

# M

**M&I (Municipal and Industrial) Water Withdrawals (Use)** — Water supplied for municipal and industrial uses provided through a municipal distribution system.

**Maar** — A flat-bottomed, roughly circular volcanic crater of explosive origin that is often filled with water.

**Macroclimate** — The general large-scale climate of a large area or country, as distinguished from *Mesoclimate* and *Microclimate*.

**Macroinvertebrate** — An animal without a backbone, large enough to see without magnification.

**Macronutrient** — A chemical element necessary in relatively large amounts (usually more than one part per million [ppm] in the plant) for the growth of plants.

**Macrophyte** — (1) A member of the macroscopic plant life, especially of a body of water. (2) The macroscopic plants in the aquatic environment. The most common macrophytes are the rooted vascular plants that are usually arranged in zones in aquatic ecosystems and restricted in the area by the extent of illumination through the water and sediment deposition along the shoreline.

**Macrophytic Algae** — Algal plants large enough either as individuals or communities to be readily visible without the aid of optical magnification.

**Maelstrom** — A whirlpool of extraordinary size or violence.

**Magma** — (Geology) Molten rock found in the mantle, beneath the crust of the earth. When forced toward the surface, magma cools and solidifies to become *Igneous* rock.

**Magmatic Water** — Water driven out of *Magma* during crystallization.

**Magnetic Separation** — The use of magnets to separate ferrous materials from mixed municipal waste stream.

**Main** — A relatively large pipe in a distribution system for drinking water or in a collection system for municipal wastewater. Of or relating to utility distribution mains for transferring water. Often used in the plural, as in water mains.

**Main Canal System** — A canal that delivers water from a primary source of supply to several points of diversion or canal-side turnouts to smaller distribution systems.

**Main Channel Pool [California]** — A pool formed by mid-channel scour that encompasses greater than sixty percent of the wetted channel.

**Mainstem** — (1) The major reach of a river or stream formed by the smaller tributaries which flow into it. (2) The principal watercourse of a river, excluding any tributaries.

**Major Flooding** — Flood conditions resulting in extensive inundation and property damage. Typically characterized by the evacuation of people and livestock and the closure of both primary and secondary roads. Also see *Minor Flooding* and *Moderate Flooding*.

**Major Landform** — A subdivision of the piedmont slope or basin floor major physiographic parts that reflects a major morphogenetic process operating through a long time, or that is the prominent result of a special erosional or depositional history. Many major landforms are dissected and their original area now is occupied by *Component Landforms*.

**Majors** — Larger *Publicly-Owned Treatment Works (POTWs)* with flows equal to at least one million gallons per day (mgd) or servicing a population equivalent to 10,000 person, certain other POTWs having significant water quality impacts. Contrast with *Minors*.

**Make Call** — See *Call the River*.

**Makeup Water** — Water added to the flow of water used to cool condensers in electric power plants. This new water replaces condenser water lost during passage of the cooling water through cooling towers or discharged in blowdowns.

**Malpais** — (Geology) A Southwest United States term for rough country underlain by basaltic lava.

**Management Indicator Species (MIS)** — (Environmental) A species selected because its welfare is presumed to be an indicator of the welfare of other species in the habitat. A species whose condition can be used to assess the impacts of management actions on a particular area. Managing for these species usually requires significant allocations of land or resources. Also see *Indicator Species*.

- Management Scenario** — (Ecology) A description of future conditions expected to result from the general implementation of a broad resource management strategy. Management scenarios are developed to explore the biological and social implications, tradeoffs, and uncertainties of *Ecosystem Management* rather than present a range of options for site specific adoption (management alternatives).
- Managerial Controls** — (Irrigation) Methods of nonpoint source pollution control based on decisions about managing agricultural wastes or application times or rates for agrochemicals.
- Mangrove** — Tropical evergreen trees and shrubs that have stilt like roots and stems, and often form dense thickets along tidal shores. Also see *Mangrove Swamp*.
- Mangrove Swamp** — A tidal swamp forest populated by plant species capable of growth and reproduction in areas that experience periodic tidal submergence in seawater with a resulting increase in saline conditions. These forests develop along coastal regions in tropical climates. Mangrove swamps are dominated by trees referred to as red mangrove, *Rizophora mangle*, black mangrove, *Avicennia germinans*, and white mangrove, *Laguncularia racemosa*. Typically, these trees have large, exposed root systems.
- Manmade Lake** — Any manmade body of water, including lakes, ponds, lagoons, and reservoirs (excluding tank-type reservoirs which are fully enclosed and contained), that are filled or refilled with water or reclaimed wastewater from any source and used for recreational, scenic, or landscape purposes, except swimming pools.
- Manometer** — An instrument for measuring pressure which usually consists of a U-shaped tube containing a liquid, the surface of which in one end of the tube moves proportionally with changes in pressure on the liquid in the other end. The term is also applied to a tube-type differential pressure gage.
- Mantle** — (Geology) The division of the earth's interior between the core and the crust. It is composed mainly of silicate rock and is around 2,900 kilometers (1,800 miles) thick.
- Mare Clausum** — A navigable body of water, such as a sea, that is under the jurisdiction of one national and closed to all others.
- Mare Liberum** — A navigable body of water, such as a sea, that is open to navigation by vessels of all nations.
- Mare Nostrum** — A navigable body of water, such as a sea, that is under the jurisdiction of one nation or that is shared by two or more nations.
- Mariculture** — The cultivation of marine organisms for use as a food resource. Compare to *Aquiculture*.
- Marina** — A water-based facility used for storage, service, launching, operation, or maintenance of watercraft.
- Marine** — (1) Of or pertaining to the sea; having to do with the ocean or the things peculiar to the ocean. (2) A system within the *Wetlands and Deepwater Habitat Classification System*. Also see *Deepwater Habitats and Wetlands*. [See Appendix D-2 for an explanation of the Wetland and Deepwater Habitat Classification System according to USFWS criteria.]
- Marine Life** — Plants and animals of the sea, from the high-tide mark along the shore (also see *Shore Life*) to the depths of the ocean. These organisms fall into three major groups: (1) *Benthos* — plants such as kelp and animals such as brittle stars that live on or depend on the bottom; (2) *Nekton* — swimming animals such as fishes and whales that move independently of water currents; and (3) *Plankton* — various small to microscopic organisms that are carried along by the currents.
- Marine Protection, Research, and Sanctuaries Act (MPRSA)** — A 1972 federal law that includes provisions requiring citizens of the United States to obtain a permit from the *U.S. Environmental Protection Agency (EPA)* before disposing of materials in the oceans. Subsequent amendments to the act have limited the types of waste that may be permitted for ocean disposal.
- Marine Sanitation Device** — Any equipment or process installed on board a vessel to receive, retain, treat, or discharge sewage.
- Marine (Nautical) Surveying** — The branch of surveying that comprises a topographic survey of the coast and a hydrographic survey of adjacent waters. Also see *National Oceanic and Atmospheric Administration (NOAA)*.
- Maritime Law** — Branch of law relating to commerce and navigation on the high seas and on other navigable waters. Specifically, the term refers to the body of customs, legislation, international treaties, and court decisions pertaining to ownership and operation of vessels, transportation of passengers and cargo on them, and rights and obligations of their crews while in transit.
- Mark** — (Nautical) A knot or piece of material placed at various measured lengths on a lead line to indicate the depth of the water, or, more generally, measurement indicators of water depth, e.g., a *Plimsoll mark*.
- Marl** — A mixture of clays, carbonates of calcium and magnesium, and remnants of shells, forming a loam useful as a fertilizer.
- Marsh** — A term frequently associated with *Wetlands*. An area of soft, wet, low-lying land, characterized by grassy vegetation that does not accumulate appreciable peat deposits and often forming a transition zone between water

and land. A tract of wet or periodically inundated treeless land, usually characterized by grasses, cattails, or other monocotyledons (sedges, lilies, irises, orchids, palms, etc.). Marshes may be either fresh or saltwater, tidal or non-tidal.

**Marsh Gas** — Gas produced during the decomposition of organic material buried in wetland soils. The primary gas produced is *Methane*, CH<sub>4</sub>.

**Marshland** — Treeless land in which the water table is at, above, or just below the surface of the ground; it is dominated by grasses, reeds, sedges, and cattails. These plants typify *Emergent Vegetation*, which has its roots in soil covered or saturated with water and its leaves held above water.

**Marsh, Tidal** — A low, flat area traversed by interlacing channels and tidal sloughs and periodically inundated by high tides. Vegetation in such areas usually consists of salt-tolerant plants, or *Halophytes*.

