



## State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

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November 12, 2004

**To: Wisconsin Licensed Well Drillers**

**Subject: Modification and Clarification of Well Construction Requirements for the Arsenic "Special Well Casing Depth Area" for Outagamie & Winnebago Counties**

Dear Wisconsin Licensed Well Driller:

The Department has made additions to fourteen of the thirty-six township maps for the above "Special Well Casing Depth Area." Within the gray shaded areas on these fourteen township maps the shallow Galena-Platteville Dolomite aquifer option is allowed (Option A). On these new maps there are two sets of numbers within each  $\frac{1}{4}$  section. The new red numbers represent the maximum depth a well may extend within the upper Galena-Platteville Aquifer. As of the date of this letter, wells may be constructed to these depths within the Galena-Platteville Dolomite without a variance. Option A wells may **not** extend deeper than the red number provided within any given  $\frac{1}{4}$  section. (The original "Special Well Casing Depth Area" requirements restricted Galena-Platteville Dolomite wells to a total depth of 80 feet.)

The new maps replace the existing maps for these fourteen townships. You may discard the original maps for these townships. (The black numbers on these maps remain unchanged and represent the approximate depth to the top of the Cambrian Sandstone; the depth wells must be cased and cement-grouted under Option B. Do not discard the other twenty-two maps where only Option B is allowed.)

If your drilling firm constructs a significant number of wells in these counties, the fourteen new maps will be enclosed with this letter. If you do not typically drill wells in Outagamie and Winnebago Counties, but would like to receive a set of these maps, please let me know and I will have a set sent to you. You may also view the maps on our Department Arsenic Web site at <http://dnr.wi.gov/org/water/dwg/arsenic/recommend.htm>.

The Department revised these fourteen township maps to be able to carry out the administration of the new well construction requirements without unnecessary paperwork. We do not want to have to prepare an undue number of variances, especially as we have already seen, in the eastern portions of Outagamie and Winnebago Counties where Option A wells are allowed. Yet we need to make certain we are doing our best to prevent any worsening of the existing arsenic contamination problems within the aquifers of this area.

Several other questions have come up regarding the well construction requirements for the original "Special Well Casing Depth Area" that became effective on October 1, 2004 for private wells constructed or reconstructed within Outagamie and Winnebago Counties.

General questions were raised regarding the reasons for and the timing of the establishment of this "Special Well Casing Depth Area." The arsenic problems of Northeastern Wisconsin have presented a

new and challenging problem for our Department. The arsenic-laden mineral layers exist naturally within several of the bedrock formations of this region. This problem is not like a plume extending from a single contaminant source, like a landfill or a spill that can be pumped out of the groundwater or cleaned up in place. The arsenic has been there for a very long time; it is not going away and cannot be remediated within the formations.

Further, the fact that this area is being rapidly developed with new homes and subdivisions increases the risk that this problem could become much worse. Every new private well that is drilled into and remains open to the St. Peter and Prairie du Chien formations allows air into these formations. Oxygen in the air injected during rotary-air drilling methods and air allowed into these formations during the operation of these wells can trigger geochemical reactions that release arsenic out of the sulfide minerals imbedded in these bedrock layers. These chemical reactions are self-perpetuating and can cause arsenic concentrations to significantly increase with time.

This newly established "Special Well Casing Depth Area" for Outagamie and Winnebago Counties represents one of the most significant steps this Department has taken in many years. We established this 'area' not only to help protect the drinking water of this region but also to protect the long term safety of the aquifers that provide and store this water. This situation will call for the highest level of professionalism from the well drilling community of Wisconsin. This means you as Licensed Well Drillers will be called upon to provide meaningful field observations of the bedrock layers encountered when drilling new wells within these counties. Your observations will help us refine the depths to the various bedrock formations and thereby help us determine the necessary casing depths where this information is lacking, especially in the western portions of Outagamie County and northwestern portions of Winnebago County.

Regarding some of the more specific questions we have received in the last several weeks, we hope the answers we have provided below will help clarify these issues.

- **Question:** Are unconsolidated (sand & gravel) formation wells allowed within this new two-county "Special Well Casing Depth Area?"

**Answer:** Yes. Unconsolidated formation wells are allowed anywhere within this two-county area. You are more likely to find unconsolidated formation wells a possibility within the western portions of these counties. Unconsolidated formation wells may be constructed according to the standard well construction code requirements of Sections NR 812.10 through 812.13. This "Special Well Casing Depth Area" was established by the Department because of arsenic contamination problems within the bedrock aquifers, not because of contamination within the unconsolidated formations above the bedrock. The stringent well construction requirements for this "Special Well Casing Depth Area" apply only to bedrock wells.

- **Question:** In the western portions of Outagamie County and northwestern portions of Winnebago County many of the depth designations on the township maps are 60 feet for the depth to the top of the Cambrian Sandstone. From experience and from well construction report information provided on the Department's CD, the actual depth to bedrock is significantly deeper in many of these western townships. When we find this situation, what well construction requirements must we meet?

**Answer:** Most of the 60-foot designations on the maps in the western townships of Outagamie County and the northwestern townships of Winnebago County were extrapolated from the surface of the 'top of the Cambrian Sandstone' farther to the east. We did the maps in this manner because there are not many existing wells that extend all the way to bedrock in these townships. As a result, the

State Geological Survey has not been able to complete the mapping of the entire bedrock formations in these areas.

In many of the ¼ sections that have '60-foot' designations, the actual depth to bedrock will be significantly deeper than 60 feet. However, for bedrock wells, cement-grouted casing must extend at least to the top of the Cambrian Sandstone. In these areas, we decided not to allow simple drilling and driving of the well casing from the ground surface to the top of bedrock using percussion drilling methods. This is because, in some places, ridges of the Prairie du Chien Dolomite can be encountered above the Cambrian Sandstone. Wells left open to the Prairie du Chien Formation are more prone to arsenic contamination.

Consultation with the Department's Northeast Region's Drinking Water Program Staff is recommended prior to construction of wells -- in the areas that have 60-foot depth designations -- to help you determine the depth to the top of the Cambrian Sandstone. In the coming months, as the Geological Survey refines the mapping of this bedrock surface and as new wells are constructed down to the bedrock, we will be better able to determine the depth to the Cambrian Sandstone in these areas. This will allow us to adjust the depth designations and redo some of the township maps in western Outagamie County and northwestern Winnebago County.

- **Question:** In some areas of northwestern Outagamie County, the Cambrian Sandstone is completely eroded away so one encounters unconsolidated material overlying crystalline Precambrian bedrock. This bedrock is usually granite. If I am drilling in an area where I know the first bedrock will be granite or similar crystalline bedrock, how may I construct the well?

**Answer:** If you plan to drill at a location where the Cambrian Sandstone is likely to be missing entirely (totally eroded away) and the first bedrock you encounter is Precambrian crystalline bedrock, you have one of two choices:

- a) Attempt to construct a standard code-complying unconsolidated formation well, as described in the answer to the first question above, Or;
- b) If an unconsolidated formation well is not possible and you encounter Precambrian crystalline bedrock below unconsolidated formations, you may complete the well according to the standard bedrock construction requirements of Sections NR 812.10 through 812.12 & NR 812.14.

If you have any questions regarding these issues, please contact the Northeast Regional Headquarters in Green Bay at (920) 492-5888.

Sincerely,

Mark F. Putra, R.S. Chief  
Private Water Systems Section  
Bureau of Drinking Water & Groundwater

cc: Statewide Drinking Water & Groundwater Program Staff  
Outagamie County Health Department  
Winnebago County Health Department