

## Glossary

**abandoned mine**—Excavations, structures, or equipment remaining from a former mining operation that, for all practical purposes, have been deserted while no intent of further mining is evident. An assumption of “abandoned” may be incorrect if an owner still exists, even if the owner has not performed any activity at the location for a long period, in which case the mine may be “inactive.”

**acid-base accounting (ABA)**—An analytical technique applied to mine wastes and geologic materials that determines the potential acidity from sulfur analysis versus the neutralization potential. It is used to predict the potential of that material to be acid producing or acid neutralizing.

**acid generating**—Refers to ore and mine wastes that contain sulfur or sulfides, which produce acid when oxidized. Acid can also be present as acid sulfates or generated by their weathering, produced originally from oxidation of sulfides.

**acid potential (AP)**—The ability of a rock or geologic material to produce acid leachate. May also be referred to as acid-generation potential or AGP.

**acid rain**—Term referring to the deposition of a mixture of wet (rain, snow, sleet, fog, dew) and dry (acidifying particles and gases) acidic components.

**acid rock drainage (ARD)**—A low pH, metal-laden, sulfate-rich drainage that occurs during land disturbance where sulfur or metal sulfides are exposed to atmospheric conditions. It forms under natural conditions from the oxidation of sulfide minerals and where the acidity exceeds the alkalinity. Nonmining exposures, such as along highway road cuts, may produce similar drainage. Also known as acid mine drainage (AMD) when it originates from mining areas.

**acidity**—The titratable acid as measured in accordance with standard methods. It is normally reported as milligrams per liter as calcium carbonate ( $\text{CaCO}_3$ ).

**acidophile**—Inorganic substance or living organism (or part thereof) that favors acidic conditions or acids.

**active treatment systems**—Systems that treat mining-influenced water with active addition of chemical reagents or the application of external energy.

**advection**—Refers to processes of transport and mixing of properties (energy, heat, moisture, etc.) of a fluid by mass motion of that fluid in the horizontal plane. In the atmosphere, the horizontal transfer of anything by the movement of air, i.e., wind. Common examples of advection include heat and moisture.

**aerobic**—Condition containing free oxygen.

**agronomic**—Pertains to the growing of crops under cultivation.

**alkalinity**—The titratable alkalinity, using a standard acid titrant, as performed in accordance with standard methods. It is normally reported as milligrams per liter as calcium carbonate ( $\text{CaCO}_3$ ), but it may also be reported as milliequivalents per liter as bicarbonate ( $\text{HCO}_3^-$ ).

**alteration**—A change produced in a rock by chemical or physical action.

**alumino silicate mineral**—A mineral in rock or soil based on aluminum and silicon, such as a feldspar, mica, or clay mineral.

**ameliorate**—To improve or make better. Commonly referring to soil, when improving soil with respect to its plant growth properties.

**amendment**—A material that is incorporated into another substance to improve its properties. For instance, a material added to soil to improve soil quality and/or plant growth, or into a mine waste facility to improve its geotechnical and/or environmental properties.

**anion**—An ion with a negative charge.

**anaerobic**—Conditions in the absence of oxygen.

**anoxic limestone drain (ALD)**—A buried trench or cell of limestone into which anoxic water is introduced to raise pH and add alkalinity, without coating the limestone with precipitates resulting from metal (Fe, Mn) oxidation.

**anthropogenic**—Formed through or related to the activities of humans.

**aquifer**—A geologic formation, group of formations, or part of a formation that contains sufficient saturated permeable material to yield significant quantities of water to springs and wells.

**aquitard**—A geologic formation, group of formations, or part of a formation with low values of hydraulic conductivity, which allows some movement of water through it, but at rates of flow lower than those of adjacent aquifers.

**authigenic mineral**—Mineral that developed in place. Mainly refers to sedimentary material formed during or after deposition.

**autotrophic bacterium**—An organism that produces complex organic compounds from simple inorganic molecules using energy from light or inorganic chemical reactions.

**backfill**—Geologic materials returned to an open pit or placed back into an underground mine, after desirable minerals have been removed, to bring a surface mine back to original contour, partially refill an open pit, or to improve stability of underground workings.

**background**—Natural concentrations of an element in natural materials that exclude human influence. A background measurement represents an idealized situation and is typically more difficult to measure than a baseline (*cf.*).

**barometric pumping**—Variation in the ambient atmospheric pressure that causes motion of air in porous and fractured earth materials, such as waste rock piles.

**baseline**—A baseline measurement represents concentrations measured at some point in time and may or may not represent the true background. Baseline concentrations are typically expressed as a range, not as a single value.