**Mass Curve** — A graph of the cumulative values of a hydrologic quantity (such as precipitation or runoff), generally as the *Ordinate* (y-axis), plotted against time or date as the *Abscissa* (x-axis). Mass curves may also be used to show the excavated or filled material per unit of distance for a canal or other earth structure.

**Mass Movement** — (Geology) The downslope movement of a portion of the land's surface (i.e., a single landslide or the gradual downhill movement of the whole mass of loose earth material) on a slope face. All movement of soil and bedrock materials occurring below the soil surface such as landslips, landflows, rock slides, slumps, etc.

**Mass Spectrometry** — An analytical technique wherein ions are separate according to their ratio of charge to mass. From the mass spectrum produced, the atomic weight of the particle can be deduced.

**Mathematical Model** — A representation of physical laws or processes expressed in terms of mathematical symbols and expressions (i.e., equations). The model is used as a basis for computer programs for examining the effect of changing certain variables in the analysis of the effect of flow changes in a water delivery system, for example. Also see *Econometric Model Building*.

**Matric Potential** — The work per unit quantity of pure water that has to be done to overcome the attractive forces of water molecules and the attraction of water to solid surfaces. The matric potential is negative above a water table and zero below a free water table.

**Matrix** — (1) Solid framework of a porous material or system. (2) The material in which an environmental sample is embedded or contained, whether it is soil, water, dried biomass, or other substance.

**Matrix Interference** — The adverse influence of the environmental sample *Matrix* on the ability to detect the presence or amount of a chemical substance in the sample.

**Matter** — Anything which is solid, liquid, or gas and has mass.

**Mattress** — (Environmental) A blanket of poles, brush, or other material interwoven or otherwise lashed together and weighted with rock, concrete blocks, or held in place to cover an area subject to scouring by flowing water.

**Masonry Dam** — A dam constructed mainly of stone, brick, or concrete blocks that may or may not be joined with mortar. A dam having only a masonry facing should not be referred to as a masonry dam. Also see *Dam*.

**Maximum Acceptable Toxicant Concentration (MATC)** — The highest concentration at which a pollutant can be present and not exert an adverse effect on the *Biota*, used to experimentally determine the toxicity of the chemical.

**Maximum Contaminant Level (MCL)** — (1) Legally enforceable standards regulating the maximum allowed amount of certain chemicals in drinking water. MDLs must be met by the time water reaches an individual's property. (2) The designation given by the *U.S. Environmental Protection Agency (EPA)* to water quality standards promulgated under the *Safe Drinking Water Act (SDWA)* (Public Law 93–523). As prescribed by the EPA after research of a contaminant, the MCL is the greatest amount of a contaminant that can be present in drinking water *without* causing a risk to human health. MCLs are set for certain inorganic and organic chemicals, turbidity, coliform bacteria, and certain radioactive materials. Also see *Drinking Water Standards* and *Drinking Water Standards [Nevada]*.

**Maximum Contaminant Level Goal (MCLG)** — The designation given by the *U.S. Environmental Protection Agency (EPA)* to water quality standards promulgated under the *Safe Drinking Water Act (SDWA)* (Public Law 93–523). This is a number which is associated with no adverse health effects. If someone drinks water for a lifetime containing the contaminant at this level, there should be no ill effects. As implied by the name, this number is a goal, not an enforceable standard. For chemicals which are believed to cause cancer (carcinogens), the MCLG is set at zero because there is no known safe level for this type of chemical.

**Maximum Depth (Reservoir)** — The greatest depth of the body of water measured in feet and 10ths of feet.

**Maximum Holding Time** — The longest time period that water samples can be retained between the taking of the sample and the laboratory analysis for a specific material before the results are considered invalid. The times vary from none in the case of the test for residual chlorine levels to six months for the testing of radioactivity. Some types of analyses require that preservatives be added to the sample, and some require storage of samples at

refrigerated temperatures.

**Maximum Probable Flood** — The largest flood for which there is any reasonable expectancy.

**Maximum Sustainable Yield** — The greatest amount of a renewable natural resource (e.g., forests or wildlife) that can be removed without diminishing the continuing production and supply of the resource.

**Maximum Thermometer** — An instrument used to measure the highest temperature since its last setting. A constriction near the bulb prevents the mercury from returning to the bulb as the temperature falls.

**Maximum Water Surface (Reservoir)** — The maximum water-surface elevation is the highest water surface elevation for which the dam is designed. It is also the top of the surcharge capacity.

**Mayordomo** — A Spanish word used in the Southwestern United States to identify the individual responsible for overseeing water allocation and maintenance of the water conveyance systems. Used synonymously for water commissioner or ditch rider.

**MBAS (Methylene Blue Active Substances)** — Generally interpreted as an indication of the presence of detergents in a solution.

**MCL** — See *Maximum Contaminant Level*.

**MCLG** — See *Maximum Contaminant Level Goal*.

**Meadow** — An area of moist low-lying grassland usually along a watercourse supporting a more dense stand of grasses and perhaps dwarf shrubs as compared to adjacent more arid uplands.

**Meadow, Dry** — An area where during the spring, early summer, and in some open winters there is a greenup of succulent vegetation. These areas are relatively few in number and highly important for sustaining animal populations within whose habitat these meadows exist. During the summer and fall there is normally dry vegetation.

**Meadow, Wet** — A perennial wet area where the water table is maintained at or close to the ground surface to maintain shallow rooted water-dependent vegetative complexes.

**Mean** — (Statistics) The sum of a set of observations divided by the number of observations. Also referred to as *Arithmetic Mean* and *Sample Mean*. Compare to *Mode* and *Median*.

**Mean Annual Flood** — The average of all the annual flood stages or discharges of record. It may be estimated by regionalization, correlation, or any other process that can furnish a better estimate of the long-term average than can the observed data. Some investigators arbitrarily define the mean annual flood as the stage or discharge having an exceedence interval of 2.33 years.

**Mean Annual Precipitation** — The average of all annual precipitation values known, or an estimated equivalent value derived by such methods as regional indexes or *Isohyetal* maps.

**Mean Annual Runoff** — The average value of all annual runoff amounts usually estimated from the period of record or during a specified base period from a specified area.

**Mean Annual Temperature** — The average of the daily maximum and minimum temperatures.

**Mean Concentration of Suspended Sediment** — The time-weighted concentration of suspended sediment passing a stream section during a 24-hour day.

**Mean Depth** — The average depth of water in a stream channel or conduit. It is equal to the cross-sectional area divided by the surface width.

**Mean Discharge** — The arithmetic mean of individual daily mean discharges during a specific period.

**Mean Free Path** — The average distance that a molecule in a fluid (air or water) moves before colliding with another molecule.

**Mean High Water (MHW)** — The average height of the high water over 19 years.

**Mean Higher High Tide** — The average height of the higher of two unequal daily high tides over 19 years.

**Mean Low Water (MLW)** — The average height of the low water over 19 years.

**Mean Lower Low Water** — The average height of the lower of two unequal daily low tides over 19 years. Tides of the northeastern Pacific Ocean are characterized as mixed, with two unequal highs and two unequal lows daily. The plane of reference for navigation channels is the long term average of the daily lower lows, termed mean lower low water.

**Mean Sea Level (MSL)** — (1) The level of the surface of the sea between mean high and mean low tide; used as a reference point for measuring elevations. (2) The average height of the sea for all stages of the tide over a nineteen year period, usually determined from hourly height observations on an open coast or in adjacent waters having free access to the sea. (3) (FEMA) For purposes of the *National Flood Insurance Program (NFIP)*, the *National Geodetic Vertical Datum (NGVD)* of 1929 or other datum, to which base flood elevations shown on a community's *Flood Insurance Rate Map (FIRM)* are referenced.

**Mean Tide Level** — A plane midway between mean high water and mean low water.

**Meander** — (1) The turn of a stream, either live or cut off. The winding of a stream channel in the shape of a series of loop-like bends. (2) A sinuous channel form in flatter river grades formed by the erosion on one side of the channel (pools) and deposition on the other side (point bars).

**Meander Amplitude** — The distance between points of maximum curvature of successive meanders of opposite phase in a direction normal to the general course of the *Meander Belt*, measured between centerlines of channels.

**Meander Belt** — The zone along a valley floor that encloses a meandering river.

**Meander Breadth** — The distance between the lines used to define the *Meander Belt*.

**Meander Length** — The distance in the general course of the meanders between corresponding points of successive meanders of the same phase.

**Meander Line** — A line delineated by government survey for the purpose of defining the bends or windings of the banks of a stream or the shore of a body of water, and as a means for ascertaining the quantity of land embraced by the survey.

