THE AMERICAN WELL OWNER

☆ INFORMATION AND ADVICE ABOUT GROUND WATER, WELLS AND WATER SYSTEMS ☆

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Ground Water Information, Awareness & Education Since 1986

Home Septic System Part II - The Absorption Field

MESSAGE FROM THE PUBLISHER

One of this edition's articles deals with water well grouting. This is an important process that is involved both in the construction of a well and in the process of decommissioning and abandoning a well. Although state and local codes do vary with regard to materials to use and abandonment procedures, the overarching principal involved is the same in both cases – water quality protection.

In a new well, the objective of grouting (sealing the upper portion of the well) is to protect the underlying aquifer from any possible downward surface contamination while allowing the well to be a safe upward conduit for water from the aquifer into the home or supply system. In the case of closing-down (abandoning) an unused and no-longer needed well, the grouting process not only protects the aquifer from the surface, but by sealing completely from the bottom to the surface, also prevents possible interconnection of water within the rock layers penetrated by the well.

Most states have a well abandonment program – but unfortunately there are often no, or few, funds available to assist well owners with the costs. Properly abandoning a well can cost more than the original construction. Well owners need to be aware of unused wells on their property and on neighboring properties. A properly constructed, but unused well should not be considered a liability. Maybe it will be needed at some time in the future. However if an old well is not capable of productive use then professional abandonment is recommended.

If an abandonment job is not done properly, then it is best not to do it! [Check out the policy of your state authorities.] Torching off the top few feet of casing and sticking a rock over the old well is absolutely the wrong thing to do! Much better to clearly mark the place, add the location of the well site to your property plan, make sure that there are no potential contamination sources nearby and cover the open casing securely so that vandals or curious youngsters can't get access. Don't let it ever be covered up with soil by an enthusiastic landscaper. All well owners have a vested interest in ensuring that old wells don't become a contamination liability.

Andrew Stone

American Ground Water Trust

Part I of the Home Septic Systems described the operation of the septic tank portion of the system (*THE AMERICAN WELL OWNER Issue 2006 Number 2*). Part II provides an overview of the absorption field part of the system where the final waste water treatment process occurs before it is released back to the natural hydrologic environment.

The Soil Absorption Field

Although septic and aeration tanks remove many pollutants from waste water, further treatment is required after the effluent leaves the tank. Nitrogen compounds, residual, suspended solids, organic/inorganic materials, bacteria, and viruses still must be reduced before the effluent is considered purified.

Soil absorption systems in the leach-field remove the remaining suspended solids by filtration and reduce the contaminants by adsorption and microbial degradation. A**d**sorption is the process by which one substance adheres to the surface of another. A**b**sorption is the process by which one substance is taken in and made part of another substance. (An adsorbent material acts like a magnet, while an absorbent substance is like a sponge).

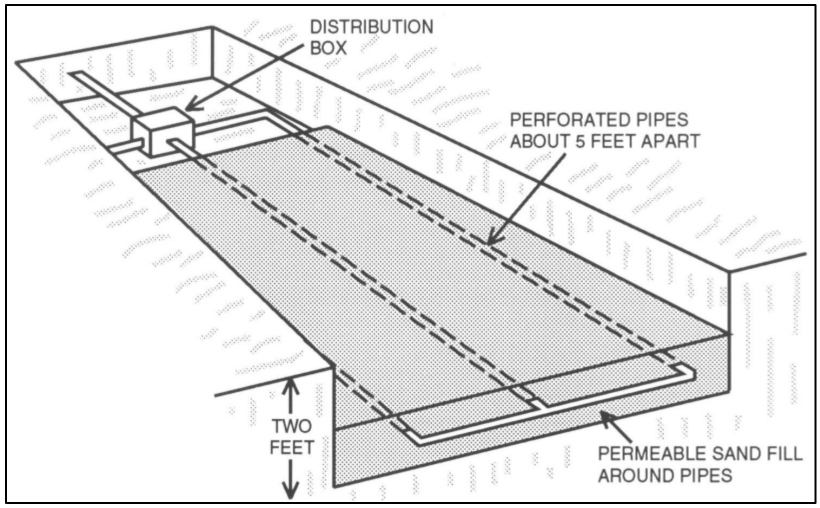
The natural action of microbes in the leach field consumes or transforms nutrients in the waste water and makes them harmless. If the volume of soil underlying a soil absorption system is great enough, all but an insignificant proportion of the pollutants (except for the nitrogen compounds) can be removed before the waste water reaches the water table.

