The Connection

A Well Drilling Industry Newletter

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Well Installation Board News

Annetta St. Clair tendered her resignation from the board August 1, 2016. She served 18 years as a representative of the public as a private well user. Ms. St. Clair moved to the state of Oregon to be a full-time grandmother. We appreciate her service and dedication to the board and the citizens of Missouri.

The August Board meeting was canceled due to a lack of board members for a quorum. The next meeting is scheduled for November 4, 2016, in Rolla. If you are interested or know anyone willing to serve on the Well Installation Board, there are three vacancies. Vacancies are for a private well user, public well user and monitoring well installation contractor.

Well Reconstruction

Reconstruction records are required anytime the original construction of a well has been altered. Regulation 10 CSR 23-3.060 (4) specifically discusses major repair to a well to include deepening of a well, installing a liner, raising casing from below ground surface, or replacing casing above ground that was damaged. In short, any repair to a well other than pump, piping or electrical work requires a reconstruction record. If you have questions, please call the Wellhead Protection Section at 573-368-2165.

Rule Update

Rule development is progressing. Proposed revisions to rules for appeals, variances, plugging, location of wells, general protection, multifamily and high yield wells have been drafted. Drafts of the remaining sections of Chapter 3 should be completed by the end of this year. Stakeholder meetings are tentatively scheduled for spring of 2017.

Geotechnical Well or Boring

This term has been broadly used by industry to cover numerous excavations. There is much confusion and misinformation whether geotechnical holes are regulated. Some contractors or consultants will use this term in an effort to exempt a boring or other excavation from Missouri Well Construction Rules (MWCR). In reality, there are very few circumstances where an excavation or boring is exempted from MWCR. The following definition of a geotechnical well or boring will clarify what is regulated:

A geotechnical well or boring means a monitoring well used to collect or evaluate subsurface data to determine the properties of geologic materials such as type, chemical composition, compressibility, strength or structure. However, geotechnical borings for construction foundation data, wells drilled in the construction phase of piers, shafts, caissons, mini-piles, soil and rock anchors, soil and rock grouting procedures, on surface water impoundment structures, pressure relief wells, roads, buildings or other construction sites that utilize drilling within the structure to be built are exempt from the MWCR.

Soil borings are the most common type of "geotechnical hole." Soil borings are considered temporary monitoring wells that must be plugged within 30 days as required by MWCR. A plugging record and fee is required. An unrestricted permitted monitoring well installation contractor is required to perform all work for ANY type of drilling or boring that is regulated by the MWCR.

Any excavation or borehole that is exempt from MWCR should be plugged, excavated or incorporated into the construction project being built. As always, any well, boring or excavation that is less than 10 feet deep is not regulated. When in doubt if a well or boring is regulated, ask the Wellhead Protection section for clarification before drilling.

The Deepest Well Drilled in Missouri

On November 7, 1987, in Dunklin County (near Senath) Noble Drilling, under contract to the Amoco Production Company, began drilling what was to become the deepest well on record in Missouri. The well was originally drilled for exploration of oil and gas February 13, 1988. Seventy-nine days and 24 drill bits after the drilling began, the total depth of 10,089 feet was reached and the #1 Spencer Trusts Well, API #24-069-2001, was completed.

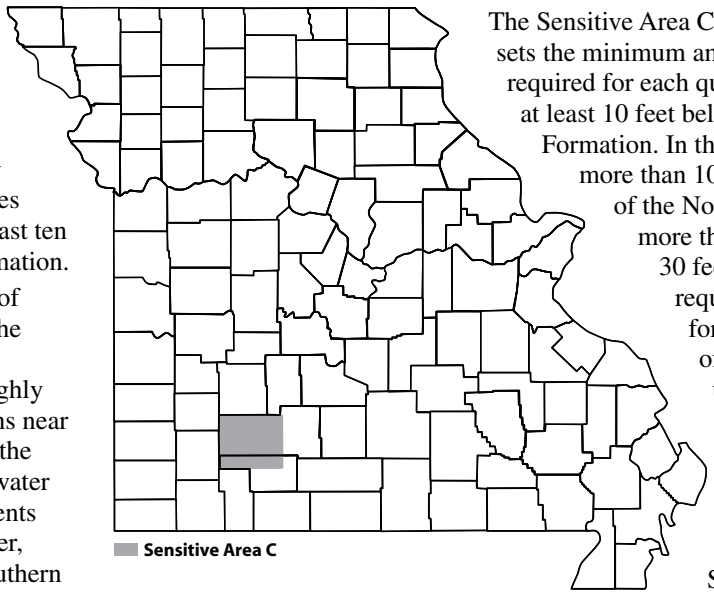
The well required 47 feet of 24" diameter surface casing, 250 feet of 16" diameter casing, 2,037 feet of 10 ¾" casing and 8,041 feet of 7 5/8" casing. A total of 3,450 sacks of cement were used to cement in the casing strings. Of this casing, 7,760 feet of the 7 5/8" casing was recovered prior to the plugging of the well, which occurred on February 21, 1988.