**Mean Monthly Temperature** — The average of the mean monthly maximum and minimum temperatures.

**Measurement Uncertainty** — The estimated amount by which the measured quantity may depart from the true value.

**Measuring Point (MP)** — An arbitrary permanent reference point from which the distance to water surface in a well is measured to obtain water level.

**Measuring Weir** — A shaped notch, typically in rectangular, trapezoidal, or triangular shape, through which flowing water is measured.

**Mechanical Aeration** — The use of mechanical energy to inject air into water to cause a waste stream to absorb oxygen.

**Mechanical Dispersion** — Process whereby solutes are mechanically mixed during advective transport, caused by the velocity variations at the microscopic level. Synonymous with *Hydraulic Dispersion*. Also see *Coefficient of Mechanical Dispersion*.

**Mechanical Turbulence** — The erratic movement of air or water influenced by local obstructions.

**Median** — (Statistics) In a set of observations, the middle-most value with an equal number of observations lying above and below the median value. Also see *Mean* and *Mode*.

**Median Stream Flow (Median Hydro)** — The rate of discharge of a stream for which there are equal numbers of greater and lesser flow occurrences during a specified period.

**Median Tolerance Limit** — The concentration of a test substance at which just 50 percent of the test animals are able to survive for a specified period of exposure.

**Mediterranean** — Surrounded nearly or completely by dry land. Used of large bodies of water, such as lakes or seas.

**Medithermal** — (Climatology) The present period of climatological conditions, beginning approximately 4,500 years ago and following the warmer *Alithermal* period. Also see *Anathermal*.

**Medium-Size Water System** — A water system that serves 3,300 to 50,000 customers.

**Megawatt (MW)** — A unit of electricity equivalent to 1 million watts or 1,000 kilowatts (KW).

**Melt** — To be changed from a solid to a liquid state by application of heat or pressure or both.

**Melting** — The changing of a solid into a liquid as in changing ice to water.

**Melting Point** — The temperature at which a solid changes to a liquid. The temperature will vary, and is consistent at equal temperatures and pressures, for each element or solid. At a standard barometric pressure of one atmosphere, water will change from a solid to a liquid at 0°C (32°F).

**Meltwater** — Water that comes from the melting ice of a glacier or a snow bank.

**Membrane** — A plastic material used in the electro dialysis and reverse osmosis processes. Electric current is the driving force that moves salt ions through solution in electro dialysis, and hydraulic pressure the driving force in reverse osmosis. More properly referred to as a semipermeable membrane.

**Membrane Filter** — (1) A thin microporous material of specific pore size used to filter bacteria, algae, and other very small particles from water. (2) Filter made of plastic or modified cellulose and having a known pore diameter. Such filters are used in the bacteriological examination of water and the separation of suspended matter before laboratory analyses. In addition to their analytical use, these filters are also used for public health purposes as well as for the sterilization of liquids. The membranes are available in a variety of sizes, with a diameter of 47–50 millimeters being the most common. Membrane filter water purification technologies are rapidly emerging as a viable and cost effective water treatment option for municipalities confronted with complex regulatory issues and increasingly stringent water treatment regulations. Membranes can be used as the primary means to remove materials from water, but they can also be used in conjunction with other physical, chemical, or biological processes to either separate the phases of water treatment or isolate specific organisms. More properly referred to as a semipermeable membrane filter.

**Membrane Filter Method** — A procedure used to recover and count bacteria in samples of liquid substances, such as water. The liquid is drawn through a *Membrane Filter* using a slight vacuum, with the bacteria in the liquid being retained on the filter. The filter disk is then transferred to a medium suitable for the growth and incubation of the bacteria.

**Membrane Filtration** — The use of a membrane, or more properly, a semipermeable membrane, to separate substances when a driving force is applied across the membrane. Once considered a viable technology only for desalination, membrane processes are increasingly employed for the removal of bacteria and other microorganisms, particulate material, and natural organic material which can impart color, tastes, and odors to water and react with disinfectants to form *Disinfection Byproducts (DBP)*. Due to their greater effectiveness, waste stream disposal, at up to 15-25 percent (and higher for the RO process) of the total treated water volume, is a significant problem with membrane treatment systems. Pressure-driven membrane filtration processes include:

- (1) **Microfiltration (MF)** – Loosely defined as a membrane separation process using membranes with a pore size of approximately 0.03 to 10 microns, a molecular weights cutoff (MWCO) of greater than 100,000 daltons, and a relatively low feedwater operating pressure of approximately 100 to 400 kPa (15-60 psi). Representative materials removed by MF include sand, silt, clays, *Giardia lamblia* and *Cryptosporidium* cysts, algae, and some bacterial species. MF is not an absolute barrier to viruses; however, when used in combination with disinfection, MF appears to control these microorganisms in water.
- (2) **Ultrafiltration (UF)** – Involves the pressure-driven separation of materials from water using a membrane pore size of approximately 10,000 to 100,000 daltons, and an operating pressure of approximately 200 to 700 kPa (30-100 psi). UF will remove all microbiological species removed by MF (partial removal of bacteria), as well as some viruses (but not an absolute barrier to viruses) and humic materials.
- (3) **Nanofiltration (NF)** – Membranes which have a nominal pore size of approximately 0.001 microns and an MWCO of 1,000 to 100,000 daltons. Pushing water through these smaller membrane pores requires a higher operating pressure than either MF or UF. Operating pressures are usually near 600 kPa (90 psi) and can be as high as 1,000 kPa (150 psi). These systems can remove virtually all cysts, bacteria, viruses, and humic materials. They provide excellent protection from DBP formation if the disinfectant residual is added after the membrane filtration step. Because NF membranes also remove alkalinity, the product water can be corrosive and further treatment may be required. NF also removes hardness from water, which accounts for NF membranes sometimes being called “softening membranes.”
- (4) **Reverse Osmosis (RO)** – This process removes contaminants from water using a semipermeable membrane that permits only water, and not dissolved ions (such as sodium and chloride), to pass through its pores. Contaminated water is subject to a high pressure that forces pure water through the membrane, leaving contaminants behind in a brine solution. RO can effectively remove nearly all inorganic contaminants from water. RO can also effectively remove radium, natural organic substances, pesticides, cysts, bacteria, and viruses. RO is particularly effective when used in series; water passing through multiple units can achieve near zero effluent contaminant concentrations.

**Meniscus** — The curved surface of the liquid at the open end of a capillary column.

**Mere** — (Middle English, from Old English) A small lake, pond, or marsh. Also, an expanse of standing water; a lake, pool. (Also French for sea.)

**Meromictic Lake** — A lake in which some water remains partly or wholly unmixed with the main water mass at circulation periods. The process leading to a meromictic state is called *Meromixis*. The perennially stagnant deep layer of a meromictic lake is the *Monimolimnion*. The part of the meromictic lake in which free circulation can occur is the *Mixolimnion*. The boundary between the monimolimnion and the mixolimnion is the *Chemocline*. Compare to *Dimictic Lake*.

**Meromixis** — A condition of permanent stratification of water masses in lakes.

**Mesa** — Table land, flat in nature, moderately elevated, and well drained.

**Mesic** — Refers to environmental conditions that have medium moisture supplies as compared to wet conditions (*Hydric*) or dry conditions (*Xeric*).

**Mesoclimate** — The climate of small areas of the earth’s surface; it may not be representative of the general climate of the district; intermediate in scale between *Macroclimate* and *Microclimate*. Places considered in mesoclimatology include small valleys, “frost hollows”, forest clearings and open spaces in towns.

**Mesohaline** — Term to characterize waters with salinity of 5 to 18‰ (parts per thousand), due to ocean-derived salts.

**Mesophyte** — A plant that grows under medium or usual conditions of atmospheric moisture supply, as distinguished from one which grows under dry or desert conditions (*Xerophyte*) or very wet conditions (*Hydrophyte*).

