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# ENVIRONMENTAL GEOLOGY - GEOL 406/506

## Glossary of useful Terms:

1. **Abiotic:** not living.
2. **Absorption:** the penetration of atoms, ions, or molecules into the bulk mass of substrate.
3. **Acclimation:** time elapsed before onset of detectable biodegradation of a contaminant.
4. **Acid:** compound with tendency to donate protons (hydrogen ions, H<sup>+</sup>).
5. **Acidic:** high concentration (activity) of free protons.
6. **Activity:** effective concentration. Normally effective concentration is lower than actual concentration due to dynamic interactions occurring in the environment.
7. **Adsorption:** the retention of atoms, ions, or molecules on the surface of another substance.
8. **Advection:** the process of transfer of fluids through a geologic formation in response to a pressure gradient.
9. **Aeration:** the process of bringing air into contact with a liquid.
10. **Aerobic:** with oxygen.
11. **Aliphatic:** of or pertaining to a broad category of carbon compounds distinguished by a straight, or branched, open chain arrangement of the constituent carbon atoms. The carbon-carbon bonds may be either saturated (all available sites are involved in bonds) or unsaturated. Alkanes, alkenes, and alkynes are aliphatic hydrocarbons.
12. **Anaerobic:** without oxygen.
13. **Anisotropic:** the condition in which hydraulic properties of the subsurface are unequal when measured in all directions.

14. **Aquifer**: a geologic formation capable of transmitting significant quantities of groundwater under normal hydraulic gradients.
15. **Aquitard**: a geologic formation that may contain groundwater but cannot transmit it at any significant rate. Aquitards frequently act as confining formations.
16. **Aromatic**: of or relating to cyclic organic compounds.
17. **Attenuation** (natural attenuation): the reduction or lessening in amount of a contaminant (usually used to refer to natural processes).
18. **Autotrophic**: "self-feeding". Refers to organisms that are able to make their own biological molecules from inorganic chemicals and an energy source.
19. **Background concentration**: naturally occurring concentrations of compounds of concern.
20. **Base**: compound with tendency to donate free hydroxide ions (OH<sup>-</sup>).
21. **Basic**: a high concentration (activity) of hydroxide ions.
22. **Bioassay**: method for determining compound toxicity.
23. **Bioaugmentation** (inoculation): addition of acclimated, non-native microbial species to a site.
24. **Bioavailability**: availability of a compound to degrading species.
25. **Biodegradability**: the relative ease with which chemical species will degrade as a result of biological metabolism.
26. **Biodegradation**: the biologically catalyzed, enzymatic destruction of a compound through reduction in complexity of the molecule. The ideal goal is to completely mineralize the contaminants.
27. **Biomass**: the amount of living matter in a given area or volume.
28. **Bioremediation**: using biological degradation to treat waste sites.
29. **Biotic**: living.
30. **Borehole**: hole drilled into the subsurface for soil sampling or placement of a well.

31. **BTEX:** Benzene, Toluene, Ethyl benzene and Xylenes.
32. **Bulk density:** the ratio of unit mass to unit volume of soil.
33. **Capillary fringe:** upper level of the water table, which is of variable height.
34. **Condensate:** the liquid that separates from a vapor during condensation.
35. **Cone of depression:** area around a pumping well where the water table has been artificially lowered.
36. **Confining layer:** a geologic formation characterized by low permeability that inhibits the flow of water.
37. **Diffusion:** the passive movement of a species from an area of higher concentration to one of lower concentration.
38. **Dispersion:** movement of a substance away from its source.
39. **Down gradient:** in the direction of decreasing head.
40. **Drawdown:** lowering the water table via pumping of groundwater.
41. **Effluent:** out-going (leaving the source).
42. **Entrained:** particles or vapor transported along with flowing liquid or gas.
43. **Equipotential:** areas of equal hydraulic head.
44. **Equipotential lines:** imaginary lines (water table contours) connecting areas of equal hydraulic head. Together they create a potentiometric surface (a map of the subsurface water table).
45. **Evaporation:** the process whereby liquid enters the gas phase.
46. **Ex-situ:** environmental medium in a different place than its original location.
47. **Extraction well:** a well used to remove substances from the subsurface.
48. **Field capacity** (water holding capacity): the maximum amount of water a soil can retain against gravity. This is the same as plant available water.
49. **Flow net:** a set of equipotential lines that indicates the direction of

groundwater flow.

50. **Free product:** petroleum or petroleum products in excess of 0.01 ft in thickness floating on surface water or groundwater.

51 **Gasoline analytical group:** aviation gasoline, gasohol, and motor gasoline or equivalent petroleum products.

52. **Gradient:** the rate of change in value of a physical or chemical parameter per unit change in position.

53. **Groundwater:** water in the subsurface within the zone of saturation (or phreatic zone).

54. **Grout seal:** A mixture of clay and/or cement in water poured between borehole and well casing. Forms a protective seal.

55. **Henry's law constant:** the ratio of the concentration of a compound in vapor to the concentration in liquid at a given temperature and pressure.

