THE AMERICAN WELL OWNER

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

A Quarterly Publication for Well Owners - 2003 Number 4

Drugs In Your Water

MESSAGE FROM THE PUBLISHER

Think About The Environment (Every Day)

The first Earth Day occurred on 22 April 1970. The date serves as a benchmark in environmental awareness. Pollution became a word that was heard frequently in calls for the government to "do something" to restore a quality of life that was threatened by the degradation of the nation's air and water. Over the last thirty years much has been achieved, and public pressure has helped keep a focus on the long-term benefits of protected resources.

Environmental protection continues to need our constant attention. While major industrial point source pollution may have been fixed by legislation, community-by-community we need to be vigilant about the dangers from more widespread effects resulting from increased population growth. Roads, gardens, lawns and buildings all impact the hydrologic system. What we toss in our drains and what we use in our gardens or driveways can end up impacting ground water quality.

Well owners ought to have enhanced environmental awareness because the water used in their homes is pumped from the subsurface in the immediate vicinity. Community awareness of cause and effect is essential for resource protection, particularly with greater suburban building density. When did you last talk to you neighbor about your local ground water? You, your neighbor and surrounding homes have a collective vested interest in protecting your shared resource. Don't take it for granted. Visit www.privatewell.com for more information about wells and ground water.

Andrew W. Stone
American Ground Water Trust

The more we test – the more we find, is the situation with water quality investigations in our rivers, lakes and aquifers. In 2002 the United States Geological Survey published results from a study of 139 of the nation's rivers in 30 states regarding pollution from pharmaceuticals, personal care products (PPCPs) and other organic wastewater products that we use in our daily activities. These compounds may impact the endocrine systems in animals and humans. (Endocrine glands release hormones into the bloodstream that help organs function properly). Eighty percent of the sampled streams were found to have some of these substances. A study in Denmark found 191 "household substances" in the wastewater from an apartment building including surfactants, emulsifiers, fragrances & flavors, preservatives, antioxidants, softeners, plasticisers, solvents and miscellaneous compounds. All of the compounds were found at extremely low concentrations in the parts per trillion range. It is only in the last several years that advances in water testing instrumentation have made it possible to detect compounds at these very low concentrations.

The results from these studies underscore a basic environmental concept that our waste products do not "go away" when we dispose of them in our solid trash or wastewater. The sunscreens, fragrances and soaps we use are washed away in nearly the same form as directly out of the bottle. Many medicines are not totally metabolized within our bodies and may be released unaltered along with "used" medicinal compounds. Our wastewater treatment methods

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

DRUGS IN YOUR WATER . . . *continued from page 1*

(public utility or on-site septic) are not designed to remove these types of compounds from the waste stream.

Investigations are ongoing to determine the effects of these compounds at such low concentrations in aquatic habitats (fauna and flora) and on humans. It is unclear whether the compounds are potential environmental health threats at these low levels individually or as the result of synergistic effects with other compounds. Dr. Paul Westerhoff at Arizona State University reports that a glass of distilled water left in a well-ventilated office overnight will absorb detectable concentrations at the parts per billion range from products such as stimulants, antidepressants and fragrances that are being used by the office staff.

The U.S. Environmental Protection Agency has proposed a "Green Pharmacy" program that would develop regulations for the safe disposal of prescription drugs and build public awareness about not disposing of medicines down drains or toilets. So far the program is unfunded by Congress.

Once in the water, it appears likely that reverse osmosis treatment would have a high removal rate for many pharmaceuticals, personal care product substances and other potential endocrine disruptor compounds. In the meantime, we can do our part to help reduce the amounts of these compounds in our wastewater by using the products as directed and in the smallest quantities possible. Try to use "all" the product in a container before disposing in the trash. Whenever possible, use naturally occurring biodegradable compounds rather than synthetic solvent or chemically preserved products. Do not dispose of excess medicines or chemical products down drains or toilets. Be sure that your water well is constructed properly and at a safe distance from on-site septic systems.

More information:
Pharmaceuticals and Personal Care Products as Environmental Pollutants:
www.epa.gov/nerlesd1/chemistry/pharma/index.htm
USGS Toxic Substance Hydrology Program:
http://toxics.usgs.gov/regional/emc.html
Statement by the Pharmaceutical Research and Manufacturers of America
http://www.phrma.org/mediaroom/press/releases///13.03.2002.366.cfm

WELL CASING -– STEEL OR PLASTIC . . . *continued from page 4*

The corrosivity of the water is an important factor. High (alkaline) or low (acidic) pH values may be corrosive to metal pipes. Similarly, water with high levels of dissolved solids ("salts") may also be corrosive to metal pipe resulting from galvanic current (electrolysis). PVC is a thermoplastic material that is very resistant to pH corrosion, is not conductive, and therefore is not susceptible to galvanic corrosion.

