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# Definitions & Explanations

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## A

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### **Abandoned Well**

A term is used when a well's use is permanently discontinued or in a condition that makes it uneconomic to repair. Wells not in use but properly capped may be referred to as out-of-use wells. To prevent the risk of contamination, abandoned wells should be sealed from the bottom up.

### **Accelerated Erosion**

Erosion of soil & sediments at a much more rapid than (geologic) erosion. Usually resulting from land use influences or natural catastrophes that expose soil surfaces, (e.g., fire).

### **Acidic Water**

Acidic water has a pH of less than 7, (which is neutral) and alkaline water has a pH of more than 7. Acid water has more free hydrogen ions (H<sup>+</sup>) than hydroxyl ions (OH<sup>-</sup>). Most wetlands have acidic water because of the decaying organic material of wetland vegetation.

*See also Alkalinity, pH.*

**Acre-Foot**

A measure of water volume, principally used in the western states of the US. An acre-foot (acre-ft) is the volume of water required to cover 1 acre of land (43,560 square feet) to a depth of 1 foot. Equal to 325,851 gallons or 1,233 cubic meters. As a very rough estimate, an acre-foot is often used as a measure of how much water a (western US) family of four might use in one year.

**Activated Carbon**

Material used in water conditioning. It is very porous and acts as an absorbent for organic matter and some dissolved gases. Homeowners with carbon filters should pay attention to service and maintenance instructions.

**Aeration**

Process of bringing air into contact with water to remove or reduce unwanted dissolved gases and/or to oxidize dissolved compounds. For example, aeration devices can be effective for removing radon from water.

**Air Stripping**

The process of removing contaminants from solution in water to solution in air. Air stripping towers are vertical cylindrical air stripping devices that are often used in groundwater remediation at sites where gasoline has contaminated groundwater.

**Alignment (a.k.a Well Alignment)**

A measure of the “vertical straightness” of a well. It is the horizontal distance between the well’s actual centerline and the true vertical centerline from the top of the hole. Well alignment is particularly important for line-shaft turbine pumps that have the pump motor at the surface.

**Alkaline Water**

Water with a pH greater than 7. In typical water analysis alkalinity is represented by carbonates and bicarbonates.

*See also pH, Acidic Water.*

**Alkalinity**

The capacity of water for neutralizing an acid solution.

## **Alluvium**

Sedimentary deposits of silt, sand, and gravel, that have been transported and then deposited by running water, usually a stream or river. Modern alluvial deposits are found in streambeds, river valleys, flood plains, deltas, and estuaries. Many ancient geological formations are made up of alluvial sediments. Alluvial aquifers are important water sources.

*See also Sand and Gravel Aquifers, Stratified Drift.*

## **Anaerobic**

A condition of oxygen deficiency found in some saturated soils. Changes in oxygen levels in soils and rock sediments can have important effects on groundwater chemistry.

## **Analytical Model**

Computer model that uses mathematical equations as a basis to describe groundwater flow.

## **Anisotropic Aquifer**

An aquifer with sediments/rock structures that result in different vertical and horizontal hydraulic properties. The opposite of this is an isotropic aquifer.

## **Annulus (a.k.a Annular Space)**

The space between a drilled hole and the well casing. Sealing the annulus can reduce the chances of surface contaminants reaching groundwater.

## **Antecedent**

The conditions occurring before a particular hydrologic event. For example, antecedent soil moisture conditions before a rainfall event will influence infiltration rates.

## **Appropriation Doctrine**

A system of water law used in the western United States under which the right to water is acquired by the user by diverting (pumping) water and applying it to a beneficial use. The right to water use is basically "first come first served." Later water users have junior rights compared with the senior rights of the first users.

## **Aquaculture**

Farming of plants and animals that live in water, such as fish, shellfish, and watercress.

Usually, some aspects of the natural aquatic environment are modified, controlled, and managed and may include ponds/diversion weirs or drilled wells to make aquaculture commercially viable. Many hatcheries and fish farms use wells as their supply source because the water has a constant temperature and chemistry.

### **Aquatic**

Associated with and dependent upon water. For example, aquatic vegetation.

### **Aqueduct**

A pipe, conduit, or channel designed to transport water from a distant remote source, usually by gravity. Part of the water system of ancient Rome was supplied with water conveyed by elaborately engineered aqueducts. Much of the water transferred from north to south in California and other western states is conveyed by aqueducts.

### **Aquiclude**

A saturated rock formation or layer of geologic sediments with low permeability. Aquicludes do not yield significant amounts of water to wells but may be important as water storage zones that release water to more permeable formations.

### **Aquifer**

1. The three-dimensional sub-surface geometry of a geologic rock formation (or, a group of rock formations or part of a formation) that contains groundwater in the spaces between sediment grains, voids, or fractures.
2. A geological formation or structure that can store and/or transmit water to wells and springs. The use of the term aquifer is usually restricted to those water-bearing formations capable of yielding water in sufficient quantity to constitute a usable supply source.

*See also Confined Aquifer, Unconfined Aquifer.*

### **Aquifer Recharge**

The process/processes by which water from precipitation (or some other part of the hydrologic system) reaches and hence increments stores of groundwater.

### **Aquifer Storage Recovery (ASR)**

A management strategy involving engineered devices such as detention ponds or

recharge wells. It deliberately adds water to groundwater storage, so to facilitate later withdrawal for some economic purpose. ASR is likely to become an increasingly important water management strategy in the western USA.

### **Aquifer Test**

Hydraulic test of an aquifer based on calculations using data from measurements of groundwater level response (drawdown and recovery) to controlled pumping. (Occasionally tests may add water to a well). Aquifer tests typically allow hydrologists to predict the amount of water in an aquifer and the rates at which it may be safely withdrawn.

### **Aquitard**

A geologic formation having very low permeability through which water cannot move.

### **Area of Influence**

The land area overlying the extent of a pumping well's cone of depression.

### **Artesian Water**

Groundwater that is under pressure when tapped by a well and can rise above the level at which it is first encountered. It may or may not flow out at ground level. The pressure in such an aquifer commonly is called artesian pressure, and the formation containing artesian water is an artesian aquifer or confined aquifer.

*See also Flowing Well.*

### **Artesian Aquifer**

An artesian aquifer (confined aquifer) occur where overlying impermeable rock layers "trap" groundwater under pressure. Depending on geology and topography, a single aquifer may be artesian (confined) in one place and unconfined in another.

### **Artesian Well**

Well (borehole) that penetrates an artesian aquifer. Water will rise up the well casing to the pressure level of the aquifer. Artesian flow describes the natural flow to the surface of water from confined aquifers. In some parts of the US, any well drilled into bedrock is (incorrectly) called an artesian well.

## **Artificial Recharge**

A process where water is put back into groundwater storage by use of engineering devices such as spreading basins or recharge wells.

*See also Aquifer Storage Recovery (ASR).*

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## **Bailer**

A cylinder of steel with a valve in the bottom that is used to remove rock cuttings or sediments from a hole being drilled by the cable tool method. A bailer may also be used to clean out a hole drilled by any method.

## **Bank Seepage**

The natural diffuse discharge of groundwater into a river or lake along its banks. If concentrated in a particular area, a seepage may more accurately be called a spring.

## **Bank Storage**

Water stored in river bank sediments. At times of high water flow in rivers, water may flow laterally into the stream bank sediments adjacent to the river. This “stored” water may flow slowly back into the river or be utilized by wells.

## **Bank Filtration**

The abstraction process for water supply that benefits from “pre-treatment filtration” of surface water by removing it from river bank wells or infiltration galleries rather than directly from surface water.

## **Bankfull Discharge**

Stream flow that completely fills the stream channel to the top of its banks.

## **Base**

Used in water chemistry. A substance that has a pH of more than 7, which is neutral. A base has less free hydrogen ions (H<sup>+</sup>) than hydroxyl ions (OH<sup>-</sup>).