In a septic system leach field (soil absorption

continued on page 2

Helping communities, residents, businesses and farms, that use water wells, maintain safe, reliable, cost-effective water supplies and ensure a sustainable local environment.

system) effluent flows or is pumped from the septic tank into a network of porous pipes located in trenches covered with soil and turf. The bottoms of the trenches must be level throughout their lengths, so they usually should follow ground contours.



Shallow trenches do a better job of treating waste water than do deep ones. Twelve inches of soil backfill over the porous pipes in the trench is usually enough to prevent freezing, even during harsh winters. The placement of gravel surrounding the pipes promotes even distribution of the effluent. Local builders and septic system installers will know the recommended depths and code requirements for your area.

The siting requirements for a soil absorption system depend mainly on the waste water flow rate, the effluent volume from the home, and the site conditions that affect the soil's ability to absorb, treat, and dispose of septic tank effluent (commonly called percolation). Waste water disposal via septic systems should not create a public health hazard or contaminate surface or ground water. A relatively small leach field (drain field) size may be used on sites that (1) have a stable, nearly level to gently sloping land surface not subject to flooding, (2) have at least six feet of well-drained permeable soil, free of coarse fragments, and (3) occur above the maximum expected level of ground water. Specific siting requirements will vary by State and one should consult with the local health department prior to design and installation planning.

Septic tanks should be pumped out to clear them of solids and scum every 1 to 3 years depending on the level of use. The cost of the service will vary (usually between $100 and $200) according to the volume pumped and the distance of your home from the disposal site. Failure to pump out the tank regularly can lead to excessive solids entering the leach field creating clogs and system failure.

For more information on onsite waste water disposal go to the National Small Flows Clearinghouse at: http://www.nesc.wvu.edu/nsfc/nsfc_index.htm.

What Is Water Well Grout?

Grout is a material for filling voids to stabilize structures and/ or prevent water flow. For example, tile grout is used in kitchens and bathrooms to fill in the spaces between tiles. It has many other construction applications, but none may be as important as those in well drilling.

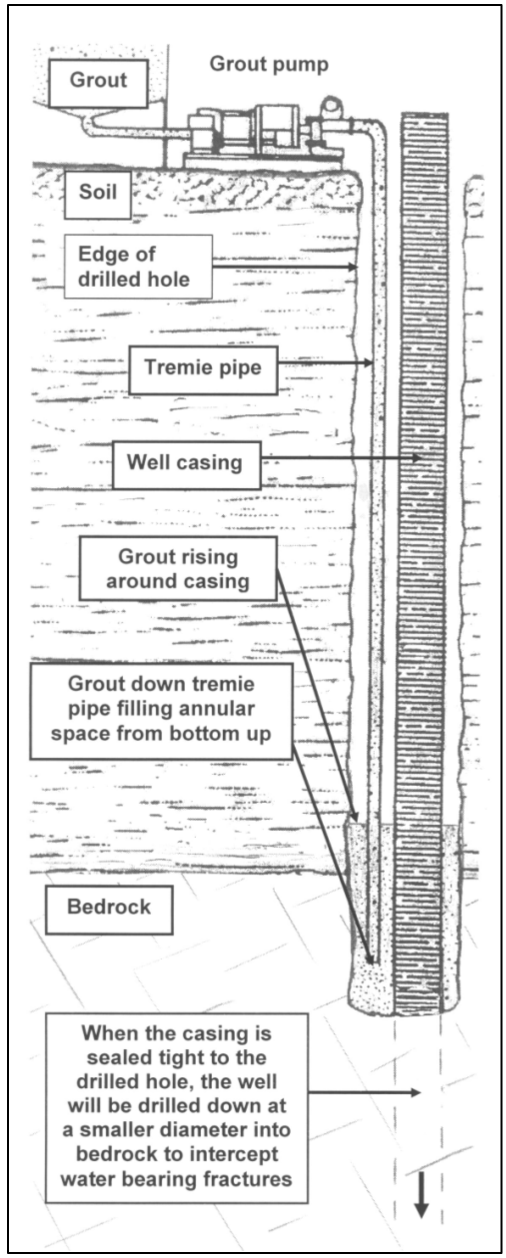
In the drilling industry grout is principally used to fill the annular space between the drilled hole and the well casing. Its primary function is to seal the borehole to prevent surface water moving down around the outside of the well casing. (see the figure on page 3)