**Mesosaline** — Term to characterize waters with salinity of 5 to 18‰ (parts per thousand), due to land-derived salts.

- Mesosphere** — The division of the *Atmosphere* above the *Stratosphere*. The mesosphere begins about 50 kilometers (31 miles) in altitude and extends to about 80 kilometers (50 miles).
- Mesotrophic (Water)** — Pertaining to a lake or other body of water characterized by moderate nutrient concentrations such as nitrogen and phosphorous and resulting significant productivity. Such waters are often shallow, with algal blooms and periods of oxygen deficiency. Slightly or moderately eutrophic water can be healthful and support a complex web of plant and animal life. However, such waters are generally undesirable for drinking water and other needs. Degrees of *Eutrophication* typically range from *Oligotrophic* water (maximum transparency, minimum chlorophyll-a, minimum phosphorus) through *Mesotrophic*, *Eutrophic*, to *Hypereutrophic* water (minimum transparency, maximum chlorophyll-a, maximum phosphorus). Also see *Carlson's Trophic State Index (TSI)* and *(Mean) Trophic State Index (TSI)*.
- Meta- or Met- (Prefix)** — Derived from by loss of water, as meta phosphoric acid.
- Metabolism** — (Biology) The sum of the processes concerned in the building up of protoplasm and its destruction incidental to life; the chemical changes in living cells, by which the energy is provided for the vital processes and activities, and new material is assimilated to repair the waste. Metabolism may be considered as including two aspects or processes: constructive metabolism (termed *Anabolism* or *Assimilation*) or destructive metabolism (termed *Catabolism* or *Dissimilation*). Anabolism and Catabolism go on together, but one may predominate and obscure the other. Also see *Zone of Net Metabolic Production*.
- Metalimnion** — The middle layer of a thermally stratified lake or reservoir. In this layer there is a rapid decrease in temperature with depth. Also referred to as *Thermocline*.
- Metamorphic Rock** — (Geology) A sedimentary or igneous rock that has been changed by pressure, heat, or chemical action. For example, limestone, a sedimentary rock, is converted to marble, a metamorphic rock.
- Metamorphism** — A change in the constitution of rock; specifically a pronounced change effected by pressure, heat, and water that results in a more compact and more highly crystalline condition.
- Meteoric Water** — Groundwater derived primarily from precipitation and the atmosphere.
- Meteorological Drought** — A drought said to occur when annual rainfall (or precipitation) is less than the long-term average annual rainfall. Compare to *Hydrological Drought* and *Agricultural Drought*.
- Meteorology** — The science that deals with the phenomenon of the atmosphere, especially weather and weather conditions.
- Meter** — A unit of length which constitutes the basis of the *Metric System*, was intended to be, and is very nearly, one ten-millionth part of the distance measured on a meridian of the earth from the equator to the pole, being equal to 39.37 U.S. inches or about 3 feet 3-3/8 inches. See *Metric System*.
- Methane** — A colorless, nonpoisonous, flammable gas, CH<sub>4</sub>, created by *Anaerobic* decomposition of organic compounds.
- Methemoglobinemia** — A blood disorder that impairs the ability of the blood supply to carry oxygen throughout the body. Also known as “blue baby syndrome”, it is frequently caused by high concentrations of nitrate in drinking water supplies. It primarily affects infants less than 6 months of age. Most instances of the problem can be traced to babies drinking milk formula mixed in water with very high nitrate levels.
- Method Blank** — Laboratory grade water taken through the entire analytical procedure to determine if samples are being accidentally contaminated by chemicals in the lab.
- Methyl Tertiary Butyl Ether (MTBE)** — A oxygenate and gasoline additive used to improve the efficiency of combustion engines in order to enhance air quality and meet air pollution standards. MTBE is a product of petroleum refining that has been added to gasoline nationwide since the late 1970's as an octane booster. Following federal actions in the early 1990's, refiners began adding more MTBE to clean up the air. Current federal law requires some minimum amount of an oxygenate in gasoline sold in areas that do not meet air quality standards. The *U.S. Environmental Protection Agency (EPA)* considers MTBE a possible human carcinogen. In addition to being a suspected carcinogen, MTBE also pollutes waters, particularly by personal watercraft using two-stroke marine engines. More recently, leaking gasoline storage tanks containing MTBE have been found to cause contamination of nearby municipal water wells forcing their closure. MTBE has been found to mix and move more easily in water than many other fuel components, thereby making it harder to control, particularly once it has entered surface or ground waters.
- Methylcellulose** — Any of various gummy products of cellulose methylation that swell in water and are used especially as emulsifiers, adhesives, thickeners, and bulk laxatives.
- Methylene Blue** — A basic aniline dye, C<sub>16</sub>H<sub>18</sub>N<sub>3</sub>SCl•3H<sub>2</sub>O, that forms a deep blue solution when dissolved in water. It is used as an antidote for cyanide poisoning and as a bacteriological stain.
- Methylene Blue Active Substances (MBAS)** — Any material which forms a blue colored salt with methylene blue,

but generally interpreted as an indication of the presence of detergents in solution.

**Methylmercury** — An organic compound that has known neurological toxicity effects that tend to biomagnify up the food chain in aquatic environments.. Biomagnification is a biological process wherein a contaminant’s concentration increases at each level up the food chain, including humans. Thus, the availability of such contaminants, even in the seemingly insignificant parts per trillion range, often are ecologically important. Typically, methylmercury is formed by the action of certain bacteria on available supplies of inorganic mercury in stream-bottom sediments containing low concentrations of dissolved oxygen. However, the reverse process, or demethylation also is known to occur and this “detoxifying” of methylmercury is the subject of ongoing research.

**Metric System** — A decimal system of measures and weights with the meter and the gram as bases. The units of the metric system at the outset were all derived from the unit of length, the *Meter*, which was intended to be, and is very nearly, one ten-millionth part of the distance measured on a meridian of the earth from the equator to the pole, being equal to 39.37 U.S. inches or about 3 feet 3–3/8 inches. Upon the meter were originally based the other primary units of measure: the square meter (area), the cubic meter (volume), the *Liter* (liquid volume), and the *Gram* (mass and weight). It was found, however, that masses could be compared with a higher degree of accuracy than that with which volumes could be determined, and it was therefore preferable to have a material standard of mass specifically defined rather than one derived from the unit of length through the unit of volume. A definite mass, the *International Prototype Kilogram* was, therefore, adopted as the standard of mass, and the unit of volume, the liter, was then redefined in terms of the standard of mass; the liter being defined as the volume of a kilogram of pure water at the temperature of its maximum density (4°C or 39.2°F), and equal to 1.000027 cubic decimeters. Also see *Avoirdupois Weight*.

**Standard Metric Tables**

[1] **Length**

|                      |                |                  |
|----------------------|----------------|------------------|
| Myriameter . . . . . | 10,000. meters | 6.2137 miles     |
| Kilometer . . . . .  | 1,000. meters  | 0.62137 miles    |
| Hectometer . . . . . | 100. meters    | 328. feet 1 inch |
| Decameter . . . . .  | 10. meters     | 393.7 inches     |
| Meter . . . . .      | 1. meter       | 39.37 inches     |
| Decimeter . . . . .  | 0.1 meter      | 3.937 inches     |
| Centimeter . . . . . | 0.01 meter     | 0.3937 inches    |
| Millimeter . . . . . | 0.001 meter    | 0.03937 inches   |

[2] **Area**

|                    |                       |                      |
|--------------------|-----------------------|----------------------|
| Hectare . . . . .  | 10,000. square meters | 2.471 acres          |
| Are . . . . .      | 100. square meters    | 119.6 square yards   |
| Centiare . . . . . | 1. square meter       | 1,550. square inches |

[3] **Volume**

| <u>Name</u>          | <u>Liters</u> | <u>Metric<br/>Cubic Measure</u> | <u>United States<br/>Measure</u> | <u>British<br/>Measure</u> |
|----------------------|---------------|---------------------------------|----------------------------------|----------------------------|
| Kiloliter . . . . .  | 1,000.        | 1 cubic meter                   | 1.308 cubic yard                 | 1.308 cubic yard           |
| Hectoliter . . . . . | 100.          | 0.1 cubic meter                 | 2.838 bu./26.418 gal             | 2.75 bu./22.00 gal         |
| Decaliter . . . . .  | 10.           | 10 cubic dm.                    | 1.135 pk./2.6418 gal             | 8.80 qt./2.200 gal         |
| Liter . . . . .      | 1.            | 1 cubic dm.                     | 0.9081 qt./1.0567 liq qt.        | 0.880 quarts               |
| Deciliter . . . . .  | 0.1           | 0.1 cubic dm.                   | 6.1025 cu. in./0.845 gill.       | 0.704 gill.                |
| Centiliter . . . . . | 0.01          | 10 cubic cm.                    | 0.6102 cu. in./0.338 fl. oz.     | 0.352 fl. oz.              |
| Milliliter . . . . . | 0.001         | 1 cubic cm.                     | 0.061 cu. in./0.27 fl. dram.     | 0.28 fl. dram.             |

Volume Table Notes:

- dm. = decimeter = 1/10 meter
- cm. = centimeter = 1/100 meter
- bu. = bushel = 4 pecks = 32 quarts
- pk. = peck = 1/4 bushel = 8 quarts
- qt. = quart = 2 pints = 1/4 gallons
- liq qt. = liquid quart = 1.1635 (dry) quarts
- gill = 1/4 pint



fl. dram = fluid dram = 1/16 ounce = 27.34375 grains = 1.772 grams

[4] **Weight**

| <u>Name</u>          | <u>Number of Grams</u> | <u>Comparable Quantity of Water at Maximum Density</u> | <u>Avoirdupois Weight</u> |
|----------------------|------------------------|--|---------------------------|
| Metric Ton . . . . . | 1,000,000.             | 1 Cubic Meter  | 2204.6 lb.                |
| Quintal . . . . .    | 100,000.               | 1 hectoliter   | 220.46 lb.                |
| Myriagram . . . . .  | 10,000.                | 1 decaliter  | 22.046 lb.                |
| Kilogram . . . . .   | 1,000.                 | 1 liter  | 2.2046 lb.                |
| Hectogram . . . . .  | 100.                   | 1 deciliter  | 3.5274 oz.                |
| Decagram . . . . .   | 10.                    | 10 cubic centimeters                                   | 0.3527 oz.                |
| Gram . . . . .       | 1.                     | 1 cubic centimeter                                     | 15.432 grains             |
| Decigram . . . . .   | 0.1                    | 0.1 cubic centimeter                                   | 1.5432 grains             |
| Centigram . . . . .  | 0.01                   | 10 cubic millimeters                                   | 0.1543 grains             |
| Milligram . . . . .  | 0.001                  | 1 cubic millimeter                                     | 0.0154 grains             |

**MGD** — Million gallons per day. A unit of water usage used in many applications of water and wastewater treatment processes.

**Microbe** — Short for *Microorganism*. Small organisms that can be seen only with the aid of a microscope. The term encompasses viruses, bacteria, yeast, molds, protozoa, and small algae; however, microbe is used most frequently to refer to bacteria. Microbes are important in the degradation and decomposition of organic materials added to the environment by natural and artificial mechanisms. Also referred to as *Germ*s.

**Microbial Growth** — The activity and growth of microorganisms such as bacteria, algae, diatoms, plankton, and fungi.

**Microbial Load** — The total number of bacteria and fungi in a given quantity of water or soil or on the surface of food. The presence of the bacteria and fungi may not be related to the presence of disease-causing organisms.

**Microbiological Anaerobic Degradation** — The use of *Microbes*, either already present at a site or introduced for a specific treatment process, to degrade and render harmless hazardous wastes and toxic compounds in soil and water. Under such conditions, the microbes are used to break down organic compounds in contaminated soil and groundwater in an environment of little or no oxygen. Also see *Attenuation* and *Natural Attenuation*.

**Microbiological Tuberculation** — (Water Quality) A condition in older water distribution pipes characterized by reddish brown mounds of various heights attached to the interior of the pipe wall. These mounds are the result of many years of iron and manganese bacterial growth that deposit iron and/or manganese oxides along with particulate matter from the water trapped in the biomass from generations of bacteria. An aging distribution system experiencing this problem is typically characterized by red water, taste and odor problems, turbidity, reduced pressure and flow rates, and a low chlorine residual. Iron bacteria are very common in all water sources with over twenty different iron bacteria that can cause tuberculation. They are generally considered to be non-pathogenic. Tuberculation usually begins with a slime that may show signs of iron oxide precipitation. The iron bacteria, which attach themselves to the interior surface of the pipe, metabolize ferrous ions from the water as an energy source, precipitating ferrous oxide which becomes trapped in the biomass of the tuberculation. In the past, tuberculation usually resulted in replacement of the water distribution pipe; however, more recently, chemical treatments of isolated sections of pipeline have proven both highly effective and less costly. Also referred to as *Tuberculation*.

**Microbiology** — The study of organisms that can be seen only with the aid of a microscope. The science deals with the structure and chemical composition of various *Microbes*, the biochemical changes within the environment that are caused by members of this group, the diseases caused by microbes, and the reaction of animals, including humans, to their presence.

**Microbiota** — The plants, animals, and microorganisms that can only be seen with the aid of a microscope.

**Microclimate** — (1) The local climate conditions, brought about by the modification of general climatic conditions by local differences in elevation and exposure. The detailed climate of a very small area of the earth’s surface. (2) Also, the localized climate conditions within an urban area or neighborhood.

**Microcosm** — A laboratory model of a natural *Ecosystem* in which certain environmental variables can be manipulated to observe the response. The model test results are not always applicable to an actual ecosystem because

the microcosm is, of necessity, a simplified collection of selected physical, chemical, and biological ecosystem components.

**Microfauna** — Animals invisible to the naked eye, such as copepods and mites.

**Microfiltration** — (Water Quality) Similar to *Reverse Osmosis*, the microfiltration process utilizes filtering membranes with larger-sized pores to remove suspended particles from water. This water filtration technique provides an economical and practical treatment process for smaller-sized water systems. Unlike other treatment processes, microfiltration relies on mechanical retention instead of chemical treatment and so long as the pore size of the membranes is smaller than the contaminant to be filtered, the constituent will not pass through.

**Microflora** — Plants invisible to the naked eye, such as diatoms and algae.

**Micrograms per Gram ( $\mu\text{g/g}$ )** — A unit expressing the concentration of a chemical constituent as the mass (micrograms) of the element per unit mass (gram) of material analyzed.

**Micrograms per Kilogram ( $\mu\text{g/kg}$ )** — A unit expressing the concentration of a chemical constituent as the mass (micrograms) of the element per unit mass (kilogram) of material analyzed. One microgram per kilogram is equivalent to 1 part per billion.

**Micrograms per Liter ( $\mu\text{g/l}$ )** — A unit expressing the concentration of a chemical constituents in water as the mass (micrograms) of the element per unit volume (liter) of material analyzed. One thousand micrograms per liter is equivalent to one *Milligram per Liter (mg/l)*. This measure is also equivalent to *Parts Per Billion (PPB)*.

**Microsiemens per Centimeter ( $\mu\text{S/cm}$ )** — A unit expressing the amount of electrical conductivity of a solution as measured between opposite faces of a centimeter cube of solution at a specified temperature. Siemens is the International System of Units nomenclature. It is synonymous with mhos and is the reciprocal of resistance measured in ohms.

**Micron ( $\mu$ )** — A unit of length equivalent to a micro-meter ( $\mu\text{m}$ ), or one-millionth of a meter ( $10^{-6}$  meter). Micro-meter is the preferred term.

**Micronutrient** — A chemical element required only in small amounts (usually less than one part per million [ppm] in the plant) for the growth of plants.

**Microscopic Particulate Analysis (MPA)** — (Water Quality) A process used to assess water treatment plant performance. This form of analysis compares type, size, and quantities of *Bioindicators*, or microbiota (1–600  $\mu\text{m}$ ) in particles found in *Raw Water* to those found in the *Finished Water*. This method is particularly effective in evaluating filtration efficiencies, as log reduction, of conventional treatment systems, as well as for on-site evaluation of alternate filtration technologies.

**Microsystem Irrigation** — Method of precisely applying irrigation water to the immediate root zone of the target plant at very low rates.

**Microwave Oven** — An oven in which food is cooked by the heat produced by the absorption of microwave energy by water molecules in the food.

**Mid-Seral Condition** — Synonymous with fair ecological conditions.

**Midstream** — The middle part of a stream.

**Migration** — The movement of oil, gas, contaminants, water, or other liquids through porous and permeable rock.

**Milldam** — A dam constructed across a stream to raise the water level so that the overflow will have sufficient power to turn a mill wheel.

**Milliequivalents per Liter (MEQ/L)** — An expression of the concentration of a material dissolved in water, calculated by dividing the concentration, in milligrams per liter, by the *Equivalent Weight* of the dissolved material. For example, the equivalent weight of aluminum is 9.0. A water concentration of aluminum of 1.8 milligrams per liter equals an aluminum concentration of 0.2 milliequivalent per liter.

**Milligram (MG)** — One-thousandth of a gram.

**Milligrams Per Liter (mg/l)** — A unit of the concentration of a constituent in water or wastewater and expresses the concentration of chemical constituents in water as the mass (milligrams) of constituent per unit volume (liter) of water. Concentration of suspended sediment also is expressed in mg/l and is based on the mass of dry sediment per liter of water-sediment mixture. It represents 0.001 gram of a constituent in 1.000 milliliter (ml) of water. It is approximately equal to one part per million (PPM). The term has replaced parts per million in water quality management.