**beneficial reuse**—Using a substance normally considered a waste product in a new application or product.

**beneficiation**—The processing of ores for the purpose of regulating the size of a desired product; removing unwanted constituents; and improving the quality, purity, or assay grade of a desired product. Concentration or other preparation of ores can be for smelting by screening, drying, flotation, or gravity or magnetic separation. Improvement of the grade of ores can be by milling, screening, flotation, sintering, gravity concentration, or other chemical and mechanical processes.

**benthos**—The organisms living on or in the bottom of water bodies.

**bioaccessibility**—The fraction of a substance that is available for absorption by an organism.

**bioavailability**—The fraction of a substance that can be absorbed by the body through the gastrointestinal system, the pulmonary system, and the skin. By its definition, bioavailability also includes the process of bioaccessibility (*cf.*).

**biodiversity**—The variety of living organisms at all levels of organization.

**biogeochemistry**—The scientific study of the chemical, physical, geological, and biological processes and reactions that govern the composition of the natural environment (including the biosphere, the hydrosphere, the pedosphere, the atmosphere, and the lithosphere), and the cycles of matter and energy that transport the earth's chemical components in time and space.

**bioirrigation**—The exchange of dissolved substances between pore water and overlying water.

**biomagnification**—Uptake of a contaminant through a food chain resulting in increasing concentrations through multiple trophic levels.

**biofilm**—Biofilms consist of microcolonies separated by interstitial voids and are heterogeneous in many respects, e.g., structurally, chemically, and physiologically. A new model of biofilm structure, declaring

microcolonies as building blocks of biofilms, is used to interpret experimental results and to verify hypotheses about the relations between biofilm structure and function. Microscale chemical profiles, intrabiofilm hydrodynamics, and intrabiofilm mass transport mechanisms are all affected by biofilm heterogeneity.

**biomass**—Standing crop of living material usually expressed as the amount of live or dry weight per unit area; usually associated with soil microbes, animals, and plant residues.

**bioreactivity**—Governs whether a contaminant will be assimilated into a cell if it is bioavailable.

**biosolids**—Wastewater treatment sludge.

**biota**—In ecology, the plant and animal life of a region.

**bioturbation**—The movement and relocation of bottom sediments by the activities of bottom-dwelling organisms.

**block model**—A model of an ore deposit generated by interpolating assay values from irregularly distributed drill hole data to a regular two- or three-dimensional grid.

**borehole**—The generalized term for any narrow shaft drilled in the ground, either vertically, horizontally, or inclined.

**borrow area**—Place from which earthy or rock materials are removed to serve as fill or for other construction purposes.

**brackish water**—Slightly salty water.

**brines**—Water saturated or nearly saturated with a salt.

**bulk density**—A measure of the mass of soil or rock (or other solid phase material) per unit volume, for instance g/cm<sup>3</sup>.

**capillary barrier**—A space between two surfaces which is purposely made wide enough to prevent the movement of moisture through the space by capillary action, for instance, by using a layer of coarser rock between finer materials Also frequently referred to as “capillary break.”

**capital investment**—The money paid to purchase a capital asset or a fixed asset.

**carbonates**—A class of rocks containing calcium (Ca) and/or magnesium (Mg) carbonate, such as limestone and dolomite.

**catchment**—See watershed.

**cation**—An ion with a positive charge.

**chain pillar**—A series of pillars left between panels that support the mine roof and allow access to the mine panels as well as air exchange in an underground mine.

**chemocline**—The border region or interface between water volumes with two contrasting and predominating chemistries within a body of water.

**cleanup**—Actions taken to address a release or threat of release of a hazardous substance that could affect humans and/or the environment. The term is sometimes used interchangeably with remedial action, removal action, response action, or corrective action.

**colonization**—The movement of new individuals or species into an area.

**commodity**—An article of commerce or a product that can be used for commerce. In a narrow sense, products traded on authorized commodity exchanges. Types of commodities include agricultural products, metals, petroleum, foreign currencies, and financial instruments.

**community**—Assemblage of plants and animals occurring in natural systems.

**compaction**—Increase in soil bulk density, caused by loading at the surface, generally by wheel traffic; the action of moving soil particles closer together by compressing the pore space.

**compost**—The end result of controlled aerobic decomposition organic matter known as composting. It is used in landscaping, horticulture, and agriculture as a soil conditioner and fertilizer to add vital humus or humic acids. It is also useful for erosion control, land and stream reclamation, wetland construction, and as landfill cover.