Many wells are drilled through unconsolidated rock materials before reaching solid bedrock. The process of "seating" the casing into bedrock is frequently accomplished with a drive-shoe that is tightly seated before drilling continues at a smaller diameter (without casing) through the bedrock. A driller, using proper care and technique, can seat steel or PVC casing satisfactorily into bedrock.

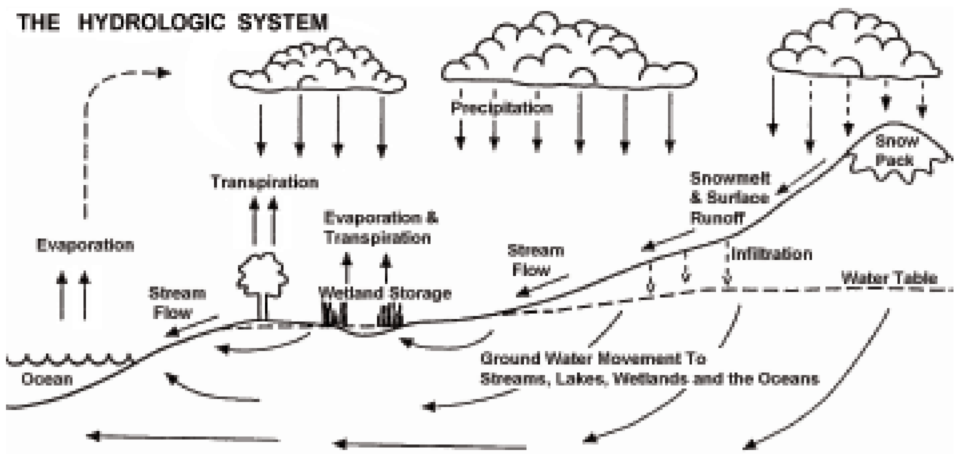
Steel casing can withstand the high temperatures generated by curing cement grout. A driller using established cooling methods to maintain a proper temperature for the casing also can grout PVC casing successfully. Bentonite clay grout (without cement) provides an excellent seal. A bentonite clay seal does not generate heat as it sets up around the casing.

Installation of well casing must avoid excessive bending or vertical (downward compressive or upward tensile stresses) that can deform or crack casing materials. Damaged casing can reduce the well's integrity and make it difficult or impossible to install pumping equipment. It may also be difficult to remove equipment for well maintenance or equipment repair if the well casing is not installed properly.

Over much of the United States, and in a wide range of geologic conditions, either steel or PVC casing is used. The question about "steel or plastic" for well casing is a decision that should be left to the professionals. Ask your driller to explain the choices to you prior to signing the contract and starting the well.

GROUND WATER MISCONCEPTIONS

We can't really see ground water except where there is a spring or a flowing artesian well. Because this resource is hidden, for some people, the existence of ground water is still mysterious. However, our knowledge of geology and our understanding of how the laws of physics work, provide explanations of how much water there is and how ground water is stored and moves in the subsurface.



The movement of water from the clouds to earth and eventually back to the clouds is called the hydrologic system [Hydrologic system is a more accurate way to describe the complexity of the pathways than hydrologic cycle]. Global surface and ground water resources are continuously moving to and from the oceans, atmosphere, plants, rivers, lakes, wetlands, estuaries, and/ or aquifers and back again. Water molecules may move as a gas, through evaporation, transpiration, sublimation [direct from ice to the atmosphere], or as a liquid, rain, rivers, ground water flow, ocean currents, or as a solid, snow hail and ice (yes, ice moves too as glaciers and icebergs).

The mistaken concept that all ground water occurs in underground lakes and rivers is based upon conditions that do sometimes occur in areas, such as Florida, where limestone rocks form aquifers. In such areas, water may flow in underground openings, such as caves and solution channels. In the vast majority of the world, however, ground water occurs in tiny fractures, fissures and spaces in rock. To work as an aquifer, rocks formations must have a sufficient number of interconnected openings (permeable material) for the water to be stored and pass through.

