

# SPECIAL WELL CASING AREA IN OUTAGAMIE & WINNEBAGO COUNTIES

## *Arsenic in Drinking Water*

**A** "Special Well Casing Depth Area" has been established by the Wisconsin Department of Natural Resources (DNR) for all of Outagamie and Winnebago counties. This is due to naturally occurring arsenic contamination of groundwater affecting many wells in these two rapidly growing counties. High concentrations of arsenic began showing up in area wells in the late 1980s. As rural areas of the counties began to develop, more and more cases of arsenic-contaminated wells were detected. Samples from some wells contained arsenic in thousands of parts per billion (ppb), some of the highest concentrations ever found in the world.

*Between 1990 and 2000 approximately 10,000 new wells were drilled in Winnebago and Outagamie counties. Of these, over 20% contain unhealthy levels of arsenic.*



## ARSENIC IN DRINKING WATER WHERE IS IT?

*Arsenic is a naturally occurring element found throughout the world, and it is especially concentrated in this part of northeastern Wisconsin. Arsenic is associated with the bedrock aquifers of this area, primarily the St. Peter Sandstone and the Prairie du Chien Dolomite. Both of these aquifers are tapped by many water wells. The arsenic is released to well water at high concentrations when it is exposed to air, primarily through the well drilling process and through the lowering of the regional water table.*

*Over the last two decades, thousands of new wells have been drilled in Outagamie and Winnebago Counties. Increased groundwater pumping and use of these wells has lowered the water table, exposing the arsenic-rich rock to air at some locations. Fluctuating water levels and the introduction of air accelerates the chemical reactions that release arsenic, and associated metals, into the groundwater. Arsenic may contaminate well water even without the introduction of air.*

### HEALTH EFFECTS OF CONSUMING WATER WITH ARSENIC – WHAT IS THE RISK?

*Consuming water containing high concentrations of arsenic has been shown to pose a significant hazard to human health. Arsenic is recognized as a carcinogen (a cause of human cancer) by the EPA. The increased risk of developing cancer from consuming water that contains more than 10 ppb of arsenic over a lifetime is about three in one thousand. The most common types of cancer associated with consuming arsenic contaminated water are skin, bladder and lung.*

*There are also non-carcinogenic health effects from arsenic ingestion including blood vessel damage, hypertension, nerve damage, diabetes, anemia, digestive problems, and changes in the color and texture of the skin. Higher incidences of depression have also been reported by individuals who have consumed arsenic, even at concentrations less than 10 ppb.*

### ORIGINAL “ARSENIC ADVISORY AREA”

*To deal with this growing problem, the DNR established an “Arsenic Advisory Area” (AAA) in 1993. This AAA was a ten-mile wide strip that extended southwest to northeast through both counties. Within this area special well construction methods were recommended. In the 11 years since these voluntary guidelines were developed, few wells have been constructed to these standards, in part because of the expense of deeper casings. During this time, the arsenic problem has continued to worsen.*

### NEW “SPECIAL CASING DEPTH AREA”

*To proactively prevent further worsening of this problem, the DNR created a “Special Well Casing Depth Area” which includes all of Outagamie and Winnebago counties. As of October 1, 2004 all new wells drilled within these counties must be constructed, grouted, and disinfected according to more stringent standards. The DNR established this “Special Area” under the provisions of Section NR 812.12(3) of the State Private Well Code in order to:*

- ✓ *Reduce the possibility that new wells would become contaminated with concentrations of arsenic that exceed the EPA Drinking Water Standard of 10 ppb.*
- ✓ *Help protect the bedrock aquifers of this area.*

## NEW WELL CONSTRUCTION REQUIREMENTS

The new law spells out specific standards for the construction of new wells. Any private well constructed within this "Special Well Casing Depth Area" must be constructed with cement-grouted steel casing extending at least to the top of the Cambrian Sandstone formation. The Cambrian Sandstone aquifer lies below the St. Peter Sandstone. Specific well casing depths will vary across the counties, and can be found on Township-level maps that show minimum depths by quarter-section (see example in diagram A). In some eastern portions of these counties property owners have the option of constructing shallower wells; however these wells must be shallow enough to terminate in the aquifer above the sulfide mineral layers (see example in diagram B).

