What is Hydrogeology?

It is the comprehensive study of groundwater, its distribution and evolution through time and space, under regional geology.

Geohydrology studies water behavior in geological environment, according to hydraulic laws. It includes shaft hydraulic that is drilling to obtain water for different purposes and environment behavior control, according to the kind of drilled material.

Both specialties associate regional and local geologic information, superficial and subsoil to contribute optimum groundwater use in favor of sustainable development.

Water and its importance

Water is the substance that allowed human to establish in specific areas and progress in different tasks. It's the main component of living matter so it constitutes 50 to 90% of the mass of organisms.

The freezing point of water is 0 °C and the boiling point is 100 °C; to atmospheric pressure of 760 mm Hg; and a temperature of 4 °C reaches it maximum density.

Polluted water supply may contribute to the transmission of gastrointestinal diseases, such as cholera, typhoid fever, dysentery and gastroenteritis, as well as viral diseases as infectious hepatitis. Also the lack of water for personal hygiene and environmental sanitation is a contributing factor to the spread of these diseases, so it is of vital importance for all countries to conduct intensive and extensive hydrogeological studies that allow knowing precisely the distribution, quantity and quality of water available in their territorial domains to optimize the sustainable development planning.

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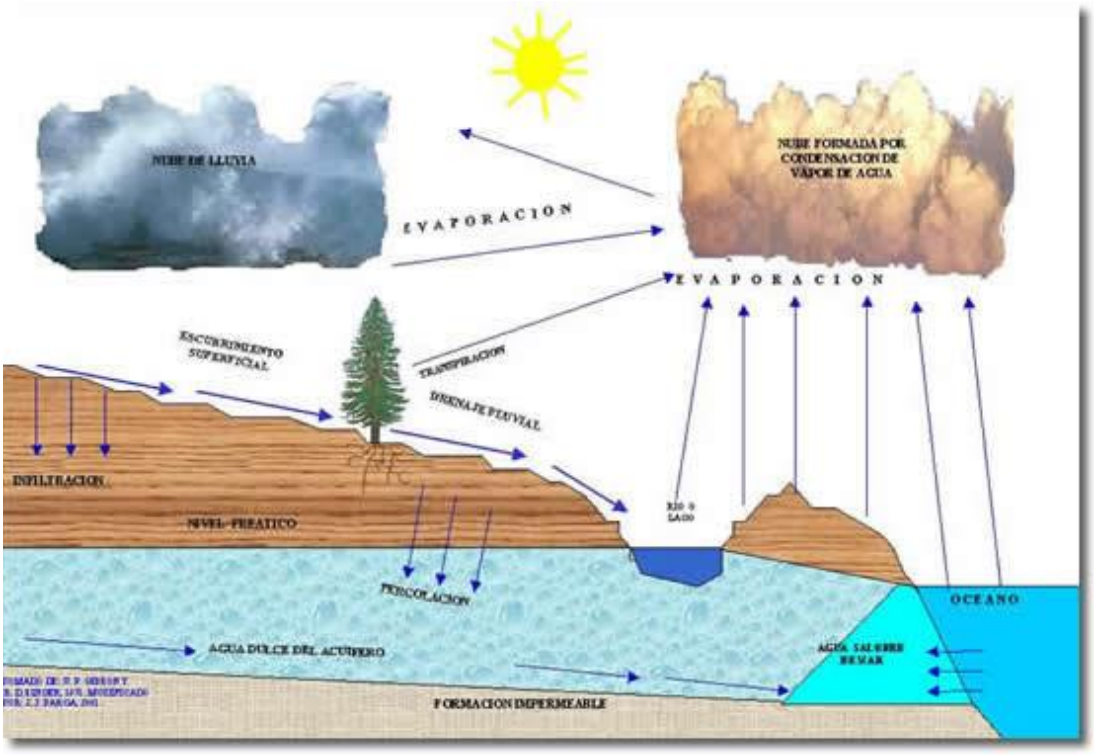
Our planet experiences a progressive decrease in the quality and availability of water. A substantial percentage of rural and urban population of the world does not have direct access to clean water. In some regions reserves have been polluted at different intensity levels with toxic chemicals.