**composite sample**—A sample made by the combination of several distinct subsamples. Composite samples are often prepared to represent a minable or treatable unit of material when it is not economically feasible or desirable to analyze a large quantity of individual samples, to represent a particular type or classification of material, or when subsample volumes are insufficient to allow analyses by desired analytical techniques.

**conceptual site model**—A representation of a site and its environment that represents what is known or suspected about contaminant sources as well as the physical, chemical, and biological processes that affect contaminant transport to potential environmental receptors.

**contaminant**—Any physical, chemical, biological, or radiological substance or matter that has an adverse effect on human and ecological receptors as well as environmental media (e.g., air, water, soil, sediment).

**constructed microbial mat**—Naturally occurring, living organisms composed primarily of cyanobacteria (formerly known as blue-green algae).

**convection**—In physics, convection is the transport and mixing of properties (energy, heat, moisture, etc.) of a fluid by mass motion of that fluid. In meteorology, convection generally refers to such transport and mixing in the vertical direction and advection (*cf.*) refers to processes in the horizontal plane.

**corrosive**—A corrosive substance is one that will destroy or irreversibly damage another substance with which it comes in contact. The main hazards to people include damage to eyes, skin, and tissue under the skin, but inhalation or ingestion of a corrosive substance can damage the respiratory and gastrointestinal tracts.

**cryoconcentration**—The concentration of chemical constituents in a liquid due to freezing.

**crystallinity**—The degree of structural order in a solid.

**data**—Any information about a feature or condition; usually implies a numerical format but also can be textual information.

**data quality objective (DQO)**—Qualitative and quantitative statement of the overall level of uncertainty that a decision maker will accept in results or decisions based on environmental data. A DQO provides the statistical framework for planning and managing environmental data operations consistent with the user's needs.

**density**—The number of individuals per unit area.

**diagenetic mineral**—Mineral that underwent a physical, chemical, or biological change after its initial formation, for instance due to changes in pressure, temperature, or fluid interaction.

**discharge point**—Location at which mineral-processing waste is pumped into a basin or impoundment.

**dissolved oxygen**—A measure of water quality indicating the amount of oxygen dissolved in water. This is one of the most important indicators of a water body's condition because most aquatic organisms require dissolved oxygen.

**dissolved solids**—The weight of matter, including both organic and inorganic matter, in solution in a stated volume of water. The amount of dissolved solids is usually determined by filtering water through a glass or 0.45- $\mu\text{m}$  pore-diameter micrometer filter, weighing the filtrate residue remaining after the evaporation of the water, and drying the salts to constant weight at 180°C.

**dolomitic limestone**—Limestone (calcium carbonate) containing a significant percentage of dolomite (calcium-magnesium carbonate).

**drainage**—Any water draining from a natural or human-made feature, including natural surface water runoff, mine drainage, and groundwater that has come to the surface.

**ecology**—The study of the interrelationship of organisms with their environment.

**ecosystem**—A community of organisms considered together with the nonliving factors of its environment.

**effluent**—A material, usually a liquid waste, that is emitted by a source, which is often industrial, such as a metallurgical or water treatment process. Gaseous effluents are usually called emissions.

**electrical conductivity**—Indicates the concentration of ionized constituents in a water sample or soil matrix.

**emissions**—Gaseous materials emitted by a source.

**environmental impact assessment**—A process required under national or regional environmental legislation in which potential environmental, physical, and social impacts and mitigation measures are identified, evaluated, and discussed. A provision for notifying citizens and considering their comments is commonly integral to the process.

**epithermal deposits**—A mineral deposit consisting of veins and replacement bodies that usually occurs in volcanic or sedimentary rocks, containing precious metals, and sometimes, although rarely, base metals. Typically formed at shallow depths (i.e., within about 1 km of the earth's surface) in a temperature range 50–200°C, usually resulting in characteristic veinlike structures.

**erosion**—The entrainment and transportation of soil through the action of wind, water, or ice.

**evapoconcentration**—The concentration of chemical constituents in a liquid due to evaporative processes.

**evapotranspiration**—The sum of evaporation and plant transpiration from the earth's land surface to atmosphere.

**exposure**—The contact of a receptor, human or ecological, with a contaminant. Exposure may be through the ingestion, inhalation, or dermal contact exposure routes.

**exothermic reaction**—A chemical reaction that releases energy in the form of heat. It is the opposite of an endothermic reaction.

**extraction**—The process of mining and removal of ore from a mine. This term is often used in relation to all processes of obtaining metals from ores, which involve breaking down ore both mechanically (crushing) and chemically (decomposition), and separating the metal from the associated gangue.