The deeper-cased wells must be drilled using rotary-mud circulation or cable-tool methods. These methods are preferred because less air is introduced to the subsurface during well construction. Drilling with rotary-air methods is not permitted in this region.

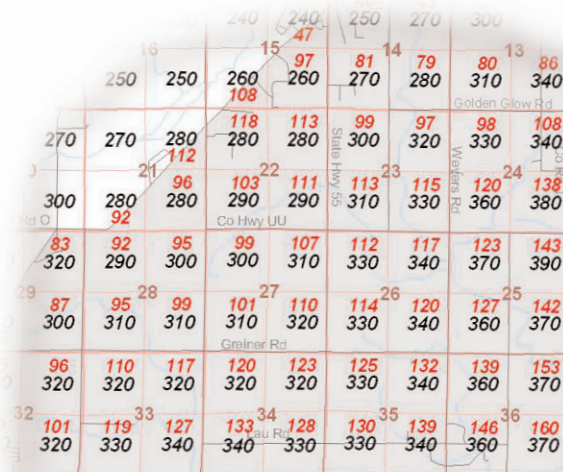
In addition, specific cement grouting methods must be used, and the grout must be mixed according to stringent DNR specifications.

Once wells are completed they must be disinfected using a liquid bleach solution with a low chlorine concentration and a short disinfectant contact time to help prevent oxidation of the sulfide minerals.

Township maps and specific details for well construction are found at:  
[www.dnr.state.wi.us/org/water/dwg/arsenic/casingrequire.htm](http://www.dnr.state.wi.us/org/water/dwg/arsenic/casingrequire.htm)



**DIAGRAM A**  
 Example of township-level map showing minimum depth by 1/4 section.



**DIAGRAM B**  
 Shallow well depth option shown in red numbers.

### BE AN INFORMED HOME BUILDER OR BUYER!

The best way to ensure you will have safe drinking water is to build or buy where municipal water is provided. If you buy an existing home with a well, have it tested for arsenic annually.

If you are building your new home, your well must be constructed to new, stringent DNR standards. Ensure that your well driller is using the required drilling methods.

## WELL COMPENSATION

Wisconsin's Well Compensation program provides financial assistance to owners of contaminated wells, including those contaminated with arsenic.

In order to be eligible for well compensation funds, the arsenic concentration in your well must be at or exceed 50 ppb (five times the Drinking Water Standard). There are also income eligibility criteria an owner must meet to be eligible. (Note: the IRS considers Well Compensation grant awards as income.)

If eligible, an owner can receive a grant to help pay for the costs of any of the following:

- ✓ A new well meeting the new, more stringent construction specifications.
- ✓ Reconstruction of an existing well to the new construction specifications.
- ✓ Connection to a nearby complying private well.
- ✓ Connection to a community water supply.
- ✓ Or, if none of the above alternatives are feasible, installation of a treatment system to remove the arsenic.



## FREQUENTLY ASKED QUESTIONS

### ***Do I have to replace my well?***

No, but often this is the best alternative if you have arsenic problems. The new special casing area does not require a private well owner to replace their well if it is contaminated. The new law only applies to the construction of new wells. However, it is recommended that current well owners test their well annually for arsenic, and take necessary treatment precautions or use an alternate source of drinking water (including new well construction) if arsenic levels test above health standards.

### ***Are there other treatment options if my well is contaminated?***

In some cases, existing wells may be treated with point-of-use systems. These are distillation or reverse osmosis systems that treat water at the faucet. Point of entry systems that treat water as it enters the house may also be used. Maintenance of treatment systems is critical to their effectiveness. Many of these systems require pre-treatment and they waste water. Consult the DNR for details of different treatment options.