**Baseflow**

The proportion of water flowing in streams and rivers that comes from groundwater. River flow during dry weather conditions may be virtually all baseflow. At least 40% of all the annual flow total of rivers in the U.S. is derived from baseflow.

**Bedrock**

The solid, but often fractured and fissured, rock formations that occur beneath soils, unconsolidated sediment deposits or weathered materials. Exposed bare rock is bedrock at the surface. Sediments or weathered material overlying bedrock is sometimes called regolith or overburden.

**Bentonite**

A colloidal clay of volcanic origin used as the main ingredient in drilling fluid (drilling mud) used in rotary well drilling processes and also used as a grouting medium to seal well casing in the drilled hole. Most bentonite in the U.S. is mined in Wyoming.

**Best Management Practices (BMP)**

Sensible land management strategies that can reduce the potential for non-point source pollution from dissolved or particulate contaminants.

**Bicarbonate**

Alkalinity in water is usually composed of bicarbonate and is reported as mg/L CaCO<sub>3</sub>.

**Bit**

The cutting tool used in well drilling. Drill bits vary in complexity from the simple chisel used in cable tool drilling to tri-cone bits used in mud rotary operations.

**Brackish Water**

Water that is salty, but less salty than seawater. Seawater has 35,000 mg/L of salts, and is described a saline.

**Brine**

Salty water with more than 10,000 mg/L of salts (principally sodium chloride).

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### **Cable Tool Drilling (a.k.a Jumper Rig)**

Drilling by cable tool (percussion drilling) is achieved by the breaking and crushing action of heavy drilling tools suspended on a cable which are repeatedly lifted and dropped.

*See also Bailer.*

### **Calcite**

Calcium carbonate ( $\text{CaCO}_3$ ) is the principal mineral in limestone.

### **Caliche**

A crust-like accumulation of impure calcium carbonate that may occur as layers within soils and sediments of arid areas. It is formed by calcium-rich water near to the ground surface which, when evaporated, leaves behind an accumulation of calcium carbonate.

### **Capillary Rise**

The natural occurrence of water in contact with, but rising above the water table. Caused by surface tension forces in the pore spaces of the rock, soil or vegetation layers that are not fully saturated. In permeable formations with fine pore spaces, capillary rise of water can be as much as 6 feet above the water table. This is known as the “capillary-fringe” of an aquifer.

### **Carbonates**

Rocks such as limestone and dolomite that are comprised principally of carbonate minerals.

### **Casing**

A cylindrical device (steel or plastic) that is installed in a well to maintain the well opening and to provide a seal. In most states casing is required for at least the first 20 or 40 feet of water wells. Well drillers typically install well casing in 20 foot lengths.

### **Center-Pivot Irrigation**

An irrigation system that applies water from nozzles on a fixed boom that moves in a circular fashion from a central point.



**Channel Flow**

Surface water flow within the boundaries of a defined natural channel, e.g., streams and rivers.

**Chlorine**

An effective oxidizing agent used in water treatment. Chlorine has been used for almost 100 years by water utilities to kill microorganisms.

**Clastic Rock**

Any rock composed of “pieces” (clasts) of pre existing rocks. Most sedimentary rocks are clastic.

**Clay**

Fine grained sediment derived from the weathering of rock minerals. Clay can store water but not transmit water.

*See also Bentonite.*

**Coefficient of Storage**

The volume of water that an aquifer adds or loses from storage per unit area/per unit change of head.

**Coliform**

A broad group of naturally occurring bacteria species found in soils and rocks. Coliform bacteria are more prevalent in near-surface soils and their presence in well water in large numbers may indicate the possibility of the presence of more harmful pathogens.

**Commercial Water Use**

Water used for motels, hotels, restaurants, office buildings, other commercial facilities, and institutions. Water for commercial uses comes both from public-supplied sources, such as a county water department, and self-supplied sources, such as local wells.

**Community Water Supply**

(Definition used by the US Environmental Protection Agency for water supply systems in the US). Water supplied by a water utility, distributed through pipelines and serving at least fifteen homes or twenty five persons.

*See also Non-Community Transient Water Supply.*

## **Condensation**

The process by which water vapor in the air changes to liquid water. Water drops on the outside of a cold glass of water are condensed water. Condensation is the opposite process of evaporation.

## **Cone of Depression**

A shape in the form of an inverted cone that develops in the water table (or potentiometric surface) as a result of pumping from a well. In practice the shape of the “cone” resulting from pumping from a well is often not symmetrical.

## **Confined Aquifer**

An aquifer, overlain by an impermeable layer, in which the water is under pressure greater than that of the atmosphere. Soil or rock below the land surface that is saturated with water. There are layers of impermeable material both above and below it and it is under pressure so that when the aquifer is penetrated by a well, the water will rise above the top of the aquifer.

*See also Artesian Aquifer.*

## **Conglomerate**

Sedimentary rock comprised of non-sorted cemented particles including gravel size and above.

*See also Grain Size.*

## **Conjunctive Use**

A management strategy for using both groundwater and surface water to maximize resources. For example, artificial recharge of aquifers with surplus surface water for later use when surface sources are scarce.

## **Consumptive Use**

That part of water withdrawn that is evaporated, transpired by plants, incorporated into products or crops, consumed by humans or livestock, or otherwise removed from the immediate hydrologic system. Also referred to as water consumed. Homes that have a well and an on-site septic system will typically return over 70% of water to the aquifer. Actual consumptive use from the well is therefore 30%.

## **Contamination**

A reduction in water quality resulting from land use activities or accidents that add toxic or undesirable chemicals, organisms or particulate matter to the hydrologic system.

## **Conveyance Loss**

Water that is lost in transit from a pipe, canal, or ditch by leakage or evaporation. Generally, the water is not available for further use; however, leakage from an irrigation ditch, for example, may percolate to a groundwater source and be available for further use. Some water utilities in major urban areas can lose up to 20% of water because of leaking pipes.

## **Creek**

A natural stream of water, usually small in size. Many creeks are intermittent and flow only after rain. There are regional variations in the way that people describe natural features. In some areas of the US the word creek describes small tidal streams in estuaries and mudflats.

## **Cryptosporidium**

A microscopic aquatic organism typically present in surface water, that if ingested, may cause gastro-intestinal problems in humans.

## **Cubic Feet per Second (CFS)**

A measure of the rate of the flow, as a unit volume, in streams, rivers, canals etc. It is equal to a volume of water one foot high and one foot wide flowing a distance of one foot in one second. One cubic foot is equal to 7.48 gallons. As an example, a child's paddling pool, 4 foot x 4 foot x 1 foot deep (16 cubic feet), would be filled in 8 seconds by water flowing at a rate of 2cfs.

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## **Darcy's Law**

An equation that states that flow through porous media is directly proportional to hydraulic head and inversely proportional to the length of flow. Henri Darcy was a French engineer

who worked at the Dijon water works in the mid 19th century. His “law” is the basis for much of the science of groundwater hydrology and one of the most important basic equations used in hydrogeologic calculations.

### **Desalinization**

The removal of salts from saline water to provide freshwater. Techniques include the use of membranes and distillation. The high costs of energy make desalinized water expensive.

### **Developed Water**

Water in a specific area that has been added to the hydrologic water system through engineering strategies.

### **Discharge**

The volume of water that passes a given location within a given period of time. Usually expressed in cubic feet per second for surface flow (or M<sup>3</sup>/sec) as gallons per minute (L/sec) for discharge from wells.

### **Disinfection By-Products**

Chemicals that result as by products from water treatment. The most common of which are trihalomethanes that can result from chlorine combining with naturally occurring carbon.

### **Diversion**

Removing water from rivers or lakes by pumping or by structures such as a ditch, canal or siphon.

### **Domestic Water Use**

Water used for household purposes, such as drinking, food preparation, bathing, washing clothes, dishes, flushing toilets, and watering lawns and gardens. About 85% of domestic water in the U.S. is delivered to homes by a public supply facility, such as a county water department. About 15% of the USA's population supply their own water, mainly from wells.