**Million Gallons per Day (MGD)** — A rate of flow of water equal to 133,680.56 cubic feet (cf) per day, or 1.5472 cubic feet per second (cfs), or 3.0689 acre-feet per day. A flow of one million gallons per day (mgd) for one year equals 1,120 acre-feet (365 million gallons).

**Millipore Filter** — A thin membrane of modified cellulose that is used as a filter in the bacteriological examination of water or wastewater. The filter is typically used to filter a given quantity of aqueous sample followed by transfer

of the filter to the surface of a special medium to allow for the growth of the bacteria that have been retained by the filter. At one time the only commercial source of these filters was the Millipore Corporation, although presently a variety of sources are now available. Even so, the common name Millipore filter has been retained.

**Millpond** — A pond created by damming a stream to produce a head of water for operating a mill.

**Millrace** — (1) The fast-moving stream of water that drives a mill wheel. (2) The channel for the water that drives a mill wheel. Also referred to as *Millrun*.

**Millstream** — The rapid stream of water flowing in a *Millrace*.

**Mill Wheel** — A wheel, typically driven by water, that powers a mill.

**Mine Drainage** — Water pumped or flowing from a mine.

**Mineral** — Any naturally occurring inorganic material with an orderly internal arrangement of atoms and specific physical and chemical properties.

**Mineralization** — (1) The general process by which elements present in organic compounds are eventually converted into inorganic forms, ultimately to become available for a new cycle of plant growth. (2) The process whereby concentrations of minerals, such as salts, increase in water, often as a natural process resulting from water dissolving minerals found in rocks and soils through which it flows.

**Mineral Resource** — Known mineral deposits of an area which have present or future utility.

**Mineral Soil** — Soil composed of predominantly mineral rather than organic materials.

**Mineral Water** — Naturally occurring or prepared water that contains dissolved mineral salts, elements, or gases, often used therapeutically. Also see *Bottled Water [General]*, *Bottled Water [Food and Drug Administration]*, and *Bottled Water [Nevada]*.

**Miner's Inch [Western United States]** — The rate of discharge through an orifice one inch square under a specific head. An old term used in the western United States, now seldom used except where irrigation or mining water rights are so specified. The equivalent flow in cubic feet per second is fixed by state statute. One miner's inch is equivalent to 0.025 cubic foot per second (1.5 cubic feet per minute, equivalent to one-fortieth of a second-foot) in Arizona, California, Montana, Nevada, and Oregon; 0.020 cubic foot per second in Idaho, Kansas, Nebraska, New Mexico, North and South Dakota, and Utah; 0.026 cubic foot per second in Colorado; and 0.028 cubic foot per second in British Columbia.

**Miner's Inch [Nevada]** — Defined as a rate of flow or discharge equivalent to 1/40 of 1 (0.025) cubic foot per second (cfs).

**Mine Wash** — Water-deposited accumulation of sandy, silty, or clayey material recently eroded in mining operations.

**Minim** — A unit of fluid measure, in the United States equal to 1/60 of a fluid dram (0.0616 milliliters, or 0.00208 fluid ounces), and in Great Britain equal to 1/20 of a scruple (0.0592 milliliters or 0.00200 fluid ounces).

**Minimal Flood Hazard Areas** — Areas between the 100-year and the 500-year flood boundaries are termed *Moderate Flood Hazard Areas*. The remaining areas are above the 500-year flood level and are termed *Minimal Flood Hazard Areas*.

**Minimum Flow Appropriation** — An appropriation designed to preserve a specified minimum flow in a stream. When the flow in the stream drops to that which is specified in the appropriation, junior appropriations will be required to stop diverting water in order to maintain the minimum flow. See *(Prior) Appropriation Doctrine*.

**Minimum Instream Flow (Streamflow)** — The specific amount of water required to support aquatic life, to minimize pollution, or for recreation. It is subject to the priority system and does not affect water rights established prior to its institution. Also referred to as *Minimum Instream Flow*.

**Minimum Moisture Content** — The amount of water in soil during the driest time of the year.

**Minimum Pool** — A term used to describe the lowest level of reservoir capacity safe for maintaining fish and aquatic life or for some other designated beneficial purpose. This term differs from *Dead Storage Capacity* in that the reservoir level may still be reduced below minimum pool, whereas the dead storage capacity represents a level below the lowest outlet level.

**Minimum Streamflow** — See *Minimum Instream Flow*.

**Minimum Thermometer** — An instrument with an index which remains at the lowest temperature occurring since its last setting.

**Minimum Tillage Farming** — A farming technique that reduces the degree of soil disruption. Crop residues are not plowed under after harvest, and special planters dig narrow furrows in the crop residue when new seeds are sown. Advantages of the technique include reductions in energy consumption by farm equipment, less soil erosion, and lower soil moisture losses during the fallow season. Disadvantages include the possibility of encouraging insect pests by leaving the crop residue in the field and the use of herbicides to control weeds in the place of mechanical cultivation. Sometimes incorrectly termed *No-Till Farming*.

- Mining (of an Aquifer)** — Withdrawal over a period of time of ground water that exceeds the rate of recharge of the aquifer.
- Mining Water Use** — Water use for the extraction of minerals occurring naturally including solids, such as coal and ores; liquids, such as crude petroleum; and gases, such as natural gas. Also includes uses associated with quarrying, well operations (*Dewatering*), milling (crushing, screening, washing, flotation, and so forth), and other preparations customarily done at the mine site or as part of a mining activity, such as dust control, maintenance, and wetland restoration. Generally, most of the water used at a mining operation is self-supplied. Also see *Self-Supplied Water*.
- Minor Flooding** — Flooding resulting in minimal or no property damage but some public inconvenience. Also referred to as *Nuisance Flooding*. Also see *Major Flooding* and *Moderate Flooding*.
- Minors** — *Publicly Owned Treatment Works (POTWs)* with flows of less than 1 million gallons per day. Contrast with *Majors*.
- Mirage** — An optical phenomenon that creates the illusion of water, often with inverted reflections of distant objects, and results from distortion of light by alternate layers of hot and cool air. Also referred to as *Fata Morgana*.
- Mire** — (1) An area of wet, soggy, muddy ground; a bog. (2) Deep, slimy soil or mud.
- Miscellaneous Site (Station)** — (USGS) A site where streamflow, sediment, and/or water-quality data are collected once, or more often on a random or discontinuous basis.
- Miscible (Liquids)** — Liquids which are soluble in each other.
- Miscible Displacement** — Mutual mixing and movement of two fluids that are soluble in each other. Synonymous with *Miscible-Phase Displacement*.
- Mismatch** — A condition in which water supplied to a given point in a conveyance or distribution system does not equal the demand for water at that point.
- Missed Detection** — (Water Quality) The situation that occurs when a test indicates that a tank is “tight” when in fact it is leaking.
- Mist** — (1) A mass of fine droplets of water in the atmosphere near or in contact with the earth; liquid particles measuring 40 to 500 microns, formed by condensation of vapor. By comparison, fog particles are smaller than 40 microns. (2) Water vapor condensed on and clouding the appearance of a surface.
- Mitigation** — (1) (Environmental, General) Actions designed to lessen or reduce adverse impacts; frequently used in the context of environmental assessment. (2) (NEPA) Action taken to avoid, reduce the severity of, or eliminate an adverse impact. Mitigation can include one or more of the following:
- [1] avoiding impacts;
  - [2] minimizing impacts by limiting the degree or magnitude of an action;
  - [3] rectifying impacts by restoring, rehabilitating, or repairing the affected environment;
  - [4] reducing or eliminating impacts over time; and
  - [5] compensating for the impact by replacing or providing substitute resources or environments to offset the loss.
- Mixed Liquor** — (Water Quality) In wastewater treatment, the liquid in the aeration tank of an activated sludge system; a mixture of activated sludge and water containing organic matter undergoing activated sludge treatment in an aeration tank.
- Mixed Liquor Suspended Solids (MLSS)** — The quantity of suspended solids in the aeration tank of an activated sludge. Reported in units of milligrams per liter (mg/l).
- Mixed Liquor Volatile Suspended Solids (MLVSS)** — That portion of *Mixed Liquor Suspended Solids (MLSS)* that will vaporize when heated to 600°C (1,112°F). This volatile fraction is mainly organic material and thus indicates the biomass present in the aeration tank. The material that does not vaporize in this test, mostly inorganic substances, is said to be fixed.
- Mixed Media Filtration** — A system using two or more dissimilar granular materials (such as anthracite, sand and garnet) blended by size and density. Such a filter is graded from coarse to fine in the direction of flow.
- Mixohaline** — Term to characterize water with salinity of 0.5 to 30‰ (parts per thousand), due to ocean salts. The term is roughly equivalent to the term brackish.
- Mixosaline** — Term to characterize water with salinity of 0.5 to 30‰ (parts per thousand), due to land-derived salts.
- Mixolimnion** — The uppermost region in a *Meromictic Lake*.
- Mizzle** — To rain in fine, mist-like droplets; to drizzle. Also, a mist-like rain, a drizzle.
- Moapa National Wildlife Refuge (NWR) [Nevada]** — One of the nine National Wildlife Refuges (NWR) located in the State of Nevada, the Moapa NWR was established in 1979 in order to protect and secure habitat for the Endangered Moapa dace and a candidate for listing, the White River springfish. The refuge contains 32 acres (0.05 square mile) and is located just north of the Moapa River Indian Reservation, 5 miles northwest of Moapa, Nevada, located in Clark County. Also see *National Wildlife Refuge (NWR) System* and *National Wildlife Refuges (NWR)*

[Nevada].