56. **Heterogeneous:** varying in structure or composition.

57. **Heterotrophic:** organisms that derive carbon and energy for growth and maintenance from the breakdown of organic matter.

58. **Homogenous:** uniform in composition or structure.

59. **Hydraulic conductivity:** a coefficient of proportionality describing the rate at which water can move through a permeable medium.

60. **Hydraulic gradient:** the change in potentiometric (peizometric) head between two points.

61. **Hydraulic head:** the potential for a fluid to flow (it is an energy potential and can be pictured as "elevation" of the water table).

62. **Hydrocarbon:** chemical species composed of carbon and hydrogen only.

63. **Hydrophilic:** tending to dissolve in water. Hydrophilic species will generally dissolve into the groundwater, and be transported with it in the same phase.

64. **Hydrophobic:** tending not to dissolve in water. Hydrophobic compounds generally form a separate, non-aqueous phase when put into contact with water. (picture a glass of oil and water).

65. **In situ**: environmental medium left in its original location.
66. **Indigenous**: naturally occurring.
67. **Infiltration**: movement of fluids from surface, through the unsaturated zone (or vadose zone) into an aquifer.
68. **Influent**: incoming.
69. **Injection well**: a well used to inject a pressurized fluid into the subsurface.
70. **Inlet well**: a well through which a fluid enters the subsurface under normal pressure.
71. **Lipophilic**: "fat-loving"/hydrophobic.
72. **MCLs**: Maximum Contaminant Levels.
73. **Mineralization**: complete conversion of organic matter to inorganic matter. Such as the breakdown of petroleum hydrocarbon molecules resulting in water and carbon dioxide end products only.
74. **Moisture content**: the amount of water lost from a soil with drying, and expressed as a unit ratio.
75. **Monitoring well**: a well used to detect the presence of free product or to collect samples.
76. **Non-aqueous phase liquid (NAPL)**: contaminants that have very low solubility in water and tend to remain in a separate bulk phase in the subsurface.
77. **Nutrients**: elements and compounds that are necessary for growth of organisms.
78. **Off-gas treatment system**: unit operations used to treat waste gas streams.
79. **Permeability**: the amount of hydraulic conductivity resulting from pore space alone.
80. **Phreatic zone**: the saturated zone or water table.
81. **pH**: acidity (or basicity) level.

82. **Piezometer**: a temporary well used to determine the direction of groundwater flow.
83. **Plume**: the portion of the subsurface that is contaminated extending away from the source of pollution.
84. **Polyaromatic hydrocarbon**: aromatic hydrocarbon with more than one fused benzene ring.
85. **Pore volume** (porosity): total volume of pore space in a given volume of soil.
86. **Pressure gradient**: a pressure differential in a given medium.
87. **Radius of influence**: the maximum distance away from an air injection or extraction source that is significantly effected by a change in pressure or flow rate of air.
88. **Recalcitrance**: resistance to degradation.
89. **Recharge**: the annual amount of moisture that is returned to an aquifer.
90. **Redox**: oxidation/reduction.
91. **Residence time**: the amount of time a compound remains in a particular environmental compartment.
92. **Saturated zone**: zone of saturated conditions in the subsurface (also known as the water table or phreatic zone).
93. **Soil moisture**: water retained in the pore spaces of the vadose zone.
94. **Solubility**: amount of a substance that can dissolve in a given medium.
95. **Sorption**: adsorption plus absorption.
96. **Sparge**: injection of air below a water table to strip dissolved volatile organic compounds and/or oxygenate groundwater to stimulate microbial decomposition of contaminants.
97. **Specific gravity**: ratio of density of a substance to the density of water.
98. **Specific retention**: amount of moisture retained by soil after gravity drainage.
99. **Specific yield**: amount of moisture yielded by a soil under gravity

drainage.

100. **Surfactant**: Surface Active Agent.

101. **Total petroleum hydrocarbons**: the concentration of all petroleum species in a given sample or environmental compartment.

102. **Total volatile organic aromatics**: the sum concentrations of BTEX.

103. **Transmissivity**: ability of a material to permit passage of a fluid through its interior.

104. **Unsaturated zone**: the portion of the subsurface above the water table (also known as the vadose zone).

105. **Vadose zone**: the unsaturated zone.

106. **Vapor pressure**: pressure exerted by a vapor against a medium (solid, liquid or other gas) with which it has attained equilibrium.

107. **Volatile organic compounds (VOC)**: organic compounds with high volatility that will generally pass into the vapor phase at normal temperatures and pressures.

108. **Water table**: the saturated zone.

109. **Well**: hole drilled into the subsurface to reach groundwater.

110. **Well casing**: steel or PVC pipe (typically) inserted into a well to prevent borehole collapse.

111. **Well pack**: sand or gravel pack placed in a well screen that acts to prevent plugging of the screen.

112. **Well screen**: part of the well casing which is slotted in the zone of interest, and allows fluids to enter the well.

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