### **Drainage Basin**

The topographic land area that contributes flow to a river/ lake/wetland as defined by a

particular point of reference. Sometime referred to as a catchment area. Large drainage basins, like the area that drains into the Mississippi River contain thousands of smaller drainage basins. Also called a “watershed.” The area contributing water to a particular reference point in a aquifer system is known as a phreatic catchment. Because of geologic structure, topographic and phreatic catchment areas may not exactly coincide, especially when small areas are considered.

### **Drawdown**

The change of groundwater level caused by pumping measured as the difference between the static water level and the water level at a particular well location after a specific period of pumping.

### **Drip Irrigation**

A common irrigation method where pipes or tubes filled with water slowly drip onto crops. Drip irrigation is a low-pressure method of irrigation and less water is lost to evaporation than high-pressure spray irrigation.

### **Dual Purpose Well**

Well designed with the capability of pumping water underground during artificial recharge and to the surface from the aquifer during recovery.

*See also Aquifer Storage Recovery (ASR).*

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## **E**

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### **Ecosystem**

An organic community of plants and animals and the physical environment they inhabit, e.g. wetlands, rivers, upland. The ecosystem describes the interactions between soil, climate vegetation and animal life.

### **Effluent**

Water that flows from a wastewater treatment plant after it has been treated. Sometimes applied to any industrial discharge of contaminated water at a point source.

*See also Point Source Pollution.*

## **Emergent Plant**

An aquatic plant that is rooted in river or pond sediments with leaves that are at or above the water surface.

## **Erosion**

The process in which rocks and soil material are worn away by water or wind. Erosion from bedrock may occur because of the presence of abrasive particles.

## **Esker**

A feature of glacial deposition, formed of sands and gravels which occur in elongated and often sinuous ridges. Eskers originate as deposits in meltwater streams beneath ice sheets.

## **Estuary**

A place where fresh and salt water mix, such as a bay, salt marsh, or where a river enters an ocean.

## **Evaporation**

The physical process by which liquid water becomes water vapor, including vaporization from water surfaces, land surfaces (including water rising by capillary action from the soil), and snow fields, but not from leaf surfaces.

*See also Transpiration, Sublimation.*

## **Evapotranspiration**

The loss of moisture from the combined effects of direct evaporation from land and water surfaces, and transpiration from vegetation.

## **Extrusive Rock**

An igneous rock formed from volcanic magma that is extruded at the surface. Rapid cooling results in small mineral grain size. Basalt and rhyolite are extrusive rock types.

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**Fault**

The zone of displacement in rock formations resulting from forces of tension or compression in the Earth's crust. Faults can cause barriers or conduits to the sub-surface flow of water.

**First Flush**

The delivery to a stream or lake of a large load of pollutants during the early part of storms because of rapid runoff of accumulated pollutants.

**Flood Stage**

The specific elevation at which floodwater begins to overflow the natural banks of a stream or body of water. For example, flood warning news reports may refer to a rising river being "within 1 foot of flood stage."

**100-Year Flood**

A 100-year flood refers to a flood level with a 1 percent chance of being equaled or exceeded in any given year. It does not refer to a flood that occurs once every 100 years.

**Flood**

An overflow of water onto lands that are used or usable by man and not normally covered by water. Floods have two essential characteristics: The inundation of land is temporary; and the land is adjacent to and inundated by overflow from a river, stream, lake, or ocean. *See also Channel Flow.*

**Floodplain**

The generally flat area adjacent to rivers that is periodically flooded. Evolving over hundreds or thousands of years, the size of floodplains is related to the frequency of flooding, the energy of the flow of the river when in flood, and the amount of sediment in the river system. Most communities have zoning laws that restrict building development on flood plains.

**Flowing Well**

A well that taps groundwater under pressure so that water flows over the well casing without pumping.

## **Fracture Zone**

A zone of cracks or fissures within rocks. Individual fractures may be of limited extent but are often connected with others. Fractures can occur for many different geologic reasons.

## **Freshwater**

Water that contains less than 1,000 milligrams per liter (mg/L) of dissolved solids; generally, more than 500 mg/L of dissolved solids is undesirable for drinking and many industrial uses. Sea water contains about 35,000 mg/l of dissolved solids, mostly sodium and chloride.

## **Frost Table**

The surface within permafrost soils to which seasonal thawing extends. Depth is usually less than 3 feet. The insulation effect of vegetation influences thawing depth. If freezing “traps” liquid water below it may be squeezed to the surface to form a temporary “icing.”

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# **G**

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## **Gage Height**

The height of the water surface above a measuring gage datum (zero point). Gage height in rivers and lakes is often recorded on a regular basis as part of routine hydrological data. Gage height is often used interchangeably with the term river stage.

## **Gaging Station**

Principally used to designate a site on a stream, lake or reservoir where hydrologic data are obtained. Water level gages are also used on wells. The U.S. Geological Survey, Water Resources Division is the principal organization involved with hydrologic measurement and data collection in the US. The monitoring of groundwater levels is an important part of the USGS data collection because it provides information about changes in the amount of water stored in aquifers.

## **Gaining Stream**

A flow of water (river or stream) that is receiving water because of discharge from



groundwater.

*See also Losing Stream.*

### **Geophysical Well Logs**

A generic name for a suite of technologies that reveal absolute or relative properties of geologic formations, aquifers and wells. Technologies include electrical resistivity, gamma-log, acoustic etc.

### **Geyser**

A hydrologic spring-like feature from which hot water and steam reach the earth's surface. "Old Faithful" in Yellowstone Park, Wyoming is probably the world's most famous geyser. Virtually all the world's geysers occur where circulating groundwater come in contact with rock formations in the earth's crust that are hot because of proximity to crustal magma.

### **Giardia**

A protozoan parasite (*Giardia Intestinalis*) commonly found in surface water. Drinking giardia-affected water that is either not filtered or not chlorinated may result in sickness. The disease is more likely to affect children than adults and is characterized by abdominal discomfort, nausea, and diarrhea.

### **Glacial Drift**

A general term for unconsolidated sediments transported by glaciers.

### **Glacial Outwash**

Clay, sand and gravel deposits that were washed out by glacial melt-water streams. These deposits may form extensive plains or fans. Thick deposits of glacial outwash may provide excellent aquifers.

### **Glacial Till (a.k.a Till)**

An unsorted, and often compacted mixture of clays, sands, rocks, and boulders deposited by melting glaciers.

### **Glacier**

A mass of ice, formed by the compaction and recrystallization of snow, that moves very slowly down slope (valley glacier) or outward (ice sheet) due to its own weight. 75% of the

world's fresh water is ice, and almost 25% is groundwater. The last major glaciation that affected North America ended only 10,000 years ago.

### **Gneiss**

A type of metamorphic rock.

### **Grain Size**

It is very common in groundwater science and engineering to use the size of the grains in sedimentary rocks as a method of description and as the basis for designing well screens. *See also Well Screen, Sediment.*

### **Grains per Gallon**

A unit of measurement still used in some North American water analyses. One grain per US gallon is equivalent to 17.12 milligrams per liter.

### **Gravel Packed Well**

A well in which a sand or gravel material is placed in the annular space between the drilled hole and the well screen. A gravel pack changes the hydraulics of water flow to a well. The main purpose of the gravel pack is to slow the entrance velocity of water from the aquifer to the well so that fine material is not drawn into the well when the pump runs.

### **Graywater**

A word coined recently to describe domestic wastewater from washing machines, showers, and baths. In some communities gray water may be recycled for lawn and garden watering. Homeowners should check local building code regulations before diverting graywater to their yards or gardens.

