

## Appendix A

# Glossary of Terms Used in the Environmental Fate Summaries

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This Appendix defines the following terms, which are used in the environmental fate summaries:

- acclimation
- activated sludge
- beta-oxidation
- bioconcentration factor (BCF)
- biodegradation
  - primary degradation
  - ultimate degradation
- biochemical oxygen demand (BOD)
- gravitational settling
- Henry's Law constant ( $H_c$ )
- hydrolysis
- hydrophile/hydrophobe
- hydroxyl radical
- leaching
- mobility
- octanol/water partition coefficient ( $K_{ow}$ )
- persistence
- photolysis
  - direct photolysis
  - indirect photolysis
- photooxidation
- screening test
- soil sorption constant ( $K_j$ )
- STP fugacity model
- transformation
- transport
- vapor pressure
- volatilization
- water solubility
- wet deposition

**Acclimation:** process in which exposure of a microbial population to a chemical results in a more rapid transformation of the chemical than initially observed

**Activated sludge:** the flocculated mixture of microorganisms and inert organic and inorganic material normally produced by aeration of sewage. Constitutes the biological treatment process most frequently employed for purification of domestic sewage

**Beta-oxidation:** microbial degradation pathway in which fatty alkyl groups are enzymatically degraded two carbons at a time, eventually resulting in total

biodegradation of the alkyl group

**Bioconcentration factor (BCF):** equilibrium ratio of the concentration of a chemical in an exposed aquatic organism to the concentration of the chemical in the surrounding water

**Biodegradation:** the transformation of chemical compounds by living organisms. Not confined to microorganisms (e.g., bacteria, fungi), but chiefly a microbial process in nature

**Primary degradation:** any biologically induced structural transformation of the parent compound that changes its molecular identity

**Ultimate degradation:** any biologically mediated conversion of an organic compound to inorganic compounds (e.g., CO<sub>2</sub> and H<sub>2</sub>O) and products associated with normal metabolic processes.

Similar to **Mineralization**

**Biochemical oxygen demand (BOD):** the amount of oxygen consumed by microorganisms when metabolizing a chemical compound

**Gravitational settling:** process by which particulate matter reaches land surfaces or water bodies via deposition from the atmosphere

**Henry's Law constant (H<sub>c</sub>):** the air/water partition coefficient, usually estimated by dividing the vapor pressure of a sparingly water soluble chemical substance by its water solubility. H<sub>c</sub> provides a measure of the volatility (see volatilization) of the chemical from soil or water

**Hydrolysis:** transformation process in which a molecule, abbreviated RX, reacts with water, forming a new chemical bond between R and oxygen derived from water, and cleaving the bond between R and X. Webster's says "a chemical process of decomposition involving splitting of a bond and addition of the elements of water"

**Hydrophile:** a molecular fragment that imparts increased water solubility, usually a polyethoxylate, sulfonate, sulfate, quaternary ammonium, phosphate, or other hydrophilic ("water-loving") group

**Hydrophobe:** a molecular fragment that imparts increased fat solubility and decreased water solubility, usually an alkyl group with at least 10 carbons or a similarly hydrophobic ("water hating") substituted benzene group

**Hydroxyl radical:** a strong oxidizing agent consisting of one oxygen atom and one hydrogen atom, which is generated naturally by the action of sunlight and is the chief oxidizing agent in the atmosphere (see photolysis/photooxidation)

**Leaching:** transport process by which dissolved chemical substances move through soil with the percolation of water

**Mobility:** ability of a chemical substance to move through soil with the percolation of water

**Octanol/water partition coefficient ( $K_{ow}$ ):** equilibrium ratio of a chemical's concentration in the octanol phase to its concentration in the aqueous phase of a two-phase octanol/water system.  $K_{ow}$  is an important parameter because it provides an indication of a chemical's water solubility and its propensity to bioconcentrate in aquatic organisms and sorb to soil and sediment

**Persistence:** ability of a chemical substance to remain in a particular environment in an unchanged form

**Photolysis:** transformation of a chemical induced by light energy

**Direct photolysis:** a photolytic process in which a chemical itself absorbs solar radiation and is subsequently transformed

**Indirect photolysis:** a photolytic process, also referred to as sensitized photolysis, in which some other chemical absorbs solar radiation initially but then transfers that energy to the chemical of interest, which is subsequently transformed

**Photooxidation:** a photolytic process in which solar radiation generates an oxidizing agent (such as hydroxyl radicals) that reacts with the chemical, resulting in its transformation

**Screening test:** broadly, a test in which the main goal is to gather preliminary, often qualitative information for the purpose of making a decision as to the need for further, more sophisticated testing. Most often used in connection with biodegradability testing

**Soil sorption constant ( $K_{oc}$ ):** a measure of the extent to which a chemical partitions between the solid and solution phases of a two-phase system, especially soil, sediment or activated sludge. Usually expressed on an organic carbon basis, as the equilibrium ratio of the amount of chemical sorbed per unit weight of organic carbon (oc) in the soil, sediment or sludge to the concentration of the chemical in solution

**STP fugacity model:** a mathematical model of a typical sewage treatment plant (STP) employing primary treatment, activated sludge secondary treatment, and secondary settling, used to predict the fate of chemical substances of interest in treatment. The STP model is based on the chemical principle of fugacity, which is a measure of the tendency of a chemical to "flee" from one phase to another (e.g., from water to air)

**Transformation:** any environmentally induced change in the molecular structure of a

chemical that includes the breaking or formation of a covalent chemical bond

**Transport:** movement of a chemical through one environmental phase or from one phase to another

**Treatability:** the amenability of a chemical substance or waste stream to removal during biological wastewater treatment, without adversely affecting the normal operation of the treatment plant

**Vapor pressure:** the pressure that is exerted by a chemical substance in the vapor phase when that phase is in equilibrium with its solid or liquid form

**Volatilization:** transport process by which a chemical substance enters the atmosphere by evaporation from the solid or solution phase on land or in a water body

**Water solubility:** the maximum amount of a chemical that will dissolve in pure water at a specified temperature, usually 25<sup>N</sup> C

**Wet deposition:** process by which a chemical that is dissolved in water in the atmosphere reaches land or a water body via precipitation (synonym: atmospheric washout)