The Connection
A Well Drilling Industry Newletter
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Well Installation Board News

The Well Installation Board met in regular session May 20, 2016, at the Missouri Geological Survey in Rolla. Department staff presented updates regarding legislation, rule development, section activities and quarterly numbers. The online submittals for well and pump records is slowly improving. Twelve percent of the well and pump records received for the first quarter of the year were submitted online. Staff is working on draft language for Chapter 3 of the Missouri Well Construction Rules, which will be sent to management for review. It is anticipated that stakeholder meetings will be scheduled for fall 2016. Scott Kaden, Groundwater Section Chief with the Survey's Water Resources Center, gave a presentation about the groundwater observation well network. In December 2015, the department marked 16 years of providing groundwater data online in near real-time at dnr.mo.gov/geology/wrc/groundwater/gwnetwork.htm. Read more in the latest issue of Missouri Resources magazine online at dnr.mo.gov/magazine/docs/mr-summer-2016.pdf#page=27. The next board meeting is scheduled for August 19, 2016, at 10 a.m. at MGS, in the Mozarkite Room located at 1251 Gale Drive, Rolla.

Grouting Wells While Driving Casing

A number of reasons necessitate a drilling contractor to drive casing when constructing a well. Issues like loose rock, mud zones or a crooked borehole will require casing to be hammered into place.

Hammering casing may lead to another problem, which is, how can an adequate bottom 30 foot casing seal be achieved? What is the appropriate grouting method to use when hammering casing? There are instances when a contractor will add grout while hammering casing and think this is an acceptable grouting method. However, this practice is not an approved method per Missouri Well Construction Rules, because the annular space between the casing and borehole is not uniform and most likely is filled with loose rock, mud or other debris.

During past stakeholder meetings, several contractors agreed that achieving a bottom seal when adding grout while the driving casing is not guaranteed, nor did they feel grout was providing any benefit since no one knew where the grout ended up.

The older well certification forms had a check box to mark for the grouting method "as casing was driven." Since then that check box on the newer certification forms has been removed. Some contractors still add grout while driving casing. Please be advised, this grouting method is a violation of Missouri Well Construction Rules and enforcement action may be taken. If casing has to be driven, the open hole grouting method probably is the best method to ensure grout is at the bottom of the casing. Rules require if a sufficient bottom seal cannot be made that a liner must be installed and grouted, per 10 CSR 23-3.080.

Variance Request Process

Requests for verbal variances have increased in recent months. Wellhead Protection's policy is to issue a variance verbally in emergency situations only (e.g., a contractor is on site and encounters a problem). Even when a variance is issued verbally, the required variance form still must be submitted. This ensures a permanent record that the variance was requested by the contractor and verbal approval was granted by the section. Without a paper copy of the variance, there may be no way to prove that a variance was requested or approved and may appear that the contractor is in violation of the Missouri Well Construction Rules. Certification of the well may be withheld if no variance exists even though verbal approval was obtained. A paper copy of the variance is essential to protect the contractor when deviating from the rules.

In order for a variance request to be processed quickly, a contractor should provide as much information as possible. However, a variance will not be issued without the following minimum requirements:

- The type of variance requested.
- A valid reason for the request (decreasing the cost of the well system or avoiding having to redo landscaping are examples of inappropriate reasons for requesting a variance).
- The owner's name and/or company name (address also is requested but the variance can be issued in care of the contractor).
- GPS location in the proper format (dd°mm'ss.s").
- The contractor's name and/or permit number (unless variance is requested by the owner).

In most cases, variances will not be granted after a well has been drilled. With the exception of problems encountered while drilling, a variance must be requested a minimum of one week prior to starting the drilling process. Requesting a variance also does not necessarily mean that the request will be granted. If a contractor requests a variance prior to drilling and begins drilling before receiving the variance, the contractor is in violation of the Missouri Well Construction Rules (10 CSR 23). If the variance request is subsequently denied, as occasionally happens, the contractor would still be responsible for construction of the well according to the Missouri Well Construction Rules (10 CSR 23).

Please remember that all variances are site and situation specific. Therefore, the section will not issue blanket variances. If a situation and/or site are not listed on an existing variance, a new or additional variance must be requested.