### **Groundwater Discharge**

The fluid output from a groundwater system. Natural groundwater discharge may occur in the form of springs or seepages. Groundwater also discharges into rivers and lakes via bank seepage or by upward flow in river and lake beds. Groundwater at the coast may reach the oceans via coastal discharge at or beyond the shore zone. Groundwater discharge and recharge are commonly linked in water budget calculations.

### **Groundwater (Unconfined)**

Water in an aquifer that has a water table that is at atmospheric pressure.

## **Groundwater Banking**

A water management strategy whereby an agency “sells or rents” excess storage space in aquifers. The surface water is used to recharge aquifers. There are aquifers in Arizona that “bank” excess or “unused” Colorado River water for late use.

*See also Aquifer Storage Recovery (ASR).*

## **Groundwater Mining**

Long term pumping water from an aquifer system at a rate greater than natural recharge. In some cases, such as in parts of Libya, the mining of groundwater is a deliberate and planned resource use strategy.

## **Groundwater Recharge**

The process of adding water to groundwater storage. In most cases groundwater recharge occurs from the infiltration of precipitation. There are projects in the US and elsewhere that use injection wells or spreading basins to artificially recharge aquifers as a technique of groundwater management.

*See also Aquifer Storage Recovery (ASR).*

## **Groundwater (Confined)**

Groundwater under pressure that is greater than atmospheric pressure. Confined groundwater is separated from direct contact with atmospheric pressure because of overlying impermeable layers of rock.

## **Groundwater Flow Rates**

Rates of flow are typically very slow when compared with surface flow in streams. Most groundwater flow is laminar in nature and does not have any excess energy to transport particulate matter. Groundwater at different depths may be moving at different rates of flow. By use of tests such as tritium content, or carbon 14, it has been possible to age date some groundwater and hence determine rates of sub-surface flow.

## **Groundwater (a.k.a. Ground Water)**

Groundwater is that part of the hydrologic system that occurs in a geologic environment. Water that is found in fully saturated soils, sediments and rocks below the surface of the ground. The water table is the upper surface of the groundwater system. Aquifers contain groundwater but not all groundwater occurs in aquifers. Groundwater may be spelled as

one word or may be hyphenated.

*See also Aquifer.*

## **Grout**

A fluid sealing mixture usually comprising bentonite and or cement that is used to seal well casing. Once emplaced, grout forms an impermeable seal.

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# H

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## **Habitat**

The environment in which the life needs of organisms/ plants/ animal populations is supplied.

## **Hardness**

A water quality index that describes the concentration of alkaline salts in water, mainly calcium and magnesium. If water is “hard” then more soap, detergent or shampoo is necessary to make bubbles for effective washing/ cleaning. Hardness is measured in milligrams per liter (mg/l) but may also be reported in the archaic form of grains per gallon.

[One grain of hardness equals 17.1mg/l] Typical water hardness classifications are:

- Soft water less than 17mg/l
- Slightly hard 17- 60 mg/l
- Moderately hard 60-120 mg/l
- Hard 120-180 mg/l
- Very hard 180 + mg/l

## **Headwater (a.k.a Headwaters)**

A descriptive rather than a scientific word. Generally it describes the upper parts of a watershed that contribute flow to a specific river or storage reservoir.

## **Heavy Metals**

Metallic elements with high atomic weights (e.g., mercury, chromium, cadmium, arsenic, and lead). They can damage living organisms at low concentrations and tend to accumulate in the food chain. Fish are particularly susceptible to mercury.

## **Hydraulic Conductivity**

The rate of flow of water through a unit cross section of aquifer (ft squared or m squared) under a unit hydraulic gradient. Expressed as g.p.d./ft squared or m/day. The hydraulic conductivity of an aquifer is an important parameter used in groundwater management calculations.

## **Hydraulic Conductivity**

A property of an aquifer (or part of an aquifer) that is measure of the ability of the rocks/ sediments to allow water to flow under specific hydraulic gradients.

## **Hydraulic Gradient**

A measurement used in groundwater science to calculate directions and rates of groundwater flow. The hydraulic gradient is the slope of the water table in unconfined aquifers or the pressure surface in confined aquifers. It may be measured from the point of recharge to the point of discharge or between any two places within a groundwater system. The hydraulic gradient is a ratio of the vertical difference between two places on the water table and their horizontal distance apart.

## **Hydric Soil**

Soil that is saturated or flooded long enough during the growing season to develop anaerobic conditions in its upper layers.

## **Hydrobabble**

Description of mistaken concepts in hydrology usually expressed as “facts” by people who do not have the scientific background to understand cause-and effect in the hydrologic system.

## **Hydrofracture**

A technique of increasing flow to a wells in bedrock by using high-pressure forces down a well to open fractures. The technique is typically used to increase flow in very low yielding wells.

## **Hydrogeology**

The study of geology from the perspective of its role and influence in hydrology. On the other hand, geohydrology is a term used to describe the study of hydrology from the

perspective of the influences of geology. In practice both terms are used interchangeably. Groundwater science is the common field of study.

### **Hydrograph**

A graphical plot of discharge vs. time for stream flow. Well hydrographs show changes of groundwater levels vs. time.

### **Hydrologic System**

A more accurate way of describing the many processes involved in the hydrologic cycle.

### **Hydrologic Cycle**

A description of the circulation of water on Earth involving transfers and storage of water vapor from the Earth's surface via evapotranspiration into the atmosphere, from the atmosphere via precipitation back to earth, and through infiltration to groundwater, runoff into streams, rivers, and lakes, and ultimately into the oceans.. The sun is the energy source that raises water from the oceans and land into the atmosphere. The force of gravity influences the surface and subsurface movement of water on land. Hydrologic system is a more accurate description.

### **Hydrologic Budget**

An accounting concept used for a specific time interval (usually a year) to quantify the inputs, outputs and changes in storage of water within a geographically defined hydrological system.

### **Hydrology**

The scientific study of the properties, circulation and distribution of water as it occurs within the atmosphere and at and below the earth's surface. Hydrology is a very broad term encompassing many sub-disciplines. It generally does not include oceanic/marine sciences or meteorological sciences but does include the hydrologic aspects of groundwater, rivers and wetlands.

### **Hydroperiod**

The duration of a particular flooding event. The period during which surface water remains on a wetland. This may range from a few days to several months or may be seasonal or permanent.

## **Hydrophytes**

Plants adapted to life in water, or in periodically flooded and/or saturated anaerobic soils. Plant characteristics include air filled root tissues, floating leaves and buttressed tree roots.

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## **Igneous Rock**

Rock formed by the solidification of magma. The mineral composition and the grain size of igneous rocks is used as the basis for defining specific rock types.

## **Impermeable Layer**

A layer of a geologic formation (consolidated or non-consolidated) which does not allow water to pass through. Most clays are considered impermeable even although flow may in fact occur at extremely slow rates.

## **Impervious Area**

Impermeable surfaces, such as pavement or rooftops, which prevent the infiltration of water into the soil.

## **Induced Infiltration (Induced Recharge)**

Pumping from wells adjacent to rivers or lakes that results in river/lake bed flow to the adjacent aquifer.

## **Infiltration**

The downward movement of water into soil and rock formations. Infiltration capacity is exceeded if the volume of rain falling is greater than the rate at which infiltration can take place. Effective infiltration is a term used to describe infiltration which increments groundwater. Once in the upper soil layers, further downward movement is sometimes described as percolation. Infiltration can occur as saturated or as non-saturated flow and rates can be very slow in some soil materials. Percolation is usually used to describe saturated flow infiltration.

*See also Percolation.*



## **Injection Well**

A well constructed for the purpose of injecting directly into the ground. Usually used to describe wells used for injecting treated (or untreated) wastewater. Wastewater is generally forced (pumped) into the well for dispersal or storage into a designated aquifer. Injection wells are generally drilled into rock formations that don't deliver drinking water, unused aquifers, or below freshwater levels.

## **Inorganic**

Not derived from or made of living matter. Peat is organic. Coal is a rock of organic origin. Rock minerals such as quartz and feldspar are inorganic.