**Moat** — A deep, wide ditch, usually filled with water, typically surrounding a fortified medieval town, fortress, or castle as a protection against assault.

**Mode** — (Statistics) In a set of observations, the most frequently occurring value. Also see *Mean* and *Median*.

**Model** — (1) (General) An idealized representation of reality developed to describe, analyze, or understand the behavior of some aspect of it. (2) (Mathematical and Statistical) A simulation, by descriptive, conceptual, statistical, or other means, of a process or thing that is difficult or impossible to observe directly, as in an *Economic Consumption Model* or a *River Flow Model*. A descriptive or conceptual model is one which represents the structure or mechanisms of a model but does not specify the relationships in numerical form. The concept of a (simulation) quantitative model is to approximate reality by means of a quantifiable process such as a mathematical equation or series of equations. In this way the model may be used to simulate various changes in conditions in a “what if” or predictive framework. The fundamental premise of model building is that within some defined bounds of statistical probability a model may be constructed based upon the past behavior of some numeric quantity or variable, or a set of such variables, so as to be able to predict the future behavior of that variable. The actual structure of the model represents the underlying set of assumptions about a phenomenon based on the model builder’s view of reality, theoretical underpinnings, proven or probable causal relationships, and deductions and inferences from past observations and experience. To be manageable and useful as a predictive tool, the model must sufficiently simplify the complexities of reality so as to lend itself to some quantifiable structure. However, this simplifying process must not be so extensive as to weaken the model’s validity and negate its usefulness as an explanatory and predictive tool.

**(Econometric) Model Building** — (Statistics) An iterative process for developing a model beginning with some information about the form and structure of the problem and with relevant data. The model building process typically follows a sequence of inter-related steps to include:

- [1] **Problem Identification and Data Selection** – Data is selected, compilation, screened, and analyzed, and the various series tested based on hypotheses of probable causation;
- [2] **Model Identification (or Specification)** – Selection of a general model structure is made based on the nature of the data and the types of outputs desired. Some of these include, for example, a simple single mathematical equation, or multiple (sequential) equations, statistically-based univariate (deterministic) autoregressive functions, multivariate analysis, simple ordinary least squares (OLS) regression, multiple regression, simultaneous equation, etc.;
- [3] **Estimation (Model Fitting)** – Based on the selection of a model structure, the data is used to best describe the behavior of the variable under observation, e.g., stream flows, reservoir levels, runoff, economic output, employment, consumer spending, etc.;
- [4] **Model Testing (and Refinement, as Necessary)** – The model’s structure and variables chosen are then validated by applying the data and observing forecast errors with respect to known (sample) values;
- [5] **Forecasting** – Based upon the ability of the model to accurately “fit” or predict historical values, the model is used to forecast beyond the last data point as prescribed by scenarios under analysis.

**Model Plant** — A hypothetical plant design used for developing economic, environmental, and energy impact analyses as support for regulations or regulatory guidelines; the first step in exploring the economic impact of potential *New Source Performance Standards (NSPS)*.

**Modeling (Forecasting and Simulation Analysis)** — The application of a mathematical process or simulation framework, for example a mathematical or *Econometric Model*, to describe various phenomenon and analyze the effects of changes in independent (i.e., explanatory) variables on dependent variables.

**Moderate Flood Hazard Areas** — Areas between the 100-year and the 500-year flood boundaries are termed *Moderate Flood Hazard Areas*. The remaining areas are above the 500-year flood level and are termed *Minimal Flood Hazard Areas*.

**Moderate Flooding** — Flood conditions characterized by the inundation of secondary roads, transfer of property to higher elevations, and some evacuations of people and livestock. Also see *Major Flooding* and *Minor Flooding*.

**Moderator** — (Physics) A substance, such as water or graphite, that is used in a nuclear reactor to regulate the speed of fast neutrons and alter the likelihood of fission.

**Moisture** — (1) Diffuse wetness that can be felt as vapor in the atmosphere or condensed liquid on the surface of objects; dampness. (2) The state or quality of being damp.

**Moisture Equivalent** — The ratio of: (1) the weight of water which the soil, after saturation, will retain against a centrifugal force 1,000 times the force of gravity, to (2) the weight of the soil when dry. The ratio is stated as a percentage.

**Moisture Stress** — A condition of physiological stress in a plant caused by a lack of water.

- Moisture Tension** — The equivalent negative pressure in the soil water. It is equal to the equivalent pressure that must be applied to the soil water to bring it to hydraulic equilibrium, through a porous permeable wall or membrane, with a pool of water of the same composition.
- Molar** — A solution containing the indicated number of *Moles* of solute per liter of solution.
- Mole** — (Chemistry) The mass of a compound in grams numerically equal to its molecular weight. Also, the mass of a compound containing Avogadro's number of molecules.
- Molecular Diffusion** — The process in which solutes are transported at the microscopic level due to variations in the solute concentrations within the fluid phases. Also see the *Coefficient of Molecular Diffusion*.
- Molecular Weight** — The sum of the atomic weights of the atoms in a molecule. For example, the molecular weight of water (H<sub>2</sub>O) is 18, the sum of the atomic weights of two hydrogen atoms (1+1=2) and oxygen (16).
- Molecule** — A group of atoms held together by chemical bonds. They may be either atoms of a single element (O<sub>2</sub>) or atoms of different elements that form a compound (H<sub>2</sub>O). The smallest amount of a compound which has all the properties of the compound.
- Monimolimnion** — The lower region in a *Meromictic Lake*.
- Monitor** — An articulated device holding a rotating nozzle with which a jet of water is regulated, used in mining and fire fighting.
- Monitoring** — (1) Sampling and analysis of air, water, soil, wildlife, and other conditions, to determine the concentrations of contaminants. (2) (Ecology) The component of *Adaptive Management* in which information is collected to track system behavior and its response to management.
- Monitoring Well** — (1) A well used to obtain water quality samples or measure groundwater levels. (2) (Water Quality) A well drilled in close proximity to a waste storage or disposal facility, or hazardous waste management facility or *Superfund Site* to check the integrity of the facility or to keep track of leakage of materials into the adjacent groundwater.
- Monomictic** — Lakes or reservoirs which are relatively deep, do not freeze over during the winter, and undergo a single stratification and mixing cycle during the year (usually in the fall).
- Monohydrate** — A compound, such as calcium chloride monohydrate, CaCl<sub>2</sub>•H<sub>2</sub>O, that contains one molecule of water.
- Monsoon** — (1) A wind system that influences large climatic regions and reverses direction seasonally. (2) A wind from the southwest or south that brings heavy rainfall to southern Asia in the summer; the rain that accompanies this wind.
- Montane** — A forest *Ecosystem* or *Biome* in mountainous areas of the tropics. The montane forest has far fewer plant species than does the *Tropical Rain Forest*, which is found at lower elevations below the mountains.
- Montane Alkali Lakes** — Lakes with a water pH greater than 7.0 found in cool, upland habitats below the timber line.
- Montane Freshwater Lakes** — *Circumneutral* lakes found in cool, upland habitats below the timber line.
- Monte Carlo Method** — (Statistics) A method that produces a statistical estimate of a quantity by taking many random samples from an assumed probability distribution, such as a normal distribution. The method is typically used when experimentation is infeasible or when the actual input values are difficult or impossible to obtain.
- Moor** — An extensive area of waste ground in high, poorly drained country, overlaid with peat, and usually more or less wet. In popular usage, the word is restricted to the European moors, in which heather is often the prevailing plant, but similar phytogeographical areas occur elsewhere. Sphagnum moss is always characteristic of high moors, and especially in North America various insectivorous (insect feeding) plants flourish in them.
- Moraine** — An accumulation of boulders, stones, or other debris carried and deposited by a glacier. Moraines, which can be subdivided into many different types, are deposits of *Glacial Till*. *Lateral Moraines* are the ridges of till that mark the sides of the glacier's path. *Terminal Moraines* are the material left behind by the farthest advance of the glacier's toe. Each different period of glaciation leaves behind its own moraines. Also see *Recessional Moraine*.
- Morphology** — (1) The science of the structure of organisms. (2) The external structure form and arrangement of rocks in relation to the development of landforms. River morphology deals with the science of analyzing the structural make-up of rivers and streams. *Geomorphology* deals with the shape of the Earth's surface.
- Most Probable Number (MPN)** — (Water Quality) (1) A statistically determined number which represents the number of bacteria most likely present in a sample, based on test data. Widely used in the evaluation of waters from a bacterial standpoint. (2) An index of the number of coliform bacteria that, more probably than any other number, would give the results shown by the laboratory examination. It is not an actual enumeration. MPN is determined from the distribution of gas-positive cultures among multiple inoculated tubes.
- Moulin** — A nearly vertical shaft or cavity worn in a glacier by surface or rock debris falling through a crack in the ice.

