Biosolids Glossary of Terms

Municipalities and privately owned wastewater treatment facilities process domestic wastewater into sludge and effluent. The sludge is then processed into a secondary resource, biosolids, that has value for land application as a supply of plant nutrients and organic matter.

This guide defines the common terms applied to the generation and land application of biosolids. Consistent use of the correct terminology leads to a clearer understanding. For example, the definition of sludge includes biosolids. However, all sludges are not biosolids. Some sludges are excluded from land application; whereas a sludge defined as biosolids may be land applied.

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.

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.

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.

Biochemical oxidation demand (BOD)

A measure of the oxygen consumed in organic rich water by aerobic microorganisms for metabolic functions.

Biosolids

Organic fertilizer or soil amendments produced by the treatment of domestic wastewater. Biosolids consist primarily of dead microbes and other organic matter. Untreated sludge or sludge that does not conform to regulated pollutants and pathogen treatment requirements are not considered biosolids.

Biosolids land-application facility

A facility where biosolids are spread onto the land at agronomic rates for production of food or fiber. The facility includes any structures necessary to store the biosolids until the soil, weather and crop conditions are favorable for land application.

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 deferments, soil conservation practices, restrictions for saturated and frozen soils, protection of endangered species and other site restrictions.

Bulk density

The mass of dry soil per unit bulk volume (solids plus pores) expressed in gram per cubic centimeter.

Cation exchange capacity (CEC)

The capacity of a soil to exchange and retain positively charged ions, or cations, expressed in terms of milliequivalents per 100 grams of soil (me per 100 grams).

Chemical oxidation demand (COD)

A measure of the oxygen needed to oxidize organic and inorganic compounds in water.

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.

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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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.

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.

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.

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.

Domestic wastewater sludge

Sludge generated from the treatment of domestic wastewater.

DNR

Missouri Department of Natural Resources. The state agency assigned to administer the Missouri Clean Water Law and other state environmental laws.

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).

EPA

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

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.

40 CFR 503

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

General permit

An operating permit developed for a category of facilities with similar characteristics. Each qualifying facility within a specified geographic area would receive an identical general permit for each operating location. An example would be septage that is land applied.

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.

Hydraulic conductivity

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

Incorporation

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

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.

Leaching

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

Land application

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

Long-term storage

The storage of biosolids (for up to two years) until the land is in condition to receive the biosolids.

Missouri Clean Water Law

Missouri statutes under Chapter 644 RsMo(1986).

NPDES

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

Operating location

All contiguous lands owned, operated or controlled by one person or a group of persons.

Operating permit

State operating permit issued under the Missouri Clean Water Law and regulations. Operating permits include both site-specific permits and general permits.

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

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

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

Person
An individual, association, partnership, firm, company, corporation, municipality, political subdivision, state or federal agency or an agent or employee thereof.

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.

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

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.

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.

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.

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

Site-specific permit
An operating permit that is developed with limitations based on a case-by-case review of site specific conditions.

Sludge
The solid, semi-solid or liquid residue removed during the treatment of wastewater. Sludge includes septage removed from septic tanks.

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.

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, or layers, that give them their properties. Such properties include texture, color, structure, and bulk density.

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.

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

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

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

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 Celsius.

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

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.

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

Surface soil

Surface soil, or the 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.

Vectors

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

Waters of the state

Any water not completely confined upon one's own property. This includes streams, ponds, lakes, drainage ways, sinkholes, losing streams, wetlands, stormwater runoff and groundwater.

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.

References

Missouri Department of Natural Resources publications.

U.S. Environmental Protection Agency publications.

Minnesota Pollution Control Agency, *Sewage Sludge Management Rules*

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