## **Interception**

The trapping and retention of precipitation by vegetation. Small amounts of precipitation may be totally intercepted by plants. Buildings, roads, etc. can also retain precipitation and prevent infiltration occurring. Storm water interception refers to the use of engineering structures to delay the flow effects from storms from reaching rivers and hence reduce the risk of flood damage.

## **Interflow**

Water that infiltrates the soil surface, and then moves laterally through the upper soil layers towards stream channels and other water bodies (lakes and wetlands). Interflow occurs on slopes where lower soil horizons (layers) are less permeable.

## **Intermittent Stream**

A stream or portion of a stream that is dry for a large part of the year and flows only in direct response to precipitation.

## **Intrusive Rock**

Igneous rock formed by magma intruding and cooling below the surface. Intrusive rock types include granite and gabbro.

## **Irrigation**

The controlled application of water for agricultural purposes through manmade systems to supply water requirements not satisfied by rainfall. There have been many



technological changes to increase agricultural irrigation efficiency so that more crop can be produced with less water.

### **Irrigation Water Use**

Water application on to assist in the growing of crops and pastures or to maintain vegetative growth in recreational lands, such as parks and golf courses.

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## **K**

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### **Kame Terrace**

A feature of glacial deposition. An elongated steep ridge of sand and gravel formed adjacent to glaciers. Kame terraces may appear to resemble sediments found in beaches but they are generally more irregular. In areas of extensive glacial sediments kame terrace deposits can be important for recharge and storage of groundwater.

### **Karst**

A term describing typical geologic/topographic attributes of limestone resulting from mineral solution. Caves, sinkholes and underground drainage are typical characteristics.

### **Kettle Hole**

A feature of former glaciated landscapes where a depression (usually now lake filled) occurs because of the melting of a residual of buried ice.

### **Kilogram (kg)**

One thousand grams. One liter of water weighs one kilogram.

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## **L**

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### **Laminar Flow**

A characteristic of groundwater flow in which water movement is non-turbulent.

**Landfill**

Waste disposal site. Sanitary landfill is a term use to describe dumps for household waste. Contamination resulting from leachates in landfills has resulted in strict design requirements.

**Leachate**

Water containing dissolved substances resulting from percolation through contaminated material.

**Leaching**

The process by which soluble materials in soil or rocks, such as salts, nutrients, pesticide chemicals or contaminants, are dissolved and transported away by water.

**Lentic Waters**

Ponds or lakes (standing water).

**Levee**

A raised bank adjacent to flood plain rivers. Levees occur naturally but many rivers have artificial levees to prevent overbank flooding.

**Limestone**

A sedimentary rock consisting principally of calcium carbonate. Limestones may be formed by deposits of shell/corals and/or from chemical precipitation in shallow seas.

**Lithology**

Descriptions used by geologists to characterize rocks based on their physical appearance.

**Losing Stream**

A river or stream of surface water that is losing water through its bed or banks which is recharging groundwater. Depending on local geologic and hydrologic conditions a stream may lose and gain flow as water moves through the hydrologic system.

*See also Gaining Stream.*

**Lotic Waters**

Flowing waters, as in streams and rivers.

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# M

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## **Macropores**

Large spaces between the organic or mineral particles in soils which give rise to high permeability.

## **Maximum Contaminant Level (MCL)**

Designation given by the U.S. Environmental Protection Agency (EPA) to water quality standards promulgated under the Safe Drinking Water Act. Based on conservative risk-assessment methodology, the MCL is the greatest amount of a contaminant that can be present in drinking water without causing a risk to human health.

## **Metamorphic Rock**

A rock type formed from pre-existing rocks/ sediments as a result of heat and/or pressure. Schists, gneiss, quartzite and slate are examples of metamorphic rocks.

## **MGD**

1. Million Gallons per Day
2. Miller Genuine Draft

## **Microdrip Irrigation**

An efficient irrigation system that uses tiny holes on plastic pipes to deliver water directly to plants.

## **Milligram (mg)**

One thousandth of a gram.

## **Milligrams per Liter (mg/l)**

Unit of the concentration of a constituent in water or wastewater. 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).

### **Million Gallons per Day**

A rate of flow of water equal to 133,680.56 cubic feet per day, or 1.5472 cubic feet per second, or 3.0689 acre-feet per day. A flow of one million gallons per day for one year equals 1,120 acre-feet (365 million gallons).

### **Monitoring Well**

A well constructed or used for the purposes of water level or water quality data collection. Monitoring wells are often installed to provide an early warning of contamination occurring down gradient from a landfill or industrial facility.

*See also Observation Well.*

### **Municipal Water System**

A water system that has at least fifteen service connections or which regularly serves 25 individuals for 60 days; also called a public water system.

*See also Community Water Supply.*

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## **N**

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### **Nephelometric Turbidity Unit (NTU)**

The unit of measure for describing the turbidity of water. It is a measure of the cloudiness of water as measured by a nephelometer. Turbidity is based on the amount of light that is reflected off particles in the water. NTUs are typically used as an index for the quality of lake water.

### **Non-Community Transient Water Supply**

A water supply system that supplies less than 25 people (less than 15 connections) and which is used for a transient populations such as in a roadside café, bed & breakfast or gas station.

*See also Community Water Supply.*

### **Non-Point Source Pollution**

A form of diffuse pollution originating from a wide land area, not from one specific location. Typical forms of NPS pollution result from sediment, nutrients, organic and toxic

substances originating from land-use activities, which are carried to lakes and streams by surface runoff. NPS contamination can occur when rainwater, snowmelt, or irrigation washes off fields, paved streets, roofs and suburban yards and picks up soil and dust particles, street dirt or chemicals and pollutants, such as nutrients and pesticides.

## **Nutrient**

An element, or compound, such as carbon, nitrogen, or phosphorus that is essential for organism (plants or animals) growth.



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## **Observation Well**

A well constructed in a specific location for the purpose of observing (measuring) changes in water level. An existing well perhaps drilled for a different purpose may also be used to observe water level changes. Observation wells are typically used for short duration data collection such as before, during and after an aquifer test. Wells that are used to collect data on a long term basis are usually referred to as monitoring wells.

*See also Monitoring Well.*

## **Ombotrophic**

A condition in which a wetland is hydrologically independent of surface water or groundwater, and is almost exclusively supplied with water from precipitation.

## **Organic Matter**

Carbon compounds usually associated with plant and animal biomass and residues, or substances made by living organisms.

## **Osmosis**

The movement of water molecules through a thin membrane. Reverse osmosis is a water treatment process used to remove or reduce salts from saline water.

## **Outfall**

The place or the outlet or structure, where a sewer, drain, or channel discharges (usually) treated waste water to a river, lake or the ocean.

## **Outwash Sediment**

Glacial sediment of stratified sand and gravel formed by glacial meltwater streams.

## **Overburden**

Originally a mining term, overburden is now used to describe any unconsolidated material overlying bed rock.

## **Overdraft**

Pumping of groundwater in excess of rates of recharge. Short term overdraft pumping may be part of a management strategy to conjunctively use surface and groundwater resources.

## **Overland Flow**

Flow of water over the land surface originating from snowmelt or precipitation. Overland flow is not concentrated in defined channels.

## **Ox-Bows**

Abandoned river meanders on flood plains. Usually curved and now occupied by lakes and wetlands unless drained for cultivation.

## **Oxygen Demand**

A measure of the need for molecular oxygen to meet the needs of biological and chemical processes in water. Even though very little oxygen will dissolve in water, it is extremely important in biological and chemical processes. Changes in oxygen levels in aquifers can result in changes in groundwater chemistry.

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# **P**

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## **Paludification**

The natural process of vegetation growth in lakes leading to their eventual infilling with accumulations of plant growth and decaying organic material. Many former kettle hole lakes resulting from the last glaciation (approximately 10,000 years ago in North America) are undergoing paludification.