**Mound System** — A septic tank effluent disposal system in which a mound of soil is built up and effluent distributed in the mound about 3.3 feet (1 meter) above the normal soil surface.

**[Groundwater] Mounding** — Commonly, an outward and upward expansion of the free water table caused by shallow re-injection, percolation below and impoundment, or other surface recharge method (essentially, the reverse of the cone of depression effect created by a pumping well). Mounding can alter groundwater flow rates and direction; however, the effects are usually localized and may be temporary, depending upon the frequency and duration of the surface recharge events.

**Mountain-Valley Fan** — A major landform created by alluvial filling of a mountain valley or *Intramontane Basin* by coalescent valley-sideslope fans whose toeslopes meet from either side of the valley along an axial drainageway. It is an extension of the upper piedmont slope into mountain valleys. Most mountain-valley fans have been dissected.

**Mouth of Stream** — The point of discharge of a stream into another stream, a lake, or the sea.

**Moutonnée (also Moutonné)** — (Geology) Rounded by glacial action into a shape resembling a sheep's back. Used of a rock formation.

**Movable Bed** — A stream bed made up of materials readily transportable by the streamflow.

**Moving Average Process** — (Statistics) As a simple mathematical process, the moving average process is merely a moving, fixed-interval average of a *Time Series* of data used to smooth fluctuations and distortions in the data and provide a more meaningful representation of underlying trends and cycles. As applied to econometric model development, a moving average process is one whereby future data values are expressed as a linear combination of past errors.

**MTBE** — See *Methyl Tertiary Butyl Ether (MTBE)*.

**Muck** — (1) A moist, sticky mixture, especially of mud and filth. (2) Highly decomposed organic material in which the original plant parts are not recognizable. Muck contains more mineral matter and is usually darker than *Peat*. (3) Earth, rocks, or clay excavated in mining.

**Mud** — (1) A slimy sticky mixture of solid material with a liquid and especially water; especially soft wet earth. (2) Also, wet soft earth composed predominantly of clay and silt — fine mineral sediments less than 0.074 mm (0.0029 inch) in diameter.

**Mud Balls** — (Water Quality) Accretions of siliceous incrustations on the exterior of sand grains in a rapid sand filter; typically removed by backwashing. Such deposits interfere with effective filtration.

**Muddle** — To make turbid or muddy.

**Mudflat** — Low-lying muddy land that is covered at high tide and exposed at low tide; A level tract lying at little depth below the surface of water or alternately covered and left bare by the tide.

**Mudflow** — Flow of a well-mixed mass of rock, earth, and water that behaves like a fluid and flows down slopes with a consistency similar to that of newly mixed concrete.

**Mudslide** — A condition where there is a river, flow or inundation of liquid mud down a hillside usually as a result of a dual condition of loss of brush cover, and the subsequent accumulation of water on the ground preceded by a period of unusually heavy or sustained rain. A mudslide may occur as a distinct phenomenon while a landslide is in progress.

**Mudslide Prone Area** — An area with land surfaces and slopes of unconsolidated material where the history, geology, and climate indicate a potential for mudflow.

**Mulch** — (1) A substance placed over the soil surface to inhibit weed growth, conserve moisture, and in some cases, prevent heat loss. Examples include straw, wood chips, and leaves. (2) A natural or artificial protective layer of suitable materials, usually of organic matter such as leaves, straw, or peat, placed around plants that aid in soil stabilization, soil moisture conservation, prevention of freezing, and control of weeds, thus providing micro-climatic conditions suitable for germination and growth of selected vegetation.

**Mulching** — The use of plant residues or other suitable materials on the soil surface, primarily to reduce evaporation of water and erosion of soil.

**Multi-Cropping** — The practice of producing two or more crops consecutively on the same parcel of land during a 12-month period. Also referred to as *Double Cropping*.

**Multiple-Plate Samplers** — Artificial substrates of known surface area used for obtaining benthic invertebrate samples. They consist of a series of spaced, hardboard plates on an eyebolt.

**Multiple-Purpose Reservoir** — A reservoir planned and constructed to provide water for more than one purpose, e.g., irrigation, recreation, and flood control. Also referred to as *MultiPurpose Project*.

**Multiple Regression (Model)** — (Statistics) A *Regression Model* structure characterized by more than one *Explanatory*, or *Exogenous Variable*, of the form

$$Y_t = \hat{\alpha} + \hat{\beta} X_{1t} + \hat{\delta} X_{2t} + \hat{\epsilon}_t$$

where  $t$  represents the time periods of observation (where  $t=1, 2, \dots, n$ ),  $Y_t$  represents the dependent (*Endogenous*) variable in time period  $t$ ,  $\hat{\alpha}$  (*alpha*) represents the model equation's constant term (without a time reference),  $\hat{\beta}$  (*beta*, also a constant term without a time reference) represents the coefficient of the first independent variable,  $X_{1t}$  represents the first independent variable in time period  $t$ ,  $\hat{\delta}$  (*delta*, a constant term without a time reference) represents the coefficient of the second independent variable,  $X_{2t}$  represents the second independent variable in time period  $t$ , and the error term,  $\hat{\epsilon}_t$  (*epsilon*), represents the value of the unexplained disturbance term.

**Multiple Use** — Harmonious and coordinated management of the various surface and subsurface resources, without impairment of the land, that will best meet the present and future needs of the people. Does not necessarily connote the combination of uses that will yield the highest economic return or greatest unit of output.

**Multipurpose Project** — A project designed to serve more than one purpose, and whose costs are normally allocated among the different functions it provides. For example, one that provides water for irrigation, recreation, fish and wildlife, habitat restoration and protection, and, at the same time, controls floods or generates electric power. Also see *Multiple Purpose Reservoir*.

**Municipal and Industrial (M&I) Water Withdrawals (Use)** — Water supplied for municipal and industrial uses provided through a municipal distribution system for rural domestic use, stock water, steam electric powerplants, and water used in industry and commerce.

**Municipal Discharge** — The discharge of effluent from waste water treatment plants which receive waste water from households, commercial establishment, and industries. Combined sewer/separate storm overflows are included in this category.

**Municipal Sewage** — Sewage (mostly liquid) originating from a community which may be composed of domestic sewage, industrial wastes, or both.

**Municipal Wastewater Facility** — Refers to those facilities that receive or dispose of wastewater derived principally from residential dwellings, business or commercial buildings, institutions, and the like. May also include some wastewater derived from industrial facilities. Also referred to as *Domestic Wastewater Facility*.

**Municipal Water** — Municipal water may come from either ground water or surface water sources. Once water has entered a municipal water system, from whatever source, it will be considered municipal water.

**Municipal Watershed** — The watershed from which the runoff is used for drinking purposes in a city.

**Municipal Water System** — A water system which has at least five service connections or which regularly serves 25 individuals for 60 days. See *Public Water System (PWS)*.

**Muskeg** — A *Swamp* or *Bog* formed by an accumulation of sphagnum moss, leaves, and decayed matter resembling *Peat*. Prevalent in Canada and Alaska and part of the North American boreal forest *Biome*.

**Mutagenic** — Causing mutation, or the abrupt change in the genotype of an organism.

**Mutchkin** — (Scottish) A unit of liquid measure equal to 0.9 U.S. pint (0.42 liter).