The grout used by the well drilling contractor may be comprised of a variety of materials that are either naturally occurring (mined from the ground) and/or are manufactured synthetic substances. Natural bentonite clay (sodium hydrous aluminum silicate clay mineral) is the most commonly used grout material because of its ability to swell to many times its original volume when mixed with water. South Dakota, Wyoming and Montana have geologic deposits of this "swelling clay" that formed from the weathering of rocks and sediments of volcanic origin.

continued on page 3

WHAT IS WATER WELL GROUT?. . . continued from page 2

The diagram on the right, (adapted from a figure in “Ground Water & Wells”) shows a section of a new well. The grout is mixed into a slurry at the surface and pumped down the drilled hole to fill the space between the casing and the sides of the hole. The grout is pumped into the bottom of the hole using a tremie line (small-diameter pipe). The grout will fill up the annular space from the bottom of the casing to the ground surface. [In some states the annular space does not <u>have</u> to be filled with grout mixture. Most states do require a minimum of 20 feet of either steel or plastic casing, for water wells.]



Once the casing is sealed tight, the driller will drill the well deeper onto bedrock (lowering the drill down inside the casing) until sufficient water bearing fractures have been intercepted to provide the required water supply. The seal between the casing and the hole in the upper layers will give protection from possible surface contamination.

Another important application for grout is as a plug for abandoned wells. Many states now require that water wells that are no longer likely to be used as water-supply sources be filled up with a plug of bentonite clay or a cement-bentonite mixture. The code requirements for sealing wells vary from state to state but the intent is to protect underlying aquifers from the risk of contamination from the surface and to prevent the vertical mixing ground water from different rock layers via old wells

This method of sealing a well using a tremie pipe has the advantage of pushing any residual water and particles out of the hole as the grout mixture rises up the drilled hole and fills in the space. The slurry easily fills in any irregular pockets in the well wall and does not allow unintended spaces to form. Sealing wells is NOT a do-it-yourself job, and a professional with the right equipment and experience is recommended. A botched well sealing is worse than leaving the well marked and covered to be sealed at some future date.

DISSOLVED SILICA IN GROUND WATER. . . continued from back page

In most situations with ground water at normal temperatures in the 50 to 60^{o}F range, silica does not dissolve readily into water. The typical concentration of dissolved silica in ground water is between 1 to 30 parts per million (ppm) although some areas of the country where quartz is abundant in the local geology, levels can reach over 100 ppm. The dissolved silica type (species) is silicic acid ($Si(OH)_4$). According to the United States Environmental Protection Agency (EPA), dissolved silica does not have any known health concerns for humans. However, the presence of high amounts of dissolved silica may interfere with water treatment systems designed to remove dissolved iron and manganese. Extremely high dissolved silica concentrations may precipitate to produce scale and restrict flow within piping systems.

Although silica is a very common element in nature it is not commonly a problem for homes using ground water for household activities and drinking water supplies.

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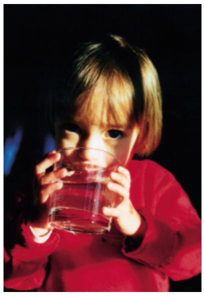

TOPICS IN UPCOMING ISSUES

- Understanding a Water Test Report
- What is a Part Per Million?
- Pesticides in Ground Water

Dissolved Silica in Ground Water

Most people know that sand is made up mostly of silica but it is not usually thought of as a potential dissolved constituent occurring in ground water or drinking water.

This photograph of Grand Prismatic Spring in Yellowstone shows sinter deposits of silica around the edge of the spring pool. Note the road at the top of the photo for scale. (Photograph – National Park Service)

Silica's common name is quartz and it is the second most abundant element on the earth. As a solid, quartz (composition: silicon dioxide, SiO_2) is a very hard usually white, opaque or creamy color (like the beach!). In rivers and streams, quartz in solid form occurs as small particles such as silt, sand or pebbles. Colloidal (micron range) size particles do not comprise a significant amount of silica in water except in hot springs and geysers. The United States Geological Survey tested the water from a spring in the Upper Geyser Basin of Yellowstone National Park and found a dissolved silica concentration of 363 parts per million at a temperature of 201°F (94°C). As it cools some of the dissolved silica turns to a solid, forming layers of silica in terraces. The name for hot-spring silica deposits is *sinter*.

continued on page 3