**Palustrine**

Fresh water wetland environments, other than those located along a river or lake, dominated by trees, shrubs, emergent vegetation, mosses or lichens.

**Particle Size**

The diameter of sediments. Different types of sediment are classified according to particle size. The particle sizes of sediments in aquifers is used in designing the size openings for well screens.

*See also Grain Size.*

**Parts per Million (ppm)**

The number of “parts” by weight of a substance per million parts of water. This unit is commonly used to represent pollutant concentrations.

**Parts per Billion (ppb)**

The number of “parts” by weight of a substance per billion parts of water. Used to measure extremely small concentrations.

**Pathogen**

A living organism that is a disease producing agent. Generally, any viruses, bacteria, or fungi that may cause disease.

**Peak Flow**

The maximum discharge of a stream or river at a given location. It usually occurs at or near the time of maximum stage.

**Peat**

An acidic, fibrous, spongy soil that develops from the accumulation of dead plant material (especially sphagnum moss), that decays slowly. Decay is slow due to low oxygen levels and the acidic, nutrient poor conditions characteristically found in peatlands.

**Per Capita Use**

The average amount of water used per person during a standard time period, generally per day.

## **Perched Groundwater**

Groundwater that occurs above the main body of groundwater, and is separated from it by unsaturated, impermeable sediments or rocks. Perched aquifers usually occur where there are discontinuous impermeable layers such as caliche.

## **Percolation**

There are several interpretations of this word:

1. The movement of water through the openings in rock or soil.
2. The movement of a portion of riverflow or lake storage to groundwater.
3. The process of downward movement of water in the unsaturated zone.

A similar word, infiltration, refers specifically to the movement of water from the atmosphere into the ground.

*See also Infiltration.*

## **Perennial Stream**

A stream that flows throughout the year in a well-defined channel.

## **Permafrost**

Ground which is permanently frozen. Within permafrost areas they may be seasonal melting and areas of discontinuous permafrost. In areas of permafrost groundwater may be the only available fluid water source. Wells and well equipment in permafrost areas are designed for sub-zero conditions.

## **Permeability**

The property of sediments and rocks that allows the movement of water through them. Permeability is related to the size of openings and fissures in solid rock; the nature of the particles in unconsolidated organic and inorganic sediments, and the extent to which the void spaces are interconnected. High yielding aquifers usually have some rock layers or fractures with high permeability. Permeable materials, such as gravel and sand, allow water to move quickly through them, whereas impermeable material, such as clay, don't allow water to flow freely.

## **Pesticide**

Any chemical used for control of plant or animal pests. Pesticides include insecticides,



herbicides, fungicides, nematocides, and rodenticides.

## **pH**

A measure of the relative acidity or alkalinity of water. Water with a pH of 7 is neutral; lower pH levels indicate increasing acidity, while pH levels higher than 7 indicate increasingly basic solutions. The range is 1 – 14.

## **Phreatic**

The zone of sub-surface saturation.

## **Phreatophytes**

Plants that are specifically adapted with deep rooting systems to draw moisture from the water table or capillary fringe.

## **Pitless Adaptor**

A device installed in a vertical well casing to allow water to be piped horizontally below the frost line to its use point (usually a home).

## **Plume**

A discrete occurrence of aquifer pollution extending down gradient from a defined source (such as a landfill or leaky storage tank) along the groundwater flow path. Plumes usually have maximum concentration at their source with dispersion and diffusion of the contaminant down-gradient.

## **Point Source Pollution**

Water pollution coming from a single point, such as a sewage outflow pipe.

*See also Non-Point Source Pollution.*

## **Pollutant**

Substance such as solid waste, sewage, garbage, sewage sludge, radioactive materials, industrial, municipal, and agricultural waste that can detrimentally affect the quality of water.

## **Polychlorinated Biphenyls (PCB)**

A group of synthetic, toxic chemical compounds which are chemically inert and not biodegradable (in the past these were often used in making paint and electrical

transformers). PCBs are typically associated with industrial wastes and are very difficult to remove once an aquifer is contaminated.

### **Porosity**

Describes the amount of water that can be stored in a rock formation. Porosity is the ratio of solid rock material and void space per unit volume of rock. Porous rock units may contain considerable amounts of water but may be poor aquifers because of low permeability (i.e. water movement is restricted). With respect to water movement, it is not just the total magnitude of porosity that is important, but the size of the voids and the extent to which they are interconnected. For example, clay may have a very high porosity with respect to water content, but it is not useful as an aquifer because the pores are usually so small and will not readily release water.

### **Potable Water**

Water of a quality suitable for drinking.

### **Potentiometric Surface**

Theoretical (imaginary) surface of the static head of groundwater in an aquifer.

### **Precipitation**

The broad range of meteorological phenomena that contribute water to the hydrologic system, including rain, snow, hail, sleet, fog, mist and dew.

### **Pressure Tank**

A tank installed as part of a water system to minimize the on-off cycles of the well pump. Pressure tanks typically store a few gallons of water and obtain their pressure from the well pump.

### **Primary Wastewater Treatment**

The first stage of the wastewater treatment process where mechanical methods, such as filters are used to remove pollutants.

### **Prior Appropriation Doctrine**

The system for allocating water used in most Western states. The doctrine of Prior Appropriation was in common use throughout the arid West as early settlers and miners began to develop the land. The prior appropriation doctrine is based on the concept of

“First in Time, First in Right.” The first person to take a quantity of water and put it to beneficial use has a higher priority of right than a subsequent user. The rights can be lost through nonuse; they can also be sold or transferred apart from the land.

*See also Riparian Water Rights.*

### **Public Water Use**

Water supplied from a public water supply and typically sold to towns for use in firefighting, street washing, municipal parks and swimming pools.

### **Public Water Supply**

Water withdrawn by agencies, such as a municipality or county water department, and by private companies that is then delivered to users. Most people’s household water in the US is delivered by a public water supplier. The systems have at least 15 service connections (such as households, businesses, or schools) or regularly serve at least 25 individuals daily for at least 60 days out of the year.

### **Pumping Test**

Controlled pumping with associated measurements of water level changes that are used to determine aquifer characteristics and the hydraulic properties of wells. This is a type of well test.

### **Pumping Level**

The level of water in a well when pumping is in progress.

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## **R**

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### **Radius of Influence**

The horizontal radial distance from a well to the points in an aquifer where there is no observable influence from pumping.

### **Raw Water**

Untreated water of any kind.

### **Natural Recharge**

Water added to an aquifer. For instance, rainfall that seeps into the ground or natural

leakage from river beds to aquifers.

### **Artificial Recharge**

Water added by flooding basins or recharge wells to increase the volume of water stored in an aquifer.

### **Recharge**

The downward movement (percolation) of rain, snowmelt or surface water through the soil, weathered material and rock layers to replenish the groundwater/aquifer stores. Concentrated zones of groundwater recharge may occur through streambeds.

### **Reclaimed Wastewater**

Treated wastewater that can be used for beneficial purposes. Golf course Irrigation and aquifer recharge are users of reclaimed water.

### **Recycled Water**

Water that is used more than one time before it passes back into the natural hydrologic system.

### **Regolith**

The layer of unconsolidated material overlying bedrock. Such material may have been transported or have been formed in place by weathering processes. The weathered regolith may provide an important zone of groundwater storage for wells that are drilled into bedrock beneath the regolith layer.

### **Reservoir**

A pond, lake, or basin, from which water is diverted or pumped for purposes of supply or river control. The term reservoir is usually used to describe impoundments that may be on-channel or off-channel. Some impoundments have been constructed to increase natural lake storage capacity.

### **Return Flow**

Irrigation water that is applied to an area and which is not consumed in evaporation or transpiration and returns to a surface stream.

## **Reverse Osmosis**

The process of removing salts from water using a membrane. Pressure from a pump is used to reverse the normal osmotic process resulting in the solvent moving from a solution of higher concentration to one of lower concentration. The water passes through a fine membrane that the salts are unable to pass through, the remaining salt waste (brine) is removed.