**extraction ratio**—The ratio of the amount of ore removed to the amount of ore remaining in a mine or disposed of as waste.

**fauna**—The animal component of natural systems.

**fermentation**—A process which derives energy from the oxidation of organic compounds, such as carbohydrates, using an electron acceptor, which is usually an organic compound.

**fermenting bacteria**—Anaerobic bacteria that use organic molecules as their final electron acceptor to produce fermentation end products.

**flora**—The plant component of natural systems.

**flotation**—The method of mineral separation in which a froth, created in water by a variety of reagents, floats some finely ground minerals while other minerals sink.

**footprint**—The planimetric area covered by a mine operation and associated roads, ponds, and other structures.

**framboidal pyrite**—Spherically shaped agglomerations of minute (approximately 0.25  $\mu\text{m}$ ) crystals of pyrite ( $\text{FeS}_2$ ). It is the most reactive of all pyrite morphologies.

**gangue**—The minerals without value in an ore; that part of an ore that is not economically desirable but cannot be avoided when mining the deposit. It is separated from the ore during beneficiation.

**geographic information system (GIS)**—A computer program or system that allows storage, retrieval, and analysis of spatially related information in both graphical and database formats.

**geomembrane**—Impermeable material (usually a geosynthetic [*cf.*]) used as a cut-off or liner to prevent movement of water.

**geophysical survey**—The systematic collection of geophysical data for spatial studies. Geophysical surveys may use a great variety of sensing instruments, and data may be collected from above or below the earth's surface or from aerial or marine platforms.

**geostatistics**—The mathematical assessment of variability in a biological, chemical, or physical parameter across a distance or area.

**geosynthetics**—The term used to describe a range of generally polymeric products used to solve civil engineering problems.

**glory hole**—An informal term for a large mine excavation open to the surface, such as a mine shaft or an open pit mine. In the block caving method of underground mining, ore collapses from above into a mine tunnel. If enough ore is removed, the ground surface collapses into a surface depression called a glory hole.

**gradient**—The inclination of profile grade line from the horizontal, expressed as a percentage; synonymous with rate of grade).

**groundwater**—Water in the zone below the surface of the earth where voids are filled with water. This is in contrast to surface water.

**habitat**—The place where a population (e.g., human, animal, plant, microorganism) lives, its surroundings, and its contents, both living and nonliving.

**heap leach/heap leaching**—An industrial mining process to extract precious metals and copper compounds from ore. The mined ore is crushed into small chunks and heaped on an impermeable plastic and/or clay-lined leach pad, where it can be irrigated with a leach solution to dissolve the valuable metals. Either sprinklers or drip irrigation is used to minimize evaporation. The solution then percolates through the heap, leaches out the precious metal, and is collected.

**hot spot**—An area or volume of ore, mine soil, spoil, tailings, or waste with an enhanced reactivity relative to the remainder.

**hydraulic backfill**—Any kind of backfill carried by water through pipelines into an underground mine. Solid particles are sluiced through the water quickly without having the chance to settle until they reach the dumping point.

**hydraulic conductivity**—A property of soil or rock that describes the ease with which water can move through pore spaces or fractures. It depends on the intrinsic permeability of the material and on the degree of saturation.

**hydraulic head**—A specific measurement of water pressure above a geodetic datum. It is usually measured as a water surface elevation, expressed in units of length, at the entrance (or bottom) of a well.

**hydrolysis**—The process of splitting the water molecule into separate components of hydrogen ions (H<sup>+</sup>) and hydroxide ions (OH<sup>-</sup>) that often react with other constituents present.

**hydrometallurgical process**—Part of the field of extractive metallurgy involving the use of aqueous chemistry for the recovery of metals from ores, concentrates, and recycled or residual materials. Hydrometallurgy is typically divided into three general areas: leaching, solution concentration and purification, and metal recovery.

**hyporheic zone**—The region beneath and lateral to a stream bed, where mixing of shallow groundwater and surface water occur. The flow dynamics and behavior in this zone (termed hyporheic flow) is recognized to be important for surface water/groundwater interactions, as well as fish spawning, among other processes.

**immediate actions**—Actions (treatment, removal, etc.) that are implemented within two years.

**impoundment**—A closed basin that is dammed or excavated and is used for the storage, holding, settling, treatment, or discharge of water, sediment, and/or liquid wastes.

**in situ treatment**—Treatment performed in place, without disturbance, removal, or excavation of the material being treated.

