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| **Environmental Enlightenment #129**By Ami Adini - Reissued January 18, 2016

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| This is a SHORT, LIGHT and SIMPLE newsletter. Its purpose is to rekindle in the initiated terminology they have once learned, and enlighten the uninitiated on terms they may have heard but never known the meaning of. |
| **Aquifers**An aquifer is an underground layer of rock and sand that contains water. It is usually composed of sand, gravel, or permeable rock which lies upon a layer of clay or other impermeable material.http://amiadini.com/NewsletterArchive/160118-NL129/envEnl-129_clip_image002.jpgThe low impermeability layer is also called an **aquiclude.** In the following diagram, there is an aquiclude above and an aquiclude under the aquifer. (Ignore the other words, they’re just……, French.)In unconsolidated sediments (silts, sands and gravels), groundwater is stored in the pore spaces between loose grains of sediment.http://amiadini.com/NewsletterArchive/160118-NL129/envEnl-129_clip_image003.gif

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| The diagram across describes an aquifer that is open to the atmosphere through the soil pores. The horizontal blue line demarks the boundary between the saturated and unsaturated zones. In the saturated zone, all pore spaces are filled with water. In the unsaturated zone, there’s air in the pores which connects to the atmosphere. In this type of aquifer, the pressure above the water table is atmospheric. | Aquifer |

An **unconfined aquifer** is a subterranean layer of water found below porous layers of earth. Unconfined aquifers are more easily polluted than confined aquifers because liquid contaminants and/or water-born contaminants can seep into them unimpeded.http://amiadini.com/NewsletterArchive/160118-NL129/envEnl-129_clip_image005.jpgA **confined aquifer** is a subterranean layer of water that is bound above and below by dense layers of rock or clay. The water table is separated from the atmosphere by the impermeable layer and is *under pressure*. This type of aquifer is sometimes called an *artesian* aquifer.http://amiadini.com/NewsletterArchive/160118-NL129/envEnl-129_clip_image006.gifIf one were to insert vertical tubes, the water would rise in the tubes. If one were to insert tubes in many locations, the water would rise in each tube to an elevation determined by the pressure at that location. If the number of tubes were to be increased infinitely and the elevation points connected, they would describe a surface. We call it *Piezometric Surface* (*Piezo* in Greek is pressure). Another name is *Potentiometric Surface.*http://amiadini.com/NewsletterArchive/160118-NL129/envEnl-129_clip_image008.jpgIn the diagram below, you see a contaminated, unconfined aquifer, resting above a clean, confined aquifer. The contaminants are illustrated in brown and yellow: LNPLs are substances lighter than water, like oil, they float; DNAPL are substances heavier than water (like chlorinated solvents), they sink.http://amiadini.com/NewsletterArchive/160118-NL129/envEnl-129_clip_image010.jpgAnother unique situation is when a confining unit (such as clay) is found within the unsaturated zone and water is trapped on this forming a saturated zone above the main water table. This is termed a **perched aquifer**.http://amiadini.com/NewsletterArchive/160118-NL129/envEnl-129_clip_image012.jpgIn case of contamination, the perched groundwater would be the first to get impacted. When drilling to perched aquifers, we must recognize their nature and not pierce the confining units.In the investigation of contaminated aquifers, we exercise caution not to breach the integrity of confining layers. Where installation of wells into a confined aquifer is called for, we screen only under the confining layer. In the diagram below, the top of the confined aquifer is indicated by the groundwater level. There are five feet (not shown) of confining clay bed just above it. The well is sitting inside a hole, where the screen is totally immersed in the aquifer. The annular space above the screen is sealed with impervious bentonite (clay). We seal the annular space tight inside the confining layer to prevent passage of substances between the two aquifers.http://amiadini.com/NewsletterArchive/160118-NL129/envEnl-129_clip_image014.jpg |
| You can find past issues of our "Environmental Enlightenment" at [amiadini.com](http://www.amiadini.com/)Wealth of information about environmental site assessments in the real estate transactions and issues concerning assessment and cleanup of contamination in the subsurface soil and groundwater. |

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| Call me if you have any questions. There are **no obligations.**Ami Adini Environmental Services, Inc.Environmental Consultants & General Engineering ContractorsCalifornia Lic. #1009513 A B HAZ ASB**818-824-8102**; **mail@amiadini.com**[www.amiadini.com](http://amiadini.com/)Ami Adini is a veteran environmental practitioner with over 40 years of experience. He carries a Bachelor of Science degree (B.Sc.) in Mechanical Engineering including academic credits in Nuclear and Chemical Engineering and postgraduate education in these fields. His career includes design and construction of nuclear plant facilities, chemical processing plants and hazardous wastewater treatment systems. He is a former California Registered Environmental Assessor Levels I & II in the 1988-2012 registry that certified environmental professionals in the assessment and remediation of environmentally impacted land, and a Registered Environmental Professional (REP) since 1989 with the National Registry of Environmental Professionals (NREP). He is a California Business & Professions Code Qualifying Responsible Managing Officer (RMO) in the General Engineering Contractor classification with Hazardous Substance Removal and Asbestos certifications, and president of AMI ADINI ENVIRONMENTAL SERVICES, INC. (AAES), a general engineering contractor and consulting firm specializing in environmental site assessments, rehabilitation of contaminated sites and removal of environmental risks from real-estate transactions. (Contact Ami for a complete resume.) **AAES provides practical solutions to environmental concerns using the highest standards of ethics and integrity while providing its clients with maximum return on their investments.** |

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