## **Riparian Water Rights**

The rights of an owner whose land abuts water. They differ from state to state and often depend on whether the water is a river, lake, or ocean. The doctrine of riparian rights has its origins in English common law. Persons who own land adjacent to a stream have the right to make reasonable use of the stream. Riparian users of a stream share the streamflow among themselves. Riparian rights cannot usually be sold or transferred for use on non-riparian land.

*See also Prior Appropriation Doctrine.*

## **Riparian Habitat**

Area adjacent to lakes streams & rivers important for plants and wildlife. Riparian areas are often protected by laws requiring “buffer strips” that can’t be developed or cultivated.

*See also Best Management Practices (BMP).*

## **Rotary Drilling**

A well drilling method achieved by the rotary action of a drill bit. The ground-up rock is removed by circulating drilling mud which may be forced down the drill pipe and out via the annular space between the drill pipe and the hole. If casing is installed as the drilling proceeds then reverse-rotary drilling may be used with the drilling fluid being pumped down the outside of the drill pipe and returned to the surface upwards through the drill pipe.

## **Runoff**

The movement of water over the surface of the land, derived from snowmelt or rainfall (as opposed to water infiltrating the ground and moving to streams as baseflow). Runoff is often used generally to describe surface water flow associated with storm rainfall.

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## **Saline Water**

Water that contains significant amounts of dissolved solids.

- Fresh water: less than 1,000 parts per million (ppm)
- Slightly saline water: from 1,000 ppm to 3,000 ppm
- Moderately saline water: from 3,000 ppm to 10,000 ppm
- Highly saline water: from 10,000 ppm to 35,000 ppm

*See also Brine, Brackish Water.*

## **Sand and Gravel Aquifers**

A term often used to describe alluvial or stratified drift aquifers comprised of unconsolidated sediments.

## **Saturated Zone (a.k.a Zone of Saturation)**

The zone within sediment and rock formations where all voids are filled with water. The level below the water table in an unconfined aquifer. The saturated zone may be considered to include water held above the water table by capillary rise. Soils and the vadose zone in rock formations are not fully saturated. Saturated thickness describes the vertical extent of an aquifer below the water table.

## **Seawater Intrusion (a.k.a Salt Water Intrusion)**

The inland movement of saline water in coastal aquifers. Saline intrusion usually results from groundwater withdrawals and is a problem in areas such as southern California and Florida.

## **Secondary Standard**

A water quality standard of the maximum recommended concentration of substances in drinking water based on aesthetic, not health-risk criteria.

## **Sediment**

A term usually applied to material in suspension in water or recently deposited from

suspension. The word sediments is used to describe different kinds of geologic deposits:

- Sediment Type Size in inches size in millimeters
- Boulder greater than 10.8 greater than 256
- Cobble 2.52 – 10.8 64 – 256
- Very Coarse Gravel 1.26 – 2.52 32 – 64
- Coarse Gravel 0.63 – 1.26 16 – 32
- Medium Gravel 0.31 – 0.63 8 – 16
- Fine Gravel 0.16 – 0.31 4 – 8
- Very Fine Gravel 0.08 – 0.16 2 – 4
- Very Coarse Sand 0.04 – 0.08 1 – 2
- Coarse Sand 0.02 – 0.04 0.5 – 1
- Medium Sand 0.01 – 0.02 0.25 – 0.5
- Fine Sand 0.005 – 0.01 0.125 – 0.25
- Very Fine Sand 0.002 – 0.005 0.063 – 0.125
- Silt 0.0002 – 0.002 0.004 – 0.063
- Clay Less than 0.0002 Less than 0.004

### **Sedimentary Rock**

Rock formed of sediment, (1) fragments of other rock transported from their sources, (2) rocks formed by or from organisms, such as most limestone, (3) rocks formed by precipitation of chemicals. Many sedimentary rocks show distinct layering, which is the result of different types of sediment being deposited in succession.

### **Sedimentation Tanks**

Wastewater tanks in which floating wastes are skimmed off and settled solids are removed for disposal.

### **Seepage**

1. The definition is similar to that for springs, however, the movement of groundwater to the surface is often slower and generally not as concentrated as in springs. By some definitions, seepage is the process and springs are the result.
2. The slow movement of groundwater through small cracks, pores, interstices, etc., into surface water or the loss of water by infiltration into the soil from fields, canal,

ditches or from any natural stream or water body.

*See also Spring.*

### **Self-Supplied Water**

Water withdrawn from a surface or groundwater source by a user rather than being obtained from a public supply. An example would be homeowners getting their water from their own well. Fifteen million US homes have their own water well.

### **Septic Tank**

A tank (usually made of concrete) used to detain domestic wastewater to allow the settling of solids prior to distribution to a leach field for soil absorption. Most solids that are retained by septic tanks are decomposed by anaerobic bacterial action.

### **Sewage Treatment Plant**

A facility designed to receive wastewater (principally from domestic sources) and by processes such as aeration and settling, restore water quality before returning it to rivers or the ocean.

### **Sewer**

A system of underground pipes that collect and deliver wastewater to treatment facilities or streams.

### **Sinkhole**

A depression in the Earth's surface caused by collapse of overlying soils or rock into pre-existing cave systems formed by dissolving of underlying limestone, salt, or gypsum. Drainage is provided through underground channels that may be enlarged by the collapse of a cavern roof. Solution of limestone is a slow process. The creation of a sink-hole however may occur rapidly.

### **Soil Moisture**

Water occurring in the pore spaces between the soil particles in the unsaturated zone. This water is available for uptake by plants.

### **Solute**

A substance that is dissolved in another substance, thus forming a solution.



## **Solvent**

A substance that dissolves other substances, thus forming a solution. Water dissolves more substances than any other and is known as the “universal solvent.”

## **Specific Conductance**

A measure of the ability of water to conduct an electrical current and expressed in units of electrical conductance, i.e., Siemens per centimeter at 25 degrees Celsius. Specific conductance can be used for approximating the total dissolved solids content of water as an indication of the presence of ions of chemical substances.

## **Specific Capacity**

The rate of discharge of a well per unit depth of drawdown. Expressed as gallons per minute per foot, (liters per minute per meter). It is used as a measure of well efficiency. The ideal for a well is high discharge and low drawdown.

## **Specific Yield**

The ratio (%) volume of water yielded by a rock to the volume of rock. In practice some water always “sticks” to the rock and so not all the water stored in a unit volume of rock is available to flow to a well.

## **Spray Irrigation**

A common irrigation method where water is sprayed from high-pressure nozzles onto crops. In spray irrigation there is greater likelihood of water being lost to evaporation.

## **Spreading Basins**

Areas used for the purpose of recharging aquifers. Spreading basins may have to be periodically scraped to remove fine sediments that restrict rates of recharge.

## **Spring**

An area where there is a concentrated discharge of groundwater that appears as a flow of water at the surface. The distinction between springs and seepages is arbitrary. Vast amounts of groundwater discharges continuously to rivers and lakes, the majority of which occurs unseen in streambeds or as bank seepage. A “spring-fed” river may not have a visible “spring.” There are many different geologic and hydrologic circumstances that

can result in springs. Wetlands, springs, and seepages may occur where the water table intersects the land surface.

### **Storm Sewer**

A sewer that carries only surface runoff, street wash, and snow melt from the land. In a separate sewer system, storm sewers should be completely separate from those that carry domestic and commercial wastewater (sanitary sewers).

### **Stratified Drift**

Sedimentary deposits comprised of sands and gravels deposited by glacial meltwater streams. Layers of silts and clays may be interbedded among the sand and gravel layers.

### **Stream**

A general term for a body of flowing water in a natural watercourse containing water at least part of the year. In hydrology, it is generally applied to the water flowing in a natural channel as distinct from a canal.