**infiltration**—The downward entry of water into a soil or other geologic material.

**infrastructure**—Elements that support development of a mine, including transportation, utility, and communication systems.

**inoculum**—A source or medium for introduction of microorganisms.

**karst topography**—A landscape shaped by the dissolution of a layer or layers of soluble bedrock, usually carbonate rock such as limestone or dolomite. Due to subterranean drainage, there may be very limited surface water, even to the absence of all rivers and lakes.

**kriging**—A geostatistical analysis procedure used to estimate an ore grade or biological, chemical, or physical value at locations where no samples were collected.

**land use**—The primary use of a specific land area.

**laterite**—A surface formation in hot and wet tropical areas which is enriched in iron and aluminum and develops by intensive and long-lasting weathering of the underlying parent rock.

**leaching**—Removal by dissolution, desorption, or other chemical reaction from a solid matrix by passing liquids through the material.

**limestone**—A sedimentary rock consisting largely of calcite ( $\text{CaCO}_3$ ).

**limnology**—The study of inland waters, such as lakes and ponds, rivers, springs, streams, and wetlands. This comprises the biological, chemical, physical, geological, and other attributes of all inland waters (running and standing waters, both fresh and saline, natural or man-made).

**lithology**—The character of a rock described in terms of its structure, color, mineral composition, grain size, and arrangement of its visible features that in the aggregate impart individuality to the rock. The term is often used to classify rock materials for characterization purposes along with the degree of alteration and acid-base characteristics.

**littoral**—Shallow water zone in lakes and ponds.

**long-term actions**—Actions which may take more than two years to implement.

**lysimeter**—An enclosed column containing a solid (such as soil) that is used to measure leaching (*cf.*) and/or evapotranspiration (*cf.*).

**manure**—Solid wastes from livestock, often mixed with bedding materials such as straw or hay.

**metalloids**—A term used in chemistry when classifying the chemical elements. On the basis of their general physical and chemical properties, nearly every element in the periodic table can be termed either a metal or a nonmetal. However, a few elements with intermediate properties, such as antimony, arsenic, boron, and silicon, are referred to as metalloids.

**metallurgy**—The science and technology of extracting and refining metals and the creation of materials or products from metals.

**metallurgical processing**—The methods employed to clean, process, and prepare metallic ores for the final marketable product.

**metastable**—A general scientific concept that describes states of delicate equilibrium. A system is in a metastable state when it is in equilibrium (not changing with time) but is susceptible to fall into lower-energy states with only slight interaction. An example of a metastable system is a supersaturated solution.

**methanogens**—A group of single-celled microorganisms that produce methane as a metabolic by-product in anoxic conditions. They are common in wetlands, where they are responsible for marsh gas, and in the guts of animals such as ruminants and humans.

**microclimate**—Localized temperature, moisture, wind, and other climate conditions, caused by differences in hydrologic climate and vegetation differences due to topography or surface configuration. For example, windbreaks create microclimates.

**milling**—The crushing and grinding of ore. The term may include the removal of harmful constituents or constituents without economic value from the ore and preparation for additional processing or sale to market.

**mine**—An opening or excavation in the ground for the purpose of extracting minerals.

**mining-influenced water**—Any water affected by mining, milling or smelting activities. This includes groundwater, surface water, acid mine drainage, acid rock drainage, and mine-impacted water.

**mine rehabilitation**—Modern mine rehabilitation aims to minimize and mitigate the environmental effects of mining.

**mineral deposit**—An occurrence of any valuable commodity or mineral that is of a sufficient size and grade (concentration) to have potential for economic development under favorable conditions.

**mineralogy**—The study of minerals and their formation, occurrence, use, properties, composition, and classification; also refers to the specific mineral or assemblage of minerals at a location or in a rock unit.

**mining**—The process of extracting useful minerals from the earth's crust.

**mitigation**—Correction of damage caused by mining activity (e.g., mine subsidence, wetland impacts, acid drainage).

**monitoring**—The periodic or continuous surveillance or testing to determine the level of compliance with process or statutory requirements in various media or in humans, plants, and animals.

**mucking**—To remove rocks or clay excavated in mining.

**mulch**—A layer of nonliving material applied or occurring on the surface that is placed on top of a growth medium to control erosion and weed growth and to conserve moisture.

**net present value**—Net present value (NPV) or net present worth (NPW) is defined as the total present value (PV) of a time series of cash flows. It is a standard method for using the time value of money to appraise long-term projects. Used for capital budgeting, and widely throughout economics, it measures the excess or shortfall of cash flows, in present value terms, once financing charges are met.