It is interesting to note the depth that some of the common Missouri formations were encountered in this well. All depth measurements were taken from a ground surface elevation of 250 feet above sea level. The Porters Creek Clay was found at a depth of 970 feet and extended to 1,490 feet. The McNairy Formation was encountered from 1,535 feet to 1,960 feet. The Jefferson City, Roubidoux and Gasconade formations were encountered from 1,960 feet to the base of the Gunter Sandstone Member at 5,445 feet below ground surface. The top of the Eminence Formation was reached at a depth of 5,445 feet. At 6,825 feet, the Derby-Doe Run was encountered. The Bonneterre Formation was reached at a depth of 7,680 feet, and the top of the Lamotte Sandstone Formation was reached at 9,938 feet.

Cores were taken from various depths. They and well cuttings were used to develop an assessment of oil possibilities and Cambrian (Eminence, Potosi, Derby-Doerun, Davis, Bonnterre and Lamotte formations) source potential. A copy of the log can be obtained from the Geological Survey Program by calling 573-368-2143.

Northview Formation in Sensitive Area C

Sensitive Area C, which comprises all of Greene County and the northern portion of Christian County, is underlain by heavily karsted bedrock that allows the rapid migration of pollutants within the subsurface. The combined effect of the delicate hydrologic setting and urban development of the Springfield area have necessitated the need for more strict drilling standards than those of the surrounding area. The drilling specifications for domestic wells outlined by the Missouri Well Construction Rules requires casing in Special Area C wells to be set at least ten feet below the bottom of the Northview Formation.



The Northview Formation is one of a group of low-permeability formations that comprise the Ozark Confining Unit. The Ozark Confining Unit functions as an aquitard between the highly weathered and fractured limestone formations near the surface and the formations that make up the Ozark Aquifer below. The restricted groundwater flow through the Ozark Confining Unit prevents migration of pollutants into the Ozark Aquifer, the principal water-bearing formations in southern Missouri.

The lithology of the Northview Formation within Sensitive Area C is variable. Its thickness ranges from about 5 feet in the south to 80 feet in the north. In the north, where the Northview is thickest, the lower part is a dolomitic siltstone and shale, and the upper part is a silty dolomite with several prominent siltstone beds. In the south, the Northview thins into greenish-gray silty shale. The color and texture of cuttings from the Northview Formation make it distinguishable from associated formations.

The Sensitive Area C Casing Depth Map sets the minimum amount of casing required for each quarter section to extend at least 10 feet below the Northview Formation. In the event casing extends more than 10 feet below the bottom of the Northview Formation, more than the minimum 30 feet of grout will be required to seal off the formation. Regardless of the amount of casing used, the Northview Formation must be grouted from 10 feet below to the top.

Prior to drilling in Sensitive Area C, please consult the casing depth map or call our office for the casing amount. The map is online at dnr.mo.gov/geology/geosrv/wellhd/.Observing the required casing point for each locale and installing a proper grout seal through the Northview Formation will help ensure against degradation of Missouri's groundwater quality.

Welcome Contractors

The following individuals are now part of the Missouri Department of Natural Resources' permitted contractor community:

Aecom – Katarzyna Walkowska
Amec Foster Wheeler – CeLena Clough, Robyn Kurz
Arcadis – Andrew Shelton
GSE – Nicholas Moreno
Larsen & Associates – Donald Plumb
Partner Eng & Science – Wesley Critz
Ramboll Environ – Michael Rawitch
Rockley Mechanical – William Rockley
Terracon – Kathryn Laramie

Welcome Apprentice Contractors

The following individuals are now part of the Missouri Department of Natural Resources' permitted apprentice contractor community:

Bill Matthews Pump – Roger Stevens
Dakota Technologies – Brendan Hays
Environmental Works – Christopher Meredith
Schroepfer Well Drlg – Ryann Dwyer

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A Geologist's Letter to Santa

Dear Santa,

Santa, this year all I want for Christmas are detailed driller's logs. They are so nice to have. A great deal can be learned from them, like where the first water below the casing is found. This information can be of use in a well with a recurring bacteria problem. If the casing is properly sealed, the bacteria are probably entering the well in this first water.

Also, it is helpful to know where mud zones are. If the well is producing muddy water we can be of more help to the owner in recommending a fix. Using a downhole camera sometimes does not identify a problem area, especially when the water is turbid. Detailed logs also are helpful for other drillers to know where the malevolent mud may be lurking when drilling a nearby well.