### **Streamflow**

The water discharge that occurs in a natural channel. A more general term than runoff, streamflow may be applied to river discharge whether or not it is affected by diversion or regulation.

### **Sublimation**

Evaporation occurring directly from ice or snow without passing through the liquid state.

### **Subsidence**

A dropping of the land surface as a result of groundwater being pumped. Cracks and fissures can appear in the land. Subsidence resulting from over pumping is usually an irreversible process. Parts of eastern Texas have subsidence districts that are managed to reduce pumping and curtail subsidence. Venice and Mexico City have subsidence problems resulting from groundwater withdrawals.

### **Subsurface Water**

All water occurring beneath the earth's surface. It includes soil moisture and groundwater.

## **Surface Water**

Water that is on the Earth's surface, such as in a stream, river, lake, or reservoir.

## **Surfactant**

A substance used to reduce surface tension in a liquid. Foam surfactants are used in some drilling processes. Surfactants are also used to increase the efficiency of some groundwater remediation techniques.

## **Suspended Sediment**

Very fine soil particles that remain in suspension in water for a considerable period of time without contact with the bottom. Such material remains in suspension due to the upward components of turbulence and currents and/or by suspension.

## **Suspended Sediment Concentration**

The ratio of the mass of dry sediment in a water/sediment mixture to the mass of the water/sediment mixture. Typically expressed in milligrams of dry sediment per liter of water sediment mixture. Reducing suspended sediment is crucial for water used in recharge wells and spreading basins.

## **Swale**

A natural depression or engineered wide shallow ditch designed to temporarily store, route or filter runoff.

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# **T**

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## **Test Hole**

Test holes are typically used in applications of engineering geology whereas test wells are used in groundwater investigations to obtain information about geologic and/or hydrologic conditions. Test holes are usually drilled at a small diameter. Based on the information obtained, production wells of a larger diameter may be installed.

## **Test Well**

A well used to assess and/or test the geologic and hydraulic properties of an aquifer. A series of test wells may be drilled in order to determine the most effective location for a

(much more expensive) production well. Test wells are usually of a smaller diameter than production wells.

### **Total Dissolved Solids (TDS)**

The amount of dissolved material in water usually measured in milligrams per liter (mg/L).

### **Transmissivity**

The capacity of a rock to transmit water under pressure. The rate at which water moves through a unit width of an aquifer under a unit hydraulic gradient. The coefficient of transmissibility is the rate of flow of water, at the prevailing water temperature, in gallons per day, through a vertical strip of the aquifer one foot wide, extending the full saturated height of the aquifer under a hydraulic gradient of 100 percent. A hydraulic gradient of 100 percent means a one foot drop in head in one foot of flow distance.

### **Transpiration**

The process by which water that is absorbed by plants, usually through the roots, is evaporated into the atmosphere from the plant surface, via stomata (tiny pores) on the leaves and stems.

*See also Evapotranspiration.*

### **Tremie Pipe**

A pipe used to carry materials (usually grout) to a specific depth in a drilled hole. Tremie pipes are slowly withdrawn as the grout is placed in the well.

### **Tributary**

A smaller river or stream that flows into a larger river or stream. Usually, a number of smaller tributaries merge to form a river.

### **Turbidity**

The amount of solid particles that are suspended in water and that cause light rays shining through the water to scatter. Thus, turbidity makes the water cloudy or even opaque in extreme cases. Turbidity is measured in nephelometric turbidity units (NTU).



## **Unconfined Aquifer**

An aquifer with no confining layer between the water table and the ground surface above. Under non-pumping conditions, wells drilled in unconfined aquifers will have water levels the same as the surrounding water table elevation.

## **Unconsolidated Rock**

A rock that consists of fragments of weathered rock material (including sands, gravels and cobbles) that are not cemented to form solid rock. Alluvial deposits, glacial till, and sand dunes are typical unconsolidated rock formations.

## **Unsaturated Zone (a.k.a Vadose Zone)**

Zone in the upper layers of the soil, unconsolidated sediments, and bedrock where the pore spaces are not completely filled with water (i.e. not saturated).



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## **Vadose Water**

Sub-surface water occurring in the unsaturated zone, also called the zone of aeration.



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## **Wastewater Treatment Return Flow**

Water returned to the environment by wastewater treatment facilities.

## **Wastewater**

Water that has been used in homes, industries, and businesses that is not suitable for reuse as a drinking source unless it is treated.

## **Water Balance**

See hydrologic budget.

## **Water Quality**

A term used to describe the chemical, physical, and biological characteristics of water with respect to its suitability for a particular purpose.

## **Water Well**

An engineered device created to access subsurface water. Wells may be bored, or drilled (horizontally or vertically) or constructed as a vertical or horizontal shaft.

*See also Monitoring Well, Observation Well, Recharge, Dual Purpose Well, Test Well, Well Rehabilitation, Well Point.*

## **Well Screen**

A cylinder of steel or plastic material used to allow water to enter a well while preventing sediment or rock particles from entering the well. A screen operates something like a sieve. Well screens may be wire wrapped, louver or perforated, and can be made from different materials and at different opening sizes. The selection of well screen design and opening size may depend on characteristics of the geologic formation, required yield and the thickness of the aquifer.

*See also Grain Size.*

## **Water Table**

The water table is the upper surface of the saturated zone of an unconfined aquifer. The water table may be located at or near the land surface, or at some depth below the land surface. The depth of the water table may fluctuate seasonally throughout the year. Wetlands, springs, and seepages may occur where the water table intersects the land surface.

## **Water Cycle**

The circulation of water movement from the oceans to the atmosphere and to the Earth and return to the atmosphere through various stages or processes such as precipitation, interception, runoff, infiltration, percolation, storage, evaporation, and transportation.

*See also Hydrologic Cycle.*

## **Watershed**

The topographic area drained by a river. Watershed boundaries can be defined for the contributing area to any portion of a river system. Watershed areas can be defined for

most wetlands and include the total land area from which hydrologic input may be derived. In very flat areas, wetland watersheds are difficult to define.

*See also Drainage Basin.*

### **Well Rehabilitation**

The process of using mechanical or chemical techniques to restore declining well yield caused by biological and or chemical encrustation of well casing and/or the gravel pack or rock formations immediately adjacent to the well bore.

### **Well Sealing**

Unused wells may need to be sealed in order to protect aquifers from surface contaminants, or to prevent comingling of waters from different aquifers in the same well, or from aquifers interconnected by different wells.

*See also Abandoned Well.*

### **Well**

A hole in the ground made to gain access to an aquifer to obtain water for economic use. Wells may be dug (mostly old wells less than 50 feet deep) or drilled. Drilled water wells in solid rock are typically up to 300 feet deep. Wells in alluvial and glacial sediments are typically about 100 feet deep.

### **Well Point**

A screened cylinder (usually steel and less than 4 inches in diameter) that is driven into the ground and which can serve to access groundwater.

### **Well Development**

The application of techniques after and during the drilling process that bring the well to its maximum yield capacity and achieve maximum well efficiency.

### **Wetfall**

The deposition of pollutants on the land surface washed out of the atmospheric by precipitation. Atmospheric pollutants may also reach the ground in particulate form independent of rainfall.

### **Wetland**

An area that is inundated or saturated by surface or groundwater, supports a prevalence

of vegetation adapted for life in saturated soil conditions, and is characterized by saturated, anaerobic soils. The term “wetland” includes bogs, marshes, swamps, wet meadows and other similar areas.

### **Withdrawal**

Water removed from a ground or surface water source for use.

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## **X**

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### **Xeriscaping**

A method of landscaping that uses plants that are well adapted to the local area and are drought resistant. Xeriscaping is becoming popular as a means of water conservation.

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## **Z**

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### **Zone of Aeration**

The unsaturated zone above the water table where the pore spaces may contain a combination of air and water.

*See also Vadose Zone.*



50 Pleasant Street Suite 2, Concord, NH 03301 USA

Phone: 603-228-5444



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