Foregoing points out the importance of hydrology, the science that studies water distribution on Earth, its physical and chemical reactions with other substances existing in nature and its relation to life on the planet.

Water perpetual motion between Earth and atmosphere is known as hydrological cycle: water vapor is produced by evaporation at land surface and in water bodies, and transpiration of living beings. This vapor circulates through atmosphere and falls as rain or snow. In condensation and precipitation, rain or snow absorbs from the atmosphere different amounts of carbon dioxide, other gases and sometimes, radioactive substances, as well as small amounts of organic and inorganic material, which is subsequently precipitated along with water.



The water cycle

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Groundwater

Groundwater is located below the surface, confined to a pressure equal to or greater than atmospheric, saturates the rocky medium through which is moved and stored.

Liquid may arise in open spaces of lithological units such as gaps between crystals or grains, failures, joints, lithological contacts and other discontinuities and in rocks cavities caused by cooling, dissolution or weathering.

Movement and groundwater storage depend on the thickness, texture and rocks structure that constitutes the earth's crust, besides the physical ability of water to move through a permeable medium.

Also, the imbalance caused by the interaction of different forces, such as gravity and differential pressures, makes the water remains in constant motion, creating deposits which supplies wells and springs, keeping the flow of some streams during periods of drought.

The lithological units that have a greater capacity to store and provide the vital fluid are called aquifers. These may be placed near surface of earth, contained in permeable rocks or confined to deep fractured and/or failed rocks.

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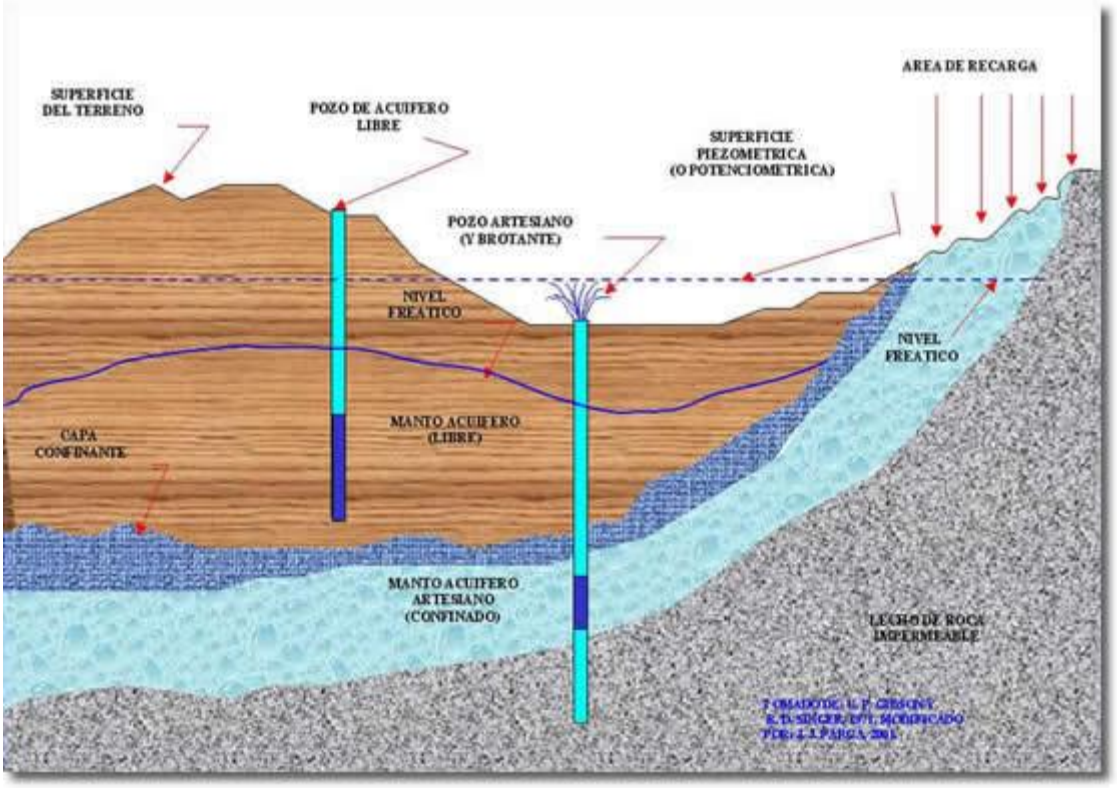

Types of layers aquifers

Aquifers are supplied or recharged by water that has fallen on the surface of earth as a result of rainfall, hail or snow, and dispersed through soil, sand, gravel and fractured rocks; so water remains stored in one or more geologic formations consisting by permeable rocks which hold back or let liquid pass.