Details about the kind of rock encountered would be great! Is the rock limestone, shale, sandstone or chert? Is it white, gray, green, black, blue or tan? This adds much to the bank of general geological knowledge, and having this information can also help drillers in the field estimate about how much farther he or she may have to drill to reach a particular water-producing formation.

Several drillers routinely go into detail about the kind of rock, the color of the rock, presence of voids, how much water they encounter and at what depths. This type of information is very valuable. Most importantly, it enables us to help the driller, well owner and pump installer. For example, a concerned driller calls because he has not encountered water at the expected depth. We can check well logs from that area, and if we are fortunate enough to have detailed logs, we can tell the driller something like, "So you are at 235 feet? The logs show the Porters Creek clay down to about 245 feet. One more rod should take you into the McNairy sand." Detailed logs would enable us to tell a well owner that the reason his well is 300 feet deeper than his neighbor's well is that there is a fault between the two wells and his neighbor's well is able to produce from a shallower aquifer. Detailed logs could also help make pump installers' lives a bit easier. If the well is pumping sand, it is helpful to know where the sand layers are. Logs that say "0-45 feet, overburden; 45-350 feet, rock" don't provide sufficient helpful information.

So you see Santa, this isn't an entirely selfish wish. Many people, including drillers, pump installers and well owners benefit from detailed logs!

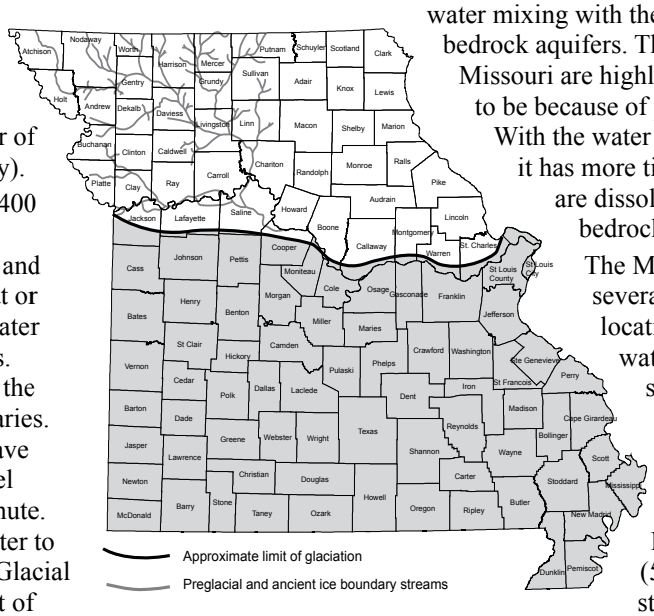
Best regards,

Your friendly geologist

Glacial Drift Aquifers of Northwest Missouri

Most of Missouri north of the Missouri River is covered by glacial drift. This is gravel, sand, silt and clay that was pushed into the state and deposited by glaciers more than 17,000 years ago. The best zones for groundwater productions are in ancient buried river channels or in areas where the drift is deep and has a thick layer of clean sand and gravel (without silt and clay).

The thickness of the glacial drift can be 0-400 feet. Well depths in the drift usually range from 100 to 250 feet deep. The clean sand and gravel that produce the water is typically at or near the bottom of the drift. The highest water yields come from the buried river channels. Many of these channels follow or are near the current Grand River channel and its tributaries. Wells constructed in these channels that have more than 100 feet of clean sand and gravel can yield 100-500 gallons of water per minute. These zones usually are used to supply water to towns, industries and irrigation purposes. Glacial deposits that have between 25 and 100 feet of clean sand generally yield 10-25 gpm. These areas are suitable for most domestic needs. Over half of northwestern Missouri (62 percent) has less than 25 feet of clean sand that yields little or no water.



The quality of the glacial drift groundwater varies over the region. Typically the water is hard and high in iron, total dissolved solids and sulfates, but is low in chlorides. The reason for the poor quality is the result of the drift aquifer's water mixing with the saline waters from the bedrock aquifers. The bedrock aquifers in northern Missouri are highly mineralized. This is thought to be because of poor recharge circulation. With the water remaining in a stagnant state, it has more time to pick up minerals that are dissolved from the surrounding bedrock.

The Missouri Geological Survey has several publications that can help in locating areas more favorable for water production. Water resource studies have been completed for many of the counties in northwestern Missouri, which aids in locating these areas. Please contact our Maps and Publications office (573-368-2125) or one of our staff members for information about ordering these publications. They also are available from the Missouri Geology store at missourigeologystore.com.

(Compiled from *Mineral and Water Resources of Missouri*, Vol. XLIII, 2nd Series, 1967; *The Stratigraphic Succession in Missouri*, Vol. XL, 2nd Series/Revised, 1995; G*roundwater Resources of Missouri*, Vol. II, 1997)

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