**neutral mine drainage**—A neutral pH, metal-laden, sulfate-rich drainage that occurs during land disturbance where sulfur or metal sulfides are exposed to atmospheric conditions. It forms under natural conditions from the oxidation of sulfide minerals and where the alkalinity equals or exceeds the acidity.

**neutralization potential (NP)**—The amount of alkaline or basic material in rock or soil materials that is estimated by acid reaction followed by titration to determine the capability of neutralizing acid from exchangeable acidity or pyrite oxidation. May also be referred to as acid neutralization potential or ANP.

**neutralization reaction**—A chemical reaction in which an acid and a base or alkali (soluble base) react to produce salt and water, which do not exhibit any of the acid or base properties.

**ore**—The naturally occurring material from which a mineral or minerals of economic value can be extracted profitably or to satisfy social or political objectives. The term is generally, but not always, used to refer to metalliferous material and is often modified by the names of the valuable metal constituents.

**ore deposit**—A mineral deposit that has been tested and found to be of sufficient size, grade, and accessibility to be extracted for a profit at a specific time, based on economic assumptions.

**organic matter**—The accumulation of disintegrated and decomposed biological residues and other organic compounds synthesized by microorganisms or used in mining and metallurgical processing; found in soils, ores, concentrates, waste rocks, tailings, and metallurgical processing wastes.



**overburden**—Material of any nature, consolidated or unconsolidated, that overlies a deposit of useful and minable materials or ores, especially those deposits that are mined from the surface by open cuts or pits.

**oxidation**—A chemical process involving a reaction(s) that produces an increase in the oxidation state of elements such as iron and sulfur.

**passive treatment systems**—Systems that treat mining-influenced water without continual and active additions of chemicals, including aerobic and anaerobic wetlands, anoxic limestone drains, successive alkalinity-producing systems, and open limestone channels.

**pathway**—The physical course a chemical or pollutant takes from its source to an exposed organism.

**peat**—An accumulation of partially decayed vegetation matter. Peat forms in wetlands or peatlands.

**periphyton**—A complex mixture of algae, bacteria, microbes, and detritus that is attached to submerged surfaces in most aquatic ecosystems. It serves as an important food source for many aquatic organisms. It can also absorb contaminants, removing them from the water column and limiting their movement through the environment.

**permafrost**—Soil at or below the freezing point of water for two or more years. Most permafrost is located in high latitudes (i.e., land in close proximity to the North and South poles), but alpine permafrost may exist at high altitudes in much lower latitudes.

**permanent technology**—Technologies that, once implemented, provide a long-term solution which requires little or no maintenance or oversight.

**pH**—A measure of the acidity (pH less than 7) or alkalinity (pH greater than 7) of a solution; a pH of 7 is considered neutral. It is a measure of the hydrogen ion concentration (more specifically, the negative log of the hydrogen ion activity for glass electrodes) of a soil suspension or solution.

**photochemistry**—A subdiscipline of chemistry; the study of the interactions between atoms, small molecules, and light (or electromagnetic radiation).

**photosynthesis**—A metabolic pathway that converts carbon dioxide into organic compounds, especially sugars, using the energy from sunlight. Photosynthesis occurs in plants, algae, and many species of bacteria.

**physiography**—The physical structure and shape of an environment.

**phytoremediation**—The treatment of environmental problems through the use of plants.

**pit lake**—Any perennial or ephemeral water body that occupies an excavation in the land surface created for the collection of ore material.

**pollutant**—Any organic substance, inorganic substance, a combination of organic and inorganic substances, a pathogenic organism, or heat that, when introduced into the environment, adversely impacts the usefulness of a resource.

**pore water**—Water occupying the voids in soil or sediment.

**porphyry copper deposits**—Large to very large low-grade copper ore bodies which are associated with porphyritic intrusive rocks. The ore generally occurs as disseminations along hairline fractures as well as within larger veins, which often form a stockwork.

**porosity**—A measure of the void spaces in a material. Expressed as a fraction between 0 and 1, or as a percentage between 0% and 100%.

**potentiometric map**—A contour map of the potentiometric or water level surface. As on the surface of the earth, water flows from high elevation, or potential, to low elevation. Thus, a potentiometric map indicates which direction water is moving in the subsurface.

**production**—The total amount of mass produced by a plant, mine, aquifer, and so forth.

**prospecting**—The physical search for minerals, fossils, precious metals, or mineral specimens.

**pyrometallurgical process**—The thermal treatment of minerals and metallurgical ores and concentrates to bring about physical and chemical transformations in the materials to enable recovery of valuable metals.