A blank variance form may be obtained online at dnr.mo.gov/forms/780-1422-f.pdf, or by requesting one from staff by calling 573-368-2165.

What about Coliform Bacteria?

If disease-causing organisms are in your water, you often can't tell by how the water looks, tastes or smells. Water testing is the only way to know if your water is safe. Have your water tested once each year. Late spring or early summer is the best time to test. Keep in mind that bacterial contamination is most likely to show up during wet weather.

Indicator organisms are used to detect the presence of disease-causing organisms. For drinking water, coliform bacteria are used. Coliform bacteria are used because they are usually present in water that contains disease-causing organisms, survive longer in the aquatic environment, are relatively harmless, and are easily grown, isolated and identified. Most coliform bacteria are not disease-causing. However, some varieties are.

Generally, if coliform bacteria are determined to be present in a water sample, an additional test will (or should) be run for the presence of Escherichia coli (also known as E.coli). E. coli are coliform bacteria that occur in the digestive system of healthy warm-blooded animals. They are known to be present in large numbers in human sewage. The presence of E. coli in a water sample indicates sewage material may be present, and if sewage is present, more harmful disease-causing organisms may be present.

Water that contains disease-causing organisms could cause intestinal infections, dysentery, hepatitis, typhoid fever, cholera and other illnesses. While these diseases are not always fatal, infants, the elderly and the ill are particularly at risk.

Water is unsafe for drinking if one or more coliform bacteria are found per 100 ml (milliliters) of water sample. Counts above 2,300 are unsafe for swimming, and counts above 10,000 are unsafe for boating.

When coliform bacteria show up in a water supply system, a defective well may be the cause. Problems that can allow contamination of a well water supply include:

- Missing or defective well caps, poor seals around wires, pipes, and where caps meet casing.
- Contamination seepage through well casing. Cracks or openings in the top of the well allow contaminants in the well. This seepage is common in shallow wells constructed with concrete, clay tile or brick.
- Vertical contamination seepage along the outside of well casing. Open space around the casing should be sealed with grout when the well is constructed. Most older wells were not grouted when constructed.
- Well flooding is a common problem for wellheads located below ground in pits or on floodplains that frequently get flooded during wet weather.

During the last 35 years, well and water distribution system construction has improved to a point where bacterial contamination is not as common in newer wells. However, sometimes coliform are detected. After addressing the contamination source, the entire water system should be disinfected using shock chlorination. Shock chlorination involves placing a strong chlorine solution in the well and the complete distribution system to kill nuisance and disease-causing organisms. More than one shock chlorination treatment may be needed to effectively treat the entire water supply.

Shock chlorination is recommended: upon completion of a new well or when an existing well is returned to service, when any portion of the distribution system is opened for repairs or maintenance, following contamination by flood water or surface runoff, and when lab results indicate the presence of bacteria.

Bacterial contamination of drinking water can be a problem. A water test is the only way to evaluate whether bacteria are present in a water supply. Proper well location and construction are keys to avoiding bacterial contamination of drinking water. If contamination is present, attempt to identify and eliminate the source of contamination. In some cases, this may include reconstructing the well to seal out the problem. Then, the supply should be properly disinfected.

If the source of bacterial contamination cannot be identified and eliminated, continuous disinfection of the water supply may be necessary. This generally is the last resort after all possible construction remedies have been considered. Options for continuous disinfection include continuous chlorination, ultraviolet radiation, distillation, and ozonation. Chlorination is the most common type of continuous disinfection used.

Why Does My Well Need a GPS location?

An accurate location for wells in the state is an important part of the well certification process. The collection of Global Positioning System or GPS data can provide the most precise location information available. Reliable data is vital for the Missouri Department of Natural Resources to protect the water and other natural resources of Missouri, but most importantly, collection of GPS data is required by regulation, 10 CSR 23-3.060, and must be reported in degrees, minutes and seconds format.

An accurate GPS location is valuable in the certification of wells. In order for most wells to be certified, well and corresponding pump records are matched using GPS data and other location information. If this information is missing or inaccurate, this process may be difficult or even impossible.