Much of the water in aquifers infiltrates close to where it is found. It is rare for ground water to travel great distances except in some of the major aquifers. Ground water moves very slowly through the earth, in most cases only a few inches per year. There are no underground rivers flowing with great volumes of water from "Canada to Kansas" or Michigan to Florida." However, there are some large aquifers, such as the Ogallala in the United States High Plains that do extend for hundreds of miles.

It is commonly believed that ground water and surface water are separate systems. However, consider, a stream in late summer. Although it may not have rained for several days or weeks, there may still be a considerable flow of water in the stream. This water could not have been derived from surface runoff or rainfall. The water in the stream is water that has flowed from ground water storage in the geologic formations adjacent to the stream channel. In dry periods, this ground water is 100% of the flow. In times of storm rainfall, the percentage of ground water will fall, and much of the flow will be surface runoff. As time goes on after the storm, the percentage of the flow from ground water will increase. In fact, about 40 percent of the entire combined annual river flow in the U.S. (including the Mississippi River) originates as ground water.

Some people worry that once ground water is removed it never returns. In most parts of the United States, water removed from the ground is constantly replaced through rainfall or snowmelt. Thus, ground water is a renewable resource, although in some places the rate of replenishment is very slow. If a slow rate of replenishment is exceeded by the rate of ground water pumping it is called ground water mining. If the amount of water taken from wells in a certain locality, combined with other (ecological) water demands, is less than the long-term aquifer replenishment from rainfall, pumping may be continued indefinitely without causing any harmful effects. This is called sustainable use.

Before the development of scientific techniques of ground water hydrology, the natural laws controlling water movement were unknown. This led to the idea, preserved in case law in the courts, that the occurrence and movement of water in the ground was mysterious and occult and that the principals of its behavior could not be known. In fact, using well-established natural laws of physics and thermodynamics and the relevant hydrologic data, the quantity and quality of ground water can be predicted and the effects of pumping from wells calculated. For most home wells, there is also an onsite wastewater disposal system and so virtually 100% of in-house water use is returned to the ground water system. Using ground water for lawn irrigation in summer may result in depletion of the aquifer. Our use of resources needs to be based on sustainability.

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AMERICAN GROUND WATER TRUST
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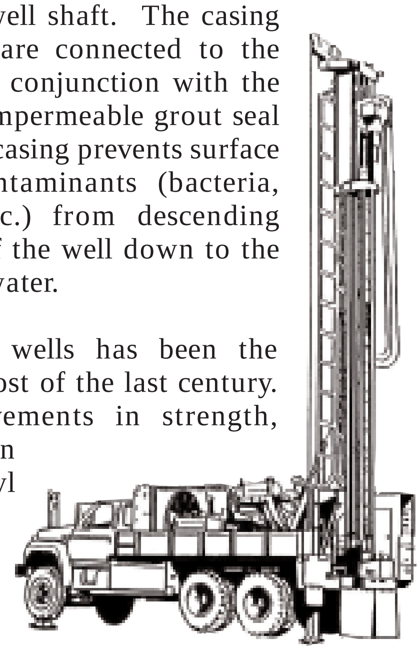
TOPICS IN UPCOMING ISSUES

- Who Owns Your Well Water?
- A Well's Cone of Depression
- How to Fix Declining Well Yield

WELL CASING - STEEL OR PLASTIC

In the grocery store we are often asked "paper or plastic?" We have a choice based on convenience and our perception of recycling benefits. However, the selection of casing for a water well is not something that can be left to consumer choice. The professionals responsible for the design and construction of a well make their decisions to use steel or plastic based on practical installation criteria, the type of equipment they will be using to construct the well, state and local code requirements and perhaps also on cost. The purpose of a well is to provide access to the aquifer. Once constructed, the well is the conduit for the pumping system that will bring water from the aquifer for use at the surface.

Casing provides support for the wall of the well so that loose rock fragments or unconsolidated sand and gravel through which the well has penetrated do not collapse into the well shaft. The casing protects the electrical wires, pull cable and water tubing/piping that are connected to the submersible pump. It also provides a vertical-cylindrical surface that in conjunction with the outer vertical wall of the drilled hole can facilitate the placement of an impermeable grout seal around the well casing. The grout seal in the annular space outside of the casing prevents surface water and potential contaminants (bacteria, fertilizers, pesticides etc.) from descending along the outside wall of the well down to the zones of stored ground water.



Steel casing for water wells has been the material of choice for most of the last century. However, with improvements in strength, durability and corrosion resistance of polyvinyl chloride (PVC) plastics over the last two decades, PVC casing has become very common as a casing material for drinking water wells.

The type of casing that will be used in a well depends on several factors including water chemistry and geology.

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