**quality assurance/quality control (QA/QC)**—A system of procedures, checks, audits, and corrective actions to ensure that all research design and performance, environmental monitoring and sampling, and other technical and reporting activities are of the quality that meets the testing objectives.

**random sample**—A subset of a statistical population in which each item has an equal and independent chance of being chosen.

**receptor**—A human or ecological entity exposed to a stressor.

**reclamation**—Rehabilitation or return of disturbed land to productive uses; includes all activities of spoil movement, grading, and seeding and the return of productivity equal to or exceeding that prior to its being disturbed.

**redox**—Shorthand for reduction-oxidation. Describes all chemical reactions in which atoms have their oxidation number (oxidation state) changed, most commonly through the transfer of electrons.

**refining**—The purification of a crude metal product; normally, the stage following smelting.

**remediation**—Cleanup or other methods used to remove or contain a toxic spill or hazardous materials from a site. It is the process of correcting, counteracting, or removing an environmental problem and often refers to the removal of potentially toxic materials from soil or water.

**remining**—The return to underground or surface mines or previously mined areas for further ore removal by surface mining and reclaiming to current reclamation standards. Also refers to the process of mining for processing of mine and mill wastes (processed or unprocessed) to extract additional metals or other commodities due to a change in extraction technology or economics that make such remining profitable.

**repository**—A controlled storage environment for mine wastes.

**representative sample**—A portion of material or water that is as nearly identical in content and consistency as possible to that in the larger body of material or water being sampled.

**residential yard**—The area around a house that is typically used for outdoor activities. In some cases, playgrounds or park areas may be treated as residential yards.

**respiration**—The metabolic oxidation of organic compounds by living organisms to produce energy (i.e., breathing).

**riparian**—The land bordering a stream channel.

**risk**—A measure of the probability that damage to life, health, property, and/or the environment will occur as a result of a given hazard.

**risk assessment**—A qualitative and/or quantitative evaluation of the risk posed to human health and/or the environment by the actual or potential presence and/or use of specific pollutants. Risk assessments are conducted for a number of reasons, including to establish whether an ecological risk exists, to identify the need for additional data collection, to focus on the dangers of a specific pollutant or the risks posed to a specific site, and to help develop contingency plans and other responses to pollutant releases.

**risk management**—The process of evaluating and selecting alternative regulatory and nonregulatory responses to risk. The selection process necessarily requires the consideration of legal, economic, and behavioral factors.

**sample**—A representative portion of a population.

**saprobization**—The use of microbial populations to create alkalinity to essentially reverse the acidification process.

**sedimentation**—The process of depositing entrained soil particles or geologic materials from water. In a mining context, it usually results from erosion of disturbed land and is considered a negative impact to streams and other water bodies.

**sediment**—Any particulate matter that can be transported by fluid flow and that eventually is deposited.

**sewage sludge**—The mainly organic, solid residual materials resulting from the treatment of sewage, often used as a soil amendment.

**shale**—A thinly bedded or fissile sedimentary rock formed from clay or silt.

**shovel**—Machine used to excavate ore or other minerals and to load these minerals for transport. Its bucket is loaded from the top, and the bottom is opened for emptying the contents.

**skarn**—Skarn is a metamorphic rock formed during metamorphism and in the contact zone of magmatic intrusions like granites with carbonate-rich rocks such as limestone or dolomite.

**slimes**—Material of silt or clay in size, resulting from the washing, concentration, or treatment of ground ore.

**slope**—The degree to which the ground angle deviates from horizontal, expressed as a percent rise over run or as a degree angle.

**slurry**—Any mixture of solids and fluids that behaves as a fluid and can be transported hydraulically (e.g., by pipeline). See also tailings.

**smelting**—The chemical reduction of a metal from its ore or concentrate by a process usually involving fusion, so that earthy and other impurities separate as lighter and more fusible slags and can readily be removed from the reduced metal. The process commonly involves addition of reagents (fluxes) that facilitate chemical reactions and the separation of metals from impurities.

**solid mine waste**—All solid waste materials resulting from mining, milling, and smelting activities. This includes development or waste rock, overburden, chat, tailings, slimes or fine tailings, smelter waste, soils, or sediments affected by mine wastes.

**sorption**—Refers to the action of both absorption and adsorption taking place simultaneously. As such, it is the effect of gases or liquids being incorporated into a material of a different state and adhering to the surface of another molecule. Absorption is the incorporation of a substance in one state into another of a different state (e.g., liquids being absorbed by a solid or gases being absorbed by a liquid). Adsorption is the physical adherence or bonding of ions and molecules onto the surface of another molecule.