With increasing technological advances, hand held GPS units have become more accurate and very affordable. Several GPS applications are available for smart phones, some for little or no cost, which makes gathering GPS coordinate data for well and pump locations very easy and economical.

The department provides several online tools that can help to ensure the accuracy of GPS coordinates for well locations. The Geographic Information System Check Location tool (dnr.mo.gov/gisutils) can be used to find the correct county; convert GPS coordinates from another format to degrees, minutes and seconds. It also provides a visual comparison to ensure that the GPS coordinates plot in the location where the well was drilled. Another useful tool is the Missouri Geological Survey Geosciences Technical Resource Assessment Tool (GeoSTRAT): dnr.mo.gov/geostrat. GeoSTRAT is useful for a variety of purposes including the search for existing wells and information in an area to confirm GPS coordinates and other location information such as legal description and county.

Sinkholes

Sinkholes are depressed or collapsed areas formed by dissolution of carbonate bedrock or collapse of underlying caves. They range in size from several square yards to hundreds of acres and may be very shallow or hundreds of feet deep. Sinkholes are part of what is called karst topography, which also includes caves, springs and losing streams.

Much of the state is underlain by carbonate bedrock that has the potential for karst development. Water moving through tiny cracks in limestone and dolomite slowly dissolves the rock and carries it away in solution. Through this process, large caves and caverns can develop in the subsurface. As rock is removed, the soil above washes into the void space. With time, sinkholes form on the surface.

While many sinkholes occur as circular, bowl shaped depressions, others are not readily visible on the surface because voids are plugged or capped with soil or thin layers of rock. The sinkholes begin with slow soil piping (erosion) over a long period. When the soil above the void can no longer support itself, it collapses to reveal a deep hole that connects to an underlying bedrock opening. These voids may be discovered during excavation, by drilling or through geophysical exploration.

Residential and commercial development in a karst area can pose environmental and logistical problems. Aside from structurally impacting foundations of homes and other buildings, sinkholes often serve as direct conduits for rapid surface water infiltration into the underlying groundwater aquifer. Contaminants near or at the surface can quickly enter the aquifer and pollute drinking water supplies. Increased stormwater runoff resulting from parking lots, highways and household guttering often is diverted into sinkholes. The increased inflow of water not only can transport contaminants but also can lead to the accelerated development and growth of sinkholes. Managing stormwater runoff and waste disposal in sinkhole-prone areas is important to maintain good groundwater quality and prevent environmental contamination.

This large sinkhole collapsed in 2006 in the Missouri town of Nixa.

Sinkholes often are tied to changes we create in the land surface. Some new sinkholes have been linked to land-use practices, especially from the pumping of groundwater and from various construction and development practices. For example, when a large lagoon or run-off storage pond is built, the substantial weight of the new construction material and water can trigger an underground collapse of the supporting material, causing a sinkhole. Sinkholes also can form when the groundwater table is lowered by human usage or droughts.

The surface sediments that cover buried cavities and openings found in the aquifer systems are delicately balanced by groundwater fluid pressure. The water below ground is actually helping to keep the ground surface in place. A drop in groundwater levels can cause an underground structural failure to occur, causing a sinkhole to form. In urbanized areas sinkholes can be hazardous as they can destroy highways and buildings.

The Missouri Geological Survey's Geological Survey Program has verified approximately 16,000 sinkholes in Missouri. Read more about sinkholes online at dnr.mo.gov/geology/geosrv/envgeo/sinkholes.htm or create a map of known sinkholes using the Survey's Missouri Geosciences Technical Resource Assessment Tool known as GeoSTRAT at dnr.mo.gov/geostrat/.