### ***How often should I test my water?***

Arsenic in drinking water cannot be detected by taste, sight or smell. The only way to know the concentration of arsenic in your water is through regular testing by a state certified laboratory. Because arsenic concentrations can vary over time, annual testing is recommended. Anytime you detect a change in your water's taste, color or odor you should have the water tested. If your water tests above 10ppb for arsenic, stop drinking your water and use bottled water for drinking and food preparation. If your water tests between 5 and 10 ppb you may want to reduce your exposure by using another source of water for drinking. Your local health department can help you with options for testing your well.

### ***What options do communities have?***

There are several approaches communities can take which are outlined in Table A. Communities can encourage cluster wells or OTM (other than municipal) wells, require new subdivisions to be constructed using conservation subdivision design and cluster well options, or consider hooking up to municipal services. Water conservation and recharge protection are also important tools for maintaining safe and adequate drinking water.



## SUMMARY

In all portions of Outagamie and Winnebago Counties well drillers and property owners are required to meet the new “Special Well Casing Depth Area” well construction and disinfection specifications. In some areas where the shallow aquifer yields sufficient water (shown in gray in diagram B) a property owner may be able to get by with constructing a shallow well. Outside the gray areas shown in Diagram B, owners must obtain a variance prior to drilling a shallow well.

Well depth requirements differ across the counties, depending on the depth to the bedrock layers. This will affect the cost of your well. Table A shows various options and costs for domestic water supplies.

## WHERE TO GET MORE INFORMATION

For more information on arsenic in drinking water, contact your county UW-Extension office. For health effect questions and water testing, contact your local health department. For questions regarding the Special Casing Zone and well drilling specifications, contact your local Department of Natural Resources office.

## References & other resources:

DNR Arsenic website:

[www.dnr.state.wi.us/org/water/dwg/Arsenic/Index.htm](http://www.dnr.state.wi.us/org/water/dwg/Arsenic/Index.htm)

“Arsenic in Drinking Water.” 2000. DNR publication PUB-DG-062-00.

[www.dnr.state.wi.us/org/water/dwg/arsenic/arsbroch.pdf](http://www.dnr.state.wi.us/org/water/dwg/arsenic/arsbroch.pdf)

“Arsenic in Well Water: Understanding your test results”. 2001. Dept of Health and Family Services.

[www.dnr.state.wi.us/org/water/dwg/arsenic/AsNewsNov01.pdf](http://www.dnr.state.wi.us/org/water/dwg/arsenic/AsNewsNov01.pdf)

“Well Chlorination in Arsenic Sensitive Areas: Too much of a good thing?”. 2002. DNR.

[www.dnr.state.wi.us/org/water/dwg/WellChlorination.pdf](http://www.dnr.state.wi.us/org/water/dwg/WellChlorination.pdf)

Outagamie County Public Health Division:

[www.co.outagamie.wi.us/publichealth](http://www.co.outagamie.wi.us/publichealth)  
(920) 832-5100

Winnebago County Public Health Department

[www.co.winnebago.wi.us/health/health.htm](http://www.co.winnebago.wi.us/health/health.htm)  
(920) 232-3000

**Table A. ADVANTAGES & DISADVANTAGES OF WATER TREATMENT AND PROTECTION OPTIONS FOR INDIVIDUALS & COMMUNITIES IN ARSENIC AREAS (Winnebago & Outagamie Counties)**

