modifies the bulk density and porosity of the soil.

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Soil profile — A two-dimensional view of the soil from the earth's surface down to and including the parent material.

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Specific gravity — The relative weight of a given volume of the solid phase (pore space excluded) of a material. This value is compared to an equal volume of distilled water at 2 degrees C.

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Stabilization — This is the process used to reduce harmful bacteria and odors in biosolids. Typically, stabilization is accomplished through aerobic (with oxygen) or anaerobic (without oxygen) digestion. Digestion refers to the breakdown of complex organic substances through the action of bacteria and other microorganisms.

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Stormwater — That portion of rainfall that does not infiltrate into the soil.

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Subsoil — The part of the soil profile beneath the surface soil that has been altered from its original geologic characteristics. In many instances, it is called a "B horizon."

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Surface runoff — The portion of rainfall, irrigation water or wastewater that does not infiltrate into the soil.

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Surface soil — Surface soil (A horizon) is the portion of the soil profile at the interface with the earth's atmosphere. It is normally the portion of the profile containing the greatest amount of organic matter. If the surface is plowed it is called a plow layer or Ap horizon.

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Vectors — Rodents, flies, mosquitoes or other organisms capable of transporting infectious agents.

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Vector Attraction — The characteristic of sewage sludge that attracts rodents, flies, mosquitoes or other organisms capable of transporting infectious agents.

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Vector Attraction Reduction — Decreasing the characteristic of sewage sludge that attracts rodent, flies, mosquitoes or other organisms capable of transmitting infectious agents.

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WEF —The Water Environment Federation (WEF) was formed in 1928. It is a not-for-profit technical and educational organization with 32,000 individual members and 80 affiliated Member Associations representing an additional 50,000 water quality professionals throughout the world. WEF and its member associations proudly work to achieve our mission of preserving and enhancing the global water environment. <http://www.wef.org/Home>

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Wetlands — Areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, under normal circumstances, a prevalence of vegetation typically

adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas. Constructed wetlands for wastewater treatment are not included.

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