Welcome Contractors

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

Barr Engineering – Taylor Balogh
CH2M Hill – Zachary Dolebeare, Jeffrey Haberl
Environmental Resources Management – William Halley
Environmental Restoration – Daniel Baugh
Genesis Environmental – Wendy Nogle
Geosyntec Consultants – Maureen Roth
Halmick Mechanical – Samuel Halmick
Huffman Construction LLC – Joseph Russom
Jake's Backhoe & Construction – Justin Weber
Kennedy/Jenks Consultants – Clinton Wyatt
Layne Christensen – Mark Mizuta
Midwest Environmental – Ross Schmutzler
MoDNR – Rita Alexander, Amber Steele
Poultry Pump – Wayne Cannon, Brian Cannon
Stantec Consulting Corp. – Justin Olson, Joshua White
Trihydro Corp. – Kyle McDonald
Trileaf Corp. – Samuel Hoskins, Arthur Leverenz
Water Well Solutions – Jeffrey Stollhans

Welcome Apprentice Contractors

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

Brotcke Well & Pump – Anthony Harrison, Jerry Hancock, John Woody
Bulldog Drilling – Mark Baetji, Joshua Edwards
Environmental Works – Joshua Davis
Flynn Drilling – Nathan Cody, Colt Wesley, Devon Fuller, Nicklaus Shocklee, Kaleb Shocklee, Kenneth Johnley, Brad Lavy
Geothermal Experts – Kyle Guerrant
Jerry Williams Pump – Eric Bergsieker
Richard's Pump Service – David Koch
Wicker Well Drilling – Rusty Shepard, Arthur Friend

Farewell

The people addressed below are no longer permitted to operate as contractors according to the Water Well Drillers Act and Missouri Well Construction Regulations:

Brawley, David
Button, Robert

Missouri Department of Natural Resources
Missouri Geological Survey
Wellhead Protection
PO Box 250
Rolla, MO 65402-0250

PRSRT STD
U.S. POSTAGE PAID
JEFFERSON CITY, MO
PERMIT NO. 440

Wellhead Protection Section Staff
573-368-2165

Staff Website: dnr.mo.gov/geology/geosrv/wellhd/job.htm
Well Online Services: dnr.mo.gov/mowells/

- **Kyle Rollins – Section Chief**
  Management of section, regulations, policy and rulemaking.
  573-368-2171 • kyle.rollins@dnr.mo.gov
- **Justin Davis – Investigation and Remediation Unit Chief**
  Field investigation and remediation, variances, casing depths, well construction and abandonment information.
  573-368-2167 • justin.davis@dnr.mo.gov
- **Karen Smith– Processing Unit Chief**
  Information regarding pending enforcement letters, permitting and testing.
  573-368-2174 • karen.smith@dnr.mo.gov
- **MaLinda Bassett – Section Secretary**
  General information, fee letters, requests for forms and publications.
  573-368-2165 • malinda.bassett@dnr.mo.gov
- **Andrew Combs – Environmental Specialist**
  Field investigation, well plugging, heat pump records.
  573-368-2159 • andrew.combs@dnr.mo.gov
- **Airin Haselwander - Geologist**
  Public Water Systems, pilot holes, casing depths and variances.
  573-368-2196 • airin.haselwander@dnr.mo.gov
- **Eric Hohl – Technical Assistant**
  Water well construction and certification information and abandonment registration information.
  573-368-2168 • eric.hohl@dnr.mo.gov
- **Jeannie Hoyle – Permitting Clerk**
  Permitting, testing and apprentice information.
  573-368-2450 • jeannie.hoyle@dnr.mo.gov
- **Lori Miller – Correspondence Clerk**
  Matching of well and pump records, correspondence requesting information.
  573-368-2318 • lori.miller@dnr.mo.gov
- **Brad Mitchell – Geologist**
  Field investigation, well construction information, variances and casing depths.
  573-368-2116 • brad.mitchell@dnr.mo.gov
- **Matt Parker – Geologist**
  Field investigation, well construction, Special Area 2, variances and casing depths.
  573-368-2170 • matt.parker@dnr.mo.gov
- **Amber Steele – Environmental Specialist**
  Regulations, enforcement, policy, rulemaking and legislation.
  573-368-2115 amber.steele@dnr.mo.gov
- **Vacant – Office Support Assistant**
  General information, data entry and receptionist.
  573-368-2375

The Connection is published by the Missouri Department of Natural Resources' Missouri Geological Survey. Suggestions, ideas and comments concerning this newsletter are welcome. Send comments to: Missouri Department of Natural Resources' Missouri Geological Survey, Wellhead Protection Section, PO Box 250, Rolla, MO 65402-0250, phone: 573-368-2165 or fax: 573-368-2317.