**source**—The material or area from which mine-related contaminants originate.

**stakeholders**—A person, group, organization, or system that affects or can be affected by an organization's actions.

**stratigraphy**—The layering or bedding of varying rock types reflecting changing environments of formation and deposition. Also, a branch of geology that concerns itself with the study of rock layers and layering (stratification).

**stressor**—An event that provokes stress.

**sulfosalts**—Complex sulfide minerals with the general formula  $A_mB_nS_p$ , where A represents a metal such as copper, lead, or silver; B represents a semimetal such as arsenic, antimony or bismuth; and S is sulfur or rarely selenium.

**surface mining (strip mining)**—A procedure of mining that entails the complete removal of overburden material; may generally refer to either an area and/or a contour mine.

**surface water**—Water at or near the land surface, such as lakes and streams, as opposed to groundwater.

**sustainable development**—A pattern of resource use that aims to meet human needs while preserving the environment so that these needs can be met not only in the present, but in the indefinite future. The term was used by the Brundt Land Commission, which coined what has become the most often-quoted definition of sustainable development as development that “meets the needs of the present without compromising the ability of future generations to meet their own needs.”

**tailings**—The solid waste product (gangue and other material) resulting from the milling and mineral concentration process (washing, concentration, and/or treatment) applied to ground ore. This term is usually used for sand to clay-sized refuse that is considered too low in mineral values to be treated further, as opposed to the concentrates that contain the valuable metals.

**tailings dam**—See tailings impoundment.

**tailings impoundment**—Any structure designed and constructed for the purpose of capturing and retaining liquid-solid slurries of mill tailings in which the solids settle. The liquid may or may not be discharged or captured for recycling after the solids have settled out of suspension. “Tailings pond” and “tailings dam” are often used interchangeably with “tailings impoundment” and tailings storage facilities.

**taxa**—Taxonomic groups.

**temporary technology**—Technology that can be implemented quickly to minimize exposure to mine-related wastes. These technologies require additional actions or maintenance to provide long-term protection.

**thermal stratification**—Refers to a temperature layering effect that occurs in water. Stratification is due to differences in water density: warm water is less dense than cool water and therefore tends to float on top of the cooler heavier water.

**thermoclines**—The border region or interface between water volumes with two contrasting temperatures (and frequently densities and composition) within a body of water.

**topography**—The physical structure, shape, and features (natural and man-made) of an environment.

**toxicity**—A property of a substance that indicates its ability to cause physical and/or physiological harm to an organism (plant, animal, or human), usually under particular conditions and above a certain concentration limit, below which no toxicity effects have been observed.

**turbidity**—The cloudiness or haziness of a fluid caused by individual particles (suspended solids) that are generally invisible to the naked eye. The measurement of turbidity is a key test of water quality.

**vadose zone**—The portion of earth between the land surface and the water table or zone of saturation. Also named the unsaturated zone.

**volcanogenic massive sulphide (VMS) deposits**—A type of metal sulfide ore deposit, mainly copper-lead-zinc, which is associated with and created by volcanic-associated hydrothermal events in submarine environments.

**waste rock**—Barren or mineralized rock that has been mined but is of insufficient value to warrant treatment and, therefore, is removed ahead of the metallurgical processes and disposed of on site. The term is usually used for wastes that are larger than sand-sized material and can be up to large boulders in size; also referred to as waste rock dump or rock pile.

**water balance**—An accounting of the inflow to, outflow from, and storage changes of water in a hydrologic unit over a fixed period.

**water quality standards**—Ambient standards for water bodies. The standards prescribe the use of the water body and establish the water quality criteria that must be met to protect designated uses.

**watershed**—The land area that drains into a stream. The watershed for a major river may encompass a number of smaller watersheds that ultimately combine at a common point.

**weathering**—Process whereby earthy or rocky materials are changed in color, texture, composition, or form (with little or no transportation) by exposure to atmospheric agents.

**weir**—A small overflow-type dam commonly used to raise the level of a river or stream. Water flows over the top of a weir, although some weirs have sluice gates which release water at a level below the top of the weir. The crest of an overflow spillway on a large dam is often called a weir. Weirs are frequently used for flow measurements.

**wetlands**—Land areas containing ponded water or saturated surface soil for some portion of the growing season. Those with standing water for long periods may be mined only under special conditions, and the owner usually must reconstruct more acres of wetlands than originally disturbed.

**workings**—The entire system of openings (underground as well as at the surface) in a mine.