<b>Option</b>	<b>Advantages</b>	<b>Disadvantages</b>	<b>Approximate Cost (if appropriate)</b>
<b>Individual Private Well</b>	<p>Effective when using mandatory Arsenic Construction specifications</p> <p>No up-front costs for the developer</p> <p>Common for rural living</p> <p>Homeowner has "control"</p>	<p>Well water testing is responsibility of the homeowner</p> <p>High initial cost due to extra casing requirements</p>	<p>\$7,000-\$17,000 per home</p>
<b>Individual Well (Shallow)</b>	<p>Less expensive because of shallow depths</p> <p>No up-front costs for developer</p> <p>Homeowner has "control"</p> <p>Common for rural living</p>	<p>Well water testing is the responsibility of the homeowner</p> <p>Only an option in certain area of the Special Casing Zone</p> <p>Requires water conservation because shallow aquifers may not provide as much water</p> <p>Well is more susceptible to contamination due to land use activities</p>	<p>\$4,000-\$7,000 per home</p>
<b>Shared/Cluster Well (2-6 homes/well)</b>	<p>Lower initial costs per home than individual well</p> <p>Effective with mandatory arsenic construction specifications</p>	<p>Large up-front costs for developer</p> <p>Well water not tested unless done so by homeowners</p> <p>All homeowners need to agree with sharing a well</p> <p>Need good contract with all homeowners</p> <p>Water use may not be proportional among homeowners</p> <p>Developer must design lots around the placement of the shared wells</p> <p>Design could alter the number of available lots</p> <p>Legal issues with the agreement to share costs activities</p>	<p>\$4,000 - \$7,000 per home</p>
<b>OTM (Other Than Municipal) Well (as defined by DNR)</b>	<p>Lower initial cost per well than an individual</p> <p>Well is regulated to ensure safe drinking water</p> <p>Effective at addressing arsenic concern for developers and buyers</p> <p>Potential to plug into future municipal system</p>	<p>Must form an association to pay for ongoing maintenance and well testing.</p> <p>Homeowner pays a water bill</p> <p>Large up-front costs for developer</p> <p>Requires fiscal feasibility for the developer. (e.g., Towns can act like a lender and offer low-interest loans that are paid off as lots are sold)</p>	<p>\$4,000 - \$6,500 per home</p>

<b>Option</b>	<b>Advantages</b>	<b>Disadvantages</b>	<b>Approximate Cost (if appropriate)</b>
<b>Removal of Arsenic with Water Treatment</b>	<p>Effective when removing low levels of arsenic</p> <p>Lower initial cost than installing a new well</p>	<p>Ineffective for higher levels of arsenic</p> <p>Additional annual maintenance and energy costs</p> <p>Ineffective if not properly maintained</p> <p>May require additional pretreatment to be effective</p> <p>Arsenic found in residuals (septic, treated water) is still bioavailable when disposed or spread on the land</p> <p>Inefficiency: RO uses 3-4 gallons to provide one gallon of drinking water</p>	<p>Initial Cost: \$4,000-\$7,000</p> <p>Annual Maintenance Cost: \$400-\$500</p>
<b>Extension of Municipal Services</b>	<p>Regulated supply of safe drinking water</p> <p>Fluoridation is available</p> <p>Reduction or elimination of aesthetic and health contaminants (iron, manganese, bacteria)</p>	<p>High cost initially to connect to municipal services</p> <p>Homeowner pays water bill</p>	<p>Initial costs vary</p>
<b>Conservation of Water</b>	<p>Reduces use of groundwater</p> <p>Reduces groundwater drawdown that leads to release of arsenic into wells</p> <p>Less stress on well and longer pump and well life</p> <p>Less cost with sewer or septic operation</p> <p>Less chance of septic system failure</p>	<p>Higher initial cost for conservation fixtures</p> <p>Effectiveness of conservation is dependent on home owner/family making behavioral changes</p> <p>May not reduce or prevent arsenic contamination unless implemented across the region</p>	
<b>Protection of Recharge Areas</b>	<p>Protects areas where rain water soaks in to recharge groundwater aquifers</p> <p>Results in more groundwater and better groundwater quality</p> <p>Results in better surface water quality due to increased base flow and reduced runoff to rivers and streams</p>	<p>May limit development in recharge protection zones</p> <p>Requires a long-range planning commitment by local government and citizens</p>	

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*May 2005*