An aquifer of uniform shape and texture and free flowing (either near the surface or in depth) takes the form of an inverted cone, known as the depression cone. This has its apex in the dynamic water level in the well during pumping, and the cone base in the static water level.

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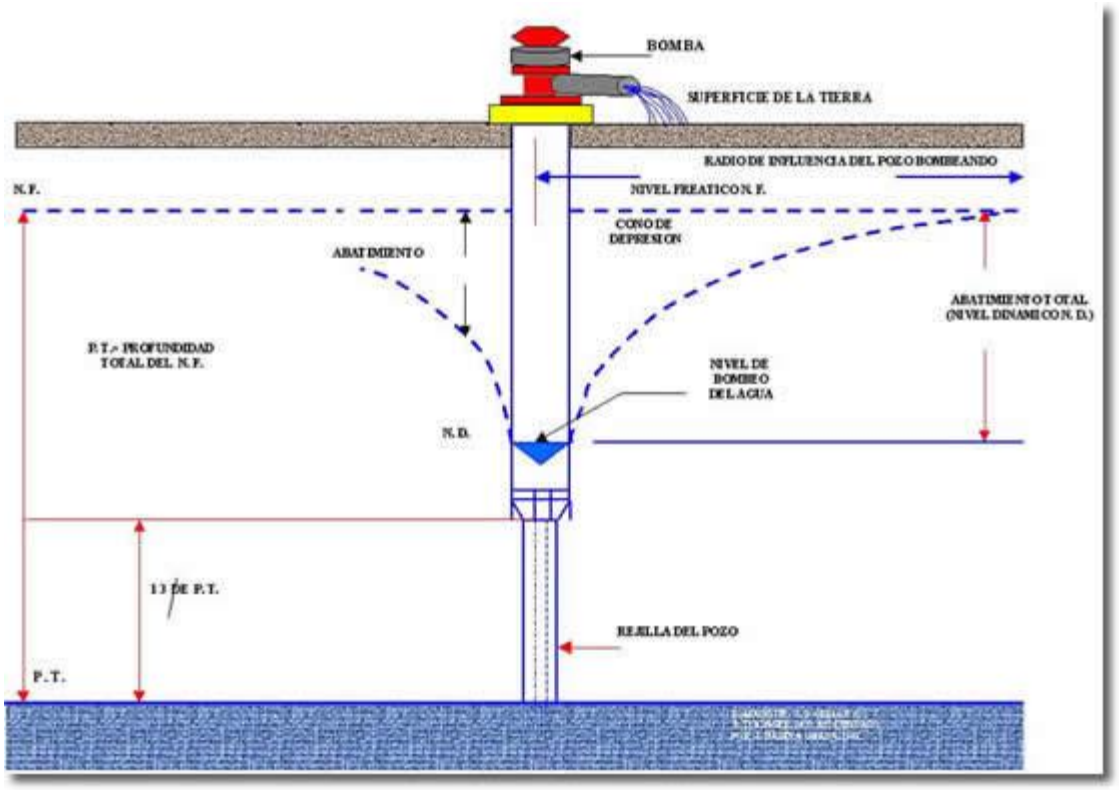

Cone of depression near a well with pump working

Groundwater is found almost everywhere, but can only be extracted in significant amounts when it accumulates abundantly when being trapped in appropriate and specific places of aquifers. It is also present in the upper portion of the soil, where it adheres, by capillary action, to the particles thereof. In this condition, it is called bound water and has different features of free water.

In its movement over and through the earth's crust, water reacts with soil and rocks minerals. Main dissolved components on surface water and groundwater are: sodium carbonates, chlorides, sulfates, potassium, calcium and magnesium.

When shallow groundwater is polluted, it may contain large amounts of nitrogen and chlorides compounds as consequent of human and animal waste. Usually water from deep wells contains only minerals in solution.

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